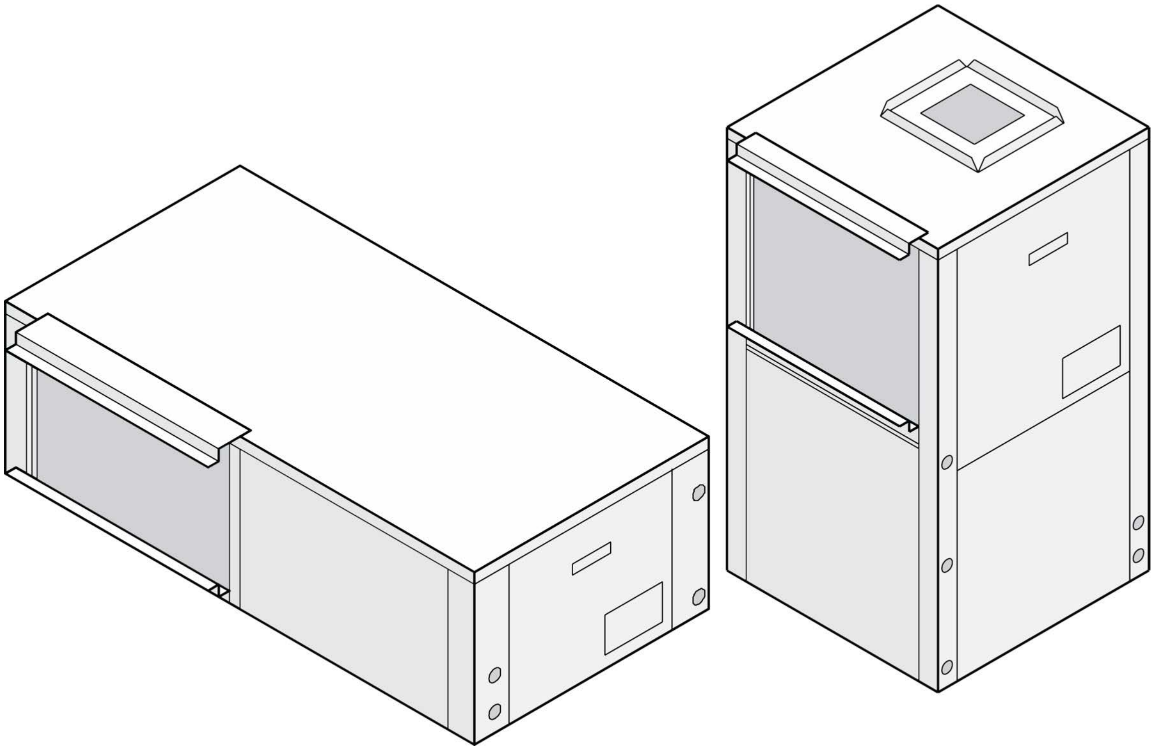


QV Series Heat Pumps

QV024 | QV030 | QV036 | QV042 | QV048 | QV060

BOSCH

Installation, Operation, and Maintenance Manual

8733834054 (2022/11)

CONTENTS

DOCUMENT CONVENTIONS

Key to Symbols

Warnings

Warnings in this document are identified by a warning triangle printed against a gray 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 situation that, if not avoided, will result in death or serious injury.
- **WARNING** indicates a situation that, if not avoided, could result in death or serious injury.
- **CAUTION** indicates a situation that, 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: PERSONAL INJURY HAZARD OR PROPERTY DAMAGE
Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock, or other conditions that may cause death, serious personal injury and/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.

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

DANGER: PERSONAL INJURY HAZARD
Poisonous gas can be created when refrigerant (R410A) is exposed to open flames.

WARNING: PERSONAL INJURY HAZARD
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: FLAMMABLE REFRIGERANT
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.

WARNING: Do NOT reuse screws removed from the unit in Step #1 to mount the hanging brackets to the unit.

CAUTION: BURN HAZARD Hot surfaces inside unit may cause burns.

CAUTION: PERSONAL INJURY HAZARD
When servicing horizontal units do not remove top panel while unit is suspended as this compromises unit structure. If top panel removal is required for service, the base of the unit must be completely supported on a level surface strong enough to hold its weight.

CAUTION: PERSONAL INJURY HAZARD
Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing and gloves when handling parts.

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 or failure.

MODEL NOMENCLATURE

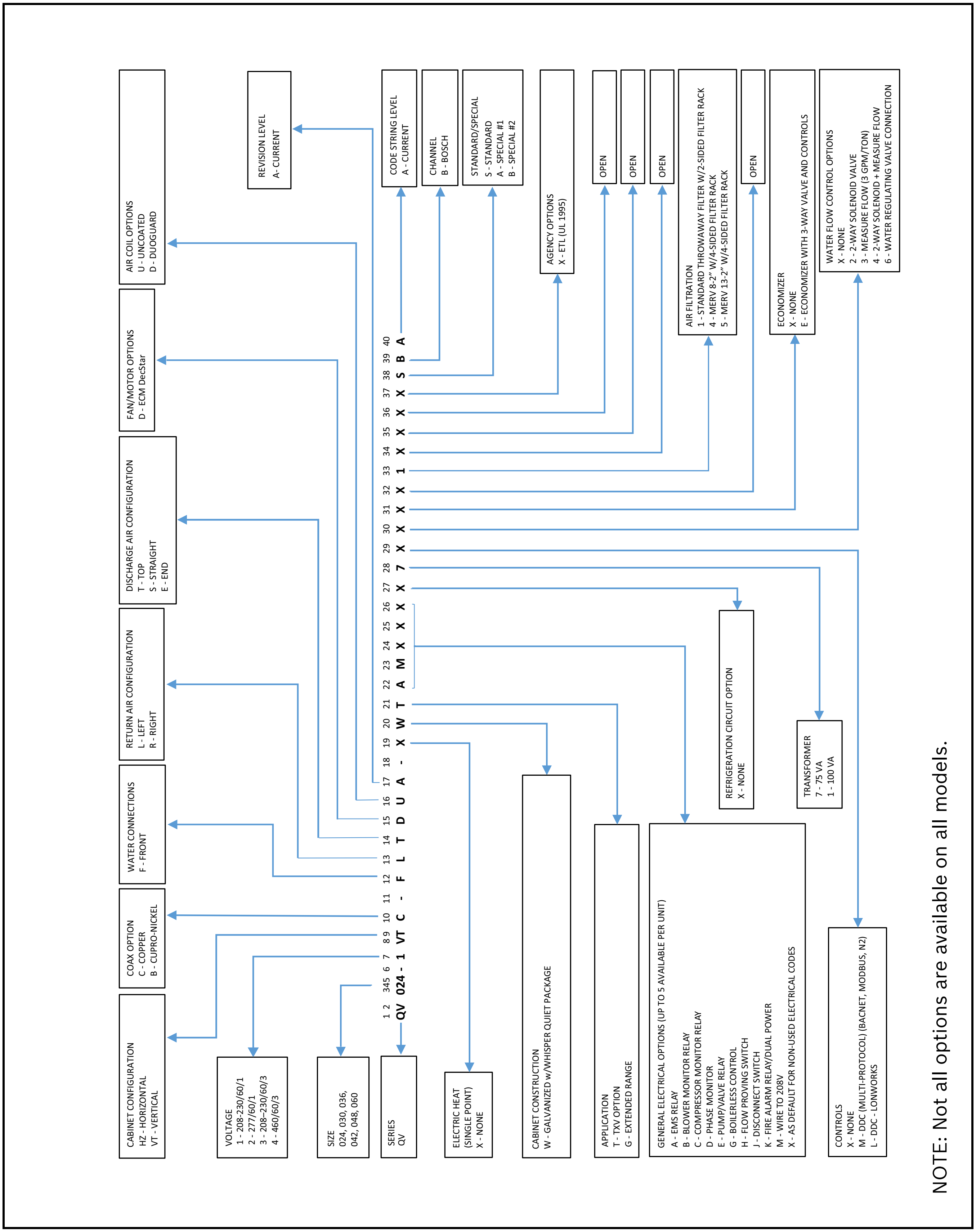


Fig. 1 Model Nomenclature

GENERAL DESCRIPTION

The QV 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 QV 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.

QV series units are available in two basic configurations: Vertical Top-Supply Air (VT) and Horizontal End-Supply Air or Straight-Through Supply Air (HZ). 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.

QV 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, QV series models can operate with entering fluid temperatures between 50°F and 110°F in cooling and between 30°F and 80°F in heating.

QV units can accommodate a wide range of air temperatures, however, standard QV 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.

NOTICE: QV units are designed and rated for indoor installation only.

Do not install QV units in environments that fall below freezing or exceed 100°F ambient. QV cabinets are constructed of heavy-gauge galvanized steel and will resist most common types of corrosion but avoid installations in high-salt concentration or highly-corrosive environments.

QV series units are offered with a wide range of factory-installed options including: internal 2-way valves; DuoGuard™ 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. See the Options section on page #33.

On-board safety features will protect the major unit components from damage.

INSPECTING AND STORING THE EQUIPMENT

Moving and Storage

If the equipment is not needed for immediate installation upon its arrival at the job site, it should be left in its shipping carton and stored in a clean and dry area. Units must only be stored or moved in the normal upright position at all times.

NOTICE: Be careful 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 two (2) high.
- Do not stack horizontal units 6-tons capacity more than three (3) high.

Initial Inspection

Verify that all items have been received and that there is no visible damage. Note any damage or shortage on all copies of the freight bill. Concealed damage not discovered until after removing the units from packaging must be reported to the carrier.

Inspection and Unpacking Prior to Installation

Inspect the product carefully for any defects or other discrepancies. If any are identified, contact the Bosch Wholesaler/Distributor from which you purchased the unit.

The following should be checked:

- Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
- Verify that the unit is the correct model for the entering water temperature of the job.
- Only remove the packaging when the unit is ready for installation.
- Verify that the refrigerant tubing is free of kinks or dents, and that it does not touch other unit components.
- Inspect all electrical connections. Be sure connections are clean and tight at the terminals.
- Remove any blower support Styrofoam from underneath the blower.
- Remove any shipping brackets from the unit attached to the pallet.

UNIT INSTALLATION

This section contains information on the following:

WARNING: This product is to be installed, serviced, and uninstalled by professionals only.

NOTICE: Do not use QV 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.

LOCATION SELECTION

Unit location selection is very important for proper installation, functioning, and ease of servicing.

When selecting a location for the unit, the following conditions must be met:

- Location must be indoors.
- The ambient temperatures must be maintained above freezing.
- Location must be isolated from sleeping areas, private offices, and other acoustically sensitive spaces.
- Mount the unit using an adequate slope of the condensate lines to allow for proper drainage. If an appropriate slope cannot be achieved, a field-supplied condensate pump may be required.
- On horizontal units, adequate room must be below the unit level for the condensate drain trap and avoid placing the unit above piping, ducting, and electrical lines to facilitate future removal and replacement of unit.
- Sufficient space for duct connection must be available. Do not allow the weight of the duct work to rest on the unit.
- Adequate clearance for filter replacement and drain pan cleaning must exist. Do not allow piping, conduit, etc. to block filter access.
- Sufficient access to allow maintenance and servicing of the fan and fan motor, compressor and coils must be allowed. Removal of the entire unit from the closet should not be necessary.
- An unobstructed path to the unit within the closet or mechanical room must be present. Space should be sufficient to allow return air to freely enter the unit.
- Ready access to water valves, fittings, and screwdriver access to unit side panels, discharge collar, and all electrical connections must be provided. Note: Where access to side panels is limited, pre-removal of the control box side-mounting screws may be necessary for future servicing.

NOTICE: QV series units are not approved for outdoor installation; therefore, they must be installed inside a structure in a conditioned space.

DO NOT locate in areas that are subject to freezing or areas subject to temperature or humidity extremes. Units must be installed in a conditioned space that is not subject to extremes of temperature or humidity to avoid cabinet sweating and/or equipment damage.

NOTICE: DO NOT place the unit above supply piping.

PROTECTING THE UNIT DURING CONSTRUCTION

Once the unit is properly positioned on the job site, cover it with either a shipping carton, vinyl film, or an equivalent protective covering. Cap opens 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.

RETURN AND SUPPLY AIR DUCT FLANGES PREPARATION

QV heat pumps feature fold-out return and supply air duct flanges. These fold-out flanges come folded in from the factory to allow the heat pumps to more easily fit through doorways and other tight spaces, and also to prevent damage in shipping and handling.

Following installation of the heat pump fold-out all fold-out flanges to ensure that return and supply air flow 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 (VT) UNITS

In order to minimize vibration transmission from the unit to the building structure mount the QV Series vertical units on a vibration absorbing pad slightly larger than the unit base. (See Fig. 2.)

It is generally not necessary to anchor the unit unless required by local code. All major service access for the QV Series vertical 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, install units 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.

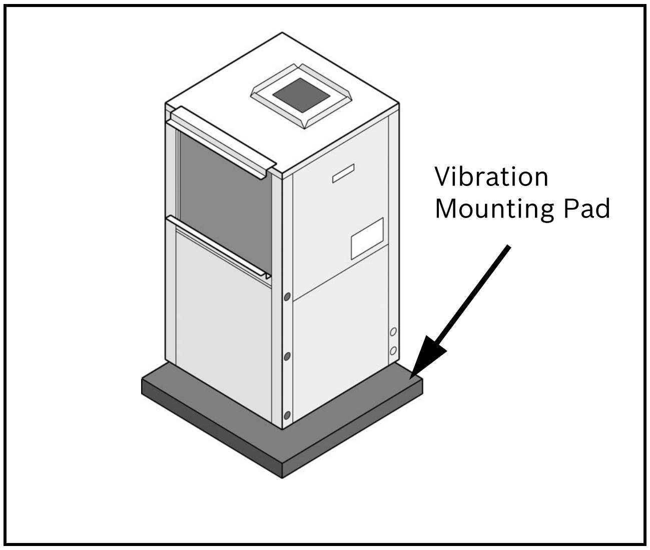


Fig. 2 Vibration Mounting Pad

HORIZONTAL (HZ) UNITS

Configuring the Horizontal Supply Air Orientation

The supply air location on QV Series Horizontal units can be field converted from end blow to straight through or vice-versa.

	NOTICE: Blower configuration changes should be done prior to unit being installed in the final location.

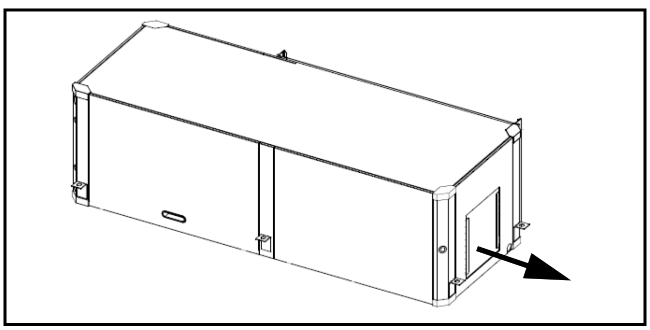


Fig. 3 End-Blow Orientation

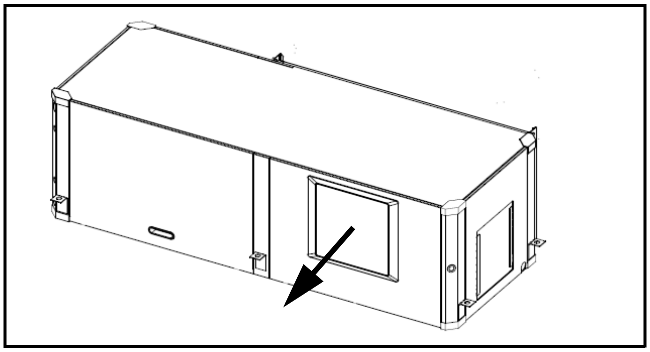


Fig. 4 Straight-Through Orientation

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. Unplug power and control harness from motor module.
4. Remove motor module mounting bracket with module (sit on the divider).
5. Unscrew and carefully remove the blower panel with the blower attached.

NOTICE: Be careful not to damage the refrigerant coils or any other internal unit components.

6. Turn the blower panel 180°.
7. Insert the blower panel with the blower and motor into the desired location. Screw the panel into place.
8. Reinstall motor module mounting bracket with module in the previous blower location.
9. Reconnect the motor power and control harness to the motor module. Make sure to connect wires to the proper speed taps.
10. Reinstall the blower access panel.
11. Reconnect power to the unit.

Mounting Horizontal (HZ) Units

While HZ units may be installed on any level surface strong enough to hold their weight, they are typically suspended above a ceiling by threaded rods. Attach the unit corners using a hanging bracket kit supplied with the HZ units. The rods must be securely anchored to the ceiling. Refer to the hanging bracket assembly and installation instructions for details.

NOTICE: Horizontal units installed above the ceiling must conform to all local codes. An auxiliary drain pan, if required by code, must be at least four inches larger than the bottom perimeter of the heat pump.

Plumbing connected to the heat pump must not come in direct contact with building structure or its components (such as joists, trusses, walls, etc.).

Some applications require an attic floor installation of the HZ unit. In those cases, the unit must be set in a full-sized 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 normally 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 must be run to an eave at a location that will be noticeable.

The HZ units condensate drain pans are NOT internally sloped.

NOTICE: HZ units must be installed pitched 1/4” towards the condensate drain connection in both directions to facilitate condensate removal. (See Fig. 5.)

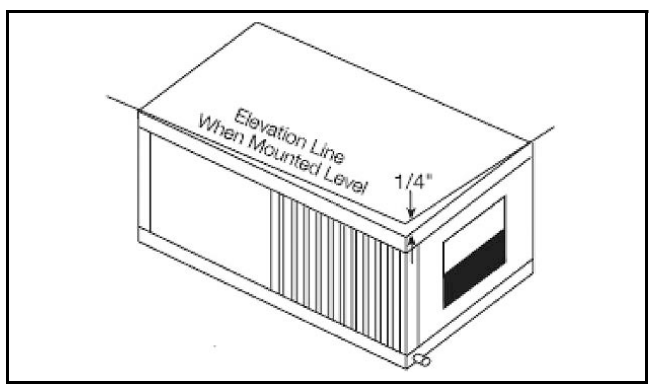


Fig. 5 Pitched Unit

NOTICE: If the unit is located in a crawl space, the bottom of the unit must be at least four inches above grade to prevent flooding of the electrical parts due to heavy rains.

Installing the Hanging Bracket Kit

All HZ units come with hanging bracket installation kit to facilitate suspended unit mounting using threaded rod. Hanging brackets are to be installed as shown in Fig. 6.

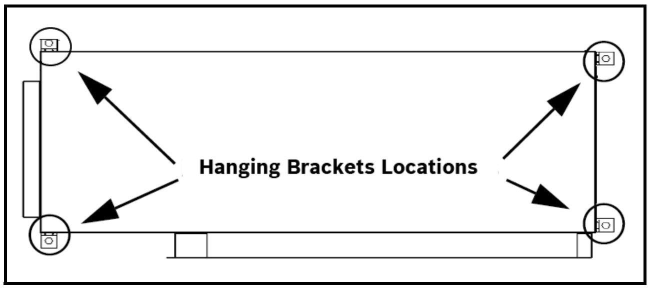


Fig. 6 Hanging Brackets Locations

This kit includes the following:
(5) Brackets
(5) Rubber Vibration Isolators
(8) Screws: #10 x 1/2
(10) Bolts: 1/4–28 x 1/2” Hex bolt (Note: Not needed for this series.)

The following are needed and are to be field provided:

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

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

1. Remove and discard factory provided screws from locations where hanging brackets will be installed as shown in Fig. 7.

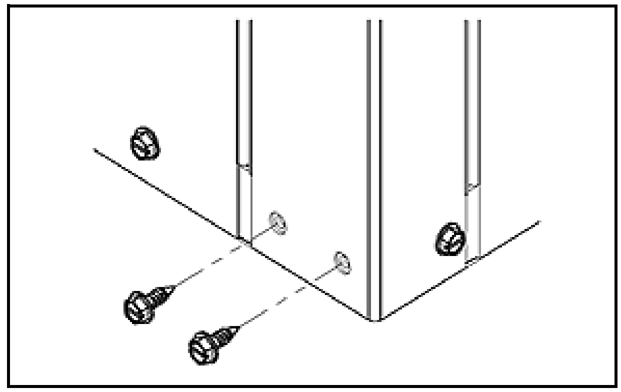


Fig. 7

2. Mount the four brackets to unit corner post using the bolts provided in the kit as shown in Fig. 8.

WARNING: Do NOT reuse screws removed from the unit in Step #1 to mount the hanging brackets to the unit.

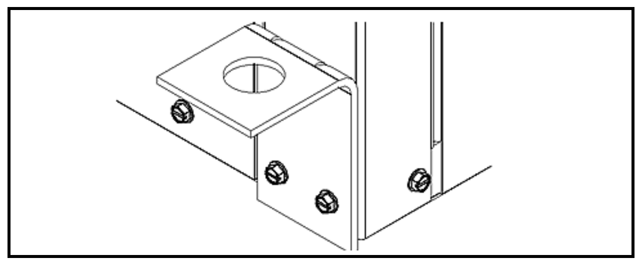


Fig. 8

3. Install rubber grommet onto the brackets as shown in Fig. 9.

4. Hang the unit and assemble the field-provided threaded rod, nuts, and washers on to the brackets as shown in Fig. 9.

DANGER: The rods must be securely anchored to the ceiling.

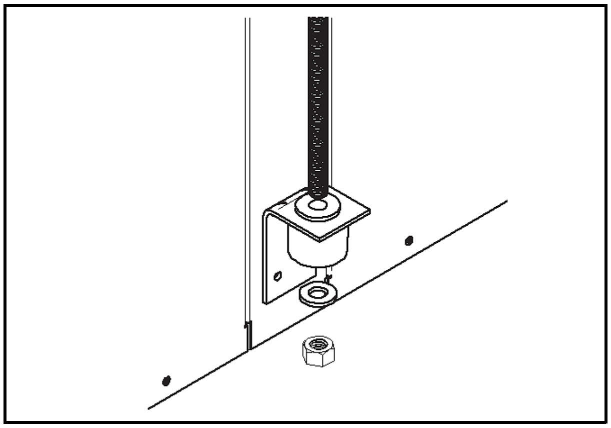


Fig. 9 Threaded Rod

CONDENSATE DRAIN

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.

Units 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 that is on the drain pan while the unit’s fan is operating. A second trap must NOT be included. (See Fig. 10.)

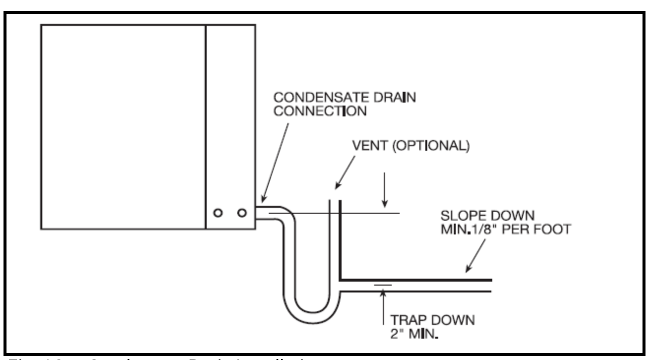


Fig. 10 Condensate Drain Installation

DUCT SYSTEM

All QV Series models are provided with a supply air outlet collar and return air duct flange to facilitate duct connections.

Supply air duct and return air duct flanges are shipped unfolded with the unit. They need to be folded. See “Return and Supply Air Duct Flanges Preparation” on page #9 for details.

Refer to unit Dimensional Drawings for physical dimensions of the collar and flange. (See page #51.)

A flexible duct connector is recommended for supply and return air duct connections on metal duct systems. In order to avoid heat loss or gain and prevent condensate forming during the colling operation insulate all metal ducting with a minimum of 1" duct insulation. Application of the unit to uninsulated duct work is not recommended as the unit’s performance will be adversely affected.

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

For new or replacement market installations, please refer to current ASHRAE procedures for duct sizing to ensure proper unit's operation and air distribution. If the duct system is too small, larger duct work should be installed. Check for any leaks in the existing duct work and repair as needed.

The duct system and all diffusers must be sized to handle the designed air flow quietly. To maximize sound attenuation of the unit’s blower, insulate the supply and return air plenums. There should be no direct straight air path through the return air grille into the heat pump. The return air inlet to the heat pump must have at least one 90 degree turn away from the space return air 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.

NOTICE: Do not connect discharge ducts directly to the blower outlet.

PIPING

Supply and return piping must be as large as the unit connections on the heat pump (larger on long runs).

In order to avoid possible vibration, use flexible hose between the unit and the rigid system.

NOTICE: Never use flexible hoses of a smaller inside diameter than that of the water connections on the unit.

Units are equipped with female pipe thread fittings for water connections.

NOTICE: Piping systems that contains steel pipes or fittings may be subject to galvanic corrosion. Dielectric fittings should be used to isolate the steel parts of the system to avoid galvanic corrosion.

To prevent leaks and possible heat exchanger fouling, use Teflon tape sealer when connecting water piping connections to the unit.

NOTICE: Do not overtighten the connections.

Install ball valves in the supply and return lines for unit isolation and unit water flow balancing.

QV units are supplied with a copper or optional cupro-nickel condenser. Copper is adequate only for ground water that is not high in mineral content. Refer to Table 5.

NOTICE: Proper testing is required to ensure the well water quality is suitable for use with water source equipment.

In conditions anticipating moderate scale formation or in brackish water, a cupro-nickel heat exchanger is recommended. (Refer to the water quality table on page #24.) Water quality must meet the standards stated in the table.

Both the supply and discharge water lines will sweat if subjected to low water temperature. Insulate lines 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 drops and poor throttling characteristics.

Pressure/temperature ports are recommended in both the supply and return lines for system flow balancing and determining the system capacity versus rated conditions. 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: Do not expose water piping to freezing ambient temperatures.

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

Always check carefully for water leaks and repair appropriately.

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 gauges 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.

Flushing

> **WARNING:** If equipped with a disconnect switch, de-energize unit by opening line voltage at disconnect switch or If no disconnect switch is present, de-energize by opening line voltage at the service panel before flushing the system.

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. Refer to the Antifreeze section below 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 homogeneous 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 must 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 must be at 15°F (30°F-15°F=15°F).

ELECTRICAL—POWER SUPPLY WIRING

High-Voltage Wiring

> **WARNING: PERSONAL INJURY HAZARD**
> Field wiring must be installed by qualified and trained personnel.

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 must 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 must be installed by qualified and trained personnel. Refer to the unit wiring diagram for field connection requirements.

To minimize the transmission of vibration from the unit cabinet to the building, enclose the power wiring to the heat pump in a flexible conduit. For heat pumps with unit-mounted disconnect switches, connect the field power 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 must 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 must 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.

WARNING: Power to the unit must be within the operating voltage range indicated on the unit's nameplate or on the performance data sheet.

NOTICE: Operation of unit on improper line voltage or with excessive phase imbalance will be hazardous to the unit, constitutes abuse and may void the warranty.

Properly-sized fuses or HACR circuit breakers must be installed for branch circuit protection. See the unit nameplate for maximum fuse or breaker size.

The unit is provided with a concentric knock-out for attaching common trade sizes of conduit. Route power supply wiring through this opening. Always connect the ground lead to the grounding lug provided in the control box and power leads to the line side of compressor contactor as indicated on the wiring diagrams starting on page #49.

ELECTRICAL—LOW-VOLTAGE WIRING

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

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

Thermostat

Unless provided with DDC controls, the QV heat pump can be controlled by most commonly available single-stage heat pump thermostats.

The reversing valve on the QV series is energized when the unit is in cooling mode. Position thermostats on an interior wall away from supply ducts.

Avoid external walls and locations subject to direct sunlight and drafts. Thermostat wiring must be 18AWG (American Wire Gauge). Refer to the installation instructions of the thermostats for further details.

Refer to the installation instructions for the thermostat for further details.

NOTICE: To prevent voltage drops in the control circuit, do not exceed the recommended thermostat wire lengths detailed in Table 3.

Connection	Function
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

Table 1 Thermostat Connections Options

VA Capacity

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 must be considered when connecting low-voltage accessories to the heat pump such as thermostats or solenoid valves. Table 2 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.

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

Standard Construction		Optional Components	
Component	VA	Component	VA
Reversing Valve Solenoid	8–9	Monitor Relay (VA draw per relay)	6–7
Compressor Contactor	6-8	Internal Two-Way Motorized Valve	7
UPM Board	2	LED Annunciator	1
Total VA Draw	**22–26**		

Table 2 Low-Voltage VA Draw—Standard Construction, Hot Gas Reheat or Economizer, and Optional Components

Thermostat to HVAC Equipment Wiring

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 3 and ensure that the wires from the thermostat to the HVAC equipment are not too long.

Copper Wire Gauge	Maximum Wire Length
22 AWG (0,33mm^2)	46m (150 ft.)
20 AWG (0,50mm^2)	73m (240 ft.)
18 AWG (0,75mm^2)	117m (385 ft.)

Table 3 Length by Wire Gauge for Thermostat to HVAC Equipment Wiring

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 4.

Copper Wire Gauge	Maximum 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 4 Length by Wire Gauge for Remote Sensor to Programmable Thermostat Wiring

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 Fig. 11.

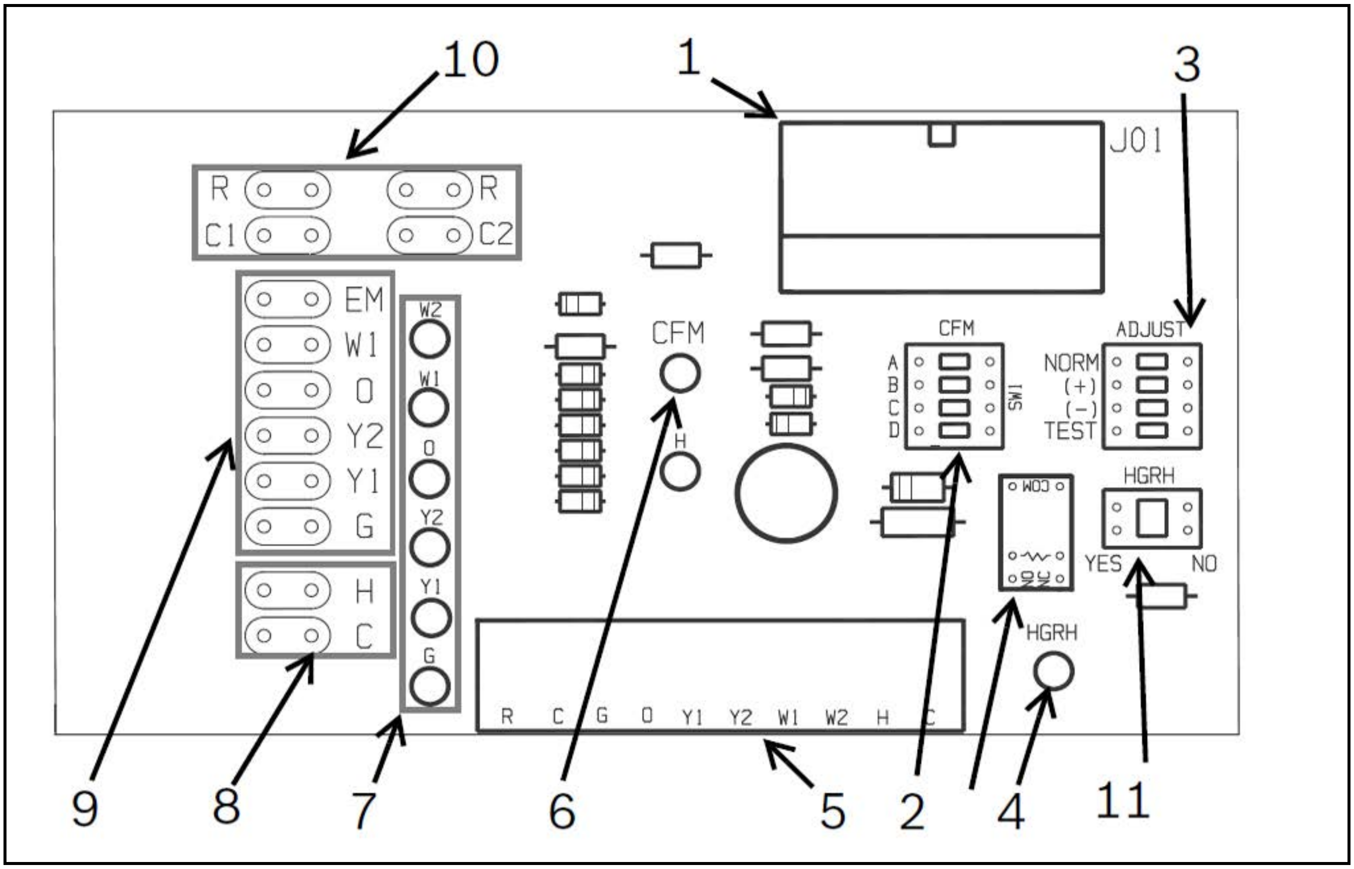


Fig. 11 ECM Interface Board

[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

SPECIFIC APPLICATION CONSIDERATIONS

Well Water Systems

(Refer to Fig. 12)

Refer to the Water Qualify Table on page #24 to ensure the water quality is suitably for use with water source equipment. In conditions of brackish water or where moderate scale formation is anticipated, a cupro-nickel heat exchanger is required. In well water applications, water pressure must always be maintained in the heat exchanger to avoid insufficient water flow. 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.

Connect the solenoid valves 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.

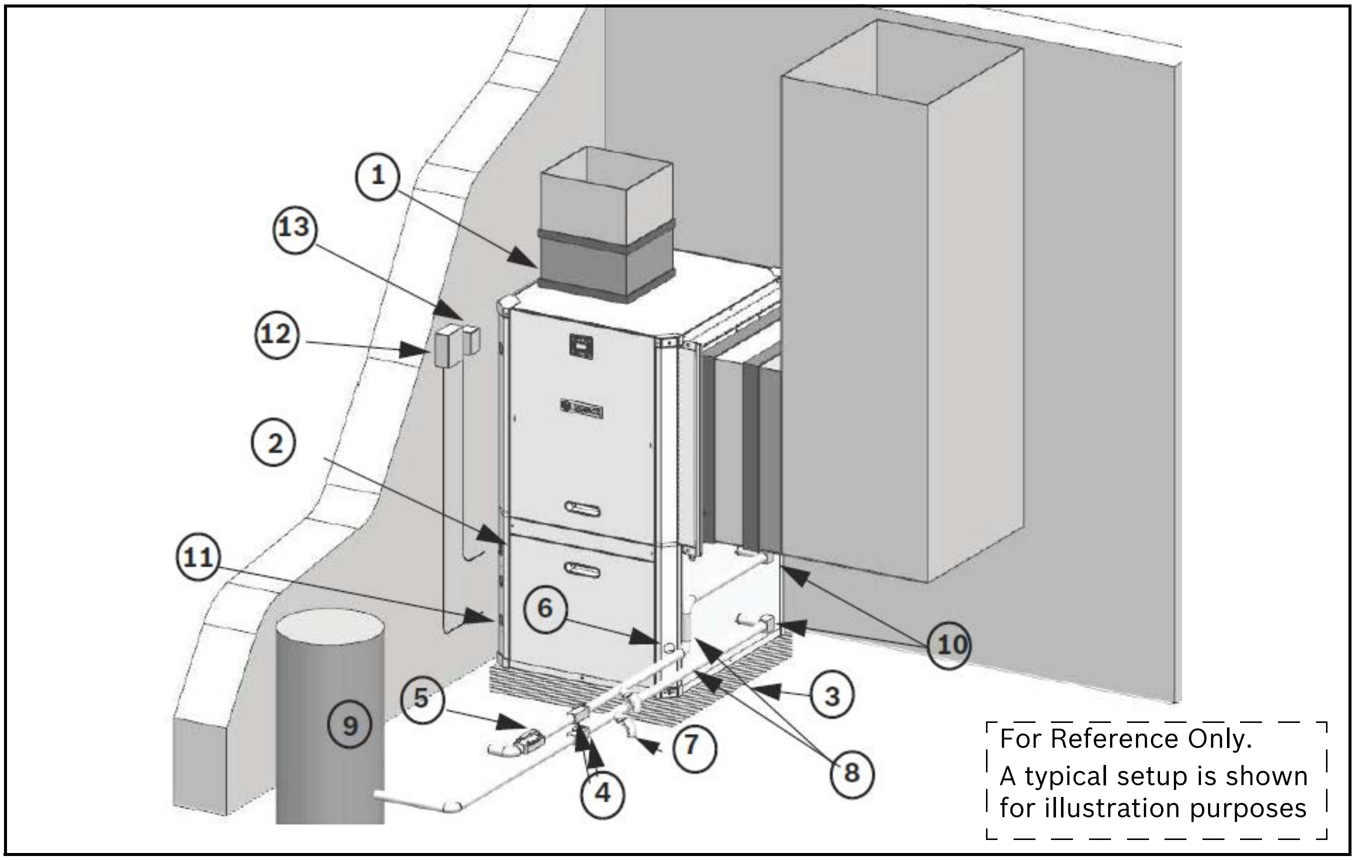


Fig. 12 Typical Well Water Setup

[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

Open Well Water Systems

When a water well is used exclusively for supplying water to the heat pump, operate the pump 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-trow relays wired in parallel are required. In either case, a larger sized VA transformer may be required.

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.)

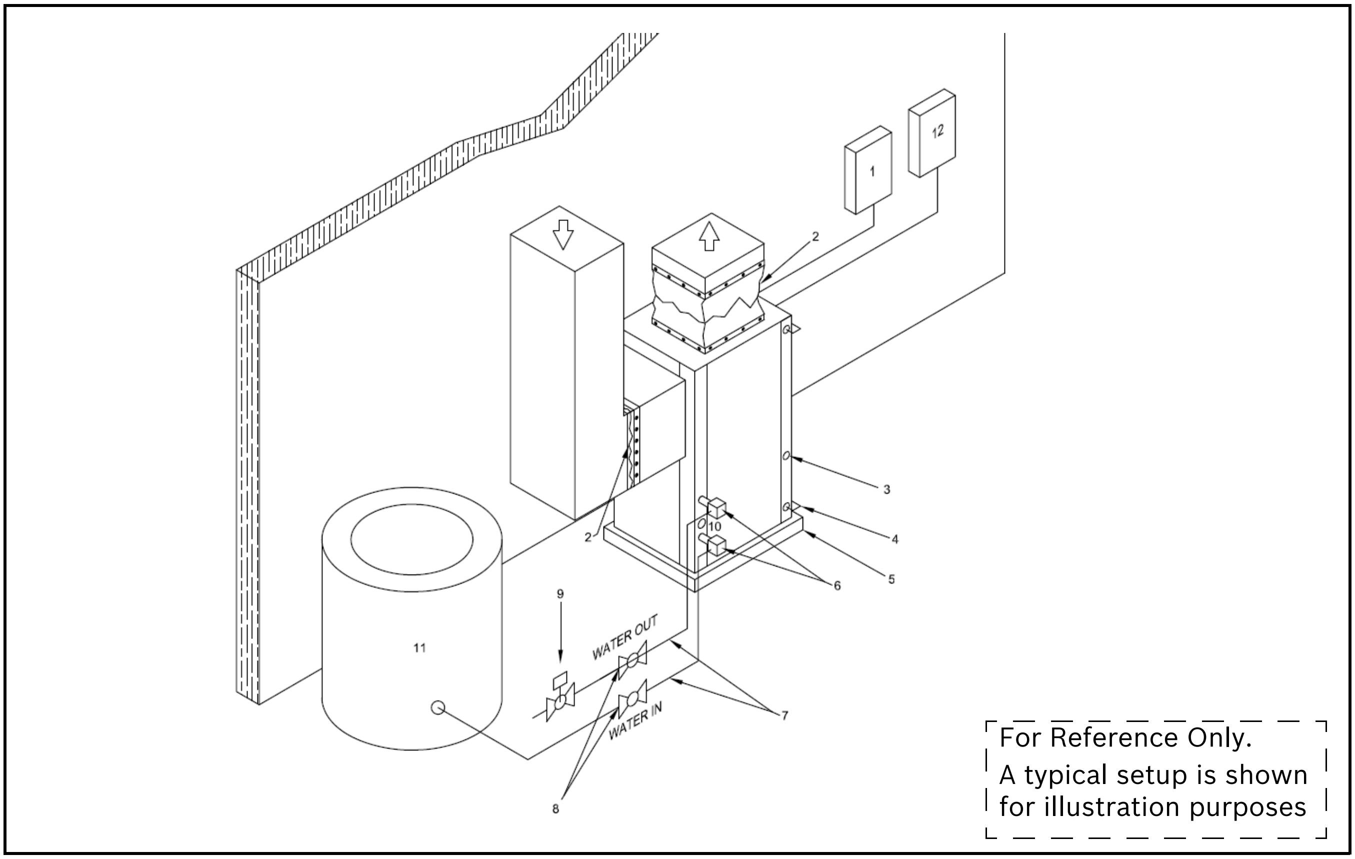


Fig. 13 Open Well Water Setup

[1] Line-Voltage Disconnect
[2] Flex Duct Connection
[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)

Cooling Tower/Boiler Systems

(Refer to Fig. 14)

These systems typically use a common loop temperature maintained at 50°F to 100°F to ensure 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.

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

To ensure against leaks and possible heat exchanger fouling, use Teflon tape thread sealant. (Teflon is a registered trademark of DuPont).

Consult the dimensional drawings on pages #51 through #54 for piping sizes.

To avoid possible vibration, use flexible hoses between the unit and the rigid system. For unit isolation and unit water-flow balancing, install ball valves in the supply and return lines.

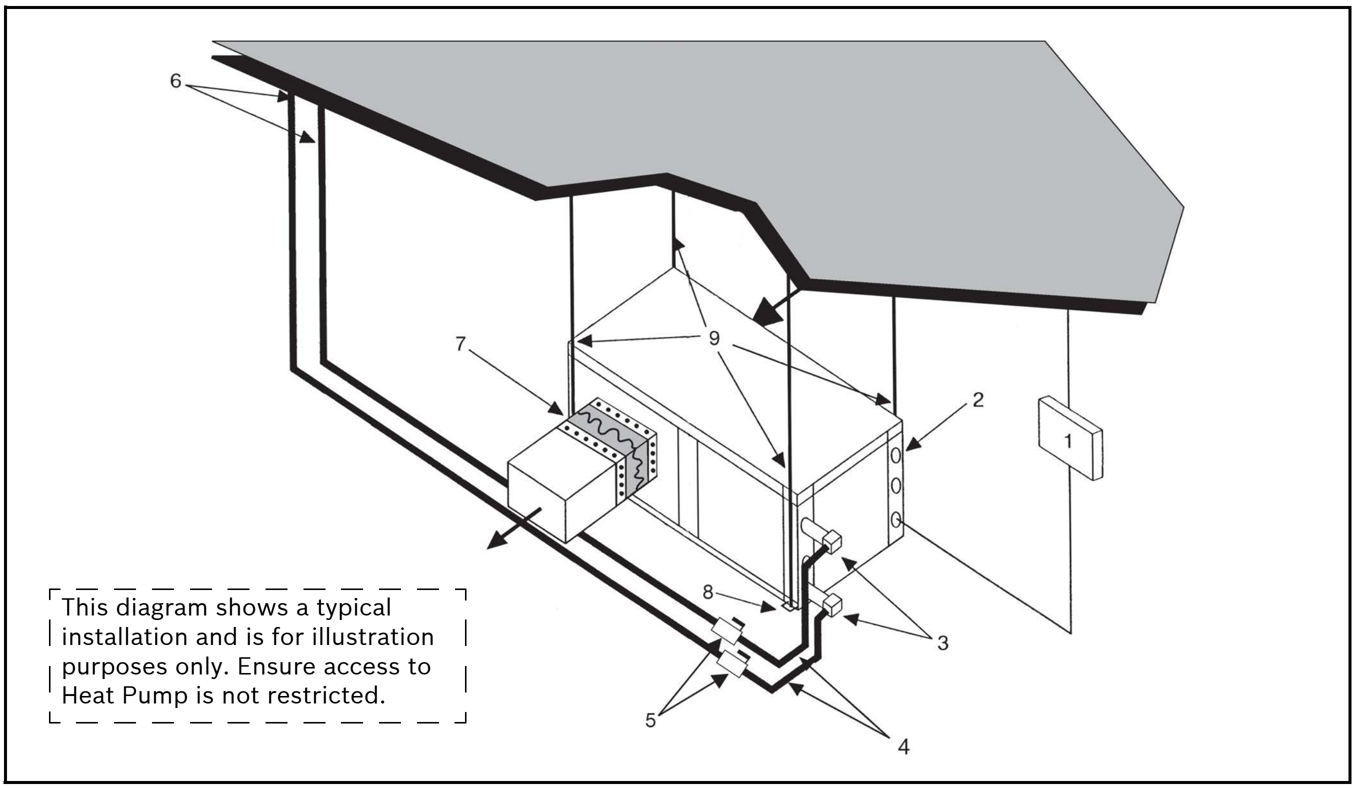


Fig. 14 Typical Cooling Tower and Boiler System Setup

[1] Line-Voltage Disconnect (unit)
[2] Low-Voltage Control Connection
[3] P/T Plugs (optional)
[4] Hose Kits
[5] Ball Valves
[6] Supply and Return Line of Central System
[7] Flex Duct Connection
[8] Hanging Bracket Assembly
[9] Threaded Rod

Geothermal Closed-Loop Systems

(Refer to Fig. 15)

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

NOTICE: Closed-loop and pond applications require specialized design knowledge and specialized training.

Use the Ground Loop Pumping Package (GLP) makes the installation easier. Anti-freeze solutions must be used low loop temperatures are expected to occur.

Refer to the GLP installation manuals for more specific instructions.

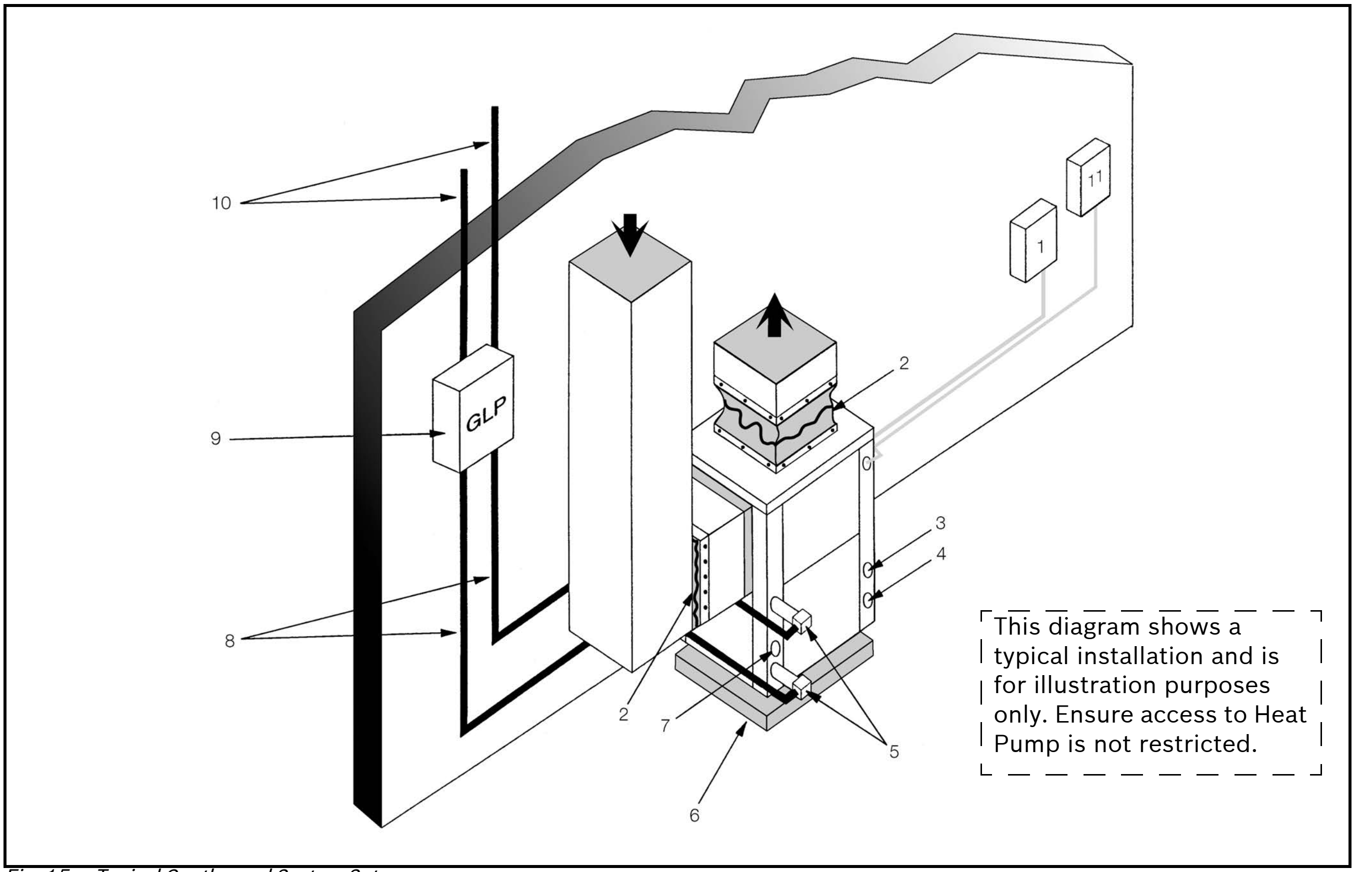


Fig. 15 Typical Geothermal System Setup

[1] Line-Voltage Disconnect (unit)
[2] Flex Duct Connection
[3] Low-Voltage Control Connection
[4] Line-Voltage Connection (unit)
[5] P/T ports
[6] Vibration Pad
[7] Condensate Drain Connection
[8] Ground Loop Connection Kit
[9] Ground Loop Pumping Package
[10] Polyethylene with Insulation

WATER QUALITY CONSIDERATIONS

> **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 required to ensure proper operation of the QV series heat pump. See the Water Qualify Table on page #24.

For closed loop and boiler/tower systems water chemistry must be checked and maintained to ensure that corrosive elements, dissolved oxygen, and pH levels are kept in check. It is important to be sure 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. Table 5 shows 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.

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			
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_2S)	< 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_2S.			
** Equivalent to 30 mesh strainer			

Table 5 Water Quality

POST-INSTALLATION SYSTEM CHECKOUT

After completing the installation and before energizing the unit, the following system checks MUST be made:

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.

DANGER: Ensure the cabinet and electrical box are properly grounded.

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. Confirm 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.

PRE-START-UP

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.

Scroll Compressor Rotation

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, activating the unit lockout. This requires a manual reset.

To reset, turn the thermostat on and then off.

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

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 ± 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.

Operating limits listed in the Unit Starting Conditions section 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.

START-UP

Use the procedure below to initiate a proper start-up.

DANGER: ELECTRICAL SHOCK Disconnect switch is only to be closed when the electrical box cover is secured to electrical box and all exterior panels are secured on the unit.

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.

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.
4. 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.
5. Check the temperature of both supply and discharge water.
6. 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 five 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.

COMMISSIONING

Record all system vitals using the "checkout sheet" and keep with equipment. (See page #60.)

SAFETY DEVICES AND THE UPM CONTROLLER OVERVIEW

QV models are equipped with the Unit Protection Module (UPM) that controls the compressor operation and monitors the safety.

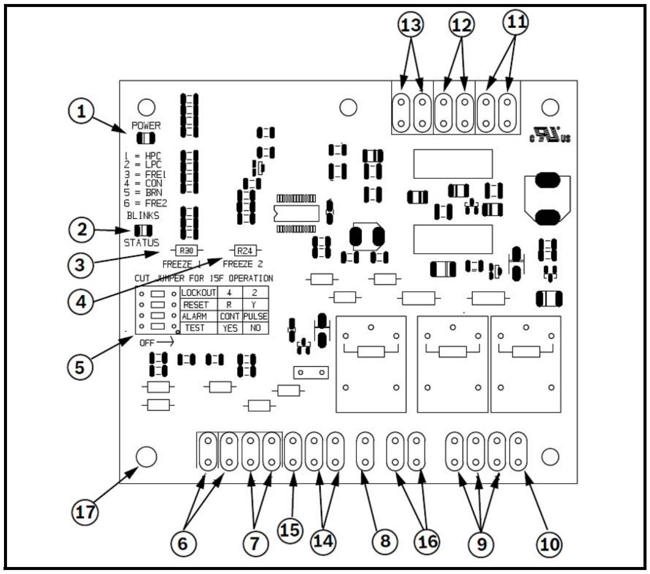


Fig. 16 UPM controller board

[1] Board Power Indicator
[2] UPM Status LED Indicator (Fault Status)
[3] Water Source Coil Freeze Protection Temperature Selection (R30, FREEZE 1)
[4] Air Coil Freeze Protection Temperature Selection (R24, FREEZE 2)
[5] UPM Board Settings
[6] Water Coil Freeze Connection (FREEZE 1)
[7] Air Coil Freeze Connection (FREEZE 2)
[8] LCD 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

When a malfunction light is used for diagnostic purposes, the connection is made at the dry contact connection terminals of the UPM board.

If the thermostat is provided with a malfunction light powered off of the common (C) side of the transformer, a jumper between “R” and “COM” terminal of “ALR” contacts must be installed.

Each unit is factory equipped with a UPM that controls the compressor operation and monitors the safety controls that protect the unit.

Safety controls include the following:

- High-pressure switch located in the refrigerant discharge line and wired across the HPC (High-Pressure Switch Connection) terminals on the UPM.
- Low-pressure switch located in the unit refrigerant suction line and wired across the LPC (Low-Pressure Switch Connection) terminals (LPC1 and LPC2) on the UPM.
- Waterside freeze protection sensor, mounted close to condensing water coil, monitors refrigerant temperature between condensing water coil and thermal expansion valve or capillary tube. If temperature drops below or remains at freeze limit trip for 30 seconds, the controller will shut down the compressor and enter into a soft-lockout condition. The default freeze limit trip is 26°F; however, this can be changed to 15°F by cutting the R30 (Freeze 1) resistor located on top of DIP switch SW1 (Refer to Fig. 16, item [3] for resistor location). Refer to Fig. 17 for sensor location.

The UPM Board Dry Contacts are Normally Open (NO).

NOTICE: If the 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 (do not cut R30 resistor) in order to shut down the unit at the appropriate leaving water temperature and protect your heat pump from freezing if a freeze sensor is included.

- Evaporator freeze protection 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 the freeze limit trip for 30 seconds, the controller will shut down the compressor and enter into a soft-lockout condition. The default freeze limit trip is 26°F.

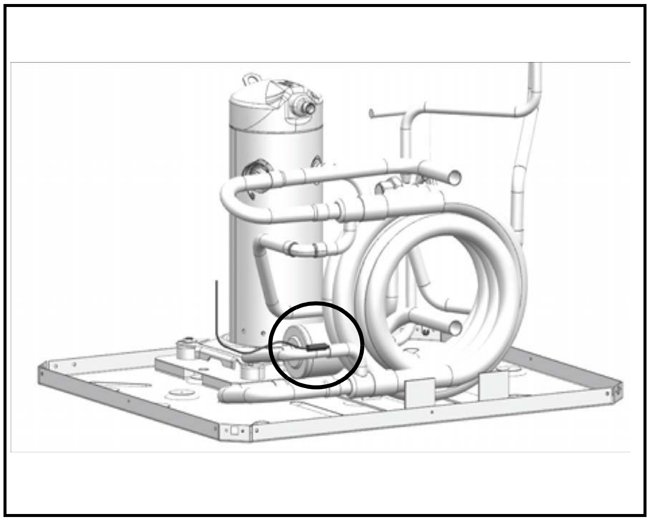


Fig. 17 Waterside Freeze Protection Sensor Location

- The condensate overflow protection sensor is located in the drain pan of the unit and connected to the “COND” terminal on the UPM board. (Refer to Fig. 16, item [15].)

The UPM Board includes the following features:

- **ANTI-SHORT CYCLE TIMER:** Five-minute delay on break timer to prevent compressor short cycling.
- **RANDOM START:** Each controller has an unique random start delay ranging from 270 to 300 seconds on initial power up to reduce the chance of multiple unit simultaneously starting at the same time after power up or after a power interruption, in order to avoid creating a 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 shut down the compressor and enter a soft lockout. The compressor will not be energized until the low-pressure switch closes and the anti-short cycle time delay expires. If the low-pressure switch opens 2 or 4 times in 1 hour, the unit will enter a hard lockout. In order to exit hard lockout power to the unit would need to be reset. The reset signal is either a Y or R signal depending on the position of the dip switch as shown in Table 8. If the reset is set to R, the board must be manually powered off and powered back on to exit the hard lock out.
- **BROWNOUT/SURGE/POWER INTERRUPTION PROTECTION:** The brownout protection in the UPM board will shut down the compressor if the incoming power falls below 18 VAC. The compressor will remain OFF 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 dip switch setting for "ALARM." If it is set to "CONST," a constant signal will be produced to indicate a fault has occurred and the unit requires inspection to determine the type of fault. If it is set to "PULSE," a pulse signal is produced and a fault code is detected by a remote device indicating the fault. For blink code explanation, see Table 6. The remote device must have a malfunction detection capability when the UPM board is set to "PULSE."
- **TEST DIP SWITCH:** A test dip switch is provided to reduce all time delays settings to 10 seconds during troubleshooting or verification of unit operation.

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.

- **FREEZE SENSOR:** The default setting for the freeze limit trip is 26°F (Sensor 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 load side coil it is recommended to leave the factory default setting on the board.** The 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-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 status LED will be active, blinking the fault code. The LED will flash (3 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 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 Fig. 17. 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 status LED will be active, blinking the fault code. The LED will flash 3 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: The freeze sensor will not guard against the loss of water. A flow switch is recommended to prevent the unit from running if water flow is lost or reduced.

- **INTELLIGENT RESET:** If a fault condition is initiated, the five-minute delay on break time period is initiated and the unit will restart after these delays expire. During this period the fault LED will indicate the cause of the fault. If the fault condition still exists or occurs 2 or 4 times (depending on 2 or 4 setting for Lockout dip switch) before 60 minutes, the unit will go into a hard lockout and requires a manual lockout reset.
- **LOCKOUT RESET:** A hard lockout can be reset by turning the unit thermostat off and then back on when the “RESET” dip switch is set to “Y” or by shutting off unit power at the circuit breaker when the “RESET” dip switch is set to “R.”

The blower motor will remain active during a lockout condition.

Blinks	Fault	Fault Criteria
None	None	All fault conditions normal
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	Brown Out	Control voltage has fallen below 18 VAC
6	Air Coil Freeze Condition	Refrigerant temperature to the air coil has fallen below 26°F for 30 seconds

Table 6 UPM Fault Blink Codes

UPM Board Factory Default Settings	
TEMP	26°F
LOCKOUT	2
RESET	Y
ALARM	PULSE
TEST	NO

Table 7 UPM Board Factory Default Settings

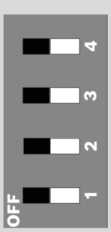
UPM DIP SWITCH SELECTABLE POSTIONS			
	Lockout	4	2
	Reset	R	Y
	Alarm	Cont	Pulse
	Test	Yes	No

Table 8 UPM DIP Switch Selectable Positions

DECSTAR® MOTOR TECHNOLOGY OVERVIEW

QV series is offered with a constant airflow ECM motor as standard feature. This standard feature 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:

- High Efficiency Blower (HEB) housing with shaft-less rotor system that allows the impeller to be hub-less.
- Average 15–35% (100–150 Watt) reduction.
- Unique blower system removes motor from blower inlet eliminating restriction and improving system efficiency.
- Allows to deliver ultimate CFM with lower RPM.
- A low-CFM ventilation feature that circulates air at 70% of full load when "fan only" is called.
- 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 on page #18.)
- Three-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 on page #18.)
- 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 on page #18.)
- 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.)

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i | Refer to the Motor Performance Data table on page #32 for heat pump blower performance with the DecStar motor.

Motor Performance Data

Model	Motor Speed Tab	Adjust	Default Factory Motor Setting	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
QV024	A	–		680	680	680	680	680	680	680	680	655	610	–	–
		Normal	X	780	800	800	800	800	800	800	800	770	720	–	–
		+		890	900	920	920	920	920	920	850	820	775	–	–
QV030	B	–		805	805	805	805	805	805	805	805	780	725	–	–
		Normal	X	915	930	950	960	950	950	950	880	850	800	–	–
		+		1045	1045	1060	1060	1060	1060	1000	960	890	860	–	–
QV036	A	–		1020	1020	1020	1020	1020	1020	1020	1020	1020	1020	–	–
		Normal	X	1200	1200	1200	1200	1200	1200	1200	1200	1160	1120	–	–
		+		1380	1380	1380	1380	1380	1380	1330	1290	1250	1215	–	–
QV042	A	–		1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	–
		Normal	X	1400	1400	1400	1400	1400	1400	1400	1400	1380	1315	1270	–
		+		1555	1555	1570	1570	1570	1535	1500	1460	1415	1375	1330	–
QV048	A	–		1360	1360	1360	1360	1360	1360	1360	1360	1360	1360	1360	–
		Normal	X	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	–
		+		1840	1840	1840	1840	1840	1840	1840	1840	1840	1840	1840	–
QV060 VT	A	–		1575	1575	1575	1575	1575	1575	1575	1575	1575	1575	1575	1575
		Normal	X	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
		+		2015	2015	2015	2015	2015	2015	2015	2015	2015	2015	1930	1890
QV060 HZ	A	–		–	1575	1575	1575	1575	1575	1575	1575	1575	1575	1575	1575
		Normal	X	–	–	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
		+		–	–	–	2015	2015	2015	2015	2015	1920	1885	1840	1840

Table 9 Constant Airflow Motor Performance Table

Note: Air flow is 70% of tabulated values during fan-only operation. Air flow is 85% of tabulated value during passive dehumidification mode when enabled.

OPTIONS

A number of options are available on QV Series of Heat Pumps. The following details the purpose, function, and components of each option.

Extended Range Option

QV heat pumps are supplied standard with bi-flow, balanced port thermal expansion valve 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 QV consists of a bi-flow, balanced port thermal expansion valve and an insulated water-to-refrigerant heat exchanger. With the extended range option installed QV 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

QV 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.

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 QV series this water valve can be factory mounted and wired internally to the unit. The QV 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.

i 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.

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

Economizer

QV series heat pumps can be provided an optional waterside economizer. The waterside 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 QV 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 QV series economizer is designed for **cooling only**. If heating economizer operation is desired, consult the factory for applications and design information.

Note: See page #12, Fig. 10 for Condensate Drain.

MAINTENANCE

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

1. Filter changes or cleaning are required at regular intervals. The time period between filter changes will depend upon type of environment where the equipment is used. In a single-family home that is not under construction, changing or cleaning the filter every 60 days is sufficient. In other applications such as motels where daily vacuuming produces a large amount of lint, filter changes may need to be as frequent as bi-weekly.

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

2. An annual “checkup” by a trained and qualified HVAC mechanic is required. Complete the check-out sheet on page #60 when performing the annual maintenance checkup. Record the performance measurements of volts, amps, and water temperature differences for both heating and cooling. 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. Check the condensate drain 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 mechanic immediately and have them check for:
   - water flow problems
   - water temperature problems
   - air flow problems, or
   - air temperature problems.

   Use of the pressure and temperature charts for the unit may be required to properly determine the cause.

TROUBLESHOOTING

Unit Troubleshooting

NOTICE: If troubleshooting a system that is low on refrigerant due to a system leak, do not simply add refrigerant. The leak must be found and repaired per F-Gas regulation.

Unit Troubleshooting					
Problem	**Mode**		**Check**	**Possible Cause**	**Action**
	Cooling	**Heating**			
NO COMPRESSOR OPERATION BUT FAN RUNS	X		Is the Fault LED blinking one (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	Is the Fault LED blinking one (1) time?	High pressure fault—No or low air flow	Check the fan motor for proper operation.
					Check the air filter.
					Inspect the air coil for dirt/debris.
					Check duct work—Are dampers closed or blocked?
	X		Is the Fault LED blinking two (2) times?	Low pressure fault—No or low air flow	Check the fan motor for proper operation.
					Check the air filter.
					Inspect the air coil for dirt/debris.
					Check duct work—Are dampers closed or blocked?
				Low pressure fault—Low refrigerant	Check refrigerant pressure with a gauge set.

Unit Troubleshooting					
Problem	**Mode**		**Check**	**Possible Cause**	**Action**
	Cooling	**Heating**			
NO COMPRESSOR OPERATION BUT FAN RUNS (CONTINUED)		X	Is the Fault LED blinking two (2) times?	Low pressure fault—No or low air flow	Check water valves and/or pumps for proper operation. Check for water coil blockage.
				75 Unit	Check for proper flow rate and water temperature, but low-water-side temp rise in cooling.
				Low pressure fault—Low refrigerant	Check refrigerant pressure with a gauge set.
		X	Is the Fault LED blinking three (3) times?	Freeze fault, water coil—No or low water flow	Check water valves and/or pumps for proper operation. Check for water coil blockage.
				Freeze fault - low water temperature	Check water temperature - is it below 40° F 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 page #27).
				Freeze fault - low refrigerant	Check refrigerant pressure with a gauge set.
	X		Is the Fault LED blinking four (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 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.

Unit Troubleshooting					
Problem	**Mode**		**Check**	**Possible Cause**	**Action**
	Cooling	**Heating**			
NO COMPRESSOR OPERATION BUT FAN RUNS (CONTINUED)	X	X	Is the Fault LED blinking five (5) times?	Brown out fault—Low voltage supply	Check primary voltage—Ensure it is between the limits listed on the unit data plate.
				Brown out fault—Bad thermostat connection	Check control voltage—if below 18V check accessories connected to the unit and ensure they do not exceed the VA draw shown in Table 2 on page #16.
					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 the Fault LED blinking six (6) times?	Freeze fault, air coil—No or low air flow	Check fan motor for proper operation.
					Check the air filter.
					Inspect the air coil for dirt/debris.
					Check duct work—Are dampers closed or blocked?
				Freezer 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.
				Freezer fault, air coil—Low refrigerant	Check refrigerant pressure with a gauge set.
	X	X	No Fault LED—Contractor 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 24 VAC (between "R" and "C"). Ohm contactor coil—an open circuit indicates a burned coil.

Unit Troubleshooting

Problem	Mode		Check	Possible Cause	Action
	Cooling	Heating			
NO COMPRESSOR OPERATION BUT FAN RUNS (CONTINUED)	X	X	No Fault LED—Contractor Energized	Open compressor overload	Check for supply voltage at the load side of the contactor. For three-phase models check phase rotation and voltage at all three phases.
				Poor wiring connection	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.

Unit Troubleshooting					
Problem	**Mode**		**Check**	**Possible Cause**	**Action**
	Cooling	**Heating**			
NO FAN OPERATION—CONSTANT AIRFLOW MOTOR	X	X	See Action	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 problem	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 AND HEATING	X	X	Reversing valve solenoid energized	Faulty solenoid	Check that the reversing valve solenoid is receiving 24 VAC.
					If it is receiving 24 VAC, 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.

Unit Troubleshooting					
Problem	**Mode**		**Check**	**Possible Cause**	**Action**
	Cooling	**Heating**			
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 the duct work.
			Loss of refrigeration capacity	Low refrigerant	Check refrigerant pressures with a gauge set.
HIGH HUMIDITY	X		Air flow is too high	Fan speed setting is too high	Consult the blower performance table and reduce fan speed if possible.
			Lost 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 the thermostat is not located near a supply air duct.

Unit Troubleshooting					
Problem	**Mode**		**Check**	**Possible Cause**	**Action**
	Cooling	**Heating**			
OBJECTIONABLE NOISE LEVELS	X	X	Air noise	Poor ductwork/ grill design	Ensure the ductwork and grills are properly sized for the 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 vibration pad.
				Unit not connected with flexible conduit, water lines, and/or ductwork	Install unit in accordance with the installation instructions staring on page #8.
				Unit cabinet touching wall or other building components	Adjust unit location to avoid unit touching structure.
			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/descale water coil.
				Low air flow elevating head pressure	Check filter.
					Increase fan speed.
			Water hammer	Fast-closing valves installed	Change valves to slow-close type.

Table 10 Unit Troubleshooting

SPECIFICATION TABLES

Operating Temperatures and Pressures

Operating Temperatures and Pressures										
			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)
QV024	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	321–384	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				
QV030	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
	100°	3.5	149–182	405–495	13–15	15–19				
		7.5	143–174	381–465	7–9	16–20				

Operating Temperatures and Pressures

			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)
QV036	30°	4.5					74–90	244–299	3–4	13–15
		9.0					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
		9.0	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
		9.0	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
		9.0	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
		9.0	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
		9.0	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
		9.0	144–176	328–401	8–9	17–21	156–191	327–400	6–7	26–32
	100°	4.5	155–189	392–480	13–16	16–19				
		9.0	149–182	369–451	8–9	17–21				
QV042	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				

Operating Temperatures and Pressures

			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)**
QV048	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	348–424	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				
QV060	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
	100°	8	128–157	373–456	16–19	17–21				
		12	125–152	349–426	11–13	18–22				

Water-Side Pressure Drop Table

Model	Water Flow Rate (GPM)	Water-Side Pressure Drop without Internal VaQVe (PSI)	Water-Side Pressure Drop with Internal VaQVe (PSI)
QV024	3.0	1.7	2.0
	4.0	2.8	3.4
	6.0	5.8	7.2
QV030	4.0	2.0	2.6
	6.0	4.2	5.6
	8.0	7.0	9.6
QV036	4.5	1.6	2.4
	6.0	2.6	4.0
	9.0	5.4	8.6
QV042	5.0	2.0	3.0
	8.0	4.6	7.2
	11.0	8.2	13.0
QV048	6.0	0.8	1.4
	8.0	1.4	2.5
	12.0	2.8	5.4
QV060	7.5	1.4	2.4
	10.0	2.3	4.1
	15.0	4.8	8.8
Note: All values are based upon pure water at 70° F.			

Table 11 Water Side Pressure Drop Table

Compressor Characteristics

Model	Voltage Code	Cold Winding Resistance Values (+/-10%)					Run Capacitor (μF/V)
		Single Phase		Three Phase			
		R-C	S-C	T1–T2	T2–T3	T3–T1	
QV024	1	1.5	1.83	–	–	–	35/370
	1	1.30	1.64	–	–	–	35/370
	2	1.45	2.17	–	–	–	40/370
	3	–	–	2.153	2.153	1.763	–
	4	–	–	7.640	7.64	9.498	–
QV030	1	1.12	1.57	–	–	–	40/370
	1	1.18	1.78	–	–	–	40/370
	2	1.33	2.60	–	–	–	40/370
	3	–	–	1.73	1.763	2.202	–
	3	–	–	1.91	1.91	1.54	–
	4	–	–	7.773	7.773	9.651	–
QV036	1	0.89	1.66	–	–	–	45/370
	2	1.22	1.15	–	–	–	60/370
	3	–	–	1.53	1.53	1.21	–
	4	–	–	5.657	5.657	7.053	–
	4	–	–	5.87	5.87	4.86	–
QV042	1	0.60	1.61	–	–	–	45/370
	3	–	–	1.2	1.2	1.2	–
	4	–	–	4.82	4.82	4.82	–
QV048	1	0.50	0.81	–	–	–	70/370
	3	–	–	1.13	1.13	1.13	–
	4	–	–	4.6	4.6	4.6	–
	5	–	–	6.32	6.32	6.32	–
QV60	1	0.44	0.83	–	–	–	80/370
	1	0.42	0.93	–	–	–	80/370
	1	0.58	1.56	–	–	–	80/370
	3	–	–	0.68	0.68	0.68	–
	3	–	–	0.86	0.86	0.86	–
	4	–	–	3.2	3.2	3.2	–
	4	–	–	3.48	3.48	3.48	–
	4	–	–	3.7	3.7	3.7	–
	5	–	–	5.33	5.33	5.33	–
	5	–	–	5.64	5.64	5.64	–
	5	–	–	5.75	5.75	5.75	–

Table 12 Compressor Characteristics

Corner Weights (Horizontal Cabinets Only)

Model	Total		Left-Hand Evaporator				Right-Hand Evaporator			
			Left Front	Right Front	Left Back	Right Back	Left Front	Right Front	Left Back	Right Back
QV024	lbs.	205.8	56.0	67.4	57.8	24.6	67.4	56.0	24.6	57.8
	kg.	93.4	25.4	30.6	26.2	11.2	30.6	25.4	11.2	26.2
QV030	lbs.	218.8	59.0	71.4	60.8	27.6	71.4	59.0	27.6	60.8
	kg.	99.3	26.8	32.4	27.6	12.5	32.4	26.8	12.5	27.6
QV036	lbs.	244.2	85.8	56.0	42.6	59.8	56.0	85.8	59.8	42.6
	kg.	110.9	39.0	25.4	19.3	27.1	25.4	39.0	27.1	19.3
QV042	lbs.	244.8	86.8	69.8	37.8	50.4	69.8	86.8	50.4	37.8
	kg.	111.1	39.4	31.7	17.2	22.9	31.7	39.4	22.9	17.2
QV048	lbs.	298.2	110.4	74.8	91.6	21.4	74.8	110.4	21.4	91.6
	kg.	135.4	50.1	34.0	41.6	9.7	34.0	50.1	9.7	41.6
QV060	lbs.	318.2	111.4	80.0	99.3	27.5	80.0	111.4	27.5	99.3
	kg.	144.5	50.6	36.3	45.1	12.5	36.3	50.6	12.5	45.1
Note: The front is the control box end of the unit.										

Table 13 Corner Weights (HZ)

Water Coil Volume

Model	Coaxial Coil Volume (gal)
QV024	0.24
QV030	0.24
QV036	0.27
QV042	0.27
QV048	0.49
QV060	0.62

Table 14 Water Coil Volume

WIRING DIAGRAMS

EON Motors

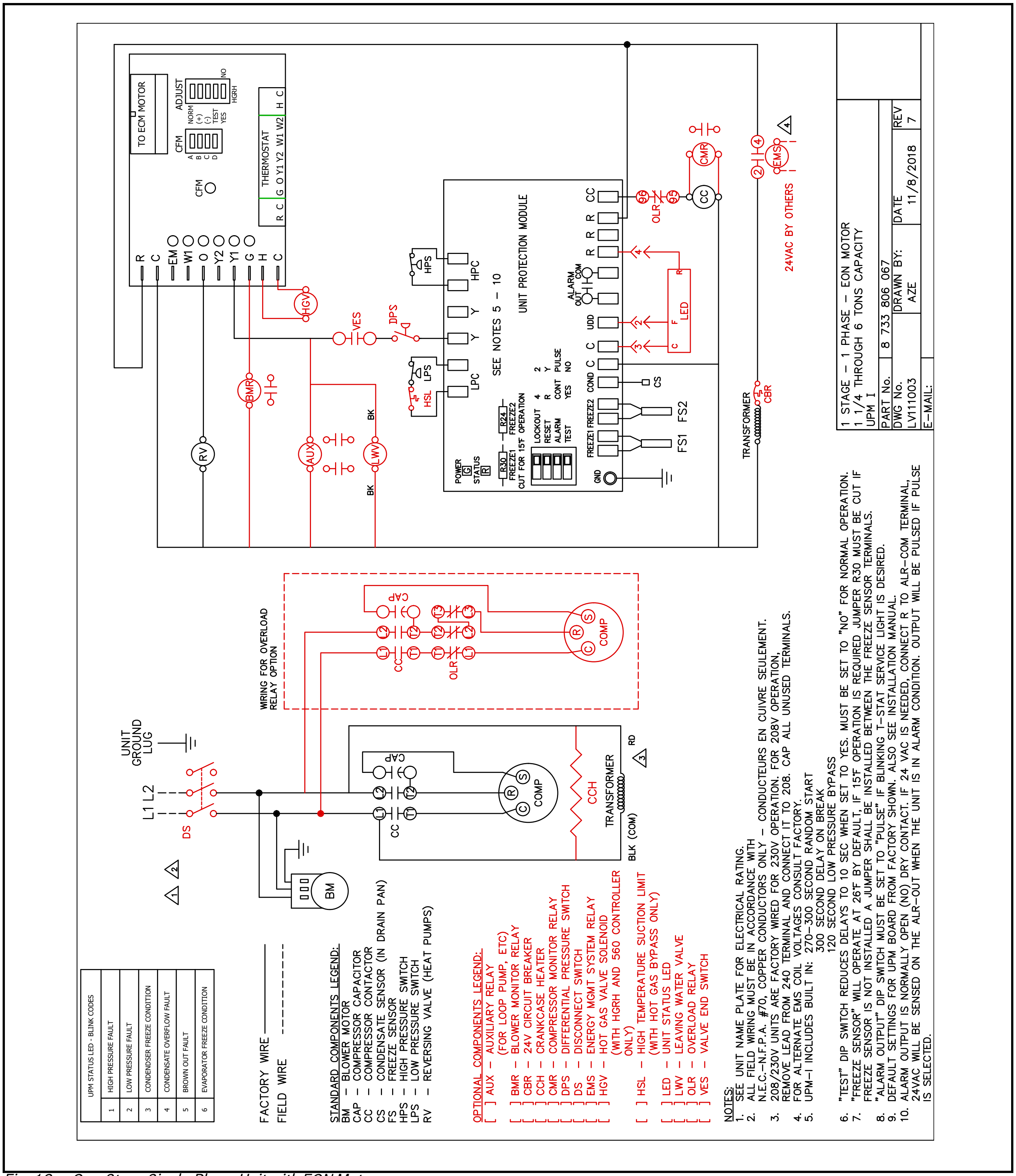


Fig. 18 One-Stage Single-Phase Unit with EON Motor

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

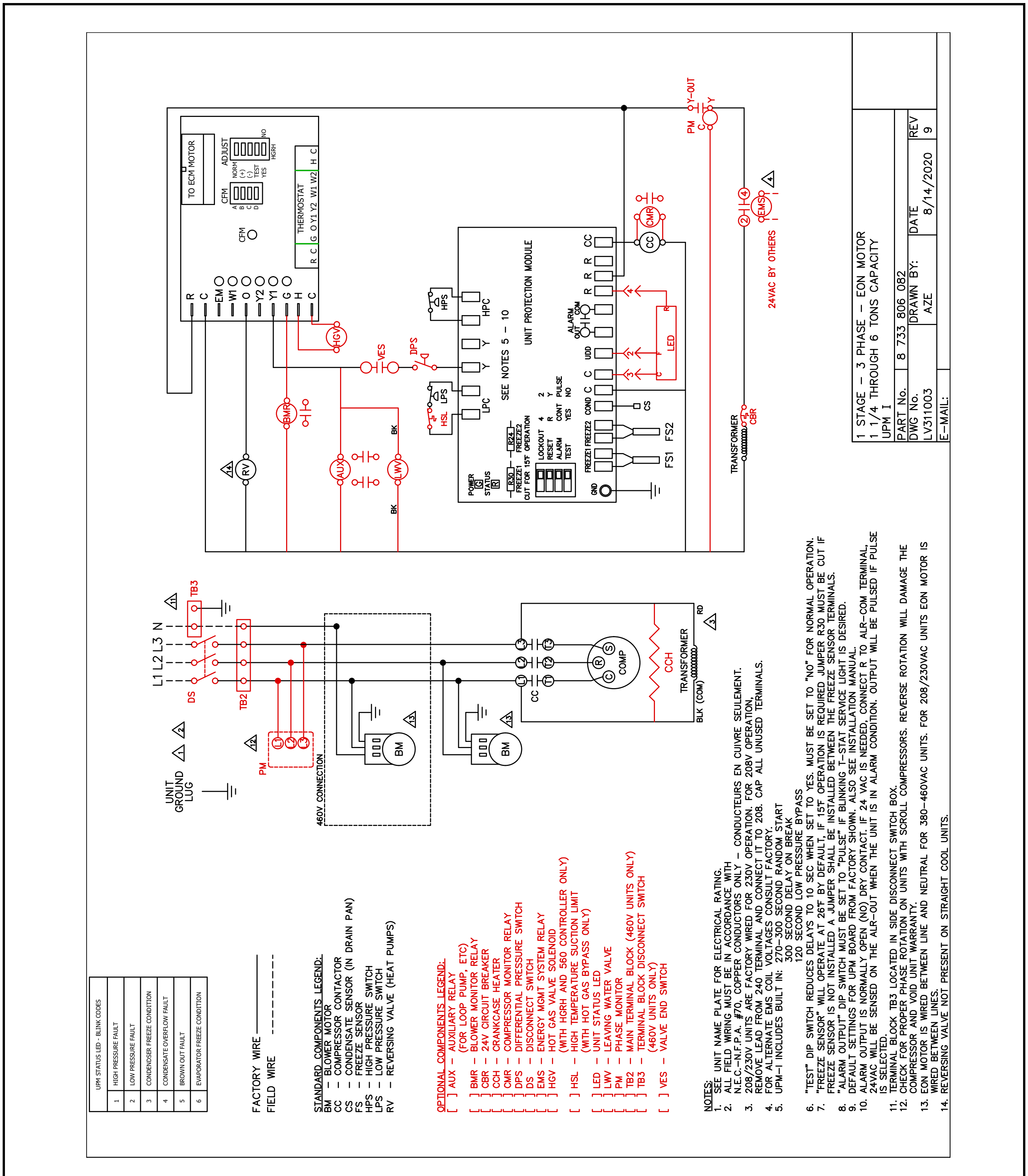


Fig. 19 One-Stage Three-Phase Unit with EON Motor

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

DIMENSIONAL DRAWINGS

Vertical Units

Model	A Width	B Depth	C Height	D Discharge Depth	E Discharge Width	F Cabinet Edge to Discharge	G Left Side to Discharge	H Water Inlet	J Water Outlet	K Condensate Drain	M R/A Duct Width	N R/A Duct Flange Height	P Filter Rack Height	Q Right Side to Discharge	Condenser Water Connections	Recommended Replacement Nominal Filter Size
QV024	21.5	21.5	39.25	14.0	16.0	3.8	0.6	2.80	8.45	18.87	20.0	18.0	20.0	4.9	3/4"FPT	20 x 20 x 1
QV030	21.5	21.5	39.25	14.0	16.0	3.8	0.6	2.80	8.45	18.87	20.0	18.0	20.0	4.9	3/4"FPT	20 x 20 x 1
QV036	21.5	26.0	43.25	14.0	16.0	6.0	0.6	2.75	10.77	18.87	24.0	22.0	24.0	4.9	3/4"FPT	24 x 24 x 1
QV042	21.5	26.0	44.25	14.0	16.0	6.0	0.6	2.75	10.77	18.87	24.0	22.0	24.0	4.9	3/4"FPT	24 x 24 x 1
QV048	24.0	32.5	45.25	18.0	16.0	7.3	0.8	3.26	13.20	20.87	30.0	22.0	24.0	7.3	1"FPT	24 x 30 x 1
QV060	24.0	32.5	45.25	18.0	16.0	7.3	0.8	3.26	13.20	20.87	30.0	22.0	24.0	7.3	1"FPT	24 x 30 x 1

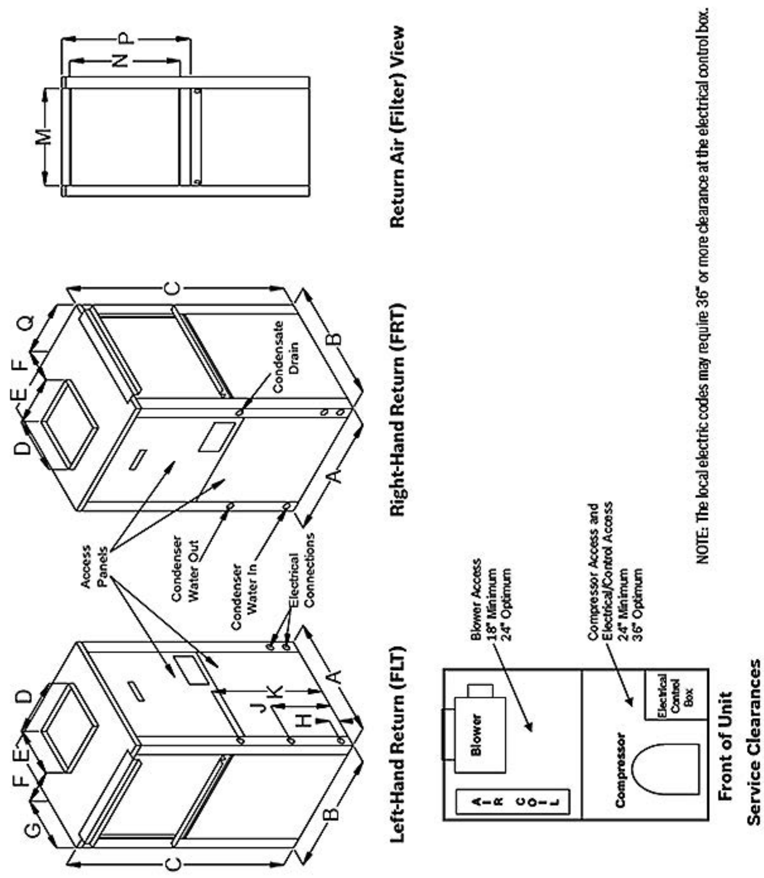


Fig. 20 Vertical (VT) Units Dimensional Drawings

Horizontal Units

Left-Hand Return Unit Dimensions

Model	A Width	B Depth	C Height	D Cabinet End to Filter Rack	E R/A Duct Width	F Cab Front to Filter Rack	G Water Inlet	H Water Outlet	J Side to Discharge (End)	K Discharge Width	M Top to Discharge (FLE & FRS)	N Discharge Height	P End to Discharge (Straight)	Q Top to Discharge (FRE & FLS)	R Filter Rack Height	T R/A Duct Flange Height	Condenser Water Connections	Recommended Replacement Nominal Filter Size
QV024	22.0	43.0	18.0	1.5	25.0	16.5	2.86	14.13	5.44	9.13	1.25	6.85	4.93	9.80	16.8	15.0	3/4" FPT	16 x 25 x 1
QV030	22.0	43.0	18.0	1.5	25.0	16.5	2.86	14.1	5.44	9.13	1.25	6.85	4.93	9.80	16.8	15.0	3/4" FPT	16 x 25 x 1
QV036	22.0	54.5	19.0	1.5	30.15	22.86	2.86	16.13	7.43	9.13	1.7	6.85	4.94	10.30	18.8	18.3	3/4" FPT	18 x 30 x 1
QV042	22.0	54.5	19.0	1.5	30.11	22.86	2.86	18.52	5.44	91.3	1.9	6.85	4.94	10.30	18.8	16.4	3/4" FPT	18 x 30 x 1
QV048	25.0	54.5	21.0	1.5	34.6	18.4	2.86	18.52	4.30	13.22	1.50	9.31	3.71	10.19	20.7	18.4	1" FPT	20 x 34.5 x 5 x 1
QV060	25.0	54.5	21.0	1.5	34.6	18.4	2.86	18.52	6.32	11.76	7.16	12.5	5.82	1.68	20.6	18.4	1" FPT	20 x 34.5 x 5 x 1

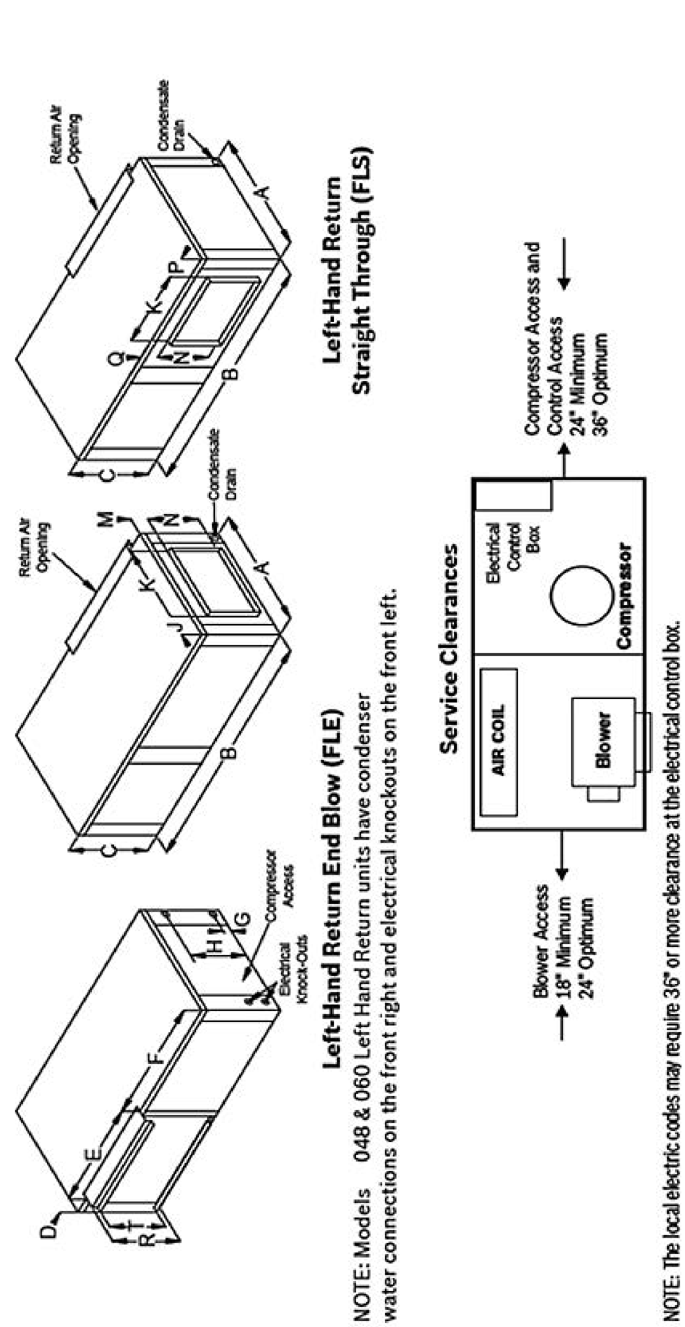


Fig. 21 Left-Hand Horizontal (HZ) Units Dimensional Drawings

Right-Hand Return Unit Dimensions

Model	A Width	B Depth	C Height	D Cabinet End to Filter Rack	E R/A Duct Width	F Cab Front to Filter Rack	G Water Inlet	H Water Outlet	J Side to Discharge (End)	K Discharge Width	M Top to Discharge (FLE & FRS)	N Discharge Height	P End to Discharge (Straight)	Q Top to Discharge (FRE & FLS)	R Filter Rack Height	T R/A Duct Flange Height	Condenser Water Connections	Recommended Replacement Nominal Filter Size
QV024	22.0	43.0	18.0	1.5	25.0	16.5	2.47	15.00	5.43	9.13	9.79	6.85	4.93	1.36	16.7	16.3	3/4" FPT	16 x 25 x 1
QV030	22.0	43.0	18.0	1.5	25.0	16.5	2.47	15.0	5.43	9.13	9.79	6.85	4.93	1.36	16.7	16.3	3/4" FPT	16 x 25 x 1
QV036	22.0	54.5	19.0	1.5	30.15	22.86	2.86	16.13	5.43	9.13	10.3	6.85	4.83	1.75	18.8	17.0	3/4" FPT	18 x 30 x 1
QV042	22.0	54.5	19.0	1.5	30.15	22.85	2.86	16.13	5.30	91.3	10.30	6.9	4.93	1.86	18.8	17.0	3/4" FPT	18 x 30 x 1
QV048	25.0	54.5	21.0	1.5	34.6	18.4	2.86	18.52	5.48	13.22	10.19	9.31	4.98	1.50	20.2	18.4	1" FPT	20 x 34.5 x 5 x 1
QV060	25.0	54.5	21.0	1.5	34.6	18.4	2.86	18.52	5.48	13.22	10.19	9.3	4.98	1.50	20.2	18.4	1" FPT	20 x 34.5 x 5 x 1

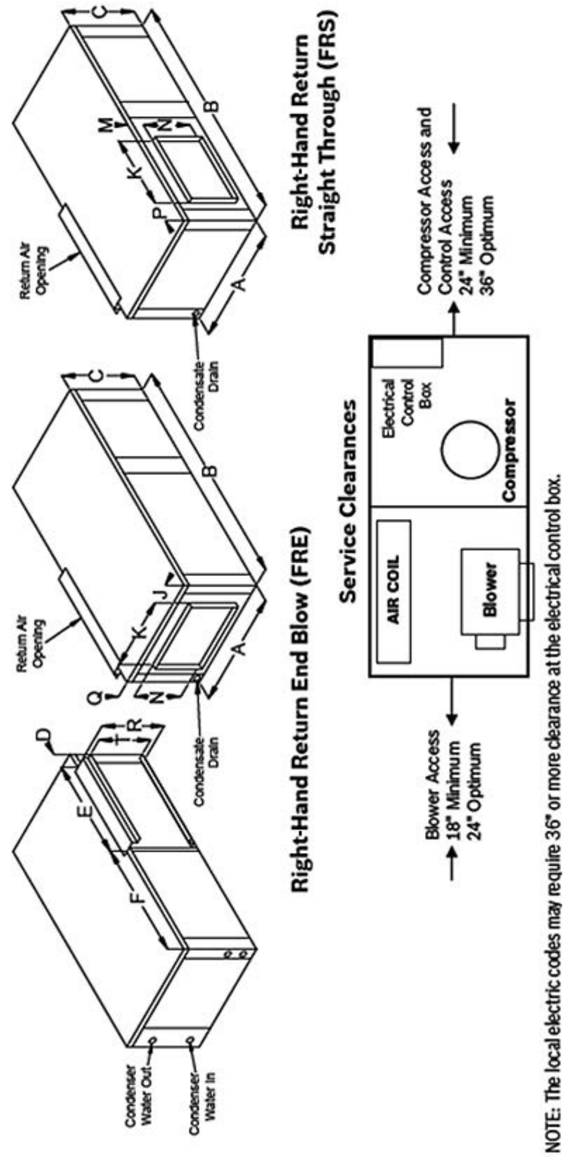


Fig. 22 Right-Hand Horizontal (HZ) Units Dimensional Drawings

Overall unit dimensions 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.

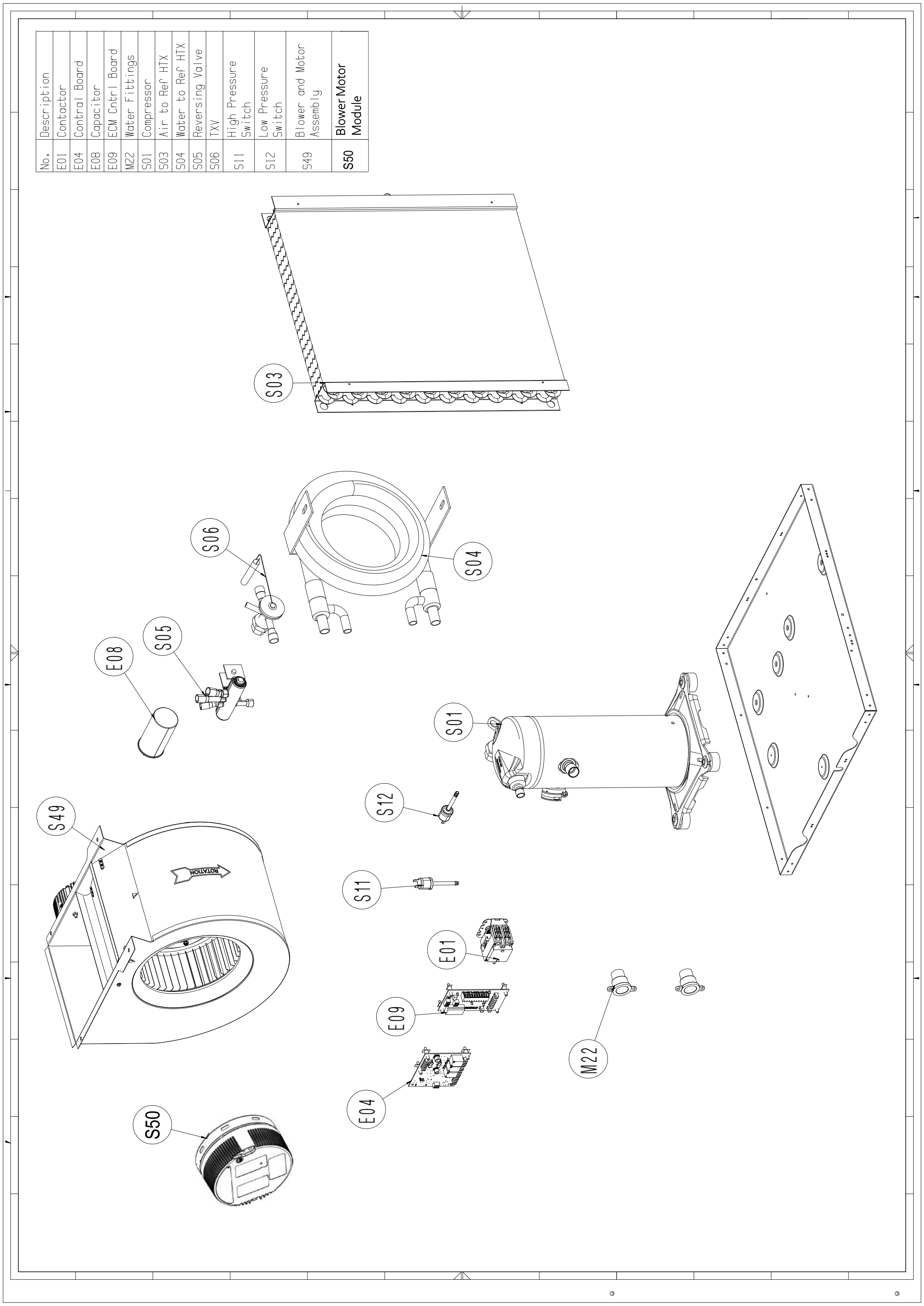
All dimensions within +-0.125”. All condensate drain connections are 3/4” FPT. Horizontal Units can be field converted between end blow and straight through supply air configurations. Specifications subject to change without notice.

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.

EXPLODED VIEWS FOR SPARE PARTS SELECTION

Main Components Exploded View



No.	Description
E01	Contactor
E04	Contral Board
E08	Capacitor
E09	ECM Cntrl Board
M22	Water Fittings
S01	Compressor
S03	Air to Ref HTX
S04	Water to Ref HTX
S05	Reversing Valve
S06	TXV
S11	High Pressure Switch
S12	Low Pressure Switch
S49	Blower and Motor Assembly
S50	Blower Motor Module

Fig. 23 Main Components Exploded View

Horizontal Cabinet Exploded View

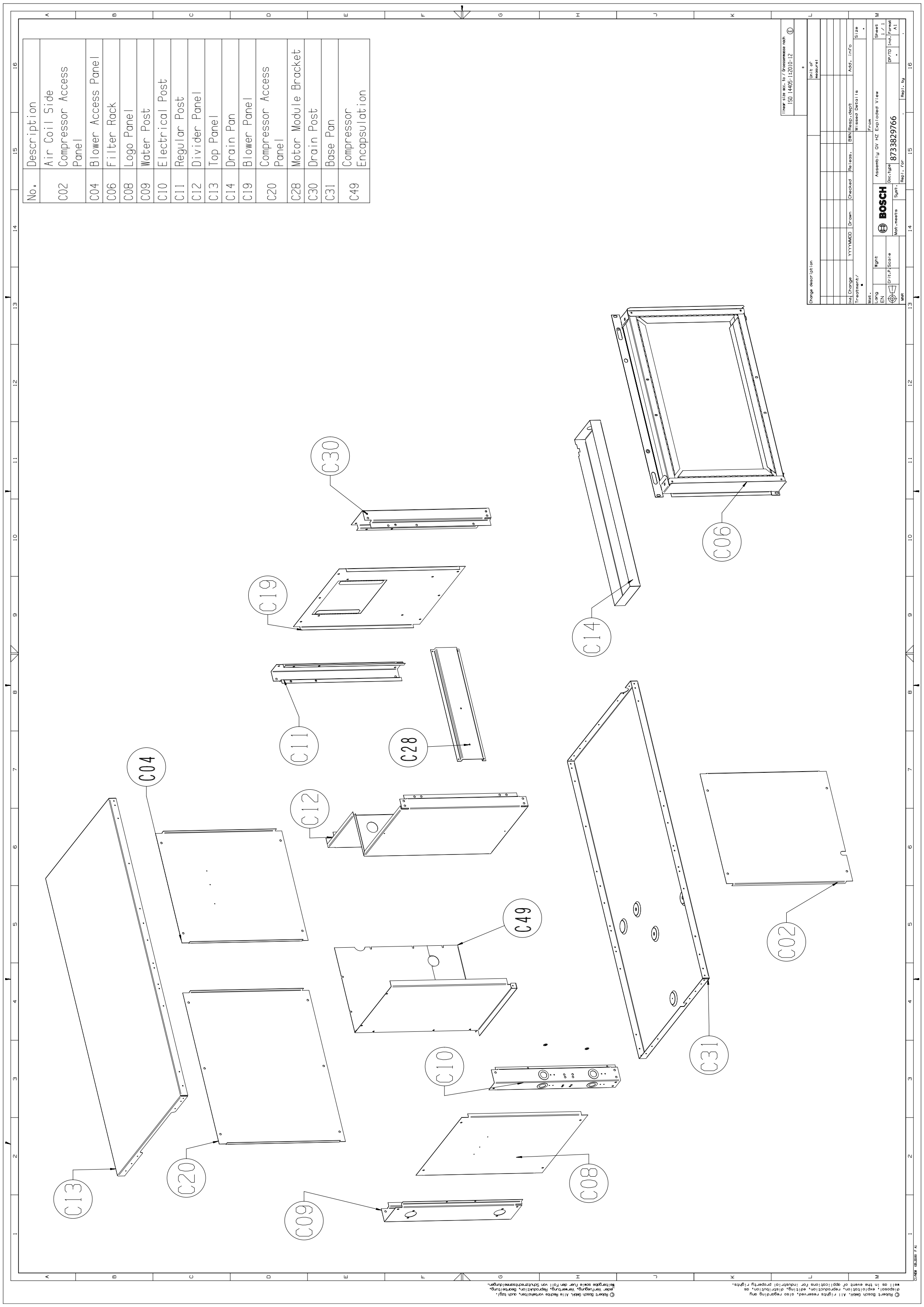


Fig. 24 Horizontal Cabinet Exploded View

Vertical Cabinet Exploded View

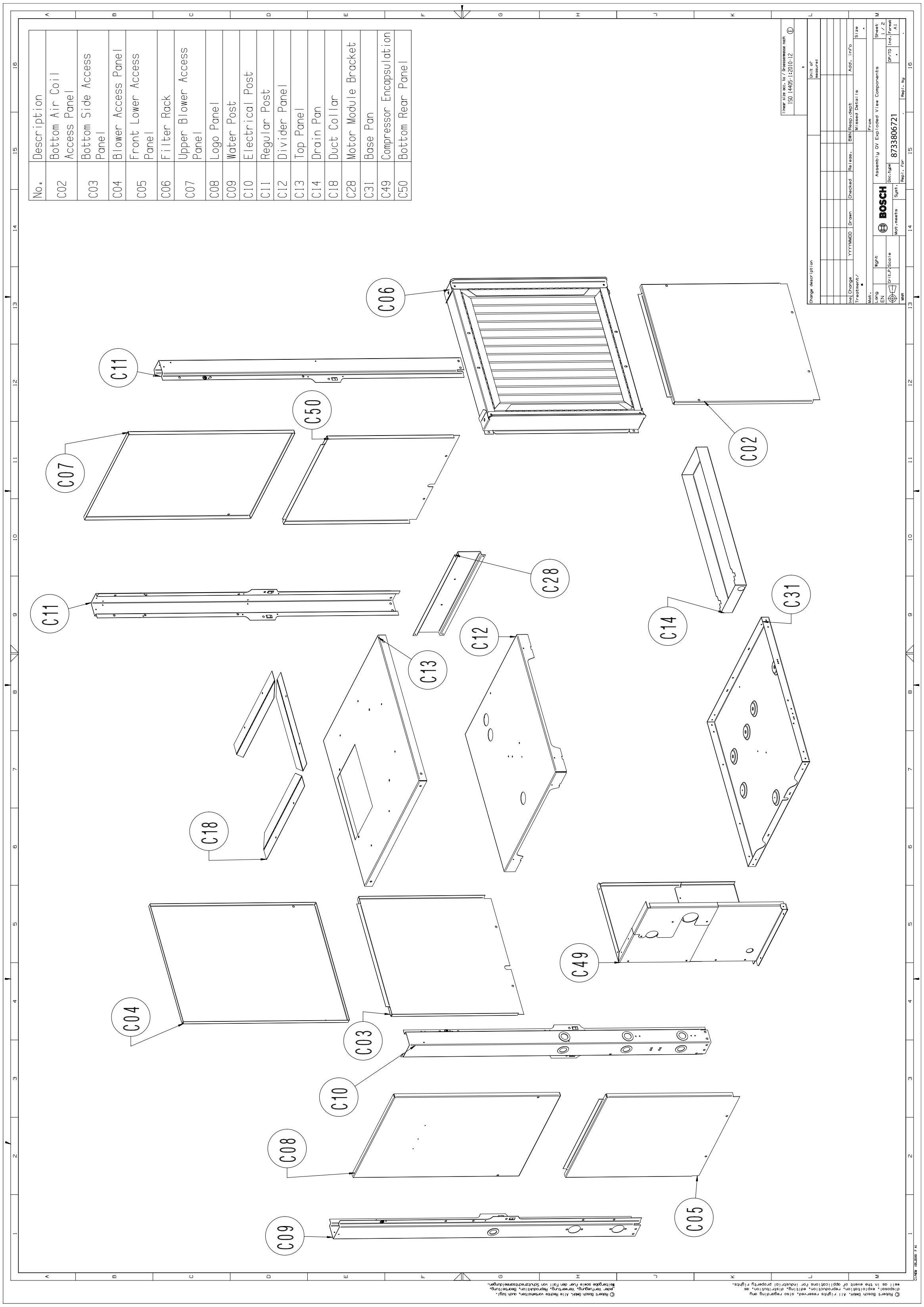


Fig. 25 Vertical Cabinet Exploded View

TERMINOLOGY

Acronyms

ASC — Anti-Short Cycle

AWG — American Wire Gauge

CFM — Cubic Feet per Minute

DDC — Digital Direct Controller

ECM — Electronically Commutated Motor

FLA — Full-Load Amps

GLHP — Ground Loop Heat Pump

HP — Horse Power

HPC — High-Pressure Switch Connection

HPS — High-Pressure Switch

IOM — Installation, Operation, and Maintenance Manual

LED — Light Emitting Diode

LPC — Low-Pressure Switch Connection

LPS — Low-Pressure Switch

LRA— Locked Rotor Amps

NO — Normally Open

NPA — Name Plate Amps

(R/A) — Return Air

RLA — Running Load Amps

Terms

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.

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

Discharge Pressure — Referring to the pressure leaving compressor.

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.

Recovery — Referring to 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 — Referring to the reuse of a recovered fluorinated-greenhouse gas following a basic cleaning process.

Repair — Referring to 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.

Suction Pressure — Referring to the pressure entering compressor.

DECOMMISSIONING INFORMATION

Only trained and qualified technicians are allowed to decommission and dispose of equipment following the 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, service, or disconnect the equipment.

Protecting the Environment

Components

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

Many parts in the Heat Pump can be fully recycled at 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.

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 Capacity ______________

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

* Required for Troubleshooting ONLY

NOTES

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Bosch Thermotechnology Corp.
65 Grove Street, Watertown, MA 02472
Phone: +1 (800) 283-3787 | Fax: +1 (603) 965-7568
www.bosch-climate.us.com
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