



Evans Cooling Systems, Inc.  
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## INSTALLATION PROCEDURE – CUMMINS ISX

### Procedure for installing Evans waterless Heavy Duty coolant, 205° F thermostats, and Two ResistorPacs into a Cummins ISX engine

VER 22Mar2012

**CAUTIONARY NOTE: DO NOT FLUSH COOLING SYSTEM WITH WATER!**

**REGARDING OLDER ENGINES:** Metal to metal connections may be corroded. Do not apply force that can damage such connections and cause leaks.

**About the two ResistorPacs:** The first one, normally 180 Ohms, is placed in series with the coolant temperature sensor, raising the fan-on, fan-off, and derating temperatures by making the ECM “think” the coolant temperature is cooler than it really is. The ECM-driven coolant temperature gauge will reflect what the ECM thinks the coolant temperature is, about 20°F less than it really is. The second ResistorPac, normally 100 Ohms, is placed in series with the oil temperature sensor, raising the derating temperature based on oil temperature. The ECM-driven coolant temperature gauge will reflect what the ECM thinks the coolant temperature is, about 20°F less than it really is.



Coolant and oil temperature ResistorPacs with EZ-installation feature

[Some 2006 and 2007 ISX engines use a combined oil pressure/temperature sensor. **This procedure assumes that the oil temperature sensor is separate from the oil pressure sensor.**]

1. Supplies, information, and special tools needed:
  - a. **Obtain this information from the owner:**
    - 1) What is the Engine Serial Number (ESN)?
    - 2) Is the engine equipped with a coolant filter?
  - b. **Obtain this information from Cummins:**
    - 1) What is the P/N for the coolant temperature sensor (CTS)?
    - 2) What is the P/N for the oil temperature sensor (OTS)?
      - a) **Do not proceed if the CTS and OTS part numbers are not the same.**
    - 3) How many thermostats are there?
  - c. **Purchase these items from Cummins:**
    - 1) The correct thermostat housing gasket.
    - 2) Fleetguard Part # WF2127 non-chemical coolant filter (if the engine is equipped with a coolant filter).
  - d. **The following items are sourced from Evans Cooling Systems, Inc.:**
    - 1) At least 16 gallons of Evans waterless Heavy Duty coolant. If the truck is equipped with an APU, fuel tank heater, and/or a DEF tank heater, add the additional coolant requirements.
    - 2) Evans-provided labels to warn against the addition of water.
    - 3) The number of 205°F thermostats as required by the engine (P/N E3033-205). (Note: the E3033-205 thermostat is stamped “210” but is calibrated for 205°F.)
    - 4) One (1) Evans **180-ohm** ResistorPac P/N RP2-C180-CU2-1030. (It inserts between the existing **coolant** temperature sensor plug and receptacle.)
    - 5) One (1) Evans **100-ohm** ResistorPac P/N RP2-OIL100-CUMMINS. (It inserts between the existing **oil** temperature sensor plug and receptacle.)
    - 6) Refractometer for measuring water content – Evans P/N E2190.
    - 7) An Evans “Water-Chaser” P/N E2195, a device useful for inserting coolant into hoses for flushing.
  - e. A high-volume air source (rather than high pressure) such as Makita blower Model UB 1101, widely available from the internet. A shop doing installations commercially should consider a Model MB 3CD Master Blaster. A powerful (and clean) shop vac, used in the blower mode, is also an acceptable high-volume air source.
  - f. An angled pick for difficult hoses.
  - g. Funnels.
  - h. A tennis ball (if there are two thermostats).
2. Place containers to catch drained coolant.
3. If the engine is hot, wait for it to cool to a safe temperature. Never open a cooling system pressure cap if the engine is hot.
4. Remove the pressure cap and drain coolant from the bottom of the radiator. Sometimes there is a petcock in the bottom radiator hose.
5. While the coolant is draining, remove the air filter and ducting.
6. Pull off bottom radiator hose completely. Leave it to drain.



Heater hose and transmission cooler connections at cylinder head

7. Draining the heater circuits (use the Water-Chaser for these operations):
  - a. Close the manual valves shown on the heater hoses.
  - b. Disconnect the heater hoses from the cylinder head end.
  - c. Turn the cab heater “on” and set to max temperature.
  - d. **If there is a second heater (e.g. for a sleeper cab), turn it on and set it to “max”.**
  - e. Turn the key “on”.
  - f. Blow air through both hoses until there is no further flow out the pump inlet.
  - g. Insert a quantity of Evans HD into the heater hose end(s) and blow air.
  - h. Turn key off. Leave the manual valves closed for now.
8. If there is a transmission cooler and a coolant hose connection from the engine, open the hose and blow air toward the transmission cooler. Insert a quantity of Evans HD into the hose end and blow more air. Re-connect the hose.
9. If there are other coolant circuits, such as for an APU, or a DEF tank heater, or for a fuel tank heater, carefully drain them, blow air through them and chase with coolant.
10. Open the thermostat housing and remove the existing thermostat(s).
11. If there are two thermostats, block the lower thermostat housing hole with the tennis ball.
12. Blow high-volume air into the unblocked thermostat housing hole until coolant stops draining through the bottom hose.
13. Pour the rest of the gallon of Evans waterless HD coolant into the unblocked thermostat housing hole and then blow high-volume air into the hole until coolant stops draining through the bottom hose.
14. If the engine is equipped with a coolant filter, remove it and blow air into the thermostat housing until no fluid emerges from the filter housing. Install a new non-chemical coolant filter.
15. Remove the tennis ball (if used). Install the 205°F thermostat(s) and reassemble the thermostat housing, using the new thermostat housing gasket.
15. Reattach any hoses; close the bottom radiator hose drain; open the manual heater valves.

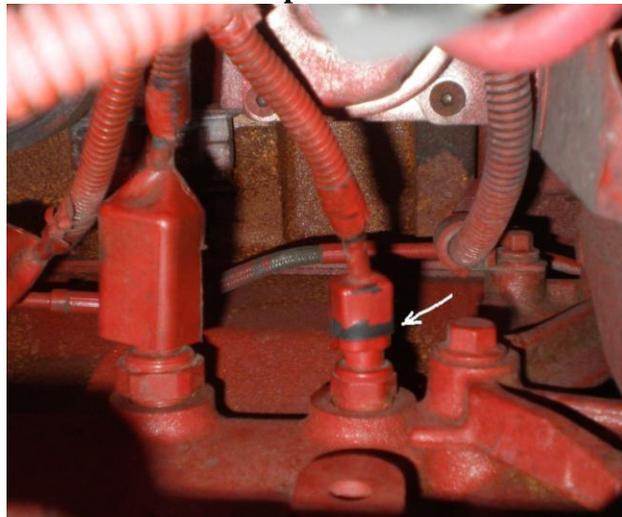
**The coolant temperature sensor:**



The location of the coolant temperature sensor is on top of the thermostat housing and behind the outlet hose.

16. Install the ResistorPac P/N RP2-C180-CU2-1030 into the **coolant** temperature sensor circuit as follows:
- First, LOOK at the coolant temperature sensor and remember what it looks like. The sensor for oil temperature looks the same as the coolant temperature sensor but will be more difficult to find.
  - Remove connector from the coolant temperature sensor.
  - Insert connector into ResistorPac plug.
  - Insert other end of the ResistorPac into the coolant temperature sensor.
  - Zip-tie the Resistor-Pac to a suitable location.
  - Zip-tie the wires appropriately.

**The oil temperature sensor:**



<<<Toward front    The white arrow points to the **oil temperature sensor**.    Toward rear>>>

The photo was taken from under the left (driver's) side of the engine looking upward. In actual orientation, the sensor screws into the oil manifold horizontally. The oil manifold attaches to a vertical wall of the block.

The sensor is not visible from the side of the engine because it is located behind the lift fuel pump. It is easily seen from underneath the engine with a flashlight. Once its location has been observed, installing the RP2-OIL100-CUMMINS ResistorPac can be accomplished from underneath or from the side of the engine by reaching behind the lift fuel pump. Doing this while the engine is cool is highly recommended.

17. After being certain that you have found the correct location for the oil temperature sensor, install the RP2-OIL100-CUMMINS ResistorPac into the oil temperature sensor circuit using the same procedure as 16, above.
19. Police the hose connections to assure that they are tight.
20. Re-install the air filter and associated ducting.
21. Fill the cooling system with Evans waterless Heavy Duty Coolant.
22. Operate the engine to assure the opening of the thermostats and thorough circulation of the coolant. Add coolant as required to maintain the “hot” level.
23. The coolant in the expansion tank will get hot due to the coolant entering the expansion tank from the vent line attached to the thermostat housing. The high temperature assures that the coolant in the expansion tank is well-circulated. A refractometer reading may be taken at the expansion tank under the following conditions:
  - The thermostats are clearly open.
  - The coolant in the expansion tank is hot.
  - No coolant was recently added to the expansion tank.
  - Alternatively, take the reading after several days of operation.
24. Measuring the water content with the refractometer – see the last page.
25. Place the labels to warn against the addition of water or water-based coolant.
26. The equipment is ready for use. Upon cool-down and for a couple of days, small amounts of coolant may be necessary. Don’t overfill the expansion tank – leave some room for fluid expansion.
27. Use the same radiator cap without modifications. Although it is possible to run an open-vented system, the pressure cap will give you a virtually “sealed system”. Because there will be no vapor component, the pressure will remain quite low within the system (the only pressure will come from the expansion of the liquid against the air in the top of the expansion tank). It is unlikely that the pressure will ever breathe outward and that outside air will enter the system on a cool-down.
28. Bar’s Leaks Liquid Aluminum Stop Leak is compatible with Evans waterless coolants and is effective in stopping small leaks.

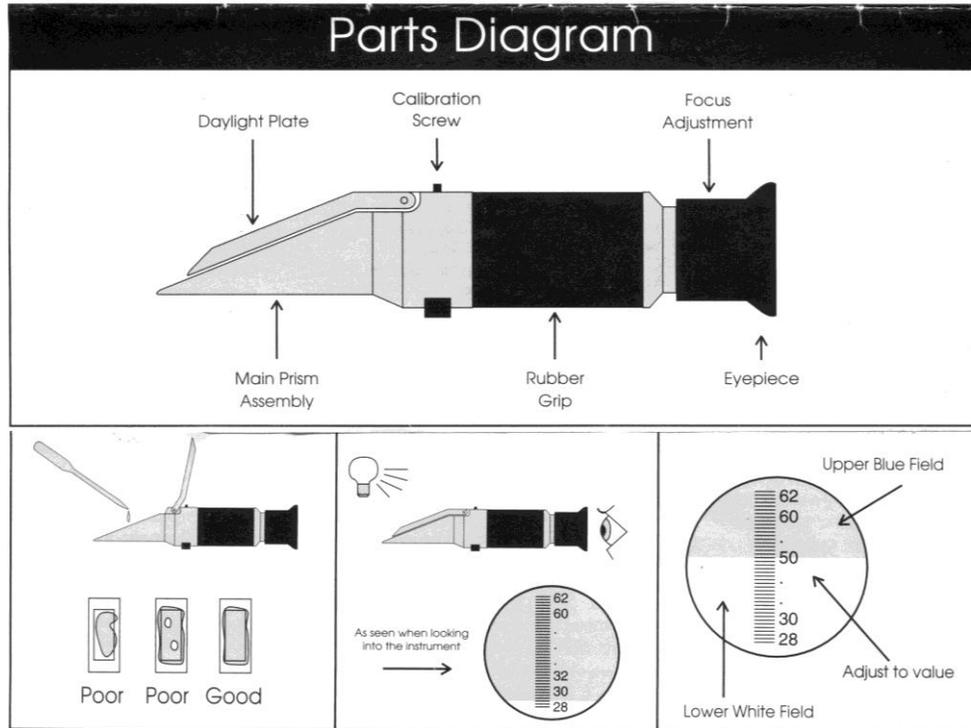
**The procedures contained herein are subject to revision as techniques evolve that speed up the work and that conserve materials. The latest revision can be found on [www.evanscooling.com](http://www.evanscooling.com).**

# Evans Refractometer Part# E2190 for Reading Water Content of Waterless Coolant

VER 10Aug11

## Hand Held Brix Refractometer

Range: 28-62°  
Minimum Division: 0.2°  
Dimensions: 27 x 40 160mm  
Weight: 176 grams



Readings are temperature sensitive, so calibrate before use:

**Calibrate the refractometer** by placing a drop of new Evans Waterless Coolant (NPG+, NPG+c, NPGR, HDTC, or HDC) on the refractometer glass. Use the small screwdriver supplied with the instrument and set the reading to 55.7.

Always clean the glass and the daylight plate with a clean, soft cloth between readings.

Place a small amount of coolant, obtained from a location in the cooling system where the coolant is well-mixed, on the glass and close the daylight plate.

<u>°Brix</u>	<u>% water</u>
55.7	0.0
55.0	1.0
54.7	2.0
54.4	3.0
54.0	4.0
53.5	5.0
53.0	6.0
<u>52.5</u>	<u>7.0</u>