ENGLISH

Model Series F27HC

Installation, Operation, Service and Maintenance Instructions

"UNIT COOLERS FOR COLD ROOMS"

NSF®

UNIT FOR USE WITH WALK-IN COOLER, FREEZER OR REFRIGERATED WAREHOUSE

UL® LISTED

Tecumseh®

designed by LU-VE

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WARNING SYMBOLS AND THEIR MEANING

Hand Injury Possible

Forklift Traffic

Electricity

Toxic Substances

Hot Surfaces

Automatic Start

Overhead Load

Sharp Element

MANDATORY SIGNS AND THEIR MEANING

Hand Protection Required

Eye Protection Required

Ear Protection Required

Check Guard

Protective Clothing Reqd

Hard Hat Area

Use Safety Footwear

Connect To Earth Ground

Activate Before Work

OTHER SIGNS AND THEIR MEANING

No Fire, Open Flame or Smoking

This is only a "Right To Know" law in the state of CA. It does not mean that LU-VE products contain any substance or materials that may cause cancer or reproductive harm

GENERAL SAFETY INFORMATION AND PRECAUTIONS

RISK OF PERSONAL INJURY OR DAMAGE TO MATERIALS OR PROPERTY MAY OCCUR IN THE CASE OF A FAILURE TO FOLLOW THESE INSTRUCTIONS COMPLETELY!

- Installation, maintenance and service are to be performed only by qualified personnel who are familiar with local codes and applicable regulations. They should also have prior experience working with this type of equipment.

- Avoid contact with sharp edges and coil surfaces as they are potentially hazardous. Wear appropriate personal protection equipment (PPE) whenever necessary to avoid personal injury.

- Read and observe all precautions and warnings on tags, labels, stickers and literature attached to or provided with equipment.

- Employ authorized personnel only for operating any moving and lifting equipment (ex. forklifts, scissor lifts, cranes, etc.)

- In order to avoid potential damage all equipment should be left in the original shipping container until just prior to installation.

- When rigging and lifting units never work directly below suspended loads.

- Always wear appropriate personal protection equipment (PPE) whenever handling, lifting, installing, servicing and performing routine maintence on equipment.

- Make sure that all power and control wiring to the equipment conforms to the requirements of all relevant local and national codes and is in accordance with the data listed on the unit rating label.

- All sources of power should be turned OFF, tagged and locked out before attempting any type of service, maintenance or repairs. Failure to do so could result in damage to equipment, personal injury or death to servicing personnel.

- All coil assemblies are shipped internally pressurized with dry air or nitrogen. Before attempting to remove caps or seals to make any field connections to the coil reduce internal coil pressure to atmosphere.

- Some traces of a transparent liquid may remain inside the coil circuit after the manufacturing process. This is evaporative oil which is completely compatible with all refrigerants and refrigeration oils in current use. This oil can sometimes collect in small quantities inside the coil header connections where it may be observed by installing personnel when removing the factory caps. It can be easily verified that this is oil and not water due to the fact that it evaporates very quickly when touched. If a drop of it is placed on a flat surface it widens out quickly like a stain and if exposed to flame it burns readily, giving off a white smoke.

- When welding or brazing make sure the torch flame is directed away from any potentially flammable materials, sensitive equipment surfaces and components. Provide adequate shielding, wet rags or thermal paste when necessary. If required, provide a fire watch with an available means of fire suppressant and clearly post emegency exits in the event of evacuation.

- Refrigerants used in cooling and freezing equipment can be hazardous to people as well as the environment and may even be fatal in sufficient concentrations. Only personnel who are trained and certified to handle refrigerants should be allowed to do so. Follow all applicable local and national codes which may apply to transporting, charging, reclaiming and disposing of these chemicals.

- After any service or routine maintenance is performed be sure to properly reinstall all access / cover panels, fan guards, drain pans, electrical covers and their fasteners. Never operate equipment with any of these componenents missing or damaged.

- Tecumseh designed by LU-VE products are manufactured using the following primary materials;

  - Plastic Material; Polyethylene, ABS, Rubber
  - Ferrous Materials; Iron, Stainless Steel, Copper, Aluminum (possibly coated / treated for corrosion protection)

- Tecumseh designed by LU-VE products are manufactured to the following industry standards;

  - UL412:2011 Ed.5+R:09 Jan 2017
  - CSA C22.2#120 Issued: 01/03/2013 Ed
  - 4 Refrigeration Equipment and NSF 7:2016
  - PED 2014/68/EU
  - Safety of Machinery EN 60204-1
  - Directive 2014/30/EC and subsequent modifications
  - Electromagnetic compatibility
  - Low voltage - Reference Directive 2014/35/EC

PRODUCT WARRANTY STATEMENT

Subject to the limitations and disclaimers contained herein, Tecumseh Products Company ("Seller") warrants to its original equipment manufacturer customer ("OEM"), that any compressors, condensing units, unit coolers, component parts, controllers, or other goods manufactured by Seller and sold by Seller to OEM (collectively, "Goods") will be free from defects in material and workmanship under normal use with regular service and maintenance for the greater of; (a) twenty (20) months from the date of manufacture by Seller or, (b) eighteen (18) months from the date of invoice (the "Warranty Period"). Products sold by Seller to Authorized Wholesale (collectively, "Goods") will be free from defects in material and workmanship under normal use with regular service and maintenance for a period of sixty (60) months from the date of manufacture by Seller or twelve (12) months from the date of sale by Tecumseh's authorized wholesaler, whichever occurs first (the "Warranty Period").

This WARRANTY does not cover:

- Costs, expenses, or any other type of damage incurred by any other person concerning the repair or replacement of any Goods;
- Any Goods that become inoperative because of system processing, design or installation;
- An indication in the Goods that there is no defect in material or workmanship;
- Transportation costs other than the freight allowance expressly described herein;
- Any Goods where Seller's serial number, code plate, or serial label is missing, rendered illegible, tampered with and/or altered in any way; or;
- Goods sold through export unless agreed upon by Seller and Authorized Wholesaler or OEM in a written service agreement duly executed by the parties authorized representatives.

For more information please contact your local Tecumseh Sales representative or Corporate office at:

Tecumseh Products Company / 5683 Hines Drive / Ann Arbor, MI 48108 / Ph. 734.585.9500 / www.tecumseh.com

RECEIVING AND INSPECTION

When the equipment is initially received, a responsible individual acting on behalf of the equipment purchaser must be present to check the quantity of cartons and crates being delivered against the bill of lading to confirm that all items listed therein are accounted for. Inspect all shipping containers (boxes and crates) for any signs of visible damage. Report any damage or shortages to the delivering freight company immediately. It is the customer's responsibility to file all claims with the freight company. Damaged equipment may be refused but must not be returned to the manufacturer for any reason without prior authorization.

Installing personnel must exercise caution when removing equipment from crates and boxes to prevent physical injury to themselves or the product. Always wear appropriate personal protection equipment (PPE) such as hard hats, gloves, safety glasses, safety shoes, long sleeve shirts and pants, etc. to avoid physical injury. When lifting smaller units by hand always utilize proper lifting techniques to avoid personal injury. Equipment should be left in the original shipping container whenever possible until just prior to installation. Do not use piping connections, fan guards, drain pans or other such similar components as lifting points. On larger units which must be removed from the shipping container or skid with lifting straps make sure to utilize a spreader bar to avoid damage to the units sheet metal housing.

REMOVING EQUIPMENT FROM SHIPPING CONTAINERS / PACKAGING

If using a forklift roll the unit over onto a wooden pallet with the shipping skid "up" (**Figure 1 - Steps 1 & 2 - Page 6**).
Remove the banding which holds the cardboard box to the shipping skid, then using a razor knife, carefully cut the box down all (4) corners and fold the cardboard down onto the pallet, leaving the unit resting on the original cardboard shipping blocks and carton top flaps (**Figure 2 - Step 3 - Page 6)**.

Remove the (4) nuts and bolts that secure the unit mounting brackets to the shipping skid and lay aside the skid (**Figure 2 - Steps 4 & 5 - Page 6**).

With the shipping container and skid removed, remove the two side access panels from the ends of the unit and check closely for any concealed or hidden damage. If any damage is noted, report it to the manufacturer immediately before proceding with the equipment installation. All units are shipped with approx. 25 PSIG of dry air or nitrogen holding charge in the coil. Use an accurate suction service gauge to verify internal coil pressure prior to proceeding with the unit installation. Although the absence of pressure or a lower than nor-mal pressure reading does not necessarily indicate a leak, if the reading is "low" a leak test must be performed before contrinuing with the installation or requesting a return goods authorization from the distributor or manufacturer **(Figure 3 - Step 6 - Page 6)**.

RIGGING AND MOUNTING

Fig. 1

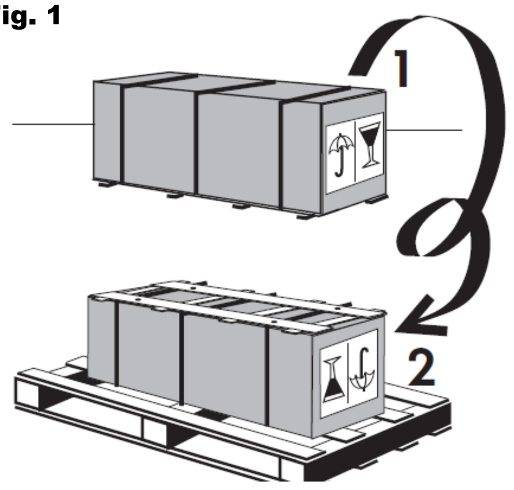
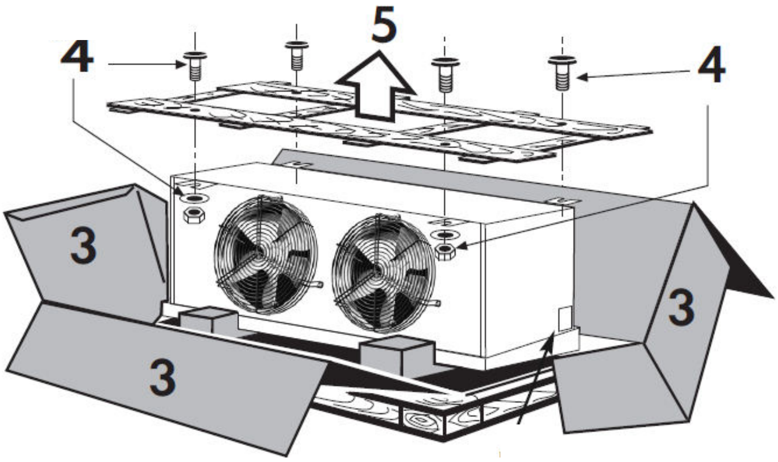


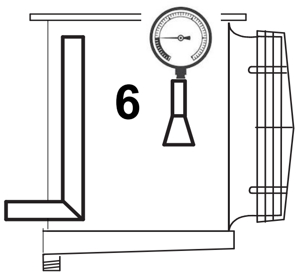
Fig. 2



Check coil pressure with an accurate service gauge. If pressure is “low” or “0” the unit must be checked for leaks before installation (**Figure 3 - Step 6**).

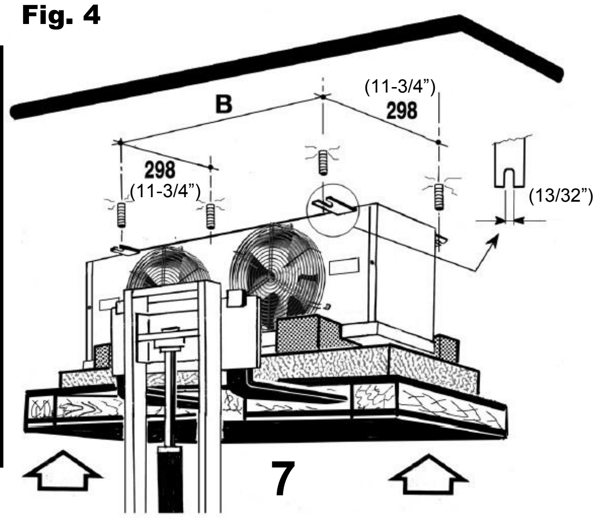
Do not return the unit to the distributor or manufacturer without prior authorization!

Fig. 3

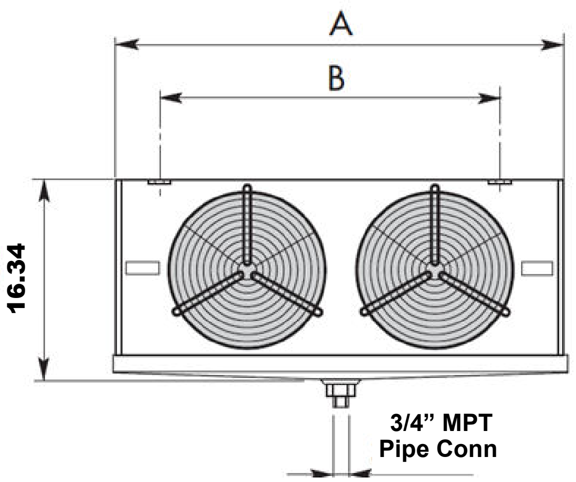


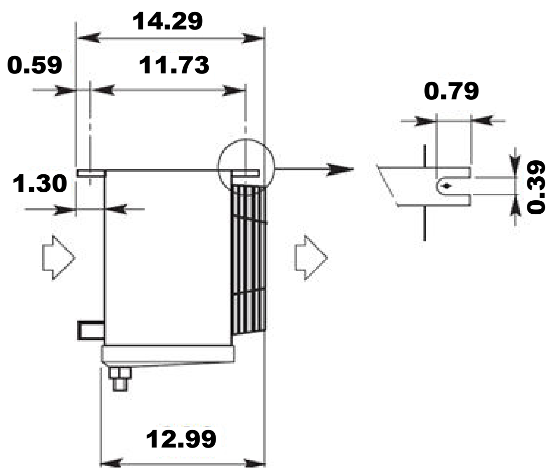
The unit can now be lifted to it’s final mounting position by inserting the lifting forks into the pallet and raising the unit into place (**Figure 4 - Step 7**). On longer units it is important to find the center “balance point” of the unit and spread the lifting forks wide enough to avoid tipping.

Fig. 4



UNIT MOUNTING POINTS





DIMENSIONAL DATA

Unit Model Series	F27HC	25-4 19-6 16-7	36-4 28-6 23-7	49-4 38-6 31-7	71-4 55-6 46-7	107-4 85-6 70-7	142-4 110-6 92-7
Number of Fans	**12.4” Dia**	1	1	2	2	3	4
Refrig Conn	**Liquid**	⅜”	½”	½”	½”	½”	½”
Refrig Conn	**Suction**	⅜”	⅞”	⅞”	1-⅛”	1-⅛”	1-⅛”
Dimension	**A**	26-11/16"	26-11/16"	41-1/4"	41-1/4"	55-13/16"	70-3/8"
Dimension	**B**	16-1/4"	16-1/4"	30-13/16"	30-13/16"	45-3/8"	60"

RECOMMENDED UNIT COOLER PLACEMENT

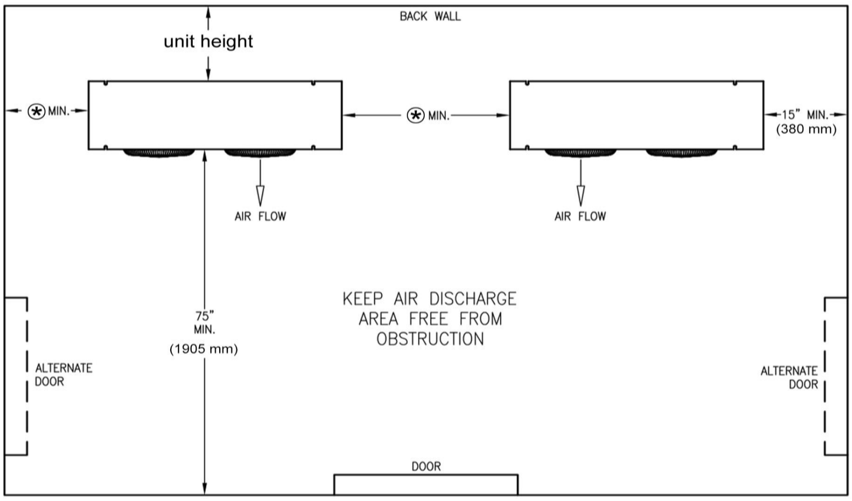
Air flow within the refrigerated space is critical to achieving optimum cooling and freezing results. If air flow is compromised for any reason the unit may not provide satisfactory cooling performance. There are many potential reasons for poor air flow - few of which are the result of inadequate system capacity or unit malfunction. Some of the more obvious reasons for poor airflow include;

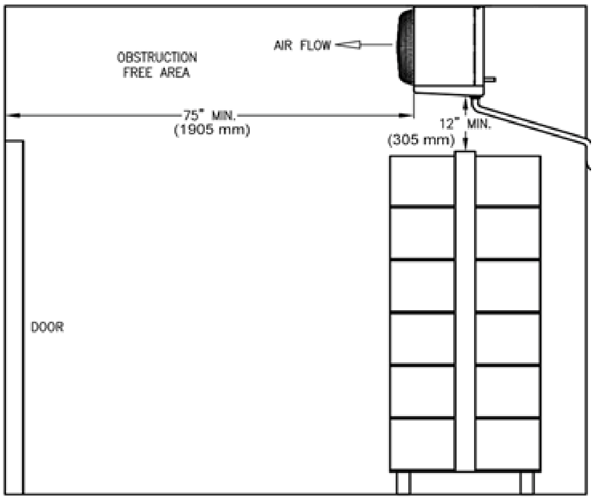
- Unit installed above doors (coil blocked with frost / ice)
- Insufficient return air space between unit and wall
- Insufficient free area in front of the unit
- Unit mounted to close to beams or product racking
- Multiple units installed to close together
- Low ceiling height / unit mounted to close to floor level
- Units mounted perpendicular / blowing at right angles to each other
- Poor product packaging or improper product stacking arrangement
- Too much product loaded into the room at one time
- Wrong unit design for application
- Too few units for room volume
- Multiple, miss-matched units or fan types used in the same room

For the best possible cooling performance always consider the following design recommendations;

- Always locate units as far away from door openings as possible - preferably blowing directly towards doors or other openings.
- Allow a minimum return air space behind the coil equal to the height of the unit (**Figure 10 - below**).
- On larger installations place units where they can blow freely down open aisleways between product racking / shelves.
- Mount units directly to the ceiling whenever possible (greater overall air throw is partially achieved by increasing the distance between the unit and the floor).
- For blast chilling or freezing applications consideration must be given for installing air baffles, discharge chutes, coves, return air plenums, etc. to prevent air bypass / recirculation due to high external static pressure.

TYPICAL UNIT COOLER PLACEMENT IN COOLER / FREEZER





* Minimum clearance required for coil heater replacement is the length of the unit (electric defrost models). Heaters are removeable from the refrigerant connection end of the unit.

In addition to the above consideration should also be given to the potential length and layout of refrigerant piping runs and condensate drain lines based upon the unit coolers' physical location. It is always preferable to minimize the length of these runs - particularly inside the conditioned space. Minimum clearances must also be maintained around the unit to allow access for service, routine maintenance and cleaning of the unit when required. For electric defrost units the minimum service access required to replace the coil defrost heaters is illustrated below (**Figure 11** - **below**).

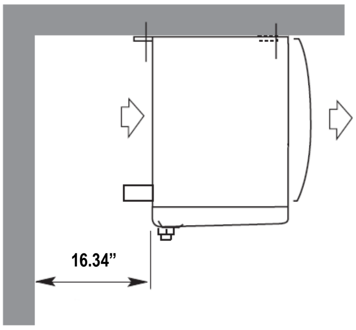


Fig. 10

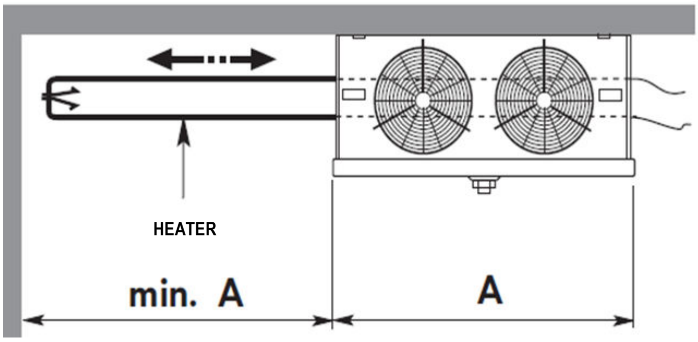
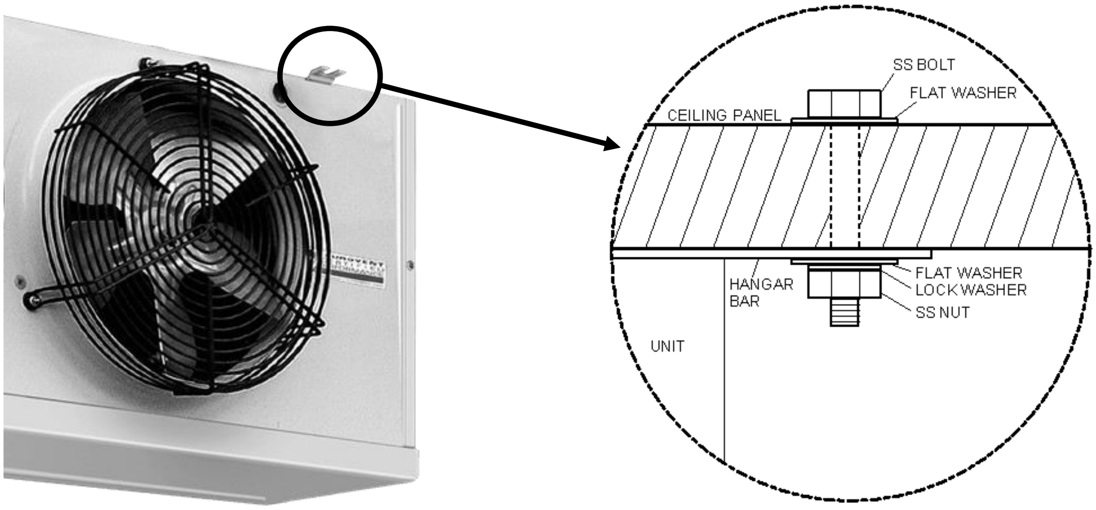


Fig. 11

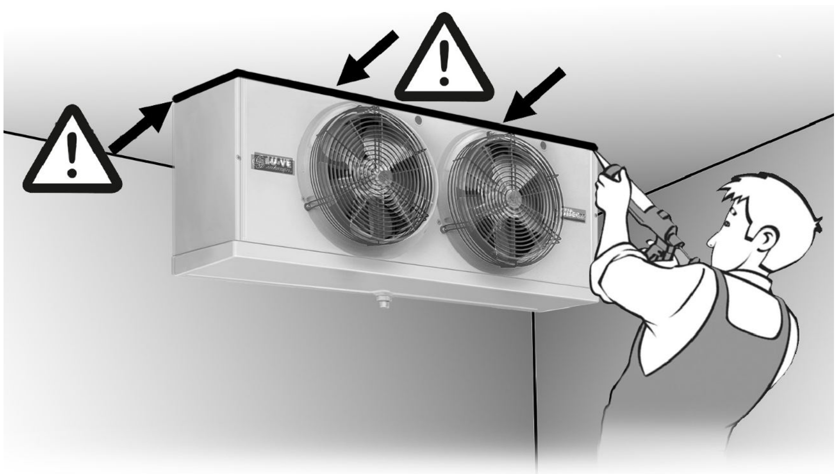
UNIT MOUNTING DETAIL

Units should be mounted flush to a level ceiling panel using 3/8” stainless steel bolts, hangar rods or lag screws.
There is no need to block or pitch the unit to ensure proper condensate drainage if the unit is mounted level.

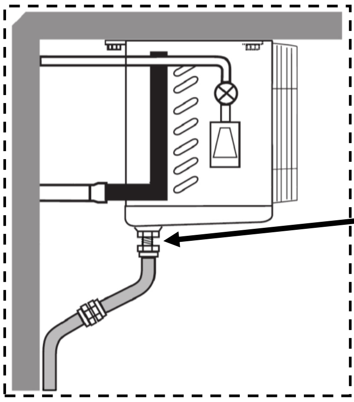


NSF SANITATION

Seal the gap between the top of the unit and the ceiling with NSF approved sealant to prevent accumulation of dirt and foreign material.

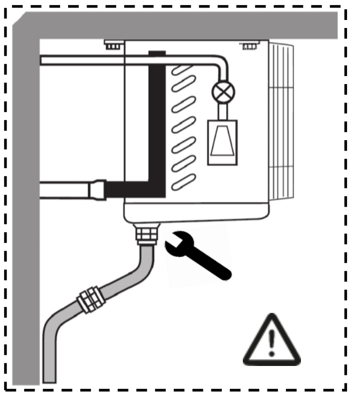


CONDENSATE DRAIN PAN CONNECTION



Apply an approved pipe thread sealant to the threads of the drain pan fitting before making the field piping connection.

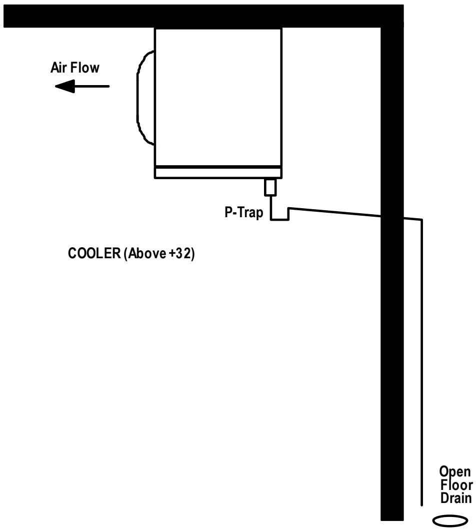
Do not torque / over-tighten the field pipe fitting attached directly to the drain pan connection! Use a backer wrench on the drain pan fitting and tighten the attached pipe fitting no more than approx. 1/2 turn beyond hand tight.

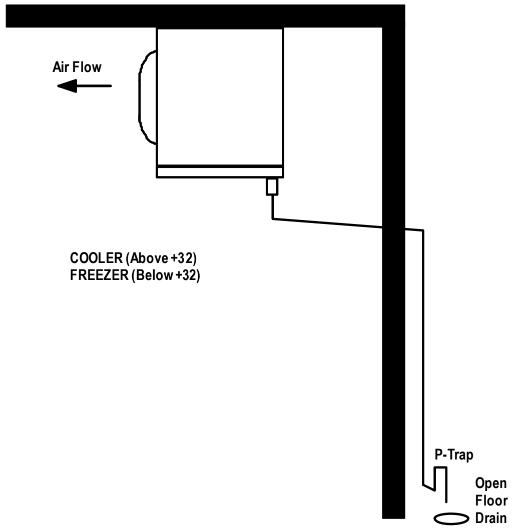


CONDENSATE DRAIN LINES

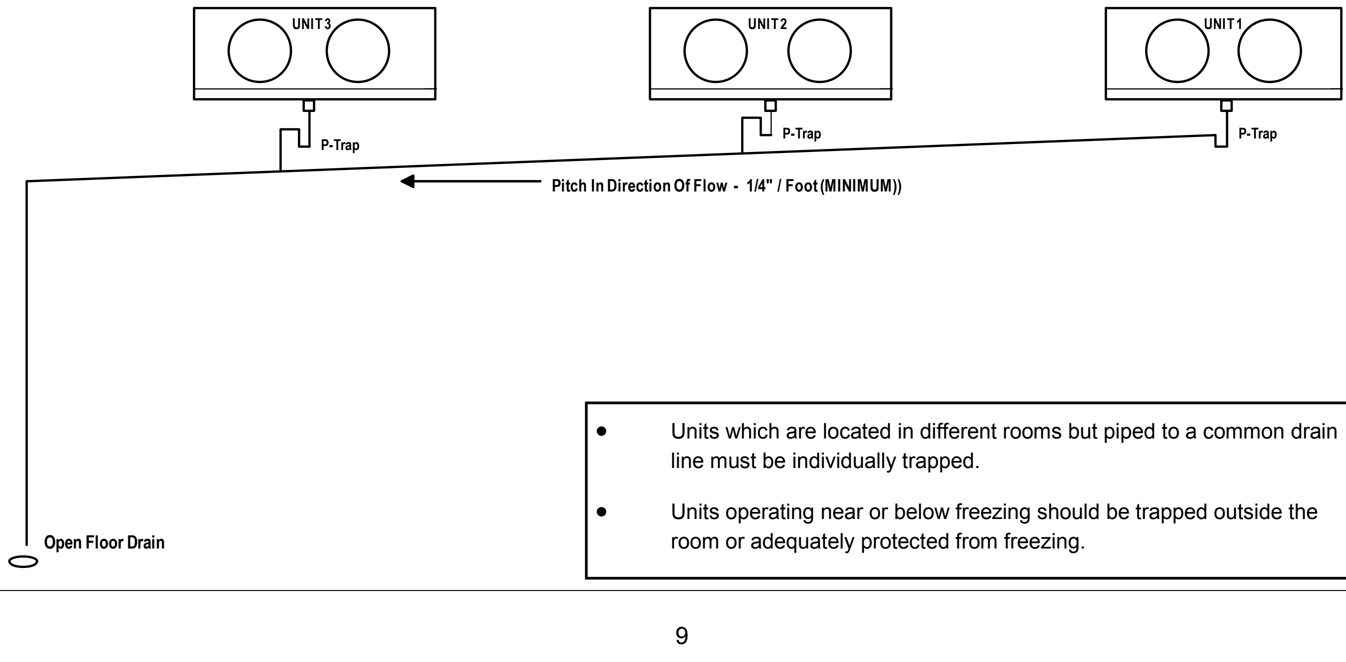
- It is the installers responsibility to ensure that all drain line piping is installed in accordance with local and national plumbing codes.
- Drain line piping runs should be kept as short as possible within the conditioned space whenever possible.
- Pitch all field piping in the direction of flow a *minimum* of 1/4” per foot of pipe run.
- Use an approved pipe thread sealant on the threads of the drain line fitting. ***DO NOT OVER-TIGHTEN THE FITTING ATTACHED DIRECTLY TO THE DRAIN PAN CONNECTION!***
- Install a P-trap in all unit drain lines. Traps in freezer drain lines should be located outside the freezer whenever possible.
- The use of plastic (PVC) pipe is acceptable only on cooler applications operating above freezing.
- For all freezer applications (+32 degrees and lower) use copper pipe only.
- Use an insertion type drain line heater on all freezer applications or wrap all piping and P-traps exposed to freezing temperatures with self regulating type heat tape and insulate wherever practical. A *minimum* of 20 watts / foot of drain line is generally recommended for freezers operating down to 0 degrees and 30 watts / foot of drain line for those operating from 0 down to -20 degrees.
- Common drain lines serving multiple units (whether in the same space or different rooms) must be adequately sized to handle the condensate flow from *ALL* connected evaporators. ***DO NOT REDUCE THE DRAIN LINE PIPE SIZE SMALLER THAN THE CONNECTION ON THE DRAIN PAN!*** The branch lines from each individual evaporator must also be separately trapped.
- All drain lines must terminate above an open floor drain or in an outdoor area where the condensate will not pose any personal safety or environmental issues. Do not connect drain lines directly to the building sewer system.
- Check the unit drain pan after an initial period of operation to ensure there is no standing water in the pan. Check unit for level or correct field piping if necessary to eliminate standing water.

CONDENSATE DRAIN LINE PIPING — SINGLE UNIT





CONDENSATE DRAIN LINE PIPING — MULTIPLE UNITS ON A COMMON DRAIN LINE



- Units which are located in different rooms but piped to a common drain line must be individually trapped.
- Units operating near or below freezing should be trapped outside the room or adequately protected from freezing.

REFRIGERANT PIPING

CAUTION! UNIT IS PRESSURIZED WITH DRY AIR OR INERT GAS FOR SHIPPING

THIS HOLDING CHARGE MUST BE VENTED AND THE SYSTEM LEAK TESTED AND EVACUATED BEFORE CHARGING WITH REFRIGERANT

CHARGE SYSTEM WITH ONLY PURE, VIRGIN REFRIGERANT

Use only clean, sealed ACR grade copper tubing for refrigerant duty. Unit warranty coverage may be voided if system is installed with any other type of tubing. All piping must be installed according to local and national codes as well as accepted commercial refrigeration industry standards and practices. All tubing should be cut using a wheel type tubing cutter (no hacksaws) and all cut tubing must be de-burred. Clean all joints with sand cloth and apply a small amount of high quality paste flux (being careful to avoid placing any flux near the ends of the tubing) before firmly joining connections. When brazing, use only high temperature, silver bearing solder on all joints while continuously flowing a regulated, low pressure, inert gas through the inside of the piping to avoid the formation of scale and copper oxides.

Note: The line sizing required for the system is not necessarily the same size as the factory pipe connections supplied on the unit. We strongly recommend that you work directly with an experienced consulting engineer to properly size and design system piping however as a convenience to our customers (and with no liability for services provided as gratis) we can supply the installer with line sizing charts which may be used to select the field line sizing based upon the calculated, overall equivalent feet of tubing (lineal feet plus allowances for fittings), refrigerant type, unit capacity and SST.

GENERAL UNIT PIPING GUIDELINES

Refer to ASHRAE REFRIGERATION HANDBOOK for detailed system piping design information!

- Always consider the overall length of field piping runs when locating unit coolers and matching condensing units. Excessively long piping runs should be avoided whenever possible.
- Select the optimum pipe size which minimizes total system pressure drop while maintaining sufficient internal gas velocities to ensure continuous oil return back to the compressor. Often times pipe selection is a compromise between operating efficiency over the lifetime of the system and initial, installed cost.
- Pitch all horizontal suction lines in the direction of refrigerant flow (minimum 1/4” / foot of run) to ensure oil return. Install a P-trap at the bottom of ALL vertical suction risers (**Figure 1**). This not only helps with oil return but protects the expansion valve sensing bulb from the affects of liquid drain back at the outlet of the evaporator.
- Install an intermediate P-trap in all vertical risers over 20’ and every 15’ thereafter.
- A P-trap is not required at the outlet connection if the field piping travels horizontally leaving the unit and is pitched sharply away from the unit (**Figure 2**). Likewise a trap is not needed if the piping turns down immediately exiting the unit.
- Reduce suction riser size when necessary to help maintain minimum gas velocity and ensure continuous system oil return.
- Install inverted P-traps at the top of individual suction risers when piping multiple suction risers from individual units into a common suction line located above the evaporator outlets.
- Provide adequate pipe supports near the unit cooler connections and at regular intervals to help maintain pitch (prevent line sagging) and excessive movement / breakage. Support all external valves and piping components individually.
- Install auxiliary suction to liquid heat exchangers whenever necessary to overcome excessive liquid line heat gain and / or pressure drop due to exposure to high ambient temperatures or tall vertical risers. When properly selected and applied such devices will help maintain 100% bubble free liquid at the TXV inlet.
- Insulate all field piping (both suction and liquid lines) where practical to avoid excessive heat gain and condensation drippage which may pose a potential safety hazard to personnel and the immediate environment. Protect insulation from physical damage and destructive UV rays with industry approved jacketing materials or coating.
- Although the suction line is the most critical from an overall system capacity and oil return standpoint the liquid line must also be properly sized to minimize pressure drop and ensure 100% vapor free liquid is continuously delivered to the inlet of the TXV.

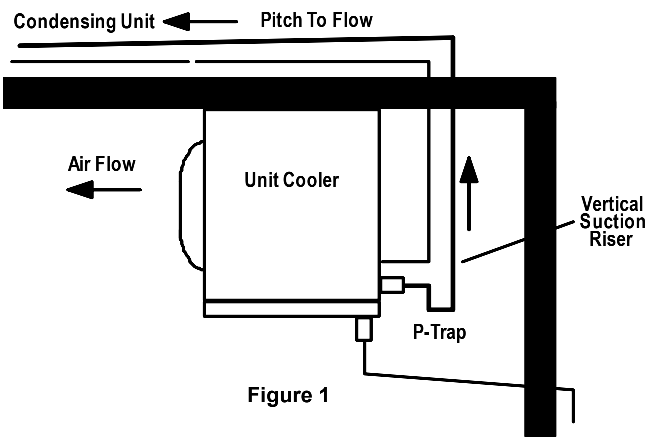


Figure 1

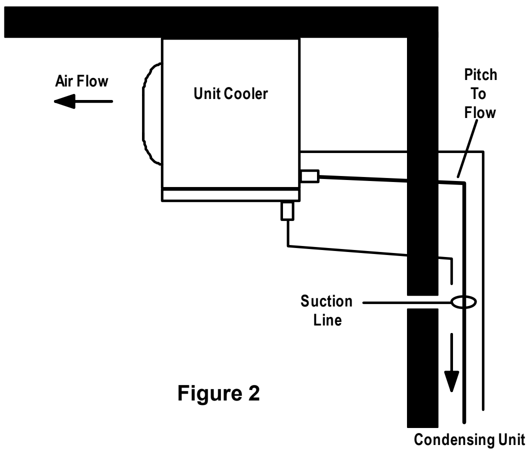
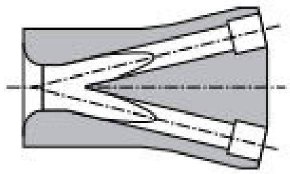
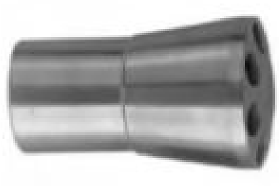


Figure 2



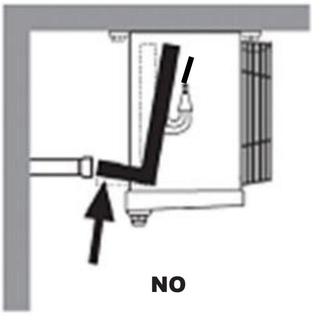
Venturi Distributor



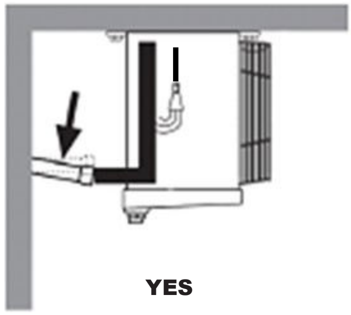
All F27HC model series unit coolers are equipped with a venturi-flo refrigerant distributor which ensures maximum efficiency of the coil under most all operating conditions. There is no orifice or nozzle plate to select / install in the distributor inlet. For optimum coil performance the TXV should be mounted within the end compartment of the unit and as short a distance as possible from the distributor inlet. *Do not install any elbows between the outlet of the TXV and the inlet of the distributor!* A 1/4" O.D. equalizer tube is supplied on all units. Never cap this line - use only externally equalized valves. See **Figures 4, 5 & 6 (below)** for location and mounting of the TXV sensing bulb.

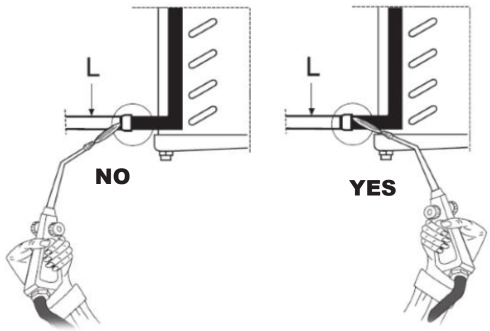
If not supplied with the unit, the expansion valve must be selected according to the design characteristics of the particular system - taking into consideration the following criteria; *Refrigerant type, design room temperature, system TD or design saturated suction temperature (SST), liquid temperature (subcooling) and the minimum operating head pressure (SCT) of the system.* LU-VE can provide a separate valve selection table of suggested expansion valves for the most common refrigerants, operating temperatures and system TD's however we strongly recommend that you consult with your supplier or valve manufacturer for selection assistance - especially for any unusual or non-standard applications.

If a liquid line solenoid valve is to be installed in the system we recommend placing it in the field piping reasonably close to the unit cooler. Do not select valves based only on the physical connection size - the valve you install may be much to large for the application which can result in operational problems with the valve and possibly even damage to the connected unit cooler or system piping. Refer to the valve manufacturers capacity charts or selection software or consult with your local valve supplier for assistance. Always be sure to provide adequate pipe clamps and supports for external piping and components - never allow the unit coil connections to support the weight or unrestricted movement of any field installed piping components. Any damage to the coil which is determined to be caused by improper field piping design / installation will void the product warranty coverage.

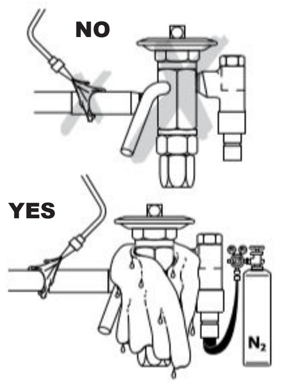


Do not bend or forcibly move the suction header connection or liquid distributor assembly of the coil in order to line up with the field installed piping. Adjust all field piping to the unit connections!





Always direct the torch flame away from all unit and valve connections when brazing to avoid overheating and potentially damaging components. Use wet rags or thermal paste when necessary and always flow low pressure nitrogen while brazing to prevent scale / oxidation from forming inside the system.



*Mount the TXV sensing bulb on a straight, horizontal section of the suction line tubing (**Figure 4**) as close to the evaporator outlet as possible and before the suction line P-trap (**Figure 5**). Position the bulb on the side of the pipe at one of the locations noted (**Figure 6**). Securely fasten the bulb to the side of the pipe with the provided straps. Completely wrap the bulb and piping with insulation to complete the installation.*

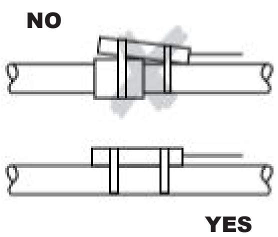


Figure 4

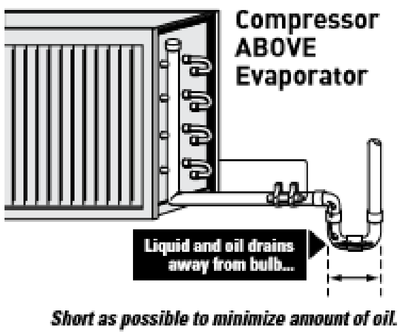
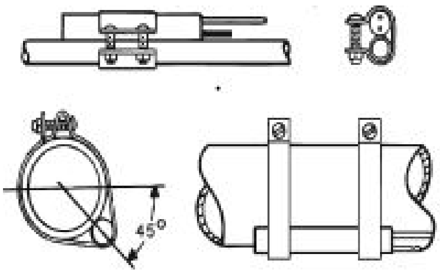


Figure 5

7/8" OD Pipe and Smaller



7/8" OD Pipe and Larger

Figure 6

LEAK TESTING

Once all field piping connections have been made and the braze joints visually inspected for any obvious voids or gaps introduce a trace amount of the system refrigerant through a service gauge manifold to achieve an equalized, static pressure of 25 to 30 PSIG. Make sure that all service and shut off valves are in the open position and slowly introduce a regulated, inert gas such as nitrogen to increase the static system pressure to approx. 150 PSIG.

Note: Always verify the MAXIMUM system test pressure allowed for all other components in the system before pressurizing to this level!

Allow sufficient time for the entire sealed system to achieve an equalized test pressure before physically checking all braze joints and installed system components (both field and factory) with an electronic leak detector. Be sure to turn off the fans of any units operating nearby or block all air movement with tarps or baffles during testing. If any leaks are indicated double check the suspected area using soap bubbles, a strong light and an inspection mirror (if necessary). Note the location of any leaks found, reduce the system pressure to atmosphere, repair the leak(s) (being sure to again flow low pressure nitrogen inside the system while brazing), then repeat the previously used test procedure to confirm all leaks have been satisfactorily repaired. Allow the system to stand at test pressure overnight if possible (or several hours at a minimum), and confirm that there has been no discernable pressure decay during that time.

EVACUATION AND CHARGING

All refrigeration systems must be properly evacuated prior to charging with refrigerant. Simply purging the system with refrigerant or skipping this important step entirely will result in system operational problems, shortened equipment life and voiding the product warranty coverage. Use a deep vacuum pump which has been properly maintained and the oil recently changed. Connect the pump (along with an electronic micron gauge) using a service gauge manifold with large bore hoses or tubing. Operate the vacuum pump continuously during the entire evacuation process (larger volume systems may take several hours and multiple pump oil changes to achieve a satisfactory vacuum level). Monitor the micron gauge during this time and when a minimum reading of 400 microns is achieved, blank off the gauge, shut off the pump and observe the gauge for 10-15 minutes. At this point, if the system is tight and dry, there should be no observed decay of the vacuum gauge reading. Break the vacuum with the correct system refrigerant and charge as per the system design requirements.

Note: Always refer to the manufacturers charging data for the system condensing unit as the unit cooler operating charge represents only a very small portion of the total, year round operating charge required for the entire system. Be sure to charge any refrigerant blend as a liquid (not vapor) in order to avoid fractionization.

EVAPORATOR SUPERHEAT

In order to maximize evaporator efficiency and total system capacity a superheat reading must be taken at all system evaporators and the expansion valve(s) adjusted when necessary to optimize coil performance. Pressures and temperatures should be monitored during the initial room pulldown, final readings taken and valve adjustments made (if required) once the room is at or near the design operating temperature and ideally, before the product has been loaded. For most applications with normal traffic patterns, stable operating room temps and uniform frost loading on the coil (SST below +32 degrees) the optimum, operating superheat at the evaporator outlet should be in the range of 6-10 degrees. If valve control is extremely stable then lower is typically better to ensure maximum coil performance. If box traffic and product loading is excessive, coils are located near areas of high moisture infiltration (not recommended) then a slightly higher operating superheat is recommended in order to protect the system compressor from possible valve overfeeding. Most compressor manufacturers recommend a minimum of 20 degrees superheat at or near the compressor inlet and on very close coupled systems some compromise may need to be made to protect the compressor. The use of a suction to liquid heat exchanger or suction accumulator may be necessary in applications where minimum compressor superheat cannot be maintained.

TAKE THE FOLLOWING TEMPERATURES AND PRESURES

RAT - Return Air Temperature to the unit.

SP - Suction Pressure at evaporator coil outlet (converted to the equivalent **SST** of system refrigerant).

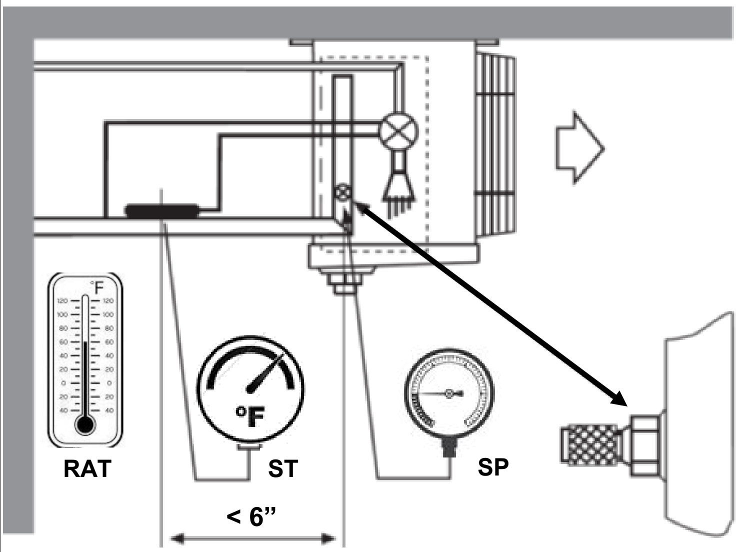
ST - Suction Temperature measured at the expansion valve sensing bulb

For optimum unit cooler performance the superheat at the coil outlet (**ST - SST**) should be as low as possible, considering stable valve operation (little to no hunting) and as close as possible to the **RAT**.

The thermostatic expansion valve must be properly sized for the design operating conditions of the installation and adjusted to maximize unit cooler performance.

Always refer to the valve manufacturers installation and operation instructions for detailed information on adjusting the specific valve installed on the unit.

CHECKING EVAPORATOR SUPERHEAT



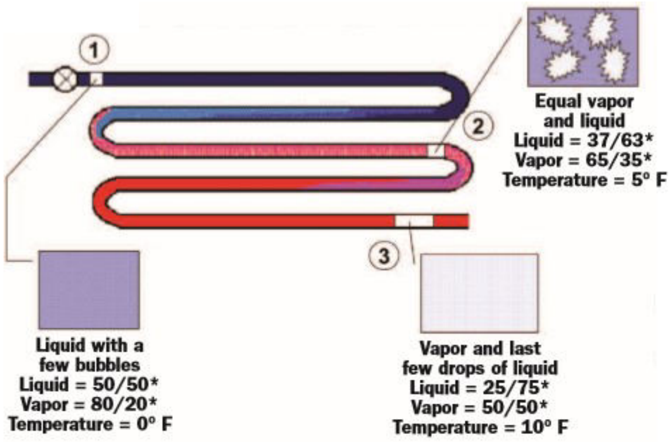
REFRIGERANT BLENDS — TEMPERATURE GLIDE

The majority of HFC refrigerants in use today are referred to as refrigerant "blends" (composed of two or more different refrigerants). As such, each component within this "blend" evaporates (or condenses) at different temperatures. The temperature range within which each of these different refrigerants completely changes state from a liquid to a gas (or vice versa) is referred to as "temperature glide". Essentially this means that the traditional way we measure superheat and liquid sub-cooling must be adjusted to account for this temperature "glide". Depending upon which one of these refrigerant is used in the system the temperature glide could range from as low as 6 to perhaps as high as 12 degrees. Technically R-404A is also a blend but since it's temperature glide is only around 1 degree it is typically treated as an azeotrope (a refrigerant whose components boil and evaporate at the same temperature).

When measuring superheat at the evaporator outlet of a system utilzing any of these high glide rfrigerants you must always refer to the refrigerants' "Dew Point" which is the point at which the last droplet of liquid refrigerant has vaporized. These values are all listed for easy reference on all current temperature pressure charts, mechanical and electronic service gauge manifolds and apps commonly used by todays field service technicians. If in doubt about the values you've measured always refer to published data supplied by the various refrigerant manufacturers to confirm your field measurements. Regardless of which type of refrigerant is used in the system the service technicians goal is still the same - to maximize the evaporator performance while ensuring both adequate compressor motor cooling and the prevention of liquid floodback.

The diagram on the right graphically illustrates the relationship or "glide" of two different components making up a single refrigerant blend as they pass through the evaporator coil. The number on the left of the / mark represents the percentage of refrigerant "A" and the number to the right of the / mark represents the percentage of refrigerant "B" which is present at each location (1, 2 & 3) in the evaporator coil.

Note that the mixture is only equal (50/50) at the inlet (100% liquid) and at the outlet (100% vapor) of the evaporator coil.



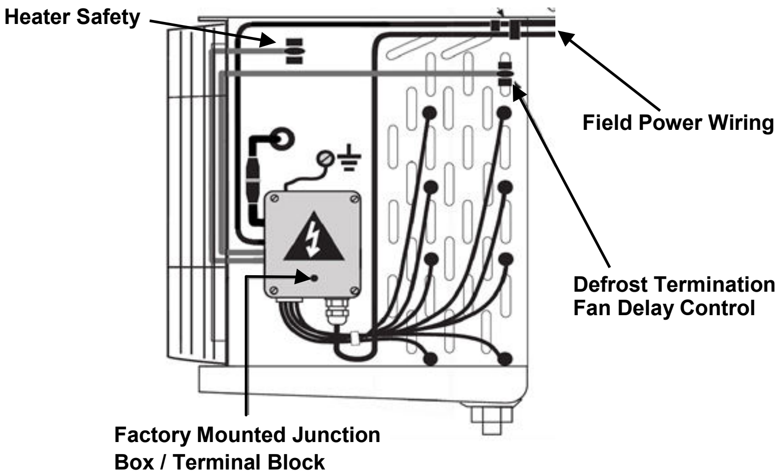
FIELD WIRING — ELECTRICAL REQUIREMENTS

The electrical characteristics of each unit are clearly marked on the unit rating label located on the front facing, left hand end cover of the unit (as viewed facing the fans). This label lists the operating voltage, phase and amp draw of the fan motors and defrost heaters (when equipped). It also lists the *MINIMUM CIRCUIT AMPACITY (**MCA**)* and *MAXIMUM OVER CURRENT PROTECTION DEVICE* (**MOPD**) which should be used in order to determine the minimum wire gauge size required to supply power to the unit and the largest circuit breaker / fuse size it should be fed from. These values apply only to the main power supply to the unit - there may be separate, field control circuit wiring required which can be ran in smaller gauge wiring, but must still be suitable for the applied voltage.

All field wiring must be ran using copper conductors only and in total compliance with the National Electrical Code (NEC) as well as any local or state codes. There are multiple knockouts supplied on the electrical end of the unit (opposite the refrigerant connection end) to accommodate field installed wiring / conduit connections. Field wiring must be landed on the factory supplied terminal block located inside the electrical end panel. Refer to the unit wiring diagram located on the inside of the electrical end cover panel for the specific terminals to connect to. When making the field wiring connections it is always advisable to double check the factory wiring connections to be sure that none have loosened in shipment or are otherwise dislodged from their terminals. The unit must also be properly grounded which may require that a dedicated ground wire be ran to the unit (depending upon local code requirements and the type of conduit utilized in the installation).

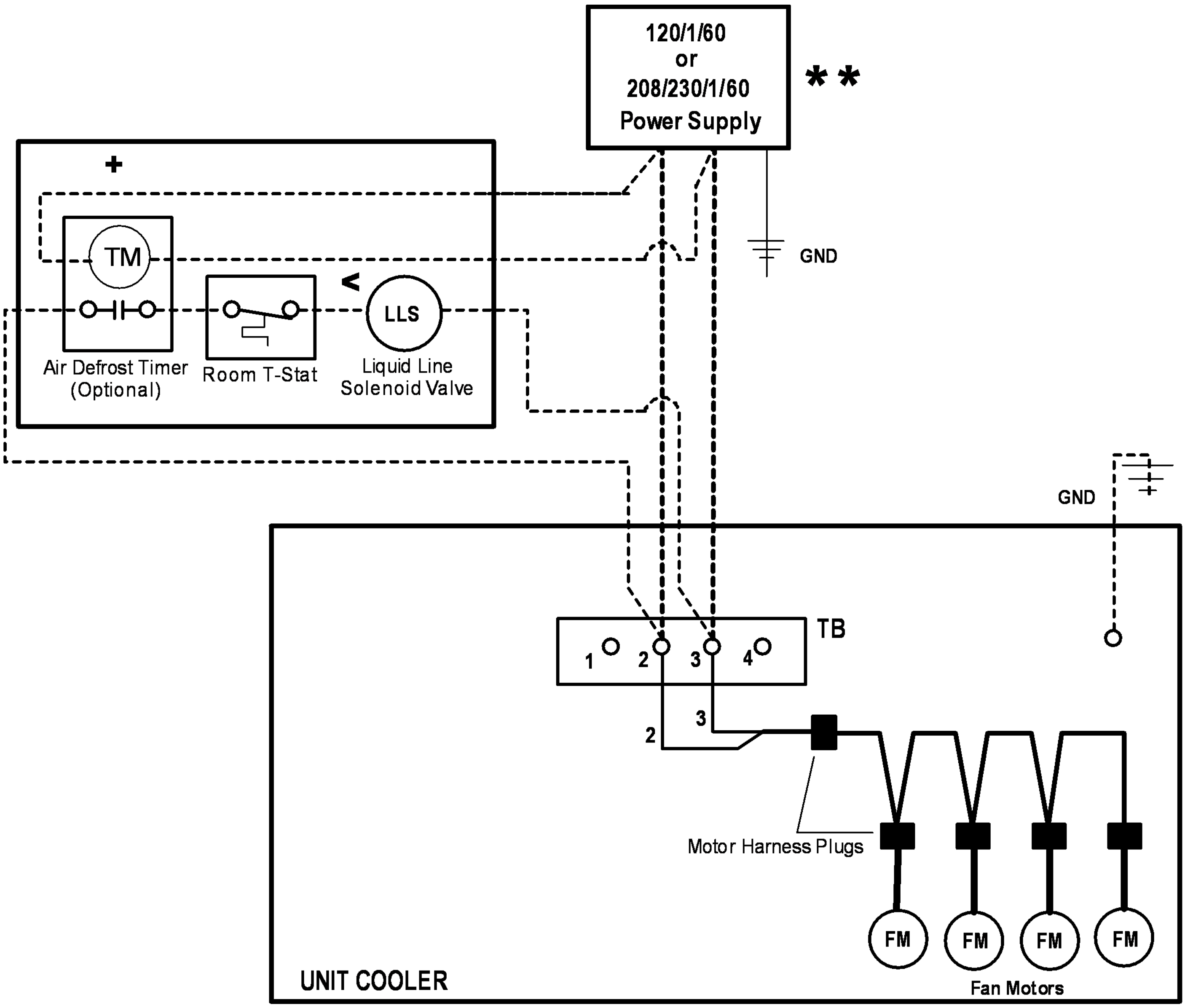
FACTORY WIRING

The fan motors for all air defrost units are factory wired to the terminal block. On electric defrost units all fan motors, defrost heaters, heater safety and fan delay / defrost termination controls are factory wired. If not provided as a factory mounted option it is the installing contractors responsibility to install and wire a room thermostat, liquid line solenoid valve and defrost timer (when required). The typical wiring diagrams supplied on the following pages will assist with the field wiring of these controls - as well as wiring for multiple units on a single system when required.



FIELD WIRING DIAGRAMS — TYPICAL

AIR DEFROST — 115/1/60 OR 208/230/1/60 UNIT COOLER



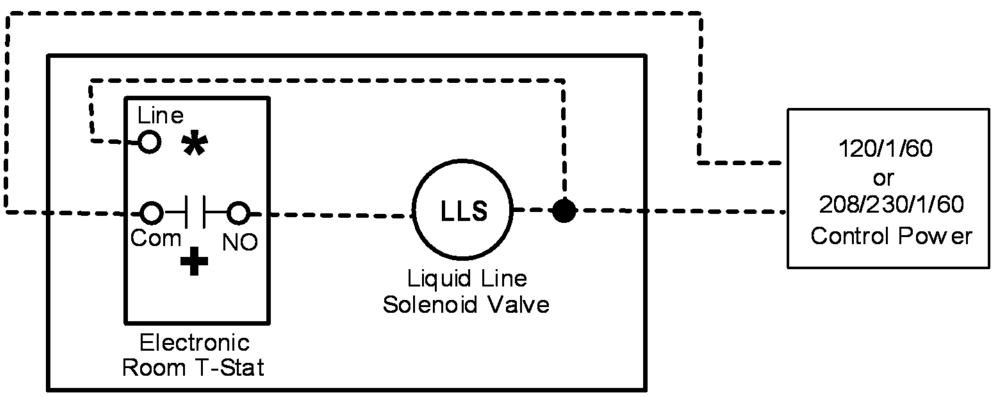
<u>IMPORTANT WIRING NOTES - INSTALLER PLEASE READ CAREFULLY!</u>

** Sub-circuit fusing or service disconnect switches are not shown but may be required as per the NEC and / or local codes. It is the responsibility of the installing contractor to interpret and comply with all applicable electrical codes.

+ An air defrost time clock may be supplied as an option (either field installed or factory mounted on the system condensing unit).

< The room thermostat and liquid line solenoid valve are shown as field installed but may be factory mounted in the unit cooler. Make sure the solenoid holding coil is wired for the correct control voltage (115 or 230).

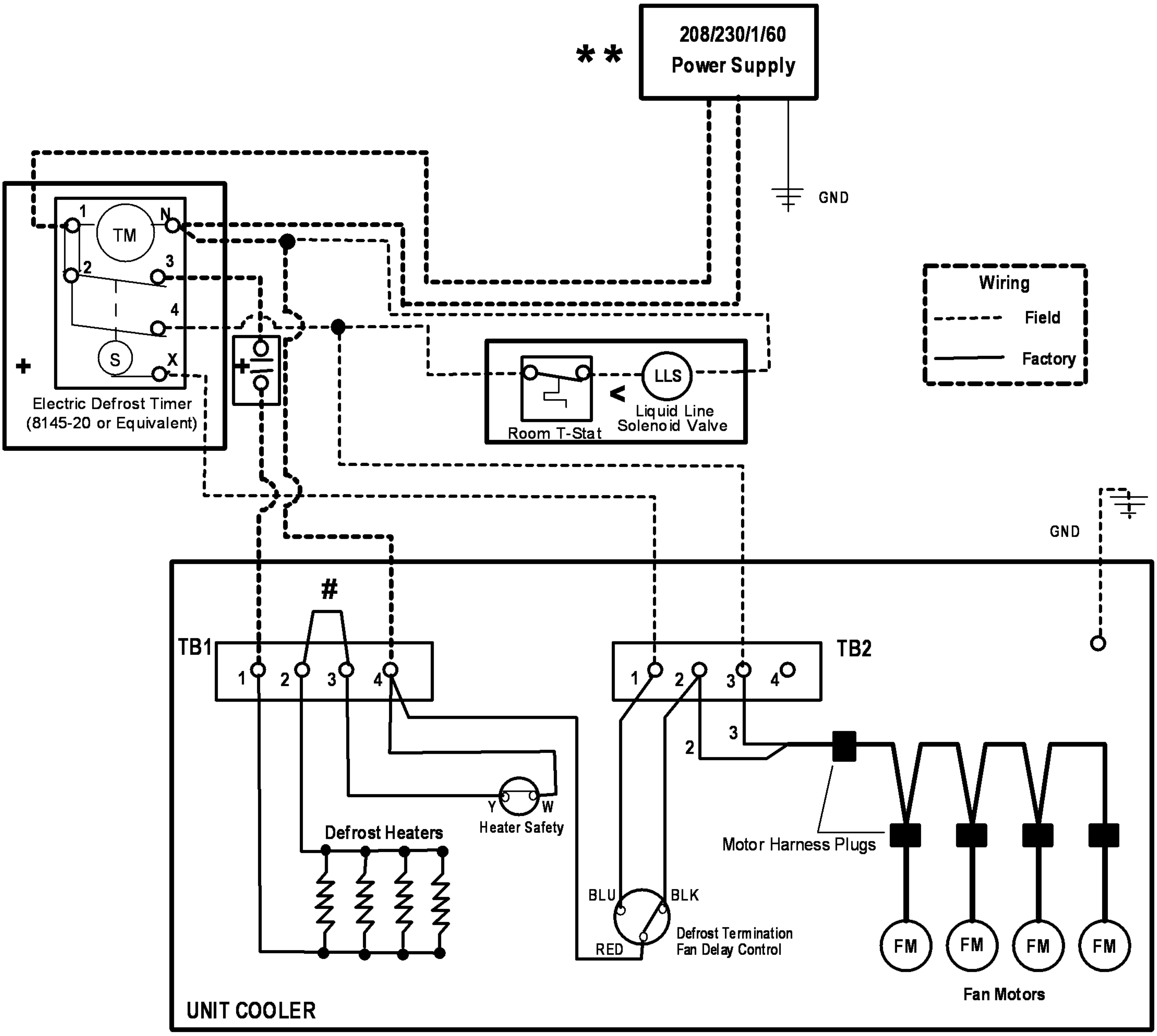
ELECTRONIC ROOM THERMOSTAT WIRING OPTION



* Be sure that room thermostat power wiring matches the unit cooler control voltage.

\+ Wire across normally open (NO) thermostat contacts.

ELECTRIC DEFROST — 208/230/1/60 — (1) UNIT COOLER (TIMER ONLY)



IIMPORTANT WIRING NOTES - INSTALLER PLEASE READ CAREFULLY!

** Sub-circuit fusing or service disconnect switches are not shown but may be required as per the NEC and / or local codes. It is the responsibility of the installing contractor to interpret and comply with all applicable electrical codes.

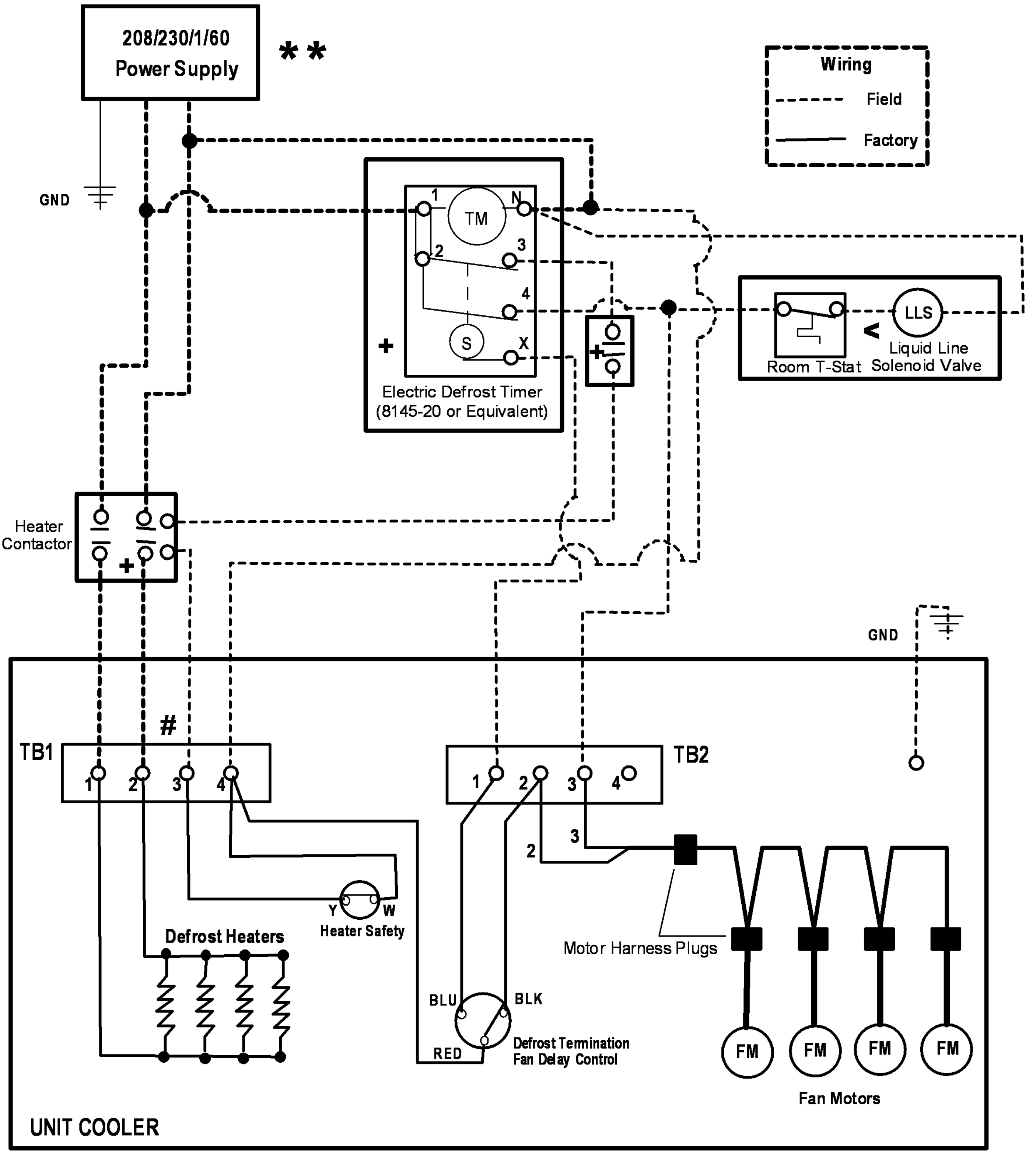
+ The defrost time clock and block out relay are typically located in the system condensing unit. All unit cooler power should feed from this unit. Make sure that the heater amp draw does not exceed the defrost timer contact rating (typically 40 resistive amps for an 8145-20 or equivalent timer). Also be sure the wire gauge size is adequate to carry the total amp load required.

Factory installed jumper - remove if using a heater contactor.

< The room thermostat and liquid line solenoid valve are shown as field installed but may be factory mounted in the unit cooler. Make sure the solenoid holding coil is wired for the correct control voltage (115 or 230).

FIELD WIRING DIAGRAMS — TYPICAL

ELECTRIC DEFROST — 208/230/1/60 — (1) UNIT COOLER WITH HEATER CONTACTOR



IMPORTANT WIRING NOTES - INSTALLER PLEASE READ CAREFULLY!

** Sub-circuit fusing or service disconnect switches are not shown but may be required as per the NEC and / or local codes. It is the responsibility of the installing contractor to interpret and comply with all applicable electrical codes.

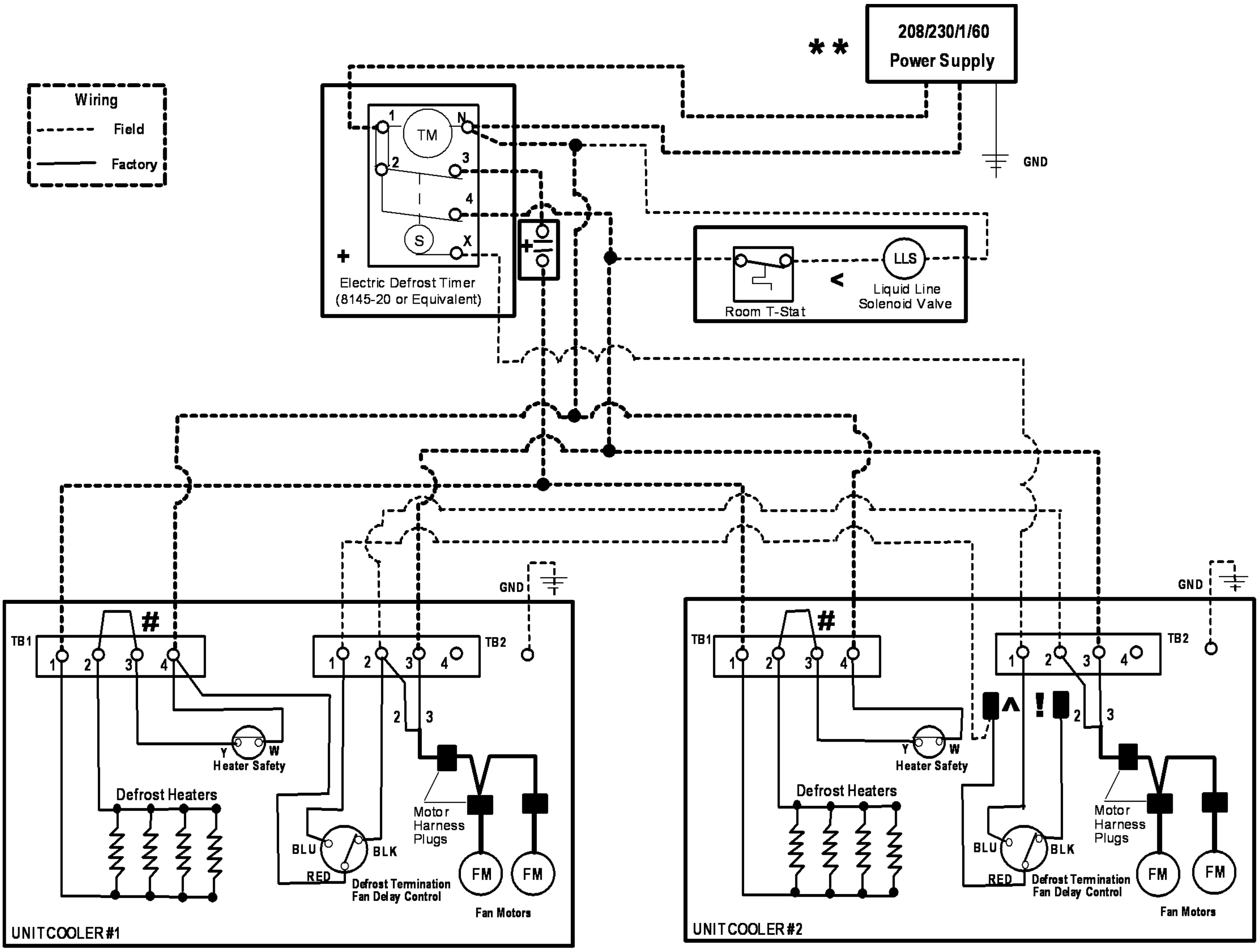
+ The defrost time clock, block out relay / auxiliary switch and heater contactor are typically located in the system condensing unit. All unit cooler power should feed from this unit. Make sure the total heater amp draw does not exceed the resistive rating of the contactor. Also be sure the wire gauge size is adequate to carry the total amp load required.

When using a heater contactor with unit cooler defrost heaters factory wired for single phase remove factory installed jumper between terminals 2 & 3 on TB1 and wire directly to heater contactor as shown above.

< The room thermostat and liquid line solenoid valve are shown as field installed but may be factory mounted in the unit cooler. Make sure the solenoid holding coil is wired for the correct control voltage (115 or 230).

FIELD WIRING DIAGRAMS — TYPICAL

ELECTRIC DEFROST — 208/230/1/60 — (2) UNIT COOLERS / TIMER ONLY



IMPORTANT WIRING NOTES - INSTALLER PLEASE READ CAREFULLY!

** Sub-circuit fusing or service disconnect switches are not shown but may be required as per the NEC and / or local codes. It is the responsibility of the installing contractor to interpret and comply with all applicable electrical codes.

\+ The defrost time clock and block out relay are typically located in the system condensing unit. All unit cooler power should feed from this unit. When connecting multiple unit cooler defrost heaters to (1) defrost time clock make sure the total heater amp draw does not exceed the defrost timer contact rating (typically 40 resistive amps for an 8145-20 or equivalent timer), Also be sure the wire gauge size is adequate to carry the total amp load required. If the combined heater amp draw exceeds the defrost timer rating a heater contactor must be installed (see alternate wiring diagram for 1 or 2 heater contactor wiring arrangement).

! When connecting (2) electric defrost unit coolers to (1) defrost timer remove the black wire from the defrost termination / fan delay control which is factory wired to terminal 2 - TB2 on unit cooler #2 and cap the wire. This will allow the fan delay on unit cooler #1 to control the fans on both unit coolers.

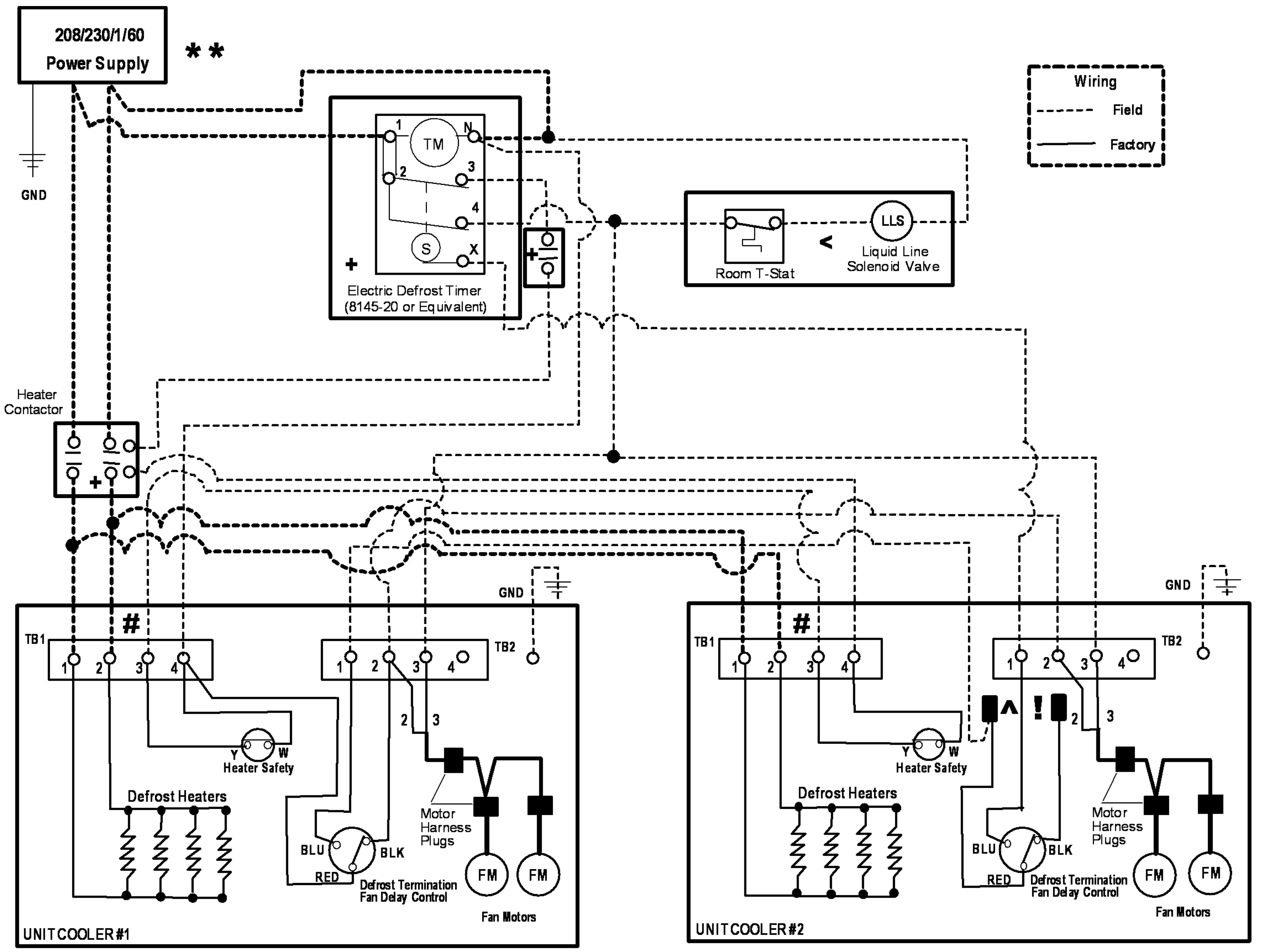
^ When connecting (2) electric defrost unit coolers to (1) defrost timer remove the red wire from the defrost termination / fan delay control which is factory wired to terminal 4 - TB1 on unit cooler #2 and hard wire to a field wire connected to terminal 1 - TB2 on unit cooler #1. This will place the (2) defrost termination controls in series so that both units must reach temperature in order to terminate the defrost cycle.

When using a heater contactor with unit cooler defrost heaters factory wired for single phase remove factory installed jumper between terminals 2 & 3 on TB1 and wire directly to heater contactor.

< The room thermostat and liquid line solenoid valve are shown as field installed but may be factory mounted in the unit cooler. Make sure the solenoid holding coil is wired for the correct control voltage (115 or 230).

FIELD WIRING DIAGRAMS — TYPICAL

ELECTRIC DEFROST — 208/230/1/60 — (2) UNIT COOLERS / (1) HEATER CONTACTOR



IMPORTANT WIRING NOTES - INSTALLER PLEASE READ CAREFULLY!

** Sub-circuit fusing or service disconnect switches are not shown but may be required as per the NEC and / or local codes. It is the responsibility of the installing contractor to interpret and comply with all applicable electrical codes.

+ The defrost time clock, block out relay / auxiliary switch and heater contactor are all typically located in the system condensing unit. All unit cooler power should feed from this unit. When connecting multiple unit cooler defrost heaters to (1) heater contactor make sure the total heater amp draw does not exceed the resistive amp rating of the contactor. Also be sure the wire gauge size is adequate to carry the total amp load required.

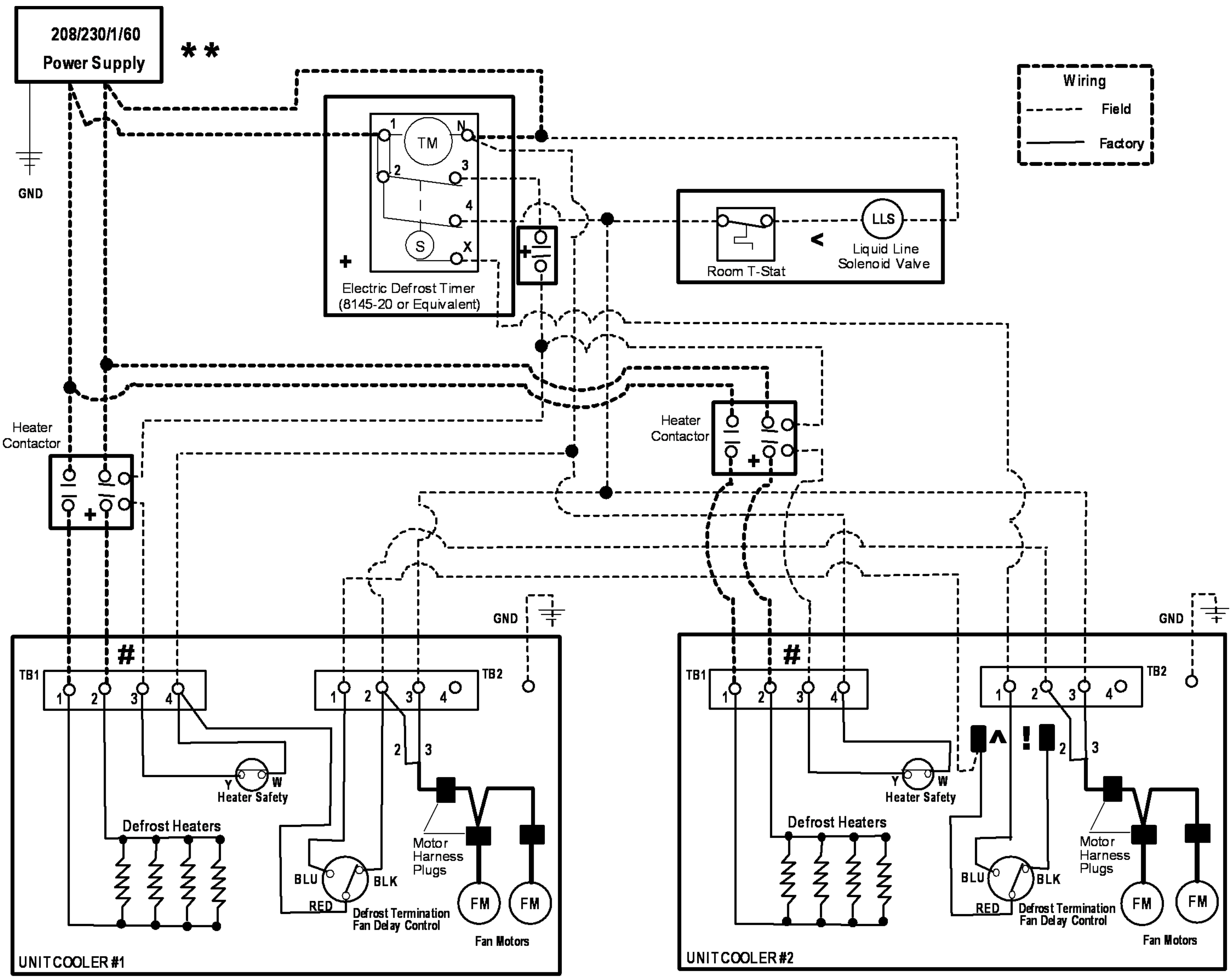
When using a heater contactor with unit cooler defrost heaters factory wired for single phase remove factory installed jumper between terminals 2 & 3 on TB1 and wire directly to heater contactor as shown above.

! When connecting (2) electric defrost unit coolers to (1) defrost timer remove the black wire from the defrost termination / fan delay control which is factory wired to terminal 2 - TB2 on unit cooler #2 and cap the wire. This will allow the fan delay on unit cooler #1 to control the fans on both unit coolers.

^ When connecting (2) electric defrost unit coolers to (1) defrost timer remove the red wire from the defrost termination / fan delay control which is factory wired to terminal 4 - TB1 on unit cooler #2 and hard wire to a field wire connected to terminal 1 - TB2 on unit cooler #1. This will place the (2) defrost termination controls in series so that both units must reach temperature in order to terminate the defrost cycle.

< The room thermostat and liquid line solenoid valve are shown as field installed but may be factory mounted in the unit cooler. Make sure the solenoid holding coil is wired for the correct control voltage (115 or 230).

ELECTRIC DEFROST — 208/230/1/60 — (2) UNIT COOLERS / (2) HEATER CONTACTORS



IMPORTANT WIRING NOTES - INSTALLER PLEASE READ CAREFULLY!

** Sub-circuit fusing or service disconnect switches are not shown but may be required as per the NEC and / or local codes. It is the responsibility of the installing contractor to interpret and comply with all applicable electrical codes.

+ The defrost time clock, block out relay / auxiliary switch and contactors are typically located in the system condensing unit. All unit cooler power should feed from this unit. Make sure the total heater amp draw does not exceed the resistive amp rating of the contactors supplied. Also be sure the wire gauge size is adequate to carry the total amp load required.

^ When connecting (2) electric defrost unit coolers to (1) defrost timer remove the black wire from the defrost termination / fan delay control which is factory wired to terminal 2 - TB2 on unit cooler #2 and cap the wire. This will allow the fan delay on unit cooler #1 to control the fans on both unit coolers.

! When connecting (2) electric defrost unit coolers to (1) defrost timer remove the red wire from the defrost termination / fan delay control which is factory wired to terminal 4 - TB1 on unit cooler #2 and hard wire to a field wire connected to terminal 1 - TB2 on unit cooler #1. This will place the (2) defrost termination controls in series so that both units must reach temperature in order to terminate the defrost cycle.

< The room thermostat and liquid line solenoid valve are shown as field installed but may be factory mounted in the unit cooler. Make sure the solenoid holding coil is wired for the correct control voltage (115 or 230).

START UP

Check The Following Items Before And After Initial Start Up

- Verify that all electrical connections (both main power and control wiring) have been properly secured and all access covers replaced.
- Check to be sure that all field piping has been insulated, properly supported and secured with clamps.
- Confirm that the TXV sensing bulb has been securely fastened to the suction line and insulated.
- Verify that all condensate drain line piping has been completed, all piping is properly pitched, supported and secured with clamps. On low temperature applications make sure that all drain line piping is insulated, drain line heaters are installed and wired to a dedicated power source for continuous operation.
- Check to be sure that all pipe and conduit penetrations into the cooler / freezer have been properly sealed to prevent the infiltration or warm, moist air into the conditioned space. Unsealed gaps or voids will quickly become "conduits" through which moisture laden outside air will flow into the cooler or freezer placing an unnecessary burden on the refrigeration system and potentially creating both safety concerns for operating personnel as well as operation problems for the unit cooler, (ex. coil icing / steaming, stalled / burned out fan motors, broken fan blades, liquid flood back to the compressor, etc.).
- Measure the incoming voltage at the main power terminal block. Voltage measured should be within +/- 10% of the unit nameplate rating.
- On initial start up and pulldown of a warm box (electric defrost units only) the defrost termination / fan delay control will hold out the fans until the coil temperature reaches (and continuously maintains) approx. +25 degrees F (+/-). Prior to start up of these units a wire jumper should be physically installed between terminals 1 and 3 on the power terminal board which will temporarily bypass the fan delay side of the switch - forcing the fans to run continuously. Once the room temperature has dropped down near freezing the jumper wire should be removed for proper operation.
- Once the unit is running check all fan motors for proper rotation and air throw. If poor air circulation is noted refer to page 7 of this manual for possible causes and correction of air flow issues.
- Observe the unit for any unusual noise or vibration. Investigate and correct the cause of any issues noted.
- With the system fully charged with refrigerant and the room at or near design operating temperature check superheat at the evaporator coil outlet. Adjust the expansion valve (if required) to obtain correct, operating superheat (see ***EVAPORATOR SUPERHEAT - Page 12***).
- Check for any standing water in the condensate drain pan. If the drain pan is holding water check for proper P-traps in the line (in the absence of a trap, negative pressure at the drain pan connection fitting can cause water to hold up in the pan). Verify unit is mounted level. Check drain line piping for correct pitch or possible obstructions / debris and correct as required.
- On electric defrost units manually force system into a defrost cycle. Check the amp draw of the heaters and compare this reading to the unit rating label in order to verify that all defrost heaters are functioning correctly. Allow the system to operate through a complete defrost cycle and observe that the unit terminates the defrost cycle on the defrost termination temperature control (approx. +70 degrees +/-). Observe that the fans are delayed no more than approx. (2) minutes immediately following the defrost cycle.
- Adjust the system defrost control / timer to periodically initiate a defrost cycle. For "Air Defrost" or off cycle timers a typical setting would be 2-3 times per day for 45 minutes per cycle. Electric defrost timers are typically set to provide (4) 30 minute defrost cycles per day however it should be noted that every installation is potentially different and that defrost is a "necessary evil". Generally speaking fewer defrost cycles per day is always better - particularly if any steaming is observed near the end of the defrost cycle. Steaming is characterized by a hissing sound which is caused by water droplets as they contact an overtemp heater sheath and immediately vaporize into steam which then condenses on any adjacent cold surfaces such as fan panels, drain pans, fan blades, motor mounts, ceiling panels, etc.. Although in many cases a technicians initial reaction is to increase or lengthen the defrost cycle the exact opposite is usually the best course of corrective action. Reduce the number of cycles per day and verify the cycle is being terminated by the defrost termination temperature control (Refer to **Troubleshooting Defrost Cycle - Page 22**).

IMPORTANT NOTES AND INFORMATION

♦ Tecumseh designed by LU-VE unit coolers are designed to operate with the following commonly used refrigerants;

R-404A, R-507, R-134A; R-407A, R-407C, R-407F, R-448A and R-449A

For field retrofit applications it is also generally acceptable to use R-438A, R-449B or similar field service replacement refrigerants which have been designed to closely match the operating characteristics of the original refrigerant they replace.

Unit coolers may also be custom designed / circuited for use with other fluids such as water or glycol

♦ The maximum working pressure of all units using copper tube coils is ***350 PSIG***. The maximum, recommended unit test pressure for field leak testing purposes is ***150 PSIG***.

Note: Always verify the maximum test pressure rating of any connected valves, controls (ex. solenoids, expansion valves, pressure transducers, etc.) to avoid possible damage to these components during pressure testing.

TROUBLESHOOTING MOTOR AND FAN BLADE ASSEMBLY

Observation	Possible Cause	Corrective Action
Fan Motor Rocks Back And Forth	Normal pre-start alignment for EC motor	Not Applicable
Fan Motor(s) Don't Operate	No power to unit (check voltage at main power term block)	Check circuit breaker or incoming power from defrost time clock
	Bad / loose connection at motor lead plug or terminal block	Replace or repair burned, damaged or loose connections
	Obstruction blocking fan blade	Clear obstruction to make sure fan blade / motor turns freely
	Fan delay control open on electric defrost unit	Control closes at +25 deg F. Temporarily jump out or replace defective control
	Motor physically locked up	If fan blade is free but motor will not turn replace motor
	Motor windings shorted, open or burned	Check resistance between motor lead wires and ground Replace defective motor
Fan Motor(s) Turn Slow	Low Voltage	Check voltage at motor leads. Must be +/- 10% of nameplate
	Coil fouled with frost / ice / dirt	Clear / clean coil of all frost / ice build-up / dirt
	Product stacked too close to coil face	Relocate product to clear return air path to coil
Motor / Fan Assembly Noisy	Fan hitting obstruction Damaged or out of balance fan blade	Rotate motor / fan assembly by hand Clear obstructions or replace fan blade / motor
	Motor bearings worn or damaged	Replace defective motor
	Damaged / broken motor mount	Replace damaged / broken motor mount

Refer to the illustration on page 23 for removal / replacement of fan blade and motor assembly

TROUBLESHOOTING CORROSION OF THE COIL ASSEMBLY

Observation	Possible Cause	Corrective Action
Visible deterioration of the coil fins. Flakes of aluminum or white powder present in drain pan, on product or elsewhere in the room	Wrong cleaning agent or too high of concentration of cleaner being used. Inadequate / improper rinsing of cleaner from the coil surface	Use correct cleaner for the application. Follow the manufacturers directions completely. Use copious amounts of rinse water
	Corrosive agent present in air attacking aluminum fins	Identify the source of corrosion. Some potential sources include; vinegar based salad dressings (acetic acid) and various spices often found in prepared foods, sulfur (from water / melting ice, forklift charging stations), products of combustion present in automobile exhaust (untrapped drain lines near drive throughs / driveways), exhaust from fork lifts, cooking areas / vent hoods, sewer gas from drains / vents, etc.
Pin hole leaks in copper tubes / return bends or factory braze joints	Corrosive agent present in air attacking the copper tubing or phosphorous in braze joints (copper may also appear discolored - possibly black or green)	Similar scenario to the above - attempt to identify the potential source of the corrosive agent. Some possible sources include; chlorine or ammonia (present in many commercial cleaners), urine, sulfur (from water / melting ice), dairy products (lactic acid), bread or bread dough (active yeast), ethylene gas (ripening fruits), acids in dried sausage / pepperoni, etc.

If the source of the corrosion cannot be identified and / or effectively eliminated from the immediate area of the unit installation then a replacement unit with a coated coil assembly is highly recommended. Depending upon the concentration of the corrosive agent and level of exposure it is possible to experience premature failure of the coil surface within a very short period of time after installation (even if the coil has been coated). Regardless of the time frame between exposure and failure any coil which has failed due to exposure to environmental corrosion is considered to be outside the product warranty coverage.

TROUBLESHOOTING DEFROST CYCLE AND DEFROST HEATERS

Observation	Possible Cause	Corrective Action
Coil Blocked with Frost / Ice	Excessive moisture infiltration into cooler / freezer (fan guard, motor / fan assembly, unit housing, wall / ceiling panels may also be covered with heavy frost accumulation)	Relocate unit away from doors / other openings
		Seal / repair all sources of air leaks into walk-in box
		Install strip curtains on access doors
		Limit door openings / close door when entering / exiting walk-in
		Install door switch (interlock fans and liquid solenoid valve)
		Install P-trap in drain line at unit cooler
	Fan motor out	See motor troubleshooting chart
	Defrost cycle not being initiated by timer	Check / replace defective defrost timer
	Defrost heater(s) not energized during defrost	Check voltage at term block. Must be +/- 10% of nameplate
		Check for loose or burned wires / connections at terminal block. Repair or replace as necessary
		Check heater safety (opens at +70). Replace defective control
		Heaters burned out. Check resistance across heater leads. Replace any heaters reading "open" (infinite resistance)
		Check external heater contactor (when supplied). Replace if defective
	Box temperature too low (air defrost unit)	Set room thermostat to min +34 degrees
		Install off-cycle “air” defrost timer
		Install defrost heaters / replace with electric defrost unit
	Heater restraining clips broken / missing (heaters shifted)	Reposition heaters / replace restraining clips
Incomplete Defrost Cycle (All Heaters Energized)	Excessive moisture infiltration into cooler / freezer	See above
	Too few defrost cycles / day	Increase number of defrost cycles per day
	Defrost cycle too short (terminates on time)	Set defrost timer to minimum 30 min per cycle
	Defrost cycle too short (terminates on temp)	Check defrost termination control (closes at +55 deg). Replace defective control
Ice build-up on fan guard, fan / motor assembly, motor mount, fan panel (also ice droplets on ceiling panel in front of fans and behind coil / on upper back wall and on product. Also ice on floor around unit	Incoming voltage too high	Check voltage at term block. Maximum 10% of nameplate
	Too many defrost cycles / day	Reduce number of defrost cycles / day
	Defrost cycle too long	Check defrost termination control (closes at +55 deg) Replace defective control
	Coil not building frost uniformly	No P-trap installed in drain line at unit cooler. Install trap
		Superheat too high. Adjust TXV / lower superheat
		Poor refrigerant distribution in coil (liquid temp too low). Insulate liquid line / increase liquid temp to TXV
	Fans start immediately following defrost cycle	Check fan delay control (closes at +25 deg). Replace defective control
	Heater restraining clips broken / missing (heaters shifted)	Reposition heaters / replace restraining clips
Drain Pan Filled With Ice Ice build-up on floor	Unit not mounted level	Check / adjust level of unit as required
	Insufficient / improper drain line pitch	Pitch drain line a minimum of 1/4" / foot
	Drain line too small	Drain line must be no smaller than outlet connection on pan
	Drain line blocked / plugged with debris	Clear blockage / manually clear ice build-up from drain pan
	P-trap located outdoors (un-heated in winter)	Re-locate trap / add heat / insulate
	Defective drain pan heater	Check heater resistance / replace if defective
	Defective / inadequate drain line heater	Replace defective heater / add additional heat if required. Insulate drain line piping

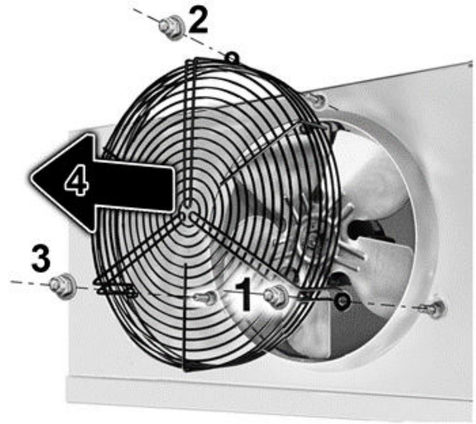
See detailed instructions for replacing defrost heaters on page 24

SERVICE — MAINTENANCE

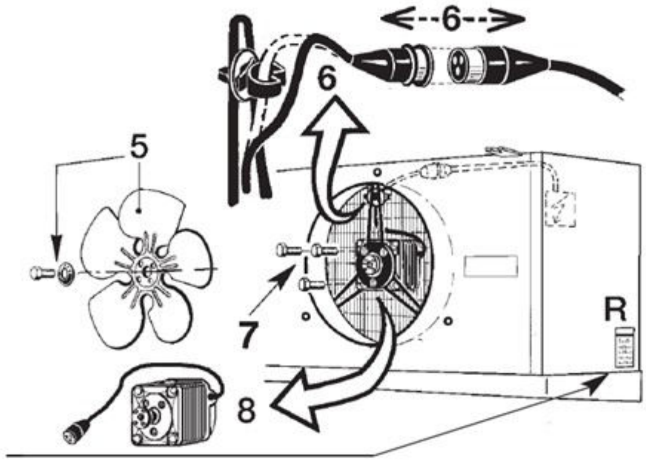
IMPORTANT! Before any service / maintenance operations are performed to the unit, locate and lock out the main power supply to the unit. Note: In some cases more than (1) power source (breaker or service disconnect switch) may be supplied.

BE SURE TO LOCK OUT / TAG OUT ALL SOURCES OF POWER!

FAN GUARD REMOVAL — STEPS 1 THRU 3



FAN BLADE / MOTOR REMOVAL — STEPS 4 THRU 8

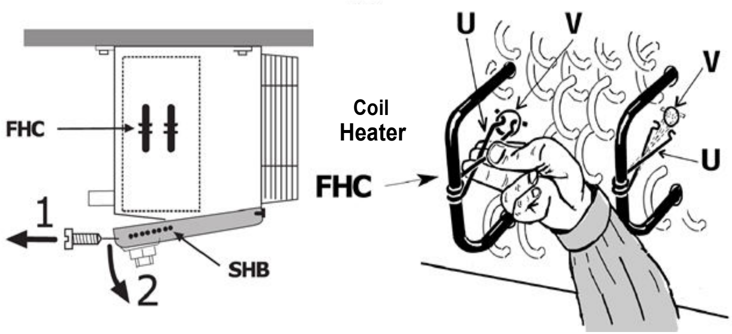


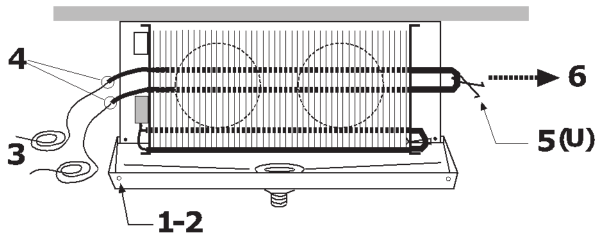
SERVICE — MAINTENANCE

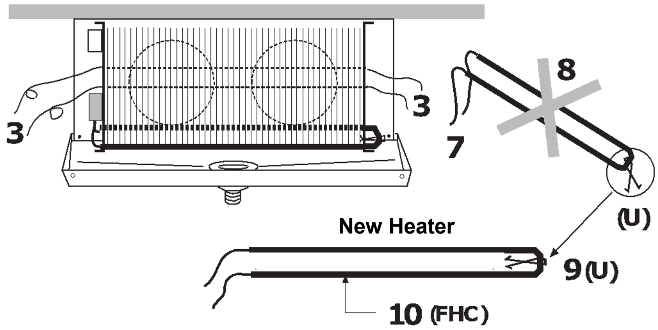
IMPORTANT! Before any service / maintenance operations are performed to the unit, locate and lock out the main power supply to the unit. Note: In some cases more than (1) power source (breaker or service disconnect switch) may be supplied.

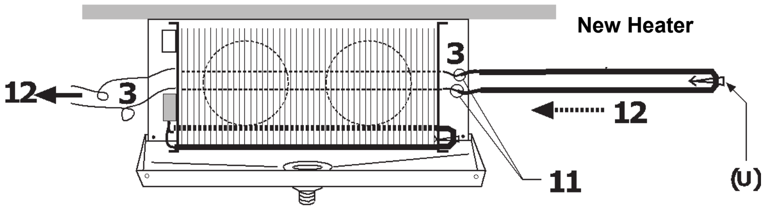
BE SURE TO LOCK OUT / TAG OUT ALL SOURCES OF POWER!

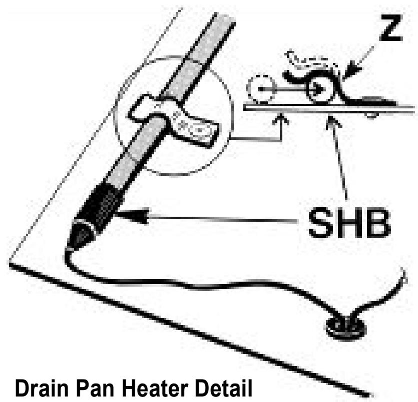
COIL AND DRAIN PAN HEATER REPLACEMENT PROCEDURE











Drain Pan Heater Detail

1. Before removing the electric heaters make sure that they are all at ambient temperature

2. Remove both left and righthand unit end covers by removing (3) Philips head screws per side

3. If the drain pan heater (**SHB**) is to be replaced remove the field installed condensate drain line from the unit, then detach the drain pan by re moving (4) Philips head screws (**Items 1 & 2**)

4. Identify the coil heater to be replaced (**FHC**) and attach pulling wires for the replacement heater to the (2) wire leads of the defective heater **(Items 3 & 4)**

5. The heater retaining clip (**item U**) must be removed from the old heater by squeezing the clip together to release it from the hole in the tube sheet **(Item V)**

6. Remove the defective heater by pulling it straight out from the retaining clip end of the heater (**Items 5 & 6**) being careful to leave the (2) pulling wires inside the coil **(Item 3)**

7. Install the retaining clip (**U**) onto the replacement heater **(Item 9)**

8. Attach the (2) pulling wires still in the coil (**Item 3**) to the wire leads of the replacement heater (**Item 7**) and guide the boot ends of the heater through the holes in the tube sheet (**Item 11**) and straight into the coil (**Item 12**) while an assistant pulls gently on the opposite end of the (2) pulling wires

*IMPORTANT! Be careful when inserting a replacement heater into the coil assembly in a confined area. The heaters are annealed to allow some flexibility and bending during installation however sharp bends or kinks must be avoided to prevent damaging the replacement heater. The ends of the heater entering the coil must always be inserted straight - attempting to force the heater into the coil at an angle (**Item 8**) may result in internal damage to the coil assembly!*

9. When the replacement heater is in its final position insert the heater retaining clip into the hole in the tube sheet to prevent any movement of the heater during operation

10. Reconnect the (2) heater wire leads being careful to properly secure any excess wire in order to prevent it from contacting the heated portion of any of the heaters

11. Replacement of the drain pan heater (**SHB**) is accomplished by disconnecting the (2) wire leads and gently prying up the metal retainer clips (**Item Z**) to release the heater

12. Replacement is the reverse of this procedure

START UP — SERVICE — MAINTENANCE NOTES

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