Carrier

Omnizone™
50BV020-064
Water-Cooled
Indoor Self-Contained Systems

Installation, Start-Up, Service and Controls Operation and Troubleshooting

CONTENTS

SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment.

Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply.

Follow all safety codes, including ANSI (American National Standards Institute) Z223.1. Wear safety glasses and work gloves. Use quenching cloth for unbrazing operations. Have fire extinguisher available for all brazing operations.

It is important to recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, CAUTION, and NOTE. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used to identify unsafe practices, which **may** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance with the equipment.

The qualified installer or service provider must use factory-authorized kits, parts, or accessories when servicing or repairing this product. Refer to the individual instructions packaged with the kits or accessories when installing.

⚠WARNING

Before performing service or maintenance operations on unit, turn off main power switch to unit and open all disconnects. More than one disconnect switch may be required to de-energize this equipment. Electric shock hazard can cause injury or death.

⚠CAUTION

Use care in handling, rigging, and setting bulky equipment.

⚠WARNING

DO NOT USE TORCH to remove any component. System contains oil and refrigerant under pressure.

To remove a component, wear protective gloves and goggles and proceed as follows:

a. Shut off electrical power to unit.
b. Recover refrigerant to relieve all pressure from system using both high-pressure and low pressure ports.
c. Traces of vapor should be displaced with nitrogen and the work area should be well ventilated. Refrigerant in contact with an open flame produces toxic gases.
d. Cut component connection tubing with tubing cutter and remove component from unit. Use a pan to catch any oil that may come out of the lines and as a gage for how much oil to add to the system.
e. Carefully un-sweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

Failure to follow these procedures may result in personal injury or death.

⚠CAUTION

DO NOT re-use compressor oil or any oil that has been exposed to the atmosphere. Dispose of oil per local codes and regulations. DO NOT leave refrigerant system open to air any longer than the actual time required to service the equipment. Seal circuits being serviced and charge with dry nitrogen to prevent oil contamination when timely repairs cannot be completed. Failure to follow these procedures may result in damage to equipment.

GENERAL

Omnizone™ 50BV Indoor Packaged units are very flexible for a variety of applications. These self-contained units are available as water source cooling only and heat pump units. The 50BV units are available with either constant volume (CV) or variable air volume (VAV) controls. Finally, Omnizone 50BV units are available in two cabinet styles. Unit sizes 020-034 are constructed in a single-piece, unpainted galvanized cabinet. Unit sizes 034-064 are available as modular units, and can be taken apart for easier installation. Modular units are built using an unpainted, galvanized steel cabinet with steel framework, and can be easily disassembled without breaking the refrigerant lines. See Table 1 for a model number reference by application.

Each unit contains multiple scroll compressors piped in separate refrigerant circuits. Each water-cooled circuit includes a coaxial (tube-in-tube) condenser, TXV (thermostatic expansion valve), individual evaporator coils, and all interconnecting piping. Water source units are shipped fully charged with Puron® (R-410A) refrigerant.

Each unit is equipped with one or two forward-curved centrifugal blowers, to ensure quiet air delivery to the conditioned space. Constant volume units are equipped with a non-inverter rated supply fan motor and operate at a single fan speed. Single piece units include adjustable sheave that can be field adjusted to change the airflow rate. Modular units include a fixed sheave. For VAV applications, the unit is supplied with an inverter duty motor with variable frequency drive(s) (VFD) that automatically adjusts blower speed to maintain a constant, adjustable duct static pressure.

Constant volume units can be controlled by a field provided two-stage cooling only (50BVT) or two-stage heat pump (50BVV) thermostat or field provided digital controller.

VAV units include a digital VAV controller that provides compressor staging (two or four stages) based on return air temperature and supply air temperature set points for multi-zone VAV operation.

All 50BV units have removable access panels for easy servicing. These panels allow access to controls, compressors, condensers, VFD(s) (if applicable), evaporator motors, blowers, belts, pulleys, and refrigeration components.

MAJOR CONTROL COMPONENTS

Constant Volume (CV) Units

UNIT PROTECTION MODULE (UPM)

The UPM for the 50BVT and V units provide both equipment safety and diagnostics capability including:

- Condensate Overflow Protection prevents unit operation in the event that the drain pan clogs.
- Random Start provides a programmable start with a range of 30 to 60 seconds.
- Anti-short Cycle Timer provides a 5-minute delay to prevent compressor short cycling.
- Low Pressure Bypass Timer bypasses the low-pressure switch for 120 seconds to avoid nuisance trips during cold start-up.
- Brownout/Surge/Power Interruption Protection will shut down the main control board functions if the secondary voltage falls below 18 volts or goes above 30 volts. A blink code will flash while in fault mode. This will automatically reset when the voltage returns to the valid range.
- Alarm Output contacts provide remote fault indication.
- Test/Service Pin is a jumper that reduces all time delay settings to 6 seconds during troubleshooting or operation verification.
- Reset occurs after a 5-minute delay when a fault condition occurs. When the timer expires, the unit will restart. If the same condition occurs a second time, the unit will be locked out.
- Lockout Reset requires that the unit power be cycled at the unit controller via either the thermostat or unit disconnect.

NOTE: The refrigerant circuits on dual or quad compressor models are completely independent. If either stage has a fault condition the remaining stage will continue to operate without interruption. A freeze or condensate overflow lockout will shut down all refrigerant circuits.

- LEDs are provided for diagnostic purposes.
- Freeze protection will shut down the compressor circuit if the refrigerant liquid temperature to the water to refrigerant heat exchanger falls below 26°F for 30 seconds continuous. This trip point can be lowered to 15°F for geothermal applications employing antifreeze by cutting the JP1 and JP2 jumpers on the board.

Table 1 — Model Number Reference By Application Type

MODEL	TYPE[a]	AVAILABLE CAPACITY	CONSTRUCTION	CONTROLS
50BVJ	Water-Cooled	18 to 30 nominal tons	Single-piece	VAV
50BVT	Water-Cooled	30 to 60 nominal tons	Modular	CV
50BVV	Water-Cooled Heat Pump	30 to 60 nominal tons	Modular	CV
50BVW	Water-Cooled	30 to 60 nominal tons	Modular	VAV

NOTE(S):

a. All units are cooling only unless specified.

LEGEND

CV — Constant Volume
VAV — Variable Air Volume

Variable Air Volume (VAV) Units

The 50BVJ and W units come equipped with a Carrier I/O Flex 6126 controller with expander module and a supply fan VFD, in addition to the UPM.

The I/O Flex controller is factory installed, wired and configured to match the unit order configuration (stages of cooling and modulating HGRH).

The I/O Flex controller provides staging of the unit compressors, supply fan speed control, modulating hot gas reheat control (for supply air temperature control, not dehumidification), and safety operation (in conjunction with the UPM).

NOTE: The VAV units utilize face split coils and should not be operated below 50% of nominal airflow to prevent coil freezing.

PRE-INSTALLATION

Omnizone™ 50BV units are intended for indoor installation only. Review unit dimensions, piping and wiring connections, service clearances, and other equipment details included in this installation guide, the product data, or the unit submittal prior to equipment installation.

Inspection

Upon receipt of shipment, carefully check the shipment against the bill of lading. Single piece units ship as a complete assembly. Modular units ship as either one (30 ton low boy), two (30 ton high boy, 40-60 ton low boy), or four (40-60 ton high boy) separate pieces. Make sure all pieces have been received. Inspect the carton or crating of each unit, and inspect each unit for damage on both the interior and exterior. Ensure the shipping company makes proper notation of any shortages or damage on all copies of the freight bill. Concealed damage not discovered during unloading must be reported to the shipping company **within 5 days** of receipt of shipment.

NOTE: It is the responsibility of the purchaser to file all necessary claims with the shipping company.

UNIT STORAGE

The 50BV units are designed and packaged for indoor storage and use only. If the equipment is not needed for immediate installation upon its arrival at the job site, it should be left in its shipping carton and stored in a clean, dry area. Units should not be stored in a location that is subject to freezing. Units must only be stored or moved in the normal upright position, as indicated by the up arrows on each carton, at all times. DO NOT STACK UNITS.

INSTALLATION

Step 1 — Check Equipment

Upon receipt of equipment at the job site, inspect the carton or crating of each unit, and inspect each unit for damage on both the interior and exterior. Note any damage and contact your local Carrier equipment sales office.

Prior to proceeding with installation or rigging, verify the following:

1. Make sure the equipment received is the correct capacity, configuration, and voltage, compared to the unit submittals or product data.
2. Verify all modules/pieces have been received.
3. Verify all required accessories or other field installed components (hose kits, controls, thermostats, shut off valves, control interfaces etc.) have been received.
4. Verify that the equipment type matches the application type (CV/SAV vs. VAV).

If any of the above items are missing or incorrect, contact your local Carrier equipment sales office.

Before unit installation, read all manuals and become familiar with the unit and its operation. Thoroughly check out the system before operation. Complete the inspections and instructions listed below to prepare a unit for installation. See tables on pages 27-28 for unit physical data and tables on pages 35-36 for unit electrical data. For unit service clearances refer to page 9 and for typical unit dimensions refer to pages 10-26.

Step 2 — Check Jobsite

Prior to proceeding with removal of existing equipment and installation of new equipment, verify the following:

1. Verify the jobsite voltage matches the unit voltage.
2. Verify that the power feed and power system protection (if existing) match the unit nameplate MCA and MOCP.
3. Verify installation path for equipment, check dimensions for installation path. Check weights of any elevators or jobsite rigging equipment.
4. Verify that the unit will fit in the installation location with the proper service clearances.
5. For CV/SAV applications, verify that the proper thermostat or control system exists for unit operation.
6. For VAV applications, verify that VAV air terminal units have been installed or will be installed prior to starting up the 50BV unit. Also verify that a control interface (Virtual BACview with USB link cable) will be available.

If any of the above items are missing or incorrect, contact your local Carrier equipment sales office.

UNIT LOCATION

Locate unit in an indoor area that allows easy removal of the filters, access panels, and accessories. Make certain enough space is available for service personnel to perform maintenance or repairs.

See Fig. 6 for service clearances. Provide sufficient room to make all water, duct, and electrical connections. If the unit is located in a small mechanical equipment room, make sure adequate space is available for air to return freely to the unit. These units are not approved for outdoor installations and must be installed inside the structure. Do not locate in areas that are subject to freezing.

INSTALLATION GUIDELINES (ALL UNITS)

1. Be sure that the location chosen for unit installation provides ambient temperatures maintained above freezing.

2. Provide enough space for duct connections. Do not allow the weight of the ductwork to rest on the unit.
3. Provide adequate clearance for filter replacement and drain pan cleaning. Do not allow piping, conduit, etc. to block filter access.
4. Provide access to allow maintenance and servicing of the blowers and blower motors, compressor and coils in accordance with the provided service clearances.
5. Provide an unobstructed path to the unit within the closet or mechanical room. Space should allow return air to freely enter the space.
6. Provide ready access to water valves and fittings, and screwdriver access to unit side panels, discharge collar, and all electrical connections.
7. For CV units, verify that a thermostat or field provided digital control will be available.
8. For VAV units, verify that pressure independent air terminal will be installed and a control interface is available (Virtual BACnet with USB Link cable).

UNIT PLACEMENT

Ensure that the floor or equipment support structure is structurally strong enough to support the weight of the equipment with minimum deflection. A good, level floor is required for proper unit operation and to ensure proper fit-up and alignment of all bolt-together and union-coupled modules on modular units. Utilize vibration isolation springs or pads between the unit and the support structure or floor to reduce vibration and sound.

IMPORTANT: It is the installing contractor's responsibility to ensure that all equipment is installed with proper access for installation of accessories, configuration of components and controls, equipment start-up, maintenance, service, and equipment removal, in accordance with Carrier's recommended service clearances and installation instructions.

Please refer to the Carrier Commercial WSHP Warranty Statement (document number 04-570008-01) for details on warranty exclusions regarding equipment, access, removal and clearances.

ACOUSTICAL CONSIDERATIONS

Proper acoustical considerations are a critical part of every system's design and operation. Each system design and installation should be reviewed for its own unique requirements. For job specific requirements, contact an acoustical consultant for guidance and recommendations. Consider the following recommendations:

1. Locate unit and supply/return ducts away from noise-sensitive locations, including sleeping areas, private offices, and other sound sensitive spaces.
2. Whenever possible, work with the architect to locate the equipment rooms around the perimeters of restrooms, hallways, fire escapes, stair wells, etc., to reduce noise transmission. This allows not only for isolation from radiated sound but also enables the contractor to route duct systems around sensitive locations.
3. Construct the equipment room of concrete block or use a double offset stud wall with interwoven insulation. Seal all penetrations.
4. Design the system for low total static pressure.
5. Use suitable vibration isolation pads or isolation springs according to the design engineer's specifications.
6. A flexible canvas duct connector is recommended on both the supply and return air sides of units to be connected to system ductwork.
7. Use a minimum of 15 ft of return ductwork between the last air terminal or diffuser and the unit.
8. Insulate supply and return ducts with 2-in., 3-lb density insulation.
9. Round duct is recommended. If rectangular ductwork is used, keep aspect ratios as small as possible (i.e., as close to square as possible).
10. Avoid any direct line of sight from return air grilles into the unit's return. If return air is to be ducted to an equipment room, an elbow should be installed within the equipment room.
11. Running a return air drop to near the floor of the room will aid in sound attenuation.
12. Do not exceed the recommended supply duct velocity of 2,000 fpm.
13. Do not exceed the recommended return duct velocity of 1,000 fpm.
14. Use turning vanes on 90-degree elbows.
15. Place isolation springs under each corner of the unit and under compressor sections.
16. Consider the use of compressor sound blankets where the above steps cannot be taken.

Step 3 — Rig and Place Unit

Use proper lifting and handling practices to avoid damage to the unit. See Tables 2 and 3 for typical operating weights and Fig. 7-23 for unit dimensions.

NOTE: Unit options may change unit operating weights and dimensions.

SINGLE PIECE UNITS (50BVJ)

Single piece units are shipped as an entire assembly with factory refrigerant charge. Single piece units are not designed to be disassembled for rigging. Use spreader bars and rigging straps if lifting with a crane to avoid damage to the unit. Otherwise, move with a fork truck using the shipping pallet.

NOTE: Do not rotate or tip any of the main unit sections prior to or during installation.

For single piece units with take apart construction special order (ETO) package, units will ship a nitrogen charge and split refrigerant piping to allow the unit top and bottom sections to be field separated. Refrigerant charge and field brazing of refrigerant piping will be required. Do not rotate or tip units or unit sections prior to or during installation.

MODULAR UNITS (50BVT,V,W)

Modular units are shipped in multiple sections (except the low boy size 034) for easy movement and installation without the need for breaking refrigerant lines. Move modular units with a fork truck using the included base rails or use spreader bars and lifting straps as shown in Fig. 1.

NOTE: Do not rotate or tip any of the main unit sections prior to or during installation.

LOW BOY UNITS

50BV low boy units are short and wide, to allow installation in height restricted areas. Low boy units ship as either one (034) or two (044-064) separate modules that are mated together during the final installation. See Fig. 10, 11, 14, and 15 for low boy base unit dimensions. The filter rack/economizer section of the low boy unit can be field removed for easier installation. See Fig. 4 and 5 for low boy field splits.

HIGH BOY UNITS

50BV high boy units are tall and thin and ship in two (034) or four (044-064) modules that require field assembly (fan section and main section). See Fig. 8, 9, 12, 13 and 23 for high boy base unit dimensions. The filter rack/economizer can be removed from the main section to allow all high boy units to fit through a 36-in. wide opening (the fan assembly needs to be rotated). See Fig. 2 and 3 for high boy field splits.

Refer to Fig. 7-23 for unit dimensions. Refer to Tables 2 and 3 for physical data.

REMOVE PACKAGING

Remove all protective plastic and other supports only after the units have been installed. Remove and discard unit top cover protector, filter cover, controller display protector, remove any included shipping supports, and water piping connection packaging.

ASSEMBLING MODULAR UNITS

50BVT,V,W unit sizes 034-064 ship in pieces. Reassemble the unit. Use the loose hardware provided in the main air-conditioning section and the instructions below.

1. The filter/economizer section ships bolted to the main air-conditioning section and can be removed in the field (high and low boy units). When reattaching the filter/economizer section to the main air-conditioning section, place the filter side of the filter/economizer section facing out and away from the main air-conditioning section.
2. If the unit has two filter/economizer and two main air-conditioning sections (unit sizes 044-064), bolt the remaining filter/economizer section and main air-conditioning section together, as in Step 1.
3. For units with two filter/economizer and two main air-conditioning sections, use the provided unions to assemble the water connections between the two additional sections joined in Step 2.
4. For unit sizes 044-064, connect the condensate drain hoses from the "B" side of the unit to the drain manifold on the "A" side of the unit.
5. For unit sizes 044-064, connect power wiring from the main terminal block in the "A" side of the unit to the power terminal block in the "B" side of the unit.

⚠ CAUTION

Remove all shipping blocks, if any, under blower housing or damage to the fan may occur.

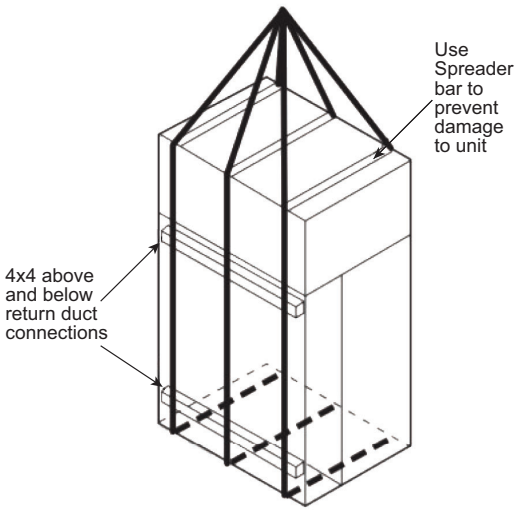
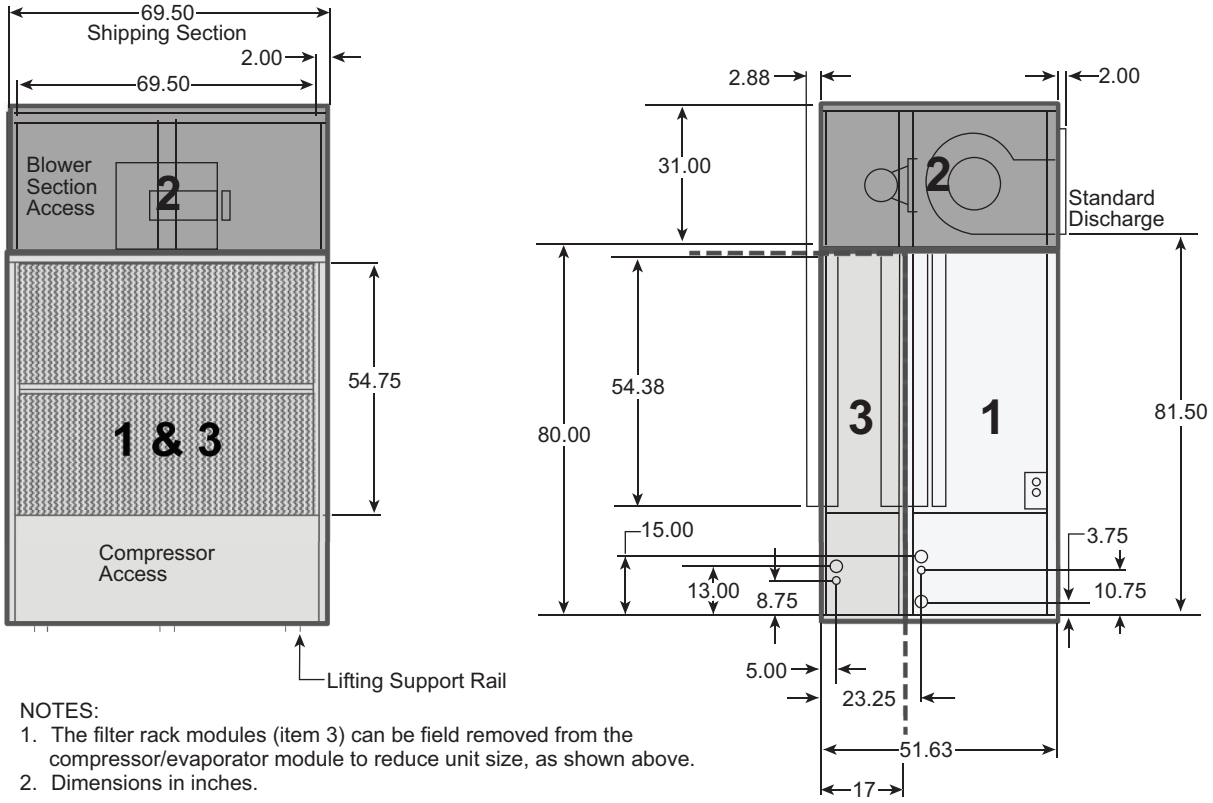


Fig. 1 — Modular Unit Rigging



NOTES:
1. The filter rack modules (item 3) can be field removed from the compressor/evaporator module to reduce unit size, as shown above.
2. Dimensions in inches.

Fig. 2 — High Boy Field Split - 30 Ton

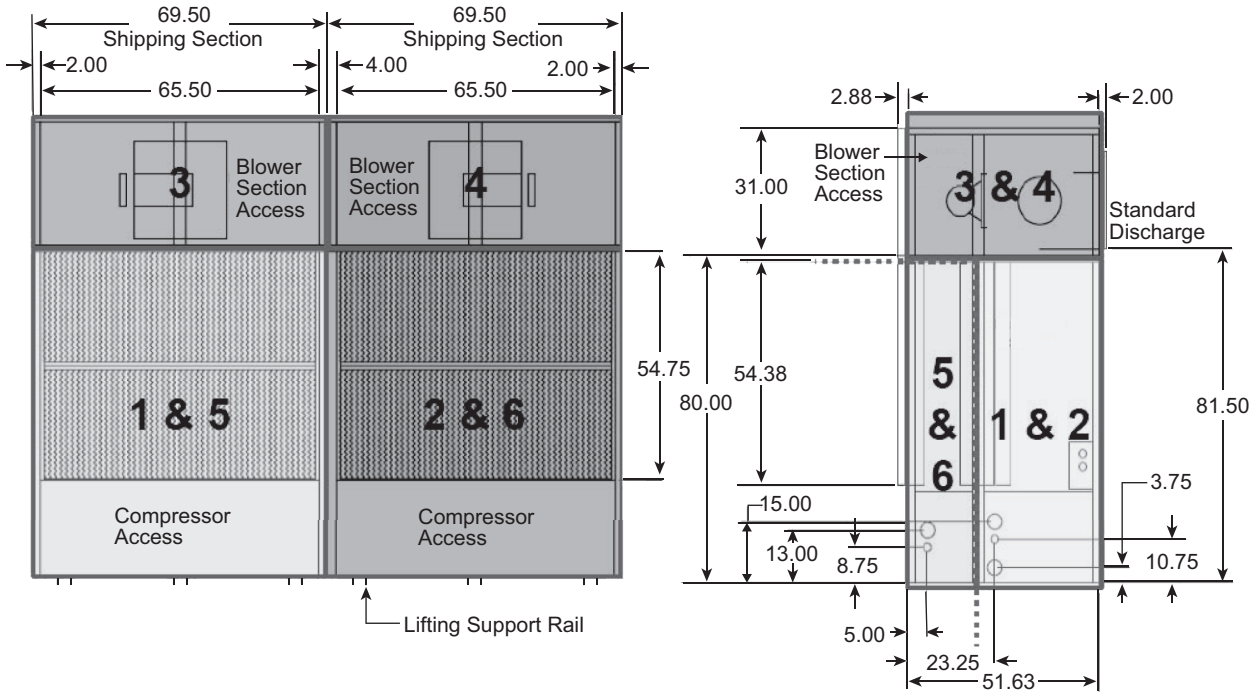
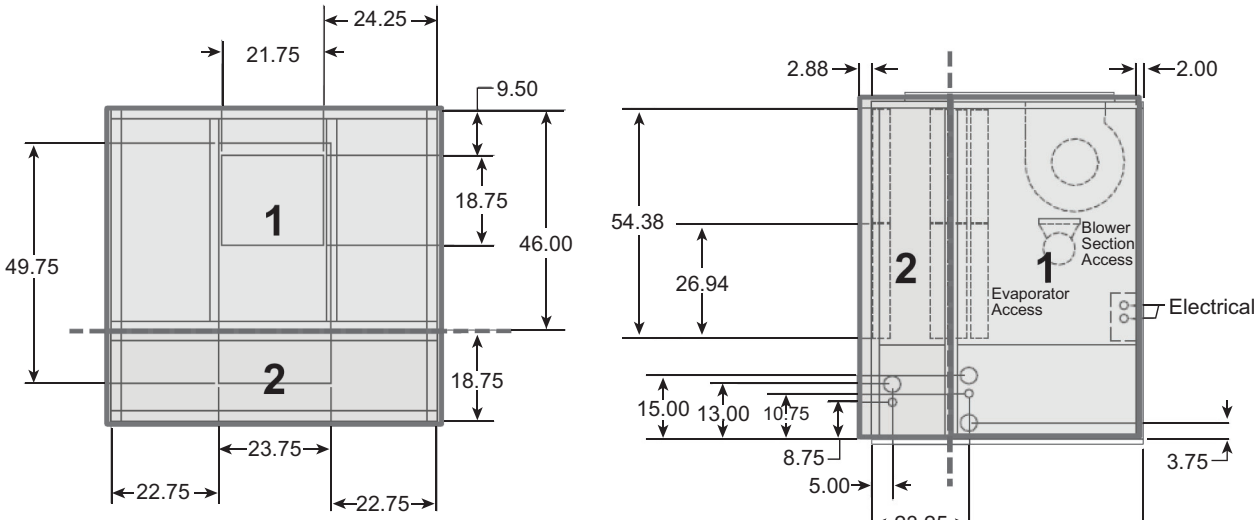


Fig. 3 — High Boy Field Split - 40-60 Ton



NOTES:
1. The filter rack modules (item 2) can be field removed from the compressor/evaporator module to reduce unit size, as shown above.
2. Dimensions in inches.

Fig. 4 — Low Boy Field Split - 30 Ton

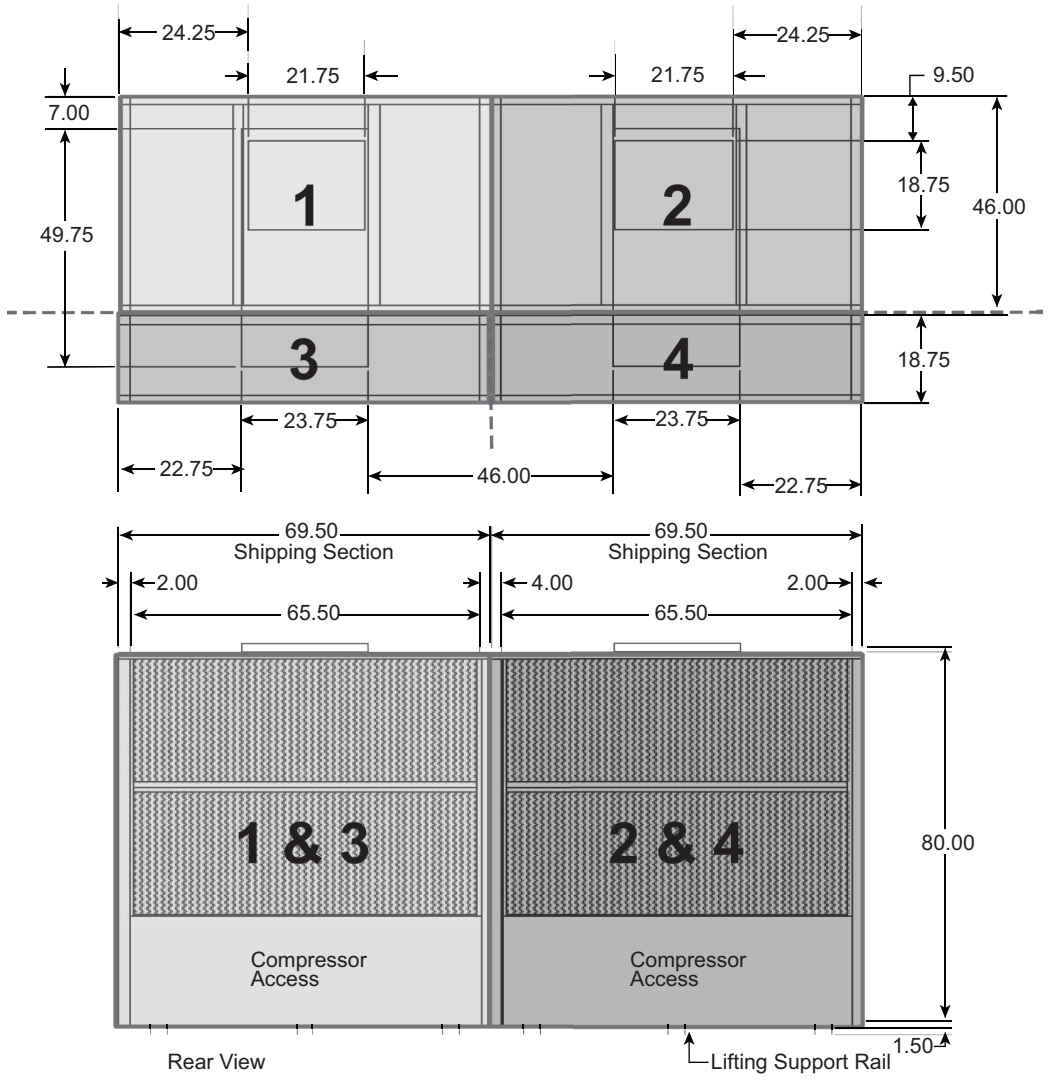


Fig. 5 — Low Boy Field Split - 40-60 Ton

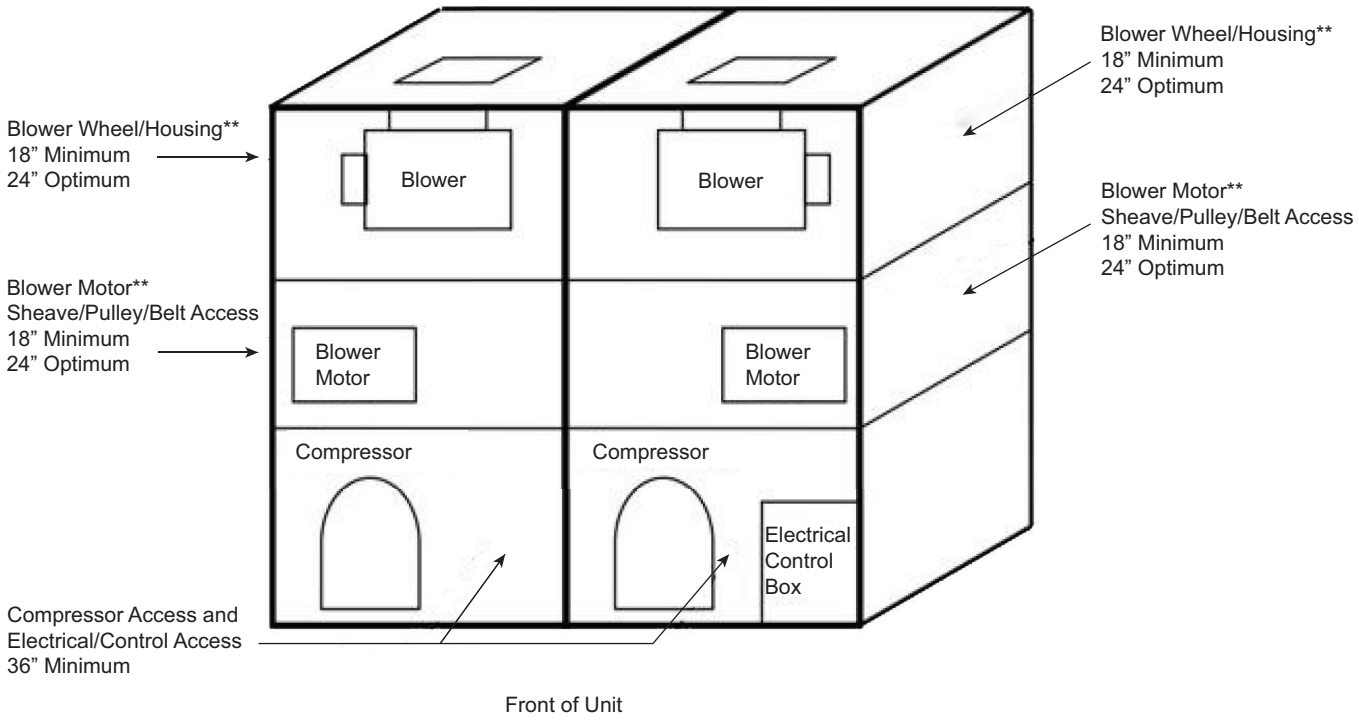
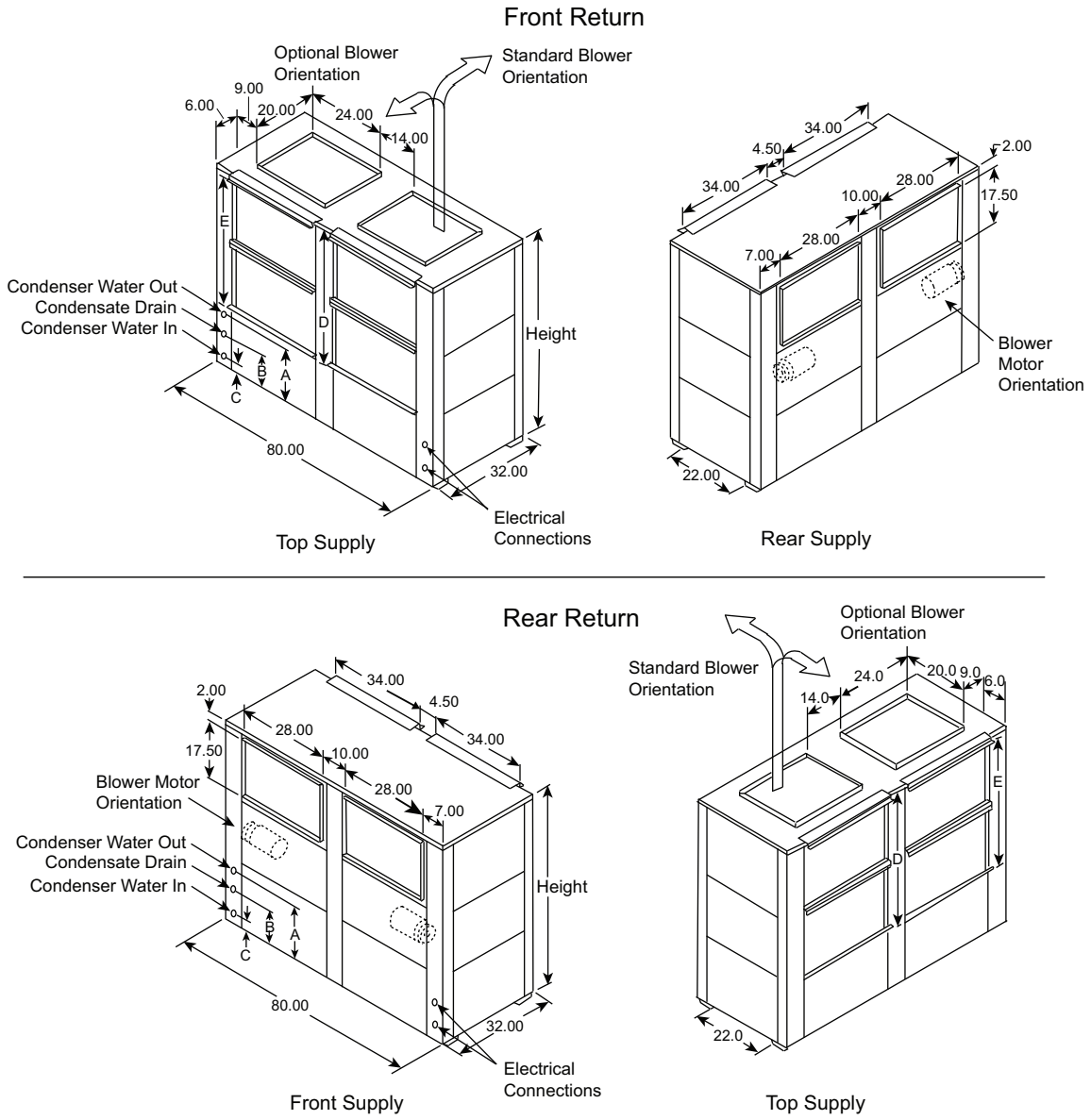


Fig. 6 — 50BV Service Clearances



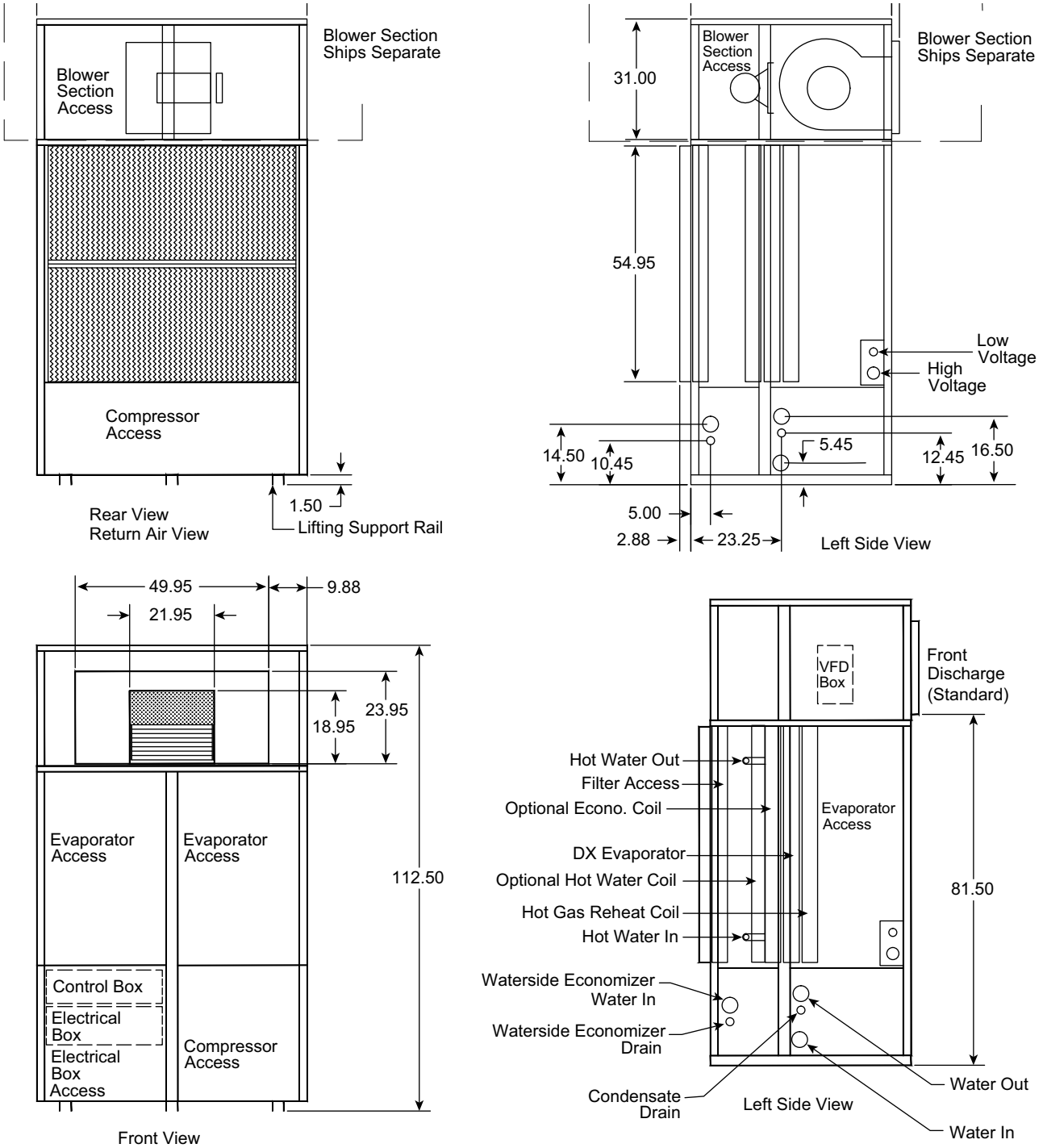
UNIT SIZE 50BVJ	HEIGHT	WIDTH	DEPTH*	CONDENSER WATER CONNECTIONS				DUCT FLANGE	FILTER RACK	REPLACEMENT FILTER SIZE (NOMINAL)
				A	B	C	Diameter (FPT)	D	E	
020	62.00	80.00	32.00	18.00	8.75	2.75	2	38.00	40.00	20 x 34-1/2 x 1 (4 per unit)
024	66.50	80.00	32.00	18.00	8.75	2.75	2	38.00	40.00	
028	66.50	80.00	32.00	18.00	8.75	2.75	2	38.00	40.00	30 x 34-1/2 x 1 (4 per unit, size 034 only)
034	86.50	80.00	32.00	17.00	9.00	3.50	2	58.00	60.00	

* When WSHP Open Controller is installed increase depth by 3.00 inches.

NOTES:

1. All dimensions in inches unless otherwise noted. All dimensions within ± 0.125 in. Specifications subject to change without notice. Condensate connections are 1.25 in. FPT on sizes 020 through 034.
2. Front of unit is side with water and electrical connections.

Fig. 7 — 50BVJ020-034 Dimensions



Water Connections	
H_2O In*	2.5
H_2O Out*	2.5
Condensate*	0.75
Economizer Condensate	1.25
HW In/Out Sweat Connection	1.38

*F.P.T. Type Connection

Filters	
Nominal	**Quantity**
17 x 27 x 4	8

NOTES:
1. Optional hot water coil connections may add up to 3 in. on both the left and right side of the unit increasing the unit width an additional 6 in.
2. Dimensions in inches.
3. Recommended minimum service clearances are as follows:
   a. Front and rear — 36 in.
   b. Left of right side — 65 in. for coil removal
   c. Side opposite coil removal — 36 in.
4. For all other airflow configuration drawings see SCUBuilder program.
5. Dimensions Include Base Rail Height (1.5 in.).

Fig. 8 — 50BVT,V,W034 (High-Boy) Dimensions
Rear Return, Front Supply with Waterside Economizer and Hot Water Coil

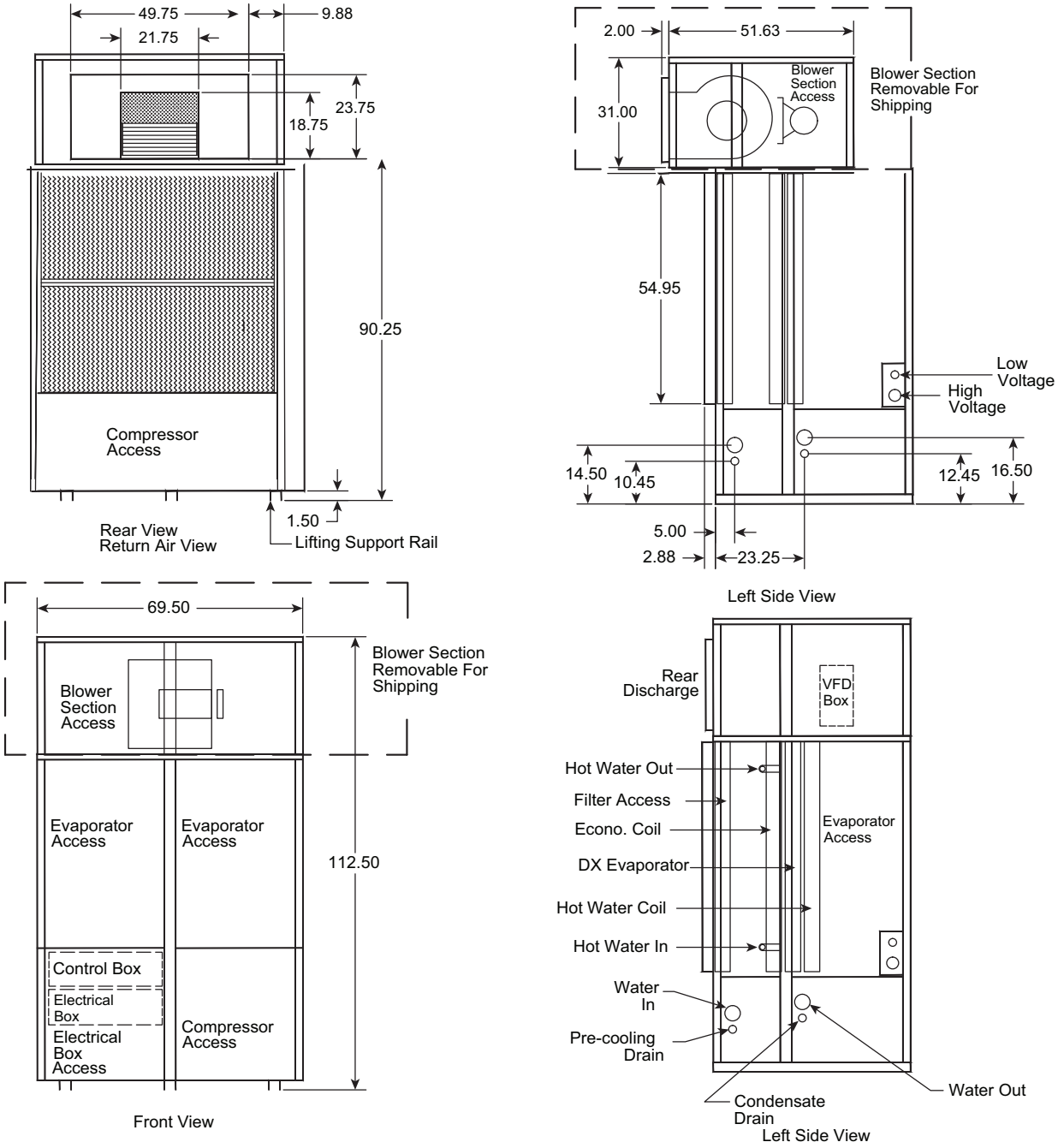
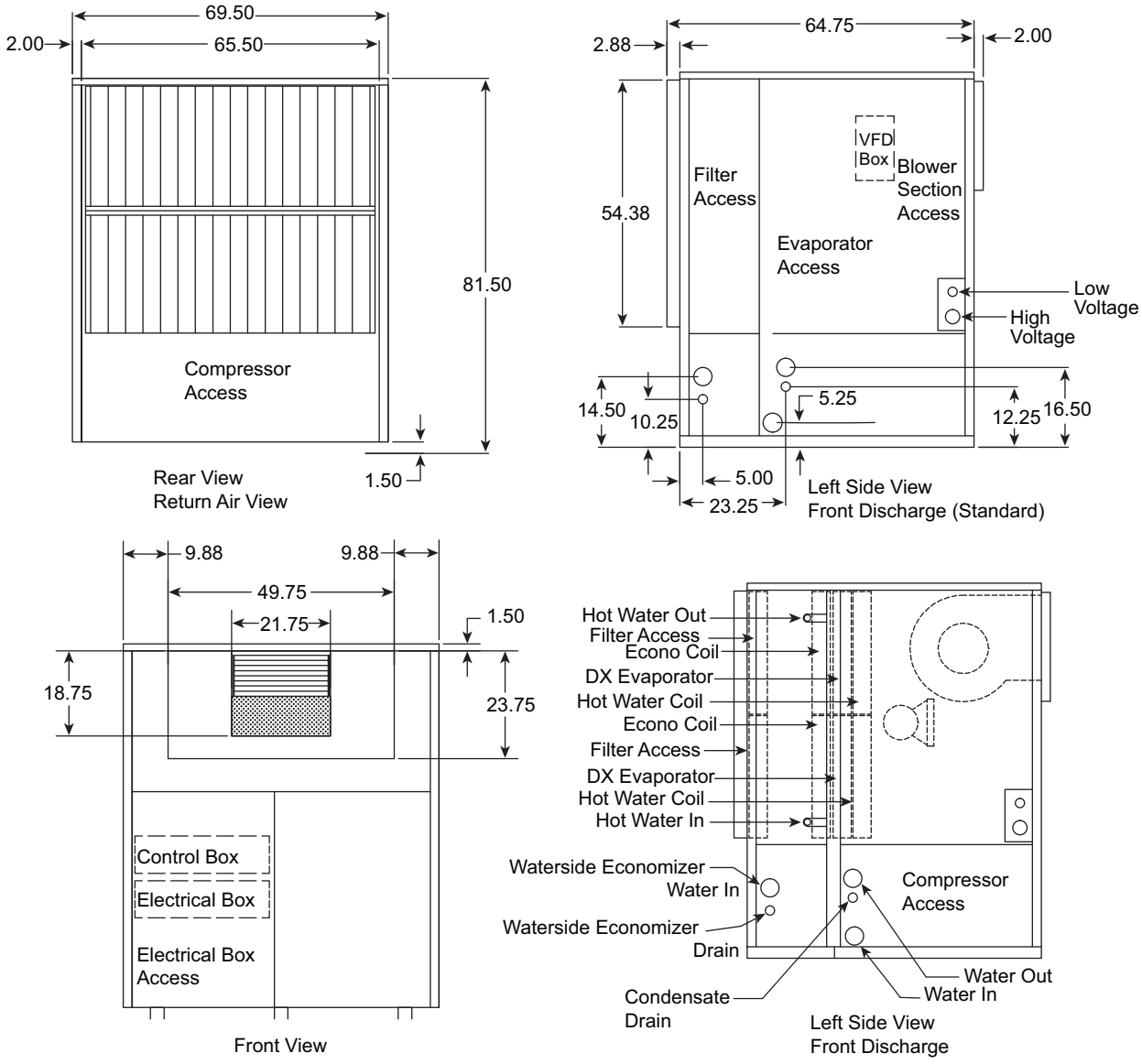
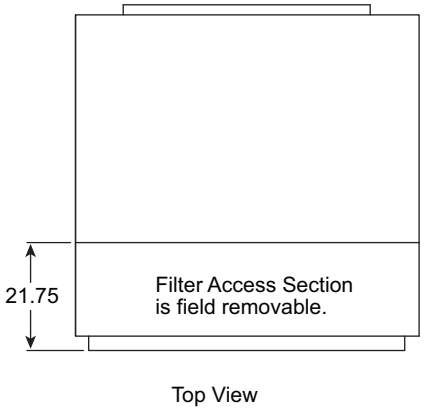


Fig. 9 — 50BVT,W,V034 (High Boy) Dimensions
Rear Return, Rear Supply with Waterside Economizer and Hot Water Coil





Filters**		
Nominal	**Actual**	**Quantity**
17 x 27	16.5 x 26.50	8

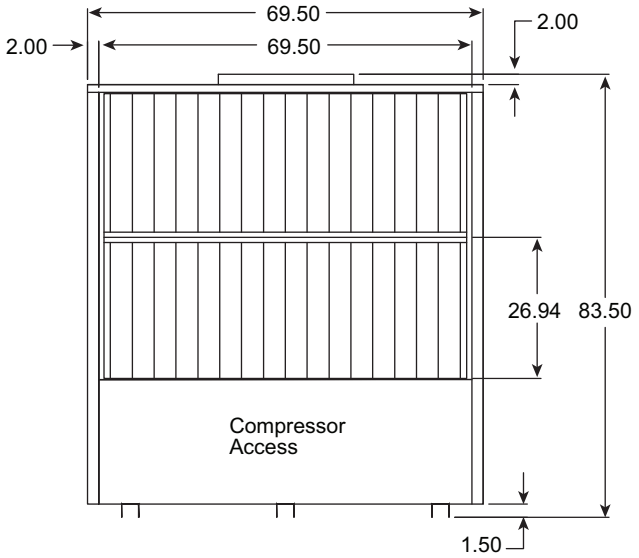
**4 in. thick

Water Connections	
H_2O In*	2.5
H_2O Out*	2.5
Condensate*	0.75
Pre-Cooling Drain	1.25
HW In/Out Sweat Connection	1.38

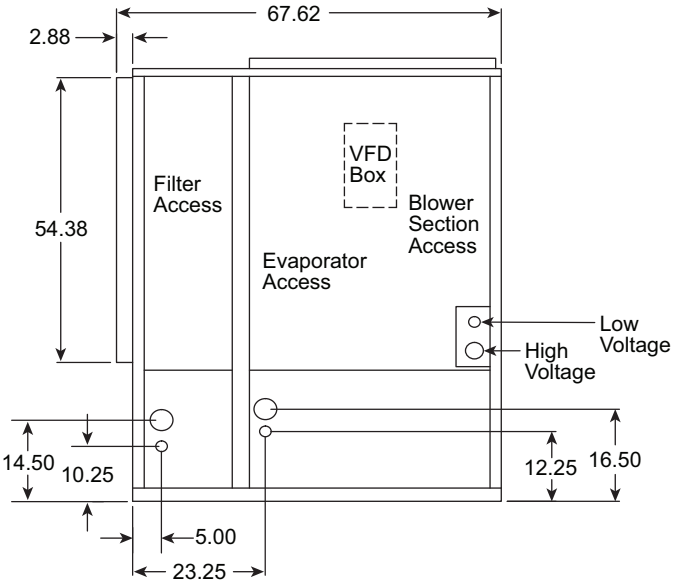
*F.P.T. Type Connection

NOTES:
1. Dimensions in inches.
2. Recommended minimum service clearances are as follows:
   a. Front and rear — 36 in.
   b. Left and right side — 65 in. for coil removal
   c. Side opposite coil removal — 36 in.
3. For all other airflow configuration drawings see SCUBuilder program.
4. Dimensions include base rail height (1.5 in.).

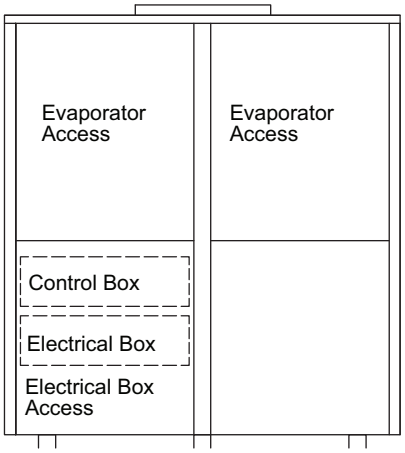
Fig. 10 — 50BVT, V, W034 (Low-Boy) Dimensions
Rear Return, Front Supply with Waterside Economizer



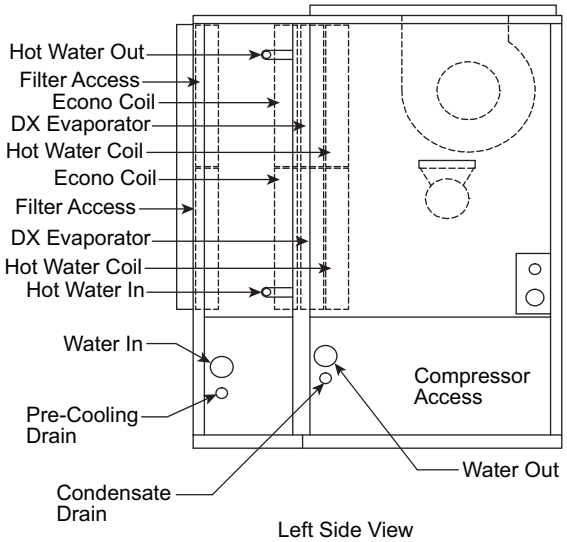
Rear View
Return Air View



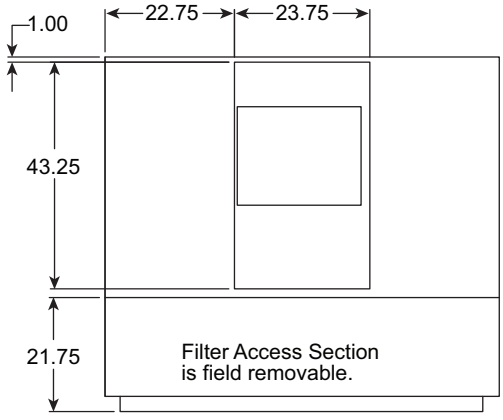
Left Side View
Top Discharge



Front View



Left Side View
Top Discharge



Top View
Top Discharge

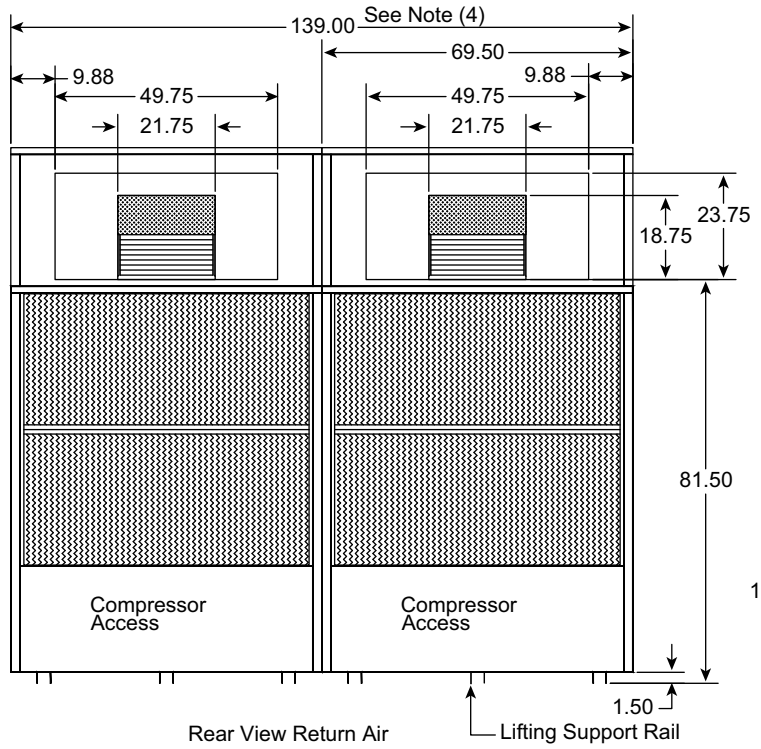
Water Connections	
H2O In*	2.5
H2O Out*	2.5
Condensate*	1.25
Pre-Cooling Drain*	1.25
HW In/Out	1.38

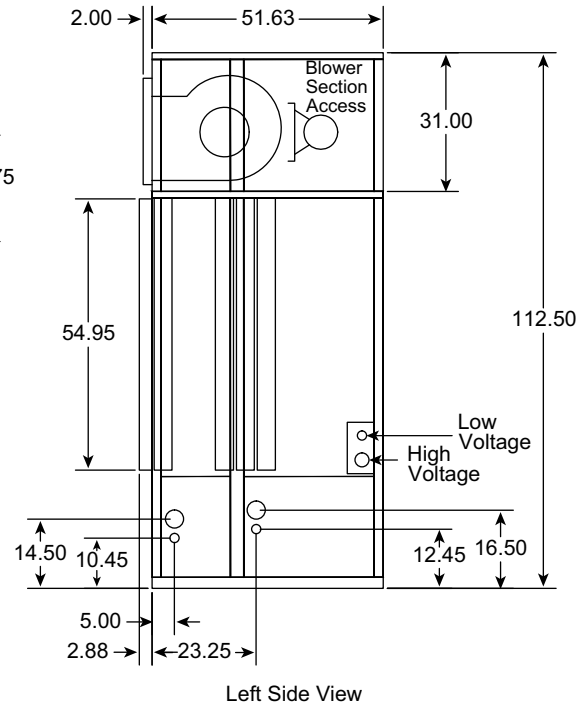
*F.P.T. Type Connection

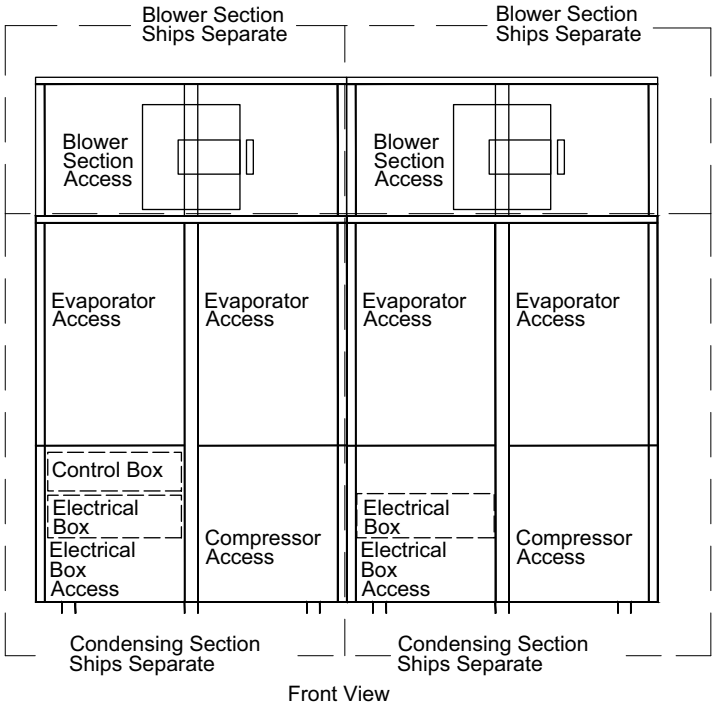
Filters		
Nominal	**Actual**	**Quantity**
17 x 27	16.5 x 26.50	8

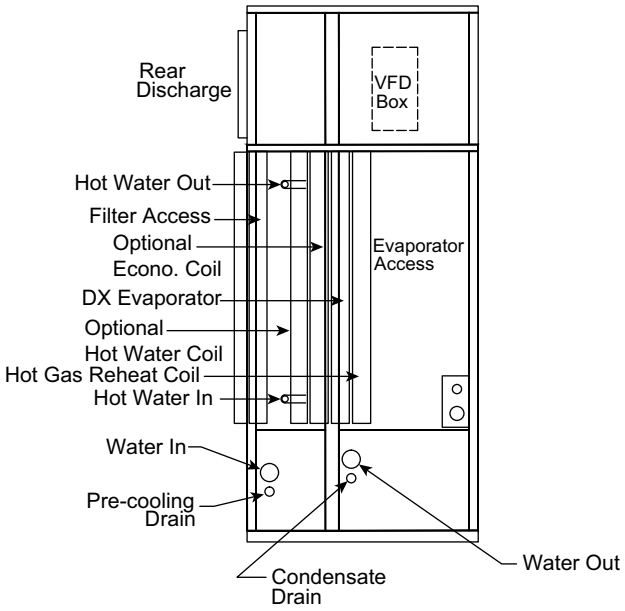
NOTES:
1. Dimensions in inches.
2. Recommended minimum service clearances are as follows:
   a. Front and rear — 36 in.
   b. Left and right side — 65 in.for coil removal
   c. Side opposite coil removal — 36 in.
3. For all other airflow configuration drawings see SCUBuilder program.
4. Dimensions include base rail height (1.5 in.).

Fig. 11 — 50BVT,W,V034 (Low Boy) Dimensions
Rear Return, Top Supply Drawing with Waterside Economizer









Water Connections			
Model	44	54	64
H_2O In*	2.5	3.0	3.0
H_2O Out*	2.5	3.0	3.0
Condensate*	0.75	0.75	0.75
Economizer	1.25	1.25	1.25
HW In/Out Sweat Connction	1.38	1.38	1.38

*F.P.T. Type Connection

Filters		
Nominal	**Actual**	**Quantity**
17 x 27 x 4	16.5 x 29.75 x 4	16

NOTES:
1. Dimensions in inches.
2. Recommended minimum service clearances are as follows:
   a. Front and rear — 36 in.
   b. Left or right side — 65 in. for coil removal
3. For all other airflow configuration drawings see SCUBuilder program.
4. Dimensions include base rail height (1.5 in.).

Fig. 12 — 50BVT,V,W044-064 (High-Boy) Dimensions
Rear Return, Rear Supply with Waterside Economizer and Hot Water Coil

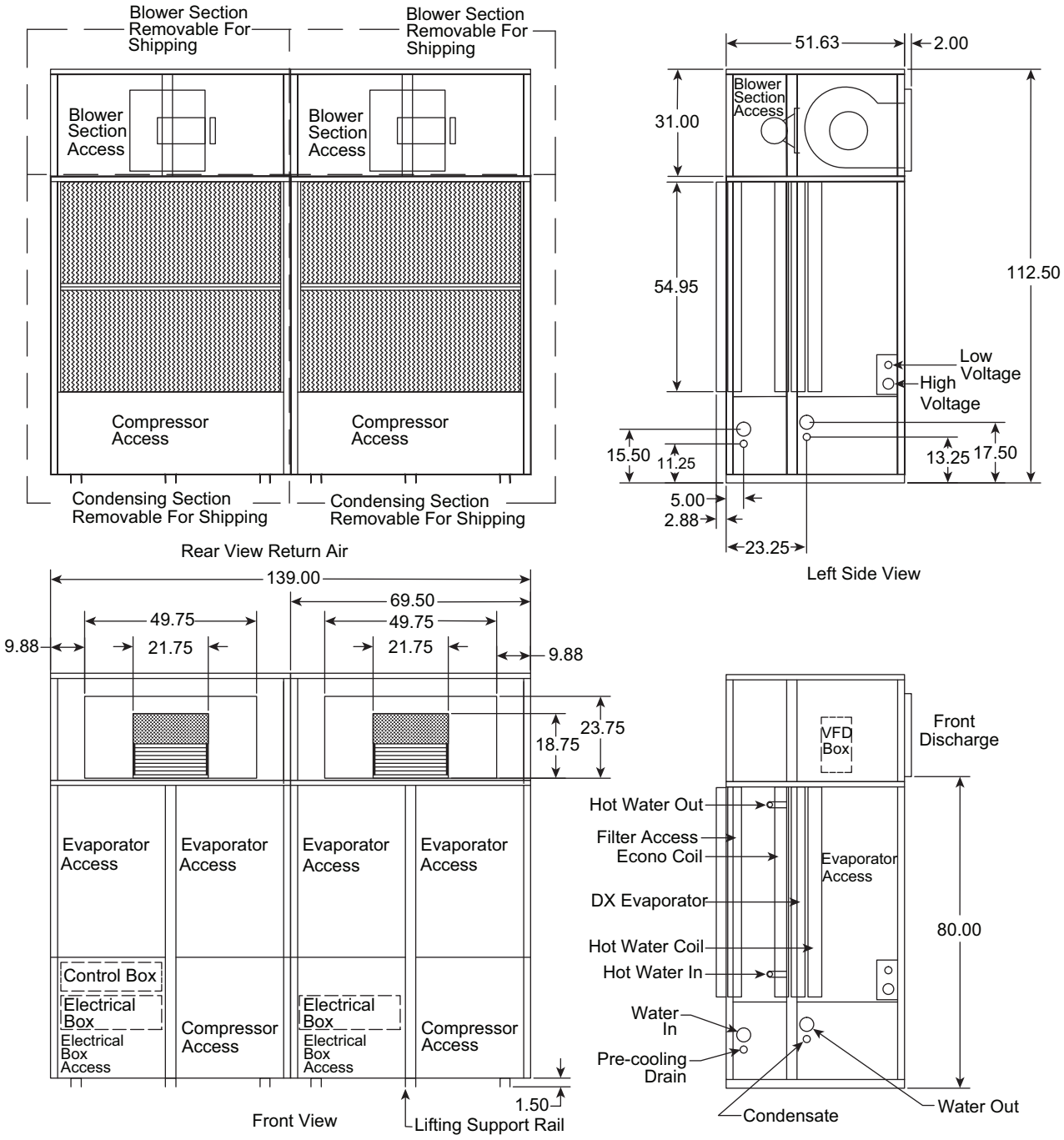
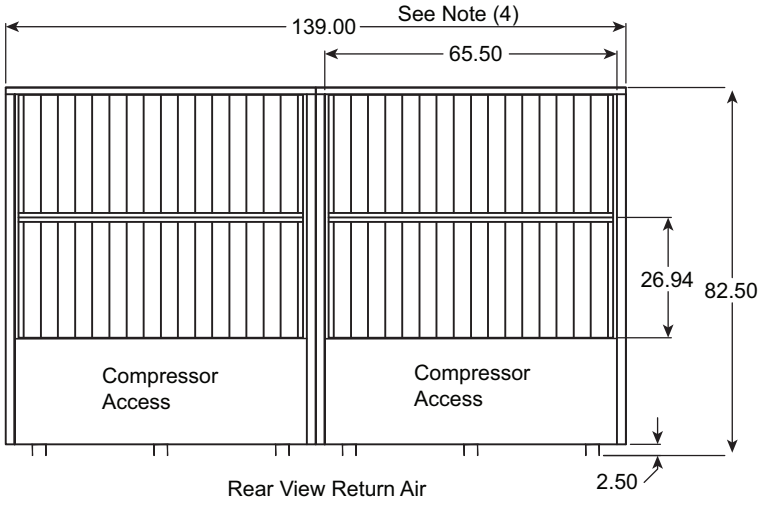
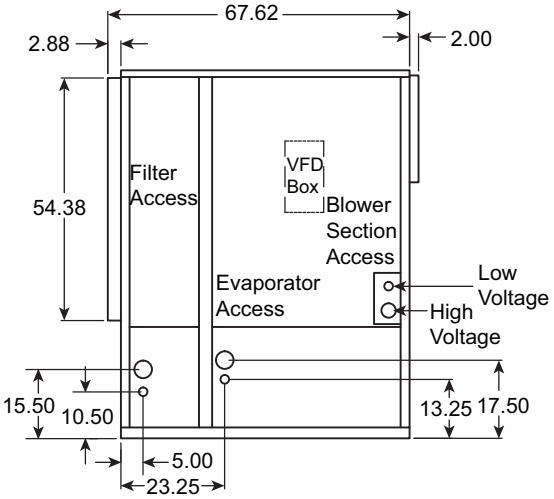


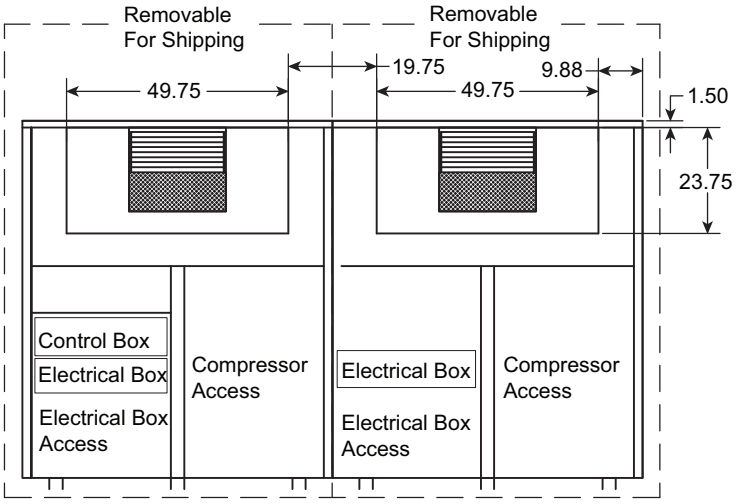
Fig. 13 — 50BVT,W,V 044-064 (High Boy) Dimensions
Rear Return, Front Supply with Waterside Economizer and Hot Water Coil



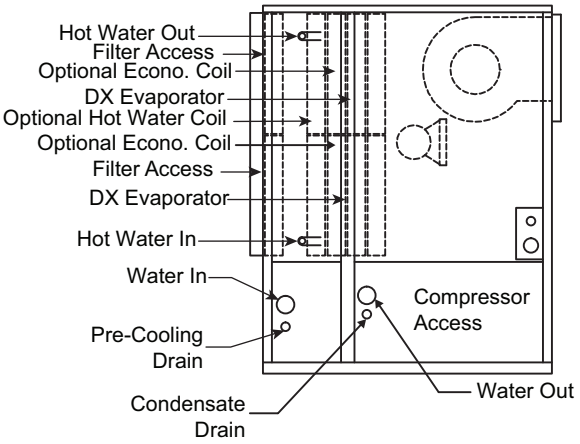
Rear View Return Air

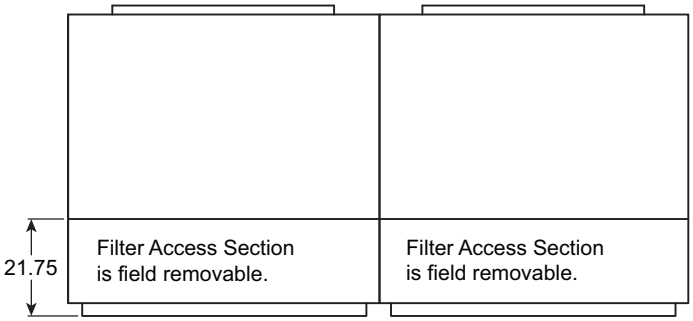


Left Side View Top Discharge



Front View





Top View

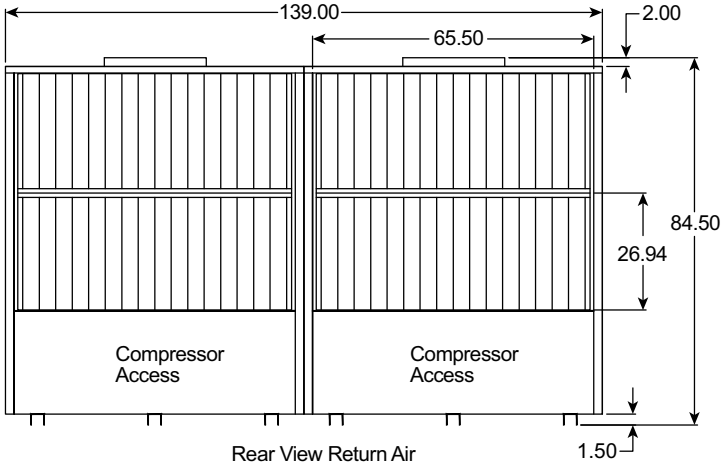
Water Connections			
Model	44	54	64
H2O In*	2.5	3.0	3.0
H2O Out*	2.5	3.0	3.0
Condensate*	1.25	1.25	1.25
Pre-Cooling Drain*	1.25	1.25	1.25
HW In/Out Sweat Connection	1.38	1.38	1.38

*F.P.T. Type Connection

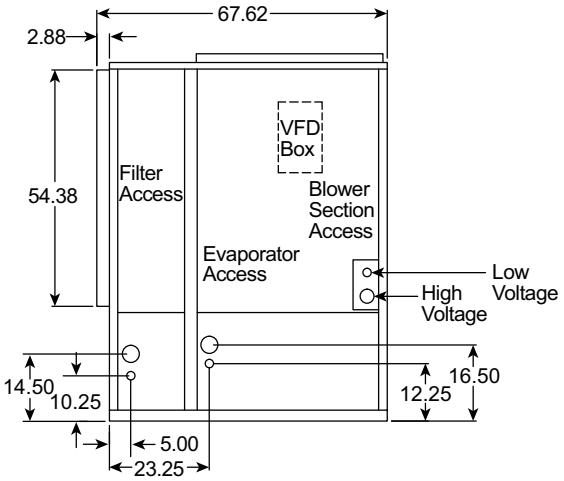
Filters		
Nominal	**Actual**	**Quantity**
17 x 27 x 4	16.5 x 29.75 x 4	16

NOTES:
1. Dimenions in inches.
2. Recommended minimum service clearances are as follows:
   a. Front and rear - 30 in.
   b. Left or right side - 65 in. for coil removal
3. For all other airflow configuration drawings, see SCUBuilder program.
4. Dimensions include base rail height (1.5 in.).

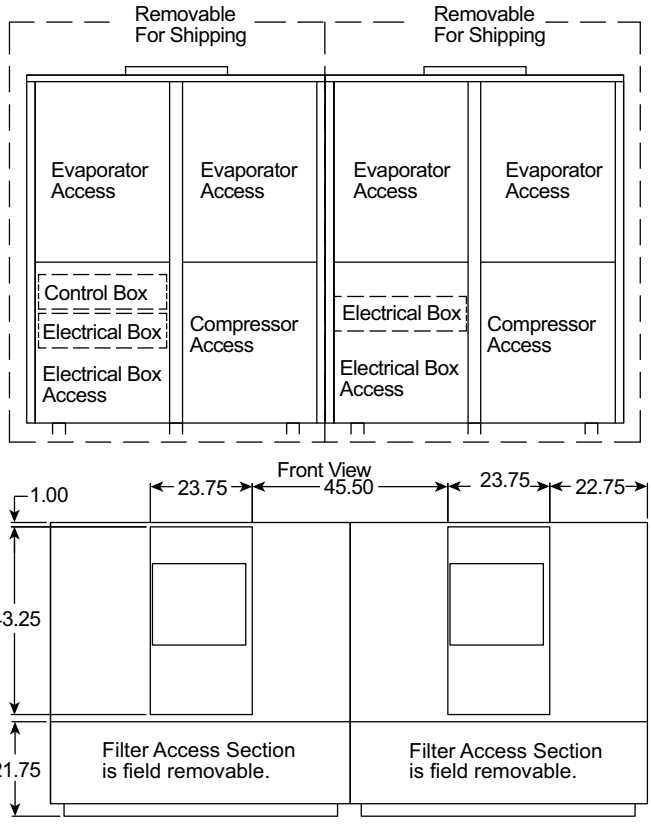
Fig. 14 — 50BVT,V,W 044-064 (Low-Boy) Dimensions
Rear Return, Front Supply with Waterside Economizer and Hot Water Coil



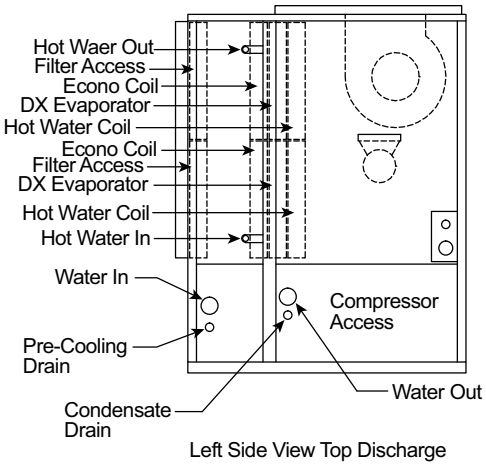
Rear View Return Air



Left Side View Top Discharge



Top View (Top Discharge)



Left Side View Top Discharge

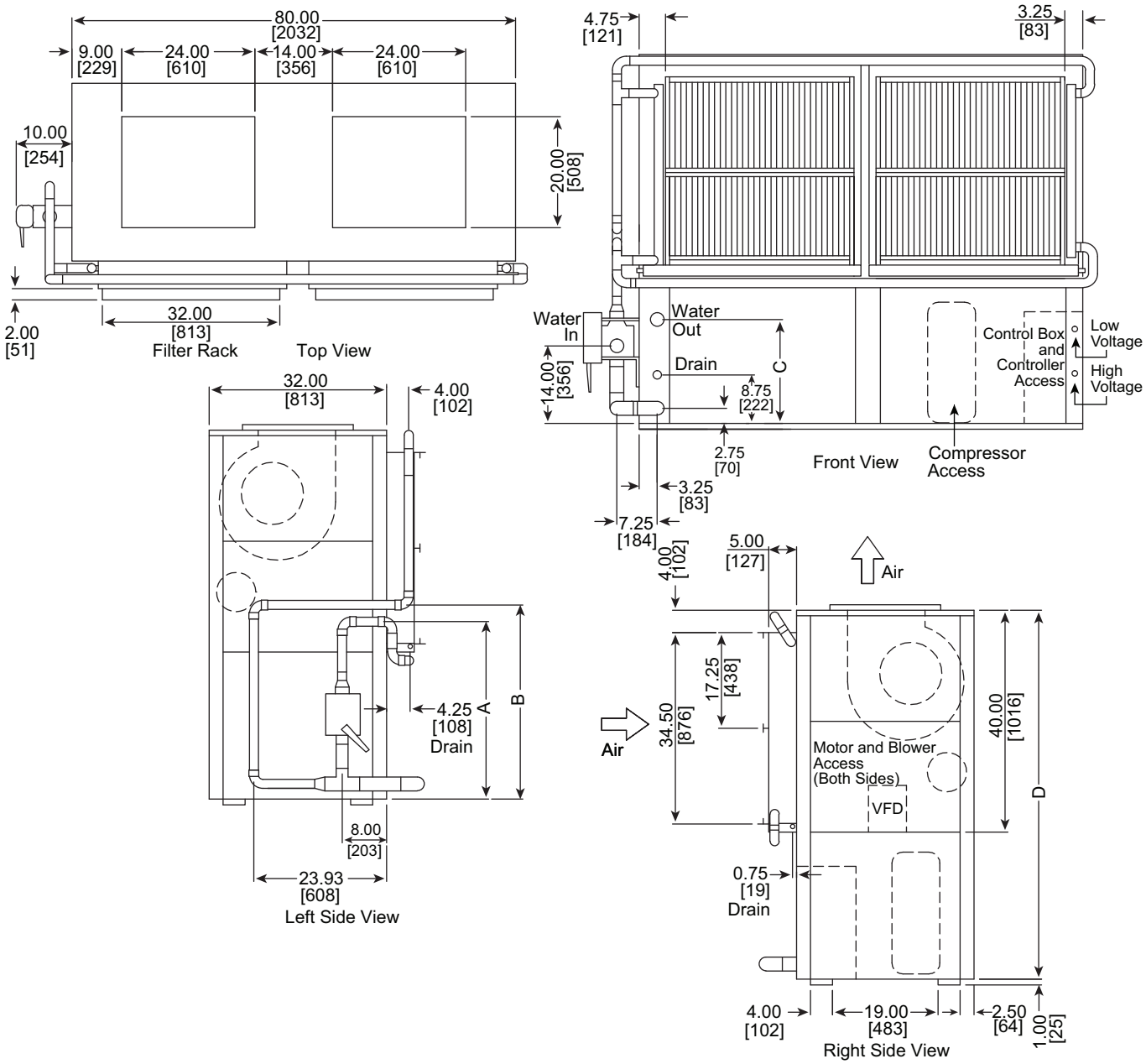
Filters		
Nominal	**Actual**	**Quantity**
17 x 27	16.5 x 29.75	16

Water Connections			
Model	44	54	64
H_2O In*	2.5	3.0	3.0
H_2O Out*	2.5	3.0	3.0
Condensate*	0.75	0.75	0.75
Pre-Cooling Drain*	1.25	1.25	1.25
HW In/Out Sweat Connection	1.38	1.38	1.38

*F.P.T. Type Connection

NOTES:
1. Dimensions in inches.
2. Recommended minimum service clearances are as follows:
   a. Front and rear — 36 in.
   b. Left or right side — 65 in. for coil removal
   c. Side opposite coil removal — 36 in.
3. For all other airflow configuration drawings see SCUBuilder program.
4. Dimensions include base rail height (1.5 in.).

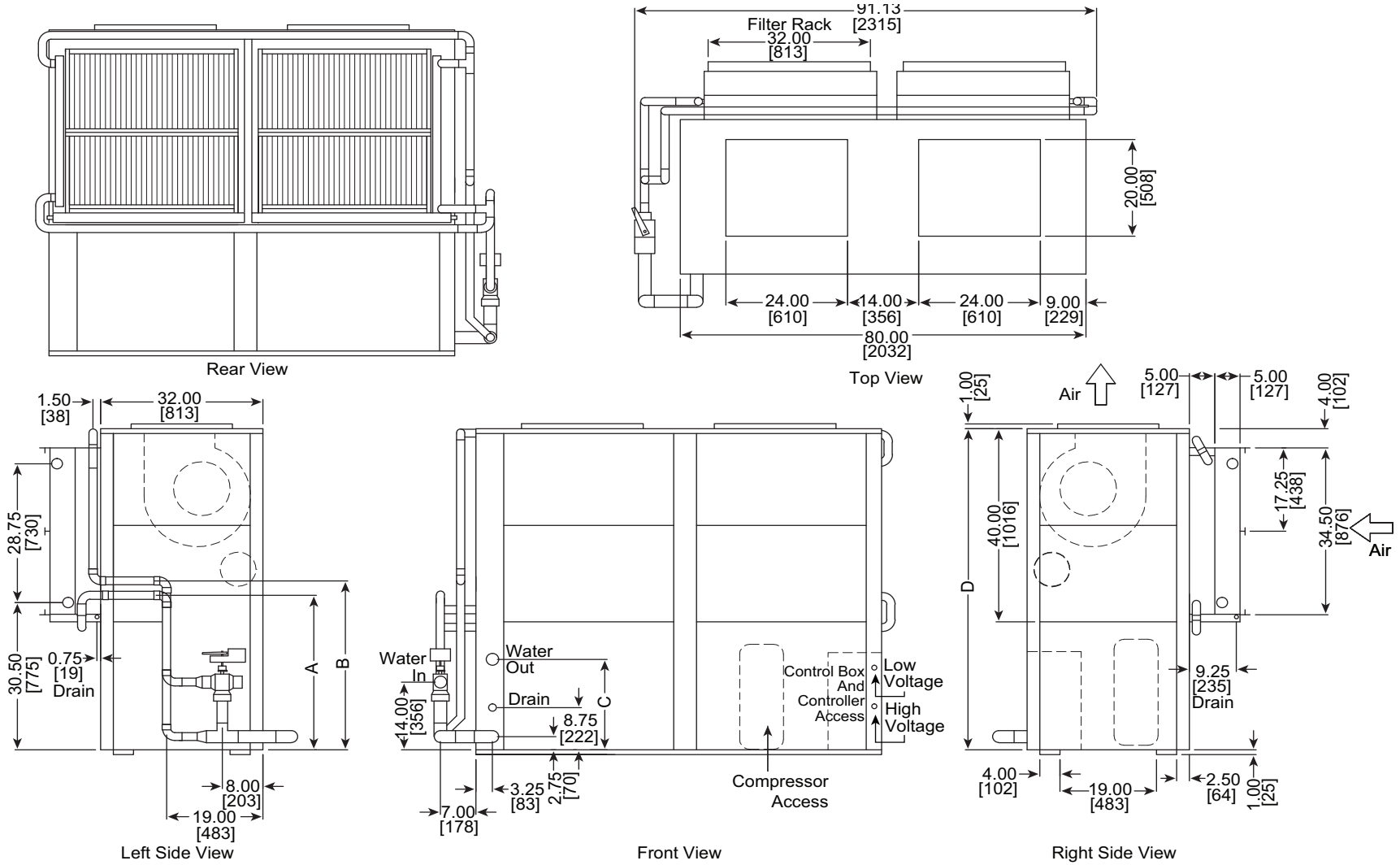
Fig. 15 — 50BVT,W,V 044-064 (Low Boy) Dimensions
Rear Return, Top Supply with Waterside Economizer and Hot Water Coil



Size	020	024	028
Filter Qty. and Size	(4) 17 X 34-1/2 X 1"	(4) 17x 34-1/2 X 1"	(4) 17x 34-1/2 X 1"
Condensate Conn.	1-1/4" FPT	1-1/4" FPT	1-1/4" FPT
Water Conn.	2" FPT	2" FPT	2" FPT
D	62"	66.5"	66.5"
C	17.5"	18.75"	18.75"
B	31"	35"	35"
A	28"	32"	32"

NOTES:
1. Dimensions in inches [mm].
2. Refer to base unit certified drawing for additional unit dimensions, service clearance, and alternate airflow configurations.
3. For all other airflow configuration drawings see SCUBuilder program.
4. 50BVJ are Rear Return, Top Supply only.

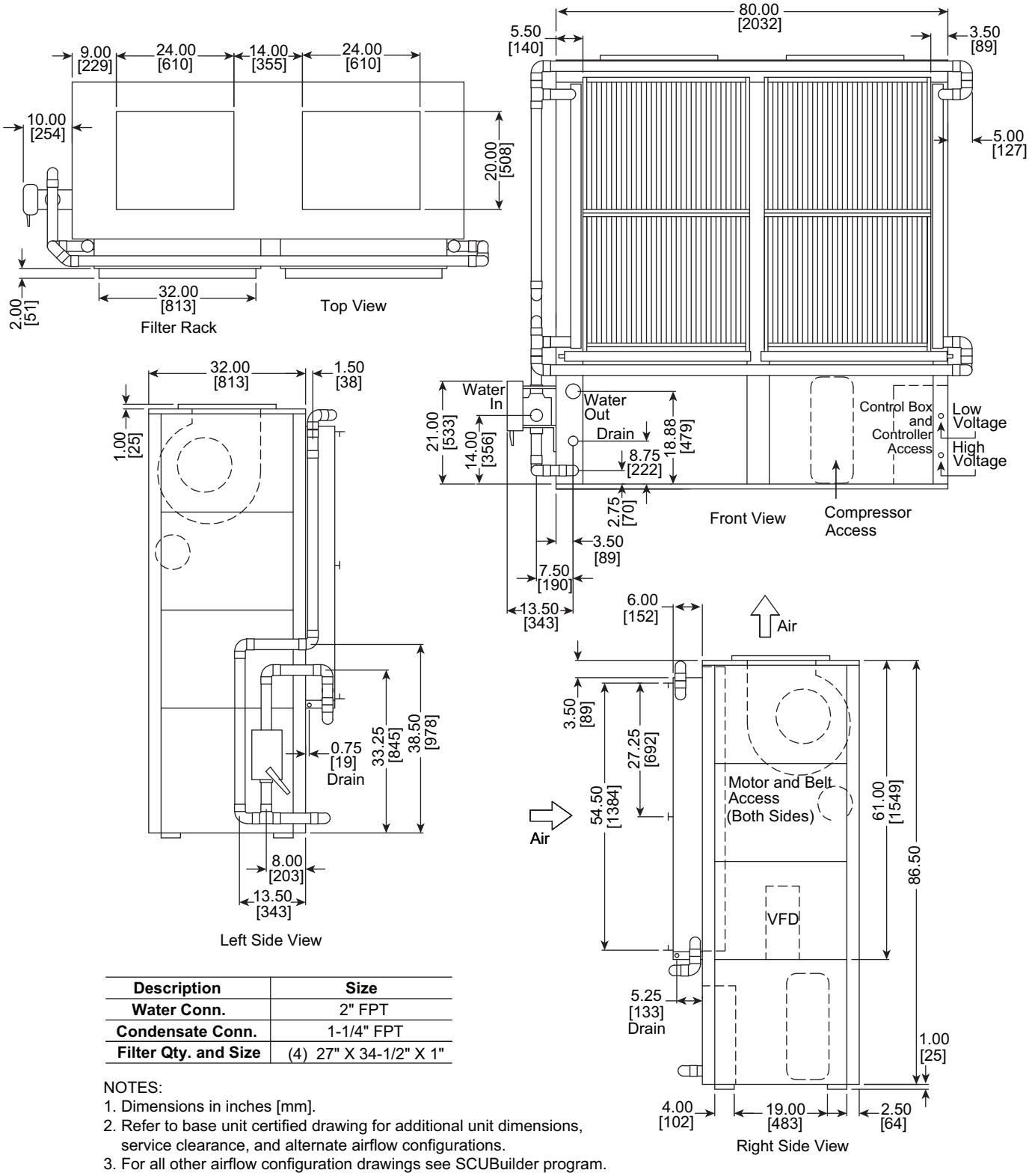
Fig. 16 — 50BVJ 020-028 Dimensions
Front Return, Top Supply with Optional Waterside Economizer



Size	020	024	028
Filter Qty. and Size	(4) 17 X 34-1/2 X 1"	(4) 17x 34-1/2 X 1"	(4) 17x 34-1/2 X 1"
Condensate Conn.	1-1/4" FPT	1-1/4" FPT	1-1/4" FPT
Water Conn.	2" FPT	2" FPT	2" FPT
D	62"	66.5"	66.5"
C	17.5"	18.75"	18.75"
B	31"	32"	32"
A	28"	32"	32"

NOTES:
1. Dimensions in inches [mm].
2. Refer to base unit certified drawing for additional unit dimensions, service clearance, and alternate airflow configurations.
3. For all other airflow configurations drawings see SCUBuilder program.

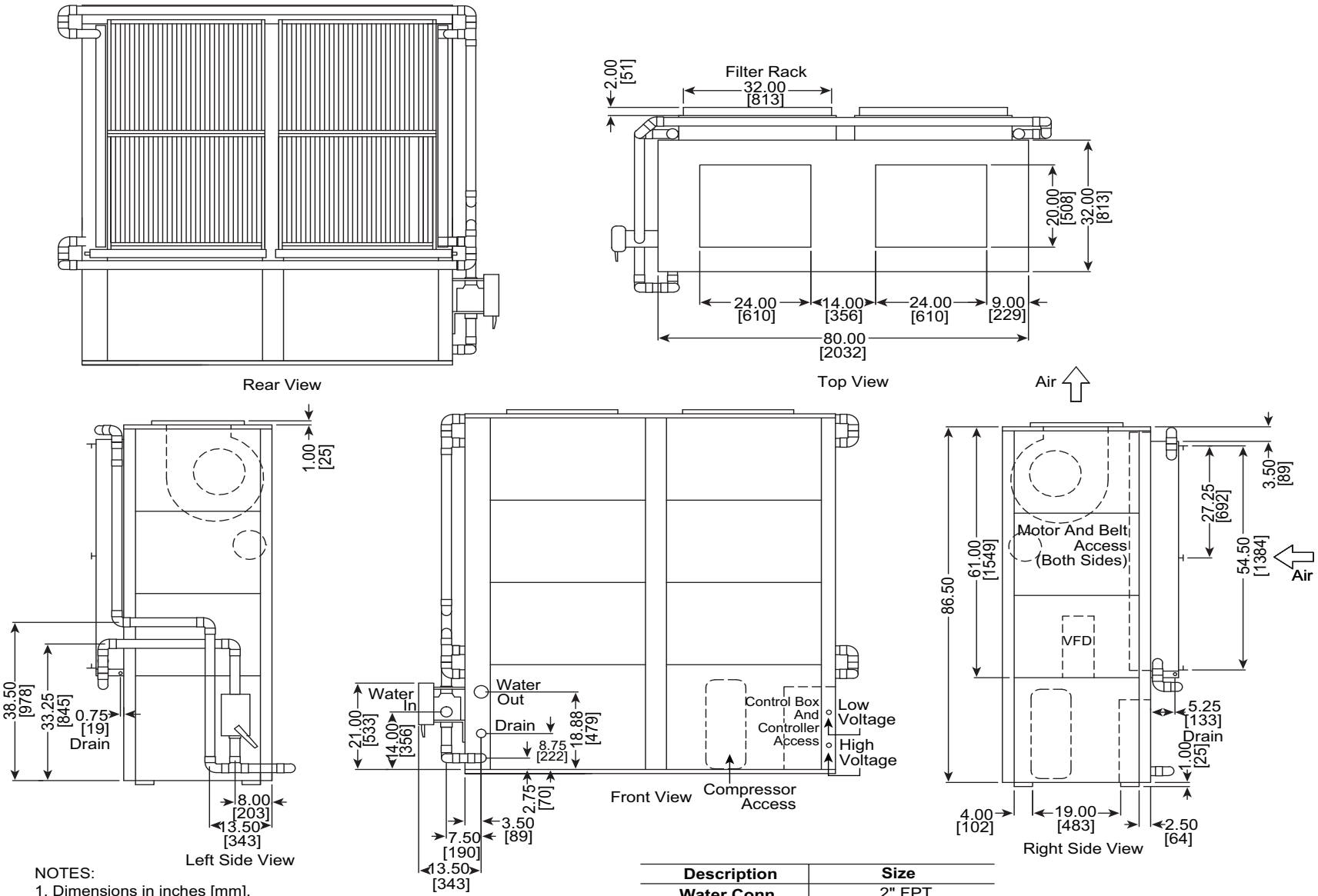
Fig. 17 — 50BVJ 020-028 Dimensions
Rear Return, Top Supply with Waterside Economizer and Hot Water Coil



Description	Size
Water Conn.	2" FPT
Condensate Conn.	1-1/4" FPT
Filter Qty. and Size	(4) 27" X 34-1/2" X 1"

NOTES:
1. Dimensions in inches [mm].
2. Refer to base unit certified drawing for additional unit dimensions, service clearance, and alternate airflow configurations.
3. For all other airflow configuration drawings see SCUBuilder program.

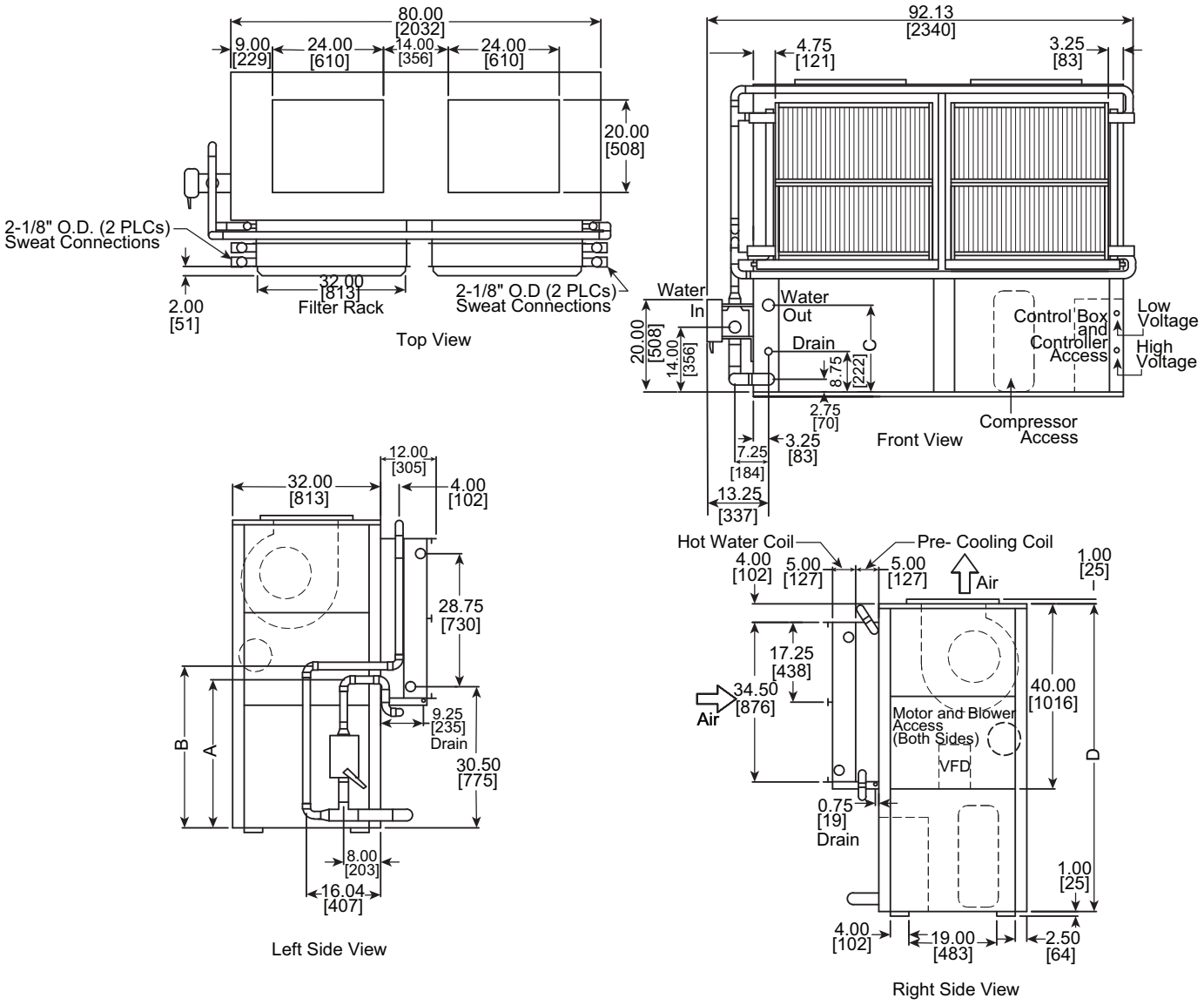
Fig. 18 — 50BVJ 034 Dimensions
Front Return, Top Supply with Optional Waterside Economizer



NOTES:
1. Dimensions in inches [mm].
2. Refer to base unit certified drawing for aditional unit dimensions, service clearance, and alternate airflow configurations.
3. For all other airflow configuration drawings see SCUBuilder program.
4. 50BVJ are rear return, top supply only.

Description	Size
Water Conn.	2" FPT
Condensate Conn.	1-1/4" FPT
Filter Qty. and Size	(4) 27" X 34-1/2" X 1"

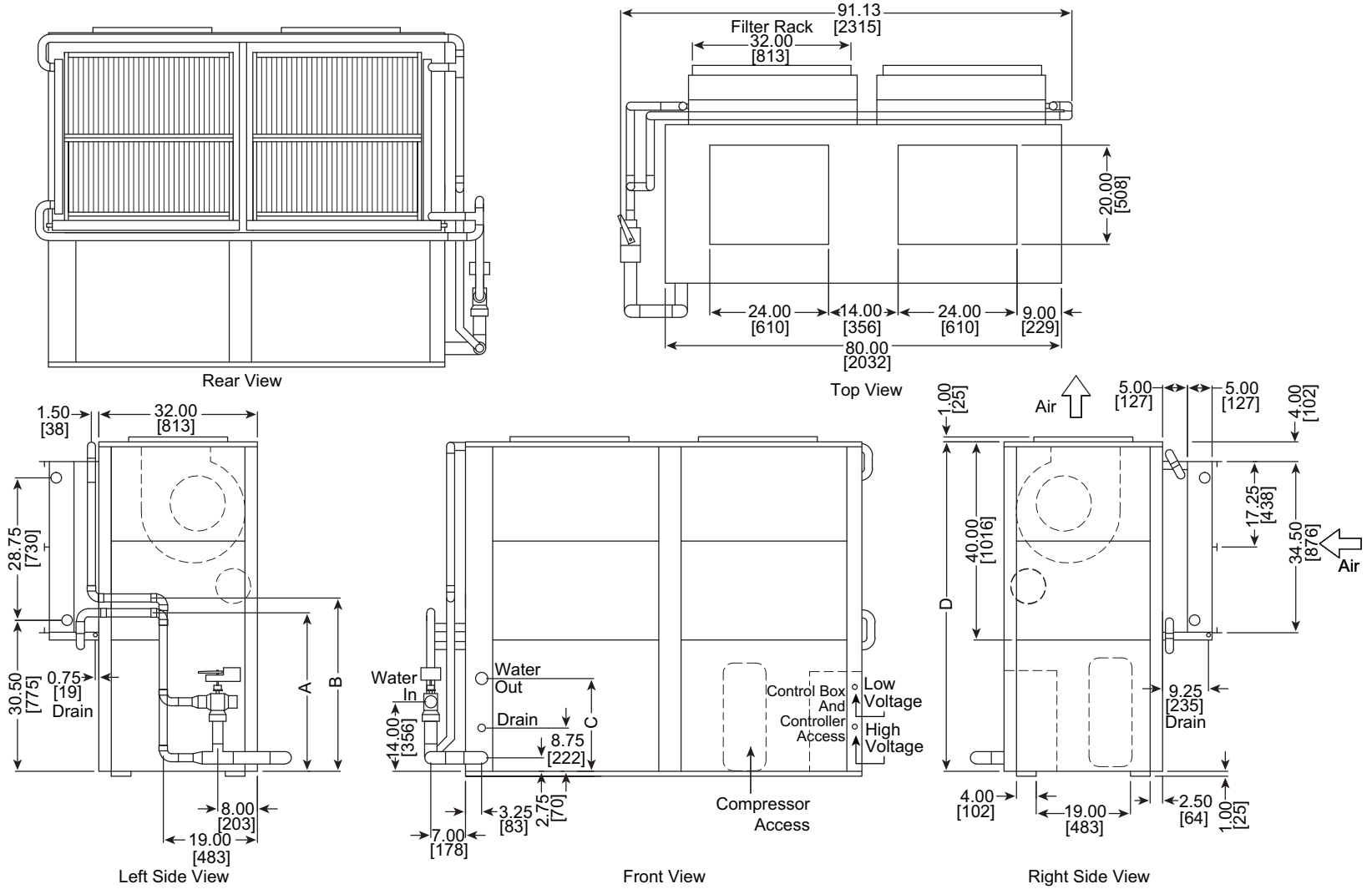
Fig. 19 — 50BVJ 034 Dimensions
Rear Return, Top Supply with Optional Waterside Economizer



Size	020	024	028
Hot Water Coil Conn.	(4) 2-1/8" O.D.	(4) 2-1/8" O.D.	(4) 2-1/8" O.D.
Filter Qty. & Size	(4) 17 X 34-1/2 X 1"	(4) 17x 34-1/2 X 1"	(4) 17x 34-1/2 X 1"
Condensate Conn.	1-1/4" FPT	1-1/4" FPT	1-1/4" FPT
Water Conn.	2" FPT	2" FPT	2" FPT
D	62"	66.5"	66.5"
C	17.5"	18.75"	18.75"
B	31"	35"	35"
A	28"	32"	32"

NOTES:
1. Dimensions in inches [mm].
2. Refer to base unit certified drawing for additional unit dimensions, service clearance, and alternate airflow configurations.
3. For all other airflow configuration drawings see SCUBuilder program.

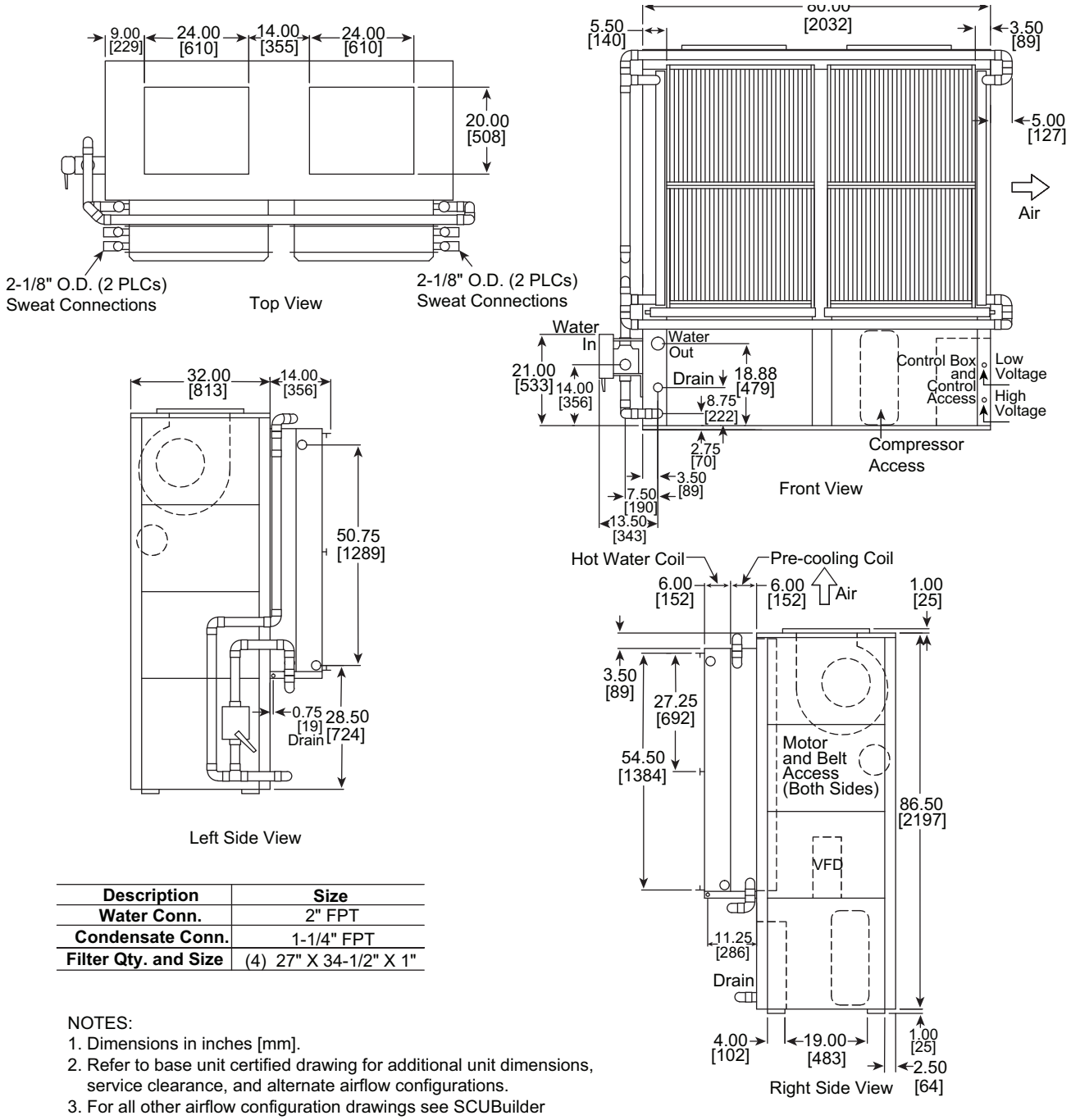
Fig. 20 — 50BVJ 020-028 Dimensions
Front Return, Top Supply with Waterside Economizer and Hot Water Coil



Size	020	024	028
Filter Qty. and Size	(4) 17 X 34-1/2 X 1"	(4) 17x 34-1/2 X 1"	(4) 17x 34-1/2 X 1"
Condensate Conn.	1-1/4" FPT	1-1/4" FPT	1-1/4" FPT
Water Conn.	2" FPT	2" FPT	2" FPT
D	62"	66.5"	66.5"
C	17.5"	18.75"	18.75"
B	31"	32"	32"
A	28"	32"	32"

NOTES:
1. Dimensions in inches [mm].
2. Refer to base unit certified drawing for additional unit dimensions, service clearance, and alternate airflow configurations.
3. For all other airflow configurations drawings see SCUBuilder program.

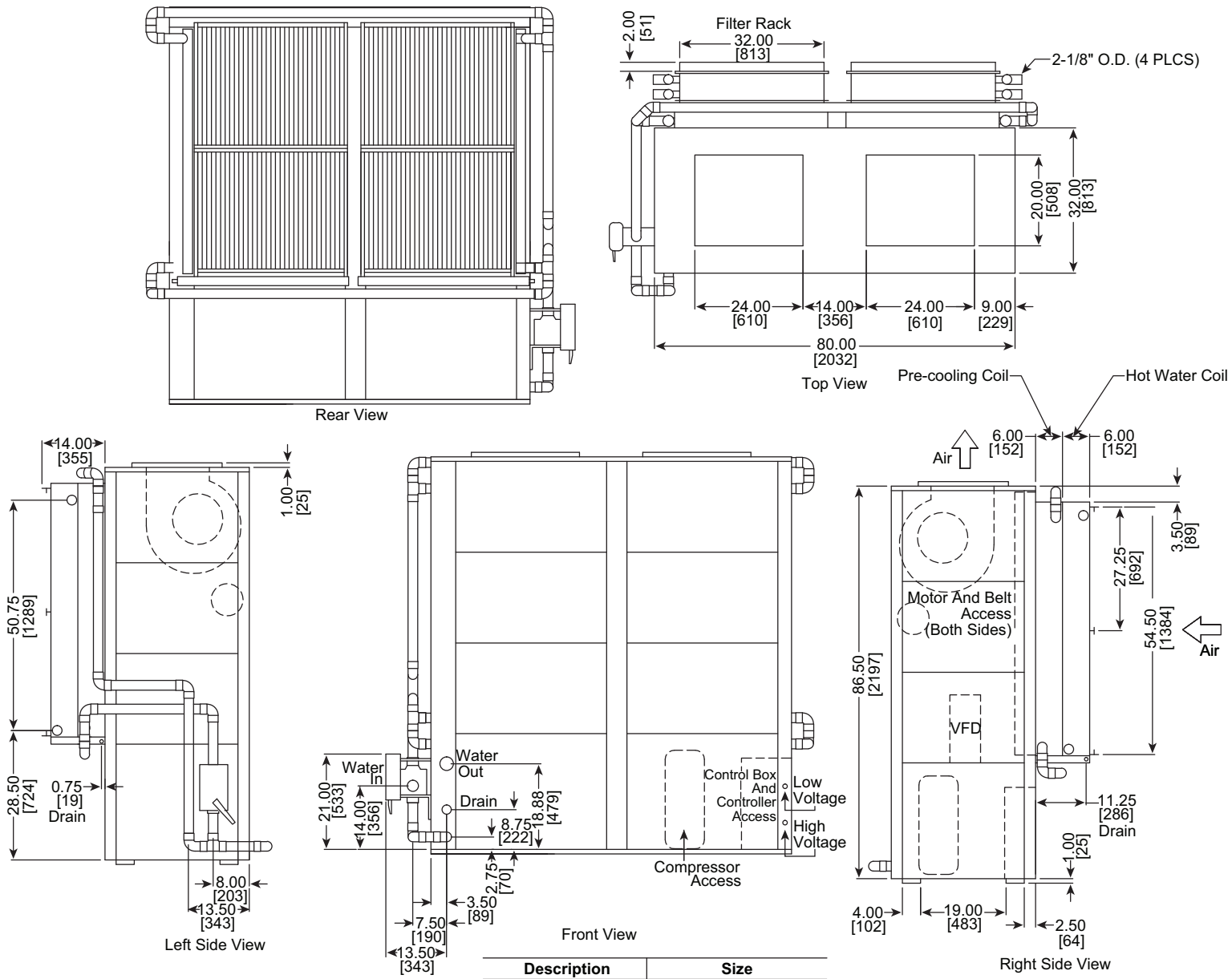
Fig. 21 — 50BVJ 020-028 Dimensions
Rear Return, Top Supply with Waterside Economizer and Hot Water Coil



Description	Size
Water Conn.	2" FPT
Condensate Conn.	1-1/4" FPT
Filter Qty. and Size	(4) 27" X 34-1/2" X 1"

NOTES:
1. Dimensions in inches [mm].
2. Refer to base unit certified drawing for additional unit dimensions, service clearance, and alternate airflow configurations.
3. For all other airflow configuration drawings see SCUBuilder program.

Fig. 22 — 50BVJ 034 Dimensions
Front Return, Top Supply with Waterside Economizer and Hot Water Coil



Description	Size
Water Conn.	2" FPT
Condensate Conn.	1-1/4" FPT
Filter Qty. and Size	(4) 27" X 34-1/2" X 1"

Fig. 23 — 50BVJ 034 Dimensions
Rear Return, Top Supply with Waterside Economizer and Hot Water Coil

Table 2 — Physical Data — 50BVJ

UNIT 50BVJ	020	024	028	034
NOMINAL CAPACITY (Tons)	18	20	25	30
OPERATING WEIGHT (lb)	1,090	1,310	1,530	1,650
SHIPPING WEIGHT (lb)	1,180	1,400	1,630	1,750
COMPRESSOR	Copeland Scroll			
Quantity	2	2	2	2
Number of Refrigerant Circuits	2	2	2	2
REFRIGERANT TYPE	R-410A			
Expansion Device	TXV	TXV	TXV	TXV
Operating Charge (oz) per Ckt	130	145	145	288
CONDENSER	Tube-in-Tube Coaxial			
Quantity of Manifolded Coils	2	2	2	2
Nominal Flow Rate (gpm)	50	60	75	90
Water Flow Range (gpm)	36-72	40-80	50-100	60-120
Max Water Working Pressure (psig)	450	450	450	450
Max Refrig. Working Pressure (psig)	600	600	600	600
Water Connection Size (in.)/Type (Qty)	2 FPT(1)	2 FPT(1)	2 FPT(1)	2 FPT(1)
Volume (gal)	3.0	3.4	3.4	3.3
EVAPORATOR COIL				
Rows…Fins/in.	3…14	3…14	3…14	3…14
Total Face Area (sq ft)	18.1	18.1	18.1	27.1
EVAPORATOR FAN				
(Quantity) Size	(2)15x15	(2)15x15	(2)15x15	(2)15x15
Type Drive	Belt	Belt	Belt	Belt
Nominal cfm	7,000	8,000	10,000	12,000
Motor Quantity	2	2	2	2
Motor HP Options	2, 3, 5	2, 3, 5	3, 5	5
Motor Nominal rpm (2, 3 HP)	1,725	1,725	1,725	—
Motor Nominal rpm (5 HP)	3,450	3,450	3,450	3,450

LEGEND

TXV — Thermostatic Expansion Valve

Table 3 — Physical Data — 50BVT, V, W

UNIT 50BVT,V,W	034	044	054	064
NOMINAL CAPACITY (Tons)	30	40	50	60
OPERATING WEIGHT (lb)	2,650	4,750	5,500	5,550
SHIPPING WEIGHT (lb)	2,866	4,846	5,700	5,732
COMPRESSOR	Copeland Scroll			
Quantity	2	4	4	4
Number of Refrigerant Circuits	2	4	4	4
REFRIGERANT TYPE	R-410A			
Expansion Device	TXV	TXV	TXV	TXV
Operating Charge (oz per Ckt)	288	160	288	288
CONDENSER	Tube-in-Tube Coaxial			
Quantity of Manifolded Coils	2	4	4	4
Nominal Flow Rate (gpm)	90	120	150	180
Water Flow Range (gpm)	60-120	80-160	100-200	120-240
Max Water Working Pressure (psig)	400	400	400	400
Max Refrig. Working Pressure (psig)	600	600	600	600
Water Connection Size (in.)/Type (Qty)	2.5 FPT(1)	2.5 FPT(1)	3 FPT(1)	3 FPT(1)
Volume (gal)	5.4	7.2	10.8	10.8
EVAPORATOR COIL				
Rows…Fins/in.	4…12	3…12	4…12	4…12
Total Face Area (sq ft)	22.4	44.8	44.8	44.8
EVAPORATOR FAN				
Quantity…Size	1…18x18	2…18x18	2…18x18	2…18x18
Type Drive	Belt	Belt	Belt	Belt
Nominal cfm	12,200	16,000	20,000	24,000
Motor HP Options	1	2	2	2
Supply Fan Motor HP Range	7.5, 10, 15, 20	7.5, 10, 15	7.5, 10, 15, 20	7.5, 10, 15, 20
Motor Nominal rpm	1750	1750	1750	1750
Fan rpm (Range)	794-1,256	794-1,256	794-1,256	794-1,256
Motor Bearing Type	Ball	Ball	Ball	Ball
RETURN AIR FILTERS				
Quantity…Size (in.)	8…17x27x4	16…17x27x4	16…17x27x4	16…17x27x4

LEGEND

TXV — Thermostatic Expansion Valve

Install Ductwork

All dual fan units are required to use a "pair of pants" configuration as shown in Fig. 24. Refer to the Carrier System Design Manual or ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) standards for the duct connection to unit with 2 fans. An adequate straight length of ducting from the unit should be allowed before elbows are installed. If connecting an elbow directly to the fan outlet, a minimum straight length of 3 fan diameters from the fan outlet is recommended. Elbows should turn in the direction of fan rotation. Abrupt turns will generate air turbulence, excessive noise, and cause vibration, which can lead to component failure. Turning vanes should be used in all short radius bends. Ensure that ducting does not obstruct access to the unit for routine servicing.

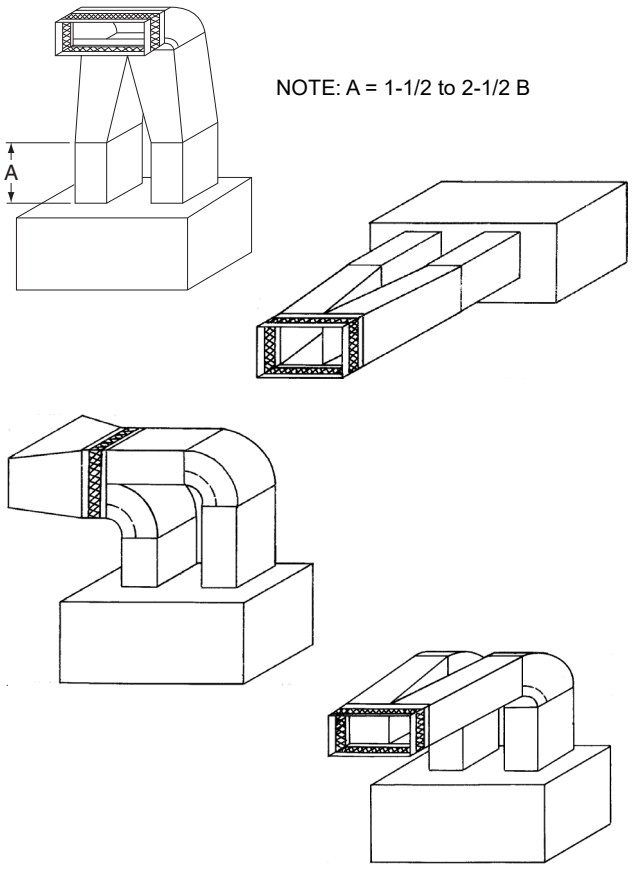


Fig. 24 — Typical Fan Discharge Connections for Multiple Fan Units

A supply air outlet collar and return air duct flange are provided on all units to facilitate duct connections. Refer to dimensional drawings (Fig. 7-23) for connection sizes and locations.

A flexible canvas duct connector is recommended on both supply and return air sides of the units to be connected to the system ductwork.

All metal ductwork should be adequately insulated to avoid heat loss or gain and to prevent condensation from forming on the duct walls. Uninsulated ductwork is not recommended, as the unit's performance will be adversely affected.

Do not connect discharge ducts directly to the blower outlet(s). The factory filter should be left in place on a free return system.

If the unit will be installed in a new installation, the duct system should be designed in accordance with the System Design Manual, Part 2 and with ASHRAE (American Society of Heating, Refrigeration and Air-Conditioning Engineers) procedures for duct sizing. If the unit will be connected to an existing duct system, check that the existing duct system has the capacity to handle the required airflow for the unit application at an acceptable system static pressure. If the existing duct system is too small, larger ductwork must be installed.

The duct system and diffusers should be sized to handle the design airflow volumes quietly. To maximize sound attenuation of the unit's blower(s), the supply and return air plenums should be insulated for a length of at least 15 ft from the unit. Direct line of sight from return air grilles into the unit's return should be avoided. If return air is to be ducted to an equipment room, an elbow should be installed within the equipment room. Running a return air drop to near the floor of the room will aid in sound attenuation. Avoid transmitting vibrations generated by the movement of air in the ducting to the walls of the building. This is especially important where ductwork penetrates walls. The maximum recommended return air velocity is 1,000 fpm. Lower return air velocities will result in lower sound power levels. The use of round supply duct plenums should be considered, as it will significantly reduce low frequency sound at the equipment room. If rectangular supply plenums are used, the aspect ratio of the duct should be kept as small as possible (i.e., as close to square as possible). The large, flat surface areas associated with large aspect ratio duct systems will transmit sound to the space, and the potential for duct-generated noise is increased. The maximum recommended supply air duct velocity is 2,000 fpm.

DUCT STATIC PRESSURE PROBE AND TUBING (VAV ONLY)

On VAV systems, the duct static pressure sensor is factory supplied (ships inside control cabinet) and requires field installation and field provided tubing and pressure pick-up port. The pressure sensor low port should be left open to atmosphere. The pressure sensor high port should be connected with tubing to a pressure pick up port. The pressure pick up port should be installed as close to 2/3 of the way down the duct system in a straight section of duct, away from any turning vanes, take offs, or areas in the duct that could feature turbulence.

Install the duct static pressure probe with the tip facing into the airflow. See Fig. 25.

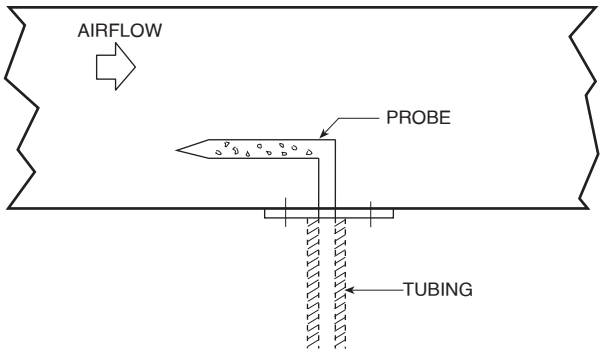


Fig. 25 — Duct Static Pressure Probe

Use 1/4-in. OD approved polyethylene tubing for up to 50 ft (3/8-in. OD for 50 to 100 ft) to connect the probe to the bulkhead fitting mounted above the unit display panel. Carefully route the tubing from the probe to this bulkhead fitting.

The static pressure control should be adjusted so that, at full airflow, all of the remote VAV terminal boxes receive the minimum static pressure required plus any downstream resistance. Control the system to the lowest static pressure set point that will satisfy airflow requirements. Lower static pressure set points reduce total required brake horsepower and reduce generated sound levels.

DUCT HIGH-STATIC (DHS) LIMIT SWITCH (VAV ONLY)

The duct high static limit switch is a field provided mechanical safety that prevents duct over pressurization. The switch is optional and is field-provided.

IMPORTANT: Use tubing that complies with local codes. Improper location or installation of the supply duct pressure tubing will result in unsatisfactory unit operation and poor performance.

Step 4 — Make Piping Connections

CONDENSER WATER PIPING

Always follow national and local codes when installing water piping to ensure a safe and proper installation. Connections to the unit should incorporate vibration eliminators to reduce noise and vibration to the building, and shutoff valves to facilitate servicing.

Prior to connecting the unit(s) to the condenser water system, the system should be flushed to remove foreign material that could cause condenser fouling. Install a screen strainer with a minimum of 20 mesh ahead of the condenser inlet to prevent condenser fouling and internal condenser tube damage from foreign material.

Supply and return water piping must be at least as large as the unit connections, and larger for long runs. Refer to the System Design Manual, Part 3, and standard piping practice, when sizing, planning, and routing water piping. See dimension drawings (Fig. 7-23) for water connection sizes and locations.

Units are furnished standard with a copper heat exchanger. A cupronickel heat exchanger is also available as a factory-installed option. Copper is adequate for closed loop systems where good quality water is available. In conditions where scale formation or water treatment is questionable, the optional cupronickel heat exchanger should be used. Where the water is especially corrosive or could lead to excessive fouling, intermediate plate frame heat exchangers are recommended.

⚠ CAUTION

Galvanized pipe or fittings are not recommended with 50BV units due to the possibility of galvanic corrosion caused by dissimilar metals. When selecting piping materials, use only approved piping materials that meet applicable codes and that will handle the temperatures and pressures that may be experienced in the application. Piping systems will sweat if low temperature fluid is used in the system. For these applications, supply and return water piping should be insulated to protect from condensation damage. The minimum recommended entering water temperature to the unit is 50°F.

The unit is capable of operating with entering water temperatures as low as 55°F in cooling or heat pump heating mode, without the need for head pressure control. If the entering water temperature is expected to be lower, or more stable unit operation is desired, a field-supplied water-regulating valve may be used. The extended range option or field provided coaxial coil insulation should be supplied to prevent condensation, when the entering water temperature can be below the dew point in the unit installation location.

This unit has multiple independent refrigerant circuits with separate condensers. The individual condensers are manifolded together on the waterside to provide easy, single-point water connections. In order to achieve proper head pressure control when a water-regulating valve is used, a temperature-actuated valve is recommended. This allows any of the independent refrigerant circuits to operate while still modulating condenser water flow in response to loop water temperature.

A glycol solution should be used if ambient temperatures are expected to fall below freezing or if the loop water temperature is below 55°F while the unit is operating in heating mode. Refer to Table 4, which lists freezing points of glycol at different concentrations. A minimum concentration of 20% is recommended. Water pressure drop will increase and unit performance will decrease with increasing glycol concentrations.

Units with factory-installed waterside economizers have cooling water passing through the economizer and condenser in series while operating in the economizer mode. During normal operation, water bypasses the economizer coil.

Table 4 — Glycol Freezing Points

% GLYCOL	FREEZE POINT (° F)	
	Ethylene Glycol	Proplylene Glycol
20	18	19
30	7	9
40	–7	–5
50	–28	–27

All manual flow valves used in the system should be of the ball valve design. Globe or gate valves must not be used due to high pressure drops and poor throttling characteristics.

Do not exceed recommended condenser fluid flow rates shown in Tables 5 and 6. Serious damage or erosion of the heat exchanger tubes could occur. Piping systems should not exceed 10 fps fluid velocities to ensure quietness and tube wall integrity. Refer to Tables 5 and 6 for condenser water pressure drop versus flow rate. Flow rates outside of the published range should not be used.

Table 5 — Condenser Pressure Drop 50BVJ Units

FLOW RATE (gpm)	SIZE 020	SIZE 024	SIZE 028	SIZE 034
	Pressure Drop (ft wg)			
35	9.1	—	—	—
40	9.9	6.2	—	—
45	13.5	7.5	—	—
50	14.9	9.3	9.3	—
55	18.4	10.9	10.9	—
60	20.6	12.9	12.9	10.8
65	23.9	14.8	14.9	12.7
70	27.2	17.0	17.2	15.5
75	—	19.2	19.2	16.9
80	—	21.7	22.2	19.7
85	—	—	24.1	21.7
90	—	—	27.8	24.4
95	—	—	30.8	27.1
100	—	—	34.0	29.5
105	—	—	—	33.1
110	—	—	—	36.3
115	—	—	—	39.7
120	—	—	—	43.2

Table 6 — Condenser Pressure Drop 50BVT,V,W Units

FLOW RATE (gpm)	SIZE 034	SIZE 044	SIZE 054	SIZE 064
	Pressure Drop (ft wg)			
60	8.9	—	—	—
70	11.7	—	—	—
80	14.9	6.3	—	—
90	18.4	8.6	—	—
100	24.2	10.4	6.0	—
110	29.3	12.3	7.3	—
120	34.9	14.4	8.8	8.7
130	—	16.7	10.2	10.2
140	—	19.4	11.7	11.8
150	—	22.3	13.2	13.2
160	—	25.3	15.5	14.8
170	—	—	17.4	16.6
180	—	—	19.6	18.3
190	—	—	21.8	21.8
200	—	—	24.2	24.2
210	—	—	—	26.6
220	—	—	—	29.2
230	—	—	—	31.9
240	—	—	—	34.8

Ball valves should be installed in the supply and return lines for unit isolation and water flow balancing.

Pressure and temperature ports are recommended in both the supply and return lines for system flow balancing. These openings should be 5 to 10 pipe diameters from the unit water connections. For thorough mixing and temperature stabilization, wells in the water piping should extend at least 1/2 pipe diameter into the pipe. Measure the condenser waterside pressure drop and refer to Tables 5 and 6 for help to properly set the water flow rate.

Improper fluid flow due to valving, piping, or improper pump operation constitutes abuse that may result in voiding of unit warranty. The manufacturer will not be responsible for damages or failures resulting from improper piping design or piping material selection.

EVAPORATOR CONDENSATE DRAIN

The condensate drain connection is 1-1/4-in. FPT and is located on the same side of the unit as the condenser water connections. See dimension drawings (Fig. 7-23) for exact location.

Drain lines should be pitched away from the unit with a minimum slope of 1/8-in. per foot and conform to all local and national codes.

A trap must be installed in the condensate line to ensure free condensate flow (units are not internally trapped). A vertical air vent is sometimes required to avoid air pockets.

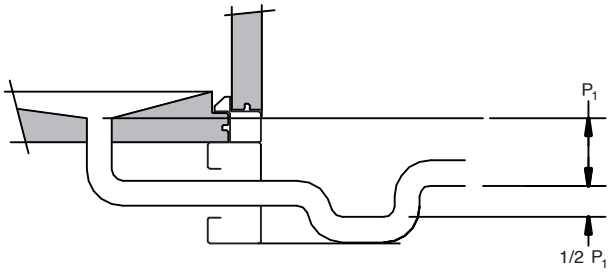
Install a condensate-trapping drain line at the unit's drain connection. See Fig. 26 for correct drain layout.

When calculating trap depth, remember that it is not the total static pressure but the upstream or downstream static resistance that is trapped against. For instance, when calculating the trap depth for a cooling coil condensate pan, trap against the coil pressure drop in that coil section and any other pressure drops upstream of it.

If calculating the trap depth for the cooling coil, use the total static pressure drop (coil plus any other components upstream of it) plus 1 in. (P_1 = negative static pressure + 1 in.), as shown in Fig. 26.

Traps must store enough condensate to prevent losing the drain seal at start-up. The "Minimum 1/2 P_1" dimension ensures that enough condensate is stored.

Drain pans should be cleaned periodically to avoid the build-up of dirt and bacterial growth.



NOTE: P_1 equals negative static pressure plus 1 inch.

Fig. 26 — Condensate Drain Layout

HOT WATER HEATING COIL (OPTIONAL)

A factory-installed one or 2-row hot water heating coil is available as an option. The coil is supplied with hot water from a boiler through separate piping from the condenser water loop. All controls, including the hot water valve, freeze protection, and the valve control signal, for heating operation are field-supplied.

Piping should be in accordance with accepted industry standards and all components rated for the system pressure expected. Pipe coils so that they will drain, and provide a drain and vent. The factory installed VAV controller is not capable of controlling an external heat source, including hot water.

Always connect the supply to the bottom of the coil, and the return to the top of the coil. Refer to Fig. 7-23 for hot water supply and return piping locations.

Water coils should not be subjected to entering-air temperatures below 38°F to prevent coil freeze-up. If air temperatures across the coil are going to be below this value, use a glycol or brine solution. Use a solution with the lowest concentration that will match the coldest air expected. Excess concentrations will greatly reduce coil capacity. A coil freeze protection system that shuts off the supply fan and opens the hot water valve to 100% should also be considered.

The return air duct system should be carefully designed to get adequate mixing of the return air and outdoor air streams to prevent cold spots on the coil that could freeze.

A 2 or 3-way, field-supplied modulating control valve or a simple two-position on-off valve may be used to control water flow. Select the valve based on the control valve manufacturer's recommendations for size and temperature rating. Select the control valve CV based on pressure drop and flow rate through the coil. This information is available from the *SCU*Builder software program or Tables 7 and 8.

Pipe sizes should be selected based on the head pressure available from the pump. Water velocity should not exceed 8 fps. Design the piping system for approximately 3 ft of loss per 100 equivalent ft of pipe. The piping system should allow for expansion and minimize vibration between the unit and piping system.

WATERSIDE ECONOMIZER (OPTIONAL)

The optional waterside economizer (pre-cooling coil) is factory-installed and piped internally, in series with the condenser water circuit (Fig. 27). A diverting valve and factory controls are included with the option. The condenser water supply is connected to the economizer water in and the condenser water return is connected to the condenser water out. In addition, when unit is shipped with economizer option, the economizer drain must be connected to a separate trap. Follow the same steps for the economizer drain as described for evaporator condensate drain. An Aquastat is used to modulate water flow through the economizer. The controller is mounted to the low voltage control box. Electrical connections are factory installed and wired. The remote bulb is shipped internal to the unit and requires field mounting. Care should be taken not to dent the bulb or mis-calibration may occur. The Aquastat has a temperature range adjustment (–30 to 100°F) and is field set. See Fig. 7-23 for connection locations and sizes. See Tables 9 and 10 for economizer waterside pressure drop data.

Table 7 — Hot Water Coil Pressure Drop 50BVJ Units

FLOW RATE (gpm)	SIZE 020	SIZE 024	SIZE 028	SIZE 034
	Pressure Drop (ft wg)			
10	0.7	0.7	0.7	—
15	1.5	1.5	1.5	—
20	2.6	2.6	2.6	—
25	4.0	4.0	4.0	—
30	5.8	5.8	5.8	0.1
35	7.8	7.8	7.8	0.1
40	10.2	10.2	10.2	0.1
45	12.9	12.9	12.9	0.2
50	15.8	15.8	15.8	0.2
55	—	—	—	0.3
60	—	—	—	0.3
65	—	—	—	0.4

Table 8 — Hot Water Coil Pressure Drop 50BVT,V,W Units

FLOW RATE (gpm)	SIZE 034	SIZE 044	SIZE 054	SIZE 064
	Pressure Drop (ft wg)			
45	2.4	—	—	—
50	3.0	—	—	—
55	3.6	—	—	—
60	4.2	—	—	—
65	5.0	—	—	—
70	5.7	—	—	—
75	6.6	—	—	—
80	7.5	—	—	—
85	8.4	—	—	—
90	9.5	2.6	2.5	2.5
100	—	2.9	3.1	3.1
110	—	3.5	3.7	3.7
120	—	4.2	4.2	4.4
130	—	5.1	4.9	5.1
140	—	5.9	5.7	5.9
150	—	6.7	6.6	6.6
160	—	7.6	7.6	7.5
170	—	8.6	8.6	8.5
180	—	9.6	9.6	9.5

Table 9 — Economizer Pressure Drop Curve (ft wg), 50BVJ Units

FLOW RATE (gpm)	SIZE 020	SIZE 024	SIZE 028	SIZE 034
	Pressure Drop (ft wg)			
35	8.9	—	—	—
40	11.5	11.0	—	—
45	14.4	13.8	—	—
50	17.6	16.9	16.9	—
55	21.1	20.4	20.4	—
60	24.9	24.1	24.1	3.5
65	29.0	28.1	28.2	4.1
70	34.4	32.5	32.5	4.7
75	—	37.1	37.2	5.4
80	—	42.1	42.1	6.1
85	—	—	47.4	6.9
90	—	—	52.9	7.7
95	—	—	58.7	8.5
100	—	—	64.9	9.4
105	—	—	—	10.3
110	—	—	—	11.3
115	—	—	—	12.3
120	—	—	—	13.4

Table 10 — Economizer Pressure Drop Curve (ft wg), 50BVT,V,W Units

FLOW RATE (gpm)	SIZE 034	SIZE 044	SIZE 054	SIZE 064
	Pressure Drop (ft wg)			
60	13.1	—	—	—
70	17.9	—	—	—
80	23.5	5.8	—	—
90	29.8	7.3	—	—
100	36.9	9.1	9.0	—
110	44.8	11.0	11.0	—
120	53.4	13.1	13.1	13.1
130	—	15.4	15.4	15.4
140	—	17.9	17.9	17.9
150	—	20.6	20.6	20.6
160	—	23.5	23.5	23.5
170	—	—	26.6	26.5
180	—	—	29.8	29.8
190	—	—	33.3	33.2
200	—	—	36.9	36.8
210	—	—	—	40.7
220	—	—	—	44.7
230	—	—	—	48.9
240	—	—	—	53.3

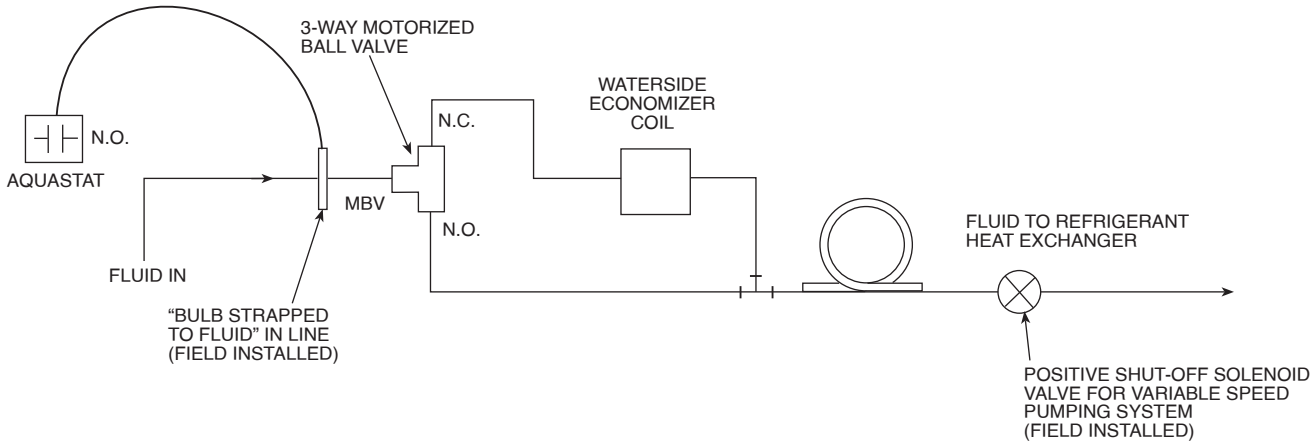


Fig. 27 — Optional Water Economizer

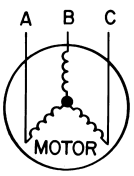
Step 5 — Complete Electrical Connections

Verify that electrical requirements listed on the unit nameplate match available power supply. The unit voltage must be within the range shown in Tables 11 and 12 and phases must be balanced within 2%. Contact the local power company for line voltage corrections. Never operate a motor where a phase imbalance in supply voltage is greater than 2%.

For an unbalanced 3-phase supply voltage, use the following formula to determine the percent of voltage imbalance:

$$\text{Percent Voltage Imbalance} = 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

Example: Supply voltage is 460-3-60.



AB = 452 V
BC = 464 V
AC = 455 V

$$\text{Average Voltage} = \frac{452 + 464 + 455}{3}$$

$$= \frac{1371}{3}$$

$$= 457$$

Determine maximum deviation from average voltage:

(AB) 457 – 452 = 5 V
(BC) 464 – 457 = 7 V
(AC) 457 – 455 = 2 V

Maximum deviation is 7 V.

Determine percent of voltage imbalance:

$$\text{\% Voltage Imbalance} = 100 \times \frac{7}{457}$$

$$= 1.53\%$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

IMPORTANT: If supply voltage phase imbalance is more than 2%, contact the local electric utility company immediately.

POWER WIRING

Properly sized fuses or HACR (Heating, Air-Conditioning and Refrigeration) circuit breakers must be installed for branch circuit protection, according to the national and applicable local codes. See unit nameplate and Tables 11 and 12 for maximum overcurrent protection size.

These units are provided with single point, main power supply terminal blocks. Refer to Fig. 7-23 for conduit connection locations.

Connect the power leads as indicated on the unit wiring diagrams (found in the Troubleshooting section) and be certain to connect the ground lead to the ground lug in the unit high voltage electrical box. Refer to Tables 11 and 12 for unit electrical data.

Modular Units

For units with multiple main air-conditioning sections, connect the high voltage compressor power wiring to the line side of the high voltage terminal block in the second section's high voltage electrical box. This wiring is located in the upper portion of the compressor compartment.

Connect the low voltage wiring, located in the compressor compartment, between the two air-conditioning sections using the quick connects provided.

For the supply fan motor, connect the 3-phase high voltage wiring, coiled behind the high voltage panel, to the line side of the supply fan motor terminal block located in the fan compartment. For VAV units, connect the 3-phase high voltage wiring to the line side of VFD.

For units with multiple fans, connect the control power wiring with the quick connects provided at the fan compartment junction.

CONTROL WIRING (CV ONLY)

A standard commercial thermostat controls constant volume units. These units turn compressors on or off in response to zone temperature. The 50BV 034 unit provides 2 stages of cooling. See Fig. 28 for typical thermostat wiring.

50BVT,V 034 Only

This model has 2 independent refrigerant circuits, each capable of being staged independently. Thermostat wiring is connected to the 6-position low voltage terminal block located in the unit electrical box. The 50BV units have a 24-vac control transformer, which provides power to the control circuit and to the thermostat. The thermostat connections and their functions are as follows:

C — Transformer 24-vac Common

O — Reversing Valve (heat pumps only)

Y1 — 1st Stage Compressor Contactor

Y2 — 2nd Stage Compressor Contactor

R — Transformer 24-vac Hot

G — Indoor Fan Contactor

H — Dehumidification (on/off HGRH only)

Select an appropriate commercial thermostat that has 2 stages of cooling control. If the unit is a heat pump, make sure the thermostat is capable of heat pump control.

Install the thermostat in the space where the temperature is being controlled, according to the instructions provided with the thermostat.

⚠WARNING

Before wiring the thermostat to the unit, make sure that main power to the unit has been disconnected. Failure to heed this warning could result in personal injury.

To wire the thermostat:

1. Connect the 'C' terminal from the 50BV unit to the 'C' terminal on the thermostat.
2. Wire the 'Y1' and 'Y2' terminals from the 50BV unit to the 'Y1' and 'Y2' terminals, respectively, at the thermostat.
3. Make a connection between the 'G' terminal on the unit and the 'G' terminal on the thermostat.
4. Attach a wire from the 'R' terminal at the unit to the 'R' terminal at the thermostat.
5. 50BVV ONLY: If the unit is a heat pump, connect a final wire from terminal 'O' on the heat pump unit to the 'W1/O/B' terminal at the thermostat. Configure the thermostat for heat pump operation using the installation instructions provided with the thermostat. Set the reversing valve polarity of the thermostat to 'O'.
6. For units with cycling (on/off) HGRH, connect the thermostat H output to the H terminal on the 50BV. Set up the thermostat to provide an H output only, as the unit will automatically enable the Y1 and O terminals when there is a call for H (dehumidification).

See Fig. 29 for typical thermostat wiring.

50BVT,V044-064 Only

Unit sizes 044-064 have 4 independent refrigerant circuits. These units can be controlled using a standard commercial, 2-stage thermostat. In this case, the first stage of cooling will turn on compressors 1 and 2, and the second stage will turn on compressors 3 and 4. It is also possible to have 4 stages of cooling, using a suitable field-supplied control method.

For 2-stage thermostat wiring, refer to Fig. 29. Jumpers must be installed between the G and O terminals in Modules A and B. A field-supplied, 24-v pilot relay should be used to energize Y2 on Module B whenever Y1 is energized on Module A. Similarly, a field-supplied 24-v pilot relay should be installed to energize Y4 on Module B whenever Y3 on Module A is energized (Y2 stage of thermostat calls for cooling).

Finally, verify that transformer phasing is consistent between Modules A and B.

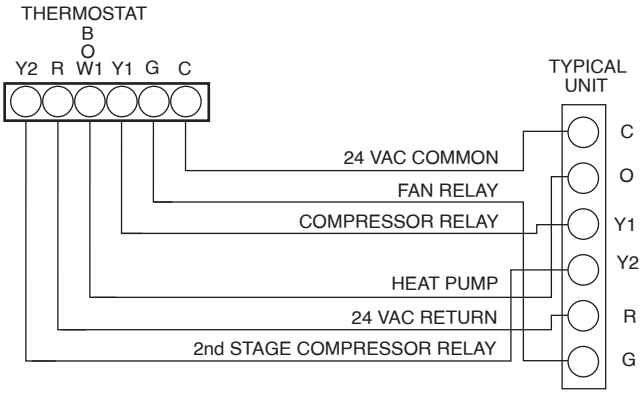


Fig. 28 — Typical Wiring Unit Sizes 034 (Two-Stage Cooling Unit)

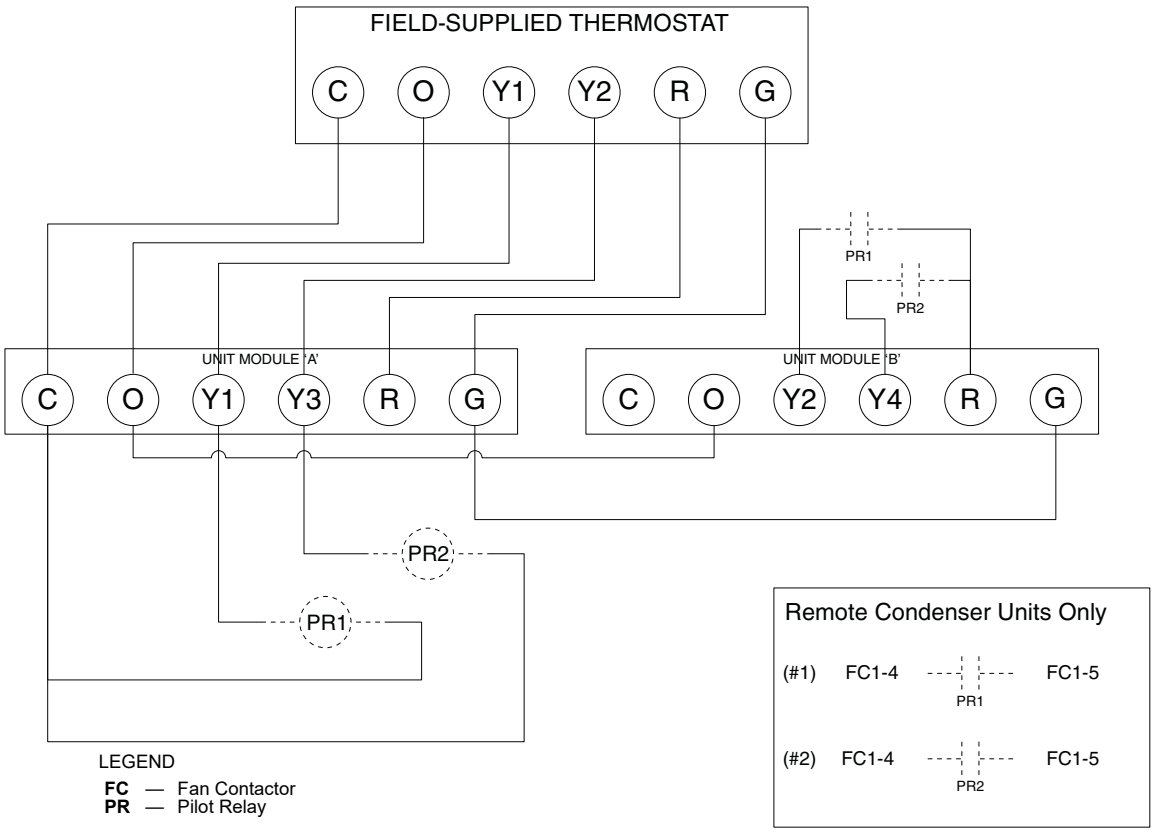


Fig. 29 — Typical Wiring 40 to 60 Ton Units (Two-Stage Cooling)

Table 11 — Electrical Data — with Belt Drive Motor, Inverter Duty (50BVJ)

50BVJ SIZE	RATED VOLTAGE	VOLTAGE MIN/MAX	COMPRESSOR			INDOOR FAN MOTOR			POWER SUPPLY	
			QTY	RLA (EACH)	LRA (EACH)	MOTOR HP	MOTOR QTY	FLA (EACH)	MIN CIRCUIT AMPS	MAX FUSE/ HACR
20	208-230/3/60	197/253	2	29.5	195.0	2.0	2	6.2	78.8	100
			2	29.5	195.0	3.0	2	8.8	84.0	110
			2	29.5	195.0	5.0	2	13.5	93.4	110
	460/3/60	414/506	2	14.7	95.0	2.0	2	3.1	39.3	50
			2	14.7	95.0	3.0	2	4.3	41.7	50
			2	14.7	95.0	5.0	2	6.2	45.5	60
	575/3/60	518/632	2	12.2	80.0	2.0	2	2.0	31.5	40
			2	12.2	80.0	3.0	2	3.5	34.4	45
			2	12.2	80.0	5.0	2	4.5	36.5	45
24	208-230/3/60	197/253	2	30.1	225.0	2.0	2	6.2	80.1	110
			2	30.1	225.0	3.0	2	8.8	85.3	110
			2	30.1	225.0	5.0	2	13.5	94.7	110
	460/3/60	414/506	2	16.7	114.0	2.0	2	3.1	43.8	60
			2	16.7	114.0	3.0	2	4.3	46.2	60
			2	16.7	114.0	5.0	2	6.2	50.0	60
	575/3/60	518/632	2	12.2	80.0	2.0	2	2.0	31.5	40
			2	12.2	80.0	3.0	2	3.5	34.4	45
			2	12.2	80.0	5.0	2	4.5	36.5	45
28	208-230/3/60	197/253	2	48.1	245.0	3.0	2	8.8	125.8	150
			2	48.1	245.0	5.0	2	13.5	135.2	175
	460/3/60	414/506	2	18.6	125.0	3.0	2	4.3	50.5	60
			2	18.6	125.0	5.0	2	6.2	54.3	70
	575/3/60	518/632	2	14.7	100.0	3.0	2	3.5	40.0	50
			2	14.7	100.0	5.0	2	4.5	42.1	50
34	208-230/3/60	197/253	2	55.8	340.0	5.0	2	13.5	152.6	200
	460/3/60	414/506	2	26.9	173.0	5.0	2	6.2	72.9	90

LEGEND

FLA — Full Load Amps
HP — Horsepower
LRA — Locked Rotor Amps
RLA — Rated Load Amps

Table 12 — Electrical Data — with Belt Drive Motor, Inverter Duty[a] (50BVV,W,T)

50BVV,W,T SIZE	RATED VOLTAGE	VOLTAGE MIN/MAX	COMPRESSOR			INDOOR FAN MOTOR			POWER SUPPLY	
			QTY	RLA (EACH)	LRA (EACH)	MOTOR HP	MOTOR QTY	FLA (EACH)	MIN CIRCUIT AMPS	MAX FUSE/ HACR
034	208-230/3/60	197/253	2	55.8	340	7.5	1	19.8	145.4	200
			2	55.8	340	10	1	25.4	151.0	200
			2	55.8	340	15	1	37.5	163.1	200
			2	55.8	340	20	1	48.5	174.1	225
	460/3/60	414/506	2	26.9	173	7.5	1	9.9	70.4	90
			2	26.9	173	10	1	12.7	73.2	100
			2	26.9	173	15	1	18.8	79.3	100
			2	26.9	173	20	1	24.3	84.8	110
	575/3/60	518/632	2	23.7	132	7.5	1	7.9	61.2	80
			2	23.7	132	10	1	10.3	63.6	80
			2	23.7	132	15	1	15.1	68.4	90
			2	23.7	132	20	1	19.5	72.8	90
044	208-230/3/60	197/253	4	33.3	239	7.5	2	19.8	181.1	200
			4	33.3	239	10	2	25.4	192.3	225
			4	33.3	239	15	2	37.5	217.6	250
			4	33.3	239	20	2	48.5	242.3	250
	460/3/60	414/506	4	17.9	125	7.5	2	9.9	95.9	110
			4	17.9	125	10	2	12.7	101.5	110
			4	17.9	125	15	2	18.8	113.9	125
			4	17.9	125	20	2	24.3	126.3	150
	575/3/60	518/632	4	12.8	80	7.5	2	7.9	70.2	80
			4	12.8	80	10	2	10.3	75.0	80
			4	12.8	80	15	2	15.1	85.2	100
			4	12.8	80	20	2	19.5	95.1	110
054	208-230/3/60	197/253	4	48.1	245	7.5	2	19.8	244.0	250
			4	48.1	245	10	2	25.4	255.2	300
			4	48.1	245	15	2	37.5	279.4	300
			4	48.1	245	20	2	48.5	301.5	350
	460/3/60	414/506	4	18.6	125	7.5	2	9.9	98.9	110
			4	18.6	125	10	2	12.7	104.5	110
			4	18.6	125	15	2	18.8	116.7	125
			4	18.6	125	20	2	24.3	129.1	150
	575/3/60	518/632	4	14.7	100	7.5	2	7.9	78.3	90
			4	14.7	100	10	2	10.3	83.1	90
			4	14.7	100	15	2	15.1	92.8	100
			4	14.7	100	20	2	19.5	102.7	110
064	208-230/3/60	197/253	4	55.8	340	7.5	2	19.8	276.8	300
			4	55.8	340	10	2	25.4	288.0	300
			4	55.8	340	15	2	37.5	312.2	350
			4	55.8	340	20	2	48.5	334.2	350
	460/3/60	414/506	4	26.9	173	7.5	2	9.9	134.1	150
			4	26.9	173	10.0	2	12.7	139.7	150
			4	26.9	173	15.0	2	18.8	151.9	175
			4	26.9	173	20.0	2	24.3	162.9	175
	575/3/60	518/632	4	23.7	132	7.5	2	7.9	116.5	125
			4	23.7	132	10.0	2	10.3	121.3	125
			4	23.7	132	15.0	2	15.1	130.9	150
			4	23.7	132	20.0	2	19.5	139.7	150

NOTE(S):

a. The presence of an inverter duty motor does not guarantee that the unit will be provided with a VFD; only 50BVW (VAV) units are provided with a VFD as standard.

LEGEND

FLA — Full Load Amps
VFD — Variable Frequency Drive
HP — Horsepower
LRA — Locked Rotor Amps
RLA — Rated Load Amps

Control Wiring (VAV Only)

While most of the factory supplied and installed sensors are factory wired, some sensors are factory supplied for field installation or are field supplied and installed. Factory supply, field installed sensors include the supply air temperature (SAT) sensor, duct static pressure (DPT) sensor, and return air temperature (RAT) sensors. Refer to Table 13 for recommended cables.

Table 13 — Recommended Cables

MANUFACTURER	PART NUMBER
Alpha	2413 or 5463
American	A22503
Belden	8772
Columbia	02525

SUPPLY AIR TEMPERATURE SENSOR (SAT)

50BV VAV units ship with a factory installed supply air temperature sensor in one of the blower housings. This sensor should not be used for VAV operation. It is recommended to disconnect the factory sensor and utilized a field supplied and installed SAT sensor.

The field supplied supply air temperature sensor should be a duct probe style thermistor (Carrier P/N 33ZCSENPAT) with a 10K-type II resistance output curve (10K ohm at 77°F) that is wired back to IN-6 of the unit controller. The duct probe sensor should be installed in the supply duct at least 10 ft away from the unit or any heat sources. See Fig. 30.

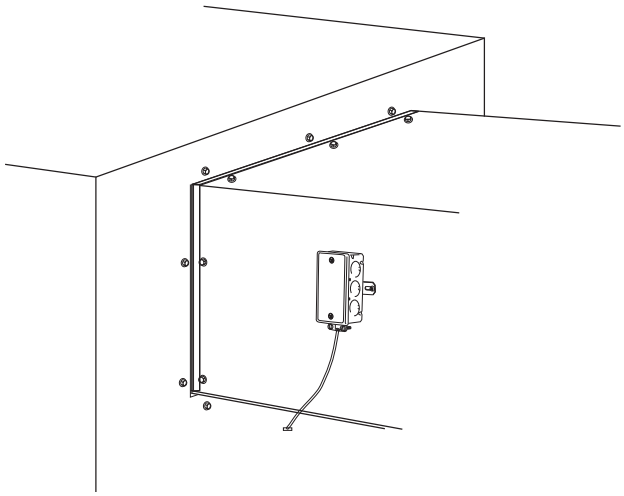


Fig. 30 — Supply-Air Temperature Sensor Installation (Unit Discharge Location)

SMOKE DETECTOR/FIRE ALARM SHUTDOWN (FSD)

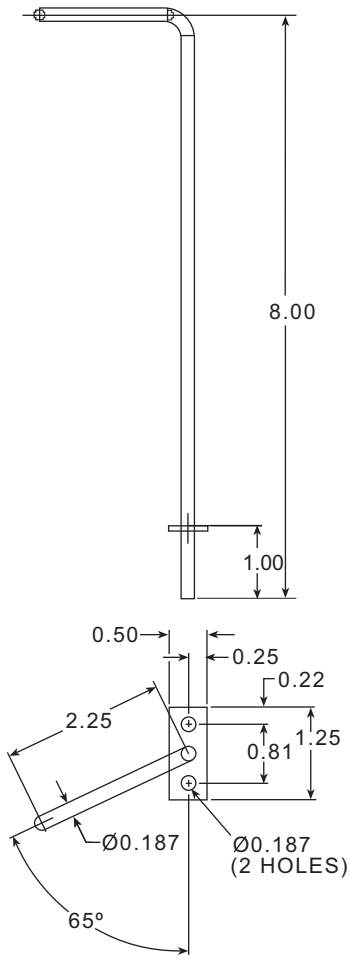
To allow a smoke detector to shut the 50BV unit down, field terminate the sensor on IN-1 of the I/O Flex EX8160 expander. Use the BACview tool to enable its operation.

REMOTE OCCUPANCY (ROCC)

The 50BV unit may be commanded by another control system or a twist timer to become occupied and run when a set of dry contacts close. In order for this to occur, wire the NO dry contacts to UI-12 on the I/O Flex 6126 controller. From the BACview setup screen, configure the occupancy command to be Digital Input.

RETURN AIR TEMPERATURE (RAT) SENSOR

VAV units will ship with 2-4 return air temperature (RAT) sensors, which are used for determining load for cooling staging. The RAT sensors must be field installed in the return air ductwork or in front of the return air filter (free return) at various points to properly sense the return air condition. The RAT sensors should be installed near the unit to sense the true load on the unit (including any mixed air). The RAT sensors are daisy chained and wired back to UI-8 on the unit controller. See Fig. 31. See Table 14 for thermistor resistance versus temperature values for supply-air and return air temperature sensor.



NOTES: All dimensions are in inches.

Fig. 31 — Return Air Temperature Sensor

Table 14 — Thermistor Resistance vs Temperature Values for Supply-Air and Return Air Temperature Sensor (10,000 ohms)

TEMP (°C)	TEMP (°F)	RESISTANCE (Ohms)	TEMP (°C)	TEMP (°F)	RESISTANCE (Ohms)	TEMP (°C)	TEMP (°F)	RESISTANCE (Ohms)
-39	-39.44	323,839	37	2.78	28,365	113	45.00	4,367
-37	-38.33	300,974	39	3.89	26,834	115	46.11	4,182
-35	-37.22	279,880	41	5.00	25,395	117	47.22	4,006
-33	-36.11	260,410	43	6.11	24,042	119	48.33	3,838
-31	-35.00	242,427	45	7.22	22,770	121	49.44	3,679
-29	-33.89	225,809	47	8.33	21,573	123	50.56	3,525
-27	-32.78	210,443	49	9.44	20,446	125	51.67	3,380
-25	-31.67	196,227	51	10.56	19,376	127	52.78	3,242
-23	-30.56	183,068	53	11.67	18,378	129	53.89	3,111
-21	-29.44	170,775	55	12.78	17,437	131	55.00	2,985
-19	-28.33	159,488	57	13.89	16,550	133	56.11	2,865
-17	-27.22	149,024	59	15.00	15,714	135	57.22	2,751
-15	-26.11	139,316	61	16.11	14,925	137	58.33	2,642
-13	-25.00	130,306	63	17.22	14,180	139	59.44	2,538
-11	-23.89	121,939	65	18.33	13,478	141	60.56	2,438
-9	-22.78	114,165	67	19.44	12,814	143	61.67	2,343
-7	-21.67	106,939	69	20.56	12,182	145	62.78	2,252
-5	-20.56	100,218	71	21.67	11,590	147	63.89	2,165
-3	-19.44	93,909	73	22.78	11,030	149	65.00	2,082
-1	-18.33	88,090	75	23.89	10,501	151	66.11	2,003
1	-17.22	82,670	77	25.00	10,000	153	67.22	1,927
3	-16.11	77,620	79	26.11	9,526	155	68.33	1,855
5	-15.00	72,911	81	27.22	9,078	157	69.44	1,785
7	-13.89	68,518	83	28.33	8,653	159	70.56	1,718
9	-12.78	64,419	85	29.44	8,251	161	71.67	1,655
11	-11.67	60,592	87	30.56	7,866	163	72.78	1,594
13	-10.56	57,017	89	31.67	7,505	165	73.89	1,536
15	-9.44	53,647	91	32.78	7,163	167	75.00	1,480
17	-8.33	50,526	93	33.89	6,838	169	76.11	1,427
19	-7.22	47,606	95	35.00	6,530	171	77.22	1,375
21	-6.11	44,874	97	36.11	6,238	173	78.33	1,326
23	-5.00	42,317	99	37.22	5,960	175	79.44	1,279
25	-3.89	39,921	101	38.33	5,697	177	80.56	1,234
27	-2.78	37,676	103	39.44	5,447	179	81.67	1,190
29	-1.67	35,573	105	40.56	5,207	181	82.78	1,149
31	-0.56	33,599	107	41.67	4,981	183	83.89	1,109
33	0.56	31,732	109	42.78	4,766	185	85.00	1,070
35	1.67	29,996	111	43.89	4,561	187	86.11	1,034

START-UP

General

Complete the Start-Up Checklist on page CL-1 before attempting system start-up.

CRANKCASE HEATERS

The 50BVT,V,W, 034-064 units include crankcase heaters. Crankcase heaters are energized as long as there is power to the unit.

Wait 24 hours before starting the compressors to permit warming by the crankcase heaters.

AFTER 24 hours, continue with the procedures below.

CONFIRM THE INPUT POWER PHASE SEQUENCE

The input power phase rotation sequence must be L1-L2-L3 = ABC (or forward or clockwise) as indicated with a phase rotation meter. Incorrect input phase rotation will cause the compressors to rotate in reverse, which results in no cooling capacity.

IMPORTANT: On VAV units, fan rotation direction CANNOT be used for the phase sequence check; fan rotation for VAV units with a variable speed drive is independent of the unit input wiring sequence.

If the compressor is rotating in the wrong direction, it may: emit increased noise; shut down due to internal overload protection; have only a small decrease in suction pressure when it starts; or have only a small increase in discharge pressure when it starts. Also, no cooling will be produced at the evaporator. If any of these conditions occurs, refer to the Service section to correct the compressor rotation before continuing.

INTERNAL WIRING

Check all electrical connections in unit control boxes; tighten as required.

RETURN-AIR FILTERS

Check that correct filters are installed in filter racks (see Tables 2 and 3). Do not operate unit without return-air filters.

COMPRESSOR MOUNTING

Compressors are internally mounted on resilient rubber supports. Do not loosen or remove compressor hold down bolts.

REFRIGERANT SERVICE PORTS

Each refrigerant system has a total of 2 Schrader-type service gauge ports per circuit. One port is located on the suction line, and one on the compressor discharge line. Be sure that caps on the ports are tight.

WATER PIPING

Verify water piping is properly installed and water flow is present prior to operating unit. Check for water leaks and correct as needed.

CV Unit Start-Up

EVAPORATOR FAN

Fan belt and variable pitch motor pulleys are factory installed. Be sure that fans rotate in the proper direction.

COOLING

Set the space thermostat to OFF position. Turn on unit power. Set space thermostat to COOL and the fan to AUTO. Adjust the thermostat temperature setting below room temperature. Compressor 1 starts on closure of contactor (compressors 1 and 2 on 4-circuit units with 2-stage thermostat).

Adjust the thermostat to an even lower setting until the thermostat energizes Y2 (the second cooling stage). Compressor 2 starts on closure of contactor (compressors 3 and 4 on 4-circuit units with 2-stage thermostat).

Adjust the thermostat temperature to a setting just below room temperature. The second stage of cooling should turn off.

Set the thermostat temperature above room temperature. All compressors and the unit fan should now be off.

Set the thermostat below room temperature and confirm that the compressors and fan turn off.

Table 15 — Fan Performance — 50BVJ020 [a,b,c,d,e,f,g]

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp
4500	—	—	—	—	—	—	***623***	***459***	***0.52***	—	—	—	—	—	—
5000	—	—	—	—	—	—	***638***	***545***	***0.61***	—	—	—	—	—	—
5500	—	—	—	—	—	—	***655***	***641***	***0.72***	***725***	***755***	***0.85***	—	—	—
6000	—	—	—	***608***	***641***	***0.72***	***676***	***755***	***0.85***	***742***	***878***	***0.99***	807	1001	1.13
6500	—	—	—	***636***	***755***	***0.85***	***699***	***878***	***0.99***	761	1010	1.14	821	1142	1.29
7000	***604***	***774***	***0.87***	***666***	***906***	***1.02***	***726***	***1029***	***1.16***	784	1170	1.32	841	1311	1.48
7500	***634***	***916***	***1.03***	***693***	***1057***	***1.19***	***750***	***1189***	***1.34***	805	1330	1.50	858	1480	1.67
8000	***667***	***1085***	***1.22***	***723***	***1226***	***1.38***	777	1377	1.55	829	1526	1.72	880	1676	1.89
8500	***700***	***1273***	***1.43***	753	1423	1.60	804	1573	1.77	853	1732	1.95	902	1836	2.13
9000	***735***	***1480***	***1.67***	785	1638	1.84	833	1745	2.02	881	1908	2.21	927	2071	2.40

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp
4500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6500	881	1283	1.44	—	—	—	—	—	—	—	—	—	—	—	—
7000	897	1451	1.63	951	1601	1.80	—	—	—	—	—	—	—	—	—
7500	911	1629	1.83	963	1727	2.00	1014	1881	2.18	—	—	—	—	—	—
8000	930	1781	2.07	979	1935	2.24	1028	2098	2.43	1076	2260	2.62	1124	2422	2.81
8500	950	1989	2.31	997	2152	2.50	1043	2323	2.69	1089	2485	2.88	1134	2697	3.09
9000	973	2233	2.59	1018	2404	2.79	1062	2576	2.99	1106	2779	3.18	1149	2960	3.39

NOTE(S):

a. Units are available with the following motor and drive combinations: 2, 3, 5 hp standard drive; 2, 3 hp medium static drive. For 2, 3 hp standard drives, the drive range is 753 to 952 rpm. For medium static drives, the drive range is 872 to 1071 rpm. For 5 hp standard drives, the drive range is 967 to 1290 rpm.
b. ***Bold italics*** indicates field-supplied drive required.
c. Do not operate in shaded area.
d. Static pressure losses must be applied to external static pressure before entering the fan performance table.
e. Interpolation is permitted: extrapolation is not.
f. Fan performance is based on filter, unit casing, and wet coil losses.
g. Bhp values are per fan. Watts values are per motor. Unit has 2 supply fans and 2 motors.

LEGEND

bhp — Brake Horsepower Input to Supply Fan
Watts — Input Power to Supply Fan Motor

Table 16 — Fan Performance — 50BVJ024 [a,b,c,d,e,f,g]

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp
5,000	—	—	—	—	—	—	***638***	***545***	***0.61***	—	—	—	—	—	—
5,500	—	—	—	—	—	—	***655***	***641***	***0.72***	***725***	***755***	***0.85***	—	—	—
6,000	—	—	—	***608***	***641***	***0.72***	***676***	***755***	***0.85***	***742***	***878***	***0.99***	807	1001	1.13
6,500	—	—	—	***636***	***755***	***0.85***	***699***	***878***	***0.99***	761	1010	1.14	821	1142	1.29
7,000	***604***	***774***	***0.87***	***666***	***906***	***1.02***	***726***	***1029***	***1.16***	784	1170	1.32	841	1311	1.48
7,500	***634***	***916***	***1.03***	***693***	***1057***	***1.19***	***750***	***1189***	***1.34***	805	1330	1.50	858	1480	1.67
8,000	***667***	***1085***	***1.22***	***723***	***1226***	***1.38***	777	1377	1.55	829	1526	1.72	880	1676	1.89
8,500	***700***	***1273***	***1.43***	753	1423	1.60	804	1573	1.77	853	1732	1.95	902	1836	2.13
9,000	***735***	***1480***	***1.67***	785	1638	1.84	833	1745	2.02	881	1908	2.21	927	2071	2.40
9,500	769	1713	1.93	816	1827	2.12	863	1989	2.31	908	2152	2.50	952	2323	2.69
10,000	802	1908	2.21	848	2080	2.41	892	2251	2.61	936	2422	2.81	978	2624	3.01

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp
5,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5,500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6,500	881	1283	1.44	—	—	—	—	—	—	—	—	—	—	—	—
7,000	897	1451	1.63	951	1601	1.80	—	—	—	—	—	—	—	—	—
7,500	911	1629	1.83	963	1727	2.00	1014	1881	2.18	—	—	—	—	—	—
8,000	930	1781	2.07	979	1935	2.24	1028	2098	2.43	1076	2260	2.62	1124	2422	2.81
8,500	950	1989	2.31	997	2152	2.50	1043	2323	2.69	1089	2485	2.88	1134	2697	3.09
9,000	973	2233	2.59	1018	2404	2.79	1062	2576	2.99	1106	2779	3.18	1149	2960	3.39
9,500	996	2494	2.89	1039	2697	3.09	1081	2879	3.30	1123	3060	3.51	1165	3251	3.73
10,000	1020	2806	3.22	1061	2988	3.42	1102	3178	3.64	1142	3360	3.85	1182	3559	4.08

NOTE(S):

a. Units are available with the following motor and drive combinations: 2, 3, 5 hp standard drive; 2, 3 hp medium static drive. For 2, 3 hp standard drives, the drive range is 753 to 952 rpm. For medium static drives, the drive range is 872 to 1071 rpm. For 5 hp standard drives, the drive range is 967 to 1290 rpm.
b. ***Bold italics*** indicates field-supplied drive required.
c. Do not operate in shaded area.
d. Static pressure losses must be applied to external static pressure before entering the fan performance table.
e. Interpolation is permitted: extrapolation is not.
f. Fan performance is based on filter, unit casing, and wet coil losses.
g. Bhp values are per fan. Watts values are per motor. Unit has 2 supply fans and 2 motors.

LEGEND

bhp — Brake Horsepower Input to Supply Fan
Watts — Input Power to Supply Fan Motor

Table 17 — Fan Performance — 50BVJ028 [a,b,c,d,e,f,g]

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp
6,250	—	—	—	***624***	***678***	***0.79***	***689***	***797***	***0.92***	753	917	1.06	815	1045	1.21
7,000	***604***	***751***	***0.87***	***666***	***880***	***1.02***	***726***	***999***	***1.16***	784	1136	1.32	841	1273	1.48
7,500	***634***	***889***	***1.03***	***693***	***1027***	***1.19***	***750***	***1155***	***1.34***	805	1291	1.50	858	1437	1.67
8,000	***667***	***1054***	***1.22***	***723***	***1191***	***1.38***	***777***	***1337***	***1.55***	829	1482	1.72	880	1627	1.89
8,500	***700***	***1237***	***1.43***	***753***	***1382***	***1.60***	***804***	***1528***	***1.77***	853	1682	1.95	902	1836	2.13
9,000	***735***	***1437***	***1.67***	***785***	***1591***	***1.84***	***833***	***1745***	***2.02***	881	1908	2.21	927	2071	2.40
9,500	***769***	***1664***	***1.93***	***816***	***1827***	***2.12***	***863***	***1989***	***2.31***	908	2152	2.50	952	2323	2.69
10,000	***802***	***1908***	***2.21***	***848***	***2080***	***2.41***	***892***	***2251***	***2.61***	936	2422	2.81	978	2624	3.01
10,500	***835***	***2179***	***2.53***	***879***	***2350***	***2.73***	***921***	***2531***	***2.93***	963	2742	3.14	1004	2924	3.35
11,000	***870***	***2467***	***2.86***	***912***	***2688***	***3.08***	***952***	***2870***	***3.29***	992	3060	3.51	1032	3251	3.73
11,500	***904***	***2824***	***3.24***	***944***	***3015***	***3.46***	983	3206	3.67	1022	3405	3.90	1060	3605	4.13
12,000	***937***	***3169***	***3.63***	976	3369	3.86	1014	3569	4.09	1051	3777	4.33	1088	3985	4.57
12,500	972	3550	4.07	1010	3759	4.31	1046	3967	4.55	1082	4184	4.80	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp
6,250	877	1173	1.36	—	—	—	—	—	—	—	—	—	—	—	—
7,000	897	1410	1.63	951	1555	1.80	—	—	—	—	—	—	—	—	—
7,500	911	1582	1.83	963	1727	2.00	1014	1881	2.18	—	—	—	—	—	—
8,000	930	1781	2.07	979	1935	2.24	1028	2098	2.43	1076	2260	2.62	1124	2422	2.81
8,500	950	1989	2.31	997	2152	2.50	1043	2323	2.69	1089	2485	2.88	1134	2697	3.09
9,000	973	2233	2.59	1018	2404	2.79	1062	2576	2.99	1106	2779	3.18	1149	2960	3.39
9,500	996	2494	2.89	1039	2697	3.09	1081	2879	3.30	1123	3060	3.51	1165	3251	3.73
10,000	1020	2806	3.22	1061	2988	3.42	1102	3178	3.64	1142	3360	3.85	1182	3559	4.08
10,500	1044	3106	3.56	1084	3296	3.78	1123	3496	4.01	1161	3686	4.23	1200	3886	4.45
11,000	1070	3451	3.95	1109	3641	4.17	1146	3840	4.40	1184	4049	4.64	1220	4248	4.87
11,500	1097	3804	4.36	1134	4012	4.60	1170	4221	4.84	1206	—	—	—	—	—
12,000	1124	4193	4.81	—	—	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Units are available with the following motor and drive combinations: 2, 3, 5 hp standard drive; 2, 3 hp medium static drive. For 2, 3 hp standard drives, the drive range is 753 to 952 rpm. For medium static drives, the drive range is 872 to 1071 rpm. For 5 hp standard drives, the drive range is 967 to 1290 rpm.
b. ***Bold italics*** indicates field-supplied drive required.
c. Do not operate in shaded area.
d. Static pressure losses must be applied to external static pressure before entering the fan performance table.
e. Interpolation is permitted: extrapolation is not.
f. Fan performance is based on filter, unit casing, and wet coil losses.
g. Bhp values are per fan. Watts values are per motor. Unit has 2 supply fans and 2 motors.

LEGEND

bhp — Brake Horsepower Input to Supply Fan
Watts — Input Power to Supply Fan Motor

Table 18 — Fan Performance — 50BVJ034 [a,b,c,d,e,f,g]

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp
9,000	***639***	***1187***	***1.36***	***693***	***1334***	***1.53***	***745***	***1490***	***1.71***	***795***	***1646***	***1.89***	***843***	***1802***	***2.07***
9,500	***665***	***1362***	***1.56***	***717***	***1518***	***1.74***	***766***	***1674***	***1.92***	***814***	***1839***	***2.11***	***861***	***2004***	***2.30***
10,000	***693***	***1555***	***1.78***	***743***	***1720***	***1.97***	***791***	***1894***	***2.17***	***836***	***2058***	***2.36***	***881***	***2232***	***2.56***
10,500	***721***	***1775***	***2.03***	***769***	***1949***	***2.23***	***815***	***2122***	***2.43***	***859***	***2296***	***2.63***	***902***	***2478***	***2.84***
11,000	***749***	***2004***	***2.30***	***795***	***2186***	***2.51***	***840***	***2369***	***2.71***	***882***	***2551***	***2.92***	***924***	***2742***	***3.14***
11,500	***777***	***2259***	***2.59***	***822***	***2451***	***2.81***	***864***	***2642***	***3.03***	***906***	***2833***	***3.25***	***946***	***3024***	***3.47***
12,000	***805***	***2533***	***2.90***	***848***	***2733***	***3.13***	***889***	***2933***	***3.36***	***929***	***3133***	***3.59***	968	3333	3.82
12,500	***835***	***2842***	***3.26***	***877***	***3042***	***3.49***	***917***	***3251***	***3.73***	***955***	***3460***	***3.97***	993	3668	4.20
13,000	***865***	***3169***	***3.63***	***905***	***3378***	***3.87***	***944***	***3596***	***4.12***	981	3813	4.37	1018	4021	4.61
13,500	***894***	***3514***	***4.03***	***933***	***3741***	***4.29***	971	3958	4.54	1007	4184	4.80	—	—	—
14,000	***924***	***3895***	***4.46***	***961***	***4121***	***4.72***	998	4356	4.99	—	—	—	—	—	—

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp	rpm	Watts	bhp
9,000	***890***	***1958***	***2.24***	***936***	***2122***	***2.43***	982	2296	2.63	1026	2460	2.82	1071	2642	3.03
9,500	***906***	***2168***	***2.48***	***950***	***2341***	***2.68***	994	2515	2.88	1037	2688	3.08	1079	2870	3.29
10,000	***925***	***2405***	***2.76***	967	2578	2.96	1009	2760	3.16	1051	2942	3.37	1092	3124	3.58
10,500	***944***	***2660***	***3.05***	986	2842	3.26	1026	3024	3.47	1066	3215	3.68	1105	3405	3.90
11,000	***965***	***2924***	***3.35***	1004	3115	3.57	1043	3315	3.80	1082	3505	4.02	1120	3705	4.25
11,500	985	3224	3.69	1024	3414	3.91	1062	3614	4.14	1099	3813	4.37	1136	4021	4.61
12,000	1006	3532	4.05	1044	3732	4.28	1080	3940	4.52	1117	4148	4.75	1152	4356	4.99
12,500	1030	3877	4.44	1066	4085	4.68	1102	4302	4.93	—	—	—	—	—	—
13,000	1053	4239	4.86	—	—	—	—	—	—	—	—	—	—	—	—
13,500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
14,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Units are available with the following motor and drive combinations: 2, 3, 5 hp standard drive; 2, 3 hp medium static drive. For 2, 3 hp standard drives, the drive range is 753 to 952 rpm. For medium static drives, the drive range is 872 to 1071 rpm. For 5 hp standard drives, the drive range is 967 to 1290 rpm.
b. ***Bold italics*** indicates field-supplied drive required.
c. Do not operate in shaded area.
d. Static pressure losses must be applied to external static pressure before entering the fan performance table.
e. Interpolation is permitted: extrapolation is not.
f. Fan performance is based on filter, unit casing, and wet coil losses.
g. Bhp values are per fan. Watts values are per motor. Unit has 2 supply fans and 2 motors.

LEGEND

bhp — Brake Horsepower Input to Supply Fan
Watts — Input Power to Supply Fan Motor

Table 19 — Blower Performance

50BV V,W,T SIZE	NOMINAL AIRFLOW (cfm)	AIRFLOW (cfm)	EXTERNAL STATIC PRESSURE (in. wg WET COIL AND FILTER INCLUDED)											
			2.00		2.50		3.00		3.50		4.00		4.50	
			rpm	HP	rpm	HP	rpm	HP	rpm	HP	rpm	HP	rpm	HP
034	12,200	9,500	813	7.5	871	15	949	10	1034	15	1111	15	1172	15
		10,000	813	7.5	916	10	949	10	1034	15	1111	15	1172	15
		10,500	842	10	916	10	982	15	1034	15	1111	15	1172	15
		11,000	842	10	916	10	982	15	1034	15	1111	15	1172	15
		11,500	871	15	916	15	982	15	1034	15	1111	15	1172	20
		12,000	871	15	949	15	982	15	1072	15	1111	20	1172	20
		12,500	871	15	949	15	1034	15	1072	20	1111	20	1172	20
		13,500	916	15	982	20	1034	20	1072	20	1149	20	—	—
044	16,000	13,000	794	7.5	916	7.5	982	7.5	1111	7.5	1200	10	1256	10
		14,000	794	7.5	871	7.5	982	7.5	1072	10	1172	10	1256	10
		15,000	794	7.5	871	7.5	982	7.5	1072	10	1172	10	1256	15
		16,000	794	7.5	871	7.5	982	7.5	1034	10	1149	10	1256	15
		17,000	794	7.5	871	7.5	982	7.5	1034	10	1111	15	1214	15
		18,000	813	7.5	871	7.5	949	10	1034	10	1111	15	1172	15
		19,000	813	7.5	871	15	949	10	1034	15	1111	15	1172	15
054	20,000	16,000	794	7.5	871	7.5	982	7.5	1034	10	1149	10	1256	15
		17,000	794	7.5	871	7.5	982	7.5	1034	10	1111	15	1214	15
		18,000	813	7.5	871	8	949	10	1034	10	1111	15	1172	15
		19,000	813	7.5	871	15	949	10	1034	15	1111	15	1172	15
		20,000	813	7.5	916	10	949	10	1034	15	1111	15	1172	15
		21,000	842	10	916	10	982	15	1034	15	1111	15	1172	15
		22,000	842	10	916	10	982	15	1034	15	1111	15	1172	15
		23,000	871	15	916	15	982	15	1034	15	1111	15	1172	20
		24,000	871	15	949	15	982	15	1072	15	1111	20	1172	20
064	24,000	19,000	813	7.5	871	15	949	10	1034	15	1111	15	1172	15
		20,000	813	7.5	916	10	949	10	1034	15	1111	15	1172	15
		21,000	842	10	916	10	982	15	1034	15	1111	15	1172	15
		22,000	842	10	916	10	982	15	1034	15	1111	15	1172	15
		23,000	871	15	916	15	982	15	1034	15	1111	15	1172	20
		24,000	871	15	949	15	982	15	1072	15	1111	20	1172	20
		25,000	871	15	949	15	1034	15	1072	20	1111	20	1172	20

CONTROLS

Unit Protection Module (UPM)

GENERAL DESCRIPTION

The Unit Protection Module (UPM) as shown in Fig. 32 is a printed circuit board (PCB) that interfaces with the thermostat for constant volume units or the digital direct controller.

The main purpose of this device is to protect the compressors by monitoring the different states of switches and sensors of each refrigerant circuit. This device provides time delays and protects the unit against freezing of the water and refrigerant heat exchangers as well as condensate overflow when the appropriate sensors are installed.

FEATURES AND SAFETIES

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

Power Random Start-Up

This feature prevents multiple units sharing same electrical circuit or network from starting at the same time. It assures that units sharing the same electrical circuit do not demand high inrush currents simultaneously when starting back up after a power failure.

If the controller has been completely powered down for more than 28 milliseconds, a random delay is initiated. If the controller is set to normal operation (test switch set to NO), then typically the unit will start within the time range of 270 to 300 seconds.

In order for the random sequence to initiate the unit power must be removed completely.

IMPORTANT: If the board is set to “TEST” mode through the “TEST” DIP switch, SW1 delay will be 10 seconds.

Anti-Short Cycle Delay

This feature protects the compressor short cycling if the Y call is set and removed. The anti-short cycle delay is 300 seconds on break during normal operation.

NOTE: If the board is set to test mode through the “TEST” DIP switch, the delay will be 5 seconds.

High and Low Pressure Protection

The UPM monitors the state of the high and low pressure switch inputs of each refrigerant circuit, HP1, LP1, HP2, and LP2. These switches must be closed for the controller to energize the compressor output (CC1 and CC2). The CC output will only be energized when the switches are closed and the anti-short cycle (and/or random start-up when applicable) has expired.

High Pressure Protection

If the HP1 or HP2 switches are open upon a Y1 or Y2 call, the UPM will not energize the respective CC1 or CC2 outputs; the corresponding compressor will remain off, the fault LED will flash 1 time for the HP1 and 3 times for HP2, and the alarm contact will remain off.

If a compressor is running in normal mode on a Y call (Y1 or Y2 or both) and the high pressure switch opens, the UPM will shut down the compressor output and will keep it off until the switch closes and the anti-short cycle has expired. The controller will keep track of the number of times the switch opens; if, within a 1-hour period, the switch opens the number of times set via the DIP switch, the controller will shut down the compressor and perform a hard lockout condition. Under this condition the alarm contact will be energized.

The UPM allows the user to configure the counts that the HP will be allowed to open within 1 hour before the UPM performs a hard lockout on the compressor. The user can select either two or four times by changing switch 4 on the DIP switch SW1 on the UPM board.

Low Pressure Protection

If the LP1 or LP2 switches are open upon a Y1 or Y2 call (Y1 or Y2 or both) the UPM will not energize the CC1 or CC2 outputs; the corresponding compressor will remain off, the fault LED will flash two times for the LP1 and 4 times for the LP2, and the alarm contact will remain off.

If the compressor is running in normal mode on a Y call (Y1 or Y2 or both) and the low pressure switch opens, the UPM will keep the compressor running for 2 minutes. If the condition remains after this period of time, the compressor will shut down and the UPM will start a soft lockout. The UPM will flash 2 times for the LP1 and 4 times for the LP2 and the alarm contact will remain off.

If the switches close, the UPM will start the compressor after the anti-short cycle has expired and UPM will energize the compressor output

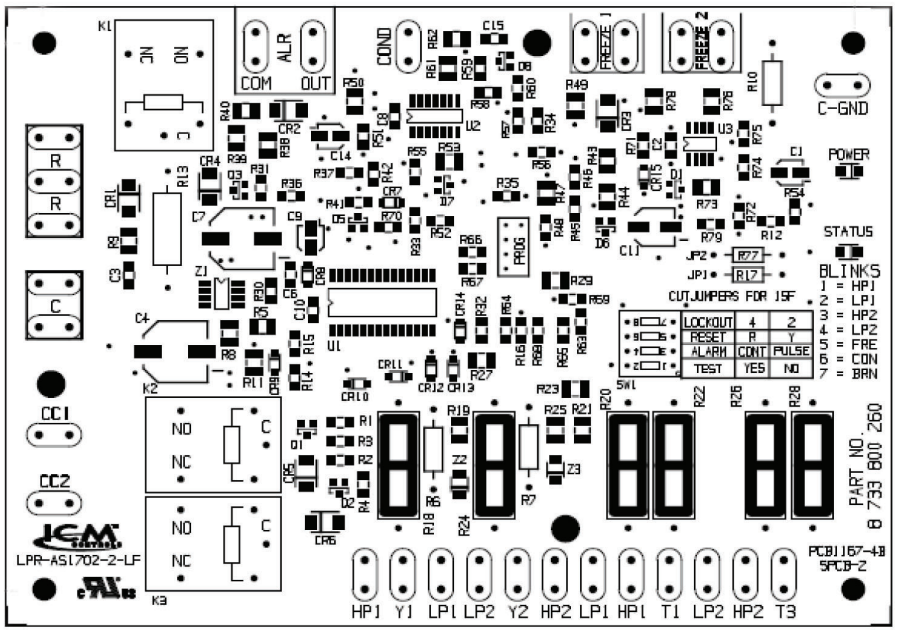


Fig. 32 — Two-Stage Unit Protection Module

IMPORTANT: To exit the hard lockout the controller must be reset from the Y or R terminal by removing the power from the selected terminal. The user can choose which will be the reset point via the DIP switch SW1.

Ground

The UPM controller takes its ground reference from the unit chassis which is connected to the controller via the C-GND spade terminal.

DIP Switch Settings

The DIP switch is used to configure most of the available features of the UPM as follows:

- Alarm mode, Constant or Pulse
- Reset mode, Y signal or R signal
- Lockout mode, 2 or 4 strikes
- Test mode, Normal or Test operation

The settings shown in Fig. 33 are factory default. The unit wiring diagram is the ultimate guide for factory DIP switch default settings.

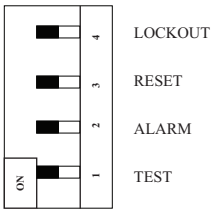


Fig. 33 — Dip Switch Settings

The following table is available on the UPM board as well and it depicts the switch position and its associated functionality (Table 20).

Table 20 — UPM Dip Switch Configuration

4	LOCKOUT	4	2
3	RESET	R	Y
2	ALARM	CONT	PULSE
1	TEST	YES	NO

Selectable Alarm Mode

The UPM controller can be configured to have either a constant signal or a pulse.

If constant (CONT) is selected the UPM will provide a closed contact until the alarm is cleared.

If pulsed (PULSE) is selected the UPM will sequence the alarm contact with the fault LED flashes.

Freeze Protection

The default setting for the freeze limit trip is 30°F; this can be changed to 15°F by cutting the R17 for Compressor 1 and R77 for Compressor 2 resistor located on top of the DIP switch SW1. The UPM controller will constantly monitor the refrigerant temperature with the sensor mounted close to the condensing water coil between the thermal expansion valve and water coil as shown in Fig. 34.

If temperature drops below or remains at the freeze limit trip for 30 seconds, the controller will shut the compressor down and enter into a soft lockout condition. Both the status LED and the Alarm contact will be active. The LED will flash 5 times the code associated with this alarm condition.

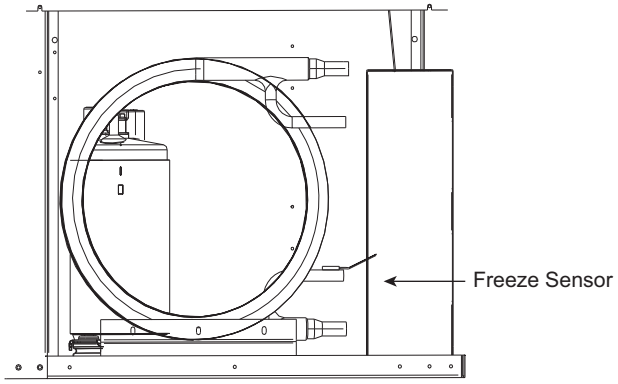


Fig. 34 — Freeze Sensor Location

Brownout Protection

The UPM controller will constantly monitor the power supply. If the nominal voltage drops below 25% of its value (18 VAC approximately), the unit will enter brownout protection mode. The compressor CC outputs will be de-energized and the unit will enter the soft lockout mode. The controller will **not** monitor the power supply during the first **500 milliseconds** of compressor start-up to avoid noise and false alarms. Once the UPM detects a brownout condition, its fault LED will flash 7 times as error code indication.

Condensation Overflow

The UPM controller continuously monitors the drain pan for high condensate water level. To do so it utilizes a sensor which, when condensate sensor option is present, identifies an alarm condition when the sensor's impedance drops below 230,000 ± 15%. Once the UPM senses this resistance value, it enters into a hard lockout and reports the corresponding code via its status LED (6 flashes). To exit the hard lockout, water has to return to its normal level and UPM has to be reset by removing the power from the Y terminal (R if set on the DIP switch). The compressors will be turned on after anti-short cycle expires.

Sequence of Operation, CV Units — 50BVT,V

The following sequence of operation applies to constant volume units.

Cooling is initiated when the set point in the remote thermostat is not met (space temperature is higher than set point). The unit sequence of operation is as follows:

Contact closure at the 'G' terminal will provide power to the supply fan contactor energizing the supply fan. The supply fan will be off during unoccupied schedule, depending upon the features of the thermostat used.

The 'O' terminal energizes the reversing valve (heat pump units only). Typically 'Y1' will also be energized at this time for cooling operation. The second stage of cooling 'Y2' will be initialized after a minimum run time and there is a differential from set point plus a deadband or a proportional plus integral calculation based upon demand and length of time space temperature is greater than set point.

Additional assurance is provided by a delay on make timer in the second-stage compressor contactor circuit to avoid dual compressor in-rush starting current.

Heating mode (heat pump models only) follows the same sequence as above except that the reversing valve is not energized.

The UPM sequence of operation illustrated in Fig. 35 applies for both refrigerant circuits. The second compressor is energized 10 seconds after the first if both Y1 and Y2 signals are applied simultaneously.

WATER ECONOMIZER COOLING

The unit diverts condenser inlet waterflow through an optional economizer coil to pre-cool evaporator entering airflow. If the entering water temperature is colder than the setting on the Aquastat and the return-air temperature is warmer than the setting on the return air thermostat, the two-position diverting valve will direct water to the economizer coil.

Economizer water flow is in series with the condensers allowing compressor operation while the economizer is operating.

Y CALL (COOLING OR HEATING)

The UPM will energize the compressor's output (CC) in an event of a "Y" Call from a thermostat or controller (after the random start-up and/or the anti-short cycle delays have elapsed). The Y input terminal must be energized with a 24 VAC signal.

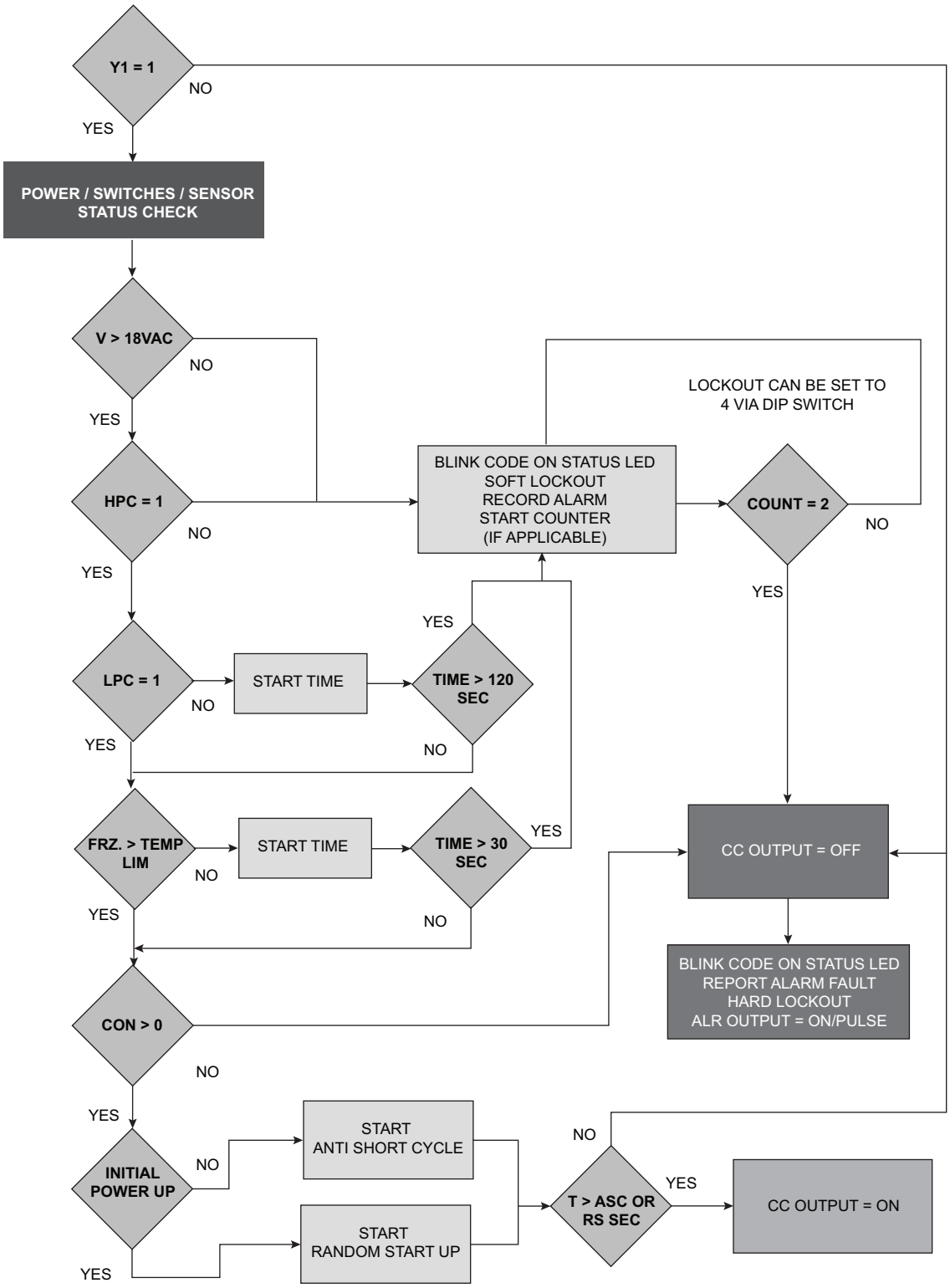


Fig. 35 — UPM Sequence of Operation (SOO) Flow Chart

I/O Flex 6126 Controller Specifications

POWER

24 vac ± 10%, 50 to 60 Hz, 20 va power consumption (26 va with BACview tool attached):

26 Vdc (25 V min, 30 V max)

Single Class II 100 va or less

PHYSICAL

Rugged aluminum housing, removable screw terminals with custom silk-screening available.

ENVIRONMENTAL OPERATING RANGE

–20 to 140°F (–29 to 60°C), 10 to 95% relative humidity, non-condensing.

DIGITAL OUTPUTS

6 binary outputs relay contacts rated at 5A max at 250 VAC. Configured normally open or normally closed.

ANALOG OUTPUTS

6 analog outputs, 1 and 2 are configurable for 0 to 10V or 0 to 20mA; 3 through 6 are 0 to 10V only.

UNIVERSAL INPUTS

12 universal inputs are used to monitor input from various sensors. These universal inputs can be set for one of three different sensor input types:

1. Voltage (0 to 10 V),
2. Temperature (resistance temperature detector or thermistor) or discrete contact, or
3. Current (0 to 20 mA).

Inputs 1 and 2 may be used for pulse counting.

STANDARD COMMUNICATION PORTS

Comm Port:

P1: Communication with the ARC156 networks

P2a: Configurable for EIA-232 or EIA-485 (2 wire or 4 wire). Network protocol selectable for BACnet (MS/TP or PTP), Modbus, N2, LonWorks SLTA, or modem.

P2b: Configurable for LonWorks plug-in or Ethernet.

RNET PORT

Supports up to four RS Standard sensors and one RS Plus, RS Pro for averaging or high/low select control. The sensors can share the Rnet port with BACview.

LOCAL ACCESS PORT

For local communication with a laptop computer running virtual BACview.

XNET PORT

For communication with the I/O Flex EX8160 expander.

BACNET[1] SUPPORT

Conforms to the Advanced Application Controller (B-AAC) Standard Device Profile as defined in ANSI/ASHRAE Standard 135-2004 (BACnet) Annex L.

STATUS INDICATION

Visual (LED) status of network communication, running, errors, power, transmit/receive for Port 1 and Port 2a and for each of the 12 outputs.

BATTERY

10-year Lithium 3 v coin cell battery, CR2032, provides a minimum of 10,000 hours of data retention during power outages.

PROTECTION

Incoming power and network connections are protected by non-replaceable internal solid-state polyswitches that reset themselves when the condition that causes a fault returns to normal. The power, network, input, and output connections are also protected against voltage transient and surge events.

LISTED BY

UL-916 (PAZX), CUL-916 (PAZX7), FCC Part 15-Subpart B-Class A, CE EN50082-1997.

WEIGHT

1lb, 3 oz (0.5 kg).

OVERALL DIMENSIONS

5 in. (width) by 11-3/4 in. (height) by 2 in. (recommended panel depth). 127 mm (width) by 299 mm (height) by 51 mm (recommended panel depth).

MOUNTING HOLE DIMENSIONS

Four mounting holes, two above and below.

Width: 4 in. (102 mm)

Height: 1-3/8 in. (289 mm)

Addressing the I/O Flex 6126 Controller

The I/O Flex 6126 controller's two rotary switches determine the I/O Flex 6126 controller's MAC address when it is placed on a BACnet/ARC 156 or BACnet MS/TP network. The rotary switches define the MAC address portion of the device's BACnet address, which is composed of the network address and the MAC address. They also set the slave address on a Modbus or N2 network, when less than 100.

If the I/O Flex 6126 controller has been wired for power, when changing its address in the field the power switch must be cycled or the screw terminal connector from its power terminals labeled Gnd and Hot. The controller reads the address each time power is applied to it.

Using the rotary switches; set the controller's address. Set the Tens (10's) switch to the tens digit of the address, and set the Ones (1's) switch to the ones digit. See Fig. 36.

EXAMPLE: If the controller's address is 01, point the arrow on the Tens (10's) switch to 0 and the arrow on the Ones (1's) switch to 1.

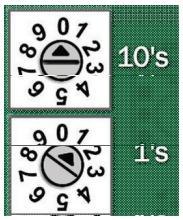


Fig. 36 — Address Rotary Switch

NOTE: The I/O Flex 6126 controller recognizes its address only after power has been cycled.

BACnet Protocol Selection

50BV VAV controllers are capable of both BACnet ARCnet and MS/TP. The factory default is ARCnet. To change to MS/TP, using the Virtual BACview interface, press FN + 0 to go to the network screen. Change the "+' symbol from ARCnet to MS/TP, using the arrow keys and soft keys to make the change.

1.BACnet is a registered trademark of ASHRAE.

Wiring Inputs and Outputs

Refer to Table 24 for wiring inputs and outputs.

Table 21 — Input Wiring Specifications

INPUT	MAXIMUM LENGTH	MINIMUM GAUGE	SHIELDING
0-5 VDC **0-10 VDC**	1000 ft (305 m)	26 AWG	Shielded
0-20 mA	3000 ft (914 m)	26 AWG	Shielded or Unshielded
Thermistor **Dry contact** **Pulse counter**	1000 ft (305 m)	22 AWG	Shielded
RTD	100 ft (30 m)	22 AWG	Shielded
ZS sensor **BACview** **Equipment Touch**	500 ft (152 m)	18 AWG, 4 conductor if BACview is connected to the Rnet 22 AWG, 4 conductor if only RS room sensors are connected to the Rnet	Shielded or Unshielded

LEGEND

AWG — American Wire Gauge
RTD — Resistance Temperature Detector

Input – I/O Flex 6126 Controller

The I/O Flex 6126 controller has 12 inputs that accept the signal types described below. See Table 22.

Table 22 — I/O Flex 6126 Controller Inputs

INPUT	SIGNAL TYPE SUPPORTED	DESCRIPTION
All	Thermistor RTD 0 – 10 Vdc 4–20 mA	Type 2 (10 K ohm at 77° F). Input voltages should be from 0.489 VDC to 3.825 VDC for thermistors.
All	Dry contact	A 5 VDC wetting voltage detects contact position, resulting in a 0.5 mA maximum sense current when the contacts are closed.
UI-1, UI-2	0–20 mA Pulse input	The input impedance of the I/O Flex 6126 controller is approximately 1 Mohm.

BINARY OUTPUTS

The I/O Flex 6126 controller has 6 binary outputs that can be connected to a maximum of 24 VAC/VDC inputs. Each output is a dry contact rated at 1A, 24 V maximum and is normally open. To size output wiring, consider the following when field installing accessories:

- Total loop distance from the power supply to the controller, and then to the controlled device

NOTE: Include the total distance of actual wire. For 2-conductor wires, this is twice the cable length.

- Acceptable voltage drop in the wire from the controller to the controlled device
- Resistance (ohms) of the chosen wire gauge
- Maximum current (amps) the controlled device requires to operate

ANALOG OUTPUTS

The I/O Flex 6126 controller has 6 analog outputs that support voltage or current devices. The controlled device must share the same ground as the controller and have the following input impedance:

0 to 10 VDC min 500 ohms

0 to 20 mA min 800 ohms

See Table 24 for a detailed list of standard inputs and outputs.

TO WIRE FIELD ACCESSORIES ON THE I/O FLEX 6126 CONTROLLER OR I/O FLEX EX8160 EXPANDER

1. Turn off power to the I/O Flex 6126 controller.
2. Connect the input or output wiring to the screw terminals on the controller:
   a. Connect the shield wire to the GND terminal with the ground wire.
   b. For a loop-powered 4 to 20 mA sensor, wire the sensor's positive terminal to the + terminal on the I/O Flex 6126 controller's Aux Power Out Port. Wire the sensor's negative terminal to an input's + terminal.
3. Set the appropriate jumpers on the I/O Flex 6126 controller. See Table 23.

Table 23 — I/O Flex 6126 Controller Jumper Settings

USE	TYPE	DESCRIPTION
Any Input	Thermistor Dry Contact 0-5 Vdc 0 – 10 Vdc 0–20 mA RTD	Set each input's Universal Input Mode Select jumper to the type of signal the input will receive
Aux Power Out Port	Loop-powered 4–20 mA	Set the Select jumper to +5V or +24V as required by the sensor.

4. Connect the binary output wiring to the screw terminals on the I/O Flex 6126 controller and to the controlled device (Fig. 37).

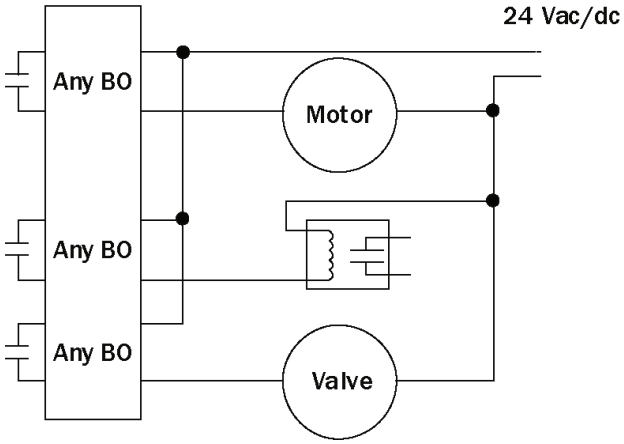


Fig. 37 — Binary Output Diagram

5. Connect the analog output wiring to the screw terminals on the I/O Flex 6126 controller and to the controlled device (Fig. 38).
6. Set the AO Mode Select jumper to the type of device the output is being wired to.
7. Turn on the I/O Flex 6126 controller's power (Fig. 39).

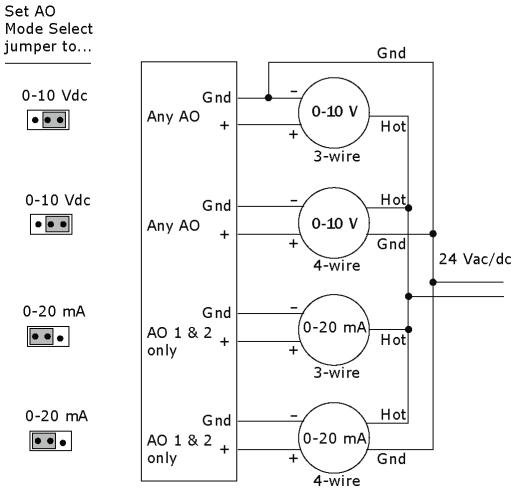


Fig. 38 — Analog Output Diagram

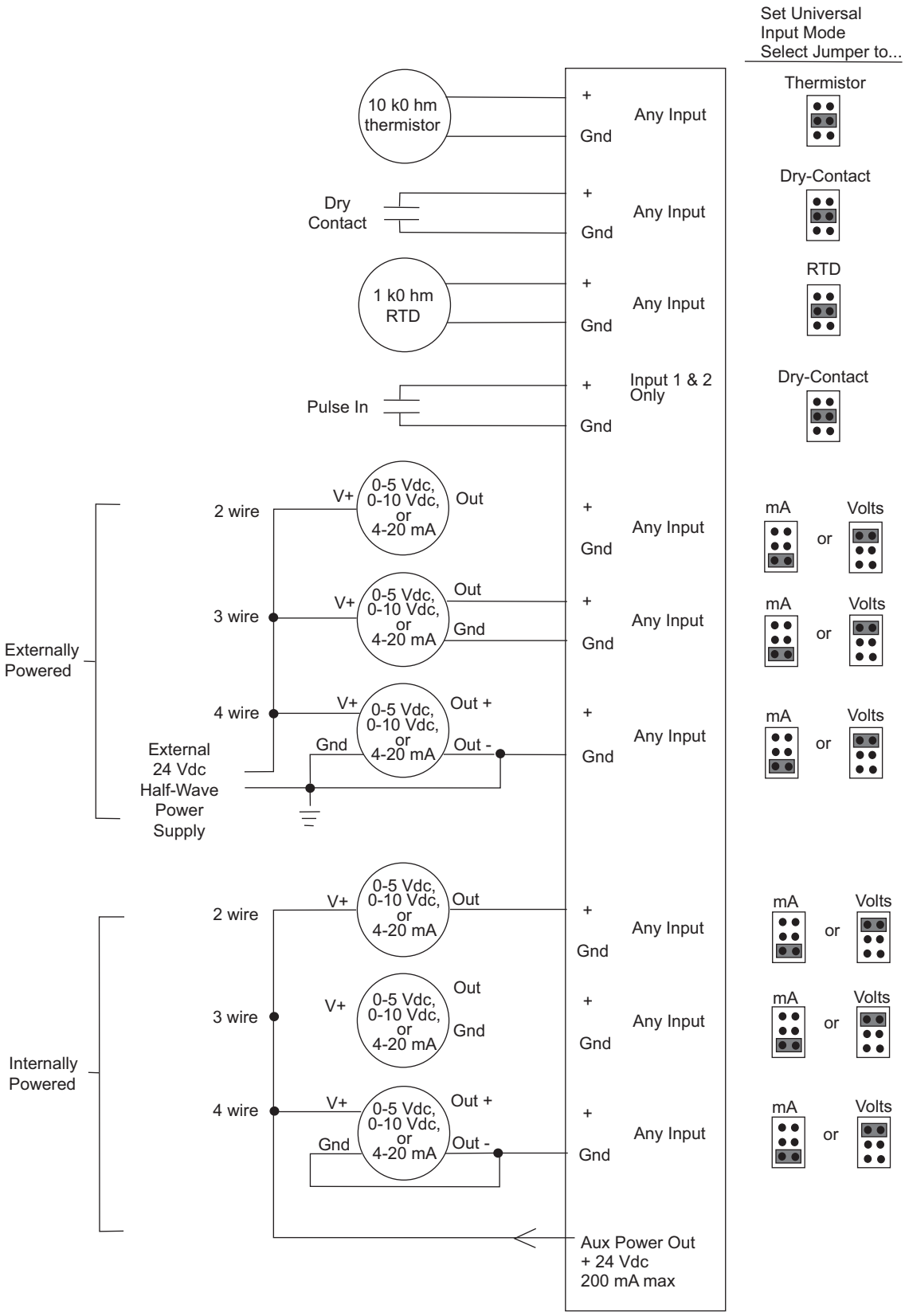


Fig. 39 — I/O Flex 6126 Controller Input Modes and Diagram

Table 24 — 50BVJ,W Standard I/O Table[a]

INPUT TYPE	TYPICAL DEVICE	TYPE OF I/O	CONNECTION PIN NUMBERS	I/O TYPE CONFIG
I/OFLEX 6126 CONTROLLER				
INPUTS				
OCCUPANCY OVERRIDE [b]	Dry Contact (N.O)	UI (0-10 V, RTD Therm/Dry, 0-20 mA)	UI-12 - 19 and 20	DI
DUCT STATIC PRESSURE SENSOR	0 -5 VDC	UI (0-10 V, RTD Therm/Dry, 0-20 mA)	UI-11 -17 and 18	AI
COMPRESSOR STATUS (COMPRESSOR 4)	IEM 2	UI (0-10 V, RTD Therm/Dry, 0-20 mA)	UI-10 - 16 and 17	DI
COMPRESSOR STATUS (COMPRESSORS 1-3)	IEM 1	UI (0-10 V, RTD Therm/Dry, 0-20 mA)	UI-09 - 14 and 15	DI
RETURN AIR SENSORS	10K Type II	UI (0-10 V, RTD Therm/Dry, 0-20 mA)	UI-08 - 13 and 14	AI
ENTERING WATER TEMPERATURE (REQUIRED FOR ECONOMIZER)	10K Type II	UI (0-10 V, RTD Therm/Dry, 0-20 mA)	UI-07 - 11 and 12	AI
SUPPLY AIR TEMPERATURE SENSOR	10K Type II	UI (0-10 V, RTD Therm/Dry, 0-20 mA)	UI-06 - 10 and 11	AI
RELATIVE HUMIDITY SENSOR[bc]	0-5 VDC	UI (0-10 V, RTD Therm/Dry, 0-20 mA)	UI-05 - 8 and 9	AI
CO_2 SENSOR (REQUIRED FOR DEMAND CONTROL	0-5 VDC	UI (0-10 V, RTD Therm/Dry, 0-20 mA)	UI-04 - 7 and 8	AI
LEAVING WATER TEMPERATURE SENSOR (STANDARD)	10K Type II	UI (0-10 V, RTD Therm/Dry, 0-20 mA)	UI-03 - 5 and 6	AI
UPM II - COMPRESSORS 2 and 4		UI Pulse Counting (0-20 mA)	UI-02 - 2 and 4	DI - pulse
UPM II - COMPRESSORS 1 and 3		UI Pulse Counting (0-20 mA)	UI-01 - 2 and 3	DI - pulse
OUTPUTS				
OPEN		AO (0-10 V)	AO-6 - 11 and 12	AO
OPEN		AO (0-10 V)	AO-5 - 9 and 10	AO
RETURN FAN SPEED (VFD DRIVE TERMINAL STRIP)[b]	ABB ACH550-UH	AO (0-10 V)	AO-4 - 7 and 8	AO
OPEN		AO (0-10 V)	AO-3 - 5 and 6	AO
MODULATING HOT GAS RE-HEAT VALVES		AO (4-20mA/0-10 V)	AO-2 - 3 and 4	AO
FAN SPEED - (VFD DRIVE TERMINAL STRIP AI-1)	ABB ACH550-UH	AO (4-20mA/0-10 V)	AO-1 - 1 and 2	AO
COMPRESSOR STAGE 4 COMMAND (Y4)		BO (Relay 5A at 250Vac)	BO-6 - 16-18	BO
COMPRESSOR STAGE 3 COMMAND (Y3)		BO (Relay 5A at 250Vac)	BO-5 - 13-15	BO
COMPRESSOR STAGE 2 COMMAND (Y2)		BO (Relay 5A at 250Vac)	BO-4 - 10-12	BO
COMPRESSOR STAGE 1 COMMAND (Y1)		BO (Relay 5A at 250Vac)	BO-3 - 7-9	BO
OPEN		BO (Relay 5A at 250Vac)	BO-2 - 4-6	BO
SUPPLY FAN ENABLE SIGNAL (VFD DRIVE TERMINAL STRIP)	ABB ACH550-UH	BO (Relay 5A at 250Vac)	BO-1 - 1-3	BO
XNET REMOTE EXPANSION	I/O Flex EX8160 expander	I/O Expansion Board	Xnet	Comm-Port
I/O FLEX EX8160 EXPANDER				
INPUTS				
OPEN		UI (0-5 V, Therm Dry)	IN-16 - 15 and 16	UI
OPEN		UI (0-5 V, Therm Dry)	IN-15 - 13 and 14	UI
OPEN		UI (0-5 V, Therm Dry)	IN-14 - 11 and 12	UI
OPEN		UI (0-5 V, Therm Dry)	IN-13 - 9 and 10	UI
OPEN		UI (0-5 V, Therm Dry)	IN-16 - 15 and 16	UI
CONDENSER WATER VALVE END SWITCH (OPTIONAL)		UI (0-5 V, Therm Dry)	IN-11 - 5 and 6	UI
RETURN STATIC SENSOR	0 -5 VDC	UI (0-5 V, Therm Dry)	IN-10 - 3 and 4	AI
OPEN		UI (0-5 V, Therm Dry)	IN-9 - 1 and 2	DI
SUPPLY DUCT HIGH STATIC[b]		BI (Dry contact)	IN-8 - 15 and 16	DI
SUPPLY FAN THERMAL OVERLOAD[b]		BI (Dry contact)	IN-7 - 13 and 14	DI
WATER FLOW PROVING SWITCH		BI (Dry contact)	IN-6 - 11 and 12	DI
RETURN FAN THERMAL OVERLOAD (OPTIONAL)[b]		BI (Dry contact)	IN-5 - 9 and 10	DI
FILTER INPUT[b]		BI (Dry contact)	IN-4 - 7 and 8	DI
RETURN PLENUM HIGH STATIC[b]		BI (Dry contact)	IN-3 - 5 and 6	DI
RETURN FAN STATUS SWITCH[b]		BI (Dry contact)	IN-2 - 3 and 4	DI
SMOKE DETECTOR INPUT[b]		BI (Dry contact)	IN-1 - 1 and 2	DI
OUTPUTS				
OPEN		BO (Dry contact)	BO-8 - 15 and 16	DO
OPEN		BO (Dry contact)	BO-7 - 13 and 14	DO
OPEN		BO (Dry contact)	BO-6 - 11 and 12	DO
OPEN		BO (Dry contact)	BO-5 - 9 and 10	DO
RETURN FAN ENABLE[b]		BO (Dry contact)	BO-4 - 7 and 8	ZDO
DAMPER COMMAND START/STOP[b]		BO (Dry contact)	BO-3 - 5 and 6	DO
ECONOMIZER VALVE COMMAND		BO (Dry contact)	BO-2 - 3 and 4	DO
CONDENSER WATER VALVE COMMAND (START/STOP)		BO (Dry contact)	BO-1 - 1 and 2	DO

NOTE(S):

a. Transformer's common terminals are tied together.
b. Inputs and outputs are optional. Sensors not provided. 50BV units do not contain a return fan; return fan control is available for return fan separate from 50BV unit.
c. Read-only points. No effect on Sequence of Operation.

LEGEND

AI — Analog Input
AO — Analog Output
BI — Digital Input
BO — Digital Output
UI — Universal Input

I/O Flex EX8160 Expander Module

GENERAL DESCRIPTION

The I/O Flex EX8160 expander expands the input/output capability of the I/O Flex 6126 controller. The I/O Flex 6126 controller supports one I/O Flex EX8160 expander.

The I/O Flex EX8160 expander is mounted onto the I/O Flex 6126 controller enclosure.

The expander may also be mounted separately within the mounting enclosure. Screw the I/O Flex EX8160 expander into an enclosed panel using the mounting holes provided on the cover plate. Be sure to leave about 2 inches (5 centimeters) on each side for wiring. Connect the I/O Flex EX8160 expander to the I/O Flex 6126 controller before applying power to either one. See Fig. 40.

Connecting I/O Flex EX8160 Expander and I/O Flex 6126 Controller

1. Turn off the power to both the I/O Flex EX8160 expander and the I/O Flex 6126 controller.
2. Wire the screw terminals connecting each devices' XNET Remote Expansion connector.
3. Turn on the power to both the I/O Flex EX8160 expander and the I/O Flex 6126 controller.

VAV Control Parameters, Status, and Alarms

Control

- Integral occupancy schedule
- External occupancy control: Manual ON, BAS command, or DI Enable
- Supply Fan and VFD control
- Compressor 1 control
- Compressor 2 control
- Compressor 3 control
- Compressor 4 control
- Unit Enable manual control (optional)
- Modulating HGRH control
- Condenser water valve control
- Waterside Economizer control
- Outdoor Air Damper (OAD) control (enable)
- Return Fan control (enable)

Status

- Cooling control status
- Cooling demand percentage (0 to 100%)
- Supply air temperature
- Return air temperature
- Leaving water temperature
- Entering water temperature
- Fan-Hours runtime counter (filter replacement indicator)
- Fan starts counter
- Compressor 1 starts counter
- Compressor 2 starts counter
- Compressor 3 starts counter
- Compressor 4 starts counter

Alarms

- Leaving water temperature high/low trip
- Discharge air temperature high/low trip
- Entering water temperature high/low trip
- Sensor failure alarm
- Unit filter runtime trip (optional)
- Comp 1 runtime trip
- Comp 2 runtime trip
- Comp 3 runtime trip
- Comp 4 runtime trip
- Freeze stat sensor UPM alarm (optional)
- Low pressure sensor UPM alarm
- High pressure sensor UPM alarm
- Low pressure sensor UPM alarm
- High pressure sensor UPM alarm
- Condensate overflow UPM alarm
- High/low voltage UPM alarm

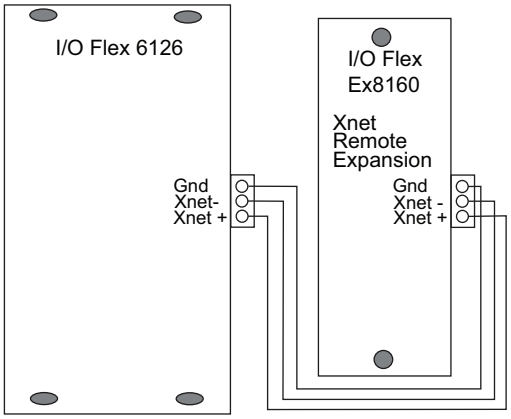


Fig. 40 — Flex and Expansion XNET Connection

Sequence of Operation, VAV Units Only 50BVJ,W

See the integration points list on page 89 for specific points and values.

CONTROL SOURCE (RUN CONDITIONS)

The unit may have external or internal control sources to initiate heating or cooling operation.

EXTERNAL CONTROL SOURCE

The unit may be controlled from the following external sources:

- Digital input
- BAS – Building Automation System
- Manual on

DIGITAL INPUT

Provides a method of running the unit by providing a contact closure (On/Off) to UI-12. Digital input provides a simple interface for enabling unit operation. Once enabled, the unit will run until the occupied set point has been satisfied.

BAS

Provides a network interface to the heat pump. The I/O Flex 6126 controller supports the following building automation protocols (see Table 25):

Table 25 — Communication Protocol

BACnet	Building Automation and Control network
Modbus	Common open industrial protocol standard
LonWorks	LonWorks Automation and control network (Card required)

MANUAL ON

Places the unit in manual run mode; the unit will operate until the set point is satisfied.

INTERNAL CONTROL SOURCE (KEYPAD)

All controllers are provided with a battery backup real time clock. When configured for Keypad, the internal scheduler uses the local time and user schedule to initiate unit operation. Occupied Schedule: 56°F supply air set point (adjustable).

Unit Mode

50BV VAV units are configured with DX cooling and modulating HGRH. The selected unit mode in the 50BV controller should be Discharge Air control. Other modes are not applicable and can cause operational issues.

Fan Modes

The Fan mode option is used to select the type of fan hardware being used with the unit. Fan hardware is application specific and will determine the behavior for the specific application for which it is being applied.

The Fan option may be configured with one of the following operations:

- Supply Air Fan (SAF) Start/Stop (also known as On/Off signaling)
- Variable Frequency Drive (or Variable Fan used in VAV applications)
- Return Fan interlock with Supply Fan (If SAF runs RAF runs)

START/STOP FANS

The fan enable signal is provided on BO-1 of the I/O Flex 6126 controller; operation is interlocked with cooling and re-heat operations. The return air fan can be enabled via the BACview tool, and it will be commanded 5 seconds after the supply fan has been engaged at all times.

The supply fan can also be set to stop if the return fan is in alarm via the BACview tool.

VARIABLE FREQUENCY DRIVE (VFD) FAN

The VFD uses an analog signal (0 to 10V) to control the speed of the blower. This signal is output from Analog Output 1 (AO-1) of the I/O Flex 6126 controller.

The supply and return air fan speeds are modulated by independent PID loops to maintain independent static pressure set points; the factory-provided duct static pressure sensor is required as input (connected to UI 11 for supply and IN-10 for return) on the I/O Flex 6126 controller and the I/O Flex EX8160 expander, for the VFD blower option. Units do not allow for mounting of the Return Fan VFD inside the equipment and require the VFD equipment to be mounted close to the unit. An inside wall in the mechanical room close to the unit is typically used for mounting an external VFD. See Table 26-29 for VFD factory default settings.

SUPPLY AND RETURN FAN OPERATION

When the unit control is set for occupied operation the fan will run continuously as the default behavior. If the return fan is enabled, it will follow the operation of the supply fan mode which may be modified to cycle only during mechanical operation. During unoccupied operation the fan will only cycle during a call to maintain a cooling set point.

FAN OPERATION DURING DISCHARGE (SUPPLY AIR TEMPERATURE) AIR CONTROL (DAC)

For DAC applications, the fan's speed is calculated as a demand percent calculated based on the PID static pressure sensor value and the static pressure set point.

If static pressure reset strategies are utilized the minimum fan speed recommended is 40% of nominal CFM. If the fan demand is less than 40% of nominal CFM (20% for the return fan) the PID loop will be disregarded and the fan will run at the minimum value.

Units configured for discharge air control will run only when the controller is in occupancy mode.

VFD CONTROL

The following applies for VFD Control:

- Variable frequency drive fan control requires a static pressure measurement. A duct static pressure sensor is factory supplied to be installed in the field.
- The static pressure sensor uses inches of water column as the unit of measure.
- The static pressure sensor is configured for UI-11 port of the I/O Flex 6126 controller for the supply duct and IN-10 for the return air duct.
- The static pressure set point is user configurable and is used by the static pressure PID control.
- The minimum VFD fan speed is user configurable and is set during the test and balance phase of the commissioning phase.
- A high static pressure alarm will be generated for a static pressure exceeding the maximum static pressure trip point for a minimum of 10 minutes.
- The static pressure sensor will be range-validated and a sensor failure alarm will be generated for a missing sensor.
- The VFD output may be switched to a constant value for a smoke event if enabled.

FAN OPERATION DURING SMOKE EVENT

The speed of the fan during a smoke event is user configurable for VFD enabled units (defaults to 100%).

FAN HISTORY STATISTICS

The controller will collect fan history statistics and sum the total number of fan start events that occurred in the preceding 1-hour period. The fan history may be reset by the user. Fan history reset may be performed locally at the unit with a BACview terminal.

Digital Inputs for Monitoring

The controller software may be configured to provide digital inputs for monitoring unit faults and alarms. The equipment integrator must configure the input for the appropriate installed option and desired function. The functional options may be configured via a local terminal or building automation system.

FILTER STATUS (DFS)

The I/O Flex 6126 controller has the option of providing a filter alarm for indicating that the filter needs servicing. The filter-status service option may be implemented with hardware or with fan run time. The filter switch hardware is connected directly to IN-4 on the I/O Flex EX8160 expander with a contact closure indicating a service event.

The following applies to the filter status:

- The filter status (replacement) may be configured for accumulated running time.
- The total fan run time prior to filter service is user configurable, factory default 2000 hrs.
- The filter timer may be reset upon the filter being serviced.

WATER DIFFERENTIAL PRESSURE SWITCH (DPS)

The differential pressure switch is applied to a unit for which the flow of water through the heat exchange must be confirmed prior to the unit operating. The differential pressure switch hardware is connected directly to IN-6.

In addition, the following applies to the DPS option:

- An alarm notification is set if the DPS is asserted True (no flow condition).
- A DPS alarm will terminate compressor operation.
- Three DPS events will hard lockout the unit.
- The DPS hard lockout condition which will keep the unit off can be cleared by a reset via the BACview tool.
- A sum of all DPS events will be logged for a 1-hour period.

SMOKE DETECTOR STATUS (SDS)

The unit may be set up to receive a smoke event via a contact closure. The smoke detector input is available for field wiring on IN-1 of the I/O Flex EX8160 expander.

The response to a smoke event must be determined by safety regulations and jurisdiction of the local governing body. The smoke detector response must be enabled and set up upon system start-up. The default behavior for a smoke event will terminate the operation of the unit (fan and compressor).

The unit may be configured for operation during a smoke event for specific safety applications. Variable Frequency Drive configured units can be configured for a specific fan speed during a smoke event.

A smoke detector contact closure on IN-1 will produce a Smoke Alert.

COMPRESSOR STATUS

The unit is equipped with compressor status current transducers and Input Expansion Modules (IEM) and will verify that the compressor stages are running by monitoring the status of the current switches. If the compressor fails (no current flow) an individual alarm per compressor stage will occur.

The controller will identify the compressor operating in the following three modes:

- Auto (no alarm)
- Hand mode
- Failed

Cooling Operation

The controller will maintain the supply air temperature and set point by staging the compressor(s). To prevent short-cycling, there is a 10-minute delay between compressor stages. Additionally, there will be a 3-minute delay (adjustable) to prove water flow prior to Compressor 1 operation when the unit is first powered on. The compressor will run subject to internal safeties and controls provided by the UPM board.

Table 26 — VFD Factory Default Settings

ABB 550 Drive Factory Configuration VFD 1			
GROUP NUMBER	**PARAMETER NUMBER**	**DESCRIPTION**	**VALUE**
99	9902	Application Macro	HVAC Default
	9904	Motor control Mode	Scalar
	9905	Motor Nominal Voltage	
	9906	Motor Nominal Current	
	9907	Motor Nominal Frequency	
	9908	Motor Nominal Speed	
	9909	Motor Nominal Power	
10	1001	EXT1 Commands	DI1 - Start/Stop
	1002	EXT2 Commands	N/A
	1003	Direction	Forward
11	1103	REF1 Select	AI-1
	1104	REF1 Minimum	0 Hz at 60 Hz/ 0 Hz at 50 Hz
	1105	REF 1 Maximum	60 Hz at 60 Hz / 50 Hz at 50 Hz
12	1201	Constant Speed Select	NOT SEL
	1202	Constant Speed Value (Field Programmable)	6 Hz - Motor Nominal Frequency
13	1301	Minimum AI-1	0%
	1302	Maximum AI-1	100%
	1303	Filter AI-1	1 Sec
	1304	Minimum AI-2	0%
	1305	Maximum AI-2	100%
	1306	Filter AI-2	1 Sec
14	1401	Relay Output 1	Ready
	1402	Relay Output 2	Run
	1403	Relay Output 3	Fault (Inverted)
15	1507	AO2 Content	AI-1 (Used to control VFD2 Reference)
	1508	AO2 Content Min	0%
	1509	AO2 Content Max	100%
	1510	Minimum AO2	0.0mA
	1511	Maximum AO2	20.0mA
	1512	Filter AO2	1 Sec
16	1601	Run Enable	DI-1
	1608	Start Enable 1	DI-4
	1609	Start Enable 2	N/A
20	2002	Minimum Fan Speed	0
	2003	Maximum Current	30% higher that Motor (s) FLA
	2007	Minimum Frequency	0 Hz
	2008	Maximum Frequency	60 Hz / 50 Hz (Per motor frequency rating)
21	2101	Start Function	Fly Start
	2102	Stop Function	Coast
22	2202	Accelerate Time	30 Seconds
	2203	Decelerate Time	30 Seconds
26	2605	Volt/ Freq Ratio	Square
	2606	Switching Frequency	4Khz
	2607	Switching Frequency Control	ON

Table 27 — VFD Factory Default Settings (cont)

ABB 550 Drive Factory Configuration VFD 1			
GROUP NUMBER	**PARAMETER NUMBER**	**DESCRIPTION**	**VALUE**
30	3006	Motor Thermal Time	1050s
	3007	Motor Load Curve	100%
	3008	Zero Speed Load	70%
	3009	Break Point Frequency	35 Hz
	3010	Stall Function	NOT SEL
	3011	Stall Frequency	20 Hz
	3012	Stall Time	20 Sec
	3017	Earth Fault	Enabled
31	3101	Number of Retries	5
	3102	Trial Time	30Sec
	3103	Delay Time	6 Sec
	3104	AR Overcurrent	Enabled
	3105	AR Overvoltage	Enabled
	3106	AR Undervoltage	Enabled
	3107	AR AI<Minimum	Disabled
	3108	AR External Fault	(0) Disabled
34	3401	Signal Parameter 1	Output Freq
	3402	Signal 1 Minimum	0
	3403	Signal 1 Maximum	60 / 50 (Maximum motor operating Hertz)
	3404	Output 1 DPS Form	0
	3405	Output 1 DSP Unit	% SP
	3406	Output 1 Minimum	0
	3407	Output 1 Maximum	100
	3408	Signal Parameter 2	Current (Motor Current Measured by the Drive)
	3409	Signal 2 Minimum	0
	3410	Signal 2 Maximum	FLA + 15% A
	3411	Output 2 DPS Form	0
	3412	Output DSP Unit	A (2)
	3413	Output 2 Minimum	0
	3414	Output 2 Maximum	FLA + 15% A
	3415	Signal Parameter 3	AI-1
	3416	Signal 3 Minimum	0
	3417	Signal 3 Maximum	10
	3418	Output 3 DPS Form	0
	3419	Output DSP Unit	V (2)
	3420	Output 3 Minimum	0
	3421	Output 3 Maximum	10
40	4001	Gain	2.5
	4002	Integration Time	3Sec
	4005	Error Value Inver	NO
	4006	Units	%
	4007	Display Format	x.xxx
	4010	Set Point Select	Internal
	4012	Set Point Minimum	0V
	4013	Set Point Maximum	10V
	4027	PID1 Parameter Set	SET1

Table 28 — VFD Factory Default Settings (cont)

Drive Factory Configuration VFD 2			
GROUP NUMBER	**PARAMETER NUMBER**	**DESCRIPTION**	**VALUE**
99	9902	Application Macro	HVAC Default
	9904	Motor control Mode	Scalar
	9905	Motor Nominal Voltage	[a]
	9906	Motor Nominal Current	[a]
	9907	Motor Nominal Frequency	[a]
	9908	Motor Nominal Speed	[a]
	9909	Motor Nominal Power	[a]
10	1001	EXT1 Commands	DI1 - Start/Stop
	1002	EXT2 Commands	N/A
	1003	Direction	Forward
11	1103	REF1 Select	AI-1
	1104	REF1 Minimum	0Hz at 60Hz/ 0Hz at 50Hz
	1105	REF 1 Maximum	60 Hz at 60Hz / 50 Hz at 50Hz
12	1201	Constant Speed Select	NOT SEL
	1202	Constant Speed Value (Field Programmable)	6 Hz - Motor Nominal Frequency
13	1301	Minimum AI-1	0%
	1302	Maximum AI-1	100%
	1303	Filter AI-1	1 Sec
	1304	Minimum AI-2	0%
	1305	Maximum AI-2	100%
	1306	Filter AI-2	1 Sec
14	1401	Relay Output 1	Ready
	1402	Relay Output 2	Run
	1403	Relay Output 3	Fault (Inverted)
15	1507	AO2 Content	AI-1
	1508	AO2 Content Min	0%
	1509	AO2 Content Max	100%
	1510	Minimum AO2	0.0mA
	1511	Maximum AO2	20.0mA
	1512	Filter AO2	1 Sec
16	1601	Run Enable	DI-1
	1608	Start Enable 1	DI-4
	1609	Start Enable 2	N/A
20	2002	Minimum Fan Speed	0
	2003	Maximum Current	30% higher that Motor (s) FLA
	2007	Minimum Frequency	0Hz
	2008	Maximum Frequency	60Hz / 50Hz (Per motor frequency rating)
21	2101	Start Function	Fly Start
	2102	Stop Function	Coast
22	2202	Accelerate Time	30 Seconds
	2203	Decelerate Time	30 Seconds
26	2605	Volt/ Freq Ratio	Square
	2606	Switching Frequency	4Khz
	2607	Switching Frequency Control	ON

NOTE(S):

a. Refer to Motor name plate.

Table 29 — FD Factory Default Settings (cont)

Drive Factory Configuration VFD 2			
GROUP NUMBER	**PARAMETER NUMBER**	**DESCRIPTION**	**VALUE**
30	3006	Motor Thermal Time	1050s
	3007	Motor Load Curve	100%
	3008	Zero Speed Load	70%
	3009	Break Point Frequency	35 Hz
	3010	Stall Function	NOT SEL
	3011	Stall Frequency	20 Hz
	3012	Stall Time	20 Sec
	3017	Earth Fault	Enabled
31	3101	Number of Retries	5
	3102	Trial Time	30 Sec
	3103	Delay Time	6 Sec
	3104	AR Overcurrent	Enabled
	3105	AR Overvoltage	Enabled
	3106	AR Under voltage	Enabled
	3107	AR AI<Minimum	Disabled
	3108	AR External Fault	(0) Disabled
34	3401	Signal Parameter 1	Output Freq
	3402	Signal 1 Minimum	0
	3403	Signal 1 Maximum	60 / 50 (Maximum motor operating Hertz)
	3404	Output 1 DPS Form	0
	3405	Output 1 DSP Unit	% SP
	3406	Output 1 Minimum	0
	3407	Output 1 Maximum	100
	3408	Signal Parameter 2	Current (Motor Current Measured by the Drive)
	3409	Signal 2 Minimum	0
	3410	Signal 2 Maximum	FLA + 15% A
	3411	Output 2 DPS Form	0
	3412	Output DSP Unit	A (2)
	3413	Output 2 Minimum	0
	3414	Output 2 Maximum	FLA + 15% A
	3415	Signal Parameter 3	AI-1
	3416	Signal 3 Minimum	0
	3417	Signal 3 Maximum	20mA
	3418	Output 3 DPS Form	0
	3419	Output DSP Unit	mA(2)
	3420	Output 3 Minimum	0
	3421	Output 3 Maximum	20
40	4001	Gain	2.5
	4002	Integration Time	3 Sec
	4005	Error Value Inver	NO
	4006	Units	%
	4007	Display Format	x.xxx
	4010	Set Point Select	Internal
	4012	Set Point Minimum	0V
	4013	Set Point Maximum	10V
	4027	PID1 Parameter Set	SET1

For discharge air control applications the minimum on-times and off-times in Table 30 are applicable:

Table 30 — Discharge Air Control

COMPR 1		COMPR 2		COMPR 3		COMPR 4	
Min ON	Min OFF	Min ON	Min OFF	Min ON	Min OFF	Min ON	Min OFF
10	5	10	5	10	5	7	5

If for any reason the compressor alarms reset, the unit compressors will start within 10 seconds of each other.

COOLING

Cooling will be enabled whenever:

- Unit is in occupied mode
- The fan output is on
- The loop valve is open

COOLING MODE

When commanded into cooling mode, the unit will energize the condenser water valve and wait for its valve end switch to be made prior to energizing the compressors.

Once the valve has been proved open the unit will command the compressor to stage according to the cooling percentage required. This value is provided via a reverse acting PID loop which compares the supply air temperature (SAT) value and the SAT cooling set point (AV:66).

The unit monitors return air temperature to assure air entering the unit is greater than 60°F (adjustable) prior to running in the cooling with modulating hot gas reheat, when the controller is set to operate with multiple reset points. If the controller is set to operate with single return temperature reset the factory default value will be the free cooling value 50°F (adjustable).

If at any time the cooling set point is greater than the return air temperature (RAT) the unit will enter into economizer assist mode.

Compressors will be staged as follows:

Compressor 1 will run:

When the fan is running

AND the condenser valve is proved.

AND the cooling demand is greater than 25%

Compressor 2 will run:

When compressor one has run for 10 minutes

AND the cooling demand is greater than 50%

Compressor 3 will run:

When compressor two has run for 10 minutes

AND the cooling demand is greater than 75%

Compressor 4 will run:

When compressor 2 has run for 10 minutes

AND the cooling demand is greater than 90%

When the unit runs in cooling mode the hot gas re-heat valve will be enabled and modulated to maintain supply air temperature set point, factory default is 55°F (AV:93, adjustable) ± 4°F.

DISCHARGE AIR CONTROL WITH MODULATING REHEAT

When in cooling mode, if the unit is equipped with modulating hot gas re-heat, the hot gas re-heat will be enabled and modulated to maintain supply air temperature set point, factory default is 55°F (adjustable) ± 4°F.

The cooling stages can be reset based on a single point or multiple return air temperature (RAT) values as indicated in Table 31:

Table 31 — Cooling Stage Reset Values

POINT	VALUE
Single:	
Free Cooling	50°F < RAT
Mechanical Cooling	RAT > 50°F (enabled)
Multiple:	
Free Cooling	50°F <RAT < 59°F
Mechanical Cooling (Comp 1)	60°F <RAT < 69°F (adj.)
Mechanical Cooling (Comp 2)	70°F <RAT < 77°F (adj.)
Mechanical Cooling (Comp 3)	78°F <RAT < 83°F (adj.)
Mechanical Cooling (Comp 4)	RAT > 83°F (adj.)

All values have a hysteresis of 2.0°F.

If discharge air set point reset is required, when the value of the discharge air set point is greater than the value of the return air reset for a particular compressor, the return limit will have to be adjusted via the BACnet tool to compensate for the demand changes and release. The particular compressor stage or the unit must be set to a single reset point and the discharge set point reset can be adjusted as needed.

Any of the following alarms will immediately shut down all compressor stages. Refer to the sensor section or the integration points list for default values:

- Leaving water high
- Leaving water low
- Entering later low
- Fan alarms
- Low static pressure
- Water differential pressure switch (DPS)
- Smoke

DISCHARGE AIR TEMPERATURE (DAT) SENSOR

The DAT sensor is shipped loose in the electrical controls box compartment and is to be field installed in the supply duct work and terminated on UI-6 of the I/O Flex 6126 controller.

The sensor should be installed where the air flow pattern is laminar to avoid temperature stratification. If supplemental heating is to be installed then the DAT sensor should be mounted downstream of the discharge side of the heating coil.

HIGH DISCHARGE AIR TEMPERATURE CONDITION (COOLING)

DAT measurements are tested for a high limit trip above 70°F. An alarm is asserted for high discharge air temperature under the following conditions:

- DAT is above the high limit for 5 minutes
- Fan operation asserted
- Cooling mode
- Valid DAT sensor measurement

HIGH STATIC LOCK

The controller will monitor the static pressure high limit switch (if installed) and will increment a counter every time the static pressure switch trips. A High Static Alarm will be generated, and will reset automatically. Upon receiving the alarm 3 times, the unit will lock out to protect the ductwork and prevent cycling of major unit components.

If the lock state is reached in addition to the high static alarm, code 100 will be set and broadcast over the BACnet network via the Systems Status point (AV: 16).

Since the controller interprets this as an issue that needs technical assistance, the unit can only be reset from its HMI BACview tool.

WATERSIDE ECONOMIZER MODE

If the entering water temperature is less than the set point 55°F (adjustable) the unit will transition to economizer mode:

- Disable mechanical cooling stage 1 operation for minimum of 12 minutes.
- Enable economizer valve.
- Waterside economizer will operate until the entering water temperature reset value is reached; default is 58°F (adjustable).

When in economizer mode, if the entering water temperature reaches the reset value in less than 5 minutes, the first stage of mechanical cooling operation will be disabled for at least 5 minutes.

In economizer operation, if the unit requires additional stages of mechanical cooling, the controller will command them according to the unit demand percentage calculated by the Cooling PID. If additional stages of cooling were running those will be maintained.

The fan will continue to modulate to meet the static pressure set point, the economizer valve will be commanded to open, and the economizer will be treated as the first stage of cooling.

LEAVING WATER TEMPERATURE (LWT)

The controller will monitor the leaving water temperature. Alarms will be provided as follows:

- High Leaving Water Temp: If compressor(s) is running and the leaving water temperature is greater than 135°F (adjustable).
- Low Leaving Water Temp: If compressor(s) is running and the leaving water temperature is less than 33°F (adjustable).
- Leaving Water Sensor Failure: If leaving water sensor outside of normal operating limits. Should a High or Low Leaving Water Temperature Alarm occur, the call for cooling will be removed.

UPM Fault Monitor

The controller will monitor both Unit Protection Modules (UPM1 and UPM2) fault inputs.

Upon hard lockout alarm, compressors are disabled by the UPM board.

Alarms will be provided through BACnet point current alarm (AV:17) as follows:

- HP1: High Pressure Alarm (circuit 1)
- HP2: High Pressure Alarm (circuit 2)
- LP1: Low Pressure Alarm (circuit 1)
- LP2: Low Pressure Alarm (circuit 2)
- HP3: High Pressure Alarm (circuit 3)
- HP4: High Pressure Alarm (circuit 4)
- LP3: Low Pressure Alarm (circuit 3)
- LP4: Low Pressure Alarm (circuit 4)
- FRE: Freeze Alarm
- FRE2: Freeze Alarm
- CON: Condensate Alarm B
- RN: Brownout Alarm

Troubleshooting

COMMUNICATION LEDS

The LEDs indicate if the controller is speaking to the devices on the network. The LEDs should reflect communication traffic based on the baud rate set. The higher the baud rate the more solid the LEDs become.

The Run and Error LEDs indicate controller and network status. See Table 32 for Communication LEDs and Table 33 for Run and Error LEDs.

Table 32 — Communication LEDs[a]

LEDS	STATUS
POWER	Lights when power is being supplied to the controller.
RX	Lights when the controller receives data from the network segment; there is an Rx LED for Ports 1 and 2.
TX	Lights when the controller transits data from the network segment; there is an Tx LED for Ports 1 and 2.
RUN	Lights based on controller health.
ERROR	Lights based on controller health.

NOTE(S):

a. The I/O Flex 6126 controller is protected by internal solid-state polyswitches on the incoming power and network connections. These polyswitches are not replaceable, but they will reset themselves if the condition that caused the fault returns to normal.

Table 33 — Run and Error LEDs

IF RUN LED SHOWS...	AND ERROR LED SHOWS...	STATUS IS...
2 flashes per second	Off	Normal
	2 flashes, alternating with Run LED	Five minute auto-restart delay after system error
	3 flashes, then off	The controller has just been formatted
	4 flashes, then pause	Two or more devices on this network have the same ARC156 network address
	1 flash per second	The controller is alone on the network
	On	Exec halted after frequent system errors or control programs halted
5 flashes per second	On	Exec start-up aborted, boot is running
	Off	Firmware transfer in progress, boot is running
7 flashes per second	7 flashes per second, alternating with Run LED	Ten-second recovery period after burnout
14 flashes per second	14 flashes per second, alternating with Run LED	Burnout
Alternating flashes with Error LED	Alternating flashes with the Run LED	The controller files have been archived
On	On	Failure. Try the following solutions: Turn the I/O Flex 6126 controller off, then on. Format the I/O Flex 6126 controller. Download memory to the I/O Flex 6126 controller. Replace the I/O Flex 6126 controller.

COMPLIANCE

⚠CAUTION

This unit uses a microprocessor control system. Do not short or jumper between terminations on circuit boards or modules; control or board failure may result.

Be aware of electrostatic discharge (static electricity) when handling or making contact with circuit boards or module connections. Always touch a chassis (grounded) part to dissipate body electrostatic charge before working inside control center.

Use extreme care when handling tools near boards and when connecting or disconnecting terminal plugs. Circuit boards can easily be damaged. Always hold boards by the edges and avoid touching components and connections.

This equipment uses, and can radiate, radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to International Standard in North America EN61000-2/3 which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

Always store and transport replacement or defective boards in an anti-static shipping bag.

50BVJ and 50BVW Controls

This section is for 50BV units with VAV controls (50BVJ and 50BVW). The VAV controls will include an I/O Flex 6126 controller with an I/O Flex Ex8160 Expander module.

The hand-held BACview or Virtual BACview is used to access the 6126 controller. These devices are used to view current unit conditions and change parameters.

NOTE: The handheld BACView was obsoleted in 2019 and is no longer available for purchase. Existing handhelds are still compatible with the 50BV control interface currently available for purchase.

The hand-held BACview connects to the Rnet port on the 6126 controller. The hand-held BACview uses a fixed screen with 4 lines. Due to the limited screen view, the user will need to scroll up and down to view data and make any configuration changes. Figure 41 illustrates a typical hand-held BACview.

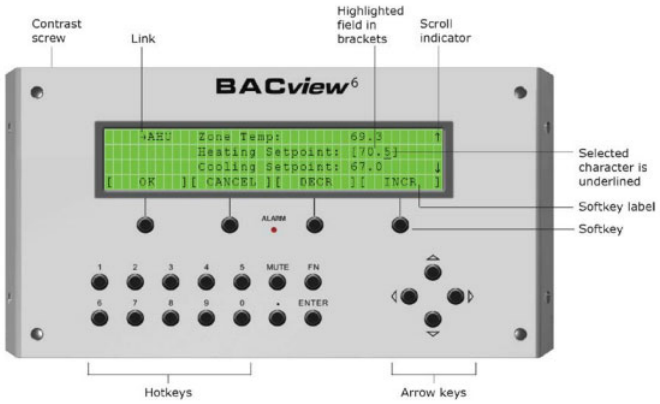


Fig. 41 — Hand-Held BACview

Virtual BACview (see Fig. 42) provides the end-user an interface to a controller using a laptop. It uses the dongle/cable assembly found in the technician tool kit (TECH-TKIT) to connect from a USB port on the laptop to the Rnet port on the 6126 controller.

The **Row Count:** field is for configuring the number of lines on the screen. The minimum is 4 rows and the maximum is 100 rows. The **Comm Port:** selector allows selection of the COM port allowing the computer to communicate with the 6126 controller.

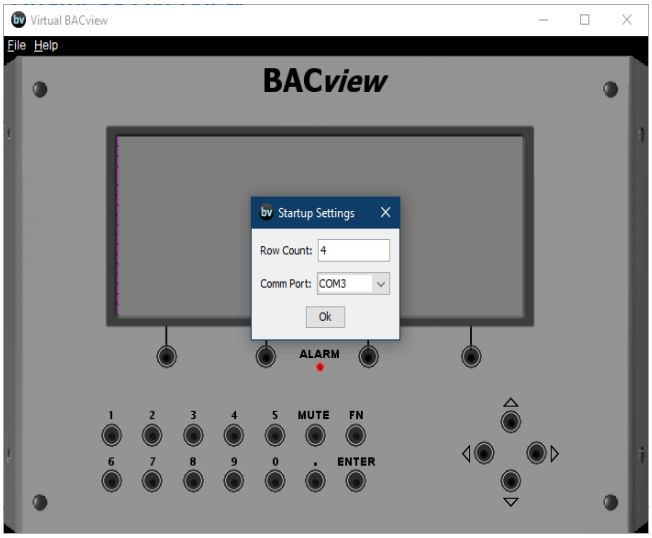


Fig. 42 — Virtual BACview

All BACview illustrations in this section are from Virtual BACview, and may not represent the screen viewed on a hand-held BACview module, which is limited to four (4) rows of text. The Virtual BACview software interface provides the same functionality as the hand-held module when connected to a controller, with some additional benefits, such as the flexibility of using a mouse or keyboard to modify control parameters, and the added convenience of changing the screen size (rows only) to display more information at the same time.

By default, the BACview goes into screen-saver mode after 1 minute of inactivity. Pressing any key reactivates the screen to the Home Screen.

To verify the COM port to use for Virtual BACview, go to the Device Manager screen, expand the Port (COM & LPT), locate the Silicon Labs driver, and note the listed COM port. For the example shown in Fig. 43, the COM port is COM3.

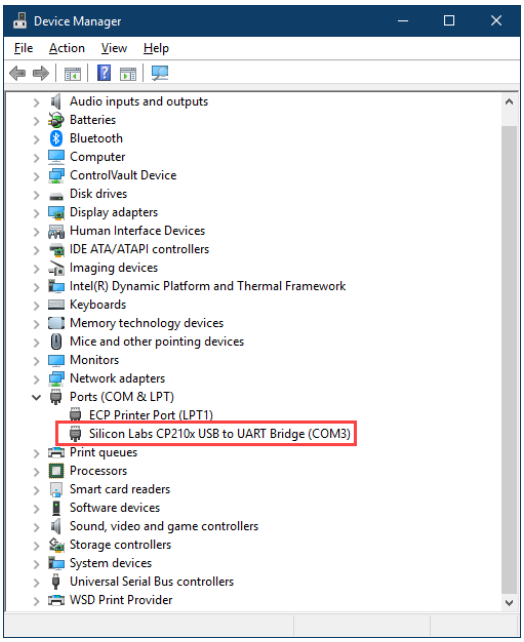


Fig. 43 — Virtual BACview COM Port Example

The controller will present the Admin or User Password screen illustrated in Fig. 44. To proceed, enter **1111** and click the **[OK]** softkey to continue. Click the **[CANCEL]** softkey to return to the previous screen.

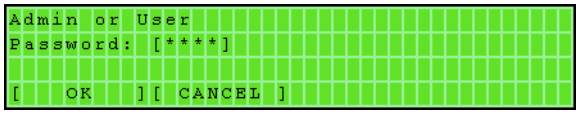


Fig. 44 — Admin or User Password Screen

Table 34 provides typical softkey commands encountered while trouble shooting or configuring the unit.

Table 34 — Typical BACview Softkey Commands

SOFTKEY	FUNCTION
[OK]	Click this softkey when accepting a configuration change
[CANCEL]	Click this softkey to cancel a configuration change
[DECR]	Click this softkey to decrease the parameter value
[INCR]	Click this softkey to increase the parameter value
[→PREV]	Click this softkey to return to the previous screen
[→ALARM]	Click this softkey to review alarms
[→CLOCKSET]	Click this softkey to review/change the time and date

While navigating through the screens, certain values can be changed (e.g., set points, counters, sensor offset, etc.). To change the value, move the brackets to the value to be changed and press **ENTER**. Click the **[DECR]** or the **[INCR]** softkeys to decrease or increase the value. Click **[OK]** to save the change, or click **[CANCEL]** to abandon the change.

If a key has not been pressed for a certain amount of time, the Inactivity Default screen will appear (see Fig. 45). The screen displays the unit status, the current supply air temperature, the time, day and date. Press any key to continue.

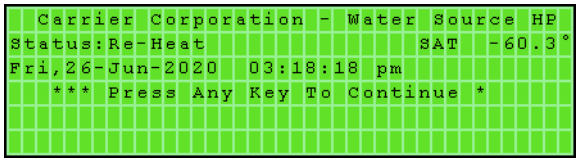


Fig. 45 — Inactivity Default Screen

HOTKEYS

Hotkeys are to BACview as shortcuts are to a computer. BACview can support up to 10 hotkeys. Table 35 provides standard hotkeys for 50BV units with VAV controls.

Table 35 — Standard BACview Hotkeys

HOTKEY	SCREEN
FUNCTION 1	Admin or User Password
FUNCTION 2	View/Set User Password
FUNCTION 3	Set Current Time/Date
FUNCTION 4	Alarm
FUNCTION 5	BACnet
FUNCTION 6	Keypad Configuration
FUNCTION 7	Tuning Parameters
FUNCTION 8	Calibration
FUNCTION 9	Checkout/Overrides
FUNCTION 0	Network Protocol

To activate the hotkey with a hand-held BACview, press **FN** and the number. To activate the hotkey with Virtual BACview, press **Ctrl** and the number. In the following sections, where a screen can be accessed using a hotkey, it will be provided below the section heading. Certain screens can only be accessed using the hotkey sequence.

NETWORK PROTOCOL

Hotkey Access:

Handheld BACview: **Fn + 0**

Virtual BACview: **Ctrl + 0**

The Network Protocol screen (see Fig. 46) displays the current network protocol.

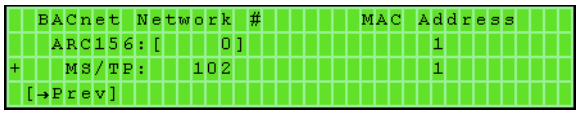


Fig. 46 — Network Protocol Screen

The "+" sign on the left side of the screen indicates that the ARC156 protocol is active. To change to MS/TP:

1. Move the bracket to the ARC156 number and press **ENTER**. The screen softkeys will appear, allowing the network number to be changed.
2. Decrease the ARC156 network number to "0" using the increase **[→INCR]** and/or decrease **[→DECR]** softkeys.
3. Click the **[→OK]** softkey to save the value.
4. Move the bracket to the MS/TP line and press **ENTER**.
5. Use the **[→INCR]** and/or **[→DECR]** softkeys to enter the network number.
6. Click the **[→OK]** softkey to save the value.
7. Click the **[→Prev]** softkey to exit the screen. Access the Network Protocol screen by using the hotkey to confirm that the "+" sign is now on the MS/TP line.

KEYPAD CONFIGURATION

Hotkey Access:

Handheld BACview: **Fn + 6**

Virtual BACview: **Ctrl + 6**

The Keypad Configuration screen (see Fig. 47) allows adjustment of the amount of time the BACview handheld keypad remains lit. See Table 36 for screen function information.

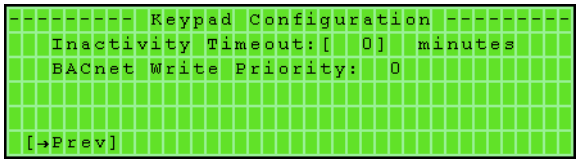


Fig. 47 — Keypad Configuration Screen

Click the **[→PREV]** softkey to return to the Home screen.

Table 36 — Keypad Configuration Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Inactivity Timeout (adjustable)	Displays the time the handheld BACview will remain lit
BACnet Write Priority	Adjustable
[→Prev]	Softkey access to previous screen

TUNING PARAMETERS

Hotkey Access:

Handheld BACview: **Fn + 7**

Virtual BACview: **Ctrl + 7**

The Tuning Parameters screen (see Fig. 48) shows the current capacities of the fan, economizer and compressors.

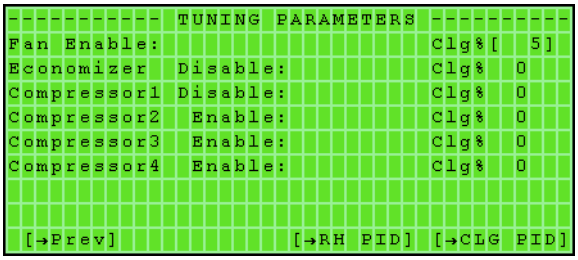


Fig. 48 — Tuning Parameters Screen

Click the **[→PREV]** softkey to return to the Home screen.

MODULATING HOT GAS RE-HEAT

Access: Tuning Parameters Screen, [→RH PID] softkey

The Modulating Hot Gas Re-Heat screen (see Fig. 49) allows the user to change the MHGRH Sample Time, Proportional, Integral and Derivative gains, plus the Loop dead band and the Ramp Interval. Care should be taken before changing any settings on this screen. See Table 37 for screen function information.

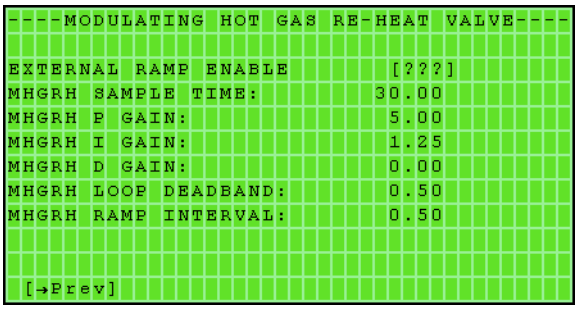


Fig. 49 — Modulating Hot Gas Re-Heat Screen

Click the **[→PREV]** softkey to return to the Fan Set Points screen.

Table 37 — Modulating Hot Gas Re-Heat Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
External Ramp Enable	Not Applicable
MHGRH SAMPLE TIME (adjustable)	Displays the current Sample Time
MHGRH P GAIN (adjustable)	Displays the current Proportional Gain
MHGRH I GAIN (adjustable)	Displays the current Integral GainKEY
MHGRH D GAIN (adjustable)	Displays the current Derivative Gain
MHGRH LOOP DEADBAND (adjustable)	Displays the current Loop Deadband
MHGRH RAMP INTERVAL (adjustable)	Displays the current MHGRH Ramp Interval
[→Prev]	Softkey access to previous screen

CALIBRATION

Hotkey Access:

Handheld BACview: Fn + 8

Virtual BACview: Ctrl + 8

The Calibration screen (see Fig. 50) allows the value of the sensors to be offset. See Table 38 for screen function information.

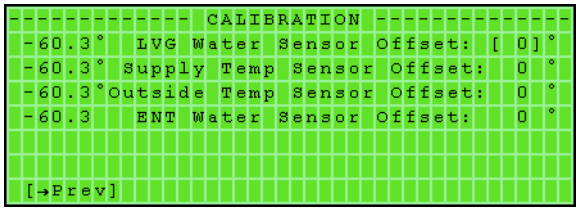


Fig. 50 — Calibration Screen

Using the arrow keys, move the bracket to the value to be changed. Click the **[→PREV]** softkey to return to the previous screen.

Table 38 — Calibration Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
LVG Water Sensor Offset (adjustable)	Displays the existing temperature on the left side and the amount of offset on the right side. Offset can be from -9 to +99
Supply Temp Sensor Offset (adjustable)	Displays the existing temperature on the left side and the amount of offset on the right side. Offset can be from -9 to +99
Outside Temp Sensor Offset (adjustable)	Displays the existing temperature on the left side and the amount of offset on the right side. Offset can be from -9 to +99
ENT Water Sensor Offset (adjustable)	Displays the existing temperature on the left side and the amount of offset on the right side. Offset can be from -9 to +99
[→Prev]	Softkey access to previous screen

CHECKOUT/OVERRIDES

Hotkey Access:

Handheld BACview: Fn + 9

Virtual BACview: Ctrl + 9

The Checkout/Overrides screen (see Fig. 51) displays the current conditions of the digital outputs, analog outputs, analog inputs, and binary inputs.

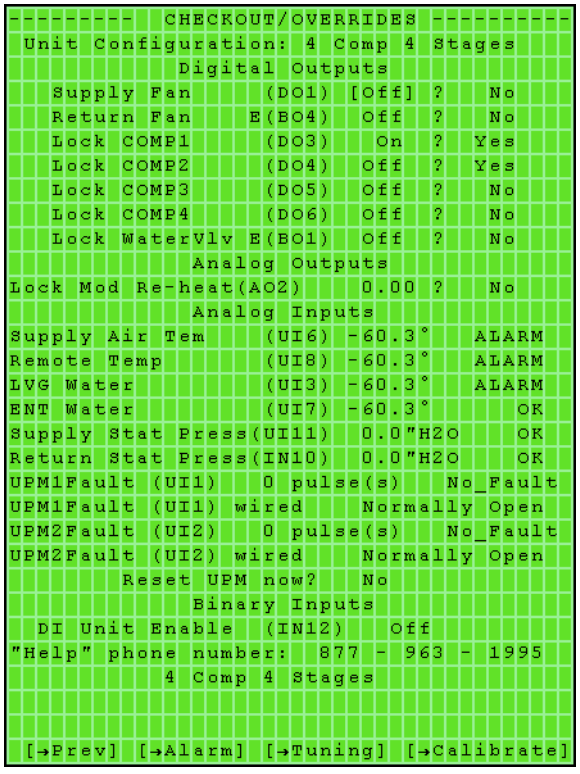


Fig. 51 — Checkout/Overrides Screen

To enable (on) or disable (off) the digital outputs:

1. Move the brackets to the appropriate output and press **ENTER**. The screen softkeys will appear, allowing the value to be changed.
2. Click the **[→INCR]** or **[→DECR]** softkeys to change the value.
3. To save the change, click the **[→OK]** softkey. To cancel the change, click the **[→CANCEL]** softkey.

To change the analog outputs:

1. Move the brackets to the appropriate output and press **ENTER**. The screen softkeys will appear, allowing the value to be changed.
2. Click the **[→INCR]** or **[→DECR]** softkey to change the value.
3. To save the change, click the **[→OK]** softkey. To cancel the change, click the **[→CANCEL]** softkey.

For the **[→Alarm]**, **[→Tuning]** and **[→Calibrate]** softkeys, see the previous sections.

HOME

The Home screen (see Fig. 52) displays the main categories of the software that the user can interface with on the BACview. Most pages contain parameters that can be configured to suit an application. See Table 39 for screen function information.

Fig. 52 — Home Screen

Table 39 — Home Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Status	Displays current unit operating mode
Outside	Displays current outside air temperature
Supply Temp	Displays current supply air temperature
Supply Stpt	Displays current supply air temperature set point
Cooling Stages Demand	Displays current number of cooling stages
→Unit Operation	Access to Unit Operation screen
→Temperature	Access to current temperature readings
→Fan	Access to fan parameters
→Heat/Cool	Access to heating and cooling parameters
→UPM Faults	Access to UPM faults
→Sched	Access to unit schedule
→Alarm Config	Access to alarm configurations
→UserPW	Access to view/set user password
→Temp Reset	Access to outside air temperature reset
→BACnet	Access to BACnet parameters
[→Alarm]	Softkey access to Alarm screen
[→ClockSet]	Softkey access to ClockSet screen
[→SETUP]	Softkey access to the Unit Operation Set Point screen
[→Help]	Softkey access to Help screen

ALARM

Access: Home screen, [→Alarm] softkey

Hotkey Access:

Handheld BACview: Fn + 4

Virtual BACview: Ctrl + 4

The Alarm screen (see Fig. 53) allows the user to access the module event history.

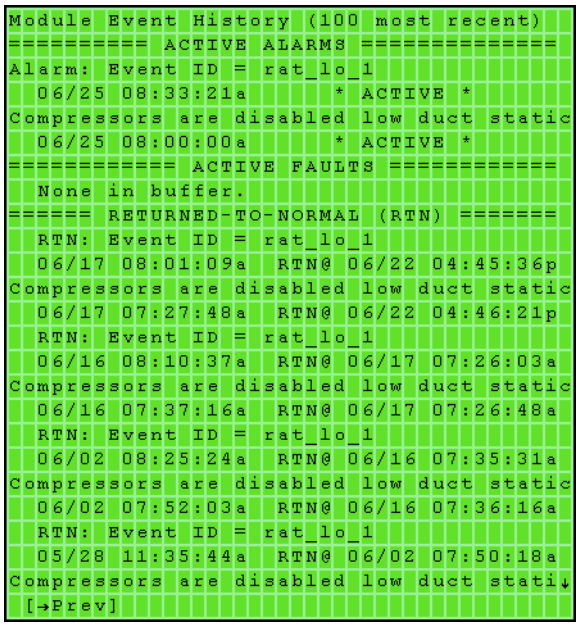


Fig. 53 — Alarm Screen

This screen will display up to 100 most recent events. The categories are Active Alarms, Active Faults, Returned-to-Normal (RTN) events and Manually Cleared (CLR) events. Click the **[→PREV]** softkey to return to the Home screen.

SET CURRENT TIME/DATE (24 HR CLOCK)

Access: Home screen, [→Clockset] softkey

Hotkey Access:

Handheld BACview: Fn + 2

Virtual BACview: Ctrl + 2

The Set Current Time/Date (24 hr clock) screen (see Fig. 54) allows the time and date to be set.

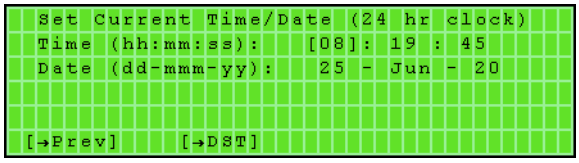


Fig. 54 — Set Current Time/Date (24 hr clock) Screen

To change the time and date:

1. Move the bracket using the arrow keys to the hour, minute, seconds, day, month or year values.
2. Press **ENTER** to change the value.
3. Click the **[→PREV]** softkey to return to the Home screen or click the **[→DST]** softkey to access the daylight savings time screen.

UNIT OPERATION

Access: Home screen

The Unit Operation screen (see Fig. 55) shows the current unit operation status.

Fig. 55 — Unit Operation Screen

Click the **[→PREV]** softkey to return to the Home screen, click the **[→Alarm]** softkey to view the Alarm screen, or click the **[→Stpt]** softkey to access the unit parameters and to make any changes to the configuration. See Table 40 for screen function information.

Table 40 — Unit Operation Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Unit Status (non-adjustable)	Current unit operating status
Software Mode (non-adjustable)	**Manual_On**: Unit is turned on by the hand-held BACview or by Virtual BACview **Digital Input**: Unit is turned on by contact closure (UI-12, terminals 19 and 20) **Keypad Schedule**: Unit is turned on by a configured schedule **BAS_Command**: Unit is turned on by a BAS command over the network
Hardware Enabled (non-adjustable)	**FLEX**: 6126 controller only **Flex + EXPANDER**: 6126 controller and 8160 expander module
Reset Sensor Location (non-adjustable)	Outside Air Return Air Mixed Air
Heat/Cool Options (non-adjustable)	**Cooling + HGRH**: Configuration when the unit has HGRH **Cooling Only**: Configuration when the unit does not have HGRH
DI Enable Contact: (non-adjustable)	**Off**: Digital input disabled **On**: Digital input enabled
Keypad Schedule Status (non-adjustable)	**On**: Keypad schedule enabled **Off**: Keypad schedule disabled
BAS Command (non-adjustable)	**On**: BAS command is enabled **Off**: BAS command is disabled
Unit Command (non-adjustable)	Occupied Unoccupied
Supply Fan Command (non-adjustable)	On Off
Return Fan Command: (non-adjustable)	On Off
Cooling Percent (non-adjustable)	**0%** to **100%**
Coil Configuration (non-adjustable)	Parallel Evap

ARCHIVE-COMMISSIONING

Access: Unit Operation Set Point screen, [→Archive] softkey

The Archive-Commissioning screen (see Fig. 56) allows the user to save the unit configuration.

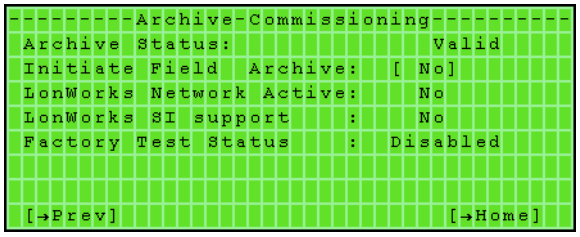


Fig. 56 — Archive-Commissioning Screen

Click the **[→PREV]** softkey to return to the Unit Operation Set Point screen, or click the **[→Home]** softkey to access the Home screen. See Table 41 for screen function information.

Table 41 — Archive-Commissioning Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Archive Screen (non-adjustable)	Valid
Initiate Field Archive (adjustable)	No
LonWorks Network Active (non-adjustable)	Indicates whether a LonWorks network is active
LonWorks SI support	Adjustable
Factory Test Status (adjustable)	**Disabled** - default: This is for use by the factory only. It should never be Enabled. **Enabled**: If Enabled change to Disabled

To archive the configuration:

1. Move the brackets to "No" value on the Initiate Field Archive line.
2. Press **ENTER**.
3. Click on the [**DECR]** or the **[INCR]** softkeys to change the value to "Yes".
4. Click **[OK]** to save the change or **[CANCEL]** to abandon the change. If **[OK]** is clicked, the screen will display "Yes" for a very short time, then revert to "No," signifying that the configuration has been archived.

HELP

Access: Home screen, [→Help] softkey

The Help screen (see Fig. 57) displays a telephone number for technical support. It also displays the software part number and the version number.

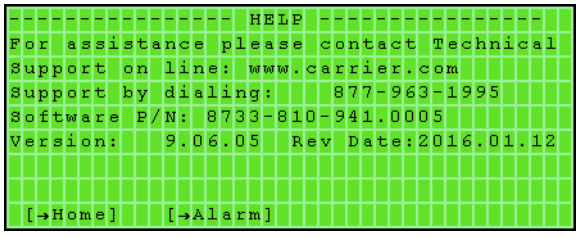


Fig. 57 — Help Screen

The is nothing that can be adjusted on this screen. Click the **[→Home]** softkey to return to the Home screen, or click the **[→Alarm]** softkey to access the Alarm screen.

UNIT FAN

Access: Home Screen

The Unit Fan screen (see Fig. 58) allows the user to view all the current values of the supply fan.

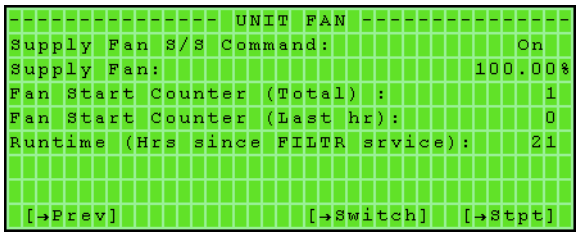


Fig. 58 — Unit Fan Screen

Click the **[→PREV]** softkey to return to the Home screen, click the **[→Switch]** softkey to access the Supply Fan Lockout screen, or click the **[→Stpt]** softkey to access the Fan Set Points screen. See Table 42 for screen function information.

Table 42 — Unit Fan Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Supply fan S/S Command (non-adjustable)	On - Fan is running
Supply Fan (non-adjustable)	Supply fan capacity
Fan Start Counter (Total) (non-adjustable)	Total number of fan starts
Fan Start Counter (Last hr) (non-adjustable)	Total number of fan starts in the last hour
Runtime (Hours since FILTR service) (non-adjustable)	Total number of hours since the filters were changed

UNIT OPERATION SET POINT

Access: Unit Operation screen, [→Stpt] softkey)

The Unit Operation Set Point screen (see Fig. 59) allows the user to make configuration changes.

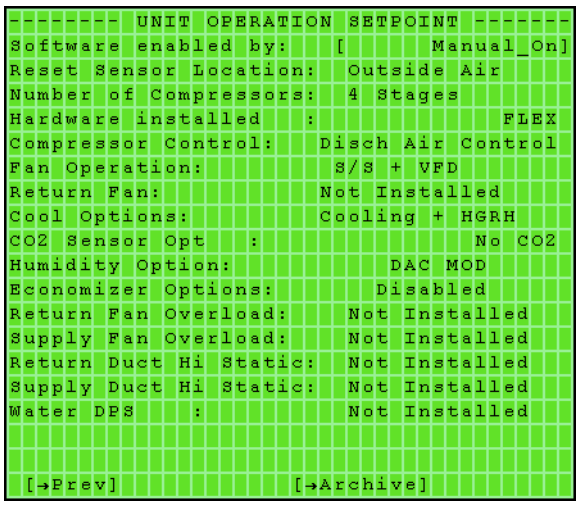


Fig. 59 — Unit Operation Set Point Screen

Click the **[→PREV]** softkey to return to the Unit Operation screen or click the **[→Archive]** softkey to access the Archive-Commissioning screen. See Table 43 for screen function information.

Table 43 — Unit Operation Set Point Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Software enabled by (adjustable)	Manual_On Digital_Input Keypad_Schedule BAS_Command
Reset Sensor Location (adjustable)	Outside Air Return Air Mixed Air
Number of Compressors (adjustable)	1 Stage 2 Stages 3 Stages 4 Stages
Hardware Installed (adjustable)	**FLEX**: 6126 controller only **FLEX + EXPANDER**: 6126 controller and 8160 expander module
Compressor Control (adjustable)	Disch Air Control
Fan Operation (adjustable)	S/S + VFD Start/Stop
Return Fan (adjustable)	Not Installed Installed
Cool Options (adjustable)	Cooling + HGRH Cooling Only
CO2 Sensor Opt (adjustable)	No CO_2 CO_2 Monitoring CO_2 Mon + Damper BAS CO_2 Monitoring BAS CO_2 Mon + Damper Open when fan runs
Humidity Option (adjustable)	DAC MOD RH+DAC MOD BAS MOD
Economizer Options (adjustable)	Disabled Economizer
Return Fan Overload (adjustable)	Not Installed Installed
Supply Fan Overload (adjustable)	Not Installed Installed
Return Duct Hi Static (adjustable)	Not Installed Installed
Supply Duct Hi Static (adjustable)	Not Installed Installed
Water DPS (adjustable)	Not Installed Installed

SUPPLY FAN LOCKOUTS

Access: Unit Fan screen, [→Switch] softkey

The Supply Fan Lockouts screen (see Fig. 60) allows the user to view fan overload and high static alarms, and allows the overload and high static counters to be reset.

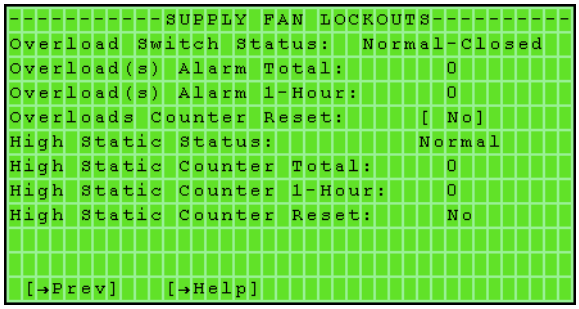


Fig. 60 — Supply Fan Lockouts Screen

Click the **[→PREV]** softkey to return to the Unit Fan screen or click the **[→Help]** softkey to access the Help screen. See Table 44 for screen function information.

Table 44 — Supply Fan Lockouts Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Overload Switch Status (non-adjustable)	Displays the current switch status of the supply fan overload
Overload(s) Alarm Total (non-adjustable)	Displays the total of overload alarms
Overload(s) Alarm 1-Hour (non-adjustable)	Displays the total of overload alarms in the last hour
Overloads Counter Reset (adjustable)	Allows the reset of the Overload Alarm Total and Overload Alarm in the last hour
High Static Status (non-adjustable)	Displays current status of High Static
High Static Counter Total (non-adjustable)	Displays the total of High Static occurrences
High Static Counter 1-Hour (non-adjustable)	Displays the total of High Static occurrences in the last hour
High Static Counter Reset (adjustable)	Allows the reset of the High Static Counter Total and High Static Counter in the last hour

To reset the Overload(s) Alarm Total and Overload(s) Alarm 1-Hour values:

1. Move brackets onto "No" on the Overloads Counter Reset line, and press **ENTER**.
2. Click on the **[INCR]** softkey to change setting to "Yes".
3. Press **ENTER** to reset. The display will show "Yes" momentarily then the display will change to "No". Overload(s) Alarm Total and Overload(s) Alarm 1-Hour will reset to "0".

To reset the High Static Counter Total and High Static Counter 1-Hour values:

1. Move brackets onto "No" on the High Static Counter Reset line, and press **ENTER**.
2. Click on the **[INCR]** softkey to change setting to "Yes".
3. Press **ENTER** to reset. The display will show "Yes" momentarily then display will change to "No". High Static Counter Total and High Static Counter 1-Hour will reset to "0".

FAN SET POINTS

Access: Unit Fan screen, [→Stpt] softkey

The Fan Set Points screen (see Fig. 61) allows the user to configure the supply fan to run continuously in occupancy/night setback mode and to set the minimum fan speed. It also allows the supply fan runtime and start counters to be reset.

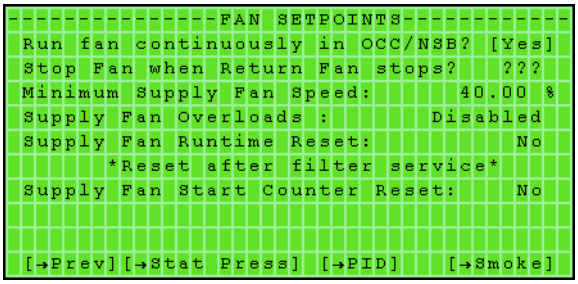


Fig. 61 — Fan Set Points Screen

Click the **[→PREV]** softkey to return to the Unit Fan screen, click the **[→Stat Press]** softkey to access the Static Pressure screen, click the **[→PID]** softkey to access the PID Tuning Parameters screen or click the **[→Smoke]** softkey to access the Smoke Detector screen. See Table 45 for screen function information.

Table 45 — Fan Set Points Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Run fan continuously in OCC/NSB? (adjustable)	**Yes**: Run fan in Occupied (OCC) or Night Set Back (NSB) mode **No**: Do not run fan in Occupied (OCC) or Night Set Back (NSB) mode
Stop Fan when Return Fan stops? (adjustable)	???; Default setting - unit does not have a return fan **Yes**: Supply Fan will stop when return fan stops **No**: Supply Fan will continue to run when return fan stops
Minimum Supply Fan Speed (adjustable)	40.00% (default value) Range is from 0.00% to 99.99%
Supply Fan Overloads (non-adjustable)	Disabled This value cannot be changed
Supply Fan Runtime Reset (adjustable)	**No** (default): Supply Fan Runtime will not be reset **Yes**: Supply Fan Runtime will be reset after **[OK]** softkey is clicked
Supply Fan Start Counter Reset (adjustable)	No (default)

SMOKE DETECTOR

Access: Fan Set Points screen, [→Smoke] softkey

The Smoke Detector screen (see Fig. 62) allows the user to view the status of the smoke detector and the input. It also allows the smoke detector input, fan response and fan speed to be changed when the smoke detector is activated.

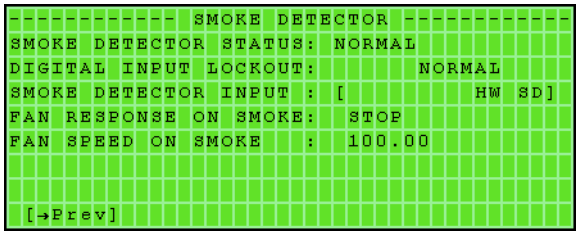


Fig. 62 — Smoke Detector Screen

Click the **[→PREV]** softkey to return to the Fan Set Points screen. See Table 46 for screen function information.

Table 46 — Smoke Detector Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
SMOKE DETECTOR STATUS (non-adjustable)	Displays the current status of the smoke detector
DIGITAL INPUT LOCKOUT (non-adjustable)	Displays the current status of the digital input lockout
SMOKE DETECTOR INPUT (adjustable)	Displays the current configuration of the smoke detector input: **HW SD**: Hard Wired Smoke Detector **BAS SD**: Building Automation System Smoke Detector **BAS SD + HW SD**: Building Automation System Smoke Detector and Hard Wired Smoke Detector **Disable**: smoke detector Disabled
FAN RESPONSE ON SMOKE (adjustable)	Displays the current configuration of what the supply fan will do when a smoke detector is activated: **Stop**: Fan will Stop when the smoke detector is activated **Run**: Fan will Run when the smoke detector is activated
FAN SPEED ON SMOKE (adjustable)	Displays what the fan speed will be when the smoke detector is activated: Range is from 0.00% to 100%
[→Prev]	Softkey access to Fan Set Points screen

STATIC PRESSURE

Access: Fan Set Points screen, [→Stat Press] softkey

The Static Pressure screen (see Fig. 63) allows the user to view the existing duct static pressure and allows the duct static pressure set point, low trip and offset to be adjusted.

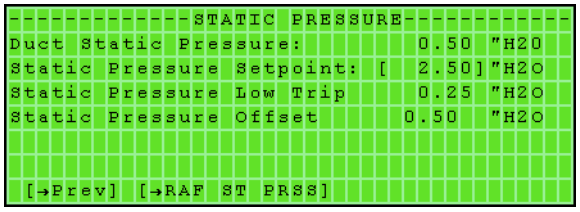


Fig. 63 — Static Pressure Screen

Click the **[→PREV]** softkey to return to the Fan Set Points screen or click the **[→RAF ST PRSS]** softkey to access the Return Duct Static Pressure screen. See Table 47 for screen function information.

Table 47 — Static Pressure Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Duct Static Pressure (non-adjustable)	Displays the current duct static pressure
Static Pressure Set Point (adjustable)	Displays the current duct pressure set point
Static Pressure Low Trip (adjustable)	Displays the current static pressure low trip point
Static Pressure Offset (adjustable)	Current static pressure offset value Range: 0.00 to 99.98

RETURN DUCT STATIC PRESSURE

Access: Static Pressure screen, [→RAF ST PRSS] softkey

The Return Duct Static Pressure screen (see Fig. 64) will not have any significance since there is no return fan on a 50BV unit.

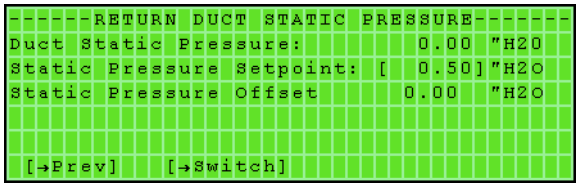


Fig. 64 — Return Duct Static Pressure Screen

Click the **[→PREV]** softkey to return to the Static Pressure screen or click the **[→Switch]** softkey to access the Return Fan Lockouts screen.

RETURN FAN LOCKOUTS

Access: Return Duct Static Pressure screen, [→Switch] softkey

The Return Fan Lockouts screen (see Fig. 65) will not have any significance since there is no return fan on a 50BV unit.

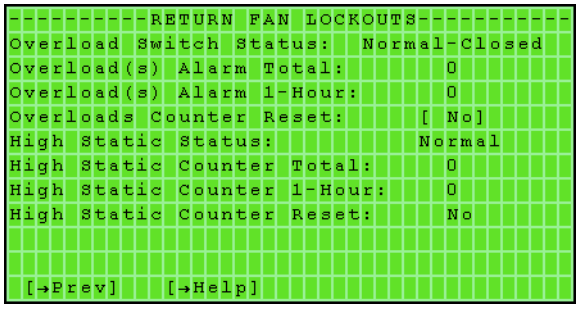


Fig. 65 — Return Fan Lockouts Screen

Click the **[→PREV]** softkey to return to the Return Duct Static Pressure screen or click the **[→Help]** softkey to access the Help screen.

SUPPLY FAN PID TUNING PARAMETERS

Access: Fan Set Points screen, [→PID] softkey

The PID Tuning Parameters screen (see Fig. 66) allows the user to change the Proportional, Integral and Derivative gains plus the Loop dead band. Care should be taken before changing any setting on this screen.

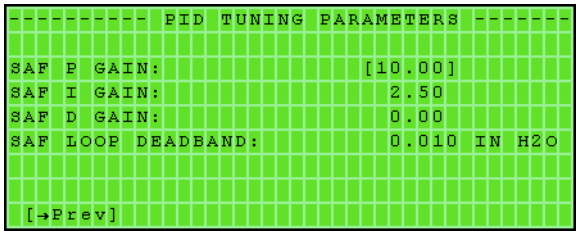


Fig. 66 — PID Tuning Parameters Screen

Click the **[→PREV]** softkey to return to the Fan Set Points screen. See Table 48 for screen function information.

Table 48 — PID Tuning Parameters Functions

FIELD / KEY	FUNCTION / INFORMATION
SAF P GAIN (adjustable)	Displays the current Proportional Gain
SAF I GAIN (adjustable)	Displays the current Integral Gain
SAF D GAIN (adjustable)	Displays the current Derivative Gain
SAF LOOP DEADBAND: (adjustable)	Displays the current PID loop dead-band in inches of water
[→Prev]	Softkey access to previous screen

UPM FAULTS

Access: Home screen

The UPM Faults screen (see Fig. 67) allows the user to view the current status of the UPM board and to view the safeties connected to the UPM board. The screen also allows the user to reset the UPM, reset the UPM alarms and reset the UPM alarm counts.

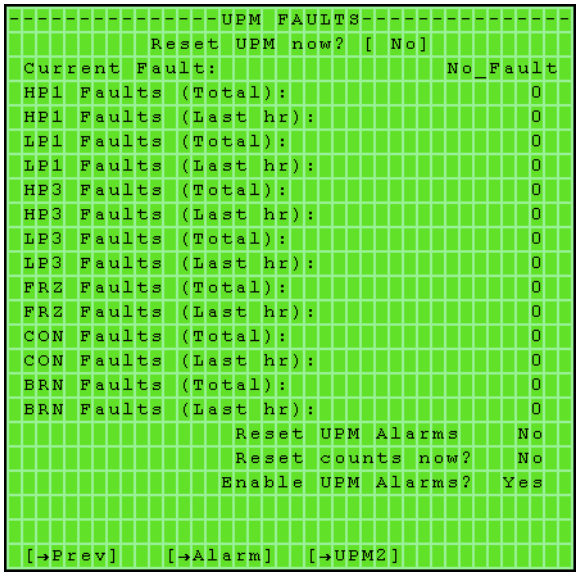


Fig. 67 — UPM Faults Screen

Click the **[→PREV]** softkey to return to the Home screen, click the **[→Alarm]** softkey to access the Alarm screen or click the **[→UPM2]** softkey to access the UPM2 Faults screen. See Table 49 for screen function information.

To reset the Unit Protection Module (UPM):

1. Move brackets onto "No" on the Reset UPM now? line and press **ENTER**.
2. Click on the [INCR] softkey to change setting to "Yes".
3. Press **ENTER** to reset. The display will show "Yes" momentarily then display will change to "No". The UPM is now reset.

To reset the UPM Alarms:

1. Move brackets onto "No" on the Reset UPM Alarms line and press **ENTER**.
2. Click on the **[INCR]** softkey to change setting to "Yes".
3. Press **ENTER** to reset. The display will show "Yes" momentarily then display will change to "No" The UPM alarm is now reset.

To reset the number of UPM alarm counts:

1. Move brackets onto "No" on the Reset count now? line and press **ENTER**.
2. Click on the **[INCR]** softkey to change setting to "Yes".
3. Press **ENTER** to reset. The display will show "Yes" momentarily then display will change to "No". The UPM alarm counts is now reset.

Table 49 — UPM Faults Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Reset UPM now? (adjustable)	Allows the user to reset the Unit Protection Module (UPM)
Current Fault (non-adjustable)	Displays if the UPM has registered a fault
HP1 Faults (Total) (non-adjustable)	Displays the number of High-Pressure switch faults for Circuit 1 since the last reset
HP1 Faults (Last hr) (non-adjustable)	Displays the number of High-Pressure switch faults for Circuit 1 in the last hour
LP1 Faults (Total) (non-adjustable)	Displays the number of Low-Pressure switch faults for Circuit 1 since the last reset
LP1 Faults (Last hr) (non-adjustable)	Displays the number of Low-Pressure switch faults for Circuit 1 in the last hour
HP3 Faults (Total) (non-adjustable)	Displays the number of High-Pressure switch faults for Circuit 3 since the last reset
HP3 Faults (Last hr) (non-adjustable)	Displays the number of High-Pressure switch faults for Circuit 3 in the last hour
LP3 Faults (Total) (non-adjustable)	Displays the number of Low-Pressure switch faults for Circuit 3 since the last reset
LP3 Faults (Last hr) (non-adjustable)	Displays the number of Low-Pressure switch faults for Circuit 3 in the last hour
FRZ Faults (Total) (non-adjustable)	Displays the number of Freeze alarms since the last reset
FRZ Faults (Last hr) (non-adjustable)	Displays the number of Freeze alarms in the last hour
CON Faults (Total) (non-adjustable)	Displays the number of Condensate alarms since the last reset
CON Faults (Last hr) (non-adjustable)	Displays the number of Condensate alarms in the last hour
BRN Faults (Total) (non-adjustable)	Displays the number of Brown Out alarms since the last reset
BRN Faults (Last hr) (non-adjustable)	Displays the number of Brown Out alarms in the last hour
Reset UPM Alarms (adjustable)	Allows the UPM alarms to be reset
Reset count now? (adjustable)	Allows the number of UPM alarm counts to be reset.
Enable UPM Alarms? (adjustable)	Allows the UPM alarms to be enabled or disabled.

UPM2 FAULTS

Access: UPM FAULTS screen, [→UPM2] softkey

The UPM2 Faults screen (see Fig. 68) allows the user to view the current status of the UPM board and to view the safeties connected to the UPM board. The screen also allows the user to reset the UPM, reset the UPM alarms and reset the UPM alarm counts.

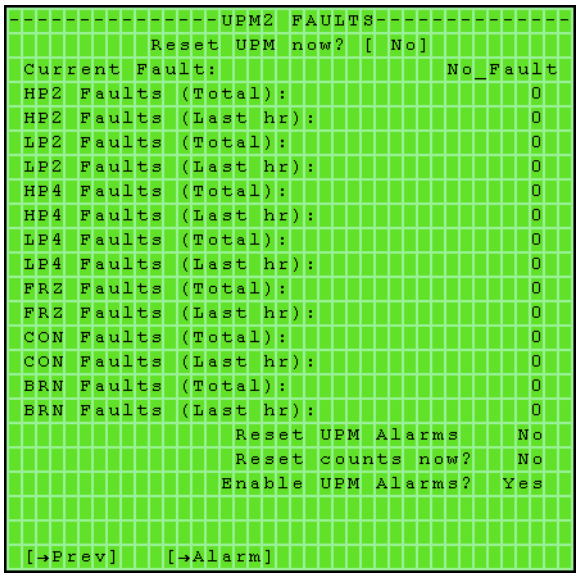


Fig. 68 — UPM2 Faults Screen

Click the **[→PREV]** softkey to return to the UPM FAULTS screen or click the **[→Alarm]** softkey to access the Alarm screen. See Table 50 for screen function information.

To reset the Unit Protection Module (UPM):

1. Move brackets onto "No" on the Reset UPM now? line and press **ENTER**.
2. Click on the [INCR] softkey to change setting to "Yes".
3. Press **ENTER** to reset. The display will show "Yes" momentarily then display will change to "No". The UPM is now reset.

To reset the UPM Alarms:

1. Move brackets onto "No" on the Reset UPM Alarms line and press **ENTER**.
2. Click on the **[INCR]** softkey to change setting to "Yes".
3. Press **ENTER** to reset. The display will show "Yes" momentarily then display will change to "No". The UPM alarm is now reset.

To reset the number of UPM alarm counts:

1. Move brackets onto "No" on the Reset count now? line and press **ENTER**.
2. Click on the **[INCR]** softkey to change setting to "Yes".
3. Press **ENTER** to reset. The display will show "Yes" momentarily then display will change to "No". The UPM alarm counts is now reset.

Table 50 — UPM2 Faults Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Reset UPM now? (adjustable)	Allows the user to reset the Unit Protection Module (UPM)
Current Fault (non-adjustable)	Displays if the UPM has registered a fault
HP2 Faults (Total) (non-adjustable)	Displays the number of High-Pressure switch faults for Circuit 2 since the last reset
HP2 Faults (Last hr) (non-adjustable)	Displays the number of High-Pressure switch faults for Circuit 2 in the last hour
LP2 Faults (Total) (non-adjustable)	Displays the number of Low-Pressure switch faults for Circuit 2 since the last reset
LP2 Faults (Last hr) (non-adjustable)	Displays the number of Low-Pressure switch faults for Circuit 2 in the last hour
HP4 Faults (Total) (non-adjustable)	Displays the number of High-Pressure switch faults for Circuit 4 since the last reset
HP4 Faults (Last hr) (non-adjustable)	Displays the number of High-Pressure switch faults for Circuit 4 in the last hour
LP4 Faults (Total) (non-adjustable)	Displays the number of Low-Pressure switch faults for Circuit 4 since the last reset
LP4 Faults (Last hr) (non-adjustable)	Displays the number of Low-Pressure switch faults for Circuit 4 in the last hour
FRZ Faults (Total) (non-adjustable)	Displays the number of Freeze alarms since the last reset
FRZ Faults (Last hr) (non-adjustable)	Displays the number of Freeze alarms in the last hour
CON Faults (Total) (non-adjustable)	Displays the number of Condensate alarms since the last reset
CON Faults (Last hr) (non-adjustable)	Displays the number of Condensate alarms in the last hour
BRN Faults (Total) (non-adjustable)	Displays the number of Brown Out alarms since the last reset
BRN Faults (Last hr) (non-adjustable)	Displays the number of Brown Out alarms in the last hour
Reset UPM Alarms (adjustable)	Allows the UPM alarms to be reset
Reset count now? (adjustable)	Allows the number of UPM alarm counts to be reset.
Enable UPM Alarms? (adjustable)	Allows the UPM alarms to be enabled or disabled.

ALARM CONFIG

Access: Home Screen

The Alarm Config screen (see Fig. 69) allows the user to view and set the different trip points for the unit.

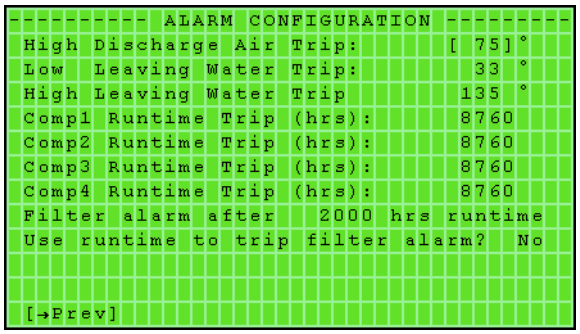


Fig. 69 — Alarm Config Screen

Click the **[→PREV]** softkey to return to the Home screen. See Table 51 for screen function information.

Table 51 — Alarm Config Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
High Discharge Air Trip (adjustable)	Displays the current High Discharge Air Trip set point
Low Leaving Water Trip (adjustable)	Displays the current low leaving water trip set point
High Leaving Water Trip (adjustable)	Displays the current high leaving water trip set point
Comp1 Runtime Trip (hrs) (adjustable)	Displays the current Compressor 1 runtime trip set point in hours
Comp2 Runtime Trip (hrs) (adjustable)	Displays the current Compressor 2 runtime trip set point in hours
Comp3 Runtime Trip (hrs) (adjustable)	Displays the current Compressor 3 runtime trip set point in hours
Comp4 Runtime Trip (hrs) (adjustable)	Displays the current Compressor 4 runtime trip set point in hours
Filter Alarm after 2000 hrs runtime (adjustable)	Displays the current setting for the filter alarm in hours.
Use runtime to trip filter alarm? (adjustable)	Allows the user to receive an alarm after the filter alarm setting has been exceeded.
[→Prev]	Softkey access to previous screen

OUTSIDE AIR RESET (TEMP RESET)

Access: Home Screen

The Outside Air Reset screen (see Fig. 70) allows the user to view the existing reset air temperature. It also allows the user to change the location of sensor, the type of sensor and the temperature reset set point.

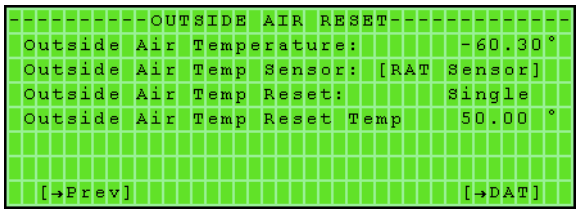


Fig. 70 — Outside Air Reset Screen

Click the **[→PREV]** softkey to return to the Home screen or click the **[→DAT]** softkey to access the DISCHARGE AIR screen. See Table 52 for screen function information.

Table 52 — Outside Air Reset Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Outside Air Temperature (non-adjustable)	Displays the current outside air temperature
Outside Air Temp Sensor (adjustable)	Displays the current reset sensor. Options are: RAT Sensor BAS RAT
Outside Air Temp Reset (adjustable)	Displays the current type of reset sensor. Options are: Single Multiple
Outside Air Temp Reset Temp (adjustable)	Displays the current reset temperature setting
[→Prev]	Softkey access to previous screen
[→DAT]	Softkey access to discharge air temperature screen

DISCHARGE AIR

Access: OUTSIDE AIR RESET screen, [→DAT] softkey

The Discharge Air screen (see Fig. 71) allows the user to view the effective discharge air set point and the discharge air temperature. It also allows the user to change the discharge air temperature set point and offset.

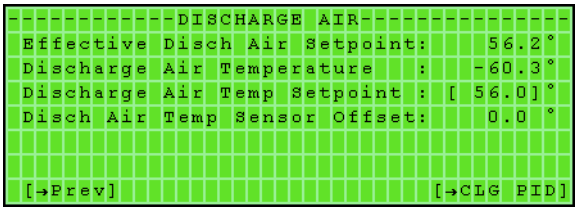


Fig. 71 — Discharge Air Screen

Click the **[→PREV]** softkey to return to the Outside Air Rest screen or click the **[→CLG PID]** softkey to access the Cooling Discharge Air Control PID screen. See Table 53 for screen function information.

Table 53 — Discharge Air Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Effective Disch Air Set Point (non-adjustable)	Displays the current discharge air set point based on any resets
Discharge Air Temperature (non-adjustable)	Displays the current discharge air temperature
Discharge Air Temp Set Point (adjustable)	Displays the current discharge air set point less any resets
Disch Air Temp Sensor Offset (adjustable)	Displays the current discharge air sensor offset value
[→Prev]	Softkey access to previous screen
[→CLG PID]	Softkey access to cooling PID settings

COOLING DISCHARGE AIR CONTROL PID

Access: Discharge Air screen, [→CLG PID] softkey

The Cooling Discharge Air Control PID screen (see Fig. 72) allows the user to change the Cooling Sample Time, Proportional, Integral and Derivative gains plus the Loop dead band and the Ramp Interval. Care should be taken before changing any settings on this screen.

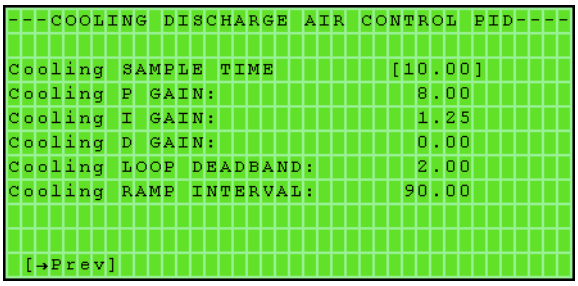


Fig. 72 — Cooling Discharge Air Control PID Screen

Click the **[→PREV]** softkey to return to the Discharge Air screen. See Table 54 for screen function information.

Table 54 — Cooling Discharge Air Control PID Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Cooling SAMPLE TIME (adjustable)	Shows the current Sample Time
Cooling P GAIN (adjustable)	Shows the current Proportional Gain
Cooling I GAIN (adjustable)	Shows the current Integral Gain
Cooling D GAIN (adjustable)	Displays the current Derivative Gain
Cooling LOOP DEADBAND (adjustable)	Displays the current Loop Deadband
Cooling RAMP INTERVAL (adjustable)	Displays the current Cooling Ramp Interval
[→Prev]	Softkey access to previous screen

TEMPERATURE

Access: Home Screen

The Temperature screen (see Fig. 73) allows the user to view the supply air, outside air, leaving water and entering water temperatures.

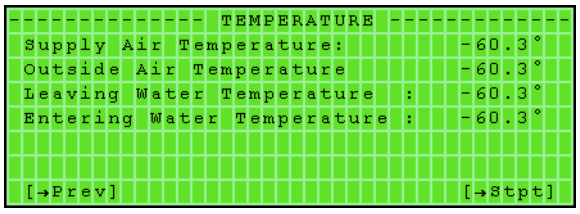


Fig. 73 — Temperature Screen

Click the **[→PREV]** softkey to return to the Home screen or click the **[→Stpt]** softkey to access the Temperature Set Point screen. See Table 55 for screen function information.

Table 55 — Temperature Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Supply Air Temperature (non-adjustable)	Displays the current Supply Air Temperature
Outside Air Temperature (non-adjustable)	Displays the current Outside Air Temperature
Leaving Water Temperature (non-adjustable)	Displays the current Leaving Water Temperature
Entering Water Temperature (non-adjustable)	Displays the current Entering Water Temperature
[→Prev]	Softkey access to previous screen
[→Stpt]	Softkey access to the Temperature Set Point screen

TEMPERATURE SET POINT

Access: Temperature screen, [→Stpt] softkey

The Temperature Set Point (see Fig. 74) screen allows the user to view effective cooling set point. Also, it allows the user to change the supply air set point, differential set point and high temperature alarm.

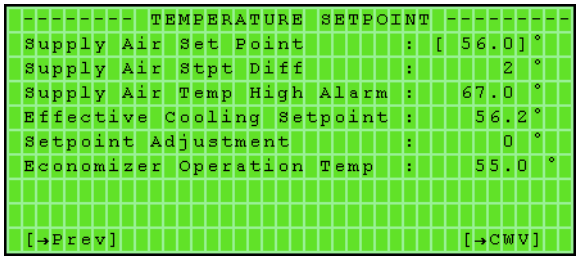


Fig. 74 — Temperature Set Point Screen

Click the **[→PREV]** softkey to return to the Temperature screen or click the **[→CMV]** softkey to access the Condenser Water Valve screen. See Table 56 for screen function information.

Table 56 — Temperature Set Point Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Supply Air Set Point (adjustable)	Displays the current Supply Air set point
Supply Air Stpt Diff (adjustable)	Displays the current Supply Air set point differential
Supply Air Temp High Alarm (adjustable)	Displays the current Supply Air high alarm set point
Effective Cooling Set Point (non-adjustable)	Displays the current effective cooling set point
Set Point Adjustment (adjustable)	Displays the current set point adjustment
Economizer Operation Temp (adjustable)	Displays the current setting at which the Economizer will start to operate
[→Prev]	Softkey access to previous screen
[→CMV]	Softkey access to the Condenser Water Valve screen

CONDENSER WATER VALVE

Access: Temperature Set Point screen, [→CMV] softkey

The Condenser Water Valve screen (see Fig. 75) allows the user to view the condenser water valve status. It also allows the user to change the condenser water valve delay time and to enable the alarm for the condenser water valve.

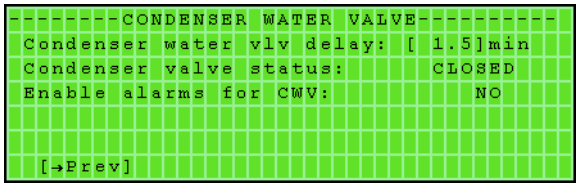


Fig. 75 — Condenser Water Valve Screen

Click the **[→PREV]** softkey to return to the Temperature Set Point screen. See Table 57 for screen function information.

Table 57 — Condenser Water Valve Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Condenser water vlv delay (adjustable)	Displays the current condenser water valve delay time
Condenser valve status (non-adjustable)	Displays the current condenser water valve status
Enable alarms for CWV (adjustable)	Displays the current status for the alarming of the condenser water valve
[→Prev]	Softkey access to previous screen

HEATING/COOLING (HEAT/COOL)

Access: Home Screen

The Heating/Cooling screen (see Fig. 76) allows the user to view the current unit mode, cooling PID loop strength, and various compressor information.

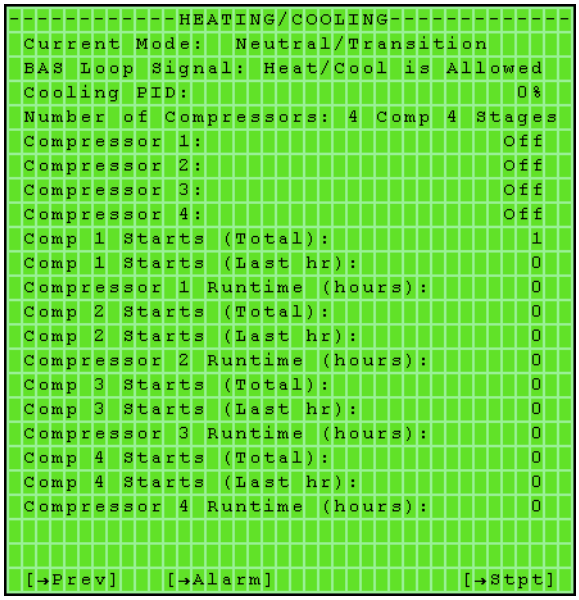


Fig. 76 — Heating/Cooling Screen

Click the **[→PREV]** softkey to return to the Home screen, click the **[→Alarm]** softkey to access the Alarm screen or click the **[→Stpt]** softkey to access the Heating/Cooling Set Point screen. See Table 58 for screen function information.

HEATING/COOLING SET POINT

Access: Heating/Cooling screen, [→Stpt] softkey

The Heating/Cooling Set Point screen (see Fig. 77) allows the user to reset start count and/or runtime for each compressor.

Fig. 77 — Heating/Cooling Set Point Screen

Click the **[→PREV]** softkey to return to the Heating/Cooling screen or click the **[→CLG PID]** softkey to access the Cooling Discharge Air Control PID screen. See Table 59 for screen function information.

Table 58 — Heating/Cooling Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Current Mode (non-adjustable)	Displays the current operating mode of the unit
BAS Loop Signal (non-adjustable)	Displays the current BAS Loop Signal
Cooling PID (non-adjustable)	Displays the current PID loop strength
Number of Compressors (non-adjustable)	Displays the current number of compressors and stages for the unit
Compressor 1 (non-adjustable)	Displays the current status of Compressor 1
Compressor 2 (non-adjustable)	Displays the current status of Compressor 2
Compressor 3 (non-adjustable)	Displays the current status of Compressor 3
Compressor 4 (non-adjustable)	Displays the current status of Compressor 4
Comp 1 Starts (Total) (non-adjustable)	Displays the current number of Compressor 1 starts since the last reset
Comp 1 Starts (Last hr) (non-adjustable)	Displays the current number of Compressor 1 starts in the last hour (sliding scale)
Compressor 1 Runtime (hours) (non-adjustable)	Displays the current Compressor 1 runtime in hours
Comp 2 Starts (Total) (non-adjustable)	Displays the current number of Compressor 2 starts since the last reset
Comp 2 Starts (Last hr) (non-adjustable)	Displays the current number of Compressor 2 starts in the last hour (sliding scale)
Compressor 2 Runtime (hours) (non-adjustable)	Displays the current Compressor 2 runtime in hours
Comp 3 Starts (Total) (non-adjustable)	Displays the current number of Compressor 3 starts since the last reset
Comp 3 Starts (Last hr) (non-adjustable)	Displays the current number of Compressor 3 starts in the last hour (sliding scale)
Compressor 3 Runtime (hours) (non-adjustable)	Displays the current Compressor 3 runtime in hours
Comp 4 Starts (Total) (non-adjustable)	Displays the current number of Compressor 4 starts since the last reset
Comp 4 Starts (Last hr) (non-adjustable)	Displays the current number of Compressor 4 starts in the last hour (sliding scale)
Compressor 4 Runtime (hours) (non-adjustable)	Displays the current Compressor 4 runtime in hours
[→Prev]	Softkey access to previous screen
[→Alarm]	Softkey access to the Alarm screen
[→Stpt]	Softkey access to the Set Point screen

Table 59 — Heating/Cooling Set Point Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Compressor 1 Start Count Reset (adjustable)	Displays the state of Compressor 1 start count reset
Compressor 1 Runtime Reset (adjustable)	Displays the state of Compressor 1 runtime reset
Compressor 2 Start Count Reset (adjustable)	Displays the state of Compressor 2 start count reset
Compressor 2 Runtime Reset (adjustable)	Displays the state of Compressor 2 runtime reset
Compressor 3 Start Count Reset (adjustable)	Displays the state of Compressor 3 start count reset
Compressor 3 Runtime Reset (adjustable)	Displays the state of Compressor 3 runtime reset
Compressor 4 Start Count Reset (adjustable)	Displays the state of Compressor 4 start count reset
Compressor 4 Runtime Reset (adjustable)	Displays the state of Compressor 4 runtime reset
[→Prev]	Softkey access to previous screen
[→CLG PID]	See the Temp Reset section for the Cooling PID information

To reset compressor starts and/or runtimes:

1. Move the brackets to the value that needs resetting and press **ENTER**.
2. Click on the **[DECR]** or the **[INCR]** softkeys to change the value to "Yes."
3. Click **[OK]** to reset the number to "0". For these parameters the value will revert to "No" after several seconds.
4. Click the **[CANCEL]** softkey to abandon the reset before any resets occur. Clicking the **[CANCEL]** softkey after a reset has occurred will not bring back the compressor start count and runtime values.

SCHEDULE

Access: Home Screen

The Schedule screen (see Fig. 78) allows the user to configure a weekly schedule.

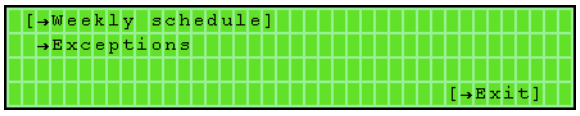


Fig. 78 — Schedule Screen

Click the **[→Exit]** softkey to return to the Home screen. See Table 60 for screen function information.

Table 60 — Schedule Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
→Weekly schedule	Allows access to the unit weekly schedule. Press **ENTER** to access this screen.
→Exceptions	Allows access to the Exception screen. Press **ENTER** to access this screen.
[→Exit]	Softkey access to Home screen

VIEW AND EDIT DAILY SCHEDULE

Access: Schedule screen, select →Weekly schedule, press ENTER

The View and Edit Daily Schedule screen (see Fig. 79) allows the user to configure the unit on /off schedule for each day of the week.

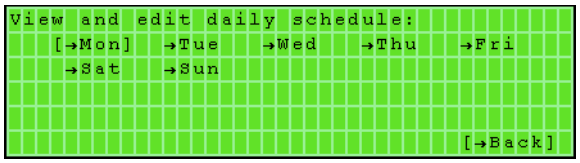


Fig. 79 — View and Edit Daily Schedule Screen

Click the **[→Back]** softkey to return to the Schedule screen. See Table 61 for screen function information.

Table 61 — View and Edit Daily Schedule Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
[→Mon], [→Tue], etc.	Move the brackets to any day and press **ENTER** to access the schedule for that day
[→Back]	Softkey return to Schedule screen

WEEKLY SCHEDULE

View and Edit Daily Schedule screen, select [→Day], press ENTER

The Weekly Schedule screen (see Fig. 80) allows the user to configure unit on/off times.

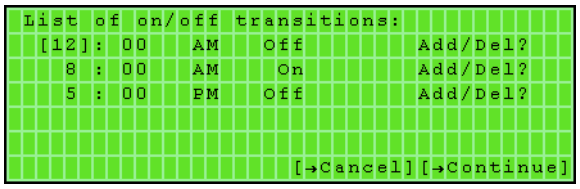


Fig. 80 — Weekly Schedule Screen

Move the brackets to either the hour, minutes, AM/PM, On/Off or Add/Del? to make the necessary changes.

Click the **[→Cancel]** softkey to return to the Schedule screen or the **[→Continue]** softkey to access other days of the week to which to save the schedule.

SAVE DAILY SCHEDULE

Access: Weekly Schedule screen, [→Continue] softkey

The Save Daily Schedule screen (see Fig. 81) allows the user to save the schedule that was made for one day of the week to other days of the week.

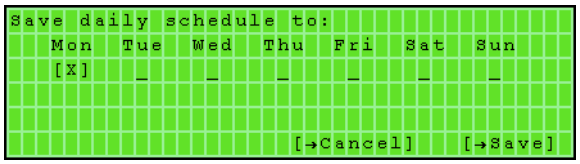


Fig. 81 — Save Daily Schedule Screen

1. Move the brackets to the day and press **ENTER**.
2. Click on the **[DECR]** or the **[INCR]** softkeys to display an **X** below the desired day.
3. Click **[OK]** to save the schedule for that day, or click **[CANCEL]** to abandon the change.
4. After all the days have been scheduled, click the **[→Save]** softkey to save the daily schedules or click the **[→Cancel]** softkey to not save the schedule.

USERPW

Access: Home screen

Hotkey Access:

Handheld BACview: Fn + 1

Virtual BACview: Ctrl + 1

The UserPW screen (see Fig. 82) allows a User password to be configured for the unit.

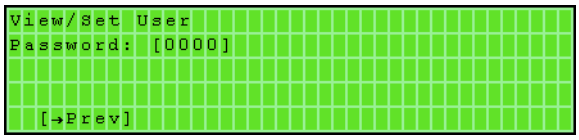


Fig. 82 — UserPW Screen

Press **ENTER** to change the User password. It is recommended not to change the user password. It is configured at the factory as 1111. Click the **[→Prev]** softkey to return to the Home screen.

BACNET

Access: Home screen

Hotkey Access:

Handheld BACview: Fn + 5

Virtual BACview: Ctrl + 5

The BACnet screen (Fig. 83) allows the user to configure the unit for a network connection.

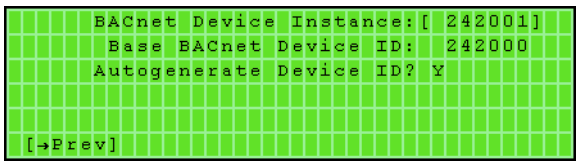


Fig. 83 — BACnet Screen

Click the **[→Prev]** softkey to return to the Home screen. See Table 62 for screen function information.

Table 62 — BACnet Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
BACnet Device Instance (adjustable)	Displays the existing device instance number
Base BACnet Device ID (adjustable)	Displays the existing base BACnet device I.D.
Autogenerate Device ID? (adjustable)	Displays the current setting for the autogenerate device I.D.

SET CURRENT TIME/DATE

Hotkey Access:

Handheld BACview: Fn + 2

Virtual BACview: Ctrl + 2

The Set Current Time/Date screen (see Fig. 84) allows the time and date to be set.

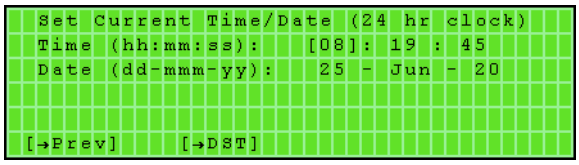


Fig. 84 — Set Current Time/Date Screen

1. Move the bracket using the arrow keys to the hour, minute, seconds, day, month or year values.
2. Press **ENTER** to change the value. The screen softkeys will appear which will allow the value to be changed.
3. Click the **[→INCR]** or **[→DECR]** softkeys to change the value.
4. To save the change click the **[→OK]** softkey. To cancel the change, click the **[→CANCEL]** softkey.

DAYLIGHT SAVINGS TIME

Hotkey Access:

Handheld BACview: Fn + 3

Virtual BACview: Ctrl + 3

The Daylight Savings Time screen (see Fig. 85) allows the values for daylight savings time to be changed. The start time (military) and length (days) of the DST can be changed. Also, the start and end times for DST can be changed.

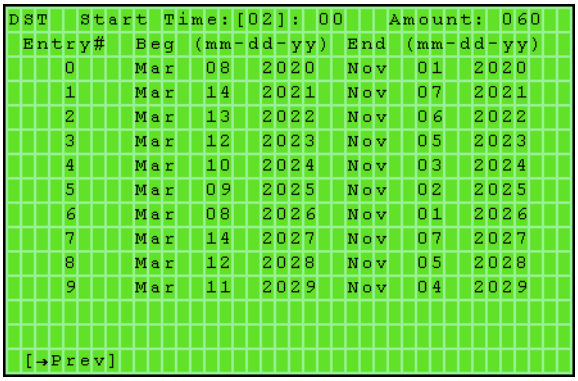


Fig. 85 — Daylight Savings Time Screen

1. Move the bracket using the arrow keys to the value that needs to be changed.
2. Press **ENTER** to change the value. The screen softkeys will appear which will allow the value to be changed.
3. Click the **[→INCR]** or **[→DECR]** softkeys to change the value.
4. To save the change click the **[→OK]** softkey. To cancel the change, click the **[→CANCEL]** softkey.

BACNET INSTANCE AND ID

Hotkey Access:

BACview: Fn + 5

Virtual BACview: Ctrl + 5

The BACnet Instance and ID screen (see Fig. 86) allows the values for the device instance, device ID and the Autogenerate Device ID to be changed.

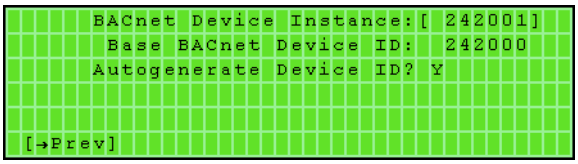


Fig. 86 — BACnet Instance and ID Screen

1. Move the bracket using the arrow keys to the value that needs to be changed.
2. Press **ENTER** to change the value. The screen softkeys will appear which will allow the value to be changed.
3. Click the **[→INCR]** or **[→DECR]** softkeys to change the value.
4. To save the change click the **[→OK]** softkey. To cancel the change, click the **[→CANCEL]** softkey.

KEYPAD CONFIGURATION

Hotkey Access:

BACview: Fn + 6

Virtual BACview: Ctrl + 6

The Keypad Configuration screen (see Fig. 87) allows the value for the time the BACview handheld keypad is kept lit.

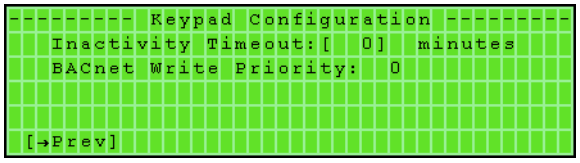


Fig. 87 — Keypad Configuration Screen

1. Move the bracket using the arrow keys to the value that needs to be changed.
2. Press **ENTER** to change the value. The screen softkeys will appear which will allow the value to be changed.
3. Click the **[→INCR]** or **[→DECR]** softkeys to change the value.
4. To save the change click the **[→OK]** softkey. To cancel the change, click the **[→CANCEL]** softkey.

CO2

Access: Home Screen, Unit Operation Screen

When **CO2 Sensor Opt** is enabled at the Unit Operation Set Point screen (see Fig. 59), the Home screen and Unit Operation screen provide additional CO_2-related options and information, as illustrated in Fig. 88 and Fig. 89.

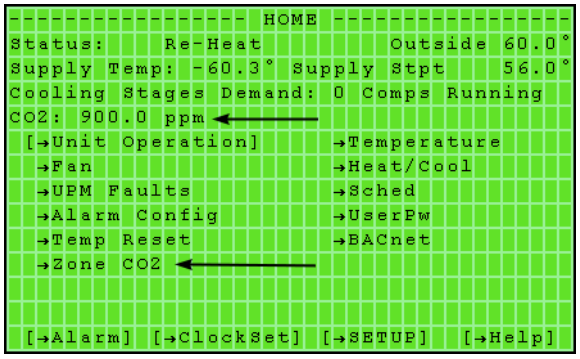


Fig. 88 — Home Screen with Zone CO2 Option

See Table 63 for Home screen CO_2 function information.

Table 63 — Home Screen CO_2 Functions

FIELD / KEY	FUNCTION / INFORMATION
CO2	Displays the current CO_2 sensor reading
→Zone CO2	Click to display the Zone CO_2 Control screen (see Fig. 90)

Fig. 89 — Unit Operation Screen with CO_2 Sensor Information

See Table 64 for Unit Operation screen CO_2 function information.

Table 64 — Unit Operation Screen CO_2 Functions

FIELD / KEY	FUNCTION / INFORMATION
CO2 Sensor	Displays the current CO_2 sensor reading

The Zone CO2 Control screen (see Fig. 90) allows the user to view the current CO_2 level.

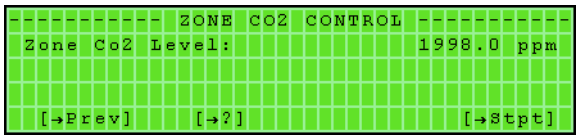


Fig. 90 — Zone CO2 Control Screen

Click the **[→?]** softkey to access the CO2 Help screen. Click the **[→Stpt]** softkey to access the Zone CO2 Set Point screen. See Table 64 for Unit Operation screen CO_2 function information.

Table 65 — Zone CO2 Control Screen Functions

FIELD / KEY	FUNCTION / INFORMATION
Zone CO2 Level	Displays the current CO_2 sensor reading
[→?]	Click to access the CO_2 Help screen (see Fig. 91)
[→Stpt]	Click to access the Zone CO_2 Set Point screen (see Fig. 92)

The CO2 Help screen (see Fig. 91) offers guidance when either **CO2 Mon + Damper** or **CO2 Monitoring** is selected on the Unit Operation Set Point screen (see Fig. 59), but the controller is not reading the sensor.

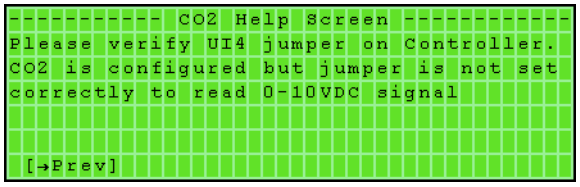


Fig. 91 — CO2 Help Screen

The CO2 Help screen directs the user to verify that the jumper for UI-04 is in the correct position (0-10V). If the UI-04 jumper is in the correct position, this Help screen option is not shown.

The Zone CO2 Set Point screen (see Fig. 92) allows the user to change the CO_2 set point

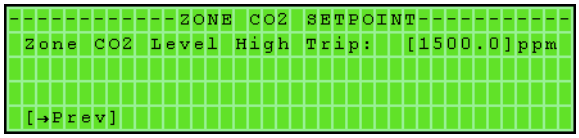


Fig. 92 — Zone CO2 Set Point Screen

To change the CO_2 set point:

1. Press **ENTER** to change the value. The screen softkeys will appear which will allow the value to be changed.
2. Click the **[→INCR]** or **[→DECR]** softkeys to change the value.
3. To save the change, press the **[→OK]** softkey. To cancel the change, press the **[→CANCEL]** softkey.

SERVICE

⚠CAUTION

Improper phase sequence will cause scroll compressor failure due to reverse rotation.

Compressor Rotation

To determine whether or not the compressor is rotating in the proper direction:

1. Connect service gauges to 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:
3. Turn off power to the unit and tag disconnect.
4. Reverse any 2 of the unit power leads.
   Reapply power to the unit. The suction and discharge pressure levels should now move to their normal start-up levels.
   Also, check that the fan is rotating in the proper direction.

Incorrect wiring can lead to improper phase sequence resulting in scroll compressor failure due to reverse rotation. Signs of reverse rotation include:

- Excessive noise
- Reverse rotation of 3 phase indoor fan
- Rapid temperature rise on suction tube
- No pressure differential
- No cooling

Correct immediately. Shut off power at disconnect and switch any 2 power leads at unit terminal block or pigtails.

Fan Motor Replacement

If required, replace the fan motor with an equal or better type and efficiency motor with equal horsepower. The motor must be rated for a VFD or inverter application. Do not change the horsepower unless there is a system design requirement change and VFD size analysis.

CHECK/CHANGE VFD OUTPUT CURRENT LIMIT

The VFD provides additional fan motor protection by limiting the output current to a programmed value. This value has been factory set according to the factory-installed motor and VFD sizing options.

If the VFD and/or motor is replaced, the VFD setup mode parameter "tHr1" should be reprogrammed to the following calculated values for optimum motor protection and operating range:

For VFD size about equal to motor:

tHr1 = 100*motor nameplate Amps / VFD rated output Amps

MAINTENANCE

Cleaning Unit Exterior

Unit exterior panels should be wiped down using a damp soft cloth or sponge with a mixture of warm water and a mild detergent.

Coil Cleaning

Hot water, steam, and direct expansion coils must be cleaned at least once a year to maintain peak performance. Dirty coils can contribute to decreased heating or cooling capacity and efficiency, increased operating costs, and compressor problems on direct expansion systems. Dirt, grease, and other oils can also reduce the wettability of the coil surfaces, which can result in moisture blow-off from cooling coils and resulting water leakage problems. If the grime on the surface of the coils becomes wet, which commonly occurs with cooling coils, microbial growth (mold) can result, causing foul odors and health-related indoor air quality problems.

Coils can become dirty over a period of time, especially if air filter maintenance is neglected. Coils should be inspected regularly and cleaned when necessary. Clean coils with a vacuum cleaner, fresh water, compressed air, or a bristle brush (not wire). Do **not** use high-pressure water or air—damage to fins may result. Backflush coil to remove debris. Commercial coil cleaners may also be used to help remove grease and dirt. Steam cleaning is NOT recommended. After cleaning, use a fin comb of the correct fin spacing when straightening mashed or bent coil fins.

Units installed in corrosive environments should be cleaned as part of a planned maintenance schedule. In this type of application, all accumulations of dirt should be cleaned off the coil.

Inspection

Check coil baffles for tight fit to prevent air from bypassing the coil. Check panels for air leakage, particularly those sealing the fan and coil compartments. Check for loose electrical connections, compressor oil levels, proper refrigerant charge, and refrigerant piping leaks. Before start-up, be sure all optional service valves are open.

Air Filters

The 50BV single-piece units come with 1-in. filters. The standard 1-in. filters provide lower pressure drop and longer filter service intervals. The 50BV modular units come with 4-in. filters.

Inspect air filters every 30 days and replace filters as necessary.

Replacement filters should have a minimum efficiency rating of MERV 6 per ASHRAE rating procedures and be rated for up to 625 fpm velocity. Job requirements or local codes may specify higher minimum ratings.

Condensate Drains

Clean the drain line and unit drain pan at the start of each cooling season. Check flow by pouring water into the drain.

Water-Cooled Condensers

Water-cooled condensers may require cleaning of scale (water deposits) due to improperly maintained closed-loop water systems. Sludge build-up may need to be cleaned in an open tower system due to inducted contaminants.

Local water conditions may cause excessive fouling or pitting of tubes. Condenser tubes should be cleaned at least once a year, or more often if the water is contaminated.

Proper water treatment can minimize tube fouling and pitting. If such conditions are anticipated, water treatment analysis is recommended. Refer to the System Design Manual, Part 5, for general water conditioning information.

⚠ CAUTION

Follow all safety codes. Wear safety glasses and rubber gloves when using inhibited hydrochloric acid solution. Observe and follow acid manufacturer's instructions.

Isolate the supply and return water connections when removing piping to the condenser.

Clean condensers with an inhibited hydrochloric acid solution. The acid can stain hands and clothing and attack concrete, and, without inhibitor, can attack steel. Cover surroundings to guard against splashing. Vapors from vent pipe are not harmful, but take care to prevent liquid from being carried over by gases.

Warm solution acts faster, but cold solution is just as effective if applied for a longer period.

GRAVITY FLOW METHOD

Do not add solution faster than the vent can exhaust the generated gases.

When condenser is full, allow the solution to remain overnight; then drain the condenser and flush with clean water. Follow acid manufacturer's instructions. Refer to Fig. 93.

FORCED CIRCULATION METHOD

Fully open the vent pipe when filling the condenser. The vent may be closed when the condenser is full and the pump is operating.

Regulate the flow to the condenser with a supply line valve. If the pump is the non-overloading type, the valve may be fully closed while the pump is running.

For average scale deposit, allow the solution to remain in the condenser overnight. For heavy scale deposit, allow a full 24 hours. Drain the condenser and flush with clean water. Follow acid manufacturer's instructions. Refer to Fig. 94.

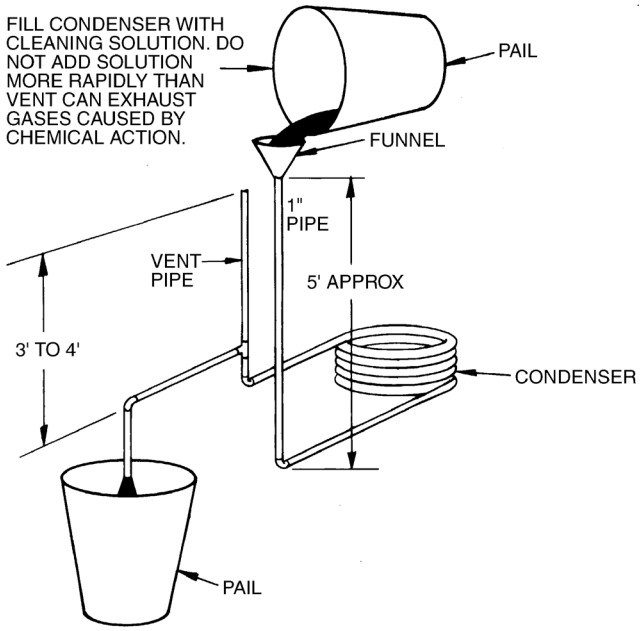


Fig. 93 — Gravity Flow Method

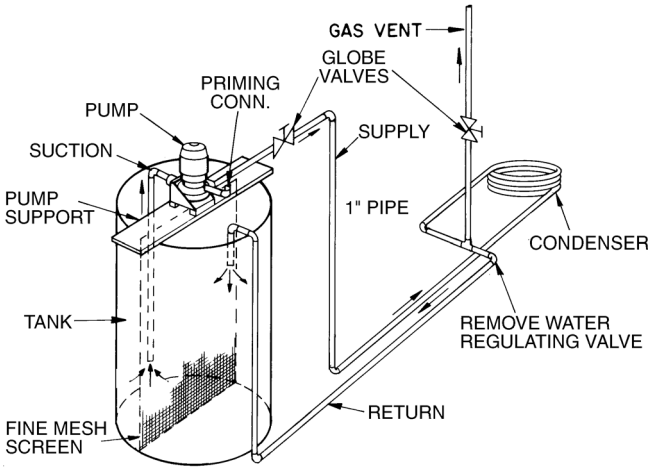


Fig. 94 — Forced Circulation Method

Fan Motor Lubrication

The fan motor was properly lubricated at the time of manufacture. Lubricate the fan motor(s) with SAE-20 (Society of Automotive Engineers) non-detergent electric oil.

IMPORTANT: PILLOW BLOCK STYLE FAN BEARINGS: Bearings have been prelubricated with high quality grease. Bearings must be relubricated once every 6 months or every 2500 hours of operation, whichever comes first.

Fan Bearing Lubrication

Inspect the fan bearings for proper lubrication every 6 month or 2500 hours of operation, whichever comes first. Standard units have grease fittings on the fan shaft bearings, located on each side of the blower wheel. Lubricate bearings with a lithium-based grease (NLGI Grade 2).

Fan Sheaves

Factory-supplied drives are pre-aligned and tensioned; however, it is recommended that the belt tension and alignment be checked before starting the unit. Always check the drive alignment after adjusting belt tension.

To install sheaves on the fan or motor shaft:

1. Isolate power to the unit.
2. Remove side unit access panel(s).
3. Remove any rust-preventive coating on the fan shaft.
4. Make sure the shaft is clean and free of burrs. Add grease or lubricant to bore of sheave before installing.
5. Mount sheave on the shaft; to prevent bearing damage, do not use excessive force.

Each factory-assembled fan, shaft, and drive sheave assembly is precision aligned and balanced. If excessive unit vibration occurs after field replacement of sheaves, the unit should be rebalanced. To change the drive ratio, follow the steps in the Evaporator Fan Performance Adjustment section (page 79).

After 1 to 3 minutes of operation, check the belt tension. Also check tension frequently during the first 24 hours of operation and adjust if necessary. Periodically check belt tension throughout the run-in period, which is normally the initial 72 hours of operation.

ALIGNMENT

Make sure that fan shafts and motor shafts are parallel and level. The most common causes of misalignment are nonparallel shafts and improperly located sheaves. Where shafts are not parallel, belts on one side are drawn tighter and pull more than their share of the load. As a result, these belts wear out faster, requiring the entire set to be replaced before it has given maximum service. If misalignment is in the sheave, belts enter and leave the grooves at an angle, causing excessive belt and sheave wear.

Shaft Alignment

Check shaft alignment by measuring the distance between the shafts at 3 or more locations. If the distances are equal, then the shafts are parallel.

Sheave Alignment

1. To check the location of the fixed sheaves on the shafts, use a straightedge or a piece of string. If the sheaves are properly aligned, the string will touch them at the points indicated by the arrows in Fig. 95. Rotate each sheave a half revolution to determine whether the sheave is wobbly or the drive shaft is bent. Correct any misalignment.
2. With sheaves aligned, tighten cap screws evenly and progressively.
   NOTE: There should be a 1/8-in. to 1/4-in. gap between the mating part hub and the bushing flange. If the gap is closed, the bushing is probably the wrong size.
3. With taper-lock bushed hubs, be sure the bushing bolts are tightened evenly to prevent side-to-side pulley wobble. Check by rotating sheaves and rechecking sheave alignment. When substituting field-supplied sheaves for factory-supplied sheaves, only the motor sheave should be changed.

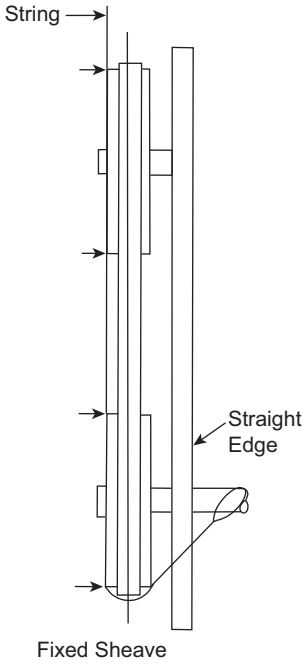


Fig. 95 — Sheave Alignment

Evaporator Fan Performance Adjustment

To change fan speeds from factory settings:

1. Shut off unit power supply.
2. Loosen nuts on the 4 carriage bolts in the mounting base. Using adjusting bolts and plate, slide the motor and remove the belt.
3. Loosen movable-pulley flange setscrew.
4. Screw the movable flange toward the fixed flange to increase speed, and away from the fixed flange to decrease speed. Increasing the fan speed increases the load on the motor. Do not exceed the maximum speed specified in Tables 2 and 3.
5. Set the movable flange at nearest keyway of the pulley hub and tighten the setscrew. (See Tables 2 and 3 for speed change for each full turn of pulley flange.)
6. Replace and tighten the belts (see Belt Tension Adjustment section).
7. Restore power to the unit.

To align fan and motor pulleys:

1. Loosen fan pulley setscrews.
2. Slide fan pulley along fan shaft.
3. Make angular alignment by loosening motor from mounting plate.
4. Restore power to unit.

BELT TENSION ADJUSTMENT

Using a gauge, apply 4 lb of force to the center of the belt and adjust the tension until a deflection of 1/64-in. is achieved for every inch of shaft center distance. See Fig. 96.

Ideal belt tension is the lowest value under which belt slip will not occur at peak load conditions.

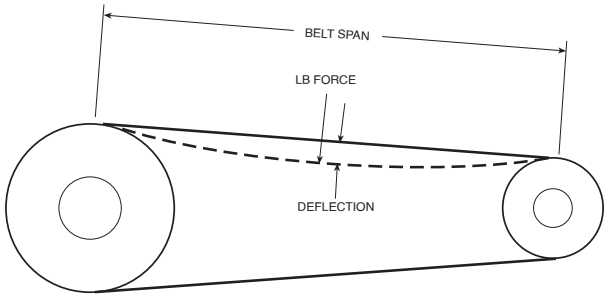


Fig. 96 — Fan Belt Tension

Compressor Oil

All units are factory charged with oil. It is not necessary to add oil unless compressor(s) is removed from the unit. If necessary, oil can be removed/charged via Schrader fitting. Operate the system at high evaporator temperature prior to oil recharge to assist oil return to the compressor(s) from other system components. If necessary, recharge the system as shown in Table 66.

Table 66 — Oil Recharge

50BV UNIT	SIZE	COMPRESSOR	OIL CHARGE (oz)	OIL TYPE
J	020	ZP94KCE	81	3MA-POE
	024	ZP103KCE	106	
	028	ZP137KCE	106	
	034	ZP182KCE	106	
T, V, W	034	ZP182KCE	106	
	044	ZP120KCE	106	
	054	ZP137KCE	106	
	064	ZP182KCE	106	

TROUBLESHOOTING

Refer to Tables 67 and 68 to determine the possible cause of the problem and the associated procedure necessary to correct it.

Table 67 — Unit Troubleshooting

PROBLEM	POSSIBLE CAUSE	CORRECTION PROCEDURE
Unit Will Not Start.	Loss of unit power	Check power source. Check fuses, circuit breakers, disconnect switch. Check electrical contacts.
	Unit voltage not correct	Check and correct.
	Open fuse	Check for short circuit in unit.
	Open protection device	Check relays (phase monitor option), contacts, pressure switches.
	Unit or motor contactor out of order	Test and replace if necessary.
Fan Does Not Operate.	Contactor or relay overload or out of order	Test and replace if necessary.
	VFD not running	Confirm VFD parameters set.
	Motor defective	Test and replace if necessary.
	Broken belt	Replace belt.
	Loose electrical contact	Tighten contact.
Compressor is Noisy, But Will Not Start.	Under voltage	Check and correct.
	Defect in compressor motor	Replace compressor.
	Missing phase	Check and correct.
	Compressor seized	Check and replace if necessary.
Compressor Starts, But Does Not Continue to Run.	Compressor or contact defect	Test and replace if necessary.
	Unit is under charged	Check and correct any leaks. Add refrigerant.
	Unit is too big	Check load calculation.
	Compressor is overloaded	Check protection device and replace. Check for missing phase. Check TXV. Check temperature in suction discharge line.
Unit is Noisy.	Compressor noise	Check TXV and replace if necessary. Compressor rotation incorrect; check and correct. Check internal noise.
	Tube vibration or condenser water problem	Check and correct.
	Unit panel or part vibrating	Check and tighten appropriate part.
Unit Runs Continuously, But Has Low Capacity.	Unit is too small	Check load calculation.
	Low refrigerant or non-condensing gas present	Check for leaks and add refrigerant or gas as necessary.
	Compressor defect	Check pressure and amps. Replace if necessary.
	Insufficient flow of refrigerant in evaporator	Check filter drier and replace if necessary. Check TXV and adjust or replace if necessary. Check position of TXV bulb and equalizer.
	Oil in evaporator	Drain evaporator.
	Low airflow	Check filters, and clean or replace as necessary. Check coils, and clean as necessary. Check for restrictions in ductwork. Check fan rotation and adjust. Check fan motor. Check belts for wear.
High Discharge Pressure.	Low waterflow in condenser	Purge air.
	Dirty condenser tubes.	Clean condenser.
	High temperature in condenser water	Check water tower fans and pumps.
	Overcharged	Check and reclaim excess charge. Adjust subcooling.
	Non-condensing gas present	Verify and correct.

LEGEND

TXV — Thermostatic Expansion Valve
VFD — Variable Frequency Drive

Table 68 — CV Units LED Diagnostic Codes[a]

NO. OF BLINKS	DESCRIPTION
1	1st Stage High-Pressure Lockout
2	1st Stage Low-Pressure Lockout
3	2nd Stage High-Pressure Lockout
4	2nd Stage Low-Pressure Lockout
5	Freeze Protection Lockout[b]
6	Condensate Overflow Lockout[b]

NOTE(S):

a. The main control board has a red LED (light-emitting diode) for fault indication and will blink a code as described above. Count the number of blinks to determine the lockout condition.
b. Freeze protection and condensate overflow lockout require optional sensors.

SCHEMATICS

Refer to Fig. 97-104 for voltage and wiring schematics.

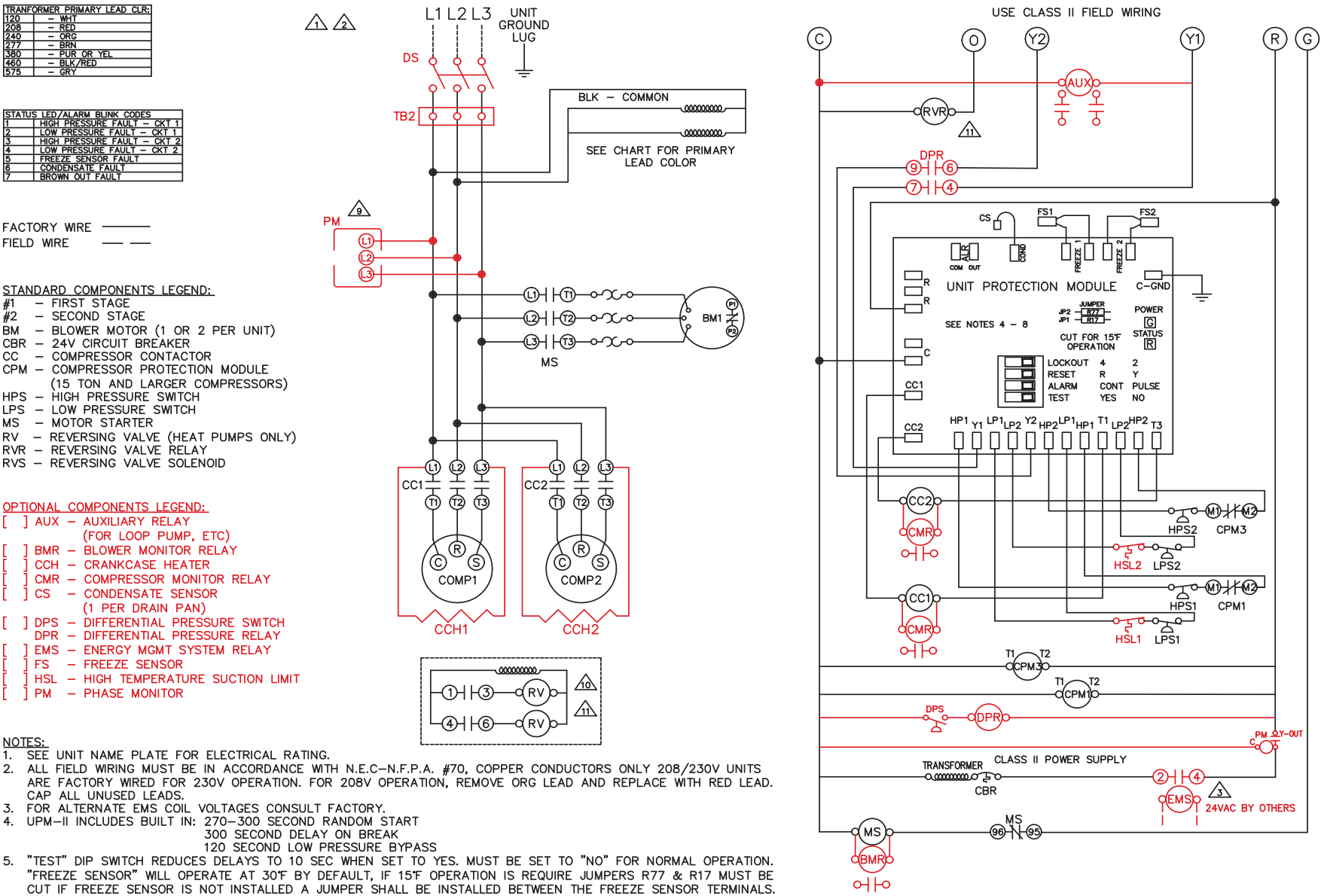
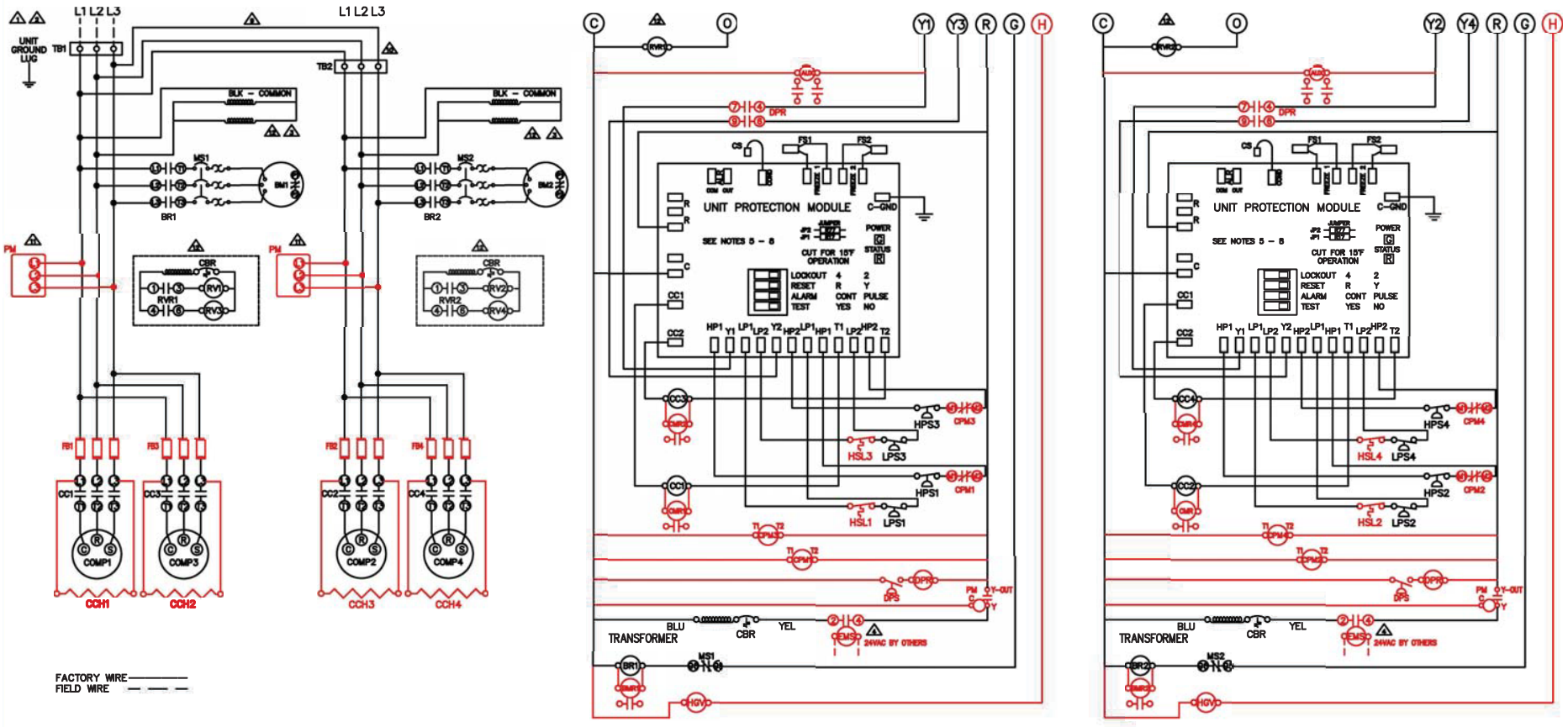


Fig. 97 — 50BVT,V 034 Constant Volume Wiring Diagram



FACTORY WIRE ————
FIELD WIRE — — —

STANDARD COMPONENTS LEGEND:

BM	– BLOWER MOTOR
BR	– BLOWER RELAY
CBR	– 24V CIRCUIT BREAKER
CC	– COMPRESSOR CONTACTOR
FS	– FREEZE SENSOR
HPS	– HIGH PRESSURE SWITCH
LPS	– LOW PRESSURE SWITCH
MS	– MOTOR STARTER
P1,P2	– MOTOR THERMAL PROTECTION (WHEN PROVIDED)
RV	– REVERSING VALVE (HEAT PUMPS)
RVR	– REVERSING VALVE RELAY (HEAT PUMPS)
TB1	– MAIN SUPPLY VOLTAGE TERMINAL BLOCK
TB2	– SECONDARY SUPPLY VOLTAGE TERMINAL BLOCK

OPTIONAL COMPONENTS LEGEND:

[ ] AUX	– AUXILIARY RELAY (FOR LOOP PUMP, ETC)
[ ] BMR	– BLOWER MOTOR RELAY
[ ] CCH	– CRANKCASE HEATER
[ ] CMR	– COMPRESSOR MONITOR RELAY
[ ] CS	– CONDENSATE SENSOR (1 PER DRAIN PAN)
[ ] DPS	– DIFFERENTIAL PRESSURE SWITCH
[ ] DPR	– DIFFERENTIAL PRESSURE RELAY
[ ] EMS	– ENERGY MGMT SYSTEM RELAY
[ ] HGV	– HOT GAS VALVE SOLENOID (USED WITH DDC CONTROLLER ONLY)
[ ] HSL	– HIGH TEMPERATURE SUCTION LIMIT
PM	– PHASE MONITOR

STATUS LED/ALARM BLINK CODES

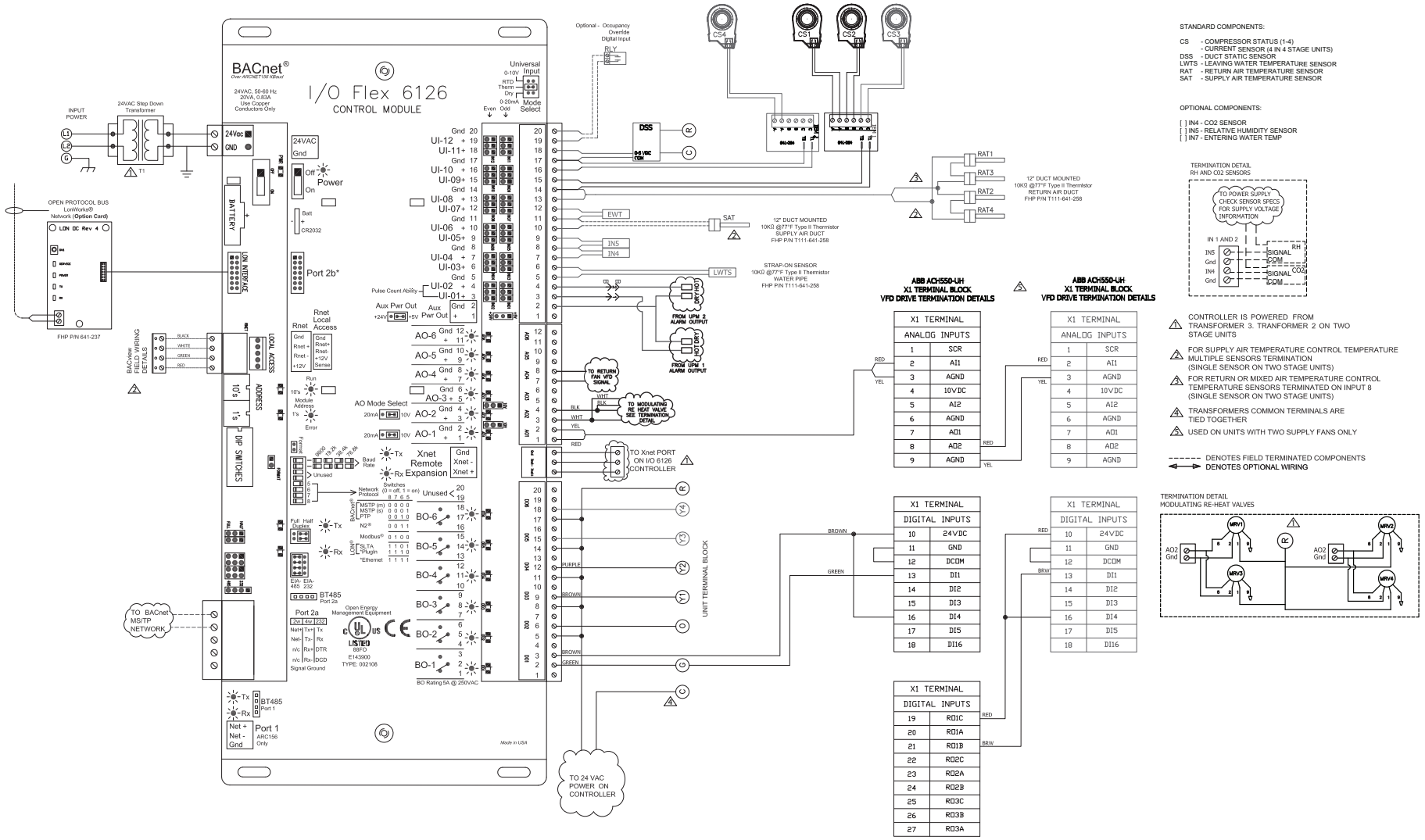
1	HIGH PRESSURE FAULT – CKT 1
2	LOW PRESSURE FAULT – CKT 1
3	HIGH PRESSURE FAULT – CKT 2
4	LOW PRESSURE FAULT – CKT 2
5	FREEZE SENSOR FAULT
6	CONDENSATE FAULT
7	BROWN OUT FAULT

TRANFORMER PRIMARY LEAD CLR:

208	– RED
240	– ORG
380	– PUR OR YEL
460	– BLK/RED
575	– GRY

NOTES:
1. SEE UNIT NAME PLATE FOR ELECTRICAL RATING
2. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C–N.F.P.A. #70
3. 208/230V UNITS ARE FACTORY WIRED FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEADS.
4. FOR ALTERNATE EMS COIL VOLTAGES CONSULT FACTORY.
5. UPM–II INCLUDES BUILT IN: 270–300 SECOND RANDOM START
   5 MINUTE DELAY ON BREAK
   120 SECOND LOW PRESSURE BYPASS
   5 SECOND STAGE DELAY
6. "TEST" JUMPER PIN REDUCES DELAYS TO 5 SEC WHEN SET TO YES.
7. "FREEZE SENSOR" JUMPER PIN MUST BE SET TO NO IF FREEZE SENSOR IS NOT INSTALLED.
8. "ALARM OUTPUT" JUMPER PIN MUST BE SET TO PULSE IF BLINKING T–STAT SERVICE LIGHT IS DESIRED.
9. WIRE FOR LINE CONNECTION BETWEEN TB1 AND TB2 SUPPLIED BY FACTORY TO BE RECONNECTED IN THE FIELD.
10. WIRE FOR CLASS II VOLTAGE FACTORY SUPPLIED TO BE TERMINATED IN THE FIELD WIRES LABELED A, B, C, D AND E
11. CHECK PHASE ROTATION ON ALL SCROLL COMPRESSOR UNITS. REVERSE ROTATION WILL DAMAGE THE COMPRESSOR AND VOID UNIT WARRANTY.
12. REVERSING VALVES AND RELAYS ARE NOT PRESENT ON STRAIGHT COOL UNITS. ONLY 2 UNIT TRANSFORMERS ARE REQUIRED.

Fig. 98 — 50BVT,V 044-064 Constant Volume Wiring Schematic



NOTE: Jumper installed for condenser water flow switch when not supplied.

Fig. 99 — 50BVJ,W Variable Air Volume Control Wiring Schematic

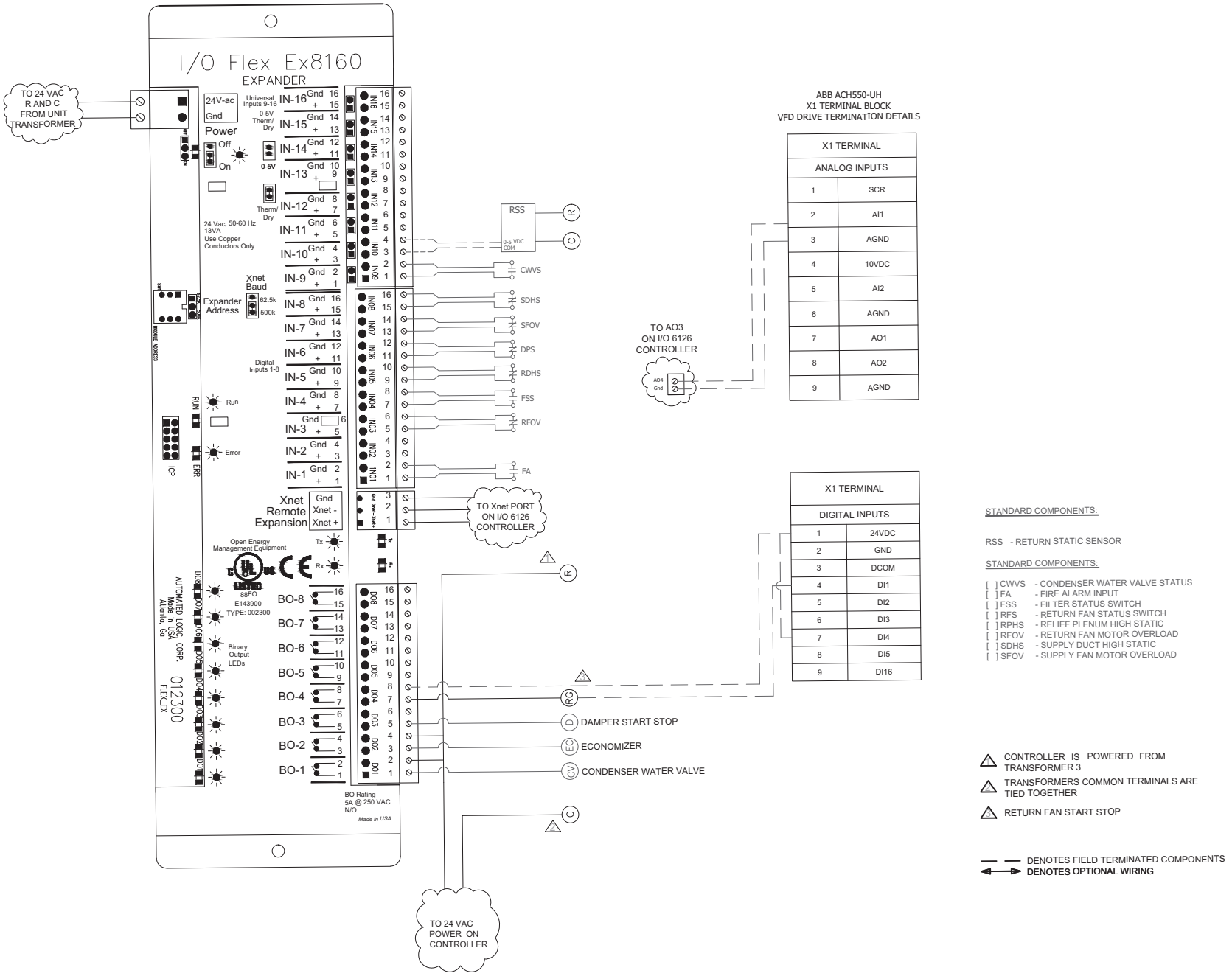
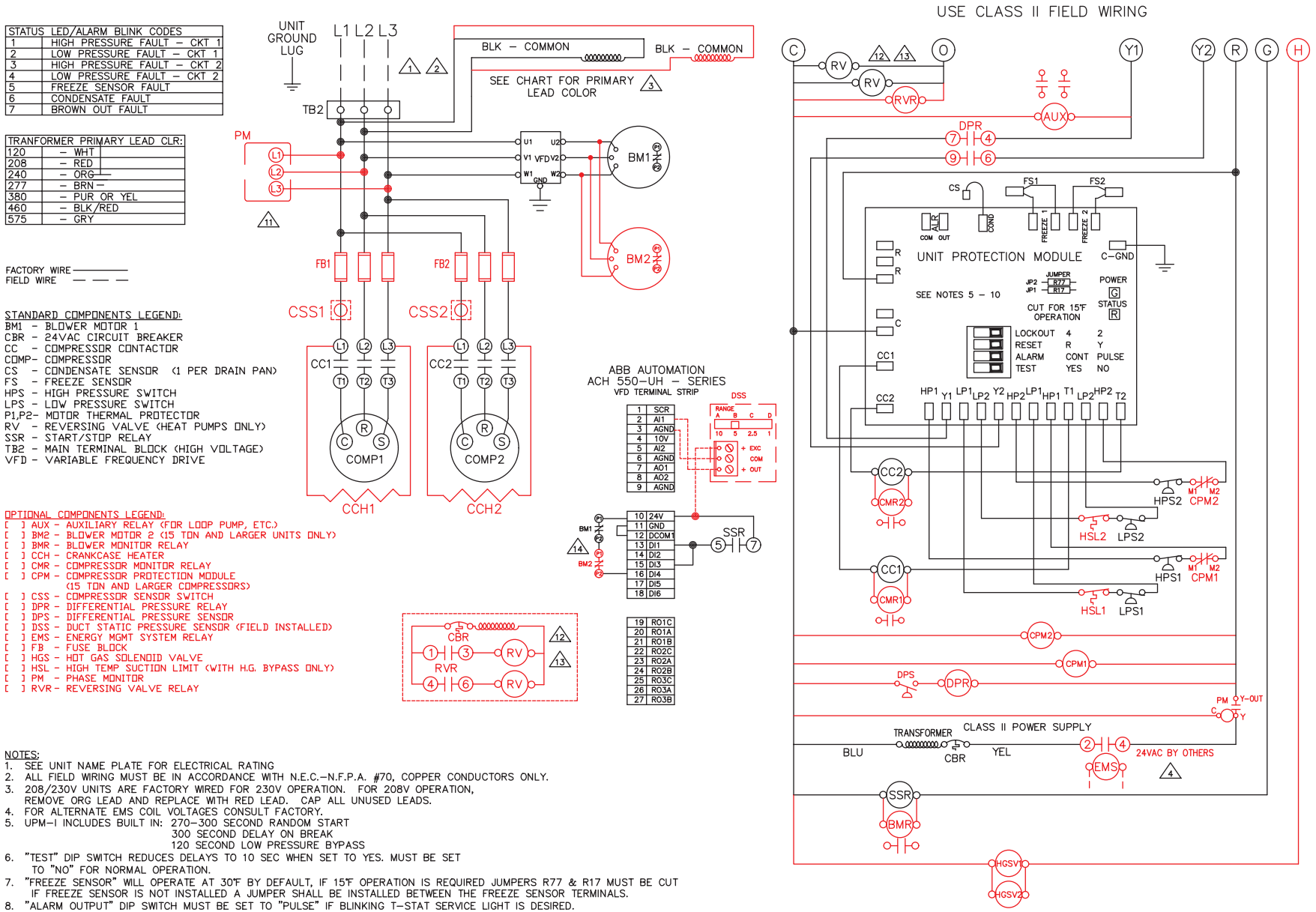
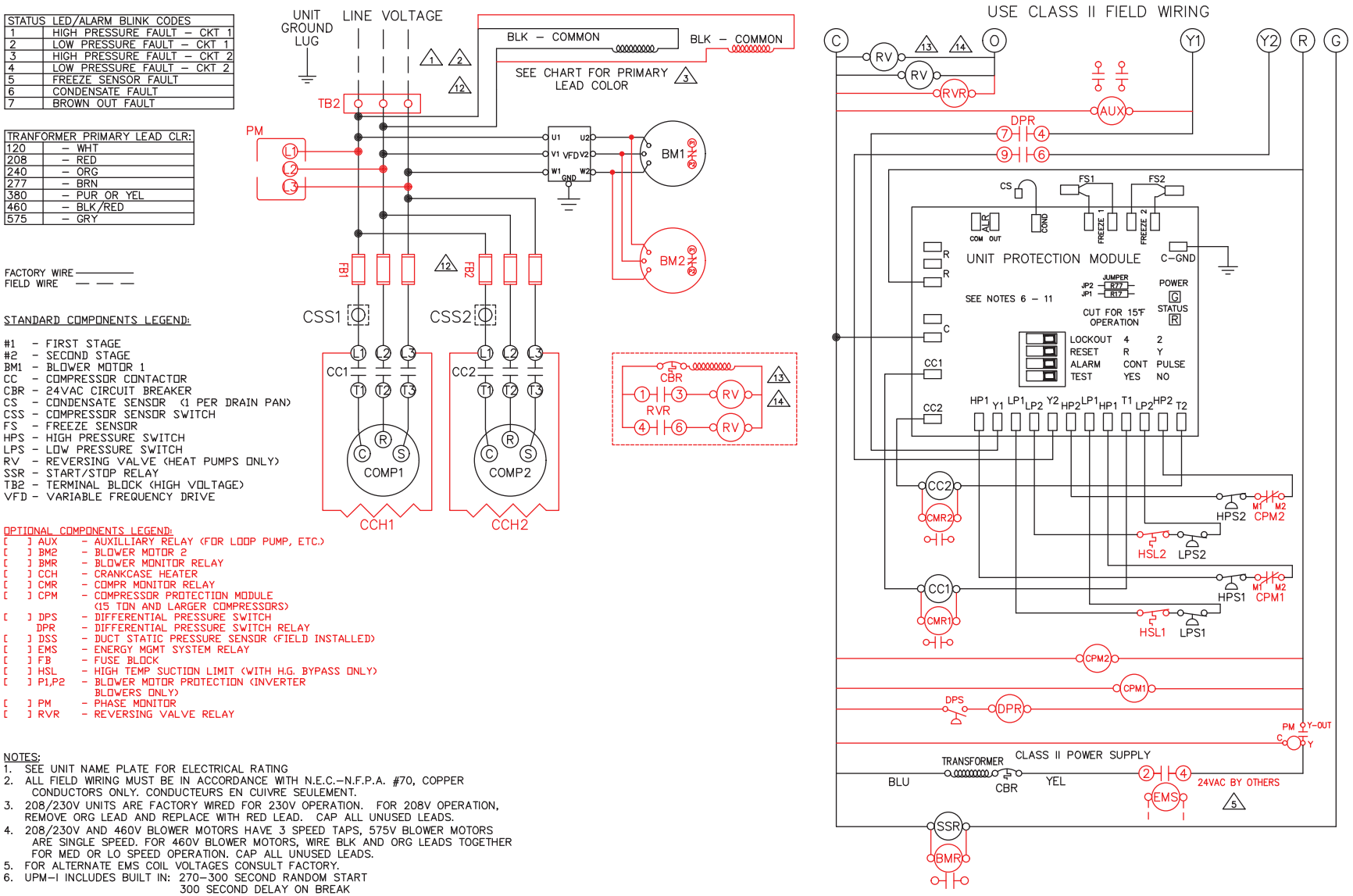


Fig. 100 — 50BVJ,W Variable Air Volume Control Expander Module Wiring Diagram



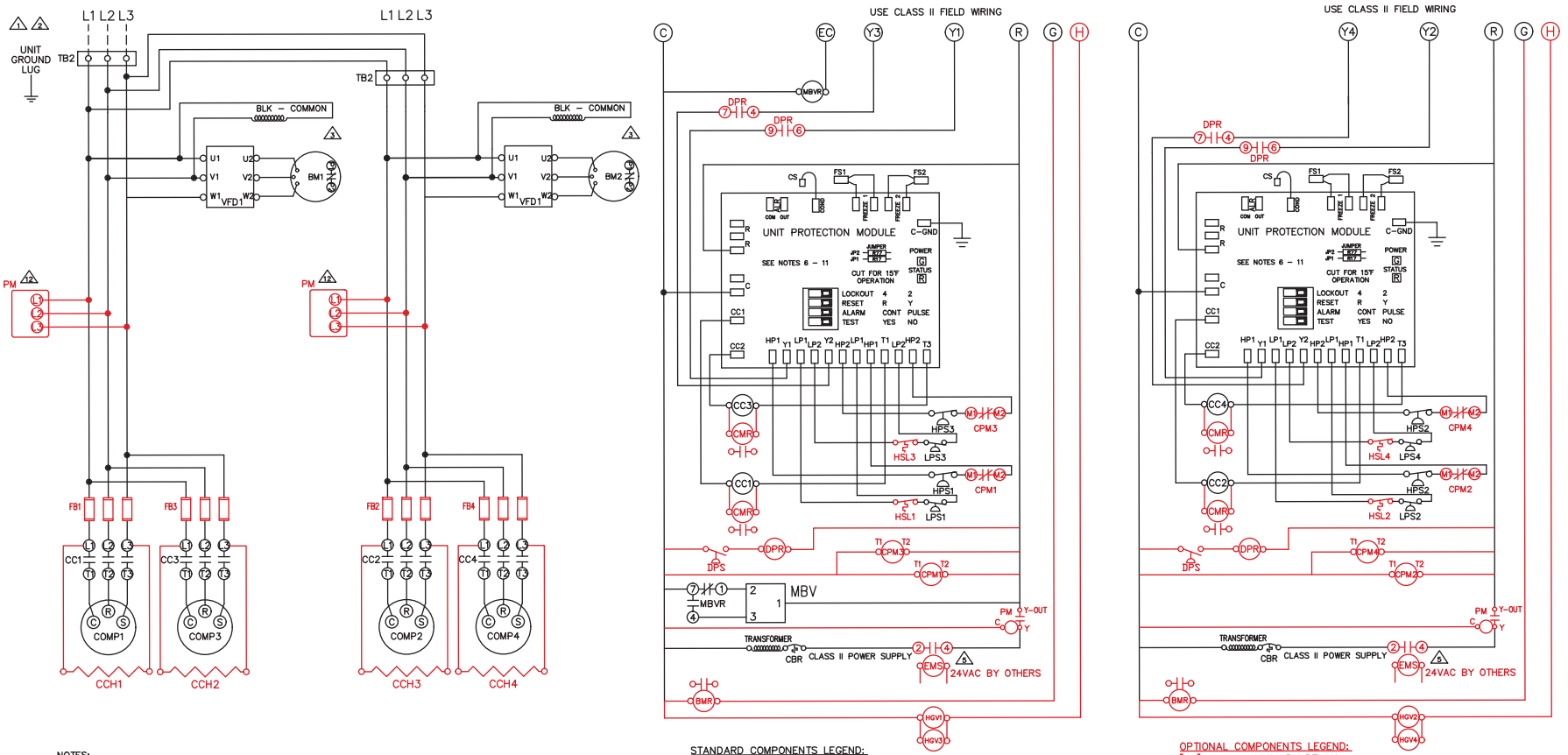
NOTES:
1. SEE UNIT NAME PLATE FOR ELECTRICAL RATING
2. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C.–N.F.P.A. #70, COPPER CONDUCTORS ONLY.
3. 208/230V UNITS ARE FACTORY WIRED FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEADS.
4. FOR ALTERNATE EMS COIL VOLTAGES CONSULT FACTORY.
5. UPM–I INCLUDES BUILT IN: 270–300 SECOND RANDOM START
   300 SECOND DELAY ON BREAK
   120 SECOND LOW PRESSURE BYPASS
6. "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
7. "FREEZE SENSOR" WILL OPERATE AT 30°F BY DEFAULT, IF 15°F OPERATION IS REQUIRED JUMPERS R77 & R17 MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
8. "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BLINKING T–STAT SERVICE LIGHT IS DESIRED.
9. DEFAULT SETTINGS FOR UPM BOARD FROM FACTORY SHOWN. ALSO SEE INSTALLATION MANUAL.
10. ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24 VAC IS NEEDED, CONNECT R TO ALR–COM TERMINAL, 24VAC WILL BE SENSED ON THE ALR–OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.
11. CHECK FOR PROPER PHASE ROTATION ON UNITS WITH SCROLL COMPRESSORS. REVERSE ROTATION WILL DAMAGE THE COMPRESSOR AND VOID UNIT WARRANTY.
12. REVERSING VALVES ARE WIRED TO A SEPARATE TRANSFORMER ON 30 TON UNITS
13. REVERSING VALVES AND REVERSING VALVES RELAYS ARE NOT PRESENT ON "STRAIGHT COOL" UNITS.
14. P1 & P2 INTERLOCKS OF THE BLOWER MOTOR(S) MUST BE CONNECTED IN SERIES WITH TERMINALS 10 & 16 OF THE VFD TO ENABLE THE SAFETY INTERLOCK OF THE VFD AND TO PROTECT THE MOTOR(S) FROM THERMAL DAMAGE. TERMINALS 11 & 12 MUST ALSO BE CONNECTED TOGETHER.

Fig. 101 — 50BVJ020-034 Variable Air Volume Wiring Diagram



NOTES:
1. SEE UNIT NAME PLATE FOR ELECTRICAL RATING
2. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C.–N.F.P.A. #70, COPPER CONDUCTORS ONLY. CONDUCTEURS EN CUIVRE SEULEMENT.
3. 208/230V UNITS ARE FACTORY WIRED FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEADS.
4. 208/230V AND 460V BLOWER MOTORS HAVE 3 SPEED TAPS, 575V BLOWER MOTORS ARE SINGLE SPEED. FOR 460V BLOWER MOTORS, WIRE BLK AND ORG LEADS TOGETHER FOR MED OR LO SPEED OPERATION. CAP ALL UNUSED LEADS.
5. FOR ALTERNATE EMS COIL VOLTAGES CONSULT FACTORY.
6. UPM–I INCLUDES BUILT IN: 270–300 SECOND RANDOM START
   300 SECOND DELAY ON BREAK
   120 SECOND LOW PRESSURE BYPASS
7. "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
8. "FREEZE SENSOR" WILL OPERATE AT 30°F BY DEFAULT, IF 15°F OPERATION IS REQUIRED JUMPERS R77 & R17 MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
9. "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BLINKING T–STAT SERVICE LIGHT IS DESIRED.
10. DEFAULT SETTINGS FOR UPM BOARD FROM FACTORY SHOWN. ALSO SEE INSTALLATION MANUAL.
11. ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24 VAC IS NEEDED, CONNECT R TO ALR–COM TERMINAL, 24VAC WILL BE SENSED ON THE ALR–OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.
12. CHECK FOR PROPER PHASE ROTATION ON UNITS WITH SCROLL COMPRESSORS. REVERSE ROTATION WILL DAMAGE THE COMPRESSOR AND VOID UNIT WARRANTY.
13. REVERSING VALVES ARE WIRED TO A SEPARATE TRANSFORMER ON 30 TON UNITS.
14. (O) SIGNAL IS NOT WIRED FOR COOLING ONLY UNITS AND REVERSING VALVES/(RELAYS) ARE NOT PRESENT.

Fig. 102 — 50BVW034 Variable Air Volume Wiring Diagram



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4. 208/230V AND 460V BLOWER MOTORS HAVE 3 SPEED TAPS, 575V BLOWER MOTORS ARE SINGLE SPEED. FOR 460V BLOWER MOTORS, WIRE BLK AND ORG LEADS TOGETHER FOR MED OR LO SPEED OPERATION. CAP ALL UNUSED LEADS.
5. FOR ALTERNATE EMS COIL VOLTAGES CONSULT FACTORY.
6. UPM–I INCLUDES BUILT IN: 270–300 SECOND RANDOM START
   300 SECOND DELAY ON BREAK
   120 SECOND LOW PRESSURE BYPASS
7. "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
8. "FREEZE SENSOR" WILL OPERATE AT 30°F BY DEFAULT, IF 15°F OPERATION IS REQUIRED JUMPER R42 MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
9. "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BLINKING T–STAT SERVICE LIGHT IS DESIRED.
10. DEFAULT SETTINGS FOR UPM BOARD FROM FACTORY SHOWN. ALSO SEE INSTALLATION MANUAL.
11. ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24 VAC IS NEEDED, CONNECT R TO ALR–COM TERMINAL, 24VAC WILL BE SENSED ON THE ALR–OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.
12. CHECK FOR PROPER PHASE ROTATION ON UNITS WITH SCROLL COMPRESSORS. REVERSE ROTATION WILL DAMAGE THE COMPRESSOR AND VOID UNIT WARRANTY.
13. AQUASTAT IS CONNECTED BETWEEN Y1 AND C SIGNALS FOR STRAIGHT COOL UNITS AND NO REVERSING VALVES NOR REVERSING VALVE RELAYS WILL BE PRESENT.

STANDARD COMPONENTS LEGEND:

BM	– BLOWER MOTORS (1 PER SECTION)
BR	– BLOWER RELAYS
CC	– COMPRESSOR CONTACTOR
CBR	– 24V CIRCUIT BREAKER
CS	– CONDENSATE SENSOR (1 PER DRAIN PAN)
FS	– FREEZE SENSORS
HPS	– HIGH PRESSURE SWITCHES
LPS	– LOW PRESSURE SWITCHES
MBV	– MOTORIZED BALL VALVE
MBVR	– MOTORIZED BALL VALVE RELAY
MRV	– MODULATING REHEAT VALVES
TB2,3	– MAIN POWER TERMINAL BLOCKS

OPTIONAL COMPONENTS LEGEND:
[ ] AUX – AUXILIARY RELAY (FOR LOOP PUMP, ETC.)
[ ] BMR – BLOWER MONITOR RELAY
[ ] CCH – CRANKCASE HEATER
[ ] CMR – COMPRESSOR MONITOR RELAY
[ ] CPM – COMPRESSOR PROTECTION MODULE (15 TON AND LARGER COMPRESSORS)
[ ] DPS – DIFFERENTIAL PRESSURE SWITCH
DPR – DIFFERENTIAL PRESSURE RELAY
[ ] EMS – ENERGY MGMT SYSTEM RELAY
[ ] FB – FUSE BLOCK
[ ] HSL – HIGH TEMP SUCTION LIMIT (WITH H.G. BYPASS ONLY)
[ ] HGV – HOT GAS VALVE SOLENOID (UNITS WITH DDC AND HGRH ONLY)
[ ] PM – PHASE MONITOR

FACTORY WIRE
FIELD WIRE

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

TRANFORMER PRIMARY LEAD CLR:	
120	– WHT
208	– RED
240	– ORG
277	– BRN
380	– PUR OR YEL
460	– BLK/RED
575	– GRY

Fig. 103 — 50BVW044-064 Variable Air Volume Wiring Schematic

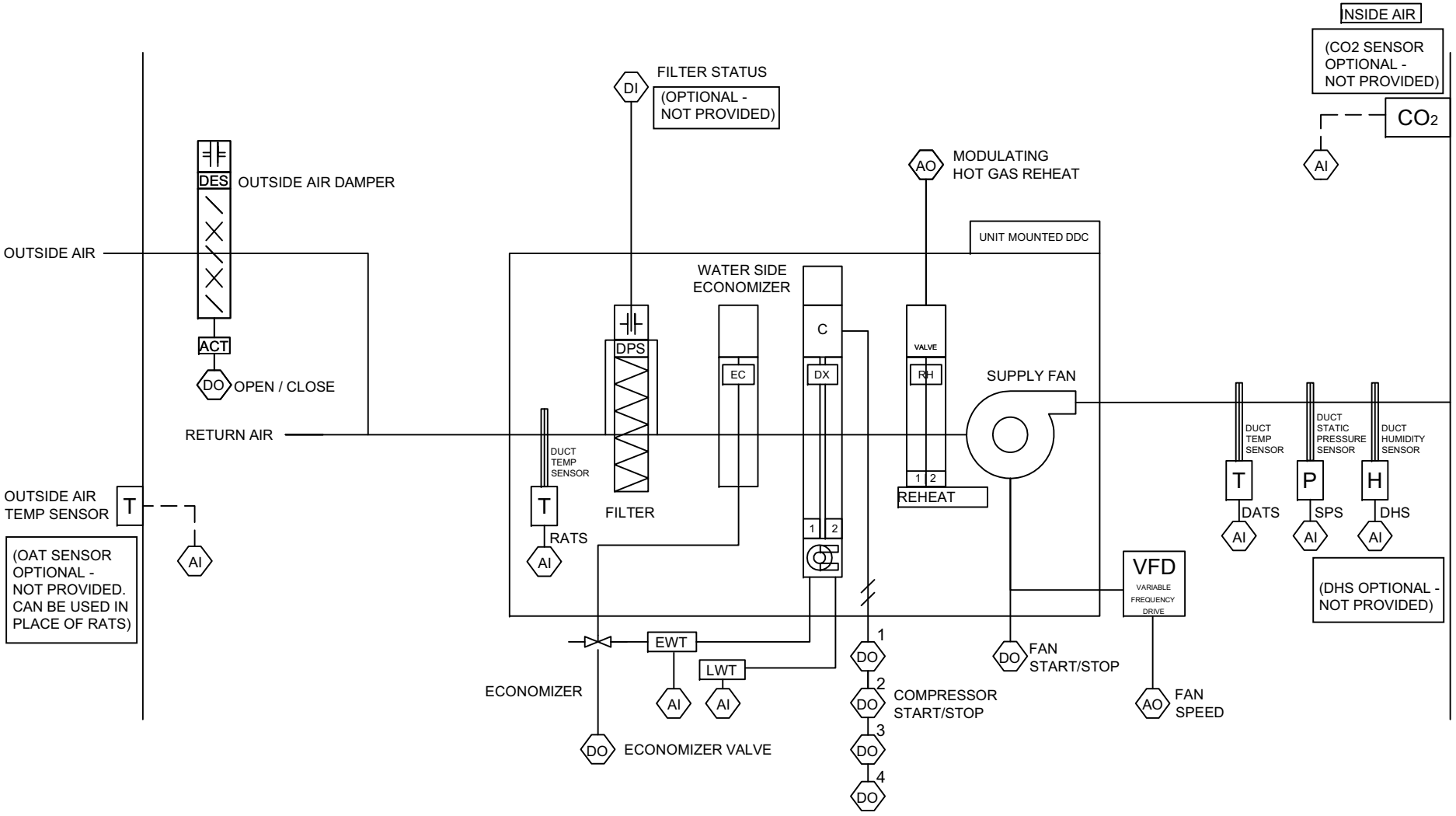

Fig. 104 — 50BVJ,W Sensor Schematic

SENSORS AND INTEGRATION POINTS

Refer to Table 69 for factory-provided sensors and Table 70 for a detailed integration points list.

Table 69 — Factory-Provided Sensors for VAV Units 50BVJ,W

UNIT	DESCRIPTION	QTY	SHIPPING LOCATION	INSTALLATION LOCATION
50BVJ 020-034	Supply Air Temperature sensor	1	loose for field installation	Supply air stream
	Return Air Temperature Sensor	1	loose for field installation	Return air stream
	Entering Water Temperature	1	Installed	Condenser entering water
	Leaving Water Temperature	1	Installed	Condenser leaving water
	Duct Static Pressure Sensor	1	loose for field installation	Supply air stream
	Compressor Current Transducer	[a]	Installed	Unit electrical box
50BVW 034-064	Supply Air Temperature Sensor	1	loose for field installation	Supply air stream
	Return Air Temperature Sensor	4	loose for field installation	Return air stream
	Entering Water Temperature	1	Installed	Condenser entering water
	Leaving Water Temperature	1	Installed	Condenser leaving water
	Duct Static Pressure Sensor	1	loose for field installation	Supply air stream
	Compressor Current Transducer	[a]	Installed	Unit electrical box

NOTE(S):

a. 1 per compressor.

Table 70 — Integration Points List

PROTOCOL MAP		MODBUS		BACNET			LONWORKS		OPERATION
DISPLAY NAME	READ/ WRITE	Register Type	Register Number	Reference Name	Object Type	Object Id	Nv Name	Snvt	Description
ALARM STATUS	R	Discrete Input	5	alm_status	BV	24	nvoAlmStatus	SNVT_switch(95)	Alarm Status of Unit (see “Current Alarm” for more information)
ALLOW CWV ALARM	R/W	Coil	1	allow_cwv_alrm	BV	106		Select	Enable Condensate Water Valve Alarm Pass Through 0 = Off 1 = Enable CWV Alarm
BAS CO2 SENSOR VALUE	R/W	Holding Register (Float)	1	bas_co2_val	AV	49		Select	CO_2 Sensor Value provided by BAS in PPM
BAS DAT SENSOR	R/W	Holding Register (Float)	3	bas_dat_val	AV	90		Select	Discharge Air Temperature (DAT) provided by BAS in °F
BAS RETURN AIR TEMP	R/W	Holding Register (Float)	5	bas_rat	AV	29		Select	Return Air Temperature Value provided by the BAS
BAS RH SENSOR VALUE	R/W	Holding Register (Float)	7	bas_rh_sen_val	AV	56		Select	Relative Humidity (RH) provided by BAS in %
BAS SD INPUT	R/W	Coil	2	bas_sd_in	BV	91		Select	Network Parameter to set the BAS Smoke Detector Alarm
BOILERLESS-ECONOMIZER STATUS	R	Input Register (Float)	1	econ_boil_mode_ stat	AV	34		Select	Economizer Option Status 0 = Disabled 1 = Water Side Economizer
BRN	R	Discrete Input	6	brn_2st	BV	10		Select	Network Alarm indicating Brownout sense on UPM1
BRN	R	Discrete Input	7	brn_4st	BV	58		Select	Network Alarm indicating Brownout sense on UPM2
BV OCCUPANCY COMMAND (BAS)	R/W	Coil	3	occupancy_cmd	BV	1	nviOccBASCmd	SNVT_switch(95)	Network Parameter to set the Occupancy Command 0 = Unoccupied (Default) 1 = Occupied
C1_FAIL	R	Discrete Input	8	comp1_fail	BV	150		Select	Network Alarm indicating compressor commanded to run but no current feedback is sensed
C1_HAND	R	Discrete Input	9	comp1_hand	BV	151		Select	Network Alarm indicating compressor is running but the controller is not issuing an automatic command.
C2_FAIL	R	Discrete Input	10	comp2_fail	BV	154		Select	Network Alarm indicating compressor commanded to run but no current feedback is sensed

Table 70 — Integration Points List (cont)

PROTOCOL MAP		MODBUS		BACNET			LONWORKS		OPERATION
DISPLAY NAME	READ/ WRITE	Register Type	Register Number	Reference Name	Object Type	Object Id	Nv Name	Snvt	Description
C2_HAND	R	Discrete Input	11	comp2_hand	BV	155		Select	Network Alarm indicating compressor is running but the controller is not issuing an automatic command.
C3_FAIL	R	Discrete Input	12	comp3_fail	BV	157		Select	Network Alarm indicating compressor commanded to run but no current feedback is sensed
C3_HAND	R	Discrete Input	13	comp3_hand	BV	158		Select	Network Alarm indicating compressor is running but the controller is not issuing an automatic command.
C4_FAIL	R	Discrete Input	14	comp4_fail	BV	160		Select	Network Alarm indicating compressor commanded to run but no current feedback is sensed
C4_HAND	R	Discrete Input	15	comp4_hand	BV	161		Select	Network Alarm indicating compressor is running but the controller is not issuing an automatic command.
CMP1_RNTM	R	Discrete Input	16	comp1_rntm	BV	35		Select	Compressor 1 Runtime Alarm Status, (8760 Hours) 0 = Off 1 = Timer Has Expired
CMP2_RNTM	R	Discrete Input	17	comp2_rntm	BV	36		Select	Compressor 2 Runtime Alarm Status, (Hours) 0 = Off 1 = Timer Has Expired
CMP3_RNTM	R	Discrete Input	18	comp3_rntm	BV	69		Select	Compressor 3 Runtime Alarm Status (Hours) 0 = Off 1 = Timer Has Expired
CMP4_RNTM	R	Discrete Input	19	comp4_rntm	BV	71		Select	Compressor 4 Runtime Alarm Status (Hours) 0 = Off 1 = Timer Has Expired
CO2 SENSOR ENA	R/W	Holding Register (Float)	9	co2_sensor_ena	AV	26		Select	Zone CO_2 Sensor Enable Setup 0 = No CO_2 (Default) 1 = CO_2 Monitoring 2 = CO_2 + Damper 3 = CO_2 BAS Monitoring 4 = CO_2 BAS + Damper 5 = Open Damper as Fan runs
COIL CONFIGURATION STATUS	R	Input Register (Float)	3	coil_cfg_status	AV	150		Select	Network Status of Coil Configuration 0 = Parallel 1 = Series
COMP STAGE1 OUTPUT CMD	R	Discrete Input	20	cmp_stg1_cmd	BV	11	nvoCmp1Cmd	SNVT_switch(95)	Compressor Stage 1 Output Status 0 = Compressor Stage 1 Off 1 = Compressor 1 On
COMP STAGE2 OUTPUT CMD	R	Discrete Input	21	cmp_stg2_cmd	BV	12	nvoCmp2Cmd	SNVT_switch(95)	Compressor Stage 2 Output Status 0 = Compressor 2 Off 1 = Compressor 2 On
COMP STAGE3 OUTPUT CMD	R	Discrete Input	22	cmp_stg3_cmd	BV	66	nvoCmp3Cmd	SNVT_switch(95)	Compressor Stage 3 Output Status 0 = Compressor 3 Off 1 = Compressor 3 On
COMP STAGE4 OUTPUT CMD	R	Discrete Input	23	cmp_stg4_cmd	BV	67	nvoCmp4Cmd	SNVT_switch(95)	Compressor Stage 2 Output Status 0 = Compressor 4 Off 1 = Compressor 4 On
COMP1 RUNTIME RST	R/W	Coil	4	cmp1_rntm_rst	BV	13	nviCmp1RntRst	SNVT_switch(95)	Compressor 1 Runtime Reset. Momentary On/Off required.
COMP2 RUNTIME RST	R/W	Coil	5	cmp2_rntm_rst	BV	14	nviCmp2RntRst	SNVT_switch(95)	Compressor 2 Runtime Reset. Momentary On/Off required.
COMP3 RUNTIME RST	R/W	Coil	6	cmp3_rntm_rst	BV	68	nviCmp3RntRst	SNVT_switch(95)	Compressor 3 Runtime Reset. Momentary On/Off required.
COMP4 RUNTIME RST	R/W	Coil	7	cmp4_rntm_rst	BV	70	nviCmp4RntRst	SNVT_switch(95)	Compressor 4 Runtime Reset. Momentary On/Off required.

Table 70 — Integration Points List (cont)

PROTOCOL MAP		MODBUS		BACNET			LONWORKS		OPERATION
DISPLAY NAME	READ/ WRITE	Register Type	Register Number	Reference Name	Object Type	Object Id	Nv Name	Snvt	Description
COMPRESSOR 1 STATUS	R	Discrete Input	3	comp1_status	BV	152		Select	Network Parameter indicating the status of Compressor 1
COMPRESSOR 2 STATUS	R	Discrete Input	2	comp2_status	BV	153		Select	Network Parameter indicating the status of Compressor 2
COMPRESSOR 3 STATUS	R	Discrete Input	1	comp3_status	BV	156		Select	Network Parameter indicating the status of Compressor 3
COMPRESSOR 4 STATUS	R	Discrete Input	4	comp4_status	BV	159		Select	Network Parameter indicating the status of Compressor 4
COMPRESSOR CONTROL STATUS	R	Input Register (Float)	5	comp_ctrl_status	AV	60		Select	Compressor Control Status 0 = Zone Control 1 = Discharge Air Control
COMPRESSOR STAGES	R	Input Register (Float)	7	cmp_stgs	AV	14	nvoCmpStgs	SNVT_count_inc(9)	Compressor Stages Configured Status 1 = 1 Compressor 1 Stage 2 = 2 Compressor 2 Stages 3 = 3 Compressor 3 Stages (3 and 4 Stage units only) 4 = 4 Compressor 4 Stages (50BV Default)
COMPRESSORS MODE	R/W	Holding Register (Float)	11	comp_mode	AV	70		Select	Compressor Mode Setup 0 = Zone 1 = Discharge Air Control (Default)
CON	R	Discrete Input	24	con_2st	BV	9		Select	UPM Board 1 Condensate Alarm 0 = Normal 1 = Condensate Alarm
CON2	R	Discrete Input	25	con_4st	BV	57		Select	UPM Board 2 Condensate Alarm 0 = Normal 1 = Condensate Alarm
CONDENSER VALVE STATUS	R	Discrete Input	26	cond_vlv_status	BV	105		Select	Condenser Valve Status (Closed to Enable Compressor Operation) 0 = Compressor Operation Disabled 1 = Compressor Operation Enabled
CONTINUOUS FAN	R/W	Coil	8	Cont_fan	BV	18		Select	Run Fan continuously During Occupancy Mode Setup 0 = Cycle Fan with Compressor Operation 1 = Run Fan when Occupied (Default)
CONTROL SOURCE	R/W	Holding Register (Float)	13	ctrl_source	AV	15		Select	Control Source for Occupancy Setup 0 = Digital Input 1 1 = Keypad Schedule 2 = BAS Occupancy Command 3 = Factory Use 4 = Manual On-Continuous (Default)
COOLING ECONO	R	Discrete Input	27	clg_econ	BV	63		Select	Network Parameter to set Cooling Econo temperature 0 = Hardwired Sensor (Default) 1 = BAS Sensor Value
COOLING PERCENTAGE	R	Input Register (Float)	9	clg_pct	AV	13	nvoClgPct	SNVT_count_inc(9)	Network Status of Cooling Demand in percentage (%)
COOLING SET POINT	R/W	Holding Register (Float)	57	sat_stpt_cl	AV	66		Select	Network Parameter to set the Cooling Set point 55 °F (Default)
CSAT_HI	R	Discrete Input	28	csat_hi	BV	80		Select	Network Parameter to set CSAT HI 0 = Hardwired Sensor (Default) 1 = BAS Sensor Value

Table 70 — Integration Points List (cont)

PROTOCOL MAP		MODBUS		BACNET			LONWORKS		OPERATION
DISPLAY NAME	READ/ WRITE	Register Type	Register Number	Reference Name	Object Type	Object Id	Nv Name	Snvt	Description
CURRENT ALARM	R	Input Register (Float)	11	current_alarm	AV	17	nvoCurAlm	SNVT_count_inc(9)	Alarm Status of unit: 0 = No Alarm 1-7 = UPM1 Fault Code 9-16 =UPM2 Fault Code 20 = Output Overridden via Keypad 30 = Sensor Failure 40 = Leaving Water Temp Alarm 50 = Zone Temp Alarm 60 = Discharge Air Temperature 70 = Filter Alarm/ Compressors 1 & 2 Runtime 90 = High CO_2 Level Alarm 100 = Supply Fan Locked 110 = Static Press Low
CWV COMMAND	R	Discrete Input	29	cwv_command	BV	109	nvoCwvCommand	SNVT_switch(95)	Condenser Water Valve Command Status 0 = Off 1 = On
CWV_FAIL	R	Discrete Input	30	cwv_fail	BV	107		Select	Condenser Water Valve Failure Alarm
CWV_HAND	R	Discrete Input	31	cwv_hand	BV	108		Select	Condenser Hand Alarm Condenser Valve Command Enabled without unit commanded
DA_SENS_FAIL	R	Discrete Input	32	da_sen	BV	31		Select	Network Alarm Indicating Discharge Air Sensor Failure 0 = Normal 1 = Alarm
DAMPER OUTPUT CMD	R	Discrete Input	33	damper_cmd	BV	49	nvoDamperCmd	SNVT_switch(95)	Damper Output Status 0 = Closed 1 = Open
DAT SENSOR SELECTION	R/W	Holding Register (Float)	15	dat_sel	AV	81		Select	Discharge Air Temperature Sensor Setup 0 = Hardwired Sensor (Default) 1= BAS Supplied DAT value
DAT SENSOR SOURCE SELECTION STATUS	R	Input Register (Float)	13	dat_sel_sta	AV	82		Select	Discharge Air Temperature Sensor Selection Status 0 = Hardwired Sensor DAT 1 = BAS Supplied DAT
DAT_HI	R	Discrete Input	34	dat_hi	BV	29		Select	Discharge Air Temperature Sensor Alarm (Cooling) 0 = Normal 1 = High DAT (Default: >70 °F)
DEMAND LEVEL	R/W	Holding Register (Float)	17	demand_level	AV	64		Select	Demand Level Set point Adjust in °F
DO_LOCK	R	Discrete Input	35	do_lock	BV	37		Select	Network Parameter to set DO LOCK 0 = Hardwired Sensor (Default) 1 = BAS Sensor Value
DPS ALARM	R	Discrete Input	36	DPS_alarm	BV	77		Select	Network Parameter to set DPS Alarm 0 = Hardwired Sensor (Default) 1 = BAS Sensor Value
DX_RNTM	R	Discrete Input	37	dx_rntm	BV	79		Select	Network Parameter to set DX RNTM 0 = Hardwired Sensor (Default) 1 = BAS Sensor Value
EFF HGR MOD VALVE 1	R	Input Register (Float)	15	eff_hgr_mod_vlv1	AV	28	nvoEffHgrModVlv1	SNVT_lev_percent (81)	Hot Gas Reheat Modulating Valve Output Status in %
EFF RA FAN SPEED	R	Input Register (Float)	45	eff_ra_fan_speed	AV	162	nvoEffRaFanSpeed	SNVT_lev_percent (81)	Supply Air Fan Speed Network Status in %
EFF RA STATIC PRESSURE	R	Input Register (Float)	47	eff_ra_sta_press	AV	163	nvoEffRaStaPress	SNVT_count_inc(9)	Network Status of the Supply Duct Static Pressure Sensor

Table 70 — Integration Points List (cont)

PROTOCOL MAP		MODBUS		BACNET			LONWORKS		OPERATION
DISPLAY NAME	READ/ WRITE	Register Type	Register Number	Reference Name	Object Type	Object Id	Nv Name	Snvt	Description
EFF SA FAN SPEED	R	Input Register (Float)	17	eff_sa_fan_speed	AV	55	nvoEffSaFanSpeed	SNVT_lev_percent (81)	Supply Air Fan Speed Network Status in %
EFF SA STATIC PRESSURE	R	Input Register (Float)	19	eff_sa_sta_press	AV	53	nvoEffSaStaPress	SNVT_press_p (113)	Network Status of the Supply Duct Static Pressure Sensor
EFF ZONE CO2 LEV	R	Input Register (Float)	21	eff_zn_co2_lev	AV	25	nvoEffZnCo2Lev	SNVT_count_inc(9)	Network Status of the CO_2 Sensor Levels in PPM
EFFECT EW TEMP	R	Input Register (Float)	23	eff_ewt	AV	62	nvoEffEwt	SNVT_temp_p(105)	Network Status of the Entering Water Temperature in °F
EFFECT LEAVING WTR TEMP	R	Input Register (Float)	25	eff_lwt	AV	11	nvoEffLwt	SNVT_temp_p(105)	Network Status of the Entering Water Temperature in °F
EFFECT OUTDOOR AIR TEMP	R	Input Register (Float)	27	eff_rat	AV	75	nvoEffRat	SNVT_temp_p(105)	Network Status of the Return Air Temperature in °F
ELW_SENS_FAIL	R	Discrete Input	38	elw_sen	BV	72		Select	Network Parameter to set ELW sensor FAIL 0 = Hardwired Sensor (Default) 1 = BAS Sensor Value
ENABLED STAGES	R	Input Register (Float)	29	enabled_clstages	AV	68		Select	Network Status of the number of Compressor Stages Enabled
FACTORY TEST	R/W	Coil	14	fac_test_enable	BV	91000		Select	Factory Reserved
FAN MODE STATUS	R	Input Register (Float)	31	fan_mode_status	AV	51		Select	Network Status of the Fan Mode Selection 0 = Start / Stop Fan Operation 1 = Variable Frequency Drive Fan Operation
FAN OUTPUT CMD	R	Discrete Input	39	fan_cmd	BV	17		Select	Network Parameter to set Fan Output Cmd 0 = Hardwired Sensor (Default) 1 = BAS Sensor Value
FAN_MODE	R/W	Holding Register (Float)	19	fan_mode	AV	50		Select	Network Parameter to set Fan Mode of Operation 1 = Standard Fan Configuration 2 = Variable Frequency Drive Configuration (VAV Default)
FILTER	R	Discrete Input	40	filter	BV	40		Select	Filter Status 0 = Normal 1 = Clean Filter
FRE	R	Discrete Input	41	frz_2st	BV	8		Select	UPM Board 1 Freeze Alarm 0 = Normal 1 = Active Freeze Condition
FRE2	R	Discrete Input	42	frz_4st	BV	56		Select	UPM Board 2 Freeze Alarm 0 = Normal 1 = Active Freeze Condition
HIGH STATIC COUNT RST	R/W	Coil	23	rtn_sup_stc_ctr_rst	BV	99		Select	Network Parameter to reset the high static alarm counter Momentary toggle ON/OFF to reset counter
HP1	R	Discrete Input	43	hp1_2st	BV	5	nvoHp1Alarm	SNVT_switch(95)	UPM Board 1 High Pressure Alarm Status for Compressor 1 0 = Normal 1 = Active High Pressure 1 Alarm
HP2	R	Discrete Input	44	hp2_2st	BV	52	nvoHp2Alarm	SNVT_switch(95)	UPM Board 2 High Pressure Alarm Status for Compressor 3 0 = Normal 1 = Active High Pressure 3 Alarm
HP3	R	Discrete Input	45	hp3_3st	BV	7	nvoHp3Alarm	SNVT_switch(95)	UPM Board 1 High Pressure Alarm Status for Compressor 2 0 = Normal 1 = High Pressure 2 Alarm

Table 70 — Integration Points List (cont)

PROTOCOL MAP		MODBUS		BACNET			LONWORKS		OPERATION
DISPLAY NAME	READ/ WRITE	Register Type	Register Number	Reference Name	Object Type	Object Id	Nv Name	Snvt	Description
HP4	R	Discrete Input	46	hp4_4st	BV	54	nvoHp4Alarm	SNVT_switch(95)	UPM Board 2 High Pressure Alarm Status for Compressor 4 0 = Normal 1 = High Pressure 4 Alarm
INPUT_LOCK	R	Discrete Input	47	input_lock	BV	38		Select	Network Parameter to set INPUT LOCK 0 = Hardwired Sensor (Default) 1 = BAS Sensor Value
LOOP ENABLED	R/W	Coil	9	loop_enabled	BV	23	nviLoopEna	SNVT_switch(95)	Network Parameter to set Loop Enabled 0 = Hardwired Sensor (Default) 1 = BAS Sensor Value
LOW SP	R	Discrete Input	48	sta_press_low	BV	81		Select	Network Parameter to set LOW SP 0 = Single LOW Value 1 = Multiple LOW Values (Default)
LP1	R	Discrete Input	49	lp1_2st	BV	4	nvoLp1Alarm	SNVT_switch(95)	UPM Board 1 Low Pressure Alarm Status for Compressor 1 0 = Normal 1 = LP1 Alarm Active
LP2	R	Discrete Input	50	lp2_2st	BV	53	nvoLp2Alarm	SNVT_switch(95)	UPM Board 2 Low Pressure Alarm Status for Compressor 3 0 = Normal 1 = LP3 Alarm Active
LP3	R	Discrete Input	51	lp3_3st	BV	6	nvoLp3Alarm	SNVT_switch(95)	UPM Board 1 Low Pressure Alarm Status for Compressor 2 0 = Normal 1 = LP2 Alarm Active
LP4	R	Discrete Input	52	lp4_4st	BV	55	nvoLp4Alarm	SNVT_switch(95)	UPM Board 2 Low Pressure Alarm Status for Compressor 4 0 = Normal 1 = LP4 Alarm Active
LVG_HI	R	Discrete Input	53	lvg_hi	BV	32		Select	Leaving Water Temperature Alarm (High) 0 = Normal 1 = High LWT Alarm Active (Default: >135 °F)
LVG_LO	R	Discrete Input	54	lvg_lo	BV	33		Select	Leaving Water Temperature (LWT) Alarm (Low) 0 = Normal 1 = Low LWT Alarm Active (Default: <33 °F)
LVG_SENS_FAIL	R	Discrete Input	55	lvg_sen	BV	34		Select	Leaving Water Temperature Alarm (Sensor) 0 = Normal 1 = Sensor Failure (Check Sensor Hardware Configuration)
MODE STATUS	R	Input Register (Float)	33	mode_status	AV	24	nvoModeStatus	SNVT_count_inc (9)	Unit Mode of Operation Selection Status 0 = Cooling only 5 = Cooling + Hot Gas Re-Heat
OAT RESET	R/W	Holding Register (Float)	21	oat_reset1	AV	80	nviOatReset1	SNVT_count_inc (9)	Outside Air Temperature (Free Cooling) Operation in °F Default: 50 °F
OAT RESET 2	R/W	Holding Register (Float)	23	oat_reset2	AV	72	nviOatReset2	SNVT_count_inc (9)	Outside Air Temperature (Stage 1 Cooling) Operation in °F Default: 60 °F
OAT RESET 3	R/W	Holding Register (Float)	25	oat_reset3	AV	74	nviOatReset3	SNVT_count_inc (9)	Outside Air Temperature (Stage 2 Cooling) Operation in °F Default: 70 °F
OAT RESET 4	R/W	Holding Register (Float)	27	oat_reset4	AV	76	nviOatReset4	SNVT_count_inc (9)	Outside Air Temperature (Stage 3 Cooling) Operation in °F Default: 78 °F

Table 70 — Integration Points List (cont)

PROTOCOL MAP		MODBUS		BACNET			LONWORKS		OPERATION
DISPLAY NAME	READ/ WRITE	Register Type	Register Number	Reference Name	Object Type	Object Id	Nv Name	Snvt	Description
OAT RESET 5	R/W	Holding Register (Float)	29	oat_reset5	AV	79	nviOatReset5	SNVT_count_inc (9)	Outside Air Temperature (Stage 4 Cooling) Operation in °F Default: 84 °F
OAT RESET MA	R/W	Holding Register (Float)	31	oat_reset_ht	AV	92		Select	Outside Air Mixed Air Temperature (Pre-Heating) Operation in °F Default: 40 °F
OCCUPANCY STATUS	R	Discrete Input	56	occ_status	BV	21	nvoOccStatus	SNVT_switch(95)	Network Parameter to set Occupancy Status 0 = Hardwired Sensor (Default) 1 = BAS Sensor Value
OUTSIDE AIR RESET MODE STATUS	R	Input Register (Float)	37	oat_rst_mode_stat	AV	89		Select	Return Air Temperature Reset Mode Status 0 = Single 1 = Multiple
OVERLOAD	R	Discrete Input	57	blwr_ovrload_alm	BV	75		Select	Network Alarm of Supply Fan Motor Overload 0 = Normal 1 = Motor Overload Alarm
OVERLOAD STATUS	R	Discrete Input	58	blw_ovrload_status	BV	74		Select	Network Status of Supply Fan Motor Overload 0 = Normal 1 = Motor Overload Alarm
POINT NAME	R/W	Holding Register (Float)	53	ao_two	AV	92002		Select	Factory Reserved
POINT NAME	R/W	Holding Register (Float)	55	ao_one	AV	92001		Select	Factory Reserved
POINT NAME	R/W	Coil	13	do_one	BV	91001		Select	Factory Reserved
POINT NAME	R/W	Coil	15	do_two	BV	91002		Select	Factory Reserved
POINT NAME	R/W	Coil	16	do_three	BV	91003		Select	Factory Reserved
POINT NAME	R/W	Coil	17	do_six	BV	91006		Select	Factory Reserved
POINT NAME	R/W	Coil	18	do_five	BV	91005		Select	Factory Reserved
POINT NAME	R/W	Coil	19	do_four	BV	91004		Select	Factory Reserved
POINT NAME	R/W	Coil	20	do_one_one	BV	91007		Select	Factory Reserved
POINT NAME	R/W	Coil	21	do_one_three	BV	91009		Select	Factory Reserved
POINT NAME	R/W	Coil	22	do_one_two	BV	91008		Select	Factory Reserved
RA HIGH STATIC	R	Discrete Input	76	raf_hi_static_alm	BV	96	nvoRafHiStaticAl	SNVT_switch(95)	Network Alarm indicating return high return duct static 0 = Normal 1 = High Static Alarm
RA STATIC PRESS HIGH TRIP	R/W	Holding Register (Float)	59	ra_sta_hi_trip	AV	164	nviRaStaHiTrip	SNVT_count_inc (9)	Network Alarm indicating status of high levels of static
RA STATIC PRESS SET POINT	R/W	Holding Register (Float)	61	ra_sta_press_stpt	AV	165	nviRaStaPressStp	SNVT_count_inc (9)	Network Alarm indicating status of press levels of static
RA_SENS_FAIL	R	Discrete Input	71	ras_sen	BV	84		Select	Network Parameter to set RA SENSOR FAIL 0 = Hardwired Sensor (Default) 1 = BAS Sensor Value
RAS_HI	R	Discrete Input	72	ras_hi	BV	83		Select	Network Parameter set RAS HI 0 = Hardwired Sensor (Default) 1 = BAS Sensor Value
RAT RESET MODE	R/W	Holding Register (Float)	33	rat_rst_mode	AV	71		Select	Network Parameter to set Return Air Temperature reset mode 0 = Single Reset Value 1 = Multiple Reset Values (Default)
RAT RESET SELECTION	R/W	Holding Register (Float)	35	rat_sel	AV	73		Select	Network Parameter to set Return Air Temperature Selection 0 = Hardwired Sensor (Default) 1 = BAS Sensor Value
RAT SELECT	R	Input Register (Float)	35	rat_sel_sta	AV	78		Select	Network Parameter to set Return Air Temperature Select 0 = Single RAT Value 1 = Multiple RAT Values (Default)

Table 70 — Integration Points List (cont)

PROTOCOL MAP		MODBUS		BACNET			LONWORKS		OPERATION
DISPLAY NAME	READ/ WRITE	Register Type	Register Number	Reference Name	Object Type	Object Id	Nv Name	Snvt	Description
RAT SENS FAIL	R	Discrete Input	59	rat_sen	BV	73		Select	Return Air Temperature Sensor Alarm 0 = Normal 1 = Sensor Failure (Check Sensor)
RAT_HI	R	Discrete Input	60	rat_hi	BV	78		Select	Return Air Temperature Sensor Alarm 0 = Normal 1 = Sensor Value > 120°F
RESET FAN RNTM	R/W	Coil	10	fan_rntm_rst	BV	19		Select	Reset Fan Runtime. Momentary On/Off required. Toggled upon filter change.
RETURN AIR FAN MIN SPEED	R/W	Holding Register (Float)	63	raf_min_speed	AV	166		Select	Network Parameter to set Return Air Temperature fan min speed 0 = Single min Value 1 = Multiple min Values (Default)
RETURN FAN OUTPUT CMD	R	Discrete Input	73	rtn_fan_cmd	BV	82	nvoRtnFanCmd	SNVT_switch(95)	Network Parameter to set the return air fan minimum speed 40% (Factory Default)
REV VALVE OUTPUT CMD	R	Discrete Input	61	rev_vlv_cmd	BV	15		Select	Network Status of the Rev valve output
RF OVERLOAD	R	Discrete Input	74	rblwr_ovrload_alm	BV	86		Select	Network Alarm indicating return fan motor overload trip 0 = Normal 1 = Overload Alarm
RF OVERLOAD STATUS	R	Discrete Input	75	rtn_blw_ovrload_status	BV	98		Select	Network Status indicating return fan motor overload trip 0 = Normal 1 = Overload Alarm
RH SENSOR SEL	R/W	Holding Register (Float)	37	rh_sensor_sel	AV	57		Select	Network Parameter to set RH sensor 0 = Single sensor Value 1 = Multiple sensor Values (Default)
SA STATIC PRESS HIGH TRIP	R/W	Holding Register (Float)	39	sa_sta_hi_trip	AV	54		Select	Network Parameter to set the high static pressure trip point Default 3.0 " of H_2O
SA_CFG	R	Discrete Input	62	sa_config_error	BV	90		Select	Network Alarm indicating Smoke detector configuration Error
SA_SENS_FAIL	R	Discrete Input	63	sas_sen	BV	65		Select	Network Status Indicating Supply Static Pressure Sensor Failure 0 = Normal 1 = Sensor Failed
SAS_HI	R	Discrete Input	64	sas_hi	BV	64	nvoSasHi	SNVT_switch(95)	Static Air Pressure Alarm (High) 0 = Normal 1 = High Static Pressure (Default: 3.0" H_20)
SMK DET ALARM	R	Discrete Input	65	smoke	BV	89	nvoSmoke	SNVT_switch(95)	Smoke Detector Alarm 0 = Normal 1 = Alarm
SMOKE DETECTOR STATUS	R	Discrete Input	66	smoke_status	BV	87		Select	Network Status of Smoke Detector 0 = Normal 1 = Smoke Alarm
STATIC SHUTDOWN	R	Discrete Input	77	sa_stc_shtdwn	BV	16		Select	Network Alarm indicating return high supply duct static 0 = Normal 1 = High Static Alarm
STATIC PRESS SET POINT	R/W	Holding Register (Float)	41	sta_press_stpt	AV	52	nviStaPressStpt	SNVT_press_p (113)	Network Parameter to set the Duct Static Pressure Set point in inches of H_2O Setup
STATIC PRESSURE SHUTDOWN	R/W	Holding Register (Float)	43	st_press_trip	AV	69		Select	Network Parameter to set Static Pressure Shutdown trip 0 = Single Pressure Value 1 = Multiple Pressure Values (Default)

Table 70 — Integration Points List (cont)

PROTOCOL MAP		MODBUS		BACNET			LONWORKS		OPERATION
DISPLAY NAME	READ/ WRITE	Register Type	Register Number	Reference Name	Object Type	Object Id	Nv Name	Snvt	Description
SUPPLY AIR TEMPERATURE	R	Input Register (Float)	39	eff_sat	AV	10	nvoEffSATemp	SNVT_temp_p (105)	Network Parameter to set Supply Air Temperature 0 = Hardwired Sensor (Default) 1 = BAS Sensor Value
SUPPLY AIR SET POINT TRIP	R/W	Holding Register (Float)	45	sat_hi_trip	AV	63		Select	Network Parameter to set Supply Air Set point trip 0 = Single Set point Value 1 = Multiple Set point Values (Default)
SUPPLY AIR SET POINT DIFFERENTIAL	R/W	Holding Register (Float)	47	sat_stpt_diff	AV	65		Select	Network Parameter set Supply Air Set point differential 0 = Single Set point Value 1 = Multiple Set point Values (Default)
SUPPLY AIR TEMP SET POINT	R	Input Register (Float)	41	sa_setpt	AV	31	nviSAtStpt	SNVT_temp_p (105)	Network Parameter to set Supply Air Temperature Set point 0 = Hardwired Sensor (Default) 1 = BAS Sensor Value
SYSTEM STATUS	R	Input Register (Float)	43	sys_status	AV	16	nvoSysStatus	SNVT_count_inc (9)	General System Status 0 = Unoccupied 1 = Occupied 2 = Fan Only 4 = Cooling 5 = Transition to Cool 10 = Re-Heat
UNIT_MODE	R/W	Holding Register (Float)	49	unit_mode	AV	23		Select	Network Parameter to configure Unit operating mode 0 = Cooling only 5 = Cooling + Hot Gas Re-Heat
UPM INPUT	R	Discrete Input	67	upm_input	BV	39		Select	UPM Input Failure Alarm - Board 1 0 = UPM Connected 1 = UPM Connection Failure
UPM INPUT	R	Discrete Input	68	upm2_input	BV	59		Select	UPM Input Failure Alarm - Board 1 0 = UPM Connected 1 = UPM Connection Failure
UPM RESET	R/W	Coil	11	upm_rst	BV	25		Select	UPM Board 1 Reset. Momentary On/Off required.
UPM RESET	R/W	Coil	12	upm2_rst	BV	60		Select	UPM Board 2 Reset. Momentary On/Off required.
ZN_CO2_FAIL	R	Discrete Input	69	zn_co2_fail	BV	51		Select	CO_2 Zone Sensor Alarm (Sensor) 0 = Normal 1 = Sensor Failure (Check Sensor Hardware)
ZN_CO2_HI	R	Discrete Input	70	zn_co2_hi	BV	48		Select	CO_2 Zone Sensor Alarm (High) 0 = Normal 1 = High CO_2 Level (Default: >1995 PPM)
ZONE CO2 HIGH TRIP	R/W	Holding Register (Float)	51	zn_co2_hi_trip	AV	27		Select	Network Alarm indicating status of high levels of CO_2

LEGEND

BAS — Building Automation System
DAT — Discharge Air Temperature
LWT — Leaving Water Temperature
R — Read
UPM — Unit Protection Module
W — Write

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

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START-UP CHECKLIST

(Fill out this form on Start-Up and file in job folder)

NOTE: To avoid injury to personnel and damage to equipment or property when completing the procedures listed in this start-up checklist, use good judgment, follow safe practices, and adhere to the safety considerations/information as outlined in preceding sections of this Installation, Start-Up, Service and Controls Operation and Troubleshooting document.

I. PRELIMINARY INFORMATION:

50BV UNIT: MODEL NO. _____ SERIAL NO. _____

START-UP DATE: _____

II. PRE-START-UP:

VERIFY ALL SHIPPING MATERIALS HAVE BEEN REMOVED FROM THE UNIT

IS THERE ANY DAMAGE? _____ IF SO, WHERE _____

_____

WILL THIS DAMAGE PREVENT UNIT START-UP? (Y/N) _____

CHECK POWER SUPPLY. DOES IT AGREE WITH UNIT? (Y/N) _____

HAS THE GROUND WIRE BEEN CONNECTED? (Y/N) _____

HAS THE CIRCUIT BREAKER AND DISCONNECT BEEN SIZED AND INSTALLED PROPERLY? (Y/N) _____

ARE THE POWER WIRES TO THE UNIT SIZED AND INSTALLED PROPERLY? (Y/N) _____

HAS THE CORRECT INPUT POWER PHASE SEQUENCE BEEN CONFIRMED WITH A METER? (Y/N) _____

HAS THE FAN AND MOTOR PULLEY BEEN CHECKED FOR PROPER ALIGNMENT AND DOES THE FAN BELT HAVE PROPER TENSION? (Y/N) _____

HAS WATER BEEN PLACED IN DRAIN PAN TO CONFIRM PROPER DRAINAGE? (Y/N) _____

ARE PROPER AIR FILTERS IN PLACE AND CLEAN? (Y/N) _____

VERIFY THAT THE UNIT IS INSTALLED WITHIN LEVELING TOLERANCES (Y/N) _____

CONTROLS

(CV ONLY) HAS THE THERMOSTAT BEEN INSTALLED AND VERIFIED TO BE OPERATIONAL? (Y/N) _____

(VAV ONLY) HAS THE DUCT STATIC PRESSURE PROBE BEEN INSTALLED? (Y/N) _____

HAVE CONTROL CONNECTIONS BEEN MADE AND CHECKED? (Y/N) _____

ARE ALL WIRING TERMINALS (including main power supply) TIGHT? (Y/N) _____

(VAV ONLY) HAS THE SUPPLY AIR TEMPERATURE AND RETURN AIR TEMPERATURE SENSORS BEEN INSTALLED? (Y/N) _____

HAS THE UNIT CONTROL SYSTEM INTERFACE BEEN PROVIDED (VIRTUAL BACVIEW)? (Y/N) _____

PIPING

HAVE LEAK CHECKS BEEN MADE AT COMPRESSOR, CONDENSER, EVAPORATOR, TXVs (Thermostatic Expansion Valves), SOLENOID VALVES, FILTER DRIERS, AND FUSIBLE PLUGS WITH A LEAK DETECTOR? (Y/N) _____

HAVE WATER AND STEAM VALVES BEEN OPENED (to fill piping and heat exchangers)? (Y/N) _____

HAS AIR PURGE BEEN PERFORMED? (Y/N) _____

HAS THE WATER PIPING BEEN CHECKED FOR LEAKS AND VALVE OPERATION VERIFIED (Y/N) _____

HAS THE CONDENSER FLUID BEEN CHECKED FOR PROPER FLOW AND CONCENTRATION (Y/N) _____

DUCTWORK

HAS THE DUCTWORK BEEN PROPERLY INSTALLED WITH A PAIR OF PANTS (DUAL FAN UNITS) (Y/N) _____

(VAV ONLY) ARE ALL ZONE DAMPERS INSTALLED AND VERIFIED TO BE OPERATIONAL (Y/N) _____

ELECTRICAL

CHECK VOLTAGE IMBALANCE

LINE-TO-LINE VOLTS: AB _____ V AC _____ V BC _____ V

(AB + AC + BC)/3 = AVERAGE VOLTAGE = _____ V

MAXIMUM DEVIATION FROM AVERAGE VOLTAGE = _____ V

VOLTAGE IMBALANCE = 100 X (MAX DEVIATION)/(AVERAGE VOLTAGE) = _____ % (IF OVER 2% VOLTAGE IMBALANCE, DO NOT ATTEMPT TO START SYSTEM; CALL LOCAL POWER COMPANY FOR ASSISTANCE.)

III. START-UP:

CHECK FAN SPEED AND RECORD. _____

AFTER AT LEAST 15 MINUTES RUNNING TIME, RECORD THE FOLLOWING MEASUREMENTS:

	CIRCUIT 1	CIRCUIT 2	CIRCUIT 3	CIRCUIT 4
SUCTION PRESSURE				
SATURATED SUCTION TEMP				
SUCTION LINE TEMP				
SUPERHEAT DEGREES				
DISCHARGE PRESSURE				
SATURATED CONDENSING				
LIQUID LINE TEMP				
SUBCOOLING DEGREES				
LIQUID SIGHT GLASS (CLEAR/BUBBLES)				
ENTERING CONDENSER-WATER TEMP				
LEAVING CONDENSER-WATER TEMP				
EVAP ENTERING-AIR DB (dry bulb) TEMP				
EVAP ENTERING-AIR WB (wet bulb) TEMP				
EVAP LEAVING-AIR DB TEMP				
EVAP LEAVING-AIR WB TEMP				
HOT GAS BYPASS SETTING				

COMPRESSOR AMPS:				
L1				
L2				
L3				
SUPPLY FAN AMPS:				
L1				
L2				
L3				

NOTES: _____

_____

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE