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Selective Catalytic Reduction (SCR) Efficiency And NOx Sensor Diagnostic Trouble Codes (DTC) P225C, P225E, P221A and P2201: NOx Sensor Diagnostic Information TO BE USED BEFORE SENSOR REPLACEMENT - OBD13 And Newer Emissions (Commonly Model Year 20

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> **Internal Content**

DO NOT REPLACE EITHER NOx SENSOR FOR ANY OF THE FOLLOWING CODES (P2201, P221A, P225C, P225E, P20EE, P207F, P103C) PRIOR TO REVIEWING THE INSTRUCTIONS BELOW

The purpose of this article is to prevent unnecessary component replacement. ALL OTHER DIAGNOSTIC TESTS AND CHECKS MUST BE PERFORMED when diagnosing one of the codes above if the tests below do not immediately reveal an issue.
If an eService case must be submitted, ALL INFORMATION specified in Step Five MUST be included at the time the case is opened. Cases missing required information will be Refused.

Overview

Guided Diagnostics for SCR efficiency or NOx sensor fault codes will often result in No Fault Found. This often leads to replacement of one or both sensors despite no indication from diagnostic steps to do so. NOx sensor function is a possible cause, and is listed as such for the code description in the DTC description in Premium Tech Tool (PTT). However although the sensors themselves are a possibility, **NOx sensor codes are most often a symptom, not a cause of emissions issues**. NOx sensors should be confirmed to be reading incorrectly or functioning erratically before they are replaced.

Fault Codes

A complete list of DTCs related to this Solution can be found in the Fault Codes section below.

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- Review the Detailed Status Information for the relevant code on the DTC Readout.

DTC List (2 Items)

Control Unit ▲	DTC	Status
Brake ECU (MID 136)	SID 69: Axel load sensor, FMI 2: Data erratic, intermittent, or incorrect	Active
Engine Control Module (EMS)	P229F64: NOx Sensor Gas Outlet Removed, Signal Plausibility Failure	Active 0

NOx Sensor Gas Outlet Removed

⊟ Detailed status information

Title ▲	Value
Confirmed DTC	True
Pending DTC	False
Test failed	True
Test failed since last clear	True
Test failed this operation cycle	True
Test not completed since last clear	False
Test not completed this operation cycle	False
Warning indicator requested	False

• If Confirmed DTC is **TRUE**: Proceed with diagnostics
• If Confirmed DTC is **FALSE**: Disregard and focus on other symptoms or DTCs relevant to the complaint.

- A NOx Conversion should be run to check NOx sensor signal and function for any of the above codes.

NOTE: A NOx conversion test only checks NOx sensor function. The test compares the readings of the two sensors as the engine cycles through multiple conditions to confirm they are in agreement. **The results of the NOx Conversion test do not indicate anything about the condition of the SCR itself.**

1. In PTT, run Operation 2549-08-03-03 NOx Conversion, located under the Test tab.

2. While running the routine if you get new NOx sensor fault code (Egs: P220E-93 , P220F-93), then troubleshoot that fault code. Typically P220E-93 fault code suggests replacement of NOx1 sensor.

3. Take screenshots of the graph and sensor values approximately 2-3 minutes prior to engine shutdown. A guide to taking screenshots can be found in THIS solution.

    - Inlet and Outlet NOx values should be within 40 parts per million (ppm) of one another just before the engine shuts down. Shown below is an example of how a graph with two properly

⌧ Live UI unctioning sensors will look:
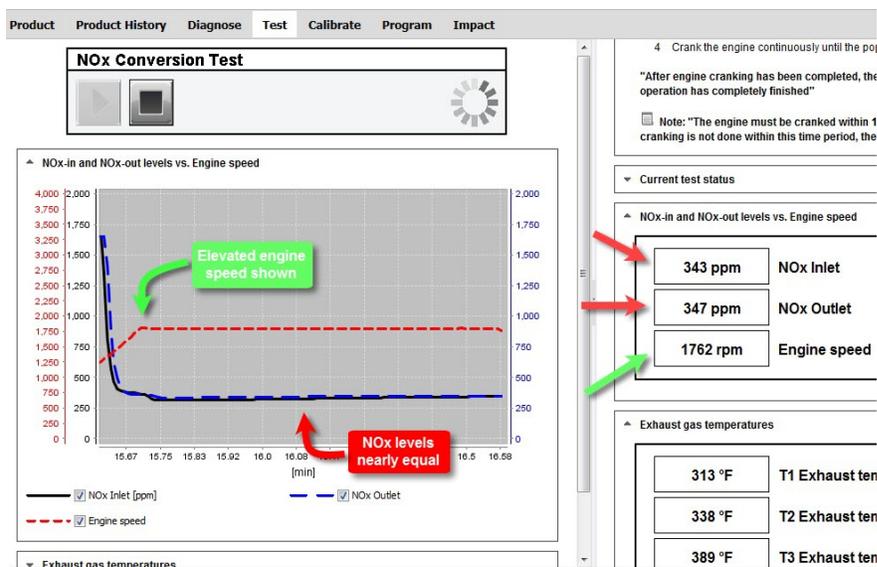
4. If no issues are found with the sensor readings from the NOx Conversion review, the sensors are not the source of the conditions causing the codes to log. Further diagnostic steps of other components will need to be performed to determine the cause of the faults.

5. If this solution is being reviewed for P20EE, P207F, P225E or P103C, the DEF Dosing Valve Solution for the same DTCs should be reviewed for further information.

6. If diagnostic steps do not locate a root cause for the code(s), open an eService case with Dealer Technical Support

- The screenshot(s) taken of the NOx conversion screen prior to engine shutdown (as shown in the screenshot above) should be attached to the case.
- A **complete** summary of all tests performed along with **numeric measurements,** a DTC Readout, and any information concerning previous visits and parts replaced <u>must</u> be included when the case is opened.
  • **"Ok", "Good" and "Followed GD" are not acceptable descriptions of tests performed and test results.**
- Add the solution numbers for **all** CBR articles followed.

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🏷️ Tags

k15560422   p2201-64   p221a-00   p225c-00

p225e-00   p220164   p221a00   p225c00

p225e00

Related links and attachments

KC-104

KC-908

💬 **Feedback**

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Selective Catalytic Reduction (SCR) Efficiency And Diesel Exhaust Fluid (DEF) Dosing Valve Diagnostic Trouble Codes (DTC) P208E, P103B; Dosing Valve Diagnostic Information TO BE USED BEFORE DEF DOSING VALVE REPLACEMENT - OBD13 And Newer Emissio

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> **Internal Content**

Related links and attachments

No links or attachments available

DO NOT REPLACE THE DEF DOSING VALVE FOR ANY OF THE ABOVE CODES PRIOR TO REVIEWING THE INFORMATION BELOW

The purpose of this article is to prevent unnecessary component replacement. <u>ALL OTHER DIAGNOSTIC TESTS AND CHECKS MUST BE PERFORMED</u> when diagnosing one of the codes above if the tests below do not immediately reveal an issue.

If an eService case must be submitted, <u>ALL INFORMATION</u> specified in Step Five MUST be included at the time the case is opened. Cases missing required information will be Refused.

Overview

During testing of the DEF dosing valve with Guided Diagnostics, certain observations and normal behaviors of the valve can be mistaken for symptoms of a malfunction. This normally results in the replacement of a dosing valve that is functioning correctly, leading to no change in the fault conditions and further diagnosis required or possible return visits in the future. The information below should be reviewed and the DEF Dosing Valve confirmed to be defective prior to replacement.

Fault Codes

A complete list of DTCs related to this Solution can be found in the Fault Codes section below.

Information

- Review the Detailed Status Information for the relevant code on the DTC Readout.

DTC List (2 Items)

Control Unit ▲	DTC	Status
Brake ECU (MID 136)	SID 69: Axel load sensor, FMI 2: Data erratic, intermittent, or incorrect	Active
Engine Control Module (EMS)	P229F64: NOx Sensor Gas Outlet Removed, Signal Plausibility Failure	Active 0

NOx Sensor Gas Outlet Removed

⊟ Detailed status information

Title ▲	Value
Confirmed DTC	True
Pending DTC	False
Test failed	True
Test failed since last clear	True
Test failed this operation cycle	True
Test not completed since last clear	False
Test not completed this operation cycle	False
Warning indicator requested	False

• If Confirmed DTC is **TRUE**: Proceed with diagnostics
• If Confirmed DTC is **FALSE**: Disregard and focus on other symptoms or DTCs relevant to the complaint.

1. Minor crystal accumulation at or near the tip of the Dosing Valve is normal.

2. A wet dosing valve tip is normal and does not indicate a leak.

3. When performing Operation 2589-08-03-05 Aftertreatment Selective Catalytic Reduction (SCR) System Test A - System pressure build up, it is normal to see a small amount of DEF released from the dosing valve. This occurs because air is bled from the system during pump start up, and there will be some DEF present with the air in the line as it is pushed out through the dosing valve.

  - During the test, the dosing valve is only open for the bleed operation and is closed when the pump is maintaining the correct pressure. A continuous spray from the valve at this time indicates a problem with the valve.

4. When performing Operation 2589-08-03-05 Aftertreatment Selective Catalytic Reduction (SCR) System Test B - Dosing test, it is very important that the dosing volumes are measured and recorded accurately. A 250 mL graduated cylinder with 2 mL graduations is the best instrument for this test.

  - Consistent dosing test failure can be justification for DEF dosing valve replacement.
  - **NOTE:** It is rare for this test to fail by exceeding the expected volume.

5. If diagnostic steps do not locate a root cause for the code(s), open an eService case with Dealer Technical Support
      - A **complete** summary of all tests performed along with **numeric measurements,** a DTC Readout, and any information concerning previous visits and parts replaced must be included when the case is opened.
            • **"Ok", "Good" and "Followed GD" are not acceptable descriptions of tests performed and test results.**
      - Add the solution numbers for **all** CBR articles followed.

Tags

K21134562   P103B-00   P208E-00   P103B00

P208E00

Feedback

Give feedback to help improve the content of this article

Methods For Taking A Screenshot / Screen Capture For eService Cases Or Other Use; Premium Tech Tool (PTT) And Other Software

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> **Internal Content**

Related links and attachments

No links or attachments available

Overview

There are a variety of reasons a screenshot may be needed for review. Diagnostic Trouble Code Readouts, PTT errors, product or control unit information, diagnostic test results, steps and messages, and oscilloscope readings name a few.

There are tools available to capture a screenshot, and Windows itself also has the ability to copy a screenshot to the clipboard without launching a program. This solution will cover the two methods that can be used on most every computer. If there is other imaging software installed on a computer that allows screen captures (Snagit, Jing, and FastStone Capture are a few examples), the software instructions will need to be followed.

## Procedure

I. Using The Windows Snipping Tool

Computers running Windows XP or newer (Windows 7, Windows 8, Windows 10) have the Snipping Tool utility installed as part of the Windows software package. The Snipping Tool allows shots to be taken of specific parts of the screen, speeding the process of capturing and saving a screenshot.

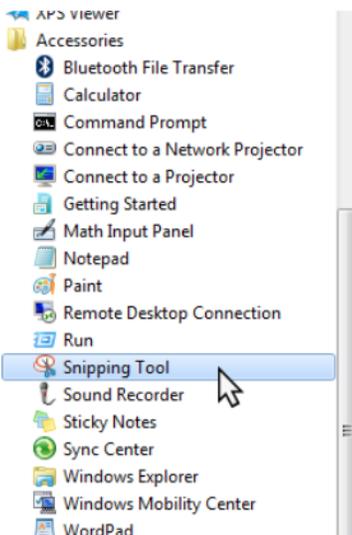**For Windows XP, Windows 7, and Windows 10:**

1. Click on the Start Menu, then mouse over or click on All Programs:
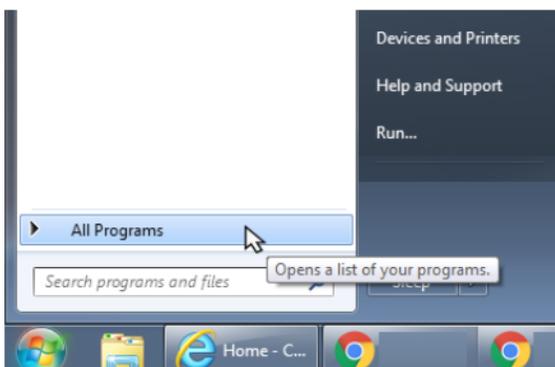
2. Scroll through the list of programs and find the Accessories folder:
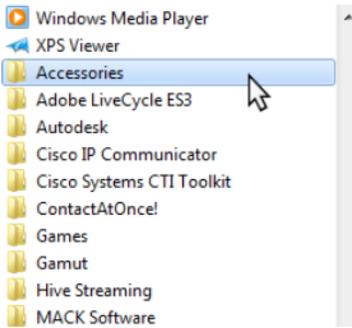
3. Click on the Accessories folder, then find the Snipping Tool. Click to open the program.
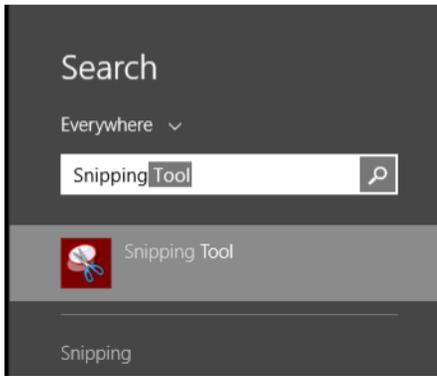

For Windows 8:

1. Click the Start button to bring up the Start Screen

2. Click the Search button (magnifying glass) in the upper right-hand corner of the screen

3. Type "Snipping" into the search bar. Click on Snipping Tool to open the program

For all Windows versions:

4. The Snipping Tool will open ready to capture a shot. The cursor should change to a cross icon. If the capture doesn't start automatically, click the New button in the Snipping Tool Window.

4a. Move the cursor to where one corner of the screenshot should be. Click and hold the left mouse button, then drag the mouse to the opposite corner of the desired shot:
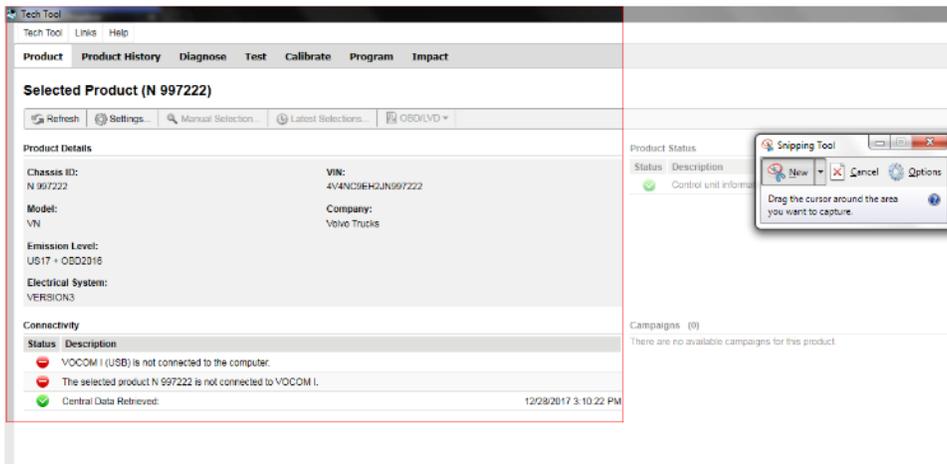
4b. When the left mouse button is released, Snipping Tool will capture the highlighted area and open it in a preview window:
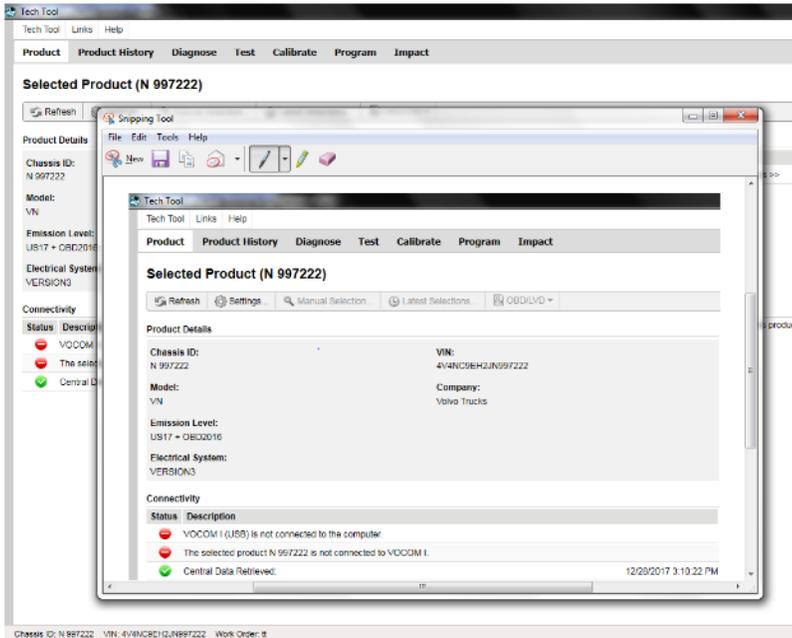
5. If a shot of a complete window is needed, click the dropdown icon (down arrow) next to the New button in the Snipping Tool and select Window Snip. Clicking once on the desired window to copy will open a screenshot of the full window in the preview pane:
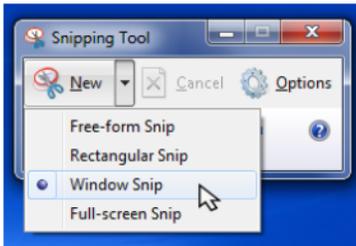
6. Click on the Save (Disk) icon in the preview window. Save the file to desktop or a folder where it can be located. Attach the file to the eService case as needed.

II. Using The Print Screen Key

1. If the screenshot will be of a specific window, make sure the window is maximized first.

2. To capture a screenshot of the full screen, press the Print Screen key on the keyboard. **NOTE:** Many laptops have Print Screen sharing a key with another function. It may be necessary to hold the Function key (Usually marked as Fn) as Print Screen is pressed

Wired keyboard   Laptop keyboard

2a. If taking a shot of a specific window, holding the Alt key and pressing Print Screen (Alt+Fn+Print Screen on a laptop) will only capture the contents of the currently selected window

Wired keyboard   Laptop keyboard

3. Open MS Paint

• **For Windows XP and Windows 7** Paint is located in the Accessories folder of the Start menu, follow the above steps for locating Snipping Tool

• **For Windows 8** Follow the steps for the Snipping Tool above to go to the Search box on the Start screen. Search for Paint

4. With Paint open, press either Ctrl+V on the keyboard to paste the screenshot, click the Paste button in the upper left-hand corner of the screen (Windows 7), or select Paste from the Edit menu at the top of the screen (Windows XP). The screenshot will appear in the drawing area.

5. Save the screenshot to Desktop or another folder where it can be easily located. Attach it to the eService case as needed.

Tags

K52225504   US04   US07   US10

US10+OBD13   US14+OBD13   US14+OBD15

US14+OBD16   US17+OBD16   US17+OBD18

VN   VAH   VHD   VT   11L ENGINE

13L ENGINE   16L ENGINE   MP7   MP8

MP10   CU15   CU12 CNG   CU9 CNG

CU9   LEU   LR   MRU - TERRAPRO

TE - TERRAPRO   AN - ANTHEM   CHU - PINNACLE

AXLE BACK   CXU - PINNACLE   AXLE FRONT

GR - GRANITE   GU - GRANITE   PI - PINNACLE

TD - TITAN   CH   CHN   CL   CT

CTP713   CTP713B   CV   CX   CXM

CXN   CXP612   CXP613   CXU613   DM

DM6   DMM   FDM   LE   MH   Mr.

MR6   RB   RB6   RD   RD6   RD8

RM6   RW6   RW7

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Product   **Product History**   **Diagnose**   **Test**   **Calibrate**   **Program**   **Impact**

Test

Select an operation and click Start

[+] Sort by function

🔍

[+] 1 - Service and maintenance

[−] 2 - Engine, Engine mounting and equipment

    [+] 20 - General

    [+] 21 - Engine

    [+] 22 - Lubrication and Oil System

    [+] 23 - Fuel system

    [−] 25 - Inlet and exhaust system

         2500-08-03-02 Boost pressure, test

         2500-08-03-03 Response, test

         2500-08-03-05 Intake and Exhaust Systems, Checks

         2530-08-03-02 Engine Brake Function

         2530-08-03-03 Warm Hold Function

         2545-08-03-02 Exhaust Aftertreatment Diagnostics

         2589-08-03-02 Exhaust Aftertreatment System, Service Regeneration

         2545-08-03-04 Exhaust Aftertreatment System Logged Data

         2549-08-03-03 NOx Conversion

         2551-08-03-02 Variable Geometry Turbo Function

         2584-08-03-01 SCR System, forced heating

         2589-08-03-05 Aftertreatment selective catalytic reduction (SCR) system

         2589-08-03-06 SCR System Drain

         2589-08-03-17 Aftertreatment Particulate Sensor, Diagnostic Monitor

         2589-08-03-18 Exhaust Aftertreatment System Analysis

    [+] 26 - Cooling System

    [+] 27 - Engine controls

    [+] 28 - Ignition and control system

    [+] 29 - Miscellaneous

[+] 3 - Electrical system and instruments

[+] 4 - Transmission

[+] 5 - Brakes

6 - Axles, suspension and steering

2549-08-03-03 NOx Conversion

[✓] Run the operation in simulation mode

Purpose

Check NOx sensor offset

Components to be tested are:

- NOx sensor

📄 **Note:** This operation should only be used in the following circumstances

- Reference from diagnostic/service information or Technical support
- Relevant DTCs: **P207F, P20EE, P225E, P225C**
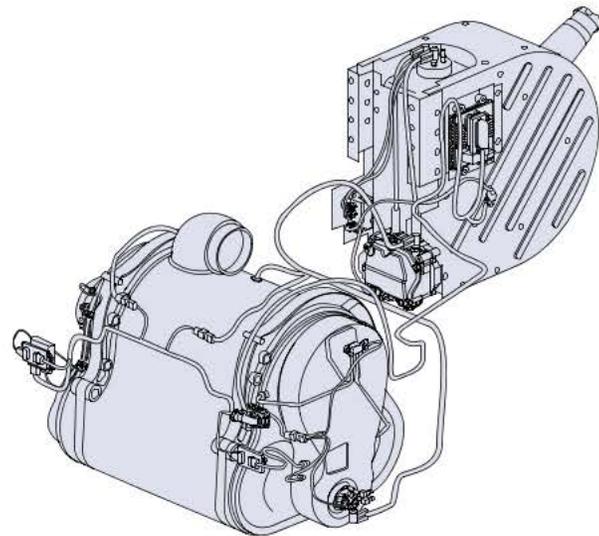
Description

The test can be used when:

- Verification - To compare system behaviour before and after repair

📄 **Note:** Operation may take approximately 20 - 30 minute(s) to complete

Start >   Cancel

Type here to search

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8/31/2021

2549-08-03-03 NOx Conversion

Simulation

Information >> Conditions >> Execution

Purpose

Check NOx sensor offset

Components to be tested are:

- NOx sensor

Note: This operation should only be used in the following circumstances

- Reference from diagnostic/service information or Technical support
- Relevant DTCs: **P207F, P20EE, P225E, P225C**

Description

The test can be used when:

- Verification - To compare system behaviour before and after repair

Note: Operation may take approximately 20 - 30 minute(s) to complete

▼ Information

Aftertreatment selective catalytic reduction (SCR) system

Continue >   Cancel