

INSTALLATION AND OPERATION

SOLOCHILL™ MICRO DISTRIBUTED

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P096412C · V7 09/17/2019



Due to our commitment to continuous improvement, all specifications shown in this manual are subject to change without notice.

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Thank You!

Hillphoenix cases with SoloChill™ Micro Distributed condensing units provide for a micro-distributed remote DX system with minimized refrigerant charge due to the closely coupled condensing unit. Each condensing unit is cooled by a field installed water-loop minimizing noise versus traditional air-cooled self-contained cases.

Each case and condensing unit utilizes a comprehensive controls system which monitors the water loop, condensing unit, and display case performance and adapts the variable speed condensing unit to minimize energy and optimize performance. Each evaporator utilizes an Electronic Expansion Valve (EEV) that is also integrated into the controls to further optimize performance and reduce the labor time associated with traditional mechanical valve installations.

The controls system allows field networking of each case/condensing-unit controller to the store executive controller. In addition, local networks (up to 6 control units) may be installed to create case line-ups that defrost on a common schedule, similar to traditional refrigeration circuits of traditional remote systems.

1.0 Important Notices

We designate important information in all Hillphoenix installation and operations handbooks with alert symbols. These notices provide information about potential dangers to personal health and safety – as well as case damage – if these instructions are not carefully followed.



ATTENTION!

Indicates important information that is critical to proper system performance.



CAUTION!

Indicates the threat of potential injury if all instructions are not followed carefully.



DANGER!

Indicates an immediate threat of serious injury or death if all instructions are followed carefully.

Service Notes

To ensure optimum case performance, we strongly recommend that Hillphoenix display cases be installed and serviced by trained and qualified technicians who have experience working with commercial refrigerated display cases and storage cabinets. For a list of Hillphoenix-authorized installation and service contractors, visit hillphoenix.com/dealer-group.

2.0 General Information

This manual covers general installation and operational information for the SoloChill™ Micro Distributed condensing unit. Hillphoenix recommends you retain a copy for future reference

Store Conditions

Hillphoenix cases are designed to operate in AHRI conditions: a climate-controlled store that maintains a 75 °F (24 °C) interior temperature and a maximum 55% relative humidity. Case operation will be adversely affected by exposure to excessively high ambient temperatures and/or humidity.

Receiving Cases

Inspect cases carefully. In the event of shipping damage and/or shortages, please contact the Hillphoenix Service parts Department at 800-283-1109.

Case Damage

Claims for damage must be: (1) noted on either the freight bill or the express receipt, and (2) signed by the carrier's agent. Otherwise, the carrier may refuse the claim. If damage becomes apparent after the cases are unpacked, retain all packing materials and submit a written request (along with photos of the damage) to the carrier for inspection within 14 days of receipt of the cases.

Missing Items

Hillphoenix cases are inspected before shipping to ensure the highest level of quality. Any claim for missing items must be made to Hillphoenix within 48 hours of receipt of cases.

Technical Support

For technical support issues regarding this unit, contact the Hillphoenix Case Division Technical Support at 800-283-1109.

Ordering Case Parts

If you need to contact Hillphoenix regarding specific fixtures or parts, call 1-833-1 833-372-7871 and ask for Service Parts.

If the part does not have a barcode, provide the following information:

- Model number and serial number of the case for which the part is intended. The case serial number may be found on the serial plate located inside the case on the top left panel.
- Length of the part, if applicable.
- Color of part (if painted) or color of polymer part.
- Whether the part is for a left-handed or a right -handed application.
- Quantity of parts
- Ship-to location.

If Hillphoenix Service Parts decides that a part must be returned instead of scrapped, you will be issued a Return Material Authorization number.



1-833-372-7871



3.0 SoloChill Condensing Unit Info

Location of Condensing Unit

The letters “QA” in the case model name indicate a case designed and built for use with the water-loop condensing system. For multi-deck cases, the water-loop condensing unit is pre-installed on the left rear top of the case. The unit is adjacent to the electrical junction box at the left rear top of the case (see Fig. 1 below).

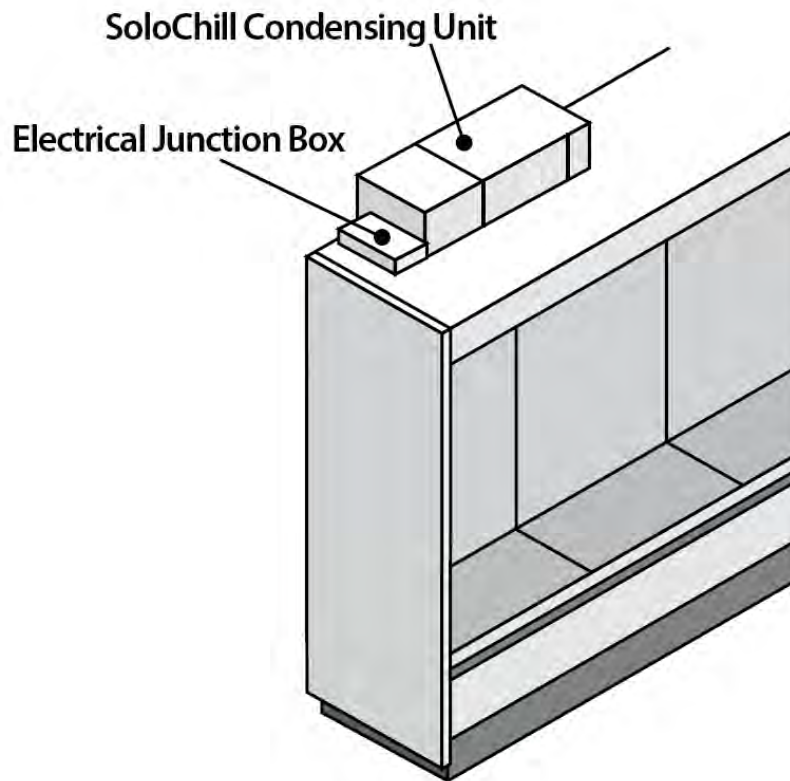


Fig. 1. Location of the SoloChill condenser on a multi-deck case.

For the “QA” models of certain service or semi-vertical case types, the water-loop condensing unit is typically mounted under the tank of the case.

These “QA” case models should be set in a manner similar to that used for typical cases; consult the appropriate Installation Manual for the specific case models. Be cautious to avoid damaging the condensing units or any refrigeration pipes outside the case. Damage may result from lifting the case under the condensing unit, or from impacting door bulkheads, walls, and other obstructions. Be mindful of the asymmetric position and weight of the condensing unit (nominally 150 to 200 lbs) when maneuvering the case into position.

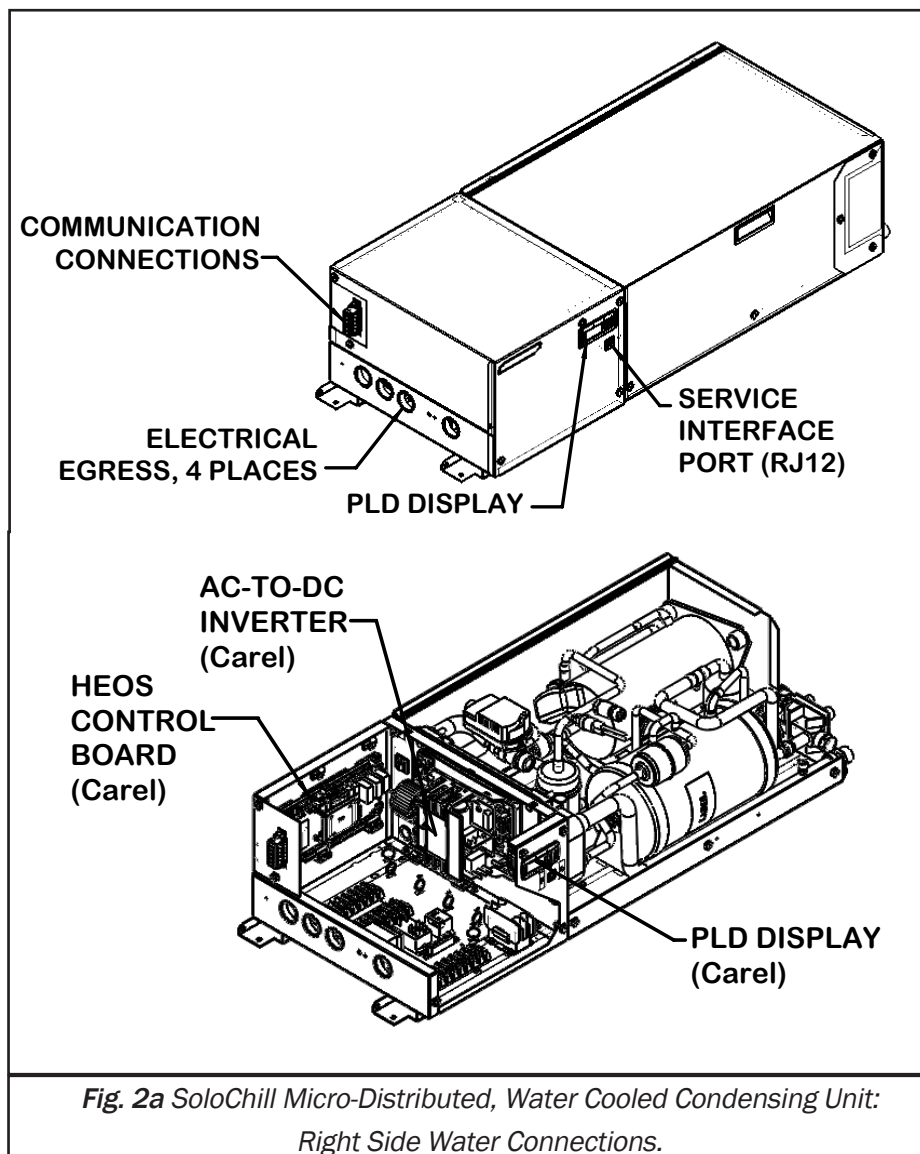


CAUTION!

NEVER start any SoloChill-equipped case until the store's water-loop system has been connected, commissioned, and confirmed to be operating correctly..

3.1 Location of Control Board

Each condensing unit has a compartment on its left-hand side containing a HEOS control board (Carel) and electrical connections. It is located behind/below the removable cover (see Fig. 2a). The cover for this electrical area should be removed only by contractors responsible for servicing the unit. Also note the location of the inverter which provides variable DC power to the brushless DC compressor (BLDC).



Access to the interior of the SoloChill unit may be obtained by removing several screws that hold the protective black metal case that protects the interior components. This case/cover should always be reinstalled and returned to its original location. In the right-hand drawing above, note that the HEOS control board is mounted to the fixed rear wall of the SoloChill condensing units on all display cases. It will always be located in this position

SoloChill condensing units on island cases with 5 inch or 7 inch baseframes will require that the condensing unit be mounted in a 2 foot (24 inch) pipe box positioned between cases in the lineup or in a remotely mounted location. In such instances, the Heos control board may be positioned in an alternative orientation.

3.2 Location of Refrigeration Components

The right-hand side of each SoloChill condensing unit has a compartment that contains all of the basic refrigeration components. The removable cover protects these components. A second, smaller service cover is also provided at the front right corner of the condensing unit for access to service valves (see Figures 3a and 3b below).

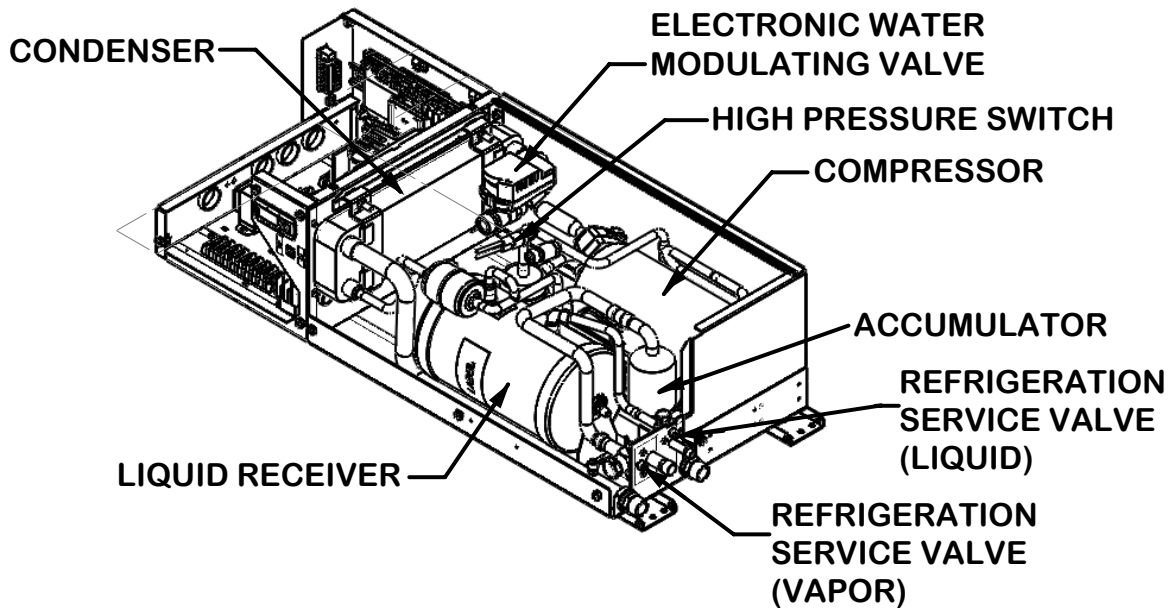


Fig. 3a Location of Components within the SoloChill Condensing Unit.

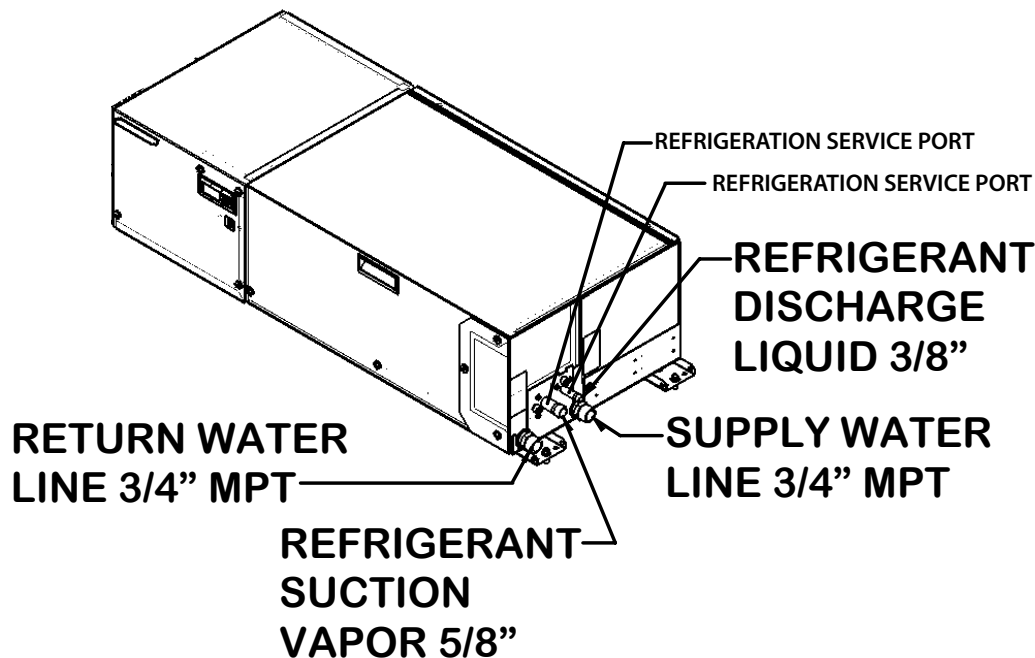


Fig. 3b Location of Connections at the end of the SoloChill Condensing Unit.

Field contractors typically should avoid removing the covers from the refrigeration section. However, if needed, the service cover may be removed to access the service valves. Note that the water SUPPLY and RETURN lines for the heat removal (condensing) pass through the right-hand side of the condensing unit. The refrigerant lines (suction and discharge) are also located on this end of the SoloChill condensing unit.

4.0 Water Supply Connections to Water Loop

For each SoloChill unit to perform its function of condensing the vapor refrigerant back into a liquid it must remove heat from the refrigerant before it is returned to the display case or walk-in cooler or freezer. The actual condensing unit is a brazed plate heat exchanger located within each SoloChill water-loop condensing unit. These brazed plate heat exchangers are mounted inside of the refrigeration compartment of the SoloChill unit. There are a large number of narrow passageways inside of the heat exchanger to allow fluids to flow and for heat to be transferred from one fluid to the other. There are connections on the exterior, right-hand side of every SoloChill condensing unit to provide a steady supply of water as part of the water cooling loop. A second connection is also located a short distance away to provide a return flow of the water after it has absorbed heat in the condenser. Please examine these connections as depicted in the Fig. 4 drawing below.

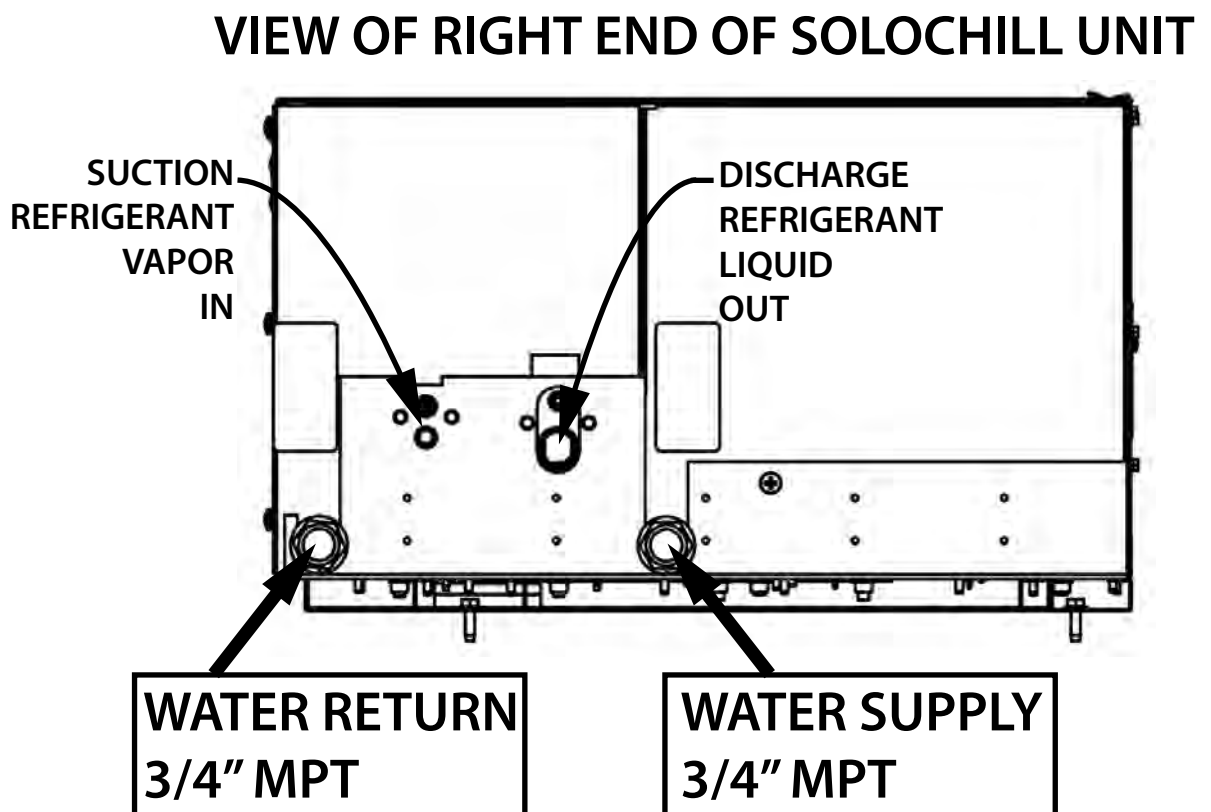


Fig. 4 Location of Water SUPPLY and RETURN Connections on a SoloChill Condensing Unit.

Shut-off valves are required on the store-installed water lines at both the SUPPLY and the RETURN of each condensing unit (See the Fig. 4 drawing above). The installation of these valves permits the isolation of the individual SoloChill condensing unit from the remainder of the water loop without any interruption of the water supply to other SoloChill units being supplied with water from the water loop.

The shutoff valve on the SUPPLY line should also include a 20-mesh strainer (see Fig. 5 below).

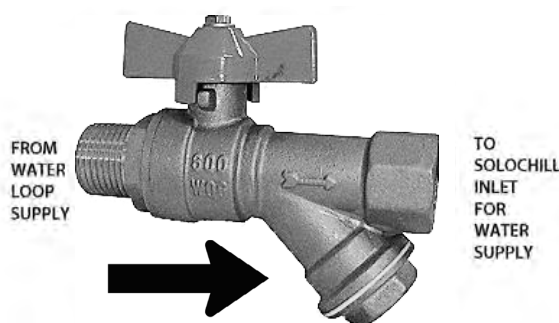


Fig. 5. Orientation of Shut-off Valve with strainer. The valve and strainer are field-supplied, field-installed components.



Fig. 6 Shut-off Valve for Water RETURN to Water Loop, strainer is not required, also a field-supplied, field-installed component.

Once the store water loop lines have all been plumbed per the store plan details, the water cooling system should be commissioned and confirmed as operational prior to starting any individual display cases or condensing units. Particular attention should be paid to the fluid requirements of the system as these may differ between store site installations (examples might be distilled water with treatments vs. inhibited glycol and water, etc.).

Prior to opening the valves and allowing water into the SoloChill condensing units, the water lines should be thoroughly flushed to ensure any unwanted debris has been flushed out. It is recommended that the strainers be serviced one week after system start-up to ensure a clear path exists for water flow to into the SoloChill unit and to the heat exchanger.

5.0 Water Loop Pump Station

The drawing below is provided **ONLY** for purposes of an example of a generic pump station that may utilized to provide motive power for circulation of water in the water loop. The actual pump station design may be different from this example..

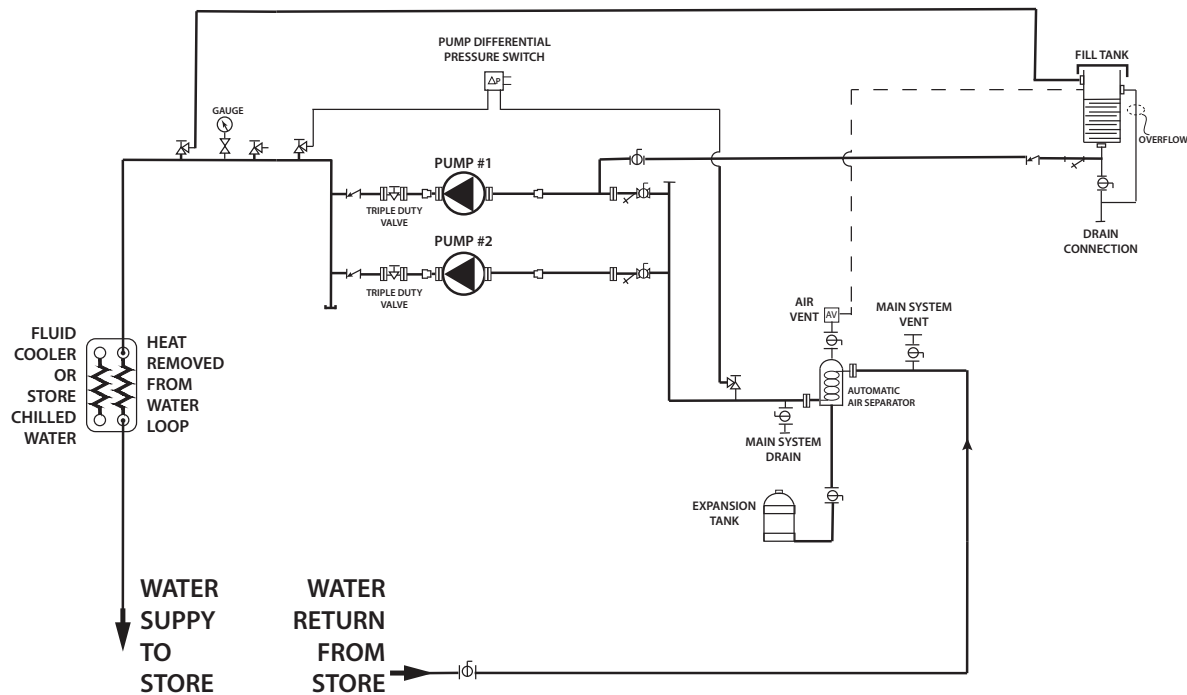


Fig. 7 Individual Pump Station designs may vary, but this is a typical example of a two-pump system for use in a Water Loop.

The water loop piping must supply water to every SoloChill unit in the supermarket. The piping runs in the supermarket may be constructed using copper pipe as well as CPVC and/or PEX-A pipe. It will be necessary to refer often to the architectural drawings for the piping layout designed for the store. Close consultation with these drawings will aid in ensuring that all piping for the water loop is properly routed to the necessary locations where main piping headers and branch lines are to be located. As noted in the diagram above, all RETURN water from all SoloChill units must ultimately be directed to the main water return to the pump station. After having heat removed from it, the water must then be directed to the SUPPLY piping that feeds all of the SUPPLY connections on all of the SoloChill units.

Standard practices and procedures should always be followed for the installation of all water loop piping runs. This applies to all piping and fittings used for the installation. To ensure the performance of a satisfactory, leak-free installation, this piping should always be installed by a qualified, competent contractor who is familiar with hydronic systems.

5.1 Water Loop Supply and Return

The drawing shown on the previous page depicts the portion of the water loop which accomplishes two critical functions. It is responsible for: 1) providing the motive force (pumping) to constantly circulate the water/glycol mixture throughout the loop, and 2) removing/rejecting the heat (via the fluid cooler) that is carried by the water/glycol. Noted by the text in the lower left-hand corner of that drawing are the points where water is returned from the store and where water (minus the heat it had been carrying) is supplied to the store. In particular, it is supplied to the network of SoloChill units distributed throughout the interior of the store. As an example of the typical routing of piping that is utilized within the store, the drawing shown below provides a visual picture of water being supplied to the condensers (heat exchangers) of two representative SoloChill units. Take particular note of the ball valves installed where water is supplied to, and returned from, the individual SoloChill units. Within the SoloChill unit, and located on the copper piping exiting the condenser (heat exchanger) there is a motor-operated modulating valve whose degree-of-opening is normally controlled by the Heos control board (thus controlling condensation of the refrigerant).

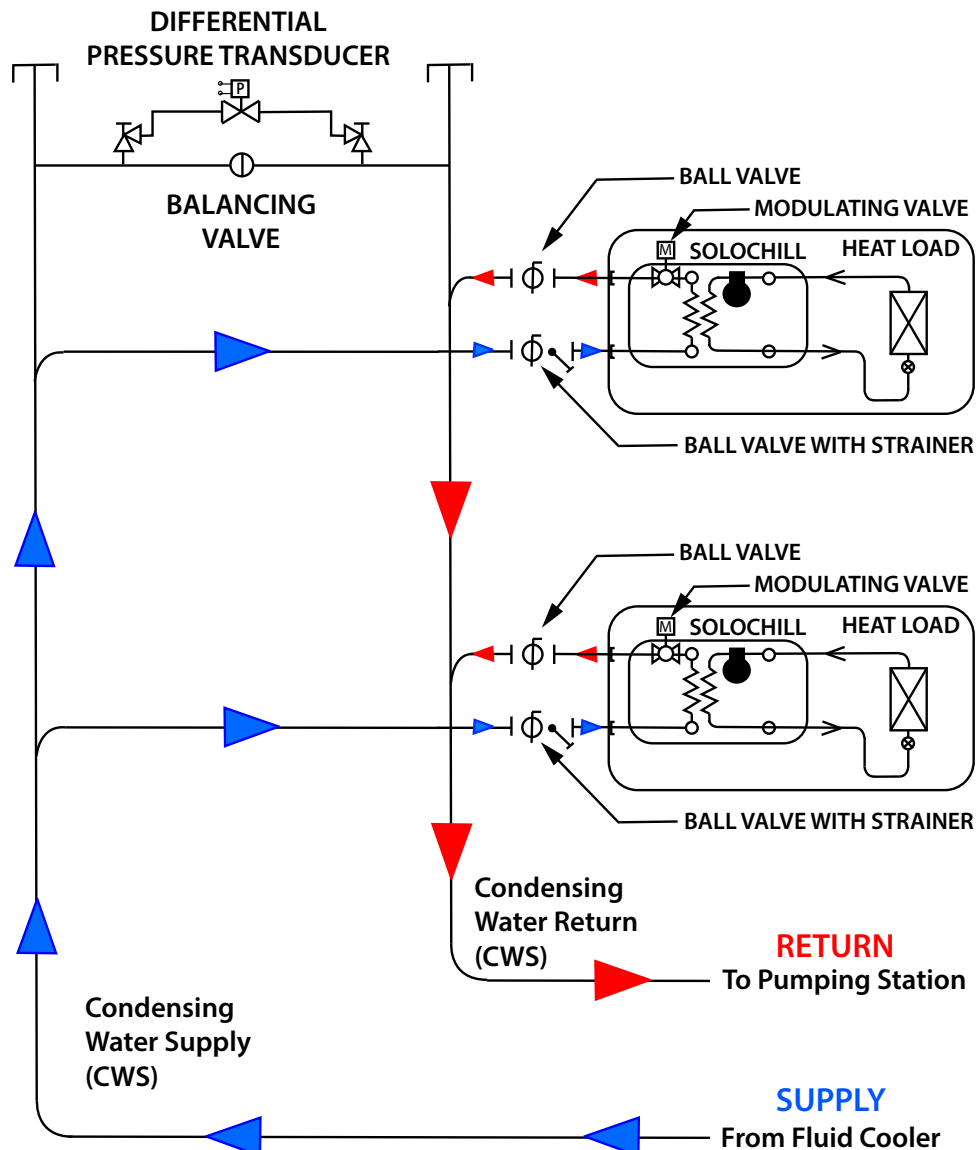


Fig. 8. Water Loop SUPPLY and RETURN to SoloChill Units.

5.2 Water Loop Charging Procedure

Prior to any efforts to be in a position to operate the system, the entire water loop system must be satisfactorily completed and verified to be complete. With the entire system being configured in a loop, any attempts to start up or test the system will immediately result in extensive, unintended leakage of water/glycol and the need to start again.

When ready, the water loop system may be charged with fluid in accordance with the steps listed in the procedure below:

Fluid Loop Charging Procedure

1. Verify that all piping connections in the water loop system are completed satisfactorily.
2. **Ensure that all SoloChill units are electrically connected and have power supplied to them.**
3. Verify that every SoloChill modulating valve has been CLOSED.
4. OPEN all supply valves and return valves to all SoloChill units.
5. OPEN all loop valves so as to permit fluid flow through the entire loop.
6. OPEN all valves to supply fluid to the water loop.
 - a. If a pump skid has been installed, completely fill the pump skid with fluid.
(charge fluid until the pressure at the pump suction has reached 15 psig)
 - b. Energize the pump skid
7. Completely fill the fluid loop.
8. Run the fluid pumps for a duration of 30 minutes to circulate fluid through the primary loop.
9. On each SoloChill unit, OPEN the modulating valve **for a maximum time period of one (1) minute.**
 - a. Once the one (1) minute time period has ended, CLOSE the modulating valve.
10. Repeat the performance of step 9. at each/every SoloChill unit until all units have been filled with fluid and have been purged of air.
11. If a pump skid is being used, check the fluid loop reservoir level, refilling it as required.
12. If any of the SoloChill units in the system were not energized for any reason in step 2 above, then a time period of 24 hours should be allowed to pass before energizing those units.



6.0 Electrical Connections

Each “QA” case model (SoloChill condensing unit equipped) provides single-point connections for 4-wire (hot, hot, neutral, ground) 208V power input from the store. A local power disconnect is provided for the cases. Depending upon the particular case model this may be a 2-pole circuit breaker or a 208V-compatible switch to interrupt the 2 hot wires feeding the case.

For larger 330/420V units, two (2) breakers may be provided. One breaker interrupts power to the Inverter/Compressor while the second breaker interrupts power to the case. Consult the appropriate wiring diagram and associated work order for additional details.



DANGER!

Electrical shock hazard - more than one disconnect switch may be required to de-energize the case and condensing unit for servicing..

Electrical connections for utility or service cases are typically located under the case in a race or a junction box. For upright multi-deck cases the electrical box with power disconnects is always located at the top left rear of the case.

Please consult Figure B-1 in Appendix B for a detailed drawing which shows electrical connections.

6.1 Importance of Proper Connections

The improper connection of store wires to the case input wires may damage electrical components and controllers. Thus it is important to be certain the neutrals from separate power panels (208V vs. 120V controller back-up power) are connected to the correct points on the case. Similarly, check and verify that the hot wires from the 208V panel are landed to the 208V points of the case, and the hot from the 120V controller back-up panel is properly connected to the hot-wire designated for 120V controller power.

For upright multi-deck cases, options exist for the installation of a factory-installed raceway located near the top front portion of the case. If this option is ordered and is present on cases, store power connections may be made directly within the raceway—six wires extend from the power disconnect breakers/switches through flex conduit and into the raceway.

For open cases, the raceway will sit forward of the shipping anchor points, and thus may run the entire length of the case. Covers for the high-voltage raceway and also for the end close-offs are provided as shipped-loose items in the case.

After running wires, these covers must be installed as shown in Fig. 9 (see below). The open trough at the rear of the raceway may be used for holding the low-voltage controller network cables.

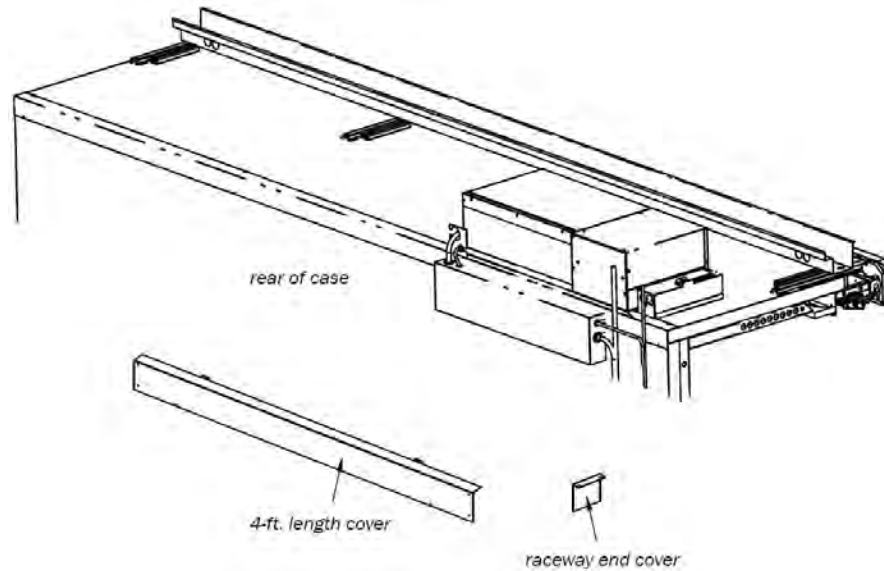


Fig. 9 Location of Optional Raceway with Covers Shipped Loose for Installation.

For display cases with doors, the shipping anchor points are located forward of the raceway. As result, a 5 inch portion at the end of each race-way is absent to allow for the shipping anchors. As shown in Fig. 10, below, two shipped-loose raceway ends are provided, and these pieces can be installed to provide either a close-off of the raceway or to allow for pass-thru to the next door case raceway. Covers for the high voltage raceway areas are provided shipped-loose for installation after wiring has been run in the raceway. In addition, a single L-shaped bracket is provided shipped-loose per case for continuation of the low-voltage trough from one case raceway to the adjacent display case with doors in the line-up.

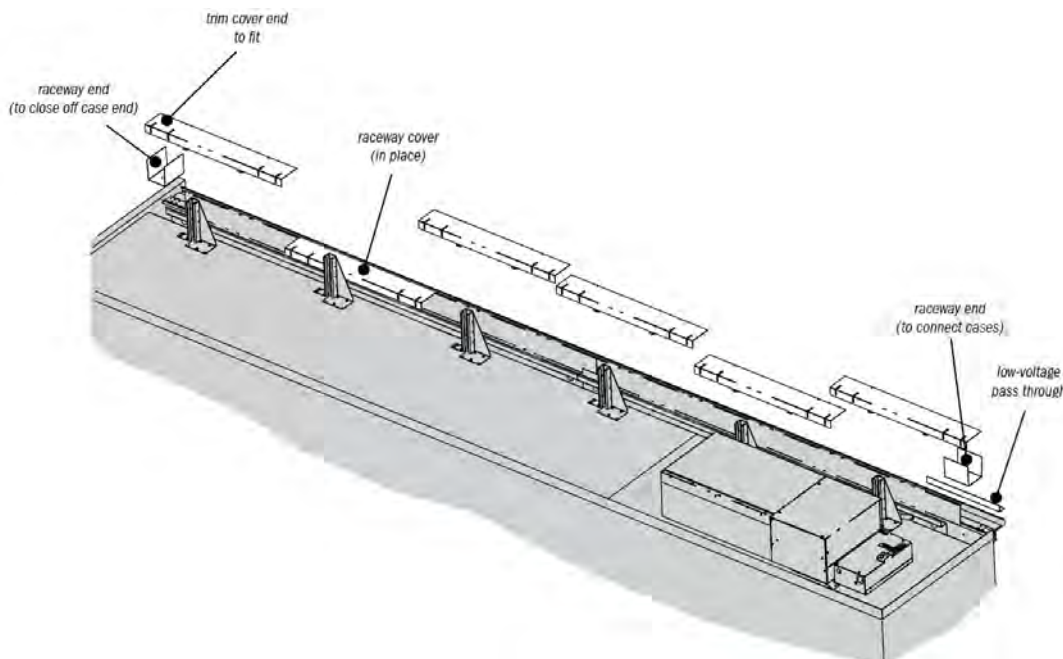


Fig. 10 Raceway Cover Installation for Door Cases with Raceway Option

6.2 Display Cases with Factory Installed SoloChill Units

1. General

- a. For most display case applications, the case is supplied with the SoloChill condensing unit that has been factory-installed with internal piping and wiring connections already completed. Field installed connections include power, water and Boss network wiring.
- b. The typical location for the SoloChill unit is on top of the case in the left hand corner. In some service and semi-vertical case designs, the SoloChill unit is located in the bottom of the case. Refer to the specific case model Technical Reference Sheet for specific details.

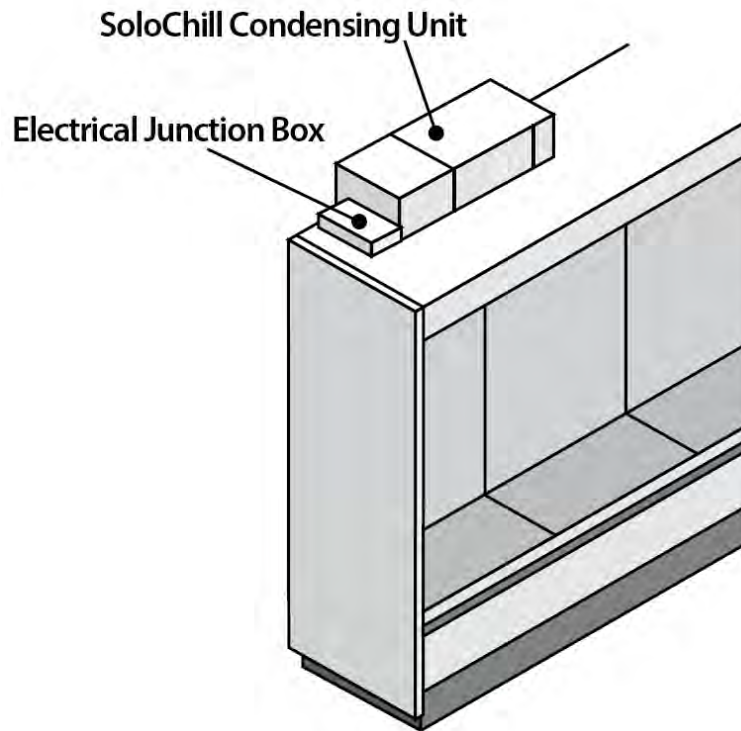


Fig. 11. Location of the SoloChill condenser on a multi-deck case.

2. Installation

- a. Power
 - i. Power to the case is provided with a single-point, 4-wire (hot, hot, neutral, ground) 208V, single phase power input.
 - ii. Each case may include a switch to disconnect 120V controller power to shut down the SoloChill unit.
 - iii. Cases utilizing a DA091, DA130, or DA220 SoloChill unit will include a single breaker for overcurrent protection of the case and SoloChill unit. Cases utilizing a DA330 or DA420 SoloChill unit will have two breakers for overcurrent protection—one for case power and one for the SoloChill unit.
- b. Water - See Section 4.0 for details on the water connections to the SoloChill unit.
- c. Network - See Section 7.0 for details on network wiring Connections to SoloChill units.

6.3 Display Cases with Remote Mounted SoloChill Units

1. General

- a. In applications where the SoloChill unit is mounted in a location that is remote from its associated display case, additional wiring is required between the display case and the SoloChill unit. Of course, it will also be necessary to run additional refrigeration piping between the two as well. This also means that systems must be charged and leak checked in the field.
- b. In some instances there will be multiple evaporator coils in the display case lineup with a single SoloChill unit being used to provide refrigeration for all. In applications such as these, the SoloChill unit controls the operation of one primary (master) evaporator coil, and the other evaporator coils will each have a separate controller. Note that each of these separate controllers requires its own, separate power supply.
- c. Dual temperature operation is possible in some island case applications. When dual temperature operation is included, the case section with the primary (master) evaporator **must be operated at low temperature only**, but the other sections may be switched to operate at medium temperature conditions.

2. Installation

- a. Power
 - i. Power to the SoloChill unit is provided with a single-point, 4-wire (hot, hot, neutral, ground) 208V, single phase power input.
 - ii. Power for fans and heaters (defrost, anti-sweat, drain) for the master evaporator is provided from the SoloChill unit.
 - iii. Smaller SoloChill units (DA091, DA130, DA220) will include a single breaker for overcurrent protection of the case and SoloChill unit. Larger SoloChill units (DA330, DA420) will have two breakers for overcurrent protection—one for case power and one for the SoloChill unit.
 - iv. See Figures 12 and 13 on the next page for the general wiring diagrams, and see Appendix B for the more detailed wiring information (Fig. B-1 for larger units and Fig. B-2 for smaller units).
- b. Sensors and EEV - Belden cable should be used for connecting temperature sensors and pressure transducer in the display case to the SoloChill unit. See Appendix B for wiring details.
- c. Water - See Section 4.0 for details on the water connections to the SoloChill unit.
- d. Network - In multi-evaporator display cases with remote SoloChill units, all controller are connected on the Boss supervisory Communication Loop. Additionally, the Master and Slave controllers in the SoloChill and case are connected on a second, pLAN Communication Loop. See Section 7.0 for details on the network wiring connections to the SoloChill units.

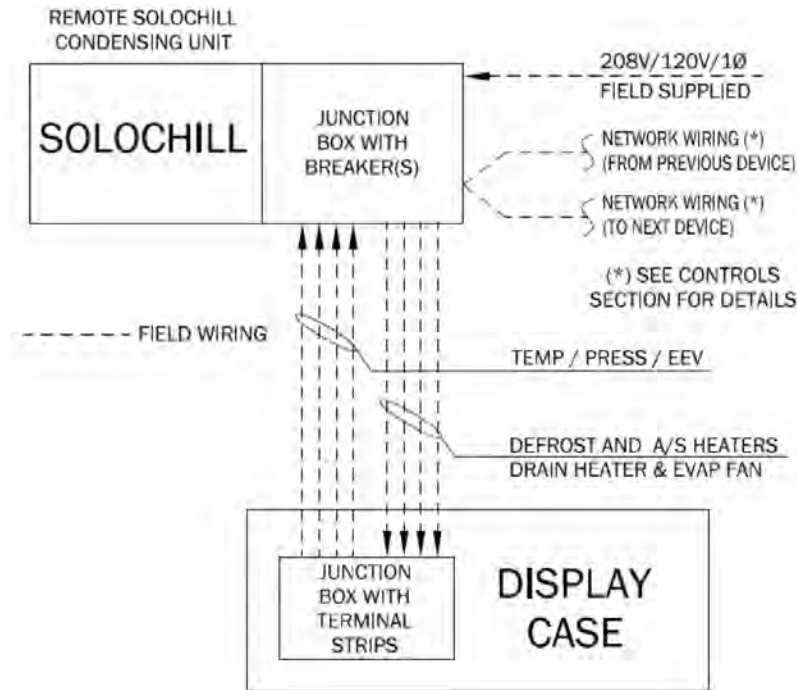


Fig. 12 Display Case with Remote SoloChill General Wiring.

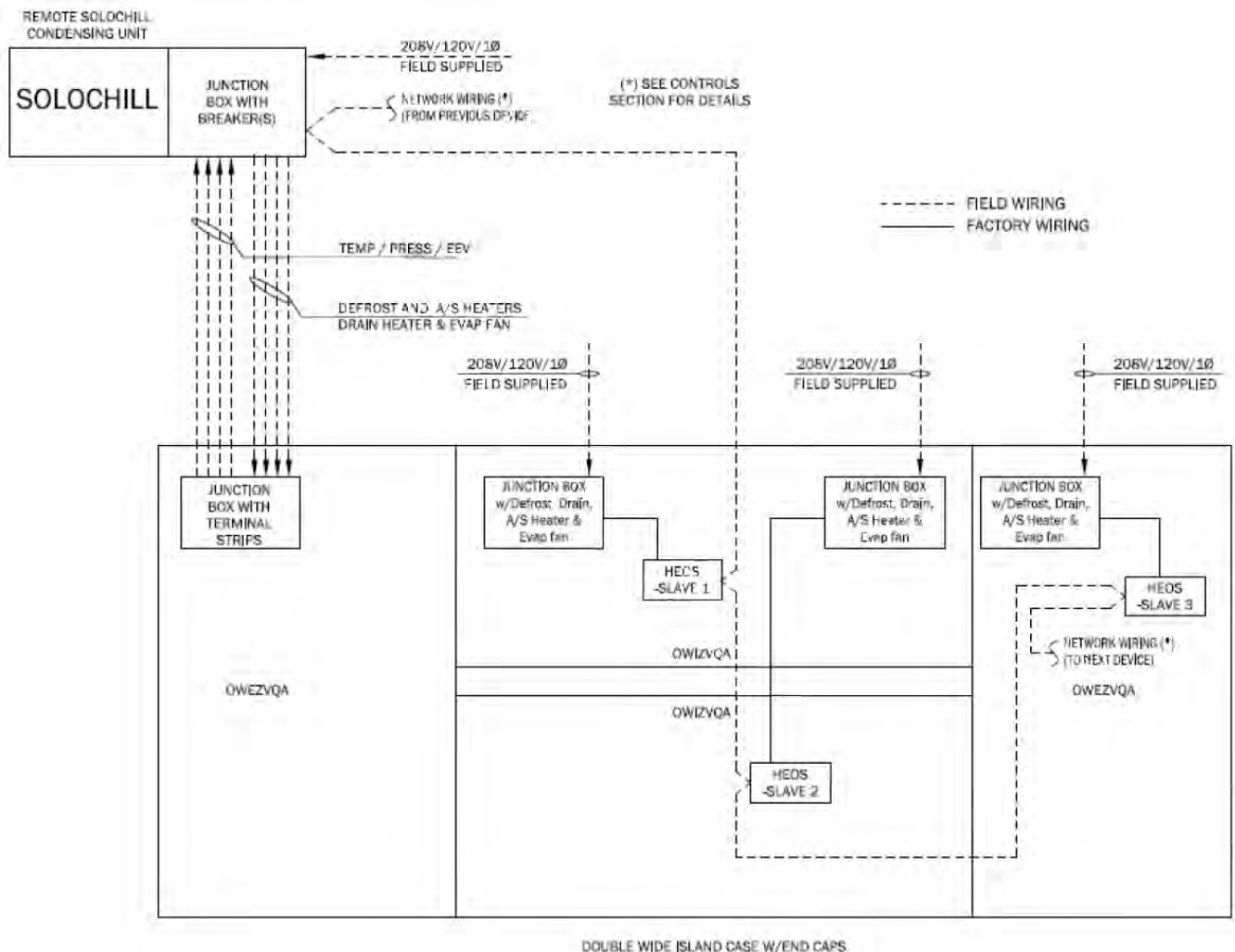


Fig. 13 Multi-Evaporator Display Case with Remote SoloChill General Wiring.

6.4 Walk-In Applications with Remote Mounted SoloChill Condensing Units

1. General

- a. In walk in cooler and freezer applications, SoloChill units are shipped loose for field installation. SoloChill units for walk-in applications come with a factory-mounted electrical junction box. This junction box includes a main breaker as well as power and control connections for the unit cooler fans, defrost, and electronic expansion valve.
- b. The maximum distance between the SoloChill unit and the unit cooler should be less than fifty (50) feet. The maximum distance is determined by the EEV cable length of fifty (50) feet. Consideration of distance taken up by cable routing should be included in the maximum distance between the SoloChill unit and the unit cooler.
- c. Unit coolers are to be ordered with Carel temperature sensors, transducer plus cable, and Carel E2V electronic expansion valve plus cable—all factory installed, but terminated in the field.

2. Installation

- a. In typical installations, the SoloChill unit is installed directly onto a solid, flat structure (a walk-in roof), or possibly suspended from the building ceiling on unistrut secured by a threaded rod. (see example installation Fig. 14)

3. Piping

- a. Refrigeration - always follow standard refrigeration piping practices when connecting the condensing unit to the unit cooler.
- b. Water - see section 4.0. Note that the fitting sizes for water connections are specified as 3/4 inch MPT.

4. Wiring

- a. Sensor and EEV Wiring
 - i. The unit cooler is ordered with the following items as factory-installed.
 1. Carel E2V electronic expansion valve
 2. Carel Stator/Cable plus extension kit (Carel #E2VSTA03A1)
 3. Carel suction pressure transducer (0-250 psi)
 4. Carel Transducer cable
 5. Transducer shut off valve
 6. Temperature sensors
 - a. Discharge/Air Off
 - b. Return/Air On
 - c. Defrost Termination
 - d. Suction

- ii. The temperature sensors and transducer will typically be wired to terminal pins in the unit cooler panel. Belden 9409 cable (or equivalent) should be used to connect temperature sensors between the terminal pins in the unit cooler and the HEOS control board in the SoloChill unit (refer to Appendix B, Figure B-2 and Figure B-3 for details). The transducer connection should be made with Belden 8760 cable (or equivalent).
- iii. EEV Cable - The EEV cable requires a connector on one end that will connect directly to the HEOS board in the SoloChill unit. This connector is approximately $\frac{3}{4}$ inch X $\frac{1}{4}$ inch in cross section. Please refer to Appendix B, Figure B-4, Figure B-5, and Figure B-6 for details)
 - 1. Standard cable - unit coolers are supplied with a Stator/Cable set plus 6 meter (approximately twenty, 20, feet) If the SoloChill unit is located more than twenty (20) feet away from the unit cooler, longer extensions (available from Hillphoenix) should be obtained (see below).
 - 2. Extension cables available
 - a. 30 ft extension cable - HP #106934
 - b. 40 ft extension cable - HP #106938
 - c. 50 ft extension cable - HP #106939
- b. SoloChill Unit Power Wiring - refer to Appendix B Figure B-7 for detailed information

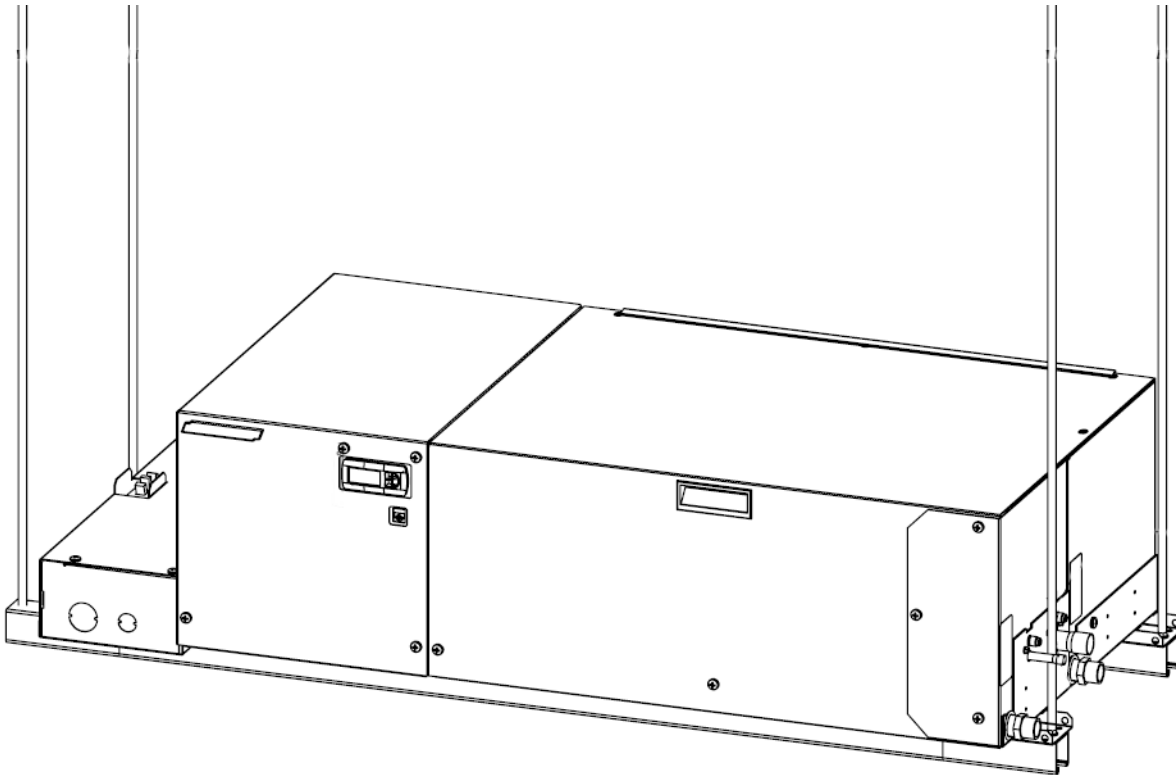


Fig. 14 Alternate SoloChill Unit Mounting Method for Walk-In Coolers/Freezers

6.5 Walk-In Applications with Remote, Non-SoloChill, Water-Cooled Condensing Units

1. General

- a. In instances where there is not a suitable SoloChill unit to meet capacity requirements for a particular walk-in application, Hillphoenix will provide a non-SoloChill, water-cooled condensing unit.
- b. In applications such as these, the unit cooler is still provided with the same sensors and expansion valve as with the SoloChill condensing unit application. However, the Carel HEOS controller and the corresponding power and controls are provided in a control panel (HEOS Panel) with a properly sized disconnect switch rather than being included with a SoloChill unit. The Heos panel will include fan and defrost contactors and breakers for walk-ins with electric defrost, and equipped with fan contactors and breakers only if the walk-in is designed for off-time defrost.
- c. The condensing unit is powered separately and operates independently off of the low pressure switch control.
- d. All applications such as these must adhere to the same maximum distance limits between the unit cooler and the HEOS panel as with SoloChill applications (based on maximum EEV cable length).

2. Installation

- a. HEOS Panels - The panel may be installed on the roof of the walk-in cooler/freezer near the location of the unit cooler or may be suspended from the ceiling using uni-strut and secured by threaded rods, in a manner similar to the SoloChill Unit mounting.
- b. Non-SoloChill Condensing Units - the manufacturer's recommended installation instructions should be followed but, in general, installation methods similar to those used with SoloChill installations may be followed.

3. Piping

- a. Refrigeration - always follow standard refrigeration piping practices when connecting the condensing unit to the unit cooler. The system must be charged and leak-checked in the field.
- b. Water - see section 4.0. Note that the fitting sizes for water connections on non-SoloChill condensing units may vary from those used on SoloChill units. Refer to the individual manufacturer's documentation to verify the proper fitting sizes for water connections.

4. Wiring

- a. Methods - the same wiring methods as specified in the previous section "Walk-Ins with Remote Mount SoloChill Condensing Units" are to be used with non-SoloChill condensing unit applications, with the exception that third-party condensing unit will typically be powered separately from the HEOS panel.

6.6 High Side Fluid Cooling System

1. Fluid (Water Loop) System

a. Specifications - The SoloChill units supplied by Hillphoenix are able to operate over a wide range of temperature and pressure conditions. The specifications used for the high side fluid cooling system should be based on the specifics of the application at the particular location where installation is taking place.

i. Typical Installations - typical installations include an evaporative or adiabatic fluid cooler to remove heat, and a fluid pumping system that may be located either indoors or in an outdoor enclosure. The following specifications are recommended for typical water loop installations.

1. Cooling Fluid Makeup:

- a. 25% inhibited propylene glycol. A higher percentage may be needed for freeze protection in some climates. Propylene glycol is recommended because it is food grade and has inhibitors to prevent corrosion, scaling, and fouling from bacterial growth. Consult the manufacturer's guidelines for water quality, and adhere to the recommended specifications for mixing water and propylene glycol.
- b. 100% water systems may be used for the cooling fluid, provided that an adequate water treatment program including inhibitors and bactericide to prevent corrosion, scaling, and fouling is followed.

2. Cooling Fluid Design Temperature:

- a. The recommended design fluid temperature is 85°F or lower if the summer wet bulb temperature is low enough to achieve a lower fluid temperature.
- b. SoloChill units are designed for use based on an 85°F fluid temperature and a 95°F condensing temperature. The SoloChill units have sufficient capacity to operate with up to a maximum 95°F fluid temperature to accommodate fluctuations in fluid temperature without an impact on case performance.
- c. SoloChill units include a factory installed modulating ball valve to control condensing temperature at various fluid temperatures.
- d. The SoloChill units can operate when fluid temperatures are as low as 40°F. In locations where ambient temperatures drop below 0°F in the winter, a modulating 3-way mixing valve should be included in the system to permit bypass of the fluid cooler, thereby maintaining the minimum fluid temperature to a value above 40°F. When a modulating 3-way mixing valve is used, Hillphoenix recommends installing the valve at the pump skid where the valve controller will typically be located.

3. Cooling Fluid System Pressure Rating: 100 psig

- a. The SoloChill units themselves may be operated with pressures up to 400 psig, but typical pump systems have much lower pressure ratings. Pump skids from Hillphoenix have a standard pressure rating of 100 psig.

4. Cooling Fluid System Piping Specifications

- a. In typical installations, either a combination of CPVC and PEX Class A piping, or type M or thicker copper is used.
- b. CPVC is recommended for piping diameters of 2 inches and larger, and PEX class A is only recommended for pipe sizes of less than 2 inches.
- c. Consult the manufacturer's recommendations for applying CPVC and PEX tubing, as some application limitations such as UV degradation and requirements for additional bracing versus copper piping installations should be considered.

i. Variations of Typical Installations

1. Existing or Shared Fluid Cooling Systems - If a SoloChill system is to be installed utilizing an existing fluid cooling system, verification investigations should be made to ensure that sufficient pump head is available to accommodate pressure drops in the SoloChill piping system as well as a maximum of five (5) psig pressure drop across the SoloChill unit.
2. Chilled Water Systems - SoloChill units may be installed utilizing building chilled water systems if the system pressure rating is 400 psig or less, and temperatures are maintained between 40°F minimum and 95°F maximum, and other factors mentioned above are sufficiently addressed.

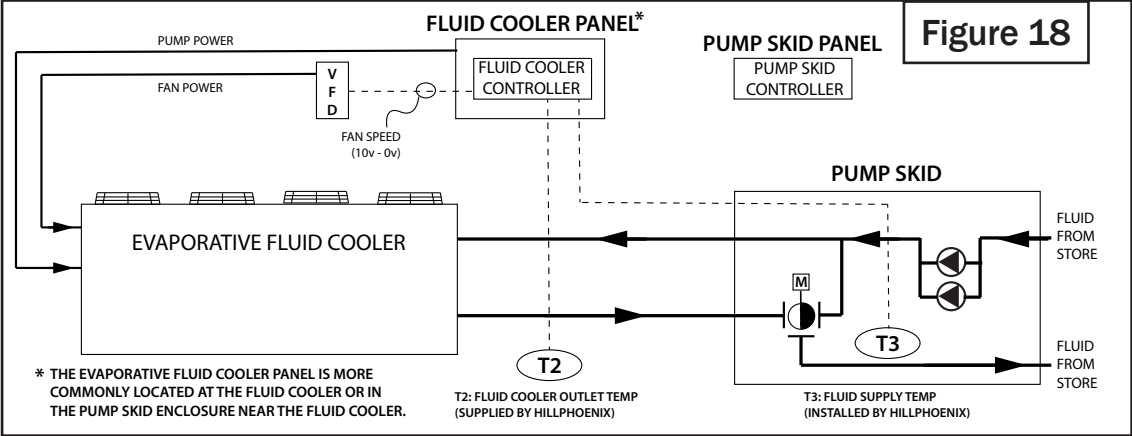
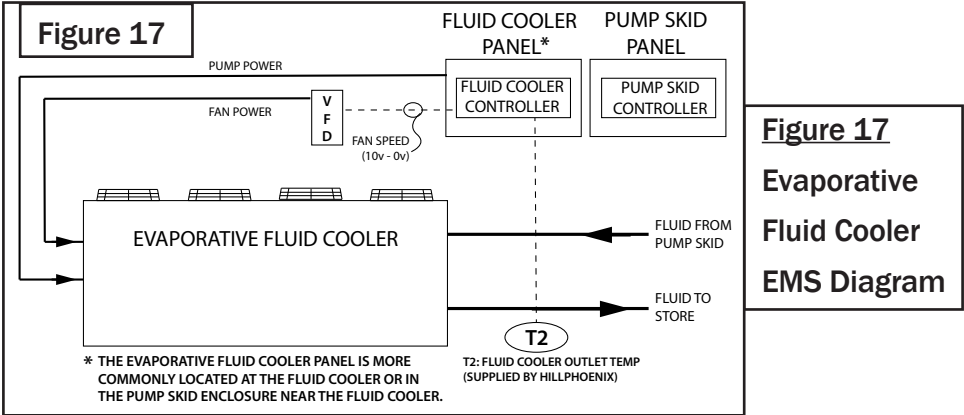
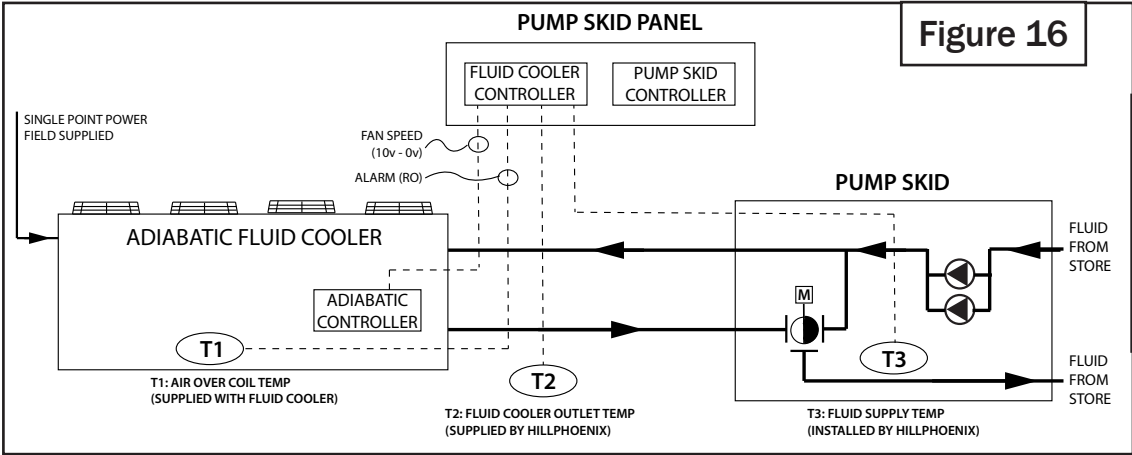
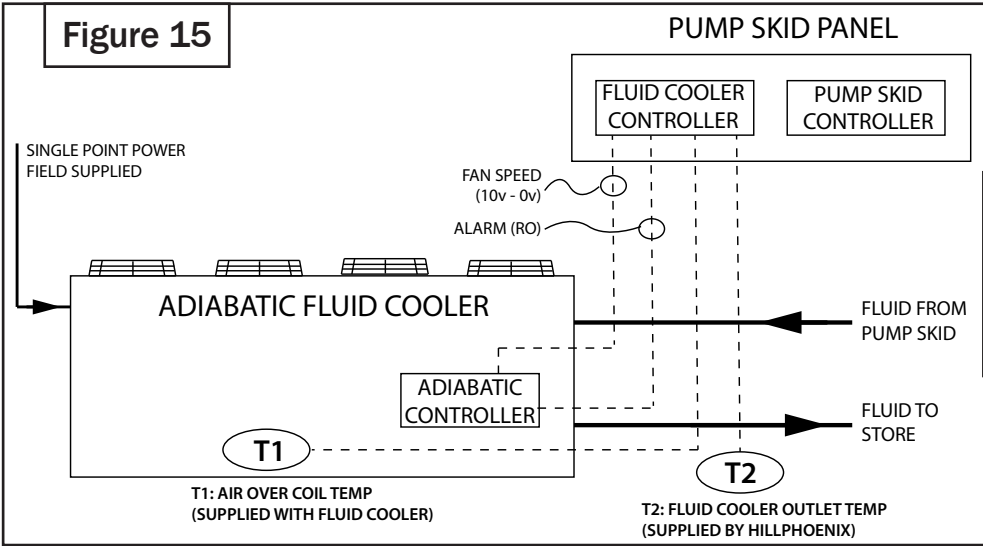
- b. Fluid Coolers - Fluid coolers such as air-cooled and evaporative should be sized to provide 85°F outlet fluid temperature based on the total heat of rejection (THR) and the flow rate of the system.

i. Adiabatic Fluid Cooler

1. An adiabatic fluid cooler will typically have a single point power connection that is supplied with power from a store panel.
2. Adiabatic fluid coolers will typically include a controller that controls the water/adiabatic operation. A separate fan speed signal is provided from a Carel controller located in the pump skid panel, or on a separate panel.
3. See Figure 15 and Figure 16 for example adiabatic fluid cooler EMS diagrams.

ii. Evaporative Fluid Cooler

1. An evaporative fluid cooler will typically require separate power for a fan and for a pump. A VFD may be provided by the evaporative cooler manufacturer, or Hillphoenix may provide the VFD along with a Carel controller located in a separate panel.
2. See Figure 17 and Figure 18 for example Evaporative Fluid Cooler EMS diagrams.



7.0 Communications and Network Connections

A CAREL Heos controller is used for management of cases and SoloChill Micro Distributed condensing units. The control board is fitted with plug-in screw terminals and comes with a built-in electronic expansion valve driver.

In order to manage multiplexed cases, a Heos controller can manage a local Master-Slave network comprising a maximum of 6 units (1 Master and 5 Slaves). Each controller is fitted with its own display (PLD) and an RJ-12 connector for use with a PGDe interface for service or commissioning. Inside each SoloChill condensing unit are terminal block connections for communication. Separate Belden twisted-pair connections are made to manage RS485 and pLAN communication lines. The terminal block is located on the bottom of the Heos side of the unit. The terminal locations are labeled, for RS485 (Modbus) communication, for pLAN communication. When a Master-Slave relationship exists between 2 or more units, the Belden twisted pair wire for pLAN input communication should be run only from Master to Slave1, to Slave2, to Slave3 etc. The RS485 (Modbus) connection should run to all SoloChill units from BMS communication. (see Fig. 19)

7.1 Main Features

- Board with built-in driver for CAREL single-pole valve
- Defrosts may be activated from the keypad, digital input, via network from the Master or supervisor
- Modulating management of cooling capacity by inverter on BLD compressor
- Coordination of network defrosts.
- Stand-alone or multi-evaporator management
- Management of lights and curtains
- Automatic balancing of cooling capacity in multi-evaporator configuration
- Anti-Sweat heater modulation
- COP calculation and management
- Evaporator fan speed modulation
- Advanced superheat control with protection against low superheat (LowSH), low-evaporation temperature (LOP), high-evaporation temperature (MOP), and low-suction temperature (LSA)
- RS485 serial for BMS inside
- pLAN for Master-Slave Communication

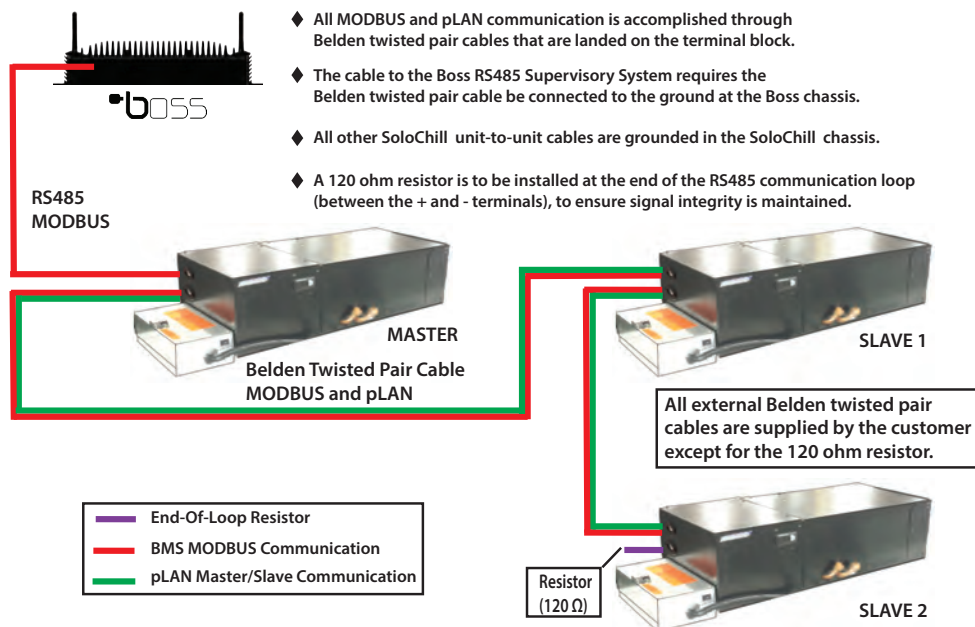


Fig. 19 RS485 and pLAN Communication Connections and Layout for SoloChill Units

7.2 General Control Board (Heos) Connection Diagram

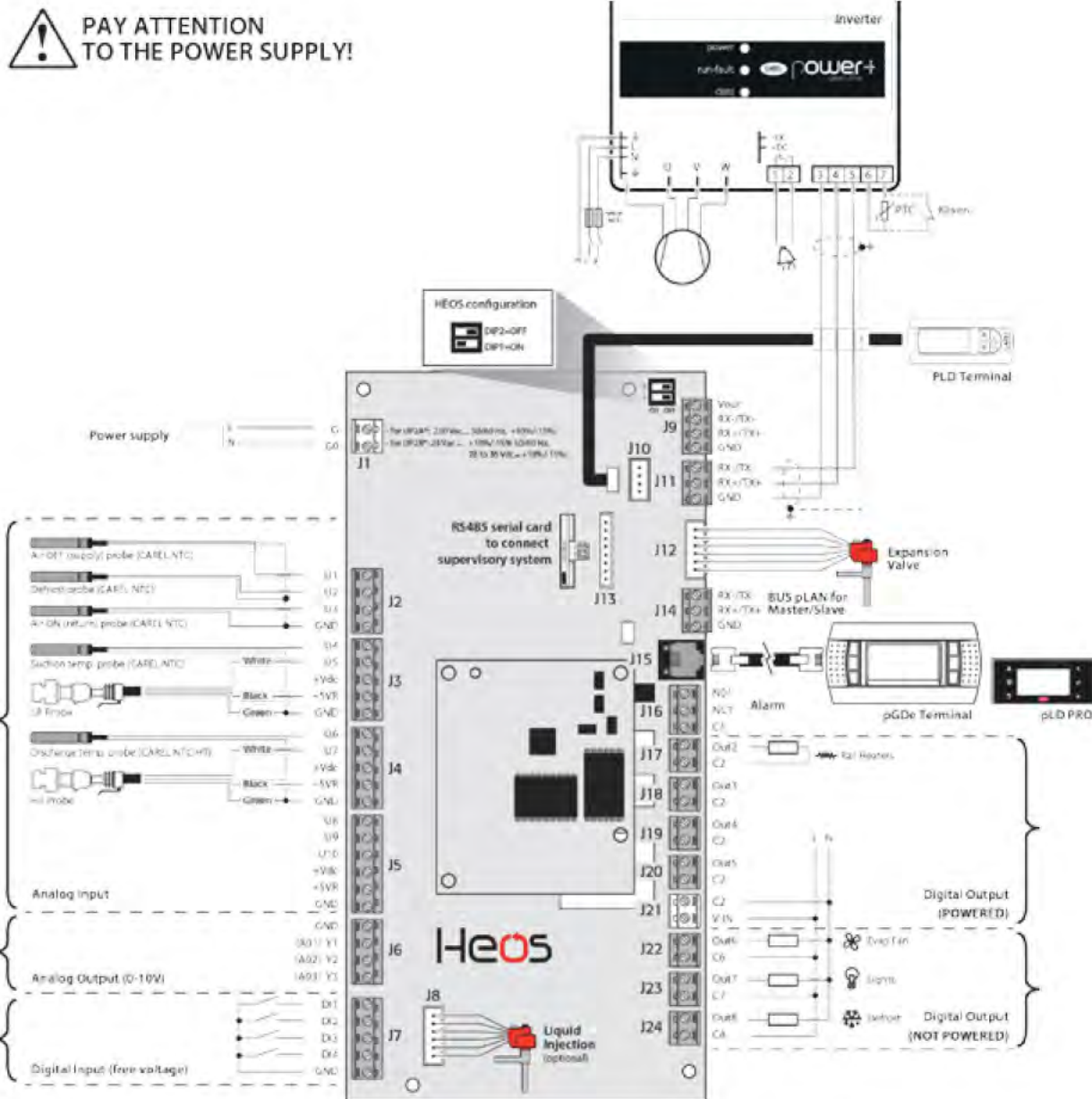


Fig. 20 (*) The 4-20 mA pressure probes are connected as follows: white to U_x and black to $+V_{dc}$, green not used

()** 230Vac SSR output, maximum switchable power 15 VA

Class A software: the safety devices providing overload and high pressure protection must control the compressor directly, and consequently need to be wired in series with the compressor contactor control signal.

I/O Selection Table

Par. Analog Inputs

/FA	Air outlet temperature (default U1)	/FY	Condenser water outlet temperature
/Fb	Defrost temperature (default U2)	/FG	Auxiliary probe 1
/Fc	Air intake temperature (default U3)	/FH	Auxiliary probe 2
/P3	Condensing pressure (default U7)	/LA	EC evaporator fans
/P4	Suction pressure (default U5)	/Lb	Anti-sweat heaters
/P1	Discharge temperature (default U6)	/Lc	Water control valves
/P2	Suction temperature (default U4)	/Ld	Condenser pump
/Fq	Liquid temperature	/LE	Auxiliary output
/Fi	Room temperature	/LF	Water-cooled condenser output
/FL	Room humidity	/LG	Air-cooled condenser output
/FM	Glass temperature		
/FW	Condenser water inlet temperature		

Par. Digital Inputs

/b1	Remote alarm	A9	Virtual input
/b2	Delayed remote alarm	/EA	Fans 1 (default (D06))
/b3	Enable defrost	/EC	Lights (default D07)
/b4	Start network defrost	/Ed	Defrost heaters (default D08)
/b5	Door switch	/EE	Alarms
/b6	Remote ON/OFF	/EF	Auxiliary output
/b7	Curtain/light switch – day/night	/EG	Anti-mist heaters
/b8	Continuous cycle	/EM	Liquid injection solenoid
/b9	Cold room maintenance	/EN	Curtain contact
/bA	Showcase cleaning	/Eo	ON/OFF compressor
/bb	Inverter alarm	/Er	Inverter valves output
/bC	Lights	/ES	Fan/condenser output

7.3 Communication Connections - RS485 and pLAN For SoloChillCondensing Unit - Version 3

In Version 3 of the Hillphoenix SoloChill micro-distributed, water-cooled condensing unit, the method for connecting RS485 and pLAN communications was through the use of Belden cable and a labeled terminal block located just inside the electronic portion of the SoloChill condensing unit. A labeled photograph of this terminal block showing the types of communication connections to be made is shown below.

RS485: supervisory network

pLAN: private local area network (master-slave communications)

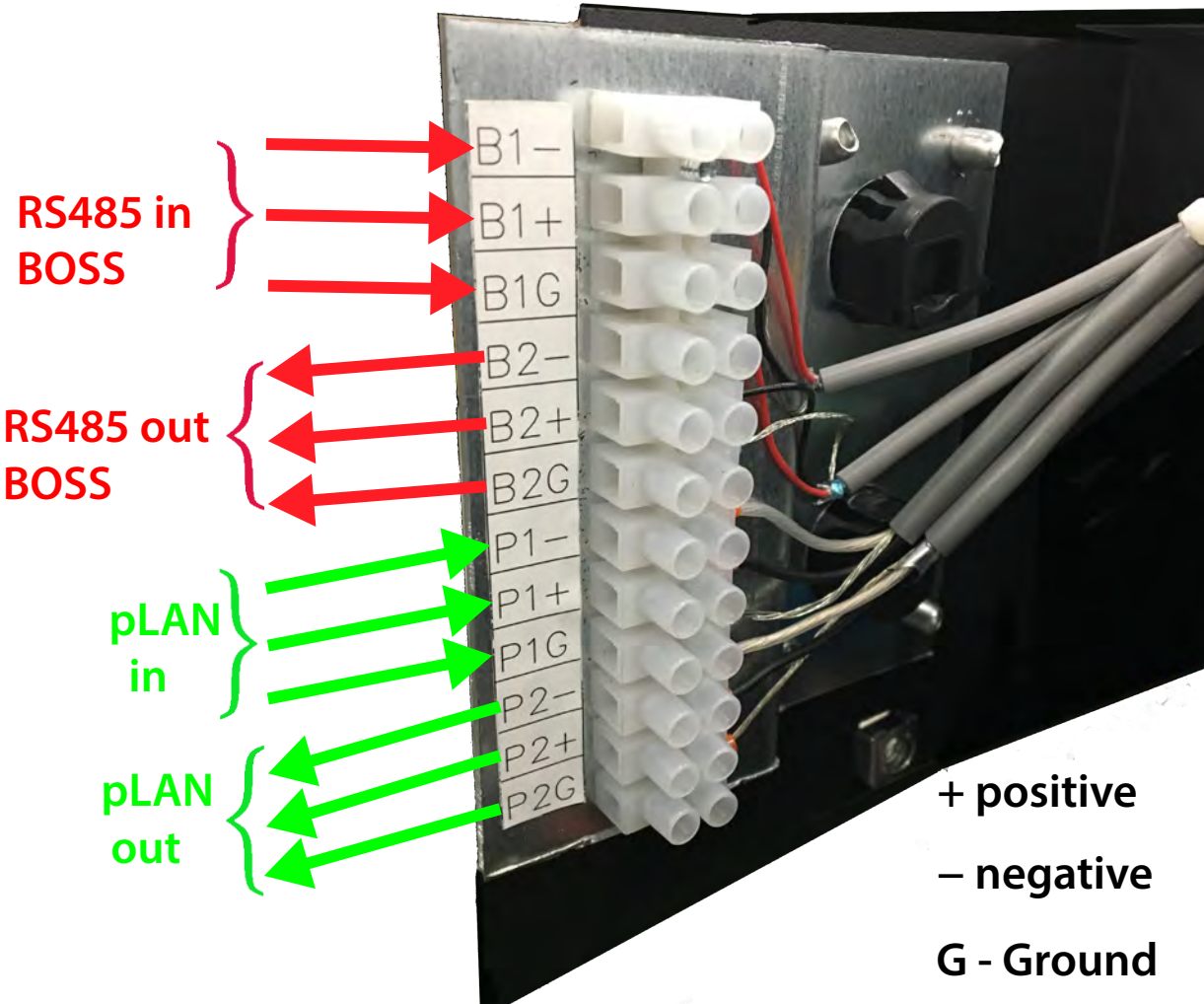


Fig. 21 RS485 and pLAN Communication Connections and Layout for SoloChill Units (V3)

Terminal Block for Communications is Located Inside of SoloChill Units
(pLAN Communications are not necessary for all SoloChill Units)

7.4.1 Field Communication Wiring Requirements

The previous section showed the RS485 (BOSS) and pLAN communication connections as they are made to their proper landing points on the Heos Control Board *inside* of each SoloChill unit. These connections are summarized as follows:

- RS485 (BOSS) connected to serial card and to location J13 on the Heos Control Board.
- pLAN (Master/Slave) connected to location J14 on the Heos Control Board.

Of course, every SoloChill unit (Heos board) distributed throughout the store must be capable of sending/receiving communications to/from the BOSS supervisor via the RS485 communication wires. In addition, for common operational purposes (such as group defrost) SoloChill units (Heos boards) may be grouped together (a group may consist of up to six SoloChill units, one master unit and up to five slave units).

All Heos-to-Heos (SoloChill-to-SoloChill) communication connections must be performed in the field as part of the overall SoloChill system installation. These communication connections include the following:

- RS485 BOSS supervisory network incoming cable
- RS485 BOSS supervisory network outgoing cable
- pLAN Master/Slave network incoming cable (only required for units in a Master/Slave relationship)
- pLAN Master/Slave network outgoing cable (only required for units in a Master/Slave relationship)

As shown in the diagram below, a 6 position male Phoenix connector (supplied by with each SoloChill unit by Hillphoenix) is to be used when making system communication connections. Please examine this drawing closely and make a special note of the two items written in the lines below the Figure title.

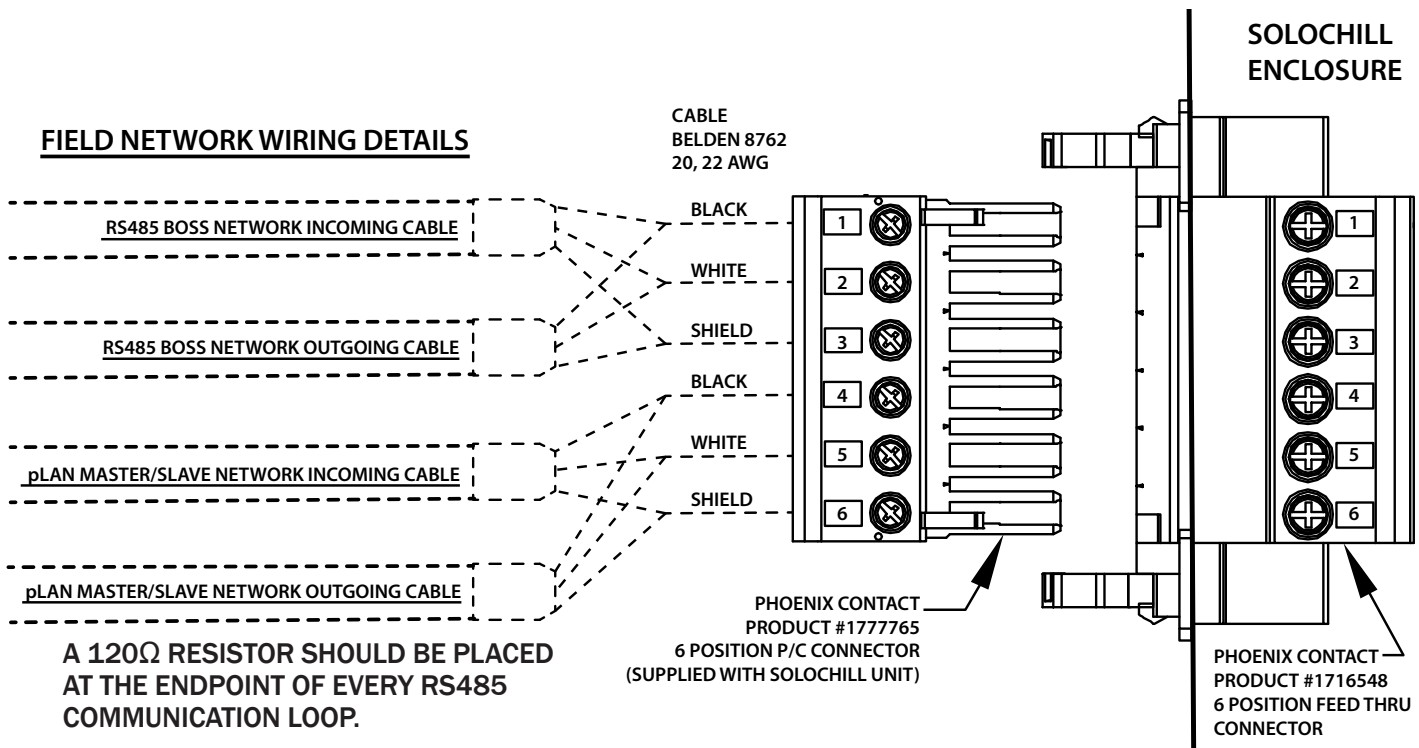


Fig. 23 Field Installed Communication Wiring: RS485 (BOSS) and pLAN Communication (V4)

All Units Require RS485 (BOSS) Supervisory Communication Connections

Only Units Grouped In a Master/Slave Relationship Require pLAN Connections

7.5 Functional Diagrams

There are two possible showcase/coldroom configurations. The first involves the various units being fitted individually with their own compressor and condenser, meaning the individual case is completely independent, and shares the cooling water loop with the rest of the system. In the second case, the condenser is shared and consequently the Slave cases are only fitted with the evaporator, Heos controller, and corresponding electronic expansion valve, while the compressor is controlled by the board designated as the Master.

The system configurations may be set from a hand-held terminal (pGDe) as illustrated in the chapter on Commissioning; while on the case itself a PLD is normally used to display the temperature and any alarm signals. Defrosts may be coordinated via the pLAN that controls a maximum of six units, or alternatively, controlled by the supervisor.

Single Evaporator Configuration

In this case, each case/cold room has its own compressor, controlled by the corresponding board, which manages all system devices (expansion valve, display case temperature control, alarms, etc.). The Master/Slave network is used to coordinate defrosts, lights, and night curtain switch; otherwise these functions must be managed by the supervisor.

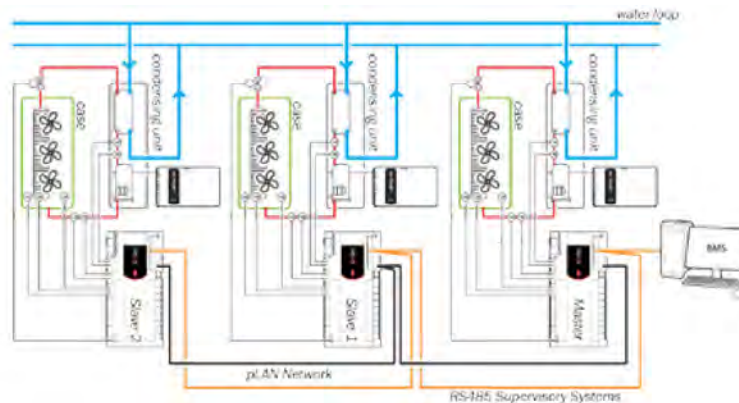


Fig. 24 Stand-alone Network Configuration

Multi-evaporator Master/Slave Network

The Master controller manages the compressor and coordinates the functions of the up to 5 Slave controllers connected via the pLAN. Each Slave controller manages the individual case and has an external PLD user terminal for temperature monitoring. Each controller, both Master and Slave, is connected to the supervisor network. The Master only shares the evaporation pressure, and not the corresponding temperature.

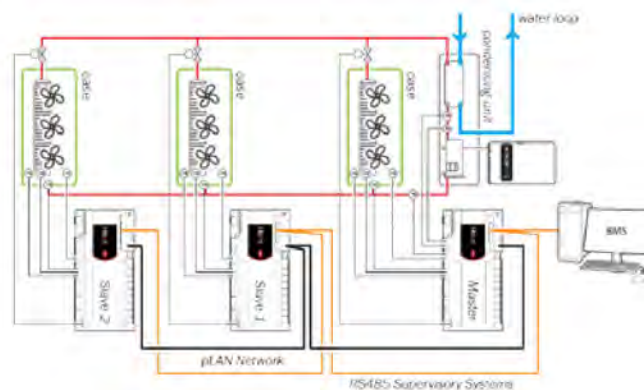


Fig. 25 Multi-Evaporator Master/Slave Network Configuration

RS485 Supervisor Network

A maximum number of 199 HEOS controllers (Master or Slave) may be connected to the supervisor network on one serial line (via CAREL or Modbus® protocol).

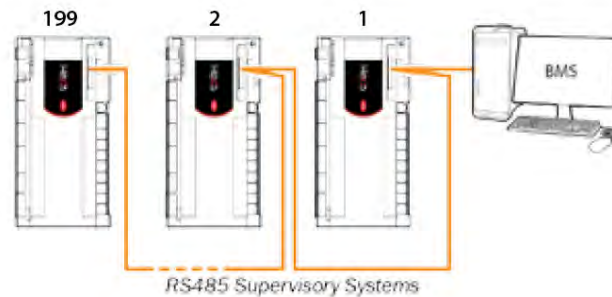


Fig. 26 RS485 Supervisor Network to Control up to 199 Controllers

7.6 Servicing the Heos Control Board

For servicing the control board, proceed as follows, closely consulting the detailed wiring diagrams:

- Before performing any operations on the control board, disconnect the main power supply by turning the main switch in the electrical panel to OFF.
- Avoid touching the control board with bare hands, as any electrostatic discharges may damage the electronic components.
- Suitable electrical protection must be ensured by the manufacturer of the showcase or by appropriate installation of the controller.
- Connect any digital inputs, $L_{max} = 10 \text{ m}$ (32 ft)
- Connect the temperature probe and pressure probe, $L_{max} = 10 \text{ m}$ (32 ft)
- Connect the electronic expansion valve (EEV) cable to connector J12.
- Connect the inverter serial communication cable (if used) to terminal J11.
- Connect the optional PGDe terminal (needed for commissioning) to connector J15.
- Connect the optional PLD terminal to connector J10.
- Connect the power supply to the controller and the inverter, if used.
- Program the controller using the guided commissioning procedure.
- Program the individual controllers using the Wizard (also used to assign the pLAN address) and then connect the controllers in the same pLAN Master/Slave group together, using connector J14. For connection, use a shielded cable and make sure that the maximum distance between consecutive controllers is 100 m (328 ft). The minimum cable size is AWG22.
- Connect the electrical loads to the relay outputs only after having programmed the controller. Always carefully evaluate the maximum capacity of the output relays as specified in the Technical Specifications.
- The supervisor serial line should be connected to the card inserted on connector J13.



Important Notices Regarding Installation

Avoid installing the controllers in environments with the following characteristics:

- Relative humidity greater than 90% or with condensation.
- Strong vibrations or knocks.
- Exposure to water sprays.
- Exposure to aggressive and polluting atmospheres (e.g. sulphur or ammonia fumes, saline mist, smoke) to avoid corrosion and/or oxidation.
- Strong magnetic and/or radio frequency interference (therefore avoid installing the devices near transmitting antennae).
- Exposure of the controllers to direct sunlight, and to the elements in general.



Important Notices Regarding Controller Connections

The following warnings must be observed when connecting the controllers:

- Incorrect power connections may seriously damage the controller.
- Use cable ends suitable for the corresponding terminals. Loosen each screw and insert the cable ends, then tighten the screws and gently tug the cables to check they are sufficiently tight.
- Separate as much as possible the probe and digital input cables from cables to inductive loads and power cables, so as to avoid possible electromagnetic disturbance. Never run power cables (including the electrical panel cables) and probe signal cables in the same conduits.
- Do not run probe signal cables in the immediate vicinity of power devices (contactors, circuit breakers, etc.).
- Reduce the path of probe cables as much as possible, and avoid spiral paths that enclose power devices.



Important - Class A Software

The safety devices which provide overload and high pressure protection must be connected to control the compressor directly, and consequently these devices must be wired in series with the compressor contactor control signal.



Note When Connecting the RS485 Serial Network

- Connect the shield to the GND terminals on the controller.
- Earth the shield to GND.
- Use shielded, twisted cable (e.g. Belden 8762 - AWG20) for connection lengths to 1640 feet.
- For the supervisor serial network (J13): connect a 120 Ω terminating resistor between the Tx/Rx+ and the Tx/Rx terminals on the last controller in the network (the one furthest away from the supervisor).

8.0^{BOSS} Local Supervisor

The Carel Boss local supervisor is the focal point for the collection and dissemination of **all** of the SoloChill refrigeration system operating information. The numerous Heos nodes in the system (namely all of the individual SoloChill units), generate large amounts of information regarding their current state of operation. The Boss local supervisor is the central point for collecting all of this information and making it available for viewing and potential adjustment by the persons responsible for the entire SoloChill micro-distributed system's operation.



The Boss local supervisor arrives at the job site packaged in its own box. Contained in the box are the following items:

- 1 the device itself
- 2 two antennae
- 3 power cable (*) only for codes/locations where it is supplied)
- 4 power supply module
- 5 technical documents
- 6 terminals
- 7 two resistors for the end of the serial line

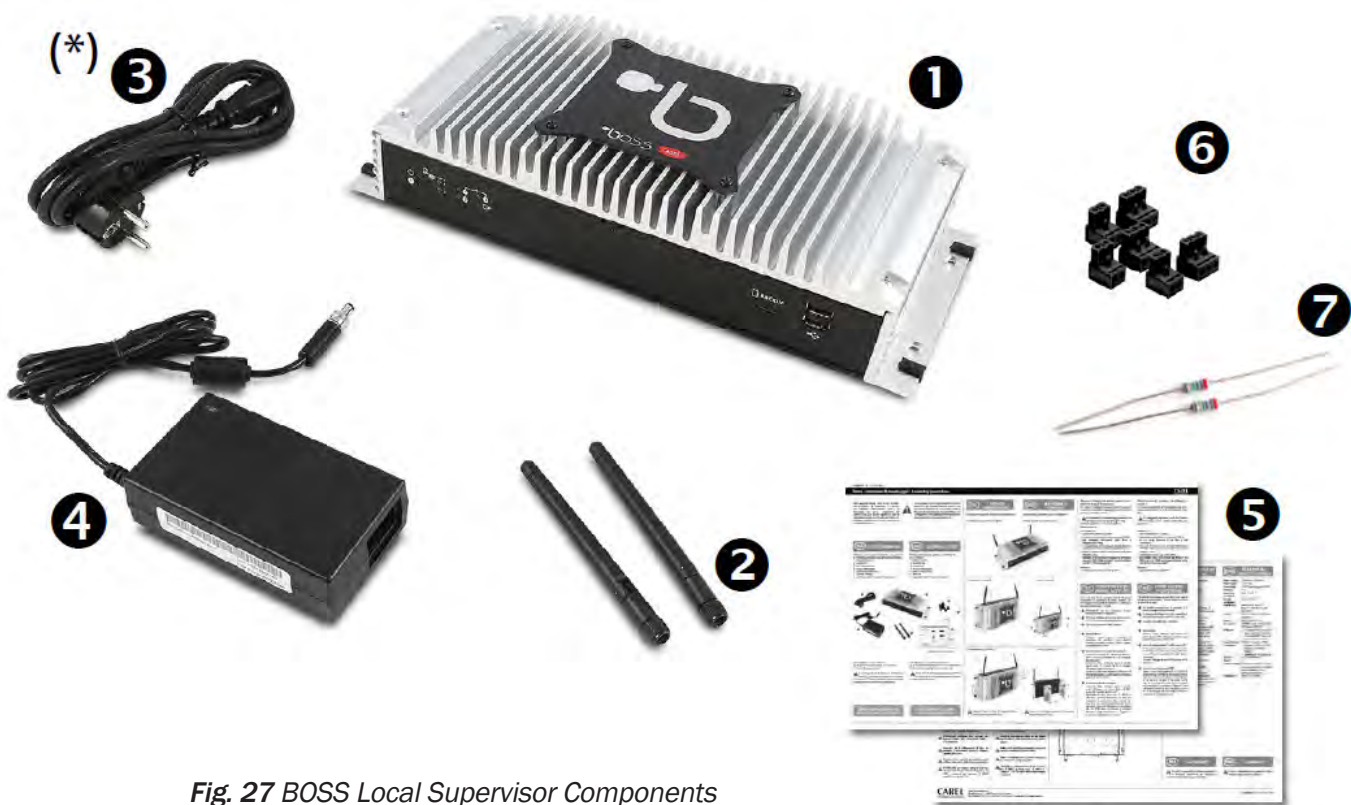
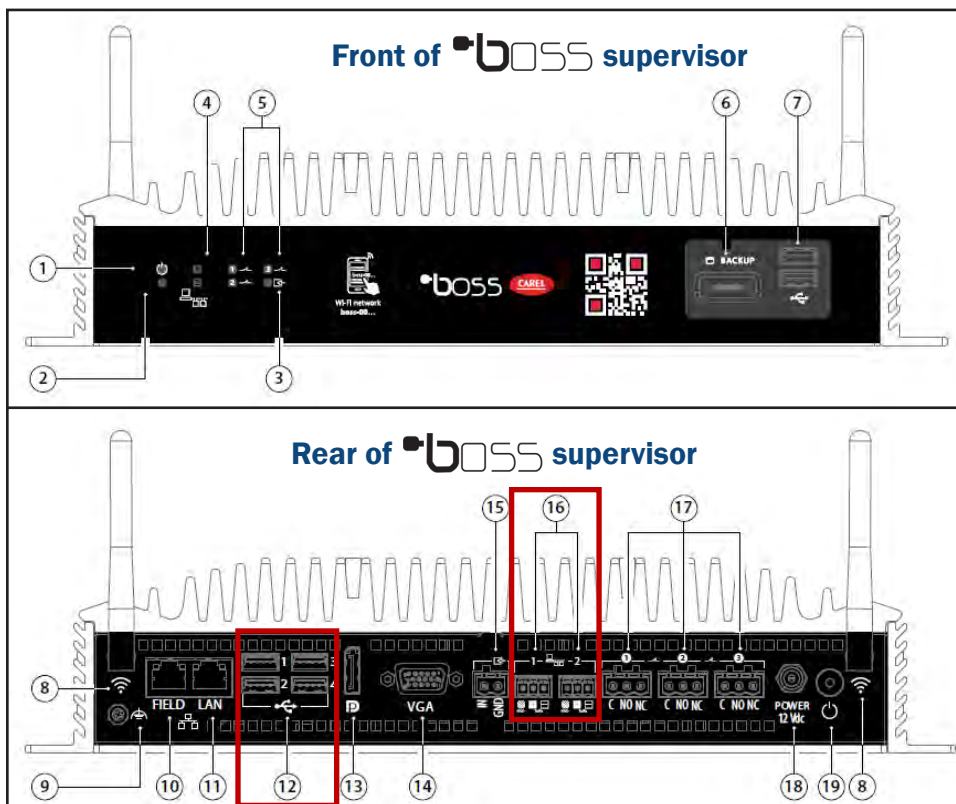


Fig. 27 BOSS Local Supervisor Components

All current SoloChill micro-distributed system operating parameters (set points) and all real-time operating conditions are collected, and may be viewed via accessing the Boss supervisor using a suitable connected mobile device. User devices such as cellular phones, tablets, laptops, and desktops are able to access information available through the Boss. Figure 19, shown back on page 22, provides a small scale view of how the Heos controllers inside the SoloChill units transmit their information (via Belden cable) back through the RS485 network and to the connection points located on the rear of the Boss.

A **maximum number of six (6)** RS485 communication loops may be connected to the rear of the Boss local supervisor. There are two (2) native RS485 ports (see callout 16 below) that could handle two communication loops, plus there are four (4) USB ports available for RS485 network connection (see callout 12 below). If the USB ports are to be used to accommodate additional communication loops, a corresponding number of USB-to-RS485 converters must be utilized to make the connections (see the photo at right).



Key to front/rear callouts	
1.	ON/OFF status LED
2.	Alarm status LED
3.	Digital input status LED.
4.	RS485 status LED (1,2).
5.	relay status LIED (1, 2, 3)
6.	µSD port
7.	USB ports (1, 2)
8.	Two antennas.
9.	Earth
10.	Field Ethernet
11.	LAN Ethernet
12.	USB ports (1, 2, 3, 4).
13.	Display port.
15.	VGA port
16.	RS485 line (1, 2)
17.	Relay outputs (1, 2, 3)
18.	Power supply
19.	ON/OFF button

Fig. 28 BOSS Local Supervisor Front and Rear Views

Important Note in Regard to Communication Wiring: The wiring used for making all communications connections to the nodes/Heos units and to the Boss is to be Belden twisted pair. Belden 8762 (AWG20) or equivalent is acceptable for all lengths up to 500 meters (1640 ft.).

8.1 Controls and Communication

For servicing the control board, proceed as follows, closely consulting the detailed wiring diagrams:

a. Overview

- i. SoloChill systems utilize Carel controls.
- ii. Individual, fully functional controllers are used at each device. Carel HEOS controllers are used for SoloChill units. Other Carel controllers are used for other portions of the SoloChill system such as fluid coolers and 3-way valves. Additional controllers for other systems such as HVAC, lighting and leak detection can be provided. Contact your HP representative for details.
- iii. A Carel Boss supervisory controller is required and is used to collect and display operational data for all devices used through a serial line network. The Boss supervisory controller can be accessed either locally or remotely.
 1. Local Access
 - a. A USB compatible keyboard and mouse may be connected to the Boss along with a VGA or HDMI compatible monitor for local access the Boss controller.
 - b. The Boss controller also has built-in Wi-Fi capability to create a network and allow access to it through Wi-Fi compatible devices.
 2. Remote Access - The Boss may be configured to use a static IP address on the user's network. However, to ensure optimum security for the user's network, HP recommends and provides a 4G modem with a set number of year(s) of service with each SoloChill system order that allows remote access while keeping the control system completely separate for the user's network.
- iv. The Carel Boss controller (and 4G modem if included) are factory programmed and can be shipped for installation on site or HP can install and prewire these devices in a control panel.
- v. The Carel control system used with SoloChill systems is a fully capable Building Management System (BMS) or is capable of communicating to most other BMS controllers over Modbus or Bacnet protocol.
 1. If the third party BMS uses Modbus/Bacnet IP protocol, it should be connected to the Boss controller using the Ethernet FIELD port (see number 10 in Figure 23, shown earlier). If the third part BMS controller is using RTU protocol, it should be connected using the RS485-2 port (see number 16 in Figure 23, shown earlier).
 2. The Ethernet LAN port is used to connect the modem mentioned above. See Figure 23.
 3. Contact your HP representative for details on integration with non-Carel BMS control systems. Some development activity is required on the non-SoloChill BMS controls and various methods (license fees, development service quote per project, etc.) are used by BMS companies to cover

the expense of the integration.

b. RS-485 Serial Communication Network

- i. Belden 8762 cable (or equivalent) should be used for the serial line network. See the earlier Figure 18 for the cable connection detail at the SoloChill unit.
- ii. The maximum designed sum length per communication loop should not exceed 500 meters (~1640 feet).
- iii. The serial network cable should not be run near power cables. Use separate conduits for communication cables. In addition, the cable should be kept away from devices that generate magnetic or electromagnetic fields such as radio antennas, transformers, contactors, neon lights, etc.
- iv. A daisy chain layout must be used for the network – no branches or star configurations are allowed.

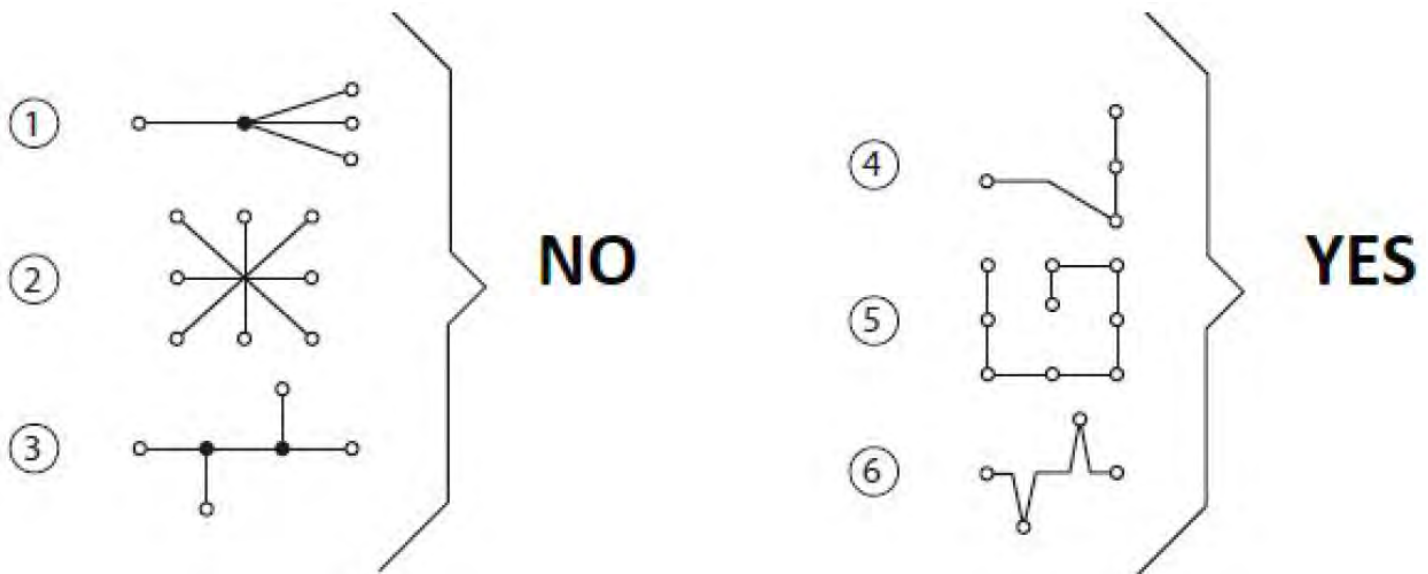


Fig. 29 Network Design Layouts

- v. As a general rule, the optimum number of controllers or devices on a single Boss communication loop should be 30 or fewer and the number of devices per loop should be balanced as much as possible. For example, a network with 40 devices should be split into 2 loops of approximately 20 devices per loop rather than one loop with 30 devices and another with 10. The total length of run on each loop is also an important factor in determining the number of devices on each loop. A loop containing 40 devices (cases) all grouped in one area of the store may perform better than a loop with 20 devices that are spread out over a long distance.
- vi. The Boss network may have up to 6 communication loops. The Boss controller has two RS485 ports (see Number 16 in Figure 18 below). Additionally, the Boss controller has four USB ports which are used for additional Comm Loops (see Number 12 in Figure 23, shown earlier). Loops connecting to the USB ports require a USB to RS485 converter (Carel model CVSTDUMORO / Hillphoenix part number

106180). In addition to the 4 USB ports, the Boss controller has 2 Auxiliary USB ports reserved for a computer Mouse and Monitor (See Number 7 in Figure 23, shown earlier). These ports can also be configured for additional Modbus/Bacnet communication lines if required.

- vii. The following guide should be used when assigning controllers to communication loops
 - 1. Serial lines 1 through 8: The Boss controller uses Carel protocol for communication in serial lines 1 through 8 and these aren't used in SoloChill installations.
 - 2. RS485-1, Serial line 9 is for system components (i.e. controllers for pump skid, 3-way valve, fluid cooler, etc)
 - 3. USB1 through 4, Serial lines 10 through 14 are for display cases and unit coolers using Carel HEOS controllers.
 - 4. RS485-2 port is generally reserved for connection to third part BMS controllers with Modbus RTU communications.
- viii. Each communication loop is to be terminated with a 120Ω ¼W resistor connected between the "+" and "-" terminals. Master/Slave pLAN networks are not to be terminated with a resistor.
- c. pLAN Master/Slave Controls
 - i. The Carel HEOS controllers can manage local pLAN Master/Slave networks up to 6 controllers (1 master and 5 slave controllers).
 - ii. All Master and Slave controllers are connected on the main Boss network. Additionally, Master/Slave networks are wired on a second pLAN port.
 - iii. Master/Slave networks are used for two primary purposes:
 - 1. Refrigeration/Defrost management in case lineups with common air space
 - 2. Multi-evaporator management in cases with multiple evaporators being refrigerated by a single SoloChill unit.
- d. Communication Loop Layout and Serial Addressing – provided that the rules above are followed, the designer has discretion in the order, numbering and identification of loop layout and address schedule but Hillphoenix recommends the follow guidelines in order to maintain consistent and standardized designs which can help reduce time required to set up the system and avoid errors during implementation. See Figures 30 and 31 for examples of a Communication Loop Layout and Serial Addressing Schedule.
 - i. The Communication Loop lines should progress numerically from left to right across the store when standing at the front door looking toward the back of the store.
 - 1. In cases of lineups with common air space, the Master/Slave order should be from left to right

when facing the front of the lineup with the HEOS controller in the far left case should be designated as the Master Controller.

- ii. The address number for the cases in each Communication Loop are sequentially numbered with the lowest number being closest to the Boss controller. The first address number starts with an address of 10 and then increasing sequentially.
- iii. The recommended communication port settings are:
 1. Baud rate: 19200
 2. Data bits: 8
 3. Parity: N
 4. Stop bits: 2

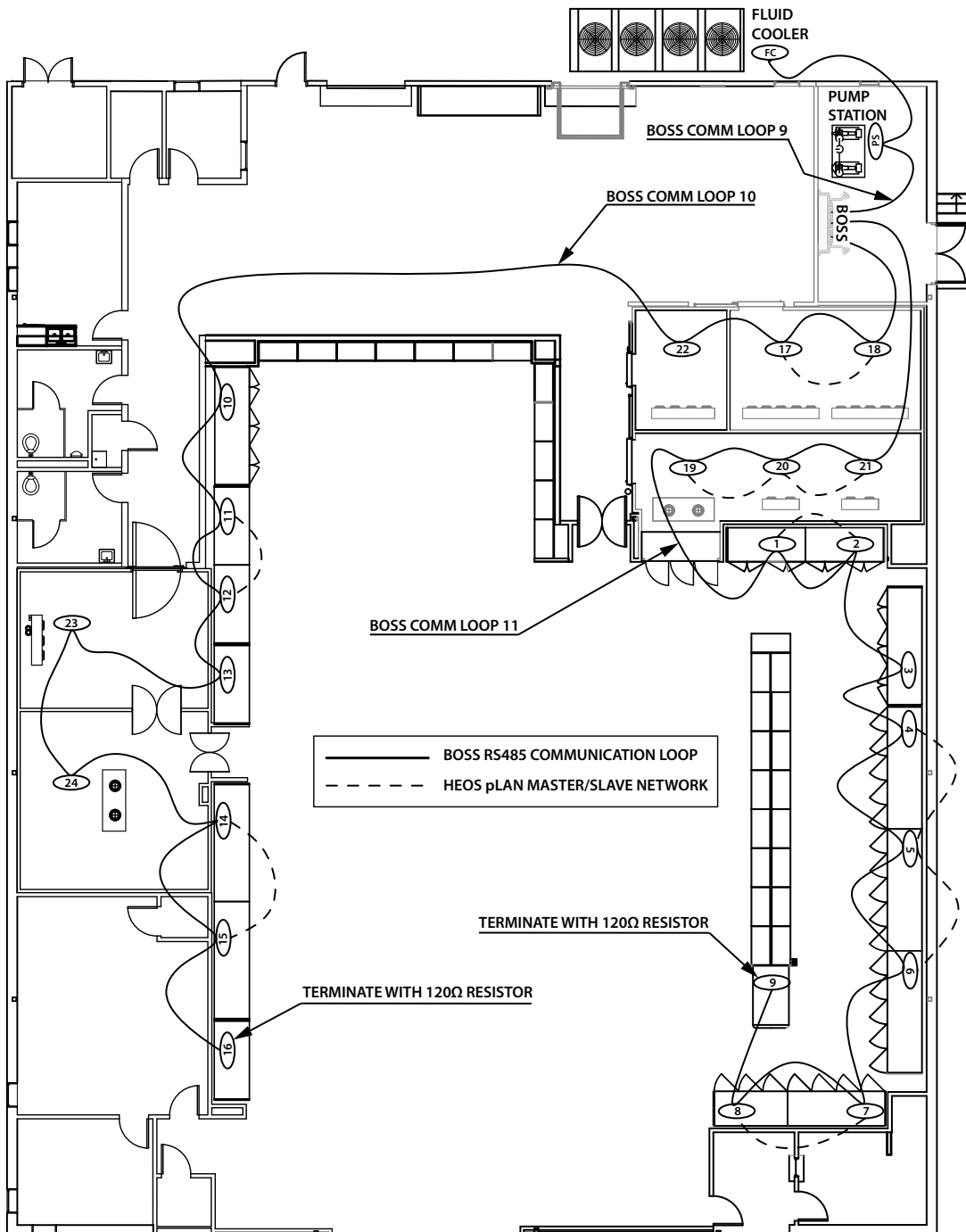


Fig. 30 RS485 and pLAN Communication Layout Example

System	Comm Loop #	Case Serial Address	Modbus/Serial address	Boss Connection Port	boss name	Master/Slave	Master/Slave Number	Controller Type	Description	Case	Refrigerant	Condensing Unit	Notes
				RS485-1	Comm Line 9								
	9	005	9.010		BOSS			Mitsubishi	MEZZANINE BOSS				
	9	006	9.011		Pumping Station - 9.010 Cooling Tower I/O - 9.011			OPCO	Pumping Station Cooling Tower I/O				
					Comm Line 10								
				RS485-2	Boss								
18	10	010	10.010		18 - (1/2) FREEZER STORAGE - 10.010	S	1a	HEOS	(1/2) FREEZER STORAGE	LLE-170	R448A	DA420	
17	10	011	10.011		17 - (1/2) FREEZER STORAGE - 10.011	M	1	HEOS	(1/2) FREEZER STORAGE	LLE-170	R448A	DA420	
22	10	012	10.012		22 - MEAT COOLER - 10.012	M	2	HEOS	MEAT COOLER	LET-120	R448A	DA330	
10	10	013	10.013		10 - 12 PACKAGED MEAT - 10.013	M	3	HEOS	12 PACKAGED MEAT	ORBOA	R448A	DA091	
11	10	014	10.014		11 - 8 MULTI DECK MEAT - 10.014	S	4a	HEOS	8 MULTI DECK MEAT	OHMHQA-NRG	R448A	DA220	
12	10	015	10.015		12 - 8 MULTI DECK MEAT - 10.015	M	4	HEOS	8 MULTI DECK MEAT	OHMHQA-NRG	R448A	DA220	
13	10	016	10.016		15 - 8 CUT PRODUCE - 10.016	M	5	HEOS	8 CUT PRODUCE	OSDMAQ-NRG	R448A	DA220	
23	10	017	10.017		23 - PRODUCE COOLER - 10.017	M	6	HEOS	PRODUCE COOLER	ADT-208	R448A	DA420	
24	10	018	10.018		24 - PRODUCE PREP - 10.018	M	7	HEOS	PRODUCE PREP	WK-130	R448A	DA220	
14	10	019	10.019		14 - 12 BULK PRODUCE - 10.019	S	8a	HEOS	12 BULK PRODUCE	OHPOA-NRG	R448A	DA220	
15	10	020	10.020		15 - 12 BULK PRODUCE - 10.020	M	8	HEOS	12 BULK PRODUCE	OHPOA-NRG	R448A	DA220	
16	10	021	10.021		16 - 8 CUT PRODUCE - 10.021	M	9	HEOS	8 CUT PRODUCE	OSDMAQ-NRG	R448A	DA220	TERMINATE WITH 120Ω, 1/4 WATT RESISTOR
					Comm Line 11								
				USB-1	Boss								485/USB adapter
21	11	010	11.010		21 - (1/2) DAIRY COOLER - 11.010	M	10	HEOS	DAIRY CHILL DOORS RM 67	WK-130	R448A	DA220	
20	11	011	11.011		20 - (1/2) DAIRY COOLER - 11.011	S	10a	HEOS	(1/2) DAIRY CHILL RM67	ADT-120	R448A	DA220	
19	11	012	11.012		19 - DAIRY COOLER DOORS - 11.012	S	10b	HEOS	(1/2) DAIRY CHILL RM67	ADT-120	R448A	DA220	
1	11	013	11.013		1 - 4 DOORS DAIRY - 11.013	M	11	HEOS	8' DAIRY (4 DOORS)	ORBOA	R448A	DA091	
2	11	014	11.014		2 - 4 DOORS DAIRY - 11.014	S	11a	HEOS	8' DAIRY (4 DOORS)	ORBOA	R448A	DA091	
3	11	015	11.015		3 - 6 DOORS DAIRY - 11.015	M	12	HEOS	12' DAIRY (6 DOORS)	ORBOA	R448A	DA091	
4	11	016	11.016		4 - 5 DOORS FROZEN FOOD - 11.016	M	13	HEOS	5 DR FROZEN FOOD	ORZQA	R448A	DA420	
5	11	017	11.017		5 - 5 DOORS FROZEN FOOD - 11.017	S	13a	HEOS	5 DR FROZEN FOOD	ORZQA	R448A	DA420	
6	11	018	11.018		6 - 5 DOORS FROZEN FOOD - 11.018	S	13b	HEOS	5 DR FROZEN JUICE	ORZQA	R448A	DA420	
7	11	019	11.019		7 - 4 DOORS ICE CREAM - 11.019	M	14	HEOS	4 DR ICE CREAM	ORZQA	R448A	DA220	
8	11	020	11.020		8 - 3 DOORS ICE CREAM - 11.020	S	14a	HEOS	3 DR ICE CREAM	ORZQA	R448A	DA220	
9	11	021	11.021		9 - 6 DUAL TEMP FROZEN FOODS	M	15	HEOS	6 DUAL TEMP FROZEN FOODS	ONIZGG	R448A	DA220	TERMINATE WITH 120Ω, 1/4 WATT RESISTOR

Fig. 31 Address Schedule Example

Checking back on page 31, and examining the numbered items on the front and rear of the Boss local supervisor, it will be noted that there are points for the connection of a monitor, keyboard, and mouse. See items (7), (13) and (14). These locations are very useful for setting up a wired, central monitoring station. If the Boss is connected to a LAN network (see point (11)), it may be accessed through another PC in the LAN. Of course, the integrated Wi-Fi network may also be utilized for access.

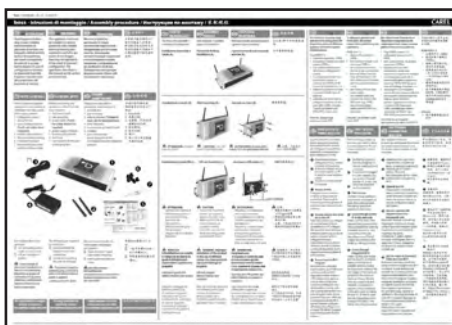
Troubleshooting Communication Connection Issues

If any issues or perceived problems arise, or if any observed irregularities are found to exist in the connections, it is suggested that the following checks be run:

- Connect a laptop computer directly to the instruments to see if they are correctly configured.
- Attempt to identify the position of the fault by dividing the line in two parts and checking the two halves of the line; after gaining an understanding of which half has the fault, repeat the process with further subdivisions of the line, etc.
- Check the connection polarity of the RS485 line on the units located in the section of the line that was determined to contain the fault.
- Place another 120 Ω terminal resistor at the start of the line (on the serial converter). In this way the RS485 line is loaded further and will increase its protection against interference (if the reason for the poor communication condition was due to noise).
- Check the insulation on the cable. To do this, disconnect the cable from all controllers and from the RS485 serial converter. After that, at the beginning of the cable (Boss side), use an ohmmeter to check the resistance of the wires Suggested checks:
 - between the D+ and D- there must be 120 Ω of resistance plus the cable resistance (more or less an extra 30 Ω to 40 Ω); If the final resistance is not fitted, there must be an open circuit.
 - between D+ and the GND there must be an open circuit (infinite resistance)
 - between D- and GND there must be an open circuit (infinite resistance)
 - between D+ and the electrical earth (ground), there must be an open circuit (infinite resistance)
 - between D- and the electrical earth (ground), there must be an open circuit (infinite resistance)
 - between GND and the electrical earth (ground), there must be an open circuit (infinite resistance)

Carel  **Assembly Procedure is available via the internet at the following location:**

<https://www.carel.com/documents/10191/0/+0500092ML/c802c8fe-8985-4cba-81f5-eb3bdc83bf48?version=1.4>



9.0 Fascia Installation

1. Attach fascia front panel to support brackets (Fig 32)
2. Attach fascia supports to top of case.
3. Attach fascia outside end panels to top of case.
4. Slide fascia inside end panels into outside end panels, Adjust as needed to match width of case.

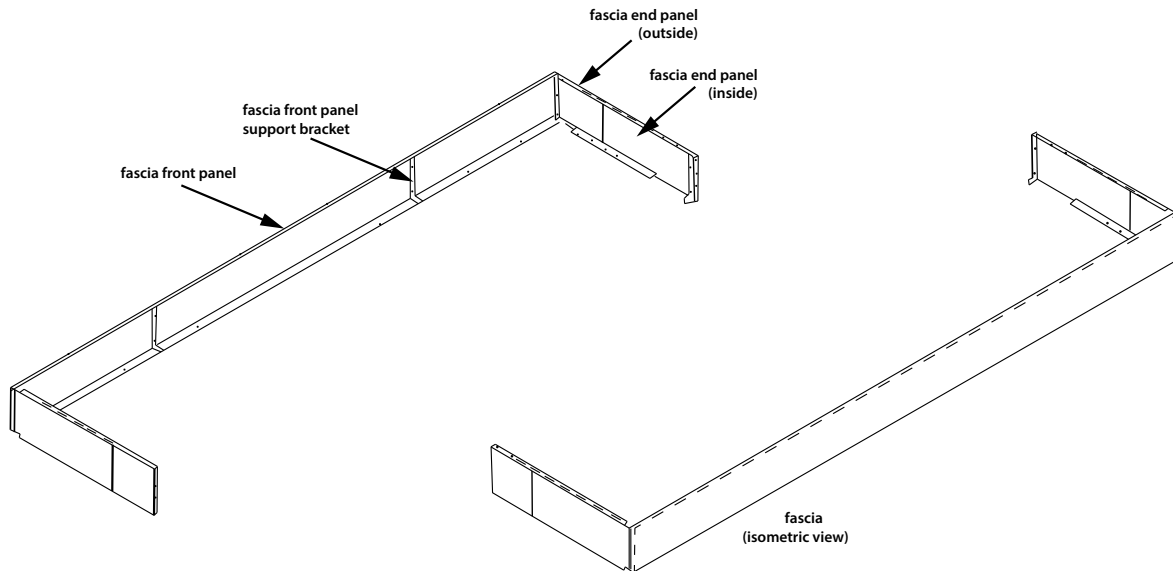


Fig. 32 Fascia Assembly

In some instances, a case may also require a rear fascia. If so ordered for the case, a section of rear fascia is also shipped loose. The rear fascia option provides flanges that mate to the end fascia and are aligned with pre-punched holes and fastened with screws.

10.0 Differences Between SoloChill™ Cases and Standard Remote DX Cases

Most features and options of a SoloChill equipped case remain similar to its traditional remote DX counterpart, however requirements for temperature probes will differ.

All SoloChill equipped cases use a defrost probe, a discharge-air probe and a coil-outlet (suction temperature probe). A pressure transducer is also required, and is mounted in the suction line that exits the evaporator coil.

For all upright cases, the defrost probe is mounted in or on the left end of the evaporator coil. The coil-outlet probe and pressure transducer are also near the left end of the coil where the suction line is attached to the coil. Removal of the first deck pan at left of an upright multi-deck case provides access to all three items (defrost probe, coil-outlet probe, pressure transducer). The discharge air probe is always located behind a plastic plug button in the horizontal section of the flue-panel for the upright multi-deck cases. These are the only and specific locations intended for use, and supersede other locations that may be discussed in the traditional remote DX manuals.

Defrost strategies also differ. Standard remote DX cases may employ a variety of defrost techniques as specified by customer order. However, SoloChill equipped cases always use electric defrost heaters for low-temperature cases and off-cycle defrost for medium-temperature cases

11.0 SoloChill™ Unit Dimensions

There are only five different water-cooled, micro-distributed SoloChill condensing units manufactured by Hillphoenix. These five models are utilized for both the units that are already installed on top of and underneath display cases as well as those used for removing heat from walk-in coolers and freezers. The most common way that these units are identified is by the capacity of the Toshiba rotary compressor which is installed inside each individual unit.

The compressors (from smallest to largest) are designated with the following identifiers: DA091, DA130, DA220, DA330, and DA420. The outside dimensions of the smaller SoloChill condensing units apply to the units containing the DA091, DA130, and DA220 compressors. The corresponding SoloChill unit outside dimensions are shown on the next page in Fig. 33.

The outside dimensions of the larger SoloChill condensing units apply to the units containing the DA330 and DA420 compressors. The corresponding SoloChill outside dimensions are shown on the next page in Fig. 34.

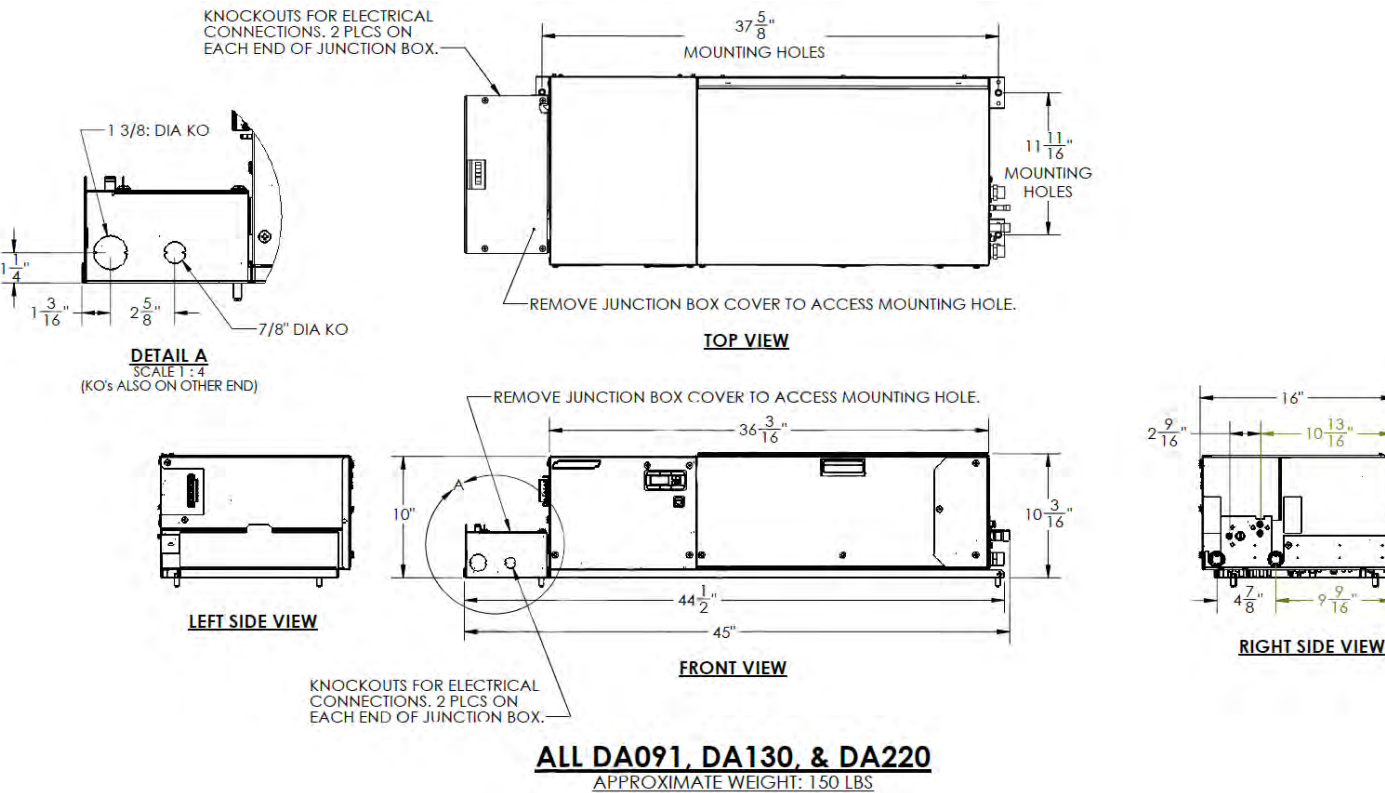


Fig. 33 SoloChill Units DA091, DA130, DA220

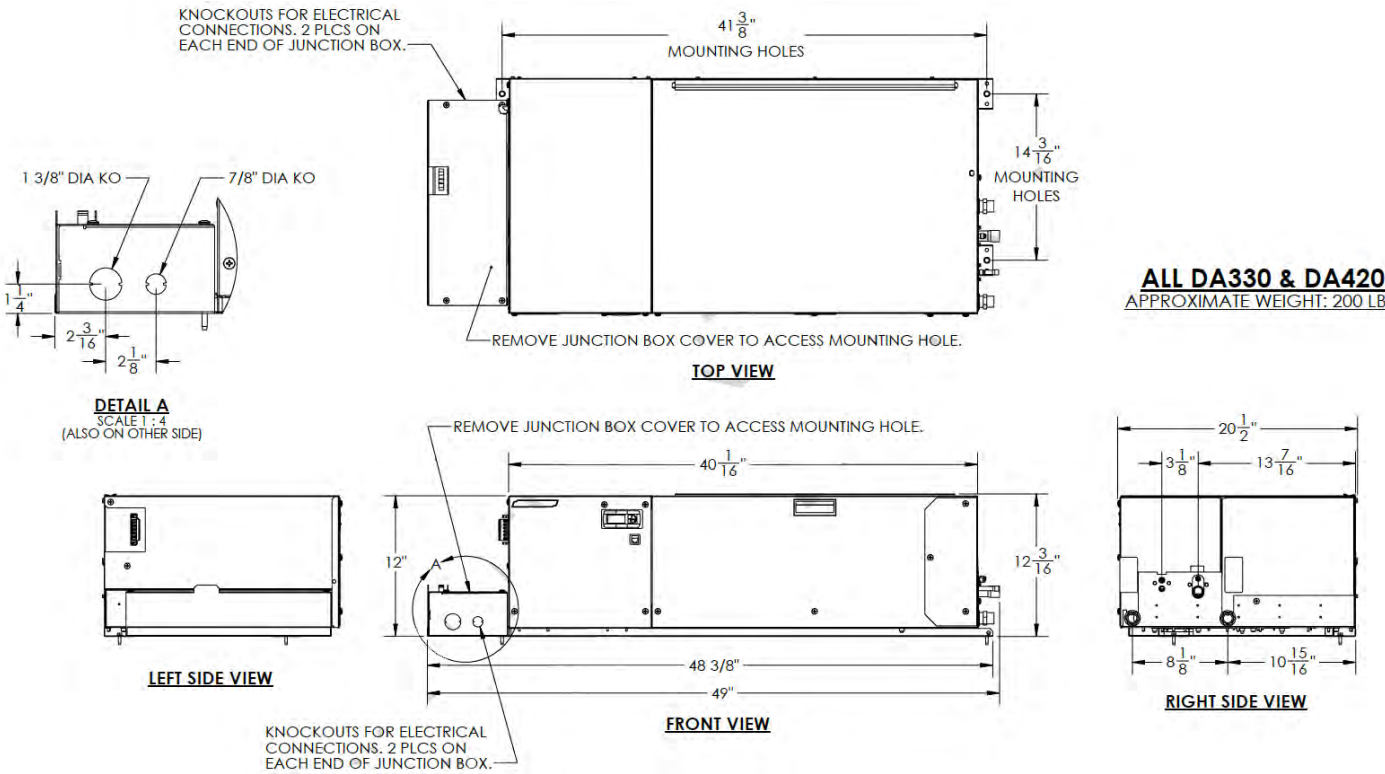


Fig. 34 SoloChill Units DA091, DA130, DA220

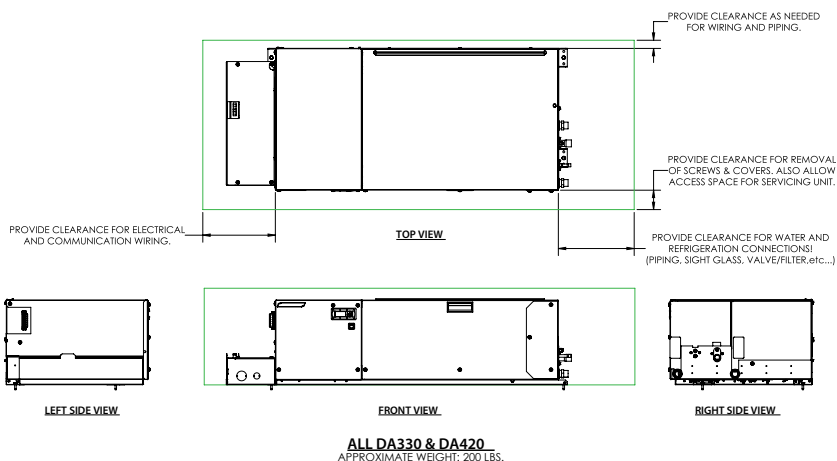
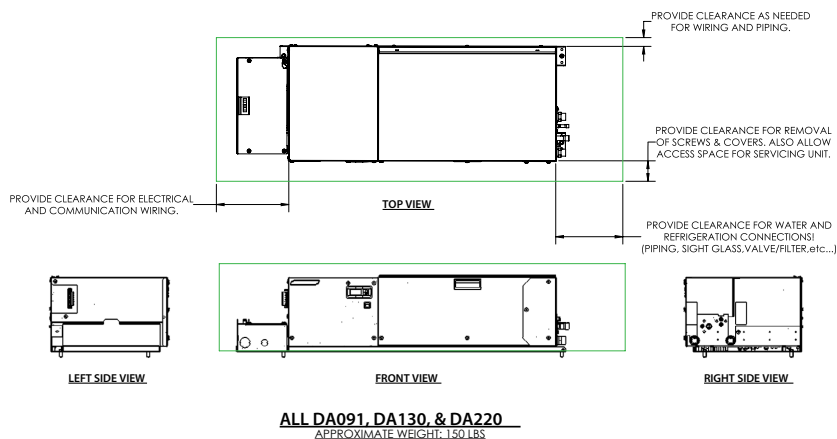
SoloChill Condensing Unit Accessibility

The drawings shown on the previous page display the greatest outside dimensions of a SoloChill Units (both the 091/130/220 units and the 330/420 units). These units may be installed to provide heat removal for walk-in coolers and freezers. When specifying the outside dimensions or “envelope” that should be allowed for installing any SoloChill Unit on top of or near a walk-in cooler/freezer it is important to allow sufficient room for reasonable access to the various critical features of these units.:

Note in Figs 23 and 24 that there is also an auxiliary electrical junction box that is designed to be installed/affixed to the left hand side of the SoloChill unit’s outer shell/box itself. These auxiliary junction boxes are 7 inches wide. they are not very tall, but it would be prudent to allow the full depth 20 7/16 inches as the SoloChill Unit itself (be able to reach the breakers installed in the junction box), and the full height of the installed SoloChill unit.

In addition, it would also be preferable to be able to see/read the external PLD display mounted on the front of the SoloChill unit, and also be able to plug in a hand-held PGD into the RJ12 jack located on the front of the SoloChill unit for the viewing/changing of parameters.

Finally, at some time it may be necessary to remove the outer covers/panels from the electrical portion (left hand side) and/or the mechanical portion (right hand side) of the SoloChill unit. These covers/panels may be removed to view/troubleshoot/service components located inside of it. If you would think that you would EVER want to remove the covers and look inside, you should allow sufficient room to be able to remove them.



12.0 SoloChill Operational Setpoints

The operational setpoints (or parameters) specified for any particular water-cooled, micro-distributed SoloChill Condensing unit are determined by a combination of the unit design and the intended function of the unit. To view the specific setpoints determined for a specific SoloChill condensing unit and application, please consult the Master Addendum that was provided to the store. This document contains the Engineering Reference data for the individual SoloChill units and their intended applications.

13.0 SoloChill System Maintenance

The SoloChill refrigeration system is effectively a closed system, with remote system control provided by the BOSS supervisor, no preventative maintenance on the condensing unit portion of the system is necessary. An alarm will be generated on the BOSS supervisor should an operational parameter reach a value that is out of its normal operational range. However, the two most important items from a maintenance and performance standpoint are the maintenance of the fluid cooling loop (water loop) and frequent cleaning and maintenance of the cases or unit coolers that make up part of the individual to the SoloChill condensing unit.

Water Loop Maintenance

For many applications, the propylene glycol concentration should be maintained at a level of 25% in a propylene glycol and water mixture. This percentage, protects from freezing down to a temperature of 14 °F. With the use of a refractometer, it is suggested that the concentration of propylene glycol in the working fluid be verified once every 6 months. If propylene glycol is required to be added, it is imperative to use a propylene glycol of the same type and from the same manufacturer. The corrosion inhibition formulations from different brands or types may not be compatible and may result in coagulation or the formation of precipitants. If water is to be added, purified water must be used (i.e., water produced through distillation or reverse osmosis). Water must meet these impurity standards:

Impurity	Level
Chlorides	< 25 PPM
Sulfates	< 25 PPM
Calcium*	< 50 PPM
Magnesium*	< 50 PPM
* Calcium and Magnesium, expressed as PPM calcium carbonate, the total hardness as calcium carbonate must be less than 80 PPM.	

Refrigerated Display Cases and Walk-In Coolers/Freezers Maintenance

Display cases and walk-ins should be cleaned and inspected at a minimum of once each month. It should be verified that the evaporator coil is clean and the flow of air is unobstructed. Also, check to ensure fans and heaters are in good condition, coil surfaces are undamaged, the proper temperature for the product being refrigerated is maintained.



Warranty

HEREINAFTER REFERRED TO AS MANUFACTURER

FOURTEEN MONTH WARRANTY. MANUFACTURER'S PRODUCT IS WARRANTED TO BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP UNDER NORMAL USE AND MAINTENANCE FOR A PERIOD OF FOURTEEN MONTHS FROM THE DATE OF ORIGINAL SHIPMENT. A NEW OR REBUILT PART TO REPLACE ANY DEFECTIVE PART WILL BE PROVIDED WITHOUT CHARGE, PROVIDED THE DEFECTIVE PART IS RETURNED TO MANUFACTURER. THE REPLACEMENT PART ASSUMES THE UNUSED PORTION OF THE WARRANTY.

This warranty does not include labor or other costs incurred for repairing, removing, installing, shipping, servicing, or handling of either defective parts or replacement parts.

The fourteen month warranty shall not apply:

1. To any unit or any part thereof which has been subject to accident, alteration, negligence, misuse or abuse, operation on improper voltage, or which has not been operated in accordance with the manufacturer's recommendation, or if the serial number of the unit has been altered, defaced, or removed.
2. When the unit, or any part thereof, is damaged by fire, flood, or other act of God.
3. Outside the continental United States.
4. To labor cost for replacement of parts, or for freight, shipping expenses, sales tax or upgrading.
5. When the operation is impaired due to improper installation.
6. When installation and startup forms are not properly complete or returned within two weeks after startup.

THIS PLAN DOES NOT COVER CONSEQUENTIAL DAMAGES. Manufacturer shall not be liable under any circumstances for any consequential damages, including loss of profit, additional labor cost, loss of refrigerant or food products, or injury to personnel or property caused by defective material or parts or for any delay in its performance hereunder due to causes beyond its control. The foregoing shall constitute the sole and exclusive remedy of any purchases and the sole and exclusive liability of Manufacturer in connection with this product.

The Warranties are Expressly in Lieu of All Other Warranties, Express or Implied and All Other Obligations or Liabilities on Our Part. The Obligation to Repair or Replace Parts or Components Judged to be Defective in Material or Workmanship States Our Entire Liability Whether Based on Tort, Contract or Warranty. We Neither Assume Nor Authorize Any Other Person to Assume for Us Any Other Liability in Connection with Our Product.

MAIL CLAIM TO:

Hillphoenix Display Merchandisers

1925 Ruffin Mill Road, Colonial Heights, VA 23834
800-283-1109

**Hillphoenix Refrigeration Systems &
Power Systems**

2016 Gees Mill Road, Conyers, GA 30013
770-285-3200

Hillphoenix Specialty Products

703 Franklin Street, Keosauqua, IA 52565
319-293-3777

APPENDIX A

SoloChill Micro-Distributed Case-Mounted Condensing Units Electrical and Communication Drawings

Figure	Title	Page
A-1	<i>Low-Temp Case and Condensing Unit: 091, 130, 220</i>	A-2
A-2	<i>Low-Temp Case and Condensing Unit: 330, 420</i>	A-3
A-3	<i>Medium-Temp Case and Condensing Unit: 091, 130, 220</i>	A-4
A-4	<i>Medium-Temp Case and Condensing Unit: 330, 420</i>	A-5
A-5	<i>Medium-Temp Condensing Unit Wiring Diagram: 091, 130, 220, service and utility cases</i>	A-6
A-6	<i>Single Point and Disconnects Upright Multi-Deck Case Junction Box (091, 130, 220)</i>	A-7
A-7	<i>Single Point and Disconnects Upright Multi-Deck Case Junction Box (330, 420)</i>	A-8
A-8	<i>Seven Inch Case Junction Box Wiring</i>	A-9

Low-Temperature Case And Condensing Unit (091, 130, 220)

Typical 091/130/220 Compressors

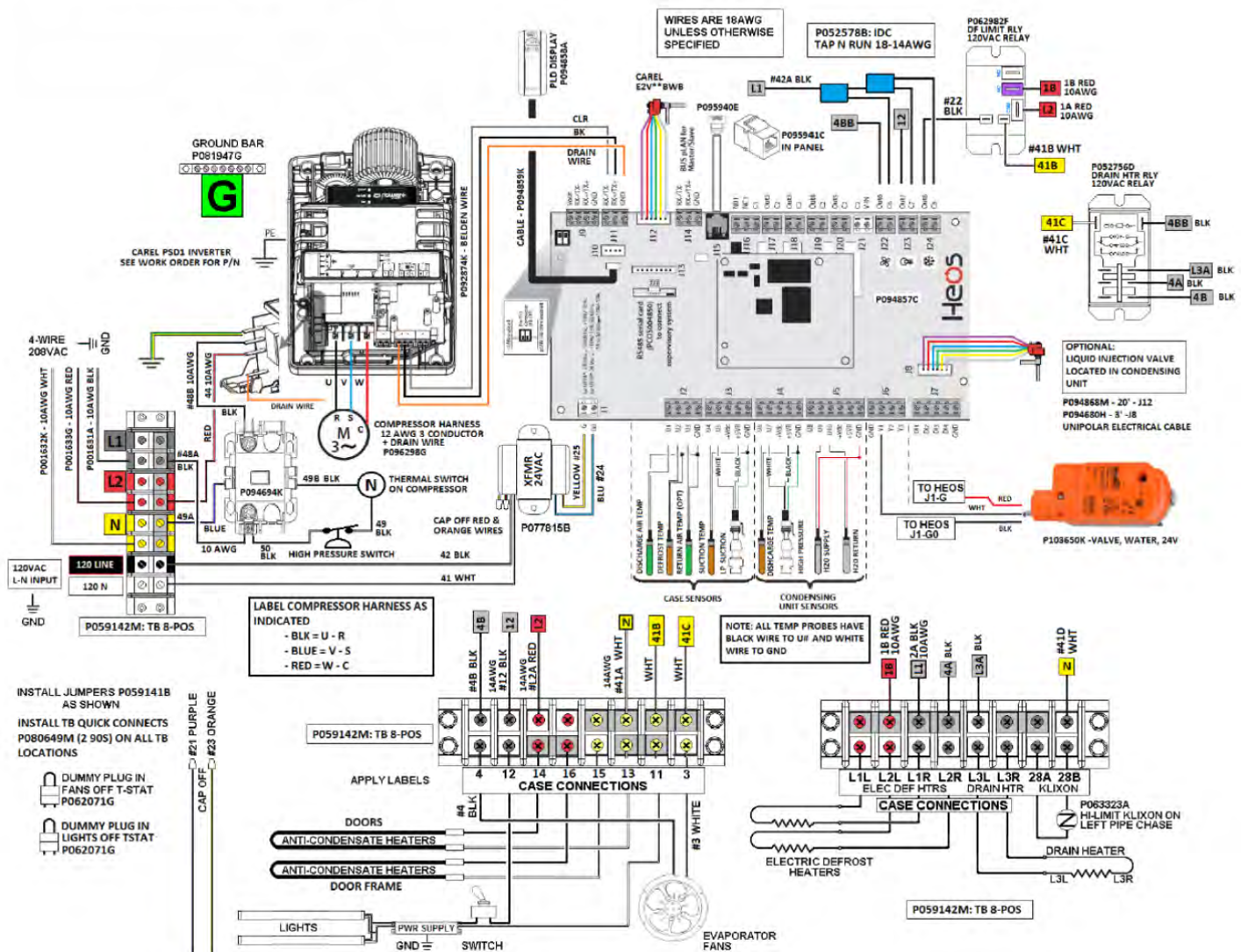


Fig. A-1 See Electrical Box for the Wiring Diagram Specific to Your Cases

Low-Temperature Case And Condensing Unit (330, 420)

Typical for 330/420 Compressors

WIRES ARE 18AWG
UNLESS OTHERWISE
SPECIFIED

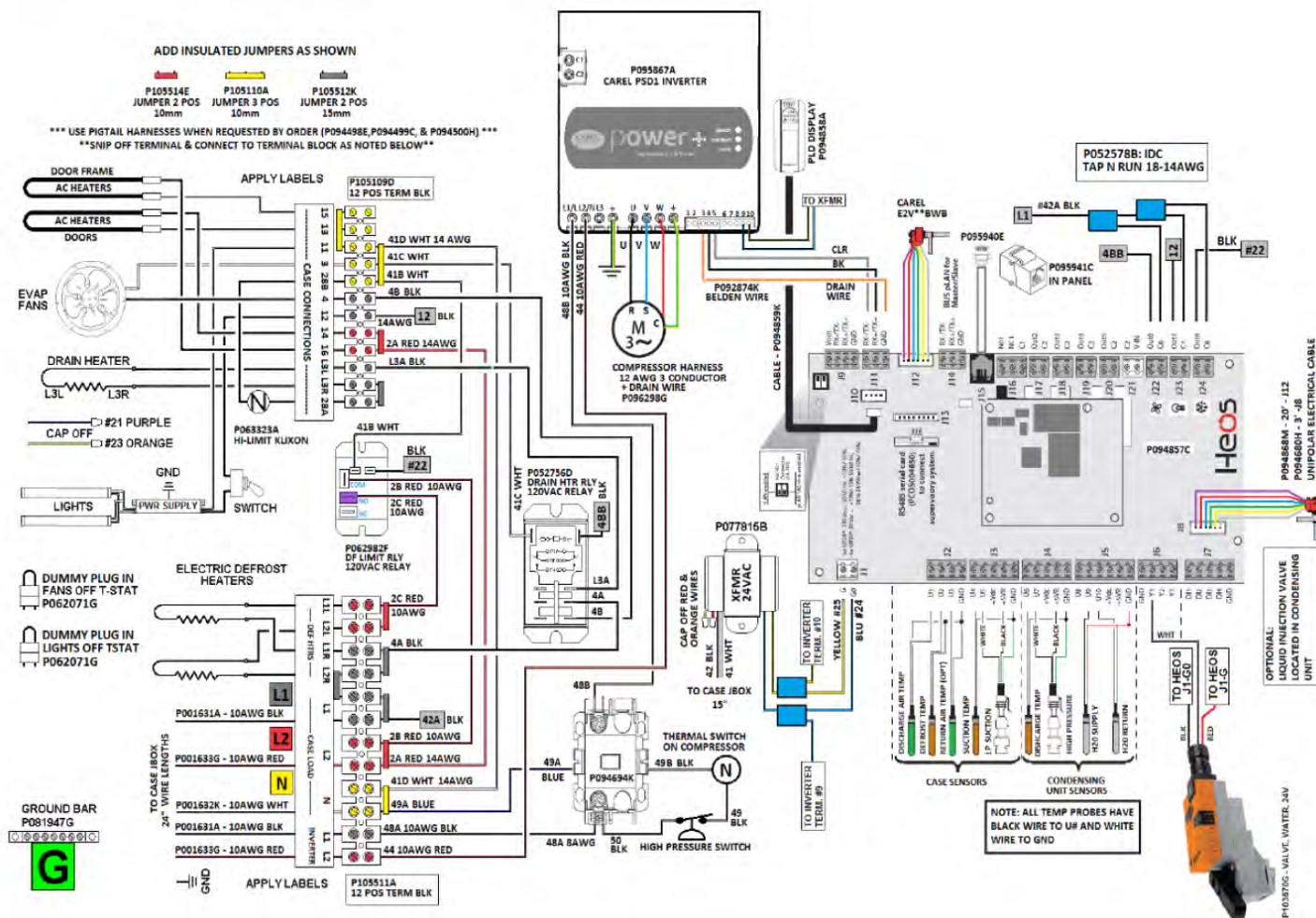
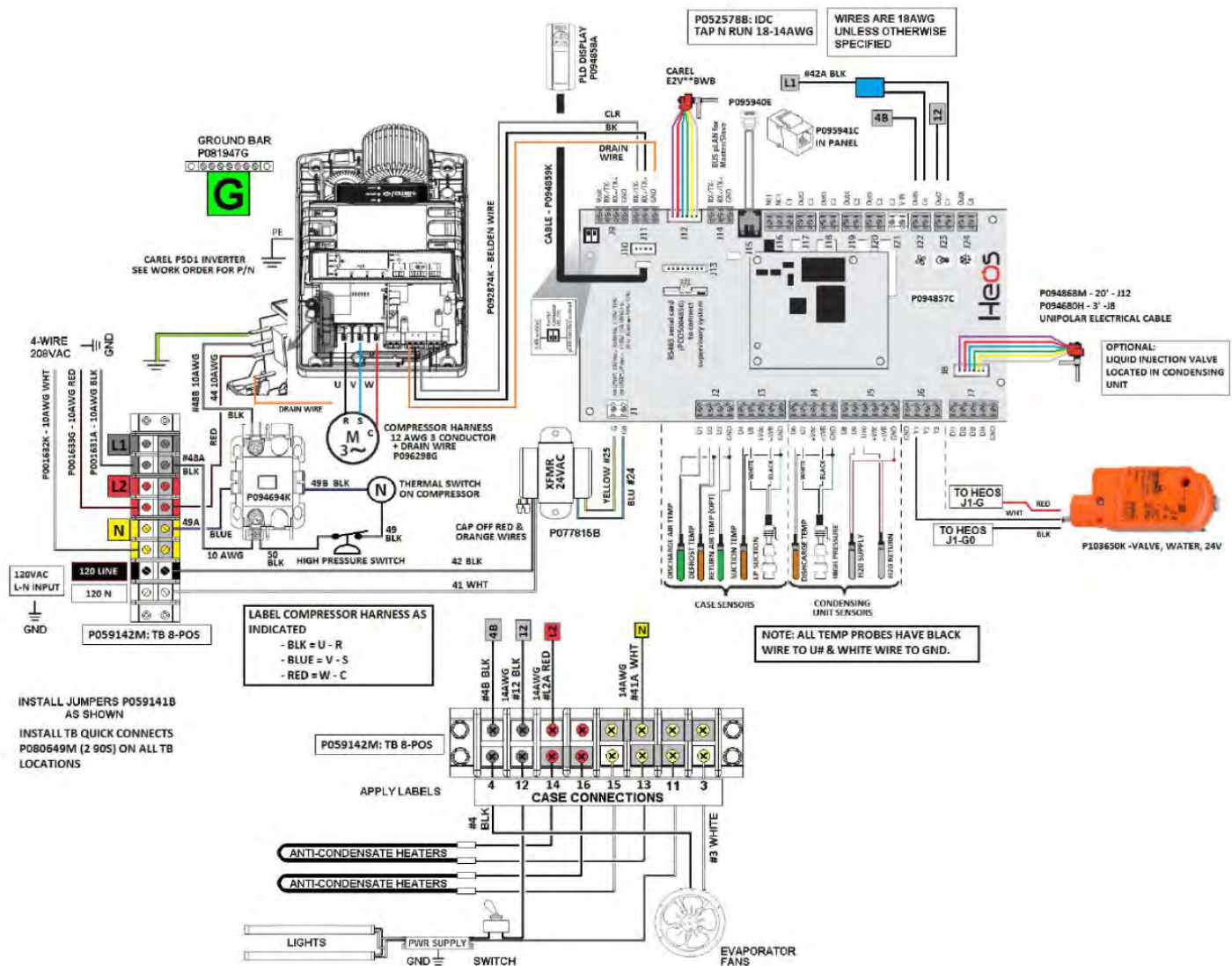


Fig. A-2 See Electrical Box for the Wiring Diagram Specific to Your Cases

Medium-Temperature Case And Condensing Unit (091, 130, 220)

Typical 091/130/220 Compressors



Medium-Temperature Case And Condensing Unit (330, 420)

Typical 330/420 Compressors

WIRES ARE 18AWG
UNLESS OTHERWISE
SPECIFIED

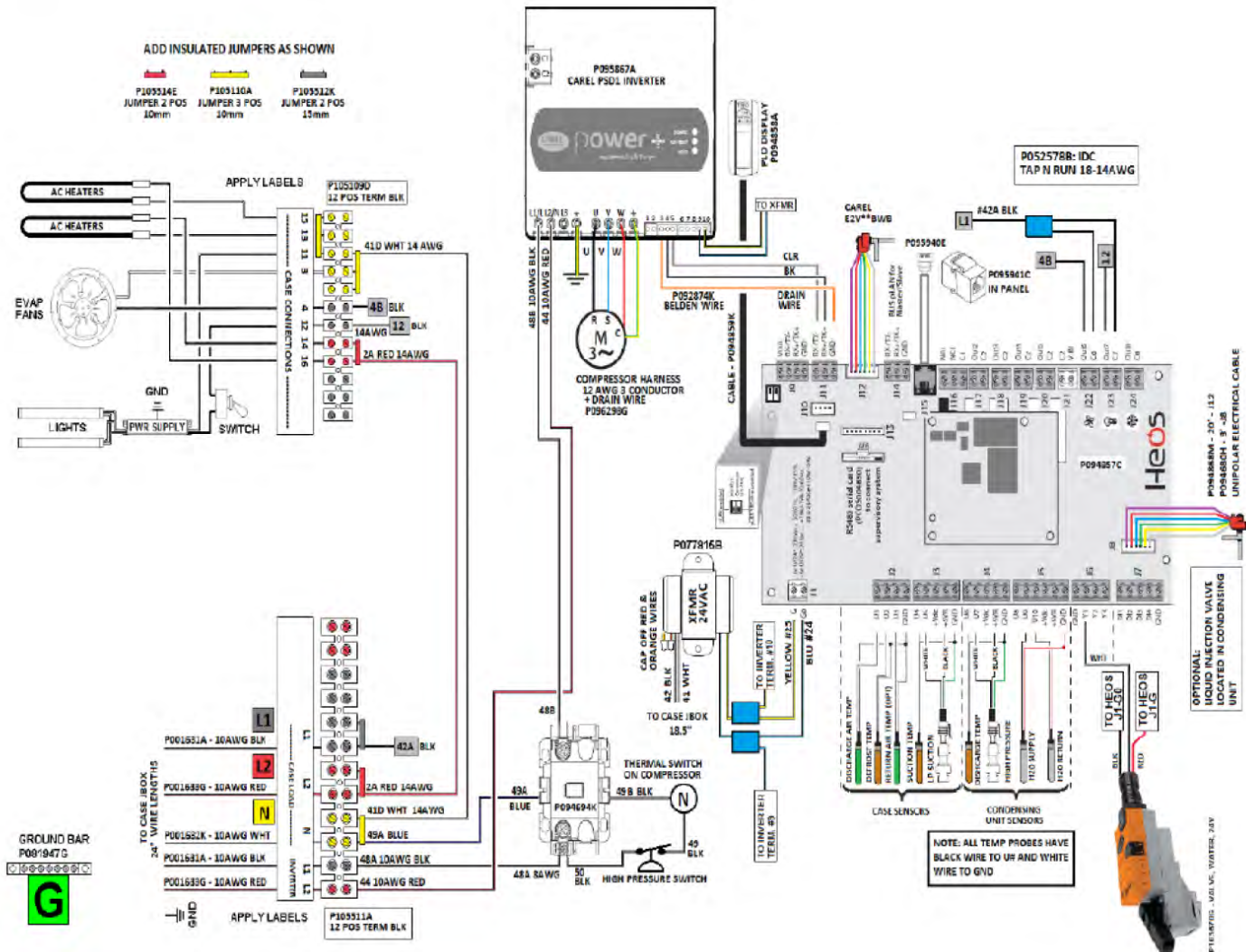


Fig. A-4 See Electrical Box for the Wiring Diagram Specific to Your Cases

Medium-Temperature Condensing Unit - Wiring Diagram (091, 130, 220)

Typical for Utility or Service Cases
(091/130/220 Compressors)

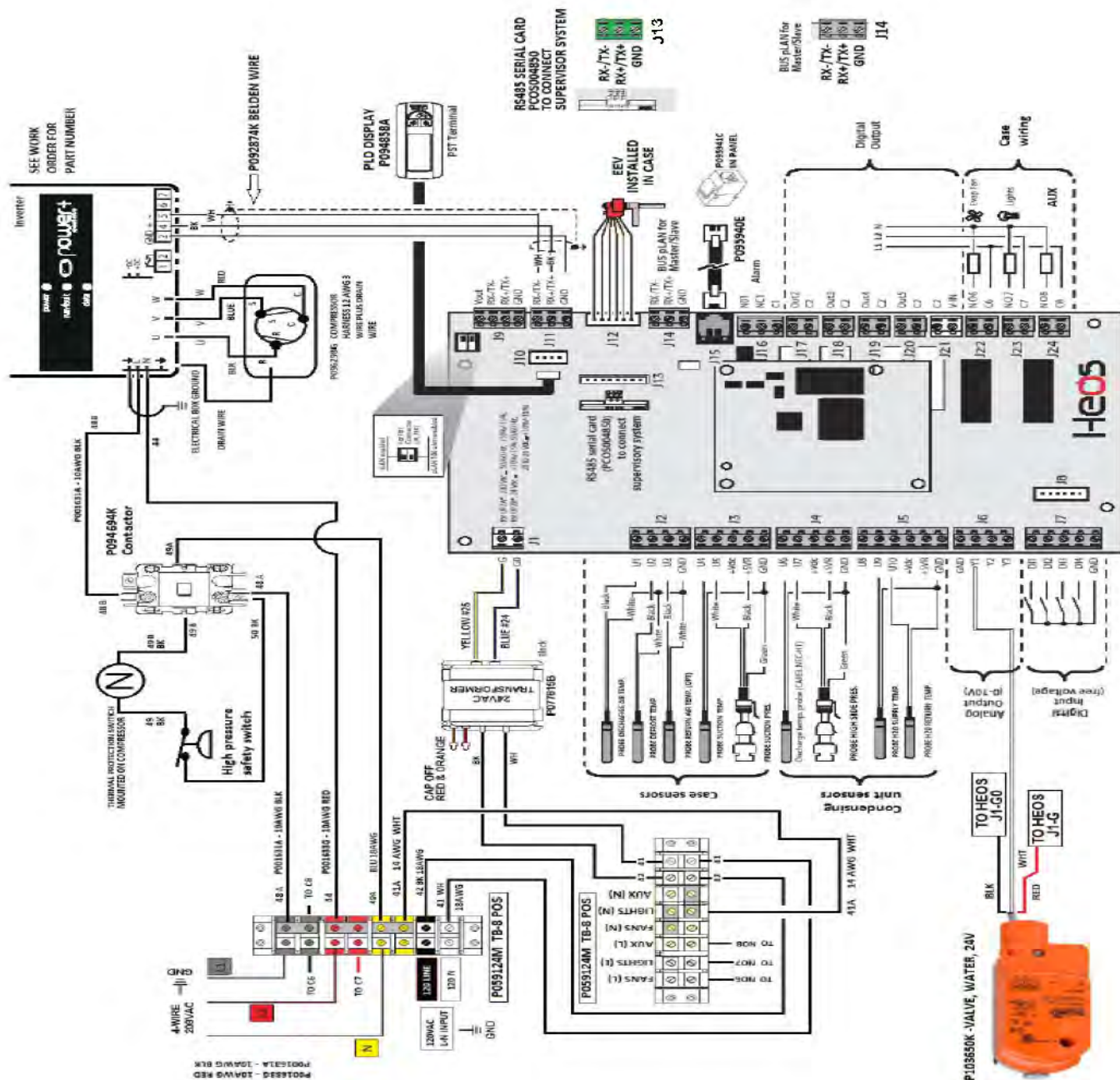


Fig. A-5 See Electrical Box for the Wiring Diagram Specific to Your Cases

Single-Point and Disconnects of Upright Multi-Deck Case Junction Box

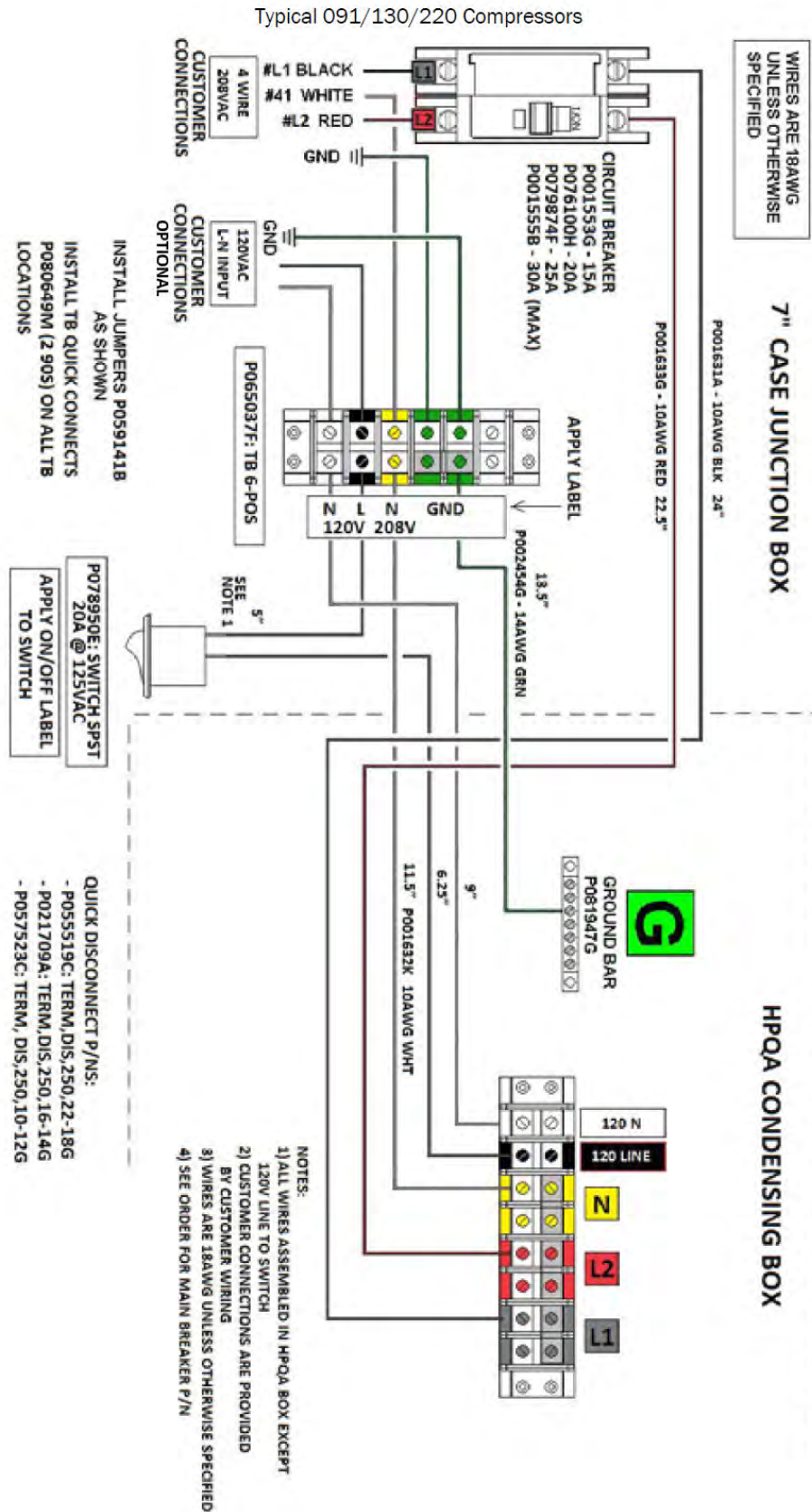


Fig. A-6 See Electrical Box for the Wiring Diagram Specific to Your Cases

Single-Point and Disconnects of Upright Multi-Deck Case Junction Box

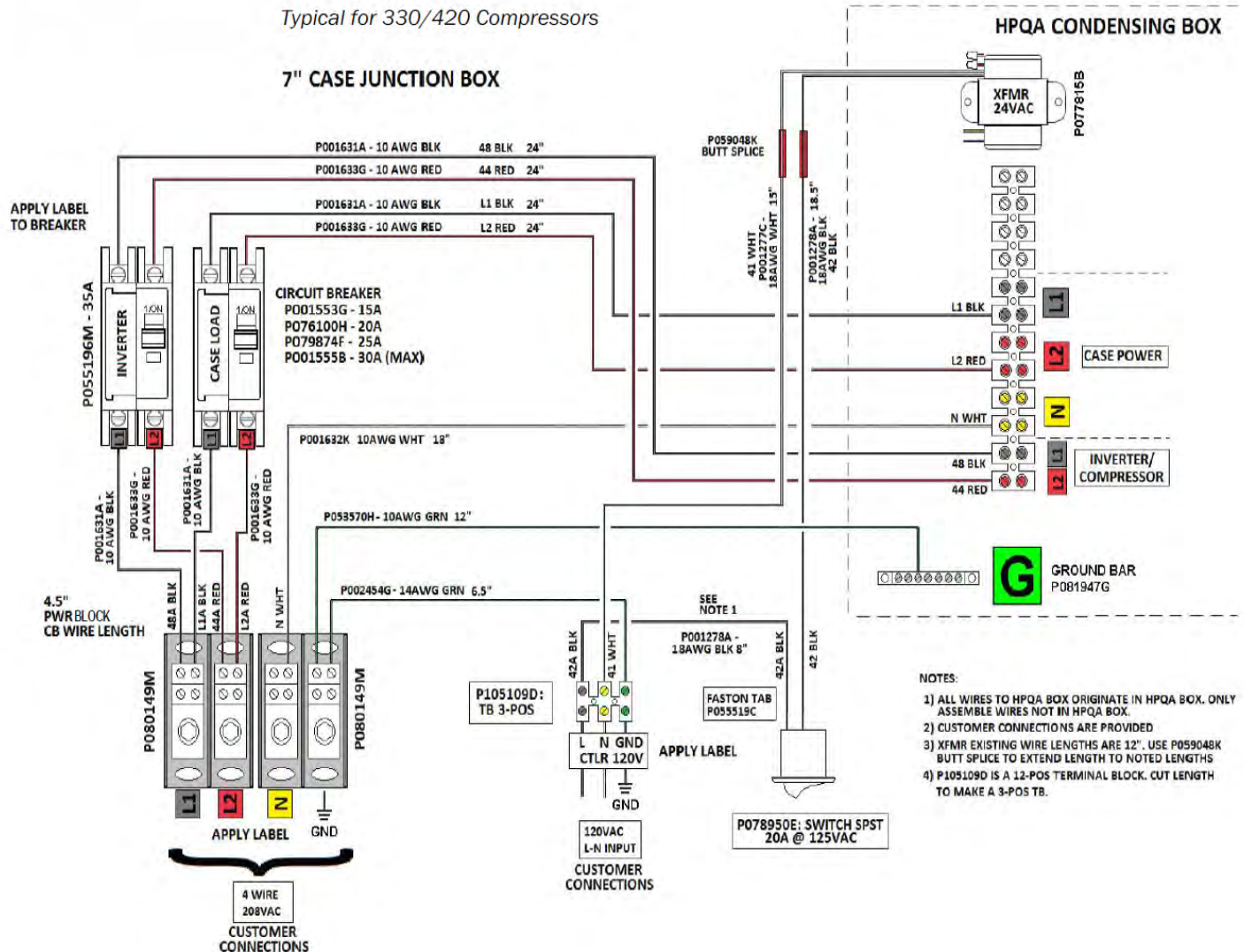


Fig. A-7 See Electrical Box for the Wiring Diagram Specific to Your Cases

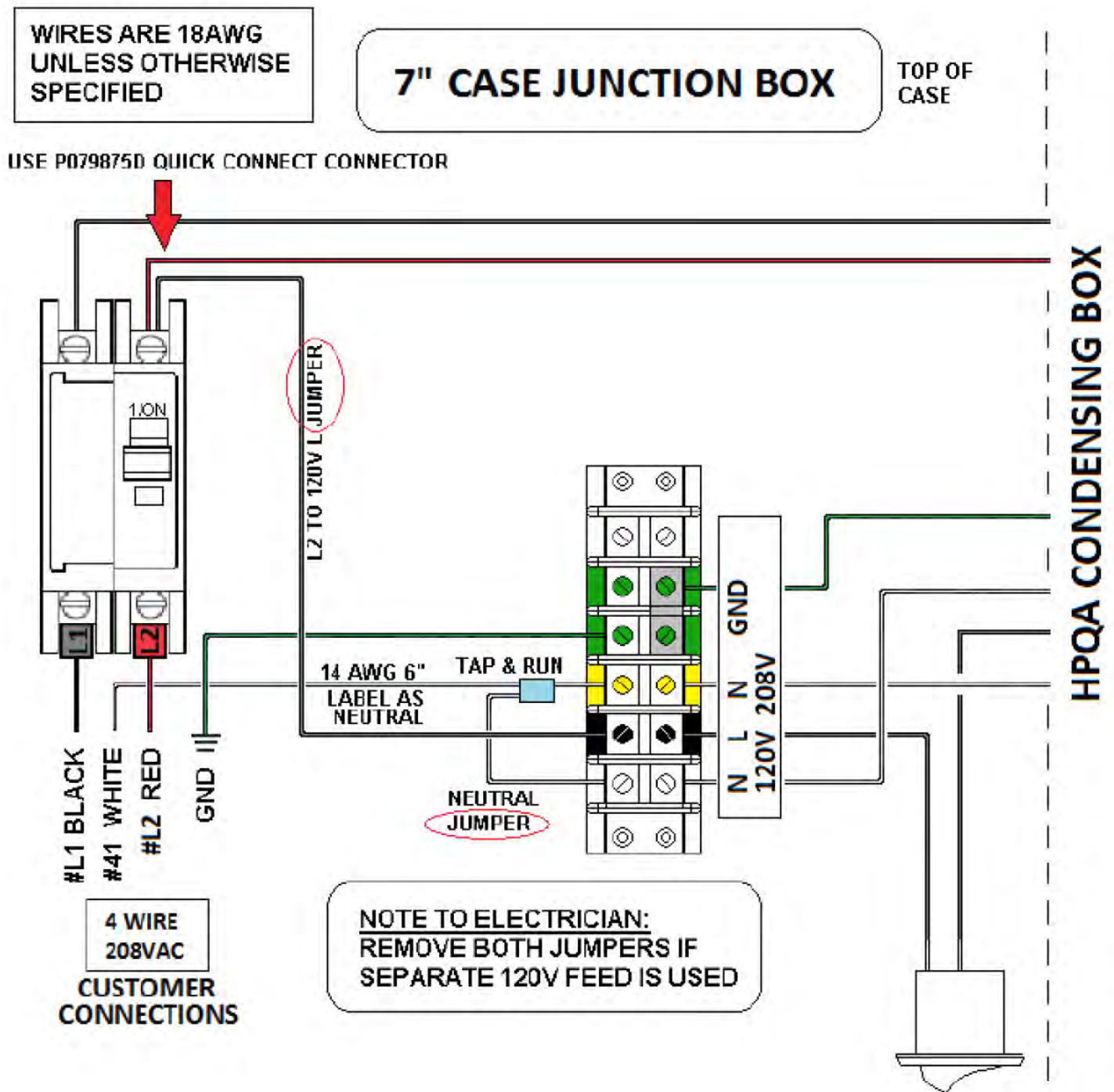


Fig. A-8 Wiring to HPQA Condensing Box

APPENDIX B

SoloChill Micro-Distributed

Walk-In and Remote Mounted Condensing Units

Electrical and Communication

Drawings

Figure	Title	Page
B-1	<i>Detailed Wiring Diagram for SoloChill Units</i>	B-2
B-2	<i>Unit Cooler Control Wiring Detail</i>	B-3
B-3	<i>Sensor/Transducer HEOS Control Board Connection Locations</i>	B-3
B-4	<i>EEV Stator/Cable Set Plus Extension</i>	B-4
B-5	<i>EEV Stator/Cable Set Plus Extension -DETAILS</i>	B-4
B-6	<i>EEV Cable Connection to HEOS Control Board Location</i>	B-5
B-7	<i>Unit SoloChill to Unit Cooler Power Wiring</i>	B-5
B-8	<i>SoloChill Unit Wiring Diagram for 091, 130, 220</i>	B-6
B-9	<i>SoloChill Unit Wiring Diagram for 330, 420</i>	B-8

B-2 SoloChill Micro-Distributed Condensing Unit

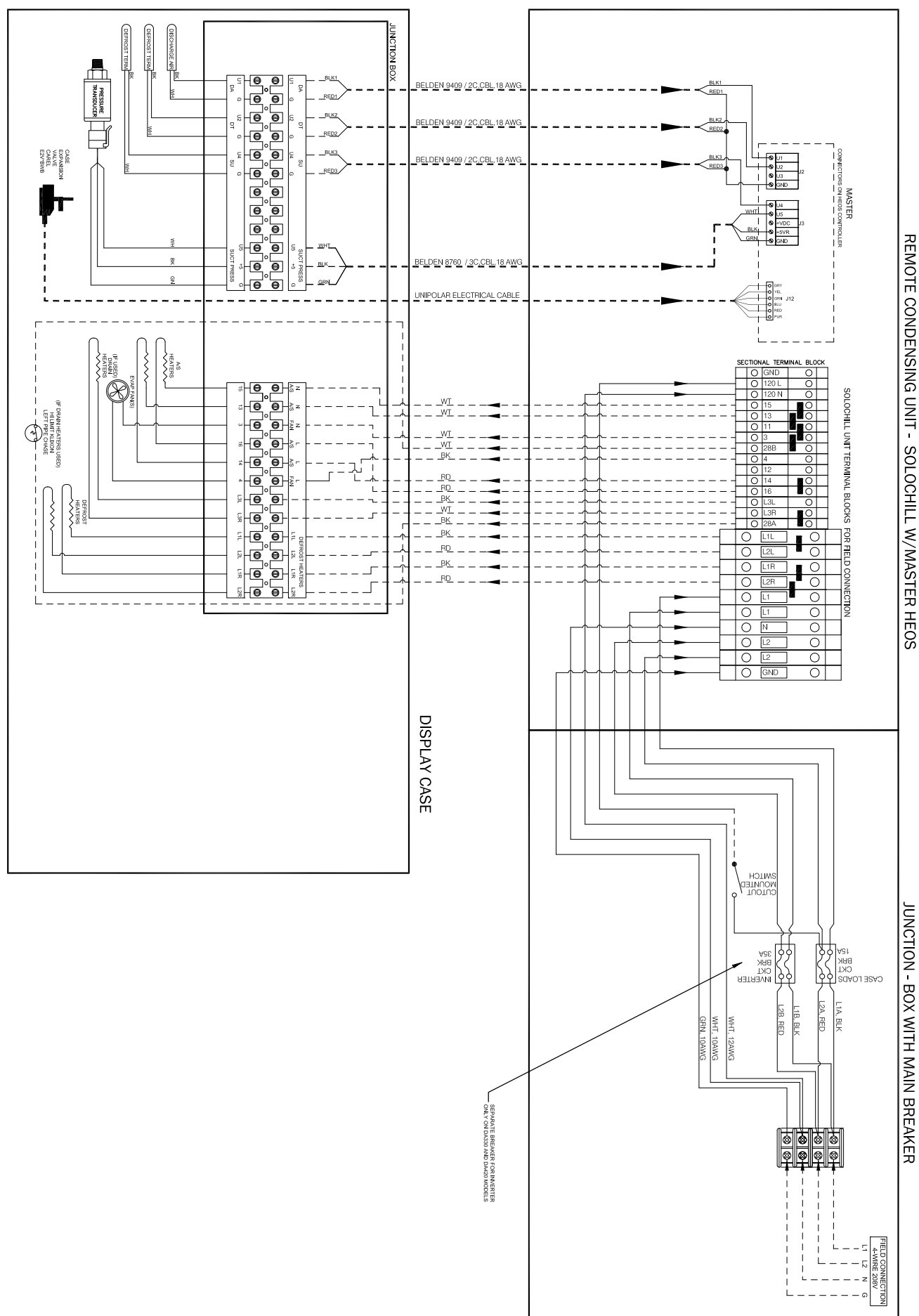


Fig. B-1 Detailed Wiring Diagram for SoloChill Units

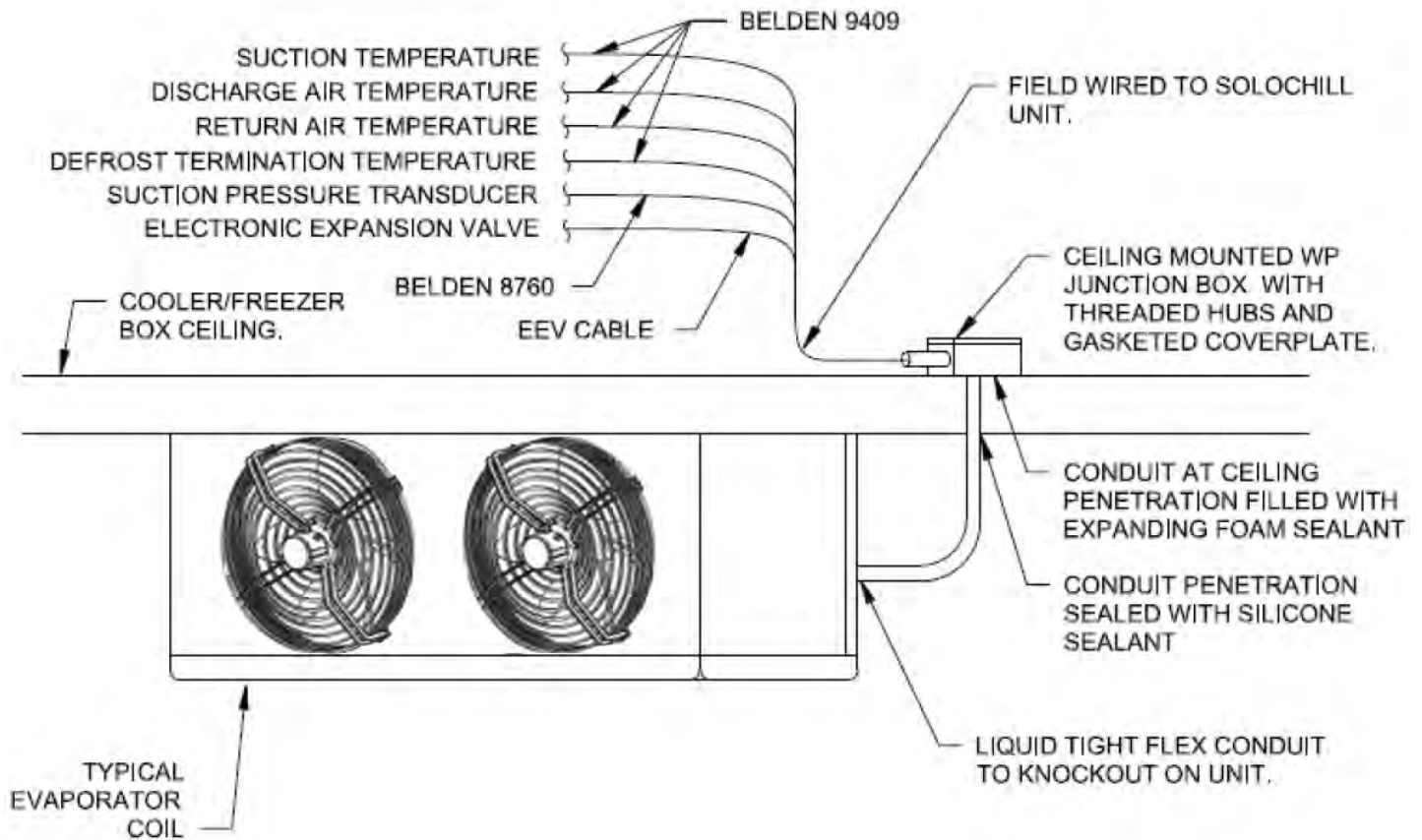


Fig. B-2 Unit Cooler Control Wiring Detail

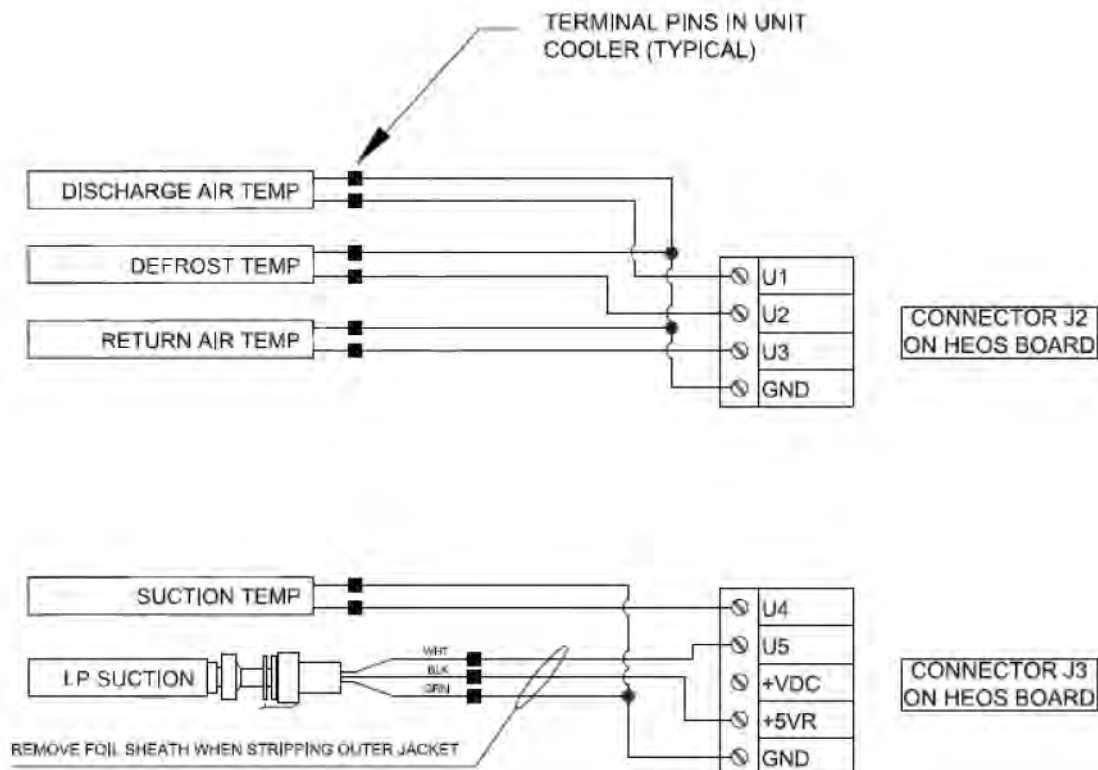


Fig. B-3 Sensor/Transducer HEOS Control Board Connection Locations

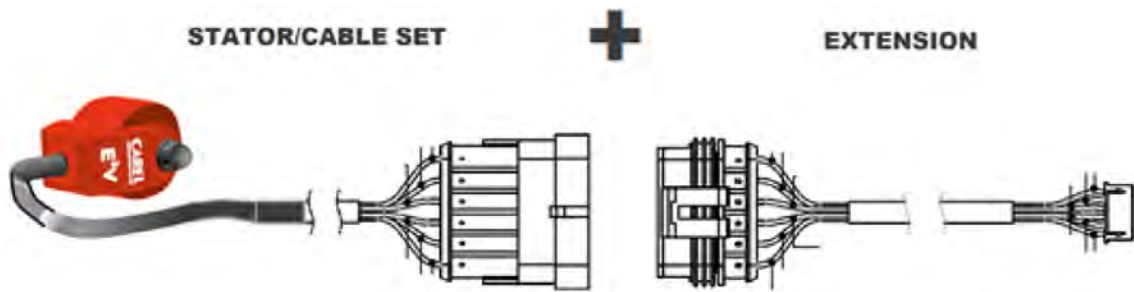
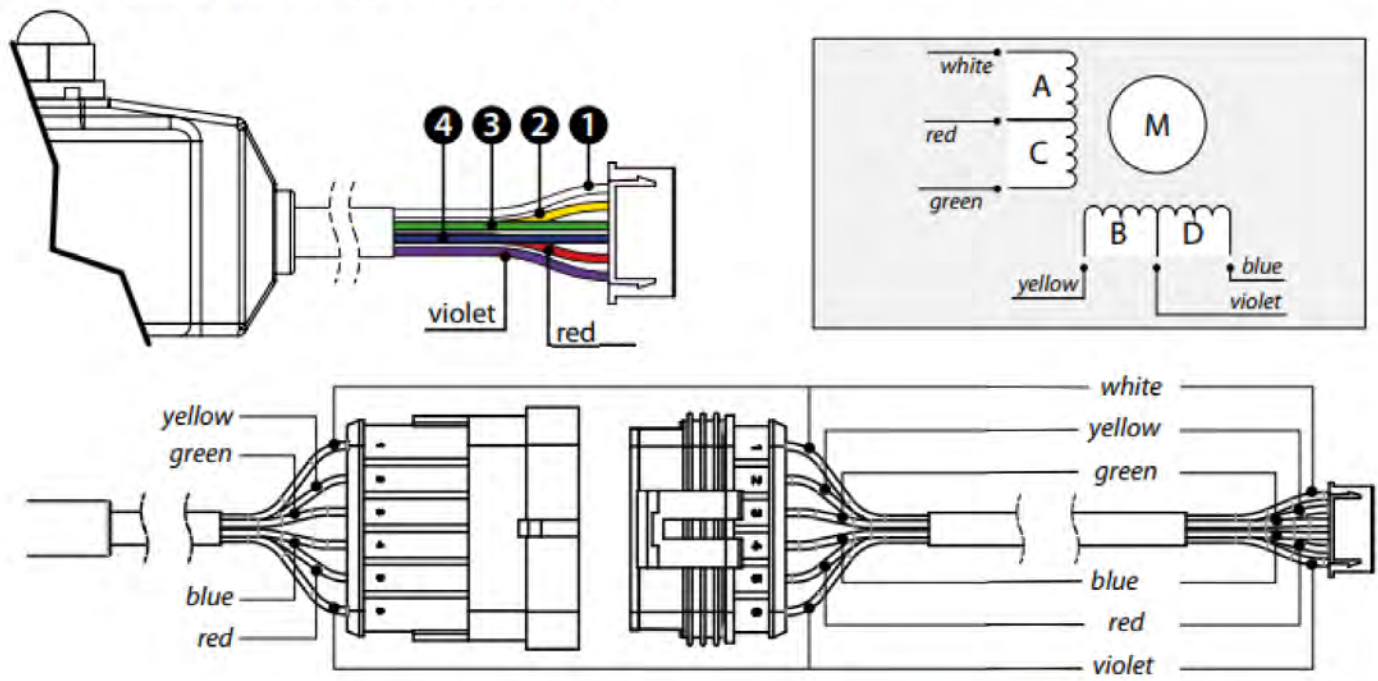


Fig. B-4 EEV Stator/Cable Set Plus Extension

Electrical Connections



Coil	Wire	Excitation state							
		1	2	3	4	5	6	7	8
A	① White	12 V	12 V	OFF	OFF	OFF	OFF	OFF	12 V
B	② Yellow	OFF	12 V	12 V	12 V	OFF	OFF	OFF	OFF
C	③ Green	OFF	OFF	OFF	12 V	12 V	12 V	OFF	OFF
D	④ Blue	OFF	OFF	OFF	OFF	OFF	12 V	12 V	12 V

← open valve
→ close valve

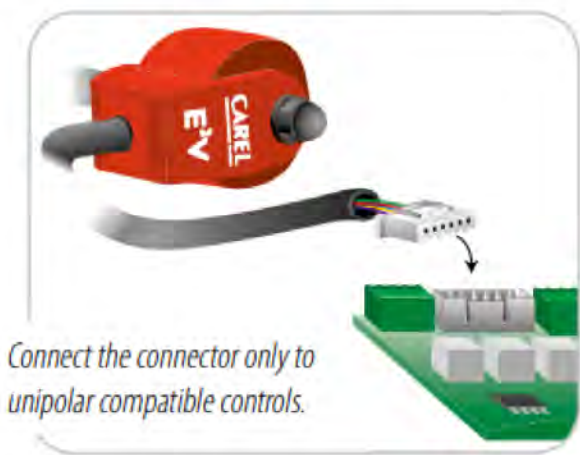


Fig. B-5 EEV Stator/Cable Set Plus Extension -DETAILS



Fig. B-6 EEV Cable Connection to HEOS Control Board Location

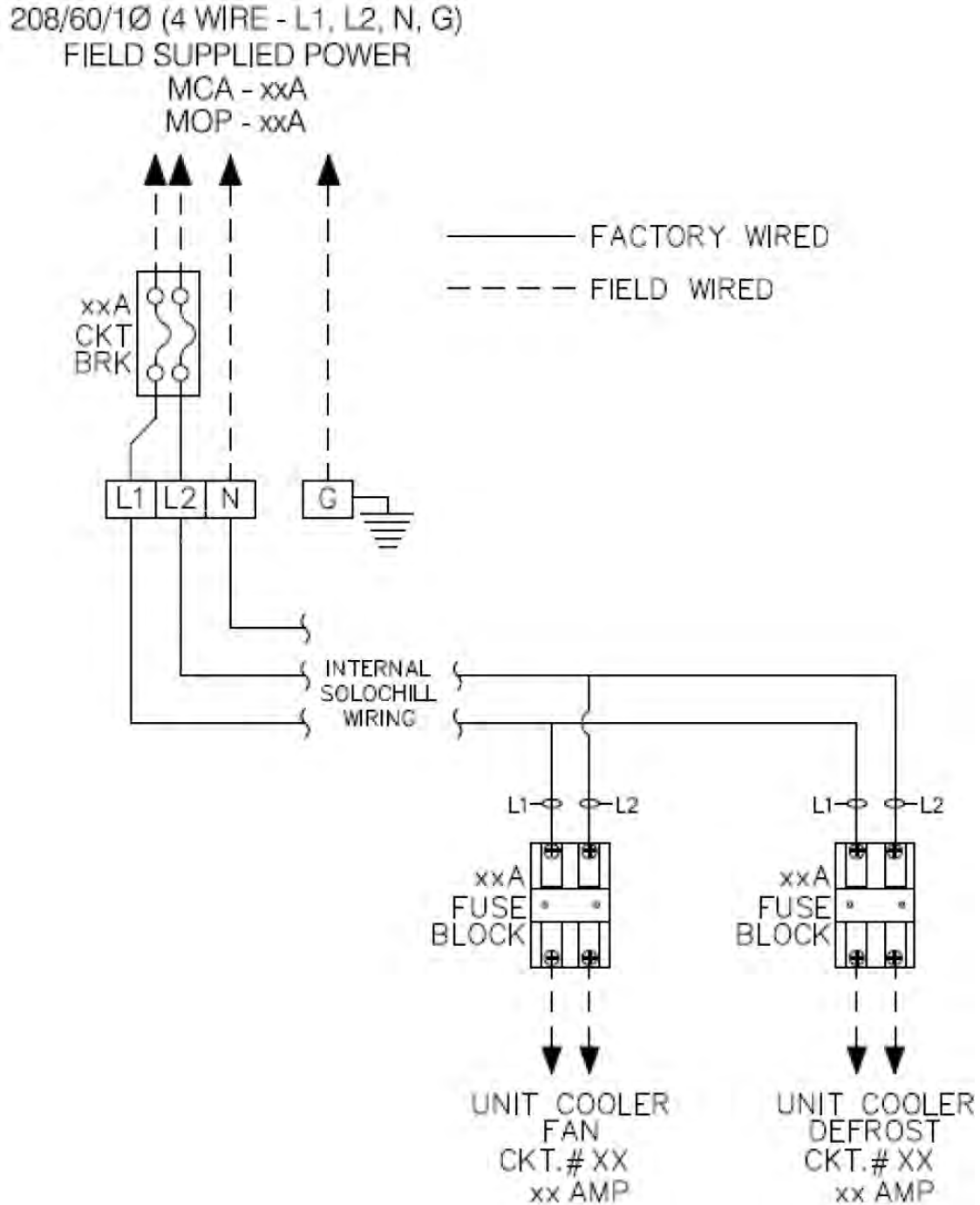


Fig. B-7 Unit SoloChill to Unit Cooler Power Wiring

B-6 SoloChill Micro-Distributed Condensing Unit

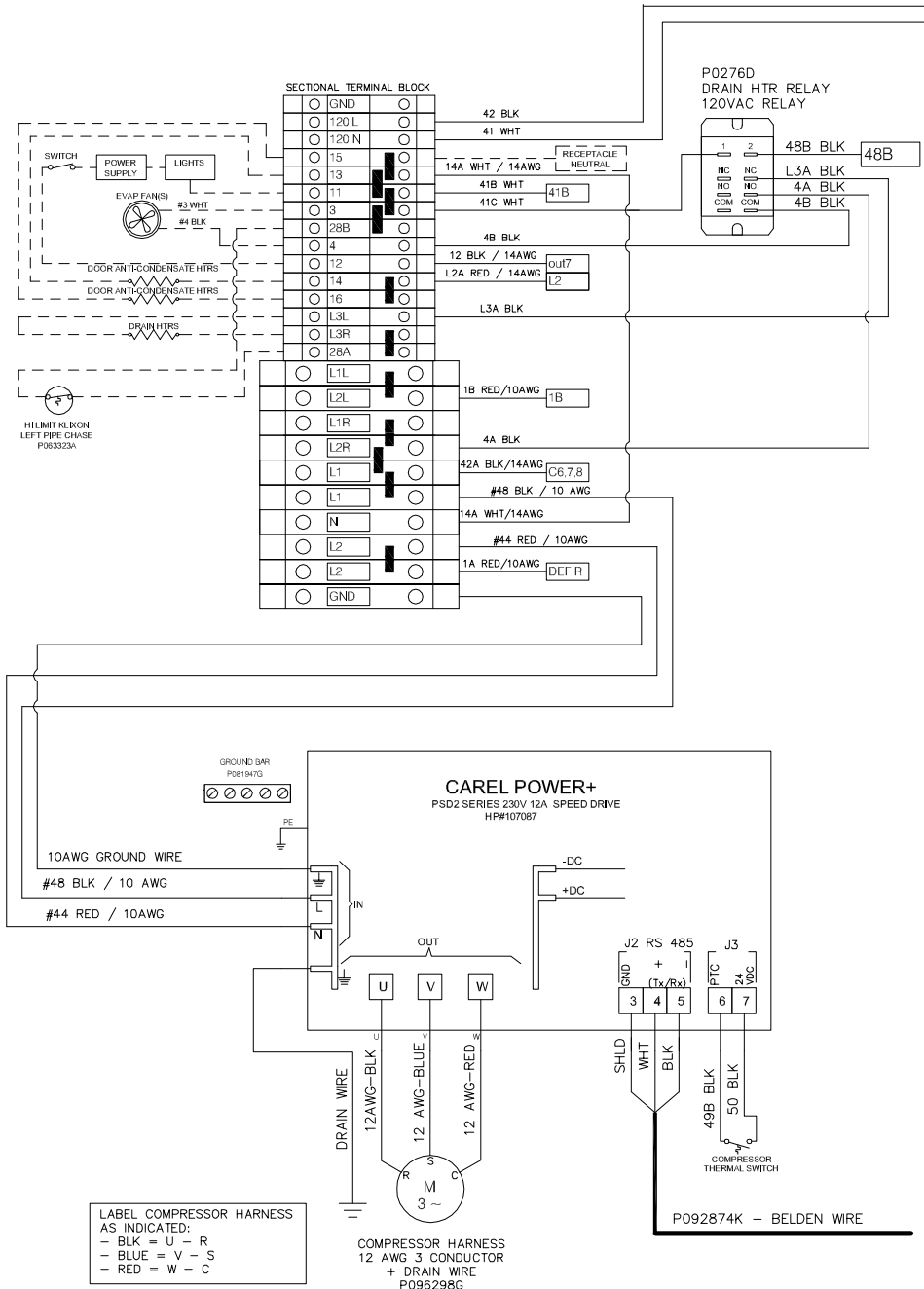


Fig. B-8 SoloChill Wiring Diagram for Units 091, 130, 220 Left Hand Side

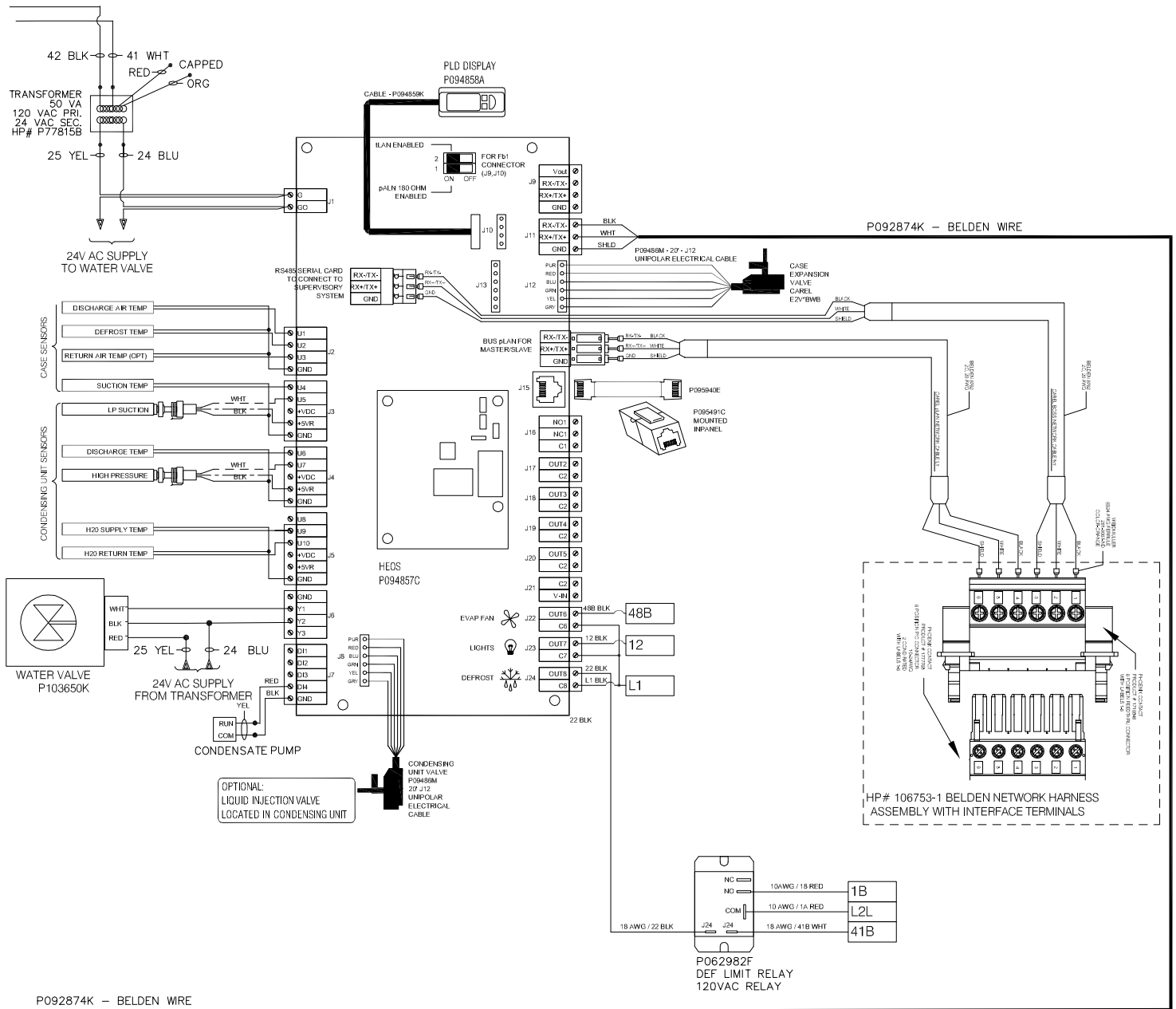


Fig. B-8 SoloChill Wiring Diagram for Units 091, 130, 220 Right Hand Side

B-8 SoloChill Micro-Distributed Condensing Unit

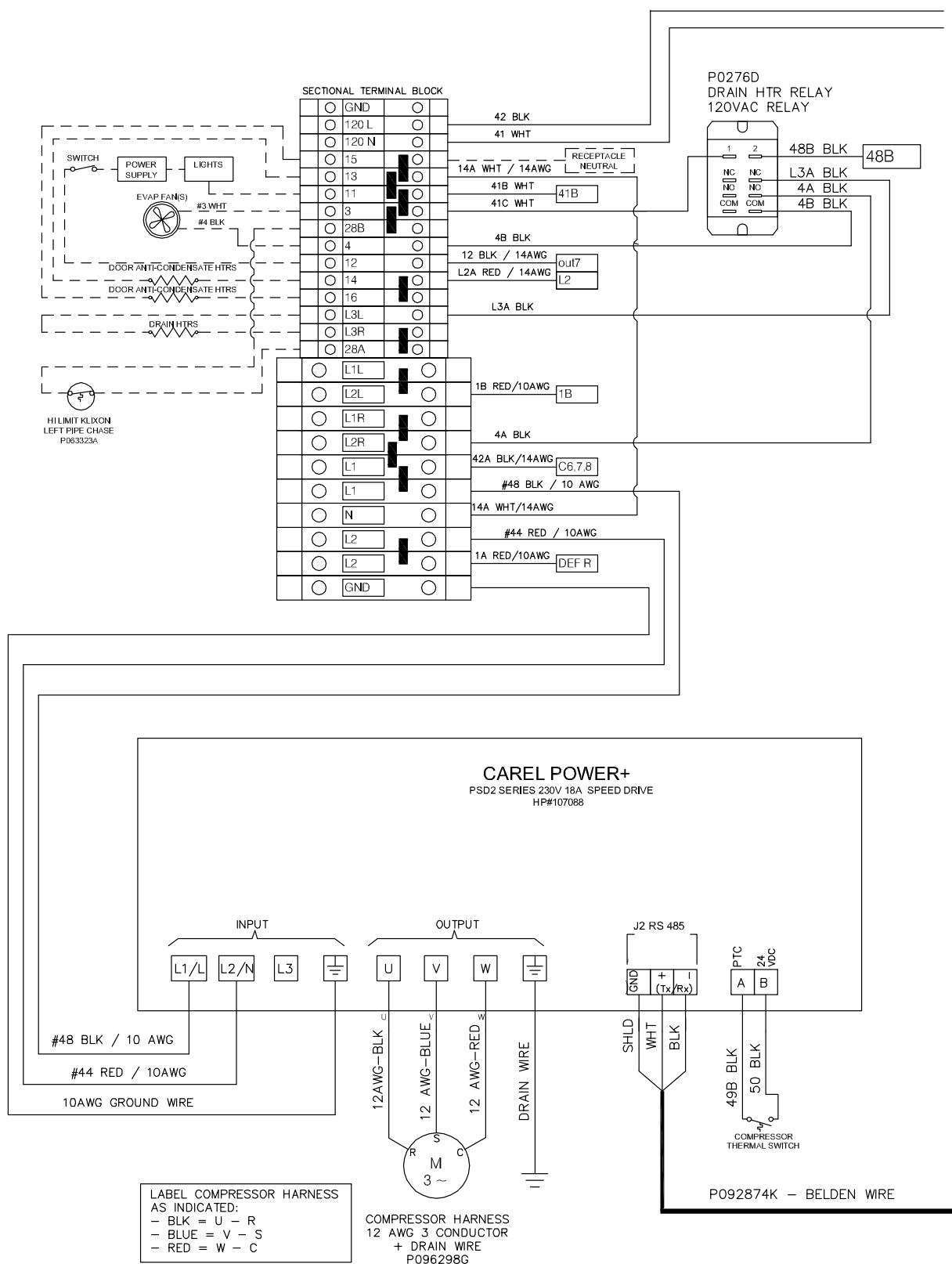


Fig. B-9 SoloChill Wiring Diagram for Units 330, 420 Left Hand Side

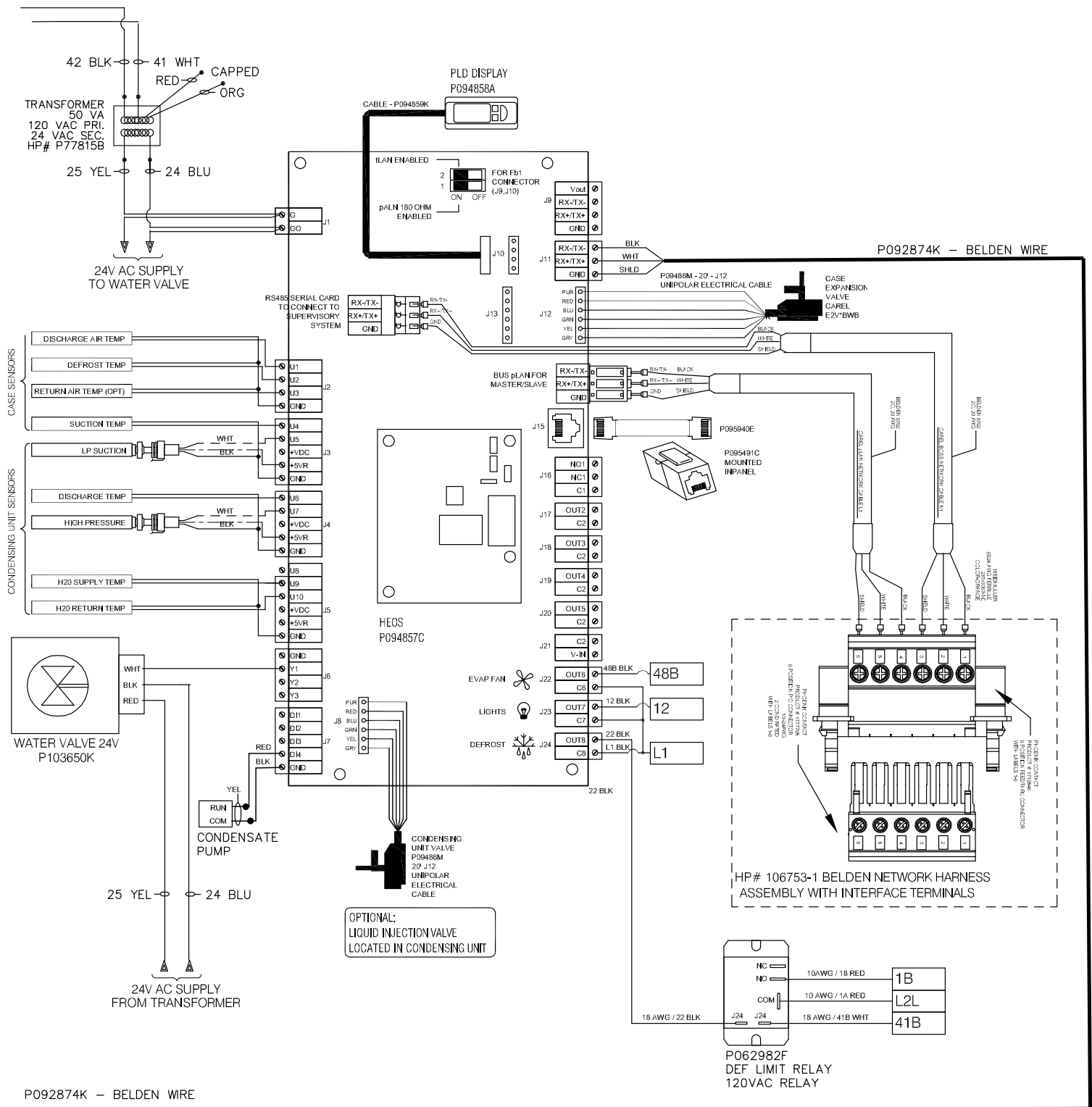


Fig. B-9 SoloChill Wiring Diagram for Units 330, 420 Right Hand Side

