



# NOx Sensor Troubleshooting Guide - US10+OBD13 And Newer Emissions



## Component Overview

There are two Nitrogen Oxide (NOx) sensors in the Exhaust Aftertreatment System, an INLET and OUTLET. They are smart sensors reporting on the DL7 (J1939-7) data link and they measure the INLET (Pre SCR) and OUTLET (Post SCR) of NOx. The NOx sensors have unique CAN identification numbers and cannot be swapped. Additionally these sensors are not operational until the exhaust is up to operating temperature and free of moisture. The Engine Control Module compares the INLET and OUTLET NOx readings to evaluate the efficiency of the SCR.

The primary failure mode the NOx Sensors is internal failure, which will generate a sensor specific fault code.

## Diagnosis and Repair

Review the tables below to determine which category the Fault Code currently being diagnosed falls under. Proceed according to the instructions for the appropriate section.

### INLET NOx Sensor (NOx 1) Diagnostic Trouble Codes - Sensor Failure

REPLACE the sensor if any codes in red below are active and/or confirmed. Do not replace for inactive codes.

Fault Code	Fault Description
P22FB-92	NOx Sensor Performance - Sensing Element Bank 1 Sensor 1, Performance or Incorrect Operation
P220E-93	NOx Sensor Heater Control Circuit Range/Performance (Bank 1 Sensor 1), No operation
P2200-13	NOx Sensor Bank 1 Sensor 1, Circuit Open
P2203-00	NOx Sensor Circuit High Bank 1 Sensor 1
P2205-13	NOx Sensor Gas Outlet Open Circuit, Circuit open
P2206-00	NOx sensor heater control circuit low, bank 1 sensor 1
P2208-00	NOx sensor heater sense circuit, bank 1 sensor 1



**Direction/Repair:** Replace the sensor in accordance with Impact

instructions.

**Do NOT Cut the sensor wiring harness**, all NOx sensors are currently on mandatory return.

### Inlet NOx Sensor (NOx 1) Diagnostic Trouble Codes - Potential Sensor Failure

These codes in yellow below indicate that the inlet NOx sensor is potentially damaged, but further investigation is required to verify sensor condition.

Fault Code	Fault Description
P026C-00	Fuel Injection Quantity Lower Than Expected
P026D-00	Fuel Injection Quantity Higher Than Expected
P2201-64	NOx Sensor Bank 1 Sensor 1, Signal plausibility failure
P225C-00	NOx Sensor Performance - Signal Stuck High Bank 1 Sensor 1

**Direction:** Run the applicable PTT Operation per OBD Level.

Emission Level	PTT Operation
OBD 13-16	2549-08-03-03 Nox Conversion Test
OBD 17-18 VGT Only	2589-08-03-18 Exhaust Aftertreatment System Analysts (make sure Nox Subtest is selected)
OBD 17-18 TC Only	No test... Replace INLET (Nox 1) Nox Sensors if not replaced within past 3 months and release truck. If Nox sensor has been replaced within past 3 months open an E-Service Case.
OBD 19 and Newer VGT Only	2549-08-03-03 Nox Conversion Test  OR (whichever is available)  2589-08-03-18 Exhaust Aftertreatment System Analysts (only Nox Subtest available)
OBD 19 and Newer TC	2549-08-03-03 Nox Conversion Test

 Live UI

**Repair:**

- If the INLET (NOx1) sensor fails the evaluation, replace the Inlet NOx Sensor ONLY.
- If the NOx2 sensor (Outlet NOx Sensor) fails the test, disregard the results.

**OUTLET NOx Sensor (NOx 2) Diagnostic Trouble Codes - Sensor Failure**

REPLACE the sensor if any codes in red table below are active and/or confirmed. Do not replace for inactive codes.

Fault Code	Fault Description
P220F-93	NOx Sensor Incorrect Value at Startup, No operation
P229E-13	NOx Sensor Bank 1 Sensor 2, Circuit open
P22A6-00	NOx sensor heater sense circuit, bank 1 sensor 2
P22A1-00	NOx Sensor Circuit High Bank 1 Sensor 2
P22A3-13	NOx Sensor Heater Control Bank 1 Sensor 2, Circuit open
P22A4-00	NOx sensor heater control circuit low, bank 1 sensor 2
P22FE-00	NOx Sensor Performance - Sensing Element Bank 1 Sensor 2

Direction/Repair: Replace the sensor in accordance with Impact instructions.

**Do NOT Cut the sensor wiring harness**, all NOX sensors are currently on mandatory return.

**Outlet NOx Sensor (NOx 2) Diagnostic Trouble Codes - Potential Sensor Failure**

Fault Code	Fault Description
P225E-00	NOx Sensor Performance - Signal Stuck High Bank 1 Sensor 2

**Direction:** Run the applicable PTT Operation per OBD Level.

Emission Level	PTT Operation
OBD 13-16	2549-08-03-03 NOx Conversion Test
OBD 17-18 VGT Only	2589-08-03-18 Exhaust Aftertreatment System Analysts (make sure NOx and SCR Subtest are selected)
OBD 17-C Only	No test... Replace Outlet (NOx 2) NOx Sensors if not replaced within past 3 months and release truck. If NOx sensor has been replaced within past 3 months open an E-Service Case

Only	replaced within past 6 months open an E-Service Case.
OBD 19 and Newer VGT Only	2549-08-03-03 NOx Conversion Test  OR (whichever is available)  2589-08-03-18 Exhaust Aftertreatment System Analysts ( <b>only Nox Subtest available</b> )
OBD 19 and Newer TC Only	2549-08-03-03 NOx Conversion Test

**Repair:**

- If the Outlet (NOx 2) sensor fails the evaluation, replace the Outlet NOx Sensor ONLY.
- If the NOx 1 sensor (Inlet NOx Sensor) fails the test, disregard the results.

**Diagnostic Trouble Codes With NOx Sensor in the Description**

Direction/Repair: **DO NOT REPLACE** the NOx sensor(s) for these codes. Diagnostics should be performed using PTT Diagnostics and the comment section in the table below.

Fault Code	Fault Description	Comments
P220A-1C	NOx Sensor Supply Voltage Circuit (Bank 1 Sensor 1), Circuit voltage out of range	Power supply
P220B-1C	NOx Sensor Gas Outlet High Voltage, Circuit voltage out of range	Power supply
P225D-00	NOx Sensor Performance - Signal Stuck Low Bank 1 Sensor 1	Sensor reading fresh air
P225F-00	NOx Sensor Performance - Signal Stuck Low Bank 1 Sensor 2	Sensor reading fresh air
U029D-00	Lost Communication With NOx Sensor "A"	Most likely Harness Issue
U029E-00	Lost Communication with NOx Sensor B	Most likely Harness Issue

P229F-64	NOx Sensor Gas Outlet Removed, Signal  plausibility failure	Nuisance  code, most likely "Confirmed = False"
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Although the codes above have the term "NOx sensor" in their descriptions, it is highly unlikely that the sensor is the cause of any of these codes. The table above specifies the likely cause of each code.

### Rules for Replacement

Warranty will only cover replacement of the NOx Sensors if one of the codes in Red or Yellow listed above is active or confirmed. If the NOx Sensor is suspected to have failed with no active or confirmed codes, an eService case is required for further evaluation.

### Review the video link below.

<b>MACK</b>	<a href="#">NOx Sensor</a>
<b>VOLVO</b>	<a href="#">NOx Sensor</a>

**Standard Diagnostic Time for a NOx Sensor is 1.0 hr.**

#### Tags

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- [p2205-13](#)
- [p2206-00](#)
- [p2208-00](#)
- [p026c-00](#)
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