BOSCH

Installation, Operation, and Maintenance Manual

CF Series Heat Pumps

CF007 | CF009 | CF012 | CF015 | CL018 | CF024 | CF030 | CF036 | CF042 | CF048 | CF060 | CF070

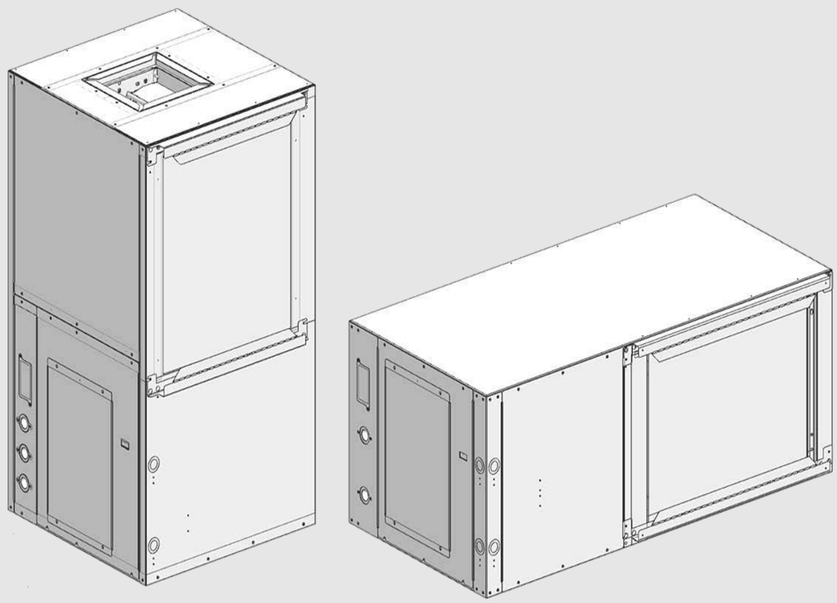

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Table of Contents

1 Document Conventions

1.1 Key to Symbols

1.1.1 Warnings

Warnings in this document are identified by a warning triangle followed by a signal word.

Signal word at the beginning of a warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.

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

⚠ DANGER

DANGER indicates a situation that, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a situation that, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION indicates a situation that, if not avoided, could result in minor to moderate injury.

NOTICE

NOTICE is used to address practices not related to personal injury.

1.1.2 Important Information

i

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

1.1.3 Additional Symbols

Symbol	Meaning
▶	A step in an action sequence.
→	A reference to a related part in the document.
•	A list entry.
–	A list entry (second level)

Table 1 Additional Symbols

1.2 General Safety Instructions

⚠ 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.

⚠ 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

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 of Installing the Hanging Bracket Kit to mount the hanging brackets to the unit.

⚠ WARNING

Do NOT use means to accelerate the defrosting process or to clean, unless recommended in these instructions.

⚠ WARNING

Fire Hazard!

The appliance must be stored in a room without continuously operating ignition sources (e.g., open flames, an operating gas appliance, or an operating electric heater).

⚠ WARNING

Fire Hazard!

Auxiliary devices that may be ignition sources must NOT be installed in the ductwork, unless the auxiliary devices are approved for use with the specific appliance or declared suitable for the refrigerant.

⚠ 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 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.

NOTICE

This appliance is not intended for use by people (including children) with reduced physical, sensory, or mental capabilities, or with lack of experience and knowledge, unless they are supervised or have been given instruction concerning use of the appliance by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the appliance.

1.3 Refrigerant Safety Warnings

Refrigerant Safety Group A2L

⚠ DANGER

Poisonous Gas!

Poisonous gas can be created when refrigerant (R454B) is exposed to open flames.

⚠ WARNING

Risk of Fire!

Flammable Refrigerant Used—To be repaired only by trained service personnel. DO NOT puncture refrigerant tubing.

⚠ WARNING

Risk of Fire!

Flammable Refrigerant Used—Dispose of properly in accordance with federal or local regulations.

⚠ WARNING

Personal Injury Hazard!

Do NOT pierce or burn refrigerant lines.

⚠ WARNING

Be aware that refrigerants may not contain an odor.

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.

2 Model Nomenclature

CF 024 – 1 VT C – L L T P D A – X A G X X X X X X 7 X X X X 1 X X X X S B A

1-2 3-5 6 7 8-9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

MODEL:
CF

NOMINAL CAPACITY:
007, 009, 012, 015, 018, 024, 030, 036, 042, 048, 060, 070

ELECTRICAL CONFIGURATION:
1 — 208–230/60/1
2 — 277/60/1
3 — 208–230/60/3
4 — 460/60/3

CABINET CONFIGURATION:
CF — Counterflow
HZ — Horizontal
VT — Vertical

COAX OPTIONS:
C — Copper
N — Cupro-nickel

WATER CONNECTION:
A — Front-Right Water
L — Front-Left Water

RETURN AIR CONFURATION:
L — Left
R — Right

DISCHARGE AIR LOCATION:
B — Bottom
E — End
S — Straight Through
T — Top

FAN/MOTOR OPTION:
A — Constant Airflow ECM
T — Constant Torque ECM

AIR COIL:
D — DuoGuard
U — Uncoated

REVISION LEVEL:
A — Current

ELECTRIC HEAT:
X — None
A — 5 kW
C — 10 kW
D — 15 kW
E — 20 kW

CABINET CONSTRUCTION:
A — G90 Steel / 1/2" 1.5 LB Dual-Density Fiberglass
C — G90 Steel / 1/2" Closed-Cell Foam
D — G90 Steel / 1/2" 1.5 LB Dual-Density Fiberglass, Extra Quiet
F — G90 Steel / 1/2" Closed-Cell Foam, Extra Quiet
2 — G90 Steel / 1/2" Closed-Cell Foam, 2% Air Leakage
3 — G90 Steel / 1/2" Closed Cell Foam, Extra Quiet, 2% Air Leakage

APPLICATION:
G — Extended Range (Geothermal)

CODE STRING LEVEL:
A — Revision

CHANNEL:
B — Bosch

STANDARD/SPECIAL:
S — Standard
A — Special #1

AGENCY OPTIONS:
X — Standard, 5k SCCR
D — 5k SCCR, Dual-Point Power (Fire Alarm Relay)
G — 100kA SCCR

NOT USED:
X — None

DRIVE SPEED (MC ONLY):
X — N/A

MOTOR HP/QTY (BELT DRIVE ONLY)
X — N/A

AIR FILTRATION:
1 — 1" Throwaway - 2-Sided Filter Rack (Side Access)
2 — MERV13 - 4" 4-Sided Filter Rack (Side Access)
4 — MERV8 - 2" 4-Sided Filter Rack (Side Access)
5 — MERV13 - 2" 4-Sided Filter Rack (Side Access)
A — 1" Throwaway - 2-Sided Filter Rack (Bottom Access)
B — MERV13 - 4" 4-Sided Filter Rack (Bottom Access)
D — MERV8 - 2" 4-Sided Filter Rack (Bottom Access)
E — MERV13 - 2" 4-Sided Filter Rack (Bottom Access)

NOT USED:
X — None

ECONOMIZER:
X — None
E — Economizer with 3-Way Valve and Controls

WATER-FLOW CONTROL OPTIONS:
X — None
2 — 2-Way Solenoid Valve
3 — MeasureFlow (3 GPM/Ton)
4 — 2-Way Solenoid + MeasureFlow
6 — Water Regulating Valve Connection
7 — 2-Way Solenoid + Flow Proving
8 — 2-Way Solenoid + MeasureFlow + Flow Proving
9 — MeasureFlow + Flow Proving
H — Flow Proving Switch (DPS)

CONTROLS:
X — Standard
M —DDC - Multi-Protocol (BacNET, Modbus, N2)

TRANSFORMER:
1 — 100 VA
7 — 75 VA

REFRIGERATION:
X — None
B — Hot Gas Bypass
C — Hot Gas Bypass with Hot Gas Reheat
D — Heat Recovery Package
H — Hot Gas Reheat - On/Off
M — Hot Gas Reheat, Modulating

ELECTRICAL OPTIONS:
X — As Default for Non-Used Electrical Codes
A — EMS relay
B — Blower Monitor Relay
C — Compressor Monitor Relay
E — Pump/Valve Relay
G — Boilerless Control
J — Disconnect Switch
K — Fire Alarm Relay/Dual Power
L — Refrigerant Leak Sensor
M — Wire Transformer to 208 Volts

Fig. 1 Model Nomenclature

3 General Description

The CF 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 Water Loop Heat Pump, Ground Loop Heat Pump, and Ground Water Heat Pump application points. All CF Water-to-Air Heat Pumps conform to UL 60335-2-40 by Intertek-ETL.

CF series units are available in three basic configurations: Vertical Top-Supply Air (VT), Horizontal End-Supply Air or Straight-Through Supply Air (HZ), and CounterFlow Bottom-Supply Air (CF). Each of these configurations are available with either left- or right-hand return air. HZ models can have the supply air field converted from end discharge air to straight through with no additional parts required.

i

CF units can accommodate a wide range of air temperatures, however, standard CF models should not be used for 100% outside air without consulting with Engineering Applications (EAP). 100% outside air routinely requires higher levels of dehumidification than is available from equipment designed for return air applications.

NOTICE

CF units are designed and rated for conditioned space installation only.

NOTICE

DO NOT install CF units in environments that fall below freezing or exceed 100°F ambient.

NOTICE

CF 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.

CF 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 #36.

i

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

3.1 Operating Limits

3.1.1 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.

3.1.2 Power Supply

A voltage variation of ± 10% of nameplate utilization voltage is acceptable.

3.1.3 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.

3.1.4 Normal Operating Conditions

Normal operating conditions must fall in the limits defined in the table below. (→Refer to Table 2.)

<table>
<tr><th colspan="5">Operating Limits</th></tr>
<tr><th>Fluid Type</th><th colspan="2">Specification</th><th>Cooling</th><th>Heating</th></tr>
<tr><td rowspan="6">Air</td><td colspan="2">Minimum ambient air temperature</td><td>50°F</td><td>40°F</td></tr>
<tr><td colspan="2">Maximum ambient air temperature</td><td>100°F</td><td>85°F</td></tr>
<tr><td colspan="2">Rated ambient air temperature</td><td>80°F</td><td>68°F</td></tr>
<tr><td colspan="2">Minimum air coil entering air db/wb</td><td>65/57°F</td><td>45°F</td></tr>
<tr><td colspan="2">Maximum air coil entering air db/wb</td><td>95/85°F</td><td>80°F</td></tr>
<tr><td colspan="2">Rated air coil entering air db/wb</td><td>80/67°F</td><td>68/59°F</td></tr>
<tr><td rowspan="11">Liquid</td><td colspan="2" rowspan="2">Antifreeze Protection Required</td><td>–</td><td>LWT <40°F</td></tr>
<tr><td>–</td><td>EWT <50°F</td></tr>
<tr><td colspan="2">Minimum water coil entering fluid temperature</td><td>45°F</td><td>20°F</td></tr>
<tr><td colspan="2">Maximum water coil entering fluid temperature</td><td>110°F</td><td>80°F</td></tr>
<tr><td rowspan="3">Rated water coil entering fluid temperature</td><td>Water Loop</td><td>86°F</td><td>68°F</td></tr>
<tr><td>Ground Loop</td><td>77°F</td><td>32°F</td></tr>
<tr><td>Ground Water</td><td>59°F</td><td>50°F</td></tr>
<tr><td rowspan="2">Maximum operating water pressure</td><td>Standard Unit</td><td colspan="2">400 psi/2,785 kPa</td></tr>
<tr><td>With factory installed water valve option</td><td colspan="2">300 psi/2,068 kPa</td></tr>
<tr><td colspan="2">Minimum operating water flow rate</td><td colspan="2">1.5 GPM per ton</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="5">Note: Maximum and minimum operating limits may not be combined. Refer to Engineer Submittal Sheet on the product information page. (See the QR code on the back page of the IOM).

Acronyms:
LWT: Leaving Water Temperature
EWT: Entering Water Temperature</td></tr>
</table>

Table 2 Operating Limits

3.2 Approved Supplementary Heaters

Unit Model/Size	Electric Heat Kit 5kW Model: HK050-1501	Electric Heat Kit 10kW Model: HK100-1501	Electric Heat Kit 15kW Model: HK150-1501	Electric Heat Kit 20kW Model: HK200-1501
007	–	–	–	–
009	–	–	–	–
012	–	–	–	–
015	–	–	–	–
018	✓	–	–	–
024	✓	✓	–	–
030	✓	✓	–	–
036	✓	✓	✓	–
042	✓	✓	✓	–
048	✓	✓	✓	✓
060	✓	✓	✓	✓
070	✓	✓	✓	✓

Table 3 Approved Supplementary Heaters

4 Inspecting and Storing the Equipment

4.1 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 units with under 6-tons capacity more than two (2) high.
- DO NOT stack horizontal units with 6-tons capacity more than three (3) high.

4.2 Initial Inspection

Verify that all items have been received and that there is no visible damage. Note any visible 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 Bosch by the original purchaser by filing a claim at:
https://claims.bosch-homecomfort.us

4.3 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 shipping brackets from the unit attached to the pallet.

5 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 CF 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. Warranty will be void if the units are used during construction.

5.1 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.
- 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, discharge collar, and all electrical connections must be provided.

NOTICE

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

A “conditioned space” is a 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.

5.2 Minimum Conditioned Room Area

NOTICE

The minimum height of the room (ceiling height) is 7.2 feet (2.2 m).

Due to the flammable nature of the refrigerant, there are certain requirements that must be met to employ the use of units with A2L Refrigerant with charge amount above 62.8oz. If a unit is connected via a duct system, the total conditioned area must meet the minimum value shown in the table below. This value is only valid if the minimum airflow (Qmin) requirement is also met. Refer to the Blower Performance Table to verify airflow values. (➔See Table 14 on page #47.)

Model	Configuration	Total Refrigeration Charge oz. (kg.)	Ceiling Height					Qmin CFM (m^3/hr)
			7.2' (2.2m)	8' (2.4m)	9' (2.7m)	10' (3.0m)	12' (3.7m)	
			Minimum Area of the Total Conditioned Space in ft^2 (m^2)					
CF060	HZ	80 (2.3)	147.5 ft^2 (13.7 m^2)	133.0 ft^2 (12.4 m^2)	118.3 ft^2 (11.0 m^2)	106.4 ft^2 (9.9 m^2)	88.7 ft^2 (8.2 m^2)	266 (452)
	VT	67.5 (1.9)	124.4 ft^2 (11.6 m^2)	112.3 ft^2 (10.4 m^2)	99.8 ft^2 (9.3 m^2)	89.8 ft^2 (8.3 m^2)	74.8 ft^2 (7.0 m^2)	225 (381)

Table 4 Refrigerant Charge

5.3 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 open ends of pipes stored on the job site. This precaution is especially important in areas where painting, plastering, or spraying of fireproof material, etc. is not yet complete. Foreign material that accumulates within the units can prevent proper start-up and require costly clean-up operations. Before installing any of the systems components, be sure to examine each pipe and all the fitting valves. Remove any dirt or foreign material found in or on these components.

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.

5.4 Return and Supply Air Duct Flanges Preparation

CF 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.

5.5 Mounting Vertical (VT) Units

In order to minimize vibration transmission from the unit to the building structure mount the CF 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 CF 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.

Fig. 2 Vibration Absorbing Pad

5.6 Horizontal (HZ) Units

5.6.1 Configuring the Horizontal Supply Air Orientation

The supply air location on CF 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.

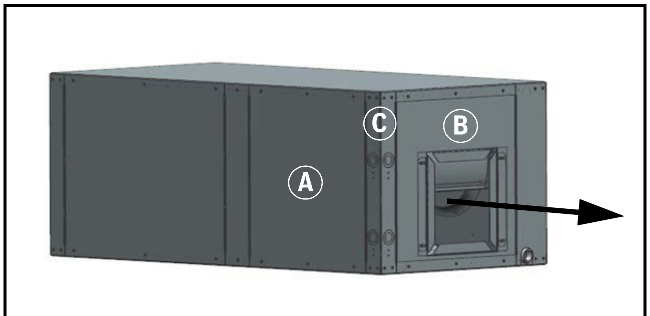

Fig. 3 End-Blow Orientation

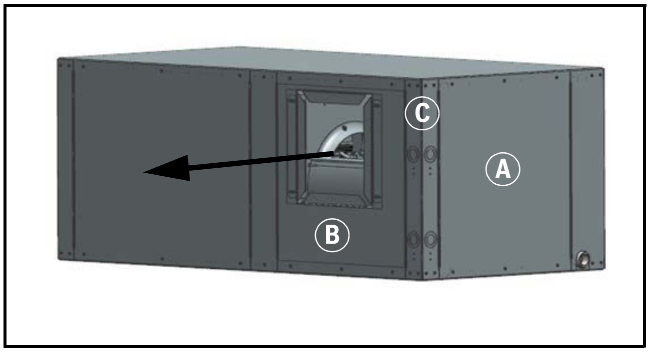

Fig. 4 Straight-Through Orientation

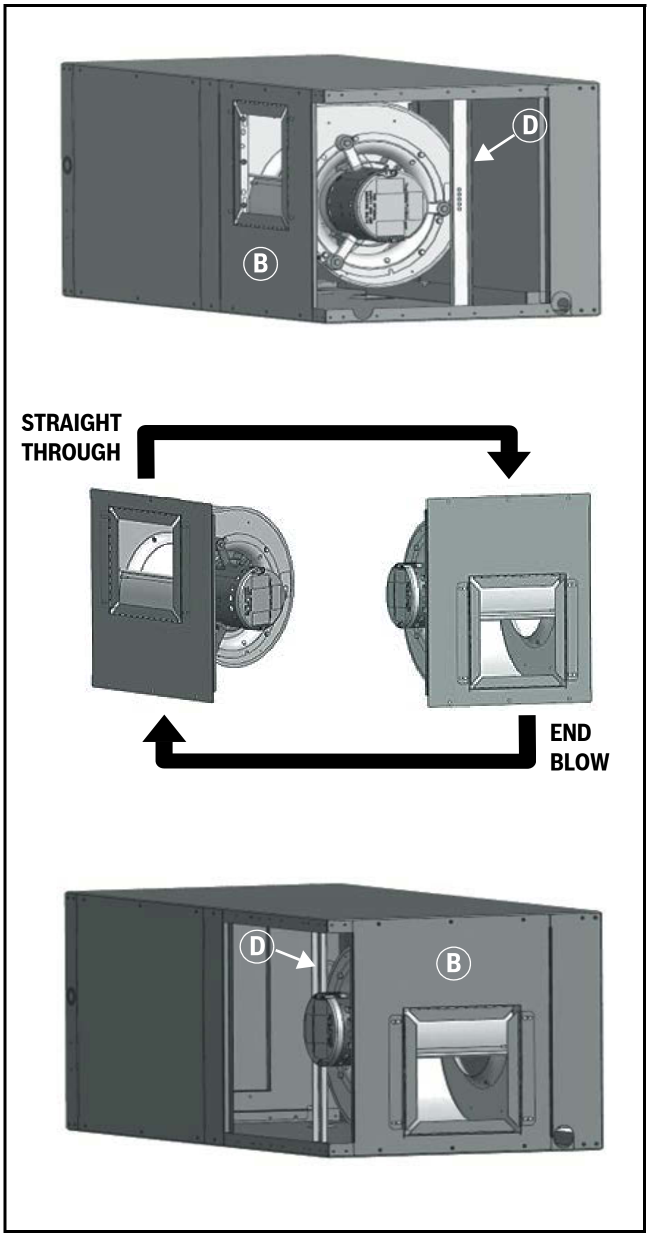

Fig. 5 Blower Configuration

To convert the supply air direction, follow the steps below: (➔See Fig. 3, Fig. 4, and Fig. 5.)

1. If the unit is connected to power, shut OFF the unit and disconnect switch or circuit breaker.
2. Locate the Motor Access Panel (A). Remove the three screws at top and the three screws at the bottom of the panel. Remove the access panel and place it aside.

NOTICE

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

3. Locate Blower Panel (B). Remove the three screws from top and the three screws from bottom of the panel. Leave the blower panel in place on the base pan.
4. Locate Access Panel Corner Post (C). Remove the four screws from top and the four screws from the bottom. Remove the corner post and set it aside.
5. Locate Blower Support Bracket (D). Remove the one screw and set it aside.
6. Move Blower Panel (B) with blower to desired location, rotating it 180°. (➔See Fig. 5.) The motor power and control harness can be unplugged to facilitate blower relocation.
7. Reinstall Access Panel Corner Post (C) using the eight screws previously removed.
8. Fasten Blower Panel (B) using the six screws previously removed.
9. Reinstall and fasten Blower Support Bracket (D) using the one screw previously removed.
10. Reattach the motor power and control harness if disconnected earlier.
11. Reinstall and fasten Motor Access Panel (A) using the six screws previously removed.

5.6.2 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 pad. 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 pads. 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.)

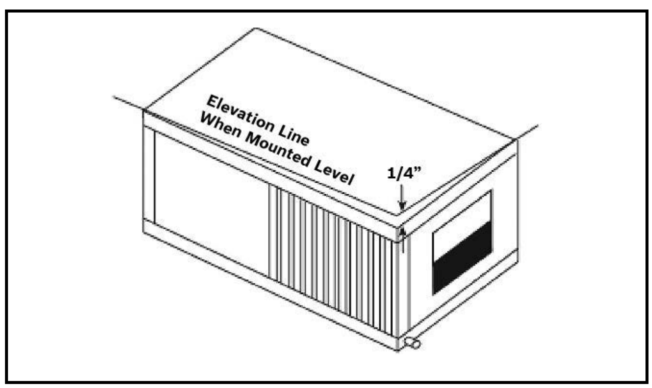

Fig. 6 Pitched Unit

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.

5.6.3 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. 7.

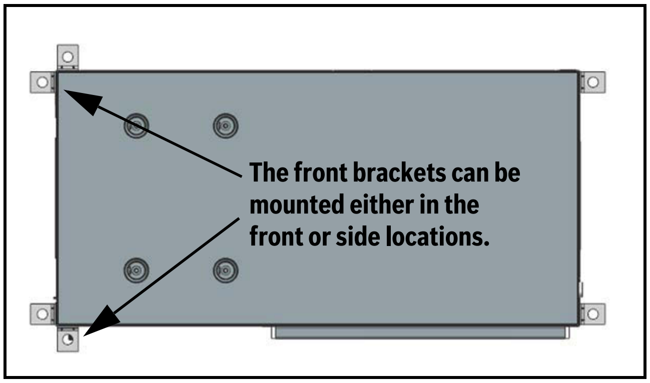

Fig. 7 Hanging Brackets Locations

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. 8.

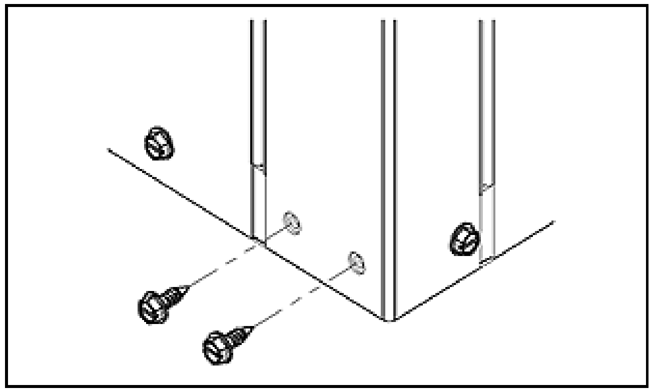

Fig. 8 Screw Locations

2. Mount the four brackets to unit’s corner posts using the screws provided in the kit as shown in Fig. 9. The bracket tabs go into the slots on the base, and then the brackets are screwed down.

   The front brackets can be orientated in either way depicted in Fig. 7. Choose the best option for the situation.

⚠ WARNING

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

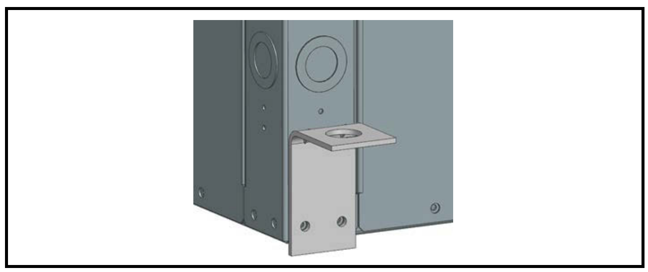

Fig. 9 Attaching Brackets

3. Install rubber grommet onto the brackets as shown in Fig. 10.
4. Hang the unit and assemble the field-provided threaded rod, nuts, and washers on to the brackets as shown in Fig. 10.

⚠ DANGER

The rods must be securely anchored to the ceiling.

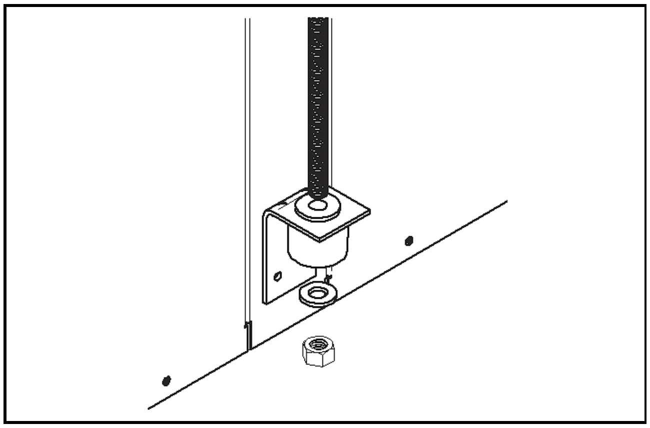

Fig. 10 Attaching a Threaded Rod to a Mounting Bracket

5.7 Condensate Drain

5.7.1 Horizontal (HZ) and CounterFlow (CF) Units

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.

i

Horizontal and CounterFlow configuration 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. 11.)

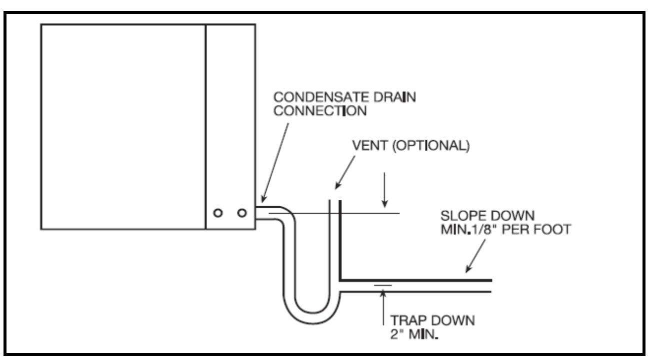

Fig. 11 Condensate Drain Installation

5.7.2 Vertical (VT) Units

Vertical configuration units are internally trapped from the factory. A second trap must NOT be included. (➔See Fig. 12.)

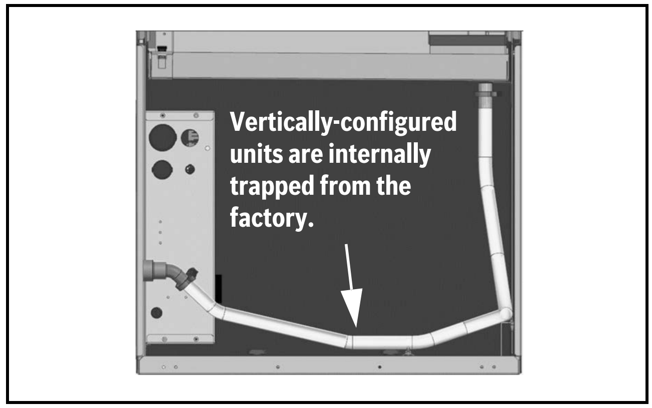

Fig. 12 Vertical Units are Internally Trapped

5.8 Duct System

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

i

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 #13 for details.

Refer to unit Dimensional Drawings for physical dimensions of the collar and flange. (➔See page #90.)

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 cooling 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.

5.9 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.

NOTICE

DO NOT overtighten the connections to avoid damage to threads.

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

CF units are supplied with a copper or optional cupro-nickel condenser. A cupro-nickel heat exchanger is recommended for the following:

- Conditions anticipating moderate scale formation
- Brackish water
- Ground Loop application
- Ground water application

(➔Refer to the Water Quality Table on page #28.) Water quality must meet the standards stated in the table.

NOTICE

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

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 quarter-turn brass full-port 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. (➔Refer to the Water-Side Pressure Drop Table on page #74.)

NOTICE

DO NOT expose water piping to freezing ambient temperatures unless the fluid is properly protected with antifreeze.

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.

5.9.1 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.

5.9.2 Closed-Loop 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 shutting OFF 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 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.

5.9.3 Antifreeze

In areas where entering loop temperatures drop below 50°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).

5.10 Electrical—Power Supply Wiring

5.10.1 High-Voltage Wiring

DANGER

Electric Shock!

The system contains an oversize, protective, earthing (grounding) terminal that must be properly connected otherwise personal injury or death may result.

WARNING

Field wiring must be installed by qualified and trained personnel.

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

All field-installed wiring must comply with the National Electric Code as well as all applicable local codes.

NOTICE

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

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.

NOTICE

All high-voltage connections must be torqued as specified by the component's manufacturer.

Refer to the unit's electrical data on the unit's nameplate for wire and branch circuit protection sizing. Supply power voltage and phasing must match the required voltage and phasing shown on the unit's 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's wiring diagram for field connection requirements.

The Electrical Box is designed to swing out of the way allowing for improved access and servicing of the unit. To ensure proper swing functionality, it is essential to provide sufficient wire length. This can be achieved by using flexible conduit installed in the unit (➔See Fig. 13) to guide the wire length determination. Adequate wire length is required to enable full extension or opening of the control box, up to 90 degrees.

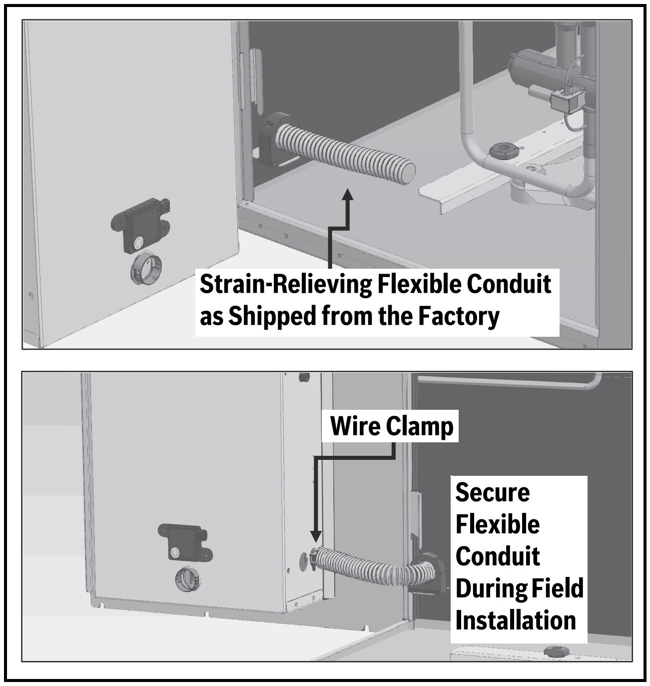

Fig. 13 Flexible Conduit

5.10.2 Power Supply and Ground Connections

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.

The unit is provided with concentric knockouts for attaching common trade sizes of conduit. Route the power-supply wiring through the knockout opening and the flexible conduit inside the unit. After the field wiring is routed to the electrical box, ensure the wire clamp is tightened to secure the flexible conduit to the electrical box. (➔See Fig. 13.) Always connect the ground lead to the grounding lug provided in the unit. Follow the unit's wiring diagram and the following instructions for power leads and ground connection depending on unit options.

5.10.2.1 Standard Units

For standard models, power is connected to the line (L) side of the compressor contactor and the ground to the ground lug in the unit electrical box.

5.10.2.2 Units with Disconnect Switch

For models with unit-mounted disconnect switches, connect the field power to the marked terminals on the disconnect switch, and the ground to the ground lug or terminal block (in the case of 460V with a constant airflow motor) in the disconnect switch box.

5.10.2.3 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 must be connected to the terminal block located in a dedicated electrical box.

5.10.2.4 Units with 100kA SCCR option

For units with the 100kA SCCR option, the power supply must be connected to the fuse block located in a dedicated fuse box.

5.10.2.5 460-V Models with Constant Airflow Motors

460V heat pumps with constant airflow motors require five power supply wires: the standard three high-voltage wires, the ground wire, and a neutral wire. These units employ a 265-V motor that requires power from one phase of the 460-V supply and the neutral wire.

5.10.2.6 Units with Internal Electric Heat

Units supplied with internal electric heat require two (2) separate power supplies. One power supply feeds the compressor, and a second power supply feeds the electric heat, fan motor and control circuit. The compressor power supply must be connected to the line (L) side of the compressor contactor. The Electric Heat, fan motor and control-circuit power supply must be connected to either terminal block (5kW and 10 kW) or jumper bar (15kW and 20kW) located in a dedicated electric heat control box. (➔Refer to section 13.8 Electric Heat Option on page #39.)

⚠ CAUTION

The unit ground wire must never be used as a neutral wire.

5.10.3 Transformer Settings for 208/230-V Units

All 208/230-V units are factory wired to 240V by default. For job sites with a 208-V power supply, the primary leads on the unit transformer will need to be changed from 240V to 208V. Refer to the unit wiring diagram for details.

5.11 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.

5.11.1 Thermostat

Unless provided with DDC controls, the CF heat pump can be controlled by most commonly available single-stage or two-stage heat pump thermostats, depending on model.

The reversing valve on the CF 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.

NOTICE

To prevent voltage drops in the control circuit, do not exceed the recommended thermostat wire lengths detailed in Table 7.

Connection	Function
Y1	First-Stage Compressor Operation
Y2	Second-Stage Compressor Operation
G	Fan
O	Reversing Valve (energized in cooling)
W1	Auxiliary Electric Heat (runs in conjunction with compressor)
EM/W2	Emergency Heat (electric heat only)
NC	Transformer 24 VAC Common (extra connection)
C1	Transformer 24 VAC Common (primary connection)
R	Transformer 24 VAC Hot
H	Dehumidification Mode

Table 5 Unit Thermostat Connections

5.11.2 VA Capacity

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 6 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		Optional Components	
Component	**VA**	**Component**	**VA**	**Component**	**VA**
Reversing Valve Solenoid	12	Total VA Draw from "Standard"	27	Compressor Monitor Relay	4
Compressor Contactor Single Phase	10	Option Card	5	Blower Monitor Relay	4
UPM Board	5	Hot Gas Reheat Solenoid	9	Energy Management Relay	4
		Economizer Valve	3	Fire Alarm Relay	4
				Heater Relay	10
				Aux Relay	10
				Heating/Blower Relay	4
				5600 DDC	26
				EON Board	1
				Leaving Water Valve	7
				Compressor Contactor Three Phase	10
Total VA Draw	**27**	**Total VA Draw**	**44**	**Total Draw is Dependent on the Options Installed**	

Table 6 Low-Voltage VA Draw—Standard Construction, Hot Gas Reheat or Economizer, and Optional Components

5.11.3 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 7 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)	150 ft. (46m)
20 AWG (0,50mm^2)	240 ft. (73m)
18 AWG (0,75mm^2)	385 ft. (117m)

Table 7 Length by Wire Gauge for Thermostat to HVAC Equipment Wiring

5.11.4 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 8.

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 8 Length by Wire Gauge for Remote Sensor to Programmable Thermostat Wiring

5.12 ECM Interface Board

NOTICE

ECM Interface Boards are used only with the Constant Airflow motor option.

NOTICE

Do not set the ADJ DIP switch to the (-) setting when electric heaters are installed. Doing so may cause the heaters to cycle on their thermal overload switches, potentially shortening the life of the switches.

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. 14.

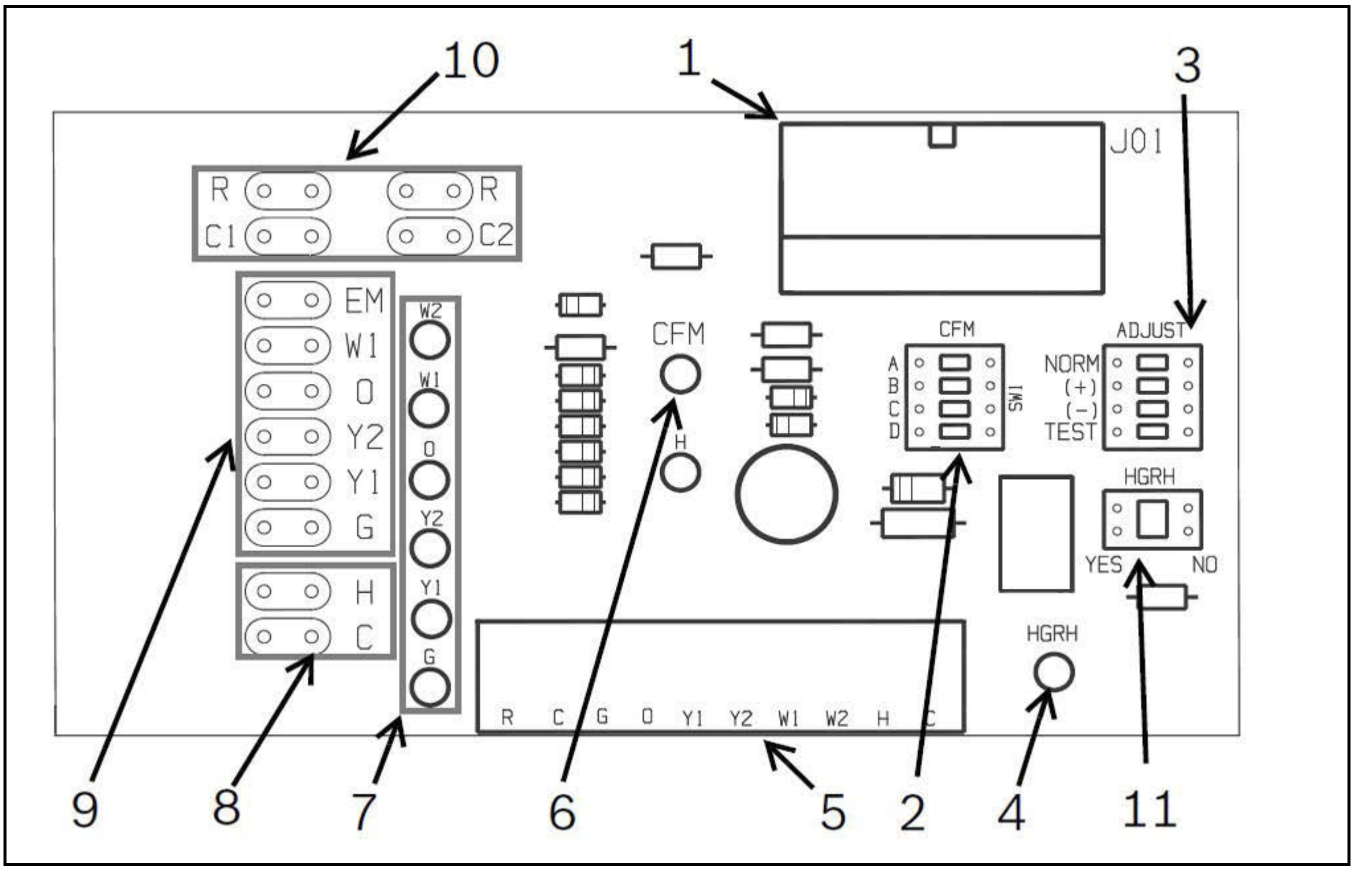

Fig. 14 ECM Interface Board

[1] Motor Harness Plug
[2] Blower CFM Adjustment
[3] Motor Settings
[4] HGRH 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

6 Specific Application Considerations

6.1 Well Water Systems

(➔Refer to Fig. 15)

➔Refer to the Water Qualify Table on page #28 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.

6.2 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-throw 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.)

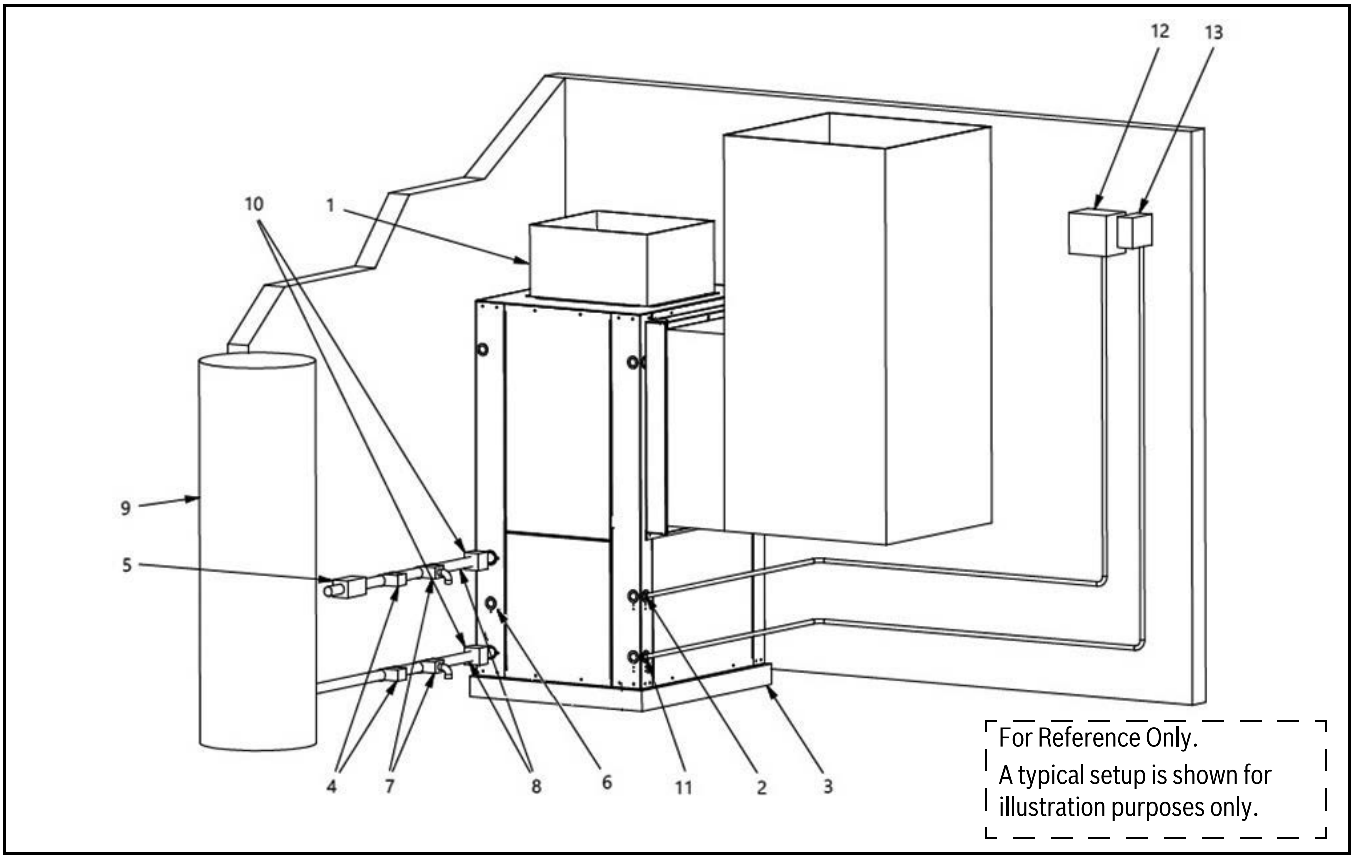

Fig. 15 Typical Well Water Setup

[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] Control Panel/Thermostat
[13] Unit Line Voltage Disconnect

6.3 Cooling Tower/Boiler Systems

(➔Refer to Fig. 16)

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.

i

To ensure against leaks and possible heat exchanger fouling, use an appropriate thread sealant.

➔Consult the dimensional drawings starting on page #90 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.

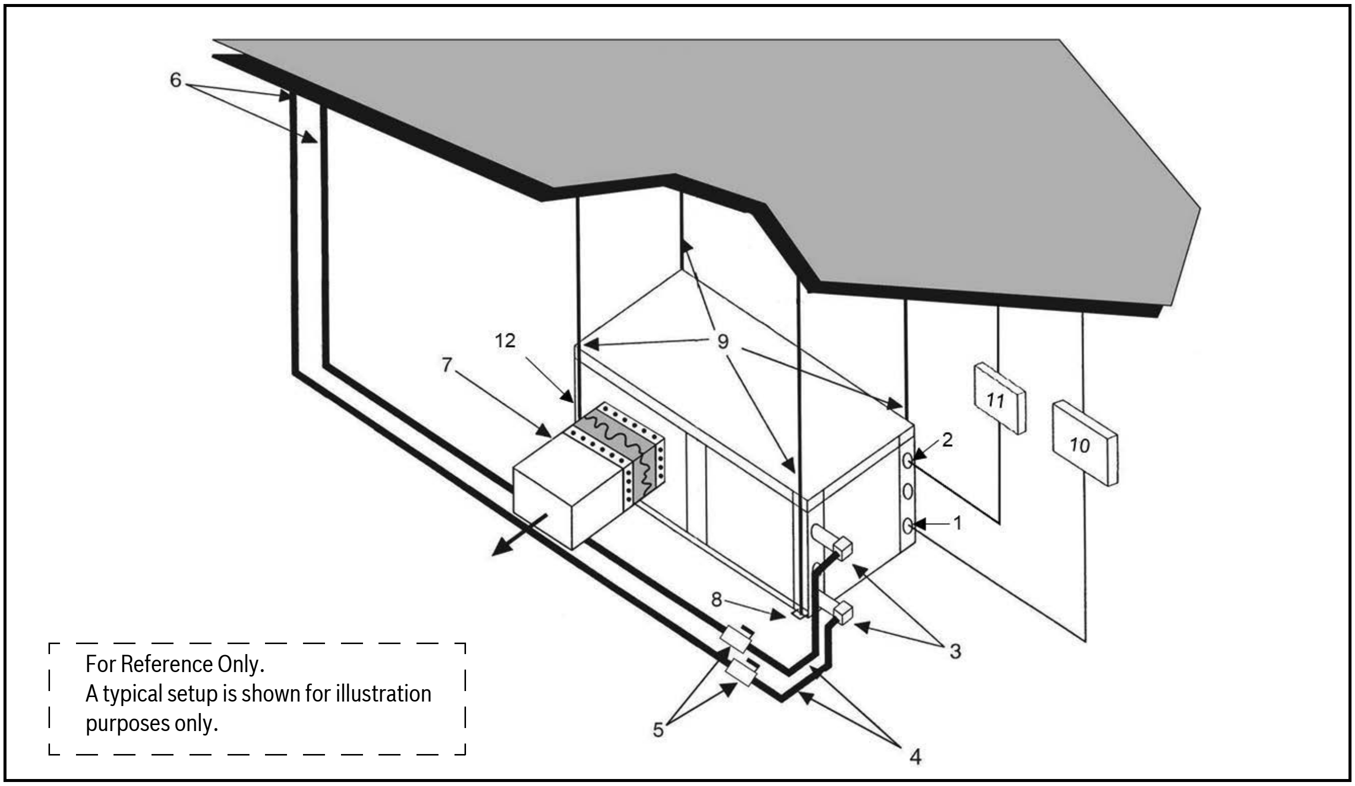

Fig. 16 Typical Cooling Tower and Boiler System Setup

[1] Line-Voltage Connection (unit)
[2] Low-Voltage Control Connection
[3] P/T Ports (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
[10] Unit Line Voltage Disconnect
[11] Control Panel/Thermostat
[12] Condensate Drain Connection

6.4 Geothermal Closed-Loop Systems

(➔Refer to Fig. 17)

Operation of an CF 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.

Using Bosch Flow Centers makes the installation easier.

Anti-freeze solutions must be used when low loop temperatures are expected to occur.

Refer to the GLP installation manuals for more specific instructions.

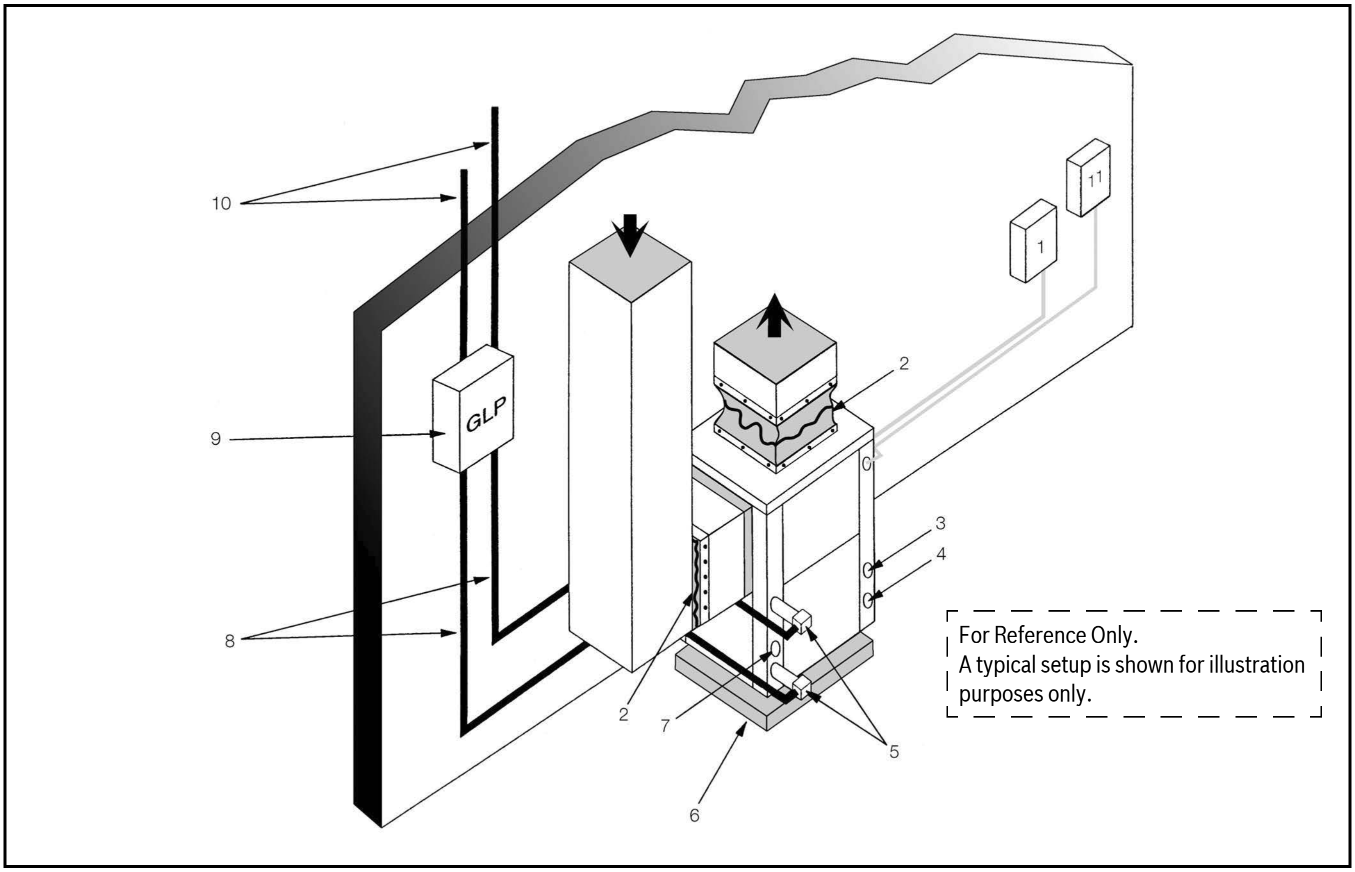

Fig. 17 Typical Geothermal System Setup

[1] Unit Line Voltage Disconnect
[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
[11] Control Panel/Thermostat

7 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 heat pump. (➔Refer to the Water Quality Table on page #28.)

For closed loop and boiler/cooling 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 9 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 9 Water Quality Table

8 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 duct work has been properly fastened to supply and return duct collars.
11. Make sure return air filters are positioned correctly in the filter rack if removed during installation.

9 Pre-Start-Up

9.1 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.

9.2 Checking Scroll Compressor Rotation

Scroll compressors, like the ones used on the CF series, are phase sensitive. When out of phase, the compressors will run in reverse. After a few minutes of reverse operation, a scroll compressor internal overload protection will open, activating the unit lockout. (This requires a manual reset. To reset, power cycle the unit.)

NOTICE

A compressor running in reverse has a noisier than normal operation and a lower current draw than its rated value.

This means that for proper operation, the correct direction of rotation must be ensured. The most accurate way to ascertain this is through the use of gauges. Follow the steps below when using gauges:

1. Connect service gauges to the suction and discharge pressure fittings.
2. Energize the compressor.

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, follow the steps in 9.2.1 Correcting Direction of Rotation.

Alternatively, in locations with multiple units attached to the same branch circuit, where it is difficult to place pressure gauges on all of them, and several units are determined to be phased incorrectly:

1. Install pressure gauges and a phase rotation meter on one system to serve as a baseline.
2. Check the remaining systems with the phase rotation meter.
3. Follow the steps in 9.2.1 to make corrections.

9.2.1 Correcting Direction of Rotation

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If you determine that the entire job site has a concern with electrical phasing, contact the utility company to ensure phasing is corrected.

1. Turn OFF power to the unit. (Always follow your Lock-out/ Tag-out procedure.)
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.

NOTICE

Do not use fan rotation as an indication of the unit's phase being correctly wired, as fans are always single phase.

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There is a time delay before the compressor will start.

10 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.

10.1 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.

10.2 Unit Start Up Heating Mode

Operate the unit in heating cycle after checking the cooling cycle. Allow five minutes between tests for the pressure 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. 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.
6. Check for vibration, noise, and water leaks.

11 Commissioning

Record all system vitals using the “checkout sheet” and keep with equipment. (➔See page #104.)

12 Safety Devices and the UPM Controller Overview

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

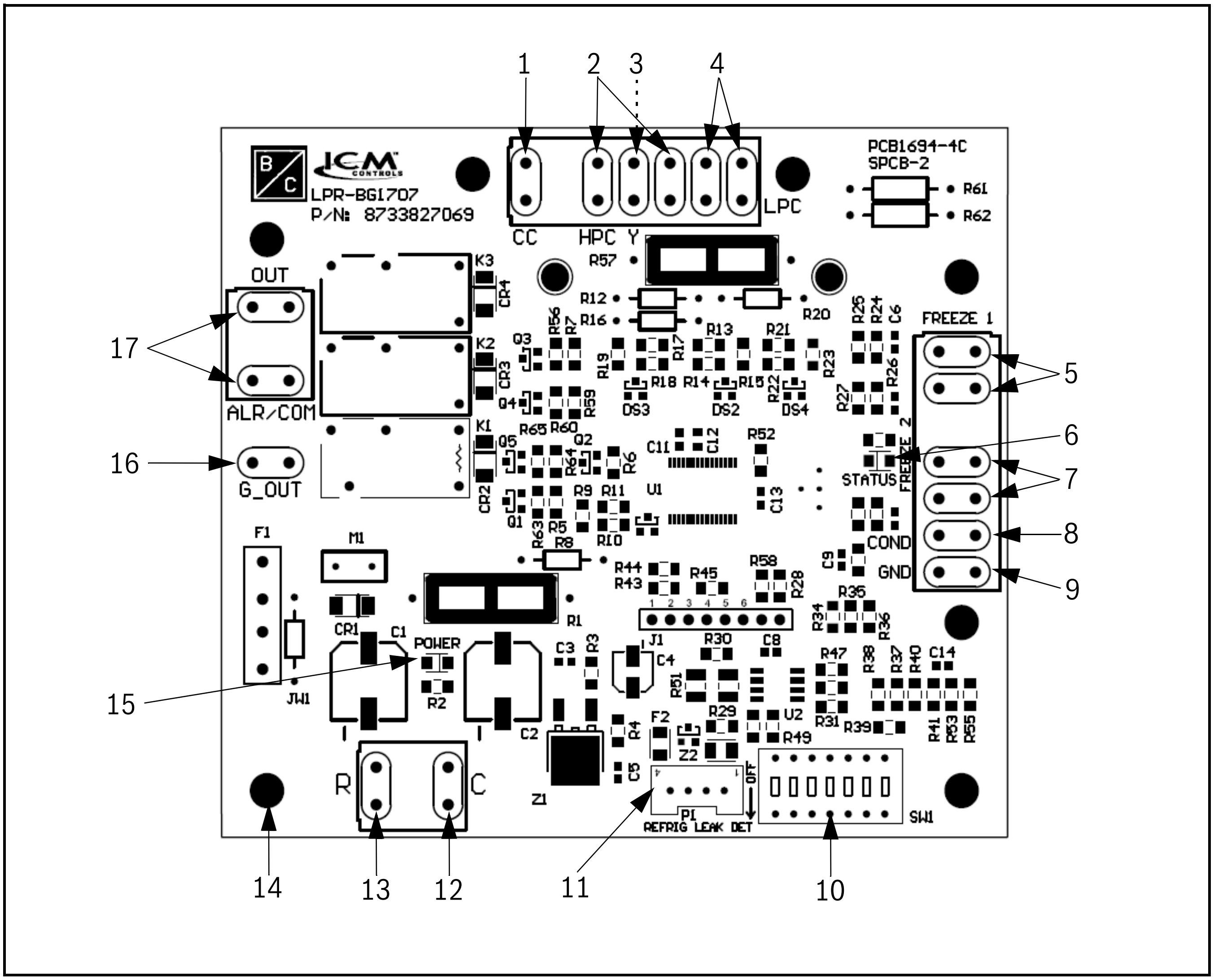


Fig. 18 UPM Controller Board

[1] Compressor Contact Output
[2] High-Pressure Switch Connection
[3] Call for Compressor Input Signal (Y1)
[4] Low-Pressure Switch Connection
[5] Water Coil Freeze Connection (FREEZE 1)
[6] UPM Status LED Indicator (Fault Status)
[7] Air Coil Freeze Connection (FREEZE 2)
[8] Condensate Overflow Sensor Connection
[9] Ground
[10] UPM Settings DIP Switch (SW1)
[11] A2L Sensor
[12] 24VAC Power Common
[13] 24VAC Power Input
[14] UPM Standoff
[15] Power LED
[16] Fan (Fan in the event of an A2L leakage)
[17] Dry Contact

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:

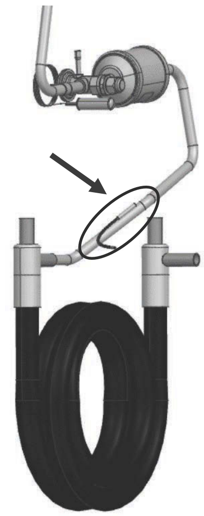
- High-pressure switch located in the refrigerant discharge line and wired across the HPC (High-Pressure Switch Connection) terminals on the UPM.
- Low-pressure switch located in the unit refrigerant suction line and wired across the LPC (Low-Pressure Switch Connection) terminals on the UPM.
- Waterside freeze protection sensor (FREEZE 1), mounted close to condensing water coil (➔Refer to Fig. 19), monitors refrigerant temperature between condensing water coil and thermal expansion valve. If temperature drops below or remains at freeze limit trip for 120 seconds, the controller will shut down the compressor and enter into a soft-lockout condition. The default freeze limit trip is 25°F; however, this can be changed by flipping DIP switch SW1. (➔Refer to Fig. 18, item [10].)(➔Refer to Fig. 21.)

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

NOTICE

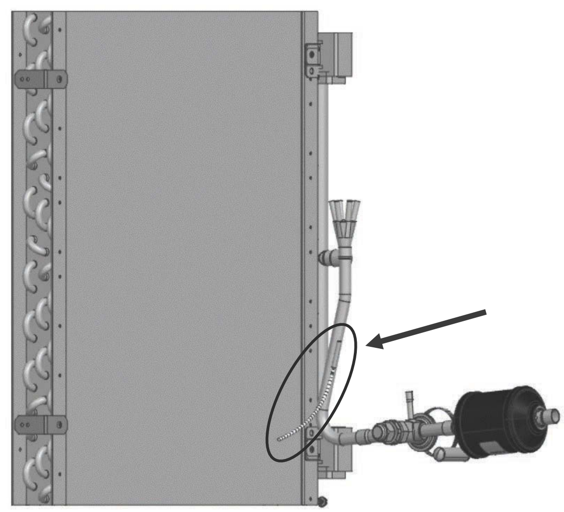
If the unit is employing a fresh water system (no anti-freeze protection), it is extremely important to have the Freeze 1 set to 25°F (DIP Switch SW1 set to OFF) in order to shut down the unit at the appropriate leaving water temperature and protect your heat pump from freezing if a freeze sensor is included.

- Air coil freeze protection sensor (FREEZE 2), mounted between the thermal expansion device and the air coil (➔Refer to Fig. 20), monitors refrigerant temperature between the air coil and thermal expansion valve. If temperature drops below or remains at the freeze limit trip for 120 seconds, the controller will shut down the compressor and enter into a soft-lockout condition. The default freeze limit trip is 25°F.



Note: Vertical (VT) Configuration Depicted

Fig. 19 Waterside Freeze Protection Sensor Location (FREEZE 1)



Note: Vertical (VT) Configuration Depicted

Fig. 20 Air Coil Freeze Protection Sensor Location (FREEZE 2)

- 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. 18, item [8].)

12.1 UPM Default Settings and DIP Switch Positions

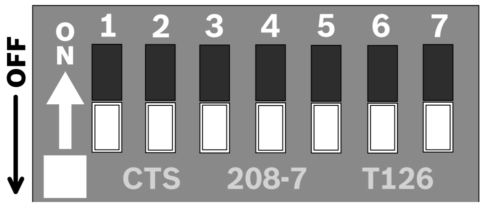


Fig. 21 UPM Settings DIP Switch (SW1)

UPM DIP Switch Selectable Positions				
Position	**Function**	**ON**	**OFF**	**Factory Default**
1	Lockout	4	2	2
2	Reset	R	Y	Y
3	Alarm	Cont	Pulse	Pulse
4	Test	Yes	No	No
5	Freeze 1	15°F	25°F	25°F
6	Freeze 2	15°F	25°F	25°F
7	Pump	ON	OFF	OFF

Table 10 UPM DIP Switch Selectable Positions

12.2 UPM Board Features

The UPM Board includes the following features:

- **ANTI-SHORT CYCLE TIMER:** Five-minute delay on break timer to prevent compressor short cycling.

- **COMPRESSOR MINIMUM RUN TIME:** The UPM has a minimum compressor run time of five minutes. If Y-call is removed the compressor will remain energized until the five minutes have expired.

- **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.

- **TEST DIP SWITCH:** The DIP switch position "4" controls the Test function. When it is set to "ON," it will reduce all time delays settings to 10 seconds during troubleshooting or verification of unit operation. (➔Refer to Fig. 18, item [10].) (➔Refer to Fig. 21.)(➔See Table 10.)

⚠ CAUTION

Operation of the unit in test mode can lead to accelerated wear and premature failure of components. The "TEST" switch must be set back to "OFF" after troubleshooting/servicing.

- **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 two 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 two or four times in one hour, the unit will enter a hard lockout. In order to exit a hard lockout, power to the unit would need to be reset. The reset signal is either a Y or R signal depending on if DIP switch position "2" is set to ON or OFF. (➔Refer to Fig. 21.)(➔See Table 10.) If it set to ON, 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." (➔Refer to Fig. 21.)(➔See Table 10.) If DIP switch position "3" is set to "ON," 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 "OFF," a pulse signal is produced and a fault code is detected by a remote device indicating the fault. (➔For blink code explanation, see Table 11.) The remote device must have a malfunction detection capability when the UPM board is set to "PULSE."

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 25°F for 120 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 25°F for 120 seconds.
7	Refrigerant Leak Fault	Refrigerant LFL% is more than 15%.

Table 11 UPM Fault Blink Codes

- **FREEZE SENSOR:** The default setting for the freeze limit trip is 25°F (FREEZE 1); however, this can be changed to 15°F by flipping the DIP switch position "5" (➔Refer to Fig. 18, item [10]) (➔Refer to Fig. 21), 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 monitoring 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 (FREEZE 1) mounted close to the condensing water coil between the thermal expansion valve and the water coil. If the temperature drops below or remains at the freeze-limit trip for 120 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 (three times) the code associated with this alarm condition. If this alarm occurs two times (or four if DIP switch position "1" is set to "ON") within an hour, the UPM controller will enter into a hard-lockout condition. It will constantly monitor the refrigerant temperature with the sensor (FREEZE 2) mounted close to the air coil between the thermal expansion valve and air coil, as shown in Fig. 20. If the temperature drops below or remains at the freeze limit trip for 120 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 six times the code associated with this alarm condition. If this alarm occurs two times (or four times if DIP switch position "1" is set to "ON")(➔Refer to Fig. 21)(➔See Table 10) within an hour, the controller will enter into a hard-lockout condition.

NOTICE

The freeze sensor (FREEZE 1) 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 two or four times (depending if the Lockout DIP switch position "1" is set to "OFF" or "ON") (➔Refer to Fig. 21)(➔See Table 10) before 60 minutes, the unit will go into a hard lockout and requires a manual lockout reset.

- **LOCKOUT RESET:** The method to exit a hard lockout depends of the Reset DIP switch setting:
  - To clear a hard lockout when the DIP switch position "2" is set to "OFF" (Y), power can be cycled OFF then back ON either at the unit's thermostat or at the circuit breaker.
  - To clear a hard lockout when the DIP switch position "2" is set to "ON" (R), power must be cycled OFF then back ON at the circuit breaker (not at the thermostat).

  (➔Refer to Fig. 21.) (➔See Table 10.)

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The blower motor will remain active during a lockout condition.

- **PUMP DIP SWITCH:** When DIP switch position "7" is set to "ON" and no Y call has been received in the past 8 hours, the compressor will have a delay of 30 seconds to allow a loop pump to circulate water before compressor starts. (➔Refer to Fig. 21.) (➔See Table 10.)

- **CONDENSATE SENSOR:** The condensate sensor operates by looking for continuity to ground; a fault is triggered if continuity is found.

12.3 UPM Sequence of Operation

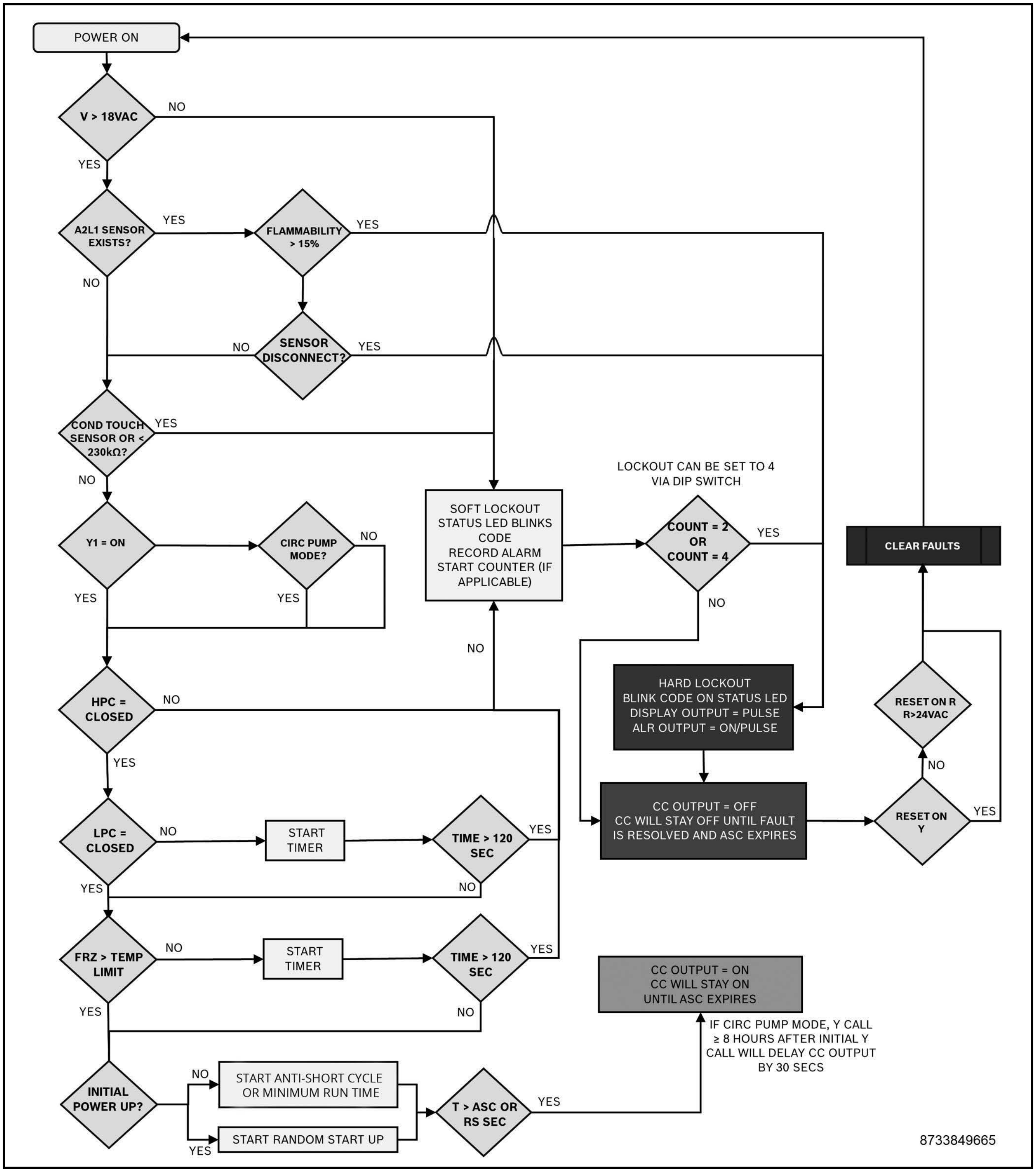

Fig. 22 UPM Sequence of Operation Flowchart

13 Options

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

13.1 Unit Mounted Non-Fused Disconnect Switch

CF 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.

13.2 Internal Two-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 CF series this water valve can be factory mounted and wired internally to the unit. The CF series internal water valve option features a 24VAC motorized water valve rated to 300 psig working pressure. This valve is wired to open on a thermostat call for compressor operation (heating or cooling) and will remain open as long as the thermostat calls. The valve can remain seated with up to 20 psi of back pressure on all sizes.

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

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

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

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

13.3 Economizer

CF 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 Option Card, and the unit control circuit.

The economizer option operates in the following sequence:

- Validates that Operating Mode Dip Switch SW1 (➔Refer to Fig. 23) position “2” is in the “ON” position.
- The heat pump switches from compressor cooling to economizer cooling mode when the unit thermostat calls for cooling operation and the water in temperature thermistor indicates that the supply water temperature is below the desired set point specified in:
  - Units with Option Card: The Cool Set Point Potentiometer (➔Refer to Fig. 23).
  - Units with DDC: The Bosch Equipment Touch or building management.
- 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 set point specified in the option card or DDC (as indicated above), then the three-way valve diverts water back to the condenser coil and the heat pump compressor will start in 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 CF 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 CF series economizer is designed for **cooling only**. If heating economizer operation is desired, consult the factory for applications and design information.

➔For the economizer drain, refer to the Condensate Drain section on page #17.

13.4 Hot Gas Reheat

CF series heat pumps can be provided with an optional hot gas reheat. The hot gas reheat option cools and dehumidifies the supply air by running the air through air coil heat exchanger (hot gas reheat coil) mounted down stream of the evaporator coil when the humidity level is above the specified set point.

The major components of the hot gas reheat option are the air coil heat exchanger, the hot gas reheat three-way valve, the option card, and the unit control circuit.

The hot gas reheat option operates in the following sequence:

- ▶ Validate that Operating Mode Dip Switch SW1 (➔Refer to Fig. 23) position "3" is in the "ON" position.
- ▶ The heat pump will run in Hot Gas Reheat mode ONLY when cooling demand is satisfied and the unit thermostat calls for humidity (H) when the level of humidity is above the desired set point specified either by the:
  - – Wall Thermostat, or
  - – (For Units with DDC)—The Bosch Equipment Touch or Building Management.
- ▶ In Hot Gas Reheat mode, the pump will operate at full load cooling and dehumidifying the air and then reheating it back to a temperature close to the entering dry bulb temperature.
- ▶ If there is a call for cooling while the unit is operating in the reheat mode, then unit will revert to cooling until the demand is satisfied.

13.5 Boilerless Control

CF series heat pumps can be provided with an optional Boilerless Heat Control that can be field wired to enable an external heat source. The Boilerless Control option would disable the heat pump heating and an auxiliary heat solution can be enabled.

The major components of the Boilerless Control option are the option card, the unit control circuit, and the electric-auxiliary heat.

The Boilerless Control option operates in the following sequence:

1. When equipped with electric heat:

- ▶ Validates that Operating Mode Dip Switch SW1 (➔Refer to Fig. 23) position "1" is in the "ON" position.
- ▶ The heat pump switches from compressor heating to Boilerless Control mode when the unit thermostat calls for heating operation and the water in temperature thermistor indicates that the supply water temperature is below the desired set point specified either by:
  - – (For Units with Option Card)—The Cool Set Point Potentiometer (➔Refer to Fig. 23), or
  - – (For Units with DDC)—The Bosch Equipment Touch or Building Management.
- ▶ If, during a call for heating, the supply water temperature climbs above the set point specified in the option card or DDC (as indicated above), then the heat pump compressor starts the heating mode and the electric heat turns OFF.

2. If not equipped with electric heat:

- ▶ Validates that Operating Mode Dip Switch SW1 (➔Refer to Fig. 23) position "1" is in the "ON" position.
- ▶ The heat pump switches compressor OFF.
- ▶ If, during a call for heating, the supply water temperature climbs above the set point specified in the option card or DDC (as indicated above), then the heat pump compressor starts heating mode.

13.6 Option Card (included with Economizer, Hot Gas Reheat and/or Boilerless control options)

The option card manages the compressor, blower motor, electronic ball valve, electric heater, and reversing valve operation for the following options: Hot Gas Reheat, Economizer, and Boilerless Control applications. Using the option card eliminates the need of relays and aquastat.

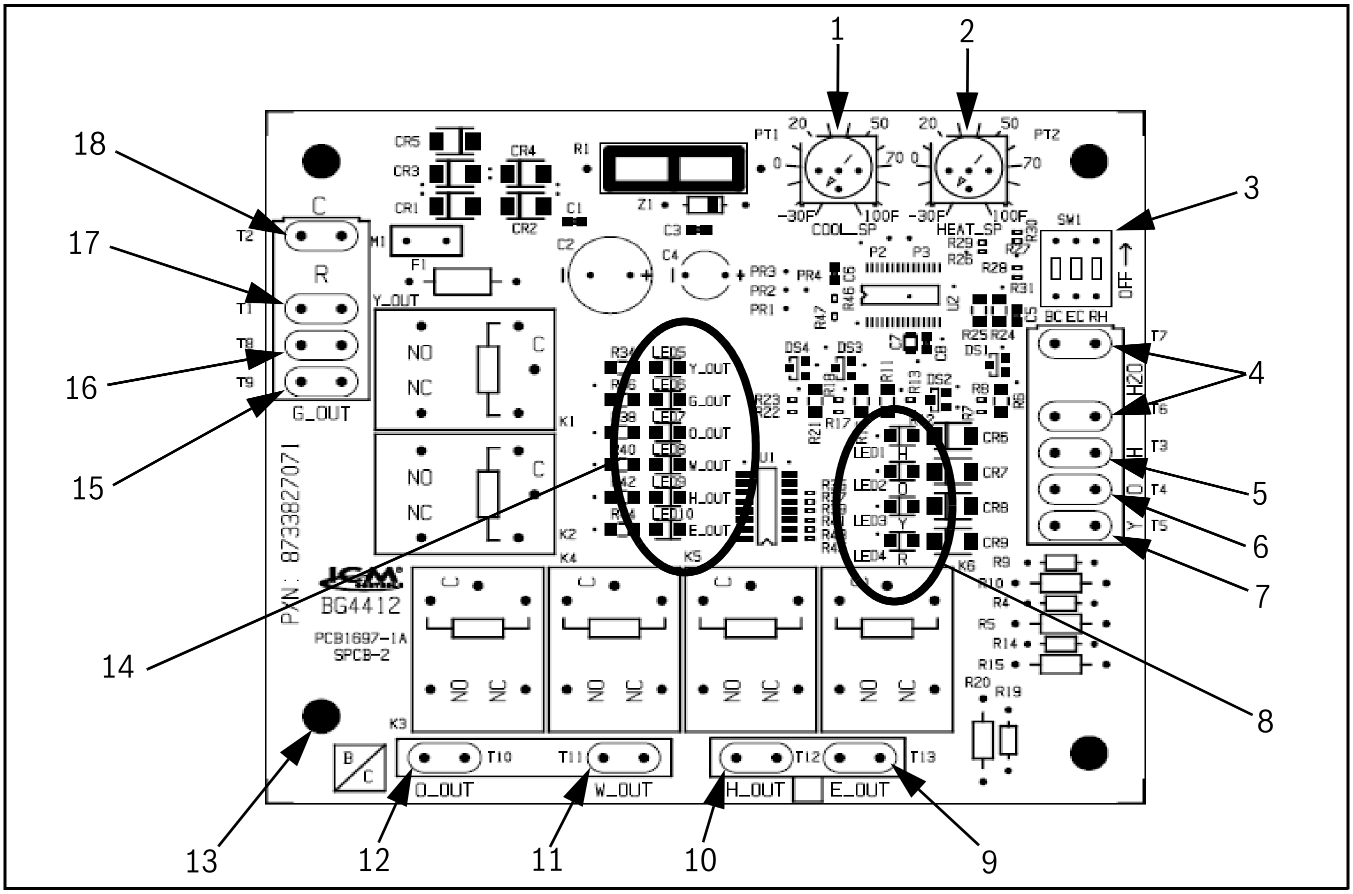

Fig. 23 Option Card

[1] Cool Set Point Potentiometer (Economizer)
[2] Heat Set Point Potentiometer (Boilerless Control)
[3] Operating Mode Dip Switch
[4] Entering Water Temperature
[5] H Signal Input
[6] O Signal Input
[7] Y Call Input
[8] LED Input Status
[9] Economizer Output "E_OUT"
[10] Hot Gas Reheat Output "H_OUT"
[11] Boilerless Control "W_OUT"
[12] Reversing Valve Output "O_OUT"
[13] Option Card Standoff
[14] LED Output Status
[15] FAN Output "G_OUT"
[16] Y Call Output "Y_OUT"
[17] 24VAC Power Input
[18] 24VAC Power Common

13.7 Refrigerant Leak Detection System

If installed, the refrigerant leak detection system is comprised of two components: the A2L refrigerant sensor and the UPM board. The sensor continually samples the air and if the concentration of refrigerant detected is higher than the preset threshold (15% LFL), it sends a signal to the UPM, which then switches OFF the compressor and turns ON the blower. The compressor remains OFF until the saturation level is below (15%LFL) and the power is cycled in order to restore normal operations. If the A2L sensor is connected to the UPM, it must always remain connected. If communication is lost, the UPM enters a refrigerant leak hard lockout fault and energize the alarm contact. To test that the communication between the sensor and board is active, the sensor can be disconnected from the UPM, which should simulate a fault. The A2L sensor for the refrigerant leak detection system must only be replaced with the part specified on the spare parts list.

⚠ WARNING

When the refrigerant leak detection system is installed, the unit must be powered except when servicing. Continuous air circulation is required for the refrigerant leak detection system to function properly.

13.8 Electric Heat Option

⚠ WARNING

Electric Heater Option requires its own electric power supply separate from the heat pump's power supply. DO NOT attempt to wire the package into the same circuit as the heat pump

Units supplied with internal electric heat require two (2) separate power supplies. One power supply feeds the compressor, and a second power supply feeds the electric heat, fan motor and control circuit. This allows the electric heaters to continue to operate along with the blower motor in the case of unit compressor and/or compressor power supply failure.

CF Series model has a number of heater sizes. Refer to Engineer Submittal Sheet on the product information page for heater option compatibility with specific CF series units. (See the QR code on the back page of the IOM).

13.9 Hot Gas Bypass

The function of the hot gas bypass option is to prevent icing of the air coil when the unit is operating at low-load conditions. This situation could arise if the space experiences widely different heating and cooling loads or a unit sized for heating that has a much lower cooling load, for example a conference center.

Without a hot gas bypass circuit the evaporating temperature will fall and ice could form on the coil restricting air flow and aggravating the situation. Eventually the coil could be totally blocked, resulting in possible refrigerant liquid entering the compressor and failure of the system.

The hot gas bypass valve, located in the compressor discharge line, diverts hot gas to the inlet of the air coil. The valve is factory set to open when the evaporating pressure falls to 105 PSI and will modulate to prevent the pressure falling any lower. This setting is field adjustable, and this set point may be adjusted as required.

Units with the hot gas bypass feature include a limit switch on the suction line wired in series with the low-pressure switch, which acts as a safety device. The limit switch shuts OFF the compressor if it senses the suction temperature is above 120 deg F and triggers a low-pressure fault.

13.10 Pump Relay

The factory installed pump relay option can be used to energize a supply pump or solenoid valve when there is a call for compressor operation. This relay can be used to switch either high or low voltage power.

13.11 DPS Water Flow Proving Switch

The DPS water flow proving switch option prevents compressor operation if there is inadequate water flow through the water-to-refrigerant heat exchanger in the heat pump. The DPS operates by monitoring the water side pressure drop across the water-to-refrigerant heat exchanger. When the pressure drop between the water in and water out lines reaches a pre-set value, compressor operation is enabled.

13.12 Heat Recovery Package (HRP)

The Heat Recovery Package is a factory-installed option on CF series heat pumps. The HRP can be used to heat potable water during unit operation using waste heat from the compressor discharge gas. In some cases, the HRP can provide most or all of the hot water requirements for a typical home.

The HRP consists of three major components:

- Double-wall, vented refrigerant-to-water heat exchanger
- Circulating pump, and
- Control circuit.

The heat exchanger is rated for use with potable water and is acceptable for use as a domestic water heating device in most building codes.

The pump circulates water between the domestic hot water tank and HRP heat exchanger in the Heat Pump.

The control circuit ensures that the HRP only operates when there is available heat from the compressor, and when the domestic hot water is within a safe temperature range of below 120 deg. F.

When the heat pump compressor operates, the HRP monitors the temperature of the discharge gas from the compressor. Once discharge gas is hot enough to provide useful heat to the domestic water tank, the circulating pump is enabled, drawing water from the tank through the HRP heat exchanger and then depositing the heated water back into the tank.

The HRP is provided with an ON/OFF switch in case the end user desires that the HRP be inactivated (typically during the winter months when space heating is most important).

NOTICE

If the heat recovery unit is installed in an area where freezing may occur, the unit must be drained during winter months to prevent heat exchanger damage. Heat exchanger ruptures that occur due to freezing will void the heat recovery package warranty along with the heat pump warranty.

13.13 HRP Water Tank Preparation

1. Turn OFF electrical or fuel supply to the water heater.
2. Attach garden hose to water tank drain connection and run other end of hose outdoors or to an open drain.
3. Close cold water inlet valve to water heater tank.
4. Drain tank by opening drain valve on the bottom of the tank, then open pressure relief valve or hot water faucet.
5. Once drained the tank should be flushed with cold water until the water leaving the drain hose is clear and free of sediment.
6. Close all valves and remove the drain hose.
7. Install HR water piping.

All hot water piping should be a minimum of 3/8th O.D. copper tube to a maximum distance of fifteen (15) feet. For distances beyond fifteen feet but not exceeding sixty (60) feet, use a 1/2” copper tube. Separately insulate all exposed surfaces of both connecting water lines with 3/8” walled closed-cell insulation. Install isolation valves on the supply and return to the heat recovery.

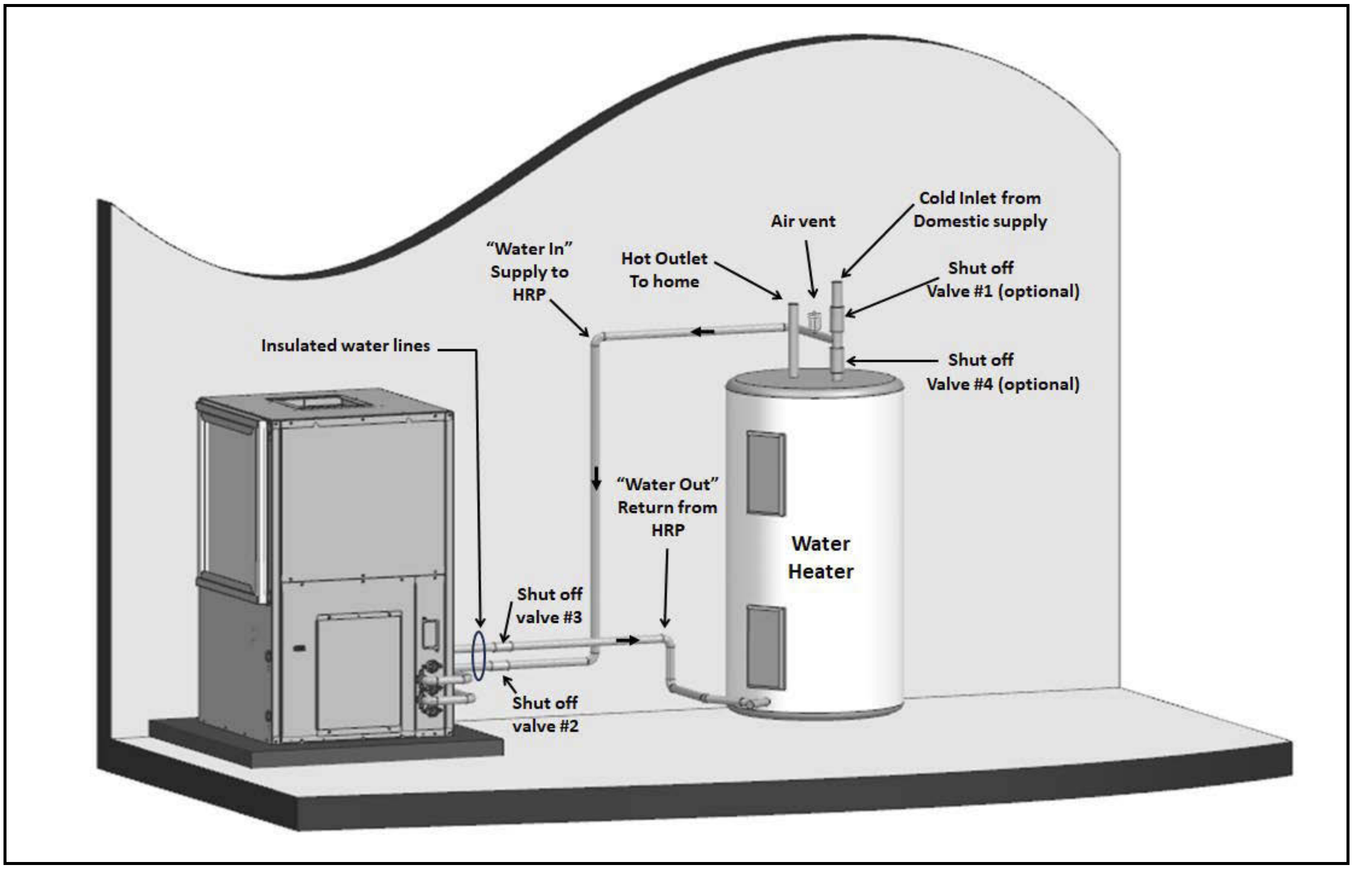

Fig. 24 HRP Water Tank System Setup

> **i**
> Diagram is for illustration purposes only. Ensure access to Heat Pump is not restricted.

> **i**
> All piping from HRP to domestic water tank must be copper or any metal of stronger alloy.

13.14 Water Tank Refill

1. Open the cold water supply to the tank.
2. Open a hot water faucet to vent air from the system until water flows from the faucet, then close.
3. Depress the hot water tank pressure relief valve handle to ensure there is no air remaining in the tank.
4. Carefully inspect all plumbing for water leaks. Correct as required.
5. Purge all air from HR through an external purge valve. Allow all air to bleed out until water appears at the valve. Locate the external purge value at the highest point in the installation.

6. Before restoring the power or fuel supply to the water heater, adjust the temperature setting on the tank thermostat(s) to ensure maximum utilization of the heat available from the refrigeration system and conserve the most energy. On tanks with both upper and lower elements and thermostats, the lower element should be turned down to 100° F, while the upper element should be adjusted to 120° F. Depending upon the specific needs of the customer, you may need to adjust the upper element differently. On tanks with a single thermostat lower the thermostat setting to 120° F or the “LOW” position.

After thermostat adjustments are completed, replace the access cover and restore the electrical or fuel supply to the water heater.

13.15 Initial Start-Up of a HRP System

CAUTION

Make sure all valves in the heat recovery water piping system are open. NEVER OPERATE THE HEAT RECOVERY PUMP DRY.

1. Turn ON the heat pump. The Heat Recovery ump should not run if the compressor is not running.
2. Turn HR switch to the “ON” position. The pump will operate if entering water temperature to HR is below 120°F.
3. The temperature difference between the water entering and leaving the heat recovery should be 5° to 15°F.
4. Allow the unit to operate for 20 to 30 minutes to ensure it is functioning properly. The pump will shut off when the Heat Recovery entering water temperature reaches 120°F.

14 Fan Motor Options

14.1 Constant Torque Motors (ECM)

For installations where the efficiency of an electronically-commutated, brushless DC motor (ECM) motor is required, but the features of a constant airflow motor are not required, the CF series is offered with a constant torque ECM motor option.

Constant Torque motors are wired as follows from factory:

For unit sizes 7, 9, and 12, motors are provided with 4 speed taps:
- Tap 1: Fan Only operation
- Tap 2: Passive Dehumidification
- Tap 3: Full Load
- Tap 4: Extra speed tap. Not connected from factory.

For unit sizes 15 and 18, motors are provided with 5 speed taps:
- Tap 1: Fan Only operation
- Tap 2: Passive Dehumidification
- Tap 3: Extra speed tap not connected from factory
- Tap 4: Full Load
- Tap 5: EH operation (use only when EH installed)

For unit sizes 24 to 70, motor are provided with 5 speed taps:
- Tap 1: Fan Only operation
- Tap 2: Passive Dehumidification
- Tap 3: Part Load
- Tap 4: Full Load
- Tap 5: EH operation (use only when EH installed)

About Passive Dehumidification (Tab 2): A passive dehumidification mode reduces fan airflow when dehumidification is requested by the thermostat—this reduces the sensible heat ratio of the cooling coil and extends cooling run time to more effectively dehumidify.

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

14.1.1 Constant Torque Motor Performance Data—Vertical Configuration

Model	Tap #	Default Factory Motor Setting	CFM											
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
CF007	1	FO	213	192	171	154	–	–	–	–	–	–	–	–
	2	DH	306	290	275	260	246	233	217	–	–	–	–	–
	3	FL	345	331	318	304	292	279	267	–	–	–	–	–
	4		439	425	412	400	390	380	371	–	–	–	–	–
CF009	1	FO	232	215	198	183	168	–	–	–	–	–	–	–
	2	DH	328	317	305	293	280	268	258	–	–	–	–	–
	3	FL	368	355	344	334	321	311	301	–	–	–	–	–
	4		451	442	434	424	416	406	378	–	–	–	–	–
CF012	1	FO	278	260	242	225	205	–	–	–	–	–	–	–
	2	DH	402	392	379	365	353	341	328	315	–	–	–	–
	3	FL	436	430	418	406	394	383	372	362	–	–	–	–
	4		541	526	523	502	481	459	437	413	–	–	–	–
CF015	1	FO	478	437	391	354	321	305	259	–	–	–	–	–
	2	DH	552	520	465	436	408	376	342	320	–	–	–	–
	3		536	484	451	411	375	360	323	293	–	–	–	–
	4	FL	628	589	550	505	487	449	416	403	–	–	–	–
	5	EH	731	706	670	628	590	551	488	426	–	–	–	–
CF018	1	FO	588	551	504	448	415	397	360	328	–	–	–	–
	2	DH	656	633	599	541	510	475	442	413	–	–	–	–
	3		704	683	651	624	559	526	491	469	–	–	–	–
	4	FL	734	710	678	656	597	552	521	500	–	–	–	–
	5	EH	809	787	755	737	701	646	609	552	–	–	–	–
CF024	1	FO	654	639	606	588	549	500	464	439	–	–	–	–
	2	DH	773	757	729	700	680	648	593	543	–	–	–	–
	3	PL	698	683	653	634	600	550	510	479	–	–	–	–
	4	FL	882	855	839	813	793	768	717	564	–	–	–	–
	5	EH	1037	1012	971	928	880	818	753	574	–	–	–	–
CF030	1	FO	815	777	748	677	662	628	590	568	–	–	–	–
	2	DH	944	920	888	857	786	762	740	719	–	–	–	–
	3	PL	875	853	816	783	724	700	666	641	–	–	–	–
	4	FL	1069	1037	1012	981	953	917	847	830	–	–	–	–
	5	EH	1214	1189	1161	1133	1106	1063	918	861	–	–	–	–

Model	Tap #	Default Factory Motor Setting	CFM											
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
CF036	1	FO	984	954	927	889	814	774	742	725	706	669	—	—
	2	DH	1135	1105	1080	1054	1017	949	910	876	846	832	—	—
	3	PL	1032	1001	974	947	882	831	797	766	750	732	—	—
	4	FL	1295	1270	1244	1219	1200	1175	1147	1067	1021	953	—	—
	5	EH	1386	1362	1335	1311	1289	1266	1243	1220	1047	951	—	—
CF042	1	FO	1088	1060	1032	996	959	928	895	865	778	739	—	—
	2	DH	1284	1259	1234	1210	1185	1149	1124	1099	1069	1032	—	—
	3	PL	1218	1191	1166	1142	1104	1078	1049	1011	982	950	—	—
	4	FL	1490	1466	1442	1419	1397	1375	1342	1314	1289	1227	—	—
	5	EH	1568	1543	1520	1497	1475	1452	1427	1394	1348	1268	—	—
CF048	1	FO	1213	1183	1156	1129	1104	1079	1048	1016	897	858	—	—
	2	DH	1458	1431	1408	1386	1363	1341	1317	1293	1267	1240	—	—
	3	PL	1318	1293	1265	1239	1215	1190	1165	1135	1104	983	—	—
	4	FL	1702	1678	1657	1633	1606	1587	1566	1541	1513	1454	—	—
	5	EH	1801	1775	1753	1728	1704	1683	1658	1628	1571	1493	—	—
CF060	1	FO	1561	1519	1488	1459	1415	1385	1338	1301	1263	1217	1177	1119
	2	DH	1848	1821	1795	1757	1730	1700	1667	1639	1609	1567	1531	1497
	3	PL	1677	1648	1608	1579	1550	1510	1482	1450	1402	1368	1323	1285
	4	FL	2142	2116	2089	2057	2029	2009	1978	1942	1913	1883	1852	1812
	5	EH	2231	2202	2176	2147	2119	2090	2063	2036	2003	1971	1941	1907
CF070	1	FO	1647	1598	1562	1531	1488	1456	1424	1379	1347	1311	1259	1158
	2	DH	1951	1923	1884	1856	1828	1794	1758	1731	1700	1662	1632	1599
	3	PL	1832	1795	1762	1733	1704	1662	1636	1605	1562	1530	1499	1456
	4	FL	2255	2221	2194	2164	2137	2109	2073	2046	2018	1991	1957	1920
	5	EH	2497	2467	2440	2410	2379	2350	2319	2290	2262	2233	2202	2151

Note: DH = Dehumidification, EH = Electric Heat (when installed), FL = Full Load, FO = Fan Only, and PL = Part Load

Table 12 Constant Torque Motor Performance Data—Vertical Configuration

Off delay = 30 seconds = After receiving an OFF command motor will continue running for 30 seconds. CFM based on wet coil and 1" Merv 5 Throwaway. DH is the default tap for Dehumidification.

14.1.2 Constant Torque Motor Performance Data—Horizontal Configuration

Model	Tap #	Default Factory Motor Setting	CFM											
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
CF007	1	FO	208	188	167	—	—	—	—	—	—	—	—	—
	2	DH	304	290	276	263	248	233	221	—	—	—	—	—
	3	FL	344	331	320	308	295	283	270	—	—	—	—	—
	4		441	431	420	411	402	392	382	—	—	—	—	—
CF009	1	FO	228	204	181	—	—	—	—	—	—	—	—	—
	2	DH	337	321	304	289	272	257	244	—	—	—	—	—
	3	FL	377	363	348	334	320	304	291	—	—	—	—	—
	4		465	453	441	429	417	405	394	—	—	—	—	—
CF012	1	FO	282	265	246	227	211	—	—	—	—	—	—	—
	2	DH	402	389	377	364	350	338	323	311	—	—	—	—
	3	FL	442	428	416	403	392	381	368	356	—	—	—	—
	4		541	531	519	507	493	474	449	422	—	—	—	—
CF015	1	FO	464	414	383	361	320	283	262	—	—	—	—	—
	2	DH	534	504	464	418	397	359	321	302	—	—	—	—
	3	FL	518	462	446	400	378	340	304	283	—	—	—	—
	4		614	595	537	503	473	444	422	388	—	—	—	—
	5	EH	705	684	653	603	589	556	516	443	—	—	—	—
CF018	1	FO	557	519	466	441	425	382	328	309	—	—	—	—
	2	DH	660	626	607	569	513	498	476	433	—	—	—	—
	3	FL	684	667	632	612	547	534	504	482	—	—	—	—
	4		726	708	676	654	622	559	548	512	—	—	—	—
	5	EH	812	794	764	746	712	678	602	578	—	—	—	—
CF024	1	FO	707	689	657	619	551	534	526	487	—	—	—	—
	2	DH	792	762	743	712	676	611	598	552	—	—	—	—
	3	PL	746	715	697	664	598	575	551	529	—	—	—	—
	4	FL	910	881	861	833	815	779	644	574	—	—	—	—
	5	EH	1104	1060	1009	957	894	832	757	585	—	—	—	—
CF030	1	FO	809	780	736	703	657	631	588	544	—	—	—	—
	2	DH	938	912	885	844	811	772	746	708	—	—	—	—
	3	PL	879	852	816	776	746	706	679	638	—	—	—	—
	4	FL	1053	1029	995	967	939	897	870	832	—	—	—	—
	5	EH	1208	1182	1152	1125	1097	1064	1031	997	—	—	—	—

Model	Tap #	Default Factory Motor Setting	CFM											
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
CF036	1	FO	964	939	897	865	833	797	763	736	700	676	–	–
	2	DH	1151	1127	1104	1076	1041	1018	987	955	919	831	–	–
	3	PL	1040	1006	980	953	924	883	851	824	789	764	–	–
	4	FL	1306	1286	1264	1243	1216	1188	1146	1051	944	846	–	–
	5	EH	1408	1386	1365	1342	1311	1258	1181	1078	955	848	–	–
CF042	1	FO	1075	1051	1026	994	970	899	860	828	807	781	–	–
	2	DH	1288	1267	1243	1217	1196	1173	1146	1114	997	935	–	–
	3	PL	1206	1177	1156	1134	1111	1081	1054	978	942	912	–	–
	4	FL	1470	1447	1426	1408	1387	1363	1337	1288	1214	971	–	–
	5	EH	1586	1564	1542	1522	1493	1440	1373	1304	1223	969	–	–
CF048	1	FO	1205	1181	1151	1126	1101	1076	1050	1011	923	897	–	–
	2	DH	1449	1426	1403	1378	1356	1336	1312	1292	1269	1236	–	–
	3	PL	1301	1273	1252	1229	1205	1182	1155	1125	1092	1004	–	–
	4	FL	1679	1658	1639	1617	1596	1578	1552	1511	1444	1358	–	–
	5	EH	1771	1751	1731	1709	1686	1657	1659	1540	1463	1368	–	–
CF060	1	FO	1559	1531	1502	1460	1429	1388	1357	1312	1263	1225	1176	1133
	2	DH	1857	1823	1801	1769	1737	1707	1673	1643	1611	1569	1536	1486
	3	PL	1658	1625	1599	1561	1532	1493	1465	1428	1387	1343	1296	1256
	4	FL	2146	2117	2089	2065	2038	2006	1977	1949	1915	1877	1804	1706
	5	EH	2236	2205	2176	2149	2119	2088	2067	2027	1981	1916	1824	1728
CF070	1	FO	1656	1610	1578	1544	1496	1461	1412	1378	1340	1272	1184	1131
	2	DH	1965	1925	1894	1866	1827	1793	1758	1714	1678	1641	1601	1565
	3	PL	1832	1794	1764	1722	1689	1655	1608	1576	1538	1495	1456	1399
	4	FL	2253	2219	2190	2159	2125	2099	2068	2033	1992	1956	1920	1883
	5	EH	2487	2458	2424	2395	2364	2333	2306	2271	2236	2200	2151	2081

Note: DH = Dehumidification, EH = Electric Heat (when installed), FL = Full Load, FO = Fan Only, and PL = Part Load

Table 13 Constant Torque Motor Performance Data—Horizontal Configuration

Off delay = 30 seconds = After receiving an OFF command motor will continue running for 30 seconds. CFM based on wet coil and 1" Merv 5 Throwaway. DH is the default tap for Dehumidification.

14.1.3 Constant Torque Motor Performance Data—Counter Flow

Model	Tap #	Default Factory Motor Setting	CFM											
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
CF024	1	FO	717	695	660	626	569	526	495	460	—	—	—	—
	2	DH	800	768	737	708	673	598	548	495	—	—	—	—
	3	PL	756	723	693	668	621	551	530	486	—	—	—	—
	4	FL	906	878	856	823	788	679	552	499	—	—	—	—
	5	EH	1110	1058	1007	930	871	768	574	510	—	—	—	—
CF030	1		826	770	729	697	667	606	574	530	—	—	—	—
	2	DH	992	944	901	856	815	794	773	705	—	—	—	—
	3	PL	885	827	782	735	726	693	624	588	—	—	—	—
	4	FL	1117	1076	1029	979	947	908	892	866	—	—	—	—
	5		1255	1221	1194	1151	1097	1049	983	959	—	—	—	—
CF036	1		1003	973	941	896	840	803	775	755	728	693	—	—
	2	DH	1147	1120	1095	1063	1029	1004	931	904	875	865	—	—
	3	PL	1068	1040	1008	969	926	874	835	817	796	774	—	—
	4	FL	1315	1291	1268	1243	1214	1182	1155	1092	1050	997	—	—
	5		1394	1370	1348	1324	1299	1269	1239	1213	1187	1013	—	—
CF042	1		1103	1073	1042	1009	977	934	847	819	794	773	—	—
	2	DH	1296	1272	1246	1217	1188	1161	1132	1105	1007	967	—	—
	3	PL	1230	1204	1175	1145	1116	1086	1061	1014	923	906	—	—
	4	FL	1488	1464	1442	1418	1391	1366	1337	1310	1281	1255	—	—
	5		1587	1567	1544	1520	1495	1468	1441	1413	1384	1341	—	—
CF048	1		1215	1188	1160	1133	1101	1066	1029	923	874	849	—	—
	2	DH	1444	1422	1400	1375	1350	1329	1299	1269	1239	1186	—	—
	3	PL	1308	1281	1255	1230	1201	1168	1139	1105	1066	934	—	—
	4	FL	1671	1645	1624	1602	1580	1559	1530	1485	1406	1274	—	—
	5		1787	1765	1741	1716	1691	1666	1611	1528	1433	1323	—	—
CF060	1		1622	1549	1500	1468	1424	1383	1347	1292	1245	1183	1130	1066
	2	DH	1871	1841	1812	1773	1740	1711	1679	1634	1599	1565	1517	1471
	3	PL	1697	1666	1621	1589	1555	1511	1477	1439	1389	1346	1288	1230
	4	FL	2159	2133	2098	2068	2039	2011	1981	1946	1914	1882	1845	1804
	5		2244	2217	2189	2161	2131	2098	2071	2043	2010	1975	1934	1898

Model	Tap #	Default Factory Motor Setting	CFM											
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
CF070	1		1694	1621	1574	1540	1507	1459	1424	1388	1338	1296	1246	1182
	2	DH	1941	1913	1883	1846	1813	1783	1756	1715	1684	1651	1606	1571
	3	PL	1851	1821	1790	1754	1718	1687	1651	1612	1580	1543	1496	1458
	4	FL	2256	2228	2198	2170	2142	2113	2086	2053	2020	1990	1956	1919
	5		2491	2466	2440	2409	2381	2352	2321	2292	2262	2230	2197	2161

Note: DH = Dehumidification, EH = Electric Heat (when installed), FL = Full Load, FO = Fan Only, and PL = Part Load

Table 14 Constant Torque Motor Performance Data—Counter-Flow Configuration

Off delay = 30 seconds = After receiving an OFF command motor will continue running for 30 seconds. CFM based on wet coil and 1" Merv 5 Throwaway. DH is the default tap for Dehumidification.

14.2 Constant Airflow Motors (ECM)

NOTICE

The 460-V heat pump units that are equipped with the Constant Airflow Motor option require power-supply wiring that includes a properly-sized neutral wire 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.

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

Additionally these motors feature:

- 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 #23.)
- 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 #23.)
- 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 #23.)
- 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 testing and balancing.)

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

14.2.1 Constant Airflow Motors Performance Data—Vertical Configuration

Model	Fan Speed	Default Factory Motor Setting	CFM											
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
CF015	A -		425	425	425	425	425	425	425	425	–	–	–	–
	A Norm	X	500	500	500	500	500	500	500	500	–	–	–	–
	A +		575	575	575	575	575	575	575	575	–	–	–	–
CF018	A -		510	510	510	510	510	510	510	510	–	–	–	–
	A Norm	X	600	600	600	600	600	600	600	600	–	–	–	–
	A +		700	700	700	700	700	700	700	700	–	–	–	–
CF024	A -		680	680	680	680	680	680	680	680	–	–	–	–
	A Norm (Full)	X	800	800	800	800	800	800	800	800	–	–	–	–
	A +		920	920	920	920	920	920	920	920	–	–	–	–
	A -		510	510	510	510	510	510	510	510	–	–	–	–
	A Norm (Part)	X	600	600	600	600	600	600	600	600	–	–	–	–
	A +		690	690	690	690	690	690	690	690	–	–	–	–
CF030	A -		808	808	808	808	808	808	808	808	–	–	–	–
	A Norm (Full)	X	950	950	950	950	950	950	950	950	–	–	–	–
	A +		1093	1093	1093	1093	1093	1093	1093	1093	–	–	–	–
	A -		612	612	612	612	612	612	612	612	–	–	–	–
	A Norm (Part)	X	720	720	720	720	720	720	720	720	–	–	–	–
	A +		828	828	828	828	828	828	828	828	–	–	–	–
CF036	A -		1020	1020	1020	1020	1020	1020	1020	1020	1020	1020	–	–
	A Norm (Full)	X	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	–	–
	A +		1380	1380	1380	1380	1380	1380	1380	1380	1380	1380	–	–
	A -		765	765	765	765	765	765	765	765	765	765	–	–
	A Norm (Part)	X	900	900	900	900	900	900	900	900	900	900	–	–
	A +		1035	1035	1035	1035	1035	1035	1035	1035	1035	1035	–	–
CF042	A -		1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	–	–
	A Norm (Full)	X	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	–	–
	A +		1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	–	–
	A -		952	952	952	952	952	952	952	952	952	952	–	–
	A Norm (Part)	X	1120	1120	1120	1120	1120	1120	1120	1120	1120	1120	–	–
	A +		1288	1288	1288	1288	1288	1288	1288	1288	1288	1288	–	–

Model	Fan Speed	Default Factory Motor Setting	CFM											
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
CF048	A -		1360	1360	1360	1360	1360	1360	1360	1360	1360	1360	—	—
	A Norm (Full)	X	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	—	—
	A +		1840	1840	1840	1840	1840	1840	1840	1840	1840	1840	—	—
	A -		1020	1020	1020	1020	1020	1020	1020	1020	1020	1020	—	—
	A Norm (Part)	X	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	—	—
	A +		1380	1380	1380	1380	1380	1380	1380	1380	1380	1380	—	—
CF060	A -		1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
	A Norm (Full)	X	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
	A +		2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300
	A -		1275	1275	1275	1275	1275	1275	1275	1275	1275	1275	1275	1275
	A Norm (Part)	X	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
	A +		1725	1725	1725	1725	1725	1725	1725	1725	1725	1725	1725	1725
CF070	A -		1785	1785	1785	1785	1785	1785	1785	1785	1785	1785	1785	1785
	A Norm (Full)	X	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
	A +		2415	2415	2415	2415	2415	2415	2415	2415	2415	2415	2415	2415
	A -		1403	1403	1403	1403	1403	1403	1403	1403	1403	1403	1403	1403
	A Norm (Part)	X	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
	A +		1897	1897	1897	1897	1897	1897	1897	1897	1897	1897	1897	1897

Table 15 Constant Airflow Motors Performance Data—Vertical Configuration

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Air flow is 69% of tabulated values during fan-only operation. When passive dehumidification mode is enabled, air flow is 85% of tabulated value. CFM based on wet coil and 1" Merv 5 Throwaway.

14.2.2 Constant Airflow Motors Performance Data—Horizontal Configuration

Model	Fan Speed	Default Factory Motor Setting	CFM											
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
CF015	A -		425	425	425	425	425	425	425	425	—	—	—	—
	A Norm	X	500	500	500	500	500	500	500	500	—	—	—	—
	A +		575	575	575	575	575	575	575	575	—	—	—	—
CF018	A -		510	510	510	510	510	510	510	510	—	—	—	—
	A Norm	X	600	600	600	600	600	600	600	600	—	—	—	—
	A +		700	700	700	700	700	700	700	700	—	—	—	—
CF024	A -		680	680	680	680	680	680	680	680	—	—	—	—
	A Norm (Full)	X	800	800	800	800	800	800	800	800	—	—	—	—
	A +		920	920	920	920	920	920	920	920	—	—	—	—
	A -		510	510	510	510	510	510	510	510	—	—	—	—
	A Norm (Part)	X	600	600	600	600	600	600	600	600	—	—	—	—
	A +		690	690	690	690	690	690	690	690	—	—	—	—
CF030	A -		810	810	810	810	810	810	810	810	—	—	—	—
	A Norm (Full)	X	950	950	950	950	950	950	950	950	—	—	—	—
	A +		1100	1100	1100	1100	1100	1100	1100	1100	—	—	—	—
	A -		640	640	640	640	640	640	640	640	—	—	—	—
	A Norm (Part)	X	750	750	750	750	750	750	750	750	—	—	—	—
	A +		860	860	860	860	860	860	860	860	—	—	—	—
CF036	A -		1020	1020	1020	1020	1020	1020	1020	1020	1020	1020	—	—
	A Norm (Full)	X	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	—	—
	A +		1380	1380	1380	1380	1380	1380	1380	1380	1380	1380	—	—
	A -		765	765	765	765	765	765	765	765	765	765	—	—
	A Norm (Part)	X	900	900	900	900	900	900	900	900	900	900	—	—
	A +		1035	1035	1035	1035	1035	1035	1035	1035	1035	1035	—	—
CF042	A -		1230	1230	1230	1230	1230	1230	1230	1230	1230	1230	—	—
	A Norm (Full)	X	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	—	—
	A +		1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	—	—
	A -		970	970	970	970	970	970	970	970	970	970	—	—
	A Norm (Part)	X	1120	1120	1120	1120	1120	1120	1120	1120	1120	1120	—	—
	A +		1310	1310	1310	1310	1310	1310	1310	1310	1310	1310	—	—

Model	Fan Speed	Default Factory Motor Setting	CFM											
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
CF048	A -		1360	1360	1360	1360	1360	1360	1360	1360	1360	1360	—	—
	A Norm (Full)	X	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	—	—
	A +		1840	1840	1840	1840	1840	1840	1840	1840	1840	1840	—	—
	A -		1020	1020	1020	1020	1020	1020	1020	1020	1020	1020	—	—
	A Norm (Part)	X	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	—	—
	A +		1380	1380	1380	1380	1380	1380	1380	1380	1380	1380	—	—
CF060	A -		1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
	A Norm (Full)	X	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
	A +		2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300
	A -		1275	1275	1275	1275	1275	1275	1275	1275	1275	1275	1275	1275
	A Norm (Part)	X	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
	A +		1725	1725	1725	1725	1725	1725	1725	1725	1725	1725	1725	1725
CF070	A -		1785	1785	1785	1785	1785	1785	1785	1785	1785	1785	1785	1785
	A Norm (Full)	X	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
	A +		2415	2415	2415	2415	2415	2415	2415	2415	2415	2415	2415	2415
	A -		1403	1403	1403	1403	1403	1403	1403	1403	1403	1403	1403	1403
	A Norm (Part)	X	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
	A +		1898	1898	1898	1898	1898	1898	1898	1898	1898	1898	1898	1898

Table 16 Constant Airflow Motors Performance Data—Horizontal Configuration

Air flow is 69% of tabulated values during fan-only operation. When passive dehumidification mode is enabled, air flow is 85% of tabulated value. CFM based on wet coil and 1" Merv 5 Throwaway.

14.2.3 Constant Airflow Motors Performance Data—Counter Flow

Model	Fan Speed	Default Factory Motor Setting	CFM											
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
CF024	A -		680	680	680	680	680	680	680	680	—	—	—	—
	A Norm (Full)	X	800	800	800	800	800	800	800	800	—	—	—	—
	A +		920	920	920	920	920	920	920	920	—	—	—	—
	A -		510	510	510	510	510	510	510	510	—	—	—	—
	A Norm (Part)	X	600	600	600	600	600	600	600	600	—	—	—	—
	A +		690	690	690	690	690	690	690	690	—	—	—	—
CF030	A -		808	808	808	808	808	808	808	808	—	—	—	—
	A Norm (Full)	X	950	950	950	950	950	950	950	950	—	—	—	—
	A +		1093	1093	1093	1093	1093	1093	1093	1093	—	—	—	—
	A -		612	612	612	612	612	612	612	612	—	—	—	—
	A Norm (Part)	X	720	720	720	720	720	720	720	720	—	—	—	—
	A +		828	828	828	828	828	828	828	828	—	—	—	—
CF036	A -		1020	1020	1020	1020	1020	1020	1020	1020	1020	1020	—	—
	A Norm (Full)	X	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	—	—
	A +		1380	1380	1380	1380	1380	1380	1380	1380	1380	1380	—	—
	A -		765	765	765	765	765	765	765	765	765	765	—	—
	A Norm (Part)	X	900	900	900	900	900	900	900	900	900	900	—	—
	A +		1035	1035	1035	1035	1035	1035	1035	1035	1035	1035	—	—
CF042	A -		1190	1190	1190	1190	1190	1190	1190	1190	1190	1190	—	—
	A Norm (Full)	X	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	—	—
	A +		1610	1610	1610	1610	1610	1610	1610	1610	1610	1610	—	—
	A -		952	952	952	952	952	952	952	952	952	952	—	—
	A Norm (Part)	X	1120	1120	1120	1120	1120	1120	1120	1120	1120	1120	—	—
	A +		1288	1288	1288	1288	1288	1288	1288	1288	1288	1288	—	—
CF048	A -		1360	1360	1360	1360	1360	1360	1360	1360	1360	1360	—	—
	A Norm (Full)	X	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	—	—
	A +		1840	1840	1840	1840	1840	1840	1840	1840	1840	1840	—	—
	A -		1020	1020	1020	1020	1020	1020	1020	1020	1020	1020	—	—
	A Norm (Part)	X	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	—	—
	A +		1380	1380	1380	1380	1380	1380	1380	1380	1380	1380	—	—

Model	Fan Speed	Default Factory Motor Setting	CFM											
			0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
CF060	A -		1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
	A Norm (Full)	X	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
	A +		2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300
	A -		1275	1275	1275	1275	1275	1275	1275	1275	1275	1275	1275	1275
	A Norm (Part)	X	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
	A +		1725	1725	1725	1725	1725	1725	1725	1725	1725	1725	1725	1725
CF070	A -		1785	1785	1785	1785	1785	1785	1785	1785	1785	1785	1785	1785
	A Norm (Full)	X	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
	A +		2415	2415	2415	2415	2415	2415	2415	2415	2415	2415	2415	2415
	A -		1403	1403	1403	1403	1403	1403	1403	1403	1403	1403	1403	1403
	A Norm (Part)	X	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
	A +		1897	1897	1897	1897	1897	1897	1897	1897	1897	1897	1897	1897

Table 17 Constant Airflow Motors Performance Data—Counter-Flow Configuration

During fan only operation air flow is 69% of tabulated value. When passive dehumidification mode is enabled, air flow is 85% of tabulated value. CFM based on wet coil and 1" Merv 5 Throwaway.

15 Maintenance

⚠ WARNING

Personal Injury Hazard!
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.

⚠ 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.

15.1 Filter Changes

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.

15.2 Annual Checkup

An annual "checkup" by a trained and qualified HVAC mechanic is required. Complete the check-out sheet on page #104 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.

15.3 Annual Condensate Drain Cleaning

Clean and flush the condensate drain annually to ensure proper drainage.

16 Handling Periodic Lockouts

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.

17 Servicing and Repair Information

17.1 Personal Protective Equipment

Ensure that all personal protective equipment is available and being used correctly.

17.2 Confined Space Work

Work in confined spaces must be avoided.

17.3 Controlled Work Procedure

All work must be undertaken under a controlled procedure to minimize the risk of a flammable gas or vapor being present while the work is being performed.

17.4 Safety Checks

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimized. The following precautions must be taken prior to conducting work on the refrigerating system.

17.4.1 Inform Everyone in the General Work Area

All maintenance staff and others working in the local area must be instructed on the nature of work being carried out.

17.4.2 Check for the Presence of Refrigerant

The area must be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with R-454B refrigerant; *i.e.*, non-sparking, adequately sealed, or intrinsically safe.

17.4.3 Fire Extinguisher

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire-extinguishing equipment must be available on hand. Have a dry powder or CO_2 fire extinguisher adjacent to the charging area.

17.4.4 Ignition Sources

Ensure the following prior to the work taking place:

- ▶ The area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks.
- ▶ "No Smoking" signs must be posted.
- ▶ All possible ignition sources, including cigarette smoking, must be kept sufficiently far away from the site of installation, repair, removal, or disposal during which refrigerant may possibly be released and exposed to the surrounding area and the ignition sources.
- ▶ Ensure that any person carrying out work in relation to a refrigerating system that involves exposing any pipe work knows that they must NOT use any sources of ignition in such a manner that it may lead to the risk of fire or explosion.

17.4.5 Ventilated Area

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. The ventilation must safely disperse all released refrigerant, preferably expelling it externally into the atmosphere. The ventilation must be present during the period that the work is carried out.

17.4.6 Checks to the Refrigerating Equipment

Where electrical components are being changed, they must be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines must be followed. If in doubt, consult Bosch service and support for assistance.

The following checks must be applied to installations using flammable refrigerants:

- ▶ Ensure the actual refrigerant charge is in accordance with the room size within which the refrigerant containing parts are installed.
- ▶ Ensure that the ventilation machinery and outlets are operating adequately and are not obstructed.
- ▶ Check the secondary circuit for the presence of refrigerant, if an indirect refrigerating circuit is being used.
- ▶ Ensure the markings on the equipment continues to be visible and legible. Markings and signs that are illegible must be corrected.
- ▶ Ensure the refrigerating pipes or components are installed in a position where they are unlikely to be exposed to any substance that may corrode refrigerant containing components, unless the components are constructed of materials that are inherently resistant to being corroded or are suitably protected against being so corroded.

17.5 Checks to Electrical Devices

Repair and maintenance to electrical components must include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then electrical supply must NOT be connected to the circuit until the safety fault is satisfactorily corrected. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution must be used. This must be reported to the owner of the equipment, so all parties are advised.

The following are required initial safety checks:

- ▶ Ensure that capacitors are discharged—this must be done in a safe manner to avoid possibility of sparking.
- ▶ Ensure that no live-electrical components and wiring are exposed while charging, recovering, or purging the system.
- ▶ Ensure that there is continuity of earth bonding.

17.6 Repairs to Sealed Components

NOTICE

Sealed-electrical components must be replaced.

17.7 Repair to Intrinsically-Safe Components

NOTICE

Intrinsically-safe components must be replaced.

17.8 Check Cabling

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges, or any other adverse environmental effects. The check must also take into account the effects of aging or continual vibrations from sources such as compressors or fans.

17.9 Detection of Flammable Refrigerants

Under NO circumstances may potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) must NOT be used.

The following leak-detection methods are deemed acceptable for all refrigerant systems:

- Electronic leak detectors may be used to detect refrigerant leaks but in the case of flammable refrigerants, the sensitivity may not be adequate or may need re-calibration. (Detection equipment must be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak-detection equipment must be set to a percentage for the Lower-Flammable Limit (LFL) (25% maximum) of the gas that is confirmed.
- Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine must be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work. Examples of leak detection fluids are:
  - bubble method
  - fluorescent method agents.

If a leak is suspected, all naked flames must be removed/ extinguished.

If a leakage of refrigerant is found that requires brazing, all of the refrigerant must be recovered from the system or isolated (by means of shut-off valves) in a part of the system remote from the leak.

17.10 Removal and Evacuation

When breaking into the refrigerant circuit to make repairs—or for any other purpose—conventional procedures must be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration. The following procedure must be adhered to safely remove refrigerant following local and national regulations:

1. Evacuate.
2. Purge the circuit with inert gas (optional for A2L).
3. Open the circuit.

The refrigerant charge must be recovered into the correct recovery cylinders if venting is not allowed by local or national codes. For appliances containing flammable refrigerants, the system must be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen must not be used for purging refrigerant systems.

For appliances containing flammable refrigerants, refrigerants purging must be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum (optional for A2L). This process must be repeated until no refrigerant is within the system (optional for A2L). When the final oxygen-free nitrogen charge is used, the system must be vented down to atmospheric pressure to enable work to take place.

⚠ WARNING

Fire Hazard!

The outlet for the vacuum pump must not be close to any potential ignition sources, and ventilation must be available.

17.11 Charging Procedures

In addition to conventional charging procedures, the following requirements must be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment.
- Ensure hoses or lines are as short as possible to minimize the amount of refrigerant contained in them.
- Ensure cylinders are kept in an appropriate position according to the instructions.
- Ensure that the refrigerating system is earthed prior to charging the system with refrigerant.
- Be sure to label the system when charging is complete (if not already).
- Use extreme care not to overfill the refrigerating system.
- Ensure the system is pressure-tested with the appropriate purging gas prior to recharging the system.
- Ensure the system is leak-tested on completion of charging but prior to commissioning. A follow-up leak test must be carried out prior to leaving the site.

17.12 Recovery

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.

Ensure the following:

- Ensure that only appropriate refrigerant recovery cylinders are employed when transferring refrigerant into cylinders.
- Ensure that the correct number of cylinders for holding the total system charge are available.
- Ensure all cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant (*i.e.*, special cylinders for the recovery of refrigerant).
- Ensure all cylinders are complete with a pressure-relief valve and associated shut-off valves that are all in good working order.
- Ensure empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.
- Ensure the recovery equipment is in good working order.
- Ensure set of instructions for the recovery equipment is at hand .
- Ensure the recovery equipment is suitable for the recovery of the flammable refrigerant. If in doubt, the manufacturer should be consulted.
- Ensure a set of calibrated weighing scales are available and in good working order.
- Ensure the hoses are complete with leak-free disconnect couplings and are in good condition.
- Ensure the recovered refrigerant is processed according to local legislations/regulations in the correct recovery cylinder, and the relevant waste transfer note arranged.
- Ensure there is no mixing of refrigerants in the recovery units and especially not in cylinders.
- If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body must NOT be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it must be carried out safely.

17.13 Service Access

17.13.1 Swing-Out Electrical Box

The Electrical Box is designed to swing out of the way, enhancing the unit's accessibility and serviceability. (➔See Fig. 25 and Fig. 26.) For additional details, refer to section 5.10.1 on page #19.

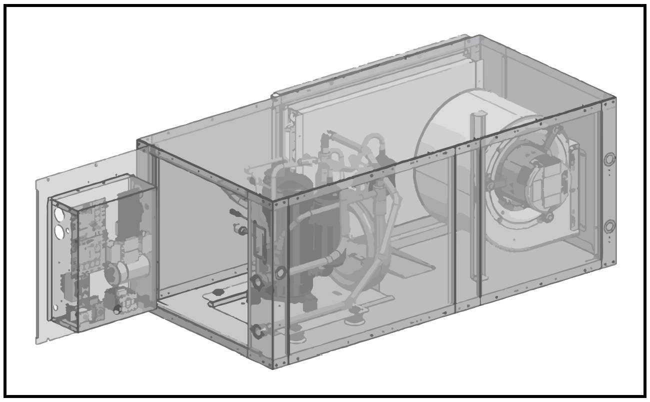

Fig. 25 Swing-Out Electrical Box on a Horizontal Unit

17.13.2 Blower Assembly Access for Vertical Units

For vertically-configured units, the Blower Assembly is designed to slide out to facilitate access and servicing of the blower/motor assembly. (➔See Fig. 26.)

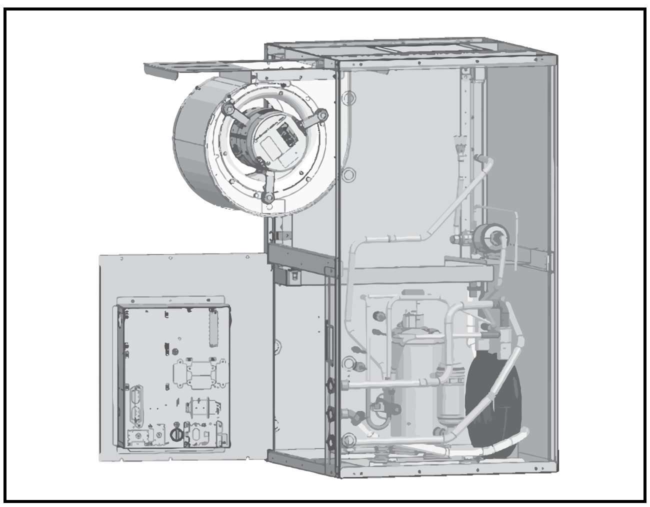

Fig. 26 Electrical Box and Blower Assembly Access

If removal of the blower assembly is required (e.g., when installation constraints prevent the use of the slide-out feature), follow these steps:

- ▶ Remove the three screws positioned above the motor.
- ▶ Drop down and slide off the welded pins situated on the opposite side from the motor.

(➔See Fig. 27.)

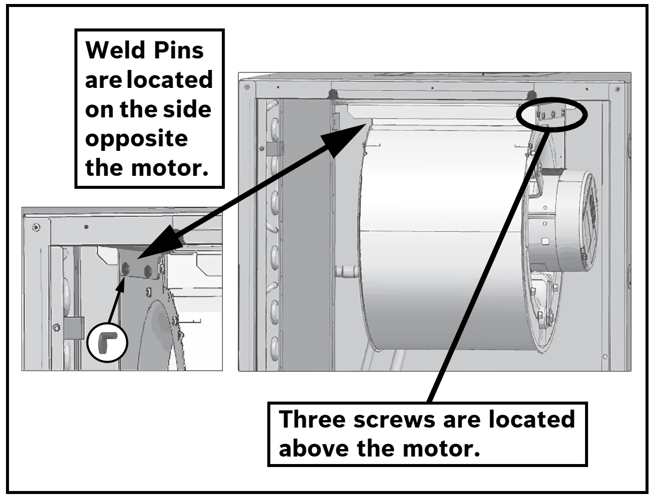

Fig. 27 Screws and Welded Pins Locations for Vertical Units

17.13.3 Blower Assembly Access for Horizontal Units

For horizontally-configured units, follow the steps below to remove the Blower Assembly:

- ▶ Remove the three screws located on the motor side of the blower assembly.
- ▶ Twist and pull the blower back from welded pins located on opposite side to the motor, near the evaporator.

(➔See Fig. 28.)

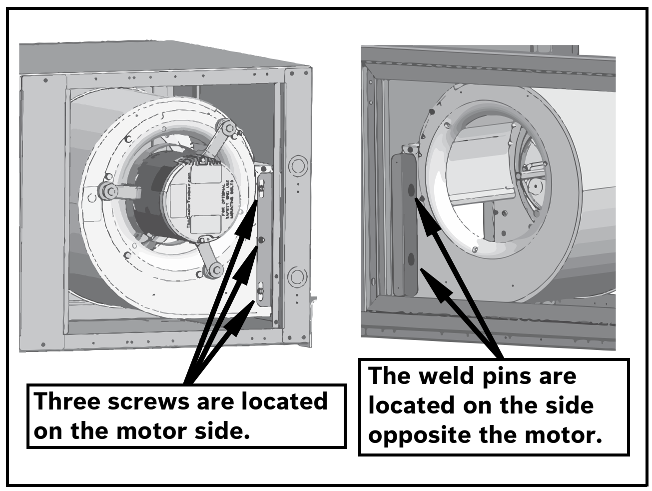

Fig. 28 Screws and Welded Pins Locations for Horizontal Units

18 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.

18.1 Protecting the Environment

18.1.1 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.

18.1.2 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.

18.1.3 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.

18.2 Decommissioning Procedure

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail.

It is recommended good practice that all refrigerants are recovered safely.

→Refer to Servicing and Repair Information on page 56 for additional safety precautions.

Follow the procedure below.

1. Before attempting the procedure:
   - ▶ Become familiar with the equipment and its operation.
   - ▶ Ensure that electrical power is available for the recovery machine before the task is commenced.
   - ▶ Ensure an oil and refrigerant sample is taken in case analysis is required prior to re-use of recovered refrigerant.
   - ▶ Isolate the system electrically. Lock-Out/Tag-Out recommended.
   - ▶ Ensure that mechanical handling equipment is available, if required, for handling refrigerant cylinders
   - ▶ Ensure that all personal protective equipment is available and being used correctly.
   - ▶ Ensure that the recovery process is supervised at all times by a competent person.
   - ▶ Ensure that the recovery equipment and cylinders conform to the appropriate standards.
2. Pump down refrigerant system, if possible.
3. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
4. Make sure that cylinder is situated on the scales before recovery takes place.
5. Start the recovery machine and operate in accordance with instructions.
6. DO NOT overfill cylinders (no more than 80% volume liquid charge).
7. DO NOT exceed the maximum working pressure of the cylinder, even temporarily.
8. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
9. Recovered refrigerant must NOT be charged into another REFRIGERATING SYSTEM unless it has been cleaned and checked through reclamation according to local legislations/regulations.

18.3 Labeling

The following are required:

- ▶ Equipment must be labeled stating that it has been decommissioned and emptied of refrigerant.
- ▶ The label must be dated and signed.
- ▶ Ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

19 Troubleshooting

19.1 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.

19.1.1 Online Help Resources

For FAQs, videos, service bulletins, and more, visit our Service and Support web page at www.boschheatingcooling.com/service or use your cell phone to scan the code below.

Unit Troubleshooting

Problem	Mode: Cooling	Mode: Heating	Check	Possible Cause	Action
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.
				Fouled or scaled water-coil	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 #31).
				Freeze fault - low refrigerant	Check refrigerant pressure with a gauge set.
	X	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.
				Condensate fault—False trigger	Check that the condensate sensor is mounted on the drain pan, and the terminal is not touching sheet metal.

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 the transformer primary voltage taps—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 6 on page #22.
					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.
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.

<table>
<tr><th colspan="6">Unit Troubleshooting</th></tr>
<tr><th rowspan="2">Problem</th><th colspan="2">Mode</th><th rowspan="2">Check</th><th rowspan="2">Possible Cause</th><th rowspan="2">Action</th></tr>
<tr><th>Cooling</th><th>Heating</th></tr>
<tr><td rowspan="3">No compressor Or fan operation</td><td rowspan="3">X</td><td rowspan="3">X</td><td>Power LED ON</td><td>Bad thermostat connection / faulty thermostat</td><td>Check thermostat and wiring. Check unit terminal block for 24 VAC between "Y" and "C" and "G" and "C."</td></tr>
<tr><td rowspan="2">Power LED OFF</td><td>Low or no supply power</td><td>Ensure that the supply voltage to the unit is with in the range shown on the unit data plate.</td></tr>
<tr><td>Faulty control transformer</td><td>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.</td></tr>
<tr><td rowspan="4">No Fan operation—constant Airflow motor</td><td rowspan="4">X</td><td rowspan="4">X</td><td rowspan="4">See Action</td><td>No fan operation signal</td><td rowspan="4">• Make sure all CFM DIP switches are in the proper configuration (refer to the blower performance tables).
• Check for 24V between R & C on ECM board.
• Move FAN switch to ON at thermostat. Check for 24V at G & C (should be the same as R & C) terminals on ECM board. If no voltage is present from G to C, examine the thermostat or thermostat wires.
• Check high voltage at the ECM motor harness circuit. If no voltage is present, ensure that high voltage is present to the unit. For 208/230V at L1 & L2 (black and white wire), for 265/277V at L1 & N (must be within 10%).
• Check the 16-pin harness connection and continuity for each wire. If any pin does not have continuity, change the harness.
• On the ECM Interface board, set the DIP switch to Test (ON) while verifying that G to C has 24 volts. If the motor does not start, replace the ECM motor. If the motor starts, replace the ECM Interface Board.</td></tr>
<tr><td>Loose wiring</td></tr>
<tr><td>Interface board problem</td></tr>
<tr><td>Faulty motor</td></tr>
</table>

Unit Troubleshooting					
Problem	**Mode**		**Check**	**Possible Cause**	**Action**
	Cooling	**Heating**			
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.
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 #12.
				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 18 Unit Troubleshooting

19.2 Option Card Troubleshooting

Option Card Troubleshooting					
Problem	**Mode**	**Check**	**Then**	**Action**	**Additional Action**
No Hot Gas Reheat operation	Cooling/Hot Gas Reheat	Is the H_OUT LED on the Option Card ON?	If Yes, check the Hot Gas Reheat Valve.	1. Ensure there is 24VAC between “H_OUT” and “C.” 2. Ensure the solenoid is working.	If action1 is true and action 2 is not, then replace the Hot Gas Reheat Valve.
			If No, check if there is 24VAC between “H_OUT” and “C” on the Option Card.	If there is 24VAC, then replace the Option Card.	
No Economizer operation	Cooling	Is the E_OUT LED on the Option Card ON?	If Yes, ensure the Cool Setpoint in the Option Card is set above the water temperature.	If true, check the Economizer Valve.	Replace the Economizer Valve as needed.
No Boilerless Control operation	Heating	Is the W_OUT LED on the Option Card ON?	If Yes, ensure the Heat Setpoint in the Option Card is set above the water temperature.	If true and the unit is equipped with electric heat, then check the electric heat operation.	

Table 19 Option Card Troubleshooting

20 Specification Tables

20.1 Operating Temperatures and Pressures

Operating Temperatures and Pressures										
			Cooling				Heating			
Model	Entering Water Temp. (°F)	Water Flow (GPM/Ton)	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)
CF007	30°	1.4	–	–	–	–	69–79	227–237	5–6	15–19
		2	–	–	–	–	72–82	228–238	4–5	15–19
	40°	1.4	115–138	148–180	11–17	19–23	84–94	236–246	7–8	18–22
		2	115–137	142–171	8–12	19–23	88–98	238–248	5–6	18–22
	50°	1.4	115–141	164–204	12–16	19–23	101–111	246–256	8–9	20–24
		2	115–139	158–195	8–11	18–23	105–115	249–259	6–7	21–25
	60°	1.4	115–143	190–238	11–16	18–22	116–126	256–266	9–10	23–27
		2	116–142	185–228	8–11	18–22	121–131	259–269	6–7	24–28
	70°	1.4	117–146	219–274	11–14	18–21	132–142	266–276	10–11	25–29
		2	117–146	214–264	8–11	19–22	138–148	270–280	7–8	26–30
	80°	1.4	118–150	251–313	10–16	18–22	150–160	278–288	11–12	28–32
		2	118–149	248–305	7–10	18–22	158–168	283–293	8–9	30–34
	90°	1.4	119–153	287–357	10–14	18–21	170–180	291–301	13–14	31–35
		2	119–152	286–350	7–10	18–21	–	–	–	–
	100°	1.4	121–157	328–405	9–14	17–21	–	–	–	–
		2	121–156	328–398	6–9	17–21	–	–	–	–
CF009	30°	1.8	–	–	–	–	61–81	217–273	5–6	16–20
		2.5	–	–	–	–	64–85	219–276	4–5	16–20
	40°	1.8	111–136	156–188	11–16	19–24	75–98	227–287	6–7	18–23
		2.5	111–135	149–176	8–11	19–24	77–102	229–289	4–5	19–24
	50°	1.8	112–138	180–220	11–15	19–24	90–117	238–301	7–9	21–27
		2.5	112–136	174–211	8–12	19–24	92–121	240–304	5–6	21–27
	60°	1.8	113–140	208–255	11–15	19–24	107–138	251–317	8–10	24–31
		2.4	113–138	201–246	8–11	19–24	110–143	254–322	6–7	24–31
	70°	1.8	115–143	238–292	11–14	18–23	126–160	265–335	9–12	26–34
		2.5	115–142	232–284	8–11	18–23	130–167	268–340	7–8	27–35
	80°	1.8	116–145	272–334	10–14	18–22	145–183	280–354	11–13	30–38
		2.5	117–144	266–325	7–10	18–23	152–192	285–360	8–9	30–39
	90°	1.8	118–148	310–379	9–14	17–22	–	–	–	–
		2.5	118–147	305–371	7–9	17–22	–	–	–	–
	100°	1.8	120–151	351–428	9–12	17–21	–	–	–	–
		2.5	121–150	347–420	6–9	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)
CF012	30°	2	–	–	–	–	61–77	230–289	6–7	19–22
		3	–	–	–	–	64–81	233–294	4–5	20–23
	40°	2	109–135	151–193	14–18	22–26	74–93	242–304	7–8	22–26
		3	109–134	141–180	10–11	22–27	79–98	246–310	5–6	23–27
	50°	2	109–137	175–224	14–18	22–25	81–117	256–321	9–10	25–29
		3	109–136	164–210	10–11	22–26	86–124	262–328	6–7	27–31
	60°	2	110–139	201–257	13–18	22–26	104–128	271–339	10–12	28–33
		3	110–138	191–244	9–11	22–26	111–137	278–347	7–8	29–35
	70°	2	112–142	231–294	13–17	22–25	121–149	287–358	11–13	31–37
		3	112–140	221–281	9–12	21–25	130–158	295–368	7–9	33–39
	80°	2	113–144	263–334	12–17	21–25	140–170	306–380	12–14	35–41
		3	113–143	254–321	8–11	21–25	151–182	316–392	8–10	37–44
	90°	2	115–147	299–379	12–16	21–24	–	–	–	–
		3	115–146	291–367	8–11	20–24	–	–	–	–
	100°	2	116–149	338–428	12–15	20–24	–	–	–	–
		3	117–148	333–417	8–11	20–24	–	–	–	–
CF015	30°	2.5	–	–	–	–	60–76	240–295	6–7	20–22
		3.8	–	–	–	–	63–80	244–299	4–5	20–23
	40°	2.5	106–133	156–197	13–19	22–26	72–91	253–310	7–8	22–25
		3.8	106–132	145–183	9–12	22–26	77–97	257–316	5–5	23–26
	50°	2.5	106–135	180–227	13–19	21–25	79–116	267–327	9–10	26–29
		3.8	106–134	169–213	9–12	21–26	84–122	273–334	6–7	26–30
	60°	2.5	107–137	207–261	13–18	21–25	101–126	283–345	10–11	28–32
		3.8	107–136	196–247	9–12	21–25	109–135	290–354	7–8	30–34
	70°	2.5	109–140	237–298	13–17	21–25	118–146	300–366	11–12	32–36
		3.8	109–139	226–284	8–11	21–25	127–156	310–377	8–9	33–38
	80°	2.5	110–143	270–338	12–17	21–24	138–168	320–388	13–14	35–40
		3.8	110–141	260–325	8–11	20–24	148–180	331–401	9–10	37–43
	90°	2.5	112–145	306–383	12–16	20–24	158–191	342–413	14–16	39–44
		3.8	112–144	298–371	8–10	20–24	–	–	–	–
	100°	2.5	113–147	346–434	11–16	20–23	–	–	–	–
		3.8	114–147	339–421	8–9	19–23	–	–	–	–

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)
CF018	30°	3	–	–	–	–	57–67	250–270	6–7	18–22
		5	–	–	–	–	63–73	256–276	4–5	20–24
	40°	3	109–127	177–197	15–18	23–27	70–80	264–284	7–8	21–25
		5	108–126	159–179	9–12	23–27	77–87	271–291	4–5	23–27
	50°	3	111–129	204–224	15–18	22–26	84–94	278–298	8–9	24–28
		5	109–127	186–206	9–12	22–26	93–103	287–307	5–6	26–30
	60°	3	113–131	235–255	14–17	22–26	99–109	293–313	10–11	28–32
		5	111–129	217–237	8–11	22–26	110–120	304–324	6–7	30–34
	70°	3	115–133	269–289	14–17	21–25	116–126	310–330	11–12	31–35
		5	113–131	251–271	8–11	22–26	129–139	323–343	7–8	33–37
	80°	3	116–134	307–327	13–16	21–25	135–145	329–349	12–13	35–39
		5	116–134	289–309	8–11	21–25	150–160	344–364	8–9	37–41
	90°	3	119–137	348–368	13–16	21–25	155–165	349–369	13–14	38–42
		5	118–136	331–351	7–10	21–25	–	–	–	–
	100°	3	121–139	393–413	12–15	20–24	–	–	–	–
		5	120–138	377–397	7–10	20–24	–	–	–	–
CF024	30°	3	–	–	–	–	60–70	260–280	8–9	19–23
		6	–	–	–	–	67–77	267–287	4–5	21–25
	40°	3	108–125	188–206	19–22	21–25	73–83	274–294	10–11	22–26
		6	106–123	160–178	9–12	21–25	82–92	283–303	5–6	24–28
	50°	3	109–126	215–233	19–22	21–25	87–97	289–309	12–13	25–29
		6	108–125	187–205	9–12	21–25	98–108	300–320	6–7	27–31
	60°	3	111–128	245–263	18–21	21–25	102–112	305–325	13–14	28–32
		6	109–126	217–235	9–12	21–25	115–125	319–339	7–8	31–35
	70°	3	112–129	279–297	18–21	20–24	119–129	323–343	15–16	32–36
		6	111–128	250–268	9–12	21–25	135–145	340–360	8–9	35–39
	80°	3	114–131	315–333	17–20	20–24	137–147	342–362	17–18	35–39
		6	113–130	288–306	8–11	20–24	157–167	364–384	9–10	39–43
	90°	3	116–133	354–372	17–20	19–23	164–174	371–391	19–20	40–44
		6	115–132	330–348	8–11	20–24	–	–	–	–
	100°	3	118–135	397–415	16–19	19–23	–	–	–	–
		6	117–134	376–394	8–11	19–23	–	–	–	–

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)
CF030	30°	4	–	–	–	–	57–67	259–279	8–9	20–24
		7.5	–	–	–	–	63–73	264–284	4–5	21–25
	40°	4	108–126	195–213	19–22	22–26	69–79	269–289	9–10	23–27
		7.5	106–124	169–187	10–13	22–26	77–87	275–295	5–6	24–28
	50°	4	110–128	222–240	19–22	22–26	83–93	281–301	10–11	26–30
		7.5	108–126	195–213	10–13	22–26	92–102	289–309	6–7	28–32
	60°	4	111–129	252–270	18–21	22–26	98–108	295–315	12–13	29–33
		7.5	110–128	225–243	9–12	22–26	109–119	306–326	7–8	32–36
	70°	4	113–131	285–303	17–20	21–25	114–124	311–331	14–15	33–37
		7.5	112–130	258–276	9–12	21–25	128–138	325–345	8–9	36–40
	80°	4	114–132	322–340	17–20	21–25	136–146	331–351	15–16	37–41
		7.5	113–131	296–314	9–12	21–25	150–160	345–365	9–10	40–44
	90°	4	116–134	362–380	16–19	20–24	153–163	335–355	17–18	41–45
		7.5	115–133	337–355	8–11	21–25	–	–	–	–
	100°	4	118–136	405–423	16–19	20–24	–	–	–	–
		7.5	117–135	383–401	8–11	20–24	–	–	–	–
CF036	30°	4.5	–	–	–	–	55–65	240–260	8–9	18–22
		9	–	–	–	–	61–71	246–266	4–5	19–23
	40°	4.5	113–129	198–222	20–23	22–26	66–76	251–271	9–10	21–25
		9	111–127	166–190	10–13	23–27	74–84	258–278	5–6	22–26
	50°	4.5	114–130	224–248	19–22	22–26	79–89	263–283	11–12	23–27
		9	113–129	192–216	9–12	22–26	89–99	272–292	6–7	25–29
	60°	4.5	116–132	254–278	19–22	22–26	93–103	276–296	12–13	26–30
		9	114–130	221–245	9–12	22–26	105–115	288–308	7–8	29–33
	70°	4.5	117–133	287–311	18–21	21–25	109–119	291–311	14–15	29–33
		9	116–132	254–278	9–12	22–26	123–133	306–326	8–9	32–36
	80°	4.5	119–135	323–347	18–21	21–25	126–136	308–328	16–17	33–37
		9	117–133	291–315	9–12	21–25	144–154	325–345	8–9	36–40
	90°	4.5	120–136	363–387	17–20	20–24	144–154	326–346	17–18	37–41
		9	119–135	332–356	8–11	21–25	167–177	347–367	9–10	41–45
	100°	4.5	122–138	405–429	16–19	20–24	–	–	–	–
		9	121–137	376–400	8–11	20–24	–	–	–	–

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)
CF042	30°	6	–	–	–	–	55–65	255–279	7–8	19–23
		10.5	–	–	–	–	60–70	260–284	4–5	20–24
	40°	6	109–125	202–226	17–20	22–26	67–77	268–292	8–9	21–25
		10.5	107–123	173–197	10–13	22–26	73–83	275–299	5–6	23–27
	50°	6	110–126	229–253	17–20	21–25	80–90	282–306	10–11	24–28
		10.5	109–125	199–223	9–12	22–26	88–98	291–315	6–7	26–30
	60°	6	112–128	258–282	16–19	21–25	94–104	298–322	11–12	27–31
		10.5	110–126	228–252	9–12	21–25	104–114	310–334	7–8	30–34
	70°	6	113–129	291–315	16–19	21–25	143–153	353–377	1–2	37–41
		10.5	112–128	260–284	9–12	21–25	123–133	330–354	8–9	33–37
	80°	6	115–131	328–352	15–18	20–24	128–138	336–360	14–15	34–38
		10.5	114–130	296–320	9–12	21–25	143–153	353–377	9–10	37–41
	90°	6	117–133	368–392	15–18	20–24	148–158	358–382	16–17	38–42
		10.5	115–131	337–361	8–11	20–24	166–176	378–402	9–10	42–46
	100°	6	118–134	411–435	14–17	19–23	–	–	–	–
		10.5	117–133	381–405	8–11	20–24	–	–	–	–
CF048	30°	8	–	–	–	–	54–74	268–288	6–7	20–24
		12	–	–	–	–	57–77	272–292	4–5	20–24
	40°	8	105–121	183–203	14–17	21–24	67–87	283–303	8–9	23–27
		12	104–120	169–189	9–12	22–26	71–91	288–308	5–6	24–28
	50°	8	106–122	210–230	14–17	21–25	81–101	300–320	9–10	26–30
		12	106–122	196–216	9–12	21–25	86–106	306–326	6–7	27–31
	60°	8	108–124	241–261	14–17	21–25	97–117	319–339	10–11	29–33
		12	108–124	227–247	9–12	21–25	104–124	327–347	7–8	31–35
	70°	8	110–126	275–295	13–16	20–24	115–135	340–360	11–12	33–37
		12	109–125	261–281	9–12	20–24	123–143	350–370	8–9	35–39
	80°	8	112–128	313–333	13–16	20–24	134–154	364–384	13–14	37–41
		12	111–127	300–320	8–11	20–24	145–165	376–396	9–10	39–43
	90°	8	113–129	354–374	12–15	19–23	156–176	390–410	14–15	41–45
		12	113–129	342–362	8–11	20–24	169–189	404–424	10–11	43–47
	100°	8	115–131	399–419	12–15	19–23	–	–	–	–
		12	115–131	388–408	8–11	19–23	–	–	–	–

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)
CF060	30°	10	–	–	–	–	49–65	217–274	5–7	18–22
		15	–	–	–	–	53–69	219–277	4–5	18–23
	40°	10	106–131	185–224	14–20	22–26	60–78	225–287	7–8	21–25
		15	106–130	171–207	10–13	22–26	63–82	228–291	5–6	21–26
	50°	10	107–133	209–255	13–19	22–26	71–92	235–301	8–9	23–28
		15	107–132	196–239	9–12	22–27	75–97	239–307	5–6	23–29
	60°	10	108–135	237–290	13–19	21–26	84–107	247–318	9–11	25–31
		15	109–134	223–273	9–13	22–26	89–114	251–324	6–7	27–33
	70°	10	110–137	268–329	13–19	21–25	98–125	260–336	10–12	29–35
		15	110–136	254–311	8–13	21–25	105–133	266–344	7–8	30–37
	80°	10	111–139	302–370	12–18	21–25	115–144	275–355	11–14	32–39
		15	112–138	209–353	9–12	21–25	123–154	282–365	8–10	34–41
	90°	10	113–141	339–415	12–18	20–24	134–166	291–377	12–15	35–43
		15	113–140	328–398	8–11	20–24	144–178	301–388	9–11	38–46
	100°	10	114–143	381–464	12–16	20–24	–	–	–	–
		15	115–142	370–447	8–11	20–24	–	–	–	–
CF070	30°	10	–	–	–	–	54–70	248–305	6–8	22–26
		17	–	–	–	–	58–74	253–311	4–5	22–27
	40°	10	100–126	194–234	16–20	22–27	66–84	262–324	8–9	25–29
		17	99–124	174–212	9–13	23–28	71–90	268–331	5–6	26–31
	50°	10	101–128	217–265	15–20	22–27	79–100	279–345	10–11	28–33
		17	101–127	198–243	9–12	22–27	85–107	286–354	6–7	29–35
	60°	10	103–130	244–300	15–20	22–26	94–117	297–368	11–13	31–37
		17	102–129	225–277	8–13	22–26	101–126	307–380	7–8	33–39
	70°	10	104–132	275–337	15–19	21–26	110–137	318–394	12–14	35–41
		17	103–130	256–315	8–13	21–26	120–148	331–409	8–9	37–44
	80°	10	105–133	309–378	14–19	21–25	130–159	343–423	13–16	39–46
		17	105–133	290–356	8–11	21–26	141–172	357–440	8–10	42–49
	90°	10	107–136	346–424	14–18	21–25	153–185	370–456	14–17	44–52
		17	106–134	329–401	8–11	21–25	165–199	386–473	9–11	46–54
	100°	10	108–138	388–472	13–18	20–24	–	–	–	–
		17	108–137	372–451	8–11	20–24	–	–	–	–

Table 20 Operating Temperatures and Pressures

20.2 Water-Side Pressure Drop Table

Model	Water Flow Rate (GPM)	Water-Side Pressure Drop without Internal Valve (PSI)	Water-Side Pressure Drop with Internal Valve (PSI)
CF007	0.8	0.4	0.6
	1.1	0.7	1.0
	1.5	1.1	1.5
	2.0	1.8	2.3
CF009	1.1	1.1	1.3
	1.7	2.1	2.4
	2.3	3.4	3.8
	3.0	5.6	6.2
CF012	1.5	1.2	1.4
	2.3	2.6	3.1
	3.8	4.3	4.9
	5.0	7.1	7.9
CF015	1.9	1.3	1.6
	2.8	2.6	3.1
	3.8	4.3	4.9
	5.0	7.1	7.9
CF018	2.3	0.9	1.4
	3.4	1.9	2.6
	4.5	3.1	4.0
	6.0	5.1	6.4
CF024	3.0	1.1	1.2
	4.5	2.2	2.3
	6.0	3.6	3.8
	8.0	6.0	6.2
CF030	3.8	1.6	1.7
	5.6	3.3	3.4
	7.5	5.4	5.6
	10.0	8.9	9.1
CF036	4.5	2.2	2.3
	6.8	4.4	4.6
	9.0	7.2	7.5
	12.0	11.9	12.3
CF042	5.3	2.0	2.2
	7.9	4.1	4.3
	10.5	6.7	7.0
	14.0	11.0	11.5
CF048	6.0	1.2	1.4
	9.0	2.4	2.7
	12.0	4.0	4.4
	16.0	6.6	7.1
CF060	7.5	1.8	1.9
	11.3	3.7	3.8
	15.0	6.1	6.3
	20.0	10.1	10.4
CF070	9.0	2.5	2.6
	13.5	5.1	5.3
	18.0	8.4	8.7
	24.0	14.0	14.4
Note: All values are based upon pure water at 70° F.			

Table 21 Water-Side Pressure Drop Table

20.3 Compressor Characteristics

Model	Voltage Code	Cold Winding Resistance Values (+/-7%)					Run Capacitor (μF/V)
		Single Phase		Three Phase			
		R-C	S-C	T1–T2	T2–T3	T3–T1	
CF007	208–230/1/160	5.50	6.64	–	–	–	15μF/370V
	265/1/60	7.84	5.59	–	–	–	15μF/440V
CF009	208–230/1/60	3.78	2.91	–	–	–	25μF/370V
	265/1/60	4.30	4.27	–	–	–	20μF/440V
CF012	208–230/1/60	2.84	1.96	–	–	–	35μF/370V
	265/1/60	3.67	2.96	–	–	–	30μF/440V
CF015	208–230/1/60	2.60	2.28	–	–	–	40μF/370V
	265/1/60	3.04	3.18	–	–	–	30μF/440V
CF018	208–230/1/60	1.97	1.42	–	–	–	50μF/440V
	265/1/60	2.54	1.87	–	–	–	30μF/440V
CF024	208–230/1/60	1.18	1.61	–	–	–	55μF/440V
	265/1/60	2.44	2.23	–	–	–	40μF/440V
	208–230/3/60	–	–	1.59			–
	460/3/60	–	–	6.079			–
CF030	208–230/1/60	1.110	1.060	–	–	–	60μF/440V
	265/1/60	1.176	1.661	–	–	–	35μF/440V
	208–230/3/60	–	–	1.423			–
	460/3/60	–	–	4.565			–
CF036	208–230/1/60	0.719	1.431	–	–	–	40μF/370V
	265/1/60	0.888	1.342	–	–	–	45μF/370V
	208–230/3/60	–	–	0.975			–
	460/3/60	–	–	4.266			–
CF042	208–230/1/60	0.568	1.636	–	–	–	45μF/370V
	265/1/60	0.665	1.539	–	–	–	40μF/370V
	208–230/3/60	–	–	1.117			–
	460/3/60	–	–	4.404			–
CF048	208-230/1/60	0.518	1.603	–	–	–	45μF/370V
	208–230/3/60	–	–	0.796	0.975	0.796	–
	460/3/60	–	–	4.404			–
	575/3/60	–	–	5.613			–
CF060	208–230/1/60	0.356	0.727	–			70μF/370V
	208–230/3/60	–	–	0.629	0.772	0.629	–
	460/3/60	–	–	3.44			–
	575/3/60	–	–	4.91	3.75	4.91	–
CF070	208–230/1/60	0.336	0.921	–	–	–	80μF/370V
	208–230/3/60	–	–	0.542			–
	460/3/60	–	–	2.161			–
	575/3/60	–	–	4.91	3.75	4.91	–

Table 22 Compressor Characteristics

20.4 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
CF007 HZ	lbs.	144.0	39.6	35.4	32.2	36.8	35.4	39.6	36.8	32.2
	kg.	65.3	18.0	16.1	14.6	16.7	16.1	18.0	16.7	14.6
CF009 HZ	lbs.	136.6	42.4	33.4	28.2	32.6	33.4	42.4	32.6	28.2
	kg.	62.0	19.2	15.1	12.8	14.8	15.1	19.2	14.8	12.8
CF012 HZ	lbs.	153.0	42.4	38.4	33.8	38.4	38.4	42.4	38.4	33.8
	kg.	69.4	19.2	17.4	15.3	17.4	17.4	19.2	17.4	15.3
CF015 HZ	lbs.	155.0	44.6	38.2	33.8	38.4	38.2	44.6	38.4	33.8
	kg.	70.3	20.2	17.3	15.3	17.4	17.3	20.2	17.4	15.3
CF018 HZ	lbs.	173.0	51.8	41.0	37.2	43.0	41.0	51.8	43.0	37.2
	kg.	78.5	23.5	18.6	16.9	19.5	18.6	23.5	19.5	16.9
CF024 HZ	lbs.	193.8	47.2	62.2	47.2	37.2	62.2	47.2	37.2	47.2
	kg.	87.9	21.4	28.2	21.4	16.9	28.2	21.4	16.9	21.4
CF030 HZ	lbs.	204.2	50.4	61.6	54.0	38.2	61.6	50.4	38.2	54.0
	kg.	92.6	22.9	27.9	24.5	17.3	27.9	22.9	17.3	24.5
CF036 HZ	lbs.	205.2	61.6	46.6	40.6	56.4	46.6	61.6	56.4	40.6
	kg.	93.1	27.9	21.1	18.4	25.6	21.1	27.9	25.6	18.4
CF042 HZ	lbs.	281.0	70.4	88.0	78.0	44.6	88.0	70.4	44.6	78.0
	kg.	127.5	31.9	39.9	35.4	20.2	39.9	31.9	20.2	35.4
CF048 HZ	lbs.	292.0	77.0	89.8	75.6	49.6	89.8	77.0	49.6	75.6
	kg.	132.4	34.9	40.7	34.3	22.5	40.7	34.9	22.5	34.3
CF060 HZ	lbs.	324.2	96.7	91.9	71.1	64.7	91.9	96.7	64.7	71.1
	kg.	147.1	43.8	41.7	32.2	29.3	41.7	43.8	29.3	32.2
CF070 HZ	lbs.	320.6	108.4	87.2	51.4	73.6	87.2	108.4	73.6	51.4
	kg.	145.4	49.2	39.6	23.3	33.4	39.6	49.2	33.4	23.3
*The front is the control box end of the unit.										

Table 23 Corner Weights (HZ)

20.5 Model 24 Thermistor (Freeze Sensor) Test Values

Temperature (°F)	Resistance
-35	280.1K
-30	324.1K
-25	196.3K
-20	165.1K
-15	139.3K
-10	118.0K
-5	100.2K
0	85.35K
5	72.91K
10	62.48K
15	53.64K
20	46.23K
25	39.91K
30	34.56K
35	30.00K
40	26.10K
45	22.76K
50	19.90K
55	17.44K
60	15.31K
65	13.48K
70	11.88K
75	10.50K
80	9298
85	8250
90	7331
95	6532
100	5826
105	5209
110	4663
115	4182
120	3757
125	3381
130	3047
135	2750
140	2486
145	2251
150	2041
155	1854
160	1686
165	1535
170	1400
175	1278
180	1168
185	1070
190	980.5
195	899.6
200	826.8
205	760.7
210	700.7
215	646.1
220	596.4
225	551.5
230	510.2
235	472.5
240	438.3

Table 24 Model 24 Thermistor (Freeze Sensor) Test Values

21 Wiring Diagrams

21.1 Two-Stage, Single-Phase, Standard Unit with Constant Torque (CT) Motor

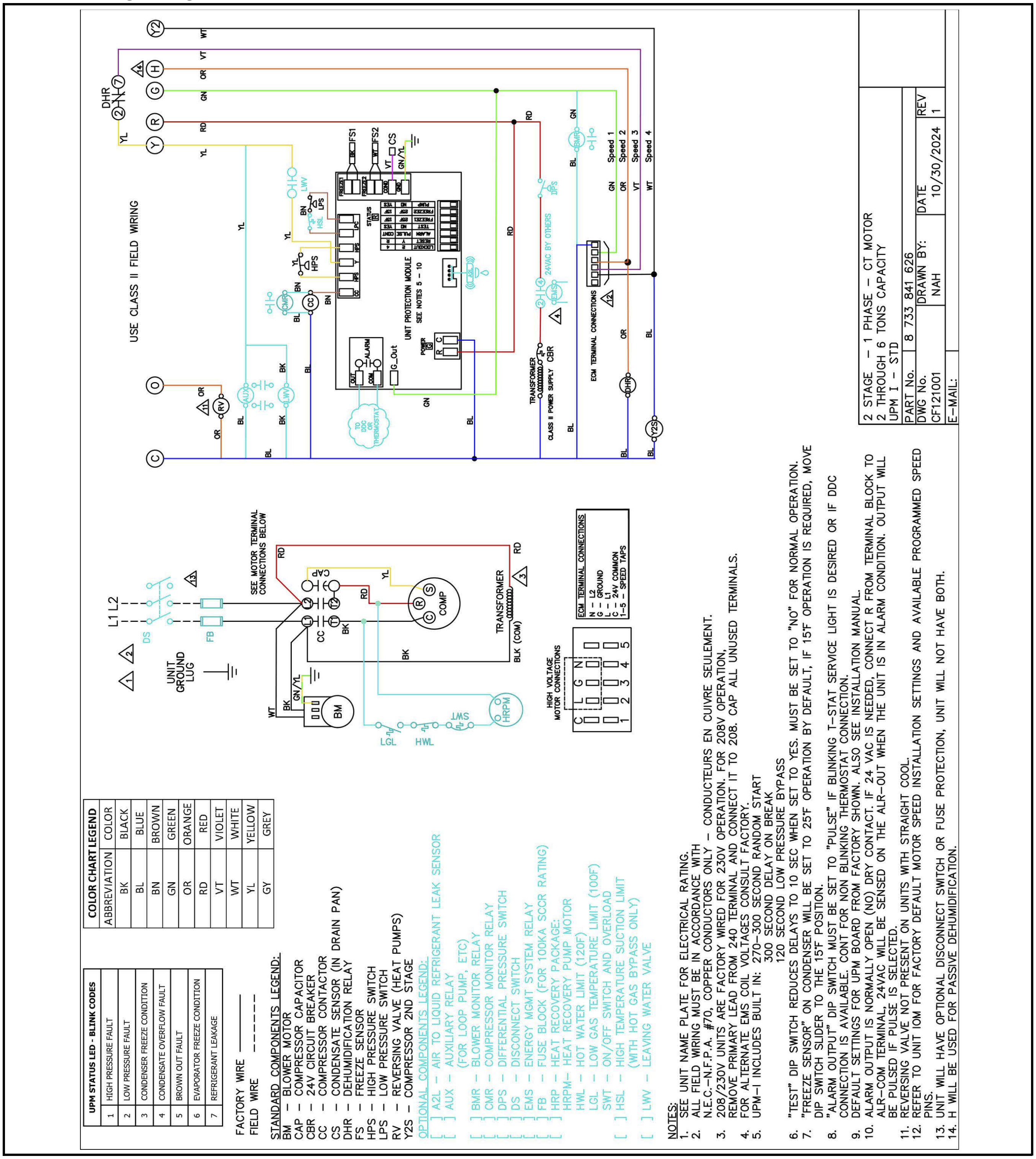

Fig. 29 Two-Stage, Single-Phase, Standard Unit with CT Motor

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

21.2 Two-Stage, Single-Phase, Standard Unit with Constant Airflow (CA) Motor

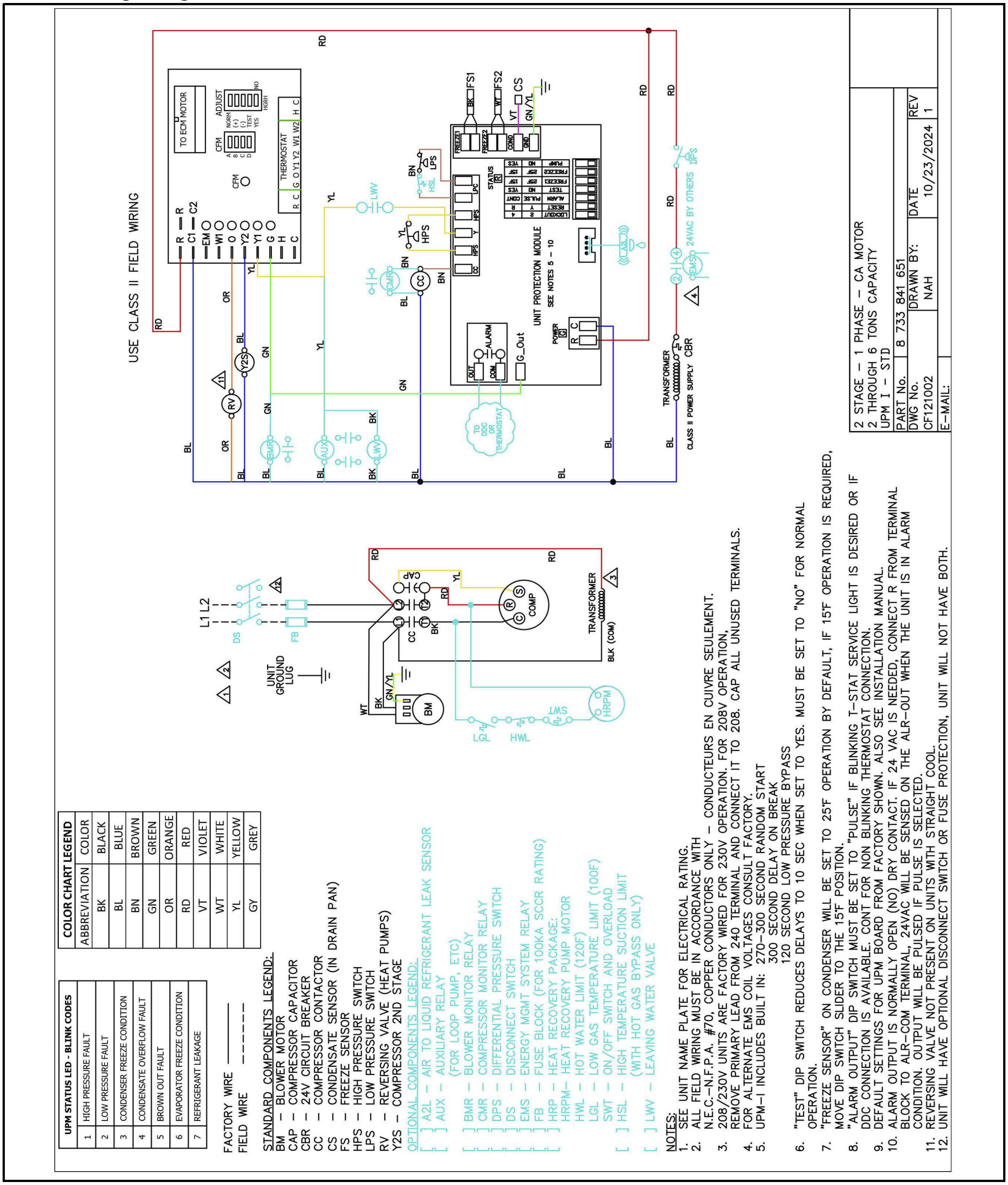

Fig. 30 Two-Stage, Single-Phase, Standard Unit with CA Motor

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

21.3 Two-Stage, Single-Phase Unit with Optional Components and CT Motor

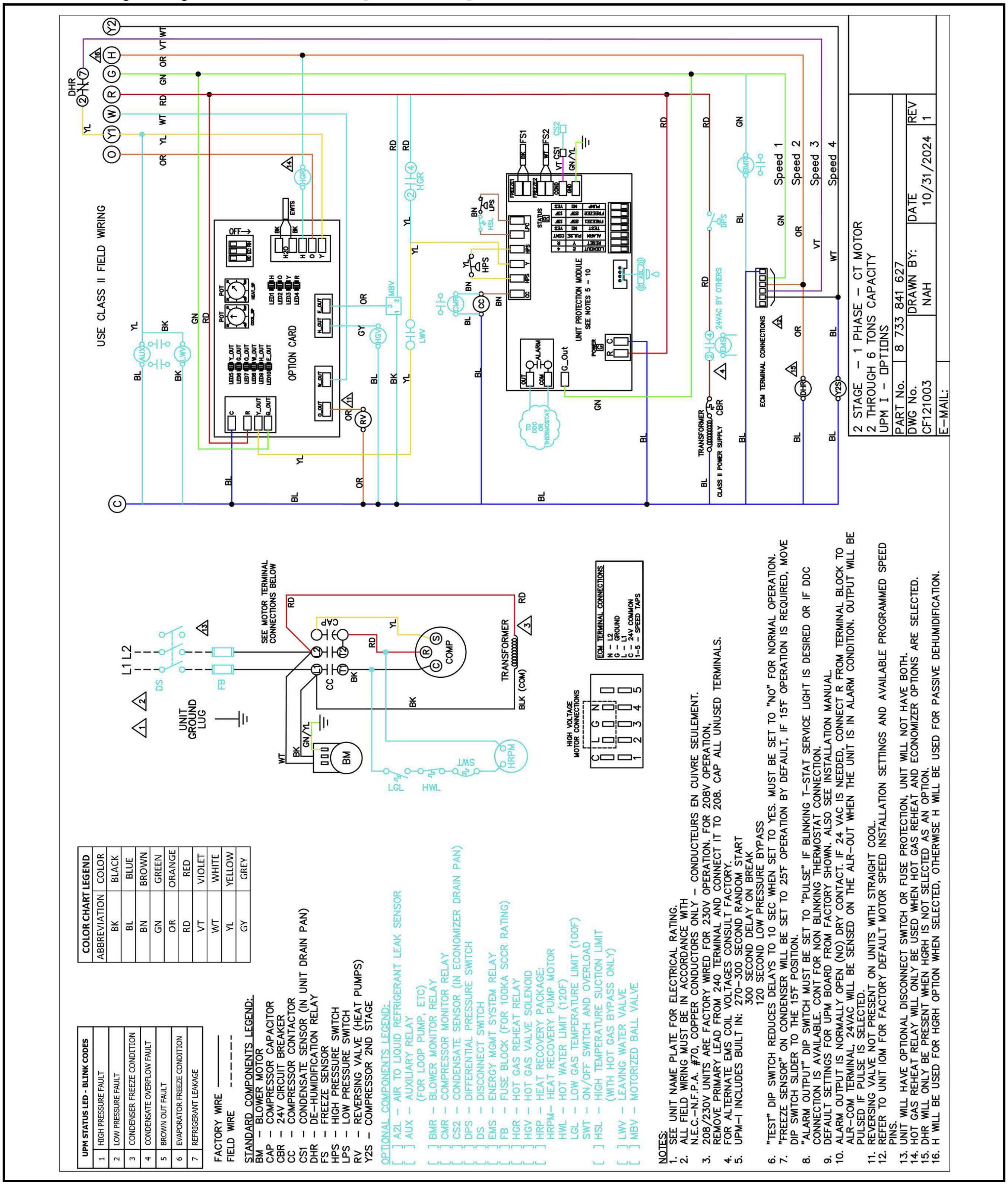

Fig. 31 Two-Stage, Single-Phase Unit with Optional Components and CT Motor

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

21.4 Two-Stage, Single-Phase Unit with Optional Components and CA Motor

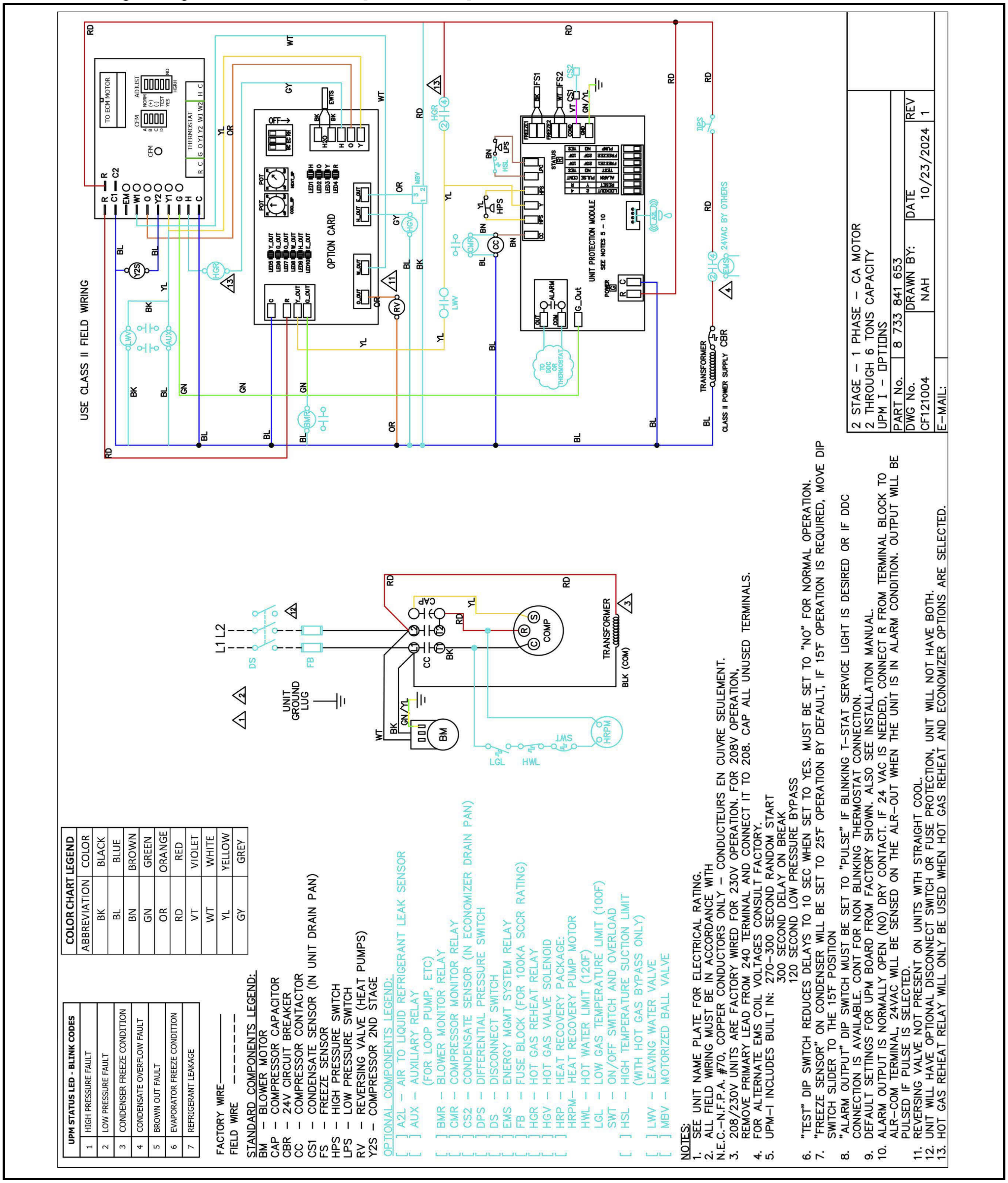

Fig. 32 Two-Stage, Single-Phase Unit with Optional Components and CA Motor

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

21.5 Two-Stage, Single-Phase Unit with CT Motor and Electric Heat

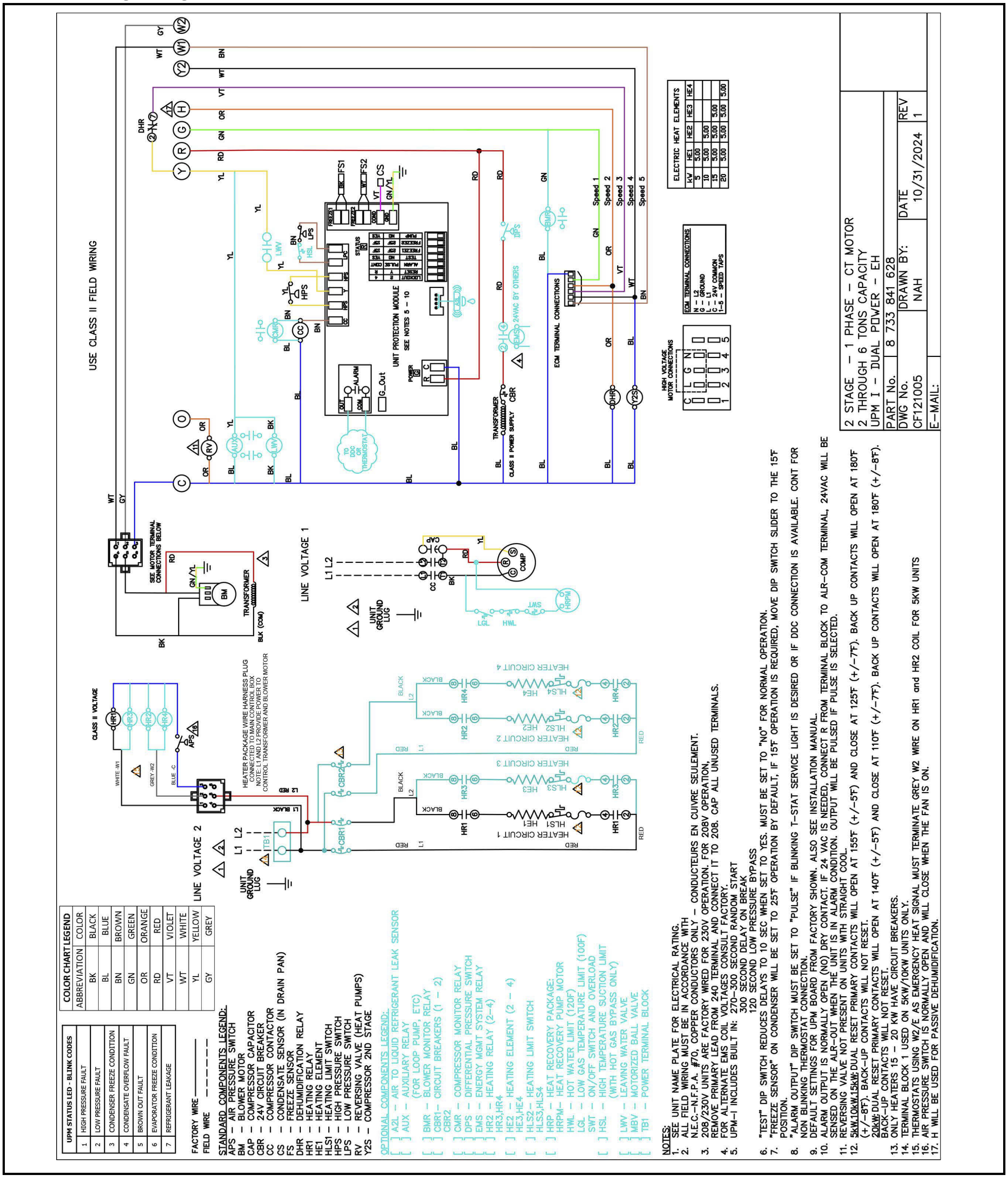

Fig. 33 Two-Stage, Single-Phase Unit with CT Motor and Electric Heat

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

21.6 Two-Stage, Single-Phase Unit with CA Motor and Electric Heat

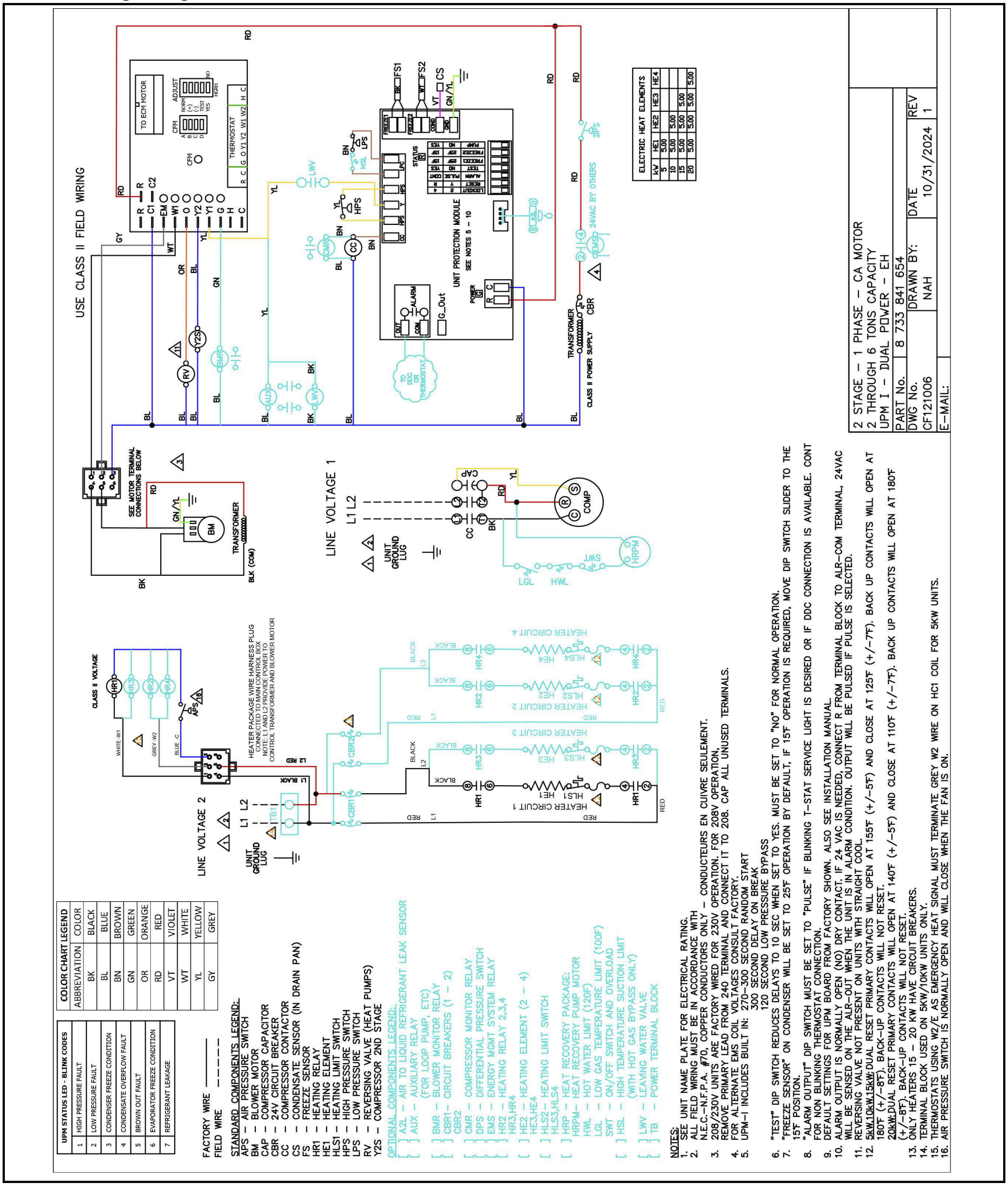

Fig. 34 Two-Stage, Single-Phase Unit with CA Motor and Electric Heat

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

21.7 Two-Stage, Single-Phase Unit with Optional Components, CT Motor, and Electric Heat

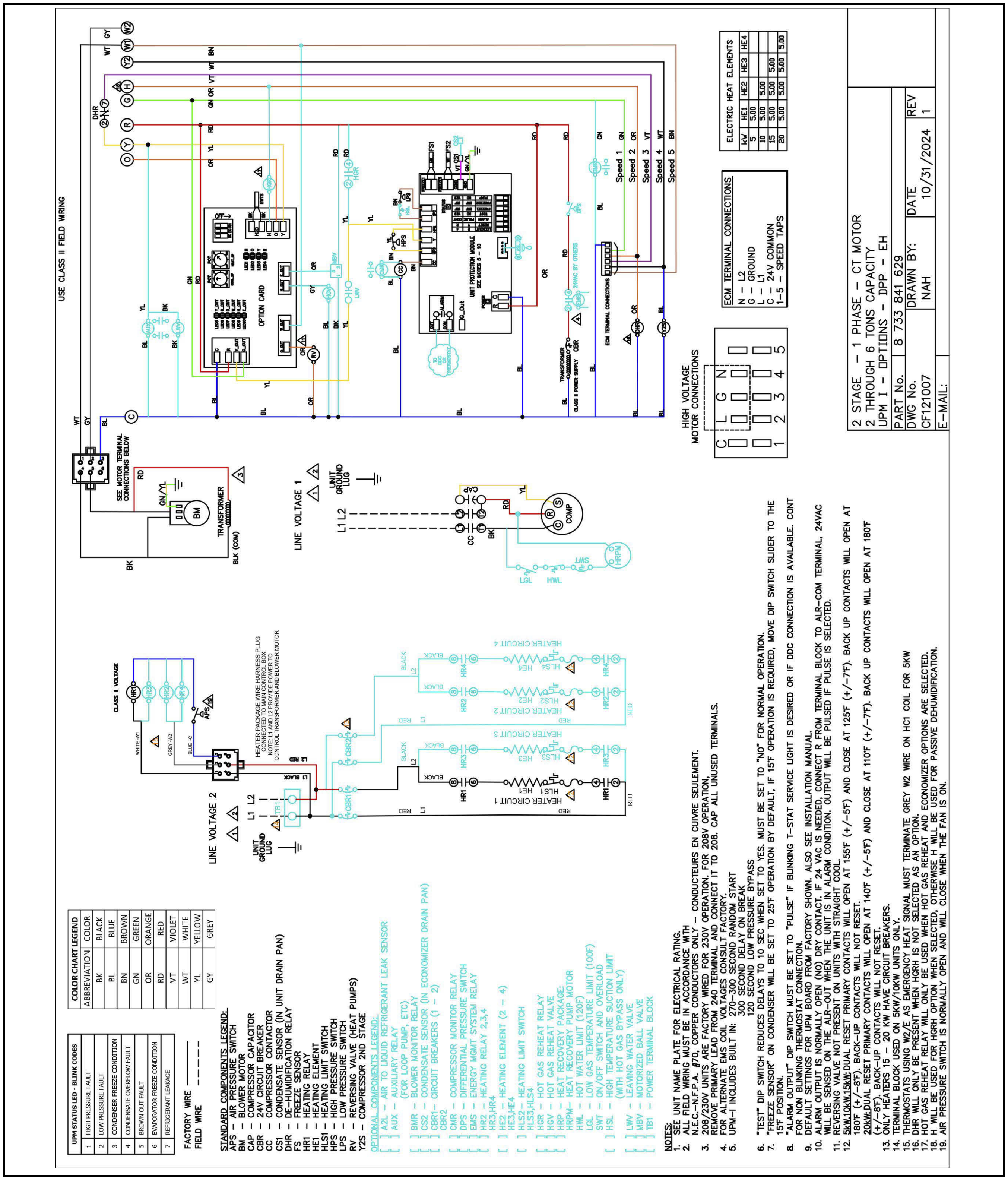

Fig. 35 Two-Stage, Single-Phase Unit with Optional Components, CT Motor, and Electric Heat

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

21.8 Two-Stage, Single-Phase Unit with Optional Components, CA Motor, and Electric Heat

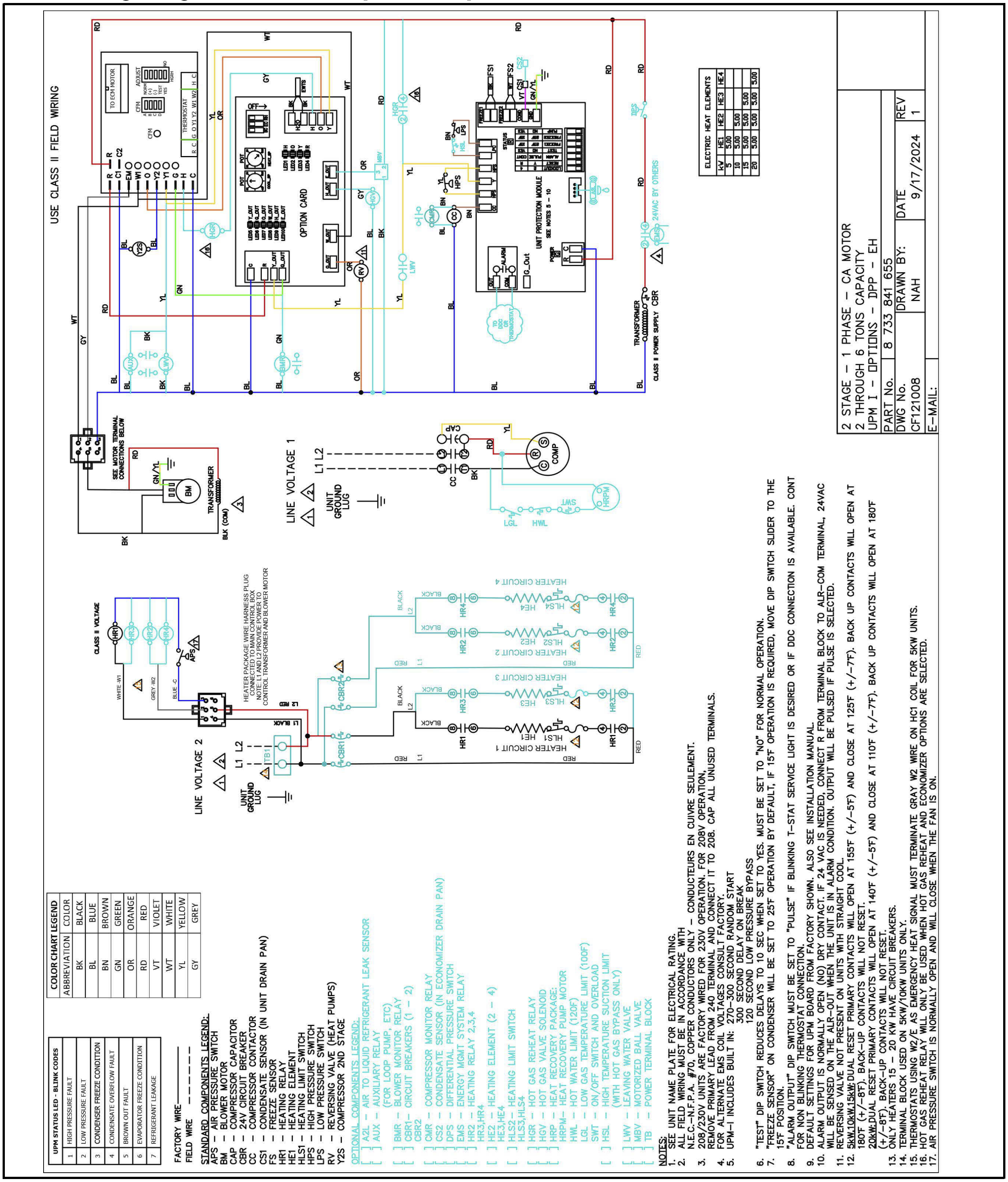

Fig. 36 Two-Stage, Single-Phase Unit with Optional Components, CA Motor, and Electric Heat

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

21.9 Two-Stage, Three-Phase, Standard Unit with CT Motor

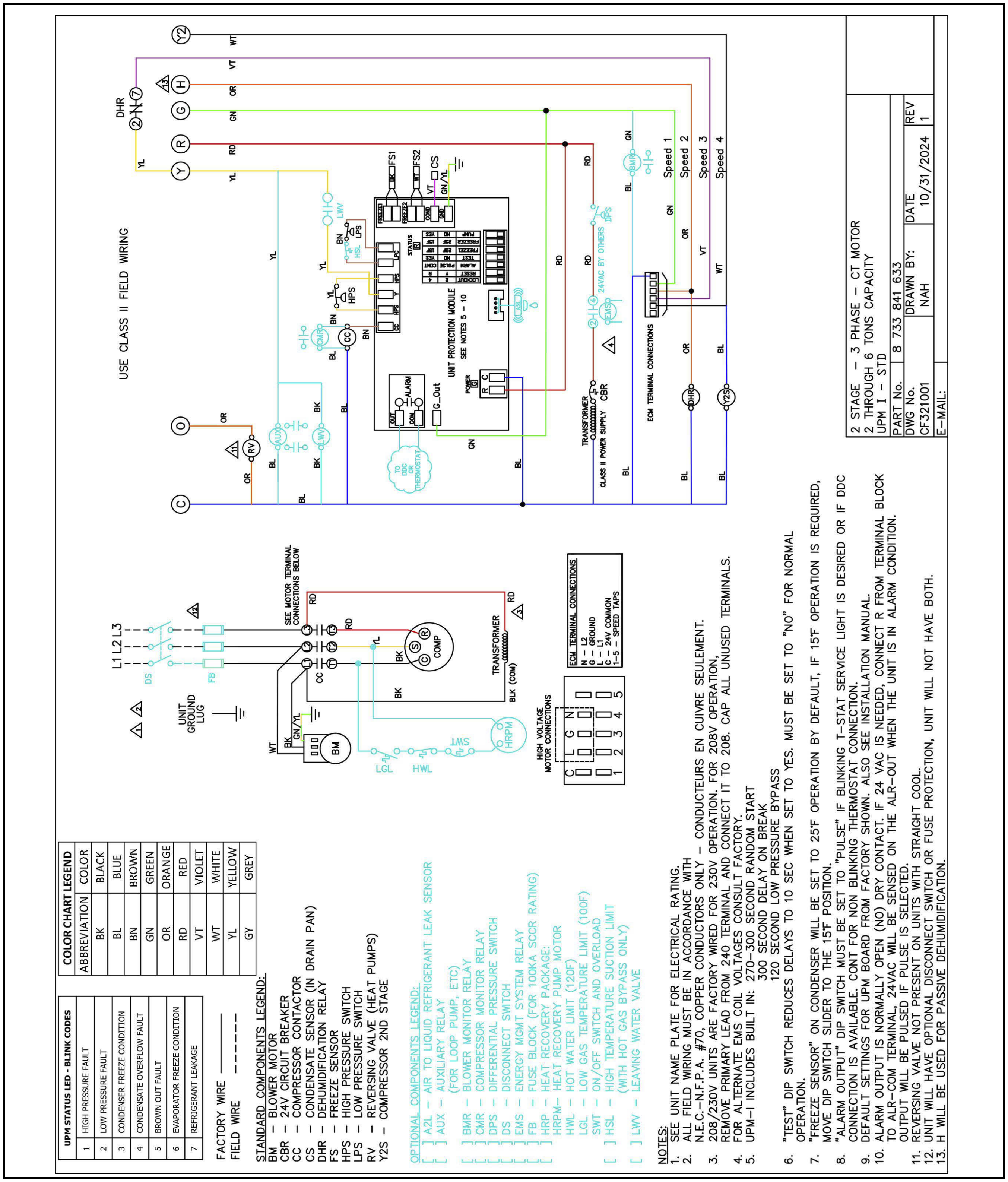

Fig. 37 Two-Stage, Three-Phase, Standard Unit with CT Motor

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

21.10 Two-Stage, Three-Phase, Standard Unit with CA Motor

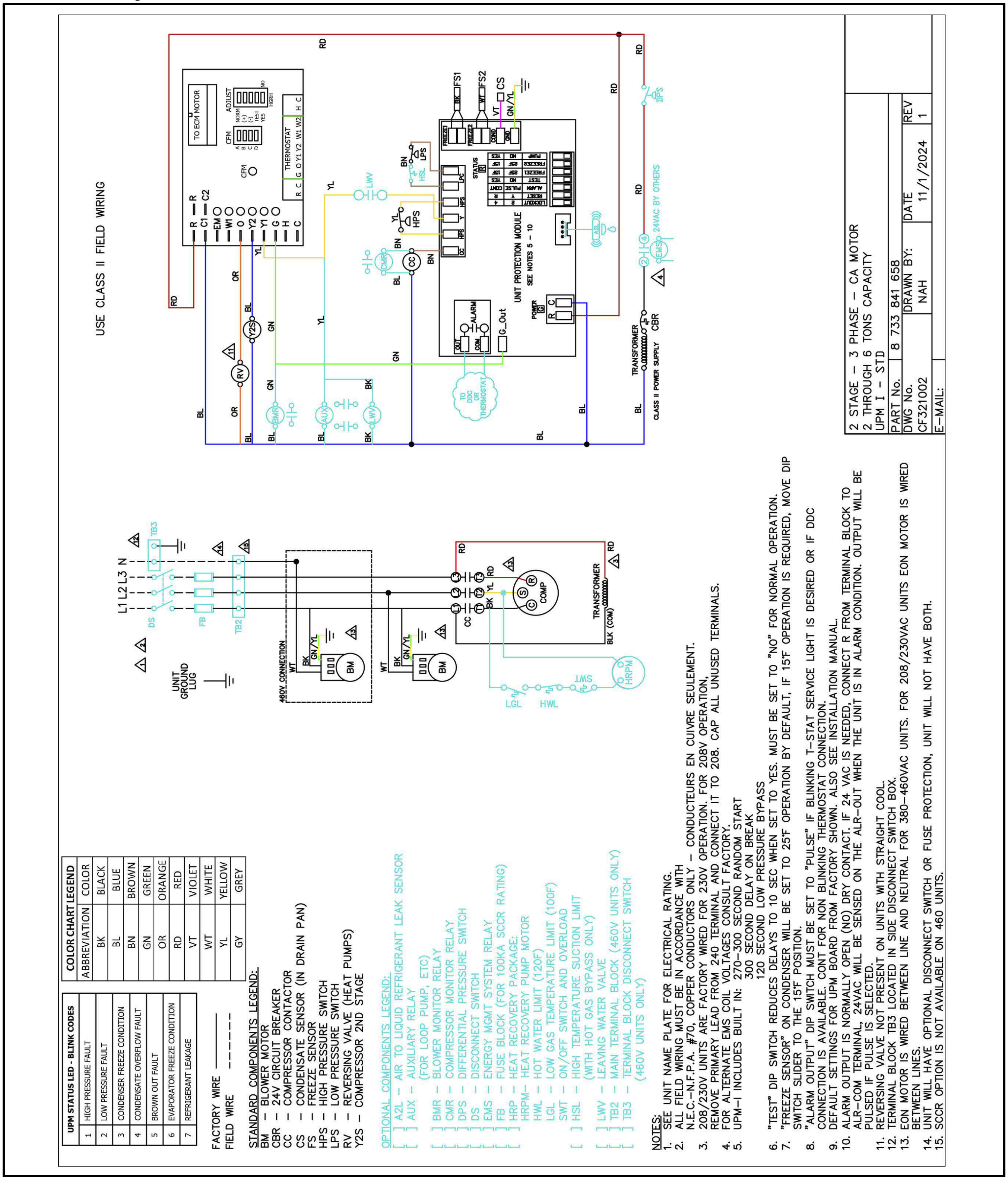

Fig. 38 Two-Stage, Three-Phase, Standard Unit with CA Motor

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

21.11 Two-Stage, Three-Phase Unit with Optional Components and CT Motor

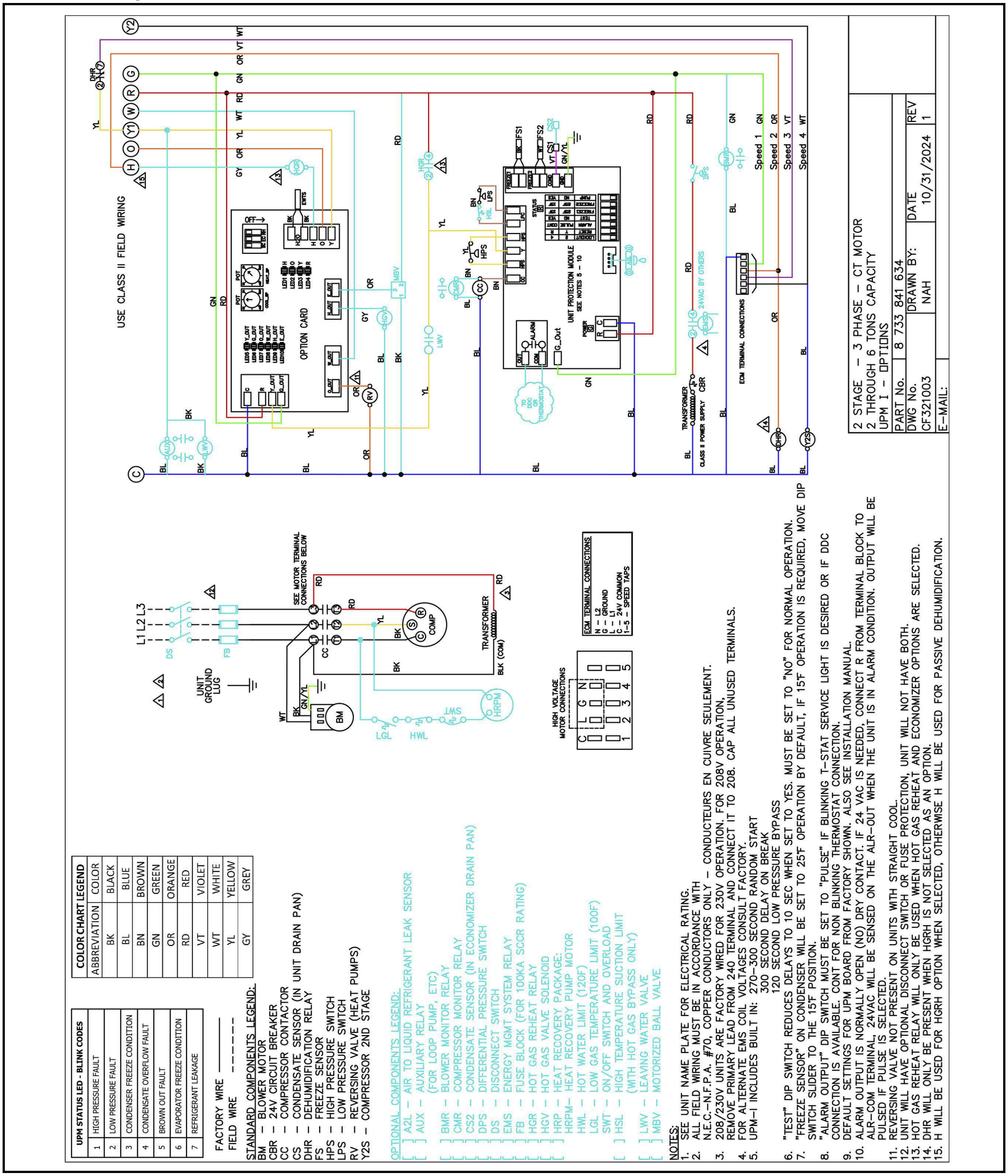

Fig. 39 Two-Stage, Three-Phase Unit with Optional Components with CT Motor

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

21.12 Two-Stage, Three-Phase Unit with Optional Components and CA Motor

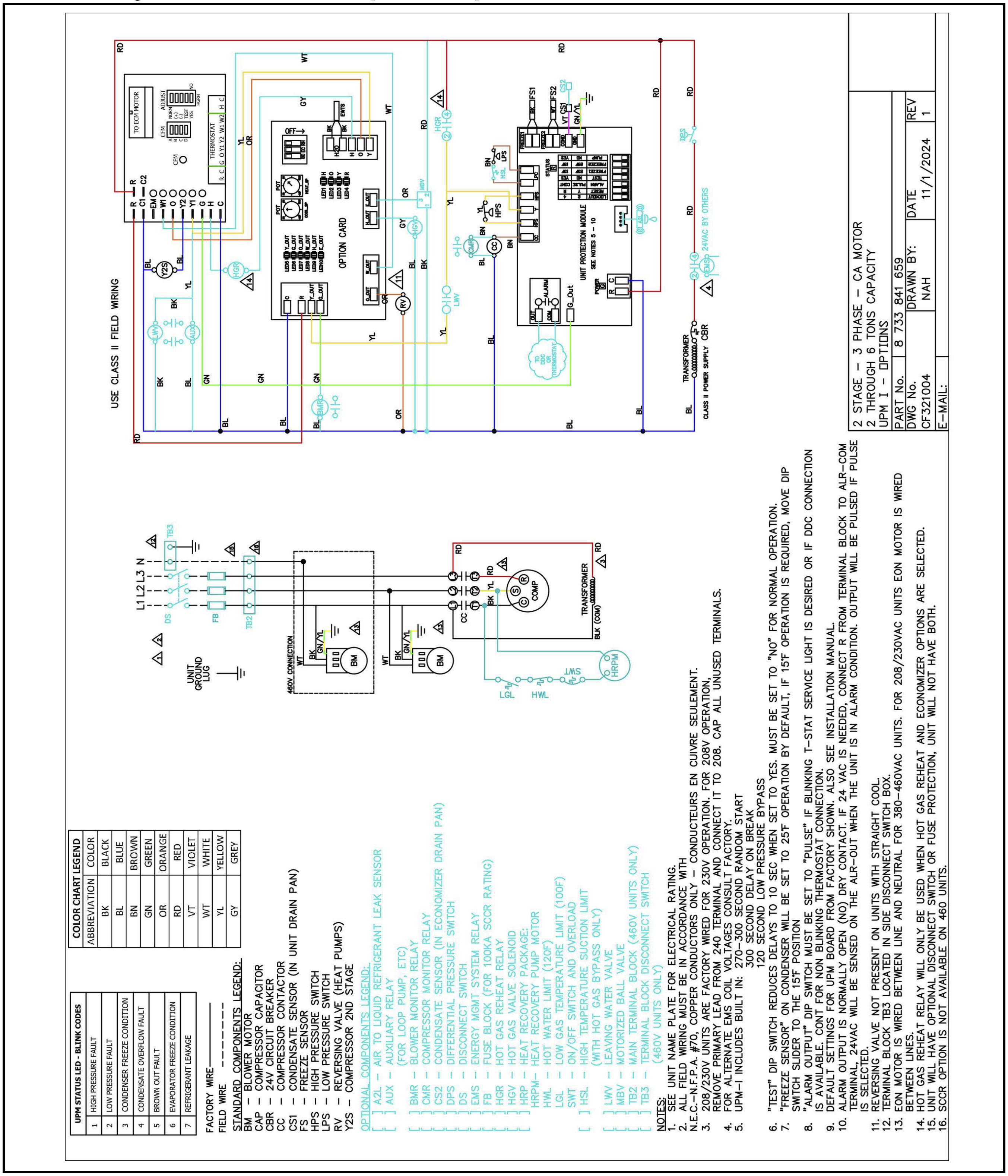

Fig. 40 Two-Stage, Three-Phase Unit with Optional Components with CA Motor

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

22 Dimensional Drawings

22.1 Vertical (VT) Unit Dimensions

Model		CF007	CF009	CF012	CF015	CF018	CF024	CF030	CF036	CF042	CF048	CF060	CF070
Condensate Drain Connection		3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT
Recommended Replacement Nominal Filter Size		17" x 19"	17" x 19"	17" x 19"	17" x 19"	18" x 22"	18" x 22"	19" x 27"	24" x 30"	24" x 30"	24" x 30"	18" x 30" (2 Filters)	18" x 30" (2 Filters)
Condenser Water Connections		3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	1" FPT	1" FPT	1" FPT
A	Width	21.5"	21.5"	21.5"	21.5"	21.5"	21.5"	21.5"	21.5"	24"	24"	24"	24"
B	Depth	21.5"	21.5"	21.5"	21.5"	21.5"	21.5"	21.5"	26"	26"	26"	33"	33"
C	Height	33"	33"	33"	33"	39"	39"	39"	44"	44"	44"	51"	51"
D	Discharge Depth	4"	4"	4"	9.5"	9.5"	9.5"	10.5"	10.5"	10.5"	10.5"	12.5"	12.5"
E	Discharge Width	6.75"	6.75"	6.75"	9.25"	9.25"	9.25"	9.75"	9.75"	10.5"	10.5"	11.75"	11.75"
F	Cabinet Edge to Discharge	7.25"	7.25"	7.25"	4.25"	4.25"	4.25"	2.25"	5.75"	5"	5"	9"	9"
G	Cabinet Edge to Discharge (Left-Hand Return)	7.5"	7.5"	7.5"	6.25"	6.25"	6.25"	6.25"	5.5"	6.75"	6.75"	6.25"	6.25"
H	Water Inlet	3.5"	3.5"	3.5"	3"	3.25"	3.25"	3.25"	3.25"	3.25"	3.25"	3"	3"
J	Water Outlet	8.5"	8.5"	8.5"	8.5"	8.5"	8.5"	8.5"	8.5"	8.5"	8.5"	8.25"	8.25"
K	Condensate Drain	5.75"	5.75"	5.75"	5.75"	6"	6.25"	5.84"	5.75"	5.75"	5.75"	5.75"	5.5"
M	R/A Duct Width	17.5"	17.5"	17.5"	17.5"	18"	18"	16.25"	24"	23.75"	23.75"	27.25"	27.25"
N	R/A Duct Flange Height	15"	15"	15"	15"	20"	20"	24.75"	28"	28"	28"	34"	34"
P	Filter Rack Height	17.25"	17.25"	17.25"	17.25"	22.25"	22.25"	22.25"	30"	31.25"	31.25"	37.25"	37.25"
Q	Cabinet Edge to Discharge (Right-Hand Return)	7.5”	7.5”	7.5”	6.25"	6.25"	6.25"	6.25"	5.58"	6.75"	6.75"	6.25"	6.25"

Table 25 Vertical (VT) Unit Dimensions

- Specifications subject to change without notice.
- All dimensions within ±0.125".
- Overall unit dimensions do not include filter rack or duct flanges.

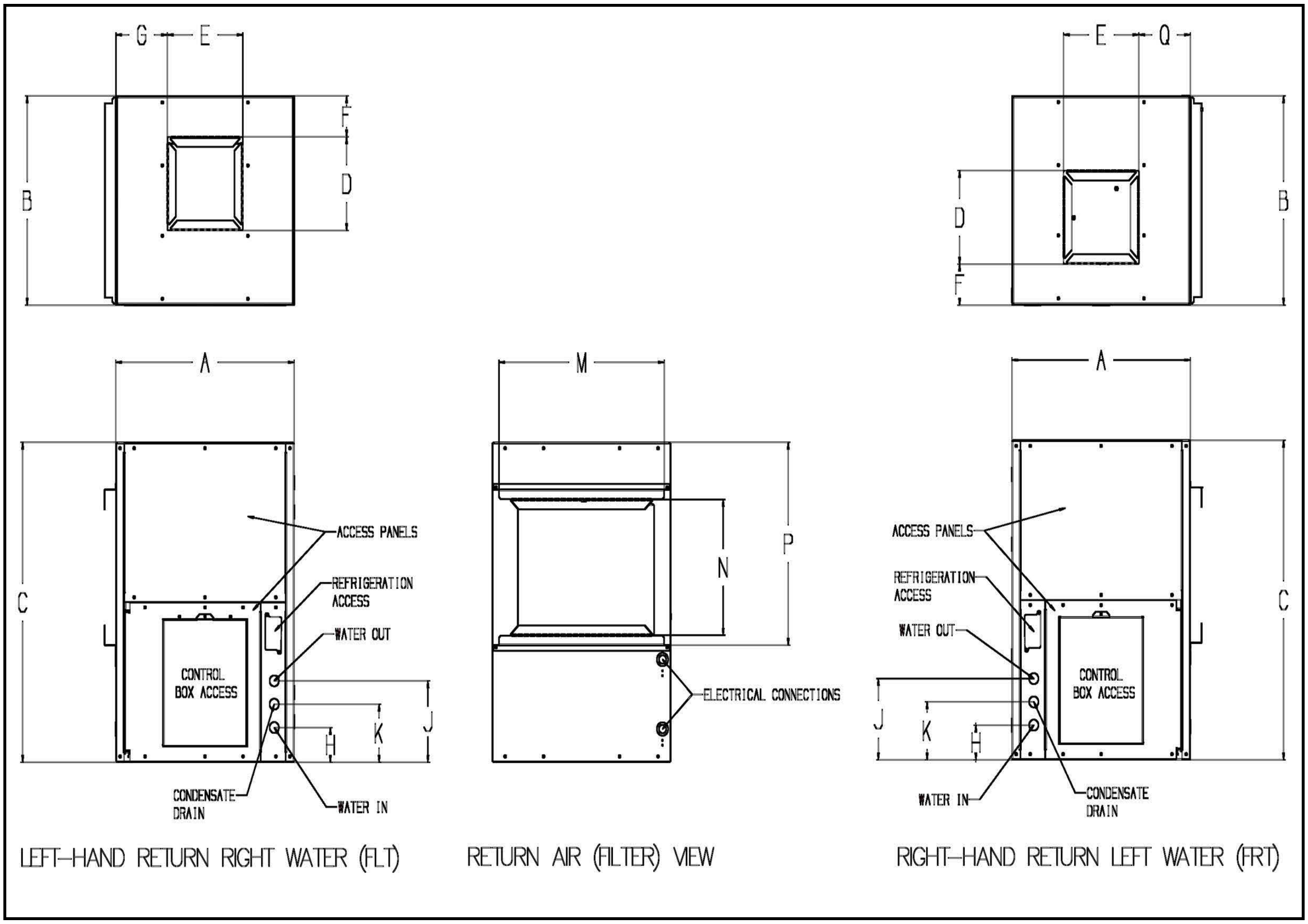

Fig. 41 Vertical (VT) Unit Drawings

22.2 Vertical (VT) Cabinet Options Dimensions

	Model		CF007	CF009	CF012	CF015	CF018	CF024	CF030	CF036	CF042	CF048	CF060	CF070
Economizer	AA	Cabinet+ Economizer Width (Left-Hand Return)	29.25”	29.25”	29.25”	29.25”	27”	27”	31”	31”	33.5”	33.5”	32”	31”
	BB	Cabinet+ Economizer Depth (Left-Hand Return)	26.5”	26.5”	26.5”	26.5”	26.25”	26.25”	26”	31.25”	31.25”	31.25”	38.75”	38.75”
	CC	Cabinet+ Economizer Width (Right-Hand Return)	28.75”	28.75”	28.75”	28.75”	29.5”	29.5”	30.5”	31”	33.5”	32.5”	32”	31”
	DD	Cabinet+ Economizer Depth (Right-Hand Return)	25.75”	25.75”	25.75”	25.75”	29.50”	29”	26.5”	31.5”	31.5”	30.5”	36.75”	36.75”
	EE	Economizer	3.75”	3.75”	3.75”	3.75”	3.75”	3.75”	4”	4”	4”	4”	4”	4”
	FF	Economizer Pipe	5”	5”	5”	5”	4”	4.75”	4.25”	4.25”	4.25”	4.25”	5.75”	4”
	GG	Economizer Drain	17”	17”	17”	17”	17.75”	17.75”	13.75”	14.75”	14.75”	14.75”	13.25”	13.25”
	HH	ECONO Valve (Right-Hand Return)	5.5”	5.5”	5.5”	5.5”	4.25”	4.25”	4.25”	7.25”	7.25”	7.25”	4”	4”
	II	ECONO Valve (Left-Hand Return)	12”	12”	12”	12”	12.75”	12.75”	10”	11”	11”	11”	9.5”	9.5”
Filter Racks Options	JJ	1" Filter Rack	1.25”	1.25”	1.25”	1.25”	1.25”	1.25”	1.25”	1.25”	1.25”	1.25”	1.25”	1.25”
	KK	2" Filter Rack	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”
	LL	4" Filter Rack	4.25”	4.25”	4.25”	4.25”	4.25”	4.25”	4.25”	4.25”	4.25”	4.25”	4.25”	4.25”
	MM	Filter Rack Height	16”	16”	16”	16”	17”	17”	13”	14”	14”	14”	12.75”	13.75”
	NN	R/A Duct Flange Height	15”	15”	15”	15”	20”	20”	24.75”	28”	28”	28”	34”	34”
	OO	R/A Duct Flange Width	16.75”	16.75”	16.75”	16.75”	16”	16”	16.25”	22”	22”	22”	27.25”	27.25”
Disconnect Switch	QQ	Disconnect Switch Width	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”
	RR	Disconnect Switch Depth	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”
	SS	Disconnect Switch Height	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”	2.75”	2.75”
DDC	TT	DDC Panel Width	9”	9”	9”	9”	9”	9”	9”	9”	9”	9”	9”	9”
	UU	DDC Panel Depth	3”	3”	3”	3”	3”	3”	3”	3”	3”	3”	3”	3”
	VV	DDC Panel Height	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	3”	3”
HRP	WW	HRP Inlet	N/A	N/A	N/A	N/A	N/A	4.75”	4.5”	4.5”	4.5”	4.5”	4.25”	4.25”
	YY	HRP Outlet	N/A	N/A	N/A	N/A	N/A	7.25”	7”	7”	7”	7”	6.75”	6.75”

Table 26 Vertical Cabinet Options Dimensions

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- Specifications subject to change without notice.
- All dimensions within ±0.125".
- Filter rack dimensions does not include 1" duct flange.
- 2" filter racks can accept either a 1" or 2" filter.
- 4" filter racks can accept either a 2" or 4" filte

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- Economizer Drains are 3/4" FNPT.
- HRP Connections are 1/2" FNPT.

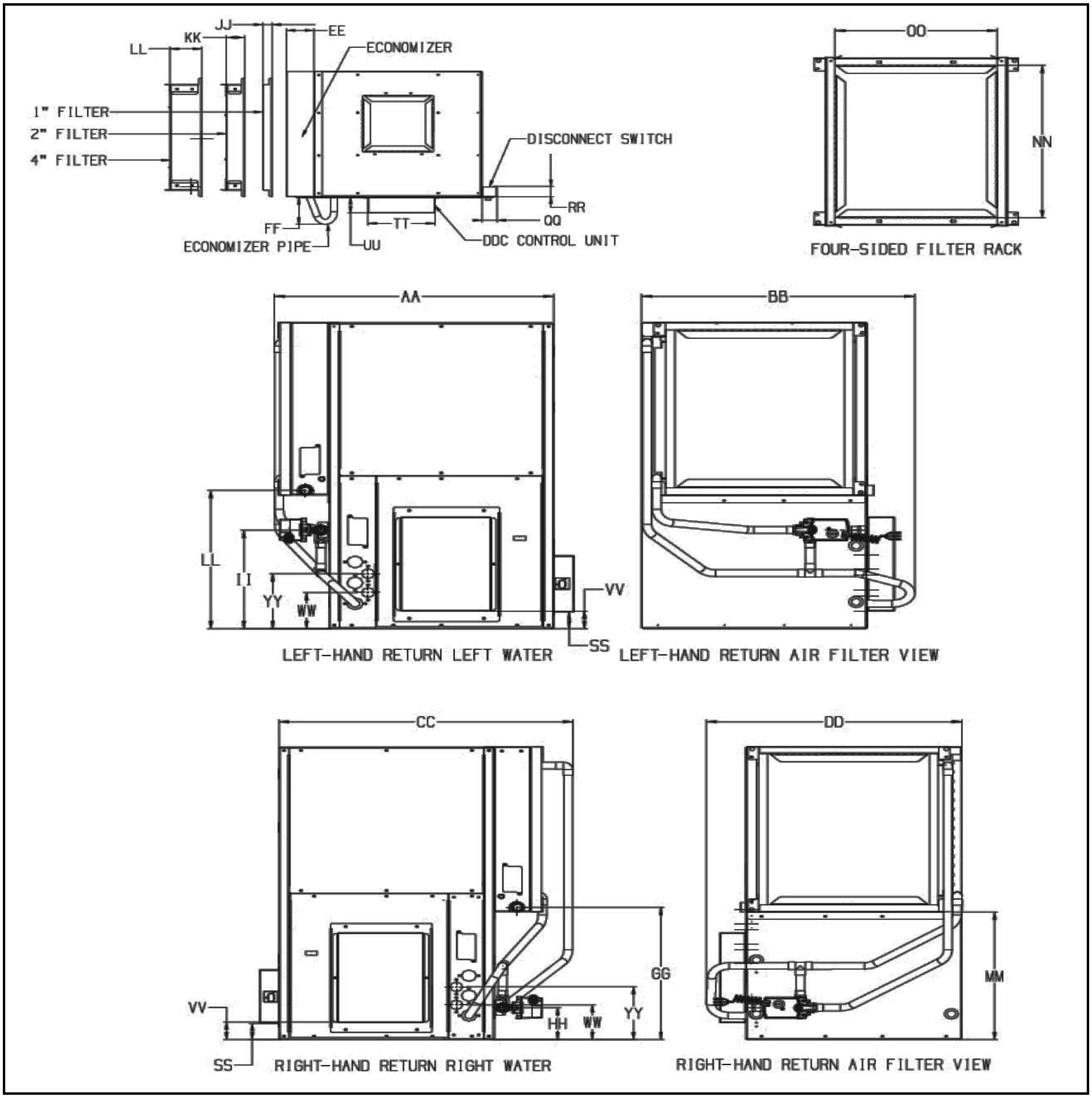

Fig. 42 Vertical Cabinet Options Drawing

22.3 Horizontal (HZ) Unit Dimensions

Model		CF007	CF009	CF012	CF015	CF018	CF024	CF030	CF036	CF042	CF048	CF060	CF070
Condensate Drain Connection		3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT
Recommended Replacement Nominal Filter Size		16" x 24"	16" x 24"	16" x 24"	16" x 24"	17" x 25"	17" x 25"	18" x 30"	18" x 30"	20" x 34"	20" x 34"	20" x 20" and 20" x 24"	20" x 24" (2 Filters)
Condenser Water Connections		3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	1" FPT	1" FPT	1" FPT
A	Width	21.5"	21.5"	21.5"	21.5"	21.5"	21.5"	21.5"	21.5"	24"	24"	24"	24"
B	Depth	44"	44"	44"	44"	44"	44"	47"	47"	54"	54"	62"	65"
C	Height	17"	17"	17"	17"	18"	18"	19"	19"	21"	21"	21"	21"
D	Discharge Height	4"	4"	4"	9.5"	9.5"	9.5"	10.5"	10.5"	10.5"	10.5"	12.5"	12.5"
E	Discharge Width	6.75"	6.75"	6.75"	9.25"	9.25"	9.25"	9.75"	9.75"	10.5"	10.5"	11.75"	11.75"
H	Water Inlet	3.25"	3.25"	3.25"	3.25"	3.25"	3.25"	3.25"	3.25"	3.25"	3.25"	3"	3"
J	Water Outlet	8.5"	8.5"	8.5"	8.5"	8.5"	8.5"	8.5"	8.5"	8.5"	8.5"	8.25"	8.5"
M	R/A Duct Width	24"	24"	24"	24"	24.25"	24.25"	29.25"	29.25"	33.25"	33.5"	43"	47.5"
N	R/A Duct Flange Height	14"	14"	14"	14"	15.25"	15.25"	16"	16"	18"	18"	18"	18"
P	Filter Rack Height	16"	16"	16"	16"	17.25"	17.25"	18"	18"	20"	20"	20"	20"
R	Cab Front to Filter Rack	19.25"	19.25"	19.25"	19.25"	18.5"	18.5"	15.5"	15.5"	19.5"	19.5"	16"	16"
T	Cabinet End to Filter Rack	0.75"	0.75"	0.75"	0.75"	1.25"	.100"	.100	1"	1"	1"	1"	1"
U	Side to Discharge (End)	7.75"	7.75"	7.75"	6.5"	6.5"	6.5"	6"	5.5"	8.25"	8.25"	6.75"	6.75"
V	Top to Discharge (FLE & FRS)	9.5"	9.5	9.5"	6"	7"	7"	6"	6"	8"	8"	6.75"	6.75"
W	End to Discharge (Straight)	5.75"	5.75"	5.75"	6"	6"	6	5.5"	5.5"	5.5"	5.25"	6"	5.5"
X	Top to Discharge (FRE & FLS)	9.5"	9.5"	9.5"	1.5"	1.5"	1.5"	1.75"	1.75"	1.5"	1.75"	1.75"	1.75"

Table 27 Horizontal (HZ) Units Dimensions

- Specifications subject to change without notice.
- All dimensions within ±0.125".
- Overall unit dimensions do not include filter rack or duct flanges.
- Unit sizes 015–070 can be field converted between end blow and straight-through supply air configurations.

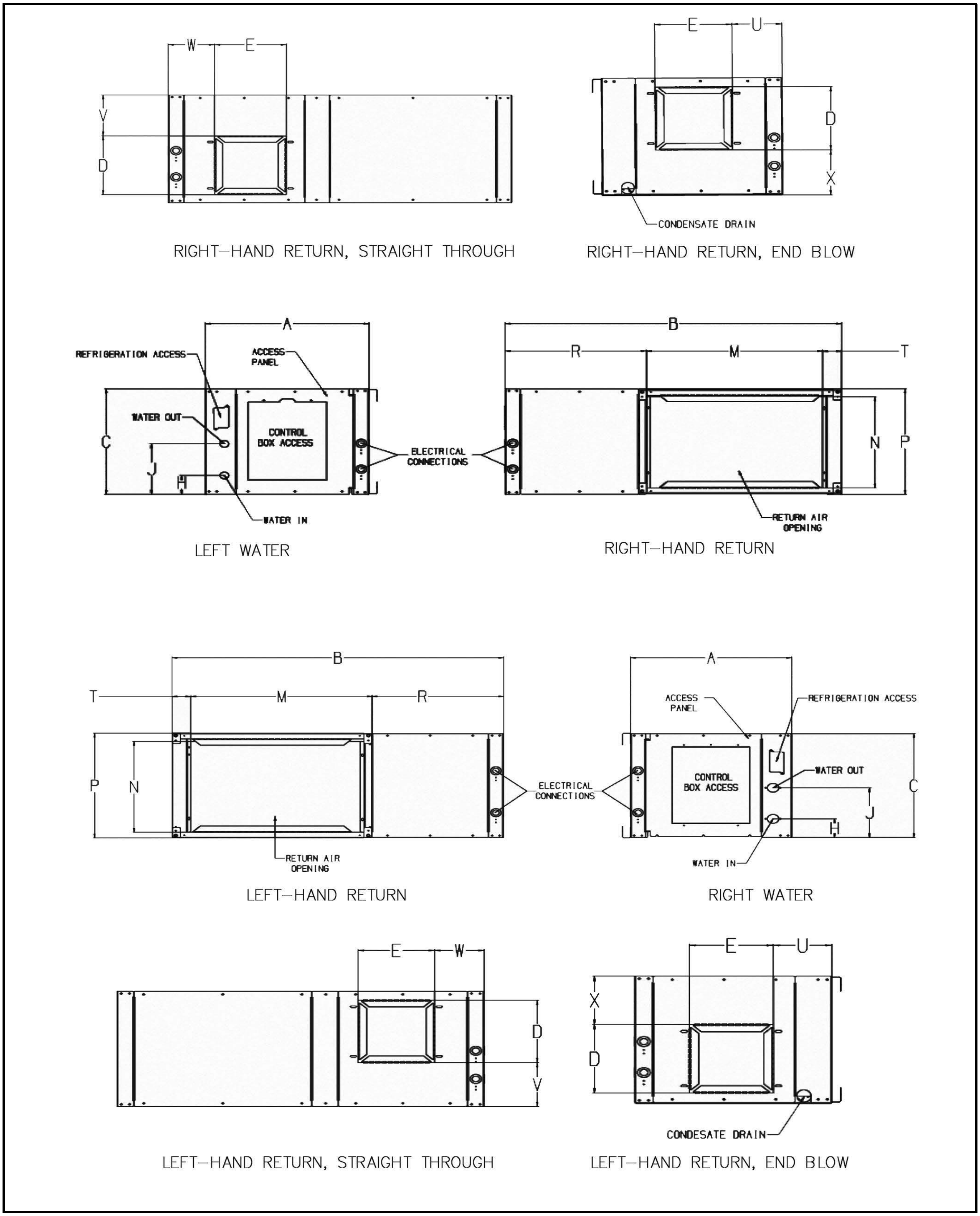

Fig. 43 Horizontal (HZ) Units Dimensional Drawings

22.4 Horizontal (HZ) Cabinet Options Dimensions

	Model		CF007	CF009	CF012	CF015	CF018	CF024	CF030	CF036	CF042	CF048	CF060	CF070
Economizer	AA	Cabinet + Economizer Width (Left Hand Return)	26.5”	26.5”	26.5”	26.5”	26.5”	26.5”	26.5”	26.5”	29”	29”	29”	29”
	BB	Cabinet Depth + Economizer (Left-Hand Return)	48.5”	48.5”	48.5”	48.5”	48.5”	48.5”	50.5”	50.5”	57.5”	62”	70”	73”
	CC	Cabinet + Economizer Width (Right-Hand Return)	26.5”	26.5”	26.5”	26.5”	26.5”	26.5”	26.5”	26.5”	29”	29”	29”	29”
	DD	Cabinet Depth + Economizer (Right-Hand Return)	48”	48”	48”	48”	48”	48”	50.25”	50.25”	57.25”	58.25”	71”	74”
	EE	Economizer	4”	4”	4”	4”	3.75”	3.75”	4”	4”	4”	4”	4”	4”
	FF	Economizer Pipe	4.5”	4.5”	4.5”	4.5”	4”	4”	4.25”	4”	4”	3”	4”	4.25”
	GG	Economizer Drain	1.57”	1.57”	1.57”	1.57”	1.65”	1.65”	1.5”	1.5”	1.75”	1.75”	1.25”	1.25”
	HH	ECONO Valve (Right-Hand Return)	7.35”	7.35”	7.35”	7.35”	8.02”	8.02”	12.5”	12.5”	9.5”	9.5”	12.75”	12.75”
	II	ECONO Valve (Left-Hand Return)	10.56”	10.56”	10.56”	10.56”	10.72”	10.72”	6.5”	6.75”	12.25”	12.25”	9.25”	9.25”
Filter Rack Options	JJ	1" Filter Rack	1.25”	1.25”	1.25”	1.25”	1.25”	1.25”	1.25”	1.25”	1.25”	1.25”	1.25”	1.25”
	KK	2" Filter Rack	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”
	LL	4" Filter Rack	4.25”	4.25”	4.25”	4.25”	4.25”	4.25”	4.25”	4.25”	4.25”	4.25”	4.25”	4.25”
	MM	Filter Rack Height	0.92”	0.92”	0.92”	0.92”	0.78”	0.78”	1”	1”	0.75”	0.75”	0.75”	0.75”
	NN	R/A Duct Flange Height	14”	14”	14”	14”	15.25”	15.25”	16”	16”	18”	18”	18”	18”
	OO	R/A Duct Flange Width	22”	22”	22”	22”	23”	23”	28”	28”	32”	32”	42”	46”
Disconnect Switch	QQ	Disconnect Switch Width	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”
	RR	Disconnect Switch Depth	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”	2”
	SS	Disconnect Switch Height	2”	2”	2”	2”	3”	3”	3”	3”	2”	2”	2”	2”
DDC	TT	DDC Panel Width	9”	9”	9”	9”	9”	9”	9”	9”	9”	9”	9”	9”
	UU	DDC Panel Depth	3”	3”	3”	3”	3”	3”	3”	3”	3”	3”	3”	3”
	VV	DDC Panel Height	2.25”	2.25”	2.25”	2.25”	3”	3”	3”	3”	2.25”	2.25”	2.25”	2.25”
HRP	WW	HRP Inlet	N/A	N/A	N/A	N/A	N/A	4.75”	4.75”	4.75”	4.75”	4.75”	4.5”	4.5”
	YY	HRP Outlet	N/A	N/A	N/A	N/A	N/A	7”	7”	7”	7”	7”	7”	7”

Table 28 Horizontal (HZ) Cabinet Options Dimensions

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- Specifications subject to change without notice.
- All dimensions within ±0.125".
- Filter rack dimensions does not include 1" duct flange.
- 2" filter racks can accept either a 1" or 2" filter.
- 4" filter racks can accept either a 2" or 4" filter.

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- Economizer Drains are 3/4" FNPT.
- HRP Connections are 1/2" FNPT.

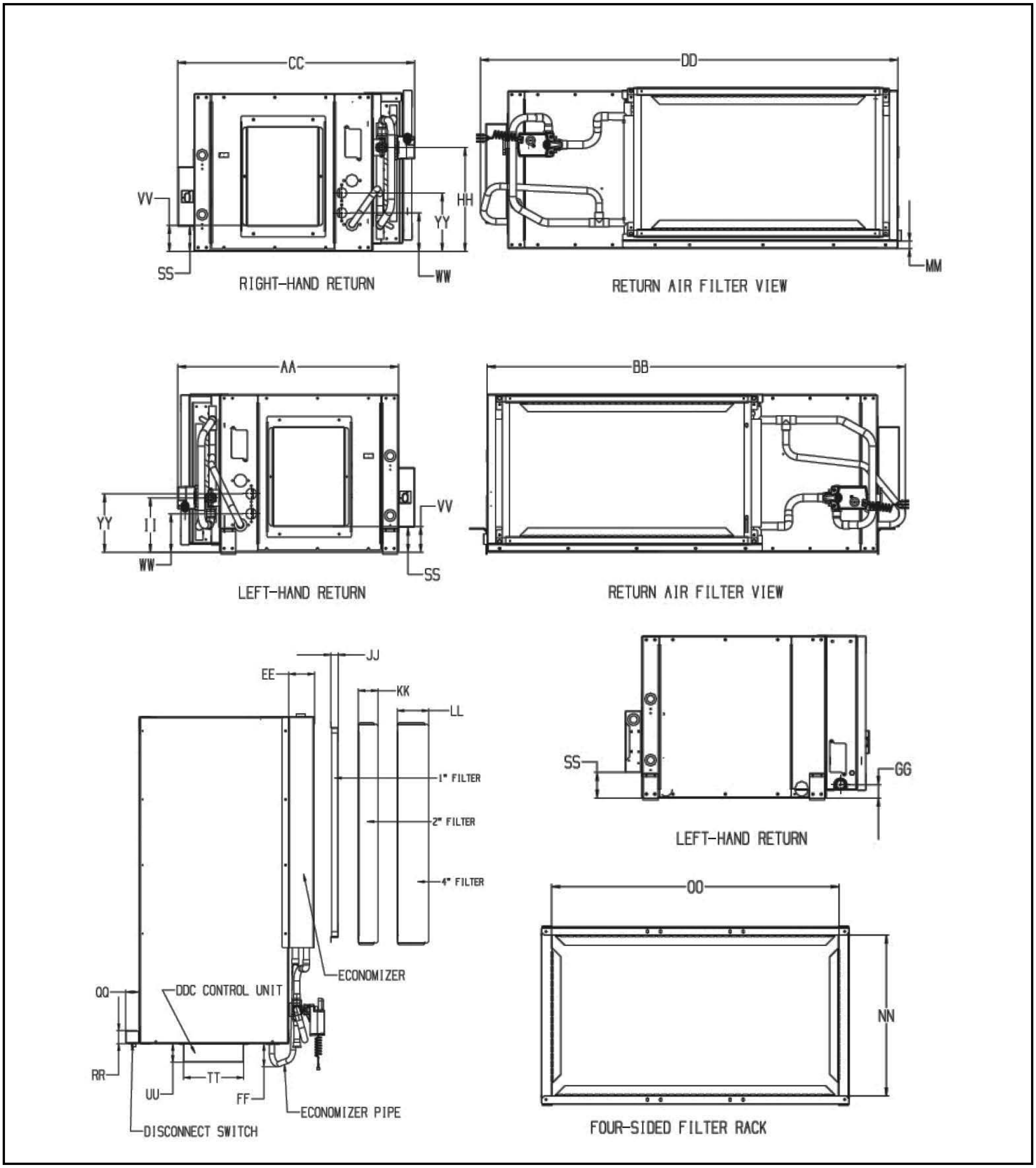

Fig. 44 Horizontal (HZ) Cabinet Options Drawing

22.5 Counter Flow Unit Dimensions

Model		CF024	CF030	CF036	CF042	CF048	CF060	CF070
Condensate Drain Connection		3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT
Recommended Replacement Nominal Filter Size		18" x 22"	19" x 27"	24" x 30"	24" x 30"	24" x 30"	18" x 30" (2 Filters)	18" x 30" (2 Filters)
Condenser Water Connections		3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	1" FPT	1" FPT	1" FPT
A	Width	21.5"	21.5"	21.5"	24"	24"	24"	24"
B	Depth	21.5"	21.5"	26"	26"	26"	33"	33"
C	Height	39"	39"	44"	44"	44"	51"	51"
D	Discharge Depth	9.5"	11.25"	11.25"	11.25"	11.25"	12.5"	12.5"
E	Discharge Width	9.25"	11"	10.75"	10.5"	10.5"	11.75"	11.75"
F	Cabinet Edge to Discharge	3.75"	3"	5.75"	5.75"	5.75"	9.75"	9.75"
G	Cabinet Edge to Discharge (Left-Hand Return)	7.25"	6"	5.5"	6.75"	6.75"	7.75"	7.75"
H	Water Inlet	28"	28"	33"	33"	33"	41.75"	41.75"
J	Water Outlet	35"	35"	40"	40"	40"	48.5"	48.5"
K	Condensate Drain	1.25"	1.25"	1.25"	1.25"	1.25"	1.25"	1.25"
M	R/A Duct Width	18"	18.25"	24"	24"	24"	27"	27"
N	R/A Duct Flange Height	20"	25"	28"	28"	28"	38.25"	38.25"
P	Filter Rack Height	38"	38"	43.25"	43.25"	43.25"	41"	41"
Q	Cabinet Edge to Discharge (Right-Hand Return)	7.25"	6"	5.5"	6.75"	6.75"	7.75"	7.75"

Table 29 Counter Flow Unit Dimensions

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- Specifications subject to change without notice.
- All dimensions within ±0.125".
- Overall unit dimensions do not include filter rack or duct flanges.

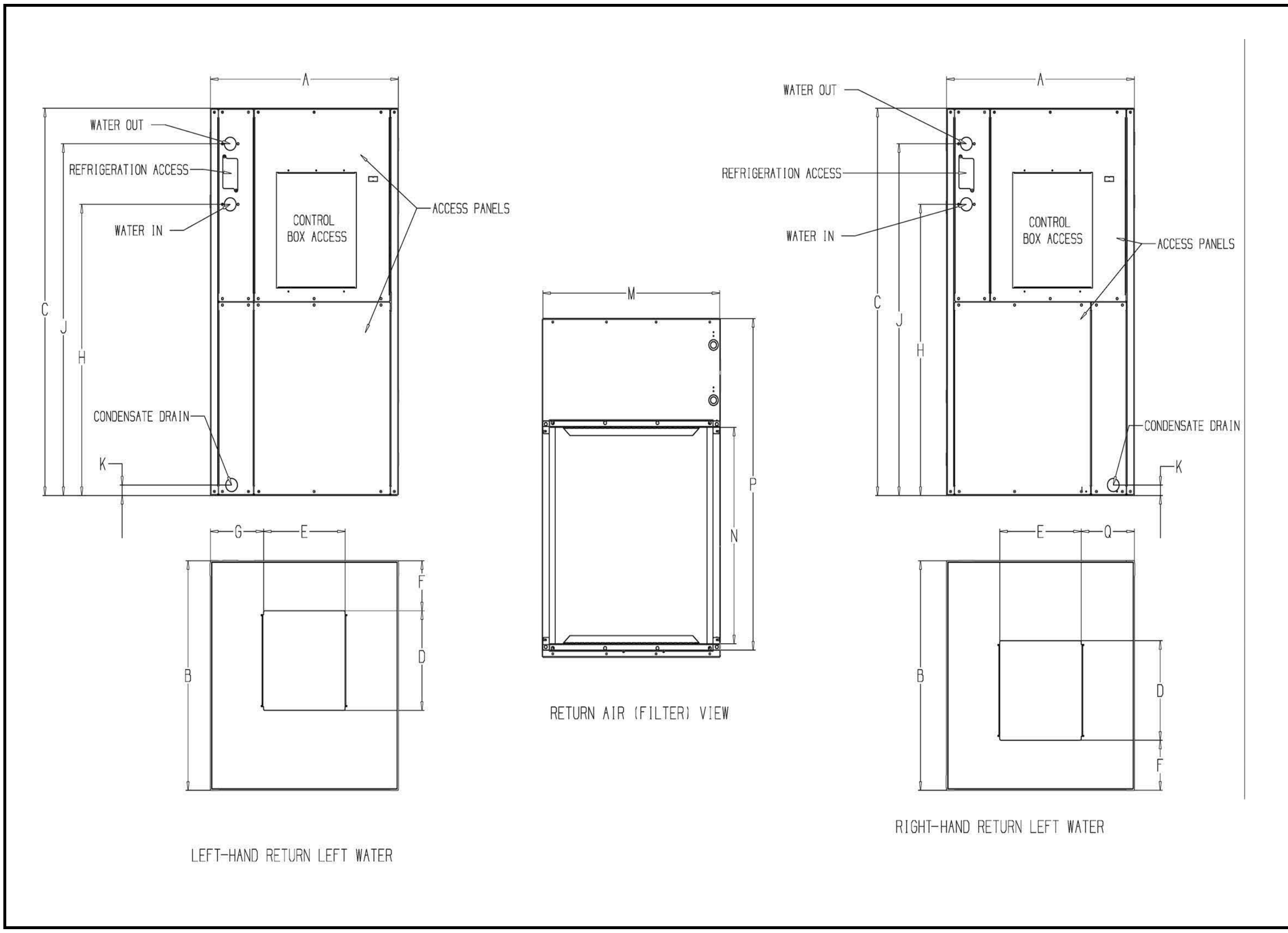


Fig. 45 Counter Flow Unit Dimensions Drawings

22.6 Counter Flow Options Dimensions

	Model		CF024	CF030	CF036	CF042	CF048	CF060	CF070
Economizer	AA	Cabinet + Economizer Width (Left-Hand Return)	29.5”	30”	29.5”	32.5”	32.5”	33.5”	33.5”
	BB	Cabinet + Economizer Depth (Left-Hand Return)	25.25”	25.25”	29.75”	29.5”	29.5”	36.5”	36.5”
	CC	Cabinet + Economizer Width (Right-Hand Return)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	DD	Cabinet + Economizer Depth (Right-Hand Return)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	EE	Economizer	3.5”	3.5”	3.75”	3.75”	3.75”	3.75”	3.75”
	FF	Economizer Pipe	3.75”	3.75”	3.75”	3.5”	3.5”	3.5”	3.5”
	GG	Economizer Drain	1.25”	1.5”	1.5”	1.25”	1.25”	1.5”	1.5”
	HH	ECONO Valve (Right-Hand Return)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	II	ECONO Valve (Left-Hand Return)	35”	35”	39.25”	37.5”	37.5”	47.75”	47.75”
Filter Racks	JJ	1" Filter Rack	1.25”	1.25”	1.25”	1.25”	1.25”	1.25”	1.25”
	KK	2" Filter Rack	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”	2.25”
	LL	4" Filter Rack	4.25”	4.25”	4.25”	4.25”	4.25”	4.25”	4.25”
	MM	Filter Rack Height	0.75”	0.75”	1”	1.25”	1.25”	2”	2”
	NN	R/A Duct Flange Height	20”	24.75”	28”	28”	28”	34”	34”
	OO	R/A Duct Flange Width	16”	16.25”	22”	22”	22”	27.25”	27.25”
Disconnect Switch	QQ	Disconnect Switch Width	2”	2”	2”	2”	2”	2”	2”
	RR	Disconnect Switch Depth	1.75”	1.75”	1.75”	1.75”	1.75”	1.75”	1.75”
	SS	Disconnect Switch Height	26.75”	26.75”	31.25”	31.25”	31.25”	38.25”	38.25”
DDC	TT	DDC Panel Width	8.75”	8.75”	8.75”	8.75”	8.75”	8.75”	8.75”
	UU	DDC Panel Depth	2.75”	2.75”	2.75”	2.75”	2.75”	2.5”	2.75”
	VV	DDC Panel Height	19.75”	19.75”	24”	24”	24”	28.25”	28.25”
HRP	WW	HRP Inlet	30.25”	30.25”	35.25”	35.25”	35.25”	44”	44”
	YY	HRP Outlet	32.75”	32.75”	37.75”	37.75”	37.75”	46.25”	46.25”

Table 30 Counter Flow Options Dimensions

- Specifications subject to change without notice.
- All dimensions within ±0.125".
- Filter rack dimensions does not include 1" duct flange.
- 2" filter racks can accept either a 1" or 2" filter.
- 4" filter racks can accept either a 2" or 4" filter.
- Economizer Drains are 3/4" FNPT.
- HRP Connections are 1/2" FNPT.

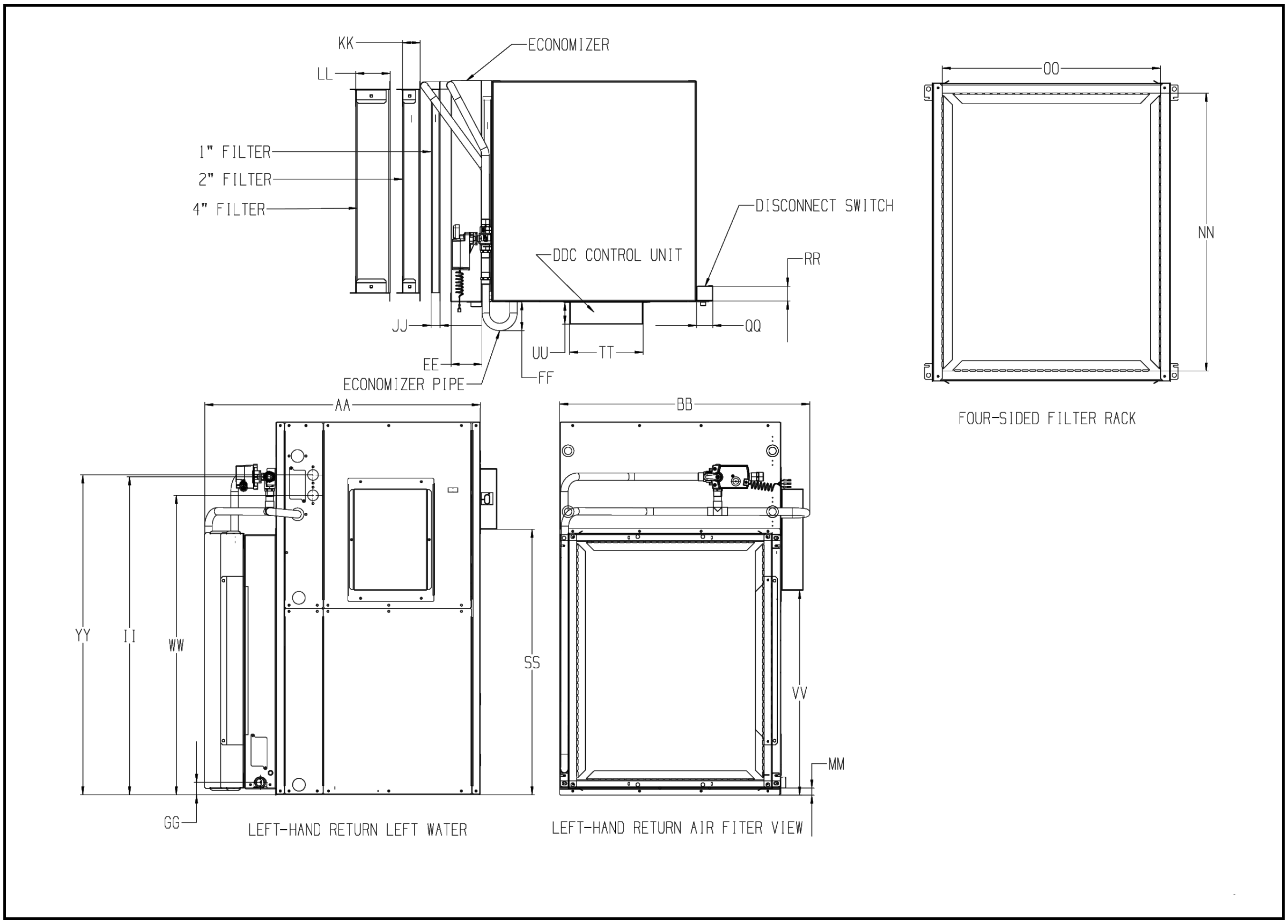
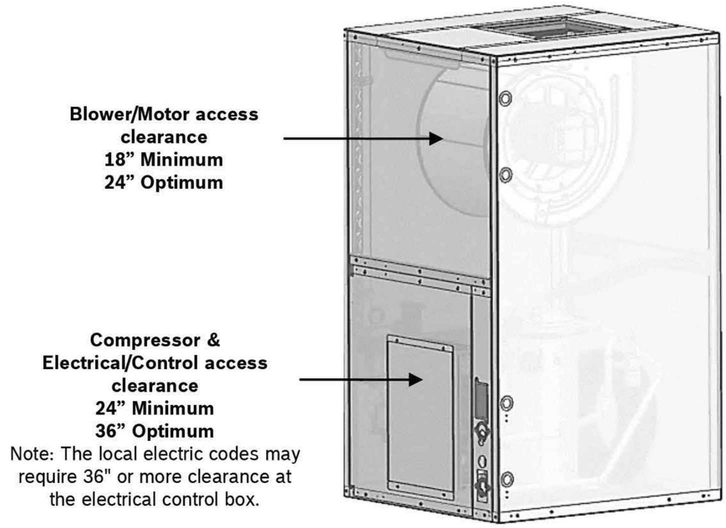


Fig. 46 Counter Flow Options Dimensions Drawing

22.7 Service Clearance

Vertical and CounterFlow Cabinet Service Clearance



Horizontal Cabinet Service Clearance

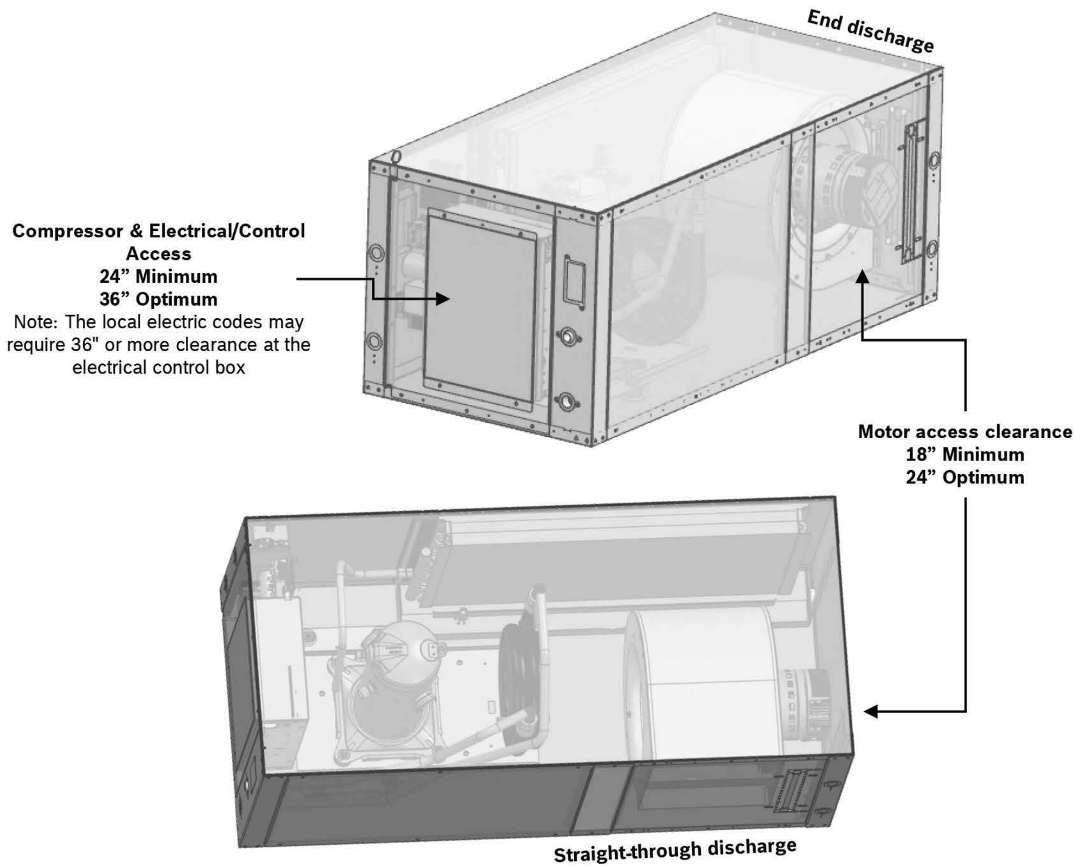


Fig. 47 Vertical and Horizontal Cabinet Service Clearance

23 Terminology

23.1 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

LFL — Lower Flammability Limit

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 — Rated Load Amps

23.2 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.

24 Check-Out Sheet

Customer Data

Customer Name: ____________________ Date: ____________________
Address 1: ____________________
Address 2: ____________________
Phone: ____________________
Unit Number: ____________________

Unit Nameplate

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

Operating Conditions

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

* Required for Troubleshooting ONLY

25 Notes

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Bosch Thermotechnology Corp. reserves the right to make changes without notice due to continuing engineering and technological advances.

Additional Product Information Page

To see additional product information and documentation, please visit the product page:
www.bosch-homecomfort.com/us/ or scan the QR code below.

Spare Parts Manual

For assistance finding applicable spare parts, refer to the spare parts manual:
https://www.bosch-homecomfort.com/us/en/residential/technical-documentation/spare-parts-diagrams/heating-and-cooling-heat-pump-systems/geothermal-water-sourced-heat-pump/ or scan the QR code below.