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Coding Information

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Title: N9/10 and N13 Aftertreatment Outlet NOx Sensor Internal Water Shield

Applies To: Navistar Powered Vehicles Equipped with SCR and Vertical Exhaust Configurations (N13 Units Built Prior to August 1, 2014; N9/10 Unit Built Prior to August 1, 2015)

CHANGE LOG

Please refer to the change log text box below for recent changes to this article:

11/18/2015 - "Applies To:" Description Changed 11/05/2015 - Initial Article Release
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DESCRIPTION

Water intrusion can cause the malfunction or failure of the aftertreatment outlet NOx sensor on vertical exhaust configurations. See below for a list of feature codes for vertical exhaust configurations on Navistar powered vehicles. The recommended repair is to install a rain shield which prevents water traveling down vertical exhausts from contacting the outlet NOx sensor. Follow the diagnostic steps in this article to determine if your vehicle should be repaired by installing the aftertreatment rain shield in the outlet of the SCR catalyst .

Vertical Exhaust Configuration Feature Codes:

- 07BDS
- 07BDT
- 07BEJ
- 07BEP
- 07BER
- 07BHR
- 07BHS
- 07BHT
- 07BHU
- 07BJU
- 07BJX
- 07BKD
- 07BKE
- 07BKG
- 07BKM
- 07BKU
- 07DXM
- 07DXN

NOTE: For Cummins® powered vehicles experiencing the same symptoms, refer to TSB150057 located on QuickServe Online.

SYMPTOM(s)

Diagnostic Trouble Code(s) & Dashboard Indicator Light(s):

SPN	FMI	Description	Lamp
3226	4	Aftertreatment 1 Outlet NOx Sensor Circuit - Voltage Below Normal or Shorted to Low Source	Amber
3226	10	Aftertreatment 1 Outlet NOx Sensor - Abnormal Rate of Change	Amber

503110 | Aftertreatment 1 Outlet NOx Sensor Heater - Abnormal Rate of Change | Amber

Customer Observations or Concerns:

Customer may experience a MIL and possible reduced engine performance.

SPECIAL TOOL(S) / SOFTWARE

Tool Description
8 mm (5/16 in) Drill Bit
End Wrench
Center Punch
Cleaning Solvent
Electric Drill
Flathead Screwdriver
Masking Tape
Metal File
Needle Nose Pliers
Rubber Gloves
Ruler Measuring 6 inches or Greater
Safety Glasses
Sand Paper 40 to 60 Grit
Shop Towels
Stir Stick

SERVICE PARTS INFORMATION

The parts required for installation are shown in Table 1 and 2 below.

Table 1 - Service Parts for N13			
Description	Part Number	Quantity Required	Stocked Location
NOx Sensor Internal Water Shield	4352880	1	Cummins Distributor
Screw, Hex Flange Head Cap	4354269	2	Cummins Distributor
Template	4353074	1	Cummins Distributor
High Temp Sealant	5362108	1	Cummins Distributor

Table 1 - Service Parts for N9/10			
Description	Part Number	Quantity Required	Stocked Location
NOx Sensor Internal Water Shield	4353926	1	Cummins Distributor
Screw, Hex Flange Head Cap	4354269	2	Cummins Distributor
Template	4353074	1	Cummins Distributor
High Temp Sealant	5362108	1	Cummins Distributor

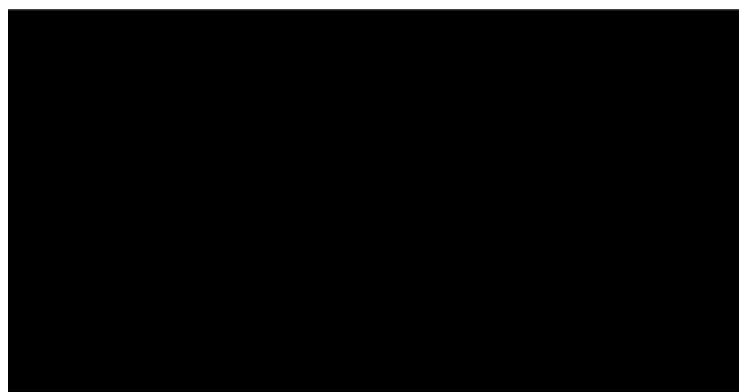
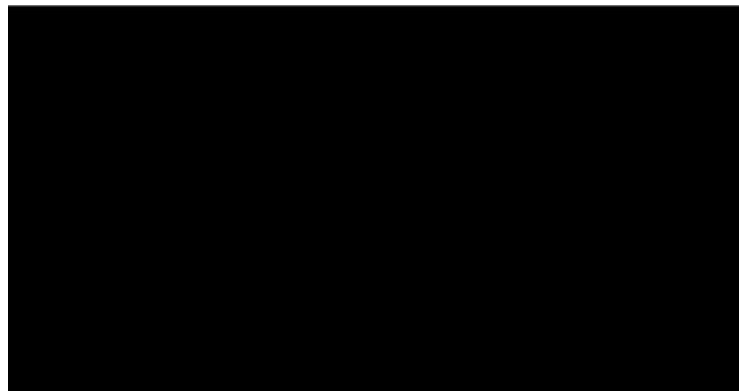
NOTE: Cummins® High Temp Sealant, Part Number 5362108, is the only sealant approved to be used in this procedure.

DIAGNOSTIC STEPS

Step	Action	Decision
1	VERIFY CONCERN: Reference electronic service tool to read the fault codes. Check for fault codes 3226-4, 3226-10, or 5031-10. Are any of the listed fault codes active or inactive?	Yes: Follow the steps below in the <i>Repair Steps</i> section to install a water shield. Diagnose the NOx Out sensor using the steps in the appropriate diagnostic manual.
		No: Exit this article and return to appropriate Fault Code Action Plan (FCAP) to continue troubleshooting fault codes.

REPAIR STEPS

A video has been created to help illustrate the following adjustment procedure. Watch the two videos below to view the repair from start to finish.

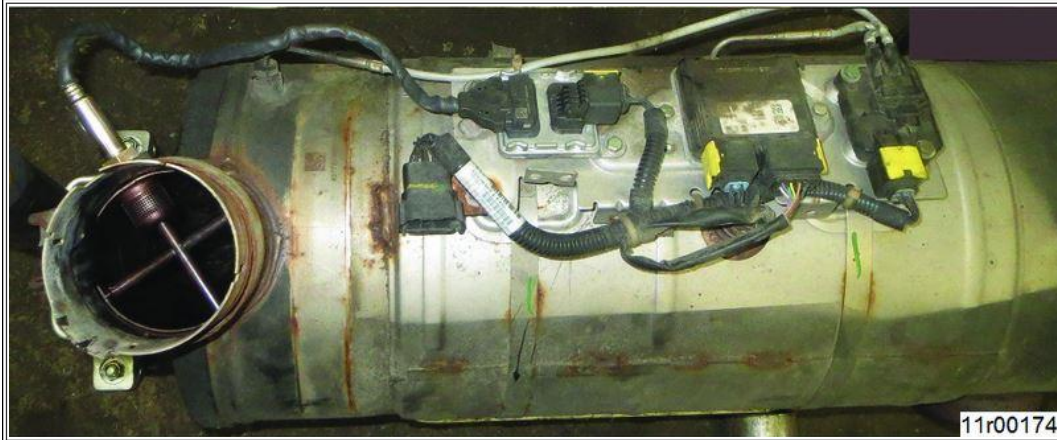


REMOVAL PROCEDURE:

Wait for the aftertreatment system to cool down before working on the hot exhaust or exhaust components. Failure to do so could result in personal injury.

**WARNING:**

1. Remove aftertreatment SCR assembly from chassis. See Exhaust Aftertreatment System with SCR Service Manual for repair steps.
2. Remove aftertreatment outlet NOx sensor from aftertreatment SCR. See Exhaust Aftertreatment System with SCR Service Manual for repair steps.

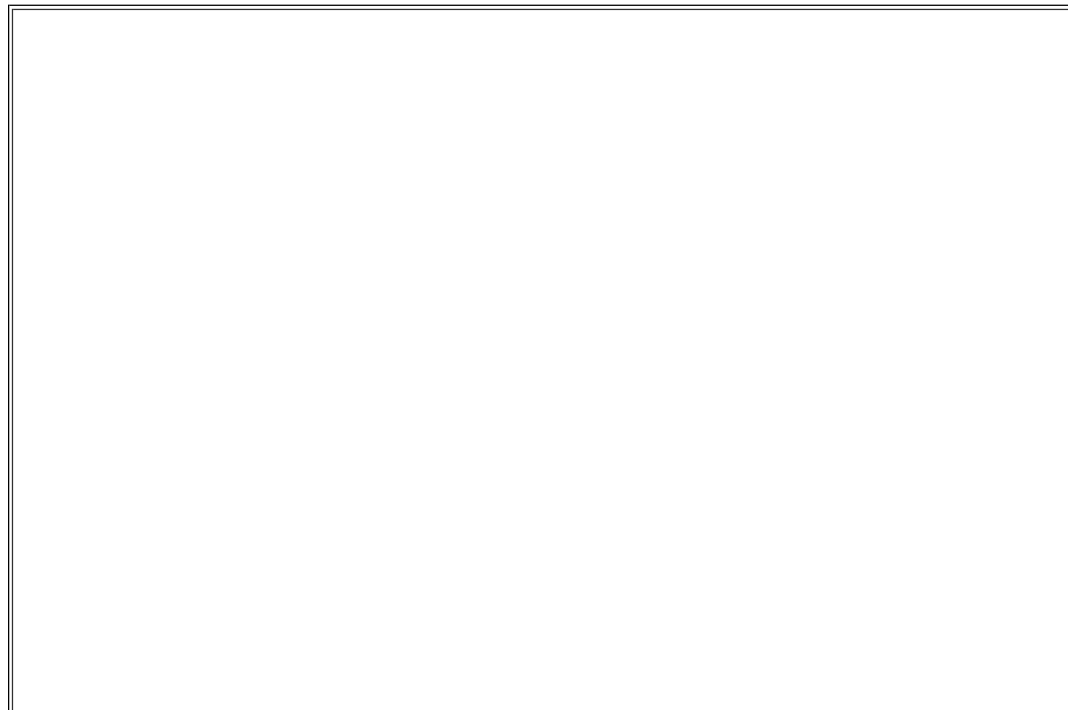
**Figure 1: SCR Catalyst Off Chassis****INSPECTION, DRILLING, AND CLEANING PROCEDURE:****CAUTION:**

Do **not** use a metallic object to clean the aftertreatment SCR catalyst. This will scratch the surface of the aftertreatment SCR catalyst which may cause excessive diesel exhaust fluid buildup.

CAUTION:

Do **not** use any chemical solvents or cleaners to clean internal metal surface. Possible damage to aftertreatment SCR catalyst may occur.

1. Every aftertreatment SCR catalyst unit has a drain hole (Figure 2, Item 1) which allows water accumulated in the unit to drain out of the system. A plugged drain hole can cause an aftertreatment outlet NOx sensor to malfunction. The drain hole **must** be clear of debris, dirt, or any other material.
2. If debris, dirt, or any other material is present carefully clean the affected area with a nonmetallic tool.



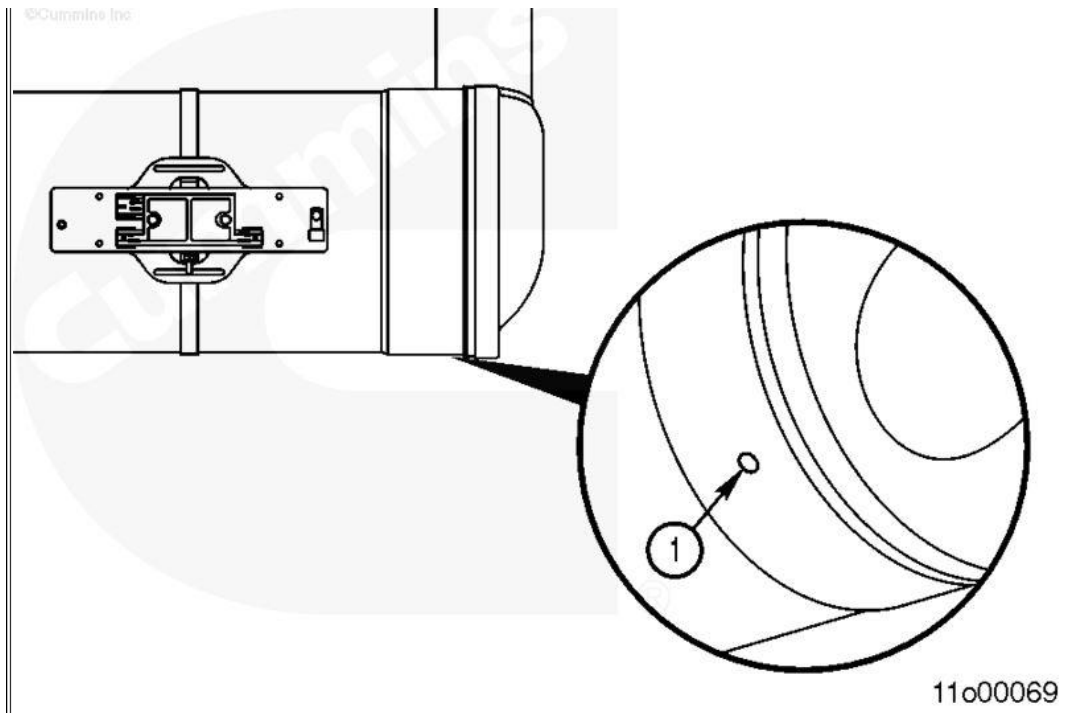


Figure 2: SCR Catalyst Drain Hole Location

Item 1: Drain Hole

3. The drain hole (Figure 3, Item 1) is **always** oriented in the lowest section of the aftertreatment SCR catalyst outlet (Figure 3, Item 2), pointed toward ground.

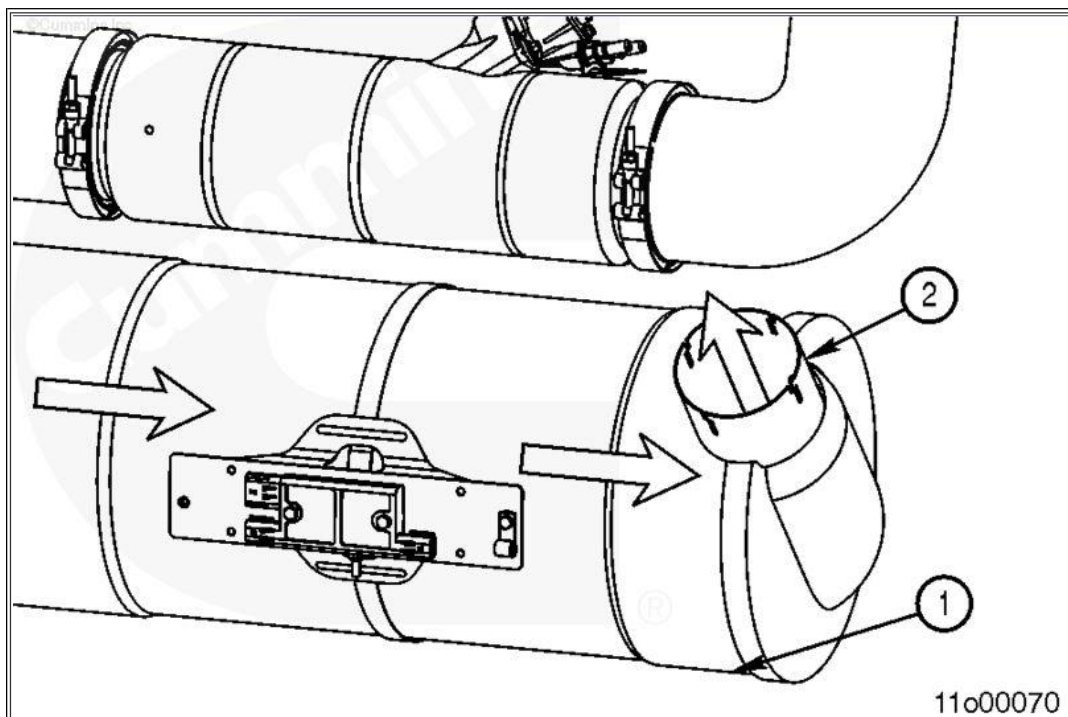


Figure 3: Orientation of Drain Hole

Item 1: Location of Drain Hole

Item 2: SCR Catalyst Outlet

4. Cut template for either a Marmon joint or Torca joint. See template, Part Number 4353074, for more information.
5. Attach appropriate template to aftertreatment SCR catalyst outlet pipe, as shown in Figure 4.



Figure 4: Rain Shield Template



WARNING:

To reduce the possibility of personal injury, wear goggles and protective clothing.

6. Use center punch to mark holes at designated location on template.
7. Drill holes using bit sizes specified on template.

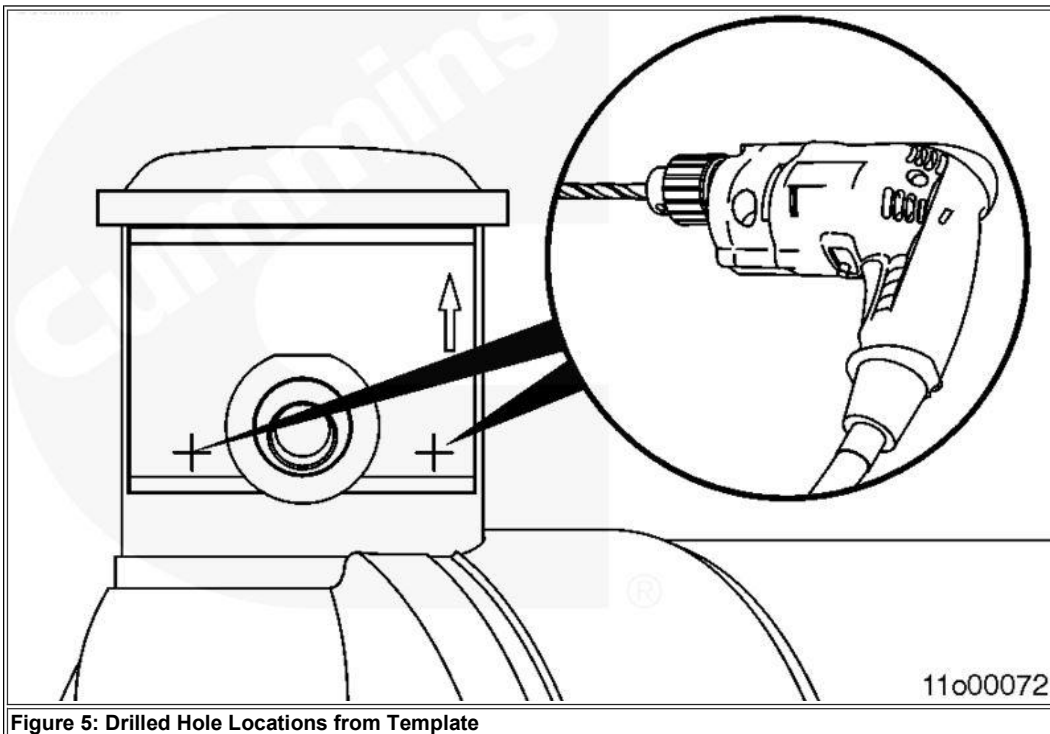


Figure 5: Drilled Hole Locations from Template




8. Remove template.
9. Remove any burrs from holes using a metal file.
10. Clean metal shavings out of aftertreatment SCR catalyst. These shavings could potentially clog drain hole.
11. Mask off sensing wheel cup screen area using masking tape as shown in Figure 6.



Figure 6: NOx Sensor Wheel Cup Screen Area

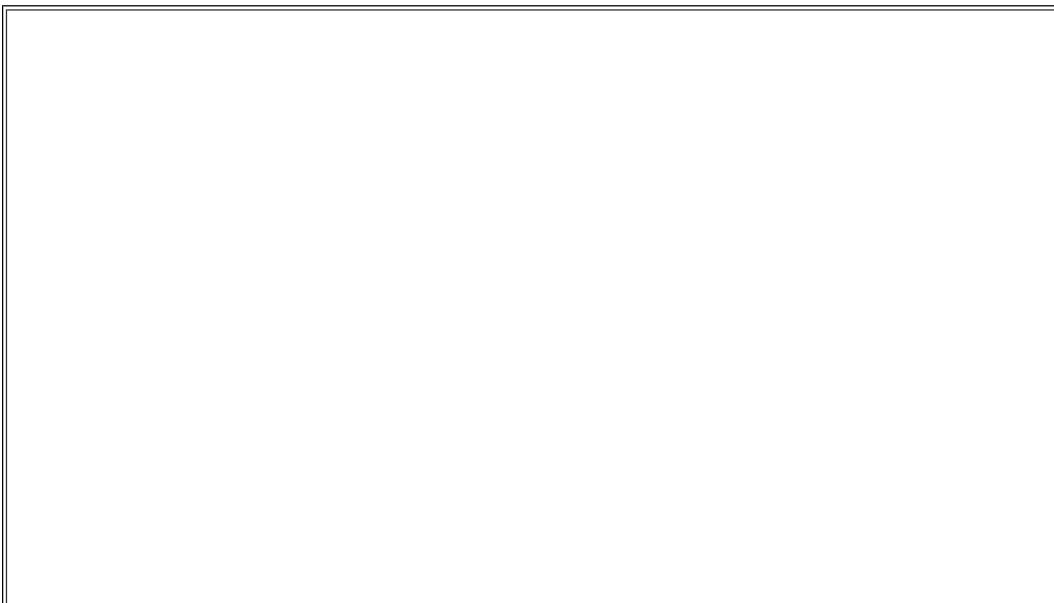
12. Roughen the smooth surfaces of the SCR catalyst pipe on either side of the sensing wheel and directly above the sensing wheel using 40 to 60 grit sand paper.

13. Roughen the top (the side facing up while looking down into the SCR catalyst outlet) of the outlet NOx sensor internal water shield's surface using 40 to 60 grit sand paper.

 WARNING:	When using solvents, acids, or alkaline materials for cleaning, follow the manufacturer's recommendations for use. Wear goggles and protective clothing to reduce the possibility of personal injury.
 WARNING:	Some solvents are flammable and toxic. Read the manufacturer's instructions before using.
 WARNING:	Use skin and eye protection when handling caustic solutions to reduce the possibility of personal injury.

14. Use cleaning solvent to clean surfaces thoroughly from oil, grease, dirt, corrosion, or other contaminants.

15. Attach masking tape to aftertreatment outlet NOx sensor internal water shield making sure to leave one inch of exposed metal as shown in Figure 7.



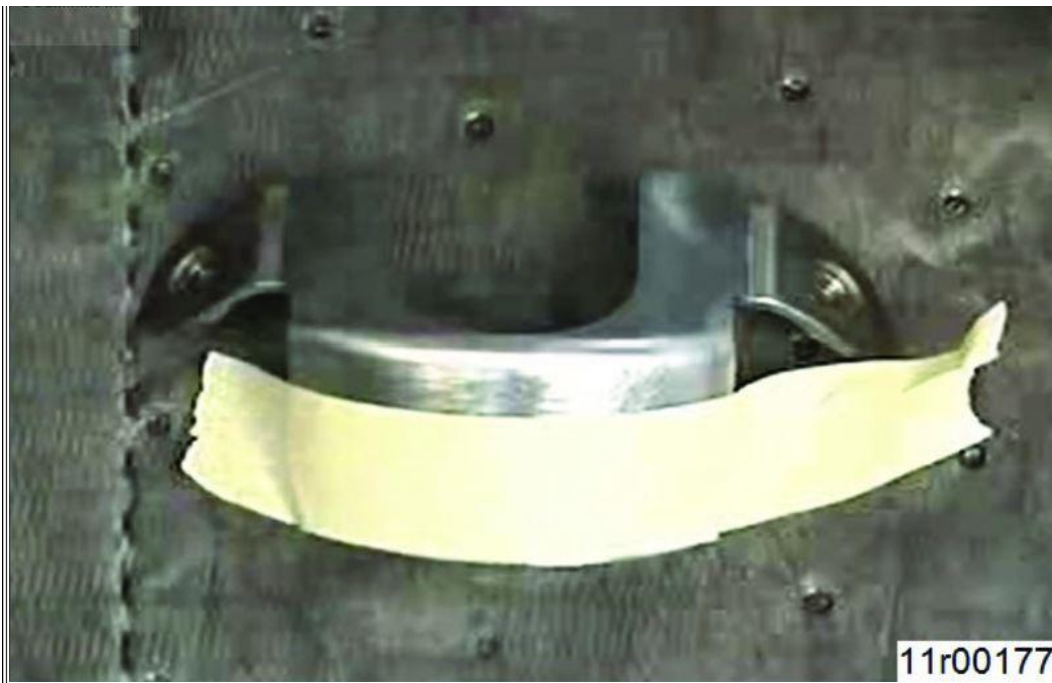


Figure 7: NOx Sensor Internal Water Shield

INSTALLATION PROCEDURE:

1. Orient aftertreatment outlet NOx sensor internal water shield towards aftertreatment SCR catalyst outlet. See illustration in Figure 8 with exhaust flow direction arrow.
2. Install two capscrews and washers from outside and handtighten.
3. Tighten capscrews to a torque value of 7.3 Nm (5.4 ft-lb).

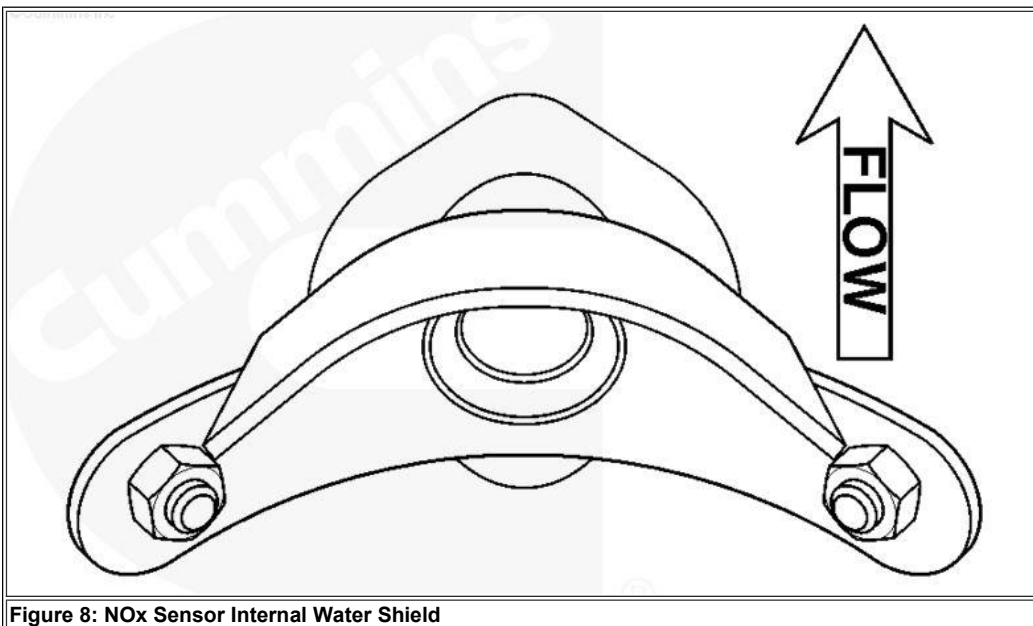


Figure 8: NOx Sensor Internal Water Shield

4. Attach masking tape to aftertreatment SCR catalyst outlet pipe. Apply masking tape 1 inch high and 4 inches wide about 1 inch above the outlet NOx sensor internal water shield as shown in Figure 9. The purpose of this masking tape is to remove excess high temp sealant.



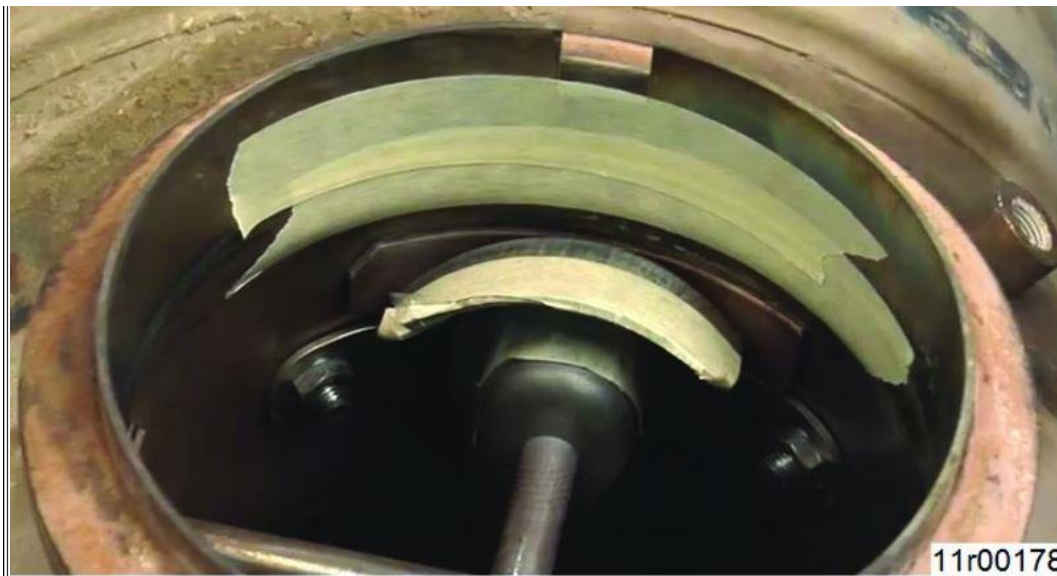


Figure 9: Masking Tape on SCR Catalyst Outlet Pipe

CAUTION:

Do not allow high temp sealant to fall into the aftertreatment SCR catalyst during application.

5. The high temp sealant **must** be mixed thoroughly for at least one minute as shown in Figure 10.



Figure 10: Mix High Temp Sealant

6. All surfaces **must** be free of oil, grease, dirt, corrosion, or other contaminants before using high temp sealant.
7. Smooth metal surfaces **must** be roughened using 40 to 60 grit sand paper before using high temp sealant.
8. With rubber gloves, use a finger or an application tool to apply the high temp sealant evenly to seal the gap between aftertreatment SCR catalyst outlet pipe and aftertreatment outlet NOx sensor internal water shield as shown in Figure 11 below.
9. Make sure the high temp sealant is well packed. If the high temp sealant is **not** well packed, the bonding will **not** be good and air pockets can result.



Figure 11: Applying High Temp Sealant to Water Shield



WARNING:

To reduce the possibility of personal injury, wear goggles and protective clothing.

CAUTION:

Do not allow high temp sealant to fall into the aftertreatment SCR catalyst during masking tape removal.

10. The masking tape **must** be removed before the high temp sealant hardens. At room temperature the high temp sealant will harden in around 4 hours.

11. Remove excess high temp sealant using a rag or a gloved hand.

12. Remove masking tape.



Figure 12: Masking Tape Removed from Water Shield

13. Install aftertreatment outlet NOx sensor. See Exhaust Aftertreatment System with SCR Service Manual for repair steps.

14. Install aftertreatment SCR catalyst assembly. See Exhaust Aftertreatment System with SCR Service Manual for repair steps.

15. To cure the high temp sealant, run a stationary regeneration after installing the aftertreatment SCR catalyst assembly.

WARRANTY INFORMATION

Warranty Claim Coding:

Group:	18250 - DEF Controls/Sensors
Noun:	649 - Sensor, Exhaust Out (NOx)

Claim Comment Suggestion:

It is recommended this iKNOW article number (IK0700087) is included in the claim comments when the rain shield installation procedure is completed.

Standard Repair Time(s):

Vehicles equipped with N13 ESN prefix 124 or 127				
Repair	Model	Engine	SRT	Hours
NOx Outlet Sensor - Remove and Replace	All	N13 Update	A18-1649UT	Click Here
SCR Catalyst - Remove and Replace	All	N13 Update	A18-1858UT	Click Here
NOx Sensor Internal Water Shield Installation	All	All	A18-T1	1.2
Stationary Regeneration	All	All	A12-7235A-20	Click Here

Vehicles equipped with N13 ESN prefix 126				
Repair	Model	Engine	SRT	Hours
NOx Outlet Sensor - Remove and Replace	WorkStar	N13	N18-1649US	Click Here
	TranStar		Q18-1649US	
	ProStar		R18-1649US	
SCR Catalyst - Remove and Replace	TranStar	N13	Q18-1858US	Click Here
	ProStar		R18-1858US	
NOx Sensor Internal Water Shield Installation	All	All	A18-T1	1.2
Stationary Regeneration	All	All	A12-7235A-20	Click Here

Vehicles Equipped with N9/10 Engines				
Repair	Model	Engine	SRT	Hours
NOx Outlet Sensor - Remove and Replace	DuraStar	N9/10	KL18-1649TS-20	Click Here
	CE/RE Bus		GY18-1649TS-20	
	WorkStar		M18-1649TS-20	
SCR Catalyst - Remove and Replace	DuraStar	N9/10	KL18-1858TS	Click Here
	WorkStar		M18-1858TS	
NOx Sensor Internal Water Shield Installation	All	All	A18-T1	1.2
Stationary Regeneration	All	All	A12-7235A-20	Click Here

OTHER RESOURCES

[Master Service Information Site](#)

[Exhaust Aftertreatment System with SCR Service Manual](#)

[2015 N13 Engine Diagnostic Manual](#)

[2013 N13 Engine Diagnostic Manual](#)

[2013 N9 and N10 Engine Diagnostic Manual](#)



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