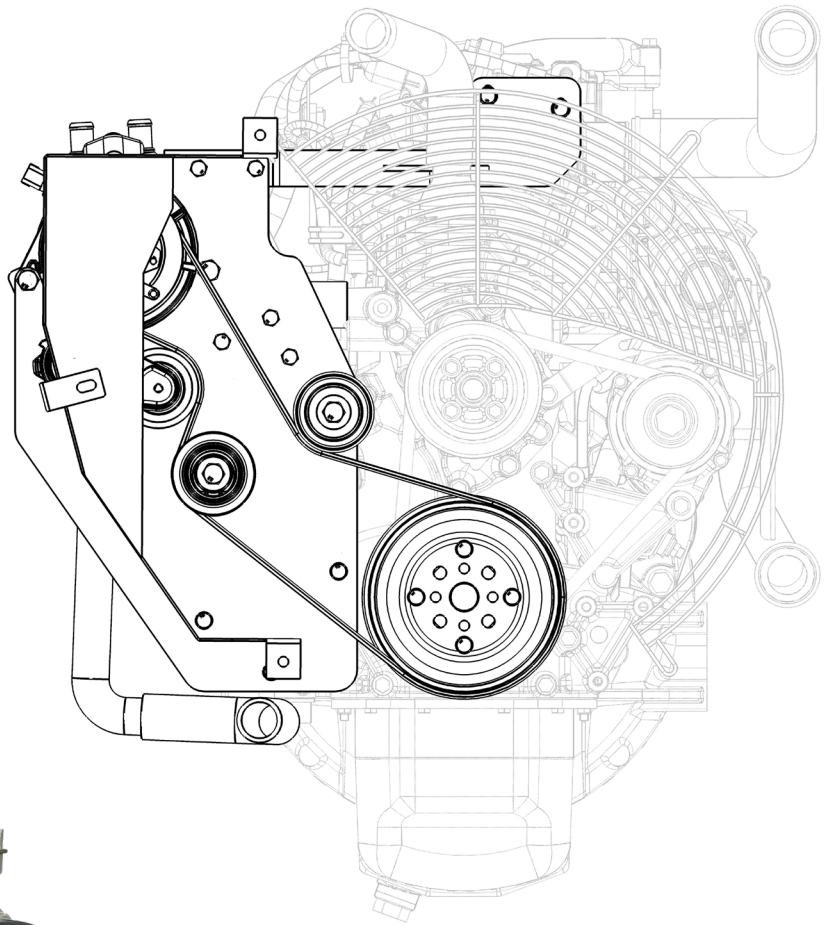


Thermal Load Management System Installation Manual Atlas Copco Kits 130A & 130B

LHG700 Generator Thermal Load Management System
Specifically designed for the
Atlas Copco / Chicago
Pneumatic CPG25 and CPG45
equipped with the Isuzu 4LE2
Series engine.

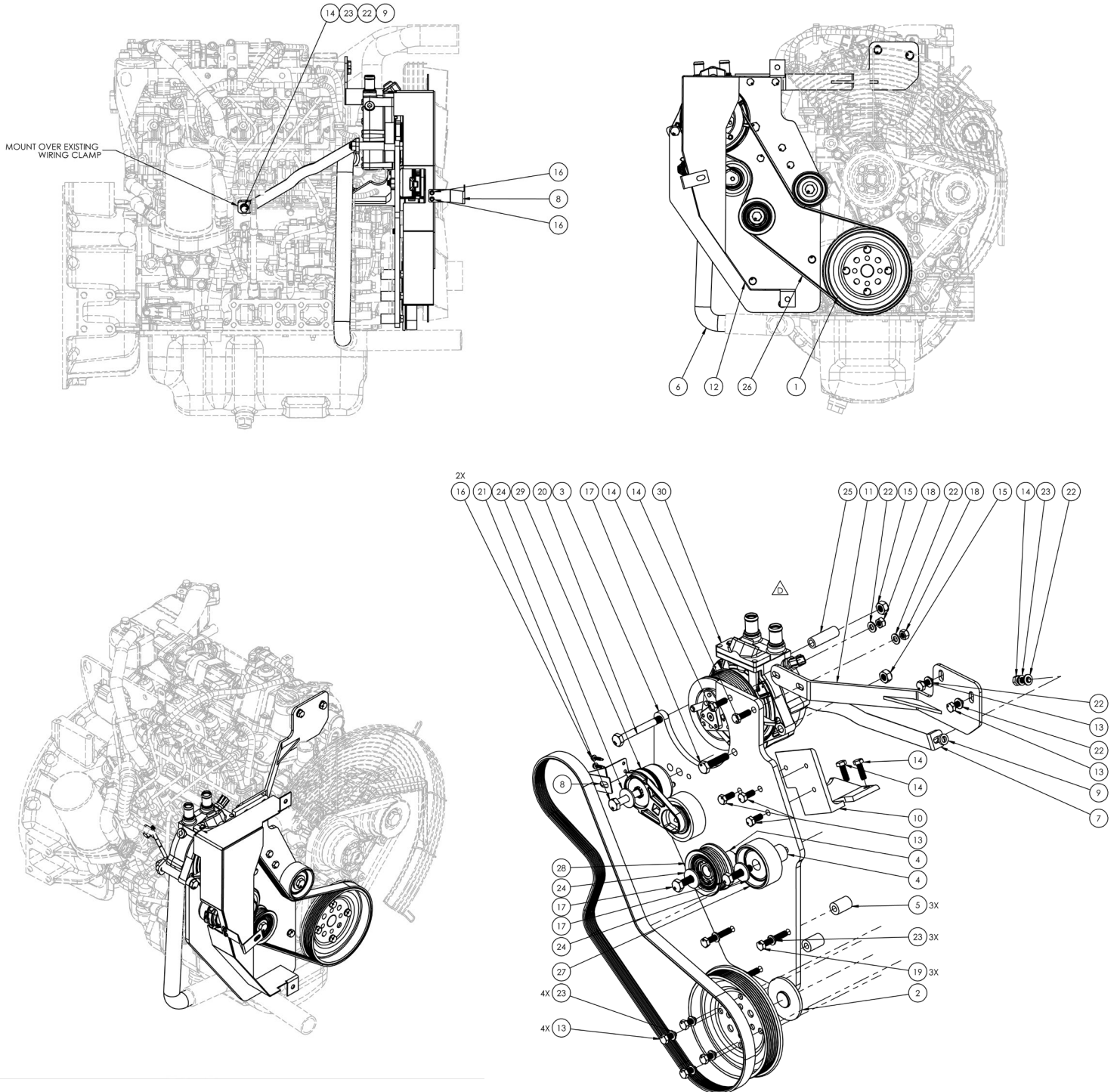


1 Contents

- 2 VENTECH TLMS-0130 ILLUSTRATIONS AND PART LISTS 4
 - 2.1 VENTECH TLMS-0130A (KIT #130A) – ATLAS COPCO/CP QAS45 & CPG45 ILLUSTRATED4
 - 2.2 VENTECH TLMS-0130A (KIT #130A) – ATLAS COPCO/CP QAS45 & CPG45 PARTS LIST4
 - 2.3 VENTECH TLMS-0130B (KIT #130A) – ATLAS COPCO/CP QAS25 & CPG25 ILLUSTRATED6
 - 2.4 VENTECH TLMS-0130B (KIT #130B) – ATLAS COPCO/CP QAS25 & CPG25 PARTS LIST6
- 3 INTRODUCTION8
 - 3.1 ABOUT THE VENTECH THERMAL LOAD MANAGEMENT SYSTEM (TLMS) AND LIQUID HEAT GENERATOR (LHG700) RAPID SUPPLEMENTAL HEATER.....8
 - 3.2 KIT #130 OVERVIEW8
- 4 THE INSTALLATION PROCESS.....10
 - 4.1 INSTALLATION INSTRUCTIONS12
 - 4.1.1 *Prepare the Generator for Installation*.....12
 - 4.1.2 *Mechanical Installation*.....17
 - 4.1.3 *Electrical Installation*.....38
 - 4.1.4 *Finishing the Installation*46
- 5 ABOUT THE LHG AND ITS BENEFITS.....56
 - 5.1 HOW IT WORKS.....56
 - 5.2 ABOUT WET STACKING.....56
 - 5.3 WHY AVOID WET STACKING?57
- 6 STARTING AND OPERATING THE LHG700 FOR THE FIRST TIME.....57
- 7 AUTOMATIC TIMER (AUTO LOAD BANKING / WET STACKING ABATEMENT)57
- 8 APPENDIX A: SCHEMATICS OF VENTECH-SUPPLIED WIRING HARNESSSES58
- 9 APPENDIX B: LHG BELT GUARD ASSEMBLY MODIFICATION TEMPLATE.....60

2 Ventech TLMS-0130 Illustrations and Part Lists

2.1 Ventech TLMS-0130A (Kit #130A) – Atlas Copco/CP QAS45 & CPG45 Illustrated



2.2 Ventech TLMS-0130A (Kit #130A) – Atlas Copco/CP QAS45 & CPG45 Parts List

ITEM NO.	PART NUMBER	REV	DESCRIPTION	QTY.
1	14-0421	A0	LHG 6-PK PULLEY (ALTER 14-0026)	1
2	14-0435	B0	PULLEY ADAPTER	1
3	14-0453	G0	BACKING PLATE	1
4	14-0456	C0	IDLER PULLEY SPACER	2
5	14-0459	B0	BOLT SPACER	3
6	14-0475	A0	COOLANT INLET TUBE	1
7	14-0546	B0	BRACKET, GUSSET	1
8	14-0549	D0	GUARD TIE BRACKET	1
9	14-0554	A0	BACKSTAY SPACER	1
10	140-0143	A0	MOUNTING BRACKET	1
11	140-0144	A0	TOP STAY WELDMENT	1
12	140-0146	B0	LHG BELT GUARD ASSEMBLY, 45kW	1
13	920-0009	A0	M8-1.25 x 20 HEX HD BOLT - 8.8 - ZINC PLATED	10
14	920-0010	A0	M8-1.25 X 25 HEX HD BOLT - 8.8 - ZINC PLATED	5
15	920-0013	A0	M10-1.5 NYLOC NUT - 8.8 - ZINC PLATED	3
16	920-0014	A0	#8 X 3/4" HEX HEAD SELF-DRILLING SCREW	2
17	920-0019	A0	M10-1.5 X 45 HEX HD BOLT - 8.8 - ZINC PLATED	3
18	920-0031	A0	M8-1.25 NYLOC NUT	2
19	920-0032	A0	M8-1.25 x 50 HEX BOLT - 8.8 - ZINC PLATED	3
20	920-0059	A0	M10-1.5 x 100 HEX HD BOLT - 8.8 - ZINC PLATED	1
21	920-0152	A0	M10-1.5 x 75 HEX HD BOLT - 8.8 - ZINC PLATED	1
22	925-0002	A0	M8 FLAT WASHER	6
23	925-0012	A0	M8 LOCK WASHER	9
24	925-0031	A0	M10 OVERSIZED WASHER - ZINC PLATED	3
25	926-0013	A0	SPACER, M10 ID, 16mm OD, 50mm Lg.	1
26	980-0081	A0	BELT, 6 RIB, DAYCO P/N 5060538	1
27	981-0005	A0	PULLEY, IDLER, 70mm DIA., 17mm ID, FLAT	1
28	981-0018	A0	PULLEY, IDLER, 70mm DIA., 17mm ID, 6-RIB	1
29	982-0003	A0	TENSIONER, BELT, 70mm PULLEY, CCW	1
30	LHG700 GEN		VENTECH LHG700 GENSET, 5/8" FITTINGS	1
-	990-0108	A0	5/8" HEATER HOSE, 90 DEG. ELBOW, 24" LG. (NOT SHOWN)	2
-	990-0115	A0	ELBOW, 3/8" NPT(M) TO 5/8" HOSE BARB (NOT SHOWN)	1
-	990-0135	A0	BARB, 3/8" NPT(M) TO 5/8" HOSE (NOT SHOWN)	1
-	990-0093	A0	SAE #10 WORM DRIVE HOSE CLAMP W/ LINER (NOT SHOWN)	4
-	135-0036	A0	GENERATOR 2-PORT ECU W/ AMP MEASUREMENT (NOT SHOWN)	1
-	130-0041	A0	TLMS POWER MEASUREMENT HARNESS (NOT SHOWN)	1
-	130-0042	A0	TLMS LHG HARNESS (NOT SHOWN)	1
-	990-0215	A0	GROMMET, BUNA-N, 1-1/2" OD, 1/8" THK, 1/2" OD (NOT SHOWN)	1

2.4 Ventech TLMS-0130B (Kit #130B) – Atlas Copco/CP QAS25 & CPG25 Parts List

ITEM NO.	PART NUMBER	REV	DESCRIPTION	QTY.
1	14-0421	A0	LHG 6-PK PULLEY (ALTER 14-0026)	1
2	14-0435	B0	PULLEY ADAPTER	1
3	14-0453	G0	BACKING PLATE	1
4	14-0456	C0	IDLER PULLEY SPACER	2
5	14-0459	B0	BOLT SPACER	3
6	14-0467	B0	SPACER, FAN, 31mm	1
7	14-0475	A0	COOLANT INLET TUBE	1
8	14-0546	B0	BRACKET, GUSSET	1
9	14-0554	A0	BACKSTAY SPACER	1
10	140-0143	A0	MOUNTING BRACKET	1
11	140-0144	A0	TOP STAY WELDMENT	1
12	140-0147	A0	LHG BELT GUARD ASSEMBLY, 45KW	1
13	920-0009	A0	M8-1.25 x 20 HEX HD BOLT - 8.8 - ZINC PLATED	10
14	920-0010	A0	M8-1.25 X 25 HEX HD BOLT - 8.8 - ZINC PLATED	5
15	920-0013	A0	M10-1.5 NYLOC NUT - 8.8 - ZINC PLATED	3
16	920-0019	A0	M10-1.5 X 45 HEX HD BOLT - 8.8 - ZINC PLATED	3
17	920-0031	A0	M8-1.25 NYLOC NUT	2
18	920-0032	A0	M8-1.25 x 50 HEX BOLT - 8.8 - ZINC PLATED	3
19	920-0059	A0	M10-1.5 x 100 HEX HD BOLT - 8.8 - ZINC PLATED	1
20	920-0152	A0	M10-1.5 x 75 HEX HD BOLT - 8.8 - ZINC PLATED	1
21	920-0203	A0	M6-1.0 x 55 HEX HD BOLT - 8.8 - ZINC PLATED	4
22	925-0002	A0	M8 FLAT WASHER	6
23	925-0012	A0	M8 LOCK WASHER	9
24	925-0031	A0	M10 OVERSIZED WASHER - ZINC PLATED	3
25	926-0013	A0	SPACER, M10 ID, 16mm OD, 50mm Lg.	1
26	980-0081	A0	BELT, 6 RIB, DAYCO P/N 5060538	1
27	981-0005	A0	PULLEY, IDLER, 70mm DIA., 17mm ID, FLAT	1
28	981-0018	A0	PULLEY, IDLER, 70mm DIA., 17mm ID, 6-RIB	1
29	982-0003	A0	TENSIONER, BELT, 70mm PULLEY, CCW	1
30	LHG700 GEN		VENTECH LHG700 GENSET, 5/8" FITTINGS	1
-	990-0108	A0	5/8" HEATER HOSE, 90 DEG. ELBOW, 24" LG. (NOT SHOWN)	2
-	990-0115	A0	ELBOW, 3/8" NPT(M) TO 5/8" HOSE BARB (NOT SHOWN)	1
-	990-0135	A0	BARB, 3/8" NPT(M) TO 5/8" HOSE (NOT SHOWN)	1
-	990-0093	A0	SAE #10 WORM DRIVE HOSE CLAMP W/ LINER (NOT SHOWN)	4
-	135-0036	A0	GENERATOR 2-PORT ECU W/ AMP MEASUREMENT (NOT SHOWN)	1
-	130-0041	A0	TLMS POWER MEASUREMENT HARNESS (NOT SHOWN)	1
-	130-0042	A0	TLMS LHG HARNESS (NOT SHOWN)	1
-	990-0215	A0	GROMMET, BUNA-N, 1-1/2" OD, 1/8" THK, 1/2" OD (NOT SHOWN)	1

3 Introduction

3.1 About the Ventech Thermal Load Management System (TLMS) and Liquid Heat Generator (LHG700) Rapid Supplemental Heater

This Manual details the installation of a Ventech Thermal Load Management System utilizing Ventech's proprietary Liquid Heat Generator (LHG700) technology.

Once installed, the Ventech TLMS will:

1. Rapidly heat, and maintain, the generator coolant to full operating temperature.
2. Add mechanical load to the engine, resulting in a significant increase in Exhaust Gas Temperature. Elevated EGTs will diminish Wet Stacking conditions, providing cleaner combustion with higher exhaust temperatures, improved oil life, and general generator health.
3. Negate the need for frequent Load Banking due to the buildup of oils and soot (Wet Stacking).

The Ventech TLMS System is designed to rapidly heat the coolant and load the engine using a mechanical fluid heater (the LHG700) which draws mechanical energy from the crankshaft via a serpentine belt and converts this energy into heat directly into the engine coolant. The conversion process is similar to an automotive torque converter or dynamometer. The conversion occurs at an efficiency of up to 98%, and the energy conversion is instantaneous.

3.2 Kit #130 Overview

TLMS Kit#130 is designed to fit both the Atlas Copco / CP 25kVA and 45kVA Generator Models equipped with the Isuzu 4LE2 diesel engine. The kit is intended for a factory installation performed by a skilled Shop Technician in conjunction with this installation Manual. Ventech recommends that you read this entire manual before commencing the installation process.

Kit #130 includes the following:

1. Ventech LHG700 Rapid Supplemental Heater
2. LHG700 Mounting Hardware
3. Bolt-On Secondary Drive Pulley (PolyVee)
4. Secondary PolyVee Serpentine Belt
5. Automatic Belt Tensioner Hardware
6. All necessary piping, hoses, fittings, and hose clamps
7. Ventech TLMS Current Measurement Controller with Current Transformers (3) and Harnesses (2)
8. Miscellaneous fasteners to complete the installation

Important. Before beginning the installation, check the Parts List provided at the beginning of this manual against the kit contents. Please contact Ventech should any components be missing.

4 The Installation Process

The sequence of tasks to complete the installation is as follows:

Prepare the Generator for Installation (Overview)

1. Disconnect Battery
2. Drain Coolant
3. Remove factory engine fan belt guarding
4. Remove electrical panel retaining bolts.
5. Remove the driveshaft guard

Mechanical Installation (Overview)*

1. Remove OEM fan belt
2. Remove OEM crankshaft drive pulley
3. Install secondary drive pulley and spacer assembly
4. Reinstall OEM fan belt
5. Sub-assemble the LHG mounting bracket (fabricated bracket, tensioner, pulley, and spacer)
6. Install LHG700 bracket assembly
7. Install LHG700
8. Install LHG700 rear mount bracket
9. Install heater fittings hosing
10. Install hoses

Electrical Installation (Overview)

1. Mount microcontroller
2. Mount control switch
3. Mount harness

*Where bolts are to be used, please use the following torque specs on fasteners (unless otherwise specifically identified):

	Class 8.8	Class 10.9	Units
M6	92.9	133	In-lbs
M8	225.4	232	In-lbs
M10	37.2	53.2	ft-lbs

IMPORTANT NOTE: *All bolts that are installed without lock washers should be treated with Loctite® 242 or a similar thread locker.*

4.1 Installation Instructions

4.1.1 Prepare the Generator for Installation

4.1.1.1 *Disconnect Battery*

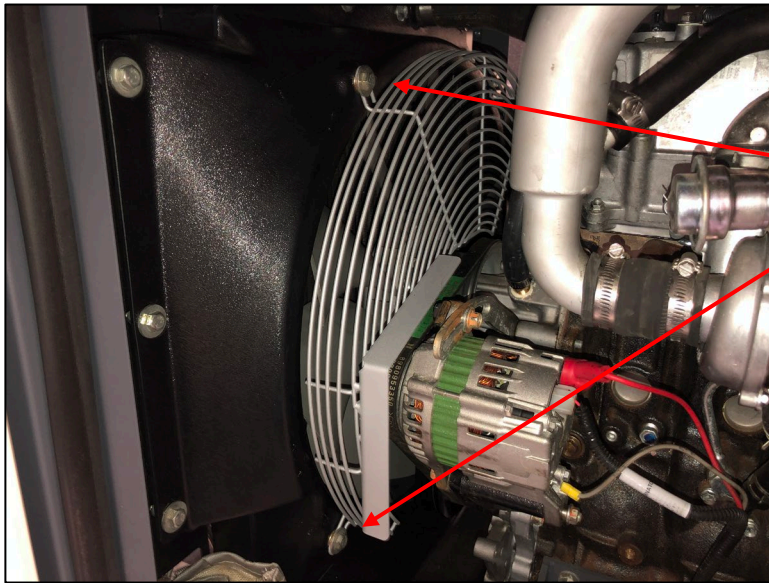


4.1.1.2 *Drain Coolant*

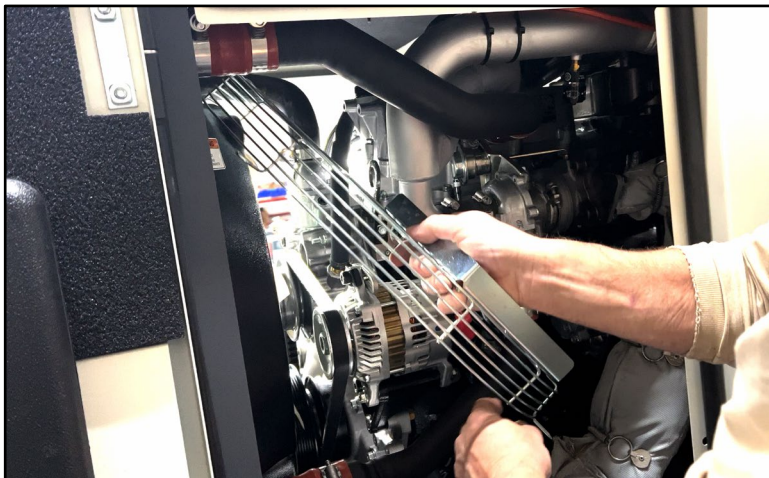
Remove the radiator cap and drain coolant using the drain hose and drain valve equipped on the generator.



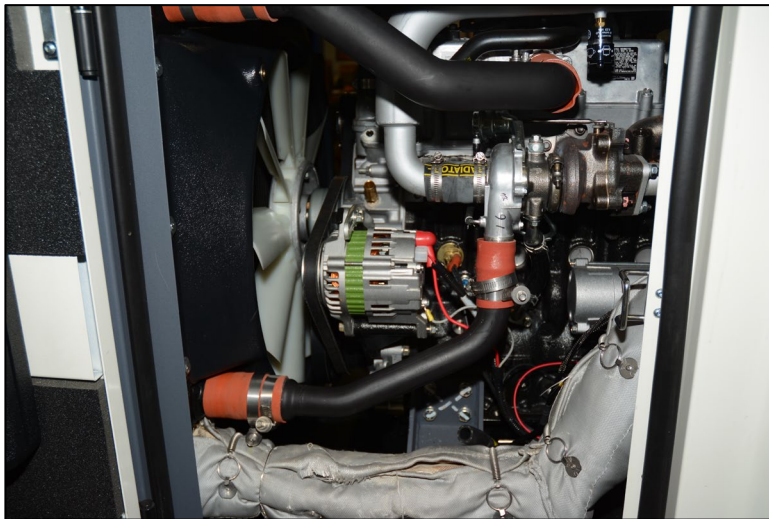
4.1.1.3 Remove Factory Engine Fan Belt Guarding



Remove mounting bolts and all guarding. (note: there may be additional bolts on other side of guard.)

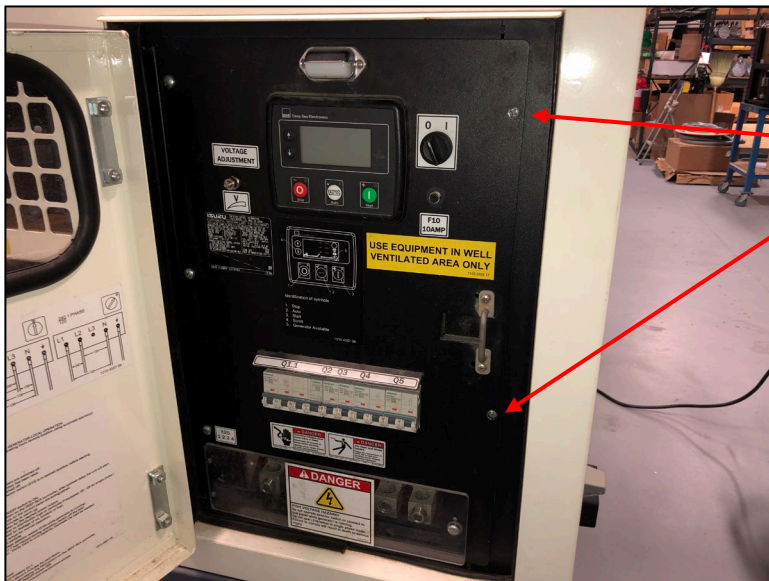


Remove the fan guard and save for later use.



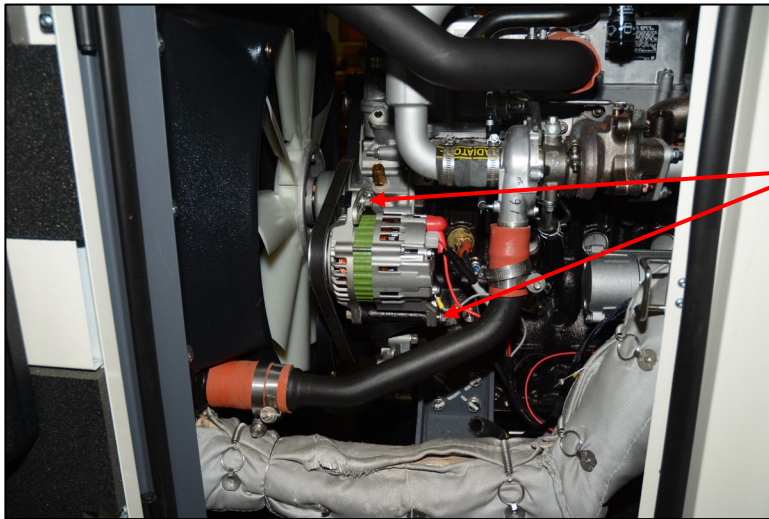
Fan assembly shown with guarding removed

4.1.1.4 Remove Electrical Panel Retaining Bolts

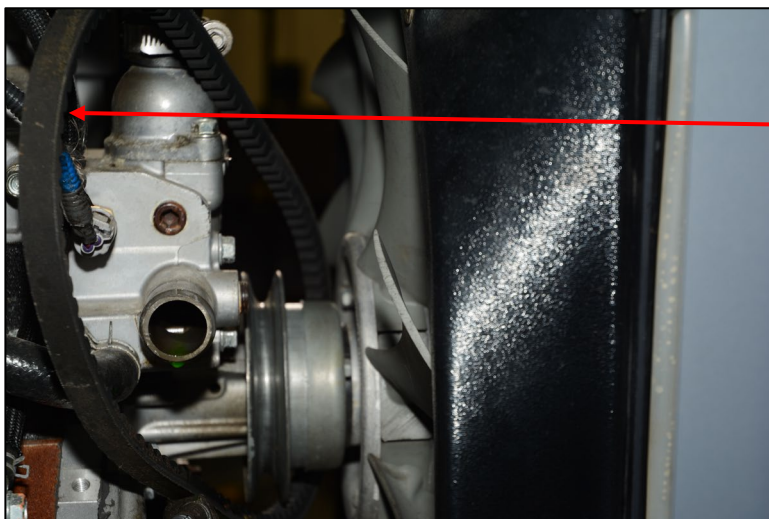


Remove two (2) electrical panel bolts (the electrical panel can now be swung open).

4.1.1.5 Remove OEM Serpentine Belt

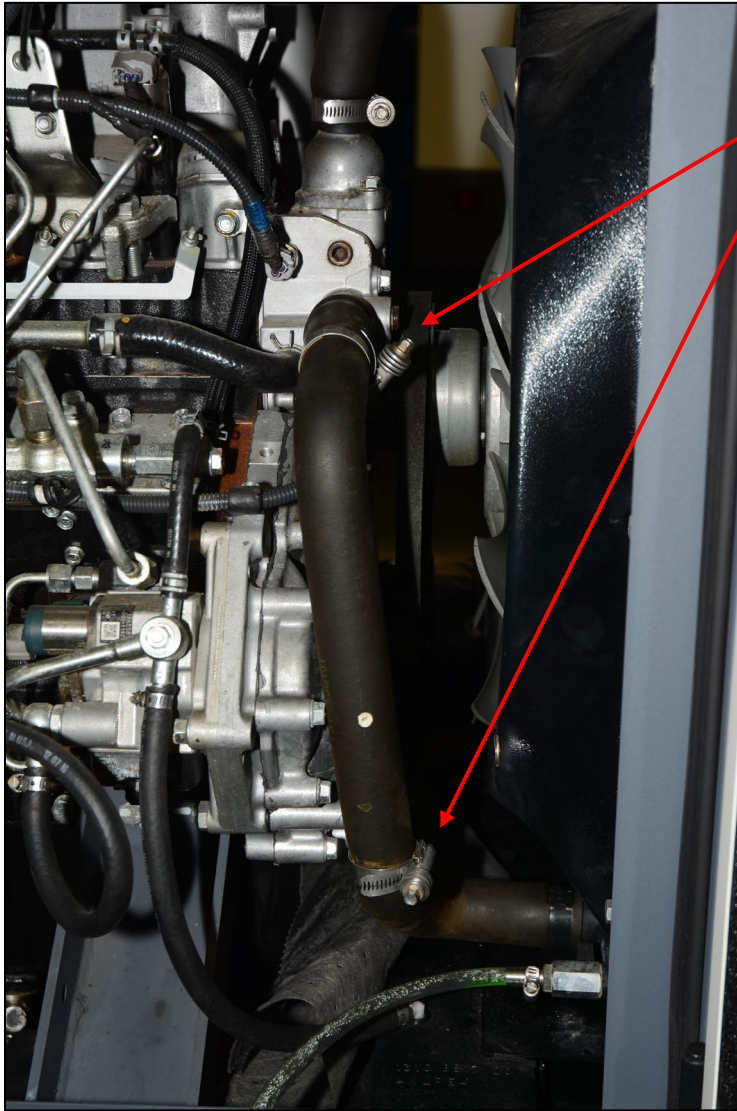


Loosen the engine alternator mounting bolts and rotate alternator towards engine to loosen the tension on the fan belt.



Pull belt back out of the way as shown.

4.1.1.6 Remove OEM Lower Radiator Hose



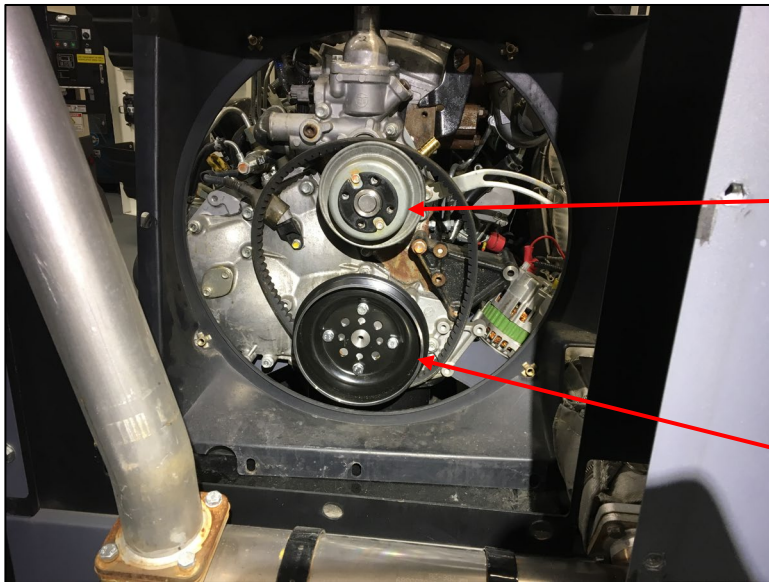
Loosen both upper and lower hose clamps and remove coolant inlet hose.

4.1.2 Mechanical Installation

IMPORTANT NOTE: *All bolts that are installed without lock washers should be treated with Loctite® 242 or a similar thread locker.*

4.1.2.1 Remove Existing Fan Spacer and Install Drive Pulley (***QAS & CPG 25kW ONLY***)

Due to a more aggressive fan *on the 25kW units*, the fan needs to be inserted further into the radiator shroud to allow clearance for the drive pulley mounting to the front of the crank.

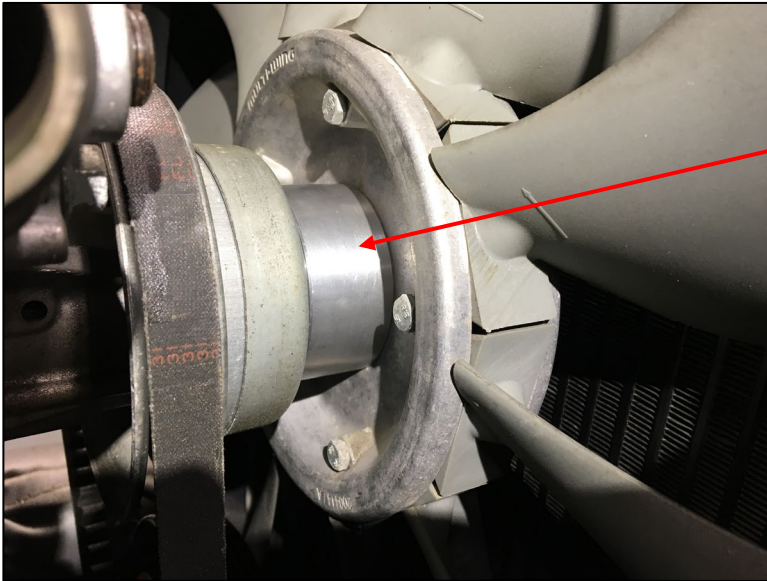


Remove generator roof and radiator per approved Atlas Copco procedure.

Remove fan bolts, fan, and keep the existing fan spacer from the front of the water pump. Leave the existing clearance spacer installed as shown.

While fan is removed, install Ventech supplied drive pulley (14-0421-A0) and pulley adapter (14-0435-A0) to the front of the crank pulley using 4 M8x20mm bolts (920-0009-A0) and 4 M8 lock washers (925-0012-A0).

4.1.2.2 Reinstall the Fan With New Spacer (QAS & CPG 25kW ONLY)

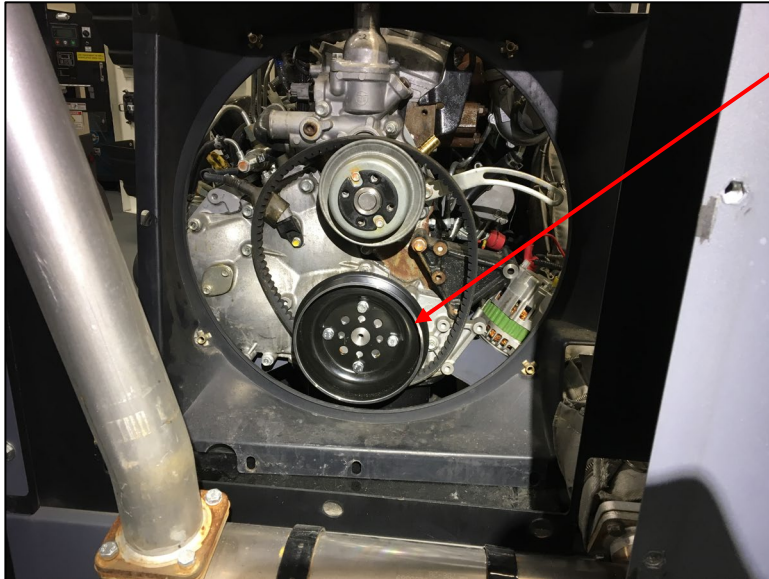


Reinstall fan keeping the original spacer and adding the additional fan spacer (14-0467-B0) and 4 M6x55mm bolts (920-203-A0).

Reinstall radiator and generator roof. Installation is reverse of removal.

4.1.2.3 *Install Drive Pulley (QAS & CPG 45kW ONLY)*

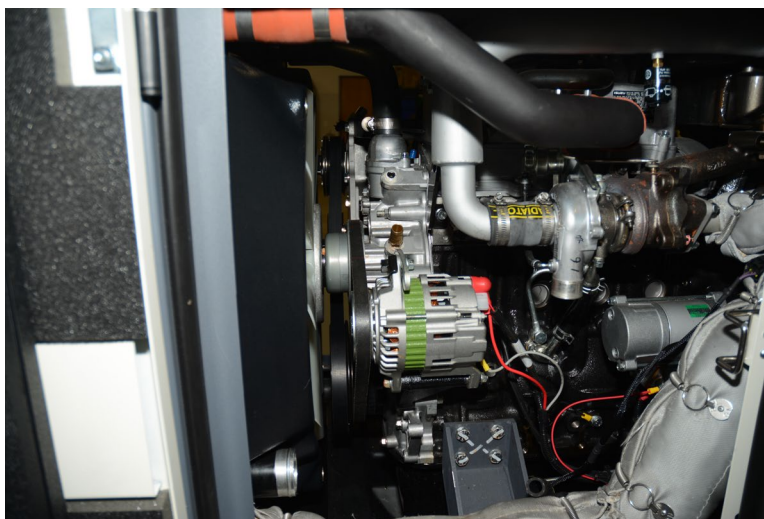
Unlike the 25kW units, the 45kW kit does not require the fan spacer to be changed and does not require removal of the radiator or generator roof. The pulley can be installed from the side.



Install the Ventech supplied drive pulley (14-0421-A0) and pulley adapter (14-0435-A0) to the front of the crank pulley using 4 M8x20mm bolts (920-0009-A0) and 4 M8 lock washers (925-0012-A0).

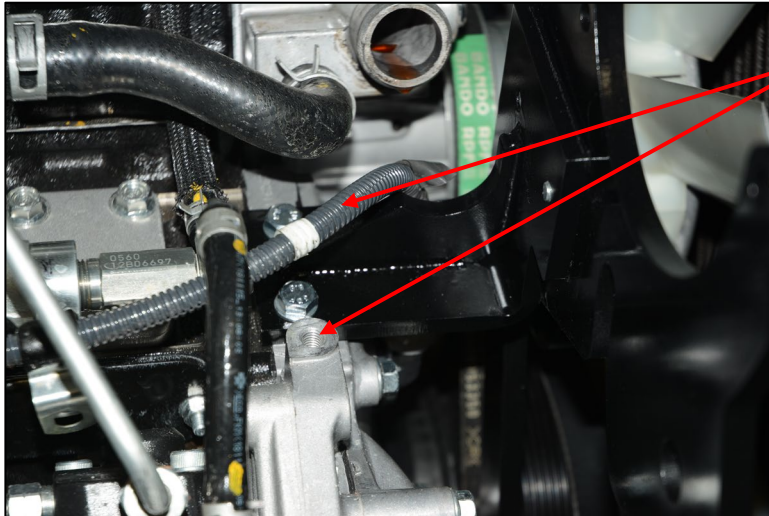
*QAS/CPG 25 shown with radiator removed here for clarity. Radiator removal is NOT required.

4.1.2.4 *Reinstall the OEM Fan Belt*

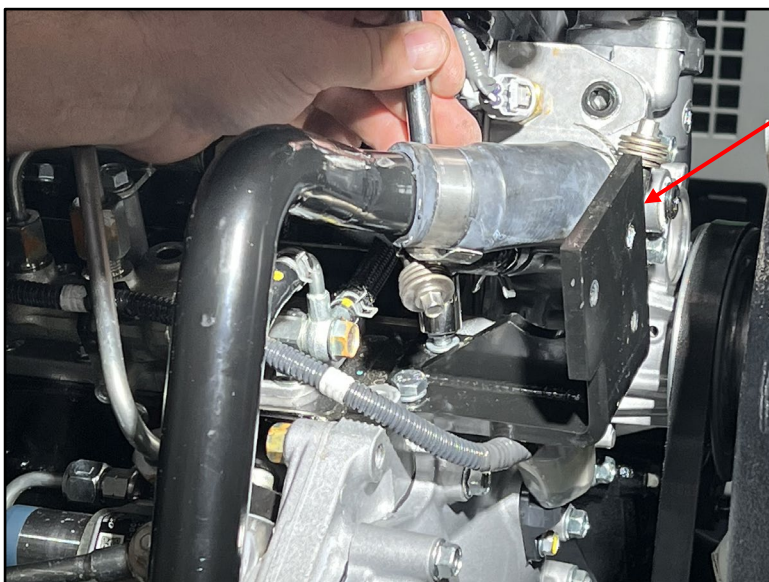


Installation is reverse of removal process outlined in 4.1.2.1.

4.1.2.5 Install the LHG Mounting Brackets and Platework



Remove bolt from P-clip holding the camshaft position sensor to the mounting boss and save P-clip for later use. This will allow the LHG mounting bracket to be located.



Install Mounting Bracket (140-0143-A0) using 2 M8 x 25mm bolts (920-0010-A0) and 2 M8 Flat Washers (925-0002-A0) onto machined pads on the engine as shown.

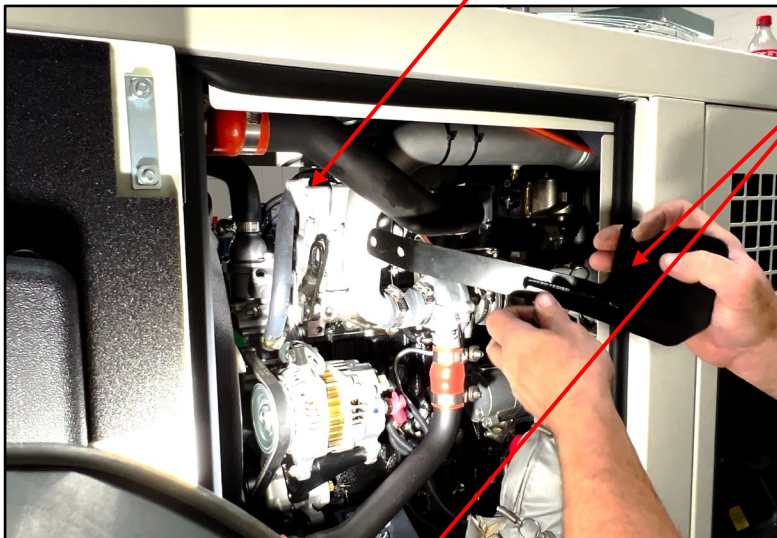
Leave the bolts loose to make the eventual installation of the backing plate easier.

Note: this image shows the replaced coolant hose in

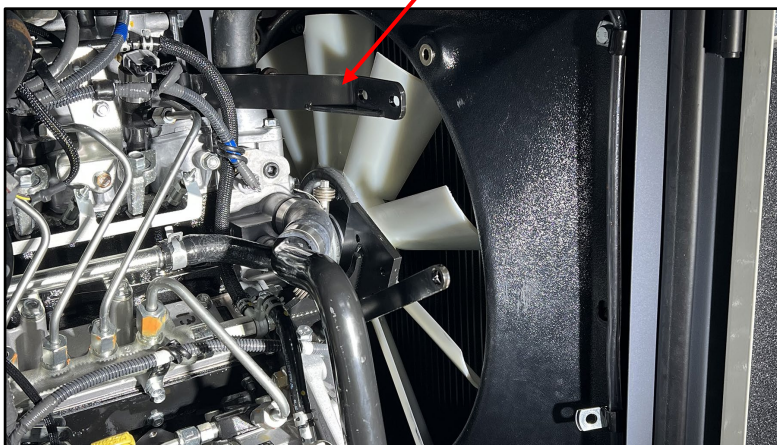
4.1.2.6 *Install the Top Stay Weldment*



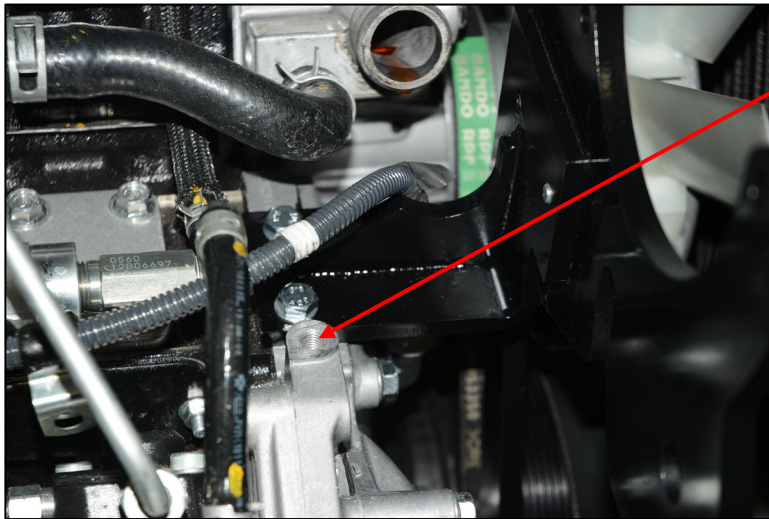
Locate the two mounting holes at the top front of the engine.



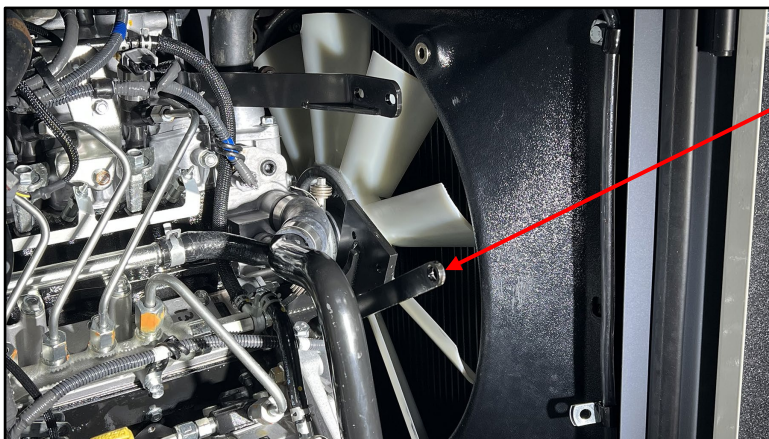
Install the Top Stay Weldment (140-0144-A0). Using 2 M8 Flat Washers (925-0002-A0) and 2 M8 1.25 x 20 HEX HD Bolts (920-0009-A0)



4.1.2.7 Install the Support Bracket



Locate the mounting boss (right side of engine) from step 4.1.2.6.



Install the Support Bracket (14-0461-B0) using 1 M8 1.25 x 20 HEX HD Bolts (920-0009-A0), 1 M8 Lock Washer (925-0012-A0), and 1 M8 Flat Washers (925-0002-A0).

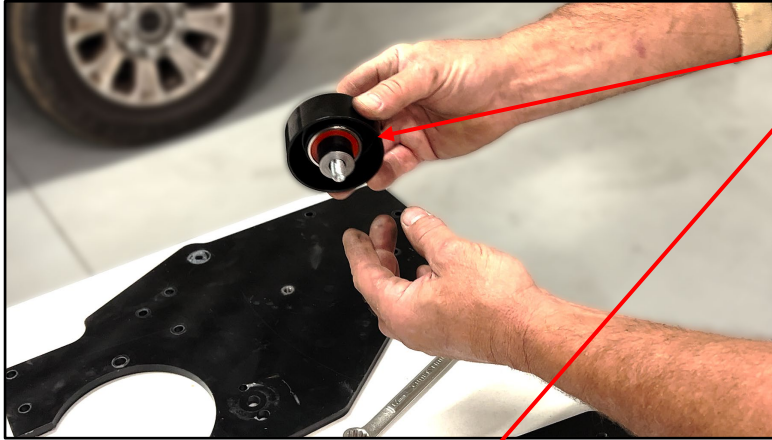
Install the P-Clip removed in step 4.1.2.6 ON TOP OF the Support Bracket, NOT between the support bracket and the mounting boss.

Special note: The Support Bracket (14-0461-B0) will be eliminated and replaced by a longer LHC bolt spacer in later versions of the 0130A and 0130B kits.

Note: Leave the bolt loose to make the eventual installation of the backing plate easier.

4.1.2.8 Prepare the Backing Plate

4.1.2.8.1 Install the Flat Pulley Idler

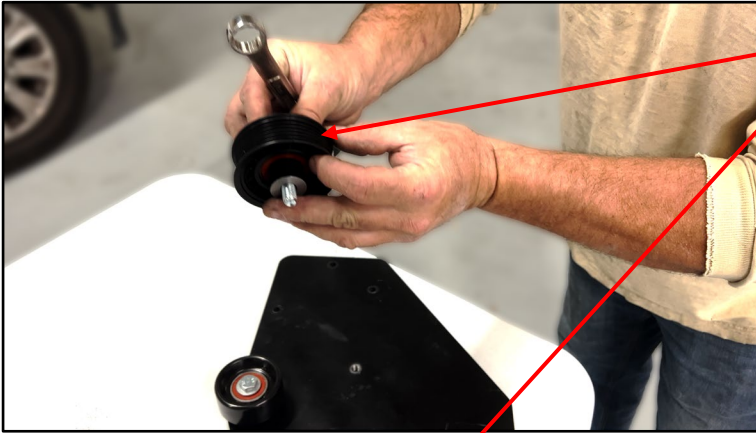


Install the Idler Pulley (981-0005-A0), with Idler Pulley Spacer (14-0456-C0) and M10 Washer (925-0031-A0) to the Backing Plate (14-0453-G0), using Hex HD Bolt (920-0019-A0).

Note: the washer is in the front of the pulley and not shown in these pictures.

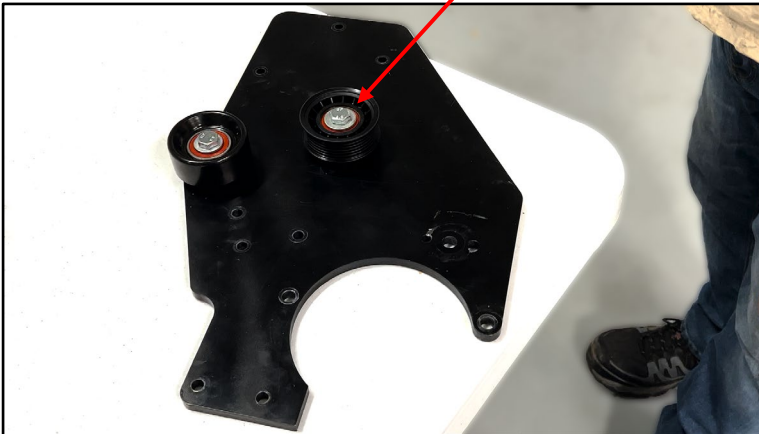


4.1.2.8.2 Install the Ribbed Pulley Idler

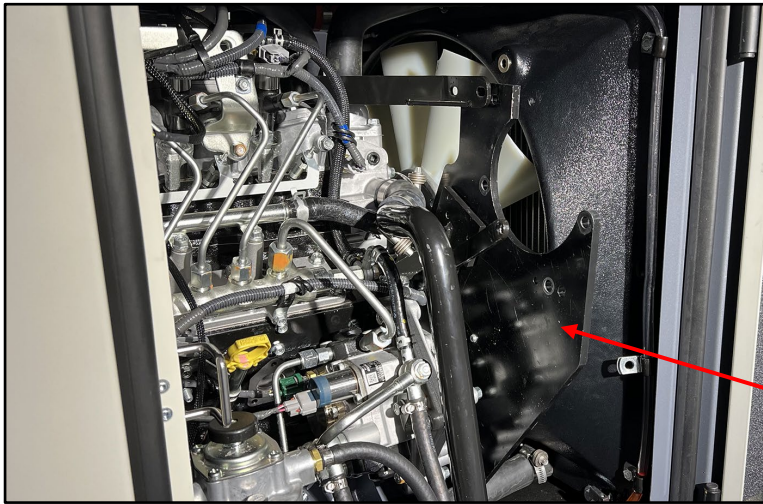


Install the Idler Pulley (981-0018-A0), with Idler Pulley Spacer (14-0456-C0) and M10 Washer (925-0031-A0) to the Backing Plate (14-0453-G0), using Hex HD Bolt (920-0019-A0).

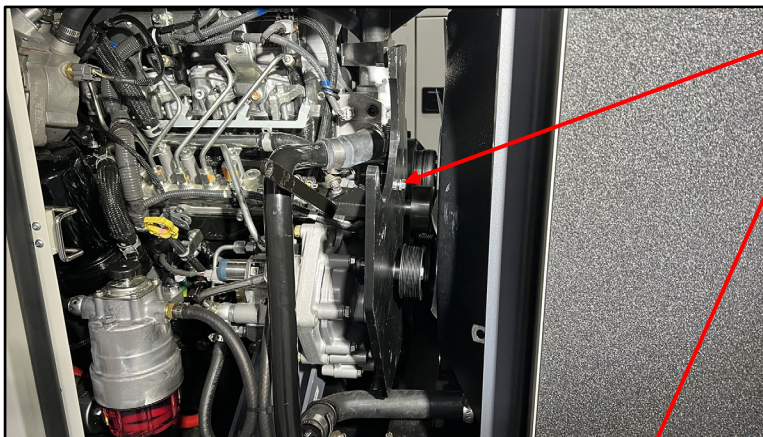
Note: the washer is in the front of the pulley.



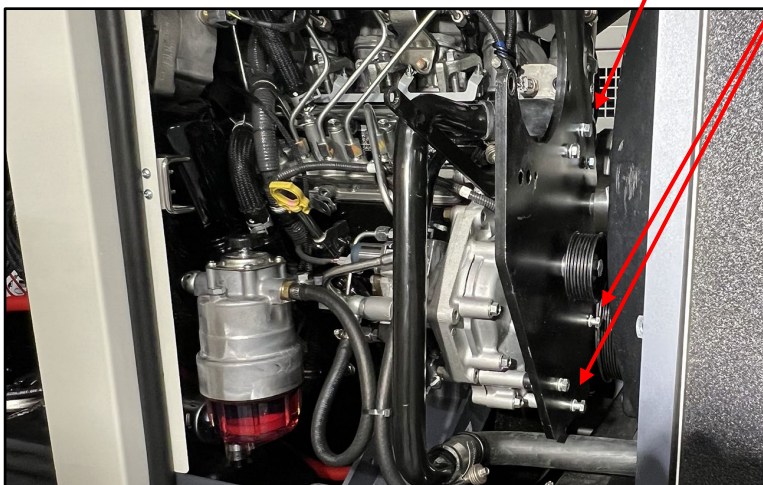
4.1.2.9 Mount the Backing Plate



Make sure the bolts holding the Mounting Bracket (140-0143-A0) and the Support Bracket (14-0461-B0) are loose to allow for easier positioning and installation of the Backing Plate.

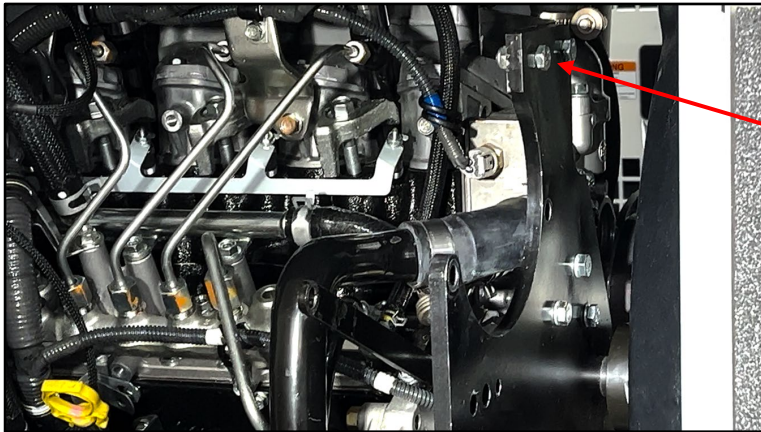


Position the Backing Plate (14-0453-G0) and begin by attaching it loosely to the Mounting Bracket (140-0143-A0) using only 1 - the top right - M8 1.25 x 20mm bolt (920-0009-A0).

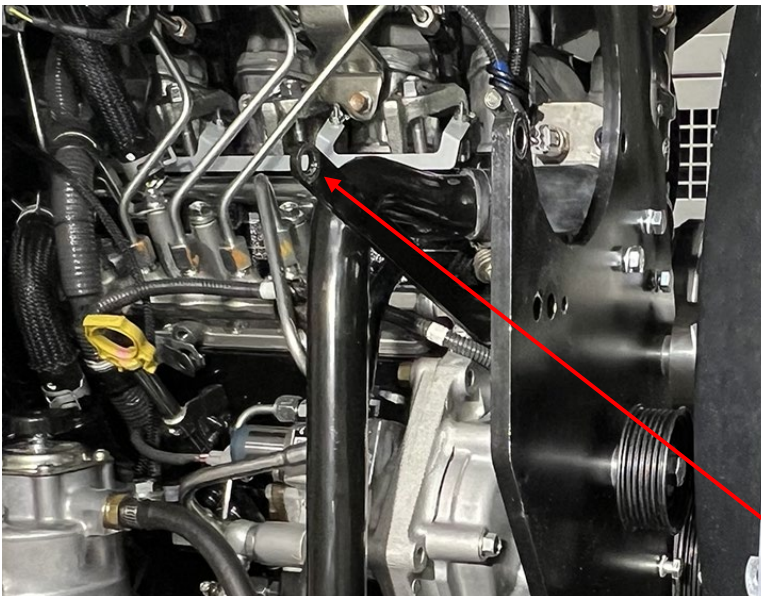


Next, loosely attach the Backing Plate to the engine block as shown utilizing 3 Bolt Spacers (14-0459-B0) and 3 M8x50mm bolt (920-0032-A0) and 3 M8 lock washers (925-0012-A0).

Now loosely add the two other center M8 1.25 x 20mm bolts (920-0009-A0).



Now attach the Backing Plate to the Top Stay Weldment (140-0144-A0) using 2 M8 1.25 x 25mm bolts (920-0009-A0), 2 M8 Flat Washers (925-0002-A0) and 2 M8 1.25 NYLOC nuts (920-0031-A0).

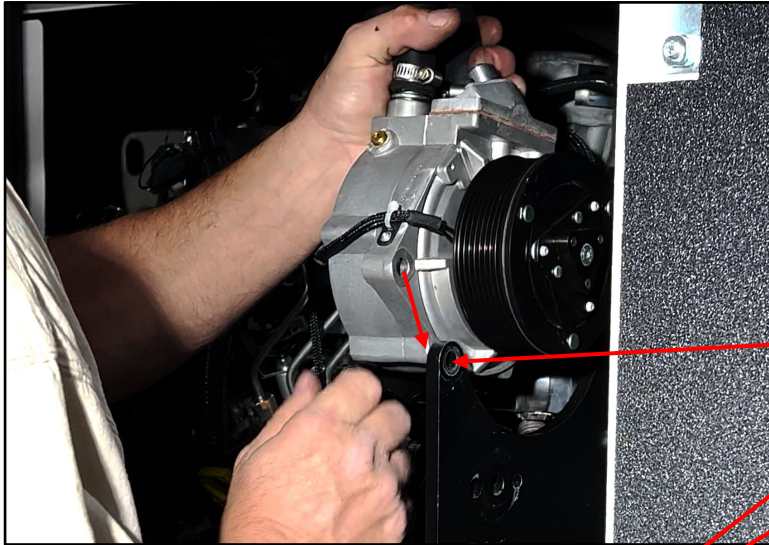


IMPORTANT: Finish the Backing Plate installation by tightening all the mounting bolts for the Backing Plate. Tighten the 3 engine block bolts (lowest bolts) first. Then tighten the 3 Mounting Bracket bolts and, finally, the top two, Stay bolts.

Finally, check and re-tighten all Backing Plate bolts from the bottom up, as necessary.

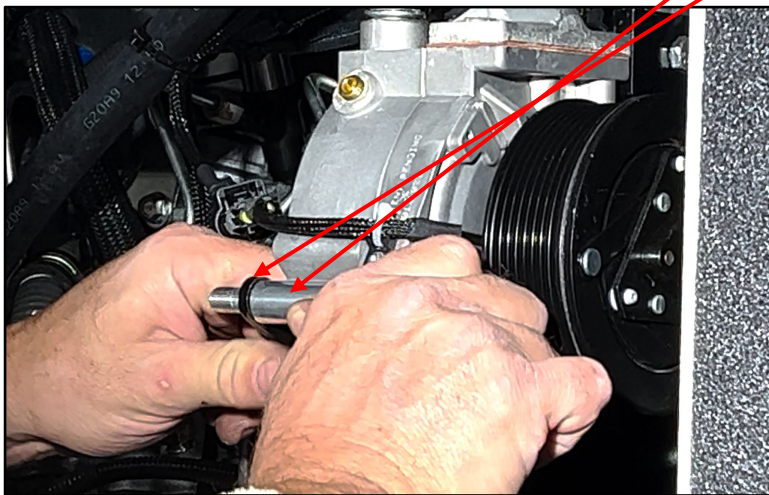
Leave the bolts connecting the Support Bracket to the engine loose to facilitate the LGH installation.

4.1.2.10 Install the LHG700

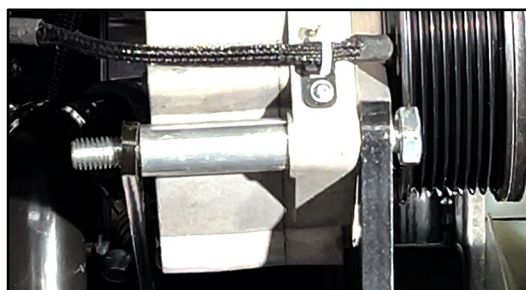


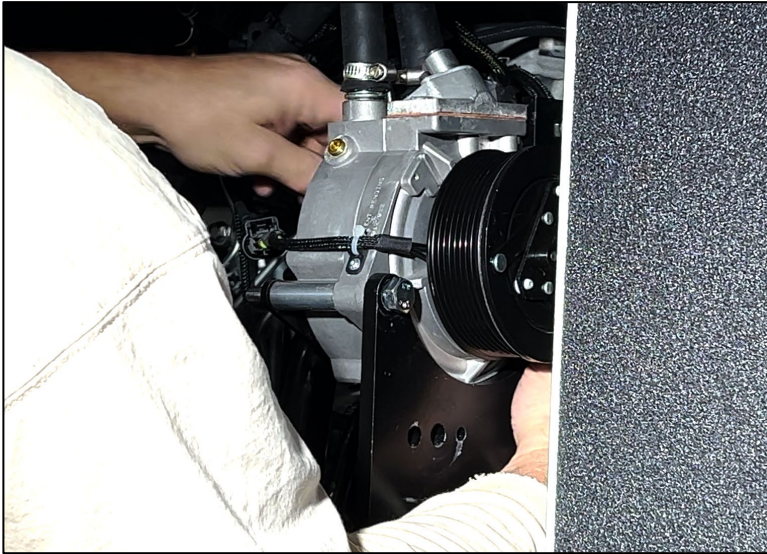
Install LHG700 into bracket assembly as shown.

On the outboard side, hold the LHG in place by inserting an M10x100mm bolt (920-0059-A0) through the backing plate and LHG700, followed by the M10 x 45mm spacer (926-0004-A0), Support Bracket (14-0461-B0)



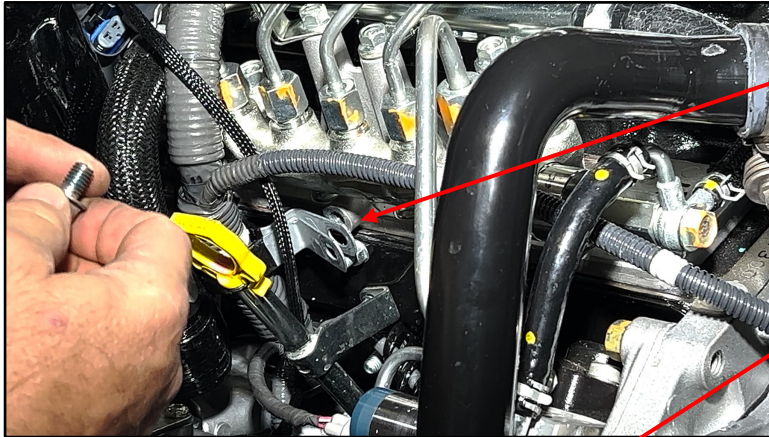
Do not install the M10 NYLOC nut (920-0013-A0) at this point.



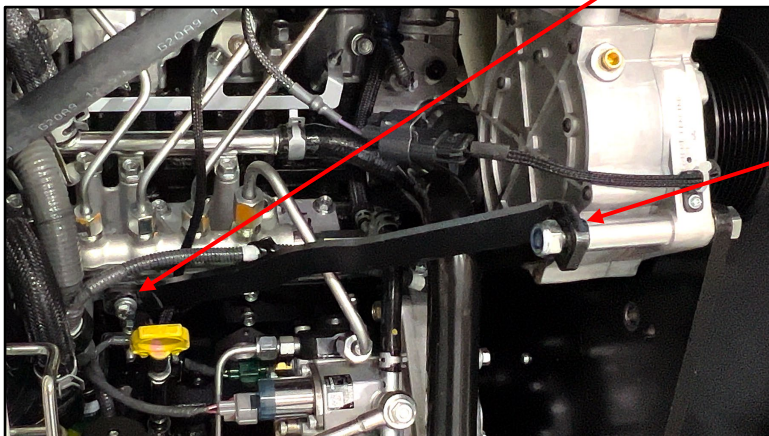


Attach the side nearest the engine using an M10x40mm bolt (920-0072-A0) and M10 NYLOC nut (920-0013-A0).

4.1.2.11 Install the Bracket, Gusset



Remove the bolt holding the P-clip under the fuel lines on the left (LHG) side of the engine.



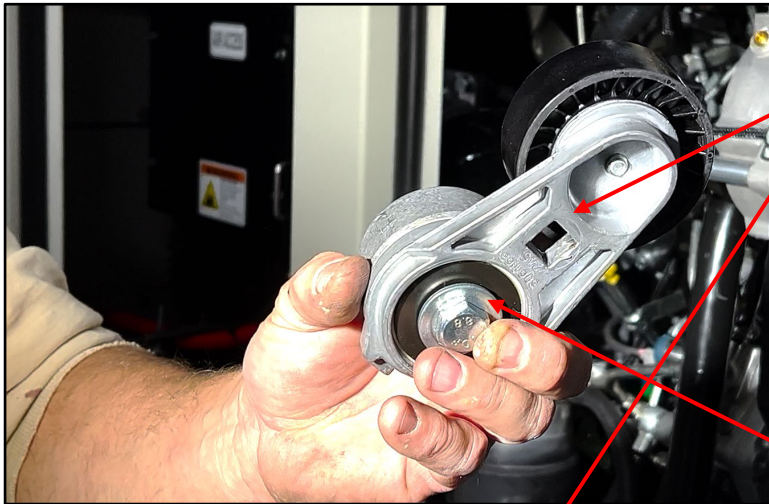
Install the Spacer (14-0554) **IN FRONT** of the P-Clip, the Gusset Bracket (14-0546-B0) **IN FRONT** of the Spacer, followed by the M8 Flat Washer (925-0002-A0), M8 lock washer (925-0012-A0) and an M8 1.25 x 25mm bolt (920-0009-A0) holding it all in place.

Now, connect it to the LHG assembly behind the Support Bracket using an M10 1.5 NYLOC Nut (920-0013-A0)

IMPORTANT: Tighten the bolts connecting the Support Bracket to the engine.

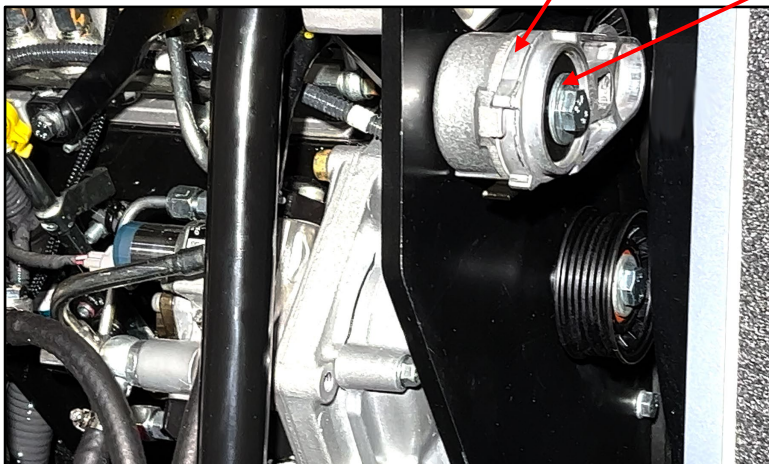
Check and tighten all Backing Plate, Bracket, Stay, and Weldment bolts.

4.1.2.12 Install the Belt Tensioner

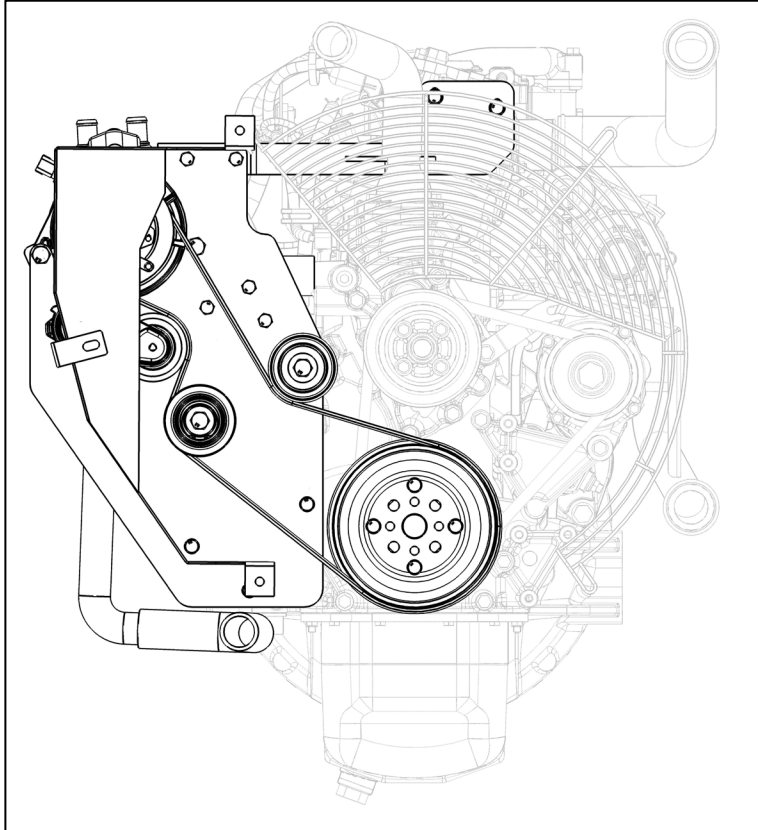


Attach the Belt Tensioner (982-0003-A0) using the M10 1.5 x 75mm bolt (920-0152-A0), oversized M10 washer (925-0031-A0), and M10 NYLOC nut (920-0013-A0)

*Note: Oversized washer installs on fan-side of the backing plate, NOT under the NYLOC nut.

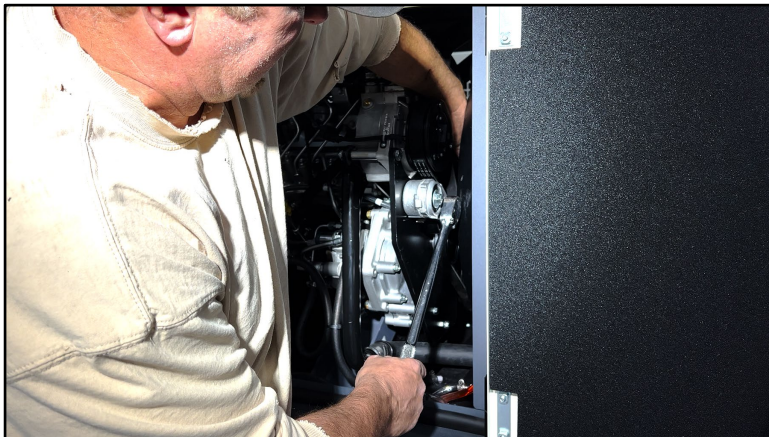


4.1.2.13 *Install the Drive Belt*

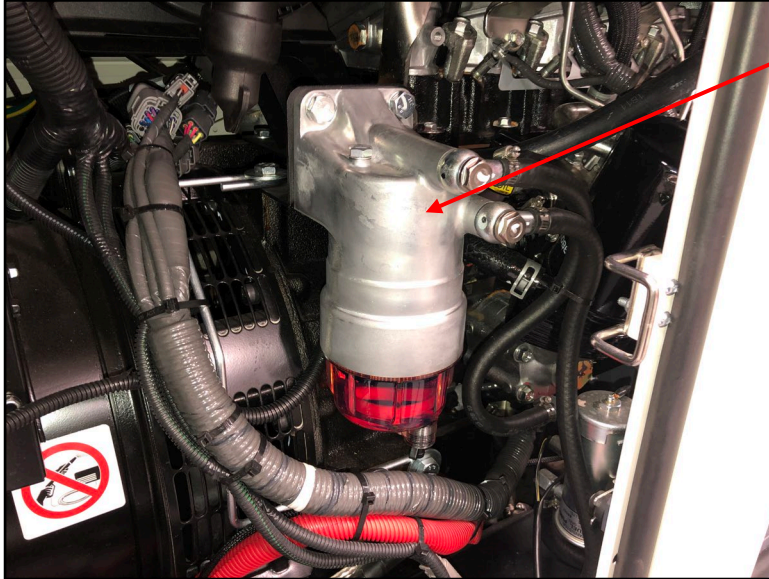


Install Belt (980-0072-A0), routing as shown in the diagram to the left.

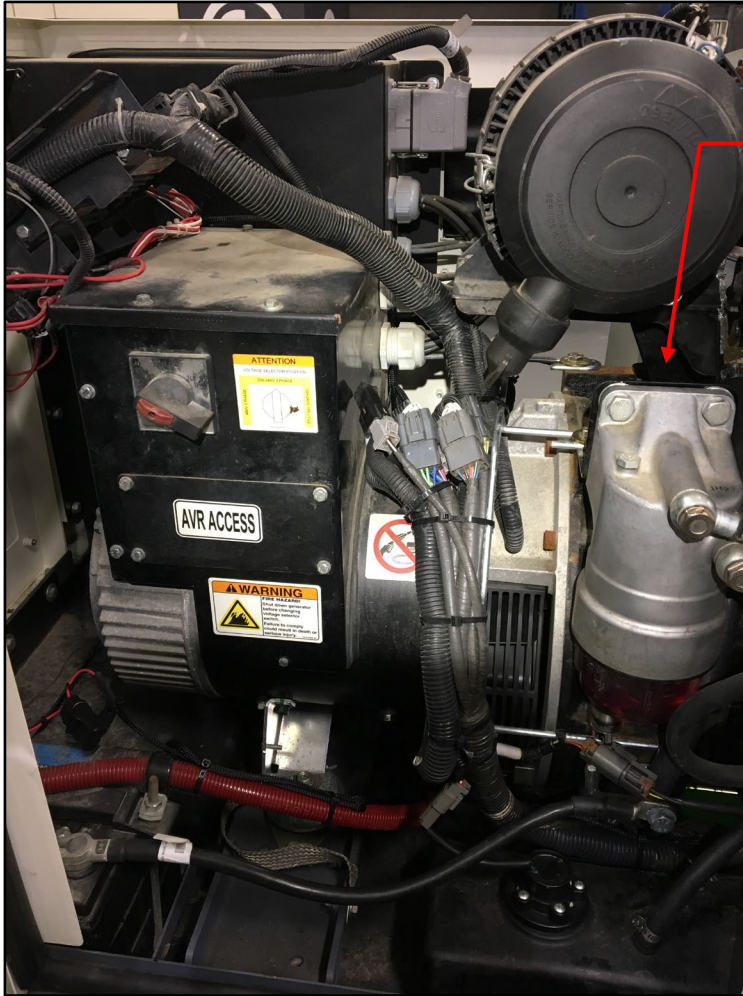
It is often quicker and easier to have one person on either side of the engine for this step.



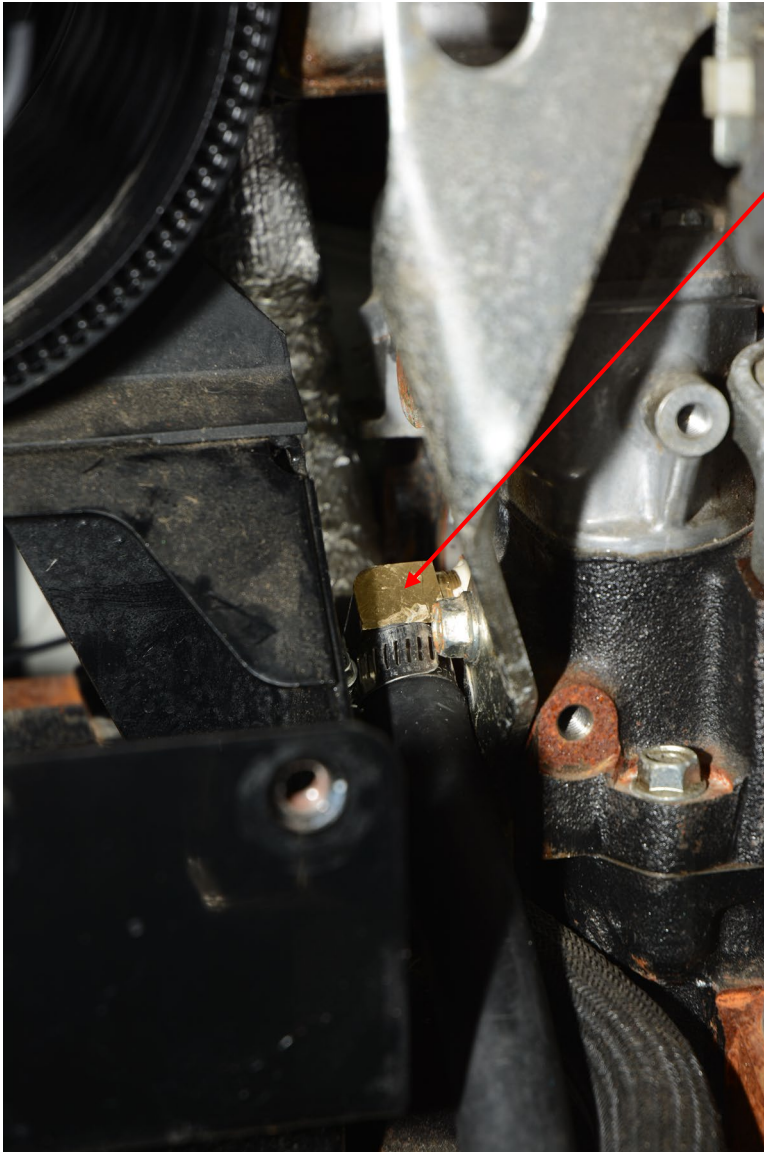
4.1.2.14 *Install the LHG Heater Fittings*



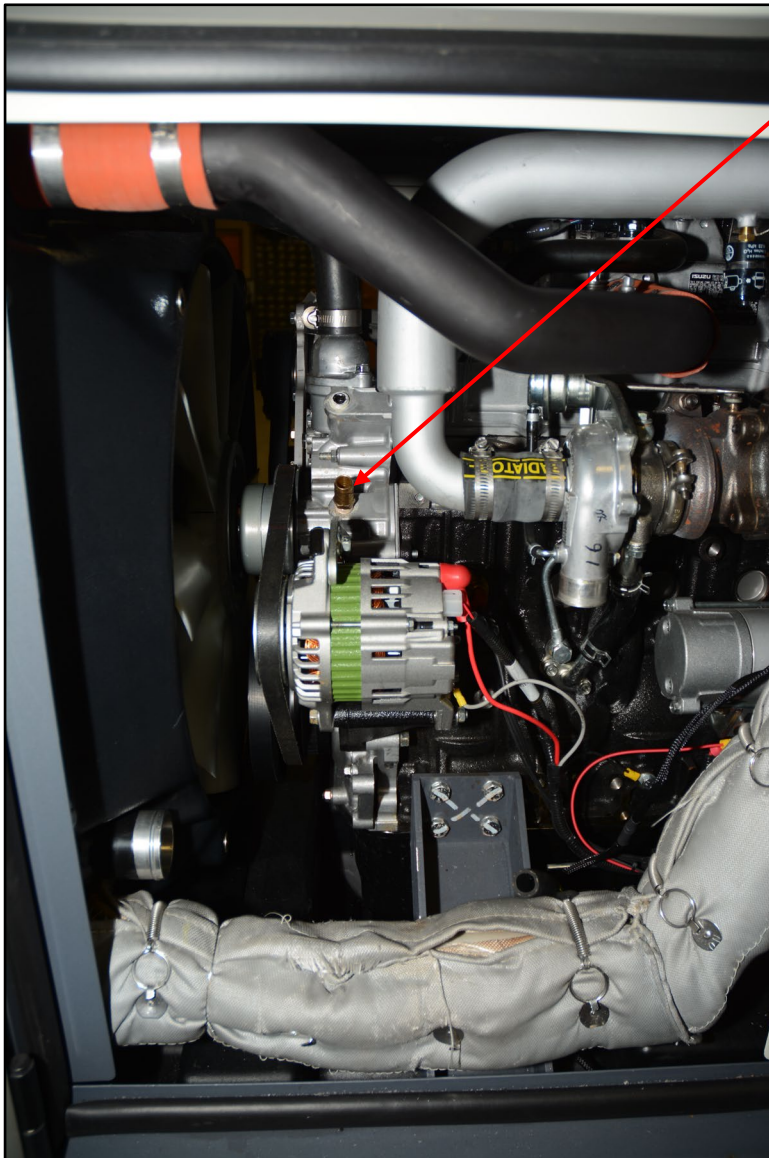
Remove fuel/water separator.



Remove the 3 bolts holding air cleaner bracket to engine bell housing (beneath air cleaner). Shift air cleaner assembly rearward to gain access to vacant port on rear of engine head.

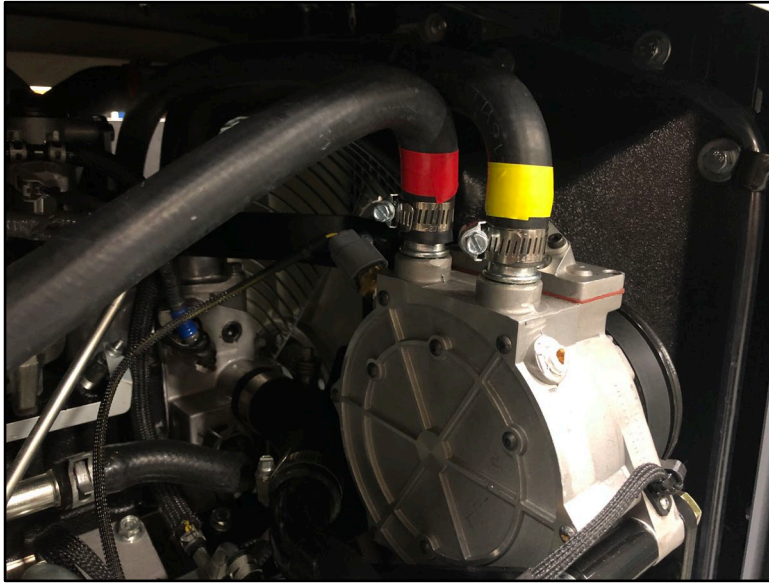


Remove 3/8" NPT plug from head and install 3/8" NPT(M) to 5/8" hose barb elbow (990-0115-A0) into head using Teflon tape on the threads.

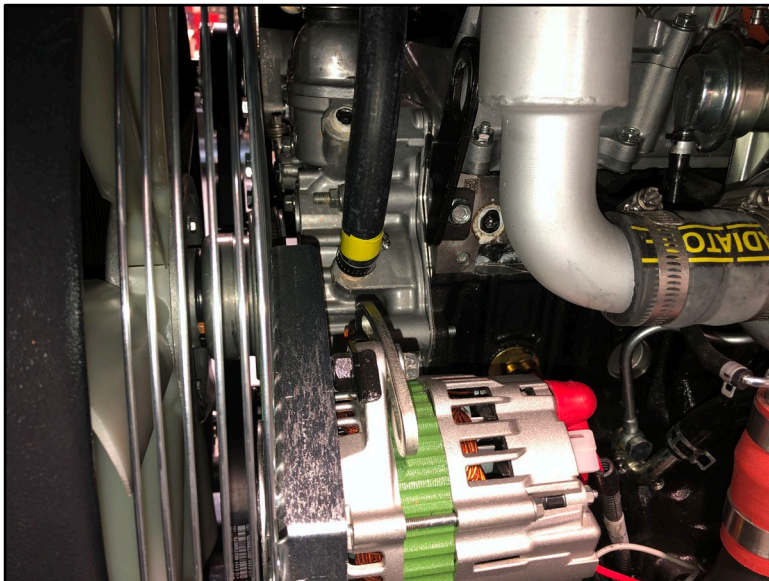


Remove 3/8" NPT plug from water pump inlet and install 3/8" NPT(M) to 5/8" hose barb (990-0135-A0) into water pump inlet using Teflon tape on the threads.

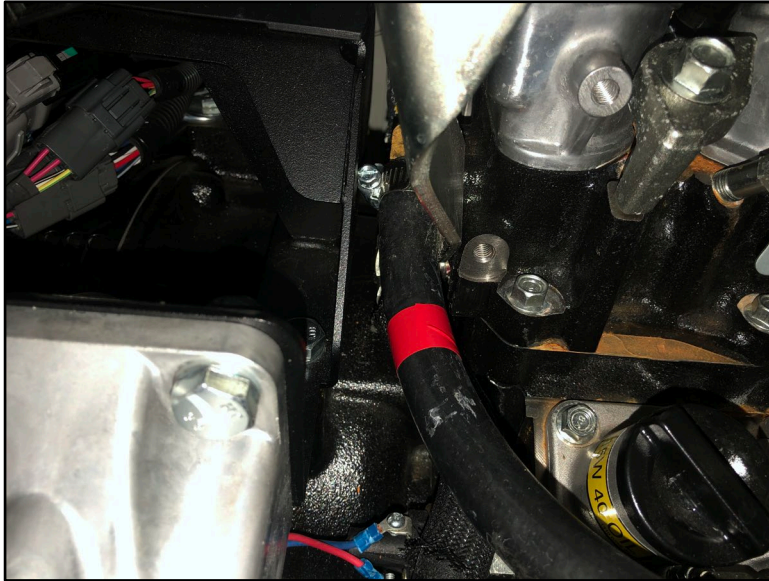
4.1.2.15 Install Hoses



Connect two pieces of 5/8" heater hose to the LHG. The longer section is marked with **RED** and is the inlet to the LHG. The **YELLOW** marked hose is the shorter length and is the outlet from the LHG. Use (2) SAE #10 hose clamps to secure the connection.



The other end of the **YELLOW**-marked hose attaches to the water inlet of the engine utilizing the hose barb installed in the water pump. Use (1) SAE #10 hose clamp to secure the connection.

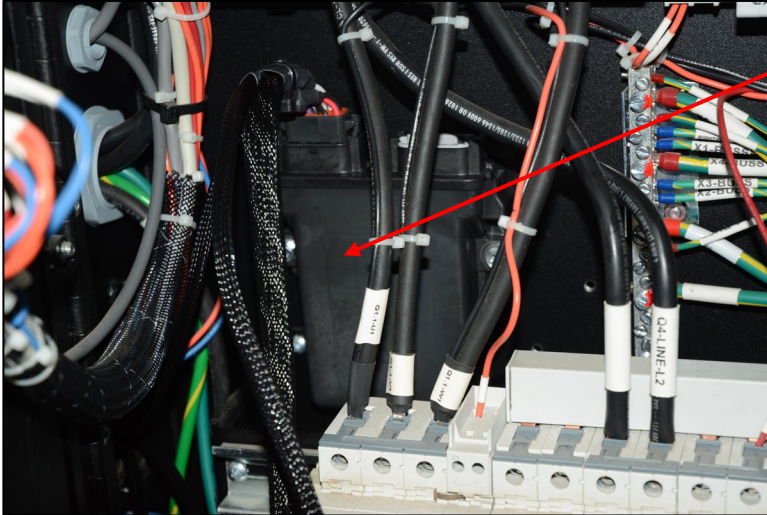


The other end of the **RED**-marked hose attaches to a water outlet of the engine utilizing the hose barb installed in the rear of the engine head. Use (1) SAE #10 hose clamp to secure the connection.

Finish by replacing the Air Cleaner and the Fuel / Water Separator.

4.1.3 Electrical Installation

4.1.3.1 Mount the TLMS Controller (ECU)



Verify there is nothing on the rear side of the control box that will be damaged, and then using the two self-drilling screws included, mount the controller in the location shown here.

4.1.3.2 Install the Electrical Harness

There are two harnesses included in the controller kit. The one with the large black plug is the power harness, and the one with the large grey plug is the control harness.

The power harness contains 3 separate legs: The first contains the current transformers to measure amperage being put out by the generator, the second leg contains four wires to measure output voltage (3-phase “hot” leads, and one neutral), and the third leg contains connections for battery voltage to power the ECU (positive and negative). The first two legs will connect inside the electrical cabinet, and the third will be routed out of the cabinet to the battery.

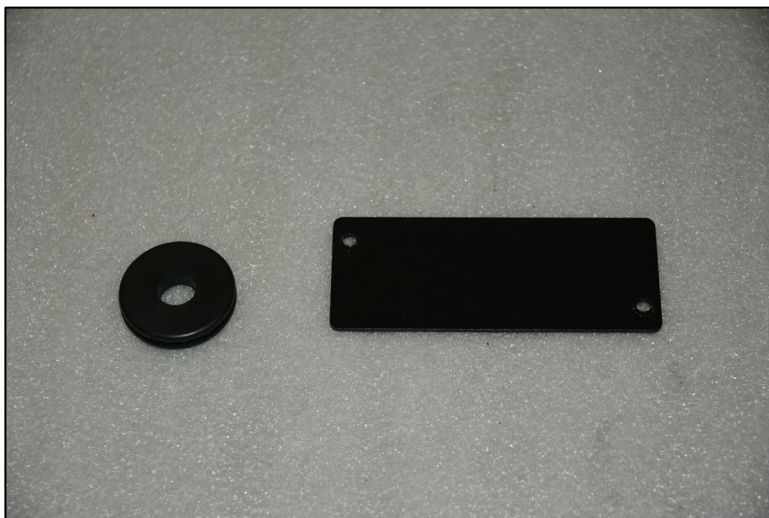
The control harness contains 3 separate legs as well. The first leg is a short jumper to a DB9 connector used for serial connection to a PC, the second is for an outside temperature sensor, and the third is the control wiring to the LHC. The first leg remains inside the cabinet, the remaining two legs will need to be routed outside the cabinet.



To begin installing the wiring harnesses, remove the diesel fuel inlet assembly shown here by removing all the screws around the perimeter and loosening the hose clamp on the back side.



Here, the diesel fuel inlet assembly is shown removed. There is a neck down into the fuel tank that will need to be covered using either a plastic bag or plug to keep debris from contaminating the fuel.

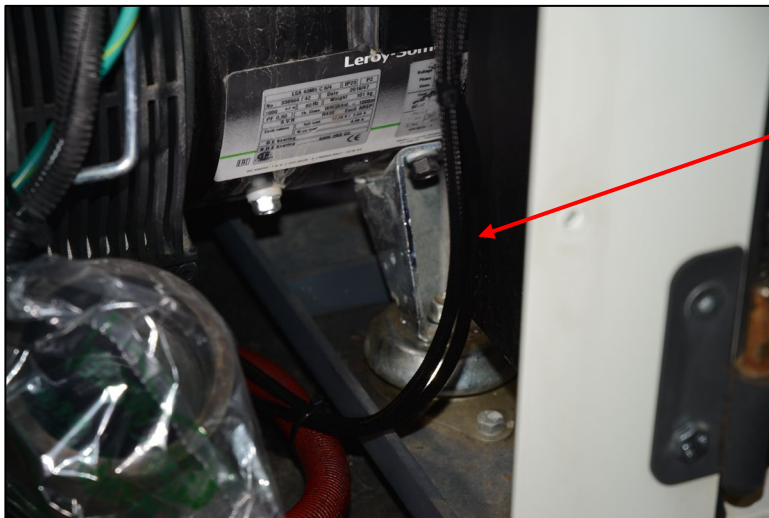


On the lower left side of the electrical cabinet, there is a small rectangular cover bolted on shown on the right here. Remove this cover and punch a 1.25" hole in it (a 3/4" conduit punch works well) to fit the grommet shown here on the left. If the cabinet does not have this cover, you will have place this hole into the box itself.

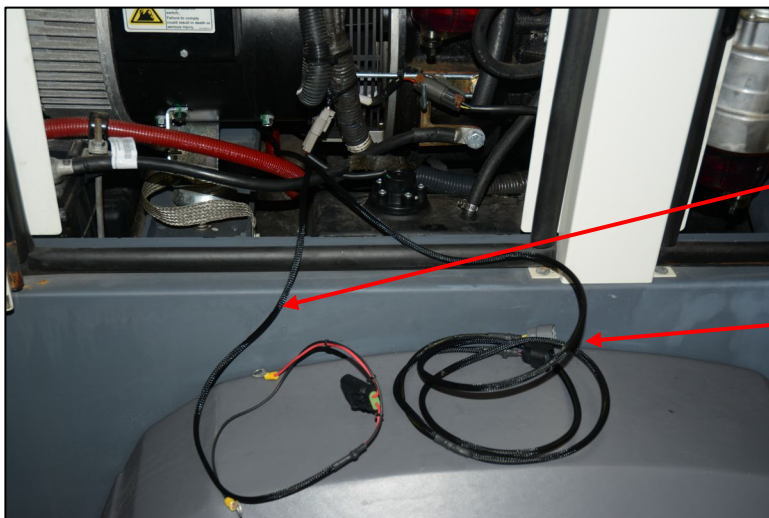


Here, the cover and grommet is shown installed. The three harness legs running out are as follows:

- 1.) Battery Voltage (Fused positive lead and a negative lead)
- 2.) Outside Air Temperature Sensor
- 3.) LHG Control (2 Weatherpak connectors)

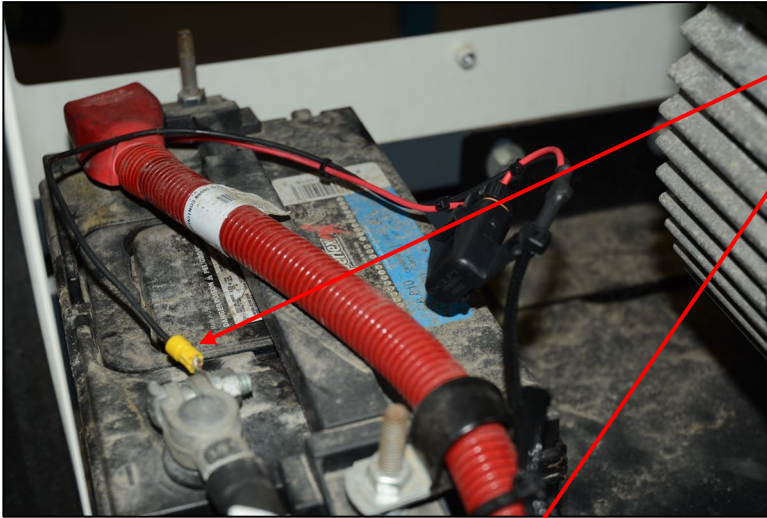


Route the Battery Voltage and LHG Control harness legs under the alternator as shown to the opposite side of the generator. The Outside Ambient Temperature Sensor can be left loose now. This will be addressed later. *Note that the diesel fuel inlet neck is covered here with a plastic bag.*



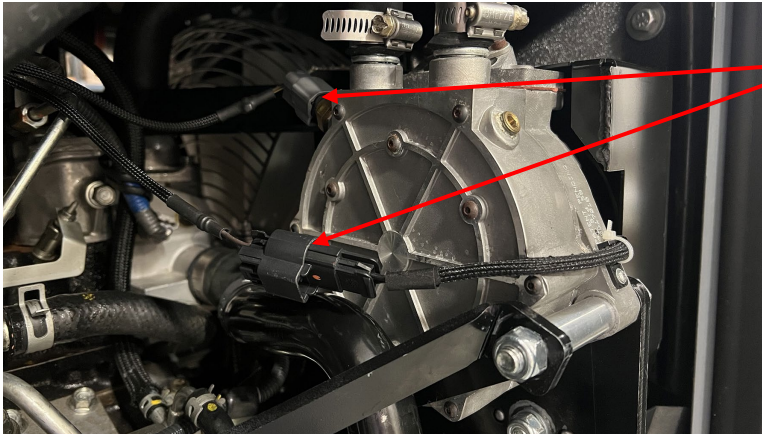
Battery Voltage harness leg

LHG Control Harness leg



Connect battery voltage harness as shown. Use wire ties to neatly route wiring.



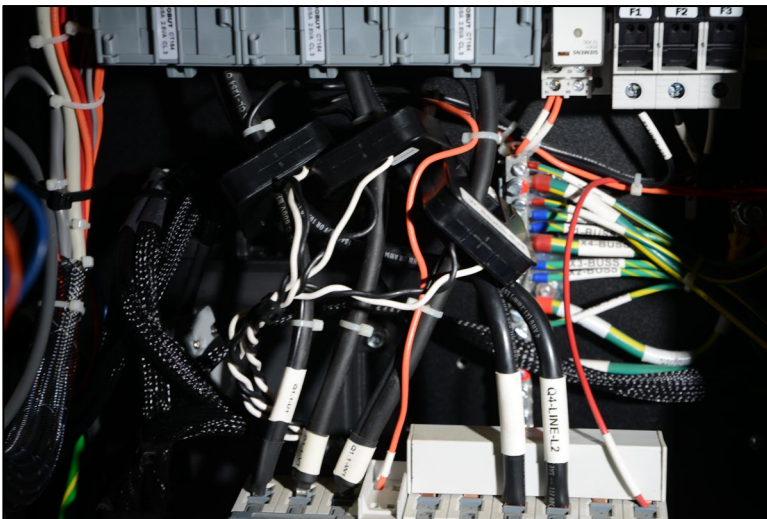
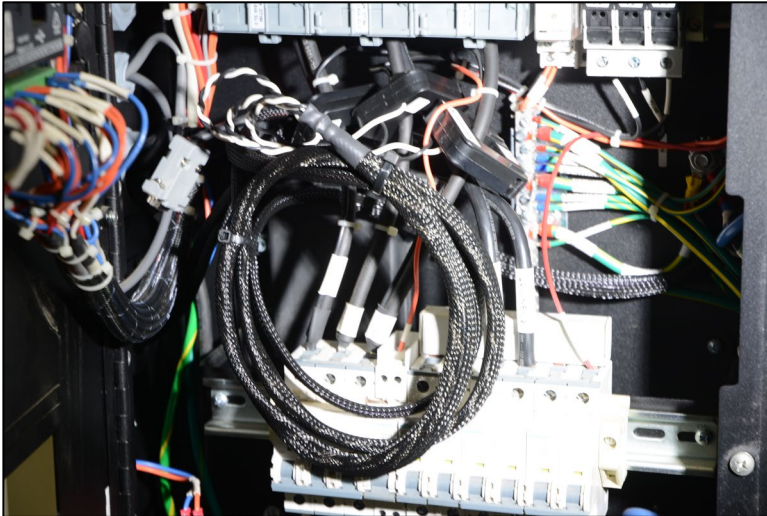


Connect LHG harness to LHG as shown. Use wire ties as needed to neatly route harness. Connectors are specific to mating connector (cannot be connected incorrectly)



Route Outside Ambient Temperature Sensor (OATS) as shown to the rear of the generator as shown, avoiding sharp edges and hot surfaces. There may be a need to drill two small holes in the plastic baffle in order to wire tie OATS in place.

*QAS25 with roof removed shown here for clarity. CPG/QAS 25&45 are all typical. Roof removal is **NOT** required. Access to the location is possible through right-hand side door (passenger-side).



Back inside the electrical enclosure, attach the 3 current transformers to the cables passing through the existing current transformers (grey objects at top of photo) making sure to encapsulate **ALL** wires passing through the existing wires. Make sure to match labels on the Ventech supplied current transformers with the current transformers already in the enclosure. From left to right, these should be “U”, “V”, and “W”.

Ventech supplied current transformers are a separable type, using a small screwdriver to detach the top caps (end opposite of white and black wires). **NOTE:** Caps are keyed and only fit one way. Using excessive pressure if caps are oriented incorrectly can permanently damage transformers, rendering them unusable.

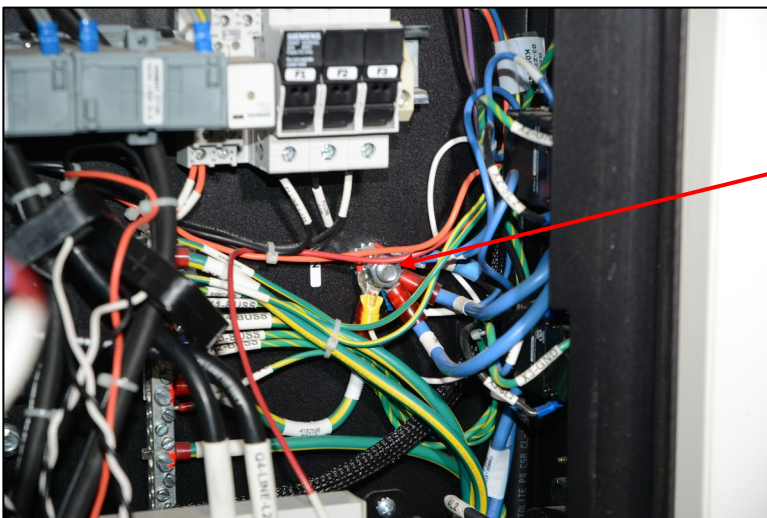
Coil up excess cable as shown and secure with wire ties. Tuck the coil neatly behind the existing output wires as shown in the picture to the left.



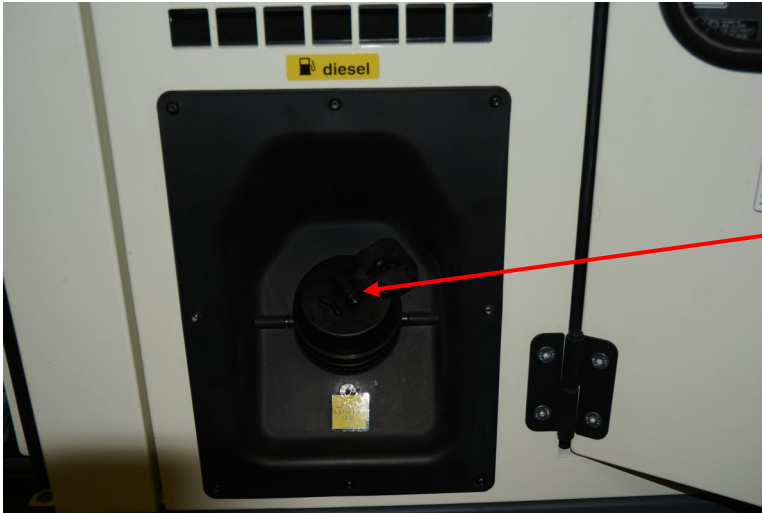
Locate the 4 voltage sensing wires. If they are terminated differently than shown, modify them to match. The purple, black, and brown wires should have approximately 1/4" of insulation stripped from the ends. The white wire requires a 3/8" loop crimp terminal.



Locate the breakers labeled "F1", "F2", and "F3" in the upper right corner of the electrical cabinet. Loosen the top 3 screw terminals and terminate the 3 stripped voltage sensing wires as shown. From left to right, this should be brown (U), black (V), and purple (W). Retighten screws and verify both the sensing wires and the existing wires are both held securely in the terminals.



Slightly below and to the right of the three breakers mentioned in the previous step, there is a neutral lug. Loosen and remove the nut, terminate the white wire with the 3/8" loop terminal, and reinstall the nut.



Make sure all wiring is neatly tucked away and secured.

Reinstall diesel fuel inlet.

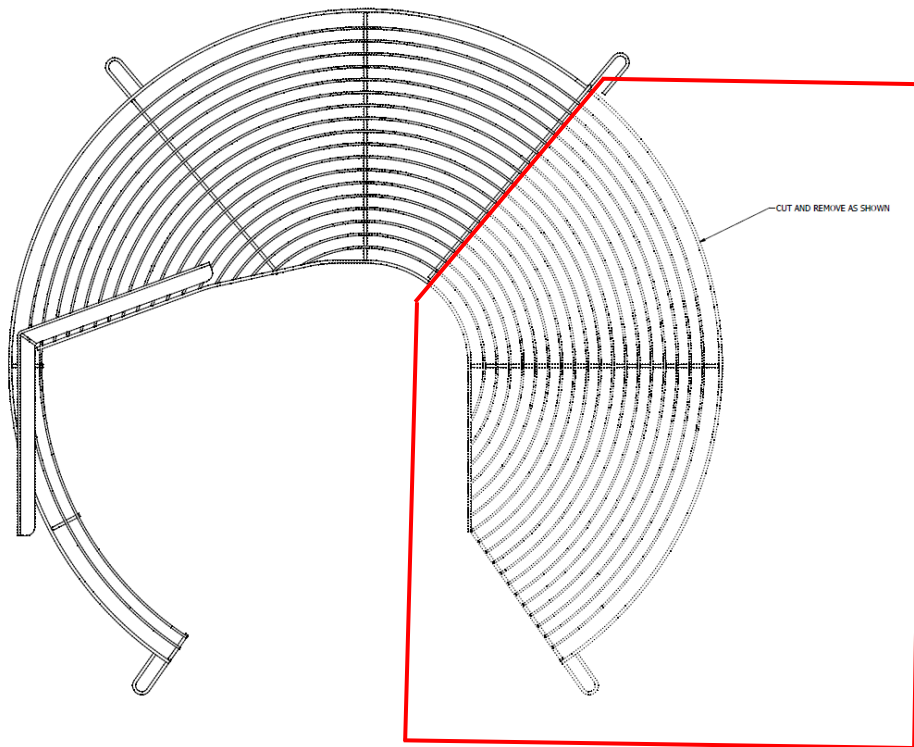
This completes the wiring harness installation.

4.1.4 Finishing the Installation

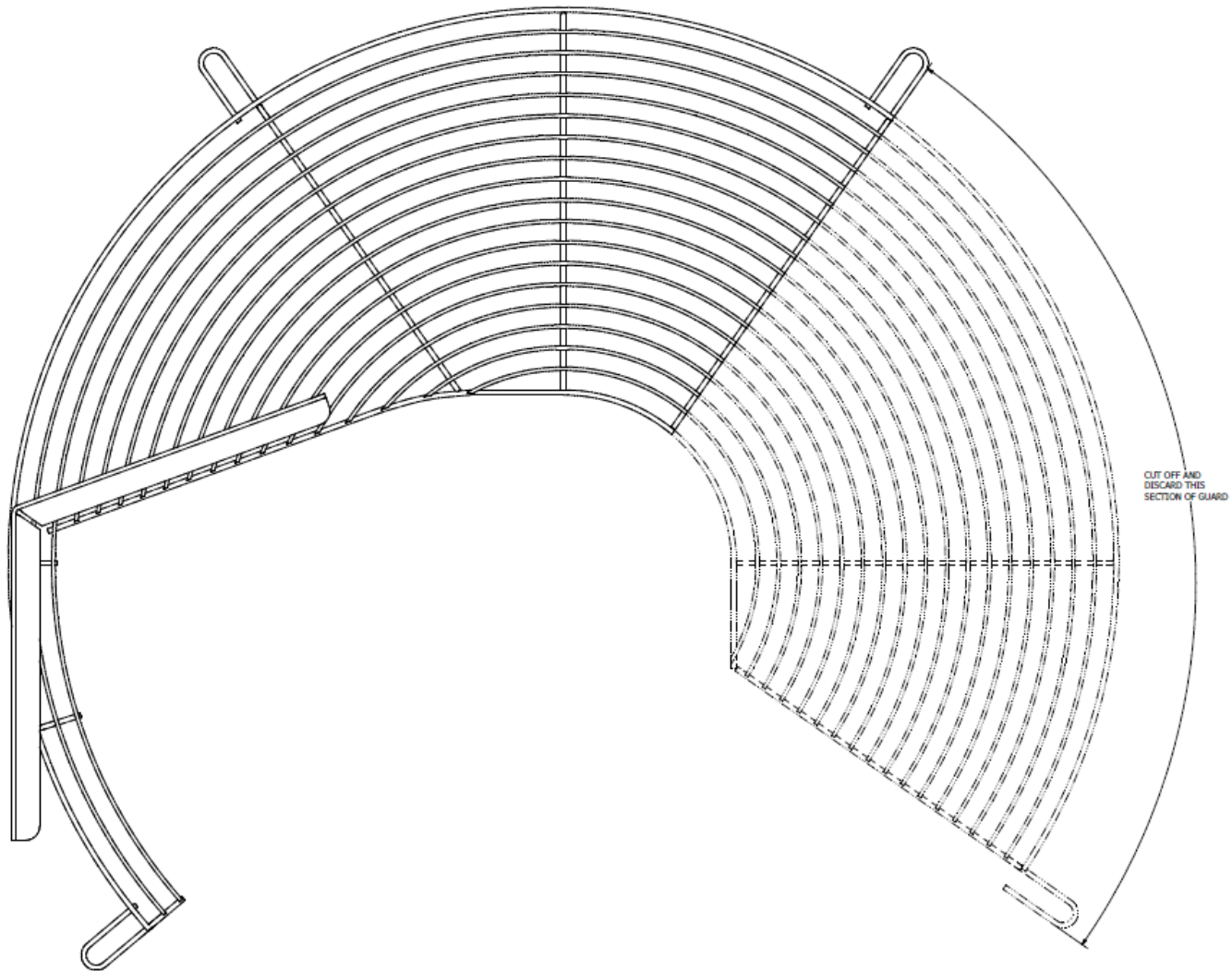
4.1.4.1 *Modify and Reinstall the Fan Guard*

One side of the existing QAS/CPG 25/45 belt guard will require modification to accommodate the LHG and associated belt wrap. Follow the drawing below as shown:

45kW Units:



25kW Units:

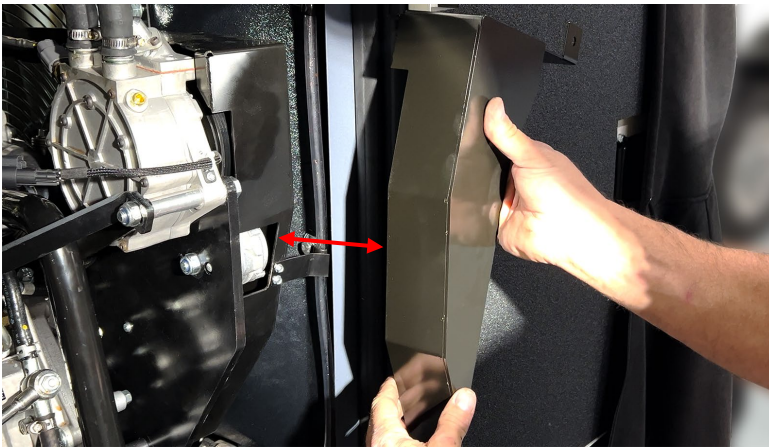




Reinstall fan guard in its stock location using original hardware.

Wait to install the top bolt, which will hold in the LHG Belt Guard.

4.1.4.2 Install the LHG Belt Guard (Modifying it if Necessary)



While newer kits will come with notched guards, it may be necessary to modify the LHG belt guard assembly (140-0146-A0 for 45kW, 140-0147-A0 for 25kW), using the template in the kit and in Appendix B at the end of this document, to cut an opening for the back of the Belt Tensioner.

NOTE: image shows an unmodified guard in the technician's hands and a modified guard mounted on the engine.

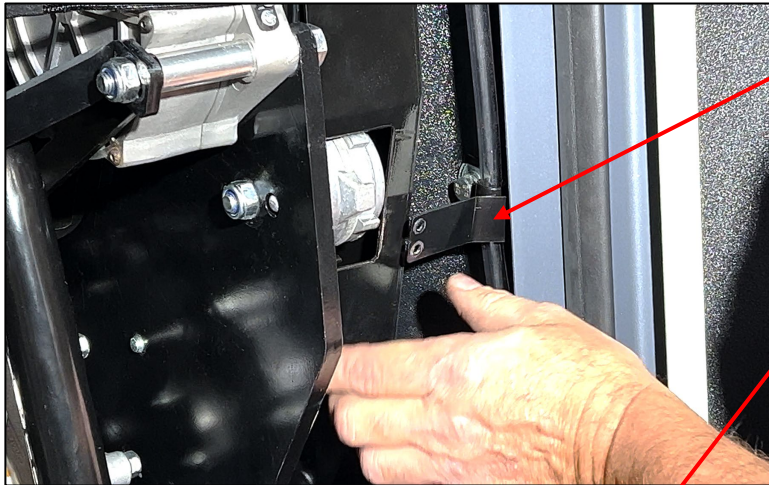


Install the LHG belt guard assembly (140-0146-A0 for 45kW, 140-0147-A0 for 25kW).

Note” this bolt will hold both the top of the belt guard and the top of the fan guard.

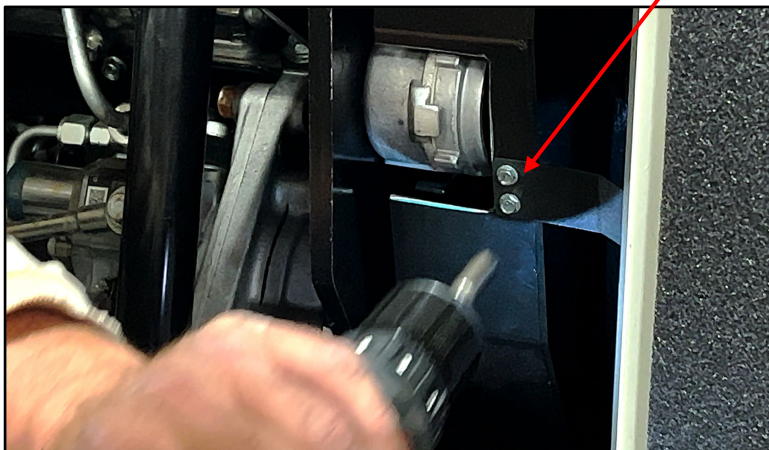
The bottom of the belt guard will be held in place by the remaining fan guard bolt, which is no longer necessary for the modified fan guard.

4.1.4.2.1 Install the LHG Belt Guard Tie Bracket (QAS & CPG 45kW ONLY)



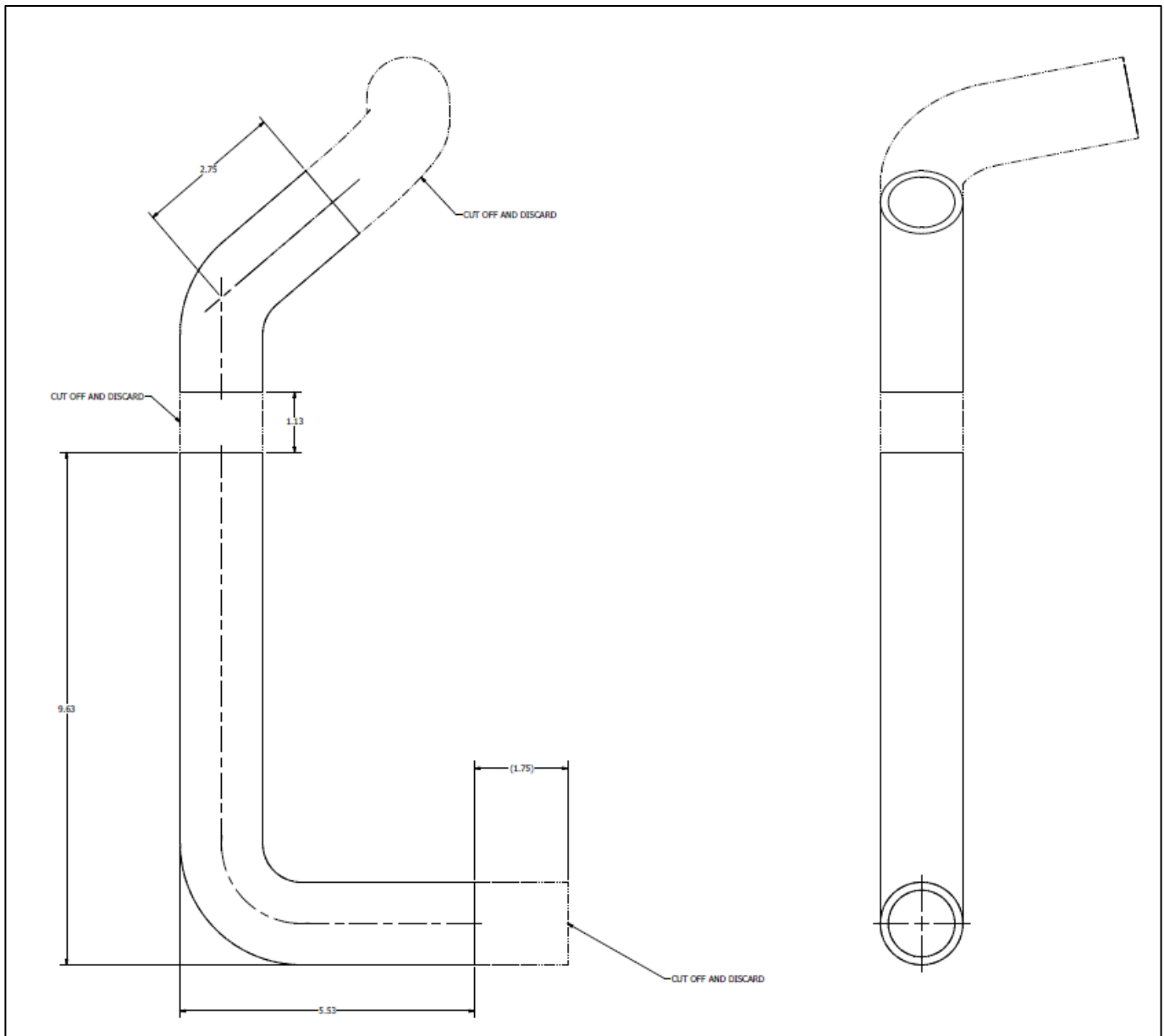
Install the LHG Belt Guard Tie Bracket (14-0549-D0) behind the hose and P-Clamp, as shown here.

Secure the Tie Bracket to the Belt Guard using the two supplied #8 X 3/4" Hex Head Self-Drilling Screws (920-0014-A0).

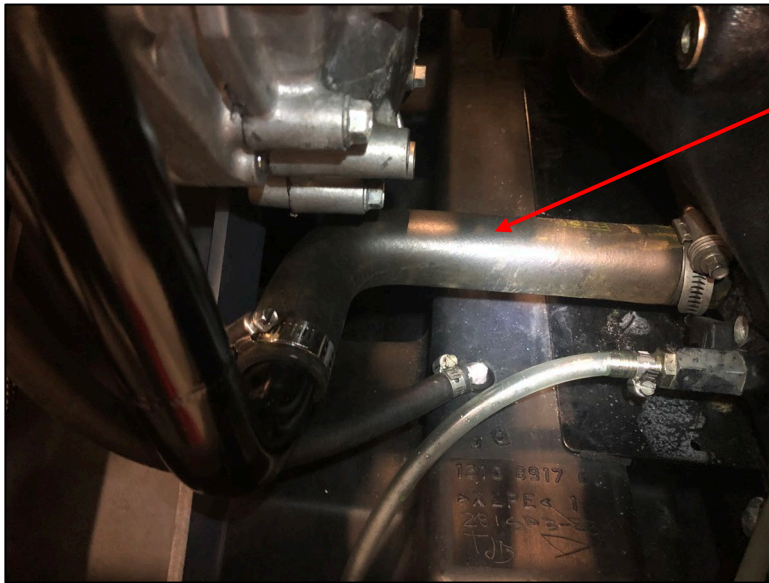


4.1.4.3 *Modify Existing Lower Radiator Hose*

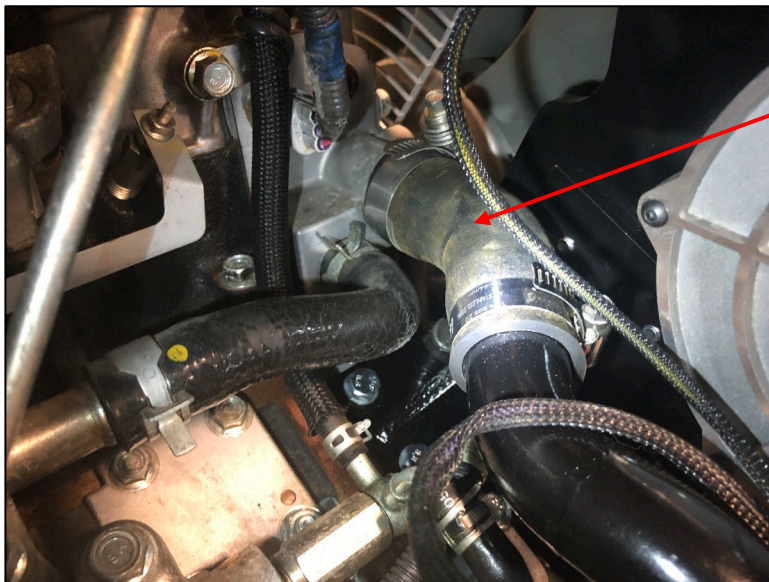
Due to the placement of the LHG700, the radiator outlet to engine coolant inlet plumbing must be modified. This is accomplished by modifying the stock lower radiator hose and the addition of a formed steel tube (provided with the kit). Modify the stock hose by cutting as shown below, retaining the two cut elbow pieces shown, which will be used to connect the new metal tube to the engine and radiator:



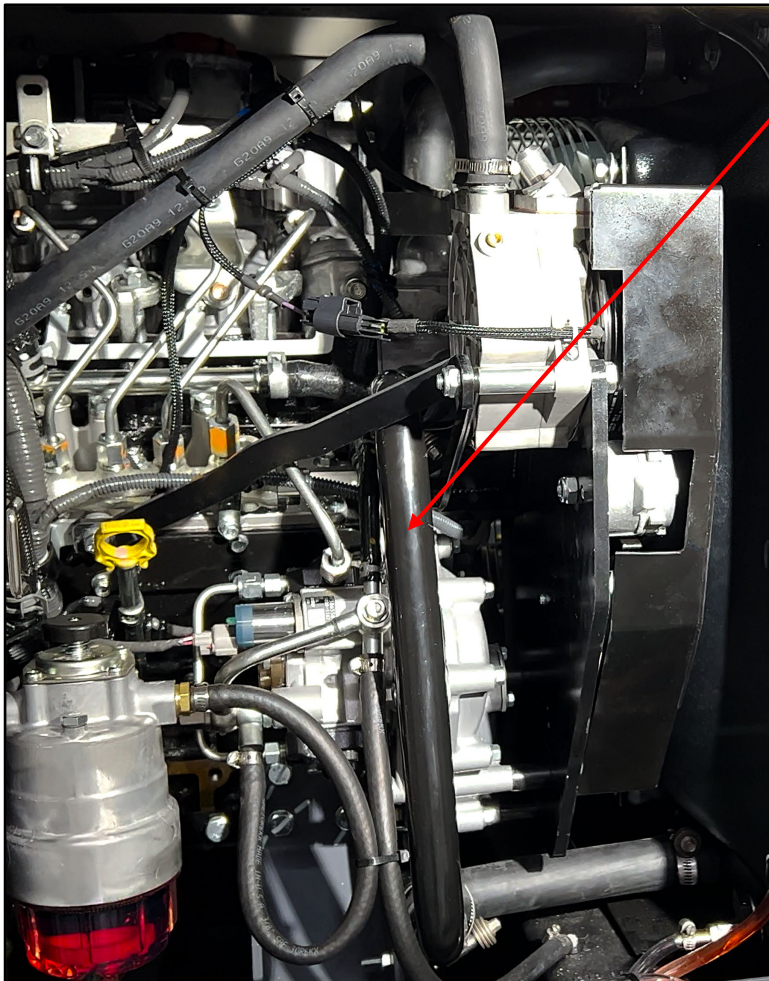
4.1.4.4 *Install Modified Radiator Hose*



Install the larger piece of modified tubing to the radiator as shown with the stock hose clamp. Do not fully tighten yet as adjustment will be needed before final assembly.



Install the shorter piece of tubing to the engine coolant intake as shown with the stock hose clamp. Do not fully tighten yet as adjustment will be needed before final assembly.

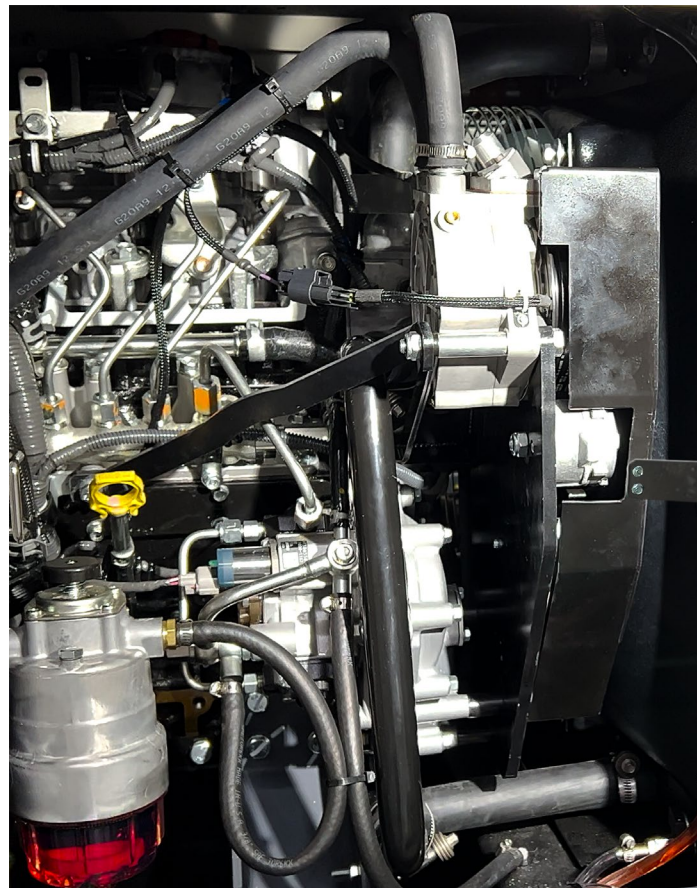


Install the formed metal tube (14-0475-A0) between the two lengths of hoses installed in previous steps using hose clamps to secure the tube to the hosing. Once placement is satisfactory, tighten all hose clamps.

4.1.4.5 Final Installation Steps

1. Check all electrical connections
2. Tidy Harness using cable ties provided
3. Close Generator Electrical Enclosure
4. Check all hose clamps for tightness
5. Check all Fasteners for tightness
6. Fill Generator radiator with coolant and purge generator cooling system in accordance with Atlas Copco guidelines

4.1.4.6 Views of Finished Installation



5 About the LHG and its Benefits.

5.1 How it Works

The LHG700 improves generator reliability, performance, and lifespan by maintaining operating temperatures and minimizing Wet Stacking. The LHG achieves these objectives with two key effects:

1. The LHG700 rapidly heats and maintains the engine coolant at an optimum operating temperature.
 4. The LHG700 applies mechanical load to the engine, resulting in improved combustion and higher Exhaust Gas Temperatures.

5.2 About Wet Stacking

Wet stacking is a condition in diesel engines in which not all the fuel is burned and passes on into the exhaust side of the turbocharger and on into the exhaust system. The word “stacking” comes from the term “stack” for exhaust pipe or chimney stack. The oily exhaust pipe is, therefore, a “wet stack”.

In diesel generators, it is usually because the diesel engine is running at only a small percentage of its capacity.

It is detectable when there is a black oily deposit around exhaust pipe connections and around the turbocharger. Continuous black exhaust from the stack when under a constant load is also an indication that all the fuel is not being burned.

When unburned fuel is exhausted out of the combustion chamber, it starts to build up in the exhaust side of the engine, resulting in fouled injectors and a buildup of carbon on the exhaust valves, turbocharger, and exhaust.

Excessive deposits can result in a loss of engine performance as gases bypass valve seats, exhaust buildup produces back pressure, and deposits on the turbo blades reduces turbo efficiency.

Permanent damage will not be incurred over short periods, but over longer periods, deposits will scar and erode key engine surfaces.

Also, when engines run below the designed operational temperature, the piston rings do not expand to adequately seal the space between the pistons and the cylinder walls. This results in unburned fuel and gases escaping into the oil pan,

where they dilute the lubricating properties of the oil, leading to premature engine wear.

5.3 Why avoid Wet Stacking?

- Wet stacking shortens engine life by many years and before planned replacement.
- Wet stacking causes Pollution. Many urban areas restrict the level of smoke emissions wet stacking produces.
- Wet stacking diminishes engine performance as deposits reduce maximum power even before engine damage begins to occur. Eventually, a prematurely worn engine will have lower maximum power than it is designed to produce.
- Wet Stacking increases maintenance costs. An engine experiencing wet stacking will require considerably more maintenance.

6 Starting and Operating the LHG700 for the First Time.

The LHG700 will operate automatically during cold operation of the Atlas Copco/Chicago Pneumatics generator.

LHG ON The LHG will **engage** when **ALL** of the conditions below are TRUE:

- The generator is running (RPM greater than 255)
- The generator Coolant Temperature is below 176°F (80°C).
- The LHG is running below 3500 RPM

LHG OFF The LHG will **disengage** when **ANY** of the conditions below are TRUE:

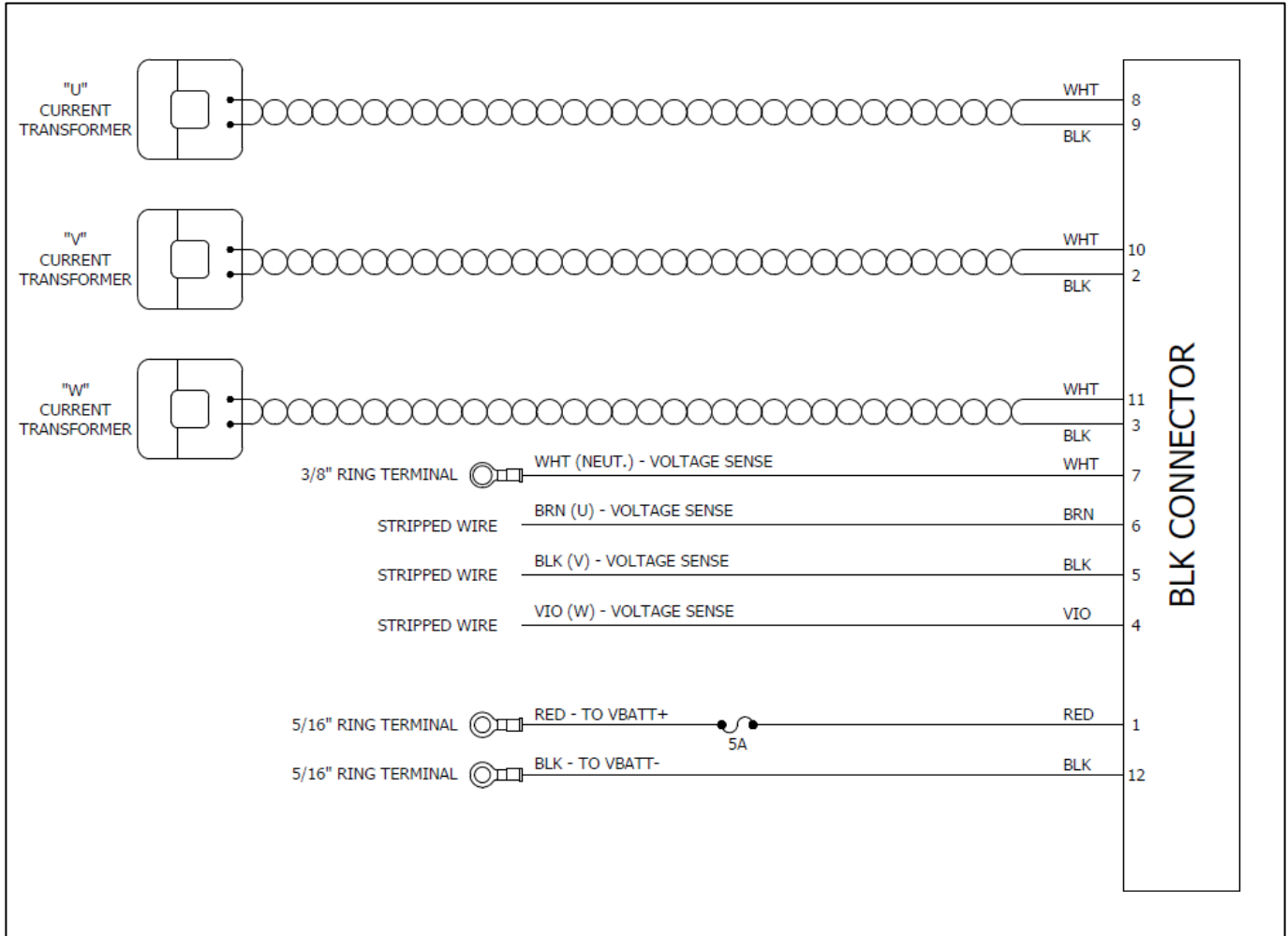
- The generator is not running (RPM less than 255)
- The generator Coolant Temperature exceeds 194°F (90°C).
- The generator's electrical load exceeds 10kW (nominal).

7 Automatic Timer (Auto Load Banking / Wet Stacking Abatement)

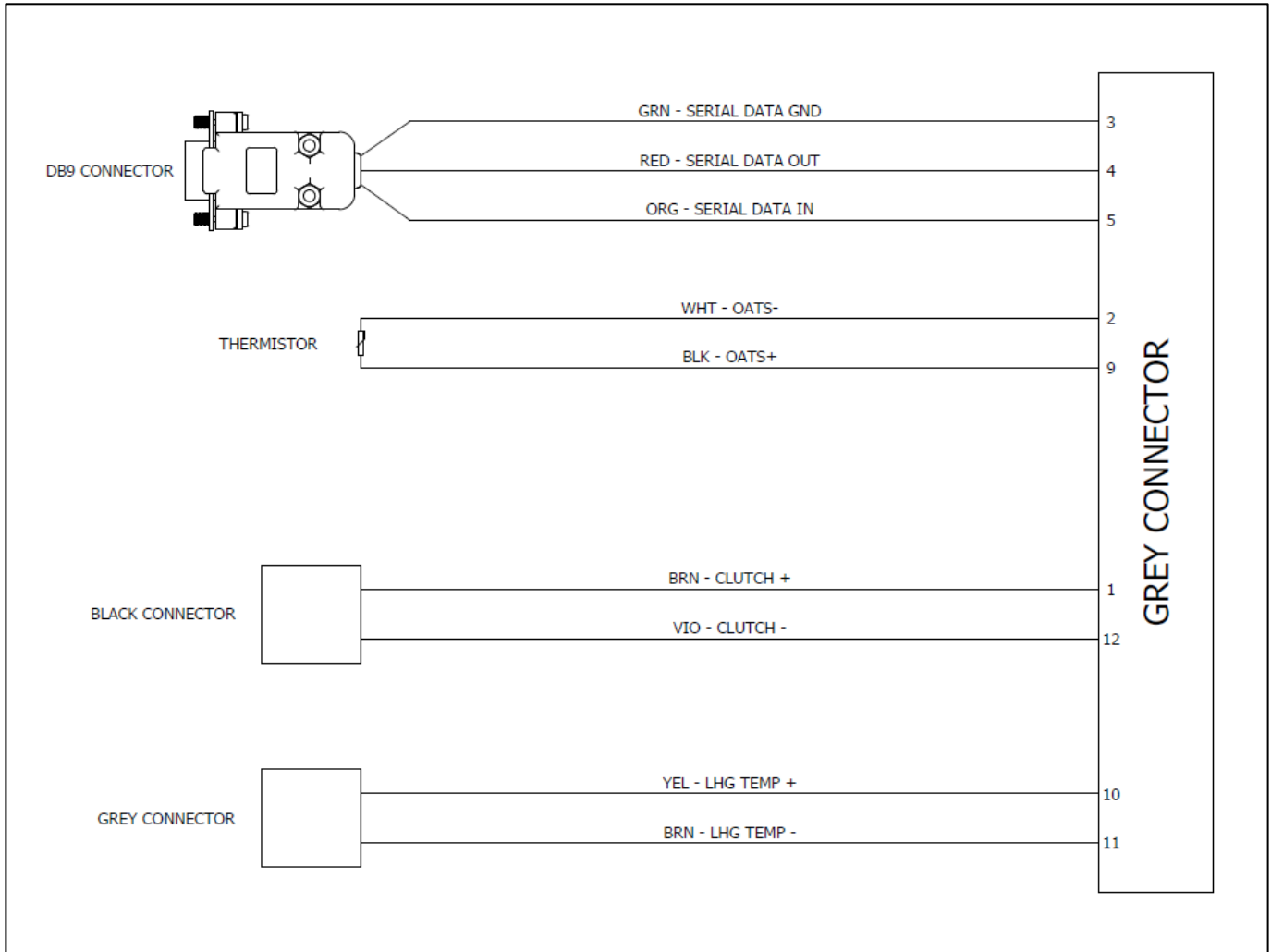
The LHG700 Controller is programmed to automatically cycle the engagement and disengagement of the LHG heater at a predetermined interval of 30 minutes ON, followed by 30 minutes OFF. The automatic timer will reset to a 30-minute countdown in the ON mode if the LHG is manually switched on or off by the operator,

8 Appendix A: Schematics of Ventech-Supplied Wiring Harnesses

LHG Power Harness:



LHG Interface Harness:



9 Appendix B: LHG Belt Guard Assembly Modification Template

The following page contains a to scale drawing and template that can be used for the LHG Belt Guard Assembly Modification mentioned in section 4.2.4.1. It was appended to this document as a letter-sized page (8.5" x 11").

If you intend to use this appendix as your template for the modification procedure, please make sure you DO NOT scale the page when reproducing it and double-check all measurements against the stated specifications.