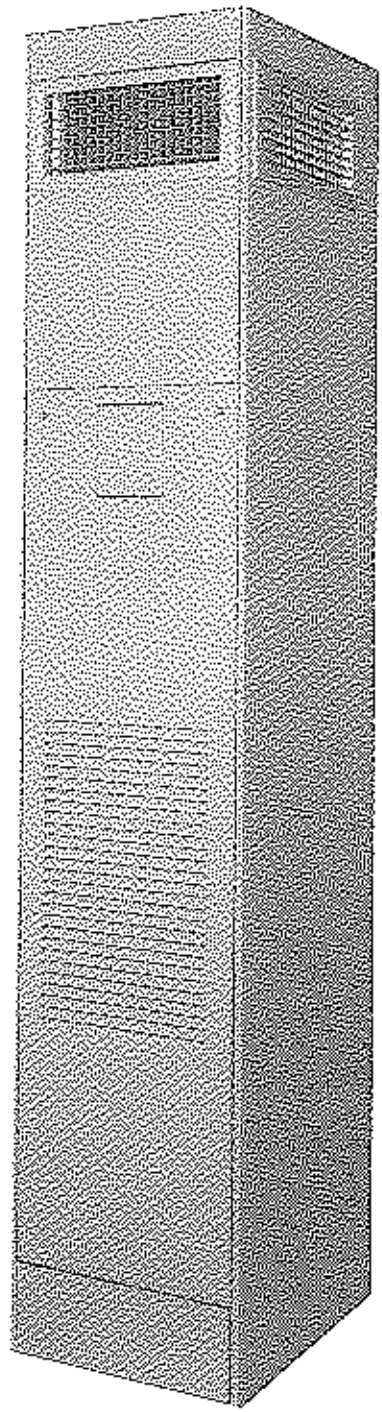
ClimateMaster

FORMERLY CHP CONRAD FORMERLY FREDRICK CLIMATE MASTER, INC

Installation Operation Maintenance

Water Source Heat Pumps:

Vertical Stacked (Hi-Rise)



Designed for Heat Pump Applications

Models
816-10
816-15
816-20
816-28
816-30
816-36

Continuing engineering research results in steady improvements. Therefore, these ratings and specifications are subject to change without notice.

Table of Contents

General Information

Hi-Rise (816) Heat Pump units are specifically designed to occupy a small amount of floor space and are typically "furred in" behind drywall.

Ranging from 9,000 to 32,400 btuh in size, the Hi-Rise unit consists of a slide-out chassis, riser piping, control wiring, and water flow controls factory-packaged in an 88-inch high cabinet. The cabinet contains a discharge plenum with single- or multiple-discharge arrangement options that eliminate the need for duct work in most applications.

CAUTION: Do NOT apply (816) units in locations subject to temperature extremes (e.g., attics, garages, rooftops, etc.). The temperature, humidity and corrosive conditions often present under these circumstances can greatly inhibit performance, reliability, and service life.

Unit dimensions are shown in Figure 1 (see page 4); general information about these units—including filter size, refrigerant charge, etc.—is provided in Table 1 (see page 5). Electrical data is found in the "Installation" section of this manual under "Electrical Wiring".

Initial Inspection

Each (816) heat pump consists of two principal components which are shipped separately:

- A *cabinet assembly*, containing electrical power connections, controls or thermostat connections, blower-motor assembly, condensate drain pan, and (typically) riser pipes for connection to the water circulating system and the condensate disposal sewer.
- A *chassis assembly* designed to fit into the cabinet, containing a compressor, water-to-refrigerant heat exchanger, refrigerant-to-air heat exchanger, reversing valve, capillary tubes, a complete refrigerant charge, primary condensate pan, and some electrical components.

Be sure to inspect the carton or crating housing of each (816) component as it is received at the job site and before signing the freight bill. Verify that all items have been received and that there is no visible damage; note any shortages or damage on all copies of the freight bill. In the event of damage or shortage, remember that the purchaser is responsible for filing the necessary claims with the carrier. Concealed damage not discovered until after unloading must be reported to the carrier within 15 days of its receipt.

Unit wiring diagrams and installation/operation/maintenance instructions are provided with each unit. Before unit start-up, be sure to read this booklet to become familiar with the unit and its operation.

Notice that an installation checklist is provided at the end of this manual; it should be completed after all the installation procedures described have been accomplished. A periodic maintenance checklist is provided in the "Maintenance" section to outline recommended maintenance schedules. Do not substitute these checklists for the detailed information found in the appropriate sections of this manual.

In addition, a start-up/inspection log has also been included at the end of this manual to encourage thorough unit checkout at initial start-up.

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, upright position at all times. Note the markings on each carton to determine its model number; the chassis can then be matched to the cabinet having the same model number.

Do not remove any equipment from its shipping package until it is needed for installation.

Unit Protection

Since the cabinet of the 816 units may have riser pipes of different sizes and special air supply grille arrangements, each cabinet may be individually tagged for a specific location in the building. Be sure that each cabinet is positioned at the proper unit installation site.

Once the 816 units are situated, they must be covered with either a shipping carton, vinyl film, or an equivalent protective covering; open ends of pipes stored on the job site must be capped. This precaution is especially important in areas where painting, plastering, or spraying of fireproof material and the like is not yet complete. Foreign material that is allowed to accumulate within the units can prevent proper start-up and necessitate costly clean-up operations.

Before installing any of the system components, be sure to examine each pipe, fitting, and valve; remove any dirt found on these components.

Do NOT use these units as a source of heat during construction of the building since the units' filters will quickly fill with construction dirt and debris. (Operating a unit with a clogged filter impairs or prevents unit operation, and—as stated earlier—necessitates costly unit clean-up.) Climate Master strongly recommends that an alternative means of providing temporary heat be used.

Pre-installation

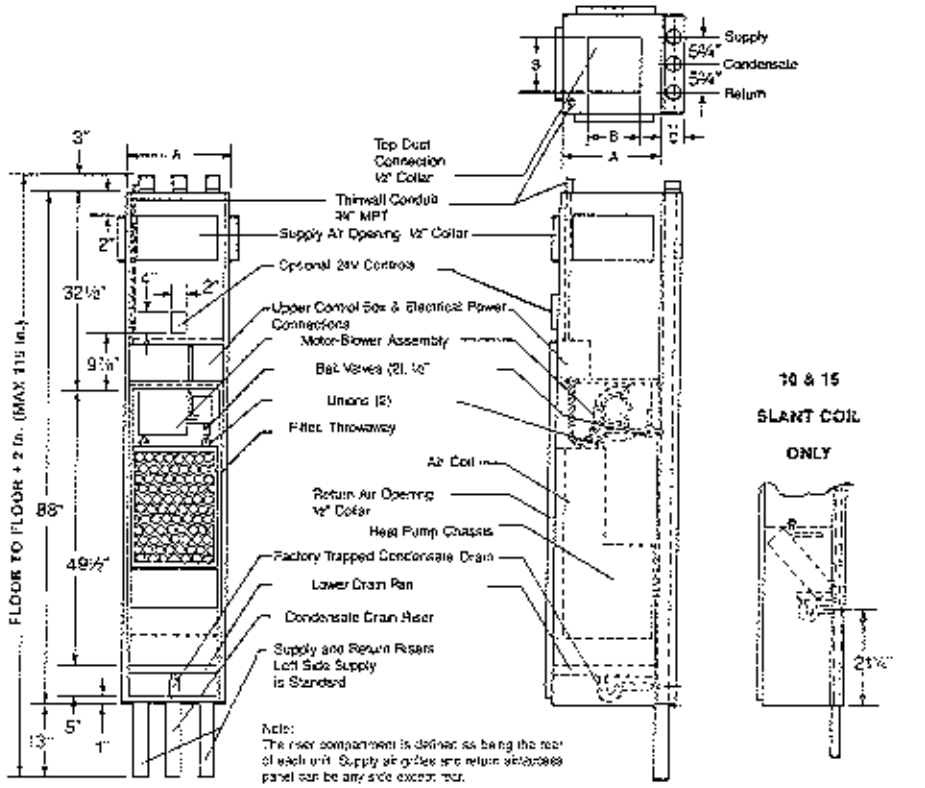
To prepare an 816 unit for installation, be sure to complete the inspections and instructions listed below:

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
2. Match each unit chassis to the proper cabinet.
3. Verify that the refrigerant tubing is free of kinks or dents and that it does not touch other unit components.
4. Inspect all electrical connections; connections should be clean and tight at the terminals.
5. Visually inspect the blower assembly then manually rotate the fan wheel to ensure that it turns freely.

The compressors of all 816 units are internally spring-mounted, so there are no hold-down bolts to remove.

Figure 1

DIMENSIONAL DATA



GRILLE SELECTIONS

STANDARD SUPPLY GRILLE SIZES WHEN AIR FLOW IS DIVIDED EQUALLY THROUGH EACH GRILLE				
Rated Air Flow	Model	Single Grille 100% Of CFM	Two Grilles 50% Of CFM Per Grille	Three Grilles 33% Of CFM Per Grille
300 CFM	10	12" W x 10" H	10" W x 8" H	Not Recommended
420 CFM	15	12" W x 12" H	10" W x 8" H	Not Recommended
840 CFM	20	14" W x 14" H	14" W x 8" H	14" W x 8" H
825 CFM	28	Not Recommended	16" W x 10" H	16" W x 8" H
1050 CFM	30	Not Recommended	16" W x 12" H	16" W x 8" H
1300 CFM	36	Not Recommended	16" W x 14" H	16" W x 10" H

Note: Do not use the above chart for applications requiring top air discharge or multiple air outlets with unequal air flow.

MULTIPLE DISCHARGE/TOP DISCHARGE GRILLE & OPENING SIZING WHEN AIR FLOW IS DIVIDED UNEQUALLY													
Model	Specified Discharge CFM	Grille Selection Chart											Top Discharge Opening Size (Up to 100% Unit CFM)
		10" Wide x			14" Wide x			16" Wide x					
		6" H	8" H	10" H	6" H	8" H	12" H	6" H	8" H	10" H	12" H	14" H	
10 15	100-150	▫											10 x 10
	175-225		▪										
	250-275			▪									
20	150-200				▪								13 x 13
	250-325					▪							
	400-450						▪						
25 30 36	200-275							▫					17 x 17
	300-350								▫				
	375-450									▫			
	500-600										▫		
	625-725											▪	

Grilles are factory installed in exposed cabinets, painted the same color as the cabinet. Grilles are shipped loose for field installation after drywall has been applied to units that are furred-in, and can be unpainted aluminum or painted steel.

Triple discharge openings are not recommended for Models 10 and 15 units. Single discharge openings are not recommended for Models 25, 30 and 36. If these are required, consult the factory for special engineering recommendations.

Double deflection grilles with opposed blade dampers are recommended when a unit is to be supplied with side grille and top discharge, or with multiple grilles having air flow divided unequally.

Table 1 - General

Unit Data

Physical Characteristic	816-10	816-15	816-20	816-28	816-30	816-36
Blower (1)						
Motor Horsepower	1/20	1/12	1/8	1/6	1/5	1/4
Wheel Size (D" × W")	6.75 × 7.25	7.13 × 7.25	7.63 × 7	7.63 × 9	8.5 × 9.25	9.13 × 10
Filter Size (2)	14 × 20	14 × 20	16 × 28	20.25 × 28	20.25 × 28	20.25 × 28
Unit Weight (lbs.)						
Shipping	290	300	355	435	440	475
Operating	275	285	340	420	425	460
Ref.-to-Air Heat Exchanger						
Face Area (Sq. Ft.)	1.3	1.71	2.67	2.87	3.5	3.17
No. of Rows Deep	3	3	3	3	3	4
Copper Tube Size	1/2	1/2	1/2	1/2	1/2	1/2
No. of Fins/Inch	13	13	13	13	13	13
Refrig. Charge (R-22)	28 ozs.	30 ozs.	40 ozs.	57 ozs.	66 ozs.	60 ozs.

Notes:
(1) Blower is direct-drive, PSC-type, with internal thermal overload.
(2) Filter is one-inch, throwaway type.

Installation

Supply and Return Piping

Besides complying with any applicable codes, system piping should also include the following features:

1. A drain valve at the base of each supply and return riser to enable system flushing at start-up and during routine servicing, and
2. strainers at the inlet of each system circulating pump. (Shutoff/balancing valves, flow indicators, and drain tees in the supply runout and return at each floor facilitate loop balancing and servicing.)

Insulation is not required on the loop water piping except on those sections that run through unheated areas or outside the building. This is because the loop temperature is normally between 60 and 90 F; therefore, the piping will neither sweat nor suffer heat loss.

The supply, return and condensate risers which are factory-installed in each cabinet assembly are typically constructed of Type M copper tubing, and are available in a number of different diameters and lengths. Each riser has a three-inch expanded section at the top to simplify field connection. Interconnecting piping is provided with a combination balancing/shutoff valve in the supply line to allow removal of the unit chassis without draining water from the riser circuit.

Condensate Piping

The condensate connection between the drain pan assembly and the condensate riser is typically factory-installed and trapped in all 816 vertical coil units.

For "Slant Coil" units, installer must connect rubber P-trap, supplied with chassis, to Condensate Riser. An access panel on the front of the chassis facilitates this installation.

Cabinet Assembly: Riser Connections

1. Keep the riser pipes clear of the floor and move the cabinet into position; then raise the cabinet upright and lower it into place. Make sure that the riser pipes fit into the connections of the unit below.

   Notice that the top of each riser is equipped with a three-inch swaged section, and that there is sufficient extension at the bottom to allow insertion of approximately two inches of the riser into the swaged top of the riser below. [See Figures 1 (page 4) and 2 (page 6) for 816 component identification.]

CAUTION: To ensure correct riser positioning and to compensate for variations in floor-to-floor dimensions, do NOT allow the unit-to-unit riser joint to bottom out.

   Note: In some applications, the unit risers must be supplemented with factory-or-field supplied "between-the-floor" extensions. Be sure to assemble these extensions into position at this time.

2. Once the risers are centered in the pipe chase, shim as required to ensure that the cabinet is set level and is perfectly vertical ("plumb") in two planes. (This will assure proper unit operation and condensate drainage.)

3. Using sheet metal angles attached to both the cabinet and the floor, anchor the cabinet assembly to the building structure on at least two sides.

   Braces installed at the top of the cabinet will provide an additional anchor and simplify the installation of wallboard around the cabinet.

4. After all the units on a riser are anchored into place, complete the unit-to-unit riser joints as described below:

   a. Center the horizontal supply and return runouts in the expansion slots in the back panel of the cabinet assembly. Also, make sure that each runout is perpendicular to the back panel.

   b. Verify that each riser joint is vertically aligned and that riser penetration into each swaged joint is at least one inch. (Remember, however, that the riser joints must *not* bottom out.)

   c. Braze the riser joints with Phos-Copper, Silfos, or some other high-temperature alloy. Soft solders (e.g., 50-50, 60-40, or 85-15) or other low-temperature lead alloys are not suitable for this application.

      Note: When completing the riser connections, remember that wide variations in floor-to-floor dimensions may necessitate cutting off or extending individual risers. The installing contractor is solely responsible for such modifications.

5. Anchor the built-in risers to the building structure at some point. To allow the risers to move freely within the pipe chase with normal vertical expansion and contraction, however, do not fasten them rigidly within each unit.

   Note that the riser assemblies are designed to accommodate as much as 1½ inches of expansion and contraction (i.e., 3 inches of total movement). If the total calculated riser expansion exceeds 3 inches, the installing contractor must provide and install additional expansion devices in each riser.

6. Verify that the individual unit shut-off valves are closed. These valves should remain closed until after the system has been cleaned and flushed and the chassis connected.

7. Install a valve loop between the risers at the end farthest from the pump. The valve is opened while fresh water is pumped throughout the system and closed once the system is clean.

   Specific instructions for system cleaning, flushing, and checkout are provided in the "Start-up" section of this manual.

8. Install vents in the piping loop as required to ensure that the system is kept free of air.

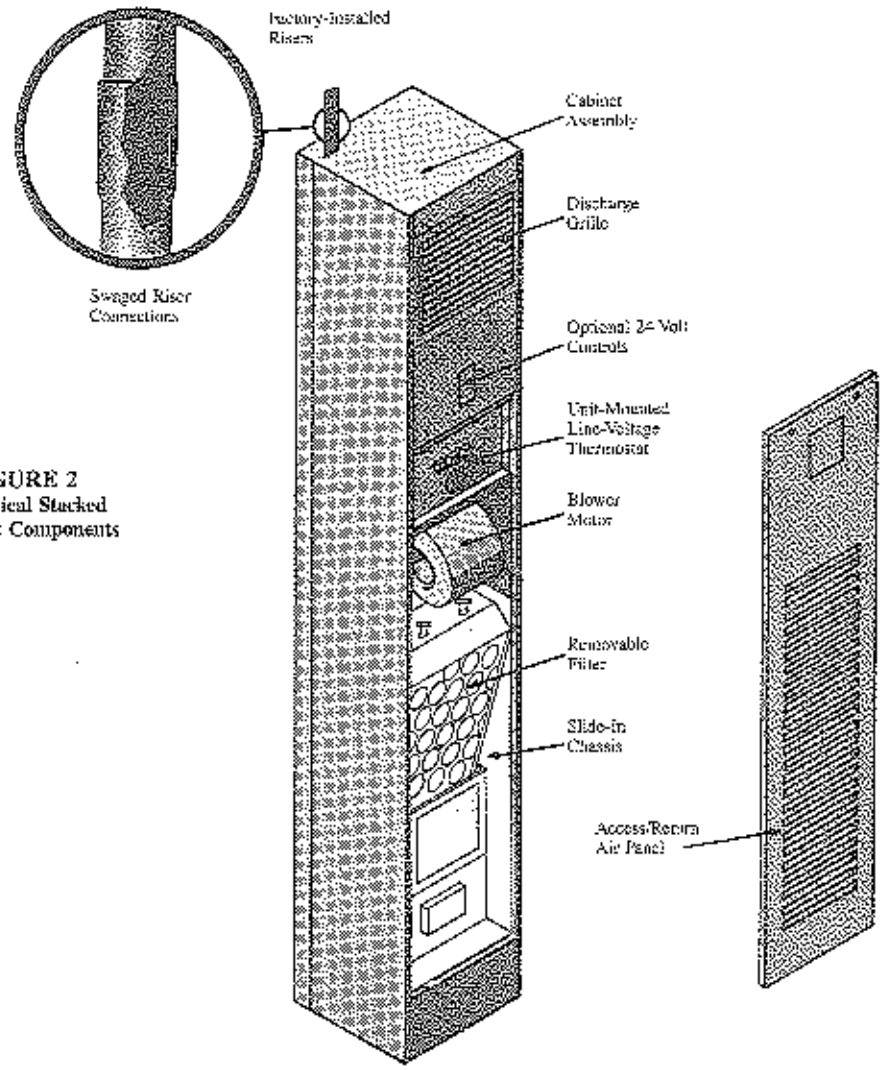


FIGURE 2
Vertical Stacked Unit Components

Cabinet Assembly: Electrical Connections

WARNING: TO AVOID POSSIBLE INJURY OR DEATH DUE TO ELECTRICAL SHOCK, OPEN SUPPLY POWER DISCONNECT SWITCH AND SECURE IT IN THAT POSITION.

CAUTION: Use only copper conductors for field-installed electrical wiring. Unit terminals are not designed to accept other types of conductors.

Before connecting the electrical power supply to the unit, be sure to compare the electrical data on the unit nameplate with the characteristics of the available power supply to be sure they are compatible. For your reference, unit electrical data is provided in Table 2 below. Refer to Table 3 (see page 8) for the cabinet-only electrical data of those units equipped with the electric heat option.

Route the power wiring to the unit control panel through the factory-installed conduit at the top of the cabinet. To ensure proper electrical hookup, be sure to consult the wiring diagram shipped with the unit.

Remember that all field-installed wiring — including the electrical ground — must comply with the National Electrical Code, as well as applicable local codes. In addition, all field wiring must conform to the Class II temperature limitations described in the NEC. Size the wiring to handle the circuit ampacity marked on the unit nameplate. Use the information on the nameplate to determine the maximum fuse or circuit breaker size needed to adequately protect the unit.

Table 2 - 816 Electrical Data

Unit Size	Electrical Character.	Compressor		Blower FLA	Total FLA	Min. Ckt. Amps	Max. Fuse Size (2)
		LRA	RLA				
816-10	208-230/60/1	20.0	3.9	0.55	4.45	5.5	15 Amps
	265/60/1	16.0	3.1	0.40	3.50	4.5	15 Amps
816-15	208-230/60/1	31.0	5.8	0.65	6.45	7.9	15 Amps
	265/60/1	27.0	4.7	0.50	5.20	6.4	15 Amps
816-20	208-230/60/1	49.0	8.7	0.90	9.60	11.8	20 Amps
	265/60/1	44.0	7.3	0.71	8.01	9.9	15 Amps
816-28	208-230/60/1	57.0	11.3	1.20	12.50	15.4	25 Amps
816-30	208-230/60/1	57.0	12.4	1.95	14.35	17.5	30 Amps
816-36	208-230/60/1	65.0	14.4	2.00	16.40	20.0	30 Amps

Notes:
(1) Electrical data in this table is based on unit nameplate utilization voltage.
(2) Dual-element time-delay fuse or HACR (Heating, Air Conditioning, Refrigeration) circuit breaker.

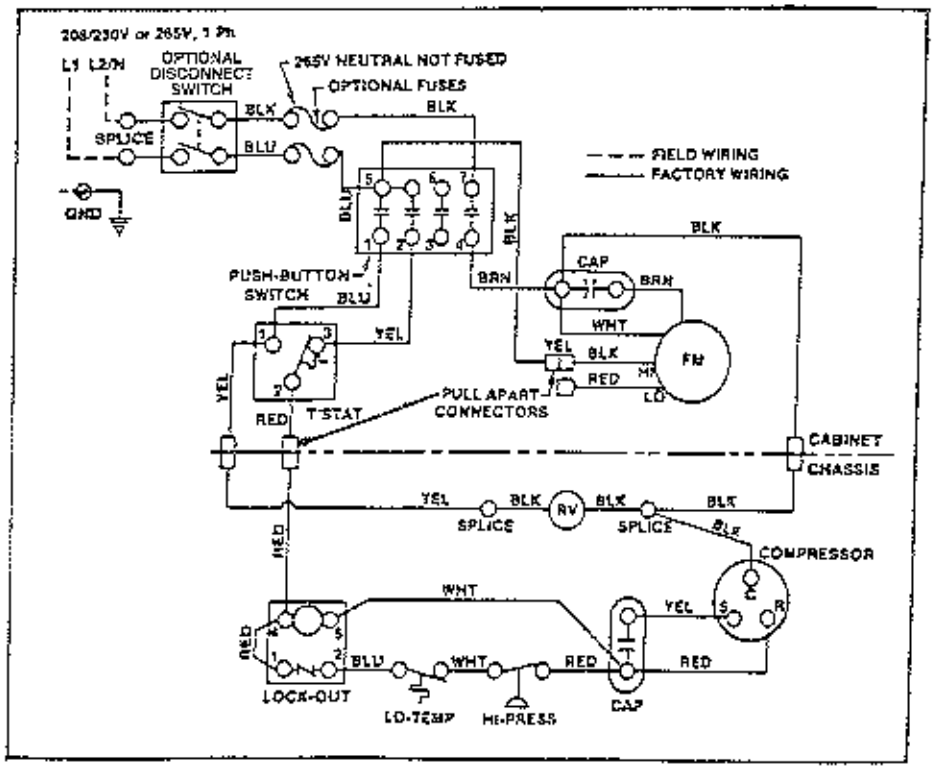
Table 3 - Cabinet-Only Electrical Data
(Incl. Opt. Elec. Heat)

Unit Size	Elec. Charac.	Voltage Utiliz. Range	Elec. Heat Desig.	Kw	Compressor RLA	Compressor LRA	Blower Motor FLA	Min. Ckt. Amps	Max. Fuse Size (1)
10	208/60/1	197-229	A	4.5	—	—	0.55	27.8	25
			B	3.4	—	—	0.55	21.1	20
			C	2.3	—	—	0.55	14.2	15
	230/60/1	207-253	D	4.5	—	—	0.55	24.2	25
			E	3.0	—	—	0.55	16.4	15
			F	1.5	—	—	0.55	8.5	15
15	208/60/1	197-229	A	5.6	—	—	0.65	34.7	30
			B	4.5	—	—	0.65	28.0	25
			C	3.4	—	—	0.65	21.2	20
	230/60/1	207-253	D	6.0	—	—	0.65	32.1	30
			E	4.5	—	—	0.65	24.3	25
			F	3.0	—	—	0.65	16.5	15
20	208/60/1	197-229	A	7.5	—	—	0.90	46.3	40
			B	6.0	—	—	0.90	37.3	35
			C	4.5	—	—	0.90	28.3	25
	230/60/1	207-253	D	8.0	—	—	0.90	42.8	40
			E	6.0	—	—	0.90	32.4	30
			F	4.0	—	—	0.90	22.0	20
28	208/60/1	197-229	A	12.0	—	—	1.20	73.8	65
			B	7.5	—	—	1.20	46.7	40
			C	4.5	—	—	1.20	28.7	30
			G	6.0	—	—	1.20	37.4	35
	230/60/1	207-253	D	12.0	—	—	1.20	64.0	55
			E	8.0	—	—	1.20	43.2	40
			F	4.0	—	—	1.20	22.4	25
30	208/60/1	197-229	A	13.5	—	—	1.95	83.7	75
			B	7.5	—	—	1.95	47.6	45
			C	4.5	—	—	1.95	29.6	30
	230/60/1	207-253	D	14.0	—	—	1.95	75.4	70
			E	8.0	—	—	1.95	44.1	45
			F	4.0	—	—	1.95	23.4	25
36	208/60/1	197-229	A	15.0	—	—	2.00	92.8	80
			B	10.5	—	—	2.00	65.8	60
			C	6.0	—	—	2.00	38.7	40
	230/60/1	207-253	D	16.0	—	—	2.00	85.9	75
			E	10.0	—	—	2.00	54.7	50
			F	6.0	—	—	2.00	33.8	35

Notes:
(1) Dual-element time-delay fuse (amps) or HACR (Heating, Air Conditioning, Refrigeration) circuit breaker.
(2) Compressor RLA and LRA data is provided in Table 2.
Refer to Figure 3 (see page 9) for a schematic of the field connections which must be made by the installing (or electrical) contractor.

FIGURE 3
Typical Field Connections for Units w/Unit-Mounted Line Voltage Controls

Wiring Diagram for Line Voltage Unit Mounted
MANUAL CHANGEOVER THERMOSTAT

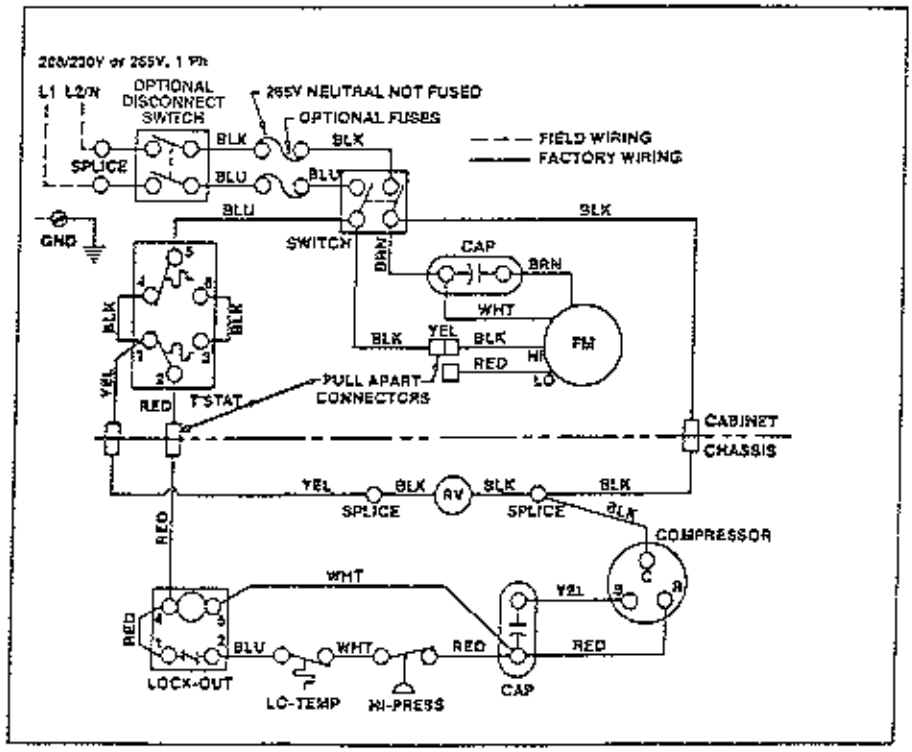


Wiring Diagram for Line Voltage Unit Mounted
AUTOMATIC CHANGEOVER THERMOSTAT

RV	*REVERSING VALVE SOLENOID COIL*
FM	*FAN MOTOR*
CAP	*CAPACITOR*

WARNING
DISCONNECT ELECTRICAL POWER SOURCE TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK.

CAUTION
USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE.



Cabinet Assembly: Installation of Optional Wall-Mounted Thermostats

The 816 units are available with any one of several control options: unit-mounted line-voltage automatic (ACO) or manual changeover (MCO) controls; low-voltage, unit-mounted ACO or MCO thermostat; or a remote low-voltage ACO or MCO thermostat.

In those applications where a remote, wall-mounted thermostat is used, specific installation instructions are provided in the instruction guide which accompanies each thermostat accessory. For your convenience, a typical field connection diagram is included in Figure 4A & 4B.

CAUTION: Zone integrity must be maintained to efficiently control units or groups of units. Unless zones of control are considered and accounted for, adjacent units may operate in heating and cooling modes simultaneously.

In each instance, the low-voltage wiring between the unit terminal block and wall thermostat must be made in compliance with the applicable electrical codes (i.e., NEC and local codes), and completed before the unit is installed. Use of a fourwire, color-coded, low-voltage cable is recommended. ACO wall thermostats may require field installation of two jumper wires: one between thermostat Terminals RC and RH, and one between Terminals W2 and Y1. Check the wiring diagram to determine whether or not these jumpers are needed for a specific application.

Recommended wire sizes and lengths for installing the thermostat are provided in Table 4. The total resistance of these low-voltage wires must not exceed 1 ohm; any resistance in excess of 1 ohm may cause the control to malfunction because of the high voltage drop.

The suggested thermostat heat anticipator setting for 816 units with manual changeover thermostats is 0.4 amps. For automatic changeover thermostats, set the first-stage heat anticipator at 1.0 amps and the second-stage heat anticipator at 0.4 amps.

Table 4 - Recommended Thermostat Wire Sizes

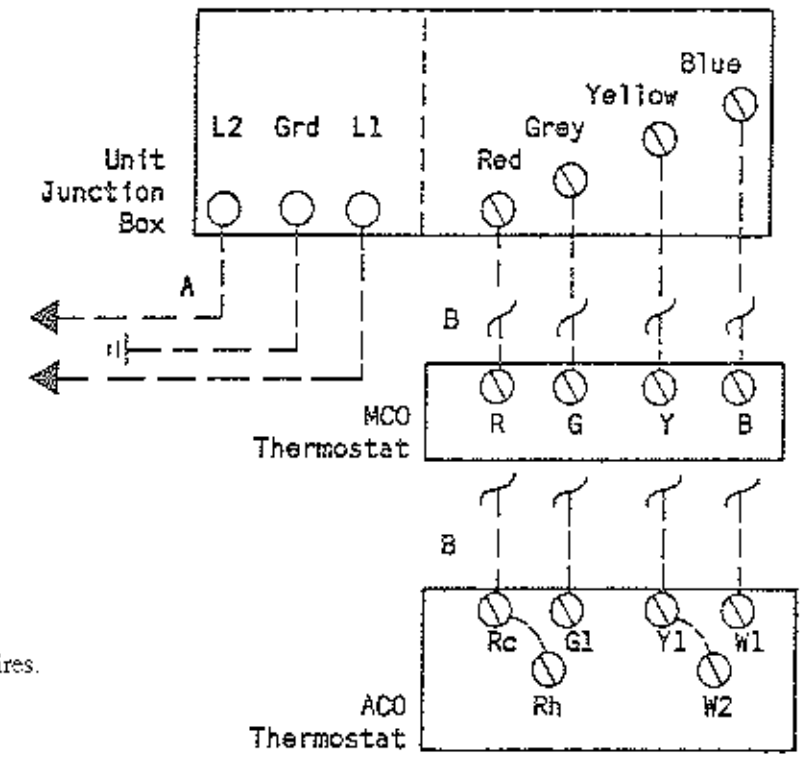
Wire Size	Max. Wire Length*
22-Gauge	30 Feet
20-Gauge	50 Feet
18-Gauge	75 Feet
16-Gauge	125 Feet
14-Gauge	200 Feet

*Length = Physical distance from thermostat to unit.

FIGURE 4A - Typical 816 Field Connections for Units with Wall-Mounted 24V Thermostats

WARNING
DISCONNECT ELECTRICAL POWER SOURCE TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK.

CAUTION
USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE.



Legend:

A = Two power wires on single-phase units.
B = 18/1C MCO or ACO thermostat — 4 wires.
MCO = Manual changeover thermostat.
ACO = Automatic changeover thermostat.

Note:
All customer-supplied wiring to be copper only, and must conform to NEC and local electrical codes. Wiring shown with dashed lines must be field-supplied and field-installed.

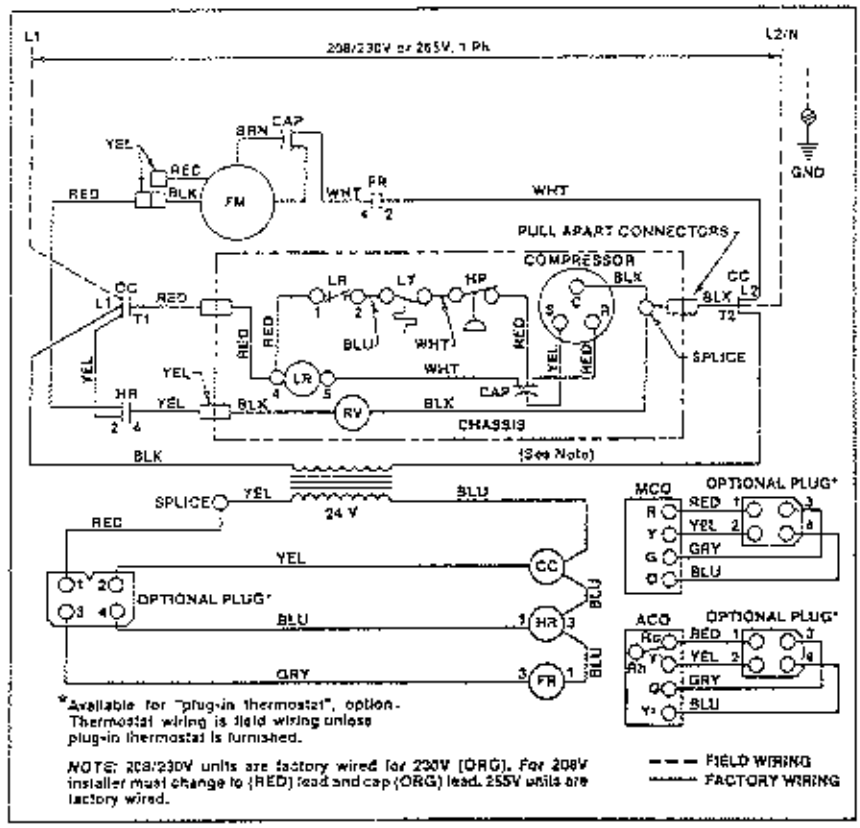
FIGURE 4B - Typical 816 Field Connections for Units with Wall-Mounted 24V Thermostats

Wiring Diagram for

24 VOLT CONTROL CIRCUIT

FOR OPTIONAL PLUG-IN THERMOSTAT, Either Manual or Auto Changeover

RV	REVERSING VALVE SOLENOID COIL
FM	FAN MOTOR
LR	LOCK OUT RELAY
CAP	CAPACITOR
LT	LOW TEMP CUT OUT
HP	HI PRESSURE CUT OUT
HR	HEATING RELAY
CC	COMPRESSOR CONTACTOR
FR	FAN RELAY

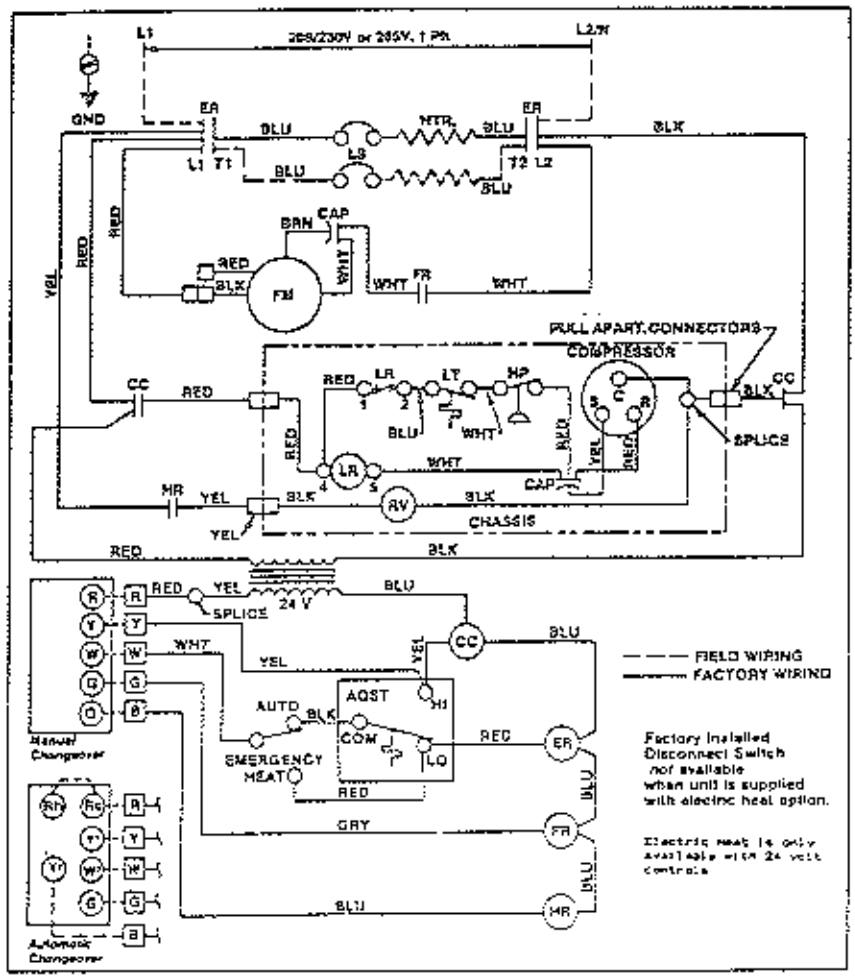


Wiring Diagram for

24 VOLT CONTROL CIRCUIT

With Optional "Boilerless" Electric Heat Option

RV	REVERSING VALVE SOLENOID COIL
FM	FAN MOTOR
LR	LOCK OUT RELAY
CAP	CAPACITOR
LT	LOW TEMP CUT OUT
HP	HI PRESSURE CUT OUT
HR	HEATING RELAY
CC	COMPRESSOR CONTACTOR
FR	FAN RELAY



Cabinet Assembly: Wallboard Installation

Normal methods can be used to install the wallboard, however, the use of adhesive bonding alone is not recommended.

Secure the drywall to the stud framework with low-profile, pan-head sheet metal screws. It is not necessary to fasten the wallboard to either the drain pan edges or the control box enclosure.

CAUTION: To prevent electrical shorts and drain pan leaks, exercise care when driving screws in the vicinity of the unit control box and drain pan. Also, do not apply screws or nails where they may penetrate the chassis, risers, electrical junction boxes, raceways, or interfere with chassis removal.

When cutting out supply and return holes for grilles, be sure to vacuum all drywall dust from the coils, drain pans, and blower discharge plenum.

CAUTION: Keep drywall dust out of the unit. This dust can damage motors and reduce coil efficiency; compressor damage can also occur.

After the wallboard is in place and the room is prepared for final wall treatment, securely cover the cabinet supply and return air openings. (Cardboard cut from the unit shipping cartons can be used for this purpose.) If wall texture or color will be applied with a sprayer, do not allow any overspray to contact the coil, fan, or other unit components. Unit warranties are void if paint or other foreign debris is found on any of the internal components of the unit.

Cabinet Assembly: Optional Duct Installation

If return air is designed to enter the unit through openings in a stud wall, a duct must be field-supplied and field-installed to seal against the return air grille. Be sure to add a blockoff above and below the chassis to ensure that all air entering the unit passes through the filter and refrigerant-to-air coil.

CAUTION: Do not operate the unit — at any time — without the complete enclosure, supply grille, return air grille, and filter in place. Unit operation in any other condition may result in clogged coil surfaces, motor ventilation openings, and fan blades, as well as possible component failures.

Chassis Installation

1. Slide the chassis into the cabinet until the front chassis flange mates with the cabinet flange to form an air-tight seal. To minimize sound transmission, verify that the chassis is centered left-to-right, and that it is not twisted askew on the cabinet rails.

2. Connect the water coil pipe unions; to avoid stripping the threads, do not overtighten these connections.

   Note: If field-supplied hose kits will be used to link the supply and return runouts to the water coil, install them at this time.

3. Verify that the shutoff/balancing valve in the return line and the shutoff valve in the supply line are closed. Then, flush the system using the procedure described in "Preparation for Start-Up: System Cleaning and Flushing".

4. Once the water loop is flushed clean, open the unit water valves and check the piping for leaks.

5. Complete the electrical connections between the cabinet and chassis. Three quick-connect plugs (i.e., one black, one red, and one yellow) can be found at the end of a flexible cable attached to the chassis. The three mating plugs are located at the ends of the wires terminating to the immediate left of the cabinet control box.

   Anchor the upper end of the flexible chassis cable in the knockout hole, then connect the three sets of plugs, matching them by color.

6. Install the air filter in the chassis. To do this, insert the top edge of the filter into the top filter bracket. Push the filter up until the bottom can be pushed into place, then lower the filter into the bottom bracket.

7. Complete these checks before installing the return air/access panel:

   ☐ Rotate the fan wheel by hand to ensure that it turns freely and does not rub the housing. (Rough handling during shipment may have caused the wheel to shift; adjust if necessary.)

   ☐ Verify that the water piping connections to the chassis are complete, and that the unit service valves are open (after flushing the system water piping).

   ☐ Make sure that the power connections between the cabinet and chassis are properly made with the color-coded plugs and receptables for each wire.

   ☐ Check the unit drain line to ensure that it is not clogged and that it is properly positioned and secured.

   ☐ Verify that the nuts used to secure the blower assembly to the fan deck are tight.

8. Install the optional return air sensing bulb — if factory-supplied — as described below:

   a. Insert the sensing bulb through the plastic bushings found in the bottom panel of the control box and top panel of the chassis.

   b. Route the bulb and attached capillary tube just outside the filter frame. Allow sufficient length to make all bends gradual; coil any excess tubing below the control box.

   c. Position the sensing bulb in the approximate center of the filter and insert it into the filter media to hold it in place.

   d. Check the length of the capillary tube between the sensing bulb and the thermostat control for kinks; straighten any that are found. In addition, be sure that the capillary tube does not contact any live electrical terminal within the control box.

9. Install the cabinet return air/access panel. If the panel includes a return air louver, insert the bottom of the panel first then push the panel in at the top. Secure the panel into place by turning the cam lock fasteners. (It may be necessary to adjust these fasteners depending on the thickness of the wallboard used.)

   If a "solid" return air/access panel is provided, the upper and lower blockoff plates (which also include the brackets for supporting the panel) must be attached to the cabinet after the chassis is properly installed. To install these blockoff plates:

   a. Remove the four sheet metal screws that fasten the drywall stop around the perimeter of the opening used for chassis removal and installation.

   b. Tuck the upper blockoff plate inside the flange at the top of the chassis and attach it to the cabinet with the four screws removed in Step 9a.

   c. Loosen the screw that secures the bottom center panel of the chassis control panel to the chassis.

   d. Insert the lower blockoff panel underneath the control panel cover. Secure the bottom edge of the blockoff at each side by removing a screw from the drywall stop and replacing each in the same hole.

   e. Retighten the screw at the top center of the blockoff plate (i.e., loosened in Step 9c).

Supply Grille Installation

To complete 816 unit installation, install supply grilles over the cabinet discharge openings. Supply grilles are available in either single or double deflection configurations; grille sizes are determined by the supply air arrangement of the unit. Refer to Table 5 for typical grille sizes and arrangements based on unit size.

Grille installation is accomplished by simply inserting the grille into the cabinet discharge opening; the grille flange should rest against the drywall material covering the cabinet. Secure the grille to the cabinet with the screws provided.

Note: Supply grilles are factory-installed on exposed cabinet models. Once the grilles are installed, the grille louvers can be manually adjusted to alter the flow pattern of supply air into the controlled space.

Table 5 - Supply Grille Sizes and Arrangements (3)

Unit Size	Single Discharge (1)	Double Discharge (2)	Triple Discharge (2)
816-10	12" × 10"	10" × 6"	Not Recommended
816-15	12" × 12"	14" × 8"	Not Recommended
816-20	14" × 14"	14" × 8"	14" × 6"
816-28	Not Recommended	16" × 10"	16" × 6"
816-30	Not Recommended	16" × 12"	16" × 8"
816-36	Not Recommended	16" × 14"	16" × 10"

Notes:
(1) Side or front
(2) Any combination of top-ducted, side or front.
(3) Grille sizes and arrangements are based on an equal CFM through each grille.

Start-Up

Preparation for Start-up: System Cleaning and Flushing

Cleaning and flushing the Water Source Heat Pump System—when correctly done—is the single, most important step to ensuring proper start-up and the continued efficient operation of the system.

Carefully follow the instructions provided below to properly clean and flush the system:

WARNING: BEFORE SERVICING THE UNIT, OPEN UNIT DISCONNECT TO PREVENT INJURY OR DEATH DUE TO ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS.

1. Make sure that the supply and return riser service valves are closed at each unit.
2. Verify that electrical power to the units is disconnected and that the heat rejector is de-energized.
3. Fill the system with water, leaving the air vents open. Watch to see that all of the air is bled from the system; at the same time, prevent any overflow of water. Check the system for leaks and repair appropriately.
4. Check and adjust the water/air level in the expansion tank.
5. Start the pumps—with the strainers in place—and systematically check each vent to ensure that all of the air is bled from the system. Verify that make-up water is available and adjusted properly to replace the space taken up by the air.
6. Set the boiler to raise the loop temperature to approximately 85 F. Open a drain at the lowest point in the system; make sure that the make-up water replacement rate equals the rate of bleed.

   Continue to bleed the system until the water appears clean—or for at least three hours—whichever is longest, then, completely drain the system.
7. Refill the system and add trisodium phosphate in a proportion of approximately one pound per 150 gal-

lons of water. Reset the boiler to raise the loop temperature to about 100 F.

CAUTION: To avoid possible damage to piping systems constructed of plastic piping, do NOT allow loop temperature to exceed 110 F.

Circulate the solution for a minimum of eight to 24 hours. At the end of this period, shut off the circulating pump and drain the solution. Repeat if necessary. (Many contractors repeat this operation—i.e., filling and dumping—as many as eight times to ensure system water cleanliness.)

8. Open the supply and return riser service valves at each unit, then refill the system and remove all of the air.

9. Test the system pH with litmus paper and leave the system water slightly alkaline (i.e., pH 7.5 to 8.5). If the system continues to be acidic, appropriate chemicals must be added.

   CAUTION: At no time should "Stop-Leak" or any similar chemical agent be used in this system. Addition of such chemicals to the loop water will foul the system and inhibit unit operation.

10. After the system is successfully cleaned and flushed, set up the controls to properly maintain loop temperatures, then, check the main system panels, safety cutouts, and alarms.

Preparation for Start-Up: System Checkout

After completing the installation (including system cleaning and flushing) of the Water Source Heat Pump System, a series of system checks and recordings of system parameters must be made. An outline of these system checks is provided below and covers only the most essential aspects of the system. A much more complete checklist is provided in the "Water Source Heat Pump System Start-Up and Inspection Sheet" found near the end of this manual. The installing contractor should use this form to ensure that the system checkout and start-up inspections are conducted properly.

In addition, the installing contractor should also complete the abbreviated "Installation Checklist" at the back of this booklet and return it to the Climate Master Service Dept.

1. **Voltage Check:** Ensure that voltage is within the utilization range specifications of the unit compressor and fan motor.

2. **System Water Temperature:** Ensure that it is within an acceptable range to facilitate start-up; see Table 6. (When conducting this check, be sure to verify that the heating and cooling setpoints are correct as well.)

3. **System Water pH:** Verify that system water exhibits an approximately neutral balance (i.e., a pH of 7.5 to 8.5); this will contribute to the longevity of the heat exchangers.

4. **System Flushing:** Proper system cleaning and flushing is the most important aspect of the start-up procedure for water source heat pump installations. Make sure that the system has been flushed properly with all supply and return unit riser valves closed; this prevents possible fouling of the unit heat exchangers by system water.

   Water used in the system must be clear city water with no visible dirt, piping slag, or chemical cleaning agents apparent.

5. **Closed-Type Cooling Tower (or Open Tower w/ Heat Exchanger):** Is required to ensure continued cleanliness of the system water, while providing the means for removing excess heat from the building. Be sure to check equipment for proper temperature setpoints and operation.

6. **Balanced Water Flow Rate to Heat Pump:** Make sure that—as each heat pump unit is installed—the inlet and outlet water temperatures are recorded; refer to the "WSHP System Start-Up/Inspection Sheet".

   This check will eliminate nuisance trip-outs resulting from water velocities that are either too low or too high; it can also prevent the occurrence of erosive water flow rates.

Table 6 - Operating Limits (3)

Constraint	Minimum	Normal	Maximum
Power Supply Voltage: (1)			
208-230/60/1	197	208-230	252
265/60/1	240	265	290
Entering Air Temperature: (2)			
Wet Bulb (Cooling)	57 F	61-67 F	75 F
Dry Bulb (Heating)	50 F	65-75 F	80 F
Leaving Water Temperature:			
Cooling	70 F	95-105 F	110 F
Heating	45 F	50- 65 F	75 F
Surrounding Ambient	40 F DB	70-75 DB, 61-65 FWB	80 F DB, 70 F WB
Water Pressure (Excluding Hose Kits)	—	—	400 Psig

Notes:

(1) Voltage utilization range complies with ARI Standard 110.

(2) When using 100 percent outside air as a source of ventilation, a 40 F DB minimum and a 78 F WB maximum are acceptable, but the cabinet may sweat during hot weather.

(3) Determination of operating limits is dependent primarily upon 3 factors: 1) return air temperature, 2) water temperature, and 3) ambient temperature. Whenever any one of these factors is at a minimum or maximum level, the other two factors should be at normal levels to ensure proper unit operation.

(4) Extreme variations in temperature and humidity, corrosive water or air will adversely affect unit performance, reliability and service life.

7. **Standby Pump Installed:** Each system must have a standby pump for proper sequencing and operation.

8. **System Controls Operational:** Verify that the system controls are functioning and providing the proper sequencing; this check is necessary to ensure

that no catastrophic system failures occur (e.g., frozen cooling towers or heat exchangers, nuisance system shutdowns, etc.)

9. **Freeze Protection for Water System:** Be sure that freeze protection is provided for the outdoor portion of the loop water system. Inadequate freeze protection can lead to extremely expensive tower and system piping repairs.

   Note: A problem commonly associated with this type of system occurs when it is filled—during construction—for the purpose of cleaning, flushing and testing. After testing is complete and the system is drained, the building is often left without heat during winter conditions. Since the water coils never fully drain by themselves, they will freeze unless glycol is added to the system. Be sure to avoid this practice whenever winter conditions prevail.

10. **System Water Loop Free of Air:** Verify that all air is removed from the system. (Air in the system will impair unit operation and cause corrosion in the system piping.)

11. **Unit Filters Clean:** Check to ensure that the unit filter is clean; this will contribute to the proper operation of the unit by ensuring adequate airflow across the coil.

    Climate Master recommends that the contractor install a new filter in each unit before attempting start-up. In addition, use a vacuum to remove any debris or dirt lodged in or on the units.

12. **Check Unit Fans for Free Rotation:** Manually rotate the fan wheel to make sure that it rotates freely and that it is secured properly to the fan shaft. Do not oil the fan motor on start-up: it was lubricated at the factory.

13. **System Control Center Installed:** A system control and alarm panel is a necessity to ensure control of the temperature setpoints for operation of the system's heat rejector and boiler.

    Ideally, the panel should also contain condition signals, both audio and visual, to indicate abnormal loop water temperatures or lack of water flow. Indicator lights for the primary and standby loop circulator pumps should also be provided.

14. **Miscellaneous:** Note any questionable aspects of the installation.

Unit Start-Up

Use the procedure outlined on the next page to initiate proper unit start-up:

1. Adjust all valves to the full open position and verify that the return air/access panel is installed on each Hi-Rise unit.

2. Adjust the thermostat system switch to OFF and close the unit disconnect switch to provide supply power to the unit.

   WARNING: HIGH VOLTAGE IS PRESENT IN SOME AREAS OF THE UNIT CONTROL PANEL WITH THE DISCONNECT SWITCH CLOSED. BE SURE TO EXERCISE CAUTION WHEN WORKING WITH ENERGIZED EQUIPMENT.

3. Move the thermostat temperature indicator level to its lowest setting and position the system switch at COOL; the unit should now operate in the cooling mode provided that room temperature is above 40 F.

   Check for cool air delivery at the unit supply air grilles a few minutes after the units have begun to operate. List the identification number of any machines that do not function at this time.

   Be sure to check the elevation and cleanliness of the condensate line as well; any dripping could be a sign of a blocked line.

4. Reposition the thermostat system switch to OFF and adjust the temperature indicator lever to its highest setting, then move the system switch to HEAT. The unit should now operate in the heating mode provided that room temperature is below 80 F.

   Note: 816 heat pumps are designed to start heating at a minimum return air temperature of 40 F with a normal water flow rate and ambient temperature. Under this "cold start" condition (see Table 6), increase the water temperature to 80 F until the temperature in the controlled space reaches a normal, comfortable level. Then, return the system boiler control to the recommended setting of 70 F.

   Once the unit has begun to run, check for warm air delivery at the unit supply air grilles. Again, the installing contractor must list the room identification of any machines that do not function.

5. If the unit fails to operate, conduct the following checks:

   a. Check the voltage and current; it should be in accordance with the electrical specifications described on the unit nameplate.

   b. Look for wiring errors; check for loose terminal screws where wire connections have been made on both the line-voltage and low-voltage terminal boards.

   c. Check for dirty filters; a clogged filter will cause the unit's safety cutouts to stop unit operation.

   d. Verify that the supply and return piping is properly connected to the unit water coil. When the unit is in the cooling mode, the leaving water temperature is approximately 12 to 15 F warmer than that of the entering water (at the application flow rate of 2 to 2.5 gpm/ton). The temperature differential across the coil during cooling operation is 20 F.

      During the heating cycle, the leaving water temperature is approximately 6 to 8 F cooler than that of the entering water (at the recommended application flow rate). The temperature differential across the coil is 30 F during the heating mode.

e. If the fan fails to operate, check to see that the fan wheel turns freely and that it is secured to the shaft. Also, determine whether the fan operates during both the heating and cooling modes.

f. If the checks described above fail to reveal the problem and the unit still will not operate, be sure to contact a trained service technician to ensure proper diagnosis and repair of the equipment.

Balancing Water Flow

Use the instructions provided below to adjust the water flow rate through the water coil in those units equipped with a combination shutoff/balancing valve in the supply or return line.

Note: If flow measurement connections are provided on the unit, use them as described in the directions which accompany these devices.

1. Fasten one sensor of a dual-temperature test instrument to the supply (or inlet) water pipe inside the unit. Attach the other sensor to the return pipe.
2. Install the return air/access panel; use care to avoid damaging the sensor leads of the test instrument.
3. Start the unit in the cooling mode using the instructions provided in "Unit Start-Up".
4. Note the temperature rise of the water flowing through the unit. Gradually close the balancing/shutoff valve until the desired temperature rise is obtained (i.e., usually approximately 15 F).

   Note: This same water flow rate will result in a 7 or 8 F drop in temperature when the unit is operating in the heating mode.

Adjusting Fan Speed

To adjust the fan speed on those Hi-Rise units not equipped with a fan speed selector switch:

1. Open the unit electrical disconnect switch.

   WARNING: OPEN AND LOCK UNIT DISCONNECT TO PREVENT INJURY OR DEATH DUE TO ELECTRICAL SHOCK OR CONTACT WITH MOVING COMPONENTS.
2. Remove the unit front panel and open the control panel.
3. Locate the fan motor leads. Notice that two of these leads (i.e., the black and red leads) are fitted with yellow plug connectors.
4. As shipped from the factory, the black lead is connected to the fan motor to provide high speed operation. To operate the fan at low speed, unplug the black lead's connector and install the connector on the red lead in its place.

   Note: Whenever the unit is provided with a top-duct supply-air connection, the fan must be wired to run at high speed to ensure proper air delivery.

Operation

Units with Factory-Installed Controls

Use the instructions outlined below to operate the heat pump from the unit-mounted switch and thermostat located behind the unit control door.

☐ **Automatic Changeover Control**

Adjust the control switch to the ON position, then turn the thermostat knob toward WARMER to raise the room temperature or toward COOLER to lower it.

Once the desired comfort setting is determined, the thermostat will automatically select heating or cooling operation to maintain this setting as long as the control switch remains in the ON position.

When comfort heating or cooling is not required, move the control switch to the OFF position.

☐ **Manual Changeover Control**

Adjust the control switch to either HEAT or COOL, as desired.

To obtain the desired comfort level, turn the thermostat knob toward WARMER to raise the room temperature, or toward COOLER to lower it. Once the comfort setting is determined, simply use the control switch to select HEAT or COOL, as necessary.

When comfort heating or cooling is not required, move the control switch to the OFF position.

Units With Remote Wall-Mounted Thermostats

To operate an 816 unit from a remotely-located, wall-mounted 24-volt thermostat, use the instructions provided below:

1. Move the heating and cooling setpoint levers to the desired comfort level positions. (The minimum temperature differential between the heating and cooling setpoints is 3 F.)

2. Adjust the thermostat system switch to the desired mode of operation. System switch positions include:

   ☐ OFF: Both heating and cooling systems are off; the fan is also deenergized if the fan switch is positioned at AUTO.

   ☐ AUTO: Unit will automatically heat or cool, depending upon the variation of room temperature from the thermostat set-point.

   ☐ HEAT: Heating system is automatically controlled by the thermostat; cooling system operation is locked out at this time.

   ☐ COOL: Cooling system is automatically controlled by the thermostat; heating system operation is locked out.

3. Position the fan switch at ON or AUTO, as desired. Note: When this switch is positioned at ON, fan operation is continuous, regardless of system switch position. If set at AUTO, the fan will cycle with the compressor during heating or cooling operation.

Maintenance

Maintenance Procedures

Perform the maintenance procedures outlined below at the intervals indicated.

WARNING: BEFORE SERVICING UNIT, OPEN UNIT DISCONNECT SWITCH TO PREVENT INJURY OR DEATH DUE TO ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS.

☐ Inspect filters every three months.

A regular maintenance schedule is recommended and the frequency of filter changeouts depends upon the type of occupancy (e.g., hotel, office school).

CAUTION: To avoid fouled machinery and extensive unit clean-up, do not operate units without filters in place or use as a temporary heat source during construction.

To remove the filter from an 816 unit, lift the filter up and pull it out of the unit at the bottom. Replace the old filter by sliding the top edge of a new filter up into the rack, then push in the bottom of the filter and it will drop into place.

Refer to Table 1 (in "General Information") to determine the proper filter type and size for each 816 unit.

☐ Check condensate drain pans for algae growth at three-month intervals.

When algae growth is apparent, consult a water treatment specialist for proper chemical treatment. Typically, the application of an algacide every three months will eliminate algae problems in most locations.

☐ Lubricate fan motors annually.

All 816 heat pumps are fully lubricated when shipped from the factory; do not oil initially.

Use a hand pressure oiler to add six drops of SAE-20 non-detergent oil to each of the fan motor oil holes once each year; this is most conveniently done at the time of a filter change.

☐ Visually inspect the unit at least once each year.

When inspecting each 816 unit, give special attention to the hose assemblies (if used in lieu of the factory-installed copper connections); note any signs of deterioration or cracking and repair any leaks immediately.

☐ Conduct an amperage check annually on the compressor and fan motor. Amperage draw on this equipment should not exceed normal full load or rated loan amps by more than 10 percent of the values noted on the unit nameplate. Record the values obtained in this check in a log book so that a deteriorating condition in a fan motor or compressor can be detected prior to component failure.

☐ Clean the heat exchangers at least once each year (or more frequently if the unit is located in a "dirty" environment) to help maintain proper unit operating efficiency.

Safety Control Reset

All 816 heat pumps are furnished with high-pressure and low-temperature cutouts to prevent the machine from operating at abnormal conditions of temperature or water flow. The high-pressure control used on 816 units is designed to open its contacts at 360 psig and automatically reclose them at 200 psig, while the contacts of the low-temperature switch open at 40 F and reclose at 46 F. A lockout relay is electrically linked with these cutouts, and interrupts unit heating or cooling operation until the machine is reset manually.

Reset is accomplished by adjusting the control (or system) switch to OFF and back to HEAT or COOL (or AUTO), as desired. (The 816 units can also be reset by opening and closing the circuit breaker.)

Note: If the unit must be reset more than twice at normal entering air temperatures, be sure to check it for a dirty filter, abnormal entering water temperature, inadequate or excessive water flow, and internal malfunctions.

WSHP System Start-Up/Inspection Sheet

Installing Contractor: Use this form to thoroughly check out the system and units before and during start-up. (This form need not be returned.)

Job Name _____ Job Location _____

Sales Order No. _____ Installing Contractor _____

Sales Engineer _____ Bldg. Maintenance Mgr. _____

Sales Office _____ Engineer _____

Telephone No. _____

In order to minimize troubleshooting and costly unit and system failures, complete the following checks and data entries before the system is put into full operation:

Loop Water Circuit

☐ Cleaning/Flushing completed per specification
Date: _____
Company: _____

☐ Balanced per specification
Date: _____
Company: _____

☐ Chemical treatment per specification
Date: _____
Company: _____

Heat Rejector

☐ Closed-Loop Cooling Tower
Tower Make/Model No. _____

☐ Full Loop Water Flow Thru Tower

Checked for proper operation of:
☐ Closure Dampers
☐ Spray Pump
☐ Fan Motors
☐ Sump Float Valve
☐ Sump Heater
☐ Heat Tape (on exposed piping)
☐ Exposed Piping Properly Insulated

Loop Temperature Control Method

☐ System Panel Installed
Panel Type: _____

Checked for proper operation of:
☐ High Temperature Alarm
☐ Low Temperature Alarm
☐ No Flow Alarm
☐ Pump Sequencing Device
☐ Pump Lead/Lag Feature
☐ Cooling Tower
☐ Boiler

☐ Open Tower w/Heat Exchanger
Tower Make/Model No. _____
Heat Exch. Model No. _____

☐ Tower Operates Properly
☐ Loop Water Inlet Temp. _____ F
☐ Loop Water Outlet Temp. _____ F
☐ Tower Water Inlet Temp. _____ F
☐ Tower Water Outlet Temp. _____ F
☐ Tower Loop Pumps Quantity: _____
☐ Automatic Sequencing
☐ Alarms

Boiler

Boiler Type: _____
Boiler Model No. _____

☐ Operating Control Setpoint: _____ F
(Should be 60 to 70 F)
☐ Hi-Limit Cutout Setpoint: _____ F
(Should be 80 F)
☐ Steps of Heating Checked in Sequence
☐ Checked Line Current to Each Heater Element (Electric Only)

System Make-Up Water

☐ Automatic
☐ Manual
☐ Chemically Treated

Make-Up Air System

☐ Installed per Specification

System Main Circulating Pumps

Pump Make/Model No. _____

Quantity: _____

☐ Automatic Pump Sequencing
☐ No Flow Alarm
☐ Discharge Pressure: _____ Psig
☐ Suction Pressure: _____ Psig
☐ Flow Rate: _____ GPM

Vibration Isolation:
☐ From Floor
☐ From Piping System

System Piping

☐ Closed Loop

Piping Materials: _____

☐ Thermometer/Aquastats Installed in Loop
☐ Correct Level in Expansion Tank

Air Vents

☐ Installed at Proper Points in System

Individual Heat Pump Check

Complete this inspection for each unit:

Unit Location: _____

Unit Model No. _____

Unit Serial No. _____

☐ Clean Filter
☐ Clean Drain Pan
☐ Condensate Trap Installed

Unit Started In:
☐ Heating Mode ☐ Cooling Mode
☐ Entering Air Temp. _____ F
☐ Leaving Air Temp. _____ F
☐ Entering Water Temp. _____ F
☐ Leaving Water Temp. _____ F
☐ Volts (Under Load) _____ V
☐ Fan Amps _____
☐ Compressor Amps _____

Comments: _____

Installation Checklist

The following form should be filled out by the installing contractor and returned to the local Utica Sales Office. (To avoid disassembling this manual, simply make a photographic copy of the completed form and send it to the sales office.)

Job Name _____ Job Location _____

Sales Order No. _____ Installing Contractor _____

Sales Engineer _____ Engineer _____

Sales Office _____ Bldg. Maintenance Mgr. _____

Telephone No. _____

Essential Items Checkout

☐ Voltage _____

☐ System Water pH _____

☐ Loop Temp. Cooling Setpoint _____ F

☐ Loop Temp. Heating Setpoint _____ F

☐ Loop Water Flushed Clean

☐ Water Flow Rate to Heat Pump(s) Balanced

☐ Standby Pump Installed

☐ System Controls Functioning Properly

☐ Outdoor Portion of Water System Protected from Freeze-Up

☐ Loop System Free of Air

☐ Filters Clean

☐ Condensate Traps Installed

☐ Other Conditions Found _____

ClimateMaster

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