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Title: MaxxForce 11/13L - SPN 2659 FMI 21 - EGR Low Flow

Applies To: 2010 Emissions MaxxForce 11/13 All truck models

CHANGE LOG

2015/06/09 - Removed step 1 for N13--replace core, only (thanks for support in reviewing fouled N13 coolers). Fixed tool number in Step 6.
2015/06/02 - Updated iKNow Article links in Step 7 (Step 6 as of 6/9/15).
2015/02/21 - Added fault code status (Symptoms)
2014/10/14 - Added comment about no code, put "diagnostics" into step based
2014/10/09 - Fixed Service Action Repair Plan Links (Symptoms)

DESCRIPTION

This document will guide the user through the diagnostics and repair procedure for Diagnostic Trouble Code 2659-21 (EGR Cooler Low Flow). Listed below are the symptoms, common tools and parts necessary for repair, repair procedures and warranty information. The document will guide the user through the new Low Temp (LT) core removal and installation procedure, which is faster and more effective than prior repair methods--we are **no longer cleaning EGR Coolers**.

This document replaces/retires:

- 2010 MaxxForce 11 & 13L EGR Cooler Resource Center
- EGR Cooler Low Flow Triage (Flow Chart)
- EGR Cooler iApproval (no longer necessary)

REPAIR VIDEO

The entire repair procedure for a ProStar (basic procedure is the same for all vehicles) has been put into video and available in the Learning Management System. Go to the LMS via this link. Then "Course Catalog," "Critical Repair Videos," "LT EGR Cooler Core Replacement Procedure," and enroll. After enrolling, go back to "My Current Enrollments" to watch.

SYMPTOMS

Diagnostic Trouble Codes & Dashboard Indicator Lights:

DTC/Light	Description	Status
SPN 111 FMI 1	Low Coolant	Any
SPN 2659 FMI 21	EGR Low Flow	Any

Possible Statuses: Active, Inactive, Pending, Healing

Customer Observations or Concerns:

- Malfunction Indicator Light (MIL)
- Red Stop Lamp (RSL)
- Coolant consumption
- Low coolant
- Coolant puddling under engine
- White smoke from the exhaust
- Coolant in the oil or oil analysis

SPECIAL TOOLS

Tool Description	Tool Number	Comments	Instructions
LT Core Removal/Install Tool	12-892-04		Link
Coolant Management Tool	KL5007NAV		Link
EGR Leak Detection Kit	12-892-02	Only if necessary, formerly KL2006NAV	Link
EGR Cooler Alignment Tool	12-892-01	Only if necessary	Link
EGR Cooler Lifting Bracket	12-892-03	Only if necessary	

DIAGNOSTIC STEPS

NOTE
Visual inspection is not an approved method for diagnosing a low temp cooler. There are many parameters considered by the ECM when determining EGR flow, and it is not simply a restriction across the cooler. Navistar has always had (and will continue to have) the stance that "no code means no replacement." Warranty will not be honored if there is no code in the health report.
Cleaning or replacement of the high temp cooler for fouling (plugging) is never necessary, as it can only plug if the core is leaking (failed).

Step	Action	Decision
1	**DIAGNOSTIC:** **Is SPN 111-1 or coolant consumption present along with SPN 2659-21?**	**Yes. Proceed to Step 4** **No. Proceed to Step 2**

Step	Action	Decision
2	**DIAGNOSTIC:** **No diagnostics are necessary--simply replace the cooler per chassis instructions.** **Which model of truck is being worked on?**	**ProStar+ 113 or 122. Proceed to IK1201096** **TranStar. Proceed to IK1201097**

		WorkStar or Cat. Proceed to IK1201098
		PayStar or LoneStar. Proceed to Step 3

Step	Action	Decision
3	**A procedure for in-chassis core replacement has not been developed. This is not to say it's not possible. At this time, we are recommending off-chassis replacement of the core.**	**Follow the Engine Service Manual for EGR Cooler removal and proceed to the off-chassis core R&R instructions in the REPAIR PROCEDURE.**

Step	Action	Decision
4	**DIAGNOSTIC:** **Are any of the following a possibility for a coolant loss false possitive?** **-Vehicle recently had a cooling system repair and improperly refilled** **-Vehicle recently repaired and the fault code not successfully cleared** **-Operator unaware of the proper filling procedure (over-filling)**	**Yes. Review concern and return to Step 2** **No. Proceed to Step 5**

Step	Action	Decision
5	Use the coolant management tool to drain the cooling system. Reference chassis specific service manuals to disassemble truck for EGR Cooler pressure testing.	Proceed to **Step 6**

Step	Action	Decision
6	**DIAGNOSTIC**: Use 12-892-02 (EGR cooler pressure tester) to test the EGR Cooler--Low Temp section first. Which section is leaking? Reference **Figure 1** for a cooler configuration visual aid (dearation fittings).	**HT**. Proceed to IK1201113. After replacing the HT core (and coolant still drained), return to **Step 2** **HT and LT**. Proceed to **Step 7**.

		LT Internally. Return to **Step 2** and follow core replacement instructions
		LT Externally. Proceed to **Step 3**
		Neither. Proceed to IK1201066 for coolant loss diagnostics. When repair is complete, return to **Step 2**.

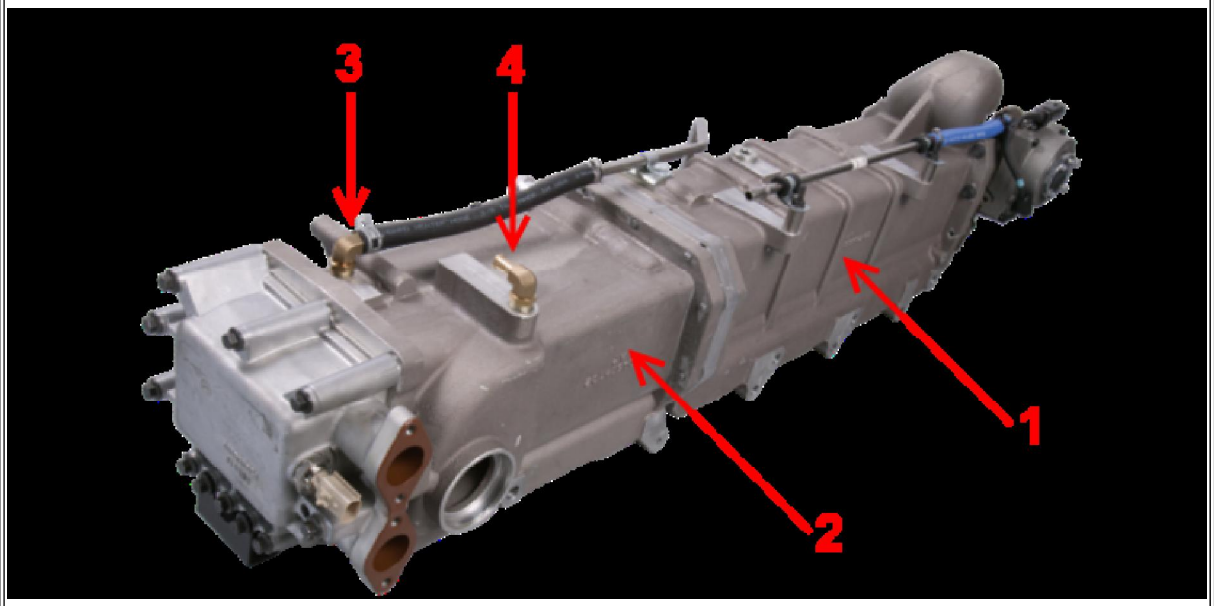

Figure 1: 2010 MaxxForce 11/13 EGR Cooler Assembly

Item 1: High Temp (HT) Cooler
Item 2: Low Temp (LT) Cooler
Item 3: LT Cooler Pressure Test Port (dearation fitting)
Item 4: HT Cooler Pressure Test Port (dearation fitting)

Step	Action	Decision
7	**DIAGNOSTIC:** **If BOTH cooler halves are found leaking, make sure the LT cooler did not appear failed due to residual air in the core from the High Temp testing. Typically this happens when the leak detection hose is not vented to atmosphere (left in water) between tests and/or when the HT is tested and the fittings are switched quickly--the air pressure in the core passages is**	**Yes. Proceed to IK1201113. After replacing the HT core (and coolant still drained), return to Step 2.** **No. Return to Step 6**

	still enough to cause bubbles when putting pressure to the LT. Always pressure test the LT section THEN the HT section. **Are both halves still leaking?**	

SERVICE PARTS INFORMATION

Kit Description	Part Number	Quantity Required	Notes
Kit, Low Temp Core	2513209C91	1	MF 11/13 and N13
Kit, High Temp Core	2513445C91	1	MF 11/13 and N13
Kit, Low Temp Seal	2512193C91	1	If Leaking from LT Joint Seal
Module, HT	3014254C95	1	For HT Failure Only
Module, LT (MaxxForce)	3015862C92		For external leaks ONLY, in place of LT Kit
Module, LT (N13)	2511089C91		For external leaks ONLY, in place of LT Kit
P-80 Assembly Lube	2511097C1		Case of 6 Pints

REPAIR STEPS

The following repair steps are for the **LT core removal and installation off chassis**. There is no limitation to the number of times this procedure can be used for a Low Temp housing, as long as there are no physical concerns with the housing itself (cracks, damage, broken fittings, etc) and ALL o-rings are replaced during every repair.

REPAIR VIDEO

The entire repair procedure for a ProStar (basic procedure is the same for all vehicles) has been put into video and available in the Learning Management System. Go to the LMS via this link. Then "Course Catalog," "Critical Repair Videos," "LT EGR Cooler Core Replacement Procedure," and enroll. After enrolling, go back to "My Current Enrollments" to watch.

REMOVAL PROCEDURE

At this point, the cooler should still be off the truck. This procedure can be performed at any point during the HT repair. If done when the two coolers are separated, it will be much easier to replace the o-rings.

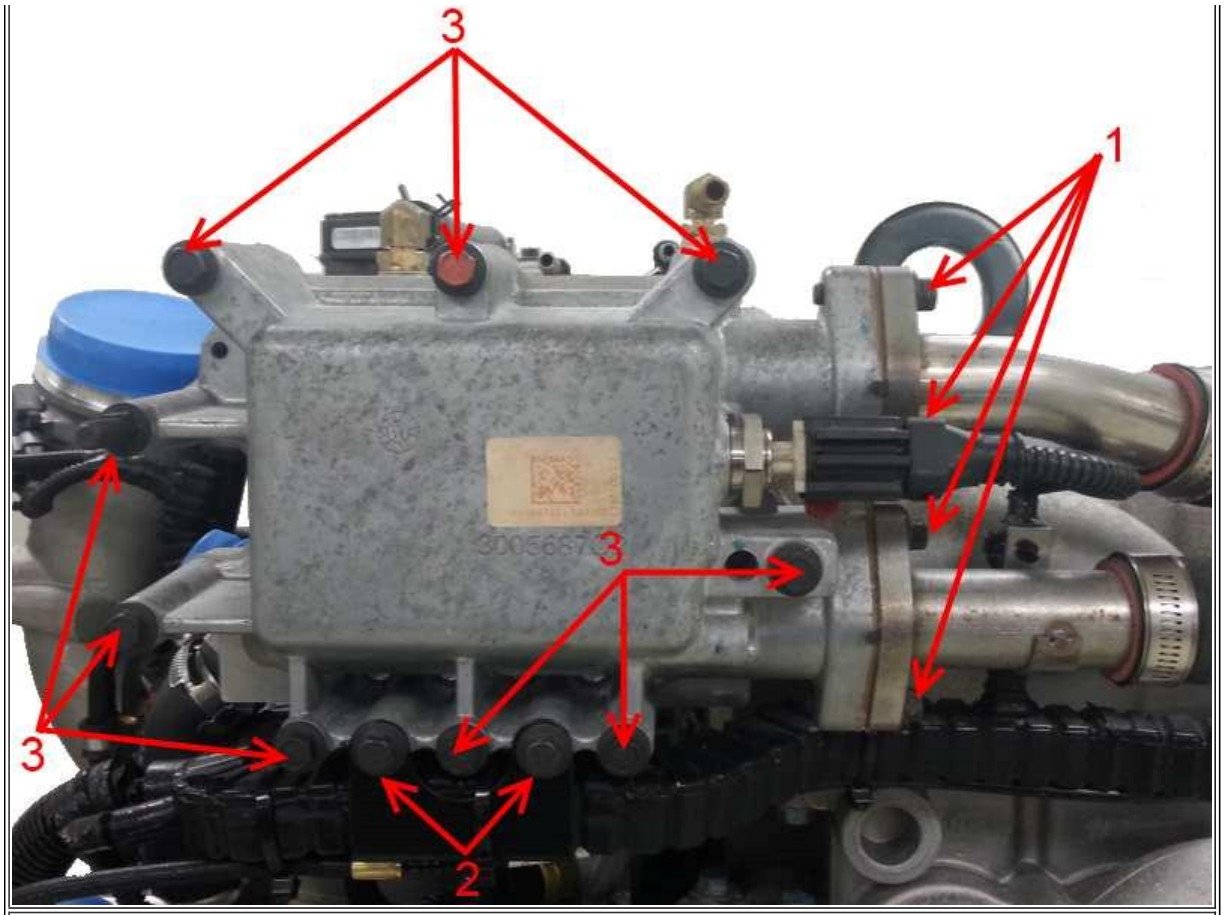

Figure 2: EGR Outlet Cover, Bolts and Tubes

Item 1: EGR Outlet Tube Bolts
Item 2: Engine Harness Bracket Bolts
Item 3: EGR Outlet Cover Bolts

1. Remove the eight bolts and one stud bolt from the front cover, and remove (**Figure 2**, Item 3).

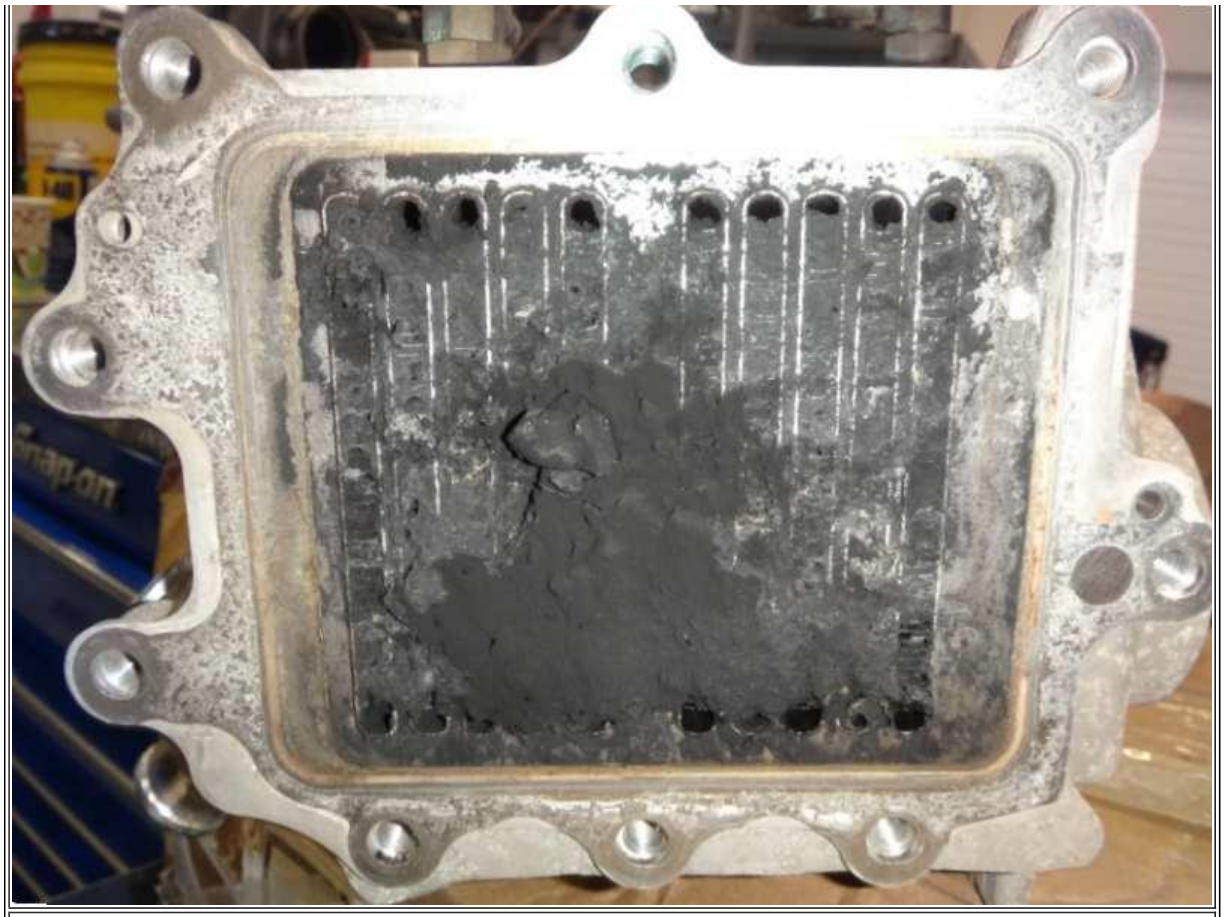

Figure 3: Soot Build-Up on the Core Face

Significant build-up will not allow the tool to sit against the core.

2. If necessary, scrape off soot build-up on the outlet of the core. The plate must sit flat against the face.

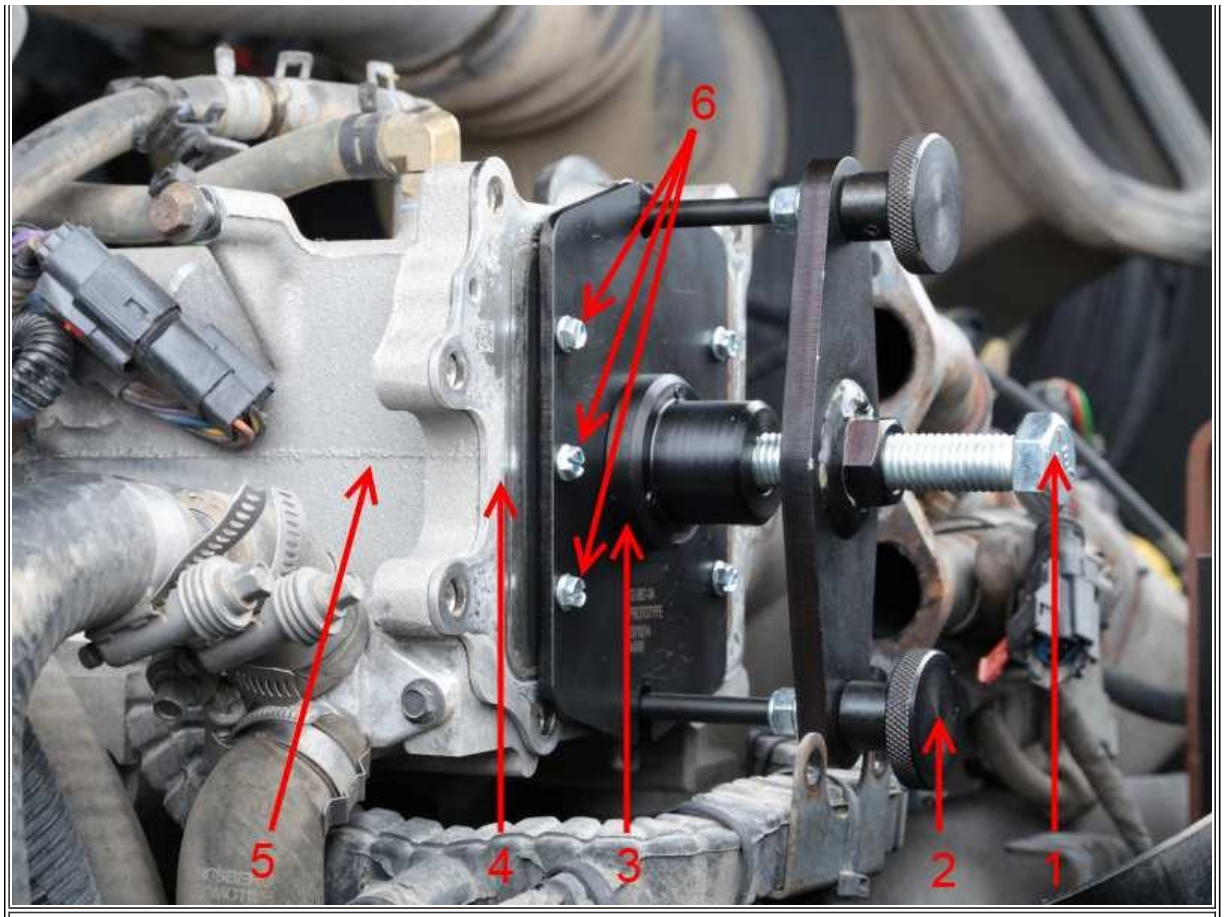

Figure 4: Low Temp EGR Core Extractor

Item 1: Removal Bolt
Item 2: Thumb Screws
Item 3: Removal Plate
Item 4: LT Core
Item 5: LT Housing
Item 6: Self Tapping Screws

3. Install the LT EGR Core Puller Tool (12-892-04), per the tool instructions.
4. Back out the bolt (**Figure 4**, Item 1) until the core pulls loose (typically 3/4" from the housing).
5. Remove the tool and pull the core from the housing.

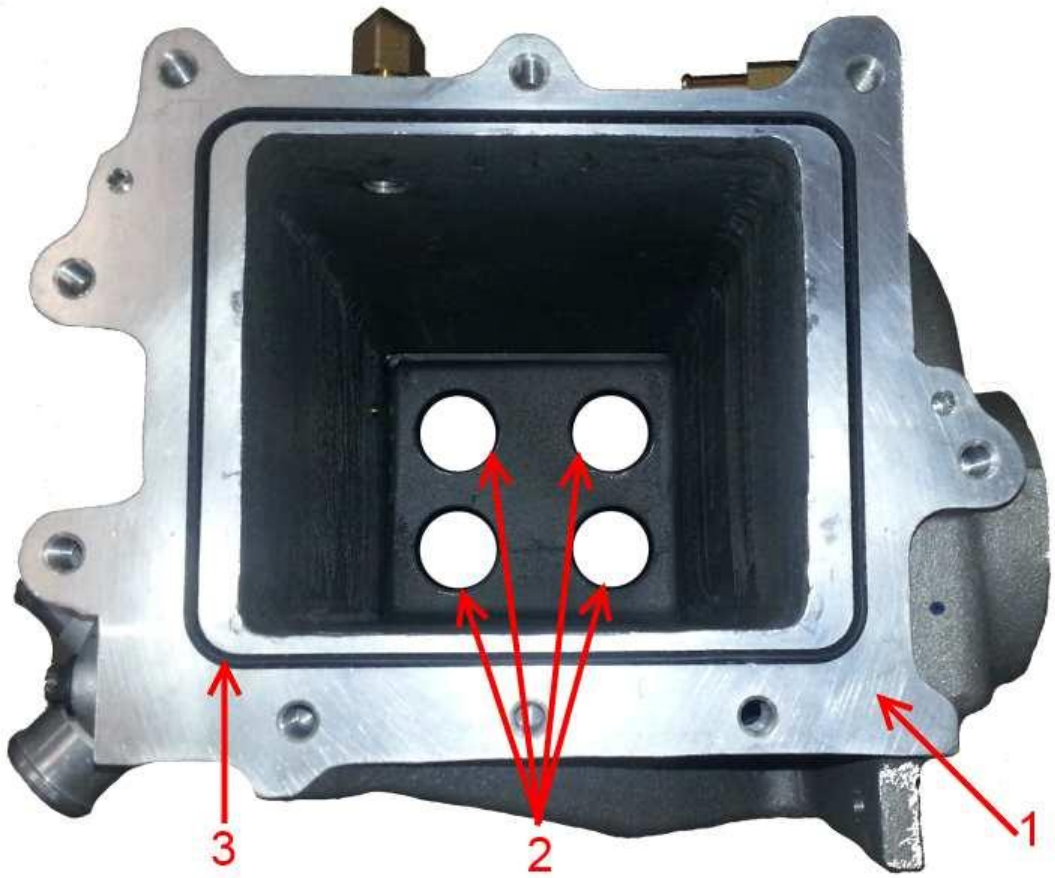

Figure 5: Low Temp Cooler Housing Face

Item 1: Housing
Item 2: Core O-Rings
Item 3: Housing Seal

6. Remove the housing seal and discard (**Figure 14**, Item 3)

7. Use a seal pick to remove the four o-rings at the housing inlet and discard (**Figure 14**, Item 2).

CAUTION
Use care not to damage the o-ring groove in the housing.

INSTALLATION PROCEDURE

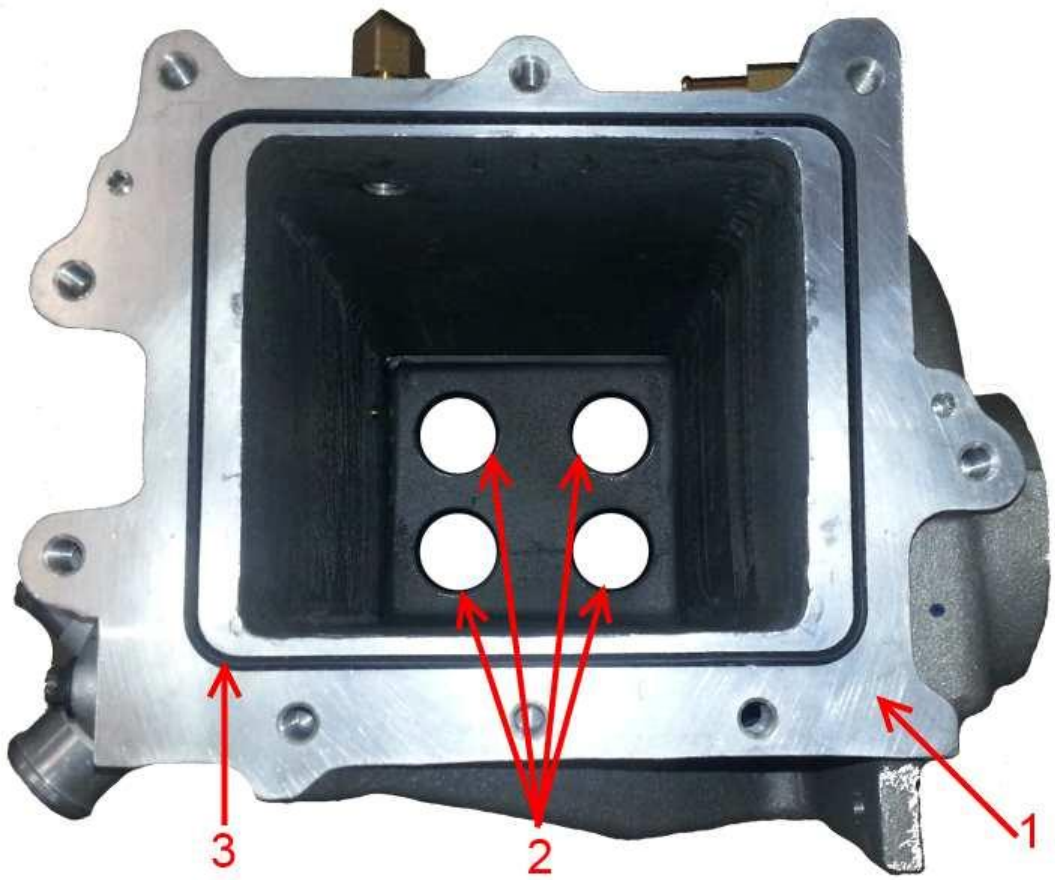

Figure 6: Low Temp Cooler Housing Face

Item 1: Housing
Item 2: Core O-Rings
Item 3: Housing Seal

1. Install the new seal into the LT housing (**Figure 6**, Item 3).
2. Clean the o-ring grooves of contaminates (soot). Coolant is not a concern, and will act as a lubricant.
3. Install the new o-rings from the LT core kit (**Figure 6**, Item 2).

NOTE
Ensure no soot or other debris are left in the grooves. Debris can cause leaks from improper sealing and/or cause the o-ring to be damaged by the core during installation.

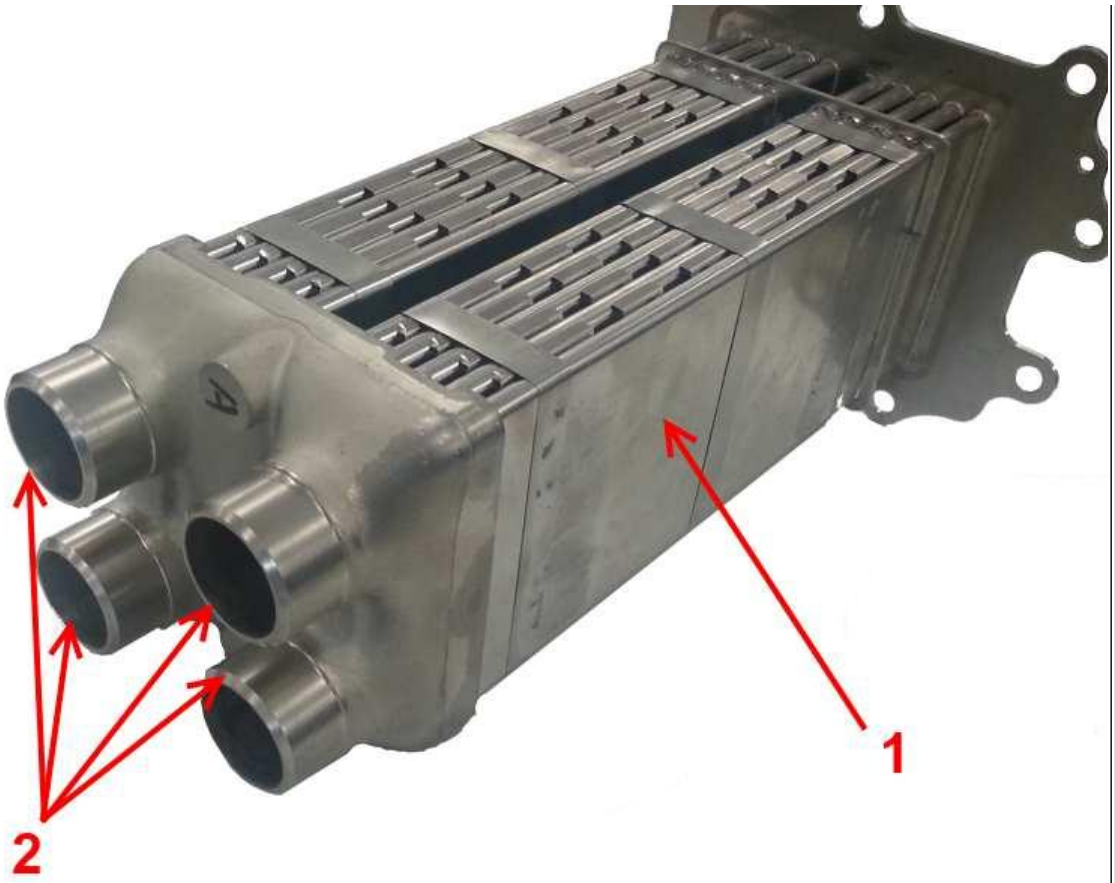

Figure 7: Low Temp Cooler Inlet Manifold

Item 1: Low Temp EGR Cooler Core
Item 2: Inlet Manifold Ports

3. Use liberal amounts of P-80 to lubricate the LT core inlet manifold and the four o-rings in the LT housing.

4. Insert the core into the housing and maneuver it into the o-rings.

CAUTION
The core header plate must be less than a 1/2" from the housing face (core resting in o-rings) before driving the core in. Failure to comply will result in damage to the core, housing and tool.

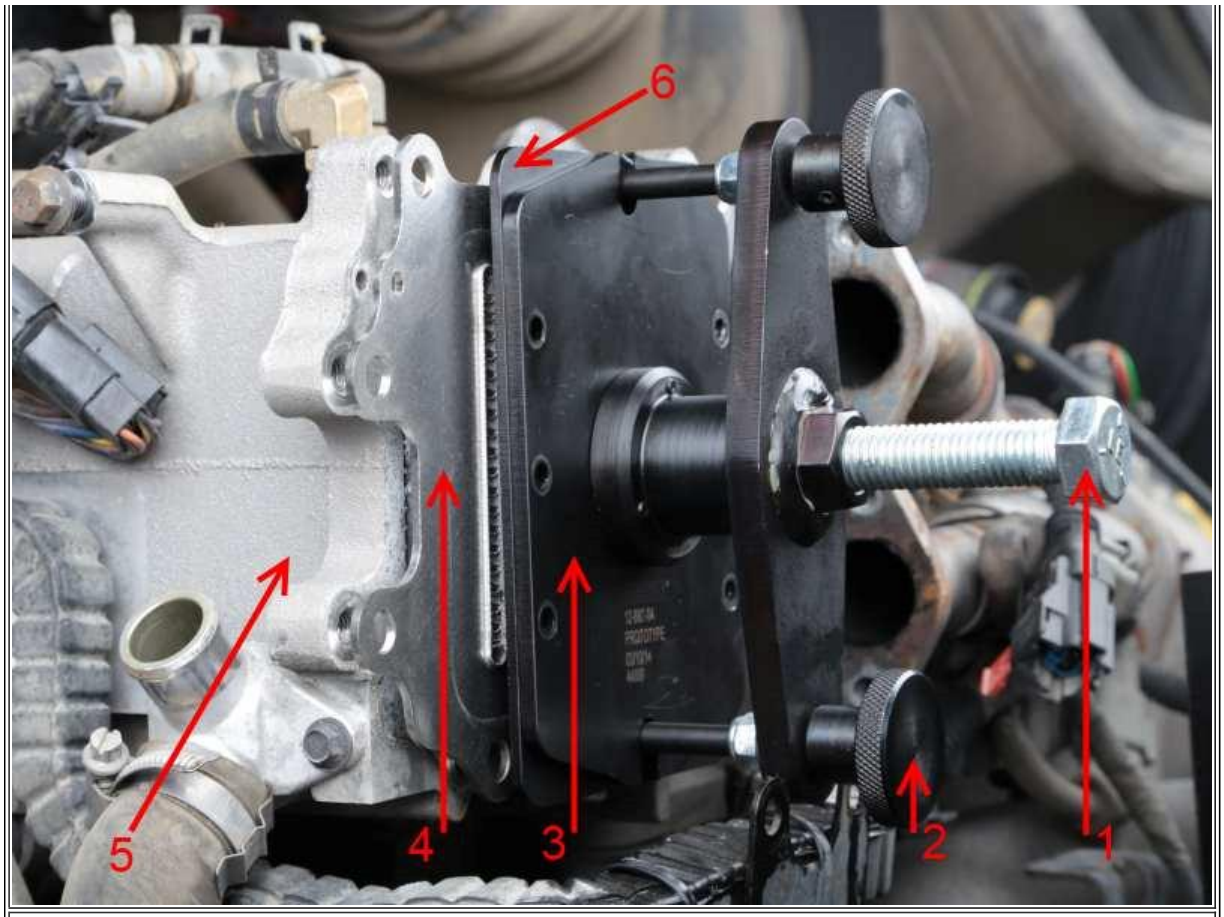

Figure 8: Low Temp Core Install Tool

Item 1: Insertion Bolt
Item 2: Thumb Screw
Item 3: Removal Plate
Item 4: LT Core
Item 5: LT Housing
Item 6: Installation Plate

5. Install the LT Core installation tool, per the tool instructions.

6. Press the EGR cooler core into the housing **until the core header plate makes contact with the housing seal**.

CAUTION
DO NOT over-torque the bolt, as damage to the core may result. Typical installation will take less than 5 lb-ft of torque to drive the core in. It is normal for the core to sit a couple millimeters off the face of the housing, and will seat/seal when the front cover is installed.

CAUTION
Never use the front cover to drive the core into the housing. Damage to the tube to header braze will result. Always use the tool, as it also aids in alignment of the core.

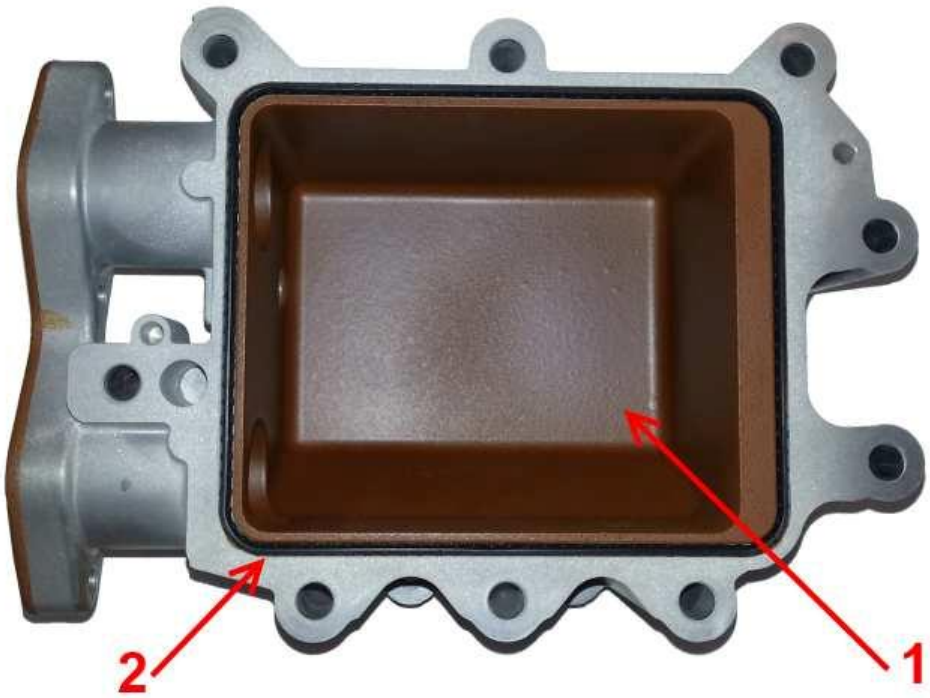

Figure 9: EGR Outlet Cover

Item 1: Front Cover
Item 2: Ring Seal

7. Inspect the front cover for reuse--Review IK1201087 - Front Cover Reuse Guidelines for direction.
8. Remove the seal from the groove and discard.
9. Insert the new seal from the LT Core kit.

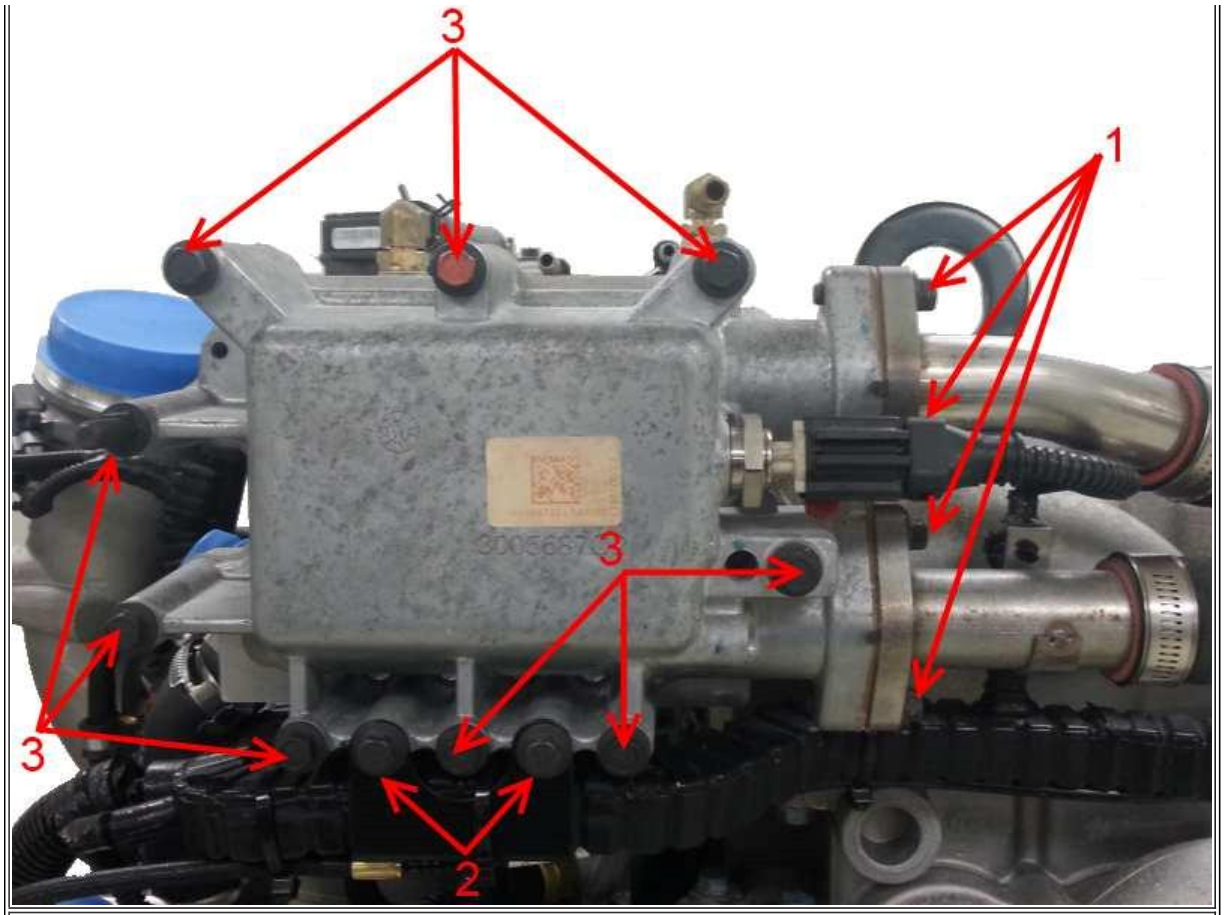

Figure 10: EGR Outlet Cover, Bolts and Tubes

Item 1: EGR Outlet Tube Bolts
Item 2: Engine Harness Bracket Bolts
Item 3: EGR Outlet Cover Bolts

10. Install the front cover, noting the location of the stud bolt in **Figure 10**.

11. Resume the cooler assembly installation instructions in the service manual.

12. Use the Coolant Management Tool to refill the cooling system.

13. If the system in unable to maintain vacuum, perform a cooling system pressure decay test . If no external leaks can be found, pressure test the EGR Cooler.

NOTE

The vacuum fill is a critical aspect of the repair. Any issues (cut/damaged/missing o-rings) will be caught here, as well as ensuring no air pockets are left in the system (which can reduce the life of the cooler or make the system appear leaking as the pockets are burped).

If there is no choice but to use the bucket fill method, it will be CRITICAL to pressure test the cooling system after the repair.

14. Per best practice, verify repair.

For an internal leaking cooler

Replace the engine oil and filter for coolant contamination and follow iKNow IK1201065 for Lambda Sensor Relearn.
Provide the customer with oil change information.

15. If you have issues/concerns/comments/etc, PLEASE SUBMIT FEEDBACK. We can't fix something if we don't know it's an issue...

WARRANTY INFORMATION

Warranty Claim Coding:

Group:	12000 - Engine
Noun:	892 - Cooler, EGR

Warranty Claim Comment Guidance:

"Vehicle came in with 2659-21 and [**coolant consumption / 111-1**]. Replaced HT section, replaced LT core, performed Lambda [**diagnostics / replacement / relearn**]."

"Vehicle in with [**coolant consumption / 111-1**]. Both HT and LT failed. Replaced HT section, replaced LT core, performed Lambda [**diagnostics / replacement / relearn**]."

Standard Repair Times:

Step	Description	SRT	Hours
	LT CORE REPLACEMENT OFF CHASSIS		
All	ProStar+ LT Core R&R during HT replacement (**add-on**)	R12-6892U-6	0.3
All	TranStar LT Core R&R during HT replacement (**add-on**)	Q12-6892U-6	0.3
All	WorkStar R&R during HT replacement (**add-on**)	N12-6892U-6	0.3
All	CAT CT660 LT Core R&R during HT replacement (**add-on**)	TC12-6892U-6	0.3
All	PayStar LT Core R&R during HT replacement (**add-on**)	T12-6892U-6	0.3
All	LoneStar LT Core R&R during HT replacement (**add-on**)	S12-6892U-6	0.3
	MODULE ASSEMBLY REMOVAL		
	ProStar+ Full Cooler Removal and Install	R12-6892U-20	5.8
	TranStar Full Cooler Removal and Install	Q12-6892U-20	5.6
	WorkStar Full Cooler Removal and Install	N12-6892U-20	6.1
	CAT CT660 Full Cooler Removal and Install	TC12-6892U	6.4
	PayStar Full Cooler Removal and Install	T12-6892U-20	5.6
	LoneStar Full Cooler Removal and Install	S12-6892U-20	5.8
	LT CORE R&R IN CHASSIS		
	ProStar+122 LT Core Replacement in Chassis	R12-7892U-20	1.7
	ProStar+113 LT Core Replacement in Chassis	R12-7892U	1.8
	TranStar LT Core Replacement in Chassis	Q12-7892U	2.1
	WorkStar LT Core Replacement in Chassis	N12-7892U	2.1

	CAT CT660 LT Core Replacement in Chassis	TC12-7892U	2.1
EGR COOLER PRESSURE TESTING IN CHASSIS			
	ProStar+122 Cooler Pressure Test	R12-7892U-4	2.9
	ProStar+113 Cooler Pressure Test	R12-7892U-4	2.9
	TranStar Cooler Pressure Test	Q12-7892U-4	2.6
	WorkStar Cooler Pressure Test	N12-7892U-4	2.6
	CAT CT660 Cooler Pressure Test	TC12-7892U-4	3.9
	PayStar Cooler Pressure Test	T12-7892U-4	2.7
	LoneStar Cooler Pressure Test	S12-7892U-4	2.9
EGR COOLER PRESSURE TEST (add-on, w/cooler removal)			
	ProStar+ In-Chassis Pressure test add-on	R12-6892U-1	0.8
	TranStar In-Chassis Pressure test add-on	Q12-6892U-1	0.8
	ProStar In-Chassis Pressure test add-on	N12-6892U-1	0.8
	CAT CT660 In-Chassis Pressure test add-on	TC12-6892U-1	0.8
	PayStar In-Chassis Pressure test add-on	T12-6892U-1	0.8
	LoneStar In-Chassis Pressure test add-on	S12-6892U-1	0.8
HT or LT MODULE SEPARATION AND ASSEMBLY (for half cooler replacement)			
	ProStar+ Cooler Half R&R	R12-6892U-3	0.5
	TranStar Cooler Half R&R	Q12-6892U-3	0.5
	WorkStar Cooler Half R&R	N12-6892U-3	0.5
	CAT CT660 Cooler Half R&R	TC12-6892U-3	0.5
	LoneStar Cooler Half R&R	T12-6892U-3	0.5
	PayStar Cooler Half R&R	S12-6892U-3	0.5
MISCELLANEOUS RELEVANT SRTs			
	Cooling System Leak Test	A09-9022A	0.3
	EGR Cooler Pressure Test (add-on if LT core replaced for leaking)	R12-6892U-1	0.8
	Engine Oil Replacement *Already in HT and/or LT Module Replacement SRT *Use when LT core is leaking and the only part replaced	A12-1889U	0.6
	Lambda Relearn or Replacement (see SRT section of iKNow)	IK1201065	

SRT Manual

CLAIM SRT EXAMPLES:

For **PayStar/LoneStar**, the SRT will be the cooler removal (x12-6892U-20) and cooler core R&R (x12-6892U-6)

Example 1: ProStar+122 has low flow code ONLY
Core R&R in-chassis - R12-7892U-20, 1.7 hrs

Example 2: ProStar+122 has external coolant leak
Cooler Removal - R12-6892U-20, 5.8 hrs
Cooler Separation/assembly - R12-6892U-3, 0.5 hrs

OTHER RESOURCES

2010 MaxxForce 11/13 Resource Center (IK1200548)
2010 MaxxForce 11/13 Diagnostic Manual

2010 MaxxForce 11/13 Service Manual

LT Core Removal/Install Tool Instructions (TL2900085)
Front Cover Reuse Guidelines (iKNow 1201087)
ProStar Instructions (iKNow 1201096)
TranStar Instructions (iKNow 1201097)
WorkStar/CAT Instructions (iKNow 1201098)

HT Core Removal/Installation (iKNow 1201113)

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