55 Dragon Court, Woburn, MA 01801, Tel: (781-933-7300), www.Lytron.com

820-0228 – Install Instructions for Cryo Comp. Flow Meter (P/N: 205-0121) GE P/N: 5156316

Tools Required:

- 7/8" wrench or slip wrench
- Adjustable wrench or slip wrench
- Tie Wraps (Lytron P/N 101601-01)
- 2' foam insulation tape

Removal Procedure:

1. Perform shutdown of system in accordance with Lytron manual #820-0190.
2. Lockout/Tag out system in accordance with GE procedures.
3. Drain system. Drain system in accordance with Lytron manual #820-0190. Alternate draining through the pump housing is also permissible.
4. Move Electrical Power Box out of the way by following Lytron procedure #820-0233.
5. Remove cabling to flow meter by disconnecting from Signal Box and cutting retaining tie wraps along wire route.
6. Disconnect incoming fluid from Cryo meter (top) by using the adjustable wrench and 7/8" wrench. (Refer to Photo 1)

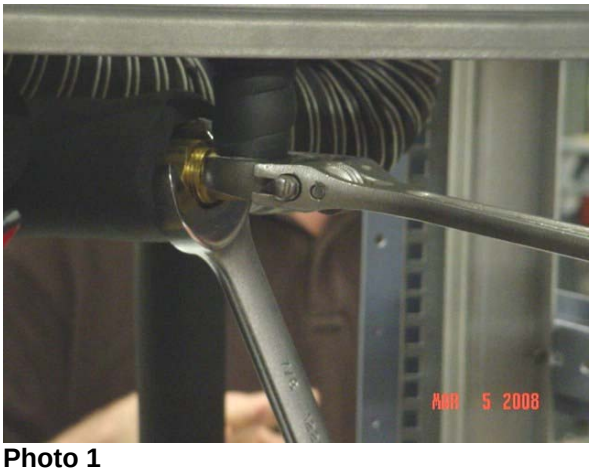
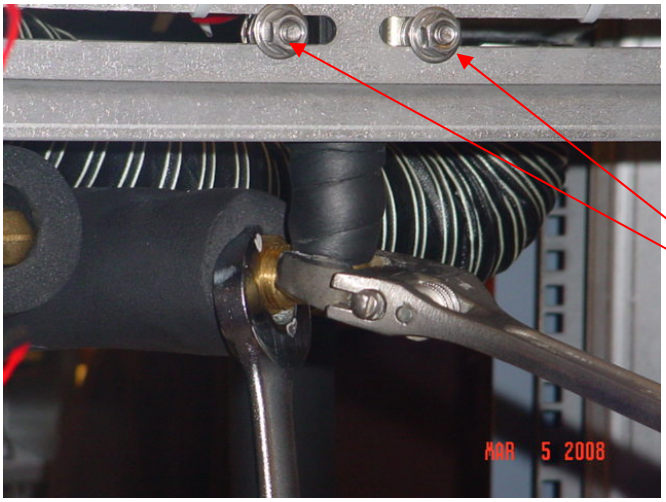


Photo 1

7. Disconnect outgoing fluid from Cryo meter (bottom).
8. Loosen 3/8" nuts securing Cryo meter (2 places).

NOTE: There are 4 flat washers and 1 lock washer per bolt. Care should be taken so that they do not drop into machinery.



3/8” Nuts & supporting washers

Photo 2

9. After removing 3/8” nuts and supporting washers & bracket, remove the Cryo meter assembly from the top of the machine. (Refer to Photo 2)

End of Procedure

Re-install of Cryo Comp. Flow Meter (P/N: 205-0121)

1. From the top of the machine, place the Cryo meter so that it will easily mate with supply and return lines (top and bottom).
2. Use mounting bracket and 3/8” nuts and supporting washers that were saved during the removal of the old meter. Use 4 washers and a lock washer per bolt.

CAUTION: Do not over tighten the 3/8” nuts as this might impede flow through the meter.

3. Connect the upper and lower fluid connections using an adjustable wrench and a 7/8” wrench.
4. Route cable for Cryo meter along support beam toward the left edge of the machine. Secure with suitable tie wraps.
5. Continue to route cable until it terminates at the Signal box jack XX to jack 26. Secure with tie wraps.
6. Fill system in accordance with Lytron manual #820-0190.
7. Check for leaks around unit just installed.
8. Wrap exposed joints with foam insulation tape to prevent condensation.
9. Return machine to running condition per Lytron manual #820-0190.

End of Procedure

820-0229 - REPLACEMENT INSTRUCTIONS FOR PN 205-0121-01 PUMP AND 205-0121-25 (GE PN 5156321)

PPE REQUIRED: Safety glasses, Safety shoes, Gloves

TOOLS REQUIRED:

- Tools included with FRU
  - Strap Wrench
  - Pliers for VFD Chip
- Hoist Service Kit 5196226
- Non-Magnetic Tool Kit 5113258
- Bucket
- DVMR Coolant 5174313-4 (1 kit = 4 US Gal)

REMOVAL PROCEDURE:

1. Perform shutdown of system in accordance with Lytron manual #820-0190.
2. Disable MagMon from sending alarms during procedure.
3. Lockout/Tagout system in accordance with GE procedures.
4. Drain the respective pump by:
   a. Closing the gate valve beneath the reservoir.
   b. Direct the hose at the bottom of the pump into bucket.
   c. Open the drain valve and remove the bolt on the face of the pump. Refer to picture below for pump locations.

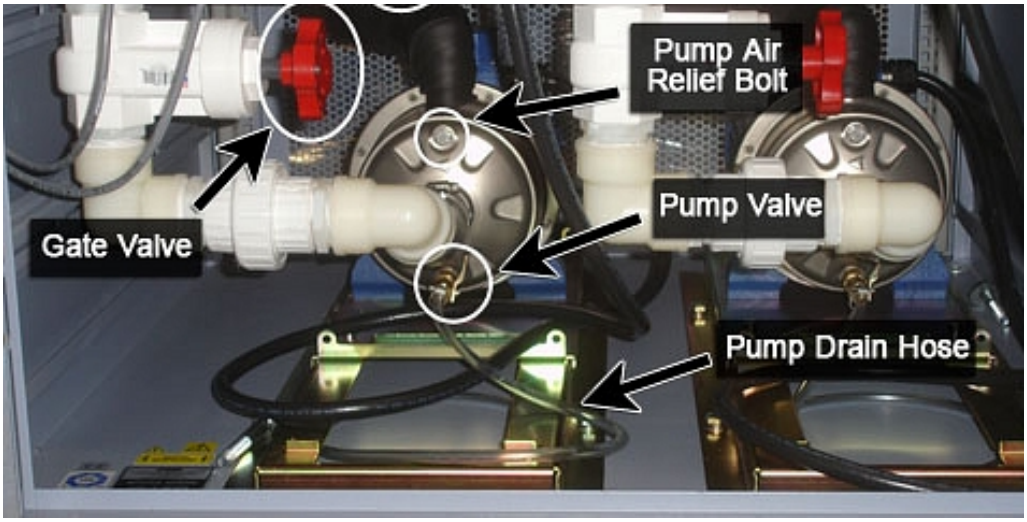


Photo 1 Component Locations for Draining (Ebara Pump)

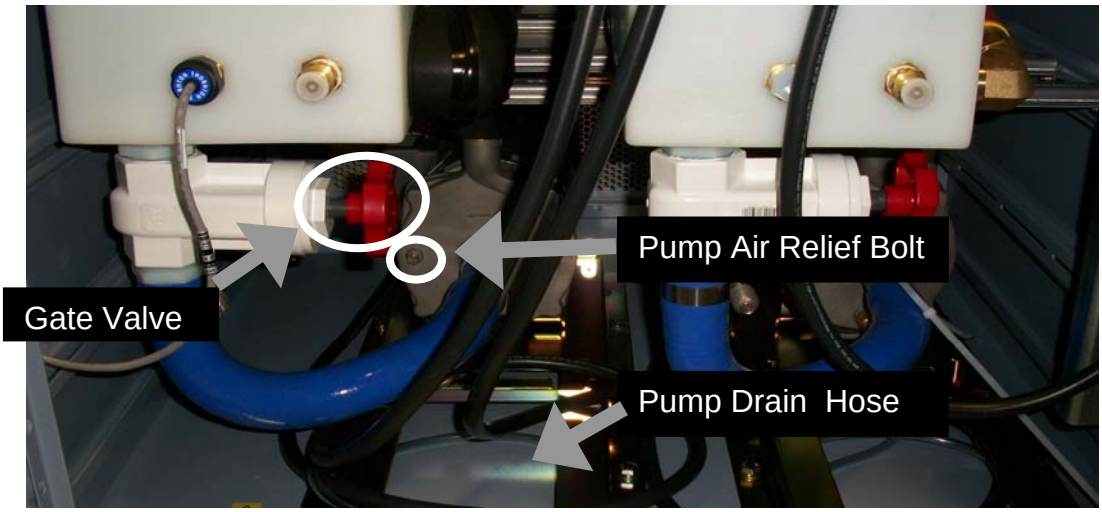


Photo 1A Component Locations for Draining (Price Pump)

5. Install Hoist Assembly (reference GE service procedure) and Chain lift assembly included in Pump FRU kit.
6. Open Front cover of Power box inside HEC.
7. Locate Variable Frequency Drive (VFD) for pump in question.
8. Remove pump supply wiring from VFD (record wire locations for re-installation).
9. Remove power cord from bottom of Power Box.
10. Remove discharge hose from top of pump using Slip-joint pliers on SAE flare fitting.
11. Break suction hose from tank at union (see Photo #2) using strap wrench (applies to Ebara pump only).

Photo 2 - Breaking the Suction Hose Connection to the Tank (Ebara Pump Only)

12. Loosen hose clamp to remove blue suction hose(applies to updated Ebara configuration and Price pump).
13. Loosen retaining screws for pump tray (2 places – Refer to photo)

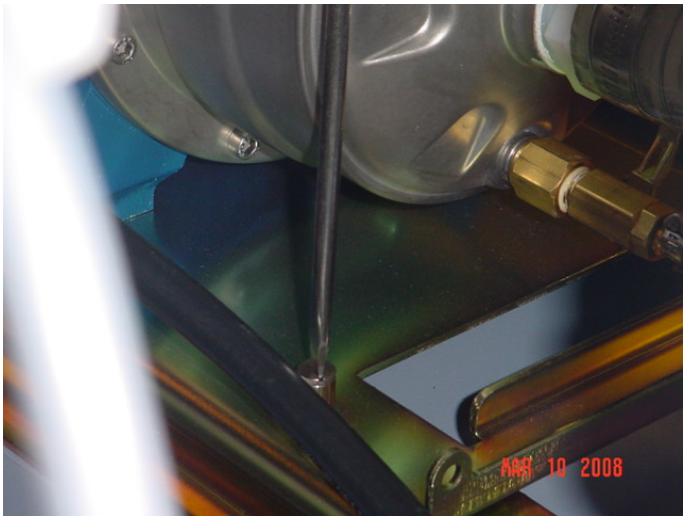


Photo 3 Loosening the Pump Tray Retain Screws

14. Grab tray by built in handle and pull forward until it stops. Lift up over lip of cabinet to facilitate lifting with hoist.

15. Assemble Hoist Kit to HEC.

16. Attach Chain lift assembly to pump lifting brackets on 4 corners of pump plate. Ensure that both chains going to back brackets are mated to the same link. Ensure the front bracket chains are likewise mated. This will provide a balanced lift.
17. Attach Chain lift assembly to Hoist assembly.

Photo 4 Hoist Assembly Hook and Chain

18. Place Hoist Assembly handle in “Up” position.

Photo 5 Hoist Handle in “UP” Position

19. Ratchet Hoist Assembly handle to begin lifting the pump.
20. When pump is high enough to clear cabinet, carefully swing Chain lift assembly toward the packing crate
21. When pump is in proper position, place Hoist assembly ratchet in “Down” position.
22. Lower pump until it is settled in crate.

End of Procedure

INSTALLATION PROCEDURE

NOTE: Depending on the revision of the HEC, it is possible that there is a mismatch between pump suction hoses. The molded blue hose should be used whenever possible.

1. If the system has a rigid PVC hose present, it must first be removed. Refer to the boxed outlined section below titled “INSTALLING THE MOLDED HOSE” on how to remove the rigid PVC suction line.
2. Machine should be in a shutdown condition as required by above procedure.
3. Position Pump crate as close to machine as possible to facilitate lifting of the pump.
4. Attach Hoist Assembly chain hook to the pump through 4 eyelets located on the pump tray.

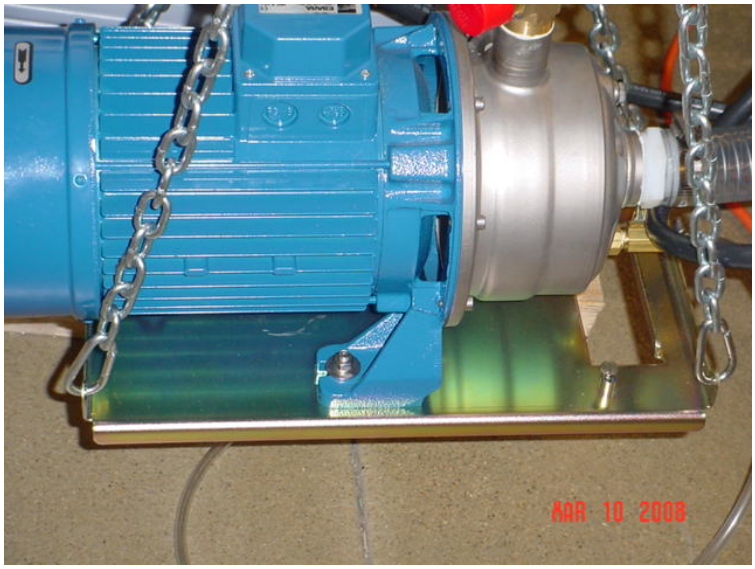


Photo 6 Lifting the Pump Assembly (EBARA pump pictured)

5. Place Hoist Assembly handle in the “UP” position.
6. Take slack out of chain length by ratcheting the handle.
7. While guiding the tightened chain with your free hand, slowly lift the pump until it clears the lip of the machine.
8. Slide the pump into the machine along the Hoist Assembly track.

NOTE: The pump will be unable to go the complete distance due to the angle with the machine.

9. Lower the pump until the pump front end rests on the lip of the machine.
10. Remove the Hoist Assembly chain hooks from the pump.
11. Move the pump onto the pump positioning tracks.
12. Slide the pump back into the machine to align and tighten the two thumbscrews that secure the pump.
13. Remove the Hoist Assembly from the machine.
14. Reattach discharge hose at top of pump.

INSTALLING THE MOLDED HOSE:

1. Remove existing pump suction hose assembly from HEC (leave gate valve in place: ensure it does not rotate when removing fittings with slip-joint pliers)

2. Wrap threads of supplied plastic barbed fittings with the supplied PTFE tape. Wrap entire area of threads with two full wraps (in a clockwise direction when looking at the threaded end).

3. Thread new hose barb fitting into bottom of gate valve to make a leak-tight connection.

4. Place the supplied Breeze-brand hose clamps over pump suction hose and install over barb on front of the pump and beneath the gate valve (hose is orientation specific and can only be installed one way). Refer to photo below

5. Tighten Breeze hose clamp until the stacked washers flatten.

.

15. Fill the system in accordance with Lytron manual #820-0190. Ensure gate valve beneath tank is fully open.
16. Route the power cable for the pump through the machine to the Power Box.
17. Wire the pump to the appropriate Variable Frequency Drive (VFD). Wires are phase sensitive and need to be installed in correct location (see labels on wires)

IMPORTANT: The HEC may have pumps from different manufacturers. (Price or Ebara). It is imperative that the pump type be exactly matched with the correct VFD chip. The Pump FRU kit will contain the correct VFD chip for the pump, as well as a pliers to facilitate removal and replacement of the VFD chip.

An incorrectly-matched pump and VFD chip will result in either high pressure or low flows, risking equipment damage and/or systems errors.

Price pumps/chips and the Ebara pump/chips can be identified according to the following photos and descriptions:

Price

Ebara

Price Pump:

Irregular pump face shape.

Bolt at 9 o'clock position on pump face.

Price VFD Chip:

Identified with 'P"

Ebara Pump:

Circular pump face shape.

Bolt at 12 o'clock on pump face.

Ebara VFD Chip:

Plain, colored chip.

NOTE: Suction hose is independent of pump type (Ebara cabinets may have white or blue hose type)

The gradient coil pump in on the left-hand side of the HEC and corresponds to the VFD in the left most location in the Power Box. The power electronics pump is on the right-hand side of the HEC and corresponds to the VFD in the middle location in the Power Box. The right most VFD is for the chilled air blower and is not impacted by this replacement procedure.

If the style of chip matches the style of pump according to the above descriptions, the next section can be skipped and you may proceed with the next step in the installation procedure.

The chip is replaced using the pliers shipped with the Pump kit. Remove the tape holding the chip in the front of the respective VFD in the Power Box. Grab with the pliers and pull straight out. To install the new chip, align it according to its keyed shape and press in fully with your finger. Place a piece of tape (in the FRU kit) over the newly-installed chip.

(Note: If the VFD chip is missing, lost or broken from the Pump FRU, see the GE FRU Manual and order the correct VFD chip.)

Figure 6 Remove the existing VFD chip with replacing the Ebara pump with a Price Pump.

Figure 7 Complete installation. (This HEC has an Ebara gradient coil pump and a Price power electronics pump, as noted by the 'P' on the VFD chip in the power electronics VFD)

18. Replace front cover of Power Box.

FINALIAZTION

1. Clear the Lockout/Tagout in accordance with GE procedures.
2. Re-start HEC and turn pump ON. Add new DVMR coolant as necessary.
3. Check for any leakage. Repair if necessary.
4. Perform a TPS reset.
5. Ensure HEC is in a scan-ready state and not in the low power mode; this is done by prescribing a scan at least to the point where the scan protocol.
6. Return to the HEC and view the displayed speeds on the two pump VFDs.

Note if the VFD is displaying 'F1' the VFD chip is either not installed or not seated fully.

Review the charts below and circle 'YES' or 'NO' below, indicating you have confirmed the correct speed based on pump and system configuration:

GRADIENT COIL PUMP:

Pump Type (identify as described above):	EBARA	PRICE
Displayed Value On left-most VFD ('VFD GPMP')	50 +/- 1	61 +/- 1

CORRECT GC Pump Speed? YES / NO

POWER ELECTRONICS PUMP:

Pump Type: (identify as described above):	EBARA		PRICE	
RF-amplifier type in PGR cabinet (identify by presence of red and blue cooling hoses hooked up to front of RF-amplifier. Hoses will not be present on air cooled RF amplifiers.	Liquid	Air	Liquid	Air
Displayed value on middle VFD ('VFD PPMP')	50 +/- 1	43 +/- 1	61 +/- 1	53 +/- 1

Correct PE pump speed YES / NO

7. If either of the pump speeds do not match the charts above, turn OFF the pumps and:

   A. Re-inspect that the VFD chips match the pump type.
   B. Ensure the HEC is in a scan-ready state and not in low-power mode.

If you do not have the proper VFD chips to match up with the pumps present, consult the FRU manual and order the required VFD chips.

Further Troubleshooting information can be found in the GE Service Methods document "HEC Troubleshooting".

End of Procedure

Revision History

REV	ECN# / REASON FOR CHANGE	DATE	APPRV'D
A	INITIAL RELEASE	6/20/08	HB
B	REV PER ECN 17636 CHANGES TO PUMP PLUMBING PER CUSTOMER REQUEST.	3/17/11	MG
C	CHANGES REQUESTED BY CUSTOMER TO INCLUDE VFD CHIP AND OTHER EDITORIAL CHANGES	01/02/12	HB

820-0311 – Install instructions for PN 205-0121-23 Pump Hose (GE P/N 5402967)

Tools Included in Kit:

- Strap wrench (Lytron PN 530-0790)
- Teflon (PTFE) tape

Tools Required:

- 3/8" wrench or adjustable wrench
- Large slip-joint pliers

Optional Tool:

Procedure:

1. Perform shutdown of system in accordance with Lytron manual #820-0190. (GE P/N 5161931 Heat Exchanger Cabinet Installation) found in the cabinet or on the Service DVD.

2. Lockout/Tagout system in accordance with GE procedures.

3. Drain system. Drain system in accordance with Lytron manual #820-0190. *It is also acceptable to drain the system through the pump drain.*

To install the molded hose:

4. Remove existing pump suction hose assembly from HEC. (Leave gate valve in place; ensure gate valve does not rotate when removing fittings with slip-joint pliers.)

Figure 1 Removing existing hose assembly detail.

5. Wrap threads of supplied plastic barbed fitting with the supplied PTFE tape. Wrap entire area of threads with two full wraps (in a clockwise direction when looking at the threaded end).

6. Thread new hose barb fitting into bottom of gate valve to make a leak-tight connection.

Figure 2 Installing new hose bard fitting detail.

7. Place the supplied Breeze-brand hose clamps over pump suction hose and install over barb on front of the pump and beneath the gate valve. (Hose is orientation specific and can only be installed one way) Refer to photo below:

Figure 3 Detail of Hose orientation

8. Tighten Breeze hose clamps with 3/8" wrench until the stacked washers flatten.
9. Fill the system in accordance with Lytron manual #820-0190 (GE P/N 5161931).
10. Clear the Lockout/Tagout in accordance with GE procedures.
11. Perform a normal startup according to Lytron manual #820-0190.
12. Check for any leakage. Repair if necessary.

End of Procedure

Revision History

REV	ECN# / REASON FOR CHANGE	DATE	ENG APPV'D	SERV APPRV'D
A	Initial Release	5/5/2011	NG	HB

LYTRON
Total Thermal Solutions 55 Dragon Court, Woburn, MA 01801, Tel: (781-933-7300), www.Lytron.com

820-0339 – Replacement Instructions GC and PE Mixing Valves PN 205-0121-30 (GE P\N 5156318)

Purpose: The purpose of this document is to provide instruction on how to remove and replace the GC and PE mixing valves. Note that there are 2 different types of valves (refer to illustrations within this document to determine mixing valve type). The mixing valve will be supplied with a mounting bracket and hoses making installation and removal in all cabinets possible. The GC and PE valve assemblies in a new cabinet are identical in form, only the hose lengths are different. This kit has been designed with hose lengths to replace either a GC or PE valve.

Scope: This instruction applies to all DVMR Heat Exchanger Cabinets (HEC).

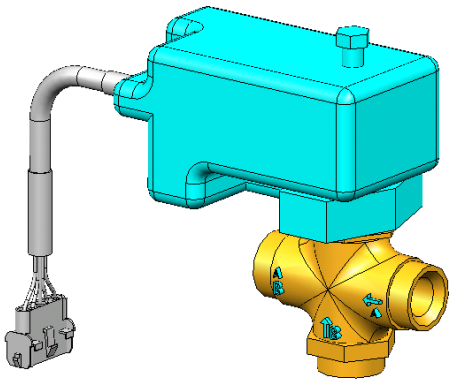
Tools Required:

- 1-1/4" open end or adjustable wrench
- Adjustable wrench (opening up to 1-1/8" for backing stationary fittings)
- 7/16" deep welled socket or wrench
- Absorbent towels
- Wet/Dry Vacuum or Bucket for draining

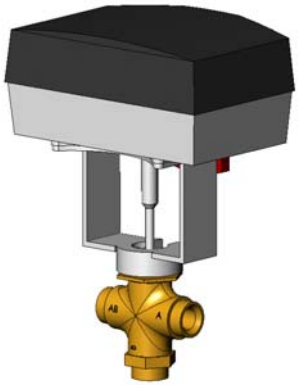
People Required: 2

Time Required: 2 hours per valve

Refer to the illustrations below to determine mixing valve type.



Discontinued Valve Style – Typical of G6000EN Cabinets



New Valve Style – Typical of G6001EN Cabinets

Illustration 1 – Mixing Valve Styles

Removal Procedure:

1. Perform shutdown and lockout of system in accordance with the GE "LOTO for Heat Exchanger Cabinet (HEC)" procedure.

2. Open door to heat exchanger cabinet. If necessary, the door can be removed from its hinges by disconnecting the ground strap (The ground strap nut can either be removed using a 10mm or adjustable wrench) and lifting up on the door.

3. Close Facility Supply and Return Ball valves located at the top of the HEC to isolate HEC from facility water.

4. Locate either GC or PE mixing valve (Refer to Illustration 2).

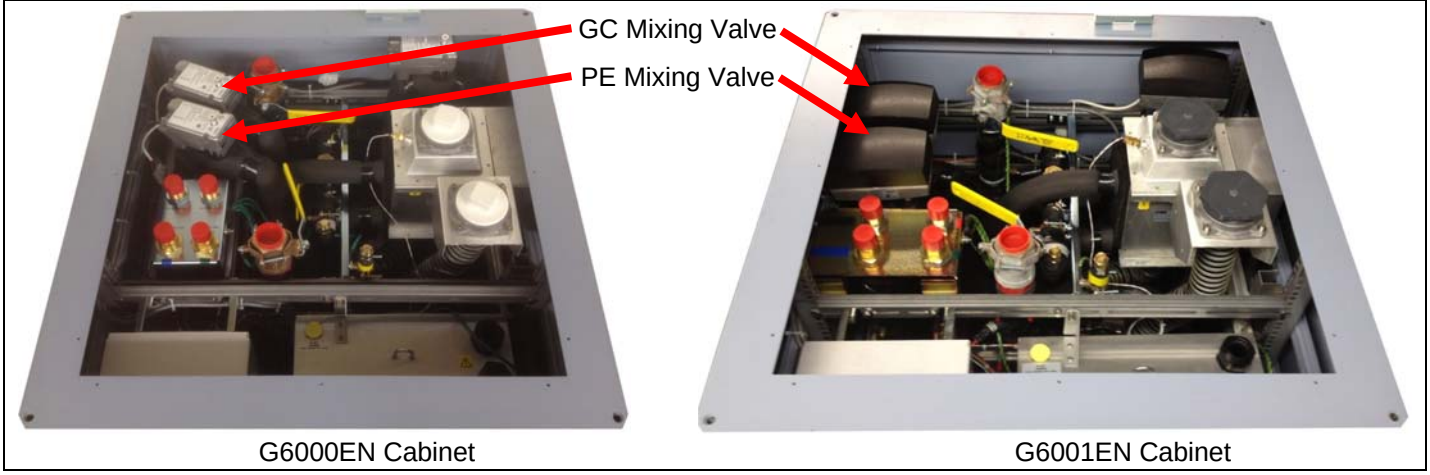


Illustration 2 – GC and PE Mixing Valve Locations in G6000EN and G6001EN Cabinets

5. Drain Facility side plumbing per GE draining procedures.

Mixing Valve Assembly Kit

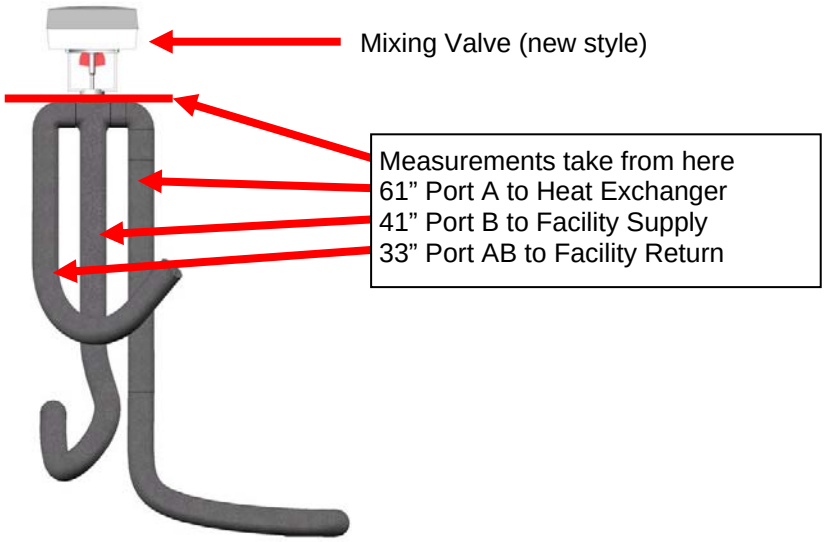


Illustration 3 - Connections for Either the GC or PE Mixing Valve Kit

⚠CAUTION When removing items weighing greater than 35lbs, the hoist system must be utilized. Failure to use the hoist system may result in damage to the equipment or personal injury.

6. It is recommended to move/remove either the Signal Box or the Electrical Box to gain access to connection points on Facility Return header. In order to slide the Electrical Box to the side, disconnect the cables between the Electrical Box and the Signal Box. Refer to Lytron Procedures #820-0233 (Electrical Box) and #820-0234 (Signal Box) for details on removing these parts. It is also recommended to remove the blower to get better access to the hoses per GE main Blower replacement procedure under Heat Exchanger Cabinet Setup.

7. The Photos below detail the locations for connecting ports A, AB, and B to the system. Refer to Illustration 3 above for locations of ports detailed in following photos. NOTE: Both Signal Box and Electrical Box have been removed in the photos below for ease of locating connections.

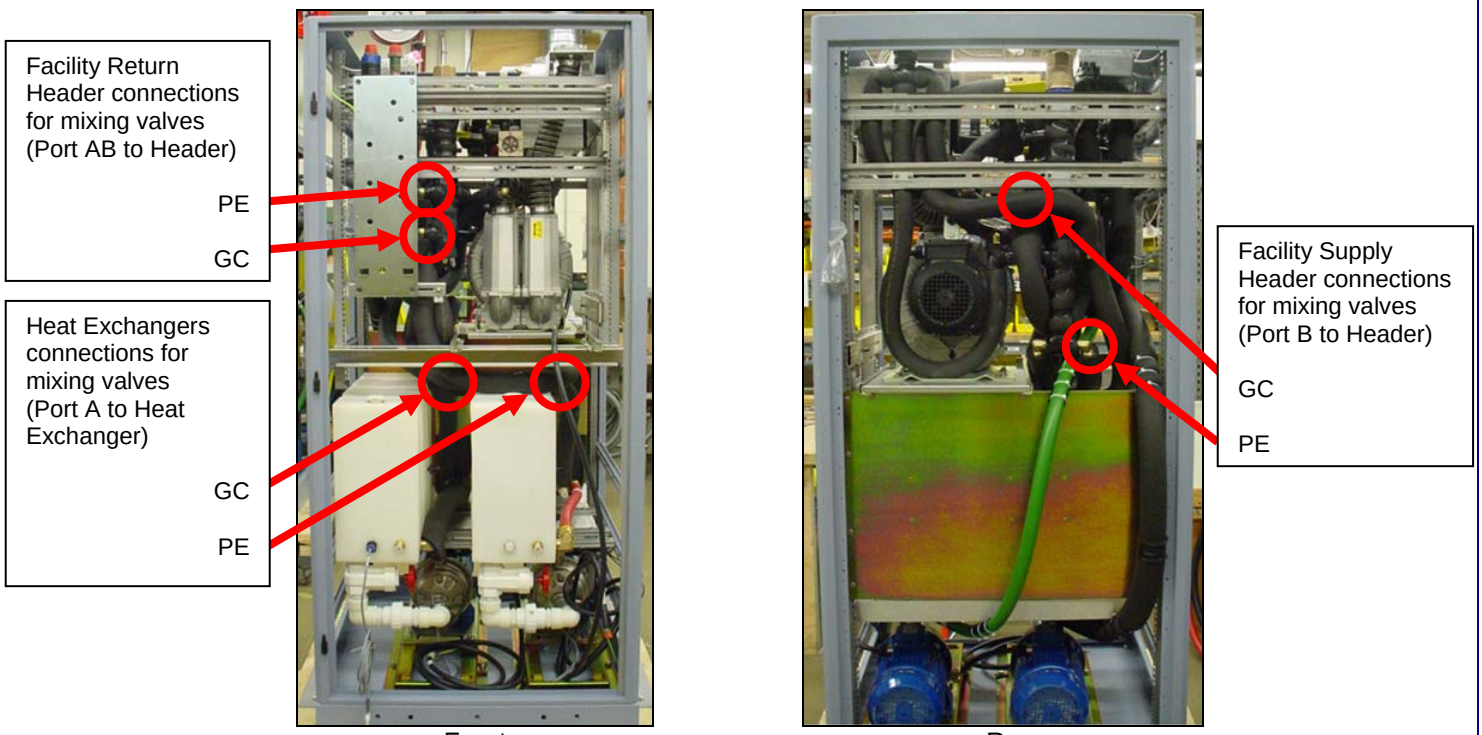


Illustration 4 - Detail of Cabinet with Signal Box and Electrical Box removed (Front and Rear Views)

8. Remove 5 pin connector for appropriate mixing valve (GC or PE).

NOTICE Fittings within the HEC should be backed with a second wrench in order to prevent them from turning. Failure to do so could result in fluid leaks and damage to the equipment.

9. Using a 1-1/4" wrench on the swivel fitting and an adjustable wrench to back the stationary fitting, remove the Port A hose from the Heat Exchanger (top, left fitting of heat exchanger when looking from the front). It may be necessary to cut the insulation around the fitting in order to expose the wrench flats. There may be residual coolant in the hose that will need to be drained.

10. Again using the 1-1/4" wrench and the adjustable wrench, remove the Port AB hose from Facility Return connection at the header. As above, insulation may need to be removed at the header and the hose drained.

11. Again using the 1-1/4" wrench and the adjustable wrench, remove the Port B hose from the Facility Supply connection at the header. As above, insulation may need to be removed at the header and the hose drained. To locate the correct hose, follow the hose connection from the valve. Refer to Illustration 5 for locations of Port B on the Facility Supply Header.

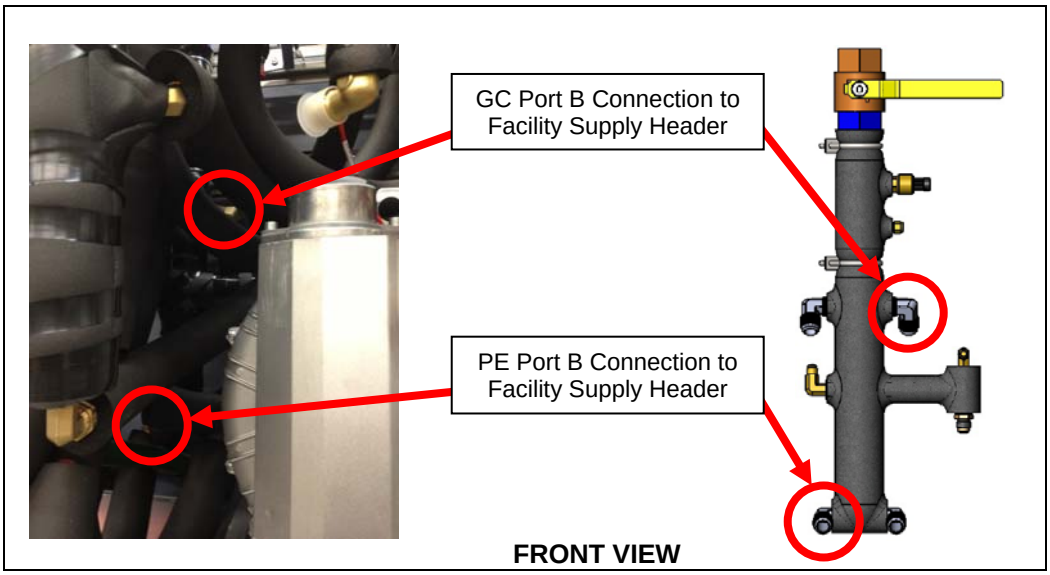


Illustration 5 – Front View Location of Port B Connections to Facility Supply Header for GC and PE Valves

12. ***a. (G6000EN Cabinet Valve Replacement)*** - While supporting the valve assembly with one hand, remove the 1/4-20 nuts that secure the valve to the system using a U bracket assembly using the 7/16" deep welled socket or wrench. There are 2 U brackets, on each U bracket there are 2 nuts (Total of 4 nuts per valve). Refer to Illustration 6 for location of the 4 nuts for each of the valves.
b. (G6001EN Cabinet Valve Replacement) - Loosen hex screw on side of mounting bracket using the 7/16" deep welled socket or wrench.

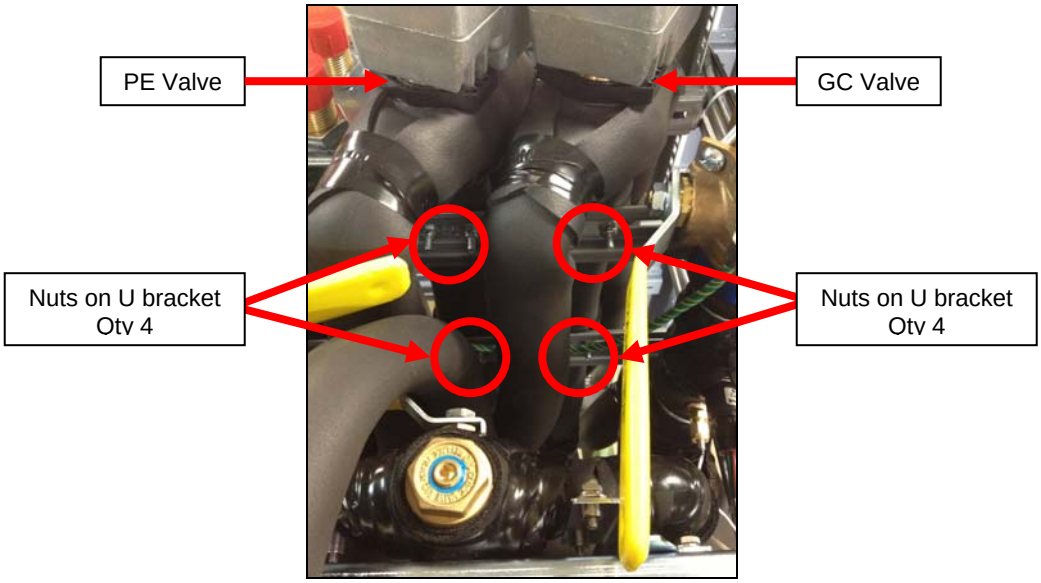


Illustration 6 – Location of 4 Nuts for Each of the GC and PE Valves

13. Remove the valve assembly (valve, 3 attached hoses, and bracket hardware) by pulling it up through the top of the cabinet. It may be necessary to alternate feeding the hoses up through the cabinet and pulling the valve assembly out the top of the cabinet.

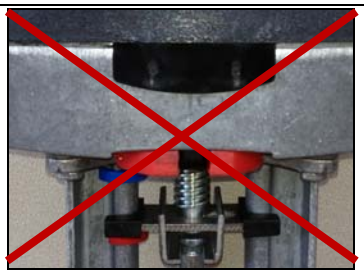
Installation Procedure:

NOTICE The mixing valve has a RED MANUAL/AUTO SWITCH. The valve must be placed in AUTO prior to energizing the system. Identify the correct position of the switch prior to

energizing system (Refer to Illustration 7). Verify prior to operating unit. Failure to place the switch in AUTO could result in failure of the unit to operate correctly.

POSITION A – Incorrect

POSITION B CORRECT



POSITION C Incorrect

Illustration 7 – Manual/Auto Switch Position on Mixing Valve

1. Insert the new valve assembly into the cabinet from the top by feeding the hoses down into the cabinet. Both style cabinets will have one hose (Port AB) inserted between the frame strut and cabinet side panel and the other two hoses (Ports A and B) will be inserted between the two frame struts on the left of the cabinet (Reference Illustration 8).

Illustration 8 – New Style Valve Installed in G6000EN Cabinet (System without Insulation)

2. Once in the cabinet, the four tabs of the mounting bracket should go behind the two frame struts. Secure the assembly to frame with hex screw on the left side of the bracket using the 7/16" deep welled socket or wrench. (Reference Illustration 9)

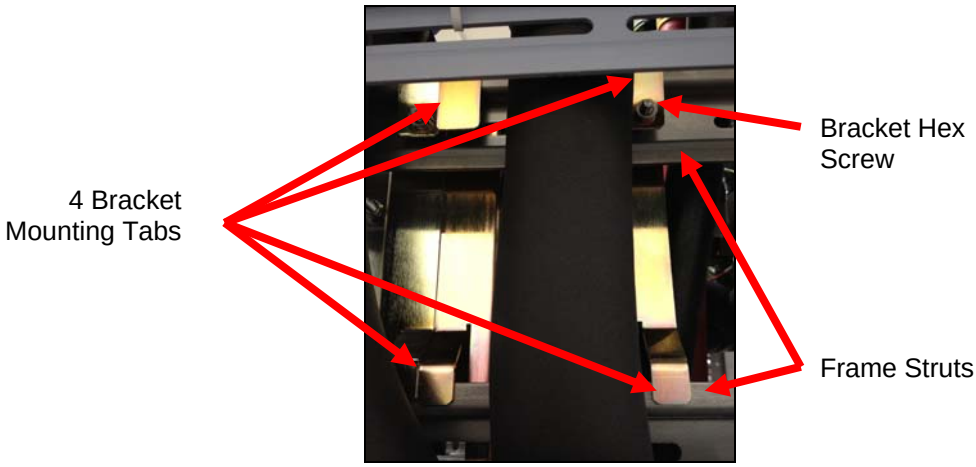


Illustration 9 – Rear View of PE Mixing Valve Installed in Cabinet

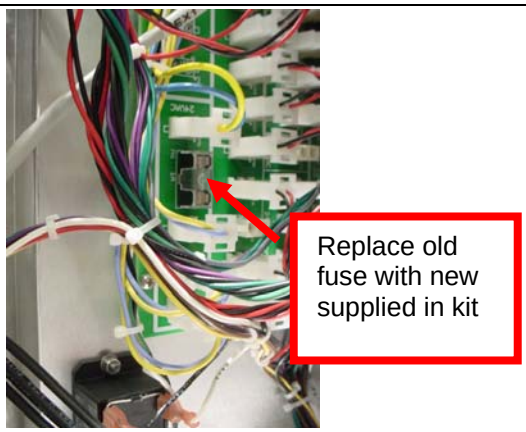
3. Using a 1-1/4" wrench on the swivel fitting and an adjustable wrench to back the stationary fitting install the Port B hose to the Facility Supply connection at the header. Tighten hand tight and then tighten an additional 1/4 turn.

4. Again using the 1-1/4” wrench and the adjustable wrench, install the Port A hose to the Heat Exchanger (top, left fitting of heat exchanger when looking from the front). Tighten hand tight and then tighten an additional 1/4 turn.

5. Again using the 1-1/4” wrench and the adjustable wrench, install the Port AB hose to Facility Return connection at the header. Tighten hand tight and then tighten an additional 1/4 turn.

6. ***(G6000EN Systems Only)*** - After installation, the new mixing valves will require the fuse in the Signal Box to be changed to a higher value (T2AL250V). The fuse is part of the New Mixing Valve Kit and needs to be installed on the inside left hand side wall of the Signal Box. (Reference Illustration 10)

Signal Box Mixing Valve Fuse Location In-Line



Signal Box Mixing Valve Fuse Location Board Mounted

Illustration 10 – G6000EN Signal Box Fuse Locations (Two Design Styles)

7. Label the new fuse with the supplied label. For the inline fuse, place the label in the vicinity of the fuse. For the circuit board mounted fuse, place the label over the existing labeling on the circuit board.

8. Remove any tubing utilized for draining in previous steps.

9. Ensure all connections are tight and properly insulated.

10. Reconnect 5 pin connector to mixing valve assembly.

11. Open Facility Supply Ball valve.

12. Open Facility Return Ball valve.

13. Check for leaks around the manifolds of mixing valve(s) replaced.

14. Use the 2” insulation supplied to rewrap the terminations of the hose insulation within the system as necessary.

15. Reinstall any assemblies (Electrical Boxes, Doors, etc) that were removed during the process to gain access to mixing valves within the cabinet.

16. Clear Lockout/Tag out for the system in accordance with GE procedures.

17. Restart system.

18. Place system back into operation.

End of Procedure

Revision History

REV	ECN# / REASON FOR CHANGE	DATE	ENG APPRV'D	SERV APPRV'D
1	Engineering Release	01/08/2013	GDD	
2	Changed HEC1 to G6000EN and HEC1.5 to G6001EN.	01/08/2013	GDD	
3	Updated with requested changes from GEHC. Changed required people to 2, made removal of the Signal Box or Electrical Box recommended in removal step 6, corrected valve callout in removal step 7, added illustrations to removal steps 11 and 12, and inserted installation step 7 to label the new fuse.	01/15/2013	GDD	
4	Revised and clarified dimensions in illustration 3.	01/18/2013	GDD	

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820-0340 – Replacement Instructions Chilled Air Blower Mixing Valves PN 205-0121-31 (GE P\N 5156320)

Purpose: The purpose of this document is to provide instruction on how to remove and replace the Chilled Air Blower mixing valve. Note that there are 2 different types of valves (refer to illustrations within this document to determine mixing valve type). The mixing valve will be supplied with a mounting bracket and hoses making installation and removal in all cabinets possible.

Scope: This instruction applies to all DVMR Heat Exchanger Cabinets (HEC).

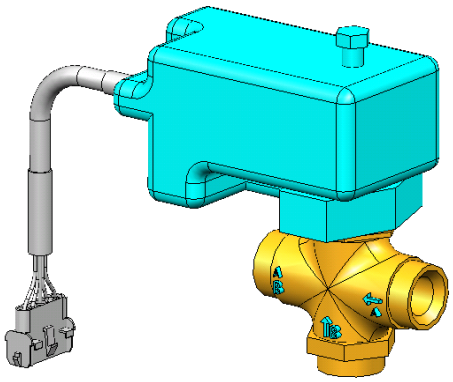
Tools Required:

- 7/8" open end or adjustable wrench.
- Adjustable wrench (opening up to 3/4" for backing stationary fittings)
- 7/16" deep welled socket or wrench.
- Flat-head screwdriver (for removing cover of valve actuator for installation into G6000EN cabinets)
- Absorbent towels.
- Wet/Dry Vacuum or Bucket for draining.

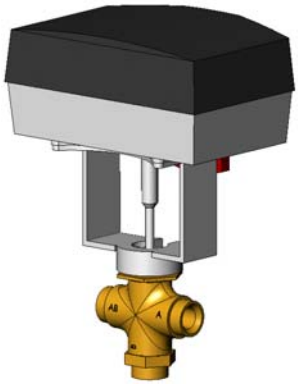
People Required: 2

Time Required: 2 hours per valve.

Refer to the illustrations below to determine mixing valve type.



Discontinued Valve Style – Typical of G6000EN Cabinets



New Valve Style – Typical of G6001EN Cabinets

Illustration 1 – Mixing Valve Styles

Removal Procedure:

1. Perform shutdown and lockout of system in accordance with the GE "LOTO for Heat Exchanger Cabinet (HEC)" procedure.

2. Open door to heat exchanger cabinet. If necessary, the door can be removed from its hinges by disconnecting the ground strap (The ground strap nut can either be removed using a 10mm or adjustable wrench) and lifting up on the door.

3. Close Facility Supply and Return Ball valves located at the top of the HEC to isolate HEC from facility water.

4. Locate the chilled air mixing valve (Refer to Illustration 2).

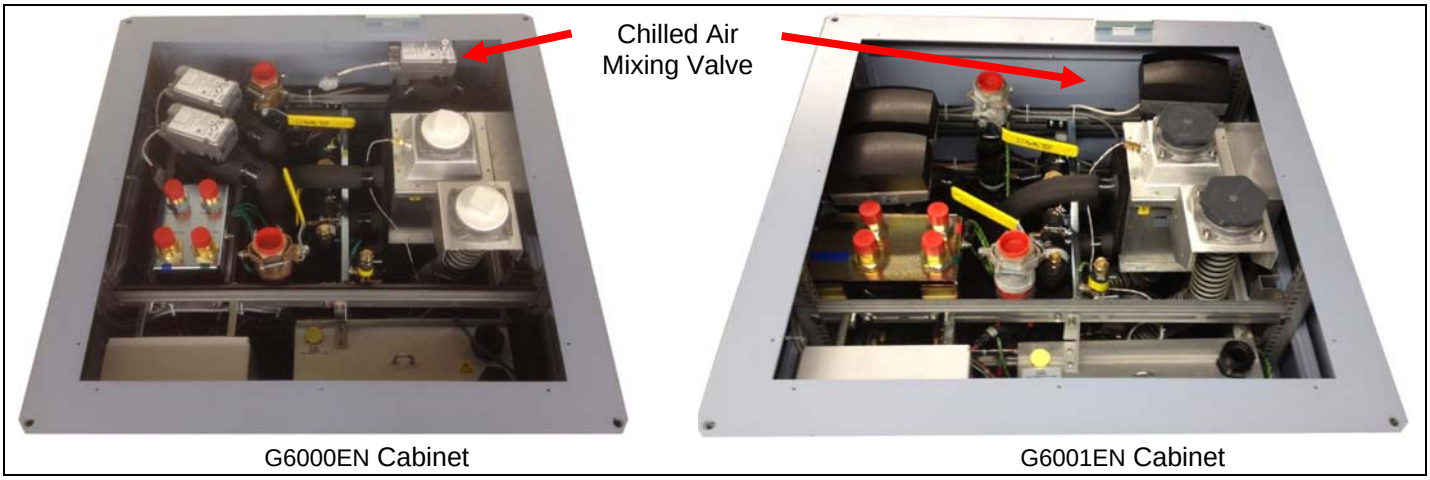


Illustration 2 – Chilled Air Mixing Valve Locations in G6000EN and G6001EN Cabinets

5. Drain Facility side plumbing per GE draining procedures.

Mixing Valve Assembly Kit

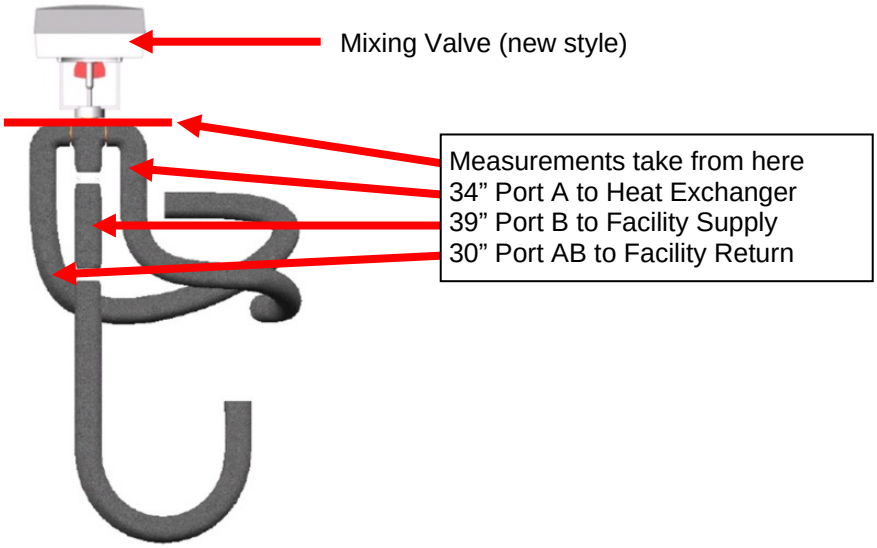


Illustration 3 - Connections for the Chilled Air Mixing Valve Kit

⚠CAUTION When removing items weighing greater than 35lbs, the hoist system must be utilized. Failure to use the hoist system may result in damage to the equipment or personal injury.

6. It is recommended to move/remove either the Signal Box or the Electrical Box to gain access to connection points on Facility Return header. In order to slide the Electrical Box to the side, disconnect the cables between the Electrical Box and the Signal Box. Refer to Lytron Procedures #820-0233 (Electrical Box) and #820-0234 (Signal Box) for details on removing these parts. It is also recommended to remove the blower to get better access to the hoses per GE main Blower replacement procedure under Heat Exchanger Cabinet Setup.

7. The Photos below detail the locations for connecting ports A, AB, and B to the system. Refer to Illustration 3 above for locations of ports detailed in following photos. NOTE: Both Signal Box and Electrical Box have been removed in the photos below for ease of locating connections.

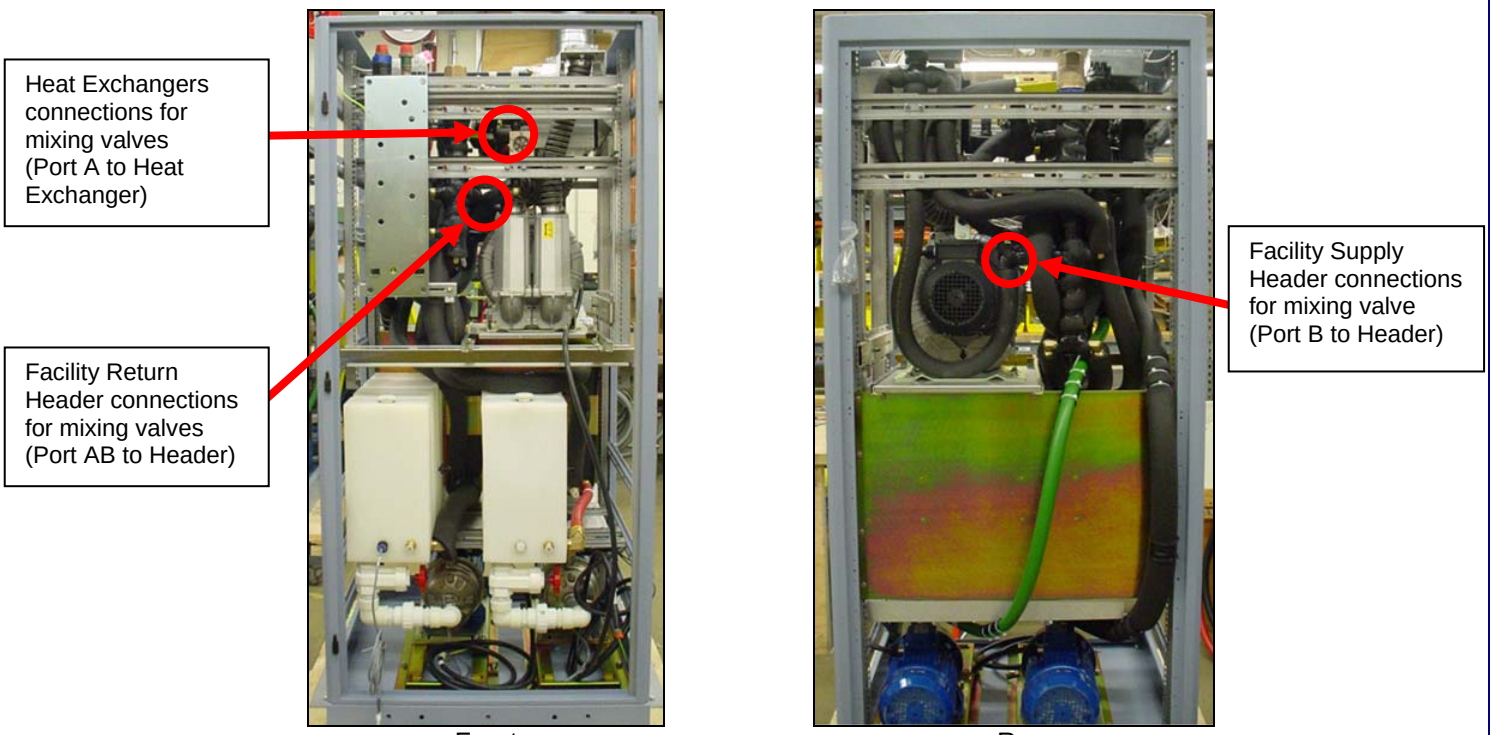


Illustration 4 - Detail of Cabinet with Signal Box and Electrical Box removed (Front and Rear Views)

8. Remove 5 pin connector for the mixing valve.

NOTICE Fittings within the HEC should be backed with a second wrench in order to prevent them from turning. Failure to do so could result in fluid leaks and damage to the equipment.

9. Using a 7/8" wrench on the swivel fitting and an adjustable wrench to back the stationary fitting, remove the Port A hose from the Heat Exchanger (top fitting of Liquid-to-Air heat exchanger). It may be necessary to cut the insulation around the fitting in order to expose the wrench flats. There may be residual coolant in the hose that will need to be drained (Reference Illustration 5)

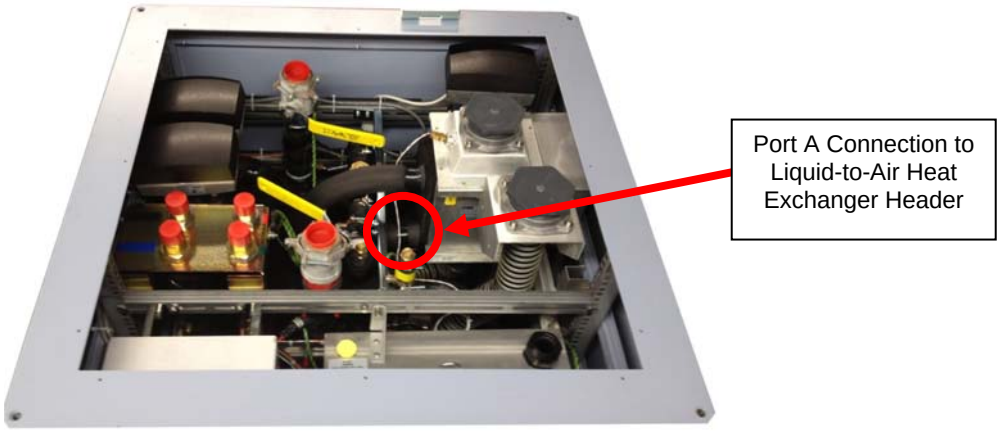


Illustration 5 – Port A Location of the Chilled Air Mixing Valve

10. Again using the 7/8” wrench and the adjustable wrench, remove the Port AB hose from Facility Return connection at the header. As above, insulation may need to be removed at the header and the hose drained.

11. Again using the 7/8” wrench and the adjustable wrench, remove the Port B hose from the Facility Supply connection at the header. As above, insulation may need to be removed at the header and the hose drained. To locate the correct hose, follow the hose connection from the valve. Refer to Illustration 6 for locations of Port B on the Facility Supply Header.

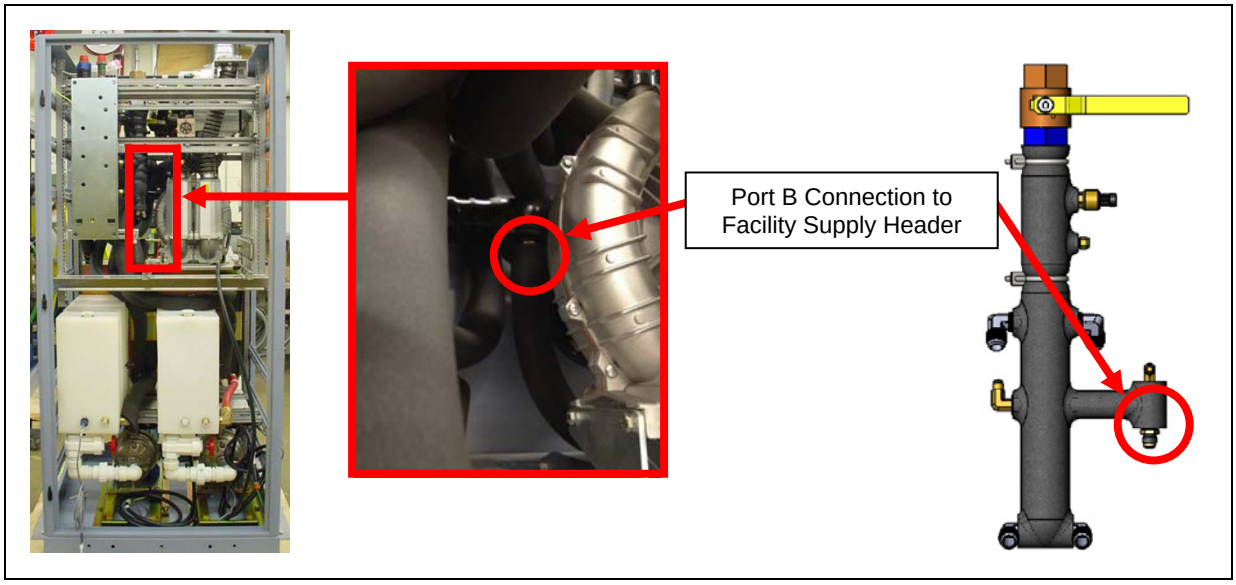


Illustration 6 – Front View Location of Port B Connection to Facility Supply Header

12. ***a. (G6000EN Cabinet Valve Replacement)*** - While supporting the valve assembly with one hand, remove the 1/4-20 nuts that secure the valve to the system using a U bracket assembly using the 7/16” deep welled socket or wrench. There are 2 U brackets, on each U bracket there are 2 nuts (Total of 4 nuts per valve). Refer to Illustration 7 for location of the 4 nuts for each of the valves.
b. (G6001EN Cabinet Valve Replacement) - Loosen hex screw on side of mounting bracket using the 7/16” deep welled socket or wrench.

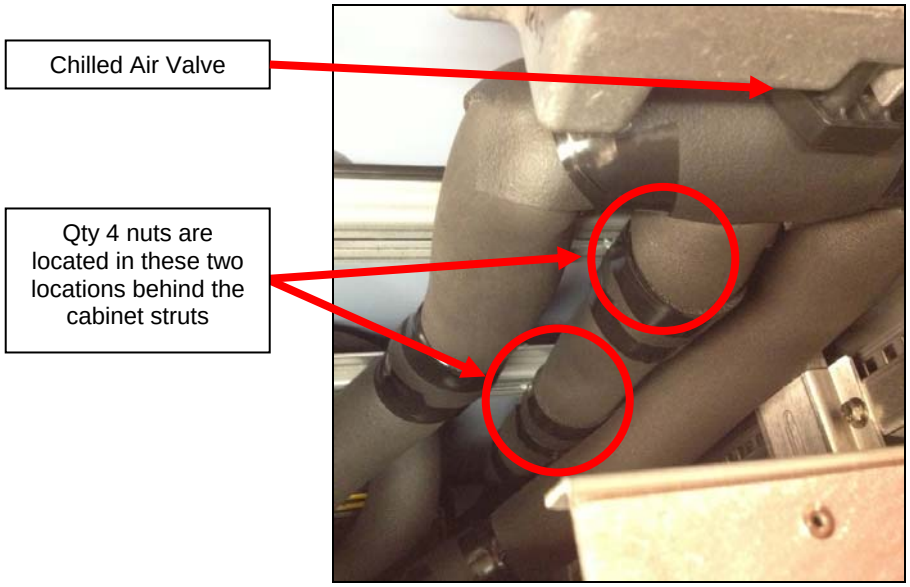


Illustration 7 – Location of 4 Nuts for Each of the GC and PE Valves

13. Remove the valve assembly (valve, 3 attached hoses, and bracket hardware) by pulling it up through the top of the cabinet. It may be necessary to alternate feeding the hoses up through the cabinet and pulling the valve assembly out the top of the cabinet.

Installation Procedure:

NOTICE The mixing valve has a RED MANUAL/AUTO SWITCH. The valve must be placed in AUTO prior to energizing the system. Identify the correct position of the switch prior to energizing system (Refer to Illustration 8). Verify prior to operating unit. Failure to place the switch in AUTO could result in failure of the unit to operate correctly.

Illustration 8 – Manual/Auto Switch Position on Mixing Valve

1. ***(G6000EN Cabinet Valve Installation Only)*** – It may be necessary to remove the top cover of the actuator that is part of the mixing valve assembly in order to fit the Chilled Air Valve into a G6000EN cabinet. In order to do this, insert a flat-head screwdriver under the tab of black actuator cover and lift up (Reference Illustration 9).

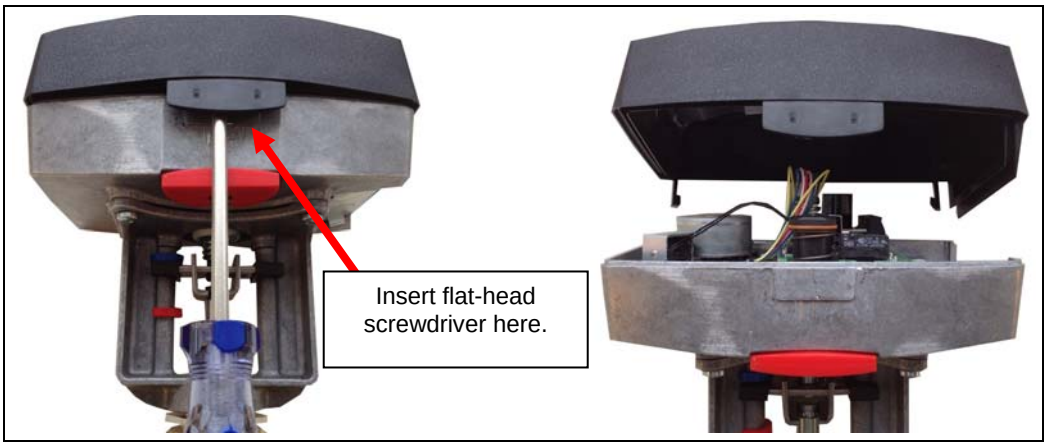


Illustration 9 – Removal of the Actuator Cover

2. Insert the new valve assembly into the cabinet from the top by feeding the hoses down into the cabinet. Both style cabinets will have the new valve installed such that all three hoses will be in front of the two cabinet struts that run horizontally across the rear of the cabinet.

3. Once in the cabinet, the four tabs of the mounting bracket should go behind the two frame struts. Secure the assembly to frame with hex screw on the left side of the bracket using the 7/16" deep welled socket or wrench. (Reference Illustration 10)

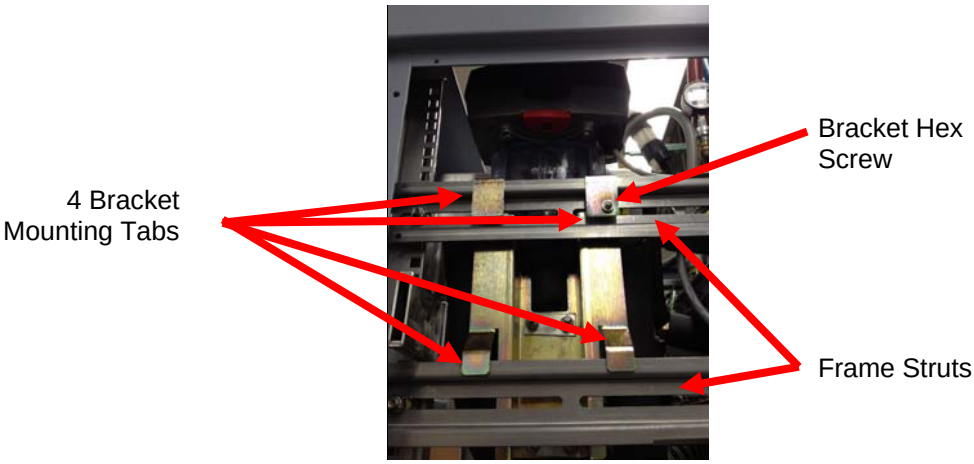


Illustration 10 – Rear View of Chilled Air Mixing Valve Installed in Cabinet

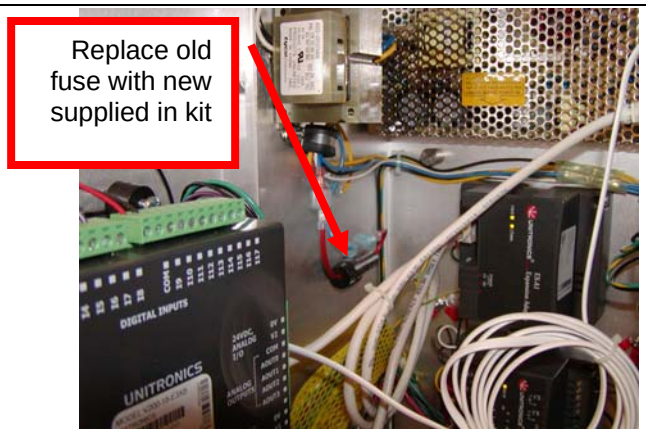
4. Once the valve assembly has been sercured in place, re-install the actuator cover if removed during step 1.

5. Using a 7/8" wrench on the swivel fitting and an adjustable wrench to back the stationary fitting install the Port B hose to the Facility Supply connection at the header. Tighten hand tight and then tighten an additional 1/4 turn.

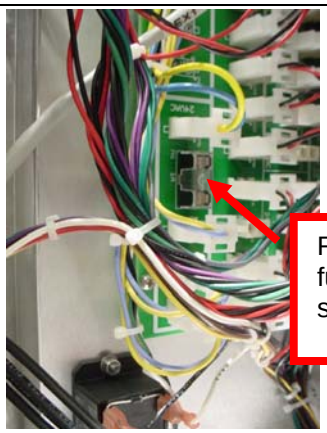
6. Again using the 7/8" wrench and the adjustable wrench, install the Port A hose to the Heat Exchanger (top fitting of Liquid-to-Air heat exchanger). Tighten hand tight and then tighten an additional 1/4 turn.

7. Again using the 7/8" wrench and the adjustable wrench, install the Port AB hose to Facility Return connection at the header. Tighten hand tight and then tighten an additional 1/4 turn.

8. ***(G6000EN Systems Only)*** - After installation, the new mixing valves will require the fuse in the Signal Box to be changed to a higher value (T2AL250V). The fuse is part of the New Mixing Valve Kit and needs to be installed on the inside left hand side wall of the Signal Box. (Reference Illustration 11)



Signal Box Mixing Valve Fuse Location In-Line



Signal Box Mixing Valve Fuse Location Board Mounted

Illustration 11 – G6000EN Signal Box Fuse Locations (Two Design Styles)

9. Label the new fuse with the supplied label. For the inline fuse, place the label in the vicinity of the fuse. For the circuit board mounted fuse, place the label over the existing labeling on the circuit board.

10. Remove any tubing utilized for draining in previous steps.
11. Ensure all connections are tight and properly insulated.
12. Reconnect 5 pin connector to mixing valve assembly.
13. Open Facility Supply Ball valve.
14. Open Facility Return Ball valve.
15. Check for leaks around the manifolds of mixing valve(s) replaced.
16. Use the 2” insulation supplied to rewrap the terminations of the hose insulation within the system as necessary.
17. Reinstall any assemblies (Electrical Boxes, Doors, etc) that were removed during the process to gain access to mixing valves within the cabinet.
18. Clear Lockout/Tag out for the system in accordance with GE procedures.
19. Restart system.
20. Place system back into operation.

End of Procedure

Revision History

REV	ECN# / REASON FOR CHANGE	DATE	ENG APPRV'D	SERV APPRV'D
1	Engineering Release	01/16/2013	GDD	
2	Changed Illustration 10 to say Chilled Air and updated arrows in illustration 3.	01/17/2013	GDD	
3	Revised and clarified dimensions in illustration 3.	01/18/2013	GDD	
4	Corrected location of Port A in illustrations 4 and 5.	01/30/2013	GDD	

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820-0232 – Install Instructions Main Blower (P/N: 205–0121-04) GE P/N: 5156315

Tools Required:

- Hoist Assembly (P/N: 205-0121-17)
- Flat bladed screwdriver
- 1/2” wrench or slip wrench

Removal Procedure:

1. Perform shutdown of system in accordance with Lytron manual #820-0190.
2. Lockout/Tag out system in accordance with GE procedures.
3. Install Hoist Assembly (P/N: 205-0121-17)
4. Remove Electrical Box cover by loosening 4 thumb screws (Refer to photo 1).

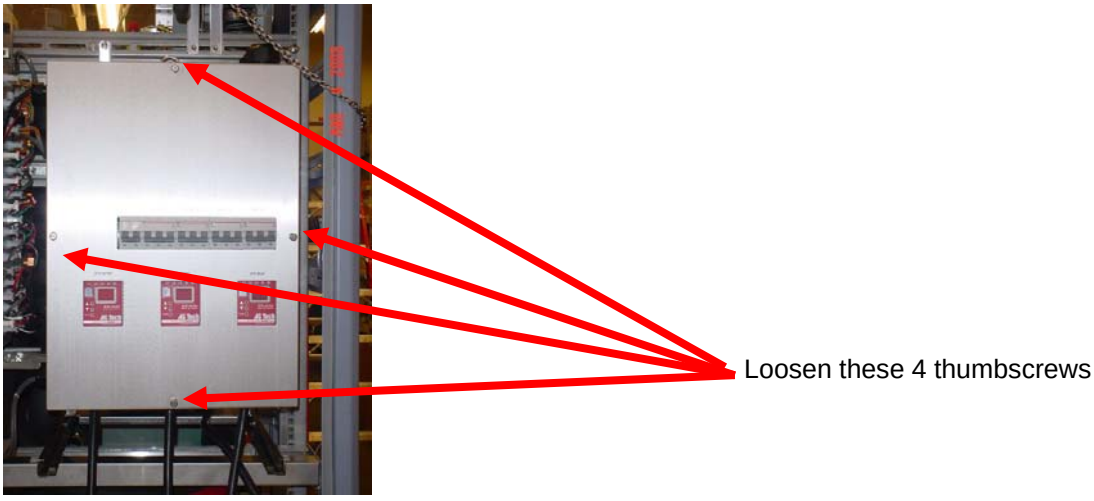


Photo 1 Electrical Box exterior

5. Remove leads U, V, and W as well as GND connection from Blower Variable Frequency Drive (VFD) (Refer to Photo 2).

CAUTION: OBSERVE PROPER SAFETY PROCEDURES WHEN INSIDE THE ELECTRICAL CABINET. HIGH VOLTAGE IS PRESENT WHEN COVER IS REMOVED.

6. Remove Blower power cable from bottom of Electrical Box.
7. Remove the following cable from the connectors at the Signal Box:
    a. P1 115v Power to the PLC
    b. P2 DI Kit
    c. P19 GPMP (GC Pump) VFD
    d. P20 PPMP (PE Pump) VFD
    e. P7 Blower VFD

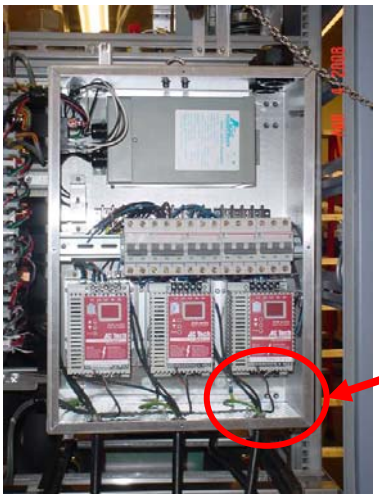


Photo 2

8. Pull Electrical Box forward by loosening 2 thumb screws to the left of the cabinet (top and bottom) securing it to the frame.
9. Pull forward and swing out of the way to the right.
10. Remove supply and return air hoses by loosening worm gear clamps with 1/4 " nut driver or regular flat blade screwdriver. Carefully move hoses out of the way in order to facilitate blower removal.

CAUTION: Care should be taken when removing hoses. The hoses are easily torn.

11. Coil power cord into 6" coils and attach to blower using tie wraps.
12. Loosen 2 thumbscrews securing blower plate to frame.
13. Slide out blower until is stops on the rails. Be careful that the blower hoist lift bracket does not damage the removed air hoses.
14. Attach hoist chain eyelet to Blower lifting bracket.

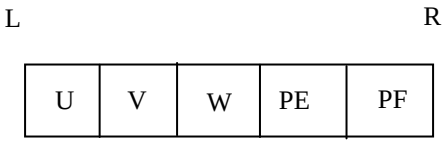
CAUTION: Ensure hoist ratchet handle is selected to "UP" position.

15. Take out slack from lift chain.
16. Remove the ½" bolts, lock washers, and flat washers that secure Blower to frame. Use a ½" wrench or socket.
17. Raise Blower using hoist. Ratchet in the "UP" direction using handle until the Blower clears its' mounting tray.
18. Push mounting tray in toward the rear of the chiller.
19. Put Hoist ratchet in the "DOWN" position and lower the Blower to a cart or pallet.
20. Disconnect hoist chain eyelet from Blower.

End of Procedure

Installation of Blower:

1. Place Blower close to front of cabinet.
2. Attach Hoist chain eyelet to Blower lift bracket.
3. Place Hoist ratchet in the “UP” position.
4. Lift Blower steadily to a height above the mounting tray.
5. Pull mounting tray forward.
6. Lower Blower onto tray and align with bolt holes.
7. Use a 1/2” wrench or socket to tighten 4 bolts, lock washers, and flat washers that secure Blower to mounting tray.
8. Push Blower and tray toward back of machine and lock into position with 2 thumbscrews in the front.
9. Ensure power leads are uncoiled from the Blower and ready to attach to the Variable Frequency Drive (VFD).
10. Connect supply and return air hoses to the Blower. Be careful not to tear the hoses as they are delicate. Tighten with flat bladed screwdriver.
11. Swing Electrical Box to the left and secure with 2 thumbscrews on the top and bottom of the Electrical Box.
12. Route the power cable for the Blower to the appropriate VFD and wire as follows:



13. Reattach the following cables at the connectors on the Signal Box:
    a. P1 115v Power to the PLC
    b. P2 DI Kit
    c. P19 GPMP (GC Pump) VFD
    d. P20 PPMP (PE Pump) VFD
    e. P7 Blower VFD

End of Procedure

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820-0233 – Replacement Instructions for Electrical Power Box (P/N: 205-0121-05) GE P/N: 5156319

WARNING: Lytron Part # 205-0121-05 – GEHC #5156319 is equipped with Lenze AC Tech VFD's and has been produced since2007. This part is **NON-RoHS Compliant**. **DO NOT USE** in **RoHS Compliant** HEC cabinets.

Tools Required:

1. #2 Philips screwdriver
2. Flat bladed screwdriver (large and small)
3. Hoist Service Kit 5196226

Removal Procedure:

1. Lockout/Tag out HEC electrical power in accordance with GE procedures.
2. Attach Hoist Assembly GE 'Hoist Service Kit' instructions found on the service methods CD.
3. Remove Power Box cover by loosening 4 thumb screws (Refer to photo 1).

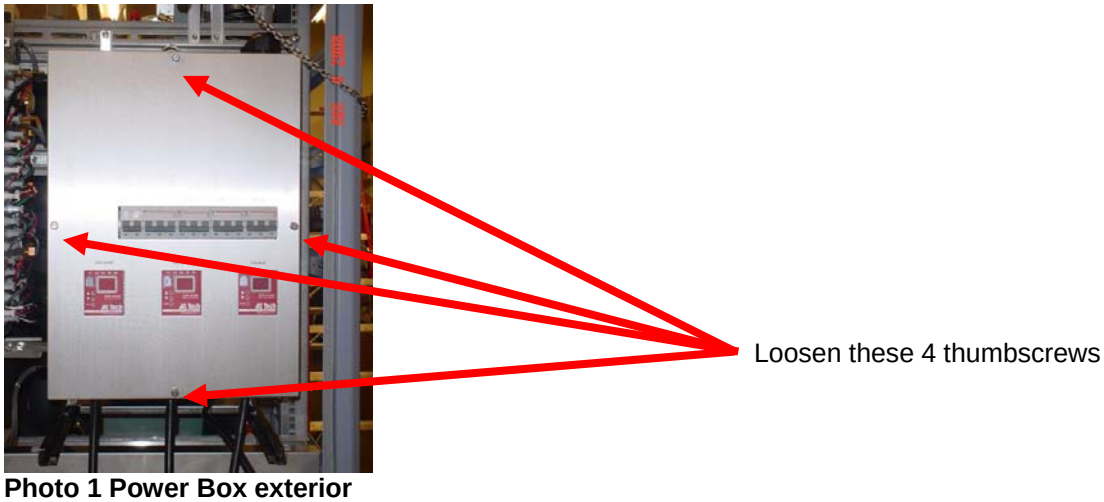


Photo 1 Power Box exterior

4. Remove leads U, V, and W as well as GND connection from Blower Variable Frequency Drive (VFD), Gradient Coil (GC) VFD, and Power Electronics (PE) VFD.
5. Remove GC power cable, PE power cable, and the Blower power cable from the bottom of the Power Box.

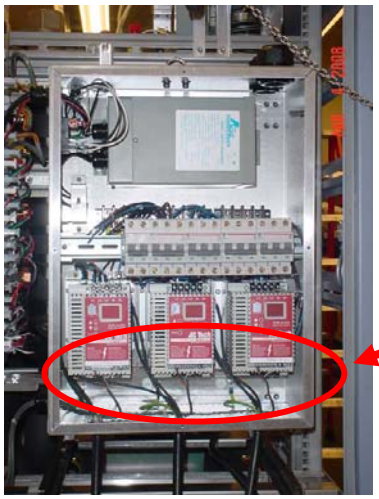
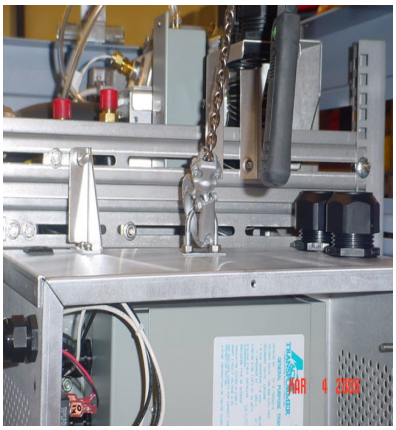


Photo 2 Interior of the Power Box

6. From the left side of the Power Box, remove the following cables going to the Signal Box (SB):
    a. P1 115V power to the Signal Box.
    b. P2 DI Kit
    c. P19 GPMP VFD (GC Pump)
    d. P20 PPMP-VFD (PE Pump)
    e. P7 Blower VFD

7. Disconnect the incoming facility and outgoing cryo compressor power cored.
IMPORTANT: label or mark cables to ensure phases can be hooked up the same later.

8. Attach Hoist Assembly chain hook to the lifting hook of the EB.



Picture 3 Hoist attachment to Power Box

9. Loosen upper & lower thumbscrews on the left side of the Power Box that secures it to the frame of the cabinet.

10. Pullout Power Box out until it meets the stops on the rail.

CAUTION: Ensure hoist ratchet handle is selected to “UP” position.

11. Raise the Power Box up off of its hinges in order to facilitate removal.

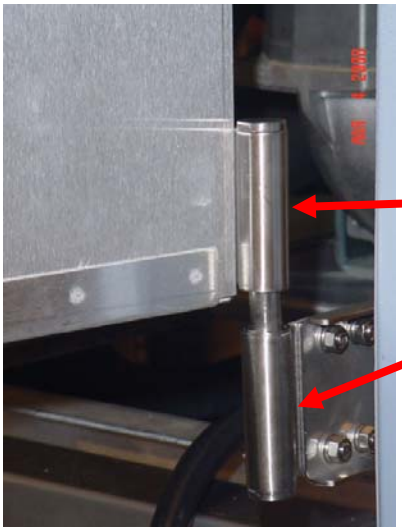


Photo 4 EB Hinge detail

12. While raising the Power Box, move it forward so that it clears the cabinet interior.

CAUTION: Ensure hoist ratchet handle is selected to "DOWN" position.

13. Lower Power Box until it rests on pallet or shipping container.

Photo 5 Lowering Power Box to floor

14. Note: Do not get rid of existing Power Box at this time; parts are required from it during the installation procedure. Specifically, remove the VFD EPM chip in each VFD. Since there are two different types (for different pumps), be mindful of which EPM chip goes with each VFD. These EPM chips will need to be re-installed in the new Power Box. Refer to next section for removal and installation of EPM chip.

End of Procedure

Installing Electrical Power Box (P/N: 205-0121-05)

WARNING: Lytron Part # 205-0121-05 - 5156319 is equipped with Lenze AC Tech VFD's and has been produced since 2007. This part is **NON-RoHS Compliant**. DO NOT USE in **RoHS Compliant** HEC cabinets.

Tools Required:

- #2 Philips screwdriver
- Flat bladed screwdriver (Large and small)
- Hoist Service Kit 5196226

Procedure:

1. Ensure LOTO is still applied as before.
2. Place Hoist ratchet handle in "DOWN" position. Let out enough chain to reach the floor.
3. Attach Hoist chain eyelet to the hoist eyelet located on the top of the Power Box.
4. Place Hoist ratchet handle into the "UP" position.
5. Slowly raise the Power Box up by taking out the slack in the chain.
6. Pull out the Power Box mounting rail with exposed hinge sleeves forward until it stops.
7. Continue raising up the Power Box until it can be just above the exposed hinge sleeves on the rail.
8. Place the hoist ratchet handle in the "DOWN" position.
9. Lower the Power Box until the hinge pins on the Power Box are fully seated in the hinge sleeves.
10. Lower chain slightly to induce slack in the chain line.
11. Remove the Hoist chain eyelet from the Power Box eyelet located on the top of the Power Box.
12. Push the Power Box back into the cabinet on the mounting rails.
13. Secure Power Box to HEC in two places by tightening the upper and lower thumbscrews on the left side of the Power Box.

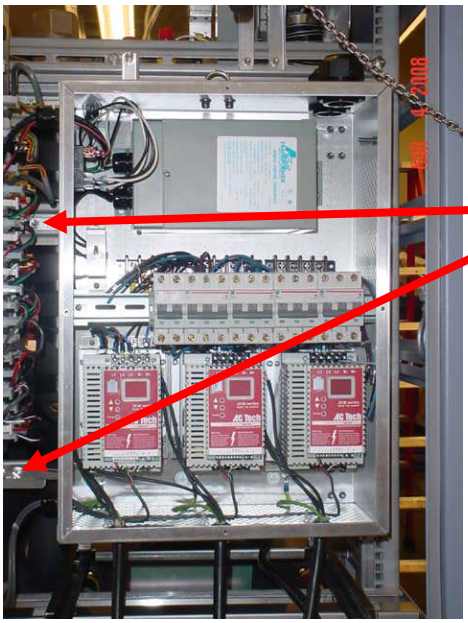


Photo 6

14. Install GC power cable, PE power cable, and the Blower power cable from the bottom of the Power Box.

15. Install leads U, V, and W as well as GND connection from Blower Variable Frequency Drive (VFD), Gradient Coil (GC) VFD, and Power Electronics (PE) VFD.

IMPORTANT: Ensure leads are installed in correct locations

16. From the left side of the Power Box, install the following cables going to the Signal Box:

    a. P1 115V power to the Signal Box.
    b. P2 DI Kit
    c. P19 GPMP -VFD(GC Pump)
    d. P20 PPMP-VFD (PE Pump)
    e. P7 Blower VFD

IMPORTANT: The HEC may have pumps from different manufacturers. (Price or Ebara). It is imperative that the pump type be exactly matched with the correct VFD chip. The Pump FRU kit will contain the correct VFD chip for the pump, as well as pliers to facilitate removal and replacement of the VFD chip.

An incorrectly-matched pump and VFD chip will result in either high pressure or low flows, risking equipment damage and/or systems errors.

Price pumps/chips and the Ebara pump/chips can be identified according to the following photos and descriptions:

Price

Price Pump:

Irregular pump face shape.

Bolt at 9 o'clock position on pump face.

Price VFD Chip:

Identified with 'P"

Ebara

Ebara Pump:

Circular pump face shape.

Bolt at 12 o'clock on

pump face.

Ebara VFD Chip:

Plain, colored chip.

NOTE: Suction hose is independent of pump type (Ebara cabinets may have white or blue hose type)

The gradient coil pump is on the left-hand side of the HEC and corresponds to the VFD in the left most location in the Power Box. The power electronics pump is on the right-hand side of the HEC and corresponds to the VFD in the middle location in the Power Box. The right most VFD is for the chilled air blower and is not impacted by this replacement procedure.

If the style of chip matches the style of pump according to the above descriptions, the next section can be skipped and you may proceed with the next step in the installation procedure.

The chip is replaced using the pliers shipped with the Pump kit. Remove the tape holding the chip in the front of the respective VFD in the Power Box. Grab with the pliers and pull straight out. To install the new chip, align it according to its keyed shape and press in fully with your finger. Place a piece of tape (in the FRU kit) over the newly-installed chip.

(Note: If the VFD chip is missing, lost or broken from the Pump FRU, see the GE FRU Manual and order the correct VFD chip.)

Photo 7 Remove the existing VFD chip with replacing the Ebara pump with a Price Pump.

Photo 8 Complete installation. (This HEC has an Ebara gradient coil pump and a Price power electronics pump, as noted by the 'P' on the VFD chip in the power electronics VFD)

17. Re-install VFD EPM Chips that were removed from previous Power Box.
18. Clear the Lockout/Tagout in accordance with GE procedures.
19. Re-start HEC and turn pump ON. Add new DVMR coolant as necessary.
20. Check for any leakage. Repair if necessary.
21. Perform a TPS reset.
22. Ensure HEC is in a scan-ready state and not in the low power mode; this is done by prescribing a scan at least to the point where the scan protocol.
23. Return to the HEC and view the displayed speeds on the two pump VFDs.
24. Note if the VFD is displaying 'F1' the VFD chip is either not installed or not seated fully.

Review the charts below and circle 'YES' or 'NO' below, indicating you have confirmed the correct speed based on pump and system configuration:

GRADIENT COIL PUMP:

Pump Type (identify as described above):	EBARA	PRICE
Displayed Value On left-most VFD ('VFD GPMP')	50 +/- 1	61 +/- 1

CORRECT GC Pump Speed? YES / NO

POWER ELECTRONICS PUMP:

Pump Type: (identify as described above):	EBARA		PRICE	
RF-amplifier type in PGR cabinet (Liquid cooled is identified by presence of red and blue cooling hoses hooked up to the front of the RF amplifier. Hoses will not be present on air cooled RF Amplifiers)	Liquid	Air	Liquid	Air
Displayed value on middle VFD ('VFD PPMP')	50 +/- 1	43 +/- 1	61 +/- 1	53 +/- 1

Correct PE pump speed YES / NO

If either of the pump speeds do not match the charts above, turn OFF the pumps and:

A. Re-inspect that the VFD chips match the pump type.
B. Ensure the HEC is in a scan-ready state and not in low-power mode.

If you do not have the proper VFD chips to match up with the pumps present, consult the FRU manual and order the required VFD chips.

25. Install main power leads through the top of the POWER BOX. Wire according to phasing as before. Reconnect cryo compressor power cord to respective circuit breaker.

IMPORTANT: Note incoming facility voltage and place voltage selector switch in the correct position (if questions, see GE installation procedure for 'System Power On'.

26. Replace cover on front of Power Box. Clear LOTO to HEC. Restart HEC according to GE Installation procedures for HEC power-on and startup.

27. If it is suspected that the phases were not hooked up correctly, the pumps and blower can be inspected for proper rotation – the rotation direction is marked on each unit with an arrow.

Photo 9 Complete Installation

End of Procedure

820-0348 – Replacement Instructions for Electrical Power Box (PN 205-0121-33) GEHC # 5156319-100

Tools Required:

1. #2 Philips screwdriver
2. 3/32" Flat blade screwdriver
3. Wire strippers
4. 1/4" Flat blade screwdriver
5. Magnetic Pick-up tool (adjustable, telescopic)
6. Hoist Assembly (Lytron PN 205-0121-17, GE P\N 5262029, 5196226)

WARNING: HIGH VOLTAGE PRESENT, LOTO FROM MAIN DISCONNECTS.

Identification of Power Box types

CAUTION: BEFORE YOU BEGIN, VERIFY THE POWER BOX TYPE YOU ARE REPLACING, AND THAT THE FRU HAS BEEN ORDERED AND RECEIVED

Power Box Comparison

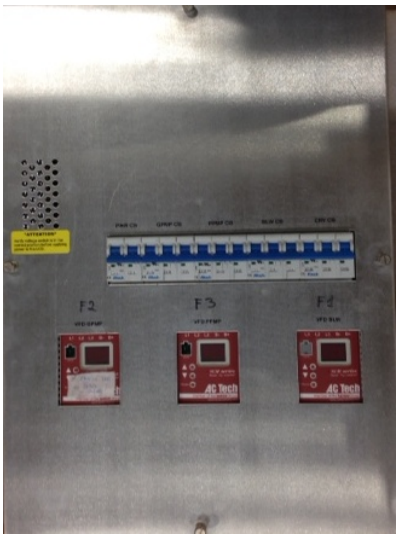
There are two types of variable frequency drives offered in HEC power boxes:

- Lytron Part # 205-0121-05 - 5156319 is equipped with Lenze AC Tech VFD's and has been produced since2007. This part is **NON-RoHS Compliant**.
- Lytron Part # 205-0121-33 – 5156319-100 is equipped with Eaton VFD's and is released as a RoHS compliant design in 2014. This part **MUST** be used for **RoHS Compliancy**

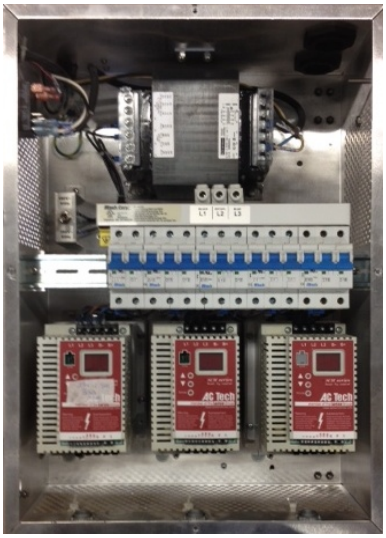
While both boxes are functionally equivalent, speed scaling is accomplished differently in each box.

A summary of key differences are listed below:

- Lytron 205-0121-33 – 5156319-100 uses the same external dimension and cabinet interfaces as the original Lytron 205-0121-05 / 5156319 power box.
- To accommodate the larger Eaton VFD's, the internal box has been modified in the following way:
    a. Circuit breakers moved up approximately 3.5"
    b. 50/60 Hz switch moved up approximately 2"
    c. Drives are now mounted on a plate that runs across the box. This is to maintain same distance between front of drive and inside of cover.
    d. Ground studs 3X are now located on the floor of the box perpendicular to the floor.
    e. Speed scaling is accomplished by wire jumper. (Speed scaling in AC Tech drives includes a switchable EEPROM chip.



Lenze / AC Tech Box Covered



Lenze / AC Tech Box Uncovered

New Eaton Box Covered

New Eaton Box Uncovered

Removal Procedure:

1. Perform shutdown of system in accordance with Lytron manual #820-0190.
2. Lockout/Tag out system from main disconnect in accordance with GE procedures.
3. Remove LCS7397GX door by opening door and removing door from its hinges.
4. Attach Hoist Assembly to cabinet per GE Procedures.
5. Remove Electrical Box cover by loosening 4 thumb screws (refer to photo below).

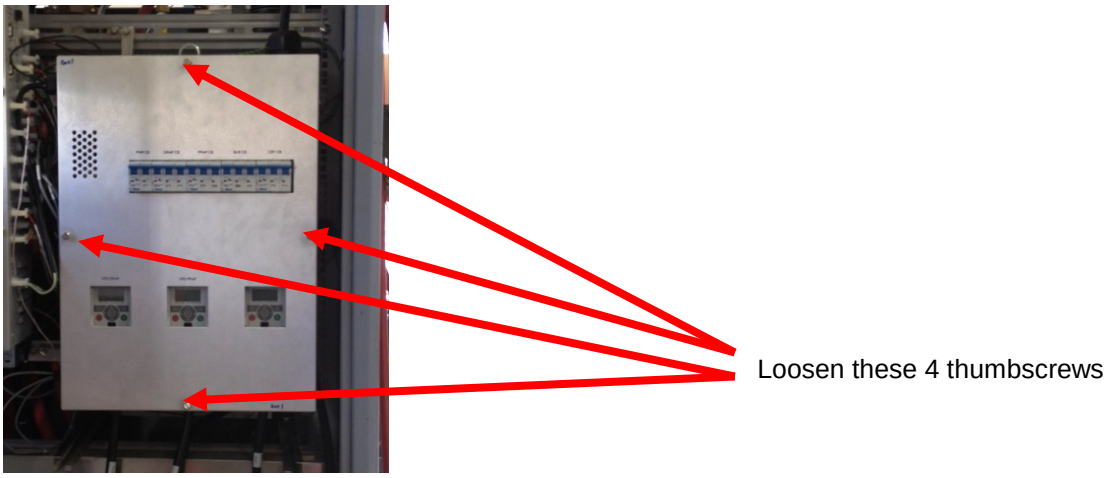


Photo 1 Electrical Box exterior

6. Remove power leads U/T1, V/T2, and W/T3 as well as GND connection from Blower Variable Frequency Drive (VFD), Gradient Coil (GC) VFD, and Power Electronics (PE) VFD. Note each location for re-installation in the new electrical power box.
7. Remove GC power cable, PE power cable, and the Blower power cable from the bottom of the Electrical Box (Power Box).
8. Remove Cryo compressor power cable from circuit breaker. Note wire position and color.

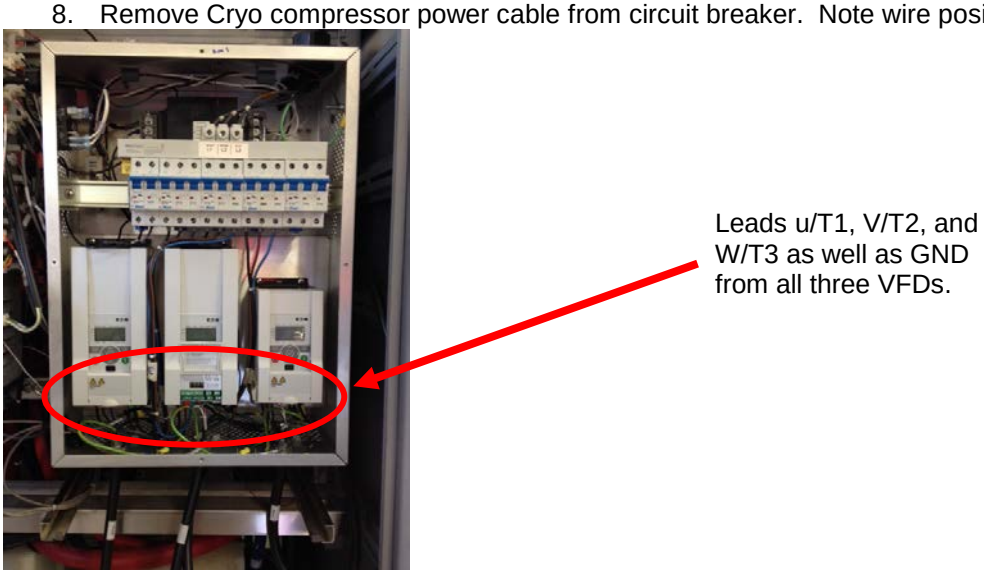


Figure 2 Interior of the Electrical Box

9. From the left side of the Power Box, remove the following cables going to the Signal Box (SB):
    a. P1 115V power to the Programmable Logic Controller (PLC)
    b. P2 DI Kit
    c. P19 GPMP-VFD (GC Pump control)
    d. P20 PPMP-VFD (PE Pump control)
    e. P7 Blower VFD (Blower control)
10. Remove the main power cables that feed the Power Box. Note locations and wire colors of L1, L2, L3.
11. Attach Hoist Assembly chain hook to the lifting eyelet of the Power Box.

Figure 3 Hoist attachment to Electrical Box

Figure 3a. Thumbscrew locations

12. Loosen upper & lower thumbscrews on the left side of the Power Box that secures it to the frame of the cabinet Refer to Figure 3a.
13. Pullout Power Box until it meets the stops on the rail.

CAUTION: Ensure hoist ratchet handle is selected to "UP" position.

14. Raise the Power Box up off of its hinges in order to facilitate removal.

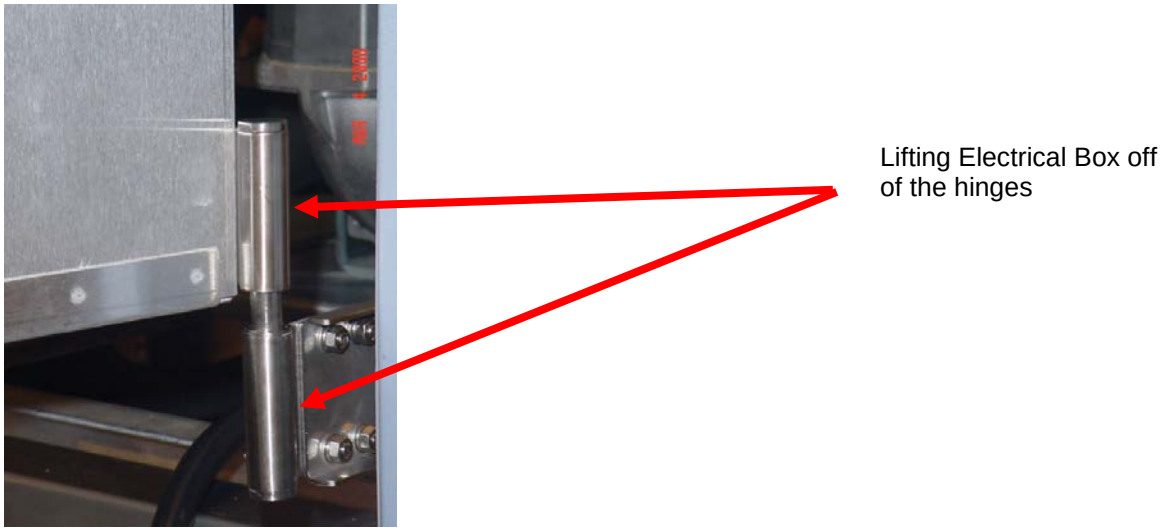


Figure 4 Power Box Hinge detail

15. While raising the Power Box, move it forward so that it clears the cabinet interior.

CAUTION: Ensure hoist ratchet handle is selected to "DOWN" position.

16. Lower Power Box until it rests on pallet or shipping container.

Figure 5 Lowering Electrical Box to floor.

Installing Electrical Power Box (PN 205-0121-33) GEHC # 5156319-100

Tools Required:

1. #2 Philips screwdriver
2. 3/32” Flat blade screwdriver
3. Wire strippers
4. 1/4" Flat blade screwdriver
5. Magnetic Pick-up tool (adjustable, telescopic)
6. Hoist Assembly (Lytron PN 205-0121-17, GE P\N 5262029)

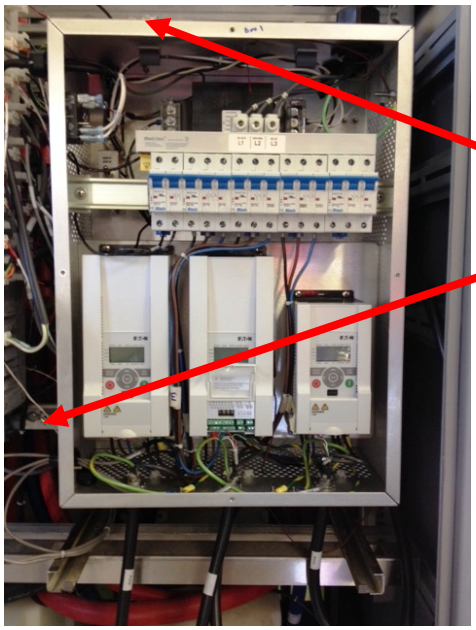
Procedure:

1. Perform shutdown of system in accordance with Lytron manual #820-0190.
2. Lockout/Tag out system in accordance with GE procedures.
3. Remove LCS7397GX door by opening door and removing door from its hinges.
4. Attach Hoist Assembly to cabinet per GE procedures as in similar fashion described starting at Step 4 in ***Removal Procedure*** that started this document.
5. Place Hoist ratchet handle in “DOWN” position. Let out enough chain to reach the floor.
6. Attach Hoist chain hook to the lifting eyelet of the Power Box.
7. Place Hoist ratchet handle into the “UP” position.
8. Slowly raise the Power Box up by carefully pulling the chain and begin to raise the Power Box.

9. Pull out the Power Box mounting rail with exposed hinge sleeves forward until it stops.
10. Continue raising the Power Box until it can be just above the exposed hinge sleeves on the rail.
11. Place the hoist ratchet handle in the "***DOWN***" position.
12. Lower the Power Box until the hinge pins on the Power Box are fully seated in the hinge sleeves.

Place Electrical Box on the hinges

13. Lower chain slightly to induce slack in the chain line.
14. Remove the Hoist chain hook from the Power Box lifting eyelet located on the top of the Power Box
15. Push the Power Box back into the cabinet on the mounting rails.
16. Secure Power Box to machine frame using upper and lower thumbscrews locations. Refer to photo below.



Thumbscrew locations

17. Install GC power cable, PE power cable, and the Blower power cable from the bottom of the Electrical Box (Power Box). Ensure braided shield is folded over outer insulation and clamped in strain relief. Refer to photos below.

Pump/Blower Power Wires			
	VFD Terminal		Function
Lead Color	AC Tech	Eaton	Line Voltage
Black	L1	L1	Line 1 Power
Brown	L2	L2	Line 2 Power
Blue	L3	L3	Line 3 Power

18. Install leads U/T1, V/T2, and W/T3 as well as GND connection from Blower Variable Frequency Drive (VFD), Gradient Coil (GC) VFD, and Power Electronics (PE) VFD. Use table below to determine correct terminal location. Refer to table below.

Power Wires From Circuit Breakers to VFD's			
	VFD Terminal		Function
Lead Labeling	AC Tech	Eaton	Line Voltage
One	Pin U	Pin U/T1	Line 1
Two	Pin V	Pin V/T2	Line 2
Three	Pin W	Pin W/T3	Line 3

Table 1. Power Wires from CB to VFDs

Control Wires			
	VFD Terminal		Function
Lead Color	AC Tech	Eaton	
Red	1	8	Motor Start
Black	2	3	Ground
White	25	2	4-20 mA analog input

Table 1a – Control wire terminal locations

CAUTION: BEFORE YOU BEGIN, VERIFY THE PUMP TYPE AS EITHER A PRICE PUMP OR AND EBARA PUMP. IDENTIFICATION IS NECESSARY FOR COMPLETION OF NEXT SECTION.

Price pumps/chips and the Ebara pump/chips can be identified according to the following photos and descriptions

Price

Price Pump:

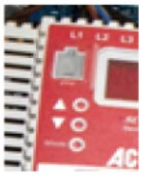
Irregular pump face shape.

Bolt at 9 o'clock position on pump face.

Price VFD Chip:

Identified with 'P"

Ebara



Ebara Pump:

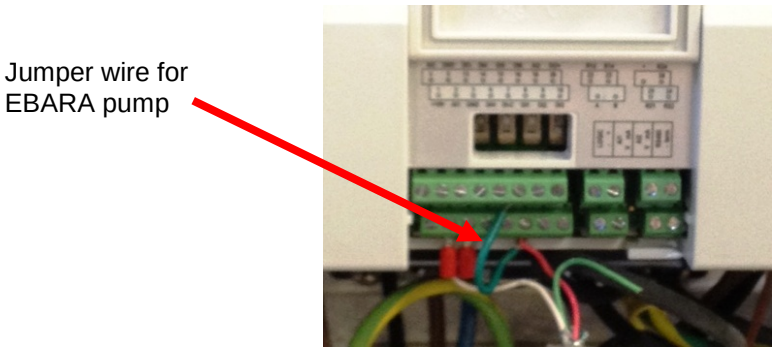
Circular pump face shape.

Bolt at 12 o'clock on pump face.

Ebara VFD Chip:

Plain, colored chip.

19. If HEC cabinet has an EBARA pump, a jumper (qty 2 supplied in kit) will be needed on the EATON VFD to which the pump is attached. Add jumper wire from terminal 8 to terminal 16 if EBARA pump is present during installation of Power Box.



20. From the left side of the Power Box, install the following cables going to the Signal Box (SB):
    a. P1 115V power to the Programmable Logic Controller (PLC)
    b. P2 DI Kit
    c. P19 GPMP (GC Pump control)
    d. P20 PPMP-VFD (PE Pump control)
    e. P7 Blower VFD (Blower control)
21. Install main power leads through the top of the Power Box. Wire each breaker as required by electrical schematic Lytron PN 830-0239 and wiring diagram PN 830-0239-01.

CAUTION: OBSERVE PROPER SAFETY PROCEDURES WHEN INSIDE THE ELECTRICAL CABINET. HIGH VOLTAGE IS PRESENT WHEN COVER IS REMOVED.

22. Remove LOTO from HEC cabinet using standard GE procedures.
23. Turn on power in accordance with Lytron manual #820-0190.
24. To check proper rotation of pumps & blowers (including cryo compressor), turn on each breaker momentarily to observe the direction of the individual motor or blower. If rotation is reversed, verify wiring in Step 18. To correct a reverse rotation, switch two of the three phases for the appropriate breaker. If all motors and/or blowers rotate opposite, switch two of the three incoming power feeds.
25. Replace the cover to the Power Box by securing the 4 thumbscrews.

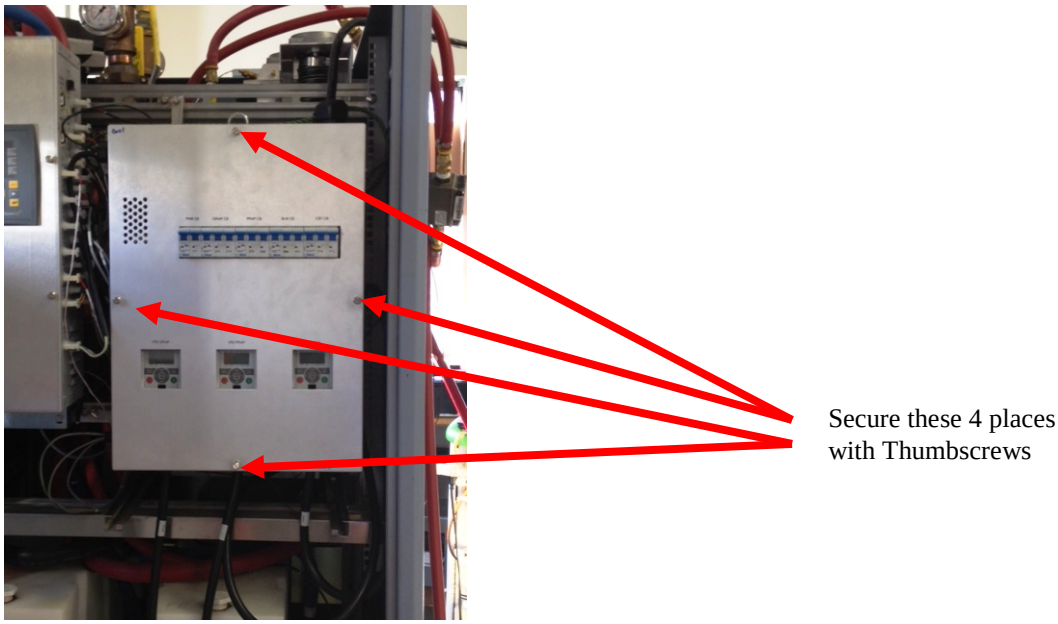


Figure 6 Front Cover in place (Thumbscrew locations).

26. Start system in accordance with startup procedures in Lytron manual #820-0190.

FINALIAZTION

1. Clear the Lockout/Tagout in accordance with GE procedures.
2. Re-start HEC and turn pump ON. Add new DVMR coolant as necessary.
3. Check for any leakage. Repair if necessary.
4. Perform a TPS reset.
5. Ensure HEC is in a scan-ready state and not in the low power mode; this is done by prescribing a scan at least to the point where the scan protocol has been downloaded.
6. Return to the HEC and view the displayed speeds on the two pump VFDs.

GRADIENT COIL PUMP:

Pump Type (Identify as described above):	EBARA	PRICE
Displayed Value On left-most VFD ('VFD GPMP')	50 +/- 1	61 +/- 1

POWER ELECTRONICS PUMP:

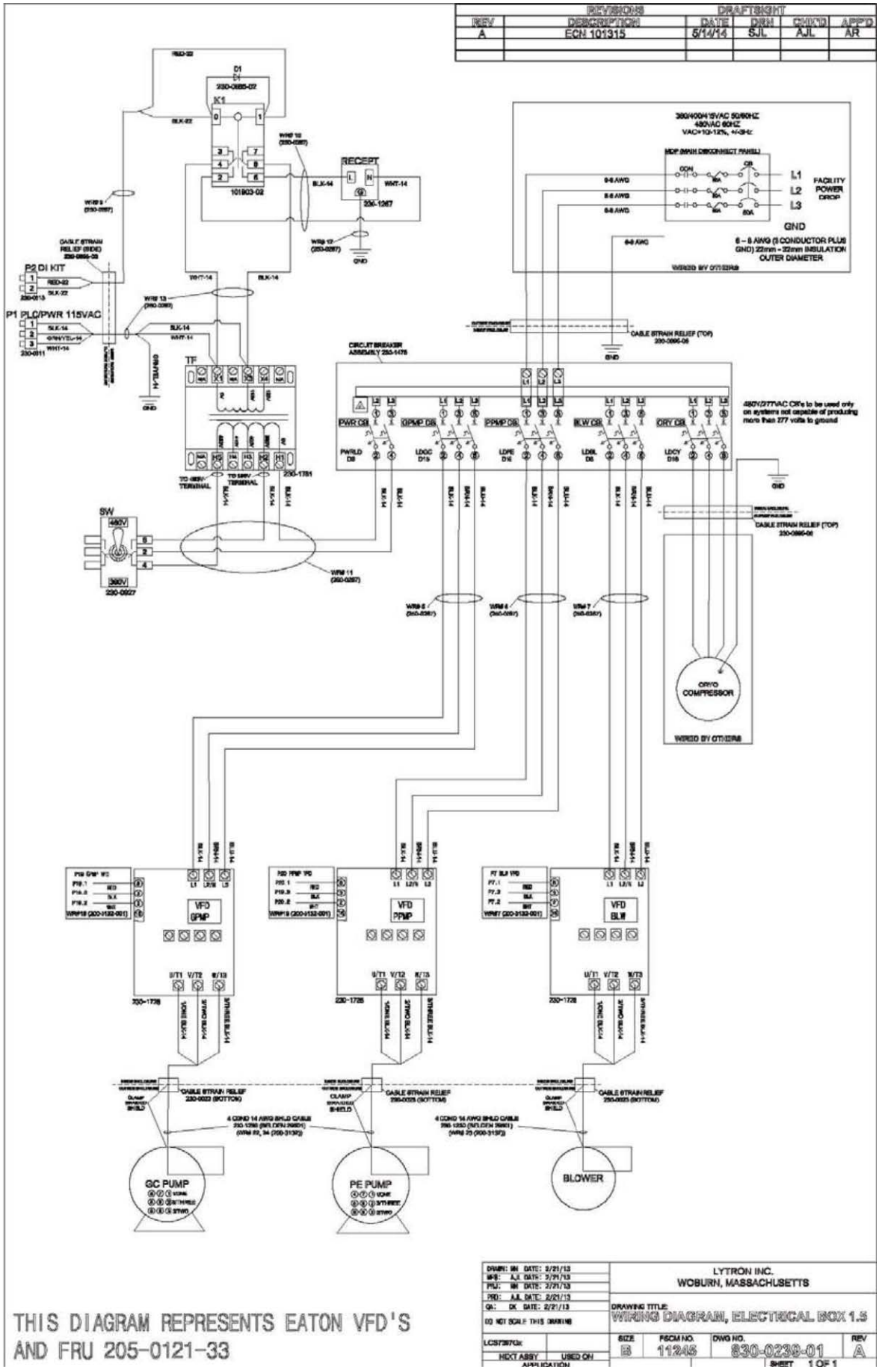
Pump Type: (Identify as described above):	EBARA		PRICE	
RF-amplifier type in PGR cabinet (identify by presence of red and blue cooling hoses hooked up to front of RF-amplifier. Hoses will not be present on air cooled RF amplifiers.	Liquid	Air	Liquid	Air
Displayed value on middle VFD ('VFD PPMP')	50 +/- 1	43 +/- 1	61 +/- 1	53 +/- 1

7. If either of the pump speeds does not match the charts above, turn OFF the pumps and:

   A. If the pump is an Ebara pump, check corresponding VFD for that jumper wire is installed and wired to the correct terminals.
   B. Ensure the HEC is in a scan-ready state and not in low-power mode.

Further Troubleshooting information can be found in the GE Service Methods document "HEC Troubleshooting".

END OF PROCEDURE


REVISIONS
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AJL
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RECEPT
P2 DI KIT
P1 PLC/PWR 115VAC
TF
SW
480V
360V
380/400/415VAC 50/60HZ
480VAC 60HZ
FACILITY POWER DROP
L1
L2
L3
GND
CABLE STRAIN RELIEF (TOP)
CIRCUIT BREAKER ASSEMBLY 255-1478
PWR CB
GPMP CB
PPMP CB
BLW CB
DRY CB
480Y/277VAC CB's to be used only on systems not capable of producing more than 277 volts to ground
DRYD COMPRESSOR
VFD GPMP
VFD PPMP
VFD BLW
CABLE STRAIN RELIEF (BOTTOM)
GC PUMP
PE PUMP
BLOWER
THIS DIAGRAM REPRESENTS EATON VFD'S
AND FRU 205-0121-33
LYTRON INC.
WOBURN, MASSACHUSETTS
DRAWING TITLE:
WIRING DIAGRAM, ELECTRICAL BOX 1.5
SIZE
FSCM NO.
DWG NO.
REV
B
11245
830-0238-01
A

Revision History

REV	ECN# / REASON FOR CHANGE	DATE	ENG APPRV'D	SERV APPRV'D
A	Initial Release	10/09/14	MN	HB

LYTRON Total Thermal Solutions™ 55 Dragon Court, Woburn, MA 01801, Tel: (781-933-7300), www.Lytron.com

820-0234 Replacement Instructions - Signal Box (PN 205-0121-06) GE PN 5269691

Tools Required:

- Flat bladed screwdriver
- Wire Cutters(as needed to cut zip ties)

NOTICE The signal box weighs approximately 14 lbs.

Removal Procedure:

1. Perform shutdown and lockout of system in accordance with the GE 'LOTO for Heat Exchanger Cabinet (HEC) procedure.
2. Open door to heat exchanger cabinet. If necessary, the door can be removed from its hinges by lifting up on the door.
3. Open front cover of signal box by loosening 6 thumbscrews.
4. Secure signal box cover to Signal box frame by hanging cover hinge holes over the Signal frame built-in tabs. Refer to Photo 1.

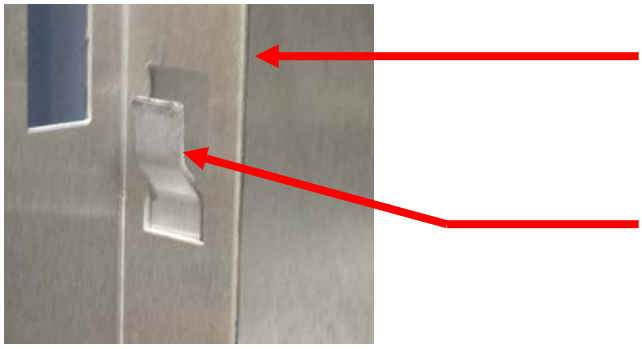

Photo 1 Detail showing mounting Signal Box cover onto built-in tabs of frame.

5. Remove all cables from their respective J## sockets on the right side of the signal box.

Photo 2 Detail of different connection locations

Photo 3 Detail showing HEC ID connector

6. While supporting the signal box with one hand, loosen 4 thumbscrews located inside the signal box that secure the signal box to the heat exchanger cabinet frame.

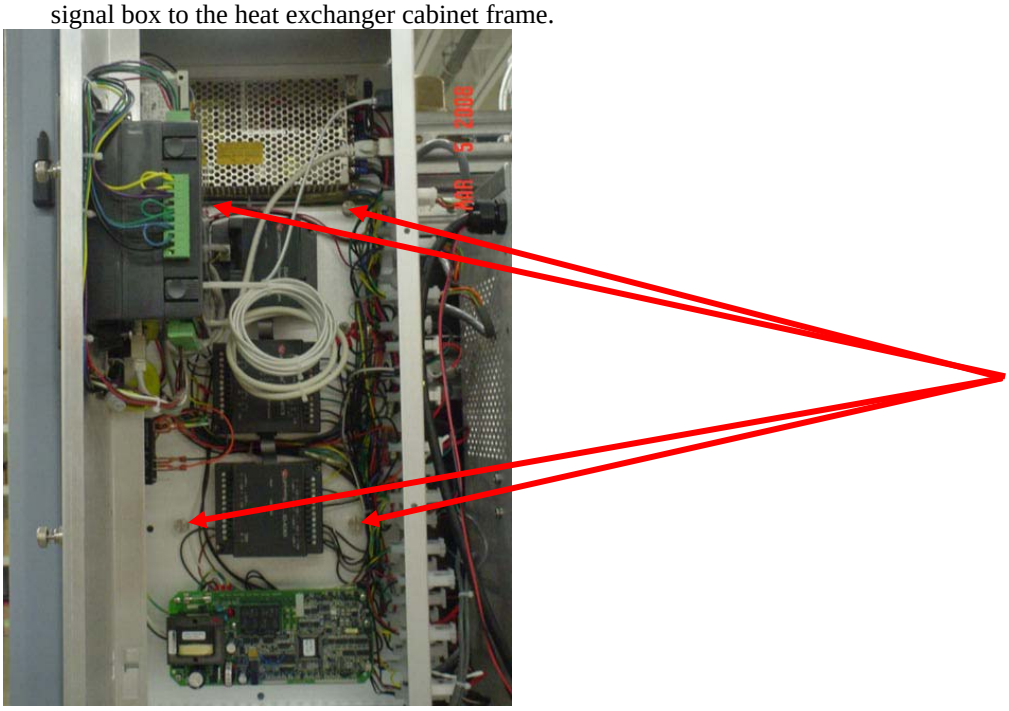

Photo 4 signal box interior- thumbscrew location

7. Close the main cover to the signal box.
8. Crate signal box for shipment.

End of Procedure

Installation Procedure:

1. Remove new signal box front cover by loosening 6 screws.
2. Position the signal box so that the mounting holes in the main cabinet frame align with thumbscrews on the signal box.
3. Tighten one thumbscrew at a time to just finger tight. Tighten thumbscrew and then its opposite counterpart until all 4 thumbscrews are secure. Refer to attached photo 4.
4. Plug connectors J1 through J28 into the appropriate jack on the right side of the signal box. Refer to attached photo 1.
    - Depending on revision of signal box, the location of the connectors J1 through J28 may be different (see attached photo 2). Later revision signal box will have a J29 'HEC ID' plug which will only have a connector plug on G6001EN cabinets (see attached photo 3). J10 'DI-2' and J27 'BLW-VEL' may also remain blank.
        i. NOTE: When replacing the new signal box in a cabinet that had an earlier revision signal box some cable ties may have to be cut. The power box door will have to be opened to cut the J1 zip ties to gain enough length on the cable to make the connection (see attached photo 5).

Photo 5 Close-Up of J1 zip ties in power box

5. Replace front cover on the signal box.
6. Remove Lockout/Tagout in accordance with GE procedures.
7. Start system per Lytron manual #820-0190.

End of Procedure

Revision History

REV	ECN# / REASON FOR CHANGE	DATE	ENG APPRV'D	SERV APPRV'D
C		1/24/2013		

LYTRON Total Thermal Solutions™ 55 Dragon Court, Woburn, MA 01801, USA Tel: +1-781-933-7300, www.Lytron.com

820-0235 – Install Instructions Liquid Pressure Transducer (XDCR) (P/N: 205-0121-07) GE P/N: 5267643

Tools Required:

- Adjustable or open end Wrench
- Loctite™ 565
- Loctite™ 7649 Primer

Removal Procedure:

1. Perform shutdown of system in accordance with Lytron manual #820-0190.
2. Lockout/Tag out system in accordance with GE procedures.
3. Drain system in accordance with Lytron manual #820-0190.
4. Locate Pressure Transducer (xdcr) to remove.
5. Remove electrical connection by pressing down on xdcr retention tab and carefully extracting the connection. (Refer to Photo 1)

Photo 1

6. Using an adjustable or open end wrench, remove the pressure xdcr from the system. Leave the cable in place.

Install Instructions for Liquid Pressure Transducer (XDCR)

1. Prepare threaded end of transducer (xdcr) with Light coating of Loctite 7649 primer and allow to dry (approx 2 min) then apply a bead of Loctite 565 around the threads starting 1 thread from end of xdcr.
2. Carefully screw xdcr into manifold.
3. Using an adjustable or open end wrench, tighten to hand tight.
4. Connect signal harness to xdcr.
5. Fill system in accordance with Lytron manual #820-0190.
6. Check for leaks around unit just installed.
7. Return machine to running condition per Lytron manual #820-0190.
8. Check pressure reading associated with pressure transducer just replaced.

REVISION	DATE	ECN# DESCRIPTION OF CHANGE
A	6/11/08	INITIAL RELEASE
B	5/14/10	ECN# 17091, REVISED TOOLS REQ'D, INSTALL INSTRUCTIONS.
C	5/27/10	ECN# 17178 CHANGED GE P/N TO 5267643

LYTRON Total Thermal Solutions™ 55 Dragon Court, Woburn, MA 01801, Tel: (781-933-7300), www.Lytron.com

820-0236 – Install Instructions for Liquid Temperature Sensor (RTD) (P/N: 205-0121-08) GE P/N: 5268665

Tools Required:

- (2) 9/16” wrenches or slip wrench
- Loctite™ 565
- Tie Wraps (Lytron P/N 101601-01)

Removal Procedure:

1. Perform shutdown of system in accordance with Lytron manual #820-0190.
2. Lockout/Tag out system in accordance with GE procedures.
3. Drain system. Drain system in accordance with Lytron manual #820-0190.
4. Locate Liquid Temperature Sensor (RTD) to remove. There are temperature detectors located in the GC Supply, PE Supply, and Facility Water. (Refer to Photo 1)

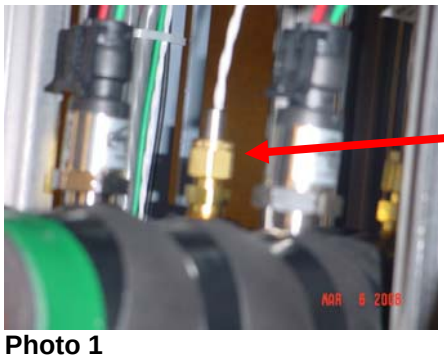

Photo 1

5. Disconnect the associated RTD from the Signal Box.
6. Cut tie wraps that secure the RTD from the Signal Box to the RTD position.
7. While holding the inner nut with a 9/16” wrench, remove RTD by loosening RTD outer nut with a second 9/16” wrench.
8. Remove nut and ferrule from temperature sensor by sliding off. Leave inner nut attached to manifold.

End of Procedure

Install Instructions for Liquid Temperature Sensor (RTD)

1. Install new ferrule and barrel connector by sliding them on over the temperature sensor.
2. Discard new bottom nut.
3. Prepare screw end of Liquid Temperature Sensor (RTD) with a moderate amount of Loctite 565 or equivalent.
4. Carefully screw RTD into manifold.
5. Using a 9/16” wrench, tighten to hand tight.
6. Route RTD cable along original path to the Signal Box. Tie wrap in place.
7. Connect signal harness to Signal Box.
8. Fill system in accordance with Lytron manual #820-0190.
9. Check for leaks around unit just installed.
10. Return machine to running condition per Lytron manual #820-0190.
11. Check reading associated with Liquid Temperature Sensor just replaced.

End of Procedure

LYTRON Total Thermal Solutions™ 55 Dragon Court, Woburn, MA 01801, Tel: (+1-781-933-7300), www.Lytron.com

820-0238 – Install Instructions Air Temperature Sensor (RTD) (P/N 205-0121-10) GE P/N: 5269689

Tools Required:

- (2) 9/16” wrenches or slip wrenches
- Loctite™ 565
- Tie Wraps (Lytron PN 101601-01)

Removal Procedure:

1. Perform shutdown of system in accordance with Lytron manual #820-0190.
2. Lockout/Tag out system in accordance with GE procedures.
3. Locate Air Temperature Sensor (RTD) to remove. Sensor is located on exhaust of heat exchanger.

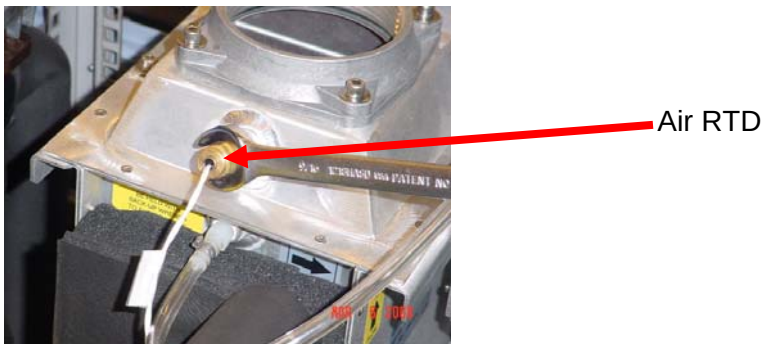

Photo 1

4. Disconnect the associated RTD from the Signal Box.
5. Cut tie wraps that secure the RTD routed from the Signal Box to the RTD position.
6. While holding the inner nut with a 9/16” wrench, remove RTD by loosening RTD outer nut with a second 9/16” wrench.
7. Remove nut and ferrule from temperature sensor by sliding off. Leave inner nut attached to exhaust plenum.

End of Procedure

Install Instructions for Air Temperature Sensor (RTD)

1. Install new ferrule and barrel connector by sliding them on over the temperature sensor.
2. Discard new inner nut.
3. Prepare screw end of Air Temperature Sensor (RTD) with a moderate amount of Loctite 565 or equivalent.
4. Carefully screw RTD into manifold.
5. Using a 9/16” wrench, tighten to hand tight.
6. Route the RTD cable along original path to the Signal Box. Tie wrap in place.
7. Connect signal harness to Signal Box.

8. Check for air leaks around unit just installed.
9. Return machine to running condition per Lytron manual #820-0190.
10. Check reading associated with Air Temperature Sensor just replaced.

End of Procedure

Revision History

REV	ECN# / REASON FOR CHANGE	DATE	APPRV'D
A	Initial Release	6/11/2008	H. Bufe
B	Updated	7/1/08	M. Golini
C	ECN 17682 changed GE P/N to 5269689	3/3/11	H. Bufe

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820-0239 – Install Instructions for Tank Level Switch (P/N: 205-0121-11) GE P/N: 5267644

Tools Required:

- 1” wrench or slip wrench
- 1 ½” wrench or slip wrench
- Loctite™ 739 or equivalent

Removal Procedure:

1. Perform shutdown of system in accordance with Lytron manual #820-0190.
2. Lockout/Tag out system in accordance with GE procedures.
3. Drain system. Drain system in accordance with Lytron manual #820-0190. Alternate draining through the pump housing is also acceptable.

NOTE: Removal of lower Tank Level Switch requires removal of the pump discharge hose to the tank.

4. Remove pump discharge hose from left side of tank (looking from the front of the system).

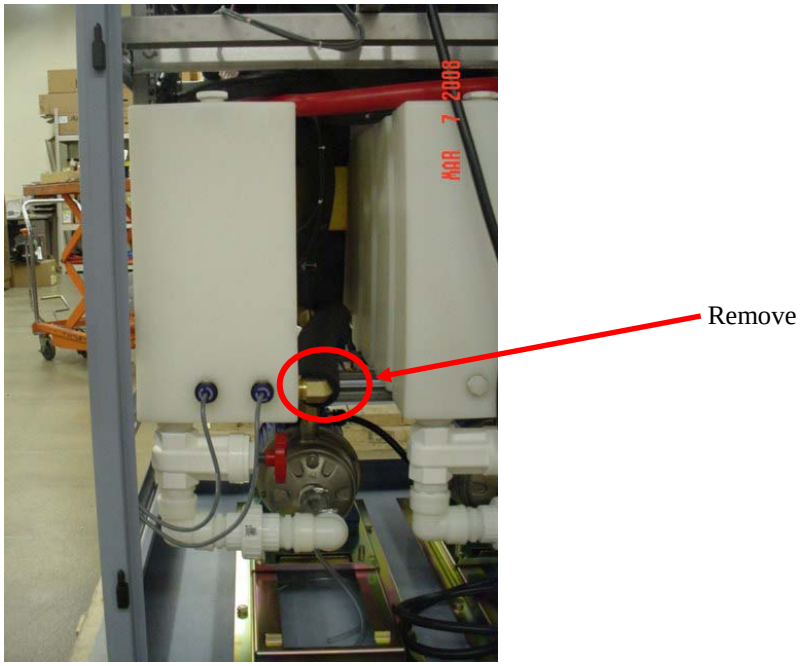


Photo 1 Tank inlet location

5. Disconnect the switch leads from Tank Level switch.
6. Remove the Tank Level switch using a 1” wrench or slip wrench.

End of Procedure

Install Instructions:

1. Apply a generous amount of Loctite 739 or equivalent around the threads of the tank level switch.
2. Screw the tank level switch into the tank.
3. Allow some time for the Loctite to setup (approx. 10min).
4. Attach leads to tank switch.
5. Re-attach pump discharge to tank.
6. Fill system in accordance with Lytron manual #820-0190.
7. Start system normally.
8. Refer to PLC screen to verify proper level switch operation.

End of Procedure

820-0240 Install Instructions Resistivity Sensor Kit (PN 205-0121-12) GE PN 5267649

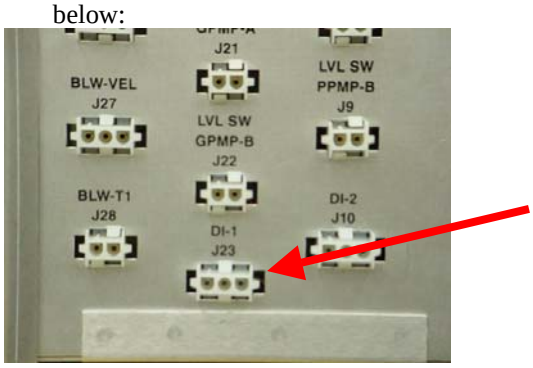
Tools Required:

- Adjustable wrench or Slip Wrench
- Nylon Plug Fitting (Lytron PN 430-0277)
- Teflon™ Tape
- Loctite™ 565
- Tie Wraps

NOTE: For systems with 2 Resistivity sensors, please refer to Procedure below as well as the procedure starting on page 2 of this instruction for removal of duplicate sensor.

Procedure:

1. Shutdown and Lockout/Tag out system in accordance with GE procedures.
   NOTE: The Gradient Pump should be off before proceeding - verify by looking at variable frequency drive for GPMP, the display should be blank.
2. Drain the gradient coil reservoir by following GE service procedures.
3. Unplug the failed DI sensor from the appropriate jack on the side of the Signal Box. Refer to the table and photo below:



Sensor	Jack
DI-1	J23

Illustration 1 Detail of DI Sensor Jack on side of Signal Box

4. Remove the DI sensor cable from its routing from the tank to the right side of the Signal Box.
5. Using an adjustable wrench, unscrew the DI Sensor from the tank.

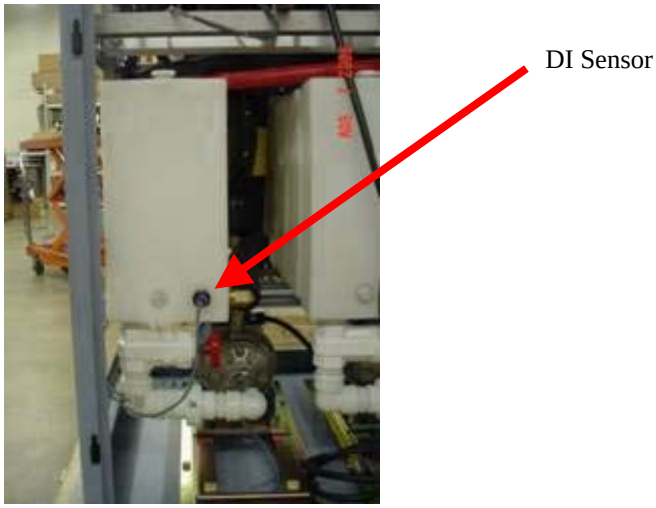


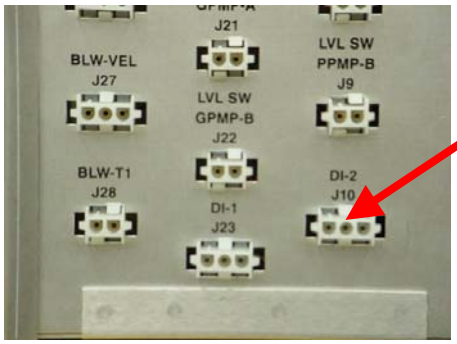
Illustration 2 DI Sensor Location

Installation of Resistivity Sensor Kit.

1. Apply adequate amount of Loctite™ 565 around the threads of the new sensor.
2. Using the adjustable wrench, screw new sensor into the tank. Allow at least 30 minutes for Loctite™ to set up.
3. After making a service loop by the tank, tie wrap cable in place along route to Signal Box.
4. Plug new sensor into DI-1 (J23) on the side of the Signal Box.
5. Fill the system with coolant previously removed using the funnel provided in the HEC and remove LOTO.
6. Restore power to the HEC and restart pumps and blower if they don't come on automatically (hold up and push F1, F2, F3).
7. Check for leaks around sensor just replaced.
8. Monitor system for proper operation.

Procedure (For systems having 2 Resistivity Sensors in Tank):

1. Shutdown and Lockout/Tag out system in accordance with GE procedures.
   NOTE: The Gradient Pump should be off before proceeding - verify by looking at variable frequency drive for GPMP, the display should be blank.
2. Drain the gradient coil reservoir by following GE service procedures.
3. Unplug the failed DI sensor from the appropriate jack on the side of the Signal Box. Refer to the table and photo below:



Sensor	Jack
DI-2	J10

Illustration 3 Detail of DI Sensor Jack on side of Signal Box

4. Remove the DI sensor cable from its routing from the tank to the right side of the Signal Box.
5. Using an adjustable wrench, unscrew the DI Sensor from the tank.

6. Refer to ***Installation of Resistivity Sensor Kit*** for installation steps.

End of Procedure

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820-0242 – Install Instructions Fuse Kit (PN 205-0121-16) GE PN 5266827

Tools Required:

- No special tools required

Procedure:

1. Perform shutdown of system in accordance with Lytron manual #820-0190.
2. Lockout/Tag out system in accordance with GE procedures.
3. Locate Fuse on DI board in Signal Box (Refer to picture).

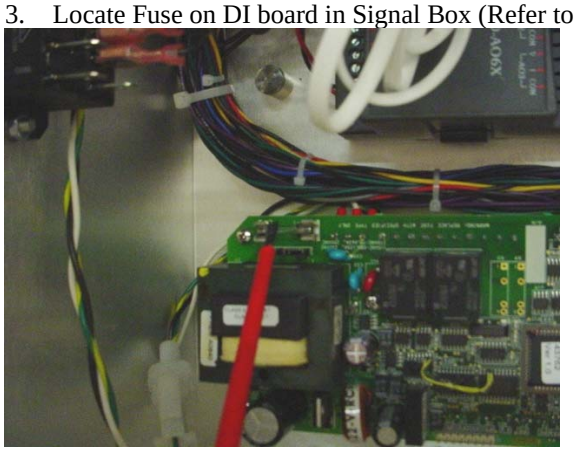


Photo 1 DI Board Fuse location

4. Replace fuse with same value from kit.
5. Locate fuse for mixing valve next to P5 on the top left inside the Signal Box. (Refer to picture).
6. Replace fuse with same value from kit.

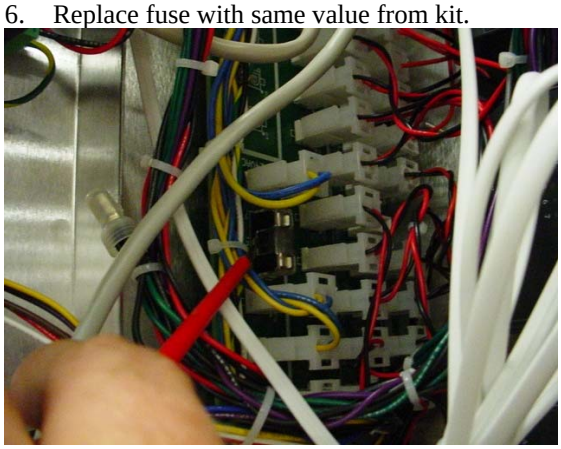
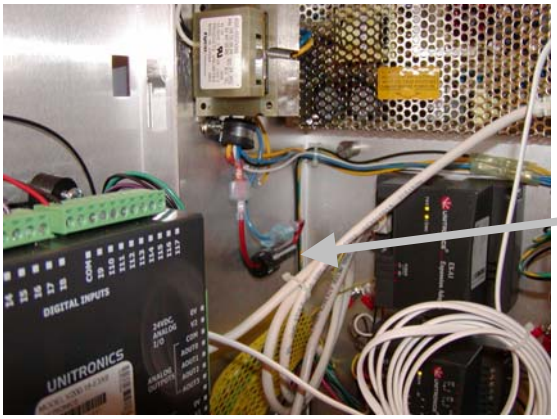


Photo 2 Fuse location on inside of Signal Box

NOTE: On older models of machine there is a fuse for the mixing valve located in the upper left inside of Signal Box. Refer to photo below for location.



Older style in-line fuse holder

Photo 3 Older Style In-line Fuse holder.

7. Clear Lockout/Tag out of system per GE procedures.
8. Start system in accordance with Lytron manual #820-0190.
9. Observe system for proper operation - specifically in relation to fuse replaced.

End of Procedure

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820-0242 – Install Instructions Pressure Differential Sensor Board Kit (P/N: 205-0121-14) GE P/N: 5267648

Tools Required:

- Philips #2 screwdriver or equivalent
- 4mm Allen wrench or equivalent
- Small flat blade screwdriver
- Tie Wraps (Lytron P/N 101601-01)

Removal Procedure:

1. Perform shutdown of system in accordance with Lytron manual #820-0190.
2. Lockout/Tag out system in accordance with GE procedures.
3. Remove air line to Pressure Differential Sensor Box at fitting marked “High” on the top of the box. Mark High line to differentiate from Low line.
4. Remove air line to Pressure Differential Sensor Box at fitting marked “Low” on the top of the box. Mark Low line to differentiate from High line.
5. Remove cover to the Pressure Differential Sensor Box to reveal internal components using the Philips screwdriver.
6. Use a 4mm Allen wrench to remove the Pressure Differential Sensor Box from the frame. Retain screws for re-installation.
7. Remove the following wires from the marked 3 position terminal board using a flat bladed screwdriver (Refer to photo 1 below).

    a. “+” – Red Wire
    b. “-” – White
    c. “O” – Black

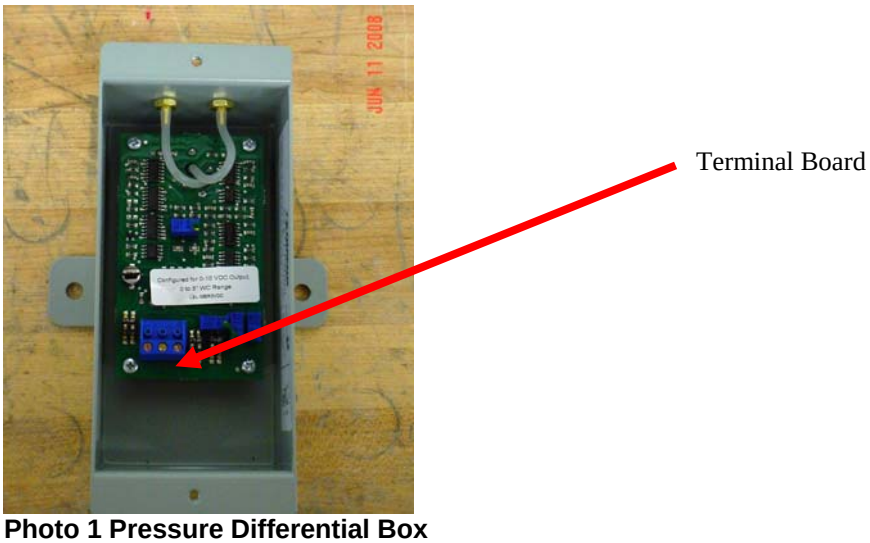

Photo 1 Pressure Differential Box

8. Remove wires through strain relief.

End of Procedure

Installation of Pressure Differential Sensor Board Kit

1. Remove cover from the new Pressure Differential Sensor Box.
2. Install new strain relief on new box.
3. Thread 3 wire cables (Red, White, and Black) through strain relief from the bottom.
4. Attach each wire to screw terminals in the following order:
    a. “+” – Red Wire
    b. “-“ – White
    c. “O” – Black
5. Visually check dip switches S1, S2, and S3 against the following table:

	DIP 1	DIP 2
S1	ON	OFF
S2	ON	OFF
S3	ON	OFF

6. Mount box using 4mm screws saved from the removal of the box.
7. Attach air line marked “High” to Pressure Differential Sensor Box air connection on the top marked “High”.
8. Attach air line marked “Low” to Pressure Differential Sensor Box air connection on the top marked “Low”.
9. Replace cover to Pressure Differential Sensor Box.
10. Return system to normal operation using GE guidelines.
11. Monitor system for proper operation.

End of Procedure

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820-0241 – Filter Replacement for Cryocooler Compressor Valves P/N: 205-0121-13 (GE P/N: 5269685 or 5269685-2)

NOTE: The Kit contains 3 styles of filter elements, depending on the configuration of the strainer valve. The filter elements are all 150 micron (100 mesh) screens. Configuration #1 is used in the plastic strainer; configurations #2 and #3 are used in the Jomar valves while configuration 3 uses the smaller of the two included screens.

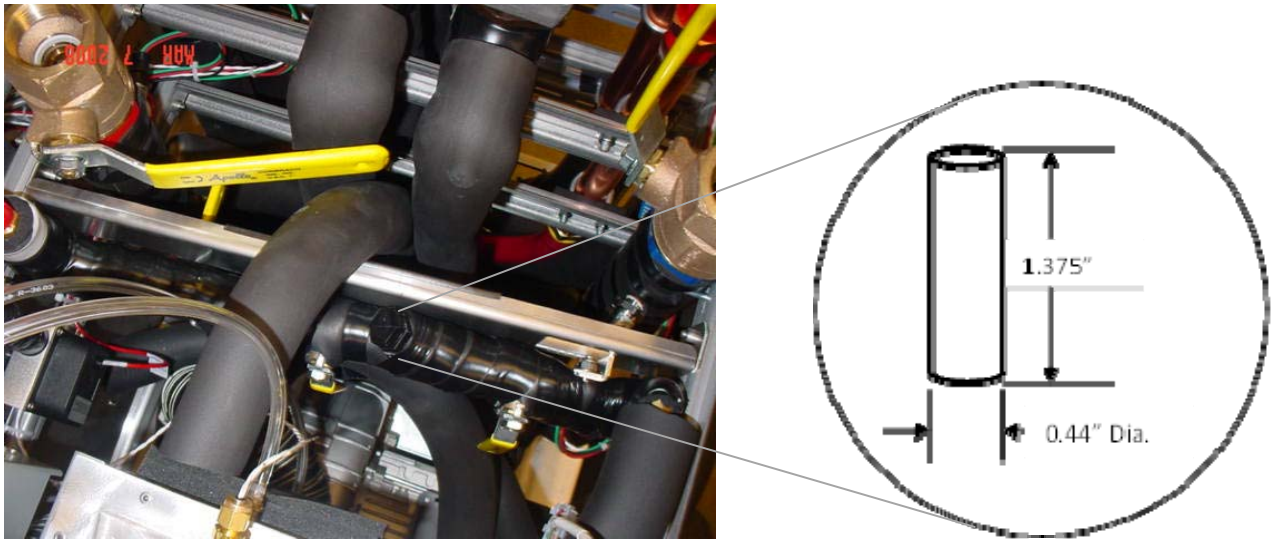
Procedure Timing:

20 min for all Configurations

Tools Required:

- Adjustable wrench
- Snap Ring Pliers utilized in configurations #2 and #3 (included in HEC or Cryogen Supply Header FRU Kit)

Configuration #1 (Old Style Filter Replacement):



1. Refer to the illustration below, and actuate the three yellow-handled valves in the order described:
   a. Open lower right valve: Callout “A”
   b. Close middle valve: Callout “B”
   c. Close left valve: Callout “C”

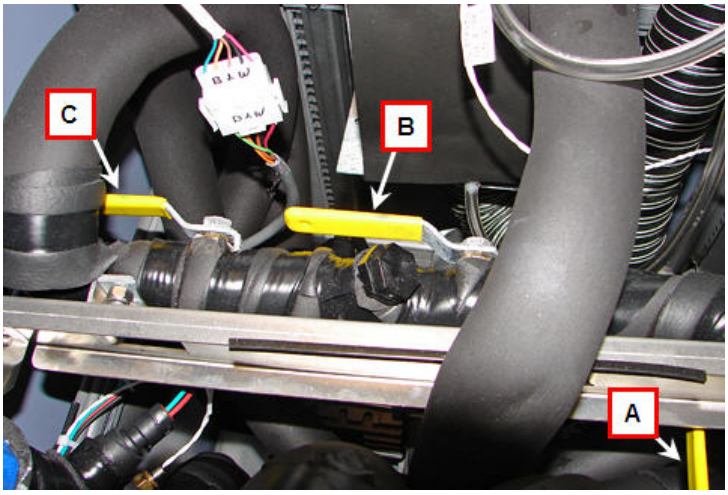


Illustration 1: Configuration #1 Location of Cryocooler Compressor Valves

2. Remove the black plastic hex cap shown below.

Illustration 2: Configuration #1 - Location of Hex Cap over Filter

3. Pull out the wire mesh cylindrical screen from the exposed valve and replace it.
4. Proceed as follows to complete the process:
   a. Match the filter type to what was removed and install a clean filter, and tighten down securely.
   b. Replace the hex cap.
   c. Open the left valve (C).
   d. Open the middle valve (B).
   e. Close the right valve (A).

Configuration #2 and #3(New Style Filter Replacement):

Configuration #2

.985” Long x .70” Dia.

Configuration #3

.78” Long x .685” Dia.

NOTE: Configuration #2 and configuration #3 are identical except for length of assembly and filter size. Procedure for changing the filter is identical for both configurations. For illustration purposes, only configuration#2 is shown below.

1. Close the Jomar Filter Ball Valve in the header by turning the handle perpendicular to the pipe of the supply header. (Open and closed positions are shown below.)

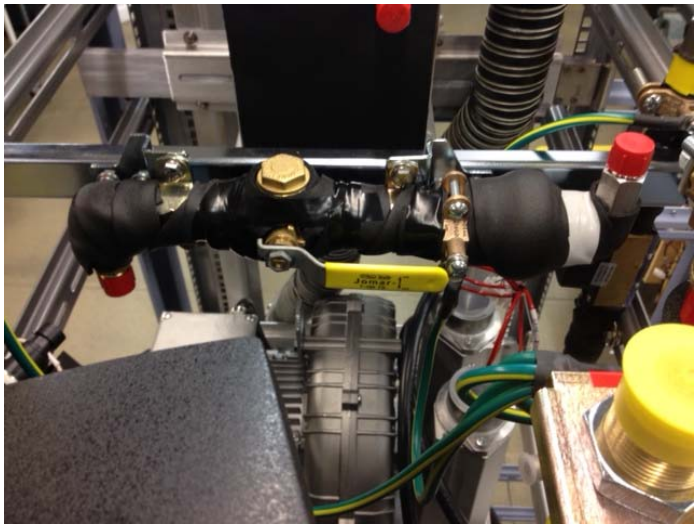


Illustration 3: Configuration #2 Filter Ball Valve Open

Illustration 4: Configuration #2 Filter Ball Valve Closed

2. Unscrew the top of the ball valve using an adjustable wrench.
3. Remove the snap ring from the valve with the snap ring pliers to expose the strainer basket (The snap ring pliers are included with the HEC).

Illustration 5: Configuration #2 - Using Snap Ring Pliers to remove spring clip.

4. Remove the strainer basket. Select the matching strainer from the FRU kit and replace (reference photos at beginning of section for strainer differences).

Illustration 6: Configuration #2 Removing Strainer Basket from Valve

5. Select the appropriate matching snap ring from what was removed and replace..
6. Replace the top of the ball valve, and tighten slightly past hand tight to ensure the O-ring is engaged.

END OF PROCEDURE

REVISION HISTORY		
REV	**ECN / DATE**	**REASON FOR CHANGE**
A	6/11/2008	Initial Release
B	ECN# 17216 / 6/04/2010	Documenting changes requested by GE
C	ECN# 100952 11/08/2013	Change Jomar valve to new style.

820-0295 – Install Instructions for Cryo Fitting Kit GE PN 5357155

Tools Required:

- Cryo Fitting Kit (5357155)
  - Kit Includes
    - Fitting
    - Teflon™ tape
    - Wrench
    - Insulating tape
    - Install Instructions

Removal of Installed Fittings

Procedure:

1. Perform shutdown of system in accordance with Lytron manual #820-0190.
2. Lockout/Tag out system in accordance with GE procedures.
3. Shut off Facility water Supply at the top of the unit. Drain Facility water per GE procedures.

   Note: Before shutting off the facility water supply, check with the facility maintenance to determine what measures are needed. The goal is to prevent dead head of pumps or other possible issues.

4. Disconnect cryo hoses from the HEC by loosening and disconnecting them at the swivel flare fitting.

   CAUTION: There may be residual coolant in the lines, which may drip out during removal. Any coolant that escapes should be cleaned up with an absorbent towel.

5. Using a utility knife, cut away the black insulating covering around the fitting (see Illustration 1).
6. Using the pipe wrench supplied in the FRU kit to hold the pipe, loosen and remove the installed cryo fittings with an adjustable wrench. (See Illustration 2)

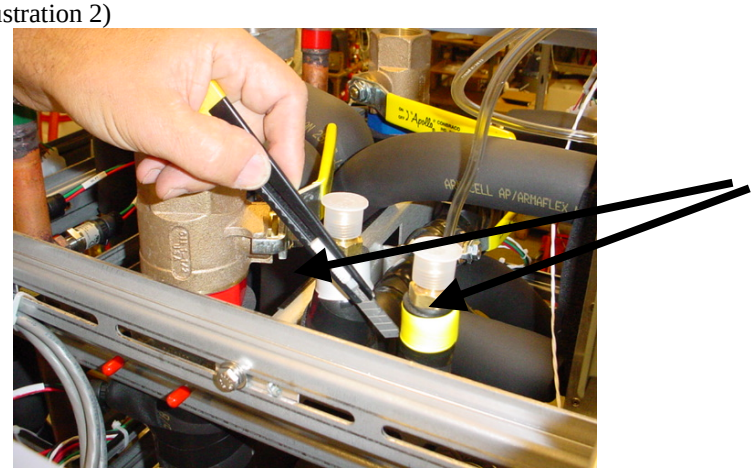


Illustration 1 Detail of Removing Insulation around fitting.

Place pipe wrench here.

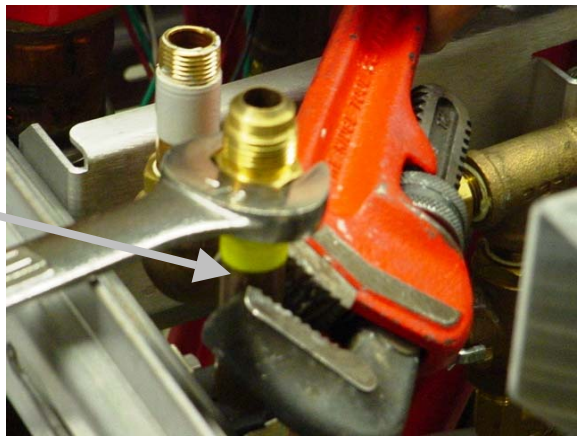


Illustration 2

Detail of Removing Fittings

Installation of Cryo Fitting Kit

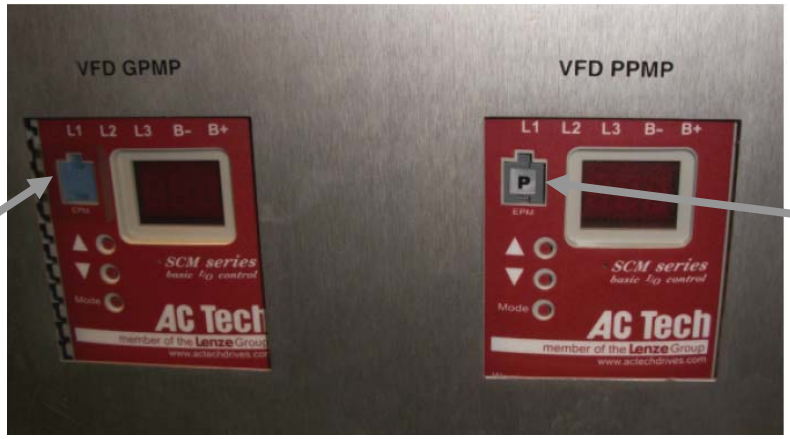
1. Clear threads of tubes prior to cryo fitting installation.
2. Wrap threads with 2 turns of Teflon™ tape prior to installation of fittings.
3. Screw fitting onto pipe until finger tight.
4. Using the pipe wrench supplied in the FRU kit to keep the base from moving, tighten the fitting over the Teflon ™ tape until finger tight and then 2-3 turns past finger tight.
5. Tape around the black insulating tape to secure the insulation.
6. Reconnect the cryo compressor hoses at top of HEC by tightening the female flare fitting onto the newly installed male flare cryo fitting. Hold the male cryo fitting with a wrench while tightening. Tighten female flare to finger tight and then ¼ turn past finger tight.
7. Open the Facility water Supply by opening valves on top of the system. Check for leaks before proceeding.
8. Check for any leakage around fittings just installed and correct before proceeding.
9. Replace insulating tape around joint.
10. Return system to operation.

<u>Note:</u> Pipe wrench is magnetic and a consumable. For safety reasons, it should be discarded once procedure is complete.

820-0327 – HEC Variable Frequency Drive EPM Chip Replacement (PN 205-0121-27) GE PN 5443037

Purpose: This procedure is only required when a pump has been changed. The EPM chip modifies the frequency range of the VFD to match corresponding pump in HEC. The Price pump must have EPM chip with "P" in the corresponding VFD. Ebara pumps must be controlled by a VFD that does not have a letter/label on the EPM chip.

NOTE: The Ebara pump EPM chip replacement procedure is the same as for the Price pump with the exception of not having a label on the chip.



Lack of letter indicates Ebara pump.

Indicates presence of Price Pump

Photo 1 Detail of VFD EPM Chip in different Pump Style VFDs

Tools Required:

1. Pliers for VFD Chip (included with VFD Chip FRU Kit, Lytron PN 205-0212-27)

IMPORTANT: The HEC may have pumps from different manufacturers. (Price or Ebara). It is imperative that the pump type be exactly matched with the correct VFD chip. The Pump FRU kit will contain the correct VFD chip for the pump, as well as pliers to facilitate removal and replacement of the VFD chip.

An incorrectly-matched pump and VFD chip will result in either high pressure or low flows, risking equipment damage and/or systems errors.

Procedure:

1. Perform shutdown of system in accordance with Lytron manual #820-0190.
2. Lockout/Tag out system in accordance with GE procedures.

Price pumps/chips and the Ebara pump/chips can be identified according to the following photos and descriptions:

Price

Ebara

Price Pump:
Irregular pump face shape.
Bolt at 9 o'clock position on pump face.

Price VFD Chip:
Identified with 'P"

Ebara Pump:
Circular pump face shape.
Bolt at 12 o'clock on
pump face.

Ebara VFD Chip:
Plain, colored chip.

NOTE: Suction hose is independent of pump type (Ebara cabinets may have white or blue hose type)

The gradient coil pump is located on the left-hand side of the HEC and corresponds to the VFD in the left most location in the Power Box. The power electronics pump is on the right-hand side of the HEC and corresponds to the VFD in the middle location in the Power Box. The right most VFD is for the chilled air blower and is not impacted by this replacement procedure.

If the style of chip matches the style of pump according to the above descriptions, the next section can be skipped and you may proceed with the next step in the installation procedure.

3. Remove the tape holding the chip in the front of the respective VFD in the Power Box.
4. Grab with the pliers and pull straight out.
5. Place removed chip in plastic bag to avoid mixing chips.
6. To install the new chip, align it according to its keyed shape and press in fully with your finger. Place a piece of tape (in the FRU kit) over the newly-installed chip.

(Note: If the VFD chip is missing, lost or broken from the Pump FRU, see the GE FRU Manual and order the correct VFD chip.)

Figure 6 Remove the existing VFD chip with replacing the Ebara pump with a Price Pump.

Figure 7 Complete installation. (This HEC has an Ebara gradient coil pump and a Price power electronics pump, as noted by the 'P' on the VFD chip in the power electronics VFD)

FINALIZATION

1. Clear the Lockout/Tagout in accordance with GE procedures.
2. Re-start HEC and turn pump ON. Add new DVMR coolant as necessary.
3. Check for any leakage. Repair if necessary.
4. Perform a TPS reset.
5. Ensure HEC is in a scan-ready state and not in the low power mode; this is done by prescribing a scan at least to the point where the scan protocol.
6. Return to the HEC and view the displayed speeds on the two pump VFDs.

Note if the VFD is displaying 'F1' the VFD chip is either not installed or not seated fully.

Review the charts below and circle 'YES' or 'NO' below, indicating you have confirmed the correct speed based on pump and system configuration:

GRADIENT COIL PUMP:		
Pump Type (Identify as described above):	EBARA	PRICE
Displayed Value On left-most VFD ('VFD GPMP')	50 +/- 1	61 +/- 1

CORRECT GC Pump Speed? YES / NO

POWER ELECTRONICS PUMP:

Pump Type: (Identify as described above):	EBARA		PRICE	
RF-amplifier type in PGR cabinet (Liquid cooled is identified by presence of red and blue cooling hoses hooked up to the front of the RF amplifier. Hoses will not be present on air cooled RF Amplifiers)	Liquid	Air	Liquid	Air
Displayed value on middle VFD ('VFD PPMP')	50 +/- 1	43 +/- 1	61 +/- 1	53 +/- 1

Correct PE pump speed YES / NO

7. If either of the pump speeds do not match the charts above, turn OFF the pumps and:

   A. Re-inspect that the VFD chips match the pump type.
   B. Ensure the HEC is in a scan-ready state and not in low-power mode.

If you do not have the proper VFD chips to match up with the pumps present, consult the FRU manual and order the required VFD chips.

End of Procedure

820-0297 – Install Instructions Cryo Supply Header (P/N 205-0121-19) GE P/N 5376555

Cryo Supply Header Replacement

1 Personnel Requirements

Required Persons	Preliminary Reqs	Procedure	Finalization
1	Not Applicable	1 hour	15 mins

2 Overview

The Cryo Supply Header is a manifold located in the top portion of the Heat Exchanger Cabinet that routes facility-supplied coolant to the cryogen compressor and allows for filtering of the coolant.

- There are currently three configurations of this assembly in the product:
  - Configuration 1: Original style header contains a 150-micron plastic Y-filter that is removable with a hex head cap and can be seen in Illustration 1.
  - Configuration 2: A version of the supply header simplified with a 150-micron basket filter and can be seen in Illustration 2.
  - Configuration 3: The 150-micron screen is physically smaller than used in Configuration 2. The current version can be seen in Illustration 3.
- This procedure outlines replacement of all 3 configuration headers.

Illustration 1: Configuration 1 Cryo Supply Header

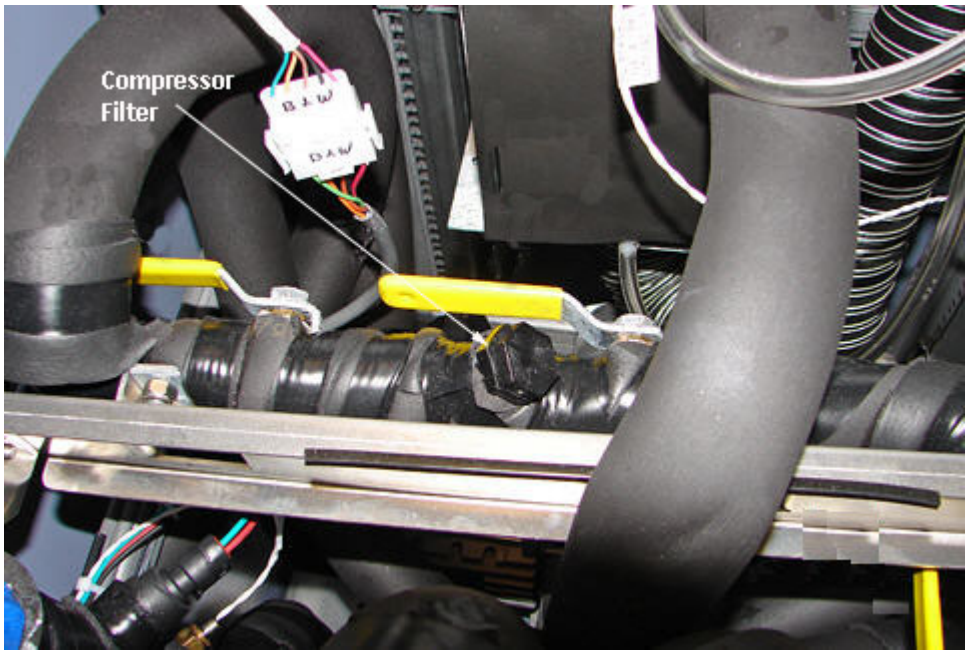
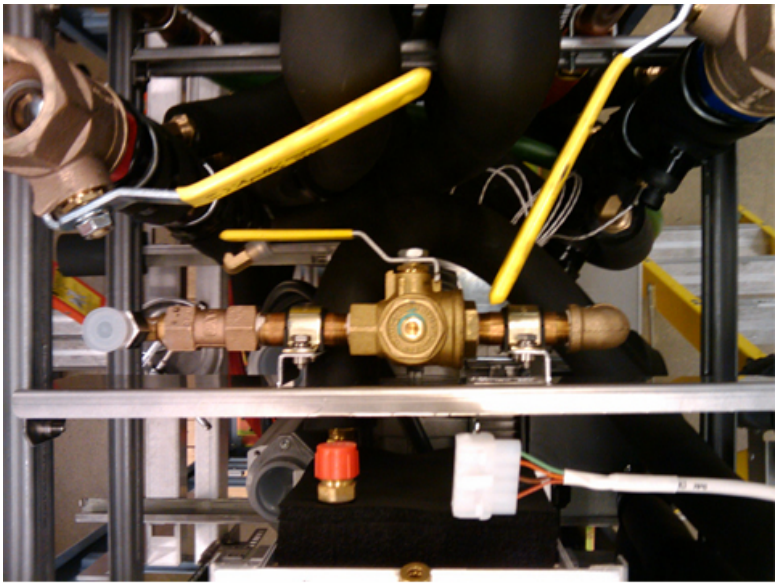


Illustration 2: Configuration 2 Cryo Supply Header



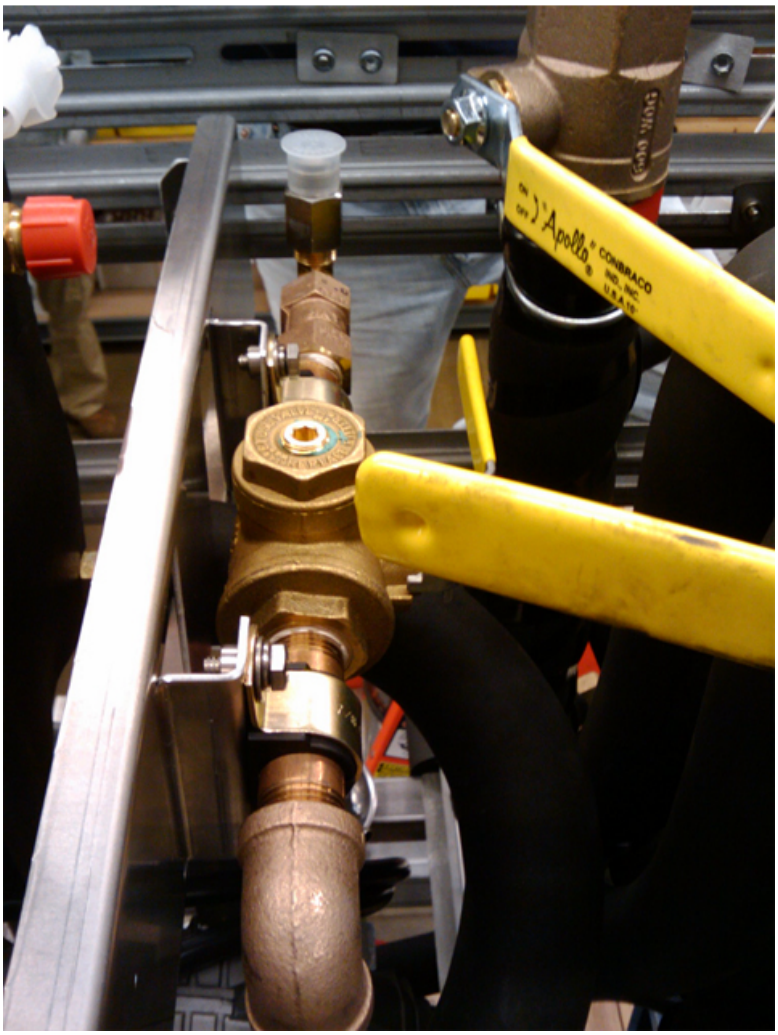
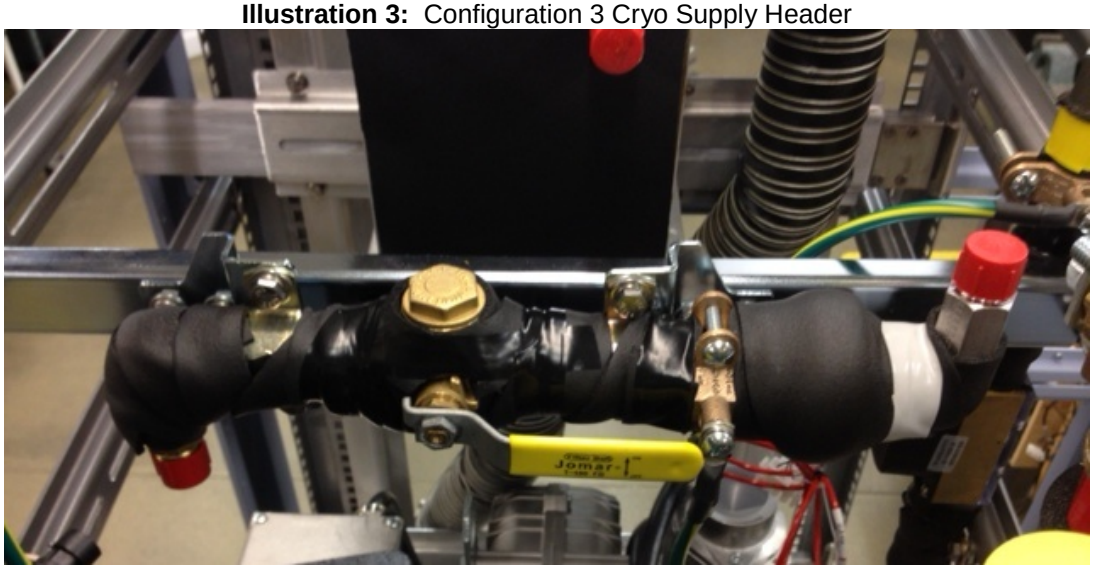


Illustration 3: Configuration 3 Cryo Supply Header



3 Preliminary Requirements

3.1 Tools and Test Equipment

Item	Qty	Effectively	Part#	Manufacturer
Adjustable Wrench	2	-	-	-
Service Platform	1	-	-	-
Coolant Draining Kit	1	-	-	-

3.2 Safety

PRESSURIZED LIQUID!
THERE IS PRESSURIZED LIQUID INSIDE THE HEC CABINET WHEN ENERGIZED.
Perform LOTO on the Heat exchanger cabinet. See the MR Service Safety Manual, PN 5452735.

4 Procedure

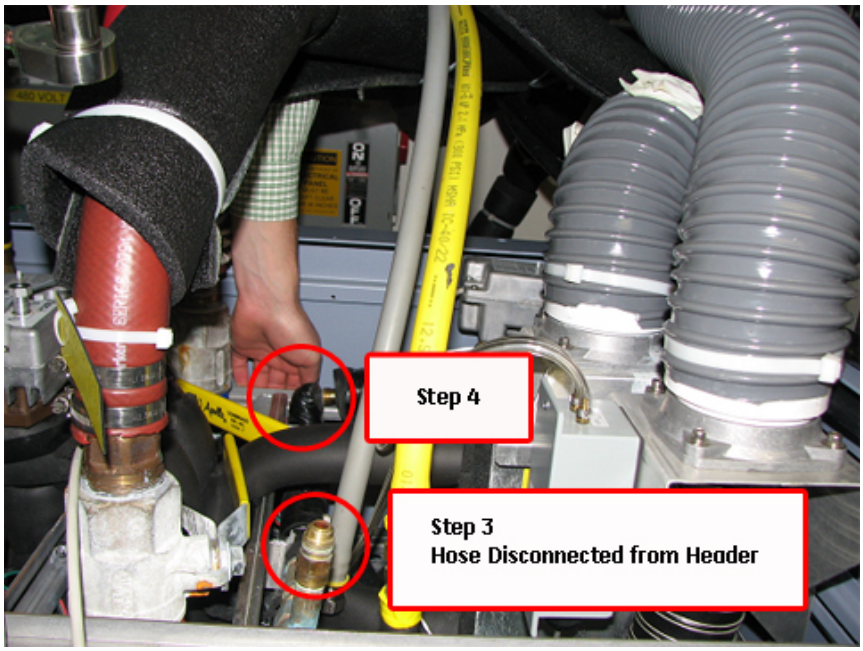
4.1 Cryo Supply Header Removal

NOTE: This section outlines removal for Configuration 1, but the process is the same all 3 configurations.

1. Perform *LOTO for the HEC*. See MR Service Safety Manual, PN 5452735.
2. Drain the facility water from the cabinet per the *Coolant Draining* procedure following GE Procedures.

3. Remove the gray hose from the front side of the header by loosening the swivel joint. (See Illustration 3.)

Illustration 3: Front Hose Removal

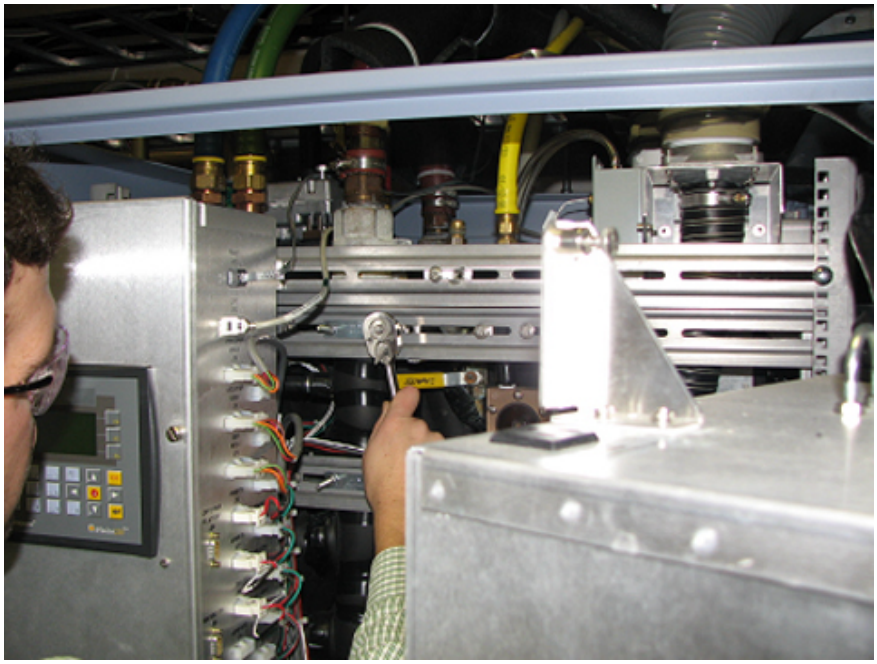


4. Remove the insulation and hose from the back side of the header by loosening the swivel joint.

5. Move the power box from the front of the cabinet out of the way by loosening the upper and lower screws that attach the box to the cabinet.

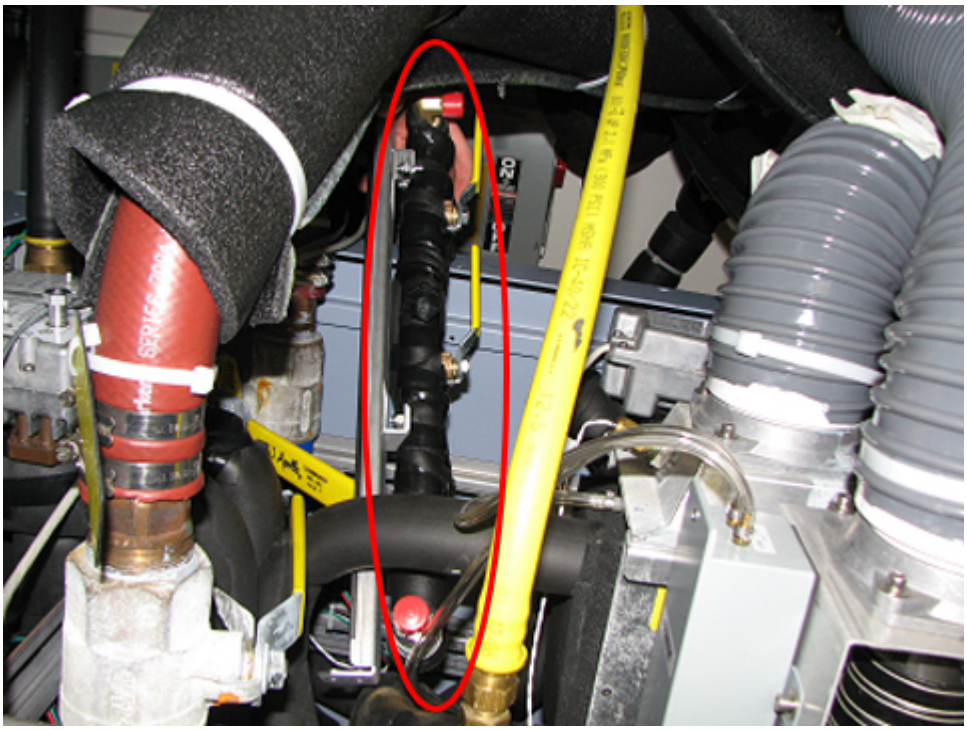
6. Loosen 4 bolts (2 in the front of the cabinet, 2 in the back) that secure the cryo supply header assembly to the cabinet rails. (See Illustration 4.)

Illustration 4: Removing Cryo Supply Header Screws



7. Remove cryo supply header from top of cabinet. (See Illustration 5.)

Illustration 5: Cryo Supply Header Removal



4.2 Cryo Supply Header Installation

1. Orient the cryo supply header with the hex cap facing up and attach rear hose to cryo header. **These should be finger tightened plus an additional quarter turn; with two wrenches, one for holding lower fitting in place and the other to tighten upper fitting.**
2. Fasten new cryo supply header by securing 4 previously removed screws to the cabinet rails.
3. Attach previously removed front hose and secure firmly to prevent leaking. **These should be finger tightened plus an additional quarter turn; with two wrenches, one for holding lower fitting in place and the other to tighten upper fitting.**
4. Return the power box to its original location by securing two screws originally loosened securing it to the cabinet brackets.
5. Ensure all valves are open to allow coolant flow through facility plumbing of the HEC.
6. Remove LOTO from HEC. See the MR Safety Manual, PN 5452735.

5 Finalization

1. Check the fittings for leaks and retighten if necessary.
2. Confirm coolant flow to the cryo compressor on the PLC box.
3. Confirm that cryogen compressor flow is greater than or equal to 7 L/min (pressure is less than 6 bar at the facility inlet).

Revision History

REV	ECN# / REASON FOR CHANGE	DATE	ENG.APPR'D	SRV APPRV'D
A	Initial Release	5/5/11	APT	HB
B	ECN #100952	11/08/13	NG	HB