

**2004 4.6L (LH2)
ENGINE DIAGNOSTIC PARAMETERS**

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL TYPE & Trips
Intake Camshaft Position Actuator Solenoid Control Circuit Bank 1	P 2089 Short to Battery P 2088 Short to Ground P 0010 Open Circuit	The purpose is to diagnose electrical errors detected by the PWM Driver in ECU on the Oil Control Solenoid actuator circuit	The drive self check the electrical condition to determine the source of electrical failure. If any of the electrical failure is detected an errors flag is set after the failure counter max value is reached Failure counter > 16 (1.6 s) <u>If this error is set the following actions are taken:</u> <ul style="list-style-type: none"> - Cam phasing (VCP function) is set to limp home (function Passive) - Deactivation of "Hardware Based Diagnosis with the CJ120 - Deactivate Generator L & F Terminal Monitor - Disable knock Control - Knock control adaptation (Circuit 1) - Maximum end of Pre-injection angle is used & a calibratable constant for start of injection - Disable fuel quality adaptation at start (start injection time adaptation) - Disable downstream lambda trim control - Disable Plausibility check of WARF Sensors - Disable WARF Sensors diagnosis Heater Coupling - Disable Diagnosis of the WRAF Sensor Dynamic - Disable Monitoring Upstream Sensor Signal - Disable Monitoring Upstream Sensor Signal during pull full cutoff (PUC) - Disable downstream oxygen sensor diagnosis - Disable dynamic fuel trim diagnosis - Disable catalyst efficiency diagnosis 	Battery voltage > 11 V No previous failure on the Oil Control solenoid actuator is present	Recurrence Rate: 100 ms	M/2
Intake Camshaft Position System Performance. Bank 1 & 2	P0011 Bank 1 P0021 Bank 2	The purpose of this diagnosis is to detect a difference in the camshaft position relative to the desired position (set point). To ignore temporary differences during the controller adjustment period,	Actual Cam position > desired cam position (set point) + allowed tolerance for deviation - Actual camshaft position > desired position (set point) + 6 ° CKP Actual Cam position < desired cam	- VCP State – enable (the cam phasing function is active – controller is active & set points are calculated) - Min engine speed for steady deviation < engine speed < Max	Recurrence Rate: Every 360° Crank Revolution	M / 1

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		<p>there is a calibratable cycle counter that has to expire before the diagnosis is activated.</p> <p>If the controller adjustment and the PWM adaptation cycles have expired and a steady position of the camshaft is the result of the actual engine state, this camshaft difference is integrated.</p> <p>If the integrated difference reaches a max calibrated value the Failure counter is incremented.</p> <p>Also, when the actual position is within acceptable window another integrator will start and when the value of the reaches the diagnosis initialization value the failure counter is decremented.</p>	<p>position (set point) + allowed tolerance for deviation</p> <ul style="list-style-type: none"> - Actual camshaft position < desired position (set point) + 6 ° CKP <p>The errors flag for intake camshaft is set after the failure counter max value is reached</p> <p>Failure counter > 16 (1.6s)</p> <p><u>If this error is set the following actions are taken:</u></p> <ul style="list-style-type: none"> - Cam phasing (VCP function) is set to limp home (function Passive) - Deactivation of "Hardware Based Diagnosis with the CJ120 - Deactivate Generator L & F Terminal Monitor - Disable knock Control - Knock control adaptation (Circuit 1) - Maximum end of Pre-injection angle is used & a calibratable constant for start of injection - Disable fuel quality adaptation at start (start injection time adaptation) - Disable downstream lambda trim control - Disable Plausibility check of WARF Sensors - Disable WARF Sensors diagnosis Heater Coupling - Disable Diagnosis of the WRAF Sensor Dynamic - Disable Monitoring Upstream Sensor Signal - Disable Monitoring Upstream Sensor Signal during pull full cutoff (PUC) - Disable downstream oxygen sensor diagnosis - Disable dynamic fuel trim diagnosis - Disable catalyst efficiency diagnosis <p>Cam phasing (VCP function) is set to limp</p>	<p>engine speed for steady deviation Table base on oil temp < N RPM < Table based on oil temp</p> <ul style="list-style-type: none"> - Min oil pressure for steady deviation < actual oil pressure < Max oil pressure for steady deviation 1 Bar < actual oil pressure < 7 bar - PWM adaptation cycle has expired - VCP is not in Limp Home (no failure on VCP electrical or mechanical) 		

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			home (function Passive) until the transition from engine run to engine stop is detected, even if the error is resolved			
Exhaust Camshaft Position Actuator Solenoid Control Circuit Bank 1	P 2091 Short to Battery P 2090 Short to Ground P 0013 Open Circuit	The purpose is to diagnose electrical errors detected by the PWM Driver in ECU on the Oil Control Solenoid actuator circuit	The drive self check the electrical condition to determine the source of electrical failure. If any of the electrical failure is detected an errors flag is set after the failure counter max value is reached Failure counter > 16 (1.6s) <u>If this error is set the following actions are taken:</u> <ul style="list-style-type: none"> - Cam phasing (VCP function) is set to limp home (function Passive) - Deactivation of "Hardware Based Diagnosis with the CJ120 - Deactivate Generator L & F Terminal Monitor - Disable knock Control - Knock control adaptation (Circuit 1) - Maximum end of Pre-injection angle is used & a calibratable constant for start of injection - Disable fuel quality adaptation at start (start injection time adaptation) - Disable downstream lambda trim control - Disable Plausibility check of WARF Sensors - Disable WARF Sensors diagnosis Heater Coupling - Disable Diagnosis of the WRAF Sensor Dynamic - Disable Monitoring Upstream Sensor Signal - Disable Monitoring Upstream Sensor Signal during pull full cutoff (PUC) - Disable downstream oxygen sensor diagnosis - Disable dynamic fuel trim diagnosis - Disable catalyst efficiency diagnosis 	Battery voltage > 11 V No previous failure on the Oil Control solenoid actuator is present	Recurrence Rate: 100 ms	M/2
Exhaust Camshaft Position System	P0014 Bank 1	The goal of this diagnosis is to detect steady deviation of the camshaft position relative to	Actual Cam position > desired cam position (set point) + allowed tolerance for deviation	- VCP State – enable (the cam phasing function is active – controller	Recurrence Rate: 360° CKP	M/2

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<p>Performance. Bank 1 & 2</p>	<p>P0024 Bank 2</p>	<p>the desired position (set point) by integrating the camshaft deviation at specific conditions. To ignore temporary deviations during the controller adjustment there is a tuneable cycle counter, That has to expire before the diagnosis is activated.</p> <p>If the controller adjustment and the PWM adaptation cycles have expired and a steady position of the camshaft is the result of the actual engine state, this camshaft deviation is integrated.</p> <p>If the integrated deviation reaches a max calibrated value the debounce errors counter is incremented. And If the integrator reach the value of the diagnosis initialization value the errors counter is decrement.</p>	<ul style="list-style-type: none"> - Actual camshaft position > desired position (set point) + 6 ° CKP Actual Cam position < desired cam position (set point) + allowed tolerance for deviation - Actual camshaft position < desired position (set point) +6 ° CKP The errors flag for intake camshaft is set after the failure counter max value is reached Failure counter > 16 1.6s) <u>If this error is set the following actions are taken:</u> - Cam phasing (VCP function) is set to limp home (function Passive) - Deactivation of "Hardware Based Diagnosis with the CJ120 - Deactivate Generator L & F Terminal Monitor - Disable knock Control - Knock control adaptation (Circuit 1) - Maximum end of Pre-injection angle is used & a calibratable constant for start of injection - Disable fuel quality adaptation at start (start injection time adaptation) - Disable downstream lambda trim control - Disable Plausibility check of WARF Sensors - Disable WARF Sensors diagnosis Heater Coupling - Disable Diagnosis of the WRAF Sensor Dynamic - Disable Monitoring Upstream Sensor Signal - Disable Monitoring Upstream Sensor Signal during pull full cutoff (PUC) - Disable downstream oxygen sensor diagnosis - Disable dynamic fuel trim diagnosis - Disable catalyst efficiency diagnosis 	<p>is active & set points are calculated)</p> <ul style="list-style-type: none"> - Min engine speed for steady deviation < engine speed < Max engine speed for steady deviation Table base on oil temp < N RPM < Table based on oil temp - Min oil pressure for steady deviation < actual oil pressure < Max oil pressure for steady deviation 1 Bar < actual oil pressure < 7 bar - PWM adaptation cycle has expired - VCP is not in Limp Home (no failure on VCP electrical or mechanical) 		

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			Cam phasing (VCP function) is set to limp home (function Passive) until the transition from engine run to engine stop is detected, even if the error is resolved.			
Intake Cam /Crank Correlation Bank 1 & 2	P0016 Bank 1 P0018 Bank 2	<p>The goal of this diagnosis is to detect if the actual CAM edge change lies in the permissible expected range. A hysteresis range is set around the expected CKP position in which the errors free CAM edge change is expected. If a Cam edge change does not occur in this CKP range then an errors is detected.</p> <p>This diagnosis is done on two reference edges (180° CKP apart) which are defined in the SW, (the edges are correlated to the max opening of the intake camshaft lift curve/design edge)</p> <p>The design reference Cam position is also defined in the SW.</p>	<p>VCP State Ready (cam phasing function is in a ready state after all activation condition are fulfilled) or Adaptation (in this state the mechanical edges are learned relative to design edges)</p> <p>Actual camshaft position > deign camshaft position + Mechanical tolerance Actual camshaft position > 133° CKP + 12° CKP</p> <p>Actual camshaft position < deign camshaft position - Mechanical tolerance Actual camshaft position < 133° CKP – 12° CKP</p> <p>VCP State enable (the cam phasing function is active – controller is active & setpoints are calculated)</p> <p>Actual camshaft position > Deign reference camshaft position – Max adjustable phase range – tolerance for desired camshaft position (set point) around home position Actual camshaft position > 133° CKP – 40° CKP - 3° CKP</p> <p>Actual camshaft position < deign camshaft position + tolerance for desired camshaft position (set point) around home position Actual camshaft position > 133° CKP + 3° CKP</p> <p>The errors flag for Exhaust Cam /Crank Correlation is set after the Failure Counter Max Value is reached</p> <p>Failure counter > 16 (1.6s)</p> <p><u>If this error is set the following actions are taken:</u></p>	<ul style="list-style-type: none"> - Battery voltage ≥ 11 V - VCP is not in Limp Home (no failure on VCP electrical or mechanical) - The EOL/Service Tool request for VCP Mechanical check is Passive <p>At ECM reset & transition from engine run to stop: The errors flag is cleared</p>	<p>Recurrence Rate: 100 ms</p>	<p>M/2</p>

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			<ul style="list-style-type: none"> - Cam phasing (VCP function) is set to limp home (function Passive) - Deactivation of "Hardware Based Diagnosis with the CJ120 - Deactivate Generator L & F Terminal Monitor - Disable knock Control - Knock control adaptation (Circuit 1) - Maximum end of Pre-injection angle is used & a calibratable constant for start of injection - Disable fuel quality adaptation at start (start injection time adaptation) - Disable downstream lambda trim control - Disable Plausibility check of WARF Sensors - Disable WARF Sensors diagnosis Heater Coupling - Disable Diagnosis of the WRAF Sensor Dynamic - Disable Monitoring Upstream Sensor Signal - Disable Monitoring Upstream Sensor Signal during pull full cutoff (PUC) - Disable downstream oxygen sensor diagnosis - Disable dynamic fuel trim diagnosis - Disable catalyst efficiency diagnosis <p>Cam phasing (VCP function) is set to limp home (function Passive) until the transition from engine run to engine stop is detected, even if the error is resolved</p>			
Exhaust Cam /Crank Correlation Bank 1 & 2	P0017 Bank 1 P0019 Bank 2	<p>The goal of this diagnosis is to detect if the actual CAM edge change lies in the permissible expected range. A hysteresis range is set around the expected CKP position in which the errors free CAM edge change is expected. If a Cam edge change does not occur in this CKP range then an errors is detected. This diagnosis is done on two</p>	<p>VCP State Ready (cam phasing function is in a ready state after all activation condition are fulfilled) or Adaptation ((in this state the mechanical edges are learned relative to design edges)</p> <p>Actual camshaft position > deign camshaft position + Mechanical tolerance</p> <p>Actual camshaft position > -117° CKP + 12° CKP</p>	<p>The following conditions are fulfilled:</p> <ul style="list-style-type: none"> - Battery voltage ≥ 11 V - VCP is not in Limp Home (no failure on VCP electrical or mechanical) - The EOL/Service Tool request for VCP Mechanical check is Passive <p>At ECM reset & transition from engine run to stop: The errors flag is cleared</p>	<p>Recurrence Rate: 100 ms</p>	<p>M/2</p>

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		<p>reference edges (180° CKP apart) which are defined in the SW, (the edges are correlated to the max opening of the intake camshaft lift curve/design edge) The design reference Cam position is also defined in the SW.</p>	<p>Actual camshaft position < deign camshaft position - Mechanical tolerance Actual camshaft position < -117° CKP – 12° CKP</p> <p>VCP State enable (the cam phasing function is active – controller is active & setpoints are calculated)</p> <p>Actual camshaft position > Deign reference camshaft position + Max adjustable phase range + tolerance for desired camshaft position (set point) around home position Actual camshaft position > -117° CKP + 50° CKP + 3° CKP</p> <p>Actual camshaft position < deign camshaft position - tolerance for desired camshaft position (set point) around home position Actual camshaft position > -117° CKP – 3° CKP</p> <p>The errors flag for Exhaust Cam /Crank Correlation is set after the Failure Counter Max Value is reached</p> <p>Failure counter > 16 (1.6s)</p> <p><u>If this error is set the following actions are taken:</u></p> <ul style="list-style-type: none"> - Cam phasing (VCP function) is set to limp home (function Passive) - Deactivation of “Hardware Based Diagnosis with the CJ120 - Deactivate Generator L & F Terminal Monitor - Disable knock Control - Knock control adaptation (Circuit 1) - Maximum end of Pre-injection angle is used & a calibratable constant for start of injection - Disable fuel quality adaptation at start (start injection time adaptation) - Disable downstream lambda trim control - Disable Plausibility check of WARF 			

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			<p>Sensors</p> <ul style="list-style-type: none"> - Disable WRAF Sensors diagnosis Heater Coupling - Disable Diagnosis of the WRAF Sensor Dynamic - Disable Monitoring Upstream Sensor Signal - Disable Monitoring Upstream Sensor Signal during pull full cutoff (PUC) - Disable downstream oxygen sensor diagnosis - Disable dynamic fuel trim diagnosis - Disable catalyst efficiency diagnosis <p>Cam phasing (VCP function) is set to limp home (function Passive) until the transition from engine run to engine stop is detected, even if the error is resolved</p>			
<p>Intake Camshaft Position Actuator Solenoid Control Circuit Bank 2</p>	<p>P 2093 Short to Battery</p> <p>P 2092 Short to Ground</p> <p>P 0020 Open Circuit</p>	<p>The purpose is to diagnose electrical errors detected by the hardware on the actuator Solenoid circuit</p>	<p>The drive self check the electrical condition to determine the source of electrical failure.</p> <p>If any of the electrical failure is detected an errors flag is set after the failure counter max value is reached</p> <p>Failure counter > 16 (1.6s)</p> <p><u>If this error is set the following actions are taken:</u></p> <ul style="list-style-type: none"> - Cam phasing (VCP function) is set to limp home (function Passive) - Deactivation of "Hardware Based Diagnosis with the CJ120 - Deactivate Generator L & F Terminal Monitor - Disable knock Control - Knock control adaptation (Circuit 1) - Maximum end of Pre-injection angle is used & a calibratable constant for start of injection - Disable fuel quality adaptation at start (start injection time adaptation) - Disable downstream lambda trim control 	<p>Battery voltage > 11 V</p> <p>No previous failure on the Oil Control solenoid actuator is present</p>	<p>Recurrence Rate: 100 ms</p>	<p>M/2</p>

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			<ul style="list-style-type: none"> - Disable Plausibility check of WARF Sensors - Disable WARF Sensors diagnosis Heater Coupling - Disable Diagnosis of the WRAF Sensor Dynamic - Disable Monitoring Upstream Sensor Signal - Disable Monitoring Upstream Sensor Signal during pull full cutoff (PUC) - Disable downstream oxygen sensor diagnosis - Disable dynamic fuel trim diagnosis - Disable catalyst efficiency diagnosis 			
Exhaust Camshaft Position Actuator Solenoid Control Circuit Bank 1	P 2095 Short to Battery P 2094 Short to Ground P 0023 Open Circuit	The purpose is to diagnose electrical errors detected by the hardware on the actuator Solenoid circuit	The drive self check the electrical condition to determine the source of electrical failure. If any of the electrical failure is detected an errors flag is set after the failure counter max value is reached Failure counter > 16 (1.6s) <u>If this error is set the following actions are taken:</u> <ul style="list-style-type: none"> - Cam phasing (VCP function) is set to limp home (function Passive) - Deactivation of "Hardware Based Diagnosis with the CJ120 - Deactivate Generator L & F Terminal Monitor - Disable knock Control - Knock control adaptation (Circuit 1) - Maximum end of Pre-injection angle is used & a calibratable constant for start of injection - Disable fuel quality adaptation at start (start injection time adaptation) - Disable downstream lambda trim control - Disable Plausibility check of WARF Sensors - Disable WARF Sensors diagnosis Heater Coupling - Disable Diagnosis of the WRAF Sensor Dynamic - Disable Monitoring Upstream Sensor 	Battery voltage > 11 V No previous failure on the Oil Control solenoid actuator is present	Recurrence Rate: 100 ms	M/2

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			<ul style="list-style-type: none"> - Signal - Disable Monitoring Upstream Sensor Signal during pull full cutoff (PUC) - Disable downstream oxygen sensor diagnosis - Disable dynamic fuel trim diagnosis - Disable catalyst efficiency diagnosis 			
Mass Air Flow (MAF) Sensor Performance	P0101	The load/TP rationality check can detect unplausibilities in the system, but only in combination with the output of the FSD (fuel system diagnosis) it is possible to identify the faulty sensor (load or throttle position) and to distinguish between a MAF sensor errors and a MAP sensor errors. Usually the reduced area and the pressure controller will be deactivated (and reset) if a plausibility errors occurs. This means, the IMM goes to pre-controlled and the only signal used is the throttle position.	<p>If the FSD detects an errors in the fuel path, this means that the TP signal is bad. If the FSD detects no errors this means, the unplausibility was caused from a faulty load sensor. Based on which sensor control is active the faulty load sensor could be disguised Load/TP rationality = 1 FSD errors = 0 Pressure ration (MAP/AMP) < 0.85 MAF sensor is faulty</p> <p>The MAF sensor performance errors flag is set after the errors counter reaches max value Failure counter > 16 (200ms)</p>	Drive cycle has started The load/TP rationality check was complete No pervious faulty exists on the MAF performance	Recurrence Rate: 12.5 ms	M/2
Mass Air Flow (MAF) Sensor Circuit	P0102 Low Frequency P0103 High Frequency	The purpose of the diagnosis shall be to detect electrical faults in the frequency sensor HFM, The diagnosis will be divided in two different cases, when the engine doesn't run but the ignition key is ON (HFM-idle diagnosis) and when the motor is running (HFM diagnosis).	<p>Low frequency MAF Frequency for Diagnoses < 50 Hz Frequency is lower than 200 Hz</p> <p>Low frequency flag = 1 after debounce Failure counter > 16 (200ms)</p> <p>High Frequency MAF Frequency for Diagnoses > 12425 Hz Frequency is higher than 20000 kHz high frequency errors flag = 1 after debounce</p> <p>MAF Frequency for Diagnoses > 520 Kg/h MAF Frequency for Diagnoses < 1 Kg/h Sensor has exceed the diagnostic</p>	<p>Engine not running</p> <ul style="list-style-type: none"> - ignition Key on - Engine stopped <p>Engine running</p> <ul style="list-style-type: none"> - ignition Key on - Engine started - Engine speed > 500 rpm 	Recurrence Rate: 12.5 ms	M / 2

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			<p>threshold</p> <p>the MAF errors flag is set if any of the condition is fulfilled</p> <p>Failure counter >16 (200ms)</p> <p>MAF sensor control is not active (output signal is d) Map sensor control is activated (output signal is used by intake manifold model)</p>			
Throttle Body Performance	P0068	<p>The load/TP plausibility check proofs the consistency between load and throttle position. The plausibility is checked by comparing the excitation of the controller (reduced area & pressure with the corresponding "basic" value (Throttle reduce area if area controlled, ambient pressure if pressure controlled). In addition, the throttle reduce area adaptation values are checked separately. This is necessary, because at closed throttle small absolute values (e.g. due to leakage air adaptation) may result in large relative values that pretend a bad system.</p> <p>If the current load and throttle position signals are not consistent (implausible) a flag is set, that indicates problems in the plausibility check (or area adaptation value) is above a calibratable threshold, The unplausibility detected only states, that the actual load and throttle position do not fit together and therefore a large controller excitation is required to bring them into line.</p>	<p>Plausibility check throttle reduced area adaptation values</p> <p>(The additive and multiplicative adaptation values of the reduced area are checked separately. If one of them exceeds the corresponding threshold, a related errors flag is set, if the value is inside the thresholds the respective flag is reset. Because adaptation is done with a slow Recurrence Rate, no filtering of the adaptation values is required and they are directly used)</p> <ul style="list-style-type: none"> - Throttle reduced are controller additive < 15 cm ^2 - Throttle reduced are controller additive > 15 cm ^2 - Throttle reduced area controller factor < 35% - Throttle reduced area controller factor > 35% <p>Plausibility check throttle reduced area controller excitation (In the plausibility check only the steady state conditions are of interest. Therefore, the controller excitations of the reduced area controller is smoothed with a low pass filter. This controller output is only calculated as long as the corresponding controller is active. If the plausibility check is deactivated the calculation of the moving mean value from the reduced area controller output is stopped (but not reset). Depending on several input variables the</p>	<p>Drive cycle has started No errors currently exist on the throttle or load. Diagnoses in not disabled 600 RPM < engine speed < 6300 RPM 0.2 < pressure ration (MAP/ambient) < .95</p>	Recurrence Rate: 25 ms	M/2

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		<p>If the fuel system diagnosis is available, it is possible to identify the reason of the unplausibility (i.e. errors in the load signal or throttle position) and to distinguish between the different type of load errors (MAF or MAP). To get reasonable results from the FSD, a certain delay time is required before accessing the FSD results.</p>	<p>threshold for the controller excitation is selected. If e.g. the ECT-sensor goes bad, the threshold for plausibility errors detection can be chosen higher, so that more controller excitation is allowed. If the filtered reduced area controller excitation reaches a certain thresholds the plausibility check errors is set to active).</p> <ul style="list-style-type: none"> - Filtered reduced area controller < 35% - filtered reduced area controller > 35% <p>Plausibility check pressure controller excitation (In the plausibility check only the steady state conditions are of interest. Therefore, the controller excitations of the reduced area controller is smoothed with a low pass filter. This controller output is only calculated as long as the corresponding controller is active. If the plausibility check is deactivated the calculation of the moving mean value from the reduced area controller output is stopped (but not reset). Depending on several input variables the threshold for the controller excitation is selected. If e.g. the ECT-sensor goes bad, the threshold for plausibility errors detection can be chosen higher, so that more controller excitation is allowed. If the ratio of the filtered pressure controller excitation and the (adapted) ambient pressure reaches a certain threshold, the plausibility check errors is set to active.</p> <ul style="list-style-type: none"> - filtered pressure controller excitation < 225 hpa - filtered pressure controller excitation > 225 hpa <p>if any of the above condition are fulfilled then the TP/Load plausibility errors flag is set after failure counter max value is reached Failure counter > 16 (400ms)</p>			

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			<p><u>If this diagnostic is present the following are disabled</u> The intake model adaptive & excitation are rested and the model is calculating the load in pre-control (open loop no close feedback signal is used from the sensors). Only the throttle signal is used.</p>			
Throttle Body Performance	P0068	The load/TP rationality check can detect unplausibilities in the system, but only in combination with the output of the FSD (fuel system diagnosis) it is possible to identify the faulty sensor (load or throttle position) and to distinguish between a MAF sensor errors and a MAP sensor errors. Usually the reduced area and the pressure controller will be deactivated (and reset) if a plausibility errors occurs. This means, the IMM goes to pre-controlled and the only signal used is the throttle position.	<p>If the FSD detects an errors in the fuel path, this means that the TP signal is bad. If the FSD detects no errors this means, the unplausibility was caused from a faulty load sensor.</p> <p>Load/TP rationality = 1 FSD errors = 1 Throttle is faulty</p> <p>The throttle body performance errors flag is set after the errors counter reaches max value</p> <p>Failure counter > 16 (400ms)</p>	<p>Drive cycle has started The load/TP rationality check was complete No pervious faulty exists on the throttle body performance</p>	<p>Recurrence Rate: 25 ms</p>	M/2
Manifold Absolute Pressure (MAP) Sensor Performance	P0106	The load/TP rationality check can detect unplausibilities in the system, but only in combination with the output of the FSD (fuel system diagnosis) it is possible to identify the faulty sensor (load or throttle position) and to distinguish between a MAF sensor errors and a MAP sensor errors. Usually the reduced area and the pressure controller will be deactivated (and reset) if a plausibility errors occurs. This means, the IMM goes to pre-controlled and the only signal used is the throttle position.	<p>If the FSD detects an errors in the fuel path, this means that the TP signal is bad. If the FSD detects no errors this means, the unplausibility was caused from a faulty load sensor.</p> <p>Based on which sensor control is active the faulty load sensor could be disguised</p> <p>Load/TP rationality = 1 FSD errors = 0 Pressure ration (MAP/AMP) > 0.85 MAP sensor is faulty</p> <p>The MAP sensor performance errors flag is set after the errors counter reaches max value</p> <p>Failure counter > 16 (400ms)</p>	<p>Drive cycle has started The load/TP rationality check was complete No pervious faulty exists on the MAP performance</p>	<p>Recurrence Rate: 25 ms</p>	M/2
Manifold Absolute Pressure (MAP) Sensor Circuit	<p>P0107 Low Voltage</p> <p>P0108 High Voltage</p>	The purpose is to diagnose the mean value of the analog input signal (V_MAP) from MAP sensor to the micro-controller.	<p>High voltage MAP Volts > 4.9V Short to battery or open circuit errors detected</p> <p>Low voltage</p>	<p>Ignition key on Engine stopped Engine running and steady throttle</p>	<p>Recurrence Rate; 25ms</p>	M / 2

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			<p>MAP Volts < .08V Short to ground errors detected</p> <p>Failure counter > 16 (400ms)</p> <p>The MAP DTC is set if the failure conditions are fulfilled.</p>			
<p>Manifold Absolute Pressure (MAP) Sensor Circuit Intermittent</p>	<p>P1106 Intermittent high</p> <p>P1107 Intermittent Low</p>	<p>The purpose is to diagnose the mean value of the analog input signal (V_MAP) from MAP sensor to the ECM.</p>	<p>High pass filter of V_MAP > 4.9V</p> <p>Evaluation of sign (MAPn – MAPn-1) errors is set High intermittent errors detected</p> <p>Evaluation of sign (MAPn – MAPn-1) errors not set Low intermittent errors is detected Low pass filter of V_MAP < .11V</p> <p>The MAP errors flag is set if any of the condition is fulfilled after debounce</p> <p>Failure counter > 16 (400ms)</p> <p>MAP sensor control is d (output signal is d) MAF sensor control is activated (output signal is used by intake manifold model)</p>	<p>Ignition key on Engine stopped Engine running and steady throttle</p>	<p>Recurrence Rate; 25ms</p>	<p>n / 1</p>
<p>Intake Air temperature (IAT) Sensor Circuit</p>	<p>P0112 Low Voltage</p> <p>P0113 High Voltage</p>	<p>The purpose is to diagnose the analog input signal (V_TIA) from induction air temperature Low or high voltage errors</p>	<p>Low Voltage Time after start > 120s IAT Voltage < .04V Short to ground (low voltage detected)</p> <p>High voltage Time after start > 120s IAT Voltage > 4.9V Short to battery or line break (high voltage detected)</p> <p>If any of the condition if fulfilled the IAT errors flag is set after failure counter max value is reached</p> <p>Failure counter > .1s</p>	<p>Ignition Key on</p>	<p>Recurrence Rate: 100 msec</p>	<p>M / 2</p>

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL TYPE & Trips
			Load/TP Rationality threshold will be extended			
Intake Air temperature (IAT) Sensor Circuit Intermittent	P1111 Intermittent high P1112 Intermittent low	The purpose is to diagnose In case of intermittent failure detected on IAT sensor, a specific ABC counter is managed. Target is to avoid sudden calculation transition in any function based on IAT temperature	ABS (Actual air temperature for segment n – filtered air temperature for segment n) > IAT High Intermittent ABS (IAT n – IAT Filtered n) > 4.9V IAT Low Intermittent < .04V IAT intermittent errors flag is set after debounce Failure counter > .1s	Ignition Key on	Recurrence Rate: 100 msec	N / 1
Engine Coolant Sensor Performance	P0116	This Diagnostic Detects a Stuck ECT sensor signal. An ECT model is used to determine the expected rate of change in the ECT sensor. Once a calibratable delta between ECT model minimum value and ECT model maximum value is reached the decision portion of the diagnostic is entered. If the delta between ECT minimum value and ECT maximum value is less than a calibratable table value the sensor is considered stuck.	ECT change on this drive cycle < 1.5° C If this error is detected then the ECT model temp is used. The error will latch for this drive cycle (until power latch occurs).	Disable conditions: <ul style="list-style-type: none"> ECT fault IAT fault MAF fault EMOP active Enable conditions: <ul style="list-style-type: none"> Engine running ECT model temp change on this drive cycle > 100°C if start temp= minus 40°C, through 20°C if start temp= 70°C at (table based on ECT at start) The diagnostic will not fail if start temp > 70°C (temp gage value is supplied by ECT sensor by ECM via communication bus) ***Please confirm true for all carlines. 	Recurrence Rate 1 sec (Currently completes before end of 18 th cycle of -7° C FTP. Validation of calibration is NOT complete)	M \ 2
Engine Coolant Temperature Sensor Electrical Diagnosis (ECT)	P 0117 P 0118	This Diagnosis is to detect an Electrical malfunction, Short circuit to VB, SCG, OL.	<ul style="list-style-type: none"> ECT Volts < .06V Failure Ctr. > .1s P 0117 = Active (SCG) <ul style="list-style-type: none"> ECT Volts > 4.9V Inlet Air Temp. ≥ -7°C Eng Run Time ≥ 120s Failure Ctr. > .1s P 0118 = Active 	<ul style="list-style-type: none"> Short circuit to ground Diagnosis IGN = ON EMOP = Not Active <ul style="list-style-type: none"> Short circuit to VB or OL Diagnosis IGN = ON EMOP = Not Active 	Recurrence Rate: 100 ms	M / 2
Engine Coolant Temperature	P 0125	Detects if ECT has reached sufficient temperature to allow	ECT < Table used for Lamda Sensor Closed Loop operation	Disable conditions: <ul style="list-style-type: none"> Inlet air temp < -8.25c 	Recurrence Rate: 1 s	M \ 2

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL TYPE & Trips
(ECT) Insufficient for Closed Loop Fuel Control		closed loop fuel using an ECT model vs. measured ECT.	If this error is detected then the ECT model temp is used. The error will latch for this drive cycle (until power latch occurs).	<ul style="list-style-type: none"> Inlet air temp sensor fault ECT fault MAF sensor fault MAF/TP sensor plausibility fault Enable conditions: <ul style="list-style-type: none"> Engine running time > 30s AND open loop time > 120s idle time < 50& fuel cut off time < 50% 	Currently the normal time to closed loop is 15 seconds. Closed loop is forced after 120 seconds.	
Engine Coolant Temperature (ECT) Below Thermostat Regulating Temperature	P 0128	Detects a stuck open thermostat, using an ECT model vs. measured ECT.	ECT has not been greater than 72°C for 10 seconds OR ECT < 62 c for catylyst diagnostic enable temperature OR ECT < 62c for lamda sensor diagnostic enable temperature	Disable conditions: <ul style="list-style-type: none"> ECT fault Time to close loop fault MAF sensor fault MAF/TP sensor plausibility fault ECT @ start < -8.25° C ECT @ start > 50° C Enable conditions: <ul style="list-style-type: none"> ECT model > 90° C idle time < 95% fuel cutoff time < 50% 	Recurrence Rate: 1 s Run time varies with the ECT at start. Completes before end of 18 th cycle of -7° C FTP.)	M \ 2
Engine Coolant Sensor Signal Voltage	P 1114 P 1115	This diagnostic will detect an intermittent short to ground or intermittent short to battery voltage / open	<ul style="list-style-type: none"> ECT Volts < .04V Failure Ctr. > .1s P 1114 = Active (INT SCG) <ul style="list-style-type: none"> ECT Volts > 4.9V Inlet Air Temp. ≥ -7°C Eng Run Time ≥ 120s Failure Ctr. > .1s P 1115 = Active 	<ul style="list-style-type: none"> <u>INT Short circuit to ground Diagnosis</u> IGN = ON EMOP = Not Active <ul style="list-style-type: none"> <u>INT Short circuit to VB or OL Diagnosis</u> IGN = ON EMOP = Not Active 	Recurrence Rate: 100mS	N / 1
Throttle Position Sensor # 1 Electrical Diagnosis (TP)	(TP 1) Low Volts P 0122 (TP 2) High Volts P 0123	This Diagnosis is to detect an Electrical malfunction, Short circuit to VB, SCG, OL.	TP Volts < .098 Failure Ctr. = 12 (60ms) P 0122 = Active (SCG) TP Volts > 4.89 Failure Ctr. = 12 (60ms) P 0123 = Active (SCVB / OL)	Activation: IGN =1. The error bits, Failure-counters and other variables or bits are initialised Deactivation: IGN =0 or the setting conditions are not fulfilled anymore - TP DTC already set - Limp home active	5 ms	M \ 1
Throttle Position Sensor # 1 Electrical Diagnosis (TP)	(TP 2) Low Volts P 0222 (TP 2) High Volts P 0223	The potentiometer voltage for channel 2 must be within the admissible limits. This DTC can distinguish the circuit's low & High Voltage.	TP Volts < 0.4643 V Failure counter max = 12 (60ms) P222 = Active Limp home – RPM limitation TP Volts > 4.8436 V Failure counter max = 12 (60ms) P223 = Active Limp home – RPM limitation	Activation: IGN =1. The error bits, Failure-counters and other variables or bits are initialised Deactivation: IGN =0 or the setting conditions are not fulfilled anymore - TP DTC already set - Limp home active	5 ms	M \ 1

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Wide Range Air Fuel Sensor # 1 Electrical Diagnosis (B1S1)	SCG P 0131 SCVB P 0132 Open Line P 0134	This Diagnostic is intended to detect a SCG, SCVB, or Open in the signal line or in the WRAF sensor. The Electrical Diagnosis is performed internally through the ECM (BSW) by the CJ120 Register.	If the CJ120 detects an Open signal, SCG, or SCVB. AND Failure Counter > 100 (500 ms) (inc @ 2) Related P-Codes = Active	<u>This diagnostic is inhibited if any of the following DTC's are present:</u> HO2S <u>Enable Conditions</u> IGN = ON Diagnosis = Active	Recurrence Rate: 10 ms	M / 2
HO2S Slow Response Bank 1 & 2 Sensor 1	(Bank 1) P0133 (Bank 2) P0153	This diagnosis observes the amplitude of the Lambda sensor in response to forced lambda stimulation. The sensor value is compared to a Lambda sensor model and a filtered ratio is generated. This value is filtered by a gain table that is used to standardize the amplitude portion with respect to engine speed and load. The integral of all cycles during the test is the compared to a single threshold to determine the response of the sensor signal. By observing the amplitude of the sensor signal during a given forced stimulation period, the response time of the sensor can be determined. A sensor with slow response time will not achieve the modeled amplitude during a forced stimulation period.	1.) A dynamic parameter of the sensor is calculated by dividing the period of the lambda air/fuel ratio switching characteristic by a multiplication of the amplitude of the lambda by the difference between the lambda set point that includes the period, amplitude and the basic lambda set-point 2.) The value of this dynamic parameter is multiplied by a gain value that is used to standardize the amplitude portion with respect to engine speed and load and added to an integrated value of the dynamic parameter. 3.) This function is equipped with a counter that counts the number of single calculations. Once the minimum number of calculations 15 cyc. is exceeded another calculation is made. This calculation divides the integrated dynamic sensor parameter value by the counter value. This calculation gives the characteristic value of the sensor dynamics. The characteristic value of the sensor dynamic is then compared to the limited diagnosis value for error diagnosis. If Sensor Dynamic Total < .2 P0133 = Active P0153 = Active	Enable conditions <ul style="list-style-type: none"> ● HO2S Ready (Lambda Sensor Closed Loop) ● Lambda forced stimulation active ● Baro ≥ 740hPa ● Rpm > 1216 < 3104 ● MAF > 170 < 400mgstk ● Catalyst diagnosis active. Catalyst diagnostic generates the forced stimulation used to diagnose the Catalyst OSC and HO2S Response Time simultaneously. <u>This diagnostic is inhibited if any of the following DTC's are present:</u> CKP Sensors CMP Sensors MAF Sensors MAP Sensors Injectors DTC's Ignition Coil DTC's HO2S DTC's Limp home Safety (ETC) EVAP / CPS DTC's TP DTC's ECT DTC's Misfire DTC's	Recurrence Rate: 10 ms During low engine speed and load conditions a longer forced stimulation period is required to assure correct diagnosis. The longest period used is 1.24 seconds. This value is multiplied by 15 cycles to determine the worst case test time. The result is 18.6 seconds. Under most operating conditions the test will complete in one continuous test. However, if the test is interrupted, test results for previous cycles are stored. This means the 15 cycles do not have to be consecutive in order to complete the diagnostic. They must all be within the same key cycle.	M \ 2
HO2S Heater Electrical Circuit Bank 1 Sensor 1	P 0030 OC P 0031 SCG P 0032 SCB	The purpose of the diagnostic is intended to detect electrical faults within the oxygen sensor	If: SCB Diagnosis = Enabled PWM signal ≥ 99%	Enable Conditions: IGN = ON, Eng = ON	Recurrence rate 1 s	M \ 2

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HO2S Heater Electrical Circuit Bank 2 Sensor 1	P0050 OC P0051 SCG P0052 SCB	Heater Circuit. This diagnostic takes into consideration the following electrical faults based the heater drivers ATM3x. Short to B+ by Over-temperature or Overcurrent. Short to ground and Open-line. The heater driver is capable of detecting OL and SCB when in the "ON" State and will detect the SCG only when in the "OFF" state. The heater power is controlled by a PWM signal, the driver will be placed alternately in an "ON" and then "OFF" state.	Diagnostic = Active Or if: Exhaust temp. $\geq 400^{\circ}\text{C}$ Diagnostic = Active If: SCG Diagnosis = Enabled PWM signal $\leq .39\%$ Diagnostic = Active If: OL Diagnosis = Enabled PWM signal $\geq .39\%$ Diagnostic = Active	Batt volts $> 11 < 16$ Diagnostic = Enabled <u>This diagnostic is inhibited if any of the following DTC's are present:</u> VB DTC's		
HO2S Heater Electrical Circuit Bank 1 Sensor 2 HO2S Heater Electrical Circuit Bank 2 Sensor 2	P 0036 OC P 0037 SCG P 0038 SCB P0056 OC P0057 SCG P0058 SCB	The purpose of the diagnostic is intended to detect electrical faults within the oxygen sensor Heater Circuit. This diagnostic takes into consideration the following electrical faults based the heater drivers. Short to B+, Short to ground and Open-line. The heater driver is capable of detecting OL and SCB when in the "ON" State and will detect the SCG only when in the "OFF" state. The heater power is controlled by a PWM signal, the driver will be placed alternately in an "ON" and then "OFF" state.	If: SCB Diagnostic Flag = Enabled Heater state \neq Preheating Diagnostic = Active Or: Cat Temp $\geq 400\text{ C}$ Diagnostic = Active If: SCG Diagnostic Flag = Enabled Diagnostic = Active If: OL Diagnostic Flag = Enabled Diagnostic = Active	<u>Enable Conditions:</u> IGN = ON, Eng = ON Batt volts $> 11 < 16$ Diagnostic = Enabled <u>This diagnostic is inhibited if any of the following DTC's are present:</u> VB DTC's	Recurrence rate 1 s	M \ 2
HO2S Heater Performance Bank 1 and 2 Sensor 1	(Bank 1) P 0135 (Bank 2) P 0155	This function will diagnose an upstream oxygen sensor heater failure that would lead to an increase in emissions beyond the legal thresholds. The diagnosis shall be carried out by determining whether the operative readiness of the sensor exceeds a time threshold or whether the measured oxygen sensor ceramic temperature exceeds or falls below set bounds over a number of measurement cycles. The temperature of the	After the enable criteria are met the sensor is observed for readiness. If the sensor is not ready a timer is started. If this timer exceeds 20 seconds an exaggerated stimulation is performed to try to force the sensor to ready state. If the sensor is still not active after 25 seconds of exaggerated stimulation an error is set. If the sensor is ready previous to the timer exceeding the 20 seconds another test is performed. The test will wait 60 seconds from the time the engine was started. At this point the sensor temperature is observed once per second (resistance = temp) for 32 seconds. If the sensor	<u>Enable Conditions:</u> Engine = ON Heater State not OFF or in Protection Batt Voltage $> 11 < 16\text{v}$ Heater PWM $> 25\%$ <u>This diagnostic is inhibited if any of the following DTC's are present:</u> WRAF sensor internal resistance DTC's	Recurrence rate 1 s	M \ 2

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		sensor is determined by measuring the internal resistance of the sensor.	temperature is less than 600C or greater than 900C a fail counter is incremented. After the 32 seconds has elapsed the fail counter is observed. If the fail counter exceeds 28 an error is set. P0135 = Active P0155 = Active	WRAF sensor heater electrical DTC's WRAF sensor signal electrical DTC's VB DTC's MAF DTC's Load-TP diagnosis DTC's WRAF sensor Plausibility DTC's		
Heated Oxygen Sensor (HO2S) Low Voltage Bank 1 & 2 Sensor 2	(Bank 1) P0137 (Bank 2) P0157	This Diagnostic detects a SCG in the circuit or the Oxygen Sensor	HO2S Down Volts < 2mV HO2S Down Resistance < 10 Ohms Timer 2 > 5 Sec. (Failure Window) Failure Counter > 16 (1.6 sec.) P0137 = Active P0157 = Active	<u>This diagnostic is inhibited if any of the following DTC's are present:</u> HO2S Circuit Faults <u>Enable Conditions</u> IGN = ON Dynamic Fuel Trim = Active MAF > 100Kg/h Timer 1 > 25.5 Sec. (Stabilization) Diagnostic = Active	Recurrence rate 100 ms	M / 2
Heated Oxygen Sensor (HO2S) High Voltage Bank 1 & 2 Sensor 2	(Bank 1) P0138 (Bank 2) P0158	This Diagnostic detects a SCVB in the circuit or the Oxygen Sensor	HO2S Down Volts > 2 volts Failure Counter > 16 (1.6 sec.) P0138 = Active P0158 = Active	<u>This diagnostic is inhibited if any of the following DTC's are present:</u> HO2S Circuit Faults <u>Enable Conditions</u> IGN = ON Diagnostic = Active	Recurrence Rate: 100ms	M / 2
HO2S Slow Response Bank 1 & 2 Sensor 2	(Bank 1) P0139 (Bank 2) P0159	This diagnosis can detect the sluggish behavior of the rich/lean switch times during the transition to the trailing fuel cut-off. The results are statistically treated. The allowable sensor behavior is based on the sensors signal under different MAF and signal band limits. <i>Non-Intrusive Monitoring</i>	After the enable conditions are met and PUC is determined to be active, the current downstream O2 voltage is monitored and stored. If the stored value is above 600mV and MAF > 10 < 200 Kg/h the test is started. Once the sensor voltage drops 15% of the stored value a timer is started. This timer is then stopped when the voltage drops 70% of the stored value. At this point the test is determined to be valid and the diagnostic counter is incremented by one. The switching time value is then converted to a weighted value. This process is repeated for 5 PUC events. Each time the diagnostic counter is incremented the weighted value is added to a	All monitoring conditions must be met No inhibition reason for diagnosis Coolant Temp > 70 C Downstream Sensors = Ready Vehicle Speed > 5 < 180 Km/h Cat temp > 450 C <u>This diagnostic is inhibited if any of the following DTC's are present:</u> Throttle position sensor errors Canister purge solenoid errors Canister purge solenoid mechanical errors Coolant temperature sensor errors Coolant temperature signal stuck errors	Recurrence Rate 20 ms	M \ 2

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			<p>total value. At the end of the 5 PUC events the total value is divided by the number of PUC events and another value is developed. This value is then compared to a threshold. If the value exceeds the threshold the sensor is determine to be slow.</p> <p>If Total Response Time > 1.002</p> <p>P0139 = Active P0159 = Active</p>	<p>Coolant temperature signal gradient errors Coolant temp. sensor plausibility errors Manifold pressure sensor errors Crankshaft sensor errors Camshaft sensor errors Injection valve errors Fuel system diagnosis errors Vehicle speed sensor errors O2 sensor up output stage OBD1 errors O2 sensor heater up OBD1 output stage errors O2 sensor heater up OBD2 errors O2 sensor down OBD1 output stage errors O2 sensor heater down OBD1 output stage errors O2 sensor down OBD2 switching time errors, in case of a Switching errors in the last driving cycle, this condition is faded out O2 sensor heater down OBD2 errors misfire carb A errors misfire carb B errors OBD II downstream oxygen sensor diagnosis enabled</p> <p>If any one of the above errors is active then the diagnosis of the monitoring sensors for will be inhibited.</p>		
Heated Oxygen Sensor (HO2S) insufficient Activity B1S2	(Bank 1) P0140 (Bank 2) P0160	This Diagnostic detects an Open Signal in the Oxygen Sensor or the circuit	<p>HO2S Down Volts < 522mV HO2S Down Volts > 356mV Time ≥ 5 Sec HO2S Down Resistance > 60000 Ohms Failure Counter > 16 (1.6 sec.)</p> <p>P0140 = Active P0160 = Active</p>	<p><u>This diagnostic is inhibited if any of the following DTC's are present:</u> HO2S Circuit Faults</p> <p><u>Enable Conditions</u> IGN = ON Catalyst Temp. > 650C HO2S Down = Ready Heater State = Heating Diagnostic = Active</p>	Recurrence Rate 100 ms:	M / 2
Wide Range Air Fuel Sensor # 1	SCG P 0151	This Diagnostic is intended to detect a SCG, SCVB, or Open	If the CJ120 detects an Open signal, SCG, or SCVB.	<u>This diagnostic is inhibited if any of the following DTC's are present:</u>	Recurrence Rate: 10 ms	M / 2

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Electrical Diagnosis (B2S1)	SCVB P 0152 Open Line P 0154	in the signal line or in the WRAF sensor. The Electrical Diagnosis is performed internally through the ECM (BSW) by the CJ120 Register.	AND Failure Counter > 100 (500 ms) (inc @ 2) Related P-Codes = Active	HO2S <u>Enable Conditions</u> IGN = ON Diagnosis = Active		
HO2S Heater Performance Bank 1 and 2 Sensor 2	(Bank 1) P 0141 (Bank 2) P 0161	The diagnosis strategy compares the WRAF sensor heater internal resistance to a threshold during conditions when the exhaust gas temperature is low enough to cause the sensor ceramic temperature to fall outside normal operating levels if a failure is present. From the internal resistance of the sensor the temperature of the sensor can be calculated.	After the enable criteria are met a timer is started. When this timer exceeds 240 seconds the modeled exhaust temperature is compared to a threshold of 650C. If the temperature exceeds the threshold the sensor resistance is observed once per second for 60 seconds. If the sensor resistance is greater than 1100 ohms a fail counter is incremented. After the 60 seconds has elapsed the fail counter is observed. If the fail counter exceeds 40, an error is set.	<u>Enable Conditions:</u> Engine = ON Heater = Heating Batt Voltage > 11 < 16V Heater PWM ≥ 0 ≤ 99.6% <u>This diagnostic is inhibited if any of the following DTC's are present:</u> <ul style="list-style-type: none"> ● MAF DTC's ● VB DTC's ● Load-TP diagnosis DTC's ● WRAF sensor electrical DTC's ● WRAF sensor heater electrical DTC's 	Recurrence rate 1 s	M \ 2
Fuel System Lean Bank 1	P 0171	Fuel System correction is monitored to determine if the system is too lean <i>Non-Intrusive Monitoring</i>	If the output for the lambda controller + the fuel adapts is greater than the emissions failure threshold for fuel system diagnosis during 100 seconds of a 300 second test period. (Test period timer is only incremented if enable conditions are met) If Short Term + Long Term Fueling > 25% FOR TIME > 100 SEC. P 0171 = Active	<u>Enable Conditions:</u> <ul style="list-style-type: none"> ● Closed Loop Active ● Application conditions fulfilled ● Fuel system diagnosis errors not detected during this trip. ● No inhibition due to high charcoal canister saturation. The canister purge system cycles closed for 60 seconds after 240 seconds of purge under all circumstances. Once canister purge has cycled off, there is no canister load and thus no canister inhibition due to saturation. ● Rpm > 500 ● MAF > 60mgstk ● Coolant Temp > 70°C ● Baro > 740hPa ● Intake Air Temp > -7°C If any one of the above conditions are not met then the diagnostic function will not	Recurrence Rate 20 ms Worst case to detect a fuel system fault is when the charcoal canister is saturated. This could require a worst case time of 580 seconds after ECT enable temperature is met. (Two 240 second purge cycles plus 100 seconds of purge off time.)	M \ 2

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				activate <u>This diagnostic is inhibited if any of the following DTC's are present:</u> TP errors ECT errors IAT errors MAF errors Camshaft sensor errors Misfire Present Canister purge errors Crank shaft sensor errors Fuel system diagnosis inhibited		
Fuel System Rich Bank 1	P 0172	Fuel System correction is monitored to determine if the system is too rich <i>Non-Intrusive Monitoring</i>	If the output for the lambda controller + the fuel adapts is greater than the emissions failure threshold for fuel system diagnosis during 100 seconds of a 300 second test period. (Test period timer is only incremented if enable conditions are met) If Short Term + Long Term Fueling < -25% FOR TIME > 100 SEC. P 0172 = Active	<u>Enable Conditions:</u> <ul style="list-style-type: none"> • Closed Loop Active • Application conditions fulfilled • Fuel system diagnosis errors not detected during this trip. • No inhibition due to high charcoal canister saturation. The canister purge system cycles closed for 60 seconds after 240 seconds of purge under all circumstances. Once canister purge has cycled off, there is no canister load and thus no canister inhibition due to saturation. • Rpm > 500 • MAF > 60mgstk • Coolant Temp > 70°C • Baro > 740hPa • Intake Air Temp > -7°C If any one of the above conditions are not met then the diagnostic function will not activate <u>This diagnostic is inhibited if any of the following DTC's are present:</u> TP errors ECT errors IAT errors MAF errors Camshaft sensor errors	Recurrence Rate 20 ms Worst case to detect a fuel system fault is when the charcoal canister is saturated. This could require a worst case time of 580 seconds after ECT enable temperature is met. (Two 240 second purge cycles plus 100 seconds of purge off time.)	M \ 2

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL TYPE & Trips
				Misfire Present Canister purge errors Crank shaft sensor errors Fuel system diagnosis inhibited		
Fuel System Lean Bank 2	P 0174	This diagnostic condition is used to observe the output of linear lambda control to determine if the system is too lean <i>Non-Intrusive Monitoring</i>	If the output for the lambda controller + the fuel adapts is greater than the emissions failure threshold for fuel system diagnosis during 100 seconds of a 300 second test period. (Test period timer is only incremented if enable conditions are met) If Short Term + Long Term Fueling > 25% FOR TIME > 100 SEC. P 0174 = Active	Enable Conditions: <ul style="list-style-type: none"> • Closed Loop Active • Application conditions fulfilled • Fuel system diagnosis errors not detected during this trip. • No inhibition due to high charcoal canister saturation. The canister purge system cycles closed for 60 seconds after 240 seconds of purge under all circumstances. Once canister purge has cycled off, there is no canister load and thus no canister inhibition due to saturation. • Rpm > 500 • MAF > 60mgstk • Coolant Temp > 70°C • Baro > 740hPa • Intake Air Temp > -7°C If any one of the above conditions are not met then the diagnostic function will not activate <u>This diagnostic is inhibited if any of the following DTC's are present:</u> TP errors ECT errors IAT errors MAF errors Camshaft sensor errors Misfire Present Canister purge errors Crank shaft sensor errors Fuel system diagnosis inhibited	Recurrence Rate 20 ms	M \ 2
Fuel System Rich Bank 2	P 0175	This diagnostic condition is used to observe the output of linear lambda control to determine if the system is too rich	If the output for the lambda controller + the fuel adapts is greater than the emissions failure threshold for fuel system diagnosis during 100 seconds of a 300 second test period. (Test period timer is only incremented if enable conditions are met)	Enable Conditions: <ul style="list-style-type: none"> • Closed Loop Active • Application conditions fulfilled • Fuel system diagnosis errors not detected during this trip. 	Recurrence Rate 20 ms	M \ 2

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		<i>Non-Intrusive Monitoring</i>	<p>If Short Term + Long Term Fueling < -25% FOR TIME > 100 SEC.</p> <p>P 0175 = Active</p>	<ul style="list-style-type: none"> No inhibition due to high charcoal canister saturation. The canister purge system cycles closed for 60 seconds after 240 seconds of purge under all circumstances. Once canister purge has cycled off, there is no canister load and thus no canister inhibition due to saturation. Rpm > 500 MAF > 60mgstk Coolant Temp > 70°C Baro > 740hPa Intake Air Temp > -7°C <p>If any one of the above conditions are not met then the diagnostic function will not activate</p> <p><u>This diagnostic is inhibited if any of the following DTC's are present:</u> TP errors ECT errors IAT errors MAF errors Camshaft sensor errors Misfire Present Canister purge errors Crank shaft sensor errors Fuel system diagnosis inhibited</p>		
<p>HO2S Circuit Low Voltage During Power Enrichment Bank 1 & 2 Sensor 2</p>	<p>(Bank 1) P1137</p> <p>(Bank 2) P1157</p>	<p>The purpose is to diagnose a downstream oxygen sensor that will not exceed a high voltage threshold during full load enrichment.</p>	<p>Downstream oxygen sensor voltage < 700mV during full load fuel enrichment.</p> <p>AND</p> <p>Failure Counter > 16 (1.6 sec)</p> <p>P1137 = Active P1157 = Active</p>	<p>Activation Conditions</p> <ul style="list-style-type: none"> Cat temp > 650C Downstream sensor is ready and heating Full load is present for a specified time done with a MAF integral window (100 – 300 grams) <p>This diagnostic is inhibited if any of the following DTC's are present:</p> <ul style="list-style-type: none"> Downstream O2 heater errors Downstream O2 Sensor errors Injector errors Canister purge solenoid errors MAF errors TP errors Misfire errors 	<p>100ms</p> <p>The diagnostic shall activate at every sensor acquisition.</p>	<p>M / 2</p>

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HO2S Circuit High Voltage During Decel Fuel Cut-Off (DFCO) Bank 1 & 2 Sensor 2	(Bank 1) P1138 (Bank 2) P1158	The purpose is to diagnose a downstream oxygen sensor that will not exceed a low voltage threshold during fuel cut-off.	Downstream oxygen sensor voltage > 30mV during decel fuel cut-off. AND Failure Counter > 50 (1 sec) (inc. @ 5) P1138 = Active P1158 = Active	Activation Conditions <ul style="list-style-type: none"> • Cat temp > 650C • Downstream sensor is ready and heating • Decel Fuel Cut-off is present for a specified time done with a MAF integral window (35 - 120 grams) This diagnostic is inhibited if any of the following DTC's are present: <ul style="list-style-type: none"> • Downstream O2 heater errors • Downstream O2 Sensor errors • Injector errors • Canister purge solenoid errors • MAF errors • TP errors • Misfire errors 	100ms The diagnostic shall activate at every sensor acquisition.	M / 2
Post Catalyst Fuel Trim Lean condition Bank 1 and 2 Fuel Correction Diagnostic, Portion #1	P2096 P2098	Fuel correction is used to compensate the fuel system rich or lean condition. This diagnostic has two functions. 1. The purpose is to diagnose an excess upstream sensor delay from the trim controller. 2. The purpose is to diagnosis excess deviation of the downstream sensor voltage as compared to the set-point of the trim controller. If portion 1 or 2 has failed the other portion will be disabled.	If the trim controller has exceeded its ability to keep the downstream sensor in a desired range for 22 seconds out of a 25 second test period. Fuel Trim Correction < -2.93% FOR TIME > 22 SEC. P2096 = Active P2098 = Active	Activation Conditions <ul style="list-style-type: none"> • Dynamic trim is active for more than 10 seconds • Canister purge is steady state This diagnostic is inhibited if any of the following DTC's are present: <ul style="list-style-type: none"> • Canister purge solenoid errors • ECT errors • MAF errors • MAP errors • Crankshaft sensor errors • Camshaft sensor errors • Fuel System errors • WRAF Sensor errors • WRAF Sensor HTR errors • Oxygen Sensor errors • Oxygen sensor heater errors • Misfire errors 	1 sec	M / 2
Post Catalyst Fuel Trim Lean condition Bank 1 and 2 Fuel Correction Diagnostic, Portion #2	P2096 P2098	Fuel correction is used to compensate the fuel system rich or lean condition. This diagnostic has two functions. 1. The purpose is to diagnose an excess upstream sensor delay from the trim controller. 2. The purpose is to diagnosis excess deviation of the	Downstream sensor voltage deviation from trim controller set-point: If Downstream O2 voltage is > 151 mV or < 498 mV from set-point for 70 seconds of a 75 second test period. P2096 = Active P2098 = Active	Activation Conditions <ul style="list-style-type: none"> • Dynamic trim is active for more than 10 seconds • Canister purge is steady state This diagnostic is inhibited if any of the following DTC's are present: <ul style="list-style-type: none"> • Canister purge solenoid errors • ECT errors • MAF errors • MAP errors 	1 sec	M / 2

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		<p>downstream sensor voltage as compared to the set-point of the trim controller.</p> <p>If portion 1 or 2 has failed the other portion will be disabled.</p>		<ul style="list-style-type: none"> • Crankshaft sensor errors • Camshaft sensor errors • Fuel System errors • WRAF Sensor errors • WRAF Sensor HTR errors • Oxygen Sensor errors • Oxygen sensor heater errors • Misfire errors 		
<p>Post Catalyst Fuel Trim Rich condition Bank 1 and 2</p> <p>Fuel Correction Diagnostic, Portion #1</p>	<p>P2097 P2099</p>	<p>Fuel correction is used to compensate the fuel system rich or lean condition. This diagnostic has two functions.</p> <p>1. The purpose is to diagnose an excess upstream sensor delay from the trim controller.</p> <p>2. The purpose is to diagnosis excess deviation of the downstream sensor voltage as compared to the set-point of the trim controller.</p> <p>If portion 1 or 2 has failed the other portion will be disabled</p>	<p>If the trim controller has exceeded its ability to keep the downstream sensor in a desired range for 22 seconds out of a 25 second test period.</p> <p align="center">Fuel trim correction > 2.93% FOR TIME > 22 SEC.</p> <p align="center">P2097 = Active P2099 = Active</p>	<p>Activation Conditions</p> <ul style="list-style-type: none"> • Dynamic trim is active for more than 10 seconds • Canister purge is steady state <p>This diagnostic is inhibited if any of the following DTC's are present:</p> <ul style="list-style-type: none"> • Canister purge solenoid errors • ECT errors • MAF errors • MAP errors • Crankshaft sensor errors • Camshaft sensor errors • Fuel System errors • WRAF Sensor errors • WRAF Sensor HTR errors • Oxygen Sensor errors • Oxygen sensor heater errors • Misfire errors 	<p align="center">1 sec</p>	<p align="center">M / 2</p>
<p>Post Catalyst Fuel Trim Rich condition Bank 1 and 2</p> <p>Fuel Correction Diagnostic, Portion #2</p>	<p>P2097 P2099</p>	<p>Fuel correction is used to compensate the fuel system rich or lean condition. This diagnostic has two functions.</p> <p>1. The purpose is to diagnose an excess upstream sensor delay from the trim controller.</p> <p>2. The purpose is to diagnosis excess deviation of the downstream sensor voltage as compared to the set-point of the trim controller.</p> <p>If portion 1 or 2 has failed the other portion will be disabled</p>	<p>Downstream sensor voltage deviation from trim controller set-point:</p> <p>If Downstream O2 voltage is > 151 mV or < 498 mV from set-point for 70 seconds of a 75 second test period.</p> <p>P2097 = Active P2099 = Active</p>	<p>Activation Conditions</p> <ul style="list-style-type: none"> • Dynamic trim is active for more than 10 seconds • Canister purge is steady state <p>This diagnostic is inhibited if any of the following DTC's are present:</p> <ul style="list-style-type: none"> • Canister purge solenoid errors • ECT errors • MAF errors • MAP errors • Crankshaft sensor errors • Camshaft sensor errors • Fuel System errors • WRAF Sensor errors • WRAF Sensor HTR errors • Oxygen Sensor errors • Oxygen sensor heater errors • Misfire errors 	<p align="center">1 sec</p>	<p align="center">M / 2</p>

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HO2S Signal Circuit Shorted to Heater Circuit Bank 1 & 2 Sensor 1 (Heater Coupling)	(Bank 1) P2231 (Bank 2) P2234	The diagnosis detects an increase of leakage current from the heater to the sensor circuit. The leakage is originated by a loss of insulation resistance and induces noise on the signal. Through the heater coupling the measured signal of the WRAF sensor is perturbed and the lambda regulation is influenced. The diagnosis criteria is the difference of the sensor voltage measured at specific times, triggered by the rising and falling edge of the heater PWM-signal.	After the enable conditions are met a cycle counter is started. The counter increments each time a heater cycle is complete and a rise and fall value is calculated. If the actual lambda rise or fall calculated value is greater than 5.8% from modeled lambda characteristic a fail counter is incremented by 1. At the end of 100 cycles, the fail counter is compared to a threshold of 80. If the fail counter exceeds the threshold an error is set. P2231 = Active P2234 = Active	Enable Conditions Eng. = ON Closed Loop Not in Fuel cutoff Heater PWM ≥ 15% or ≤ 85% Forced Stimulation Amplitude < 3% Forced Stimulation Duration < .35 Sec. Exhaust Temp > 400C Diagnosis = Active <u>This diagnostic is inhibited if any of the following DTC's are present:</u> HO2S Circuit Faults	Recurrence Rate 100 ms	M / 2
Injector Control Circuit Cylinder #1	P 0201 P 0261 P 0262	This function will detect an open line, short to ground, and short to battery voltage on Injector Cylinder #1	Detection of injection valve errors are done by hardware diagnosis. Failure Counter = 16 (1.6s) If Engine speed > 1200 rpm High recurrence 100 ms =1.6s = active If Engine speed < 1200 rpm Diag low recurrence 300 ms=4.8s = active	<ul style="list-style-type: none"> • <u>OL Diagnosis</u> • <u>Short circuit to ground</u> • <u>Short circuit to VB Diagnosis</u> • IGN = ON • Fuel pump = on • No inhibit on injector circuit • No SPI bus errors 	Recurrence Rate high: 100 ms low: 300 ms	M \ 2
Injector Control Circuit Cylinder #2	P 0202 P 0264 P 0265	This function will detect an open line, short to ground, and short to battery voltage on Injector Cylinder #2	Detection of injection valve errors are done by hardware diagnosis. Failure Counter = 16 (1.6s) If Engine speed > 1200 rpm High recurrence 100 ms =1.6s = active If Engine speed < 1200 rpm Diag low recurrence 300 ms=4.8s = active	<ul style="list-style-type: none"> • <u>OL Diagnosis</u> • <u>Short circuit to ground</u> • <u>Short circuit to VB Diagnosis</u> • IGN = ON • Fuel pump = on • No inhibit on injector circuit • No SPI bus errors 	Recurrence Rate high: 100 ms low: 300 ms	M \ 2
Injector Control Circuit Cylinder #3	P 0203 P 0267 P 0268	This function will detect an open line, short to ground, and short to battery voltage on Injector Cylinder #3	Detection of injection valve errors are done by hardware diagnosis. Failure Counter = 16 (1.6s) If Engine speed > 1200 rpm High recurrence 100 ms =1.6s = active If Engine speed < 1200 rpm Diag low recurrence 300 ms=4.8s = active	<ul style="list-style-type: none"> • <u>OL Diagnosis</u> • <u>Short circuit to ground</u> • <u>Short circuit to VB Diagnosis</u> • IGN = ON • Fuel pump = on • No inhibit on injector circuit • No SPI bus errors 	Recurrence Rate high: 100 ms low: 300 ms	M \ 2

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Injector Control Circuit Cylinder #4	P 0204 P 0270 P 0271	This function will detect an open line, short to ground, and short to battery voltage on Injector Cylinder #4	Detection of injection valve errors are done by hardware diagnosis. Failure Counter = 16 (1.6s) If Engine speed > 1200 rpm High recurrence 100 ms = 1.6s = active If Engine speed < 1200 rpm Diag low recurrence 300 ms = 4.8s = active	<ul style="list-style-type: none"> • <u>OL Diagnosis</u> • <u>Short circuit to ground</u> • <u>Short circuit to VB Diagnosis</u> • IGN = ON • Fuel pump = on • No inhibit on injector circuit • No SPI bus errors 	Recurrence Rate high: 100 ms low: 300 ms	M \ 2
Injector Control Circuit Cylinder #5	P 0205 P 0273 P 0274	This function will detect an open line, short to ground, and short to battery voltage on Injector Cylinder #5	Detection of injection valve errors are done by hardware diagnosis. Failure Counter = 16 (1.6s) If Engine speed > 1200 rpm High recurrence 100 ms = 1.6s = active If Engine speed < 1200 rpm Diag low recurrence 300 ms = 4.8s = active	<ul style="list-style-type: none"> • <u>OL Diagnosis</u> • <u>Short circuit to ground</u> • <u>Short circuit to VB Diagnosis</u> • IGN = ON • Fuel pump = on • No inhibit on injector circuit • No SPI bus errors 	Recurrence Rate high: 100 ms low: 300 ms	M \ 2
Injector Control Circuit Cylinder #6	P 0206 P 0276 P 0277	This function will detect an open line, short to ground, and short to battery voltage on Injector Cylinder #6	Detection of injection valve errors are done by hardware diagnosis. Failure Counter = 16 (1.6s) If Engine speed > 1200 rpm High recurrence 100 ms = 1.6s = active If Engine speed < 1200 rpm Diag low recurrence 300 ms = 4.8s = active	<ul style="list-style-type: none"> • <u>OL Diagnosis</u> • <u>Short circuit to ground</u> • <u>Short circuit to VB Diagnosis</u> • IGN = ON • Fuel pump = on • No inhibit on injector circuit • No SPI bus errors 	Recurrence Rate high: 100 ms low: 300 ms	M \ 2
Injector Control Circuit Cylinder #7	P 0207 P 0279 P 0280	This function will detect an open line, short to ground, and short to battery voltage on Injector Cylinder #7	Detection of injection valve errors are done by hardware diagnosis. Failure Counter = 16 (1.6s) If Engine speed > 1200 rpm High recurrence 100 ms = 1.6s = active If Engine speed < 1200 rpm Diag low recurrence 300 ms = 4.8s = active	<ul style="list-style-type: none"> • <u>OL Diagnosis</u> • <u>Short circuit to ground</u> • <u>Short circuit to VB Diagnosis</u> • IGN = ON • Fuel pump = on • No inhibit on injector circuit • No SPI bus errors 	Recurrence Rate high: 100 ms low: 300 ms	M \ 2
Injector Control Circuit Cylinder #8	P 0208 P 0282 P 0283	This function will detect an open line, short to ground, and short to battery voltage on Injector Cylinder #8	Detection of injection valve errors are done by hardware diagnosis. Failure Counter = 16 (1.6s) If Engine speed > 1200 rpm High recurrence 100 ms = 1.6s = active If Engine speed < 1200 rpm	<ul style="list-style-type: none"> • <u>OL Diagnosis</u> • <u>Short circuit to ground</u> • <u>Short circuit to VB Diagnosis</u> • IGN = ON • Fuel pump = on • No inhibit on injector circuit • No SPI bus errors 	Recurrence Rate high: 100 ms low: 300 ms	M \ 2

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			Diag low recurrence 300 ms=4.8s = active			
Random Misfires detected	P0300	<ul style="list-style-type: none"> CARB A misfire failure criteria: Risk of catalyst damage, monitoring interval over 200 crankshaft revolutions. CARB B1 misfire failure criteria: Emission increase, monitoring interval over the first 1000 crankshaft revolutions. CARB B4 misfire failure criteria: Emission increase, monitoring interval over 1000 crankshaft revolutions. For errors detection, misfire must take place for 4 monitoring intervals. 	<p>Monitoring during the 200 crankshaft revolutions: If the single cylinder misfire detected over a critical threshold (48)</p> <p>Misfire Cylinder Limp Home Process: The concerning cylinder is shut off immediately Max (2) cylinders will be shut off with this process.</p> <p>Monitoring at the end of 200 crankshaft revolutions: If the global sum of detected misfire is greater than the threshold (48) Or If the sum of detected misfire of each bank is greater than the threshold (48)</p> <p>If RPM < 2700, Load percentage is < 70 and Counter is > than a Calibratable value, then engine criteria is in the FTP region</p> <p>At the end of first 1000 crankshaft revolutions: If the sum of detected misfire is greater than threshold (35)</p> <p>At the end of (other than first) 1000 crankshaft revolutions: If the sum of detected misfire is greater than threshold (35) And The number of violation intervals is greater than (4) during the driving cycle.</p>	<u>Enable Conditions</u> When the Driving Cycle has started.	Every segment	"A" M / 1 Flashes "B 1" M / 2 "B 4" M / 2
Individual Misfire Cylinders # 1 - 8	P 0301 P 0302 P 0303 P 0304 P 0305 P 0306 P 0307 P 0308	During Misfire A monitoring process, if the number of detected misfire on a single cylinder is over a threshold (48) of short term catalyst protection, Misfire cylinder limp home is activated, and Misfire "A" errors is confirmed. At each end of Misfire A, B1,	<p>During the Misfire A monitoring window: If the sum of detected misfires of a single cylinder is greater than a threshold (48) Misfire cylinder limp home process is activated:</p> <p>At the end of Misfire A monitoring window:</p>	Same as above	Every segment	A" M / 1 Flashes "B 1" M / 2 "B 4"

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		or B4 monitoring intervals, if the misfire errors is confirmed for the interval, the cylinder with the highest misfire rate is determined. This threshold is calibratable.	If misfire A criteria is confirmed, and the number of detected misfire on a cylinder is over the ratio threshold (48) The Errors is stored If RPM < 2700, Load percentage is < 70 and Counter is > than a Calibratable value, then engine criteria is in the FTP region At the end of Misfire B1/B4 window: If misfire B1/B4 criteria is confirmed, and the number of detected misfire on a cylinder is over the ratio threshold (35) The Errors is stored			M / 2
Crankshaft Angle sensor Errors (CASE Learn) System Variation Not Learned	P0315	This Diagnostic incorporates the CASE learning algorithm proprietary to GM. It performs the target wheel learning with a request via the Scan / EOL tool.	At the end of EOL CASE learning process: If there is not a sufficient number of TDCs' for learning Or At least one of the ER segment adaptation values at the limit Then The symptom "CASE learn " is not successful" P 0315 = Active	Enable Conditions: If requested from a Scan / EOL tool and the throttle is depressed to WOT and CASE has not learned in the first cycle, It is recommended to release the throttle and repeat the procedure. Gear = P / N Then CASE learn procedure is active	At EOL testing with Scan / EOL tool.	M / 1
Misfire detected with rough road Rough road data not available	P1380	Rough road conditions must be detected to prevent erroneous misfire detection. The speed disturbance of vehicle wheels is used to evaluate the rough road condition. A rough road signal coming from the ABS ECM through the CAN. If the CAN rough road index receiving message in failure mode, a specific flag is set to inform that misfire was detected without rough road detection available	If misfire A, B1 or B4 is detected and the CAN rough road index receiving message in failure mode, then P1380 = active	<u>Enable Conditions:</u> When the Driving Cycle has started	Every segment	N / 1
Misfire detected with rough road No communication with brake control module	P1381	Rough road conditions must be detected to prevent erroneous misfire detection. The speed disturbance of vehicle wheels is used to evaluate the rough road condition. A rough road signal coming from the wheel speed sensors through the CAN. If the loss of communication	If misfire A, B1 or B4 is detected and the communication with ABS module is in failure mode, then P1381 = active	<u>Enable Conditions:</u> When the Driving Cycle has started	Every segment	N / 1

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		from wheel speed sensors occurs, a specific flag is set to inform that misfire was detected with no communication with brake control module. (Customer requirement)				
Knock Sensor Circuit (Bank1)	P0325	<p>The rationality check on the analog input signal from the ATM40 device to the micro-controller is performed under 2 complementary algorithms:</p> <p>(1) Checks the signal value. (2) Checks scattering of this signal.</p> <p>For the range check, the absolute noise value of the ATM40 device is checked if it is inside the normal operating range. This basic check on signal is performed on all cylinders.</p> <p>Two algorithms used, Master and Slave, is to observe the signal bandwidth, both algorithms have to show the same state to increment the failure counter.</p> <p>Master algorithm: The bandwidth of the signal is evaluated for cylinder 3 and 5. In case of short to ground, short to battery or an open, the bandwidth is smaller than during normal operation. The magnitude is compared with a threshold to detect the knock sensor failure.</p> <p>Slave algorithm: The bandwidth of cylinder 3 and 5 are accumulated via an integration method. The accumulated voltage value is</p>	<p>Range check: Every 90° CKP, the absolute noise value of the ATM40 device is checked if it is inside the normal operating range 0.18 – 4.80V. If an errors is detected, the symptom of knock sensor 1 failure is detected as no signal</p> <p>Master Algorithm: Every 720° CKP, If the bandwidth magnitude of cylinder 3 and 5 does not exceed the threshold 0.04v, the cycle counter is incremented by 1, this counter is reset as soon as the magnitude of cylinder 3 and 5 exceeds the threshold 0.04v. If the cycle counter reaches the 150, a failure has been</p> <p>Slave algorithm: Every 720° CKP, if the accumulated bandwidths value of cylinder 3 and 5 is reached the threshold 3.0v, the cycle counter and accumulated value is reset, otherwise, the cycle counter will be incremented by 1. If the cycle counter reaches the threshold 150, the failure is confirmed. If both detect a failure, the symptom of knock sensor 1 failure is detected as signal plausibility. The failure counter is incremented.</p> <p>If after the failure has been set, the magnitude of cylinder 3 or 5 exceeds the threshold 0.04v, then the cycle counter is decremented by 5. As soon as the cycle counter equals 0 and no check range errors currently present, the failure counter is decremented by 1.</p>	<p><u>This diagnostic is inhibited if any of the following DTC's are present:</u> Crankshaft Sensor Camshaft Sensor CAN/Communication Failures (SPI)</p> <p>Enable Conditions: IGN = ON Engine state is not in "engine start" or "fuel cut-off" MAF > min value depend on engine speed and coolant temperature 240 mg MAF > min MAF for knock diagnosis 220 mg Rpm > min engine speed for knock diagnosis (1400rpm) Diagnosis = Active</p>	Every 720 CKP 300 engine revolutions (150 engine cycles)	M / 2

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		<p>compared with the threshold to detect the knock sensor failure.</p> <p>If both algorithms detect a failure, the failure counter is incremented.</p>	<p>When the Failure Ctr. > 16 P 0325 = Active Limp Home: In case of a noise failure the knock control is disabled and spark advance limp home is performed. If the catalyst heating function is active, it is also take into account. With a crankshaft, camshaft, or SPI bus failure present, knock control changes also to limp home.</p> <p>Limp Home value: If conditions for knock control are valid and noise failure is present Then the gradient limitation 4.9deg in retard direction is used. If conditions for knock control are not fulfilled and noise failure is present, Then the gradient limitation 0.8deg in advance direction is used.</p>			
Knock Sensor Performance (Bank1)	P 0326	<p>Two algorithms used, Master and Slave, is to observe the signal bandwidth, both algorithms have to show the same state to increment the failure counter.</p> <p>Master algorithm: The bandwidth of the signal is evaluated for cylinder 3 and 5. In case of short to ground, short to battery or an open, the bandwidth is smaller than during normal operation. The magnitude is compared with a threshold to detect the knock sensor failure.</p> <p>Slave algorithm: The bandwidth of cylinder 3 and 5 are accumulated via an integration method. The accumulated voltage value is compared with the threshold to detect the knock sensor failure.</p>	<p>Master Algorithm: Every 720° CKP, If the bandwidth magnitude of cylinder 3 and 5 does not exceed the threshold 0.04v, the cycle counter is incremented by 1, this counter is reset as soon as the magnitude of cylinder 3 and 5 exceeds the threshold 0.04v. If the cycle counter reaches 150, a failure has been detected</p> <p>Slave algorithm: Every 720° CKP, if the accumulated bandwidths value of cylinder 3 and 5 is reached the threshold 3.0v, the cycle counter and accumulated value is reset, otherwise, the cycle counter will be incremented by 1. If the cycle counter reaches the threshold 150, the failure is confirmed. If both detect a failure, the symptom of knock sensor 1 failure is detected as signal plausibility. The failure counter is incremented. If after the failure has been set, the magnitude of cylinder 3 or 5 exceeds the threshold 0.04v, then the cycle counter is</p>	<p><u>This diagnostic is inhibited if any of the following DTC's are present:</u> Crankshaft Sensor Camshaft Sensor CAN/Communication Failures (SPI)</p> <p>Enable Conditions: IGN = ON Engine state is not in "engine start" or "fuel cut-off" MAF > min value depend on engine speed and coolant temperature 240 mg MAF > min MAF for knock diagnosis 220 mg Rpm > min engine speed for knock diagnosis (1400rpm) Diagnosis = Active</p>	Every 720 CKP 300 engine revolutions (150 engine cycles)	M \ 2

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL TYPE & Trips
		<p>If both algorithms detect a failure, the failure counter is incremented.</p>	<p>decremented by 5. As soon as the cycle counter equals 0 and no check range errors currently present, the failure counter is decremented by 1. When the Failure Ctr. > 16 P 0326 = Active Limp Home: In case of a noise failure the knock control is disabled and spark advance limp home is performed. If the catalyst heating function is active, it is also take into account. With a crankshaft, camshaft, or SPI bus failure present, knock control changes also to limp home. Limp Home value: If conditions for knock control are valid and noise failure is present Then the gradient limitation 4.9deg in retard direction is used. If conditions for knock control are not fulfilled and noise failure is present, Then the gradient limitation 0.8deg in advance direction is used.</p>			
<p>Knock Sensor Circuit (Bank2)</p>	<p>P0330</p>	<p>The rationality check on the analog input signal from the ATM40 device to the micro-controller is performed under 2 complementary algorithms: (3) Checks the signal value. (4) Checks scattering of this signal.</p> <p>For the range check, the absolute noise value of the ATM40 device is checked if it is inside the normal operating range. This basic check on signal is performed on all cylinders.</p> <p>Two algorithms used, Master and Slave, is to observe the signal bandwidth, both algorithms have to show the same state to increment the failure counter.</p> <p>Master algorithm:</p>	<p>Range check: Every 90° CKP, the absolute noise value of the ATM40 device is checked if it is inside the normal operating range 0.18 – 4.8v. If an errors is detected, the symptom of knock sensor 1 failure is detected as no signal</p> <p>Master Algorithm: Every 720° CKP, If the bandwidth magnitude of cylinder 3 and 5 does not exceed the threshold 0.04v, the cycle counter is incremented by 1, this counter is reset as soon as the magnitude of cylinder 3 and 5 exceeds the threshold 0.04v. If the cycle counter reaches the 150, a failure has been detected.</p> <p>Slave algorithm: Every 720° CKP, if the accumulated bandwidths value of cylinder 3 and 5 is reached the threshold, the cycle counter and accumulated value is reset, otherwise, the cycle counter will be incremented by 1.</p>	<p><u>This diagnostic is inhibited if any of the following DTC's are present:</u> Crankshaft Sensor errors Camshaft Sensor errors CAN/Communication Failures (SPI)</p> <p>Enable Conditions: IGN = ON Engine state is not in "engine start" or "fuel cut-off" MAF > min value depend on engine speed and coolant temperature 240 mg MAF > min MAF for knock diagnosis 220 mg Rpm > min engine speed for knock diagnosis 1400rpm Diagnosis = Active</p>	<p>Every 720 CKP 300 engine revolutions (150 engine cycles)</p>	<p>M / 2</p>

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		<p>The bandwidth of the signal is evaluated for cylinder 3 and 5. In case of short to ground, short to battery or an open, the bandwidth is smaller than during normal operation. The magnitude is compared with a threshold to detect the knock sensor failure.</p> <p>Slave algorithm: The bandwidth of cylinder 3 and 5 are accumulated via an integration method. The accumulated voltage value is compared with the threshold to detect the knock sensor failure.</p> <p>If both algorithms detect a failure, the failure counter is incremented.</p>	<p>If the cycle counter reaches the threshold 150, The failure is confirmed.</p> <p>If both detect a failure, the symptom of knock sensor 1 failure is detected as signal plausibility. The failure counter is incremented.</p> <p>If after the failure has been set, the magnitude of cylinder 3 or 5 exceeds the threshold 3v, then the cycle counter is decremented by 5. As soon as the cycle counter equals 0 and no check range errors currently present, the failure counter is decremented by 1.</p> <p>When the Failure Ctr. > 16 P 0330 = Active Limp Home: In case of a noise failure the knock control is disabled and spark advance limp home is performed. If the catalyst heating function is active, it is also take into account. With a crankshaft, camshaft, or SPI bus failure present, knock control changes also to limp home.</p> <p>Limp Home value: If conditions for knock control are valid and noise failure is present Then the gradient limitation 4.9deg in retard direction is used. If conditions for knock control are not fulfilled and noise failure is present, Then the gradient limitation 0.8v in advance direction is used.</p>			
Knock Sensor Performance (Bank2)	P 0331	<p>Two algorithms used, Master and Slave, is to observe the signal bandwidth, both algorithms have to show the same state to increment the failure counter.</p> <p>Master algorithm: The bandwidth of the signal is evaluated for cylinder 3 and 5. In case of short to ground, short to battery or an open, the</p>	<p>Master Algorithm: Every 720° CKP, If the bandwidth magnitude of cylinder 3 and 5 does not exceed the threshold 0.04v, the cycle counter is incremented by 1, this counter is reset as soon as the magnitude of cylinder 3 and 5 exceeds the threshold 0.04v. If the cycle counter reaches the 150, a failure has been detected.</p> <p>Slave algorithm: Every 720° CKP, if the accumulated</p>	<p><u>This diagnostic is inhibited if any of the following DTC's are present:</u> Crankshaft Sensor errors Camshaft Sensor errors CAN/Communication Failures (SPI)</p> <p>Enable Conditions: IGN = ON Engine state is not in "engine start" or "fuel cut-off" MAF > min value depend on engine speed</p>	Every 720 CKP 300 engine revolutions (150 engine cycles)	M \ 2

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		<p>bandwidth is smaller than during normal operation. The magnitude is compared with a threshold to detect the knock sensor failure.</p> <p>Slave algorithm: The bandwidth of cylinder 3 and 5 are accumulated via an integration method. The accumulated voltage value is compared with the threshold to detect the knock sensor failure.</p> <p>If both algorithms detect a failure, the failure counter is incremented.</p>	<p>bandwidths value of cylinder 3 and 5 is reached the threshold, the cycle counter and accumulated value is reset, otherwise, the cycle counter will be incremented by 1. If the cycle counter reaches the threshold (150), the failure is confirmed by this algorithm.</p> <p>If both detect a failure, the symptom of knock sensor 1 failure is detected as signal plausibility. The failure counter is incremented.</p> <p>If after the failure has been set, the magnitude of cylinder 3 or 5 exceeds the threshold 3v, then the cycle counter is decremented by 5. As soon as the cycle counter equals 0 and no check range errors currently present, the failure counter is decremented by 1.</p> <p>When the Failure Ctr. > 16 P 0331 = Active Limp Home: In case of a noise failure the knock control is disabled and spark advance limp home is performed. If the catalyst heating function is active, it is also take into account. With a crankshaft, camshaft, or SPI bus failure present, knock control changes also to limp home.</p> <p>Limp Home value: If conditions for knock control are valid and noise failure is present Then the gradient limitation 4.9deg in retard direction is used. If conditions for knock control are not fulfilled and noise failure is present, Then the gradient limitation 0.8v in advance direction is used.</p>	<p>and coolant temperature 240 mg MAF > min MAF for knock diagnosis 220 mg Rpm > min engine speed for knock diagnosis 1400rpm Diagnosis = Active</p>		
Crankshaft sensor circuit Electrical Diagnosis	P0335 Crank implausibly Missing Signal	The purpose of the function is to detect a failure if synchronisation on crankshaft signal cannot be achieved.	If no crankshaft signal is detected after a number of camshaft signal edges are detected Cam Pulses = 16 Then the crankshaft signal is missing	Ignition key on Not in crankshaft errors limp home position	Once per crankshaft Revolution	M / 1

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		Crankshaft error is detected without debouncing if the crank error is set by the camshaft signal acquisition. This is the case if a number of camshafts signal edges were detected at a plausible speed and gradient, and the system is still not synchronized with the crankshaft signal. If valid crankshaft teeth have already been detected, the symptom will be "implausible signal", otherwise it will be "no signal".	If the number crankshaft teeth error is set Then the crankshaft signal is implausibly			
Crankshaft performance Diagnosis	P0336 Loss of Synchronization Missing Teeth Additional Teeth	<p>The purpose of the function is to detect crankshaft failure when the system loses synchronization on the crankshaft signal.</p> <p>Synchronization will be lost if the reference gap is not detected at the correct position. The crankshaft signal acquisition may tolerate up to two missing/additional teeth without losing synchronization, depending on the used target wheel and on configuration data.</p> <p>Synchronization is always lost with counting too many teeth, because the reference gap will be counted as a normal tooth when too many teeth are missing.</p> <p>Tooth Number Error</p> <p>The number of teeth per crankshaft revolution is monitored by evaluation of the counter for missing or additional teeth. The low byte of this counter counts the missing teeth, the high byte counts the additional</p>	<p>The number of teeth per crankshaft revolution is monitored by evaluation of the counter for missing or additional teeth Based on this value of the crankshaft pulse counter the corresponding symptom is set</p> <p>The pulse counter > ± 2</p> <p>The error flag is set after the maximum failure counter is reached</p> <p>Failure counter > 16</p> <p><u>If this error is set the following actions are taken:</u> Engine stop will be set by a time-out if no more crankshaft signal edges are detected. A failure then may be detected by a plausibility test against the camshaft signal. The engine will synchronize and calculated a crank position based on the intake camshaft</p>	<p>Ignition key on</p> <p>Not in crankshaft errors limp home position</p>	Once per crankshaft revolution	M / 1

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		<p>teeth. The crankshaft signal acquisition may tolerate up to two missing/additional teeth without losing synchronization, depending on the used target wheel and on configuration data.</p> <p>If a tooth was missing or added during one revolution, then all variables based on teeth counting will be produced with an error. This concerns e.g. spark advance, segment time, misfire segments, camshaft position, etc. The purpose of the function is to provide an information when the crankshaft signal is inaccurate, in order to take the necessary actions.</p> <p>Depending on the value of crankshaft motoring counter, the symptom will be "missing teeth", or "additional teeth"</p>				

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Intake Camshaft Position (CMP) Sensor Circuit Bank 1 & 2	P0340 Missing Signal (bank 1) P0345 Missing Signal (bank 2)	The intake target wheel is an 8x signal consists of 4 long and 4 short high phases and low phases correspondingly. The falling signal edges are numbered from 0 to 7, starting with 0 at the falling edge before logical cylinder 0 TDC. All falling signal edges are having the same distance. A continuous camshaft edge counter is incremented with every plausible falling signal edge. The diagnoses detect camshaft errors: if no signal edge is detected during one crankshaft revolution.	Camshaft segment period (Time between two camshaft signal edges) < min time between two camshaft signal edges Camshaft segment period < [(1, 1, 1, 0.5, 1, 1, 1, 2) * engine speed based factor] Camshaft segment period (Time between two camshaft signal edges) > max time between two camshaft signal edges Camshaft segment period > [(1, 1, 1, 0.5, 1, 1, 1, 2) * engine speed based factor] No signal edge is detected for a time > max time between two camshaft signal edges No signal edge is detected for a time > 970 ms Camshaft edge counter for current segment = 0 Camshaft edge counter for current segment = Camshaft edge counter for pervious segment (no increment) Missing signal flag = 1 IVVT limp home - function is disabled Synchronization off intake cam is disabled	Ignition Key on	Recurrence Rate: Once pre crankshaft revolution Or Camshaft signal implausible is detected	M\2
Ignition Coil Cylinder #1	P 0351 P 2300 P 2301	This function will detect an open line, short to ground, and short to battery voltage on Ignition Coil Cylinder #1	Detection of coil errors are done by hardware diagnosis. Failure Counter = 16 (1.6s)	<ul style="list-style-type: none"> • <u>OL Diagnosis</u> • <u>Short circuit to ground</u> • <u>Short circuit to VB Diagnosis</u> • IGN = ON • No inhibit on coil circuit 	Recurrence Rate 100 ms	M \ 2
				•		
Ignition Coil Cylinder #2	P 0352 P 2303 P 2304	This function will detect an open line, short to ground, and short to battery voltage on Ignition Coil Cylinder #2	Detection of coil errors are done by hardware diagnosis. Failure Counter = 16 (1.6s)	<ul style="list-style-type: none"> • <u>OL Diagnosis</u> • <u>Short circuit to ground</u> • <u>Short circuit to VB Diagnosis</u> • IGN = ON • No inhibit on coil circuit 	Recurrence Rate 100 ms	M \ 2
Ignition Coil Cylinder #3	P 0353 P 2306	This function will detect an open line, short to ground, and	Detection of coil errors are done by hardware diagnosis.	<ul style="list-style-type: none"> • <u>OL Diagnosis</u> • <u>Short circuit to ground</u> 	Recurrence Rate 100 ms	M \ 2

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	P 2307	short to battery voltage on Ignition Coil Cylinder #3	Failure Counter = 16 (1.6s)	<ul style="list-style-type: none"> • <u>Short circuit to VB Diagnosis</u> • IGN = ON • No inhibit on coil circuit 		
Ignition Coil Cylinder #4	P 0354 P 2309 P 2310	This function will detect an open line, short to ground, and short to battery voltage on Ignition Coil Cylinder #4	Detection of coil errors are done by hardware diagnosis. Failure Counter = 16 (1.6s)	<ul style="list-style-type: none"> • <u>OL Diagnosis</u> • <u>Short circuit to ground</u> • <u>Short circuit to VB Diagnosis</u> • IGN = ON • No inhibit on coil circuit 	Recurrence Rate 100 ms	M \ 2
Ignition Coil Cylinder #5	P 0355 P 2312 P 2313	This function will detect an open line, short to ground, and short to battery voltage on Ignition Coil Cylinder #5	Detection of coil errors are done by hardware diagnosis. Failure Counter = 16 (1.6s)	<ul style="list-style-type: none"> • <u>OL Diagnosis</u> • <u>Short circuit to ground</u> • <u>Short circuit to VB Diagnosis</u> • IGN = ON • No inhibit on coil circuit 	Recurrence Rate 100 ms	M \ 2
Ignition Coil Cylinder #6	P 0356 P 2315 P 2316	This function will detect an open line, short to ground, and short to battery voltage on Ignition Coil Cylinder #6	Detection of coil errors are done by hardware diagnosis. Failure Counter = 16 (1.6s)	<ul style="list-style-type: none"> • <u>OL Diagnosis</u> • <u>Short circuit to ground</u> • <u>Short circuit to VB Diagnosis</u> • IGN = ON • No inhibit on coil circuit 	Recurrence Rate 100 ms	M \ 2
Ignition Coil Cylinder #7	P 0357 P 2318 P 2319	This function will detect an open line, short to ground, and short to battery voltage on Ignition Coil Cylinder #7	Detection of coil errors are done by hardware diagnosis. Failure Counter = 16 (1.6s)	<ul style="list-style-type: none"> • <u>OL Diagnosis</u> • <u>Short circuit to ground</u> • <u>Short circuit to VB Diagnosis</u> • IGN = ON • No inhibit on coil circuit 	Recurrence Rate 100 ms	M \ 2
				•		
Ignition Coil Cylinder #8	P 0358 P 2321 P 2322	This function will detect an open line, short to ground, and short to battery voltage on Ignition Coil Cylinder #8	Detection of coil errors are done by hardware diagnosis. Failure Counter = 16 (1.6s)	<ul style="list-style-type: none"> • <u>OL Diagnosis</u> • <u>Short circuit to ground</u> • <u>Short circuit to VB Diagnosis</u> • IGN = ON • No inhibit on coil circuit 	Recurrence Rate 100 ms	M \ 2

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Intake Camshaft position (CMP) sensor performance Bank 1 & 2	P0341 Implausible Signal (bank 1) P0346 Implausible Signal (bank 2)	<p>The 8x signal consists of 4 long and 4 short high phases and low phases correspondingly. The falling signal edges are numbered from 0 to 7, starting with 0 at the falling edge before logical cylinder 0 TDC. All falling signal edges are having the same distance.</p> <p>A plausibility test is done at every falling signal edge. The algorithm has to synchronize on the camshaft signal. A corresponding status flag is set if synchronization is achieved. An errors flag is set if synchronization fails.</p> <p>The diagnoses detect camshaft errors: if synchronization on the signal fails</p>	<p>Camshaft segment time ratio (the period of two consecutive high level divided by the period of two corresponding low levels) is calculated at every falling camshaft signal edge, a match is searched in a table containing one theoretical ratio and the falling edge number. The calculated segment time ration has a threshold to compensate for ration during high engine speed increase.</p> <p>If no time ratio match is found then:</p> <p>Camshaft signal implausible flag is set</p> <p>IVVT limp home – function is disabled Synchronization off intake cam is disabled</p>	<p>Ignition Key on</p>	<p>Recurrence Rate: Once pre crankshaft revolution Or Camshaft signal implausible is detected</p>	<p>M/2</p>

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Exhaust Camshaft Position (CMP) Sensor Circuit Bank 1 & 2	P0365 Missing Signal (bank 1) P0390 Missing Signal (bank 2)	This diagnoses of Segment disc for determining of the relative position of the exhaust CAM. For no signal	No polarity change of the camshaft signal The errors flag for exhaust camshaft missing signal is set after the failure counter max value is reached Failure counter > 16 <u>The diagnoses is present the following are disabled</u> <ul style="list-style-type: none"> - Cam phasing (VCP function) is set to limp home (function Passive) - Deactivation of "Hardware Based Diagnosis with the CJ120 - Deactivate Generator L & F Terminal Monitor - Disable knock Control - Knock control adaptation (Circuit 1) - Maximum end of Pre-injection angle is used & a calibratable constant for start of injection - Disable fuel quality adaptation at start (start injection time adaptation) - Disable downstream lambda trim control - Disable Plausibility check of WRAF Sensors - Disable WRAF Sensors diagnosis Heater Coupling - Disable Diagnosis of the WRAF Sensor Dynamic - Disable Monitoring Upstream Sensor Signal - Disable Monitoring Upstream Sensor Signal during pull full cutoff (PUC) - Disable downstream oxygen sensor diagnosis - Disable dynamic fuel trim diagnosis - Disable catalyst efficiency diagnosis 	Ignition Key on	Recurrence Rate: 100 ms	M/2

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Exhaust Camshaft position (CMP) sensor performance Bank 1	P0366 Implausible Signal (bank 1) P0391 Implausible Signal (bank 2)	This diagnoses of Segment disc for determining of the relative position of the exhaust camshaft. Implausible signal detection	<p>Polarity change occurs on the wrong position. Rising edge (Transition from low to high level) should occur in a window 34 crank tooth and 46 crank Tooth</p> <p>Falling edge (Transition from high to low level) should occur in a window 34+60 crank tooth and 46+60 crank Tooth</p> <p>Exhaust camshaft edge must occur with a certain crank tooth window</p> <p>The errors flag for exhaust camshaft implausible signal is set after the failure counter max value is reached</p> <p>Failure counter > 16</p> <p><u>The diagnoses is present the following are disabled</u></p> <ul style="list-style-type: none"> - Cam phasing (VCP function) is set to limp home (function Passive) - Deactivation of "Hardware Based Diagnosis with the CJ120 - Deactivate Generator L & F Terminal Monitor - Disable knock Control - Knock control adaptation (Circuit 1) - Maximum end of Pre-injection angle is used & a calibratable constant for start of injection - Disable fuel quality adaptation at start (start injection time adaptation) - Disable downstream lambda trim control - Disable Plausibility check of WARF Sensors - Disable WARF Sensors diagnosis Heater Coupling - Disable Diagnosis of the WRAF Sensor Dynamic - Disable Monitoring Upstream Sensor Signal - Disable Monitoring Upstream Sensor Signal during pull full cutoff (PUC) - Disable downstream oxygen sensor diagnosis - Disable dynamic fuel trim diagnosis - Disable catalyst efficiency diagnosis 	<p>Ignition Key on</p> <p>A delay period (C_T_DLY_CAM_DIAG_EX = 0.5 second) has expired after the start has ended</p> <p>No previous failure on the exhaust camshaft being diagnosed</p>	Recurrence Rate: 100 ms	M / 2

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Catalyst System Low Efficiency Bank 1	P 0420	This DTC detects an insufficient catalyst O2 storage capacity and consequently insufficient conversion properties. This is detected by imposing a forced stimulation and monitoring by a downstream sensor signal During Catalyst test the canister purge is closed. This is to eliminate the need to enable based on canister load.	Monitoring cycle counter must end Catalyst diagnosis value must be greater than the maximum threshold for catalyst diagnosis to detect a catalyst malfunction. The threshold value is set to .5 (based on the integrated downstream lambda sensor voltage signal deviation relative to the mean value of the downstream signal)	<ul style="list-style-type: none"> Start of a driving cycle Enable Conditions Coolant Temp > 62 °C Cat Temp > 576 °C < 901°C Vehicle Speed > 25kph < 255kph Rpm > 1216 < 3104 MAF > 170mgstk, < 400mgstk Limited dynamic conditions must exist (no extreme variations in speed and load) Lambda controller must be active Forced stimulation of the linear lambda control is active Baro > 740hPa <u>This diagnostic is inhibited if any of the following DTC's are present:</u> Cam sensor errors Crank sensor errors ECT errors IAT errors Vehicle speed errors O2 Sensor errors TP errors Fuel system diagnosis errors Misfire errors	20 ms Once per DC During low engine speed and load conditions a longer forced stimulation period is required to assure correct diagnosis. The longest period used is 1.24 seconds. This value is multiplied by 20 cycles to determine the worst case test time. The result is 24.8 seconds. Under most operating conditions the test will complete in one continuous test. However, if the test is interrupted, test results for previous cycles are stored. This means the 20 cycles do not have to be consecutive in order to complete the diagnostic. They do have to all be within the same key cycle.	M \ 2
Catalyst System Low Efficiency Bank 2	P 0430	This DTC detects an insufficient catalyst O2 storage capacity and consequently insufficient conversion properties. This is detected by imposing a forced stimulation and monitoring by a downstream sensor signal During Catalyst test the canister purge is closed. This	Monitoring cycle counter must end Catalyst diagnosis value must be greater than the maximum threshold for catalyst diagnosis to detect a catalyst malfunction. The threshold value is set to .5 (based on the integrated downstream lambda sensor voltage signal deviation relative to the mean value of the downstream signal)	<ul style="list-style-type: none"> Start of a driving cycle Enable Conditions Coolant Temp > 62 °C Cat Temp > 576 °C < 901°C Vehicle Speed > 25kph < 255kph	20 ms Once per DC During low engine speed and load conditions a longer forced stimulation period is required to assure correct diagnosis. The	M \ 2

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		canister purge is closed. This is to eliminate the need to enable based on canister load.	downstream signal) The Load areas are:	Rpm > 1216 < 3104 MAF > 170mgstk, < 400mgstk Limited dynamic conditions must exist (no extreme variations in speed and load) Lambda controller must be active Forced stimulation of the linear lambda control is active Baro > 740hPa <u>This diagnostic is inhibited if any of the following DTC's are present:</u> Cam sensor errors Crank sensor errors ECT errors IAT errors Vehicle speed errors O2 Sensor errors TP errors Fuel system diagnosis errors Misfire errors	diagnosis. The longest period used is 1.24 seconds. This value is multiplied by 20 cycles to determine the worst case test time. The result is 24.8 seconds. Under most operating conditions the test will complete in one continuous test. However, if the test is interrupted, test results for previous cycles are stored. This means the 20 cycles do not have to be consecutive in order to complete the diagnostic. They do have to all be within the same key cycle.	

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Evaporative Emission (EVAP) Purge Solenoid Control Circuit	Open Line P 0443 SCG P 0458 SCVB P 0459	The purpose is to diagnose electrical errors detected by the hardware (depending of output driver used).	The Electrical diagnosis is detected by the hardware internal to the ECM. SCG, SCVB, or Open Line will be detected.	<u>This diagnostic is inhibited if any of the following DTC's are present</u> No CPS Errors <u>Enable Conditions:</u> IGN = ON	Recurrence Rate 100 ms	M / 2
Evaporative Emission (EVAP) Vent Solenoid Control Circuit	Open Line P 0449 SCG P 0498 SCVB P 0499	The purpose is to diagnose electrical errors detected by the hardware (depending of output driver used).	The Electrical diagnosis is detected by the hardware internal to the ECM. SCG, SCVB, or Open Line will be detected.	<u>This diagnostic is inhibited if any of the following DTC's are present</u> EVAP <u>Enable Conditions:</u> IGN = ON	Recurrence Rate 100 ms	M / 2
Fuel Level Sensor # 1 Performance / Rationality Diagnosis	P 0461	This Diagnostic checks the integrity of the Fuel Level sensor signal.	Fuel Level > FTL @ Start + .78%. Or Fuel Level < FTL @ Start - .78%. For Time > 1800s and Failure Ctr = 2 P 0461 = Active	<u>Enable Conditions</u> IGN = ON ENG = RUNNING Fuel Level > 7.8 L Fuel Level < 27.73 L Vehicle Spd > 25 kph Diagnosis = Active	Recurrence Rate 1 s	N / 1
Fuel Level Sensor # 1 Electrical Diagnosis	P 0462	This Diagnostic Detects a SCG in the Fuel Level Sensor or Circuit	FTL Volts < .5V for Time > 20s and Failure Ctr. > 50s P 0462 = Active	<u>Enable Conditions</u> IGN = ON System Voltage Faults = None	Recurrence Rate 1 s	N / 1
Fuel Level Sensor # 1 Electrical Diagnosis	P 0463	This Diagnostic Detects an Open Signal Line / SCVB in the Fuel Level Sensor or Circuit	FTL Volts > 3v for Time > 20s and Failure Ctr. > 50s P 0463 = Active	<u>Enable Conditions</u> IGN = ON System Voltage Faults = None	Recurrence Rate 1 s	N / 1
Vehicle Speed Input Signal Diagnosis	P 0500	The Vehicle speed input diagnostic is performed by verifying the Can Link is functional and the TCM is sending reliable output shaft data.	IGN = ON Can Message = Invalid Failure Ctr. > 16 (1.6s) P 0500 = Active	<u>This diagnostic is inhibited if any of the following DTC's are present:</u> VSS Can Communication Diagnosis = Active	Recurrence Rate 100 ms	M / 2
Start Switch Circuit (Crank)	P 0512	This diagnostic will detect an incorrect Crank Request Key	NOT COMPLETE		100mS	N / 1

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SENSED PARAMETER	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA AND THRESHOLD VALUE(S)	SECONDARY PARAMETERS AND ENABLE CONDITIONS	TIME LENGTH AND FREQUENCY	MIL TYPE & Trips
Request) (LAV Only)		Position				
Engine Oil Pressure (EOP) Sensor Rationality	P0521 Pressure Sensor plausibility check (Stuck Sensor)	In case of engine speed gradient variation (increasing or decreasing), during this engine speed variation we can check the oil pressure variation to determine a stuck sensor: in case of no variation after a certain delay we set an error assuming we have a failure with the Oil pressure sensor (detection of stuck value).	<p>Absolute value of the delta between the current engine speed value and previous engine speed value < a calibratable threshold is met for a period of time greater than a calibratable time</p> <p>Time = 1 second</p> <p>ABS(RPM(n) – RPM(n-1)) < 25 rpm</p> <p>Absolute value of the delta between the current acquisition and previous oil pressure value < a calibratable threshold</p> <p>ABS(EOP_MES(n) – EOP_MES(n-1)) < 0.25 bar</p> <p>If the condition is met for a period of time greater than a calibratable period Time = 1.5 second</p> <p>If a failure is detected an errors flag is set after the failure counter max value is reached</p> <p>Failure counter > 16 (1.6s)</p> <p><u>If this error is set the following actions are taken:</u> Cam phasing (VCP function) will be engine speed limited (minimum engine speed to activate cam phasing will be increased to 1500 RPM)</p>	<p>No previous failure on the Oil Pressure sensor is present</p> <p>Ignition Key on</p> <p>The coolant must be within thresholds: Minimum coolant temperature for oil pressure diagnosis < current coolant temperature < maximum coolant temperature for oil pressure diagnosis 20° C < ECT < 100° C</p> <p>The engine speed must be within thresholds: Minimum engine speed for oil pressure diagnosis < current engine speed < maximum engine speed for oil pressure diagnosis 600 < RPM < 6300</p>	100ms	M / 1
Engine Oil Pressure (EOP) Sensor Circuit	P0522 Low Voltage P0523 High Voltage	The Oil Pressure Sensor is checked for defects by a range check of its output voltage V_POIL. Two different conditions can be detected: - Oil pressure sensor signal line short to ground or open line - Oil pressure sensor signal line short to battery voltage	<p>Short to ground/open circuit (low Voltage) Sensor voltage < threshold for detection short ground/open line Sensor Volts < .1V</p> <p>Short to battery (high voltage) Sensor voltage > threshold for detection</p>	Ignition Key on	Recurrence Rate; 100 ms	M / 1

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			<p>short to battery Sensor Volts < 4.9V</p> <p>If any of the electrical failure is detected an errors flag is set after the failure counter max value is reached</p> <p>Failure counter > 16 (1.6s)</p> <p><u>If this error is set the following actions are taken:</u> Cam phasing (VCP function) will be engine speed limited (minimum engine speed will be increased)</p>			
Engine Idle Speed Diagnosis	P 0506 P 0507	This diagnostic detects an out of control Idle Rpm, When Idle conditions are desired.	<p>Rpm > Desired Rpm By TBL (200) Time > 10s Failure Ctr. > 1.6s P 0507 = Active Or Rpm < Desired Rpm By TBL (100) Time > 10s Failure Ctr. > 1.6s P 0506 = Active</p>	<p><u>This diagnostic is inhibited if any of the following DTC's are present:</u> Crankshaft Sensor ETC TP Fuel Injectors Ignition Coils MAF MAP CPS</p> <p><u>Enable Conditions</u> IGN = ON Eng = Running Throttle = Closed for a Time > 5s TP Adapt = Done Vehicle Speed = 0 ECT > -7c ECT < 120c MAF < 300 mg/stk CPS Duty Cyc. < 100% Diagnosis = Active</p>	Recurrence Rate; 100 ms	M / 2
A/C System High Side Pressure Sensor	P 0531	This Diagnostic will detect a skewed signal, a plausibility check on A/C Pressure Sensor will check if the signal is valid	<p>AC Request = No AC Clutch = No AC Volts > 4.9 for Time > 240s Failure Ctr. > 16 (1.6) P 0531 = Active</p>	<p><u>Plausibility diagnosis</u> IGN = ON ENG = RUNNING RPM > 450</p>	Recurrence Rate; 100 ms	N \ 1
A/C System High Side Pressure Sensor	P 0532 P 0533	This Diagnostic will detect an open line, short to ground, and short to battery voltage on A/C Pressure Sensor	<p>Detection of A/C pressure sensor electrical errors are done by hardware diagnosis internal to the ECM. AC Volts > 4.9V Failure Ctr. > 16 (1.6s) P 0533 = Active</p>	<p><u>OL Diagnosis, Short circuit to ground Short circuit to VB Diagnosis</u> IGN = ON A/C requested = on Diagnostic = Active</p> <p>If any AC DTC is stored, The AC system</p>	Recurrence Rate; 100 ms	N \ 1

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			AC Volts < .1V Failure Ctr. > 16 (1.6s) P 0532 = Active	will be disabled.		
System Voltage Diagnosis	P 0562	This Diagnosis detects low system voltage	System Volts < 8v Failure counter > 30 (3s) P 0563 = Active	<u>Enable Conditions</u> IGN = ON ENG = RUNNING ENG Runtime > 10s RPM > 500	Recurrence Rate; 100 ms	G / 1
System Voltage Diagnosis	P 0563	This Diagnosis detects High system voltage	System Volts > 16v Failure counter > 30 (3s) P 0562 = Active	<u>Enable Conditions</u> IGN = ON ENG = RUNNING ENG Runtime > 10s RPM > 500	Recurrence Rate; 100 ms	G / 1
Control Module Read Only Memory (ROM) Diagnosis	P 0601	This diagnostic will detect an ECM errors for ROM	Detection of ECM ROM errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 (1.6s)	IGN = ON	Recurrence Rate; 100 ms	M \ 1
Control Module Not Programmed	P 0602	This is for service ECU	ECM Not Programmed			N / 1
Control Module Random Access Memory (RAM) Diagnosis	P 0604	This diagnostic will detect an ECM errors for RAM	Detection of ECM RAM errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 (1.6s)	IGN = ON	Once per Ignition Cycle (100 ms abc increment)	M \ 1
ETC – LEVEL 3 MONITORING FUNCTIONS. ECM Self Test Control Module Performance (Safety Level 3) Diagnosis	P 0606	The multiple diagnostic monitors associated with this diagnostic trouble code have all been added due to the ETC system. The monitors include RAM and ROM checks; pre-drive check; Can, SPI, Check Sum. instruction set tests; program flow monitoring and communication monitoring by both the main microprocessor and the monitoring microprocessor. There is also a check of the ability to control engine speed without throttle control.	<ol style="list-style-type: none"> 1. It is checked each driving cycle that the monitoring microprocessor can disable through hardware connection the throttle and fuel injector drivers. 2. A special set of instructions are checked continuously with set inputs for proper calculation. 3. The program flow counter is monitored by checking that the level 2 monitors are called at specific time intervals. 4. The communication between the main microprocessor and the monitoring microprocessor is checked that correct signals are sent at specific time intervals. 5. The ROM check tests the algorithm 	<u>Enable Conditions</u> Key "ON"	Every crankshaft revolution	M / 1

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			<p>software and the calibration data separately and continuously as well as the entire ROM at startup.</p> <p>6. The RAM test checks the entire RAM at startup and does continuous complement checks of the level 2 monitoring flags.</p> <p>7. Once a level 2 errors has occurred, the engine speed limitation monitor checks that engine speed is controlled below a threshold.</p> <p>Detection of ECM self test errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 cts (Time depends on engine speed) P 0606 = active</p>			
Vehicle Speed output Signal Electrical Diagnosis	P 0608	The Hardware detects electrical errors on the vehicle speed output signal ine.	The Hardware detects OL, SCG, & SCVB Failure Ctr. > 16 (3.2s)	<p><u>This diagnostic is inhibited if any of the following DTC's are present:</u> VSS</p> <p><u>Enable Conditions</u> IGN = ON</p>	Recurrence Rate; 200 ms	N / 1
Starter Relay Circuit	P 0615 P 0616 P 0617	This diagnostic will detect an ECM input open line, short to ground, or short to battery voltage on the Starter Relay Circuit	Detection of Starter Relay Circuit electrical errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 (3.2s) P 0615 = active P 0616 = active P 0617 = active	<p>When the relay is commanded on, an open, or short to battery voltage can be detected.</p> <p>When the relay is commanded off, a short to ground can be detected.</p>	Recurrence Rate; 200 ms	N / 1
Generator F-Terminal Diagnosis	P 0625 P 0626	This diagnostic detects a failure on the Generator F – Terminal. The F – Terminal is monitored by the ECM. There are two Test performed: Key ON & Run	<p>Key ON Test Gen Filtered (MMV) Duty Cycle \geq 65% Time > 5s Failure Ctr. > 1 (.2s) P 0626 = Active</p> <p>Run Test Rpm < 3000 Gen Filtered (MMV) Duty Cycle \leq 5% Time > 5s Failure Ctr. > 1 (.2s) P 0625 = Active</p>	<p><u>This diagnostic is inhibited if any of the following DTC's are present:</u> Crankshaft Sensor Cam Sensor Generator</p> <p><u>Enable Conditions</u> Key ON Test IGN = ON Rpm = 0 Run Test IGN ON ENG ON</p>	Recurrence Rate; 200 ms	G / 1
Fuel Pump Speed Control Feedback Circuit	P 0627	This diagnostic will detect ECM input noisy on interface in the Fuel Pump Speed	Detection of Variable Fuel Pump Speed electrical errors are done by hardware diagnosis internal to the ECM.	IGN = ON Fuel pump controlled by fuel pump speed control (FPSC)	Recurrence Rate; 100 ms	N / 1

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		Control Circuit	Failure Ctr. > 16 (1.6) P 0627 = active	No SPI bus failures		
Fuel Pump Relay Circuit Low Voltage	P 0628	This diagnostic will detect an open line or short to ground on Fuel Pump Relay	Detection of Fuel Pump Relay electrical errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 (1.6s) P 0628 = active	IGN = ON Fuel pump not controlled by fuel pump speed control (FPSC)	Recurrence Rate; 100 ms	N / 1
Fuel Pump Speed Control Output Circuit Low Voltage	P 0628	This diagnostic will detect an ECM input open line or short to ground on the Fuel Pump Speed Control Feedback Circuit	Detection of Variable Fuel Pump Speed electrical errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 (1.6) P 0628 = active	IGN = ON Fuel pump controlled by fuel pump speed control (FPSC) No SPI bus failures	Recurrence Rate; 100 ms	N / 1
Fuel Pump Speed Control Output Circuit High Voltage	P 0629	This diagnostic will detect a short to battery voltage on Fuel Pump Relay Circuit	Detection of Fuel Pump Relay electrical errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 (1.6) P 0629 = active	IGN = ON Fuel pump controlled by fuel pump speed control (FPSC)	Recurrence Rate; 100 ms	N / 1
Fuel Pump Relay Circuit High Voltage	P 0629	This diagnostic will detect a short to battery voltage on Fuel Pump Relay Circuit	Detection of Fuel Pump Relay electrical errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 (1.6) P 0629 = active	IGN = ON Fuel pump not controlled by fuel pump speed control (FPSC)	Recurrence Rate; 100 ms	N / 1
Fuel Pump Speed Control Feedback Circuit	P 0231	This diagnostic will detect a fuel pump open circuit between the Fuel Pump Speed Control Module and the Fuel Pump	Detection of Variable Fuel Pump Speed electrical errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 (1.6) P 0231 = active	IGN = ON Fuel pump controlled by fuel pump speed control (FPSC) No SPI bus failures	Recurrence Rate; 100 ms	N / 1
Fuel Pump Speed Control Feedback Circuit	P 0232	This diagnostic will detect a fuel pump open circuit between the Fuel Pump Speed Control Module and the Fuel Pump	Detection of Variable Fuel Pump Speed electrical errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 (1.6) P 0232 = active	IGN = ON Fuel pump controlled by fuel pump speed control (FPSC) No SPI bus failures	Recurrence Rate; 100 ms	N / 1
Fuel Tank Transfer Pump	P 2636	This diagnostic will detect a failed fuel tank transfer pump	Primary tank fuel almost empty (primary tank fuel total less than 6.25 Litter) AND Secondary tank above empty threshold (secondary tank fuel total above 33 Litter) for a period of 60 Second.	IGN = ON	1S	N / 1
Fuel Pump Speed Control Feedback Circuit	P 1251	This diagnostic will detect an output driver failure on the Fuel Pump Speed Control or an FPSC internal Failure	Detection of Variable Fuel Pump Speed electrical errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 (1.6s) P 1251 = active	IGN = ON Fuel pump controlled by fuel pump speed control (FPSC) No SPI bus failures	Recurrence Rate; 100 ms	N / 1
Fuel Pump Speed Control Feedback Circuit	P 1252	This diagnostic will detect an erratic output on the Fuel Pump Speed Control	Detection of Variable Fuel Pump Speed electrical errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 (1.6s) P 1252 = active	IGN = ON Fuel pump controlled by fuel pump speed control (FPSC) No SPI bus failures	Recurrence Rate; 100 ms	N / 1

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Fuel Pump Speed Control Feedback Circuit	P 1253	This diagnostic will detect a input failure 100% duty cycle on the Fuel Pump Speed Control Feedback Circuit	Detection of Variable Fuel Pump Speed electrical errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 (1.6s) P 1253 = active	IGN = ON Fuel pump controlled by fuel pump speed control (FPSC) No SPI bus failures	Recurrence Rate; 100 ms	N / 1
Engine Metal Overtemperature Protection	P 1258	This diagnostic will detect an errors for an Engine Metal Overtemperature	Detection of Engine Metal Overtemperature is internal to the ECM. Failure Ctr. > 22 (2.2s) P 1258 = active	IGN = ON Engine running This Diagnostic inhibits IAT, ECT, Misfire, Lambda, Fuel System, and Cruise Diagnostics from running.	Recurrence Rate; 100 ms	M / 1
Fuel Pump Speed Control Feedback Circuit	P 1254	This diagnostic will detect a input failure 0% duty cycle on the Fuel Pump Speed Control Feedback Circuit	Detection of Variable Fuel Pump Speed electrical errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 (1.6s) P 1254 = active	IGN = ON Fuel pump controlled by fuel pump speed control (FPSC) No SPI bus failures	Recurrence Rate; 100 ms	N / 1
Multifunction Cruise Switch 1	P 0564	This diagnostic will detect an Out of Range Cruise Switch Set/Coast Stuck Cruise Switch Resume/Accel Stuck Cruise Switch,	Detection of an Out of Range Cruise Switch is Failure Ctr > 48 (4.8s) P 0564 is active	IGN = ON Engine = Running	Recurrence Rate; 100 ms	N / 1
Brake Lamp Switch	P 0572 P 0573	This diagnostic will detect a short to ground/stuck closed or a short to battery/stuck open	Detection of Brake Lamp Switch is VS = 0 kph (Vehicle must come to a stop to inc. counter.) Failure Ctr. > 255 P 0572 P 0573	IGN = ON Engine = Running VB > 11V TP > 40% VS > 80 kph	Recurrence Rate; 100 ms	N / 1
Extended Travel Brake Switch Circuit (LAV ONLY)	P 1575	<u>Not supported at this time</u>				N / 1
Throttle Actuator Position Performance	P 0638	This diagnosis is to detect a throttle valve errors. Command Performance	I Duty cycle of the ETC Position Controller I >= 100 % for Time > 0.85 s And if the Time < 1.2s (if breaks free in this amount of time, we do not have an errors) Otherwise : Failure counter max = 12 P 0638 = Active Limp home – RPM limitation.	Activation: IGN =1. Deactivation: IGN =0 - LV_ERR_TP already set - Limp home active	Recurrence Rate; 5 ms	M / 1

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Reference Voltage #1 Diagnosis (5 V)	P 0641	The purpose of this Diagnostic is to detect a failure On the 5 V Reference line which is a supply to multiple engine sensors.	Ref V < 2V (SCG) Failure Ctr. > 8 (.2s) P 0641 = Active Ref V > 3V (SVB) Failure Ctr. > 8 (.2s) P 0641 = Active Ref V Diff > .5V Failure Ctr. > 8 (.2s) Ref Signal = Noisy P 0641 = Active	<u>Enable Conditions</u> IGN = ON	Recurrence Rate; 25 ms	M / 1
A/C Compressor Clutch Relay	P 0646 P 0647	This Diagnostic will detect an open line, short to ground, and short to battery voltage on A/C Compressor Clutch Relay	Detection of A/C compressor clutch relay electrical errors are done by hardware diagnosis internal to the ECM. If at Ignition "ON" an errors is detected Failure Ctr. > 16 (1.6s) P 0646 or P 0647 is Active	<u>OL Diagnosis. Short circuit to ground</u> <u>Short circuit to VB Diagnosis</u> IGN = ON AC Request = ON A/C Clutch = ON Diagnostic = Active	Recurrence Rate; 100 ms	N \ 1
Reference Voltage #2 Diagnosis (5 V)	P 0651	The purpose of this Diagnostic is to detect a failure On the 5 V Reference line which is a supply to multiple engine sensors.	Ref V < 2V (SCG) Failure Ctr. > 8 (.2s) P 0651 = Active Ref V > 3V (SVB) Failure Ctr. > 8 (.2s) P 0651 = Active Ref V Diff > .5V Failure Ctr. > 8 (.2s) Ref Signal = Noisy P 0651 = Active	<u>Enable Conditions</u> IGN = ON	Recurrence Rate; 25 ms	M / 1
Malfunction Indicator Lamp	P 0650	This Diagnosis detects electrical errors: OL/SCG or SCVB, in the Malfunction Indicator Lamp/Circuit	Detection of Malfunction Indicator Lamp errors are done by hardware diagnosis internal to the ECM. Failure counter > 16 (3.2s)	IGN = ON Battery voltage > 11V	Recurrence Rate; 200 ms	M / 2
Cooling Fan Relay #1 Control Circuit Low Voltage (LAV ONLY)	P 0691	This Diagnostic will detect a low voltage / open circuit on Cooling fan	Detection of Cooling Fan electrical errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 (3.2s) P 0691 = Active	OL / SCG Diagnosis IGN = ON	Recurrence Rate; 200 ms	M \ 2
Cooling Fan Relay # 1 Control Circuit High	P 0692	This Diagnostic will detect High voltage on the Cooling fan relay / circuit.	Detection of Cooling Fan electrical errors are done by hardware diagnosis internal to the ECM.	Short circuit to battery voltage IGN = ON	Recurrence Rate; 200 ms	M \ 2

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Voltage			Failure Ctr. > 16 (3.2s) P 0692 = Active			
Cooling Fan Relay #2 Control Circuit Low Voltage	P 0693	This Diagnostic will detect a low voltage / open circuit on Cooling fan <u>Not Supported on the XLR</u>	Detection of Cooling Fan electrical errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 (3.2s) P 0693 = Active	OL / SCG Diagnosis IGN = ON	Recurrence Rate; 200 ms	M \ 2
Cooling Fan Relay #2 Control Circuit High Voltage	P 0694	This Diagnostic will detect High voltage on the Cooling fan relay / circuit. <u>Not Supported on the XLR</u>	Detection of Cooling Fan electrical errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 16 (3.2s) P 0694 = Active	Short circuit to battery voltage IGN = ON	Recurrence Rate; 200 ms	M \ 2
Control Module Power Main Relay	P 0686 P 0687	This diagnostic will detect an ECM input open line, short to ground, or short to battery voltage on the Control Module Power Main Relay	Detection of Main Relay Circuit electrical errors are done by hardware diagnosis internal to the ECM. Failure Ctr. > 10 (2s) P 0686 = active P 0687 = active	IGN = ON	Recurrence Rate; 200 ms	N / 1
Control Module Power Main Relay (Feedback Diag)	P 0689 P 0690	The Diagnosis is performed to detect if the Main Relay has effectively switched and remains on after Key-On. The Diagnosis is also performed to detect if the Main Relay has effectively switched off after Key-Off.	If ignition switch is on and ignition voltage > 11volts And time >1.5 seconds has elapsed. Then if VB (relay voltage) is < 10 volts for 0.200 seconds P0689 = active or If ignition switch is off And time >1.5 seconds has elapsed. Then if VB (relay voltage) is > 10 volts for 0.125 seconds P0690 = active	IGN = ON and ignition voltage > 11 volts OR Ignition Off	Recurrence Rate; 12.5 ms	N / 1
Transmission Control Unit	P 0700	This diagnostic will detect an errors for the TCU and report it to the ECM to Light the MIL	Detection of TCU errors are done by hardware diagnosis internal to the ECM Failure Ctr. > 1 (.1s) P 0700 = active	IGN = ON	Recurrence Rate; 100 ms	M / 1
Brake Lamp Switch	P 0703	This diagnostic will detect the plausibility of the Brake Lamp Switch	Detection of Brake Lamp Switch Plausibility is Failure Ctr. > 48 (4.8s) P 0703 is active	IGN = ON Engine = Running	Recurrence Rate; 100 ms	N / 1
Automatic Gear Shift Signal	P 0850	This diagnostic will detect a failure on the Park Neutral	Selected Gear = PN PN = Not Active	<u>This diagnostic is inhibited if any of the following DTC's are present:</u>	Recurrence Rate; 1s	N / 1

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(Park / Neutral)		Switch	P 0850 = Active VSS > 10mph Failure counter > 16 s PN = Active P0850 = Active	Gear Errors (TCM) CAN Errors VSS IGN = ON PN Input = Active		
TCS Drag Reduction Request (LAV ONLY)	P 1513	This diagnostic will detect a No Response on TCS Drag Reduction Request	Detection of the TCS Drag Reduction Request is Failure Ctr > 16 (200ms) P 1513 is active	IGN = ON Engine = Running	Recurrence Rate; 12.5 ms	N / 1
Theft Deterrant System	P 1626 Signal Lost P 1629 Message not Received	This Diagnostic will detect if the VTD Signal is lost or not received	Detection of the Theft Deterrant Missing Message is performed internal to the ECM Failure Ctr > 16 (1.6) P 1626 is active P 1629 is Active	IGN = ON	Recurrence Rate; 100 ms	N / 1
Theft Deterrant Learn Mode Active	P 1630	This diagnostic will detect an errors on Learn Mode Active for Theft Deterrant	Detection of the Theft Deterrant Learn Mode is performed internal to the ECM Failure Ctr > 16 (1.6s) P 1630 is active	IGN = ON	Recurrence Rate; 100 ms	N / 1
Theft Deterrant Start Enable Signal Not Correct	P1631	This diagnostic will detect an errors on Signal Not Correct for Theft Deterrant	Detection of the Theft Deterrant Start Enable Signal Not Correct is performed internal to the ECM Failure Ctr > 16 (1.6s) P 1631 is active	IGN = ON	Recurrence Rate; 100 ms	N / 1
Lift / Dive for RTD (Real Time Damping)	P 1652	This diagnostic will detect the plausibility for Lift / Dive for RTD	Detection of the Lift / Dive for RTD is Failure Ctr > 16 (.4s) P 1652 is active	IGN = ON Engine = Running	Recurrence Rate; 25 ms	N / 1
Generator L-Terminal Diagnosis	P 2500 Generator L-Terminal Low Voltage P 2501 Generator L-Terminal High Voltage	This diagnostic detects a failure on the Generator L – Terminal. The Generator L-terminal is monitored by the Powertrain controller. The Generator voltage regulator indicates a fault condition (i.e., internal fault, broken belt) by pulling the L-terminal input to a “low” state. There are two Test performed: Key ON & Run	The Generator L-terminal output diagnostics indicate a short to power failure or a short to ground failure continuously for a time period, that is greater than or equal to Key ON Test Gen Filtered (MMV) Duty Cycle ≥ 97% Time > 15s Failure Ctr. > 1 (.2s) P 2501 = Active Run Test Gen Filtered (MMV) Duty Cycle ≤ 2% Time > 5s Failure Ctr. > 1 (.2s) P 2500 = Active	Key-on Test. Run Test <u>This diagnostic is inhibited if any of the following DTC's are present:</u> L –terminal CAM Crank Rpm = 0	Recurrence Rate; 100 ms	G / 1

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			The generator L-terminal fault diagnostic trouble code (DTC) shall be cleared when the conditions for the L-Terminal fault DTC are not present, or when a Service Test Tool has commanded clearing of the DTC.			
Fuel Level Sensor # 2 Performance / Rationality Diagnosis	P 2066	This Diagnostic checks the integrity of the Fuel Level sensor signal.	Fuel Level > FTL @ Start + .78%. Or Fuel Level < FTL @ Start - .78%. For Time > 1800s and Failure Ctr = 2 P 2066 = Active	<u>Enable Conditions</u> IGN = ON ENG = RUNNING Fuel Level > 7.8 L Fuel Level < 27.73 L Vehicle Spd > 25 kph Diagnosis = Active	Recurrence Rate; 1s	N / 1
Fuel Level Sensor # 2 Electrical Diagnosis	P 2067	This Diagnostic Detects a SCG in the Fuel Level Sensor or Circuit	FTL Volts < .5V for Time > 20s and Failure Ctr. > 50s P 2067 = Active	<u>Enable Conditions</u> IGN = ON System Voltage Faults = None	Recurrence Rate; 1s	N / 1
Fuel Level Sensor # 2 Electrical Diagnosis	P 2068	This Diagnostic Detects an Open Signal Line / SCVB in the Fuel Level Sensor or Circuit	FTL Volts > 3v for Time > 20s and Failure Ctr. > 50s P 2068 = Active	<u>Enable Conditions</u> IGN = ON System Voltage Faults = None	Recurrence Rate; 1s	N / 1
Throttle Actuator Control (TAC) Motor Control Circuit	P2100	The TAC H-Bridge IC checks every 1ms the MTC if there is a short circuit to battery voltage or ground. In addition the IC is able to detect overtemperature.	TAC H-Bridge IC Flag = 1 Failure counter max = 12 P 2100 =Active Limp home – RPM limitation.	Activation: IGN =1. The errors bits, Failure-counters and other variables or bits are initialised Deactivation: IGN =0 or the setting conditions are not fulfilled anymore - LV_ERR_TP already set - Limp home active	Recurrence Rate; 1s	M / 1
Throttle Actuator Position Performance	P 2101	This diagnosis is able to detect a throttle valve errors or a jammed actuator. The given pulse width modulation signal MTCPWM exceeds the position controller permissible maximum value for longer than designated time.	TP Average – TP Set Point > 1.503 ° TP for the Time > 2 s Failure counter max = 12 P 2101 = Active Limp home – RPM limitation	Activation: IGN =1. Deactivation: IGN =0 - LV_ERR_TP already set - Limp home active	Recurrence Rate; 5 ms	M / 1

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Throttle Actuator Position Module Performance – Safety Level 2	P 2108	This DTC is able recognize that any of the safety level 2 flags are enabled (APP, MAF,ADC,ECT, etc) The errors would be set and limp home is enabled.	Any of the level 2 flags enabled : LV_XXX_MON = 1 Failure counter max = 12 P 2108 = Active Limp home – RPM limitation	Activation: IGN = 1 Deactivation: IGN = 0 - LV_ERR_TP already set - Limp home active	Recurrence Rate 40 ms	M / 1
Throttle position adaptation	P 2119	This diagnosis is to determine the measurement inaccuracy between the two signal voltages. They will be referenced to their supply voltage. After the initial engine start and component change the characteristic Potentiometer value is learnt within an adaptation routine. The value for the lower stop is stored at the end of the driving cycle in the non-volatile memory. A plausibilization unit monitors both sensor signals, as well as the belonging supply voltage and from them establishes the system state of the THR-position acquisition (undisturbed, disturbed, THR-position not recognizable). From the voltages of both TP-channels, the THR-position for each channel is determined, taking into consideration the adaptation values for the lower stop. If the conditions are not fulfilled the errors is set. Ignition and injection would be deactivated.	<p align="center"><u>Start Routine</u></p> <p><u>First Check of Limp Home position at Start routine (ST_CHK_CHK LIH 1)</u></p> <p>$\text{Voltage_TP_X} - 0.84 \text{ V} \leq 0.2490 \text{ V}$</p> <p>P 2119 = Active</p> <p>Ignition and injection remains deactivated</p> <p>NEXT Step :</p> <p><u>Spring test at the Start routine (ST_CHK_GO UPPER POS)</u></p> <p>$\text{TP_AV} - 17.0027^\circ \leq 1.860^\circ \text{TP} / 5\text{ms}$</p> <p>P 2119 = Active</p> <p>Limp Home 2 Active</p> <p><u>2nd Limp Home position at Start routine (ST_CHK_CHK LIH 2)</u></p> <p>$\text{Voltage_TP_1/2} - \text{Adapt.value for ch 1/2} \leq 0.2490 \text{ V}$</p> <p>P 2119 = Active</p> <p>Limp Home 2 Active</p> <p align="center"><u>Adaptation Routine</u></p> <p><u>Adaptation of limp home position (AD_CHK LIH 1)</u></p> <p>$\text{Voltage TP Ch 1} / 0.840 \leq 0.3027 \text{ V}$</p>	Activation: IGN = 1 Deactivation: IGN = 0 - LV_ERR_TP already set - Limp home active	Recurrence Rate 5 ms	M / 1

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			<p> Voltage TP Ch 2 / 4.141 ≤ 0.3027 V P 2119 = Active Limp Home 2 Active <u>Spring test at the adaptation routine</u> TP_AV - 17.0027 ° ≤ 1.860 °TP / 5ms P 2119 = Active *Limp Home 2 Active <u>2nd Limp home check</u> Voltage_TP_1/2 - Adapt.value for ch 1/2 ≤ 0.2490 V P 2119 = Active *Limp Home 2 Active <u>Adaptation of lower mechanical stop (AD_GO LOWER STOP)</u> Voltage_TP_1 - 0.508 V ≤ 0.0781 Voltage_TP_1 - 4.492 V ≤ 0.0781 P 2119 = Active *Limp Home 1 Active <u>Limp home spring Test opening</u> TP_Set point_during adapt ≥ 8.0017 ° <u>Third Check of Limp Home position at Adaptation routine (AD_CHK LIH 3)</u> Voltage_TP_1 - 0.508 V ≤ 0.0781 Voltage_TP_2 - 4.492 V ≤ 0.0781</p>			

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			P 2119 = Active *Limp Home 2 Active * <u>ETC Limp Home 1</u> -Throttle valve without the power(hold by spring in the Limp-Home position) -Engine speed limitation in limp home mode(<u>with</u> considering the drivers request) * <u>ETC Limp Home 2</u> -Throttle valve without the power(hold by spring in the Limp-Home position) -Engine speed limitation in limp home mode(<u>without</u> considering the drivers request)			
Accelerator Pedal Position (APP) Sensor 1 Circuit Low Voltage	P2122	This DTC can distinguish the circuit's high voltage. During normal operation, the output voltages of the APP-sensors must lie within a permitted range.	Voltage_PVS_1 < 0.1465 V Failure counter max = 12 P2122 = Active Limp home – calibrateble TQ reduction with pedal limitation	Activation: IGN =1. The errors bits, Failure-counters and other variables or bits are initialised Deactivation: IGN =0 or the setting conditions are not fulfilled anymore - LV_ERR_PVS already set - Limp home active	Recurrence Rate 25 ms	M / 1
Accelerator Pedal Position (APP) Sensor 1 Circuit High Voltage	P2123	This DTC can distinguish the circuit's high voltage. During the normal operation, the output voltages of the APP-sensors must lie within a permitted range.	V_PVS_1 > 4.8096 V LV_ERR_PVS_H_1 = 1 Failure counter max = 12 P2123 = Active Limp home – calibrateble TQ reduction with pedal limitation	Activation: IGN =1 Deactivation: IGN =0 - LV_ERR_PVS already set - Limp home active	Recurrence Rate 25 ms	M / 1
Throttle Position (TP) Sensor 1-2 Correlation	P 2135	This DTC detects the rationality between TP 1 and 2. Test performs a comparison between TP 1 voltage vs. TP 2 in order to detect relative deviation of the two TP voltages. (calculated from the maximum value of the both channels).	TP ratio check calculation > 0.2688 V Failure counter max = 12 (.3s) Errors is set and P 2135 = Active Limp home – RPM limitation If we have that : MAF_Measured < 519 mg/stk	Activation: IGN =1. The errors bits, Failure-counters and other variables or bits are initialised Deactivation: IGN =0 or the setting conditions are not fulfilled anymore. - LV_ERR_TP already set - Limp home active	Recurrence Rate 25 ms	M / 1

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			We proceed with calculation of MAF_SUB_X (Maf,IAT,ECT,Baro) and Deviation TP_MAF_DIF_X (for each channel) used for determining which channel is faulty)			
Accelerator Pedal Position (APP) Sensor 1-2 Correlation	P 2138	The objective of the Ratio Check is to detect a relative deviation of the two APP voltages. If the voltages differ more than a permitted Hysteresis, the fault code will be set during debouncing.	Ratio check calculation of CH 1 & 2 V Diff > .32V Hysteresis (calculated from the max values of the channels) Ratio deviation errors is set (not able to detect the faulty channel) Failure counter max = 12 P 2138 = Active Limp home – calibratable TQ reduction with pedal limitation	Activation: IGN = 1. Deactivation: IGN = 0 - LV_ERR_PVS already set - Limp home active	Recurrence Rate 25 ms	M / 1
Accelerator Pedal Position (APP) Sensor 2 Circuit Low Voltage	P2127	This DTC can distinguish the circuit's low voltage. During the normal operation, the output voltages of the APP-sensors must lie within a permitted range.	Voltage PVS_2 < 0.1465 V P2127 = Active Failure counter max = 12 Limp home – calibratable TQ reduction with pedal limitation	Activation: IGN =1. The errors bits, Failure-counters and other variables or bits are initialised Deactivation: IGN =0 or the setting conditions are not fulfilled anymore. - LV_ERR_PVS already set - Limp home active	Recurrence Rate 25 ms	M / 1
Accelerator Pedal Position (APP) Sensor 2 Circuit High Voltage	P2128	This DTC can distinguish the circuit's high voltage. During normal operation, the output voltages of the APP-sensors must lie within a permitted range.	Voltage PVS_2 > 4.5898 Failure counter max = 12 P2128 = Active Limp home –calibrateble TQ reduction with pedal limitation	Activation: IGN =1. The errors bits, Failure-counters and other variables or bits are initialised Deactivation: IGN =0 or the setting conditions are not fulfilled anymore. - LV_ERR_PVS already set - Limp home active	Recurrence Rate 25 ms	M / 1

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Throttle position start check 1	P 2176	This diagnostic checks the following conditions First limp home check and Adaptation of the Limp Home Position Limp home spring test Second limp home check	Voltage_TP_1,2 compared to adaptive Voltages are (.249 V) time > (.05 s) then conditions not met. New adaptation is necessary if engine start cancelled First Limp home check must be fulfilled. The actual value of the throttle position has to reach the setpoint 11.99° within the hysteresis(1.86°/5ms) within a limit maximum of time (.2 S). Limp home-Engine speed limitation. Limp home spring test must be fulfilled. TP V 1,2 compared to adaptive Voltages are > .249 V for time .05 s then conditions not met. New adaptation is necessary if engine start cancelled or else Limp home-Engine speed.	Activation: IGN =1 Each step must be met in order to continue on to the next step Deactivation: IGN=0 - TP adaptation request - Limp home active - Ignition and Injection are active	Recurrence Rate 5 ms	M/1
Evaporative Emission (EVAP) System (≤ 1mm Leak Detected)	P 0442	Leak detection based on decay method. Vacuum is generated in the fuel tank system by means of canister purge valve opening and canister vent valve closed, then the purge is stopped and the leak size is calculated from the variation of the differential pressure (tank, atmosphere). The leak size calculated is compared to a threshold.	A- 1mm detection Leak diameter calculated > 0.664	-Time after start ≥ 600 s -Barometric Pressure ≥ 700 hPa -ECT ≥ 75 degre C -IAT ≥ 3 degre C -Minimum time purging in part load before monitoring canister load >= 0.5 time = 50 s canister load < 0.5 time = 30 s -Charcoal Canister Load ≤ 1.5 -17 hPa < DTP < 1 hPa -Vehicle Speed < 8 km/h -Differential tank pressure fluctuation detected at least once before monitoring active -Service request not active (canister purge valve, venting valve) -Lambda Close loop active <u>The monitoring is inhibited if any of the following errors are present :</u> -DTP errors -Vehicle speed errors -Canister purge valve errors -Venting valve errors	Time lenght < 25 s Recurrence Rate : 1 per trip	M \ 2

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				<ul style="list-style-type: none"> -TP errors -MAF errors -IAT errors -ECT errors -Upstream lambda sensor errors -Injector errors -Misfiring 		
Evaporative Emission (EVAP) Vent System Performance (Stuck Closed)	P 0446	During normal in-use conditions the differential pressure (tank, atmosphere) in the fuel tank system has to be greater than a threshold	DTP value < -17 hPa <u>Failure counter</u> : Increment = 1 Max counter = 5 <u>This diagnostic disables the followings</u> : -EVAP emission control -EVAP monitoring -DTP diagnosis	Engine stop phase not active Engine start phase not active Canister purge active <u>The monitoring is inhibited if any of the following errors are present</u> : -DTP errors -Venting valve electrical errors	Recurrence Rate = 50ms	M / 2
Fuel Tank Pressure – Sensor (DTP) Performance	P 0451	The DTP sensor performance is performed from two ways : A- Constant sensor value detection. From engine start and for calibrated time duration the variation of the DTP signal has to be greater than a calibrated threshold. B- Noisy sensor value detection. At idle the DTP signal value variations have to be smaller than 2 thresholds (peak/peak, slope).	A- Differential tank pressure variation < 0.02v <u>Failure counter</u> : Increment = 1 Max counter = 30 <u>This diagnostic disables the followings</u> : -DTP diagnosis -EVAP monitoring -Venting valve stuck close diagnosis B Differential tank pressure sensor variation > 0.5 hPa Differential tank pressure sensor slope > 1 hPa/s <u>Failure counter</u> : Increment = 1 Max counter = 30 <u>This diagnostic disables the followings</u> : -DTP diagnosis	A- Engine started -Vehicle speed variation > 45 km/h -Canister flow variation > 0.01 kg/h -Differential tank pressure > 0.02V <u>The monitoring is inhibited if any of the following errors are present</u> : -DTP errors (noisy, electrical) -Vehicle speed errors -Canister purge valve errors B -Idle speed active -Differential tank pressure fluctuation detected at least once before idle speed active <u>The monitoring is inhibited if any of the following errors are present</u> : -DTP errors (constant, electrical) -Vehicle speed errors -Canister purge valve errors -Venting valve errors -MAF errors	A Time lenght < 5 Sec Frequency = 50 ms B Time lenght < 5 Sec	M / 2

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			-EVAP monitoring -Venting valve stuck close diagnosis	-TP errors -IAT errors -ECT errors -Upstream lambda sensor errors -FSD -Injector errors -Misfiring		
Fuel Tank Pressure – Sensor (DTP) Electrical Diagnosis	P 0452 FTP Circuit Low Volts P 0453 FTP Circuit High Volts	The DTP sensor electrical diagnosis is performed by two ways, A- Short to ground B- Short to battery or line break	A- Differential tank pressure variation < 0.02v <u>Failure counter :</u> Increment = 1 Max counter = 30 <u>This diagnostic disables the followings :</u> -DTP diagnosis -EVAP monitoring -Venting valve stuck close diagnosis B Differential tank pressure sensor variation > 0.5 hPa Differential tank pressure sensor slope > 1 hPa/s <u>Failure counter :</u> Increment = 1 Max counter = 30 <u>This diagnostic disables the followings :</u> -DTP diagnosis -EVAP monitoring -Venting valve stuck close diagnosis	Engine started	All the time when engine runs. Frequency = 50 ms	M / 2
Fuel Tank Pressure – Sensor (DTP) Intermittent	P 0454	The DTP sensor intermittent diagnosis is performed by two ways, C- Short to ground D- Short to battery or line break	A- Differential tank pressure variation < 0.049v B Differential tank pressure sensor > 4.95v <u>Failure counter :</u> Increment = 1 Max counter = 16 <u>This diagnostic disables the followings :</u> -DTP diagnosis -EVAP monitoring -Venting valve stuck close diagnosis	Engine started	All the time when engine runs. Frequency = 50 ms	N \ 1

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Evaporative Emission (EVAP) System (Large Leak Detected)	P 0455	<p>The large leak detection is performed from two ways :</p> <p>A-Leak detection based on decay method. Vacuum is generated in the fuel tank system by means of canister purge valve opening and canister vent valve closed, then the purge is stopped and the leak size is calculated from the variation of the differential pressure (tank, atmosphere). The leak size calculated is compared to a threshold.</p> <p>B-Leak detection based on fuel cap missing strategy. Time counter is set then vacuum is generated in the fuel tank system. Vacuum level is compared to a threshold. This vacuum threshold has to be reached as long as the time counter is smaller than a threshold. This strategy is repeated for a defined number before to set the final errors</p>	<p>A- Evacuation time during monitoring > 17 s DTP variation during evacuation phase > -6 hPa</p> <p>B- DTP average variation < 6 hPa Time evacuation ≥ 8 s Number check repetition with consecutive failure in a row>= 2</p>	<p>A- Same than Evaporative Emission (EVAP) System (≤ 1mm Leak Detected)</p> <p><u>The monitoring is inhibited if any of the following errors are present :</u> Same than Evaporative Emission (EVAP) System (≤ 1mm Leak Detected)</p> <p>B- <u>From Engine off</u> Time after start < 500 s (120 s) Or, <u>From Engine On</u> -Last idle speed time duration > 10 s (60 s) -Time from last idle speed to start the monitoring =< 100 s</p> <p><u>General conditions</u> -Idle speed not active -Leak detection monitoring conditions not active -Time elapsed from the last check > 50 s - Limited Vehicle speed variation < 12 km - Minimum vehicle speed > 12km/h Limited barometric pressure variation < 8 hPa -Canister purge valve flow > 0.5 kg/h</p> <p><u>The monitoring is inhibited if any of the following errors are present :</u> Same than Evaporative Emission (EVAP) System (≤ 1mm Leak Detected)</p>	<p>A Time lenght < 26.25 Recurrence Rate = 1 per trip</p> <p>B Time lenght < 26.25 s</p>	M \ 2
Evaporative Emission (EVAP) Vent System Performance (Stuck Open)	P0455	<p>The opening check is done during the EVAP monitoring. When the evacuation phase is over the differential pressure in the tank has to be lower than a threshold</p>	<p>-Evacuation time duration > 17 s -DTP variation evacuation phase < -6 hPa <u>Failure counter :</u> Increment = 1 Max counter = 1 <u>This diagnostic disables the followings :</u> -DTP diagnosis -EVAP monitoring</p>	<p>Leak detection monitoring in evacuation phase</p> <p><u>The monitoring is inhibited if any of the following errors are present :</u> Same than Evaporative Emission (EVAP) System (≤ 1mm Leak Detected)</p>	Recurrence Rate = 1 per trip	M / 2
Evaporative Emission (EVAP) System Flow	P 0496	<p>The Canister valve opening check is done during the EVAP monitoring. At the beginning of</p>	<p>Time elapsed in Vapor generation phase < 5 s DTP variation > - 5.5 hPa</p>	<p>Leak detection monitoring in Vapor generation phase</p>	Frequency = 1 per trip	M / 2

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During Non-Purge (Stuck Open)		the leak monitoring the vapor level is measured by closing the canister purge valve and the canister vent valve. While the vapor level measurement the differential pressure inside the tank has to be greater than a threshold, otherwise a failure is detected	<p><u>Failure counter</u> : Increment = 1 Max counter = 7</p> <p><u>This diagnostic disables the followings</u> : -Canister Purge valve in minimum mode -Lambda diagnosis – upstream sensor -Lambda diagnosis – downstream sensor -Lambda adaptation -DTP sensor diagnosis -Idle speed adaptation -FSD</p>	<u>The monitoring is inhibited if any of the following errors are present</u> : Same than Evaporative Emission (EVAP) System (≤ 1mm Leak Detected)		
Lost Communication with TCS	U 1040	This diagnostic will detect a failure on the Class 2 Data link connection to the TCS (265 only)	Detection of Class 2 Failure is internal to the ECM. Failure Ctr. > 16 (3.2s) P 1040 = active	IGN = ON Engine = Running	Recurrence Rate 12.5 ms	N / 1
Electrical Class 2 Failure	U1300 U1301	This diagnostic will detect an electrical open, short to ground, or short to battery voltage (265 Only)	Detection of Electrical Class 2 Failure is internal to the ECM. Failure Ctr. > 16 (3.2s) P 1300 = active P 1301 = active	IGN = ON	Recurrence Rate 12.5 ms	N / 1
Can Bus Communication Malfunction	U 0001	This diagnostic will detect a failure on the Can Bus Data link connection	Detection of Can Bus Failure is internal to the ECM. Failure Ctr. > 16 (3.2s) P 0001 = active	IGN = ON	Recurrence Rate 12.5 ms	N / 1
Lost Communications With Transmission Control System	U 0101	Communication is performed internal to the ECM	Detection of Class 2 Failure is internal to the ECM. Failure Ctr. > 16 (3.2s)	IGN = ON	Recurrence Rate 12.5 ms	M / 1
Loss of Module on CAN bus	U 0002	Adaptive cruise DTC set only if adaptive cruise is present. (295 only)	Detection of CAN bus is internal to the ECU Failure counter > 16 (3.2s)	IGN = ON	Recurrence Rate 12.5 ms	N / 1
Lost Communications With BCM System	U 0140	Communication is performed internal to the ECM	Detection of BCM is internal to the ECU Failure counter > 16 (3.2s)	IGN = ON	Recurrence Rate 12.5 ms	N / 1
Lost Communications With Brake/Traction Control System	U 0121	Communication is performed internal to the ECM (215 Only)	Detection is internal to the ECU Failure counter > 16 (3.2s)	IGN = ON	Recurrence Rate 12.5 ms	N / 1

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Lost Communications With Powertrain Control (ACC) System	U 0104	Communication is performed internal to the ECM (215 Only)	Detection is internal to the ECU Failure counter > 16 (3.2s)	IGN = ON	Recurrence Rate 12.5 ms	N / 1
Lost Data from DIM	U 1064	265 Only	Detection is internal to the ECU Failure counter > 16 (3.2s)	IGN = ON	Recurrence Rate 12.5 ms	N / 1
Lost Data from CCP	U 1153	265 Only	Detection is internal to the ECU Failure counter > 16 (3.2s)	IGN = ON	Recurrence Rate 12.5 ms	N / 1
Lost Data from VTD	U 1192	265 Only	Detection is internal to the ECU Failure counter > 16 (3.2s)	IGN = ON	Recurrence Rate 12.5 ms	N / 1