



Countries: CANADA, UNITED STATES **Document ID:** IK1200915
Availability: ISIS **Revision:** 25
Major System: ENGINES **Created:** 6/7/2013
Current Language: English **Last Modified:** 2/24/2016
Other Languages: [Español](#) **Author:** Mujtaba Aidroos
Viewed: 12436

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Coding Information

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Title: SPN132(x) - FMI 31 Misfire Diagnostics IBB

Applies To: EPA 2010, 2013 and 2015 11L & 13L Engines

CHANGE LOG

02/24/2016 - Article updated to further explain CPA testing procedure and Cam & Crank correct polarity error
 01/20/2016 - Article updated for CPA testing and case file data archiving.
 10/19/2015 - Article was republished for a few months for data testing.
 08/17/2015 - Retired article. Refer to the diagnostics in manual 1741.
 08/13/2015 - Author updated for feedback purposes.
 07/16/2015 - Fixed SRTs for Injector Replacement (note: For ProStar, injectors can be replaced w/out pulling the dog box--new SRT)
 06/24/2015 - Fixed broken link to Cylinder Balance Test, fixed coding for New Zealand

DESCRIPTION

This document provides diagnostics and repair procedures for SPN 132x FMI 31 Misfire Cylinder - (x) fault codes. Thoroughly review the document to ensure that the engine is repaired correctly and within warranty guidelines. Safeguards have been included in certain calibrations to prevent engine damage, and will not allow the engine to restart.

NOTE:

Navistar is no longer replacing Cylinder Heads for a fallen Valve Bridge. Cylinder Heads are cleanable and able to return to service.

If you are a fleet customer and do not have access to the Case File System, the truck will need to go to a local dealership for repairs.

NOTE:

An interview with the driver of the unit at the time of the fault code setting is critical with assisting the troubleshooting process
Common questions:

- Is there a low power with the fault code
- Does the unit have a rough running engine
- Has the unit been down for a major repair (s) recently

SYMPTOMS

Diagnostic Trouble Codes:

DTC/Light	Description
SPN 1322 FMI 31 (link to SARP)	Misfire - Multiple Cylinders
SPN 1323 FMI 31 (link to SARP)	Misfire - Cylinder 1
SPN 1324 FMI 31	Misfire - Cylinder 2
SPN 1325 FMI 31	Misfire - Cylinder 3
SPN 1326 FMI 31	Misfire - Cylinder 4
SPN 1327 FMI 31	Misfire - Cylinder 5

SPN 1328 FMI 31

Misfire - Cylinder 6

Customer Observations or Concerns:

- Misfire or rough running engine
- Engine Self Shut-down
- MIL Lamp

Fault Code Entry Conditions:

Condition / Description	Setting Criteria	Enable Conditions / Values	Time Required
Crankshaft acceleration indicates misfire on individual cylinders or Crankshaft acceleration indicates misfire on multiple cylinders	Misfire event count >180	• Engine speed >500 rpm and <950 rpm • Time after Key On > 0 seconds • Battery voltage > 10.7 Volts • Battery voltage <15 Volts • Key On • ABS, value idle speed error <200 rpm • ECT1 >29.96 C • Vehicle Speed <1.864 mph • DPF regeneration request disabled • Timing Wheel Adaptation learning complete (Wheel learn)	440 Revolutions

Related Fault Codes:

DTC/Light	Description
SPN 731 FMI 16 (link to SARP)	Knock Detected: Cylinder Acceleration above Normal
SPN 111 FMI 1 (link to SARP)	Low Coolant Level

SPECIAL TOOLS / SOFTWARE

Tool Description	Tool Number	Comments	Instructions
EST (Engine Service tool)		Servicemaxx, EZ Tech, ect	
CPA Tool			

SERVICE PARTS INFORMATION

Kit Description	Part Number	Quantity Required	Notes
Kit, Cylinder Head Removal	3007651C9x	1	All
Kit, Cylinder Head	3007648C9x	1	All
Gasket, 13L Cylinder Head	62039010402	1	13L Only
Gasket, 11L Cylinder Head	62039010403	1	11L Only
Sensor Lambda	3006233Cx	1	All
Kit, Oil Filter	3007498C9x	1	All
Oil (Customer Determined)	NA		
Fluid EGR Cleaning	3015979C1	2.5	All
Kit, Oil Centrifuge Filter	2606467C9x	1	2010+ MF 11/13L

DIAGNOSTIC STEPS

Before following SPN132(x)- FMI 31 diagnostics please perform CPA RCT (relative compression test) and CPA Injector test before diagnostics and after repairs are

completed. You will NOT receive a WAC from any of the tests. Please note, DO NOT open a case file until after pre and post repair CPA data has been completed. The work package must followed and CPA data must be completed BEFORE opening a case file.

Step 1: Follow directions in the document below. Record CPA data **before** diagnostics. If the test does not prompt you to stop cranking during the RCT portion then crank for 10 seconds then key off for 3 seconds then repeat 2 more times for a total of 3 cranking sessions then **stop** the recording.

[13L CPA RCT and Injector test](#) (Please open and print for your convenience. Make sure to check for updates to the CPA test procedure as they will change)

Step 2: Follow SPN132(x)-FMI 31 misfire diagnostics as they are listed in the FCAP work package. Follow the links based on the fault(s) listed in the health report. **Do NOT open a case file until the work package has been completed.**

Please follow the links below if you have a 2013-2015/N13 engine

1322-31 https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601_x1322x31fcap.xml
 1323-31 https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601_x1323x31fcap.xml
 1324-31 https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601_x1324x31fcap.xml
 1325-31 https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601_x1325x31fcap.xml
 1326-31 https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601_x1326x31fcap.xml
 1327-31 https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601_x1327x31fcap.xml
 1328-31 https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601_x1328x31fcap.xml

Please follow the links below if you have a 2010-2012/MX13 engine

1323-31 https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000001741_x1323x31fcap.xml
 1324-31 https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000001741_x1324x31fcap.xml
 1325-31 https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000001741_x1325x31fcap.xml
 1326-31 https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000001741_x1326x31fcap.xml
 1327-31 https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000001741_x1327x31fcap.xml
 1328-31 https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000001741_x1328x31fcap.xml

Step 3: **If parts were replaced**, perform CPA RCT and CPA Injector test again (use the PDF listed in Step 1).

Step 4: Open a case file and attach the before and after CPA recordings. In the case file description add notes explaining that the case file is for CPA data ONLY and what the final repair involved. **Please do NOT open a case file until pre and post repair CPA data has been completed and all repairs have been completed.**

Step 5: If the resolution involved replacing injector(s) then ask to have the injector(s) blue tag returned to Muj Aidroos at the Woodridge facility. Tech Services will then close the case file. Also, please give feedback. If you are receiving errors or have any issues please add those comments or screen shots of the issues to the case file if possible.

TECH TIPS

For Head Replacements

1. Transfer 6 injector hold down spacer pucks beneath the injector hold downs over to the new head (Figure 1)
2. Compare the new and old Cylinder Head Gaskets. If an 11L Cylinder Head Gasket is installed on a 13L engine it will prevent the pistons from reaching top dead center once the head is torqued down. since the bore size is smaller than a 13L Piston.
 - A. 11L Gasket does NOT have a notch at the RR corner of the cylinder head gasket (Figure 2)
 - B. 13L Gasket does have a notch at the RR corner of the cylinder head gasket (Figure 3)
3. Be sure to properly time the cam gear per the service manual.
4. Reuse the Cam Bearings unless they are damaged



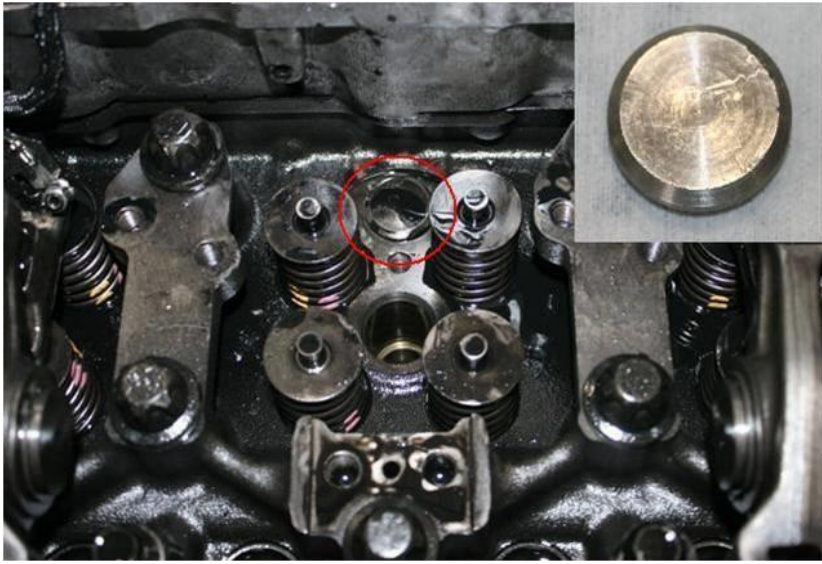


Figure 1: Injector Hold Down Puck



Figure 2: 11L Head Gasket

1: No Notch



Figure 3: 13L Head Gasket

1: Notch out for Cylinder Head



Figure 4: Cylinder Head Camshaft Bearing Caps

Some 2010 EPA heads have older style cam caps--they are okay to use and should be torqued to the 2010 service manual specs (18 lb-ft).

TEST PROCEDURE(s)

Cylinder Balance Procedure:

1. Open EST (Engine Service Tool)
2. Connect to the engine
3. Go to Test/ KOER Test/ Cylinder Balance
4. Start the Engine and allow the Cylinder (x) Crankshaft Angular Velocity Data Values to stabilize.
5. Slowly accelerate the engine up to 1500 rpm keeping Actual Engine Torque (#2 in example below) below 150 lb-ft. Run engine at 1500 RPM for 5 min.
6. Referencing the values (#1 in example below). Locate the Cylinder(s) that are running outside or higher than the rest.

Example:

- Cylinder 1 - Value: 0.7
- Cylinder 2 - Value: -0.1

- Cylinder 3 - Value: -0.2
- Cylinder 4 - Value: -0.2
- Cylinder 5 - Value: -0.2
- Cylinder 6 - Value: -0.2

Cylinder 1 is reading the highest and is not consistent with the other 5 cylinders. Therefore, this cylinder is suspect for the fault.

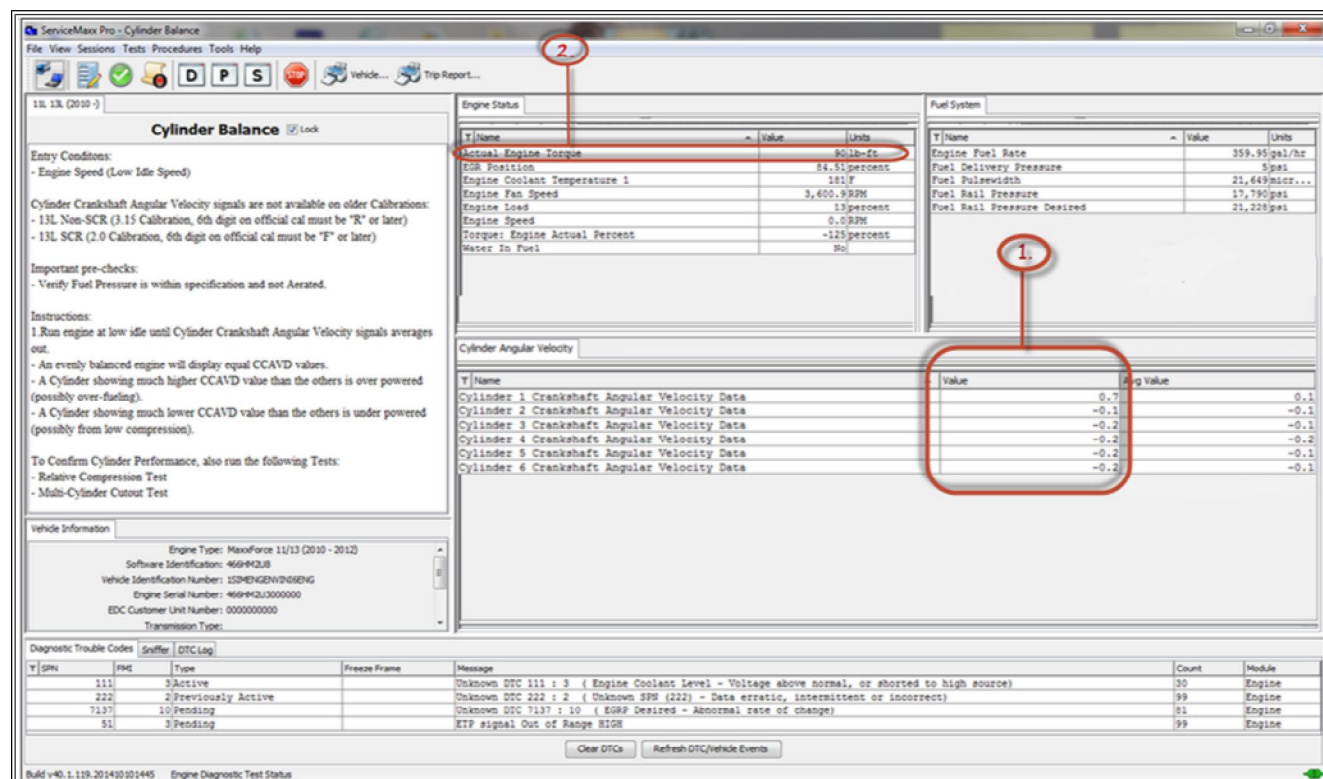


Figure 5. Screen Shot of Cylinder Balance Session

Item 1: Cylinder (x) Crankshaft Angular Velocity Data - Average Values

Item 2: Actual Engine Torque Value

WARRANTY INFORMATION

Warranty Claim Coding:

Group:	As Repaired
Noun:	As Repaired

Standard Repair Times:

Step	Description	Chassis	Engine	SRT	Hours
1.	Valve Cover Remove and Install	ProStar	2010+ MF 11/13 2013+ N13	R12-1564U	
		TranStar (8600)	2010+ MF 11/13 2013+N13	Q12-1564U	
		WorkStar	2010+ MF 11/13 2013+ N13	N12-1564U	
		PayStar	2010+ MF 11/13 2013+ N13	T12-1564U	
1.	Cylinder Head Inspection	ProStar	2010+ MF 11/13 2013+ N13	R12-2117U	

		TranStar (8600)	2010+ MF 11/13 2013+ N13	Q12-2117U	
		WorkStar	2010+ MF 11/13 2013+ N13	N12-2117U	
		PayStar (5000)	2010+ MF 11/13 2013+ N13	T12-2117U	
4.	Cylinder Head Cleaning	All			
		ProStar 122	2010+ MF 11/13 2013+ N13	R12-1342L	
		Prostar 113	2010+ MF 11/13 2013+ N13	R12-1342L-20	
6.	Cylinder Head Replace	TranStar (8600)	2010+ MF 11/13 2013+ N13	Q12-1342U	
		WorkStar	2010+ MF 11/13 2013+ N13	N12-1342U	
		PayStar (5000)	2010+ MF 11/13 2013+ N13	T12-1342U	
			2010+ MF 11/13 2013+ N13	R12-7563U-20	
		ProStar			
		Each Additional		R12-7563U-11	
			2010+ MF 11/13 2013+ N13	Q12-7563U	
		TranStar (8600)			
		Each Additional		Q12-7563U-11	
5.	Injector Replacement (One)				
			2010+ MF 11/13 2013+ N13	N12-7563U	
		WorkStar			
		Each Additional		N12-7563U-11	
			2010+ MF 11/13 2013+ N13	T12-7563U	
		PayStar (5000)			
		Each Additional		T12-7563U-11	
6.	Injector/RCT CPA	All	2010+MF 11/13 2013+N13	T Time	.7

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