| | | | |
|---|---|---|---|
| **Countries:** | RUSSIA, AUSTRALIA, BAHAMAS, BOLIVIA, BELIZE, CANADA, CHILE, TAIWAN, COLOMBIA, COSTA RICA, DOMINICAN REPUBLIC, ECUADOR, EL SALVADOR, TRINIDAD AND TOBAGO, UNITED STATES, URUGUAY, VENEZUELA, MEXICO, ARUBA, NICARAGUA, PERU, PUERTO RICO, Curaçao, GUAM, GUATEMALA, GUYANA, HAITI, HONDURAS, JAMAICA, KOREA, SOUTH KOREA, NEW ZEALAND, PANAMA, SOUTH AFRICA | **Document ID:** | IK1200915 |
| **Availability:** | ISIS, FleetISIS | **Revision:** | 17 |
| **Major System:** | ENGINES | **Created:** | 6/7/2013 |
| **Current Language:** | English | **Last Modified:** | 7/16/2015 |
| **Other Languages:** | NONE | **Author:** | Jay Weston |
| **Viewed:** | 11497 | | |

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**Title: 132(x) - 31 Misfire Diagnostics IBB**

**Applies To: EPA 2010 11L & 13L Engines**

## CHANGE LOG

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.
12/15/2015 - Fixed diagnostic step numbering
12/02/2014 - Updated repair procedure

## DESCRIPTION

This document will guide the user through diagnostics and repair procedures for SPN 132x FMI 31 Misfire Cylinder - (x) fault codes. It is important to 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<br>or<br>Crankshaft acceleration indicates misfire on multiple cylinders | Misfire event count >180 | • Engine speed >500 rpm and <950 rpm<br>• Time after Key On > 0 seconds<br>• Battery voltage > 10.7 Volts<br>• Battery voltage <15 Volts<br>• Key On<br>• ABS. value idle speed error <200 rpm<br>• ECT1 >29.96 C<br>• Vehicle Speed <1.864 mph<br>• DPF regeneration request disabled<br>• 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 | |

## 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 Lamda | 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

| Step | Action | Decision |
|---|---|---|
| 1. | **Inspect the overhead**<br><br>Remove the valve cover and inspect bridges.<br><br>Is there a fallen valve bridge? | **Yes.** Verify there is no damage to the valve stems, valve keeper or valve. Reinstall the Valve Bridge and adjust lash. Verify that the engine can be bared over by hand.<br><br>Proceed to Step 2. |
| | | **No.** Proceed to Step 4. |

| Step | Action | Decision |
|---|---|---|
| 2. | **Verify coolant loss**<br><br>Check for a SPN 111 FMI1 Low Coolant Level or a complaint of coolant loss.<br><br>Does the engine have a SPN 111 FMI 1 Low Coolant Level or have a complaint of coolant loss? | **Yes**. Proceed to IKnow IK1201066<br><br>Once the coolant loss is identified and resolved. Proceed to Step 3. |
| | | **No**. Proceed to Step 3. |

| Step | Action | Decision |
|---|---|---|
| 3. | **Clean cylinder head**<br><br>Follow IKnow IK1201124 for the procedure.<br><br>After Repairs are complete, perform Crankshaft Relearn Procedure, per IK1200646 and verify engine operation of the engine with a test drive.<br><br>Is there still a Misfire? | **Yes**. Proceed to Step 4 |
| | | **No**. Diagnostics Complete |

| Step | Action | Decision |
|---|---|---|
| 4. | **Perform multi-cylinder cut-out test**<br><br>Connect EST (Engine Service Tool)<br>Run the Multi-Cylinder Cut Out Test manually cutting out 5 cylinders at a time.<br><br>Do all 6 cylinder hold RPM? | **Yes**. Proceed to Step 5. |
| | | **No**. Replace the injector at all the locations that would not hold RPM. Once repairs are complete retest. |

| Step | Action | Decision |
|---|---|---|
| 5. | **Perform cylinder balance test**<br><br>See "Test Procedures" below or click for Cylinder Balance Test.<br><br>Are all 6 Cylinders within ± 0.3? | **Yes**. Diagnostics Complete |
| | | **No**. Remove the engines Oil Pan and inspect the cylinders for damage. Examples:<br><br>• Bent Rods<br>• Damage to engine block<br><br>If no damage is found remove the Cylinder Head and inspect the cylinder location that was identified in the Cylinder Balance Test for a loss of compression. Possible Causes<br><br>• Bent Valves<br>• Stuck Rings |

## 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

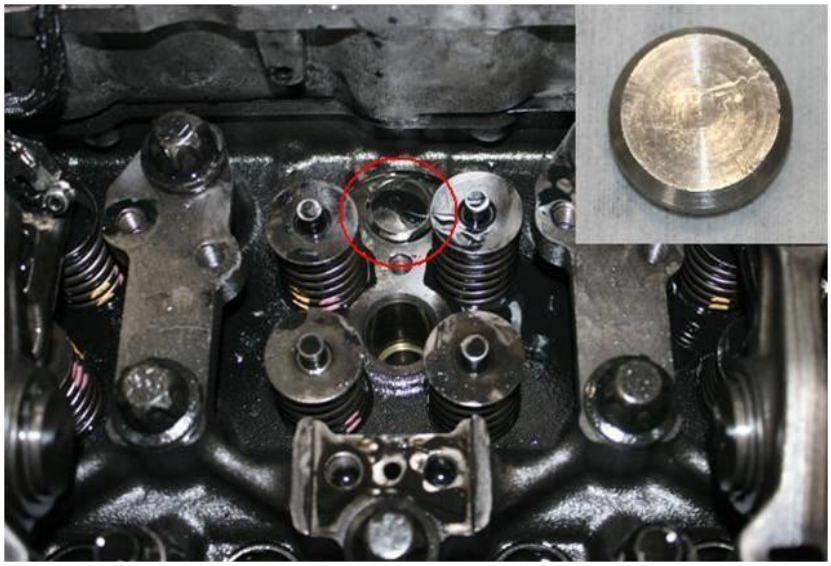

**Figure 1: Injector Hold Down Puck**

**Figure 2: 11L Head Gasket**

1: No Notch

**Figure 3: 13L Head Gasket**

1: Notch out for Cylinder Head

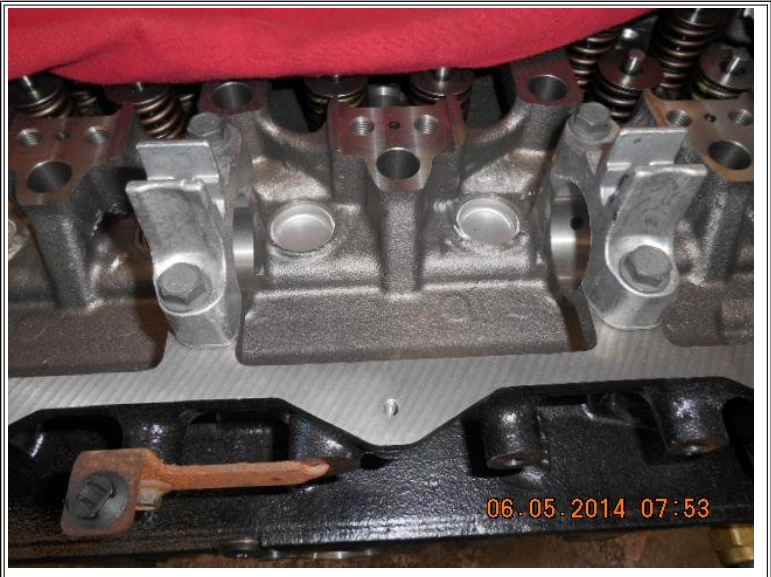


**Figure 4: Cylinder Head Camshaft Bearing Caps**

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.

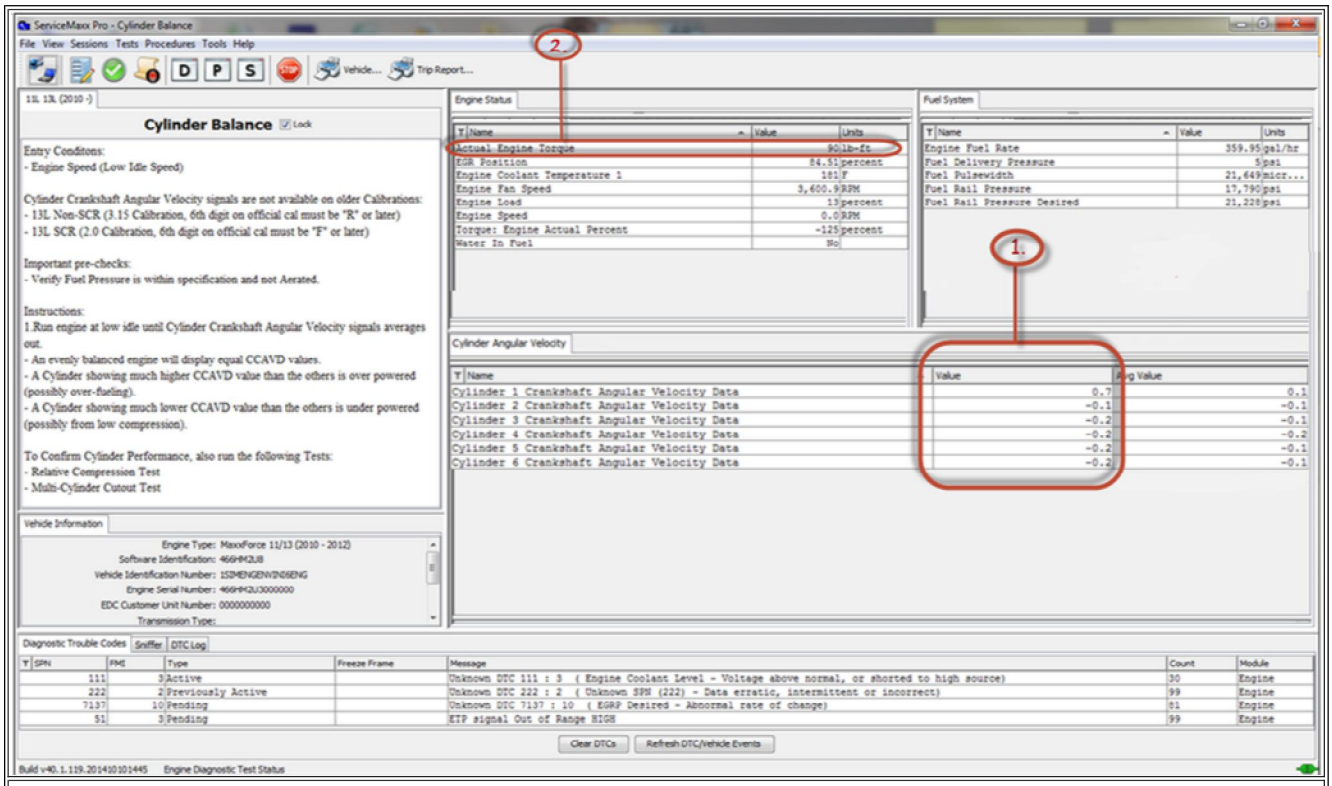


**Figure 5. Screen Shot of Cylinder Balance Session**

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 | 2.2 |
| | | TranStar (8600) | 2010+ MF 11/13 2013+N13 | Q12-1564U | 1.5 |
| | | WorkStar | 2010+ MF 11/13 2013+ N13 | N12-1564U | 1.5 |
| | | PayStar | 2010+ MF 11/13 2013+ N13 | T12-1564U | 1.5 |
| 1. | Cylinder Head Inspection | ProStar | 2010+ MF 11/13 2013+ N13 | R12-2117U | 0.3 |

| | | | | | |
|---|---|---|---|---|---|
| | | TranStar (8600) | 2010+ MF 11/13 2013+ N13 | Q12-2117U | 0.3 |
| | | WorkStar | 2010+ MF 11/13 2013+ N13 | N12-2117U | 0.3 |
| | | PayStar (5000) | 2010+ MF 11/13 2013+ N13 | T12-2117U | 0.3 |
| 4. | Cylinder Head Cleaning | All | | | 3.4 |
| 6. | Cylinder Head Replace | ProStar 122 | 2010+ MF 11/13 2013+ N13 | R12-1342L | 20.2 |
| | | Prostar 113 | 2010+ MF 11/13 2013+ N13 | R12-1342L-20 | 19.9 |
| | | TranStar (8600) | 2010+ MF 11/13 2013+ N13 | Q12-1342U | 18.9 |
| | | WorkStar | 2010+ MF 11/13 2013+ N13 | N12-1342U | 19.9 |
| | | PayStar (5000) | 2010+ MF 11/13 2013+ N13 | T12-1342U | 18.9 |
| 5. | Injector Replacement (One) | ProStar | 2010+ MF 11/13 2013+ N13 | R12-7563U-20 | 1.6 |
| | | | Each Additional | R12-7563U-11 | 0.3 |
| | | TranStar (8600) | 2010+ MF 11/13 2013+ N13 | Q12-7563U | 3.3 |
| | | | Each Additional | Q12-7563U-11 | 0.3 |
| | | WorkStar | 2010+ MF 11/13 2013+ N13 | N12-7563U | 3.3 |
| | | | Each Additional | N12-7563U-11 | 0.3 |
| | | PayStar (5000) | 2010+ MF 11/13 2013+ N13 | T12-7563U | 3.3 |
| | | | Each Additional | T12-7563U-11 | 0.3 |

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