



Countries: CANADA, UNITED STATES Document ID: IK1200915  
 Availability: ISIS Revision: 23  
 Major System: ENGINES Created: 6/7/2013  
 Current Language: English Last Modified: 1/25/2016  
 Other Languages: [Español](#) Author: Mujtaba Aidroos  
 Viewed: 12030

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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

- 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
- 01/13/2015 - Fixed broken links to iKNOW Article's in Diagnostic Steps

## 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	<ul style="list-style-type: none"> <li>• Engine speed &gt;500 rpm and &lt;950 rpm</li> <li>• Time after Key On &gt; 0 seconds</li> <li>• Battery voltage &gt; 10.7 Volts</li> <li>• Battery voltage &lt;15 Volts</li> <li>• Key On</li> <li>• ABS, value idle speed error &lt;200 rpm</li> <li>• ECT1 &gt;29.96 C</li> <li>• Vehicle Speed &lt;1.864 mph</li> <li>• DPF regeneration request disabled</li> <li>• Timing Wheel Adaptation learning complete (Wheel learn)</li> </ul>	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.

Step 1: Follow directions in the document below. Record CPA data before diagnostics.

[13L CPA RCT and Injector test](#) (open and print out)

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.

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](https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601_x1322x31fcap.xml)  
1323-31 [https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601\\_x1323x31fcap.xml](https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601_x1323x31fcap.xml)  
1324-31 [https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601\\_x1324x31fcap.xml](https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601_x1324x31fcap.xml)  
1325-31 [https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601\\_x1325x31fcap.xml](https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601_x1325x31fcap.xml)  
1326-31 [https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601\\_x1326x31fcap.xml](https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601_x1326x31fcap.xml)  
1327-31 [https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601\\_x1327x31fcap.xml](https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601_x1327x31fcap.xml)  
1328-31 [https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000004601\\_x1328x31fcap.xml](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](https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000001741_x1323x31fcap.xml)  
1324-31 [https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000001741\\_x1324x31fcap.xml](https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000001741_x1324x31fcap.xml)  
1325-31 [https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000001741\\_x1325x31fcap.xml](https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000001741_x1325x31fcap.xml)  
1326-31 [https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000001741\\_x1326x31fcap.xml](https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000001741_x1326x31fcap.xml)  
1327-31 [https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000001741\\_x1327x31fcap.xml](https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000001741_x1327x31fcap.xml)  
1328-31 [https://evaluate.internationaldelivers.com/service/SVCDOCS/Navistar/engine/0000001741\\_x1328x31fcap.xml](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.

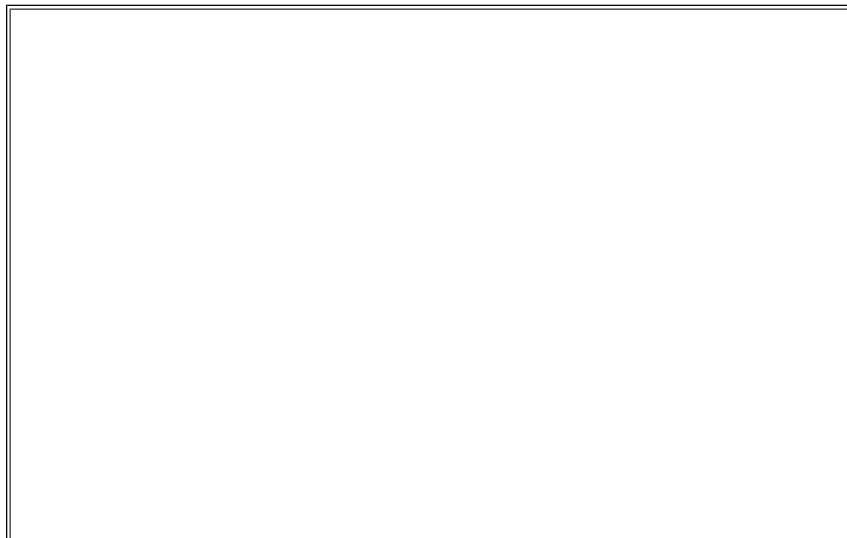
If the resolution involved replacing injector(s) then ask to have the injector(s) blue tag returned to Muj Aidroos at the Woodridge facility. Tech Services will then close the case file.

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## **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



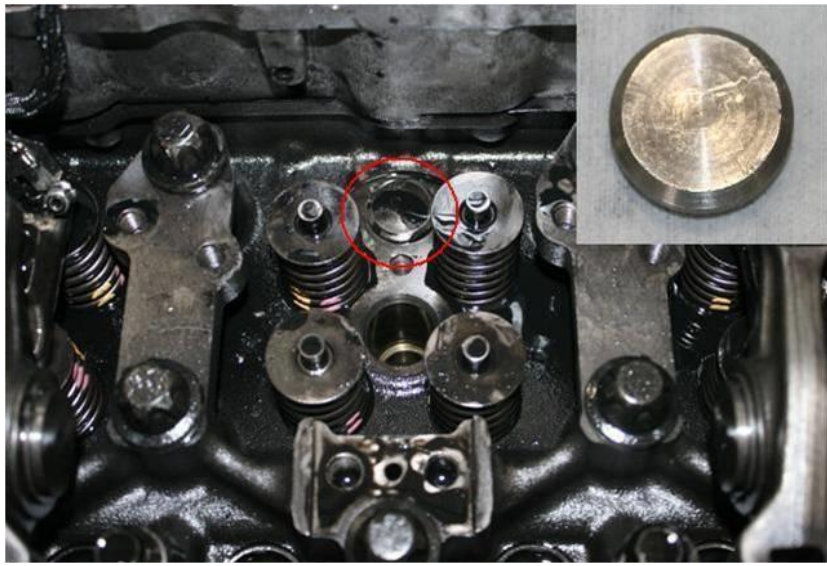


Figure 1: Injector Hold Down Puck



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:**

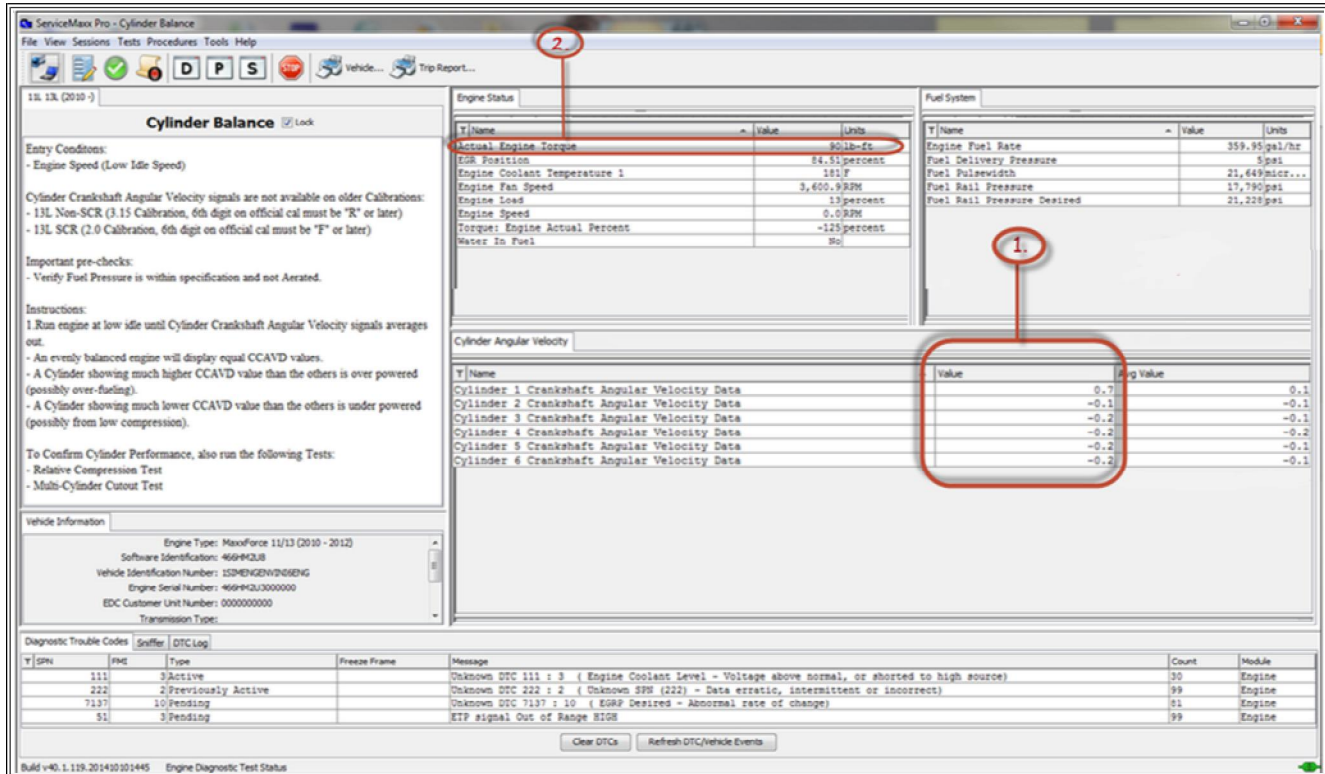
1. Open EST (Engine Service Tool)
2. Connect to the engine
3. Go to Test/ KOER Test/ Cylinder Balance
4. Start the Engine and allow the Cylinder (x) Crankshaft Angular Velocity Data Values to stabilize.
5. Slowly accelerate the engine up to 1500 rpm keeping Actual Engine Torque (#2 in example below) 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:

<b>Group:</b>	As Repaired
<b>Noun:</b>	As Repaired

### Standard Repair Times:

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

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

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