



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



### 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 (NOx1) 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
P220013	NOx Sensor Bank 1 Sensor 1, Circuit Open
P220300	NOx Sensor Circuit High Bank 1 Sensor 1
P220513	NOx Sensor Gas Inlet Open Circuit, Circuit open
P220600	NOx sensor heater control circuit low, bank 1 sensor 1
P220800	NOx sensor heater sense circuit, bank 1 sensor 1
P220E93	NOx Sensor Heater Control Circuit Range/Performance (Bank 1 Sensor 1), No operation
P22FB92	NOx Sensor Performance - Sensing Element Bank 1 Sensor 1, Performance or Incorrect Operation

**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 (NOx1) 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
P026C00	Fuel Injection Quantity Lower Than Expected
P026D00	Fuel Injection Quantity Higher Than Expected
P220164	NOx Sensor Bank 1 Sensor 1, Signal plausibility failure
P225C00	NOx Sensor Performance - Signal Stuck High Bank 1 Sensor 1

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

Emission Level	PTT Operation
OBD13 to OBD16	2549-08-03-03 NOx Conversion Test
OBD17 to current	2589-08-03-18 Exhaust Aftertreatment System Analysis (only NOx subtest to be run)  or (whichever is available)  2549-08-03-03 NOx Conversion Test
OBD17 to current	If no test is available... Replace INLET (NOx1) NOx Sensors if not replaced within past 3 months and release truck.  If the NOx sensor has been replaced within past 3 months open an E-Service Case.

### 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 (NOx2) 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
P220F93	NOx Sensor Incorrect Value at Startup, No operation
P229E13	NOx Sensor Bank 1 Sensor 2, Circuit open
P22A100	NOx Sensor Circuit High Bank 1 Sensor 2
P22A313	NOx Sensor Heater Control Bank 1 Sensor 2, Circuit open
P22A400	NOx sensor heater control circuit low, bank 1 sensor 2
P22A600	NOx sensor heater sense circuit, bank 1 sensor 2
P22FE00	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 (NOx2) Diagnostic Trouble Codes - Potential Sensor Failure

Fault Code	Fault Description
P113600	NOx Sensor 1/2 Correlation Calibration Error Bank 1
P225E00	NOx Sensor Performance - Signal Stuck High Bank 1 Sensor 2

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

Emission Level	PTT Operation
OBD13 to OBD16	2549-08-03-03 NOx Conversion Test
OBD17 to current	2589-08-03-18 Exhaust Aftertreatment System Analysis (All available subtest to be run)  OR (whichever is available)  2549-08-03-03 NOx Conversion Test
OBD17 to current	If no test is available... Replace Outlet (NOx2) 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.

### Repair:

- If the Outlet (NOx2) sensor fails the evaluation, replace the Outlet NOx Sensor ONLY.
- If the NOx1 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
P220A1C	NOx Sensor Supply Voltage Circuit (Bank 1 Sensor 1), Circuit voltage out of range	Power supply
P220B1C	NOx Sensor Gas Outlet High Voltage, Circuit voltage out of range	Power supply
P225D00	NOx Sensor Performance - Signal Stuck Low Bank 1 Sensor 1	Sensor reading fresh air
P225F00	NOx Sensor Performance - Signal Stuck Low Bank 1 Sensor 2	Sensor reading fresh air
P229F64	NOx Sensor Gas Outlet Removed, Signal plausibility failure	Nuisance code, most likely "Confirmed = False"
U029D00	Lost Communication With NOx Sensor "A"	Most likely Harness Issue
U029E00	Lost Communication with NOx Sensor "B"	Most likely Harness Issue

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.

Standard Diagnostic Time for a NOx Sensor is 1.0 hr.

### Tags

[p2200-13](#)    [p2203-00](#)    [p2205-13](#)    [p2206-00](#)  
[p2208-00](#)    [p026c-00](#)    [p026d-00](#)    [p2201-64](#)  
[p225c-00](#)    [p220f-93](#)    [p229e-13](#)    [p220a-1c](#)  
[p220b-1c](#)    [p225d-00](#)    [p225f-00](#)    [u029d-00](#)

<a href="#">u029e-00</a>	<a href="#">p229f-64</a>	<a href="#">p22fb-92</a>	<a href="#">p220e-93</a>
<a href="#">p22a6-00</a>	<a href="#">p22a1-00</a>	<a href="#">p22a3-13</a>	<a href="#">p22a4-00</a>
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<a href="#">p207f-00</a>	<a href="#">mack</a>	<a href="#">unlocking uptime</a>	<a href="#">p220013</a>
<a href="#">p220300</a>	<a href="#">p22fb92</a>	<a href="#">p220e93</a>	<a href="#">p220513</a>
<a href="#">p220600</a>	<a href="#">p220800</a>	<a href="#">p026c00</a>	<a href="#">p026d00</a>
<a href="#">p220164</a>	<a href="#">p225c00</a>	<a href="#">p220f93</a>	<a href="#">p229e13</a>
<a href="#">p22a600</a>	<a href="#">p22a100</a>	<a href="#">p22a313</a>	<a href="#">p22a400</a>
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[Make and Model > Mack > TD - Titan](#)

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