

SERVICE INFORMATION BULLETIN

Group: 00 - General
Warranty Code:
Bulletin No. SB 11 - 004
Issue Date: 11 - 05 -2011

HDOBD Specification Table

Component /System/Controller	Fault Code	Monitor Strategy Description	Malfunction Criteria (Primary Parameter)	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illumination
2-1. Fuel system and CCM								
Suction control valve for fuel supply pump /Fuel system/Engine ECU (Fuel system pressure control)	P0088	Comparison of fuel rail pressure between target and actual (high pressure)	Actual fuel rail pressure - Target fuel rail pressure	>= 15MPa (2175.495psi)	Conditions below continue	10sec	15sec	1DCY
					Engine speed	>= 700rpm		
					Fuel injection quantity	>= 5mm3/st		
					ΔFuel injection quantity	> -1.7mm3/st		
					Target suction control valve drive current	>= 1500mA		
	P0087	Comparison of fuel rail pressure between target and actual (low pressure)	Actual fuel rail pressure - Target fuel rail pressure	<= -15MPa (-2175.495psi)	Conditions below continue	5sec	15sec	1DCY
					Engine speed	>= 700rpm		
					Fuel injection quantity	>= 5mm3/st		
					ΔFuel injection quantity	< 2.6 mm3/st		
					Target suction control valve drive current	<= 1250mA		
Fuel injector /Fuel system/Engine ECU (Injection quantity) (Injection timing)	P0263(#1cyl) P0266(#2cyl) P0269(#3cyl) P0272(#4cyl) P0275(#5cyl) P0278(#6cyl)	Monitor fuel injection quantity and engine speed fluctuation (at idle)	Fuel injection quantity of each cylinder	>= 20-40mm3/st (quantity decrease) (timing retard) or <= 0-9mm3/st (quantity increase) (timing advance)	Conditions below continue	30sec	20sec	2DCY
					Engine speed	250 - 900rpm		
					Fuel injection quantity	0 - 50mm3/st		
					PTO	Deactivated		
					Exhaust brake	Deactivated		
					and after that,			
					Conditions below continue	10sec		
					Engine speed	695-775rpm		
					Gear position	No change		
					Fuel injection quantity	< 30mm3/st		
					Engine coolant temp	>= 60degC (140F)		
					Accelerator pedal position	= 0%		
					Vehicle speed	= 0mile/h		
					PTO	Deactivated		
					Exhaust brake	Deactivated		
					No malfunction : see 'Monitor disable DTC table'			
Crankshaft position sensor /Fuel system/Engine ECU	P0335	Disconnection	Crankshaft position sensor pulse count per 1 revolution	= 0	Battery voltage	10V-16V	0.8sec (at 750rpm)	1DCY
					Engine speed	> 0rpm		
	P0336	Rationality check	Crankshaft position sensor pulse count per 1 revolution	<> 56	Battery voltage	10V-16V	50sec (at 750rpm)	1DCY
					Engine speed	>= 500rpm		
Camshaft position sensor /Fuel system/Engine ECU	P0340	Disconnection	Camshaft position sensor pulse count per 1 revolution	= 0	Battery voltage	10V-16V	0.8sec (at 750rpm)	1DCY
					Engine speed	> 0rpm		
	P0341	Rationality check	Camshaft position sensor pulse count per 2 revolutions	<> 7	Battery voltage	10V-16V	100sec (at 750rpm)	1DCY
					Engine speed	>= 500rpm		

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Crankshaft and Camshaft position sensor /Fuel system/Engine ECU	P0016	Rationality check	Phase gap between camshaft position sensor pulse and crankshaft position sensor pulse	<= 13deg or >= 23deg	Battery voltage	10V-16V	1sec	1DCY
					Engine speed	700rpm - 1000rpm		
					Engine coolant temp	>= 60degC (140F)		
					Target engine speed - Actual engine speed	<= 20rpm		
Fuel rail pressure sensor (main) /Fuel system/Engine ECU	P0192	Range check (low)	Fuel rail pressure sensor (main) voltage	<= 0.64V (-15MPa) (-2175.495psi)	Battery voltage	10V-16V	0.2sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
	P0193	Range check (high)	Fuel rail pressure sensor (main) voltage	>= 4.78V (281MPa) (40754.273psi)	Battery voltage	10V-16V	0.2sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
Fuel rail pressure sensor (sub) /Fuel system/Engine ECU	P1197	Range check (low)	Fuel rail pressure sensor (sub) voltage	<= 0.89V (-33MPa) (-4786.089psi)	Battery voltage	10V-16V	0.2sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
	P1198	Range check (high)	Fuel rail pressure sensor (sub) voltage	>= 4.82V (248MPa) (35968.184psi)	Battery voltage	10V-16V	0.2sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
Fuel rail pressure sensor /Fuel system/Engine ECU	P119F	Rationality check : Comparison of fuel rail pressure sensor voltage between main and sub	Fuel pressure sensor (sub) voltage - Fuel pressure sensor (main) voltage	> 1.06V or < 0.04V	Battery voltage	10V-16V	3sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
					Fuel rail pressure (main)	<= 220MPa (31907.26psi)		
					No malfunction : see 'Monitor disable DTC table'			
Fuel injector /Fuel system/Engine ECU	P0201(#1cyl) P0202(#2cyl) P0203(#3cyl) P0204(#4cyl) P0205(#5cyl) P0206(#6cyl)	Disconnection	Fuel injector driver circuit current	= 0A	Battery voltage	10V-16V	4sec (at 750rpm)	1DCY
					Engine speed	> 0rpm		
					Fuel injector driver charge circuit	Activated		
					No malfunction : see 'Monitor disable DTC table'			
Fuel injector driver charge circuit /Fuel system/Engine ECU	P0611	Circuit monitor (low)	Fuel injector driver charge circuit voltage	< 55V	Battery voltage	10V-16V	0.096sec	1DCY
					Fuel injector	Deactivated		
	P0200	Circuit monitor (high)	Fuel injector driver charge circuit voltage	> 105V	Battery voltage	10V-16V	0.384sec	1DCY
					Fuel injector	Deactivated		

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Fuel injector driver 1 /Fuel system/Engine ECU	P1211	Circuit monitor (low)	Fuel injector driver circuit 1 voltage	< 0.9V	Battery voltage	10V-16V	0.6sec (at 750rpm)	1DCY
					Fuel injector	Activated		
					Engine speed	> 0rpm		
	P1212	Circuit monitor (high)	Fuel injector driver circuit 1 voltage	> 9V	Battery voltage	10V-16V	0.6sec (at 750rpm)	1DCY
					Fuel injector	Deactivated		
					Engine speed	> 0rpm		
Fuel injector driver 2 /Fuel system/Engine ECU	P1214	Circuit monitor (low)	Fuel injector driver circuit 2 voltage	< 0.9V	Battery voltage	10V-16V	0.6sec (at 750rpm)	1DCY
					Fuel injector	Activated		
					Engine speed	> 0rpm		
	P1215	Circuit monitor (high)	Fuel injector driver circuit 2 voltage	> 9V	Battery voltage	10V-16V	0.6sec (at 750rpm)	1DCY
					Fuel injector	Deactivated		
					Engine speed	> 0rpm		
Suction control valve for fuel supply pump /Fuel system/Engine ECU	P0628	Circuit monitor (low)	Suction control valve drive current	< 500mA	Battery voltage	10V-16V	2.1sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
					Fuel injector	Activated		
					Fuel injector driver charge circuit	Activated		
	P0629	Circuit monitor (high)	Suction control valve drive current	> 1900mA	Battery voltage	10V-16V	2.1sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
					Fuel injector	Activated		
					Fuel injector driver charge circuit	Activated		
Fuel injector adjustment data error /Fuel system/Engine ECU	P1601	Data check	Adjustment data or Adjustment data check sum or EEPROM memory	Not written or >= 127 or <= -128 Error Error			3sec	1DCY

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2-2. Misfire

Continuously misfiring (poor compression) /Engine ECU	P0301(#1cyl) P0302(#2cyl) P0303(#3cyl) P0304(#4cyl) P0305(#5cyl) P0306(#6cyl)	Monitor fuel injection quantity and engine speed fluctuation (at idle)	Fuel injection quantity of each cylinder	>= 40mm3/st	Conditions below continue	30sec	10sec	1DCY
					Engine speed	250 - 900rpm		
					Fuel injection quantity	0 - 50mm3/st		
					PTO	Deactivated		
					Exhaust brake	Deactivated		
					and after that,			
					Conditions below continue	10sec		
					Engine speed	695-775rpm		
					Gear position	No change		
					Fuel injection quantity	< 50mm3/st		
					Engine coolant temp	>= 60degC (140F)		
					Accelerator pedal position	= 0%		
					Vehicle speed	= 0mile/h		
					PTO	Deactivated		
					Exhaust brake	Deactivated		
No malfunction : see 'Monitor disable DTC table'								

2-3. EGR system and CCM (including Boost pressure control system CCM)

EGR Cooler /EGR system/Engine ECU (Low Flow)	P0401	Low EGR ratio	Actual (calculated) EGR ratio	< 15% (at high engine speed and middle load condition) ~ 27% (at low load condition)	Engine operating in judgment area (decided by Engine speed and Fuel injection quantity)	All engine speed : 0-10mm3/st, >= 1500rpm at 20mm3/st, >= 2250rpm at 60mm3/st, Deactivated at 65mm3/st and more	30 sec	1DCY
					Nominal EGR flow	>= 40g/sec		
					Barometric pressure	>= 83kPa (12.038psi)		
					No malfunction : see 'Monitor disable DTC table'			

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EGR valve /EGR system/Engine ECU (High Flow)	P0402	High EGR ratio	Actual (calculated) EGR ratio	> 40%	Conditions below continue	5sec	30sec	1DCY
					Burner	activated		
					Engine coolant temperature	<= 60degC (140F)		
					Engine speed	<= 1000rpm		
					Fuel injection quantity	<= 15mm3/st		
					No malfunction : see 'Monitor disable DTC table'			
					or			
					Conditions below continue	5sec		
					Burner	Deactivated		
					Engine coolant temperature	<= 40degC (104F)		
					Engine speed	<= 1000rpm		
					Fuel injection quantity	<= 100mm3/st		
					No malfunction : see 'Monitor disable DTC table'			
					or			
					Conditions below continue	5sec		
					Engine coolant temperature	> 40degC (104F) <= 60degC (140F)		
					Engine speed	<= 1000rpm		
					Fuel injection quantity	>= 100mm3/st		
					No malfunction : see 'Monitor disable DTC table'			
					or			
					Conditions below continue	5sec		
					Engine coolant temperature	> 60degC (140F)		
					Engine speed	<= 1000rpm		
					Fuel Injection quantity	>= 100mm3/st		
					No malfunction : see 'Monitor disable DTC table'			
EGR valve /EGR system/Engine ECU (Feedback control)	P0402	Monitor EGR feedback value	EGR feedback value	= Minimum limit	Engine speed	>= 50rpm	30sec	1DCY
					Fuel Injection quantity	>= 0mm3/st		
					Target EGR valve position	> 0%		
					Barometric pressure	>= 75kPa (10.877psi)		
					IAT(AFS built-in)	>= -35degC (-31F) <= 120degC (248F)		
					Exhaust Brake	Deactivated		
					PTO	Deactivated		
					Battery voltage	>= 10V <= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
					No malfunction : see 'Monitor disable DTC table'			

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EGR Cooler /EGR system/Engine ECU (EGR Cooler Performance)	P2457	High EGR gas temperature	EGR gas temperature	>= 270degC (518F)	Conditions below continue	11sec	2sec	2DCY
					Battery voltage	>= 10V <= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
					Engine is operating in judgment area (below)			
					Engine speed	>= 1000rpm <= 1250rpm		
					Fuel injection quantity	>= 80mm3/st		
					or			
					Engine speed	>= 1250rpm <= 1500rpm		
					Fuel injection quantity	>= 40mm3/st		
					or			
					Engine speed	>= 1500rpm <= 1750rpm		
					Fuel injection quantity	>= 30mm3/st		
					or			
					Engine speed	>= 1750rpm <= 2000rpm		
					Fuel injection quantity	>= 10mm3/st		
					or			
					Engine speed	>= 2000rpm <= 2500rpm		
					Fuel injection quantity	>= 10mm3/st <= 50mm3/st		
					Engine speed	>= 2500rpm <= 2750rpm		
Fuel injection quantity	>= 10mm3/st <= 40mm3/st							
Target EGR valve position	>= 30%							
Rationality check of EGRT sensor	Complete							
No malfunction : see 'Monitor disable DTC table'								
Air flow sensor /EGR system/Engine ECU	P0104	Range check (low)	Air flow sensor output frequency	< 0.85kHz (-5.5kg/h)	Battery voltage	>= 10V <= 16V	2sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
		Range check (high)	Air flow sensor output frequency	> 9.8kHz (1632kg/h)	Battery voltage	>= 10V <= 16V	2sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		

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	P0101	Rationality check by 2 steps, specify the malfunctioning sensor from 2 check results (1) Air flow check Comparing Calculated air mass flow (inputs : engine speed, boost pressure, and so on) and Actual air mass flow (2) Pressure check Comparing Actual boost pressure and Actual barometric pressure	(1) Air flow check Average calculated air mass flow /Average actual air mass flow	<= 0.85 or >= 1.15	Engine speed	>= 2000rpm <= 2600rpm	10sec	1DCY	
			and after that, (2) Pressure check Average boost pressure -Average barometric pressure	< 18kPa (2.611psi)	Δ Engine speed	<= 30rpm			
					Fuel injection quantity	>= 0mm3/st <= 80mm3/st			
					Δ Fuel injection quantity	<= 10mm3/st			
					Δ Air mass flow	<= 10g/sec			
					Engine coolant temperature	<= 60degC (140F)			
					Target EGR valve position	<= 0%			
					No malfunction : see 'Monitor disable DTC table'				
			Boost pressure sensor /Boost pressure control system /Engine ECU	P0237	Range check (low)	Boost pressure sensor voltage	< 0.19V (22.8kPa) (3.307psi)	Battery voltage	>= 10V <= 16V
Conditions below continue	5sec								
Engine stall	Yes								
or Engine speed	>= 500rpm								
P0108	Range check (high)	Boost pressure sensor voltage		> 4.11V (365kPa) (52.937psi)	Battery voltage	>= 10V <= 16V	3sec	1DCY	
					Conditions below continue	5sec			
					Engine stall	Yes			
					or Engine speed	>= 500rpm			
P0106	Rationality check by 2 steps, specify the malfunctioning sensor from 2 check results (1) Air flow check Comparing Calculated air mass flow (inputs : engine speed, boost pressure, and so on) and Actual air mass flow (2) Pressure check Comparing Actual boost pressure and Actual barometric pressure	(1) Air flow check Average calculated air mass flow /Average actual air mass flow		<= 0.85 or >= 1.15	Engine speed	>= 2000rpm <= 2600rpm	10sec	1DCY	
					and after that, (2) Pressure check Average boost pressure -Average barometric pressure	>= 18kPa (2.611psi)			Δ Engine speed
			Fuel injection quantity						>= 0mm3/st <= 80mm3/st
			Δ Fuel injection quantity						<= 10mm3/st
			Δ Air mass flow						<= 10g/sec
			Engine coolant temperature						<= 60degC (140F)
			Target EGR valve position						<= 0%
			No malfunction : see 'Monitor disable DTC table'						

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Barometric pressure sensor /Engine ECU	P2228	Range check (low)	Barometric pressure sensor voltage	< 1.9V (43.3kPa) (6.28psi)	Battery voltage	>= 10V	3sec	1DCY	
						<= 16V			
					Conditions below continue	5sec			
					Engine stall	Yes			
		or Engine speed	>= 500rpm						
	P2229	Range check (high)	Barometric pressure sensor voltage	> 4.2V (120kPa) (17.404psi)	Battery voltage	>= 10V	3sec	1DCY	
						<= 16V			
					Conditions below continue	5sec			
					Engine stall	Yes			
		or Engine speed	>= 500rpm						
	P2227	Rationality check by 2 steps, specify the malfunctioning sensor from 2 check results (1) Air flow check Comparing Calculated air mass flow (inputs : engine speed, boost pressure, and so on) and Actual air mass flow (2) Pressure check Comparing Actual boost pressure and Actual barometric pressure	(1) Air flow check Average calculated air mass flow /Average actual air mass flow	> 0.85 and < 1.15		>= 2000rpm	10sec	1DCY	
						<= 2600rpm			
					Δ Engine speed	<= 30rpm			
					Fuel injection quantity	>= 0mm3/st			
						<= 80mm3/st			
					Δ Fuel injection quantity	<= 10mm3/st			
Δ Air mass flow					<= 10g/sec				
Engine coolant temperature					<= 60degC (140F)				
Target EGR valve position			<= 0%						
No malfunction : see 'Monitor disable DTC table'									
and after that, (2) Pressure check Average boost pressure -Average barometric pressure			>= 18kPa (2.611psi)						3sec
				Key (Ignition) switch	OFF				
	Engine stop (stall)	Yes							

Intake air temperature sensor (AFS built-in) /Engine ECU	P0112	Range check (low)	Intake air temperature sensor (AFS built-in) voltage	< 0.06V (105degC) (221F)	Battery voltage	>= 10V	3sec	1DCY
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
		or Engine speed	>= 500rpm					
	P0113	Range check (high)	Intake air temperature sensor (AFS built-in) voltage	> 4.55V (-40degC) (-40F)	Battery voltage	>= 10V	3sec	1DCY
						<= 16V		
					Conditions below continue	5sec		
Engine stall					Yes			
	or Engine speed	>= 500rpm						

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	P011C	Rationality check (at engine start)	Average IAT (AFS built-in) - Average IAT (intercooler outlet) and Average IAT (AFS built-in) - Average IAT (intake manifold)	>= 30degC (86F) >= 30degC (86F)	Conditions below continue Engine speed Fuel Injection quantity Engine coolant temperature Battery voltage Conditions below continue Engine stall or Engine speed No malfunction : see 'Monitor disable DTC table'	30sec <= 890rpm <= 35mm3/st >= -30degC (-22F) <= 35degC (86F) >= 10V <= 16V 5sec Yes >= 500rpm	40sec	1DCY
Intake air temperature sensor (intercooler outlet) /Boost pressure control system /Engine ECU	P007C	Range check (low)	Intake air temperature sensor (intercooler outlet) voltage	< 0.06V (200degC) (392F)	Battery voltage Conditions below continue Engine stall or Engine speed	>= 10V <= 16V 5sec Yes >= 500rpm	3sec	1DCY
	P007D	Range check (high)	Intake air temperature sensor (intercooler outlet) voltage	> 4.87V (-35degC) (-31F)	Battery voltage Conditions below continue Engine stall or Engine speed IAT(AFS built-in) No malfunction : see 'Monitor disable DTC table'	>= 10V <= 16V 5sec Yes >= 500rpm >= -20degC (-4F)	3sec	1DCY
	P007B	Rationality check (at engine start)	Average IAT (intercooler outlet) - Average IAT (AFS built-in) and Average IAT (intercooler outlet) - Average IAT (intake manifold)	>= 30degC (86F) >= 30degC (86F)	Conditions below continue Engine speed Fuel Injection quantity Engine coolant temperature Battery voltage Conditions below continue Engine stall or Engine speed No malfunction : see 'Monitor disable DTC table'	30sec <= 890rpm <= 35mm3/st >= -30degC (-22F) <= 35degC (95F) >= 10V <= 16V 5sec Yes >= 500rpm	40sec	1DCY

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Intake air temperature sensor (intercooler outlet) /Boost pressure control system /Engine ECU	P007B	Rationality check (at engine running)	Actual IAT (intercooler outlet) - IAT (intercooler outlet, at engine start)	< -20degC (-4F)	Engine speed	<= 890rpm	30sec	1DCY
					Fuel Injection quantity	<= 35mm3/st		
					Engine coolant temperature	>= -30degC (-22F)		
						<= 35degC (95F)		
					Battery voltage	>= 10V		
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
					Time elapsed since engine start	<= 30sec		
					and after that,			
					Conditions below continues	20sec		
					Engine coolant temperature	>= 60degC (140F)		
					Boost pressure	>= 140kPa (20.305psi)		
					Engine speed	>= 1750rpm		
					Fuel injection quantity	>= 50mm3/st		
					IAT (AFS built-in)	>= 20degC (68F)		
					No malfunction : see 'Monitor disable DTC table'			
			Actual IAT (intercooler outlet) - IAT (intercooler outlet, at engine start)	>= 25degC (77F)	Engine speed	<= 890rpm	30sec	1DCY
					Fuel Injection quantity	<= 35mm3/st		
					Engine coolant temperature	>= -30degC (-22F)		
						<= 35degC (95F)		
					Battery voltage	>= 10V		
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
					Time elapsed since engine start	<= 30sec		
					and after that,			
					Conditions below continues	20sec		
					Engine coolant temperature	>= 60degC (140F)		
					Boost pressure	<= 140kPa (20.305psi)		
					Engine speed	<= 1250rpm		
					Fuel injection quantity	<= 20mm3/st		
					No malfunction : see 'Monitor disable DTC table'			
Intake air temperature sensor (intake manifold) /Engine ECU	P0097	Range check (low)	Intake air temperature sensor (intake manifold) voltage	< 0.06V (200degC) (392F)	Battery voltage	>= 10V	3sec	1DCY
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		

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	P0098	Range check (high)	Intake air temperature sensor (intake manifold) voltage	> 4.87V (-35degC) (-31F)	Battery voltage	>= 10V <= 16V	3sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
					IAT(AFS built-in)	>= -20degC (-4F)		
					No malfunction : see 'Monitor disable DTC table'			
	P0096	Rationality check (at engine start)	Average IAT (intake manifold) - Average IAT (AFS built-in) and Average IAT (intake manifold) - Average IAT (intercooler outlet)	>= 30degC (86F) >= 30degC (86F)	Conditions below continue	30sec	40sec	1DCY
					Engine speed	<= 890rpm		
					Fuel Injection quantity	<= 35mm3/st		
					Engine coolant temperature	>= -30degC (-22F) <= 35degC (95F)		
					Battery voltage	>= 10V <= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
					No malfunction : see 'Monitor disable DTC table'			
Intake air temperature sensor (intake manifold) /Engine ECU	P0096	Rationality check (at engine running)	IAT (intake manifold) - IAT (intercooler outlet)	<= 10degC (50F)	Rationality check (at engine start)	Completed	30sec	1DCY
					Conditions below continue	20sec		
					Engine speed	>= 1250rpm		
					Fuel injection quantity	>= 50mm3/st		
					Engine coolant temperature	>= 60degC (140F)		
					Target EGR valve position	>= 30%		
					Target air mass flow - Actual air mass flow	<= 100mg/cyl		
					Battery voltage	>= 10V <= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
					No malfunction : see 'Monitor disable DTC table'			

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			IAT (intake manifold) - IAT (intercooler outlet)	>= 55degC (131F)	Rationality check (at engine start) Conditions below continue Engine speed Fuel injection quantity Engine coolant temperature Target EGR valve position EGR high flow check (2-3-2) Battery voltage Conditions below continue Engine stall or Engine speed No malfunction : see 'Monitor disable DTC table'	Completed 20sec <= 1250rpm <= 20mm3/st >= 60degC (140F) <= 60% Completed >= 10V <= 16V 5sec Yes >= 500rpm	30sec	1DCY
EGR gas temperature sensor /EGR system/Engine ECU	P041C	Range check (low)	EGR gas temperature sensor voltage	< 0.06V (280degC) (536F)	Condition below continues Fuel injection quantity Battery voltage Conditions below continue Engine stall or Engine speed	10sec <= 40mm3/st >= 10V <= 16V 5sec Yes >= 500rpm	3sec	1DCY
	P041D	Range check (high)	EGR gas temperature sensor voltage	> 4.93V (-25degC) (-13F)	Battery voltage Conditions below continue Engine stall or Engine speed IAT(AFS built-in) No malfunction : see 'Monitor disable DTC table'	>= 10V <= 16V 5sec Yes >= 500rpm >= -20degC (-4F)	3sec	1DCY
	P041B	Rationality check (at engine start)	Average EGR gas temperature	>= 70degC (158F)	Conditions below continue Engine speed Fuel Injection quantity Engine coolant temperature Battery voltage Conditions below continue Engine stall or Engine speed No malfunction : see 'Monitor disable DTC table'	30sec <= 890rpm <= 35mm3/st >= -30degC (-22F) <= 35degC (95F) >= 10V <= 16V 5sec Yes >= 500rpm	40sec	1DCY

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		Rationality check (at engine running)	EGR gas temperature	<= 50degC (122F)	Conditions below continue	30sec	30sec	1DCY
					Engine speed	>= 1750rpm		
					Fuel injection quantity	>= 50mm3/st		
					Target EGR valve position	>= 30%		
					Engine coolant temperature	>= 60degC (140F)		
					Battery voltage	>= 10V <= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
					No malfunction : see 'Monitor disable DTC table'			
Valve position sensor /EGR system /EGR valve controller and Engine ECU	P1458	Parity check (receive data rationality)	Parity check	Error	Battery voltage	>= 10V <= 16V	1.01sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
		Decrease in flux of magnet	Flux of magnet	< 35kA/m	Battery voltage	>= 10V <= 16V	1.01sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
EGR valve controller temperature sensor 1 /EGR system /EGR valve controller and Engine ECU	P1458	Range check	EGR valve controller temperature sensor 1 value	= -50degC (-58F) or = 200degC (392F)	Battery voltage	>= 10V <= 16V	2sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
EGR valve controller temperature sensor 2 /EGR system /EGR valve controller and Engine ECU	P1458	Parity check (receive data rationality) (disconnection)	Parity check	Error	Battery voltage	>= 10V <= 16V	1.01sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		

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EGR valve controller temperature sensor 1 and 2 /EGR system /EGR valve controller and Engine ECU	P1458	Rationality check : Comparison of EGR valve controller temperature sensor value between 1 and 2	EGR valve controller temperature 1 - EGR valve controller temperature 2	<= -30degC (-22F)	EGR valve controller temperature 2	>= -20degC (-22F)	2sec	1DCY
					Battery voltage	>= 10V		
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
				>= 30degC (86F)	EGR valve controller temperature 2	<= 150degC (302F)	2sec	1DCY
					Battery voltage	>= 10V		
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
DC motor /EGR system /EGR valve controller and Engine ECU	P1458	Comparison of EGR valve position between target (from ECM) and actual	Target EGR valve position (from ECM) - Actual EGR valve position	>= 5deg	Target EGR valve position (from ECM)	>= 10deg	3sec	1DCY
					Battery voltage	>= 10V		
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
CAN communication /EGR system /EGR valve controller and Engine ECU	P1458	Monitor CAN message	CAN message from ECM	Not received	Battery voltage	>= 10V	2sec	1DCY
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
Valve link /EGR system /EGR valve controller and Engine ECU	P1458	Valve full close position check at key off	Actual full close position - Full close position (EEPROM)	>= 10deg	Key switch	OFF	1sec	1DCY
					Battery voltage	>= 10V		
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
Controller circuit board /EGR system /EGR valve controller and Engine ECU	P1458	High temperature	EGR valve controller temperature 1	>= 165degC (329F)	Battery voltage	>= 10V	1.6sec	1DCY
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
Actuator battery voltage /EGR system /EGR valve controller and Engine ECU	P1458	Low battery voltage	Actuator battery voltage	< 7V	Battery voltage	>= 10V	1.06sec	1DCY
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		

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Controller memory /EGR system /EGR valve controller and Engine ECU	P1458	Comparison of stored data	Number of same data or Number of Mirror check error data	< 3 ≥ 3	Battery voltage	≥ 10V	3times + 1sec (at ECM)	1DCY
						≤ 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	≥ 500rpm		

2-4. Boost pressure control system and CCM

Variable nozzle turbocharger /Boost pressure control system/Engine ECU (Underboost)	P0299	Comparison of Actual boost pressure and Estimated boost pressure based on target	Actual boost pressure - Estimated boost pressure	<= -33.3kPa (-4.83psi) (boost pressure = 140kPa) (20.305psi) ~ -64kPa (-9.282psi) (boost pressure >= 250kPa) (36.258psi)	Condition below continues Engine coolant temperature Conditions below continue Target boost pressure (gauge) Fuel injection quantity ΔFuel injection quantity No malfunction : see 'Monitor disable DTC table'	600sec >= 0degC (32F) 4sec >= 40kPa (5.801psi) >= 30mm3/st >= -1.5mm3/st <= 1.5mm3/st	30sec	1DCY
Variable nozzle turbocharger /Boost pressure control system/Engine ECU (Overboost)	P0234	Comparison of Actual boost pressure and Estimated boost pressure based on target	Actual boost pressure - Estimated boost pressure	>= 25kPa (3.626psi) (boost pressure = 140kPa) (20.305psi) ~ 29kPa (4.206psi) (boost pressure >= 160kPa) (23.205psi)	Condition below continues Engine coolant temperature Conditions below continue Target boost pressure (gauge) Fuel injection quantity ΔFuel injection quantity No malfunction : see 'Monitor disable DTC table'	600sec >= 0degC (32F) 4sec >= 40kPa (5.801psi) >= 30mm3/st >= -1.5mm3/st <= 1.5mm3/st	30sec	1DCY
Variable nozzle turbocharger /Boost pressure control system/Engine ECU (Slow response)	P226C	Comparison of Actual nozzle position and Target nozzle position	Actual nozzle position - Target nozzle position	>= 4%	ΔTarget nozzle position No malfunction : see 'Monitor disable DTC table'	>= 3.99%	4sec	1DCY
Intercooler /Boost pressure control system/Engine ECU (Charge air undercooling)	P1515	High Intake air temperature (intercooler outlet)	Intake air temperature (intercooler outlet)	>= 74degC (165.2F) (IAT(AFS built-in) = -15degC) (5F) ~ 146degC (294.8F) (IAT(AFS built-in) = 65degC) (149F)	Conditions below continue Engine speed Fuel injection quantity Boost pressure Rationality check of IAT(AFS built-in) (2-3-6-6) Rationality check of IAT(intercooler outlet) (2-3-6-8, 9) Exhaust brake Battery voltage Conditions below continue Engine stall or Engine speed No malfunction : see 'Monitor disable DTC table'	30sec >= 1500rpm >= 40mm3/st >= 150kPa (21.755psi) Completed Completed Deactivated >= 10V <= 16V 5sec Yes >= 500rpm	5sec	2DCY

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Nozzle position sensor /Boost pressure control system /VNT controller and Engine ECU	P0045	Range check	Three terminals of position sensor	All Low or All High	Battery voltage	>= 10V <= 16V	2sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
DC motor /Boost pressure control system /VNT controller and Engine ECU	P0045	Circuit monitor (open) : Turn on three terminals of DC motor (one trial) at power on or after Nozzle stuck detected	Three terminals of DC motor	<= 1.0V	Power on	Yes	3trials + 1sec (at ECM)	1DCY
					or Nozzle stuck (2-4-5-4)	Detected		
					Battery voltage	>= 10V <= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
		Circuit monitor (short),	Current of over current protection circuit (HI) or Current of over current protection circuit (LO)	>= 20.7A >= 20.7A	Battery voltage	>= 10V <= 16V	3sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
Nozzle /Boost pressure control system /VNT controller and Engine ECU	P0045	Nozzle stuck : Detecting high drive duty and after that, move nozzle to reverse direction and target position (one trial)	DC motor drive duty and after that, (DC motor movement to reverse direction or Target nozzle position - Actual nozzle position)	>= 95% <= 1deg >= 1deg			3sec + 5trials + 1sec (at ECM)	1DCY
		Nozzle operating range by wiping (move nozzle to open and close position) at key off	Hard stop (nozzle operating) range	> 40.5deg or < 30.5deg	Key switch	OFF	2trials + 1sec (at ECM)	1DCY
					Battery voltage	>= 10V <= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		

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		Nozzle operating range by initialization (move nozzle to open position) at power on	Range from start position to open position or Position sensor	> 40.5deg Not constant	Power on	Yes	1trial 5sec + 1sec (at ECM)	1DCY
					Battery voltage	>= 10V <= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
CAN communication /Boost pressure control system /VNT controller and Engine ECU	P00AF	Monitor CAN message	CAN message from ECM or Target nozzle position (from ECM)	Not received > 100%	Battery voltage	>= 10V <= 16V	2sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
Power supply voltage /Boost pressure control system /VNT controller and Engine ECU	P00AF	Low Power supply voltage	Power supply voltage	< 8V	Battery voltage	>= 10V <= 16V	6sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
		High Power supply voltage	Power supply voltage	> 18V	Battery voltage	>= 10V <= 16V	6sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
EEPROM of VNT controller /Boost pressure control system /VNT controller and Engine ECU	P00AF	Comparison of stored data	Calculated CRC16 = CRC16 stored in EEPROM or 3 EEPROM data (Nozzle operating range failure (2-4-5-5) flag)	No All different	Power on	Yes	1time + 1sec (at ECM)	1DCY
					Battery voltage	>= 10V <= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		

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2-5. NMHC converting catalyst

Catalyst located downstream of PM filter /Engine ECU	P0420	Monitor the generated heat at the catalyst by in-cylinder post injection	$\Sigma(\text{Generated heat}) / \Sigma(\text{Nominal heat})$	≤ 0.35	DPF active regeneration	Completed	10sec	2DCY
					Cumulative DEF dosing quantity (from NOx sensor (SCR downstr) rationality check (2-8-2-1) Completed)	$\geq 0.2g$		
					(EGT (Burner outlet, from BCU) + EGT (DOC outlet))/2	$\leq 340\text{degC (644F)}$		
					and after that, start post injection			
					Cumulative post injection quantity	$\geq 30g$		
					(EGT (Burner outlet, from BCU) + EGT (DOC outlet))/2	$\geq 270\text{degC (518F)}$		
					No malfunction : see 'Monitor disable DTC table'			

2-6. NOx converting catalyst and CCM

SCR catalyst and NH3 catalyst /NOx converting catalyst system/Engine ECU (Conversion efficiency)	P20EE	Deviation between Target NOx conversion efficiency and Actual NOx conversion efficiency	Target NOx conversion efficiency (from DCU) - Average NOx conversion efficiency	≥ 1.0	Condition below continues	600sec	5sec	1DCY
					Engine speed	$\geq 700\text{rpm}$		
					Conditions below continue	60sec		
					Exhaust gas mass flow	$\geq 500\text{kg/h}$ $< 1000\text{kg/h}$		
					SCR catalyst temp. (from DCU)	$\geq 280\text{degC (536F)}$ $< 320\text{degC (608F)}$		
					NOx (SCR upstream)	$\geq 0\text{ppm}$ $< 200\text{ppm}$		
					Target NOx conversion efficiency * NOx (SCR upstream)	$\leq 20\text{ppm}$		
					Fuel injection quantity	$\geq 50\text{mm3/st}$ $< 100\text{mm3/st}$		
					Conditions below continue	121sec		
					NOx sensor (SCR upstream)	Stable		
					NOx sensor (SCR downstream)	Stable		
					Burner	Deactivated		
					Barometric pressure	$\geq 83\text{kPa (12.038psi)}$		
					No malfunction : see 'Monitor disable DTC table'			

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Diesel exhaust fluid /NOx converting catalyst system/Engine ECU (Improper reductant)	P207F	Deviation between Target NOx conversion efficiency and Actual NOx conversion efficiency	Target NOx conversion efficiency (from DCU) - Average NOx conversion efficiency	>= 0.46	Condition below continues	600sec	5sec	1DCY	
					Engine speed	>= 700rpm			
					Conditions below continue	60sec			
					Exhaust gas mass flow	>= 500kg/h < 1000kg/h			
					SCR catalyst temp. (from DCU)	>= 280degC (536F) < 320degC (608F)			
					NOx (SCR upstream)	>= 0ppm < 200ppm			
					Target NOx conversion efficiency * NOx (SCR upstream)	<= 20ppm			
					Fuel injection quantity	>= 50mm3/st < 100mm3/st			
					Conditions below continue	121sec			
					NOx sensor (SCR upstream)	Stable			
					NOx sensor (SCR downstream)	Stable			
					Burner	Deactivated			
					Barometric pressure	>= 83kPa (12.038psi)			
					No malfunction : see 'Monitor disable DTC table'				
			and after that, catalyst heat up performed				Immediately		
			Average NOx conversion efficiency (during catalyst heat up)	> 0	SCR catalyst temp. (from DCU)	>= 360degC (680F)			
DEF injector /NOx converting catalyst system/DeNOx ECU (Delivery performance)	P202E	Monitor DEF pressure drop with DEF pump drive duty constant and DEF injector drive duty full (Pressure line check at system start up)	DEF pressure	> 750kPa (108.775psi)	Pressure stability check (2-6-32)	Completed	4sec x 50trials	1DCY	
		Monitor min-max difference of DEF pump drive duty against min-max difference of DEF injector drive duty (at system running)	Min-max difference of DEF pump drive duty	< 2.7%	Min-max difference of DEF injector drive duty	> 20%	20sec x 3times	1DCY	
					and after that, pressure line check (same as system start up)				
			DEF pressure	> 750kPa (108.775psi)					4sec
Diesel exhaust fluid tank /NOx converting catalyst system/Engine ECU (Empty reductant tank)	P203F	Monitor DEF tank level and DEF dosing quantity	DEF tank level (from DCU) - (Accumulated DEF dosing amount / DEF tank volume)	<= 5%	No malfunction : see 'Monitor disable DTC table'		Immediately	1DCY	

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Feedback control /NOx converting catalyst system/DeNOx ECU	P2BAE	Monitor feedback factor	Feedback factor	= Maximum limit			5sec +	1DCY
					Time elapsed since previous feedback factor exceeding	< 180sec	5sec × 2times	
Exhaust gas temperature sensor (SCR inlet) /NOx converting catalyst system/DeNOx ECU	P2481	Range check (low)	Sensor voltage	< 0.69V (-50degC) (-58F)			1sec	1DCY
	P2482	Range check (high)	Sensor voltage	> 2.2V (950degC) (1742F)			1sec	1DCY
	P2483	Rationality check (at engine start)	EGT(SCR inlet) - AAT	> 100degC (212F)	AAT - ECT(from ECM)	< 8degC (46.4F)	1sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
		Rationality check (at engine running)	Actual EGT(SCR inlet)	< 160degC (320F)	Condition below continues	10sec	7sec	1DCY
					Calculated EGT(SCR inlet)	> 210degC (410F)		
DEF tank level sensor /NOx converting catalyst system/DeNOx ECU	P203C	Range check (low)	Sensor voltage	< 0.1V (110% : 20.9L)			0.4sec	1DCY
	P203D	Range check (high)	Sensor voltage	> 4.7V (7.4% : 1.406L)			0.4sec	1DCY
DEF tank temperature sensor /NOx converting catalyst system/DeNOx ECU	P205C	Range check (low)	Sensor voltage	< 0.2V (107degC) (224.6F)			0.4sec	1DCY
	P205D	Range check (high)	Sensor voltage	> 4.7V (-40degC) (-40F)			0.4sec	1DCY
	P205B	Rationality check	DEF tank temperature - AAT	> 50degC (122F)	System voltage	> 10V < 16V	1sec	1DCY
					AAT - ECT(from ECM)	< 8degC (46.4F)		
					AAT - EGT(SCR inlet)	< 8degC (46.4F)		
					EGT(SCR inlet) - ECT(from ECM)	< 8degC (46.4F)		
					No malfunction : see 'Monitor disable DTC table'			

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DEF pressure sensor /NOx converting catalyst system/DeNOx ECU	P204C	Range check (low)	Sensor voltage	< 0.53V (-90kPa) (-13.053psi)			1sec	1DCY
	P204D	Range check (high)	Sensor voltage	> 4.75V (1370kPa) (198.695psi)			0.4sec	1DCY
	P204B	Rationality check : Monitor DEF pressure before system start up	DEF pressure	> 50kPa (7.252psi)	System voltage	> 10V < 16V	1sec	1DCY
					DEF defrosting	Completed		
					EGT (SCR inlet)	< 150degC (302F)		
					DEF pump temperature 1	> 0degC (32F)		
DEF pump temperature sensor 1 /NOx converting catalyst system/DeNOx ECU					DEF pressure line	No DEF		
					No malfunction : see 'Monitor disable DTC table'			
	P142A	Range check (low)	DEF pump temperature sensor 1 duty	< 15% (-40degC) (-40F)			5sec	1DCY
		Range check (high)	DEF pump temperature sensor 1 duty	> 85% (85degC) (185F)			5sec	1DCY
	P142B	Rationality check (at engine start)	DEF pump temperature 1 - AAT	> 22degC (71.6F)	System voltage	> 10V < 16V	0.5sec	1DCY
					AAT - ECT(from ECM)	< 8degC (46.4F)		
					AAT - EGT(SCR inlet)	< 8degC (46.4F)		
					EGT(SCR inlet) - ECT(from ECM)	< 8degC (46.4F)		
					No malfunction : see 'Monitor disable DTC table'			
		Rationality check : Monitor DEF pump temperature 1 while DEF tank heater valve is opened	Actual DEF pump temperature 1 - Recorded DEF pump temperature 1 (at the start of this monitor)	< 2degC (35.6F)	System voltage	> 10V < 16V	2sec	1DCY
DEF pump temperature sensor 2 /NOx converting catalyst system/DeNOx ECU					DEF tank heater valve	Opened		
					Engine coolant temperature (from ECM)	> 55degC (131F)		
					No malfunction : see 'Monitor disable DTC table'			
					Time elapsed since above 3 conditions are fulfilled	>= 600sec		
DEF pump temperature sensor 2 /NOx converting catalyst system/DeNOx ECU	P142A	Range check (low)	DEF pump temperature sensor 2 duty	< 15% (-40degC) (-40F)			5sec	1DCY
		Range check (high)	DEF pump temperature sensor 2 duty	> 85% (85degC) (185F)			5sec	1DCY

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	P142B	Rationality check (at engine start)	DEF pump temperature 2 - AAT	> 22degC (71.6F)	System voltage	> 10V < 16V	0.5sec	1DCY
					AAT - ECT(from ECM)	< 8degC (46.4F)		
					AAT - EGT(SCR inlet)	< 8degC (46.4F)		
					EGT(SCR inlet) - ECT(from ECM)	< 8degC (46.4F)		
					No malfunction : see 'Monitor disable DTC table'			
		Rationality check : Monitor DEF pump temperature 2 while DEF tank heater valve is opened	Actual DEF pump temperature 2 - Recorded DEF pump temperature 2 (at the start of this monitor)	< 2degC (35.6F)	System voltage	> 10V < 16V	2sec	1DCY
					DEF tank heater valve	Opened		
					Engine coolant temperature (from ECM)	> 55degC (131F)		
					DEF tank heater valve	Opened		
					Engine coolant temperature (from ECM)	> 40degC (104F)		
					No malfunction : see 'Monitor disable DTC table'			
					Time elapsed since above 3 conditions are fulfilled	>= 600sec		
Ambient air temperature sensor /NOx converting catalyst system/DeNOx ECU	P0072	Range check (low)	Sensor voltage	< 3.25V (100degC) (212F)			0.4sec	1DCY
	P0073	Range check (high)	Sensor voltage	> 4.76V (-40degC) (-40F)			0.4sec	1DCY
	P0071	Rationality check	Ambient air temperature - ECT(from ECM)	> 70degC (158F)	DEF pump temp. 1 - ECT(from ECM)	< 8degC (46.4F)	0.5sec	1DCY
					DEF pump temp. 1 - EGT(SCR inlet)	< 8degC (46.4F)		
					EGT(SCR inlet) - ECT(from ECM)	< 8degC (46.4F)		
					No malfunction : see 'Monitor disable DTC table'			
DeNOx ECU temperature sensor 1 /NOx converting catalyst system/DeNOx ECU	P0668	Range check (low)	Sensor voltage	< 0.85V (-50degC) (-58F)			1sec	1DCY
	P0669	Range check (high)	Sensor voltage	> 2V (150degC) (302F)			1sec	1DCY
	P0667	Rationality check : Comparison of DeNOx ECU temperature sensor value between 1 and 2	DeNOx ECU temperature 1 - DeNOx ECU temperature 2	> 14degC (57.2F)	Battery voltage	> 9V < 16V	5sec	1DCY
DeNOx ECU temperature sensor 2 /NOx converting catalyst system/DeNOx ECU	P0668	Range check (low)	Sensor voltage	< 0.85V (-50degC) (-58F)			1sec	1DCY
	P0669	Range check (high)	Sensor voltage	> 2V (150degC) (302F)			1sec	1DCY

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	P0667	Rationality check : Comparison of DeNOx ECU temperature sensor value between 1 and 2	DeNOx ECU temperature 1 - DeNOx ECU temperature 2	> 14degC (57.2F)	Battery voltage	> 9V < 16V	5sec	1DCY
DEF injector /NOx converting catalyst system/DeNOx ECU	P2048	Circuit monitor (low side)	DEF injector circuit (low side) voltage	< 0.2V	DEF injector duty cycle	> 0%	0.05sec	1DCY
	P2049	Circuit monitor (high side)	DEF injector circuit (high side) voltage	< 2.0V	DEF injector duty cycle	> 0%	0.05sec	1DCY
	P2047	Functional monitor : Monitor DEF injector circuit current profile at the beginning of DEF injector activation	Second order differential of DEF injector circuit current profile	< 80A/sec2	DEF injector duty cycle	> 0%	50times	2DCY
					DEF pressure	> 350kPa (50.762psi) < 1500kPa (217.55psi)		
					Battery voltage	> 9V < 16V		
					Time elapsed since DEF injector activation	< 0.0025sec		
DEF pump motor /NOx converting catalyst system/DeNOx ECU	P208A	Circuit monitor (open load)	Circuit voltage	> 2.7V < 5.0V	DEF pump duty cycle	> 0%	2sec	1DCY
	P208C	Circuit monitor (low)	Circuit voltage	< 0.66V	DEF pump duty cycle	> 0%	8sec	1DCY
	P208D	Circuit monitor (high)	Circuit voltage	= 2.7V	DEF pump duty cycle	> 0%	2sec	1DCY
	P208B	Functional monitor : Comparison of pump motor speed between target and actual	Target pump motor speed - Actual pump motor speed	> 300rpm	DEF defrosting EGT(SCR inlet)	Completed > 150degC (302F)	5sec × 3times	1DCY
Reverting valve /NOx converting catalyst system/DeNOx ECU	P20A0	Circuit monitor (open load)	Circuit voltage	> 2.7V < 5.0V	Reverting valve	Activated	2sec	1DCY
	P20A2	Circuit monitor (low)	Circuit voltage	< 0.66V	Reverting valve	Activated	0.05sec	1DCY
	P20A3	Circuit monitor (high)	Circuit voltage	= 2.7V	Reverting valve	Activated	2sec	1DCY
	P20A1	Functional monitor : Monitor DEF pressure during pressure reduction at key off	DEF pressure	> 50kPa (7.252psi)	DEF pressure (before key off)	> 800kPa (116.026psi) < 1050kPa (152.285psi)	Immediately	1DCY
					Battery voltage	> 9V < 16V		
					Time elapsed since key off	>= 25sec		

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DEF tank heater valve /NOx converting catalyst system/DeNOx ECU	P20B1	Circuit monitor (open load)	Circuit voltage	> 2.7V < 5.0V	DEF tank heater valve	Activated	0.5sec	1DCY
	P20B3	Circuit monitor (low)	Circuit voltage	< 0.66V	DEF tank heater valve	Activated	0.05sec	1DCY
	P20B4	Circuit monitor (high)	Circuit voltage	= 2.7V	DEF tank heater valve	Activated	0.1sec	1DCY
	P20B2	Functional monitor (stuck close)	Actual DEF tank temperature - Recorded DEF tank temperature (at the start of this monitor)	< 1degC (33.8F)	DEF tank heater valve Engine coolant temperature (from ECM) No malfunction : see 'Monitor disable DTC table' Time elapsed since above 3 conditions are fulfilled	Opened > 40degC (104F) No malfunction : see 'Monitor disable DTC table' >= 1000~1200sec	Immediately	1DCY
		Functional monitor (stuck open)	DEF tank temperature	> 75degC (167F)	No malfunction : see 'Monitor disable DTC table'	10sec	1DCY	
Suction line /NOx converting catalyst system/DeNOx ECU	P20E8	Monitor DEF pressure (pressure build up check at system start up)	DEF pressure	< 800kPa (116.026psi)	DEF defrosting	Completed	3trials	1DCY
					EGT(SCR inlet)	> 150degC (302F)		
					Time elapsed since pressure build up start	>= 50sec		
Back flow line /NOx converting catalyst system/DeNOx ECU	P20E9	Monitor DEF pressure (back flow line check with reduced DEF pump duty at system start up)	ΔDEF pressure	>= 0kPa (0psi)	Pressure build up check (2-6-6-30)	Completed	2sec	1DCY
		Monitor DEF pressure (pressure stability check at system start up)	DEF pressure	< 850kPa (123.278psi) or > 950kPa (137.781psi)	Back flow line check (2-6-6-31)	Completed	300sec	1DCY
CAN communication /NOx converting catalyst system/DeNOx ECU	U0100	Monitor CAN message	CAN message from ECM	Not received			3sec	1DCY
	U029D	Monitor CAN message	CAN message from NOx sensor (SCR upstream)	Not received			3sec	1DCY
	U029E	Monitor CAN message	CAN message from NOx sensor (SCR downstream)	Not received			3sec	1DCY

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Diesel Particulate Filter /PM filter system/Engine ECU (Filtering Performance) (Missing substrate)	P244A	Monitor differential pressure a little before the start of DPF active regeneration	Average differential pressure	< 0kPa (0psi) (Exh.gas vol.flow = 200L/sec) ~ 2kPa (0.29psi) (Exh.gas vol.flow >= 600L/sec)	Conditions below continue Calculated soot loading on DPF >= 89% Regen.threshold Burner Deactivated Exhaust gas volumetric flow >= 205 L/sec Number of judgment < 10 No malfunction : see 'Monitor disable DTC table'	15sec	6times	1DCY
Frequent Regeneration /PM filter system/Engine ECU	P2459	Monitor possible maximum soot accumulation from engine at DPF active regeneration start	Calculated soot loading on DPF for frequency monitor	< Regen.threshold	Calculated soot loading on DPF >= Regen.threshold No malfunction : see 'Monitor disable DTC table'		Immediately	2 drive cycles
Diesel Particulate Filter /PM filter system/Engine ECU (Incomplete regeneration)	P244B	Monitor differential pressure just after DPF active regeneration completed	Average differential pressure	>= 10kPa (1.45psi) (Exh.gas vol.flow = 200L/sec) ~ 38kPa (5.511psi) (Exh.gas vol.flow = 1000L/sec)	Conditions below continue Calculated soot loading on DPF > 0% < 21% Regen.threshold Cumulative exhaust gas mass flow from Burner deactivated >= 50kg Exhaust gas volumetric flow >= 205 L/sec Number of judgment < 10 No malfunction : see 'Monitor disable DTC table'	15sec	6times	1DCY
Feedback Control /PM filter system/Burner ECU (Unable to achieve target temperature)	P2030	Comparison of Target temperature and Exhaust gas temperature (Burner outlet)	Target temperature - Exhaust gas temperature (Burner outlet)	> 30degC (86F)	Burner status Operating No malfunction : see 'Monitor disable DTC table'		30sec × 3times	1DCY
Exhaust gas temperature sensor (DOC inlet) /PM filter system/Engine ECU	P242C	Range check (low)	EGT(DOC inlet) sensor voltage	< 0.0057V (1240degC) (2264F)	Battery voltage >= 10V <= 16V Conditions below continue 5sec Engine stall Yes or Engine speed >= 500rpm		3sec	1DCY
	P242D	Range check (high)	EGT(DOC inlet) sensor voltage	> 4.958V (-46degC) (-50.8F)	IAT(AFS built-in) >= -20degC (-4F) Battery voltage >= 10V <= 16V Conditions below continue 5sec Engine stall Yes or Engine speed >= 500rpm No malfunction : see 'Monitor disable DTC table'		3sec	1DCY

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	P242B	Rationality check (at engine start)	EGT(Burner outlet : from BCU) - EGT(DOC inlet)	>= 70degC (158F)	Battery voltage	>= 10V <= 16V	1sec	1DCY
					Condition below continues	5sec		
					Engine speed	>= 500rpm		
					Time elapsed since engine start	<= 10sec		
					ECT - IAT(AFS built-in)	<= 8degC (46.4F)		
					EGT(Burner outlet : from BCU) - EGT(DOC outlet)	< 70deg C		
					ECT	>= -10degC (14F)		
					IAT(AFS built-in)	>= -10degC (14F)		
					EGT(Burner outlet)	< 30degC (86F)		
					No malfunction : see 'Monitor disable DTC table'			
Exhaust gas temperature sensor (DOC outlet) /PM filter system/Engine ECU	P2470	Range check (low)	EGT(DOC outlet) sensor voltage	< 0.0057V (1240degC) (2264F)	Battery voltage	>= 10V <= 16V	3sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
	P2471	Range check (high)	EGT(DOC outlet) sensor voltage	> 4.958V (-46degC) (-50.8F)	IAT(AFS built-in)	>= -20degC (-4F)	3sec	1DCY
					Battery voltage	>= 10V <= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
	P246F	Rationality check (at engine start)	EGT(Burner outlet : from BCU) - EGT(DOC outlet)	>= 70degC (158F)	Battery voltage	>= 10V <= 16V	1sec	1DCY
					Condition below continues	5sec		
					Engine speed	>= 500rpm		
					Time elapsed since engine start	<= 10sec		
					ECT - IAT(AFS built-in)	<= 8degC (46.4F)		
					EGT(Burner outlet : from BCU) - EGT(DOC inlet)	< 70deg C		
					ECT	>= -10degC (14F)		
					IAT(AFS built-in)	>= -10degC (14F)		
					EGT(Burner outlet)	< 30degC (86F)		
					No malfunction : see 'Monitor disable DTC table'			

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		Rationality check (at engine running)	Calculated EGT(DOC outlet) - Actual EGT(DOC outlet)	>= 100degC (212F)	Time elapsed since engine start > 10sec Cumulative exhaust gas mass flow (>= 230kg/h) Cumulative exhaust gas mass flow (Burner deactivated) and after that, Battery voltage >= 10V <= 16V Condition below continues 5sec Engine speed >= 500rpm ECT- IAT(AFS built-in) > 8degC (46.4F) Exhaust gas mass flow >= 230kg/h Conditions below continues 10sec ΔEngine speed <= 30rpm ΔFuel injection quantity <= 10mm3/st Vehicle speed >= 18.8mile/h Fuel injection quantity >= 0mm3/st No malfunction : see 'Monitor disable DTC table'	3sec	1DCY
Differential pressure sensor /PM filter system/Engine ECU	P1427	Range check (low)	Differential pressure sensor voltage	< 0.5V (-6.41kPa) (-0.93psi)	Battery voltage >= 10V <= 16V Conditions below continue 5sec Engine stall Yes or Engine speed >= 500rpm	3sec	1DCY
	P1428	Range check (high)	Differential pressure sensor voltage	> 4.46V (95.1kPa) (13.793psi)	Battery voltage >= 10V <= 16V Conditions below continue 5sec Engine stall Yes or Engine speed >= 500rpm	3sec	1DCY
	P1426	Rationality check : Monitor differential pressure in engine stall condition	Differential pressure	< -2kPa (-0.29psi) or > 2kPa (-0.29psi)	Time elapsed since engine stop >= 2sec No malfunction : see 'Monitor disable DTC table'	2sec	1DCY
Diesel Particulate Filter /PM filter system/Engine ECU (over temperature)	P200C	High EGT(DOC inlet)	EGT(DOC inlet)	> 950degC (1742F)	No malfunction : see 'Monitor disable DTC table'	5sec	1DCY
Diesel Particulate Filter /PM filter system/Engine ECU (clogged)	P2463	Monitor calculated soot loading on DPF	Calculated soot loading on DPF	> 247% Regen.threshold		Immediately	1DCY

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Exhaust gas temperature sensor (Burner inlet) /PM filter system/Burner ECU	P0545	Range check (low)	Exhaust Gas Temp (Burner inlet) sensor voltage	< 0.1V (-50degC (-58F) at BCU temp = 25degC (77F)	No malfunction : see 'Monitor disable DTC table'	1sec	1DCY
	P0546	Range check (high)	Exhaust Gas Temp (Burner inlet) sensor voltage	> 4.3V (1300degC (2372F) at BCU temp = 25degC (77F)	No malfunction : see 'Monitor disable DTC table'	0.5sec	1DCY
	P2080	Rationality check : Comparison of actual temperature and predicted temperature	Actual Flame temp - Predicted Flame temp based upon EGT(Burner inlet) Actual EGT (Burner outlet) - Predicted EGT(Burner outlet) based upon EGT(Burner inlet)	> 30degC (86F) and > 30degC (86F)	Conditions below continue Burner status Exhaust brake No malfunction : see 'Monitor disable DTC table'	10min Waiting for request Deactivation	30sec 1DCY
Exhaust gas temperature sensor (Burner outlet) /PM filter system/Burner ECU	P2032	Range check (low)	Exhaust Gas Temp (Burner outlet) sensor voltage	< 0.1V (-50degC (-58F) at BCU temp = 25degC (77F)	No malfunction : see 'Monitor disable DTC table'	1sec	1DCY
	P2033	Range check (high)	Exhaust Gas Temp (Burner outlet) sensor voltage	> 4.3V (1300degC (2372F) at BCU temp = 25degC (77F)	No malfunction : see 'Monitor disable DTC table'	0.5sec	1DCY
	P2084	Rationality check : Comparison of actual temperature and predicted temperature	Actual EGT(Burner outlet) - Predicted EGT(Burner outlet) based upon EGT(Burner inlet) Actual Flame temp - Predicted Flame temp based upon EGT(Burner outlet)	> 30degC (86F) and > 30degC (86F)	Conditions below continue Burner status Exhaust brake No malfunction : see 'Monitor disable DTC table'	10min Waiting for request Deactivation	30sec 1DCY
Flame temperature sensor /PM filter system/Burner ECU	P141B	Range check (low)	Flame temp sensor voltage	< 0.1V (-50degC (-58F) at BCU temp = 25degC (77F)	Burner status No malfunction : see 'Monitor disable DTC table'	Waiting for request	1sec 1DCY
	P141C	Range check (high)	Flame temp sensor voltage	> 4.2V (1200degC (2192F) at BCU temp = 25degC (77F)	No malfunction : see 'Monitor disable DTC table'		0.5sec 1DCY
	P141D	Rationality check : Comparison of actual temperature and predicted temperature	Actual Flame temp - Predicted Flame temp based upon EGT(Burner inlet) Actual Flame temp - Predicted Flame temp based upon EGT(Burner outlet)	> 50degC (122F) and > 50degC (122F)	Conditions below continue Burner status Exhaust brake No malfunction : see 'Monitor disable DTC table'	10min Waiting for request Deactivation	30sec 1DCY

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BCU temperature sensor /PM filter system/Burner ECU	P060C	Range check (low)	BCU temp sensor voltage	< 0.12V (-43.81degC) (-46.858F)	No malfunction : see 'Monitor disable DTC table'	0.5sec	1DCY
		Range check (high)	BCU temp sensor voltage	> 4.58V (181.95degC) (359.51F)	No malfunction : see 'Monitor disable DTC table'	0.5sec	1DCY
	P018C						
		Rationality check	BCU temp - Intake air temp (AFS built-in, from ECM)	> 30degC (86F)	Conditions below continue Engine speed (from ECM) > 450rpm No malfunction : see 'Monitor disable DTC table'	5min 30sec	1DCY
Atomizer fuel pressure sensor /PM filter system/Burner ECU	P018C	Range check (low)	Atomizer fuel pressure sensor voltage	< 0.1V (-70.40kPa) (-10.21psi)	No malfunction : see 'Monitor disable DTC table'	0.5sec	1DCY
	P018D	Range check (high)	Atomizer fuel pressure sensor voltage	> 4.89V (766.77 kPa) (111.207psi)	No malfunction : see 'Monitor disable DTC table'	0.5sec	1DCY
	P2436	Rationality check : Monitor Atomizer fuel pressure while Burner deactivated	Atomizer fuel pressure	< -69kPa (-10.007psi) or > 69kPa (10.007psi)	Burner status Fuel Pump No malfunction : see 'Monitor disable DTC table'	Waiting for request Deactivation	600sec
	P2436	Rationality check : Monitor atomizer fuel pressure and Atomizer nozzle pressure	Atomizer fuel pressure	> -69kPa (-10.007psi) < 69kPa (10.007psi)	Burner status Fuel Pump No malfunction : see 'Monitor disable DTC table'	Initial check Activation	3sec
Atomizer air pressure sensor /PM filter system/Burner ECU	P2432	Range check (low)	Atomizer air pressure sensor voltage	< 0.1V (-62.27 kPa) (-9.031psi)	No malfunction : see 'Monitor disable DTC table'	0.5sec	1DCY
	P2433	Range check (high)	Atomizer air pressure sensor voltage	> 4.89V (1174.96 kPa) (170.408psi)	No malfunction : see 'Monitor disable DTC table'	0.5sec	1DCY
Air supply (from Air tank) /PM filter system/Burner ECU	P2431	Monitor Atomizer air pressure and Atomizer nozzle pressure	Atomizer air pressure	< 350kPa (50.762psi)	Engine speed (from ECM) > 450rpm No malfunction : see 'Monitor disable DTC table'	120sec	1DCY
			and after that, Active diagnostic mode				
			Atomizer nozzle pressure	<= 186kPa (26.976psi)	Time elapsed since Atomization air valve opened	>= 5sec	Immediately
			Above 2 detections in a row	Yes		3times	
Atomizer nozzle pressure sensor /PM filter system/Burner ECU	P2437	Range check (low)	Atomizer nozzle pressure sensor voltage	< 0.1V (-70.40kPa) (-10.21psi)	No malfunction : see 'Monitor disable DTC table'	0.5sec	1DCY
	P2438	Range check (high)	Atomizer nozzle pressure sensor voltage	> 4.89V (766.77 kPa) (111.207psi)	No malfunction : see 'Monitor disable DTC table'	0.5sec	1DCY

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Atomizer /PM filter system/Burner ECU	P2436	Atomizer air pressure failure	Atomizer air pressure	< 350kPa (50.762psi)	Engine speed (from ECM)	> 450rpm	120sec	1DCY
			and after that, Active diagnostic mode		No malfunction : see 'Monitor disable DTC table'			
			Atomizer nozzle pressure	> 186kPa (26.976psi)	Time elapsed since Atomization air valve opened	>= 5sec	Immediately	
		Atomizer fuel pressure too high	Atomizer fuel pressure	> 696kPa (100.943psi)	Burner status	Initial check	3sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
		Atomizer nozzle pressure failure	Atomizer nozzle pressure	< 200kPa (29.007psi) or > 434kPa (62.944psi)	Burner status	Initial check	5sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
		Atomizer fuel pressure regulator failure	Atomizer fuel pressure	< 558kPa (80.928psi)	Burner status	Initial check	3sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
and after that, Active diagnostic mode								
Atomizer fuel pressure (Current /Recorded before Fuel injector activation)	>= 85%				Time elapsed since Atomizer fuel injector 100% activation	>= 1sec		
Atomizer fuel injector /PM filter system/Burner ECU	P20D3	Circuit monitor (GND short)	Atomizer fuel injector circuit resistance	< 0.6Ohm	Atomizer fuel injector	Activation	1sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
	P20D4	Circuit monitor (battery short, open)	Atomizer fuel injector circuit resistance	< 0.6Ohm	Atomizer fuel injector	Deactivation	0.8sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
	P2436	Functional monitor (stuck open)	Burner system failure (2-7-4, or 2-7-6-40, or 2-7-6-41, or 2-7-6-43)	Detected	No malfunction : see 'Monitor disable DTC table'		1time	1DCY
					and after that, Active diagnostic mode			
					Atomizer nozzle pressure (Current - Recorded before Fuel pump activation)	> 35kPa (5.076psi)		
		Functional monitor (stuck close)	Burner system failure (2-7-4, or 2-7-6-40, or 2-7-6-41, or 2-7-6-43)	Detected	No malfunction : see 'Monitor disable DTC table'		1time	1DCY
					and after that, Active diagnostic mode			
Atomizer nozzle pressure (Current - Recorded before Fuel pump activation)	<= 35kPa (5.076psi)				Time elapsed since Fuel pump activation and after that,	>= 5sec		
		Time elapsed since Atomizer fuel injector 100% activation		>= 0.5sec				

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Atomizer master air valve /PM filter system/Burner ECU	P0414	Circuit monitor (GND short)	Atomizer master air valve circuit resistance	< 0.60hm	Atomizer master air valve No malfunction : see 'Monitor disable DTC table'	Activation	1sec	1DCY
	P0413	Circuit monitor (battery short, open)	Atomizer master air valve circuit resistance	< 0.60hm	Atomizer master air valve	Deactivation	0.8sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
Atomizer atomization air valve /PM filter system/Burner ECU	P0417	Circuit monitor (GND short)	Atomizer atomization air valve circuit resistance	< 0.60hm	Atomizer atomization air valve No malfunction : see 'Monitor disable DTC table'	Activation	1sec	1DCY
	P0416	Circuit monitor (battery short, open)	Atomizer atomization air valve circuit resistance	< 0.60hm	Atomizer atomization air valve	Deactivation	0.8sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
Fuel pump /PM filter system/Burner ECU	P2633	Circuit monitor (GND short)	Fuel pump circuit resistance	< 0.60hm	Fuel pump No malfunction : see 'Monitor disable DTC table'	Activation	1sec	1DCY
	P2634	Circuit monitor (battery short, open)	Fuel pump circuit resistance	< 0.60hm	Fuel pump	Deactivation	0.8sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
	P2636	Functional monitor (rotor lock)	Δ Current (after and before Fuel pump activation) and Battery voltage/ Δ Current	> 0A < 20hm	Burner status	Initial check	Immediately	1DCY
					No malfunction : see 'Monitor disable DTC table'			
					Time elapsed since Fuel pump deactivation	>= 3sec		
					Time elapsed since Fuel pump activation	>= 3sec		
		Functional monitor	Atomizer fuel pressure and after that, Active diagnostic mode Atomizer fuel pressure (Current - Recorded before Fuel injector activation)	>= -69kPa (-10.007psi) <= 69kPa (10.007psi) <= 35kPa (5.076psi)	Burner status	Initial check	3sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
					Time elapsed since Atomizer fuel injector 100% activation	>= 3sec	Immediately	
		Functional monitor	Atomizer fuel pressure and after that, Active diagnostic mode Atomizer fuel pressure (Current /Recorded before Fuel injector activation)	< 558kPa (80.928psi) < 85%	Burner status	Initial check	3sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
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Ignition coil /PM filter system/Burner ECU	P2300	Circuit monitor (open)	Ignition coil circuit switch feedback voltage	< 1V	Ignition module	Activation	4sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
	P2300	Circuit monitor (GND short)	Ignition coil circuit switch current	> 8A	Ignition module	Activation	15sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
	P2301	Circuit monitor (battery short)	Ignition coil circuit switch feedback voltage	> 4V	Ignition module	Deactivation	0.8sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
	P2302	Circuit monitor (open)	Ignition coil circuit power supply voltage	< 1V			3sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
Ignition module /PM filter system/Burner ECU	P0351	Circuit monitor	Primary-side coil current	> 0.89A	Ignition module	Activation	0.25sec	1DCY
					Ignition coil driver	Deactivation		
					No malfunction : see 'Monitor disable DTC table'			
Combustion air valve /PM filter system/Burner ECU	P3040	Circuit monitor (GND short)	Combustion air valve circuit resistance	< 0.6Ohm	Combustion air valve	Activation	1sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
	P3041	Circuit monitor (battery short, open)	Combustion air valve circuit resistance	< 0.6Ohm	Combustion air valve	Deactivation	0.8sec	1DCY
					No malfunction : see 'Monitor disable DTC table'			
	P2441	Functional monitor (stuck closed)	Burner system failure (2-7-4, or 2-7-6-40, or 2-7-6-41, or 2-7-6-43)	Detected	No malfunction : see 'Monitor disable DTC table'		1time	1DCY
			and after that, Active diagnostic mode					
			Atomizer nozzle pressure (Current - Recorded before Fuel pump activation)	> 35kPa (5.076psi)	Time elapsed since Fuel pump activation and after that,	>= 5sec	Immediately	
					Time elapsed since Atomizer fuel injector 100% activation	>= 0.5sec		

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		Functional monitor (stuck open) : Comparison of boost pressure between before and after Combustion air valve activation	ΔBoost pressure (Before Combustion air valve activation - Current)	<= 3.5kPa (0.508psi)	Conditions below continue Burner status Engine percent torque (from ECM) ΔEngine torque / Engine torque ΔEngine speed / Engine speed Engine speed and Actual engine torque (from ECM) Boost pressure (gauge : from ECM) ΔBoost pressure No malfunction : see 'Monitor disable DTC table' and after that, Combustion air valve is activated Burner status Engine percent torque (from ECM) ΔEngine torque / Engine torque ΔEngine speed / Engine speed	2sec Waiting for request < 90 % < 4 %/sec < 5 %/sec > 2000rpm and 400Nm > 120kPa (17.404psi) <= 3.5kPa/sec (0.508psi/sec) Waiting for request < 90 % < 4 %/sec < 5 %/sec	1.5sec x 3times	1DCY
CAN communication /PM filter system/Burner ECU	U0100	Monitor CAN message	CAN message from ECM	Not received	No malfunction : see 'Monitor disable DTC table'		3sec	1DCY
A/D converter input battery voltage /PM filter system/Burner ECU	P2507	Range check (low)	A/D converter input battery voltage	= 0V	No malfunction : see 'Monitor disable DTC table'		0.5sec	1DCY
	P2508	Range check (high)	A/D converter input battery voltage	> 5V	No malfunction : see 'Monitor disable DTC table'		0.5sec	1DCY
A/D converter Input actuators supply voltage /PM filter system/Burner ECU	P060C	Range check (low)	A/D converter input actuators supply voltage	< 0.37V	No malfunction : see 'Monitor disable DTC table'		0.5sec	1DCY
		Range check (high)	A/D converter input actuators supply voltage	> 4.74V	No malfunction : see 'Monitor disable DTC table'		0.5sec	1DCY
A/D converter input sensor supply voltage /PM filter system/Burner ECU	P0642	Range check (low)	A/D converter input sensor supply voltage	< 0.5V	No malfunction : see 'Monitor disable DTC table'		0.5sec	1DCY
	P0643	Range check (high)	A/D converter input sensor supply voltage	> 1.9V	No malfunction : see 'Monitor disable DTC table'		0.5sec	1DCY
A/D converter input ignition key switch voltage /PM filter system/Burner ECU	P2531	Range check (low)	A/D converter input ignition key switch voltage	= 0V	No malfunction : see 'Monitor disable DTC table'		0.5sec	1DCY
	P2532	Range check (high)	A/D converter input ignition key switch voltage	> 5V	No malfunction : see 'Monitor disable DTC table'		0.5sec	1DCY
Battery voltage /PM filter system/Burner ECU	P2506	Range check (low)	Battery voltage	< 9V	Engine speed > 450rpm		10sec	1DCY
		Range check (high)	Battery voltage	> 16V	Engine speed > 450rpm		10sec	1DCY

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Sensor supply voltage /PM filter system/Burner ECU	P0562	Range check (low)	Sensor supply voltage	< 4.5V	No malfunction : see 'Monitor disable DTC table'		0.5sec	1DCY
	P0563	Range check (high)	Sensor supply voltage	> 5.3V	No malfunction : see 'Monitor disable DTC table'			
Burner misfire /PM filter system/Burner ECU	P2030	Monitor difference of Flame temp or Exhaust Gas Temp (Burner outlet) against Exhaust Gas Temp (Burner inlet)	Δ (Flame temp - Exhaust Gas Temp (Burner inlet)) or Δ (Exhaust Gas Temp (Burner outlet) - Exhaust Gas Temp (Burner inlet))	13degC/sec (55.4F/sec) (Flame temp. < 600degC) (1112F)	Burner status	Operating	10sec × 3times	1DCY
				No malfunction : see 'Monitor disable DTC table'				
				5degC/sec (41F/sec) (Flame temp. - 600~800degC) (1112~1472F)				
				3degC/sec (37.4F) (Flame temp. >> 800degC) (1472F)				
Lost flame /PM filter system/Burner ECU	P2030	Monitor drop of Exhaust Gas Temp (Burner outlet) against Target temp	Target temp - Exhaust Gas Temp (Burner outlet) and Δ Exhaust Gas Temp (Burner outlet)	> 25degC (77F)	Burner status	Operating	12sec × 3times	1DCY
				No malfunction : see 'Monitor disable DTC table'				
				< 0degC (32F)				
EGT(Burner inlet) too high /PM filter system/Burner ECU	P2029	High Exhaust Gas Temp (Burner inlet)	EGT(Burner inlet)	> 550degC (1022F)	No malfunction : see 'Monitor disable DTC table'		1sec	1DCY
EGT(Burner outlet) too high /PM filter system/Burner ECU	P2030	High Exhaust Gas Temp (Burner outlet)	EGT(Burner outlet)	> 700degC (1292F)	No malfunction : see 'Monitor disable DTC table'		1sec	1DCY
EEPROM of Burner ECU /PM filter system/Burner ECU	P062F	Comparison of checksum between calculated and stored	Calculated chechsum = Stored checksum	No	Power on	Yes	Immediately	1DCY

2-8. Exhaust gas sensor

NOx sensor (SCR upstream) /NOx converting catalyst system /NOx sensor controller and DeNOx ECU (Sensor and Heater - circuit)	P2202	Range check (open, short)	Open wire (interface - sensor) or Short circuit between wires of sensor	Detected			10sec + Immediately(at DCU)	1DCY
				Detected				

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/DeNOx ECU (Performance and Monitoring capability)	P2201	Rationality check : Comparison between calculated NOX and actual NOX	(Actual NOX(from NOx sensor (SCR upstr)) - Calculated NOX(SCR upstr, from ECM)) /Calculated NOX(SCR upstr, from ECM) (with averaging)	< -0.6 or > 3	NOx sensor (SCR upstream)	Activated	20sec*3times	1DCY
					Burner	Deactivated		
					Time elapsed since Burner deactivated	>= 900sec		
					DOC monitor (2-5-1)	Deactivated		
					Time elapsed since engine start	> 300sec		
					ECT(from ECM)	> 60degC (140F)		
					ΔCalculated NOX(SCR upstr, from ECM) /Calculated NOX(SCR upstr, from ECM)	<= 0.5		
					Barometric pressure	>= 81kPa (11.748psi)		
					AAT	> -10degC (14F) < 40degC (104F)		
/NOx sensor controller and DeNOx ECU (Feedback)	P2201	Monitor NOx sensor circuit after sensor heated up	(Actual heater resistance - Target heater resistance)/Target or ΔCurrent of O2 electrode(1st cavity) or Current of O2 electrode(2nd cavity) or ΔCurrent of NOx electrode or NOx electrode potential or Sensor voltage	> 6.25% >= 0.3mA/10ms < 4.6μA, or > 9.4μA > 0.43μA/10ms < 360mV or > 440mV < 12V or > 16.5V	NOx sensor (SCR upstream)	Activated	90sec	1DCY
					ΔFuel injection quantity (from ECM)	< 40mg/cyl		
/NOx sensor controller and DeNOx ECU (Heater performance)	P2209	Monitor NOx sensor circuit while sensor heating up	(Actual heater resistance - Target heater resistance)/Target or ΔCurrent of O2 electrode(1st cavity) or Current of O2 electrode(2nd cavity) or ΔCurrent of NOx electrode or NOx electrode potential or Sensor voltage	> 6.25% >= 0.3mA/10ms < 4.6μA, or > 9.4μA > 0.43μA/10ms < 360mV or > 440mV < 12V or > 16.5V	Calculated EGT(SCR outlet)	>= 100degC (212F)	180sec	1DCY
					ECT(from ECM)	>= 65degC (149F)		

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NOx sensor (SCR downstream) /NOx converting catalyst system /NOx sensor controller and DeNOx ECU (Sensor and Heater - circuit)	P2215	Range check (open, short)	Open wire (interface - sensor) or Short circuit between wires of sensor	Detected			10sec + Immediately(at DCU)	1DCY
				Detected				
/Engine ECU (Performance and Monitoring capability)	P2214	Rationality check : Comparison with NOx sensor (SCR upstream)	Average (NOX (SCR downstr.) / NOX (SCR upstr.))	< 0.5 or > 1.5	DPF active regeneration	Completed	10sec	2DCY
					Conditions below continue	5sec		
					Cumulative NOx mass flow (SCR upstr) from DPF active regen complete	>= 5.8g		
					NOX (SCR upstream)	>= 10ppm <= 500ppm		
					ΔNOX (SCR upstream)	<= 50ppm		
					Exhaust gas mass flow	>= 300kg/h <= 1000kg/h		
					SCR catalyst temperature	>= 300degC (572F)		
					No malfunction : see 'Monitor disable DTC table'			
/NOx sensor controller and DeNOx ECU (Feedback)		Monitor NOx sensor circuit after sensor heated up	(Actual heater resistance - Target heater resistance)/Target or ΔCurrent of O2 electrode(1st cavity) or Current of O2 electrode(2nd cavity) or ΔCurrent of NOx electrode or NOx electrode potential or Sensor voltage	> 6.25% >= 0.3mA/10ms < 4.6μA, or > 9.4μA > 0.43μA/10ms < 360mV or > 440mV < 12V or > 16.5V	NOx sensor (SCR downstream)	Activated	90sec	1DCY
					ΔFuel injection quantity (from ECM)	< 40mg/cyl		

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/NOx sensor controller and DeNOx ECU (Heater performance)	P2222	Monitor NOx sensor circuit while sensor heating up	(Actual heater resistance - Target heater resistance)/Target or ΔCurrent of O2 electrode(1st cavity) or Current of O2 electrode(2nd cavity) or ΔCurrent of NOx electrode or NOx electrode potential or Sensor voltage	> 6.25% ≥ 0.3mA/10ms < 4.6μA, or > 9.4μA > 0.43μA/10ms < 360mV or > 440mV < 12V or > 16.5V	Calculated EGT(SCR outlet) ECT(from ECM)	≥ 100degC (212F) ≥ 65degC (149F)	180sec	1DCY
2-9. Engine cooling system								
Thermostat /Engine cooling system /Engine ECU	P0128	Comparison of Estimated engine coolant temperature to Actual engine coolant temperature.	Actual engine coolant temperature	< 71degC (159.8F)	Engine speed Engine coolant temperature Engine run time No malfunction : see 'Monitor disable DTC table' and after that, Estimated engine coolant temp	≥ 700rpm ≤ 52degC (125.6F) ≥ 60sec	5sec	2DCY
Engine coolant temperature sensor /Engine cooling system /Engine ECU	P0117	Range check (low)	Engine coolant temperature sensor voltage	≤ 0.10V (139degC) (282.2F)	Battery voltage Conditions below continue Engine stall or Engine speed	≥ 10V ≤ 16V 5sec Yes ≥ 500rpm	3sec	1DCY
	P0118	Range check (high)	Engine coolant temperature sensor voltage	≥ 4.77V (-39degC) (-38.2F)	IAT(AFS built-in) Battery voltage Conditions below continue Engine stall or Engine speed No malfunction : see 'Monitor disable DTC table'	≥ -20degC (-4F) ≥ 10V ≤ 16V 5sec Yes ≥ 500rpm	3sec	1DCY

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	P0116	Rationality check (at engine start)	Intake air temperature (AFS built-in) - Engine coolant temperature	>= 15degC (59F)	Engine speed	>= 700rpm	5sec	2DCY
					Engine coolant temperature	<= 60degC (140F)		
					IAT(AFS built-in) - EGRT	>= -5degC (23F)		
						<= 5degC (41F)		
					Time elapsed since engine start	>= 10sec		
						<= 30sec		
		No malfunction : see 'Monitor disable DTC table'						
	Rationality check (at engine running) : Calculation of fuel consumption contributed for raising engine coolant temperature	Fuel consumption per Δengine coolant temperature.	> 40cc/degC (1.183cc/F)	Engine speed	>= 700rpm	5sec	2DCY	
				Engine coolant temperature	<= 60degC (140F)			
				Time elapsed since engine start	>= 60sec			
				No malfunction : see 'Monitor disable DTC table'				
				and after that,				
				Fuel consumption contributed for raising engine coolant temperature	>= 300cc			

2-10. Crankcase ventilation system

[illegible]

2-11. Other CCM

Idle speed control system /Engine ECU	P0519	Comparison of engine speed between target and actual	Actual engine speed - Target engine speed	>= 25rpm	Conditions below continue	10sec	15sec	2DCY
					Accelerator pedal position	= 0%		
					Engine coolant temperature	>= 60degC (140F)		
					Vehicle speed	= 0mile/h		
					No malfunction : see 'Monitor disable DTC table'			
Glow plug /Glow control system /Glow controller and Engine ECU	P0671(#1cyl) P0672(#2cyl) P0675(#5cyl) P0676(#6cyl)	Circuit monitor (low)	Glow plug drive current	< 0.5-0.9A	Request for glow plug activation (from ECM)	Yes	0.3sec	2DCY
					Conditions below continue	1sec		
					Battery voltage	>= 10V		
						<= 16V		
					Starter	Deactivated		

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		Circuit monitor (high)	Glow plug drive current	> 21-36A	Request for glow plug activation (from ECM)	Yes	0.3sec	2DCY
					Conditions below continue	1sec		
					Battery voltage	>= 10V		
						<= 16V		
					Starter	Deactivated		
Glow controller /Glow control system /Glow controller and Engine ECU	P0683	Circuit monitor (open, GND short) Battery for glow controller	Glow controller	Deactivated (and no response)	Request for glow plug activation (from ECM)	Yes	4.4sec	2DCY
					Conditions below continue	1sec		
					Battery voltage	>= 10V		
						<= 16V		
					Starter	Deactivated		
	P064C	Circuit monitor (open, GND short) Battery for glow plug	Battery voltage (Glow controller) - Battery voltage (Glow plug)	> 2V	Request for glow plug activation (from ECM)	Yes	0.3sec	2DCY
					Conditions below continue	1sec		
					Battery voltage	>= 10V		
						<= 16V		
					Starter	Deactivated		
	P0683	Circuit monitor (low) Glow control signal	Glow control signal voltage	< 1V	Request for glow plug activation (from ECM)	Yes	4.49sec	2DCY
					Conditions below continue	1sec		
					Battery voltage	>= 10V		
						<= 16V		
					Starter	Deactivated		
	P0683	Circuit monitor (high) Glow control signal	Glow control signal voltage	> 6.6V	Request for glow plug activation (from ECM)	Yes	4.4sec	2DCY
					Conditions below continue	1sec		
					Battery voltage	>= 10V		
						<= 16V		
					Starter	Deactivated		
Glow controller /Glow control system /Glow controller and Engine ECU	P0683	Circuit monitor (open, short) Diagnosis signal	Glow controller diagnosis signal	No signal	Request for glow plug activation (from ECM)	Yes	4.4sec	2DCY
					Conditions below continue	1sec		
					Battery voltage	>= 10V		
						<= 16V		
					Starter	Deactivated		

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	P064C	Functional monitor : Over temperature	Glow controller temperature	> 120-150degC (248-302F)	Request for glow plug activation (from ECM)	Yes	0.3sec	2DCY
					Conditions below continue	1sec		
					Battery voltage	>= 10V <= 16V		
					Starter	Deactivated		
Glow lamp (Wait-to-start lamp) /Glow control system /Engine ECU	P0381	Circuit monitor (low)	Glow lamp circuit voltage	<= 7V	Request for glow plug activation (from ECM)	No	10sec	1DCY
					Battery voltage	>= 10V <= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
		Circuit monitor (high)	Glow lamp circuit voltage	>= 8.4V	Request for glow plug activation (from ECM)	Yes	3sec	1DCY
					Battery voltage	>= 10V <= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
Accelerator pedal position sensor 1 /Engine ECU	P2122	Range check (low)	Accelerator pedal position sensor 1 voltage	<= 0.6V (-15.4%)	Battery voltage	>= 10V <= 16V	1sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
	P2123	Range check (high)	Accelerator pedal position sensor 1 voltage	>= 4.1V (147%)	Battery voltage	>= 10V <= 16V	1sec	1DCY
Accelerator pedal position sensor 2 /Engine ECU	P2127	Range check (low)	Accelerator pedal position sensor 2 voltage	<= 1.4V (-15.4%)	Battery voltage	>= 10V <= 16V	1sec	1DCY
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
	P2128	Range check (high)	Accelerator pedal position sensor 2 voltage	>= 4.9V (147%)	Battery voltage	>= 10V <= 16V	1sec	1DCY

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Accelerator pedal position sensor 1 and 2 /Engine ECU	P2138	Rationality check : Comparison of sensor voltage between sensor1 and sensor2	Accelerator pedal position sensor 2 voltage - Accelerator pedal position sensor 1 voltage	<= 0V or >= 1.6V	Battery voltage	>= 10V	3sec	1DCY	
						<= 16V			
					Conditions below continue	5sec			
					Engine stall	Yes			
					or Engine speed	>= 500rpm			
Vehicle speed sensor /Engine ECU	P0500	Range check (low)	Vehicle speed	= 0mile/h	Conditions below continue	5sec	5sec	1DCY	
					Engine speed	>= 1200rpm			
					Gear position	Not neutral			
					Fuel injection quantity	>= 60mm3/st			
					Engine coolant temperature	>= 50degC (122F)			
					Battery voltage	>= 10V			
						<= 16V			
					No malfunction : see 'Monitor disable DTC table'				
	P0501	Range check (high)	Vehicle speed sensor pulse frequency	>= 256Hz (112mile/h)	Engine speed	>0rpm	5sec	1DCY	
					Fuel injection quantity	<= 0mm3/st			
					Battery voltage	>= 10V			
						<= 16V			
Neutral switch /Engine ECU	P0850	Rationality check	Neutral switch signal	No change	Conditions below continue	10sec	2times	1DCY	
					Vehicle speed	>= 31.25mile/h			
					Battery voltage	>= 10V			
						<= 16V			
					and after that,				
					Vehicle speed	= 0mile/h			
Transmission information (automatic transmission) /Vehicle ECU and Engine ECU	P073D	Rationality check : Compare neutral switch, neutral information and lockup information	Lockup information (from Vehicle ECU) or	Error	Battery voltage	>= 10V	5sec	1DCY	
						<= 16V			
					PTO	Deactivated			
			No malfunction : see 'Monitor disable DTC table'				10sec		
					Not neutral				10sec
					Neutral				10sec
		Engaged			10sec				
		Neutral			10sec				
		(Neutral information (from Vehicle ECU) and Neutral switch) or (Lockup information (from Vehicle ECU) and Neutral information (from Vehicle ECU))				10sec			

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Transmission information (automated manual transmission) /Vehicle ECU and Engine ECU	P073D	Rationality check : Compare driveline engaged information and neutral information	Driveline engaged information or (Driveline engaged information and neutral information)	Error Engaged Neutral	Battery voltage	>= 10V	10sec	1DCY
						<= 16V		
					PTO	Deactivated		
					No malfunction : see 'Monitor disable DTC table'			
Intake throttle valve position sensor 1 /Engine ECU	P0122	Range check (low)	Sensor voltage	<= 0.2V (5deg)	Battery voltage	>= 10V	3sec	1DCY
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
	P0123	Range check (high)	Sensor voltage	>= 4.8V (120deg)	Battery voltage	>= 10V	3sec	1DCY
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
or Engine speed					>= 500rpm			
Intake throttle valve position sensor 2 /Engine ECU	P0222	Range check (low)	Sensor voltage	<= 0.2V (5deg)	Battery voltage	>= 10V	3sec	1DCY
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
	P0223	Range check (high)	Sensor voltage	>= 4.8V (120deg)	Battery voltage	>= 10V	3sec	1DCY
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
or Engine speed					>= 500rpm			
Intake throttle valve position sensor 1 and 2 /Engine ECU	P2135	Rationality check : Compare sensor 1 and 2 value	Intake throttle valve position 1 - Intake throttle valve position 2	>= 5deg	Battery voltage	>= 10V	3sec	1DCY
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
DC motor for intake throttle valve /Engine ECU	P2100	Circuit monitor (low)	Intake throttle drive current	< 0.3A	Battery voltage	>= 10V	6sec	1DCY
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
					Intake throttle drive duty	>= 50%		

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	P2103	Circuit monitor (high)	Intake throttle drive current and Temperature of drive circuit	>= 12A >= 160degC (320F)	Battery voltage Conditions below continue Engine stall or Engine speed No malfunction : see 'Monitor disable DTC table'	>= 10V <= 16V 5sec Yes >= 500rpm	112msec	1DCY
Intake throttle valve /Engine ECU	P2101	Functional monitor (stuck open)	Actual intake throttle valve position (%) - Target intake throttle valve position (%)	< -10%	Conditions below continue Battery voltage Conditions below continue Engine stall or Engine speed ΔEngine speed ΔFuel injection quantity Target intake throttle valve position (%)	10sec >= 10V <= 16V 5sec Yes >= 500rpm < 20rpm < 2mm3/st >= 50%	30sec	1DCY
		Functional monitor (stuck close)	Actual intake throttle valve position (%) - Target intake throttle valve position (%)	> 10%	Conditions below continue Battery voltage Conditions below continue Engine stall or Engine speed ΔEngine speed ΔFuel injection quantity Target intake throttle valve position (%)	10sec >= 10V <= 16V 5sec Yes >= 500rpm < 20rpm < 2mm3/st <= 50%	30sec	1DCY
Exhaust brake /Engine ECU	P1681	Circuit monitor (low)	Exhaust brake magnetic valve circuit voltage	<= 2.8V	Exhaust brake Battery voltage	Activated >= 10V <= 16V	3sec	1DCY
	P1682	Circuit monitor (high)	Exhaust brake magnetic valve circuit voltage	>= 3V	Exhaust brake Battery voltage	Deactivated >= 10V <= 16V	3sec	1DCY
Starter switch /Engine ECU	P0617	Rationality check	Starter switch signal	On	Battery voltage Engine speed	>= 10V <= 16V >= 1100rpm	30sec	1DCY
CAN communication bus for vehicle control /Engine ECU	U1001	Monitor CAN bus off state based on ISO11898-1 reference 1.1.1.1	CAN bus off state	On	Conditions below continue Battery voltage	2.5sec >= 11V <= 16V	96msec	1DCY

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CAN communication bus for emission control /Engine ECU	U0073	Monitor CAN bus off state based on ISO11898-1 reference 1.1.1.1	CAN bus off state	On	Conditions below continue	2.5sec	96msec	1DCY
					Battery voltage	>= 11V		
						<= 16V		
CAN communication with Vehicle ECU /Engine ECU	U110A	Monitor CAN message	CAN message from Vehicle ECU	Not received	Conditions below continue	2.5sec	3sec	1DCY
					Battery voltage	>= 11V		
						<= 16V		
CAN communication with EGR valve controller /Engine ECU	U1122	Monitor CAN message	CAN message from EGR valve controller	Not received	Conditions below continue	2.5sec	3sec	1DCY
					Battery voltage	>= 11V		
						<= 16V		
CAN communication with VNT controller /Engine ECU	U1123	Monitor CAN message	CAN message from VNT controller	Not received	Conditions below continue	2.5sec	3sec	1DCY
					Battery voltage	>= 11V		
						<= 16V		
CAN communication with DeNOx ECU /Engine ECU	U010E	Monitor CAN message	CAN message from DeNOx ECU	Not received	Conditions below continue	2.5sec	3sec	1DCY
					Battery voltage	>= 11V		
						<= 16V		
CAN communication with Burner ECU /Engine ECU	U111E	Monitor CAN message	CAN message from Burner ECU	Not received	Conditions below continue	2.5sec	20sec	1DCY
					Battery voltage	>= 11V		
						<= 16V		
CAN communication with NOx sensor (SCR upstream) /Engine ECU	U029D	Monitor CAN message	CAN message from NOx sensor (SCR upstream)	Not received	Conditions below continue	2.5sec	3sec	1DCY
					Battery voltage	>= 11V		
						<= 16V		
CAN communication with NOx sensor (SCR downstream) /Engine ECU	U029E	Monitor CAN message	CAN message from NOx sensor (SCR downstream)	Not received	Conditions below continue	2.5sec	3sec	1DCY
					Battery voltage	>= 11V		
						<= 16V		
VIN data /Engine ECU	P0610	Data check	VIN data	Not written or Out of range or Changed or Not received	Battery voltage	>= 10V	5sec	1DCY
						<= 16V		
					Conditions below continue	5sec		
					Engine stall	Yes		
					or Engine speed	>= 500rpm		
Flash ROM /Engine ECU	P0605	Compare Flash ROM check sum calculated with kept in software	Check sum	Error			96msec	1DCY