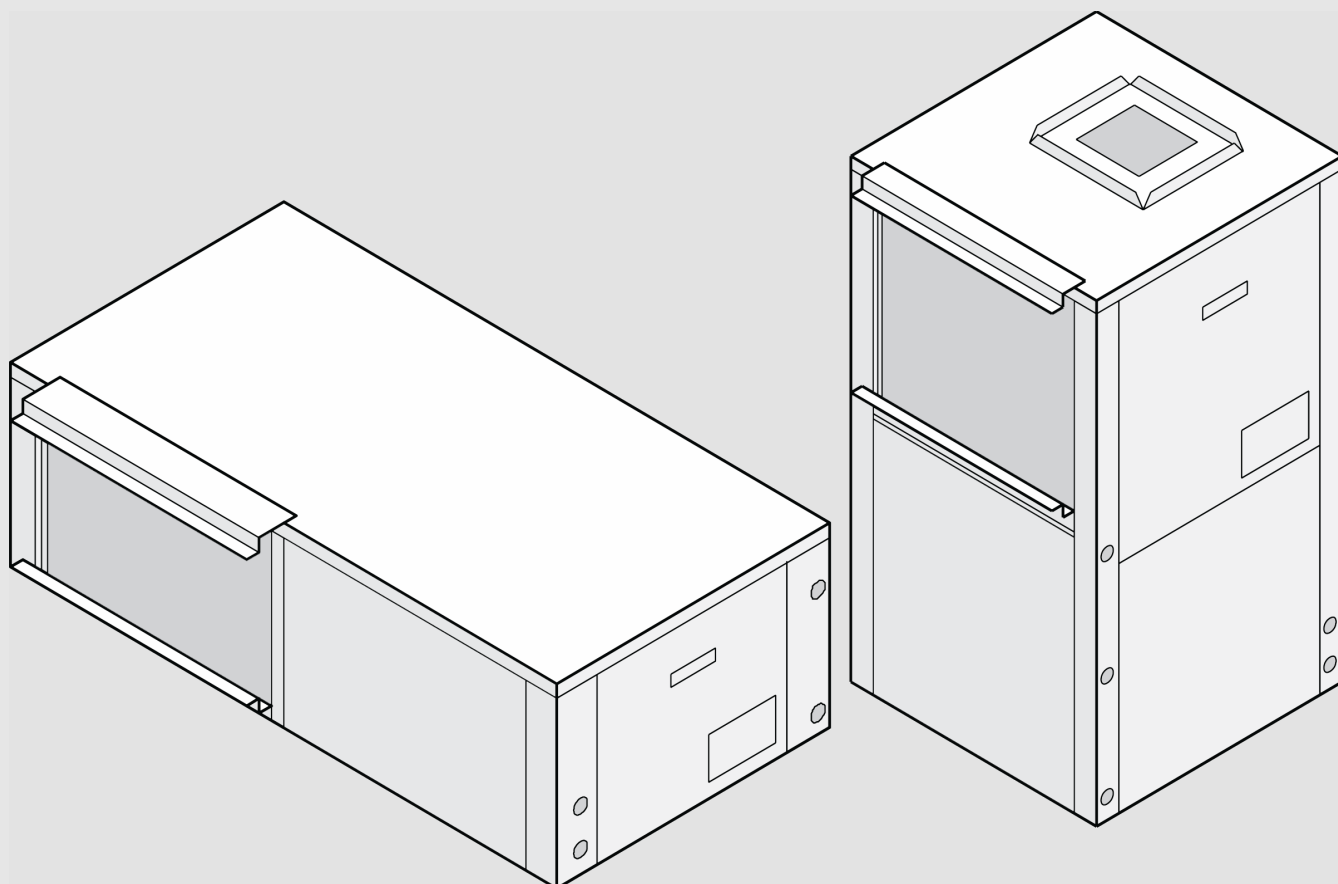




LV MODEL



BOSCH

Installation and Maintenance Manual

8733944336 (2016/09)

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KEY TO SYMBOLS

Warnings



Warnings in this document are identified by a warning triangle printed against a grey background. Keywords at the start of the warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.

The following keywords are defined and can be used in this document:

- **DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION** indicates a hazardous situation which, if not avoided, could result in minor to moderate injury.
- **NOTICE** is used to address practices not related to personal injury.

Important Information



This symbol indicates important information where there is no risk to property or people.

SAFETY WARNINGS

IMPORTANT: Read the entire instruction manual before starting installation.



DANGER: Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.



WARNING: 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.



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.



WARNING: 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.

NOTICE: To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must be serviced only by technicians who meet local, state, and federal proficiency requirements.

NOTICE: All refrigerant discharged from this unit must be recovered WITHOUT EXCEPTION. Technicians must follow industry accepted guidelines and all local, state, and federal statutes for the recovery and disposal of refrigerants. If a compressor is removed from this unit, refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, refrigerant lines of the compressor must be sealed after it is removed.

NOTICE: To avoid equipment damage, DO NOT use these units as a source of heating or cooling during the construction process. Doing so may affect the unit's warranty. The mechanical components and filters will quickly become clogged with construction dirt and debris, which may cause system damage.

MODEL NOMENCLATURE

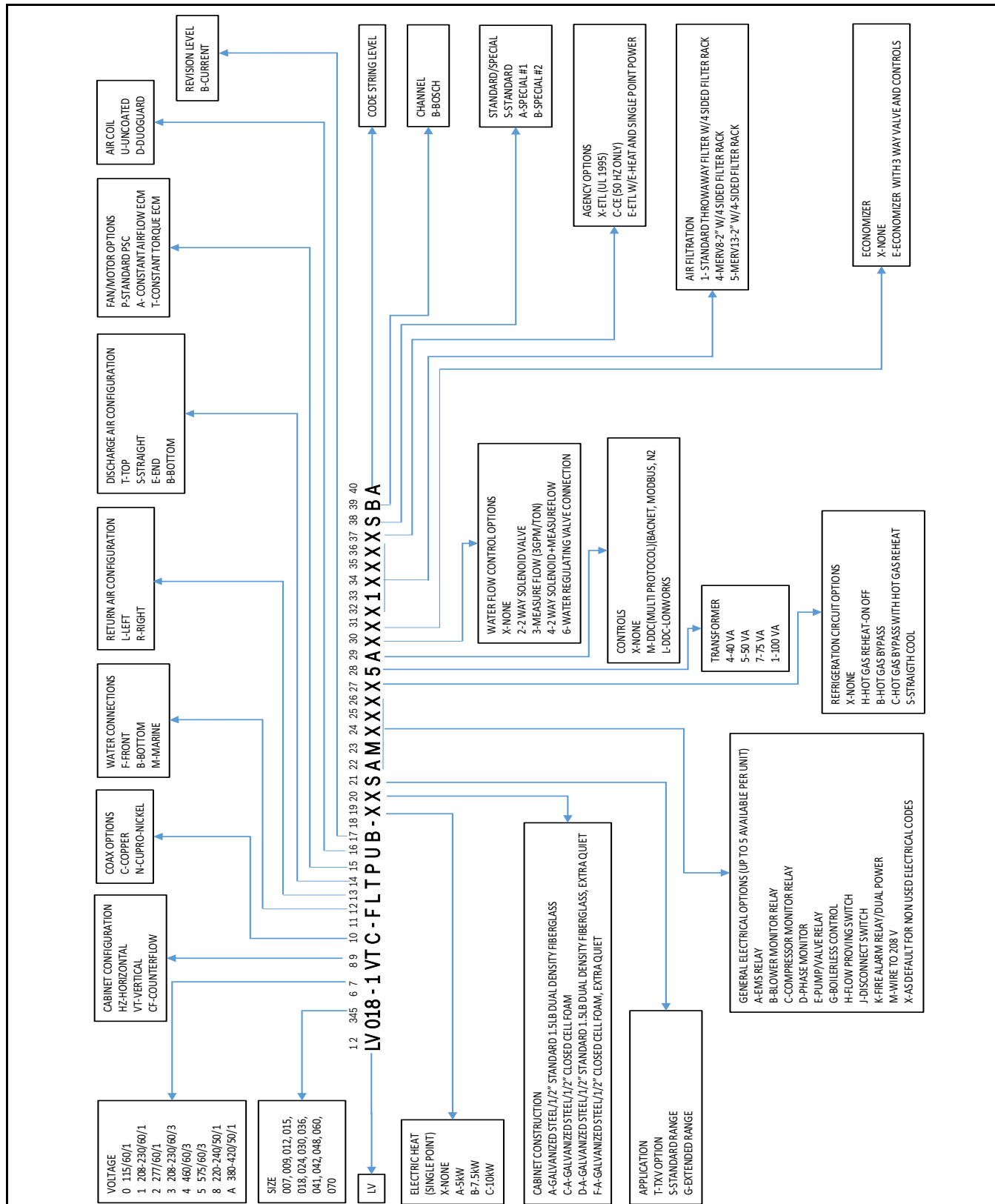


Figure #1

Not all Options are available on all models.

GENERAL DESCRIPTION

The LV series water-to-air heat pump provides an unmatched combination of performance, features and flexibility for both high performance new construction applications and replacement of existing water-to-air heat pumps. All units are certified by the Air conditioning, Heating and Refrigeration Institute (AHRI) to AHRI/ANSI/ASHRAE/ISO standard 13256-1 for water-to-air and brine-to-air heat pumps at both Water Loop Heat Pump and Ground Loop Heat Pump application points.

All Water-to-Air Heat Pumps conform to UL 1995 standard and are certified to CAN/CSA C22.2 No 236 by Intertek-ETL.

These units meet all current applicable requirements of ASHRAE 90.1.

LV series units are designed to operate with entering fluid temperatures between 50°F and 100°F in cooling and 50°F and 80°F in heating with the base configuration. With the extended range option, LV series models can operate with entering fluid temperatures between 50°F and 110°F in cooling and between 20°F and 80°F in heating. LV units can accommodate a wide range of air temperatures, however, standard LV models should not be used for 100% outside air without consulting the factory applications group. 100% outside air routinely requires higher levels of dehumidification than is available from equipment designed for return air applications.

LV series units are available in three basic configurations: vertical top supply air (VT), horizontal end supply air or straight through supply air (HZ) and counter flow down supply air (CF). Each of these configurations are available with either left or right hand return air. HZ models can have the supply air field converted from end discharge air to straight through with no extra parts required.

LV units are designed and rated for indoor installation only. LV units should not be installed in environments that fall below freezing or exceed 100°F ambient. LV cabinets are constructed of heavy gauge G-90 galvanized steel and will resist most common types of corrosion for the life of the equipment.

LV series units are offered with a wide range of factory installed options including: PSC, constant torque ECM or constant air flow ECM fan motors; hot gas reheat; hot gas bypass; internal 2 way valves; tin plated air coils; 2"4-sided filter racks; MERV 13 filters (with constant airflow ECM motors); on board DDC controls; copper or cupro nickel water coils; water-side economizers and more refer to the unit model number for installed options..



Note that some options are offered in limited sizes and/or voltages.



On board safety features will protect the major unit components from damage under most foreseeable installation and operation problems.

MOVING AND STORAGE

If the equipment is not needed for immediate installation upon arrival at the job site, it should be left in its packaging and stored in a clean, dry area.

Units must be moved and stored in the normal upright position at all times.

Use caution to avoid damage to filter racks and duct flanges when storing or handling units.

NOTICE: Never lift or move units by filter racks, external piping or attached options/accessories.

NOTICE: Never stack units when transporting them.



NOTICE: When storing units:

Do not stack units larger than 6 tons capacity!

Do not stack vertical or counter flow units under 6 tons capacity more than 2 high

Do not stack horizontal units 6 tons capacity more than 3 high

INSTALLATION

Step 1- Check Job Site

Installation, operation and maintenance instructions are provided with each unit. Before unit start-up, read all manuals and become familiar with unit and its operation. Thoroughly check out the system before operation. Complete the inspections and instructions listed below to prepare a unit for installation.

Horizontal Units

LV units are designed for **indoor installation only**. Be sure to allow adequate space around the unit for servicing.

Vertical Counter flow Units

LV Units are designed for **indoor installations only**. While vertical units are typically installed in a floor-level closet or a small mechanical room, the unit access guidelines for these units are very similar to those described for horizontal units.

Step 2- Check Unit

Upon receipt of shipment at the job site, carefully check the shipment against the bill of landing. Make sure all units have been received. Inspect each unit for damage. Ensure the shipping company makes proper notation of any shortages or damage on all copies of the freight bill. Concealed damage not discovered during unloading must be reported to the shipping company.

Please inspect the product carefully for any defects or discrepancies.

Should you identify any issue, contact the Bosch Wholesaler / Distributor you purchased the unit from.

1. Be sure that the location chosen for unit installation provides ambient temperatures maintained above freezing.
2. Be sure the installation location is isolated from sleeping areas, private offices and other acoustically sensitive spaces.
3. Be sure unit is mounted at a height sufficient to provide an adequate slope of the condensate lines. If an appropriate slope cannot be achieved, a field-supplied condensate pump may be required.
4. On horizontal units, allow adequate room below the unit for condensate drain trap and do not locate the unit above supply piping.
5. Provide sufficient space for duct connection. do not allow the weight of the duct work to rest on the unit.
6. Provide adequate clearance for filter replacement and drain pan cleaning. Do not allow piping, conduit, etc. To block filter access.
7. Provide sufficient access to allow maintenance and servicing of the fan and fan motor, compressor and coils. Removal of the entire unit from the closet should not be necessary.
8. Provide an unobstructed path to the unit within the closet or mechanical room. Space should be sufficient to allow return air to freely enter the space.
9. Provide ready access to water valves, fittings, and screwdriver access to unit side panels, discharge collar, and all electrical connections.
10. Where access to side panels is limited, pre-removal of the control box side mounting screws may be necessary for future servicing.

Protection

Once the units are properly positioned on the job site, cover them with either a shipping carton, vinyl film, or an equivalent protective covering. Cap open ends of pipes stored on the job site. This precaution is especially important in areas where painting, plastering or spraying of fireproof material, etc. Is not yet complete. Foreign material that accumulates within the units can prevent proper start-up and require costly clean-up operations. Before installing any of the systems components, be sure to examine each pipe, fitting valves and remove any dirt or foreign material found in or on these components.

Inspect Unit

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
2. Verify that the unit is the correct model for the entering water temperature of the job.
3. Do not remove the packaging until the unit is ready for installation.
4. Verify that the refrigerant tubing is free of kinks or dents, and that it does not touch other unit components.
5. Inspect all electrical connections. Be sure connections are clean and tight at the terminals.
6. Remove any blower support styrofoam from underneath the blower.

7. Remove any shipping brackets from the unit attached to the pallet.

Step 3- Locate the Unit

Locate the unit in an indoor area that allows easy access to the filter, front access panel and blower access panel, and has enough room for service personnel to perform maintenance and repair work. Provide sufficient room to make fluid, electrical and duct work connections.

Locate the unit in conditioned space and avoid installation in corrosive environments.

If the unit is installed in a confined space, such as a closet, provisions must be made for return air to freely enter the face of the unit's air coil.

Unit condensate drains are not internally trapped.

Allow room below the unit base for horizontal and counter flow models for an adequate condensate trap.

NOTICE: These units are not approved for outdoor installation; therefore, they must be installed inside the structure being conditioned space. Do not locate in areas that are subject to freezing.

NOTICE: Do not locate the unit above supply piping.
Do not locate the unit in areas subject to freezing or in areas subject to temperature or humidity extremes.

NOTICE: LV series packaged units are not approved for outdoor installation. Units must be installed in conditioned space that is not subject to extremes of temperature or humidity to avoid cabinet sweating and/or equipment damage.

NOTICE: Do not use LV series units for temporary heating, air conditioning or ventilation during construction, especially when plastering, sanding or painting. Care should be taken to avoid introduction of dust, paint or debris into the air coil.

Step-4 Mount The Unit

Duct Flanges

The Unit heat pump feature foldout return and supply air duct flanges. These fold-out flanges allow the heat pumps to more easily fit through doorways and other tight spaces, and also prevent damage in shipping and handling.

It is recommended that all fold-out flanges be folded out once the heat pump is installed to ensure that return and supply airflow is not obstructed. These Flanges can be easily folded using standard or duckbill pliers. Once folded out these flanges can be used to support light duct work loads.

Mounting Vertical Units

LV Series vertical and counter flow units should be mounted level on a vibration absorbing pad slightly larger than the unit base in order to minimize vibration transmission from the unit to the building structure. See Figure #2 It is generally not necessary to anchor the unit unless required by local code.

All major service access for the LV Series vertical and counter flow models is from the front side of the unit. When installing the unit in a confined space such as a closet, ensure that the service panel screws are accessible, that the filter can be replaced without damage and that water and electrical connections are accessible. For models with a unit mounted disconnect switch, make sure the switch can be easily seen and operated.

To reduce sound transmission, units should be installed using flexible electrical conduit and hose kits. Care should be taken to ensure that no part of the unit cabinet is touching part of the building structure. For ducted return applications, a flexible duct connection should be used.

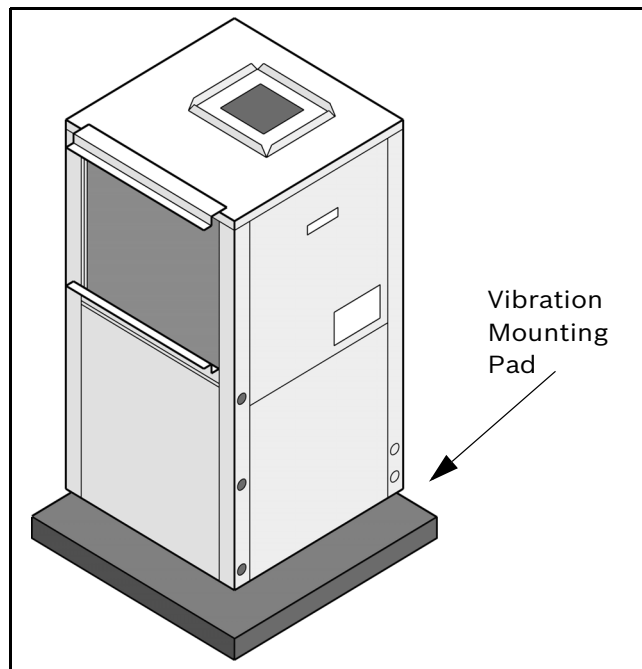


Figure # 2 Mounting Vertical Units

Mounting Horizontal Units

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 included with the unit.

NOTICE: Horizontal (HZ) units must be installed pitched toward the condensate drain connection 1/8" per foot.

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 eaves at a location that will be noticeable.

NOTICE: 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.

Hanging Bracket Kit

Installation instructions

All horizontal units come with Hanging Bracket Kit to facilitate suspended unit mounting using threaded rod. Hanging Brackets are to be installed as shown in Figure#3

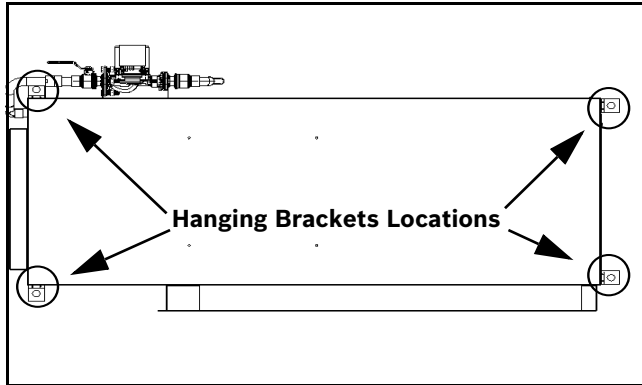


Figure # 3

This kit includes the following:

- (5) Brackets
- (5) Rubber Vibration Isolators
- (8) Screws # 10x1/2"
- (10) Bolts 1/4-28x1/2" hex Bolt (not used on this model)

The following are needed and are to be field provided:

- Threaded rod (3/8" max dia)
- Hex Nuts
- Washers (1-3/4" min O.D.)

1. Remove and discard factory provided screws from location where Hanging Brackets will be installed shown in Figure#4

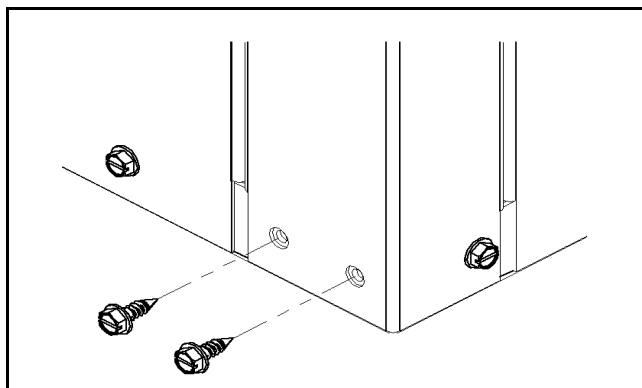


Figure # 4

2. Mount 4 Brackets to unit corner post using the bolts provided in the kit as shown on Figure # 5



WARNING: Do not re-use screws removed from the unit on step 1 to mount the hanging Brackets to the unit.

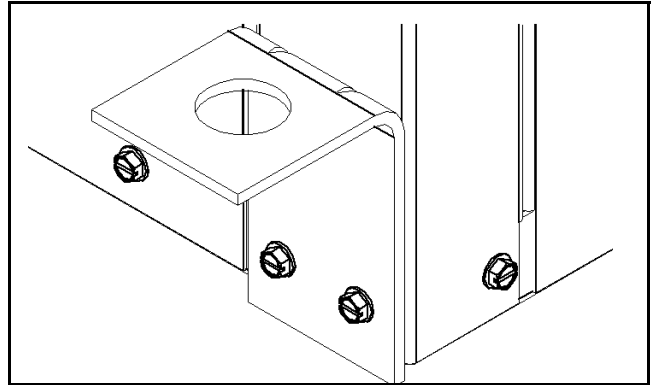


Figure # 5



WARNING: Follow all applicable codes requirements when hanging this unit. Selecting threaded rod material, etc.

3. Install Rubber Grommet on the bracket as shown in Figure# 6.
4. Hang the unit and assemble the field provided Thread Rod, Nuts and Washers on to the Brackets as shown in Figure# 6.



DANGER: Rods must be securely anchored to the ceiling.

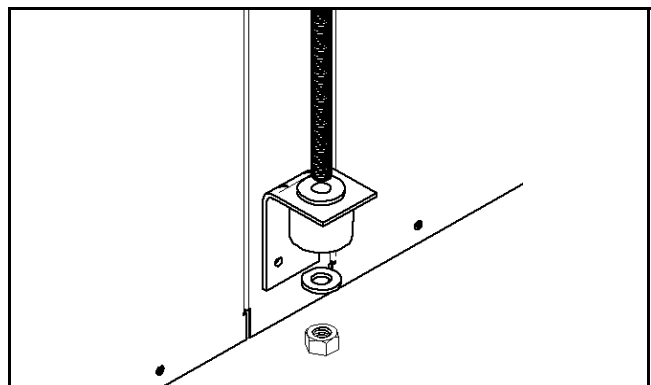


Figure # 6

Step-5 Check Duct System

All units are provided with a return air duct flange and supply air duct connections. Refer to unit dimensional drawings (Page# 55).

A flexible duct connector is recommended for supply and return air duct connections on metal duct systems. All metal ducting should be insulated with a minimum of 1" inch duct insulation to avoid heat loss or gain and prevent condensate from 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.

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 through the air grill into the heat pump. The return air inlet to the heat pump must have at least one 90° turn away from the space return air grill. If air noise or excessive air flow are a problem, the blower speed can be changed to a lower speed to reduce air flow.



Do not connect discharge ducts directly to the blower outlet. Use ashrae guidelines for duct sizing

The factory filter rack should be left in place on a free return system.

Horizontal Supply Air Configuration Conversion

The supply air location on horizontal units can be quickly field converted from end blow to straight through or vice versa. To convert the supply air direction, follow the steps below:

1. If connected to power, shut off the unit and disconnect switch or circuit breaker.
2. Unscrew and remove the blower access panel.
3. Disconnect the wires from the unit electrical box to the blower motor. Note which speed taps are wired for units with PSC or constant torque motors.
4. Unscrew and carefully remove the blower panel with the blower and motor attached. Be careful not to damage the refrigerant coils or any other internal unit components.
5. Remove the blower support brackets from the bottom of the blower housing and relocate them to the top of the blower housing.

6. Turn the blower panel 180° so that the blower support brackets are now at the bottom of the blower.
7. Insert the blower panel with the blower and motor into the desired location. Be careful not to damage the refrigerant coils or any other internal unit components. Screw the panel into place.
8. Replace the wires between the blower motor and electrical box. Make sure to connect wires to the proper speed taps.
9. Replace the blower access panel.
10. Reconnect power to the unit.

Step 6-Install Condensate Drain.

A drain line must be connected to the heat pump and pitched away from the unit a minimum of 1/8-inch per foot to allow the condensate to flow away from the unit. This connection must be in conformance with local plumbing codes. A trap must be installed in the condensate line to ensure free condensate flow. (Heat pumps are not internally trapped). A vertical air vent is sometimes required to avoid air pockets. (See figure # 7)

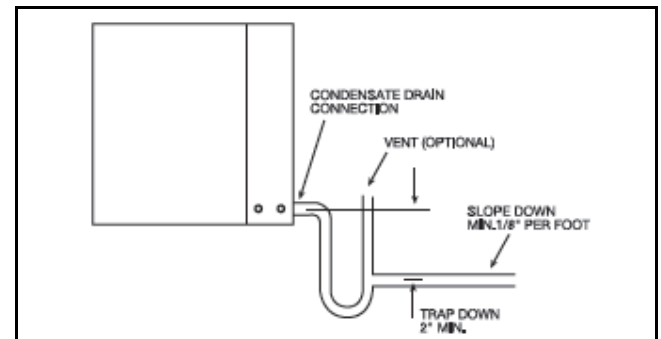


Figure # 7 Condensate Drain

The depth of the trap depends on the amount of positive or negative air pressure on the drain pan while the unit fan is operating. A second Trap must not be included. The Horizontal unit should be pitched approximately 1/4 inch towards the drain in both directions, to facilitate condensate removal. (see figure # 8)

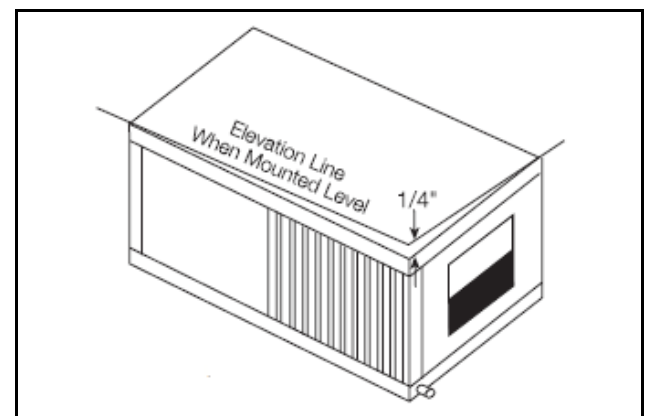


Figure # 8 Pitched Unit

Step 7-Pipe Connections

Depending on the application there are 3 types of WSHP piping systems to choose from: water loop, ground water-and ground loop.

All WSHP units use female pipe thread fittings for water connections. When making piping connections considered the following:

- Insulation may be required on piping to avoid condensation in the case where fluid in loop piping operates at temperatures below dew point of surrounding air.
- Piping systems that contains steel pipes or fittings may be subject to galvanic corrosion. Dielectric fittings may be used to isolate the steel parts of the system to avoid galvanic corrosion.

Water Loop applications

Water loop applications usually include a number of units plumbed to a common piping system. Maintenance of any of the units can introduce air into the system. Therefore, air elimination equipment comprises a major portion of the mechanical room plumbing.

The flow rate is usually set between 2.25 and 3 GPM per ton of cooling capacity. For proper maintenance and servicing, pressure-temperature (P/T) ports are necessary for temperature and flow verification.

In addition to complying with any applicable codes, consider the following for system piping:

- Piping systems using water temperatures below 50°F require 1/2 inch closed cell insulation on all piping surfaces to prevent pipe sweating.
- Avoid all plastic to metal threaded fittings due to the potential for leaks.
- Teflon tape thread sealant is recommended to seal pipe threads.
- Use Backup wrench. Do not overtighten connections.
- Route piping to avoid service access areas to unit.
- Flush the piping system prior to operation to remove dirt and foreign materials from the system.

Ground Loop Applications

Temperatures between 20° and 110°F and a cooling capacity of 2.25 to 3 GPM of flow per ton is recommended. In addition to complying with any applicable codes, consider the following for system piping:

- Limit piping materials to only polyethylene fusion in the buried sections of the loop.
- Do not use galvanized or steel fittings at anytime due to corrosion.
- Avoid all plastic to metal threaded fittings due to the potential for leaks. Use a flange fitted substitute.
- Do not overtighten connections.
- Route piping to avoid service access areas to unit.
- Use pressure-temperature (P/T) plugs to measure flow and pressure drop.

Step 8 Wire Field Power Supply

High Voltage

All field-installed wiring must comply with the National Electric Code as well as all applicable local codes. Refer to the unit electrical data on the unit nameplate for wire and branch circuit protection sizing. Supply power voltage and phasing should match the required voltage and phasing shown on the unit nameplate. Operating the unit below the minimum voltage, above the maximum voltage or with incorrect phasing can result in poor system performance or damage to the heat pump. All field wiring should be installed by qualified and trained personnel. Refer to the unit wiring diagram for field connection requirements.

Power wiring to the heat pump should be enclosed in flexible conduit to minimize the transmission of vibration from the unit cabinet to the building.

For heat pumps with unit mounted disconnect switches, field power should be connected to the marked terminals on the disconnect switch. For heat pumps without unit-mounted disconnect switches (except for 460-volt units noted below and units with dual power supply), power is connected to the line (L) side of the compressor contactor and the ground lug in the unit electrical box.

Units with Dual Power Supplies

For models with dual power supplies, one power supply feeds the compressor and a second power supply feeds the unit fan motor and control circuit. The compressor power supply should be connected to the line (L) side of the compressor contactor. The fan motor and control circuit power supply meets the voltage, amperage and phase requirements of its load. Refer to the unit name plates for requirements.

460-V Models with Constant Airflow Motors

The 460-V heat pumps with the constant airflow motor option require a properly sized neutral wire with the power supply wiring in addition to the three high voltage wires and the ground wire. These units employ a 265-V motor that requires power from one phase of the 460-V supply and the neutral wire.



CAUTION: The unit ground wire should never be used as a neutral wire

Transformer Settings for 208/230-V Units

As a factory built, all 208/230-V operation unless the wire for 208-v option is ordered. For Job sites with a 208-V power supply, the primary leads on the unit transformer will need to be changed from 240-V to 208-V. Refer to the unit wiring diagram for details.

NOTICE: All High voltage connections must be torqued as specified on contactor specifications to avoid the risk of overheating

Low Voltage

For heat pumps with PSC or constant torque fan motors, all thermostat wiring is connected to a terminal block located in the unit electrical box. For heat pumps with a constant airflow fan motor thermostat wiring is connected to a removal terminal strip located on the ECM (Electronically Commutated Motor) control board located in the electrical box. Refer to the unit wiring diagram for connection details.



CAUTION: Never route control wiring through the same conduit as power supply wiring.

Unless provided with DDC controls, the unit heat pump can be controlled by most commonly available single-stage heat pump thermostats. Note that the reversing valve on the unit is energized when the unit is in the cooling mode. Thermostats should be located on an interior wall away from supply ducts. Avoid locations subject to direct sunlight, drafts, external walls. Thermostat wiring should be 18AWG (American Wire Gauge). Refer to the installation instructions of the thermostats for further details.

NOTICE: Exceptionally long runs of thermostat wire should be avoided to prevent voltage drops in the control circuit.

See Table #1 and #2 for recommended length

Unit heat pumps are supplied with a 50VA control transformer as a standard. Models with DDC, hot gas reheat or an economizer are supplied with a 75 VA transformer. The 75 VA and 100 VA transformers are available as optional components for most models (size 018 and larger for 100 VA). The VA capacity of the transformer should be considered when connecting low voltage accessories to the heat pump such as thermostats or solenoid valves. Table # 3 shows the VA draw of factory mounted components in the low voltage heat pump. The total VA draw of the heat pump internal components plus attached accessories must be lower than the VA capacity of the unit control transformer.

NOTICE: Exceeding the transformer capacity can result in low control voltage, erratic unit operation or damage to the heat pump.

Thermostat to HVAC Equipment

The thermostat may not function properly if the total resistance of any of the thermostat to HVAC equipment wires exceeds 2.5 ohms. To ensure that wire length does not cause excess resistance, refer to Table # 1 and ensure that the wires from the thermostat to the HVAC equipment are not too long.

Table 1: Copper wire size	Maximum recommended wire length
22 AWG (0.33mm ²)	150 ft (46m)
20 AWG (0.50mm ²)	240 FT (73m)
18 AWG (0.75mm ²)	385 FT (117m)

Remote Sensor to Programmable Thermostat

Because remote temperature sensors measure resistance, very long cable runs can cause slight errors in the measurement. For the highest temperature reading accuracy, avoid exceeding the maximum recommended wire lengths show in Table # 2.

Table 2: Copper wire size	Maximum recommended remote sensor wire length
22 AWG (0.33mm ²)	1000 ft (300m)
20 AWG (0.50mm ²)	1500 FT (450m)
18 AWG (0.75mm ²)	2500 FT (750m)

Table 3: Low Voltage VA Draw

STANDARD CONSTRUCTION		HOT GAS REHEAT OR ECONOMIZER		OPTIONAL COMPONENTS	
Component	VA	Component	VA	Component	VA
Blower Relay (PSC motors only)	6-7	Total from 'Standard'	22-26	Monitor Relay (VA draw per relay)	6-7
Reversing Valve Solenoid	8-9	Additional Control Relays	12-14	Internal 2 Way Motorized Valve	7
Compressor Contactor	6-8	Hot Gas Reheat Solenoid	8-9	LED Annunciator	1
UPM Board	2				
Total VA draw	22-26	Total VA draw	42-49		

Step 9- Wire Field Controls

Units Controls ECM-UPM

ECM Interface Board

Thermostat wiring is connected to the 10 pin screw type terminal block on the lower center portion of the ECM Interface Board. In addition to providing a connecting point for thermostat wiring, the interface board also translates thermostat inputs into control commands for the Electronic Commutated Motor (ECM) DC fan motor and displays an LED indication of operating status. The thermostat connections and their functions are as shown in figure # 9

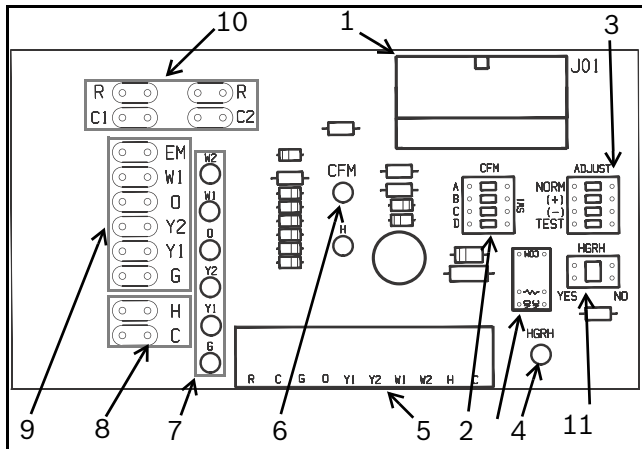


Figure # 9

- [1] Motor harness plug
- [2] Blower CFM adjustment
- [3] Motor settings
- [4] Dehumidification indication
- [5] Thermostat contact inputs
- [6] CFM count indicator
- [7] Thermostat input status indication
- [8] Reheat digital outputs
- [9] Thermostat outputs
- [10] 24 VAC
- [11] Hot gas Re-heat enable switch

Safety devices and the UPM control

Each unit is factory provided with a UPM board controller that controls the compressor operation and monitors the safety.

If the unit is being connected to a thermostat with a malfunction light, this connection is made at the unit malfunction output or relay.

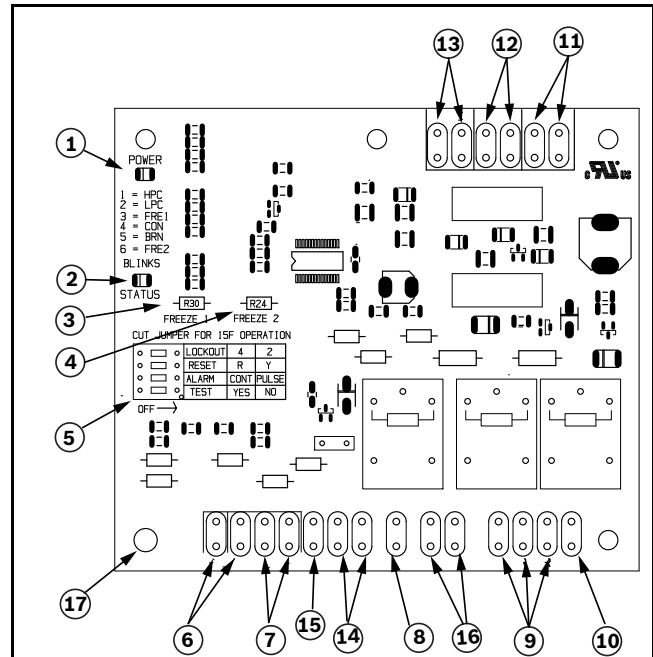
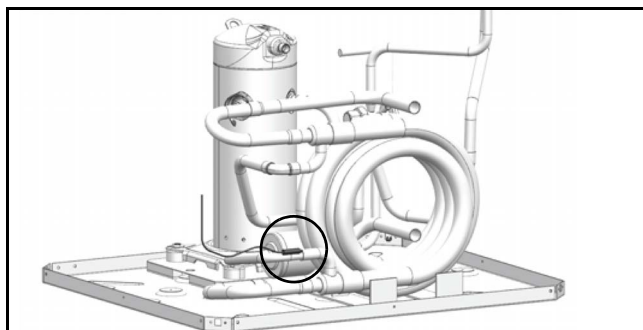


Figure # 10

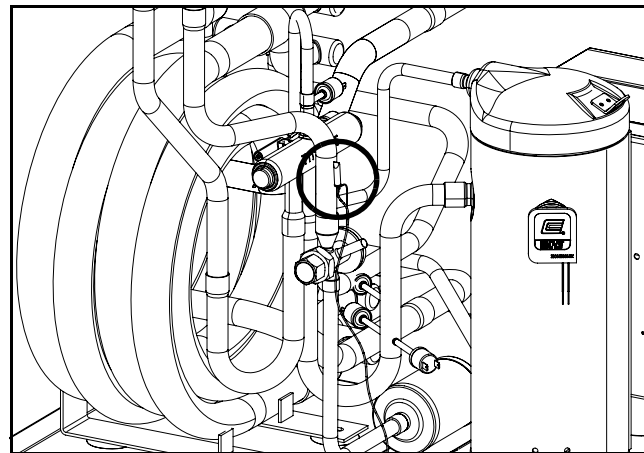
- [1] Board Power Indicator
- [2] UPM Status LED Indicator
- [3] Water Coil Freeze Protection Temperature Selection
- [4] Air Coil Freeze Protection Temperature Selection
- [5] UPM Board Settings
- [6] Water Coil Freeze Connection
- [7] Air Coil Freeze Connection
- [8] LED Unit Display Connection
- [9] 24VAC Power Input
- [10] Compressor Contact Output
- [11] High Pressure Switch Connection
- [12] Call for Compressor Y1
- [13] Low Pressure Switch Connection
- [14] 24VAC Power Common
- [15] Condensate Overflow Sensor
- [16] Dry Contact
- [17] UPM Ground Standoff

Safety features includes the following:

- High pressure switch located in the refrigerant discharge line and wired across the HPC terminals on the complete UPM board
- Low pressure switch located in the unit suction line and wired across terminals LPC1 and LPC2 on the complete UPM Board
- Complete UPM board dry contacts are normally open (NO).
- Water side 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 a soft lockout condition. The default freeze limit trip is 26°F, however this can be changed to 15°F by cutting the R30 or Freeze1 resistor located on top of DIP switch SW1. For resistor location. If unit is employing a fresh water system (no anti-freeze protection), it is extremely important to have the Freeze 1 R30 resistor set to 26°F in order to shut down the unit at the appropriate leaving water temperature and protect heat pump from freezing if a freeze sensor is included.
- Evaporator freeze sensor, mounted between the thermal expansion device and the evaporator, monitors refrigerant temperature between the evaporator coil and thermal expansion valve. If temperature drops below or remains at freeze limit trip for 30 seconds, the controller will shutdown the compressor and enter into a soft lockout condition. The default freeze limit trip is 26°F See Figure # 10
- The condensate overflow protection sensor is located in the drain pan of the unit and connected to the COND terminal on the complete UPM board.

**Figure # 11 Water side Freeze Protection Sensor**

NOTICE: If unit is employing a fresh water system (no anti-freeze protection), it is extremely important to have the Freeze1 R30 resistor set to 26°F in order to shutdown the unit at the appropriate leaving-water temperature and protect your heat pump from freezing if a freeze sensor is included.

**Figure # 12**

The UPM Board includes the following features:

- **ANTI-SHORT CYCLE TIMER:** 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 on initial power up to reduce the chance of multiple units simultaneously starting at the same time after power up or after a power interruption, thus avoiding creating large electrical spike.
- **LOW PRESSURE BYPASS TIMER:** If the compressor is running and the low pressure switch opens, the controller will keep the compressor ON for 120 seconds. After 2 minutes if the low pressure switch remains open, the controllers will shutdown 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 lockout power to the unit would need to be reset.
- **BROWNOUT/SURGE/POWER INTERRUPTION:** 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 until the voltage is above 18 VAC and 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 pulse is selected the alarm output will be pulsed. The fault output will depend on the on the dip switch setting for "ALARM". If it is set to "CONST", a constant signal will be produced to indicate a fault and the unit requires inspection to determine the type of fault. If is set to "PULSE", a pulse signal is produced and a fault code is detected by a remote device indicating the fault. See LED fault indication for blink code explanation. The remote device must have a malfunction detection capability when the UPM board is set to "PULSE".



If 24 VAC output is needed, R must be wired to ALR-COM terminal; 24 VAC will be available to the ALR-OUT terminal when the unit is in the alarm condition.

- **DISPLAY OUTPUT:** The display output is a pulse output connected to the Unit Diagnostics Display (UDD) and it pulses 24VAC when the unit is in an lockout alarm condition.
- **TEST DIP SWITCH:** A test dip switch is provided to reduce all time delays settings to 10 seconds during troubleshooting or verification of unit operation. In test mode the fault LED will flash 5 times in cooling or 3 times in heating for five minutes.

NOTICE: Operation of unit in test mode can lead to accelerated wear and premature failure of components. The “TEST” switch must be set back to “NO” after troubleshooting/servicing.

Table 4: UPM Fault Blink Codes

LED Blinks	Fault	Fault Criteria
None	None	All fault conditions nominal
1	High Pressure	Refrigerant discharge pressure has exceeded 600 PSIG
2	Low Pressure	Refrigerant suction pressure has fallen below 40 PSIG
3	Water Coil Freeze Condition	Refrigerant temperature to the water coil has fallen below 26°F for 30 seconds
4	Condensate Overflow	Condensate levels in the unit drain pan are too high
5	Air Coil Freeze Condition	Refrigerant temperature to the air coil has fallen below 26°F for 30 seconds
6	Brown Out	Control voltage has fallen below 18 VAC

UPM Board Factory Default Settings

TEMP	26°F
LOCKOUT	2
RESET	Y
ALARM	PULSE
TEST	NO

Freeze Sensor

The default setting for the freeze limit trip is 26°F (sensor number 1); however this can be changed to 15°F by cutting the R30 resistor located on top of the DIP switch SW1, freeze limit trip should only be changed to 15°F when a closed loop system with appropriate antifreeze mixture is used. Since freeze sensor 2 is dedicated to monitor the evaporator coil it is recommended to leave the factory default setting on the board. The complete UPM controller will constantly monitor the refrigerant temperature with the sensor mounted close to the condensing water coil between the thermal expansion valve and water coil. If temperature drops below or remains at the freeze limits for 30 seconds. The controller will shut the compressor down and enter into a soft lockout condition. Both the status LED and the alarm contact will be active. The LED will flash three times the code associated with this alarm condition. If this alarm occurs 2 times (or 4 if DIP switch is set to 4) within an hour the complete UPM controller will enter into a hard lockout condition. It will constantly monitor the refrigerant temperature with the sensor mounted close to the evaporator between the thermal expansion valve and evaporator coil as shown in figure # 11

If temperature drops below or remains at the freeze limit trip for 30 seconds, the controller will shut the compressor down and enter into a soft lockout condition. Both the status LED and the alarm contact will be active. The LED will flash three times the code associated with this alarm condition. If this alarm occurs 2 times (or 4 if DIP switch is set to 4) within an hour the controller will enter into a hard lockout condition.

NOTICE: It is recommended to have a flow switch to prevent the unit from running if water flow is lost.

Intelligent Reset

If a fault condition is initiated, the 5 minute delay on break time period is initiated and the unit will restart after this delays expire and if the fault condition has been resolved. 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 settings 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 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 power at the circuit breaker when the RESET DIP switch is set to “R”.

THERMOSTAT OPTIONS

Y1	First Stage Compressor Operation
G	Fan
O	Reversing Valve (energized in cooling)
W1	Auxiliary Electric Heat (runs in conjunction with compressor)
NC	Transformer 24 VAC Common (extra connection)
C1	Transformer 24 VAC Common (primary connection)
R	Transformer 24 VAC Hot
H	Dehumidification Mode

UPM DIP SWITCH DEFAULT POSITION

	lockout	4	2
	reset	R	Y
	alarm	Cont	pulse
	test	yes	no

PRE-START-UP**System Checkout**

After completing the installation, and before energizing the unit, the following system checks should be made prior to initial startup:

1. Verify that the supply voltage to the heat pump is in accordance with the nameplate ratings.
2. Make sure that all electrical connections are tight and secure.
3. Check the electrical fusing and wiring for the correct size.
4. Verify that the low voltage wiring between the thermostat and the unit is correct.
5. Verify that the water piping is complete and correct.
6. Check that the water flow is correct, and adjust if necessary.
7. Check the blower for free rotation, and that it is secured to the shaft.
8. Verify that vibration isolation has been provided.
9. Unit is serviceable. Be certain that all access panels are secured in place.
10. Verify that the blower support has been removed.
11. Verify that duct work has been properly fastened to supply and return duct collars.
12. Make sure return air filters are positioned correctly in the filter rack if removed during installation.

Air coil

To obtain maximum performance, clean the air coil before starting the unit. A 10% solution of dishwasher detergent and water is recommended for both sides of the coil. Rinse thoroughly with water.

START-UP

Use the procedure below to initiate a proper start-up

NOTICE: This equipment is designed for indoor installation only

Operating Limits**Environment**

This equipment is designed for indoor installation only. Extreme variations in temperature, humidity and corrosive water or air will adversely affect the unit performance, reliability and service life.

Power Supply

A voltage variation of $\pm 10\%$ of nameplate utilization voltage is acceptable.

Unit Starting Conditions

Minimum ambient temperature for heating operation is 45°F. Minimum entering air for heating is 40°F. Minimum entering water temperature for heating with standard range units is 50°F and for extended range units is 20°F. Air and water flow rates must be within the cataloged range.



These operating limits are not suitable for continuous operating conditions. Assume that such start up conditions are for the purpose of bringing the building space up to occupancy temperature.



WARNING: When the disconnect switch is closed, high voltage is present in some areas of the electrical panel. Exercise caution when working with the energized equipment.

1. Restore power to system.
2. Turn thermostat fan position to ON. Blower should start.
3. Balance airflow at registers.
4. Adjust all valves to the full open position and turn on the line power to the heat pump unit.
5. Operate unit in the cooling cycle first, then the heating cycle. for unit operating limits. Allow 15 minutes between cooling and heating tests for pressure to equalize.



Two factors determine the operating limits of a unit: entering air temperature and water temperature. Whenever any of these factors are at a minimum or maximum level, the other two factors must be at a normal level to ensure proper unit operation.

Scroll Compressor Rotation (4 and 5 Tons only)

It is important to be certain that the compressor is rotating in the proper direction. To determine whether or not compressor is rotating in the proper direction see as follows:

1. Connect services gases to suction and discharge pressure fittings.
2. Energize the compressor.
3. The suction pressure should drop and the discharge pressure should rise, as is normal on any start up.

If the suction pressure does not drop and the discharge pressure does not rise to normal levels:

1. Turn off power to the unit. Install disconnect tag.
2. Reverse any two of the unit power leads.
3. Reapply power to the unit and verify pressures are correct.

The suction and discharge pressure levels should now move to their normal start-up levels.

When the compressor is rotating in the wrong direction, the unit makes more noise and does not provide cooling.

After a few minutes of reverse operation, the scroll compressor internal overload protection will open, thus activating the unit lockout. This requires a manual reset. To reset, turn the thermostat on and then off.



There is a 5 minute time delay before the compressor will start.

```

graph TD
    START([START]) --> Y1{Y1 = ON}
    Y1 -- YES --> PSC[POWER/ SWITCHES/SENSOR  
STATUS CHECK]
    Y1 -- NO --> RY{RESET ON  
Y}
    RY -- YES --> CF[CLEAR FAULTS]
    RY -- NO --> R24V{R = 24VAC}
    R24V -- YES --> START
    R24V -- NO --> CF
    
    PSC --> V18V{V > 18VAC}
    V18V -- YES --> HPC{HPC =  
CLOSED}
    V18V -- NO --> BCS[BLINK CODE ON STATUS LED  
SOFT LOCKOUT  
RECORD ALARM  
START COUNTER (IF APPLICABLE)]
    HPC -- YES --> LPC{LPC =CLOSED}
    HPC -- NO --> BCS
    LPC -- YES --> FRZ{FRZ >TEMP  
LIMIT}
    LPC -- NO --> CCOUT1{CC OUPUT=  
ON}
    CCOUT1 -- YES --> T120{TIME > 120 SEC}
    CCOUT1 -- NO --> BCS
    T120 -- YES --> BCS
    T120 -- NO --> FRZ
    FRZ -- YES --> T30{TIME > 30 SEC}
    FRZ -- NO --> START_TIMER1[START  
TIMER]
    T30 -- YES --> BCS
    T30 -- NO --> CON{CON > 0}
    CON -- YES --> IPUP{INITIAL  
POWER UP}
    CON -- NO --> BCS
    IPUP -- YES --> RSC[START  
RANDOM START UP]
    IPUP -- NO --> ASC[START  
ANTI SHORT CYCLE]
    RSC --> TASC{T > ASC OR  
RS SEC}
    ASC --> TASC
    TASC -- YES --> CCOUT2[CC OUTPUT = ON]
    TASC -- NO --> BCS
    
    BCS --> CNTNEED{COUNTER  
NEEDED?}
    CNTNEED -- YES --> CNTINC[CNT = CNT+1]
    CNTNEED -- NO --> CCOUT2
    CNTINC --> COUNT2{COUNT = 2  
OR  
COUNT = 4}
    COUNT2 -- YES --> HARDLOCK{HARD  
LOCKOUT?}
    COUNT2 -- NO --> BCS
    HARDLOCK -- YES --> BCS_PULSE[BLINK CODE ON STATUS LED  
DISPLAY OUTPUT = PULSE  
ALR OUTPUT = ON/PULSE]
    HARDLOCK -- NO --> CCOUT2
    BCS_PULSE --> CCOUT2
    CCOUT2[CC OUTPUT = OFF] --> START
  
```

LV Heat Pump Series

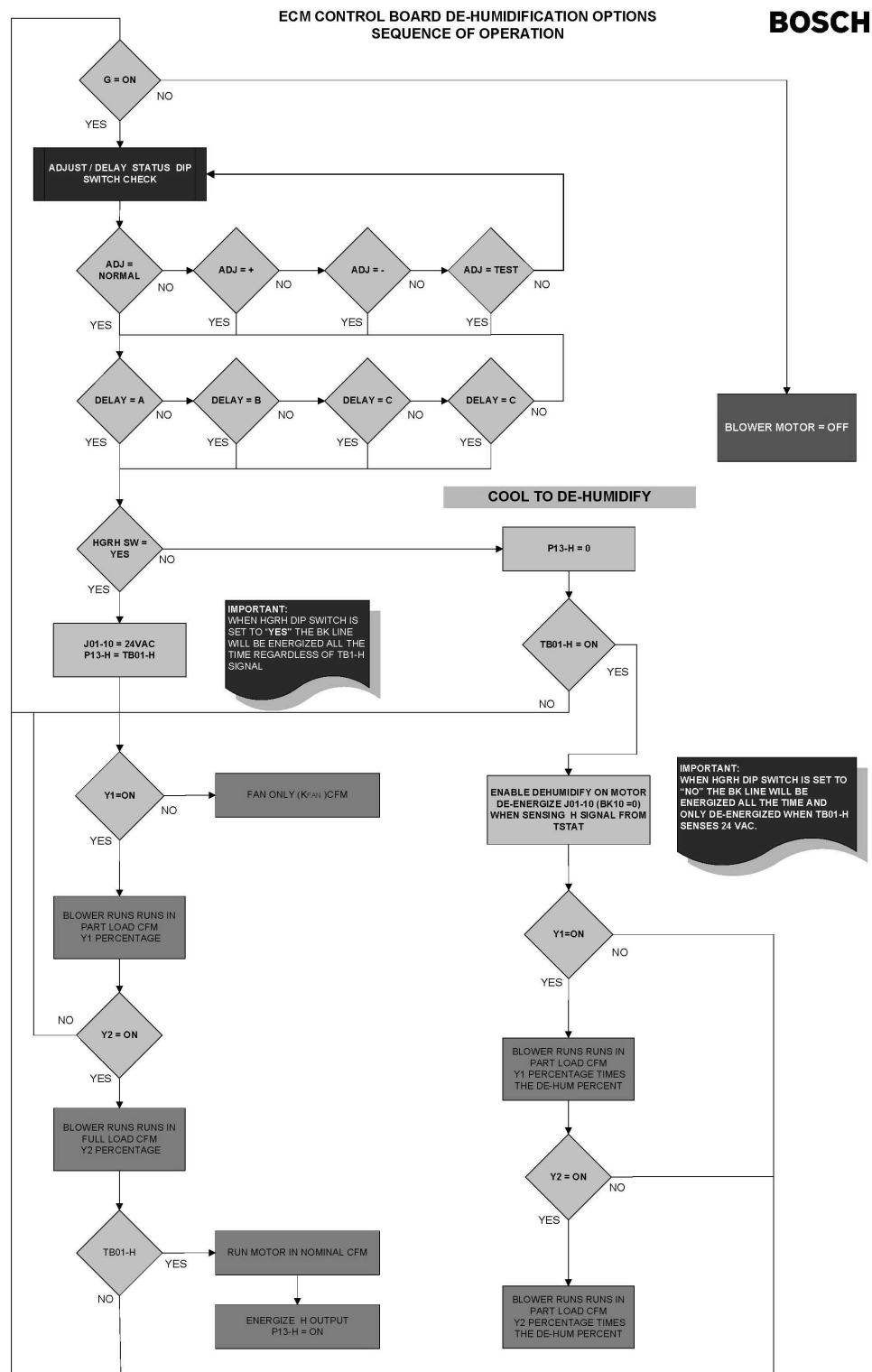


Figure # 14

Unit Start Up Cooling Mode

1. Adjust the unit thermostat to the warmest position. Slowly reduce the thermostat position until the compressor activates.
2. Check for cool air delivery at unit grille a few minutes after the unit has begun to operate.
3. Verify that the compressor is ON and that the water flow rate is correct by measuring pressure drop through the heat exchanger using P/T plugs. Check elevation and cleanliness of the condensate lines; any dripping could be a sign of a blocked line. Be sure the condensate trap includes a water seal.
4. Check the temperature of both supply and discharge water.
5. Check air temperature drop across the coil when compressor is operating. Air temperature drop should be between 15° and 25°F.

Unit Start Up Heating Mode



Operate the unit in heating cycle after checking the cooling cycle. Allow 5 minutes between tests for the pressure or reversing valve to equalize.

1. Turn thermostat to lowest setting and set thermostat switch to HEAT position.
2. Slowly turn the thermostat to a higher temperature until the compressor activates.
3. Check for warm air delivery at the unit grille within a few minutes after the unit has begun to operate.
4. Check the temperature of both supply and discharge water. If temperature is within range, proceed. If temperature is outside the range, check the heating refrigerant pressures.
5. Once the unit has begun to run, check for warm air delivery at the unit grille.
6. Check air temperature rise across the coil when compressor is operating. Air temperature rise should be between 20°F and 30°F after 15 minutes load.
7. Check for vibration, noise and water leaks.

Flow Regulation

Flow regulation can be accomplished by two methods. Most water control valves have a flow adjustment built into the valve. By measuring the pressure drop through the unit heat exchanger, the flow rate can be determined. Adjust the water control valve until the desired flow is achieved. Since the pressure constantly varies, two pressure gages may be needed in some applications.

An alternative method is to install a flow control device. These devices are typically an orifice of plastic material designed to allow a specified flow rate that are mounted on the outlet of the water control valve. Occasionally these valves produce a flow noise that can be reduced by applying some back pressure. To accomplish this, slightly close the leaving isolation valve of the well water setup.



WARNING: Open the disconnect switch and secure it in an open position before flushing the system.

Flushing

Once the piping is complete, units require final purging and loop charging. A flush cart pump of at least 1.5 hp is needed to achieve adequate flow velocity in the loop to purge air and dirt particles from the loop. Flush the loop to purge air and dirt particles from the loop. Flush the loop in both directions with a high volume of water at a high velocity.

Follow the steps below to properly flush the loop:

1. Verify that the power is off.
2. Fill loop with water from the hose through flush cart before using flush cart pump to ensure an even fill. Do not allow the water level in the flush cart tank to drop below the pump inlet line to prevent air from filling the line.
3. Maintain a fluid level in the tank above the return tee to avoid entering back into the fluid.
4. Shutting off the return valve that connects into the flush cart reservoir it will allow 50 psig surges to help purge air pockets. This maintains the pump at 50 psig.
5. To purge, keep the pump at 50 psig until maximum pumping pressure is reached.
6. Open the return valve to send a pressure surge through the loop to purge any air pockets in the piping system.
7. A noticeable drop in fluid level will be seen in the flush cart tank. This is the only indication of air in the loop.



If air is purged from the system while using a 10 inch PVC flush tank, the level drop will only be 1 to 2 inches, since liquids are incompressible. If the level drops more than this, flushing should continue since air is still being compressed in the loop. If level is less than 1 to 2 inches, reverse the flow.

8. Repeat this procedure until all air is purged.
9. Restore power.

Antifreeze may be added before, during or after the flushing process. However, depending on when it is added in the process, it can be wasted. refer to the Antifreeze section for more detail.

Loop static pressure will fluctuate with the seasons. Pressures will be higher in the winter months than during the warmer months. this fluctuation is normal and should be considered when charging the system initially. Run the unit in either heating or cooling for several minutes to condition the loop to a homogenous temperature.

When complete, perform a final flush and pressurize the loop to a static pressure of 40 to 50 psig for winter months or 15 to 20 psig for summer months.

After pressurization, be sure to remove the plug from the end of the loop pump motor to allow trapped air to be discharged and to ensure the motor housing has been flooded. Be sure the loop flow center provides adequate flow through the unit by checking pressure drop across the heat exchanger.

Antifreeze

In areas where entering loop temperatures drop below 40°F or where piping will be routed through areas subject to freezing, antifreeze is needed. Alcohols and glycols are commonly used as antifreeze agents. Freeze protection should be maintained to 15°F below the lowest expected entering loop temperature. For example, if the lowest expected entering loop temperature is 30°F, the leaving loop temperature would be 22°F to 25°F. Therefore, the freeze protection should be at 15°F (30°F-15°F=15°F).

NOTICE: All alcohols should be pre-mixed and pumped from a reservoir outside the building or introduced under water level to avoid build up of fumes.

Antifreeze concentration should be checked from a well mixed sample using a hydrometer to measure specific gravity.

Freeze Protection Selection

The 26°F FP1 factory setting (water) should be used to avoid freeze damage to the unit.

Once antifreeze is selected, the (FP1 jumper) should be clipped on the control to select the low temperatures (antifreeze 15°F) set point to avoid nuisance faults.

APPLICATION CONSIDERATIONS

Well Water Systems

Copper is adequate for ground water that is not high in mineral content. Should your well driller express concerns regarding the quality of the well water available or should any know hazards exists in your area, we recommend proper testing to assure the well water quality is suitable for use with water source equipment. (See water quality table on page #21) in conditions anticipating moderate scale formation or in brackish water a cupro-nickel heat exchanger is recommended. In well water applications water pressure must always be maintained in the heat exchanger. This can be accomplished with a control valve or a bladder type expansion tank. When using a single water well to supply both domestic water and the heat pump care must be taken to ensure that the well can provide sufficient flow for both. In well water applications a slow closing solenoid valve must be used to prevent water hammer. Solenoid valves should be connected across Y1 and C1 on the interface board for all. Make sure that the VA draw of the valve does not exceed the contact rating of the thermostat.

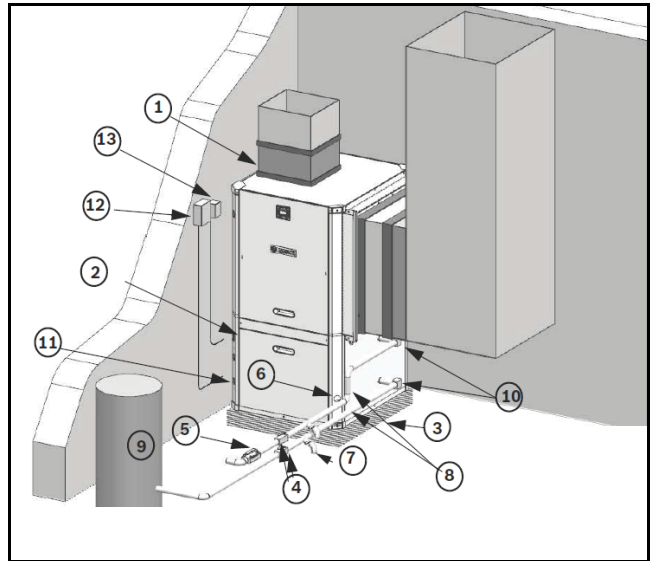


Figure # 15

1. Flex Duct Connection.
2. Low Voltage Control Connection
3. Vibration Pad
4. Ball Valves
5. Solenoid Valve Slow Closing
6. Condensate Drain Connection
7. Drain Valves
8. Hose Kits (optional)
9. Pressure Tank (optional)
10. P/T Ports (optional)
11. Line Voltage Connection
12. Electric Heater Line Voltage Disconnect
13. Unit Line Voltage Disconnect

Cooling Tower/Boiler Systems

These systems typically use a common loop temperature maintained at 50°F to 100°F. To assure adequate cooling and heating performance.

In the cooling mode, heat is rejected from the unit into the water loop. A cooling tower provides cooling to the loop water thus maintaining a constant supply temperature to the unit. When utilizing open cooling towers, chemical water treatment is mandatory to ensure the water is free from corrosive elements. A secondary heat exchanger (plate frame) between the unit and the open cooling tower may also be used. It is imperative that all air be eliminated from the closed loop side of the heat exchanger to ensure against fouling. In the heating mode, heat is absorbed from the water loop. A boiler can be utilized to maintain the loop at the desired temperature.

Consult the specification sheets for piping sizes.

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



Teflon tape thread sealant should be used against leaks and possible heat exchanger fouling. (Teflon is a registered trademark of DuPont).

Consult the specifications sheets for piping sizes

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.

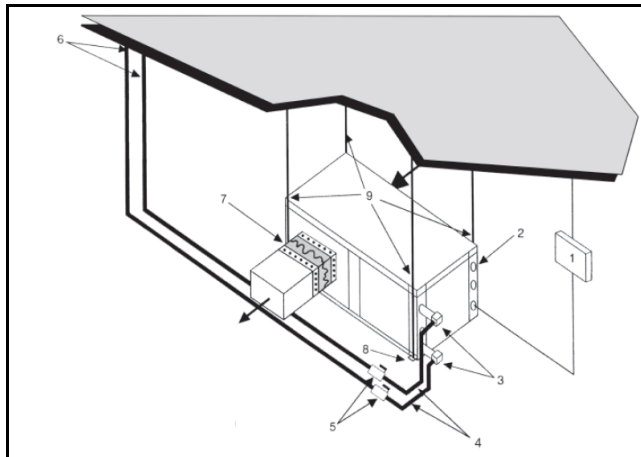


Figure # 16 Cooling/Boiler Application

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 the central system
7. Flex Duct Connection
8. Hanging Brackets Assembly
9. Threaded Rod

Geothermal Closed Loop Systems

Operation of an LV Series unit on a closed loop application requires the extended range option

NOTICE: 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 the Ground loop Pumping Package (GLP), makes the installation easy. Anti-freeze solutions must be utilized when low loop temperatures are expected to occur.



Refer to Ground Loop installation manuals for more specific instructions.

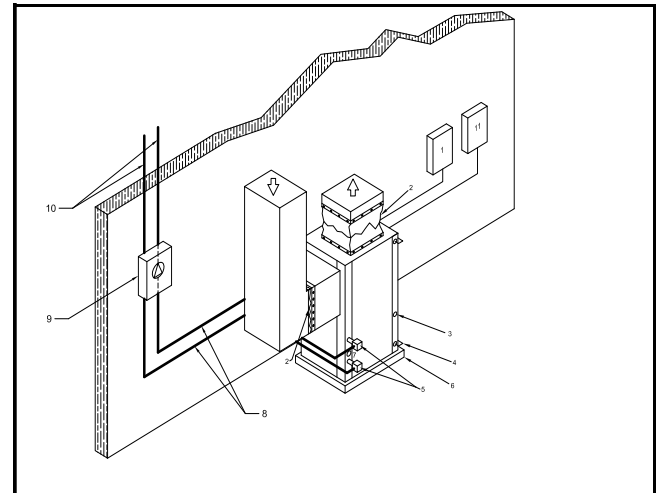


Figure # 17 Earth Coupled Application

1. Line voltage disconnect unit
2. Flex Duct Connection
3. Low voltage Control Connection
4. Line Voltage Connection
5. P/T Ports
6. Vibration Pad
7. Condensate Drain
8. Ground Loop Connection Kit
9. Ground Loop Pumping Package
10. Polyethylene With Insulation

Open Well Water Systems

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 up size 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.)

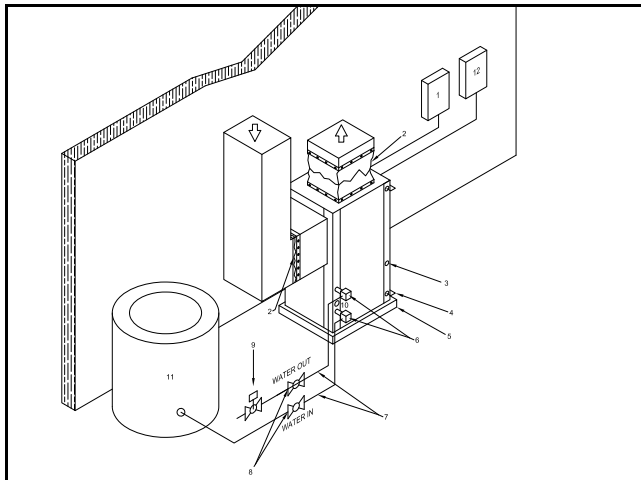


Figure # 18 Well Water Applications

1. Line Voltage Disconnect
2. Flex Duct Connector
3. Low Voltage Control Connection
4. Line Voltage Connection
5. Vibration Pad
6. P/T Ports
7. Hose Kits (Optional)
8. Ball Valves
9. Solenoid Valve Slow Closing
10. Condensate Drain Connection
11. Pressure Tank (Optional)

WATER QUALITY

NOTICE: Failure to ensure proper water quality and flow rates can shorten the life of the heat pump and potentially void the unit warranty.

Maintaining proper water quality is important for ensuring a long service life for an LV series heat pump. For closed loop and boiler/tower systems water chemistry can be checked and easily maintained to ensure that corrosive elements, dissolved oxygen and pH levels are kept in check. It is important to ensure that any additive, antifreeze or corrosion inhibitor that is added to the water loop is compliant with all applicable laws and regulations and is compatible with copper, brass and bronze alloys. ensure that all recommended safety precautions are followed when handling or adding chemicals to the water loop.

For open loop systems, water quality is very important. Refer to the Water Quality Table on page# 21, for acceptable ranges for a variety of water quality factors. The three main concerns in open loop installations are scaling, corrosion and fouling.

In installations with hard water, scaling due to a buildup of carbonates on the heat exchanger wall can gradually degrade the heat pump performance over time.

Heat pumps that are affected by scaling may exhibit low suction pressures in heating and high head pressures in cooling with a gradual loss of capacity and efficiency. Scaled heat exchangers can be cleaned by a qualified technician but care should be taken to avoid scaling in the first place.

To limit scaling, water flow rates should be kept at 3 gallons/minute per nominal cooling ton (a 10°F temperature rise in cooling) and care should be taken to avoid air in the water lines from suction side leaks. Cupro-nickel coils are generally recommended.

In installations with high hydrogen sulfide, chlorine or ammonia, corrosion is a potential problem. In these installations a cupro-nickel heat exchanger is required along with maintaining proper flow and keeping air out of the system. If water quality is outside of the values in the water quality table, then a closed loop is required. Fouling due to iron bacteria can also pose problems in some open loop installations. Iron bacteria fouling can quickly degrade system performance and plug heat exchangers.

Air in the water system will greatly accelerate the fouling or corrosion process.

WATER QUALITY TABLE

Table 5: Water Quality			
POTENTIAL PROBLEM	Water Characteristic	Acceptable Value	
		Copper	Cupro-Nickel
	pH (Acidity/Alkalinity)	7-9	7-9
SCALING	Hardness (CaCO ₃ , MgCO ₃)	< 350 ppm	< 350 ppm
	Ryznar Stability Index	6.0 - 7.5	6.0 - 7.5
	Langelier Saturation Index	-0.5 - +0.5	-0.5 - +0.5
CORROSION	Hydrogen Sulfide (H ₂ S)	< 0.5 ppm *	10-50 ppm
	Sulfates	< 125 ppm	< 125 ppm
	Chlorine	< 0.5 ppm	< 0.5 ppm
	Chlorides	< 20 ppm	< 150 ppm
	Carbon Dioxide	< 50 ppm	< 50 ppm
	Ammonia	< 2 ppm	< 2 ppm
	Ammonia Chloride	< 0.5 ppm	< 0.5 ppm
	Ammonia Nitrate	< 0.5 ppm	< 0.5 ppm
	Ammonia Hydroxide	< 0.5 ppm	< 0.5 ppm
	Ammonia Sulfate	< 0.5 ppm	< 0.5 ppm
	Dissolved Solids	< 1,000 ppm	< 1,500 ppm
IRON FOULING	Iron (Fe ²⁺ Iron Bacteria Potential)	< 0.2 ppm	< 0.2 ppm
	Iron Oxide	< 1 ppm	< 1 ppm
EROSION	Suspended Solids	< 10 ppm, < 600 µm size **	< 10 ppm, < 600 µm size **
	Maximum Water Velocity	6 ft/sec	6 ft/sec
* No "rotten egg" smell present at < 0.5 ppm H ₂ S.			
** Equivalent to 30 mesh strainer			

Condensate Connections

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.

This connection must be in conformance with local plumbing codes. A trap must be installed in the condensate line to ensure free condensate flow. (Heat Pumps are not internally trapped).

A vertical air vent is sometimes required to avoid air pockets.

The depth 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 Duct System

All LV Series models are provided with a return air duct flange and supply air duct connections.

Refer to unit Dimensional Drawings for physical dimensions of the collar and flange. Page# 55. A flexible connector is recommended for supply and return air duct connections on metal duct systems. All metal ducting should be insulated with a minimum of 1" (one inch) duct insulation to avoid heat loss or gain and prevent condensate from forming during the cooling operation. Application of the unit to non-insulated duct work is not recommended as the unit's performance will be adversely affected.

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. LV 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. (refer to Water Quality table on page#22)



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. (refer to Water Quality table on page#22)

In conditions anticipating moderate scale formation or in brackish water a cupro-nickel heat exchanger is required. 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. 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 ensure 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.

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

NOTICE: Never exceed the recommended water flow rates. Serious damage or erosion of the water to refrigerant heat exchanger could occur.

OPTIONS

Extended Range Option

LV heat pumps are supplied standard with capillary style expansion device tuned to typical boiler/tower system operating conditions. For applications that will experience more extreme fluid flow rates or temperatures (heating fluid temperatures below 50°F and/or cooling fluid temperatures below 60°F or above 100°F), an extended range option is required.

The extended range option on the LV consists of a bi-flow, balanced port thermal expansion valve and an insulated water-to-refrigerant heat exchanger. With the extended range option installed LV units can provide heating with fluid temperatures as low as 20°F and as high as 80°F and cooling with fluid temperatures as low as 50°F and as high as 110°F.

Unit Mounted Non-Fused Disconnect Switch

LV heat pumps can be supplied with an optional unit mounted disconnect switch mounted to the electrical corner post of the unit.

Field electrical wiring is connected to the switch and the switch then routes power to the heat pump electrical box. When the switch is in the “OFF” position, the heat pump electrical box is completely de-energized.

Hot Gas Reheat

(Available on size 015 and larger)

LV series heat pumps size 015 and larger can be provided with hot gas reheat for active dehumidification. In operation hot gas reheat dehumidifies space by cooling the air and removing moisture and then reheating the air back to a neutral temperature using waste heat from the compressor. The net effect is to decrease the relative humidity of the space without changing the sensible temperature.

The major components of the hot gas reheat option are the hot gas reheat coil, the reheat solenoid valve and the control circuit. When the control circuit energizes the heat pump in reheat mode, the heat pump will operate in the cooling mode. The hot gas solenoid valve diverts the compressor discharge gas to the reheat coil which is mounted downstream of the unit evaporator. This hot gas re-heats the cooled air coming off of the evaporator.

To function, heat pumps with hot gas reheat must be controlled by both a thermostat and a humidistat (or a combination thermostat/humidistat). The humidistat must provide a dry contact closure on a rise in humidity above set point.



Note that the ability of the reheat coil to reheat cooled air back to a neutral temperature is affected by the water temperature of the system.

At water temperatures of 85° F, the reheat coil can recover 95% to 100% of the sensible capacity of the evaporator. At water temperatures below 60°F, the reheat coil can only recover 5% to 25% of the sensible capacity of the evaporator.

Refer to the unit wiring diagram for control circuit details.

Hot Gas Bypass

(Available on size 024 and larger)

The hot gas bypass option can be used to reduce cooling capacity in low air temperature applications such as applications with a large percentage of outside air.

As the air temperature entering the unit drops, the suction pressure and evaporating temperature start to drop as well.

At an evaporating temperature of 40°F the hot gas bypass valve will start to divert a portion of the hot compressor discharge gas to the low temperature liquid entering the evaporator coil. This hot gas serves to warm the evaporator coil and reduces the cooling capacity of the heat pump.



Note that the hot gas bypass valve is inoperative in the heating mode.

Internal 2-Way Water Valve

In many applications, including variable pumping and well water installations, a motorized water valve is required on the heat pump water circuit. On the LV series this water valve can be factory mounted and wired internally to the unit.

The LV series internal water valve option features a 24VAC motorized water valve rated to 450 psig working pressure. This valve is wired to open on a thermostat call for compressor operation (heating or cooling) and will remain open as long as the thermostat calls. The valve can remain seated with up to 20 psi of back pressure on all sizes.

The valve consists of two main parts: the valve body and the actuator. The valve body is brazed into the leaving water line of the heat pump and is a permanent part of the unit. The valve actuator can be easily removed from the valve body for service.

Refer to the water side pressure drop table in the troubleshooting section of this manual to determine the appropriate pressure drop across the heat pump with and without the water valve option.



Note that the 2-Way Water Valve option will add additional pressure drop between the water in and water out connections of the heat pump.



Note that this water valve cannot be used as an isolation valve.

Economizer

LV series heat pumps can be provided an optional water side economizer. The water side economizer option allows a cooling demand to be satisfied by circulating cold water through a water-to-air heat exchanger (economizer coil) mounted to the return air opening of the heat pump instead of energizing the compressor. The major components of the economizer option are the water-to-air heat exchanger, the three way water diverting valve, the aquastat and the unit control circuit. The economizer option operates in the following sequence:

- When the unit thermostat calls for cooling operation and the economizer aquastat indicates that the supply water temperature is below the aquastat set point, then heat pump switches from compressor cooling to economizer cooling mode.
- In economizer cooling mode the three way diverting valve shifts, diverting water through the economizer coil and then to the condenser coil. The unit fan operates but the compressor does not start. This mode effectively cools the air passing through the heat pump with the cold water supply instead of compressor cooling.
- If the call for cooling is satisfied, then the heat pump fan simply shuts off.
- If, during a call for cooling, the supply water temperature climbs above the aquastat set point, then the three way valve will divert water back to the condenser coil and the heat pump compressor will start in the cooling mode.



Note that the economizer coil incorporates its own drain pan to collect condensate from the coil. This pan **MUST** be independently trapped and piped into the drain line for the heat pump.



The LV series economizer option is designed for **free return** applications. If the heat pump is to be connected to return air duct work, the economizer may need to be slightly modified.



The LV series economizer is designed for **cooling only**. If heating economizer operation is desired, consult the factory for applications and design information.



Note: See Page #9 Figure #7 for Condensate Drain

CERTIFIED PERFORMANCE TABLE

Table 6: LV Series AHRI Ratings

MODEL	PSC Motor (Base)							
	WLHP				GLHP			
	Cooling Capacity	EER	Heating Capacity	COP	Cooling Capacity	EER	Heating Capacity	COP
LV007	6,100	12.20	7,800	5.30	6,800	15.10	4,900	3.40
LV009	8,200	12.40	9,900	4.70	8,700	14.60	5,700	3.20
LV012	10,900	12.20	13,000	4.30	11,800	14.10	8,700	3.20
LV015	14,200	12.80	16,100	4.40	14,200	14.60	11,300	3.30
LV018	19,400	13.40	22,200	4.60	21,200	15.80	14,300	3.50
LV024	23,400	13.40	26,600	4.40	25,000	15.50	17,000	3.40
LV030	29,200	13.20	33,400	4.30	31,000	14.70	20,900	3.30
LV036	37,900	14.70	41,800	4.60	39,900	16.90	26,900	3.50
LV041	39,500	13.10	44,600	4.30	43,000	14.30	29,400	3.20
LV042	40,000	13.70	46,300	4.30	42,600	14.80	31,000	3.30
LV048	45,900	13.00	56,400	4.30	48,800	14.90	35,400	3.40
LV060	57,900	13.00	67,200	4.30	60,100	14.10	46,900	3.20
LV070	64,000	13.30	72,800	4.40	66,400	15.00	50,800	3.40
MODEL	ECM Motor (Option)							
	WLHP				GLHP			
	Cooling Capacity	EER	Heating Capacity	COP	Cooling Capacity	EER	Heating Capacity	COP
LV015	13,700	13.90	15,500	4.40	14,400	16.20	10,700	3.30
LV018	19,700	14.40	21,900	4.80	21,500	15.90	14,100	3.70
LV024	23,800	14.50	26,200	4.60	25,400	16.80	16,700	3.60
LV030	30,000	15.00	32,800	4.60	31,600	17.50	20,400	3.40
LV036	38,200	15.40	41,400	4.70	40,200	17.70	26,500	3.60
LV041	40,500	13.60	43,700	4.40	42,200	15.90	28,500	3.60
LV042	40,900	14.10	45,300	4.40	43,500	16.30	30,100	3.50
LV048	46,800	14.20	55,600	4.50	49,600	16.30	34,600	3.60
LV060	59,000	14.30	66,400	4.30	61,100	16.40	46,200	3.30
LV070	65,200	14.60	71,800	4.60	67,600	16.60	50,000	3.50



GLHP ratings require an extended range option
 ECM motors can be either constant torque or constant CFM
 Ratings based upon AHRI/ANSI 13256-1 with 1" disposable filter

FAN MOTOR OPTIONS

Permanent Split Capacitor Motors (PSC)

The standard motor for all LV series heat pumps is a PSC motor. For all models other than 575 V units, the supplied motor is a three speed motor. 575 V motors are single speed. If a speed change is required, follow the instructions below:

1. Disconnect power to the heat pump.
2. For units with leaded motors, remove the front access cover.
3. Remove the fan speed wire from the fan relay. Clip the ¼" quick connect from the lead and cap the unused lead.

4. Uncap the desired fan speed wire and terminate with a ¼" quick connect. Connect to the fan relay.
5. If the motor is a 460 V motor and the speed is changed from high to medium or low, connect the high speed motor lead to the orange intermediate winding lead instead of simply capping it.

Refer to the PSC motor performance tables for heat pump blower performance with the PSC motor option.

Table 7: PSC Motor Performance Data

Model	Fan Speed	Rated Airflow												
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
LV-007	Low		370	340	295	250	-	-	-	-	-	-	-	-
	Med	300	390	360	330	300	260	-	-	-	-	-	-	-
	Hi		410	380	350	315	280	210	-	-	-	-	-	-
LV-009	Low		370	340	295	250	-	-	-	-	-	-	-	-
	Med		390	360	330	300	260	-	-	-	-	-	-	-
	Hi	350	410	380	350	315	280	210	-	-	-	-	-	-
LV-012	Low		300	290	290	300	-	-	-	-	-	-	-	-
	Med		380	380	360	330	290	-	-	-	-	-	-	-
	Hi	400	420	400	380	360	340	320	-	-	-	-	-	-
LV-015	Low		500	450	400	-	-	-	-	-	-	-	-	-
	Med		560	520	480	430	400	-	-	-	-	-	-	-
	Hi	500	700	650	600	550	500	450	400	-	-	-	-	-
LV-018	Low		630	590	560	-	-	-	-	-	-	-	-	-
	Med	650	810	790	760	730	680	590	-	-	-	-	-	-
	Hi		1010	970	920	870	800	680	530		-	-	-	-
LV-024	Low		650	610	570	540	510	-	-	-	-	-	-	-
	Med		830	820	800	770	720	620	-	-	-	-	-	-
	Hi	850	1050	1000	950	910	840	710	570		-	-	-	-
LV-030	Low		740	730	700	660	610	-	-	-	-	-	-	-
	Med		830	810	770	730	680	620	-	-	-	-	-	-
	Hi	950	1000	950	900	830	750	698	630		-	-	-	-
LV-036	Low		1290	1250	1200	1150	1080	1000	-	-	-	-	-	-
	Med		1410	1350	1290	1220	1150	1060	900	-	-	-	-	-
	Hi	1200	1500	1440	1370	1290	1210	1120	1000	900	-	-	-	-

Table 7: PSC Motor Performance Data

Model	Fan Speed	Rated Airflow												
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
LV-041	Low		950	900	840	780	720	700	-	-	-	-	-	-
	Med		1200	1140	1080	1010	930	870	820	-	-	-	-	-
	Hi	1300	1490	1400	1320	1240	1160	1080	990	910	-	-	-	-
LV-042	Low		1210	1210	1190	1160	1120	1080	-	-	-	-	-	-
	Med		1460	1450	1430	1390	1330	1250	1160	-	-	-	-	-
	Hi	1400	1750	1710	1670	1620	1560	1460	1330	1210	1080	-	-	-
LV-048	Low		1450	1440	1420	1400	1360	1320	-	-	-	-	-	-
	Med		1700	1670	1630	1580	1530	1470	1400	-	-	-	-	-
	Hi	1600	1930	1870	1810	1740	1670	1600	1520	1430	1340	-	-	-
LV-060	Low		1560	1550	1540	1530	1505	1475	1440	1400	-	-	-	-
	Med		1890	1880	1870	1860	1825	1790	1730	1670	1590	1500	-	-
	Hi	2000	2220	2200	2150	2100	2050	2000	1940	1870	1800	1700	1590	-
LV-070	Low		1570	1560	1550	1540	1530	1505	1475	1440	1400	-	-	-
	Med		1900	1890	1880	1870	1860	1825	1790	1730	1670	1590	1500	-
	Hi	2100	2240	2220	2200	2150	2100	2050	2000	1940	1870	1800	1700	1590



575V models utilize 1 speed motors (high only)

Constant Torque Motors (ECM)

For installations where the efficiency of an electronically commutated brushless DC motor (ECM) motor is required, but the features of a constant airflow motor are not required, the LV series is offered with a constant torque ECM motor option. These motors feature up to 90% thermal efficiency combined with a flatter fan curve than a PSC motor and simple operation. These motors are provided with 5 speed taps to allow for a wide range of air flow and external static options. To change a speed tap follow the instructions below:

1. Disconnect power to the heat pump.
2. Remove the blower access panel.
3. Remove the speed tap wire from the terminal it is currently connected to and connect it to the terminal desired.



Refer to the constant torque motor performance tables for heat pump blower performance with the constant torque motor option.

Table 8: Constant Torque Blower Motor Data

Model	Tap #	Rated Airflow												
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
LV-015	1		480	440	410	370	340	-	-	-	-	-	-	-
	2		530	490	450	420	380	340	-	-	-	-	-	-
	3	500	600	560	510	470	440	410	370	-	-	-	-	-
	4		650	600	560	520	500	480	440	380	-	-	-	-
	5		710	660	620	580	550	520	490	470	-	-	-	-
LV-018	1		630	590	560	530	490	-	-	-	-	-	-	-
	2	650	720	700	670	630	600	560	-	-	-	-	-	-
	3		790	770	750	710	670	620	560	-	-	-	-	-
	4		910	890	850	810	740	670	590	520	-	-	-	-
	5		1010	970	920	860	810	750	660	530	-	-	-	-
LV-024	1		650	610	580	560	520	-	-	-	-	-	-	-
	2		740	720	690	660	620	570	-	-	-	-	-	-
	3		850	830	800	770	730	690	630	-	-	-	-	-
	4	850	950	920	890	870	840	820	770	650	-	-	-	-
	5		1160	1110	1050	990	920	800	670	560	-	-	-	-
LV-030	1		620	600	570	540	490	-	-	-	-	-	-	-
	2		730	710	670	640	610	550	-	-	-	-	-	-
	3		820	790	760	740	710	670	630	-	-	-	-	-
	4		940	910	880	850	800	740	660		-	-	-	-
	5	950	1070	1010	950	900	840	760	670		-	-	-	-
LV-036	1		1120	1090	1055	1030	1000	-	-	-	-	-	-	-
	2		1260	1230	1200	1170	1140	1080	-	-	-	-	-	-
	3	1200	1330	1293	1253	1210	1167	1100	1030	-	-	-	-	-
	4		1400	1357	1307	1250	1193	1120	1040	963	-	-	-	-
	5		1470	1420	1360	1290	1220	1140	1050	970	890	-	-	-
LV-041	1		840	770	700	620	-	-	-	-	-	-	-	-
	2		1220	1150	1080	1010	950	-	-	-	-	-	-	-
	3		1430	1360	1280	1200	1130	1080	-	-	-	-	-	-
	4	1300	1540	1460	1380	1300	1220	1140	1060	-	-	-	-	-
	5		1620	1550	1470	1370	1260	1180	1090	1000	-	-	-	-
LV-042	1		1270	1250	1230	1210	-	-	-	-	-	-	-	-
	2		1440	1420	1410	1410	1400	1380	1340	-	-	-	-	-
	3	1400	1540	1530	1510	1500	1490	1470	1430	1350	-	-	-	-
	4		1650	1630	1610	1600	1580	1530	1460	1360	1240	-	-	-
	5		1730	1720	1700	1670	1620	1570	1490	1380	1260	1100	-	-

Table 8: Constant Torque Blower Motor Data

Model	Tap #	Rated Airflow												
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
LV-048	1		1390	1370	1350	1320	-	-	-	-	-	-	-	-
	2		1600	1580	1550	1530	1510	-	-	-	-	-	-	-
	3	1600	1730	1700	1670	1650	1630	1600	1580	1540	-	-	-	-
	4		1830	1810	1780	1760	1740	1710	1670	1600	1520	-	-	-
	5		1930	1910	1880	1860	1830	1780	1720	1640	1540	1420	-	-
LV-060	1		1900	1880	1860	1820	-	-	-	-	-	-	-	-
	2		2000	1970	1950	1920	1890	1860	-	-	-	-	-	-
	3	2000	2110	2090	2060	2030	2010	1970	1940	1910	1880	-	-	-
	4		2220	2200	2170	2140	2110	2080	2050	2060	2050	2000	1920	-
	5		2340	2320	2290	2260	2230	2210	2180	2150	2110	2070	2000	1930
LV-070	1		2050	2010	1970	1930	-	-	-	-	-	-	-	-
	2		2150	2120	2080	2030	1990	1960	-	-	-	-	-	-
	3	2100	2270	2230	2200	2160	2120	2080	2040	2010	1980	-	-	-
	4		2390	2350	2320	2280	2250	2200	2160	2130	2100	2070	2030	-
	5		2520	2480	2450	2420	2380	2330	2290	2260	2220	2170	2100	2020

updated 7/30/14

Constant Airflow Motors (ECM)

For installations where constant air delivery is critical or where external static pressure drop can vary greatly (such as with high MERV value filters) the LV series is offered with a constant air flow ECM motor option. This option provides ECM motor efficiency combined with a constant air delivery across a wide range of external static pressures. These motors dynamically adjust their power output to precisely match the desired air flow on a pre-programmed fan curve. Additionally these motors feature:

1. A low CFM ventilation feature that circulates air at 70% of full load when fan only is called.
2. A passive dehumidification mode that reduces air flow during a cooling call when dehumidification is also required – this reduces the sensible heat ratio of the cooling coil and extends cooling run time to more effectively dehumidify. (refer to the ECM Interface Board section of this manual)
3. 3 speed settings per model. Units are factory set to “NORM” but can be field adjusted to “+” to increase CFM by 15% or to “-” to reduce CFM by 15%. (refer to the ECM Interface Board section of this manual)
4. A “TEST” mode that operates the motor at a 70% torque setting. This setting can be used to diagnose programming problems in the motor itself. (refer to the ECM Interface Board section of this manual)

5. A CFM indicator light that provides a blink for each 100 CFM of air delivered (note that this blink code is approximate and should not replace test and balancing).



Refer to the constant air flow motor performance tables for heat pump blower performance with the constant air flow motor option.

Table 9: Constant Airflow Motor Performance Table

Model	Fan Speed	Rated Airflow												
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
LV-015	A - Low		450	450	450	450	450	450	450	440	440	430	-	-
	A - Normal	500	500	500	500	500	500	500	500	480	470	460	-	-
	A - Hi		580	580	580	580	580	580	580	570	560	550	-	-
LV-018	B - Low		550	540	540	540	540	540	540	530	520	500	-	-
	B - Normal	650	650	650	650	650	650	650	640	630	610	590	-	-
	B - Hi		750	750	750	750	750	750	740	730	710	690	-	-
LV-024	C - Low		720	720	720	720	720	720	720	700	650	560	-	-
	C - Normal	850	850	850	850	850	850	850	850	850	800	700	-	-
	C - Hi		960	960	960	960	960	960	960	960	880	790	-	-
LV-030	D - Low		810	810	810	810	810	810	810	770	720	650	-	-
	D - Normal	950	950	950	950	950	950	950	950	900	850	780	-	-
	D - Hi		980	980	980	980	980	980	980	950	900	820	-	-
LV-036	A - Low		1020	1020	1020	1020	1020	1020	1000	990	960	930	-	-
	A - Normal	1200	1200	1200	1200	1200	1200	1200	1180	1160	1130	1090	-	-
	A - Hi		1380	1380	1380	1380	1380	1380	1360	1330	1300	1250	-	-
LV-041	A - Low		1100	1100	1100	1100	1100	1090	1070	1050	1020	990	-	-
	A - Normal	1300	1280	1280	1280	1280	1280	1260	1240	1220	1180	1140	-	-
	A - Hi		1300	1300	1300	1300	1300	1280	1260	1240	1200	1160	-	-
LV-042	B - Low		1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	-
	B - Normal	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	-
	B - Hi		1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	-
LV-048	A - Low		1340	1340	1340	1340	1340	1340	1340	1340	1340	1340	1340	-
	A - Normal	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	-
	A - Hi		1810	1810	1810	1810	1810	1810	1810	1810	1810	1810	1810	-
LV-060	A - Low		1700	1700	1700	1700	1700	1700	1700	1700	1690	1690	1680	-
	A - Normal	2000	2000	2000	2000	2000	2000	2000	2000	2000	1980	1980	1980	-
	A - Hi		2220	2220	2220	2220	2220	2220	2220	2220	2130	2100	2070	-
LV-070	B - Low		1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	-
	B - Normal	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	-
	B - Hi		2330	2330	2330	2330	2330	2330	2330	2330	2330	2330	2330	-



Note: Air flow is 70% of tabulated values during fan only operation. Air flow is 80% of tabulated value during passive dehumidification mode when enabled.

STANDARD BLOWER MOTOR

Table 10: Electrical Data Table - Standard Blower Motor

MODEL	Voltage Code	Voltage/Hz/Phase	Voltage Min/Max	Compressor			Blower Motor			Min Circuit Amps	Max Fuse /HARC
				QTY	RLA	LRA	FLA	HP	Total Unit FLA		
LV007	1	208-230/60/1	197/253	1	2.6	17.7	0.96	0.1	3.56	4.2	15
	2	265/60/1	238/292	1	2.6	13.5	0.96	0.1	3.56	4.2	15
LV009	1	208-230/60/1	197/253	1	3.4	22.2	0.96	0.1	4.36	5.2	15
	2	265/60/1	238/292	1	2.9	18.8	0.85	0.1	3.75	4.5	15
LV012	0	115/60/1	103/126	1	9.6	58.4	2.2	0.1	11.8	14.2	20
	1	208-230/60/1	197/253	1	4.6	28	0.96	0.1	5.56	6.7	15
	2	265/60/1	238/292	1	3.8	22.2	0.85	0.1	4.65	5.6	15
LV015	1	208-230/60/1	197/253	1	5.6	29.0	1.10	0.17	6.7	8.1	15
	2	265/60/1	238/292	1	4.6	20.0	0.90	0.17	5.5	6.2	15
LV018	1	208-230/60/1	197/253	1	6.5	43	1.8	0.25	8.3	9.9	15
	2	265/60/1	238/292	1	5.8	46	1.6	0.25	7.4	8.9	15
LV024	1	208-230/60/1	197/253	1	7.4	43	1.8	0.25	9.2	11.1	15
	2	265/60/1	238/292	1	6.7	46	1.6	0.25	8.3	10.0	15
	3	208-230/60/3	197/253	1	5.9	63	1.8	0.25	7.7	9.2	15
	4	460/60/3	414/506	1	2.9	30	0.9	0.25	3.8	4.5	15
LV030	1	208-230/60/1	197/253	1	9.9	54	1.8	0.25	11.7	14.2	20
	2	265/60/1	238/292	1	8.5	46	1.6	0.25	10.1	12.2	20
	3	208-230/60/3	197/253	1	6.9	63	1.8	0.25	8.7	10.4	15
	4	460/60/3	414/506	1	5.4	30	0.9	0.25	6.3	7.7	15
LV036	1	208-230/60/1	197/253	1	13	74	4.4	0.5	17.4	20.7	30
	2	265/60/1	238/292	1	11.3	67	3.3	0.5	14.6	17.4	25
	3	208-230/60/3	197/253	1	7.8	68	4.4	0.5	12.2	14.2	20
	4	460/60/3	414/506	1	3.9	34	1.8	0.5	5.7	6.7	15
LV041	1	208-230/60/1	197/253	1	13.6	88	4.4	0.75	18.0	21.4	35
	3	208-230/60/3	197/253	1	8.8	68	4.4	0.75	13.2	15.4	20
	4	460/60/3	414/506	1	4.4	34	2.8	0.75	7.2	8.3	15
LV042	1	208-230/60/1	197/253	1	13.6	88	4.4	0.5	18	21.4	35
	3	208-230/60/3	197/253	1	8.8	68	4.4	0.5	13.2	15.4	20
	4	460/60/3	414/506	1	4.4	34	1.8	0.5	6.2	7.3	15
LV048	1	208-230/60/1	197/253	1	15.7	84	4.4	0.75	20.1	24.0	35
	3	208-230/60/3	197/253	1	11	88	4.4	0.75	15.4	18.2	25
	4	460/60/3	414/506	1	5.4	44	2.8	0.75	8.2	9.6	15
	5	575/60/3	517/633	1	4.4	36	2.6	0.75	7	8.1	15
LV060	1	208-230/60/1	197/253	1	26.3	134	5.5	0.75	31.8	38.4	60
	3	208-230/60/3	197/253	1	15.6	110	5.5	0.75	21.1	25.0	40
	4	460/60/3	414/506	1	7.8	52	2.8	0.75	10.6	12.6	20
	5	575/60/3	517/633	1	5.8	38.9	2.6	0.75	8.4	9.9	15
LV070	1	208-230/60/1	197/253	1	28.3	178	5.5	0.75	33.8	40.9	60
	3	208-230/60/3	197/253	1	19.2	136	5.5	0.75	24.7	29.5	45
	4	460/60/3	414/506	1	8.7	66.1	2.8	0.75	11.5	13.7	20
	5	575/60/3	517/633	1	6.9	55.3	2.6	0.75	9.5	11.2	15

Constant Torque ECM Blower Motor

Table 11: Electrical Data Table - Constant Torque ECM Blower Motor

MODEL	Voltage Code	Rated Voltage	Voltage Min/Max	Compressor			Fan Motor	Fan Motor HP	Total Unit FLA	Min Circuit	Max Fuse
				QTY	RLA	LRA					
LV015	1	208-230/60/1	197/253	1	5.6	29	2.8	0.33	8.4	9.8	15
	2	265/60/1	238/292	1	4.6	20	2.6	0.33	7.2	8.4	15
LV018	1	208-230/60/1	197/253	1	6.5	43	2.8	0.33	9.3	10.9	15
	2	265/60/1	238/292	1	5.8	46	2.6	0.33	8.4	9.9	15
LV024	1	208-230/60/1	197/253	1	7.4	43	2.8	0.33	10.2	12.1	15
	2	265/60/1	238/292	1	6.7	46	2.6	0.33	9.3	11.0	15
	3	208-230/60/3	197/253	1	5.9	63	2.8	0.33	8.7	10.2	15
	4	460/60/3	414/506	1	2.9	30	2.1	0.5	5	5.7	15
LV030	1	208-230/60/1	197/253	1	9.9	54	2.8	0.33	12.7	15.2	25
	2	265/60/1	238/292	1	8.5	46	2.6	0.33	11.1	13.2	20
	3	208-230/60/3	197/253	1	6.9	63	2.8	0.33	9.7	11.4	15
	4	460/60/3	414/506	1	5.4	30	2.1	0.5	7.5	8.9	15
LV036	1	208-230/60/1	197/253	1	13	74	4.1	0.5	17.1	20.4	30
	2	265/60/1	238/292	1	11.3	67	3.9	0.5	15.2	18.0	25
	3	208-230/60/3	197/253	1	7.8	68	4.1	0.5	11.9	13.9	20
	4	460/60/3	414/506	1	3.9	34	2.1	0.5	6	7.0	15
LV041	1	208-230/60/1	197/253	1	13.6	88	6	0.75	19.6	23.0	35
	3	208-230/60/3	197/253	1	8.8	68	6	0.75	14.8	17.0	25
	4	460/60/3	414/506	1	4.4	34	4.6	0.75	9	10.1	15
LV042	1	208-230/60/1	197/253	1	13.6	88	6	0.75	19.6	23.0	35
	3	208-230/60/3	197/253	1	8.8	68	6	0.75	14.8	17.0	25
	4	460/60/3	414/506	1	4.4	34	4.6	0.75	9	10.1	15
LV048	1	208-230/60/1	197/253	1	15.7	84	6	0.75	21.7	25.6	40
	3	208-230/60/3	197/253	1	11	88	6	0.75	17	19.8	30
	4	460/60/3	414/506	1	5.4	44	4.6	0.75	10	11.4	15
LV060	1	208-230/60/1	197/253	1	26.3	145	7.6	1	33.9	40.5	60
	3	208-230/60/3	197/253	1	15.6	123	7.6	1	23.2	27.1	40
	4	460/60/3	414/506	1	7.8	70	4	1	11.8	13.8	20
LV070	1	208-230/60/1	197/253	1	28.3	158	7.6	1	35.9	43.0	70
	3	208-230/60/3	197/253	1	19.2	155	7.6	1	26.8	31.6	50
	4	460/60/3	414/506	1	8.7	75	4	1	12.7	14.9	20

Constant CFM ECM Blower Motor

Table 12: Electrical Data Table - Constant CFM ECM Blower Motor

MODEL	Voltage Code	Rated Voltage	Voltage Min/Max	Compressor			Fan Motor	Fan Motor HP	Total Unit FLA	Min Circuit	Max Fuse
				QTY	RLA	LRA					
LV015	1	208-230/60/1	197/253	1	5.6	29	2.8	0.33	8.4	9.8	15
	2	265/60/1	238/292	1	4.6	20	2.6	0.33	7.2	8.4	15
LV018	1	208-230/60/1	197/253	1	6.5	43	2.8	0.33	9.3	10.9	15
	2	265/60/1	238/292	1	5.8	46	2.6	0.33	8.4	9.9	15
LV024	1	208-230/60/1	197/253	1	7.4	43	2.8	0.33	10.2	12.1	15
	2	265/60/1	238/292	1	6.7	46	2.6	0.33	9.3	11.0	15
	3	208-230/60/3	197/253	1	5.9	63	2.8	0.33	8.7	10.2	15
	4	460/60/3	414/506	1	2.9	30	2.6	0.33	5.5	6.2	15
LV030	1	208-230/60/1	197/253	1	9.9	54	2.8	0.33	12.7	15.2	25
	2	265/60/1	238/292	1	8.5	46	2.6	0.33	11.1	13.2	20
	3	208-230/60/3	197/253	1	6.9	63	2.8	0.33	9.7	11.4	15
	4	460/60/3	414/506	1	5.4	30	2.6	0.33	8	9.4	15
LV036	1	208-230/60/1	197/253	1	13	74	4.3	0.5	17.3	20.6	30
	2	265/60/1	238/292	1	11.3	67	4.1	0.5	15.4	18.2	25
	3	208-230/60/3	197/253	1	7.8	68	4.3	0.5	12.1	14.1	20
	4	460/60/3	414/506	1	3.9	34	4.1	0.5	8	9.0	15
LV041	1	208-230/60/1	197/253	1	13.6	88	6.8	0.75	20.4	23.8	35
	3	208-230/60/3	197/253	1	8.8	68	6.8	0.75	15.6	17.8	25
	4	460/60/3	414/506	1	4.4	34	5.5	0.75	9.9	11.0	15
LV042	1	208-230/60/1	197/253	1	13.6	88	6.8	0.75	20.4	23.8	35
	3	208-230/60/3	197/253	1	8.8	68	6.8	0.75	15.6	17.8	25
	4	460/60/3	414/506	1	4.4	34	5.5	0.75	9.9	11.0	15
LV048	1	208-230/60/1	197/253	1	15.7	84	6.8	0.75	22.5	26.4	40
	3	208-230/60/3	197/253	1	11	88	6.8	0.75	17.8	20.6	30
	4	460/60/3	414/506	1	5.4	44	5.5	0.75	10.9	12.3	15
LV060	1	208-230/60/1	197/253	1	26.3	145	9.1	1	35.4	42.0	60
	3	208-230/60/3	197/253	1	15.6	123	9.1	1	24.7	28.6	45
	4	460/60/3	414/506	1	7.8	70	6.9	1	14.7	16.7	20
LV070	1	208-230/60/1	197/253	1	28.3	158	9.1	1	37.4	44.5	70
	3	208-230/60/3	197/253	1	19.2	155	9.1	1	28.3	33.1	50
	4	460/60/3	414/506	1	8.7	75	6.9	1	15.6	17.8	25

TROUBLESHOOTING

UNIT TROUBLESHOOTING					
Problem	Mode		Check	Possible Cause	Action
	Cooling	Heating			
No compressor operation but fan runs	X		Is fault LED Blinking 1 time?	High Pressure fault - no or low water flow	Check water valves and/or pumps for proper operation. Check for water coil blockage.
				High Pressure fault - high water temperature	Check water temperature - is it in range?
				High Pressure fault - fouled or scaled water coil	Check for proper flow rate and water temperature, but low water side temp rise in cooling
		X		High Pressure fault - no or low air flow	Check fan motor for proper operation.
					Check air filter
					Inspect air coil for dirt/debris
	X		Is fault LED Blinking 2 times?	Low Pressure fault - no or low air flow	Check fan motor for proper operation.
					Check air filter
					Inspect air coil for dirt/debris
		X		Low Pressure fault - low refrigerant	Check duct work - are dampers closed or blocked?
				Low Pressure fault - low refrigerant	Check refrigerant pressure with gauge set
				Low Pressure fault - no or low water flow	Check water valves and/or pumps for proper operation. Check for water coil blockage.
		X	Is fault LED Blinking 3 times?	75Unit	Check for proper flow rate and water temperature, but low water side temp drop in heating.
				Low Pressure fault - low refrigerant	Check refrigerant pressure with gauge set
				Freeze fault, water coil - no or low water flow	Check water valves and/or pumps for proper operation. Check for water coil blockage.
		X		Freeze fault - low water temperature	Check water temperature - is it below 40° entering? If heat pump is connected to a closed loop with antifreeze check that the "FREEZE 1" resistor on the UPM board has been cut to set the unit to antifreeze mode (see UPM features on pages 15-17).
				Freeze fault - low refrigerant	Check refrigerant pressure with gauge set

UNIT TROUBLESHOOTING

Problem	Mode		Check	Possible Cause	Action
No compressor operation but fan runs	X		Is fault LED Blinking 4 times?	Condensate fault - poor drainage	Check condensate pan for high water level. Check drain line for blockages, double trapping or inadequate trapping.
				Condensate fault - blocked return air	Check condensate pan for high water level. Check air filter and return air duct work for blockage. Check that there is adequate space between the return air opening and walls or other obstructions on free return applications.
	X	X	Is fault LED Blinking 5 times?	Brown out fault - low supply voltage	Check primary voltage - ensure it is within the limits listed on the unit data plate.
				Brown out fault - overloaded control circuit	Check control voltage - if it is below 18 V check accessories connected to the unit and ensure that they do not exceed the VA draw shown on page 11.
				Brown out fault - bad thermostat connection	Check that thermostat wiring is proper gauge and length, that it is not damaged and that all connections at the thermostat and heat pump are secure.
	X		Is fault LED Blinking 6 times?	Freeze fault, air coil - no or low air flow	Check fan motor for proper operation.
					Check air filter
					Inspect air coil for dirt/debris
				Freeze fault, air coil - blocked return air	Check that there is adequate space between the return air opening and walls or other obstructions on free return applications.
				Freeze fault, air coil - low refrigerant	Check refrigerant pressure with gauge set.
	X	X	No fault LED - contactor not energized	Thermostat not calling for compressor operation	Ensure that the thermostat is on and calling for "Y"
				Bad thermostat connection	Check "Y" connection from thermostat. ensure that there is 24 VAC between "Y" and "C".
				Loose wire to contactor coil	Check wiring - ensure that there is 24 VAC across the contactor coil.
				Burned out contactor coil	Test contactor with 24VAC (between "R" and "C"). Ohm contactor coil - an open circuit indicates a burned coil.

UNIT TROUBLESHOOTING					
Problem	Mode		Check	Possible Cause	Action
No compressor operation but fan runs	X	X	No fault LED - contactor energized	Open compressor overload	Check for supply voltage at the load side of the contactor. For 3 phase models check phase rotation and voltage at all 3 phases.
				Poor wiring connections	Look for signs of heat on the wiring insulation. Check that all wiring connections are secure and properly torqued.
				Burned out compressor	Does compressor hum when power is applied? If not check the resistance of the compressor windings using the values shown in the compressor characteristics chart. Note that the compressor must be cool (70° F) when checking the windings.
No compressor or fan operation	X	X	Power LED on	Bad thermostat connection / faulty thermostat	Check thermostat and wiring. Check unit terminal block for 24 VAC between "Y" and "C" and "G" and "C".
			Power LED off	Low or no supply power	ensure that the supply voltage to the unit is with in the range shown on the unit data plate.
				Faulty control transformer	Check for 24 VAC between "R" and "C" on the unit terminal block. For 75 and 100 VA transformers, check that the transformer circuit breaker has not tripped. Check low voltage circuit for overload conditions or short circuits before replacing the transformer.
No fan operation - PSC motor	X	X	Fan relay energized	Faulty motor	check supply voltage from the fan relay to the motor. Check that all motor wires are secure. With power off spin the motor shaft - noise, resistance or uneven motion can be signs of motor failure.
			Fan relay not energized	No fan operation signal	Check for 24 VAC across the fan relay coil. Check all wiring connections.
				Bad fan relay	If the relay coil is energized but the relay does not pull in, check the resistance across the relay coil - an open circuit is an indicator of a faulty relay.
No fan operation - constant torque motor	X	X		No fan operation signal	Check for 24 VAC between "G" and "C". Check all wiring connections.
				Loose wiring	Check all wiring connections at motor and control box.
				Faulty motor	Check supply voltage to the motor. Check that all motor wires are secure. With power off spin the motor shaft - noise, resistance or uneven motion can be signs of motor failure.

UNIT TROUBLESHOOTING					
Problem	Mode		Check	Possible Cause	Action
No fan operation - constant airflow motor	X	X		No fan operation signal	Check for 24 VAC between "G" and "C". Check all wiring connections. Make sure that the thermostat connection plug is securely connected.
				Loose wiring	Check all wiring connections at motor and control box. Check that power and control harnesses are securely connected.
				Interface board problems	Make sure that the interface board is not damaged and that all DIP switches are in the proper configuration (refer to the blower performance tables).
				Faulty motor	Check supply voltage to the motor. Check that all motor wires are secure. Move the "TEST" DIP switch to "ON" and the other switches to "OFF" on the "ADJUST" switch block on the interface board - the motor should run at 70% torque when "G" is called. With power off spin the motor shaft - noise, resistance or uneven motion can be signs of motor failure.
Unit not shifting into cooling	X		Reversing valve solenoid energized	Faulty solenoid	Check that the reversing valve solenoid is receiving 24 VAC. If so, check the resistance of the solenoid - an open circuit may indicate a burned out solenoid.
			Reversing valve solenoid not energized	Miswired/faulty thermostat	Check that the reversing valve thermostat wire is connected to the "O" terminal of the thermostat. Check for a contact closure between "O" and "R".
				Loose wire on "O" terminal	Check that the wires from the thermostat to the unit are securely connected and that the wires from the electrical box to the reversing valve are connected.
Excessively cold supply air temperature in cooling or excessively hot supply air temperature in heating	X	X	Reduced air flow	Dirty Filter	Replace filter.
				Fan speed too low	Consult blower performance table and increase fan speed if possible.
				Excessive duct pressure drop	Consult blower performance table and increase fan speed if possible.
Excessively warm supply air temperature in cooling and/or excessively cool air in heating	X	X	Air flow too high	Fan speed setting too high	Consult blower performance table and reduce fan speed if possible.
			High or low water temperature	Inlet water temperature out of range	Check unit capacity vs. water temperature.
			Air leakage	Leaky duct work	Inspect duct work.
			Loss of refrigeration capacity	Low refrigerant	Check refrigerant pressures with gauge set.

UNIT TROUBLESHOOTING					
Problem	Mode		Check	Possible Cause	Action
High humidity	X		Air flow too high	Fan speed setting too high	Consult blower performance table and reduce fan speed if possible.
			Loss of refrigeration capacity	Low refrigerant	Check refrigerant pressures with gauge set.
			Short cycling	Unit oversized	Check unit performance against building load calculations.
				Poor thermostat location	Make sure that thermostat is not located by a supply air duct .
Objectionable noise levels	X	X	Air noise	Poor duct work/grille design	ensure duct work and grilles are properly sized for unit air flow.
				Fan speed setting too high	Consult blower performance table and reduce fan speed if possible.
			Structure bourne noise	Unit not mounted on full vibration pad	Mount unit on a vibration pad (see page 7).
				Unit not connected with flexible conduit, water lines and/or duct work	Install unit in accordance with instructions on pages 6-8.
				Unit cabinet touching wall or other building component	Adjust unit location to avoid unit touching structure.
	X		Compressor noise	High water temperature or low water flow rate elevating head pressure	Increase water flow rate and/or reduce water temperature if possible.
				Scaled or fouled water coil elevating heat pressure	Clean/de scale water coil.
		X		Low air flow elevating head pressure	Check filter.
					Increase fan speed.
	X	X	Water hammer	Fast closing valves installed	change valves to slow-close type.

TEMPERATURE /PRESSURE TABLE

Table 13: 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
LV007	30°	1.4					65-80	282-344	6-7	14-17
		1.9					73-89	294-359	3-4	15-18
	40°	1.4	106-129	146-178	17-21	18-22	80-98	299-365	7-9	16-20
		1.9	102-124	133-162	10-13	19-23	89-108	311-380	4-5	17-21
	50°	1.4	115-141	180-220	17-20	17-21	95-116	315-385	9-11	19-23
		1.9	111-135	163-200	10-12	18-23	105-128	329-402	5-7	20-24
	60°	1.4	124-152	213-261	16-19	17-21	109-133	332-406	11-13	21-26
		1.9	120-146	194-237	10-12	18-22	121-148	346-423	6-8	22-27
	70°	1.4	134-163	247-302	15-19	17-20	124-151	349-427	12-15	23-28
		1.9	128-157	225-275	9-11	18-21	138-168	364-444	7-9	25-30
	80°	1.4	143-175	281-343	14-18	16-20	138-169	366-447	14-17	26-31
		1.9	137-168	255-312	9-11	17-21	154-188	381-466	8-10	27-33
	90°	1.4	152-186	315-385	14-17	16-19	153-187	383-468	16-19	28-34
		1.9	146-179	286-350	8-10	17-20	170-208	399-487	9-12	29-36
	100°	1.4	161-197	349-426	13-16	15-19				
		1.9	155-190	317-387	8-10	16-20				
LV009	30°	1.8					91-111	251-307	5-6	21-25
		2.4					95-116	256-313	3-4	22-26
	40°	1.8	112-137	144-176	14-17	22-27	107-130	267-327	6-7	24-29
		2.4	106-130	137-167	10-12	23-28	112-137	273-333	4-5	25-30
	50°	1.8	116-142	177-217	13-16	21-26	123-150	284-347	7-9	27-33
		2.4	111-135	169-206	9-12	22-27	129-158	289-353	5-6	28-34
	60°	1.8	121-148	211-258	13-16	21-26	139-170	300-366	8-10	30-37
		2.4	115-140	200-245	9-11	22-27	146-179	306-374	6-7	32-39
	70°	1.8	126-154	245-299	13-15	20-25	156-190	316-386	9-12	33-41
		2.4	119-146	232-284	9-11	21-26	163-200	322-394	7-8	35-43
	80°	1.8	130-159	278-340	12-15	20-24	172-210	332-406	11-13	36-44
		2.4	124-151	264-323	9-11	21-26	180-220	339-414	8-9	38-47
	90°	1.8	135-165	312-381	12-15	19-24	188-230	349-426	12-15	39-48
		2.4	128-157	296-362	9-10	20-25	197-241	355-434	8-10	41-51
	100°	1.8	140-171	345-422	12-14	19-23				
		2.4	133-162	328-401	8-10	20-24				

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
LV012	30°	2.6					73-89	266-325	5-6	15-18
		3					77-94	272-333	3-4	16-19
	40°	2.6	117-143	189-231	14-17	18-22	86-105	279-341	6-7	17-21
		3	112-137	178-217	8-9	19-24	90-110	286-350	4-5	18-22
	50°	2.6	126-154	221-270	14-17	18-21	162-198	293-358	7-8	20-24
		3	121-148	207-253	8-9	19-23	170-208	300-366	5-6	21-25
	60°	2.6	131-160	252-308	13-16	17-21	110-134	306-374	8-10	22-27
		3	125-153	237-290	8-9	18-22	115-141	314-383	6-7	23-29
	70°	2.6	135-165	284-347	13-16	17-20	122-150	320-391	9-11	24-30
		3	130-158	266-326	7-9	18-22	129-157	327-400	6-8	26-32
	80°	2.6	140-171	320-391	13-16	16-20	134-164	333-407	11-13	27-33
		3	134-164	300-367	7-9	17-21	141-172	341-417	7-9	28-35
	90°	2.6	144-176	360-440	13-16	16-19	147-179	347-424	12-14	29-36
		3	138-169	338-414	7-9	17-21	154-188	355-434	8-10	31-38
	100°	2.6	149-182	405-495	13-15	15-19				
		3	143-174	381-465	7-9	16-20				
LV015	30°	2.8					74-90	244-299	3-4	13-15
		3.8					78-95	251-306	2-3	13-16
	40°	2.8	122-149	183-224	14-18	19-23	87-106	257-314	4-5	15-18
		3.8	117-143	172-210	8-10	20-24	91-111	263-322	3-3	16-19
	50°	2.8	131-160	214-261	14-18	18-22	164-201	269-329	5-6	17-20
		3.8	126-154	201-245	8-10	19-24	173-211	276-337	3-4	18-22
	60°	2.8	136-166	244-298	14-17	18-22	111-136	282-344	6-7	19-23
		3.8	131-160	230-281	8-10	19-23	117-143	289-353	4-5	20-24
	70°	2.8	141-172	275-336	14-17	17-21	124-152	294-360	7-8	21-25
		3.8	135-165	258-316	8-10	18-22	131-160	302-369	5-6	22-27
	80°	2.8	145-178	310-378	14-17	17-20	136-166	307-375	8-9	23-28
		3.8	140-171	291-356	8-10	18-22	143-175	314-384	5-6	24-30
	90°	2.8	150-183	349-426	14-17	16-20	149-182	319-390	8-10	25-30
		3.8	144-176	328-401	8-9	17-21	156-191	327-400	6-7	26-32
	100°	2.8	155-189	392-480	13-16	16-19				
		3.8	149-182	369-451	8-9	17-21				

OPERATING DATA

MODEL	ENTERING WATER TEMP, °F	WATER FLOW GPM	COOLING				HEATING			
			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
LV018	30°	3					65-80	282-344	6-7	14-17
		5					73-89	294-359	3-4	15-18
	40°	3	121-148	184-225	17-21	18-22	80-98	299-365	7-9	16-20
		5	117-143	167-204	10-13	19-23	89-108	311-380	4-5	17-21
	50°	3	123-151	222-271	17-20	17-21	95-116	315-385	9-11	19-23
		5	119-145	202-247	10-12	18-23	105-128	329-402	5-7	20-24
	60°	3	125-153	260-318	16-19	17-21	109-133	332-406	11-13	21-26
		5	120-147	237-289	10-12	18-22	121-148	346-423	6-8	22-27
	70°	3	127-155	298-365	15-19	17-20	124-151	349-427	12-15	23-28
		5	122-149	271-331	9-11	18-21	138-168	364-444	7-9	25-30
	80°	3	129-158	336-411	14-18	16-20	138-169	366-447	14-17	26-31
		5	124-152	306-374	9-11	17-21	154-188	381-466	8-10	27-33
	90°	3	131-160	374-458	14-17	16-19	153-187	383-468	16-16	28-34
		5	126-154	340-416	8-10	17-20	170-208	399-487	9-12	29-36
	100°	3	133-162	413-504	13-16	15-19				
		5	128-156	375-458	8-10	16-20				
LV024	30°	5					72-87	296-361	5-6	21-25
		7					75-92	301-368	3-4	22-26
	40°	5	114-139	155-190	14-17	22-27	88-107	314-384	6-7	24-29
		7	108-132	147-180	10-12	23-28	92-112	321-392	4-5	25-30
	50°	5	116-142	192-234	13-16	21-26	104-127	333-407	7-9	27-33
		7	111-135	182-222	9-12	22-27	109-133	340-415	5-6	28-34
	60°	5	119-146	228-279	13-16	21-26	120-146	352-430	8-10	30-37
		7	113-138	217-265	9-11	22-27	125-153	359-439	6-7	32-39
	70°	5	122-149	264-323	13-15	20-25	136-166	371-453	9-12	33-41
		7	116-142	251-307	9-11	21-26	142-174	378-462	7-8	35-43
	80°	5	125-152	301-368	12-15	20-24	152-185	389-476	11-13	36-44
		7	118-145	286-349	9-11	21-26	159-194	397-485	8-9	38-47
	90°	5	127-156	337-412	12-15	19-24	168-205	408-499	12-15	39-48
		7	121-148	320-392	9-10	20-25	176-215	416-509	8-10	41-51
	100°	5	130-159	374-457	12-14	19-23				
		7	124-151	355-434	8-10	20-24				

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
LV030	30°	3.5					73-89	266-325	5-6	15-18
		7.5					77-94	272-333	3-4	16-19
	40°	3.5	117-143	189-231	14-17	18-22	86-105	279-341	6-7	17-21
		7.5	112-137	178-217	8-9	19-24	90-110	286-350	4-5	18-22
	50°	3.5	126-154	221-270	14-17	18-21	162-198	293-358	7-8	20-24
		7.5	121-148	207-253	8-9	19-23	170-208	300-366	5-6	21-25
	60°	3.5	131-160	252-308	13-16	17-21	110-134	306-374	8-10	22-27
		7.5	125-153	237-290	8-9	18-22	115-141	314-383	6-7	23-29
	70°	3.5	135-165	284-347	13-16	17-20	122-150	320-391	9-11	24-30
		7.5	130-158	266-326	7-9	18-22	129-157	327-400	6-8	26-32
	80°	3.5	140-171	320-391	13-16	16-20	134-164	333-407	11-13	27-33
		7.5	134-164	300-367	7-9	17-21	141-172	341-417	7-9	28-35
	90°	3.5	144-176	360-440	13-16	16-19	147-179	347-424	12-14	29-36
		7.5	138-169	338-414	7-9	17-21	154-188	355-434	8-10	31-38
LV036	30°	3.5	149-182	405-495	13-15	15-19				
		7.5	143-174	381-465	7-9	16-20				
	30°	4.5					74-90	244-299	3-4	13-15
		9					78-95	251-306	2-3	13-16
	40°	4.5	122-149	183-224	14-18	19-23	87-106	257-314	4-5	15-18
		9	117-143	172-210	8-10	20-24	91-111	263-322	3-3	16-19
	50°	4.5	131-160	214-261	14-18	18-22	164-201	269-329	5-6	17-20
		9	126-154	201-245	8-10	19-24	173-211	276-337	3-4	18-22
	60°	4.5	136-166	244-298	14-17	18-22	111-136	282-344	6-7	19-23
		9	131-160	230-281	8-10	19-23	117-143	289-353	4-5	20-24
	70°	4.5	141-172	275-336	14-17	17-21	124-152	294-360	7-8	21-25
		9	135-165	258-316	8-10	18-22	131-160	302-369	5-6	22-27
	80°	4.5	145-178	310-378	14-17	17-20	136-166	307-375	8-9	23-28
		9	140-171	291-356	8-10	18-22	143-175	314-384	5-6	24-30
	90°	4.5	150-183	349-426	14-17	16-20	149-182	319-390	8-10	25-30
		9	144-176	328-401	8-9	17-21	156-191	327-400	6-7	26-32
100°	100°	4.5	155-189	392-480	13-16	16-19				
		9	149-182	369-451	8-9	17-21				

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
LV041 & LV042	30°	6					64-78	248-303	5-6	15-18
		10					67-82	254-311	3-4	16-19
	40°	6	109-134	183-224	18-22	19-23	75-91	261-319	6-8	17-21
		10	105-128	172-210	10-12	20-25	79-96	267-327	4-5	18-23
	50°	6	118-144	214-261	18-22	19-23	142-173	273-334	8-10	20-24
		10	113-138	201-245	10-12	20-24	149-182	280-342	5-7	21-26
	60°	6	122-149	244-298	17-21	18-22	96-117	286-349	9-11	22-27
		10	117-143	230-281	10-12	19-24	101-123	293-358	6-8	24-29
	70°	6	126-154	275-336	17-21	18-22	107-131	299-365	11-13	25-30
		10	121-148	258-316	10-12	19-23	113-138	306-374	7-9	26-32
	80°	6	130-159	310-378	17-21	17-21	117-143	311-380	12-15	27-33
		10	125-153	291-356	10-12	18-22	123-151	319-390	8-10	29-35
	90°	6	134-164	349-426	17-20	17-20	128-157	324-396	13-16	29-36
		10	129-158	328-401	9-12	18-22	135-165	332-406	9-11	31-38
	100°	6	139-170	392-480	16-20	16-20				
		10	133-163	369-451	9-11	17-21				
LV048	30°	6					71-87	277-339	6-7	15-19
		10					75-92	284-347	4-5	16-20
	40°	6	118-144	194-237	21-25	19-23	84-102	291-356	7-9	18-22
		10	113-138	182-223	12-14	20-24	88-108	299-365	5-6	19-23
	50°	6	127-155	226-276	21-25	18-22	159-194	305-373	9-11	20-25
		10	122-149	213-260	12-14	19-24	167-204	313-383	6-7	21-26
	60°	6	131-160	259-316	21-25	18-22	108-132	320-391	10-13	23-28
		10	126-154	243-297	12-14	19-23	113-138	328-400	7-9	24-29
	70°	6	136-166	291-355	20-25	17-21	120-147	334-408	12-15	25-31
		10	130-159	273-334	12-14	18-22	126-154	342-418	8-10	27-32
	80°	6	140-171	328-401	20-24	17-20	131-161	348-425	14-17	27-34
		10	135-165	308-377	11-14	18-22	138-169	356-436	9-11	29-36
	90°	6	145-177	369-451	20-24	16-20	144-176	362-442	15-18	30-37
		10	139-170	347-424	11-14	17-21	151-185	371-453	10-12	32-39
	100°	6	149-183	415-508	19-24	16-19				
		10	143-175	391-477	11-14	17-21				

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
LV060	30°	8					68-84	256-313	5-7	19-23
		12					73-89	261-319	4-5	20-25
	40°	8	113-138	173-212	18-22	19-23	81-99	277-339	7-8	22-26
		12	110-134	162-198	12-14	20-24	86-105	283-346	5-6	23-28
	50°	8	116-142	207-253	17-21	19-23	93-114	299-365	8-9	24-29
		12	112-137	193-236	12-14	19-24	99-121	305-373	6-7	25-31
	60°	8	118-145	240-293	17-21	18-23	106-129	321-392	9-11	26-32
		12	115-140	224-274	11-14	19-23	113-138	327-400	7-8	28-34
	70°	8	121-148	273-334	17-21	18-22	118-145	342-418	10-12	29-35
		12	117-143	255-312	11-14	19-23	126-154	349-427	8-9	30-37
	80°	8	123-151	307-375	16-20	18-22	131-160	364-444	11-14	31-38
		12	120-146	287-350	11-13	19-23	139-170	371-454	8-10	33-40
	90°	8	126-154	340-416	16-20	18-22	143-175	385-471	12-15	33-41
		12	122-149	318-388	11-13	18-22	152-186	393-480	9-11	35-43
LV070	30°	12					68-84	256-313	5-7	19-23
		16					73-89	261-319	4-5	20-25
	40°	12	117-143	182-222	15-19	21-26	81-99	277-339	7-8	22-26
		16	114-139	170-208	11-14	22-27	86-105	283-346	5-6	23-28
	50°	12	120-147	215-263	15-18	20-25	93-114	299-365	8-9	24-29
		16	117-143	201-246	11-14	21-26	99-121	305-373	6-7	25-31
	60°	12	123-150	248-304	14-17	20-24	106-129	321-392	9-11	26-32
		16	119-146	232-284	11-13	21-25	113-138	327-400	7-8	28-34
	70°	12	126-154	282-344	14-17	19-24	118-145	342-418	10-12	29-35
		16	122-149	263-322	10-13	20-25	126-154	349-427	8-9	30-37
	80°	12	129-157	315-385	13-16	19-23	131-160	364-444	11-14	31-38
		16	125-153	294-360	10-12	19-24	139-170	371-454	8-10	33-40
	90°	12	132-161	348-426	13-16	18-22	143-175	385-471	12-15	33-41
		16	128-156	326-398	10-12	19-23	152-186	393-480	9-11	35-43
	100°	12	134-164	382-466	12-15	17-21				
		16	131-160	357-436	9-11	18-22				

WATERSIDE PRESSURE DROP TABLE

Table 14:

Model	Water Flow Rate (GPM)	Water Side Pressure Drop with out Internal Valve (PSI)	Water Side Pressure Drop with Internal Valve (PSI)
LV007	1.0	0.3	0.5
	2	1.1	1.8
	3.0	2.3	3.8
LV009	1.0	0.5	0.6
	2.0	1.7	2.3
	3.0	3.5	5.0
LV012	1.5	1.0	1.4
	2.5	2.6	3.6
	3.5	4.8	6.7
LV015	2.0	1.9	2.5
	3.0	3.9	5.3
	4.0	6.5	9.1
LV018	2.5	1.1	2.1
	4.0	2.7	5.2
	5.0	4.0	8.0
LV024	3.0	1.7	2.0
	4.0	2.8	3.4
	6.0	5.8	7.2
LV030	4.0	2.0	2.6
	6.0	4.2	5.6
	8.0	7.0	9.6
LV036	4.5	1.6	2.4
	6.0	2.6	4.0
	9.0	5.4	8.6
LV041	5.0	2.0	3.0
	8.0	4.6	7.2
	11.0	8.2	13.1
LV042	5.0	2.0	3.0
	8.0	4.6	7.2
	11.0	8.2	13.0
LV048	6.0	0.8	1.4
	8.0	1.4	2.5
	12.0	2.8	5.4
LV060	7.5	1.4	2.4
	10.0	2.3	4.1
	15.0	4.8	8.8
LV070	9.0	2.0	3.4
	12.0	3.4	5.9
	18.0	7.0	12.7

All values based upon pure water at 70° F.

COMPRESSOR CHARACTERISTICS

Model	Voltage Code	Voltage/Hz/Phase	Compressor Data Plate			Cold Winding Resistance Values (+/- 10%)			Run Capacitor (µF/V)
			Phase	RLA	LRA	Single Phase		Three Phase	
						R-C	S-C	Line-Line	
LV007 VT & CF	1	208-230/60/1	1	2.6	17.7	4.08	6.63	-	15/370
	2	265/60/1	1	2.6	13.5	5.34	6.77	-	15/440
LV007 HZ	1	208-230/60/1	1	2.6	17.7	4.08	6.63	-	15/370
	2	265/60/1	1	2.6	13.5	5.34	6.77	-	15/440
LV009 VT & CF	1	208-230/60/1	1	3.4	22.2	2.95	7.35	-	15/370
	2	265/60/1	1	2.9	18.8	4.27	10.74	-	10/440
LV009 HZ	1	208-230/60/1	1	3.4	22.2	2.95	7.35	-	15/370
	2	265/60/1	1	2.9	18.8	4.27	10.74	-	10/440
LV012 VT & CF	0	115/60/1	1	9.6	58.4	0.58	3.149	-	35/370
	1	208-230/60/1	1	4.6	28	2.3	5.9	-	20/370
	2	265/60/1	1	3.8	22.2	3.47	8.7	-	15/440
LV012 HZ	0	115/60/1	1	9.7	58.4	0.58	4	-	35/370
	1	208-230/60/1	1	4.6	27.9	2.3	5.9	-	20/370
	2	265/60/1	1	3.8	22.2	3.47	8.69	-	15/440
LV015	1	208-230/60/1	1	5.6	29	2.31	5.45	-	25/440
	2	265/60/1	1	4.6	20	3.58	7.39	-	15/440
LV018	1	208-230/60/1	1	6.5	43	1.431	2.383	-	30/370
	2	265/60/1	1	5.8	46	1.4	2.4	-	30/440
LV024	1	208-230/60/1	1	7.4	43	1.431	2.383	-	35/370
	2	265/60/1	1	6.7	46	1.4	2.4	-	30/440
	3	208-230/60/3	3	5.9	63	-	-	1.362	-
	4	460/60/3	3	2.9	30	-	-	5.329	-
LV030	1	208-230/60/1	1	9.9	54	0.982	1.729	-	35/370
	2	265/60/1	1	8.5	46	1.4	2.46	-	30/440
	3	208-230/60/3	3	6.9	63	-	-	1.362	-
	4	460/60/3	3	3.6	30	-	-	5.329	-
LV036	1	208-230/60/1	1	13.0	74	0.819	1.634	-	40/370
	2	265/60/1	1	11.3	67	0.802	1.76	-	35/370
	3	208-230/60/3	3	7.8	68	-	-	1.152	-
	4	460/60/3	3	3.9	34	-	-	4.606	-
LV041	1	208-230/60/1	1	13.6	88	0.656	1.558	-	45/370
	2	265/60/1	1	12.0	67	0.802	1.76	-	35/370
	3	208-230/60/3	3	8.8	68	-	-	1.152	-
	4	460/60/3	3	4.4	34	-	-	4.606	-
LV042	1	208-230/60/1	1	13.6	88	0.656	1.558	-	45/370
	2	265/60/1	1	12.0	67	0.802	1.76	-	35/370
	3	208-230/60/3	3	8.8	68	-	-	1.152	-
	4	460/60/3	3	4.4	34	-	-	4.606	-
LV048	1	208-230/60/1	1	15.7	84	0.54	1.6	-	45/370
	3	208-230/60/3	3	11.0	88	-	-	0.928	-
	4	460/60/3	3	5.4	44	-	-	3.593	-
	5	575/60/3	3	4.4	36	-	-	5.678	-
LV060	1	208-230/60/1	1	26.3	134	0.453	0.792	-	80/370
	3	208-230/60/3	3	15.6	110	-	-	0.68	-
	4	460/60/3	3	7.8	52	-	-	3.2	-
	5	575/60/3	3	5.8	38.9	-	-	5.33	-
LV070	1	208-230/60/1	1	28.3	178	0.97	0.365	-	80/370
	3	208-230/60/3	3	19.2	136	-	-	0.6	-
	4	460/60/3	3	8.7	67.1	-	-	2.52	-
	5	575/60/3	3	6.9	55.3	-	-	3.74	-

CORNER WEIGHTS (HZ)

Configuration			Left Hand Return				Right Hand Return			
Model		Total	Left Front*	Right Front*	Left Back	Right Back	Left Front*	Right Front*	Left Back	Right Back
LV007-HZ	Lbs	98	28	21	25	24	21	28	24	25
	kg	45	13	10	11	11	10	13	11	11
LV009-HZ	Lbs	103	29	23	26	25	23	29	25	26
	kg	47	13	10	12	11	10	13	11	12
LV012-HZ	Lbs	105	29	24	26	26	24	29	26	26
	kg	48	13	11	12	12	11	13	12	12
LV015-HZ	Lbs	127	36	28	34	29	28	36	29	34
	kg	58	16	13	15	13	13	16	13	15
LV018-HZ	Lbs	177	57	36	48	37	36	57	37	48
	kg	80	26	16	22	17	16	26	17	22
LV024-HZ	Lbs	181	58	37	48	38	37	58	38	48
	kg	82	26	17	22	17	17	26	17	22
LV030-HZ	Lbs	194	61	41	52	41	41	61	41	52
	kg	88	28	18	23	19	18	28	19	23
LV036-HZ	Lbs	237	71	49	66	52	49	71	52	66
	kg	108	32	22	30	24	22	32	24	30
LV042-HZ	Lbs	231	70	47	64	50	47	70	50	64
	kg	105	32	21	29	23	21	32	23	29
LV048-HZ	Lbs	268	87	60	62	60	60	87	60	62
	kg	122	39	27	28	27	27	39	27	28
LV060-HZ	Lbs	288	88	65	69	66	65	88	66	69
	kg	131	40	29	31	30	29	40	30	31
LV070-HZ	Lbs	316	98	72	76	70	72	98	70	76
	kg	143	44	32	35	32	32	44	32	35

*Front is control box end

WATER COIL VOLUME

LV Model	Coaxial Coil Volume (gal)
007	0.04
009	0.06
012	0.08
015	0.09
018	0.14
024	0.14
030	0.24
036	0.27
041	0.27
042	0.27
048	0.49
060	0.62
070	0.62

WIRING DIAGRAMS

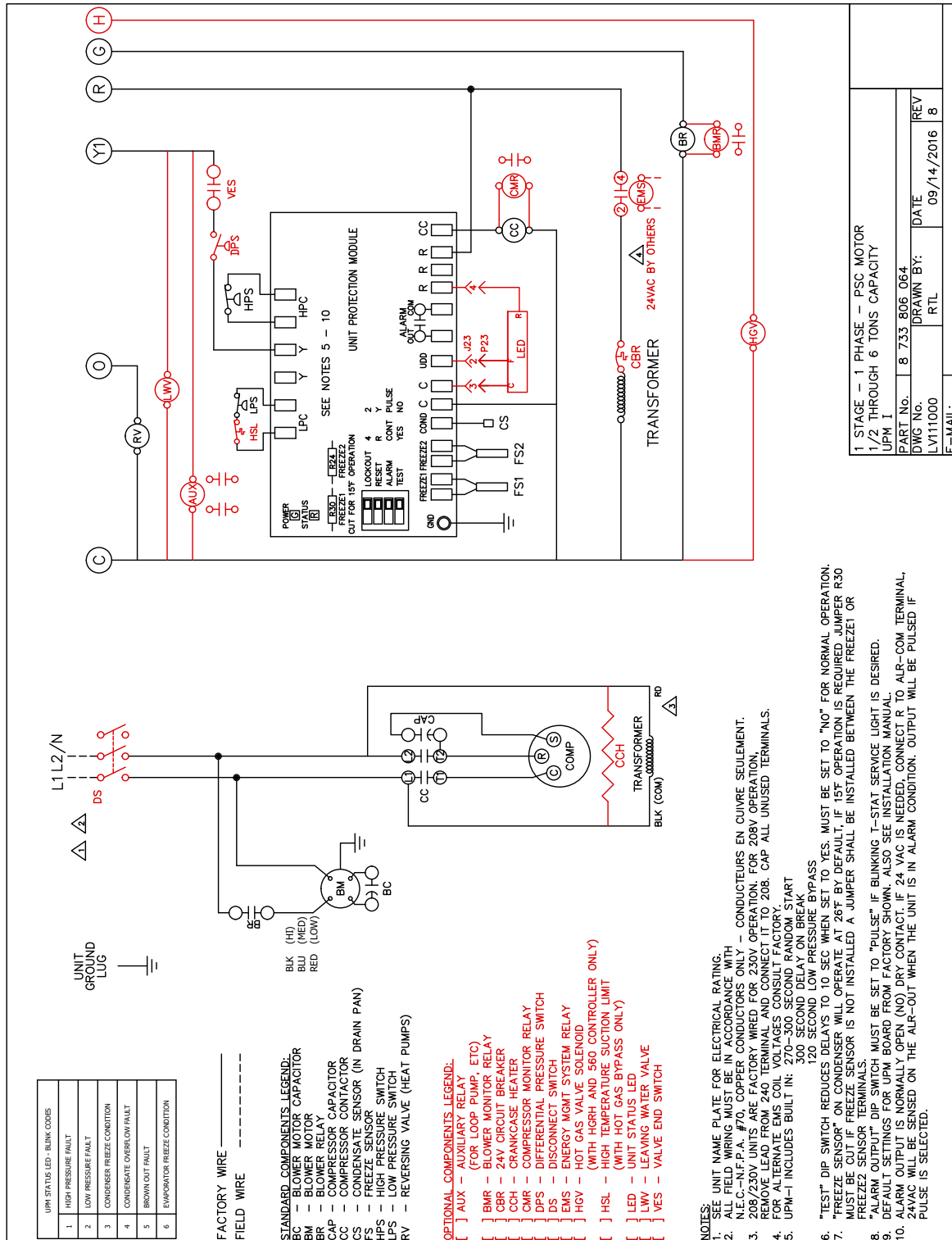
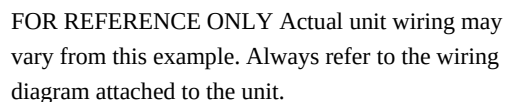
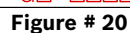


Figure # 19



FOR REFERENCE ONLY Actual unit wiring may vary from this example. Always refer to the wiring diagram attached to the unit.



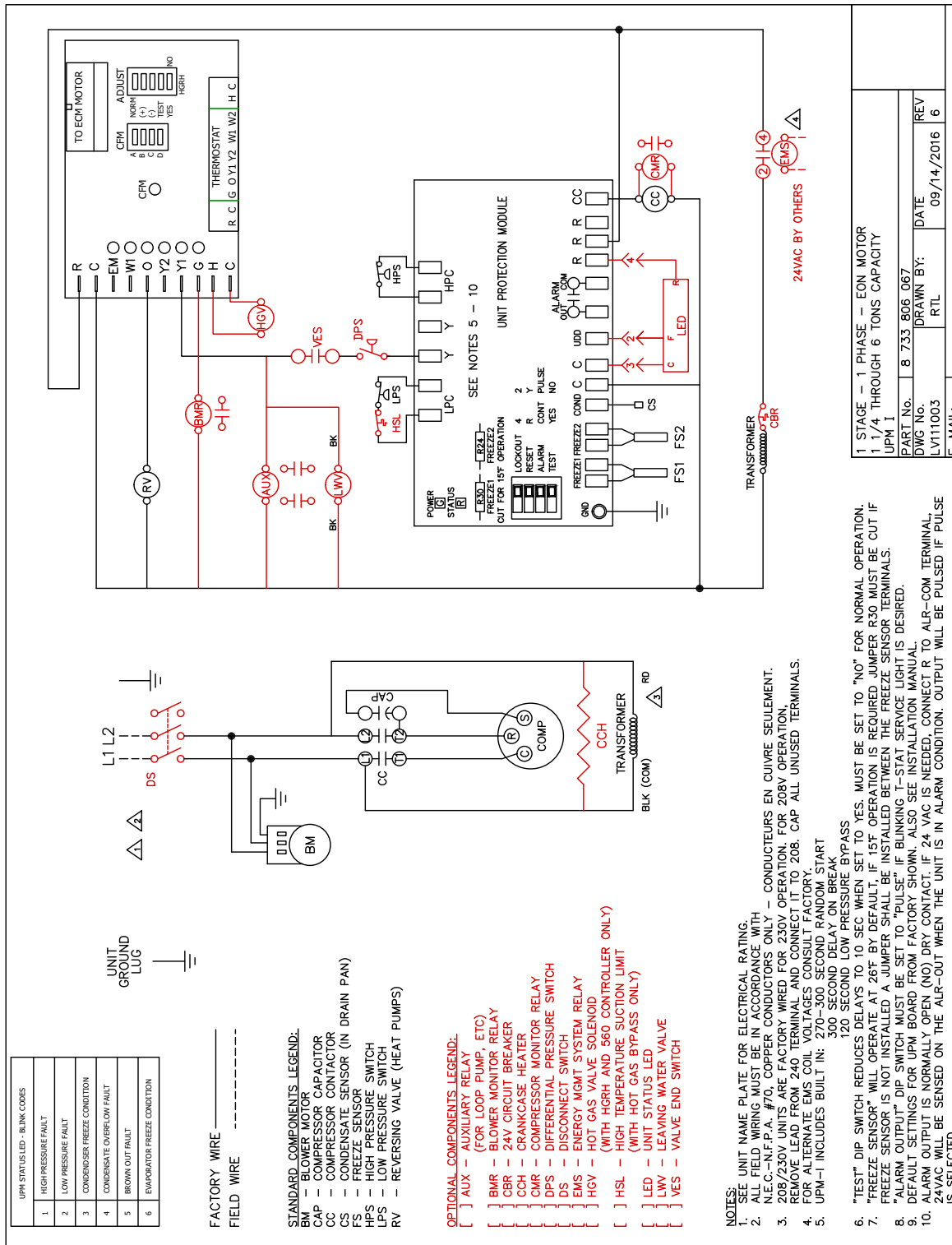


Figure # 21



FOR REFERENCE ONLY Actual unit wiring may vary from this example. Always refer to the wiring diagram attached to the unit.

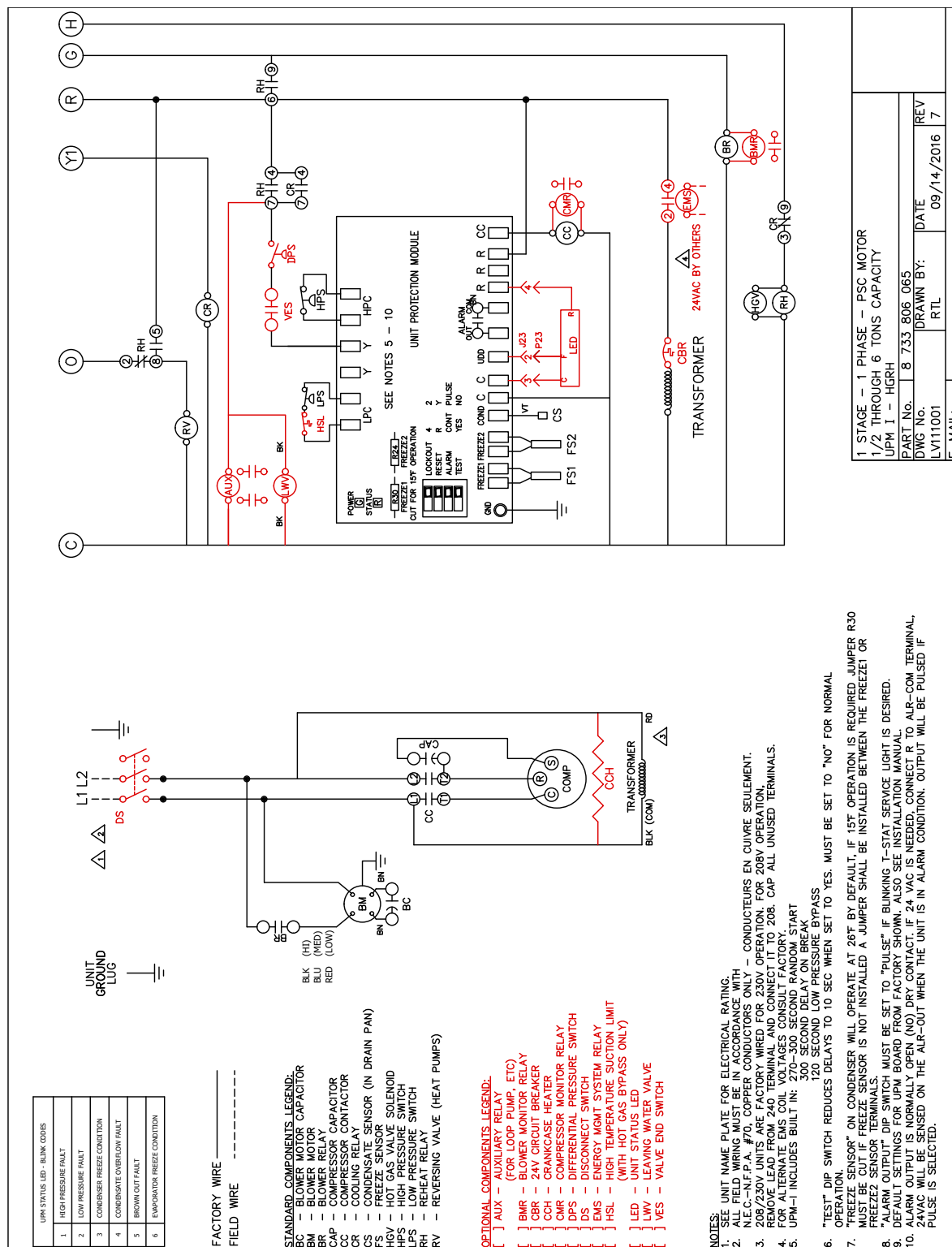


Figure # 22



FOR REFERENCE ONLY Actual unit wiring may vary from this example. Always refer to the wiring diagram attached to the unit.

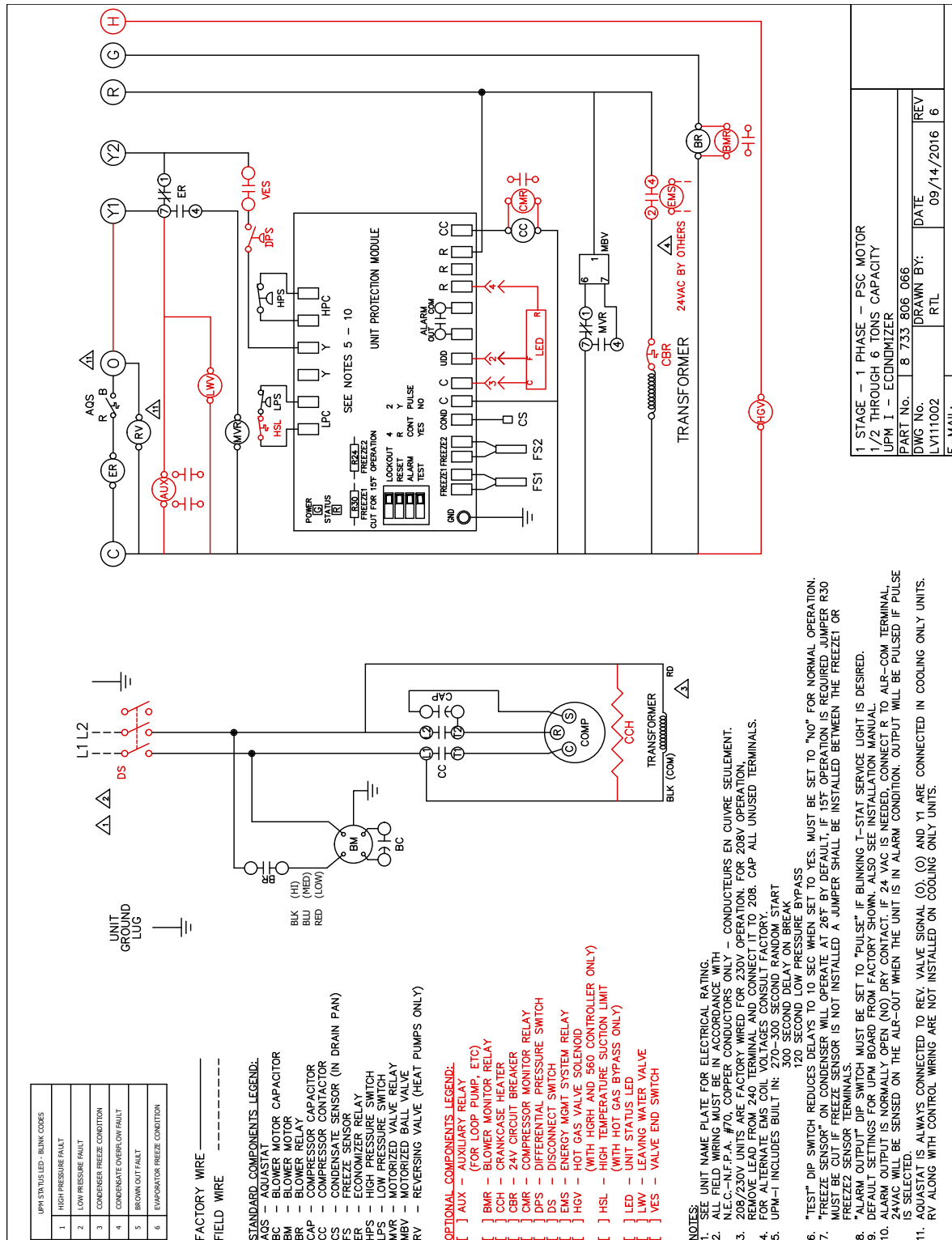


Figure # 23



FOR REFERENCE ONLY Actual unit wiring may vary from this example. Always refer to the wiring diagram attached to the unit.

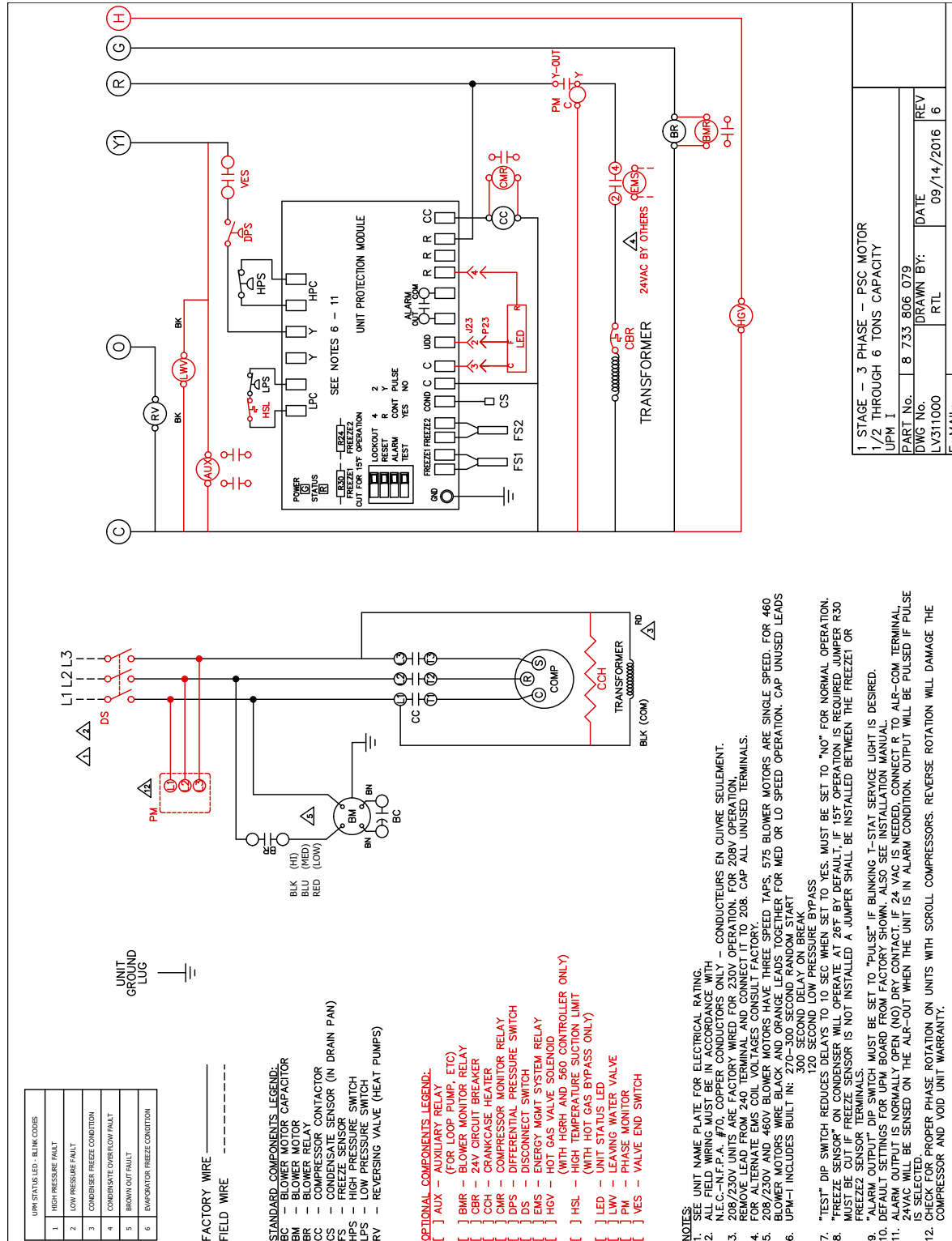


Figure # 24



FOR REFERENCE ONLY Actual unit wiring may vary from this example. Always refer to the wiring diagram attached to the unit.

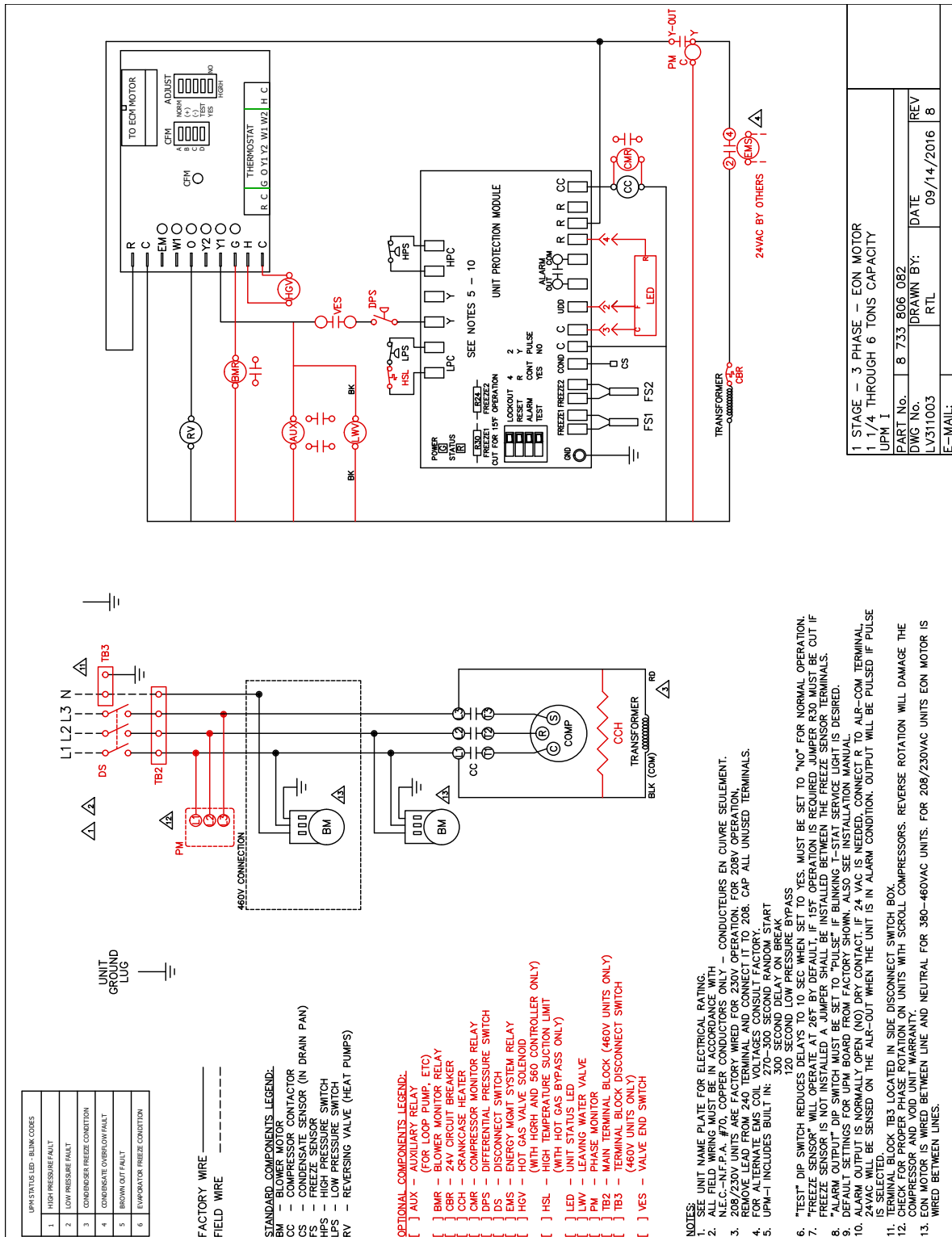


Figure # 25

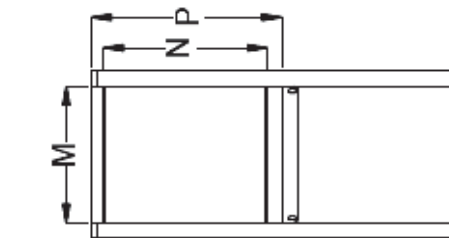


FOR REFERENCE ONLY Actual unit wiring may vary from this example. Always refer to the wiring diagram attached to the unit.

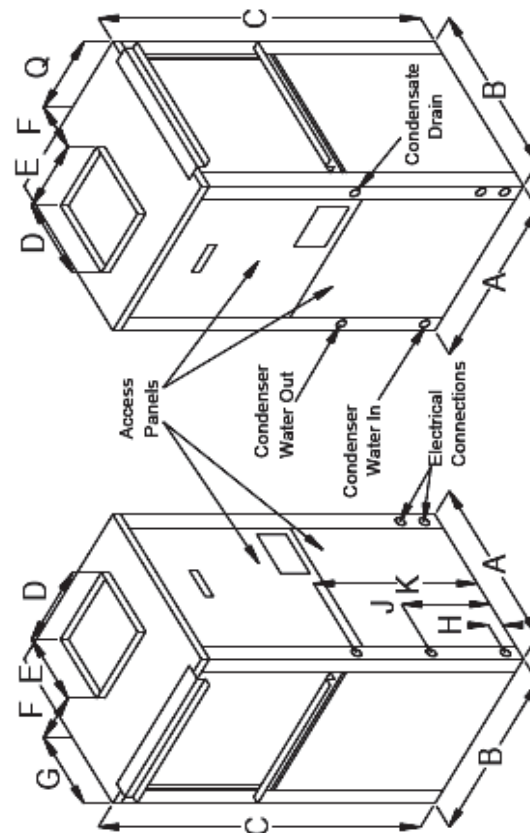
DIMENSIONAL DRAWINGS

Vertical

Model	A	B	C	D	E	F	G	H	J	K	M	N	P	Q	Condenser Water Connections	Recommen- ded Replacement Nominal Filter Size
LV007	19.0	19.0	24.25	10.0	8.0	4.61(LH)/9.3(RH)	9.3	2.44	9.68	13.87	16.0	8.0	10.0	5.4	3/4"FPT	10 x 16 x 1
LV009	19.0	19.0	24.25	10.0	8.0	4.61(LH)/9.3(RH)	9.3	2.44	9.68	13.87	16.0	8.0	10.0	5.4	3/4"FPT	10 x 16 x 1
LV012	19.0	19.0	24.25	10.0	8.0	4.61(LH)/9.3(RH)	9.3	2.44	9.68	13.87	16.0	8.0	10.0	5.4	3/4"FPT	10 x 16 x 1
LV015	21.5	21.5	32.25	14.0	14.0	3.1	5.2	2.85	8.45	15.87	20.0	14.0	16.0	5.2	3/4"FPT	16 x 20 x 1
LV018	21.5	21.5	32.25	14.0	14.0	3.1	5.2	2.85	8.45	15.87	20.0	14.0	16.0	5.2	3/4"FPT	16 x 20 x 1
LV024	21.5	21.5	39.25	14.0	14.0	3.1	5.2	2.80	8.45	18.87	20.0	18.0	20.0	5.2	3/4"FPT	20 x 20 x 1
LV030	21.5	21.5	39.25	14.0	14.0	3.1	5.2	2.80	8.45	18.87	20.0	18.0	20.0	5.2	3/4"FPT	20 x 20 x 1
LV036	21.5	26.0	43.25	16.0	14.0	4.0	5.0	2.75	10.77	18.87	24.0	22.0	24.0	5.0	3/4"FPT	24 x 24 x 1
LV041	21.5	21.5	39.25	16.0	14.0	1.7	4.7	2.80	8.45	18.87	20.0	18.0	20.0	4.7	3/4"FPT	20 x 20 x 1
LV042	21.5	26.0	43.25	16.0	14.0	4.0	5.0	2.75	10.77	18.87	24.0	22.0	24.0	5.0	3/4"FPT	24 x 24 x 1
LV048	24.0	32.5	45.25	18.0	14.0	7.0	6.2	3.26	13.20	20.87	30.0	22.0	24.0	6.2	1"FPT	24 x 30 x 1
LV060	24.0	32.5	45.25	18.0	14.0	7.0	6.2	3.26	13.20	20.87	30.0	22.0	24.0	6.2	1"FPT	24 x 30 x 1
LV070	26.0	33.25	58.25	18.0	16.0	7.8	7.2	2.92	13.36	25.87	30.0	30.0	32.0	7.2	1"FPT	16 x 30 x 1 (2)



Return Air (Filter) View

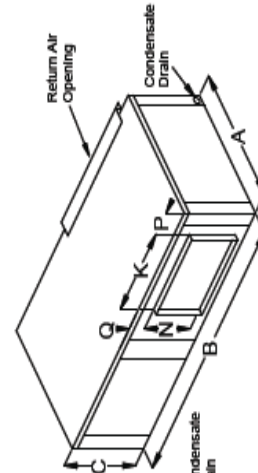


Right Hand Return (FRT)

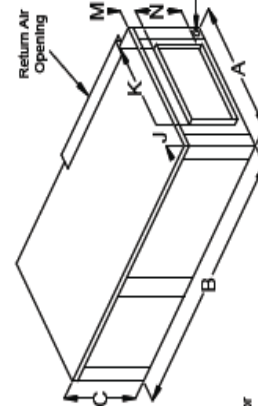
Left Hand Return (FLT)

Horizontal

Model	A	B	C	D	E	F	G	H	J	K	M	N	P	Q	R	T	Condenser Water Connections	Recommen- ded Replacement Nominal Filter Size
	Width	Depth	Height	Cabinet End to Filter Rack	R/A Duct Width	Cab Front to Filter Rack	Water Inlet	Water Outlet	Side to Discharge (End)	Discharge Width	Top to Discharge (FLE & FRS)	Discharge Height	End to Discharge (Straight)	Top to Discharge (FRE & FLS)	Filter Rack Height	R/A Duct Flange Height		
LV007	19.0	33.0	11.5	1.5	16.15	15.35	2.38	9.5	5.375	6.3	5.97	4.1	4.875	1.41	11.3	8.6	3/4" FPT	10 x 16 x 1
LV009	19.0	33.0	11.5	1.5	16.15	15.35	2.38	9.5	5.375	6.3	5.97	4.1	4.875	1.41	11.3	8.6	3/4" FPT	10 x 16 x 1
LV012	19.0	33.0	11.5	1.5	16.15	15.35	2.38	9.5	5.25	6.43	6.31	4.1	4.75	1.14	11.3	8.6	3/4" FPT	10 x 16 x 1
LV015	22.0	43.0	17.0	1.5	20.15	21.35	2.86	15.0	8.15	6.43	9.55	4.1	7.65	3.4	16.8	15.0	3/4" FPT	16 x 20 x 1
LV018	22.0	43.0	17.0	1.5	20.15	21.35	2.86	14.13	5.42	9.13	6.11	9.65	4.92	1.23	16.8	15.0	3/4" FPT	16 x 20 x 1
LV024	22.0	43.0	17.0	1.5	25.0	16.5	2.86	14.13	5.42	9.13	6.11	9.65	4.92	1.23	16.8	15.0	3/4" FPT	16 x 25 x 1
LV030	22.0	43.0	17.0	1.5	25.0	16.5	2.47	15.0	5.42	9.13	6.11	9.65	4.92	1.23	16.8	15.0	3/4" FPT	16 x 25 x 1
LV036	22.0	54.5	19.0	1.5	30.15	22.85	2.86	16.13	6.47	9.13	7.5	10.28	5.97	1.21	18.8	17.0	3/4" FPT	18 x 30 x 1
LV042	22.0	54.5	19.0	1.5	30.15	22.85	2.86	16.13	5.27	10.45	6.46	11.3	4.77	1.22	18.8	17.0	3/4" FPT	18 x 30 x 1
LV048	25.0	54.5	21.0	1.5	34.6	18.4	2.86	18.52	7.25	10.45	7.46	11.36	6.75	2.16	20.8	19.0	1" FPT	20 x 34.5 x 5 x 1
LV060	25.0	54.5	21.0	1.5	34.6	18.4	2.86	18.52	6.32	11.76	6.81	12.5	5.82	1.68	20.8	19.0	1" FPT	20 x 34.5 x 5 x 1
LV070	25.0	65.0	21.0	1.5	48.1	15.4	2.86	18.52	6.32	11.76	6.81	12.5	5.82	1.68	20.8	19.0	1" F PT	20 x 24 x 1 (2)

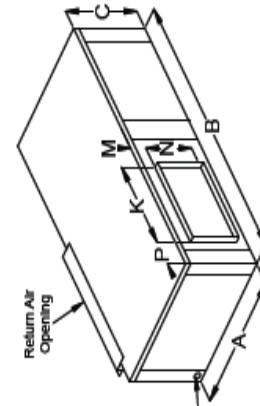


**Left Hand Return
Straight Through (FLS)**

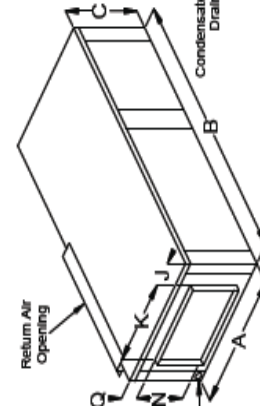


Left Hand Return End Blow (FLE)

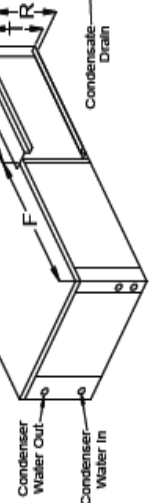
NOTE: Models LV048 & 060 Left Hand Return units have condenser water connections on the front right and electrical knockouts on the front left.



**Right Hand Return
Straight Through (FRS)**



Right Hand Return End Blow (FRE)



Please See notes on page#57



Overall unit dimension do not include filter rack, duct flanges or economizer.



For economizer Dimensions horizontal units with the optional economizer kit may require field provided hanging provisions.



All dimensions within ± 0.125 ". All condensate drain connections are 3/4" FPT. Horizontal Units can be field converted between end blow and straight through supply air configurations. Specifications subject to change without notice.

1" filter rack extends 1.23" beyond the side of the unit. 2" filter rack extends 2.89" beyond the side of the unit.

The 2" filter rack is 4 sided with a filter access door on one end and can accept either a 1" or a 2" filter.

MAINTENANCE

1. Filter changes or cleaning 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 be needed to be as frequent as biweekly.

NOTICE: Equipment should never be used during construction due to likelihood of wall board dust accumulation in the air coil of the equipment which permanently affects the performance and may shorten the life of the equipment.

2. An annual "checkup" is required by a licensed refrigeration Technician. 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. The condensate drain must be checked annually by cleaning and flushing to ensure proper drainage.
4. 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 technician 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

INFORMATION ON DECOMMISSIONING

Only Trained and qualified technicians are allowed to decommission and dispose of equipment following applicable requirements and local codes.



WARNING: Decommissioning 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.

Protecting the Environment

Components

Many parts in the Heat Pump can be fully recycled in the end of the product life. Contact your city authorities for information about the disposal of recyclable products.

Refrigerant

At the end of the service life of this appliance and prior to its environmental disposal, a person qualified to work with refrigerant circuits must recover the refrigerant from within the sealed system as per applicable local codes.

Hazardous Waste

Some components in the Heat Pump may be considered as hazardous waste such as batteries.

For their disposal contact your local household hazardous waste collection site.



By disposing of this product correctly you will help ensure that the waste undergoes the necessary treatment, recovery and recycling thus preventing potential negative effects on the environment and human health which could otherwise arise due to inappropriate waste handling.

TERMINOLOGY

HPC-Heat Pump Controller

DDC- Digital Direct Controller

PCBA- Printed Circuit Board Assembly

LED- Light Emitted Diode

HPS- High Pressure Switch

LPS- Low Pressure Switch

NO- Normally Open

CS1/2- Compressor's Output

ASC- Anti-short Cycle

WDT- Watch Dog Timer

HRP- Heat Recovery Package

EWT- Entering Water Temperature

DWT- Domestic Water Temperature

DRT- Discharge Refrigerant Temperature

RHS- Relative Humidity Sensor

RH- Relative Humidity

SCT-Service Configuration Tool

APP-Application

FZE-Freeze Evaporator Sensor

CFM-Cubic Feet Per Minute

PCB-Printed Circuit Board

DAT-Discharge Air Temperature

RAT-Return Air Temperature

LWT-Leaving Water Temperature

FZC-Freeze Coax Sensor

WIM-Wireless Interface Module

SSID-Service Set Identifier

QR-Quick Response

Wi-Fi-Wireless Fidelity, Wireless Internet

HP-Heat Pump

EEPROM- Electrically Erasable Programmable Read Only Memory

Suction Pressure - Pressure entering compressor

Discharge Pressure - Pressure leaving compressor

(R/A) - Return Air

Recovery - Means the collection and storage of fluorinated greenhouse gases from products, including containers, and equipment during maintenance or servicing or prior to the disposal of the products or equipment;

Recycling- Means the reuse of a recovered fluorinated greenhouse gas following a basic cleaning process;

Reclamation-Means the reprocessing of a recovered fluorinated greenhouse gas in order to match the equivalent performance of a virgin substance, taking into account its intended use;

Decommissioning- Means the final shut-down and removal from operation or usage of a product or piece of equipment containing fluorinated greenhouse gases;

Repair- Means the restoration of damaged or leaking products or equipment that contain, or whose functioning relies upon, fluorinated greenhouse gases, involving a part containing or designed to contain such gases;

Conditioned space-Space within a building provided with heated or cooled air, or both (or surfaces); and, where required, with humidification or dehumidification means, to maintain conditions for an acceptable thermal environment.

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) _____

Maximum Circuit Ampacity _____

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 Sub cooling* _____

* 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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NOTES

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Revised: 09/2016

