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| **Current Language:** | English | **Last Modified:** | 5/1/2015 |
| **Other Languages:** | NONE | **Author:** | Aaron Mimbs |
| **Viewed:** | 5422 | | |

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**Title: MaxxForce 7 Misfire Diagnostics**

**Applies To: All MaxxForce 7**

## CHANGE LOG

2015/05/01 - Added keywords to article
2015/04/22 - Added keywords to article
2015/04/06 - Updated CPA launching instructions, added EPA13 IPA monitor warning
2015/01/28 - Added 2007-2009 MaxxForce 7 Part Numbers
2015/01/20 - Clarified step 10 decision

## DESCRIPTION

Due to the lack of misfire diagnostics in the Manual, this document will guide the user through misfire diagnostics on the MaxxForce 7.

## SYMPTOMS

**Diagnostic Trouble Codes:**

| DTC/Light | Description |
|---|---|
| NONE | |

**Customer Observations or Concerns:**

- Engine Idles Rough
- Popping through Intake
- Oil Above FULL
- Distinct Engine "Thuds" Corresponding with Engine Speed

## SPECIAL TOOL(s) / SOFTWARE

| Tool Description | Tool Number | Comments | Instructions |
|---|---|---|---|
| Cylinder Performance Analyzer | 12-999-01 | | |
| ServiceMaxx | | | |
| Clean Fuel Source | 15-637-01 | | |
| Engine Blow-by Orifice Tool | ZTSE4146A | | |
| Oil Fill Tube Orifice Adapter | ZTSE4284 | | |
| Pressure Test Kit or Slack Tube Manometer | ZTSE4409 or ZTSE2217A | | |
| Standard Plug | Obtained Locally | | |
| Fuel Injector Electrical Connector Release Tool | ZTSE4820 | | |
| Kit, Fuel System Cap | ZTSE4710 | | |
| Plugs, High Pressure Pump-Rail | ZTSE4861 | | |
| Flex Hone | ZTSE4349 | | |

Tools Resource Center

## SERVICE PARTS INFORMATION

| Kit Description | Part Number | Quantity Required | Notes |
|---|---|---|---|
| FUEL, DIESEL FUEL INJECTOR CLEANER | 7080427C1 | 1 Bottle | Tank additive for fuel injector cleaning |

2007 - 2009 MaxxForce 7

| Kit Description | Part Number | Quantity Required | Notes |
|---|---|---|---|
| INJECTOR ASM, FUEL | 1875072C91 | As Required | Includes Tube Assembly |
| LEVER, BRIDGE VALVE ARM | 1854009C1 | As Required | Rocker Arm |
| TUBE ASSY FUEL RAIL TO INJECTOR | 1886547C1 | As Required | Injector to Rail Jumper Tube |
| CAM ASM, FOLLOWER & GUIDE | 1835139C92 | As Required | Lifter and Lifter Guide |
| ROD ASM, PUSH | 1837730C2 | As Required | Push Tube |
| PISTON ASSEMBLY | 1874918C91 | As Required | Complete Piston Assembly |
| MOUNTING KIT TURBOCHARGER | 1876540C92 | As Required | Turbo Seals & Oil Supply Tube |

2010 - 2013 MaxxForce 7

| Kit Description | Part Number | Quantity Required | Notes |
|---|---|---|---|
| KIT INJECTOR | 1899239C92 | As Required | Includes Tube Assembly |
| PLATE ASSEMBLY DUAL FULCRUM | 1880498C91 | As Required | Rocker Arm Assembly (Exh & Int) |
| TUBE ASSY FUEL RAIL TO INJECTOR | 1886547C1 | As Required | Injector to Rail Jumper Tube |
| CAM ASM, FOLLOWER & GUIDE | 1835139C93 | As Required | Lifter and Lifter Guide |
| ROD ASM, PUSH | 1873916C2 | As Required | Push Tube |
| PISTON ASSEMBLY | 1883516C91 | As Required | Complete Piston Assembly |
| KIT, TURBO MOUNTING | 1897455C93 | As Required | Turbo Seals & Oil Supply Tube |

## DIAGNOSTIC STEPS

| Step | Action | Decision |
|---|---|---|
| 1 | **DIAGNOSTIC:**<br><br>Generate Health Report<br><br>Are there any PENDING/ACTIVE DTCs not related to an engine misfire?<br><br>**Note:** On EPA13 MaxxForce 7's SPN 651-658 are Injector Timing Faults which can be false, generated due to excessive parasytic loading on the engine. The false codes have been corrected in Calibration PRS24LR2 and later. | **Yes**. Follow the FCAP as outlined. If no FCAP is available perform an iKNow search for documents relevant to the issue. If no articles can be found see the proper Diagnostic Manual. Step 2<br><br>**No**. Step 2 |

| Step | Action | Decision |
|---|---|---|
| 2 | **DIAGNOSTIC:**<br><br>Is the ECM Calibration Up-to-Date? | **Yes**. Step 4<br><br>**No**. Update calibration.<br><br>EPA13 MF7 Step 3<br>EPA10 MF7 Step 4 |

| Step | Action | Decision |
|---|---|---|
| 3 | **CALIBRATION EFFECTIVENESS:**<br><br>On EPA13 OBD engines, perform the following with calibration PRS24LR2.<br><br>1. Clear any faults<br>2. Start the engine<br>3. Allow the engine to idle for 2 minutes in NEUTRAL<br>4. Shut down the engine<br>5. Make note of any faults that became PENDING or ACTIVE<br>6. Clear any faults that may have come PENDING or ACTIVE<br>7. Turn on the excessories (Air conditioning, lights, booster pumps, ect.)<br>8. Start the engine and put it in DRIVE<br>9. Allow the engine to idle for two minutes in DRIVE<br><br>Did the injector timing faults return? | **Yes**. Step 4<br><br>**No**. Release to the customer |

| Step | Action | Decision |
|---|---|---|
| 4 | **DIAGNOSTIC:** | **Yes**. Correct Issue; Step 5 |

| | | |
|---|---|---|
| | Perform Visual Checks Per the Diagnostic Manual and/or Performance Diagnostic Sheet.<br><br>Any issues noted? | **No**. Step 5 |

| Step | Action | Decision |
|---|---|---|
| 5 | **DIAGNOSTIC:**<br><br>In ServiceMaxx go to *Procedures >> KOEO Procedures >> Fuel Pressure Adaptation Reset* and follow the on screen commands.<br><br>Does the engine still misfire? | **Yes**. Step 6<br><br>**No**. Complete any other work needed and release unit to customer. If this is a problematic unit continue with Step 6 |

| Step | Action | Decision |
|---|---|---|
| 6 | **DIAGNOSTIC:**<br><br>ONLY using ZTSE4146A (Orifice size 0.406")<br><br>Perform Crankcase Pressure and Blow-By Tests. If it is determined unsafe to do so, please skip and continue to Step 7.<br><br>***2007 - 2009 MaxxForce 7***<br>Measure Crankcase Pressure (9" H2O) per the Diagnostic Manual or IK1200881<br><br>***2010 - 2013 MaxxForce 7***<br>Measure Crankcase Pressure (Spec 24" H2O) and Blow-by (9" H2O) per the Diagnostic Manual.<br><br>NOTE: If Blow-by is in specification and Crankcase Pressure is beyond specification, verify the crankcase breather is a non-serviceable certified breather. Please See *121203 New Non-Serviceable Crankcase Breather - EPA 10 MaxxForce® 7.* If required, replace the Crankcase Breather and reevaluate readings.<br><br>Are the readings within specification? | **Yes**. Step 7<br><br>**No**. Potential Base Engine Issue.<br><br>Perform Step 7 & Step 8 and then open a case file with Navistar's Technical Support group with all relevant information, pictures, parameter file and recordings for further assistance. |

| Step | Action | Decision |
|---|---|---|
| 7 | **DIAGNOSTIC:**<br><br>See Section *Cylinder Performance Analyzer Diagnostics* for Engine Misfires below.<br><br>Did the CPA tool flag a cylinder misfiring at idle? | **Yes**. Step 8<br><br>**No**. Step 8 |

| Step | Action | Decision |
|---|---|---|
| 8 | **DIAGNOSTIC:**<br><br>Relative Compression Test<br><br>Note: 2007 - 2009 MaxxForce 7 the RCT may not be accurate or has an inability to document cylinder compression. If this is the case then perform a manual compression test on the suspected bank ONLY (Both if Required). General Specification Rule - If Cylinders are within 40 psi of each other after FOUR revolutions, compression is not an issue.<br><br>In ServiceMaxx under "Tests", "KOEO Tests", perform the "Relative Compression Test".<br><br>Specification: All cylinders are within 7 RPM of each other. | **1**.CPA Flagged no Misfires and RCT (or MCT) is within specification; Step 9<br><br>**2**. CPA Flagged a Misfire and RCT (or MCT) is within specification; Step 10<br><br>**3**. CPA Flagged a Misfire and RCT (or MCT) is out of specification; Step 10 |

| Step | Action | Decision |
|---|---|---|
| 9 | **DIAGNOSTIC:**<br><br>Engine misfire is not present. Re-evaluate engine condition, operation, and "misfire" operating conditions.<br><br>Other Possibilities:<br><br>1. Engine "misfire" at elevated RPMs<br>2. Engine surging due to other condition (EGR, ITV, FRP, Low Side Fuel Pressure, Aftertreatment, Elevated Oil Level, etc.) | **Yes**. See the Fuel System Cleaning section below.<br><br>**No**. Complete any other work needed and release unit to customer. |

| | | |
|---|---|---|
| | After reevaluation does the engine still qualify for misfire diagnostics? | |

| Step | Action | Decision |
|---|---|---|
| 10 | **DIAGNOSTIC:**<br><br>Remove the valve cover and injector. Inspect the injector tip, rocker arms, and push tubes.<br><br>Are any components damaged or worn?<br><br>NOTE: If the injector tip is heavily damaged the cylinder/piston may exhibit unrepairable damage, if this is the case do not replace components at this time and proceed to Step 12 | **Yes**. Replace components and reassemble the engine. Reset the fuel pressure adaptives; Step 11<br><br>**No**. Replace injector reassemble engine. Reset the fuel pressure adaptives; Step 11 |

| Step | Action | Decision |
|---|---|---|
| 11 | **DIAGNOSTIC:**<br><br>Does the engine still misfire? | **Yes**. Return to Step 7, if the CPA tool flags the same cylinder, Step 12<br><br>**No**. Repair complete, release truck |

| Step | Action | Decision |
|---|---|---|
| 12 | **DIAGNOSTIC:**<br><br>Remove the engine oil pan and inspect for debris and damage to the base engine Lifters, Cam, Cylinder Walls, Crankshaft, or Pistons/Rods?<br><br>Were any issue noted? | **Yes**. Step 13<br><br>**No**. Step 14 |

| Step | Action | Decision |
|---|---|---|
| 13 | **DIAGNOSTIC:**<br><br>Does the engine fall under any of the following conditions?<br><br>1. Severe Camshaft Lobe Damage<br>2. Severe Cylinder Wall Damage<br>3. Severe Crankshaft Damage<br>4. Severe Crankcase Damage | **Yes**. Open a case file with Navistar's Technical Support group with all relevant information, pictures, parameter file and recordings for further assistance.<br><br>**No**. If related and can be corrected proceed with repairs, if not Step 14 |

| Step | Action | Decision |
|---|---|---|
| 14 | **DIAGNOSTIC:**<br><br>Remove the cylinder head per the Engine Service Manual and Perform Base Engine Inspections.<br><br>Were any Issues Noted? | **Yes**. Step 15<br><br>**No**. Step 16 |

| Step | Action | Decision |
|---|---|---|
| 15 | **DIAGNOSTIC:**<br><br>Does the engine fall under any of the following conditions?<br><br>1. Severe Camshaft Lobe Damage<br>2. Severe Cylinder Wall Damage<br>3. Severe Crankshaft Damage<br>4. Sever Crankcase Damage | **Yes**. Open a case file with Navistar's Technical Support group with all relevant information, pictures, parameter file and recordings for further assistance.<br><br>**No**. If related and can be corrected proceed with repairs, Step 16 |

| Step | Action | Decision |
|---|---|---|
| 17 | **DIAGNOSTIC:**<br><br>Remove the piston assembly and inspect.<br><br>Are any issues noted? | **Yes**. If non-condemning replace/repair components per the Engine Service Manual reassemble the engine. If the issue has not been resolved by this time open a case file with Navistar's Technical Support group with all relevant |

| | |
|---|---|
| | information, pictures, parameter file and recordings for further assistance. |
| | **No**. Open a case file with Navistar's Technical Support group with all relevant information, pictures, parameter file and recordings for further assistance. |

## CYLINDER PERFORMANCE ANALYZER DIAGNOSTICS FOR ENGINE MISFIRES

NOTE: ON THE MAXXFORCE 7 THE CPA TOOL IS VERY ACCURATE IN FLAGGING ENGINE MISFIRES AT IDLE ONLY. ELEVATED ENGINE SPEEDS BRINGS HIGHER TORSIONAL VIBRATIONS WHICH CAN AND WILL IMPROPERLY FLAG CYLINDERS FOR A MISFIRE. THE SAME APPLIES FOR UNDER A LOAD AND DRIVING.

**Connecting the CPA Tool**

The Camshaft Position Sensor and Crankshaft Position Sensor connectors are reversed, in comparison to the DT, 9 and 10. On the CPA box, the BNC cables need to be connected such that the correct sensor is feeding the correct port (Crank to Crank, Cam to Cam)--the crankshaft position sensor is located on the right (passenger) side of the engine towards the front just above the oil pan and the camshaft position sensor is located on the left (drivers) side of the engine.

If needed see the following iKNow article for further CPA instructions IK1200812 - Diagnosing Cylinder Performance Related Symptoms Using the CPA Tool

**CPA Software Preparation**

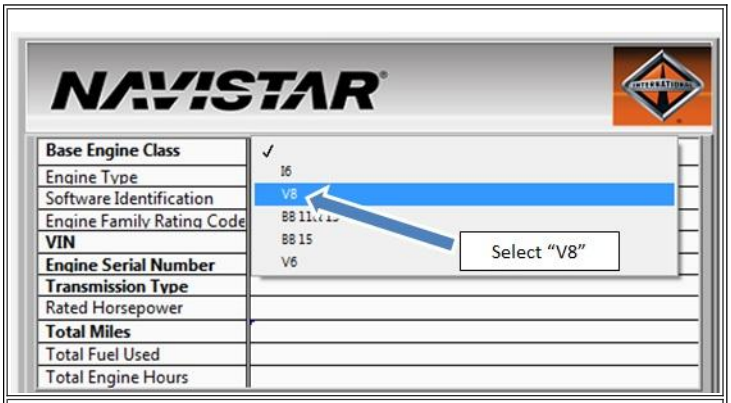


**Figure 1: Cylinder Performance Analyzer Information Table**

Item 1: Base Engine Class V8

1. After connecting the CPA tool to the truck and laptop, launch the Engine Cylinder Performance Analyzer software from ServiceMaxx. Make sure the base engine class is selected as V8 before continuing see **Figure 1**.

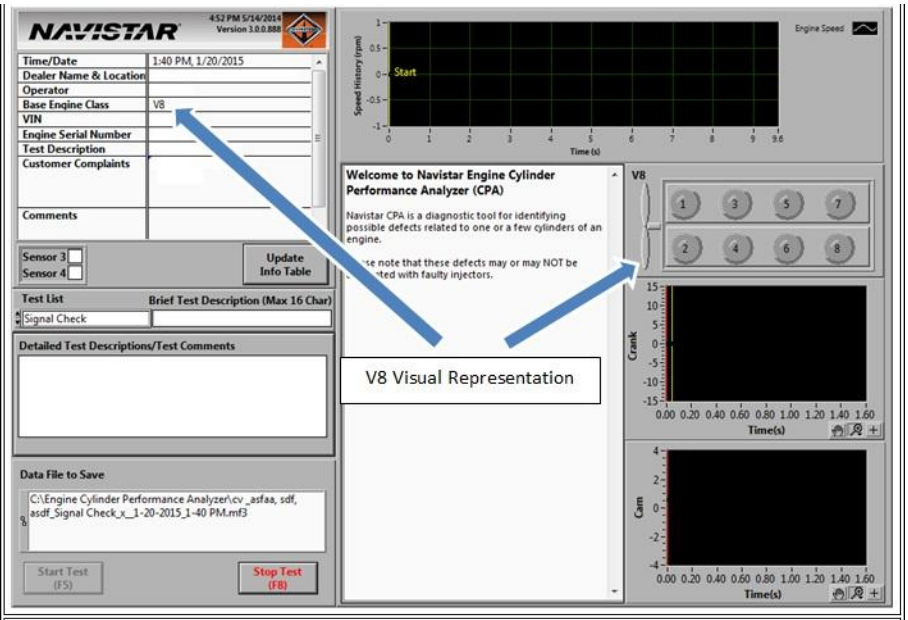


**Figure 2: Cylinder Performance Analyzer Information Table**

Item 1: Base Engine Class V8

2. If done properly, the engine misfire display figure shows an 8 cylinder engine shown in Figure 2.

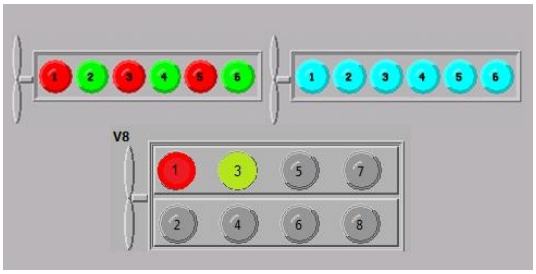


**Figure 3: Cylinder Performance Analyzer MisFire Indicator**

**Attention**
**The EPA13 MaxxForce 7 has a montior called the Injector Performance Analyzer, this monitor runs after every key cycle during the first two minutes of idling time. Before anaylzing performance with the CPA tool allow the engine to idle for two minutes for the monitor to complete its analysis and return the engine to a normal idling pattern.**

3. With the CPA tool, perform the standard "Signal Check." After passing the signal check, begin recording the engine data during the time of the misfire complaint (Cold Idle or Hot Idle). The same standard misfire display follows the same rules as the DT, 9 and 10 Engines and can be seen in Figure 3.

Return to Step 7

## REPAIR STEPS

**Fuel System Cleansing**

1. Warm the engine to operating temperature
2. Connect the clean fuel source 15-637-01
3. Add 1/2 bottle Fuel System Cleaner to the clean fuel source and mix throughly with a full container
4. Run the engine high idle until nearly all the fuel has been used up (Do not run it dry and air bound the system)
5. If the truck has atleast a 1/2 tank of fuel add the remaining cleanser to the tank. If not give the customer the bottle to add before the next fill up

## WARRANTY INFORMATION

**Warranty Claim Coding:**

| | |
|---|---|
| **Group:** | 12000 - Engines |
| **Noun:** | 313 - Carrier Assembly, Rocker Arm |
| | 404 - Lifter, Valve |
| | 416 - Rods, Push |
| | 563 - Injector Unit (Electrical) |
| | 137 - Piston, Pin, Lock, Bushing |
| | 192 - Sleeve Cylinder |
| | 051 - Crankcase |

Warranty Coding Manual

**Standard Repair Times:**

Due to extensive SRT options and requirements for the repair plans, see the Standard Repair Time Manual for specific engine/vehicle combinations.

Standard Repair Time Manual

| STEP | DESCRITPTION | MANUAL SECTION |
|---|---|---|
| Step 1 | ECM Calibration | ELECTRONIC CONTROL MODULE (ECM OR ECM/IDM) - ENGINE PROGRAM |
| Step 2 | Visual Inspection | ELECTRONIC ENGINE PERFORMANCE, DIAGNOSE |
| Step 3 & 4 | Check for DTCs & Reset Adaptives | ELECTRONIC ENGINE PERFORMANCE, DIAGNOSE |
| Step 6 | Crankcase Pressure Test | ELECTRONIC ENGINE PERFORMANCE, DIAGNOSE |
| | Blow-by Test (EPA 2010) | ELECTRONIC ENGINE PERFORMANCE, DIAGNOSE |
| | Crankcase Breather Replacement EPA (2010) | CRANKCASE BREATHER HOUSING ASSEMBLY, REPLACE |
| Step 7 | Cylinder Performance Analyzer | T-Time (0.7 Hours) CYLINDER PERFORMANCE ANALYZER (CPA) TOOL, DIAGNOSIS |
| Step 8 | Relative Compression Test (EPA 2010) | ELECTRONIC ENGINE PERFORMANCE, DIAGNOSE |
| | Manual Compression Test (EPA 2007) | ELECTRONIC ENGINE PERFORMANCE, DIAGNOSE |
| Step 10 | Rocker Arm Replacement | ROCKER ARM, PUSH RODS AND/OR VALVE BRIDGES (V-ENGINES), REPLACE |
| | Injector Replacement | FUEL INJECTOR(S) (ELECTRONIC ENGINES), REPLACE |
| Step 12 | Oil Pan R&R | OIL PAN AND/OR GASKET, REPLACE |
| Step 14 | Cylinder Head Removal (EPA 2007) | CYLINDER HEAD GASKET (V-ENGINES), REPLACE |
| | Cylinder Head Removal (EPA 2010) | CYLINDER HEAD OR REPLACE GASKET (V ENGINES), R&R AND OR REPLACE |
| Step 16 | Piston and Rings Replace | PISTON RINGS, REPLACE |

## OTHER RESOURCES

Master Service Information Site

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