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Coding Information

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Title: Low Temperature Radiator Diagnostics

Applies To: Big Bore, ProStar, TranStar, WorkStar, LoneStar, N13, MaxxForce 13

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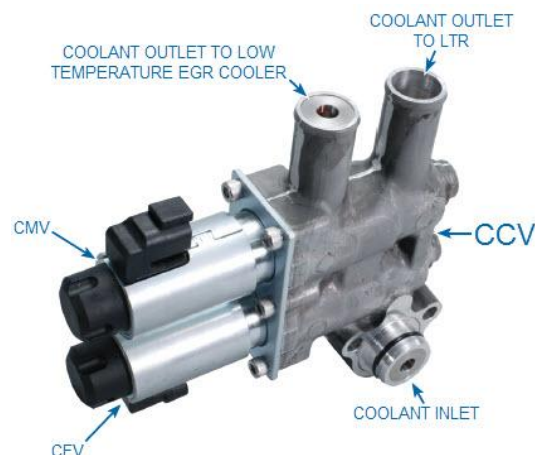
Change Log

09/03/2014 - Updated document to step based diagnostics. Added sample snapshots. Added SRT and Warranty coding. Added the information from IK0900060 - LRT O-Ring Repair

Description

Any complaint for engine de-rate (loss of power) or engine shutdown when hot, loaded, or pulling hills will require the CCV (Coolant Control Valve) and LTR (Low Temperature Radiator) to be inspected. This issue can also be very difficult to duplicate without a loaded trailer or hills to pull.

The CCV consists of the CMV (Coolant Mixer Valve) and CFV (Coolant Flow Valve) and is located on the front of the engine, upper right side.



Symptoms

- Engine De-Rate
- Warning Lamps in Cluster
- Fan Engages before the Programmed Temperature (Fan On Temp)

Possible Diagnostic Trouble Codes

SPN	FMI	Description

1173	16	TC2CIT Signal Above Desired (Interstage CAC Under Cooling)
27	0	EGRP Fault: Over Temperature

Troubleshooting Step(s)

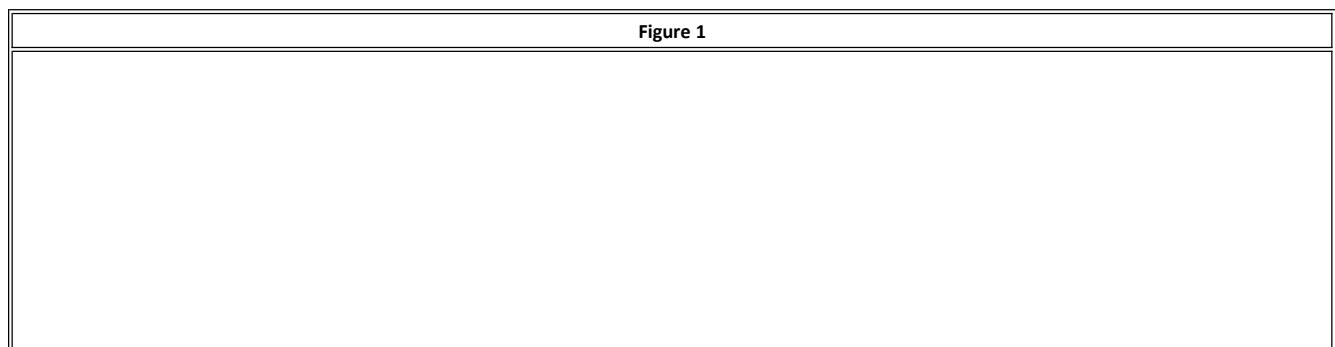
Step	Action	Decision
1	Symptom Verification Using the EST get a Performance Snapshot: - With engine at operating temperature, drive at highway speeds with engine at 1500rpm in cruise control for 2 minutes. - Monitor ECT1 and ECT2. - ECT2 should be 20-40°F lower than ECT1. Note: The engine must be as hot as possible to get good data on the snapshot. Coolant temps even at 180° will not get the CMV to start moving. Is ECT 2 20-40°F lower than ECT1? See Figure 1 for an example snapshot of an internally plugged LTR. See Figure 2 for an example snapshot of a clean LTR.	Yes: Symptom may not be duplicated, continue to step 2.
		No: Continue to Step 2
2	Cooling package Inspection Check the cooling system package for external plugging. Especially check for debris packed between the cooling system components. (Bug screen, A/C Condenser, HP CAC, LTR, and the radiator) Is the Cooling Package free of debris?	Yes: Continue to Step 3
		No: Clean and Retest
3	CCV Test Using the EST perform the CCV performance test multiple times to see if the temperatures are separating. Is the CCV responding to command and are the temperatures separating correctly? See the "Signals to Watch" section of this document on where to find the CCV Test in ServiceMaxx.	Yes: Continue to step 4
		No: Repair CCV Issue and retest.
4	LTR Internal Flow Remove the inlet and outlet of the LTR. Using a garden hose at the inlet, make sure the flow coming out of the LTR is consistent with the flow going in. Is the LTR flowing properly? See Video 1 below for an example of a plugged LTR. See Video 2 below for an example of a clean LTR.	Yes: Symptom is not duplicating. Return unit to service.
		No: Replace the LTR. Add Phosphate conditioner p/n 2611268C1 in cooling system when replacing the LTR.

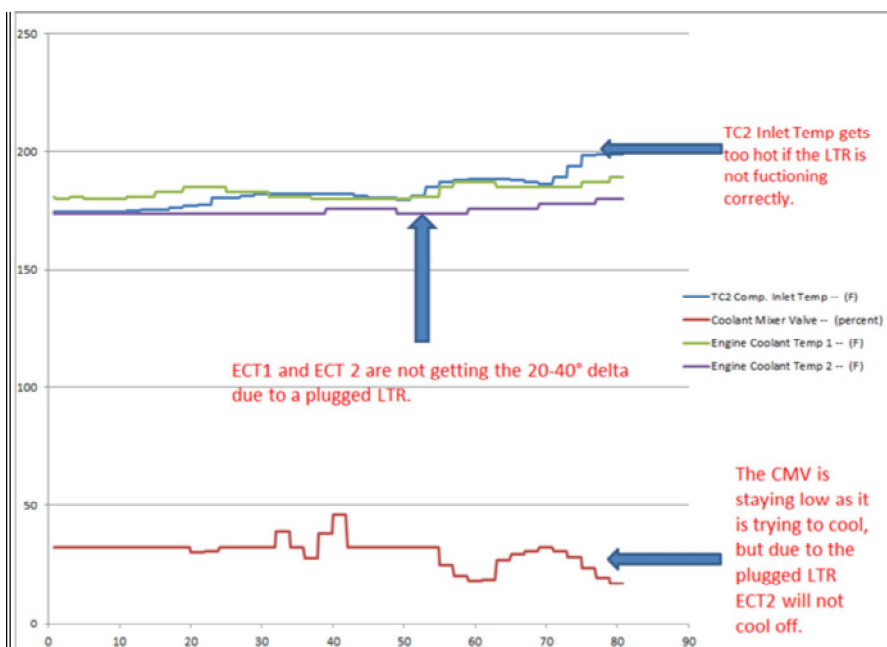
NOTE:

The below videos are examples only and not a determination of the flow spec for the LTR.



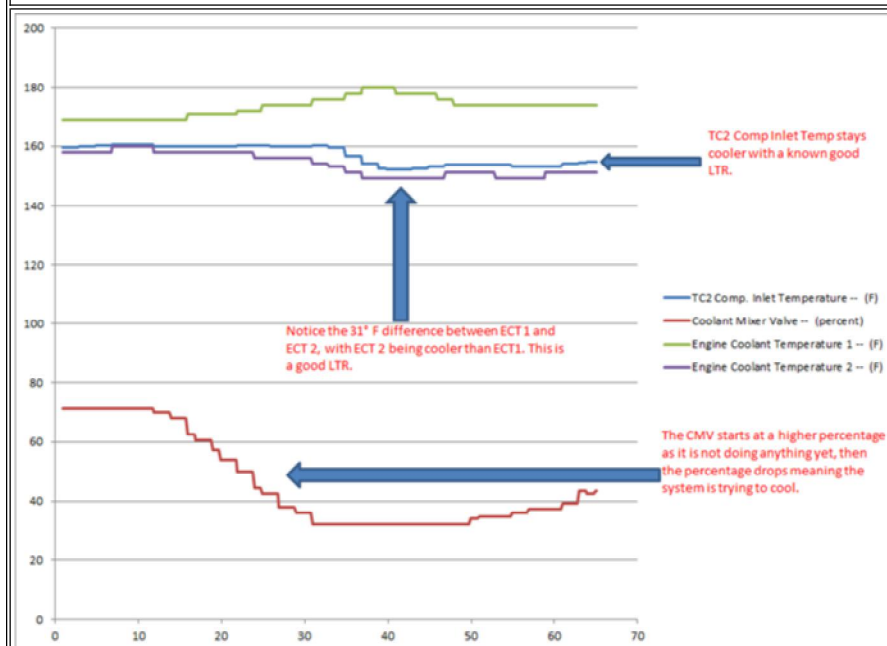
Example Snapshot(s)





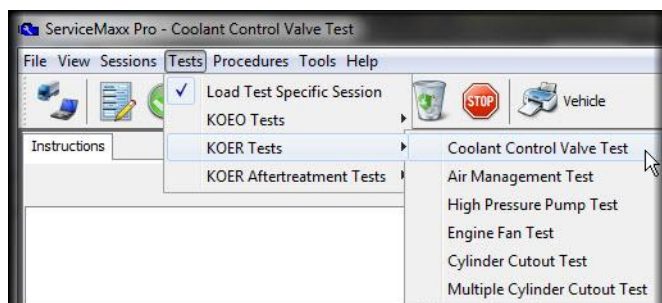
Snapshot of a Plugged LTR

Figure 2



Snapshot of a Clean LTR

Signal(s) to Watch



Coolant Valve Test

Entry conditions:

- Engine Coolant Temp (Above 160 F)
- Brake Switch (Released)
- Accel Pedal Position (0 %)
- Vehicle Speed (0 MPH)

Use this test to validate the performance of the coolant control valves and cooler.

NOTE: Actuator control will only actuate 5 seconds per cycle. You will need to run the test over and over to see it's effect on ECT2. Later calibrations will allow longer run time.

* The Coolant Mixer Valve controlled to 95% will by-pass the low temperature radiator to help engine warm up. Controlling the valve to 5% will cool the coolant going to the EGR Cooler.

- 1) Run engine up to normal operating temperature.
- 2) With either valve at (95%) ECT1 and ECT2 should be within 5 degree F of each other.
- 3) With Coolant Mixer Valve at (5%) ECT2 and TC2CIT should cool 30 degree F lower than ECT1.

Temperature signals

Name	Value	Units
Engine Coolant Temp 1		F
Engine Coolant Temp 2		F
TC2 Comp. Inlet Temp		F

Test Inhibitors

Name	Value	Units
Accel Pedal Position 1		percent
Brake Switch		
Vehicle Speed		mph

Control Signals

Name	Value	Units
Coolant Flow Valve		percent
Coolant Mixer Valve		percent

Coolant Control Valves

Actuator: Coolant Flow Valve

☒ On (95% Duty Cycle)
☐ Off (5% Duty Cycle)

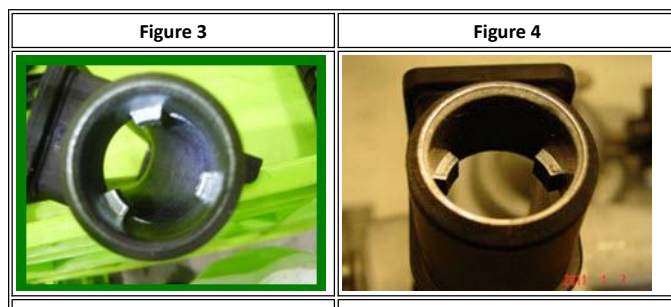
Start Test Stop Test

LTR O-Ring Repair

The Low Temperature Radiator (LTR) O-rings can be replaced on units that were built after 04/01/2011.

Resolution

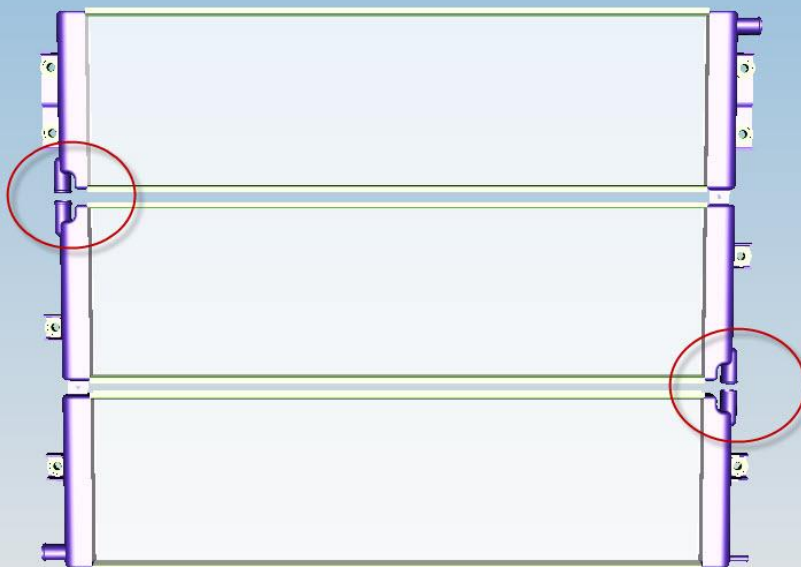
With the LTR disassembled, refer to the Figure 3 and Figure 4 below. If the tank has 3 retainer tabs (Figure 3) present you can replace just the o-rings and reassemble. If only 2 tabs are present (Figure 4), the LTR must be replaced.



- 3 tab o-ring retainer
- LTR O-Rings can be replaced
- The LTR can be reused

- 2 tab o-ring retainer
- LTR O-Rings cannot be replaced
- The LTR must be replaced

Figure 5



Location of the O-Rings on the LTR

Service Part(s) Information

Part #	Description	Qty
2604297C92	LTR	1
2609670C91	LTR O-Ring Kit	1
3008066C93	CCV	1
2611268C1	Phosphate Conditioner	1

Warranty Information

Warranty Claim Coding:

Group	09009 - Radiators
Noun	022 - Core

Diagnostics:

Action	SRT Code	Hours
LTR Internal Flow Check	T-time	0.3
External Radiator Cleaning	T-time	0.5

LTR Replacement:

Model	SRT Code	Hours
8600	Q09-1022U-20	2.1

ProStar	R09-1022U-20	1.9
5000	T09-1022U-20	2.1
Cat CT 660	TC09-1022U-20	1.6

Other Resources

- [Coolant Flow Valve Troubleshooting](#)
- [Coolant Mixer Valve Troubleshooting](#)
- [0000001741](#) - MaxxForce 11 and 13 Engine Diagnostic Manual (EPA 10) 2013 HD-OBD
- [0000002161](#) - 2013 N13 Engine Diagnostic Manual with SCR HD-OBD (EPA 10)
- [Master Service Information Page](#)

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