



GLOBAL
power technologies

HEAT RECOVERY SYSTEM (HRS) Installation Manual

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1 HEALTH AND SAFETY

This manual provides instructions for the safe installation of the Global Power Technologies (GPT) Heat Recovery System (HRS).

In the event of unforeseen or special problems, it is not permitted to take unauthorized remedial action. In such cases, contact the GPT customer service department to obtain the necessary information to proceed.

All agreements, assurances, and legal relationships, as well as all obligations of GPT, shall be governed by the respective valid purchase contract which is not influenced by the content of this document.

**WARNING!**

Do not block air flow to duct openings or to the duct inlet screen. Doing so may result in over-temperature as well as damage the TEG.

**WARNING!**

If the HRS Assembly is being mounted to a wooden exterior, then a sheet metal barrier must be installed between the generator cooling fins and the wall surface.

**WARNING!**

Wear appropriate gloves and personal protective equipment. Sharp edges may exist on some of the sheet metal components.

2 THEORY OF OPERATION

The HRS System is designed to capture waste heat from the cooling fins of a Thermoelectric Generator (TEG) for the purpose of warming an interior space. A convection loop is formed between the HRS duct and the building interior. Cool air enters the HRS duct from the lower building cutout, where it is then warmed by the TEG fins before recirculating back through the upper building cutout.

The amount of convection airflow is controlled by a thermostat, actuator, and duct dampers to keep the interior at a desired temperature. A distribution fan helps disperse the warm air throughout the building interior. The HRS Control Panel connects the thermostat, actuator, distribution fan, and TEG Power and Voltage Sensing Relay (VSR) outputs. The VSR connection ensures that the thermostat will not open the damper doors if the TEG is turned off and connected to a site battery.

3 INTRODUCTION

The HRS System comes partially pre-assembled. Do not disassemble any pre-assembled parts. Throughout this manual, refer to the HRS Assembly Diagram, Figure 8, and Parts List at the end of the document. The installation requires at least two people.

The vent duct and hood extend upwards past the intersection of the exterior wall and roof. There is very little horizontal clearance in this location so there can be no roof overhang in this area.

The mounting frame for this system is designed to attach to an exterior wall. The system design permits attachment to walls of virtually any construction type. The wall must be reasonably flat, and the exterior finish should not have any significant profile. Fasteners specific to the type of wall are required for attaching the HRS and are not supplied with the system. Should wood frame construction be used, the frame is designed for 16-inch on center mounting.

Ensure the inside of the wall the HRS is to be mounted upon provides unblocked air circulation to both the top and bottom duct openings. Space any equipment a minimum of 6" (152mm) away from the duct openings. Do not allow materials to be stacked against the wall blocking duct openings during operation.

The HRS System electrical components consume a maximum of 13W (10W nominal) of TEG output power when energized. Remaining TEG power is available for customer site loads.

4 RECOMMENDED INSTALLATION HARDWARE

1. Fasteners to attach the HRS system to the wall, suitable for the wall type. Minimum Quantity: 16 required. Mounting holes are 5/16" diameter generally suited for nominal 1/4" diameter fasteners.
2. Carpenter's square for checking the level of assembly.
3. Tools suitable for cutting holes in the wall material as required.
4. 1/4" Nut Driver
5. 24 V_{DC} Power Supply (minimum 6W).

5 UNCRATING

1. Remove the lid from the crate.
2. Remove the actuator cover screws and the Actuator Cover ([Item H15, Figure 8](#)). Store in a safe area.
3. Remove screws securing complete assembly to the crate.
4. Carefully lift the HRS Major Assembly from the crate.
5. Remove the distribution fan assembly from the crate and store it in a safe area.

6 CREATING THE WALL OPENINGS

Correct positioning of the wall openings is the most critical step in HRS installation. Ensure that your chosen cutout positions meet all constraints listed below before proceeding with the cutting process. Refer to Figure 1 throughout this section.

1. **Constraint:** The lower wall cutout must be at least 24.5" (622mm) above ground level. If snow is common in the region, then the lower cutout must be at least 24.5" (622mm) above the maximum snowpack height instead.
2. **Constraint:** The upper wall cutout must be no more than 49" (1245mm) vertically below the peak building height, else the exhaust duct will not clear the rooftop.
3. **Constraint:** Roof overhang above the wall cutouts cannot exceed 1.75" (44mm).
4. **Constraint:** The upper wall cutout should be 10" (254mm) below the interior ceiling to allow for mounting of the hot air distribution fan.

Choose the highest position for your wall openings that meets all constraints. The wall cutouts should be 12" (305mm) wide and 14" (1209mm) tall, with a vertical separation of 47.6" O.C (1209mm). Mark the locations as required, and then proceed with cutting.

One or more cable/conduit wall cutouts will be required for system wiring. It is recommended to make these cable entry holes during installation Section 15. Example cable entries are shown in Figure 1 below.

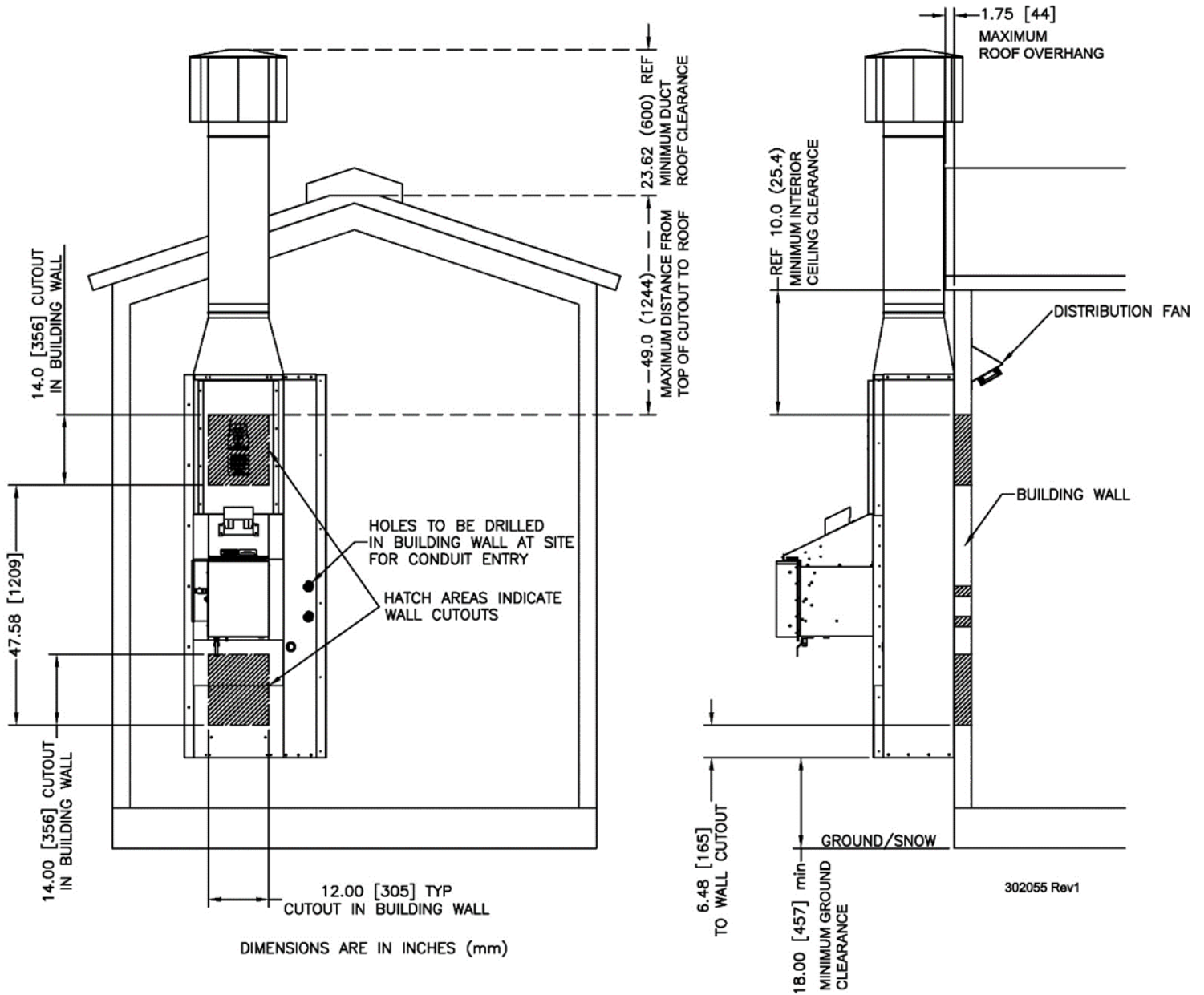


Figure 1 - Building cutout dimensions

7 MOUNTING THE HRS MAJOR ASSEMBLY

1. After wall cutouts are completed, locate the HRS Major Assembly, shown in Figure 4 below. Do not disassemble this assembly.
2. Level the HRS Major Assembly in the correct location and secure to the building exterior through the frame's pre-drilled holes. Holes are 5/16" diameter and spaced at 16" O.C and are suited for nominal 1/4" fasteners. These fasteners are not supplied as they are dependent on the type of wall to which the HRS is being attached (i.e.: wood, masonry, metal).
 - If you are having difficulty centering the HRS Major Assembly over the building cutouts, you can mark the center of the damper doors using a sharpie or temporary tape. Then one operator can visually confirm centering from the building interior while the other operator positions it.
3. Seal any gaps between the building wall and the HRS Major Assembly with the supplied caulking.
4. If additional support for the HRS duct tube is required due to strong winds or heavy snow, an option wall support to support the duct tube against a straight wall, PN 304003 or roof support to provide support to the duct tube on a sloped roof, PN 304002 is available, contact GPT for more information.

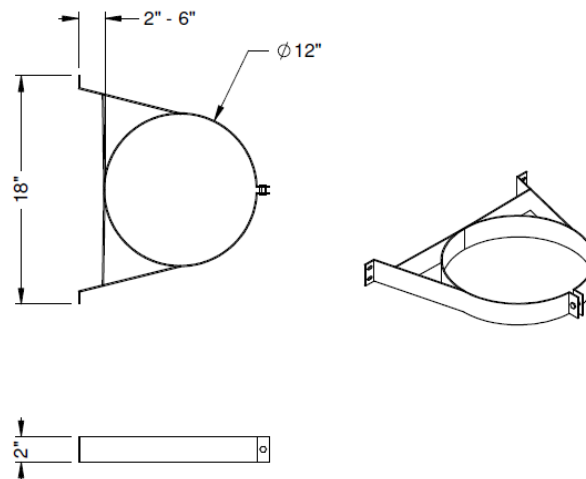


Figure 2 – PN 304003, Optional Wall Support

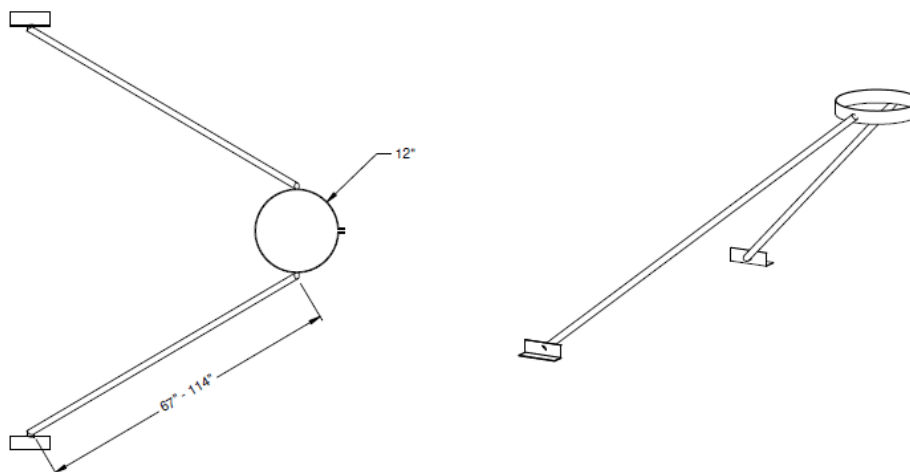


Figure 3 - PN 304002, Optional Roof Support



Figure 4 – HRS Major Assembly (do not disassemble)

8 ATTACHING A MODEL P-5050/P-5100 TEG TO THE HRS MAJOR ASSEMBLY

1. If it came pre-installed, temporarily remove the Heat Shield Cover (Item H18, Figure 8) from the front of the front of the HRS Major Assembly. It should now look like Figure 4 below.
2. Remove the model P-5050/P-5100 thermoelectric generator from the crate by undoing the 4 bolts holding the TEG to the crate.
3. Carefully place the TEG on its back so it is resting on its cooling fins. This is the best way to set down the TEG once the temporary shipping legs have been removed.
4. Remove the shipping legs from the generator by first detaching the HRS mounting bar. Retain the six 1/4 x 2.5" hex screws removed from the legs for TEG installation. Keep the shipping legs in case the TEG needs to be sent in for service.
5. Reattach the HRS mounting bars on each side of the generator using the four 1/4 x 2.0" hex screws and washers that shipped loose with the HRS system. Install these screws/washers in the two recessed holes on each mounting bar.
6. Install two of the previous 1/4 x 2.5" hex screws into the bottom two non-recessed holes on each mounting bar, leaving the topmost hole empty for now.
7. Fully engage these screws, then loosen them by 6 full turns.
8. Carefully lift and position the TEG in the HRS Duct so that the loosened screws drop into the slotted holes on the sides of the HRS frame.
9. Install the topmost 1/4 x 2.5" hex screw on each side of the generator.
10. Level the TEG using a carpenter's square, then fully tighten all hex head screws to secure the TEG to the mounting frame.

9 ATTACHING A MODEL 5220 TEG TO THE HRS MAJOR ASSEMBLY

1. Remove the model 5220 thermoelectric generator from the crate by undoing the 4 bolts holding the TEG to the crate.
2. Note that there are fragile electronic components located on the underside of the model 5220 TEG cabinet, so use caution to ensure they are not damaged.
3. Carefully place the TEG on its back so it is resting on its cooling fins. This is the best way to set down the TEG once the temporary shipping legs have been removed.
4. Remove the shipping legs from the generator.
5. Remove the lifting lug from behind the TEG exhaust port.
6. Retain the shipping legs, lifting lug, and associated fasteners in case the TEG needs to be sent in for service.
7. The HRS mounting bars on the sides of the generator should each have six installed 1/4" hex screws. Remove and retain the middlemost non-recessed hex screw from each side.
8. Loosen the topmost and bottommost non-recessed screws on each side by 6 full turns.
9. Carefully lift and position the TEG in the HRS Duct so that the loosened screws drop into the slotted holes on the sides of the HRS frame.
10. Reinstall the middle hex screw on each side of the generator.
11. Level the TEG using a carpenter's square, then fully tighten all six hex head screws to secure the TEG to the mounting frame.

10 INSTALLING THE WARM AIR EXHAUST

1. Install the square-to-round transition duct (Item H6, Figure 8) to the top of the HRS assembly using the supplied #8 X 1/2 hex screws (3 screws per each of the 3 sides). Ensure this transition fits over the wrapper to prevent water ingress.
2. Use the supplied caulking materials to seal the contact area between the wall and the transition.
3. Install the 12" diameter warm air exhaust tube using the supplied #8 X 1/2 hex screws. The bottom end of this tube (without the rolled lip) should be installed on the outside of the transition duct, folding in the edges of the transition duct as necessary.
4. Attach the AeroFoil Ventilator (Item H5, Figure 8) to the top of the exhaust tube using supplied #8 X 1/2 hex screws. The bottom of this ventilator should be on the outside of the exhaust tube, so fold in the exhaust tube edges as necessary.

11 FINISHING THE FRONTSIDE INSTALLATION

1. If it was removed in prior steps or came uninstalled, locate the Heat Shield Cover (Item H18, Figure 8) with the labels and logo. Install this on the front of the HRS Assembly using the supplied #8 X 3/8" Philips sheet metal screws. See Figure 5 below for reference throughout this section.
2. Install the left and right upper covers (Items H16 & H17, Figure 8) using the supplied #8 X 9/16" screws. These L-shaped covers should be installed so the bottom edge of the front-facing piece is flush against the top of the TEG body. For model P-5050 & P-5100 generators, these upper covers need to slide behind the TEG rain cap.
3. Identify the correct lower cover for your model of TEG (Items H19 & H20, Figure 8). Models P-5050 & P-5100 should use the 9" X 17.75" lower cover, while the model 5220 will need the larger 11.25" X 17.75" lower cover. The unused lower cover may be discarded.
4. Install this lower cover below the TEG using the supplied #8 X 9/16" screws. It is mounted onto the lower arms of the left and right upper covers and should be flush against the bottom of the TEG.

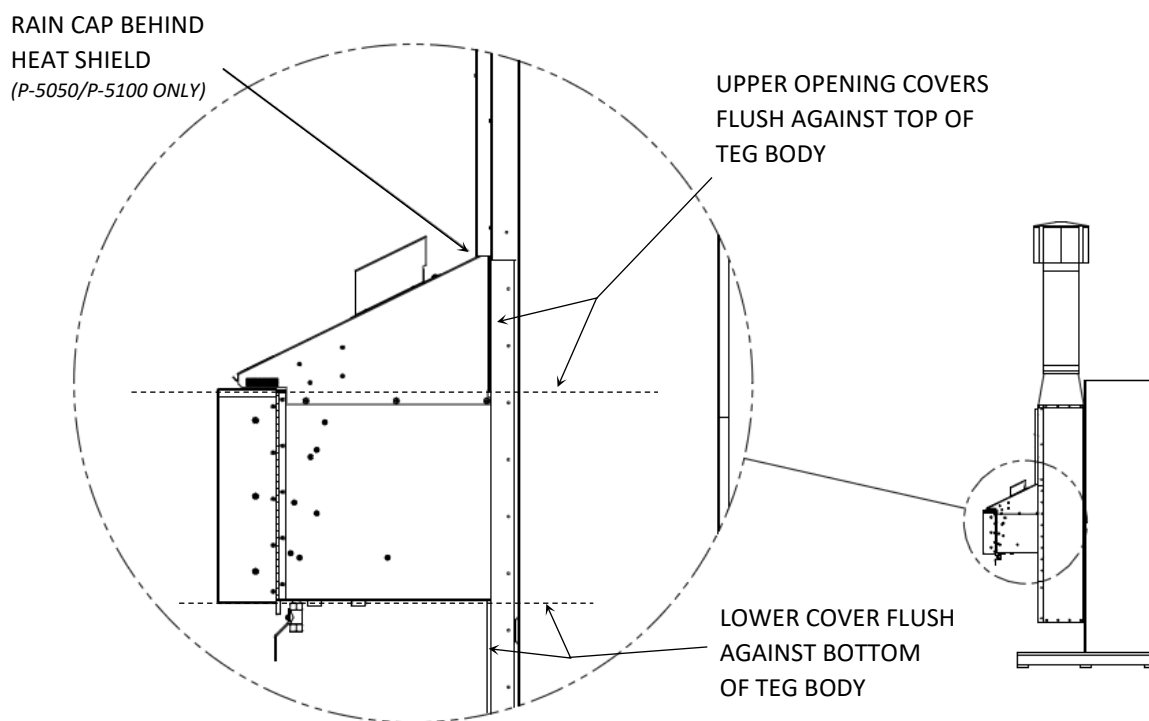


Figure 5 – Frontside Installation Details

12 DAMPER DOOR AND LINKAGE ADJUSTMENT

The assembly arrives with the actuator link and damper doors preconfigured for normal operating conditions, but a verification test must be performed before running the system with heat applied. The below steps can also be followed if adjustment is required during routine maintenance.

1. With both damper doors closed, verify the control arms on the damper and actuator shaft are at an angle of 45° from the duct walls. See Figure 6 below.
2. With the actuator electrically disconnected, connect the $24 V_{DC}$ power supply to the actuator motor leads. Turn on the power supply and observe the door movement from closed to open. Turn off the supply and observe the doors close.
3. Adjust the control arms and linkages, if necessary, to obtain full closure and opening of the damper doors. They should slightly touch the insulation at the far side of the duct when open.

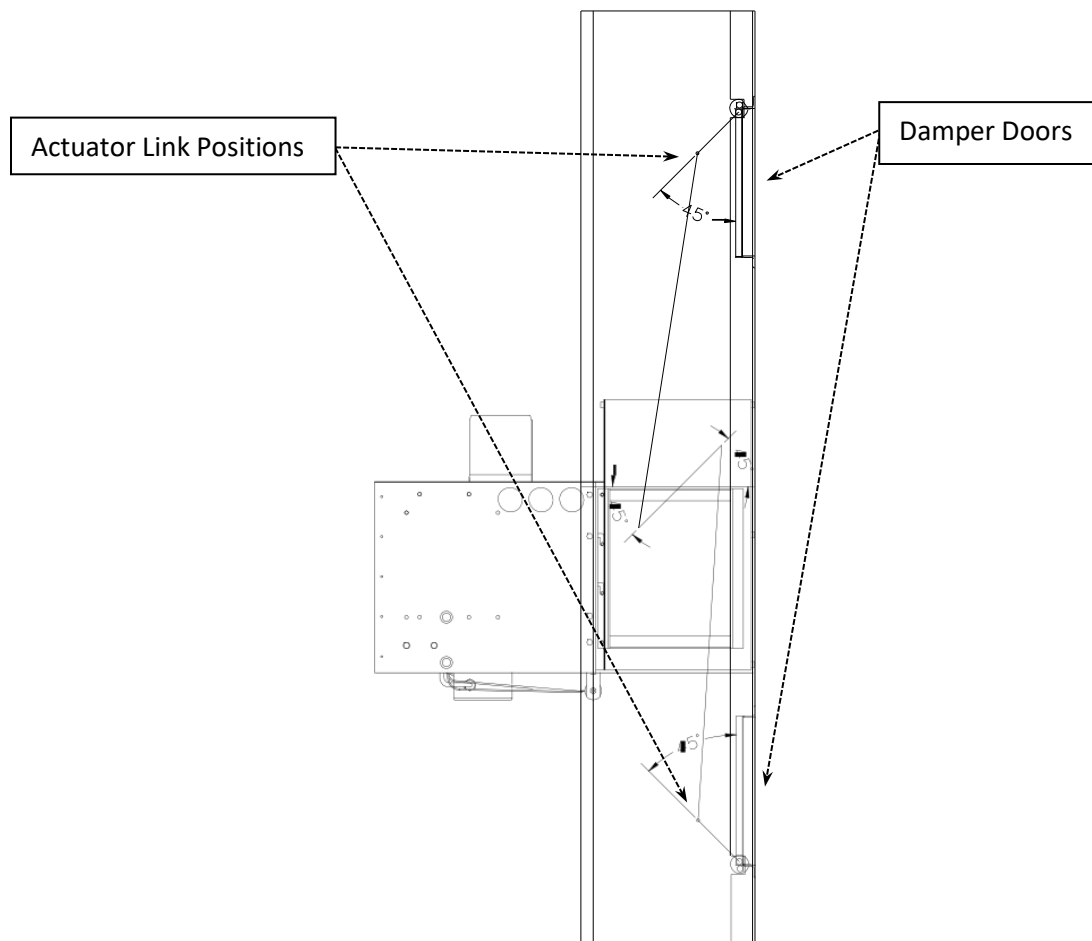


Figure 6 – Linkage adjustment; dampers shown in closed position

13 HRS CONTROL PANEL INSTALLATION

The HRS Control Panel enclosure is IP66 / NEMA 4X rated and may be mounted on the building exterior or interior. Choose a central mounting location that best suits the site, knowing that the HRS Control Panel will need to connect to the thermostat, distribution fan, actuator, and TEG.

- Control Panel mounting hole dimensions: 7.024" X 11.206" (178.4mm X 284.6mm)

14 THERMOSTAT AND DISTRIBUTION FAN INSTALLATION

1. Mount the thermostat in the desired position on the interior wall away from warm and cold drafts.
2. Adjust the thermostat temperature setpoint to the desired level for the building.
3. Mount the hot-air distribution fan in the desired position on the interior wall above the upper wall cutout. Ensure the direction of fan air flow is pointing downwards.

15 HRS SYSTEM WIRING

Refer to the Wiring Diagram in Figure 7 for interconnection details. System wiring is not supplied with the HRS Assembly.

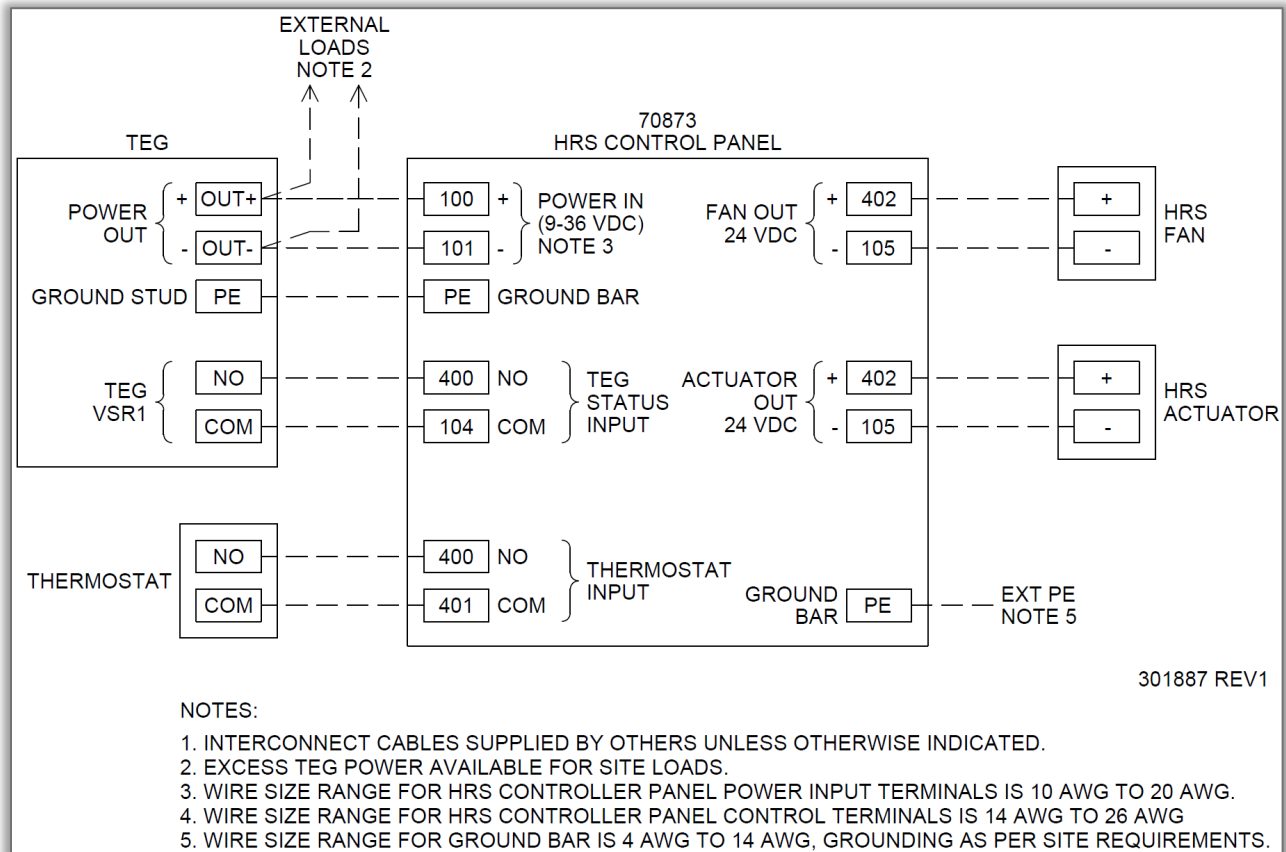


Figure 7 – Wiring Diagram for Heat Recovery Systems

- One or more small wall cutouts are required for these wiring connections; see Figure 1 in Section 6. These holes should be sized appropriately for the customer's system wiring. Ensure these holes are positioned so they are protected within the actuator cover (Item H1, Figure 8) once installed.
- Holes should be drilled in the bottom of the HRS Control Panel enclosure to accommodate system wiring connections as required.
- Refer to the [TEG Operating Manual](#) as required for the location of the TEG POWER OUT connections and GROUND STUD.
- Refer to the [TEG Operating Manual](#) for the location of the TEG VSR1 connection point. For TEG models with two VSR's, connect to VSR1 only. The TEG VSR1 should remain at factory settings (set to trigger at 11.5V for a 12V TEG, or 23V for a 24V TEG) and not be adjusted.

16 COMPLETING THE INSTALLATION

1. Connect the fuel supply to the TEG manual shutoff valve (TEG fitting is 1/4" Female NPT) using the thread sealant provided with the TEG. Leak-check the complete fuel system from the fuel supply line to the burner inlet using a commercial leak detector fluid such as Snoop®.
2. Perform the steps in Sections 2.2/2.3 in the TEG Operating Manual for starting and tuning the TEG.
 - ***P-5050 & P-5100 TEGs only.*** It is important to disconnect all connections from the TEG Customer Output when evaluating its V_{SET} voltage. This includes the connection to the HRS Control Panel. If this is not done, there is a risk the TEG may end up overfired, resulting in a shortened lifespan.
3. Connect any external site loads to the TEG power output terminals as required.
4. Go through the System Checklist in the next section before attaching the actuator cover.
5. Position the actuator cover (Item H1, Figure 8) over the actuator assembly and linkages, then attach to the HRS Assembly using the supplied #8 X 9/16" screws.

17 SYSTEM CHECKLIST

Once all other installation actions have been completed, populate the System Checklist on the following page with details from the installation.

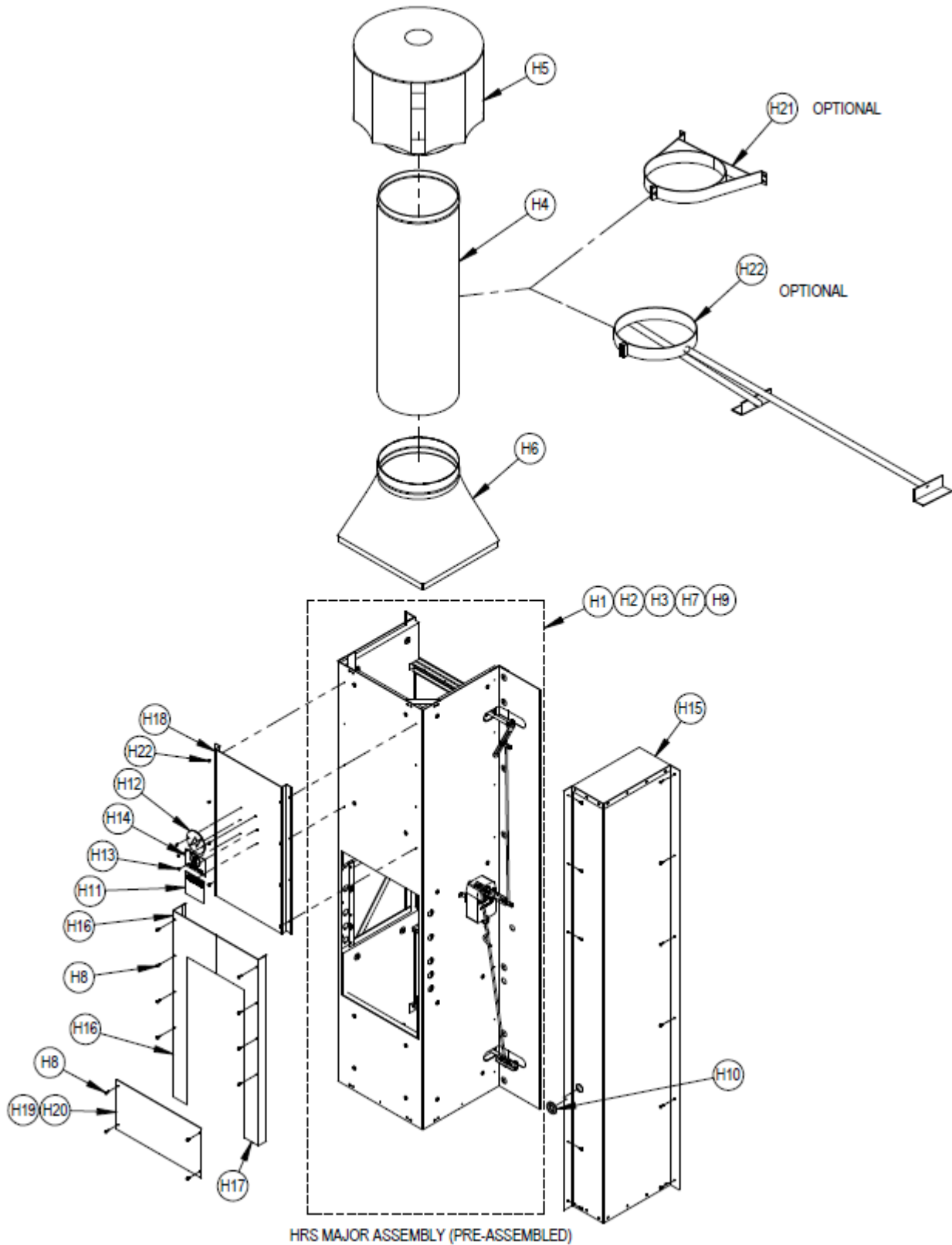
Completion and return of this checklist with photos to GPT Customer Service is required to activate the warranty on HRS Systems. Contact information for GPT Customer Service is included below.



#16, 7875 - 57th Street SE
Calgary, Alberta T2C 5K7
Direct: (403) 720-1190
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E-mail: customer.service@globalte.com
Web: www.globalte.com

Heat Recovery System Checklist		
Company Name		
TEG Model & Serial Number	P-5050 / P-5100 / 5220	SN: _____
Installation Requirement		Confirmation
Are both top and bottom duct openings clear of obstructions?		YES / NO
Measured dimensions of top duct opening, width X height:		_____ X _____
Measured dimensions of bottom duct opening, width X height:		_____ X _____
Least measured distance between either interior duct opening and any interior mounted equipment:		_____
If the HRS is attached to a wooden exterior, is a sheet metal barrier installed between the exterior and the cooling fins?		YES / NO / N/A
Confirm mesh inlet screen at the bottom of the duct is undamaged:		YES / NO
Measured distance from snow or ground level to mesh inlet screen at the bottom of the duct:		_____
Measured distance from roof peak to top of HRS duct rain cap:		_____
TEG fuel system leak-check completed with no leaks observed:		YES / NO
TEG is able to start up and produce correct power for the present ambient temperature and altitude. Record setup voltage and ambient temperature.		V _{SET} : _____ T _{AMB} : _____
----- HRS System Test -----		
<p>A short final systems test should be performed to confirm functionality with the completed installation. Follow each step below and verify expected result. Remember to reset your thermostat setpoint once the test is completed.</p> <ol style="list-style-type: none"> 1. Set the thermostat setpoint <i>above</i> the current ambient temperature and confirm the damper doors fully open without binding. 2. Confirm the air distribution fan operates when dampers are actuated. 3. Set the thermostat setpoint <i>below</i> the current ambient temperature and confirm the damper doors fully close without binding. 		<p>YES / NO</p> <p>YES / NO</p> <p>YES / NO</p>
<p>At least three photos taken of HRS installation:</p> <ol style="list-style-type: none"> 1. Photo of building interior showing the wall cutouts. 2. Photo of HRS Assembly, angled from left side. 3. Photo of HRS Assembly, angled from right side (actuator cover off). 		YES / NO

18 HRS ASSEMBLY DIAGRAM AND PARTS LISTS



66658 Rev3

Figure 8 – Heat Recovery System Assembly, exploded view

Item	Part No.	Description	HRS ASSEMBLY PARTS LIST
H1	65700	DUCT WRAPPER, W/ INSULATION, 16" DEEP HRS, P-5050/P-5100/5220	
H2	65701	DUCT FRAME WELDMENT, 16" DEEP HRS, P-5050/P-5100/5220	
H3	65811	DAMPER WELDMENT, TOP & BOTTOM, 16" DEEP, P-5100 HRS	
H4	21061	TUBE, 12" DIA. X 36" LG, GALV. STEEL, HRS	
H5	1165	VENTILATOR, AERO-FOIL	
H6	65720	TRANSITION, 18" X 16" TO 12" DIA., 15" DEEP HRS	
H7	21065	ACTUATOR ASSEMBLY, HRS	
H8	301627	SCREW, SELF TAP, HEX, #8X0.563, ZN PLT	
H9	65722	SCREEN, INLET, 16" DEEP HRS, P-5050/P-5100/5220	
H10	6939	GROMMET, SPAENAU RB-106	
H11	684	LABEL, CAUTION, HOT SURFACES	
H12	683	LABEL, GPT BRANDING	
H13	393	RIVET, POP, 1/8 DIA, .063-.125 GRIP, 305 SS	
H14	6609	LABEL, CAUTION, HOT	
H15	65876	COVER, ACTUATOR ASSY, 16" DEEP HRS	
H16	66641	COVER, UPPER OPENING, HRS, P-5050/P-5100/5220, LEFT	
H17	65719	COVER, UPPER OPENING, HRS, P-5050/P-5100/5220, RIGHT	
H18	65875	HEAT SHIELD, HRS	
H19	65721	LOWER COVER, DUCT, HRS, P-5050/P-5100	
H20	302100	LOWER COVER, DUCT, HRS, 5220	
H21	304003	WALL SUPPORT, HRS DUCT TUBE, (OPTIONAL, CONTACT GPT)	
H22	304002	ROOF SUPPORT, HRS DUCT TUBE, (OPTIONAL, CONTACT GPT)	

Part No.	Description	HRS SYSTEM PARTS LIST
352	CAULKING GUN	
353	SEALANT, DOW 732-CL, 300 ML	
21050	FAN ASSY, HRS	
58427	TSTAT, WALL MOUNT, HONEYWELL T822K1034	
65724	SCREW, HEX HD, 1/4 X 2, SS	
65725	SCREW, HEX HD, 1/4 X 2.5, SS	
70873	HRS CONTROL PANEL	

For parts and service please contact Global Power Technologies' Customer Service Department at:



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