

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                   | Fault<br>Code | Monitor Description                                                   | Malfunction Criteria                                                                                    | Threshold Value                                                                                                                                       | Secondary Parameters                                                                                              | Enable Conditions | Time Required                                                | MIL<br>Illum.   |
|------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------|-----------------|
| Intake<br>Camshaft<br>Actuator<br>Solenoid<br>Circuit Open<br>– Bank 1 | P0010         | Diagnoses the VVT system high side driver circuit for circuit faults. | The ECM detects that voltage is high during driver off state (indicates short to power or open circuit) | Short to power:<br>≤ 0.5 Ω impedance between signal and controller power<br>Open Circuit:<br>≥ 200 K Ω impedance between signal and controller ground | System supply voltage is within limits Output driver is commanded on, Ignition switch is in crank or run position | > 11.00 Volts     | 20 failures out of 25 samples<br>250 ms / sample, continuous | Type B, 2 Trips |

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| Component/<br>System                                    | Fault<br>Code | Monitor Description                                                                                | Malfunction Criteria                                                                                                                 | Threshold Value                                                                  | Secondary Parameters                                                                            | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                             | Time Required                                           | MIL<br>Illum.      |
|---------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|--------------------|
| Intake<br>Camshaft<br>System<br>Performance<br>– Bank 1 | P0011         | Detects a VVT system error by comparing the desired and actual cam positions when VVT is activated | Camshaft position error [absolute value of (desired position - actual position)] is compared to thresholds to determine if excessive | (Intake cam Bank 1) Cam Position Error > 5.00 deg.<br><b>(CamPosErrorLimlc1)</b> | DTC's are NOT active: P0010, IntakeCamSensorTFTKO CrankSensorTFTKO CrankIntakeCamCorrelationFA. | System Voltage > 11.00 Volts,<br>Engine is running<br>VVT is enabled<br>Desired cam position > 0<br>Power Take Off (PTO) not active<br><br>Both Desired & Measured cam positions cannot be < 5.00<br><b>(CamPosErrorLimlc1)</b> or have both > 20.00 deg.<br><b>(PerfMaxlc1)</b> .<br><br>Desired cam position cannot vary more than 4.50<br>Cam Deg for at least 1.00 sec.<br><b>(StablePositionTimeIc1)</b> | 50.00 failures out of 150.00 samples<br>100 ms / sample | Type B,<br>2 Trips |

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| Component/<br>System                                                    | Fault<br>Code | Monitor Description                                                   | Malfunction Criteria                                                                                    | Threshold Value                                                                                                                                       | Secondary Parameters                                                                                                 | Enable Conditions | Time Required                                                | MIL<br>Illum.      |
|-------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------|--------------------|
| Exhaust<br>Camshaft<br>Actuator<br>Solenoid<br>Circuit Open<br>– Bank 1 | P0013         | Diagnoses the VVT system high side driver circuit for circuit faults. | The ECM detects that voltage is high during driver off state (indicates short to power or open circuit) | Short to power:<br>≤ 0.5 Ω impedance between signal and controller power<br>Open Circuit:<br>≥ 200 K Ω impedance between signal and controller ground | System supply voltage is within limits<br>Output driver is commanded on, Ignition switch is in crank or run position | > 11.00<br>Volts  | 20 failures out of 25 samples<br>250 ms / sample, continuous | Type B,<br>2 Trips |

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| Component/<br>System                                     | Fault<br>Code | Monitor Description                                                                                | Malfunction Criteria                                                                                                                 | Threshold Value                                                                  | Secondary Parameters                                                                                      | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                            | Time Required                                            | MIL<br>Illum.      |
|----------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|--------------------|
| Exhaust<br>Camshaft<br>System<br>Performance<br>– Bank 1 | P0014         | Detects a VVT system error by comparing the desired and actual cam positions when VVT is activated | Camshaft position error [absolute value of (desired position - actual position)] is compared to thresholds to determine if excessive | (Exhaust cam Bank 1) Cam Position Error > 5.00 deg. ( <b>CamPosErrorLimEc1</b> ) | DTC's are NOT active: P0013,<br>ExhaustCamSensorTFTKO<br>CrankSensorTFTKO<br>CrankExhaustCamCorrelationFA | System Voltage > 11.00 Volts,<br>Engine is running<br>VVT is enabled<br>Desired cam position > 0<br>Power Take Off (PTO) not active<br><br>Both Desired & Measured cam positions cannot be < 5.00 deg. ( <b>CamPosErrorLimEc1</b> ) or have both > ( 20.00) ( <b>PerfMaxEc1</b> ).<br><br>Desired cam position cannot vary more than 4.50<br>Cam Deg for at least 1.00 sec. ( <b>StablePositionTimeEc1</b> ) | 100.00 failures out of 300.00 samples<br>100 ms / sample | Type B,<br>2 Trips |

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| Component/<br>System                                  | Fault<br>Code                             | Monitor Description                                                                                                                                                                                                               | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Threshold Value | Secondary Parameters                                                                                                                                 | Enable Conditions                                                                                                        | Time Required                                                                                                                                                                                                                                                                                                       | MIL<br>Illum.      |
|-------------------------------------------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Crankshaft -<br>Sprocket<br>Correlation<br>Diagnostic | P0016,<br>P0017,<br>P0018<br>and<br>P0019 | On engines with an intermediate sprocket between the crankshaft and the camshafts, this diagnostic detects a timing misalignment between the crankshaft, sprocket and camshafts that will cause all 4 camshafts to be misaligned. | Bank 1 Cam Sensor A pulses more than -6.0 crank degrees before or 9.9 crank degrees after nominal position in one cam revolution<br>+<br>Bank 1 Cam Sensor B pulses more than -5.6 crank degrees before or 9.9 crank degrees after nominal position in one cam revolution<br>+<br>Bank 2 Cam Sensor A pulses more than -6.1 crank degrees before or 9.9 crank degrees after nominal position in one cam revolution<br>+<br>Bank 2 Cam Sensor B pulses more than -7.3 crank degrees before or 9.9 crank degrees after nominal position in one cam revolution | >= 8            | Crankshaft and camshaft position signals are synchronized<br><br>Engine is Spinning<br><br>Cam phaser is in "parked" position<br><br>No Active DTCs: | P0335, P0336<br>P0340, P0341<br>P0345, P0346<br>P0365, P0366<br>P0390, P0391<br>5VoltReferenceA_FA<br>5VoltReferenceB_FA | 2 failures out of 3 tests.<br><br>A failed test is 1 out of 10 samples.<br><br>There is a delay after the first failed test to allow the camshaft position to return to the park position.<br><br>This time is defined by the table "Cam Correlation Oil Temperature Threshold".<br><br>One sample per cam rotation | Type B,<br>2 Trips |

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| Component/<br>System                                                   | Fault<br>Code | Monitor Description                                                   | Malfunction Criteria                                                                                    | Threshold Value                                                                                                                                       | Secondary Parameters                                                                                               | Enable Conditions | Time Required                                                | MIL<br>Illum.      |
|------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------|--------------------|
| Intake<br>Camshaft<br>Actuator<br>Solenoid<br>Circuit Open<br>– Bank 2 | P0020         | Diagnoses the VVT system high side driver circuit for circuit faults. | The ECM detects that voltage is high during driver off state (indicates short to power or open circuit) | Short to power:<br>≤ 0.5 Ω impedance between signal and controller power<br>Open Circuit:<br>≥ 200 K Ω impedance between signal and controller ground | System supply voltage is within limits. Output driver is commanded on, Ignition switch is in crank or run position | > 11.00<br>Volts  | 20 failures out of 25 samples<br>250 ms / sample, continuous | Type B,<br>2 Trips |

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| Component/<br>System                                    | Fault<br>Code | Monitor Description                                                                                | Malfunction Criteria                                                                                                                 | Threshold Value                                                                  | Secondary Parameters                                                                                    | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                    | Time Required                                           | MIL<br>Illum.      |
|---------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|--------------------|
| Intake<br>Camshaft<br>System<br>Performance<br>– Bank 2 | P0021         | Detects a VVT system error by comparing the desired and actual cam positions when VVT is activated | Camshaft position error [absolute value of (desired position - actual position)] is compared to thresholds to determine if excessive | (Intake cam Bank 2) Cam Position Error > 5.00 deg.<br><b>(CamPosErrorLimlc2)</b> | DTC's are NOT active: P0020,<br>IntakeCamSensorTFTKO<br>CrankSensorTFTKO<br>CrankIntakeCamCorrelationFA | System Voltage > 11.00 Volts,<br>Engine is running<br>VVT is enabled<br>Desired cam position > 0<br>Power Take Off (PTO) not active<br><br>Both Desired & Measured cam positions cannot be < 5.00 deg.<br><b>(CamPosErrorLimlc2)</b> or have both > (20.00) deg.<br><b>(PerfMaxlc2)</b> .<br><br>Desired cam position cannot vary more than 4.50<br>Cam Deg for at least 1.00 sec.<br><b>(StablePositionTimeIc2)</b> | 50.00 failures out of 150.00 samples<br>100 ms / sample | Type B,<br>2 Trips |

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| Component/<br>System                                                    | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                                                    | Threshold Value                                                                                                                                       | Secondary Parameters                                                                                                 | Enable Conditions | Time Required                                                | MIL<br>Illum.      |
|-------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------|--------------------|
| Exhaust<br>Camshaft<br>Actuator<br>Solenoid<br>Circuit Open<br>– Bank 2 | P0023         | Detects a VVT system error by monitoring the circuit for electrical integrity | The ECM detects that voltage is high during driver off state (indicates short to power or open circuit) | Short to power:<br>≤ 0.5 Ω impedance between signal and controller power<br>Open Circuit:<br>≥ 200 K Ω impedance between signal and controller ground | System supply voltage is within limits<br>Output driver is commanded on, Ignition switch is in crank or run position | > 11.00<br>Volts  | 20 failures out of 25 samples<br>250 ms / sample, continuous | Type B,<br>2 Trips |



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| Component/<br>System                                     | Fault<br>Code | Monitor Description                                                   | Malfunction Criteria                                                                                                                 | Threshold Value                                                                     | Secondary Parameters                                                                                      | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                   | Time Required                                            | MIL<br>Illum.      |
|----------------------------------------------------------|---------------|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|--------------------|
| Exhaust<br>Camshaft<br>System<br>Performance<br>– Bank 2 | P0024         | Diagnoses the VVT system high side driver circuit for circuit faults. | Camshaft position error [absolute value of (desired position - actual position)] is compared to thresholds to determine if excessive | (Exhaust cam Bank 2) Cam Position Error > 5.00 deg.<br>( <b>CamPosErrorLimEc2</b> ) | DTC's are NOT active: P0023,<br>ExhaustCamSensorTFTKO<br>CrankSensorTFTKO<br>CrankExhaustCamCorrelationFA | System Voltage > 11.00 volts,<br>Volts,<br>Engine is running<br>VVT is enabled<br>Desired cam position > 0<br>Power Take Off (PTO) not active<br><br>Both Desired & Measured cam positions cannot be < 5.00 deg.<br>( <b>CamPosErrorLimEc2</b> )<br>or have both > ( 20.00 )<br>( <b>PerfMaxEc2</b> ).<br><br>Desired cam position cannot vary more than 4.50<br>Cam Deg for at least 1.00 sec.<br>( <b>StablePositionTimeEc2</b> ) | 100.00 failures out of 300.00 samples<br>100 ms / sample | Type B,<br>2 Trips |

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| Component/<br>System                                | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                               | Threshold Value                                                                  | Secondary Parameters                | Enable Conditions                           | Time Required                                                             | MIL<br>Illum.                                                                         |
|-----------------------------------------------------|---------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| O2S Heater<br>Control<br>Circuit Bank<br>1 Sensor 1 | P0030         | Diagnoses the Heater<br>Output low side driver<br>circuit for circuit faults. | Voltage low during driver<br>off state (indicates open<br>circuit) | Open Circuit:<br>≥ 200 K Ω impedance<br>between signal and<br>controller ground. | Ignition<br>Voltage<br>Engine Speed | = Crank or Run<br>> 11.0 volts<br>> 400 RPM | 20 failures out<br>of 25 samples<br><br>250 ms / sample<br><br>Continuous | Type B,<br>2 Trips<br>Note: In<br>certain<br>controlle<br>rs P0031<br>may also<br>set |

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| Component/<br>System                                 | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                    | Threshold Value                                                                   | Secondary Parameters                | Enable Conditions                           | Time Required                                                             | MIL<br>Illum.                                                                         |
|------------------------------------------------------|---------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| O2S Heater<br>Control<br>Circuit<br>Bank1<br>Sensor1 | P0031         | Diagnoses the Heater<br>Output low side driver<br>circuit for circuit faults. | Voltage low during driver<br>off state (indicates short-<br>to-ground). | Short to ground:<br>≤ 0.5 Ω impedance<br>between signal and<br>controller ground. | Ignition<br>Voltage<br>Engine Speed | = Crank or Run<br>> 11.0 volts<br>> 400 RPM | 20 failures out<br>of 25 samples<br><br>250 ms / sample<br><br>Continuous | Type B,<br>2 Trips<br>Note: In<br>certain<br>controlle<br>rs P0030<br>may also<br>set |

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| Component/<br>System                                 | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                  | Threshold Value                                                                 | Secondary Parameters                | Enable Conditions                           | Time Required                                                             | MIL<br>Illum.      |
|------------------------------------------------------|---------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------|---------------------------------------------------------------------------|--------------------|
| O2S Heater<br>Control<br>Circuit<br>Bank1<br>Sensor1 | P0032         | Diagnoses the Heater<br>Output low side driver<br>circuit for circuit faults. | Voltage high during driver<br>on state (indicates short<br>to power). | Short to power:<br>≤ 0.5 Ω impedance<br>between signal and<br>controller power. | Ignition<br>Voltage<br>Engine Speed | = Crank or Run<br>> 11.0 volts<br>> 400 RPM | 20 failures out<br>of 25 samples<br><br>250 ms / sample<br><br>Continuous | Type B,<br>2 Trips |

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| Component/<br>System                                | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                | Threshold Value                                                                  | Secondary Parameters                | Enable Conditions                           | Time Required                                                             | MIL<br>Illum.                                                                         |
|-----------------------------------------------------|---------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| O2S Heater<br>Control<br>Circuit Bank<br>1 Sensor 2 | P0036         | Diagnoses the Heater<br>Output low side driver<br>circuit for circuit faults. | Voltage low during driver<br>off state (indicates open<br>circuit). | Open Circuit:<br>≥ 200 K Ω impedance<br>between signal and<br>controller ground. | Ignition<br>Voltage<br>Engine Speed | = Crank or Run<br>> 11.0 volts<br>> 400 RPM | 20 failures out<br>of 25 samples<br><br>250 ms / sample<br><br>Continuous | Type B,<br>2 Trips<br>Note: In<br>certain<br>controlle<br>rs P0037<br>may also<br>set |

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| Component/<br>System                                 | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                    | Threshold Value                                                                   | Secondary Parameters                | Enable Conditions                           | Time Required                                                             | MIL<br>Illum.                                                                         |
|------------------------------------------------------|---------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| O2S Heater<br>Control<br>Circuit<br>Bank1<br>Sensor2 | P0037         | Diagnoses the Heater<br>Output low side driver<br>circuit for circuit faults. | Voltage low during driver<br>off state (indicates short-<br>to-ground). | Short to ground:<br>≤ 0.5 Ω impedance<br>between signal and<br>controller ground. | Ignition<br>Voltage<br>Engine Speed | = Crank or Run<br>> 11.0 volts<br>> 400 RPM | 20 failures out<br>of 25 samples<br><br>250 ms / sample<br><br>Continuous | Type B,<br>2 Trips<br>Note: In<br>certain<br>controlle<br>rs P0036<br>may also<br>set |

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| Component/<br>System                                 | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                  | Threshold Value                                                                 | Secondary Parameters                | Enable Conditions                           | Time Required                                                             | MIL<br>Illum.      |
|------------------------------------------------------|---------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------|---------------------------------------------------------------------------|--------------------|
| O2S Heater<br>Control<br>Circuit<br>Bank1<br>Sensor2 | P0038         | Diagnoses the Heater<br>Output low side driver<br>circuit for circuit faults. | Voltage high during driver<br>on state (indicates short<br>to power). | Short to power:<br>≤ 0.5 Ω impedance<br>between signal and<br>controller power. | Ignition<br>Voltage<br>Engine Speed | = Crank or Run<br>> 11.0 volts<br>> 400 RPM | 20 failures out<br>of 25 samples<br><br>250 ms / sample<br><br>Continuous | Type B,<br>2 Trips |

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| Component/<br>System                                | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                | Threshold Value                                                                  | Secondary Parameters                | Enable Conditions                           | Time Required                                                             | MIL<br>Illum.                                                                         |
|-----------------------------------------------------|---------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| O2S Heater<br>Control<br>Circuit Bank<br>2 Sensor 1 | P0050         | Diagnoses the Heater<br>Output low side driver<br>circuit for circuit faults. | Voltage low during driver<br>off state (indicates open<br>circuit). | Open Circuit:<br>≥ 200 K Ω impedance<br>between signal and<br>controller ground. | Ignition<br>Voltage<br>Engine Speed | = Crank or Run<br>> 11.0 volts<br>> 400 RPM | 20 failures out<br>of 25 samples<br><br>250 ms / sample<br><br>Continuous | Type B,<br>2 Trips<br>Note: In<br>certain<br>controlle<br>rs P0051<br>may also<br>set |



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| Component/<br>System                                 | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                    | Threshold Value                                                                   | Secondary Parameters                | Enable Conditions                           | Time Required                                                             | MIL<br>Illum.                                                                         |
|------------------------------------------------------|---------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| O2S Heater<br>Control<br>Circuit<br>Bank2<br>Sensor1 | P0051         | Diagnoses the Heater<br>Output low side driver<br>circuit for circuit faults. | Voltage low during driver<br>off state (indicates short-<br>to-ground). | Short to ground:<br>≤ 0.5 Ω impedance<br>between signal and<br>controller ground. | Ignition<br>Voltage<br>Engine Speed | = Crank or Run<br>> 11.0 volts<br>> 400 RPM | 20 failures out<br>of 25 samples<br><br>250 ms / sample<br><br>Continuous | Type B,<br>2 Trips<br>Note: In<br>certain<br>controlle<br>rs P0050<br>may also<br>set |

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| Component/<br>System                                 | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                  | Threshold Value                                                                 | Secondary Parameters                | Enable Conditions                           | Time Required                                                             | MIL<br>Illum.      |
|------------------------------------------------------|---------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------|---------------------------------------------------------------------------|--------------------|
| O2S Heater<br>Control<br>Circuit<br>Bank2<br>Sensor1 | P0052         | Diagnoses the Heater<br>Output low side driver<br>circuit for circuit faults. | Voltage high during driver<br>on state (indicates short<br>to power). | Short to power:<br>≤ 0.5 Ω impedance<br>between signal and<br>controller power. | Ignition<br>Voltage<br>Engine Speed | = Crank or Run<br>> 11.0 volts<br>> 400 RPM | 20 failures out<br>of 25 samples<br><br>250 ms / sample<br><br>Continuous | Type B,<br>2 Trips |

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| Component/<br>System                               | Fault<br>Code | Monitor Description                                                                   | Malfunction Criteria                               | Threshold Value       | Secondary Parameters                                                                                         | Enable Conditions                                                                                                       | Time Required             | MIL<br>Illum.      |
|----------------------------------------------------|---------------|---------------------------------------------------------------------------------------|----------------------------------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------|
| HO2S<br>Heater<br>Resistance<br>Bank 1<br>Sensor 1 | P0053         | Detects an oxygen sensor heater having an incorrect or out of range resistance value. | Heater Resistance outside of the expected range of | $6.1 < \Omega < 13.4$ | No Active DTC's<br><br>Coolant – IAT Engine Soak Time<br>Coolant Temp<br>Ignition Voltage<br>Engine Run time | ECT_Sensor_FA P2610<br>IAT_SensorFA < 8.0 °C<br>> 28,800 seconds<br>-30.0 < °C < 45.0<br>< 32.0 volts<br>< 0.22 seconds | Once per valid cold start | Type B,<br>2 Trips |

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| Component/<br>System                                                                        | Fault<br>Code | Monitor Description                                                                            | Malfunction Criteria                                     | Threshold Value       | Secondary Parameters                                                                                            | Enable Conditions                                                                                                             | Time Required                | MIL<br>Illum.      |
|---------------------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------|
| HO2S<br>Heater<br>Resistance<br>Bank 1<br>Sensor 2)<br>(For Dual<br>Bank<br>Exhaust<br>Only | P0054         | Detects an oxygen<br>sensor heater having<br>an incorrect or out of<br>range resistance value. | Heater Resistance<br>outside of the expected<br>range of | $6.1 < \Omega < 13.4$ | No Active DTC's<br><br>Coolant – IAT<br>Engine Soak Time<br>Coolant Temp<br>Ignition Voltage<br>Engine Run time | ECT_Sensor_FA<br>P2610<br>IAT_SensorFA<br>< 8.0 °C<br>> 28,800 seconds<br>-30.0 < °C < 45.0<br>< 32.0 volts<br>< 0.25 seconds | Once per valid<br>cold start | Type B,<br>2 Trips |

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| Component/<br>System                                | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                | Threshold Value                                                                  | Secondary Parameters                | Enable Conditions                           | Time Required                                                             | MIL<br>Illum.                                                                         |
|-----------------------------------------------------|---------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| O2S Heater<br>Control<br>Circuit Bank<br>2 Sensor 2 | P0056         | Diagnoses the Heater<br>Output low side driver<br>circuit for circuit faults. | Voltage low during driver<br>off state (indicates open<br>circuit). | Open Circuit:<br>≥ 200 K Ω impedance<br>between signal and<br>controller ground. | Ignition<br>Voltage<br>Engine Speed | = Crank or Run<br>> 11.0 volts<br>> 400 RPM | 20 failures out<br>of 25 samples<br><br>250 ms / sample<br><br>Continuous | Type B,<br>2 Trips<br>Note: In<br>certain<br>controlle<br>rs P0057<br>may also<br>set |

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| Component/<br>System                                 | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                    | Threshold Value                                                                   | Secondary Parameters                | Enable Conditions                           | Time Required                                                             | MIL<br>Illum.                                                                         |
|------------------------------------------------------|---------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| O2S Heater<br>Control<br>Circuit<br>Bank2<br>Sensor2 | P0057         | Diagnoses the Heater<br>Output low side driver<br>circuit for circuit faults. | Voltage low during driver<br>off state (indicates short-<br>to-ground). | Short to ground:<br>≤ 0.5 Ω impedance<br>between signal and<br>controller ground. | Ignition<br>Voltage<br>Engine Speed | = Crank or Run<br>> 11.0 volts<br>> 400 RPM | 20 failures out<br>of 25 samples<br><br>250 ms / sample<br><br>Continuous | Type B,<br>2 Trips<br>Note: In<br>certain<br>controlle<br>rs P0056<br>may also<br>set |

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| Component/<br>System                                 | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                  | Threshold Value                                                                 | Secondary Parameters                | Enable Conditions                           | Time Required                                                             | MIL<br>Illum.      |
|------------------------------------------------------|---------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------|---------------------------------------------------------------------------|--------------------|
| O2S Heater<br>Control<br>Circuit<br>Bank2<br>Sensor2 | P0058         | Diagnoses the Heater<br>Output low side driver<br>circuit for circuit faults. | Voltage high during driver<br>on state (indicates short<br>to power). | Short to power:<br>≤ 0.5 Ω impedance<br>between signal and<br>controller power. | Ignition<br>Voltage<br>Engine Speed | = Crank or Run<br>> 11.0 volts<br>> 400 RPM | 20 failures out<br>of 25 samples<br><br>250 ms / sample<br><br>Continuous | Type B,<br>2 Trips |

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| Component/<br>System                               | Fault<br>Code | Monitor Description                                                                   | Malfunction Criteria                               | Threshold Value       | Secondary Parameters                                                                                            | Enable Conditions                                                                                                             | Time Required             | MIL<br>Illum.      |
|----------------------------------------------------|---------------|---------------------------------------------------------------------------------------|----------------------------------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------|
| HO2S<br>Heater<br>Resistance<br>Bank 2<br>Sensor 1 | P0059         | Detects an oxygen sensor heater having an incorrect or out of range resistance value. | Heater Resistance outside of the expected range of | $6.1 < \Omega < 13.4$ | No Active DTC's<br><br>Coolant – IAT<br>Engine Soak Time<br>Coolant Temp<br>Ignition Voltage<br>Engine Run time | ECT_Sensor_FA<br>P2610<br>IAT_SensorFA<br>< 8.0 °C<br>> 28,800 seconds<br>-30.0 < °C < 45.0<br>< 32.0 volts<br>< 0.22 seconds | Once per valid cold start | Type B,<br>2 Trips |



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| Component/<br>System                               | Fault<br>Code | Monitor Description                                                                   | Malfunction Criteria                               | Threshold Value       | Secondary Parameters                                                                                            | Enable Conditions                                                                                                             | Time Required             | MIL<br>Illum.      |
|----------------------------------------------------|---------------|---------------------------------------------------------------------------------------|----------------------------------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------|
| HO2S<br>Heater<br>Resistance<br>Bank 2<br>Sensor 2 | P0060         | Detects an oxygen sensor heater having an incorrect or out of range resistance value. | Heater Resistance outside of the expected range of | $6.1 < \Omega < 13.4$ | No Active DTC's<br><br>Coolant – IAT<br>Engine Soak Time<br>Coolant Temp<br>Ignition Voltage<br>Engine Run time | ECT_Sensor_FA<br>P2610<br>IAT_SensorFA<br>< 8.0 °C<br>> 28,800 seconds<br>-30.0 < °C < 45.0<br>< 32.0 volts<br>< 0.25 seconds | Once per valid cold start | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                               | Fault<br>Code | Monitor Description                                                                     | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Threshold Value                                                                                                                                                                                                                                                                                                                   | Secondary Parameters | Enable Conditions                                      | Time Required                                                                                                | MIL<br>Illum.      |
|----------------------------------------------------|---------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|--------------------|
| MAP / MAF /<br>Throttle<br>Position<br>Correlation | P0068         | Detect when MAP and MAF do not match estimated engine airflow as established by the TPS | <p>Difference between MAP and estimated MAP exceeds threshold (kPa), or P0651 (5 Volt Ref), or P0107 (MAP circuit low), or P0108 (MAP circuit high) have failed this key cycle, then MAP portion of diagnostic fails</p> <p>Absolute difference between MAF and estimated MAF exceed threshold (grams/sec), or P0102 (MAF circuit low), or P0103 (MAF circuit hi) have failed this key cycle, or maximum MAF versus RPM (Table) is greater than or equal to maximum MAF versus battery voltage, then MAF portion of diagnostic fails</p> | <p>Table, f(TPS). See supporting tables:<br/><b>Delta MAP Threshold f(TPS)</b></p> <p>Table, f(TPS). See supporting tables:<br/><b>Delta MAF Threshold f(TPS)</b></p> <p>Table, f(RPM). See supporting tables:<br/><b>Maximum MAF f (RPM)</b></p> <p>Table, f(Volts). See supporting tables:<br/><b>Maximum MAF f (Volts)</b></p> | Engine Speed         | <p>&gt; 800 RPM</p> <p>Run/Crank voltage &gt; 6.41</p> | <p>Continuously fail MAP and MAF portions of diagnostic for 0.1875 s</p> <p>Continuous in MAIN processor</p> | Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                               | Fault<br>Code | Monitor Description                                                | Malfunction Criteria                                                                 | Threshold Value                           | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Enable Conditions                                                                                                                                                                                                                                                                              | Time Required                                                                                                   | MIL<br>Illum.      |
|--------------------------------------------------------------------|---------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------|
| Internal Control Module SIDI High Pressure Pump min/ max authority | P0089         | This DTC Diagnoses pump control windup to its max or min authority | High Pressure Fuel Pump Delivery Angle<br><br>High Pressure Fuel Pump Delivery Angle | $\geq 240^\circ$<br><br>Or $\leq 0^\circ$ | Battery Voltage<br><br>Low Side Fuel Pressure<br><br>Engine Run Time<br><br><br><br>Barometric Pressure<br>Inlet Air Temp<br><br>Fuel Temp<br><br>Additional Enable Conditions:<br>All must be true<br>(High Pressure Pump is enabled and High Fuel pressure sensor ckt is Not (FA,FP or TFTKO) and High Pressure fuel pump ckt is Not (FA,FP or TFTKO) and Cam or Crank Sensor Not FA and IAT,IAT2,ECT Not FA and Low side Fuel Pump Relay ckt Not FA and Estimate fuel rail pressure is valid and Green Engine (In assembly plant) is not enabled and Not if low fuel condition | $\geq 11$ Volts<br><br>$> 0.275$ MPa<br><br>$\geq$ KtFHPD_t_PumpCntrlEng RunThrsh (see supporting tables) Enabled when a code clear is not active or not exiting device control Engine is not cranking<br><br>$\geq 70.0$ KPA<br>$\geq -10.0$ degC<br><br>$-10 \leq \text{Temp degC} \leq 100$ | Windup High -<br><br>750 failures out of 938 samples<br><br>Windup Low -<br><br>750 failures out of 938 Samples | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                               | Enable Conditions | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------|---------------|
|                      |               |                     |                      |                 | and<br>Low side Fuel Pump is on<br>and<br>Injector Flow Test is not<br>active and<br>Device control<br>commanded pressure is<br>false and<br>Device control pump ckt<br>enabled on is false and<br>Engine movement<br>detected is true<br>andManufacturers enable<br>counter is 0)<br>Flex Fuel Sensor Not FA<br>Ignition voltage out of<br>correlation error(P1682)<br>not active |                   |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                                                                                                                                                                                    |                   |               |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                             | Fault<br>Code | Monitor Description                                                                                   | Malfunction Criteria                                       | Threshold Value                                                           | Secondary Parameters                | Enable Conditions                                                                                                                       | Time Required                                                 | MIL<br>Illum.      |
|------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|--------------------|
| High Pressure Pump Control Solenoid Enable Low Side Open Circuit | P0090         | The DTC Diagnoses the High Pressure Pump Control Solenoid Enable Low Side Circuit for circuit faults. | Voltage low during driver off state indicates open circuit | Open Circuit:<br>≥ 200 K Ω impedance between signal and controller ground | Engine Speed<br><br>Battery Voltage | >= 50 RPM<br><br>>= 11 Volts<br><br>Not in pump device control<br>Enabled when a code clear is not active or not exiting device control | 20 failures out of 40 samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                | Fault<br>Code | Monitor Description                                                                                   | Malfunction Criteria                                          | Threshold Value                                                     | Secondary Parameters                | Enable Conditions                                                                                                                       | Time Required                                                 | MIL<br>Illum.      |
|---------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|--------------------|
| High Pressure Pump Control Solenoid Enable Low Side Short to Ground | P0091         | The DTC Diagnoses the High Pressure Pump Control Solenoid Enable Low Side Circuit for circuit faults. | Voltage low during driver off state indicates short-to-ground | Short to ground:<br>≤ 0.1 Amps between signal and controller ground | Engine Speed<br><br>Battery Voltage | >= 50 RPM<br><br>>= 11 Volts<br><br>Not in pump device control<br>Enabled when a code clear is not active or not exiting device control | 20 failures out of 40 samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                             | Fault<br>Code | Monitor Description                                                                                   | Malfunction Criteria                                         | Threshold Value                                                                        | Secondary Parameters                | Enable Conditions                                                                                                                   | Time Required                                                 | MIL<br>Illum.      |
|------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|--------------------|
| High Pressure Pump Cntrl Solenoid Enable Low Side Short to Power | P0092         | The DTC Diagnoses the High Pressure Pump Control Solenoid Enable Low Side Circuit for circuit faults. | Voltage high during driver on state indicates short to power | Short to power:<br>≤ 1.1 or 15 Amps selectable thershold based on High pressure Pump . | Engine Speed<br><br>Battery Voltage | >= 50 RPM<br>>= 11 Volts<br><br>Not in pump device control<br>Enabled when a code clear is not active or not exiting device control | 20 failures out of 40 samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                                        | Fault<br>Code | Monitor Description                                                                                          | Malfunction Criteria                                                                                                            | Threshold Value | Secondary Parameters                                                                                                                           | Enable Conditions                                                                                                                                                           | Time Required                                                                      | MIL<br>Illum.      |
|-----------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|--------------------|
| Intake Air Temperature Sensor 2 Circuit Performance (applications with humidity sensor, but no manifold temperature sensor) | P0096         | Detects an IAT2 sensor that has stuck in range by comparing to IAT and engine coolant temperature at startup | ABS(Power Up IAT - Power Up IAT2)<br><br>AND<br><br>ABS(Power Up ECT – Power Up IAT2)<br>>=<br>ABS(Power Up ECT – Power Up IAT) | > 10 deg C      | Time between current ignition cycle and the last time the engine was running<br><br>Powertrain Relay Voltage for a time<br><br>No Active DTCs: | > 28,800 seconds<br><br>>= 11.00 Volts<br>>= 0.9 seconds<br><br>PowertrainRelayFault<br>ECT_Sensor_Ckt_FA<br>IAT_SensorCircuitFA<br>MnfdTempSensorCktFA<br>HumTempSnsrCktFA | Executes once at the beginning of each ignition cycle if enable conditions are met | Type B,<br>2 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                       | Fault<br>Code | Monitor Description                                                               | Malfunction Criteria | Threshold Value            | Secondary Parameters                                          | Enable Conditions                                            | Time Required                                                      | MIL<br>Illum.      |
|--------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------|----------------------|----------------------------|---------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------|--------------------|
| Intake Air<br>Temperature<br>Sensor<br>Circuit 2 Low<br>(applications<br>with<br>humidity) | P0097         | Detects a continuous<br>short to ground or open<br>in the IAT 2 signal<br>circuit | Raw IAT 2 Input      | < 13 Hertz<br>(~-60 deg C) | Powertrain Relay Voltage<br>for a time<br><br>No Active DTCs: | >= 11.00 Volts<br>>= 0.9 seconds<br><br>PowertrainRelayFault | 40 failures out<br>of 50 samples<br><br>1 sample every<br>100 msec | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                           | Fault<br>Code | Monitor Description                                                   | Malfunction Criteria | Threshold Value             | Secondary Parameters                                          | Enable Conditions                                            | Time Required                                                      | MIL<br>Illum.      |
|------------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------|----------------------|-----------------------------|---------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------|--------------------|
| Intake Air<br>Temperature<br>Sensor<br>Circuit 2<br>High<br>(applications<br>with<br>humidity) | P0098         | Detects a continuous<br>high frequency in the<br>IAT 2 signal circuit | Raw IAT 2 Input      | > 390 Hertz<br>(~150 deg C) | Powertrain Relay Voltage<br>for a time<br><br>No Active DTCs: | >= 11.00 Volts<br>>= 0.9 seconds<br><br>PowertrainRelayFault | 40 failures out<br>of 50 samples<br><br>1 sample every<br>100 msec | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                              | Fault<br>Code | Monitor Description                                             | Malfunction Criteria                                                                                                                                                                               | Threshold Value                                      | Secondary Parameters                                          | Enable Conditions                                            | Time Required                                                             | MIL<br>Illum.      |
|-------------------------------------------------------------------|---------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------------|--------------------|
| Intake Air<br>Temperature<br>Sensor 2<br>Intermittent<br>In-Range | P0099         | Detects a noisy or erratic IAT 2 signal circuit or IAT 2 sensor | String Length<br><br>Where:<br>"String Length" = sum of<br>"Diff" calculated over<br><br>And where:<br>"Diff" = ABS(current IAT 2<br>reading - IAT 2 reading<br>from 100 milliseconds<br>previous) | > 100.00 DegC<br><br>10 consecutive IAT 2<br>samples | Powertrain Relay Voltage<br>for a time<br><br>No Active DTCs: | >= 11.00 Volts<br>>= 0.9 seconds<br><br>PowertrainRelayFault | 4 failures out of<br>5 samples<br><br>Each sample<br>takes 1.0<br>seconds | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System           | Fault<br>Code | Monitor Description                                                   | Malfunction Criteria                                                                                               | Threshold Value                                                                                                                                                                                                       | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                   | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Time Required                                                                                                                                                                                          | MIL<br>Illum.      |
|--------------------------------|---------------|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| High Pressure Start Diagnostic | P00C6         | The DTC Diagnoses the high side fuel pressure during engine cranking. | The ECM detects that the fuel pressure is not rising or has fallen beyond acceptable limits during engine cranking | <p>Pressure Fall Test:<br/>High Side Fuel Rail Pressure &lt;= Supporting Table KtFHPD_p_HPS_PressFallLoThrsh</p> <p>Pressure Rise Test:<br/>High Side Fuel Pressure &lt; Supporting Table KtFHPC_p_HighPressStart</p> | <p>Low side feed fuel pressure</p> <p>Engine Run Time<br/>Run/Crank Voltage<br/>Engine Coolant</p> <p>For each engine start, only 1 diagnostic is performed. The pressure rise test will run if High side fuel pressure is less than KtFHPC_p_HighPressStart, otherwise, the pressure fall diagnostic will run The pressure fall runs when the engine is cranking.</p> | <p>&gt;= 0 KPA</p> <p>&lt; = 0 sec<br/>&gt; 8 Volts<br/>-100 &lt;= °C &lt;= 85</p> <p>All must be true (High Pressure Pump is enabled and High Fuel pressure sensor ckt is Not (FA,FP or TFTKO) and High Pressure fuel pump ckt is Not (FA,FP or TFTKO) and Cam or Crank Sensor Not FA and IAT, IAT2 and ECT Not FA and Low side Fuel Pump Relay ckt Not FA and Estimate fuel rail pressure is valid and Green Engine (In assembly plant) is not enabled and Not if low fuel condition and Low side Fuel Pump is on and Injector Flow Test is not active and Device control commanded pressure is false and Device control pump ckt enabled on is false and Engine movement detected is true and Manufacturers enable</p> | <p>Pressure Fall Test:<br/>Injected cylinder events &gt;= Supporting Table KtFHPD_Cnt_HPS_PressFallLoThrsh</p> <p>Pressure Rise Test:<br/>Time &gt;= Supporting Table KtFHPC_t_HighPressStartTmout</p> | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                  | Enable Conditions                                                                                                                             | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Barometric Pressure<br>Inlet Air Temp | counter is 0)<br>Flex Fuel Sensor Not FA<br>Ignition voltage out of<br>correlation error(P1682)<br>not active<br>>= 70.0 KPA<br>>= -10.0 DegC |               |               |
|                      |               |                     |                      |                 |                                       |                                                                                                                                               |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                             | Fault<br>Code | Monitor Description                                                                                                                              | Malfunction Criteria                   | Threshold Value | Secondary Parameters                                                                                                                                                                                                                      | Enable Conditions                                                                                                                                                                              | Time Required                                               | MIL<br>Illum.     |
|------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-------------------|
| Intake Air Pressure Measurement System - Multiple Sensor Correlation (naturally aspirated with TIAP/Baro sensor) | P00C7         | Detects an inconsistency between pressure sensors in the induction system in which a particular sensor cannot be identified as the failed sensor | ABS(Manifold Pressure - Baro Pressure) | > 10.0 kPa      | Time between current ignition cycle and the last time the engine was running<br><br>Engine is not rotating<br><br>Manifold Pressure<br>Manifold Pressure<br>Baro Pressure<br>Baro Pressure<br><br>No Active DTCs:<br><br>No Pending DTCs: | > 409.6 seconds<br><br>>= 50.0 kPa<br><= 115.0 kPa<br>>= 50.0 kPa<br><= 115.0 kPa<br><br>EngineModeNotRunTimer Error<br>MAP_SensorFA<br>AAP_SnsrFA<br><br>MAP_SensorCircuitFP<br>AAP_SnsrCktFP | 4 failures out of 5 samples<br><br>1 sample every 12.5 msec | Type X,<br>No MIL |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                | Fault<br>Code | Monitor Description                                                                                                | Malfunction Criteria                                              | Threshold Value                                                                 | Secondary Parameters            | Enable Conditions                                                                                                                            | Time Required                                                          | MIL<br>Illum.      |
|-------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------------------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Fuel Press<br>Regulator<br>Solenoid<br>Supply<br>Voltage<br>Control<br>Circuit Open | P00C8         | The DTC Diagnoses<br>the Fuel Press<br>Regulator Solenoid<br>Supply Voltage Control<br>Circuit for circuit faults. | Voltage High during driver<br>off state indicates open<br>circuit | Open circuit:<br>≥ 200 K Ω impedance<br>between signal and<br>controller ground | Engine Speed<br>Battery Voltage | >= 50 RPM<br>>= 11 Volts<br><br>Not in pump device<br>control<br>Enabled when a code<br>clear is not active or not<br>exiting device control | 20<br>failures out of<br>40<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                               | Fault<br>Code | Monitor Description                                                                                                | Malfunction Criteria                                               | Threshold Value                                                                                 | Secondary Parameters            | Enable Conditions                                                                                                                            | Time Required                                                          | MIL<br>Illum.      |
|------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Fuel Press<br>Regulator<br>Solenoid<br>Supply<br>Voltage<br>Control<br>Circuit Low | P00C9         | The DTC Diagnoses<br>the Fuel Press<br>Regulator Solenoid<br>Supply Voltage Control<br>Circuit for circuit faults. | Voltage low during driver<br>on state indicates short to<br>ground | Short to ground:<br>≤ 1.1 or 15 Amps<br>selectable thershold<br>based on High<br>pressure Pump. | Engine Speed<br>Battery Voltage | >= 50 RPM<br>>= 11 Volts<br><br>Not in pump device<br>control<br>Enabled when a code<br>clear is not active or not<br>exiting device control | 20<br>failures out of<br>40<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                | Fault<br>Code | Monitor Description                                                                                                | Malfunction Criteria                                               | Threshold Value                                                         | Secondary Parameters            | Enable Conditions                                                                                                                            | Time Required                                                          | MIL<br>Illum.      |
|-------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Fuel Press<br>Regulator<br>Solenoid<br>Supply<br>Voltage<br>Control<br>Circuit High | P00CA         | The DTC Diagnoses<br>the Fuel Press<br>Regulator Solenoid<br>Supply Voltage Control<br>Circuit for circuit faults. | Voltage high during driver<br>on state indicates short to<br>power | Short to Power:<br>≤ 0.1 Amps between<br>signal and controller<br>power | Engine Speed<br>Battery Voltage | >= 50 RPM<br>>= 11 Volts<br><br>Not in pump device<br>control<br>Enabled when a code<br>clear is not active or not<br>exiting device control | 20<br>failures out of<br>40<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                               | Fault<br>Code | Monitor Description                                                              | Malfunction Criteria                                                                                                                               | Threshold Value                                          | Secondary Parameters                                                                                                                                                      | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Time Required                                                     | MIL<br>Illum.      |
|--------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|--------------------|
| Mass Air<br>Flow System<br>Performance<br>(naturally<br>aspirated) | P0101         | Determines if the MAF<br>sensor is stuck within<br>the normal operating<br>range | Filtered Throttle Model<br>Error<br>AND<br>ABS(Measured Flow –<br>Modeled Air Flow) Filtered<br>AND<br>ABS(Measured MAP –<br>MAP Model 2) Filtered | <= 350 kPa*(g/s)<br><br>> 20 grams/sec<br><br>> 20.0 kPa | Engine Speed<br>Engine Speed<br>Coolant Temp<br>Coolant Temp<br>Intake Air Temp<br>Intake Air Temp<br>Minimum total weight<br>factor (all factors<br>multiplied together) | >= 500 RPM<br><= 6,800 RPM<br>>= -7 Deg C<br><= 126 Deg C<br>>= -20 Deg C<br><= 125 Deg C<br><br>>= 0.50<br><br>Filtered Throttle Model<br>Error multiplied by TPS<br>Residual Weight Factor<br>based on RPM<br><br>Modeled Air Flow Error<br>multiplied by MAF<br>Residual Weight Factor<br>based on RPM and MAF<br>Residual Weight Factor<br>based on MAF Est<br><br>MAP Model 2 Error<br>multiplied by MAP2<br>Residual Weight Factor<br>based on RPM<br><br>See "Residual Weight<br>Factor" tables.<br><br>MAP_SensorCircuitFA<br>EGRValvePerformance_F<br>A<br>MAF_SensorCircuitFA<br>CrankSensor_FA<br>ECT_Sensor_FA<br>IAT_SensorFA<br><br>EGRValve_FP<br>ECT_Sensor_Ckt_FP<br>IAT_SensorCircuitFP | Continuous<br><br>Calculation are<br>performed every<br>12.5 msec | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                | Fault<br>Code | Monitor Description                                                                        | Malfunction Criteria | Threshold Value                 | Secondary Parameters                                                                               | Enable Conditions                                                  | Time Required                                                               | MIL<br>Illum.      |
|-----------------------------------------------------|---------------|--------------------------------------------------------------------------------------------|----------------------|---------------------------------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------|
| Mass Air<br>Flow Sensor<br>Circuit Low<br>Frequency | P0102         | Detects a continuous short to low or a open in either the signal circuit or the MAF sensor | MAF Output           | <= 800 Hertz<br>(~ 1.65 gm/sec) | Engine Run Time<br>Engine Speed<br>Ignition Voltage<br>Above criteria present for a period of time | > 0.0 seconds<br>>= 300 RPM<br>>= 10.0 Volts<br><br>>= 1.0 seconds | 300 failures out of 375 samples<br><br>1 sample every cylinder firing event | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                 | Fault<br>Code | Monitor Description                                       | Malfunction Criteria | Threshold Value                     | Secondary Parameters                                                                                  | Enable Conditions                                                  | Time Required                                                                        | MIL<br>Illum.      |
|------------------------------------------------------|---------------|-----------------------------------------------------------|----------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------|
| Mass Air<br>Flow Sensor<br>Circuit High<br>Frequency | P0103         | Detects a high<br>frequency output from<br>the MAF sensor | MAF Output           | >= 14,500 Hertz<br>(~ 770.0 gm/sec) | Engine Run Time<br>Engine Speed<br>Ignition Voltage<br>Above criteria present for<br>a period of time | > 0.0 seconds<br>>= 300 RPM<br>>= 10.0 Volts<br><br>>= 1.0 seconds | 300 failures out<br>of 375 samples<br><br>1 sample every<br>cylinder firing<br>event | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                | Fault<br>Code | Monitor Description                                                     | Malfunction Criteria                            | Threshold Value  | Secondary Parameters                                                                                                                                                | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                               | Time Required                                                | MIL<br>Illum.   |
|---------------------------------------------------------------------|---------------|-------------------------------------------------------------------------|-------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------|
| Manifold Absolute Pressure Sensor Performance (naturally aspirated) | P0106         | Determines if the MAP sensor is stuck within the normal operating range | Filtered Throttle Model Error                   | <= 350 kPa*(g/s) | Engine Speed<br>Engine Speed<br>Coolant Temp<br>Coolant Temp<br>Intake Air Temp<br>Intake Air Temp<br>Minimum total weight factor (all factors multiplied together) | >= 500 RPM<br><= 6,800 RPM<br>>= -7 Deg C<br><= 126 Deg C<br>>= -20 Deg C<br><= 125 Deg C<br><br>>= 0.50<br><br>Filtered Throttle Model Error multiplied by TPS Residual Weight Factor based on RPM<br><br>MAP Model 1 Error multiplied by MAP1 Residual Weight Factor based on RPM<br><br>MAP Model 2 Error multiplied by MAP2 Residual Weight Factor based on RPM<br><br>See "Residual Weight Factor" tables. | Continuous<br><br>Calculations are performed every 12.5 msec | Type B, 2 Trips |
|                                                                     |               |                                                                         | AND<br>ABS(Measured MAP – MAP Model 1) Filtered | > 20.0 kPa       |                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                              |                 |
|                                                                     |               |                                                                         | Manifold Pressure OR                            | < 50.0 kPa       | Time between current ignition cycle and the last                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                 | 4 failures out of 5 samples                                  |                 |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                             | Enable Conditions                                                                                                               | Time Required               | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---------------|
|                      |               |                     | Manifold Pressure    | > 115.0 kPa     | time the engine was running<br>Engine is not rotating<br>No Active DTCs:<br><br>No Pending DTCs: | > 409.6 seconds<br><br>EngineModeNotRunTimer<br>Error<br>MAP_SensorFA<br>AAP_SnsrFA<br><br>MAP_SensorCircuitFP<br>AAP_SnsrCktFP | 1 sample every<br>12.5 msec |               |
|                      |               |                     |                      |                 |                                                                                                  |                                                                                                                                 |                             |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                      | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria | Threshold Value                                                     | Secondary Parameters | Enable Conditions | Time Required                                                   | MIL<br>Illum.      |
|-----------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------|----------------------|-------------------|-----------------------------------------------------------------|--------------------|
| Manifold<br>Absolute<br>Pressure<br>Sensor<br>Circuit Low | P0107         | Detects a continuous short to low or open in either the signal circuit or the MAP sensor. | MAP Voltage          | < 3.0 % of 5 Volt Range<br>(This is equal to 0.15 Volts or 3.5 kPa) | Continuous           |                   | 320 failures out of 400 samples<br><br>1 sample every 12.5 msec | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                       | Fault<br>Code | Monitor Description                                                                                       | Malfunction Criteria | Threshold Value                                                         | Secondary Parameters | Enable Conditions | Time Required                                                   | MIL<br>Illum.      |
|------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------|----------------------|-------------------|-----------------------------------------------------------------|--------------------|
| Manifold<br>Absolute<br>Pressure<br>Sensor<br>Circuit High | P0108         | Detects an open sensor ground or continuous short to high in either the signal circuit or the MAP sensor. | MAP Voltage          | > 90.0 % of 5 Volt Range<br>(This is equal to 4.50 Volts, or 115.0 kPa) | Continuous           |                   | 320 failures out of 400 samples<br><br>1 sample every 12.5 msec | Type B,<br>2 Trips |



13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                                  | Fault<br>Code | Monitor Description                                                                    | Malfunction Criteria                                                   | Threshold Value | Secondary Parameters                                                         | Enable Conditions                                                                                           | Time Required                                                                      | MIL<br>Illum.   |  |
|-----------------------------------------------------------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----------------|--|
| Intake Air Temperature Sensor Circuit Performance (applications with humidity sensor and manifold temperature sensor) | P0111         | Detects an IAT sensor that has stuck in range by comparing to IAT2 and IAT3 at startup | ABS(Power Up IAT - Power Up IAT2)                                      | > 10 deg C      | Time between current ignition cycle and the last time the engine was running | > 28,800 seconds                                                                                            | Executes once at the beginning of each ignition cycle if enable conditions are met | Type B, 2 Trips |  |
|                                                                                                                       |               |                                                                                        | AND                                                                    |                 |                                                                              |                                                                                                             |                                                                                    |                 |  |
|                                                                                                                       |               |                                                                                        | ABS(Power Up IAT - Power Up IAT3)                                      | > 25 deg C      | Powertrain Relay Voltage for a time                                          | >= 11.00 Volts<br>>= 0.9 seconds                                                                            |                                                                                    |                 |  |
|                                                                                                                       |               |                                                                                        | AND                                                                    |                 | No Active DTCs:                                                              | PowertrainRelayFault<br>ECT_Sensor_Ckt_FA<br>IAT_SensorCircuitFA<br>MnfdTempSensorCktFA<br>HumTempSnsrCktFA |                                                                                    |                 |  |
|                                                                                                                       |               |                                                                                        | ABS(Power Up IAT2 - Power Up IAT3)                                     | <= 25 deg C     |                                                                              |                                                                                                             |                                                                                    |                 |  |
|                                                                                                                       |               |                                                                                        | Power Up IAT2 is between Power Up IAT and Power Up IAT3                |                 | Time between current ignition cycle and the last time the engine was running | > 28,800 seconds                                                                                            | Executes once at the beginning of each ignition cycle if enable conditions are met |                 |  |
|                                                                                                                       |               |                                                                                        | AND                                                                    |                 |                                                                              |                                                                                                             |                                                                                    |                 |  |
|                                                                                                                       |               |                                                                                        | ABS(Power Up IAT - Power Up IAT3)                                      | > 25 deg C      | Powertrain Relay Voltage for a time                                          | >= 11.00 Volts<br>>= 0.9 seconds                                                                            |                                                                                    |                 |  |
|                                                                                                                       |               |                                                                                        | AND                                                                    |                 | No Active DTCs:                                                              | PowertrainRelayFault<br>ECT_Sensor_Ckt_FA<br>IAT_SensorCircuitFA<br>MnfdTempSensorCktFA<br>HumTempSnsrCktFA |                                                                                    |                 |  |
|                                                                                                                       |               |                                                                                        | ABS(Power Up IAT2 - Power Up IAT) > ABS(Power Up IAT2 - Power Up IAT3) |                 |                                                                              |                                                                                                             |                                                                                    |                 |  |
|                                                                                                                       |               |                                                                                        | Power Up IAT3 is between Power Up IAT and Power Up IAT2                |                 | Time between current ignition cycle and the last time the engine was running | > 28,800 seconds                                                                                            | Executes once at the beginning of each ignition cycle if enable conditions are met |                 |  |
|                                                                                                                       |               |                                                                                        | AND                                                                    |                 |                                                                              |                                                                                                             |                                                                                    |                 |  |
|                                                                                                                       |               |                                                                                        | ABS(Power Up IAT - Power Up IAT2)                                      | > 10 deg C      | Powertrain Relay Voltage for a time                                          | >= 11.00 Volts<br>>= 0.9 seconds                                                                            |                                                                                    |                 |  |
|                                                                                                                       |               |                                                                                        | AND                                                                    |                 | No Active DTCs:                                                              | PowertrainRelayFault<br>ECT_Sensor_Ckt_FA<br>IAT_SensorCircuitFA<br>MnfdTempSensorCktFA                     |                                                                                    |                 |  |
|                                                                                                                       |               |                                                                                        | ABS(Power Up IAT3 -                                                    |                 |                                                                              |                                                                                                             |                                                                                    |                 |  |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                     | Threshold Value | Secondary Parameters | Enable Conditions | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------------------------------------------|-----------------|----------------------|-------------------|---------------|---------------|
|                      |               |                     | Power Up IAT) ><br>ABS(Power Up IAT3 -<br>Power Up IAT2) |                 |                      | HumTempSnsrCktFA  |               |               |
|                      |               |                     |                                                          |                 |                      |                   |               |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                               | Fault<br>Code | Monitor Description                                                              | Malfunction Criteria | Threshold Value           | Secondary Parameters | Enable Conditions | Time Required                                                | MIL<br>Illum.      |
|----------------------------------------------------|---------------|----------------------------------------------------------------------------------|----------------------|---------------------------|----------------------|-------------------|--------------------------------------------------------------|--------------------|
| Intake Air<br>Temperature<br>Sensor<br>Circuit Low | P0112         | Detects a continuous short to ground in the IAT signal circuit or the IAT sensor | Raw IAT Input        | < 58 Ohms<br>(~150 deg C) | Engine Run Time      | > 0.00 seconds    | 40 failures out of 50 samples<br><br>1 sample every 100 msec | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                | Fault<br>Code | Monitor Description                                                                    | Malfunction Criteria | Threshold Value                | Secondary Parameters | Enable Conditions | Time Required                                                      | MIL<br>Illum.      |
|-----------------------------------------------------|---------------|----------------------------------------------------------------------------------------|----------------------|--------------------------------|----------------------|-------------------|--------------------------------------------------------------------|--------------------|
| Intake Air<br>Temperature<br>Sensor<br>Circuit High | P0113         | Detects a continuous<br>open circuit in the IAT<br>signal circuit or the IAT<br>sensor | Raw IAT Input        | > 142,438 Ohms<br>(~-60 deg C) | Engine Run Time      | > 0.00 seconds    | 40 failures out<br>of 50 samples<br><br>1 sample every<br>100 msec | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                            | Fault<br>Code | Monitor Description                                         | Malfunction Criteria                                                                                                                                                                           | Threshold Value                                   | Secondary Parameters | Enable Conditions | Time Required                                                             | MIL<br>Illum.      |
|-----------------------------------------------------------------|---------------|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------------------|-------------------|---------------------------------------------------------------------------|--------------------|
| Intake Air<br>Temperature<br>Sensor<br>Intermittent<br>In-Range | P0114         | Detects a noisy or erratic IAT signal circuit or IAT sensor | String Length<br><br>Where:<br>"String Length" = sum of<br>"Diff" calculated over<br><br>And where:<br>"Diff" = ABS(current IAT<br>reading - IAT reading<br>from 100 milliseconds<br>previous) | > 80.00 DegC<br><br>10 consecutive IAT<br>samples | Continuous           |                   | 4 failures out of<br>5 samples<br><br>Each sample<br>takes 1.0<br>seconds | Type B,<br>2 Trips |

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| Component/<br>System                                               | Fault<br>Code | Monitor Description                                  | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Threshold Value                                                                                                                           | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                          | Time Required                                                                 | MIL<br>Illum.      |
|--------------------------------------------------------------------|---------------|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------|
| Engine<br>Coolant<br>Temperature<br>(ECT)<br>Sensor<br>Performance | P0116         | This DTC detects ECT temp sensor stuck in mid range. | <p>A failure will be reported if any of the following (1-3) occur after the following soak conditions,<br/>Engine off time &gt; 28,800 seconds<br/>Propulsion system off time &gt; 0 seconds</p> <p>1) ECT at power up &gt; IAT at power up by an IAT based table lookup value (fast fail).</p> <p>2) ECT at power up &gt; IAT at power up by 15.0 Deg C and a block heater has not been detected.</p> <p>3) ECT at power up &gt; IAT at power up by 15.0 Deg C and the time spent cranking the engine without starting is greater than 10.0 seconds with the LowFuelConditionDiag</p> | <p>See the table named: <b>P0116_Fail if power up ECT exceeds IAT by these values</b> in the Supporting tables section</p> <p>= False</p> | <p>No Active DTC's</p> <p>Non-volatile memory initialization</p> <p>Test complete this trip<br/>Test aborted this trip<br/>IAT<br/>LowFuelCondition<br/>Diag</p> <p>=====<br/>Block Heater detection is enabled when either of the following occurs:</p> <p>1) ECT at power up &gt; IAT at power up by</p> <p>2) Cranking time</p> <p>=====<br/>Block Heater is detected and diagnostic is aborted when 1) or 2) occurs:</p> <p>1a) Vehicle drive time</p> <p>1b) Vehicle speed</p> <p>1c) Additional Vehicle drive time is provided to 1a when Vehicle speed is below 1b as follows:</p> <p>1d) IAT drops from power</p> | <p>VehicleSpeedSensor_FA<br/>IAT_SensorFA<br/>ECT_Sensor_Ckt_FA<br/>IgnitionOffTime<br/>Valid<br/>TimeSinceEngineRunning<br/>Valid</p> <p>= Not occurred</p> <p>= False<br/>= False<br/>≥ -7 °C</p> <p>= False</p> <p>=====<br/>&gt; 15.0 °C</p> <p>&lt; 10.0 seconds</p> <p>=====<br/>&gt; 400 seconds</p> <p>&gt; 14.9 MPH</p> <p>0.50 times the seconds with vehicle speed below 1b</p> | <p>1 failure</p> <p>500 msec/<br/>sample</p> <p>Once per valid cold start</p> | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                     | Enable Conditions                                                                                                                                                | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | up IAT<br><br>2a) ECT drops from<br>power up ECT<br><br>2b) Engine run time<br><br>=====<br>Diagnostic is aborted<br>when 3) or 4) occurs:<br><br>3) Engine run time with<br>vehicle speed below 1b<br><br>4) Minimum IAT during<br>test | $\geq 5.3^{\circ}\text{C}$<br><br>$\geq 5^{\circ}\text{C}$<br><br>Within $\leq 60$ seconds<br><br>=====<br><br>$> 1800$ seconds<br><br>$\leq -7^{\circ}\text{C}$ |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                                          |                                                                                                                                                                  |               |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                               | Fault<br>Code | Monitor Description                                                                                            | Malfunction Criteria        | Threshold Value | Secondary Parameters | Enable Conditions | Time Required                                                         | MIL<br>Illum.      |
|----------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------|----------------------|-------------------|-----------------------------------------------------------------------|--------------------|
| Engine<br>Coolant<br>Temp<br>Sensor<br>Circuit Low | P0117         | Circuit Continuity<br>This DTC detects a<br>short to ground in the<br>ECT signal circuit or<br>the ECT sensor. | ECT Resistance (@<br>150°C) | < 46 Ohms       |                      |                   | 5 failures out of<br>6 samples<br><br>1 sec/ sample<br><br>Continuous | Type B,<br>2 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                | Fault<br>Code | Monitor Description                                                                                                  | Malfunction Criteria        | Threshold Value | Secondary Parameters             | Enable Conditions               | Time Required                                                         | MIL<br>Illum.      |
|-----------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------|----------------------------------|---------------------------------|-----------------------------------------------------------------------|--------------------|
| Engine<br>Coolant<br>Temp<br>Sensor<br>Circuit High | P0118         | Circuit Continuity<br>This DTC detects a<br>short to high or open in<br>the ECT signal circuit<br>or the ECT sensor. | ECT Resistance (@<br>-60°C) | > 419,000 Ohms  | Engine run time<br>OR<br>IAT min | > 10.0 seconds<br><br>≥ -7.0 °C | 5 failures out of<br>6 samples<br><br>1 sec/ sample<br><br>Continuous | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                           | Fault<br>Code | Monitor Description                                                                                                                                                                                                           | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Threshold Value                            | Secondary Parameters | Enable Conditions | Time Required                                                         | MIL<br>Illum.      |
|--------------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------|-------------------|-----------------------------------------------------------------------|--------------------|
| Engine<br>Coolant<br>Temperature<br>(ECT)<br>Sensor<br>Circuit<br>Intermittent | P0119         | Circuit Continuity<br>This DTC detects large<br>step changes in the<br>ECT signal circuit or<br>the ECT sensor.<br>Allowable high and low<br>limits are calculated for<br>the next sample based<br>on the previous<br>sample. | ECT temperature step<br>change:<br><br>1) positive step change is<br>greater than calculated<br>high limit<br><br>OR<br><br>2) negative step change is<br>lower than calculated low<br>limit.<br><br>The calculated high and<br>low limits use the<br>following calibrations:<br>1) Sensor time constant<br>2) Sensor low limit<br>3) Sensor high limit<br><br>*****Generic Example*****<br><br>If the last ECT reading<br>was 90 Deg C, the Time<br>constant was calibrated at<br>10 seconds, the low limit<br>was calibrated to -80 Deg<br>C and the high limit was<br>calibrated to 200 Deg C<br>the calculated limits are<br>101 Deg C and 73 Deg C.<br><br>The next reading (after<br>the 90 Deg C reading)<br>must be between 73 Deg<br>C and 101 Deg C to be<br>valid.<br><br>***** | 10.0 seconds<br>-65.0 Deg C<br>200.0 Deg C | No Active DTC's      | P0117<br>P0118    | 3 failures out of<br>4 samples<br><br>1 sec/ sample<br><br>Continuous | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                      | Fault<br>Code | Monitor Description                                                                                     | Malfunction Criteria                                                                                                                               | Threshold Value                                          | Secondary Parameters                                                                                                                                                      | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Time Required                                                     | MIL<br>Illum.      |
|---------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|--------------------|
| Throttle<br>Position<br>Sensor<br>Performance<br>(naturally<br>aspirated) | P0121         | Determines if the<br>Throttle Position<br>Sensor input is stuck<br>within the normal<br>operating range | Filtered Throttle Model<br>Error<br>AND<br>ABS(Measured Flow –<br>Modeled Air Flow) Filtered<br>AND<br>ABS(Measured MAP –<br>MAP Model 2) Filtered | > 350 kPa*(g/s)<br><br>> 20 grams/sec<br><br><= 20.0 kPa | Engine Speed<br>Engine Speed<br>Coolant Temp<br>Coolant Temp<br>Intake Air Temp<br>Intake Air Temp<br>Minimum total weight<br>factor (all factors<br>multiplied together) | >= 500 RPM<br><= 6,800 RPM<br>> -7 Deg C<br>< 126 Deg C<br>> -20 Deg C<br>< 125 Deg C<br><br>>= 0.50<br><br>Filtered Throttle Model<br>Error multiplied by TPS<br>Residual Weight Factor<br>based on RPM<br><br>Modeled Air Flow Error<br>multiplied by MAF<br>Residual Weight Factor<br>based on RPM and MAF<br>Residual Weight Factor<br>based on MAF Est<br><br>See "Residual Weight<br>Factor" tables.<br><br>No Active DTCs:<br><br>MAP_SensorCircuitFA<br>EGRValvePerformance_F<br>A<br>MAF_SensorCircuitFA<br>CrankSensor_FA<br>ECT_Sensor_FA<br>IAT_SensorFA<br><br>No Pending DTCs:<br><br>EGRValve_FP<br>ECT_Sensor_Ckt_FP<br>IAT_SensorCircuitFP | Continuous<br><br>Calculation are<br>performed every<br>12.5 msec | Type B,<br>2 Trips |

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| Component/<br>System | Fault<br>Code | Monitor Description                                                | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions                                                                                      | Time Required                                                                          | MIL<br>Illum.      |
|----------------------|---------------|--------------------------------------------------------------------|----------------------|-----------------|----------------------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|--------------------|
| TPS1 Circuit<br>Low  | P0122         | Detects a continuous or intermittent short or open in TPS1 circuit | TPS1 Voltage <       | 0.3250          |                      | Run/Crank voltage ><br>6.41<br><br>No 5V reference error or fault for # 4 5V reference circuit (P06A3) | 79 / 159 counts;<br>57 counts continuous;<br>3.125 ms /count in the ECM main processor | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description                                                | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions                                                                                   | Time Required                                                                          | MIL<br>Illum.      |
|----------------------|---------------|--------------------------------------------------------------------|----------------------|-----------------|----------------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|--------------------|
| TPS1 Circuit<br>High | P0123         | Detects a continuous or intermittent short or open in TPS1 circuit | TPS1 Voltage >       | 4.750           |                      | Run/Crank voltage > 6.41<br><br>No 5V reference error or fault for # 4 5V reference circuit (P06A3) | 79 / 159 counts;<br>57 counts continuous;<br>3.125 ms /count in the ECM main processor | Type A,<br>1 Trips |

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| Component/<br>System                                                                                                    | Fault<br>Code | Monitor Description                                                                                       | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Threshold Value                                                                                                                                                                                                                                                                                                       | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                          | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                            | Time Required                                                                       | MIL<br>Illum.      |
|-------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------|
| Engine<br>Coolant<br>Temperature<br>Below Stat<br>Regulating<br>Temperature<br>) (energy<br>based<br>"Deluxe"<br>method | P0128         | This DTC detects if the engine coolant temperature rises too slowly due to an ECT or Cooling system fault | <p>Energy is accumulated after the first combustion event using Range #1 or #2 below:</p> <p>Thermostat type is divided into normal (non-heated) and electrically heated.</p> <p>For this application the "type" cal (KeTHMG_b_TMS_ElectHstEquipped) = 0<br/>If the type cal is equal to one, the application has an electrically heated t-stat, if equal to zero the the application has an non heated t-stat. See appropriate section below.</p> <p>*****<br/>Type cal above = 1<br/>(Electrically heated t-stat)<br/>== == == ==<br/>Range #1 (Primary) ECT reaches Commanded temperature minus 11 °C when Ambient min is ≤ 52 °C and &gt; 10 °C.<br/>Note: Warm up target for range #1 will be at least 64 °C<br/>== == == ==<br/>Range #2 (Alternate) ECT reaches Commanded temperature minus 31 °C when Ambient min is ≤ 10 °C and &gt; -7 °C.<br/>Note: Warm up target for range #2 will be at least</p> | <p>See the two tables named:<br/><b>P0128_Maximum Accumulated Energy for Start-up ECT conditions - Primary</b> and<br/><b>P0128_Maximum Accumulated Energy for Start-up ECT conditions - Alternate</b> in the Supporting tables section.</p> <p>This diagnostic models the net energy into and out of the cooling</p> | <p>No Active DTC's</p> <p>Engine not run time (soaking time before current trip)</p> <p>Engine run time</p> <p>Fuel Condition</p> <p>Distance traveled</p> <p>*****<br/>If Engine RPM is continuously greater than for this time period</p> <p>The diagnostic test for this key cycle will abort<br/>*****</p> <p>*****<br/>If T-Stat Heater commanded duty cycle for this time period</p> <p>The diagnostic test for this key cycle will abort<br/>*****</p> | <p>ECT_Sensor_Ckt_FA<br/>VehicleSpeedSensor_FA<br/>OAT_PtEstFiltFA<br/>IAT_SensorCircuitFA<br/>MAF_SensorFA<br/>THMR_AWP_AuxPumpFA<br/>THMR_AHV_FA<br/>THMR_SWP_Control_FA<br/>ECT_Sensor_Perf_FA</p> <p>≥ 1,800 seconds</p> <p>120 ≤ Eng Run Tme ≤ 1,450 seconds</p> <p>Ethanol ≤ 87 %</p> <p>≥ 2.40 km</p> <p>*****</p> <p>9,999 rpm<br/>5.0 seconds</p> <p>*****</p> <p>&gt; 101.0 % duty cycle<br/>&gt; 9,999.0 seconds</p> <p>*****</p> | <p>1 failure to set DTC</p> <p>1 sec/ sample</p> <p>Once per ignition key cycle</p> | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                                                                                                                                                       | Threshold Value                                                                                                                                                                                         | Secondary Parameters | Enable Conditions | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------|---------------|---------------|
|                      |               |                     | 55 °C<br>*****<br>Type cal above = 0<br>(non - heated t-stat)<br>== == == ==<br>Range #1 (Primary) ECT<br>reaches 71 °C when<br>Ambient min is ≤ 52 °C<br>and > 10 °C.<br>== == == ==<br>Range #2 (Alternate) ECT<br>reaches 55 °C when<br>Ambient min is ≤ 10 °C<br>and > -7 °C.<br>***** | system during the<br>warm-up process.<br><br>The five energy terms<br>are: heat from<br>combustion, heat from<br>after-run, heat loss to<br>enviroment, heat loss<br>to cabin and heat loss<br>to DFCO. | ECT at start run     | -60 ≤ ECT ≤ 66 °C |               |               |
|                      |               |                     |                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                         |                      |                   |               |               |

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| Component/<br>System                             | Fault<br>Code | Monitor Description                                             | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                 | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Time Required                                                                              | MIL<br>Illum.      |
|--------------------------------------------------|---------------|-----------------------------------------------------------------|----------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------|
| O2S Circuit<br>Low Voltage<br>Bank 1<br>Sensor 1 | P0131         | This DTC determines if the O2 sensor circuit is shorted to low. | Oxygen Sensor Signal | < 40.0 mVolts   | No Active DTC's<br><br>AIR intrusive test<br>Fuel intrusive test<br>Idle intrusive test<br>EGR intrusive test<br>System Voltage<br>EGR Device Control<br>Idle Device Control<br>Fuel Device Control<br>AIR Device Control<br>Low Fuel Condition Diag<br>Equivalence Ratio<br>Air Per Cylinder<br>Fuel Control State<br>Closed Loop Active<br>All Fuel Injectors for active Cylinders<br>Fuel Condition<br>Fuel State<br><br>All of the above met for | TPS_ThrottleAuthorityDefaulted<br>MAP_SensorFA<br>AIR System FA<br>Ethanol Composition Sensor FA<br>EvapPurgeSolenoidCircuit_FA<br>EvapFlowDuringNonPurge_FA<br>EvapVentSolenoidCircuit_FA<br>EvapSmallLeak_FA<br>EvapEmissionSystem_FA<br>FuelTankPressureSnsrCkt_FA<br>FuelInjectorCircuit_FA<br>= Not active<br>= Not active<br>= Not active<br>= Not active<br>10.0 < Volts < 32.0<br>= Not active<br>= Not active<br>= Not active<br>= Not active<br>= False<br>0.9805 < ratio < 1.0996<br>50 < mgram < 500<br>= Closed Loop<br>= TRUE<br><br>Enabled (On)<br>Ethanol ≤ 87 %<br>DFCO not active<br><br>> 5.0 seconds | 380 failures out of 475 samples<br><br>Frequency:<br>Continuous in 100 milli - second loop | Type B,<br>2 Trips |



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| Component/<br>System                              | Fault<br>Code | Monitor Description                                              | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Time Required                                                                                     | MIL<br>Illum.      |
|---------------------------------------------------|---------------|------------------------------------------------------------------|----------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|
| O2S Circuit<br>High Voltage<br>Bank 1<br>Sensor 1 | P0132         | This DTC determines if the O2 sensor circuit is shorted to high. | Oxygen Sensor Signal | > 1,050 mvolts  | == Open Test Criteria ==<br>No Active DTC's<br><br>System Voltage<br>AFM Status<br>Heater Warm-up delay<br>Engine Run Time<br>Engine Run Accum<br>Fuel Condition<br>=====<br>No Active DTC's<br><br>Low Fuel Condition Diag<br>Fuel Condition<br><br>Initial delay after Open<br>Test Criteria met (cold<br>start condition)<br><br>Initial delay after Open<br>Test Criteria met (not cold<br>start condition)<br><br>Equivalence Ratio<br>Air Per Cylinder<br>Fuel Control State | =====<br>TPS_ThrottleAuthorityDef<br>aulted<br>MAF_SensorFA<br>EthanolCompositionSens<br>or_FA<br>10.0 < Volts < 32.0<br>= All Cylinders active<br>= Complete<br>> 5 seconds<br>> 150 seconds<br>≤ 87 % Ethanol<br>=====<br>MAP_SensorFA<br>EvapPurgeSolenoidCircuit<br>_FA<br>EvapFlowDuringNonPurg<br>e_FA<br>EvapVentSolenoidCircuit_<br>FA<br>EvapSmallLeak_FA<br>EvapEmissionSystem_FA<br>FuelTankPressureSnrCkt<br>_FA<br>FuelInjectorCircuit_FA<br>AIR System FA<br>= False<br>≤ 87 % Ethanol<br><br>> 45.0 seconds when<br>engine soak time ><br>28,800 seconds<br><br>> 45.0 seconds when<br>engine soak time ≤<br>28,800 seconds<br><br>0.9805 ≤ ratio ≤ 1.0996<br>50 ≤ mgram ≤ 500<br>not = Power Enrichment | 70 failures out of<br>88 samples<br><br>Frequency:<br>Continuous in<br>100 milli -<br>second loop | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters     | Enable Conditions | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|--------------------------|-------------------|---------------|---------------|
|                      |               |                     |                      |                 | All of the above met for | > 3.0 seconds     |               |               |
|                      |               |                     |                      |                 |                          |                   |               |               |

13 OBDG05A Engine Diagnostics

| Component/System                                         | Fault Code | Monitor Description                                             | Malfunction Criteria                                                                                                                                                                                      | Threshold Value                                                                                                                        | Secondary Parameters                                                                                                                                                                                                                                      | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Time Required                                                | MIL Illum.      |
|----------------------------------------------------------|------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------|
| O2S Slow Response Bank 1 Sensor 1)<br>(For use with ESPD | P0133      | This DTC determines if the O2 sensor response time is degraded. | Fault condition present when the average response time is calculated over the test time, and compared to the threshold.<br><br>OR<br><br>Slope Time L/R Switches<br><br>OR<br><br>Slope Time R/L Switches | Refer to <b>P0133_02S Slow Response Bank 1 Sensor 1 "Pass/Fail Threshold table"</b> in the Supporting Tables tab<br><br>< 3<br><br>< 3 | No Active DTC's<br><br><br><br><br><br><br><br><br><br>Bank 1 Sensor 1 DTC's not active<br><br>System Voltage<br>EGR Device Control<br>Idle Device Control<br>Fuel Device Control<br>AIR Device Control<br>Low Fuel Condition Diag<br>Green O2S Condition | TPS_ThrottleAuthorityDefaulted<br>MAP_SensorFA<br>IAT_SensorFA<br>ECT_Sensor_FA<br>AmbientAirDefault<br>MAF_SensorFA<br>EvapPurgeSolenoidCircuit_FA<br>EvapFlowDuringNonPurge_FA<br>EvapVentSolenoidCircuit_FA<br>EvapSmallLeak_FA<br>EvapEmissionSystem_FA<br>FuelTankPressureSnsrCkt_FA<br>FuelInjectorCircuit_FA<br>AIR System FA<br>EthanolCompositionSensor_FA<br>EngineMisfireDetected_FA<br><br>P0131, P0132, P0134<br><br>10.0 < Volts < 32.0<br>= Not active<br>= Not active<br>= Not active<br>= Not active<br>= False<br>= Not Valid, See definition of <b>Multiple DTC Use_Green Sensor Delay Criteria - Airflow</b> and <b>Multiple DTC Use_Green Sensor Delay Criteria - Limit</b> for the following locations:<br>B1S1, B2S1 (if applicable) | Sample time is 60 seconds<br><br>Frequency:<br>Once per trip | Type B, 2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | O2 Heater on for<br>Learned Htr resistance<br><br>Engine Coolant<br>IAT<br>Engine run Accum<br><br>Time since any AFM<br>status change<br>Time since Purge On to<br>Off change<br>Time since Purge Off to<br>On change<br><br>Engine airflow<br>Engine speed<br>Fuel Condition<br>Baro<br>Air Per Cylinder<br><br>Fuel Control State<br>Closed Loop Active<br>LTM fuel cell<br>Transient Fuel Mass<br>Baro<br>Fuel Control State<br>Fuel State<br>Commanded Proportional<br>Gain<br><br>=====<br>All of the above met for | in Supporting Tables tab.<br><br>≥ 60 seconds<br>= Valid ( the heater<br>resistance has learned<br>since NVM reset, see<br>enable conditions for<br>"HO2S Heater Resistance<br>DTC's" )<br>> 54 °C<br>> -40 °C<br>> 60 seconds<br><br>> 0.0 seconds<br>> 4.0 seconds<br>> 4.0 seconds<br><br>15 ≤ grams/second ≤ 43<br>1,000 ≤ RPM ≤ 3,000<br>< 87 % Ethanol<br>> 70 kpa<br>≥ 125 mGrams<br><br>= Closed Loop<br>= TRUE<br>= Enabled<br>≤ 100.0 mgrams<br>= Not Defaulted<br>not = Power Enrichment<br>DFCO not active<br><br>≥ 0.0 %<br><br>=====<br>> 2.0 seconds |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                       | Fault<br>Code | Monitor Description                                   | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                 | Enable Conditions                                                                                                                                                                                      | Time Required                                                                        | MIL<br>Illum.      |
|------------------------------------------------------------|---------------|-------------------------------------------------------|----------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------|
| O2S Circuit<br>Insufficient<br>Activity Bank<br>1 Sensor 1 | P0134         | This DTC determines if the O2 sensor circuit is open. | Oxygen Sensor Signal | > 1,700 mvolts  | No Active DTC's<br><br>System Voltage<br>AFM Status<br>Heater Warm-up delay<br>Engine Run Time<br>Engine Run Accum<br>Fuel Condition | TPS_ThrottleAuthorityDef<br>aulted<br>MAF_SensorFA<br>EthanolCompositionSens<br>or_FA<br>10.0 < Volts < 32.0<br>= All Cylinders active<br>= Complete<br>> 5 seconds<br>> 150 seconds<br>≤ 87 % Ethanol | 100 failures out<br>of 125 samples.<br><br>Frequency:<br>Continuous 100<br>msec loop | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                            | Fault<br>Code | Monitor Description                                                                                                       | Malfunction Criteria                            | Threshold Value  | Secondary Parameters                                                                                                                                         | Enable Conditions                                                                                             | Time Required                                                                                                                    | MIL<br>Illum.      |
|-------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------|
| O2S Heater<br>Performance<br>Bank 1<br>Sensor 1 | P0135         | This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit. | Heater Current outside of the expected range of | 0.3 < Amps < 1.2 | No Active DTC's<br><br>System Voltage<br>Heater Warm-up delay<br>O2S Heater device control<br><br>B1S1 O2S Heater Duty Cycle<br><br>All of the above met for | ECT_Sensor_FA<br><br>10.0 < Volts < 32.0<br>= Complete<br><br>= Not active<br><br>> zero<br><br>> 120 seconds | 8 failures out of 10 samples<br><br>Frequency:<br>2 tests per trip<br>10 seconds delay between tests and 1 second execution rate | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                      | Fault<br>Code | Monitor Description                                             | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                 | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Time Required                                                                              | MIL<br>Illum.      |
|-------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------|----------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------|
| O2S Circuit<br>Low Voltage<br>Bank 1<br>Sensor 2)<br>(For Dual<br>Bank<br>Exhaust<br>Only | P0137         | This DTC determines if the O2 sensor circuit is shorted to low. | Oxygen Sensor Signal | < 50 mvolts     | No Active DTC's<br><br>AIR intrusive test<br>Fuel intrusive test<br>Idle intrusive test<br>EGR intrusive test<br>System Voltage<br>EGR Device Control<br>Idle Device Control<br>Fuel Device Control<br>AIR Device Control<br>Low Fuel Condition Diag<br>Equivalence Ratio<br>Air Per Cylinder<br>Fuel Control State<br>Closed Loop Active<br>All Fuel Injectors for active Cylinders<br>Fuel Condition<br>Fuel State<br><br>All of the above met for | TPS_ThrottleAuthorityDefaultedMAP_SensorFAAIR System FAEthanol Composition Sensor FAEvapPurgeSolenoidCircuit_FAEvapFlowDuringNonPurge_FAEvapVentSolenoidCircuit_FAEvapSmallLeak_FAEvapEmissionSystem_FAFuelTankPressureSnrCkt_FAFuelInjector Circuit_FA<br>= Not active<br>= Not active<br>= Not active<br>= Not active<br>10.0 < Volts < 32.0<br>= Not active<br>= Not active<br>= Not active<br>= Not active<br>= False<br>0.9805 ≤ ratio ≤ 1.0996<br>50 ≤ mgrams ≤ 500<br>= Closed Loop<br>= TRUE<br><br>Enabled (On)<br>Ethanol ≤ 87 %<br>DFCO not active<br><br>> 5.0 seconds | 430 failures out of 540 samples<br><br>Frequency:<br>Continuous in 100 milli - second loop | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                       | Fault<br>Code | Monitor Description                                              | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                           | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Time Required                                                                                       | MIL<br>Illum.      |
|--------------------------------------------------------------------------------------------|---------------|------------------------------------------------------------------|----------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------------|
| O2S Circuit<br>High Voltage<br>Bank 1<br>Sensor 2)<br>(For Dual<br>Bank<br>Exhaust<br>Only | P0138         | This DTC determines if the O2 sensor circuit is shorted to high. | Oxygen Sensor Signal | > 1,050 mvolts  | == Open Test Criteria ==<br>No Active DTC's<br><br>System Voltage<br>AFM Status<br>Heater Warm-up delay<br>Engine Run Time<br>Fuel Condition<br>=====<br>No Active DTC's<br><br>Low Fuel Condition Diag<br>Fuel Condition<br><br>Initial delay after Open<br>Test Criteria met (cold<br>start condition)<br><br>Initial delay after Open<br>Test Criteria met (not cold<br>start condition)<br><br>Equivalence Ratio<br>Air Per Cylinder<br>Fuel Control State | =====<br>TPS_ThrottleAuthorityDef<br>aulted<br>MAF_SensorFA<br>EthanolCompositionSens<br>or_FA<br>10.0 < Volts < 32.0<br>= All Cylinders active<br>= Complete<br>> 5 seconds<br>≤ 87 Ethanol<br>=====<br>MAP_SensorFA<br>EvapPurgeSolenoidCircuit<br>_FA<br>EvapFlowDuringNonPurg<br>e_FA<br>EvapVentSolenoidCircuit_<br>FA<br>EvapSmallLeak_FA<br>EvapEmissionSystem_FA<br>FuelTankPressureSnsrCkt<br>_FA<br>FuelInjectorCircuit_FA<br>AIR System FA<br>= False<br>≤ 87 % Ethanol<br><br>> 45.0 seconds when<br>engine soak time ><br>28,800 seconds<br><br>> 45.0 seconds when<br>engine soak time ≤<br>28,800 seconds<br><br>0.9805 ≤ ratio ≤ 1.0996<br>50 ≤ mgrams ≤ 500<br>not = Power Enrichment | 100 failures out<br>of 125 samples<br><br>Frequency:<br>Continuous in<br>100 milli -<br>second loop | Type B,<br>2 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters     | Enable Conditions | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|--------------------------|-------------------|---------------|---------------|
|                      |               |                     |                      |                 | All of the above met for | > 3.0 seconds     |               |               |
|                      |               |                     |                      |                 |                          |                   |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                | Fault<br>Code | Monitor Description                                                                                                                                                                                                                              | Malfunction Criteria                                                                                                                                                                             | Threshold Value                                                                                                       | Secondary Parameters                                                                                                                                                                                                                        | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Time Required                                                                                                                                                                                      | MIL<br>Illum.              |
|---------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| O2 Sensor<br>Slow<br>Response<br>Rich to Lean<br>Bank 1<br>Sensor 2 | P013A         | This DTC determines if the post catalyst O2 sensor has Slow Response in a predefined Rich to Lean voltages range during Rich to Lean transition. The diagnostic is an intrusive test which runs in a DFCO mode to achieve the required response. | The EWMA of the Post O2 sensor normalized integral value<br><br>OR<br><br>The Accumulated mass air flow monitored during the Slow Response Test (between the upper and lower voltage thresholds) | > 8.0 units<br><br><br>> 74.0 grams (upper voltage threshold is 450 mvolts and lower voltage threshold is 150 mvolts) | No Active DTC's<br><br><br>B1S2 DTC's Not Active this key cycle<br><br>System Voltage Learned heater resistance<br><br><br>ICAT MAT Burnoff delay Green O2S Condition<br><br><br>Low Fuel Condition Diag Post fuel cell<br><br>DTC's Passed | TPS_ThrottleAuthorityDefaulted<br>ECT_Sensor_FA<br>IAT_SensorFA<br>MAF_SensorFA<br>MAP_SensorFA<br>AIR System FA<br>FuelInjectorCircuit_FA<br>FuelTrimSystemB1_FA<br>FuelTrimSystemB2_FA<br>EngineMisfireDetected_FA<br>EthanolCompositionSensor_FA<br>P013B, P013E, P013F, P2270 or P2271<br><br>10.0 < Volts < 32.0<br>= Valid ( the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's" )<br>= Not Valid<br>= Not Valid, See definition of <b>Multiple DTC Use_Green Sensor Delay Criteria - Airflow and Multiple DTC Use_Green Sensor Delay Criteria - Limit</b> for the following locations: B1S2, B2S2 (if applicable) in Supporting Tables tab.<br><br>= False<br>= enabled<br><br>P2270 (and P2272 if applicable) | Frequency:<br>Once per trip<br>Note: if<br>NaPOPD_b_Res<br>etFastRespFunc<br>= FALSE for the given Fuel Bank<br>OR<br>NaPOPD_b_RapidResponseActive = TRUE,<br>multiple tests per trip are allowed. | Type A,<br>1 Trips<br>EWMA |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                          | Enable Conditions                                   | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | <p>=====</p> <p>After above conditions are met: DFCO mode is continued (wo driver initiated pedal input).</p> | <p>P013E (and P014A if applicable)</p> <p>=====</p> |               |               |
|                      |               |                     |                      |                 |                                                                                                               |                                                     |               |               |

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| Component/<br>System                                                | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                  | Malfunction Criteria                                                                                                                                                                             | Threshold Value                                                                                                     | Secondary Parameters                                                                                                                                                                                               | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Time Required                                                                                                                                                                                          | MIL<br>Illum.              |
|---------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| O2 Sensor<br>Slow<br>Response<br>Lean to Rich<br>Bank 1<br>Sensor 2 | P013B         | This DTC determines if the post catalyst O2 sensor has Slow Response in a predefined Lean to Rich voltages range during Lean to Rich transition. The diagnostic is an intrusive test which increases the delivered A/F ratio to achieve the required rich threshold. | The EWMA of the Post O2 sensor normalized integral value<br><br>OR<br><br>The Accumulated mass air flow monitored during the Slow Response Test (between the upper and lower voltage thresholds) | > 8.0 units<br><br><br>> 75 grams (lower voltage threshold is 350 mvolts and upper voltage threshold is 600 mvolts) | No Active DTC's<br><br><br>B1S2 DTC's Not Active this key cycle<br><br>System Voltage Learned heater resistance<br><br><br>ICAT MAT Burnoff delay<br><br>Green O2S Condition<br><br><br>Green Cat System Condition | TPS_ThrottleAuthorityDefaulted<br>ECT_Sensor_FA<br>IAT_SensorFA<br>MAF_SensorFA<br>MAP_SensorFA<br>AIR System FA<br>FuelInjectorCircuit_FA<br>FuelTrimSystemB1_FA<br>FuelTrimSystemB2_FA<br>EngineMisfireDetected_FA<br>EthanolCompositionSensor_FA<br>P013A, P013E, P013F, P2270 or P2271<br><br>10.0 < Volts < 32.0<br>= Valid ( the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's" )<br><br>= Not Valid<br><br>= Not Valid, See definition of <b>Multiple DTC Use_Green Sensor Delay Criteria - Airflow and Multiple DTC Use_Green Sensor Delay Criteria - Limit</b> for the following locations: B1S2, B2S2 (if applicable) in Supporting Tables tab.<br><br>= Not Valid, System is not valid until accumulated airflow is greater than | Frequency:<br>Once per trip<br>Note: if<br>NaPOPD_b_Res<br>etFastRespFunc<br>= FALSE for the given Fuel Bank<br>OR<br>NaPOPD_b_Rap<br>idResponseActive = TRUE,<br>multiple tests per trip are allowed. | Type A,<br>1 Trips<br>EWMA |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                   | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                             | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | <p>Low Fuel Condition Diag<br/>Post fuel cell</p> <p>DTC's Passed</p> <p>=====</p> <p>After above conditions are met: Fuel Enrich mode continued.</p> <p>=====</p> <p>During this test the following must stay TRUE or the test will abort: 0.96 ≤ Fuel EQR ≤ 1.08</p> | <p>720,000 grams. Airflow accumulation is only enabled when estimated Cat temperature is above 600 Deg C. (Note: This feature is only enabled when the vehicle is new and cannot be enabled in service).</p> <p>= False<br/>= enabled</p> <p>P2270 (and P2272 if applicable)<br/>P013E (and P014A if applicable)<br/>P013A (and P013C if applicable)<br/>P2271 (and P2273 if applicable)<br/>P013F (and P014B if applicable)</p> <p>=====</p> |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                               |               |               |

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| Component/<br>System                                                | Fault<br>Code | Monitor Description                                                                                                                                                                                                                              | Malfunction Criteria                                                                                                                                                                             | Threshold Value                                                                                                       | Secondary Parameters                                                                                                                                                                                                               | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Time Required                                                                                                                                                                             | MIL<br>Illum.              |
|---------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| O2 Sensor<br>Slow<br>Response<br>Rich to Lean<br>Bank 2<br>Sensor 2 | P013C         | This DTC determines if the post catalyst O2 sensor has Slow Response in a predefined Rich to Lean voltages range during Rich to Lean transition. The diagnostic is an intrusive test which runs in a DFCO mode to achieve the required response. | The EWMA of the Post O2 sensor normalized integral value<br><br>OR<br><br>The Accumulated mass air flow monitored during the Slow Response Test (between the upper and lower voltage thresholds) | > 8.0 units<br><br><br>> 74.0 grams (upper voltage threshold is 450 mvolts and lower voltage threshold is 150 mvolts) | No Active DTC's<br><br><br>B2S2 DTC's Not Active this key cycle<br><br>System Voltage Learned heater resistance<br><br><br>ICAT MAT Burnoff delay<br><br>Green O2S Condition<br><br><br><br>Low Fuel Condition Diag Post fuel cell | TPS_ThrottleAuthorityDefaulted<br>ECT_Sensor_FA<br>IAT_SensorFA<br>MAF_SensorFA<br>MAP_SensorFA<br>AIR System FA<br>FuelInjectorCircuit_FA<br>FuelTrimSystemB1_FA<br>FuelTrimSystemB2_FA<br>EngineMisfireDetected_FA<br>EthanolCompositionSensor_FA<br>P013D, P014A, P014B, P2272 or P2273<br><br>10.0 < Volts < 32.0 = Valid ( the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's" )<br><br>= Not Valid<br><br>= Not Valid, See definition of <b>Multiple DTC Use_Green Sensor Delay Criteria - Airflow and Multiple DTC Use_Green Sensor Delay Criteria - Limit</b> for the following locations: B1S2, B2S2 in Supporting Tables tab.<br><br>= False<br>= enabled | Frequency:<br>Once per trip<br>Note: if<br>NaPOPD_b_Res<br>etFastRespFunc = FALSE for the given Fuel Bank OR<br>NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed. | Type A,<br>1 Trips<br>EWMA |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                         | Enable Conditions                                                               | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | DTC's Passed<br><br>=====<br>After above conditions are met:<br>DFCO mode is continued<br>(wo driver initiated pedal input). | P2270 (and P2272 if applicable)<br>P013E (and P014A if applicable)<br><br>===== |               |               |
|                      |               |                     |                      |                 |                                                                                                                              |                                                                                 |               |               |

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| Component/<br>System                                                | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                  | Malfunction Criteria                                                                                                                                                                             | Threshold Value                                                                                                     | Secondary Parameters                                                                                                                                                                                               | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Time Required                                                                                                                                                                                   | MIL<br>Illum.              |
|---------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| O2 Sensor<br>Slow<br>Response<br>Lean to Rich<br>Bank 2<br>Sensor 2 | P013D         | This DTC determines if the post catalyst O2 sensor has Slow Response in a predefined Lean to Rich voltages range during Lean to Rich transition. The diagnostic is an intrusive test which increases the delivered A/F ratio to achieve the required rich threshold. | The EWMA of the Post O2 sensor normalized integral value<br><br>OR<br><br>The Accumulated mass air flow monitored during the Slow Response Test (between the upper and lower voltage thresholds) | > 8.0 units<br><br><br>> 75 grams (lower voltage threshold is 350 mvolts and upper voltage threshold is 600 mvolts) | No Active DTC's<br><br><br>B2S2 DTC's Not Active this key cycle<br><br>System Voltage Learned heater resistance<br><br><br>ICAT MAT Burnoff delay<br><br>Green O2S Condition<br><br><br>Green Cat System Condition | TPS_ThrottleAuthorityDefaulted<br>ECT_Sensor_FA<br>IAT_SensorFA<br>MAF_SensorFA<br>MAP_SensorFA<br>AIR System FA<br>FuelInjectorCircuit_FA<br>FuelTrimSystemB1_FA<br>FuelTrimSystemB2_FA<br>EngineMisfireDetected_FA<br>EthanolCompositionSensor_FA<br>P013C, P014A, P014B, P2272 or P2273<br><br>10.0 < Volts < 32.0<br>= Valid ( the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's" )<br><br>= Not Valid<br><br>= Not Valid, See definition of <b>Multiple DTC Use_Green Sensor Delay Criteria - Airflow</b> and <b>Multiple DTC Use_Green Sensor Delay Criteria - Limit</b> for the following locations: B1S2, B2S2 in Supporting Tables tab.<br><br>= Not Valid, System is not valid until accumulated airflow is greater than | Frequency:<br>Once per trip<br>Note: if<br>NaPOPD_b_Res<br>etFastRespFunc<br>= FALSE for the given Fuel Bank<br>OR<br>NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed. | Type A,<br>1 Trips<br>EWMA |



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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                       | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                             | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | <p>Low Fuel Condition Diag<br/>Post fuel cell</p> <p>DTC's Passed</p> <p>=====</p> <p>After above conditions are met: Fuel Enrich mode continued.</p> <p>=====</p> <p>During this test the following must stay TRUE or the test will abort:<br/>0.96 ≤ Fuel EQR ≤ 1.08</p> | <p>720,000 grams. Airflow accumulation is only enabled when estimated Cat temperature is above 600 Deg C. (Note: This feature is only enabled when the vehicle is new and cannot be enabled in service).</p> <p>= False<br/>= enabled</p> <p>P2270 (and P2272 if applicable)<br/>P013E (and P014A if applicable)<br/>P013A (and P013C if applicable)<br/>P2271 (and P2273 if applicable)<br/>P013F (and P014B if applicable)</p> <p>=====</p> |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                               |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                   | Fault<br>Code | Monitor Description                                                                                                                                                                                                    | Malfunction Criteria                                                                                                                                                                                                                                                                   | Threshold Value                                                                     | Secondary Parameters                                                                                                                                                                                                              | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Time Required                                                                                                                                                                                                                       | MIL<br>Illum.      |
|------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| O2 Sensor<br>Delayed<br>Response<br>Rich to Lean<br>Bank 1<br>Sensor 2 | P013E         | This DTC determines if the post catalyst O2 sensor has an initial delayed response to an A/F change from Rich to Lean. The diagnostic is an intrusive test which runs in a DFCO mode to achieve the required response. | <p>Post O2 sensor voltage</p> <p>AND</p> <p>The Accumulated mass air flow monitored during the Delayed Response Test under DFCO</p> <p>DFCO begins after:<br/>1) Catalyst has been rich for a minimum of<br/>AND<br/>2) Catalyst Rich Accumulation Air Flow is greater or equal to</p> | <p>&gt; 450 mvolts</p> <p>&gt; 40 grams</p> <p>&gt; 0 secs</p> <p>&gt; 10 grams</p> | <p>No Active DTC's</p> <p>B1S2 DTC's Not Active this key cycle</p> <p>System Voltage<br/>Learned heater resistance</p> <p>ICAT MAT Burnoff delay</p> <p>Green O2S Condition</p> <p>Low Fuel Condition Diag<br/>Post fuel cell</p> | <p>TPS_ThrottleAuthorityDefaulted<br/>ECT_Sensor_FA<br/>IAT_SensorFA<br/>MAF_SensorFA<br/>MAP_SensorFA<br/>AIR System FA<br/>FuelInjectorCircuit_FA<br/>FuelTrimSystemB1_FA<br/>FuelTrimSystemB2_FA<br/>EngineMisfireDetected_FA<br/>EthanolCompositionSensor_FA<br/>P013A, P013B, P013F, P2270 or P2271</p> <p>10.0 &lt; Volts &lt; 32.0<br/>= Valid ( the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's" )</p> <p>= Not Valid</p> <p>= Not Valid, See definition of <b>Multiple DTC Use_Green Sensor Delay Criteria - Airflow and Multiple DTC Use_Green Sensor Delay Criteria - Limit</b> for the following locations: B1S2, B2S2 (if applicable) in Supporting Tables tab.</p> <p>= False<br/>= enabled</p> | <p>Frequency:<br/>Once per trip<br/>Note: if<br/>NaPOPD_b_Res<br/>etFastRespFunc<br/>= FALSE for the<br/>given Fuel Bank<br/>OR<br/>NaPOPD_b_Rap<br/>idResponseActi<br/>ve = TRUE,<br/>multiple tests per<br/>trip are allowed.</p> | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                        | Enable Conditions                                                | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | DTC's Passed<br><br>Number of fueled<br>cylinders<br>=====<br>After above conditions are<br>met: DFCO mode entered<br>(wo driver initiated pedal<br>input). | P2270 (and P2272 if<br>applicable)<br><br>≤ 5 cylinders<br>===== |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                             |                                                                  |               |               |

| Component/<br>System                                                   | Fault<br>Code | Monitor Description                                                                                                                                                                                                                        | Malfunction Criteria                                                                                              | Threshold Value                         | Secondary Parameters                                                                                                                                                                                                                                               | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Time Required                                                                                                                                                                            | MIL<br>Illum.      |
|------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| O2 Sensor<br>Delayed<br>Response<br>Lean to Rich<br>Bank 1<br>Sensor 2 | P013F         | This DTC determines if the post catalyst O2 sensor has an initial delayed response to an A/F change from Lean to Rich. The diagnostic is an intrusive test which increases the delivered A/F ratio to achieve the required rich threshold. | Post O2 sensor voltage<br><br>AND<br><br>The Accumulated mass air flow monitored during the Delayed Response Test | < 350 mvolts<br><br><br><br>> 150 grams | No Active DTC's<br><br><br><br><br><br><br><br>B1S2 DTC's Not Active this key cycle<br><br><br>System Voltage Learned heater resistance<br><br><br><br><br>ICAT MAT Burnoff delay<br><br>Green O2S Condition<br><br><br><br><br><br><br>Green Cat System Condition | TPS_ThrottleAuthorityDefaulted<br>ECT_Sensor_FA<br>IAT_SensorFA<br>MAF_SensorFA<br>MAP_SensorFA<br>AIR System FA<br>FuelInjectorCircuit_FA<br>FuelTrimSystemB1_FA<br>FuelTrimSystemB2_FA<br>EngineMisfireDetected_FA<br>EthanolCompositionSensor_FA<br>P013A, P013B, P013E, P2270 or P2271<br><br>10.0 < Volts < 32.0<br>= Valid ( the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's" )<br><br>= Not Valid<br><br>= Not Valid, See definition of <b>Multiple DTC Use_Green Sensor Delay Criteria - Airflow</b> and <b>Multiple DTC Use_Green Sensor Delay Criteria - Limit</b> for the following locations: B1S2, B2S2 (if applicable) in Supporting Tables tab.<br><br>= Not Valid, System is not valid until accumulated airflow is greater than | Frequency:<br>Once per trip<br>Note: if<br>NaPOPD_b_Res<br>etFastRespFunc = FALSE for the given Fuel Bank OR<br>NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                       | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                        | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Low Fuel Condition Diag<br>Post fuel cell<br><br>DTC's Passed<br><br>Number of fueled<br>cylinders<br>=====<br>After above conditions are<br>met: Fuel Enrich mode<br>entered.<br>=====<br>During this test the<br>following must stay TRUE<br>or the test will abort: 0.96<br>$\leq$ Fuel EQR $\leq$ 1.08 | 720,000 grams. Airflow<br>accumulation is only<br>enabled when estimated<br>Cat temperature is above<br>600 Deg C. (Note: This<br>feature is only enabled<br>when the vehicle is new<br>and cannot be enabled in<br>service).<br><br>= False<br>= enabled<br><br>P2270 (and P2272 if<br>applicable)<br>P013E (and P014A if<br>applicable)<br>P013A (and P013C if<br>applicable)<br>P2271 (and P2273 if<br>applicable)<br><br>$\geq$ 1 cylinders<br>===== |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                | Fault<br>Code | Monitor Description                                         | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                 | Enable Conditions                                                                                                                                                                                   | Time Required                                                                        | MIL<br>Illum.      |
|-----------------------------------------------------------------------------------------------------|---------------|-------------------------------------------------------------|----------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------|
| O2S Circuit<br>Insufficient<br>Activity Bank<br>1 Sensor 2)<br>(For Dual<br>Bank<br>Exhaust<br>Only | P0140         | This DTC determines if<br>the O2 sensor circuit is<br>open. | Oxygen Sensor Signal | > 1,700 mvolts  | No Active DTC's<br><br>System Voltage<br>AFM Status<br>Heater Warm-up delay<br>Engine Run Time<br>Engine Run Accum<br>Fuel Condition | TPS_ThrottleAuthorityDef<br>aulted<br>MAF_SensorFA<br>EthanolCompositionSens<br>or_FA<br>10.0 < Volts < 32.0<br>= All Cylinders active<br>= Complete > 5 seconds<br>> 150 seconds<br>≤ 87 % Ethanol | 100 failures out<br>of 125 samples.<br><br>Frequency:<br>Continuous 100<br>msec loop | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                | Fault<br>Code | Monitor Description                                                                                                       | Malfunction Criteria                            | Threshold Value  | Secondary Parameters                                                                                                                                 | Enable Conditions                                                                                         | Time Required                                                                                                                     | MIL<br>Illum.      |
|---------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------|
| O2S Heater Performance Bank 1 Sensor 2) (For Dual Bank Exhaust Only | P0141         | This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit. | Heater Current outside of the expected range of | 0.3 > amps > 1.2 | No Active DTC's<br>System Voltage<br>Heater Warm-up delay<br>O2S Heater device control<br>B1S1 O2S Heater Duty Cycle<br><br>All of the above met for | ECT_Sensor_FA<br>10.0 < Volts < 32.0<br>= Complete<br><br>= Not active<br><br>> zero<br><br>> 120 seconds | 8 failures out of 10 samples<br><br>Frequency:<br>2 tests per trip<br>10 seconds delay between tests and 1 second execution rate. | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                    | Fault<br>Code | Monitor Description                                                                                                                                                                                                    | Malfunction Criteria                                                                                                                                                                                                                                                                   | Threshold Value                                                                              | Secondary Parameters                                                                                                                                                                                                                     | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Time Required                                                                                                                                                                           | MIL<br>Illum.          |
|---------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| O2 Sensor Delayed Response Rich to Lean Bank 2 Sensor 2 | P014A         | This DTC determines if the post catalyst O2 sensor has an initial delayed response to an A/F change from Rich to Lean. The diagnostic is an intrusive test which runs in a DFCO mode to achieve the required response. | <p>Post O2 sensor voltage</p> <p>AND</p> <p>The Accumulated mass air flow monitored during the Delayed Response Test under DFCO</p> <p>DFCO begins after:<br/>1) Catalyst has been rich for a minimum of<br/>AND<br/>2) Catalyst Rich Accumulation Air Flow is greater or equal to</p> | <p>&gt; 450 mvolts</p><br><p>&gt; 40 grams</p><br><p>&gt; 0 secs</p><br><p>&gt; 10 grams</p> | <p>No Active DTC's</p><br><p>B2S2 DTC's Not Active this key cycle</p><br><p>System Voltage Learned heater resistance</p><br><p>ICAT MAT Burnoff delay</p><br><p>Green O2S Condition</p><br><p>Low Fuel Condition Diag Post fuel cell</p> | <p>TPS_ThrottleAuthorityDefaulted</p> <p>ECT_Sensor_FA</p> <p>IAT_SensorFA</p> <p>MAF_SensorFA</p> <p>MAP_SensorFA</p> <p>AIR System FA</p> <p>FuelInjectorCircuit_FA</p> <p>FuelTrimSystemB1_FA</p> <p>FuelTrimSystemB2_FA</p> <p>EngineMisfireDetected_FA</p> <p>EthanolCompositionSensor_FA</p> <p>P013C, P013D, P014B, P2272 or P2273</p><br><p>10.0 &lt; Volts &lt; 32.0 = Valid ( the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's" )</p><br><p>= Not Valid</p><br><p>= Not Valid, See definition of <b>Multiple DTC Use_Green Sensor Delay Criteria - Airflow</b> and <b>Multiple DTC Use_Green Sensor Delay Criteria - Limit</b> for the following locations: B1S2, B2S2 in Supporting Tables tab.</p><br><p>= False<br/>= enabled</p> | <p>Frequency: Once per trip</p> <p>Note: if NaPOPD_b_Res etFastRespFunc = FALSE for the given Fuel Bank OR NaPOPD_b_RapidResponseActive = TRUE, multiple tests per trip are allowed</p> | <p>Type B, 2 Trips</p> |



13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                            | Enable Conditions                                                | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | DTC's Passed<br><br>Number of fueled<br>cylinders<br>=====<br><br>After above conditions are<br>met: DFCO mode entered<br>(wo driver initiated pedal<br>input). | P2270 (and P2272 if<br>applicable)<br><br>≤ 5 cylinders<br>===== |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                 |                                                                  |               |               |



13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                       | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                        | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Low Fuel Condition Diag<br>Post fuel cell<br><br>DTC's Passed<br><br>Number of fueled<br>cylinders<br>=====<br>After above conditions are<br>met: Fuel Enrich mode<br>entered.<br>=====<br>During this test the<br>following must stay TRUE<br>or the test will abort: 0.96<br>$\leq$ Fuel EQR $\leq$ 1.08 | 720,000 grams. Airflow<br>accumulation is only<br>enabled when estimated<br>Cat temperature is above<br>600 Deg C. (Note: This<br>feature is only enabled<br>when the vehicle is new<br>and cannot be enabled in<br>service).<br><br>= False<br>= enabled<br><br>P2270 (and P2272 if<br>applicable)<br>P013E (and P014A if<br>applicable)<br>P013A (and P013C if<br>applicable)<br>P2271 (and P2273 if<br>applicable)<br><br>$\geq$ 1 cylinders<br>===== |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System                             | Fault<br>Code | Monitor Description                                             | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                        | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Time Required                                                                                       | MIL<br>Illum.      |
|--------------------------------------------------|---------------|-----------------------------------------------------------------|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------------|
| O2S Circuit<br>Low Voltage<br>Bank 2<br>Sensor 1 | P0151         | This DTC determines if the O2 sensor circuit is shorted to low. | Oxygen Sensor Signal | < 40 mvolts     | No Active DTC's<br><br>AIR intrusive test<br>Fuel intrusive test<br>Idle intrusive test<br>EGR intrusive test<br>System Voltage<br>EGR Device Control<br>Idle Device Control<br>Fuel Device Control<br>AIR Device Control<br>Low Fuel Condition Diag<br>Equivalence Ratio<br><br>Air Per Cylinder<br>Fuel Control State<br>Closed Loop Active<br>All Fuel Injectors for<br>active Cylinders<br>Fuel Condition<br>Fuel State<br><br>All of the above met for | TPS_ThrottleAuthority<br>DefaultedMAP_SensorFA<br>AIR System FA<br>Ethanol Composition<br>Sensor FA<br>EvapPurgeSolenoidCircuit<br>_FA<br>EvapFlowDuringNonPurg<br>e_FA<br>EvapVentSolenoidCircuit_<br>FA<br>EvapSmallLeak_FA<br>EvapEmissionSystem_FA<br>FuelTankPressureSnsrCkt<br>_FA<br>FuelInjectorCircuit_FA<br>= Not active<br>= Not active<br>= Not active<br>= Not active<br>10.0 < Volts < 32.0<br>= Not active<br>= Not active<br>= Not active<br>= Not active<br>= False<br>0.9805 ≤ equiv. ratio ≤<br>1.0996<br>50 ≤ APC ≤ 500 mgrams<br>= Closed Loop<br>= TRUE<br><br>Enabled (On)<br>≤ 87 % Ethanol<br>DFCO not active<br><br>> 5.0 seconds | 380 failures out<br>of 475 samples<br><br>Frequency:<br>Continuous in<br>100 milli -<br>second loop | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                              | Fault<br>Code | Monitor Description                                              | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                         | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Time Required                                                                                     | MIL<br>Illum.      |
|---------------------------------------------------|---------------|------------------------------------------------------------------|----------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|
| O2S Circuit<br>High Voltage<br>Bank 2<br>Sensor 1 | P0152         | This DTC determines if the O2 sensor circuit is shorted to high. | Oxygen Sensor Signal | > 1,050 mvolts  | == Open Test Criteria ==<br>No Active DTC's<br><br>System Voltage<br>AFM Status<br>Heater Warm-up delay<br>Engine Run Time<br>Engine Run Accum<br>Fuel Condition<br>=====<br>No Active DTC's<br><br>Low Fuel Condition Diag<br>Fuel Condition<br><br>Initial delay after Open<br>Test Criteria met (cold<br>start condition)<br><br>Initial delay after Open<br>Test Criteria met (not cold<br>start condition)<br><br>Equivalence Ratio<br>Air Per Cylinder | =====<br>TPS_ThrottleAuthorityDef<br>aulted<br>MAF_SensorFA<br>EthanolCompositionSens<br>or_FA<br>10.0 < Volts < 32.0<br>= All Cylinders active<br>= Complete > 5 seconds<br>> 150 seconds<br><= 87 % Ethanol<br>=====<br>MAP_SensorFA<br>EvapPurgeSolenoidCircuit<br>_FA<br>EvapFlowDuringNonPurg<br>e_FA<br>EvapVentSolenoidCircuit_<br>FA<br>EvapSmallLeak_FA<br>EvapEmissionSystem_FA<br>FuelTankPressureSnsrCkt<br>_FA<br>FuelInjectorCircuit_FA<br>AIR System FA<br><br>= False ≤ 87 % Ethanol<br><br>> 105.0 seconds when<br>engine soak time ><br>28,800 seconds<br><br>> 105.0 seconds when<br>engine soak time ≤<br>28,800 seconds<br><br>0.9805 ≤ ratio ≤ 1.0996<br>50 ≤ mgrams ≤ 500 | 70 failures out of<br>88 samples<br><br>Frequency:<br>Continuous in<br>100 milli -<br>second loop | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                           | Enable Conditions                     | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|------------------------------------------------|---------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Fuel Control State<br>All of the above met for | not = Power Enrichment<br>> 3 seconds |               |               |
|                      |               |                     |                      |                 |                                                |                                       |               |               |

13 OBDG05A Engine Diagnostics

| Component/System                                         | Fault Code | Monitor Description                                             | Malfunction Criteria                                                                                                                                                                                      | Threshold Value                                                                                                                        | Secondary Parameters                                                                                                                                                                                                                                      | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Time Required                                                | MIL Illum.      |
|----------------------------------------------------------|------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------|
| O2S Slow Response Bank 2 Sensor 1)<br>(For use with ESPD | P0153      | This DTC determines if the O2 sensor response time is degraded. | Fault condition present when the average response time is calculated over the test time, and compared to the threshold.<br><br>OR<br><br>Slope Time L/R Switches<br><br>OR<br><br>Slope Time R/L Switches | Refer to <b>P0153_O2S Slow Response Bank 2 Sensor 1 "Pass/Fail Threshold table"</b> in the Supporting Tables tab<br><br>< 3<br><br>< 3 | No Active DTC's<br><br><br><br><br><br><br><br><br><br>Bank 2 Sensor 1 DTC's not active<br><br>System Voltage<br>EGR Device Control<br>Idle Device Control<br>Fuel Device Control<br>AIR Device Control<br>Low Fuel Condition Diag<br>Green O2S Condition | TPS_ThrottleAuthorityDefaulted<br>MAP_SensorFA<br>IAT_SensorFA<br>ECT_Sensor_FA<br>AmbientAirDefault<br>MAF_SensorFA<br>EvapPurgeSolenoidCircuit_FA<br>EvapFlowDuringNonPurge_FA<br>EvapVentSolenoidCircuit_FA<br>EvapSmallLeak_FA<br>EvapEmissionSystem_FA<br>FuelTankPressureSnrCkt_FA<br>FuelInjectorCircuit_FA<br>AIR System FA<br>EthanolCompositionSensor_FA<br>EngineMisfireDetected_FA<br><br>= P0151, P0152 or P0154<br><br>10.0 < Volts < 32.0<br>= Not active<br>= Not active<br>= Not active<br>= Not active<br>= False<br>= Not Valid, See definition of <b>Multiple DTC Use_Green Sensor Delay Criteria - Airflow</b> and <b>Multiple DTC Use_Green Sensor Delay Criteria - Limit</b> for the following locations:<br>B1S1, B2S1 in Supporting | Sample time is 60 seconds<br><br>Frequency:<br>Once per trip | Type B, 2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | O2 Heater on for<br>Learned Htr resistance<br><br>Engine Coolant<br>IAT<br>Engine run Accum<br><br>Time since any AFM<br>status change<br>Time since Purge On to<br>Off change<br>Time since Purge Off to<br>On change<br><br>Engine airflow<br>Engine speed<br>Fuel Condition<br>Baro<br>Air Per Cylinder<br><br>Fuel Control State<br>Closed Loop Active<br>LTM fuel cell<br>Transient Fuel Mass<br>Baro<br>Fuel Control State<br>Fuel State<br>Commanded Proportional<br>Gain<br><br>=====<br>All of the above met for | Tables tab.<br><br>≥ 60 seconds<br>= Valid ( the heater<br>resistance has learned<br>since NVM reset, see<br>enable conditions for<br>"HO2S Heater Resistance<br>DTC's" )<br><br>> 54 °C<br>> -40 °C<br>> 60 seconds<br><br>> 0.0 seconds<br>> 4.0 seconds<br>> 4.0 seconds<br><br>15 ≤ grams/second ≤ 43<br>1,000 ≤ RPM ≤ 3,000<br>< 87 % Ethanol<br>> 70 kpa<br>>= 125 mGrams<br><br>= Closed Loop<br>= TRUE<br>= Enabled<br>≤ 100.0 mgrams<br>= Not Defaulted<br>not = Power Enrichment<br>DFCO not active<br><br>≥ 0.0 %<br><br>=====<br>> 2.0 seconds |               |               |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                       | Fault<br>Code | Monitor Description                                   | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                 | Enable Conditions                                                                                                                                                                                      | Time Required                                                                        | MIL<br>Illum.      |
|------------------------------------------------------------|---------------|-------------------------------------------------------|----------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------|
| O2S Circuit<br>Insufficient<br>Activity Bank<br>2 Sensor 1 | P0154         | This DTC determines if the O2 sensor circuit is open. | Oxygen Sensor Signal | > 1,700 mvolts  | No Active DTC's<br><br>System Voltage<br>AFM Status<br>Heater Warm-up delay<br>Engine Run Time<br>Engine Run Accum<br>Fuel Condition | TPS_ThrottleAuthorityDef<br>aulted<br>MAF_SensorFA<br>EthanolCompositionSens<br>or_FA<br>10.0 < Volts < 32.0<br>= All Cylinders active<br>= Complete<br>> 5 seconds<br>> 150 seconds<br>≤ 87 % Ethanol | 100 failures out<br>of 125 samples.<br><br>Frequency:<br>Continuous 100<br>msec loop | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                            | Fault<br>Code | Monitor Description                                                                                                       | Malfunction Criteria                            | Threshold Value  | Secondary Parameters                                                                                                                                       | Enable Conditions                                                                                         | Time Required                                                                                                                                   | MIL<br>Illum.      |
|-------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| O2S Heater<br>Performance<br>Bank 2<br>Sensor 1 | P0155         | This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit. | Heater Current outside of the expected range of | 0.3 > amps > 1.2 | No Active DTC's<br>System Voltage<br>Heater Warm-up delay<br>O2S Heater device<br>control<br>B1S1 O2S Heater Duty<br>Cycle<br><br>All of the above met for | ECT_Sensor_FA<br>10.0 < Volts < 32.0<br>= Complete<br><br>= Not active<br><br>> zero<br><br>> 120 seconds | 8 failures out of<br>10 samples<br><br>Frequency:<br>2 tests per trip<br>10 seconds<br>delay between<br>tests and 1<br>second<br>execution rate | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/System                        | Fault Code | Monitor Description                                             | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                 | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Time Required                                                                           | MIL Illum.      |
|-----------------------------------------|------------|-----------------------------------------------------------------|----------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------|
| O2S Circuit Low Voltage Bank 2 Sensor 2 | P0157      | This DTC determines if the O2 sensor circuit is shorted to low. | Oxygen Sensor Signal | < 50 mvolts     | No Active DTC's<br><br>AIR intrusive test<br>Fuel intrusive test<br>Idle intrusive test<br>EGR intrusive test<br>System Voltage<br>EGR Device Control<br>Idle Device Control<br>Fuel Device Control<br>AIR Device Control<br>Low Fuel Condition Diag<br>Equivalence Ratio<br>Air Per Cylinder<br>Fuel Control State<br>Closed Loop Active<br>All Fuel Injectors for active Cylinders<br>Fuel Condition<br>Fuel State<br><br>All of the above met for | TPS_ThrottleAuthorityDefaulted<br>MAP_SensorFA<br>AIR System FA<br>Ethanol Composition Sensor FA<br>EvapPurgeSolenoidCircuit_FA<br>EvapFlowDuringNonPurge_FA<br>EvapVentSolenoidCircuit_FA<br>EvapSmallLeak_FA<br>EvapEmissionSystem_FA<br>FuelTankPressureSnsrCkt_FA<br>FuelInjectorCircuit_FA<br>= Not active<br>= Not active<br>= Not active<br>= Not active<br>10.0 < Volts < 32.0<br>= Not active<br>= Not active<br>= Not active<br>= Not active<br>= False 0.9805 ≤ ratio ≤ 1.0996<br>50 ≤ mgrams ≤ 500<br>= Closed Loop<br>= TRUE<br><br>Enabled (On)<br>≤ 87 % Ethanol<br>DFCO not active<br><br>> 5.0 seconds | 430 failures out of 540 samples<br><br>Frequency: Continuous in 100 milli - second loop | Type B, 2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                              | Fault<br>Code | Monitor Description                                              | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Time Required                                                                                       | MIL<br>Illum.      |
|---------------------------------------------------|---------------|------------------------------------------------------------------|----------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------------|
| O2S Circuit<br>High Voltage<br>Bank 2<br>Sensor 2 | P0158         | This DTC determines if the O2 sensor circuit is shorted to high. | Oxygen Sensor Signal | > 1,050 mvolts  | == Open Test Criteria ==<br>No Active DTC's<br><br>System Voltage<br>AFM Status<br>Heater Warm-up delay<br>Engine Run Time<br>Engine Run Accum<br>Fuel Condition<br>=====<br><br>No Active DTC's<br><br>Low Fuel Condition Diag<br>Fuel Condition<br><br>Initial delay after Open<br>Test Criteria met (cold<br>start condition)<br><br>Initial delay after Open<br>Test Criteria met (not cold<br>start condition)<br><br>Equivalence Ratio<br>Air Per Cylinder<br>Fuel Control State | =====<br>TPS_ThrottleAuthorityDef<br>aulted<br>MAF_SensorFA<br>EthanolCompositionSens<br>or_FA<br>10.0 < Volts < 32.0<br>= All Cylinders active<br>= Complete<br>> 5 seconds<br>> 150 seconds<br>≤ 87 % Ethanol<br>=====<br><br>MAP_SensorFA<br>EvapPurgeSolenoidCircuit<br>_FA<br>EvapFlowDuringNonPurg<br>e_FA<br>EvapVentSolenoidCircuit_<br>FA<br>EvapSmallLeak_FA<br>EvapEmissionSystem_FA<br>FuelTankPressureSnrCkt<br>_FA<br>FuelInjectorCircuit_FA<br>AIR System FA<br>= False<br>≤ 87 % Ethanol<br><br>> 105.0 seconds when<br>engine soak time ><br>28,800 seconds<br><br>> 105.0 seconds when<br>engine soak time ≤<br>28,800 seconds<br><br>0.9805 ≤ ratio ≤ 1.0996<br>50 ≤ mgrams ≤ 500<br>not = Power Enrichment | 100 failures out<br>of 125 samples<br><br>Frequency:<br>Continuous in<br>100 milli -<br>second loop | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters     | Enable Conditions | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|--------------------------|-------------------|---------------|---------------|
|                      |               |                     |                      |                 | All of the above met for | > 3 seconds       |               |               |
|                      |               |                     |                      |                 |                          |                   |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                   | Fault<br>Code | Monitor Description                                                                                                                                                                                                   | Malfunction Criteria                                                                                                                                                                                    | Threshold Value                                                   | Secondary Parameters                                                                                                                                                                                                  | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Time Required                                                                                                                                                                                     | MIL<br>Illum.              |
|------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| O2 Sensor<br>Delayed<br>Response<br>Rich to Lean<br>Bank 1<br>Sensor 1 | P015A         | This DTC determines if the pre catalyst O2 sensor has an initial delayed response to an A/F change from Rich to Lean. The diagnostic is an intrusive test which runs in a DFCO mode to achieve the required response. | The EWMA of the Pre O2 sensor normalized R2L time delay value<br><br>OR<br>[The Accumulated time monitored during the R2L Delayed Response Test (Gross failure).<br><br>AND<br>Pre O2 sensor voltage is | > 0.6 EWMA (sec)<br><br><br>≥ 1.5 Seconds<br><br><br>> 550 mvolts | No Active DTC's<br><br><br><br><br><br><br><br><br><br>System Voltage<br>EGR Device Control<br>Idle Device Control<br>Fuel Device Control<br>AIR Device Control<br>Low Fuel Condition Diag<br><br>Green O2S Condition | TPS_ThrottleAuthorityDefaulted<br>MAP_SensorFA<br>IAT_SensorFA<br>ECT_Sensor_FA<br>AmbientAirDefault<br>MAF_SensorFA<br>EvapPurgeSolenoidCircuit_FA<br>EvapFlowDuringNonPurge_FA<br>EvapVentSolenoidCircuit_FA<br>EvapSmallLeak_FA<br>EvapEmissionSystem_FA<br>FuelTankPressureSnsrCkt_FA<br>FuelInjectorCircuit_FA<br>AIR System FA<br>FuelTrimSystemB1_FA<br>FuelTrimSystemB2_FA<br>EthanolCompositionSensor_FA<br>EngineMisfireDetected_FA<br>P0131, P0132, P0134<br><br>10.0 < Volts < 32.0<br>= Not active<br>= Not active<br>= Not active<br>= Not active<br>= False<br><br>= Not Valid, See definition of <b>Multiple DTC Use_Green Sensor Delay Criteria - Airflow and Multiple DTC Use_Green Sensor Delay Criteria - Limit for</b> | Frequency:<br>Once per trip<br>Note: if<br>NaESPD_b_Fast<br>InitResplsActive = TRUE for the given Fuel Bank<br>OR<br>NaESPD_b_RapidResponsesActive = TRUE,<br>multiple tests per trip are allowed | Type A,<br>1 Trips<br>EWMA |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | <p>O2 Heater (pre sensor) on for<br/>Learned Htr resistance</p> <p>Engine Coolant IAT<br/>Engine run Accum</p> <p>Engine Speed to initially enable test<br/>Engine Speed range to keep test enabled (after initially enabled)</p> <p>Engine Airflow<br/>Vehicle Speed to initially enable test<br/>Vehicle Speed range to keep test enabled (after initially enabled)</p> <p>Closed loop integral<br/>Closed Loop Active<br/>Evap<br/>Ethanol<br/>Post fuel cell</p> <p>EGR Intrusive diagnostic<br/>All post sensor heater delays<br/>O2S Heater (post sensor) on Time<br/>Predicted Catalyst temp<br/>Fuel State</p> | <p>the following locations:<br/>B1S1, B2S1 (if applicable)<br/>in Supporting Tables tab.</p> <p>≥ 60 seconds<br/>= Valid ( the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's" )</p> <p>&gt; 54 °C<br/>&gt; -40 °C<br/>&gt; 60 seconds</p> <p>1,150 ≤ RPM ≤ 2,325</p> <p>1,100 ≤ RPM ≤ 2,375</p> <p>3 ≤ gps ≤ 11</p> <p>44.1 ≤ MPH ≤ 80.2</p> <p>39.8 ≤ MPH ≤ 82.0</p> <p>0.90 ≤ C/L Int ≤ 1.07<br/>= TRUE<br/>not in control of purge<br/>not in estimate mode<br/>= enabled</p> <p>= not active</p> <p>= not active</p> <p>≥ 180.0 sec<br/>500 ≤ °C ≤ 980<br/>= DFCO possible</p> |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                     | Enable Conditions                                                                    | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | <p>=====</p> <p>All of the above met for at least 3.0 seconds, and then the Force Cat Rich intrusive stage is requested.</p> <p>=====</p> <p>Pre O2S voltage B1S1 at end of Cat Rich stage<br/>Fuel State<br/>Number of fueled cylinders</p> <p>=====</p> <p>After above conditions are met: DFCO Mode is entered (wo driver initiated pedal input).</p> | <p>=====</p> <p>≥ 680 mvolts<br/>= DFCO active</p> <p>≤ 5 cylinders</p> <p>=====</p> |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                                                                                                                                                          |                                                                                      |               |               |



13 OBDG05A Engine Diagnostics

| Component/<br>System                                    | Fault<br>Code | Monitor Description                                                                                                                                                                                                             | Malfunction Criteria                                                                                                                                                                                                                                                      | Threshold Value                                                                                                                                                           | Secondary Parameters                                                                                                                                                                                                  | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Time Required                                                                                                                                                                                     | MIL<br>Illum.              |
|---------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| O2 Sensor Delayed Response Lean to Rich Bank 1 Sensor 1 | P015B         | This DTC determines if the pre catalyst O2 sensor has an initial delayed response to an A/F change from Lean to Rich. The diagnostic is an intrusive test which runs in an enriched fuel mode to achieve the required response. | The EWMA of the Pre O2 sensor normalized L2R time delay value<br><br>OR<br>[The Accumulated time monitored during the L2R Delayed Response Test (Gross failure).<br><br>AND<br>Pre O2 sensor voltage is<br><br>OR<br>At end of Cat Rich stage the Pre O2 sensor output is | > 0.6 EWMA (sec)<br><br><br><br>≥ 2.0 Seconds<br><br>Pre O2 sensor voltage is < 325 mvolts<br><br>OR<br>At end of Cat Rich stage the Pre O2 sensor output is < 680 mvolts | No Active DTC's<br><br><br><br><br><br><br><br><br><br>System Voltage<br>EGR Device Control<br>Idle Device Control<br>Fuel Device Control<br>AIR Device Control<br>Low Fuel Condition Diag<br><br>Green O2S Condition | TPS_ThrottleAuthorityDefaulted<br>MAP_SensorFA<br>IAT_SensorFA<br>ECT_Sensor_FA<br>AmbientAirDefault<br>MAF_SensorFA<br>EvapPurgeSolenoidCircuit_FA<br>EvapFlowDuringNonPurge_FA<br>EvapVentSolenoidCircuit_FA<br>EvapSmallLeak_FA<br>EvapEmissionSystem_FA<br>FuelTankPressureSnrCkt_FA<br>FuelInjectorCircuit_FA<br>AIR System FA<br>FuelTrimSystemB1_FA<br>FuelTrimSystemB2_FA<br>EthanolCompositionSensor_FA<br>EngineMisfireDetected_FA<br>P0131, P0132, P0134<br><br>10.0 < Volts < 32.0<br>= Not active<br>= Not active<br>= Not active<br>= Not active<br>= False<br><br>= Not Valid, See definition of <b>Multiple DTC Use_Green Sensor Delay Criteria - Airflow and Multiple DTC Use_Green Sensor Delay Criteria - Limit for</b> | Frequency:<br>Once per trip<br>Note: if<br>NaESPD_b_Fast<br>InitResplsActive = TRUE for the given Fuel Bank<br>OR<br>NaESPD_b_RapidResponsesActive = TRUE,<br>multiple tests per trip are allowed | Type A,<br>1 Trips<br>EWMA |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | O2 Heater (pre sensor) on<br>for<br>Learned Htr resistance<br><br>Engine Coolant<br>IAT<br>Engine run Accum<br><br>Engine Speed to initially<br>enable test<br>Engine Speed range to<br>keep test enabled (after<br>initially enabled)<br><br>Engine Airflow<br>Vehicle Speed to initially<br>enable test<br>Vehicle Speed range to<br>keep test enabled (after<br>initially enabled)<br><br>Closed loop integral<br>Closed Loop Active<br>Evap<br>Ethanol<br>Post fuel cell<br>EGR Intrusive diagnostic<br>All post sensor heater<br>delays<br>O2S Heater (post sensor)<br>on Time<br><br>Predicted Catalyst temp | the following locations:<br>B1S1, B2S1 (if applicable)<br>in Supporting Tables tab.<br><br>≥ 60 seconds<br>= Valid ( the heater<br>resistance has learned<br>since NVM reset, see<br>enable conditions for<br>"HO2S Heater Resistance<br>DTC's" )<br><br>> 54 °C<br>> -40 °C<br>> 60 seconds<br><br>1,150 ≤ RPM ≤ 2,325<br><br>1,100 ≤ RPM ≤ 2,375<br><br>3 ≤ gps ≤ 11<br><br>44.1 ≤ MPH ≤ 80.2<br><br>39.8 ≤ MPH ≤ 82.0<br><br>0.90 ≤ C/L Int ≤ 1.07<br>= TRUE<br>not in control of purge<br>not in estimate mode<br>= enabled<br>= not active<br>= not active<br>= not active<br>≥ 180.0 sec<br><br>500 ≤ °C ≤ 980 |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                      | Enable Conditions                                                                                  | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Fuel State<br>Number of fueled<br>cylinders<br><br>=====<br>When above conditions<br>are met: Fuel Enrich<br>mode is entered.<br><br>=====<br><br>During this test: Engine<br>Airflow must stay<br>between:<br>and the delta Engine<br>Airflow over 12.5msec<br>must be : | = DFCO inhibit<br><br>≥ 1 cylinders<br><br>=====<br><br>=====<br><br>0 ≤ gps ≤ 12<br><br>≤ 3.0 gps |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                                                                           |                                                                                                    |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                   | Fault<br>Code | Monitor Description                                                                                                                                                                                                   | Malfunction Criteria                                                                                                                                                                                           | Threshold Value                                                   | Secondary Parameters                                                                                                                                                                                                  | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Time Required                                                                                                                                                                                     | MIL<br>Illum.              |
|------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| O2 Sensor<br>Delayed<br>Response<br>Rich to Lean<br>Bank 2<br>Sensor 1 | P015C         | This DTC determines if the pre catalyst O2 sensor has an initial delayed response to an A/F change from Rich to Lean. The diagnostic is an intrusive test which runs in a DFCO mode to achieve the required response. | The EWMA of the Pre O2 sensor normalized R2L time delay value<br><br>OR<br>[The Accumulated time monitored during the R2L Delayed Response Test (Gross failure).<br><br>AND<br>Pre O2 sensor voltage is above] | > 0.6 EWMA (sec)<br><br><br>≥ 1.5 Seconds<br><br><br>> 550 mvolts | No Active DTC's<br><br><br><br><br><br><br><br><br><br>System Voltage<br>EGR Device Control<br>Idle Device Control<br>Fuel Device Control<br>AIR Device Control<br>Low Fuel Condition Diag<br><br>Green O2S Condition | TPS_ThrottleAuthorityDefaulted<br>MAP_SensorFA<br>IAT_SensorFA<br>ECT_Sensor_FA<br>AmbientAirDefault<br>MAF_SensorFA<br>EvapPurgeSolenoidCircuit_FA<br>EvapFlowDuringNonPurge_FA<br>EvapVentSolenoidCircuit_FA<br>EvapSmallLeak_FA<br>EvapEmissionSystem_FA<br>FuelTankPressureSnrCkt_FA<br>FuelInjectorCircuit_FA<br>AIR System FA<br>FuelTrimSystemB1_FA<br>FuelTrimSystemB2_FA<br>EthanolCompositionSensor_FA<br>EngineMisfireDetected_FA<br>P0131, P0132, P0134<br><br>10.0 < Volts < 32.0<br>= Not active<br>= Not active<br>= Not active<br>= Not active<br>= False<br><br>= Not Valid, See definition of <b>Multiple DTC Use_Green Sensor Delay Criteria - Airflow and Multiple DTC Use_Green Sensor Delay Criteria - Limit for</b> | Frequency:<br>Once per trip<br>Note: if<br>NaESPD_b_Fast<br>InitResplsActive = TRUE for the given Fuel Bank<br>OR<br>NaESPD_b_RapidResponsesActive = TRUE,<br>multiple tests per trip are allowed | Type A,<br>1 Trips<br>EWMA |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | <p>O2 Heater (pre sensor) on for Learned Htr resistance</p> <p>Engine Coolant IAT</p> <p>Engine run Accum</p> <p>Engine Speed to initially enable test</p> <p>Engine Speed range to keep test enabled (after initially enabled)</p> <p>Engine Airflow</p> <p>Vehicle Speed to initially enable test</p> <p>Vehicle Speed range to keep test enabled (after initially enabled)</p> <p>Closed loop integral</p> <p>Closed Loop Active</p> <p>Evap</p> <p>Ethanol</p> <p>Post fuel cell</p> <p>EGR Intrusive diagnostic</p> <p>All post sensor heater delays</p> <p>O2S Heater (post sensor) on Time</p> <p>Predicted Catalyst temp</p> | <p>the following locations: B1S1, B2S1 in Supporting Tables tab.</p> <p>≥ 60 seconds</p> <p>= Valid ( the heater resistance has learned since NVM reset, see enable conditions for "HO2S Heater Resistance DTC's" )</p> <p>&gt; 54 °C</p> <p>&gt; -40 °C</p> <p>&gt; 60 seconds</p> <p>1,150 ≤ RPM ≤ 2,325</p> <p>1,100 ≤ RPM ≤ 2,375</p> <p>3 ≤ gps ≤ 11</p> <p>44.1 ≤ MPH ≤ 80.2</p> <p>39.8 ≤ MPH ≤ 82.0</p> <p>0.90 ≤ C/L Int ≤ 1.07</p> <p>= TRUE</p> <p>not in control of purge</p> <p>not in estimate mode</p> <p>= enabled</p> <p>= not active</p> <p>= not active</p> <p>≥ 180.0 sec</p> <p>500 ≤ °C ≤ 980</p> |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                      | Enable Conditions                                                                            | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Fuel State<br>=====<br>All of the above met for at least 3.0 seconds, and then the Force Cat Rich intrusive stage is requested.<br>=====<br>Pre O2S voltage B1S1 at end of Cat Rich stage<br>Fuel State<br>Number of fueled cylinders<br>=====<br>After above conditions are met: DFCO Mode is entered (wo driver initiated pedal input). | = DFCO possible<br>=====<br>=====<br>≥ 680 mvolts<br>= DFCO active<br>≤ 5 cylinders<br>===== |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                                                                                                                                           |                                                                                              |               |               |

13 OBDG05A Engine Diagnostics

| Component/System                                        | Fault Code | Monitor Description                                                                                                                                                                                                             | Malfunction Criteria                                                                                                                                                                                                                                                             | Threshold Value                                                                           | Secondary Parameters                                                                                                                                                                                                  | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Time Required                                                                                                                                                                                     | MIL Illum.                 |
|---------------------------------------------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| O2 Sensor Delayed Response Lean to Rich Bank 2 Sensor 1 | P015D      | This DTC determines if the pre catalyst O2 sensor has an initial delayed response to an A/F change from Lean to Rich. The diagnostic is an intrusive test which runs in an enriched fuel mode to achieve the required response. | The EWMA of the Pre O2 sensor normalized L2R time delay value<br><br>OR<br>[The Accumulated time monitored during the L2R Delayed Response Test (Gross failure).<br><br>AND<br>Pre O2 sensor voltage is below]<br><br>OR<br>At end of Cat Rich stage the Pre O2 sensor output is | > 0.6 EWMA (sec)<br><br><br>≥ 2.0 Seconds<br><br><br>< 325 mvolts<br><br><br>< 680 mvolts | No Active DTC's<br><br><br><br><br><br><br><br><br><br>System Voltage<br>EGR Device Control<br>Idle Device Control<br>Fuel Device Control<br>AIR Device Control<br>Low Fuel Condition Diag<br><br>Green O2S Condition | TPS_ThrottleAuthorityDefaulted<br>MAP_SensorFA<br>IAT_SensorFA<br>ECT_Sensor_FA<br>AmbientAirDefault<br>MAF_SensorFA<br>EvapPurgeSolenoidCircuit_FA<br>EvapFlowDuringNonPurge_FA<br>EvapVentSolenoidCircuit_FA<br>EvapSmallLeak_FA<br>EvapEmissionSystem_FA<br>FuelTankPressureSnsrCkt_FA<br>FuelInjectorCircuit_FA<br>AIR System FA<br>FuelTrimSystemB1_FA<br>FuelTrimSystemB2_FA<br>EthanolCompositionSensor_FA<br>EngineMisfireDetected_FA<br>P0131, P0132, P0134<br><br>10.0 < Volts < 32.0<br>= Not active<br>= Not active<br>= Not active<br>= Not active<br>= False<br><br>= Not Valid, See definition of <b>Multiple DTC Use_Green Sensor Delay Criteria - Airflow and Multiple DTC Use_Green Sensor Delay Criteria - Limit for</b> | Frequency:<br>Once per trip<br>Note: if<br>NaESPD_b_Fast<br>InitResplsActive = TRUE for the given Fuel Bank<br>OR<br>NaESPD_b_RapidResponsesActive = TRUE,<br>multiple tests per trip are allowed | Type A,<br>1 Trips<br>EWMA |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | O2 Heater (pre sensor) on<br>for<br>Learned Htr resistance<br><br>Engine Coolant<br>IAT<br>Engine run Accum<br><br>Engine Speed to initially<br>enable test<br>Engine Speed range to<br>keep test enabled (after<br>initially enabled)<br><br>Engine Airflow<br>Vehicle Speed to initially<br>enable test<br>Vehicle Speed range to<br>keep test enabled (after<br>initially enabled)<br><br>Closed loop integral<br>Closed Loop Active<br>Evap<br>Ethanol<br>Post fuel cell<br>EGR Intrusive diagnostic<br>All post sensor heater<br>delays<br>O2S Heater (post sensor)<br>on Time<br><br>Predicted Catalyst temp<br>Fuel State | the following locations:<br>B1S1, B2S1 in Supporting<br>Tables tab.<br><br>≥ 60 seconds<br>= Valid ( the heater<br>resistance has learned<br>since NVM reset, see<br>enable conditions for<br>"HO2S Heater Resistance<br>DTC's" )<br><br>> 54 °C<br>> -40 °C<br>> 60 seconds<br><br>1,150 ≤ RPM ≤ 2,325<br><br>1,100 ≤ RPM ≤ 2,375<br><br>3 ≤ gps ≤ 11<br><br>44.1 ≤ MPH ≤ 80.2<br><br>39.8 ≤ MPH ≤ 82.0<br><br>0.90 ≤ C/L Int ≤ 1.07<br>= TRUE<br>not in control of purge<br>not in estimate mode<br>= enabled<br>= not active<br><br>= not active<br><br>≥ 180.0 sec<br><br>500 ≤ °C ≤ 980<br>= DFCO inhibit |               |               |



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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                        | Enable Conditions                                                                        | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Number of fueled<br>cylinders<br><br>=====<br>When above conditions<br>are met: Fuel Enrich<br>mode is entered.<br><br>=====<br><br>During this test: Engine<br>Airflow must stay<br>between:<br>and the delta Engine<br>Airflow over 12.5msec<br>must be : | $\geq 1$ cylinders<br><br>=====<br><br>$0 \leq \text{gps} \leq 12$<br><br>$\leq 3.0$ gps |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                                                             |                                                                                          |               |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                       | Fault<br>Code | Monitor Description                                   | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                 | Enable Conditions                                                                                                                                                                                      | Time Required                                                                        | MIL<br>Illum.      |
|------------------------------------------------------------|---------------|-------------------------------------------------------|----------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------|
| O2S Circuit<br>Insufficient<br>Activity Bank<br>2 Sensor 2 | P0160         | This DTC determines if the O2 sensor circuit is open. | Oxygen Sensor Signal | > 1,700 mvolts  | No Active DTC's<br><br>System Voltage<br>AFM Status<br>Heater Warm-up delay<br>Engine Run Time<br>Engine Run Accum<br>Fuel Condition | TPS_ThrottleAuthorityDef<br>aulted<br>MAF_SensorFA<br>EthanolCompositionSens<br>or_FA<br>10.0 < Volts < 32.0<br>= All Cylinders active<br>= Complete<br>> 5 seconds<br>> 150 seconds<br>≤ 87 % Ethanol | 100 failures out<br>of 125 samples.<br><br>Frequency:<br>Continuous 100<br>msec loop | Type B,<br>2 Trips |

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| Component/<br>System                            | Fault<br>Code | Monitor Description                                                                                                       | Malfunction Criteria                            | Threshold Value  | Secondary Parameters                                                                                                                                       | Enable Conditions                                                                                         | Time Required                                                                                                                                   | MIL<br>Illum.      |
|-------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| O2S Heater<br>Performance<br>Bank 2<br>Sensor 2 | P0161         | This DTC determines if the O2 sensor heater is functioning properly by monitoring the current through the heater circuit. | Heater Current outside of the expected range of | 0.3 > amps > 1.2 | No Active DTC's<br>System Voltage<br>Heater Warm-up delay<br>O2S Heater device<br>control<br>B1S1 O2S Heater Duty<br>Cycle<br><br>All of the above met for | ECT_Sensor_FA<br>10.0 < Volts < 32.0<br>= Complete<br><br>= Not active<br><br>> zero<br><br>> 120 seconds | 8 failures out of<br>10 samples<br><br>Frequency:<br>2 tests per trip<br>10 seconds<br>delay between<br>tests and 1<br>second<br>execution rate | Type B,<br>2 Trips |

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| Component/System            | Fault Code | Monitor Description                                                                                                     | Malfunction Criteria                                                                                                                                                    | Threshold Value          | Secondary Parameters                                                                                                                                                                                                                                                                                     | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Time Required                        | MIL Illum.      |
|-----------------------------|------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------|
| Fuel System Too Lean Bank 1 | P0171      | Determines if the fuel control system is in a lean condition, based on the filtered long-term and short-term fuel trim. | The filtered long-term fuel trim metric<br><br>AND<br>The filtered short-term fuel trim metric (a value < 0.95 effectively nullifies the short-term fuel trim criteria) | >= 1.365<br><br>=> 0.650 | Engine speed<br>BARO<br>Coolant Temp<br>MAP<br>Inlet Air Temp<br>MAF<br>Fuel Level<br><br>Long Term Fuel Trim data accumulation:<br><br>Sometimes, certain Long-Term Fuel Trim Cells are not utilized for control and/or diagnosis<br><br>Closed Loop Long Term FT<br><br>Fuel Consumed<br><br>EGR Diag. | 400 <rpm< 6,600<br>> 70 kPa<br>-20 <°C< 150<br>5 <kPa< 255<br>-20 <°C< 150<br>0.5 <g/s< 510.0<br>> 10 % or if fuel sender is faulty<br><br>> 25.0 seconds of data must accumulate on each trip, with at least 20.0 seconds of data in the current fuel trim cell before a pass or fail decision can be made.<br><br>(Please see " <b>Long-Term Fuel Trim Cell Usage</b> " in Supporting Tables for a list of cells utilized for diagnosis)<br><br>Enabled<br>Enabled<br>(Please see " <b>Closed Loop Enable Criteria</b> " and " <b>Long Term FT Enable Criteria</b> " in Supporting Tables.)<br><br>> 0.0 liters of fuel consumed after a fuel fill event ("Virtual Flex Fuel Sensor applications only)<br><br>Intrusive Test Not Active<br>Intrusive Test Not Active | Frequency: 100 ms<br>Continuous Loop | Type B, 2 Trips |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                  | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                     | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Catalyst Diag.<br>Post O2 Diag.<br>Device Control<br>EVAP Diag.<br><br>No active DTC: | Intrusive Test Not Active<br>Not Active<br>"tank pull down"<br>Not Active<br><br>IAC_SystemRPM_FA<br>MAP_SensorFA<br>MAF_SensorFA<br>MAF_SensorTFTKO<br>AIR System FA<br>EvapExcessPrgePsbl_FA<br>Ethanol Comp Snsr FA<br>FuelInjectorCkt_FA<br>EngMisfireDetected_FA<br>EGRValvePerf_FA<br>EGRValveCkt_FA<br>MAP_EngVacuumStatus<br>AmbPresDfitedStatus<br>TC_BoostPresSnsrFA<br>O2Snsr_B1_Snsr_1_FA |               |               |
|                      |               |                     |                      |                 |                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                       |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System              | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Threshold Value                                                                                                                                            | Secondary Parameters | Enable Conditions                                                                                                                         | Time Required                                        | MIL<br>Illum.              |
|-----------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|----------------------------|
| Fuel System<br>Too Rich<br>Bank 1 | P0172         | <p>Determines if the fuel control system is in a rich condition, based on the filtered long-term fuel trim metric.</p> <p>There are two methods to determine a Rich fault. They are Passive and Intrusive. A Passive Test decision cannot be made when Purge is enabled. The Intrusive test is described below:<br/>Intrusive Test:<br/>When the filtered Purge Long Term Fuel Trim metric is <math>\leq 0.730</math>, purge is ramped off to determine if excess purge vapor is the cause of the rich condition. If the filtered Purge Long Term Fuel Trim metric <math>&gt; 0.730</math>, the test passes without checking the filtered Non-Purge Long Term Fuel Trim metric.</p> <p>Performing intrusive tests too frequently may also affect EVAP and EPAIII emissions, and the execution frequency of other diagnostics.</p> | <p>Passive Test: The filtered Non-Purge Long Term Fuel Trim metric</p> <p>AND</p> <p>The filtered Short Term Fuel Trim metric (a value <math>&gt; 1.05</math> effectively nullifies the short-term fuel trim criteria)</p> <p>Intrusive Test: For 3 out of 5 intrusive segments, the filtered Purge Long Term Fuel Trim metric</p> <p>AND</p> <p>The filtered Non-Purge Long Term Fuel Trim metric</p> <p>AND</p> <p>The filtered Short Term Fuel Trim metric (a value <math>&gt; 1.05</math> effectively nullifies the short-term fuel trim criteria)</p> <p>Segment Def'n:<br/>Segments can last up to 45 seconds and are separated by the lesser of 12 seconds of purge-on time or enough time to purge 11 grams of vapor.</p> | <p><math>\leq 0.725</math></p> <p><math>\leq 1.996</math></p> <p><math>\leq 0.730</math></p> <p><math>\leq 0.725</math></p> <p><math>\leq 1.996</math></p> |                      | <p>Secondary Parameters and Enable Conditions are identical to those for P0171, with the exception that fuel level is not considered.</p> | <p>Frequency:<br/>100 ms<br/>Continuous<br/>Loop</p> | <p>Type B,<br/>2 Trips</p> |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                     | Threshold Value | Secondary Parameters | Enable Conditions | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|-------------------|---------------|---------------|
|                      |               |                     | <p>A maximum of 5 completed segments or 30 attempts are allowed for each intrusive test. After an intrusive test report is completed, another intrusive test cannot occur for 300 seconds to allow sufficient time to purge excess vapors from the canister. During this period, fuel trim will pass if the filtered Purge-on Long Term fuel trim &gt; 0.730 for at least 200 seconds, indicating that the canister has been purged.</p> |                 |                      |                   |               |               |
|                      |               |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                          |                 |                      |                   |               |               |





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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                  | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                     | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Catalyst Diag.<br>Post O2 Diag.<br>Device Control<br>EVAP Diag.<br><br>No active DTC: | Intrusive Test Not Active<br>Not Active<br>"tank pull down"<br>Not Active<br><br>IAC_SystemRPM_FA<br>MAP_SensorFA<br>MAF_SensorFA<br>MAF_SensorTFTKO<br>AIR System FA<br>EvapExcessPrgePsbl_FA<br>Ethanol Comp Snsr FA<br>FuelInjectorCkt_FA<br>EngMisfireDetected_FA<br>EGRValvePerf_FA<br>EGRValveCkt_FA<br>MAP_EngVacuumStatus<br>AmbPresDfitedStatus<br>TC_BoostPresSnsrFA<br>O2Snsr_B2_Snsr_1_FA |               |               |
|                      |               |                     |                      |                 |                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                       |               |               |

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| Component/<br>System              | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Threshold Value                                                                                                                                            | Secondary Parameters | Enable Conditions                                                                                                                         | Time Required                                | MIL<br>Illum.          |
|-----------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------|
| Fuel System<br>Too Rich<br>Bank 2 | P0175         | <p>Determines if the fuel control system is in a rich condition, based on the filtered long-term fuel trim metric.</p> <p>There are two methods to determine a Rich fault. They are Passive and Intrusive. A Passive Test decision cannot be made when Purge is enabled. The Intrusive test is described below:<br/>Intrusive Test: When the filtered Purge Long Term Fuel Trim metric is <math>\leq 0.730</math>, purge is ramped off to determine if excess purge vapor is the cause of the rich condition. If the filtered Purge Long Term Fuel Trim metric <math>&gt; 0.730</math>, the test passes without checking the filtered Non-Purge Long Term Fuel Trim metric.</p> <p>Performing intrusive tests too frequently may also affect EVAP and EPAIII emissions, and the execution frequency of other diagnostics.</p> | <p>Passive Test: The filtered Non-Purge Long Term Fuel Trim metric</p> <p>AND</p> <p>The filtered Short Term Fuel Trim metric (a value <math>&gt; 1.05</math> effectively nullifies the short-term fuel trim criteria)</p> <p>Intrusive Test: For 3 out of 5 intrusive segments, the filtered Purge Long Term Fuel Trim metric</p> <p>AND</p> <p>The filtered Non-Purge Long Term Fuel Trim metric</p> <p>AND</p> <p>The filtered Short Term Fuel Trim metric (a value <math>&gt; 1.05</math> effectively nullifies the short-term fuel trim criteria)</p> <p>Segment Def'n: Segments can last up to 45 seconds and are separated by the lesser of 12 seconds of purge-on time or enough time to purge 11 grams of vapor.</p> | <p><math>\leq 0.725</math></p> <p><math>\leq 1.996</math></p> <p><math>\leq 0.730</math></p> <p><math>\leq 0.725</math></p> <p><math>\leq 1.996</math></p> |                      | <p>Secondary Parameters and Enable Conditions are identical to those for P0174, with the exception that fuel level is not considered.</p> | <p>Frequency: 100 ms<br/>Continuous Loop</p> | <p>Type B, 2 Trips</p> |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                            | Threshold Value | Secondary Parameters | Enable Conditions | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|-------------------|---------------|---------------|
|                      |               |                     | <p>A maximum of 5 completed segments or 30 attempts are allowed for each intrusive test.</p> <p>After an intrusive test report is completed, another intrusive test cannot occur for 300 seconds to allow sufficient time to purge excess vapors from the canister. During this period, fuel trim will pass if the filtered Purge-on Long Term fuel trim &gt; 0.730 for at least 200 seconds, indicating that the canister has been purged.</p> |                 |                      |                   |               |               |
|                      |               |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |                      |                   |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System                  | Fault<br>Code | Monitor Description                                                                                               | Malfunction Criteria                                            | Threshold Value                                                                                       | Secondary Parameters                                                                                                             | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                         | Time Required                                                                                        | MIL<br>Illum.   |
|---------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-----------------|
| SIDI High Pressure Sensor Performance | P0191         | The DTC Diagnoses a skewed fuel rail sensor via a comparison of measured pressure and commanded/ modeled pressure | Idle test<br>(Low Side Fuel Pressure - High Side Fuel Pressure) | SIDI High Pressure Sensor Performance<br>Idle Test Enabled<br><br><= -0.650 MPa<br>OR<br>>= 0.600 MPa | Vehicle Speed<br><br>Pedal Position = 0 for<br><br>Battery Voltage<br><br>Low Pressure Fuel Pump Pressure<br><br>Engine Run Time | Enabled when a code clear is not active or not exiting device control<br>Engine is not cranking<br><br><= 0.62 MPH<br><br>320 Counts (12.5ms per count)<br><br>>= 11 Volts<br><br>>= 0.275 MPa<br><br>>= KtFHPD_t_PumpCntrlEngRunThrsh(see supporting tables)<br><br>Enabled when a code clear is not active or not exiting device control<br><br>Engine is not cranking<br><br>>= KtFHPD_Cnt_SnsPrfIdlePumpOffDly(see supporting tables) | Idle Test > = 240 counts (12.5ms per count)                                                          | Type A, 1 Trips |
|                                       |               |                                                                                                                   | High Drive Test<br>(Relief Pressure - Measured high Pressure)   | SIDI High Pressure Sensor Performance<br>High Drive Test Enabled<br><br><= -5.00 MPa                  | Engine Speed<br><br>Desired High Side Pressure<br><br>Vehicle Speed<br><br>Accelerator Pedal                                     | 1,200 <= RPM <= 2,400<br><br>5 <= MPa <= 7<br><br>>= 37 MPH<br><br>>= 0 %                                                                                                                                                                                                                                                                                                                                                                 | KtFHPD_Cnt_SnsPrfIdlePumpOffDly runs in 12.5 ms loopHigh Drive Test >= 160 counts (12.5ms per count) |                 |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                       | Threshold Value                                                                                 | Secondary Parameters                                                                                                                                      | Enable Conditions                                                                                                                                                                                                                                                         | Time Required                                 | MIL<br>Illum. |
|----------------------|---------------|---------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|---------------|
|                      |               |                     |                                                                                                            |                                                                                                 | Battery Voltage<br>Low Pressure Fuel Pump Pressure<br>Engine Run Time                                                                                     | >= 11 Volts<br>>= 0.275 MPa<br>>= KtFHPD_t_PumpCntrlEng RunThrsh(see supporting tables)<br><br>Enabled when a code clear is not active or not exiting device control<br><br>Engine is not cranking                                                                        |                                               |               |
|                      |               |                     | Low Drive Test (Commanded high Pressure - Measured high Pressure)<br><br>AND<br>Modeled Injection Pressure | SIDI High Pressure Sensor Performance Low Drive Test Enabled<br>>= 3.000 MPa<br><br>>= 3.00 MPa | Engine Speed<br>Desired High Side Pressure<br>Vehicle Speed<br>Accelerator Pedal<br>Battery Voltage<br>Low Pressure Fuel Pump Pressure<br>Engine Run Time | 1,200 <= RPM <= 2,400<br>5.00 <= MPa <= 7.00<br>>= 37 MPH<br>>= 0 %<br>>= 11 Volts<br>>= 0.275 MPa<br>>= KtFHPD_t_PumpCntrlEng RunThrsh(see supporting tables)<br><br>Enabled when a code clear is not active or not exiting device control<br><br>Engine is not cranking | LoDrive Test >= 240 counts (12.5ms per count) |               |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                       | Threshold Value                                                                | Secondary Parameters              | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Time Required                                                                                                                                                                                                                  | MIL<br>Illum. |
|----------------------|---------------|---------------------|------------------------------------------------------------|--------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
|                      |               |                     | Sensor Stuck Test<br>Measured High Pressure<br>(max - min) | SIDI High Pressure<br>Sensor Performance<br>Stuck Test Enabled<br><= 0.100 MPa | Engine Speed<br><br>Vehicle Speed | >= 2,000 RPM<br>>= 18.64 MPH<br>Enabled when a code<br>clear is not active or not<br>exiting device control<br>Engine is not cranking<br>Additional Enable<br>Conditions: All must be<br>true (High Pressure Pump<br>is enabled and High Fuel<br>pressure sensor ckt is Not<br>(FA,FP or TFTKO) and<br>High Pressure fuel pump<br>ckt is Not (FA,FP or<br>TFTKO) and Cam or<br>Crank Sensor Not FA and<br>IAT,IAT2,ECT Not FA and<br>Low side Fuel Pump<br>Relay ckt Not FA and<br>Estimate fuel rail pressure<br>is valid and Green Engine<br>(In assembly plant) is not<br>enabled and Not if low<br>fuel condition and Low<br>side Fuel Pump is on and<br>Injector Flow Test is not<br>active and Device control<br>commanded pressure is<br>false and Device control<br>pump ckt enabled on is<br>false and Engine<br>movement detected is<br>true and Manufacturers<br>enable counter is 0)Flex<br>Fuel Sensor Not FA<br>Ignition voltage out of<br>correlation error(P1682)<br>not active Fuel InjCkt Not<br>(FA or TFTKO) EST Driver<br>Not(FA) Misfire detected | Stuck Test<br>Engine Run Time<br>>=<br>KtFHPD_t_Pump<br>CntrlEngRunThr<br>sh(See<br>Supporting<br>Tables) or<br>Accumulating<br>engine crank<br>time >=<br>KtFHPD_t_SnsP<br>rfStuckCrankTm<br>out(See<br>Supporting<br>Tables) |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                               | Enable Conditions                                                                                                                                                                                                                                                                                                                        | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Barometric Pressure<br>Inlet Air Temp<br>Fuel Temp | Not(FA) MAFR sensor Not<br>(FA) MAPR sensor Not<br>(FA) APSR Pedal sensor<br>Not(FA) TPSR sensor Not<br>(FA) VSPR speed sensor<br>Not(FA) SystemRPM Not<br>(FA) Manual Clutch not<br>engaged or vehicle has<br>automatic transmission All<br>cylinder are fuel enabled<br>and<br>>= 70.0 KPA<br>>= -10.0 DegC<br>-10 <= Temp degC <= 100 |               |               |
|                      |               |                     |                      |                 |                                                    |                                                                                                                                                                                                                                                                                                                                          |               |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                  | Fault<br>Code | Monitor Description                                      | Malfunction Criteria      | Threshold Value     | Secondary Parameters | Enable Conditions                     | Time Required                                                                                                                                                               | MIL<br>Illum.      |
|---------------------------------------|---------------|----------------------------------------------------------|---------------------------|---------------------|----------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| High Pressure Sensor Out of Range Low | P0192         | This DTC Diagnoses High Pressure Sensor Out of Range Low | High Pressure Fuel Sensor | $\leq 5\%$ of 5Vref | Battery Voltage      | $\geq 11$ Volts<br><br>Engine Running | Both Run Continuously<br>Engine Synchronous<br>Mode 800 failures out of 1,000 samples<br>Time Based<br>Mode 400 failures out of 500 samples<br>6.25 ms Sample<br>Continuous | Type A,<br>1 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                   | Fault<br>Code | Monitor Description                                       | Malfunction Criteria      | Threshold Value  | Secondary Parameters | Enable Conditions                 | Time Required                                                                                                                                                               | MIL<br>Illum.      |
|----------------------------------------|---------------|-----------------------------------------------------------|---------------------------|------------------|----------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| High Pressure Sensor Out of Range High | P0193         | This DTC Diagnoses High Pressure Sensor Out of Range High | High Pressure Fuel Sensor | >= 95 % of 5Vref | Battery Voltage      | >= 11 Volts<br><br>Engine Running | Both Run Continuously<br>Engine Synchronous<br>Mode 800 failures out of 1,000 samples<br>Time Based<br>Mode 400 failures out of 500 samples<br>6.25 ms Sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                   | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                                     | Threshold Value                                                                 | Secondary Parameters              | Enable Conditions                                       | Time Required                                                              | MIL<br>Illum.      |
|----------------------------------------|---------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------|--------------------|
| Injector 1<br>Open Circuit<br>- (SIDI) | P0201         | This DTC Diagnoses<br>Injector 1 enable low<br>side driver circuit for<br>circuit faults. | Low current through the<br>low side driver during<br>operation indicates open<br>circuit | Open circuit:<br>≥ 200 K Ω impedance<br>between signal and<br>controller ground | Battery Voltage<br>Engine Running | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br><br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                   | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                                     | Threshold Value                                                                 | Secondary Parameters               | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|----------------------------------------|---------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 2<br>Open Circuit<br>- (SIDI) | P0202         | This DTC Diagnoses<br>Injector 2 enable low<br>side driver circuit for<br>circuit faults. | Low current through the<br>low side driver during<br>operation indicates open<br>circuit | Open circuit:<br>≥ 200 K Ω impedance<br>between signal and<br>controller ground | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                   | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                                     | Threshold Value                                                                 | Secondary Parameters              | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|----------------------------------------|---------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 3<br>Open Circuit<br>- (SIDI) | P0203         | This DTC Diagnoses<br>Injector 3 enable low<br>side driver circuit for<br>circuit faults. | Low current through the<br>low side driver during<br>operation indicates open<br>circuit | Open circuit:<br>≥ 200 K Ω impedance<br>between signal and<br>controller ground | Battery Voltage<br>Engine Running | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                   | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                                     | Threshold Value                                                                 | Secondary Parameters               | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|----------------------------------------|---------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 4<br>Open Circuit<br>- (SIDI) | P0204         | This DTC Diagnoses<br>Injector 4 enable low<br>side driver circuit for<br>circuit faults. | Low current through the<br>low side driver during<br>operation indicates open<br>circuit | Open circuit:<br>≥ 200 K Ω impedance<br>between signal and<br>controller ground | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                   | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                                     | Threshold Value                                                                 | Secondary Parameters               | Enable Conditions                                   | Time Required                                                          | MIL<br>Illum.      |
|----------------------------------------|---------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------|-----------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 5<br>Open Circuit<br>- (SIDI) | P0205         | This DTC Diagnoses<br>Injector 5 enable low<br>side driver circuit for<br>circuit faults. | Low current through the<br>low side driver during<br>operation indicates open<br>circuit | Open circuit:<br>≥ 200 K Ω impedance<br>between signal and<br>controller ground | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Sec<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                   | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                                     | Threshold Value                                                                 | Secondary Parameters               | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|----------------------------------------|---------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 6<br>Open Circuit<br>- (SIDI) | P0206         | This DTC Diagnoses<br>Injector 6 enable low<br>side driver circuit for<br>circuit faults. | Low current through the<br>low side driver during<br>operation indicates open<br>circuit | Open circuit:<br>≥ 200 K Ω impedance<br>between signal and<br>controller ground | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description                                                | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions                                                                                      | Time Required                                                                              | MIL<br>Illum.      |
|----------------------|---------------|--------------------------------------------------------------------|----------------------|-----------------|----------------------|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------|
| TPS2 Circuit<br>Low  | P0222         | Detects a continuous or intermittent short or open in TPS2 circuit | TPS2 Voltage <       | 0.250           |                      | Run/Crank voltage ><br>6.41<br><br>No 5V reference error or fault for # 4 5V reference circuit (P06A3) | 79 / 159 counts;<br><br>57 counts continuous;<br>3.125 ms /count in the ECM main processor | Type A,<br>1 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description                                                | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions                                                                                            | Time Required                                                                                          | MIL<br>Illum.      |
|----------------------|---------------|--------------------------------------------------------------------|----------------------|-----------------|----------------------|--------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|--------------------|
| TPS2 Circuit<br>High | P0223         | Detects a continuous or intermittent short or open in TPS2 circuit | TPS2 Voltage >       | 4.590           |                      | Run/Crank voltage ><br>6.41<br><br>No 5V reference error or<br>fault for # 4 5V reference<br>circuit (P06A3) | 79 / 159<br>counts;<br><br>57 counts<br>continuous;<br>3.125 ms /count<br>in the ECM main<br>processor | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                               | Threshold Value                                                      | Secondary Parameters               | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|---------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 1<br>Low side<br>circuit<br>shorted to<br>ground<br>(SIDI) | P0261         | This DTC Diagnoses<br>Injector 1 enable low<br>side driver circuit for<br>circuit faults. | Voltage low across low<br>side drive during off state<br>indicates short-to-ground | Short to ground:<br>≤ 1 volt between signal<br>and controller ground | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                            | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                                  | Threshold Value                                             | Secondary Parameters               | Enable Conditions                                               | Time Required                                                          | MIL<br>Illum.      |
|-----------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 1<br>Low side<br>circuit<br>shorted to<br>power (SIDI) | P0262         | This DTC Diagnoses<br>Injector 1 enable low<br>side driver circuit for<br>circuit faults. | Voltage High across low<br>side driver during On<br>state indicates short to<br>power | Short to power:<br>25 amp $\geq$ through<br>low side driver | Battery Voltage<br>Engine Run Time | $\geq$ 11 Volts<br>$\geq$ 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                               | Threshold Value                                                      | Secondary Parameters               | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|---------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 2<br>Low side<br>circuit<br>shorted to<br>ground<br>(SIDI) | P0264         | This DTC Diagnoses<br>Injector 2 enable low<br>side driver circuit for<br>circuit faults. | Voltage low across low<br>side drive during off state<br>indicates short-to-ground | Short to ground:<br>≤ 1 volt between signal<br>and controller ground | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                            | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                                  | Threshold Value                                         | Secondary Parameters               | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|-----------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 2<br>Low side<br>circuit<br>shorted to<br>power (SIDI) | P0265         | This DTC Diagnoses<br>Injector 2 enable low<br>side driver circuit for<br>circuit faults. | Voltage High across low<br>side driver during On<br>state indicates short to<br>power | Short to power:<br>25 amp >= through<br>low side driver | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                               | Threshold Value                                                      | Secondary Parameters               | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|---------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 3<br>Low side<br>circuit<br>shorted to<br>ground<br>(SIDI) | P0267         | This DTC Diagnoses<br>Injector 3 enable low<br>side driver circuit for<br>circuit faults. | Voltage low across low<br>side drive during off state<br>indicates short-to-ground | Short to ground:<br>≤ 1 volt between signal<br>and controller ground | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                            | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                                  | Threshold Value                                         | Secondary Parameters               | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|-----------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 3<br>Low side<br>circuit<br>shorted to<br>power (SIDI) | P0268         | This DTC Diagnoses<br>Injector 3 enable low<br>side driver circuit for<br>circuit faults. | Voltage High across low<br>side driver during On<br>state indicates short to<br>power | Short to power:<br>25 amp >= through<br>low side driver | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                               | Threshold Value                                                      | Secondary Parameters               | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|---------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 4<br>Low side<br>circuit<br>shorted to<br>ground<br>(SIDI) | P0270         | This DTC Diagnoses<br>Injector 4 enable low<br>side driver circuit for<br>circuit faults. | Voltage low across low<br>side drive during off state<br>indicates short-to-ground | Short to ground:<br>≤ 1 volt between signal<br>and controller ground | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                            | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                                  | Threshold Value                                             | Secondary Parameters               | Enable Conditions                                               | Time Required                                                          | MIL<br>Illum.      |
|-----------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 4<br>Low side<br>circuit<br>shorted to<br>power (SIDI) | P0271         | This DTC Diagnoses<br>Injector 4 enable low<br>side driver circuit for<br>circuit faults. | Voltage High across low<br>side driver during On<br>state indicates short to<br>power | Short to power:<br>25 amp $\geq$ through<br>low side driver | Battery Voltage<br>Engine Run Time | $\geq$ 11 Volts<br>$\geq$ 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                               | Threshold Value                                                      | Secondary Parameters               | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|---------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 5<br>Low side<br>circuit<br>shorted to<br>ground<br>(SIDI) | P0273         | This DTC Diagnoses<br>Injector 5 enable low<br>side driver circuit for<br>circuit faults. | Voltage low across low<br>side drive during off state<br>indicates short-to-ground | Short to ground:<br>≤ 1 volt between signal<br>and controller ground | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                            | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                                  | Threshold Value                                             | Secondary Parameters               | Enable Conditions                                               | Time Required                                                          | MIL<br>Illum.      |
|-----------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 5<br>Low side<br>circuit<br>shorted to<br>power (SIDI) | P0274         | This DTC Diagnoses<br>Injector 5 enable low<br>side driver circuit for<br>circuit faults. | Voltage High across low<br>side driver during On<br>state indicates short to<br>power | Short to power:<br>25 amp $\geq$ through<br>low side driver | Battery Voltage<br>Engine Run Time | $\geq$ 11 Volts<br>$\geq$ 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                               | Threshold Value                                                      | Secondary Parameters               | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|---------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 6<br>Low side<br>circuit<br>shorted to<br>ground<br>(SIDI) | P0276         | This DTC Diagnoses<br>Injector 6 enable low<br>side driver circuit for<br>circuit faults. | Voltage low across low<br>side drive during off state<br>indicates short-to-ground | Short to ground:<br>≤ 1 volt between signal<br>and controller ground | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                            | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                                  | Threshold Value                                         | Secondary Parameters               | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|-----------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 6<br>Low side<br>circuit<br>shorted to<br>power (SIDI) | P0277         | This DTC Diagnoses<br>Injector 6 enable low<br>side driver circuit for<br>circuit faults. | Voltage High across low<br>side driver during On<br>state indicates short to<br>power | Short to power:<br>25 amp >= through<br>low side driver | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System              | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                                                     | Malfunction Criteria                                                                                                                                                                                                                                                          | Threshold Value                                                                                                                                                                                                                                                                                                                                         | Secondary Parameters                                                                                                                                                                                                                                                                         | Enable Conditions                                                                                                                                                                     | Time Required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | MIL<br>Illum.                                                                               |  |
|-----------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|--|
| Random<br>Misfire<br>Detected     | P0300         | These DTC's will determine if a random or a cylinder specific misfire is occurring by monitoring various terms derived from crankshaft velocity. The rate of misfire over an interval is compared to both emissions and catalyst damaging thresholds. The pattern of crankshaft acceleration after the misfire is checked to differentiate between real misfire and other sources of crank shaft noise. | Deceleration Value vs. Engine Speed and Engine load                                                                                                                                                                                                                           | [<br>(>IdleSCD_Decel<br>AND<br>> IdleSCD_Jerk)<br>OR<br>(>SCD_Decel AND<br>> SCD_Jerk)<br>OR<br>(>IdleCylModeDecel<br>AND<br>> IdleCylModeJerk)<br>OR<br>(>CylMode_Decel<br>AND<br>> CylMode_Jerk)<br>OR<br>(>RevMode_Decel)<br>OR WHILE in Cylinder Deactivation mode:<br>(> AFM_Decel)<br>]<br>- see details on Supporting Tables Tab (P0300 Section) | Engine Run Time<br><br>Engine Coolant Temp<br>Or If ECT at startup<br>Then ECT<br><br>System Voltage<br>+ Throttle delta<br>- Throttle delta<br><br>Early Termination option:<br>(used on plug ins that may not have enough engine run time at end of trip for normal interval to complete.) | > 2 crankshaft revolution<br><br>-7 °C < ECT < 127 °C<br>< -7 °C<br>21 °C < ECT < 127 °C<br><br>9.00 < volts < 32.00<br>< 60.00 % per 25 ms<br>< 90.00 % per 25 ms<br><br>Not Enabled | Emission Exceedence = any ( 5 ) failed 200 rev blocks out of ( 16 ) 200 rev block tests<br><br>Failure reported for (1) Exceedence in 1st ( 16 ) 200 rev block tests, or ( 4 ) Exceedences thereafter.<br><br>OR<br>when Early Termination Reporting = Enabled and engine rev > 1,000 revs and < 3,200 revs at end of trip<br><br>any Catalyst Exceedence = ( 1 ) 200 rev block as data supports for catalyst damage.<br><br>Failure reported with (1 or 3) Exceedences in FTP, or (1) Exceedence outside FTP. | Type B,<br>2 Trips<br>(Mil<br>Flashes<br>with<br>Catalyst<br>damage<br>level of<br>Misfire) |  |
| Cylinder 1<br>Misfire<br>Detected | P0301         |                                                                                                                                                                                                                                                                                                                                                                                                         | The equation used to calculate deceleration value is tailored to specific vehicle operating conditions.                                                                                                                                                                       | Misfire Percent Emission Failure Threshold                                                                                                                                                                                                                                                                                                              | ≥ 2.58 % P0300                                                                                                                                                                                                                                                                               |                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                             |  |
| Cylinder 2<br>Misfire<br>Detected | P0302         |                                                                                                                                                                                                                                                                                                                                                                                                         | The selection of the equation used is based on the 1st tables encountered that are not max of range. If all tables are max of range at a given speed/load, that speed load region is an <b>Undetectable region</b> see Algorithm Description Document for additional details. | Misfire Percent Catalyst Damage                                                                                                                                                                                                                                                                                                                         | > Catalyst_Damage_Misfire_Percentage<br>in Supporting Tables                                                                                                                                                                                                                                 | (at low speed/loads, one cylinder may not cause cat damage)                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                             |  |
| Cylinder 3<br>Misfire<br>Detected | P0303         |                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                             |  |
| Cylinder 4<br>Misfire<br>Detected | P0304         |                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                             |  |
| Cylinder 5<br>Misfire<br>Detected | P0305         |                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                             |  |
| Cylinder 6<br>Misfire<br>Detected | P0306         |                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                             |  |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                | Threshold Value                                                                                                      | Secondary Parameters                                                                     | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Time Required                                        | MIL<br>Illum. |
|----------------------|---------------|---------------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|---------------|
|                      |               |                     | When engine speed and load are less than the FTP calcs (3) catalyst damage exceedences are allowed. | whenever secondary conditions are met.<br><br>$\leq 0$ FTP rpm AND<br>$\leq 0$ FTP % load<br><br>disable conditions: | Engine Speed<br>Engine Load<br>Misfire counts<br><br>Engine Speed<br><br>No active DTCs: | > 1,500 rpm AND<br>> 30 % load AND<br>< 180 counts on one cylinder<br><br>350 < rpm < ((Engine Over Speed Limit) - 150)<br><br>Engine speed limit is a function of inputs like Gear and temperature<br><br>see<br><b>EngineOverSpeedLimit</b><br>in supporting tables<br><br>TPS_FA<br>EnginePowerLimited<br>MAF_SensorTFTKO<br>MAP_SensorTFTKO<br>IAT_SensorTFTKO<br>ECT_Sensor_Ckt_TFTKO<br>5VoltReferenceB_FA<br>CrankSensorTFTKO<br>CrankSensorFA<br>CamLctnIntFA<br>CamLctnExhFA<br>CamSensorAnyLctnTFTKO<br>O<br>AnyCamPhaser_FA<br>AnyCamPhaser_TFTKO<br>AmbPresDfItDStatus | Continuous<br><br>4 cycle delay<br><br>4 cycle delay |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                   | Enable Conditions                                                                 | Time Required   | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------|---------------|
|                      |               |                     |                      |                 | P0315 & engine speed                                                   | > 1,000 rpm                                                                       | 4 cycle delay   |               |
|                      |               |                     |                      |                 | Fuel Level Low                                                         | LowFuelConditionDiagnostic                                                        | 500 cycle delay |               |
|                      |               |                     |                      |                 | Cam and Crank Sensors                                                  | in sync with each other                                                           | 4 cycle delay   |               |
|                      |               |                     |                      |                 | Misfire requests TCC unlock                                            | Not honored because Transmission in hot mode or POPD intrusive diagnostic running | 4 cycle delay   |               |
|                      |               |                     |                      |                 | Fuel System Status                                                     | ≠ Fuel Cut                                                                        | 4 cycle delay   |               |
|                      |               |                     |                      |                 | Active FuelManagement                                                  | Transition in progress                                                            | 7 cycle delay   |               |
|                      |               |                     |                      |                 | Undetectable engine speed and engine load region                       | <b>Undetectable region</b> from Malfunction Criteria                              | 4 cycle delay   |               |
|                      |               |                     |                      |                 | Abusive Engine Over Speed                                              | > 8,192 rpm                                                                       | 0 cycle delay   |               |
|                      |               |                     |                      |                 | Below zero torque (except CARB approved 3000 rpm to redline triangle.) | < <b>ZeroTorqueEngLoad</b> in Supporting Tables                                   | 4 cycle delay   |               |
|                      |               |                     |                      |                 | Below zero torque:<br>TPS<br>Vehicle Speed                             | ≤ 1 %<br>> 30 mph                                                                 | 4 cycle delay   |               |
|                      |               |                     |                      |                 | EGR Intrusive test                                                     | Active                                                                            | 0 cycle delay   |               |
|                      |               |                     |                      |                 | Manual Trans                                                           | Clutch shift                                                                      | 4 cycle delay   |               |
|                      |               |                     |                      |                 | Accel Pedal Position AND Automatic transmission shift                  | > 95.00 %                                                                         | 7 cycle delay   |               |
|                      |               |                     |                      |                 | Driveline Ring Filter active                                           |                                                                                   |                 |               |



13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Enable Conditions                                                                                                                                                                                                                                                                                                                                           | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | <p>After a low level misfire, another misfire may not be detectable until driveline ringing ceases. If no ringing seen, stop filter early.</p> <p>Filter Driveline ring:</p> <p>Stop filter early:</p> <p>Abnormal engine speed oscillations:<br/>(Rough road etc)<br/>Off Idle, number of consecutive decelerating cylinders after "misfire":<br/>(Number of decels can vary with misfire detection equation)</p> <p>TPS<br/>Engine Speed<br/>Veh Speed</p> <p>Consecutive decels while in SCD Mode<br/>Cyl Mode<br/>Rev Mode</p> <p>Misfire Crankshaft Pattern Recognition checks each "misfire" candidate in 100 engine Cycle test to see if it looks like real misfire, or some disturbance like rough road. The check is</p> | <p>&gt; "Ring Filter" # of engine cycles after misfire in Supporting Tables</p> <p>&gt; "Number of Normals" # of engine cycles after misfire in Supporting Tables tab</p> <p>&gt; 3 %<br/>&gt; 900 rpm<br/>&gt; 3 mph</p> <p>&gt; <b>Abnormal SCD Mode</b><br/>&gt; <b>Abnormal Cyl Mode</b><br/>&gt; <b>Abnormal Rev Mode</b><br/>in Supporting Tables</p> |               |               |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Enable Conditions                                                                                                                                                                                                                                                      | Time Required                                                        | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|---------------|
|                      |               |                     |                      |                 | based on a multiplier times the ddt_jerk value used to detect misfire at that speed and load. At the end of 100 engine cycle test, the ratio of unrecog/recognized is checked to confirm if real misfire is present.<br>Pattern Recog Enabled:<br>Engine Speed<br>Veh Speed<br><br>"misfire" unrecognized if:<br>Crankshaft snap after:<br>isolated "misfire"<br>repetative "misfire"<br><br>Ratio of Unrecog/Recog<br><br>Rough Road:<br>Non-Crankshaft based:<br><br>Rough Road Source<br><br>IF Rough Road Source = WheelSpeedInECM<br>ABS/TCS<br>Wheel speed noise<br>VSES<br><br>IF Rough Road Source = "FromABS"<br>ABS/TCS<br>RoughRoad<br>VSES<br><br>IF Rough Road Source = "TOSS" | Enabled<br>700 < rpm < 6,500<br>> 0.6 mph<br><br>> <b>Min_PatternMultiplier</b><br>> <b>Max_PatternMultiplier</b><br>in Supporting Tables<br><br>> 0.70<br><br>Disabled<br><br>TOSS<br><br>active<br>> WSSRoughRoadThres<br>active<br><br>active<br>detected<br>active | discard test<br><br><br><br><br><br>discard test<br><br>discard test |               |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                      | Enable Conditions                                                                                                                                                                                                       | Time Required                     | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------|
|                      |               |                     |                      |                 | TOSS dispersion<br><br>AND No Active DTCs | > <b>TOSSRoughRoadThres</b><br>in supporting tables<br><br>Transmission Output<br>Shaft Angular Velocity<br>Validity<br>TransmissionEngagedStat<br>e_FA<br>(Auto Trans only)<br>Clutch Sensor FA<br>(Manual Trans only) | discard test<br><br>4 cycle delay |               |
|                      |               |                     |                      |                 |                                           |                                                                                                                                                                                                                         |                                   |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                         | Fault<br>Code | Monitor Description                                           | Malfunction Criteria                                                                                                                                                                                                                   | Threshold Value                   | Secondary Parameters               | Enable Conditions | Time Required                                          | MIL<br>Illum.      |
|--------------------------------------------------------------|---------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------------------------|-------------------|--------------------------------------------------------|--------------------|
| Crankshaft<br>Position<br>System<br>Variation Not<br>Learned | P0315         | Monitor for valid<br>crankshaft error<br>compensation factors | Sum of Compensation<br>factors. Each Cylinder<br>pair shares one<br>compensation factor. A<br>perfect factor would be<br>1.0000. Unlearned<br>factors are defaulted out<br>of range so the sum of<br>factors would be out of<br>range. | $\geq 3.0040$<br>OR $\leq 2.9960$ | OBD Manufacturer<br>Enable Counter | MEC = 0           | 0.50 seconds<br><br>Frequency<br>Continuous100<br>msec | Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                | Fault<br>Code | Monitor Description                                                                                                                                                                            | Malfunction Criteria                                                                                                                                                                                                                                                                                                   | Threshold Value                                             | Secondary Parameters                                                                                                                     | Enable Conditions                                                                                                                          | Time Required                                             | MIL<br>Illum.      |                                                                                  |
|-----------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|--------------------|----------------------------------------------------------------------------------|
| Knock<br>Sensor (KS)<br>Performance<br>Per Cylinder | P0324         | This diagnostic checks for knock sensor performance out of the normal expected range on a per cylinder basis due to:<br>1. Excessive knock or<br>2. Abnormal engine noise or<br>3. Flat signal | Common Enable Criteria<br><br>(Applies to all 3 parts of the performance diag)                                                                                                                                                                                                                                         |                                                             | Diagnostic Enabled?<br><br>Engine Run Time<br><br>Engine Speed<br><br>Engine Air Flow<br><br>ECT<br><br>IAT                              | Yes<br><br>≥ 2.0 seconds<br><br>≤ 8,500 RPM<br><br>≥ 0 mg/cylinder<br>and<br>≤ 2,000 mg/cylinder<br><br>≥ -40 deg's C<br><br>≥ -40 deg's C | First Order Lag<br>Filters with<br>Weight<br>Coefficients | Type B,<br>2 Trips |                                                                                  |
|                                                     |               |                                                                                                                                                                                                | Specific Enable Criteria and Thresholds for 3 individual parts of the performance diag:<br><br>-----<br>1. Excessive Knock Diag:<br>Filtered Knock Intensity<br><br>VaKNKD_k_PerfCylKnock<br>IntFilt<br>(where 'Knock Intensity' = 0 with no knock; and > 0 & proportional to knock magnitude with knock)<br><br>----- | > 8.00 (no units)                                           | Engine Speed<br><br>Cumulative Number of Engine Revs Above Min Eng Speed (per key cycle)                                                 | ≥ 400 RPM<br><br>≥ 132 Revs                                                                                                                |                                                           |                    | Excessive Knk<br>Weight<br>Coefficient = 0.0300<br><br>Updated each engine event |
|                                                     |               |                                                                                                                                                                                                | 2. Abnormal Noise Diag:<br><br>Filtered FFT Intensity<br><br>(where 'FFT Intensity' = Non-knocking, background noise)                                                                                                                                                                                                  | <<br><b>AbnormalNoise_Threshold</b> (see Supporting Tables) | Individual Cylinders enabled for Abnormal Noise<br><br>Engine Speed<br><br>Cumulative Number of Engine Revs Above Min Eng Speed (per key | See <b>AbnormalNoise_CylsEnabled</b> (Supporting Tables)<br><br>≥ 2,200 RPM<br><br>≥ 200 Revs                                              |                                                           |                    | Abn Noise<br>Weight<br>Coefficient = 0.0200<br><br>Updated each engine event     |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                 | Threshold Value    | Secondary Parameters                                                                                             | Enable Conditions                      | Time Required                                                                                    | MIL<br>Illum. |
|----------------------|---------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------|---------------|
|                      |               |                     | -----<br>3. Flat Signal Diag:<br>Filtered Signal Delta<br>(Current FFT Intensity -<br>Ave_Intensity_No-Knock)<br><br>VaKNKD_k_PerfCylFlatFil<br>tInt | < 0.008 (no units) | cycle)<br>-----<br>Engine Speed<br><br>Cumulative Number of<br>Engine Revs Above Min<br>Eng Speed (per keycycle) | -----<br>≥ 8,500 RPM<br><br>≥ 400 Revs | -----<br><br>Flat Signal<br>Weight<br>Coefficient =<br>0.010<br><br>Updated each<br>engine event |               |
|                      |               |                     |                                                                                                                                                      |                    |                                                                                                                  |                                        |                                                                                                  |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System                      | Fault<br>Code | Monitor Description                                                  | Malfunction Criteria | Threshold Value                                                                                                                                                                                                                                                                                                                                                                                     | Secondary Parameters                                                                                                                                                                                                                  | Enable Conditions                                                                                                                                                                            | Time Required                                                                                                                                 | MIL<br>Illum.      |
|-------------------------------------------|---------------|----------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Knock<br>Sensor (KS)<br>Circuit Bank<br>1 | P0325         | This diagnostic checks<br>for an open in the<br>knock sensor circuit | Filtered FFT Output  | <p>&gt; <b>OpenCktThrshMin</b><br/>and<br/>&lt; <b>OpenCktThrshMax</b></p> <p><b>See Supporting<br/>Tables</b></p> <p>Thresholds for<br/>OpenMethod = 20 kHz:<br/><b>OpenCktThrshMin<br/>(20 kHz) &amp;<br/>OpenCktThrshMax<br/>(20 kHz)</b></p> <p>Thresholds for<br/>OpenMethod =<br/>NormalNoise:<br/><b>OpenCktThrshMin<br/>(Normal Noise) &amp;<br/>OpenCktThrshMax<br/>(Normal Noise)</b></p> | <p>Diagnostic Enabled?</p> <p>Engine Run Time</p> <p>Engine Speed</p> <p>Cumulative Number of<br/>Engine Revs (per key<br/>cycle) within min/max<br/>Engine Speed enable<br/>(above)</p> <p>Engine Air Flow</p> <p>ECT</p> <p>IAT</p> | <p>Yes</p> <p>≥ 2.0 seconds</p> <p>≥ 400 RPM<br/>and<br/>≤ 8,500 RPM</p> <p>≥ 133 revs</p> <p>≥ 50 mg/cylinder<br/>and<br/>≤ 2,000 mg/cylinder</p> <p>≥ -40 deg's C</p> <p>≥ -40 deg's C</p> | <p>First Order Lag<br/>Filter with Weight<br/>Coefficient</p> <p>Weight<br/>Coefficient =<br/>0.0100</p> <p>Updated each<br/>engine event</p> | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                                     | Fault<br>Code                                               | Monitor Description                                                                                                                                                                           | Malfunction Criteria                                                                                                                                                   | Threshold Value   | Secondary Parameters                                                                                        | Enable Conditions                                                                                                                          | Time Required                                                                                                                                                                                                                                                  | MIL<br>Illum.      |
|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Knock<br>Sensor (KS)<br>Performance<br>Bank 1                                                                            | P0326                                                       | This diagnostic checks for knock sensor performance out of the normal expected range, on a per sensor basis, due to<br>1. Excessive knock or<br>2. Abnormal engine noise or<br>3. Flat signal | Common Enable Criteria<br><br>(Applies to all 3 parts of the performance diag)                                                                                         |                   | Diagnostic Enabled?<br><br>Engine Run Time<br><br>Engine Speed<br><br>Engine Air Flow<br><br>ECT<br><br>IAT | Yes<br><br>≥ 2.0 seconds<br><br>≤ 8,500 RPM<br><br>≥ 0 mg/cylinder<br>and<br>≤ 2,000 mg/cylinder<br><br>≥ -40 deg's C<br><br>≥ -40 deg's C | First Order Lag<br>Filters with<br>Weight<br>Coefficients<br><br>Excessive Knk<br>Weight<br>Coefficient =<br><br>0.0100<br><br>Updated each<br>engine event<br><br>Abnormal Noise<br>Weight<br>Coefficient =<br><br>0.0067<br><br>Updated each<br>engine event | Type B,<br>2 Trips |
|                                                                                                                          |                                                             |                                                                                                                                                                                               | Specific Enable Criteria<br>and Thresholds for 3<br>individual parts of the<br>performance diag:                                                                       |                   |                                                                                                             |                                                                                                                                            |                                                                                                                                                                                                                                                                |                    |
|                                                                                                                          |                                                             |                                                                                                                                                                                               | 1. Excessive Knock Diag:<br>Filtered Knock Intensity<br><br>(where 'Knock Intensity' =<br>0 with no knock; and > 0<br>& proportional to knock<br>magnitude with knock) | > 8.00 (no units) | Engine Speed<br><br>Cumulative Number of<br>Engine Revs Above Min<br>Eng Speed (per key<br>cycle)           | ≥ 400 RPM<br><br>≥ 133 Revs                                                                                                                |                                                                                                                                                                                                                                                                |                    |
| 2. Abnormal Noise Diag:<br><br>Filtered FFT Intensity:<br>(where 'FFT Intensity' =<br>Non-knocking,<br>background noise) | < <b>AbnormalNoise_Threshold</b> (see<br>Supporting Tables) | Individual Cylinders<br>enabled for Abnormal<br>Noise<br><br>Engine Speed<br><br>Cumulative Number of<br>Engine Revs Above Min<br>Eng Speed (per key                                          | See <b>AbnormalNoise_</b><br><b>CylsEnabled</b> (Supporting<br>Tables)<br><br>≥ 2,200 RPM<br><br>≥ 199 Revs                                                            |                   |                                                                                                             |                                                                                                                                            |                                                                                                                                                                                                                                                                |                    |



13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                 | Threshold Value    | Secondary Parameters                                                                                            | Enable Conditions                      | Time Required                                                                                        | MIL<br>Illum. |
|----------------------|---------------|---------------------|------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------|---------------|
|                      |               |                     | 3. Flat Signal Diag:<br>Filtered Signal Delta<br>(Current FFT Intensity -<br>Ave_Intensity_No-Knock) | < 0.008 (no units) | cycle)<br><br>-----<br>Engine SpeedCumulative<br>Number of Engine Revs<br>Above Min Eng Speed<br>(per keycycle) | -----<br>≥ 8,500 RPM<br><br>≥ 133 Revs | -----<br>Flat Signal<br><br>Weight<br>Coefficient =<br><br>0.010<br><br>Updated each<br>engine event |               |
|                      |               |                     |                                                                                                      |                    |                                                                                                                 |                                        |                                                                                                      |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                          | Fault<br>Code | Monitor Description                                                      | Malfunction Criteria                  | Threshold Value                         | Secondary Parameters                    | Enable Conditions                        | Time Required                                            | MIL<br>Illum.      |
|-----------------------------------------------|---------------|--------------------------------------------------------------------------|---------------------------------------|-----------------------------------------|-----------------------------------------|------------------------------------------|----------------------------------------------------------|--------------------|
| Knock<br>Sensor (KS)<br>Circuit Low<br>Bank 1 | P0327         | This diagnostic checks<br>for an out of range low<br>knock sensor signal | Sensor Input or Return<br>Signal Line | < 8.0 Percent<br><br>(of 5 V reference) | Diagnostic Enabled?<br><br>Engine Speed | Yes<br><br>> 0 RPM<br>and<br>< 8,500 RPM | 50 Failures<br>out of<br>63 Samples<br><br>100 msec rate | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                           | Fault<br>Code | Monitor Description                                                       | Malfunction Criteria                  | Threshold Value                             | Secondary Parameters                    | Enable Conditions                        | Time Required                                            | MIL<br>Illum.      |
|------------------------------------------------|---------------|---------------------------------------------------------------------------|---------------------------------------|---------------------------------------------|-----------------------------------------|------------------------------------------|----------------------------------------------------------|--------------------|
| Knock<br>Sensor (KS)<br>Circuit High<br>Bank 1 | P0328         | This diagnostic checks<br>for an out of range high<br>knock sensor signal | Sensor Input or Return<br>Signal Line | > 39.0 Percent<br><br>(of 5 Volt Reference) | Diagnostic Enabled?<br><br>Engine Speed | Yes<br><br>> 0 RPM<br>and<br>< 8,500 RPM | 50 Failures<br>out of<br>63 Samples<br><br>100 msec rate | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                      | Fault<br>Code | Monitor Description                                                  | Malfunction Criteria | Threshold Value                                                                                                                                                                                                                                                                                                                                                           | Secondary Parameters                                                                                                                                                                                                       | Enable Conditions                                                                                                                                                               | Time Required                                                                                                                     | MIL<br>Illum.      |
|-------------------------------------------|---------------|----------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Knock<br>Sensor (KS)<br>Circuit Bank<br>2 | P0330         | This diagnostic checks<br>for an open in the<br>knock sensor circuit | Filtered FFT Output  | > OpenCktThrshMin<br>and<br>< OpenCktThrshMax<br><br><b>See Supporting<br/>Tables</b><br><br>Thresholds for<br>OpenMethod = 20 kHz:<br><br><b>OpenCktThrshMin<br/>(20 kHz) &amp;<br/>OpenCktThrshMax<br/>(20 kHz)</b><br><br>Thresholds for<br>OpenMethod =<br>NormalNoise:<br><br><b>OpenCktThrshMin<br/>(Normal Noise) &amp;<br/>OpenCktThrshMax<br/>(Normal Noise)</b> | Diagnostic Enabled?<br><br>Engine Run Time<br><br>Engine Speed<br><br>Cumulative Number of<br>Engine Revs (per key<br>cycle) within min/max<br>Engine Speed enable<br>(above)<br><br>Engine Air Flow<br><br>ECT<br><br>IAT | Yes<br><br>≥ 2.0 seconds<br><br>≥ 400 RPM<br>and<br>≤ 8,500 RPM<br><br>133 revs<br><br>≥ 50 mg/cylinder<br>and<br>≤ 2,000 mg/cylinder<br><br>≥ -40 deg's C<br><br>≥ -40 deg's C | First Order Lag<br>Filter with Weight<br>Coefficient<br><br>Weight<br>Coefficient =<br>0.0100<br><br>Updated each<br>engine event | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                                   | Fault<br>Code                                               | Monitor Description                                                                                                                                                                                               | Malfunction Criteria                                                                                                                                          | Threshold Value                                                                    | Secondary Parameters                                                                                        | Enable Conditions                                                                                                                          | Time Required                                                                     | MIL<br>Illum.      |
|------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------|
| Knock<br>Sensor (KS)<br>Performance<br>Bank 2                                                                          | P0331                                                       | This diagnostic checks for knock sensor performance out of the normal expected range, on a per sensor basis, due to<br>1. Excessive knock or<br>2. Abnormal engine noise on a per bank basis or<br>3. Flat signal | Common Enable Criteria<br><br>(Applies to all 3 parts of the performance diag)                                                                                |                                                                                    | Diagnostic Enabled?<br><br>Engine Run Time<br><br>Engine Speed<br><br>Engine Air Flow<br><br>ECT<br><br>IAT | Yes<br><br>≥ 2.0 seconds<br><br>≤ 8,500 RPM<br><br>≥ 0 mg/cylinder<br>and<br>≤ 2,000 mg/cylinder<br><br>≥ -40 deg's C<br><br>≥ -40 deg's C |                                                                                   | Type B,<br>2 Trips |
|                                                                                                                        |                                                             |                                                                                                                                                                                                                   | Specific Enable Criteria and Thresholds for 3 individual parts of the performance diag:                                                                       |                                                                                    |                                                                                                             |                                                                                                                                            | First Order Lag Filters with Weight Coefficients                                  |                    |
|                                                                                                                        |                                                             |                                                                                                                                                                                                                   | 1. Excessive Knock Diag:<br>Filtered Knock Intensity<br><br>(where 'Knock Intensity' = 0 with no knock; and > 0 & proportional to knock magnitude with knock) | > 8.00 (no units)                                                                  | Engine Speed<br><br>Cumulative Number of Engine Revs Above Min Eng Speed (per key cycle)                    | ≥ 400 RPM<br><br>≥ 133 Revs                                                                                                                | Excessive knk Weight Coefficient =<br><br>0.0100<br><br>Updated each engine event |                    |
| 2. Abnormal Noise Diag:<br><br>Filtered FFT Intensity:<br><br>(where 'FFT Intensity' = Non-knocking, background noise) | <<br><b>AbnormalNoise_Threshold</b> (see Supporting Tables) | Individual Cylinders enabled for Abnormal Noise<br><br>Engine Speed<br><br>Cumulative Number of Engine Revs Above Min Eng Speed (per key cycle)                                                                   | See <b>AbnormalNoise_CylsEnabled</b> (Supporting Tables)<br><br>≥ 2,200 RPM<br><br>≥ 199 Revs                                                                 | Abnormal Noise Weight Coefficient =<br><br>0.0067<br><br>Updated each engine event |                                                                                                             |                                                                                                                                            |                                                                                   |                    |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                          | Threshold Value             | Secondary Parameters                                                                              | Enable Conditions              | Time Required                                                                            | MIL<br>Illum. |
|----------------------|---------------|---------------------|---------------------------------------------------------------------------------------------------------------|-----------------------------|---------------------------------------------------------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------|---------------|
|                      |               |                     | -----<br>3. Flat Signal Diag:<br>Filtered Signal Delta<br>(Current FFT Intensity -<br>Ave_Intensity_No-Knock) | -----<br>< 0.008 (no units) | -----<br>Engine SpeedCumulative<br>Number of Engine Revs<br>Above Min Eng Speed<br>(per keycycle) | -----<br>≥ 8,500 RPM≥ 133 Revs | -----<br>Flat Signal<br>Weight<br>Coefficient =<br>0.010 Updated<br>each engine<br>event |               |
|                      |               |                     |                                                                                                               |                             |                                                                                                   |                                |                                                                                          |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                          | Fault<br>Code | Monitor Description                                                      | Malfunction Criteria                  | Threshold Value                            | Secondary Parameters                    | Enable Conditions                        | Time Required                                            | MIL<br>Illum.      |
|-----------------------------------------------|---------------|--------------------------------------------------------------------------|---------------------------------------|--------------------------------------------|-----------------------------------------|------------------------------------------|----------------------------------------------------------|--------------------|
| Knock<br>Sensor (KS)<br>Circuit Low<br>Bank 2 | P0332         | This diagnostic checks<br>for an out of range low<br>knock sensor signal | Sensor Input or Return<br>Signal Line | < 8.0 Percent<br><br>(of 5 Volt Reference) | Diagnostic Enabled?<br><br>Engine Speed | Yes<br><br>> 0 RPM<br>and<br>< 8,500 RPM | 50 Failures<br>out of<br>63 Samples<br><br>100 msec rate | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                           | Fault<br>Code | Monitor Description                                                       | Malfunction Criteria                  | Threshold Value                              | Secondary Parameters                    | Enable Conditions                        | Time Required                                            | MIL<br>Illum.      |
|------------------------------------------------|---------------|---------------------------------------------------------------------------|---------------------------------------|----------------------------------------------|-----------------------------------------|------------------------------------------|----------------------------------------------------------|--------------------|
| Knock<br>Sensor (KS)<br>Circuit High<br>Bank 2 | P0333         | This diagnostic checks<br>for an out of range high<br>knock sensor signal | Sensor Input or Return<br>Signal Line | > 39.00 Percent<br><br>(of 5 Volt Reference) | Diagnostic Enabled?<br><br>Engine Speed | Yes<br><br>> 0 RPM<br>and<br>< 8,500 RPM | 50 Failures<br>out of<br>63 Samples<br><br>100 msec rate | Type B,<br>2 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                   | Fault<br>Code | Monitor Description                                                | Malfunction Criteria                                      | Threshold Value | Secondary Parameters                                                                                                                        | Enable Conditions                                                 | Time Required                                                        | MIL<br>Illum.      |
|--------------------------------------------------------|---------------|--------------------------------------------------------------------|-----------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|----------------------------------------------------------------------|--------------------|
| Crankshaft<br>Position<br>(CKP)<br>Sensor A<br>Circuit | P0335         | Determines if a fault exists with the crank position sensor signal | Time since last crankshaft position sensor pulse received | >= 4.0 seconds  | Starter engaged<br>AND<br>(cam pulses being received<br>OR<br>( DTC P0101<br>AND<br>DTC P0102<br>AND<br>DTC P0103<br>AND<br>Engine Air Flow | = FALSE<br><br>= FALSE<br><br>= FALSE<br><br>> 3.0 grams/second ) | Continuous every 100 msec                                            | Type B,<br>2 Trips |
|                                                        |               |                                                                    | No crankshaft pulses received                             | >= 0.1 seconds  | Engine is Running<br><br>Starter is not engaged<br><br>No DTC Active:                                                                       | 5VoltReferenceB_FA                                                | Continuous every 12.5 msec                                           |                    |
|                                                        |               |                                                                    | No crankshaft pulses received                             |                 | Engine is Running<br>OR<br>Starter is engaged<br><br>No DTC Active:                                                                         | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>P0365<br>P0366        | 2 failures out of 10 samples<br><br>One sample per engine revolution |                    |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                       | Fault<br>Code | Monitor Description                                                            | Malfunction Criteria                                                                                   | Threshold Value | Secondary Parameters                                                                                                                        | Enable Conditions                                               | Time Required                                                        | MIL<br>Illum.      |
|------------------------------------------------------------|---------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------|--------------------|
| Crankshaft<br>Position<br>(CKP)<br>Sensor A<br>Performance | P0336         | Determines if a performance fault exists with the crank position sensor signal | Time in which 20 or more crank re-synchronizations occur                                               | < 25.0 seconds  | Engine Air Flow<br>Cam-based engine speed<br>No DTC Active:                                                                                 | >= 3.0 grams/second<br>> 450 RPM<br>5VoltReferenceB_FA<br>P0335 | Continuous every 250 msec                                            | Type B,<br>2 Trips |
|                                                            |               |                                                                                | No crankshaft synchronization gap found                                                                | >= 0.4 seconds  | Engine is Running<br>Starter is not engaged<br>No DTC Active:                                                                               | 5VoltReferenceB_FA                                              | Continuous every 12.5 msec                                           |                    |
|                                                            |               |                                                                                | Time since starter engaged without detecting crankshaft synchronization gap                            | >= 1.5 seconds  | Starter engaged<br>AND<br>(cam pulses being received<br>OR<br>( DTC P0101<br>AND<br>DTC P0102<br>AND<br>DTC P0103<br>AND<br>Engine Air Flow | = FALSE<br>= FALSE<br>= FALSE<br>> 3.0 grams/second ) )         | Continuous every 100 msec                                            |                    |
|                                                            |               |                                                                                | Crank pulses received in one engine revolution<br>OR<br>Crank pulses received in one engine revolution | < 51<br>> 65    | Engine is Running<br>OR<br>Starter is engaged<br>No DTC Active:                                                                             | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>P0365<br>P0366      | 8 failures out of 10 samples<br><br>One sample per engine revolution |                    |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                   | Fault<br>Code | Monitor Description                                                                                                                                                          | Malfunction Criteria                                               | Threshold Value                                                   | Secondary Parameters                                                          | Enable Conditions                                     | Time Required             | MIL<br>Illum.      |
|--------------------------------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------|---------------------------|--------------------|
| Camshaft<br>Position<br>(CMP)<br>Sensor<br>Circuit Bank<br>1 Sensor A                                  | P0340         | Determines if a fault exists with the cam position bank 1 sensor A signal                                                                                                    | Time since last camshaft position sensor pulse received            | >= 5.5 seconds                                                    | Starter engaged<br>AND<br>(cam pulses being received                          | = FALSE<br>= FALSE<br>= FALSE<br>> 3.0 grams/second ) | Continuous every 100 msec | Type B,<br>2 Trips |
|                                                                                                        |               |                                                                                                                                                                              | OR                                                                 |                                                                   | OR                                                                            |                                                       |                           |                    |
|                                                                                                        |               |                                                                                                                                                                              | Time that starter has been engaged without a camshaft sensor pulse | >= 4.0 seconds                                                    | ( DTC P0101<br>AND<br>DTC P0102<br>AND<br>DTC P0103<br>AND<br>Engine Air Flow |                                                       |                           |                    |
|                                                                                                        |               |                                                                                                                                                                              | Fewer than 4 camshaft pulses received in a time                    | > 3.0 seconds                                                     | Engine is running<br><br>Starter is not engaged<br><br>No DTC Active:         |                                                       |                           |                    |
| No camshaft pulses received during first 12 MEDRES events (There are 12 MEDRES events per engine cycle |               | Crankshaft is synchronized<br><br>Starter must be engaged to enable the diagnostic, but the diagnostic will not disable when the starter is disengaged<br><br>No DTC Active: | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>CrankSensor_FA         | Continuous every MEDRES event                                     |                                                                               |                                                       |                           |                    |
| The number of camshaft pulses received during 100 engine cycles                                        | = 0           | Crankshaft is synchronized<br><br>No DTC Active:                                                                                                                             | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>CrankSensor_FA         | 8 failures out of 10 samples<br><br>Continuous every engine cycle |                                                                               |                                                       |                           |                    |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                         | Fault<br>Code | Monitor Description                                                                   | Malfunction Criteria                                                                                                               | Threshold Value    | Secondary Parameters                                                                                                                                                         | Enable Conditions                                         | Time Required                                                     | MIL<br>Illum.      |
|------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------------|--------------------|
| Camshaft<br>Position<br>(CMP)<br>Sensor<br>Performance<br>Bank 1<br>Sensor A | P0341         | Determines if a performance fault exists with the cam position bank 1 sensor A signal | The number of camshaft pulses received during first 12 MEDRES events is<br>OR<br><br>(There are 12 MEDRES events per engine cycle) | < 4<br><br>> 6     | Crankshaft is synchronized<br><br>Starter must be engaged to enable the diagnostic, but the diagnostic will not disable when the starter is disengaged<br><br>No DTC Active: | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>CrankSensorFA | Continuous every MEDRES event                                     | Type B,<br>2 Trips |
|                                                                              |               |                                                                                       | The number of camshaft pulses received during 100 engine cycles<br>OR                                                              | < 398<br><br>> 402 | Crankshaft is synchronized<br><br>No DTC Active:                                                                                                                             | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>CrankSensorFA | 8 failures out of 10 samples<br><br>Continuous every engine cycle |                    |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                   | Fault<br>Code | Monitor Description                                                                                                                                                          | Malfunction Criteria                                               | Threshold Value                                                   | Secondary Parameters                                                  | Enable Conditions                                     | Time Required             | MIL<br>Illum.      |
|--------------------------------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------------------|---------------------------|--------------------|
| Camshaft<br>Position<br>(CMP)<br>Sensor<br>Circuit Bank<br>2 Sensor A                                  | P0345         | Determines if a fault exists with the cam position bank 2 sensor A signal                                                                                                    | Time since last camshaft position sensor pulse received            | >= 5.5 seconds                                                    | Starter engaged<br>AND<br>(cam pulses being received                  | = FALSE<br>= FALSE<br>= FALSE<br>> 3.0 grams/second ) | Continuous every 100 msec | Type B,<br>2 Trips |
|                                                                                                        |               |                                                                                                                                                                              | OR                                                                 |                                                                   |                                                                       |                                                       |                           |                    |
|                                                                                                        |               |                                                                                                                                                                              | Time that starter has been engaged without a camshaft sensor pulse | >= 4.0 seconds                                                    | AND<br>DTC P0102<br>AND<br>DTC P0103<br>AND<br>Engine Air Flow        |                                                       |                           |                    |
|                                                                                                        |               |                                                                                                                                                                              | Fewer than 4 camshaft pulses received in a time                    | > 3.0 seconds                                                     | Engine is running<br><br>Starter is not engaged<br><br>No DTC Active: |                                                       |                           |                    |
| No camshaft pulses received during first 12 MEDRES events (There are 12 MEDRES events per engine cycle |               | Crankshaft is synchronized<br><br>Starter must be engaged to enable the diagnostic, but the diagnostic will not disable when the starter is disengaged<br><br>No DTC Active: | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>CrankSensor_FA         | Continuous every MEDRES event                                     |                                                                       |                                                       |                           |                    |
| The number of camshaft pulses received during 100 engine cycles                                        | = 0           | Crankshaft is synchronized<br><br>No DTC Active:                                                                                                                             | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>CrankSensor_FA         | 8 failures out of 10 samples<br><br>Continuous every engine cycle |                                                                       |                                                       |                           |                    |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                         | Fault<br>Code | Monitor Description                                                                   | Malfunction Criteria                                                                                                               | Threshold Value    | Secondary Parameters                                                                                                                                                         | Enable Conditions                                         | Time Required                                                     | MIL<br>Illum.      |
|------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------------|--------------------|
| Camshaft<br>Position<br>(CMP)<br>Sensor<br>Performance<br>Bank 2<br>Sensor A | P0346         | Determines if a performance fault exists with the cam position bank 2 sensor A signal | The number of camshaft pulses received during first 12 MEDRES events is<br>OR<br><br>(There are 12 MEDRES events per engine cycle) | < 4<br><br>> 6     | Crankshaft is synchronized<br><br>Starter must be engaged to enable the diagnostic, but the diagnostic will not disable when the starter is disengaged<br><br>No DTC Active: | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>CrankSensorFA | Continuous every MEDRES event                                     | Type B,<br>2 Trips |
|                                                                              |               |                                                                                       | The number of camshaft pulses received during 100 engine cycles<br>OR                                                              | < 398<br><br>> 402 | Crankshaft is synchronized<br><br>No DTC Active:                                                                                                                             | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>CrankSensorFA | 8 failures out of 10 samples<br><br>Continuous every engine cycle |                    |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System              | Fault<br>Code | Monitor Description                                                                                                                                       | Malfunction Criteria                                                                                                                                                                                                                                                                 | Threshold Value                                                                                                                                                                                                                                                           | Secondary Parameters                          | Enable Conditions | Time Required                                             | MIL<br>Illum.      |
|-----------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------|-----------------------------------------------------------|--------------------|
| IGNITION<br>CONTROL<br>#1 CIRCUIT | P0351         | Diagnoses the Ignition Control (EST) low side driver circuit for circuit faults. Monitors EST for Cylinder 1 (Cylinders 1 and 4 for V6 with waste spark). | <p>The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.</p> <p>Voltage low during driver off state (indicates short-to-ground or open circuit)</p> <p>Voltage high during driver on state (indicates short-to-power)</p> | <p><u>Short to ground:</u><br/>≤ 0.5 Ω impedance between signal and controller ground</p> <p><u>Open Circuit:</u><br/>≥ 200 kΩ impedance between signal and controller ground</p> <p><u>Short to power:</u><br/>≤ 0.5 Ω impedance between signal and controller power</p> | <p>Engine running</p> <p>Ignition Voltage</p> | > 5.00 Volts      | <p>20 Failures out of 25 Samples</p> <p>100 msec rate</p> | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System              | Fault<br>Code | Monitor Description                                                                                                                                       | Malfunction Criteria                                                                                                                                                                                                                                                                 | Threshold Value                                                                                                                                                                                                                                                           | Secondary Parameters                          | Enable Conditions | Time Required                                             | MIL<br>Illum.      |
|-----------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------|-----------------------------------------------------------|--------------------|
| IGNITION<br>CONTROL<br>#2 CIRCUIT | P0352         | Diagnoses the Ignition Control (EST) low side driver circuit for circuit faults. Monitors EST for Cylinder 2 (Cylinders 2 and 5 for V6 with waste spark). | <p>The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.</p> <p>Voltage low during driver off state (indicates short-to-ground or open circuit)</p> <p>Voltage high during driver on state (indicates short-to-power)</p> | <p><u>Short to ground:</u><br/>≤ 0.5 Ω impedance between signal and controller ground</p> <p><u>Open Circuit:</u><br/>≥ 200 kΩ impedance between signal and controller ground</p> <p><u>Short to power:</u><br/>≤ 0.5 Ω impedance between signal and controller power</p> | <p>Engine running</p> <p>Ignition Voltage</p> | > 5.00 Volts      | <p>20 Failures out of 25 Samples</p> <p>100 msec rate</p> | Type B,<br>2 Trips |



13 OBDG05A Engine Diagnostics

| Component/<br>System              | Fault<br>Code | Monitor Description                                                                                                                                       | Malfunction Criteria                                                                                                                                                                                                                                                                 | Threshold Value                                                                                                                                                                                                                                                           | Secondary Parameters                          | Enable Conditions | Time Required                                             | MIL<br>Illum.      |
|-----------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------|-----------------------------------------------------------|--------------------|
| IGNITION<br>CONTROL<br>#3 CIRCUIT | P0353         | Diagnoses the Ignition Control (EST) low side driver circuit for circuit faults. Monitors EST for Cylinder 3 (Cylinders 3 and 6 for V6 with waste spark). | <p>The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.</p> <p>Voltage low during driver off state (indicates short-to-ground or open circuit)</p> <p>Voltage high during driver on state (indicates short-to-power)</p> | <p><u>Short to ground:</u><br/>≤ 0.5 Ω impedance between signal and controller ground</p> <p><u>Open Circuit:</u><br/>≥ 200 kΩ impedance between signal and controller ground</p> <p><u>Short to power:</u><br/>≤ 0.5 Ω impedance between signal and controller power</p> | <p>Engine running</p> <p>Ignition Voltage</p> | > 5.00 Volts      | <p>20 Failures out of 25 Samples</p> <p>100 msec rate</p> | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System              | Fault<br>Code | Monitor Description                                                                                                           | Malfunction Criteria                                                                                                                                                                                                                                                                 | Threshold Value                                                                                                                                                                                                                                                           | Secondary Parameters                          | Enable Conditions | Time Required                                             | MIL<br>Illum.   |
|-----------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------|-----------------------------------------------------------|-----------------|
| IGNITION<br>CONTROL<br>#4 CIRCUIT | P0354         | Diagnoses the Ignition Control (EST) low side driver circuit for circuit faults. Monitors EST for Cylinder 4 (if applicable). | <p>The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.</p> <p>Voltage low during driver off state (indicates short-to-ground or open circuit)</p> <p>Voltage high during driver on state (indicates short-to-power)</p> | <p><u>Short to ground:</u><br/>≤ 0.5 Ω impedance between signal and controller ground</p> <p><u>Open Circuit:</u><br/>≥ 200 kΩ impedance between signal and controller ground</p> <p><u>Short to power:</u><br/>≤ 0.5 Ω impedance between signal and controller power</p> | <p>Engine running</p> <p>Ignition Voltage</p> | > 5.00 Volts      | <p>20 Failures out of 25 Samples</p> <p>100 msec rate</p> | Type B, 2 Trips |

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| Component/<br>System              | Fault<br>Code | Monitor Description                                                                                                           | Malfunction Criteria                                                                                                                                                                                                                                                                 | Threshold Value                                                                                                                                                                                                                                                           | Secondary Parameters                          | Enable Conditions | Time Required                                             | MIL<br>Illum.      |
|-----------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------|-----------------------------------------------------------|--------------------|
| IGNITION<br>CONTROL<br>#5 CIRCUIT | P0355         | Diagnoses the Ignition Control (EST) low side driver circuit for circuit faults. Monitors EST for Cylinder 5 (if applicable). | <p>The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.</p> <p>Voltage low during driver off state (indicates short-to-ground or open circuit)</p> <p>Voltage high during driver on state (indicates short-to-power)</p> | <p><u>Short to ground:</u><br/>≤ 0.5 Ω impedance between signal and controller ground</p> <p><u>Open Circuit:</u><br/>≥ 200 kΩ impedance between signal and controller ground</p> <p><u>Short to power:</u><br/>≤ 0.5 Ω impedance between signal and controller power</p> | <p>Engine running</p> <p>Ignition Voltage</p> | > 5.00 Volts      | <p>20 Failures out of 25 Samples</p> <p>100 msec rate</p> | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System              | Fault<br>Code | Monitor Description                                                                                                           | Malfunction Criteria                                                                                                                                                                                                                                                                 | Threshold Value                                                                                                                                                                                                                                                           | Secondary Parameters                          | Enable Conditions | Time Required                                             | MIL<br>Illum.      |
|-----------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------|-----------------------------------------------------------|--------------------|
| IGNITION<br>CONTROL<br>#6 CIRCUIT | P0356         | Diagnoses the Ignition Control (EST) low side driver circuit for circuit faults. Monitors EST for Cylinder 6 (if applicable). | <p>The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.</p> <p>Voltage low during driver off state (indicates short-to-ground or open circuit)</p> <p>Voltage high during driver on state (indicates short-to-power)</p> | <p><u>Short to ground:</u><br/>≤ 0.5 Ω impedance between signal and controller ground</p> <p><u>Open Circuit:</u><br/>≥ 200 kΩ impedance between signal and controller ground</p> <p><u>Short to power:</u><br/>≤ 0.5 Ω impedance between signal and controller power</p> | <p>Engine running</p> <p>Ignition Voltage</p> | > 5.00 Volts      | <p>20 Failures out of 25 Samples</p> <p>100 msec rate</p> | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                   | Fault<br>Code | Monitor Description                                                                                                                                                          | Malfunction Criteria                                               | Threshold Value                                                   | Secondary Parameters                                                          | Enable Conditions                                     | Time Required             | MIL<br>Illum.      |
|--------------------------------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------|---------------------------|--------------------|
| Camshaft<br>Position<br>(CMP)<br>Sensor<br>Circuit Bank<br>1 Sensor B                                  | P0365         | Determines if a fault exists with the cam position bank 1 sensor B signal                                                                                                    | Time since last camshaft position sensor pulse received            | >= 5.5 seconds                                                    | Starter engaged<br>AND<br>(cam pulses being received                          | = FALSE<br>= FALSE<br>= FALSE<br>> 3.0 grams/second ) | Continuous every 100 msec | Type B,<br>2 Trips |
|                                                                                                        |               |                                                                                                                                                                              | OR                                                                 |                                                                   | OR                                                                            |                                                       |                           |                    |
|                                                                                                        |               |                                                                                                                                                                              | Time that starter has been engaged without a camshaft sensor pulse | >= 4.0 seconds                                                    | ( DTC P0101<br>AND<br>DTC P0102<br>AND<br>DTC P0103<br>AND<br>Engine Air Flow |                                                       |                           |                    |
|                                                                                                        |               |                                                                                                                                                                              | Fewer than 4 camshaft pulses received in a time                    | > 3.0 seconds                                                     | Engine is running<br><br>Starter is not engaged<br><br>No DTC Active:         |                                                       |                           |                    |
| No camshaft pulses received during first 12 MEDRES events (There are 12 MEDRES events per engine cycle |               | Crankshaft is synchronized<br><br>Starter must be engaged to enable the diagnostic, but the diagnostic will not disable when the starter is disengaged<br><br>No DTC Active: | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>CrankSensor_FA         | Continuous every MEDRES event                                     |                                                                               |                                                       |                           |                    |
| The number of camshaft pulses received during 100 engine cycles                                        | = 0           | Crankshaft is synchronized<br><br>No DTC Active:                                                                                                                             | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>CrankSensor_FA         | 8 failures out of 10 samples<br><br>Continuous every engine cycle |                                                                               |                                                       |                           |                    |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                         | Fault<br>Code | Monitor Description                                                                   | Malfunction Criteria                                                                                                               | Threshold Value    | Secondary Parameters                                                                                                                                                         | Enable Conditions                                         | Time Required                                                     | MIL<br>Illum.      |
|------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------------|--------------------|
| Camshaft<br>Position<br>(CMP)<br>Sensor<br>Performance<br>Bank 1<br>Sensor B | P0366         | Determines if a performance fault exists with the cam position bank 1 sensor B signal | The number of camshaft pulses received during first 12 MEDRES events is<br>OR<br><br>(There are 12 MEDRES events per engine cycle) | < 4<br><br>> 6     | Crankshaft is synchronized<br><br>Starter must be engaged to enable the diagnostic, but the diagnostic will not disable when the starter is disengaged<br><br>No DTC Active: | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>CrankSensorFA | Continuous every MEDRES event                                     | Type B,<br>2 Trips |
|                                                                              |               |                                                                                       | The number of camshaft pulses received during 100 engine cycles<br>OR                                                              | < 398<br><br>> 402 | Crankshaft is synchronized<br><br>No DTC Active:                                                                                                                             | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>CrankSensorFA | 8 failures out of 10 samples<br><br>Continuous every engine cycle |                    |

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| Component/<br>System                                                                                   | Fault<br>Code | Monitor Description                                                                                                                                                          | Malfunction Criteria                                               | Threshold Value                                                   | Secondary Parameters                                                          | Enable Conditions                                     | Time Required             | MIL<br>Illum.      |
|--------------------------------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------|---------------------------|--------------------|
| Camshaft<br>Position<br>(CMP)<br>Sensor<br>Circuit Bank<br>2 Sensor B                                  | P0390         | Determines if a fault exists with the cam position bank 2 sensor B signal                                                                                                    | Time since last camshaft position sensor pulse received            | >= 5.5 seconds                                                    | Starter engaged<br>AND<br>(cam pulses being received                          | = FALSE<br>= FALSE<br>= FALSE<br>> 3.0 grams/second ) | Continuous every 100 msec | Type B,<br>2 Trips |
|                                                                                                        |               |                                                                                                                                                                              | OR                                                                 |                                                                   | OR                                                                            |                                                       |                           |                    |
|                                                                                                        |               |                                                                                                                                                                              | Time that starter has been engaged without a camshaft sensor pulse | >= 4.0 seconds                                                    | ( DTC P0101<br>AND<br>DTC P0102<br>AND<br>DTC P0103<br>AND<br>Engine Air Flow |                                                       |                           |                    |
|                                                                                                        |               |                                                                                                                                                                              | Fewer than 4 camshaft pulses received in a time                    | > 3.0 seconds                                                     | Engine is running<br><br>Starter is not engaged<br><br>No DTC Active:         |                                                       |                           |                    |
| No camshaft pulses received during first 12 MEDRES events (There are 12 MEDRES events per engine cycle |               | Crankshaft is synchronized<br><br>Starter must be engaged to enable the diagnostic, but the diagnostic will not disable when the starter is disengaged<br><br>No DTC Active: | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>CrankSensor_FA         | Continuous every MEDRES event                                     |                                                                               |                                                       |                           |                    |
| The number of camshaft pulses received during 100 engine cycles                                        | = 0           | Crankshaft is synchronized<br><br>No DTC Active:                                                                                                                             | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>CrankSensor_FA         | 8 failures out of 10 samples<br><br>Continuous every engine cycle |                                                                               |                                                       |                           |                    |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                         | Fault<br>Code | Monitor Description                                                                   | Malfunction Criteria                                                                                                               | Threshold Value    | Secondary Parameters                                                                                                                                                         | Enable Conditions                                         | Time Required                                                     | MIL<br>Illum.      |
|------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------------|--------------------|
| Camshaft<br>Position<br>(CMP)<br>Sensor<br>Performance<br>Bank 2<br>Sensor B | P0391         | Determines if a performance fault exists with the cam position bank 2 sensor B signal | The number of camshaft pulses received during first 12 MEDRES events is<br>OR<br><br>(There are 12 MEDRES events per engine cycle) | < 4<br><br>> 6     | Crankshaft is synchronized<br><br>Starter must be engaged to enable the diagnostic, but the diagnostic will not disable when the starter is disengaged<br><br>No DTC Active: | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>CrankSensorFA | Continuous every MEDRES event                                     | Type B,<br>2 Trips |
|                                                                              |               |                                                                                       | The number of camshaft pulses received during 100 engine cycles<br>OR                                                              | < 398<br><br>> 402 | Crankshaft is synchronized<br><br>No DTC Active:                                                                                                                             | 5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>CrankSensorFA | 8 failures out of 10 samples<br><br>Continuous every engine cycle |                    |



13 OBDG05A Engine Diagnostics

| Component/<br>System                  | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Malfunction Criteria                       | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Enable Conditions                                                                                                                                                                                                                                                    | Time Required                                                                                                                                                                                                                 | MIL<br>Illum.   |
|---------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Catalyst System Low Efficiency Bank 1 | P0420         | <p>NOTE: The information contained below applies to applications that use the Idle Catalyst Monitor Algorithm</p> <p>The catalyst washcoat contains Cerium Oxide. Cerium Oxide reacts with NO and O2 during lean A/F excursions to store the excess oxygen (I.e. Cerium Oxidation). During rich A/F excursions, Cerium Oxide reacts with CO and H2 to release this stored oxygen (I.e. Cerium Reduction). This is referred to as the Oxygen Storage Capacity, or OSC. CatMon's strategy is to "measure" the OSC of the catalyst through forced Lean and Rich A/F excursions</p> <p>Normalized Ratio OSC Value Calculation Information and Definitions =<br/>                     1. Raw OSC Calculation = (post cat O2 Resp time - pre cat O2 Resp time)<br/>                     2. BestFailing OSC value from a calibration table (based on temp and exhaust gas flow)</p> | Normalized Ratio OSC Value (EWMA filtered) | < 0.35          | <p>There must be a valid idle period. The criteria are:</p> <p>Driver must be off the accel pedal. This checks that the final accel pedal position (comprehending deadband and hysteresis) is essentially zero.</p> <p>Idle Speed Control System Is Active</p> <p>Vehicle Speed</p> <p>Engine speed</p> <p>Engine run time</p> <p>Tests attempted this trip</p> <p>The catalyst diagnostic has not yet completed for the current trip.</p> <p>Catalyst Idle Conditions Met Criteria is satisfied which includes the General Enable met and the Valid Idle Period</p> | <p>&lt; 1.24 MPH</p> <p>&gt; 915 RPM for a minimum of 25 seconds since end of last idle period.</p> <p>&gt;<br/><b>CatmonMinEngineRunTimeToEnable</b><br/>This is a function of Coolant Temperature, please see "Supporting Tables" for details.</p> <p>&lt; 255</p> | <p>1 test attempted per valid idle period</p> <p>Minimum of 1 test per trip</p> <p>Maximum of 8 tests per trip</p> <p>Frequency: Fueling Related : 12.5 ms</p> <p>OSC Measurements: 100 ms</p> <p>Temp Prediction: 12.5ms</p> | Type A, 1 Trips |

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| Component/<br>System | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                           | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                  | Time Required | MIL<br>Illum. |
|----------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               | <p>3. WorstPassing OSC value (based on temp and exhaust gas flow)</p> <p>Normalized Ratio Calculation = (1-2) / (3-2)</p> <p>A Normalized Ratio of 1 essentially represents a good part and a ratio of 0 essentially represents a very bad part. The Catalyst Monitoring Test is done during idle. Several conditions must be meet in order to execute this test. These conditions and their related values are listed in the secondary parameters area of this document.</p> |                      |                 | <p>Criteria met, as well as:</p> <p>Green Converter Delay</p> <p>Induction Air</p> <p>Intrusive test(s):<br/>Fueltrim<br/>Post O2<br/>EVAP<br/>EGROther vehicle functions:</p> <p>Power Take Off<br/>RunCrank Voltage<br/>Ethanol Estimation</p> <p>ECT</p> <p>Barometric Pressure</p> <p>Idle Time before going intrusive is</p> <p>Idle time is incremented if Vehicle speed</p> <p>Short Term Fuel Trim</p> | <p>Not Active</p> <p>&gt; -20 ° C<br/>&lt; 250 ° C</p> <p>Not Active</p> <p>Not Active<br/>&gt; 10.90 Volts<br/>NOT in Progress</p> <p>&gt; 40 ° C<br/>&lt; 127 ° C</p> <p>&gt; 70 KPA</p> <p>&lt; 50 Seconds</p> <p>&lt; 1.24 MPH and the drivers foot is off accel pedal and the idle speed control system is active as identified in the Valid Idle Period Criteria section.</p> <p>&gt; 0.60<br/>&lt; 1.40</p> |               |               |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                | Enable Conditions                                                                                                                                                                                                                             | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Predicted catalyst temp<br>AND<br>Engine Airflow                                                                                                                                                                                                    | > 300.00 degC<br><br>><br><b>CatmonMinAirflowForW<br/>armCatalystDeterminati<br/>on</b><br><br>table (g/s)<br>(refer to "Supporting<br>Tables" tab)<br>(Based on engine coolant<br>at the time the<br>WarmedUpEvents counter<br>resets to 0.) |               |               |
|                      |               |                     |                      |                 | for at least                                                                                                                                                                                                                                        | 14 seconds                                                                                                                                                                                                                                    |               |               |
|                      |               |                     |                      |                 | with a closed throttle time                                                                                                                                                                                                                         | < 60 seconds<br>consecutively (closed<br>throttle consideration<br>involves having the driver<br>off the accel pedal as<br>stated in the Valid Idle<br>Period Criteria Section) .                                                             |               |               |
|                      |               |                     |                      |                 | Also, in order to increment<br>the WarmedUpEvents<br>counter, either the vehicle<br>speed must exceed the<br>vehicle speed cal or the<br>driver must NOT be off<br>the accel pedal as stated<br>in the Valid Idle Period<br>Criteria section above. |                                                                                                                                                                                                                                               |               |               |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Enable Conditions                                                                                                                                                                                                                                          | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | <p>Closed loop fueling<br/>(Please see "Closed Loop Enable Criteria" section of the "Supporting Tables" tab for details.)</p> <p>PRNDL</p> <p>Idle Stable Criteria:</p> <p>MAF</p> <p>Predicted catalyst temperature</p> <p>Engine Fueling Criteria at Beginning of Idle Period<br/>The following fueling related must also be met from between 4 and 7 seconds after the Catalyst Idle Conditions Met<br/>Criteria has been met for at least 4 seconds prior to allowing intrusive control:</p> <p>Number of pre-O2 switches</p> <p>Short Term Fuel Trim Avg</p> <p>Rapid Step Response</p> | <p>Enabled in Drive Range on an Auto Transmission vehicle.</p> <p>Must hold true from after Catalyst Idle Conditions Met to the end of test</p> <p>&gt; 3.00 g/s<br/>&lt; 12.50 g/s</p> <p>&lt; 900 degC</p> <p>&gt;= 2</p> <p>&gt; 0.96<br/>&lt; 1.04</p> |               |               |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Enable Conditions                                                                                                                                                                | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | <p>(RSR) feature will initiate multiple tests:</p> <p>If the difference between current EWMA value and the current OSC Normalized Ratio value is</p> <p>and the current OSC Normalized Ratio value is</p> <p>Maximum RSR tests to detect failure when RSR is enabled.</p> <p>Green Converter Delay Criteria<br/>This is part of the check for the Catalyst Idle Conditions Met Criteria section</p> <p>The diagnostic will not be enabled until the following has been met:</p> <p>Predicted catalyst temperature</p> <p>for</p> <p>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</p> <p>PTO</p> <p>General Enable<br/>DTC's Not Set</p> | <p>&gt; 0.20</p> <p>&lt; 0.10</p> <p>24</p> <p>&gt; 0 ° C</p> <p>0 seconds non-continuously.</p> <p>Not Active</p> <p>MAF_SensorFA<br/>MAF_SensorTFTKO<br/>AmbPresDfltStatus</p> |               |               |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 |                      | IAT_SensorCircuitFA<br>IAT_SensorCircuitTFTKO<br>ECT_Sensor_FA<br>O2S_Bank_1_Sensor_1_<br>FA<br>O2S_Bank_1_Sensor_2_<br>FA<br>O2S_Bank_2_Sensor_1_<br>FA<br>O2S_Bank_2_Sensor_2_<br>FA<br>FuelTrimSystemB1_FA<br>FuelTrimSystemB1_TFTK<br>O<br>FuelTrimSystemB2_FA<br>FuelTrimSystemB2_TFTK<br>O<br>EngineMisfireDetected_F<br>A<br>EvapPurgeSolenoidCircuit<br>_FA<br>IAC_SystemRPM_FA<br>EGRValvePerformance_F<br>A<br>EGRValveCircuit_FA<br>CamSensorAnyLocationF<br>A<br>CrankSensorFA<br>TPS_Performance_FA<br>EnginePowerLimited |               |               |
|                      |               |                     |                      |                 |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |               |

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| Component/<br>System                  | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Malfunction Criteria                       | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Enable Conditions                                                                                                               | Time Required                                                                                                                                                                                                                 | MIL<br>Illum.   |
|---------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Catalyst System Low Efficiency Bank 2 | P0430         | <p>Note: The information below applies to applications that use the Idle Catalyst Monitor Algorithm</p> <p>The catalyst washcoat contains Cerium Oxide. Cerium Oxide reacts with NO and O2 during lean A/F excursions to store the excess oxygen (I.e. Cerium Oxidation). During rich A/F excursions, Cerium Oxide reacts with CO and H2 to release this stored oxygen (I.e. Cerium Reduction). This is referred to as the Oxygen Storage Capacity, or OSC. CatMon's strategy is to "measure" the OSC of the catalyst through forced Lean and Rich A/F excursions</p> <p>Normalized Ratio OSC Value Calculation Information and Definitions =</p> <ol style="list-style-type: none"> <li>1. Raw OSC Calculation = (post cat O2 Resp time - pre cat O2 Resp time)</li> <li>2. BestFailing OSC value from a calibration table (based on temp and exhaust gas flow)</li> <li>3. WorstPassing OSC</li> </ol> | Normalized Ratio OSC Value (EWMA filtered) | < 0.35          | <p>There must be a valid idle period. The criteria are:</p> <p>Driver must be off the accel pedal. This checks that the final accel pedal position (comprehending deadband and hysteresis) is essentially zero.</p> <p>Idle Speed Control System Is Active</p> <p>Vehicle Speed</p> <p>Engine speed</p> <p>Engine run time</p> <p>Tests attempted this trip</p> <p>The catalyst diagnostic has not yet completed for the current trip.</p> <p>Catalyst Idle Conditions Met Criteria is satisfied which includes the General Enable met and</p> | <p>&lt; 1.24 MPH</p> <p>&gt; 915 RPM for a minimum of 25 seconds since end of last idle period.</p> <p>&gt;</p> <p>&lt; 255</p> | <p>1 test attempted per valid idle period</p> <p>Minimum of 1 test per trip</p> <p>Maximum of 8 tests per trip</p> <p>Frequency: Fueling Related : 12.5 ms</p> <p>OSC Measurements: 100 ms</p> <p>Temp Prediction: 12.5ms</p> | Type A, 1 Trips |

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| Component/<br>System | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                                                                                                      | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                 | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                  | Time Required | MIL<br>Illum. |
|----------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               | <p>value (based on temp and exhaust gas flow)</p> <p>Normalized Ratio Calculation = (1-2) / (3-2)</p> <p>A Normalized Ratio of 1 essentially represents a good part and a ratio of 0 essentially represents a very bad part. The Catalyst Monitoring Test is done during idle. Several conditions must be met in order to execute this test. These conditions and their related values are listed in the secondary parameters area of this document.</p> |                      |                 | <p>the Valid Idle Period Criteria met, as well as:</p> <p>Green Converter Delay</p> <p>Induction Air</p> <p>Intrusive test(s):<br/>Fueltrim<br/>Post O2<br/>EVAP<br/>EGROther vehicle functions:</p> <p>Power Take Off<br/>RunCrank Voltage<br/>Ethanol Estimation</p> <p>ECT</p> <p>Barometric Pressure</p> <p>Idle Time before going intrusive is</p> <p>Idle time is incremented if Vehicle speed</p> <p>Short Term Fuel Trim</p> | <p>Not Active</p> <p>&gt; -20 ° C<br/>&lt; 250 ° C</p> <p>Not Active</p> <p>Not Active<br/>&gt; 10.90 Volts<br/>NOT in Progress</p> <p>&gt; 40 ° C<br/>&lt; 127 ° C</p> <p>&gt; 70 KPA</p> <p>&lt; 50 Seconds</p> <p>&lt; 1.24 MPH and the drivers foot is off accel pedal and the idle speed control system is active as identified in the Valid Idle Period Criteria section.</p> <p>&gt; 0.60<br/>&lt; 1.40</p> |               |               |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                             | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Predicted catalyst temp<br>AND<br>Engine Airflow | > 300.00 degC<br><br>><br><b>CatmonMinAirflowForWarmCatalystDetermination</b><br><br>table (g/s)<br>(refer to "Supporting Tables" tab)<br>(Based on engine coolant at the time the WarmedUpEvents counter resets to 0.)<br><br>14 seconds<br><br>for at least<br><br>with a closed throttle time < 60 seconds consecutively (closed throttle consideration involves having the driver off the accel pedal as stated in the Valid Idle Period Criteria Section) .<br><br>Also, in order to increment the WarmedUpEvents counter, either the vehicle speed must exceed the vehicle speed cal or the driver must NOT be off the accel pedal as stated in the Valid Idle Period Criteria section above.<br><br>Closed loop fueling<br>(Please see "Closed Loop Enable Criteria" section of |               |               |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Enable Conditions                                                                                                                                                                                                                                                   | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | the "Supporting Tables"<br>tab for details.)<br><br>PRNDL<br><br>Idle Stable Criteria:<br><br>MAF<br><br>Predicted catalyst<br>temperature<br><br>Engine Fueling Criteria at<br>Beginning of Idle Period<br>The following fueling<br>related must also be met<br>from between 4 and 7<br>seconds after the Catalyst<br>Idle Conditions Met<br>Criteria has been met for<br>at least 4 seconds prior to<br>allowing intrusive control:<br><br>Number of pre-O2<br>switches<br><br>Short Term Fuel Trim Avg<br><br>Rapid Step Response<br>(RSR) feature will initiate<br>multiple tests: | Enabled in Drive Range<br>on an Auto Transmission<br>vehicle.<br><br>Must hold true from after<br>Catalyst Idle Conditions<br>Met to the end of test<br><br>> 3.00 g/s<br>< 12.50 g/s<br><br>< 900 degC<br><br><br><br><br><br><br><br>>= 2<br><br>> 0.96<br>< 1.04 |               |               |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Enable Conditions                                                                                                                                                                | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | <p>If the difference between current EWMA value and the current OSC Normalized Ratio value is</p> <p>and the current OSC Normalized Ratio value is</p> <p>Maximum RSR tests to detect failure when RSR is enabled.</p> <p>Green Converter Delay Criteria<br/>This is part of the check for the Catalyst Idle Conditions Met Criteria section</p> <p>The diagnostic will not be enabled until the following has been met:</p> <p>Predicted catalyst temperature</p> <p>for</p> <p>Note: this feature is only enabled when the vehicle is new and cannot be enabled in service</p> <p>PTO</p> <p>General Enable<br/>DTC's Not Set</p> | <p>&gt; 0.47</p> <p>&lt; 0.16</p> <p>24</p> <p>&gt; 0 ° C</p> <p>0 seconds non-continuously.</p> <p>Not Active</p> <p>MAF_SensorFA<br/>MAF_SensorTFTKO<br/>AmbPresDfltStatus</p> |               |               |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 |                      | IAT_SensorCircuitFA<br>IAT_SensorCircuitTFTKO<br>ECT_Sensor_FA<br>O2S_Bank_1_Sensor_1_<br>FA<br>O2S_Bank_1_Sensor_2_<br>FA<br>O2S_Bank_2_Sensor_1_<br>FA<br>O2S_Bank_2_Sensor_2_<br>FA<br>FuelTrimSystemB1_FA<br>FuelTrimSystemB1_TFTK<br>O<br>FuelTrimSystemB2_FA<br>FuelTrimSystemB2_TFTK<br>O<br>EngineMisfireDetected_F<br>A<br>EvapPurgeSolenoidCircuit<br>_FA<br>IAC_SystemRPM_FA<br>EGRValvePerformance_F<br>A<br>EGRValveCircuit_FA<br>CamSensorAnyLocationF<br>A<br>CrankSensorFA<br>TPS_Performance_FA<br>EnginePowerLimited |               |               |
|                      |               |                     |                      |                 |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |               |

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| Component/<br>System                                                                   | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Threshold Value                                                             | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                         | Time Required                                                                                                    | MIL<br>Illum.                                                                                                                                                              |
|----------------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Evaporative Emission (EVAP) System Small Leak Detected<br><br>(Not Sealed Fuel System) | P0442         | This DTC will detect a small leak ( $\geq 0.020''$ ) in the EVAP system between the fuel fill cap and the purge solenoid. On some applications a small leak is defined as $\geq 0.025''$ , $0.030''$ , or $0.150''$ . The engine off natural vacuum method (EONV) is used. EONV is an evaporative system leak detection diagnostic that runs when the vehicle is shut off when enable conditions are met. Prior to sealing the system and performing the diagnostic, the fuel volatility is analyzed. In an open system (Canister Vent Solenoid [CVS] open) high volatility fuel creates enough flow to generate a measurable pressure differential relative to atmospheric. After the volatility check, the vent solenoid will close. After the vent is closed, typically a build up of pressure from the hot soak begins (phase-1). The pressure typically will peak and then begin to decrease as the fuel cools. When | The total delta from peak pressure to peak vacuum during the test is normalized against a calibration pressure threshold table that is based upon fuel level and ambient temperature. (Please see <b>P0442: EONV Pressure Threshold (Pascals) Table</b> in Supporting Tables). The normalized value is calculated by the following equation: $1 - (\text{peak pressure} - \text{peak vacuum}) / \text{pressure threshold}$ . The normalized value is entered into EWMA (with 0= perfect pass and 1= perfect fail).<br><br>When EWMA is the DTC light is illuminated.<br><br>The DTC light can be turned off if the EWMA is and stays below the EWMA fail threshold for 3 additional consecutive trips. | $> 0.57$ (EWMA Fail Threshold),<br><br>$\leq 0.35$ (EWMA Re-Pass Threshold) | Fuel Level<br>Drive Time<br>Drive length<br>ECT<br>Baro<br>Distance since assembly plant<br>Engine not run time before key off must be<br><br>Time since last complete test if normalized result and EWMA is passing<br><br>OR<br>Time since last complete test if normalized result or EWMA is failing<br><br>Estimated ambient temperature at end of drive<br><br>Estimate of Ambient Air Temperature Valid<br>*****<br>Conditions for Estimate of Ambient Air Temperature to be valid:<br><br>1. Cold Start | $10\% \leq \text{Percent} \leq 90\%$<br>$\geq 600$ seconds<br>$\geq 5.0$ miles<br>$\geq 70$ °C<br>$\geq 70$ kPa<br>$\geq 10.0$ miles<br><br>$\leq$ refer to <b>P0442: Engine Off Time Before Vehicle Off Maximum as a Function of Estimated Ambient Temperature Table</b> in Supporting Tables.<br><br>$\geq 17$ hours<br><br>$\geq 10$ hours<br><br>$0\text{ °C} \leq \text{Temperature} \leq 34\text{ °C}$<br><br>***** | Once per trip, during hot soak (up to 2,400 sec.). No more than 2 unsuccessful attempts between completed tests. | Type A,<br>1 Trips<br><br>EWMA<br><br>Average run length is 8 to 12 trips under normal conditions<br><br>Run length is 3 to 6 trips after code clear or non-volatile reset |

### 13 OBDG05A Engine Diagnostics

Initial DTCs  
1 of 2 SECTIONS

| Component/<br>System | Fault Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Enable Conditions                                                                                                             | Time Required | MIL Illum. |
|----------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------|------------|
|                      |            | the pressure drops (-62.27) Pa from peak pressure, the vent is then opened for 60 seconds to normalize the system pressure. The vent is again closed to begin the vacuum portion of the test (phase-2). As the fuel temperature continues to fall, a vacuum will begin forming. The vacuum will continue until it reaches a vacuum peak. When the pressure rises 62.27 Pa from vacuum peak, the test then completes. If the key is turned on while the diagnostic test is in progress, the test will abort. |                      |                 | Startup delta deg C (ECT-IAT)<br><br>OR<br>2. Short Soak and Previous EAT Valid<br><br>Previous time since engine off<br><br>OR<br>3. Less than a short soak and Previous EAT Not Valid<br><br>Previous time since engine off<br>AND<br>Vehicle Speed<br>AND<br>Mass Air Flow<br><br>Must expire Estimate of Ambient Temperature Valid Conditioning Time.<br><b>P0442: Estimate of Ambient Temperature Valid Conditioning Time</b> Table in Supporting Tables.<br><br>OR<br>4. Not a Cold Start and greater than a Short Soak<br><br>Previous time since engine off<br>AND<br>Vehicle Speed<br>AND<br>Mass Air Flow | ≤ 8 °C<br><br>≤ 7,200 seconds<br><br>≤ 7,200 seconds<br>≥ 40 mph<br>≥ 8 g/sec<br><br>> 7,200 seconds<br>≥ 40 mph<br>≥ 8 g/sec |               |            |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Enable Conditions | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------|---------------|
|                      |               |                     |                      |                 | <p>Must expire maximum value in Estimate of Ambient Temperature Valid Conditioning Time. Please see <b>P0442: Estimate of Ambient Temperature Valid Conditioning Time</b> in Supporting Tables.</p> <p>1. High Fuel Volatility</p> <p>During the volatility phase, pressure in the fuel tank is integrated vs. time. If the integrated pressure is then test aborts and unsuccessful attempts is incremented.</p> <p>OR</p> <p>2. Vacuum Refueling Detected</p> <p>See P0454 Fault Code for information on vacuum refueling algorithm.</p> <p>OR</p> <p>3. Fuel Level Refueling Detected</p> <p>See P0464 Fault Code for information on fuel level refueling.</p> <p>OR</p> | <p>&lt; -5</p>    |               |               |

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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Enable Conditions                                                                                                                                   | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | <p>4. Vacuum Out of Range and No Refueling</p> <p>See P0451 Fault Code for information on vacuum sensor out of range and P0464 Fault Code for information on fuel level refueling.</p> <p>OR</p> <p>5. Vacuum Out of Range and Refueling Detected</p> <p>See P0451 Fault Code for information on vacuum sensor out of range and P0464 Fault Code for information on fuel level refueling.</p> <p>OR</p> <p>6. Vent Valve Override Failed</p> <p>Device control using an off-board tool to control the vent solenoid, cannot exceed during the EONV test</p> <p>OR</p> <p>7. Key up during EONV test</p> <p>No active DTCs:</p> | <p>0.50 seconds</p> <p>MAF_SensorFA<br/>ECT_Sensor_FA<br/>IAT_SensorFA<br/>VehicleSpeedSensor_FA<br/>IgnitionOffTimeValid<br/>AmbientAirDefault</p> |               |               |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions                                           | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------|-------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 |                      | P0443<br>P0446<br>P0449<br>P0452<br>P0453<br>P0455<br>P0496 |               |               |
|                      |               |                     |                      |                 |                      |                                                             |               |               |

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| Component/<br>System                                                                                  | Fault<br>Code | Monitor Description                                                                                                                                                                | Malfunction Criteria                                                                                                                                                                                                                                                               | Threshold Value                                                                                      | Secondary Parameters                                                                              | Enable Conditions                                                                                                                                                                                                                                                                                  | Time Required                                                                                                                               | MIL<br>Illum.      |
|-------------------------------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Evaporative<br>Emission<br>(EVAP) Vent<br>System<br>Performance<br><br>(Not Sealed<br>Fuel<br>System) | P0446         | This DTC will determine if a restriction is present in the vent solenoid, vent filler, vent hose or EVAP canister.<br><br>This test runs with normal purge and vent valve is open. | Vent Restriction Prep Test:<br>Vented Vacuum for<br>OR<br>Vented Vacuum for<br><br>Vent Restriction Test:<br>Tank Vacuum for<br>before Purge Volume<br><br>After setting the DTC for the first time, 2 liters of fuel must be consumed before setting the DTC for the second time. | < -623 Pa<br>60 seconds<br><br>> 1,245 Pa<br>60 seconds<br><br>> 2,989 Pa<br>5 seconds<br>≥ 6 liters | Fuel Level<br>System Voltage<br><br>Startup IAT<br><br>Startup ECT<br>BARO<br><br>No active DTCs: | 10 % ≤ Percent ≤ 90 %<br>11 volts ≤ Voltage ≤ 32<br>volts<br>4 °C ≤ Temperature ≤ 30<br>°C<br>≤ 35 °C<br>≥ 70 kPa<br><br>MAP_SensorFA TPS_FA<br>VehicleSpeedSensor_FA<br>IAT_SensorFA<br>ECT_Sensor_FA<br>AmbientAirDefault<br>EnginePowerLimited<br><br>P0443<br>P0449<br>P0452<br>P0453<br>P0454 | Once per Cold<br>Start<br><br>Time is<br>dependent on<br>driving<br>conditions<br><br>Maximum time<br>before test abort<br>is 1,000 seconds | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                | Fault<br>Code | Monitor Description                                                                                                                                                                    | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Threshold Value                                                                                                  | Secondary Parameters                                                                           | Enable Conditions | Time Required                                                                                                                                                                                                                                                                           | MIL<br>Illum.                                                                                                                               |
|-------------------------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Fuel Tank Pressure (FTP) Sensor Circuit Performance<br><br>(Not Sealed Fuel System) | P0451         | The DTC will be set if the fuel tank vacuum sensor is out of range when it tries to re-zero prior to the phase-1 or phase-2 portions of the engine-off natural vacuum small leak test. | <p>The tank vacuum sensor voltage is compared to a window about the nominal sensor voltage offset (~1.5 volts)</p> <p>Upper voltage threshold (voltage addition above the nominal voltage)</p> <p>Lower voltage threshold (voltage subtraction below the nominal voltage)</p> <p>The difference between tank vacuum sensor voltage and the nominal offset voltage is then normalized against the appropriate threshold listed above to produce a ratio between 0.0 and 1.0. This normalized re-zero ratio is then filtered with a EWMA (with 0= perfect pass and 1=perfect fail).</p> <p>When EWMA is</p> <p>the DTC light is illuminated.</p> <p>The DTC light can be turned off if the EWMA is</p> <p>and stays below the EWMA fail threshold for 3 additional consecutive trips.</p> | <p>0.2 volts</p> <p>0.2 volts</p> <p>&gt; 0.73 (EWMA Fail Threshold),</p> <p>≤ 0.40 (EWMA Re-Pass Threshold)</p> | This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes |                   | This test is executed during an engine-off natural vacuum small leak test. The number of times that it executes can range from zero to two per engine-off period. The length of the test is determined by the refueling rationality test, which can take up to 600 seconds to complete. | <p>Type A,<br/>1 Trips</p> <p>EWMA</p> <p>Average run length:<br/>6</p> <p>Run length is 2 trips after code clear or non-volatile reset</p> |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                | Fault<br>Code | Monitor Description                                                                         | Malfunction Criteria                                                                                                   | Threshold Value                             | Secondary Parameters                                   | Enable Conditions | Time Required                                           | MIL<br>Illum.      |
|-------------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|--------------------------------------------------------|-------------------|---------------------------------------------------------|--------------------|
| Fuel Tank Pressure (FTP) Sensor Circuit Low Voltage<br><br>(Not Sealed Fuel System) | P0452         | This DTC will detect a Fuel Tank Pressure (FTP) sensor signal that is too low out of range. | FTP sensor signal<br><br>The normal operating range of the FTP sensor is 0.5 volts (~1245 Pa) to 4.5 volts (~3736 Pa). | < 0.15 volts ( 3.0 % of Vref or ~ 1,681 Pa) | Time delay after sensor power up for sensor warm-up is | 0.10 seconds      | 640 failures out of 800 samples<br><br>12.5 ms / sample | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                 | Fault<br>Code | Monitor Description                                                                          | Malfunction Criteria                                                                                                    | Threshold Value                             | Secondary Parameters                                   | Enable Conditions | Time Required                                           | MIL<br>Illum.      |
|--------------------------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|--------------------------------------------------------|-------------------|---------------------------------------------------------|--------------------|
| Fuel Tank Pressure (FTP) Sensor Circuit High Voltage<br><br>(Not Sealed Fuel System) | P0453         | This DTC will detect a Fuel Tank Pressure (FTP) sensor signal that is too high out of range. | FTP sensor signal<br><br>The normal operating range of the FTP sensor is 0.5 volts (~1245 Pa) to 4.5 volts (~-3736 Pa). | > 4.85 volts ( 97 % of Vref or ~ -4,172 Pa) | Time delay after sensor power up for sensor warm-up is | 0.10 seconds      | 640 failures out of 800 samples<br><br>12.5 ms / sample | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                      | Fault<br>Code | Monitor Description                                                                                                                                                             | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Threshold Value                  | Secondary Parameters                                                                                                                    | Enable Conditions | Time Required                                                                                                                                                                                                                                                                                                                                           | MIL<br>Illum.      |
|-----------------------------------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Fuel Tank<br>Pressure<br>(FTP)<br>Sensor<br>Circuit<br>Intermittent<br><br>(Not Sealed<br>Fuel<br>System) | P0454         | This DTC will detect intermittent tank vacuum sensor signals that would have caused the engine-off natural vacuum small leak test to abort due to an apparent re-fueling event. | If an abrupt change in tank vacuum is detected the engine-off natural vacuum test is aborted due to an apparent refueling event. Subsequent to the abort, a refueling rationality test is executed to confirm that a refueling event occurred. If a refueling is confirmed, then the test sample is considered passing. Otherwise, the sample is considered failing indicating an intermittent signal problem. An abrupt change is defined as a change in vacuum: in the span of 1.0 seconds. But in 12.5 msec. A refueling event is confirmed if the fuel level has a persistent change of for 30 seconds. | > 112 Pa<br>< 249 Pa<br><br>10 % | This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes and the canister vent solenoid is closed |                   | This test is executed during an engine-off natural vacuum small leak test. The test can only execute up to once per engine-off period. The length of the test is determined by the refueling rationality test, which can take up to 600 seconds to complete. The test will report a failure if 2 out of 3 samples are failures.<br><br>12.5 ms / sample | Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                        | Fault<br>Code | Monitor Description                                                                                                                                                                        | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                    | Threshold Value                                                                     | Secondary Parameters                                                                                                                                                                                                                                                                                                                            | Enable Conditions                                                                                                                                                                                                                                                                                                                                            | Time Required                                                                                                                                                                                                                                                                                          | MIL<br>Illum.      |
|-------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Evaporative<br>Emission<br>(EVAP)<br>System<br>Large Leak<br>Detected<br><br>(Not Sealed<br>Fuel<br>System) | P0455         | This DTC will detect a weak vacuum condition (large leak or purge blockage) in the EVAP system.<br><br>Purge valve is controlled (to allow purge flow) and vent valve is commanded closed. | Purge volume while<br>Tank vacuum<br><br>After setting the DTC for the first time, 2 liters of fuel must be consumed before setting the DTC for the second time.<br><br>Weak Vacuum Follow-up Test (fuel cap replacement test)<br>Weak Vacuum Test failed.<br><br>Passes if tank vacuum<br><br>Note: Weak Vacuum Follow-up Test can only report a pass. | > 15 liters<br><br>≤ 2,740 Pa<br><br><br><br><br><br><br><br><br><br><br>≥ 2,740 Pa | Fuel Level<br>System Voltage<br><br>BARO<br>Purge Flow<br><br>No active DTCs:<br><br><br><br><br><br>Cold Start Test<br><br>If ECT > IAT, Startup temperature delta (ECT-IAT):<br>Cold Test Timer<br>Startup IAT<br><br>Startup ECT<br><br>Weak Vacuum Follow-up Test<br>This test can run following a weak vacuum failure or on a hot restart. | 10 % ≤ Percent ≤ 90 %<br>11 volts ≤ Voltage ≤ 32 volts<br>≥ 70 kPa<br>≥ 1.50 %<br><br>MAP_SensorFA<br>TPS_FA<br>VehicleSpeedSensor_FA<br>IAT_SensorFA<br>ECT_Sensor_FA<br>AmbientAirDefault<br>EnginePowerLimited<br><br>P0443<br>P0449<br>P0452<br>P0453<br>P0454<br><br><br><br><br>≤ 8 °C<br>≤ 1,000 seconds<br>4 °C ≤ Temperature ≤ 30 °C<br><br>≤ 35 °C | Once per cold start<br><br>Time is dependent on driving conditions<br><br>Maximum time before test abort is 1,000 seconds<br><br>Weak Vacuum Follow-up Test<br><br>With large leak detected, the follow-up test is limited to 1,300 seconds. Once the MIL is on, the follow-up test runs indefinitely. | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                | Fault<br>Code | Monitor Description                                                         | Malfunction Criteria                                    | Threshold Value | Secondary Parameters                  | Enable Conditions     | Time Required   | MIL<br>Illum.      |
|-----------------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------|---------------------------------------------------------|-----------------|---------------------------------------|-----------------------|-----------------|--------------------|
| Fuel Level<br>Sensor 1<br>Performance<br><br>(For use on<br>vehicles with<br>a single fuel<br>tank) | P0461         | This DTC will detect a fuel sender stuck in range in the primary fuel tank. | Delta fuel volume change over an accumulated 227 miles. | < 3 liters      | Engine Running<br><br>No active DTCs: | VehicleSpeedSensor_FA | 250 ms / sample | Type B,<br>2 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                             | Fault<br>Code | Monitor Description                                                                 | Malfunction Criteria            | Threshold Value | Secondary Parameters | Enable Conditions | Time Required                                          | MIL<br>Illum.      |
|--------------------------------------------------|---------------|-------------------------------------------------------------------------------------|---------------------------------|-----------------|----------------------|-------------------|--------------------------------------------------------|--------------------|
| Fuel Level<br>Sensor 1<br>Circuit Low<br>Voltage | P0462         | This DTC will detect a fuel sender stuck out of range low in the primary fuel tank. | Fuel level Sender % of 5V range | < 10 %          |                      |                   | 100 failures out of 125 samples<br><br>100 ms / sample | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                              | Fault<br>Code | Monitor Description                                                                  | Malfunction Criteria            | Threshold Value | Secondary Parameters | Enable Conditions | Time Required                                          | MIL<br>Illum.      |
|---------------------------------------------------|---------------|--------------------------------------------------------------------------------------|---------------------------------|-----------------|----------------------|-------------------|--------------------------------------------------------|--------------------|
| Fuel Level<br>Sensor 1<br>Circuit High<br>Voltage | P0463         | This DTC will detect a fuel sender stuck out of range high in the primary fuel tank. | Fuel level Sender % of 5V range | > 60 %          |                      |                   | 100 failures out of 125 samples<br><br>100 ms / sample | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                    | Fault<br>Code | Monitor Description                                                                                                                                                            | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Threshold Value | Secondary Parameters                                                                           | Enable Conditions | Time Required                                                                                                                                                                                                                                                                                                                                          | MIL<br>Illum.      |
|-----------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Fuel Level<br>Sensor 1<br>Circuit<br>Intermittent<br><br>(Not Sealed<br>Fuel<br>System) | P0464         | This DTC will detect intermittent fuel level sensor signals that would have caused the engine-off natural vacuum small leak test to abort due to an apparent re-fueling event. | If a change in fuel level is detected, the engine-off natural vacuum test is aborted due to an apparent refueling event. Subsequent to the abort, a refueling rationality test is executed to confirm that an actual refueling event occurred. If a refueling event is confirmed, then the test sample is considered passing. Otherwise, the sample is considered failing indicating an intermittent signal problem.<br><br>An intermittent change in fuel level is defined as:<br><br>The fuel level changes by and does not remain for 30 seconds during a 600 second refueling rationality test. | 10 %<br>> 10 %  | This test will execute whenever the engine-off natural vacuum small leak test (P0442) executes |                   | This test is executed during an engine-off natural vacuum small leak test. The test can only execute up to once per engine-off period. The length of the test is determined by the refueling rationality test, which can take up to 600 seconds to complete. The test will report a failure if 2 out of 3 samples are failures.<br><br>100 ms / sample | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                | Fault<br>Code | Monitor Description                                                                  | Malfunction Criteria                                         | Threshold Value                                                           | Secondary Parameters     | Enable Conditions     | Time Required                                        | MIL<br>Illum.                                                                                      |
|-------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------|-----------------------|------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Cooling Fan<br>1 Relay<br>Control<br>Circuit Open<br>(ODM) (Not<br>used on<br>EREV) | P0480         | Diagnoses the cooling fan 1 relay control low side driver circuit for circuit faults | Voltage low during driver off state (indicates open circuit) | Open Circuit:<br>≥ 200 K Ω impedance between signal and controller ground | Powertrain Relay Voltage | Voltage ≥ 11.00 volts | 50 failures out of 63 samples<br><br>100 ms / sample | Type B,<br>2 Trips<br><br>Note: In certain controllers P0691 may also set (Fan 1 Short to Ground). |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                       | Fault<br>Code | Monitor Description                                                                  | Malfunction Criteria                                         | Threshold Value                                                           | Secondary Parameters     | Enable Conditions     | Time Required                                        | MIL<br>Illum.                                                                                     |
|------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------|-----------------------|------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Cooling Fan<br>2 Relay<br>Control<br>Circuit Open<br>(ODM) | P0481         | Diagnoses the cooling fan 2 relay control low side driver circuit for circuit faults | Voltage low during driver off state (indicates open circuit) | Open Circuit:<br>≥ 200 K Ω impedance between signal and controller ground | Powertrain Relay Voltage | Voltage ≥ 11.00 volts | 50 failures out of 63 samples<br><br>100 ms / sample | Type B,<br>2 Trips<br><br>Note: In certain controllers P0693 may also set (Fan 2 Short to Ground) |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                           | Fault<br>Code | Monitor Description                                                                                                                                                  | Malfunction Criteria             | Threshold Value                                                                                                                                                                                   | Secondary Parameters                                                                                                 | Enable Conditions                                                                                                                                                                                                                                                                                                            | Time Required                                                             | MIL<br>Illum.      |
|----------------------------------------------------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------|
| Evaporative<br>Emission<br>(EVAP)<br>System Flow<br>During Non-<br>Purge<br><br>(Not Sealed<br>Fuel<br>System) | P0496         | This DTC will determine if the purge solenoid is leaking to engine manifold vacuum.<br><br>This test will run with the purge valve closed and the vent valve closed. | Tank Vacuum for<br><br>Test time | > 2,491 Pa<br>5 seconds<br><br>≥ refer to <b>P0496:<br/>Purge Valve Leak<br/>Test Engine Vacuum<br/>Test Time (Cold Start)<br/>as a Function of Fuel<br/>Level Table</b> in<br>Supporting Tables. | Fuel Level<br>System Voltage<br><br>BARO<br>Startup IAT<br><br>Startup ECT<br>Engine Off Time<br><br>No active DTCs: | 10 % ≤ Percent ≤ 90 %<br>11 volts ≤ Voltage ≤ 32<br>volts<br>≥ 70 kPa<br>4 °C ≤ Temperature ≤ 30 °C<br><br>≤ 35 °C<br>≥ 28,800.0 seconds<br><br>MAP_SensorFA<br>TPS_FA<br>VehicleSpeedSensor_FA<br>IAT_SensorFA<br>ECT_Sensor_FA<br>AmbientAirDefault<br>EnginePowerLimited<br><br>P0443<br>P0449<br>P0452<br>P0453<br>P0454 | Once per cold<br>start<br><br>Cold start: max<br>time is 1,000<br>seconds | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System               | Fault<br>Code | Monitor Description                                | Malfunction Criteria                                     | Threshold Value            | Secondary Parameters                                                                                                                                                                                                                                                                             | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                     | Time Required                                                                                                                                         | MIL<br>Illum.      |
|------------------------------------|---------------|----------------------------------------------------|----------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Low Engine<br>Speed Idle<br>System | P0506         | This DTC will<br>determine if a low idle<br>exists | Filtered Engine Speed<br>Error<br><br>filter coefficient | > 94.00 rpm<br><br>0.00350 | Baro<br><br>Coolant Temp<br><br>Engine run time<br>Ignition voltage<br>Time since gear change<br><br>Time since a TCC mode<br>change<br><br>IAT<br>Vehicle speed<br>Commanded RPM delta<br>Idle time<br><br>For manual<br>transmissions:<br>Clutch Pedal Position<br>or<br>Clutch Pedal Position | > 70 kPa<br><br>><br>KeSPDD_T_EnbIECT_Mi<br>n ( 60 °C) and <<br>KfECTI_T_EngCoolHotHi<br>Thresh ( 126 °C)<br>Must verify<br>KfECTI_T_EngCoolHotLo<br>Thresh ( 123 ) is less than<br>KfECTI_T_EngCoolHotHi<br>Thresh ( 126)<br><br>≥ 60 sec<br>255 ≥ volts ≥ 11<br>≥ 3 sec<br><br>> 3 sec<br><br>> -20 °C<br>≤ 1.24 kph<br>≤ 25 rpm<br>> 5 sec<br><br>> 88.00 pct<br>or<br>< 25.00 pct | Diagnostic runs<br>in every 12.5 ms<br>loop<br><br>Diagnostic<br>reports pass or<br>fail in 10<br>seconds once all<br>enable<br>conditions are<br>met | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | No active DTCs       | PTO not active<br>Transfer Case not in 4WD LowState<br>Off-vehicle device control (service bay control) must not be active.<br>following conditions not TRUE:<br>(VeTESR_e_EngSpdReqIntvType = CeTESR_e_EngSpdMinLimit AND VeTESR_e_EngSpdReqRespType = CeTESR_e_NoSuggestion)<br>Clutch is not depressed<br>TC_BoostPresSnrFA<br>ECT_Sensor_FA<br>EnginePowerLimited<br>EGRValveCircuit_FA<br>EGRValvePerformance_FA<br>IAT_SensorCircuitFA<br>EvapFlowDuringNonPurge_FA<br>FuelTrimSystemB1_FA<br>FuelTrimSystemB2_FA<br>FuelInjectorCircuit_FA<br>MAF_SensorFA<br>EngineMisfireDetected_FA<br>IgnitionOutputDriver FA |               |               |



13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                  | Enable Conditions                                                                                                                                            | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 |                                       | TPS_FA<br>TPS_Performance_FA<br>VehicleSpeedSensor_FA<br>FuelLevelDataFault<br>LowFuelConditionDiagnostic<br>Clutch Sensor FA<br>AmbPresDf1tdStatus<br>P2771 |               |               |
|                      |               |                     |                      |                 | All of the above met<br>for Idle time | > 5 sec                                                                                                                                                      |               |               |
|                      |               |                     |                      |                 |                                       |                                                                                                                                                              |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System                | Fault<br>Code | Monitor Description                                 | Malfunction Criteria                                     | Threshold Value              | Secondary Parameters                                                                                                                                                                                                                                                        | Enable Conditions                                                                                                                                                                                                                                                                                                                                                      | Time Required                                                                                                                                         | MIL<br>Illum.      |
|-------------------------------------|---------------|-----------------------------------------------------|----------------------------------------------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| High Engine<br>Speed Idle<br>System | P0507         | This DTC will<br>determine if a high idle<br>exists | Filtered Engine Speed<br>Error<br><br>filter coefficient | < -188.00 rpm<br><br>0.00350 | Baro<br><br>Coolant Temp<br><br>Engine run time<br>Ignition voltage<br>Time since gear change<br>Time since a TCC mode<br>change<br>IAT<br>Vehicle speed<br>Commanded RPM delta<br><br>For manual<br>transmissions:<br>Clutch Pedal Position<br>or<br>Clutch Pedal Position | > 70 kPa<br><br>><br>KeSPDD_T_EnbIECT_Mi<br>n ( 60 °C) and <<br>KfECTI_T_EngCoolHotHi<br>Thresh ( 126 °C)<br>Must verify<br>KfECTI_T_EngCoolHotLo<br>Thresh ( 123 ) is less than<br>KfECTI_T_EngCoolHotHi<br>Thresh ( 126)<br><br>≥ 60 sec<br>255 ≥ volts ≥ 11<br>≥ 3 sec<br>> 3 sec<br><br>> -20 °C<br>≤ 1.24 kph<br>≤ 25 rpm<br><br>> 88.00 pct<br>or<br>< 25.00 pct | Diagnostic runs<br>in every 12.5 ms<br>loop<br><br>Diagnostic<br>reports pass or<br>fail in 10<br>seconds once all<br>enable<br>conditions are<br>met | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | No active DTCs       | PTO not active<br><br>Transfer Case not in 4WD<br>LowState<br><br>Off-vehicle device control<br>(service bay control) must<br>not be active.<br><br>following conditions not<br>TRUE:<br>(VeTESR_e_EngSpdReqI<br>ntvType =<br>CeTESR_e_EngSpdMinLi<br>mit AND<br>VeTESR_e_EngSpdReqR<br>espType =<br>CeTESR_e_NoSuggestio<br>n)<br><br>Clutch is not depressed<br><br>TC_BoostPresSnsrFA<br>ECT_Sensor_FA<br>EnginePowerLimited<br>EGRValveCircuit_FA<br>EGRValvePerformance_F<br>A<br>IAT_SensorCircuitFA<br>EvapFlowDuringNonPurg<br>e_FA<br>FuelTrimSystemB1_FA<br>FuelTrimSystemB2_FA<br>FuelInjectorCircuit_FA<br>MAF_SensorFA<br>EngineMisfireDetected_F<br>A<br>IgnitionOutputDriver_FA<br>TPS_FA<br>TPS_Performance_FA<br>VehicleSpeedSensor FA |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                  | Enable Conditions                                                                                                 | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | All of the above met<br>for Idle time | FuelLevelDataFaultLow<br>FuelConditionDiagnostic<br>Clutch SensorFA<br>AmbPresDfstdStatus<br>P2771<br><br>> 5 sec |               |               |
|                      |               |                     |                      |                 |                                       |                                                                                                                   |               |               |

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| Component/<br>System     | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                  | Threshold Value                                                                         | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Enable Conditions                                                                                                                                         | Time Required                                                                                                                                                                                                                                                | MIL<br>Illum.      |
|--------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Cold Start<br>Rough Idle | P050D         | Monitors the combustion performance when the cold start emission reduction strategy is active by accumulating and determining the percentage of engine cycles that have less than complete combustion relative to the total number of engine cycles in which Dual Pulse is active. | Deceleration index vs. Engine Speed Vs Engine load<br><br>Deceleration index calculation is tailored to specific vehicle. Tables used are 1st tables encountered that are not max of range. Undetectable region at a given speed/load point is where all tables are max of range point. see Algorithm Description Document for additional details.<br><br>Incomplete combustion identified by P0300 threshold tables: | (>Idle SCD AND >Idle SCD ddt Tables) OR (>Idle Cyl Mode AND > Idle Cyl Mode ddt Tables) | Misfire Algorithm Enabled (Refer to P0300 for Enablement Requirements)<br><br>OBD Manufacturer Enable Counter<br><br>To enable the diagnostic, the Cold Start Emission Reduction Strategy Must Be Active per the following:<br><br>Catalyst Temperature AND Engine Coolant AND Engine Coolant AND Barometric Pressure<br><br>In addition, Dual Pulse Strategy Is Enabled and Active Per the following:<br><br>Engine Speed<br><br>Accel Position<br><br>Engine Run Time<br><br>For the engine speeds and loads in which Dual Pulse is active: | = 0<br><br>< 350.00 degC<br>> -10.00 degC<br><= 56.00 degC<br>>= 74.00 KPa<br><br>>= 450.00 RPM<br><= 2,200.00 RPM<br><br><= 1.00 Pct<br><br>< 20 seconds | Runs once per trip when the cold start emission reduction strategy is active and Dual Pulse is enabled and active.<br><br>Frequency: 100ms<br><br>Test completes after Dual Pulse is no longer active<br>OR<br>The first 500 engine cycles have been reached | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                   | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Dual Pulse Error induced misfires percentage<br><br>Dual Pulse Error induced misfires percentage<br><br>Engine Cycles<br><br>The Cold Start Emission Reduction strategy must not be exiting. The strategy will exit per the following:<br><br>Catalyst Temperature<br>AND<br>Engine Run Time<br>OR<br>Engine Run Time<br>OR<br><br>Barometric Pressure<br><br>Dual Pulse Strategy will | >= catalyst damaging misfire<br><br>< 90% of the maximum achievable catalyst damaging misfire.<br><br>>= 50<br>< 501<br><br>>= 900.00 degC<br>>= 18.38 seconds<br>><br><b>CatalystLightOffExtendedEngineRunTimeExit</b><br><br>This Extended Engine run time exit table is a function of percent ethanol and Catmons NormRatioEWMA. Refer to "Supporting Tables" for details.<br><br>< 74.00 KPa |               |               |

## 13 OBDG05A Engine Diagnostics

Initial DTCs  
1 of 2 SECTIONS

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Enable Conditions                                                                                                                                                                                                                                                                                                                                         | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | exit per the following:<br><br>Engine Speed<br>OR<br>Accel Position<br><br>Engine Run Time<br><br>Dual Pulse Strategy will also exit if the any of the "Additional Dual Pulse Enabling Criteria" is not satisfied:<br><br>"Additional Dual Pulse Enabling Criteria":<br><br>Green Engine Enrichment<br><br>Misfire Converter Protection strategy<br><br>Engine Metal Overtemp strategy<br><br>Fuel control state<br><br>Output State Control<br><br>DOD Or DFCE<br><br>Power Enrichment<br><br>Piston Protection<br><br>Hot Coolant Enrichment<br><br>Injector Flow Test<br><br>General Enable | > 2,400.00 RPM<br><br>> 2.00 Pct<br><br>>= 20 seconds<br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>Not Enabled<br><br>Not being requested<br><br>Not being requested<br><br>Open Loop<br><br>Not being requested for fuel<br><br>Not Active<br><br>Not Active<br><br>Not Active<br><br>Not Active<br><br>Not Active |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | DTC's Not Set:       | AcceleratorPedalFailure<br>ECT_Sensor_FA<br>IAT_SensorCircuitFA<br>MnfdTempSensorCktFA<br>CrankSensorFaultActive<br>FuelInjectorCircuit_FA<br>MAF_SensorFA<br>MAP_SensorFA<br>AnyCamPhaser_TFTKO<br>Clutch Sensor FA<br>IAC_SystemRPM_FA<br>IgnitionOutputDriver_FA<br>TPS_FA<br>VehicleSpeedSensor_FA<br>FuelInjectorCircuit_TFTK<br>O<br>FHPR_b_FRP_SnsrCkt_F<br>A<br>FHPR_b_FRP_SnsrCkt_T<br>FTKO<br>FHPR_b_PumpCkt_FA<br>FHPR_b_PumpCkt_TFTK<br>O<br>TransmissionEngagedStat<br>e_FA<br>EngineTorqueInaccurate<br>FuelPumpRlyCktFA |               |               |
|                      |               |                     |                      |                 |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |               |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System             | Fault<br>Code | Monitor Description                                                                                            | Malfunction Criteria                              | Threshold Value                         | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                           | Enable Conditions                                                                                                                                                                                                                                                              | Time Required                                                                                              | MIL<br>Illum.     |
|----------------------------------|---------------|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-------------------|
| Engine Oil Pressure (EOP) Switch | P0520         | When criteria are met that assure no oil pressure should be present, read state of oil pressure switch circuit | State of Engine Oil Pressure (EOP) switch circuit | Detecting.a.ground.wil<br>l.set.a.fault | Run/Crank powermode active<br><br>Engine movement detected<br><br>Key in crank position<br><br>Power down engine coolant<br><br>Powertrain relay voltage<br><br>Run/Crank Ignition voltage<br><br>AND<br><br>Time since engine last running<br><br>Timer for time since engine last running validity<br><br>OR<br><br>Engine coolant at power up<br><br>Diagnostic enabled/<br>disabled<br><br>No active DTC's | = True<br><br>= False<br><br>= False<br><br>> 80 Deg C<br><br>>= 11 volts<br><br>>= 11 volts<br><br><br><br>> 3,600 Seconds<br><br>= True<br><br><br><br>< (Power down engine coolant) minus an additional 10 Deg C<br><br>Disabled<br><br>Fault bundles:<br>ECT_Sensor_Ckt_FA | Fail detected for<br>>= 12 Sec.<br><br><br><br><br><br><br><br><br><br><br><br>250 msec loop<br>Continuous | Type C,<br>No MIL |

13 OBDG05A Engine Diagnostics

| Component/<br>System                         | Fault<br>Code | Monitor Description                                                                              | Malfunction Criteria                                                                                                                                                                               | Threshold Value | Secondary Parameters                       | Enable Conditions | Time Required                                    | MIL<br>Illum.             |
|----------------------------------------------|---------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------|-------------------|--------------------------------------------------|---------------------------|
| Cruise Control Mutil-Function Switch Circuit | P0564         | Detect when cruise control multi-function switch circuit (analog) voltage is in an illegal range | Cruise Control analog circuit voltage must be in an "illegal range" or "between ranges" for greater than a calibratable period of time for cruise switch states that are received over serial data |                 | CAN cruise switch diagnostic enable in ECM | 1.00              | fail continuously for greater than 0.794 seconds | MIL:<br>Type C,<br>No MIL |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                      | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                              | Threshold Value | Secondary Parameters                       | Enable Conditions | Time Required                                    | MIL<br>Illum.            |
|-------------------------------------------|---------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------|-------------------|--------------------------------------------------|--------------------------|
| Cruise<br>Control On<br>Switch<br>Circuit | P0565         |                     | Cruise Control On switch remains applied for greater than a calibratable period of time for architecture where cruise switch states are received over serial data |                 | CAN cruise switch diagnostic enable in ECM | 1.00              | fail continuously for greater than 20.00 seconds | MIL<br>Type C,<br>No MIL |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                   | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                                                                                                                  | Threshold Value | Secondary Parameters                       | Enable Conditions | Time Required                                     | MIL<br>Illum.             |
|----------------------------------------|---------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------|-------------------|---------------------------------------------------|---------------------------|
| Cruise<br>Control<br>Resume<br>Circuit | P0567         | Detects a failure of the cruise resume switch in a continuously applied state | Cruise Control Resume switch remains applied for greater than a calibratable period of time for architecture where cruise switch states are received over serial data |                 | CAN cruise switch diagnostic enable in ECM | 1.00              | fail continuously for greater than 90.000 seconds | MIL:<br>Type C,<br>No MIL |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System             | Fault<br>Code | Monitor Description                                                        | Malfunction Criteria                                                                                                                                               | Threshold Value | Secondary Parameters                       | Enable Conditions | Time Required                                     | MIL<br>Illum.             |
|----------------------------------|---------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------|-------------------|---------------------------------------------------|---------------------------|
| Cruise<br>Control Set<br>Circuit | P0568         | Detects a failure of the cruise set switch in a continuously applied state | Cruise Control Set switch remains applied for greater than a calibratable period of time for architecture where cruise switch states are received over serial data |                 | CAN cruise switch diagnostic enable in ECM | 1.00              | fail continuously for greater than 90.000 seconds | MIL:<br>Type C,<br>No MIL |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                  | Fault<br>Code | Monitor Description                                                                   | Malfunction Criteria                                                                                                                                                                    | Threshold Value                                                                                                                                                        | Secondary Parameters                                                                                                                                                  | Enable Conditions                                                                                                                                                                        | Time Required                      | MIL<br>Illum.              |
|-----------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|----------------------------|
| Brake Pedal<br>Position<br>Sensor<br>Circuit<br>Range/<br>Performance | P057B         | This diagnostic monitors the Brake Pedal Position Sensor for a stuck in range failure | .                                                                                                                                                                                       |                                                                                                                                                                        | Brake Pedal Position Sensor Circuit Range / Performance Diagnostic Enable                                                                                             | 1.00<br><br>ignition voltage > 10.00                                                                                                                                                     |                                    | MIL:<br>Type A,<br>1 Trips |
|                                                                       |               |                                                                                       | Calculated EWMA value must be greater than calibratable threshold after calibratable number of tests have completed to report a "test passed" for P057B                                 | EWMA value looked up in supporting table P057B<br>KtBRKI_K_FastTestPointWeight as a function of calculated brake pedal position delta<br>EWMA value is > 0.80          | calculated brake pedal position delta sample counter > 50.00 for fast test<br><br>OR<br>calculated brake pedal position delta sample counter > 1,000.00 for slow test | calculated brake pedal position delta > 8.00<br><br>OR (for slow test)<br>shift lever has been in park once this key cycle<br>vehicle speed >= 5.00<br>accelerator pedal position < 5.00 | total number of EWMA tests > 20.00 |                            |
|                                                                       |               |                                                                                       | Calculated EWMA Value must be less than calibratable threshold after calibratable number of tests have completed to report a "test failed" for P057B. This test runs once per key cycle | EWMA value looked up in supporting table P057B<br>KtBRKI_K_CmpltTestPointWeight as a function of calculated brake pedal position delta<br>EWMA value is less than 0.40 | no DTC's active (P057C, P057D)                                                                                                                                        | shift lever has been in park once this key cycle<br>vehicle speed >= 5.00<br>accelerator pedal position < 5.00                                                                           | total number of EWMA tests > 2.00  |                            |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                             | Fault<br>Code | Monitor Description                                           | Malfunction Criteria                                                                                              | Threshold Value | Secondary Parameters                                             | Enable Conditions | Time Required           | MIL<br>Illum.              |
|--------------------------------------------------|---------------|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------|-------------------|-------------------------|----------------------------|
| Brake Pedal<br>Position<br>Sensor<br>Circuit Low | P057C         | detects short to ground<br>for brake pedal position<br>sensor | If x of y samples are<br>observed below failure<br>threshold, default brake<br>pedal position to zero<br>percent. | 5.00            | Brake Pedal Position<br>Sensore Low Voltage<br>Diagnostic Enable | 1.00              | 20<br>/ 32.00<br>counts | MIL:<br>Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                              | Fault<br>Code | Monitor Description                                        | Malfunction Criteria                                                                                                         | Threshold Value | Secondary Parameters                                              | Enable Conditions | Time Required           | MIL<br>Illum.              |
|---------------------------------------------------|---------------|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------|-------------------|-------------------------|----------------------------|
| Brake Pedal<br>Position<br>Sensor<br>Circuit High | P057D         | detects open circuit for<br>brake pedal position<br>sensor | If x of y samples are<br>observed above failure<br>threshold, default brake<br>pedal position to zero<br>percent and set DTC | 95.00           | Brake Pedal Position<br>Sensore High Voltage<br>Diagnostic Enable | 1.00              | 20.00 /<br>32.00 counts | MIL:<br>Type A,<br>1 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                              | Fault<br>Code | Monitor Description                                                      | Malfunction Criteria                                                                                                                                                                  | Threshold Value | Secondary Parameters                       | Enable Conditions | Time Required                                   | MIL<br>Illum.             |
|---------------------------------------------------|---------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------|-------------------|-------------------------------------------------|---------------------------|
| Cruise Control Multi-function Circuit Low Voltage | P0580         | detects short to ground failure for cruise multi-function switch circuit | Cruise Control analog circuit voltage must be in an "Open Short To Ground" for greater than a calibratable period of time for cruise switch states that are received over serial data |                 | CAN cruise switch diagnostic enable in ECM | 1.00              | fail continuously for greater than 2.00 seconds | MIL:<br>Type C,<br>No MIL |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                               | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                                            | Threshold Value | Secondary Parameters                       | Enable Conditions | Time Required                                   | MIL<br>Illum.             |
|--------------------------------------------------------------------|---------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------|-------------------|-------------------------------------------------|---------------------------|
| Cruise<br>Control<br>Multi-<br>function<br>Circuit High<br>Voltage | P0581         |                     | Cruise Control analog circuit voltage must be in an "Short To Power" for greater than a calibratable period of time for cruise switch states that are received over serial data |                 | CAN cruise switch diagnostic enable in ECM | 1.00              | fail continuously for greater than 2.00 seconds | MIL:<br>Type C,<br>No MIL |

13 OBDG05A Engine Diagnostics

| Component/<br>System                          | Fault<br>Code | Monitor Description                                                                                | Malfunction Criteria                                                                                                                                                                                 | Threshold Value | Secondary Parameters                       | Enable Conditions | Time Required                                    | MIL<br>Illum.             |
|-----------------------------------------------|---------------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------|-------------------|--------------------------------------------------|---------------------------|
| Cruise Control Multi-Function Input B Circuit | P0589         | Detect when cruise control multi-function switch circuit B (analog) voltage is in an illegal range | Cruise Control analog circuit B voltage must be in an "illegal range" or "between ranges" for greater than a calibratable period of time for cruise switch states that are received over serial data |                 | CAN cruise switch diagnostic enable in ECM | 1.00              | fail continuously for greater than 0.794 seconds | MIL:<br>Type C,<br>No MIL |

13 OBDG05A Engine Diagnostics

| Component/<br>System                              | Fault<br>Code | Monitor Description                                                        | Malfunction Criteria                                                                                                                                                                    | Threshold Value | Secondary Parameters                       | Enable Conditions | Time Required                                   | MIL<br>Illum.             |
|---------------------------------------------------|---------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------|-------------------|-------------------------------------------------|---------------------------|
| Cruise Control Multi-Function Input B Circuit Low | P0592         | detects short to ground failure for cruise multi-function switch circuit B | Cruise Control analog circuit B voltage must be in an "Open Short To Ground" for greater than a calibratable period of time for cruise switch states that are received over serial data |                 | CAN cruise switch diagnostic enable in ECM | 1.00              | fail continuously for greater than 2.00 seconds | MIL:<br>Type C,<br>No MIL |

13 OBDG05A Engine Diagnostics

| Component/<br>System                               | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                                              | Threshold Value | Secondary Parameters                       | Enable Conditions | Time Required                                   | MIL<br>Illum.             |
|----------------------------------------------------|---------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------|-------------------|-------------------------------------------------|---------------------------|
| Cruise Control Multi-Function Input B Circuit High | P0593         |                     | Cruise Control analog circuit B voltage must be in an "Short To Power" for greater than a calibratable period of time for cruise switch states that are received over serial data |                 | CAN cruise switch diagnostic enable in ECM | 1.00              | fail continuously for greater than 2.00 seconds | MIL:<br>Type C,<br>No MIL |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                              | Fault<br>Code | Monitor Description                                                                                                                                 | Malfunction Criteria                                                                                                               | Threshold Value                                                                                                               | Secondary Parameters | Enable Conditions | Time Required                                                             | MIL<br>Illum.      |
|---------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------|---------------------------------------------------------------------------|--------------------|
| Control<br>Module<br>Read Only<br>Memory<br>(ROM) | P0601         | This DTC will be stored if the calibration check sum is incorrect or the flash memory detects an uncorrectable error via the Error Correcting Code. | The Primary Processor's calculated checksum does not match the stored checksum value. Covers all software and calibrations.        | 1 failure if the fault is detected during the first pass.<br>5 failures if the fault occurs after the first pass is complete. |                      |                   | Diagnostic runs continuously in the background.                           | Type A,<br>1 Trips |
|                                                   |               |                                                                                                                                                     | The Primary Processor's Error Correcting Code hardware in the flash memory detects an error. Covers all software and calibrations. | 254 failures detected via Error Correcting Code                                                                               |                      |                   | Diagnostic runs continuously via the flash hardware.                      |                    |
|                                                   |               |                                                                                                                                                     | The Primary Processor's calculated checksum does not match the stored checksum value for a selected subset of the calibrations.    | 2 consecutive failures detected or<br>5 total failures detected.                                                              |                      |                   | Diagnostic runs continuously. Will report a detected fault within 200 ms. |                    |
|                                                   |               |                                                                                                                                                     | The Secondary Processor's calculated checksum does not match the stored checksum value. Covers all software and calibrations.      | 1 failure if the fault is detected during the first pass.<br>5 failures if the fault occurs after the first pass is complete. |                      |                   | Diagnostic runs continuously in the background.                           |                    |
|                                                   |               |                                                                                                                                                     |                                                                                                                                    | In all cases, the failure count is cleared when controller shuts down                                                         |                      |                   |                                                                           |                    |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                | Fault<br>Code | Monitor Description                                                               | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions                                                            | Time Required                                                          | MIL<br>Illum.      |
|-------------------------------------|---------------|-----------------------------------------------------------------------------------|----------------------|-----------------|----------------------|------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Control<br>Module Not<br>Programmed | P0602         | This DTC will be stored if the PCM is a service PCM that has not been programmed. | Output state invalid |                 | PCM State            | = crank or run<br><br>PCM is identified through calibration as a Service PCM | Diagnostic runs at powerup and once per second continuously after that | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                              | Fault<br>Code | Monitor Description                                             | Malfunction Criteria                                             | Threshold Value | Secondary Parameters | Enable Conditions | Time Required                                                                             | MIL<br>Illum.      |
|---------------------------------------------------|---------------|-----------------------------------------------------------------|------------------------------------------------------------------|-----------------|----------------------|-------------------|-------------------------------------------------------------------------------------------|--------------------|
| Control<br>Module Long<br>Term<br>Memory<br>Reset | P0603         | Non-volatile memory<br>checksum error at<br>controller power-up | Checksum at power-up<br>does not match checksum<br>at power-down |                 |                      |                   | Diagnostic runs<br>at powerup<br><br>Diagnostic<br>reports a fault if<br>1 failure occurs | Type A,<br>1 Trips |



13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description                             | Malfunction Criteria                                                                                                                                                   | Threshold Value | Secondary Parameters | Enable Conditions | Time Required                                                                                                             | MIL<br>Illum.      |
|----------------------|---------------|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------|--------------------|
| ECM RAM<br>Failure   | P0604         | Indicates that the ECM has detected a RAM fault | Indicates that the primary processor is unable to correctly read data from or write data to system RAM. Detects data read does not match data written >=               | 254 counts      |                      |                   | Will finish first memory scan within 30 seconds at all engine conditions - diagnostic runs continuously (background loop) | Type A,<br>1 Trips |
|                      |               |                                                 | Indicates that the primary processor is unable to correctly read data from or write data to cached RAM. Detects data read does not match data written >=               | 254 counts      |                      |                   | Will finish first memory scan within 30 seconds at all engine conditions - diagnostic runs continuously (background loop) |                    |
|                      |               |                                                 | Indicates that the primary processor is unable to correctly read data from or write data to TPU RAM. Detects data read does not match data written >=                  | 5 counts        |                      |                   | Will finish first memory scan within 30 seconds at all engine conditions - diagnostic runs continuously (background loop) |                    |
|                      |               |                                                 | Indicates that the primary processor detects a mismatch between the data and dual data is found during RAM updates. Detects a mismatch in data and dual data updates > | 0.46666 s       |                      |                   | When dual store updates occur.                                                                                            |                    |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                       | Threshold Value | Secondary Parameters | Enable Conditions | Time Required                                                                                                             | MIL<br>Illum. |
|----------------------|---------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------|---------------|
|                      |               |                     | Indicates that the primary processor detects an illegal write attempt to protected RAM. Number of illegal writes are >                                     | 65,534 counts   |                      |                   | Diagnostic runs continuously (background loop)                                                                            |               |
|                      |               |                     | Indicates that the secondary processor is unable to correctly read data from or write data to system RAM. Detects data read does not match data written >= | 5 counts        |                      |                   | Will finish first memory scan within 30 seconds at all engine conditions - diagnostic runs continuously (background loop) |               |
|                      |               |                     |                                                                                                                                                            |                 |                      |                   |                                                                                                                           |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                   | Fault<br>Code | Monitor Description                                                       | Malfunction Criteria                                                                                                                                                                                                                                                   | Threshold Value                                                                                                  | Secondary Parameters | Enable Conditions                                                                                                 | Time Required                                                                                                                                                        | MIL<br>Illum.   |
|----------------------------------------|---------------|---------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Internal ECM Processor Integrity Fault | P0606         | Indicates that the ECM has detected an internal processor integrity fault | Loss or invalid message of SPI communication from the Secondary Processor at initialization detected by the Primary Processor or loss or invalid message of SPI communication from the Secondary Processor after a valid message was received by the Primary Processor | Loss or invalid message at initialization detected or loss or invalid message after a valid message was received |                      | Run/Crank voltage >= 6.41 or Run/Crank voltage >= 11.00 , else the failure will be reported for all conditions    | In the primary processor, 159 / 399 counts intermittent or 39 counts continuous; 39 counts continuous @ initialization. 12.5 ms /count in the ECM main processor     | Type A, 1 Trips |
|                                        |               |                                                                           | Loss or invalid message of SPI communication from the Primary Processor at initialization detected by the Secondary Processor or loss or invalid message of SPI communication from the Primary Processor after a valid message was received by the Secondary Processor | Loss or invalid message at initialization detected or loss or invalid message after a valid message was received |                      |                                                                                                                   | In the secondary processor, 20 / 200 counts intermittent or 0.1875 s continuous; 0.4750 s continuous @ initialization. 12.5 ms /count in the ECM secondary processor |                 |
|                                        |               |                                                                           | Checks for stack over or underflow in secondary processor by looking for corruption of known pattern at stack boundaries. Checks number of stack over/under flow since last powerup reset >=                                                                           | 5                                                                                                                |                      | KeMEMD_b_StackLimitTestEnbl == 1<br>Value of KeMEMD_b_StackLimitTestEnbl is: 1 .<br>(If 0, this test is disabled) | variable, depends on length of time to corrupt stack                                                                                                                 |                 |
|                                        |               |                                                                           | MAIN processor is verified by responding to a seed sent from the secondary with a key response to secondary. Checks number of incorrect keys                                                                                                                           | 2 incorrect seeds within 8 messages, 0.2000 seconds                                                              |                      | ignition in Run or Crank                                                                                          | 150 ms for one seed continually failing                                                                                                                              |                 |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                                                     | Threshold Value | Secondary Parameters | Enable Conditions                                                                                                                                                           | Time Required                                                     | MIL<br>Illum. |
|----------------------|---------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|---------------|
|                      |               |                     | received > or Secondary processor has not received a new within time limit                                                                                                               |                 |                      |                                                                                                                                                                             |                                                                   |               |
|                      |               |                     | Time new seed not received exceeded                                                                                                                                                      |                 |                      | always running                                                                                                                                                              | 0.450 seconds                                                     |               |
|                      |               |                     | MAIN processor receives seed in wrong order                                                                                                                                              |                 |                      | always running                                                                                                                                                              | 3 / 17 counts intermittent. 50 ms/count in the ECM main processor |               |
|                      |               |                     | 2 fails in a row in the Secondary processor's ALU check                                                                                                                                  |                 |                      | KePISD_b_ALU_TestEnbl d == 1<br>Value of KePISD_b_ALU_TestEnbl d is: 1.<br>(If 0, this test is disabled)                                                                    | 25 ms                                                             |               |
|                      |               |                     | 2 fails in a row in the Secondary processor's configuration register masks versus known good data                                                                                        |                 |                      | KePISD_b_ConfigRegTes tEnbl d == 1<br>Value of KePISD_b_ConfigRegTes tEnbl d is: 1.<br>(If 0, this test is disabled)                                                        | 12.5 to 25 ms                                                     |               |
|                      |               |                     | Secondary processor detects an error in the toggling of a hardware discrete line controlled by the MAIN processor:<br>number of discrete changes > =<br>or < =<br>over time window(50ms) | 7<br>17         |                      | KePISD_b_MainCPU_SO H_FltEnbl d == 1<br>Value of KePISD_b_ConfigRegTes tEnbl d is: 1<br><br>(If 0, this test is disabled)<br><br>time from initialization >= 0.4875 seconds | 50 ms                                                             |               |
|                      |               |                     | memory and complement memory do not agree                                                                                                                                                |                 |                      |                                                                                                                                                                             | 0.19 seconds                                                      |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                                                       | Threshold Value                                               | Secondary Parameters | Enable Conditions                                                                                                    | Time Required                                                                    | MIL<br>Illum. |
|----------------------|---------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|---------------|
|                      |               |                     | Software background task first pass time to complete exceeds                                                                                                                               |                                                               |                      | Run/Crank voltage > 6.41                                                                                             | 360.000 seconds                                                                  |               |
|                      |               |                     | 2 fails in a row in the MAIN processor's ALU check                                                                                                                                         |                                                               |                      | KePISD_b_ALU_TestEnbl == 1<br>Value of KePISD_b_ALU_TestEnbl is: 1.<br>(If 0, this test is disabled)                 | 25 ms                                                                            |               |
|                      |               |                     | 2 fails in a row in the MAIN processor's configuration register masks versus known good data                                                                                               |                                                               |                      | KePISD_b_ConfigRegTestEnbl == 1<br>Value of KePISD_b_ConfigRegTestEnbl is: 1.<br>(If 0, this test is disabled)       | 12.5 to 25 ms                                                                    |               |
|                      |               |                     | Checks number of stack over/under flow since last powerup reset >=                                                                                                                         | 5                                                             |                      | KeMEMD_b_StackLimitTestEnbl == 1<br>Value of KeMEMD_b_StackLimitTestEnbl is: 1.<br>(If 0, this test is disabled)     | variable, depends on length of time to corrupt stack                             |               |
|                      |               |                     | Voltage deviation >                                                                                                                                                                        | 0.4950                                                        |                      | KePISD_b_A2D_CnvtrTestEnbl == 1<br>Value of KePISD_b_A2D_CnvtrTestEnbl is: 1.<br>(If 0, this test is disabled)       | 5 / 10 counts or 0.150 seconds continuous; 50 ms/count in the ECM main processor |               |
|                      |               |                     | Checks for ECC (error correcting code) circuit test errors reported by the hardware for flash memory. Increments counter during controller initialization if ECC error occurred since last | 3 (results in MIL),<br>5 (results in MIL and remedial action) |                      | KeMEMD_b_FlashECC_CktTestEnbl == 1<br>Value of KeMEMD_b_FlashECC_CktTestEnbl is: 1.<br>(If 0, this test is disabled) | variable, depends on length of time to access flash with corrupted memory        |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                                                                                                   | Threshold Value                                               | Secondary Parameters | Enable Conditions                                                                                                                               | Time Required                                                                                                                                                                                                                       | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
|                      |               |                     | controller initialization.<br>Counter >=                                                                                                                                                                                               |                                                               |                      |                                                                                                                                                 |                                                                                                                                                                                                                                     |               |
|                      |               |                     | Checks for ECC (error correcting code) circuit test errors reported by the hardware for RAM memory circuit. Increments counter during controller initialization if ECC error occurred since last controller initialization. Counter >= | 3 (results in MIL),<br>5 (results in MIL and remedial action) |                      | KeMEMD_b_RAM_ECC_CktTestEnbl == 1<br>Value of KeMEMD_b_RAM_ECC_CktTestEnbl is: 1.<br>(If 0, this test is disabled)                              | variable,<br>depends on length of time to write flash to RAM<br>variable,<br>depends on length of time to write flash to RAM                                                                                                        |               |
|                      |               |                     | MAIN processor DMA transfer from Flash to RAM has 1 failure                                                                                                                                                                            |                                                               |                      | KePISD_b_DMA_XferTestEnbl == 1<br>Value of KePISD_b_DMA_XferTestEnbl is:<br>0.<br>(If 0, this test is disabled)                                 | variable,<br>depends on length of time to write flash to RAM                                                                                                                                                                        |               |
|                      |               |                     | Safety critical software is not executed in proper order.                                                                                                                                                                              | >= 1 incorrect sequence.                                      |                      | Table, f(Loop Time). See supporting tables:<br><b>Program Sequence Watch Enable f(Loop Time)</b><br><br>(If 0, this Loop Time test is disabled) | Fail Table, f(Loop Time). See supporting tables: <b>PSW Sequence Fail f(Loop Time)</b><br><br>/<br><br>Sample Table, f(Loop Time)See supporting tables: <b>PSW Sequence Sample f(Loop Time)</b><br><br>counts<br><br>50 ms/count in |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                  | Threshold Value                                | Secondary Parameters | Enable Conditions                                                                                                           | Time Required                                                                      | MIL<br>Illum. |
|----------------------|---------------|---------------------|-------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---------------|
|                      |               |                     |                                                                                                       |                                                |                      |                                                                                                                             | the ECM main processor                                                             |               |
|                      |               |                     | MAIN processor determines a seed has not changed within a specified time period within the 50ms task. | Previous seed value equals current seed value. |                      | KePISD_b_SeedUpdKey StorFltEnbl == 1<br>Value of KePISD_b_SeedUpdKey StorFltEnbl is:<br>1.<br>(If 0, this test is disabled) | Table, f(Loop Time). See supporting tables: <b>Last Seed Timeout f (Loop Time)</b> |               |
|                      |               |                     |                                                                                                       |                                                |                      |                                                                                                                             |                                                                                    |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                    | Fault<br>Code | Monitor Description                                                               | Malfunction Criteria                                           | Threshold Value                                                            | Secondary Parameters                  | Enable Conditions                 | Time Required                                       | MIL<br>Illum.      |
|---------------------------------------------------------|---------------|-----------------------------------------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------|-----------------------------------|-----------------------------------------------------|--------------------|
| Fuel Pump<br>Relay<br>Control<br>Circuit Low<br>Voltage | P0628         | Diagnoses the fuel pump relay control high side driver circuit for circuit faults | Voltage low during driver on state (indicates short to ground) | Short to ground:<br>≤ 0.5 Ω impedance between signal and controller ground | Run/Crank Voltage<br><br>Engine Speed | Voltage ≥ 11 volts<br><br>≥ 0 RPM | 8 failures out of 10 samples<br><br>250 ms / sample | Type B,<br>2 Trips |





### 13 OBDG05A Engine Diagnostics

| Component/<br>System                 | Fault<br>Code | Monitor Description                                          | Malfunction Criteria                                                                                | Threshold Value | Secondary Parameters | Enable Conditions                    | Time Required                                            | MIL<br>Illum.      |
|--------------------------------------|---------------|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------|----------------------|--------------------------------------|----------------------------------------------------------|--------------------|
| Control<br>Module<br>EEPROM<br>Error | P062F         | Indicates that the NVM<br>Error flag has not been<br>cleared | The next write to NVM will<br>not succeed or the<br>assembly calibration<br>integrity check failed. |                 | Ignition State       | = unlock/accessory, run,<br>or crank | 1 test failure<br><br>Diagnostic runs<br>once at powerup | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                           | Fault<br>Code | Monitor Description                               | Malfunction Criteria                      | Threshold Value | Secondary Parameters            | Enable Conditions | Time Required            | MIL<br>Illum.   |
|----------------------------------------------------------------|---------------|---------------------------------------------------|-------------------------------------------|-----------------|---------------------------------|-------------------|--------------------------|-----------------|
| VIN Not Programmed or Mismatched - Engine Control Module (ECM) | P0630         | This DTC checks that the VIN is correctly written | At least one of the programmed VIN digits | = 00 or FF      | OBD Manufacturer Enable Counter | = 0               | 250 ms / test Continuous | Type A, 1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System              | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                                            | Threshold Value              | Secondary Parameters | Enable Conditions           | Time Required                                                                           | MIL<br>Illum.      |
|-----------------------------------|---------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|------------------------------|----------------------|-----------------------------|-----------------------------------------------------------------------------------------|--------------------|
| 5 Volt<br>Reference<br>#1 Circuit | P0641         | Detects a continuous or intermittent short on the 5 volt reference circuit #1 | ECM Vref1 <<br>or ECM Vref1 ><br>or the difference between<br>ECM filtered Vref1 and<br>Vref1 > | 4.875<br>5.125<br><br>0.0495 |                      | Run/Crank voltage ><br>6.41 | 19 / 39<br>counts or<br>0.1875<br>sec continuous;<br>12.5 ms/count in<br>main processor | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                        | Fault<br>Code | Monitor Description                                                                          | Malfunction Criteria                                         | Threshold Value                                                           | Secondary Parameters                                        | Enable Conditions  | Time Required                                        | MIL<br>Illum.                                                                                                        |
|---------------------------------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------|--------------------|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Malfunction Indicator Lamp (MIL) Control Circuit (ODM) Open - For 3 DTC implementation only | P0650         | Diagnoses the malfunction indicator lamp control low side driver circuit for circuit faults. | Voltage low during driver off state (indicates open circuit) | Open circuit:<br>≥ 200 K Ω impedance between signal and controller ground | Run/Crank Voltage<br><br>Remote Vehicle Start is not active | Voltage ≥ 11 volts | 20 failures out of 25 samples<br><br>250 ms / sample | Type B,<br>No MIL<br><br>NO MIL<br><br>Note: In certain controllers P263A may also set (MIL Control Short to Ground) |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System              | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                                            | Threshold Value              | Secondary Parameters | Enable Conditions           | Time Required                                                                           | MIL<br>Illum.      |
|-----------------------------------|---------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|------------------------------|----------------------|-----------------------------|-----------------------------------------------------------------------------------------|--------------------|
| 5 Volt<br>Reference<br>#2 Circuit | P0651         | Detects a continuous or intermittent short on the 5 volt reference circuit #2 | ECM Vref2 <<br>or ECM Vref2 ><br>or the difference between<br>ECM filtered Vref2 and<br>Vref2 > | 4.875<br>5.125<br><br>0.0495 |                      | Run/Crank voltage ><br>6.41 | 19 / 39<br>counts or<br>0.1875<br>sec continuous;<br>12.5 ms/count in<br>main processor | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                               | Fault<br>Code | Monitor Description                                                               | Malfunction Criteria                                         | Threshold Value                                                                         | Secondary Parameters | Enable Conditions  | Time Required                                          | MIL<br>Illum.                                                                                                                                       |
|------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------|--------------------|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Powertrain<br>Relay<br>Control<br>(ODM) Open<br>- For 3 DTC<br>implementation only | P0685         | Diagnoses the powertrain relay control low side driver circuit for circuit faults | Voltage low during driver off state (indicates open circuit) | Open Circuit:<br>≥ 200 K Ω ohms<br>impedance between<br>signal and controller<br>ground | Run/Crank Voltage    | Voltage ≥ 11 volts | 8 failures out of<br>10 samples<br><br>250 ms / sample | Type B,<br>2 Trips<br><br>Note: In<br>certain<br>controllers<br>P0686<br>may also<br>set<br>(Powertrain<br>Relay<br>Control<br>Short to<br>Ground). |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                        | Fault<br>Code | Monitor Description                                                               | Malfunction Criteria                                            | Threshold Value                                                            | Secondary Parameters | Enable Conditions  | Time Required                                       | MIL<br>Illum.                                                                                                      |
|---------------------------------------------|---------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------|----------------------|--------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Powertrain<br>Relay<br>Control<br>(ODM) Low | P0686         | Diagnoses the powertrain relay control low side driver circuit for circuit faults | Voltage low during driver off state (indicates short-to-ground) | Short to ground:<br>≤ 0.5 Ω impedance between signal and controller ground | Run/Crank Voltage    | Voltage ≥ 11 volts | 8 failures out of 10 samples<br><br>250 ms / sample | Type B,<br>2 Trips<br><br>Note: In certain controllers P0685 may also set (Powertrain Relay Control Open Circuit). |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                         | Fault<br>Code | Monitor Description                                                               | Malfunction Criteria                                           | Threshold Value                                                          | Secondary Parameters | Enable Conditions  | Time Required                                       | MIL<br>Illum.      |
|----------------------------------------------|---------------|-----------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------|----------------------|--------------------|-----------------------------------------------------|--------------------|
| Powertrain<br>Relay<br>Control<br>(ODM) High | P0687         | Diagnoses the powertrain relay control low side driver circuit for circuit faults | Voltage high during driver on state (indicates short to power) | Short to power:<br>≤ 0.5 Ω impedance between signal and controller power | Run/Crank Voltage    | Voltage ≥ 11 volts | 8 failures out of 10 samples<br><br>250 ms / sample | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                           | Fault<br>Code | Monitor Description                                                               | Malfunction Criteria         | Threshold Value | Secondary Parameters                                                            | Enable Conditions                               | Time Required                                      | MIL<br>Illum.                                       |
|------------------------------------------------|---------------|-----------------------------------------------------------------------------------|------------------------------|-----------------|---------------------------------------------------------------------------------|-------------------------------------------------|----------------------------------------------------|-----------------------------------------------------|
| Powertrain<br>Relay<br>Feedback<br>Circuit Low | P0689         | This DTC is a check to determine if the Powertrain relay is functioning properly. | PT Relay feedback voltage is | ≤ 5 volts       | Run/Crank Voltage<br><br>Powertrain relay commanded "ON"<br><br>No active DTCs: | ≥ 11 volts<br><br>PowertrainRelayStateOn_<br>FA | 5 failures out of 6 samples<br><br>1 second/sample | Type C,<br>No MIL<br><br>Not<br>"Special<br>Type C" |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                            | Fault<br>Code | Monitor Description                                                               | Malfunction Criteria     | Threshold Value                               | Secondary Parameters                                    | Enable Conditions                                    | Time Required                                       | MIL<br>Illum.      |
|-------------------------------------------------|---------------|-----------------------------------------------------------------------------------|--------------------------|-----------------------------------------------|---------------------------------------------------------|------------------------------------------------------|-----------------------------------------------------|--------------------|
| Powertrain<br>Relay<br>Feedback<br>Circuit High | P0690         | This DTC is a check to determine if the Powertrain relay is functioning properly. | Powertrain Relay Voltage | >= 4.00 volts will increment the fail counter | Powertrain relay commanded "OFF"<br><br>No active DTCs: | >= 2.00 seconds<br><br>PowertrainRelayStateOn_<br>FA | 50 failures out of 63 samples<br><br>100ms / Sample | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                 | Fault<br>Code | Monitor Description                                                                  | Malfunction Criteria                                            | Threshold Value                                                                  | Secondary Parameters     | Enable Conditions     | Time Required                                           | MIL<br>Illum.                                                                                                         |
|----------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------|--------------------------|-----------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Cooling Fan<br>1 Relay<br>Control<br>Circuit Low<br>Voltage<br>(ODM) | P0691         | Diagnoses the cooling fan 1 relay control low side driver circuit for circuit faults | Voltage low during driver off state (indicates short-to-ground) | Short to ground:<br>≤ 0.5 Ω impedance<br>between signal and<br>controller ground | Powertrain Relay Voltage | Voltage ≥ 11.00 volts | 50 failures out of<br>63 samples<br><br>100 ms / sample | Type B,<br>2 Trips<br><br>Note: In<br>certain<br>controlle<br>rs P0480<br>may also<br>set (Fan<br>1 Open<br>Circuit). |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                  | Fault<br>Code | Monitor Description                                                                  | Malfunction Criteria                                           | Threshold Value                                                                | Secondary Parameters     | Enable Conditions     | Time Required                                           | MIL<br>Illum.      |
|-----------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------|-----------------------|---------------------------------------------------------|--------------------|
| Cooling Fan<br>1 Relay<br>Control<br>Circuit High<br>Voltage<br>(ODM) | P0692         | Diagnoses the cooling fan 1 relay control low side driver circuit for circuit faults | Voltage high during driver on state (indicates short to power) | Short to power:<br>≤ 0.5 Ω impedance<br>between signal and<br>controller power | Powertrain Relay Voltage | Voltage ≥ 11.00 volts | 50 failures out of<br>63 samples<br><br>100 ms / sample | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                 | Fault<br>Code | Monitor Description                                                                       | Malfunction Criteria                                                   | Threshold Value                                                                  | Secondary Parameters     | Enable Conditions     | Time Required                                           | MIL<br>Illum.                                                                                                         |
|----------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------------------------|-----------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Cooling Fan<br>2 Relay<br>Control<br>Circuit Low<br>Voltage<br>(ODM) | P0693         | Diagnoses cooling fan<br>2 relay control low side<br>driver circuit for circuit<br>faults | Voltage low during driver<br>off state (indicates short-<br>to-ground) | Short to ground:<br>≤ 0.5 Ω impedance<br>between signal and<br>controller ground | Powertrain Relay Voltage | Voltage ≥ 11.00 volts | 50 failures out of<br>63 samples<br><br>100 ms / sample | Type B,<br>2 Trips<br><br>Note: In<br>certain<br>controlle<br>rs P0481<br>may also<br>set (Fan<br>2 Open<br>Circuit). |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                  | Fault<br>Code | Monitor Description                                                                  | Malfunction Criteria                                           | Threshold Value                                                                | Secondary Parameters     | Enable Conditions     | Time Required                                           | MIL<br>Illum.      |
|-----------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------|-----------------------|---------------------------------------------------------|--------------------|
| Cooling Fan<br>2 Relay<br>Control<br>Circuit High<br>Voltage<br>(ODM) | P0694         | Diagnoses the cooling fan 2 relay control low side driver circuit for circuit faults | Voltage high during driver on state (indicates short to power) | Short to power:<br>≤ 0.5 Ω impedance<br>between signal and<br>controller power | Powertrain Relay Voltage | Voltage ≥ 11.00 volts | 50 failures out of<br>63 samples<br><br>100 ms / sample | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System              | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                                            | Threshold Value              | Secondary Parameters | Enable Conditions           | Time Required                                                                           | MIL<br>Illum.      |
|-----------------------------------|---------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|------------------------------|----------------------|-----------------------------|-----------------------------------------------------------------------------------------|--------------------|
| 5 Volt<br>Reference<br>#3 Circuit | P0697         | Detects a continuous or intermittent short on the 5 volt reference circuit #3 | ECM Vref3 <<br>or ECM Vref3 ><br>or the difference between<br>ECM filtered Vref3 and<br>Vref3 > | 4.875<br>5.125<br><br>0.0495 |                      | Run/Crank voltage ><br>6.41 | 19 / 39<br>counts or<br>0.1875<br>sec continuous;<br>12.5 ms/count in<br>main processor | Type A,<br>1 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                       | Fault<br>Code | Monitor Description                                                                                  | Malfunction Criteria                               | Threshold Value | Secondary Parameters | Enable Conditions               | Time Required | MIL<br>Illum.  |
|------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------|-----------------|----------------------|---------------------------------|---------------|----------------|
| Fuel Pump Control Module (FPCM) Requested MIL Illumination | P069E         | Monitors the FPCM MIL request line to determine when the FPCM has detected a MIL illuminating fault. | Fuel Pump Control Module Emissions-Related DTC set |                 |                      | Time since power-up > 3 seconds | Continuous    | Type A, No MIL |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System              | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                                            | Threshold Value              | Secondary Parameters | Enable Conditions           | Time Required                                                                           | MIL<br>Illum.      |
|-----------------------------------|---------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|------------------------------|----------------------|-----------------------------|-----------------------------------------------------------------------------------------|--------------------|
| 5 Volt<br>Reference<br>#4 Circuit | P06A3         | Detects a continuous or intermittent short on the 5 volt reference circuit #4 | ECM Vref4 <<br>or ECM Vref4 ><br>or the difference between<br>ECM filtered Vref4 and<br>Vref4 > | 4.875<br>5.125<br><br>0.0495 |                      | Run/Crank voltage ><br>6.41 | 19 / 39<br>counts or<br>0.1875<br>sec continuous;<br>12.5 ms/count in<br>main processor | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                         | Fault<br>Code | Monitor Description                                                                                                                | Malfunction Criteria  | Threshold Value                                                                                   | Secondary Parameters                                                                                                                                                                     | Enable Conditions                                                                                                                       | Time Required                                                                                                      | MIL<br>Illum.   |
|--------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------|
| Internal Control Module Knock Sensor Processor 1 Performance | P06B6         | This diagnostic checks for a fault with the internal test circuit used only for the '20 kHz' method of the Open Circuit Diagnostic | FFT Diagnostic Output | > OpenTestCktThrshMin<br><br>and<br><br>< OpenTestCktThrshMax<br><br><b>See Supporting Tables</b> | Diagnostic Enabled?<br><br>Engine Run Time<br><br>Engine Speed<br><br>Cumulative Number of Engine Revs (per key cycle) within min/max Engine Speed enable (above)<br><br>Engine Air Flow | Yes<br><br>≥ 2.0 seconds<br><br>> 400 RPM<br>and<br>< 5,000 RPM<br><br>≥ 200 Revs<br><br>≥ 50 mg/cylinder<br>and<br>≤ 2,000 mg/cylinder | First Order Lag Filter with Weight Coefficient<br><br>Weight Coefficient = 0.0200<br><br>Updated each engine event | Type B, 2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                         | Fault<br>Code | Monitor Description                                                                                                                | Malfunction Criteria  | Threshold Value                                                                           | Secondary Parameters                                                                                                                                                                     | Enable Conditions                                                                                                                       | Time Required                                                                                                      | MIL<br>Illum.   |
|--------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------|
| Internal Control Module Knock Sensor Processor 2 Performance | P06B7         | This diagnostic checks for a fault with the internal test circuit used only for the '20 kHz' method of the Open Circuit Diagnostic | FFT Diagnostic Output | > OpenTestCktThrshMin<br>and<br>< OpenTestCktThrshMax<br><br><b>See Supporting Tables</b> | Diagnostic Enabled?<br><br>Engine Run Time<br><br>Engine Speed<br><br>Cumulative Number of Engine Revs (per key cycle) within min/max Engine Speed enable (above)<br><br>Engine Air Flow | Yes<br><br>≥ 2.0 seconds<br><br>> 400 RPM<br>and<br>< 5,000 RPM<br><br>≥ 200 Revs<br><br>≥ 50 mg/cylinder<br>and<br>≤ 2,000 mg/cylinder | First Order Lag Filter with Weight Coefficient<br><br>Weight Coefficient = 0.0200<br><br>Updated each engine event | Type B, 2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                         | Fault<br>Code | Monitor Description                                                                                | Malfunction Criteria                   | Threshold Value | Secondary Parameters | Enable Conditions               | Time Required | MIL<br>Illum.  |
|--------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------|----------------------------------------|-----------------|----------------------|---------------------------------|---------------|----------------|
| Transmission Control Module (TCM) Requested MIL Illumination | P0700         | Monitors the TCM MIL request line to determine when the TCM has detected a MIL illuminating fault. | Transmission Emissions-Related DTC set |                 |                      | Time since power-up > 3 seconds | Continuous    | Type A, No MIL |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                               | Fault<br>Code | Monitor Description                                                                                 | Malfunction Criteria                                                                                                                                                                                          | Threshold Value                                                                      | Secondary Parameters                                                                                                                                                | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Time Required                                               | MIL<br>Illum.      |
|--------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|--------------------|
| Inlet Airflow<br>System<br>Performance<br>(naturally<br>aspirated) | P1101         | Determines if there are multiple air induction problems affecting airflow and/or manifold pressure. | Filtered Throttle Model Error<br><br>AND<br><br>( ABS(Measured Flow – Modeled Air Flow) Filtered<br>OR<br>ABS(Measured MAP – MAP Model 1) Filtered<br><br>AND<br><br>ABS(Measured MAP – MAP Model 2) Filtered | <= 350 kPa*(g/s)<br><br><br>> 20 grams/sec<br><br>> 20.0 kPa )<br><br><br>> 20.0 kPa | Engine Speed<br>Engine Speed<br>Coolant Temp<br>Coolant Temp<br>Intake Air Temp<br>Intake Air Temp<br>Minimum total weight factor (all factors multiplied together) | >= 500 RPM<br><= 6,800 RPM<br>> -7 Deg C<br>< 126 Deg C<br>> -20 Deg C<br>< 125 Deg C<br><br>>= 0.50<br><br>Filtered Throttle Model Error multiplied by TPS Residual Weight Factor based on RPM<br><br>Modeled Air Flow Error multiplied by MAF Residual Weight Factor based on RPM and MAF Residual Weight Factor Based on MAF Est<br><br>MAP Model 1 Error multiplied by MAP1 Residual Weight Factor based on RPM<br><br>MAP Model 2 Error multiplied by MAP2 Residual Weight Factor based on RPM<br><br>See "Residual Weight Factor" tables.<br><br>MAP_SensorCircuitFA<br>EGRValvePerformance_FA<br>A<br>MAF_SensorCircuitFA<br>CrankSensor_FA<br>ECT_Sensor_FA | Continuous<br><br>Calculation are performed every 12.5 msec | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions                                                       | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------|-------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | No Pending DTCs:     | IAT_SensorFA<br>EGRValve_FP<br>ECT_Sensor_Ckt_FP<br>IAT_SensorCircuitFP |               |               |
|                      |               |                     |                      |                 |                      |                                                                         |               |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System              | Fault<br>Code | Monitor Description                                                | Malfunction Criteria | Threshold Value | Secondary Parameters                                       | Enable Conditions                                            | Time Required                                                | MIL<br>Illum.      |
|-----------------------------------|---------------|--------------------------------------------------------------------|----------------------|-----------------|------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------|
| Humidity<br>Sensor<br>Circuit Low | P11C2         | Detects a continuous short to power in the Humidity Sensor circuit | Humidity Duty Cycle  | <= 5.0 %        | Powertrain Relay Voltage for a time<br><br>No Active DTCs: | >= 11.00 Volts<br><br>>= 0.9 seconds<br>PowertrainRelayFault | 40 failures out of 50 samples<br><br>1 sample every 100 msec | Type B,<br>2 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System               | Fault<br>Code | Monitor Description                                                               | Malfunction Criteria | Threshold Value | Secondary Parameters                                          | Enable Conditions                                            | Time Required                                                      | MIL<br>Illum.      |
|------------------------------------|---------------|-----------------------------------------------------------------------------------|----------------------|-----------------|---------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------|--------------------|
| Humidity<br>Sensor<br>Circuit High | P11C3         | Detects a continuous<br>open or short to low in<br>the Humidity Sensor<br>circuit | Humidity Duty Cycle  | >= 95.0 %       | Powertrain Relay Voltage<br>for a time<br><br>No Active DTCs: | >= 11.00 Volts<br><br>>= 0.9 seconds<br>PowertrainRelayFault | 40 failures out<br>of 50 samples<br><br>1 sample every<br>100 msec | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                          | Fault<br>Code | Monitor Description                              | Malfunction Criteria                                                                                                                                                                                        | Threshold Value                                  | Secondary Parameters                                          | Enable Conditions                                            | Time Required                                                              | MIL<br>Illum.      |
|-----------------------------------------------|---------------|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------|--------------------|
| Humidity<br>Sensor<br>Circuit<br>Intermittent | P11C4         | Detects a noisy or erratic humidity sensor input | String Length<br><br>Where:<br>"String Length" = sum of<br>"Diff" calculated over<br><br>And where:<br>"Diff" = ABS(current<br>Humidity reading -<br>Humidity reading from<br>100 milliseconds<br>previous) | > 80 %<br>10 consecutive<br><br>Humidity samples | Powertrain Relay Voltage<br>for a time<br><br>No Active DTCs: | >= 11.00 Volts<br><br>>= 0.9 seconds<br>PowertrainRelayFault | 4 failures out of<br>5 samples<br><br>Each sample<br>takes 1.00<br>seconds | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                    | Fault<br>Code | Monitor Description                                                                                          | Malfunction Criteria                                                                                                   | Threshold Value                                                           | Secondary Parameters               | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|-------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 1<br>low side<br>circuit<br>shorted to<br>high side<br>circuit | P1248         | This DTC Diagnoses<br>Injector 1 enable low<br>side driver shorted to<br>high side driver circuit<br>faults. | Voltage high across low<br>side and High side drivers<br>during on state indicates<br>low side shorted to high<br>side | Low side shorted to<br>High Side:<br>25 amp >= through<br>low side driver | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                    | Fault<br>Code | Monitor Description                                                                                          | Malfunction Criteria                                                                                                   | Threshold Value                                                               | Secondary Parameters               | Enable Conditions                                               | Time Required                                                          | MIL<br>Illum.      |
|-------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 2<br>low side<br>circuit<br>shorted to<br>high side<br>circuit | P1249         | This DTC Diagnoses<br>Injector 2 enable low<br>side driver shorted to<br>high side driver circuit<br>faults. | Voltage high across low<br>side and High side drivers<br>during on state indicates<br>low side shorted to high<br>side | Low side shorted to<br>High Side:<br>25 amp $\geq$ through<br>low side driver | Battery Voltage<br>Engine Run Time | $\geq 11$ Volts<br>$\geq 0$ Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                    | Fault<br>Code | Monitor Description                                                                                          | Malfunction Criteria                                                                                                   | Threshold Value                                                           | Secondary Parameters               | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|-------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 3<br>low side<br>circuit<br>shorted to<br>high side<br>circuit | P124A         | This DTC Diagnoses<br>Injector 3 enable low<br>side driver shorted to<br>high side driver circuit<br>faults. | Voltage high across low<br>side and High side drivers<br>during on state indicates<br>low side shorted to high<br>side | Low side shorted to<br>High Side:<br>25 amp >= through<br>low side driver | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                    | Fault<br>Code | Monitor Description                                                                                          | Malfunction Criteria                                                                                                   | Threshold Value                                                           | Secondary Parameters               | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|-------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 4<br>low side<br>circuit<br>shorted to<br>high side<br>circuit | P124B         | This DTC Diagnoses<br>Injector 4 enable low<br>side driver shorted to<br>high side driver circuit<br>faults. | Voltage high across low<br>side and High side drivers<br>during on state indicates<br>low side shorted to high<br>side | Low side shorted to<br>High Side:<br>25 amp >= through<br>low side driver | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                    | Fault<br>Code | Monitor Description                                                                                          | Malfunction Criteria                                                                                                   | Threshold Value                                                               | Secondary Parameters               | Enable Conditions                                               | Time Required                                                          | MIL<br>Illum.      |
|-------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 5<br>low side<br>circuit<br>shorted to<br>high side<br>circuit | P124C         | This DTC Diagnoses<br>Injector 5 enable low<br>side driver shorted to<br>high side driver circuit<br>faults. | Voltage high across low<br>side and High side drivers<br>during on state indicates<br>low side shorted to high<br>side | Low side shorted to<br>High Side:<br>25 amp $\geq$ through<br>low side driver | Battery Voltage<br>Engine Run Time | $\geq 11$ Volts<br>$\geq 0$ Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                    | Fault<br>Code | Monitor Description                                                                                          | Malfunction Criteria                                                                                                   | Threshold Value                                                           | Secondary Parameters               | Enable Conditions                                       | Time Required                                                          | MIL<br>Illum.      |
|-------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Injector 6<br>low side<br>circuit<br>shorted to<br>high side<br>circuit | P124D         | This DTC Diagnoses<br>Injector 6 enable low<br>side driver shorted to<br>high side driver circuit<br>faults. | Voltage high across low<br>side and High side drivers<br>during on state indicates<br>low side shorted to high<br>side | Low side shorted to<br>High Side:<br>25 amp >= through<br>low side driver | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                          | Fault<br>Code | Monitor Description                                                                                                                 | Malfunction Criteria               | Threshold Value               | Secondary Parameters                                                                                                                                            | Enable Conditions | Time Required                     | MIL<br>Illum.      |
|-----------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------|--------------------|
| Engine Metal<br>Over<br>temperature<br>Active | P1258         | The objective of the algorithm is to protect the engine in the event of engine metal overtemperature, mainly due to loss of coolant | Engine Coolant<br><br>For a period | >= 132 °C<br><br>>= 2 seconds | Engine Run Time<br><br>If feature was active and it set the coolant sensor fault then feature will be enabled on coolant sensor fault pending on the next trip. | >= 30 Seconds     | Fault present for<br>>= 0 seconds | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                               | Fault<br>Code | Monitor Description                                                                                     | Malfunction Criteria                                                                                                                                                                                                                       | Threshold Value                                                                                                | Secondary Parameters                | Enable Conditions                                                                             | Time Required                                       | MIL<br>Illum.      |
|------------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------|--------------------|
| Ignition Coil<br>Positive<br>Voltage<br>Circuit<br>Group 1 *<br>* SIDI ONLY<br>* * | P135A         | This diagnostic checks for voltage supply to the Ignition Coils (applicable only for SIDI applications) | Common Enable Criteria<br><br>Ignition Module Supply Voltage.<br><br>Three possible power supply sources for Ignition Coils:<br>Case 1: Battery<br>Case 2: Ignition Run/<br>Crank<br>Case 3: PT Relay<br><br>Case Specific Enable Criteria | < 2.5 Volts<br><br>Ignition Coil Power Source =<br><br>(see corresponding case specific enable criteria below) | Diagnostic Enabled?<br><br>PT Relay | Yes<br><br>Delay starting at Key-On<br><br>Ignition Run/Crank Voltage<br><br>PT Relay Voltage | 24 Failures out of 30 Samples<br><br>6.25 msec rate | Type A,<br>1 Trips |
|                                                                                    |               |                                                                                                         |                                                                                                                                                                                                                                            | Case 1: Battery                                                                                                |                                     | 5 Engine Revs                                                                                 |                                                     |                    |
|                                                                                    |               |                                                                                                         |                                                                                                                                                                                                                                            | Case 2: Ignition Run/<br>Crank                                                                                 |                                     | > 11.0 volts                                                                                  |                                                     |                    |
|                                                                                    |               |                                                                                                         |                                                                                                                                                                                                                                            | Case 3: PT Relay                                                                                               |                                     | > 11.0 volts                                                                                  |                                                     |                    |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                               | Fault<br>Code | Monitor Description                                                                                     | Malfunction Criteria                                                                                                                                                                                                                                  | Threshold Value                                                                                                | Secondary Parameters                | Enable Conditions                                                | Time Required                                       | MIL<br>Illum.               |
|------------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------|-----------------------------------------------------|-----------------------------|
| Ignition Coil<br>Positive<br>Voltage<br>Circuit<br>Group 2 *<br>* SIDI ONLY<br>* * | P135B         | This diagnostic checks for voltage supply to the Ignition Coils (applicable only for SIDI applications) | Common Enable Criteria<br><br>Ignition Module Supply Voltage.<br><br>Three possible power supply sources for Ignition Coils:<br>Case 1: Battery<br>Case 2: Ignition Run/<br>Crank<br>Case 3: PT Relay<br><br>Additional Case Specific Enable Criteria | < 2.5 Volts<br><br>Ignition Coil Power Source =<br><br>(see corresponding case specific enable criteria below) | Diagnostic Enabled?<br><br>PT Relay | Yes<br><br>5 Engine Revs<br><br>> 11.0 volts<br><br>> 11.0 volts | 24 Failures out of 30 Samples<br><br>6.25 msec rate | Type:<br>Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                        | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                     | Malfunction Criteria                                                                                                                                                                                                                                                                      | Threshold Value                                                                 | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                             | Enable Conditions                                                                                                                                                                                                                                                                                                                                         | Time Required                                                                                                                                                                   | MIL<br>Illum.                |
|---------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Cold Start Emissions Reduction System Fault | P1400         | Model based test computes power from exhaust flow and thermal energy resulting from elevated idle speed and retarded spark advance. Detects if the cold start emission reduction system has failed resulting in the delivered power being out of range. | Average desired accumulated exhaust power - Average actual accumulated exhaust power (too much energy delivered to catalyst)<br><br>Average desired accumulated exhaust power - Average actual accumulated exhaust power (too little energy delivered to catalyst)<br><br>(EWMA filtered) | < -32.00 KJ/s (high RPM failure mode)<br><br>> 5.00 KJ/s (low RPM failure mode) | To enable the diagnostic, the Cold Start Emission Reduction Strategy must be Active per the following:<br><br>Catalyst Temperature AND Engine Coolant AND Engine Coolant AND Barometric Pressure<br><br>The Cold Start Emission Reduction strategy must not be exiting. The strategy will exit per the following:<br><br>Catalyst Temperature AND Engine Run Time OR Engine Run Time OR<br><br>Barometric Pressure<br><br>Other Enable Criteria: | < 350.00 degC<br><br>> -10.00 degC<br><br><= 56.00 degC<br><br>>= 74.00 KPa<br><br>>= 900.00 degC<br><br>>= 18.38 seconds<br><br>><br><b>CatalystLightOffExtendedEngineRunTimeExit</b><br><br>This Extended Engine run time exit is a function of percent ethanol and Catmons NormRatioEWMA. Refer to "Supporting Tables" for details.<br><br>< 74.00 KPa | Runs once per trip when the cold start emission reduction strategy is active<br><br>Frequency: 100ms Loop<br><br>Test completes after 10 seconds of accumulated qualified data. | EWMA Based - Type A, 1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | <p>OBD Manufacturer Enable Counter</p> <p>Vehicle Speed</p> <p>Allow diagnostic to calculate residual in an off-idle state. If the value of the OffIdleEnable is equal to 1 then the "DriverOffAccelPedal" will not be checked. However, if the value of OffIdleEnable is 0 then driver must be off the accel pedal</p> <p>A change in throttle position (tip-in/tip-out) will initiate a delay in the calculation of the average qualified residual value. Therefore:<br/>When the Pedal Close Delay Timer is : the diagnostic will continue the calculation.</p> <p>For Manual Transmission vehicles:</p> | <p>0</p> <p>&lt; 1.24 MPH</p> <p>0<br/>(A value of 1 allows diagnostic to run and calculate the residual while off idle. A value of 0 requires calculation of the residual at idle)</p> <p>&gt; 5.00 seconds</p> <p>Clutch Pedal Top of Travel Achieved and Clutch Pedal Bottom of Travel Achieved. Refer to the "Clutch Pedal Top of Travel Achieved criteria" and "Clutch Pedal Bottom of Travel Achieved criteria" section of the "Supporting Tables" tab criteria</p> |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | <p>The diagnostic will delay calculation of the residual value and potentially weight the residual calculation differently based on engine run time. This is to ensure the diagnostic is operating in idle speed control as well as during the peak catalyst light off period. The time weighting factor must be :</p> <p>General Enable:</p> <p>DTC's Not Set:</p> | <p>&gt; 0<br/>These are scalar values that are a function of engine run time. Refer to <b>ColdStartDiagnosticDelayBasedOnEngineRunTime</b> and the cal axis, <b>ColdStartDiagnosticDelayBasedOnEngineRunTimeCalAxis</b> in the "Supporting Tables" for details.</p> <p>AcceleratorPedalFailure<br/>ECT_Sensor_FA<br/>IAT_SensorCircuitFA<br/>MnfdTempSensorCktFP<br/>CrankSensorFaultActive<br/>FuelInjectorCircuit_FA<br/>MAF_SensorFA<br/>MAP_SensorFA<br/>EngineMisfireDetected_FA<br/>Clutch_Sensor_FA<br/>IAC_SystemRPM_FA<br/>IgnitionOutputDriver_FA<br/>TPS_FA<br/>VehicleSpeedSensor_FA<br/>5VoltReferenceMAP_OOR_Fit<br/>TransmissionEngagedState_FA</p> |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions      | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------|------------------------|---------------|---------------|
|                      |               |                     |                      |                 |                      | EngineTorqueInaccurate |               |               |
|                      |               |                     |                      |                 |                      |                        |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System                      | Fault<br>Code | Monitor Description                                      | Malfunction Criteria                                                                 | Threshold Value                                                                                                                                    | Secondary Parameters                                                                                                                                                                                                               | Enable Conditions                                                                                                                                                                         | Time Required                   | MIL<br>Illum.   |
|-------------------------------------------|---------------|----------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------|
| Transmission Engine Speed Request Circuit | P150C         | Determines if engine speed request from the TCM is valid | Serial Communication rolling count value<br><br>Transmission engine speed protection | + 1 from previous \$19D message (PTEI3)<br><br>not equal to 2's complement of transmission engine speed request + Transmission alive rolling count | Diagnostic enable bit<br><br>Engine run time<br><br># of Protect Errors<br><br># of Alive Rolling Errors<br><br>No idle diagnostic 506/507 code<br><br>No Serial communication loss to TCM<br><br>Engine Running<br><br>Power mode | 1<br><br>0.50 sec<br><br>10 protect errors out of 10 samples<br><br>6 rolling count errors out of 10 samples<br><br>IAC_SystemRPM_FA<br><br>(U0101)<br><br>= TRUE<br><br>Run Crank Active | Diagnostic runs in 12.5 ms loop | Type B, 2 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System               | Fault<br>Code | Monitor Description                                              | Malfunction Criteria                                                         | Threshold Value | Secondary Parameters | Enable Conditions                                                                                                                                                                                                                                                                                                     | Time Required | MIL<br>Illum.      |
|------------------------------------|---------------|------------------------------------------------------------------|------------------------------------------------------------------------------|-----------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------|
| Steady State<br>Actuation<br>Fault | P1516         | Detect an inability to maintain a steady state throttle position | The absolute difference between desired and indicated throttle position is > | 2.00 percent    |                      | Run/Crank voltage > 6.41<br><br>Ignition voltage failure is false (P1682)<br><br>TPS minimum learn is not active and Throttle is being Controlled<br>Throttle is considered in a steadystate condition when the desired throttle position over a 12.5 ms period is < 0.25 percent for a settling time period > 4.00 s | 0.49 ms       | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                               | Fault<br>Code | Monitor Description                                                                                                | Malfunction Criteria                                                                                           | Threshold Value | Secondary Parameters                                                      | Enable Conditions | Time Required           | MIL<br>Illum.              |
|----------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------|-------------------|-------------------------|----------------------------|
| Adaptive<br>Cruise<br>Control<br>Signal<br>Circuit | P1553         | Detects rolling count or protection value errors in Adaptive Cruise Control Axle Torque Command serial data signal | If x of y rolling count / protection value faults occur, disable adaptive cruise control for duration of fault |                 | Adaptive Cruise Control<br>Command Serial Data<br>Error Diagnostic Enable | 1.00              | 10<br>/<br>16<br>counts | MIL:<br>Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                   | Fault<br>Code | Monitor Description                                                                            | Malfunction Criteria                                                                   | Threshold Value | Secondary Parameters | Enable Conditions | Time Required                                            | MIL<br>Illum.             |
|--------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------|----------------------|-------------------|----------------------------------------------------------|---------------------------|
| Cruise<br>Control<br>Switch State<br>Undertermin<br>ed | P155A         | Detects when cruise<br>switch state cannot be<br>determined, such as<br>low voltage conditions | cruise switch state<br>remains undetermined for<br>greater than a calibratable<br>time |                 |                      |                   | fail continuously<br>for greater than<br>15.5<br>seconds | MIL:<br>Type C,<br>No MIL |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                | Fault<br>Code | Monitor Description                                                          | Malfunction Criteria                                                                                                                                                 | Threshold Value | Secondary Parameters                       | Enable Conditions | Time Required                                     | MIL<br>Illum.             |
|-----------------------------------------------------|---------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------|-------------------|---------------------------------------------------|---------------------------|
| Cruise<br>Control Set/<br>Coast Signal<br>2 Circuit | P155B         | Detects a failure of the cruise set 2 switch in a continuously applied state | Cruise Control Set 2 switch remains applied for greater than a calibratable period of time for architecture where cruise switch states are received over serial data |                 | CAN cruise switch diagnostic enable in ECM | 1.00              | fail continuously for greater than 90.000 seconds | MIL:<br>Type C,<br>No MIL |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                 | Fault<br>Code | Monitor Description                                                             | Malfunction Criteria                                                                                                                                                    | Threshold Value | Secondary Parameters                       | Enable Conditions | Time Required                                     | MIL<br>Illum.             |
|------------------------------------------------------|---------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------|-------------------|---------------------------------------------------|---------------------------|
| Cruise Control Resume/ Acceleration Signal 2 Circuit | P155C         | Detects a failure of the cruise resume 2 switch in a continuously applied state | Cruise Control Resume 2 switch remains applied for greater than a calibratable period of time for architecture where cruise switch states are received over serial data |                 | CAN cruise switch diagnostic enable in ECM | 1.00              | fail continuously for greater than 90.000 seconds | MIL:<br>Type C,<br>No MIL |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                             | Fault<br>Code | Monitor Description                                                                                                     | Malfunction Criteria                                                                                                | Threshold Value | Secondary Parameters                                                                      | Enable Conditions | Time Required          | MIL<br>Illum.             |
|------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------|-------------------|------------------------|---------------------------|
| Front Object<br>Detection<br>Control<br>Module<br>Torque<br>Request<br>Signal<br>Message<br>Counter<br>Incorrect | P15F6         | Detects rolling count or protection value errors in Collision Preparation System Axle Torque Command serial data signal | If x of y rolling count / protection value faults occur, disable collision preparation system for duration of fault |                 | Front Object Detection<br>Module Torque Request<br>Serial Data Error<br>Diagnostic Enable | 1.00              | 4<br>/<br>10<br>counts | MIL:<br>Type C,<br>No MIL |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                            | Fault<br>Code | Monitor Description                                                                                                     | Malfunction Criteria                                                                                                   | Threshold Value | Secondary Parameters                                                                     | Enable Conditions | Time Required          | MIL<br>Illum.             |
|-----------------------------------------------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------|-------------------|------------------------|---------------------------|
| Rear Object<br>Detection<br>Control<br>Module<br>Torque<br>Request<br>Signal<br>Message<br>Counter<br>Incorrect | P15F7         | Detects rolling count or<br>protection value errors<br>Rear Virtual Bumper<br>Axle Torque Command<br>serial data signal | If x of y rolling count /<br>protection value faults<br>occur, disable rear virtual<br>bumper for duration of<br>fault |                 | Rear Object Detection<br>Module Torque Request<br>Serial Data Error<br>Diagnostic Enable | 1.00              | 4<br>/<br>10<br>counts | MIL:<br>Type C,<br>No MIL |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                             | Fault<br>Code | Monitor Description                                                                                         | Malfunction Criteria                                                                                                                       | Threshold Value | Secondary Parameters                                                        | Enable Conditions | Time Required | MIL<br>Illum.       |
|------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------------------------------------------------|-------------------|---------------|---------------------|
| Automatic Braking Engine Torque Request Signal Message Incorrect | P15F8         | Detects rolling count or protection value errors Rear Virtual Bumper Axle Torque Command serial data signal | If x of y rolling count / protection value faults occur, disable rear virtual bumper or collision preparation system for duration of fault |                 | Automatic Braking Engine Torque Request Serial Data Error Diagnostic Enable | 1.00              | 4 / 10 counts | MIL: Type C, No MIL |





13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                    | Enable Conditions                                          | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | detected is true and<br>Manufacturers enable<br>counter is 0)<br>Flex Fuel Sensor Not FA<br>Ignition voltage out of<br>correlation error(P1682)<br>not active and<br>Barometric Pressure<br>Inlet Air Temp<br>Fuel Temp | >= 70.0 KPA<br>>= -10.0 degC<br>-10 <= Temp degC <=<br>100 |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                         |                                                            |               |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System               | Fault<br>Code | Monitor Description                                                                                                                   | Malfunction Criteria             | Threshold Value | Secondary Parameters | Enable Conditions                                                                                                                                                                                                                               | Time Required                                                              | MIL<br>Illum.      |
|------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------|
| Ignition<br>Voltage<br>Correlation | P1682         | Detect a continuous or intermittent out of correlation between the Run/Crank Ignition Voltage & the Powertrain Relay Ignition Voltage | Run/Crank – PT Relay Ignition  > | 3.00 Volts      |                      | Powertrain commanded on<br><br>AND<br><br>(Run/Crank voltage > Table, f(IAT). See supporting tables: <b>PT Relay Pull-in Run/Crank Voltage f(IAT)</b><br><br>OR PT Relay Ignition voltage > 5.50 )<br><br>AND<br><br>Run/Crank voltage > 5.50 . | 240 / 480 counts or 0.1750 sec continuous; 12.5 ms/count in main processor | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System            | Fault<br>Code | Monitor Description                                                     | Malfunction Criteria                                                                           | Threshold Value | Secondary Parameters | Enable Conditions           | Time Required                                                                                          | MIL<br>Illum.      |
|---------------------------------|---------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------|----------------------|-----------------------------|--------------------------------------------------------------------------------------------------------|--------------------|
| TPS SENT<br>Comm<br>Circuit Low | P16A0         | Detects a Low Circuit<br>Fault in the TPS SENT<br>Communication Circuit | Voltage for wave pulse is<br>below state threshold as<br>defined by SAE J2716<br>SENT Protocol | 0.5 V           |                      | Run/Crank voltage ><br>6.41 | 79 / 159<br>counts;<br><br>57 counts<br>continuous;<br>3.125 ms /count<br>in the ECM main<br>processor | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System             | Fault<br>Code | Monitor Description                                                      | Malfunction Criteria                                                                           | Threshold Value | Secondary Parameters | Enable Conditions           | Time Required                                                                                          | MIL<br>Illum.      |
|----------------------------------|---------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------|----------------------|-----------------------------|--------------------------------------------------------------------------------------------------------|--------------------|
| TPS SENT<br>Comm<br>Circuit High | P16A1         | Detects a High Circuit<br>Fault in the TPS SENT<br>Communication Circuit | Voltage for wave pulse is<br>above state threshold as<br>defined by SAE J2716<br>SENT Protocol | 4.1 V           |                      | Run/Crank voltage ><br>6.41 | 79 / 159<br>counts;<br><br>57 counts<br>continuous;<br>3.125 ms /count<br>in the ECM main<br>processor | Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                       | Fault<br>Code | Monitor Description                                                 | Malfunction Criteria                                                                           | Threshold Value                            | Secondary Parameters | Enable Conditions           | Time Required                                                                                          | MIL<br>Illum.      |
|--------------------------------------------|---------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------|-----------------------------|--------------------------------------------------------------------------------------------------------|--------------------|
| TPS SENT<br>Comm<br>Circuit<br>Performance | P16A2         | Detects a Message<br>Fault in the TPS SENT<br>Communication Circuit | Message Pulse <<br>Message Pulse ><br>or<br>Message Age Limit >=<br><br>or<br>Signal CRC fails | 0.125977 ms<br>0.209991 ms<br><br>3.125 ms |                      | Run/Crank voltage ><br>6.41 | 79 / 159<br>counts;<br><br>57 counts<br>continuous;<br>3.125 ms /count<br>in the ECM main<br>processor | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                 | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                                                | Malfunction Criteria                                                                                                  | Threshold Value | Secondary Parameters | Enable Conditions       | Time Required                                                            | MIL<br>Illum.      |
|------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|-------------------------|--------------------------------------------------------------------------|--------------------|
| Internal Control Module Redundant Memory Performance | P16F3         | <p>Detect Processor Calculation faults due to RAM corruptions, ALU failures and ROM failures</p> <p>For all of the following cases: If the individual diagnostic threshold is equal to 2048 ms, this individual case is not applicable. If any of the following cases are X out of Y diagnostics and the fail (x) is greater than the sample (Y), this individual case is also not applicable.</p> | Desired Throttle Area calculated does not equal its redundant calculation                                             | N/A             | Ignition State       | Accessory, run or crank | Up/down timer<br>175<br>ms continuous,<br>0.5<br>down time<br>multiplier | Type A,<br>1 Trips |
|                                                      |               |                                                                                                                                                                                                                                                                                                                                                                                                    | Equivalence Ratio torque compensation exceeds threshold                                                               | -74.77<br>Nm    | Ignition State       | Accessory, run or crank | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier |                    |
|                                                      |               |                                                                                                                                                                                                                                                                                                                                                                                                    | Absolute difference between Equivalence Ratio torque compensation and its dual store out of bounds given by threshold | 74.77<br>Nm     | Ignition State       | Accessory, run or crank | Up/down timer<br>175<br>ms continuous,<br>0.5<br>down time<br>multiplier |                    |
|                                                      |               |                                                                                                                                                                                                                                                                                                                                                                                                    | Absolute difference of Accessory torque and its redundant calculation is out of bounds given by threshold range       | 74.77<br>Nm     | Ignition State       | Accessory, run or crank | Up/down timer<br>175<br>ms continuous,<br>0.5<br>down time<br>multiplier |                    |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                              | Threshold Value               | Secondary Parameters | Enable Conditions       | Time Required                                                            | MIL<br>Illum. |
|----------------------|---------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------|-------------------------|--------------------------------------------------------------------------|---------------|
|                      |               |                     | Absolute difference of Filtered Air-per-cylinder and its redundant calculation is out of bounds given by threshold range                                          | 92.69 mg                      | Ignition State       | Accessory, run or crank | Up/down timer<br>175<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Absolute difference between the previous Final Advance and the current Final Advance not Adjusted for Equivalence Ratio is out of bounds given by threshold range | 10.48 degrees                 |                      | Engine speed >0rpm      | Up/down timer<br>154<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Torque Learn offset is out of bounds given by threshold range                                                                                                     | High Threshold<br><br>0.00 Nm | Ignition State       | Accessory, run or crank | Up/down timer<br>175<br>ms continuous,<br>0.5<br>down time               |               |



13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                        | Threshold Value                 | Secondary Parameters | Enable Conditions       | Time Required                                             | MIL<br>Illum. |
|----------------------|---------------|---------------------|---------------------------------------------------------------------------------------------|---------------------------------|----------------------|-------------------------|-----------------------------------------------------------|---------------|
|                      |               |                     |                                                                                             | Low Threshold<br><br>0.00<br>Nm |                      |                         | multiplier                                                |               |
|                      |               |                     | One step ahead calculation of air-per-cylinder and two step ahead is greater than threshold | 80.00<br>mg                     |                      | Engine speed > 600 rpm  | Up/down timer 454 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Difference between Unmanaged Spark and PACS Spark is greater than threshold                 | 10.48<br>degrees                | Ignition State       | Accessory, run or crank | Up/down timer 475 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Commanded Predicted Engine Torque and its dual store do not match                           | N/A                             | Ignition State       | Accessory, run or crank | Up/down timer 2,048 ms continuous, 0.5 down time          |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                           | Threshold Value                                                     | Secondary Parameters | Enable Conditions       | Time Required                                                              | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------|-------------------------|----------------------------------------------------------------------------|---------------|
|                      |               |                     |                                                                                                                |                                                                     |                      |                         | multiplier                                                                 |               |
|                      |               |                     | Zero pedal axle torque is out of bounds given by threshold range                                               | High Threshold<br>897.00<br>Nm<br>Low Threshold<br>-65,535.00<br>Nm | Ignition State       | Accessory, run or crank | Up/down timer<br>175<br>ms continuous,<br>0.5<br>down time<br>multiplier   |               |
|                      |               |                     | Creep Coast Axle Torque is out of bounds given by threshold range                                              | High Threshold<br>897.00<br>Nm<br>Low Threshold<br>-65,535.00<br>Nm | Ignition State       | Accessory, run or crank | Up/down timer<br>2,048<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Absolute difference of Friction torque and its redundant calculation is out of bounds given by threshold range | 74.77<br>Nm                                                         | Ignition State       | Accessory, run or crank | Up/down timer<br>175<br>ms continuous,<br>0.5<br>down time                 |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                  | Threshold Value                                       | Secondary Parameters | Enable Conditions                                                        | Time Required                                                            | MIL<br>Illum. |
|----------------------|---------------|---------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------|----------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------|---------------|
|                      |               |                     |                                                                                                       |                                                       |                      |                                                                          | multiplier                                                               |               |
|                      |               |                     | Arbitrated Air-Per-Cylinder<br>filter coefficient is out of<br>bounds given by threshold<br>range     | High Threshold<br>1.000<br><br>Low Threshold<br>0.074 | Ignition State       | Accessory, run or crank                                                  | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Launch spark is active but<br>the launch spark<br>redundant path indicates<br>it should not be active | N/A                                                   |                      | Engine speed <<br>5,300.00<br>or<br>5,500.00<br>rpm (hysteresis pair)    | Up/down timer<br>154<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Rate limited vehicle speed<br>and its dual store do not<br>equal                                      | N/A                                                   |                      | Time since first CAN<br>message with vehicle<br>speed >=<br>0.500<br>sec | 10 / 20<br>counts;<br>25.0msec/count                                     |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                          | Threshold Value         | Secondary Parameters | Enable Conditions                            | Time Required                                                              | MIL<br>Illum. |
|----------------------|---------------|---------------------|-------------------------------------------------------------------------------|-------------------------|----------------------|----------------------------------------------|----------------------------------------------------------------------------|---------------|
|                      |               |                     |                                                                               |                         |                      |                                              |                                                                            |               |
|                      |               |                     | Preload Throttle Area and its dual store do not equal                         | N/A                     | Ignition State       | Accessory, run or crank<br><br>AFM apps only | Up/down timer<br>2,048<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Commanded engine torque due to fast actuators and its dual store do not equal | N/A                     | Ignition State       | Accessory, run or crank                      | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier   |               |
|                      |               |                     | Commanded engine torque due to slow actuators and its dual store do not equal | N/A                     | Ignition State       | Accessory, run or crank                      | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier   |               |
|                      |               |                     | TOS to wheel speed conversion factor is out of bounds given by threshold      | High Threshold:<br>1.10 | Ignition State       | Accessory, run or crank                      | 255 / 6<br>counts;<br>25.0msec/count                                       |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                 | Threshold Value                                                                                                        | Secondary Parameters | Enable Conditions                                                                                                | Time Required                                            | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|---------------|
|                      |               |                     | range                                                                | T/C Range Hi<br><br>0.10<br>T/C Range Lo<br><br>Low Threshold:<br><br>1.10<br>T/C Range Hi<br><br>0.10<br>T/C Range Lo |                      |                                                                                                                  |                                                          |               |
|                      |               |                     | TOS to wheel speed conversion factor and its dual store do not equal | N/A                                                                                                                    | Ignition State       | Accessory, run or crank                                                                                          | 255 / 6 counts;<br>25.0msec/count                        |               |
|                      |               |                     | Cylinders active greater than commanded                              | 2 cylinders                                                                                                            |                      | Engine run flag = TRUE > 2.00s<br>Number of cylinder events since engine run > 24<br><br>No fuel injector faults | Up/down timer 154ms continuous, 0.5 down time multiplier |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                               | Threshold Value | Secondary Parameters | Enable Conditions                                                                                 | Time Required                                                   | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------------------------------------------------------------------------------------|-----------------|----------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|---------------|
|                      |               |                     |                                                                                                    |                 |                      | active                                                                                            |                                                                 |               |
|                      |               |                     | Transfer case neutral request from four wheel drive logic does not match with operating conditions | N/A             | Ignition State       | Accessory, run or crank<br><br>Transfer case range valid and not over-ridden<br><br>FWD Apps only | 32 / 0 counts;<br>25.0msec/count                                |               |
|                      |               |                     | Transfer case neutral and its dual store do not equal                                              | N/A             | Ignition State       | Accessory, run or crank                                                                           | 255 / 6 counts;<br>25.0msec/count                               |               |
|                      |               |                     | Driver progression mode and its dual store do not equal                                            | N/A             | Ignition State       | Accessory, run or crank                                                                           | Up/down timer<br>475 ms continuous,<br>0.5 down time multiplier |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                            | Threshold Value                                              | Secondary Parameters | Enable Conditions       | Time Required                                             | MIL<br>Illum. |
|----------------------|---------------|---------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------------------|-------------------------|-----------------------------------------------------------|---------------|
|                      |               |                     | Predicted torque for uncorrected zero pedal determination is greater than calculated limit.     | Table, f(Engine, Oil Temp). See supporting tables + 74.77 Nm | Ignition State       | Accessory, run or crank | Up/down timer 175 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Engine Predicted Request Without Motor is greater than its redundant calculation plus threshold | 73.77 Nm                                                     | Ignition State       | Accessory, run or crank | Up/down timer 175 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Engine Immediate Request Without Motor is greater than its redundant calculation plus threshold | 73.77 Nm                                                     | Ignition State       | Accessory, run or crank | Up/down timer 175 ms continuous, 0.5 down time multiplier |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                                                          | Threshold Value | Secondary Parameters | Enable Conditions       | Time Required                                                            | MIL<br>Illum. |
|----------------------|---------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|-------------------------|--------------------------------------------------------------------------|---------------|
|                      |               |                     | Positive Torque Offset is<br>greater than its redundant<br>calculation plus threshold<br><br>OR<br><br>Positive Torque Offset is<br>less than its redundant<br>calculation minus<br>threshold | 74.77<br>Nm     | Ignition State       | Accessory, run or crank | Up/down timer<br>175<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Commanded Predicted<br>Engine Request is greater<br>than its redundant<br>calculation plus threshold                                                                                          | 74.77<br>Nm     | Ignition State       | Accessory, run or crank | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |



13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                               | Threshold Value                                         | Secondary Parameters | Enable Conditions       | Time Required                                                              | MIL<br>Illum. |
|----------------------|---------------|---------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|----------------------|-------------------------|----------------------------------------------------------------------------|---------------|
|                      |               |                     | Commanded Hybrid<br>Predicted Crankshaft<br>Request is greater than its<br>redundant calculation plus<br>threshold | 4,096.00<br>Nm                                          | Ignition State       | Accessory, run or crank | Up/down timer<br>2,048<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Commanded Hybrid<br>Immediate Crankshaft<br>Request is less than its<br>redundant calculation<br>minus threshold   | 4,096.00<br>Nm                                          | Ignition State       | Accessory, run or crank | Up/down timer<br>2,048<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Regeneration Brake<br>Assist is not within a<br>specified range                                                    | Brake Regen Assist <<br>0 Nm or<br>Brake Regen Assist > | Ignition State       | Accessory, run or crank | Up/down timer<br>2,048<br>ms continuous.                                   |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                      | Threshold Value                            | Secondary Parameters | Enable Conditions       | Time Required                                                            | MIL<br>Illum. |
|----------------------|---------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------|-------------------------|--------------------------------------------------------------------------|---------------|
|                      |               |                     |                                                                                                                                           | 0.00<br>Nm                                 |                      |                         | 0.5<br>down time<br>multiplier                                           |               |
|                      |               |                     | Cylinder Spark Delta<br>Correction exceeds the<br>absolute difference as<br>compared to Unadjusted<br>Cylinder Spark Delta                | 10.48<br>degrees                           | Ignition State       | Accessory, run or crank | Up/down timer<br>175<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | 1. Cylinder Torque Offset<br>exceeds step size<br>threshold<br><br>OR<br><br>2. Sum of Cylinder<br>Torque Offset exceeds<br>sum threshold | 1.<br>74.77<br>Nm<br><br>2.<br>74.77<br>Nm | Ignition State       | Accessory, run or crank | Up/down timer<br>175<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                          | Threshold Value | Secondary Parameters | Enable Conditions       | Time Required                                               | MIL<br>Illum. |
|----------------------|---------------|---------------------|-----------------------------------------------------------------------------------------------|-----------------|----------------------|-------------------------|-------------------------------------------------------------|---------------|
|                      |               |                     | Engine Capacity Minimum Immediate Without Motor is greater than its dual store plus threshold | 74.00 Nm        | Ignition State       | Accessory, run or crank | Up/down timer 175 ms continuous, 0.5 down time multiplier   |               |
|                      |               |                     | Engine Capacity Minimum Engine Off is greater than threshold                                  | 0 Nm            | Ignition State       | Accessory, run or crank | Up/down timer 475 ms continuous, 0.5 down time multiplier   |               |
|                      |               |                     | Engine Capacity Minimum Engine Immediate Without Motor is greater than threshold              | 0 Nm            | Ignition State       | Accessory, run or crank | Up/down timer 2,048 ms continuous, 0.5 down time multiplier |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                        | Threshold Value | Secondary Parameters | Enable Conditions              | Time Required                                               | MIL<br>Illum. |
|----------------------|---------------|---------------------|---------------------------------------------------------------------------------------------|-----------------|----------------------|--------------------------------|-------------------------------------------------------------|---------------|
|                      |               |                     |                                                                                             |                 |                      |                                |                                                             |               |
|                      |               |                     | Commanded Immediate Engine Request is greater than its redundant calculation plus threshold | 74.77 Nm        | Ignition State       | Accessory, run or crank        | Up/down timer 2,048 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | PTO Torque Request exceeds allowed rate limited PTO Torque Request                          | 9.35 Nm/25ms    | Ignition State       | Accessory, run or crank        | Up/down timer 2,048 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Engine Speed Lores Intake Firing (event based) calculation does not equal its redundant     | N/A             |                      | Engine speed greater than 0rpm | Up/down timer 154 ms continuous, 0.5                        |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                  | Threshold Value                                                                                                                      | Secondary Parameters | Enable Conditions                 | Time Required                                                            | MIL<br>Illum. |
|----------------------|---------------|---------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------|--------------------------------------------------------------------------|---------------|
|                      |               |                     | calculation                                                                                                           |                                                                                                                                      |                      |                                   | down time<br>multiplier                                                  |               |
|                      |               |                     | Engine Speed Loes<br>Intake Firing timing (event<br>based) calculation does<br>not equal its redundant<br>calculation | N/A                                                                                                                                  |                      | Engine speed greater<br>than 0rpm | Up/down timer<br>154<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Idle speed control<br>calculated predicted<br>minimum torque request<br>exceeds calculated torque<br>limit            | Table, f(Oil Temp,<br>RPM). See supporting<br>tables: <b>Speed Control<br/>External Load f(Oil<br/>Temp, RPM) +<br/>74.77<br/>Nm</b> | Ignition State       | Accessory, run or crank           | Up/down timer<br>175<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Idle speed control<br>calculated predicted<br>minimum torque without<br>reserves exceeds<br>calculated torque limit   | Table, f(Oil Temp,<br>RPM). See supporting<br>tables: <b>Speed Control<br/>External Load f(Oil<br/>Temp, RPM) +<br/>74.77</b>        | Ignition State       | Accessory, run or crank           | Up/down timer<br>175<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                  | Threshold Value | Secondary Parameters | Enable Conditions       | Time Required                                               | MIL<br>Illum. |
|----------------------|---------------|---------------------|-------------------------------------------------------------------------------------------------------|-----------------|----------------------|-------------------------|-------------------------------------------------------------|---------------|
|                      |               |                     |                                                                                                       | Nm              |                      |                         |                                                             |               |
|                      |               |                     | Difference between Driver Requested Immediate Torque primary path and its secondary exceeds threshold | 897.00 Nm       | Ignition State       | Accessory, run or crank | Up/down timer 2,048 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Driver Immediate Request is less than its redundant calculation minus threshold                       | 897.00 Nm       | Ignition State       | Accessory, run or crank | Up/down timer 475 ms continuous, 0.5 down time multiplier   |               |
|                      |               |                     | Commanded Immediate Request is greater than its redundant calculation plus threshold                  | 897.00 Nm       | Ignition State       | Accessory, run or crank | Up/down timer 2,048 ms continuous, 0.5 down time multiplier |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                      | Threshold Value | Secondary Parameters | Enable Conditions                                        | Time Required                                                              | MIL<br>Illum. |
|----------------------|---------------|---------------------|-----------------------------------------------------------------------------------------------------------|-----------------|----------------------|----------------------------------------------------------|----------------------------------------------------------------------------|---------------|
|                      |               |                     | OR<br><br>Commanded Immediate Request is less than its redundant calculation minus threshold              |                 |                      |                                                          |                                                                            |               |
|                      |               |                     | Commanded Immediate Response Type is set to Inactive                                                      | N/A             | Ignition State       | Accessory, run or crank                                  | Up/down timer<br>2,048<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Difference between Cruise Axle Torque Arbitrated Request and Cruise Axle Torque Request exceeds threshold | 112.12<br>Nm    |                      | Cruise has been engaged for more than<br>4.00<br>seconds | Up/down timer<br>2,048<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                             | Threshold Value                                                                    | Secondary Parameters | Enable Conditions              | Time Required                                             | MIL<br>Illum. |
|----------------------|---------------|---------------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------|--------------------------------|-----------------------------------------------------------|---------------|
|                      |               |                     | Desired engine torque request greater than redundant calculation plus threshold                  | 73.77 Nm                                                                           | Ignition State       | Accessory, run or crank        | Up/down timer 475 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Engine min capacity above threshold                                                              | 74.77 Nm                                                                           | Ignition State       | Accessory, run or crank        | Up/down timer 88 ms continuous, 0.5 down time multiplier  |               |
|                      |               |                     | No fast unmanaged retarded spark above the applied spark plus the threshold                      | Table, f(RPM,APC). See supporting tables: <b>Delta Spark Threshold f (RPM,APC)</b> |                      | Engine speed greater than 0rpm | Up/down timer 154 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Absolute difference of adjustment factor based on temperature and its dual store above threshold | 2.76 m/s                                                                           | Ignition State       | Accessory, run or crank        | Up/down timer 121 ms continuous, 0.5 down time multiplier |               |



13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                        | Threshold Value | Secondary Parameters | Enable Conditions               | Time Required                                             | MIL<br>Illum. |
|----------------------|---------------|---------------------|-----------------------------------------------------------------------------|-----------------|----------------------|---------------------------------|-----------------------------------------------------------|---------------|
|                      |               |                     | 1. Absolute difference of redundant calculated engine speed above threshold | 500 RPM         |                      | Engine speed greater than 0 RPM | Up/down timer 154 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | After throttle blade pressure and its dual store do not match               | N/A             | Ignition State       | Accessory, run or crank         | Up/down timer 175 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Speed Control's Predicted Torque Request and its dual store do not match    | N/A             | Ignition State       | Accessory, run or crank         | Up/down timer 175 ms continuous, 0.5 down time multiplier |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                               | Threshold Value | Secondary Parameters | Enable Conditions       | Time Required                                             | MIL<br>Illum. |
|----------------------|---------------|---------------------|--------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|-------------------------|-----------------------------------------------------------|---------------|
|                      |               |                     | Engine oil temperature and its dual store do not match                                                             | N/A             | Ignition State       | Accessory, run or crank | Up/down timer 288 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Desired throttle position greater than redundant calculation plus threshold                                        | 6.08 percent    | Ignition State       | Accessory, run or crank | Up/down timer 175 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Absolute difference of the rate limited pre-throttle pressure and its redundant calculation greater than threshold | 0.06 kpa        | Ignition State       | Accessory, run or crank | Up/down timer 175 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Throttle desired torque above desired torque plus threshold                                                        | 74.77 Nm        | Ignition State       | Accessory, run or crank | Up/down timer 475 ms continuous, 0.5 down time multiplier |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                         | Threshold Value                                                    | Secondary Parameters | Enable Conditions       | Time Required                                                            | MIL<br>Illum. |
|----------------------|---------------|---------------------|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|----------------------|-------------------------|--------------------------------------------------------------------------|---------------|
|                      |               |                     |                                                                                                                              |                                                                    |                      |                         |                                                                          |               |
|                      |               |                     | Desired filtered throttle torque exceeds the threshold plus the higher of desired throttle torque or modeled throttle torque | 74.77<br>Nm                                                        | Ignition State       | Accessory, run or crank | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Torque feedback proportional term is out of allowable range or its dual store copy does not match                            | High Threshold<br>37.38<br>Nm<br><br>Low Threshold<br>-37.38<br>Nm | Ignition State       | Accessory, run or crank | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Torque feedback integral term magnitude or rate of change is out of allowable range or its dual store                        | High Threshold<br>70.09<br>Nm                                      | Ignition State       | Accessory, run or crank | Up/down timer<br>475<br>ms continuous,<br>0.5                            |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                        | Threshold Value                                                                             | Secondary Parameters | Enable Conditions       | Time Required                                                            | MIL<br>Illum. |
|----------------------|---------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|----------------------|-------------------------|--------------------------------------------------------------------------|---------------|
|                      |               |                     | copy do not match                                                                                                                           | Low Threshold<br><br>-74.77<br>Nm<br><br>Rate of change<br>threshold<br><br>4.67<br>Nm/loop |                      |                         | down time<br>multiplier                                                  |               |
|                      |               |                     | Difference of Final Torque feedback proportional plus integral term and its redundant calculation is out of bounds given by threshold range | High Threshold<br><br>74.77<br>Nm<br><br>Low Threshold<br><br>- 74.77<br>Nm                 | Ignition State       | Accessory, run or crank | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Difference of torque desired throttle area and                                                                                              | High Threshold                                                                              | Ignition State       | Accessory, run or crank | Up/down timer<br>475                                                     |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                            | Threshold Value                                                     | Secondary Parameters | Enable Conditions       | Time Required                                                            | MIL<br>Illum. |
|----------------------|---------------|---------------------|-----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------|-------------------------|--------------------------------------------------------------------------|---------------|
|                      |               |                     | its redundant calculation is out of bounds given by threshold range                                             | 0.50 %<br><br>Low Threshold<br>- 0.50 %                             |                      |                         | ms continuous,<br>0.5<br>down time<br>multiplier                         |               |
|                      |               |                     | Difference of torque model coefficients and its redundant calculation is out of bounds given by threshold range | High Threshold<br>0.0001479 Low<br>Threshold - 0.0001479            | Ignition State       | Accessory, run or crank | Up/down timer<br>175<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Difference of base friction torque and its redundant calculation is out of bounds given by threshold range      | High Threshold<br>74.77<br>Nm<br><br>Low Threshold<br>- 74.77<br>Nm | Ignition State       | Accessory, run or crank | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                        | Threshold Value                                                  | Secondary Parameters | Enable Conditions       | Time Required                                                              | MIL<br>Illum. |
|----------------------|---------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|----------------------|-------------------------|----------------------------------------------------------------------------|---------------|
|                      |               |                     | Accessory drive friction torque is out of bounds given by threshold range                                                   | High Threshold<br>74.77<br>Nm<br><br>Low Threshold<br>0.00<br>Nm | Ignition State       | Accessory, run or crank | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier   |               |
|                      |               |                     | AC friction torque is greater than commanded by AC control software or less than threshold limit                            | High Threshold<br>40.00<br>Nm<br><br>Low Threshold<br>0.00<br>Nm | Ignition State       | Accessory, run or crank | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier   |               |
|                      |               |                     | Difference of Oil temperature delta friction torque and its redundant calculation is out of bounds given by threshold range | High Threshold<br>74.77<br>Nm                                    | Ignition State       | Accessory, run or crank | Up/down timer<br>2,048<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                   | Threshold Value                                                          | Secondary Parameters | Enable Conditions       | Time Required                                                            | MIL<br>Illum. |
|----------------------|---------------|---------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------|----------------------|-------------------------|--------------------------------------------------------------------------|---------------|
|                      |               |                     |                                                                        | Low Threshold<br><br>- 74.77<br>Nm                                       |                      |                         |                                                                          |               |
|                      |               |                     | Generator friction torque is out of bounds given by threshold range    | High Threshold<br><br>74.77<br>Nm<br><br>Low Threshold<br><br>0.00<br>Nm | Ignition State       | Accessory, run or crank | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Supercharger friction torque is out of bounds given by threshold range | High Threshold<br><br>74.77<br>Nm<br><br>Low Threshold<br><br>0.00<br>Nm | Ignition State       | Accessory, run or crank | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                         | Threshold Value                                                                                                       | Secondary Parameters | Enable Conditions                                         | Time Required                                                            | MIL<br>Illum. |
|----------------------|---------------|---------------------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------|--------------------------------------------------------------------------|---------------|
|                      |               |                     | Filtered Torque error magnitude or its increase rate of change is out of allowable range or its dual store copy do not match | High Threshold<br>74.77<br>Nm<br><br>Low Threshold<br>-74.77<br>Nm<br><br>Rate of change threshold<br>4.67<br>Nm/loop |                      | Engine speed >0rpm<br>MAF, MAP and Baro<br>DTCs are false | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Torque error compensation is out of bounds given by threshold range                                                          | High Threshold<br>74.77<br>Nm<br><br>Low Threshold<br>0.00<br>Nm                                                      | Ignition State       | Accessory, run or crank                                   | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |



13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                     | Threshold Value                                            | Secondary Parameters | Enable Conditions       | Time Required                                                   | MIL<br>Illum. |
|----------------------|---------------|---------------------|--------------------------------------------------------------------------|------------------------------------------------------------|----------------------|-------------------------|-----------------------------------------------------------------|---------------|
|                      |               |                     | Delta Torque Baro compensation is out of bounds given by threshold range | High Threshold<br>5.35 Nm<br><br>Low Threshold<br>-0.72 Nm | Ignition State       | Accessory, run or crank | Up/down timer<br>175 ms continuous,<br>0.5 down time multiplier |               |
|                      |               |                     |                                                                          |                                                            |                      |                         |                                                                 |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                    | Threshold Value                                                                       | Secondary Parameters       | Enable Conditions                                                                                                                                                                      | Time Required                                             | MIL<br>Illum. |
|----------------------|---------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|---------------|
|                      |               |                     | 1. Difference of reserve torque value and its redundant calculation exceed threshold<br><br>OR<br><br>2. Reserve request does not agree with operating conditions or Difference of final predicted torque and its redundant calculation exceed threshold<br><br>OR<br><br>3. Rate of change of reserve torque exceeds threshold, increasing direction only<br><br>OR<br><br>4. Reserve engine torque above allowable capacity threshold | 1. 73.77 Nm<br><br>2. N/A<br><br>3. 73.77 Nm<br><br>4. 73.77 Nm                       | 3. & 4.:<br>Ignition State | 1. & 2.:<br>Torque reserve (condition when spark control greater than optimum to allow fast transitions for torque disturbances) > 74.77 Nm<br><br>3. & 4.:<br>Accessory, run or crank | Up/down timer 475 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Engine Vacuum and its dual store do not match                                                                                                                                                                                                                                                                                                                                                                                           | N/A                                                                                   | Ignition State             | Accessory, run or crank                                                                                                                                                                | Up/down timer 175 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Absolute difference of the calculated Intake Manifold Pressure during engine event versus during time                                                                                                                                                                                                                                                                                                                                   | Table, f(Desired Engine Torque). See supporting tables:<br><b>Delta MAP Threshold</b> |                            | Engine speed >0rpm                                                                                                                                                                     | Up/down timer 154 ms continuous, 0.5                      |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                                               | Threshold Value          | Secondary Parameters | Enable Conditions       | Time Required                                             | MIL<br>Illum. |
|----------------------|---------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------------|-------------------------|-----------------------------------------------------------|---------------|
|                      |               |                     | event is greater than threshold                                                                                                                                                    | f(Desired Engine Torque) |                      |                         | down time multiplier                                      |               |
|                      |               |                     | Min. Axle Torque Capacity is greater than threshold                                                                                                                                | 0.00 Nm                  | Ignition State       | Accessory, run or crank | Up/down timer 175 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Driver Predicted Request is greater than its redundant calculation plus threshold<br><br>OR<br><br>Driver Predicted Request is less than its redundant calculation minus threshold | 897.00 Nm                | Ignition State       | Accessory, run or crank | Up/down timer 475 ms continuous, 0.5 down time multiplier |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                            | Threshold Value                                                                                                | Secondary Parameters | Enable Conditions                                                                     | Time Required                                                            | MIL<br>Illum. |
|----------------------|---------------|---------------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------|---------------|
|                      |               |                     | Cold Delta Friction Torque and its dual store do not match                      | N/A                                                                                                            | Ignition State       | Accessory, run or crank                                                               | Up/down timer<br>175<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Predicted torque for zero pedal determination is greater than calculated limit. | Table, f(Oil Temp, RPM). See supporting tables: <b>Speed Control External Load f(Oil Temp, RPM) + 74.77 Nm</b> | Ignition State       | Accessory, run or crank                                                               | Up/down timer<br>175<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Commanded Predicted Axle Torque and its dual store do not match                 | 1 Nm                                                                                                           | Ignition State       | Accessory, run or crank                                                               | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Steady State Estimated Engine Torque and its dual store are not equal           | N/A                                                                                                            |                      | AFM not changing from Active to Inactive and preload torque not changing and one loop | Up/down timer<br>1,988<br>ms continuous,<br>0.5                          |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                          | Threshold Value  | Secondary Parameters | Enable Conditions                         | Time Required                                                            | MIL<br>Illum. |
|----------------------|---------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------|-------------------------------------------|--------------------------------------------------------------------------|---------------|
|                      |               |                     |                                                                                                                               |                  |                      | after React command<br>Engine speed >0rpm | down time<br>multiplier                                                  |               |
|                      |               |                     | Difference of Weighting<br>factor for number of<br>cylinders fueled and its<br>redundant calculation is<br>above threshold    | 0.26             |                      | Engine run flag = TRUE ><br>10.00<br>s    | Up/down timer<br>175<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Difference of minimum<br>spark advance limit and<br>its redundant calculation<br>is out of bounds given by<br>threshold range | 10.48<br>degrees | Ignition State       | Accessory, run or crank                   | Up/down timer<br>154<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Difference of commanded<br>spark advance and<br>adjusted delivered is out<br>of bounds given by<br>threshold range            | 10.48<br>degrees |                      | Engine speed >0rpm                        | Up/down timer<br>154<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                  | Threshold Value | Secondary Parameters | Enable Conditions                                                                                                               | Time Required                                             | MIL<br>Illum. |
|----------------------|---------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|---------------|
|                      |               |                     |                                                                                                                                       |                 |                      |                                                                                                                                 |                                                           |               |
|                      |               |                     | Absolute difference between Estimated Engine Torque and its dual store are above a threshold                                          | 74.77 Nm        |                      | Engine speed >0rpm                                                                                                              | Up/down timer 475 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Absolute difference between Estimated Engine Torque without reductions due to torque control and its dual store are above a threshold | 74.77 Nm        |                      | Engine speed >0rpm                                                                                                              | Up/down timer 475 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Difference of desired spark advance for managed torque and its redundant calculation is out of bounds given by threshold range        | 10.48 degrees   |                      | Torque reserve (condition when spark control greater than optimum to allow fast transitions for torque disturbances) > 74.77 Nm | Up/down timer 454 ms continuous, 0.5 down time multiplier |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                                                 | Threshold Value                                                                                                      | Secondary Parameters | Enable Conditions       | Time Required                                             | MIL<br>Illum. |
|----------------------|---------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------|-----------------------------------------------------------|---------------|
|                      |               |                     | Absolute difference of Engine Capacity Minimum Running Immediate Brake Torque Excluding Cylinder Sensitivity and its redundant calculation is out of bounds given by threshold range | 74.77 Nm                                                                                                             |                      | Engine speed >0rpm      | Up/down timer 175 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | One step ahead calculation of air-per-cylinder greater than two step ahead calculation by threshold for time                                                                         | Threshold:<br>Dynamically calculated based on current engine conditions<br>Fault Pending<br>Threshold:<br><br>100 ms |                      | Engine speed > 600 rpm  | Up/down timer 454 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Rate limited cruise axle torque request and its dual store do not match within a threshold                                                                                           | 112.12 Nm                                                                                                            | Ignition State       | Accessory, run or crank | Up/down timer 163 ms continuous, 0.5 down time multiplier |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Threshold Value                                   | Secondary Parameters | Enable Conditions       | Time Required                                                            | MIL<br>Illum. |
|----------------------|---------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------------------|-------------------------|--------------------------------------------------------------------------|---------------|
|                      |               |                     | 1. Absolute difference of Calculated accelerator pedal position compensated for carpet learn and error conditions and its redundant calculation is out of bounds given by threshold range<br><br>OR<br><br>2. Absolute difference of Calculated accelerator pedal position compensated for carpet learn and error conditions and its dual store do not equal<br><br>OR<br><br>3. Absolute difference of Calculated accelerator pedal position and its dual store do not equal | 1.<br>5.00<br>%<br><br>2.<br>N/A<br><br>3.<br>N/A | Ignition State       | Accessory, run or crank | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     | Commanded axle torque is greater than its                                                                                                                                                                                                                                                                                                                                                                                                                                     | 897.00<br>Nm                                      | Ignition State       | Accessory, run or crank | Up/down timer<br>475                                                     |               |



13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                      | Threshold Value | Secondary Parameters | Enable Conditions                            | Time Required                                               | MIL<br>Illum. |
|----------------------|---------------|---------------------|---------------------------------------------------------------------------|-----------------|----------------------|----------------------------------------------|-------------------------------------------------------------|---------------|
|                      |               |                     | redundant calculation by threshold                                        |                 |                      |                                              | ms continuous, 0.5 down time multiplier                     |               |
|                      |               |                     | Commanded axle torque is less than its redundant calculation by threshold | -65,535.00 Nm   | Ignition State       | Accessory, run or crank                      | Up/down timer 475 ms continuous, 0.5 down time multiplier   |               |
|                      |               |                     | Preload timer and its redundant calculation do not equal                  | N/A             | Ignition State       | Accessory, run or crank<br><br>AFM apps only | Up/down timer 2,048 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | AC friction torque is greater than commanded by AC control software       | 40.00 Nm        | Ignition State       | Accessory, run or crank                      | Up/down timer 2,048 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Engine Speed Lores                                                        | N/A             |                      | Engine speed >0rpm                           | Up/down timer                                               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                               | Threshold Value | Secondary Parameters | Enable Conditions            | Time Required                                               | MIL<br>Illum. |
|----------------------|---------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|------------------------------|-------------------------------------------------------------|---------------|
|                      |               |                     | Intake Firing (time based) calculation does not equal its redundant calculation                                                    |                 |                      |                              | 175 ms continuous, 0.5 down time multiplier                 |               |
|                      |               |                     | Absolute difference of the calculated spark offset for equivalence ratio and its redundant calculation is greater than a threshold | 10.48 degrees   |                      | Engine speed >0rpm           | Up/down timer 154 ms continuous, 0.5 down time multiplier   |               |
|                      |               |                     | Transmission Torque Request calculations do not equal their dual stores                                                            | N/A             |                      | Run or Crank = TRUE > 0.50 s | 16 / 32 counts; 25.0msec/count                              |               |
|                      |               |                     | Absolute difference of the predicted motor torque ACS and its redundant calculation is greater than a threshold                    | 0.01 Nm         |                      |                              | Up/down timer 2,048 ms continuous, 0.5 down time multiplier |               |
|                      |               |                     | Absolute difference of maximum throttle area and its redundant                                                                     | 15 mm2          |                      |                              | Up/down timer 121 ms continuous,                            |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                         | Threshold Value | Secondary Parameters | Enable Conditions | Time Required                                                            | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------------------------------------------------------------------------------|-----------------|----------------------|-------------------|--------------------------------------------------------------------------|---------------|
|                      |               |                     | cacluation is greater than a threshold                                                       |                 |                      |                   | 0.5<br>down time<br>multiplier                                           |               |
|                      |               |                     | Absolute difference of Desired TIAP and its redundant cacluation is greater than a threshold | 5.00 kPa        |                      |                   | Up/down timer<br>475<br>ms continuous,<br>0.5<br>down time<br>multiplier |               |
|                      |               |                     |                                                                                              |                 |                      |                   |                                                                          |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                                            | Fault<br>Code | Monitor Description                                                           | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Threshold Value                                                                                                                   | Secondary Parameters                         | Enable Conditions            | Time Required   | MIL<br>Illum.      |
|---------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------|-----------------|--------------------|
| Fuel Level<br>Sensor 2<br>Performance<br><br>(For use on<br>vehicles with<br>mechanical<br>transfer<br>pump dual<br>fuel tanks) | P2066         | This DTC will detect a fuel sender stuck in range in the secondary fuel tank. | <p>*****</p> <p>Fuel Level in Primary and Secondary Tanks Remain in an Unreadable Range too Long</p> <p>*****</p> <p>This subtest is used</p> <p>If fuel volume in primary tank is</p> <p>and fuel volume in secondary tank is</p> <p>and remains in this condition for</p> <p>OR</p> <p>*****</p> <p>Fuel Level is in a Readable Range for both Primary and Secondary Tanks too Long</p> <p>*****</p> <p>This subtest is not used</p> <p>Volume in primary tank is</p> <p>and volume in secondary tank is</p> <p>and remains in this condition for</p> <p>OR</p> <p>*****</p> <p>Distance Traveled without a Secondary Fuel Level Change</p> <p>*****</p> <p>If the vehicle is driven a</p> | <p>≥ 1,023.0 liters</p> <p>&lt; 2.0 liters</p> <p>62 miles</p> <p>&lt; 1,023 liters</p> <p>&gt; 2 liters</p> <p>3,630 seconds</p> | <p>Engine Running</p> <p>No active DTCs:</p> | <p>VehicleSpeedSensor_FA</p> | 250 ms / sample | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                    | Threshold Value | Secondary Parameters | Enable Conditions | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|-------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|-------------------|---------------|---------------|
|                      |               |                     | distance of 180 miles<br>without the secondary fuel<br>level changing by 3 liters,<br>then the sender must be<br>stuck. |                 |                      |                   |               |               |
|                      |               |                     |                                                                                                                         |                 |                      |                   |               |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                        | Fault<br>Code | Monitor Description                                                                   | Malfunction Criteria            | Threshold Value | Secondary Parameters | Enable Conditions | Time Required                                          | MIL<br>Illum.      |
|-------------------------------------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------|---------------------------------|-----------------|----------------------|-------------------|--------------------------------------------------------|--------------------|
| Fuel Level<br>Sensor 2<br>Circuit Low<br>Voltage<br><br>(For use on<br>vehicles with<br>dual fuel<br>tanks) | P2067         | This DTC will detect a fuel sender stuck out of range low in the secondary fuel tank. | Fuel level Sender % of 5V range | < 10 %          |                      |                   | 100 failures out of 125 samples<br><br>100 ms / sample | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                                         | Fault<br>Code | Monitor Description                                                                   | Malfunction Criteria            | Threshold Value | Secondary Parameters | Enable Conditions | Time Required                                          | MIL<br>Illum.      |
|--------------------------------------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------|---------------------------------|-----------------|----------------------|-------------------|--------------------------------------------------------|--------------------|
| Fuel Level<br>Sensor 2<br>Circuit High<br>Voltage<br><br>(For use on<br>vehicles with<br>dual fuel<br>tanks) | P2068         | This DTC will detect a fuel sender stuck out of range low in the secondary fuel tank. | Fuel level Sender % of 5V range | > 60 %          |                      |                   | 100 failures out of 125 samples<br><br>100 ms / sample | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                 | Fault<br>Code | Monitor Description                                                   | Malfunction Criteria                                                                                             | Threshold Value                                                                                            | Secondary Parameters                                                                                               | Enable Conditions | Time Required                                                          | MIL<br>Illum.      |
|----------------------------------------------------------------------|---------------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------|------------------------------------------------------------------------|--------------------|
| Intake<br>Camshaft<br>Actuator<br>Solenoid<br>Circuit Low-<br>Bank 1 | P2088         | Diagnoses the VVT system high side driver circuit for circuit faults. | The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match. | Short to ground:<br>≤ 0.5 Ω to a voltage source within the Vehicle Ground Voltage Range relative to PWRGND | System supply voltage is within limits. Output driver is commanded on, Ignition switch is in crank or run position | > 11.00<br>Volts  | 20<br><br>failures out of 25<br><br>samples250 ms / sample, continuous | Type B,<br>2 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                   | Fault<br>Code | Monitor Description                                                   | Malfunction Criteria                                                                                    | Threshold Value                                                                                                                                       | Secondary Parameters                                                                                               | Enable Conditions | Time Required                                                | MIL<br>Illum.      |
|------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------|--------------------|
| Intake<br>Camshaft<br>Actuator<br>Solenoid<br>Circuit High<br>– Bank 1 | P2089         | Diagnoses the VVT system high side driver circuit for circuit faults. | The ECM detects that voltage is high during driver off state (indicates short to power or open circuit) | Short to power:<br>≤ 0.5 Ω impedance between signal and controller power<br>Open Circuit:<br>≥ 200 K Ω impedance between signal and controller ground | System supply voltage is within limits. Output driver is commanded on, Ignition switch is in crank or run position | > 11.00<br>Volts  | 20 failures out of 25 samples<br>250 ms / sample, continuous | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                   | Fault<br>Code | Monitor Description                                                         | Malfunction Criteria                                                                                                         | Threshold Value                                                                                                        | Secondary Parameters                                                                                                           | Enable Conditions | Time Required                                                               | MIL<br>Illum.      |
|------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------------------------------|--------------------|
| Exhaust<br>Camshaft<br>Actuator<br>Solenoid<br>Circuit Low –<br>Bank 1 | P2090         | Diagnoses the VVT<br>system high side driver<br>circuit for circuit faults. | The ECM detects that the<br>commanded state of the<br>driver and the actual state<br>of the control circuit do<br>not match. | Short to ground:<br>≤ 0.5 Ω to a voltage<br>source within the<br>Vehicle Ground<br>Voltage Range relative<br>to PWRGND | System supply voltage is<br>within limits. Output driver<br>is commanded on,<br>Ignition switch is in crank<br>or run position | > 11.00<br>Volts  | 20<br>failures out of<br>25<br>samples<br>250 ms /<br>sample,<br>continuous | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                    | Fault<br>Code | Monitor Description                                                   | Malfunction Criteria                                                                                    | Threshold Value                                                                                                                                       | Secondary Parameters                                                                                               | Enable Conditions | Time Required                                                | MIL<br>Illum.      |
|-------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------|--------------------|
| Exhaust<br>Camshaft<br>Actuator<br>Solenoid<br>Circuit High<br>– Bank 1 | P2091         | Diagnoses the VVT system high side driver circuit for circuit faults. | The ECM detects that voltage is high during driver off state (indicates short to power or open circuit) | Short to power:<br>≤ 0.5 Ω impedance between signal and controller power<br>Open Circuit:<br>≥ 200 K Ω impedance between signal and controller ground | System supply voltage is within limits. Output driver is commanded on, Ignition switch is in crank or run position | > 11.00<br>Volts  | 20 failures out of 25 samples<br>250 ms / sample, continuous | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                 | Fault<br>Code | Monitor Description                                                   | Malfunction Criteria                                                                                             | Threshold Value                                                                                            | Secondary Parameters                                                                                               | Enable Conditions | Time Required                                                | MIL<br>Illum.      |
|----------------------------------------------------------------------|---------------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------|--------------------|
| Intake<br>Camshaft<br>Actuator<br>Solenoid<br>Circuit Low-<br>Bank 2 | P2092         | Diagnoses the VVT system high side driver circuit for circuit faults. | The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match. | Short to ground:<br>≤ 0.5 Ω to a voltage source within the Vehicle Ground Voltage Range relative to PWRGND | System supply voltage is within limits. Output driver is commanded on, Ignition switch is in crank or run position | > 11.00<br>Volts  | 20 failures out of 25 samples<br>250 ms / sample, continuous | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                  | Fault<br>Code | Monitor Description                                                   | Malfunction Criteria                                                                                     | Threshold Value                                                                                                                                       | Secondary Parameters                                                                                               | Enable Conditions | Time Required                                                | MIL<br>Illum.      |
|-----------------------------------------------------------------------|---------------|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------|--------------------|
| Intake<br>Camshaft<br>Actuator<br>Solenoid<br>Circuit High-<br>Bank 2 | P2093         | Diagnoses the VVT system high side driver circuit for circuit faults. | .The ECM detects that voltage is high during driver off state (indicates short to power or open circuit) | Short to power:<br>≤ 0.5 Ω impedance between signal and controller power<br>Open Circuit:<br>≥ 200 K Ω impedance between signal and controller ground | System supply voltage is within limits. Output driver is commanded on, Ignition switch is in crank or run position | > 11.00<br>Volts  | 20 failures out of 25 samples<br>250 ms / sample, continuous | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                   | Fault<br>Code | Monitor Description                                                   | Malfunction Criteria                                                                                            | Threshold Value                                                                                            | Secondary Parameters                                                                                               | Enable Conditions | Time Required                                                | MIL<br>Illum.      |
|------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------|--------------------|
| Exhaust<br>Camshaft<br>Actuator<br>Solenoid<br>Circuit Low –<br>Bank 2 | P2094         | Diagnoses the VVT system high side driver circuit for circuit faults. | The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match | Short to ground:<br>≤ 0.5 Ω to a voltage source within the Vehicle Ground Voltage Range relative to PWRGND | System supply voltage is within limits. Output driver is commanded on, Ignition switch is in crank or run position | > 11.00<br>Volts  | 20 failures out of 25 samples<br>250 ms / sample, continuous | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                    | Fault<br>Code | Monitor Description                                                   | Malfunction Criteria                                                                                    | Threshold Value                                                                                                                                       | Secondary Parameters                                                                                               | Enable Conditions | Time Required                                                | MIL<br>Illum.      |
|-------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------|--------------------|
| Exhaust<br>Camshaft<br>Actuator<br>Solenoid<br>Circuit High<br>– Bank 2 | P2095         | Diagnoses the VVT system high side driver circuit for circuit faults. | The ECM detects that voltage is high during driver off state (indicates short to power or open circuit) | Short to power:<br>≤ 0.5 Ω impedance between signal and controller power<br>Open Circuit:<br>≥ 200 K Ω impedance between signal and controller ground | System supply voltage is within limits. Output driver is commanded on, Ignition switch is in crank or run position | > 11.00<br>Volts  | 20 failures out of 25 samples<br>250 ms / sample, continuous | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                       | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                     | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                         | Threshold Value                                                                                                                                                                                                                                                                                                                                                                                               | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                             | Time Required                                                                                                                                                                                                   | MIL<br>Illum.   |
|------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Post Catalyst Fuel Trim System Low Limit Bank 1 (Too Rich) | P2096         | Determines if the post catalyst O2 sensor based fuel control system has reached it's low limit authority, indicating a rich emissions/exhaust gas condition.<br>Note: If the post catalyst O2 voltage is too rich, the post catalyst O2 integral offset control is decreased. This results in lean bias fuel control in an attempt to correct the rich post O2 voltage. | Rich Fail counter<br><br>High Vapor Feature:<br>The diagnostic is at risk of reporting a false fail when excessively High Vapor (HV) conditions are present. This HV condition is indicated when the purge valve is open AND percent vapor is >= 22 % for >= 5.0 seconds. Diagnosis resumes if the purge valve is closed OR the percent vapor is <= 20 % for >= 5.0 seconds. | >= 1,000 counts per 1,250 sample counts<br><br>Note: Counters increment at a rate of 10 per second when enable conditions are met. If the fail count threshold is reached, a fail is reported and the diagnostic will not report again until the next trip. If the sample count threshold is reached before a fail is reported, a pass is reported, the counters are reset to 0, and evaluation starts again. | The diagnostic is enabled during:<br>Deceleration<br>Idle<br>Cruise<br>Light Acceleration<br>Heavy Acceleration<br><br>The following conditions must be true for > 0.0 seconds:<br><br>Ambient Air Pressure<br>Engine AirFlow<br>Intake Manifold Pressure<br>Induction Air Temperature<br>Start-up Coolant Temp.<br>PTO<br>Intrusive diag. fuel control<br><br>Long Term Secondary Fuel Trim Enabled (see "Long Term Secondary Fuel Trim Enable Criteria" in Supporting Tables)<br><br>High Vapor Conditions<br><br>No Fault Active for: | Yes<br>Yes<br>Yes<br>Yes<br>Yes<br><br>>= 70 kPa<br>>= 0.0 g/s <= 10,000.0<br>>= 10 kPa <= 255<br>>= -20 deg. C <= 150<br>>= -20 deg. C<br>Not Active<br>Not Active<br><br><br><br>Not Present<br><br>AmbientAirDefault<br>AIR System FA<br>Ethanol Composition Sensor FA<br>ECT_Sensor_FA<br>EGRValveCircuit_FA<br>EGRValvePerformance_FA<br>IAT_SensorFA<br>CamSensorAnyLocationFA<br>EvapEmissionSystem_FA | Frequency: Continuous Monitoring in 100ms loop. Counters increment when enable conditions are met. When sample count threshold is reached or fail threshold is reached, counters are reset to 0 and start over. | Type B, 2 Trips |



13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | <p>The above general enable conditions must be true for:</p> <p>Minimum accumulated counts in each cell required before counters will increment:</p> <p>Deceleration 10,000,000,272,564,200<br/>                     Idle 10,000,000,272,564,200<br/>                     Cruise 50<br/>                     Light Acceleration 50<br/>                     Heavy Acceleration 50</p> <p>Fail counter will increment if sample counter increments<br/>                     AND<br/>                     Post oxygen sensor control integral offset (in</p> | <p>EvapFlowDuringNonPurge_FA<br/>                     FuelTankPressureSnrCkt_FA<br/>                     EvapPurgeSolenoidCircuit_FA<br/>                     EvapSmallLeak_FA<br/>                     EvapVentSolenoidCircuit_FA<br/>                     FuelInjectorCircuit_FA<br/>                     MAF_SensorFA<br/>                     MAF_SensorTFTKO<br/>                     MAP_SensorFA<br/>                     MAP_EngineVacuumStatus<br/>                     EngineMisfireDetected_FA<br/>                     A/F Imbalance Bank1<br/>                     O2S_Bank_1_Sensor_1_FA<br/>                     O2S_Bank_1_Sensor_2_FA</p> <p>&gt; 0.0 seconds</p> |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                            | Enable Conditions                                                                                                                                                                                                   | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | mV) is<br>Deceleration<br>Idle<br>Cruise<br>Light Acceleration<br>Heavy Acceleration<br>AND<br>Post O2 Voltage is<br>Deceleration<br>Idle<br>Cruise<br>Light Acceleration<br>Heavy Acceleration | <=<br>-160 (control min.= -160 )<br>-160 (control min.= -160 )<br>-720 (control min.= -720 )<br>-720 (control min.= -720 )<br>-720 (control min.= -720 )<br>><br>2,000 mV<br>2,000 mV<br>720 mV<br>733 mV<br>733 mV |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                 |                                                                                                                                                                                                                     |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                        | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                      | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                      | Threshold Value                                                                                                                                                                                                                                                                                                                                                                                               | Secondary Parameters                                                                                                                                                                                                                                                                                                                                             | Enable Conditions                                                                                                                                                                                     | Time Required                                                                                                                                                                                                   | MIL<br>Illum.   |
|-------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Post Catalyst Fuel Trim System High Limit Bank 1 (Too Lean) | P2097         | Determines if the post catalyst O2 sensor based fuel control system has reached it's high limit authority, indicating a lean emissions/exhaust gas condition.<br>Note: If the post catalyst O2 voltage is too lean, the post catalyst O2 integral offset control is increased. This results in rich bias fuel control in an attempt to correct the lean post O2 voltage. | Lean Fail counter<br><br>High Vapor Feature: The diagnostic is at risk of reporting a false fail when excessively High Vapor (HV) conditions are present. This HV condition is indicated when the purge valve is open AND percent vapor is >= 22 % for >= 5.0 seconds. Diagnosis resumes if the purge valve is closed OR the percent vapor is <= 20 % for >= 5.0 seconds. | >= 1,000 counts per 1,250 sample counts<br><br>Note: Counters increment at a rate of 10 per second when enable conditions are met. If the fail count threshold is reached, a fail is reported and the diagnostic will not report again until the next trip. If the sample count threshold is reached before a fail is reported, a pass is reported, the counters are reset to 0, and evaluation starts again. | Same as P2096 except for the following:<br><br>Fail counter will increment if sample counter increments<br>AND<br>Post oxygen sensor control integral offset (in mV) is<br>Deceleration<br>Idle<br>Cruise<br>Light Acceleration<br>Heavy Acceleration<br>AND<br>Post O2 Voltage is<br>Deceleration<br>Idle<br>Cruise<br>Light Acceleration<br>Heavy Acceleration | >=<br>160 (control max.= 160 )<br>160 (control max.= 160 )<br>592 (control max.= 592 )<br>592 (control max.= 592 )<br>592 (control max.= 592 )<br><br><<br>0 mV<br>0 mV<br>569 mV<br>569 mV<br>569 mV | Frequency: Continuous Monitoring in 100ms loop. Counters increment when enable conditions are met. When sample count threshold is reached or fail threshold is reached, counters are reset to 0 and start over. | Type B, 2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                      | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                     | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                         | Threshold Value                                                                                                                                                                                                                                                                                                                                                                                               | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                    | Enable Conditions                                                                                                                                                                                                       | Time Required                                                                                                                                                                                                         | MIL<br>Illum.      |
|---------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Post<br>Catalyst Fuel<br>Trim System<br>Low Limit<br>Bank 2 (Too<br>Rich) | P2098         | Determines if the post catalyst O2 sensor based fuel control system has reached it's low limit authority, indicating a rich emissions/exhaust gas condition.<br>Note: If the post catalyst O2 voltage is too rich, the post catalyst O2 integral offset control is decreased. This results in lean bias fuel control in an attempt to correct the rich post O2 voltage. | Rich Fail counter<br><br>High Vapor Feature:<br>The diagnostic is at risk of reporting a false fail when excessively High Vapor (HV) conditions are present. This HV condition is indicated when the purge valve is open AND percent vapor is >= 22 % for >= 5.0 seconds. Diagnosis resumes if the purge valve is closed OR the percent vapor is <= 20 % for >= 5.0 seconds. | >= 1,000 counts per 1,250 sample counts<br><br>Note: Counters increment at a rate of 10 per second when enable conditions are met. If the fail count threshold is reached, a fail is reported and the diagnostic will not report again until the next trip. If the sample count threshold is reached before a fail is reported, a pass is reported, the counters are reset to 0, and evaluation starts again. | Same as P2096 except for the following:<br><br>Bank1 Fault Active criteria are replaced by the equivalent Bank2 Fault Active criteria.<br><br>Fail counter will increment if sample counter increments<br>AND<br>Post oxygen sensor control integral offset is<br>Deceleration<br>Idle<br>Cruise<br>Light Acceleration<br>Heavy Acceleration<br>AND<br>Post O2 Voltage is<br>Deceleration<br>Idle<br>Cruise<br>Light Acceleration<br>Heavy Acceleration | <=<br>-160 (control min.= -160 )<br>-160 (control min.= -160 )<br>-720 (control min.= -720 )<br>-720 (control min.= -720 )<br>-720 (control min.= -720 )<br><br>><br>2,000 mV<br>2,000 mV<br>720 mV<br>733 mV<br>733 mV | Frequency:<br>Continuous Monitoring in 100ms loop.<br>Counters increment when enable conditions are met. When sample count threshold is reached or fail threshold is reached, counters are reset to 0 and start over. | Type B,<br>2 Trips |

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| Component/<br>System                                        | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                      | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                      | Threshold Value                                                                                                                                                                                                                                                                                                                                                                                               | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                    | Enable Conditions                                                                                                                                                                                     | Time Required                                                                                                                                                                                                   | MIL<br>Illum.   |
|-------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Post Catalyst Fuel Trim System High Limit Bank 2 (Too Lean) | P2099         | Determines if the post catalyst O2 sensor based fuel control system has reached it's high limit authority, indicating a lean emissions/exhaust gas condition.<br>Note: If the post catalyst O2 voltage is too lean, the post catalyst O2 integral offset control is increased. This results in rich bias fuel control in an attempt to correct the lean post O2 voltage. | Lean Fail counter<br><br>High Vapor Feature: The diagnostic is at risk of reporting a false fail when excessively High Vapor (HV) conditions are present. This HV condition is indicated when the purge valve is open AND percent vapor is >= 22 % for >= 5.0 seconds. Diagnosis resumes if the purge valve is closed OR the percent vapor is <= 20 % for >= 5.0 seconds. | >= 1,000 counts per 1,250 sample counts<br><br>Note: Counters increment at a rate of 10 per second when enable conditions are met. If the fail count threshold is reached, a fail is reported and the diagnostic will not report again until the next trip. If the sample count threshold is reached before a fail is reported, a pass is reported, the counters are reset to 0, and evaluation starts again. | Same as P2096 except for the following:<br><br>Bank1 Fault Active criteria are replaced by the equivalent Bank2 Fault Active criteria.<br><br>Fail counter will increment if sample counter increments<br>AND<br>Post oxygen sensor control integral offset is<br>Deceleration<br>Idle<br>Cruise<br>Light Acceleration<br>Heavy Acceleration<br>AND<br>Post O2 Voltage is<br>Deceleration<br>Idle<br>Cruise<br>Light Acceleration<br>Heavy Acceleration | >=<br>160 (control max.= 160 )<br>160 (control max.= 160 )<br>592 (control max.= 592 )<br>592 (control max.= 592 )<br>592 (control max.= 592 )<br><br><<br>0 mV<br>0 mV<br>569 mV<br>569 mV<br>569 mV | Frequency: Continuous Monitoring in 100ms loop. Counters increment when enable conditions are met. When sample count threshold is reached or fail threshold is reached, counters are reset to 0 and start over. | Type B, 2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                 | Fault<br>Code | Monitor Description                                                                                                                                                   | Malfunction Criteria                                                          | Threshold Value | Secondary Parameters                                                                                                            | Enable Conditions                                                | Time Required                                        | MIL<br>Illum.      |
|----------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------|--------------------|
| Control<br>Module<br>Throttle<br>Actuator<br>Position<br>Performance | P2101         | 1) Detect a throttle positioning error2)<br>Throttle control is driving the throttle in the incorrect direction3)<br>Throttle control exceeds the reduced power limit | Difference between measured throttle position and modeled throttle position > | 6.08 percent    | TPS minimum learn is not active and Throttle is being Controlled and (Engine Running or Ignition Voltage > Ignition Voltage > ) | Run/Crank voltage > 6.41                                         | 15 counts;<br>12.5 ms/count in the primary processor | Type A,<br>1 Trips |
|                                                                      |               |                                                                                                                                                                       | OR                                                                            |                 |                                                                                                                                 |                                                                  |                                                      |                    |
|                                                                      |               |                                                                                                                                                                       | Difference between modeled throttle position and measured throttle position > | 6.08 percent    | Ignition voltage failure is false (P1682)                                                                                       | TPS minimum learn is not active and Throttle is being Controlled |                                                      |                    |
|                                                                      |               |                                                                                                                                                                       | Throttle Position >                                                           | 36.00 percent   |                                                                                                                                 | Powertrain Relay voltage > 6.41                                  | 11 counts;<br>12.5 ms/count in the primary processor |                    |
|                                                                      |               |                                                                                                                                                                       | Throttle Position >                                                           | 35.00 percent   |                                                                                                                                 | Powertrain Relay voltage > 6.41<br><br>Reduced Power is True     | 11 counts;<br>12.5 ms/count in the primary processor |                    |

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| Component/<br>System             | Fault<br>Code | Monitor Description                                                                             | Malfunction Criteria                                                                                    | Threshold Value | Secondary Parameters | Enable Conditions                                                                                                                                                                                                                                                                 | Time Required | MIL<br>Illum.     |
|----------------------------------|---------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-----------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------|
| Throttle<br>return to<br>default | P2119         | Throttle unable to<br>return to default throttle<br>position after de-<br>energizing ETC motor. | (Normalized TPS1<br>Voltage ><br>AND<br>Normalizd TPS2 Voltage<br>><br>On the main processor)           | 1.7560          |                      | Throttle de-energized for<br>Actuator, Controller, or<br>Ignition Faults (P21104,<br>P2100, P2101, P2102,<br>P2103, P1682, P0068,<br>P16F3) No TPS circuit<br>faults PT Relay Voltage ><br>5.500<br><br>No 5V reference error or<br>fault for # 4 5V reference<br>circuit (P06A3) | 0.4969 s      | Type C,<br>No MIL |
|                                  |               |                                                                                                 | OR<br><br>(Normalized TPS1<br>Voltage <<br>AND<br>Normalizd TPS2 Voltage<br><<br>On the main processor) | 1.7590          | 1.4340               |                                                                                                                                                                                                                                                                                   |               |                   |
|                                  |               |                                                                                                 | (Normalized TPS1<br>Voltage ><br>AND<br>Normalizd TPS2 Voltage<br>><br>On the main processor)           | 1.7560          |                      | Throttle de-energized for<br>Battery Saver Mode<br><br>Engine not running No<br>TPS circuit faults PT<br>Relay Voltage > 5.500<br><br>No 5V reference error or<br>fault for # 4 5V reference<br>circuit (P06A3)                                                                   | 1.5000 s      |                   |
|                                  |               |                                                                                                 | OR<br><br>(Normalized TPS1<br>Voltage <<br>AND<br>Normalizd TPS2 Voltage<br><<br>On the main processor) | 1.7590          | 1.4340               | 1.4310                                                                                                                                                                                                                                                                            |               |                   |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                     | Fault<br>Code | Monitor Description                                                                      | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions                                                                                   | Time Required                                                               | MIL<br>Illum.   |
|----------------------------------------------------------|---------------|------------------------------------------------------------------------------------------|----------------------|-----------------|----------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------|
| Accelerator<br>Pedal<br>Position<br>(APP)<br>Sensor 1 Lo | P2122         | Detect a continuous or intermittent short or open in the APP sensor #1 on Main processor | APP1 Voltage <       | 0.4625          |                      | Run/Crank voltage > 6.41<br><br>No 5V reference error or fault for # 4 5V reference circuit (P06A3) | 19 / 39 counts or 14 counts continuous; 12.5 ms/count in the main processor | Type A, 1 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                     | Fault<br>Code | Monitor Description                                                                      | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions                                                                                   | Time Required                                                               | MIL<br>Illum.      |
|----------------------------------------------------------|---------------|------------------------------------------------------------------------------------------|----------------------|-----------------|----------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------|
| Accelerator<br>Pedal<br>Position<br>(APP)<br>Sensor 1 Hi | P2123         | Detect a continuous or intermittent short or open in the APP sensor #1 on Main processor | APP1 Voltage >       | 4.7500          |                      | Run/Crank voltage > 6.41<br><br>No 5V reference error or fault for # 4 5V reference circuit (P06A3) | 19 / 39 counts or 14 counts continuous; 12.5 ms/count in the main processor | Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                     | Fault<br>Code | Monitor Description                                                                      | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions                                                                                   | Time Required                                                               | MIL<br>Illum.   |
|----------------------------------------------------------|---------------|------------------------------------------------------------------------------------------|----------------------|-----------------|----------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------|
| Accelerator<br>Pedal<br>Position<br>(APP)<br>Sensor 2 Lo | P2127         | Detect a continuous or intermittent short or open in the APP sensor #2 on Main processor | APP2 Voltage <       | 0.3250          |                      | Run/Crank voltage > 6.41<br><br>No 5V reference error or fault for # 4 5V reference circuit (P0697) | 19 / 39 counts or 14 counts continuous; 12.5 ms/count in the main processor | Type A, 1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                     | Fault<br>Code | Monitor Description                                                                      | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions                                                                                   | Time Required                                                               | MIL<br>Illum.   |
|----------------------------------------------------------|---------------|------------------------------------------------------------------------------------------|----------------------|-----------------|----------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------|
| Accelerator<br>Pedal<br>Position<br>(APP)<br>Sensor 2 Hi | P2128         | Detect a continuous or intermittent short or open in the APP sensor #2 on Main processor | APP2 Voltage >       | 2.6000          |                      | Run/Crank voltage > 6.41<br><br>No 5V reference error or fault for # 4 5V reference circuit (P0697) | 19 / 39 counts or 14 counts continuous; 12.5 ms/count in the main processor | Type A, 1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                   | Fault<br>Code | Monitor Description                                                                                    | Malfunction Criteria                                                  | Threshold Value                                                                                                | Secondary Parameters | Enable Conditions                                                                                                                                            | Time Required                                                                 | MIL<br>Illum.      |
|--------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------|
| Throttle<br>Position (TP)<br>Sensor 1-2<br>Correlation | P2135         | Detects a continuous or intermittent correlation fault between TPS sensors #1 and #2 on Main processor | Difference between TPS1 displaced and TPS2 displaced >                | 6.797<br>% offset at min. throttle position with a linear threshold to<br>9.720<br>% at max. throttle position |                      | Run/Crank voltage > 6.41<br><br>No TPS sensor faults (P0122, P0123, P0222, P0223)<br><br>No 5V reference error or fault for # 4 5V reference circuit (P06A3) | 79 / 159 counts or 58 counts continuous; 3.125 ms/count in the main processor | Type A,<br>1 Trips |
|                                                        |               |                                                                                                        | Difference between (normalized min TPS1 ) and (normalized min TPS2) > | 5.000<br>% Vref                                                                                                |                      | Run/Crank voltage > 6.41<br><br>No TPS sensor faults (P0122, P0123, P0222, P0223)<br><br>No 5V reference error or fault for # 4 5V reference circuit (P06A3) | 79 / 159 counts or 58 counts continuous; 3.125 ms/count in the main processor |                    |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                   | Fault<br>Code | Monitor Description                                                                                    | Malfunction Criteria                                                  | Threshold Value                                                                                           | Secondary Parameters | Enable Conditions                                                                                                                                                            | Time Required                                                                            | MIL<br>Illum.      |
|------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------|
| Accelerator<br>Pedal<br>Position<br>(APP)<br>Sensor 1-2<br>Correlation | P2138         | Detects a continuous or intermittent correlation fault between APP sensors #1 and #2 on Main processor | Difference between APP1 displaced and APP2 displaced >                | 5.000<br>% offset at min. pedal position with a linear threshold to<br>10.001<br>% at max. pedal position |                      | Run/Crank voltage > 6.41<br><br>No APP sensor faults (P2122, P2123,P2127, P2128)<br><br>No 5V reference errors or faultst for # 3 & # 4 5V reference circuits (P06A3, P0697) | 19 / 39 counts intermittent or 15 counts continuous, 12.5 ms/count in the main processor | Type A,<br>1 Trips |
|                                                                        |               |                                                                                                        | Difference between (normalized min APP1 ) and (normalized min APP2) > | 5.000<br>% Vref                                                                                           |                      | Run/Crank voltage > 6.41<br><br>No APP sensor faults (P2122, P2123,P2127, P2128)<br><br>No 5V reference errors or faultst for # 3 & # 4 5V reference circuits (P06A3, P0697) | 19 / 39 counts intermittent or 15 counts continuous, 12.5 ms/count in the main processor |                    |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                       | Fault<br>Code | Monitor Description                                                                 | Malfunction Criteria                                                                    | Threshold Value                                           | Secondary Parameters               | Enable Conditions                                       | Time Required                                                              | MIL<br>Illum.      |
|------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------|--------------------|
| Injector 1<br>high side<br>circuit<br>shorted to<br>ground | P2147         | This DTC Diagnoses<br>Injector 1 high side<br>driver circuit for circuit<br>faults. | Voltage high across High<br>Side Driver during On<br>state indicates short to<br>ground | Short to Ground:<br>25 amp >= through<br>High Side Driver | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br><br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                      | Fault<br>Code | Monitor Description                                                                 | Malfunction Criteria                                                                | Threshold Value                                                    | Secondary Parameters               | Enable Conditions                                       | Time Required                                                              | MIL<br>Illum.      |
|-----------------------------------------------------------|---------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------|--------------------|
| Injector 1<br>high side<br>circuit<br>shorted to<br>power | P2148         | This DTC Diagnoses<br>Injector 1 high side<br>driver circuit for circuit<br>faults. | Voltage low across High<br>side drive during off state<br>indicates short to power. | Short to Power:<br>≤ 1 volt between signal<br>and controller power | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br><br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                       | Fault<br>Code | Monitor Description                                                                 | Malfunction Criteria                                                                    | Threshold Value                                           | Secondary Parameters               | Enable Conditions                                       | Time Required                                                              | MIL<br>Illum.      |
|------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------|--------------------|
| Injector 2<br>high side<br>circuit<br>shorted to<br>ground | P2150         | This DTC Diagnoses<br>Injector 2 high side<br>driver circuit for circuit<br>faults. | Voltage high across High<br>Side Driver during On<br>state indicates short to<br>ground | Short to Ground:<br>25 amp >= through<br>High Side Driver | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br><br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                      | Fault<br>Code | Monitor Description                                                                 | Malfunction Criteria                                                                | Threshold Value                                                    | Secondary Parameters               | Enable Conditions                                       | Time Required                                                              | MIL<br>Illum.      |
|-----------------------------------------------------------|---------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------|--------------------|
| Injector 2<br>high side<br>circuit<br>shorted to<br>power | P2151         | This DTC Diagnoses<br>Injector 2 high side<br>driver circuit for circuit<br>faults. | Voltage low across High<br>side drive during off state<br>indicates short to power. | Short to Power:<br>≤ 1 volt between signal<br>and controller power | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br><br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                       | Fault<br>Code | Monitor Description                                                                 | Malfunction Criteria                                                                    | Threshold Value                                           | Secondary Parameters               | Enable Conditions                                       | Time Required                                                              | MIL<br>Illum.      |
|------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------|--------------------|
| Injector 3<br>high side<br>circuit<br>shorted to<br>ground | P2153         | This DTC Diagnoses<br>Injector 3 high side<br>driver circuit for circuit<br>faults. | Voltage high across High<br>Side Driver during On<br>state indicates short to<br>ground | Short to Ground:<br>25 amp >= through<br>High Side Driver | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br><br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                      | Fault<br>Code | Monitor Description                                                                 | Malfunction Criteria                                                                | Threshold Value                                                    | Secondary Parameters               | Enable Conditions                                       | Time Required                                                              | MIL<br>Illum.      |
|-----------------------------------------------------------|---------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------|--------------------|
| Injector 3<br>high side<br>circuit<br>shorted to<br>power | P2154         | This DTC Diagnoses<br>Injector 3 high side<br>driver circuit for circuit<br>faults. | Voltage low across High<br>side drive during off state<br>indicates short to power. | Short to Power:<br>≤ 1 volt between signal<br>and controller power | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br><br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                       | Fault<br>Code | Monitor Description                                                                 | Malfunction Criteria                                                                    | Threshold Value                                           | Secondary Parameters               | Enable Conditions                                       | Time Required                                                              | MIL<br>Illum.      |
|------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------|--------------------|
| Injector 4<br>high side<br>circuit<br>shorted to<br>ground | P2156         | This DTC Diagnoses<br>Injector 4 high side<br>driver circuit for circuit<br>faults. | Voltage high across High<br>Side Driver during On<br>state indicates short to<br>ground | Short to Ground:<br>25 amp >= through<br>High Side Driver | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br><br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                      | Fault<br>Code | Monitor Description                                                                 | Malfunction Criteria                                                                | Threshold Value                                                    | Secondary Parameters               | Enable Conditions                                       | Time Required                                                              | MIL<br>Illum.      |
|-----------------------------------------------------------|---------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------|--------------------|
| Injector 4<br>high side<br>circuit<br>shorted to<br>power | P2157         | This DTC Diagnoses<br>Injector 4 high side<br>driver circuit for circuit<br>faults. | Voltage low across High<br>side drive during off state<br>indicates short to power. | Short to Power:<br>≤ 1 volt between signal<br>and controller power | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br><br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                       | Fault<br>Code | Monitor Description                                                                 | Malfunction Criteria                                                                    | Threshold Value                                               | Secondary Parameters               | Enable Conditions                                               | Time Required                                                              | MIL<br>Illum.      |
|------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------|------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------|--------------------|
| Injector 5<br>high side<br>circuit<br>shorted to<br>ground | P216B         | This DTC Diagnoses<br>Injector 5 high side<br>driver circuit for circuit<br>faults. | Voltage high across High<br>Side Driver during On<br>state indicates short to<br>ground | Short to Ground:<br>25 amp $\geq$ through<br>High Side Driver | Battery Voltage<br>Engine Run Time | $\geq$ 11 Volts<br>$\geq$ 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br><br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                      | Fault<br>Code | Monitor Description                                                                 | Malfunction Criteria                                                                | Threshold Value                                                    | Secondary Parameters               | Enable Conditions                                       | Time Required                                                              | MIL<br>Illum.      |
|-----------------------------------------------------------|---------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------|--------------------|
| Injector 5<br>high side<br>circuit<br>shorted to<br>power | P216C         | This DTC Diagnoses<br>Injector 5 high side<br>driver circuit for circuit<br>faults. | Voltage low across High<br>side drive during off state<br>indicates short to power. | Short to Power:<br>≤ 1 volt between signal<br>and controller power | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br><br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                       | Fault<br>Code | Monitor Description                                                                 | Malfunction Criteria                                                                    | Threshold Value                                               | Secondary Parameters               | Enable Conditions                                               | Time Required                                                              | MIL<br>Illum.      |
|------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------|------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------|--------------------|
| Injector 6<br>high side<br>circuit<br>shorted to<br>ground | P216E         | This DTC Diagnoses<br>Injector 6 high side<br>driver circuit for circuit<br>faults. | Voltage high across High<br>Side Driver during On<br>state indicates short to<br>ground | Short to Ground:<br>25 amp $\geq$ through<br>High Side Driver | Battery Voltage<br>Engine Run Time | $\geq$ 11 Volts<br>$\geq$ 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br><br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                      | Fault<br>Code | Monitor Description                                                                 | Malfunction Criteria                                                                | Threshold Value                                                    | Secondary Parameters               | Enable Conditions                                       | Time Required                                                              | MIL<br>Illum.      |
|-----------------------------------------------------------|---------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------|--------------------|
| Injector 6<br>high side<br>circuit<br>shorted to<br>power | P216F         | This DTC Diagnoses<br>Injector 6 high side<br>driver circuit for circuit<br>faults. | Voltage low across High<br>side drive during off state<br>indicates short to power. | Short to Power:<br>≤ 1 volt between signal<br>and controller power | Battery Voltage<br>Engine Run Time | >= 11 Volts<br>>= 0 Seconds<br><br>P062B not FA or TFTK | 10<br>failures out of<br>20<br>samples<br><br>100 ms /sample<br>Continuous | Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                           | Fault<br>Code | Monitor Description                                                                          | Malfunction Criteria                                                                                   | Threshold Value                | Secondary Parameters | Enable Conditions                                           | Time Required | MIL<br>Illum.      |
|------------------------------------------------|---------------|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|--------------------------------|----------------------|-------------------------------------------------------------|---------------|--------------------|
| Minimum<br>Throttle<br>Position Not<br>Learned | P2176         | TP sensors were not in the minmum learn window after multiple attempts to learn the minimum. | During TPS min learn on the Main processor, TPS Voltage ><br><br>AND<br><br>Number of learn attempts > | 0.5740<br><br><br>10<br>counts |                      | Run/Crank voltage > 6.41<br><br>TPS minimum learn is active | 2.0<br>secs   | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                     | Fault<br>Code | Monitor Description                                         | Malfunction Criteria | Threshold Value | Secondary Parameters                                          | Enable Conditions                                            | Time Required                                                      | MIL<br>Illum.      |
|----------------------------------------------------------|---------------|-------------------------------------------------------------|----------------------|-----------------|---------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------|--------------------|
| Intake Air<br>Temperature<br>Sensor 1 / 2<br>Correlation | P2199         | Detects a difference<br>between the IAT and<br>IAT2 sensors | ABS (IAT - IAT2)     | > 55.0 deg C    | Powertrain Relay Voltage<br>for a time<br><br>No Active DTCs: | >= 11.00 Volts<br>>= 0.9 seconds<br><br>PowertrainRelayFault | 40 failures out<br>of 50 samples<br><br>1 sample every<br>100 msec | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System            | Fault<br>Code | Monitor Description                                                                              | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                              | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Time Required                                                                                                                                                                                                                                                                                                                                                                | MIL<br>Illum.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                    |
|---------------------------------|---------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Bank 1 Air-Fuel Ratio Imbalance | P219A         | This monitor determines if a cylinder-to-cylinder air-fuel ratio imbalance is present on bank 1. | <p>Filtered Ratio &gt;</p> <p>Note: The input to this metric is the pre catalyst oxygen sensor voltage. This voltage is used to generate a Variance metric that represents the statistical variation of the O2 sensor voltage over a given engine cycle. This metric is proportional to the air-fuel ratio imbalance (variance is higher with an imbalance than without). Multiple samples are collected in making a decision.</p> <p>The observed Variance is dependant on engine speed and load and so each result is normalized for speed and load by comparing it to a known "good system" result for that speed and load, and generating a Ratio metric.</p> <p>The Ratio metric is calculated by selecting the appropriate threshold calibration from a 17x17 table (Supporting Table "<b>Variance Threshold Bank1</b>") and subtracting it from the measured Variance. The result is then divided by a normalizer calibration from another 17 x 17 table</p> | 1.22            | <p>If the diagnostic has reported a failure on the prior trip, the Filtered Ratio must fall below 1.04 in order to report a pass. This feature prevents the diagnostic from toggling between failing and passing when the Filtered Ratio remains near the initial failure threshold of 1.22 .</p> | <p>System Voltage</p> <p>Fuel Level</p> <p>Engine Coolant Temperature</p> <p>Cumulative engine run time</p> <p>Diagnostic enabled at Idle (regardless of other operating conditions)</p> <p>Engine speed range</p> <p>Engine speed delta during a short term sample period</p> <p>Mass Airflow (MAF) range</p> <p>Cumulative delta MAF during a short term sample period</p> <p>Filtered MAF delta between samples<br/>Note: first order lag filter coefficient applied to MAF = 0.050</p> <p>Air Per Cylinder (APC)</p> <p>APC delta during short term sample period</p> <p>Filtered APC delta between samples</p> | <p>no lower than 11.0 Volts for more than 0.2 seconds</p> <p>&gt; 10.0 percent AND no fuel level sensor fault</p> <p>&gt; -20 degrees C</p> <p>&gt; 120.0 seconds</p> <p>No</p> <p>1,600 to 4,000 RPM</p> <p>&lt; 100 RPM</p> <p>0 to 1,000 g/s</p> <p>&lt; 5 g/s</p> <p>&lt; 0.60 g/s</p> <p>165 to 700 mg/cylinder</p> <p>&lt; 75 mg/cylinder</p> <p>&lt; 3.50 percent</p> | <p>Minimum of 1 test per trip, up to 11 tests per trip during RSR or FIR.</p> <p>The front O2 sensor voltage is sampled once per cylinder event. Therefore, the time required to complete a single test (when all enable conditions are met) decreases as engine speed increases. For example, 6.00 seconds of data is required at 1000 rpm while double this time is required at 500 rpm and half this time is required at 2000 rpm. This data is collected only when enable conditions are met, and as such significantly more operating time is required than is indicated above. Generally, a report will be</p> | Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Enable Conditions                                                                                                                                                                                                                                 | Time Required                                                                                                              | MIL<br>Illum. |
|----------------------|---------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|---------------|
|                      |               |                     | <p>(Supporting Table "Normalizer Bank1"). This quotient is then multiplied by a quality factor calibration from a 17 x 17 table (Supporting Table "Quality Factor Bank1"). This result is referred to as the Ratio. Note that the quality factor ranges between 0 and 1 and represents robustness to false diagnosis in the current operating region. Regions with low quality factors are not used.</p> <p>Finally, a EWMA filter is applied to the Ratio metric to generate the Filtered Ratio malfunction criteria metric. Generally, a normal system will result in a negative Filtered Ratio while a failing system will result in a positive Filtered Ratio.</p> <p>The range of the Filtered Ratio metric is application specific since both the emissions sensitivity and relationship between imbalance and the Variance metric are application specific.</p> <p>Some applications may need to command a unique cam phaser value before performing the</p> |                 | <p>Note: first order lag filter coefficient applied to APC = 0.250</p> <p>Spark Advance</p> <p>Throttle Area (percent of max)</p> <p>Intake Cam Phaser Angle</p> <p>Exhaust Cam Phaser Angle</p> <p>Quality Factor (QF)<br/>QF calibrations are located in a 17x17 lookup table versus engine speed and load (Supporting Table "Quality Factor Bank1"). QF values less than "1" indicate that we don't have 4sigma/2sigma robustness in that region. The quality of the data is determined via statistical analysis of Variance data.</p> <p>Fuel Control Status<br/>Closed Loop and Long Term FT Enabled for:</p> <p>AIR pump not on<br/>CASE learn not active<br/>EGR - no device control, no intrusive diagnostics<br/>EVAP - no device control, no intrusive diagnostics<br/>Engine OverSpeed</p> | <p>-100 to 70 degrees</p> <p>0 to 200 percent</p> <p>0 to 50 degrees</p> <p>0 to 50 degrees</p> <p>&gt;= 0.99</p> <p>&gt;= 5.0 seconds<br/>(Please see "Closed Loop Enable Criteria" and "Long Term FT Enable Criteria" in Supporting Tables)</p> | <p>made within 5 minutes of operation.</p> <p>For RSR or FIR, 22 tests must complete before the diagnostic can report.</p> |               |



13 OBDG05A Engine Diagnostics

| Component/<br>System            | Fault<br>Code | Monitor Description                                                                              | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Enable Conditions                                                             | Time Required   | MIL<br>Illum.      |
|---------------------------------|---------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------|--------------------|
| Bank 2 Air-Fuel Ratio Imbalance | P219B         | This monitor determines if a cylinder-to-cylinder air-fuel ratio imbalance is present on bank 2. | <p>Filtered Ratio &gt;</p> <p>Note: The input to this metric is the pre catalyst oxygen sensor voltage. This voltage is used to generate a Variance metric that represents the statistical variation of the O2 sensor voltage over a given engine cycle. This metric is proportional to the air-fuel ratio imbalance (variance is higher with an imbalance than without). Multiple samples are collected in making a decision.</p> <p>The observed Variance is dependant on engine speed and load and so each result is normalized for speed and load by comparing it to a known "good system" result for that speed and load, and generating a Ratio metric.</p> <p>The Ratio metric is calculated by selecting the appropriate threshold calibration from a 17x17 table (Supporting Table "<b>Variance Threshold Bank2</b>") and subtracting it from the measured Variance. The result is then divided by a normalizer calibration from another 17 x 17 table</p> | 1.11            | <p>See Bank 1 (P219A) Secondary Parameters and Enable Conditions.</p> <p>Quality Factor (QF)<br/>QF calibrations are located in a 17x17 lookup table versus engine speed and load (Supporting Table "<b>Quality Factor Bank2</b>"). QF values less than "1" indicate that we don't have 4sigma/2sigma robustness in that region. The quality of the data is determined via statistical analysis of Variance data.</p> <p>Rapid Step Response (RSR): RSR will trigger if the Ratio result from the last test is<br/>AND it exceeds the last Filtered ratio by<br/>Once triggered, the filtered ratio is reset to:</p> <p>Fast Initial Response (FIR): FIR will trigger when an NVM reset or code clear occurs. Once triggered, the filtered ratio is reset to:</p> | <p>&gt;= 0.99</p> <p>&gt;= 1.14</p> <p>&gt;= 1.20</p> <p>0.00</p> <p>0.00</p> | See Bank 1 info | Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Threshold Value | Secondary Parameters | Enable Conditions | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|-------------------|---------------|---------------|
|                      |               |                     | <p>(Supporting Table "Normalizer Bank2"). This quotient is then multiplied by a quality factor calibration from a 17 x 17 table (Supporting Table "Quality Factor Bank2"). This result is referred to as the Ratio. Note that the quality factor ranges between 0 and 1 and represents robustness to false diagnosis in the current operating region. Regions with low quality factors are not used.</p> <p>Finally, a EWMA filter is applied to the Ratio metric to generate the Filtered Ratio malfunction criteria metric. Generally, a normal system will result in a negative Filtered Ratio while a failing system will result in a positive Filtered Ratio.</p> <p>The range of the Filtered Ratio metric is application specific since both the emissions sensitivity and relationship between imbalance and the Variance metric are application specific.</p> <p>Some applications may need to command a unique cam phaser value before performing the</p> |                 |                      |                   |               |               |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria                                                                                                                         | Threshold Value | Secondary Parameters | Enable Conditions | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|-------------------|---------------|---------------|
|                      |               |                     | above calculations since cam phasing has been shown to have an impact on overall signal quality. This application Does Not Use this feature. |                 |                      |                   |               |               |
|                      |               |                     |                                                                                                                                              |                 |                      |                   |               |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                | Fault<br>Code | Monitor Description                                                                                 | Malfunction Criteria                                                                                               | Threshold Value                 | Secondary Parameters                                                                                                              | Enable Conditions                                                                                                                                                               | Time Required                                                   | MIL<br>Illum.   |
|---------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------|
| Barometric Pressure (BARO) Sensor Performance (naturally aspirated) | P2227         | Compares baro sensor to the calculated baro estimate (part throttle calculation or unthrottled MAP) | Difference between baro sensor reading and estimated baro when distance since last estimated baro update           | > 15.0 kPa<br><br><= 1.24 miles | Engine Run Time<br><br>No Active DTCs:                                                                                            | > 0.00 seconds<br><br>AmbPresSnsrCktFA<br>ECT_Sensor_Ckt_FA<br>IAT_SensorFA<br>MAF_SensorFA<br>AfterThrottlePressureFA<br>TPS_FA<br>TPS_Performance_FA<br>VehicleSpeedSensor_FA | 320 failures out of 400 samples<br><br>1 sample every 12.5 msec | Type B, 2 Trips |
|                                                                     |               |                                                                                                     | OR<br><br>Difference between baro sensor reading and estimated baro when distance since last estimated baro update | > 20.0 kPa<br><br>> 1.24 miles  | Time between current ignition cycle and the last time the engine was running<br><br>Engine is not rotating<br><br>No Active DTCs: | > 409.6 seconds                                                                                                                                                                 | 4 failures out of 5 samples<br><br>1 sample every 12.5 msec     |                 |
|                                                                     |               |                                                                                                     | Barometric Pressure<br>OR<br>Barometric Pressure                                                                   | < 50.0 kPa<br><br>> 115.0 kPa   | No Pending DTCs:                                                                                                                  | MAP_SensorCircuitFP<br>AAP_SnsrCktFP<br>AAP2_SnsrCktFP                                                                                                                          |                                                                 |                 |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                     | Fault<br>Code | Monitor Description                                                                        | Malfunction Criteria | Threshold Value                                    | Secondary Parameters | Enable Conditions | Time Required                                                   | MIL<br>Illum.      |
|--------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------|----------------------|-------------------|-----------------------------------------------------------------|--------------------|
| Barometric Pressure (BARO) Sensor Circuit Low (non-boosted applications) | P2228         | Detects a continuous short to low or open in either the signal circuit or the BARO sensor. | BARO Voltage         | < 40.0 % of 5 Volt Range<br>(2.0 Volts = 50.9 kPa) | Engine Run Time      | > 0.00 seconds    | 320 failures out of 400 samples<br><br>1 sample every 12.5 msec | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                   | Fault<br>Code | Monitor Description                                  | Malfunction Criteria                                                                                                                                                                              | Threshold Value                                 | Secondary Parameters | Enable Conditions                                                                                                                                         | Time Required                                                              | MIL<br>Illum.      |
|--------------------------------------------------------|---------------|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------|
| Barometric Pressure (BARO) Sensor Circuit Intermittent | P2230         | Detects a noisy or erratic barometric pressure input | String Length<br><br>Where:<br>"String Length" = sum of<br>"Diff" calculated over<br><br>And where:<br>"Diff" = ABS(current<br>BARO reading - BARO<br>reading from 12.5<br>milliseconds previous) | > 100 kPa<br><br>80 consecutive BARO<br>samples | No Active DTCs:      | AmbPresSnsrCktFA<br>ECT_Sensor_Ckt_FA<br>IAT_SensorFA<br>MAF_SensorFA<br>AfterThrottlePressureFA<br>TPS_FA<br>TPS_Performance_FA<br>VehicleSpeedSensor_FA | 4 failures out of<br>5 samples<br><br>Each sample<br>takes 1.00<br>seconds | Type B,<br>2 Trips |



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| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Enable Conditions                                                                                                                                                                                                                                                                                                                            | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Vehicle Speed to initially enable test<br>Vehicle Speed range to keep test enabled (after initially enabled)<br><br>Closed loop integral<br>Closed Loop Active<br>Evap<br>Ethanol<br>Post fuel cell<br>EGR Intrusive diagnostic<br>All post sensor heater delays<br>O2S Heater (post sensor) on Time<br><br>Predicted Catalyst temp<br>Fuel State<br><br>=====<br>All of the above met for at least 3.0 seconds, and then the Force Cat Rich intrusive stage is requested.<br>=====<br>During Stuck Lean test the following must stay TRUE or the test will abort:<br>0.96 ≤ Fuel EQR ≤ 1.08 | $44.1 \leq \text{MPH} \leq 80.2$<br><br>$39.8 \leq \text{MPH} \leq 82.0$<br><br>$0.90 \leq \text{C/L Int} \leq 1.07$<br>= TRUE<br>not in control of purge<br>not in estimate mode<br>= enabled<br>= not active<br><br>= not active<br><br>$\geq 180.0 \text{ sec}$<br><br>$500 \leq ^\circ\text{C} \leq 980$<br>= DFCE possible<br><br>===== |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                              |               |               |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                      | Enable Conditions                                                                                                                                                                                                                           | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Power Take Off<br>EGR Intrusive diagnostic<br>All post sensor heater<br>delays<br>O2S Heater (post sensor)<br>on Time<br><br>Predicted Catalyst temp<br>Fuel State<br><br>DTC's Passed<br><br>=====<br>After above conditions are<br>met: DFCO mode is<br>continued (wo driver<br>initiated pedal input). | = not active<br>= not active<br>= not active<br>≥ 180.0 sec<br><br>500 ≤ °C ≤ 980<br>DFCO possible<br><br>= P2270 (and P2272 if<br>applicable)<br>= P013E (and P014A if<br>applicable)<br>= P013A (and P013C if<br>applicable)<br><br>===== |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                             |               |               |



| Component/<br>System                                 | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                                                        | Malfunction Criteria                                                                                               | Threshold Value                                     | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                     | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Time Required                                                                                                                                                                                                    | MIL<br>Illum.      |
|------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| O2 Sensor<br>Signal Stuck<br>Lean Bank 2<br>Sensor 2 | P2272         | This DTC determines if the post catalyst O2 sensor is stuck in a normal lean voltage range and thereby can no longer be used for post oxygen sensor fuel control or for catalyst monitoring. The diagnostic is an intrusive test (during coast) which increases the delivered fuel to achieve the required rich threshold. | Post O2 sensor signal<br><br>AND<br><br>The Accumulated mass air flow monitored during the Stuck Lean Voltage Test | < 800 mvolts<br><br><br><br><br><br><br>> 68 grams. | No Active DTC's<br><br><br><br><br><br>B2S2 DTC's Not Active this key cycle<br><br>System Voltage<br>ICAT MAT Burnoff delay<br><br>Green O2S Condition<br><br><br><br><br><br>Low Fuel Condition Diag<br>Pedal position<br><br>Engine Speed to initially<br>enable test<br>Engine Speed range to<br>keep test enabled (after<br>initially enabled)<br><br>Engine Airflow | TPS_ThrottleAuthorityDef<br>aulted<br>ECT_Sensor_FA<br>IAT_SensorFA<br>MAF_SensorFA<br>MAP_SensorFA<br>AIR System FA<br>FuelInjectorCircuit_FA<br>FuelTrimSystemB1_FA<br>FuelTrimSystemB2_FA<br>EngineMisfireDetected_F<br>A<br>EthanolCompositionSens<br>or_FA<br>P013C, P013D, P014A,<br>P014B, P2272 or P2273<br><br>10.0 < Volts < 32.0<br>= Not Valid<br><br>= Not Valid, See definition<br>of <b>Multiple DTC<br/>Use_Green Sensor<br/>Delay Criteria - Airflow<br/>and Multiple DTC<br/>Use_Green Sensor<br/>Delay Criteria - Limit</b><br>for the following locations:<br>B1S2, B2S2 in Supporting<br>Tables tab.<br><br>= False<br>≤ 100.0 %<br><br>1,150 ≤ RPM ≤ 2,325<br><br>1,100 ≤ RPM ≤ 2,375<br><br>3 ≤ gps ≤ 11 | Frequency:<br>Once per trip<br>Note: if<br>NaPOPD_b_Res<br>etFastRespFunc<br>= FALSE for the<br>given Fuel Bank<br>OR<br>NaPOPD_b_Rap<br>idResponseActiv<br>e = TRUE,<br>multiple tests per<br>trip are allowed. | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Enable Conditions                                                                                                                                                                                                                                                                                                                            | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Vehicle Speed to initially enable test<br>Vehicle Speed range to keep test enabled (after initially enabled)<br><br>Closed loop integral<br>Closed Loop Active<br>Evap<br>Ethanol<br>Post fuel cell<br>EGR Intrusive diagnostic<br>All post sensor heater delays<br>O2S Heater (post sensor) on Time<br><br>Predicted Catalyst temp<br>Fuel State<br><br>=====<br>All of the above met for at least 3.0 seconds, and then the Force Cat Rich intrusive stage is requested.<br>=====<br>During Stuck Lean test the following must stay TRUE or the test will abort: $0.96 \leq \text{Fuel EQR} \leq 1.08$ | $44.1 \leq \text{MPH} \leq 80.2$<br><br>$39.8 \leq \text{MPH} \leq 82.0$<br><br>$0.90 \leq \text{C/L Int} \leq 1.07$<br>= TRUE<br>not in control of purge<br>not in estimate mode<br>= enabled<br>= not active<br><br>= not active<br><br>$\geq 180.0 \text{ sec}$<br><br>$500 \leq ^\circ\text{C} \leq 980$<br>= DFCE possible<br><br>===== |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                              |               |               |



13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                  | Enable Conditions                                                                                                                                                                                                                         | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Power Take Off<br>EGR Intrusive diagnostic<br>All post sensor heater<br>delays<br>O2S Heater (post sensor)<br>on Time<br><br>Predicted Catalyst temp<br>Fuel State<br>DTC's Passed<br><br>=====<br>After above conditions are<br>met: DFCO mode is<br>continued (wo driver<br>initiated pedal input). | = not active<br>= not active<br>= not active<br>≥ 180.0 sec<br><br>500 ≤ °C ≤ 980<br>= DFCO possible<br>= P2270 (and P2272 if<br>applicable)<br>= P013E (and P014A if<br>applicable)<br>= P013A (and P013C if<br>applicable)<br><br>===== |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                           |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System    | Fault<br>Code | Monitor Description                                                                         | Malfunction Criteria                | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Enable Conditions                                                                                                                                                                                      | Time Required                                      | MIL<br>Illum.      |
|-------------------------|---------------|---------------------------------------------------------------------------------------------|-------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|--------------------|
| SIDI High Pressure Pump | P228C         | This DTC Diagnoses the measured fuel rail pressure bias too low from desired fuel pressure. | Desired Pressure - Measure Pressure | >= 3.00 Mpa     | Battery Voltage<br><br>Low Side Fuel Pressure<br><br>Engine Run Time<br><br>Additional Enable Conditions:<br>All must be true (High Pressure Pump is enabled and High Fuel pressure sensor ckt is Not (FA,FP or TFTKO) and High Pressure fuel pump ckt is Not (FA,FP or TFTKO) and Cam or Crank Sensor Not FA and IAT,IAT2,ECT Not FA and Low side Fuel Pump Relay ckt Not FA and Estimate fuel rail pressure is valid and Green Engine (In assembly plant) is not enabled and Not if low fuel condition and Low side Fuel Pump is on and Injector Flow Test is not active and Device control commanded pressure is false and Device control pump ckt enabled on is false and Engine movement | >= 11 Volts<br><br>> 0.275 MPa<br><br>>=<br>KtFHPD_t_PumpCntrlEng RunThrsh (see supporting tables)<br><br>Enabled when a code clear is not active or not exiting device control Engine is not cranking | Pressure Error - 750 0 failures out of 938 samples | Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                    | Enable Conditions                                         | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | detected is true and<br>Manufacturers enable<br>counter is 0)<br>Flex Fuel Sensor Not FA<br>Ignition voltage out of<br>correlation error(P1682)<br>not active<br><br>Barometric Pressure<br>Inlet Air Temp<br>Fuel Temp | >= 70.0 KPA<br>>= -10.0 degC<br>-10 <=Temp degC <=<br>100 |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                         |                                                           |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System    | Fault<br>Code | Monitor Description                                                                         | Malfunction Criteria                | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Enable Conditions                                                                                                                                                                                      | Time Required                                    | MIL<br>Illum.   |
|-------------------------|---------------|---------------------------------------------------------------------------------------------|-------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|-----------------|
| SIDI High Pressure Pump | P228D         | This DTC Diagnoses the measured fuel rail pressure bias too high from desired fuel pressure | Desired Pressure - Measure Pressure | <= -3.00 Mpa    | Battery Voltage<br><br>Low Side Fuel Pressure<br><br>Engine Run Time<br><br>Additional Enable Conditions:<br>All must be true (High Pressure Pump is enabled and High Fuel pressure sensor ckt is Not (FA,FP or TFTKO) and High Pressure fuel pump ckt is Not (FA,FP or TFTKO) and Cam or Crank Sensor Not FA and IAT,IAT2,ECT Not FA and Low side Fuel Pump Relay ckt Not FA and Estimate fuel rail pressure is valid and Green Engine (In assembly plant) is not enabled and Not if low fuel condition and Low side Fuel Pump is on and Injector Flow Test is not active and Device control commanded pressure is false and Device control pump ckt enabled on is false and | >= 11 Volts<br><br>> 0.275 MPa<br><br>>=<br>KtFHPD_t_PumpCntrlEng RunThrsh (see supporting tables)<br><br>Enabled when a code clear is not active or not exiting device control Engine is not cranking | Pressure Error - 750 failures out of 938 samples | Type A, 1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                      | Enable Conditions                                          | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | Engine movement<br>detected is true<br>andManufacturers enable<br>counter is 0)<br>Flex Fuel Sensor Not FA<br>Ignition voltage out of<br>correlation error(P1682)<br>not active<br><br>Barometric Pressure<br>Inlet Air Temp<br>Fuel Temp | >= 70.0 KPA<br>>= -10.0 DegC<br>-10 <= Temp degC <=<br>100 |               |               |
|                      |               |                     |                      |                 |                                                                                                                                                                                                                                           |                                                            |               |               |



### 13 OBDG05A Engine Diagnostics

| Component/<br>System                        | Fault<br>Code | Monitor Description                                    | Malfunction Criteria                                                                                                                                                                                                                                                                                                                                                       | Threshold Value                                                                                                                                                                                                                                 | Secondary Parameters                                                                                                                                                                   | Enable Conditions                                                                                                    | Time Required                                                                                                                                                                                                                                                                                                                                    | MIL<br>Illum.      |
|---------------------------------------------|---------------|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Transmission Control Torque Request Circuit | P2544         | Determines if the torque request from the TCM is valid | Protect error - Serial Communication message - (\$199 - PTEI3)<br><br>OR<br><br>Rolling count error - Serial Communication message (\$199 - PPEI3) rolling count value<br><br>OR<br><br>Range Error - Serial Communication message - (\$199 - PTEI3) TCM Requested Torque Increase<br><br>OR<br><br>Multi-transition error - Trans torque intervention type request change | Message <> two's complement of message<br><br><br><br>Message <> previous message rolling count value + one<br><br><br><br>> 360 Nm<br><br><br><br>Requested torque intervention type toggles from not increasing request to increasing request | Diagnostic enabled/<br>disabled<br><br><br>Power Mode<br><br><br>Ignition Voltage<br><br><br>Engine Running<br>Run/Crank Active<br><br><br>No Serial communication loss to TCM (U0101) | Enabled<br><br><br>= Run<br><br><br>> 6.41 volts<br><br><br>= True<br>> 0.50 Sec<br><br><br>No loss of communication | >= 16 Protect errors during key cycle.<br><br>Performed on every received message<br><br>>= 6 Rolling count errors out of 10 samples.<br><br>Performed on every received message<br><br>>= 6 range errors out of 10 samples.<br><br>Performed on every received message<br><br>>= 4 multi-transitions out of 5 samples. Performed every 200 msec | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                   | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Malfunction Criteria                                                                                                                                                             | Threshold Value                            | Secondary Parameters | Enable Conditions | Time Required                                                                                                                                                                                                                                                                    | MIL<br>Illum.      |
|--------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Control<br>Module<br>Power Off<br>Timer<br>Performance | P262B         | <p>This DTC determines if the hardware timer does not initialize or count properly. There are two tests to ensure proper functioning of the timer: Count Up Test (CUT) and Range Test (RaTe).</p> <p>Count Up Test (CUT): Verifies that the HWIO timer is counting up with the proper increment.</p> <p>Range Test (RaTe): When the run/crank is not active both the hardware and mirror timers are started. The timers are compared when module shutdown is initiated or run/crank becomes active.</p> | <p>Count Up Test:<br/>Time difference between the current read and the previous read of the timer</p> <p>Range Test:<br/>The variation of the HWIO timer and mirror timer is</p> | <p>&gt; 1.50 seconds</p> <p>&gt; 25 %.</p> |                      |                   | <p>Count Up Test:<br/>4 failures out of 20 samples</p> <p>1 sec / sample</p> <p>Continuous while run/crank is not active and until controller shutdown is initiated.</p> <p>Range Test:<br/>Once per trip when controller shutdown is initiated or run/crank becomes active.</p> | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                       | Fault<br>Code | Monitor Description                                                                          | Malfunction Criteria                                            | Threshold Value                                                            | Secondary Parameters                                        | Enable Conditions  | Time Required                                        | MIL<br>Illum.                                                                                                     |
|------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------|--------------------|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Malfunction Indicator Lamp (MIL) Control Circuit (ODM) Low | P263A         | Diagnoses the malfunction indicator lamp control low side driver circuit for circuit faults. | Voltage low during driver off state (indicates short-to-ground) | Short to ground:<br>≤ 0.5 Ω impedance between signal and controller ground | Run/Crank Voltage<br><br>Remote Vehicle Start is not active | Voltage ≥ 11 volts | 20 failures out of 25 samples<br><br>250 ms / sample | Type B,<br>No MIL<br><br>NO MIL<br><br>Note: In certain controllers P0650 may also set (MIL Control Open Circuit) |

13 OBDG05A Engine Diagnostics

| Component/<br>System                             | Fault<br>Code | Monitor Description                            | Malfunction Criteria                                                    | Threshold Value                                                 | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Enable Conditions                                                                                                                                                                                                                                       | Time Required                      | MIL<br>Illum.      |
|--------------------------------------------------|---------------|------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------------|
| Control<br>Module<br>Communicati<br>on Bus A Off | U0073         | This DTC monitors for<br>a BUS A off condition | Bus off failures exceeds<br><br>before the sample time of<br>is reached | 5 counts<br>(equivalent to 0.06<br>seconds)<br><br>0.56 seconds | General Enable Criteria:<br><br>U0073<br><br>Normal CAN transmission<br>on Bus A<br><br>Device Control<br><br>High Voltage Virtual<br>Network Management<br><br>Ignition Voltage Criteria:<br><br>Ignition voltage<br><br>Power Mode<br><br>Off Cycle Enable Criteria:<br><br>KeCAND_b_OffKeyCycle<br>DiagEnbl<br><br>Ignition Accessory Line<br>and<br>Battery Voltage<br><br>General Enable Criteria<br>and either Ignition Voltage<br>Criteria or Off Cycle<br>Enable Criteria met for ><br>3.0000 seconds<br><br>CAN hardware is bus<br>OFF for | Not Active on Current Key<br>Cycle<br><br>Enabled<br><br>Not Active<br><br>Not Active<br><br>>= 11.00<br>or<br>>= 6.41<br><br>= run<br><br>= 0<br>( 1 indicates enabled)<br><br>= Active<br><br>> 11.00<br><br><br><br><br><br><br><br>> 0.1125 seconds | Diagnostic runs<br>in 12.5 ms loop | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System               | Fault<br>Code | Monitor Description                                                                | Malfunction Criteria                                                                                               | Threshold Value | Secondary Parameters                           | Enable Conditions               | Time Required                   | MIL<br>Illum.      |
|------------------------------------|---------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------|------------------------------------------------|---------------------------------|---------------------------------|--------------------|
| Lost<br>Communicati<br>on With TCM | U0101         | This DTC monitors for a loss of communication with the transmission control module | Message is not received from controller for                                                                        |                 | General Enable Criteria:                       |                                 | Diagnostic runs in 12.5 ms loop | Type B,<br>2 Trips |
|                                    |               |                                                                                    | Message \$0AB                                                                                                      | ≥ 10.0 seconds  | U0073                                          | Not Active on Current Key Cycle |                                 |                    |
|                                    |               |                                                                                    | Message \$0BD                                                                                                      | ≥ 10.0 seconds  | Normal CAN transmission on Bus A               | Enabled                         |                                 |                    |
|                                    |               |                                                                                    | Message \$0C7                                                                                                      | ≥ 10.0 seconds  | Device Control                                 | Not Active                      |                                 |                    |
|                                    |               |                                                                                    | Message \$0F9                                                                                                      | ≥ 10.0 seconds  | High Voltage Virtual Network Management        | Not Active                      |                                 |                    |
|                                    |               |                                                                                    | Message \$189                                                                                                      | ≥ 10.0 seconds  | Ignition Voltage Criteria:                     |                                 |                                 |                    |
|                                    |               |                                                                                    | Message \$199                                                                                                      | ≥ 10.0 seconds  | Ignition voltage                               | ≥ 11.00<br>or<br>≥ 6.41         |                                 |                    |
|                                    |               |                                                                                    | Message \$19D                                                                                                      | ≥ 10.0 seconds  |                                                |                                 |                                 |                    |
|                                    |               |                                                                                    | Message \$1AF                                                                                                      | ≥ 10.0 seconds  | Power Mode                                     | = run                           |                                 |                    |
|                                    |               |                                                                                    | Message \$1BE                                                                                                      | ≥ 10.0 seconds  | Off Cycle Enable Criteria:                     |                                 |                                 |                    |
|                                    |               |                                                                                    | Message \$1BF                                                                                                      | ≥ 10.0 seconds  | KeCAND_b_OffKeyCycle<br>DiagEnbl               | = 0<br>(1 indicates enabled)    |                                 |                    |
|                                    |               |                                                                                    | Message \$1F5                                                                                                      | ≥ 10.0 seconds  |                                                |                                 |                                 |                    |
|                                    |               |                                                                                    | Message \$4C9                                                                                                      | ≥ 10.0 seconds  | Ignition Accessory Line and<br>Battery Voltage | = Active<br>> 11.00             |                                 |                    |
|                                    |               |                                                                                    | General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for > 3.0000 seconds |                 |                                                |                                 |                                 |                    |
|                                    |               |                                                                                    | Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is                          |                 |                                                |                                 |                                 |                    |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                   | Enable Conditions                                                                       | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------------------------|-----------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | not active for<br><br>U0101<br><br>TCM | > 0.4000 seconds<br><br>Not Active on Current Key<br>Cycle<br><br>is present on the bus |               |               |
|                      |               |                     |                      |                 |                                        |                                                                                         |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                             | Fault<br>Code | Monitor Description                                                             | Malfunction Criteria                                                                  | Threshold Value                              | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Enable Conditions                                                                                                                                                                              | Time Required                   | MIL<br>Illum.      |
|------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|--------------------|
| Lost<br>Communicati<br>on With Fuel<br>Pump<br>Control<br>Module | U0109         | This DTC monitors for a loss of communication with the fuel pump control module | Message is not received from controller for<br><br>Message \$1EB<br><br>Message \$4D9 | <br><br>≥ 10.0 seconds<br><br>≥ 10.0 seconds | General Enable Criteria:<br><br>U0073<br><br>Normal CAN transmission on Bus A<br><br>Device Control<br><br>High Voltage Virtual Network Management<br><br>Ignition Voltage Criteria:<br><br>Ignition voltage<br><br>Power Mode<br><br>Off Cycle Enable Criteria:<br><br>KeCAND_b_OffKeyCycle DiagEnbl<br><br>Ignition Accessory Line and Battery Voltage<br><br>General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for > 3.0000 seconds<br><br>Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is | Not Active on Current Key Cycle<br><br>Enabled<br><br>Not Active<br><br>Not Active<br><br>≥ 11.00<br>or<br>≥ 6.41<br><br>= run<br><br>= 0<br>( 1 indicates enabled)<br><br>= Active<br>> 11.00 | Diagnostic runs in 12.5 ms loop | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                           | Enable Conditions                                                                       | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------------------------------------------------|-----------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | not active for<br><br>U0109<br><br>Fuel Pump Control<br>Module | > 0.4000 seconds<br><br>Not Active on Current Key<br>Cycle<br><br>is present on the bus |               |               |
|                      |               |                     |                      |                 |                                                                |                                                                                         |               |               |



### 13 OBDG05A Engine Diagnostics

**Unique DTCs  
2 of 2 SECTIONS**

| Component/<br>System                         | Fault<br>Code | Monitor Description                          | Malfunction Criteria                 | Threshold Value | Secondary Parameters | Enable Conditions | Time Required                                                 | MIL<br>Illum.      |
|----------------------------------------------|---------------|----------------------------------------------|--------------------------------------|-----------------|----------------------|-------------------|---------------------------------------------------------------|--------------------|
| Fuel<br>Composition<br>Sensor<br>Circuit Low | P0178         | Detects Out of Range<br>Low Frequency Signal | Flex Fuel Sensor Output<br>Frequency | < 45 Hertz      | Powertrain Relay     | > 11.0 Volts      | 50 failures out<br>of 63 samples<br>100 ms loop<br>Continuous | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                          | Fault<br>Code | Monitor Description                           | Malfunction Criteria                 | Threshold Value    | Secondary Parameters | Enable Conditions | Time Required                                                 | MIL<br>Illum.      |
|-----------------------------------------------|---------------|-----------------------------------------------|--------------------------------------|--------------------|----------------------|-------------------|---------------------------------------------------------------|--------------------|
| Fuel<br>Composition<br>Sensor<br>Circuit High | P0179         | Detects Out of Range<br>High Frequency Signal | Flex Fuel Sensor Output<br>Frequency | > 155 Hertz <= 185 | Powertrain Relay     | > 11.0 Volts      | 50 failures out<br>of 63 samples<br>100 ms loop<br>Continuous | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                | Fault<br>Code | Monitor Description                                                                      | Malfunction Criteria                                                    | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Enable Conditions                                                                                                                                                                          | Time Required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | MIL<br>Illum.            |
|-----------------------------------------------------|---------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Fuel Pressure Sensor "B" Circuit Range/ Performance | P018B         | This DTC detects a fuel pressure sensor response stuck within the normal operating range | Absolute value of fuel pressure change as sensed during intrusive test. | <= 30 kPa       | 1. FRP Circuit Low DTC (P018C)<br><br>2. FRP Circuit High DTC (P018D)<br><br>3. FuelPump Circuit Low DTC (P0231)<br><br>4. FuelPump Circuit High DTC (P0232)<br><br>5. FuelPump Circuit Open DTC (P023F)<br><br>6. Reference Voltage DTC (P0641)<br><br>7. Fuel Pump Control Module Driver Over-temperature DTC (P064A)<br><br>8. Control Module Internal Performance DTC (P0606)<br><br>9. Engine run time<br><br>10. Emissions fuel level (PPEI \$3FB)<br><br>11. Fuel pump control | Not active<br><br>Not active<br>Not active<br>Not active<br>Not active<br>Not active<br>Not active<br>Not low<br>Enabled<br>Normal or FRP rationality control<br>> 0.047 g/s<br>Not failed | Frequency:<br><br>Continuous; 12.5 ms loop. 60 seconds between intrusive tests that pass<br><br>Intrusive test requested if fuel system is clamped for >= 5 seconds or fuel pressure error variance <= typically (0.3 to 0.6) (calculated over a 2.5sec period); otherwise report pass<br><br>Duration of intrusive test is fueling related (5 to 12 seconds).<br><br>Intrusive test is run when fuel flow is below Max allowed fuel flow rate (Typical values in the range of 11 to 50 g/s) | DTC Type A<br><br>1 trip |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                            | Enable Conditions | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-----------------------------------------------------------------------------------------------------------------|-------------------|---------------|---------------|
|                      |               |                     |                      |                 | 12. Fuel pump control state<br><br>13. Engine fuel flow<br><br>14. ECM fuel control system failure (PPEI \$1ED) |                   |               |               |
|                      |               |                     |                      |                 |                                                                                                                 |                   |               |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                 | Fault<br>Code | Monitor Description                                                 | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions | Time Required                                         | MIL<br>Illum.            |
|--------------------------------------|---------------|---------------------------------------------------------------------|----------------------|-----------------|----------------------|-------------------|-------------------------------------------------------|--------------------------|
| Fuel Pressure Sensor "B" Circuit Low | 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<br><br>1 sample/12.5 ms | DTC Type A<br><br>1 trip |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                           | Fault<br>Code | Monitor Description                                                  | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions | Time Required                                         | MIL<br>Illum.            |
|------------------------------------------------|---------------|----------------------------------------------------------------------|----------------------|-----------------|----------------------|-------------------|-------------------------------------------------------|--------------------------|
| Fuel<br>Pressure<br>Sensor "B"<br>Circuit High | P018D         | This DTC detects if the fuel pressure sensor circuit is shorted high | FRP sensor voltage   | > 4.86 V        | Ignition             | Run or Crank      | 72 failures out of 80 samples<br><br>1 sample/12.5 ms | DTC Type A<br><br>1 trip |

13 OBDG05A Engine Diagnostics

| Component/<br>System                  | Fault<br>Code | Monitor Description                                                 | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                  | Enable Conditions                                                    | Time Required                                                                          | MIL<br>Illum.            |
|---------------------------------------|---------------|---------------------------------------------------------------------|----------------------|-----------------|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------|--------------------------|
| Fuel Pump<br>Secondary<br>Circuit Low | P0231         | This DTC detects if the fuel pump control circuit is shorted to low | Fuel Pump Current    | > 14.48A        | Ignition<br><br>OR<br>HS Comm<br><br>OR<br>Fuel Pump Control<br><br>AND<br>Ignition Run/Crank Voltage | Run or Crank<br><br>enabled<br><br>enabled<br><br>9V < voltage < 32V | 72 test failures in 80 test samples if Fuel Pump Current <100A<br><br>1 sample/12.5 ms | DTC Type A<br><br>1 trip |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                   | Fault<br>Code | Monitor Description                                                  | Malfunction Criteria                  | Threshold Value | Secondary Parameters                                                                                  | Enable Conditions                                 | Time Required                                                          | MIL<br>Illum.      |
|----------------------------------------|---------------|----------------------------------------------------------------------|---------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------------|--------------------|
| Fuel Pump<br>Secondary<br>Circuit High | P0232         | This DTC detects if the fuel pump control circuit is shorted to high | Voltage measured at fuel pump circuit | > 3.86 V        | a] Commanded fuel pump output<br>b] Fuel pump control enable<br>c] Time that above conditions are met | a] 0% duty cycle (off)<br>b] False<br>c] >= 4 sec | Once per trip<br>36 failures / 40 samples<br>1 sample / 12.5 millisecc | Type A,<br>1 Trips |



13 OBDG05A Engine Diagnostics

| Component/<br>System                   | Fault<br>Code | Monitor Description                                       | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                              | Enable Conditions                                                    | Time Required                                               | MIL<br>Illum.            |
|----------------------------------------|---------------|-----------------------------------------------------------|----------------------|-----------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------|--------------------------|
| Fuel Pump<br>Secondary<br>Circuit Open | P023F         | This DTC detects if the fuel pump control circuit is open | Fuel Pump Current    | <=0.5A          | Ignition<br><br>OR<br>HS Comm<br><br>OR<br>Fuel Pump Control<br>AND<br>Ignition Run/Crank Voltage | Run or Crank<br><br>enabled<br><br>enabled<br><br>9V < voltage < 32V | 72 test failures in 80 test samples;<br><br>1 sample/12.5ms | DTC Type A<br><br>1 trip |
|                                        |               |                                                           | Fuel Pump Duty Cycle | >20%            | Ignition<br><br>OR<br>HS Comm<br><br>OR<br>Fuel Pump Control<br>AND<br>Ignition Run/Crank Voltage | Run or Crank<br><br>enabled<br><br>enabled<br><br>9V < voltage < 32V | 72 test failures in 80 test samples;<br><br>1 sample/12.5ms |                          |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                    | Fault<br>Code | Monitor Description                                                                                           | Malfunction Criteria  | Threshold Value | Secondary Parameters                                                                                                                 | Enable Conditions                                                                            | Time Required                                           | MIL<br>Illum.      |
|-----------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------|-----------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------|--------------------|
| Fuel Pump<br>Driver Over<br>Temperature | P1255         | To detect if an internal fuel pump driver over-temperature condition exists under normal operating conditions | Fuel Pump Driver Temp | > 150C          | a1) Ignition status<br>a2) HS Comm<br>a3) Fuel Pump Control<br>b) Diagnostic<br>KeFRPD_b_FPOverTemp<br>DiagEnbl<br>c) System Voltage | a1) Run or Crank<br>a2) == Enabled<br>a3) == Enabled<br>b) == True<br>c) 9v < System V > 32v | 3 failures / 15 samples<br><br>1 sample / 12.5 millisec | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                          | Fault<br>Code | Monitor Description                                                                  | Malfunction Criteria            | Threshold Value                   | Secondary Parameters                                                                                                                                                                                                                   | Enable Conditions                                                                            | Time Required                                                  | MIL<br>Illum.      |
|-----------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------|---------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------|
| Fuel Pump<br>Driver<br>Module-<br>Ignition<br>Switch Run/<br>Start<br>Position<br>Circuit Low | P129D         | To detect if the Run/<br>Start position circuit<br>voltage is short to low /<br>open | FPPM Run_Crank Active<br>status | <> ECM Run_Crank<br>Active status | a) FPPM configuration<br>KeFRPR_e_ChassisFuel<br>PresSysType<br>b) Diagnostic<br>KeFRPR_b_FPPM_RunC<br>rnkRatlEnbld<br>c) FPPM Control Status<br>Alive Rolling Count result<br>d) Diagnostic feedback<br>received<br>e) System Voltage | a) ==<br>CeFRPR_e_ECM_FPPM<br>_Sys<br>b) == TRUE<br>c) == Valid<br>d) == TRUE<br>e) >= 9.0 v | 64 failures / 80<br>samples<br><br>1 sample / 12.5<br>millisec | Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                                  | Fault<br>Code | Monitor Description                                                                                          | Malfunction Criteria                         | Threshold Value        | Secondary Parameters                                                                                                                                                                                                                                         | Enable Conditions                                                                                                          | Time Required                                                  | MIL<br>Illum.      |
|---------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------|
| Fuel Pump<br>Driver<br>Control<br>Module<br>Signal<br>Message<br>Counter<br>Incorrect | P129E         | To detect if the<br>command message<br>received as serial data<br>from the engine control<br>module is valid | FPPM Received Duty<br>Cycle Rolling Count    | == enumeration faulted | a) FPPM configuration<br>KeFRPR_e_ChassisFuel<br>PresSysType<br>b) Fault state<br>determination enabled<br>c) FPPM Received Duty<br>Cycle Count result<br>d) FPPM Diagnostic<br>feedback received<br>e) CAN communication<br>f) System Voltage               | a) ==<br>CeFRPR_e_ECM_FPPM<br>_Sys)<br>b) == TRUE<br>c) == Valid<br>d) == TRUE<br>e) == Valid<br>f) 9v < Sys Voltage > 32v | 64 failures / 80<br>samples<br><br>1 sample / 12.5<br>millisec | Type A,<br>1 Trips |
|                                                                                       |               |                                                                                                              | FPPM Received Duty<br>Cycle Protection Value | == enumeration faulted | a) FPPM configuration<br>KeFRPR_e_ChassisFuel<br>PresSysType<br>b) Fault state<br>determination enabled<br>c) FPPM Received Duty<br>Cycle Protection Value<br>result<br>d) FPPM Diagnostic<br>feedback received<br>e) CAN communication<br>f) System Voltage | a) ==<br>CeFRPR_e_ECM_FPPM<br>_Sys)<br>b) == TRUE<br>c) == Valid<br>d) == TRUE<br>e) == Valid<br>f) 9v < Sys Voltage > 32v | 64 failures / 80<br>samples<br><br>1 sample / 12.5<br>millisec |                    |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                         | Fault<br>Code | Monitor Description                                                                | Malfunction Criteria                       | Threshold Value                          | Secondary Parameters                                                                                                                                                                                                             | Enable Conditions                                                                            | Time Required                                                  | MIL<br>Illum.      |
|------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------|--------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------|
| Fuel Pump<br>Driver<br>Control<br>Module<br>Enable<br>Circuit<br>Performance | P12A6         | To detect a driver<br>control circuit signal<br>stuck in normal<br>operating range | FPPM Fuel Control<br>Enable Active boolean | <> Fuel Control Enable<br>variable (ECM) | a) FPPM configuration<br>KeFRPR_e_ChassisFuel<br>PresSysType<br>b) Diagnostic<br>KeFRPR_b_FPPM_FuelC<br>ntrlEnblEnbld<br>c) FPPM Control Data<br>Rolling Count result<br>d) Diagnostic feedback<br>received<br>e) System Voltage | a) ==<br>CeFRPR_e_ECM_FPPM<br>_Sys<br>b) == TRUE<br>c) == Valid<br>d) == TRUE<br>e) >= 9.0 v | 40 failures / 80<br>samples<br><br>1 sample / 12.5<br>millisec | Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                        | Fault<br>Code | Monitor Description                                                                                        | Malfunction Criteria                       | Threshold Value        | Secondary Parameters                                                                                                                   | Enable Conditions                                        | Time Required                                       | MIL<br>Illum.      |
|-----------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------|--------------------|
| Fuel Pump<br>Control<br>Status<br>Signal<br>Message<br>Counter<br>Incorrect | P12A8         | To detect if the control status message transmitted as serial data from the driver control module is valid | FPPM Control Status Alive Rolling Count    | == enumeration faulted | a) FPPM configuration KeFRPR_e_ChassisFuel PresSysType<br>b) Fault state determination enabled<br>c) FPPM Diagnostic feedback received | a) == CeFRPR_e_ECM_FPPM_Sys)<br>b) == TRUE<br>c) == TRUE | 64 failures / 80 samples<br>1 sample / 12.5 millise | Type A,<br>1 Trips |
|                                                                             |               |                                                                                                            | FPPM Power Consumption Alive Rolling Count | == enumeration faulted | a) FPPM configuration KeFRPR_e_ChassisFuel PresSysType<br>b) Fault state determination enabled<br>c) FPPM Diagnostic feedback received | a) == CeFRPR_e_ECM_FPPM_Sys)<br>b) == TRUE<br>c) == TRUE | 64 failures / 80 samples<br>1 sample / 12.5 millise |                    |
|                                                                             |               |                                                                                                            | FPPM Driver Status Alive Rolling Count     | == enumeration faulted | a) FPPM configuration KeFRPR_e_ChassisFuel PresSysType<br>b) Fault state determination enabled<br>c) FPPM Diagnostic feedback received | a) == CeFRPR_e_ECM_FPPM_Sys)<br>b) == TRUE<br>c) == TRUE | 64 failures / 80 samples<br>1 sample / 12.5 millise |                    |
|                                                                             |               |                                                                                                            | FPPM Hardware Status Alive Rolling         | == enumeration faulted | a) FPPM configuration KeFRPR_e_ChassisFuel PresSysType<br>b) Fault state determination enabled<br>c) FPPM Diagnostic feedback received | a) == CeFRPR_e_ECM_FPPM_Sys)<br>b) == TRUE<br>c) == TRUE | 64 failures / 80 samples<br>1 sample / 12.5 millise |                    |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                          | Fault<br>Code | Monitor Description                                                                                                      | Malfunction Criteria                 | Threshold Value | Secondary Parameters | Enable Conditions | Time Required                                                 | MIL<br>Illum.      |
|---------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------|----------------------|-------------------|---------------------------------------------------------------|--------------------|
| Fuel<br>Conductivity<br>Out Of<br>Range<br>(water in<br>fuel) | P2269         | Detects the presence<br>of High Conductivity<br>Fuel (e.g. water in fuel)<br>via a specific range of<br>sensor frequency | Flex Fuel Sensor Output<br>Frequency | > 185 Hertz     | Powertrain Relay     | > 11.0 Volts      | 50 failures out<br>of 63 samples<br>100 ms loop<br>Continuous | Type B,<br>2 Trips |





13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Enable Conditions                                                                                                                                                                                                                                                                                                              | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | 8. Fuel Pump Control Module Driver Over-temperature DTC's (P064A)<br><br>9. Control Module Internal Performance DTC (P0606)<br><br>10. An ECM fuel control system failure (PPEI \$1ED)<br><br>11. The Barometric pressure (PPEI \$4C1) signal<br><br>12. Engine run time<br><br>13. Emissions fuel level (PPEI \$3FB)<br><br>14. Fuel pump control<br><br>15. Fuel pump control state<br><br>16. Battery Voltage<br><br>17. Fuel flow rate<br><br>( See Supporting Tables tab )<br><br>18. Fuel Pressure Control System | Normal<br><br>11V<=voltage=<32V<br><br>> 0.047 g/s<br><br>AND<br><br><= Max allowed fuel flow rate as a function of desired rail pressure & Vbatt (Typical values in the range of 11 to 50 g/s)<br><br>Is not responding to an over-pressurization due to pressure build during DFCO or a decreasing desired pressure command. |               |               |

13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|----------------------|-------------------|---------------|---------------|
|                      |               |                     |                      |                 |                      |                   |               |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                  | Fault<br>Code | Monitor Description                                                                           | Malfunction Criteria | Threshold Value | Secondary Parameters | Enable Conditions | Time Required                                            | MIL<br>Illum.      |
|-------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------|----------------------|-----------------|----------------------|-------------------|----------------------------------------------------------|--------------------|
| Control<br>Module<br>Communicati<br>on Bus "B"<br>Off | U0074         | To detect that a fault<br>has caused the CAN<br>serial data expansion<br>bus to the Off state | Bus Status           | Off             | Power mode           | Run/Crank         | 5 failures / 5<br>samples<br>1 sample / 12.5<br>millisec | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                    | Fault<br>Code | Monitor Description                                                                             | Malfunction Criteria                                                                  | Threshold Value                              | Secondary Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Enable Conditions                                                                                                                                                                                                                                            | Time Required                   | MIL<br>Illum.      |
|-------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|--------------------|
| Lost<br>Communicati<br>on with Fuel<br>Pump Driver<br>Control<br>Module | U18A2         | This DTC monitors for a loss of communication with the Fuel Pump Driver Control Module on Bus B | Message is not received from controller for<br><br>Message \$0D5<br><br>Message \$0D7 | <br><br>≥ 10.0 seconds<br><br>≥ 10.0 seconds | General Enable Criteria:<br><br>U0074<br><br>Normal CAN transmission on Bus B<br><br>Device Control<br><br>High Voltage Virtual Network Management<br><br>Ignition Voltage Criteria:<br><br>Ignition voltage<br><br>Power Mode<br><br>Off Cycle Enable Criteria:<br><br>KeCAND_b_OffKeyCycle DiagEnbl<br><br>Ignition Accessory Line and Battery Voltage<br><br>General Enable Criteria and either Ignition Voltage Criteria or Off Cycle Enable Criteria met for > 3.0000 seconds<br><br>Power Mode is in accessory or run or crank and High Voltage Virtual Network Management is not active for | Not Active on Current Key Cycle<br><br>Enabled<br><br>Not Active<br><br>Not Active<br><br>≥ 11.00<br>or<br>≥ 6.41<br><br>= run<br><br>= 0<br>(1 indicates enabled)<br><br>=Active<br><br>> 11.00<br><br><br><br><br><br><br><br><br><br><br>> 0.4000 seconds | Diagnostic runs in 12.5 ms loop | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System | Fault<br>Code | Monitor Description | Malfunction Criteria | Threshold Value | Secondary Parameters                            | Enable Conditions                                               | Time Required | MIL<br>Illum. |
|----------------------|---------------|---------------------|----------------------|-----------------|-------------------------------------------------|-----------------------------------------------------------------|---------------|---------------|
|                      |               |                     |                      |                 | U18A2<br><br>Fuel Pump Driver Control<br>Module | Not Active on Current Key<br>Cycle<br><br>is present on the bus |               |               |
|                      |               |                     |                      |                 |                                                 |                                                                 |               |               |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                           | Fault<br>Code | Monitor Description                                                                           | Malfunction Criteria                                 | Threshold Value        | Secondary Parameters                                                                                                                                                                                                                                   | Enable Conditions                                                                                                           | Time Required                                              | MIL<br>Illum.      |
|--------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------|------------------------------------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|--------------------|
| Fuel Pump<br>Driver<br>Control<br>Module Lost<br>Communication with<br>ECM/PCM | U2616         | To detect lost serial<br>data communication<br>from the power driver<br>controller to the ECM | FPPM Received Serial<br>Data Communication<br>Status | == enumeration faulted | a) FPPM configuration<br>KeFRPR_e_ChassisFuel<br>PresSysType<br>b) Fault state<br>determination enabled<br>c) Run_Crank status<br>d) FPPM Control Status<br>Alive Rolling Count result<br>e) FPPM Diagnostic<br>feedback received<br>f) System Voltage | a) ==<br>CeFRPR_e_ECM_FPPM<br>_Sys)<br>b) == TRUE<br>c) == Active<br>d) == Valid<br>e) == TRUE<br>f) 9v < Sys Voltage > 32v | 64 failures / 80<br>samples<br>1 sample / 12.5<br>millisec | Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                    | Fault<br>Code | Monitor Description             | Malfunction Criteria | Threshold Value | Secondary Parameters                                                                                    | Enable Conditions                                                                                                                                                                                                                                                                                                                                               | Time Required | MIL<br>Illum.   |
|-----------------------------------------|---------------|---------------------------------|----------------------|-----------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------|
| Transmission Output Speed Sensor (TOSS) | P0502         | No activity in the TOSS circuit | TOSS Raw Speed       | ≤ 60 RPM        | Engine Torque Minimum Throttle opening Engine Speed Ignition voltage PTO Engine Torque inaccurate P0503 | 54.0<br>≤ N-M ≤ 8,191.8<br>≥ 8.0 %<br>1,500 ≤ RPM ≤ 6,500<br>9.0 ≤ Volts ≤ 32.00<br>not active<br>KeETQC_b_MinTransRemedial = TRUE:<br>MSFR_b_EngMisfDtctd_FA,<br>MAFR_b_MAF_SnsrTFTKO,<br>MAPR_b_MAP_SnsrTFTKO<br><br>KeETQC_b_MinTransRemedial = FALSE:<br>FULR_b_FuelInjCkt_TFTKO,<br>MAFR_b_MAF_SnsrTFTKO, XOYR_b_SecurityFit,<br>Not failed this key cycle | ≥ 4.5 sec     | Type B, 2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                    | Fault<br>Code | Monitor Description      | Malfunction Criteria        | Threshold Value | Secondary Parameters                                                                                                                      | Enable Conditions                                                                                                                                                         | Time Required | MIL<br>Illum.   |
|-----------------------------------------|---------------|--------------------------|-----------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------|
| Transmission Output Speed Sensor (TOSS) | P0503         | TOSS Signal Intermittent | Loop-to-Loop change in TOSS | ≥ 350 RPM       | Raw Output Speed<br>Output Speed change<br>Time since transfer case range change<br>Ignition voltage<br>Engine Speed<br>Vehicle Speed PTO | > 300 RPM for ≥ 2.0 sec<br>≤ 150 RPM for ≥ 2.0 sec<br>≥ 6.0 sec<br>9.0 ≤ Volts ≤ 32.00<br>200 ≤ RPM ≤ 7,500 for ≥ 5.0 seconds<br>≤ 511.99 MPH for ≥ 5.0 sec<br>not active | ≥ 3.3 sec     | Type B, 2 Trips |



13 OBDG05A Engine Diagnostics

| Component/<br>System                                                    | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                   | Malfunction Criteria                                                              | Threshold Value | Secondary Parameters                                                                                                                          | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                            | Time Required            | MIL<br>Illum.      |
|-------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------|
| Clutch Pedal<br>Position<br>Sensor<br>Circuit<br>Range /<br>Performance | P0806         | Detects if Clutch Pedal Position Sensor is Stuck in a range indicative of a vehicle NOT in gear, when the vehicle is determined to be in gear. Gear determination is made by verifying that the ratio of engine RPM versus Transmission Output Speed (N/TOS) represents a valid gear. | Filtered Clutch Pedal Position Error when the vehicle is determined to be in gear | > 5 %           | N/TOS Ratio:<br><br>Transfer Case:<br><br>Vehicle speed:<br><br>Engine Torque:<br><br>Clutch Pedal Position:<br><br>OR<br><br>No Active DTCs: | Must match actual gear (i.e. vehicle in gear)<br><br>Not in 4WD Low range<br><br>> 3.4 MPH<br><br>> <b>EngTorqueThreshold</b> (see Supporting Tables)<br><br>< <b>ResidualErrEnableLow</b> (see Supporting Tables)<br>> <b>ResidualErrEnableHigh</b> (see Supporting Tables)<br><br>ClutchPstnSnsrCktHi FA<br>ClutchPstnSnsrCktLo FA<br>CrankSensor_FA<br>Transmission Output<br>Shaft Angular Velocity<br>Validity<br>VehicleSpeedSensor_FA | 25 ms loop<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                              | Fault<br>Code | Monitor Description                                       | Malfunction Criteria                         | Threshold Value                                       | Secondary Parameters                                         | Enable Conditions | Time Required            | MIL<br>Illum.      |
|---------------------------------------------------|---------------|-----------------------------------------------------------|----------------------------------------------|-------------------------------------------------------|--------------------------------------------------------------|-------------------|--------------------------|--------------------|
| Clutch Pedal<br>Position<br>Sensor<br>Circuit Low | P0807         | Detects Continuous<br>Circuit Out-of-Range<br>Low or Open | Clutch Position Sensor<br>Circuit<br><br>for | < 4 % of Vref<br><br>200 counts out of 250<br>samples | Engine Not Cranking<br>System Voltage<br><br>No active DTCs: | > 11.0 Volts      | 25 ms loop<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                               | Fault<br>Code | Monitor Description                                | Malfunction Criteria                         | Threshold Value                                        | Secondary Parameters                                         | Enable Conditions | Time Required            | MIL<br>Illum.      |
|----------------------------------------------------|---------------|----------------------------------------------------|----------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------|-------------------|--------------------------|--------------------|
| Clutch Pedal<br>Position<br>Sensor<br>Circuit High | P0808         | Detects Continuous<br>Circuit Out-of-Range<br>High | Clutch Position Sensor<br>Circuit<br><br>for | > 96 % of Vref<br><br>200 counts out of 250<br>samples | Engine Not Cranking<br>System Voltage<br><br>No active DTCs: | > 11.0 Volts      | 25 ms loop<br>Continuous | Type A,<br>1 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                    | Fault<br>Code | Monitor Description                                                    | Malfunction Criteria                      | Threshold Value         | Secondary Parameters                 | Enable Conditions | Time Required             | MIL<br>Illum.      |
|-----------------------------------------|---------------|------------------------------------------------------------------------|-------------------------------------------|-------------------------|--------------------------------------|-------------------|---------------------------|--------------------|
| Clutch Pedal<br>Position Not<br>Learned | P080A         | Detects Invalid Clutch<br>Pedal Fully Applied<br>Learn Position values | Fully Applied Learn<br>Position<br><br>OR | < 9.0 %<br><br>> 36.0 % | OBD Manufacturer's<br>Enable Counter | = 0               | 250 ms loop<br>Continuous | Type A,<br>1 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                  | Fault<br>Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                                                                                      | Malfunction Criteria                                                                                                                                                                                                                                                       | Threshold Value                                                                                          | Secondary Parameters                                                                                                                                                              | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Time Required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | MIL<br>Illum.      |
|---------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Secondary<br>AIR Incorrect<br>Airflow | P0411         | Detects an insufficient flow condition. This test is run during Phase 1 (AIR pump commanded On, Valve commanded Open). Leaks downstream of the valve are detected via an evaluation of average pressure error and average "String Length"(SL) – a term that represents the absolute pressure delta accumulated every 6.25ms, then averaged over the duration of the test. Low SL values are indicative of downstream leaks or blockages. | Average Pressure Error or<br><br>OR the following String Length (SL) Test:<br><br>Average Pressure Error or<br><br>and<br>the Average String Length<br><br>NOTE: Average Pressure Error is the average difference between the predicted pressure and the measured pressure | > 7.5 kPa<br>< -7.5 kPa<br><br><br>> 2.5 kPa<br>< -2.5 kPa<br><br><br>< <b>SL Threshold Bank 1 Table</b> | BARO<br>Inlet Air Temp<br>Coolant Temp<br>Engine off time<br>System Voltage<br>MAP not<br>Engine Speed<br>MAF not<br><br>SL Stability time<br>SL RPM range<br><br>No active DTCs: | > 74 kPa<br>> -10.0 deg C<br>> -10.0 deg C < 56.0<br>> 3,600.0 seconds<br>> 10.0 Volts < 32.0<br>< 20 kPa for 2.0 sec<br>< 5,000 RPM<br>> 50 gm/s for 3.0 sec<br><br>> 4.0 seconds<br>< 3,000 RPM > 3,400<br><br>AIRSystemPressureSens<br>or FA<br>AIRValveControlCircuit FA<br>AIRPumpControlCircuit<br>FA<br>MAF_SensorFA<br>AmbientAirDefault_NA<br>IAT_SensorFA<br>ECT_Sensor_FA<br>EngineMisfireDetected_F<br>A<br>CatalystSysEfficiencyLoB<br>1_FA<br>CatalystSysEfficiencyLoB<br>2_FA<br>ControllerProcessorPerf_<br>FA<br>5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>IgnitionOutputDriver_FA<br>FuelInjectorCircuit_FA | Phase 1<br>Conditional test<br>weight > 7.0<br>seconds<br><br>Total 'String<br>Length'<br>accumulation<br>time > 10.0 sec<br><br>Frequency: Once<br>per trip when AIR<br>pump is<br>commanded On<br><br>Conditional test<br>weight is<br>calculated by<br>multiplying the<br>following<br>Factors:<br><b>Phase 1 Baro<br/>Test Weight<br/>Factor, Phase 1<br/>MAF Test<br/>Weight Factor,<br/>Phase 1 System<br/>Volt Test Weight<br/>Factor, Phase 1<br/>Ambient Temp<br/>Test Weight<br/>Factor</b><br>(see Supporting<br>Tables) | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/System                | Fault Code | Monitor Description                                                                                                                                                                                                                                                                                                                                                                                                                       | Malfunction Criteria                                                                                                                                                                                                                                                                                                         | Threshold Value                                                                                                                                                                                                                                                                                  | Secondary Parameters                                                                                                                                                                                | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Time Required                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | MIL Illum.      |
|---------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Secondary AIR Incorrect Airflow | P0411      | Detects an insufficient flow condition. This test is run during Phase 1 (AIR pump commanded On, Valve commanded Open). Leaks downstream of the valve are detected via an evaluation of average pressure error and average "String Length" (SL) – a term that represents the absolute pressure delta accumulated every 6.25ms, then averaged over the duration of the test. Low SL values are indicative of downstream leaks or blockages. | <p>Average Pressure Error<br/>or<br/>or<br/>or</p> <p>OR the following String Length (SL) Test:</p> <p>Average Pressure Error<br/>or<br/>or<br/>or</p> <p>and the Average String Length</p> <p>or</p> <p>NOTE: Average Pressure Error is the average difference between the predicted pressure and the measured pressure</p> | <p>&gt; 7.5 kPa Bank 1<br/>&gt; 7.5 kPa Bank 2<br/>&lt; -7.5 kPa Bank 1<br/>&lt; -7.5 kPa Bank 2</p> <p>&gt; 2.5 kPa Bank 1<br/>&gt; 2.5 kPa Bank 2<br/>&lt; -2.5 kPa Bank 1<br/>&lt; -2.5 kPa Bank 2</p> <p>&lt; <b>SL Threshold Bank 1 Table</b><br/>&lt; <b>SL Threshold Bank 2 Table</b></p> | <p>BARO<br/>Inlet Air Temp<br/>Coolant Temp<br/>Engine off time<br/>System Voltage<br/>MAP not<br/>Engine Speed<br/>MAF not</p> <p>SL Stability time</p> <p>SL RPM range</p> <p>No active DTCs:</p> | <p>&gt; 74 kPa<br/>&gt; -10.0 deg C<br/>&gt; -10.0 deg C &lt; 56.0<br/>&gt; 3,600.0 seconds<br/>&gt; 10.0 Volts &lt; 32.0<br/>&lt; 20 kPa for 2.0 sec<br/>&lt; 5,000 RPM<br/>&gt; 50 gm/s for 3.0 sec</p> <p>&gt; 4.0 seconds Bank 1<br/>&gt; 4.0 seconds Bank 2</p> <p>&lt; 3,000 RPM or &gt; 3,400</p> <p>AIRSystemPressureSens or FA<br/>AIRValveControlCircuit FA<br/>AIRPumpControlCircuit FA<br/>MAF_SensorFA<br/>AmbientAirDefault_NA<br/>IAT_SensorFA<br/>ECT_Sensor_FA<br/>EngineMisfireDetected_FA<br/>CatalystSysEfficiencyLoB1_FA<br/>CatalystSysEfficiencyLoB2_FA<br/>ControllerProcessorPerf_FA<br/>5VoltReferenceA_FA<br/>5VoltReferenceB_FA<br/>IgnitionOutputDriver_FA<br/>FuelInjectorCircuit_FA</p> | <p>Phase 1<br/>Conditional test weight &gt; 7.0 seconds</p> <p>Total 'String Length' accumulation time:<br/>&gt; 10.0 sec Bank1<br/>&gt; 10.0 sec Bank2</p> <p>Frequency: Once per trip when AIR pump commanded On</p> <p>Conditional test weight is calculated by multiplying the following Factors: <b>Phase 1 Baro Test Weight Factor, Phase 1 MAF Test Weight Factor, Phase 1 System Volt Test Weight Factor, Phase 1 Ambient Temp Test Weight Factor</b> (see Supporting Tables)</p> | Type B, 2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                            | Fault<br>Code | Monitor Description                                                     | Malfunction Criteria                                                                                                         | Threshold Value                  | Secondary Parameters | Enable Conditions   | Time Required                                          | MIL<br>Illum.      |
|-------------------------------------------------|---------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------|---------------------|--------------------------------------------------------|--------------------|
| Secondary<br>AIR Solenoid<br>Control<br>Circuit | P0412         | This DTC checks the<br>AIR solenoid circuit for<br>electrical integrity | The ECM detects that the<br>commanded state of the<br>driver and the actual state<br>of the control circuit do<br>not match. | 20 failures out of<br>25 samples | System Voltage       | > 10.0 Volts < 32.0 | 25 samples<br>(250 ms per<br>sample)<br><br>Continuous | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                        | Fault<br>Code | Monitor Description                                                 | Malfunction Criteria                                                                                                         | Threshold Value                  | Secondary Parameters | Enable Conditions   | Time Required                                          | MIL<br>Illum.      |
|---------------------------------------------|---------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------|---------------------|--------------------------------------------------------|--------------------|
| Secondary<br>AIR Pump<br>Control<br>Circuit | P0418         | This DTC checks the<br>AIR Pump circuit for<br>electrical integrity | The ECM detects that the<br>commanded state of the<br>driver and the actual state<br>of the control circuit do<br>not match. | 20 failures out of<br>25 samples | System Voltage       | > 10.0 Volts < 32.0 | 25 samples<br>(250 ms per<br>sample)<br><br>Continuous | Type B,<br>2 Trips |



13 OBDG05A Engine Diagnostics

| Component/<br>System                                               | Fault<br>Code | Monitor Description                                                                         | Malfunction Criteria                                  | Threshold Value              | Secondary Parameters                                                                                                                     | Enable Conditions                                                                                                                                                                                                                                                                                                                                                           | Time Required                                                                                                             | MIL<br>Illum.      |
|--------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--------------------|
| Secondary<br>AIR System<br>Pressure<br>Sensor<br>Circuit Bank<br>1 | P2430         | This DTC detects a stuck in range pressure sensor signal when the AIR pump is commanded on. | Average Pressure Error<br><br>AND<br>Signal Variation | < 0.50 kPa<br><br>< 0.15 kPa | BARO<br>Inlet Air Temp<br>Coolant Temp<br>Engine off time<br>System Voltage<br>MAP not<br>Engine Speed<br>MAF not<br><br>No active DTCs: | > 74 kPa<br>> -10.0 deg C<br>> -10.0 deg C < 56.0<br>> 3,600.0 seconds<br>> 10.0 Volts < 32.0<br>< 20 kPa for 2.0 sec<br>< 5,000 RPM<br>> 50 gm/s for 3.0 sec<br><br>AIRValveControlCircuit FA<br>AIRPumpControlCircuit<br>FA<br>AIRSysPressSnsrB1CktL<br>oFA<br>AIRSysPressSnsrB1CktHi<br>FA<br>ControllerProcessorPerf_<br>FA<br>5VoltReferenceA_FA<br>5VoltReferenceB_FA | Stuck in range<br>cumulative time<br>> 5.0 seconds<br><br>Frequency: Once<br>per trip when SAI<br>pump is<br>commanded On | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                   | Fault<br>Code | Monitor Description                                                                                                                                                                | Malfunction Criteria                                                                                                                                    | Threshold Value                                 | Secondary Parameters                                                                                                                                                                                | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                            | Time Required                                                                                                                                                                                                                       | MIL<br>Illum.      |
|------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Secondary<br>AIR System<br>Pressure<br>Sensor<br>Performance<br>Bank 1 | P2431         | This DTC detects a skewed pressure sensor signal via a comparison of the AIR pressure sensor signal and estimated BARO, as well as an evaluation of the quality of the comparison. | Difference between AIR pressure sensor and BARO (Pump Commanded Off)<br>or<br>OR<br>Difference between AIR pressure sensor and BARO (Pump Commanded On) | > 18.0 kPa<br><br>< -10.0 kPa<br><br>> 18.0 kPa | BARO<br>Inlet Air Temp<br>Coolant Temp<br>Engine off time<br>System Voltage<br>MAP not<br>Engine Speed<br>MAF not<br><br>Transfer Case not in 4WD<br>Low<br>Run/crank active<br><br>No active DTCs: | > 74 kPa<br>> -10.0 deg C<br>> -10.0 deg C < 56.0<br>> 3,600.0 seconds<br>> 10.0 Volts < 32.0<br>< 20 kPa for 2.0 sec<br>< 5,000 RPM<br>> 50 gm/s for 3.0 sec<br><br><br><br><br><br><br><br><br><br><br>AIRValveControlCircuit FA<br>AIRPumpControlCircuit FA<br>AIRSysPressSnsrB1CktLoFA<br>AIRSysPressSnsrB1CktHiFA<br>MAF_SensorFA<br>EngineMisfireDetected_FA<br>ControllerProcessorPerf_FA<br>5VoltReferenceA_FA<br>5VoltReferenceB_FA | Skewed sensor cumulative test weight > 15.0 seconds<br><br>Continuous<br>6.25ms loop<br><br>Skewed sensor cumulative test weight is based on distance from the last Baro update. See <b>Baro Skewed Sensor Weight Factor</b> table. | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                              | Fault<br>Code | Monitor Description                                                   | Malfunction Criteria          | Threshold Value                                            | Secondary Parameters | Enable Conditions                                                          | Time Required                                              | MIL<br>Illum.      |
|-----------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------|-------------------------------|------------------------------------------------------------|----------------------|----------------------------------------------------------------------------|------------------------------------------------------------|--------------------|
| Secondary<br>AIR System<br>Pressure<br>Sensor<br>Circuit Low<br>Voltage<br>Bank 1 | P2432         | This DTC detects an<br>out of range low AIR<br>pressure sensor signal | AIR Pressure Sensor<br>signal | < 6 % of 5Vref for<br>800 failures out of<br>1,000 samples | No active DTCs:      | ControllerProcessorPerf_<br>FA<br>5VoltReferenceA_FA<br>5VoltReferenceB_FA | 1,000 samples<br>(6.25 ms per<br>sample)<br><br>Continuous | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                             | Fault<br>Code | Monitor Description                                                    | Malfunction Criteria          | Threshold Value                                             | Secondary Parameters | Enable Conditions                                                          | Time Required                                              | MIL<br>Illum.      |
|----------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------|----------------------|----------------------------------------------------------------------------|------------------------------------------------------------|--------------------|
| Secondary<br>AIR System<br>Pressure<br>Sensor<br>Circuit Hi<br>Voltage<br>Bank 1 | P2433         | This DTC detects an<br>out of range high AIR<br>pressure sensor signal | AIR Pressure Sensor<br>signal | > 94 % of 5Vref for<br>800 failures out of<br>1,000 samples | No active DTCs:      | ControllerProcessorPerf_<br>FA<br>5VoltReferenceA_FA<br>5VoltReferenceB_FA | 1,000 samples<br>(6.25 ms per<br>sample)<br><br>Continuous | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                               | Fault<br>Code | Monitor Description                                                                         | Malfunction Criteria                                  | Threshold Value              | Secondary Parameters                                                                                                                     | Enable Conditions                                                                                                                                                                                                                                                                                                                                                          | Time Required                                                                                                             | MIL<br>Illum.      |
|--------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--------------------|
| Secondary<br>AIR System<br>Pressure<br>Sensor<br>Circuit Bank<br>2 | P2435         | This DTC detects a stuck in range pressure sensor signal when the AIR pump is commanded on. | Average Pressure Error<br><br>AND<br>Signal Variation | < 0.50 kPa<br><br>< 0.15 kPa | BARO<br>Inlet Air Temp<br>Coolant Temp<br>Engine off time<br>System Voltage<br>MAP not<br>Engine Speed<br>MAF not<br><br>No active DTCs: | > 74 kPa<br>> -10.0 deg C<br>> -10.0 deg C < 56.0<br>> 3,600.0 seconds<br>> 10.0 Volts < 32.0<br>< 20 kPa for 2.0 sec<br>< 5,000 RPM<br>> 50 gm/s for 3.0sec<br><br>AIRValveControlCircuit FA<br>AIRPumpControlCircuit<br>FA<br>AIRSysPressSnsrB1CktL<br>oFA<br>AIRSysPressSnsrB1CktHi<br>FA<br>ControllerProcessorPerf_<br>FA<br>5VoltReferenceA_FA<br>5VoltReferenceB_FA | Stuck in range<br>cumulative time<br>> 5.0 seconds<br><br>Frequency: Once<br>per trip when SAI<br>pump is<br>commanded On | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                                                   | Fault<br>Code | Monitor Description                                                                                                                                                                | Malfunction Criteria                                                                                                                                    | Threshold Value                                 | Secondary Parameters                                                                                                                                                                                | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                               | Time Required                                                                                                                                                                                                                       | MIL<br>Illum.      |
|------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Secondary<br>AIR System<br>Pressure<br>Sensor<br>Performance<br>Bank 2 | P2436         | This DTC detects a skewed pressure sensor signal via a comparison of the AIR pressure sensor signal and estimated BARO, as well as an evaluation of the quality of the comparison. | Difference between AIR pressure sensor and BARO (Pump Commanded Off)<br>or<br>OR<br>Difference between AIR pressure sensor and BARO (Pump Commanded On) | > 18.0 kPa<br><br>< -10.0 kPa<br><br>> 18.0 kPa | BARO<br>Inlet Air Temp<br>Coolant Temp<br>Engine off time<br>System Voltage<br>MAP not<br>Engine Speed<br>MAF not<br><br>Transfer Case not in 4WD<br>Low<br>Run/crank active<br><br>No active DTCs: | > 74 kPa<br>> -10.0 deg C<br>> -10.0 deg C < 56.0<br>> 3,600.0 seconds<br>> 10.0 OR < 32.0 Volts<br>< 20 kPa for 2.0 sec<br>< 5,000 RPM<br>> 50 gm/s for 3.0 sec<br><br><br><br><br><br><br><br><br><br><br>AIRValveControlCircuit FA<br>AIRPumpControlCircuit FA<br>AIRSysPressSnsrB1CktLoFA<br>AIRSysPressSnsrB1CktHiFA<br>MAF_SensorFA<br>EngineMisfireDetected_FA<br>ControllerProcessorPerf_FA<br>5VoltReferenceA_FA<br>5VoltReferenceB_FA | Skewed sensor cumulative test weight > 15.0 seconds<br><br>Continuous<br>6.25ms loop<br><br>Skewed sensor cumulative test weight is based on distance from the last Baro update. See <b>Baro Skewed Sensor Weight Factor</b> table. | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                              | Fault<br>Code | Monitor Description                                                   | Malfunction Criteria          | Threshold Value                                            | Secondary Parameters | Enable Conditions                                                          | Time Required                                              | MIL<br>Illum.      |
|-----------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------|-------------------------------|------------------------------------------------------------|----------------------|----------------------------------------------------------------------------|------------------------------------------------------------|--------------------|
| Secondary<br>AIR System<br>Pressure<br>Sensor<br>Circuit Low<br>Voltage<br>Bank 2 | P2437         | This DTC detects an<br>out of range low AIR<br>pressure sensor signal | AIR Pressure Sensor<br>signal | < 6 % of 5Vref for<br>800 failures out of<br>1,000 samples | No active DTCs:      | ControllerProcessorPerf_<br>FA<br>5VoltReferenceA_FA<br>5VoltReferenceB_FA | 1,000 samples<br>(6.25 ms per<br>sample)<br><br>Continuous | Type B,<br>2 Trips |

### 13 OBDG05A Engine Diagnostics

| Component/<br>System                                                             | Fault<br>Code | Monitor Description                                                    | Malfunction Criteria          | Threshold Value                                             | Secondary Parameters | Enable Conditions                                                          | Time Required                                              | MIL<br>Illum.      |
|----------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------|----------------------|----------------------------------------------------------------------------|------------------------------------------------------------|--------------------|
| Secondary<br>AIR System<br>Pressure<br>Sensor<br>Circuit Hi<br>Voltage<br>Bank 2 | P2438         | This DTC detects an<br>out of range high AIR<br>pressure sensor signal | AIR Pressure Sensor<br>signal | > 94 % of 5Vref for<br>800 failures out of<br>1,000 samples | No active DTCs:      | ControllerProcessorPerf_<br>FA<br>5VoltReferenceA_FA<br>5VoltReferenceB_FA | 1,000 samples<br>(6.25 ms per<br>sample)<br><br>Continuous | Type B,<br>2 Trips |



13 OBDG05A Engine Diagnostics

| Component/<br>System                                       | Fault<br>Code | Monitor Description                                                                                                                                         | Malfunction Criteria                       | Threshold Value                                                                                                              | Secondary Parameters                                                                                                                                                                            | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Time Required                                                                                                                                                                                                                                                                                                                                                                       | MIL<br>Illum.      |
|------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Secondary<br>AIR System<br>Shut-off<br>Valve Stuck<br>Open | P2440         | This DTC detects if one or both of the AIR system control valves is stuck open. This test is run during Phase 2 (Pump commanded On, valve commanded closed) | Average Pressure Error<br><br>or<br><br>or | < <b>Bank 1 Valve Pressure Error</b> table<br><br>< <b>Bank 2 Valve Pressure Error</b> table<br><br>> 32 kPa for either Bank | BARO<br>Inlet Air Temp<br>Coolant Temp<br>Engine off time<br>System Voltage<br>MAP not<br>Engine Speed<br>MAF not<br>Stability Time<br><br>AIR diagnostic Phase 1 passed<br><br>No active DTCs: | > 74 kPa<br>> -10.0 deg C<br>> -10.0 deg C < 56.0<br>> 3,600.0 seconds<br>> 10.0 Volts < 32.0<br>< 20 kPa for 2.0 sec<br>< 5,000 RPM<br>> 50 gm/s for 3.0 sec<br>> 0.5 seconds<br><br>AIRSystemPressureSens or FA<br>AIRValveControlCircuit FA<br>AIRPumpControlCircuit FA<br>MAF_SensorFA<br>AmbientAirDefault_NA<br>IAT_SensorFA<br>ECT_Sensor_FA<br>EngineMisfireDetected_FA<br>CatalystSysEfficiencyLoB1_FA<br>CatalystSysEfficiencyLoB2_FA<br>ControllerProcessorPerf_FA<br>5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>IgnitionOutputDriver_FA<br>FuelInjectorCircuit_FA | Phase 2<br>Conditional test weight > 1.5 sec<br><br>Frequency:<br>Once per trip when AIR pump commanded On<br><br>Conditional test weight is calculated by multiplying the following<br>Factors:<br><b>Phase 2 Baro Test Weight Factor, Phase 2 MAF Test Weight Factor, Phase 2 System Volt Test Weight Factor, Phase 2 Ambient Temp Test Weight Factor</b> (see Supporting Tables) | Type B,<br>2 Trips |

13 OBDG05A Engine Diagnostics

| Component/<br>System                        | Fault<br>Code | Monitor Description                                                                                                        | Malfunction Criteria             | Threshold Value                                            | Secondary Parameters                                                                                                                                                                                                             | Enable Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Time Required                                                                                        | MIL<br>Illum.      |
|---------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|--------------------|
| Secondary<br>AIR System<br>Pump Stuck<br>On | P2444         | This DTC detects if the SAI pump is stuck On. This test is run during Phase 3 (Pump commanded Off, valve commanded closed) | Average Pressure Error<br><br>or | > <b>Bank 1 Pump Pressure Error</b> table<br><br>< -32 kPa | BARO<br>Inlet Air Temp<br>Coolant Temp<br>Engine off time<br>System Voltage<br>MAP not<br>Engine Speed<br>MAF not<br>Stability Time<br><br>AIR diagnostic Phase 1 passed<br>AIR diagnostic Phase 2 passed<br><br>No active DTCs: | > 74 kPa<br>> -10.0 deg C<br>> -10.0 deg C < 56.0<br>> 3,600.0 seconds<br>> 10.0 Volts < 32.0<br>< 20 kPa for > 2.0 sec.<br>< 5,000 RPM<br>> 50 gm/s for > 3.0 sec.<br>> 4.0 seconds<br><br>Phase 3 cumulative test weight is based on the distance from the last Baro update. See <b>Baro Skewed Sensor Weight Factor</b> table.<br><br>AIRSystemPressureSens<br>orFA<br>AIRValveControlCircuit FA<br>AIRPumpControlCircuit FA<br>MAF_SensorFA<br>AmbientAirDefault_NA<br>IAT_SensorFA<br>ECT_Sensor_FA<br>EngineMisfireDetected_FA<br>CatalystSysEfficiencyLoB1_FA<br>CatalystSysEfficiencyLoB2_FA<br>ControllerProcessorPerf_FA<br>5VoltReferenceA_FA<br>5VoltReferenceB_FA<br>IgnitionOutputDriver_FA<br>FuelInjectorCircuit_FA | Phase 3 Cumulative test weight > 2.0 sec.<br><br>Frequency: Once per trip when AIR pump commanded On | Type A,<br>1 Trips |

**Closed Loop Enable Clarification: Calibration values are in the Supporting Tables**

Engine run time greater than  
**KtFSTA\_t\_ClosedLoopAutostart (HYBRID ONLY)**  
     AutoStart CoolantX1      X2      X3      X4      X5      X6      X7      X8      X9      X10      X11  
     Close Loop Enable TimeY1      Y2      Y3      Y4      Y5      Y6      Y7      Y8      Y9      Y10      Y11  
 and  
**KtFSTA\_t\_ClosedLoopTime**  
     Start-Up CoolantX1      X2      X3      X4      X5      X6      X7      X8      X9      X10      X11  
     Close Loop Enable TimeY1      Y2      Y3      Y4      Y5      Y6      Y7      Y8      Y9      Y10      Y11  
 and pre converter O2 sensor voltage less  
 than  
**KfFULC\_U\_O2\_SensorReadyThrsh**  
 Lo  
     Voltage < XXXXmilliVolts  
 for  
**KcFULC\_O2\_SensorReadyEvents**  
     Time (events \* 12.5 milliseconds) > XXXXevents  
 and  
**COSC (Converter Oxygen Storage Control) not  
 enabled**  
 and  
**Consumed AirFuel Ratio is stoichiometry i.e. not in component  
 protection**  
 and  
**POPD or Catalyst Diagnostic not intrusive**  
 and  
**Turbo Scavenging Mode not  
 enabled**  
 and  
**All cylinders whose valves are active also have their injectors  
 enabled**  
 and  
**O2S\_Bank\_1\_TFTKO, O2S\_Bank\_2\_TFTKO, FuelInjectorCircuit\_FA and  
 CyInderDeacDriverTFTKO = False**

Long Term FT Enable Criteria

**Closed Loop Enable Clarification: Calibration values are in the Supporting Tables**

**Closed Loop Enable and  
Coolant greater than  
KfFCLL\_T\_AdaptiveLoCoolant**

Coolant > XXXXCelcius

**or less than**

**KfFCLL\_T\_AdaptiveHiCoolant**

Coolant < XXXXCelcius

**and**

**KtFCLL\_p\_AdaptiveLowMAP\_Limit**

|                       |    |    |    |    |    |    |    |    |    |
|-----------------------|----|----|----|----|----|----|----|----|----|
| Barometric Pressure   | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 |
| Manifold Air Pressure | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 | Y7 | Y8 | Y9 |

**and**

**TPS\_ThrottleAuthorityDefaulted =**

**False**

**and**

**Flex Fuel Estimate Algorithm is not active**

**and**

**Excessive fuel vapors boiling off from the engine oil algorithm (BOFR) is not  
enabled**

**and**

**Catalyst or EVAP large leak test not  
intrusive**

**Secondary Fuel Trim Enable**

**Criteria**

**Closed Loop Enable and**

**KfFCLP\_U\_O2ReadyThrshLo**

Voltage < XXXXmilliVolts

**for**

**KcFCLP\_Cnt\_O2RdyCyclesThrsh**

Time (events \* 12.5 milliseconds) > XXXXevents

**Long Term Secondary Fuel Trim**

**Enable Criteria**

**KtFCLP\_t\_PostIntgIDisableTime**

**Closed Loop Enable Clarification: Calibration values are in the Supporting Tables**

|                                                           |                            |    |    |    |    |    |    |    |    |    |     |     |
|-----------------------------------------------------------|----------------------------|----|----|----|----|----|----|----|----|----|-----|-----|
|                                                           | Start-Up Coolant           | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 | X11 |
|                                                           | Post Integral Enable Time  | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 | Y7 | Y8 | Y9 | Y10 | Y11 |
| <b>Plus</b>                                               |                            |    |    |    |    |    |    |    |    |    |     |     |
| <b>KtFCLP_t_PostIntgrRampInTime</b>                       |                            |    |    |    |    |    |    |    |    |    |     |     |
|                                                           | Start-Up Coolant           | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 | X11 |
|                                                           | Post Integral Ramp In Time | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 | Y7 | Y8 | Y9 | Y10 | Y11 |
| <b>and</b>                                                |                            |    |    |    |    |    |    |    |    |    |     |     |
| <b>KeFCLP_T_IntegrationCatalystMax</b>                    |                            |    |    |    |    |    |    |    |    |    |     |     |
| <b>Modeled Catalyst Temperature</b>                       | <u>&lt; XXXX Celcius</u>   |    |    |    |    |    |    |    |    |    |     |     |
| <b>and</b>                                                |                            |    |    |    |    |    |    |    |    |    |     |     |
| <b>KeFCLP_T_IntegrationCatalystMin</b>                    |                            |    |    |    |    |    |    |    |    |    |     |     |
| <b>Modeled Catalyst Temperature</b>                       | <u>&gt; XXXX Celcius</u>   |    |    |    |    |    |    |    |    |    |     |     |
| <b>and</b>                                                |                            |    |    |    |    |    |    |    |    |    |     |     |
| <b>PO2S_Bank_1_Snsr_2_FA and</b>                          |                            |    |    |    |    |    |    |    |    |    |     |     |
| <b>PO2S_Bank_2_Snsr_2_FA = False</b>                      |                            |    |    |    |    |    |    |    |    |    |     |     |
| <b>and</b>                                                |                            |    |    |    |    |    |    |    |    |    |     |     |
| <b>(KeFCLP_Pct_CatAccuSlphrPostDsbl</b>                   |                            |    |    |    |    |    |    |    |    |    |     |     |
| <b>Modeled converter sulfur percent &lt; XXXX Percent</b> |                            |    |    |    |    |    |    |    |    |    |     |     |
| <b>and</b>                                                |                            |    |    |    |    |    |    |    |    |    |     |     |
| <b>Post Integral &lt; KaFCLP_U_SlphrIntgrIOfst_Thrsh)</b> |                            |    |    |    |    |    |    |    |    |    |     |     |
| <b>X axis: Post O2 Sensor</b>                             |                            |    |    |    |    |    |    |    |    |    |     |     |
| <b>Y axis: Post O2 Mode</b>                               |                            |    |    |    |    |    |    |    |    |    |     |     |
| <b>Z: Post Integral threshold</b>                         |                            |    |    |    |    |    |    |    |    |    |     |     |

**Supporting Table - P0101\_P0106\_P0121\_P012B\_P0236\_P1101 TPS Residual Weight Factor based on RPM**

**Description:** P0101\_P0106\_P0121\_P012B\_P0236\_P1101 TPS Residual Weight Factor based on RPM

**Notes:**

| y/x | 500   | 1,000 | 1,250 | 1,500 | 1,750 | 2,000 | 2,250 | 2,500 | 3,000 | 3,500 | 4,000 | 4,500 | 5,000 | 5,500 | 6,000 | 6,500 | 7,000 |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1   | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

**Supporting Table - P0101\_P0106\_P0121\_P012B\_P0236\_P1101 MAF Residual Weight Factor based on RPM**

**Description:** P0101\_P0106\_P0121\_P012B\_P0236\_P1101 MAF Residual Weight Factor based on RPM

**Notes:**

| y/x | 500   | 1,000 | 1,250 | 1,500 | 1,750 | 2,000 | 2,250 | 2,500 | 3,000 | 3,500 | 4,000 | 4,500 | 5,000 | 5,500 | 6,000 | 6,500 | 7,000 |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1   | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.975 | 0.883 | 0.763 | 0.809 | 0.638 | 0.605 | 0.500 | 0.500 | 0.500 |

**Supporting Table - P0101\_P0106\_P0121\_P012B\_P0236\_P1101 MAF Residual Weight Factor based on MAF Est**

**Description:** P0101\_P0106\_P0121\_P012B\_P0236\_P1101 MAF Residual Weight Factor based on MAF Est

**Notes:**

| y/x | 0     | 50    | 70    | 73    | 76    | 79    | 82    | 85    | 89    | 95    | 100   | 110   | 120   | 150   | 200   | 280   | 350   |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1   | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |



**Supporting Table - P0101\_P0106\_P0121\_P012B\_P0236\_P1101 MAP1 Residual Weight Factor based on RPM**

**Description:** P0101\_P0106\_P0121\_P012B\_P0236\_P1101 MAP1 Residual Weight Factor based on RPM

**Notes:**

| y/x | 500   | 1,000 | 1,250 | 1,500 | 1,750 | 2,000 | 2,250 | 2,500 | 3,000 | 3,500 | 4,000 | 4,500 | 5,000 | 5,500 | 6,000 | 6,500 | 7,000 |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1   | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.831 | 0.769 | 0.912 | 0.845 | 0.761 | 0.831 | 1.000 | 1.000 | 1.000 | 1.000 | 0.738 |

**Supporting Table - P0101\_P0106\_P0121\_P012B\_P0236\_P1101 MAP2 Residual Weight Factor based on RPM**

**Description:** P0101\_P0106\_P0121\_P012B\_P0236\_P1101 MAP2 Residual Weight Factor based on RPM

**Notes:**

| y/x | 500   | 1,000 | 1,250 | 1,500 | 1,750 | 2,000 | 2,250 | 2,500 | 3,000 | 3,500 | 4,000 | 4,500 | 5,000 | 5,500 | 6,000 | 6,500 | 7,000 |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1   | 1.000 | 1.000 | 0.946 | 0.896 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

### Supporting Table - Closed Loop Enable Clarification - KaFCLP\_U\_SlphrIntglOfst\_Thrsh

**Description:** Integral Offset voltage thresholds (bank and cell specific calcs) used with KeFCLP\_Pct\_CatAccuSlphrPostDsbl to check for sulphur poisoning.

**Notes:** millivolts

| y/x               | CiOXYR_O2_PostCat1 | CiOXYR_O2_PostCat2 |
|-------------------|--------------------|--------------------|
| CiFCLP_Decel      | 2,048              | 2,048              |
| CiFCLP_Idle       | 2,048              | 2,048              |
| CiFCLP_Cruise     | 2,048              | 2,048              |
| CiFCLP_LightAccel | 2,048              | 2,048              |
| CiFCLP_HeavyAccel | 2,048              | 2,048              |

|                                                                                                  |
|--------------------------------------------------------------------------------------------------|
| <b>Supporting Table - P0128_Maximum Accumulated Energy for Start-up ECT conditions - Primary</b> |
|--------------------------------------------------------------------------------------------------|

**Description:** Maximum Total Energy transferred to Cooling System for Ambient and Start-up ECT conditions (Primary Test)

**Notes:** Z axis is the cooling system energy failure threshold (kJ), X axis is ECT Temperature at Power up (° C) , (Deluxe version)

| y/x | -16    | -4     | 8     | 20    | 32    | 44    | 68    |
|-----|--------|--------|-------|-------|-------|-------|-------|
| 1   | 12,629 | 11,234 | 9,840 | 8,445 | 7,049 | 5,654 | 2,864 |

## Fault Bundle Definitions

**Bundle Name:** 5VoltReferenceA\_FA

P0641

**Bundle Name:** 5VoltReferenceB\_FA

P0651

**Bundle Name:** 5VoltReferenceMAP\_OOR\_Fit

P0697

**Bundle Name:** A/F Imbalance Bank1

P219A

**Bundle Name:** A/F Imbalance Bank2

P219B

**Bundle Name:** AAP\_SnsrCktFP

Naturally aspirated: P2228, P2229. Turbocharged: P0237, P0238

**Bundle Name:** AAP\_SnsrFA

Naturally Aspirated: P2227, P2228, P2229, P2230. Turbocharged: P0237, P0238.

**Bundle Name:** AAP\_SnsrTFTKO

Naturally Aspirated: P2227, P2228, P2229, P2230. Turbocharged: P0237, P0238.

**Bundle Name:** AAP2\_SnsrCktFP

P2228, P2229

**Bundle Name:** AAP2\_SnsrFA

P2227, P2228, P2229, P2230

**Bundle Name:** AAP2\_SnsrTFTKO

P2227, P2228, P2229, P2230

**Bundle Name:** AccCktLo\_FA

P2537

**Bundle Name:** AcceleratorPedalFailure

P2122, P2123, P2127, P2128, P2138, P0697, P06A3

**Bundle Name:** ACCMLostComm

U016B

**Bundle Name:** ACFailedOnSD

See ACCM Document

**Bundle Name:** ACHighSidePressSnsrCktFA

P0532, P0533

**Bundle Name:** ACThrmlRefrigSpdVld

See ACCM Document

**Bundle Name:** AfterThrottlePressTFTKO

Naturally Aspirated or Turbocharged: P0106, P0107, P0108. Supercharged: P012B, P012C, P012D.

**Bundle Name:** AfterThrottlePressureFA

Naturally Aspirated or Turbocharged: P0106, P0107, P0108. Supercharged: P012B, P012C, P012D.

|                                 |
|---------------------------------|
| <b>Fault Bundle Definitions</b> |
|---------------------------------|

**Bundle Name:** AfterThrottleVacuumTFTKO

Naturally Aspirated or Turbocharged: P0106, P0107, P0108. Supercharged: P012B, P012C, P012D.

**Bundle Name:** AIR System FA

P0411, P2440, P2444

**Bundle Name:** AIRPumpControlCircuit FA

P0418

**Bundle Name:** AIRSystemPressureSensor FA

P2430, P2431, P2432, P2433, P2435, P2436, P2437, P2438

**Bundle Name:** AIRValveControlCircuit FA

P0412

**Bundle Name:** AmbientAirDefault

Baro Sensor Present: P2227, P2228, P2229, P2230. No Baro Sensor Present: P0101, P0102, P0103, P0106, P0107, P0108, P0111, P0112, P0113, P0114, P0121, P0122, P0123, P012B, P012C, P012D, P0222, P0223, P1221

**Bundle Name:** AmbPresDfltStatus

Baro Sensor Present: P2227, P2228, P2229, P2230. No Baro Sensor Present: P0101, P0102, P0103, P0106, P0107, P0108, P0111, P0112, P0113, P0114, P0121, P0122, P0123, P012B, P012C, P012D, P0222, P0223, P1221

**Bundle Name:** AmbPresSnsrCktFA

P2228, P2229

**Bundle Name:** AmbPresSnsrCktFP

P2228, P2229

**Bundle Name:** AnyCamPhaser\_FA

P0010, P0011, P0013, P0014, P0020, P0021, P0023, P0024

**Bundle Name:** AnyCamPhaser\_TFTKO

P0010, P0011, P0013, P0014, P0020, P0021, P0023, P0024

**Bundle Name:** BrakeBoosterSensorFA

P0556, P0557, P0558

**Bundle Name:** BrakeBoosterVacuumValid

P0556, P0557, P0558

**Bundle Name:** BSTR\_b\_ExcsvBstFA

P226B

**Bundle Name:** BSTR\_b\_ExcsvBstTFTKO

P226B

**Bundle Name:** BSTR\_b\_IC\_PmpCktFA

P023A, P023C

**Bundle Name:** BSTR\_b\_PCA\_CktFA

P0033, P0034, P0035, P0045, P0047, P0048, P0243, P0245, P0246, P0247, P0249, P0250

**Bundle Name:** BSTR\_b\_PCA\_CktLoFA

## Fault Bundle Definitions

P0034, P0047, P0245, P0249

**Bundle Name:** BSTR\_b\_PCA\_CktLoTFTKO

P0034, P0047, P0245, P0249

**Bundle Name:** BSTR\_b\_PCA\_CktTFTKO

P0033, P0034, P0035, P0045, P0047, P0048, P0243, P0245, P0246, P0247, P0249, P0250

**Bundle Name:** BSTR\_b\_PCA\_FA

P0234, P0299, P0033, P0034, P0035, P0045, P0047, P0048, P0243, P0245, P0246, P2261, P0247, P0249, P0250

**Bundle Name:** BSTR\_b\_PCA\_PstnSnsrFA

P003A, P2564, P2565

**Bundle Name:** BSTR\_b\_PCA\_PstnSnsrTFTKO

P003A, P2564, P2565

**Bundle Name:** BSTR\_b\_PCA\_TFTKO

P0234, P0299, P0033, P0034, P0035, P0045, P0047, P0048, P0243, P0245, P0246, P2261, P0247, P0249, P0250

**Bundle Name:** BSTR\_b\_PresCntrlTooHiFA

P0234

**Bundle Name:** BSTR\_b\_PresCntrlTooHiTFTKO

P0234

**Bundle Name:** BSTR\_b\_PresCntrlTooLoFA

P0299

**Bundle Name:** BSTR\_b\_PresCntrlTooLoTFTKO

P0299

**Bundle Name:** BSTR\_b\_PstnCntrlFA

P166D, P166E

**Bundle Name:** BSTR\_b\_PstnCntrlTooHiFA

P166E

**Bundle Name:** BSTR\_b\_PstnCntrlTooHiTFTKO

P166E

**Bundle Name:** BSTR\_b\_PstnCntrlTooLoFA

P166D

**Bundle Name:** BSTR\_b\_PstnCntrlTooLoTFTKO

P166D

**Bundle Name:** BSTR\_b\_TurboBypassCktFA

P0033, P0034, P0035, P00C0, P00C1, P00C2

**Bundle Name:** BSTR\_b\_TurboBypassCktTFTKO

P0033, P0034, P0035, P00C0, P00C1, P00C2

**Bundle Name:** BSTR\_b\_TurboBypB\_CktFA

P00C0, P00C1, P00C2

**Bundle Name:** BSTR\_b\_TurboBypB\_CktTFTKO

## Fault Bundle Definitions

P00C0, P00C1, P00C2

**Bundle Name:** CamLctnExhFA

P0017, P0019, P0365, P0366, P0390, P0391

**Bundle Name:** CamLctnIntFA

P0016, P0018, P0340, P0341, P0345, P0346

**Bundle Name:** CamSensor\_FA

P0016, P0017, P0018, P0019, P0340, P0341, P0345, P0346, P0365, P0366, P0390, P0391

**Bundle Name:** CamSensor\_TFTKO

P0016, P0017, P0018, P0019, P0340, P0341, P0345, P0346, P0365, P0366, P0390, P0391

**Bundle Name:** CamSensorAnyLctnTFTKO

P0016, P0017, P0018, P0019, P0340, P0341, P0345, P0346, P0365, P0366, P0390, P0391

**Bundle Name:** CamSensorAnyLocationFA

P0016, P0017, P0018, P0019, P0340, P0341, P0345, P0346, P0365, P0366, P0390, P0391

**Bundle Name:** CamSensorFA

P0016, P0017, P0018, P0019, P0340, P0341, P0345, P0346, P0365, P0366, P0390, P0391

**Bundle Name:** CamSensorTFTKO

P0016, P0017, P0018, P0019, P0340, P0341, P0345, P0346, P0365, P0366, P0390, P0391

**Bundle Name:** CatalystSysEfficiencyLoB1\_FA

P0420

**Bundle Name:** CatalystSysEfficiencyLoB2\_FA

P0430

**Bundle Name:** ClutchPstnSnsr FA

P0806, P0807, P0808

**Bundle Name:** ClutchPstnSnsrCktHi FA

P0808

**Bundle Name:** ClutchPstnSnsrCktLo FA

P0807

**Bundle Name:** ClutchPstnSnsrNotLearned

P080A

**Bundle Name:** CoolingFanSpeedTooHigh\_FA

P0495

**Bundle Name:** CrankCamCorrelationTFTKO

P0016, P0017, P0018, P0019

**Bundle Name:** CrankExhaustCamCorrelationFA

P0017, P0019

**Bundle Name:** CrankExhaustCamCorrFA

P0017, P0019

**Bundle Name:** CrankIntakeCamCorrelationFA



## Fault Bundle Definitions

|                                                 |
|-------------------------------------------------|
| P0016, P0018                                    |
| <b>Bundle Name:</b> CrankIntakeCamCorrFA        |
| P0016, P0018                                    |
| <b>Bundle Name:</b> CrankSensor_FA              |
| P0335, P0336                                    |
| <b>Bundle Name:</b> CrankSensor_TFTKO           |
| P0335, P0336                                    |
| <b>Bundle Name:</b> CrankSensorFA               |
| P0335, P0336                                    |
| <b>Bundle Name:</b> CrankSensorFaultActive      |
| P0335, P0336                                    |
| <b>Bundle Name:</b> CrankSensorTestFailedTKO    |
| P0335, P0336                                    |
| <b>Bundle Name:</b> CrankSensorTFTKO            |
| P0335, P0336                                    |
| <b>Bundle Name:</b> CylDeacSystemTFTKO          |
| P3400                                           |
| <b>Bundle Name:</b> CylnderDeacDriverTFTKO      |
| P3401, P3409, P3417, P3425, P3433, P3441, P3449 |
| <b>Bundle Name:</b> ECT_Sensor_Ckt_FA           |
| P0117, P0118, P0119                             |
| <b>Bundle Name:</b> ECT_Sensor_Ckt_FP           |
| P0117, P0118                                    |
| <b>Bundle Name:</b> ECT_Sensor_Ckt_High_FP      |
| P0118                                           |
| <b>Bundle Name:</b> ECT_Sensor_Ckt_Low_FP       |
| P0117                                           |
| <b>Bundle Name:</b> ECT_Sensor_Ckt_TFTKO        |
| P0117, P0118, P0119                             |
| <b>Bundle Name:</b> ECT_Sensor_Ckt_TPTKO        |
| P0117, P0118, P0019                             |
| <b>Bundle Name:</b> ECT_Sensor_DefaultDetected  |
| P0117, P0118, P0116, P0125                      |
| <b>Bundle Name:</b> ECT_Sensor_FA               |
| P0117, P0118, P0116, P0125, P0128               |
| <b>Bundle Name:</b> ECT_Sensor_Perf_FA          |
| P0116                                           |
| <b>Bundle Name:</b> ECT_Sensor_TFTKO            |

## Fault Bundle Definitions

P0117, P0118, P0116, P0125, P0119

**Bundle Name:** EGRValve\_FP

P0405, P0406, P042E

**Bundle Name:** EGRValveCircuit\_FA

P0403, P0404, P0405, P0406

**Bundle Name:** EGRValveCircuit\_TFTKO

P0403, P0404, P0405, P0406

**Bundle Name:** EGRValvePerformance\_FA

P0401, P042E

**Bundle Name:** EGRValvePerformance\_TFTKO

P0401, P042E

**Bundle Name:** EngineMetalOvertempActive

P1258

**Bundle Name:** EngineMisfireDetected\_FA

P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308

**Bundle Name:** EngineMisfireDetected\_TFTKO

P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308

**Bundle Name:** EngineModeNotRunTimer\_FA

P2610

**Bundle Name:** EngineModeNotRunTimerError

P2610

**Bundle Name:** EnginePowerLimited

P0068, P0122, P0123, P0222, P0223, P0601, P0604, P0606, P1682, P16F3, P1104, P2100, P2101, P2102, P2103, P2176, P160E, P160D, P0191, P0192, P0193, P00C8, P00C9, P16A0, P16A1, P16A2

**Bundle Name:** EngineTorqueEstInaccurate

EngineMisfireDetected\_FA, FuelInjedorCircuit\_FA, FuelInjedorCircuit\_TFTKO, FuelTrimSystemB1\_FA, FuelTrimSystemB2\_FA, MAF\_SensorTFTKO, MAP\_SensorTFTKO, EGRValuePerforamnce\_FA

**Bundle Name:** EngModeNotRunTmErr

P2610

**Bundle Name:** EngOilModeledTempValid

ECT\_Sensor\_FA, IAT\_SensorCircuitFA

**Bundle Name:** EngOilPressureSensorCktFA

P0522, P0523

**Bundle Name:** EngOilPressureSensorFA

P0521, P0522, P0523

**Bundle Name:** EngOilTempFA

EngOilTempSensorCircuitFA, EngOilModeledTempValid, P16F3

**EngOilTempFA - Other Definitions:**

P16F3 with GetXOYR\_b\_SecurityFlt(CeXOYR\_e\_EOTR\_SecurityFlt)

|                                 |
|---------------------------------|
| <b>Fault Bundle Definitions</b> |
|---------------------------------|

|                                               |
|-----------------------------------------------|
| <b>Bundle Name:</b> EngOilTempSensorCircuitFA |
|-----------------------------------------------|

|              |
|--------------|
| P0197, P0198 |
|--------------|

|                                                   |
|---------------------------------------------------|
| <b>Bundle Name:</b> Ethanol Composition Sensor FA |
|---------------------------------------------------|

|                     |
|---------------------|
| P0178, P0179, P2269 |
|---------------------|

|                                            |
|--------------------------------------------|
| <b>Bundle Name:</b> EvapExcessPurgePsbl_FA |
|--------------------------------------------|

|                                                      |
|------------------------------------------------------|
| Conventional fuel system, P0442, P0455, P0458, P0496 |
|------------------------------------------------------|

|                                                 |
|-------------------------------------------------|
| <b>Bundle Name:</b> EvapPurgeSolenoidCircuit_FA |
|-------------------------------------------------|

|                     |
|---------------------|
| P0443, P0458, P0459 |
|---------------------|

|                                             |
|---------------------------------------------|
| <b>Bundle Name:</b> EvapReducedPurgePsbl_FA |
|---------------------------------------------|

|                                                                                      |
|--------------------------------------------------------------------------------------|
| Only EREV sealed fuel system, P0443, P0446, P0449, P0459, P0497, P0499, P2419, P2422 |
|--------------------------------------------------------------------------------------|

|                                                |
|------------------------------------------------|
| <b>Bundle Name:</b> EvapVentSolenoidCircuit_FA |
|------------------------------------------------|

|                     |
|---------------------|
| P0449, P0498, P0499 |
|---------------------|

|                                         |
|-----------------------------------------|
| <b>Bundle Name:</b> ExhaustCamSensor_FA |
|-----------------------------------------|

|                                          |
|------------------------------------------|
| P0017, P0019, P0365, P0366, P0390, P0391 |
|------------------------------------------|

|                                            |
|--------------------------------------------|
| <b>Bundle Name:</b> ExhaustCamSensor_TFTKO |
|--------------------------------------------|

|                                          |
|------------------------------------------|
| P0017, P0019, P0365, P0366, P0390, P0391 |
|------------------------------------------|

|                                        |
|----------------------------------------|
| <b>Bundle Name:</b> ExhaustCamSensorFA |
|----------------------------------------|

|                                          |
|------------------------------------------|
| P0017, P0019, P0365, P0366, P0390, P0391 |
|------------------------------------------|

|                                           |
|-------------------------------------------|
| <b>Bundle Name:</b> ExhaustCamSensorTFTKO |
|-------------------------------------------|

|                                          |
|------------------------------------------|
| P0017, P0019, P0365, P0366, P0390, P0391 |
|------------------------------------------|

|                                        |
|----------------------------------------|
| <b>Bundle Name:</b> FanOutputDriver_FA |
|----------------------------------------|

|                                                                                                         |
|---------------------------------------------------------------------------------------------------------|
| P0480, P0481, P0482, P0691, P0692, P0693, P0694, P0695, P0696, P1485 (EREV), P1486 (EREV), P1487 (EREV) |
|---------------------------------------------------------------------------------------------------------|

|                                              |
|----------------------------------------------|
| <b>Bundle Name:</b> FHPD_b_HPC_PresErrNeg_FA |
|----------------------------------------------|

|       |
|-------|
| P228D |
|-------|

|                                                 |
|-------------------------------------------------|
| <b>Bundle Name:</b> FHPD_b_HPC_PresErrNeg_TFTKO |
|-------------------------------------------------|

|       |
|-------|
| P228D |
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|                                              |
|----------------------------------------------|
| <b>Bundle Name:</b> FHPD_b_HPC_PresErrPos_FA |
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| P228C |
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|                                                 |
|-------------------------------------------------|
| <b>Bundle Name:</b> FHPD_b_HPC_PresErrPos_TFTKO |
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| P228C |
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|                                             |
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| <b>Bundle Name:</b> FHPD_b_HPC_Windup_TFTKO |
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| P0089 |
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| <b>Bundle Name:</b> FHPD_b_HPC_Windup_FA |
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| P0089 |
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|----------------------------------------|
| <b>Bundle Name:</b> FHPD_b_PumpCurr_FA |
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| P163A |
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| <b>Bundle Name:</b> FHPD_b_PumpCurr_TFTKO |
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| P163A |
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## Fault Bundle Definitions

**Bundle Name:** FHPR\_b\_FRP\_SnsrCkt\_FA

P0192, P0193

**Bundle Name:** FHPR\_b\_FRP\_SnsrCkt\_TFTKO

P0192, P0193

**Bundle Name:** FHPR\_b\_FRP\_SnsrPerfDiag\_FA

P0191

**Bundle Name:** FHPR\_b\_FRP\_SnsrPerfDiag\_TFTKO

P0191

**Bundle Name:** FHPR\_b\_PumpCkt\_FA

P0090, P0091, P0092, P00C8, P00C9, P00CA

**Bundle Name:** FHPR\_b\_PumpCkt\_TFTKO

P0090, P0091, P0092, P00C8, P00C9, P00CA

**Bundle Name:** FuelInjectorCircuit\_FA

P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0261, P0264, P0267, P0270, P0273, P0276, P0279, P0282, P0262, P0265, P0268, P0271, PP0274, P0277, P0280, P0283, P2147, P2150, P2153, P2156, P216B, P216E, P217B, P217E, P2148, P2151, P2154, P2157, P216C, P216F, P217C, P217F, P1248, P1249, P124A, P124B, P124C, P124D, P124E, P124F

**Bundle Name:** FuelInjectorCircuit\_TFTKO

P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0261, P0264, P0267, P0270, P0273, P0276, P0279, P0282, P0262, P0265, P0268, P0271, PP0274, P0277, P0280, P0283, P2147, P2150, P2153, P2156, P216B, P216E, P217B, P217E, P2148, P2151, P2154, P2157, P216C, P216F, P217C, P217F, P1248, P1249, P124A, P124B, P124C, P124D, P124E, P124F

**Bundle Name:** FuelLevelDataFault

P0461, P0462, P0463, P2066, P2067, P2068

**Bundle Name:** FuelTrimSystemB1\_FA

P0171, P0172

**Bundle Name:** FuelTrimSystemB1\_TFTKO

P0171, P0172

**Bundle Name:** FuelTrimSystemB2\_FA

P0174, P0175

**Bundle Name:** FuelTrimSystemB2\_TFTKO

P0174, P0175

**Bundle Name:** HumidityFA

P0097, P0098, P11C2, P11C3, P2227, P2228, P2229, P2230

**Bundle Name:** HumTempSnsrCktFA

P0097, P0098

**Bundle Name:** HumTempSnsrCktFP

P0097, P0098

**Bundle Name:** HumTempSnsrFA

P0096, P0097, P0098, P0099

**Bundle Name:** IAC\_SystemRPM\_FA

## Fault Bundle Definitions

|                                                                            |
|----------------------------------------------------------------------------|
| P0506, P0507                                                               |
| <b>Bundle Name:</b> IAT_ContCorrFA                                         |
| P2199                                                                      |
| <b>Bundle Name:</b> IAT_SensorCircuitFA                                    |
| P0112, P0113                                                               |
| <b>Bundle Name:</b> IAT_SensorCircuitFP                                    |
| P0112, P0113                                                               |
| <b>Bundle Name:</b> IAT_SensorCircuitTFTKO                                 |
| P0112, P0113                                                               |
| <b>Bundle Name:</b> IAT_SensorFA                                           |
| P0111, P0112, P0113, P0114                                                 |
| <b>Bundle Name:</b> IAT_SensorTFTKO                                        |
| P0111, P0112, P0113, P0114                                                 |
| <b>Bundle Name:</b> IgnitionOffTimer_FA                                    |
| P2610                                                                      |
| <b>Bundle Name:</b> IgnitionOffTimeValid                                   |
| P2610                                                                      |
| <b>Bundle Name:</b> IgnitionOutputDriver_FA                                |
| P0351, P0352, P0353, P0354, P0355, P0356, P0357, P0358                     |
| <b>Bundle Name:</b> IntakeCamSensor_FA                                     |
| P0016, P0018, P0340, P0341, P0345, P0346                                   |
| <b>Bundle Name:</b> IntakeCamSensor_TFTKO                                  |
| P0016, P0018, P0340, P0341, P0345, P0346                                   |
| <b>Bundle Name:</b> IntakeCamSensorFA                                      |
| P0016, P0018, P0340, P0341, P0345, P0346                                   |
| <b>Bundle Name:</b> IntakeCamSensorTFTKO                                   |
| P0016, P0018, P0340, P0341, P0345, P0346                                   |
| <b>Bundle Name:</b> IntkCamPhaser_FA                                       |
| P0010, P0011, P0020, P0021                                                 |
| <b>Bundle Name:</b> KS_Ckt_Perf_B1B2_FA                                    |
| P0324, P0325, P0326, P0327, P0328, P0330, P0332, P0333, P06B6, P06B7       |
| <b>Bundle Name:</b> Long Name                                              |
| Short Name                                                                 |
| <b>Bundle Name:</b> LowFuelConditionDiagnostic                             |
|                                                                            |
| <b>LowFuelConditionDiagnostic - Other Definitions:</b>                     |
| Flag set to TRUE if the fuel level < 10.0 % AND                            |
| No Active DTCs: FuelLevelDataFault, P0462, P0463 for at least 30.0 seconds |

| Fault Bundle Definitions                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bundle Name:</b> MAF_SensorCircuitFA                                                                                                                                   |
| P0102, P0103, P010C, P010D                                                                                                                                                |
| <b>Bundle Name:</b> MAF_SensorCircuitTFTKO                                                                                                                                |
| P0102, P0103, P010C, P010D                                                                                                                                                |
| <b>Bundle Name:</b> MAF_SensorFA                                                                                                                                          |
| P0101, P0102, P0103, P010C, P010D                                                                                                                                         |
| <b>Bundle Name:</b> MAF_SensorFP                                                                                                                                          |
| P0102, P0103, P010C, P010D                                                                                                                                                |
| <b>Bundle Name:</b> MAF_SensorPerfFA                                                                                                                                      |
| P0101                                                                                                                                                                     |
| <b>Bundle Name:</b> MAF_SensorPerfTFTKO                                                                                                                                   |
| P0101                                                                                                                                                                     |
| <b>Bundle Name:</b> MAF_SensorTFTKO                                                                                                                                       |
| P0101, P0102, P0103, P010C, P010D                                                                                                                                         |
| <b>Bundle Name:</b> MAF_SnsrCktFA                                                                                                                                         |
| P121B, P121C                                                                                                                                                              |
| <b>Bundle Name:</b> MAF_SnsrCktTFTKO                                                                                                                                      |
| P121B, P121C                                                                                                                                                              |
| <b>Bundle Name:</b> MAP_EngineVacuumStatus                                                                                                                                |
| P0106, P0107, P0108 Fault Active OR P0107, P0108 Fault Pending                                                                                                            |
| <b>Bundle Name:</b> MAP_SensorCircuitFA                                                                                                                                   |
| P0107, P0108                                                                                                                                                              |
| <b>Bundle Name:</b> MAP_SensorCircuitFP                                                                                                                                   |
| P0107, P0108                                                                                                                                                              |
| <b>Bundle Name:</b> MAP_SensorFA                                                                                                                                          |
| P0106, P0107, P0108                                                                                                                                                       |
| <b>Bundle Name:</b> MAP_SensorPerfFA                                                                                                                                      |
| P0106                                                                                                                                                                     |
| <b>Bundle Name:</b> MAP_SensorPerfTFTKO                                                                                                                                   |
| P0106                                                                                                                                                                     |
| <b>Bundle Name:</b> MAP_SensorTFTKO                                                                                                                                       |
| P0106, P0107, P0108                                                                                                                                                       |
| <b>Bundle Name:</b> MnfdTempSensorCktFA                                                                                                                                   |
| Turbocharged or Supercharged, with Humidity sensor: P112C, P112D. Turbocharged or Supercharged, without Humidity sensor: P0097, P0098. Naturally Aspirated: P0112, P0113. |
| <b>Bundle Name:</b> MnfdTempSensorCktFP                                                                                                                                   |
| Turbocharged or Supercharged, with Humidity sensor: P112C, P112D. Turbocharged or Supercharged, without Humidity sensor: P0097, P0098. Naturally Aspirated: P0112, P0113. |
| <b>Bundle Name:</b> MnfdTempSensorCktTFTKO                                                                                                                                |
| Turbocharged or Supercharged, with Humidity sensor: P112C, P112D. Turbocharged or Supercharged, without Humidity sensor: P0097, P0098. Naturally Aspirated: P0112, P0113. |

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| <b>Fault Bundle Definitions</b> |
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**Bundle Name:** MnfdTempSensorFA

Turbocharged or Supercharged, with Humidity sensor: P112B, P112C, P112D, P112E. Turbocharged or Supercharged, without Humidity sensor: P0096, P0097, P0098, P0099. Naturally Aspirated: P0111, P0112, P0113, P0114.

**Bundle Name:** MnfdTempSensorTFTKO

Turbocharged or Supercharged, with Humidity sensor: P112B, P112C, P112D, P112E. Turbocharged or Supercharged, without Humidity sensor: P0096, P0097, P0098, P0099. Naturally Aspirated: P0111, P0112, P0113, P0114.

**Bundle Name:** ModuleOffTime\_FA

P2610

**Bundle Name:** ModuleOffTimeErr

P2610

**Bundle Name:** no validity name is assigned to this fault bundle

**Bundle Name:** OAT\_AmbientFilteredFA

ECM OAT: P0071, P0072, P0073, P0074, EngModeNotRunTmErr, VehicleSpeedSensor\_FA, IAT\_SensorFA, ECT\_Sensor\_DefaultDetected, MAF\_SensorFA. VIMC OAT: P0072, P0073, EngModeNotRunTmErr, VehicleSpeedSensor\_FA, ECT\_Sensor\_DefaultDetected. IAT-Based OAT: not applicable. All other cases: not applicable.

**Bundle Name:** OAT\_AmbientSensorFA

ECM OAT: P0071, P0072, P0073, P0074. VIMC OAT: P0071, P0072, P0073, EngModeNotRunTmErr, VehicleSpeedSensor\_FA, ECT\_Sensor\_DefaultDetected. IAT-Based OAT: not applicable. All other cases: not applicable.

**Bundle Name:** OAT\_PtEstFiltFA

ECM OAT: P0071, P0072, P0073, P0074, EngModeNotRunTmErr, VehicleSpeedSensor\_FA, IAT\_SensorFA, ECT\_Sensor\_DefaultDetected, MAF\_SensorFA. VIMC OAT: P0072, P0073, EngModeNotRunTmErr, VehicleSpeedSensor\_FA, ECT\_Sensor\_DefaultDetected. IAT-Based OAT: VehicleSpeedSensor\_FA, IAT\_SensorFA, MAF\_SensorFA. All other cases: EngModeNotRunTmErr, VehicleSpeedSensor\_FA, IAT\_SensorFA, ECT\_Sensor\_DefaultDetected.

**Bundle Name:** OAT\_PtEstRawFA

ECM OAT: P0071, P0072, P0073, P0074. VIMC OAT: P0071, P0072, P0073, EngModeNotRunTmErr, VehicleSpeedSensor\_FA, ECT\_Sensor\_DefaultDetected. IAT-Based OAT: IAT\_SensorFA. All other cases: IAT\_SensorFA, ECT\_Sensor\_DefaultDetected.

**Bundle Name:** OilPmpCktFA

P06DA, P06DB, P06DC

**OilPmpCktFA - Other Definitions:**

Output Driver Codes

**Bundle Name:** OilPmpFA

P06DA, P06DB, P06DC, P06DD, P06DE

**OilPmpFA - Other Definitions:**

FA only for Output Driver and rationality

**Bundle Name:** OilPmpStuckHigh

P06DA, P06DB, P06DD

**OilPmpStuckHigh - Other Definitions:**

TFTKO and FA

**Bundle Name:** OilPmpStuckLow

P06DC, P06DE

**OilPmpStuckLow - Other Definitions:**

## Fault Bundle Definitions

TFTKO and FA

**Bundle Name:** OilPmpTFTKO

P06DA, P06DB, P06DC, P06DD, P06DE

**OilPmpTFTKO - Other Definitions:**

TFTKO only for Output Driver and rationality

**Bundle Name:** PowertrainRelayFault

P1682

**Bundle Name:** PowertrainRelayStateOn\_Error

P0685

**Bundle Name:** PowertrainRelayStateOn\_FA

P0685

**Bundle Name:** PPS1\_OutOfRange

P2122, P2123

**Bundle Name:** PPS1\_OutOfRange\_Composite

P2122, P2123, P06A3

**Bundle Name:** PPS2\_OutOfRange

P2127, P2128

**Bundle Name:** PPS2\_OutOfRange\_Composite

P2127, P2128, P0697

**Bundle Name:** SCIAP\_SensorCircuitFA

P012C, P012D

**Bundle Name:** SCIAP\_SensorCircuitFP

P012C, P012D

**Bundle Name:** SCIAP\_SensorFA

P012B, P012C, P012D

**Bundle Name:** SCIAP\_SensorPerfFA

P012B

**Bundle Name:** SCIAP\_SensorPerfTFTKO

P012B

**Bundle Name:** SCIAP\_SensorTFTKO

P012B, P012C, P012D

**Bundle Name:** SuperchargerBypassValveFA

P2261

**Bundle Name:** SystemVoltageHigh\_FA

P0563

**Bundle Name:** SystemVoltageLow\_FA

P0562

**Bundle Name:** TC\_BoostPresSnsrCktFA



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| <b>Fault Bundle Definitions</b> |
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P0237, P0238

**Bundle Name:** TC\_BoostPresSnsrFA

P0236, P0237, P0238

**Bundle Name:** TCM\_EngSpdReqCkt

P150C

**Bundle Name:** THMR\_AHV\_FA

P2681, P26A3, P26A6, P26A7, P26A9

**Bundle Name:** THMR\_AWP\_AuxPumpFA

B2920, B2923, B2922

**Bundle Name:** THMR\_ECT\_Sensor\_Ckt\_FA

P0116, P0117, P0118, P00B6

**Bundle Name:** THMR\_Insuff\_Flow\_FA

P00B7

**Bundle Name:** THMR\_RCT\_Sensor\_Ckt\_FA

P00B3, P00B4

**Bundle Name:** THMR\_SWP\_Control\_FA

P261D, P261A, P261C

**Bundle Name:** THMR\_Therm\_Control\_FA

P0597, P0598, P0599

**Bundle Name:** ThrotTempSensorFA

Turbocharged or Supercharged, with Humidity sensor: P112B, P112C, P112D, P112E. Turbocharged or Supercharged, without Humidity sensor: P0096, P0097, P0098, P0099. Naturally Aspirated: P0111, P0112, P0113, P0114.

**Bundle Name:** ThrotTempSensorTFTKO

Turbocharged or Supercharged, with Humidity sensor: P112B, P112C, P112D, P112E. Turbocharged or Supercharged, without Humidity sensor: P0096, P0097, P0098, P0099. Naturally Aspirated: P0111, P0112, P0113, P0114.

**Bundle Name:** ThrottlePositionSnsrPerfFA

P0121

**Bundle Name:** ThrottlePositionSnsrPerfTFTKO

P0121

**Bundle Name:** TIAP\_SensorPerfFA

P0236

**Bundle Name:** TPS\_FA

P0122, P0123, P0222, P0223, P2135

**Bundle Name:** TPS\_FaultPending

P0122, P0123, P0222, P0223, P2135

**Bundle Name:** TPS\_Performance\_FA

P0068, P0121, P1104, P2100, P2101, P2102, P2103

**Bundle Name:** TPS\_Performance\_TFTKO

## Fault Bundle Definitions

P0068, P0121, P1104, P2100, P2101, P2102, P2103

**Bundle Name:** TPS\_TFTKO

P0122, P0123, P0222, P0223, P2135

**Bundle Name:** TPS\_ThrottleAuthorityDefaulted

P0068, P0122, P0123, P0222, P0223, P16F3, P1104, P2100, P2101, P2102, P2103, P2135

**Bundle Name:** TPS1\_OutOfRange\_Composite

P0122, P0123, P06A3

**Bundle Name:** TPS2\_OutOfRange\_Composite

P0222, P0223, P06A3

**Bundle Name:** Trans Output Rotations Rolling Count Validity

**Bundle Name:** Transfer Pump is Commanded On

**Transfer Pump is Commanded On - Other Definitions:**

Fuel Volume in Primary Fuel Tank < 0.0 liters AND

Fuel Volume in Secondary Fuel Tank ≥ 0.0 liters AND

Transfer Pump on Time < P0461, P2066, P2636: Transfer Pump Enable (see supporting table for numeric value) AND

Transfer Pump had been Off for at least 0.0 seconds AND

Evap Diagnostic (Purge Valve Leak Test, Large Leak Test, and Waiting for Purge) is not running AND

Engine Running

**Bundle Name:** Transmission Actual Gear Validity

**Bundle Name:** Transmission Engaged State Validity

**Bundle Name:** Transmission Estimated Gear Validity

**Bundle Name:** Transmission Gear Ratio Validity

**Bundle Name:** Transmission Gear Selector Position Validity

**Bundle Name:** Transmission Oil Temperature Validity

**Bundle Name:** Transmission Output Shaft Angular Velocity Validity

**Bundle Name:** Transmission Overall Actual Torque Ratio Validity

**Bundle Name:** Transmission Overall Estimated Torque Ratio Validity

**Bundle Name:** Transmission Shift Lever Position Validity

**Fault Bundle Definitions****Bundle Name:** Transmission Turbine Angular Velocity Validity**Bundle Name:** TransmissionEngagedState\_FA

MYD/MYC/MYB:, P182E, P1915

**Bundle Name:** TransmissionGearDefaulted

MYD/MYC/MYB:, P182E, P1915

**Bundle Name:** VehicleSpeedSensor\_FA

P0502, P0503, P0722, P0723

**Bundle Name:** VehicleSpeedSensorError

P0502, P0503, P0722, P0723