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Major System: ENGINES

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Coding Information

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Title: SPN 731 FMI 18 Knock Detected: Unexpected Fueling Without Demand

Applies To: 2010+ MF 11/13, 2013+ N13

CHANGE LOG

<p>01/6/2015 - Added connector composites for reference on rewiring the VSS.</p> <p>09/16/2015 - Updated related fault codes references.</p> <p>06/18/2015 - Added clearing fault code to Step 5. Additional SRT's added for AMT/OBFCT</p> <p>02/26/2015 - Fixed broken (iKNOW) links</p> <p>12/04/2014 - Updated Step 2 to Proceed to Step 8 (instead of Step 9 which does not exist).</p>

DESCRIPTION

This document will guide the user through diagnostics and repair procedures for SPN 731 FMI 18 (Knock Detected). It is important to thoroughly review the document as serious engine damage can occur if warnings are not heeded. As such, safeguards had been included in certain calibrations to prevent engine restart after the codes have been set.

NOTE:

An interview with the driver of the unit at the time of the fault code setting is critical with assisting in the troubleshooting process.

Common questions:

- Was the vehicle in motion
- Was the unit in PTO
- Has this truck been down for a major repair(s) recently

SYMPTOMS

Diagnostic Trouble Codes & Dashboard Indicator Lights:

DTC/Light	Description
SPN 731 FMI 18	Knock Detected: Unexpected Fueling Without Demand

Customer Observations or Concerns:

- Red Stop Lamp with audible alarm
- Engine self shut-down
- Inability to restart engine
- Unrequested engine acceleration

Fault Code Entry Conditions:

731-18 Knock Detected: Unexpected Fueling Without Demand		
Condition / Description	Setting Criteria	Enable Conditions / Values
The monitoring of fuel quantity needed to maintain engine speed	An increase in engine speed without an increase in fuel quantity demand.	<ul style="list-style-type: none"> • Vehicle Speed = 0 MPH

		<ul style="list-style-type: none"> • Engine Speed >500RPM <1600RPM • Engine Speed set point stable (no rapid accelerations) • Accelerator Pedal stable (no rapid movements) • Manual Transmission Clutch Pedal = 0 (not depressed) • Coolant Temperature >-9 C. <120 C. (>15 F. <248 F.) • No active faults with (listed below) <ul style="list-style-type: none"> ◦ ECT1 or ECT2 (Engine Coolant Temp) ◦ APP (Accelerator Pedal Position) ◦ VSS (Vehicle Speed Sensor) ◦ Clutch Switch ◦ Transmission Gear (Auto-manual, Auto) ◦ CKP (Crankshaft Position) ◦ CMP (Camshaft Position)
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Related Fault Codes:

SPN	FMI	Description	Diagnostic Path
190	0	Engine Overspeed Most Sever Level	Reference IK1201048
190	11	Engine Overspeed Vehicle Event	Continue with 731 diagnostics
190	15	Engine Overspeed Detected	Continue with 731 diagnostics
1322	31	Misfire - Multiple Cylinders	Reference Diagnostic Manual
132x	31	Misfire - Cylinder X(1-6)	Reference Diagnostic Manual
731	16	Knock Detected: Cylinder Acceleration Above Normal	Reference IK1201012

SPECIAL TOOLS / SOFTWARE

Tool Description	Tool Number	Comments	Instructions
Electronic Service Tool		ServiceMaxx, EZ Tech, ect	

SERVICE PARTS INFORMATION

Kit Description	Part Number	Qty	Notes
Kit, HP Turbo Cartridge	2511792C91	1	Cartridge should be used unless guided to replace complete turbo by IKnow IK1200909
Turbocharger Ass Hi Press 11L	3005698C9x	1	Cartridge should be used from compete unless guided to replace complete turbo by IKnow IK1200909
Tube Assembly, Oil Supply	3018397C9x	1	Updated routing for oil supply line
Kit, Turbo Supply Line Fitting	2512772C9x	1	Kit is needed if not equipped with new line prior to repair.
Prostar 122 Heater Hose Routin	2513145C91	1	Kit is needed if not equipped with new line prior to repair.
O-Ring, #118 0.862"x0.965"	1820907C2	1	If necessary
21 Way Connector - Female Terminal	3803140C1	2	Test Procedures/ Vehicle Speed Sensor Circuit Rewire
21 Way Connector - Female Terminal Seal	3803134C1	2	Test Procedures/ Vehicle Speed Sensor Circuit Rewire
Bulk Data Link Cable (Twisted/Shielded)	3519281C2	Bulk	Test Procedures/ Vehicle Speed Sensor Circuit Rewire
VSS Terminal	3554322C1	2	Test Procedures/ Vehicle Speed Sensor Circuit Rewire
VSS Seal Sleeve	3554318C1	2	Test Procedures/ Vehicle Speed Sensor Circuit Rewire

DIAGNOSTIC STEPS**Diagnostics for 731-18 Knock Detected: Unexpected Fueling without Demand**

Step	Action	Decision
1	Check for oil in the Intake	

	Remove boost air piping at the outlet of the turbo and outlet of the CAC. Inspect piping for large amounts of oil.	Yes. Proceed to Step 2.
	Is there a significant amount of oil present in the boost air piping?	No. Proceed to Step 3.

Step	Action	Decision
2	<p>Perform the following:</p> <p>Note: The following repairs do not need approval from Tech Services</p> <ul style="list-style-type: none"> • Replace Turbo Center Section (Refer to TSI 13-12-05R1 for procedure). • Clean CAC (Refer to TSI-13-12-17R1) • Verify that oil has not reached the DOC. If it has the DOC and DPF need to be removed to drain. (Refer to Open TSI's and Service Manual for procedure). • iApprove will need to be started and pictures are required for the inlet/outlet of the DOC (Diesel Oxidation Catalyst) and DPF (Diesel Particulate Filter). Location of the iApprove on the Vehicle Information Page, iApprove Tab <p>Note: Verify the engine will bar over by hand before starting when repairs are complete.</p>	Proceed to Step 8

Step	Action	Decision
3	Verify Application per Driver Interview	Yes. Proceed to Step 4
	Does the unit in question require a PTO mode while driving?	No. Proceed to Step 5

Step	Action	Decision
4	Verify application and parameters	Yes. Proceed to Step 5.
	Does the unit have a true Split Shaft (Auxiliary case that splits the drive line ie. Transfer Case) with a secondary VSS (Vehicle Speed Sensor)?	<p>No. Verify that PID 89101 Transfer Case Switch Signal Source is set to Drive Line Engaged. Not Split Shaft Engaged.</p> <ul style="list-style-type: none"> • Verify Fault Code does not set after the PID change. • Verify the PTO operation after PID change. <p>Note: Some applications will require wiring changes per the body builder. Contact the body builder for instructions.</p>

Step	Action	Decision
5	Use an EST (Electronic Service Tool) to perform the following:	Yes: AMT (Air Management Test) Proceed to Step 6.
	<ul style="list-style-type: none"> • Clear Fault Code (A 30 second key off period after clearing the fault is required for this fault. If the key cycle is performed the fault will return immediately) • Run an AMT (Air Management Test), and a OBFCT (On Board Filter Cleanliness Test). 	Yes: OBFCT (On Board Filter Cleanliness Test) Please Submit a Case File to Big Bore Engine Support for further assistance.
	Does the fault code come active during one of the tests?	No: Proceed to Step 7.

Step	Action	Decision
6	Perform engine fan testing	Yes. Proceed to Step 7.
	Unplug the engine fan and rerun the AMT (Air Management Test). Did the fault return during the AMT (Air Management Test)?	No. Replace the Engine Fan and retest

Step	Action	Decision
7	Perform Vehicle Speed Sensor testing 1. Did the fault code set while in motion? (Driver Interview is needed) 2. If the driver is unavailable go to Test Procedure(s)/ Low Idle Creep Test for VSS (Vehicle Speed Sensor) Operation. Did the fault code set while in motion or fail the creep test?	Yes. Replace the VSS (Vehicle Speed Sensor) and Circuit. Proceed to Test Procedures/ Vehicle Speed Sensor Circuit Rewire for instructions.
		Once repairs are made retest for fault code/VSS (Vehicle Speed Sensor) operation. No. Submit a Case File to Big Bore Engine Support for further assistance.

Step	Action	Decision
8	DIAGNOSTIC: Flywheel Relearn Follow IK1200646 for procedure. Once completed retest for the fault SPN 731 FMI 18. Note: If fault SPN 731 FMI 16 comes active follow IK1201012 . Did the fault code return?	Yes. Proceed to Step 3
		No. Diagnostic Complete

TEST PROCEDURE(s)

Low Idle Creep Test

NOTE:
Truck needs to be in an open semi-flat area where there is enough room to drive.

For manual Transmissions

1. Connect EST (Engine Service Tool) to the truck
2. Start Engine
3. Select a low gear
4. Release clutch allowing the engine to idle the truck in gear.
5. Once surging smooth's out verify that the VSS (Vehicle Speed Sensor) is reading smoothly.

For Automatic Auto/Manual Transmissions

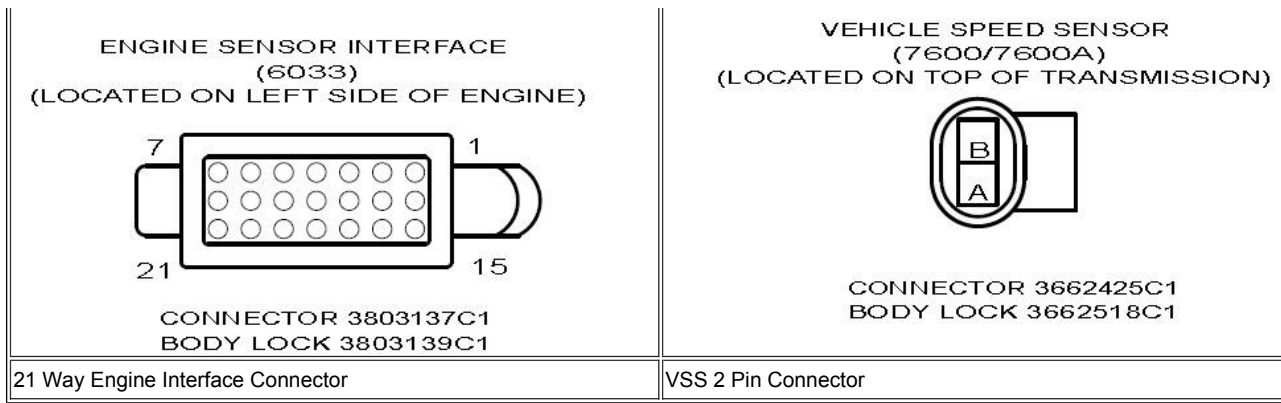
1. Connect EST (Engine Service Tool) to the truck
2. Start Engine
3. Select manual mode if available (if not put in to low gear)
4. Select the lowest available gear
5. Allow the engine to drive the unit
6. Verify that the VSS (Vehicle Speed Sensor) is reading smoothly.

Vehicle Speed Sensor Circuit Rewire



1. (6033) - 21 Way Engine Interface Connector (Location - Left Side of engine behind the ECM)
2. (7600)VSS (Vehicle Speed Sensor) 2 pin Connector (Location - tail shaft of Transmission)

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CAUTION:

Be sure to disconnect the batteries to prevent damage to electrical circuits.

1. Disconnect Vehicles Batteries
2. Install 1 - 3803140C1 and 3803134C1 on the yellow and green wires of 3519281C2 - Bulk Data Link Cable (twisted/shielded).
3. Locate the 21 Way Engine Interface Connector (see schematic above) and disconnect.
4. Remove lock and connector
5. Remove the connector back shell
6. Locate pin cavity 12 and 13.
7. Remove pins cavity 12 and 13.
8. Insert the green wire installed in pin cavity 13 (Pin and Seal should already be installed from previous steps)
9. Insert the yellow wire installed in pin cavity 12 (Pin and Seal should already be installed from previous steps)
10. Route harness to the VSS (Vehicle Speed Sensor) making sure that the harness doesn't contact any sharp objects.
11. Locate pin A and B on the VSS connector
12. Remove the pins from the VSS Connector
13. Install 1 3554322C1 and 3554318C1 on the yellow and green wires 3519281C2 - Bulk Data Link Cable (twisted/shielded).
14. Install the green wire in Pin Cavity B
15. Install the Yellow wire in Pin Cavity A
16. Secure the Harness to ensure it does not have contact with any sharp objects
17. Reinstall the 21 Way Engine Interface Connector
18. Reconnect Vehicles Batteries.

WARRANTY INFORMATION

Warranty Claim Coding:

Group:	12000 - Engine
Noun:	As Repaired

Standard Repair Times:

Step	Description	Chassis	Engine	SRT	Hours
1/2	Visual Inspection	ProStar+ 113/122	2010 MF 11/13, 2013 N13	R12-2117U	0.3 hr
		Transtar (8600)	2010 MF 11/13, 2013 N13	Q12-2117U	0.3 hr
		WorkStar	2010 MF 11/13, 2013 N13	N12-2117U	0.3 hr
		PayStar (5000)	2010 MF 11/13, 2013 N13	T12-2117U	0.3 hr
1	Turbo Center Section (Cartridge) Removal and Installation	ProStar+ 113/122	2010 MF 11/13, 2013 N13	R12-6135U-21	2.3 hr

		Transtar (8600)	2010 MF 11/13, 2013 N13	Q12-6135U-21	2.3 hr
		WorkStar	2010 MF 11/13, 2013 N13	N12-6135U-21	2.3 hr
		PayStar (5000)	2010 MF 11/13, 2013 N13	T12-6135U-21	2.3 hr
1	CAC Cleaning	All	2010 MF 11/13, 2013 N13	A09-3925A	1.1 hr
1	Calibration Update	All	2010 MF 11/13, 2013 N13	A12-3510A-20	0.5 hr
1	DOC/DPF Removal and Inspection	Horizontal Aftertreatment	2010 MF 11/13, 2013 N13	A12-4901	0.9 hr
		Vertical Aftertreatment	2010 MF 11/13, 2013 N13	A12-4903	1.0 hr
3/4	Electronic Service Tool Testing	All	2010 MF 11/13, 2013 N13	T-Time	0.3 hr
		ProStar		R12-2209U	0.2 hr
		TranStar (8600)		Q12-2209U	0.2 hr
5	On-Board Filter Cleanliness Test	PayStar (5000)	2010 MF 11/13	T12-2209U	0.2 hr
		WorkStar		N12-2209U	0.2 hr
		LoneStar		S23-2209U	0.2 hr
		CT610		TC12-2209U	0.2 hr
5/6	Air Management Test	All Models	2010 MF 11/13, 2013 N13	A12-2177U	0.1 hr
7	Low Idle Creep Test	All Models	2010 MF 11/13, 2013 N13	T-Time	0.3 hr
8	VSS Rewire	All Models	2010 MF 11/13, 2013 N13	T-Time	0.8 hr

[SRT Manual](#)

OTHER RESOURCES

[Master Service Information Site](#)

[2010 MaxxForce 11/13 Resource Center \(IK1200548\)](#)

[2010 MaxxForce 11/13 Diagnostic Manual](#)

[2010 MaxxForce 11/13 Service Manual](#)

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