

2020 - 2024  
Chevy/GMC  
6.6L Duramax  
Diesel Trucks



**Ventech** 

LHG (Liquid Heat Generator)

**INSTALLATION MANUAL**  
**Ventech Kit # 0410**

2024-07-05

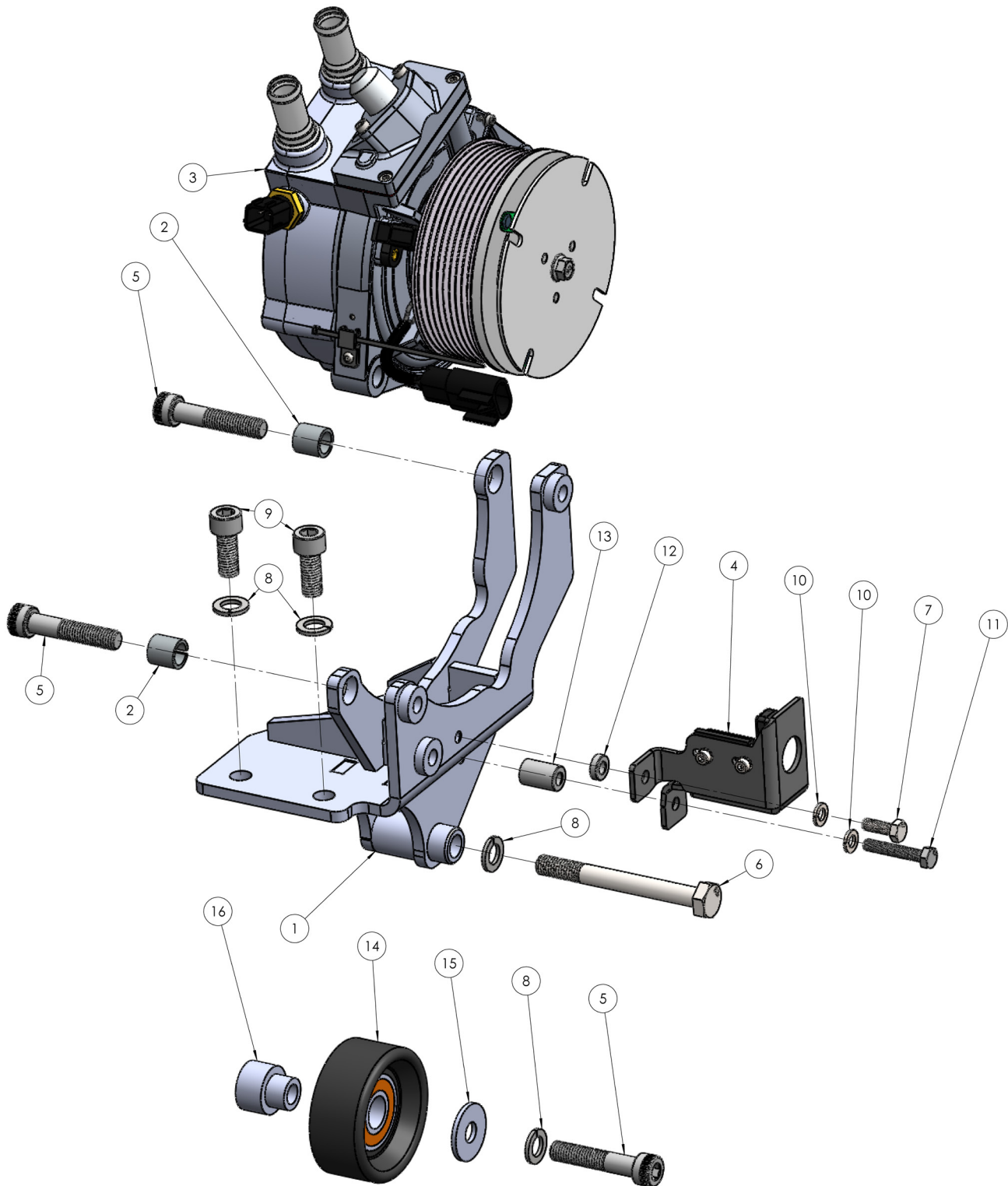
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## 1. Kit Overview

### 1.1 Kit Diagram and Part Descriptions

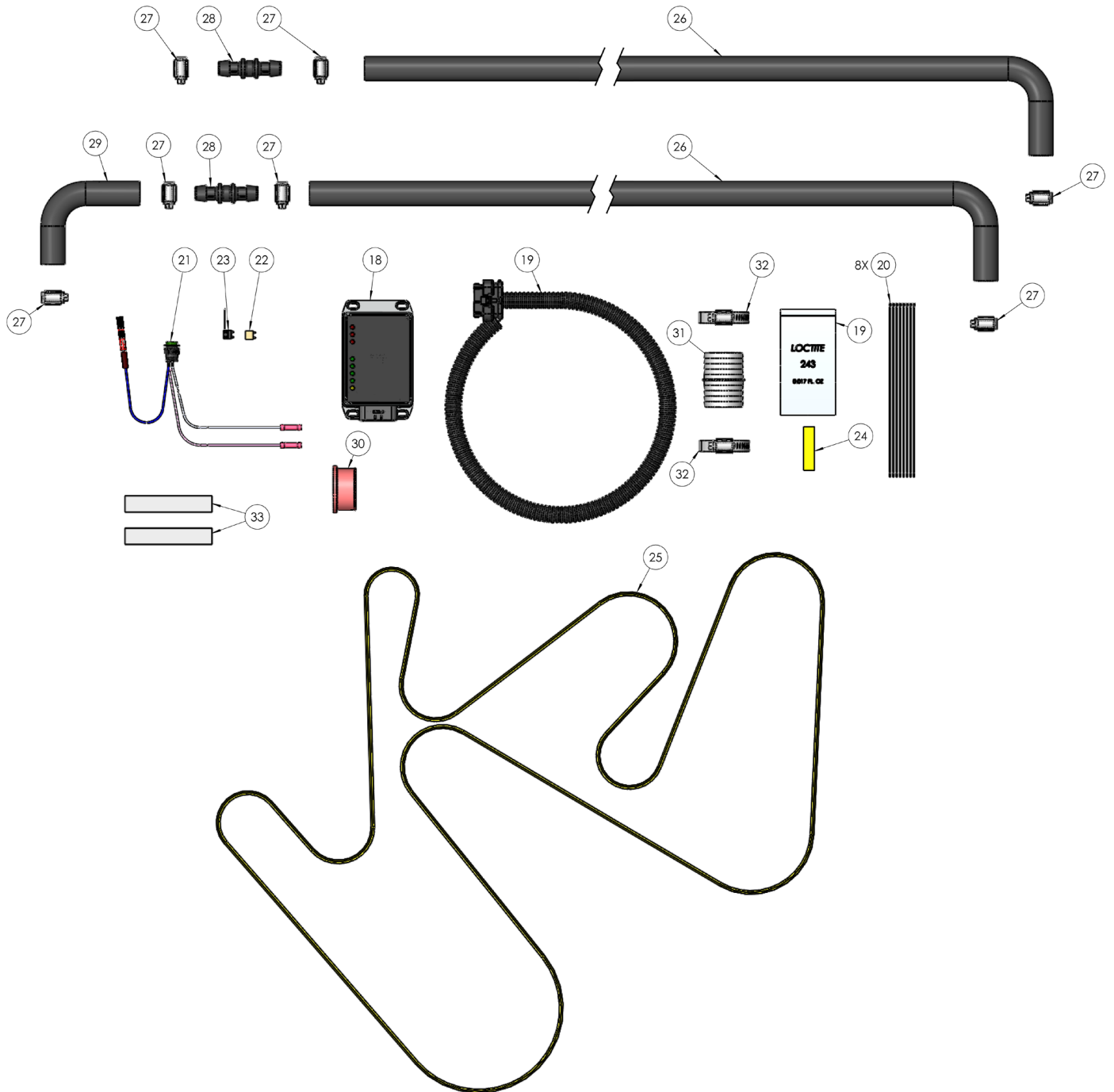




| ITEM NO. | PART NUMBER   | DESCRIPTION   | QTY. |
|----------|---------------|---|------|
| 1        | 140-0160      | KIT 410-415 - SILVERADO KIT - LHG MOUNTING BRACKET WELDMENT | 1    |
| 2        | 990-0222      | BUSHING, M10 X 15mm   | 2    |
| 3        | LHG700 DSS 58 | LHG700 DUAL SPEED SENSOR, 5/8 PLUMBING                      | 1    |
| 4        | 140-0155      | LHG700/800 ROTOR RPM BRACKET ASS'Y (STANDARD)               | 1    |
| 5        | 920-0269      | M10x1.5 X 50mm Socket Head Screw                            | 3    |
| 6        | 920-0028      | M10-1.5 X 95 HHS 8.8 ZP                                     | 1    |
| 7        | 920-0241      | M6-1.0 x 18 HEX HEAD BOLT - 8.8 - ZINC PLATED               | 1    |
| 8        | 925-0016      | M10 LOCK WASHER - ZINC PLATED                               | 4    |
| 9        | 920-0276      | M10x1.5 X 25mm SOCKET HEAD SCREW, ZINC                      | 2    |
| 10       | 925-0020      | M6 LOCK WASHER  | 2    |
| 11       | 920-0277      | M6-1.0 X 35 HHS 8.8 ZP                                      | 1    |
| 12       | 926-0024      | M6 X 4mm UNTHREADED SPACER, 13mmOD, 304SS                   | 1    |
| 13       | 926-0025      | M6 X 20mm UNTHREADED SPACER, 13mmOD, 304SS                  | 1    |
| 14       | 981-0019      | KIT 410-415 - SILVERADO KIT - IDLER PULLEY                  | 1    |
| 15       | 925-0031      | M10 OVERSIZED WASHER - ZINC PLATED                          | 1    |
| 16       | 14-0609       | KIT 410 - SILVERADO KIT - IDLER PULLEY BUSHING              | 1    |

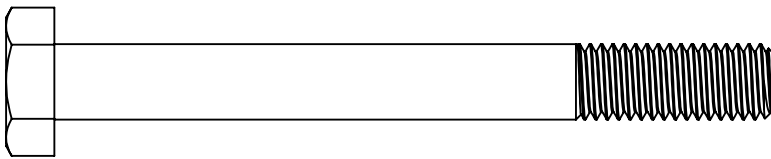
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## Kit and Part Descriptions continued

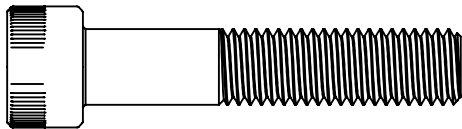


| ITEM NO. | PART NUMBER | DESCRIPTION                                    | QTY. |
|----------|-------------|--|------|
| 17       | 135-0041    | ENHANCED DELUXE ECU, LIGHT/MEDIUM TRUCK        | 1    |
| 18       | 130-0049    | DELUXE ECU HARNESS ASSY, DUAL RPM SENSOR       | 1    |
| 19       | 990-0012    | LOC-TITE 243 .017 FL. OZ (BLUE)                | 1    |
| 20       | 990-0002    | TIE WRAP, 8"                                   | 8    |
| 21       | 135-0042    | SWITCH ASSEMBLY, W/ PIGTAIL                    | 1    |
| 22       | 96-0034     | ATR-5 AUTOMOTIVE ATR FUSE, 5A, 32VDC           | 1    |
| 23       | 95-0060     | FUSE TAP, ATR, 10A MAX                         | 1    |
| 24       | 926-0023    | RPM SENSOR GAUGE STRIP 2" X .5" X .020"        | 1    |
| 25       | 980-0085    | SERPENTINE BELT, 6 RIB, 142"                   | 1    |
| 26       | 990-0108    | 5/8" HEATER HOSE W/ 90 DEG. ELBOW, 4" X 60"    | 2    |
| 27       | 990-0093    | SAE #12 HOSE CLAMPS                            | 7    |
| 28       | 990-0091    | 5/8 HOSE ADAPTER / CONNECTOR                   | 2    |
| 29       | 990-0230    | 5/8" HEATER HOSE W/ 90 DEG. ELBOW, 4" X 3.25"  | 1    |
| 30       | 14-0605     | KIT 410 - SILVERADO KIT - RESONATOR DELETE CAP | 1    |
| 31       | 990-0231    | 1-3/4" STRAIGHT BARBED COUPLER                 | 1    |
| 32       | 990-0232    | WORM DRIVE HOSE CLAMP 1-5/16 DIA - 2-1/4 DIA   | 2    |
| 33       | 926-0021    | VELCRO STRIPS 4" X 3/4"                        | 2    |

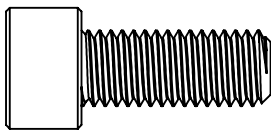
## 1.2 Identification Sizing Table



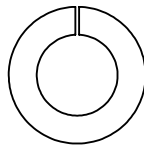
M10-1.5 X 95mm HEX BOLT  
920-0028 (1)



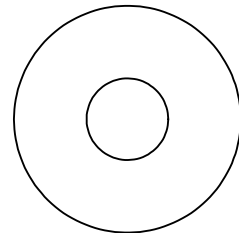
M10-1.5 X 50mm SHCS  
920-0269 (3)



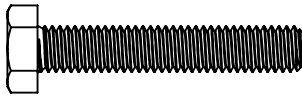
M10-1.5 X 25mm SHCS BOLT  
920-0083 (2)



M10 LOCKWASHER  
925-0016 (4)



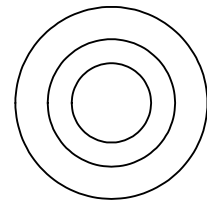
M10 OVERSIZED WASHER  
925-0031 (1)



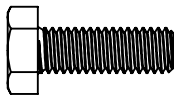
M6-1.0 X 35mm HEX BOLT  
920-0277 (1)



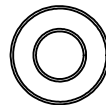
M6 LOCKWASHER  
925-0020 (2)



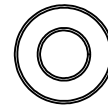
IDLER PULLEY BUSHING  
14-0609 (1)



M6-1.0 X 18mm HEX BOLT  
920-0241 (1)



M6 X 4mm SPACER  
926-0024 (1)



M6 X 20mm SPACER  
926-0025 (1)



## 2. Tools We Used



Breaker Bar(s)  
 1/2" Drive Extension  
 Torque Wrench  
 1/2 Drive Ratchet  
 3/4 Drive Ratchet  
 1/2 - 3/4" Drive Adapter  
 1/2 - 3/8" Drive Adapter  
 1/2 Drive Extension 6"  
 5/8", 3/6" Deep Well Sockets  
 9mm, 10mm Deep Well Sockets  
 8, 17mm Short Well Sockets  
 8mm Allen Socket  
 Step Drill Bit  
 4mm Drill Bit

13mm Wrench  
 3mm Allen Wrench  
 Pliers  
 10" Flat Head Screwdriver  
 Hose Cutter  
 Nippers  
 Wire Cutters  
 Drill  
 Heat Gun  
 Tape  
 Wire Stripper / Crimper (not shown)  
 Needle Nose Pliers  
 or Fuse Removal Tool (not shown)

### 3. Before you begin

Before you begin the installation, check the Kit Parts List against the content of the Installation Kit. If anything is missing or incorrect, contact Ventech immediately.

#### 3.1 Best Practices

It is very important that the LHG is installed correctly not only to obtain maximum results, but also to minimize the possibility of unit failure. The following tips address some of the more common installation mistakes.

##### 3.1.1 Fastener Torque

Torque all fasteners according to the instructions in this manual.  
Excessive fastener torque may cause damage to the bolts and/or threaded components.  
Too little torque may cause fasteners to loosen.

##### 3.1.2 Use Threadlock – (Loctite)

Loctite 243 must be applied when and where noted in this manual.

### 4. About the Ventech HeatStroke LHG

The heart of the Ventech HeatStroke Rapid

Supplemental Heater System is the proprietary Liquid Heat Generator (LHG).

By providing fast engine and cabin warmup, your engine will spend far less time “running cold,” saving fuel, and reducing wear & tear on the engine, various engine components, and after-treatment system.

The LHG generates coolant heat by the rotation of an internal ‘rotor’ opposing a stationary ‘stator’ within the LHG Heater assembly. Fluid friction is caused by a process known as toroidal vortexing or the shearing of toroidal vortices. The process is highly efficient (up to 98%) and instantaneous.

The digital ECU provided with the Ventech system determines when to activate the LHG, based on Coolant Temperature, Vehicle Voltage, Engine and LHG RPM, Ambient Air temperature, and other parameters monitored by the ECU.

The system is a fully automatic belt-driven vehicle accessory. A dashboard switch is provided for manual enable and disable of the system from within the cab.

## IMPORTANT!!

Before beginning,  
disconnect both batteries.

If your upper radiator hose is old or damaged,  
we suggest replacing it with a new one before  
you begin installing the LHG.

While this installation can be completed by one  
person, we have found it advantageous to have  
assistance, especially when removing and installing  
the serpentine belts.



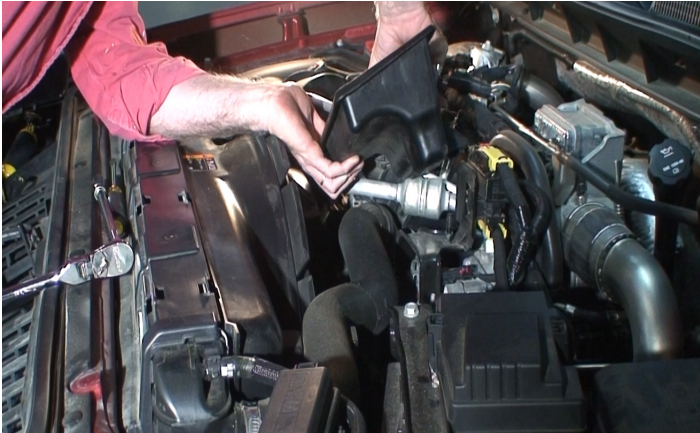
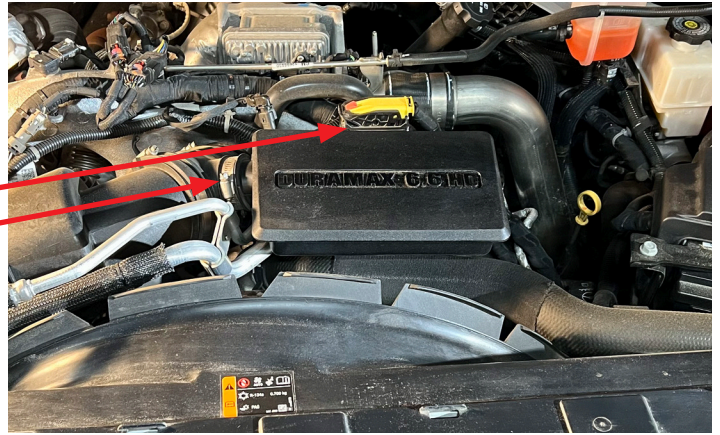
## 5. Preparing for Installation

### 5.1 Remove the Intake Resonator

Locate the Intake Resonator and remove it.

The Intake Resonator is attached to a mount on the back and with a hose clamp at the Back Air Cleaner Outlet Duct. Do not remove the hose clamp, it will be reused.

The Resonator will not be reinstalled. However, you may want to keep it.

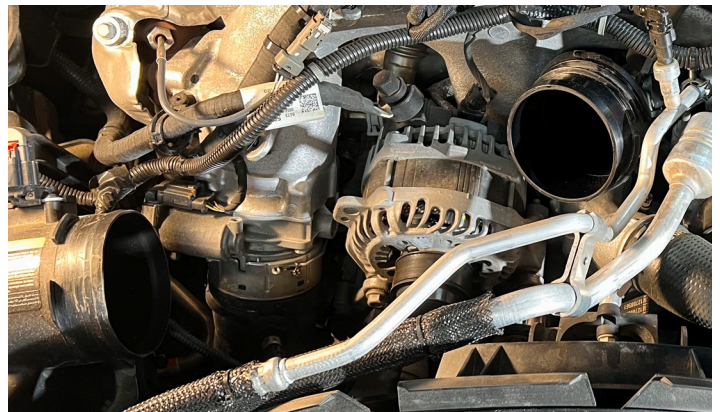
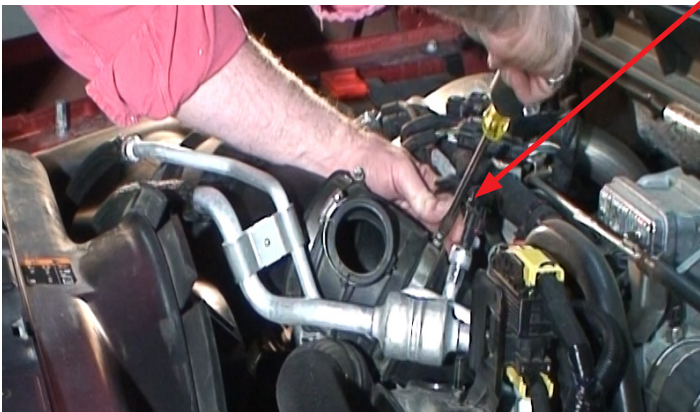


### 5.2 Remove the Air Cleaner Outlet Ducts

As shown here, remove the Front and Back Air Cleaner Outlet Ducts.

While these are separate parts, if you choose, you can keep them together.

During the LHG install. Set the Ducts aside for re-installation later.



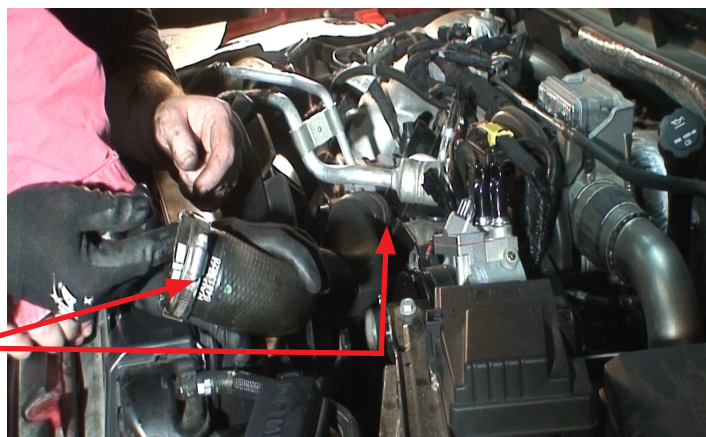


### 5.3 Remove the Upper Radiator Hose.

**IMPORTANT:** Make sure the engine is cold, and there is NO pressure in the coolant system before you take the next step.

Also, make arrangements to catch spilled antifreeze, as some will be lost during this procedure.

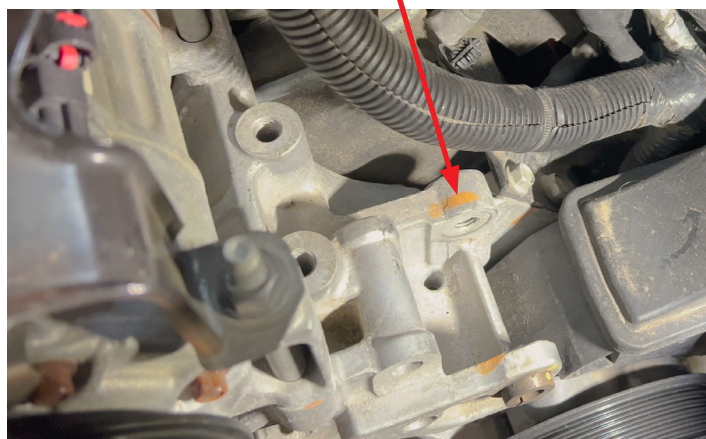
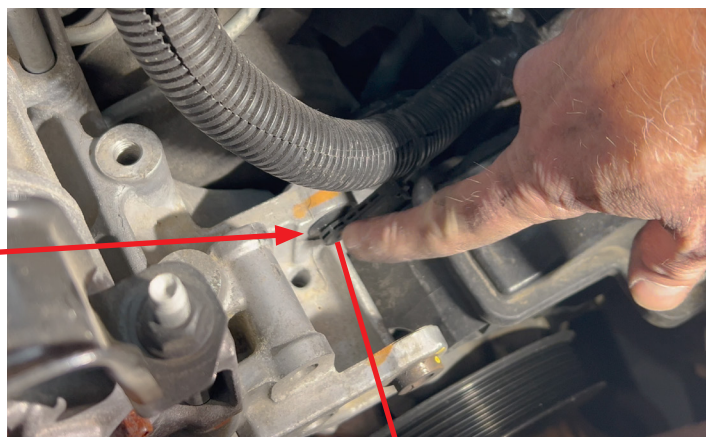
Once you are ready, detach both ends and remove the upper radiator hose, setting it aside for later.



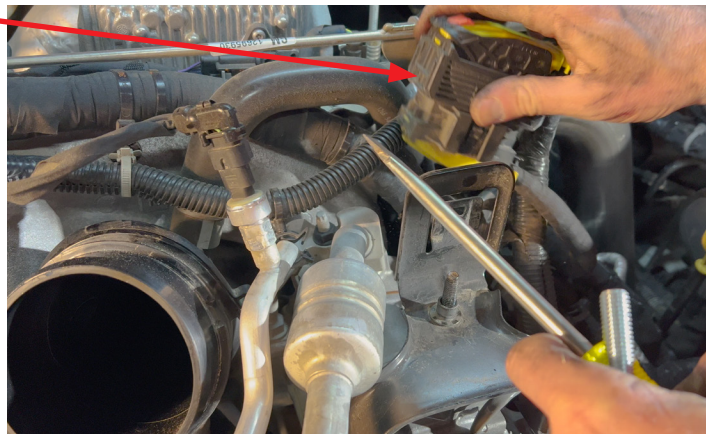
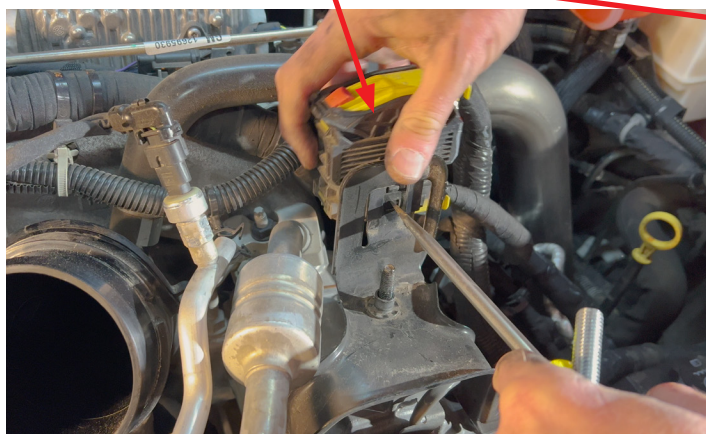
### 5.4 Prepare the LHG Bracket Mounting location

Identify the location where the LHG Bracket will be mounted.

This wire mount is in a threaded hole that will be used to mount the LHG Bracket. Use a flathead screwdriver or a puller to remove it and push the OEM wiring out of the way.



Follow this wiring harness up and detach the OEM wiring connector shown here from its mounting (you will be putting this back on after the LHG installation).





Locate the bushing shown here and make sure it is not pushed in (towards the back of the truck). If the bushing has been pushed in/back, use pliers or channel locks to work it back to the position shown here.

**IMPORTANT:** If the bushing is missing, do not proceed with the installation. This bushing is part of the original equipment on your truck and is essential to this installation. You will need to contact your dealer or other parts supplier to obtain the proper bushing before proceeding.

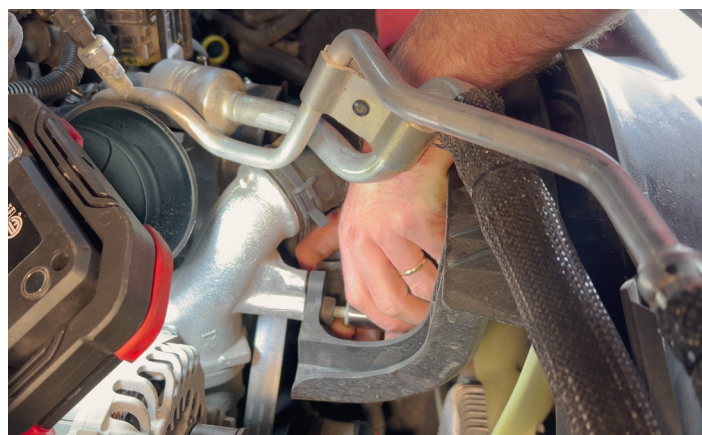


### 5.5 Disconnect the Fan Shroud

We have found that it is easier to release and re-tension the serpentine belts with the Engine Coolant Fan Rear Shroud detached.

Remove the 4 bolts that hold the shroud in place and set them aside to be reinstalled.

It is not necessary to remove the Shroud; being able to pull it forward is enough to help with belt management.

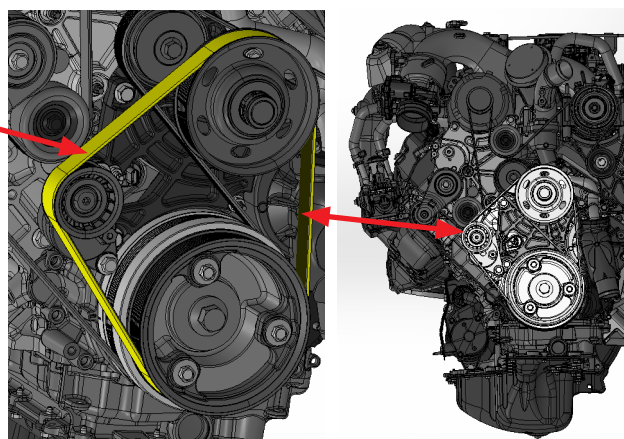


### 5.6 Remove the OE Short Serpentine Belt

Remove and set aside the Short Serpentine Belt to be reinstalled later.

We found it helpful to pull the Fan Shroud forward to allow room for a breaker bar to control the belt tensioner.

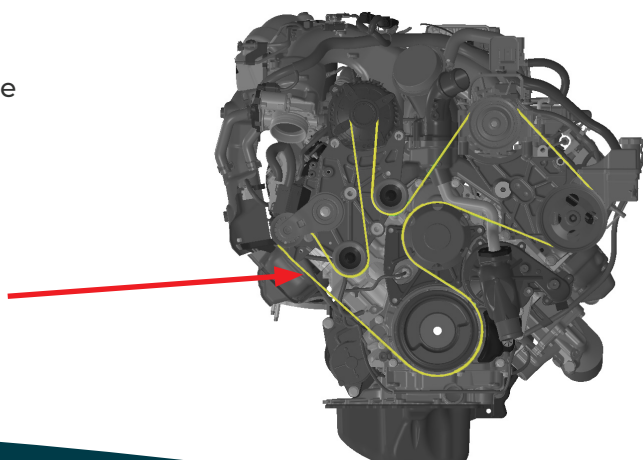
Keep this belt, as you will be reinstalling it.



### 5.7 Remove the OE Long Serpentine Belt.

As with the Short Serpentine Belt, we have found that, as you remove the Long Serpentine Belt, it may be helpful to pull the Fan Shroud forward to allow room for a breaker bar to control the belt tensioner.

The illustration to the right shows the OE belt and original (without LHG) belt routing. You will not be reinstalling the OE Long Serpentine Belt.



## 5.8 Prepare the LHG Mounting Bracket

Locate the following Kit-supplied material:

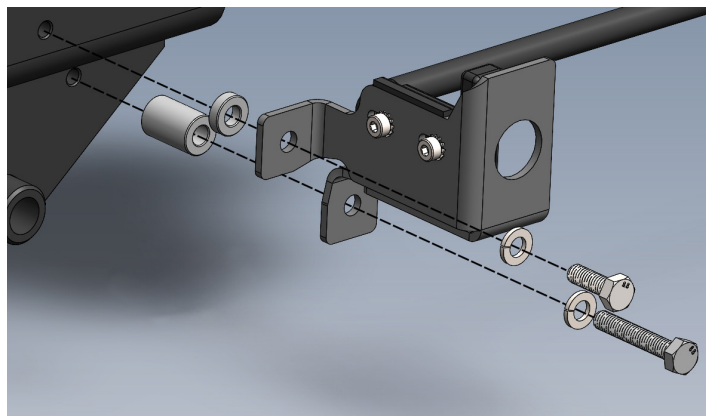
| Part #   | Description                 | Qty |
|----------|-----------------------------|-----|
| 140-0160 | LHG Mounting Bracket        | 1   |
| 140-0155 | ROTOR RPM Bracket Assembly  | 1   |
| 920-0277 | M6 - 1.0 x 35 Hex Head Bolt | 1   |
| 920-0241 | M6 - 1.0 x 18 Hex Head Bolt | 1   |
| 925-0020 | M6 Lock Washers             | 2   |
| 926-0024 | M6 X 4mm Unthreaded Spacer  | 1   |
| 926-0025 | M6 X 20mm Unthreaded Spacer | 1   |

### 5.8.1 Install the RPM Sensor on the LHG Mounting Bracket

Install the Front RPM Sensor Assembly (140-0155) onto the LHG Mounting Bracket (140-0160) as illustrated to the right.

Torque the M6 Bolts to 8 ft/lbs.

Using a hex wrench, adjust the sensor position to the highest setting (up and away from the main bracket). Snug the bolts to hold the sensor in place for now. The final adjustment of the RPM sensor will be made later in the installation.





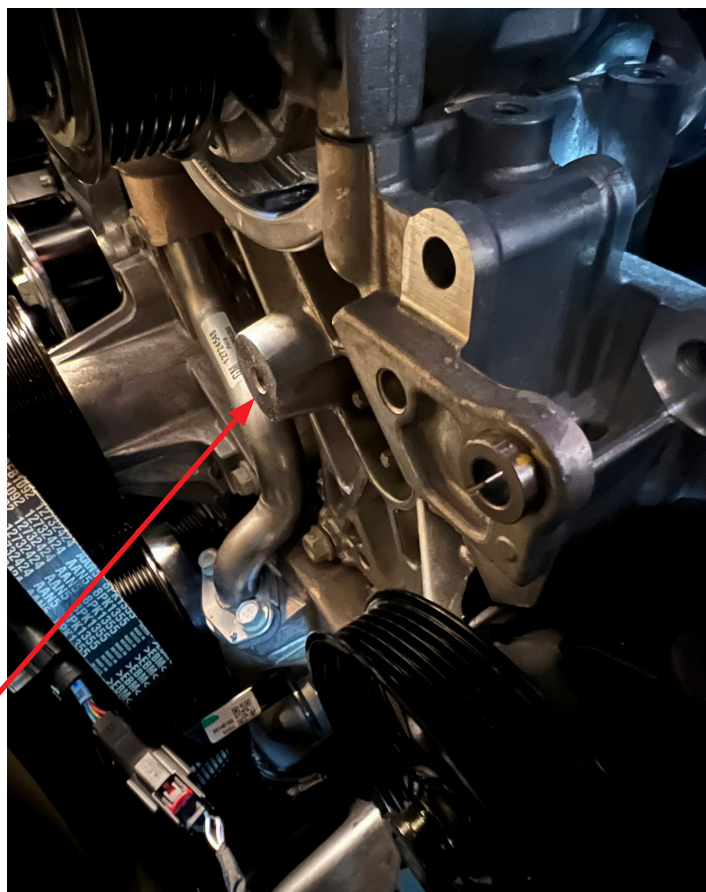
## 6. LHG Installation

### 6.1 Install the LHG Additional Pulley

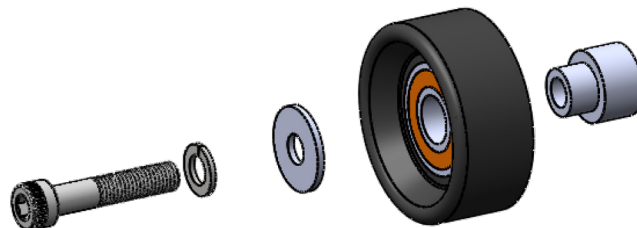
Collect the following kit-supplied parts:

| Part #   | Description           | Qty |
|----------|-----------------------|-----|
| 981-0019 | Idler Pulley          | 1   |
| 920-0269 | M10x1.5 X 50mm SHS    | 1   |
| 14-0609  | Idler Pulley Bushing  | 1   |
| 925-0031 | Oversized Flat Washer | 1   |
| 925-0016 | M10 Lock Washer       | 1   |

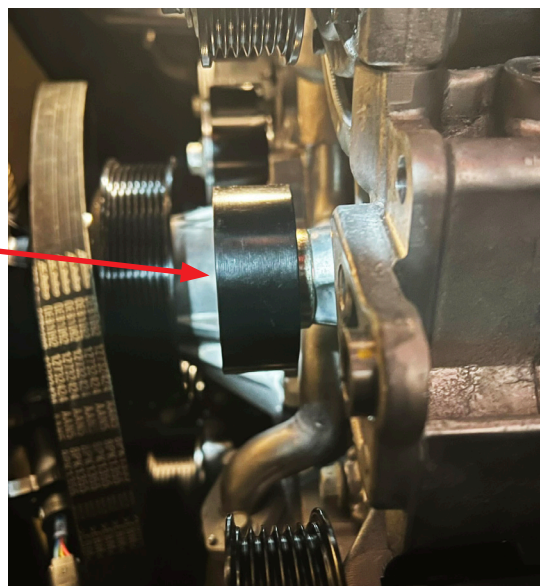
Identify the pulley mounting location shown to the right.



Arrange the pulley and hardware as shown here and install the pulley on the engine.



Torque the pulley bolt to 38 ft/lbs.



## 6.2 Install the LHG Mounting Bracket

Collect the following supplied parts:

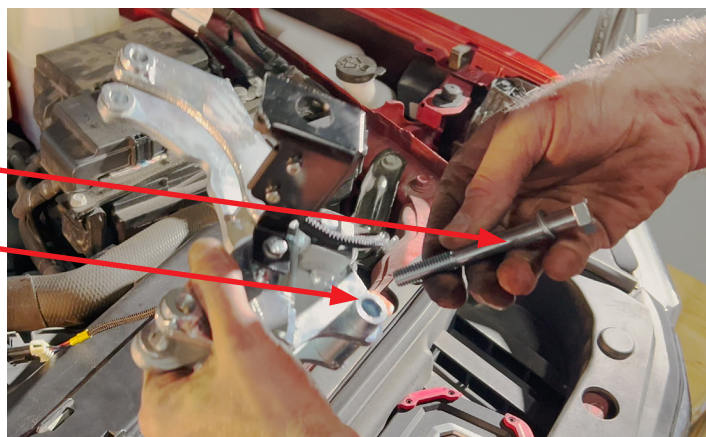
| Part #                 | Description  | Qty |
|------------------------|--|-----|
| 140-0160 /<br>140-0155 | LHG Mounting Bracket with RPM<br>Sensor Assembly Installed | 1   |
| 920-0028               | M10 - 1.5 x 95 Hex Head Bolt                               | 1   |
| 925-0016               | M10 Lock Washer  | 3   |
| 920-0276               | M10 - 1.5 x 25 SHCS  | 2   |

Make sure you have completed the checks and steps found above under item 5.4

### 6.2.1 Attach the lower LHG bracket mount location

Prepare the M10 x 95 Hex Bolt and lock washer as shown.

On the LHG Bracket, identify the lower mounting location shown to the right.



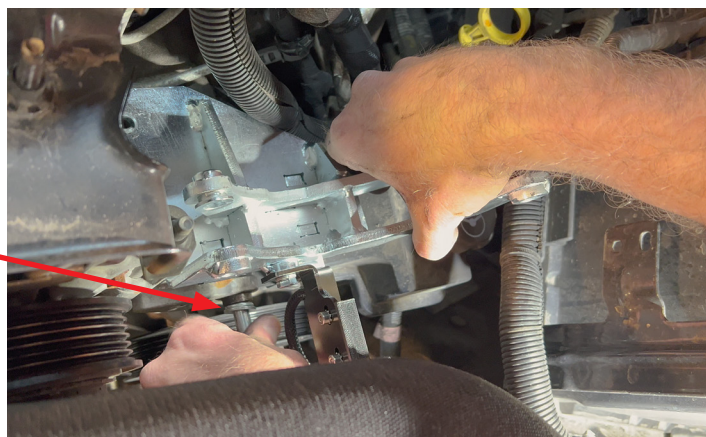
On the engine, identify the mounting location Shown to the right.





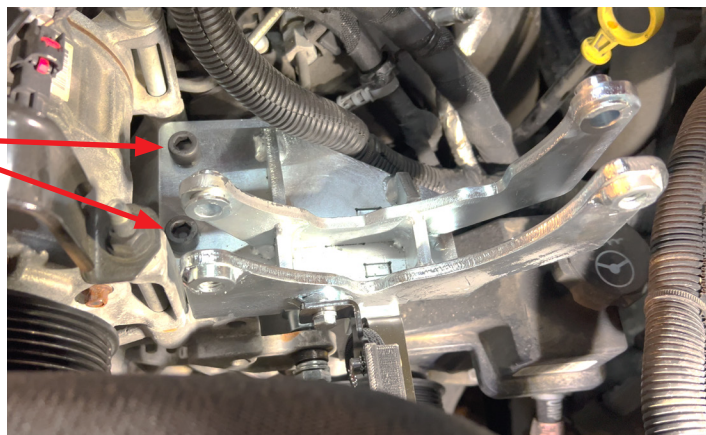
Being careful not to bump the RPM Sensor Assembly as you do so, lower the bracket into place, moving aside the OEM wiring harness and upper radiator hose as necessary.

Install and finger-tighten the M10 x 95 bolt and washers in the lower mounting location.



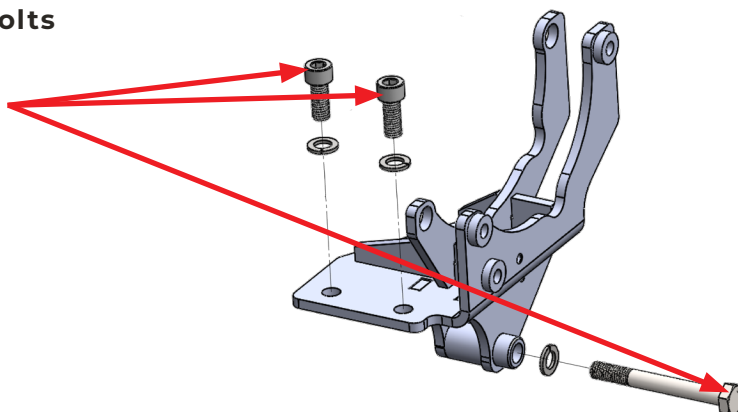
### 6.2.2 Attach the upper bracket mounting bolts

Install and the two M10 1.5 x 25 SHCS with M10 lock washers.



### 6.2.3 Torque the bracket mounting bolts

Torque all of the bracket mounting bolts to 38 ft/lbs.

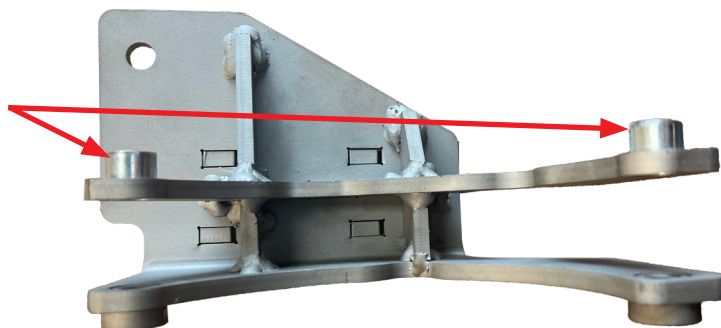


### 6.3 Attach the LHG to the Bracket

Making sure that the LHG Bracket Bushings are present, and are positioned as shown here, sticking "outside" / "away" from the LHG holding area of the bracket.

If the bushings are pushed in, use pliers or a similar tool to move them to the position shown here.

If missing, stop and contact Ventech. Do not install without the bushings.





**IMPORTANT:** Verify that the wire tieback on your LHG is in the upper position, shown here. NOT mounted to the small hole seen below.

If it is not, you will have to use a small Allen Wrench to remove the plug in the upper hole and, making sure to USE BLUE LOC-TITE, move the wire tieback to this location.

**IMPORTANT:** Gather up the wiring above the LHG, as also shown to the right, in order to prevent pinching it as you place the LHG in its bracket.

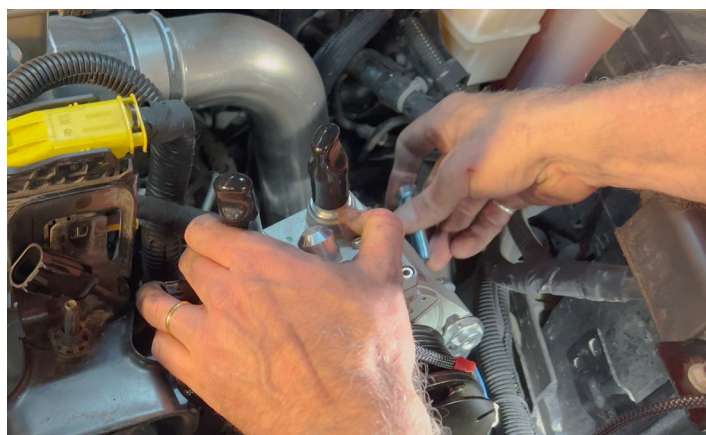
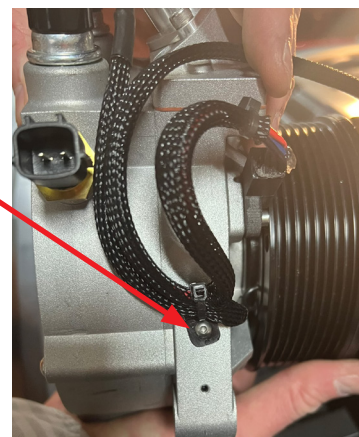
**IMPORTANT:** The LHG is heavy and can be damaged if dropped, bashed into hard objects, or if the sensor wiring is pulled or pinched. Also, the fit of the LHG to the RPM Sensor on the Bracket is very close and the RPM Sensor can be damaged through collision with the LHG.

With this in mind, carefully lower the LHG (as shown) into the Mounting Bracket.

Using the two M10 x 50 SHCS, attach the LHG to the LHG Mounting Bracket.

Insert each of the two bolts from the back of the bracket as shown and finger tighten the bolts.

Torque both LHG M10 x 50 SHCS mounting bolts to 38 ft/lbs.



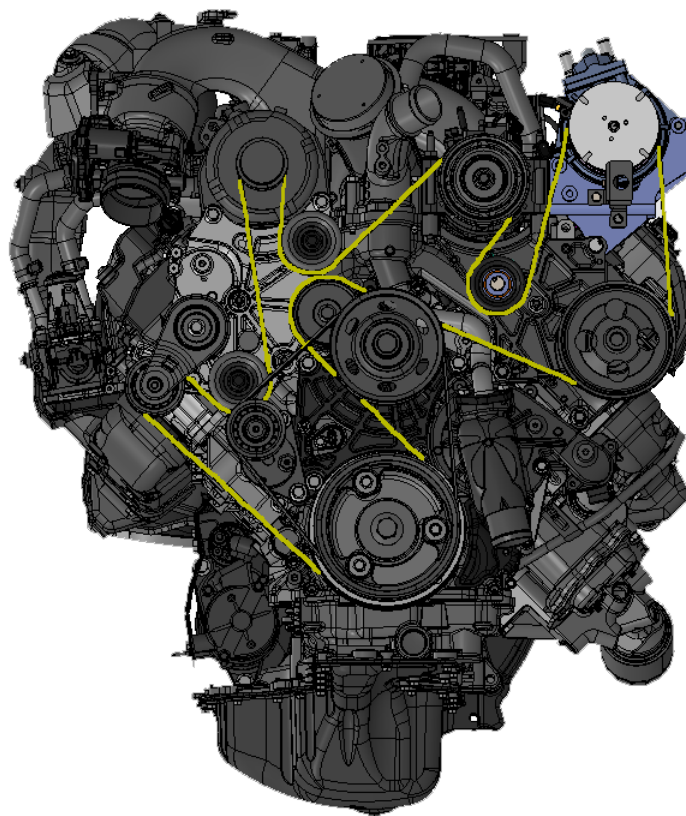
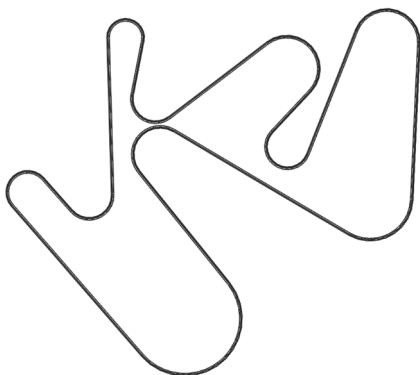
## 7. Install the Serpentine Belts

### 7.1 Install the NEW Long Serpentine Belt

This will probably be the most difficult part of the installation. We have found that having some assistance installing the long serpentine belts can be helpful.

Carefully route the new kit-supplied Serpentine Belt (980-0085) as shown here.

It may be helpful to pull the Fan Shroud forward to allow room for a breaker bar to control the belt tensioner.



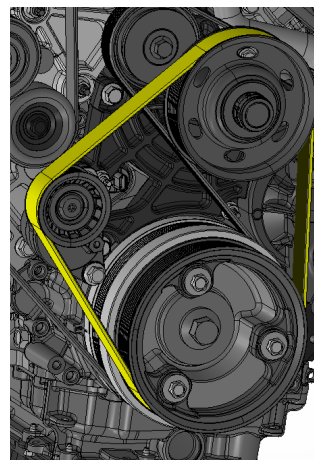
We have also noticed that the tensioner will feel like it is pulled back as far as possible before the belt fits. Applying just a bit more force to the process will cause the tensioner to give way enough to get the belt on successfully.



### 7.2 Reinstall the OEM Small Serpentine Belt

Reinstall the OEM Small Serpentine Belt - the same belt that you removed in step 5.6.

It may be helpful to pull the Fan Shroud forward to allow room for a breaker bar to control the belt tensioner.





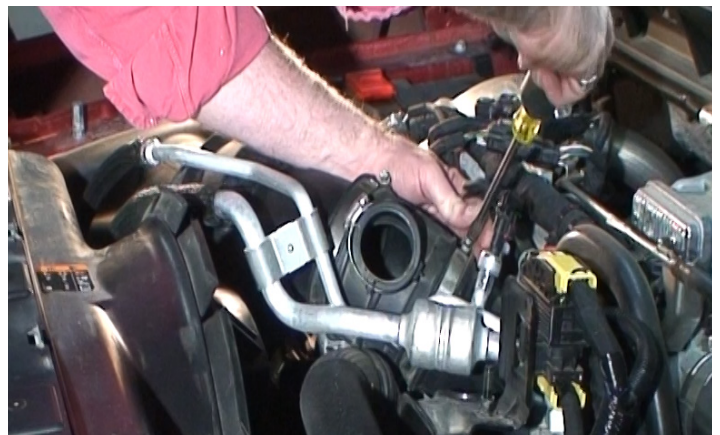
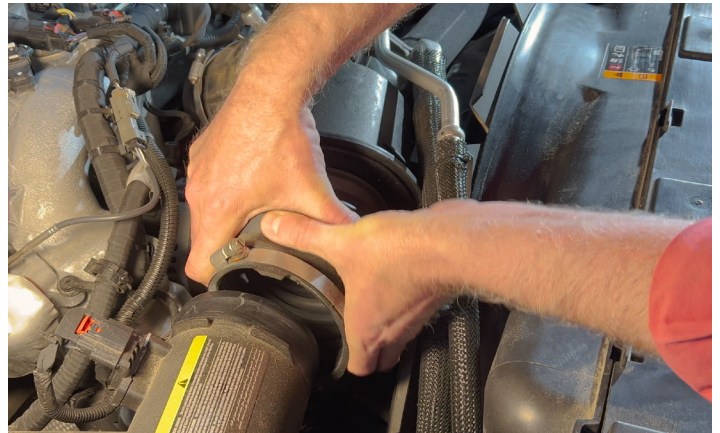
### 8. Reconnect the OEM Fan Shroud

Using the OEM (original) bolts and washers, reconnect the Fan Shroud that you disconnected in step 5.5.



### 9. Reinstall the OEM Air Cleaner Outlet Ducts

Return the OEM Air intake system to its original configuration and tighten it in place. DO NOT reinstall the resonator that was removed in step 5.2.

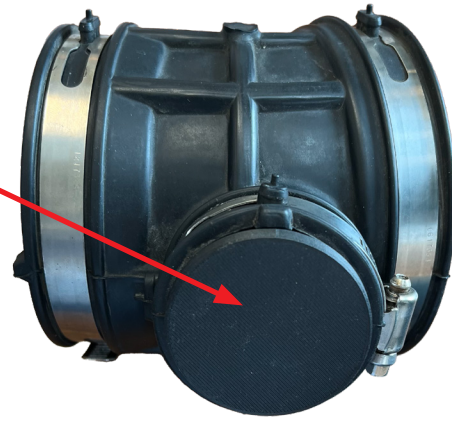


### 10. Install the Resonator Delete Cap

Locate the kit-supplied Resonator Delete Cap (14-0605) shown to the right.



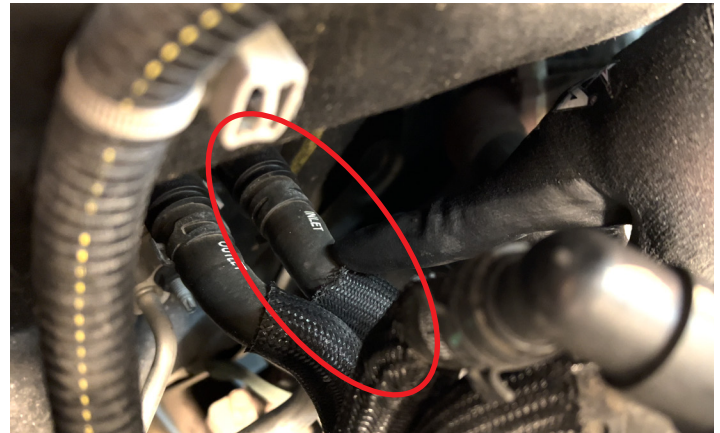
Install the Delete Cap as shown and tighten the OEM hose clamp.



# **11. Prepare the truck for LHG Coolant Hose installation,**

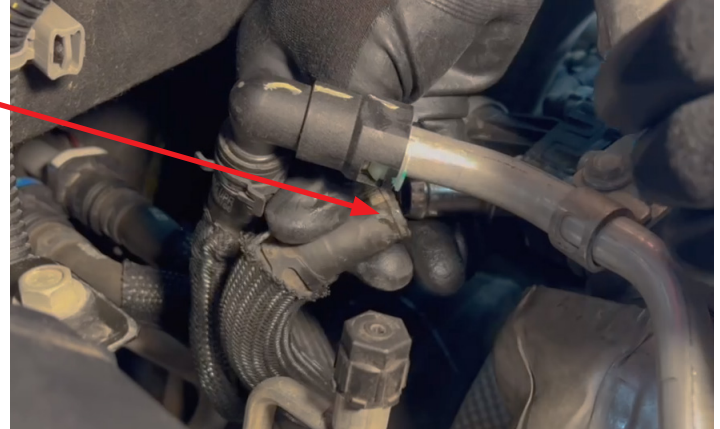
Make sure that the truck engine and coolant are cold and that there is no pressure in the coolant system.

Identify the coolant hose that runs from the heater core inlet to the engine.

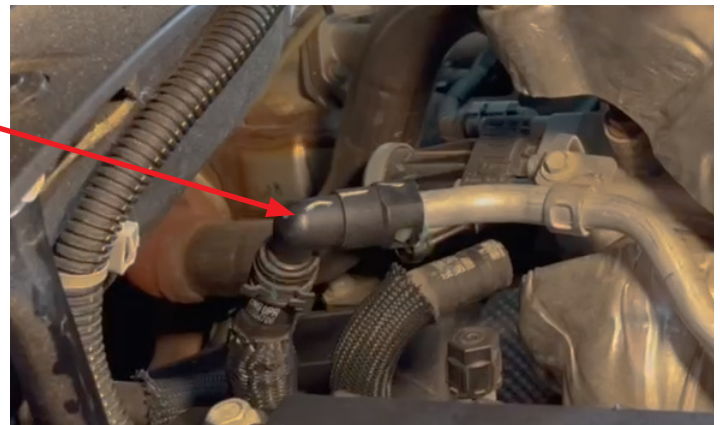


Disconnect the OEM Heater Core coolant hose at the location shown here. If there is a quick-connect here (some model years include one), leave the quick-connect in place and remove the hose from the quick-connect.

**IMPORTANT NOTE:** You will lose some coolant during this process, so you should make provisions to capture and properly dispose of spilled coolant.



Leave this hose connected.





## 12. Install the LHG Heater Hoses

The kit-supplied LHG Heater Hoses will need to be customized to fit your truck.

Because the coolant system connections vary from year to year, it is not possible to fully document each possible configuration.

Use the guidance here to configure the coolant hose connections for your application.



### 12.1 LHG to Heater Core Input Hose

On the 90-degree bend of BOTH of the supplied Heater Hoses (990-0108), trim the short end of the hoses to about 2.5 inches, as shown here.



Starting with the LHG Output to Heater Core, the fitting on the top left of the LHG, attach the 90-degree end of one of the supplied hoses.

This hose will run from the LHG to the heater core intake hose that you disconnected above. It will be connected using two hose clamps and the kit-supplied 5/8" Straight Hose Connector (990-0091).



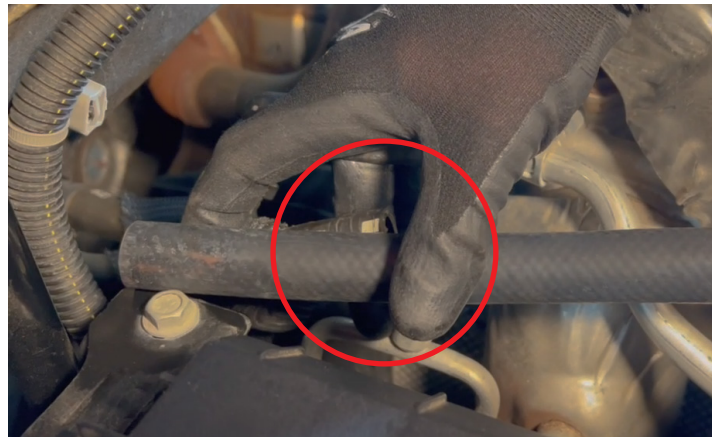
To determine the proper length for this hose, loosely place the hose on the LHG output and run it as shown over the fan shroud and next to the battery.



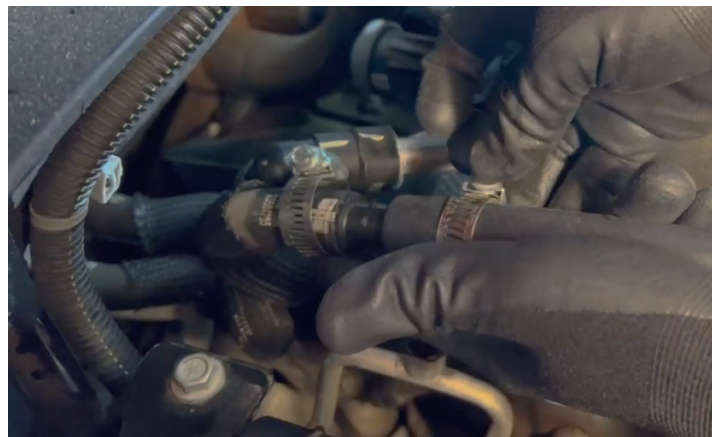


Determine the proper length, taking into account the connector and leaving just a little slack.

Mark and cut the hose.



Install the kit-supplied Hose Connector (990-0091) onto the customized Heater Hose (990-0108) and connect the hose to the Heater Core Intake Hose and LHG as shown, making sure to properly tighten the supplied hose clamps (990-0093).



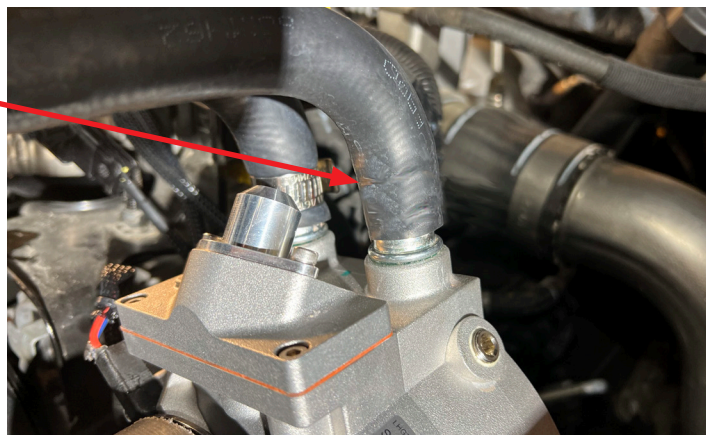
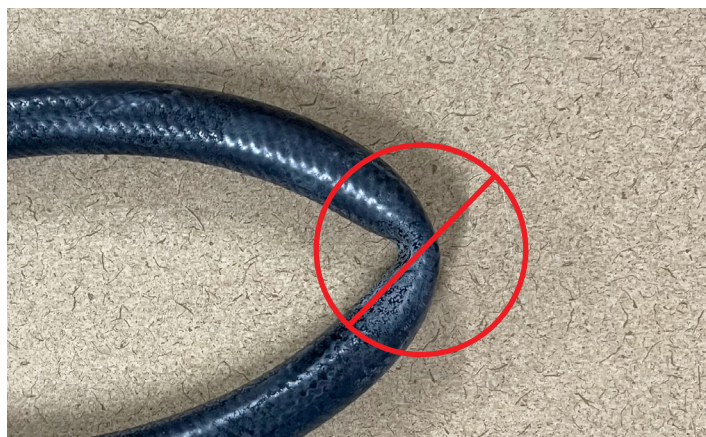


## 12.2 Engine Out to LHG Input Hose

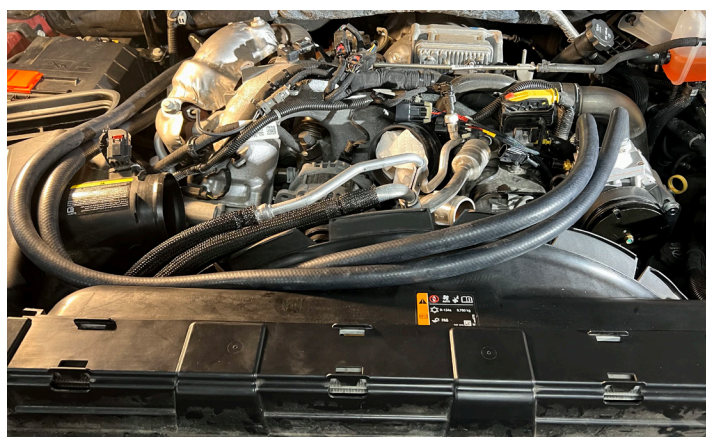
It is important that the Heater Hoses from the LHG not be kinked. For this reason, an optional short Heater Hose W/ 90 Degree Elbow (990-0230) and Hose Connector (990-0093) have been included in the kit.

Depending on your truck's configuration from the factory, these may not be necessary. You will have to determine whether to use them or not.

To help you make your decision, dry fit the 90-degree (already trimmed in step 12.1) angle end of the second supplied "Input" Heater Hose (990-0108) to the LHG Input fitting (the one on the right)



Next, run the hose next to the already installed LHG Output Hose.



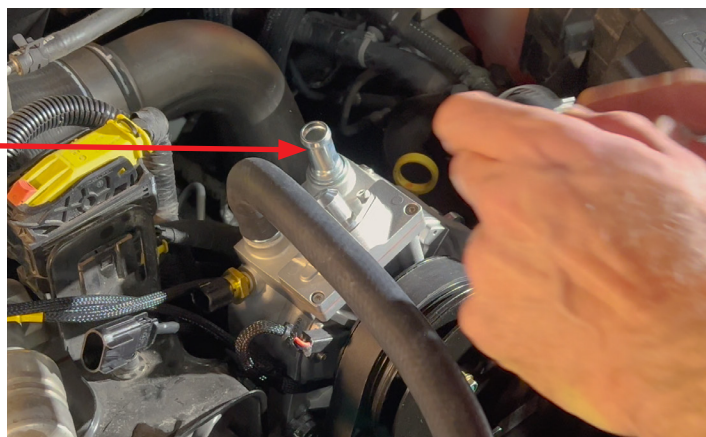
If you determine that the hose can be trimmed and connected to the engine input without a long turn or the potential of a kink in the hose (usually because there is an OEM right-angle quick-connect adapter already installed on the engine output), proceed to mark and cut the right-angle side of the hose long end of the hose in the same manner described for the output hose in step 12.1 above.

Then, jump ahead to section 13.

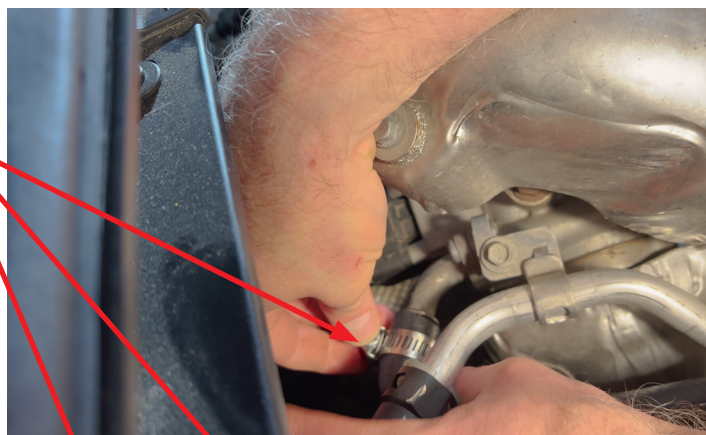


If you determine that the Right-Angle Adapter is necessary to prevent kinking, proceed as follows.

Remove the Heater Hose (990-0108) you just dry-fit from the LHG input.



Flip the hose around and attach the already trimmed right-angle end of the supplied "Input" hose (990-0108) to the engine output coolant connection using one of the supplied Hose Clamps (990-0093)

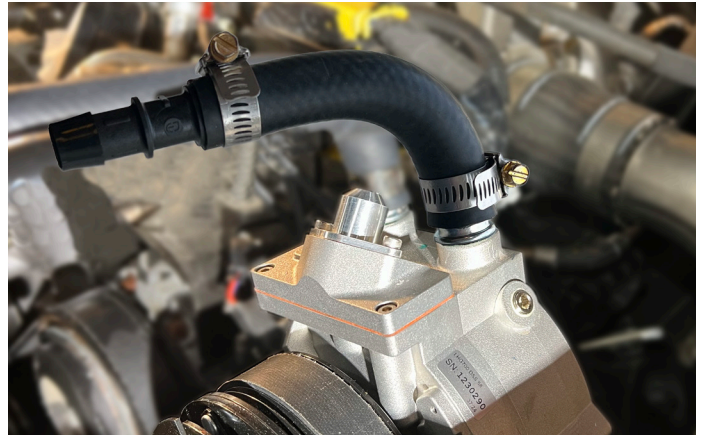


Prepare the short Heater Hose W/90 Degree Elbow (990-0230) by attaching the long end of the Elbow to the second Hose Connector (990-0093) as shown to the right.



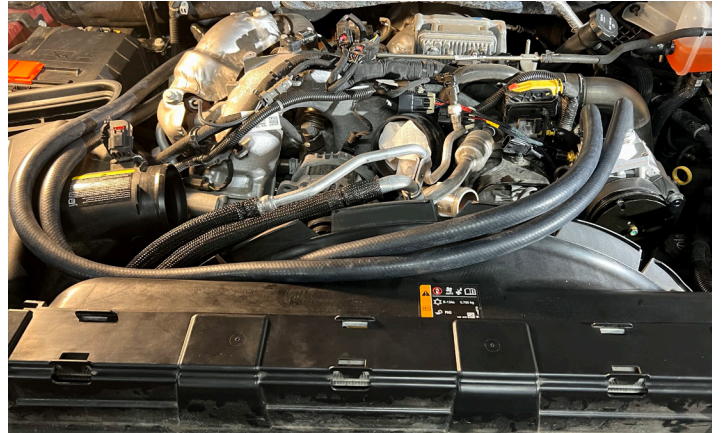


Attach the short end of the Elbow to the LHG input, as shown to the right. Trim the short end of the Elbow if necessary to match the height of the already installed hose).



Route the long end of the input hose back to the LHG, following the routing of the already installed LHG Hose.

The hose will probably be too long.



Measure, mark, and cut the hose so that, when attached to the connector, it will run right next to the already installed LHG hose as shown above.

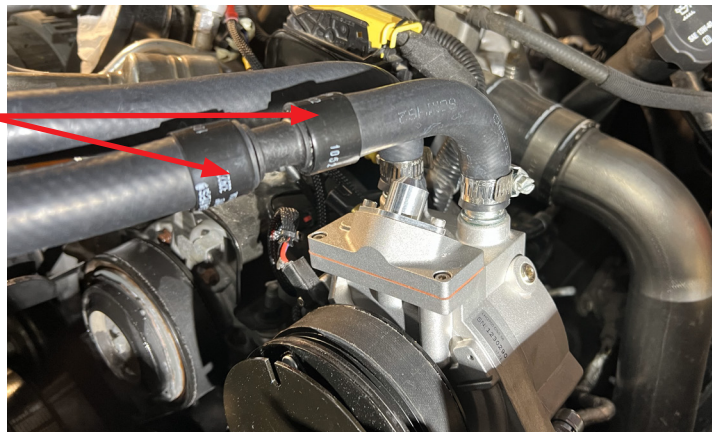
Using a supplied Hose Clamp (990-0093), attach the Hose Connector the hose.

Verify that you have tightened all of the Hose Clamps (990-0093).



When completed, the connection will look like this, however with metal hose clamps.

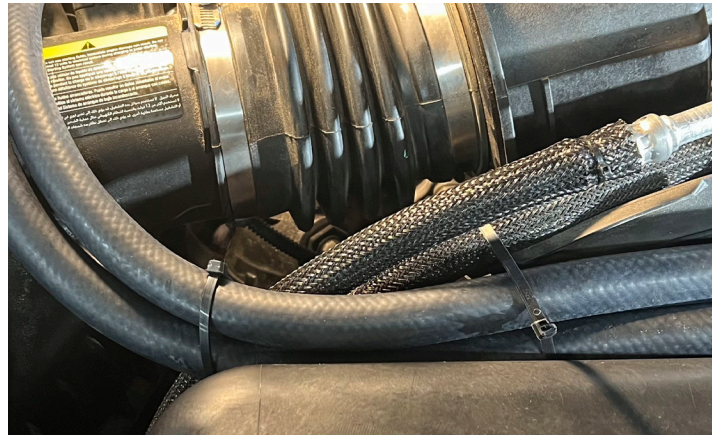
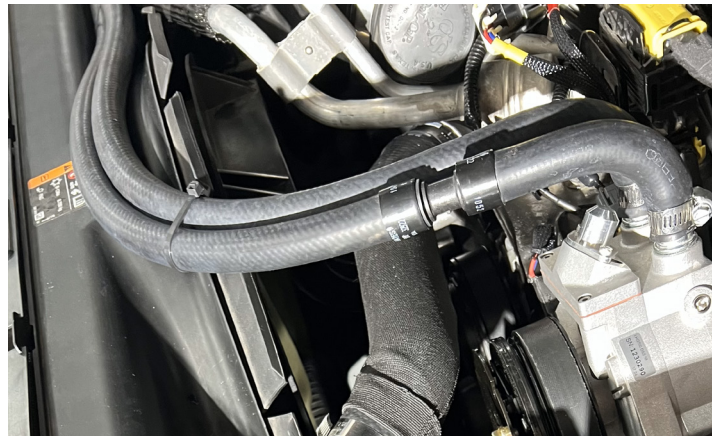
In the example to the right, we used shrink connectors instead of the Hose Clamps supplied with the Kit.





Using the kit-supplied Nylon Tie Wraps (990-0002) carefully secure the LHG input and output hoses together and to existing engine components as illustrated here.

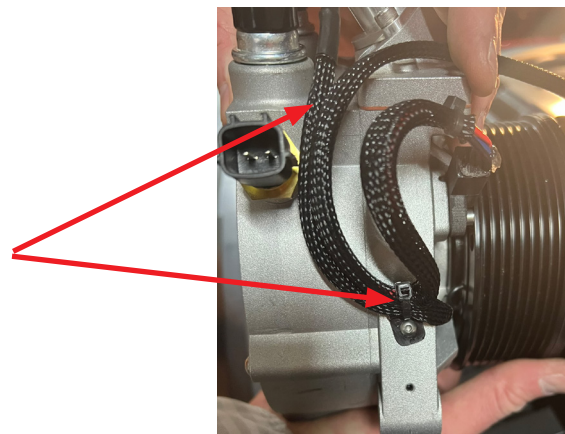
Do not tie them so tightly that they cut into the hoses or so loosely that they allow for excessive movement and chafing.



### 13. Install the LHG Wiring Harness

#### 13.1 Locate the LHG Sensor Wires

Back in step 6.3, as the LHG was attached to the mount, we verified that the sensor wires were tied off in the proper location on the LHG and were not pinched or run under the LHG in its mount.





### 13.2 Secure the LHG Sensor Wires

If you have not already, clip the yellow OEM wiring connector that was unclipped in step 6.3 to make mounting the LHG easier back onto its OEM mount.

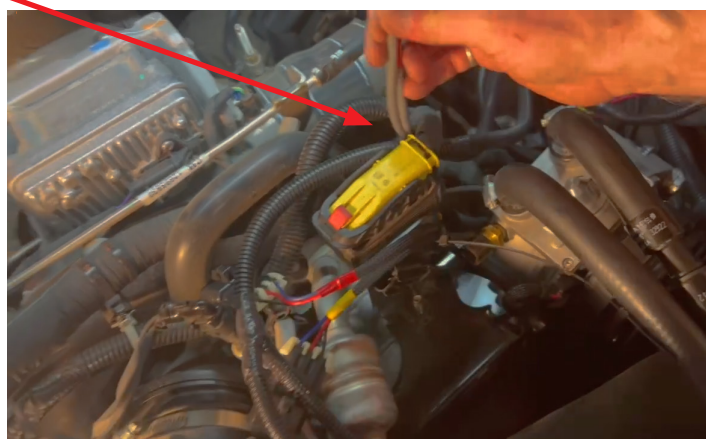
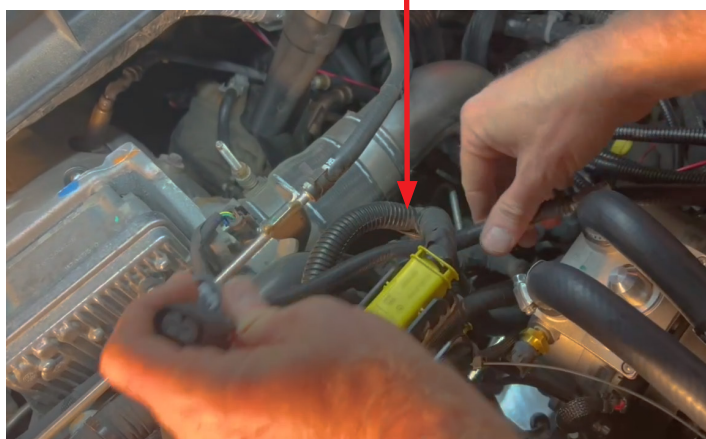
Next, use one of the kit-supplied Nylon Tie Wraps (990-0002) to secure the red and yellow-marked LHG sensor wires to the mount, as shown here.



### 13.3 Route and secure the Harness to LHG Connections

Locate the LHG Wiring Harness (130-0049) and the four connections shown to the right.

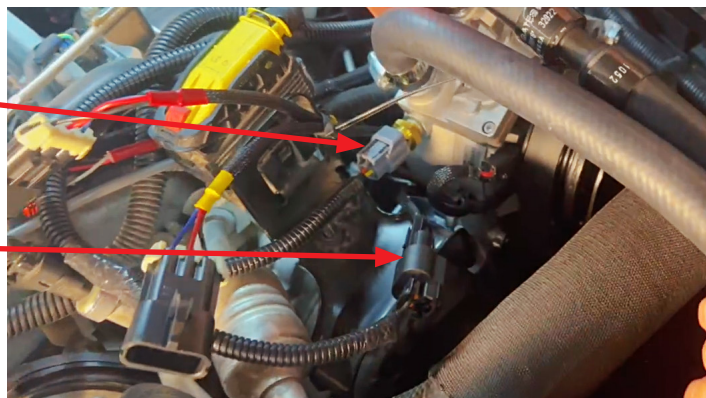
Rout these wires up behind the yellow OEM wiring connection, as shown in the two illustrations below and below right.



### 13.4 Connect the LHG to the Harness

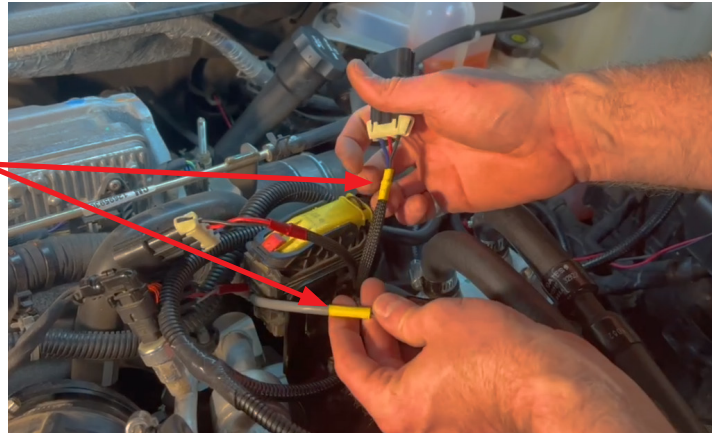
Connect the small gray connector from the Wiring Harness to the sensor connection on the upper part of the LHG housing.

Connect the small black connector from the Wiring Harness to the small black connection from the LHG.

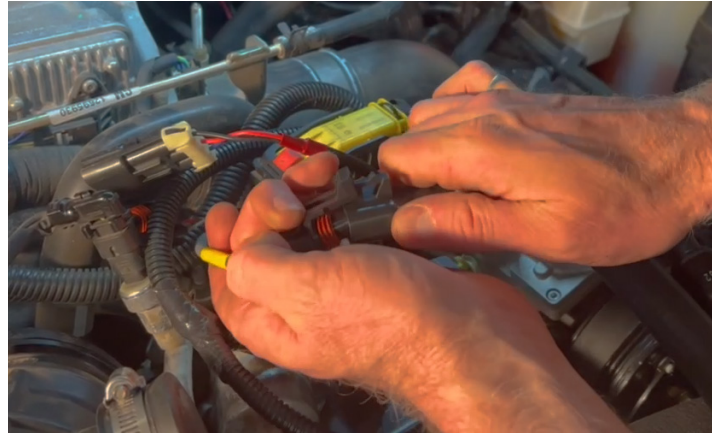


The other two connections are the same size and type, and it is important that they are not connected incorrectly.

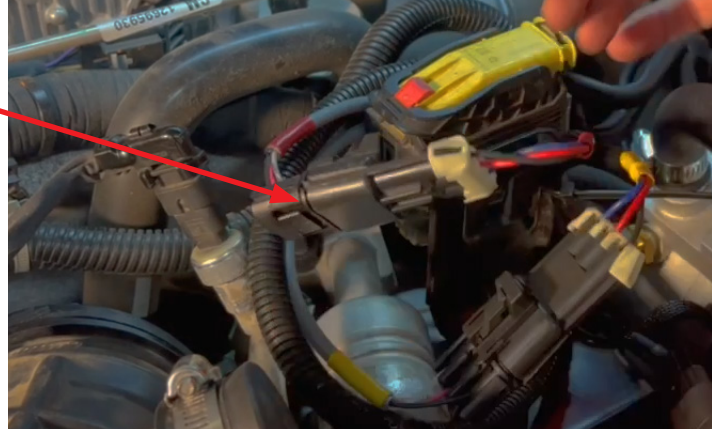
Locate the two large connectors marked with yellow tape on the wiring.



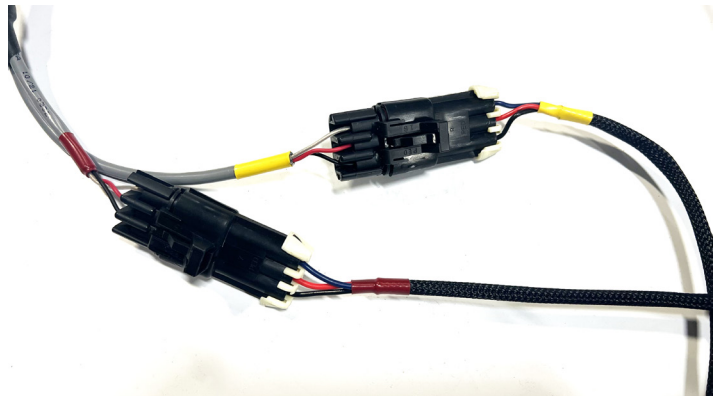
And connect them together.



Now, locate the remaining two connectors, make sure they are marked on their wiring with red tape, and connect them as shown here.



Double check to make sure the two large connectors are connected yellow to yellow and red to red as shown to the right.





### 13.5 Install the LHG Activation Switch

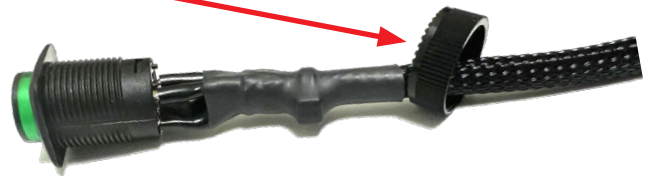
Begin by locating the kit-supplied Switch Assembly (135-0042).

Note that this is a universal Switch Assembly used for different LHG kits. Some modification of the assembly will be necessary during the installation process.



Uncoil the Switch Assembly Pigtail. Then unscrew and remove the retaining ring shown to the right by slipping it all the way down the pigtail and off the wiring.

Make sure to retain this retaining ring, as you will need it later in the process.



### 13.6 Prepare the dash for the switch.

Inside the door on the driver-side of the truck, temporarily remove the cover, unclip the fuse box to give yourself access to the area behind the dash, as shown to the right.

**NOTE:** you can install the switch without removing this cover and gaining access behind the fuse box, but we think this makes things much easier.



Locate the template provided at the end of this manual (Drawing Number 14-0613-A0). Verify that it was printed to scale (there is a measurement verification printed on the page) and carefully cut out the template.



We suggest you use the template to locate where the switch will be installed on the dash. The target on the template represents the size and location of the hole to be drilled for mounting the switch.

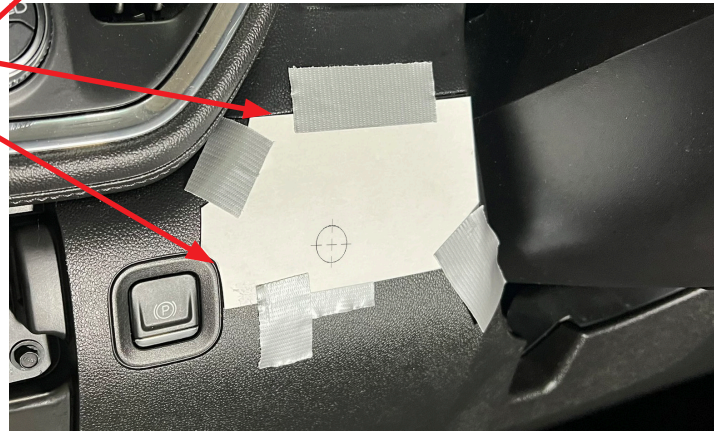
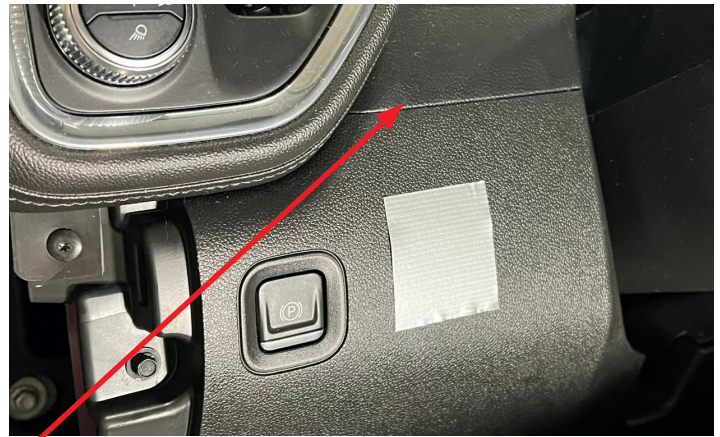
Place some painters tape or other tape where you will be drilling the hole for the switch in order to protect the surrounding area.

Next, place the cut out template on the dash aligning it with the dash separation and the OEM switch cutout shape as illustrated here.

Use painter's tape or other removable tape to secure the template in place.

Drill a pilot hole in the center of the template target.

Then, using a cone drill or a 5/8 or 16mm drill bit, carefully drill a hole for the switch at the target location.



Feed the Switch Assembly wires through the hole and out under the dash.

Then, slip the retaining ring back onto the wire (with the locking teeth toward the switch), as shown in step 13.5.



Making sure the switch is inserted completely and squared off, reach in through the side of the dash - or up from under the dash if you decided not to open the side - and tighten the retaining ring to hold the switch in place.

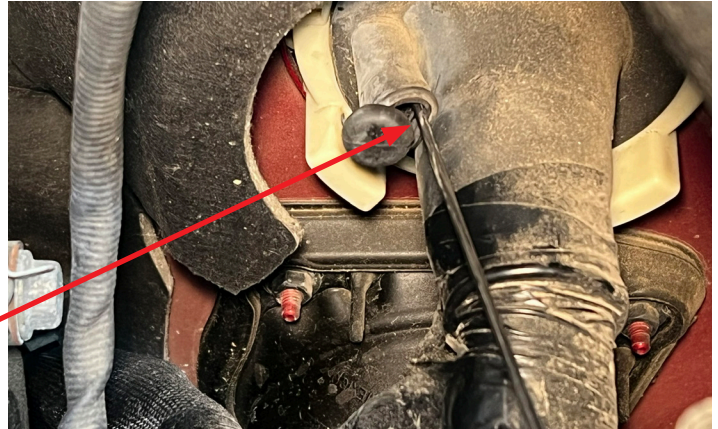
At this point, if you did open the side of the dash, you can replace the fuse box and the cover, you will no longer need this access point.



### 13.7 Run the Switch Wires and Connect to the LHG Wiring Harness

Begin by identifying where the switch wires will pass through the firewall. We were able to locate a pass-through nipple on the driver's side, near the steering column, where OEM wires go through.

As shown to the right, cut the tip off the nipple and insert a wire snake into the cabin to pull the switch wires through.

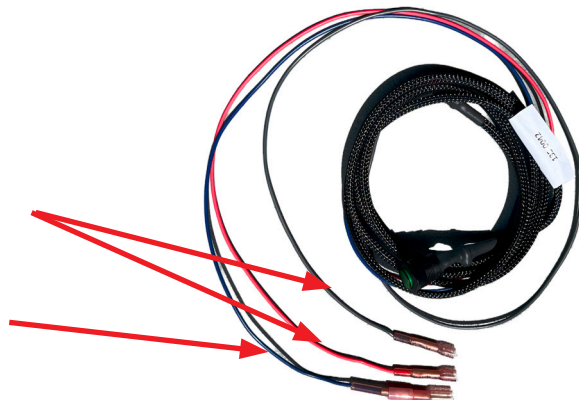


Because the Switch Wire Assembly is universal, you will need to make some adjustments to it.

The pink and gray wires will run through the firewall and be connected to the LHG Wiring Harness.

The blue wire from the switch will be routed under the dash and over to the passenger-side fuse box.

Using the wire snake that you inserted





through the firewall pass-through earlier as a guide, run the Switch Wire under the dash and determine where you will have to split the pink and gray wires off towards the firewall and the blue wire off towards the passenger side of the truck.

At this point, if necessary, you may have to cut and remove the expandable braided sleeve to allow the wires to go off in different directions.

If you need to cut the sleeve, be very careful not to damage the wires. Pinching the sleeve together, as shown above, can expand the sleeve, making it easier to cut.

Cut the sleeve where you want to route the wires in different directions. You can cut it completely and remove it, or you may choose to open an access hole and pull some the wire you want to route differently through the hole.

You may also find a retainer and some shrink wrap at the end of the sleeve that needs to be removed in order to complete the separation of the wires.

Using the kit-supplied Nylon Tie Wraps (990-0002), make sure that the switch wire (up to the location where you will separate the gray and pink from the blue wire) is tied off under the dash.

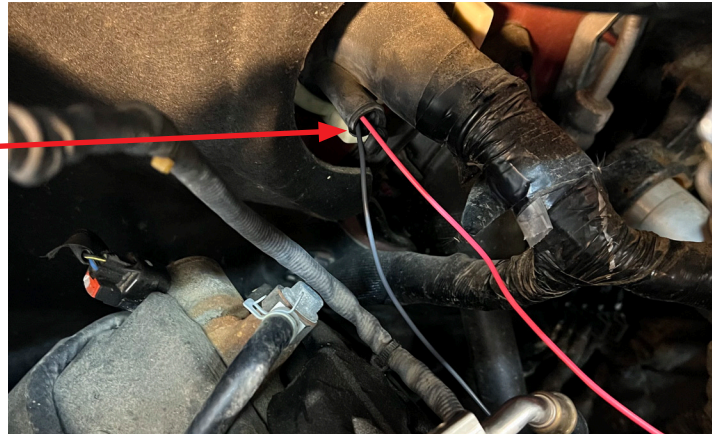
We found tying off the wire above the HVAC duct shown here works well.

Attach the red and gray wires to the



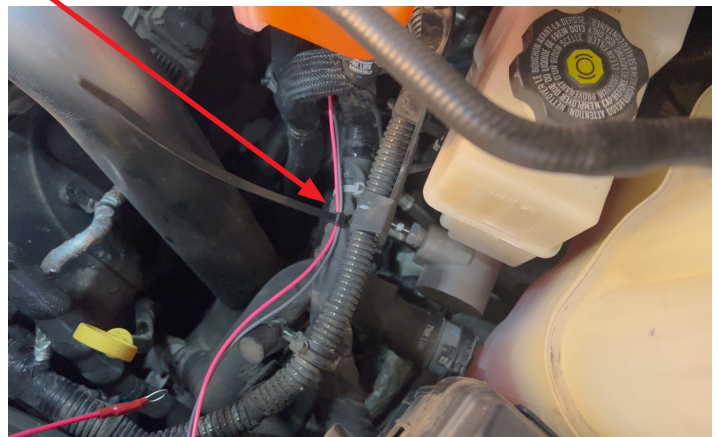


wire snake and pull them through the firewall into the engine compartment.

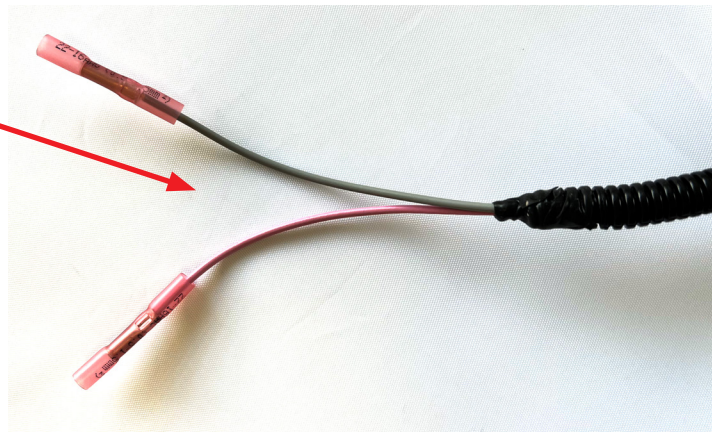
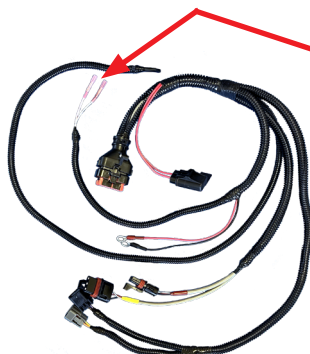


Next, using the kit-supplied Nylon Tie Wraps (990-0002), secure the wires you just pulled through the firewall to the OE wiring harness.

We suggest at least the two locations indicated here.



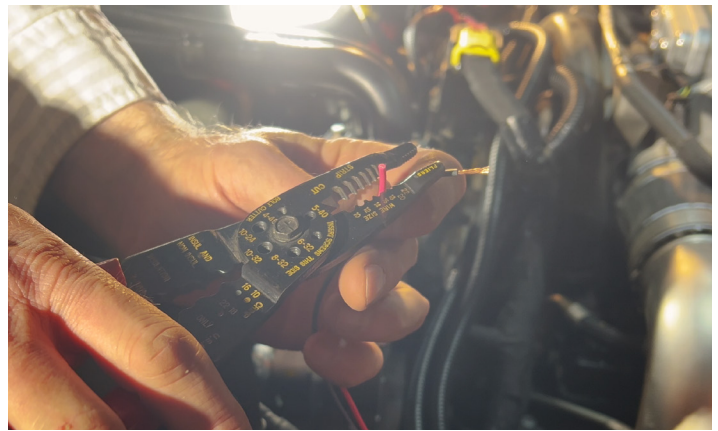
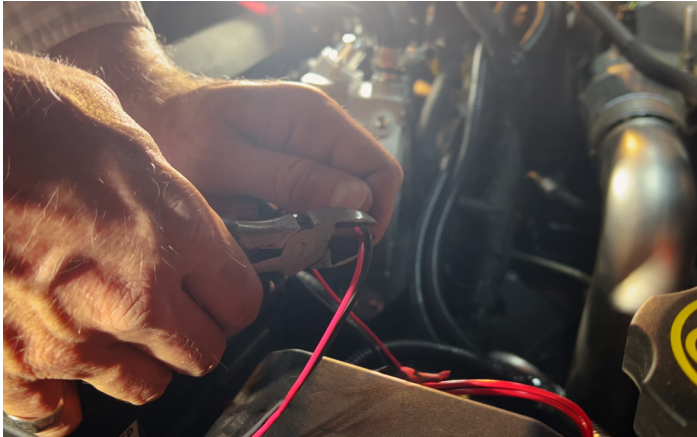
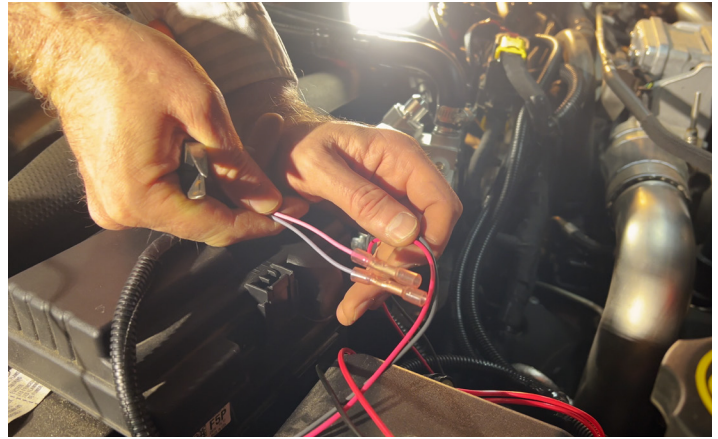
From the LHG Wiring Harness, identify the gray and pink wires.





You will need to trim the pink and gray switch wires that came through the firewall. Make sure there is enough switch wire to reach the pink and gray wires from the LHG Wiring Harness.

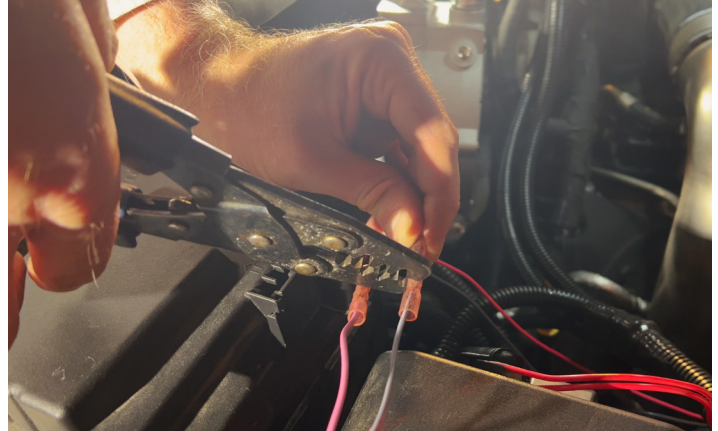
Cut the switch wires to their final length and strip about 1/4 inch of the insulation to prep them for the crimp connectors.



Attach the two pink wires (one from the switch and one from the LHG Wiring harness) using the crimp connectors.

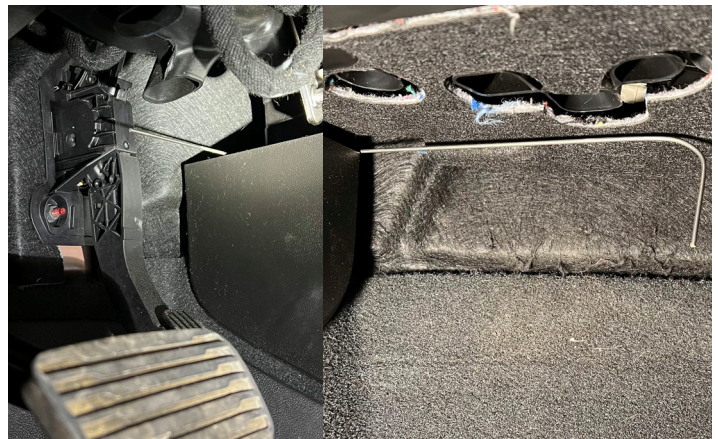
Attach the two gray wires (one from the switch and one from the LHG Wiring harness) using the crimp connectors.

Complete this wiring task by using a heat gun or other method to shrink the insulation on the crimp connectors around the connections.

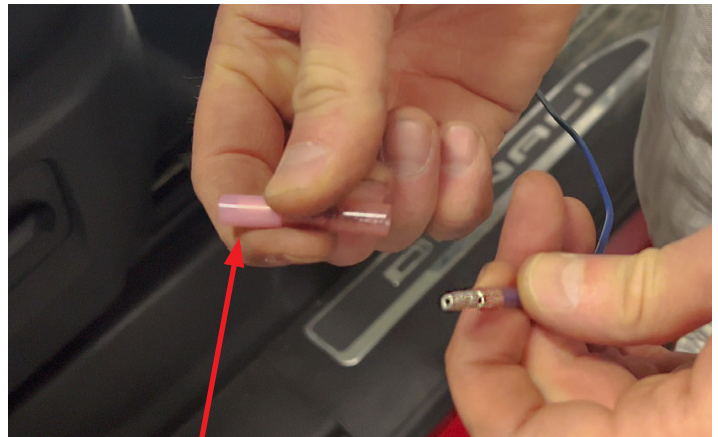


### 13.8 Connect Switch to Fused Power

Moving back inside the cab, use a wire snake or other method to route the blue wire from the switch under the dash to the passenger side of the truck

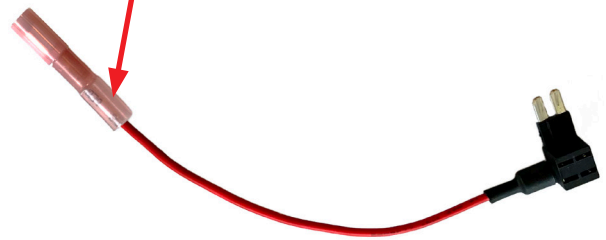


Remove the crimp quick-connection from the end of the blue wire.



Locate the kit-supplied Fuse Tap (95-0060). The Fuse Tap may come with a crimp connection already attached; if so, you will have to cut it off to prepare the Fuse Tap wire for the quick-connect you just removed from the blue wire.

Attach the crimp quick-connect you just Strip about 1/4 inch of insulation from the end of the Fuse Tap wire and attach the quick-connect end you removed from the blue wire to the Fuse Tap as shown.



Route and tie the blue wire under the dash and above the foot-well cover. The detached foot-well cover is shown here. Replace the foot-well cover when finished routing the blue wire.



Remove the cover on the fuse box inside the passenger door and route the blue wire behind the foot-well covers to the location shown here.



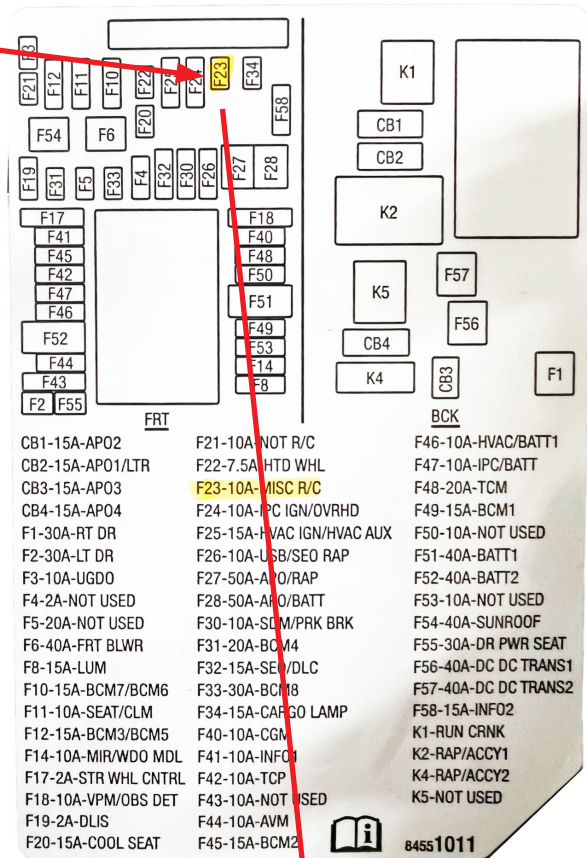


In the passenger side fuse box, locate position F23 (shown highlighted to the right).

Remove the 10-amp fuse from this location and put it in the bottom port of the Fuse Tap, as shown below.



Locate the kit-supplied 5-amp Fuse (96-0034) and put it in the upper port of the Fuse Tap, as shown above.



Insert the fuse tap into position F23 in the fuse box.

Connect the blue wire with the Fuse Tap using the quick-connect and tuck any extra wire safely out of the way.

You can now replace the fuse cover. The LHG Switch wiring is complete.

Note: different model year vehicles often have variations in their configuration. If your fuse box is not the same as the one we show here, look for a switched 5 or 10-amp fuse location to use for the Fuse Tap.



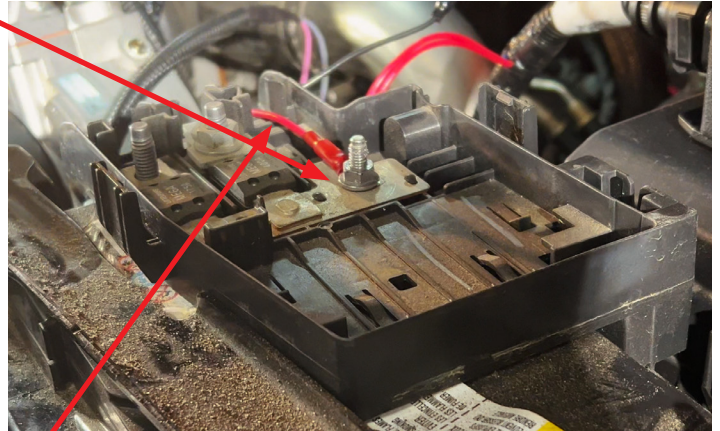
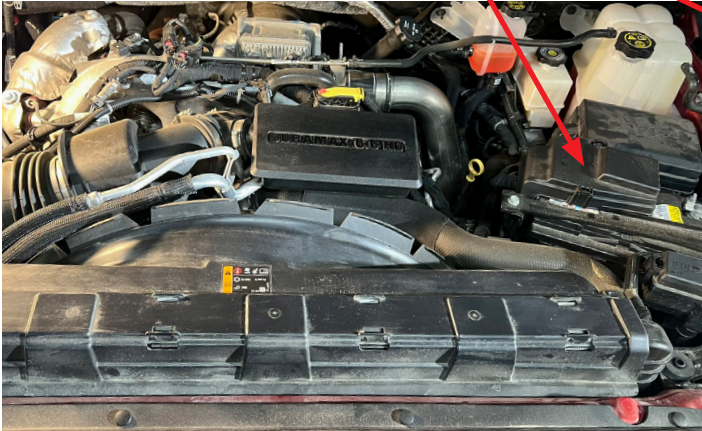
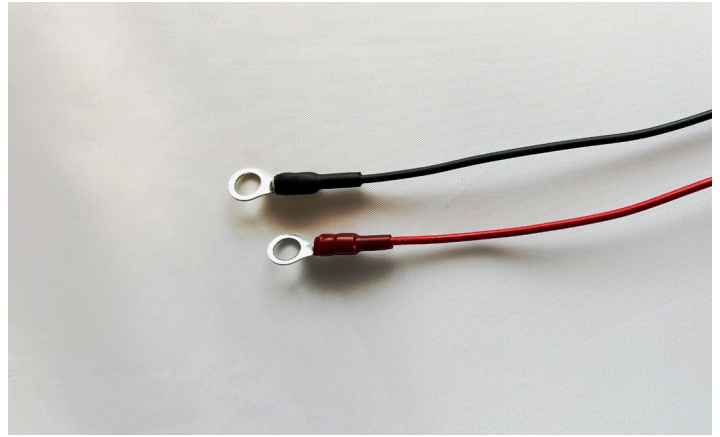


### 13.9 Connect to Battery Power

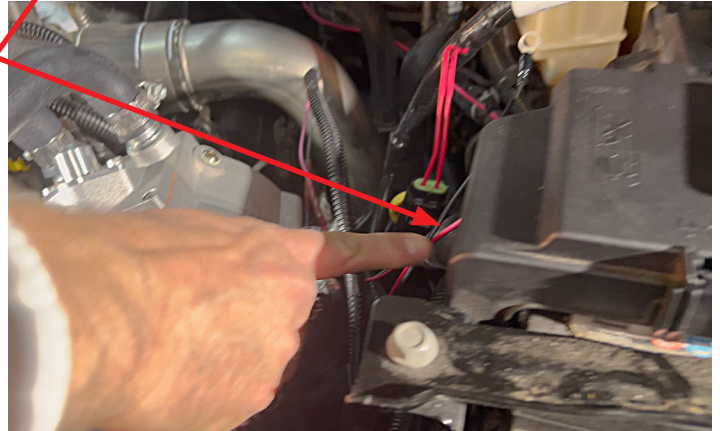
Locate the negative and positive battery connections from the LHG Wiring Harness, shown to the right.

Locate and remove the battery positive connection cover shown below.

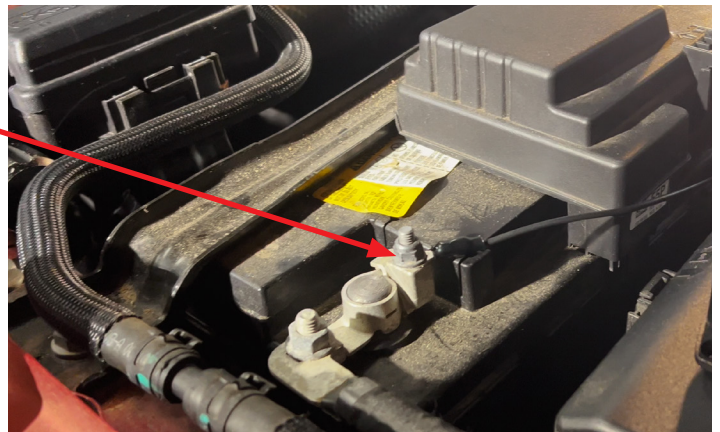
Carefully connect the positive (red) LHG Wiring Harness to the battery's positive, as illustrated here.



Carefully route the LHG positive wire out the channel shown here and replace the battery positive connection cover.



Connect the LHG Wiring Harness Negative battery connection to the battery negative as shown here.

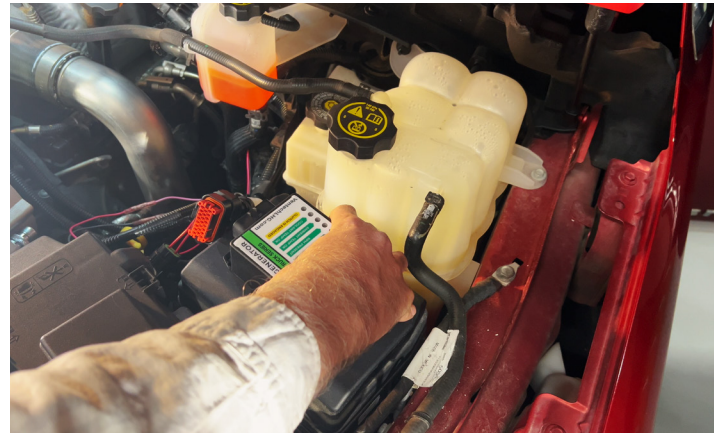
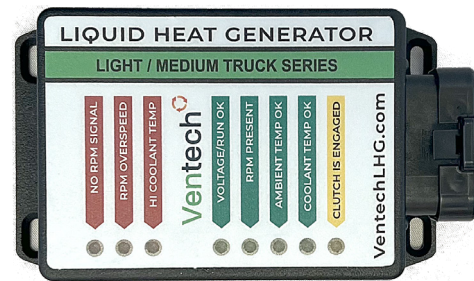




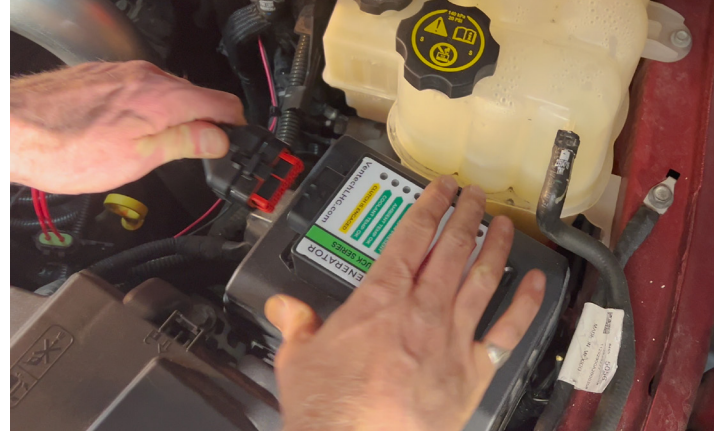
### 13.10 Connect the LHG ECU

Locate the LHG ECU (135-0041) shown here.

We chose to use the kit-supplied Velcro Strips (926-0021). to attach the ECU in the location shown here.



Once the ECU is mounted. Locate the ECU plug on the LHG Wiring Harness and plug it into the ECU.

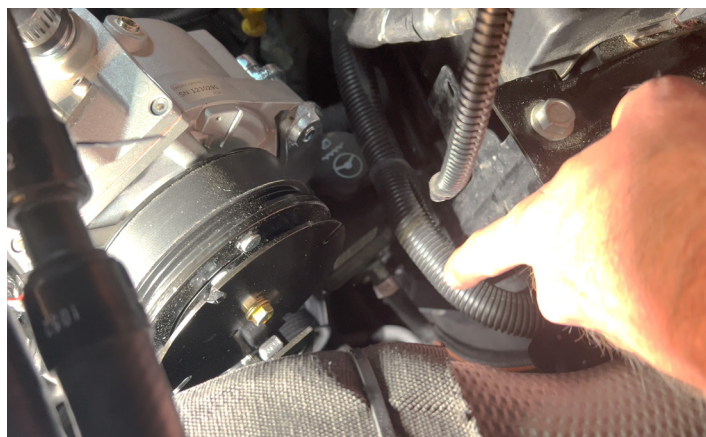


### 13.11 Position and Secure the Outside Ambient Temperature Sensor

Locate the Outside Ambient Temperature Sensor (OATS) shown to the right.



Carefully route the OATS through the engine compartment - keeping away from belts and hot services to the underside of the truck.

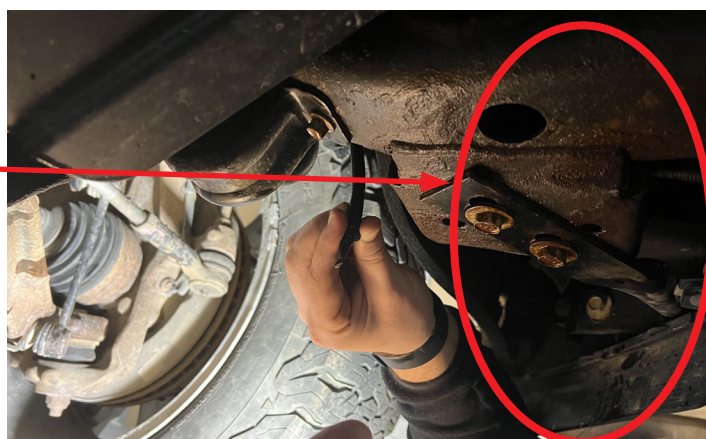


Route the tip of the OATS away from the engine to where it will have the best chance of measuring the outside temperature without interference from the heat of the engine.



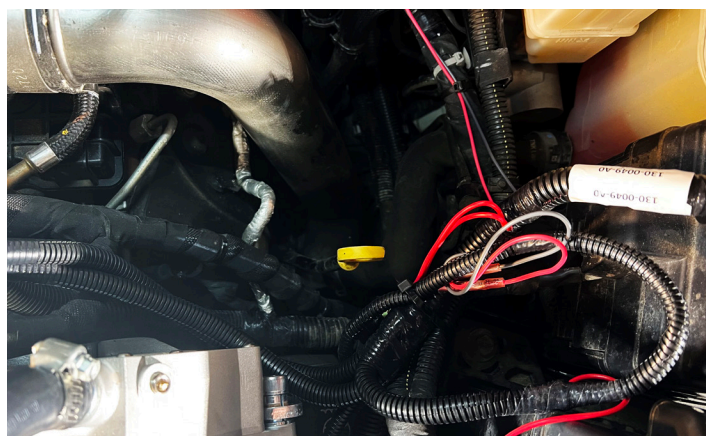
We suggest you locate it somewhere behind the front bumper where it can be securely tied off with some of the kit-supplied Nylon Tie Wraps (990-0002). We suggest somewhere in this area.

Do not let it hang down or dangle where it may be easily hit by road debris.



### 13.12 Secure the LHG Wiring Harness

Using the kit-supplied Nylon Tie Wraps (990-0002), create service loops if necessary, and secure the LHG Wiring Harness away from any sources of heat or where that may cause it damage.

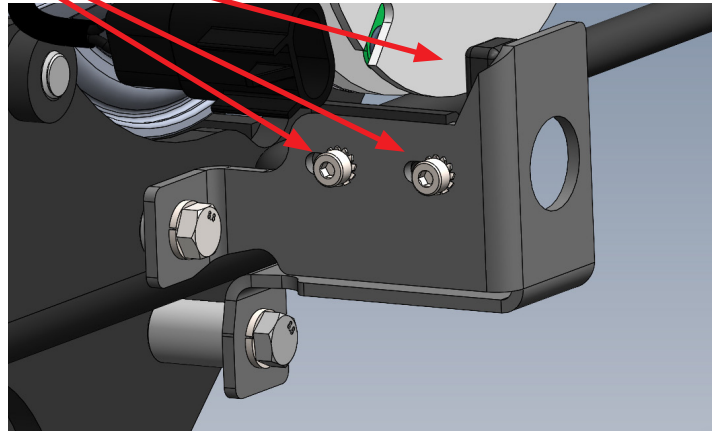
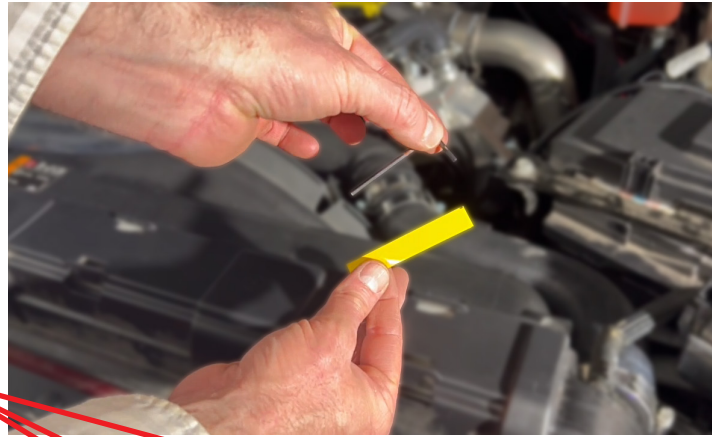




### 13.13 Adjust the LHG RPM Speed Sensor.

Locate the RPM Sensor Gauge Strip (926-0023), or a 0.020" feeler gauge and a 3mm Allen Wrench.

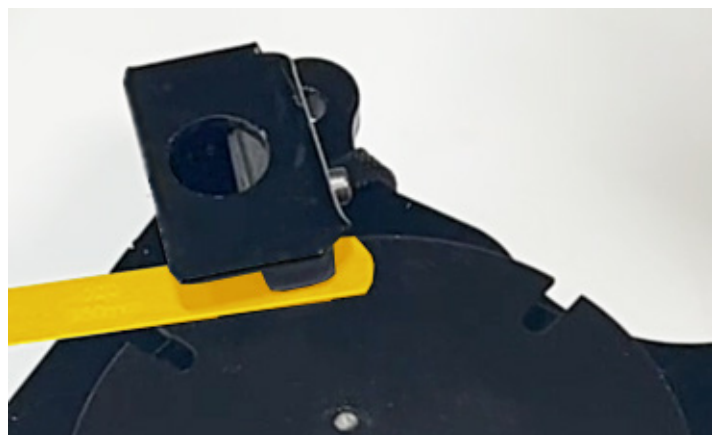
Slightly Loosen the two retaining bolts on the LHG RPM Bracket Assembly. Place the 0.020 gauge between the sensor and the speed disk.



Adjust the sensor distance so it is just touching the gauge as the gauge rests on the speed disk.

There should be a very small amount of resistance when you try to move the gauge.

Once the sensor is in the correct position, lock it in place by tightening the retaining bolts.



### 13.14 Alter and Re-Install the OEM Upper Radiator Hose.

NOTE: the following steps are essential as the LHG RPM disk will be too close to the Upper radiator hose if it is not altered.

Locate the OEM Upper Radiator Hose that you removed earlier.



Locate the kit-supplied Coolant Hose Cutting Template (20-0001), an appropriate saw or other cutting device and the kit-supplied 1-3/4" Straight Barbed Coupler (990-0231).

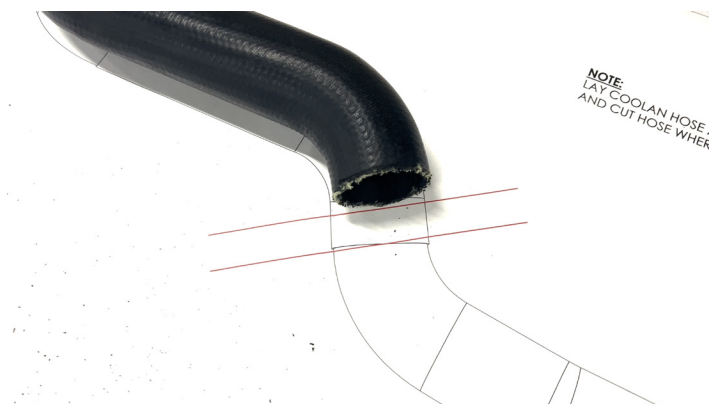
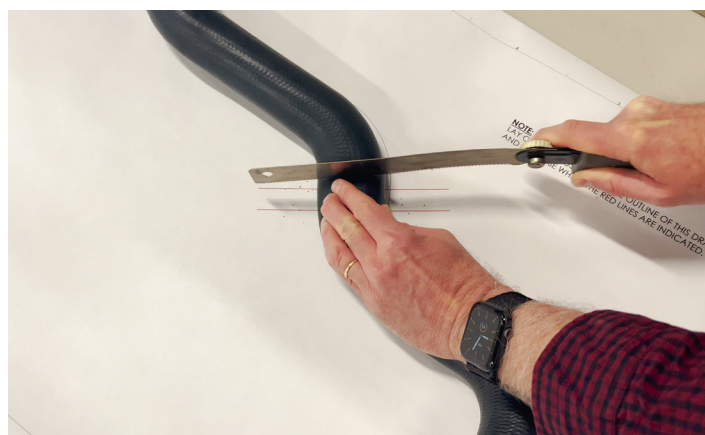


If there is a cloth guard on the hose, do not remove it. You may, however, need to fold it back from the location of the cuts or even make a small relief cut in it to allow for it to be pulled away from the cutting location.



Position the hose exactly over the illustration on the template and - one at a time - cut the hose along the plain of each red guideline.

Cut as carefully and as straight as possible.





After both cuts are made, the hose should fit the template as shown here.

At this point, make sure you clean the hose parts of any loose particles created while cutting them.



Now, use the two kit-supplied Hose clamps (990-0232) and the 1-3/4" Straight Barbed Coupler (990-231) to join the two ends of the hose.



Install the Upper Radiator Hose back on the truck. Make sure all the clamps are properly tightened and that there is clearance between the hose and the LHC, as illustrated here.





## 13.1 Concluding the installation

### ***Before starting the truck:***

Top off your coolant reservoir.

IMPORTANT: remember to check your coolant level after you have run/driven the truck, you will have lost some coolant during the installation process and it may take some run/drive time for the coolant in the reservoir to be brought into the water jacket.

### ***Before starting the truck:***

Double check that the following tasks were completed:

1. The Fan Shroud bolts have been reinstalled - Step 8,.
2. The air intake system has been reconnected with the resonator delete plug- Steps 9-10.
3. All intake clamps are tight and secure - Steps 9-10.
4. LHG input and output hose clamps are all tight and secure and heater hoses are properly routed and protected against chafing and related damage - step 12.
5. The OEM wiring connector has been clipped back into place - Step 13.2.
6. Check for loose wiring connections and battery connections.
7. Ensure the wiring harness is routed properly and protected against chafing and related damage. Secure and dress harness using cable ties. Ensure that each harness termination point has some excess length to prevent unnecessary pulling on each connector - step 13.1-4.
8. Verify the OATS is properly secured under the truck - Step 13.11.
9. Make sure you properly set the RPM Sensor - step 13.13.
10. The upper radiator hose is secure and the hose clamps are properly tightened - Section 13.14.

**THE FOLLOWING PAGES CONTAIN  
IMPORTANT INFORMATION.  
PLEASE READ  
BEFORE STARTING  
THE SYSTEM FOR THE FIRST TIME**

## 14. Initial Start-up

### 14.1 Initial startup behavior

#### 14.1.1 AIR PURGE

Firstly, the LHG ECU will disable the LHG for the first three (3) minutes of operation (engine idling). During these first three minutes, any air that may remain in the LHG coolant circuit will be purged from the system (air-purge).

During the Air-Purge all green LEDs on the ECU will cycle in sequence.

#### 14.1.2 BURNISHING

The second run-up sequence step is an automatic Burnishing of the LHG's electromagnetic clutch. This step also takes about three (3) minutes and must be performed at Idle. During this second run-up sequence, the electromagnetic clutch will be cycled (burnished) 50 times. This burnishing process cleans the clutch surfaces that may have residue build-up from the LHG's time in storage.

During the Burnishing the yellow LED on the ECU will blink on and off.

#### 14.1.3 The first start

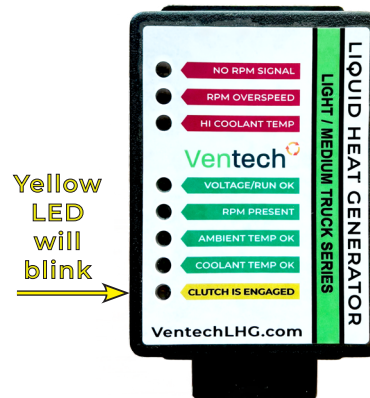
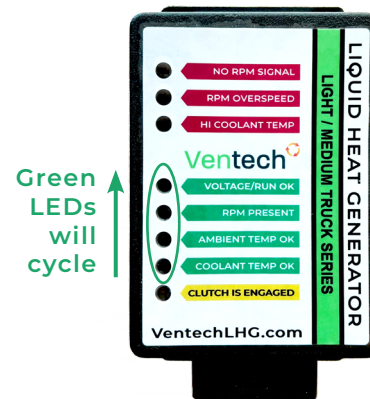
Start the vehicle engine and run at idle for ~6 minutes allowing the two run-up sequences to complete (air-purge and burnishing sequences).

#### 14.1.4 Concluding the installation

While the engine is running, but after the two run-up sequences have been completed, check the following:

Hose connections for leaks.

Coolant level in the coolant recovery tank (add coolant as needed).





## Appendix A: The LHG ECU (Digital Controller) Strategy

The Electronic Control Unit is designed to determine when to engage and disengage the LHG (via the LHG electromagnetic clutch) depending on various parameters, including temperatures, RPMs, vehicle voltage, internal timers, and other conditions.

Note: RPMs referenced below are LHG RPM, not Engine RPM. Kit #400 (Ford HeatStroke LHG) has a 1:1.66 ratio between Engine RPM and LHG RPM.

To the right is a summary of the parameters and set-points that determine whether the LHG will engage or disengage.

ALL the engagement parameters must be met to activate the clutch, while ANY individual disengagement parameter will deactivate the clutch.

NOTE: When the LHG clutch disengages, it will not re-engage until:

All conditions required to engage the clutch are met as seen above and 2 to 5 seconds have elapsed after ALL engagement parameters have been met (time delay varies depending on parameter).

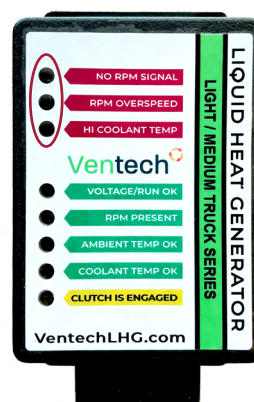
| LHG Clutch Engages<br>WHEN ALL OCCUR<br>SIMULTANEOUSLY      | LHG Clutch Disengages<br>IF ANY ONE OCCURS         |
|---|--|
| LHG RPM greater than 255 RPM                                | LHG RPM less than 256 RPM                          |
| and   | or   |
| LHG RPM less than 2,600 RPM                                 | LHG RPM greater than 6,000 RPM                     |
| and   | or   |
| LHG Temperature less than 167°F (75°C)                      | LHG Temperature greater than 185°F (85°C)          |
| and   | or   |
| Supply Voltage is above 13.0V (5 second delay),             | RPM signal is unstable (rate of change > 400)      |
| and   | or   |
| Outside Ambient Temperature (OATS) is less than 50°F (10°C) | Voltage to ECU is below 12.0V                      |
|   | or   |
|   | RPM-RPM Differential >150 RPM over 50 milliseconds |
|   | or   |
|   | RPM-RPM Differential 50-150 RPM over 3 seconds     |

## Understanding the ECU LEDs during Normal Operation and as a Diagnostic Tool.

The Ventech ECU is equipped with 8 colored LEDs that indicate the operational status of the LHG heater system.

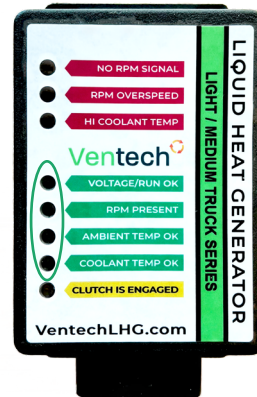
Three (3) LEDs are Red with corresponding descriptions (“No RPM Signal”, “RPM Overspeed”, and “Hi Coolant Temp”).

The Red LEDs are known as “Off-Flags”. Any illuminated Off-Flag will cause the LHG clutch to disengage.



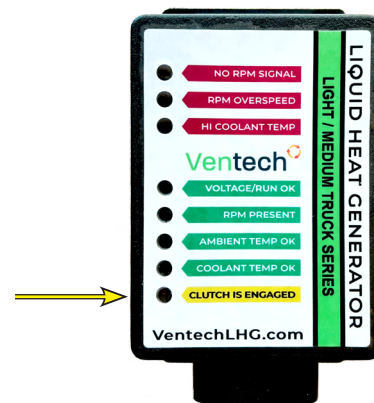
Four (4) LEDs are Green with corresponding descriptions ("Voltage/Run OK", "RPM Present", "Ambient Temp OK", and "Coolant Temp OK").

The Green LEDs are known as "On-Flags". Every On-Flag must be illuminated for the LHG clutch to engage.



One (1) LED is Yellow: "Clutch Engaged" (LHG heater is engaged and producing heat).

The LEDs emulate the key parameters detailed in the table on page 48. In order for the LHG to engage, ALL Green LEDs must be ON and ALL Red LEDs must be OFF.



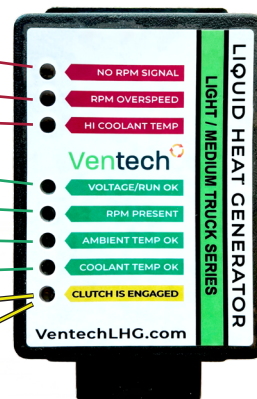
## ECU LED Lights Defined

### LED ON SOLID

- NO RPM SIGNAL (RPM less than 256)
- RPM OVERSPEED (LHG >6,000 / Engine >2,550)
- HI COOLANT TEMP (LHG Out Temp. >85°C / 185°F)
- VOLTAGE/RUN OK (Supply Voltage >13V)
- RPM Present (LHG >256 RPM)
- AMBIENT TEMP OK (Air Temp <10°C / 50°F)
- COOLANT TEMP OK (LHG Out Temp. <185°F / 167°F)
- CLUTCH IS ENGAGED (DC Clutch Voltage On)

### LED FLASHING

Clutch is Burnishing





## Understanding the ECU LEDs for Diagnostics

As noted above, when on solid, the red LEDs are "off-flags" that indicate a situation where the LHG will be disengaged. This does not necessarily indicate an error condition, as there are many situations when the LHG should not be engaged. For instance when the Engine RPMs are too high or when the coolant temperature does not need to be supplemented.

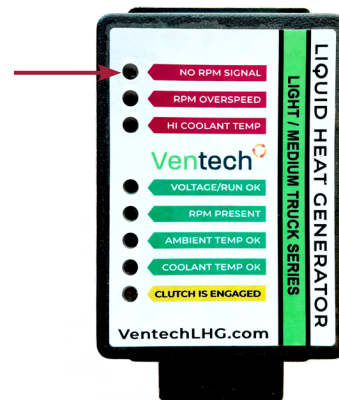
Below are some specific LHG ECU error conditions the LED light sequence associated with each.

These error conditions will remain showing on the ECU until the ignition is turned off, which will cause the LHG ECU to reset.

### No Pulley RPM

The LHG Pulley and the LHG Clutch Rotor are independently monitored by the ECU to ensure that the LHG is running properly.

If the sensor for the Pulley fails, while the engine is running, the "NO RPM SIGNAL" LED will remain solidly on (other LEDs may be on as well) and the LHG will not engage.

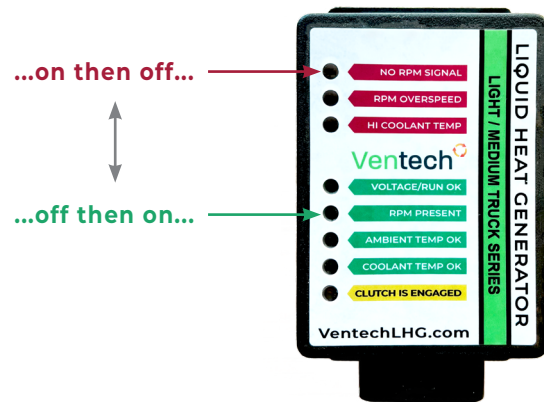


### No Rotor RPM

If the Rotor RPM sensor fails, the ECU will not be able to monitor for problems with the clutch. Should this occur the ECU will disengage and/or prevent engagement of the LHG.

If the sensor for the Rotor fails, the "NO RPM SIGNAL" LED and the "RPM PRESENT" LED will alternately and repeatedly blink on and off.

Should this situation occur, contact Ventech for assistance. The LHG will cease to produce supplemental heat until the sensor is functional.



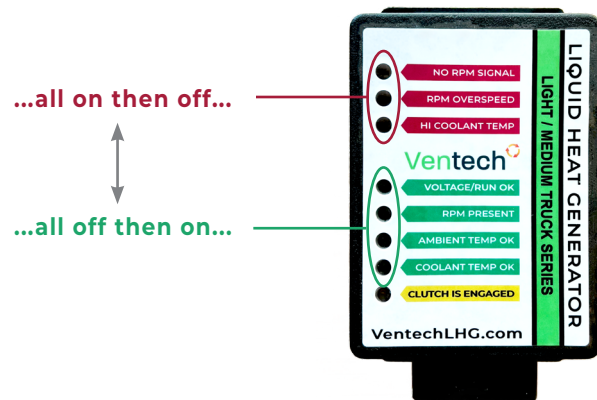
### Slipping Clutch

A slipping LHG clutch prevents proper LHG operation and can lead to other problems including belt failure. For this reason, the LHG ECU is programmed to recognize and remedy clutch slippage using an automated burnishing sequence.

The ECU will attempt to correct a slipping clutch up to 5 times during continuous operation. Should this automated burnishing fail to eliminate clutch slippage, the ECU is programmed to disengage the LHG as a safety precaution.

If there is repeated clutch slippage, all of the red LEDs and the all of the green LEDs will alternatively and repeatedly blink on and off.

Should this situation occur, Ccontact Ventech for assistance. The LHG will cease to produce supplemental heat until clutch slippage is corrected.





**Automatic Burnishing after extended periods of Non-Operation of the Vehicle.**

During vehicle storage, or other reasons for non-operation of the LHG heater system over an extended period, the electromagnetic clutch plates of the LHG can become compromised by surface rust or debris collecting on the bare metal surfaces.

If ignored, the clutch performance may be compromised resulting in clutch slippage and part failure. The LHG ECU addresses this potential condition by performing a periodic burnishing routine based on the number of days that the LHG has not been operated.

This feature is fully automatic and requires no user-intervention. Automatic burnishing will occur at the intervals described below:

At the intervals shown below, the automatic burnishing routine will start immediately after the vehicle's engine is started, irrespective of ambient air temperature.

WAIT for the burnishing routine to complete before driving the vehicle.

If the burnishing routine is interrupted before completion (engine stopped), the full burnishing routine will restart the next time the engine is started.

| Interval of Non-Operation | Burnish Cycles (upon startup after interval) | Approximate time to complete |
|---------------------------|--|------------------------------|
| 14 Days                   | 50 Clutch Cycles                             | ~ 1 Minute                   |
| 100 Days                  | 100 Clutch Cycles                            | ~ 3 Minutes                  |