
DIAGNOSTIC MANUAL

2015 N13 Engine

Navistar, Inc.

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Foreword

Navistar, Inc. is committed to continuous research and development to improve products and introduce technological advances. Procedures, specifications, and parts defined in published technical service literature may be altered.

NOTE: Photo illustrations identify specific parts or assemblies that support text and procedures; other areas in a photo illustration may not be exact.

This manual includes necessary information and specifications for technicians to maintain Navistar® diesel engines. See vehicle manuals and Technical Service Information (TSI) bulletins for additional information.

Technical Service Literature

Navistar® N13 with SCR *Engine Operation and Maintenance Manual*

Navistar® N13 with SCR *Engine Service Manual*

Navistar® N13 with SCR *Engine and Aftertreatment Wiring Schematic Form*

Technical Service Literature is revised periodically. If a technical publication is ordered, the latest revision will be supplied.

NOTE: To order technical service literature, contact your International dealer.

Service Diagnosis

Service diagnosis is an investigative procedure that must be followed to find and correct an engine application problem or an engine problem.

If the problem is engine application, see specific vehicle manuals for further diagnostic information.

If the problem is the engine, see specific *Engine Diagnostic Manual* for further diagnostic information.

Prerequisites for Effective Diagnosis

- Availability of gauges and diagnostic test equipment
- Availability of current information for engine application and engine systems
- Knowledge of the principles of operation for engine application and engine systems
- Knowledge to understand and do procedures in diagnostic and service publications

Technical Service Literature required for Effective Diagnosis

- *Engine Service Manual*
 - *Engine Diagnostic Manual*
 - Diagnostics Forms
 - Engine Wiring Schematic Form
 - Service Bulletins
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Safety Information

This manual provides general and specific maintenance procedures essential for reliable engine operation and your safety. Since many variations in procedures, tools, and service parts are involved, advice for all possible safety conditions and hazards cannot be stated.

Read safety instructions before doing any service and test procedures for the engine or vehicle. See related application manuals for more information.

Disregard for Safety Instructions, Warnings, Cautions, and Notes in this manual can lead to injury, death or damage to the engine or vehicle.

Safety Terminology

Three terms are used to stress your safety and safe operation of the engine: Warning, Caution, and Note

Warning: A warning describes actions necessary to prevent or eliminate conditions, hazards, and unsafe practices that can cause personal injury or death.

Caution: A caution describes actions necessary to prevent or eliminate conditions that can cause damage to the engine or vehicle.

Note: A note describes actions necessary for correct, efficient engine operation.

Safety Instructions

Work Area

- Keep work area clean, dry, and organized.
- Keep tools and parts off the floor.
- Make sure the work area is ventilated and well lit.
- Make sure a First Aid Kit is available.

Safety Equipment

- Use correct lifting devices.
- Use safety blocks and stands.

Protective Measures

- Wear protective safety glasses and shoes.
- Wear correct hearing protection.
- Wear cotton work clothing.
- Wear sleeved heat protective gloves.
- Do not wear rings, watches or other jewelry.
- Restrain long hair.

Vehicle

- Make sure the vehicle is in neutral, the parking brake is set, and the wheels are blocked before servicing engine.
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- Clear the area before starting the engine.

Engine

- The engine should be operated or serviced only by qualified individuals.
- Provide necessary ventilation when operating engine in a closed area.
- Keep combustible material away from engine exhaust system and exhaust manifolds.
- Install all shields, guards, and access covers before operating engine.
- Do not run engine with unprotected air inlets or exhaust openings. If unavoidable for service reasons, put protective screens over all openings before servicing engine.
- Shut engine off and relieve all pressure in the system before removing panels, housing covers, and caps.
- If an engine is not safe to operate, tag the engine and ignition key.

Fire Prevention

- Make sure charged fire extinguishers are in the work area.

NOTE: Check the classification of each fire extinguisher to ensure that the following fire types can be extinguished.

1. Type A — Wood, paper, textiles, and rubbish
2. Type B — Flammable liquids
3. Type C — Electrical equipment

Batteries

- Always disconnect the main negative battery cable first.
- Always connect the main negative battery cable last.
- Avoid leaning over batteries.
- Protect your eyes.
- Do not expose batteries to open flames or sparks.
- Do not smoke in workplace.

Compressed Air

- Use an OSHA approved blow gun rated at 30 psi.(207 kPa)
- Limit shop air pressure to 30 psi (207 kPa).
- Wear safety glasses or goggles.
- Wear hearing protection.
- Use shielding to protect others in the work area.
- Do not direct compressed air at body or clothing.

Tools

- Make sure all tools are in good condition.
 - Make sure all standard electrical tools are grounded.
-

- Check for frayed power cords before using power tools.

Fluids Under Pressure

- Use extreme caution when working on systems under pressure.
- Follow approved procedures only.

Fuel

- Do not over fill the fuel tank. Over fill creates a fire hazard.
- Do not smoke in the work area.
- Do not refuel the tank when the engine is running.

Removal of Tools, Parts, and Equipment

- Reinstall all safety guards, shields, and covers after servicing the engine.
 - Make sure all tools, parts, and service equipment are removed from the engine and vehicle after all work is done.
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How To Use This Section

CONTENT
UNDER
DEVELOPMENT

Diagnostic Trouble Code (DTC's) List

SPN	FMI	Sub-section	Condition Description
27	7	EGR (page 789)	EGRP does not agree with commanded position
27	10	EGR (page 789)	EGRP sensor feedback deviation during CSER
27	16	EGR (page 789)	Position error Position sensor feedback deviation from control command
27	18	EGR (page 789)	Position error Position sensor feedback deviation from control command
51	0	ETV (page 879)	ETP fault: over temperature
51	1	ETV (page 879)	ETP does not agree with commanded closed position
51	3	ETV (page 879)	ETP signal Out of Range HIGH
51	4	ETV (page 879)	ETP signal Out of Range LOW
51	7	ETV (page 879)	ETP does not agree with commanded position
51	10	ETV (page 879)	ETP sensor feedback deviation during CSER
84	2	EWPS (page 897)	Vehicle speed anti-tampering fault
91	2	APP (page 252)	APP1 and APP2 signal conflict
91	3	APP (page 252)	APP1 signal Out of Range HIGH
91	4	APP (page 252)	APP1 signal Out of Range LOW
94	0	FDP (page 964)	Fuel Delivery Pressure above maximum
94	3	FDP (page 964)	FDP signal Out of Range HIGH
94	4	FDP (page 964)	FDP signal Out of Range LOW
96	19	Fuel Level	Fuel Level not detected on J1939
98	3	EOL (page 848)	EOL signal Out-of-Range HIGH
98	4	EOL (page 848)	EOL signal Out-of-Range LOW
100	1	EWPS (page 897)	Engine Oil System below Critical Pressure
100	3	EOP (page 858)	EOP signal Out of Range HIGH
100	4	EOP (page 858)	EOP signal Out of Range LOW
100	11	EWPS (page 897)	Engine oil pressure below dealer programmed engine RPM value
100	17	EWPS (page 897)	Low Oil Pressure vehicle event fault
100	18	EWPS (page 897)	Engine Oil System below Warning Pressure
102	2	IMP (page 1054)	IMP signal does not agree with BARO
102	3	IMP (page 1054)	IMP signal Out of Range HIGH
102	4	IMP (page 1054)	IMP signal Out of Range LOW
102	10	AMS (page 241)	IMP Boost slow response
102	16	AMS (page 241)	Intake Manifold Pressure Overboost

SPN	FMI	Sub-section	Condition Description
102	18	AMS (page 241)	Intake Manifold Pressure Underboost
105	2	IMT (page 1062)	IMT signal erratic, intermittent or incorrect
105	3	IMT (page 1062)	IMT signal Out of Range HIGH
105	4	IMT (page 1062)	IMT signal Out of Range LOW
108	3	BARO (page 268)	BARO signal Out of Range HIGH
108	4	BARO (page 268)	BARO signal Out of Range LOW
110	0	EWPS (page 897)	Engine Coolant System above Critical Temperature
110	2	ECT1 (page 751)	ECT1 signal erratic, intermittent, or incorrect
110	3	ECT1 (page 751)	ECT1 signal Out of Range HIGH
110	4	ECT1 (page 751)	ECT1 signal Out of Range LOW
110	11	EWPS (page 897)	Event logger, coolant temperature hot, extreme
110	15	EWPS (page 897)	Engine Coolant System above Warning temperature
110	16	EWPS (page 897)	Engine Coolant System above OBD maximum temperature
110	17	EWPS (page 897)	Engine Coolant System below OBD maximum temperature
110	18	EWPS (page 897)	Engine Coolant System below closed loop minimum Temperature
111	1	ECL (page 713)	Low Engine Coolant Level
111	31	ECL (page 713)	Engine Coolant Level Low Repeated Occurrence
157	0	FRP (page 1019)	FRP relief valve opening fault
157	3	FRP (page 983)	FRP signal Out of Range HIGH
157	4	FRP (page 983)	FRP signal Out of Range LOW
157	14	FRP (page 983)	FRP Relief Valve failure
157	20	FRP (page 983)	FRP signal Drifted HIGH
157	21	FRP (page 983)	FRP signal Drifted LOW
157	31	FRP (page 983)	Pressure Linearization Monitor
158	15	ECM (page 720)	ECM Switched voltage too HIGH
158	17	ECM (page 720)	ECM Switched voltage too LOW
171	2	AAT (page 102)	AAT signal erratic, intermittent or incorrect
171	3	AAT (page 102)	AAT signal Out of Range HIGH (Body mounted sensor)
171	4	AAT (page 102)	AAT signal Out of Range LOW (Body mounted sensor)
175	0	EWPS (page 897)	Engine Oil System above Critical Temperature
175	3	EOT (page 869)	EOT signal Out of Range HIGH
175	4	EOT (page 869)	EOT signal Out of Range LOW

SPN	FMI	Sub-section	Condition Description
175	11	EWPS (page 897)	Oil Temperature Exceeds limit by large amount
175	15	EWPS (page 897)	Engine Oil System above warning temperature
188	0	EWPS (page 897)	Engine unable to achieve desired idle speed (too high)
188	1	EWPS (page 897)	Engine unable to achieve desired idle speed (too low)
188	16	EWPS (page 897)	Engine unable to achieve desired speed: secondary fuel detected
190	0	EWPS (page 897)	Engine overspeed most severe level
190	11	EWPS (page 897)	Engine overspeed vehicle event fault
190	15	EWPS (page 897)	Engine overspeed detected
191	1	TOSS (page 1453)	TOSS not detected with vehicle moving
191	2	TOSS (page 1453)	TOSS signal erratic, intermittent or incorrect
191	3	TOSS (page 1453)	TOSS signal Out of Range HIGH
191	4	TOSS (page 1453)	TOSS signal Out of Range LOW
191	16	TOSS (page 1453)	Hard wired vehicle speed reading higher than limit
412	1	EGRT (page 825)	EGRT signal stuck low, not warming up
412	2	EGRT (page 825)	EGRT signal erratic, intermittent or incorrect
412	3	EGRT (page 825)	EGRT signal Out of Range HIGH
412	4	EGRT (page 825)	EGRT signal Out of Range LOW
560	19	J1939 (page 1211)	Transmission Driveline Engaged not detected on J1939
609	19	J1939 (page 1211)	ACM not detected on J1939
626	3	Inlet Air Heater Fuel Solenoid (page 1049)	CSFS short to PWR
626	4	Inlet Air Heater Fuel Solenoid (page 1049)	CSFS short to GND
626	5	Inlet Air Heater Fuel Solenoid (page 1049)	CSFS open load/circuit
626	18	Inlet Air Heater Fuel Solenoid (page 1049) Inlet Air Heater Fuel Igniter (page 1027)	Cold Start Assist fault: Lack of heat in the Intake Manifold
628	12	ECM (page 720)	ECM Memory Error
629	0	ECM (page 720)	ECM Error - CPU Load Excessively HIGH
629	2	ECM (page 720)	ECM Error – Level 2 Monitoring
629	8	ECM (page 720)	Engine Off timer fault
629	12	ECM (page 720)	ECM Internal chip Error
629	14	ECM (page 720)	ECM Internal component overtemperature

SPN	FMI	Sub-section	Condition Description
633	3	FPCV (page 978)	FPCV short to PWR
633	4	FPCV (page 978)	FPCV short to GND
633	5	FPCV (page 978)	FPCV open load/circuit
636	2	CMP (page 303)	CMP and CKP Synchronization Error
636	8	CMP (page 303)	CMP signal noise
636	10	CMP (page 303)	CMP signal missing
637	8	CKP (page 293)	CKP signal noise
637	10	CKP (page 293)	CKP signal inactive
639	14	J1939 (page 1211)	J1939 Data Link Error (ECM unable to transmit)
639	19	J1939 (page 1211)	J1939 Data Link Error (ECM unable to transmit or receive)
647	3	EFC (page 782)	EFC short to PWR
647	4	EFC (page 782)	EFC short to GND
647	5	EFC (page 782)	EFC open load/circuit
651	3	INJ (page 1077)	Injector 1 short to PWR
651	4	INJ (page 1077)	INJ short circuit
651	5	INJ (page 1077)	INJ open circuit
651	13	CYL Balance (page 317)	Injector 1 programmable parameter error
651	16	CYL Balance (page 317)	Injector 1 Fuel quantity/timing high error
651	18	CYL Balance (page 317)	Injector 1 Fuel quantity/timing low error
652	3	INJ (page 1077)	Injector 2 short to PWR
652	4	INJ (page 1077)	Injector 2 short circuit
652	5	INJ (page 1077)	Injector 2 open circuit
652	13	CYL Balance (page 317)	Injector 2 programmable parameter error
652	16	CYL Balance (page 317)	Injector 2 Fuel quantity/timing high error
652	18	CYL Balance (page 317)	Injector 2 Fuel quantity/timing low error
653	3	INJ (page 1077)	Injector 3 short to PWR
653	4	INJ (page 1077)	Injector 3 short circuit
653	5	INJ (page 1077)	Injector 3 open circuit
653	13	CYL Balance (page 317)	Injector 3 programmable parameter error
653	16	CYL Balance (page 317)	Injector 3 Fuel quantity/timing high error
653	18	CYL Balance (page 317)	Injector 3 Fuel quantity/timing low error
654	3	INJ (page 1077)	Injector 4 short to PWR
654	4	INJ (page 1077)	Injector 4 short circuit
654	5	INJ (page 1077)	Injector 4 open circuit

SPN	FMI	Sub-section	Condition Description
654	13	CYL Balance (page 317)	Injector 4 programmable parameter error
654	16	CYL Balance (page 317)	Injector 4 Fuel quantity/timing high error
654	18	CYL Balance (page 317)	Injector 4 Fuel quantity/timing low error
655	3	INJ (page 1077)	Injector 5 short to PWR
655	4	INJ (page 1077)	Injector 5 short circuit
655	5	INJ (page 1077)	Injector 5 open circuit
655	13	CYL Balance (page 317)	Injector 5 programmable parameter error
655	16	CYL Balance (page 317)	Injector 5 Fuel quantity/timing high error
655	18	CYL Balance (page 317)	Injector 5 Fuel quantity/timing low error
656	3	INJ (page 1077)	Injector 6 short to PWR
656	4	INJ (page 1077)	Injector 6 short circuit
656	5	INJ (page 1077)	Injector 6 open circuit
656	13	CYL Balance (page 317)	Injector 6 programmable parameter error
656	16	CYL Balance (page 317)	Injector 6 Fuel quantity/timing high error
656	18	CYL Balance (page 317)	Injector 6 Fuel quantity/timing low error
724	2	O2S (page 1297)	O ₂ S Slow response detecting fueling to non-fueling
724	3	O2S (page 1297)	O ₂ S Circuit Fault: Open or short to PWR
724	4	O2S (page 1297)	O ₂ S Circuit Fault: Short to GND
724	5	O2S (page 1297)	O ₂ S Circuit Fault: Open circuit
724	20	O2S (page 1297)	O ₂ S adaptation above maximum limit
724	21	O2S (page 1297)	O ₂ S adaptation below minimum limit
731	16	EWPS (page 897)	Knock detected: Cylinder Acceleration Above Normal
731	18	EWPS (page 897)	Knock Detected: Unexpected Fueling without Demand
837	14	Body (page 273)	Speedometer Drive Output Error Refer to the <i>Chassis Electrical Circuit Diagram Manual</i>
974	3	RAPP (page 1328)	Remote APP signal Out of Range HIGH
974	4	RAPP (page 1328)	Remote APP signal Out of Range LOW
1072	3	ECB1 (page 708)	ECB1 Control short to PWR
1072	4	ECB1 (page 708)	ECB1 Control short to GND
1072	5	ECB1 (page 708)	ECB1 Control open load/circuit
1073	3	ECB2	ECB2 Control short to PWR
1073	4	ECB2	ECB2 Control short to GND
1073	5	ECB2	ECB2 Control open load/circuit
1081	3	WTSL (page 1518)	WTSL short to PWR

SPN	FMI	Sub-section	Condition Description
1081	4	WTSL (page 1518)	WTSL short to GND
1081	5	WTSL (page 1518)	WTSL open load/circuit
1110	31	ECM (page 720)	ECM detects fueling without demand
1135	3	EOL (page 848)	EOT2 signal Out of Range HIGH
1135	4	EOL (page 848)	EOT2 signal Out of Range LOW
1173	2	TC2CIS (page 1415)	TC2CIT signal does not agree with other sensors
1173	3	TC2CIS (page 1415)	TC2CIT signal Out of Range HIGH
1173	4	TC2CIS (page 1415)	TC2CIT signal Out of Range LOW
1173	16	TC2CIS (page 1415)	TC2CIT signal above desired (interstage CAC under cooling)
1177	2	TC2CIS (page 1415)	TC2CIP Underdevelopment
1177	3	TC2CIS (page 1415)	TC2CIP signal Out of Range HIGH
1177	4	TC2CIS (page 1415)	TC2CIP signal Out of Range LOW
1189	3	TC2WC (page 1447)	TC2WC short to PWR
1189	4	TC2WC (page 1447)	TC2WC short to GND
1189	5	TC2WC (page 1447)	TC2WC open load/circuit
1213	3	MIL (page 1235)	MIL circuit short to PWR
1213	4	MIL (page 1235)	MIL circuit short to GND
1213	5	MIL (page 1235)	MIL open load/circuit
1322	31	CYL Balance (page 317)	Misfire - Multiple Cylinders
1323	31	CYL Balance (page 317)	Misfire - Cylinder 1
1324	31	CYL Balance (page 317)	Misfire - Cylinder 2
1325	31	CYL Balance (page 317)	Misfire - Cylinder 3
1326	31	CYL Balance (page 317)	Misfire - Cylinder 4
1327	31	CYL Balance (page 317)	Misfire - Cylinder 5
1328	31	CYL Balance (page 317)	Misfire - Cylinder 6
1378	31	Service (page 1402)	Change Engine Oil Service Interval
1569	31	SCR (page 1331)	SCR Tamperproof Warning & Protection System Inducement Severe
1590	19	Body (page 273)	Adaptive Cruise Control not detected on J1939
1659	20	ECS (page 1231)	ECT1 below expected: Check Thermostat
1761	1	DEFTL (page 554)	DEF Tank Level sensor Inducement (Level 3 - 5)
1761	3	DEFTL (page 554)	DEFTL signal Out of Range HIGH
1761	4	DEFTL (page 554)	DEFTL signal Out of Range LOW
1761	10	DEFTL (page 554)	DEF Level abnormal rate of change

SPN	FMI	Sub-section	Condition Description
1761	11	DEFTL (page 554)	DEFTL Signal erratic, intermittent, or incorrect
1761	17	DEFTL (page 554)	DEFTL Inducement Level 1
1761	18	DEFTL (page 554)	DEFTL Inducement Level 2
1761	19	DEFTL (page 554)	DEFTL not detected on J1939
1810	0	Hard Brake Monitor (page 847)	Hard Brake monitor, event log, extreme
1810	15	Hard Brake Monitor (page 847)	Hard Brake monitor, event log, non-extreme
2588	0	EWPS (page 897)	Vehicle overspeed 1, event log, extreme
2588	15	EWPS (page 897)	Vehicle overspeed 1, event log, non-extreme
2589	0	EWPS (page 897)	Vehicle overspeed 2, event log, extreme
2589	15	EWPS (page 897)	Vehicle overspeed 2, event log, non-extreme
2623	3	APP (page 252)	APP2 signal Out of Range HIGH
2623	4	APP (page 252)	APP2 signal Out of Range LOW
2630	2	CACOT (page 275)	CACOT signal erratic, intermittent, or incorrect
2630	3	CACOT (page 275)	CACOT signal Out of Range HIGH
2630	4	CACOT (page 275)	CACOT signal Out of Range LOW
2630	16	CACOT (page 275)	CACOT undercooling
2659	10	AMS (page 241)	EGR slow response
2659	20	AMS (page 241)	EGR High Flow Rate detected
2659	21	AMS (page 241)	EGR Low Flow Rate detected
2791	0	EGR (page 789)	EGRV Overtemperature
2791	2	EGR (page 789)	EGR Feedback Communication Fault
2791	3	EGR (page 789)	EGRC short to PWR
2791	4	EGR (page 789)	EGRV supply voltage is too LOW
2791	5	EGR (page 789)	EGRC open load/circuit
2791	6	EGR (page 789)	EGR Valve Control current above normal or grounded
2791	7	EGR (page 789)	EGR Valve unable to achieve commanded position
2791	8	EGR (page 789)	EGR valve not receiving ECM PWM signal
2791	12	EGR (page 789)	EGR Valve Internal self test fault
2791	14	EGR (page 789)	EGRV Error: Internal Processor failure
2791	19	EGR (page 789)	EGR Valve Control not detected on J1939
2797	11	INJ (page 1077)	Injector Control Group 1 short circuit (INJ 1, 3, 5)
2798	11	INJ (page 1077)	Injector Control Group 2 short circuit (INJ 2, 4, 6)
3031	2	DEFTLT (page 577)	DEFTT signal erratic, intermittent or incorrect
3031	3	DEFTLT (page 577)	DEFTT signal Out of Range HIGH

SPN	FMI	Sub-section	Condition Description
3031	4	DEFTLT (page 577)	DEFTT signal Out of Range LOW
3055	0	FRPS (page 998)	FRP exceeded maximum
3055	1	FRPS (page 998)	No start due to low rail fuel pressure
3055	15	FRPS (page 998)	FRP below minimum with maximum command
3055	17	FRPS (page 998)	FRP above maximum with minimum command
3058	10	EGR (page 789)	EGR did not go into Closed loop EGR control when expected
3061	31	Inlet Air Heater Fuel Igniter (page 1027)	Cold start system warm-up fault during CSER
3216	2	NOx IN sensor module (page 1237)	NOx IN signal erratic, intermittent or incorrect
3216	4	NOx IN sensor module (page 1237)	NOx IN signal drifted LOW
3216	10	NOx IN sensor module (page 1237)	NOx IN signal abnormal rate of change
3216	13	NOx IN sensor module (page 1237)	NOx IN Out of Calibration
3216	19	NOx IN sensor module (page 1237)	NOx IN not detected on J1939
3216	20	NOx IN sensor module (page 1237)	NOx IN signal drifted HIGH
3216	21	NOx IN sensor module (page 1237)	NOx IN signal drifted LOW
3218	2	NOx IN sensor module (page 1237)	NOx IN power supply signal erratic, intermittent or incorrect
3223	0	O ₂ S (page 1297)	O ₂ S heater temperature above maximum
3223	1	O ₂ S (page 1297)	O ₂ S heater temperature below minimum
3223	3	O ₂ S (page 1297)	O ₂ S heater short to PWR
3223	4	O ₂ S (page 1297)	O ₂ S heater short to GND
3223	5	O ₂ S (page 1297)	O ₂ S heater open load/circuit
3223	17	O ₂ S (page 1297)	O ₂ S heater temperature below minimum at low battery PWR
3226	2	NOx OUT Sensor Module (page 1268)	NOx OUT signal erratic, intermittent or incorrect
3226	4	NOx OUT Sensor Module (page 1268)	NOx OUT signal Out of Range LOW
3226	10	NOx OUT Sensor Module (page 1268)	Aftertreatment Outlet NOx Sensor — abnormal rate of change

SPN	FMI	Sub-section	Condition Description
3226	13	NOx OUT Sensor Module (page 1268)	NOx OUT Out of Calibration
3226	19	NOx OUT Sensor Module (page 1268)	NOx OUT not detected on J1939
3226	20	NOx OUT Sensor Module (page 1268)	NOx OUT signal drifted HIGH
3226	21	NOx OUT Sensor Module (page 1268)	NOx OUT signal drifted LOW
3228	2	NOx OUT Sensor Module (page 1268)	NOx OUT power supply signal erratic, intermittent or incorrect
3242	0	DPFIT (page 645)	DPFIT above Critical
3242	2	DPFIT (page 645)	DPFIT signal erratic, intermittent, or incorrect
3242	3	DPFIT (page 645)	DPFIT Signal Out of Range HIGH
3242	4	DPFIT (page 645)	DPFIT signal Out of Range LOW
3242	16	DPFIT (page 645)	DPFIT above Maximum Temperature
3246	0	DPFOT (page 675)	DPFOT above Critical
3246	2	DPFOT (page 675)	DPFOT signal erratic, intermittent, or incorrect
3246	3	DPFOT (page 675)	DPFOT signal Out of Range HIGH
3246	4	DPFOT (page 675)	DPFOT signal Out of Range LOW
3246	16	DPFOT (page 675)	DPFOT Above Maximum Temperature
3251	2	DPFDP / Outlet Pressure Sensor (page 658)	DPFDP signal erratic, intermittent, or incorrect
3251	3	DPFDP / Outlet Pressure Sensor (page 658)	DPFDP signal Out of Range HIGH
3251	4	DPFDP / Outlet Pressure Sensor (page 658)	DPFDP signal Out of Range LOW
3361	2	DEFSP (page 525)	DEFSP signal erratic, intermittent or incorrect
3361	3	DEFSP (page 525)	DEFSP signal Out of Range HIGH
3361	4	DEFSP (page 525)	DEFSP signal Out of Range LOW
3362	31	DEFSP (page 525)	DEF dosing unable to prime
3363	3	DEFTHC (page 540)	DEFTHC short to PWR
3363	4	DEFTHC (page 540)	DEFTHC short to GND
3363	7	DEFTHC (page 540)	DEFTHC Mechanical system not responding or out of adjustment
3363	16	DEFTHC (page 540)	DEFTHC stuck on fault
3363	18	DEFTHC (page 540)	DEFTHC unable to thaw frozen DEF
3464	3	ETV (page 879)	ETC short to PWR

SPN	FMI	Sub-section	Condition Description
3464	4	ETV (page 879)	ETV short to GND
3464	5	ETV (page 879)	ETC open load/circuit
3480	2	AFTFP1 (page 162)	AFTFP1 signal erratic, intermittent, or incorrect
3480	3	AFTFP1 (page 162)	AFTFP1 signal Out of Range HIGH
3480	4	AFTFP1 (page 162)	AFTFP1 signal Out of Range LOW
3480	17	AFTFP1 (page 162)	AFTFP1 below normal operating range
3482	2	AFTFSV (page 183)	AFT Fuel Shutoff Valve signal erratic, intermittent or incorrect
3482	3	AFTFSV (page 183)	AFT Fuel Shutoff Valve short to PWR
3482	4	AFTFSV (page 183)	AFT Fuel Shutoff Valve short to GND
3482	7	AFTFSV (page 183)	AFT Fuel Shutoff Valve Mechanical system not responding or out of adjustment
3482	16	AFTFSV (page 183)	AFT Fuel Shutoff Valve Plugged
3490	3	AFTPAV (page 205)	AFTPAV short to PWR
3490	4	AFTPAV (page 205)	AFTPAV short to GND
3490	7	AFTPAV (page 205)	AFTPAV Mechanical system not responding or out of adjustment
3509	14	VREF (page 1499)	VREF1 voltage deviation ECM pins: C1-36
3510	14	VREF (page 1499)	VREF2 voltage deviation ECM pins: E1-85 and E1-86
3511	14	VREF (page 1499)	VREF3 voltage deviation ECM pins: E1-89
3512	14	VREF (page 1499)	VREF4 voltage deviation ECM pins: C1-37, C1-49, C2-08, and E1-58
3513	14	VREF (page 1499)	VREF5 voltage deviation ECM pins: C1-50, E1-81, and E1-82
3514	14	VREF (page 1499)	VREF6 voltage deviation ECM pin: E1-88
3556	2	AFTFI (page 218)	AFT Fuel Injector signal erratic, intermittent or incorrect
3556	5	AFTFI (page 218)	AFT Fuel Injector open load/circuit
3556	18	AFTFI (page 218)	AFT Fuel Pressure 2 below Warning Pressure
3597	4	ECM (page 720)	ECM Power Output 1 below normal ECM Pins: C1-31, C1-33, C1-54, C2-51, E1-01 and E1-51
3598	4	ECM (page 720)	ECM Power Output 2 below normal ECM Pins: C1-42, C2-06, E1-05, E1-28, E1-29 and E1-54
3599	4	ECM (page 720)	ECM Power Output 3 below normal ECM Pins: C1-30, C2-03, E1-24, E1-26 and E1-27
3610	2	DPFDP / Outlet Pressure Sensor (page 658)	DPFOP signal erratic, intermittent or incorrect

SPN	FMI	Sub-section	Condition Description
3610	3	DPFDP / Outlet Pressure Sensor (page 658)	DPFOP signal Out of Range HIGH
3610	4	DPFDP / Outlet Pressure Sensor (page 658)	DPFOP signal Out of Range LOW
3695	2	AFT System (page 120)	DPF Regen Inhibit Switch erratic, intermittent or incorrect
3703	31	AFT System (page 120)	DPF Active Regeneration Inhibited Due to Inhibit Switch
3713	31	AFT System (page 120)	DPF Active Regeneration Inhibited Due to System Timeout
3719	0	DPF System (page 598)	DPF Soot Load - Highest (level 3/3)
3719	15	DPF System (page 598)	DPF Soot Load - Lowest (level 1/3)
3719	16	DPF System (page 598)	DPF Soot Load - Moderate (level 2/3)
3750	31	AFT System (page 120)	DPF Regen inhibited due to low exhaust temperatures
3826	18	SCR (page 1331)	DEF Reagent Consumption below setpoint
3936	0	DPF System (page 598)	DPF Soot Load - Severe De-Rate
3936	7	DPF System (page 598)	DPF System - DPF exceeded maximum temperature threshold - replace DPF
3936	14	DOC / DPF Temperature Sensor Module	Part # Mismatch (What's stored in ACM vs Reading from Smart Sensor Assembly)
3936	15	DPF System (page 598)	DPF System above Warning Pressure
4076	0	EWPS (page 897)	ECT2 above Critical (EWPS programmable limit)
4076	2	ECT2 (page 767)	ECT2 signal erratic, intermittent, or incorrect
4076	3	ECT2 (page 767)	ECT2 signal Out of Range HIGH
4076	4	ECT2 (page 767)	ECT2 signal Out of Range LOW
4076	15	EWPS (page 897)	ECT2 above Warning (EWPS programmable limit)
4076	17	ECT2 (page 767)	ECT2 signal stuck low, not warming up
4192	3	WIF (page 1514)	WIF signal Out of Range HIGH
4192	4	WIF (page 1514)	WIF signal Out of Range LOW
4227	7	CCOSS (page 291)	CC Oil Separator Speed: Not spinning
4334	2	DEFLP Sensor (page 406)	DEFLP signal erratic, intermittent or incorrect
4334	3	DEFLP Sensor (page 406)	DEFLP signal Out of Range HIGH
4334	4	DEFLP Sensor (page 406)	DEFLP signal Out of Range LOW
4334	16	DEFLP Sensor (page 406)	DEFLP above Maximum Pressure
4334	18	DEFLP Sensor (page 406)	DEFLP below normal operating range
4337	2	DEFSM (page 462)	DEF Supply Module Temperature erratic, intermittent or incorrect
4337	10	DEFSM (page 462)	DEF Supply Module Temperature abnormal rate of change

SPN	FMI	Sub-section	Condition Description
4340	3	DEFPLH (page 423)	DEFL1HC short to PWR
4340	5	DEFPLH (page 423)	DEFL1HC open load/circuit
4342	3	DEFRLH (page 436)	DEFL2HC short to PWR
4342	5	DEFRLH (page 436)	DEFL2HC open load/circuit
4344	3	DEFSLH (page 449)	DEFL3HC short to PWR
4344	5	DEFSLH (page 449)	DEFL3HC open load/circuit
4360	0	SCRIT Senor (page 1367)	SCRIT above Critical Temperature
4360	2	SCRIT Senor (page 1367)	SCRIT signal erratic, intermittent or incorrect
4360	3	SCRIT Senor (page 1367)	SCRIT signal Out of Range HIGH
4360	4	SCRIT Senor (page 1367)	SCRIT signal Out of Range LOW
4360	16	SCRIT Senor (page 1367)	SCRIT Above Maximum Temperature
4360	19	SCRIT Senor (page 1367)	SCRIT signal not detected on J1939
4363	0	SCROT (page 1384)	SCROT above Critical Temperature
4363	2	SCROT (page 1384)	SCROT signal erratic, intermittent or incorrect
4363	3	SCROT (page 1384)	SCROT signal Out of Range HIGH
4363	4	SCROT (page 1384)	SCROT signal Out of Range LOW
4363	16	SCROT (page 1384)	SCROT above Maximum Temperature
4363	19	SCROT (page 1384)	SCROT signal not detected on J1939
4364	18	SCR (page 1331)	Low NOx Conversion Detected
4376	3	DEFSM (page 462)	DEF Return Valve short to PWR
4376	4	DEFSM (page 462)	DEF Return Valve short to GND
4376	7	DEFSM (page 462)	DEF Return Valve - Mechanical system not responding or out of adjustment
4752	4	EGR (page 789)	EGR Cooler Efficiency: EGR outlet Temperature above expected
4765	0	DOCIT (page 586)	DOCIT above Critical Temperature
4765	2	DOCIT (page 586)	DOCIT signal erratic, intermittent, or incorrect
4765	3	DOCIT (page 586)	DOCIT signal Out of Range HIGH
4765	4	DOCIT (page 586)	DOCIT signal Out of Range LOW
4765	16	DOCIT (page 586)	DOCIT Above Maximum Temperature
4792	7	SCR (page 1331)	SCR Catalyst System - Mechanical system not responding or out of adjustment
4792	10	SCR (page 1331)	Aftertreatment 1 SCR System abnormal rate of change
4792	14	SCR (page 1331)	SCR Catalyst System - Out of Calibration
4792	31	SCR (page 1331)	Improper Reductant in DEF Tank

SPN	FMI	Sub-section	Condition Description
4794	31	AFT System (page 120)	SCR Catalyst System Missing
4795	31	AFT System (page 598)	DPFDP excessively LOW (sensor/circuit fault or missing DPF)
5024	10	NOx IN sensor module (page 1237)	NOx IN Sensor Heater abnormal rate of change
5031	10	NOx OUT Sensor Module (page 1268)	NOx OUT Sensor Heater not reading correctly
5125	14	VREF (page 1499)	VREF 7 voltage above or below normal
5126	14	VREF (page 1499)	VREF 8 voltage above or below normal
5127	14	VREF (page 1499)	VREF 9 voltage above or below normal
5246	15	SCR (page 1331)	SCR Tamper Proof Inducement Level 1 status
5298	17	AFT System (page 120)	DOC Conversion Efficiency below minimum
5298	18	AFT System (page 120)	DOC Conversion Efficiency below Warning Pressure
5319	31	DPF System (page 598)	DPF incomplete Regeneration
5394	5	DEFDV (page 389)	DEFDC open load/circuit
5394	7	DEFDV (page 389)	DEF Dosing Valve - Mechanical system not responding
5395	0	EWPS (page 897)	Engine unable to achieve desired idle torque (too high)
5395	1	EWPS (page 897)	Engine unable to achieve desired idle torque (too low)
5397	31	DPF System (page 598)	DPF regenerations are occurring too frequently
5491	3	DEFLHR (page 396)	DEFLHR short to PWR
5491	4	DEFLHR (page 396)	DEFLHR short to GND
5541	2	TC1TOP (page 1403)	TC1TOP does not agree with BARO
5541	3	TC1TOP (page 1403)	TC1TOP signal Out of Range HIGH
5541	4	TC1TOP (page 1403)	TC1TOP signal Out of Range LOW
5542	15	TC1TOP (page 1403)	TC1TOP above desired
5542	16	EBPV (page 689)	EBP Above Desired during CSER
5542	17	TC1TOP (page 1403)	TC1TOP below desired - Check Exhaust Back Pressure Valve
5542	18	EBPV (page 689)	EBP Below Desired during CSER
5543	3	EBPV (page 689)	EBPC short to PWR
5543	4	EBPV (page 689)	EBPC short to GND
5543	5	EBPV (page 689)	EBPC open load/circuit
5548	3	Inlet Air Heater Fuel Igniter (page 1027)	IAHFI short to PWR
5548	4	Inlet Air Heater Fuel Igniter (page 1027)	IAHFI short to GND

SPN	FMI	Sub-section	Condition Description
5548	5	Inlet Air Heater Fuel Igniter (page 1027)	IAHFI open load/circuit
5548	7	Inlet Air Heater Fuel Igniter (page 1027)	Inlet Air Heater Relay return (relay, or igniter, or circuit failure)
5742	3	DOC / DPF Temperature Sensor Module	DPF Thermocouple Controller Out of Range HIGH
5742	4	DOC / DPF Temperature Sensor Module	DPF Thermocouple Controller Out of Range LOW
5742	11	DOC / DPF Temperature Sensor Module	DPF Thermocouple Controller signal erratic, intermittent, or incorrect
5742	16	DOC / DPF Temperature Sensor Module	DPF Thermocouple Controller above Maximum Temperature
5742	19	DOC / DPF Temperature Sensor Module	DPF Thermocouple Controller signal not detect on J1939
5743	3	SCR Temperature Sensor Module Assembly (page 1351)	SCR Thermocouple Controller Out of Range HIGH
5743	4	SCR Temperature Sensor Module Assembly (page 1351)	SCR Thermocouple Controller Out of Range LOW
5743	11	SCR Temperature Sensor Module Assembly (page 1351)	SCR Thermocouple Controller signal erratic, intermittent, or incorrect
5743	16	SCR Temperature Sensor Module Assembly (page 1351)	SCR Thermocouple Controller above Maximum Temperature
5743	19	SCR Temperature Sensor Module Assembly (page 1351)	SCR Thermocouple Controller signal not detect on J1939
5745	3	DEFSMH (page 480)	DEF Dosing Unit Heater Out of Range HIGH
5745	4	DEFSMH (page 480)	DEF Dosing Unit Heater Out of Range LOW
5745	18	DEFSMH (page 480)	DEF Dosing Unit Heater below Warning Temperature
5746	3	DEFSMH (page 480)	DEF Dosing Unit Heater Relay short to PWR
5746	4	DEFSMH (page 480)	DEF Dosing Unit Heater Relay short to GND
5798	2	DEFSMH (page 480)	DEF Dosing Unit Heater Temperature erratic, intermittent or incorrect
5798	10	DEFSMH (page 480)	DEF Dosing Unit Heater Temperature abnormal rate of change
7424	3	SCR (page 1331)	DEF Lamp circuit short to PWR
7424	4	SCR (page 1331)	DEF Lamp circuit short to GND
7424	5	SCR (page 1331)	DEF Lamp circuit open load / circuit

Operational Checkout Procedures

1.0 - Preliminary Vehicle Operational Checkout Procedure

Step 1	Inspect fuel level, quality, and fuel system.	Decision
	Perform Fuel Level Inspection (page 1775), Fuel System Inspection (page 1774), and Fuel Quality Inspection . Are fuel level and quality to specification, and did fuel system pass inspection?	Yes: Go to Step 2. No: Repair fuel system fault. After repairs are complete, retest for original problem.
Step 2	Inspect batteries, electrical system, and connections.	Decision
	Perform Batteries and Electrical System Inspection (page 1710). Are batteries, electrical system, and connections in good condition, tight, not corroded, and is battery voltage in specification?	Yes: Go to Step 3. No: Repair broken, loose, or corroded electrical system connections or components. Charge batteries to 12.6 V. After repairs are complete, retest for original problem.
Step 3	Inspect air intake system for damage or restrictions.	Decision
	Inspect Charge Air Cooler (CAC), Engine Throttle Valve (ETV), Mass Air Flow (MAF) sensor, air filter, intake piping, clamps, and connections for damage or restrictions. Are air intake system components damaged or restricted?	Yes: Repair air intake system damage or restrictions. After repairs are complete, retest for original problem. No: Go to Step 4.
Step 4	Inspect exhaust system for damage or restrictions.	Decision
	Inspect Diesel Oxidation Catalyst (DOC), Diesel Particulate Filter (DPF), Selective Catalyst Reduction (SCR) catalyst, exhaust back pressure valve, and exhaust piping for damage or restrictions. Are exhaust system components damaged or restricted?	Yes: Repair exhaust system damage or restrictions. After repairs are complete, retest for original problem. No: Go to Step 5.

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