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Less Info

Title: **Diagnosing Performance Related Symptoms Using the CPA Tool**

Applies To: **All Technicians, 2010 Emissions Model Year MaxxForce® DT, 9 and 10 2007 Emissions Model Year MaxxForce® DT, 9 and 10 2004 Emissions Model Year DT 466, DT 570 and HT 570**

DESCRIPTION

The purpose of this article was to combine information from several other articles into one convenient document. The other articles include:

IK1200722	**Misfire Diagnostics with the Cylinder Performance Analyzer (CPA) Tool for 2004 through 2010 Emissions Model Year Duty I-6 Engines Medium**
TL2900018	**Cylinder Performance Analyzer Tool - Tool Number OE-11178**
WPL2800064	**WPL 12-011G CPA Cylinder Performance Analyzer required use on all Applicable Engines**
TL2900023	**New Cylinder Performance Analyzer Software Released with Warranty Authorization Code**

NOTE:

The articles above have been retired. For any information regarding the CPA Tool, refer to this article.

This article describes the procedure for Diagnosing Performance Related Symptoms Using the Cylinder Performance Analyzer (CPA) Tool.

The CPA tool is a specialized tool that is capable of detecting cylinder performance concerns during hot idle, cold idle, and a road test. The tool is also capable of detecting performance concerns under any running conditions. The CPA tool helps troubleshoot cylinder performance concerns, including intermittent issues.

NOTE:

The Cylinder Performance Analyzer Tool (OE-11178) began shipping February 7, 2012 to all Dealers.

Figure 1

VEHICLE SYMPTOMS

• Engine Misfire

• Rough Running

• Vibration

TRIAGE

• Check calibration status by checking vehicle calibration scorecard and update if necessary.

1. Record active or inactive codes before a calibration update is performed.

• Check Vehicle History

• Complete any Open Campaigns

• Customer Questionnaire:

1. Has the vehicle been in for the same problem before?
2. If we rode with you as a passenger, how would you duplicate the problem?
3. Is it a dead miss or is it just running rough?
4. Does it miss all of the time or intermittently? When does it do it?
5. Can you explain when the vehicle experiences the problem? For instance, is it at idle, under load or is there anything unique about the circumstances?
6. Did any lights such as the 'check engine' light show up on the dash?
7. Did the problem just start or has it been getting worse over time?
8. Has any work been done recently to the engine?

• Are there any active or inactive DTCs related to the Code Groups identified below?

1. **Code Group 1** (Refer to 'Code Group 1')
   - If there are active or inactive codes from **Code Group 1**; perform CPA Test. Refer to **'CPA Service Information'**
2. **Code Group 2** (Refer to 'Code Group 2')

• Any DTCs unrelated to the above code groups should be diagnosed per applicable Diagnostic Manual:

1. (EPA 2010) MaxxForce DT, 9, 10 - EGES455
2. (EPA 2007) MaxxForce DT, 9, 10 - EGES3702
3. DT 466, 570 - EGES2701

CPA TOOL CONTENTS

Description	Part #	Quantity
Cylinder Performance Analyzer (CPA)	OE-11178	1
USB Cable	OE-11178-1	1
Yellow Sensor Tee Harness	OE-11178-2	1
Black Sensor Tee Harness	OE-11178-3	1

NOTE:

In order to use this tool, the Cylinder Performance Analyzer software must be downloaded onto the Electronic Service Tool (EST); also known as the EZ-Tech. The CPA software is an Automatic Update on many EZ-Techs that have been connected to a network.

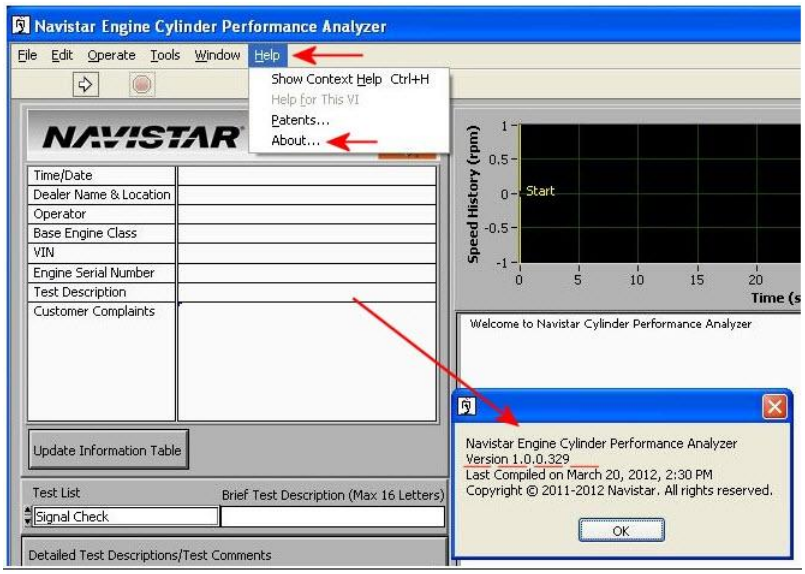
Determining the Version of the CPA Software:

1. Launch the CPA software.

2. From the top menu go to the 'Help' tab.

3. Select 'About'.

4. The version will appear in a pop up window (shown in the image below).



EZ-Techs that have received the original version of the CPA will automatically receive the update to the software when connected to the Internet

EZ-Techs that have not received any version of the software will receive (once connected to the Internet) the complete new version of the software. This version is over 300MB and requires that the EZ-Tech be connected to the Internet overnight.

*Refer to iKNow Article IK2700062 for **CPA Registration Fix**.

NOTE:

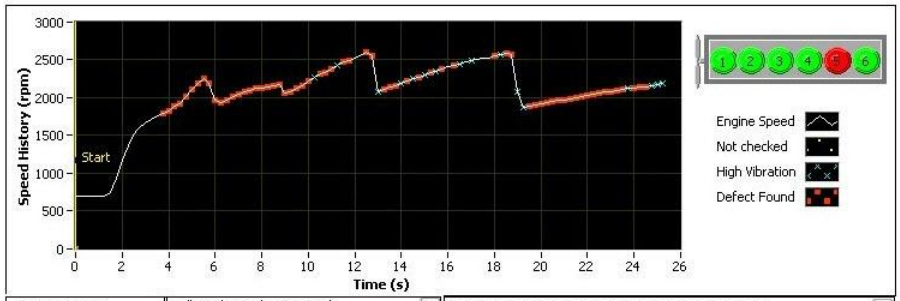
EZ-Tech Computers must be connected to the Internet overnight to recieve the latest software. Please connect your EZ-Tech to the network when it is not in use.

If you need the software manually loaded or have issues with launching the software, create an EZ-Tech Case File and ask for assistance with the CPA software installation.

WARRANTY AUTHORIZATION CODE

This WAC is required on warranty claims for any single injector replacement. IApprove is required when more than one cylinder performance issue is identified or for more than one injector replacement. The iApprove for more than one injector replacement is described in Warranty Policy Letter WPL12-018G.

- With Version 1.0.0.329, a **Warranty Authorization Code** (WAC) will be displayed in the test results screen only when a single cylinder performance issue is identified (See image below).



Test Description	Full Load to Highway Speed_
Customer Complaints	CPA Demo
Comments	
Base Engine Class	I6
Engine Type	DEMO Only
Software Identification	DEMO Only
Engine Family Rating Code	DEMO Only
VIN	1HTMMAAL49H123456
Engine Serial Number	466HM2UXXXXXXX
Transmission Type	Allison MD
Rated Horsepower	210.00 hp
Total Miles	1,000 miles
Total Fuel Used	1
Total Engine Hours	100 hr
RP1210 Time	11:58 AM, 3/20/2012
	I6
	DEMO Only

****
Test Summary

Authorization Code:

ZEUF2-MN7PL-PUOP3-SH1I6-90CG8-DVQA3

Diagnostics:

A defect has been found in relation to cylinder 5

Recommendations:

Please inspect and repair necessary electrical and mechanical components related to cylinder 5. If all components tested are within specifications, replace injector in cylinder 5. If the issue is still present after the repair, please contact technical services for further instructions.

Details of diagnostics:

Possible defects under the following conditions.

Cyl 5:
4 - 12 seconds (1833 - 2497 rpm) 94% of the time.
13 - 14 seconds (2080 - 2166 rpm) 75% of the time.
20 - 25 seconds (1922 - 2156 rpm) 90% of the time.
****

WARRANTY

Warranty Authorization Code (WAC):

CPA tool procedure needs to be followed as listed below, to obtain a WAC:

1. Perform a "Signal Check".

NOTE:

'Signal Check' does not diagnose cylinders; it is part of the set up process and checks for a strong CMP and CKP signal. The 'Signal Check' will NOT give a WAC Code if there is a cylinder issue.

2. Perform one of the following tests:
   a. 'Cold Idle'
   b. 'Hot Idle'
   c. 'Full Load to Highway Speed'

3. If there is an issue with a cylinder, a WAC will be generated.

NOTE:

A WAC does not guarantee an issue with an injector. Condensed Performance Diagnostics may point out other conditions such as a valve train or compression concerns.

WARRANTY APPROVAL REQUIREMENTS

An iApprove case file is not required when a Warranty Authorization Code (WAC) is displayed based on a single cylinder performance issue that results in a single injector replacement. This WAC is required to be included in the warranty claim comments field for any single injector replacement.

NOTE:

The CPA Tool will create a code for one injector replacement. This code is REQUIRED on the Warranty Claim for the one injector. Please put the WAC Code in the beginning of the Complaint/Cause/Correction of the Warranty Claim.

NOTE:

Use of the CPA Tool is required for diagnosis of two or more injectors and an iApproval number is required when more than one cylinder performance issue is identified.

NOTE:

A 'Cold Idle', 'Hot Idle', or 'Full Load to Highway Speed' recording is required when opening a case file. 'Signal Checks' will not be used in the diagnostic evaluation of a performance concern.

Due to the complexity of some of the codes, please printout and attach the CPA tool results to your iClaim. This will allow the claim to be paid correctly without having to be sent back to the dealer for corrections.

iAPPROVAL PROCEDURES

IApprove is required when more than one injector is replaced based CPA test results. This will require the CPA user to attach the test results to a Technical Service Case. Follow the procedures below for attaching the test results to a case file.

Attaching CPA Test Results to a Case File for iApproval:

1. Create a Technical Service Case File and note in the issue description the details of the symptoms and test results.
2. Follow all of the diagnostic procedures as outlined in this article: Diagnostic Procedures
3. Run the tests using the CPA tool and software as outlined in this article.

Attaching Recorded Data To Case File:

When using the Cylinder Performance Analyzer, the data recorded must be attached to the Tech Services Case File. To attach the data to a Case File, follow the steps and screenshots below:

1. From case file home page, select 'Browse' (*Figure 3*).

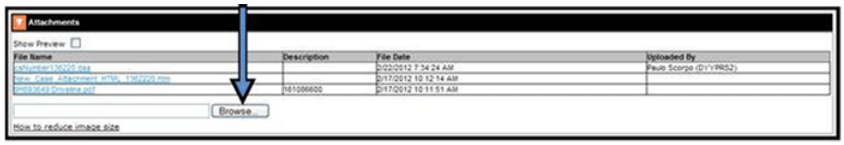


Figure 3

2. Select the 'Engine Cylinder Performance Analyzer' folder.
   - The folder is defaulted on the computer's desktop. (*Figure 4*).

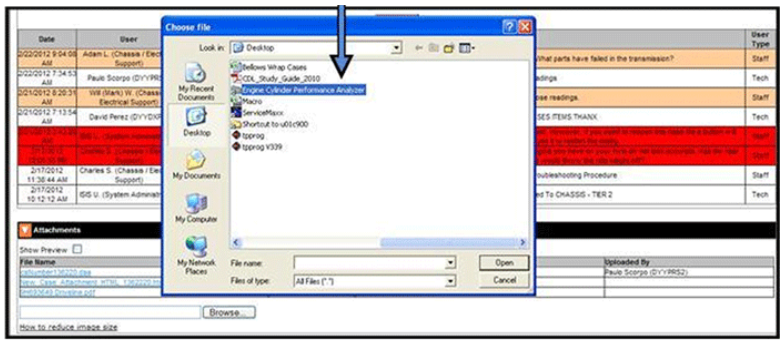


Figure 4

3. Select the WinZip File(s) from the appropriate test recording(s) (*Figure 5*).

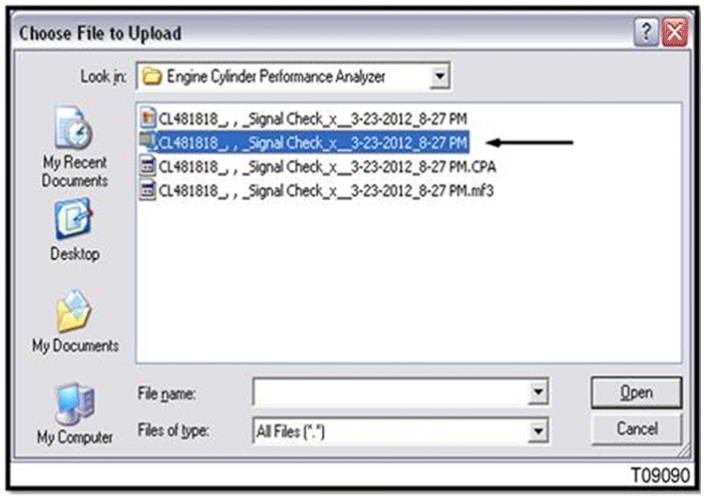


Figure 5

NOTE:
When a CPA test is conducted, the program automatically saves four files into the Engine Cylinder Performance Analyzer desktop folder. The four files are a: CPA File, MF3 File, JPEG File, and a WinZip File. The ONLY file that needs to be uploaded onto the case file is the WinZip File.

4. Verify the WinZip File is under the Attachments section of the case file home screen.

DIAGNOSTIC PROCEDURES

To confirm cylinder location and obtain a WAC; refer to **'Warranty Authorization Code'** .

Diagnostic Manual Update:

Refer to applicable Diagnostic Manual (Electronic Control Systems Diagnostics) to troubleshoot the concern to define if a harness repair is necessary:

- **(EPA 2010) MaxxForce DT, 9, 10** - EGES455
- **(EPA 2007) MaxxForce DT, 9, 10** - EGES3702
- **DT 466, 570** - EGES2701

After completing the steps listed in the Diagnostic Manual for the appropriate engine, follow the instructions for the CPA tool.

Tool instructions are provided with the tool, and are available here: OE-11178 (PDF)

The instructions are also available on the Service Tool Resource Center: TL2900008

NOTE:
Disregard the WAC if the harness repair corrected the concern.

• If there are active or inactive codes from **Code Group 2** or there are no codes, go to the following applicable condensed Performance Diagnostics:

A. (EPA 2010) Condensed Performance Diagnostics

B. (EPA 2007) Condensed Performance Diagnostics

C. (DT466, 570) Condensed Performance Diagnostics

CODE GROUP 1

(EPA 2010) MaxxForce DT, 9, 10:

• 651-3, 652-3, 653-3, 654-3,,655-3, 656-3-Injector Short to Power

• 651-4, 652-4, 653-4, 654-4, 655-4, 656-4-Injector Short Circuit

• 651-5, 652-5, 653-5, 654-5, 655-5, 656-5-Injector Open Circuit

• 2797-3-Injector Control Group 1-Open Coil Short

• 2797-4- Injector Control Group 1-Close Coil Short

• 2798-3-Injector Control Group 2-Open Coil Short

• 2798-4-Injector Control Group 2-Closed Coil Short

- 3659-4, 3660-4, 3661-4, 3662-4, 3663-4, 3664-4-Injector Close Coil-Short Circuit
- 3659-5, 3660-5, 3661-5, 3662-5, 3663-5, 3664-5-Injector Close Coil-Open Circuit

(EPA 2007) MaxxForce DT, 9, 10:

- 8001-6, 8002-6, 8003-6, 8004-6, 8005-6, 8003-6-Injector Closed Coil-Open Circuit
- 8001-5, 8002-5, 8003-5, 8004-5, 8005-5, 8003-5-Injector Open Coil-Open Circuit
- 8001-4, 8002-4, 8003-4, 8004-4, 8005-4, 8003-4-Injector Open Coil-Short Circuit
- 8001-3, 8002-3, 8003-3, 8004-3, 8005-3, 8003-3-Injector Close Coil-Short Circuit
- 8151-5-Bank A Injector Open Coil Short
- 8151-6-Bank A Injector Close Coil Short
- 8152-5-Bank B injector Open Coil Short
- 8152-6-Bank B-Injector Close Coil Short

DT466, 570:

- 421-428-High Side to Low Side Open
- 431-436-Hgh Side Shorted to Low Side
- 451-456-High Side Shorted to Ground or Vbat
- 513-Low Side to Bank 1 Open
- 514-Low Side to Bank 2 Open
- 515-Bank 1 Low Side Short to Ground
- 521-Bank 2 Low side Short to Ground

CODE GROUP 2

(EPA 2010) MaxxForce DT, 9, 10:

- 3387, 3388, 3389, 3390, 3391, 3392-20-Cylinder Balance Maximum Limit Exceeded
- 3387, 3388, 3389, 3390, 3391, 3392-21-Cylinder Balance Below Minimum Limit

(EPA 2007) MaxxForce DT, 9, 10:

- 8001, 8002, 8003, 8004, 8005, 8006-1-Cylinder Balance Below Minimum Limit
- 8001, 8002, 8003, 8004, 8005, 8006-0-Cylinder Balance Maximum Limit Exceeded

Background Information:

NOTE:
The Condensed Performance Diagnostics must be completed to rule out performance issues before using the CPA Tool.

See pages listed below for the condensed Performance Diagnostics as specified by the table below.

Applicable	Description
2010 Emissions Model Year MaxxForce® DT, 9 and 10	See Part A
2007 Emissions Model Year MaxxForce® DT, 9 and 10	See Part B
2004 Emissions Model Year DT 466, DT 570 and HT 570	See Part C

Cylinder Performance Analyzer Test:

The CPA test analyzes the crankshaft and camshaft speed signals to determine cylinder performance. The data is processed by the CPA tool and indicates

which cylinder has a performance issue. The CPA tool assists the technician in the evaluation of performance concerns.

1. Connect CMP and CKP breakout cables to the sensors and CPA tool.

2. Launch the CPA tool and follow the instructions for the CPA tool.

3. Perform a Signal Check.
   - A Signal Check is required before performing any additional tests

4. Perform a Hot Idle test.
   - Record the results.

5. Perform a Full Load to Highway Speed test.
   - Duplicate the conditions to verify the complaint.
   - Record the results

5. If misfire conditions are only present on a cold engine, a cold soak is necessary to bring the engine to ambient temperature for the Cold Idle test.
   - Perform a Cold Idle test.
   - Record the results.

6. Optional: If misfire conditions are only present on a cold engine, cold soak the engine to ambient temperature and perform a Cold Idle test.
   - Record the results.

Cylinder ID	Hot Idle	Full Load to Highway Speed	Cold Idle (Optional)
Cyl 1			
Cyl 2			
Cyl 3			
Cyl 4			
Cyl 5			
Cyl 6			

If the Cylinder Performance Analyzer test does not identify a suspect cylinder, proceed to the next step in the Performance Diagnostics form.

If the Cylinder Performance Analyzer test generates a WAC Code, inspect for mechanical damage and the injector wiring. Otherwise, replace the failed injector. See injector replacement in the Engine Service Manual.

EPA 2004 Performance Diagnostic times DT466 / 570

Hours	4300	4400	7300, 7400, 7500	Description
0.7	K12-2038H	L12-2038H	M12-2038H	Steps 1-10
0.1	K12-2058H	L12-2058H	M12-2058H	Step 12 Relative Compression

EPA 2007 Performance Diagnostic times MaxxForce DT, 9, 10

Hours	4300	4400	7300, 7400, 7500	Description
1	K12-2244K	L12-2143K	M12-2143K	Steps 1-8
0.1	K12-2273K	L12-2172K	M12-2172K	Step 13 Relative Compression
0.1	K12-2275K	L12-2174K	M12-2174K	Step 15 Intake Restriction
0.1	K12-2276K	L12-2175K	M12-2175K	Step 16 Exhaust Restriction
0.2	K12-2277K	L12-2176K	M12-2176K	Step 17 Injection Control Pressure

EPA 2010 Performance Diagnostic times MaxxForce DT, 9, 10

Hours	4300 / 4400	7300, 7400, 7500	Description
0.9	KL12-2078T	M12-2241T	Steps 1-5 (Does not include Engine Cover Removal)
0.2	KL12-2084T	M12-2247T	Step 6 Fuel Aeration Check
0.1	KL12-2087T	M12-2250T	Step 9 IPR Circuit Test
0.1	KL12-2093T	M12-2256T	Step 14 Relative Compression Test

All EPA Model Years - CPA Diagnostic SRT Operations

Hours	Code	Models	Engine
1.2	A12-2158H	Models, All	DT 466/570
1.2	A12-2158K	Models, All	MaxxForce DT/9/10
1.2	A12-2158T	Models, All	MaxxForce DT/9/10 (2010 Emissions)

CPA TOOL RELATED LINKS

WPL12-018G - Warranty iApproval Requirements WPL 12-018G

Condensed Performance Diagnostics Steps Required Prior to Using CPA Tool

A. (EPA 2010) Based on EGED555 (steps):

1. Initial Key ON Check

2. Visual Inspection

3. Electronic Service Tool (EST) Connection and Data Recording
4. Check for Diagnostic Trouble Codes (DTCs)
5. KOER Standard Test
6. Fuel Aeration Check
9. Injection Pressure Regulator (IPR) Circuit Test
14. Relative Compression Test

When tests are completed run CPA Test:

B. (EPA 2007) Based on EGED380 (steps):

1. Visual Inspection
2.1 Fuel Quality
2.2 Fuel Pressure and Aeration
2.3 Fuel Inlet Restriction
3. Sensor Compare
4. DTCs and ECM Calibration
5. KOEO Standard Test
6. EGR Valve and ITV Operation
7. KOEO Injector Test
8. KOER Standard Test
13. Relative Compression Test
15. Intake Restriction
16. Exhaust Restriction
17. Injection Control Pressure

When tests are completed, run CPA Test:

C. (DT466, 570) Based on EGED290-1 (steps):

1. Diagnostic Trouble Codes
2. KOEO Standard Test
3. KOEO Injector Test
4. Engine Oil
5. Fuel
6. Fuel Pressure and Aerated Fuel
7. Intake Restriction
8. Exhaust Restriction
9. KOER Standard Test
10. Injector Control Pressure
12. Relative Compression

When tests are completed, run CPA Test.

CONTACT INFORMATION

If you would like to order additional Tools, have questions, concerns, feedback, or need replacement parts, please contacts the Navistar Service Tool Support Center.

Web: https://evalue.internationaldelivers.com/service/service_info/aspPageRef.aspx?pageid=13

Phone: 1-800-365-0088 (Toll Free) or 630-985-4171
OR
Submit a Service Tool IKNow Case

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