2006   Isuzu NPR, Chevy W3500, GMC W3500 with 4-cyl diesel engine   and   Aisin A465 6-Speed Automatic Transmisison
ENGINE AND TRANSMISISON DIAGNOSTIC PARAMETERS

SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE AND RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MONITORING PARAMETERS AND CONDITION	MONITORING TIME LENGTH AND FREQUENCY OF CHECK	MONITORING METHOD	FAULT CODE STORAGE AND MIL ILLUMINATION

Crankshaft Position —Camshaft Position Correlation	P0016	Detects the phase difference of the Crankshaft pulse and Camshaft pulse.	[Error criteria 1]
			Condition1 is active
			Cam sensor installation error learning Absolute value > 10 CA
			(CA = Crank Angle)
			
			[Error criteria 2]
			Condition2 is active
			Crank signal input number between crank reference position (missing tooth) and cam extra tooth is inappropriate, and no cam extra tooth between missing tooth.
				None of the following codes are set:
				P0340,P0341,P0335,P0336,P0116,P0117,P0118
				
				Condition1 is active
				or Condition2 is active
				
				Condition1 is as follows
				  P0016 Common condition is active
				  Cam sensor installation error learning is completed
				
				Condition2 is as follows
				  P0016 Common condition is active
				  (At start
				    Engine Speed > 350 rpm
				    Engine Coolant Temperature > -30 deg)
				  or
				  (Not start at
				    Engine Speed > 350 rpm)
				
				P0016 Common condition is as follows
				  Elapsed time from KEY ON >= 2 sec
				  16 v >= Battery voltage >= 10 v
				  Crank pulse is Active
				  Cam pulse is Active
				  Engine Speed <= 4000 rpm
					1800 CA
					Test performed continuously
						Cam/Crank position sensor monitoring	Type B

Fuel Rail Pressure Too Low (Limiter Open)	P0087	1 v to 4.2 v 0 MPa to 200 MPa When Fuel Rail Pressure becomes more than P/L open Pressure, and Fuel Rail Pressure decreases rapidly afterwards, malfunction is determined.	When common rail pressure is higher than 175 MPa, difference of out flow fuel quantity between absolute value and calculated value is larger than threshold.	None of the following codes are set: P0193,P0192,P0643,P0642,P0091,P0092,P0602	0.016 sec Test performed continuously	Fuel Rail Pressure Sensor monitoring	Type A
Common Rail Pressure exceeds Upper Limit	P0088	1 v to 4.2 v 0 MPa to 200 MPa Detects when Fuel Rail Pressure becomes more than 208 MPa.	Fuel Rail Pressure > 208 MPa	None of the following codes are set: P0193,P0192,P0643,P0642,P0091,P0092,P0602 16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec	0.064 sec Test performed continuously	Fuel Rail Pressure Sensor monitoring	Type A
Fuel Pump Over Feed	P0089	1 v to 4.2 v 0 MPa to 200 MPa Detects when the Fuel Rail Pressure exceeds the Target Fuel Rail Pressure.	Fuel Pump feed quantity < 3 mm^3/st Fuel Rail Pressure > Target Fuel Rail Pressure + 10 MPa Stable time > 22.496 sec	None of the following codes are set: P0092,P0091,P0193,P0192,P0643,P0642,P0602 16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Pump difference learning completed Pump Control Mode is in normal mode. Injector Control Mode is active mode. Fuel quantity >= 3 mm^3/st	0.032 sec Test performed continuously	Fuel Rail Pressure Sensor monitoring	Type A
Fuel Rail Pressure Regulator Solenoid Control Circuit	P0091	Malfunction determined when the SCV current is less than (400ma). *SCV = Suction Control Valve	SCV Current <= 400 mA SCV drive duty >= 70 %	None of the following codes are set: P0092,P0642,P0643 KEY ON Condition 1 to 3 Stable time > 0.08 sec 1.Pump Control Mode has not been changed since last time. 2.Amount of SCV control feed forward correction <= 50 mA 3.16 v >= Battery voltage >= 10 v	0.164 sec Test performed continuously	SCV current monitoring	Type A

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Fuel Rail Pressure Regulator Solenoid Control Circuit	P0092	Malfunction determined when the SCV current is greater than (2700mA). *SCV = Suction Control Valve	SCV Current >= 2700 mA SCV drive duty <= 20 %	None of the following codes are set: P0091,P0642,P0643 KEY ON Condition 1 to 3 Stable time > 0.08 sec 1.Pump Control Mode has not been changed since last time. 2.Amount of SCV control feed forward correction <= 50 mA 3.16 v >= Battery voltage >= 10 v	0.04 sec Test performed continuously	SCV current monitoring	Type A
Fuel Leakage Detection	P0093	1 v to 4.2 v 0 MPa to 200 MPa Malfunction is detected from the amount of the change of Rail Pressure before and after the fuel injection.	Following a or b or c condition are fulfilled a) When common rail pressure is lower than 175 MPa , difference of out flow fuel quantity between absolute value and calculated value larger than threshold. b) Fuel leakage amount > Fuel leakage threshold fulfills more than Cal times. c) Fuel Rail Pressure < 18 MPa Fuel leakage amount is "QPC - QINJ - QTOTAL" QPC : Amount of Leak obtained from amount of change of Fuel Rail Pressure before and after fuel injection. QINJ : Injector Mechanical leakage calculated from amount of fuel return. QTOTAL : Amount of Fuel injection. Fuel leakage threshold is	None of the following codes are set: P0092,P0091,P0193,P0192,P0643,P0642,P0089, P0335,P0602 16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec Engine is not in starting mode Pump mode is normal mode Injector Control Mode is active mode. Crank signal is active Fuel Rail Pressure sensor is not failed more than 0.96 sec	180 CA Test performed continuously	Fuel Rail Pressure Sensor monitoring	Type A
Mass Air Flow (MAF) Sensor Performance	P0101	Malfunction determined when MAF is too low or too high compared with target MAF.	Target MAF - MAF > 2D threshold table at Engine Speed (mg/cyl) Target MAF - MAF < 2D threshold table at Engine Speed (mg/cyl)	None of the following codes are set: P0403,P0401,P0406,P0405,P0103,P0102,P2229, P2228,P2227,P0113,P0112,P0118,P0117,P0116, P0643,P0642,P0101,P1125,P0201,P0202,P0203, P0204,P0261,P0264,P0267,P0270,P1293,P2146, P2149,P2147,P2148,P2150,P2151,P0300,P0301, P0302,P0303,P0304,P0016,P0335,P0336,P0403, P0404,P1404,P0500,P0506,P0507,P0602,P0478, P0477,P0478 EGR control is active mode for P0401 Condition 1 to 14 Stable time > 3072 sec 1.16 v >= Battery voltage >= 10 v 2.Elapsed time from KEY ON >= 2 sec 3.Elapsed time from Starter Switch OFF >= 2 sec 4.Not At start 5.Not Engine stall 6.Change of Fuel quantity < 10 mm^3/st 7.Change of Engine Speed < 50 rpm 8.255 km/h >= Vehicle speed >= 0 km/h 9.120 deg >= Intake Air Temperature >= -7 deg 10.120 kPa >= Barometric Pressure >= 75 kPa 11.16 v > Battery voltage >= 10 v 12.APS <= 100 % 13.Engine Speed <= 3600 rpm 14.92 deg >= Engine Coolant Temperature >= 65 deg 15.Exhaust Brake Command is OFF. 16.EGR Command is OFF.	8.32 sec Test performed continuously	Mass Air Flow Sensor monitoring	Type B

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Mass Air Flow (MAF) Sensor Circuit Low Voltage	P0102	1.043 v to 4.939 v 8.5 kg/hr to 850 kg/hr Detects a sensor circuit low voltage	Mass Air Flow Sensor Voltage < 0.079999998 v	None of the following codes are set: P0103,P0642,P0643 Elapsed time from KEY ON >= 2 sec Battery voltage >= 10 v Engine Run Time >= 30 sec Engine Speed >= 600 rpm Stable time >= 3.5 sec	7 sec Test performed continuously	Mass Air Flow Sensor monitoring	Type A
Mass Air Flow (MAF) Sensor Circuit High Voltage	P0103	1.043 v to 4.939 v 8.5 kg/hr to 850 kg/hr Detects a sensor circuit High voltage	Mass Air Flow Sensor Voltage > 4.699999809 v	None of the following codes are set: P0102,P0642,P0643 Elapsed time from KEY ON >= 2 sec Battery voltage >= 10 v Engine Run Time >= 30 sec Engine Speed >= 600 rpm ((Engine Speed <= 3600 rpm and Intake Air Temperature <= -7 deg) or Intake Air Temperature > -7 deg)	6 sec Test performed continuously	Mass Air Flow Sensor monitoring	Type A
Intake Air Temperature (IAT) Sensor Circuit Low Voltage	P0112	0.33 v to 4.71 v 100 deg to -40 deg Detects a sensor circuit low voltage.	Intake Air Temperature Sensor Voltage < 0.10000001 v	None of the following codes are set: P0113 Battery voltage > 7 v Elapsed time from KEY ON >= 2 sec	3.008 sec Test performed continuously	Intake Air Temperature Sensor monitoring	Type B
Intake Air Temperature (IAT) Sensor Circuit High Voltage	P0113	0.33 v to 4.71 v 100 deg to -40 deg Detects a sensor circuit High voltage.	Intake Air Temperature Sensor Voltage > 4.9499999809 v	None of the following codes are set: P0112 Elapsed time from KEY ON >= 2 sec Engine Run Time >= 10 sec	3.008 sec Test performed continuously	Intake Air Temperature Sensor monitoring	Type B
Engine Coolant Temperature (ECT) Sensor Performance	P0116	0.21 v to 4.73 v -40 deg to 120 deg Detects a sensor performance invalid when a difference between maximum and minimum engine coolant temperature is too small.	Coolant Temp diff<= 1deg (Coolant Temp diff= Maximum Coolant temperature-Minimum Coolant temperature)	None of the following codes are set: P0118,P0117,P1125,P0335,P0336,P0602,P0642, P0643 Elapsed time from KEY ON >= 2 sec Engine Run Time > 600 sec 119 deg >=Coolant temperature>= -39 deg	5.12 sec Once per driving cycle	Coolant Temperature Sensor monitoring	Type A
Engine Coolant Temperature (ECT) Sensor Circuit Low Voltage	P0117	0.21 v to 4.73 v -40 deg to 120 deg Detects a sensor circuit low voltage.	Engine Coolant Temperature Sensor Voltage < 0.09 v	None of the following codes are set: P0118 Elapsed time from KEY ON >= 2 sec	3.2 sec Test performed continuously	Coolant Temperature Sensor monitoring	Type A
Engine Coolant Temperature (ECT) Sensor Circuit High Voltage	P0118	0.21 v to 4.73 v -40 deg to 120 deg Detects a sensor circuit low voltage.	Engine Coolant Temperature Sensor Voltage > 4.95 v	None of the following codes are set: P0117 Elapsed time from KEY ON >= 2 sec Engine Run Time > 1 sec	3.2 sec Test performed continuously	Coolant Temperature Sensor monitoring	Type A

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Engine Coolant Temperature (ECT) Insufficient For Stable Operation	P0126	0.21 v to 4.73 v -40 deg to 120 deg Detects a sensor performance invalid when a maximum engine coolant temperature is too low.	Maximum Coolant temperature<= TBD deg	None of the following codes are set: P0118,P0117,P0116,P0113,P0112,P0201,P0202, P0203,P0204,P0261,P0264,P0267,P0270,P1293, P2146,P2149,P2147,P2148,P2150,P2151,P0299, P0300,P0301,P0302,P0303,P0304,P0016,P0335, P0336,P0500,P0602,P0642,P0643 This diagnosis has not decided malfunction or normal yet. Elapsed time from KEY ON >= TBD msec TBD deg >= Power up Engine Coolant Temp >= TBD deg Minimum intake air temperature >= TBD deg Engine Run Time > Diagnostic permission time (3D table at Coolant Temperature , intake air temperature and Injection quantity) (sec) 2D table at Minimum Intake air temperature (cc/msec) < Injection quantity < TBD cc/msec Engine idle rate (Idle time / Run time) < TBD %	1.024 sec Once per driving cycle	Coolant Temperature Sensor monitoring	Type B
Engine Coolant Temperature (ECT) Below thermostat Regulating Temperature	P0128	0.21v to 4.73 v -40 deg to 120 deg Detects a thermostat failure when a maximum engine coolant temperature is too low.	Maximum Coolant temperature <= TBD deg	None of the following codes are set: P0118,P0117,P0116,P0113,P0112,P0201,P0202, P0203,P0204,P0261,P0264,P0267,P0270,P1293, P2146,P2149,P2147,P2148,P2150,P2151,P0299, P0234,P0300,P0301,P0302,P0303,P0304,P0016, P0335,P0336,P0500,P0602,P0642,P0643 This diagnosis has not decided malfunction or normal yet. Elapsed time from KEY ON >= TBD msec TBD deg >= Power up Engine Coolant Temp >= TBD deg Minimum intake air temperature >= TBD deg Engine Run Time > Diagnostic permission time (3D table at Coolant Temperature , intake air temperature and Injection quantity) (sec) 2D table at Minimum Intake air temperature (cc/msec) < Injection quantity < TBD cc/msec Engine idle rate (Idle time / Run time) < TBD %	1.024 sec Once per driving cycle	Coolant Temperature Sensor monitoring	Type B
Fuel Temperature Sensor Performance	P0181	4.52 v to 0.2 v -30 deg to 120 deg Detect Fuel Temp. Sensor performance invalid when a difference between maximum and minimum fuel temperature is too small or too large	Fuel temp diff < 1 deg (Fuel temp diff = maximum fuel temperature-minimum fuel temperature)	None of the following codes are set: P0500,P0183,P0182,P0118,P0117,P0116,P0201, P0202,P0203,P0204,P0261,P0264,P0267,P0270, P1293,P2146,P2149,P2147,P2148,P2150,P2151, P0234,P0299,P0300,P0301,P0302,P0303,P0304, P0016,P0335,P0336,P0602,P0642,P0643 16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec No engine start-up mode Engine running 838.43 sec >= Diagnosis permission duration time for fuel temperature sensor >= 101.904 sec Accumulation time of diagnosis permission vehicle speed condition > 25 km/h Accumulation injection quantity for fuel temperature sensor diagnosis > 390000 mm^3 Engine Coolant Temperature > 60 deg	0.256 sec Test performed continuously	Fuel Temperature Sensor monitoring	Type A

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Fuel Temperature Sensor Circuit Low Voltage	P0182	4.52 v to 0.2 v -30 deg to 120 deg Detects a sensor circuit low voltage.	Fuel Temperature Sensor < 0.1000000001v	None of the following codes are set: P0183,P0642,P0643 Battery voltage > 10 v Elapsed time from KEY ON >= 2 sec	1.024 sec Test performed continuously	Fuel Temperature Sensor monitoring	Type A
Fuel Temperature Sensor Circuit High Voltage	P0183	4.52 v to 0.2 v -30 deg to 120 deg Detects a sensor circuit High voltage.	Fuel Temperature Sensor > 4.80000091v	None of the following codes are set; P0182,P0642,P0643 Elapsed time from KEY ON >= 2 sec Engine Run Time >= 0 sec	1.024 sec Test performed continuously	Fuel Temperature Sensor monitoring	Type A
Fuel Rail Pressure (FRP) Sensor Circuit Low Voltage	P0192	1 v to 4.2 v 0 MPa to 200 MPa Detects a sensor circuit low voltage.	Fuel Rail Pressure Sensor < 0.69999988 v	None of the following codes are set: P0643,P0642,P0193 Elapsed time from KEY ON >= 2 sec	0.096 sec Test performed continuously	Fuel Rail Pressure Sensor monitoring	Type A
Fuel Rail Pressure (FRP) Sensor Circuit High Voltage	P0193	1 v to 4.2 v 0 MPa to 200 MPa Detects a sensor circuit low voltage.	Fuel Rail Pressure Sensor > 4.699999809 v	None of the following codes are set: P0643,P0642,P0192 Elapsed time from KEY ON >= 2 sec	0.096 sec Test performed continuously	Fuel Rail Pressure Sensor monitoring	Type A
Injector (#1/#2/#3/#4) Control Circuit open	P0201 P0202 P0203 P0204	Detects injector output open load by ECU hardware.	ECU detects injector output open load.	16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec Crank Angle Sensor active. 2 sec elapsed after Key on initialize. CPU watching IC is normal. Charge circuit is running. Injection pulse width = 0	5760 CA Test performed continuously	ECU Hardware monitoring	Type A
Turbo Charger Over boost	P0234	Detects an Over boost condition by measuring the delta between expected Over Boost threshold Pressure and actual Boost Pressure.	Boost Pressure > MAP from Engine Speed and Barometric Pressure	None of the following codes are set: P0238,P0237,P2229,P2228,P2227,P0643,P0642, P0113,P0112,P0403,P1404,P0404,P0401,P0406, P0405,P0606,P1125,P0602,P0118,P0117,P0116 Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec	3.0008 sec Test performed continuously	Boost Pressure Sensor monitoring	Type A
Turbo Charger Boost Sensor Circuit Low Voltage	P0237	0.501 v to 4.5 v 66.7 kPa to 333.3 kPa Detects a sensor circuit low voltage.	Boost Pressure Sensor < 0.100000001 v	None of the following codes are set: P0643,P0642,P0238 Elapsed time from KEY ON >= 2 sec	1.024 sec Test performed continuously	Boost Pressure Sensor monitoring	Type A
Turbo Charger Boost Sensor Circuit High Voltage	P0238	0.501 v to 4.5 v 66.7 kPa to 333.3 kPa Detects a sensor circuit High voltage.	Boost Pressure Sensor > 4.8000000191 v	None of the following codes are set: P0643,P0642,P0237 Elapsed time from KEY ON >= 2 sec	1.024 sec Test performed continuously	Boost Pressure Sensor monitoring	Type A
Injector (#1/#4/#3/#2) Circuit short (Coil short / terminal short)	P0261 P0264 P0267 P0270	Detects Injector load short (Coil short / terminal short) by ECU hardware.	ECU detect Injector Load short	16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec Crank Angle Sensor active. 2 sec elapsed after Key On Initialize. CPU watching IC is normal. Charge circuit is running. Injection pulse width = 0	5760 CA Test performed continuously	Injector Circuits monitoring	Type A

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Turbo Charger Under boost	P0299	Detects an under boost condition, a biased low sensor or Turbo system malfunction by measuring the delta between Expected Under Boost Pressure and Actual Boost Pressure.	Expected Under Boost Pressure - Actual Boost Pressure < 3D table from Engine Speed and Accel Pedal Position	None of the following codes are set: P2148,P2151,P2147,P2150,P2146,P2149,P0201, P0203,P0204,P0202,P0238,P0237,P2229,P2228, P2227,P0643,P0642,P0113,P0112,P0261,P0267, P0270,P0264,P0101,P0102,P0103,P0089,P0091, P0092,P0116,P0117,P0118,P1125,P1293,P0016, P0335,P0336,P0403,P0401,P0404,P0405,P0406, P1404,P0602,P0478 Elapsed time from KEY ON >= 2 sec Accumulation Fuel Quantity > 100 mm^3/st Mass Air Flow - Target Mass Air Flow <= 600 mg/cyl Condition 1 to 6 Stable time >= 3.072 sec 3600 rpm >= Engine Speed >= 2000 rpm Absolute value of change of Engine Speed <= 100 rpm Fuel quantity < 300 mm^3/st Absolute value of change of Fuel Quantity <= 10 mm^3/st Intake Air Temperature >= -10 deg Engine Coolant Temperature >= 65 deg	5.12 sec Test performed continuously	Boost Pressure Sensor monitoring	Type A
Engine Misfire Detected	P0300	Detects at least 1 of the cylinder is misfired.	Number of detected misfire cylinders > 1	None of the following codes are set: P0089,P0091,P0092,P0192,P0193,P1093,P0093, P2227,P2228,P2229,P0112,P0113,P0116,P0117, P0118,P1125,P0201,P0202,P0203,P0204,P0261, P0264,P0267,P0270,P1293,P2146,P2149,P2147, P2148,P2150,P2151,P0016,P0335,P0336,P0500, P0506,P0507,P0602,P0642,P0643 Each cylinder's fail or pass detection completed.	70 sec Once per driving cycle	Cylinder Balance Control monitoring	Type A
Cylinder (#1/#2/#3/#4) Misfire Detected	P0301 P0302 P0303 P0304	Detects cylinder misfire.	Cylinder balance control quantity > 30 mm^3/stroke	None of the following codes are set: P2148,P2151,P2147,P2150,P2146,P2149,P0201, P0203,P0204,P0202,P0118,P0117,P0116,P0500, P0261,P0267,P0270,P0264,P0089,P0091,P0092, P0192,P0193,P1093,P0093,P2227,P2228,P2229, P0112,P0113,P1125,P1293,P0016,P0335,P0336, P0506,P0507,P0602,P0642,P0643 Following conditions are set longer than 1 msec. Under cylinder balance control. Coolant temp >= -7 degC Each cylinder's fail or pass detection counter is not determined. Vehicle Speed < 2 mph 500 rpm < Engine Speed < 1050 rpm | Target engine speed (i) - Target engine speed(i-1)	< 100 rpm -30 mm^3/st < Target Fuel Quantity < 300 mm^3/st	70 sec Once per driving cycle	Cylinder Balance Control monitoring	Type B
Crankshaft Angle Sensor Circuit	P0335	Detects Crankshaft position sensor circuit failure when number of crank signal inputs is too small.	Number of crank signal inputs during 1rev < 1	16 v >= Battery voltage >= 10 v	3600 CA Test performed continuously	Crank Angle Sensor monitoring	Type A
Crankshaft Angle Sensor Performance	P0336	Detects Crankshaft position sensor performance invalid when number of crank signal inputs is not true.	Number of crank signal inputs between reference position (missing tooth) <> Number of teeth on crankshaft	None of the following codes are set: P0335,P0340 16 v >= Battery voltage >= 10 v Engine Speed > 350 rpm Crank signal inputs are recognized.	18000 CA Test performed continuously	Crank Angle Sensor monitoring	Type B
Camshaft Position Sensor Circuit	P0340	Detects Camshaft position sensor circuit failure when number of cam signals input is too small.	Number of cam signal inputs during 1rev < 1	16 v >= Battery voltage >= 10 v	3600 CA Test performed continuously	Cam Position Sensor monitoring	Type A

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Camshaft Position Sensor Performance	P0341	Detects Camshaft position sensor performance invalid when number of cam signal inputs is not true.	Number of cam signal inputs between reference position (extra tooth) <> Number of teeth on camshaft	None of the following codes are set: P0340 16 v >= Battery voltage >= 10 v Engine Speed > 350 rpm Cam signal inputs are recognized.	36000 CA Test performed continuously	Cam Position Sensor monitoring	Type B
Wait to Start Lamp Control Circuit (Open Load/short to GND or Short to BATT)	P0381	Malfunction is detected when the command to Wait to Start Lamp and the input level to the detection circuit are different.	Wait to Start Lamp Control command is ON Diagnostic port level of the ECM is Low or Wait to Start Lamp Control command is OFF Diagnostic port level of the ECD is Hi	Elapsed time from KEY ON >= 2 sec 10 v <= Battery voltage <= 16 v	1.04 sec Test performed continuously	Wait to Start Lamp Circuit Voltage monitoring	Type B
Exhaust Gas Recirculation (EGR) Flow Insufficient	P0401	Detects EGR valve stick by measuring delta air mass flow with opening EGR valve from closing position.	Delta air mass flow with opening EGR valve from closing position > 2D threshold table at Engine Speed. (mg/cyl)	None of the following codes are set: P0403,P0101,P0406,P0405,P0103,P0102,P2229, P2228,P2227,P0500,P0113,P0112,P0118,P0117, P0116,P0643,P0642,P0335,P0336,P1125,P0201, P0202,P0203,P0204,P0261,P0264,P0267,P0270, P1293,P2146,P2149,P2147,P2148,P2150,P2151, P0300,P0301,P0302,P0303,P0304,P0506,P0507, P0602,P0478 KEY ON Power up Time > 5.056 sec 16 v >= Battery voltage >= 10 v 92 deg >= Engine Coolant Temperature >= 65 deg	8.8 sec Once per driving cycle	Mass Air Flow Sensor monitoring	Type B
Exhaust Gas Recirculation (EGR) Control Circuit	P0403	Detects by the Pulse Width Modulation (PWM)	Detects by the PWM is no input.	None of the following codes are set: P0642,P0643 KEY ON Power up Time >= 5.056 sec 5% <= EGR Control Duty <= 95 % 16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec	6.04 sec Test performed continuously	EGR Duty monitoring	Type A
Exhaust Gas Recirculation (EGR) Performance (Duty Error)	P0404	Detects EGR duty error when Final EGR Duty is too high.	Final EGR Duty >= 70 %	None of the following codes are set: P0401,P0403,P0404,P0405,P0406,P1404,P0642, P0643 16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec	30 sec Test performed continuously	EGR Duty monitoring	Type A
Exhaust Gas Recirculation (EGR) Performance (Open Position)	P0404	Detects EGR valve position error between Target EGR Position and Actual EGR Position.	Absolute value of (Target EGR Position - EGR Position) > 10 %	None of the following codes are set: P0403,P0406,P0405,P0643,P0642,P2227,P2228, P2229,P0112,P0113,P0116,P0117,P0118 Target EGR Position > 0 % Absolute value of Target EGR Change Position <= 5 % 16 v >= Battery voltage >= 10 v 92 deg >= Engine Coolant Temperature >= 65 deg 150 deg >= Intake Air Temperature >= -7 deg 120 kPa >= Barometric Pressure >= 75Kpa Elapsed time from KEY ON >= 5.056 sec	7.936 sec Test performed continuously	EGR Position Sensor monitoring	Type B

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Exhaust Gas Recirculation (EGR) Position Sensor Circuit Low Voltage	P0405	0.7 v to 4.15 v 0 mm to 11.7 mm Detects a sensor circuit low voltage.	EGR Position Sensor < 0.5 v	None of the following codes are set: P0643,P0642,P0403,P0406 KEY ON Power up Time >= 5.056 sec 16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec	3 sec Test performed continuously	EGR Position Sensor monitoring	Type A
Exhaust Gas Recirculation (EGR) Position Sensor Circuit High Voltage	P0406	0.7 v to 4.15 v 0 mm to 11.7 mm Detects a sensor circuit high voltage.	EGR Position Sensor > 4.5 v	None of the following codes are set: P0643,P0642,P0403,P0405 KEY ON Power up Time >= 5.056 sec 16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec	3 sec Test performed continuously	EGR Position Sensor monitoring	Type A
Exhaust Brake System Monitoring	P0477	Detects Exhaust brake relay circuit ground short or Detects Exhaust brake VSV circuit ground short or open *VSV = Vacuum Switching Valve	Exhaust Brake Command ON and Relay Monitor Level Low or Exhaust Brake Command ON and VSV Monitor Level Low	None of the following codes are set: P0478,P0642,P0643,U0073,U0101 Battery Voltage > 10 v Key_on_time > 4.992 sec Engine Speed > 0 rpm Exhaust Brake Cut Relay Monitor = ON (Exhaust Brake Cut not controlled) No Exhaust Brake Cut Request From TCM Above conditions have been met for > 4.992 sec and Exhaust Brake enforcement request = OFF	1.042 sec (Relay) 1.6 sec (VSV) Test performed continuously (When exhaust brake is used)	Exhaust Brake Circuit Monitoring	Type B
Exhaust Brake System Monitoring	P0478	Detects Exhaust brake relay circuit battery short or open or Detects Exhaust brake VSV circuit battery short *VSV = Vacuum Switching Valve	Exhaust Brake Command OFF and Relay Monitor Level Hi or Exhaust Brake Command OFF and VSV Monitor Level Hi	None of the following codes are set: P0477,P0642,P0643,U0073,U0101 Battery Voltage > 10 v Key_on_time > 4.992 sec Engine Speed > 0 rpm Exhaust Brake Cut Relay Monitor = ON (Exhaust Brake Cut not controlled) No Exhaust Brake Cut Request From TCM Above conditions have been met for > 4.992 sec and Exhaust Brake enforcement request = OFF	1.042 sec (Relay) 1.6 sec (VSV) Test performed continuously (When exhaust brake is used)	Exhaust Brake Circuit Monitoring	Type A
Vehicle Speed Sensor (VSS) Circuit Revised: Apr. 24, 2006	P0500	Malfunction determined by comparing vehicle speed from TCM and vehicle speed calculated in ECU.	If AT vehicle, Absolute value of "Vehicle speed from TCM - vehicle speed calculated in ECU" > 15 MPH If MT vehicle, Vehicle speed calculated in ECU < 0 pulse/hour	None of the following codes are set: U0073,U0101,P0643,P0700 If the vehicle is AT, Received vehicle speed from TCM by CAN is not $FE00 to $FEFF. Elapsed time from KEY ON >= 3 sec If the vehicle is MT, Elapsed time from KEY ON >= 2 sec Engine Coolant Temperature > 20deg Engine Speed > 1100rpm Fuel quantity > 2D table calculated by Engine speed.	10 sec Test performed continuously	Vehicle Speed Sensor	Type B

SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE AND RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MONITORING PARAMETERS AND CONDITION	MONITORING TIME LENGTH AND FREQUENCY OF CHECK	MONITORING METHOD	FAULT CODE STORAGE AND MIL ILLUMINATION
Idle Speed Control (ISC) System RPM Lower than Expected	P0506	When ISC is controlled, it is Malfunction determined when engine speed is lower than the target.	ISC Target Engine Speed - Engine Speed > 200 rpm	None of the following codes are set: P0335,P0336,P0500,P0116,P0117,P0118,P1125, P1293,P1293,P2146,P2149,P2147,P2148,P2150, P2151,P0300,P0507,P0602,P0642,P0643 Condition 1 to 9 Stable time > 3.008 sec 1.ISC Control Mode is Manual or Auto 2.Elapsed time from KEY ON >= 2 sec 3.Not in Engine Speed Control Mode by Transmission 4.Idle Mode is active 5.Vehicle speed <= 1 MPH 6.Engine Coolant Temperature > 65 deg 7.Absolute value of change of Fuel Quantity <= 10 mm ^{3}/st 8.Absolute value of change of Engine Speed <= 20 rpm 9.Absolute value of change of ISC Target Engine Speed <= 10 rpm	10.08 sec Test performed continuously	Engine Speed monitoring	Type B
Idle Speed Control (ISC) System RPM Higher than Expected	P0507	When ISC is controlled, malfunction is determined when engine speed is higher than the target.	Engine Speed - ISC Target Engine Speed > 100 rpm	None of the following codes are set: P0335,P0336,P0500,P0116,P0117,P0118,P1125, P0506,P0602,P0602,P0642,P0643 Condition 1 to 9 Stable time > 3.08 sec 1.ISC Control Mode is Manual or Auto 2.Elapsed time from KEY ON >= 2 sec 3.Not in Engine Speed Control Mode by Transmission 4.Idle Mode is active 5.Vehicle speed <= 1 MPH 6.Engine Coolant Temperature > 65 deg 7.Absolute value of change of Fuel Quantity <= 10 mm ^{3}/st 8.Absolute value of change of Engine Speed <= 20 rpm 9.Absolute value of change of ISC Target Engine Speed <= 10 rpm	10.08 sec Test performed continuously	Engine Speed monitoring	Type B
Starter Switch Short to BATT	P0512	When a starter switch continues after the engine starts, malfunction is detected.	Starter Switch continues ON	10 v <= Battery voltage <= 16 v Elapsed time from KEY ON >= 2 sec Engine Speed > 1000 rpm	10.24 sec Test performed continuously	Starter Switch monitoring	Type B
Multi-point correction for injector tolerance - QR Code (2-D bar-code) Not Programmed	P0602	Detect QR code not programmed.	At least one of the QR-code recorded history about each injector is "non-recorded" or Checksum error	KEY ON	30.08 sec Test performed continuously	EEPROM Data monitoring	Type A
Multi-point correction for injector tolerance - QR Code ERROR	P0602	Detect QR code Error (EEPROM Error).	All of three data sets used for majority differ. or Correction data decided by majority > 127 (µs) or Correction data decided by majority < -128 (µs)	KEY ON	30.08 sec Test performed continuously	EEPROM Data monitoring	Type A
ECM Processor (Main CPU fault)	P0606	Malfunction is detected by informing of malfunction detection from Watchdog IC.	Information of malfunction detection >= 5continuous Information of malfunction detection is Condition 1 to 4 1.RUN pulse does not reverse 2.Battery voltage >= 10 v 3.Starter Switch OFF 4.Elapsed time from Power On Reset >= 350 msec	continuous	Test performed continuously	Main CPU monitoring	Type A
ECM Processor (Watchdog IC fault)	P0606	Malfunction is found in the signal sent from Watchdog IC.	Condition 1 to 4 Stable time >= 700 msec 1.RUN pulse does not reverse between 4-12 msec 2.Battery voltage >= 10 v 3.Elapsed time from Starter Switch OFF >= 500 msec 4.Elapsed time from Power On Reset >= 2000 msec	continuous	Test performed continuously	Watchdog IC monitoring	Type A
Battery 5V Reference 1 Circuit Low Voltage	P0642	Detects a sensor circuit low voltage.	5V Reference1 Sensor < 2.25 v (ECM monitors the voltage divided into the half.)	None of the following conditions are set: P0643 Elapsed time from KEY ON >= 2 sec	0.08 sec Test performed continuously	5V Reference Sensor monitoring	Type A

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SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE AND RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MONITORING PARAMETERS AND CONDITION	MONITORING TIME LENGTH AND FREQUENCY OF CHECK	MONITORING METHOD	FAULT CODE STORAGE AND MIL ILLUMINATION
Battery 5V Reference 1 Circuit High Voltage	P0643	Detects a sensor circuit high voltage.	5V Reference1 Sensor > 2.75 v (ECM monitors the voltage divided into the half.)	None of the following conditions are set: P0642 Elapsed time from KEY ON >= 2 sec	0.08 sec Test performed continuously	5V Reference Sensor monitoring	Type A
Malfunction Indicator Lamp (MIL) Control Circuit Monitoring (short to BATT or open load/short to GND)	P0650	Malfunction is detected when the command to Mil and the input level to the detection circuit are different.	MIL Control command is ON DIAG port level is Low or MIL Control command is OFF DIAG port level is Hi	KEY ON 10 v <= Battery voltage <= 16 v	1.024 sec Test performed continuously	MIL diag port monitoring	Type B
Battery 5V Reference 2 Circuit Low Voltage	P0652	Detects a sensor circuit low voltage.	5V Reference2 Sensor < 2.25 v (ECM monitors the reduced voltage (half voltage))	None of the following conditions are set: P0653 Elapsed time from KEY ON >= 2 sec	0.08 sec Test performed continuously	5V Reference sensor monitoring	Type B
Battery 5V Reference 2 Circuit High Voltage	P0653	Detects a sensor circuit high voltage.	5V Reference2 Sensor > 2.75 v (ECM monitors the reduced voltage (half voltage))	None of the following conditions are set: P0652 Elapsed time from KEY ON >= 2 sec	0.08 sec Test performed continuously	5V Reference sensor monitoring	Type B
Glow Plug Control Module (GPCM) Performance	P0670	Malfunction determination is executed based on information from the GPCM.	GPCM reporting disconnected battery line or an over voltage condition, or Any of the glow plug switches defective.	None of the following codes are set: U0106,U0073 Elapsed time from KEY ON >= 2 sec 16 v >= Battery voltage >= 10 v	1.024 sec Test performed continuously	Monitored by GPCM and message Transferred by CAN	Type B
Cylinder (#1/#2/#3/#4) Glow Plug Control Circuits	P0671 P0672 P0673 P0674	Malfunction determinant is executed based on information from the GPCM.	GPCM reporting Glow Plug Circuit is Line Open or Short Circuit.	None of the following codes are set: U0106,U0073 Elapsed time from KEY ON >= 2 sec 16 v >= Battery voltage >= 10 v	1.024 sec Once per driving cycle	Monitored by GPCM and message Transferred by CAN	Type A
Battery 5V Reference 3 Circuit Low Voltage	P0698	Detects a sensor circuit low voltage.	5V Reference3 Sensor < 2.25 v (ECM monitors the reduced voltage (half voltage))	None of the following codes are set: P0699 Elapsed time from KEY ON >= 2 sec	0.08 sec Test performed continuously	5V Reference Sensor monitoring	Type B
Battery 5V Reference 3 Circuit High Voltage	P0699	Detects a sensor circuit high voltage.	5V Reference3 Sensor > 2.75 v (ECM monitors the voltage divided into the half.)	None of the following codes are set: P0698 Elapsed time from KEY ON >= 2 sec	0.08 sec Test performed continuously	5V Reference Sensor monitoring	Type B
Transmission Control Module (TCM) Requested MIL Illumination Monitoring	P0700	MIL light on is according to the MIL illumination request by TCM.	There is MIL illumination request by TCM after request line test mode at Key ON.	After Key ON	6.4 sec Test performed continuously	Transmission Control Module	Type A
Transmission Control Module (TCM) MIL Request Circuit Monitoring	P0802	It is Malfunction determined if there is no MIL illumination request by TCM in prescribed time from power ON.	There was no MIL illumination request by TCM within request line test mode at power ON.	Not after CPU reset	2.048 sec Once per driving cycle	Transmission Control Module monitoring	Type B
Fuel Rail Pressure Low During Power Enrichment	P1093	Malfunction is detected when the fuel rail pressure is lower than the target.	Target Fuel Rail Pressure - Fuel Rail Pressure > 30 MPa	None of the following codes are set: P0092,P0091,P0193,P0192,P0643,P0642,P0089, P0335,P0336,P0602 Following condition1 or 2 is active 1.SCV driving duty except Feed forward correction <= 2D threshold table at Engine Speed 2.Amount of Fuel exhalation >= 2D threshold table at Engine Speed *SCV = Suction Control Valve	10.24 sec Test performed continuously	Fuel Rail Pressure monitoring	Type B

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SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE AND RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MONITORING PARAMETERS AND CONDITION	MONITORING TIME LENGTH AND FREQUENCY OF CHECK	MONITORING METHOD	FAULT CODE STORAGE AND MIL ILLUMINATION
Accelerator Position Sensor (APS) System (Circuit Open-Short , Correlation)	P1125	Checks accelerator pedal position sensor Circuit open-short and Correlation.	One or more of the following failure is detected 1.One sensor circuit fails (disconnection , short-circuit) and another two sensors have a correlation error. 2.Two sensors or more circuits fail (disconnection , short-circuit). 3.One 5V Power supply circuit fails (short-circuit) and another two sensors have a correlation error. 4. Three sensor have a correlation error.	None of the following codes are set: P0642,P0643,P0652,P0653,P0698,P0699	16 msec Test performed continuously	Accelerator Position Sensor Monitoring	Type B
Capacitor charge-up circuit (insufficient charge)	P1293	Detects capacitor charge-up circuit malfunction (insufficient charge or excessive charge)	ECU detect capacitor charge-up circuit's insufficient charge or excessive charge.	16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec CPU watching IC is normal. Charge circuit is running.	0.128 sec Test performed continuously	ECU Hardware monitoring	Type A
Exhaust Gas Recirculation (EGR) Closed Position Performance	P1404	Detects close position error.	Following condition 1 or (2 and 3) or (2 and 4) is approved 1.EGR Position >= 5 % 2.EGR closed position has been learned. 3.Learned EGR closed position >= 5 mm 4.Learned EGR closed position <= -5 mm	None of the following codes are set: P0403,P0406,P0405,P0643,P0642,P2227,P2228, P2229,P0112,P0113,P0116,P0117,P0118 Elapsed time from KEY ON >= 2 sec (Target EGR Position <= 0 %) stable time >= 1 sec	2.944 sec Test performed continuously	EGR Position Sensor monitoring	Type B
EEPROM Checksum error	P1621	Detects EEPROM Checksum error.	EEPROM checksum not agree with recorded checksum.	16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec	1 failures out of 1 samples.	EEPROM monitoring	Type A
Injector Control Circuits Group 1 (Cyl.#1&#4) Open Circuit	P2146	Detects COM1 Circuits open. (COM1=Injector Control Circuits Gruor1 (Cyl.#1&#4))	COM1 Circuits open.	16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec Crank Angle Sensor active. 2 sec elapsed after power on reset. CPU watching IC is normal. Charge circuit is running. Injection pulse width = 0	2880 CA Test performed continuously	ECU Hardware monitoring	Type A
Injector Control Circuits Group 1 (Cyl.#1&#4) Short to GND	P2147	Detects COM1 Circuits short to GND. (COM1=Injector Control Circuits Gruor1 (Cyl.#1&#4))	COM1 Circuits shot to GND.	16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec Crank Angle Sensor active.	2880 CA Test performed continuously	ECU Hardware monitoring	Type A
Injector Control Circuits Group 1 (Cyl.#1&#4) Short to BATT	P2148	Detects COM1 Circuits short to BATT. (COM1=Injector Control Circuits Gruor1 (Cyl.#1&#4))	COM1 Circuits shot to BATT.	16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec Crank Angle Sensor active.	2880 CA Test performed continuously	ECU Hardware monitoring	Type A
Injector Control Circuits Group 2 (Cyl.#2&#3) Open Circuit	P2149	Detects COM2 Circuits open. (COM2=Injector Control Circuits Gruor2 (Cyl.#2&#3))	COM2 Circuits open.	16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec Crank Angle Sensor active. CPU watching IC is normal. Charge circuit is running. Injection pulse width = 0	2880 CA Test performed continuously	ECU Hardware monitoring	Type A
Injector Control Circuits Group 2 (Cyl.#2&#3) Short to GND	P2150	Detects COM2 Circuits short to GND. (COM2=Injector Control Circuits Gruor2 (Cyl.#2&#3))	COM2 Circuits shot to GND.	16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec Crank Angle Sensor active.	2880 CA Test performed continuously	ECU Hardware monitoring	Type A
Injector Control Circuits Group 2 (Cyl.#2&#3) Short to BATT	P2151	Detects COM2 Circuits short to BATT. (COM2=Injector Control Circuits Gruor2 (Cyl.#2&#3))	COM2 Circuits shot to BATT.	16 v >= Battery voltage >= 10 v Elapsed time from KEY ON >= 2 sec Elapsed time from Starter Switch OFF >= 2 sec Crank Angle Sensor active.	2880 CA Test performed continuously	ECU Hardware monitoring	Type A

SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE AND RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MONITORING PARAMETERS AND CONDITION	MONITORING TIME LENGTH AND FREQUENCY OF CHECK	MONITORING METHOD	FAULT CODE STORAGE AND MIL ILLUMINATION
Barometric Pressure (BARO) Sensor Performance	P2227	2.44 v to 3.8 v 61.328 kPa to 106.658 kPa Detects difference between the barometric pressure and the boost pressure.	-7.5 kPa > Baro diff or 7.5 kPa < Baro diff Baro diff = Barometric Pressure- MAP pressure - (-2) kPa	None of the following codes are set: P0238,P0237,P0118,P0117,P0116,P0500,P1125, P0506,P0507,P0602,P0478 Engine run time > 30 sec 650 rpm < Engine Speed < 1050 rpm APS < 2 % MAF < 1600 mg/cyl Vehicle speed < 2 mph Coolant temp > 20 DegC Elapsed time from KEY ON >= 2 sec Stable time >= 3.072 sec	5.12 sec Test performed continuously	Baro Pressure Sensor monitoring	Type B
Barometric Pressure (BARO) Sensor Circuit Low Voltage	P2228	2.44 v to 3.8 v 61.328 kPa to 106.658 kPa Detects a sensor circuit low voltage.	Barometric Pressure Sensor < 1.5 v	None of the following codes are set: P2229 Battery voltage > 7 v Elapsed time from KEY ON >= 2 sec Engine run time > 1 sec	1.024 sec Test performed continuously	Baro Pressure Sensor monitoring	Type A
Barometric Pressure (BARO) Sensor Circuit High Voltage	P2229	2.44 v to 3.8 v 61.328 kPa to 106.658 kPa Detects a sensor circuit high voltage.	Barometric Pressure Sensor > 4.5 v	None of the following codes are set: P2228 Elapsed time from KEY ON >= 2 sec Engine run time > 2 sec	1.024 sec Test performed continuously	Baro Pressure Sensor monitoring	Type A
CAN Bus Reset Counter Overrun	U0073	Detects a CAN bus OFF	The CAN bus is off.	Elapsed time from KEY ON >= 2 sec 0 v <= Battery voltage <= 20 v	1.008 sec Test performed continuously	CAN bus monitoring	Type B
Lost CAN Communication with TM Control	U0101	Not receive Torque/Speed Control#1 or Electronic Transmission Controller#2	Torque/Speed Control#1(PGN 0) lost of message or Electronic Transmission Controller#2(PGN 61445) lost of message is detected Stable time >= 0.2 sec Torque/Speed Control#1 loss of message Torque Speed Control is Active KEY ON 8 v <= Ignition1 Voltage <= 16 v Not receive Torque/Speed Control#1 Stable time >= 1 sec Electronic Transmission Controller#2 loss of message Transmission Type is AT KEY ON 8 v <= Ignition1 Voltage <= 16 v Not receive Electronic Transmission Controller#2	None of the following codes are set: U0073 Elapsed time from KEY ON >= 2 sec 0 v <= Battery voltage <= 20 v	1.008 sec Test performed continuously	CAN Message from the TCM	Type A
Glow Plug Control Module Communication Failure	U0106	Malfunction determination is executed based on information from the Glow controller.	The communication with the Glow Plug Controller time-out.	Following conditions are set longer than 1.024 sec. Elapsed time from KEY ON >= 2 sec 16 v >= Battery voltage >= 10 v	1.008 sec Test performed continuously	Glow Plug Module Communication monitoring	Type B
Vehicle speed sensor (SP1) malfunction	P0503	Detects an unrealistic large change in vehicle speed	1. TCM detects sudden stop of Vehicle speed sensor signal at all conditions are satisfied. 2. Nout is 0 rpm after 1S since Vehicle speed sensor signal is stopped. Nout is value used of Output speed sensor signal in normal, when Output speed sensor signal is failed, it is used transformed value of Vehicle speed sensor signal.	1. Engine speed≧600rpm 2. Output speed sensor is failure (P0722 is stored). 3. 807rpm ≦Nout≦6350rpm (13mph) (106mph) Nout is the value used of Output speed sensor signal in normal, when Output speed sensor signal is failed, it is used transformed value of Vehicle speed sensor signal.	none	Vehicle speed (Frequency)	Type A

2006   Isuzu NPR, Chevy W3500, GMC W3500 with 4-cyl diesel engine   and   Aisin A465 6-Speed Automatic Transmisison
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SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE AND RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MONITORING PARAMETERS AND CONDITION	MONITORING TIME LENGTH AND FREQUENCY OF CHECK	MONITORING METHOD	FAULT CODE STORAGE AND MIL ILLUMINATION
Output speed sensor (SP2) malfunction	P0722	Detects pulse for Output speed sensor	TCM detects no pulse of Output speed sensor while TCM detects 4 pulses of Vehicle speed sensor signal.	1. Engine speed $\geqq$ 600rpm 2. Output speed signal is not input while Vehicle speed signal is input 500 counts continuously (4 pulse/rev). 3. Shift lever position is not P or N range. 4. TCM detects Nout is over 186 rpm for 4S. Nout is the used value of Output speed sensor signal in normal, when Output speed sensor signal is failed, it is used transformed value of Vehicle speed sensor signal.	500 counts continuously	AC voltage generated by Output speed sensor	Type B
Output Speed Sensor (SP2) malfunction	P0723	Detects an unrealistic large change in vehicle speed	1. TCM detects sudden stopped of Output speed sensor signal at all conditions are satisfied. 2. Nout is 0 rpm after 1S since Vehicle speed sensor signal is stopped.	1. Engine speed $\geqq$600rpm 2. Vehicle speed sensor is failure (DTC is none). 3. 807rpm $\leqq$Nout$\leqq$6350rpm (13mph) (106mph) Nout: It is used value of Output speed sensor signal in normal, when Output speed sensor signal is failed, it is used transformed value of Vehicle speed sensor signal.	none	AC voltage generated by Output speed sensor	Type A

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SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE AND RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MONITORING PARAMETERS AND CONDITION	MONITORING TIME LENGTH AND FREQUENCY OF CHECK	MONITORING METHOD	FAULT CODE STORAGE AND MIL ILLUMINATION
Engine Speed signal malfunction	P0727	Detects pulse for Engine speed	TCM detects Engine speed signal < 100rpm.	1. Nout ≧ 1000rpm (17mph). 2. Shift position is not P or N range. Nout: It is used value of Output speed sensor signal in normal, when Output speed sensor signal is failed, it is used transformed value of Vehicle speed sensor signal.	120S continuously	Engine speed (Frequency)	Type B
Transmission Fluid Temperature Switch malfunction	P1839	Detects a illegal position.	ATF Switch is ON.	1. Engine speed≧600rpm 2. ATF temp. ＜ 60℃	60S continuously	ATF switch	Type B
Transmission Range switch circuit malfunction （PRND2L）	P0705	Detects a illegal position.	1. Open : TCM detects no signal of range sensor. 2. Short : TCM detects 2 or more signals	Engine speed≧600rpm	30S continuously	Range switch	Type A
Shift Solenoid S1 electrical	P0753	0 to +BAT Detects an OPEN, short to GND or short to volt. in Sift Solenoid S1 circuit or solenoid.	1. GND SHORT Voltage at connector pin is 0V for 100ms continuously. 2. OPEN／IG Short Voltage at connector pin is same as IG voltage for 100ms continuously.	1. When SOL ON output. 2. Engine speed≧600rpm 1. When SOL OFF output. 2. Engine speed≧600rpm	8 counts continuously 8 counts continuously	Shift Solenoid S1	Type A
Shift Solenoid S1 malfunction (OFF stuck）	P0751	Detect a shift solenoid S1 stuck off	1. TCM detects 4th gear ratio in case of 1st gear target for 1second. 2. TCM detects 3rd gear ratio in case of 2nd gear target for 1second.	1. After 2.0sec from solenoid output. 2. 12%<TH<100%, 3. Vehicle speed>186rpm (4mph) <following condition> 4. ATF temperature≧40℃ (when ATF sensor is normal) or after 10min from Engine coolant temperature≧70℃. 5. More than 20sec after D range signal is detected 6. Engine speed≧600rpm 7. No Engine speed failure 8. No Output speed sensor failure 9. No S1,S2 solenoid electrical failure 10. No range switch failure 11. No CAN failure 12. No NC0 sensor failure	2 counts both 1. and 2. continuously	gear ratio calculated from Input and Output speed.	Type B

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SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE AND RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MONITORING PARAMETERS AND CONDITION	MONITORING TIME LENGTH AND FREQUENCY OF CHECK	MONITORING METHOD	FAULT CODE STORAGE AND MIL ILLUMINATION
Shift Solenoid S1 malfunction (ON stuck）	P0752	Detect a shift solenoid S1 stuck on	TCM detects 2nd gear ratio in case of 3rd gear target for 1second.	1. After 2.0sec from solenoid output. 2. 12%<TH<100%, 3. Vehicle speed>186rpm (4mph) <following condition> 4. ATF temperature≧40℃ (when ATF sensor is normal) or after 10min from Engine coolant temperature≧70℃. 5. More than 20sec after D range signal is detected 6. Engine speed≧600rpm 7. No Engine speed failure 8. No Output speed sensor failure 9. No S1,S2 solenoid electrical failure 10. No range switch failure 11. No CAN failure 12. No NC0 sensor failure	2 counts continuously	gear ratio calculated from Input and Output speed.	Type B
Shift Solenoid S2 electrical	P0758	0 to +BAT Detects an OPEN, short to GND or short to volt. in Sift Solenoid S2 circuit or solenoid.	1. GND SHORT Voltage at connector pin is 0V for 100ms continuously.	1. When SOL ON output. 2. Engine speed≧600rpm	8 counts continuously	Shift Solenoid S2	Type A
			2. OPEN／IG Short Voltage at connector pin is same as IG voltage for 100ms continuously.	1. When SOL OFF output. 2. Engine speed≧600rpm	8 counts continuously		
Shift Solenoid S2 malfunction (OFF stuck）	P0756	Detect a shift solenoid S2 stuck off	1.TCM detects 1st gear ratio in case of 2nd gear target for 1second.	1. After 2.0sec from solenoid output. 2. 12%<TH<100% 3. Vehicle speed>186rpm (4mph) <following condition> 4. ATF temperature≧40℃ (when ATF sensor is normal) or after 10min from Engine coolant temperature≧70℃. 5. More than 20sec after D range signal is detected. 6. Engine speed≧600rpm 7. No Engine speed failure 8. No Output speed sensor failure 9. No S1,S2 solenoid electrical failure 10. No range switch failure 11. No CAN failure 12. No NC0 sensor failure	2 counts both 1. and 2. continuously	gear ratio calculated from Input and Output speed.	Type B
			2.TCM detects 4th gear ratio in case of 3rd gear target for 1second.				

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Shift Solenoid S2 malfunction (ON stuck）	P0757	Detect a shift solenoid S2 stuck on	1. TCM detects 2nd gear ratio in case of 1st gear target for 1second. 2.TCM detects 3rd gear ratio in case of 4th gear target for 1second.	1. After 2.0sec from solenoid output 2. 12%<TH<100% 3. Vehicle speed>186rpm (4mph) <following condition> 4. ATF temperature≧40℃ (when ATF sensor is normal) or after 10min from Engine coolant temperature≧70℃. 5. More than 20sec after D range signal is detected 6. Engine speed≧600rpm 7. No Engine speed failure 8. No Output speed sensor failure 9. No S1,S2 solenoid electrical failure 10. No range switch failure 11. No CAN failure 12. No NC0 sensor failure	2 counts both 1. and 2. continuously	gear ratio calculated from Input and Output speed.	Type B
TCC Solenoid electrical	P0743	0 to +BAT Detect an electrical failure off the TCC solenoid	1. GND SHORT ; Voltage at connector pin is 0V for 100ms. 2. OPEN／IG Short ; Voltage at connector pin is same as IG voltage for 100ms continuously.	1. When SOL ON output. 2. Engine speed≧600rpm 1. When SOL OFF output. 2. Engine speed≧600rpm	8 counts continuously 8 counts continuously	TCC solenoid	Type A
TCC Solenoid malfunction (OFF stuck）	P0741	Detect a TCC solenoid stuck off	When it is satisfied all below conditions. <Running at 3rd,4th> 1. |Ne-(SP2*Gear Ratio)|≧100rpm <Running at 1st,2nd> 2. Ne-(SP2*Gear Ratio)≧100rpm.	<following condition> 1. 600rpm≦Engine Speed≦4800rpm 2. 0rpm≦Output speed≦5500rpm 3. Shift lever position is in D or 2 range. 4. While TCC ON request 5. Not during Gear shift 6. The fail detect is effective during 10S to 200S after all 1.-5. conditions are satisfied. 7. No Engine speed failure 8. No SP2 sensor failure 9. No S1,S2 and SL solenoid electrical failure 10. No CAN failure 11. ATF temperature≧40℃ (when ATF sensor is normal) or after 10min from Engine coolant temperature≧70℃ 12. Shift Solenoid stuck ON/OFF (P0751,52,56,57) DTCs are already passed.	500mS continuously	slippage calculated from engine speed and output speed and gear ratio.	Type B

SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE AND RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MONITORING PARAMETERS AND CONDITION	MONITORING TIME LENGTH AND FREQUENCY OF CHECK	MONITORING METHOD	FAULT CODE STORAGE AND MIL ILLUMINATION
TCC Solenoid malfunction (ON stuck)	P0742	Detect a TCC solenoid stuck on	When it is satisfied below conditions at conditions 11.-13. are all satisfied. | Ne - (SP2*Gear Ratio)| < 20rpm	<following condition> 1. 600rpm≦Engine Speed≦4800rpm 2. 0rpm≦Output speed≦5500rpm 3. Shift lever position is in D or 2 range. 4. While TCC OFF request 5. The fail detect is effective during 1S to 200S after all conditions 1.-4. are satisfied. 6. No Engine speed failure 7. No SP2 sensor failure 8. No S1,S2 and SL solenoid electrical failure 9. No CAN failure 10. ATF temperature≧40℃ (when ATF sensor is normal) or after 10min from Engine coolant temp. ≧70 deg. 11. TH = Idle 12. While Output speed is decreasing. SP2≦SP2(before200ms)-8rpm 13. 1200rpm≦Output speed 14. Engine coolant temp. ≧ 70 deg. 15. 4th Gear (Solenoid Output)	2S continuously	slippage calculated from engine speed and output speed and gear ratio.	Type B
			When it is satisfied below conditions at conditions 11.-15. are all satisfied. | Ne - (SP2*Gear Ratio) | < 20rpm	<following condition> 1. 600rpm≦Engine Speed≦4800rpm 2. 0rpm≦Output speed≦5500rpm 3. Shift lever position is in D or 2 range. 4. While TCC OFF request 5. The fail detect is effective during 1S to 200S after all conditions 1.-4. are satisfied. 6. No Engine speed failure 7. No SP2 sensor failure 8. No S1,S2 and SL solenoid electrical failure 9. No CAN failure 10. ATF temperature≧40℃ (when ATF sensor is normal) or after 10min from Engine coolant temp. ≧70 deg. 11. Last gear shift output is "Power on Up shift" 12. While 10S after gear shift. 13. 30% ≦TH≦ 100% 14. While Engine speed is increasing. Engine speed≧Engine speed (before 200ms) 15. While Output speed is increasing. Output speed≧Output speed (before 200ms)	1S continuously		

ENGINE   AND   TRANSMISISON   DIAGNOSTIC   PARAMETERS

SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE AND RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MONITORING PARAMETERS AND CONDITION	MONITORING TIME LENGTH AND FREQUENCY OF CHECK	MONITORING METHOD	FAULT CODE STORAGE AND MIL ILLUMINATION
Input speed sensor（NC0）malfunction	P0717	Detects pulse for Input speed sensor	NCO＜100rpm	1. Shift lever position is in D range. 2. 2nd Gear (Solenoid Output) 3. Nout≧400rpm（7mph） 4. NC0＜100rpm Nout is the used value of Output speed sensor signal in normal, when Output speed sensor signal is failed, it is used transformed value of Vehicle speed sensor signal.	2S continuously	AC voltage generated by Input speed sensor	Type B
RAM error	P1791	Detect a RAM data	TCM can not detect all RAM from step1 to step4 in initialize routine. Step1:TCM writes 55h in the RAM. Step2:TCM reads 55h in the RAM. Step3:TCM writes Aah in the RAM. Step4:TCM reads Aah in the RAM.	Detect RAM failure once after IG ON.	1 time	RAM data	Type B
ROM error	P1790	Detect a ROM checksum	Checksum error is detected on ROM.	Detect ROM failure once after IG ON.	1 time	ROM checksum	Type B
CAN Signal malfunction	U2104	Detects a CAN signal failure.	TCM cannot read CAN signal.	Engine speed≧600rpm	5S continuously	CAN failure	Type A
		Detect CAN BUS OFF	TCM detects CAN BUS OFF. (At communication start : 1S)	Engine speed≧600rpm	1S continuously	CAN BUS OFF	Type A

ENGINE AND TRANSMISISON DIAGNOSTIC PARAMETERS

SENSED PARAMETER	FAULT CODE	ACCEPTABLE OPERATING RANGE AND RATIONALITY	PRIMARY MALFUNCTION DETECTION PARAMETERS	SECONDARY MONITORING PARAMETERS AND CONDITION	MONITORING TIME LENGTH AND FREQUENCY OF CHECK	MONITORIN G METHOD	FAULT CODE STORAGE AND MIL ILLUMINATION
CAN Data invalid <Accelerator pedal position>	U2105	Detects a illegal position.	TCM detects illegal data (FB-FFH). (Except for 1S after Ignition key on.)	Engine speed≧600rpm	5S continuously	Illegal CAN data	Type A
		CAN data is not come on	TCM cannot receive CAN parameter data. (Except for 1S after Ignition key on.)	1. Engine speed≧600rpm 2. During Cruise control or PTO control		Not received CAN data	
CAN Data invalid < Accelerator pedal position (PT demand) >		Detects a illegal position.	TCM detects illegal data (FB-FFH). (Except for 1S after Ignition key on.)	Engine speed≧600rpm	5S continuously	Illegal CAN data	
		CAN data is not come on	TCM cannot receive CAN parameter data. (Except for 1S after Ignition key on.)			Not received CAN data	
CAN Data invalid < Actual engine % torque >		Detects a illegal position.	TCM detects illegal data (FB-FFH). (Except for 1S after Ignition key on.)	Engine speed≧600rpm	5S continuously	Illegal CAN data	
		CAN data is not come on	TCM cannot receive CAN parameter data. (Except for 1S after Ignition key on.)			Not received CAN data	
CAN Data invalid < Nominal friction % torque >		Detects a illegal position.	TCM detects illegal data (FB-FFH). (Except for 1S after Ignition key on.)	Engine speed≧600rpm	5S continuously	Illegal CAN data	
		CAN data is not come on	TCM cannot receive CAN parameter data. (Except for 1S after Ignition key on.)			Not received CAN data	
CAN Data invalid < Engine coolant temperature signal >		Detects a illegal position.	TCM detects illegal data (FB-FFH). (Except for 1S after Ignition key on.)	Engine speed≧600rpm	5S continuously	Illegal CAN data	
		CAN data is not come on	TCM cannot receive CAN parameter data. (Except for 1S after Ignition key on.)			Not received CAN data	
CAN Data invalid < Cruise/PTO control state >		CAN data is not come on	TCM cannot receive CAN parameter data. (Except for 1S after Ignition key on.)	Engine speed≧600rpm	5S continuously	Not received CAN data	