

EC Large Model



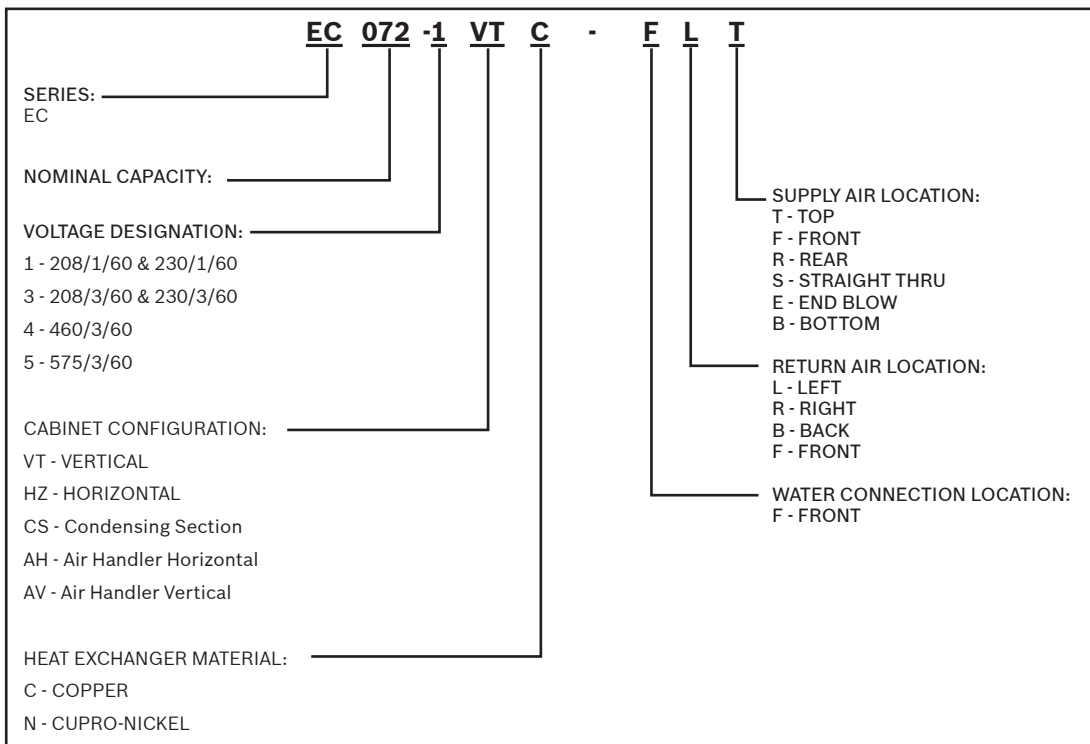
BOSCH

Installation, Operation and Maintenance Manual

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MODEL NOMENCLATURE



INTRODUCTION:

These models use scroll and reciprocating compressors and refrigerant R-410A to achieve high efficiency levels, quiet operation and reliable performance.

The new refrigerant provides performance similar to that of R-22 with one major advantage. Refrigerant R-410A is an HFC so it does not contain any ozone depleting HCFCs or CFCs.

INITIAL INSPECTION:

Be certain to inspect all cartons or crates on each unit as received at the job site before signing the freight bill. Verify that all items have been received and that there are no visible damages; note any shortages or damages on all copies of the freight bill. In the event of damage or shortage, remember that the purchaser is responsible for filing the necessary claims with the carrier. Concealed damages not discovered until after removing the units from the packaging must be reported to the carrier within 24 hours.

GENERAL DESCRIPTION:

These Water-to-Air Heat Pumps provide the best combination of performance and efficiency available. Safety devices are built into each unit to provide the maximum system protection possible when properly installed and maintained.

These Water-to-Air Heat Pumps are Underwriters Laboratories (UL), (CE) and (CUL) listed for safety. The Water-to-Air Heat Pumps are designed to operate with entering liquid temperature between 50° F and 100° F. With the extended range option, the heat pump can operate with entering liquid temperatures between 25° F and 110° F.



NOTE: 50° F Min. EWT for well water applications with sufficient water flow to prevent freezing. Antifreeze solution is required for all closed loop applications.

Cooling Tower/ Boiler and Earth Coupled (GeoThermal) applications should have sufficient antifreeze solution to protect against extreme conditions and equipment failure. Frozen water coils are not covered under warranty.



WARNING: This product should not be used for temporarily heating/cooling during construction. Doing so may effect the units warranty.

MOVING AND STORAGE:

If the equipment is not needed for immediate installation upon its arrival at the job site, it should be left in its shipping carton and stored in a clean, dry area. Units must only be stored or moved in the normal upright position as indicated by the “UP” arrows on each carton at all times. If unit stacking is required, stack

units as follows: Vertical units less than 6 tons, no more than two high. Horizontal units less than 6 tons, no more than three high. “Do not stack units larger than 6 tons.”

SAFETY CONSIDERATIONS:



CAUTION: R-410A systems operate at higher pressures than standard R-22 systems. Do not use R-22 service equipment or components on R-410A equipment.

Installation and servicing of this equipment can be hazardous due to system pressure and electrical components. Only trained and qualified personnel should install, repair, or service the equipment. Untrained personnel can perform basic functions of maintenance such as cleaning coils and replacing filters.



WARNING: Before performing service or maintenance operations on the system, turn off main power to the unit. Electrical shock could cause personal injury or death.

When working on equipment, always observe precautions described in the literature, tags, and labels attached to the unit. Follow all safety codes. Wear safety glasses and work gloves. Use a quenching cloth for brazing, and place a fire extinguisher close to the work area.

LOCATION:

Locate the unit in an indoor area that allows easy removal of the filter and access panels, and has enough room for service personnel to perform maintenance or repair. Provide sufficient room to make water, electrical, and duct connection(s). If the unit is located in a confined space such as a closet, provisions must be made for return air to freely enter the space. On horizontal units, allow adequate room below the unit for a condensate drain trap and do not locate the unit above supply piping. These units are not approved for outdoor installation; therefore, they must be installed inside the structure being conditioned. Do not locate in areas that are subject to freezing.

INSTALLATION:



WARNING: Remove all shipping blocks under blower housing. Loosen compressor mounting bolts.

MOUNTING VERTICAL UNITS:

Vertical units up to five tons are available in left, right, front, or rear air return configurations. Vertical units should be mounted level on a vibration absorbing pad slightly larger than the base to minimize vibration transmission to the building structure. It is not necessary to anchor the unit to the floor. (See Figure #1). Vertical units larger than five tons should be vibration isolated according to the design engineers specifications.

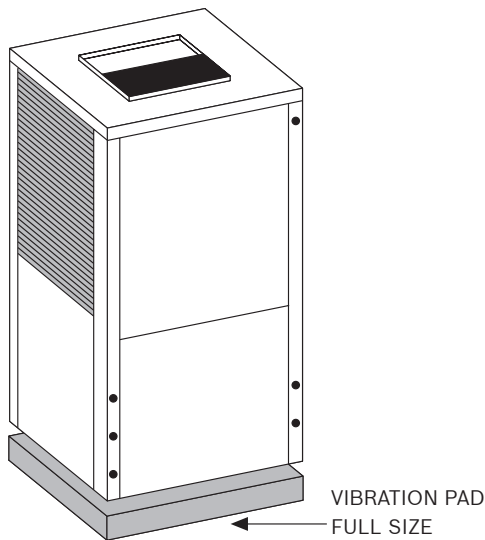


Figure #1

MOUNTING HORIZONTAL UNITS:

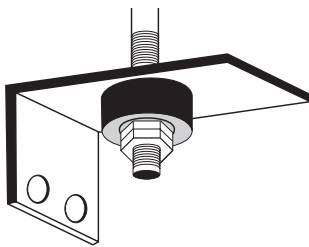


Figure #2

While horizontal units may be installed on any level surface strong enough to hold their weight, they are typically suspended above a ceiling by threaded rods. The rods are usually attached to the unit corners by hanger bracket kits. (See Figure #2). The rods must be securely anchored to the ceiling. Refer to the hanging bracket assembly and installation instructions (Included with the unit) for details. Units larger than six tons include an integral angle iron frame with mounting holes present. (See unit horizontal detail drawing). Horizontal units installed above the ceiling must conform to all local codes. An auxiliary drain pan if required by code, should be at least four inches larger than the bottom of the heat pump. Plumbing connected to the heat pump must not come in direct contact with joists, trusses, walls, etc..

Some applications require an attic floor installation of the horizontal unit. In this case the unit should be set in a full size secondary drain pan on top of a vibration absorbing mesh. The secondary drain pan prevents possible condensate overflow or water leakage damage to the ceiling. The secondary drain pan is usually placed on a plywood base isolated from the ceiling joists by additional layers of vibration absorbing mesh. In both cases, a 3/4" drain connected to this secondary pan

should be run to an eave at a location that will be noticeable. If the unit is located in a crawl space, the bottom of the unit must be at least 4" above grade to prevent flooding of the electrical parts due to heavy rains.

CONDENSATE DRAIN:



WARNING: If equipped with float style condensate overflow switch, final adjustment must be made in the field.

A drain line must be connected to the heat pump and pitched away from the unit a minimum of 1/8" per foot to allow the condensate to flow away from the unit.

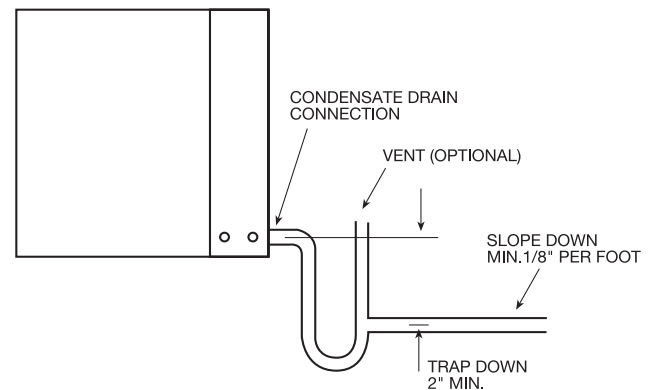


Figure #3

This connection must be in conformance with local plumbing codes. A trap must be installed in the condensate line to insure free condensate flow. (Units are not internally trapped). A vertical air vent is sometimes required to avoid air pockets. (See Figure #3). The length of the trap depends on the amount of positive or negative pressure on the drain pan.

A second trap must not be included. The horizontal unit should be pitched approximately 1/4" towards the drain in both directions, to facilitate condensate removal. (See Figure #4)

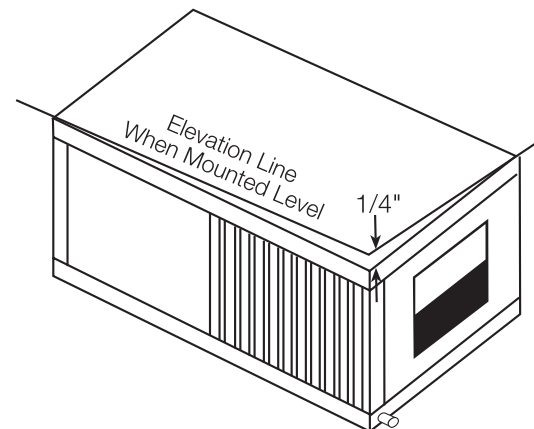


Figure #4

DUCT SYSTEM:

All models are provided with a return air duct flange, while a supply air outlet collar is provided on all models except the 6 thru 12 ton horizontal models to facilitate duct connections. Refer to the individual data specification sheet for physical dimensions of the collar and flange.

A flexible connector is recommended for supply and return air connections on metal duct systems. All metal ducting should be insulated with a minimum of one inch duct insulation to avoid heat loss or gain and prevent condensate forming during the cooling operation. Application of the unit to uninsulated duct work is not recommended as the unit's performance will be adversely affected. Do not connect discharge ducts directly to the blower outlet. The factory provided air filter must be removed when using a filter back return air grill. The factory filter should be left in place on a free return system.

If the unit will be installed in a new installation with new duct work, the installation should be designed using current ASHRAE procedures for duct sizing. If the unit will be connected to an existing duct system, a check should be made to assure that the duct system has the capacity to handle the air required for the unit application. If the duct system is too small, larger duct work must be installed. Be certain to check for existing leaks and repair.

The duct system and all diffusers should be sized to handle the designed air flow quietly. To maximize sound attenuation of the unit blower, the supply and return air plenums should be insulated. There should be no direct straight air path thru the return air grille into the heat pump. The return air inlet to the heat pump must have at least one 90 degree turn away from the space return air grille. If air noise or excessive air flow are a problem, the blower speed can be changed to a lower speed to reduce air flow.

ELECTRICAL:

All field wiring must comply with local and national fire, safety and electrical codes. Power to the unit must be within the operating voltage range indicated on the unit's nameplate. On three phase units, phases must be balanced within 2%.

Properly sized fuses or HACR circuit breakers must be installed for branch circuit protection. See equipment rating plate for maximum size. The unit is supplied with an opening for attaching conduit. Be certain to connect the ground lead to the ground lug in the control box. Connect the power leads as indicated on the unit wiring diagram.

THERMOSTAT CONNECTIONS:

Thermostat wiring is connected to the 5-position (6-position on dual compressor models) low voltage terminal block located in the upper portion of the electrical box. The thermostat connections and their functions are as follows:

C	Transformer 24 VAC Common
O	Reversing Valve (energized in cooling)
Y	Compressor contactor
Y1	1ST stage compressor contractor (dual-compressor unit)
Y2	2ND stage compressor contractor (dual-compressor unit)
R	Transformer 24 VAC Hot
G	Fan

SAFETY DEVICES AND THE UPM CONTROLLER

Each unit is factory provided with a Unit Protection Module (UPM) that controls the compressor operation and monitors the safety controls that protect the unit.

Safety controls include the following:

- High pressure switch located in the refrigerant discharge line and wired across the HPC terminals on the UPM
- Low pressure switch located in the unit refrigerant suction line and wired across terminals LPC1 and LPC2 on the UPM.
- Freeze protection sensor, mounted close to condensing water coil, monitors refrigerant temperature between condensing water coil and thermal expansion valve. If temperature drops below or remains at freeze limit trip for 30 seconds, the controller will shut down the compressor and enter into a soft lockout condition. The default freeze limit trip is 30°F, however this can be changed to 15°F by cutting the R42 resistor located on top of DIP switch SW1.
- The condensate overflow protection sensor is located in the drain pan of the unit and connected to the 'COND' terminal on the UPM board.
- Units with two compressors will be equipped with UPM II.
- UPM II provides the same protection for each compressor.
- The UPMII has the following Inputs and Outputs:

Digital Outputs: Three digital outputs relay contacts rated at 10A resistive @ 125 VAC; Two dedicated for the compressor contactor 24VAC when "ON" and one dedicated for alarm purposes dry contact Normally Open (NO)

Inputs: Dedicated inputs for:

- High Pressure Switches (HPC)
- Low Pressure Switches (LPC)
- Freeze Sensors (FREEZE) 10 K @ 77F Thermistor
- Condensate Overflow Sensor (CON) 230 K +/- 15%
- Compressor Call (Y) Signals

Please see figure 6 for UPM II Board layout.

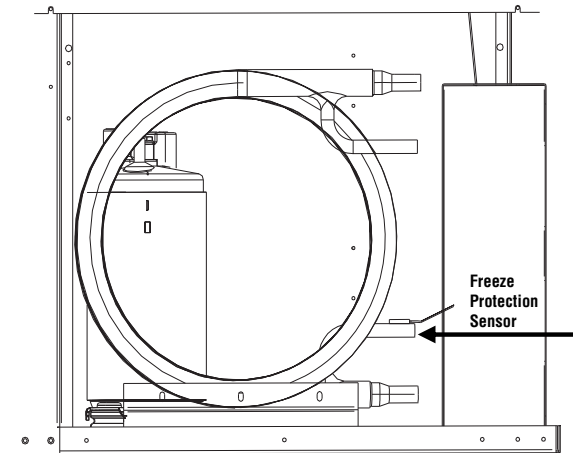


Figure 5 Freeze Protection Sensor



NOTE: If freeze protection sensor is not installed, a jumper between freeze contacts must be installed on the UPM board otherwise unit will not start.

The UPM includes the following features:

- **ANTI-SHORT CYCLE TIME**—5 minute delay on break timer to prevent compressor short cycling.
- **RANDOM START**—Each controller has a unique random start delay ranging from 270 to 300 seconds to reduce the chances of multiple units simultaneously starting after initial power up or after a power interruption, creating a large electrical spike.
- **LOW PRESSURE BYPASS TIMER**—If the compressor is running and the low pressure switch opens, then the control will keep the compressor on for 120 seconds. After 2 minutes if the low pressure switch remains open, the control will shut down the compressor and enter a soft lockout. The compressor will not be energized until the low pressure switch closes and the anti-short cycle time delay expires. If the low pressure switch opens 2–4 times in 1 hour, the unit will enter a hard lock out and need to be reset.
- **BROWNOUT/SURGE/POWER INTERRUPTION PROTECTION**—The brownout protection in the UPM board will shut down the compressor if the incoming power falls below 18 VAC. The compressor will remain off till the voltage goes above 18 VAC and the anti short cycle timer (300 seconds) times out. The unit will not go into a hard lockout.

- **MALFUNCTION OUTPUT**—Alarm output is Normally Open (NO) dry contact. If 24 VAC output is needed R must be wired to the ALR-COM terminal; 24VAC will be available on the ALR-OUT terminal when the unit is in alarm condition. If pulse is selected the alarm output will be pulsed. The fault output will depend on the dip switch setting for “ALARM”. If it set to “CONST”, a constant signal will be produced to indicate a fault has occurred and the unit requires inspection to determine the type of fault. If it is set to “PULSE”, a pulse signal is produced and a fault code is detected by a remote device indicating the fault. See L.E.D. Fault Indication below for blink code explanations. The remote device must have a malfunction detection capability when the UPM board is set to “PULSE”.
- **TEST DIP SWITCH**—A test dip switch is provided to reduce all time delay settings to 10 seconds during troubleshooting or verification of unit operation. Note that operation of the unit while in test mode can lead to accelerated wear and premature failure of the unit. The “TEST” switch must be set back to “NO” for normal operation.
- **FREEZE SENSOR**—The freeze sensor input is active all the time, if a freeze option is not selected the freeze terminals will need a jumper. There are 2 configurable freeze points, 30°F & 15°F. The unit will enter a soft lock out until the temperature climbs above the set point and the anti-short cycle time delay has expired. The freeze sensor will shut the compressor output down after 90 seconds of water flow loss and report a freeze condition. It is recommended to have a flow switch to prevent the unit from running if water flow is lost.



NOTE: If unit is employing a fresh water system (no anti-freeze protection), it is extremely important to have the “Freeze” jumper R42 resistor set to 30°F in order to shut down the unit at the appropriate leaving water temperature and protect your heat pump from freezing if a freeze sensor is included.

UNIT PROTECTION MODULE (UPM)

The Unit Protection Module (UPM) as shown in figure 6, is a printed circuit board (PCB) that interfaces with the thermostat or the digital direct controller. The main purpose of this device is to protect the compressors by monitoring the different states of switches and sensors of each refrigerant circuit, this device provides time delays and protects the unit against freezing of the water and refrigerant heat exchangers as well as condensate overflow when the appropriate sensors are installed.

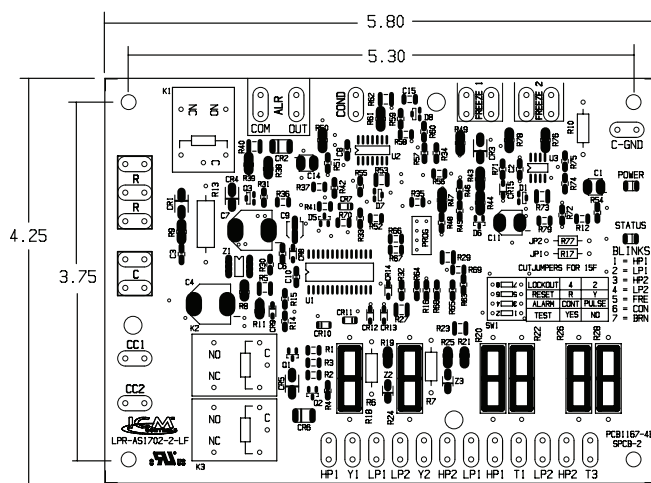


Figure 6—Refer to Unit Wiring Diagram for Connection Details

Alarm output is Normally Open (NO) dry contact. If 24 VAC output is needed R must be wired to the ALR-COM terminal; 24VAC will be available on the ALR-OUT terminal when the unit is in alarm condition. If pulse is selected the alarm output will be pulsed.

- **L.E.D. FAULT INDICATION**—Two L.E.D. indicators are provided:
 - Green: Power L.E.D. indicates 18–30 VAC present at the board.
 - Red: Fault indicator with blink codes as follows:
 - One blink—High pressure lockout
 - Two blinks—Low pressure lockout
 - Three blinks—Freeze sensor lockout
 - Four blinks—Condensate overflow
 - Five blinks—Brownout
- **INTELLIGENT RESET**—If a fault condition is initiated, the 5 minute delay on break time period is initiated and the unit will restart after these delays expire. During this period the fault LED will indicate the cause of the fault. If the fault condition still exists or occurs 2 or 4 times (depending on 2 or 4 setting for Lockout dip switch) before 60 minutes, the unit will go into a hard lockout and requires a manual lockout reset. A single condensate overflow fault will cause the unit to go into a hard lockout immediately, and will require a manual lockout reset.
- **LOCKOUT RESET**—A hard lockout can be reset by turning the unit thermostat off and then back on when the “RESET” dip switch is set to “Y” or by shutting off unit power at the circuit breaker when the “RESET” dip switch is set to “R”.



NOTE: The blower motor will remain active during a lockout condition.

- **UPM BOARD DEFAULT SETTINGS**—Your UPM board will come from the factory with the following default settings:
 - **Freeze**—“Terminals not jumped” on all the time
 - **Temp**—30°F
 - **Lockout**—2
 - **Reset**—“Y”
 - **Alarm**—“PULSE”
 - **Test**—“NO”
 - **Dry Contact**—“Normally Open (NO)”

CONSIDERATIONS

1. Always check incoming line voltage power supply and secondary control voltage for adequacy. Transformer primaries are dual tapped for 208 and 230 volts. Connect the appropriate tap to ensure a minimum of 18 volts secondary control voltage. 24 volts is ideal for best operation.
2. Long length thermostat and control wiring leads may create voltage drop. Increase wire gauge or up-size transformers may be required to insure minimum secondary voltage supply.
3. We recommend the following guidelines for wiring between a thermostat and the unit: 18 GA up to 60 foot, 16 GA up to 100 ft and 14 GA up to 140 ft.
4. Do not apply additional controlled devices to the control circuit power supply without consulting the factory. Doing so may void equipment warranties.
5. Check with all code authorities on requirements involving condensate disposal/over flow protection criteria.

SEQUENCE OF OPERATION

Cooling Mode

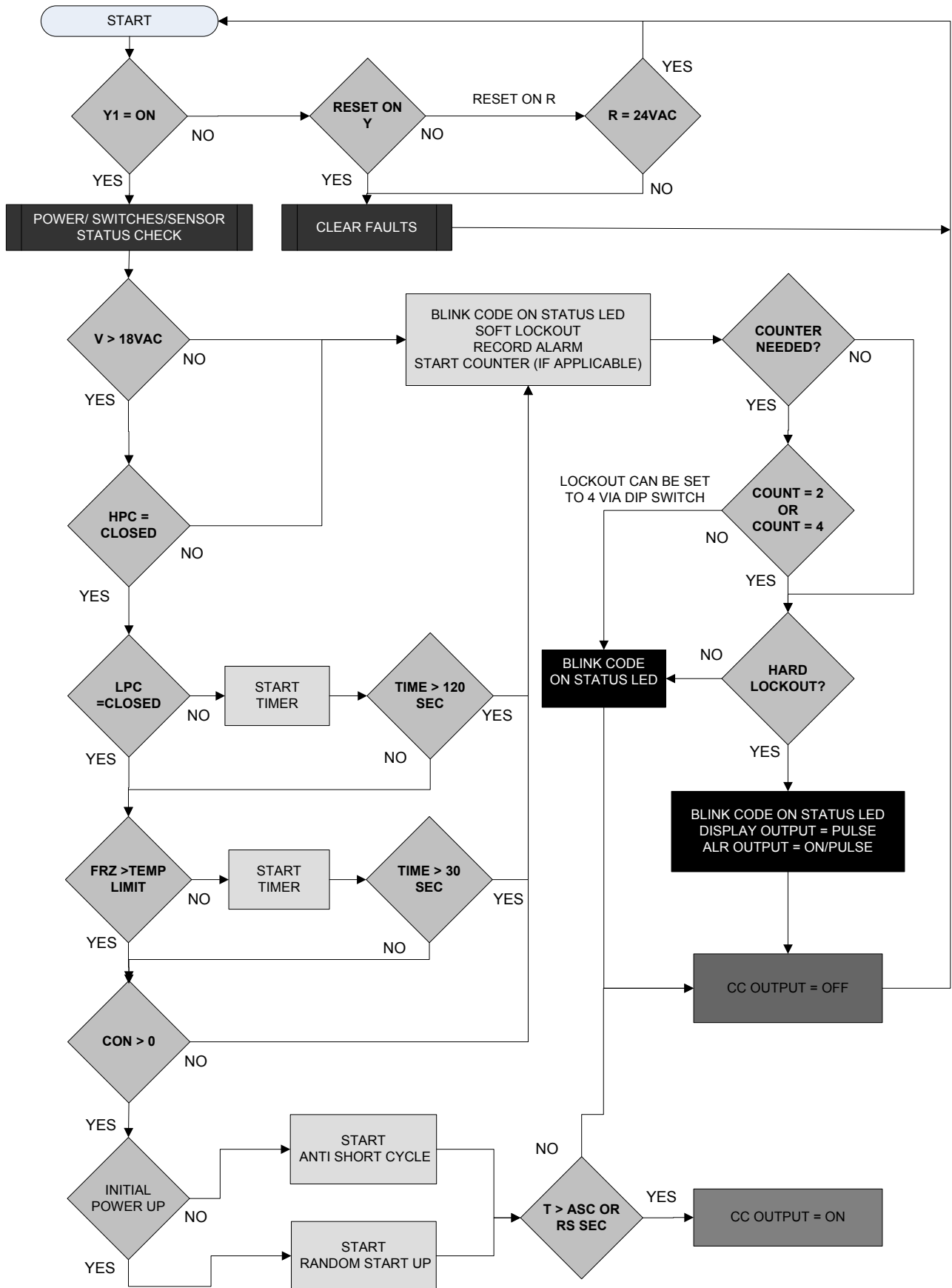
See Typical Wiring Diagram page 24. Energizing the “O” terminal energizes the unit reversing valve in the cooling mode. The fan motor starts when the “G” terminal is energized.

When the thermostat calls for cooling (Y), the loop pump or solenoid valve if present is energized and compressor will start.

Once the thermostat is satisfied, the compressor shuts down accordingly and the fan ramps down to either fan only mode or off over a span of 30 seconds.

Note that a fault condition initiating a lockout will de-energize the compressor.

UPM SEQUENCE OF OPERATION (SOO) FLOW CHART



Heating Mode

Heating operates in the same manner as cooling, but with the reversing valve de-energized. The compressor will run until the desired setpoint temperature on the thermostat is achieved.

Once the thermostat is satisfied, the compressor shuts down and the fan ramps down in either fan only mode or turns off over a span of 30 seconds. Auxiliary electric heating coils are not available on this product line.

UNIT OPTIONS

HOT GAS REHEAT (HGR)

Hot gas reheat allows the user to not only control space temperature, but also humidity levels within the conditioned space. An excess of moisture in the space can allow mold growth leading to damage in the structure or interior surfaces as well as reducing the air quality and creating an unhealthy environment.

The typical control of a unit is by a thermostat that senses the temperature in the space. By utilizing a humidistat in addition to the thermostat we are able to monitor the humidity levels in the space as well. The HGR option allows cooling and dehumidification to satisfy both the thermostat and humidistat.

PIPING:

Supply and return piping must be as large as the unit connections on the heat pump (larger on long runs). Never use flexible hoses of a smaller inside diameter than that of the water connections on the unit. Units are supplied with either a copper or optional cupro-nickel condenser. Copper is adequate for ground water that is not high in mineral content. Should your well driller express concern regarding the quality of the well water available or should any known hazards exist in your area, we recommend proper testing to assure the well water quality is suitable for use with water source equipment. In conditions anticipating moderate scale formation or in brackish water a cupro-nickel heat exchanger is recommended.

Both the supply and discharge water lines will sweat if subjected to low water temperature. These lines should be insulated to prevent damage from condensation.

All manual flow valves used in the system must be ball valves. Globe and gate valves must not be used due to high pressure drop and poor throttling characteristics. Never exceed the recommended water flow rates. Serious damage or erosion of the water to refrigerant heat exchanger could occur.

Always check carefully for water leaks and repair appropriately. Units are equipped with female pipe thread fittings. Consult the specification sheets for sizes. Teflon tape sealer should be used when connecting water

piping connections to the units to insure against leaks and possible heat exchanger fouling. Do not overtighten the connections. Flexible hoses should be used between the unit and the rigid system to avoid possible vibration. Ball valves should be installed in the supply and return lines for unit isolation and unit water flow balancing.

Pressure/temperature ports are recommended in both the supply and return lines for system flow balancing. The water flow can be accurately set by measuring the water-to-refrigerant heat exchangers water side pressure drop. See the unit specification sheets for the water flow and pressure drop information.



CAUTION: Water piping exposed to extreme, low ambient temperatures is subject to freezing.

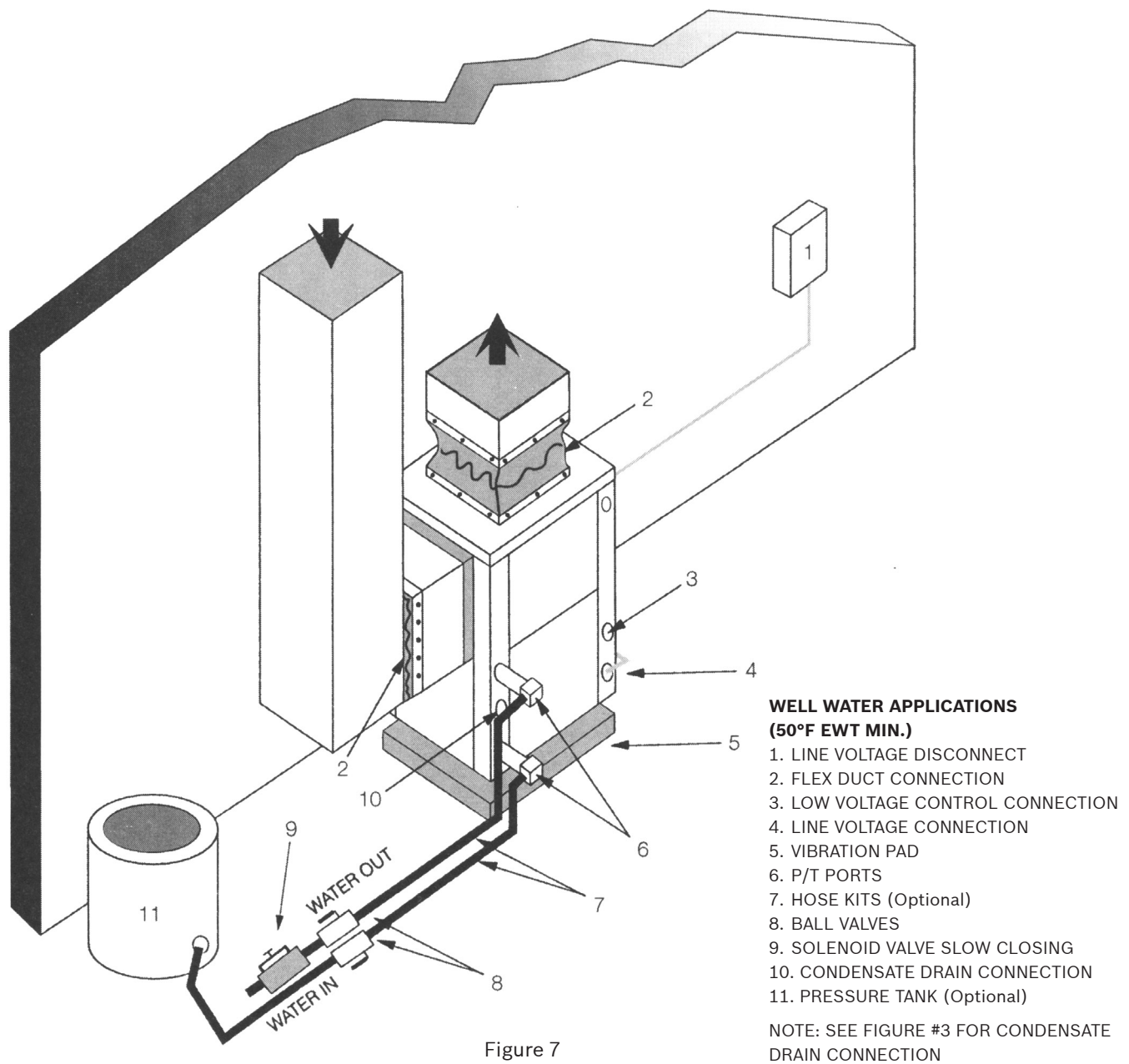


Figure 7

WELL WATER SYSTEMS:

(50° F EWT Min.)

Figure #7

When a water well is used exclusively for supplying water to the heat pump, the pump should operate only when the heat pump operates. A 24 volt, double pole single throw (DP/ST) contactor can be used to operate the well pump with the heat pump.

When two or more units are supplied from one well, the pump can be wired to operate independently from either unit. Two 24-volt double pole single throw relays wired in parallel are required. An upsized VA transformer may be required in either case.

The discharge water from the heat pump is not contaminated in any manner and can be disposed of in various ways depending on local codes (i.e. discharge well, dry well, storm sewer, drain field, stream, pond, etc.)

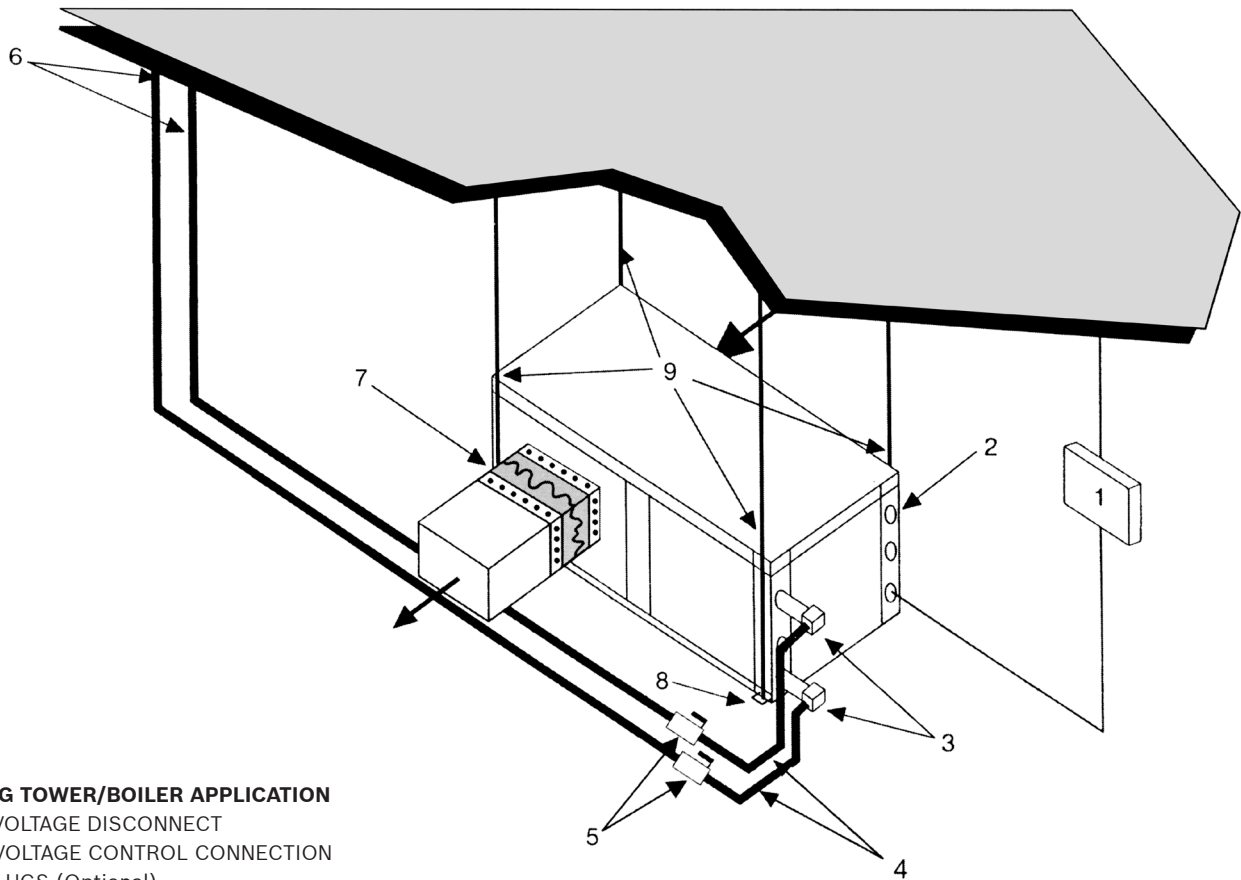


Figure #8

COOLING TOWER/BOILER APPLICATION

1. LINE VOLTAGE DISCONNECT
2. LOW VOLTAGE CONTROL CONNECTION
3. P/T PLUGS (Optional)
4. HOSE KITS
5. BALL VALVES
6. SUPPLY AND RETURN LINES OF CENTRAL SYSTEM
7. FLEX DUCT CONNECTION
8. HANGING BRACKETS ASSEMBLY (1/2 - 3 1/2 TON MODELS)
9. THREADED ROD

NOTE: SEE FIGURE #3 FOR CONDENSATE DRAIN CONNECTION

COOLING TOWER / BOILER APPLICATION:

Figure #8

To assure adequate cooling and heating performance, the cooling tower and boiler water loop temperature should be maintained between 50°F to 75°F in the heating mode and

60°F to 110°F in the cooling mode. In the cooling mode, heat is rejected from the unit into the water loop. A cooling tower provides evaporative cooling to the loop fluid; thus, maintaining a constant supply temperature to the unit. When utilizing an open cooling tower, chemical water treatment is mandatory to ensure the water is free of corrosive materials.

A secondary heat exchanger (plate frame between the unit and the open cooling tower) may also be used. It is imperative that all air is eliminated from the closed loop side of the heat exchanger to prevent condenser fouling.

In the heating mode, heat is absorbed from the water loop to the unit. A boiler can be utilized to maintain the loop within the proper temperature range.

No unit should be connected to the supply or return piping until the water system has been completely cleaned and flushed to remove dirt, piping chips or other foreign material. Supply and return hoses should be connected together during this process to ensure the entire system is properly flushed. After the cleaning and flushing has taken place the unit may be connected to the water loop and should have all valves wide open.

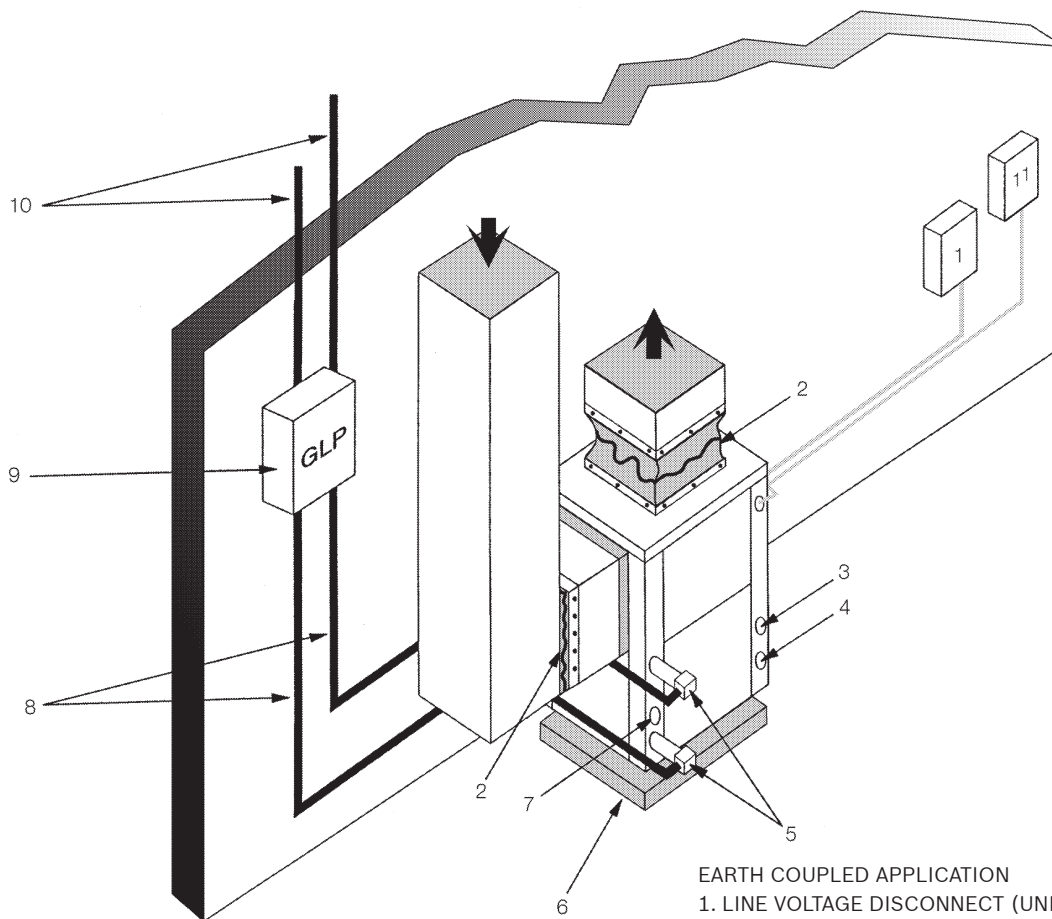


Figure #9

EARTH COUPLED APPLICATION

1. LINE VOLTAGE DISCONNECT (UNIT)
2. FLEX DUCT CONNECTION
3. LOW VOLTAGE CONTROL CONNECTION
4. LINE VOLTAGE CONNECTION (UNIT)
5. P/T PORTS
6. VIBRATION PAD
7. CONDENSATE DRAIN
8. GROUND LOOP CONNECTION KIT
9. GROUND LOOP PUMPING PACKAGE (GL001-1 or 002-1)
10. POLYETHELENE WITH INSULATION
11. LINE VOLTAGE DISCONNECT (ELECTRIC HEATER)

NOTE: SEE FIGURE #3 FOR CONDENSATE DRAIN CONNECTION

EARTH COUPLED SYSTEMS:

Operation of a unit on a closed loop application requires the extended range option.



NOTE: Closed loop and pond applications require specialized design knowledge. No attempt at these installations should be made unless the dealer has received specialized training.

Utilizing Ground Loop Pumping Package (GLP), makes the installation easy. Anti-freeze solutions must be utilized when low evaporating conditions are expected to occur. Refer to the installation manuals for more specific instructions.

SYSTEM CHECKOUT:

- After completing the installation, and before energizing the unit, the following system checks should be made:
- Verify that the supply voltage to the heat pump is in accordance with the nameplate ratings.
- Make sure that all electrical connections are tight and secure.
- Check the electrical fusing and wiring for the correct size.
- Verify that the low voltage wiring between the thermostat and the unit is correct.
- Verify that the water piping is complete and correct.
- Check that the water flow is correct, and adjust if necessary.
- Check the blower for free rotation, and that it is secured to the shaft.
- Verify that vibration isolation has been provided.
- Unit is serviceable. Be certain that all access panels are secured in place.

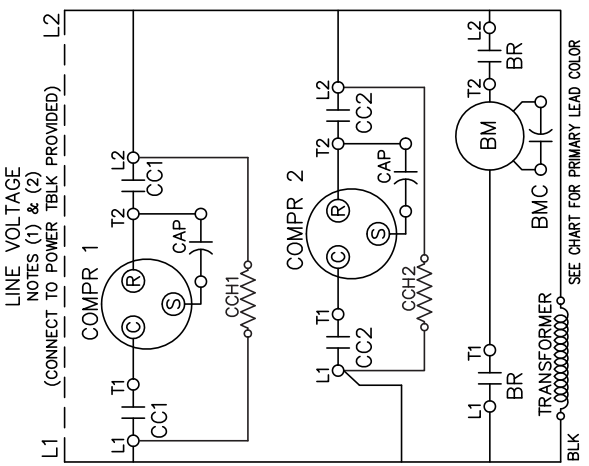
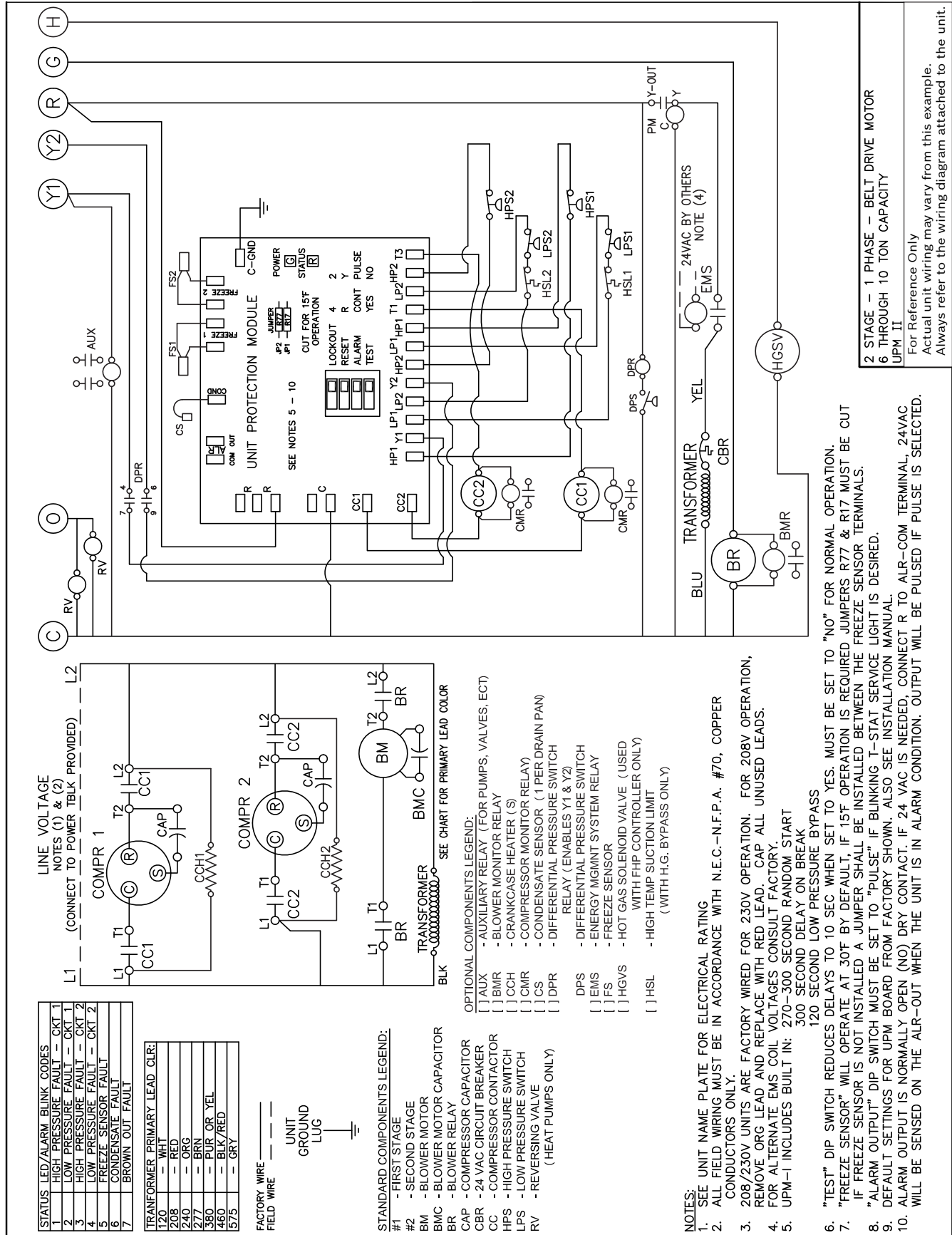
UNIT START-UP:

1. Set the thermostat to the highest setting.
2. Set the thermostat system switch to "COOL", and the fan switch to the "AUTO" position. The reversing valve solenoid should energize. The compressor and fan should not run.
3. Reduce the thermostat setting approximately 5 degrees below the room temperature.
4. Verify the heat pump is operating in the cooling mode.
5. Turn the thermostat system switch to the "OFF" position. The unit should stop running and the reversing valve should de-energize.
6. Leave the unit off for approximately (5) minutes to allow for system equalization.
7. Turn the thermostat to the lowest setting.
8. Set the thermostat switch to "HEAT".
9. Increase the thermostat setting approximately 5 degrees above the room temperature.
10. Verify the heat pump is operating in the heating mode.
11. Set the thermostat to maintain the desired space temperature.
12. Check for vibrations, leaks, etc...
13. Instruct the owner on the unit and thermostat operation.

MAINTENANCE:

1. Filter changes or cleanings are required at regular intervals. The time period between filter changes will depend upon type of environment the equipment is used in. In a single family home, that is not under construction, changing or cleaning the filter every 60 days is sufficient. In other applications, such as motels, where daily vacuuming produces a large amount of lint, filter changes may need to be as frequent as biweekly.
2. An annual "checkup" is recommended by a licensed refrigeration mechanic. Recording the performance measurements of volts, amps, and water temperature differences (both heating and cooling) is recommended. This data should be compared to the information on the unit's data plate and the data taken at the original startup of the equipment.
3. Lubrication of the blower motor is not required, however, may be performed on some motors to extend motor life. Use SAE-20 non-detergent electric motor oil.
4. The condensate drain should be checked annually by cleaning and flushing to insure proper drainage.
5. Periodic lockouts almost always are caused by air or water flow problems. The lockout (shutdown) of the unit is a normal protective measure in the design of the equipment. If continual lockouts occur call a mechanic immediately and have them check for: water flow problems, water temperature problems, air flow problems or air temperature problems. Use of the pressure and temperature charts for the unit may be required to properly determine the cause.

WIRING DIAGRAM

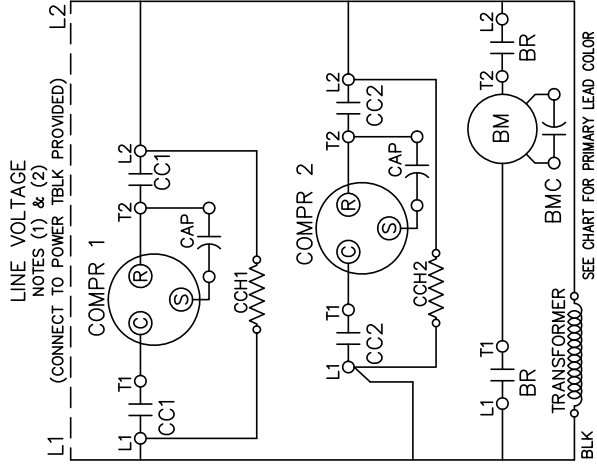
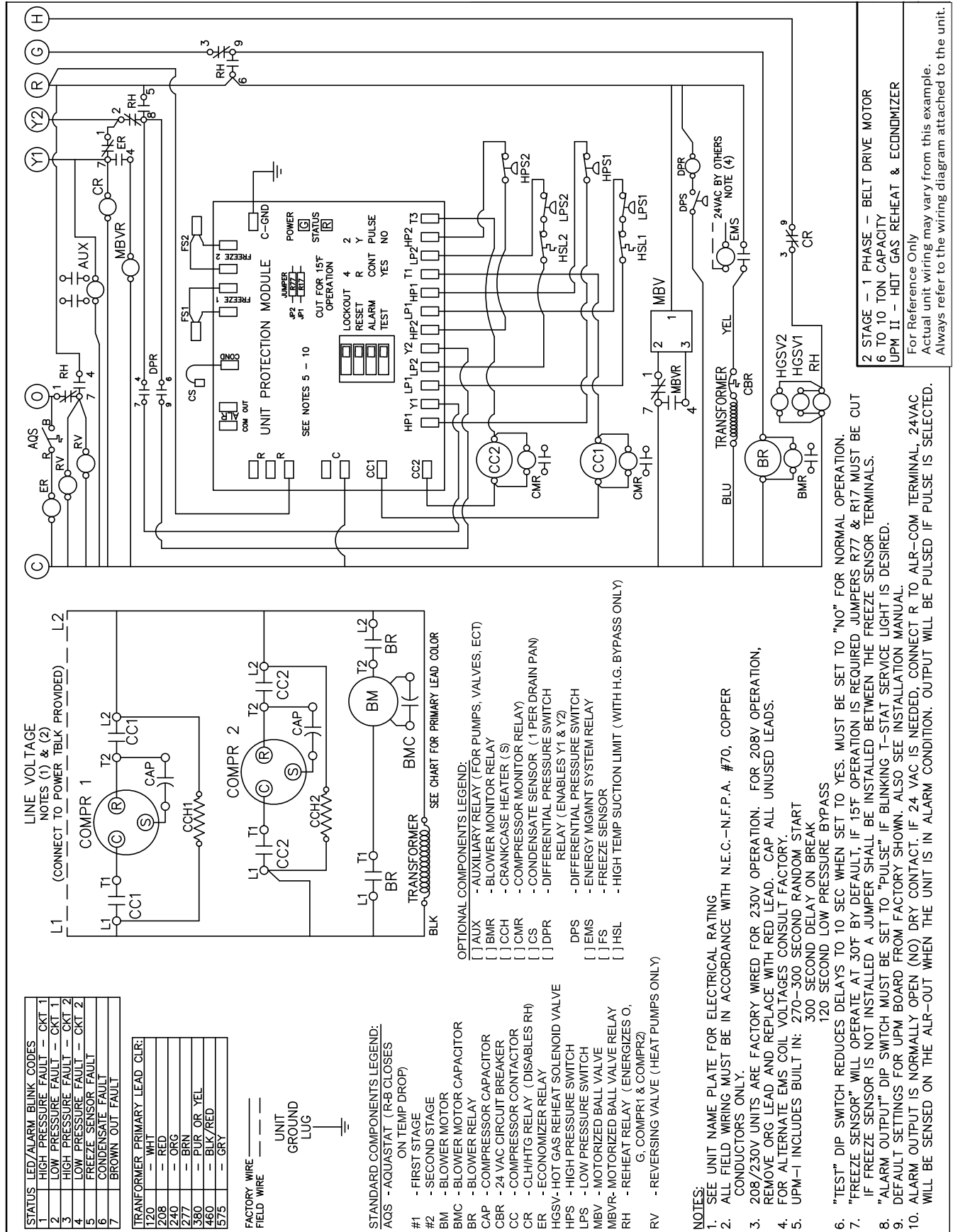


- OPTIONAL COMPONENTS LEGEND:
- () AUX - AUXILIARY RELAY (FOR PUMPS, VALVES, ECT)
 - () BMR - BLOWER MOTOR RELAY
 - () CCH - CRANKCASE HEATER (S)
 - () CMR - COMPRESSOR MONITOR RELAY
 - () CS - CONDENSATE SENSOR (1 PER DRAIN PAN)
 - () DPR - DIFFERENTIAL PRESSURE SWITCH RELAY (ENABLES Y1 & Y2)
 - () DPS - DIFFERENTIAL PRESSURE SWITCH
 - () EMS - ENERGY MGMT SYSTEM RELAY
 - () FS - FREEZE SENSOR
 - () HGVS - HOT GAS SOLENOID VALVE (USED WITH FHP CONTROLLER ONLY)
 - () HSL - HIGH TEMP SUCTION LIMIT (WITH H.G. BYPASS ONLY)

- NOTES:
1. SEE UNIT NAME PLATE FOR ELECTRICAL RATING
 2. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C.-N.F.P.A. #70, COPPER CONDUCTORS ONLY.
 3. 208/230V UNITS ARE FACTORY WIRING FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEADS.
 4. FOR ALTERNATE EMS COIL VOLTAGES CONSULT FACTORY.
 5. UPM-1 INCLUDES BUILT IN: 270-300 SECOND RANDOM START 300 SECOND DELAY ON BREAK 120 SECOND LOW PRESSURE BYPASS
 6. "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
 7. "FREEZE SENSOR" WILL OPERATE AT 30F BY DEFAULT. IF 15F OPERATION IS REQUIRED JUMPERS R77 & R17 MUST BE CUT
 8. "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BLINKING T-STAT SERVICE LIGHT IS DESIRED.
 9. DEFAULT SETTINGS FOR UPM BOARD FROM FACTORY SHOWN. ALSO SEE INSTALLATION MANUAL.
 10. ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24 VAC IS NEEDED, CONNECT R TO ALR-COM TERMINAL, 24VAC WILL BE SENSED ON THE ALR-OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.

2 STAGE - 1 PHASE - BELT DRIVE MOTOR
 6 THROUGH 10 TON CAPACITY
 UPM II
 For Reference Only
 Actual unit wiring may vary from this example.
 Always refer to the wiring diagram attached to the unit.

WIRING DIAGRAM



STATUS LED/ALARM BLINK CODES	
1	HIGH PRESSURE FAULT - CKT 1
2	LOW PRESSURE FAULT - CKT 1
3	HIGH PRESSURE FAULT - CKT 2
4	LOW PRESSURE FAULT - CKT 2
5	FREEZE SENSOR FAULT
6	CONDENSATE FAULT
7	BROWN OUT FAULT

TRANSFORMER PRIMARY LEAD CLR:	
120	WHT
208	RED
240	ORC
249	ORC
277	BRN
380	BLU OR YEL
460	BLK/RED
575	GRY

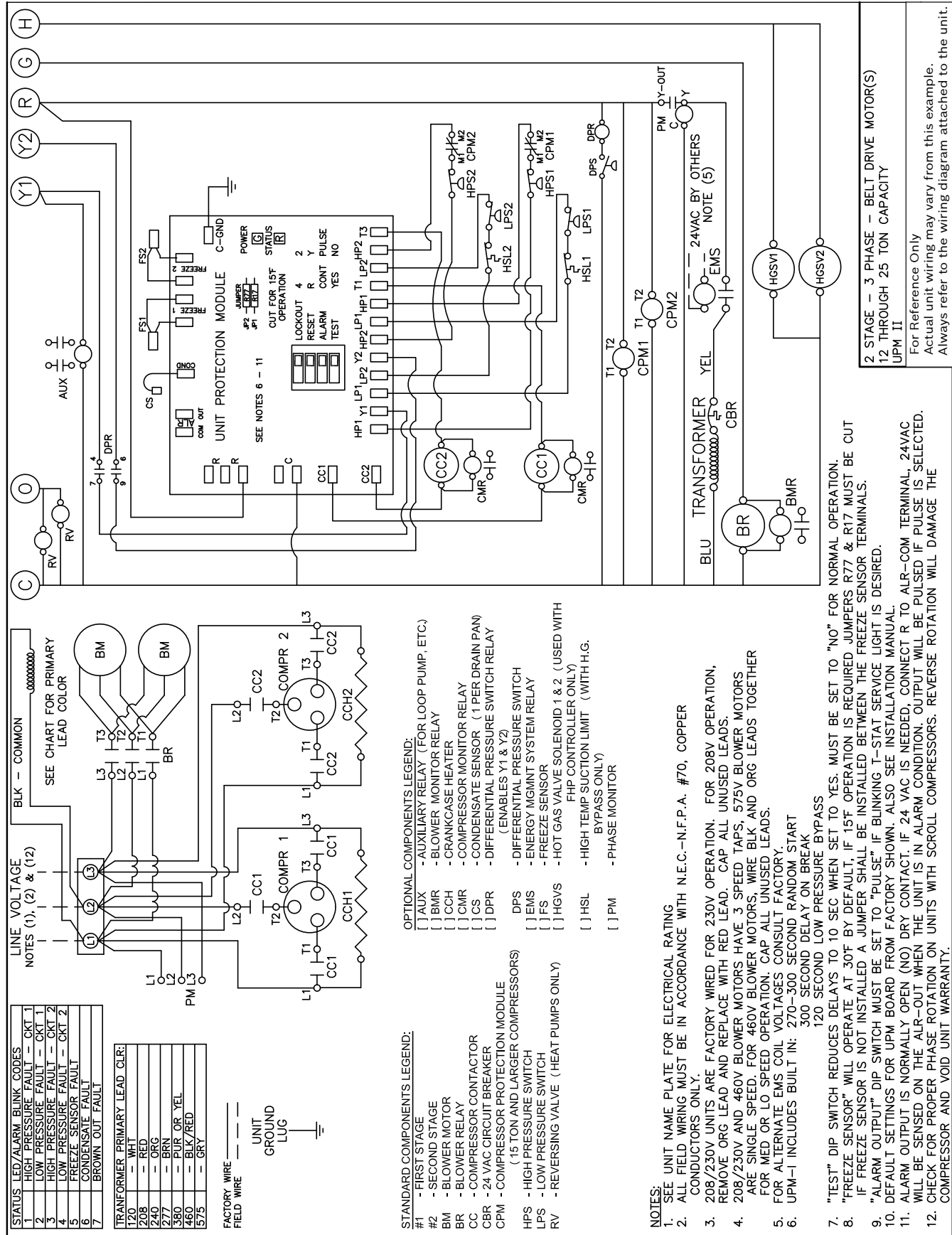


- OPTIONAL COMPONENTS LEGEND:
 [] AUX - AUXILIARY RELAY (FOR PUMPS, VALVES, ECT)
 [] BMR - BLOWER MONITOR RELAY
 [] CH - CRANKCASE HEATER (S)
 [] CMR - COMPRESSOR MONITOR RELAY
 [] CS - CONDENSATE SENSOR (1 PER DRAIN PAN)
 [] DPR - DIFFERENTIAL PRESSURE SWITCH RELAY (ENABLES Y1 & Y2)
 [] DPS - DIFFERENTIAL PRESSURE SWITCH
 [] EMS - ENERGY MGMT SYSTEM RELAY
 [] FS - FREEZE SENSOR
 [] HSL - HIGH TEMP SUCTION LIMIT (WITH H.G. BYPASS ONLY)

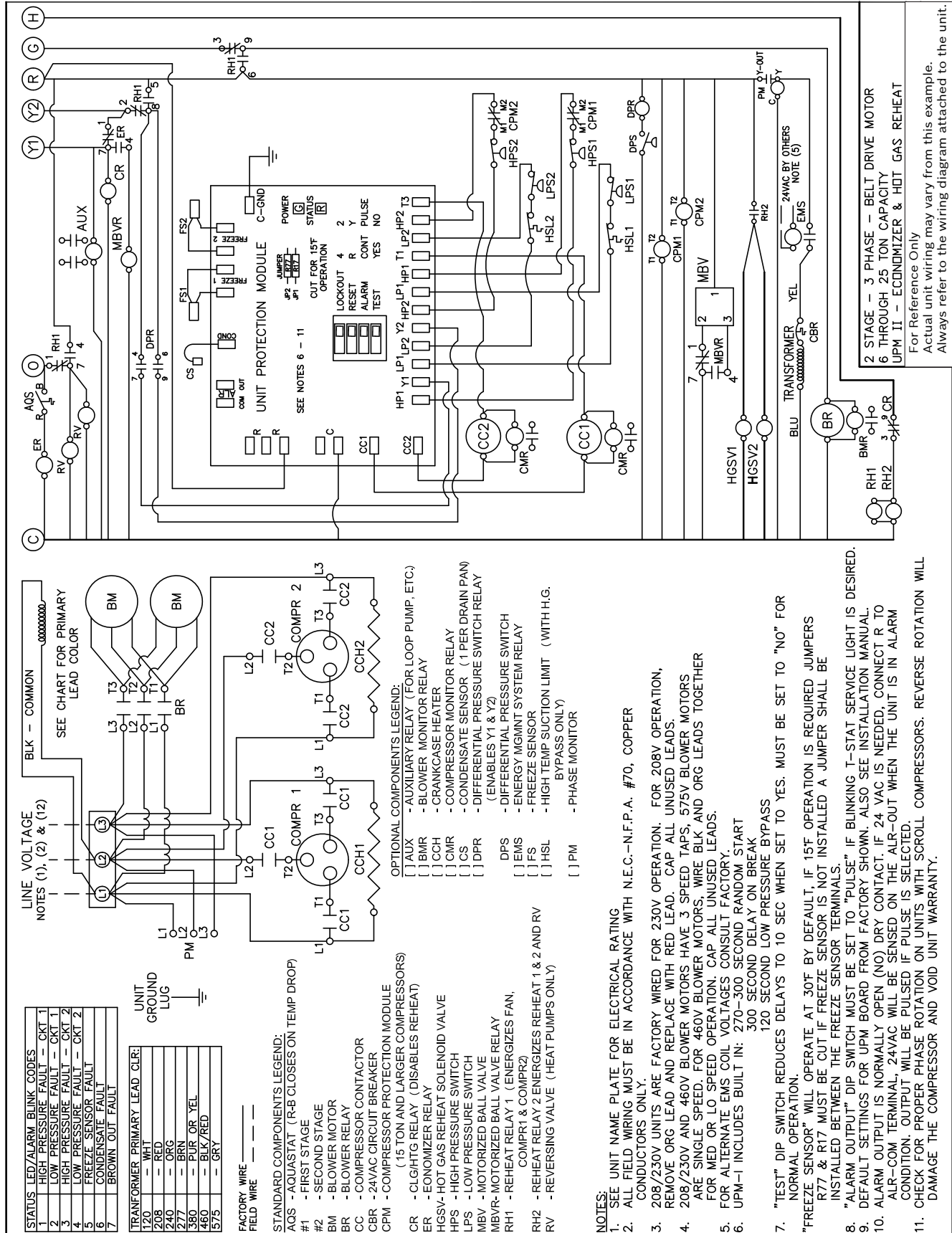
- NOTES:
 1. SEE UNIT NAME PLATE FOR ELECTRICAL RATING
 2. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C.-N.F.P.A. #70, COPPER CONDUCTORS ONLY
 3. 208/230V UNITS ARE FACTORY WIRE FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEADS.
 4. FOR ALTERNATE EMS COIL VOLTAGES CONSULT FACTORY.
 5. UPM-1 INCLUDES BUILT IN: 270-300 SECOND RANDOM START 300 SECOND DELAY ON BREAK 120 SECOND LOW PRESSURE BYPASS
 6. "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
 7. "FREEZE SENSOR" WILL OPERATE AT 30°F BY DEFAULT, IF 15°F OPERATION IS REQUIRED JUMPERS R77 & R17 MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
 8. "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BLINKING T-STAT SERVICE LIGHT IS DESIRED.
 9. DEFAULT SETTINGS FOR UPM BOARD FROM FACTORY SHOWN. ALSO SEE INSTALLATION MANUAL.
 10. ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24 VAC IS NEEDED, CONNECT R TO ALR-COM TERMINAL, 24VAC WILL BE SENSED ON THE ALR-OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.

2 STAGE - 1 PHASE - BELT DRIVE MOTOR
 6 TO 10 TON CAPACITY
 UPM II - HOT GAS REHEAT & ECONOMIZER
 For Reference Only
 Actual unit wiring may vary from this example.
 Always refer to the wiring diagram attached to the unit.

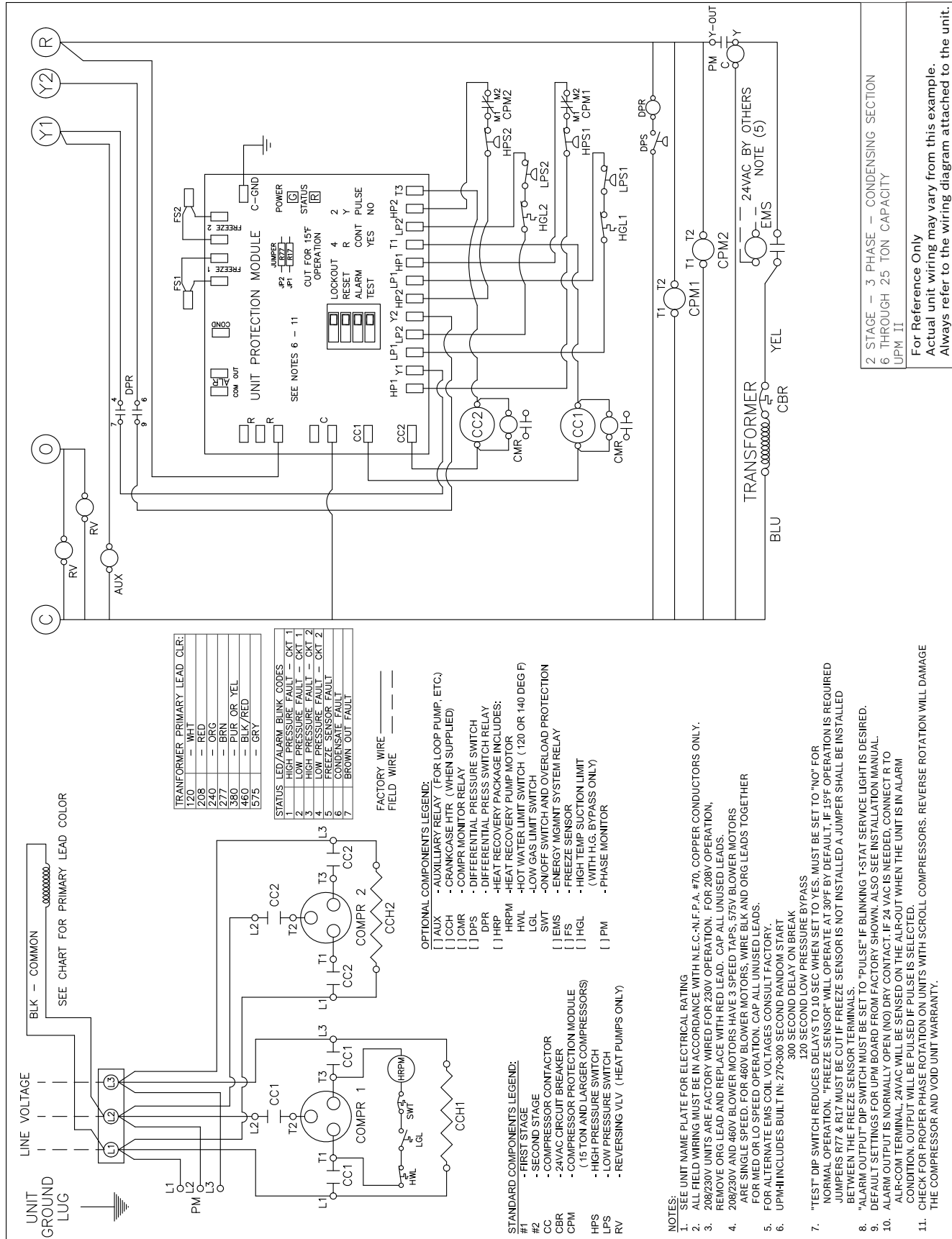
WIRING DIAGRAM



WIRING DIAGRAM



WIRING DIAGRAM



TRANSFORMER PRIMARY LEAD CLR:	STATUS LED/ALARM BLINK CODES
1/20 - WHI	1 HIGH PRESSURE FAULT - CKT 1
2/06 - RED	2 LOW PRESSURE FAULT - CKT 1
2/08 - GRN	3 HIGH PRESSURE FAULT - CKT 2
2/17 - BRN	4 LOW PRESSURE FAULT - CKT 2
3/60 - PUR OR YEL	5 FREEZE SENSOR FAULT
3/60 - BLK/RED	6 UNIT FAULT
4/60 - BLK/RED	7 BROWN OUT FAULT
5/75 - GRY	

TRANSFORMER PRIMARY LEAD CLR:	STATUS LED/ALARM BLINK CODES
1/20 - WHI	1 HIGH PRESSURE FAULT - CKT 1
2/06 - RED	2 LOW PRESSURE FAULT - CKT 1
2/08 - GRN	3 HIGH PRESSURE FAULT - CKT 2
2/17 - BRN	4 LOW PRESSURE FAULT - CKT 2
3/60 - PUR OR YEL	5 FREEZE SENSOR FAULT
3/60 - BLK/RED	6 UNIT FAULT
4/60 - BLK/RED	7 BROWN OUT FAULT
5/75 - GRY	

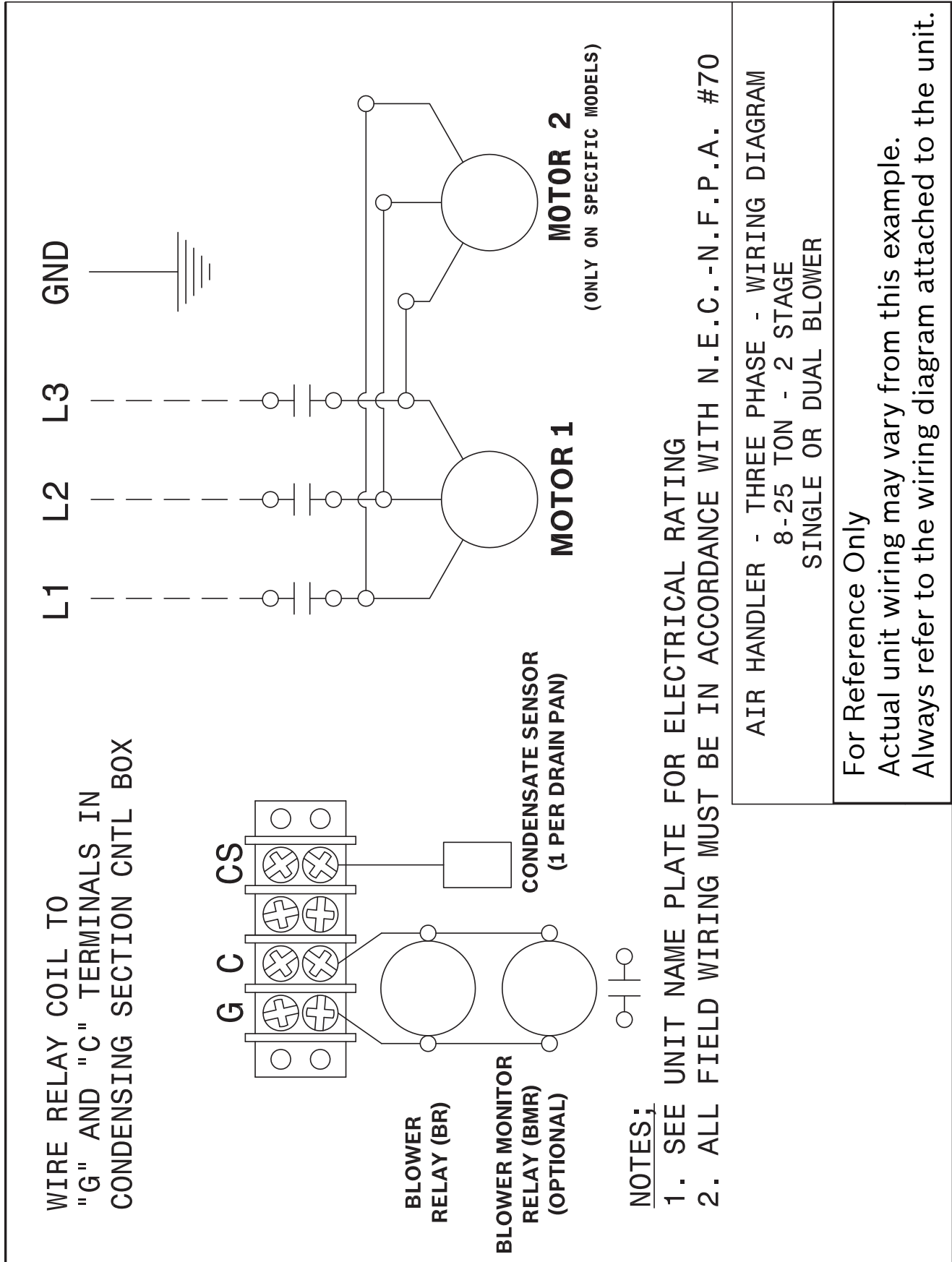
- FACTORY WIRE ---
FIELD WIRE - - - -
- OPTIONAL COMPONENTS LEGEND:**
- [] AUX - AUXILIARY RELAY (FOR LOOP PUMP, ETC.)
 - [] CCH - CRANKCASE HTR (WHEN SUPPLIED)
 - [] CMR - COMP MONITOR RELAY
 - [] DPR - DIFFERENTIAL PRESSURE SWITCH
 - [] HRP - HEAT RECOVERY PUMP MOTOR
 - [] HVL - HOT WATER LIMIT SWITCH (120 OR 140 DEG F)
 - [] LGL - LOW GAS LIMIT SWITCH
 - [] LGS - LOW WATER LIMIT SWITCH
 - [] LMS - ENERGY MGMT SYSTEM RELAY
 - [] FS - FREEZE SENSOR
 - [] HGL - HIGH TEMP SUCTION LIMIT (WITH H.G. BYPASS ONLY)
 - [] PM - PHASE MONITOR
- STANDARD COMPONENTS LEGEND:**
- #1 - FIRST STAGE
 - #2 - SECOND STAGE
 - CC - COMPRESSOR CONTACTOR
 - CBR - 24VAC CIRCUIT BREAKER
 - CPM - COMPRESSOR PROTECTION MODULE (15 TON AND LARGER COMPRESSORS)
 - HPS - HIGH PRESSURE SWITCH
 - LPS - LOW PRESSURE SWITCH
 - RV - REVERSING VLV (HEAT PUMPS ONLY)

- NOTES:**
- SEE UNIT NAME PLATE FOR ELECTRICAL RATING
 - ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C./N.F.P.A. #70, COPPER CONDUCTORS ONLY.
 - 208/230V UNITS ARE FACTORY WIRED FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEADS.
 - 208/230V AND 460V BLOWER MOTORS HAVE 3 SPEED TAPS. 575V BLOWER MOTORS ARE SINGLE SPEED. FOR 460V BLOWER MOTORS, WIRE BLK AND ORG LEADS TOGETHER FOR MED OR LO SPEED OPERATION. CAP ALL UNUSED LEADS.
 - FOR ALTERNATE EMS COIL VOLTAGES, CONSULT FACTORY.
 - UPM-H INCLUDES BUILT-IN: 270-300 SECOND RANDOM START
300 SECOND DELAY ON BREAK
120 SECOND LOW PRESSURE BYPASS
120 SECOND LOW PRESSURE DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION. "FREEZE SENSOR" WILL OPERATE AT 30°F BY DEFAULT. IF 15°F OPERATION IS REQUIRED JUMPERS R77 & R17 MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
 - "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BLINKING T-STAT SERVICE LIGHT IS DESIRED.
 - DEFAULT SETTINGS FOR UPM BOARD FROM FACTORY SHOWN. ALSO SEE INSTALLATION MANUAL.
 - ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24 VAC IS NEEDED, CONNECT R TO ALR-COM TERMINAL. 24VAC WILL BE SENSED ON THE ALR-OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.
 - CHECK FOR PROPER PHASE ROTATION ON UNITS WITH SCROLL COMPRESSORS. REVERSE ROTATION WILL DAMAGE THE COMPRESSOR AND VOID UNIT WARRANTY.

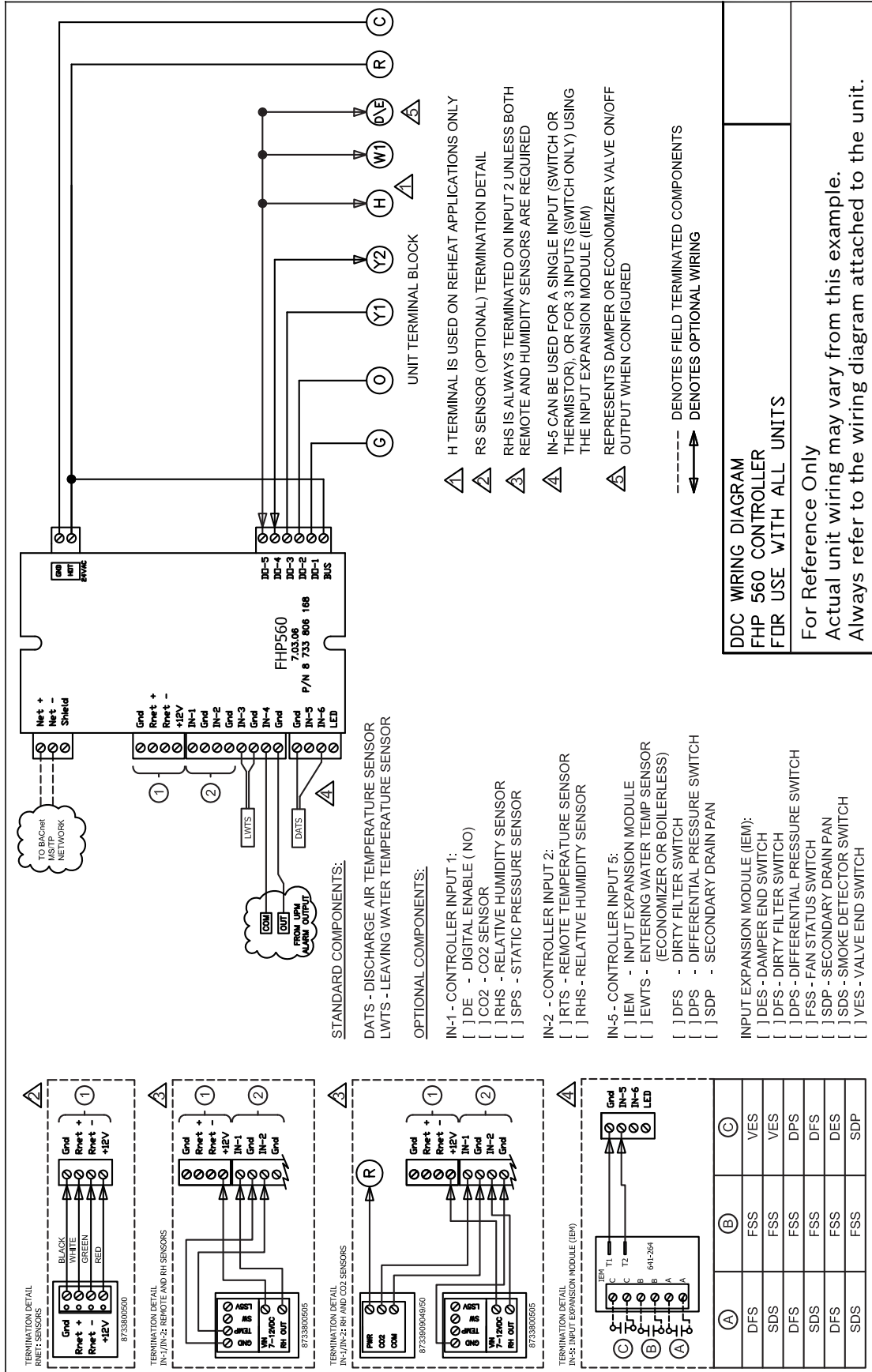
2 STAGE - 3 PHASE - CONDENSING SECTION
6 THROUGH 25 TON CAPACITY
LPM II

For Reference Only
Actual unit wiring may vary from this example.
Always refer to the wiring diagram attached to the unit.

WIRING DIAGRAM



WIRING DIAGRAM



STANDARD COMPONENTS:

- DATS - DISCHARGE AIR TEMPERATURE SENSOR
- LWTS - LEAVING WATER TEMPERATURE SENSOR

OPTIONAL COMPONENTS:

- IN-1 - CONTROLLER INPUT 1:
 - [] DE - DIGITAL ENABLE (NO)
 - [] CO2 - CO2 SENSOR
 - [] RHS - RELATIVE HUMIDITY SENSOR
 - [] SPS - STATIC PRESSURE SENSOR
- IN-2 - CONTROLLER INPUT 2:
 - [] RTS - REMOTE TEMPERATURE SENSOR
 - [] RRS - RELATIVE HUMIDITY SENSOR
- IN-5 - CONTROLLER INPUT 5:
 - [] IEM - INPUT EXPANSION MODULE (ECONOMIZER OR BOILERLESS)
 - [] EWTS - ENTERING WATER TEMP SENSOR (DIRTY FILTER SWITCH)
 - [] DFS - DIFFERENTIAL PRESSURE SWITCH
 - [] SDP - SECONDARY DRAIN PAN

- INPUT EXPANSION MODULE (IEM):**
- [] DES - DAMPER END SWITCH
 - [] DFS - DIRTY FILTER SWITCH
 - [] DPS - DIFFERENTIAL PRESSURE SWITCH
 - [] FSS - FAN STATUS SWITCH
 - [] SDP - SECONDARY DRAIN PAN
 - [] SDS - SMOKE DETECTOR SWITCH
 - [] VES - VALVE END SWITCH

- △ H TERMINAL IS USED ON REHEAT APPLICATIONS ONLY
- △ RS SENSOR (OPTIONAL) TERMINATION DETAIL
- △ RHS IS ALWAYS TERMINATED ON INPUT 2 UNLESS BOTH REMOTE AND HUMIDITY SENSORS ARE REQUIRED
- △ IN-5 CAN BE USED FOR A SINGLE INPUT (SWITCH OR THERMISTOR), OR FOR 3 INPUTS (SWITCH ONLY) USING THE INPUT EXPANSION MODULE (IEM)
- △ REPRESENTS DAMPER OR ECONOMIZER VALVE ON/OFF OUTPUT WHEN CONFIGURED

- DENOTES FIELD TERMINATED COMPONENTS
- > DENOTES OPTIONAL WIRING

(A)	(B)	(C)
DFS	FSS	VES
SDS	FSS	VES
DFS	FSS	DPS
SDS	FSS	DFS
DFS	FSS	DES
SDS	FSS	SDP

OPERATING TEMPERATURES & PRESSURES

			OPERATING DATA							
			COOLING				HEATING			
MODEL	ENTERING WATER TEMP, °F	WATER FLOW GPM	SUCTION PRESSURE PSIG	DISCHARGE PRESSURE PSIG	WATER TEMP RISE, °F	AIR TEMP DROP, °F	SUCTION PRESSURE PSIG	DISCHARGE PRESSURE PSIG	WATER TEMP DROP, °F	AIR TEMP RISE, °F
EC072	30°	10.0					65-80	282-344	6-7	14-17
		16.0					73-89	294-359	3-4	15-18
	40°	10.0	121-148	184-225	17-21	18-22	80-98	299-365	7-9	16-20
		16.0	117-143	167-204	10-13	19-23	89-108	311-380	4-5	17-21
	50°	10.0	123-151	222-271	17-20	17-21	95-116	315-385	9-11	19-23
		16.0	119-145	202-247	10-12	18-23	105-128	329-402	5-7	20-24
	60°	10.0	125-153	260-318	16-19	17-21	109-133	332-406	11-13	21-26
		16.0	120-147	237-289	10-12	18-22	121-148	346-423	6-8	22-27
	70°	10.0	127-155	298-365	15-19	17-20	124-151	349-427	12-15	23-28
		16.0	122-149	271-331	9-11	18-21	138-168	364-444	7-9	25-30
	80°	10.0	129-158	336-411	14-18	16-20	138-169	366-447	14-17	26-31
		16.0	124-152	306-374	9-11	17-21	154-188	381-466	8-10	27-33
	90°	10.0	131-160	374-458	14-17	16-19	153-187	383-468	16-19	28-34
		16.0	126-154	340-416	8-10	17-20	170-208	399-487	9-12	29-36
100°	10.0	133-162	413-504	13-16	15-19					
	16.0	128-156	375-458	8-10	16-20					
EC096	30°	13.0					72-87	296-361	5-6	21-25
		22.0					75-92	301-368	3-4	22-26
	40°	13.0	114-139	155-190	14-17	22-27	88-107	314-384	6-7	24-29
		22.0	108-132	147-180	10-12	23-28	92-112	321-392	4-5	25-30
	50°	13.0	116-142	192-234	13-16	21-26	104-127	333-407	7-9	27-33
		22.0	111-135	182-222	9-12	22-27	109-133	340-415	5-6	28-34
	60°	13.0	119-146	228-279	13-16	21-26	120-146	352-430	8-10	30-37
		22.0	113-138	217-265	9-11	22-27	125-153	359-439	6-7	32-39
	70°	13.0	122-149	264-323	13-15	20-25	136-166	371-453	9-12	33-41
		22.0	116-142	251-307	9-11	21-26	142-174	378-462	7-8	35-43
	80°	13.0	125-152	301-368	12-15	20-24	152-185	389-476	11-13	36-44
		22.0	118-145	286-349	9-11	21-26	159-194	397-485	8-9	38-47
	90°	13.0	127-156	337-412	12-15	19-24	168-205	408-499	12-15	39-48
		22.0	121-148	320-392	9-10	20-25	176-215	416-509	8-10	41-51
100°	13.0	130-159	374-457	12-14	19-23					
	22.0	124-151	355-434	8-10	20-24					
EC120	30°	16.0					73-89	266-325	5-6	15-18
		32.0					77-94	272-333	3-4	16-19
	40°	16.0	117-143	189-231	14-17	18-22	86-105	279-341	6-7	17-21
		32.0	112-137	178-217	8-9	19-24	90-110	286-350	4-5	18-22
	50°	16.0	126-154	221-270	14-17	18-21	162-198	293-358	7-8	20-24
		32.0	121-148	207-253	8-9	19-23	170-208	300-366	5-6	21-25
	60°	16.0	131-160	252-308	13-16	17-21	110-134	306-374	8-10	22-27
		32.0	125-153	237-290	8-9	18-22	115-141	314-383	6-7	23-29
	70°	16.0	135-165	284-347	13-16	17-20	122-150	320-391	9-11	24-30
		32.0	130-158	266-326	7-9	18-22	129-157	327-400	6-8	26-32
	80°	16.0	140-171	320-391	13-16	16-20	134-164	333-407	11-13	27-33
		32.0	134-164	300-367	7-9	17-21	141-172	341-417	7-9	28-35
	90°	16.0	144-176	360-440	13-16	16-19	147-179	347-424	12-14	29-36
		32.0	138-169	338-414	7-9	17-21	154-188	355-434	8-10	31-38
100°	16.0	149-182	405-495	13-15	15-19					
	32.0	143-174	381-465	7-9	16-20					

This chart shows approximate temperatures and pressures for a unit in good repair. The values shown are meant as a guide only and should not be used to estimate system charge. This chart assumes rated air flow and 80° d.b./67° w.b. entering air temperature in cooling, 70° d.b. entering air temperature in heating. Heating data at entering fluid temperatures below 50° assumes the use of antifreeze. Operation in shaded area requires the extended range option.

As a result of continuing research and development, specifications are subject to change without notice.

OPERATING TEMPERATURES & PRESSURES

			OPERATING DATA								
			COOLING				HEATING				
MODEL	ENTERING WATER TEMP, °F	WATER FLOW GPM	SUCTION PRESSURE PSIG	DISCHARGE PRESSURE PSIG	WATER TEMP RISE, °F	AIR TEMP DROP, °F	SUCTION PRESSURE PSIG	DISCHARGE PRESSURE PSIG	WATER TEMP DROP, °F	AIR TEMP RISE, °F	
EC150	30°	22.0					74-90	244-299	3-4	13-15	
		38.0					78-95	251-306	2-3	13-16	
	40°	22.0	122-149	183-224	14-18	19-23	87-106	257-314	4-5	15-18	
		38.0	117-143	172-210	8-10	20-24	91-111	263-322	3-3	16-19	
	50°	22.0	131-160	214-261	14-18	18-22	164-201	269-329	5-6	17-20	
		38.0	126-154	201-245	8-10	19-24	173-211	276-337	3-4	18-22	
	60°	22.0	136-166	244-298	14-17	18-22	111-136	282-344	6-7	19-23	
		38.0	131-160	230-281	8-10	19-23	117-143	289-353	4-5	20-24	
	70°	22.0	141-172	275-336	14-17	17-21	124-152	294-360	7-8	21-25	
		38.0	135-165	258-316	8-10	18-22	131-160	302-369	5-6	22-27	
	80°	22.0	145-178	310-378	14-17	17-20	136-166	307-375	8-9	23-28	
		38.0	140-171	291-356	8-10	18-22	143-175	314-384	5-6	24-30	
	90°	22.0	150-183	349-426	14-17	16-19	149-182	319-390	8-10	25-30	
		38.0	144-176	328-401	8-9	17-21	156-191	327-400	6-7	26-32	
	100°	22.0	155-189	392-480	13-16	16-19					
		38.0	149-182	369-451	8-9	17-21					
	EC180	30°	25.0					64-78	248-303	5-6	15-18
			45.0					67-82	254-311	3-4	16-19
40°		25.0	109-134	183-224	18-22	19-23	75-91	261-319	6-8	17-21	
		45.0	105-128	172-210	10-12	20-25	79-96	267-327	4-5	18-23	
50°		25.0	118-144	214-261	18-22	19-23	142-173	273-334	8-10	20-24	
		45.0	113-138	201-245	10-12	20-24	149-182	280-342	5-7	21-26	
60°		25.0	122-149	244-298	17-21	18-22	96-117	286-349	9-11	22-27	
		45.0	117-143	230-281	10-12	19-24	101-123	293-358	6-8	24-29	
70°		25.0	126-154	275-336	17-21	18-22	107-131	299-365	11-13	25-30	
		45.0	121-148	258-316	10-12	19-23	113-138	306-374	7-9	26-32	
80°		25.0	130-159	310-378	17-21	17-21	117-143	311-380	12-15	27-33	
		45.0	125-153	291-356	10-12	18-22	123-151	319-390	8-10	29-35	
90°		25.0	134-164	349-426	17-20	17-20	128-157	324-396	13-16	29-36	
		45.0	129-158	328-401	9-12	18-22	135-165	332-406	9-11	31-38	
100°		25.0	139-170	392-480	16-20	16-20					
		45.0	133-163	369-451	9-11	17-21					
EC210		30°	28.0					71-87	277-339	6-7	15-19
			52.0					75-92	284-347	4-5	16-20
	40°	28.0	118-144	194-237	21-25	19-23	84-102	291-356	7-9	18-22	
		52.0	113-138	182-223	12-14	20-24	88-108	299-365	5-6	19-23	
	50°	28.0	127-155	226-276	21-25	18-22	159-194	305-373	9-11	20-25	
		52.0	122-149	213-260	12-14	19-24	167-204	313-383	6-7	21-26	
	60°	28.0	131-160	259-316	21-25	18-22	108-132	320-391	10-13	23-28	
		52.0	126-154	243-297	12-14	19-23	113-138	328-400	7-9	24-29	
	70°	28.0	136-166	291-355	20-25	17-21	120-147	334-408	12-15	25-31	
		52.0	130-159	273-334	12-14	18-22	126-154	342-418	8-10	27-32	
	80°	28.0	140-171	328-401	20-24	17-20	131-161	348-425	14-17	27-34	
		52.0	135-165	308-377	11-14	18-22	138-169	356-436	9-11	29-36	
	90°	28.0	145-177	369-451	20-24	16-20	144-176	362-442	15-18	30-37	
		52.0	139-170	347-424	11-14	17-21	151-185	371-453	10-12	32-39	
	100°	28.0	149-183	415-508	19-24	16-19					
		52.0	143-175	391-477	11-14	17-21					

This chart shows approximate temperatures and pressures for a unit in good repair. The values shown are meant as a guide only and should not be used to estimate system charge. This chart assumes rated air flow and 80° d.b./67° w.b. entering air temperature in cooling, 70° d.b. entering air temperature in heating. Heating data at entering fluid temperatures below 50° assumes the use of antifreeze. Operation in shaded area requires the extended range option.

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OPERATING TEMPERATURES & PRESSURES

			OPERATING DATA							
			COOLING				HEATING			
MODEL	ENTERING WATER TEMP, °F	WATER FLOW GPM	SUCTION PRESSURE PSIG	DISCHARGE PRESSURE PSIG	WATER TEMP RISE, °F	AIR TEMP DROP, °F	SUCTION PRESSURE PSIG	DISCHARGE PRESSURE PSIG	WATER TEMP DROP, °F	AIR TEMP RISE, °F
EC240	30°	32.0					68-84	256-313	5-7	19-23
		64.0					73-89	261-319	4-5	20-25
	40°	32.0	113-138	172-210	18-22	19-23	81-99	277-339	7-8	22-26
		64.0	110-134	161-196	12-14	20-24	86-105	283-346	5-6	23-28
	50°	32.0	116-142	206-252	17-21	19-23	93-114	299-365	8-9	24-29
		64.0	112-137	193-236	12-14	19-24	99-121	305-373	6-7	25-31
	60°	32.0	118-145	241-294	17-21	18-23	106-129	321-392	9-11	26-32
		64.0	115-140	225-275	11-14	19-23	113-138	327-400	7-8	28-34
	70°	32.0	121-148	275-336	17-21	18-22	118-145	342-418	10-12	29-35
		64.0	117-143	257-314	11-14	19-23	126-154	349-427	8-9	30-37
	80°	32.0	123-151	309-378	16-20	18-22	131-160	364-444	11-14	31-38
		64.0	120-146	289-353	11-13	19-23	139-170	371-454	8-10	33-40
	90°	32.0	126-154	344-420	16-20	18-22	143-175	385-471	12-15	33-41
		64.0	122-149	321-392	11-13	18-22	152-186	393-480	9-11	35-43
100°	32.0	128-157	378-462	16-19	17-21					
	64.0	125-152	353-432	11-13	18-22					
EC300	30°	45.0					68-84	256-313	5-7	19-23
		75.0					73-89	261-319	4-5	20-25
	40°	45.0	117-143	210-256	15-19	21-26	81-99	277-339	7-8	22-26
		75.0	114-139	196-239	11-14	22-27	86-105	283-346	5-6	23-28
	50°	45.0	120-147	243-297	15-18	20-25	93-114	299-365	8-9	24-29
		75.0	117-143	227-277	11-14	21-26	99-121	305-373	6-7	25-31
	60°	45.0	123-150	276-337	14-17	20-24	106-129	321-392	9-11	26-32
		75.0	119-146	258-315	11-13	21-25	113-138	327-400	7-8	28-34
	70°	45.0	126-154	309-378	14-17	19-24	118-145	342-418	10-12	29-35
		75.0	122-149	289-353	10-13	20-25	126-154	349-427	8-9	30-37
	80°	45.0	129-157	343-419	13-16	19-23	131-160	364-444	11-14	31-38
		75.0	125-153	320-391	10-12	19-24	139-170	371-454	8-10	33-40
	90°	45.0	132-161	376-459	13-16	18-22	143-175	385-471	12-15	33-41
		75.0	128-156	351-429	10-12	19-23	152-186	393-480	9-11	35-43
100°	45.0	134-164	409-500	12-15	17-21					
	75.0	131-160	382-467	9-11	18-22					
EC360	30°	50.0					65-80	282-344	6-7	14-17
		90.0					73-89	294-359	3-4	15-18
	40°	50.0	121-148	184-225	17-21	18-22	80-98	299-365	7-9	16-20
		90.0	117-143	167-204	10-13	19-23	89-108	311-380	4-5	17-21
	50°	50.0	123-151	222-271	17-20	17-21	95-116	315-385	9-11	19-23
		90.0	119-145	202-247	10-12	18-23	105-128	329-402	5-7	20-24
	60°	50.0	125-153	260-318	16-19	17-21	109-133	332-406	11-13	21-26
		90.0	120-147	237-289	10-12	18-22	121-148	346-423	6-8	22-27
	70°	50.0	127-155	298-365	15-19	17-20	124-151	349-427	12-15	23-28
		90.0	122-149	271-331	9-11	18-21	138-168	364-444	7-9	25-30
	80°	50.0	129-158	336-411	14-18	16-20	138-169	366-447	14-17	26-31
		90.0	124-152	306-374	9-11	17-21	154-188	381-466	8-10	27-33
	90°	50.0	131-160	374-458	14-17	16-19	153-187	383-468	16-19	28-34
		90.0	126-154	340-416	8-10	17-20	170-208	399-487	9-12	29-36
100°	50.0	133-162	413-504	13-16	15-19					
	90.0	128-156	375-458	8-10	16-20					

This chart shows approximate temperatures and pressures for a unit in good repair. The values shown are meant as a guide only and should not be used to estimate system charge. This chart assumes rated air flow and 80° d.b./67° w.b. entering air temperature in cooling, 70° d.b. entering air temperature in heating. Heating data at entering fluid temperatures below 50° assumes the use of antifreeze. Operation in shaded area requires the extended range option.

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UNIT CHECK-OUT SHEET

Customer Data

Customer Name _____ Date _____
 Address _____
 Phone _____ Unit Number _____

Unit Nameplate Data

Unit Make _____
 Model Number _____ Serial Number _____
 Refrigerant Charge (oz) _____
 Compressor: RLA _____ LRA _____
 Blower Motor: FLA (or NPA) _____ HP _____
 Maximum Fuse Size (Amps) _____
 Minimum Circuit Ampacity (Amps) _____

Operating Conditions

	Cooling Mode	Heating Mode
Entering / Leaving Air Temp	_____ / _____	_____ / _____
Entering Air Measured at:	_____	_____
Leaving Air Measured at:	_____	_____
Entering / Leaving Fluid Temp	_____ / _____	_____ / _____
Fluid Flow (gpm)	_____	_____
Compressor Volts / Amps	_____ / _____	_____ / _____
Blower Motor Volts / Amps	_____ / _____	_____ / _____
Source Fluid Type	_____	_____
Fluid Flow (gpm)*	_____	_____
Fluid Side Pressure Drop*	_____	_____
Suction / Discharge Pressure (psig)*	_____ / _____	_____ / _____
Suction / Discharge Temp*	_____ / _____	_____ / _____
Suction Superheat*	_____	_____
Entering TXV / Cap Tube Temp*	_____	_____
Liquid Subcooling*	_____	_____

* Required for Troubleshooting ONLY

Auxiliary Heat

Unit Make _____
 Model Number _____ Serial Number _____
 Max Fuse Size (Amps) _____
 Volts / Amps _____ / _____
 Entering Air Temperature _____
 Leaving Air Temperature _____

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TROUBLESHOOTING

Problem	Possible Cause	Checks and Corrections
Entire unit does not run	Power Supply Off	Apply power, close disconnect
	Blown Fuse	Replace fuse or reset circuit breaker. Check for correct fuses
	Voltage Supply Low	If voltage is below minimum voltage specified on unit data plate, contact local power company.
	Thermostat	Set the fan to "ON", the fan should run. Set thermostat to "COOL" and lowest temperature setting, the unit should run in the cooling mode (reversing valve energized). Set unit to "HEAT" and the highest temperature setting, the unit should run in the heating mode. If neither the blower or compressor run in all three cases, the thermostat could be miswired or faulty. To ensure miswired or faulty thermostat verify 24 volts is available on the condensing section low voltage terminal strip between "R" and "C", "Y" and "C", and "O" and "C". If the blower does not operate, verify 24 volts between terminals "G" and "C" in the air handler. Replace the thermostat if defective.
Blower operates but compressor does not	Thermostat	Check setting, calibration, and wiring
	Wiring	Check for loose or broken wires at compressor, capacitor, or contactor.
	Safety Controls	Check UPM board red default L.E.D. for Blink Code
	Compressor overload open	If the compressor is cool and the overload will not reset, replace compressor.
	Compressor motor grounded	Internal winding grounded to the compressor shell. Replace compressor. If compressor burnout, install suction filter dryer.
	Compressor windings Open	After compressor has cooled, check continuity of the compressor windings. If the windings are open, replace the compressor
Unit off on high pressure control	Discharge pressure too high	In "COOLING" mode: Lack of or inadequate water flow. Entering water temperature is too warm. Scaled or plugged condenser. In "HEATING" mode: Lack of or inadequate air flow. Blower inoperative, clogged filter or restrictions in duct work
	Refrigerant charge	The unit is overcharged with refrigerant. Reclaim refrigerant, evacuate and recharge with factor recommended charge.
	High pressure	Check for defective or improperly calibrated high pressure switch.
Unit off on low pressure control	Suction pressure too low	In "COOLING" mode: Lack of or inadequate air flow. Entering air temperature is too cold. Blower inoperative, clogged filter or restrictions in duct work In "HEATING" mode: Lack of or inadequate water flow. Entering water temperature is too cold. Scaled or plugged condenser.
	Refrigerant charge	The unit is low on refrigerant. Check for refrigerant leak, repair, evacuate and recharge with factory recommended charge.
	Low pressure switch	Check for defective or improperly calibrated low pressure switch.
Unit short cycles	Unit oversized	Recalculate heating and or cooling loads.
	Thermostat	Thermostat installed near a supply air grill; relocate thermostat. Readjust heat anticipator.
	Wiring and controls	Check for defective or improperly calibrated low pressure switch.
Insufficient cooling or heating	Unit undersized	Recalculate heating and or cooling loads. If excessive, possibly adding insulation and shading will rectify the problem
	Loss of conditioned air by leakage	Check for leaks in duct work or introduction of ambient air through doors or windows
	Airflow	Lack of adequate air flow or improper distribution of air. Replace dirty filter
	Refrigerant charge	Low on refrigerant charge causing inefficient operation
	Compressor	Check for defective compressor. If discharge is too low and suction pressure is too high, compressor is not pumping properly. Replace compressor.
	Reversing Valve	Defective reversing valve creating bypass of refrigerant from discharge of suction side of compressor. Replace reversing valve
	Operating pressures	Compare unit operation pressures to the pressure/temperature chart for the unit.
	TXV/Capillary Tube	Check TXV for possible restriction or defect. Replace if necessary.
Moisture, noncondensables	The refrigerant system may be contaminated with moisture or noncondensables. Reclaim refrigerant, evacuate and recharge with factory recommended charge. Note: a liquid line dryer may be required.	

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