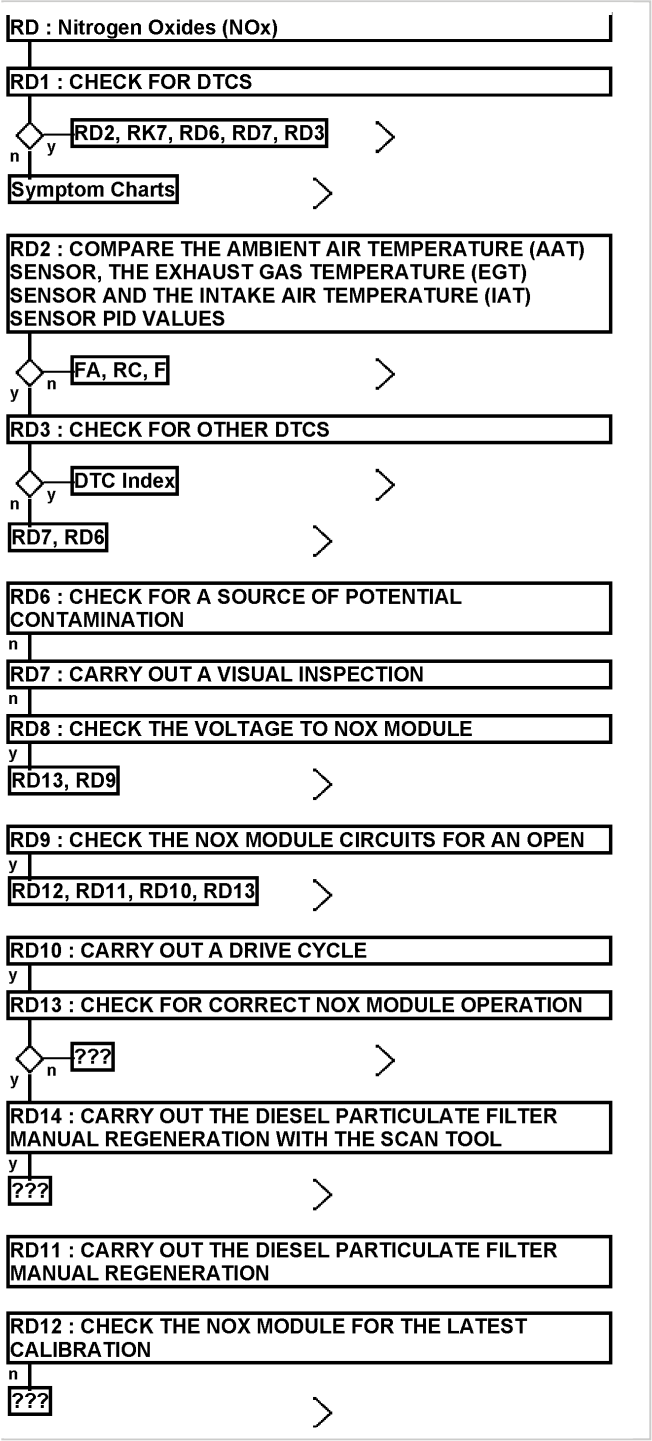
RD: NITROGEN OXIDES (NOX)

Nitrogen Oxides (NOx)



NOTE: Regeneration may occur during normal operation. During regeneration, diagnostic procedures may display biased values. If a regeneration occurs during diagnostic procedures, allow the process to complete before continuing diagnostics.

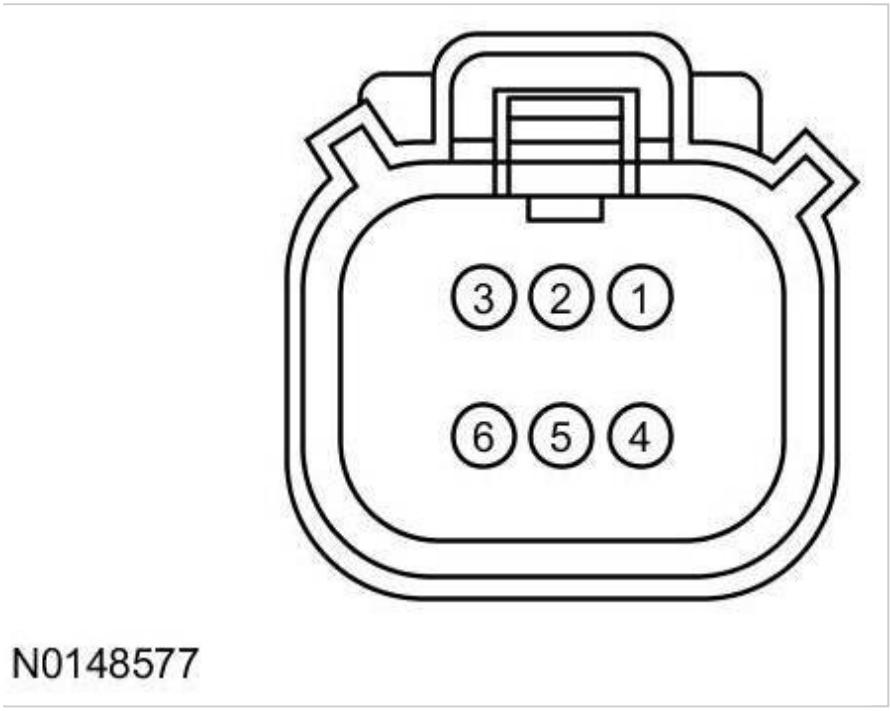
This pinpoint test is intended to diagnose the following:
harness circuits: VPWR, PWRGND, GND, CAN2+, and CAN2-
nitrogen oxides bank 1, sensor 1 (NOx11) sensor (5J299)
nitrogen oxides bank 1, sensor 2 (NOx12) sensor (5J299)
NOx11 module (5K202)
NOx12 module (5K202)

Nitrogen Oxides Bank 1, Sensor 1 (NOx11) Module Connector

Harness Side

Circuit	Pin
VPWR (Vehicle Power)	6
CAN2+ (Controller Area Network 2)	5
CAN2- (Controller Area Network 2)	2
PWRGND (Power Ground)	1
GND (Ground)	4

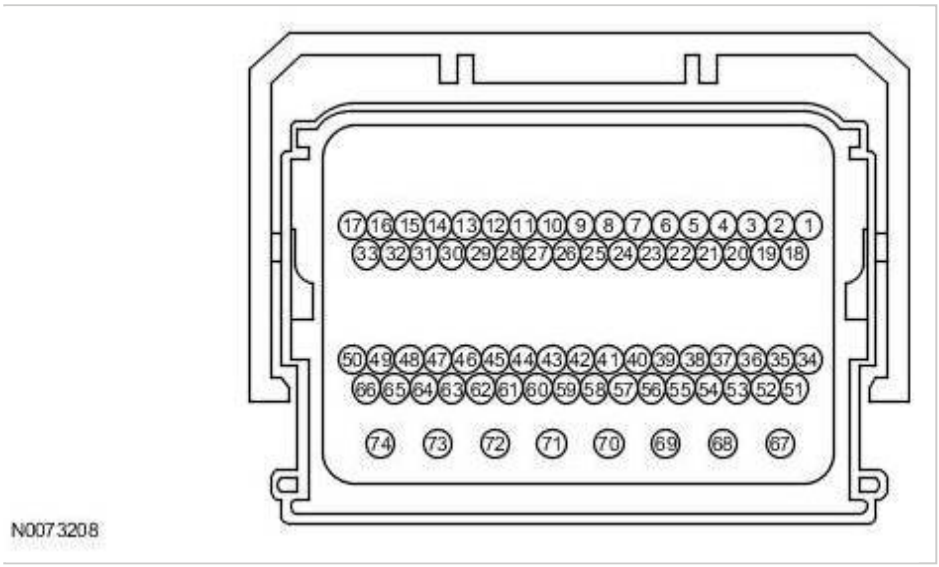
Nitrogen Oxides Bank 1, Sensor 2 (NOx12) Module Connector



Harness Side

Circuit	Pin
VPWR (Vehicle Power)	6
CAN2+ (Controller Area Network 2)	5
CAN2- (Controller Area Network 2)	2
PWRGND (Power Ground)	1
GND (Ground)	4

Powertrain Control Module-B (PCM-B) Connector



Harness Side

Circuit	Pin
CAN2+ (Controller Area Network 2)	56
CAN2- (Controller Area Network 2)	39

RD1 : CHECK FOR DTCS

Are DTCs P0139, P0140, P06EA, P06EB, P123E, P123F, P207F, P20EE, P2200, P2201, P2204, P2209, P220A, P220B P220E, P220F, P225A, P225B, P229E, P229F, P22A2, P22A7, P249C, P2A01, U029D, U029E, U05A1 or U05A2 present?

Yes	No
For DTCs P06EA or P06EB, Go to RD2. For DTC P207F, Go to RK7. For DTCs P2200, P220E, P220F, P225A, P225B or P229E, Go to RD6. For DTCs U05A1 or U05A2, Go to RD7. For all others, Go to RD3.	Concern is elsewhere. RETURN to Symptom Charts for further direction.

RD2 : COMPARE THE AMBIENT AIR TEMPERATURE (AAT) SENSOR, THE EXHAUST GAS TEMPERATURE (EGT) SENSOR AND THE INTAKE AIR TEMPERATURE (IAT) SENSOR PID VALUES

NOTE: Allow the exhaust system temperature to stabilize to the ambient temperature for a minimum of 6 hours.

Ignition ON, engine OFF.
Access the PCM and monitor the AAT (TEMP) PID.
Access the PCM and monitor the EGT14 (TEMP) PID.
Access the PCM and monitor the IAT11 (TEMP) PID.

Are the AAT, EGT14, and IAT11 PID readings within 40 °C (72 °F) of ambient temperature?

Yes	No
Go to RD3.	REFER to the appropriate pinpoint test to DIAGNOSE the sensor that is out of range. For the AAT sensor, GO to Pinpoint Test FA. For the EGT14 sensor, GO to Pinpoint Test RC. For the IAT sensor, GO to Pinpoint Test F.

RD3 : CHECK FOR OTHER DTCS

Are any DTCs present other than P0139, P0140, P06EA, P06EB, P123E, P123F, P20EE, P2201, P2204, P2209, P220A, P220B, P229F, P22A2, P22A7, P249C, P2A01, U029D or U029E?

Yes	No
Disregard the current DTC at this time. GO to DTC Index to address the next DTC.	For DTCs U029D or U029E, Go to RD7. For all others, Go to RD6.

RD4 : CHECK THE REDUCTANT

Check the quality of the reductant sample using the appropriate test equipment. Refer to Engine Control Components, Selective Catalytic Reduction (SCR) Catalyst for additional information.

Is a concern present?

Yes	No
Go to RD5.	Drive the vehicle for greater than 16 km (10 miles) at a steady state speed. Go to RD6.

RD5 : REPLACE THE REDUCTANT

Drain and refill the reductant tank with new reductant.
Drive the vehicle for greater than 16 km (10 miles) at a steady state speed
Carry out the PCM self-test.

Is DTC P207F present?

Yes	No
Go to RD6.	The system is operating correctly at this time.

RD6 : CHECK FOR A SOURCE OF POTENTIAL CONTAMINATION

Investigate the following items as potential sources of NOx11 sensor and NOx12 sensor contamination:
- **use of unapproved silicon sealers**
- **excessive oil consumption**
- **coolant leaking internally in the engine**
- **use of unapproved cleaning agents**

Is a concern present?

Yes	No
REPAIR the source of the contamination. CHANGE the engine oil and oil filter. Clear the PCM DTCs. REPEAT the self-test.	Go to RD7.

RD7 : CARRY OUT A VISUAL INSPECTION

Visually inspect the NOx11 module and the NOx12 module, the NOx11 sensor and the NOx12 sensor, the NOx11 module wiring and the NOx12 module wiring and the NOx11 module ground and the NOx12 module ground connections for the following:

- **signs of excessive heat**
- **damaged wiring harness or connectors**
- **incorrect harness routing**
- **incorrect connections**
- **incorrect ground circuit connections to the frame**

Visually inspect the exhaust system for the following:

- **exhaust leaks at flanges and gaskets**
- **exhaust leaks at the NOx11 and NOx12 sensors**

Visually inspect the intake manifold gasket for signs of leaks.
Inspect for radio frequency interference or electromagnetic interference

Is a concern present?

Yes	No
REPAIR as necessary. Clear the PCM DTCs. REPEAT the self-test.	Go to RD8.

RD8 : CHECK THE VOLTAGE TO NOX MODULE

NOTE: Only diagnose the suspect NOx module indicated by the DTC

For NOx11 module,
NOx11 Module connector disconnected.
Ignition ON, engine OFF.

Measure the voltage between:

(+) NOx11 Module Connector, Harness Side	(-)
VPWR - Pin 6	Ground

For NOx12 module,

NOx12 Module connector disconnected.

Ignition ON, engine OFF.

Measure the voltage between:

(+) NOx12 Module Connector, Harness Side	(-)
VPWR - Pin 6	Ground

Is the voltage greater than 10.5 V?

Yes	No
For DTCs P220A or P220B, Go to RD13. For all others, Go to RD9.	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

RD9 : CHECK THE NOX MODULE CIRCUITS FOR AN OPEN

NOTE: Only diagnose the suspect NOx module indicated by the DTC

Ignition OFF.
PCM_B connector disconnected.
For NOx11 module,

Measure the resistance between:

(+) NOx11 Module Connector, Harness Side	(-) PCM_B Connector, Harness Side
CAN2+ - Pin 5	CAN2+ - Pin 56
CAN2- - Pin 2	CAN2- - Pin 39

Measure the resistance between:

(+) NOx11 Module Connector, Harness Side	(-)
PWRGND - Pin 1	Ground
GND - Pin 4	Ground

For NOx12 module,

Measure the resistance between:

(+) NOx12 Module Connector, Harness Side	(-) PCM_B Connector, Harness Side
CAN2+ - Pin 5	CAN2+ - Pin 56
CAN2- - Pin 2	CAN2- - Pin 39

Measure the resistance between:

(+) NOx12 Module Connector, Harness Side	(-)
PWRGND - Pin 1	Ground
GND - Pin 4	Ground

Are the resistances less than 5 ohms?

Yes	No
For DTCs P225A or P225B, Go to RD12. For DTC P207F, INSTALL a new NOx12 sensor. CARRY OUT the Reset And Clear The Specified Function Nitrogen Oxide on the scan tool. REFER to Diagnostic Methods, Clear The Continuous Diagnostic Trouble Codes (DTCs) And Reset The Emission Monitors Information in The Powertrain Control Module (PCM). Go to RD11. For DTCs P0139, P06EA, P06EB, P2200, P2201, P220E, P220F, P229E, P229F or P2A01, INSTALL a new NOx sensor in question. CARRY OUT the Reset And Clear The Specified Function Nitrogen Oxide on the scan tool. REFER to Diagnostic Methods, Clear The Continuous Diagnostic Trouble Codes (DTCs) And Reset The Emission Monitors Information in The Powertrain Control Module (PCM). Go to RD10. For all others, Go to RD13.	REPAIR the open circuit. Clear the PCM DTCs. REPEAT the self-test.

RD10 : CARRY OUT A DRIVE CYCLE

Carry out a drive cycle. Refer to Diagnostic Methods, Drive Cycles See: Computers and Control Systems > Components > Drive Cycles.
Carry out the PCM self-test.

Are any DTCs present?

Yes	No
Go to RD13.	The system is operating correctly at this time. Clear the PCM DTCs. REPEAT the self-test.

RD11 : CARRY OUT THE DIESEL PARTICULATE FILTER MANUAL REGENERATION

Carry out the diesel particulate filter manual regeneration with the scan tool
Drive the vehicle for greater than 16 km (10 miles) at a steady state speed
Carry out the PCM self-test.

Is DTC P207F present?

Yes	No
INSTALL a new Selective Catalytic Reduction (SCR) Catalyst. CARRY OUT the Diesel Particulate Regeneration System DPF Parameter Reset function on the scan tool. REFER to Diagnostic Methods, Clear The Continuous Diagnostic Trouble Codes (DTCs) And Reset The Emission Monitors Information in The Powertrain Control Module (PCM). Clear the PCM DTCs. REPEAT the self-test.	The system is operating correctly at this time. Clear the PCM DTCs. REPEAT the self-test.

RD12 : CHECK THE NOX MODULE FOR THE LATEST CALIBRATION

PCM_B connector connected.
For DTC P225A,
NOx11 Module connector connected.
Check the NOx11 module for the correct calibration version number
For DTC P225B,
NOx12 Module connector connected.
Check the NOx12 module for the correct calibration version number

Does the NOx11 module or the NOx12 module calibration version number match the PCM?

Yes	No
The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.	For DTC P225A, REPROGRAM the NOx11 module. Clear the PCM DTCs. REPEAT the self-test. For all others, REPROGRAM the NOx12 module. Clear the PCM DTCs. REPEAT the self-test.

RD13 : CHECK FOR CORRECT NOX MODULE OPERATION

For DTCs P06EA, P123E, P2200, P2204, P2209, P220A, P249C, U029D or U05A1,
Disconnect all the NOx11 module connectors.
Visually inspect for:

- **pushed out pins**
- **corrosion**

Connect all the NOx11 module connectors and make sure they seat correctly
For all others,
Disconnect all the NOx12 module connectors.
Visually inspect for:
- **pushed out pins**
- **corrosion**

Connect all the NOx12 module connectors and make sure they seat correctly

Is the concern still present?

Yes	No
INSTALL a new NOx module in question. CARRY OUT the Reset And Clear The Specified Function Nitrogen Oxide on the scan tool. REFER to Diagnostic Methods, Clear The Continuous Diagnostic Trouble Codes (DTCs) And Reset The Emission Monitors Information in The Powertrain Control Module (PCM). Go to RD14.	For DTCs P123E, P123F, P2204 or P22A2, DRIVE the vehicle until the system warning message has cleared from the instrument cluster message center. Clear the PCM DTCs. REPEAT the self-test. For all others, the system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

RD14 : CARRY OUT THE DIESEL PARTICULATE FILTER MANUAL REGENERATION WITH THE SCAN TOOL

Carry out diesel particulate filter regeneration
Carry out a drive cycle. Refer to Diagnostic Methods, Drive Cycles See: Computers and Control Systems > Components > Drive Cycles.

Are DTCs P0140, P2209 or P22A7 present?

Yes	No
For DTC P2209, INSTALL a new NOx11 sensor. CARRY OUT the Reset And Clear The Specified Function Nitrogen Oxide on the scan tool. REFER to Diagnostic Methods, Clear The Continuous Diagnostic Trouble Codes (DTCs) And Reset The Emission Monitors Information in The Powertrain Control Module (PCM). Clear the PCM DTCs. REPEAT the self-test. For all others, INSTALL a new NOx12 sensor. CARRY OUT the Reset And Clear The Specified Function Nitrogen Oxide on the scan tool. REFER to Diagnostic Methods, Clear The Continuous Diagnostic Trouble Codes (DTCs) And Reset The Emission Monitors Information in The Powertrain Control Module (PCM). Clear the PCM DTCs. REPEAT the self-test.	The system is operating correctly at this time.