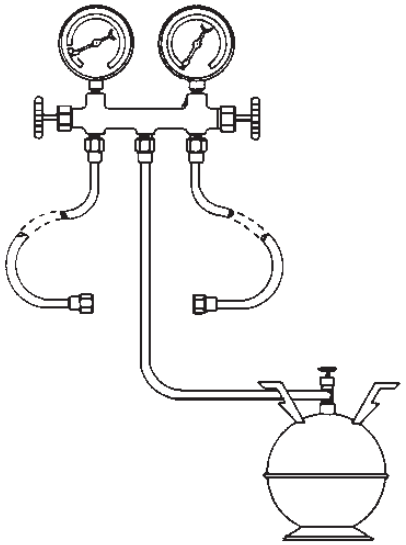
Literature Assembly
911-0616-1
BOOK 1 OF 2

Contains the following:

2100-479	Servicing Procedures
2100-597(R)	ITEC Series Air Cond Manual
2110-1581	Replacement Parts Manual
7960-420	Warranty Form

SERVICING PROCEDURE

R-410A
LEAK TEST EVACUATION
CHARGING



Bard Manufacturing Company, Inc.
Bryan, Ohio 43506

Since 1914...Moving ahead, just as planned.

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CONTENTS

General

⚠ WARNING

The oils used with R-410A refrigerant are hydroscopic and absorb water from the atmosphere readily. Do not leave systems open to the atmosphere for more than 5 minutes. If the system has been open for more than 5 minutes, change the filter dryer immediately before evacuation. Then recharge the system to the factory specified charge.

Recovery equipment rated for R-410A refrigerant
R-410A has an ozone depletion potential of zero, but must be reclaimed due to its global warming potential.

The gauge manifold set is specially designed to withstand the higher pressure associated with R-410A. Manifold sets are required to range up to 800 psig on the high side and 250 psig on the low side with a 250 psig low side retard.

All hoses must have a service rating of 800 psig. (This information will be indicated on the hoses.)

Vacuum Pump and micron gauge must be used when evacuating a system to 500 microns.

Leak Detectors
An electronic leak detector capable of detecting HFC refrigerant can be used with R-410A refrigerant.

GAUGE MANIFOLD

⚠ WARNING

Gauge manifold must be suitable for use with R-410A refrigerant and POE oils.

A necessary instrument in checking and serving air conditioning and heat pump equipment is the gauge manifold. Its purpose is to determine the operating refrigerant pressures in order for the serviceman to analyze the condition of the system.

The valving on the manifold is so arranged that when the valves are closed (front-seated) the center port on the manifold is closed to the gauges and gauge ports. With the valves in the closed position, the gauge ports are still open to the gauges, permitting the gauges to register system pressures. Opening either valve opens the center port to that side of the manifold and system.

ATTACHING GAUGE MANIFOLD

For leak testing, purging, checking charge, charging liquid or evacuating, connect high pressure side of gauge manifold to Schrader valve on liquid or discharge line. Connect suction side of gauge manifold to Schrader valve on suction line. On heat pumps the suction line is between compressor and reversing valve.

ATTACHING MANIFOLD HOSE TO SCHRADER VALVE

WARNING

As a safety measure, it is wise to detach refrigerant hoses at the lowest pressure readings on the system. To do this:

A. Put high pressure hose “B” on first. (Unit should not be running.)

B. Put low pressure hose “A” on second. (Unit should be running.)

1. Remove cap from valve.
2. Make sure gauge manifold valves are closed.
3. If hose does not have an unseating pin, a number 395 Superior or equivalent unseating coupler must be used.
4. Make sure coupler is lined up straight with Schrader valve. Screw coupler on to valve.
5. Open gauge manifold valve slightly and purge air from hose with refrigerant.
6. Read the suction pressure on compound gauge and heat pressure on pressure gauge.
7. To remove, push end of hose tight against end of Schrader valve and hold in place while quickly unscrewing coupler nut from Schrader valve.
8. Remove coupler from Schrader valve. Replace caps on valve.

Leak Test

1. Remove gauge port cap from suction and liquid service valve ports and attach manifold gauge hoses. Connect an upright R-410A drum to center port of gauge manifold. Open refrigerant drum valve and manifold high pressure gauge valve to pressurize system to a positive pressure with refrigerant vapor. Pressurize the complete system with dry nitrogen, or CO2 until the pressure reaches 200 psig. **Do not** exceed 250 psig.
2. Close manifold high pressure gauge valve. Check all soldered joints, including those on the evaporator coil with an Electronic Leak Detector suitable for use with HFC refrigerants or R-410A. If a leak is found which requires soldering, pressure in the system must be bled off since it is impossible to solder with unit pressurized. Be sure all leaks are located and marked before bleeding pressure from system.
3. Close drum valve and disconnect from center port. Release nitrogen or CO2 into the atmosphere through suction line of gauge manifold.
4. Correct any leaks and recheck. When leaks, if any, have been repaired, system is ready to be evacuated and charged. Relieve all pressure from the system down to 0 psig.
5. Change the filter dryer. When leaks, if any, have been repaired, system is ready to be evacuated and charged. Relieve all pressure from the system down to 0 psig.

EVACUATION

Evacuation

An evacuation to 500 microns is usually sufficient to remove moisture from a system using R-22 and mineral oil lubricant. A 500 micron evacuation, however, will not separate moisture from Polyol Ester oil (POE) in R-410A systems.

In addition to a 500 micron evacuation, the liquid line filter dryer (R-410A compatible) must be replaced any time the system is open. When removing a filter dryer from a system, do not use a torch; use a tubing cutter to avoid releasing moisture back into the system.

Older R-22 leak detectors, as well as halide torch leak detectors, will not detect leaks in R-410A systems. Never use air and R-410A to leak check, as the mixture may become flammable at pressures above 1 atmosphere. A system can be safely leak-checked by using nitrogen or a trace gas of R-410A and nitrogen.

Remember: *Always use a pressure regulator with nitrogen and a safety valve down stream - set at no more than 150 psig.*

1. Evacuate system to less than 500 microns, using a good vacuum pump and an accurate high vacuum gauge. Operate the pump below 500 microns for 60 minutes and then close valve to the vacuum pump. Allow the system to stand for 30 additional minutes to be sure a 500 micron vacuum or less is maintained.

WARNING

At no time use the compressor to evacuate the system or any part of it.

2. Disconnect charging line at vacuum pump and connect to refrigerant supply. Crack the cylinder valve and purge charging line at center on manifold. Then close cylinder valve.
3. The system is now ready for the correct operating charge of Refrigerant R-410A.

R-410A System Charging

Even though R-410A has a very small fractionation potential, it cannot be ignored completely when charging. To avoid fractionation, charging of an air conditioner or heat pump system incorporating R-410A **shall be done with "liquid"** to maintain optimum system performance. To insure that the proper blend composition is charged into the system, it is important that liquid only be removed from the charging cylinder. Some cylinders supplied by manufacturers have dip tubes, which allow liquid refrigerant to be removed from the cylinder when it is in the upright position. Cylinders without dip tubes have to be tipped upside down in order for liquid to be removed. The Service Technician must differentiate between which type of charging cylinder they are using to avoid removing vapor refrigerant instead of liquid refrigerant to avoid fractionation and for safety concerns.

Connect the gauge manifold to the high and low side. Allow liquid to enter the high side only. The high side will hold 80-100% of the total charge. When liquid stops flowing, close high side port. The remainder of the charge will be added to the low side. Keep in mind two issues: first, never start the compressor with less than 55 psig of suction pressure. Secondly, make sure the liquid is throttled, thus vaporized into the low side of the system to avoid compressor damage. A throttling valve can be used to insure that liquid is converted to vapor prior to entering the system. Proper manipulation (restricting) of the manifold gauge set can also act as a throttling device to insure liquid is not entering the compressor.

CHARGING

1. **Single Package Units**—Refer to the unit serial plate for the full operating charge.

PRELIMINARY CHARGING STEPS

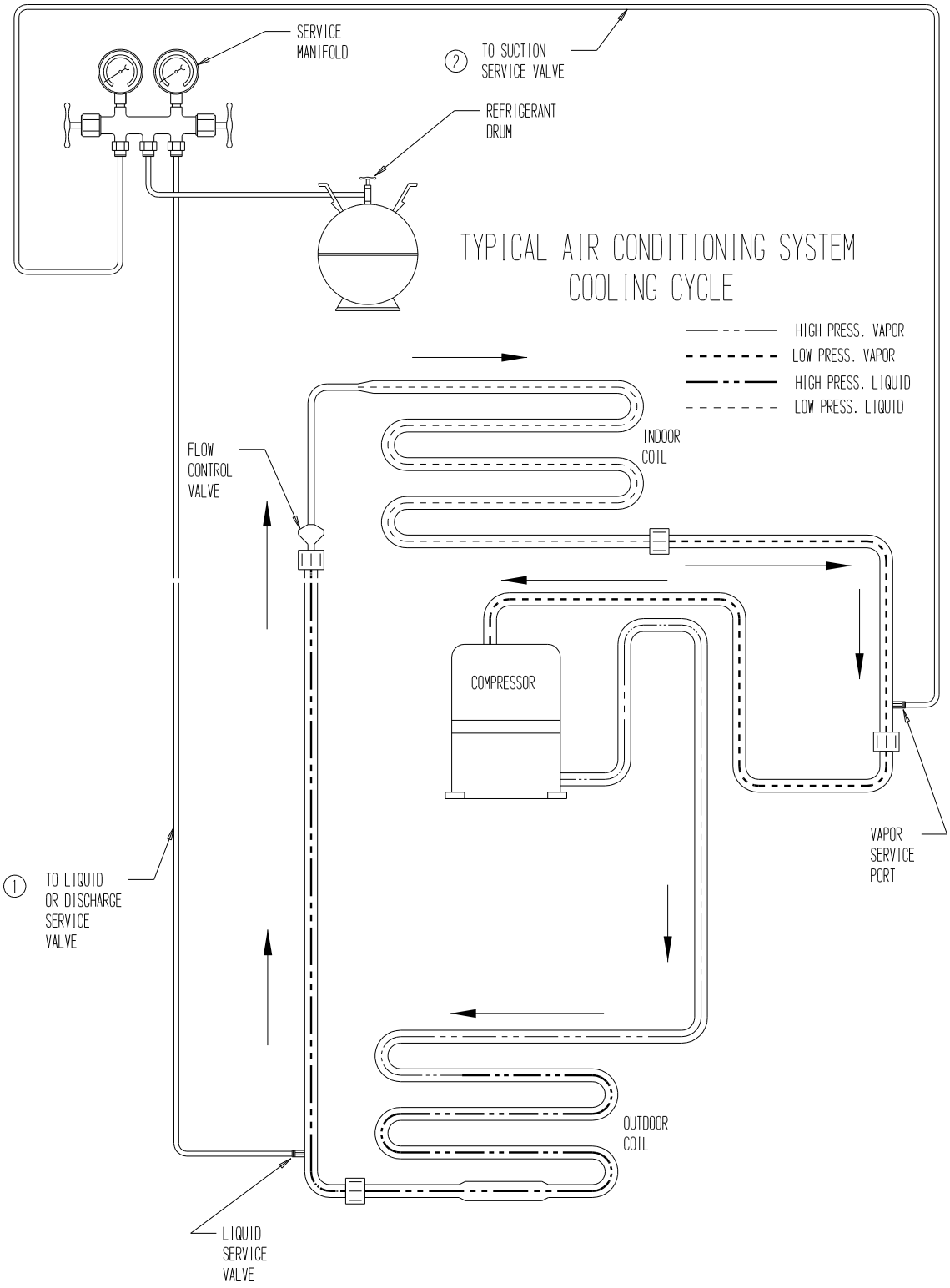
If the system has been open to the atmosphere, the filter dryer should be replaced and then evacuated. Then proceed as follows:

1. Attach a drum of proper, clean refrigerant to the center port of the charging manifold with one of the charging hoses.
2. Attach a second charging hose to the suction gauge (low pressure) side of the gauge manifold.
3. Remove the cap from the suction line valve.
4. Loosely attach the suction gauge hose to the line valve. Open the valve on the refrigerant drum and the suction valve on the charging manifold slightly to purge the air from the manifold and hoses before tightening the fitting.
5. Attach the third hose to the high pressure side of the manifold and the liquid line valve. Repeat steps 3 and 4 above.

CHARGING THE SYSTEM BY WEIGHT

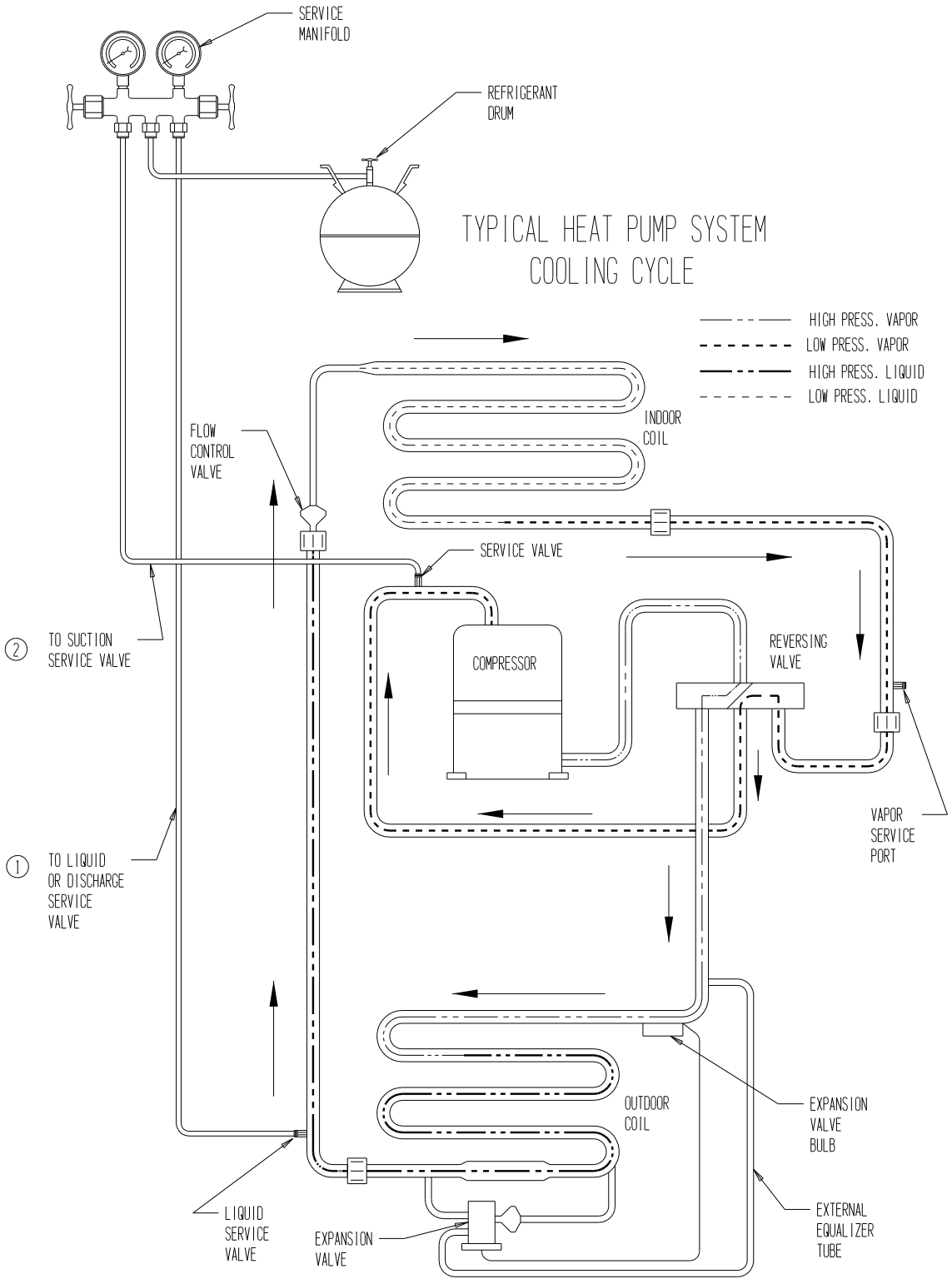
1. Connect manifold as instructed.
2. Place refrigerant drum upright on scale and determine exact weight of the refrigerant and cylinder.
3. With manifold suction valve closed and manifold discharge valve open, open refrigerant cylinder liquid valve and allow pressure in system to balance with pressure of cylinder or 80% of charge is in the unit - whichever comes first.
4. When there is approximately an 80% charge, front seat (close) the discharge manifold valve and let the system stabilize for about five minutes.
5. Start compressor by setting thermostat.
6. Finish charging with liquid by cracking the suction valve. Open the manifold low pressure valve to allow refrigerant to flow into the system. Throttle the manifold valve to keep pressure about 100 psig for R-410A.
7. When the correct weight of refrigerant has been added to the unit, close refrigerant cylinder valve and allow unit to run for 30 minutes. Refer to Start-Up Procedure and Check List for further start-up details.
8. Front seat gauge manifold valves, disconnect charging and gauge hoses and replace all valve caps.

FIGURE 1
TYPICAL AIR CONDITIONING SYSTEM COOLING CYCLE



MIS-369

FIGURE 2
TYPICAL HEAT PUMP SYSTEM COOLING CYCLE



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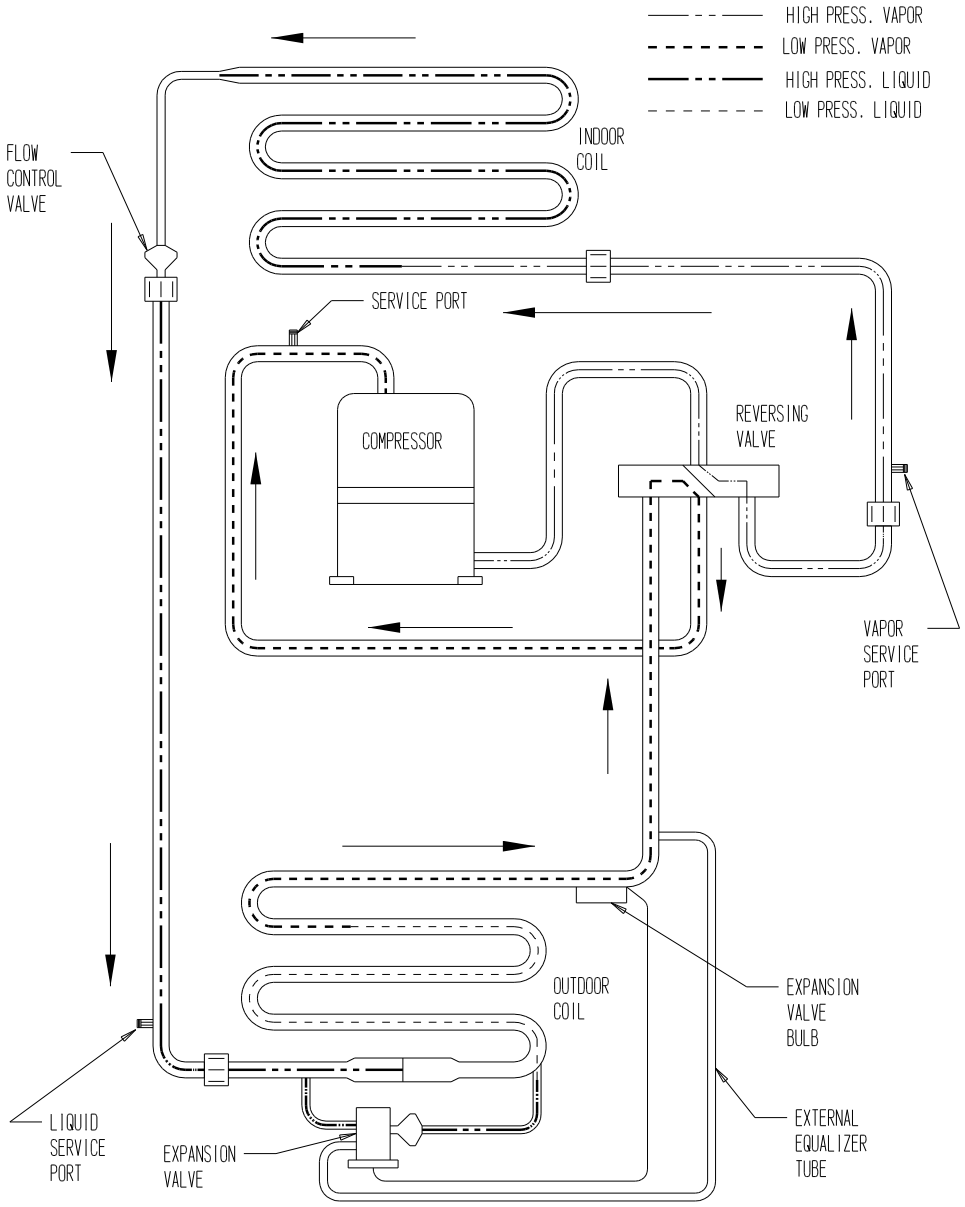
⚠ WARNING

To speed refrigerant flow, it may be necessary to place refrigerant drum in a pan of warm water (not greater than 130ºF). Remember to either consider the total weight of the pan of water or remove the drum for weighing frequently to keep track of the charging process.

FIGURE 3
HEATING CYCLE



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TROUBLESHOOTING THE MECHANICAL SYSTEM

AIR CONDITIONING AND HEAT PUMP — COOLING

LOW SUCTION—LOW HEAD PRESSURE

1. Restricted airflow over indoor coil.
2. Defective indoor fan motor.
3. Low indoor temperature
4. Iced indoor coil.
5. Restricted liquid line, dryer, metering device, etc.
6. Low charge.
7. Low ambient entering air temperature. (Low entering water temperature to water coil.①)

HIGH SUCTION—LOW HEAD PRESSURE

1. Defective or broken valves.
2. IPRV valve open.
3. Defective reversing valve.

LOW SUCTION—HIGH HEAD PRESSURE

1. Partial restriction and then overcharged.

HIGH SUCTION—HIGH HEAD PRESSURE

1. High entering outdoor air temperature. (High entering water temperature.①)
2. Low airflow outdoor coil. (Low water flow.①)
3. Overcharged.
4. Air in system.
5. Restricted outdoor coil. (Restricted water coil.①)
6. High indoor air temperature.

① Water source heat pump.

HEAT PUMP — HEATING

LOW SUCTION—LOW HEAD PRESSURE

1. Restricted airflow through outdoor coil. (Restricted water flow through water coil.①)
2. Defective outdoor motor. (Defective water pump.①)
3. Low outdoor air temperature. (Low water temperature.①)
4. Frozen outdoor coil. (Frozen water coil.①)
5. Restricted liquid line, dryer, metering device, etc.
6. Low charge.
7. Low indoor air temperature.

HIGH SUCTION—LOW HEAD PRESSURE

1. Defective or broken valves.
2. IPR valve open.
3. Defective reversing valve.

LOW SUCTION—HIGH HEAD PRESSURE

1. Partial restriction and then overcharged.

HIGH SUCTION—HIGH HEAD PRESSURE

1. High entering outdoor air temperature. (High entering water temperature.①)
2. Low indoor airflow.
3. Overcharged.
4. Air in system.
5. Restricted air coil.
6. High indoor air temperature.

① Water source heat pump.

TROUBLESHOOTING CHART FOR AIR CONDITIONERS

- ● Generally the cause. Always make these checks first.
- ◆ Occasionally the cause. Make these checks only if first checks fail to locate trouble.
- ■ Rarely the cause. Make this check only if previous checks fail to locate trouble.

Power Supply — Meter to Line Side of Contactor

	Power Failure	Blown Fuses or Tripped Circuit Breakers	Faulty Wiring	Loose Terminals	Low Voltage	Single 1PH Failure of 3PH	Unbalanced Power Supply 3PH	Voltage Too High
Compressor and condenser fan motor will not start	●	●	●	●	◆	■	■	
Compressor will not start but condenser fan will run				◆	◆	◆	◆	
Condenser fan motor will not start								
Compressor "hums" but will not start			●	●	◆	◆	◆	
Compressor cycles on overload			●	●	●	■	●	
Compressor short cycles on low pressure								
Compressor runs continuously—no cooling								
Compressor runs continuously —cooling								
Compressor noisy								
Compressor loses oil								
Head pressure too high								
Head pressure too low								
Liquid line frosting or sweating								
Suction pressure too high								
Suction pressure too low								
Evaporator frosting								
Suction line frosting or sweating								
Evaporator blower will not start	●	●	●	●	■	■		
Condenser fan motor runs contactor not pulled in								
Liquid refrigerant flooding back to compressor—cap tube system								
Space temperature too high								

Power Supply — Load Side of Contactor to Motor Terminal

	Open Disconnect Switch	Faulty Wiring	Loose Terminal	Low Voltage	Defective Contacts in Contactor	Compressor Overload	Potential Relay Fails to Open	Potential Relay Fails to Close	Run Capacitor	Start Capacitor
Compressor and condenser fan motor will not start	●	●	●	◆	◆	●				
Compressor will not start but condenser fan will run		●	●	◆	◆	●		◆	●	●
Condenser fan motor will not start		●	●							
Compressor "hums" but will not start		●	●	◆	◆	●	●			●
Compressor cycles on overload		●	●	●	●	◆	●		●	
Compressor short cycles on low pressure										
Compressor runs continuously—no cooling										
Compressor runs continuously —cooling										
Compressor noisy									◆	
Compressor loses oil										
Head pressure too high										
Head pressure too low										
Liquid line frosting or sweating										
Suction pressure too high										
Suction pressure too low										
Evaporator frosting										
Suction line frosting or sweating										
Evaporator blower will not start		●	●	■						
Condenser fan motor runs contactor not pulled in										
Liquid refrigerant flooding back to compressor—cap tube system										
Space temperature too high										

Power Supply — Control Circuit

	Faulty Wiring	Loose Terminals	Control Transformer	Low Voltage	Thermostat	Contactor Coil	Pressure Control	Condenser Fan Relay	Evaporator Fan Relay
Compressor and condenser fan motor will not start	●	●	●	◆	◆	●	●		
Compressor will not start but condenser fan will run									
Condenser fan motor will not start								●	
Compressor "hums" but will not start									
Compressor cycles on overload									
Compressor short cycles on low pressure									
Compressor runs continuously—no cooling									
Compressor runs continuously —cooling	●				●				
Compressor noisy									
Compressor loses oil									
Head pressure too high									
Head pressure too low									
Liquid line frosting or sweating									
Suction pressure too high									
Suction pressure too low									
Evaporator frosting									
Suction line frosting or sweating									
Evaporator blower will not start	●	●	●	■	■				●
Condenser fan motor runs contactor not pulled in									
Liquid refrigerant flooding back to compressor—cap tube system									
Space temperature too high					●				

Motors

	Compressor Motor	Condenser Motor	Evaporator Motor	Compressor Off on Internal Overload
Compressor and condenser fan motor will not start		■	■	
Compressor will not start but condenser fan will run	●			
Condenser fan motor will not start		●		
Compressor "hums" but will not start	◆			
Compressor cycles on overload	◆			
Compressor short cycles on low pressure				
Compressor runs continuously—no cooling				
Compressor runs continuously —cooling				
Compressor noisy				
Compressor loses oil				
Head pressure too high				
Head pressure too low				
Liquid line frosting or sweating				
Suction pressure too high				
Suction pressure too low				
Evaporator frosting			◆	
Suction line frosting or sweating				
Evaporator blower will not start			●	
Condenser fan motor runs contactor not pulled in				●
Liquid refrigerant flooding back to compressor—cap tube system				
Space temperature too high				

High Pressure Side of System — Compressor

	Hold Down Bolts	Defective Compressor Bearings	Seized Compressor	Defective Compressor Valves	Compressor Oil Level	Open or Short Motor Windings
Compressor and condenser fan motor will not start						
Compressor will not start but condenser fan will run		●	●			●
Condenser fan motor will not start						
Compressor "hums" but will not start		●	◆			◆
Compressor cycles on overload				■	■	◆
Compressor short cycles on low pressure						
Compressor runs continuously—no cooling				●		
Compressor runs continuously —cooling						
Compressor noisy	●	●		●	●	
Compressor loses oil						
Head pressure too high					■	
Head pressure too low				◆		
Liquid line frosting or sweating						
Suction pressure too high				●		
Suction pressure too low						
Evaporator frosting						
Suction line frosting or sweating						
Evaporator blower will not start						
Condenser fan motor runs contactor not pulled in						
Liquid refrigerant flooding back to compressor—cap tube system						
Space temperature too high				◆		

High Pressure Side of System — System Operation

	Refrigerant Charge Low	Overcharge of Refrigerant	High Head Pressure	High Suction Pressure	Low Suction Pressure	Temperatures	Non-Condensables (Air, etc.)	Excessive Load in Space	Liquid Valve Partially Closed
Compressor and condenser fan motor will not start	●	■	●		●		●		
Compressor will not start but condenser fan will run									
Condenser fan motor will not start									
Compressor "hums" but will not start		■	■		■	■			
Compressor cycles on overload	◆	◆	◆	◆			◆	◆	
Compressor short cycles on low pressure	●				●				
Compressor runs continuously—no cooling	●			◆			◆		
Compressor runs continuously —cooling								●	
Compressor noisy									
Compressor loses oil	●				●				
Head pressure too high		●				●	●	◆	
Head pressure too low	●				●				
Liquid line frosting or sweating									●
Suction pressure too high		◆	●			◆		●	
Suction pressure too low	●					◆			
Evaporator frosting	◆				●	◆			
Suction line frosting or sweating		●							
Evaporator blower will not start									
Condenser fan motor runs contactor not pulled in									
Liquid refrigerant flooding back to compressor—cap tube system		●				■			
Space temperature too high	●				●				

High Pressure Side of System — Condenser Air

	Condenser Fins Dirty or Plugged	Condenser Fan Belt Slipping	Condenser Air Short Circuiting	Low Condenser Air Volume	Condenser Air Temperature Low
Compressor and condenser fan motor will not start	■	■	■	■	
Compressor will not start but condenser fan will run					
Condenser fan motor will not start					
Compressor "hums" but will not start					
Compressor cycles on overload	■	■	■	■	■
Compressor short cycles on low pressure					
Compressor runs continuously—no cooling	■	■	■	■	■
Compressor runs continuously —cooling					
Compressor noisy					
Compressor loses oil					
Head pressure too high	●	●	◆	●	
Head pressure too low					●
Liquid line frosting or sweating					
Suction pressure too high					
Suction pressure too low					
Evaporator frosting					
Suction line frosting or sweating					
Evaporator blower will not start					
Condenser fan motor runs contactor not pulled in					
Liquid refrigerant flooding back to compressor—cap tube system					
Space temperature too high					

Low Side — Evaporator Air

	Plugged or Restricted Metering Device	Evaporator Fins Dirty or Plugged	Evaporator Belt Slipping	Low Evaporator Air Volume	Dirty Filters	Ductwork Small or Restricted
Compressor and condenser fan motor will not start						
Compressor will not start but condenser fan will run						
Condenser fan motor will not start						
Compressor "hums" but will not start						
Compressor cycles on overload						
Compressor short cycles on low pressure	●	●	●	●	●	●
Compressor runs continuously—no cooling	◆	●	●	●	●	●
Compressor runs continuously —cooling						
Compressor noisy						
Compressor loses oil		■	■	■	■	■
Head pressure too high	◆					
Head pressure too low						
Liquid line frosting or sweating	◆					
Suction pressure too high						
Suction pressure too low	◆	◆	●	●	●	●
Evaporator frosting	◆	◆	●	●	●	●
Suction line frosting or sweating	◆●	●	●	◆●	■	
Evaporator blower will not start						
Condenser fan motor runs contactor not pulled in						
Liquid refrigerant flooding back to compressor—cap tube system		◆	◆	◆	◆	◆
Space temperature too high	◆	●	●	●	●	●

General

	Restrictions	Thermostat Setting	Thermostat Location	Stratified Air in Space	Incorrect Refrigerant Piping	System Too Small
Compressor and condenser fan motor will not start		■				
Compressor will not start but condenser fan will run						
Condenser fan motor will not start						
Compressor "hums" but will not start						
Compressor cycles on overload	■					
Compressor short cycles on low pressure	●			■		
Compressor runs continuously—no cooling	◆	■	◆	◆		
Compressor runs continuously —cooling			●			◆
Compressor noisy					◆	
Compressor loses oil	◆				●	
Head pressure too high	■					
Head pressure too low						
Liquid line frosting or sweating	●					
Suction pressure too high						
Suction pressure too low	◆			◆	■	
Evaporator frosting	◆			◆	■	
Suction line frosting or sweating						
Evaporator blower will not start						
Condenser fan motor runs contactor not pulled in						
Liquid refrigerant flooding back to compressor—cap tube system				■		
Space temperature too high		●	◆	◆	■	●

TROUBLESHOOTING CHART FOR AIR TO AIR HEAT PUMPS

● Denotes common cause.

◆ Denotes occasional cause.

Power Supply

		Power Failure	Blown Fuse or Tripped Breaker	Faulty Wiring	Loose Terminals	Low Voltage	Single 1PH Failure of 3PH	Unbalanced 3PH	Defective Contacts in Contactor	Compressor Overload	Potential Relay	Run Capacitor	Start Capacitor	Faulty Wiring	Loose Terminals	Control Transformer	Low Voltage	Thermostat	Contactor Coil	Pressure Control or Impedance Relay	Indoor Fan Relay
		Line Voltage												Control Circuit							
Heating or Cooling Cycles	Compressor and O.D. fan motor do not operate	●	●	●	●		◆	◆	◆	◆				●	●	●	◆	◆	●	●	
	Compressor will not run O.D. fan motor runs			●	●	●	◆	◆		●	●	●	●								
	Compressor "hums" but will not start			●	●	●	●	◆	◆		●	●	●								
	Compressor cycles on overload			●	●	●	◆	◆	◆	●	●	●	●								
	Compressor off on high pressure control																			◆	●
	Compressor noisy																				
	Head pressure too high																				
	Head pressure too low																				
	Suction pressure too high																				
	Suction pressure too low																				
	I.D. blower will not start	●	●	●	●									●	●	●	◆	◆			●
	I.D. coil frosting or icing-																				
	High compressor amps					●															
Cooling Cycle	Compressor runs continuously—no cooling																				
	Liquid refrigerant flooding back to compressor																				
Heating Cycle	Compressor runs continuously—no heating																				
	Defrost cycle initiates no ice on coil																				
	Reversing valve does not shift			●	●																
	Ice build up on lower part of O.D. coil																				
	Liquid refrigerant flooding back to compressor																				
	Auxiliary heat on I.D. blower off			●	●									●	●			◆			●
	Excessive operating costs			◆	◆													◆			
	Excessive ice on O.D. coil			◆	◆																

Outdoor Section

		Discharge Line Hitting Inside of Shell	Bearings Defective	Seized	Valve Defective	Motor Windings Defective	Refrigerant Charge Low	Refrigerant Overcharge	High Head Pressure	Low Head Pressure	High Suction Pressure	Low Suction Pressure	Non-Condensables	Unequalized Pressures
		Compressor					Refrigerant System							
Heating or Cooling Cycles	Compressor and O.D. fan motor do not operate													
	Compressor will not run O.D. fan motor runs		◆	●		●								●
	Compressor "hums" but will not start		●	●		●								●
	Compressor cycles on overload		◆		◆	◆	●	●	◆		◆		●	
	Compressor off on high pressure control							●					●	
	Compressor noisy	◆	◆		●									
	Head pressure too high							●					●	
	Head pressure too low				●		●					●		
	Suction pressure too high				●			●	●					
	Suction pressure too low						●			◆				
	I.D. blower will not start													
	I.D. coil frosting or icing-						●					●		
	High compressor amps		●	●				●	●		●		●	
Cooling Cycle	Compressor runs continuously—no cooling				●		●							
	Liquid refrigerant flooding back to compressor							●	●					
Heating Cycle	Compressor runs continuously—no heating				●		●							
	Defrost cycle initiates no ice on coil						◆							
	Reversing valve does not shift						◆			◆				
	Ice build up on lower part of O.D. coil						●					◆		
	Liquid refrigerant flooding back to compressor							●	●					
	Auxiliary heat on I.D. blower off													
	Excessive operating costs						●	●						
	Excessive ice on O.D. coil						●							

Outdoor Section (continued)

		Sensing Bulb Loose-Poorly Located	Cycle Too Long (Clock timer)	Defective Control, Timer or Relay	Leaking	Defective Valve or Coil	Sticking Closed	Leaking or Defective	Plugged or Restricted Meter Device (Htg)	Fins Dirty or Plugged	Motor Winding Defective	Recirculation of Air	Air Volume Low (Cooling)	Low Temperature Coil Air (Cooling)
		Defrost Control			Rev. Valve		Check Valve		Outdoor Fan Motor and Coil					
Heating or Cooling Cycles	Compressor and O.D. fan motor do not operate													
	Compressor will not run O.D. fan motor runs													
	Compressor "hums" but will not start													
	Compressor cycles on overload				◆					◆	◆	◆	◆	
	Compressor off on high pressure control	◆	●	●			●		◆	●	●	●	●	
	Compressor noisy													
	Head pressure too high	◆	◆			◆	◆		◆	●	●	◆	●	
	Head pressure too low				●			◆						●
	Suction pressure too high				●			◆						
	Suction pressure too low						◆		◆	●	●	◆		◆
	I.D. blower will not start													
	I.D. coil frosting or icing-						◆							
	High compressor amps						◆							
Cooling Cycle	Compressor runs continuously—no cooling									◆	◆	◆	◆	◆
	Liquid refrigerant flooding back to compressor													
Heating Cycle	Compressor runs continuously—no heating		◆	◆	●									
	Defrost cycle initiates no ice on coil			●										
	Reversing valve does not shift					●								
	Ice build up on lower part of O.D. coil	●	●	●										
	Liquid refrigerant flooding back to compressor													
	Auxiliary heat on I.D. blower off													
	Excessive operating costs			●	●	●				◆	◆	◆		
	Excessive ice on O.D. coil	●	●	●		●								

Indoor Section / Aux. Heat

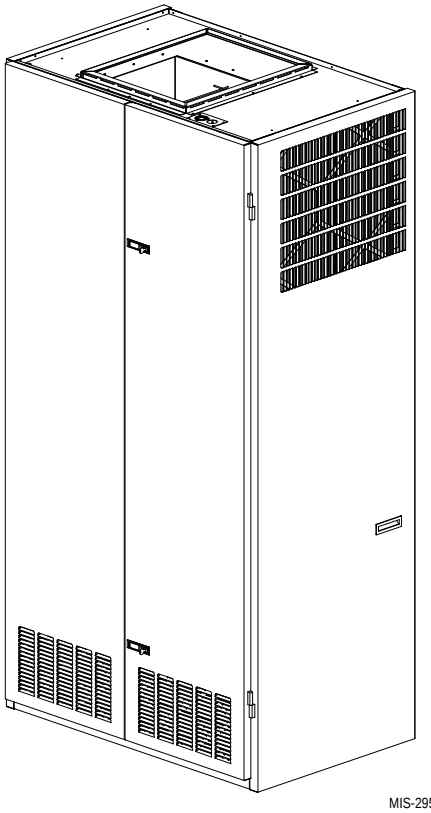
		Plugged or Restricted Metering Device (Clg)	Fins Dirty or Plugged	Motor Winding Defective	Air Volume Low	Air Filters Dirty	Undersized or Restricted Ductwork	Sticking Closed	Leaking or Defective	Auxiliary Heat Upstream of Coil
		Indoor Blower Motor and Coil						Check		Aux. Heat
Heating or Cooling Cycles	Compressor and O.D. fan motor do not operate									
	Compressor will not run O.D. fan motor runs									
	Compressor "hums" but will not start									
	Compressor cycles on overload		◆	◆	◆	●	◆			
	Compressor off on high pressure control	◆	●	●	●	●	●	●		●
	Compressor noisy									
	Head pressure too high	◆	◆	◆	●	●	◆	◆		●
	Head pressure too low								◆	
	Suction pressure too high								◆	
	Suction pressure too low	◆	●	◆	●	●	◆	◆		
	I.D. blower will not start									
	I.D. coil frosting or icing-	◆	●	●	●	●	◆			
	High compressor amps		●	●	●	●	◆	◆		
Cooling Cycle	Compressor runs continuously—no cooling		●	●	●	●	◆			
	Liquid refrigerant flooding back to compressor		●	●	●	●	◆	◆		
Heating Cycle	Compressor runs continuously—no heating									
	Defrost cycle initiates no ice on coil									
	Reversing valve does not shift									
	Ice build up on lower part of O.D. coil									
	Liquid refrigerant flooding back to compressor									
	Auxiliary heat on I.D. blower off			●						
	Excessive operating costs		◆	◆	◆					
	Excessive ice on O.D. coil									

INSTALLATION INSTRUCTIONS

I-TEC® Series
Packaged Air Conditioner

Models:

I30A1DA	I36A1DA	I42A1DA	I48A1DA	I60A1DA
I30A1DB	I36A1DB	I42A1DB	I48A1DB	I60A1DB
I30A1DC	I36A1DC	I42A1DC	I48A1DC	I60A1DC



MIS-2957 A

Bard® SINCE 1914
Climate Control Solutions

Bard Manufacturing Company, Inc.
Bryan, Ohio 43506

www.bardhvac.com

Manual: 2100-597R
Supersedes: 2100-597Q
Date: 7-25-23

CONTENTS

Figures

Tables

GETTING OTHER INFORMATION AND PUBLICATIONS

These publications can help when installing the furnace. They can usually be found at the local library or purchased directly from the publisher. Be sure to consult the current edition of each standard.

National Electrical Code ..... ANSI/NFPA 70

Standard for the Installation ..... ANSI/NFPA 90A
of Air Conditioning and Ventilating Systems

Standard for Warm Air ..... ANSI/NFPA 90B
Heating and Air Conditioning Systems

Load Calculation for ..... ACCA Manual J or
Winter and Summer Manual N
Air Conditioning

Low Pressure, Low Velocity ..... ACCA Manual D or
Duct System Design Manual Q
Winter and Summer Air Conditioning

For more information, contact these publishers:

ACCA **Air Conditioning Contractors of America**
1712 New Hampshire Avenue
Washington, DC 20009
Telephone: (202) 483-9370
Fax: (202) 234-4721

ANSI **American National Standards Institute**
11 West Street, 13th Floor
New York, NY 10036
Telephone: (212) 642-4900
Fax: (212) 302-1286

ASHRAE **American Society of Heating, Refrigeration, and Air Conditioning Engineers, Inc.**
1791 Tullie Circle, N.E.
Atlanta, GA 30329-2305
Telephone: (404) 636-8400
Fax: (404) 321-5478

NFPA **National Fire Protection Association**
Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9901
Telephone: (800) 344-3555
Fax: (617) 984-7057

GENERAL

The equipment covered in this manual is to be installed by trained, experienced service and installation technicians.

> ***The I-TEC must be installed with the Bard manufactured IWS wall sleeve and ILG louver grille accessories. These are sold as separate accessories. Any substitutions will void the manufacturer's warranty.***

The unit is designed for use with or without ductwork. For use without ductwork, Plenum Box IPBDF8-color (8" height) or IPBDF12-color (12" height) is recommended.

These instructions explain the recommended method to install the air cooled self-contained unit and the electrical connections to it.

These instructions and any instructions packaged with any separate equipment required to make up the entire heating and air conditioning system should be carefully read before beginning the installation. Note particularly "Start Procedure" and any tags and/or labels attached to the equipment.

While these instructions are intended as a general recommended guide, they do not supersede any national and/or local codes in any way. Authorities having jurisdiction should be consulted before the installation is made. See page 4 for information on codes and standards.

Size of unit for a proposed installation should be based on heat loss or heat gain calculation made according to methods of Air Conditioning Contractors of America (ACCA). The air duct should be installed in accordance with the Standards of the National Fire Protection Systems of Other Than Residence Type, NFPA No. 90A, and Residence Type Warm Air Heating and Air Conditioning Systems, NFPA No. 90B. Where local regulations are at a variance with instructions, installer should adhere to local codes.

ANSI Z535.5 Definitions:

- **DANGER:** Indicate[s] a hazardous situation which, if not avoided, will result in death or serious injury. The signal word "DANGER" is to be limited to the most extreme situations. DANGER [signs] should not be used for property damage hazards unless personal injury risk appropriate to these levels is also involved.
- **WARNING:** Indicate[s] a hazardous situation which, if not avoided, could result in death or serious injury. WARNING [signs] should not be used for property damage hazards unless personal injury risk appropriate to this level is also involved.
- **CAUTION:** Indicate[s] a hazardous situation which, if not avoided, could result in minor or moderate injury. CAUTION [signs] without a safety alert symbol may be used to alert against unsafe practices that can result in property damage only.
- **NOTICE:** [this header is] preferred to address practices not related to personal injury. The safety alert symbol shall not be used with this signal word. As an alternative to "NOTICE" the word "CAUTION" without the safety alert symbol may be used to indicate a message not related to personal injury.

I-TEC Series General Information

I-TEC MODEL NOMENCLATURE

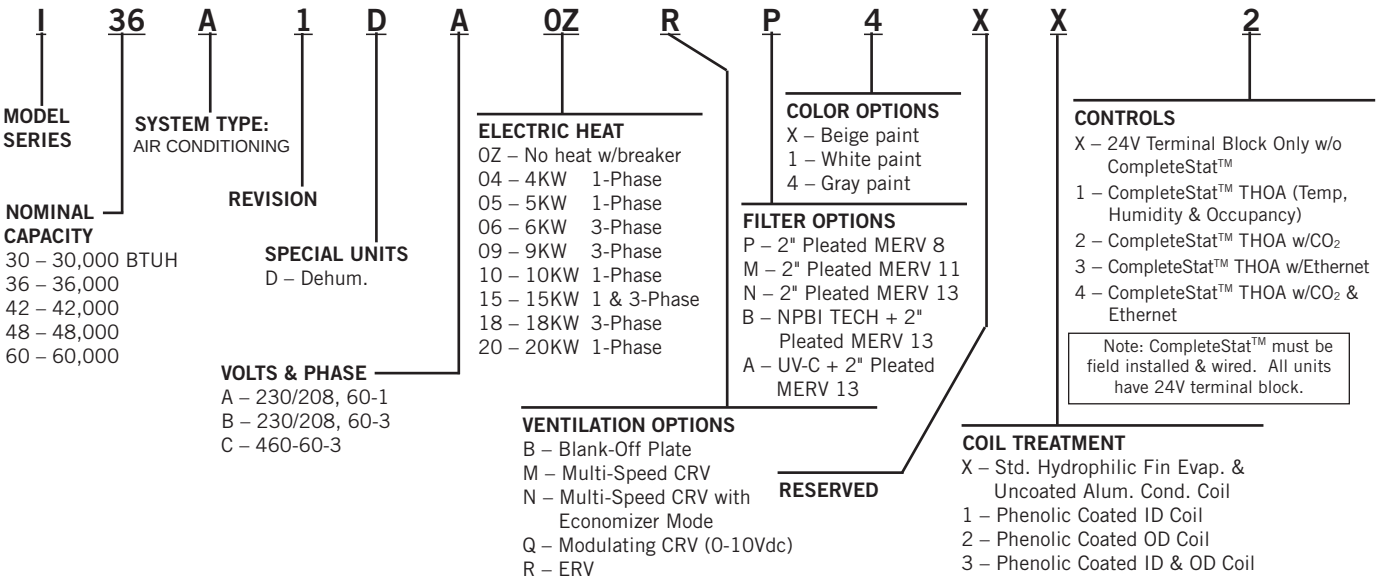


TABLE 1A
Factory Built-In Electric Heat Table

Models	I30A1DA		I30A1DB		I30A1DC	I36A1DA I42A1DA		I36A1DB I42A1DB		I36A1DC I42A1DC	I48A1DA		I48A1DB I60A1DB		I48A1DC I60A1DC	I60A1DA	
KW	240V-1	208V-1	240V-3	208V-3	460V-3	240V-1	208V-1	240V-3	208V-3	460V-3	240V-1	208V-1	240V-3	208V-3	460V-3	240V-1	208V-1
	BTUH	BTUH	BTUH	BTUH	BTUH	BTUH	BTUH	BTUH	BTUH	BTUH	BTUH	BTUH	BTUH	BTUH	BTUH	BTUH	BTUH
4.0											13,652	10,239					
5.0	17,065	12,799				17,065	12,799				17,065	12,799				17,065	12,799
6.0			20,478	15,359	20,478			20,478	15,359	20,478			20,478	15,359	20,478		
9.0			30,717	23,038	30,717			30,717	23,038	30,717			30,717	23,038	30,717		
10.0	34,130	25,598				34,130	25,598				34,130	25,598				34,130	25,598
15.0						51,195	38,396	51,195	38,396	51,195	51,195	38,396	51,195	38,396	51,195	51,195	38,396
18.0													61,434	46,076	61,434		
20.0											68,260	51,195				68,260	51,195

TABLE 1B
Indoor Blower Performance ①

MODEL	Rated ESP	MAX ESP	② Continuous Airflow	Rated 2nd Stage CFM	Rated 1st Stage CFM	③ 4 - 10KW CFM	④ 15 - 20KW CFM
I30A1D	.15	0.50	500	900	650	700	1050
I36A1D	.15	0.50	600	1150	850	700	1050
I42A1D	.20	0.50	650	1300	950	700	1050
I48A1D	.20	0.50	725	1500	1050	700	1400
I60A1D	.20	0.50	850	1700	1200	700	1400

① Motor will deliver consistent CFM through voltage supply range with no deterioration.
② Continuous fan CFM is the total air being circulated during continuous fan mode.
③ Will occur automatically with a call for "W3" or "Emergency Heat" signal from the thermostat.

TABLE 2
Electrical Specifications

Model	Rated Volts & Phase	No. Field Power Circuits	Single Circuit				Dual Circuit							
			① Minimum Circuit Ampacity	② Maximum External Fuse or Ckt. Brkr.	③ Field Power Wire Size	③ Ground Wire	① Minimum Circuit Ampacity		② Maximum External Fuse or Ckt. Breaker		③ Field Power Wire Size		③ Ground Wire Size	
							Ckt. A	Ckt. B	Ckt. A	Ckt. B	Ckt. A	Ckt. B	Ckt. A	Ckt. B
I30A1DA0Z	230/208-1	1	22	35	8	10								
A05		1	32	35	8	10								
A10		1	58	60	6	10								
I30A1DB0Z	230/208-3	1	17	25	10	10								
B06		1	23	25	10	10								
B09		1	32	35	10	10								
I30A1DC0Z	460-3	1	9	10	14	14								
C06		1	13	15	14	14								
C09		1	18	20	12	12								
I36A1DA0Z	230/208-1	1	26	40	8	10								
A05		1	32	40	8	10								
A10		1	58	60	6	10								
A15		1 or 2	84	90	4	8	26	52	40	60	8	6	10	10
I36A1DB0Z	230/208-3	1	22	30	10	10								
B06		1	23	30	10	10								
B09		1	32	35	8	10								
B15		1	51	60	6	10								
I36A1DC0Z	460-3	1	11	15	14	14								
C06		1	13	15	14	14								
C09		1	18	20	12	12								
C15		1	28	30	10	10								
I42A1DA0Z	230/208-1	1	30	45	8	10								
A05		1	32	40	8	10								
A10		1	58	60	6	10								
A15		1 or 2	82	90	4	8	56	52	60	60	6	6	10	10
I42A1DB0Z	230/208-3	1	25	35	8	10								
B06		1	25	35	8	10								
B09		1	32	35	8	10								
B15		1	52	60	6	10								
I42A1DC0Z	460-3	1	12	15	14	14								
C06		1	14	15	14	14								
C09		1	19	20	12	12								
C15		1	28	30	10	10								
I48A1DA0Z	230/208-1	1	34	50	8	10								
A04		1	34	50	8	10								
A05		1	34	50	8	10								
A10		1	59	60	6	10								
A15		1 or 2	85	90	3	8	35	52	45	60	8	6	10	10
A20		1 or 2	110	110	2	6	59	52	60	60	6	6	10	10
I48A1DB0Z	230/208-3	1	26	35	8	10								
B06		1	26	35	8	10								
B09		1	34	35	8	10								
B15		1	53	60	6	10								
B18		1	53	60	6	10								
I48A1DC0Z	460-3	1	12	15	12	12								
C06		1	14	15	12	12								
C09		1	19	20	12	12								
C15		1	29	30	10	10								
C18		1	33	35	8	10								
I60A1DA0Z	230/208-1	1	44	60	8	10								
A05		1	44	60	6	10								
A10		1	59	60	6	10								
A15		1 or 2	96	100	3	8	44	52	60	60	8	6	10	10
A20		1 or 2	112	120	2	6	60	52	60	60	6	6	10	10
I60A1DB0Z	230/208-3	1	31	45	8	10								
B06		1	31	45	8	10								
B09		1	35	45	8	10								
B15		1	58	60	6	10								
B18		1 or 2	63	70	6	8	31	54	45	60	8	6	10	10
I60A1DC0Z	460-3	1	15	20	12	12								
C06		1	15	20	12	12								
C09		1	19	20	12	12								
C15		1	29	30	10	10								
C18		1	29	30	10	10								

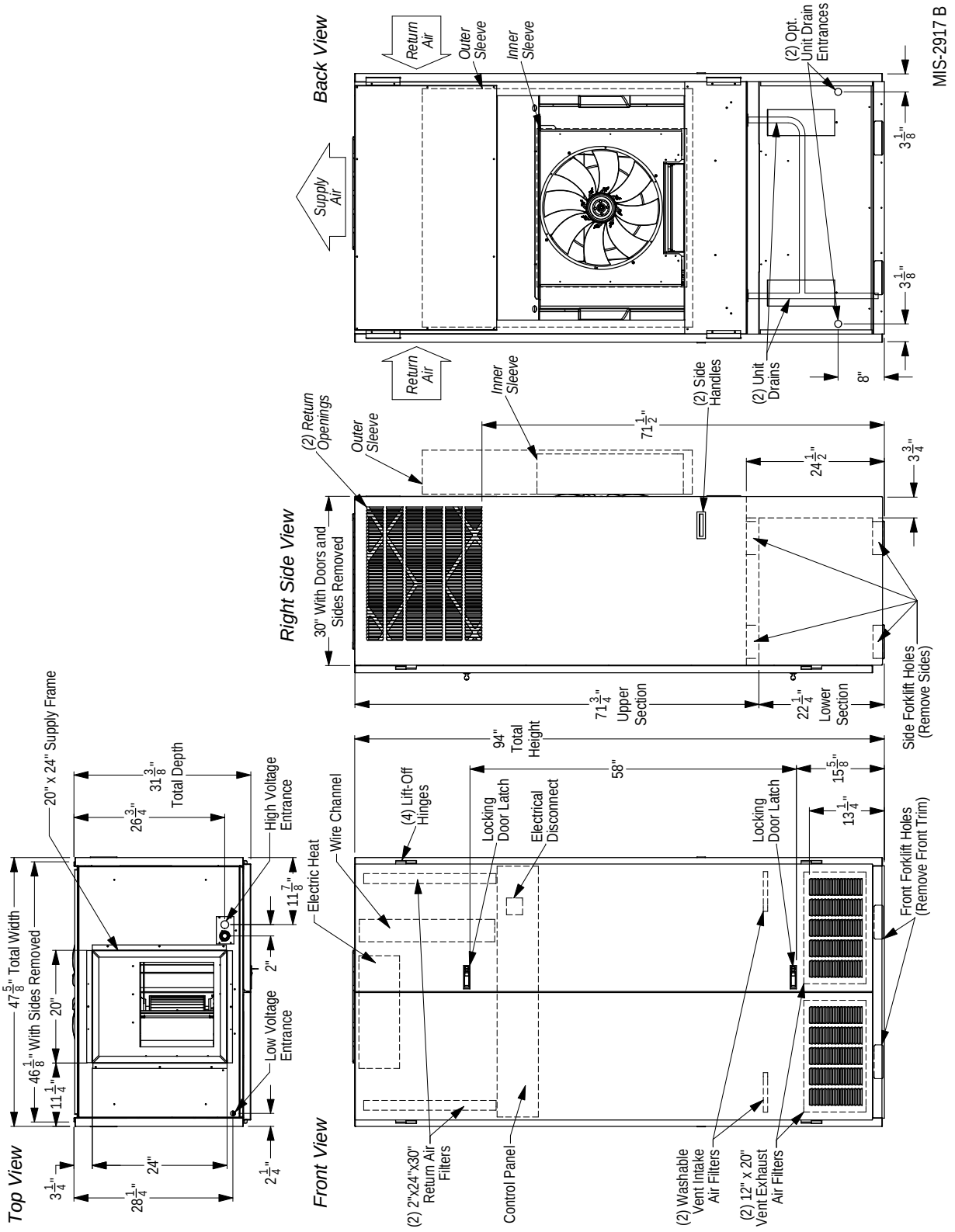
① These "Minimum Circuit Ampacity" values are to be used for sizing the field power conductors. Refer to the National Electrical code (latest version), Article 310 for power conductor sizing. ***CAUTION:*** *When more than one field power circuit is run through one conduit, the conductors must be derated. Pay special attention to note 8 of Table 310 regarding Ampacity Adjustment Factors when more than three (3) current carrying conductors are in a raceway.*

② Maximum size of the time delay fuse or circuit breaker for protection of field wiring conductors.

③ Based on 75°copper wire. All wiring must conform to the National Electrical Code and all local codes.

NOTE: *The Maximum Overcurrent Protection (MOCP) value listed is the maximum value as per UL 1995 calculations for MOCP (branch-circuit conductor sizes in this chart are based on this MOCP). The actual factory-installed overcurrent protective device (circuit breaker) in this model may be lower than the maximum UL 1995 allowable MOCP value, but still above the UL 1995 minimum calculated value or Minimum Circuit Ampacity (MCA) listed.*

FIGURE 1
Unit Dimenions



SHIPPING DAMAGE

Upon receipt of equipment, the unit should be checked for external signs of shipping damage. The skid must remain attached until the unit is ready for installation. If damage is found, the receiving party must contact the last carrier immediately, preferably in writing, requesting inspection by the carrier's agent.

UNIT REMOVAL FROM SKID

⚠ WARNING

This unit is heavy and requires more than one person to handle during installation and removal from the skid. Extreme caution must be taken to prevent injury to personnel and damage to the unit. Use appropriate safety equipment, including gloves when handling. Failure to do so may result in serious injury.

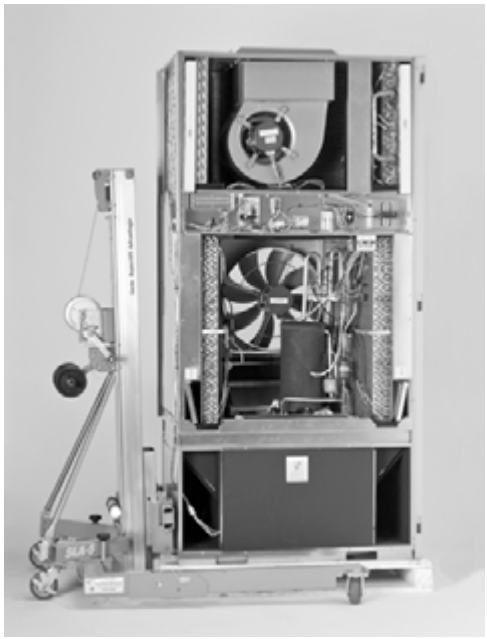
A forklift or a lift rated for the load (Figure 2A) is required to lift the unit off from the skid. This unit is top heavy and should never be tipped while moving it.

The I-TEC is designed to be lifted off the skid from the front or rear of the unit without having to remove any doors or side panels. See Figure 1 for fork openings. The shipping brackets on front and rear of the unit must be removed and discarded. The unit can now be lifted straight up and the skid can be slid out from underneath.

⚠CAUTION

Tip unit from left side only.
Failure to do so may result in injury due to unit top-heaviness or compressor damage!

FIGURE 2A – Unit on Lift

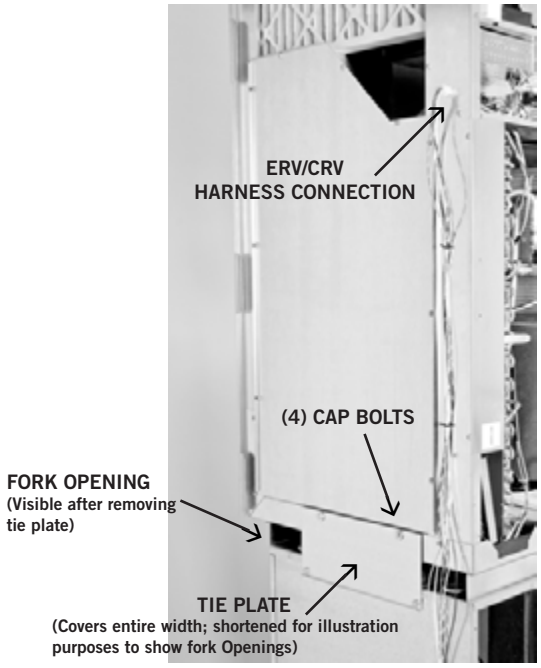


HANDLING UNIT AFTER REMOVAL FROM SKID

If a wide and tall enough opening exists, the I-TEC can be moved as a complete assembled unit. If not, it is designed to break down into two sections to allow it to pass through a 36" wide door.

1. Depress and release both top and bottom door latches and open doors.
2. Remove the doors by lifting straight up and off from the hinge pins.
3. Remove cabinet sides by first removing the four (4) sheet metal screws from the front (leading edge) of the side panel. The panel will not fall off. Swing the panel away from the chassis 20-30° and then pull forward from the two (2) tabs supporting the rear edge.
4. On each side of the unit is a tie plate that secures the top and bottom sections with four (4) cap bolts. Using a ½" wrench or socket, remove these screws from both plates and set aside.
5. If the unit is equipped with a CRV or ERV, unplug the wire harness on the left-hand side of the control box.
6. ***A forklift or a lift rated for the load is required to lift the top section off from the bottom base. Do not attempt to do this manually. Failure to do so could result in the unit tipping over and causing bodily injury and/or damage to the unit.***
7. The top section can be forked from either the right-hand or left-hand side. See Figure 1 for fork openings.
8. Carefully lift the top section straight up avoiding tipping.

FIGURE 2B – Unit Side



9. Move the top section through the doorway and place on flat surface free of debris.
10. The bottom base can now be moved through the doorway the same way.
11. Reassemble the unit by reversing this procedure.

REQUIRED STEPS AFTER FINAL PLACEMENT

The compressor is secured to the base with two (2) bolts for shipping. Although the unit will perform as designed with the shipping bolts in place, there may be a noticeable additional noise and vibration noted. To obtain the lowest noise and vibration levels, remove the shipping bolts after the unit is in its final operating location. To gain access to the compressor, the compressor access panel must be removed (see Figure 5 on page 14). Once this panel is removed, the CRV/ERV air duct must be removed (see Figure 5).

The air duct is removed by pulling it straight out; there are no screws securing it in place. Both the top and bottom will slide out at the same time (*pull hard*). Once removed, the compressor is visible as well as the tags on the shipping bolts (see Figure 6 on page 14).

After the compressor shipping bolts have been removed, the CRV/ERV air duct can be slid back in place and the compressor access panel re-attached.

MINIMUM INSTALLATION HEIGHT

The minimum installation height to the bottom of the roof or fixed ceiling for ducted applications is 9' 7". This provides enough clearance to install the duct work. See Figure 7A on page 15.

The IWS Series wall sleeve has a built-in vertical adjustment to fit window sill heights from 31-34". If additional height is required, two riser platform accessories are available. The IRP3 increases the unit height by 3" (Figure 7B on page 16) and the IRP6 by 6" (Figure 7C on page 17).

SECURING UNIT TO STRUCTURE

Shipped with the I-TEC unit is a wall mounting bracket (screwed to shipping skid on backside of unit). This bracket can be utilized to secure the top portion of the unit to the wall using the appropriate field-supplied hardware based upon the material you are fastening to. *(There are several offset holes, sized to accept up to a 1/4" diameter fastener that will easily allow you to hit studs on a framed wall.)* See ***BRACKET WALL SECTION VIEW*** for locating this top wall bracket which will need to be applied after the unit is located in the final position.

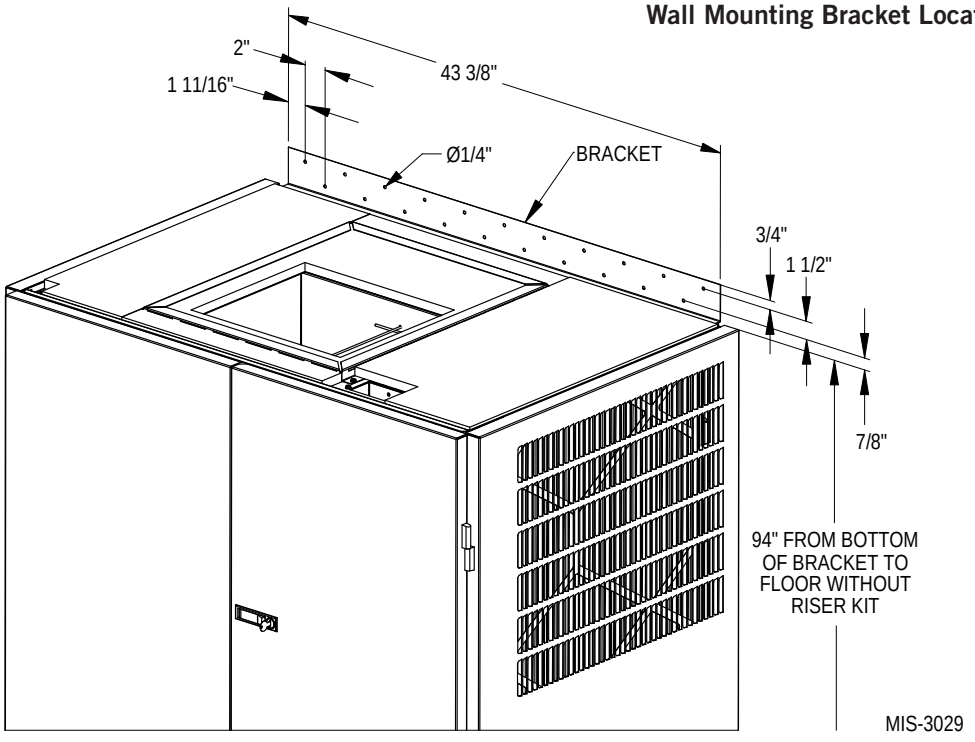
Additional/optional mounting holes for up to a 3/8" diameter fastener are also available in the backside of the unit. These can be accessed by:

- removing the air filters for the uppermost set
- removing the compressor section service door for the lower set

Refer to ***WOOD FRAMED INSTALLATION*** for additional framing required to secure unit to wall.

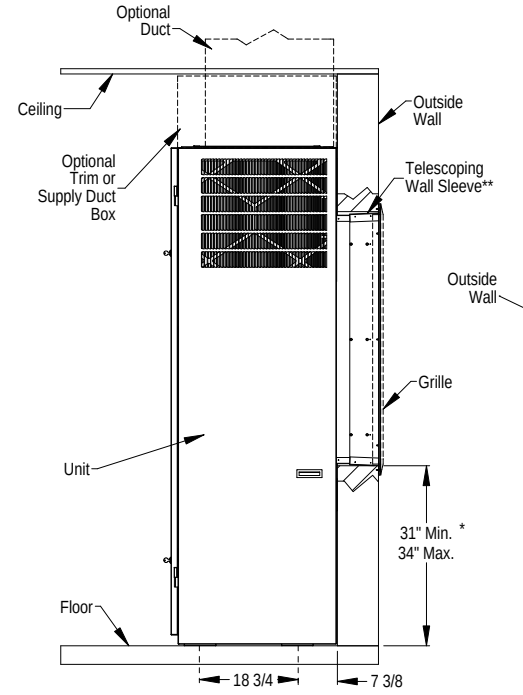
The additional/optional mounting holes will require a long extension to drive the fasteners.

Wall Mounting Bracket Location

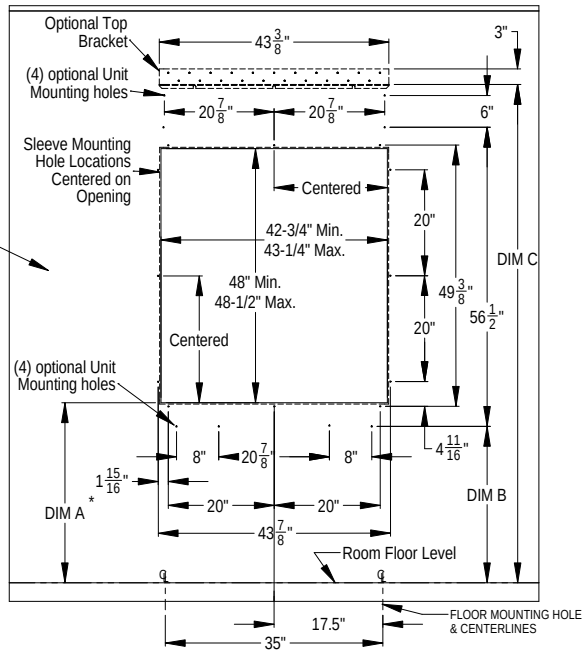


Bracket Wall Section View

RISER KIT	DIM A	DIM B	DIM C
NONE	31"-34" MAX	29 17/32"	94 1/8"
IRP-3 (3")	34"-37" MAX	32 17/32"	97 1/8"
IRP-6 (6")	37"-40" MAX	35 17/32"	100 1/8"



Right Side View

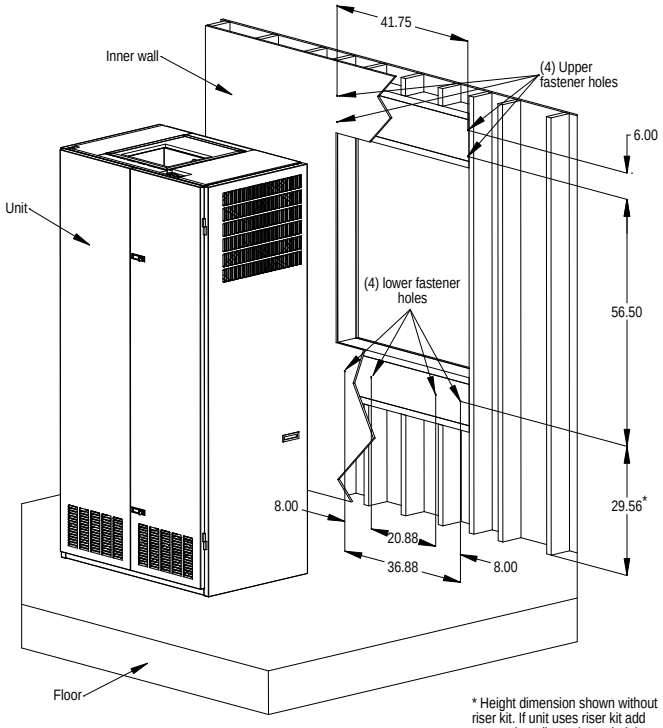


Front (Wall Only) View

* Higher Sill Heights Acheivable With Base Kit.
** Separate telescoping sleeves available for different wall thicknesses.

MIS-2918 D

Wood Framed Installation (for Wall Attachment)



* Height dimension shown without riser kit. If unit uses riser kit add appropriate dimension to height.

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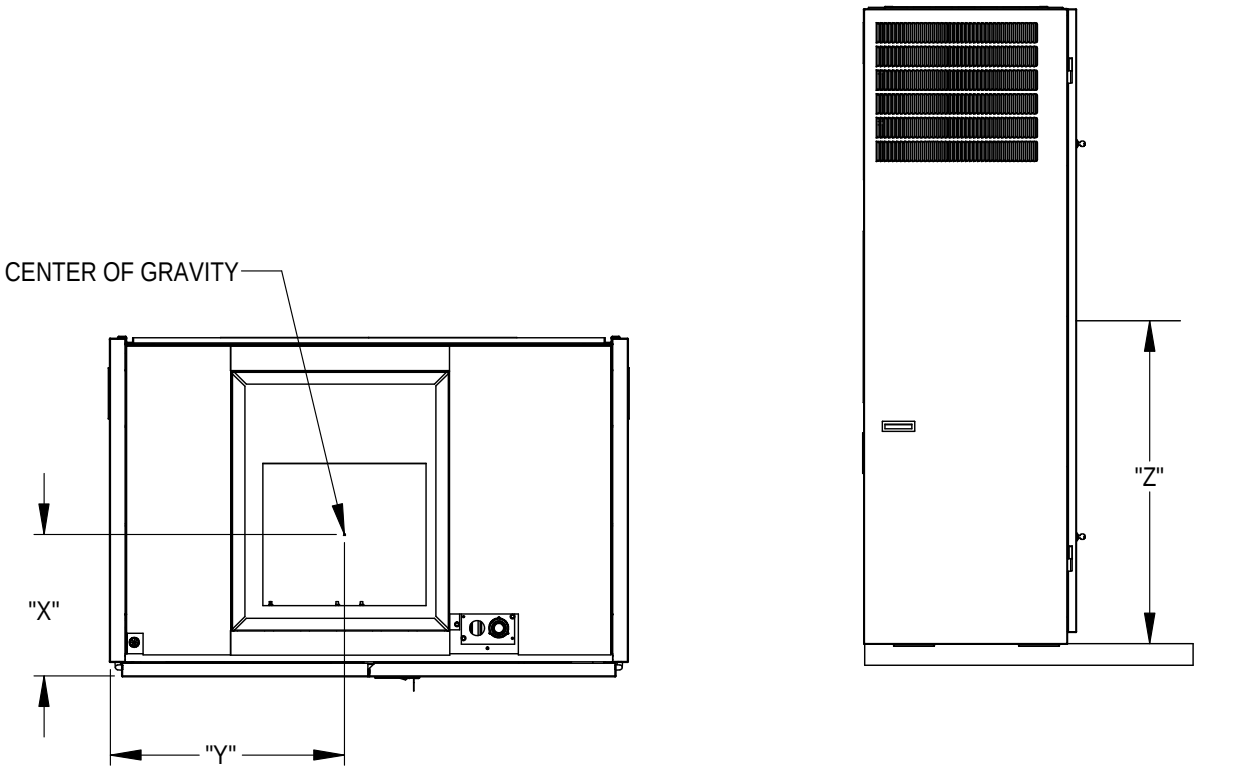
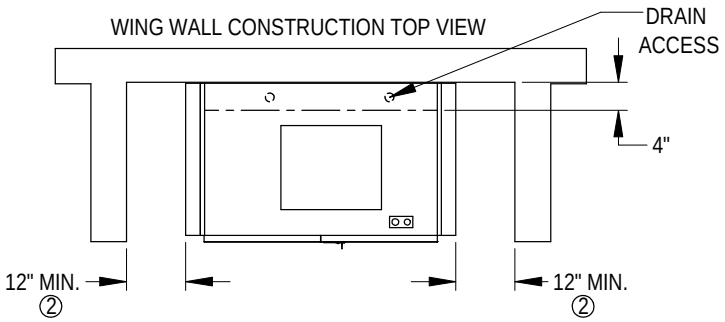
FIGURE 3
Center of Gravity

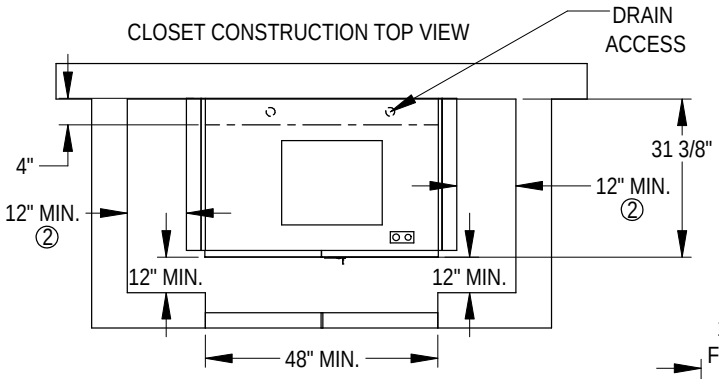


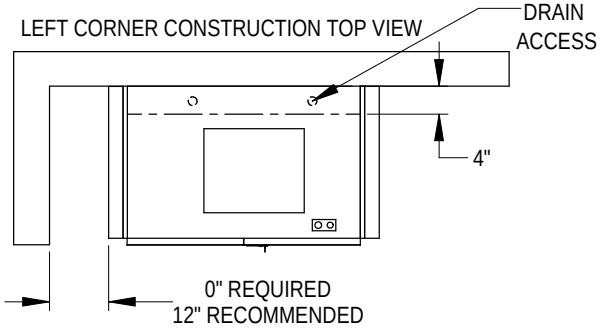
MIS-3269

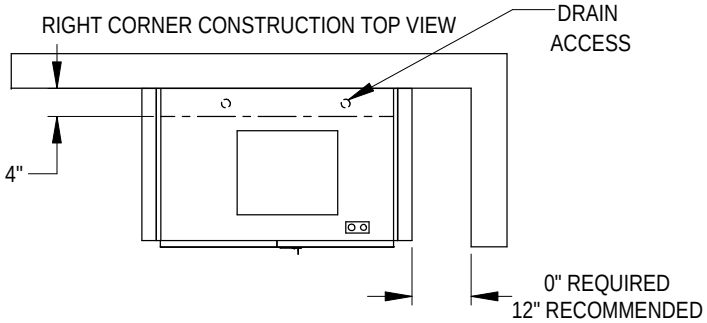
UNIT TESTED	FRONT OF UNIT DOOR TO CENTER	LEFT SIDE TO CENTER	FLOOR TO CENTER CRV & ERV	FLOOR TO CENTER NO VENT
	"X" Dimension	"Y" Dimension	"Z" Dimension	"Z" Dimension
I30A1DA, DB	13-3/4"	24"	43½"	47"
I30A1DC	13-3/4"	24¼"	43½"	47"
I36A1DA, DB	13-3/4"	24"	43½"	47"
I36A1DC	13-3/4"	24¼"	43½"	47"
I42A1DA, DB	13-3/4"	24"	43½"	47"
I42A1DC	13-3/4"	24¼"	43½"	47"
I48A1DA, DB	13-3/4"	24"	43½"	47"
I48A1DC	13-3/4"	24¼"	43½"	47"
I60A1D, DB	13-3/4"	24"	43½"	47"
I60A1DC	13-3/4"	24¼"	43½"	47"

FIGURE 4
Required Clearances and Recommended Access



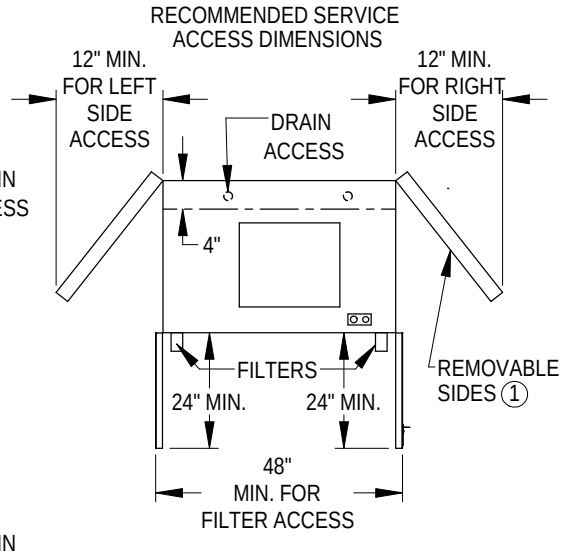






IMPORTANT

Unit can be located in corner with 0" clearance as long as other side is unobstructed



① ALL FILTER AND COMPONENT ACCESS IS FROM THE FRONT. COILS CAN BE CLEANED FROM THE FRONT, BUT SIDES ARE EASILY REMOVED FOR ENHANCED ACCESS.

② 12" MINIMUM DIMENSIONS ARE REQUIRED FOR UNIT OPERATION. IT IS STRONGLY RECOMMENDED TO USE 20" MINIMUM DISTANCES IF POSSIBLE FOR EASE OF UNIT SERVICEABILITY

MIS-3273 B

FIGURE 5
Removal of Air Duct

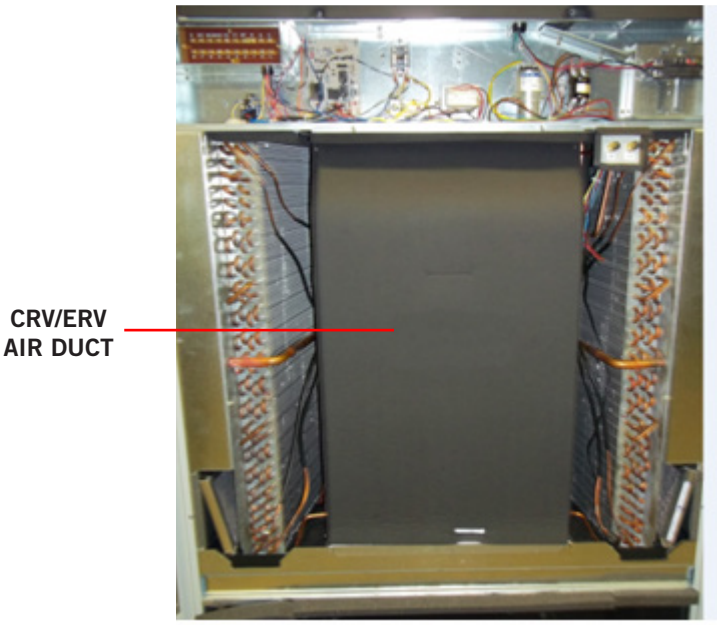


FIGURE 6
Compressor Shipping Bolts

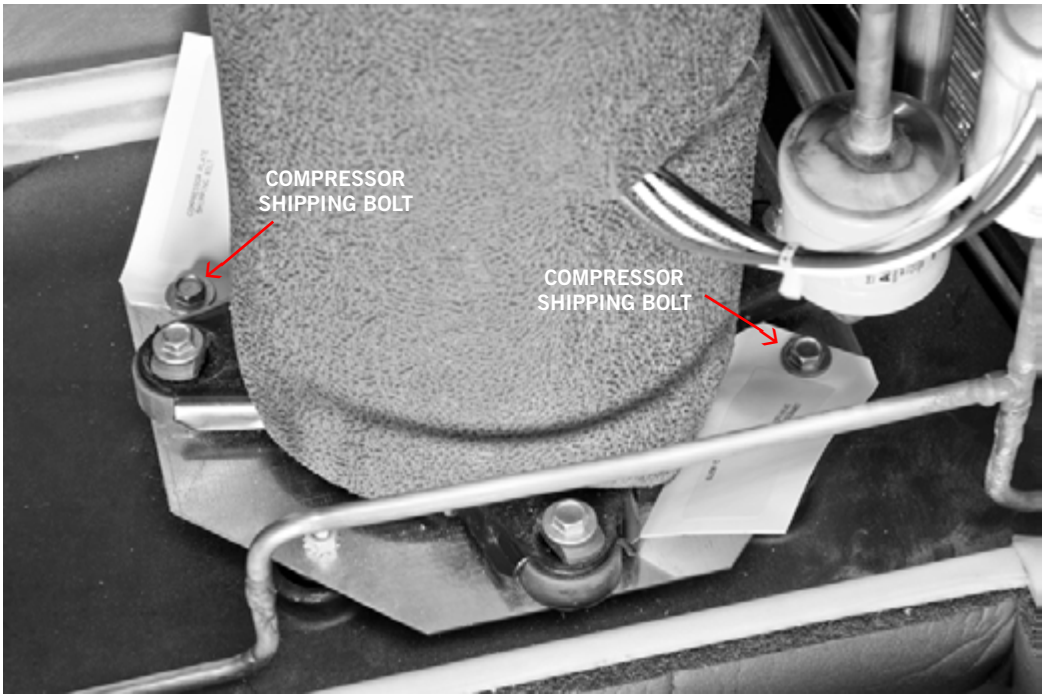


FIGURE 7A
Ducted Application – Basic Unit

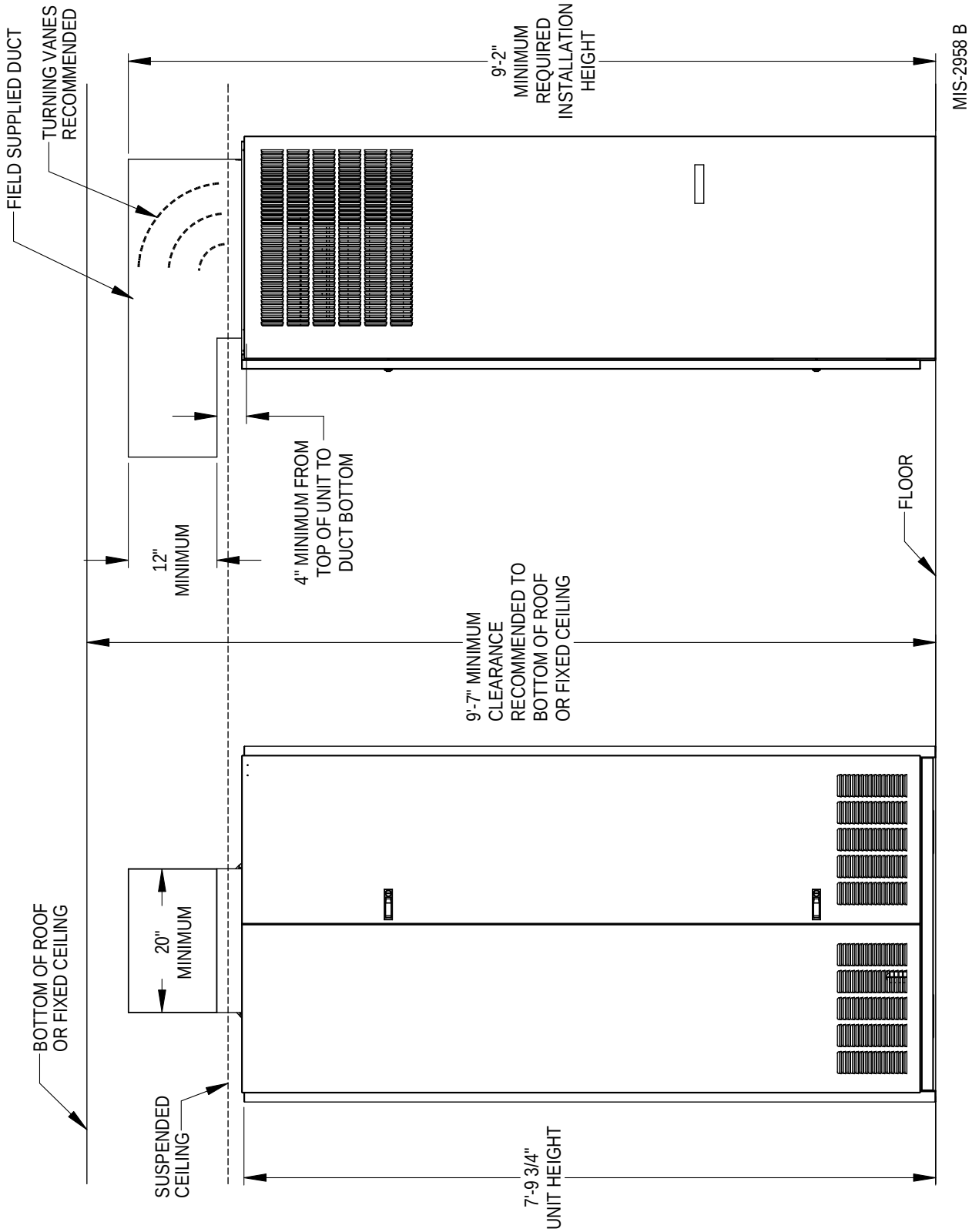


FIGURE 7B
3" Riser Application

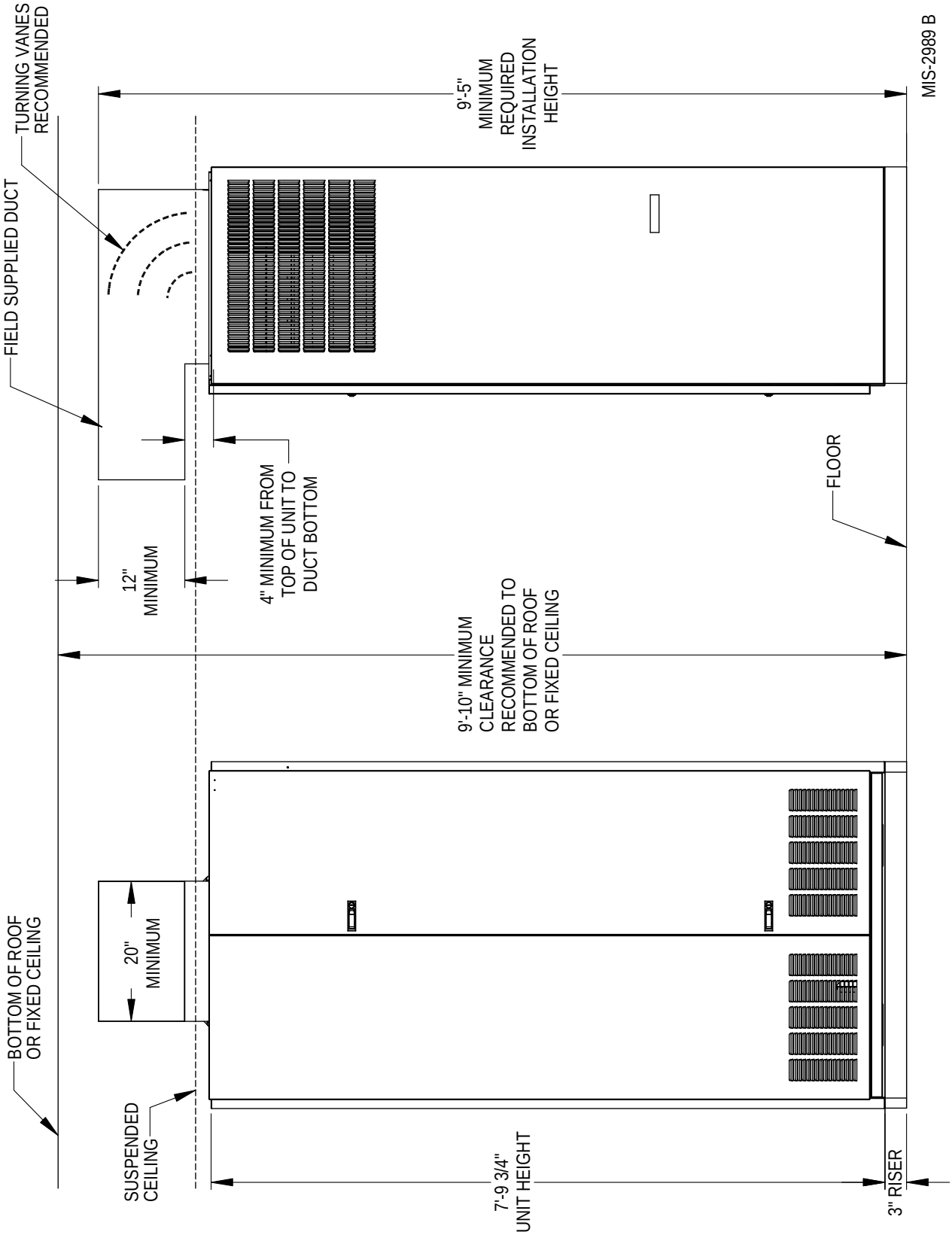
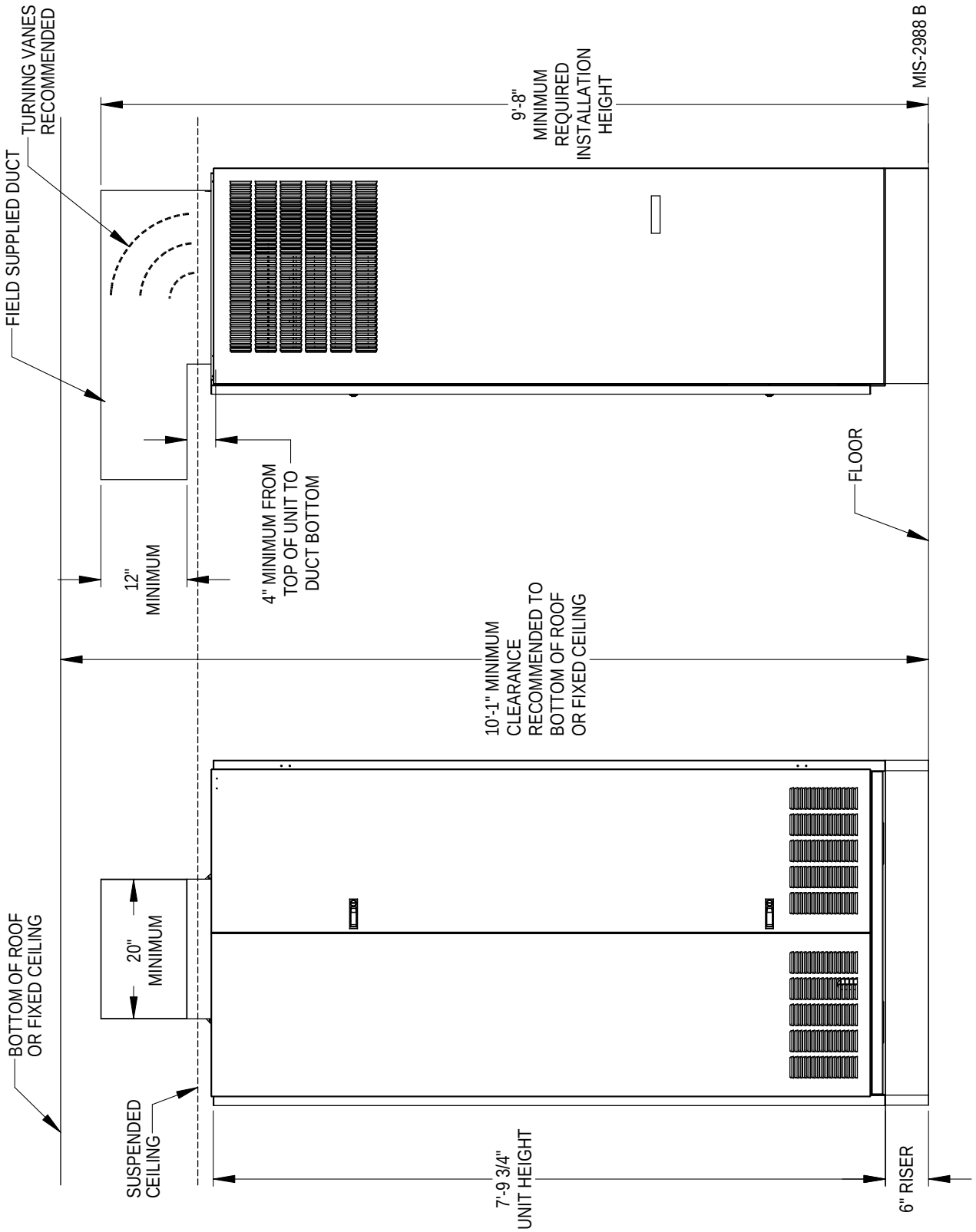


FIGURE 7C
6" Riser Application



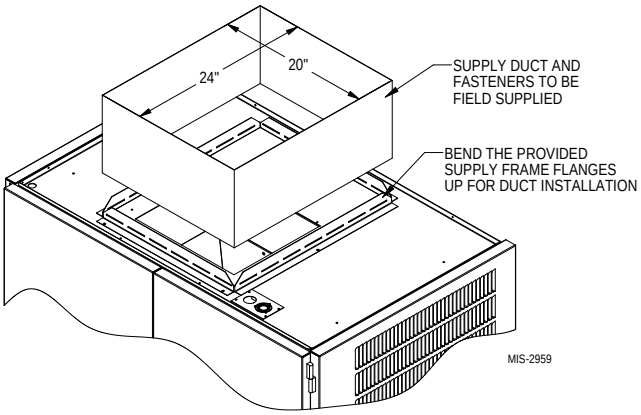
DUCT WORK

All duct work must be properly sized for the design airflow requirement of the equipment. Air Conditioning Contractors of America (ACCA) is an excellent guide to proper sizing. All duct work or portions thereof not in the conditioned space should be properly insulated in order to both conserve energy and prevent condensation or moisture damage. When duct runs through unheated spaces, it should be insulated with a minimum of 1" of insulation. Use insulation with a vapor barrier on the outside of the insulation. Flexible joints should be used to connect the duct work to the equipment in order to keep the noise transmission to a minimum.

The I-TEC Series models have provision to attach a supply air duct to the top of the unit. Duct connection size is 20" x 24". The flanges are shipped flat and must be bent upward using sheet metal flanging pliers. The duct work is field supplied. See Figure 8 for suggested attachment method.

Make sure to seal the slots in the bend-up flange at the time of securing your ductwork to the flange. This can be accomplished with either foil tape or caulk. Failing to do so may cause air leakage/whistling of air.

FIGURE 8
Supply Duct Connections



NOTE: Unit cabinet, supply air duct and duct free plenum are approved for "0" clearance to combustible material.

The I-TEC Series models are designed for use with free return (non-ducted) and either duct free with the use of IPBDF Series Plenum Box (8" or 12") or a duct supply air system.

The IPBDF Plenum Box mounts on top of the unit and has both vertically and horizontally adjustable louvers on the front discharge grille.

When used with a ducted supply, an ICX28 Cabinet Extension may be used to conceal the ductwork above the unit to the ceiling. The ICX28 extends 28" above the unit for a total height of 10'-2" for a floor mounted install (10'-5" with IRP3 riser and 10'-8" with IRP6 riser). It can be trimmed in the field for installations that require less than 10'-2".

The unit is equipped with a variable speed indoor blower motor which increases in speed with an increase in duct static pressure. The unit will therefore deliver proper rated airflow up to the maximum ESP shown in Table 1B on page 5. However, for quiet operation of the air system, the duct static should be kept as low as practical, within the guidelines of good duct design.

FILTERS

Two 2" throw away filters (24 x 30) and two 1" throw away filters (12 x 20) are supplied with each unit. The 2" filters slide into brackets on both sides for the return air openings. The 1" filters are in the cabinet doors for the vent (room air) exhaust. If a CRV or ERV vent option is used, there are two additional ½" (8 x 17) washable filters included with that option. See Figure 9 for specific locations. The filters are serviced from the inside of the building by opening the cabinet doors and do not require any tools to access.

FIGURE 9
Filter Location

CONDENSATE DRAIN

There are two condensate drain connections from the condenser drain pan (compressor area). These are visible from the rear of the unit. Factory-installed tubing connects the two drains at a tee connection and then a single drain hose with a barbed hose connector carries the condensate to the draining option chosen. Enough tubing is provided to reach all drain options and can be cut down in length.

The unit is shipped from the factory with the drain line on the left-hand side (looking at the rear of the unit). The tubing can be removed from the drain connections and flipped for a right-hand drain. See Figure 10.

The drain can be routed directly through the floor or through the wall. There are also two optional drain locations in the lower rear back panel. See Figure 10.

The I-TEC design does not require a trap in the condensate disposal tubing. Check local codes to see if a "P" trap is required.

For a stand pipe floor drain or through the wall, there is adequate hose length to reach anything located behind the unit. The lower rear portion of the cabinet is recessed approximately 4" allowing room for a "P" trap to be installed with the cabinet flush with the wall. The drain line must be able to be removed from the unit if necessary to remove the unit from the wall.

Access plates are located on the rear of the unit for servicing the drain trap (see Figure 10). ***If the drain line is to be routed through an unconditioned space, it must be protected from freezing.***

The condensate drain line can also be routed back into the unit through either the right-hand or left-hand optional drain locations on the rear of the unit. The hole is covered by insulation on the inside of the unit and will have to be cut away. Drain holes are located inside the unit in the bottom of the base about 12" in from the front on both the left and right side. These holes are covered with insulation and are not visible. They are located very close to the side panels and can be found by pressing down on the insulation. Cut insulation away to expose the hole. A drain trap can now be installed inside of the cabinet, and the drain hose routed directly through the floor.

Once the I-TEC is installed, the rear drains exiting the condenser section can be easily serviced with removal of the pre-painted metal sides (lift-off doors, remove four (4) screws to remove side).

If side access is not available, the drain lines and trap can be serviced by removing either one of the drain access panels on the rear of the unit (in the ventilation package area.) See Figure 10.

WITH NO VENT OPTION

To access the drain access panels in the rear of this section, remove the front door/cover from the box, and the plates are located in the rear of the box.

WITH COMMERCIAL ROOM VENTILATOR

1. Open hinged front doors.
2. Disconnect unit power to eliminate shock hazard.
3. Remove front cover/door of CRV vent package. (Can leave filter access panels in place.)
4. Unplug wires coming in on left side from upper unit section.
5. Unplug two wire harness from front (intake) blower.
6. Remove two (2) screws securing front (intake) blower and slide blower out of unit.
7. Remove four (4) screws that retain the partition behind/beneath intake blower removed in Step 6.
8. Rear drain access panels are now visible on both right-hand and left-hand sides in rear of box.

WITH ENERGY RECOVERY VENTILATOR

To access the rear drain access panels of this section:

1. Open hinged front doors.
2. Disconnect unit power to eliminate shock hazard.
3. Remove front cover/door of ERV vent package. (Can leave filter access panels in place.)
4. Unplug wires coming in on left side from upper unit section.
5. Unplug heat recovery cassette on the side you wish to access, and slide cassette out the front of the unit.
6. Remove two (2) screws securing partition on outboard side of cassette and remove.
7. Rear drain access panels are now visible on both right-hand and left-hand sides in rear of box.

FIGURE 10 – Drain Locations

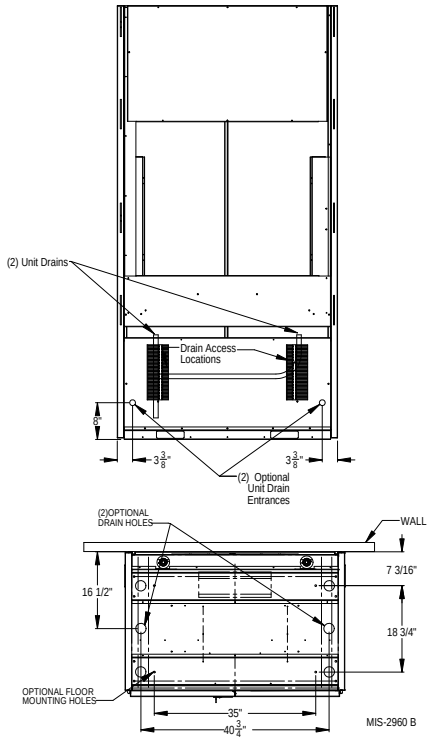


FIGURE 11A
Unit Mounting

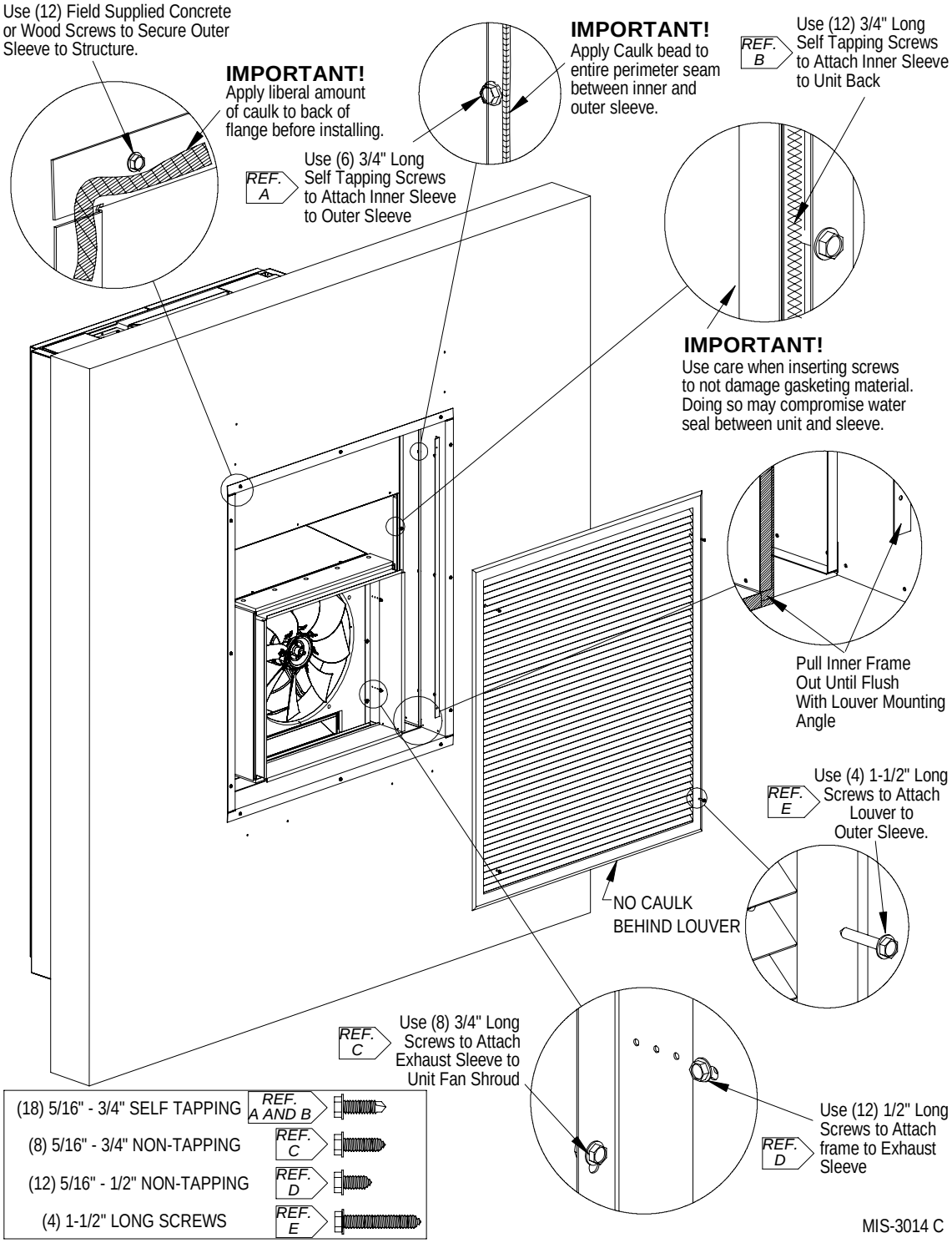
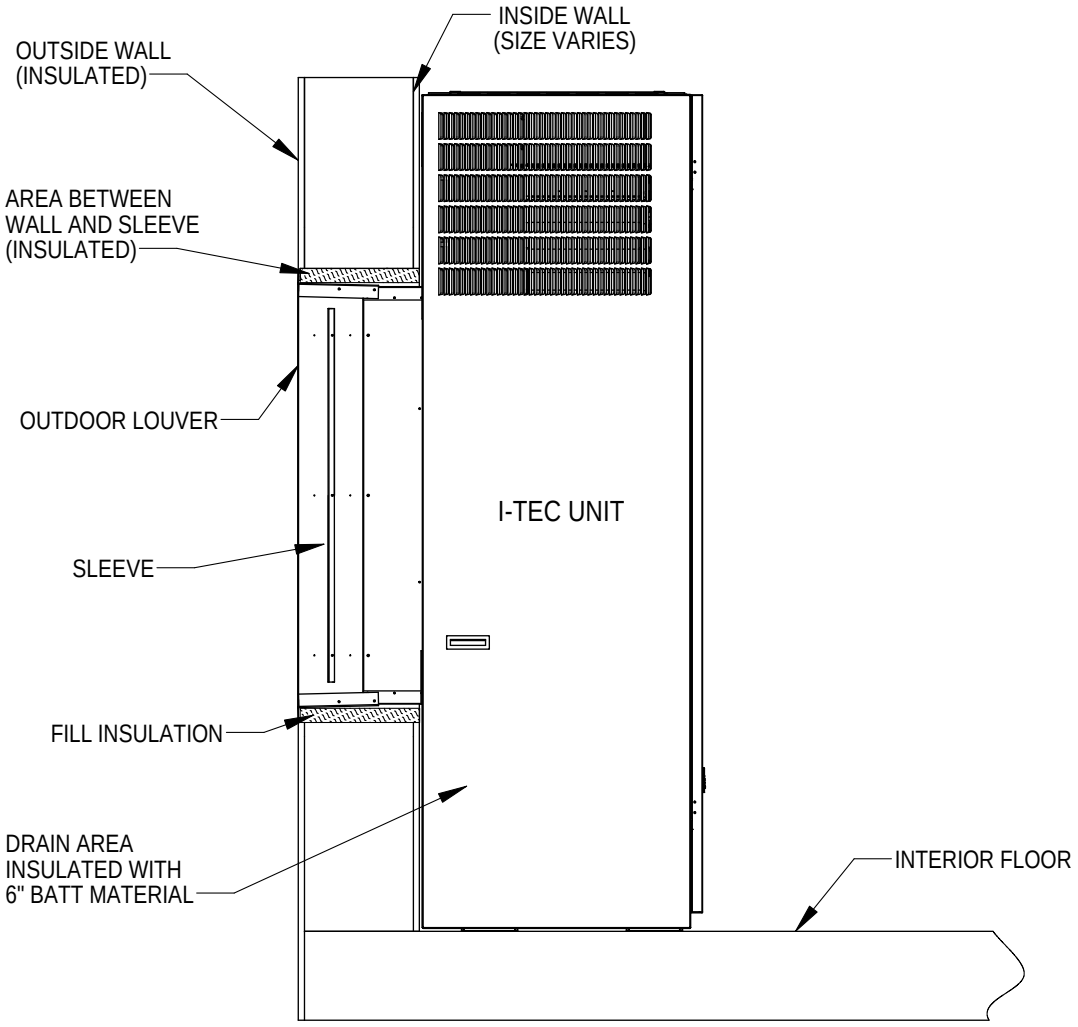


FIGURE 11B
Unit Mounting



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MOUNTING THE UNIT

The wall sleeve is attached to the I-TEC unit from the outside of the building. See Figures 11A and 11B. Refer to wall sleeve Manual 2100-562 supplied with sleeve.

Following are the steps for attaching the I-TEC to the wall sleeve.

1. Lift the unit into place making sure that it is aligned side to side.
2. Push the unit back until the rear panel touches the sleeve gasket.
3. This unit must be level from side to side and from front to back. If adjustments are necessary, shim up under the base rails with sheets of metal or any substance not affected by moisture.
4. Attach the sleeve to the unit using the ten (10) ¾" long self-tapping screws supplied with the sleeve.
5. The exhaust sleeve has three (3) ¾" long screw slots in each side flange. Line these up with the screw engagement holes in the fan panel. Attach using six (6) ¾" long pointed sheet metal screws supplied with the sleeve. Extend the sleeve out until it is flush with the louver grill attachment angles.
6. Lock the sleeve in place using two (2) ½" long pointed sheet metal screws on each side by shooting through the slot into a pre-punched hole.
7. A bottom trim piece is shipped loose for installation beneath the doors. Attach the trim piece to the unit with screws provided.
8. The compressor is secured to the base with two (2) bolts for shipping. Both bolts are identified with a tag. Remove shipping bolts (see Figure 5 on page 13).

WIRING – MAIN POWER

Refer to the unit rating plate and/or Table 2 on page 6 for wire sizing information and maximum fuse or circuit breaker size. Each unit is marked with a "Minimum Circuit Ampacity". This means that the field wiring used must be sized to carry that amount of current. Depending on the installed KW of electric heat, there may be two field power circuits required. If this is the case, the unit serial plate will so indicate. All models are suitable only for connection with copper wire. Each unit and/or wiring diagram will be marked "Use Copper Conductors Only suitable for at least 75°C". ***THESE INSTRUCTIONS MUST BE ADHERED TO.*** Refer to the National Electrical Code (NEC) for complete current carrying capacity data on the various insulation grades of wiring material. All wiring must conform to NEC and all local codes.

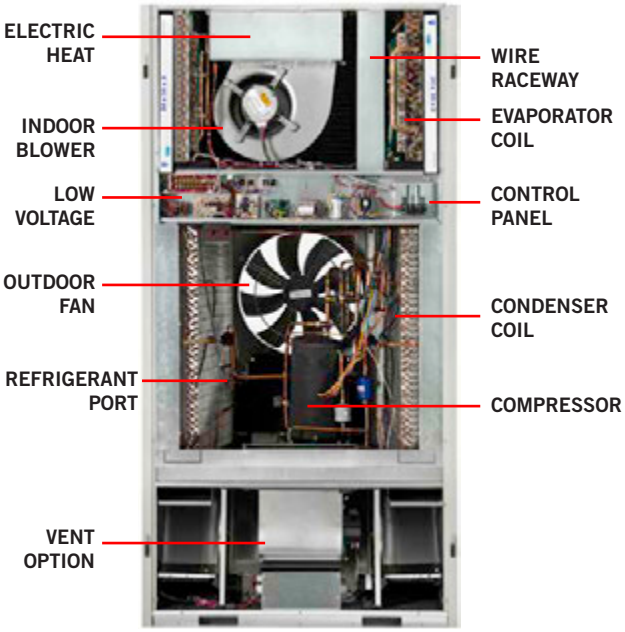
The electrical data lists fuse and wire sizes (75°C copper) for all models, including the most commonly used heater sizes. Also shown are the number of field power circuits required for the various models with heaters.

The unit rating plate lists a "Maximum Time Delay Relay Fuse" or circuit breaker that is to be used with the equipment. The correct size must be used for proper circuit protection, and also to assure that there will be no nuisance tripping due to the momentary high starting current of the compressor motor.

See **"START UP"** section for information on three phase scroll compressor start-ups.

The field wiring conduit connections are located on the top right-hand corner of the unit with a wire raceway to feed the wires down to the circuit breaker(s). See Figure 12.

FIGURE 12
Component Location



WIRING – LOW VOLTAGE WIRING

230/208V, 1 PHASE AND 3 PHASE EQUIPMENT DUAL PRIMARY VOLTAGE TRANSFORMERS

All equipment leaves the factory wired on 240V tap. For 208V operation, reconnect from 240V to 208V tap. The acceptable operating voltage range for the 240 and 208V taps are as noted in Table 3.

TABLE 3 – Operating Voltage Range

TAP	RANGE
240V	253 – 216
208V	215 – 197

NOTE: *The voltage should be measured at the field power connection point in the unit and while the unit is operating at full load (maximum amperage operating condition).*

The standard unit includes a remote thermostat connection terminal strip. See Figures 13-19 on pages 24 through 30 for connection diagrams. Compatible thermostats are listed in Table 4.

TABLE 4 – Wall Thermostats

Thermostat	Predominant Features
8403-060 (1120-445)	3 Stage Cool; 3 Stage Heat Programmable/Non-Programmable Electronic HP or Conventional Auto or Manual changeover
8403-096 (CDT-2W40-LCD-RLY)	Carbon Dioxide Sensor with LCD for Sensor Readings
8403-081 (VT8650U5500B)	2 stage Cool; 2 stage Heat Programmable/Non-Programmable Electronic HP or Conventional, Auto or Manual changeover with Humidity and Occupancy Sensor, BACnet
CS9B-THOA	3 Stage Heat, 3 Stage Cool, Prog/ NonProg, HP or Conv, Auto or Manual Changeover, Humidity Sensor w/dehumidification, Motion Sensor w/Intelligent Learning Control, BACnet-compatible
CS9B-THOCA	3 Stage Heat, 3 Stage Cool, Prog/ NonProg, HP or Conv, Auto or Manual Changeover, Humidity Sensor w/dehumidification, CO_2 Sensor, Motion Sensor w/Intelligent Learning Control, BACnet-compatible
CS9BE-THOA	3 Stage Heat, 3 Stage Cool, Prog/ NonProg, HP or Conv, Auto or Manual Changeover, Humidity Sensor w/dehumidification, Motion Sensor, Intelligent Learning Control, BACnet-compatible, Ethernet-compatible
CS9BE-THOCA	3 Stage Heat, 3 Stage Cool, Prog/ NonProg, HP or Conv, Auto or Manual Changeover, Humidity Sensor w/ dehumidification, CO_2 Sensor, Motion Sensor w/Intelligent Learning Control, BACnet-compatible, Ethernet-compatible

LOW VOLTAGE CONNECTIONS

These units use a grounded 24 volt AC low voltage circuit.

"G" terminal is the *fan input*.

"Y1" terminal is the *compressor part load input*.

"Y2" terminal is the *compressor full load input*.

"R" terminal is *24 VAC hot*.

"C" terminal is *24 VAC grounded.*

"L" terminal is *compressor lockout* **output.** This terminal is activated on a high or low pressure trip and condensate or evaporator overflow trip. This is a 24 VAC output.

"W2" terminal is *first stage electric heat* (if equipped). First stage electric heat can be operated simultaneously with the heat pump operating.

"A" terminal is the *ventilation input*. This terminal energizes any factory installed ventilation option.

"W3" terminal is *second stage electric heat*. When "W3" terminal is energized, it locks out compressor operation to limit discharge air temperature and required branch circuit ampacity.

"D" terminal is the *dehumidification mode* (on models so equipped).

NOTE: *For total and proper control using DDC, a minimum of nine controlled outputs are needed when above 10KW electric heat is employed with ventilation, a total of eight controlled outputs with below 10KW electric heat with ventilation, seven controlled outputs below 10KW electric heat with no ventilation, seven controlled outputs with no electric heat but with ventilation, and six controlled outputs with no electric heat and no ventilation. If dehumidification model and vent, ten controlled outputs are needed when above 10KW electric heat is employed with ventilation.*

LOW VOLTAGE CONNECTIONS FOR DDC CONTROL	
Fan Only	Energize G
Cooling Part Load	Energize G, Y1
Cooling Full Load	Energize G, Y1, Y2
Heating with Bank #1 Electric Heat Only	Energize G, W2
Emergency Heat	Energize G, W2, W3
Ventilation	Energize A
Dehumidification	Energize G, D

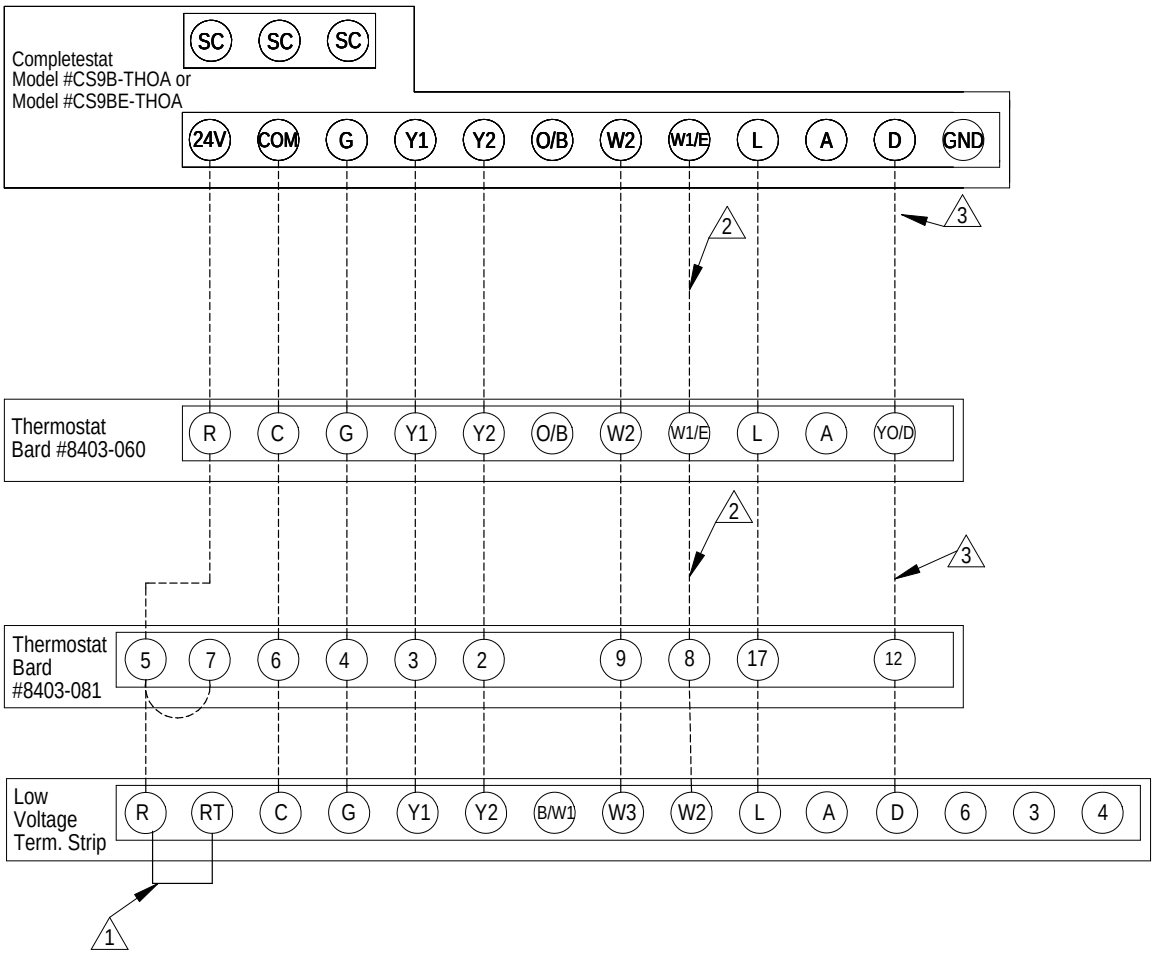
GENERAL

This unit is equipped with a variable speed ECM motor. The motor is designed to maintain rated airflow up to the maximum static allowed. ***It is important that the blower motor plugs are not plugged in or unplugged while the power is on. Failure to remove power prior to unplugging or plugging in the motor could result in motor failure.***

⚠ CAUTION

Do not plug in or unplug blower motor connectors while the power is on. Failure to do so may result in motor failure.

FIGURE 13
Basic Air Conditioner with No Ventilation Package ("B" Vent Code)



1 Factory installed jumper. Remove jumper and connect to N.C fire alarm

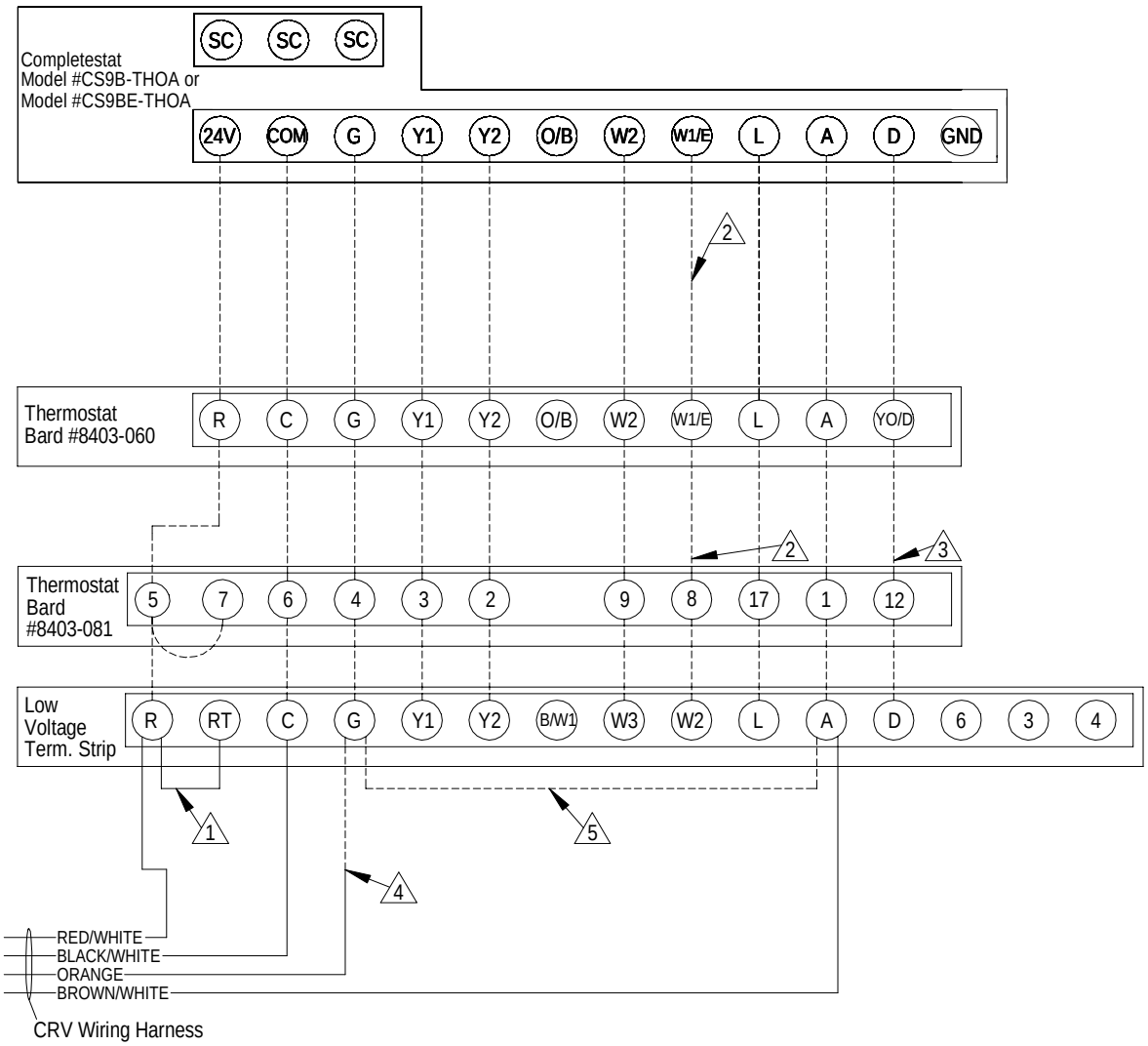
2 Not needed below 15KW

3 Additional wire required for dehumidification models

4 Relay Provided with Completestat

MIS-3257 D

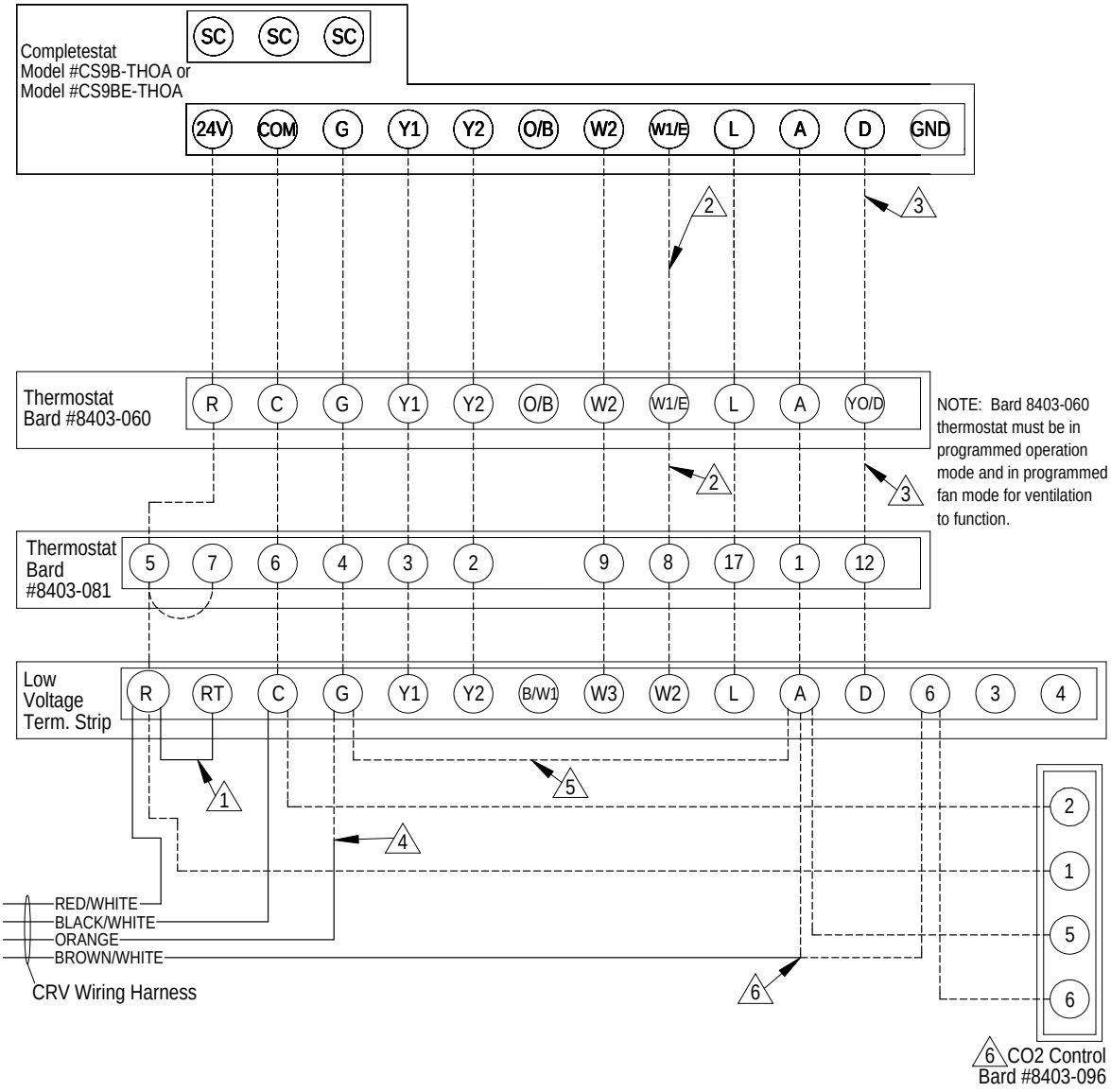
FIGURE 14
Air Conditioner with CRV, without CO_2 Control ("M" Vent Code)



1. Factory installed jumper. Remove jumper and connect to N.C fire alarm circuit if emergency shutdown required.
2. Not needed below 15KW.
3. Additional wire required for dehumidification models.
4. Connect to "G" terminal when thermostat has "Occupancy Signal".
5. Install a jumper between "G" and "A" only when thermostat without "Occupancy Signal" is used.

MIS-3258 D

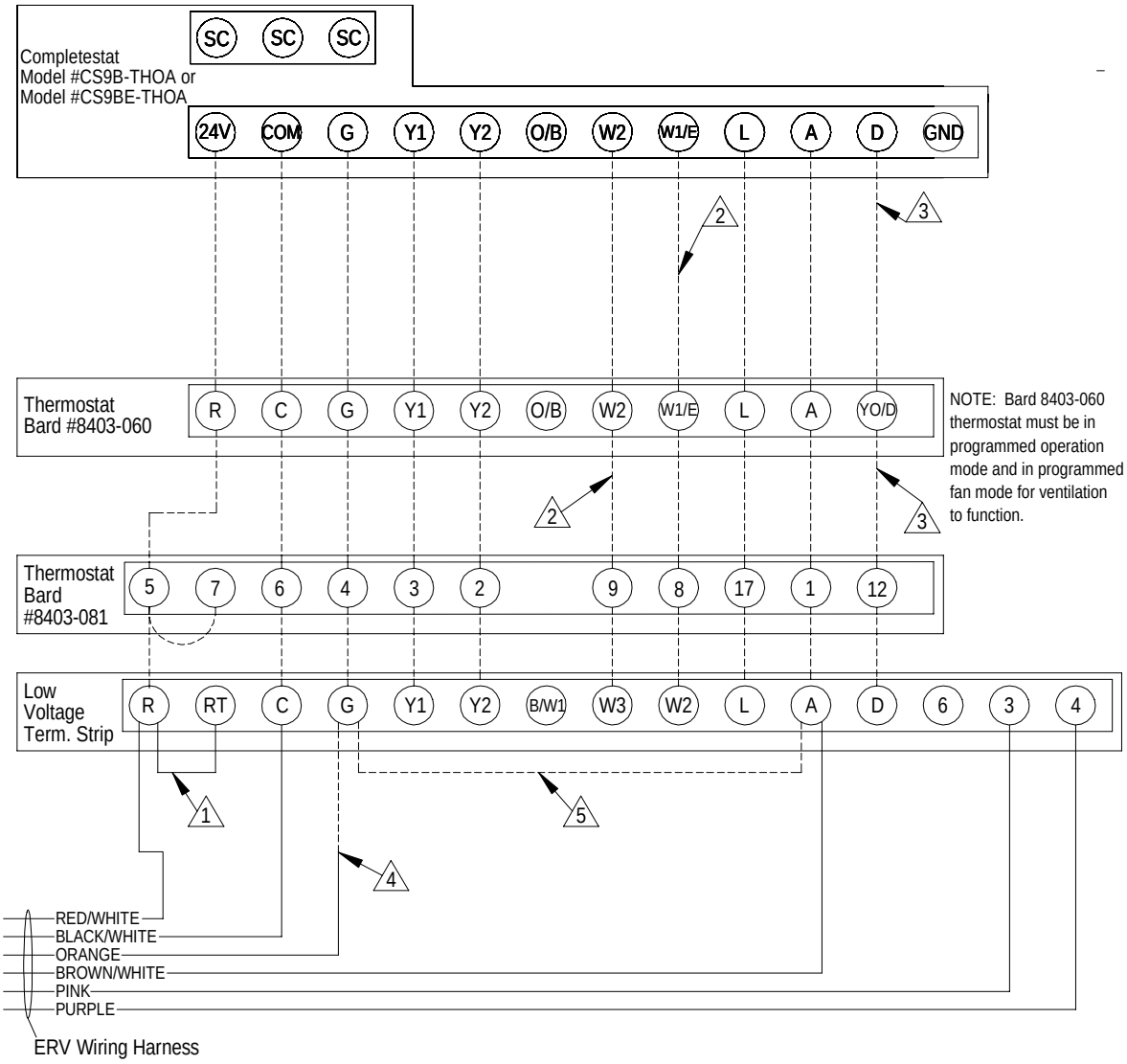
FIGURE 15
Air Conditioner with CRV and CO_2 Control ("M" Vent Code)



1. Factory installed jumper. Remove jumper and connect to N.C fire alarm circuit if emergency shutdown required.
2. Not needed below 15KW.
3. Additional wire required for dehumidification models.
4. Connect to "G" terminal when thermostat has "Occupancy Signal".
5. Install a jumper between "G" and "A" only when thermostat without "Occupancy Signal" is used.
6. If CS9B-THOC or CS9BE-THOC is used, connect "Brown/White" directly to "A" and do not use seperate CO2 controller.

MIS-3259 E

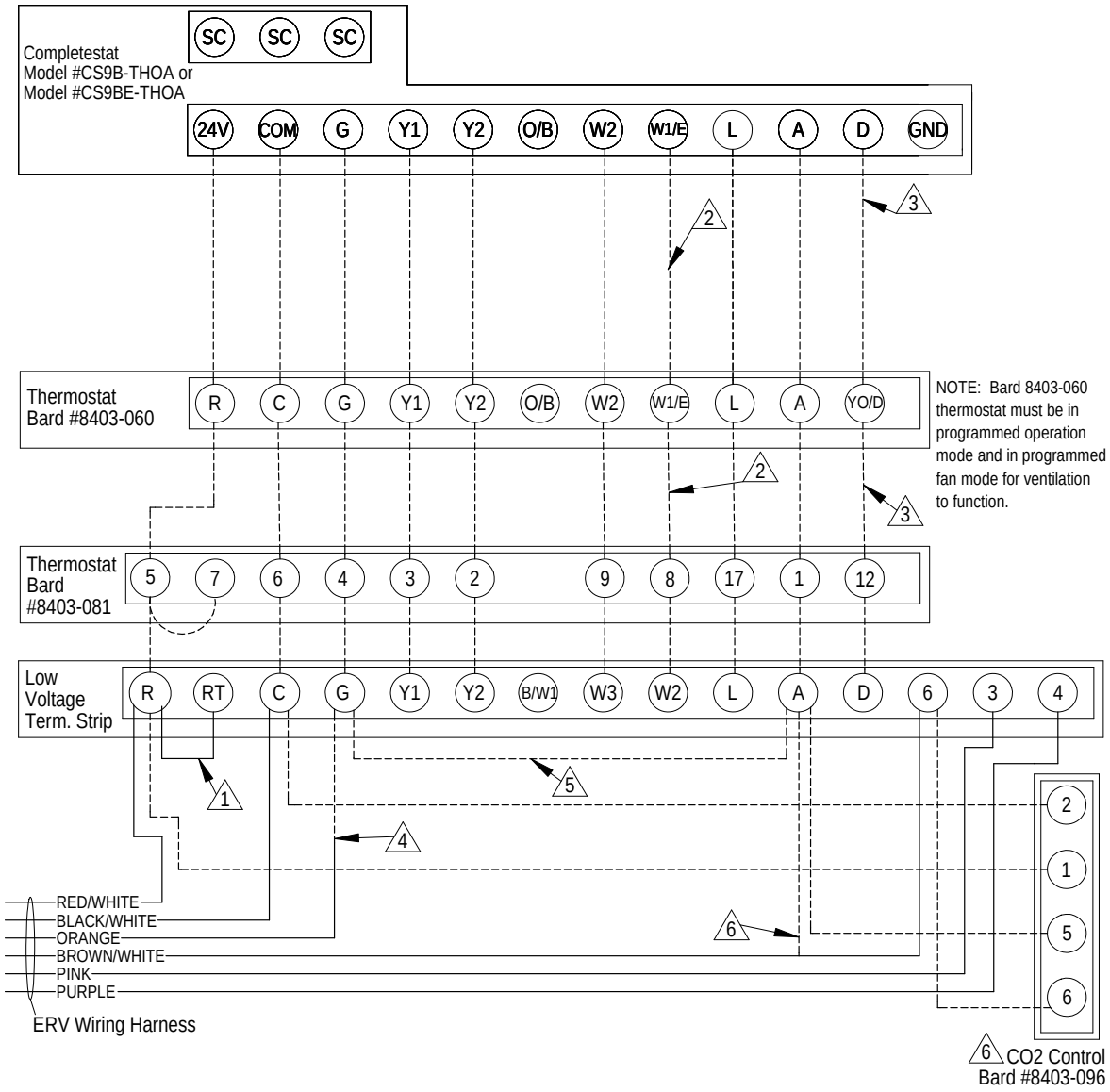
FIGURE 16
Air Conditioner with ERV, without CO_2 Control ("R" Vent Code)



1. Factory installed jumper. Remove jumper and connect to N.C fire alarm circuit if emergency shutdown required.
2. Not needed below 15KW.
3. Additional wire required for dehumidification models.
4. Connect to "G" terminal when thermostat has "Occupancy Signal".
5. Install a jumper between "G" and "A" only when thermostat without "Occupancy Signal" is used.

MIS-3260 E

FIGURE 17
Air Conditioner with ERV and CO_2 Control (On/Off Cycling) ("R" Vent Code)



1. Factory installed jumper. Remove jumper and connect to N.C fire alarm circuit if emergency shutdown required.
2. Not needed below 15KW.
3. Additional wire required for dehumidification models.
4. Connect to "G" terminal when thermostat has "Occupancy Signal".
5. Install a jumper between "G" and "A" only when thermostat without "Occupancy Signal" is used.
6. If CS9B-THOC or CS9BE-THOC is used, connect "Brown/White" directly to "A" and do not use seperate CO2 controller.

MIS-3261 E

FIGURE 18
Air Conditioner with ERV and CO_2 Control (Fully Modulating) ("R" Vent Code)

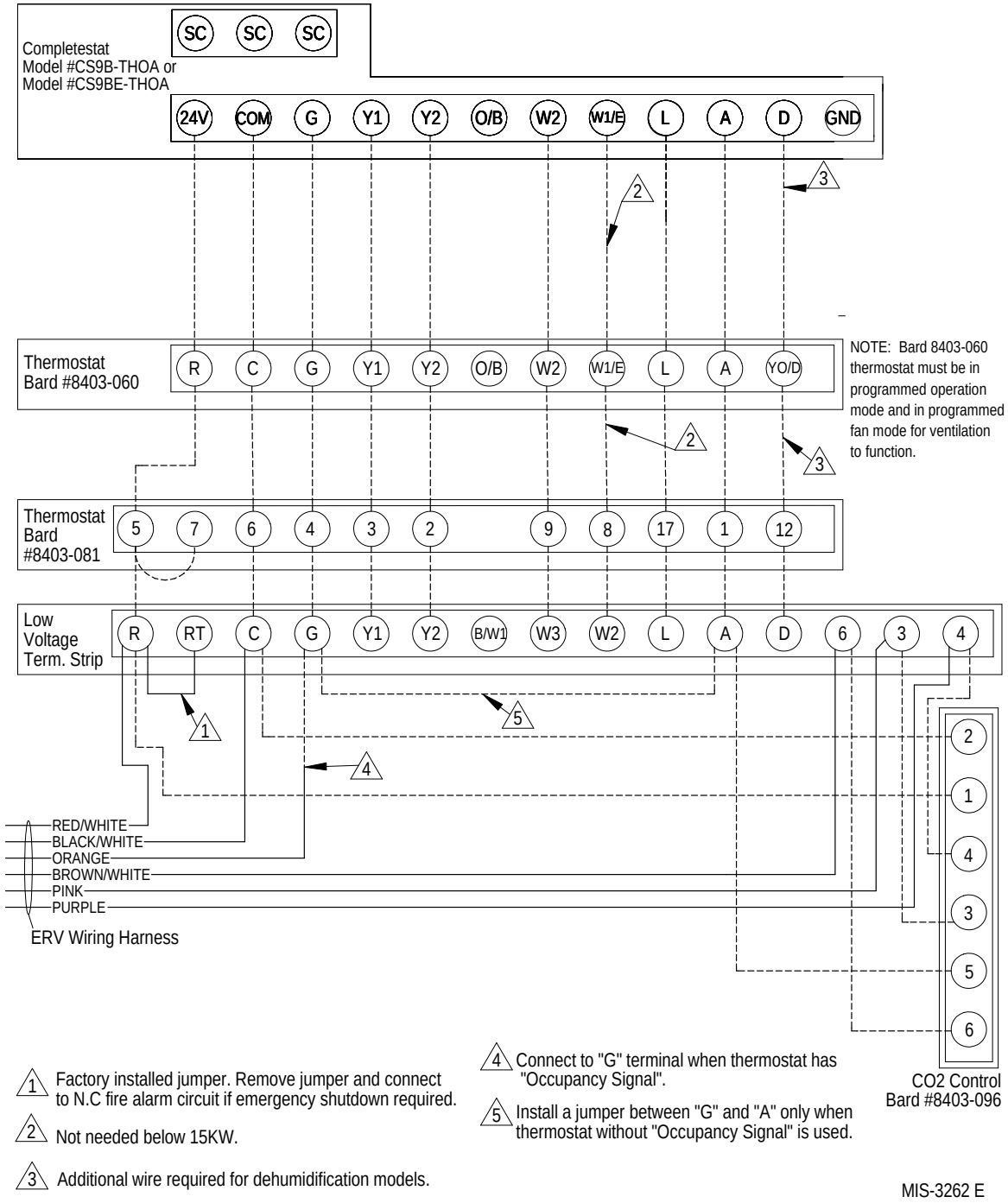
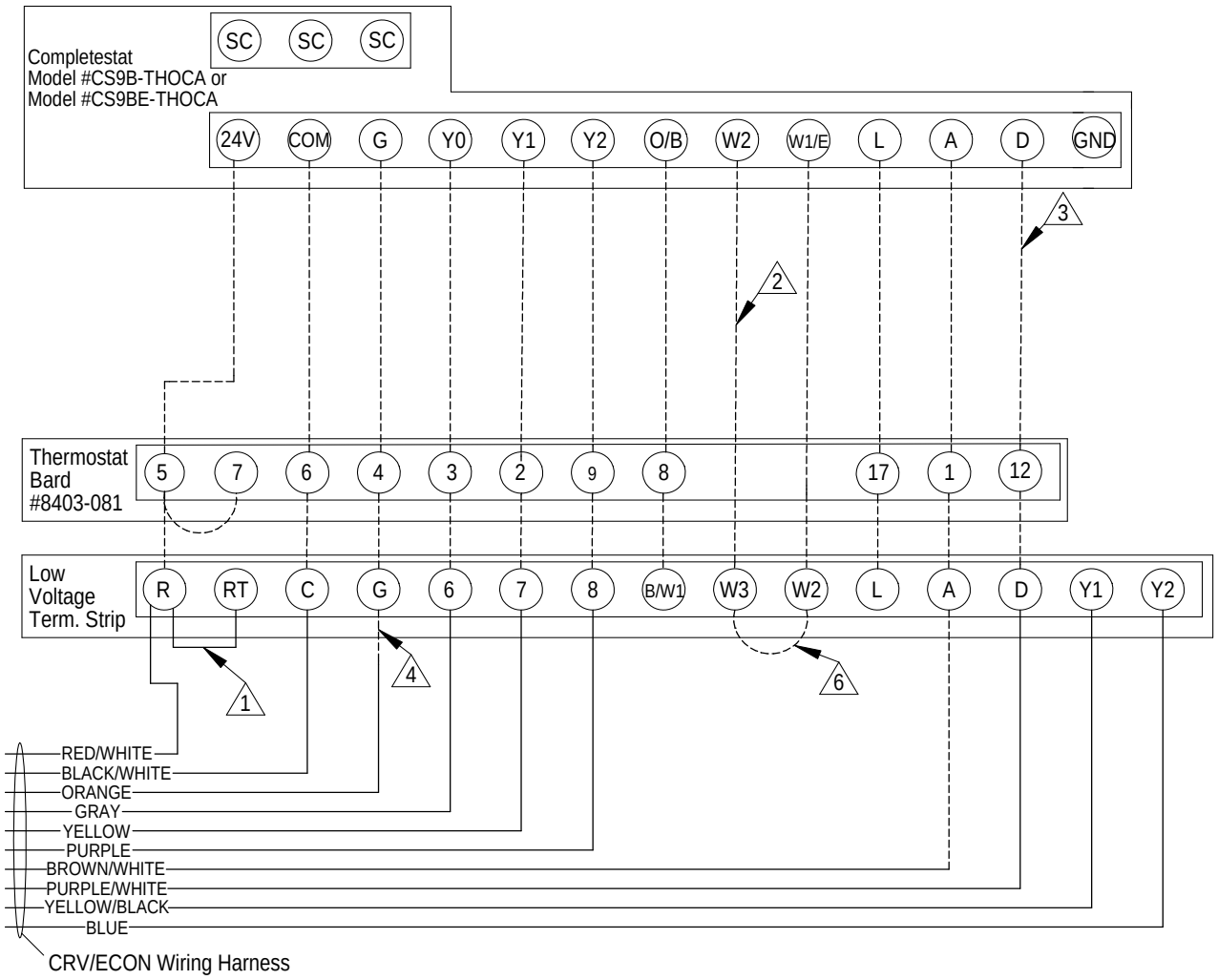


FIGURE 19

Air Conditioner with Combination CRV and DB Economizer ("N" Vent Code)

Only Recommend Bard CS9B-THOC or CS9BE-THOC as Require 3 Heating/Cooling Stages



1 Factory installed jumper. Remove jumper and connect to N.C fire alarm circuit if emergency shutdown required.

2 Not needed below 15KW.

3 Additional wire required for dehumidification models.

4 Connect orange wire to "G" terminal

6 Jumper W2 to W3 on terminal strip if unit has 15 KW of heat when using the 8301-081 thermostat.

MIS-3270 D

THESE UNITS REQUIRE R-410A REFRIGERANT AND POLYOL ESTER OIL.

GENERAL

1. Use separate service equipment to avoid cross contamination of oil and refrigerants.
2. Use recovery equipment rated for R-410A refrigerant.
3. Use manifold gauges rated for R-410A (800 psi/250 psi low).
4. R-410A is a binary blend of HFC-32 and HFC-125.
5. R-410A is nearly azeotropic—similar to R-22 and R-12. Although nearly azeotropic, charge with liquid refrigerant.
6. R-410A operates at 40-70% higher pressure than R-22, and systems designed for R-22 cannot withstand this higher pressure.
7. R-410A has an ozone depletion potential of zero, but must be reclaimed due to its global warming potential.
8. R-410A compressors use Polyol Ester oil.
9. Polyol Ester oil is hygroscopic; it will rapidly absorb moisture and strongly hold this moisture in the oil.
10. A liquid line dryer must be used; even a deep vacuum will not separate moisture from the oil.
11. Limit atmospheric exposure to 15 minutes.
12. If compressor removal is necessary, always plug compressor immediately after removal. Purge with small amount of nitrogen when inserting plugs.

TOPPING OFF SYSTEM CHARGE

If a leak has occurred in the system, Bard Manufacturing recommends reclaiming, evacuating (see criteria above), and charging to the nameplate charge. However, if done correctly, topping off the system charge can be done without problems.

With R-410A, there are no significant changes in the refrigerant composition during multiple leaks and recharges. R-410A refrigerant is close to being an azeotropic blend (it behaves like a pure compound or single component refrigerant). The remaining refrigerant charge, in the system, may be used after leaks have occurred and then "top-off" the charge by utilizing the charging charts on the inner control panel cover as a guideline.

REMEMBER: When adding R-410A refrigerant, it must come out of the charging cylinder/tank as a liquid to avoid any fractionation, and to insure optimal system performance. Refer to instructions for the cylinder that is being utilized for proper method of liquid extraction.

⚠ WARNING

Failure to conform to these practices could lead to injury or death.

SAFETY PRACTICES

1. Never mix R-410A with other refrigerants.
2. Use gloves and safety glasses. Polyol Ester oils can be irritating to the skin, and liquid refrigerant will freeze the skin.
3. Never use air and R-410A to leak check; the mixture may become flammable.
4. Do not inhale R-410A—the vapor attacks the nervous system, creating dizziness, loss of coordination and slurred speech. Cardiac irregularities, unconsciousness and ultimate death can result from breathing this concentration.
5. Do not burn R-410A. This decomposition produces hazardous vapors. Evacuate the area if exposed.
6. Use only cylinders rated DOT4BA/4BW 400.
7. Never fill cylinders over 80% of total capacity.
8. Store cylinders in a cool area, out of direct sunlight.
9. Never heat cylinders above 125°F.
10. Never trap liquid R-410A in manifold sets, gauge lines or cylinders. R-410A expands significantly at warmer temperatures. Once a cylinder or line is full of liquid, any further rise in temperature will cause it to burst.

DESCRIPTION OF STANDARD EQUIPMENT

High/Low Pressure Switch

Provides refrigerant circuit high pressure and loss of charge protection. Includes lockout circuit built into logic control board that is resettable from room thermostat.

5-Minute Compressor Time Delay

Provides short cycle protection for the compressor which extends compressor life. Built into the electronic logic control board as standard.

Condensate Overflow

Senses and provides system shut down if draining issue causes water level to rise in the lower drain pan.

Low Ambient Control

The low ambient control permits cooling operation down to 0°F outdoor ambient.

IMPORTANT INSTALLER NOTE

For improved start-up performance, wash the indoor coil with a dishwasher detergent.

PHASE MONITOR

All units with three phase scroll compressors are equipped with a 3 phase line monitor to prevent compressor damage due to phase reversal.

The phase monitor in this unit is equipped with two LEDs. If the Y signal is present at the phase monitor and phases are correct the green LED will light and the compressor contactor is allowed to energize.

If phases are reversed, the red fault LED will be lit and compressor operation is inhibited.

If a fault condition occurs, reverse two of the supply leads to the unit. Do not reverse any of the unit factory wires as damage may occur.

THREE PHASE SCROLL COMPRESSOR START UP INFORMATION

Scroll compressors, like several other types of compressors, will only compress in one rotational direction. Direction of rotation is not an issue with single phase compressors since they will always start and run in the proper direction.

However, three phase compressors will rotate in either direction depending upon phasing of the power. Since there is a 50-50 chance of connecting power in such a way as to cause rotation in the reverse direction, ***verification of proper rotation must be made.*** Verification of proper rotation direction is made by observing that suction pressure drops and discharge pressure rises when the compressor is energized. Reverse rotation also results in an elevated sound level over that with correct rotation, as well as, substantially reduced current draw compared to tabulated values.

Verification of proper rotation must be made at the time the equipment is put into service. If improper rotation is corrected at this time there will be no negative impact on the durability of the compressor. However, reverse operation for even one hour may have a negative impact on the bearing due to oil pump out.

All three phase scroll compressors used in the I-TEC series are wired identically internally. As a result, once the correct phasing is determined for a specific system or installation, connecting properly phased power leads to the same Fusite terminal should maintain proper rotation direction. The direction of rotation of the motor may be changed by reversing any two line connections to the unit.

SERVICE HINTS

1. Caution user to maintain clean air filters at all times and to not needlessly close off supply air registers. This may reduce airflow through the system, which shortens equipment service life as well as increasing operating costs and noise levels.
2. Check all power fuses or circuit breakers to be sure they are the correct rating.
3. Periodic cleaning of the outdoor coils to permit full and unrestricted airflow circulation is essential.
4. Annual maintenance is required to make sure that all of the systems are functioning properly.
   a. Check to make sure that the drains are not obstructed in any way.
   b. Remove any debris in the condenser section of the unit.
   c. Inspect and wash outdoor coils as necessary.
5. All motors are sealed and require no oiling.

SEQUENCE OF OPERATION

Cooling Part Load

On a call for cooling, the thermostat completes a circuit from R to Y1 sending the signal to the compressor logic control board. The compressor logic control board verifies that the high pressure switch, the low pressure switch and the float switch control are all in the closed position. The compressor logic control board also verifies that the condenser float switch control is in the open position. It then energizes the A terminal output. Following 10 seconds of the A terminal being energized, the CC terminal is energized and outdoor motor initiates.

The G (indoor motor) circuit is automatically completed on any call for cooling operation or can be energized by manual fan switch switch on sub-base for constant air circulation.

Cooling Full Load

Circuit R-Y1 & Y2 makes at the thermostat energizing the 2nd stage solenoid in the compressor. The default position of the compressor staging solenoid is non-energized. The compressor will run at low capacity until this solenoid is energized.

Heating Stage 1

Circuit R-G & W1 makes at the thermostat energizing the corresponding heater contactors. The indoor blower is also energized.

Heating Stage 2

Circuit R & W2 makes at the thermostat energizing the corresponding heater contactors. The indoor blower remains energized.

Alarm Relay Output

Alarm terminal is output connection for applications where alarm relay is employed. This terminal is powered whenever the compressor is locked out due to HP or LP sequences as described below.

NOTE: *Both high and low pressure switch controls are inherently automatic reset devices. The high pressure switch and low pressure switch cut out and cut in settings are fixed by specific air conditioner unit model. The lockout features, both soft and manual, are a function of the compressor logic control board.*

Logic Control Board

If the controller operates in normal mode, the green status light blinks. This indicates that 24 volt power is applied to the board and the controller is running in normal operation.

On initial power up and call for compressor, a 5-minute delay plus a random start delay of 0 to 0 seconds is applied. After the random delay, the compressor relay is energized (terminal CC). When the Y1 input opens, the compressor de-energizes.

Freeze Stat

When the Y signal is sent to the logic control board, the signal will travel from the dehum board through the freeze stat and give 24 volt power at the Y1 terminal of the compressor logic control board. Following that, the output will energize 10 seconds prior to CC output that starts the compressor.

Anti-Short Cycle Timer

After compressor shutdown, or power disruption, a 5-minute timer is applied which prevents the compressor from operating.

High Pressure Switch

(Terminals HP1 and HP2) Circuit will be proved as "closed" prior to energizing A or CC terminals. If pressure switch opens, compressor will go into soft lockout mode and compressor operation will be terminated; green fault light will be illuminated. Logic control will then go through 5-minute delay on break plus random start sequence. If no fault is found on next run cycle, compressor will continue operation. If fault reoccurs, a hard lockout will be initiated and fault signal is sent to L terminal.

Low Pressure Switch

(Terminals LP1 and LP2) Circuit will be proved as "closed" prior to energizing A or CC terminals. The condition of the LP terminals will then be ignored for the first 90 seconds after a demand for compressor operation. Following this 90-second period, if pressure switch opens, compressor will go into soft lockout mode and compressor operation will be terminated; orange fault light will be illuminated. The compressor control board will then go through a 5-minute delay on break plus random start sequence. If no fault is found on next run cycle, compressor will continue operation. If fault reoccurs, hard lockout will be initiated and the fault signal is sent to the L terminal.

Float Switch (Evaporator)

(Terminals FS1 and FS2) Circuit will be proved as "closed" prior to energizing CC terminal. If float switch opens, compressor will go into soft lockout mode and compressor operation will be terminated; red fault light will be illuminated. Compressor logic control will then go through 5-minute delay on break plus random start sequence. If no fault is found on next run cycle, compressor will continue operation. If fault reoccurs, hard lockout will be initiated and fault signal is sent to L terminal.

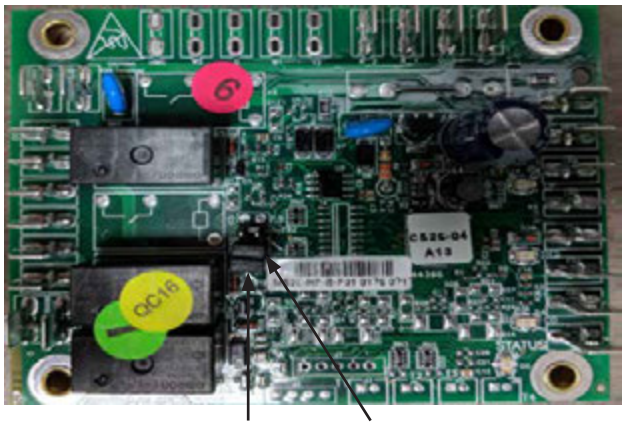
Condenser Overflow

(Terminals CO1 and CO2) Circuit will be proved as "open" prior to energizing A or CC terminals. If flow switch closes, compressor will go into soft lockout mode and compressor operation will be terminated; yellow fault light will be illuminated. If fault clears, the compressor logic control will then go through 5-minute delay on break plus random start sequence. If no fault is found on next run cycle, compressor will continue operation. If fault reoccurs, or did not clear the first time after 30 seconds, the control will go into hard lockout and fault signal is sent to L.

Over and Under Voltage Protection

When an under or over voltage condition exists, the controller locks out the unit. When condition clears, the controller automatically releases the unit to normal operation and the compressor restarts after the random start and anti-short cycle timings are met. The under and over voltage protection starts at plus or minus 20% from nominal voltage and returns to operation at plus or minus 10% from nominal voltage. All four LED fault lights will flash when an under or over voltage condition occurs. The over voltage protection can be disabled by removing the O/V jumper on the logic control board (see Figure 20 on page 34).

FIGURE 20



Intelligent Reset

The compressor logic control board has an intelligent reset feature after a safety control is activated. The controller locks out the unit for 5 minutes; at the end of this period, the controller checks to verify that all faults have been cleared. If faults have been cleared, the controller restarts the unit. If a second fault occurs, the controller will lockout the unit until the control is reset by breaking Y signal from thermostat. The last fault will be kept in memory after a full lockout; this is only cleared by cycling the unit power.

Alarm Output

The L terminal has 24 volts applied when a hard lockout occurs. This can be used to drive a fault light or a low voltage relay.

PRESSURE SERVICE PORTS

High and low pressure service ports are installed on all units so that the system operating pressures can be observed. Pressure tables covering all models can be found on pages 67 and 68. It is imperative to match the correct pressure table to the unit by model number.

This unit employs high-flow Coremax valves instead of the typical Shrader type valves.

WARNING! Do NOT use a Schrader valve core removal tool with these valves. Use of such a tool could result in eye injuries or refrigerant burns!

To change a Coremax valve without first removing the refrigerant, a special tool is required which can be obtained at www.fastestinc.com/en/SCCA07H. See the replacement parts manual for replacement core part numbers.

LOWERING OUTDOOR FAN SPEED FOR SOUND

Supplied in the literature assembly is a fan control resistor assembly that can be installed to lower the fan speed for reduced sound performance. This resistor assembly is to be installed in series with the outdoor fan control thermistor to change the temperature curve that the fan logic control sees.

It is anticipated that a 2-3% drop in system capacity and efficiency will be seen when this resistor is installed.

To install the resistor assembly:

1. Locate fan control resistor assembly in literature packet hanging on right inside door of unit.
2. Throw main power disconnect to the “OFF” position to eliminate risk of injury or death due to electrical shock.
3. Remove four (4) screws that retain the control panel cover to the unit.
4. Locate fan logic control board.
5. Locate one of the red leads of the fan control thermistor where it attaches to the fan logic control and remove it.
6. Install resistor in-line with the thermistor lead removed in Step #5, and then connect back onto the fan logic control board.

I-TEC COMMERCIAL ROOM VENTILATOR SYSTEM (VENT CODE "M")

GENERAL DESCRIPTION

The I-TEC Commercial Room Ventilator (CRV) is designed to be used with all Bard I-TEC models. The only intent of this device is to provide the required ventilation by delivering fresh air to meet IAQ (indoor air quality) requirements. In the installed application, this system also includes exhaust provisions which are balanced with the intake air to maintain building pressurization requirements of ASHRAE 62.1 Standard.

Ventilation is accomplished with two blower/ motor assemblies for maximum ventilation at low sound levels. The intake and exhaust blowers are programmed independently and are balanced to maintain a slight positive pressurization in accordance to ASHRAE 62.1 Standard.

The I-TEC CRV is also provided with filters to reduce the required service needed and to further improve the IAQ. The exhaust air blowers are protected by disposable filters and the intake air blowers are protected by washable filters. Both are accessible without the need for tools.

CONTROL WIRING

The I-TEC CRV comes wired from the factory set to 375 CFM of ventilation. Care must be taken when deciding how to control the operation of the ventilator. When designing the control circuit for the ventilator, the following requirements must be met.

1. The indoor blower must be run whenever the I-TEC CRV is run.
2. Select and configure the correct CFM ventilation level that the I-TEC CRV needs to operate and configure the system to this level following later instructions within this section. Over ventilating serves no useful purpose and significantly affects the overall efficiency of the heat pump system. System operating costs would also increase.
3. Run the I-TEC CRV only during periods when the conditioned space is occupied. Running the ventilation during unoccupied periods wastes energy, decreases the expected life of the CRV, and can result in large moisture buildup in the structure. Running the CRV when the structure is unoccupied allows moisture to build up in the structure because there is little or no cooling load. Thus, the air conditioner is not running enough to remove the excess moisture being brought in. Use a control system that in some way can control the system based upon occupancy.

NOTICE

Operating the I-TEC CRV during unoccupied periods can result in a build up of excess moisture in the structure.

RECOMMENDED CONTROL SEQUENCES

Several possible scenarios are listed below:

1. Use a programmable electronic thermostat with auxiliary terminal to control the CRV based on daily programmed occupance periods. Bard markets and recommends Bard Part #8403-060 programmable electronic thermostat.
2. Use Bard CompleteStat™ that incorporates temperature, humidity and occupancy control with learning capability into a single device. No programming required.
3. Use a DDC control system to control the CRV-based upon a room occupancy schedule to control the CRV.
4. Tie the operation of the CRV into the light switch. The lights in a room are usually on only when occupied.
5. Use a manual timer that the occupants turn to energize the CRV for a specific number of hours.
6. Use a programmable mechanical timer to energize the CRV and indoor blower during occupied periods of the day.

NOTE: *The ventilation package comes with a blower interlock function, but is disabled when it is shipped from the factory in case a thermostat with an occupancy output or occupancy sensor is not utilized. In this situation, "A" terminal must be tied to "G" terminal to drive the ventilation package. If a thermostat or control that drives occupancy output is utilized, the tape from the orange wire located in the low voltage terminal box will need to be removed and the orange wire connected to the "G" terminal to activate this function. (See Figures 13-19 on pages 24 to 30.)*

SETTING THE VENTILATION CFM LEVELS

The I-TEC CRV has four pre-set levels of ventilation CFM available. These are 300, 375, 450 and 525 CFM of ventilation air. The I-TEC CRV is shipped from the factory set on the 375 CFM ventilation level. To change between these four different levels of provided

ventilation CFM, first refer to Figure 21 to look up the corresponding CFM needed for the intake and exhaust blowers to meet the design criteria and determine which "speed/wire color" is needed. Then, perform the following steps.

⚠ WARNING

- ***Hazard of electrical shock.***
- ***Electrical shock can result in serious injury or death.***
- ***Disconnect the remote electric power supply or supplies before servicing.***

1. Open front swinging doors of main unit (by popping front door latches).
2. Throw main power disconnect to the "OFF" position to eliminate risk of injury or death due to electrical shock.
3. Remove five (5) screws holding front CRV door in place (see Figure 22).
4. Locate "Brown Wire with White Trace" that has a black terminal on the end where it connects to the terminal strip (see Figure 21).
5. Move "Brown Wire with White Trace" to the corresponding CFM level needed in accordance with Figure 21.

FIGURE 21
CRV Motor Speed/CFM Configuration

VENT OPTION INTAKE/EXHAUST SPEEDS		
WIRE COLOR	SPEED	NOM. CFM
BLACK	HI	525
BLUE	MED-HI	450
ORANGE	MED-LO	375
RED	LO	300

TO CHANGE SPEEDS, MOVE BROWN WIRE WITH WHITE TRACE.

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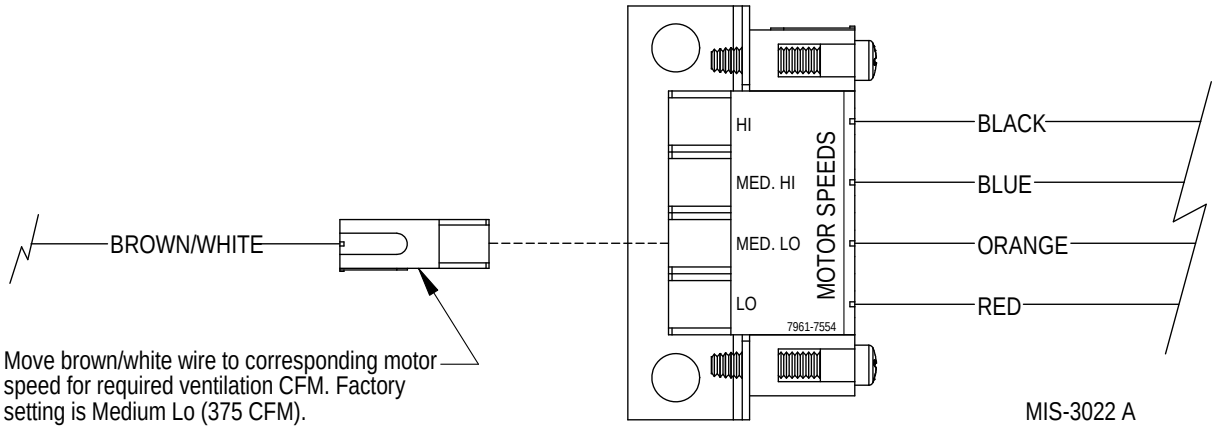
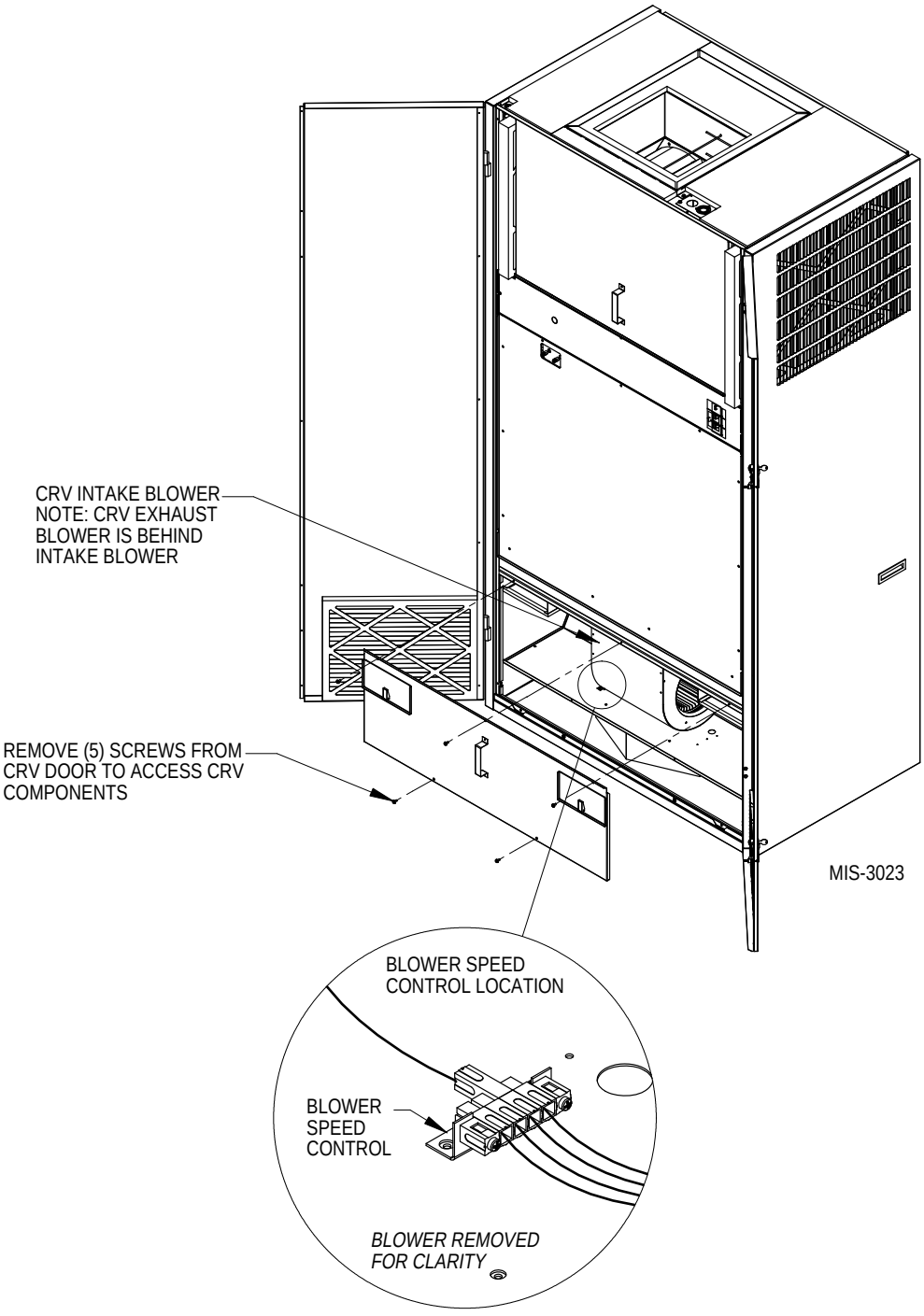


FIGURE 22
CRV Speed Change Terminal Access



I-TEC COMBINATION CRV AND ECONOMIZER VENTILATION SYSTEM (VENT CODE "N")

NOTICE

Operating the I-TEC CRV during unoccupied periods can result in a build up of excess moisture in the structure.

GENERAL DESCRIPTION

The I-TEC Combination Commercial Room Ventilator (CRV) and Dry Bulb Economizer is designed to be used with all Bard I-TEC models. This ventilation package and its control provides two roles:

- It will provide the required ventilation by delivering fresh air to meet IAQ (Indoor Air Quality) requirements through CRV portion of the device.
- It will provide up to 525 CFM of free outdoor cooling CFM when the outdoor ambient temperature is below the outdoor thermostat setpoint.

Ventilation is accomplished with two blower/ motor assemblies for maximum ventilation at low sound levels. The intake and exhaust blowers are programmed independently and are balanced to maintain a slight positive pressurization in accordance to ASHRAE 62.1 Standard.

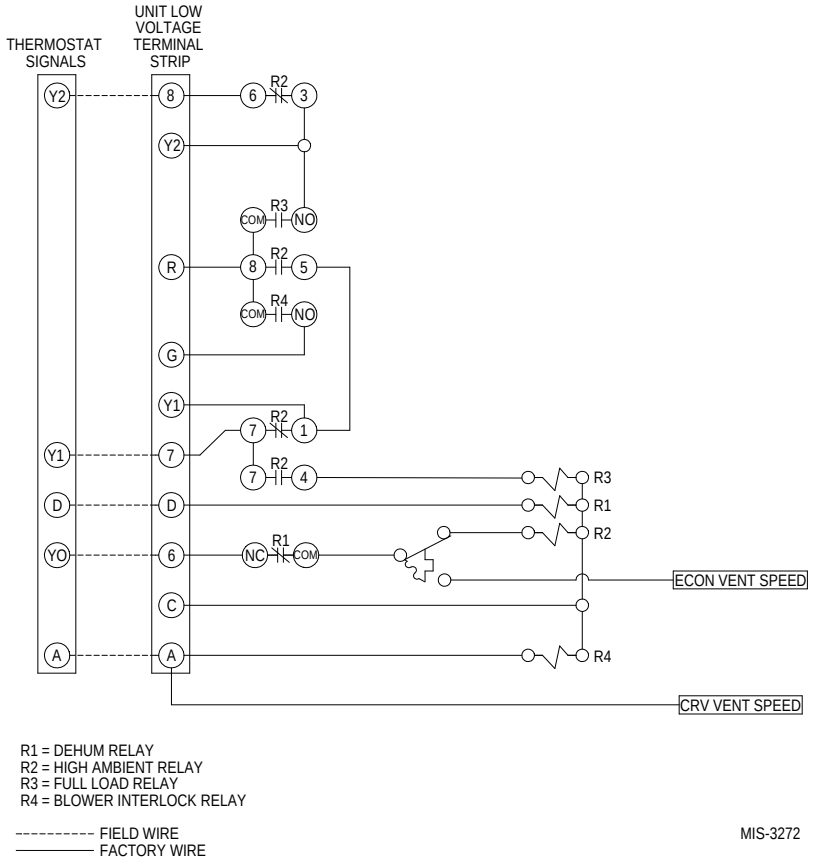
The ventilation package is also provided with filters to reduce the required service needed and to further improve the IAQ. The exhaust air blowers are protected by disposable filters and the intake air blowers are protected by washable filters. Both are accessible without the need for tools.

CONTROL WIRING

Refer to Low Voltage Connection (Figure 19).

Reference Figure 23 for Control Sequence of Operation.

FIGURE 23
Economizer Control Circuit



SETTING THE VENTILATION CFM LEVELS

The I-TEC CRV has four pre-set levels of ventilation CFM available. These are 300, 375, 450 and 525 CFM of ventilation air. This ventilation package is shipped from the factory set on the 375 CFM ventilation level while the economizer portion is set on the 525 CFM ventilation level. To change between these four different levels of provided ventilation CFM, refer to Figure 24 to look up the corresponding CFM needed for the intake and exhaust blowers to meet the design criteria and determine which "speed/wire color" is needed.

⚠WARNING

Open disconnect to shut all power OFF before doing this! Failure to do so could result in injury or death due to electrical shock.

Perform the following steps:

1. Open front swinging doors of main unit (by popping front door latches).
2. Throw main power disconnect to the "OFF" position to eliminate risk of injury or death due to electrical shock.
3. Remove six (6) screws holding front CRV door in place (see Figure 22).
4. For CRV blower speed, locate brown wire with white trace that has as black terminal on the end where it connects to the terminal strip (see Figure 24).
5. Move the brown wire with white trace to the corresponding CFM level needed in accordance with Figure 24.
6. For economizer blower speed, locate pink wire that has a black terminal on the end where it connects to the terminal strip (see Figure 24).
7. Move the pink wire to the corresponding CFM level needed in accordance with Figure 24.

FIGURE 24
Motor Speed/CFM Configuration

VENT OPTION INTAKE/EXHAUST SPEEDS		
WIRE COLOR	SPEED	NOM. CFM
BLACK	HI	525
BLUE	MED-HI	450
ORANGE	MED-LO	375
RED	LO	300

TO CHANGE SPEEDS, MOVE BROWN WIRE WITH WHITE TRACE.

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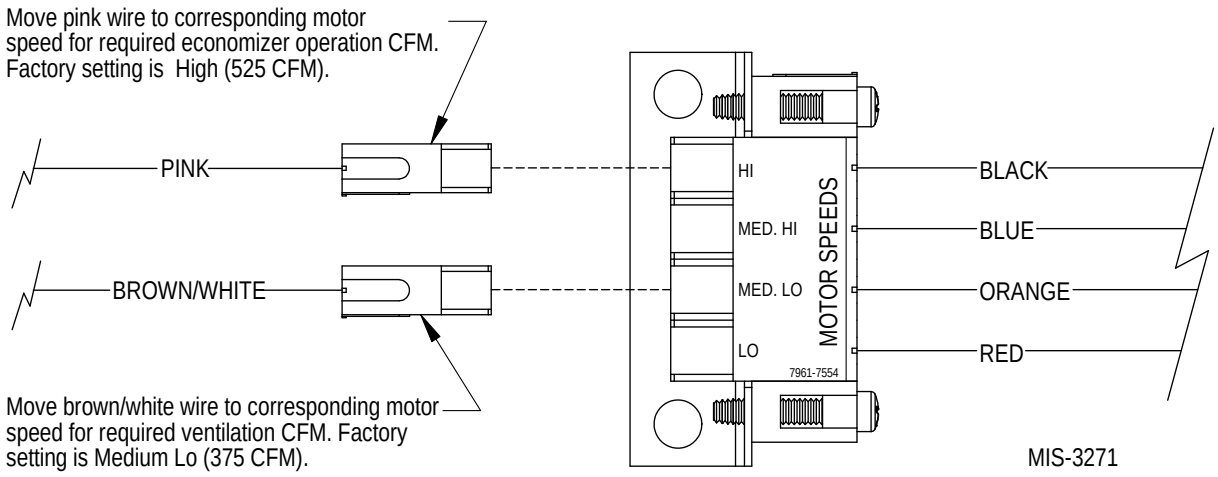


I-TEC ECONOMIZER SEQUENCE OF OPERATION

If Outdoor Temperature is Below Outdoor Thermostat Setpoint

On call from CompleteStat™ for first stage cooling:

- "YO" thermostat signal powers vent blower motors at Economizer Speed/Airflow (black – 525 CFM) through NC contacts of Relay "R1" ("Dehum Relay").

On call from CompleteStat™ for first and second stage cooling:

- "YO" thermostat signal powers vent blower motors at Economizer Speed/Airflow (black – 525 CFM) through NC contacts of Relay "R1" ("Dehum Relay").
- "Y1" thermostat signal powers "Y1" terminal on unit low voltage terminal strip through NC contacts of relay "R2" ("High Ambient Relay").

On call from CompleteStat™ for first, second and third stage cooling:

- "YO" thermostat signal powers vent blower motors at Economizer Speed/Airflow (black – 525 CFM) through NC contacts of Relay "R1" ("Dehum Relay").
- "Y1" thermostat signal powers "Y1" terminal on unit low voltage terminal strip through NC contacts of relay "R2" ("High Ambient Relay").
- "Y2" thermostat signal powers "Y2" terminal on unit low voltage terminal strip through NC contacts of relay "R2" ("High Ambient Relay").

If Outdoor Temperature is Above Outdoor Thermostat Setpoint

On call from CompleteStat for first stage cooling:

- "YO" thermostat signal powers relay coil "R2". "R2" relay then closes NO contact between "R" and "Y1" at low voltage terminal strip engaging stage 1 mechanical cooling. NC contacts of relay "R2" that connects thermostat "Y1" to "Y1" on low voltage terminal strip is opened to eliminate feedback.

On call from CompleteStat™ for first and second stage cooling:

- "YO" thermostat signal powers relay coil "R2". "R2" relay then closes NO contact between "R" and "Y1" at low voltage terminal strip engaging stage 1 mechanical cooling. NC contacts of relay "R2" that connects thermostat "Y1" to "Y1" on low voltage terminal strip is opened to eliminate feedback.
- "Y1" thermostat signal powers relay coil "R3" through now closed relay contacts "R2" closing contacts between "R" and "Y2" at low voltage terminal strip.
- "Y2" thermostat signal will do nothing, as NC contacts of relay "R2" are now opened to eliminate any feedback to thermostat.

Dehumidification Mode

On call from CompleteStat™ for dehumidification:

- "D" thermostat signal powers relay coil "R1" (Dehum. Relay). "R1" relay, then opens NC contact between "YO" and outdoor thermostat.
  - This will then negate any ECONOMIZER SPEED SIGNAL from energizing the ventilation package.
  - "Y1" & "Y2" thermostat signals will pass through NC contacts of Relay "R2" ("High Ambient Relay") as relay coil "R2" will be rendered inoperable by "R1" contacts opening. Normal cooling calls can then still apply to override Dehum. call.

HEATING MODE OPERATION

CompleteStat should never energize "YO" terminals in conjunction with "B", so relay "R2" will never energize, and neither will Economizer Ventilation Speed.

"Y1" and "Y2" signals will pass through NC contacts of relay "R2" contacts, and all heating operations will be normal.

VENTILATION MODE

The call for ventilation will never be disrupted with this control circuit. Anytime "A" signal from CompleteStat is present, the "VENTILATION SPEED" of the vent package will be energized. "A" Signal from thermostat will also energize relay "R4" ("Blower Interlock Relay") completing a circuit from "R" to "G" through the "NO" contacts to ensure blower operations on the ventilation call.

I-TEC MODULATING COMMERCIAL ROOM VENTILATOR SYSTEM (VENT CODE "Q")

NOTICE

Operating the I-TEC CRV during unoccupied periods can result in a build up of excess moisture in the structure.

GENERAL DESCRIPTION

The I-TEC Commercial Room Ventilator (CRV) is designed to be used with all Bard I-TEC models. The only intent of this device is to provide the required ventilation by delivering fresh air to meet IAQ (Indoor Air Quality) requirements. In the installed application, this system also includes exhaust provisions which are balanced with the intake air to maintain building pressurization requirements of ASHRAE 62.1 Standard.

Ventilation is accomplished with two blower/ motor assemblies for maximum ventilation at low sound levels. The intake and exhaust blowers are programmed independently and are balanced to maintain a slight positive pressurization in accordance to ASHRAE 62.1 Standard.

The I-TEC CRV is also provided with filters to reduce the required service needed and to further improve the IAQ. The exhaust air blowers are protected by disposable filters, and the intake air blowers are protected by washable filters. Both are accessible without the need for tools.

CONTROL WIRING

The I-TEC CRV comes wired from the factory set to 375 CFM of ventilation. Care must be taken when deciding how to control the operation of the ventilator. When designing the control circuit for the ventilator, the following requirements must be met.

1. The indoor blower must be run whenever the I-TEC CRV is run.
2. Select and configure the correct CFM ventilation level that the I-TEC CRV needs to operate and configure the system to this level following later instructions within this section. Over ventilating serves no useful purpose and significantly affects the overall efficiency of the heat pump system. System operating costs would also increase.
3. Run the I-TEC CRV only during periods when the conditioned space is occupied. Running the ventilation during unoccupied periods wastes energy, decreases the expected life of the CRV, and can result in large moisture buildup in the structure. Running the CRV when the structure is unoccupied allows moisture to build up in the structure because there is little or no cooling load. Thus, the air conditioner is not running enough to remove the excess moisture being brought in. Use a control system that in some way can control the system based upon occupancy.

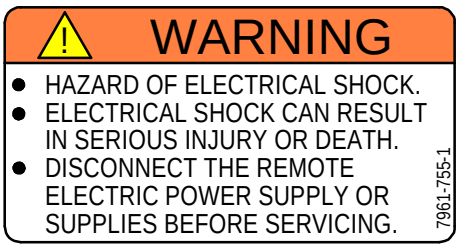
RECOMMENDED CONTROL SEQUENCES

Several possible scenarios are listed below:

1. Use a programmable electronic thermostat with auxiliary terminal to control the CRV based on daily programmed occupance periods. Bard markets and recommends Bard Part #8403-060 programmable electronic thermostat.
2. Install a Bard CompleteStat™ with occupancy sensor which learns the room usage and automatically engages ventilation (see Figure 18).
3. Use a DDC control system based upon a room occupancy schedule to control the CRV.
4. Tie the operation of the CRV into the light switch. The lights in a room are usually on only when occupied.
5. Use a manual timer that the occupants turn to energize the CRV for a specific number of hours.
6. Use a programmable mechanical timer to energize the CRV and indoor blower during occupied periods of the day.

NOTE: *The ventilation package comes with a blower interlock function, but is disabled when it is shipped from the factory in case a thermostat with an occupancy output or occupancy sensor is not utilized and "A" terminal to "G" terminal must be tied to drive the ventilation package. If a thermostat or control does drive occupancy output, remove the tape from the orange wire located in the low voltage terminal box and connect it to the "G" terminal to activate this function. (See Figures 13-19.)*

CHANGING VENTILATION CFM RATES IN MANUAL MODE



To adjust the airflow ventilation rate, first refer to Figure 25A to look up the "FLOW INDEX" needed for the intake and exhaust blowers for the CFM required. Then, perform the following steps:

1. Open front swinging doors of main unit (by popping front door latches).
2. Throw main power disconnect to the "OFF" position to eliminate risk of injury or death due to electrical shock.
3. Remove five (5) screws holding front CRV door in place (see Figure 27 on page 45).
4. Remove CRV control panel cover by removing four (4) screws (see Figure 27).
5. Locate two 0-10Vdc motor control boards in control panel (see Figure 28 on page 46).
6. On intake motor control board, observing "GREEN STATUS LIGHT", turn manual adjust potentiometer counterclockwise to increase "FLOW INDEX" or clockwise to reduce "FLOW INDEX" to match desired setting.

NOTE: *After long pause, the green status light will blink long-blinks for the "TEN COUNT" of the "FLOW RATE INDEX", then immediately followed by fast blinks which indicate the second digit. For example, a flow index of 23 would be two long blinks, followed by three fast blinks of the "GREEN STATUS LIGHT".*

7. On exhaust motor control board, observing "GREEN STATUS LIGHT", turn manual adjust potentiometer counterclockwise to increase "FLOW INDEX" or clockwise to reduce "FLOW INDEX" to match desired setting.

NOTE: *Same "GREEN STATUS LIGHT" blink as Step #6.*

CHANGING TO FULLY MODULATING MODE

If the CRV is to be operated in fully variable mode (Fig. 25B) (only run at required speed to maintain setpoint CO_2 levels), the CRV will need to be configured to the following:

1. Open front swinging doors of main unit (by popping front door latches).
2. Throw main power disconnect to the "OFF" position to eliminate risk of injury or death due to electrical shock.
3. Remove CRV control panel cover by removing four (4) screws (see Figure 27).
4. Locate two 0-10Vdc motor control boards in control panel (see Figure 28 on page 46).
5. Pull jumper pins from "M" terminals, and move to "P" terminals (see Figure 28).
6. Connect "+" 0-10Vdc output from CO_2 control to Terminal #3 (along with pink wire), and connect "-" to Terminal #4 (along with purple wire) of unit low voltage terminal strip.
7. Follow the directions supplied with the CO_2 control to configure the control appropriately.

FIGURE 25A
CRV "Manual Mode" Jumper Pin on "M" Terminal

CFM	FLOW INDEX (Light Blink Code)
525	100
500	92
475	85
450	79
425	72
400	66
375	59
350	53
325	46
300	40
275	33
250	27
225	20
200	14
175	7
150	1

To adjust the airflow ventilation rate (NO CO_2 CONTROL/NON-MODULATING), determine the "FLOW INDEX" needed for the intake and exhaust blowers for the required CFM. Use a small phillips-head screwdriver to make adjustments.

1. Locate two (2) 0-10Vdc motor control boards in control panel.
2. On ***intake*** motor control board (right hand side of control panel), observing "GREEN STATUS LIGHT", turn manual adjust potentiometer counterclockwise to increase "FLOW INDEX" or clockwise to reduce "FLOW INDEX" to match desired setting. (NOTE: After long pause, the green status light will blink long-blinks for the "TEN COUNT" of the "FLOW RATE INDEX", which then is immediately followed by fast blinks which indicate the second digit. For example, a Flow Index of 23 would be two long blinks, followed by 3 fast blinks of the green status light.)
3. On ***exhaust*** motor control board (left hand side of control panel), observing "GREEN STATUS LIGHT", turn manual adjust potentiometer counterclockwise to increase "FLOW INDEX" or clockwise to reduce "FLOW INDEX" to match desired setting. (See NOTE in Step 2.)

FIGURE 25B
CRV "Modulating Mode" Jumper Pin on "P" Terminal

CFM	Vdc Signal from CO_2 Control
525	10
500	9.4
475	8.8
450	8.2
425	7.6
400	7
375	6.4
350	5.8
325	5.2
300	4.6
275	4
250	3.4
225	2.8
200	2.2
175	1.6
150	1

After determining the air volume rates needed for the intended application (maximum and minimum), use this table to program CO_2 control output voltages in correlation to the CO_2 levels needed when Bard CO_2 Control 8403-096 is applied.

FIGURE 26
Ventilation Airflow Diagram

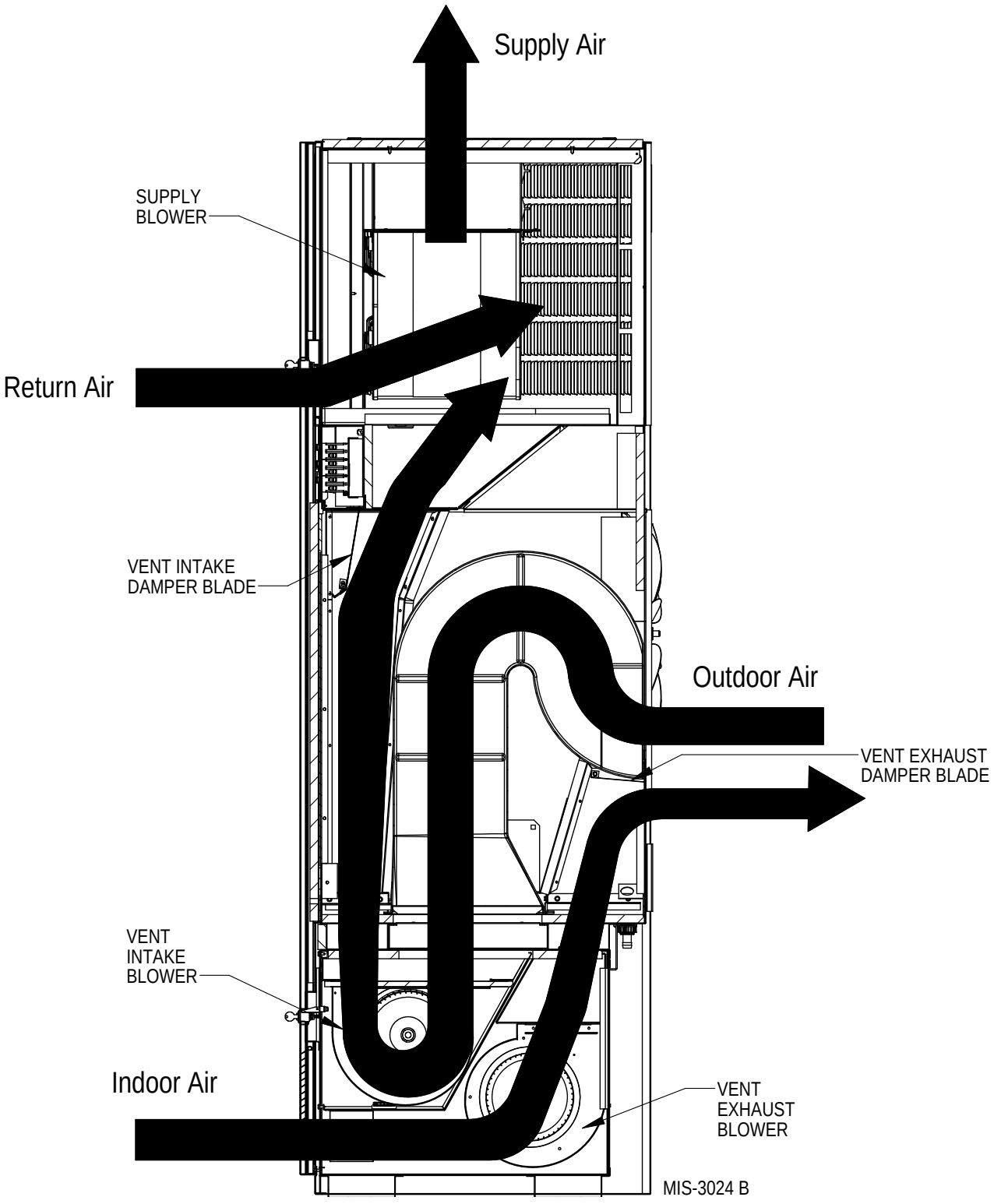


FIGURE 27
CRV Control Access

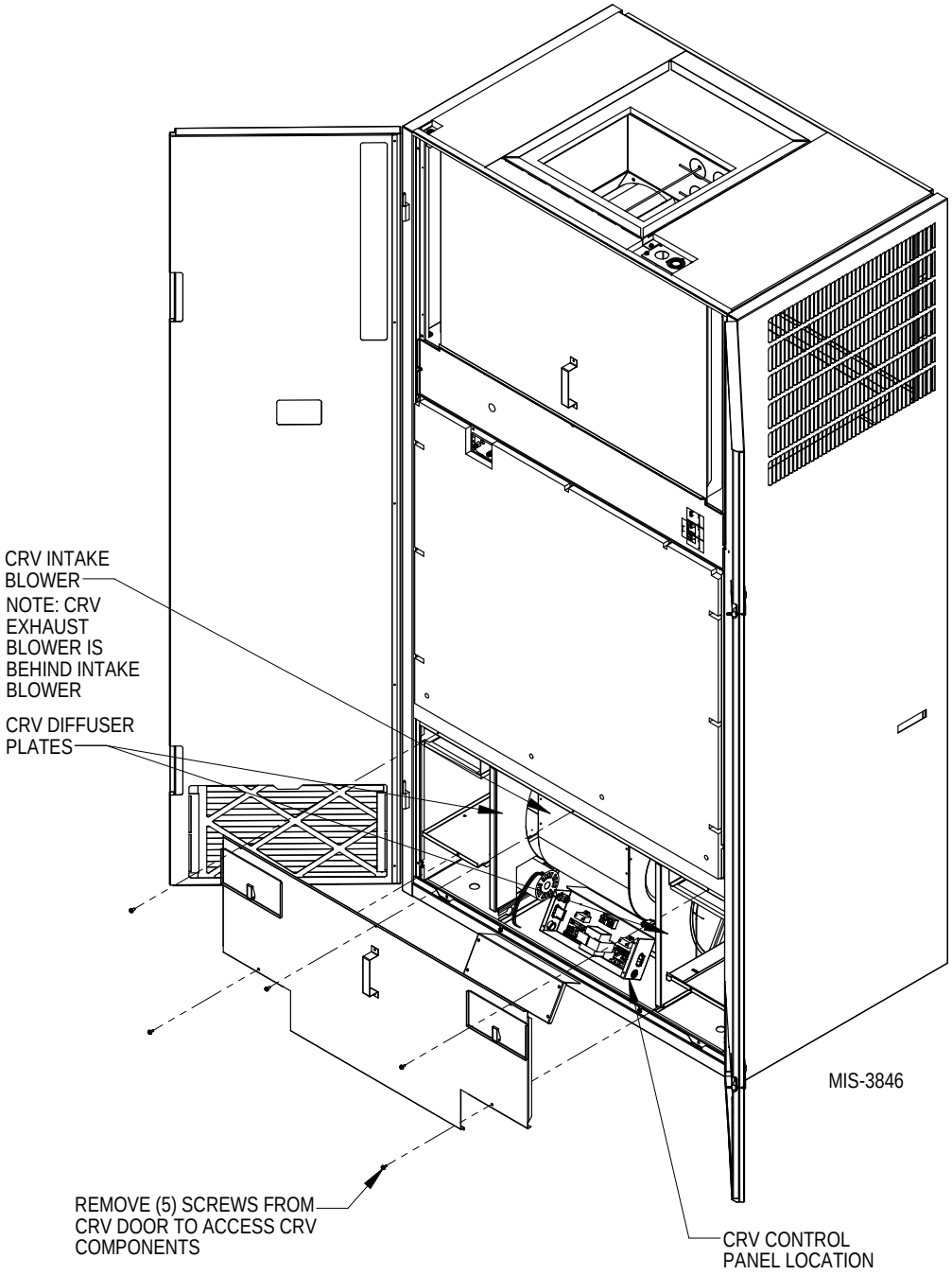
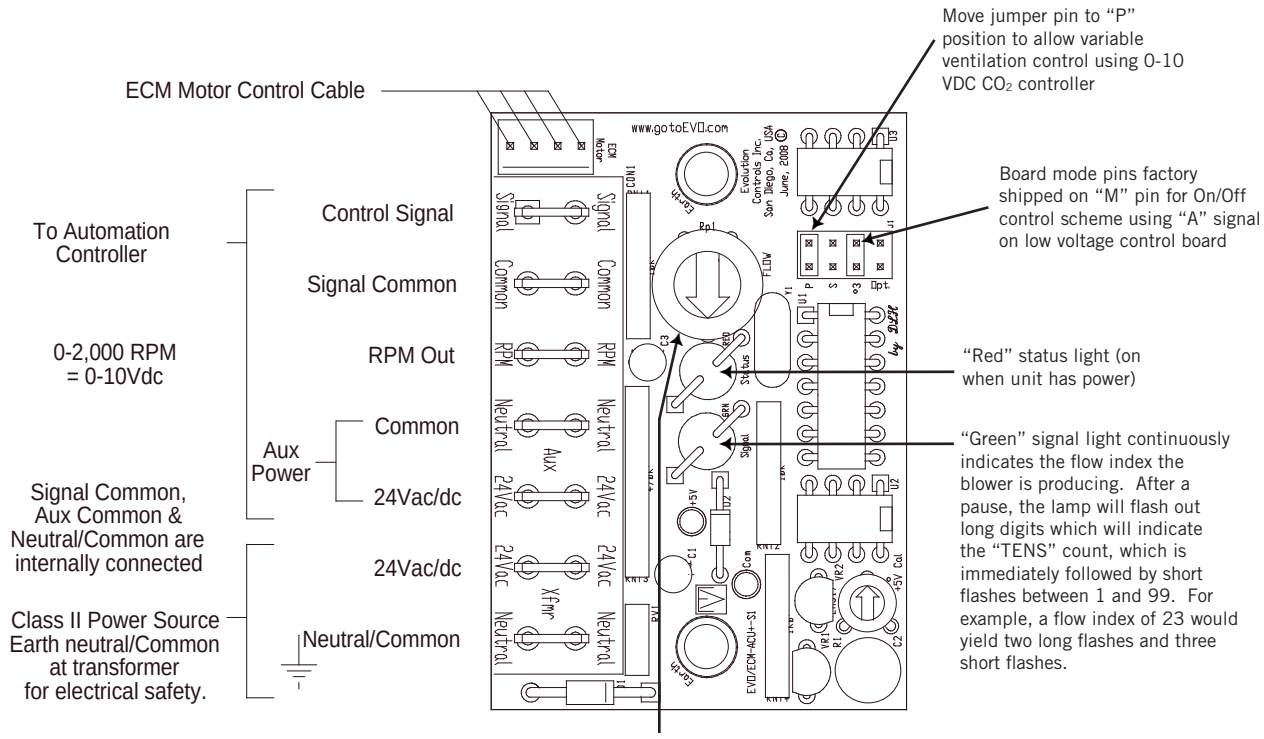


FIGURE 28
Control Board Configuration/Setting



CONFIGURING BARD PART #8403-096 CO_2 CONTROL for CRV MODULATING CONTROL

Bard part #8403-096 carbon dioxide and temperature transmitters accurately monitor the CO_2 concentration and temperature in schools, office buildings and other indoor environments to help achieve LEED® certification.

Specifications

Range: CO_2: 0 to 2000 or 0 to 5000 ppm (depending on model)
Temperature: 32 to 122°F (0 to 50°C)

Accuracy: ±40 ppm + 3% of reading

Temperature Dependence: ±8 ppm/°C at 1100 ppm

Non-Linearity: 16 ppm

Pressure Dependence: 0.13% of reading per mm of Hg

Response Time: 2 minutes for 99% step change

Ambient Operating Temperature: 32 to 122°F (0 to 50°C)

Ambient Operating Humidity: 10 to 95% RH (non-condensing)

Power Requirements: 16 to 35 VDC/19 to 28 VAC

Power Consumption: Average: 2 watts;
Peak: 3.75 watts

Sensor: Single beam, dual-wave length NDIR

Output: Current: 4 to 20 mA (max 500 Ω)
Voltage: 0 to 5 VDC or 0 to 10 VDC (min 500 Ω)
Relay: SPST NO 2A @ 30 VDC
RTD or thermistor per r-t curves (depending on model)

Weight: 5.6 oz (158.8 g)

WARNING Disconnect power supply before installation to prevent electrical shock and equipment damage.

Make sure all connections are in accordance with the job wiring diagram and in accordance with national and local electrical codes. Use copper conductors only.

CAUTION Use electrostatic discharge precautions (e.g., use of wrist straps) during installation and wiring to prevent equipment damage.

CAUTION Avoid locations where severe shock or vibration, excessive moisture or corrosive fumes are present.

CAUTION Do not exceed ratings of this device, permanent damage not covered by warranty may result.

NOTICE Upon powering the transmitter, the firmware version will flash on the display. A warm up period of 30 minutes is required for the transmitter to adjust to the current CO_2 concentration.

NOTICE Self calibration feature of the transmitter requires exposure to normal outdoor equivalent carbon dioxide level once every thirty days.

Mounting

1. Push tab on bottom of cover and lift cover from back plate.
2. Select the mounting location, away from diffusers, lights or any external influences.
3. Mount transmitter on a vertical surface to a standard electrical box using the two #6 M2C type screws provided.
4. Pull wires through sub-base hole and make necessary connections.
5. Reattach cover to base plate.

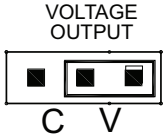
Wiring

Use maximum 18 AWG wire for wiring to terminals. Refer to Figures 13-19 for wiring information.

Selection of Voltage Outputs

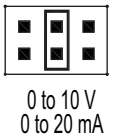
Prior to wiring, verify the voltage selector jumpers on jumpers PJ1 and PJ2 are set to voltage (see figure below).

Current/Voltage Output Selection Jumper (PJ1 & PJ2)



Next, move jumper PJ5 to the 0-10V range (see figure below).

Output Range Selection Jumper PJ5



Editing Menu Parameters

Before any adjustment can be made to the transmitter, the menu lockout jumper (PJ4) must be set to the "ON" position (see figure below).

Menu Lockout Jumper

Finish installing/wiring the control. Then, refer to Figure 21 and the building ventilation specifications to decide what the maximum ventilation rate desired is and what the minimum/maximum voltage signal is required for those levels.

Next, enter the control programming stage listed below once the system is powered-up to configure the control.

Accessing Menu Parameters

Step 1: To enter the menu structure, press △ and ▽ simultaneously for 5 seconds (display will show RON parameter).

Step 2: Press △ or ▽ to cycle between menu items.

Step 3: Press ▭ to edit the value for the displayed menu item (SET will appear on display).

Step 4: Press △ or ▽ to adjust the value of the menu item.

Step 5: Press ▭ to save the changes (SET will disappear).

Step 6: Repeat Steps 2 through 5 for each of the parameters.

Step 7: To exit the menu at any time, press and hold △ and ▽ simultaneously for 5 seconds or wait 10 seconds without pushing any buttons.

Menu Descriptions

RON Relay on setpoint
Sets the CO_2 concentration which the optional relay is energized.
Low limit: 0 PPM
Factory setting: 1000 PPM
High limit: 2000/5000 PPM (depending on model)

ROF Relay off setpoint
Sets the CO_2 concentration which the optional relay is de-energized. Setting value lower than RON provides direct action for detecting high concentrations of CO_2. Setting value higher than RON provides indirect action for detecting low concentrations of CO_2.  or  on the LCD display will be lit to indicate when the relay is energized.
Low limit: 0 PPM
Factory setting: 950 PPM
High limit: 2000/5000 PPM (depending on model)

DSP Display configuration
Determines the LCD display configuration during normal operation. The LCD display can indicate the CO_2 concentration and the temperature, the CO_2 concentration only or the temperature only. The factory default is to display both the temperature and the CO_2 concentration.
CT CO_2 concentration and temperature
C CO_2 concentration only
T Temperature only

UNI Units selection
Temperature and barometric pressure measurements can be displayed in US engineering units or SI engineering units. The factory default is to display US engineering units.

US units F for temperature and in Hg for barometeric pressure

SI units C for temperature and hPa for barometric pressure

COL CO_2 low output range
Sets the CO_2 concentration for the lowest output (4 mA or 0 VDC).
Low limit: 0 PPM
Factory setting: 0 PPM
High limit: 2000/5000 PPM (depending on model)

COH CO_2 high output range
Sets the CO_2 concentration for the highest output (20 mA, 5 VDC or 10 VDC). When COH is set above COL, the transmitter is direct acting and the output will increase with an increase in CO_2 level. When COH is below COL, the transmitter is reverse acting and the output will increase with a decrease in CO_2 level.
Low limit: 0 PPM
Factory setting: 2000/5000 PPM
(depending on model)
High limit: 2000/5000 PPM
(depending on model)

TOL Temperature low output range
Sets the temperature for the lowest output (4 mA or 0 VDC).
Low limit: 32.0°F/0.0°C
Factory setting: 32.0°F/0.0°C
High limit: 122.0°F/50.0°C

TOH Temperature high output range
Sets the temperature for the highest output (20 mA, 5 VDC or 10 VDC). When TOH is set above TOL, the transmitter is direct acting and the output will increase with an increase in temperature. When TOH is below TOL, the transmitter is reverse acting and the output will increase with a decrease intemperature.
Low limit: 32.0°F/0.0°C
Factory setting: 122.0°F/50.0°C
High limit: 122.0°F/50.0°C

BAR Barometric pressure
Sets the typical barometric pressure for the location where the transmitter is mounted. The factory setting is for standard pressure at sea level. Adjusting the barometric pressure gives a more accurate measurement, especially at higher elevations.
Low limit: 20.0 in Hg/600 hPa
Factory setting: 29.9 in Hg/1013 hPa
High limit: 32.0 in Hg/1100 hPa

I-TEC ENERGY RECOVERY VENTILATOR SYSTEM (VENT CODE "R")

GENERAL DESCRIPTION

The I-TEC Energy Recovery Ventilator (ERV) was designed to provide energy efficient, cost effective ventilation to meet IAQ (indoor air quality) requirements while still maintaining good indoor comfort and humidity control for a variety of applications such as schools, classrooms, lounges, conference rooms and others. It provides a constant supply of fresh air for control of airborne pollutants including CO_2, smoke, radon, formaldehyde, excess moisture, virus and bacteria.

The ERV incorporates rotary heat exchanger technology to remove both heat and moisture. The package consists of unique rotary Energy Recovery Cassettes that can be easily removed for cleaning or maintenance. It has two 15" diameter heat transfer wheels for efficient heat transfer. The heat transfer wheels use a permanently bonded dry dessicant coating for total heat recovery.

The I-TEC ERV is also provided with filters to reduce the required service needed and to extend the life of the heat recovery wheels. The exhaust air blower is protected by disposable filters and the intake air blower is protected by washable filters. Both are accessible without the need for tools.

Ventilation is accomplished with two blower/motor assemblies for maximum ventilation at low sound levels. The intake and exhaust blowers can be independently adjusted to maintain desired building pressurization conditions. The rotating wheels provide the heat transfer effectively during both summer and winter conditions. Provides required ventilation to meet the requirements of ASHRAE 62.1 Standard.

NOTE: During operation below 5°F outdoor temperature, freezing of moisture in the heat transfer wheel can occur. Consult the factory if this possibility exists.

The I-TEC ERV can be controlled in different ways. It can be turned ON/OFF with an occupancy control, thermostat or CO_2 control. It can also be configured for fully modulating variable speed with a CO_2 control to only bring in the minimal amount of ventilation required (helping to minimize sound levels and ventilation load on the structure).

CONTROL WIRING

The I-TEC ERV comes wired from the factory ready to operate in manual mode (ON/OFF cycling) and set to 375 CFM of ventilation. Care must be taken when deciding how to control the operation of the ventilator. When designing the control circuit for the ventilator, the following requirements must be met:

1. The indoor blower must be run whenever the I-TEC ERV is run.
2. Select and configure the correct CFM ventilation level that the I-TEC ERV needs to operate and configure the system to this level following later instructions within this section. Over ventilating serves no useful purpose and significantly affects the overall efficiency of the system. System operating costs would also increase.
3. Run the I-TEC ERV only during periods when the conditioned space is occupied. Running the ERV during unoccupied periods wastes energy, decreases the expected life of the ERV, and can result in large moisture buildup in the structure. The ERV removes 60-70% of the moisture in the incoming air, not 100% of it. Running the ERV when the structure is unoccupied allows moisture to build up in the structure because there is little or no cooling load. Thus, the air conditioner is not running enough to remove the excess moisture being brought in. Use a control system that in some way can control the system based upon occupancy.

NOTICE

Operating the I-TEC ERV during unoccupied periods can result in a build up of excess moisture in the structure.

RECOMMENDED CONTROL SEQUENCES

Several possible scenarios are listed below:

1. Use a programmable electronic thermostat with auxiliary terminal to control the ERV based on daily programmed occupance periods. Bard markets and recommends Bard Part #8403-060 programmable electronic thermostat.
2. Install a Bard CompleteStat™ with occupancy sensor which learns room usage and automatically engages ventilation.
3. Use a DDC control system to control the ERV based upon a room occupancy schedule to control the ERV.
4. Tie the operation of the ERV into the light switch. The lights in a room are usually on only when occupied.

5. Use a manual timer that the occupants turn to energize the ERV for a specific number of hours.
6. Use a programmable mechanical timer to energize the ERV and indoor blower during occupied periods of the day.

NOTE: *The ventilation package comes with a blower interlock function, but is disabled when it is shipped from the factory in case a thermostat with an occupancy output or occupancy sensor is not utilized. In this situation, "A" terminal must be tied to "G" terminal to drive the ventilation package. If a thermostat or control that drives occupancy output is utilized, the tape from the orange wire located in the low voltage terminal box will need to be removed and the orange wire connected to the "G" terminal to activate this function. (See Figures 13-19 on pages 24 to 30.)*

CHANGING VENTILATION CFM RATES IN MANUAL MODE

⚠ WARNING

- ***Hazard of electrical shock.***
- ***Electrical shock can result in serious injury or death.***
- ***Disconnect the remote electric power supply or supplies before servicing.***

To adjust the airflow ventilation rate, first refer to Figure 29A on page 52 to look up the "FLOW INDEX" needed for the intake and exhaust blowers for the CFM required. Then, perform the following steps:

1. Open front swinging doors of main unit (by popping front door latches).
2. Throw main power disconnect to the "OFF" position to eliminate risk of injury or death due to electrical shock.
3. Remove five (5) screws holding front ERV door in place (see Figure 31 on page 54).
4. Remove ERV control panel cover by removing four (4) screws (see Figure 31).
5. Locate two 0-10Vdc motor control boards in control panel (see Figure 32 on page 55).
6. On intake motor control board, observing "GREEN STATUS LIGHT", turn manual adjust potentiometer counterclockwise to increase "FLOW INDEX" or clockwise to reduce "FLOW INDEX" to match desired setting.

   NOTE: *After long pause, the green status light will blink long-blinks for the "TEN COUNT" of the "FLOW RATE INDEX", then immediately followed by fast blinks which indicate the second digit. For example, a Flow Index of 23 would be two long blinks, followed by three fast blinks of the "GREEN STATUS LIGHT".*
7. On exhaust motor control board, observing "GREEN STATUS LIGHT", turn manual adjust potentiometer counterclockwise to increase "FLOW INDEX" or clockwise to reduce "FLOW INDEX" to match desired setting.

   NOTE: *Same "GREEN STATUS LIGHT" blink as Step #6.*

CHANGING TO FULLY MODULATING MODE

To operate the ERV in fully variable mode (only run at required speed to maintain set-point CO_2 levels), the ERV needs to be configured to the following:

1. Open front swinging doors of main unit (by popping front door latches).
2. Throw main power disconnect to the "OFF" position to eliminate risk of injury or death due to electrical shock.
3. Remove ERV control panel cover by removing four (4) screws (see Figure 31 on page 54).
4. Locate two 0-10Vdc motor control boards in control panel (see Figure 32 on page 55).
5. Pull jumper pins from "M" terminals and move to "P" terminals (see Figure 32).
6. Connect "+" 0-10Vdc output from CO_2 control to Terminal #3 (along with pink wire) and connect "-" to Terminal #4 (along with purple wire) of unit low voltage terminal strip.
7. Follow the directions supplied with the CO_2 control to configure the control appropriately.

PERFORMANCE AND APPLICATION DATA

Summer Cooling Performance
(Indoor Design Conditions 75°DB/62°WB)

Ambient O.D.		VENTILATION RATE 450 CFM 65% EFFICIENCY						VENTILATION RATE 375 CFM 66% EFFICIENCY						VENTILATION RATE 300 CFM 67% EFFICIENCY					
DB/WB	F	VLT	VLS	VLL	HRT	HRS	HRL	VLT	VLS	VLL	HRT	HRS	HRL	VLT	VLS	VLL	HRT	HRS	HRL
	75	21465	14580	6884	13952	9477	4475	17887	12150	5737	11805	8018	3786	14310	9720	4590	9587	6512	3075
105	70	14580	14580	0	9477	9477	0	12150	12150	0	8018	8018	0	9720	9720	0	6512	6512	0
	65	14580	14580	0	9477	9477	0	12150	12150	0	8018	8018	0	9720	9720	0	6512	6512	0
	80	31590	12150	19440	20533	7897	12635	26325	10125	16200	17374	6682	10692	21060	8100	12960	14110	5427	8683
	75	21465	12150	9314	13952	7897	6054	17887	10125	7762	11805	6682	5123	14310	8100	6210	9587	5427	4160
100	70	12352	12150	202	8029	7897	131	10293	10125	168	6793	6682	111	8235	8100	135	5517	5427	90
	65	12150	12150	0	7897	7897	0	10125	10125	0	6682	6682	0	8100	8100	0	5427	5427	0
	60	12150	12150	0	7897	7897	0	10125	10125	0	6682	6682	0	8100	8100	0	5427	5427	0
	80	31590	9720	21870	20533	6318	14215	26325	8100	18225	17374	5345	12028	21060	6480	14580	14110	4341	9768
	75	21465	9720	11744	13952	6318	7634	17887	8100	9787	11805	5345	6459	14310	6480	7830	9587	4341	5246
95	70	12352	9720	2632	8029	6318	1711	10293	8100	2193	6793	5345	1447	8235	6480	1755	5517	4341	1175
	65	9720	9720	0	6318	6318	0	8100	8100	0	5345	5345	0	6480	6480	0	4341	4341	0
	60	9720	9720	0	6318	6318	0	8100	8100	0	5345	5345	0	6480	6480	0	4341	4341	0
	80	31590	7290	24300	20533	4738	15794	26325	6075	20250	17374	4009	13365	21060	4860	16200	14110	3256	10854
	75	21465	7290	14175	13952	4738	9213	17887	6075	11812	11805	4009	7796	14310	4860	9450	9587	3256	6331
90	70	12352	7290	5062	8029	4738	3290	10293	6075	4218	6793	4009	2784	8235	4860	3375	5517	3256	2261
	65	7290	7290	0	4738	4738	0	6075	6075	0	4009	4009	0	4860	4860	0	3256	3256	0
	60	7290	7290	0	4738	4738	0	6075	6075	0	4009	4009	0	4860	4860	0	3256	3256	0
	80	31590	4860	26730	20533	3159	17374	26325	4050	22275	17374	2672	14701	21060	3240	17820	14110	2170	11939
	75	21465	4860	16605	13952	3159	10793	17887	4050	13837	11805	2672	9132	14310	3240	11070	9587	2170	7416
85	70	12352	4860	7492	8029	3159	4870	10293	4050	6243	6793	2672	4120	8235	3240	4995	5517	2170	3346
	65	4860	4860	0	3159	3159	0	4050	4050	0	2672	2672	0	3240	3240	0	2170	2170	0
	60	4860	4860	0	3159	3159	0	4050	4050	0	2672	2672	0	3240	3240	0	2170	2170	0
	75	21465	2430	19035	13952	1579	12372	17887	2025	15862	11805	1336	10469	14310	1620	12690	9587	1085	8502
	70	12352	2430	9922	8029	1579	6449	10293	2025	8268	6793	1336	5457	8235	1620	6615	5517	1085	4432
80	65	4252	2430	1822	2764	1579	1184	3543	2025	1518	2338	1336	1002	2835	1620	1215	1899	1085	814
	60	2430	2430	0	1579	1579	0	2025	2025	0	1336	1336	0	1620	1620	0	1085	1085	0
	70	12352	0	12352	8029	0	8029	10293	0	10293	6793	0	6793	8235	0	8235	5517	0	5517
75	65	4252	0	4252	2764	0	2764	3543	0	3543	2338	0	2338	2835	0	2835	1899	0	1899
	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Winter Heating Performance
(Indoor Design Conditions 70°F DB)

Ambient O.D.	VENTILATION RATE					
	450 CFM 80% EFFICIENCY		375 CFM 81% EFFICIENCY		300 CFM 82% EFFICIENCY	
DB/°F	WVL	WHR	WVL	WHR	WVL	WHR
65	2430	1944	2025	1640	1620	1328
60	4860	3888	4050	3280	3240	2656
55	7290	5832	6075	4920	4860	3985
50	9720	7776	8100	6561	6480	5313
45	12150	9720	10125	8201	8100	6642
40	14580	11664	12150	9841	9720	7970
35	17010	13608	14175	11481	11340	9298
30	19440	15552	16200	13122	12960	10627
25	21870	17496	18225	14762	14580	11955
20	24300	19440	20250	16402	16200	13284
15	26730	21384	22275	18042	17820	14612

LEGEND:

VLT = Ventilation Load – Total
VLS = Ventilation Load – Sensible
VLL = Ventilation Load – Latent
HRT = Heat Recovery – Total
HRS = Heat Recovery – Sensible
HRL = Heat Recovery – Latent
WVL = Winter Ventilation Load
WHR = Winter Heat Recovery

Note: All performance data is based on operating intake and exhaust blower on the same speed.

FIGURE 29A
ERV "Manual Mode" Jumper Pin on "M" Terminal

CFM	FLOW INDEX (Light Blink Code)
450	100
425	89
400	83
375	76
350	59
325	50
300	40
275	32
250	25
225	12
200	9
175	4
150	1

To adjust the airflow ventilation rate (NO CO_2 CONTROL/NON-MODULATING), determine the "FLOW INDEX" needed for the intake and exhaust blowers for the required CFM. Use a small phillips-head screwdriver to make adjustments.

1. Locate two (2) 0-10Vdc motor control boards in control panel.
2. On ***intake*** motor control board (right hand side of control panel), observing "GREEN STATUS LIGHT", turn manual adjust potentiometer counterclockwise to increase "FLOW INDEX" or clockwise to reduce "FLOW INDEX" to match desired setting. (NOTE: After long pause, the green status light will blink long-blinks for the "TEN COUNT" of the "FLOW RATE INDEX", which then is immediately followed by fast blinks which indicate the second digit. For example, a Flow Index of 23 would be two long blinks, followed by 3 fast blinks of the green status light.)
3. On ***exhaust*** motor control board (left hand side of control panel), observing "GREEN STATUS LIGHT", turn manual adjust potentiometer counterclockwise to increase "FLOW INDEX" or clockwise to reduce "FLOW INDEX" to match desired setting. (See NOTE in Step 2.)

FIGURE 29B
ERV "Modulating Mode" Jumper Pin on "P" Terminal

CFM	Vdc Signal from CO_2 Control
450	10
425	8.87
400	8.31
375	7.61
350	6.73
325	5.91
300	5.15
275	4.58
250	4.06
225	2.91
200	2.57
175	2.24
150	1.74
125	0.96
100	0.77

After determining the air volume rates needed for the intended application (maximum and minimum), use this table to program CO_2 control output voltages in correlation to the CO_2 levels needed when Bard CO_2 Control 8403-096 is applied.

FIGURE 30
Ventilation Airflow Diagram

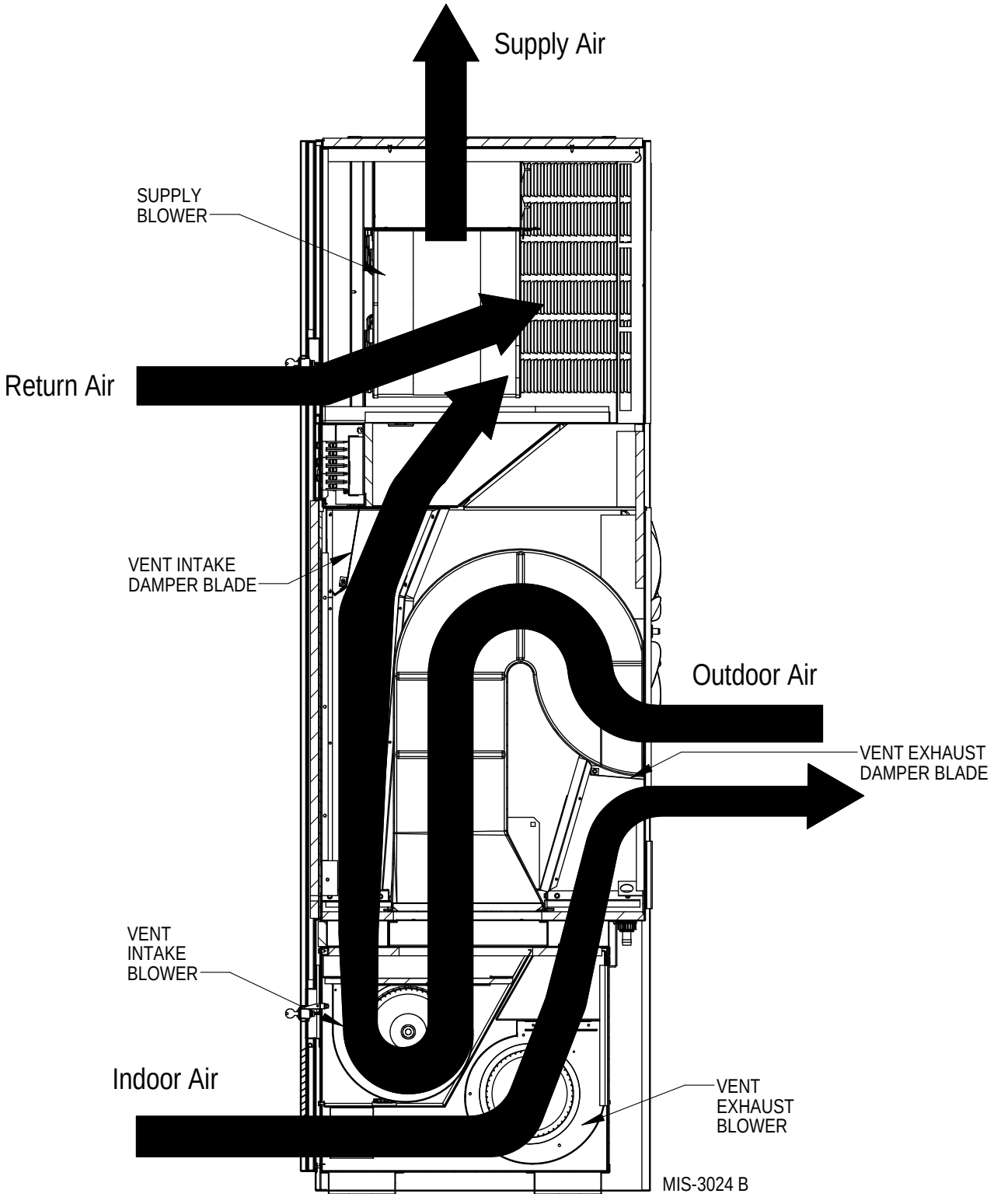


FIGURE 31
ERV Access

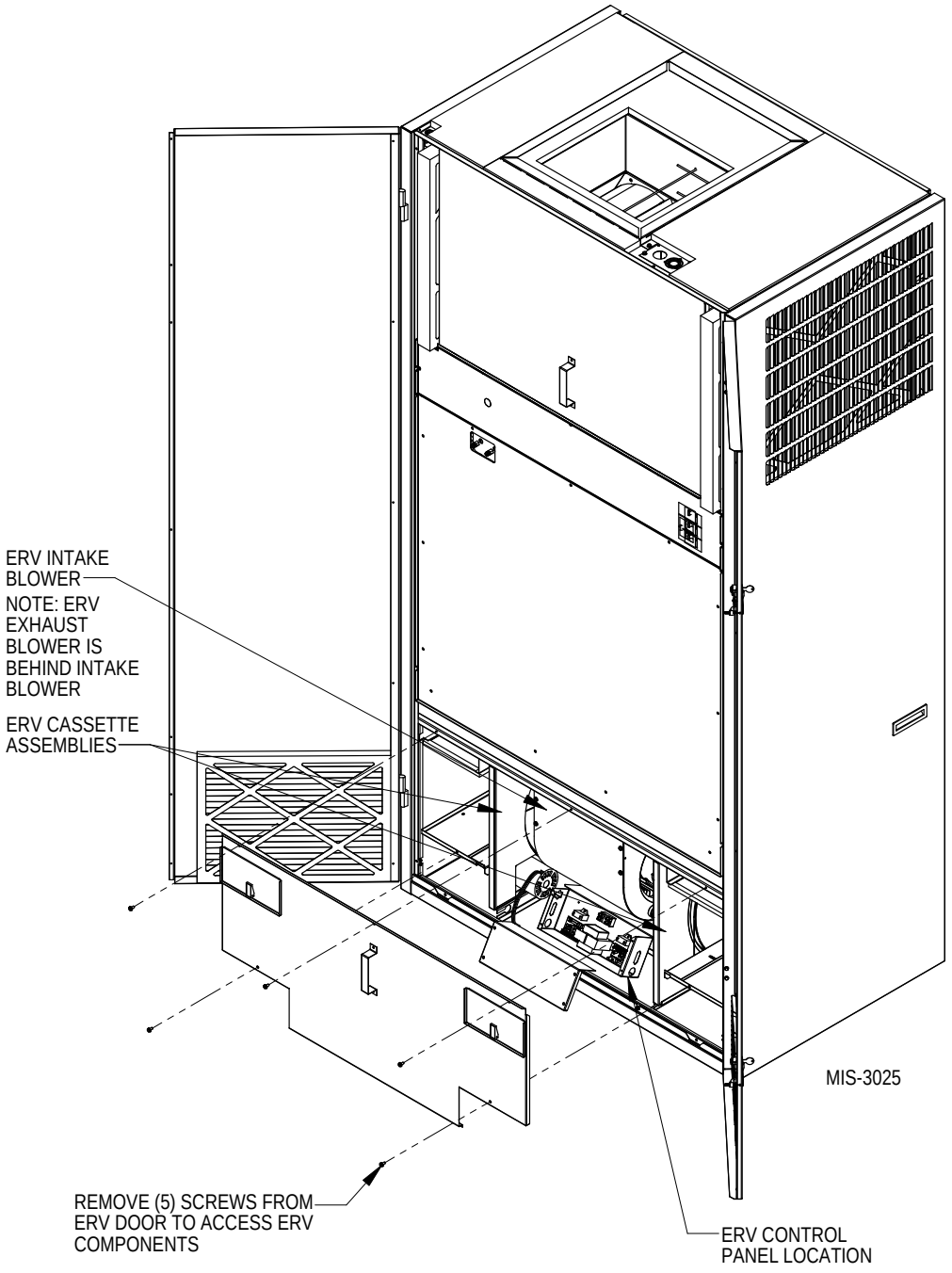
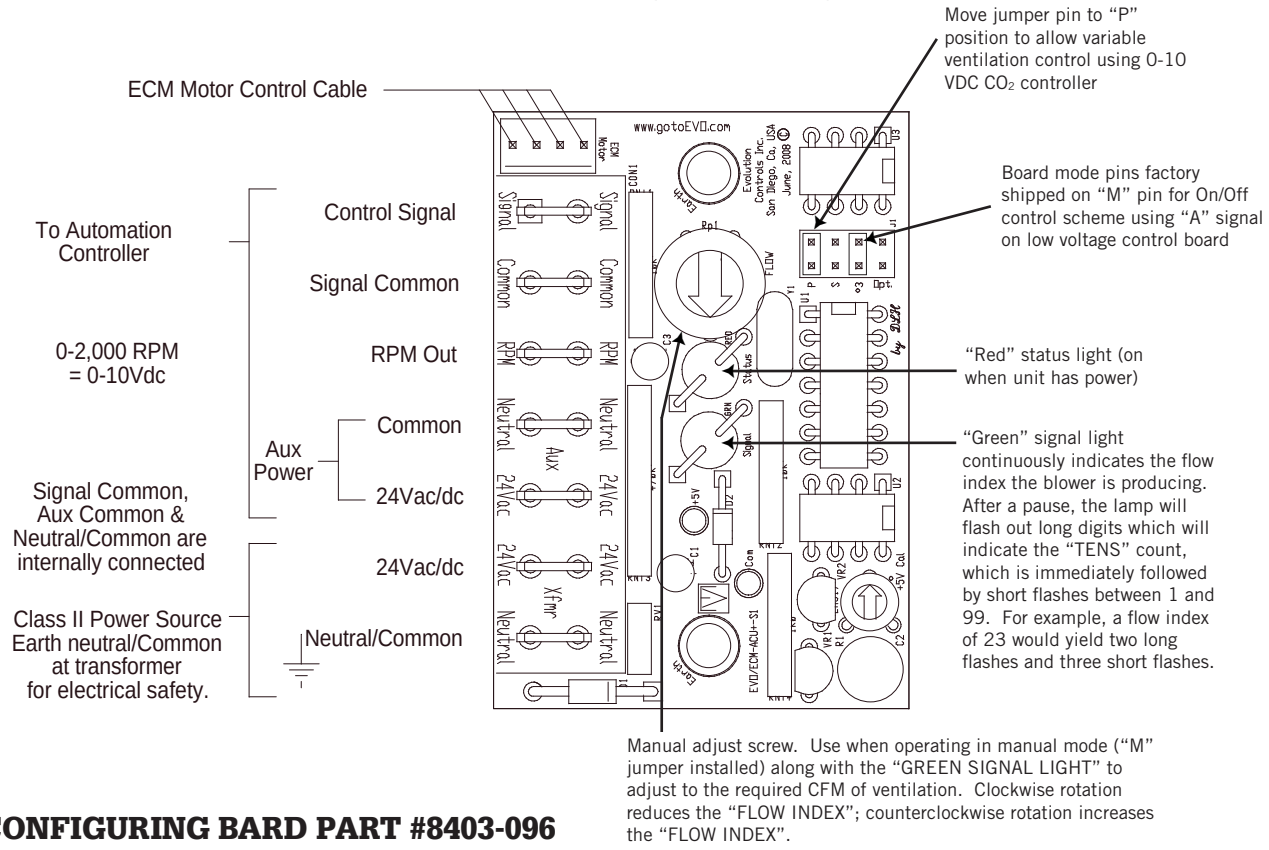


FIGURE 32
Control Board Configuration/Setting



CONFIGURING BARD PART #8403-096 CO_2 CONTROL for ERV MODULATING CONTROL

Bard part #8403-096 carbon dioxide and temperature transmitters accurately monitor the CO_2 concentration and temperature in schools, office buildings and other indoor environments to help achieve LEED® certification.

Specifications

Range: CO_2: 0 to 2000 or 0 to 5000 ppm (depending on model)
Temperature: 32 to 122°F (0 to 50°C).
Accuracy: ±40 ppm + 3% of reading.
Temperature Dependence: ±8 ppm / °C at 1100 ppm.
Non-Linearity: 16 ppm.
Pressure Dependence: 0.13% of reading per mm of Hg.
Response Time: 2 minutes for 99% step change.
Ambient Operating Temperature: 32 to 122°F (0 to 50°C).
Ambient Operating Humidity: 10 to 95% RH (non-condensing).
Power Requirements: 16 to 35 VDC / 19 to 28 VAC.
Power Consumption: Average: 2 watts; Peak: 3.75 watts.
Sensor: Single beam, dual-wave length NDIR.
Output:
Current: 4 to 20 mA (max 500 Ω);
Voltage: 0 to 5 VDC or 0 to 10 VDC (min 500 Ω);
Relay: SPST NO 2A @ 30 VDC;
RTD or thermistor per r-t curves (depending on model)
Weight: 5.6 oz (158.8 g)

WARNING Disconnect power supply before installation to prevent electrical shock and equipment damage.

Make sure all connections are in accordance with the job wiring diagram and in accordance with national and local electrical codes. Use copper conductors only.

CAUTION Use electrostatic discharge precautions (e.g., use of wrist straps) during installation and wiring to prevent equipment damage.

CAUTION Avoid locations where severe shock or vibration, excessive moisture or corrosive fumes are present.

CAUTION Do not exceed ratings of this device, permanent damage not covered by warranty may result.

NOTICE Upon powering the transmitter, the firmware version will flash on the display. A warm up period of 30 minutes is required for the transmitter to adjust to the current CO_2 concentration.

NOTICE Self calibration feature of the transmitter requires exposure to normal outdoor equivalent carbon dioxide level once every thirty days.

Mounting

1. Push tab on bottom of cover and lift cover from back plate.
2. Select the mounting location, away from diffusers, lights or any external influences.
3. Mount transmitter on a vertical surface to a standard electrical box using the two #6 M2C type screws provided.
4. Pull wires through sub base hole and make necessary connections.
5. Reattach cover to base plate.

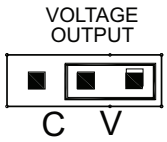
Wiring

Use maximum 18 AWG wire for wiring to terminals. Refer to Figures 13-19 on pages 24 to 30 for wiring information.

Selection of Voltage Outputs

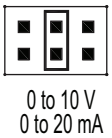
Prior to wiring, verify the voltage selector jumpers on jumpers PJ1 and PJ2 are set to voltage.

CURRENT/VOLTAGE OUTPUT SELECTION JUMPER (PJ1 & PJ2)



Next, move jumper PJ5 to the 0-10V range.

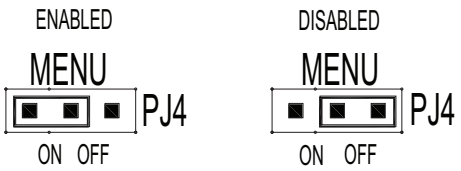
OUTPUT RANGE SELECTION JUMPER PJ5



Editing Menu Parameters

Before any adjustment can be made to the transmitter, the Menu Lockout Jumper (PJ4) must be set to the "ON" position.

MENU LOCKOUT JUMPER



Finish installing/wiring the control. Then, refer to Figure 21B on page 38 and the building ventilation specifications to decide what the maximum ventilation rate desired is and what the minimum/maximum voltage signal is required for those levels.

Next, enter the control programming stage listed below once the system is powered up to configure the control.

Accessing Menu Parameters

Step 1: To enter the menu structure, press △ and ▽ simultaneously for 5 seconds (display will show RON parameter).

Step 2: Press △ or ▽ to cycle between menu items.

Step 3: Press ▭ to edit the value for the displayed menu item (SET will appear on display).

Step 4: Press △ or ▽ to adjust the value of the menu item.

Step 5: Press ▭ to save the changes (SET will disappear).

Step 6: Repeat Steps 2 through 5 for each of the parameters.

Step 7: To exit the menu at any time, press and hold △ and ▽ simultaneously for 5 seconds or wait 10 seconds without pushing any buttons.

Menu Descriptions

RON Relay on setpoint
Sets the CO_2 concentration which the optional relay is energized.
Low limit: 0 PPM
Factory setting: 1000 PPM
High limit: 2000/5000 PPM (depending on model)

ROF Relay off setpoint
Sets the CO_2 concentration which the optional relay is de-energized. Setting value lower than RON provides direct action for detecting high concentrations of CO_2. Setting value higher than RON provides indirect action for detecting low concentrations of CO_2. △ or ▽ on the LCD display will be lit to indicate when the relay is energized.
Low limit: 0 PPM
Factory setting: 950 PPM
High limit: 2000/5000 PPM (depending on model)

DSP Display configuration
Determines the LCD display configuration during normal operation. The LCD display can indicate the CO_2 concentration and the temperature, the CO_2 concentration only or the temperature only. The factory default is to display both the temperature and the CO_2
CT CO_2 concentration and temperature
C CO_2 concentration only
T Temperature only

UNI Units selection

Temperature and barometric pressure measurements can be displayed in US engineering units or SI engineering units. The factory default is to display US engineering units.

US units F for temperature and in Hg for barometeric pressure

SI units C for temperature and hPa for barometric pressure

COL CO_2 low output range
Sets the CO_2 concentration for the lowest output (4 mA or 0 VDC).
Low limit: 0 PPM
Factory setting: 0 PPM
High limit: 2000/5000 PPM (depending on model)

COH CO_2 high output range
Sets the CO_2 concentration for the highest output (20 mA, 5 VDC or 10 VDC). When COH is set above COL, the transmitter is direct acting and the output will increase with an increase in CO_2 level. When COH is below COL, the transmitter is reverse acting and the output will increase with a decrease in CO_2 level.
Low limit: 0 PPM
Factory setting: 2000/5000 PPM (depending on model)
High limit: 2000/5000 PPM (depending on model)

TOL Temperature low output range
Sets the temperature for the lowest output (4 mA or 0 VDC).
Low limit: 32.0°F/0.0°C
Factory setting: 32.0°F/0.0°C
High limit: 122.0°F/50.0°C

TOH Temperature high output range
Sets the temperature for the highest output (20 mA, 5 VDC or 10 VDC). When TOH is set above TOL, the transmitter is direct acting and the output will increase with an increase in temperature. When TOH is below TOL, the transmitter is reverse acting and the output will increase with a decrease intemperature.
Low limit: 32.0°F/0.0°C
Factory setting: 122.0°F/50.0°C
High limit: 122.0°F/50.0°C

BAR Barometric pressure
Sets the typical barometric pressure for the location where the transmitter is mounted. The factory setting is for standard pressure at sea level. Adjusting the barometric pressure gives a more accurate measurement, especially at higher elevations.
Low limit: 20.0 in Hg/600 hPa
Factory setting: 29.9 in Hg/1013 hPa
High limit: 32.0 in Hg/1100 hPa

ENERGY RECOVERY VENTILATOR MAINTENANCE

General Information

The ability to clean exposed surfaces within air moving systems is an important design consideration for the maintenance of system performance and air quality. The need for periodic cleaning will be a function of operating schedule, climate and contaminants in the indoor air being exhausted and in the outdoor air being supplied to the building. All components exposed to the airstream, including energy recovery wheels, may require cleaning in most applications.

Rotary counterflow heat exchanges (heat wheels) with laminar airflow are “self-cleaning” with respect to dry particles. Smaller particles pass through; larger particles land on the surface and are blown clear as the flow direction is reversed. For this reason, the primary need for cleaning is to remove films of oil-based aerosols that have condensed on energy transfer surfaces. Buildup of material over time may eventually reduce airflow. Most importantly, in the case of desiccant coated (enthalpy) wheels, such films can close off micron sized pores at the surface of the desiccant material, reducing the efficiency with which the desiccant can absorb and desorb moisture.

Frequency

In a reasonably clean indoor environment such as a school, office building or home, experience shows that reductions of airflow or loss of sensible (temperature) effectiveness may not occur for 10 or more years. However, experience also shows that measurable changes in latent energy (water vapor) transfer can occur in shorter periods of time in commercial, institutional and residential applications experiencing moderate occupant smoking or with cooking facilities. In applications experiencing unusually high levels of occupant smoking, such as smoking lounges, nightclubs, bars and restaurants, washing of energy transfer surfaces as frequently as every 6 months may be necessary to maintain latent transfer efficiency. Similar washing cycles may also be appropriate for industrial applications involving the ventilation of high

levels of smoke or oil-based aerosols such as those found in welding or machining operations, for example. In these applications, latent efficiency losses of as much as 40% or more may develop over a period of 1 to 3 years.

Cleanability and Performance

In order to maintain energy recovery ventilation systems, energy transfer surfaces must be accessible for washing to remove oils, grease, tars and dirt that can impede performance or generate odors. Washing of the desiccant surfaces is required to remove contaminate buildups that can reduce adsorption of water molecules. The continued ability of an enthalpy wheel to transfer latent energy depends upon the permanence of the bond between the desiccant and the energy transfer surfaces.

Bard wheels feature silica gel desiccant permanently bonded to the heat exchange surface without adhesives; the desiccant will not be lost in the washing process. Proper cleaning of the Bard energy recovery wheel will restore latent effectiveness to near original performance.

Maintenance Procedures

NOTE: *Local conditions can vary and affect the required time between routine maintenance procedures, therefore all sites (or specific units at a site) may not have the same schedule to maintain acceptable performance. The following timetables are recommended and can be altered based on local experience.*

Quarterly Maintenance

1. Inspect mist eliminator/prefilter and clean if necessary. This filter is located in the fresh air intake hood on the front of the unit. This is an aluminum mesh filter and can be cleaned with water and any detergent not harmful to aluminum.
2. Inspect wall mount unit filter and clean or replace as necessary. This filter is located either in the unit, in a return air filter grille assembly or both. If in the unit it can be accessed by removing the lower service door on the front of the unit. If in a return air filter grille, gain access by hinging the grille open.
3. Inspect energy recovery ventilator for proper wheel rotation and dirt buildup. This can be done in conjunction with Step 2. Energize the energy recovery ventilator after inspecting the filter and observe for proper rotation and/or dirt buildup.
4. Follow Steps 5 through 8 for recommended energy recovery wheel cleaning procedures.
5. Disconnect all power to unit. Remove the lower service door of the wall mount unit to gain access to the energy recovery ventilator.
6. Remove the front access panel on the ventilator. Unplug amp connectors to cassette motors. Slide energy recovery cassette out of ventilator.
7. Use a shop vacuum with brush attachment to clean both sides of the energy recovery wheels.
8. Reverse shop vacuum to use as a blower and blow out any residual dry debris from the wheel.

NOTE: *Discoloration and staining of the wheel does not affect its performance. Only excessive buildup of foreign material needs to be removed.*

9. If any belt chirping or squealing noise is present, apply a small amount of LPS-1 or equivalent dry film lubricant to the belt.

Annual Maintenance

1. Inspect and conduct the same procedures as outlined under ***Quarterly Maintenance***.
2. To maintain peak latent (moisture) removal capacity, it is recommended that the energy recovery wheels be sprayed with a diluted nonacid based evaporator coil cleaner or alkaline detergent solution such as 409.

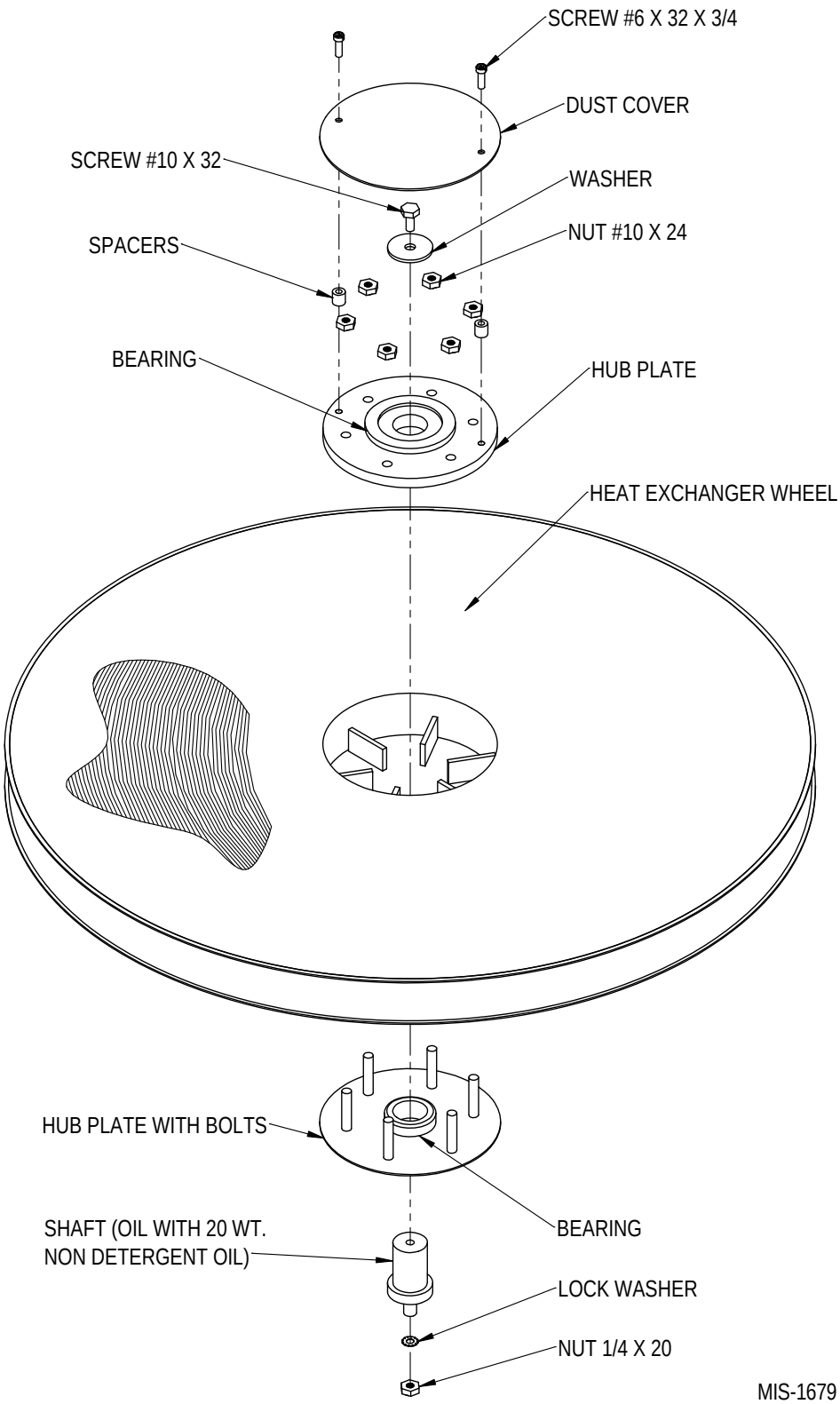
NOTE: *Do not use acid-based cleaners, aromatic solvents, temperatures in excess of 170°F or steam. Damage to the wheel may result.*

Do not disassemble and immerse the entire heat wheel in a soaking solution, as bearing and other damage may result.

3. Rinse wheel thoroughly after application of the cleaning solution and allow to drain before re-installing.
4. No re-lubrication is required to heat wheel bearings of the drive motor or to the intake and exhaust blower motors.
5. If any belt chirping or squealing noise is present, apply a small amount of LPS-1 or equivalent dry film lubricant to the belt.

See Figure 33.

FIGURE 33
Hub Assembly with Ball Bearings



CHECKING TEMPERATURE SENSOR

1. Disconnect temperature sensor from board and from right-hand outdoor coil.
2. Use an ohmmeter and measure the resistance of the sensor. Also use ohmmeter to check for short or open.
3. Check resistance reading to chart of resistance use sensor ambient temperature. (Tolerance of part is ± 10%.)
4. If sensor resistance reads very low, sensor is shorted and will not allow proper operation of the fan control.
5. If sensor is out of tolerance, shorted, open or reads very low ohms, it should be replaced.

TABLE 5
Temperature (F) vs. Resistance (R) of Temperature Sensor

F	R	F	R	F	R	F	R
-25	196871	13	56985	51	19374	89	7507
-24	190099	14	55284	52	18867	90	7334
-23	183585	15	53640	53	18375	91	7165
-22	177318	16	52051	54	17989	92	7000
-21	171289	17	50514	55	17434	93	6840
-20	165487	18	49028	56	16984	94	6683
-19	159904	19	47590	57	16547	95	6531
-18	154529	20	46200	58	16122	96	6383
-17	149355	21	44855	59	15710	97	6239
-16	144374	22	43554	60	15310	98	6098
-15	139576	23	42295	61	14921	99	5961
-14	134956	24	41077	62	14544	100	5827
-13	130506	25	39898	63	14177	101	5697
-12	126219	26	38757	64	13820	102	5570
-11	122089	27	37652	65	13474	103	5446
-10	118108	28	36583	66	13137	104	5326
-9	114272	29	35548	67	12810	105	5208
-8	110575	30	34545	68	12492	106	5094
-7	107010	31	33574	69	12183	107	4982
-6	103574	32	32634	70	11883	108	4873
-5	100260	33	31723	71	11591	109	4767
-4	97064	34	30840	72	11307	110	4663
-3	93981	35	29986	73	11031	111	4562
-2	91008	36	29157	74	10762	112	4464
-1	88139	37	28355	75	10501	113	4367
0	85371	38	27577	76	10247	114	4274
1	82699	39	26823	77	10000	115	4182
2	80121	40	26092	78	9760	116	4093
3	77632	41	25383	79	9526	117	4006
4	75230	42	24696	80	9299	118	3921
5	72910	43	24030	81	9077	119	3838
6	70670	44	23384	82	8862	120	3757
7	68507	45	22758	83	8653	121	3678
8	66418	46	22150	84	8449	122	3601
9	64399	47	21561	85	8250	123	3526
10	62449	48	20989	86	8057	124	3452
11	60565	49	20435	87	7869		
12	58745	50	19896	88	7686		

TROUBLESHOOTING CONDENSATE OVERFLOW SYSTEMS

The Bard I-TEC Series is equipped with dual condensate overflow switches. One switch (float type) is located in the indoor drain pan. It is secured to the drain pan with a screw-down clamp (see Figure 34). The second switch (electronic/conductance) is a collection of two wires with the sensor probes mounted adjacent to the left outdoor coil in the outdoor drain pan (see Figure 35).

The float type switch in the indoor drain pan is equipped with an LED light that indicates when an overflow condition is present.

Three of the four switches have normally closed contacts and one (condenser overflow switch) has a normally open contact. If any of the four switches fault, their corresponding light will blink and initialize a soft lockout of the compressor circuit. If recurrence happens on the same cooling call cycle, a hard lockout of the compressor circuit will occur. (See **Sequence of Operation** on page 32.)

The compressor logic control board has five LED lights providing status updates of the system operation (see Figure 36). When the green status light is blinking, this is an indication that there is 24V power to the board. Upon an alarm detection from one of the four safety switches, there will be a blinking light indicating a fault. The faults are as follows:

HP = Green fault illumination

LP = Orange fault illumination

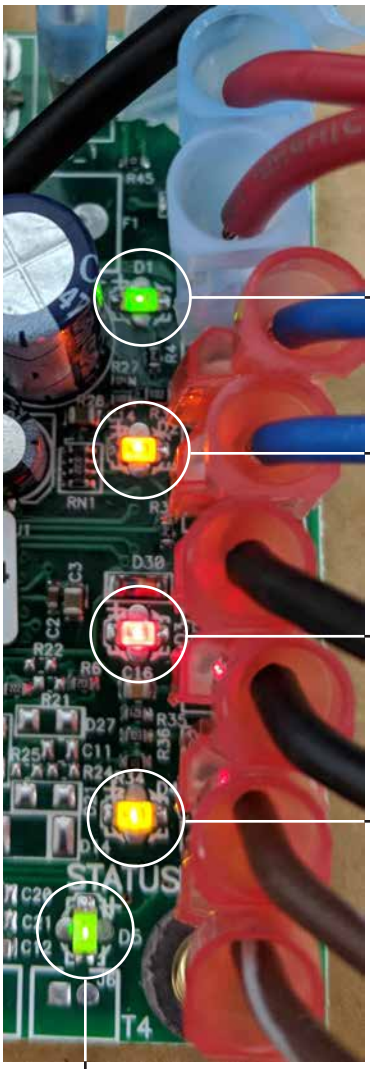
FS (Evap) = Red fault illumination

CO = Yellow fault illumination

FIGURE 34
Indoor Condensate Overflow Switch

FIGURE 35
Outdoor Condensate Sensor

FIGURE 36
LED Fault Illumination



TROUBLESHOOTING ECM™ 142R OUTDOOR FAN MOTORS

⚠ WARNING

- ***Exposed moving parts.***
- ***Disconnect all electrical power before servicing.***
- ***Failure to do so can result in severe injury or amputation.***

⚠ WARNING

- ***Hazard of electrical shock.***
- ***Electrical shock can result in serious injury or death.***
- ***Disconnect the remote electric power supply or supplies before servicing.***

1. In normal operation, this motor may rock back and forth on start up. Do not replace if this is the only symptom identified.
2. If the system is operating properly, but the motor appears to run slower than it should, the motor is good. High efficiency systems with optimized fan blades are engineered to run slow to decrease noise. The Bard I-TEC Series models also adjust fan speed based upon varied outdoor ambient conditions to optimize sound and unit efficiency.
3. If the system is noisy, freezing up, running a high head pressure, tripping the high pressure switch or compressor overload, check the following:
   a. Ensure cleanliness of condenser coil(s) and fan blade/shroud.
   b. Confirm the fan blade is not bent or deformed, isn't rubbing on the shroud, and that it is tight on the motor shaft. Also ensure the motor is secure in its mounting system, and the mounting system is secure to the unit.
   c. The Bard I-TEC is equipped with a low ambient control pressure switch. This pressure switch completes the 24VAC Common feed to the outdoor fan motor control in cooling mode. If this switch is defective, the outdoor air temperature is too cold to raise the head pressure to the 350# switch closing setpoint or the system charge is too low, this could be the cause of the issue.
   d. If motor is not running, go to next section.

⚠ CAUTION

Do not operate motor without fan blade attached. Such operations will cause the motor to oscillate up and down.

⚠ CAUTION

The correct motor that is a direct replacement for the failed motor must be obtained from the manufacturer.

USING THE WRONG MOTOR VOIDS ALL WARRANTIES AND MAY PRODUCE UNEXPECTED RESULTS.

4. If the motor does not appear to be running at the proper speed or does not shut off, refer to the next section for voltage checks to determine if the motor is getting the proper input signals.

   If the motor IS NOT receiving any communication, troubleshoot the communication issue using the diagnostic table for the fan logic control.
   a. This motor uses a 7-wire harness to control the motor.
      - Line power is connected as follows:
        "Red Wire" connects to "L1"
        "Black Wire" connects to "L2"
        "Green/Yellow Wire" connects to "Ground"
      - Control power is connected as follows: "Blue Wire" connects to "BR" terminal on the fan logic control board, and subsequently connects to 24VAC Common through the fan logic control board.* "Yellow Wire" connects to "Y" on the fan logic control board. "White Wire" connects to "W" on the fan logic control board. "Orange Wire" connects to "O" on the fan logic control board.

NOTE: *A combination of the "Yellow", "White" and "Orange" wires being energized (with 24V "R" signal) determines five different speeds the fan motor will operate at. The fan logic control board uses an outdoor thermistor sensor to determine the speed the fan should operate.*

* The common wire to the "BR" terminal is interrupted by the low ambient control. This will stop the condenser fan operation until liquid pressure reaches 350#.

TABLE 6
Troubleshooting ECM™ 142R Outdoor Fan Motor

Check line power to motor	Check between red and black wires for line power
	Verify ground by checking green wire to L1 and L2 line power
Check for 24VAC common signal to motor (against Transformer "R" Signal)	Check "BR" terminal of fan logic control board
	Check "Blue" fan lead on "Fan Relay Terminal" of "Fan Logic Control"
	** Is not energized in cooling mode until low ambient fan cycling control is closed by 325 PSIG refrigerant pressure. Above 65°F outdoors in cooling mode, the low ambient control is bypassed.
Check 24VAC "hot" outputs (to "Blue" on fan logic control) to motor. See the following tables based upon outdoor temperature and model of operation.	

Troubleshooting Fan Logic Control

Please reference the Thermistor Temperature/ Resistance Chart in this manual (Table 5 on page 60).

- GREEN STATUS LED – Blinks indicating there is a call for fan operation (simultaneous to call for compressor operation) and is normal.
- RED STATUS LIGHT (LA) – Is illuminated when low ambient control switch is in the closed position. (NOTE: This is not required in heat pump operation as the low ambient switch is bypassed in this mode of operation. Low ambient switch is also negated in cooling mode above 65°F outdoor temperature.)
- YELLOW STATUS LIGHT (B) – Is illuminated when there is a reversing valve call (for heat pump operation). (NOTE: As mentioned above, this mode of operation negates the low ambient fan cycling control.)

If the board is reading a fan temperature thermistor value of 3375Ω or less (equivalent to 125°F or an "open" sensor), the fan will operate at the highest speed setting (energizes "W" and "Y" outputs on the board).

If the board is reading a fan temperature value of 118,110Ω or greater (equivalent to -10°F or a "shorted" sensor), the fan will operate at the highest speed setting (energizes "W" and "Y" outputs on the board).

If the low ambient switch is open, the red light will not be illuminated and the "BR" terminal will show open. The "BR" terminal is the "24 volt common" switching output to the outdoor fan motor.

TABLE 7
Cooling Mode

O.D. Temp Sensor	24VAC Signals Between
Below 55°F	Orange to Blue
Between 56° - 69°F	White to Blue
Between 70° - 85°F	Yellow to Blue
Between 86° - 112°F	Orange and White to Blue
Above 112°F	White and Yellow to Blue

*If the output signals are not matching the specified temperature range, go to Table 6 and verify the thermistor output curve. If the motor **is** receiving proper communications and proper high voltage power, and is still not running, proceed with motor replacement. (When checking the resistance/temperature curve, don't forget about the optional 2.2k ohm fan control resistor assembly.)*

Replacing the Motor

This motor is replaced in one piece. The control cannot be replaced separately from the motor. Even if the control is remotely located, the replacement part will be a new control with harness and new motor.

Be sure to have the correct replacement motor from the manufacturer that is a direct replacement for the failed motor.

USING THE WRONG MOTOR VOIDS ALL PRODUCT WARRANTIES AND MAY PRODUCE UNEXPECTED RESULTS.

Always mount the replacement motor and control according to the manufacturers specifications using all required hardware to reduce vibration. Make sure all wires are free of the fan blade and not pinched in mountings or cabinet through points.

TROUBLESHOOTING ECM™ INDOOR BLOWER MOTORS

CAUTION:

Disconnect power from unit before removing or replacing connectors, or servicing motor. To avoid electric shock from the motor's capacitors, disconnect power and wait at least 5 minutes before opening motor.

Symptom	Cause/Procedure
Motor rocks slightly when starting	• This is normal start-up for ECM
Motor won't start • No movement	• Check blower turns by hand • Check power at motor • Check low voltage (24 Vac R to C) at motor • Check low voltage connections (G, Y, W, R, C) at motor • Check for unseated pins in connectors on motor harness • Test with a temporary jumper between R - G • Check motor for tight shaft • Perform motor/control replacement check • **Perform Moisture Check**
• Motor rocks, but won't start	• Check for loose or compliant motor mount • Make sure blower wheel is tight on shaft • Perform motor/control replacement check
Motor oscillates up & down while being tested off of blower	• It is normal for motor to oscillate with no load on shaft
Motor starts, but runs erratically • Varies up and down or intermittent	• Check line voltage for variation or "sag" • Check low voltage connections (G, Y, W, R, C) at motor, unseated pins in motor harness connectors • Check "Bk" for erratic CFM command (in variable-speed applications) • Check out system controls, Thermostat • **Perform Moisture Check**
• "Hunts" or "puffs" at high CFM (speed)	• Does removing panel or filter reduce "puffing"? - Reduce restriction - Reduce max airflow
• Stays at low CFM despite system call for cool or heat CFM	• Check low voltage (Thermostat) wires and connections • Verify fan is not in delay mode; wait until delay complete • "R" missing/not connected at motor • Perform motor/control replacement check
• Stays at high CFM	• "R" missing/not connected at motor • Is fan in delay mode? - wait until delay time complete • Perform motor/control replacement check
• Blower won't shut off	• Current leakage from controls into G, Y or W? Check for Triac switched thermostat or solid-state relay
Excessive noise	• Determine if it's air noise, cabinet, duct or motor noise; interview customer, if necessary
• Air noise	• High static creating high blower speed? - Is airflow set properly? - Does removing filter cause blower to slow down? Check filter - Use low-pressure drop filter - Check/correct duct restrictions
• Noisy blower or cabinet	• Check for loose blower housing, panels, etc. • High static creating high blower speed? - Check for air whistling through seams in ducts, cabinets or panels - Check for cabinet/duct deformation
• "Hunts" or "puffs" at high CFM (speed)	• Does removing panel or filter reduce "puffing"? - Reduce restriction - Reduce max. airflow
Evidence of Moisture	
• Motor failure or malfunction has occurred and moisture is present	• Replace motor and **Perform Moisture Check**
• Evidence of moisture present inside air mover	• **Perform Moisture Check**

Do	Don't
• Check out motor, controls, wiring and connections thoroughly before replacing motor	• Automatically assume the motor is bad.
• Orient connectors down so water can't get in - Install "drip loops"	• Locate connectors above 7 and 4 o'clock positions
• Use authorized motor and model #'s for replacement	• Replace one motor or control model # with another (unless an authorized replacement)
• Keep static pressure to a minimum: - Recommend high efficiency, low static filters - Recommend keeping filters clean. - Design ductwork for min. static, max. comfort - Look for and recommend ductwork improvement, where necessary	• Use high pressure drop filters some have ½" H2O drop! • Use restricted returns
• Size the equipment wisely	• Oversize system, then compensate with low airflow
• Check orientation before inserting motor connectors	• Plug in power connector backwards • Force plugs

Moisture Check

- Connectors are oriented "down" (or as recommended by equipment manufacturer)
- Arrange harness with "drip loop" under motor
- Is condensate drain plugged?
- Check for low airflow (too much latent capacity)
- Check for undercharged condition
- Check and plug leaks in return ducts, cabinet

Comfort Check

- Check proper airflow settings
- Low static pressure for lowest noise
- Set low continuous-fan CFM
- Use humidistat and 2-speed cooling units
- Use zoning controls designed for ECM that regulate CFM
- Thermostat in bad location?

Replacing ECM Control Module

To replace the control module for the GE variable-speed indoor blower motor you need to take the following steps:

1. You MUST have the correct replacement module. The controls are factory programmed for specific operating modes. Even though they look alike, different modules may have completely different functionality.

USING THE WRONG CONTROL MODULE VOIDS ALL PRODUCT WARRANTIES AND MAY PRODUCE UNEXPECTED RESULTS.

2. Begin by removing AC power from the unit being serviced. **DO NOT WORK ON THE MOTOR WITH AC POWER APPLIED.** To avoid electric shock from the motor's capacitors, disconnect power and wait at least 5 minutes before opening motor.

3. It is not necessary to remove the motor from the blower assembly, nor the blower assembly from the unit. Unplug the two cable connectors to the motor control assembly. There are latches on each connector. **DO NOT PULL ON THE WIRES.** The plugs remove easily when properly released.

4. Locate the screws that retain to the motor control bracket to the sheet metal of the unit and remove them. Remove two (2) nuts that retain the control to the bracket and then remove two (2) nuts that retain sheet metal motor control end plate. *Refer to Figure 37.*

5. Disconnect the three (3) wires interior of the motor control by using your thumb and forefinger squeezing the latch tab and the opposite side of the connector plug, gently pulling the connector. **DO NOT PULL ON THE WIRES, GRIP THE PLUG ONLY.** *Refer to Figure 37.*

6. The control module is now completely detached from the motor. Verify with a standard ohmmeter that the resistance from each motor lead (in the motor plug just removed) to the motor shell is >100K ohms. *Refer to Figure 38.* (Measure to unpainted motor end plate.) If any motor lead fails this test, do not proceed to install the control module. **THE MOTOR IS DEFECTIVE AND MUST BE REPLACED.** Installing the new control module will cause it to fail also.

7. Verify that the replacement control is correct for your application. Refer to the manufacturer's authorized replacement list. **USING THE WRONG CONTROL WILL RESULT IN IMPROPER OR NO BLOWER OPERATION.** Orient the control module so that the 3-wire motor plug can be inserted into the socket in the control. Carefully insert the plug and press it into the socket until it latches. **A SLIGHT CLICK WILL BE HEARD WHEN PROPERLY INSERTED.**

8. Reverse the steps #5, 4, 3 to reconnect the motor control to the motor wires, securing the motor control cover plate, mounting the control to the bracket, and mounting the motor control bracket back into the unit. **MAKE SURE THE ORIENTATION YOU SELECT FOR REPLACING THE CONTROL ASSURES THE CONTROL'S CABLE CONNECTORS WILL BE LOCATED DOWNWARD IN THE APPLICATION SO THAT WATER CANNOT RUN DOWN THE CABLES AND INTO THE CONTROL.** ***DO NOT OVERTIGHTEN THE BOLTS.***

9. Plug the 16-pin control plug into the motor. The plug is keyed. Make sure the connector is properly seated and latched.

10. Plug the 5-pin power connector into the motor. Even though the plug is keyed, **OBSERVE THE PROPER ORIENTATION. DO NOT FORCE THE CONNECTOR.** It plugs in very easily when properly oriented. **REVERSING THIS PLUG WILL CAUSE IMMEDIATE FAILURE OF THE CONTROL MODULE.**

11. Final installation check. Make sure the motor is installed as follows:
    a. Motor connectors should be oriented between the 4 o'clock and 8 o'clock positions when the control is positioned in its final location and orientation.
    b. Add a drip loop to the cables so that water cannot enter the motor by draining down the cables. *Refer to Figure 39.*

The installation is now complete. Reapply the AC power to the HVAC equipment and verify that the new motor control module is working properly. Follow the manufacturer's procedures for disposition of the old control module.

Figure 37
Control Disassembly

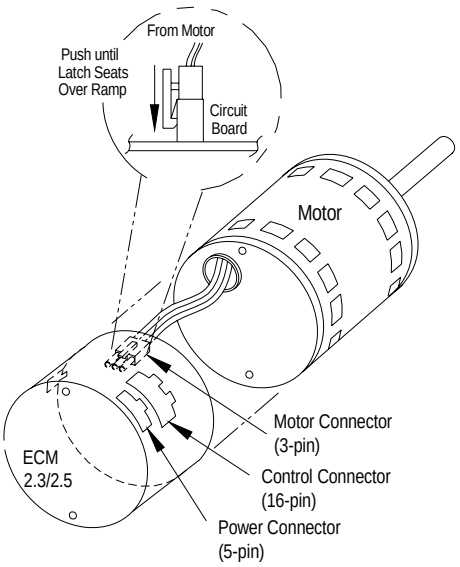


Figure 38
Winding Test

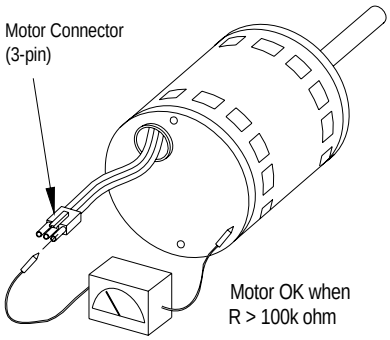
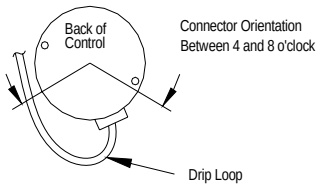


Figure 39
Drip Loop

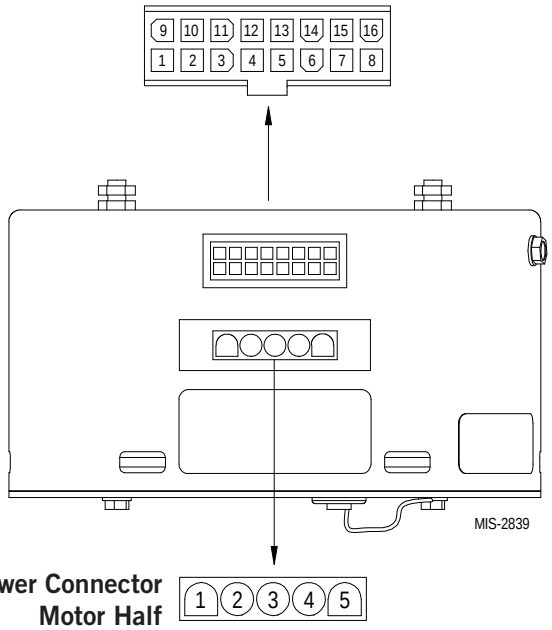


Troubleshooting ECM™ Blower Motors

MODE of OPERATION	OFF	Continuous Blower (Ventilation Mode)	Part Load Cooling	Full Load Cooling	Dehum. Mode (when equipped)	Part Load Heat Pump	Full Load Heat Pump	Heat Pump Full Load w/ 1st Bank of Elec. Heat	Heat Pump Full Load w/ 1st & 2nd Bank of Elec. Heat	Emergency Heat Mode
Thermostat 24 VAC Inuput Signals	—	"G"	"G", "Y1","Y2"	"G", "Y1","Y2"	"D"	"G", "B", "Y1"	"G", "B", "Y1", "Y2"	"G", "Y1", "Y2", "B", "W1"	"G", "Y1", "Y2", "B", "W2", "W3"	"G", "W2", "W3"
Pin #1	24 VAC "C" (Common) Signal, Always Energized									
Pin #2								X		
Pin #3	24 VAC "C" (Common) Signal, Always Energized									
Pin #4	Not Used									
Pin #5	Not Used									
Pin #6			X	X	X	X	X	X	X	
Pin #7	Not Used									
Pin #8	Not Used									
Pin #9						X	X	X		
Pin #10	Not Used									
Pin #11	Not Used									
Pin #12	24 VAC Hot "R" Signal, Always Energized									
Pin #13									X	X
Pin #14				X	X	X		X	X	
Pin #15		X	X	X	X	X	X	X	X	X
Pin #16	Not Used									

FIGURE 40

Control Connector Motor Half



POWER CONNECTOR	
PWB HEADER	**AMP 1-350945-0**
PIN	Description
1	Jumper Pin 1 to Pin 2 for 120VAC Line Input Only **
2	
3	Chassis Ground
4	AC Line
5	AC Line

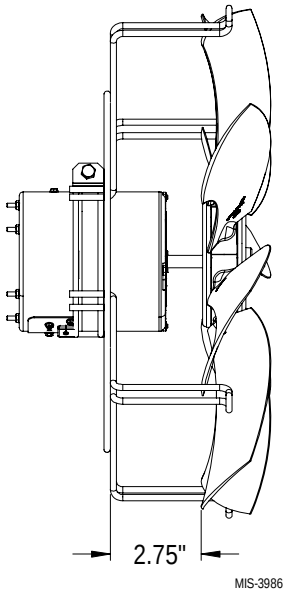
* Suggested mating connector
Housing — AMP 350809-1
Contact — AMP 350537-1

** **WARNING — Applying 240VAC line input with PIN 1 to PIN 2 jumper in place will permanently damage unit!**

FAN BLADE SETTING DIMENSIONS

The position of the fan blade should be set at 2.75", measuring from the motor mount to the closest point on the fan blade (as shown in Figure 41). Spin the blade by hand to make sure it does not hit the ring.

FIGURE 41
Fan Blade Position



REFRIGERANT CHARGE

This unit was charged at the factory with the quantity of refrigerant listed on the serial plate. AHRI capacity and efficiency ratings were determined by testing with this refrigerant charge quantity. The pressure tables found on the following pages show nominal pressures and temperatures for the units. Since many installation specific situations can affect the pressure readings, this information should only be used by certified technicians as a guide for evaluating proper system performance. They shall not be used to adjust charge. If charge is in doubt, reclaim, evacuate and recharge the unit to the serial plate charge.

TABLE 8
Full Load Cooling Pressure/Temperature

Model	Return Air Temp.	Pressure	AIR TEMPERATURE ENTERING OUTDOOR COIL °F														
			55°	60°	65°	70°	75°	80°	85°	90°	95°	100°	105°	110°	115°	120°	125°
I30A1D	75° DB 62° WB	Low Side High Side	117 202	118 224	120 246	121 267	123 289	124 310	126 332	128 354	129 375	130 399	132 423	133 448	135 472	136 496	137 520
	80° DB 67° WB	Low Side High Side	130 201	131 225	133 248	134 271	136 294	139 315	140 345	141 362	142 386	144 411	145 436	147 461	148 486	150 510	151 535
	85° DB 72° WB	Low Side High Side	145 210	146 233	148 256	149 278	151 301	152 323	154 346	156 369	157 391	159 416	160 442	162 467	164 492	165 517	167 542
I36A1D	75° DB 62° WB	Low Side High Side	126 209	127 231	129 252	130 274	131 295	132 317	134 338	135 360	136 381	137 405	138 429	139 452	141 476	142 500	143 524
	80° DB 67° WB	Low Side High Side	139 208	140 231	142 254	143 277	144 300	146 327	147 358	148 370	149 392	150 417	152 441	153 466	154 490	155 515	157 539
	85° DB 72° WB	Low Side High Side	154 217	155 240	157 262	158 285	159 307	160 330	162 352	163 375	164 397	165 422	167 447	168 471	170 496	171 521	172 540
I42A1D	75° DB 62° WB	Low Side High Side	122 218	123 238	125 258	127 279	128 299	130 319	131 339	133 360	134 380	135 404	136 428	137 452	138 476	139 500	140 524
	80° DB 67° WB	Low Side High Side	134 217	136 239	138 260	139 282	141 304	142 326	144 355	146 369	147 391	148 416	149 440	150 465	151 490	152 514	153 539
	85° DB 72° WB	Low Side High Side	139 226	140 247	142 269	143 290	144 311	145 332	147 353	148 375	149 396	150 421	151 446	152 471	153 496	154 521	155 546
I48A1D	75° DB 62° WB	Low Side High Side	125 203	126 225	127 248	128 271	129 293	129 316	130 339	131 361	132 384	134 411	135 437	136 464	138 491	139 517	140 544
	80° DB 67° WB	Low Side High Side	136 208	138 231	139 254	140 276	141 299	143 321	144 351	145 367	147 390	148 417	150 444	151 471	153 498	154 526	156 553
	85° DB 72° WB	Low Side High Side	148 215	149 238	151 261	153 284	154 307	156 331	158 354	159 377	161 400	162 428	164 456	166 484	167 512	169 539	171 567
I60A1D	75° DB 62° WB	Low Side High Side	123 218	124 241	124 265	125 289	126 312	127 336	128 360	129 383	129 407	131 434	132 462	133 489	134 516	135 544	136 571
	80° DB 67° WB	Low Side High Side	134 224	135 248	137 271	138 295	139 319	140 341	141 373	142 389	143 413	145 441	146 469	147 497	148 524	150 552	151 580
	85° DB 72° WB	Low Side High Side	146 231	147 255	148 279	150 303	151 327	153 352	154 376	156 400	157 424	159 453	160 481	161 510	163 538	164 567	166 595

TABLE 9
Part Load Cooling Pressure/Temperature

Model	Return Air Temp.	Pressure	AIR TEMPERATURE ENTERING OUTDOOR COIL °F														
			55°	60°	65°	70°	75°	80°	85°	90°	95°	100°	105°	110°	115°	120°	125°
I30A1D	75° DB 62° WB	Low Side High Side	127 184	128 206	129 227	129 249	130 270	131 292	132 313	133 334	134 356	135 380	137 403	138 427	140 451	141 475	143 498
	80° DB 67° WB	Low Side High Side	141 187	141 209	142 231	143 252	143 274	144 293	144 322	145 338	146 361	147 385	149 409	151 433	152 457	154 481	156 505
	85° DB 72° WB	Low Side High Side	154 194	154 216	155 237	156 259	156 280	157 302	157 323	158 344	159 366	161 390	162 415	164 439	166 464	168 488	170 512
I36A1D	75° DB 62° WB	Low Side High Side	131 188	133 209	134 230	136 250	137 271	139 292	140 313	142 333	143 354	144 378	145 403	146 427	148 452	149 476	150 500
	80° DB 67° WB	Low Side High Side	145 191	146 212	148 233	149 254	150 275	152 295	153 323	154 338	155 359	156 384	158 409	159 433	160 458	161 483	163 508
	85° DB 72° WB	Low Side High Side	158 198	159 219	161 240	162 260	163 281	164 302	166 323	167 343	168 364	169 389	171 414	172 439	173 464	175 489	176 515
I42A1D	75° DB 62° WB	Low Side High Side	126 192	128 212	130 233	132 253	134 274	136 294	138 315	139 335	141 356	142 379	143 402	144 426	145 449	146 472	147 496
	80° DB 67° WB	Low Side High Side	140 195	141 216	143 236	145 257	146 278	148 299	150 326	151 340	153 361	154 384	155 408	156 432	157 455	158 479	159 503
	85° DB 72° WB	Low Side High Side	144 202	145 223	147 243	148 264	150 284	151 304	152 325	154 345	155 366	156 390	157 414	158 438	159 462	160 486	161 510
I48A1D	75° DB 62° WB	Low Side High Side	129 183	130 205	131 226	132 248	133 269	133 291	134 313	135 334	136 356	137 381	139 407	140 432	142 458	143 484	144 509
	80° DB 67° WB	Low Side High Side	140 187	141 209	142 230	144 252	145 274	146 295	148 324	149 339	151 361	152 387	154 413	155 439	157 465	158 491	160 517
	85° DB 72° WB	Low Side High Side	154 189	155 212	157 234	158 257	160 280	161 303	162 325	164 348	165 371	167 397	168 424	170 451	172 477	173 504	175 530
I60A1D	75° DB 62° WB	Low Side High Side	127 196	127 218	128 240	128 261	129 283	130 305	130 326	131 348	131 370	133 396	134 422	135 448	136 474	137 500	139 526
	80° DB 67° WB	Low Side High Side	137 200	138 222	139 244	140 266	142 288	142 310	143 339	144 353	146 375	147 402	148 428	150 454	151 481	152 507	154 534
	85° DB 72° WB	Low Side High Side	152 203	153 226	153 249	154 271	155 294	156 317	157 340	158 363	159 385	161 412	162 440	164 467	165 494	167 521	168 548

REPLACEMENT PARTS MANUAL

I-TEC® Series
Packaged Air Conditioner

Models:

I30A1DA	I36A1DA	I42A1DA	I48A1DA	I60A1DA
I30A1DB	I36A1DB	I42A1DB	I48A1DB	I60A1DB
I30A1DC	I36A1DC	I42A1DC	I48A1DC	I60A1DC

General Notes

- Revised and/or additional pages may be issued from time to time.
- A complete and current manual consists of pages shown in the following contents section.

Important

- Contact the installing and/or local Bard distributor for all parts requirements. Be sure to have the complete model and serial number available from the unit rating plates.

Bard® SINCE 1914
Climate Control Solutions

Bard Manufacturing Company, Inc.
Bryan, Ohio 43506

www.bardhvac.com

Manual: 2110-1581
Supersedes: 2110-593Z
Date: 1-4-24

I**A1D SERIES WIRING DIAGRAM MATRIX

Model	Wiring Diagram	Ventilation Package	Wiring Diagram	Heater	Wiring Diagram
I30A1DA	4205-100	Commercial Room Ventilator	4204-103	0KW	4203-100
		Energy Recovery Ventilator	4204-104	5KW	4203-101
		Economizer	4204-105	10KW	4203-106
		Modulating Commercial Room Ventilator	4204-106		
I30A1DB	4205-200	Commercial Room Ventilator	4204-103	0KW	4203-200
		Energy Recovery Ventilator	4204-104	6KW	4203-201
		Economizer	4204-105	9KW	4203-201
		Modulating Commercial Room Ventilator	4204-106		
I30A1DC	4205-300	Commercial Room Ventilator	4204-103	0KW	4203-300
		Energy Recovery Ventilator	4204-104	6KW	4203-301
		Economizer	4204-105	9KW	4203-301
		Modulating Commercial Room Ventilator	4204-106	15KW	4203-302
I36A1DA	4205-100	Commercial Room Ventilator	4204-103	0KW	4203-100
		Energy Recovery Ventilator	4204-104	5KW	4203-101
		Economizer	4204-105	10KW	4203-106
		Modulating Commercial Room Ventilator	4204-106	15KW	4203-104
I36A1DB	4205-200	Commercial Room Ventilator	4204-103	0KW	4203-200
		Energy Recovery Ventilator	4204-104	6KW	4203-201
		Economizer	4204-105	9KW	4203-201
		Modulating Commercial Room Ventilator	4204-106	15KW	4203-202
I36A1DC	4205-300	Commercial Room Ventilator	4204-103	0KW	4203-300
		Energy Recovery Ventilator	4204-104	6KW	4203-301
		Economizer	4204-105	9KW	4203-301
		Modulating Commercial Room Ventilator	4204-106	15KW	4203-302
I42A1DA	4205-100	Commercial Room Ventilator	4204-103	0KW	4203-100
		Energy Recovery Ventilator	4204-104	5KW	4203-101
		Economizer	4204-105	10KW	4203-106
		Modulating Commercial Room Ventilator	4204-106	15KW	4203-104
I42A1DB	4205-200	Commercial Room Ventilator	4204-103	0KW	4203-200
		Energy Recovery Ventilator	4204-104	6KW	4203-201
		Economizer	4204-105	9KW	4203-201
		Modulating Commercial Room Ventilator	4204-106	15KW	4203-202
I42A1DC	4205-300	Commercial Room Ventilator	4204-103	0KW	4203-300
		Energy Recovery Ventilator	4204-104	6KW	4203-301
		Economizer	4204-105	9KW	4203-301
		Modulating Commercial Room Ventilator	4204-106	15KW	4203-302
I48A1DA	4205-100	Commercial Room Ventilator	4204-103	0KW	4203-100
		Energy Recovery Ventilator	4204-104	4KW	4203-101
		Economizer	4204-105	5KW	4203-102
		Modulating Commercial Room Ventilator	4204-106	10KW	4203-106
				15KW	4203-104
				20KW	4203-105
I48A1DB	4205-200	Commercial Room Ventilator	4204-103	0KW	4203-200
		Energy Recovery Ventilator	4204-104	6KW	4203-201
		Economizer	4204-105	9KW	4203-201
		Modulating Commercial Room Ventilator	4204-106	15KW	4203-202
I48A1DC	4205-300	Commercial Room Ventilator	4204-103	0KW	4203-300
		Energy Recovery Ventilator	4204-104	6KW	4203-301
		Economizer	4204-105	9KW	4203-301
		Modulating Commercial Room Ventilator	4204-106	15KW	4203-302
I60A1DA	4205-100	Commercial Room Ventilator	4204-103	0KW	4203-100
		Energy Recovery Ventilator	4204-104	4KW	4203-101
		Economizer	4204-105	5KW	4203-102
		Modulating Commercial Room Ventilator	4204-106	10KW	4203-106
				15KW	4203-104
				20KW	4203-105
I60A1DB	4205-200	Commercial Room Ventilator	4204-103	0KW	4203-200
		Energy Recovery Ventilator	4204-104	6KW	4203-201
		Economizer	4204-105	9KW	4203-201
		Modulating Commercial Room Ventilator	4204-106	15KW	4203-202
				18KW	4203-202
I60A1DC	4205-300	Commercial Room Ventilator	4204-103	0KW	4203-300
		Energy Recovery Ventilator	4204-104	6KW	4203-301
		Economizer	4204-105	9KW	4203-301
		Modulating Commercial Room Ventilator	4204-106	15KW	4203-302
				18KW	4203-302

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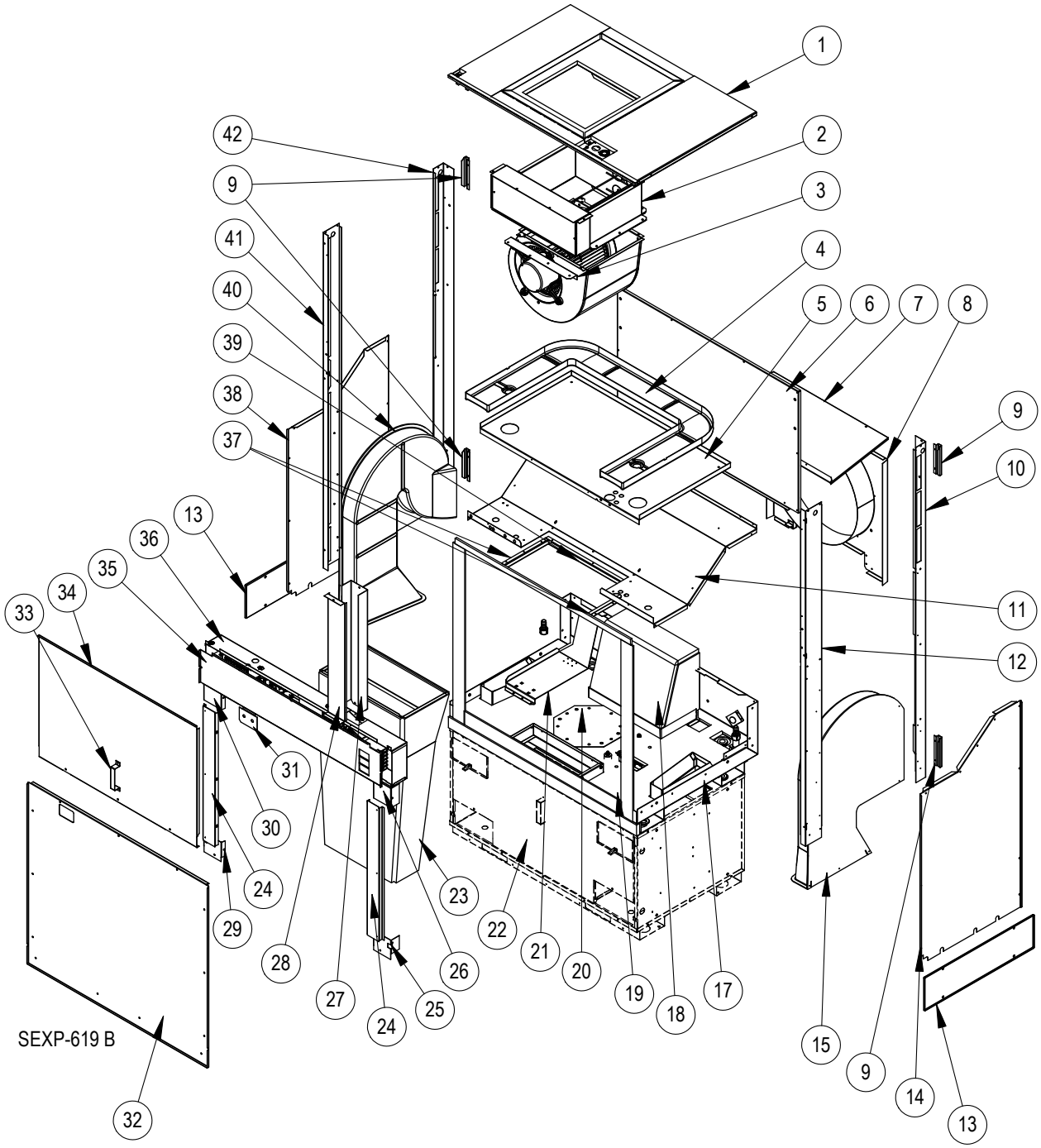
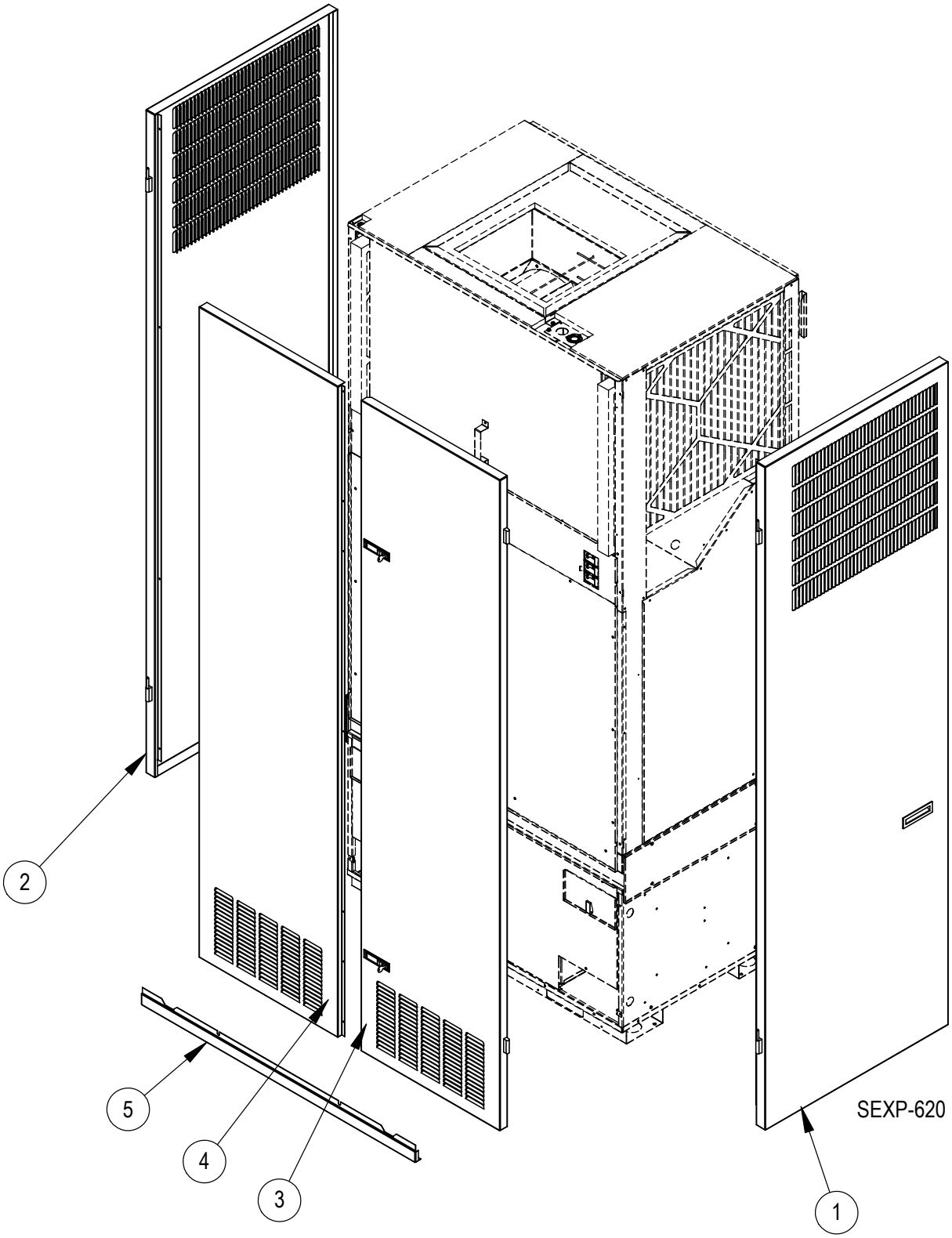
CABINET COMPONENTS



Drawing No.	Part Number	Description	All Models
1	S507-296	Top Assembly	X
2	See Heater Pkg. Section	Heater Package	X
3	105-1256	Front blower angle	X
4	6096-001	Indoor drain pan	X
5	S141-383	Evap. Coil Support	X
6	509-259-8	Unit Back Assembly	X
7	S137-641	Cond. Coil Top Fill	X
8	S125-065	Fan Shroud/Venturi Assembly	X
9	113-439	Side Bracket	4
10	S149-120	Right Rear Corner	X
11	S121-456	Condenser Partition	X
12	S149-123	Right Front Corner	X
13	113-630	Unit Connection Bracket	2
14	S101X635	Right Inner Side Panel	X
15	7001-026	Right Hand Inlet Duct (used on CRV & ERV units only)	X
17	S127-522	Condenser Base Assembly	X
18	S921-0003	Exhaust Duct Assembly	X
19	6096-009	Outdoor Drain Pan	X
20	126-417	Compressor Mounting Base	X
21	113-595 113-449	460V trans. Mtg brkt. (I36-42-48) 460V trans. Mtg brkt. (I60 Only)	X X
22	See Vent Section	Vent Option	X
23	511-177	Intake Duct Assembly (used on CRV and ERV units only	X
24	S141-391	Condenser Coil Access Door	X
25	S141X390	Lower Right Condenser Coil Support	X
26	S141X389	Upper Right Condenser Coil Support	X
27	165-603	High Voltage Wire Channel	X
28	143-202	High Voltage Wire Channel Cover	X
29	S141Y390	Lower Left Condenser Coil Support	X
30	S141Y389	Upper Left Condenser Coil Support	X
31	S113-440	Dual Service Port Bracket	X
32	S553-498	Condenser Door	X
33	113-441	Door Latch Bracket	X
34	S553-496	Evaporator Door	X
35	153-755 153-756	Control Panel Door (230V Units) Control Panel Door (460V Units)	X X
36	See Control Panel Section	Control Panel	X
37	103-493	Cond. Partition Side Offset	2
38	S101Y635	Left Inner Side Panel	X
39	103-494	Cond. Partition Rear Offset	X
40	7001-027	Left Hand Inlet Duct (used on CRV & ERV units only)	X
41	S149-121	Left Front Corner	X
42	S149-122	Left Rear Corner	X
NS	S113-426	Top Mounting Bracket	X

NS = Not Shown

PAINTED CABINET COMPONENTS

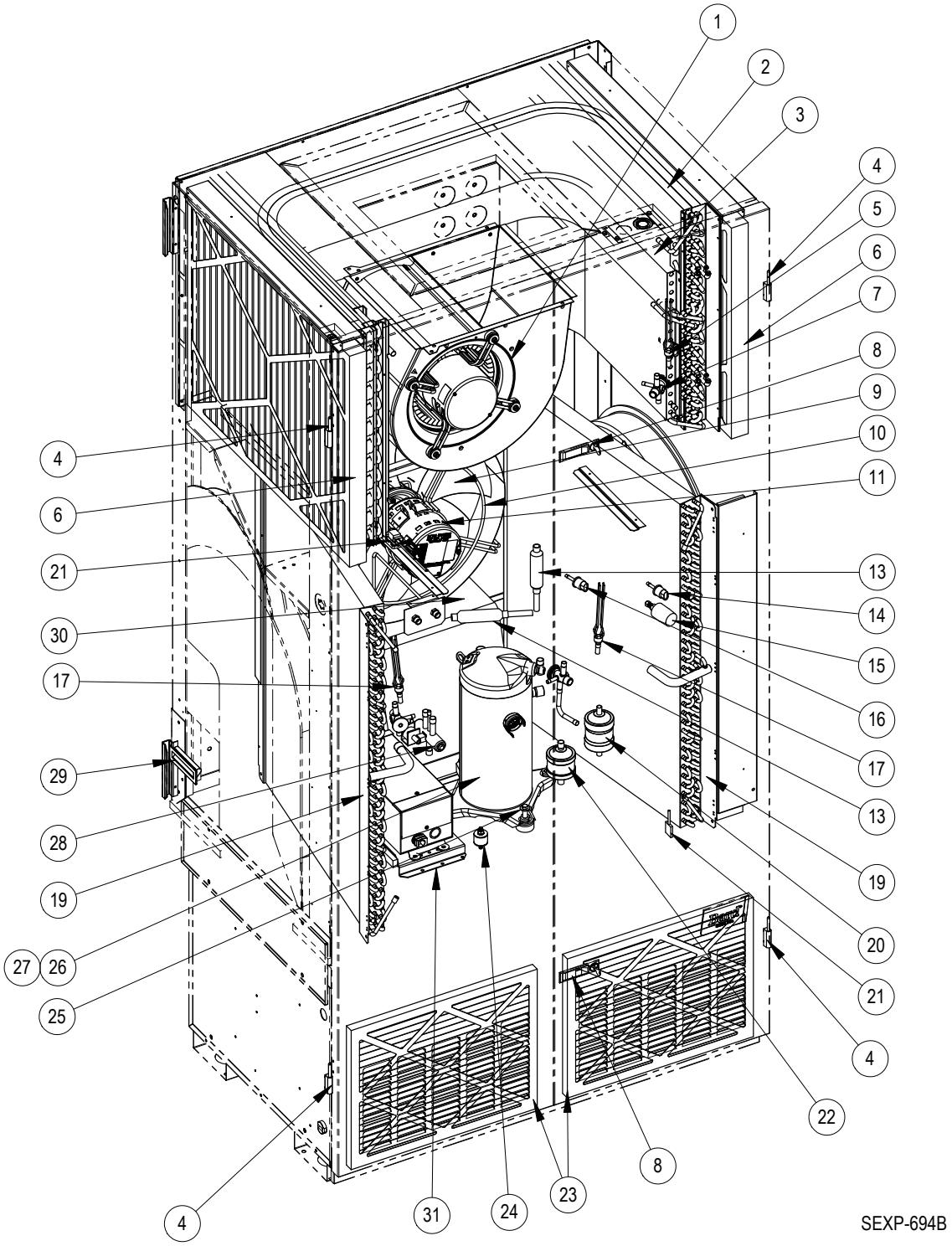


Drawing No.	Part Number	Description	All Models
1	501-636-*	Right Side	X
2	501-637-*	Left Side	X
3	S553-500-*	Right Front Door	X
4	S553-499-*	Left Front Door	X
5	115-206-*	Front Unit Trim	X
NS	5451-031	Hinge Spacer (Black Nylon)	2

* *Exterior cabinet parts are manufactured with various paint color options. To ensure the proper paint color is received, reference the following codes:*

Beige	-X
White	-1
Buckeye Gray	-4

NS = Not Shown



This drawing to be used for reference for pages 9 and 10

Drawing No.	Part Number	Description	I30A1DA	I30A1DB	I30A1DC	I36A1DA	I36A1DB	I36A1DC	I42A1DA	I42A1DB	I42A1DC	I48A1DA	I48A1DB	I48A1DC	I60A1DA	I60A1DB	I60A1DC
1	5154-016-0090BX	Complete Blower Assembly See Blower section for individual components	X	X	X												
	5154-017-0089BX					X	X	X									
	5154-017-0088BX								X	X	X						
	5154-017-0087BX											X	X	X			
	5154-018-0081BX														X	X	X
2	5060-174BX	Evaporator Coil	X	X	X												
	5060-168BX					X	X	X	X	X	X	X	X	X			
	5060-175BX														X	X	X
3	5051-173BX	Dehumidification Reheat Coil	X	X	X												
	5051-174BX					X	X	X	X	X	X						
	5051-175BX											X	X	X	X	X	X
4	5400-006	Polymide Lift-Off Hinge	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
5	5625-014	Distributor	X	X	X												
	5625-007					X	X	X	X	X	X	X	X	X			
	5625-008														X	X	X
6	7004-050 7004-051 7004-053	MERV 8 Filter MERV 11 Filter MERV 13 Filter	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
7	5651-210	Expansion Valve	X	X	X												
	5651-212											X	X	X			
	5651-211					X	X	X	X	X	X						
	5651-241														X	X	X
8	1171-063	Lockable Latch	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
9	5151-058	Fan Blade	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
10	8200-045	Fan Mount	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
11	S8105-058-0109	Programmed Outdoor Motor	X	X	X												
	S8105-058-0095					X	X	X	X	X	X						
	S8106-054-0096											X	X	X	X	X	X
13	5651-219	Check Valve	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
14	8406-142	High Pressure Switch, 650 PSIG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
15	8406-112	Low Ambient Control	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
16	8406-140	Low Pressure Switch	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
17	5625-013	Distributor	2	2	2	2	2	2	2	2	2						
	5625-007											2	2	2	2	2	2
19	5051-190BX	Condenser Coil	2	2	2												
	5051-189BX					2	2	2	2	2	2						
	5051-191BX											2	2	2	2	2	2
20	5201-022	Filter-Drier	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Continued on page 10

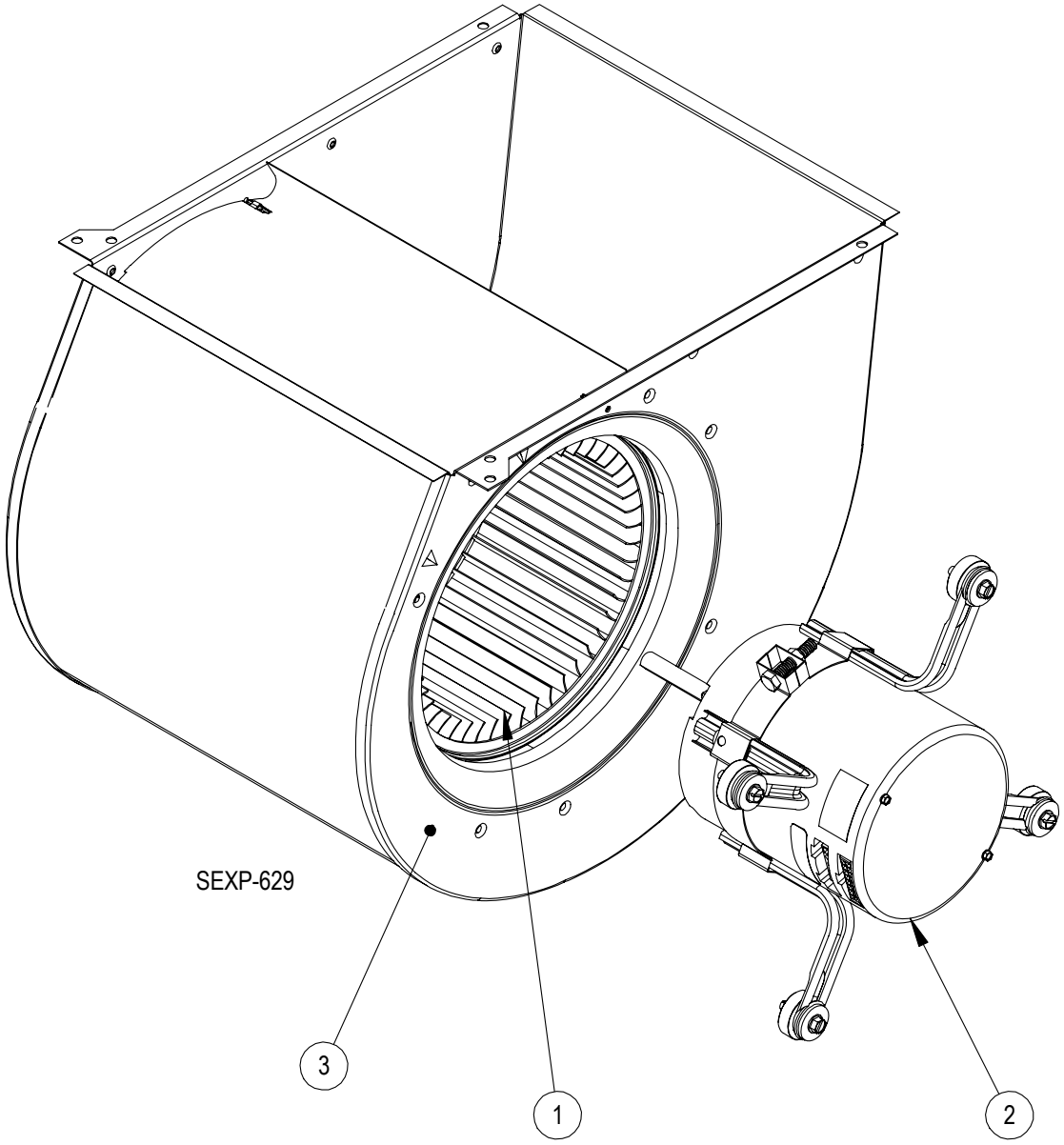
FUNCTIONAL COMPONENTS

Drawing No.	Part Number	Description	I30A1DA	I30A1DB	I30A1DC	I36A1DA	I36A1DB	I36A1DC	I42A1DA	I42A1DB	I42A1DC	I48A1DA	I48A1DB	I48A1DC	I60A1DA	I60A1DB	I60A1DC
		Continued from page 9															
22	5220-013	Pulsation Dampener/Muffler	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
23	7004-003	Filter	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
24	8001-013	Compressor Grommet	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
25	1012-328	Compressor Bolt	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
26	8000-388	Compressor	X														
	8000-389			X													
	8000-390				X												
	8000-379					X											
	8000-380						X										
	8000-381							X									
	8000-391								X								
	8000-392									X							
	8000-393										X						
	8000-382											X					
	8000-383												X				
	8000-384													X			
	8000-424														X		
	8000-425															X	
	8000-426																X
27	8002-012	Compressor Sound Cover	X	X	X	X	X	X	X	X	X						
	8002-013											X	X	X	X	X	X
28	5650-051	Dehum. Valve, 4-Pipe	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
29	1171-060	Flush Plastic Door Pull	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
30	5451-018	Motor Mount Grommet	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
31		*See separate chart below for Item #31*															
NS	6094-011	3/4" Barbed Drain Pan Fitting	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
NS	6001-016	Nylon Barbed Tee	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
NS	7950-021	1" Hose Clamp	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
NS	910-2046	Evap. Overflow Switch Ass'y (Upper)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
NS	6031-009	Coremax Valve Core	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

NS = Not Shown

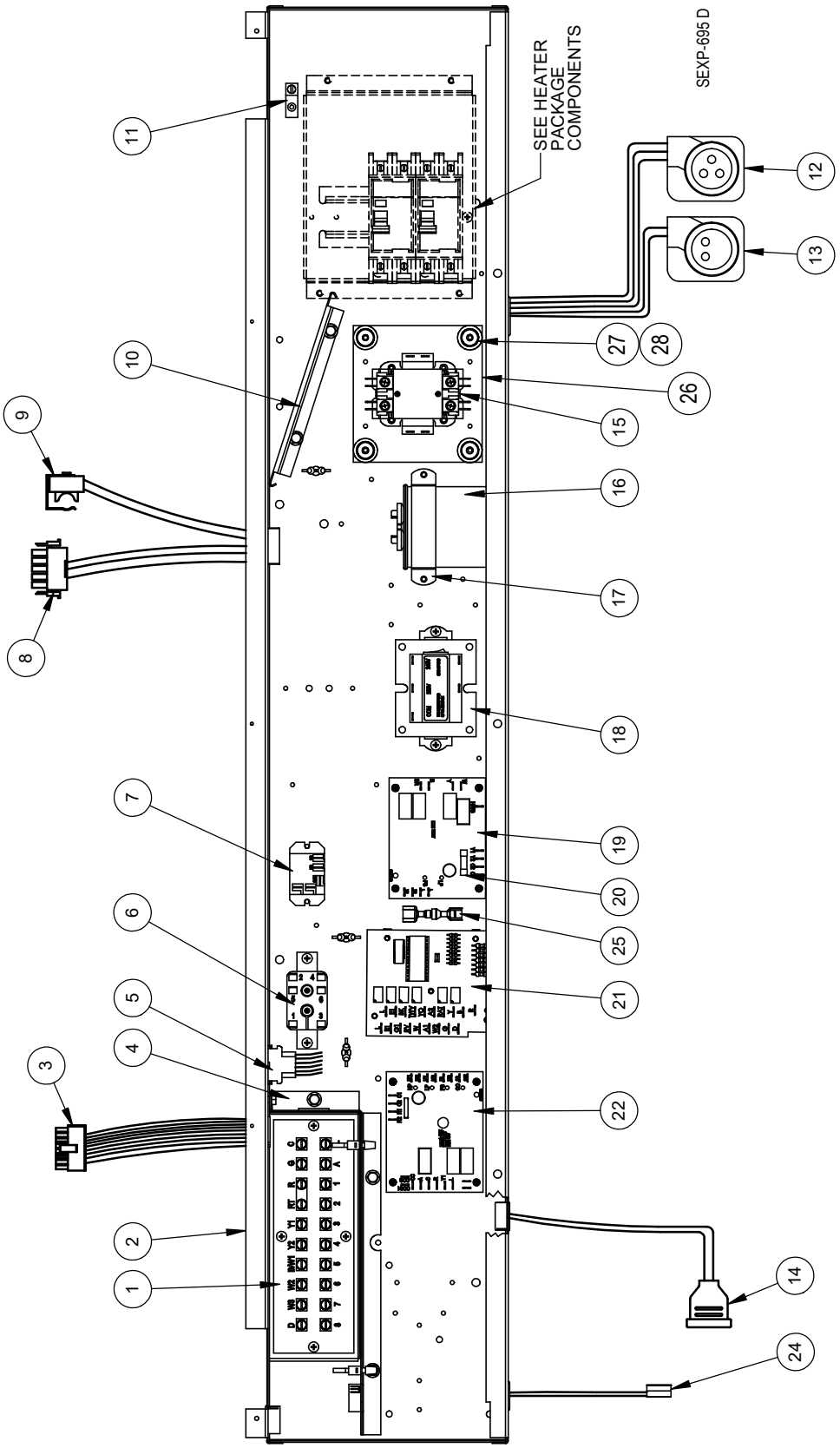
		With Vent	No Vent
31	I30A1DC	910-1880BX 1.5 KVA Stepdown Transformer with Base	910-1882BX 1 KVA Stepdown Transformer with Base
	I36A1DC	910-1881BX 2 KVA Stepdown Transformer with Base	910-1880BX 1.5 KVA Stepdown Transformer with Base
	I42A1DC		
	I48A1DC		
	I60A1DC	910-1814BX 3 KVA Stepdown Transformer with Base	910-1881BX 2 KVA Stepdown Transformer with Base

Refer to drawing on page 8



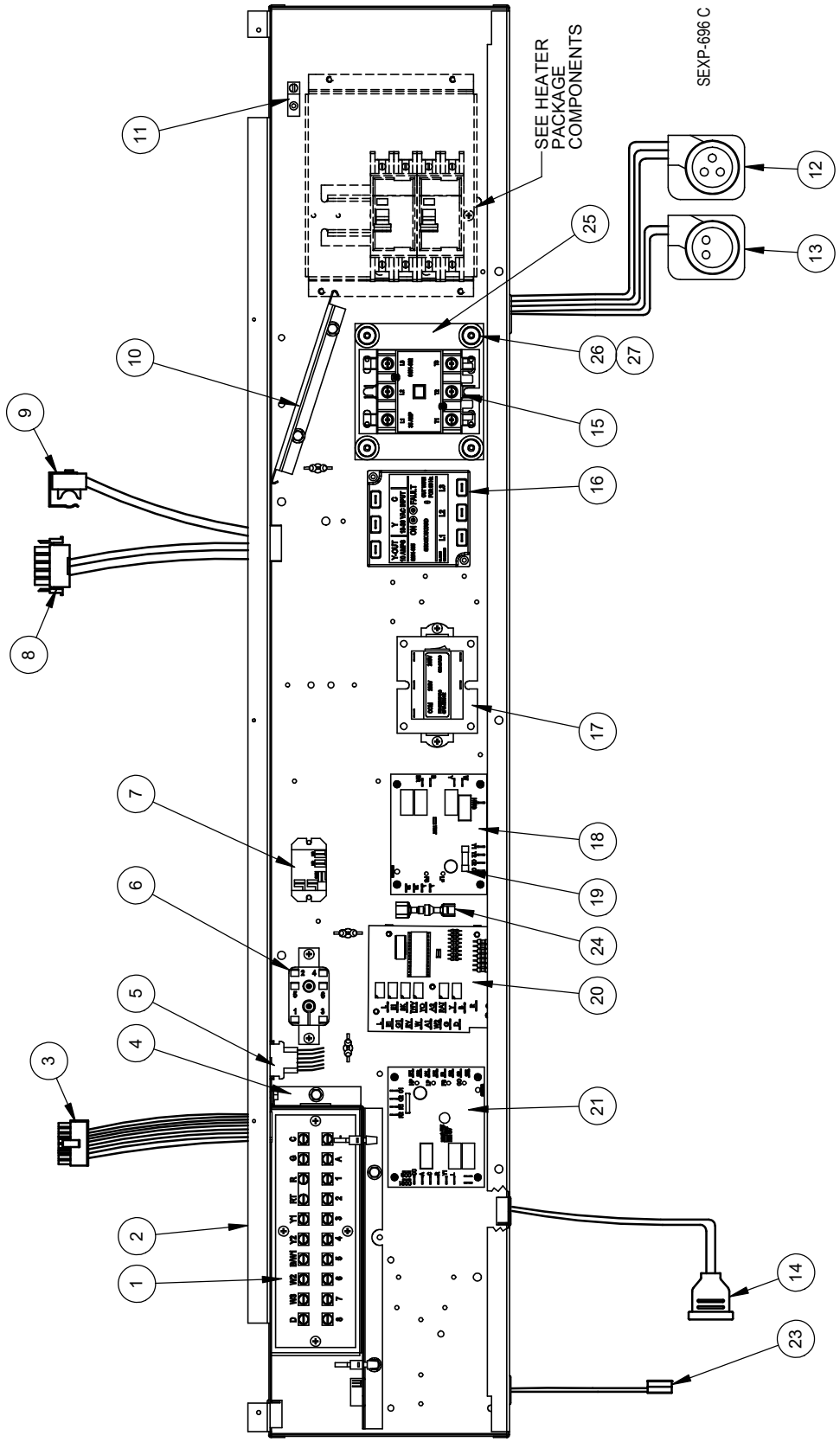
Drawing No.	Part Number	Description	5154-016-0090	5154-017-0089	5154-017-0088	5154-017-0087	5154-018-0081
1	5152-049	Blower Wheel	X	X	X	X	X
	8105-076-0090BX	1/3 HP Programmed Motor	X				
	8106-072-0089BX	1/2 HP Programmed Motor		X			
2	8106-072-0088BX	1/2 HP Programmed Motor			X		
	8106-072-0087BX	1/2 HP Programmed Motor				X	
	8107-016-0081BX	3/4 HP Programmed Motor					X
3	151-122	Housing	X	X	X	X	X

CONTROL PANEL COMPONENTS – 1 PHASE



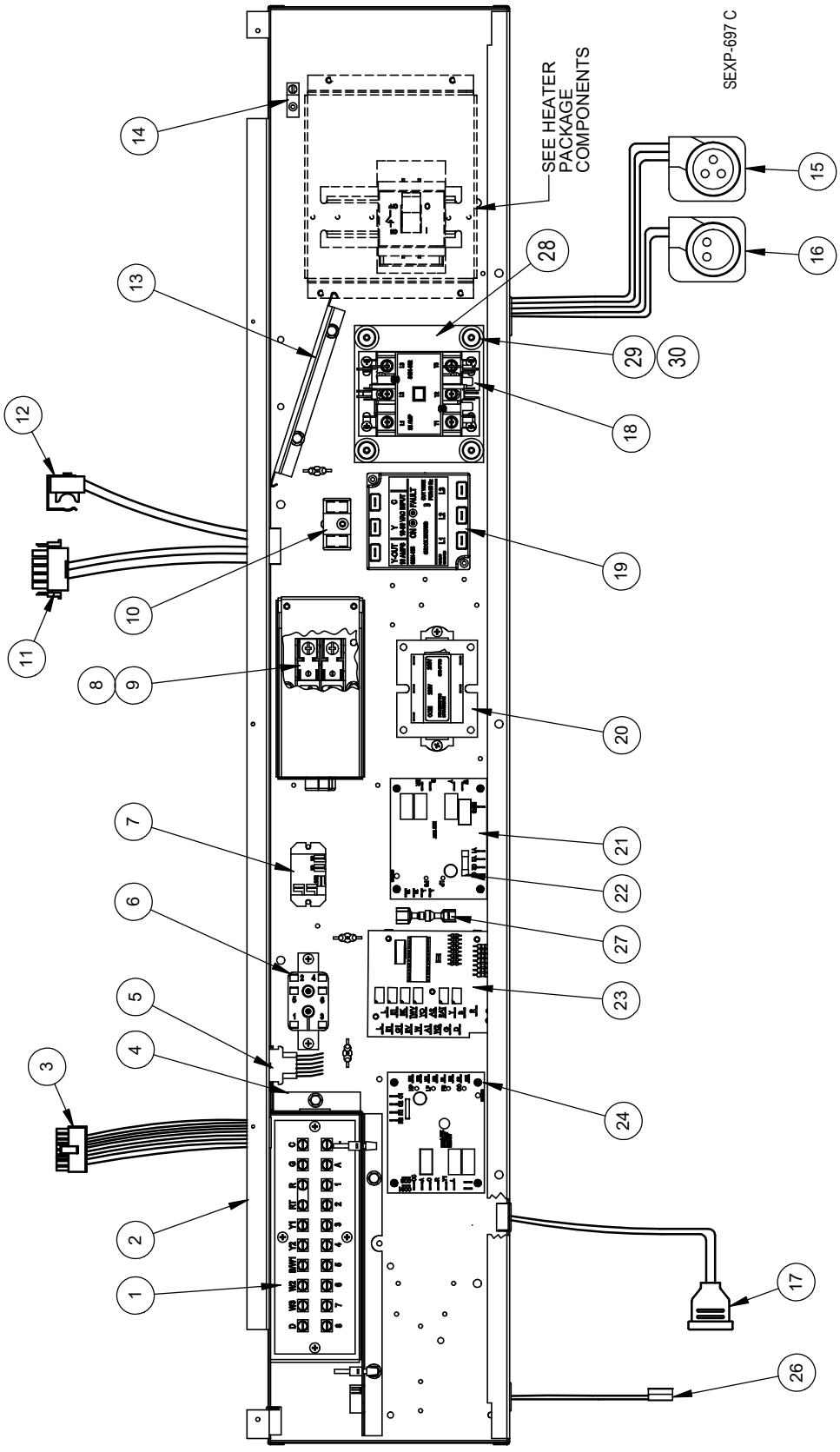
Drawing No.	Part Number	Description	I30A1DA	I36A1DA	I42A1DA	I48A1DA	I60A1DA
1	8607-032	Low Voltage Terminal Strip	X	X	X	X	X
2	517-441	Control Panel	X	X	X	X	X
3	3000-1396	16 pin 24V Indoor Blower Motor Control	X	X	X	X	X
4	117-319	Low Voltage terminal box	X	X	X	X	X
5	3000-1397	6 Pin Elect. Heat	X	X	X	X	X
6	8201-062	Relay	X	X	X	X	X
7	8201-130	Relay	X	X	X	X	X
8	3000-1398	5 Pin Indoor Blower Motor Power	X	X	X	X	X
9	8408-048	Freeze protect thermostat	X	X	X	X	X
10	135-417	Wire Shield	X	X	X	X	X
11	8611-006	Ground Terminal	X	X	X	X	X
12	3000-1222	Compressor Power Plug	X	X	X	X	X
13	3000-1223	Compressor Solenoid Plug	X	X	X	X	X
14	5650-044	Solenoid Valve plug	X	X	X	X	X
15	8401-025	Contactor 2 Pole 40 Amp	X	X	X	X	X
16	8552-035	Capacitor 40MFD 370V	X	X			
	8552-043	Capacitor 45MFD 370V			X		
	8552-095	Capacitor 30MFD 370V				X	
	8552-096	Capacitor 40MFD 440V					X
17	8550-007	Capacitor Bracket 2" Round	X	X			X
	8550-008	Capacitor Bracket 2-1/2" Round			X		
	8550-006	Capacitor Bracket 1-3/4" Round				X	
18	8407-048	Transformer 75VA with Circuit Breaker	X	X	X	X	X
19	8201-166	Fan Logic Control	X	X	X	X	X
20	8614-052	3.15 Amp Fuse	X	X	X	X	X
21	8201-113	Dehum Logic Board	X	X	X	X	X
22	8201-140	Compressor Logic Board	X	X	X	X	X
24	8408-040	Fan Control Thermistor	X	X	X	X	X
25	910-1816	Fan Control Resistor (Optional)	X	X	X	X	X
26	116-332	Contactor Isolation Plate	X	X	X	X	X
27	5451-025	Rubber Grommet	X	X	X	X	X
28	5451-026	Nylon Flanged Bushing	X	X	X	X	X

CONTROL PANEL COMPONENTS – 3 PHASE



Drawing No.	Part Number	Description	I30A1DB	I36A1DB	I42A1DB	I48A1DB	I60A1DB
1	8607-032	Low Voltage Terminal Strip	X	X	X	X	X
2	517-441	Control Panel	X	X	X	X	X
3	3000-1396	16 pin 24V Indoor Blower Motor Control	X	X	X	X	X
4	117-319	Low Voltage Terminal Box	X	X	X	X	X
5	3000-1397	6 Pin Elect. Heat	X	X	X	X	X
6	8201-062	Relay	X	X	X	X	X
7	8201-130	Relay	X	X	X	X	X
8	3000-1398	5 Pin Indoor Blower Motor Power	X	X	X	X	X
9	8408-048	Freeze Protect Thermostat	X	X	X	X	X
10	135-417	Wire Shield	X	X	X	X	X
11	8611-006	Ground Terminal	X	X	X	X	X
12	3000-1231	Compressor Power Plug	X	X	X	X	X
13	3000-1223	Compressor Solenoid Plug	X	X	X	X	X
14	5650-044	Solenoid Valve Plug	X	X	X	X	X
15	8401-002	Contactor 3 Pole 25 Amp	X	X	X	X	X
16	8201-174BX	3-PH Line Monitor	X	X	X	X	X
17	8407-048	Transformer 75VA with Circuit Breaker	X	X	X	X	X
18	8201-166	Fan Logic Control	X	X	X	X	X
19	8614-052	3.15 Amp Fuse	X	X	X	X	X
20	8201-113	Dehum Logic Board	X	X	X	X	X
21	8201-140	Compressor Logic Board	X	X	X	X	X
23	8408-040	Fan Control Thermistor	X	X	X	X	X
24	S910-1816	Fan Control Resistor (Optional)	X	X	X	X	X
25	116-332	Contactor Isolation Plate	X	X	X	X	X
26	5451-025	Rubber Grommet	X	X	X	X	X
27	5451-026	Nylon Flanged Bushing	X	X	X	X	X

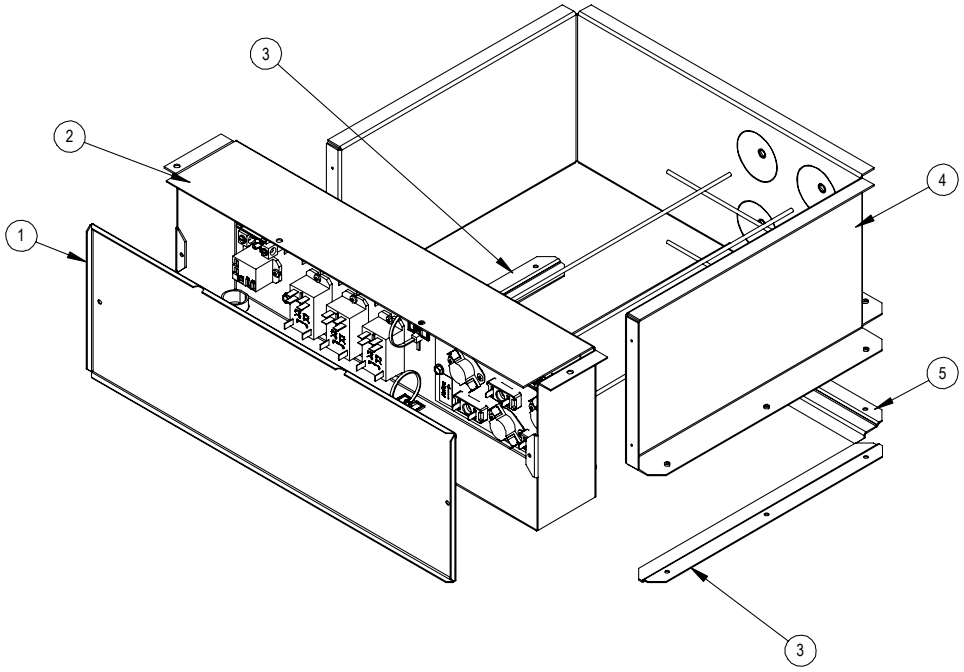
CONTROL PANEL COMPONENTS – 460V 3 PHASE

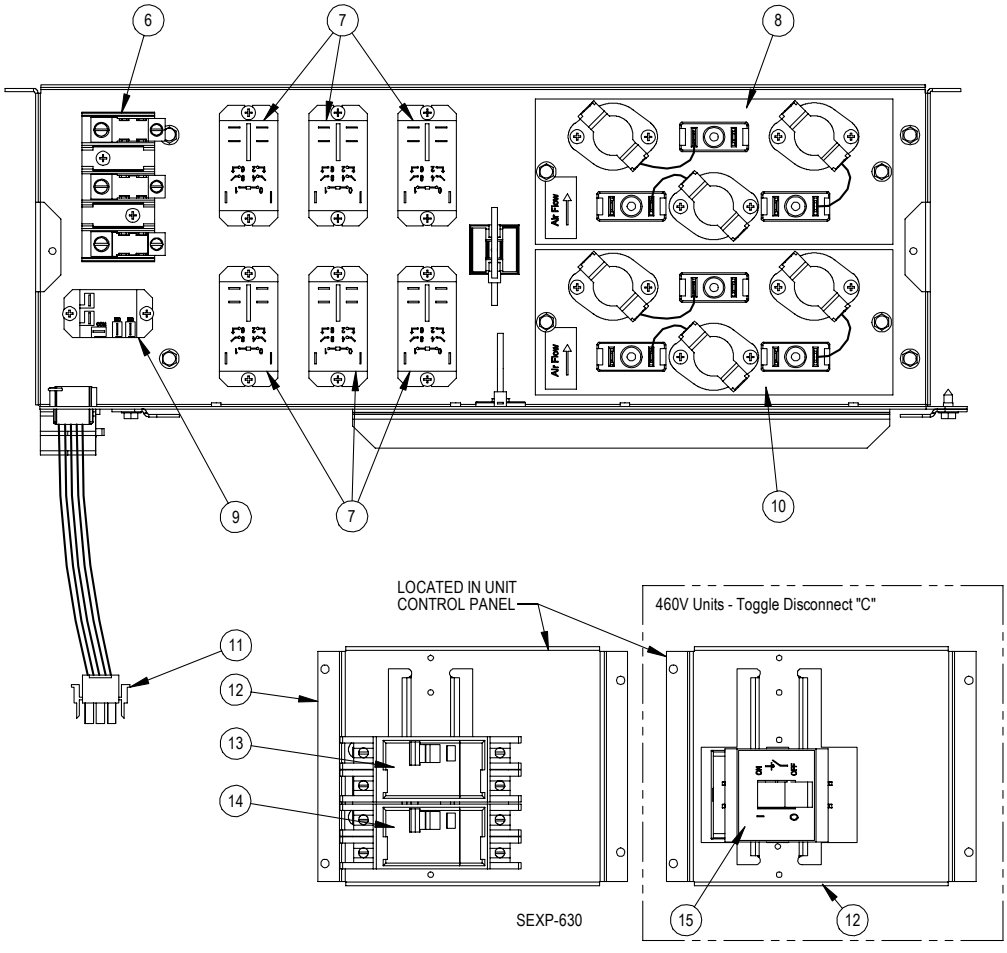


Drawing No.	Part Number	Description	I30A1DC	I36A1DC	I42A1DC	I48A1DC	I60A1DC
1	8607-032	Low Voltage Terminal Strip	X	X	X	X	X
2	517-441	Control Panel	X	X	X	X	X
3	3000-1396	16 pin 24V Indoor Blower Motor Control	X	X	X	X	X
4	117-319	Low Voltage Terminal Box	X	X	X	X	X
5	3000-1397	6 Pin Elect. Heat	X	X	X	X	X
6	8201-062	Relay	X	X	X	X	X
7	8201-130	Relay	X	X	X	X	X
8	8614-041	Fuse Block	X	X	X	X	X
9		*See separate chart below for Item #9*					
10	8607-017	Terminal Block	X	X	X	X	X
11	3000-1398	5 Pin Indoor Blower Motor Power	X	X	X	X	X
12	8408-048	Freeze Protect Thermostat	X	X	X	X	X
13	135-417	Wire Shield	X	X	X	X	X
14	8611-006	Ground Terminal	X	X	X	X	X
15	3000-1231	Compressor Power Plug	X	X	X	X	X
16	3000-1223	Compressor Solenoid Plug	X	X	X	X	X
17	5650-044	Solenoid Valve Plug	X	X	X	X	X
18	8401-002	Contactor 3 Pole 25 Amp	X	X	X	X	X
19	8201-174BX	3-PH Line Monitor	X	X	X	X	X
20	8407-048	Transformer 75VA with Circuit Breaker	X	X	X	X	X
21	8201-166	Fan Logic Control	X	X	X	X	X
22	8614-052	3.15 Amp Fuse	X	X	X	X	X
23	8201-113	Dehum Logic Board	X	X	X	X	X
24	8201-140	Compressor Logic Board	X	X	X	X	X
26	8408-040	Fan Control Thermistor	X	X	X	X	X
27	S910-1816	Fan Control Resistor (Optional)	X	X	X	X	X
28	116-332	Contactor Isolation Plate	X	X	X	X	X
29	5451-025	Rubber Grommet	X	X	X	X	X
30	5451-026	Nylon Flanged Bushing	X	X	X	X	X

		With Vent	**No Vent**
9	I30A1DC	(2) Part #8614-046 5A Class CC Fuse	(2) Part #8614-047 3.2A Class CC Fuse
	I36A1DC	(2) Part #8614-042 7A Class CC Fuse	(2) Part #8614-046 5A Class CC Fuse
	I42A1DC	(2) Part #8614-042 7A Class CC Fuse	(2) Part #8614-046 5A Class CC Fuse
	I48A1DC	(2) Part #8614-042 7A Class CC Fuse	(2) Part #8614-046 5A Class CC Fuse
	I60A1DC	(2) Part #8614-043 10A Class CC Fuse	(2) Part #8614-042 7A Class CC Fuse

ELECTRIC HEATER COMPONENTS





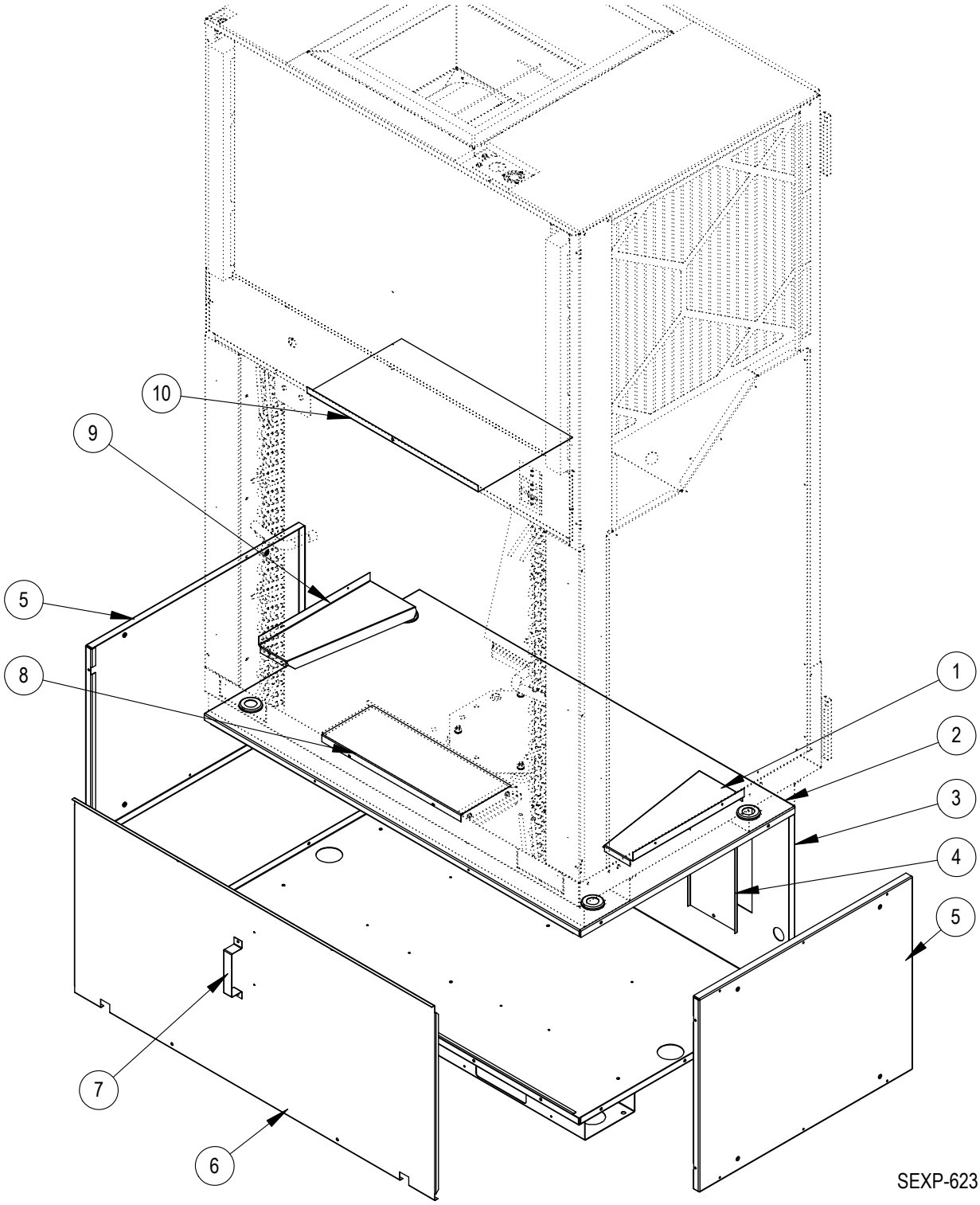
Drawing No.	Part No.	Description	I30A1DA0Z	I30A1DA05	I30A1DA10	I36A1DA0Z	I36A1DA05	I36A1DA10	I36A1DA15	I42A1DA0Z	I42A1DA05	I42A1DA10	I42A1DA15	I48A1DA0Z	I48A1DA05	I48A1DA10	I48A1DA15	I48A1DA20	I60A1DA0Z	I60A1DA05	I60A1DA10	I60A1DA15	I60A1DA20
1	143-148	Heater Box Cover	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	117-313	Heater Front Plate	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3	103-486	Side Blower Offset	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	117-307	Heater Wrapper	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5	103-487	Rear Blower Angle	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7	8401-036	Contactor 2-Pole 30A		X	2		X	2	3		X	2	2		X	2	3	4		X	2	3	4
8	142-159	Heater Blank Off Plate	X	X	X	X	X	X		X	X	X		X	X	X			X	X	X		
	8604-135	Heat Strip 5KW							X				X				X					X	
	8604-136	Heat Strip 10KW																X					X
9	8201-130	Relay		X	X		X	X	X		X	X	X		X	X	X	X		X	X	X	X
10	142-159	Heater Blank Off Plate	X			X				X				X					X				
	8604-135	Heat Strip 5KW		X			X				X				X					X			
	8604-136	Heat Strip 10KW			X			X	X			X	X			X	X	X			X	X	X
	8604-134	Heat Strip 4KW													X								
11	3003-097	6-Pin Electric Heater Wire Harness		X			X				X				X					X			
	3003-099	6-Pin Electric Heater Wire Harness			X			X				X				X					X		
	3003-101	6-Pin Electric Heater Wire Harness							X				X				X					X	
	3003-108	6-Pin Electric Heater Wire Harness																X					X
12	127-418	Circuit Breaker Base	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
13	8615-037	Circuit Breaker 30A 2-Pole			X																		
	8615-041	Circuit Breaker 60A 2-Pole			X			X	X			X	X				X	X				X	X
14	8615-038	Circuit Breaker 35A 2-Pole	X	X																			
	8615-040	Circuit Breaker 50A 2-Pole												X	X								
	8615-055	Circuit Breaker 40A 2-Pole				X	X		X				X										
	8615-041	Circuit Breaker 60A 2-Pole														X		X	X	X	X	X	X
	8615-039	Circuit Breaker 45A 2-Pole								X	X					X	X						

ELECTRIC HEATER COMPONENTS

Drawing No.	Part No.	Description	I30A1DB0Z	I30A1DB06	I30A1DB09	I36A1DB0Z	I36A1DB06	I36A1DB09	I36A1DB15	I42A1DB0Z	I42A1DB06	I42A1DB09	I42A1DB15	I48A1DB0Z	I48A1DB06	I48A1DB09	I48A1DB15	I48A1DB18	I60A1DB0Z	I60A1DB06	I60A1DB09	I60A1DB15	I60A1DB18
1	143-148	Heater Box Cover	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	117-313	Heater Front Plate	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3	103-486	Side Blower Offset	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	117-307	Heater Wrapper	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5	103-487	Rear Blower Angle	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6	8607-014	Terminal Block																X					X
7	8401-036	Contactor 2-Pole 30A		3	3		3	3	6		3	3	6		3	3	6	6		3	3	6	6
8	142-159	Heater Blank Off Plate	X	X	X	X	X	X		X	X	X		X	X	X			X	X	X		
	8604-137	Heat Strip 6KW							X				X				X					X	
	8604-138	Heat Strip 9KW																X					X
9	8201-130	Relay		X	X		X	X	X		X	X	X		X	X	X	X		X	X	X	X
10	142-159	Heater Blank Off Plate	X			X				X				X					X				
	8604-137	Heat Strip 6KW		X			X				X				X					X			
	8604-138	Heat Strip 9KW			X			X	X			X	X			X	X	X			X	X	X
11	3003-103	6-Pin Electric Heater Wire Harness		X	X		X	X			X	X			X	X				X	X		
	3003-105	6-Pin Electric Heater Wire Harness							X				X				X	X				X	X
12	127-418	Circuit Breaker Base	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
14	8615-051	Circuit Breaker 25A 3-Pole	X	X																			
	8615-042	Circuit Breaker 35A 3-Pole			X			X		X	X	X		X	X	X							
	8615-052	Circuit Breaker 30A 3-Pole				X	X																
	8615-044	Circuit Breaker 45A 3-Pole																	X	X	X	X	X
	8615-045	Circuit Breaker 50A 3-Pole																					
	8615-046	Circuit Breaker 60A 3-Pole							X				X				X	X				X	X

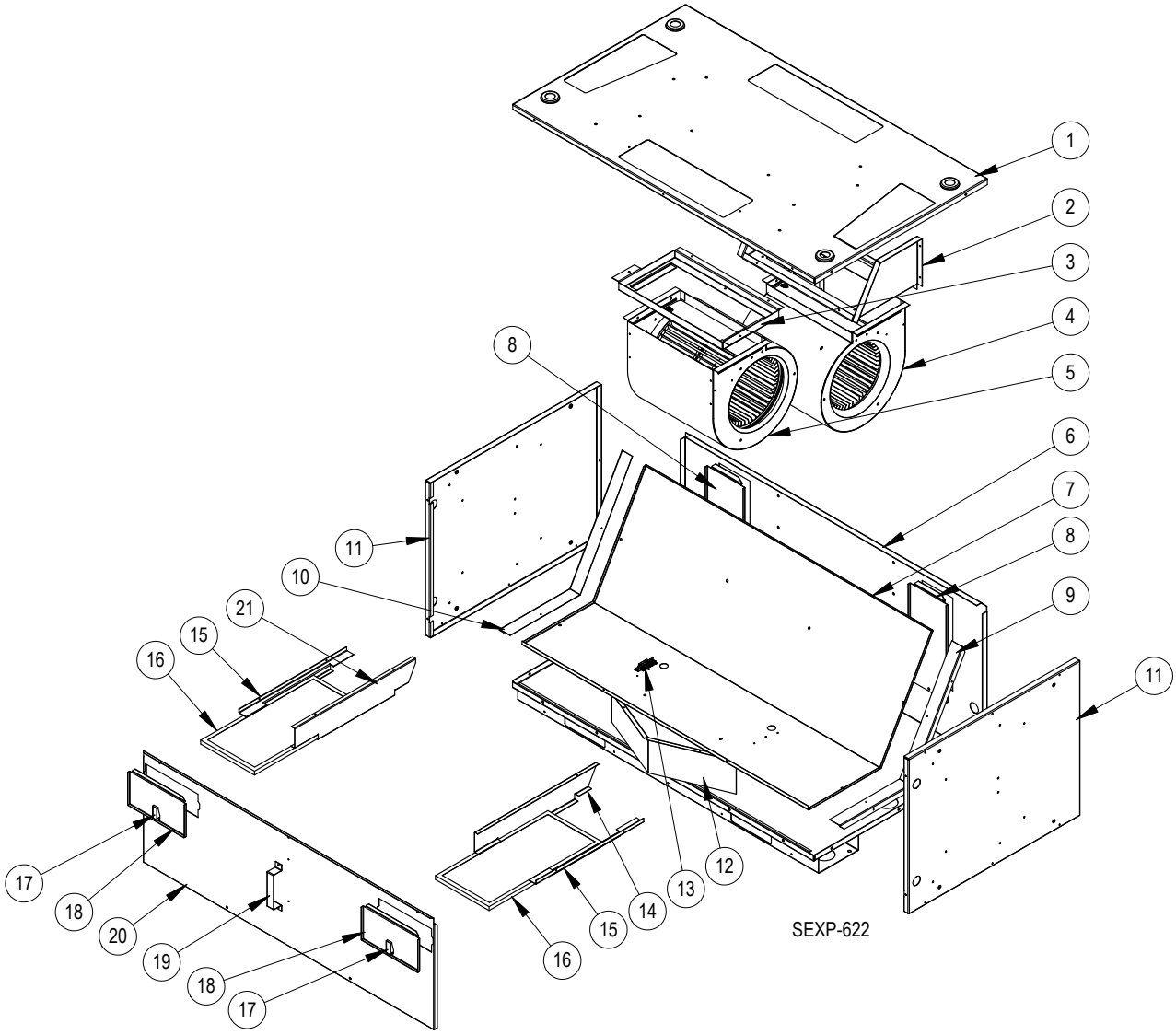
Drawing No.	Part No.	Description	I30A1DC0Z	I30A1DC06	I30A1DC09	I36A1DC0Z	I36A1DC06	I36A1DC09	I36A1DC15	I42A1DC0Z	I42A1DC06	I42A1DC09	I42A1DC15	I48A1DC0Z	I48A1DC06	I48A1DC09	I48A1DC15	I48A1DC18	I60A1DC0Z	I60A1DC06	I60A1DC09	I60A1DC15	I60A1DC18
1	143-148	Heater Box Cover	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	117-313	Heater Front Plate	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3	103-486	Side Blower Offset	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	117-307	Heater Wrapper	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5	103-487	Rear Blower Angle	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6	8607-014	Terminal Block							X				X				X					X	
7	8401-036	Contactor 2-Pole 30A		2	2		2	2	6		2	2	6		2	2	6	4		2	2	6	4
8	142-159	Heater Blank Off Plate	X	X	X	X	X	X		X	X	X		X	X	X			X	X	X		
	8604-139	Heat Strip 6KW							X				X				X					X	
	8604-140	Heat Strip 9KW																X					X
9	8201-130	Relay		X	X		X	X	X		X	X	X		X	X	X	X		X	X	X	X
10	142-159	Heater Blank Off Plate	X			X				X				X					X				
	8604-139	Heat Strip 6KW		X			X				X				X					X			
	8604-140	Heat Strip 9KW			X			X	X			X	X			X	X	X			X	X	X
11	3003-099	6-Pin Electric Heater Wire Harness		X	X		X	X			X	X			X	X				X	X		
	3003-108	6-Pin Electric Heater Wire Harness							X				X				X	X				X	X
12	127-418	Circuit Breaker Base	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
15	8615-067	Toggle Disconnect 40A 460V	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

VENT BOX (ONLY) COMPONENTS



Drawing No.	Part Number	Description	Vent Box Only
1	S143X164	Right Side Intake Fill	X
2	507-298	Vent Box Top	X
3	S527-419	Vent Box Base	X
4	543-158	Drain Access Plate	2
5	S501-639	Vent Box Side	2
6	553-508	Vent Box Door	X
7	113-441	Door Latch Bracket	X
8	S143-160	Lower Intake Fill	X
9	S143Y164	Left Side Intake Fill	X
10	S143-161	Upper Intake Fill	X

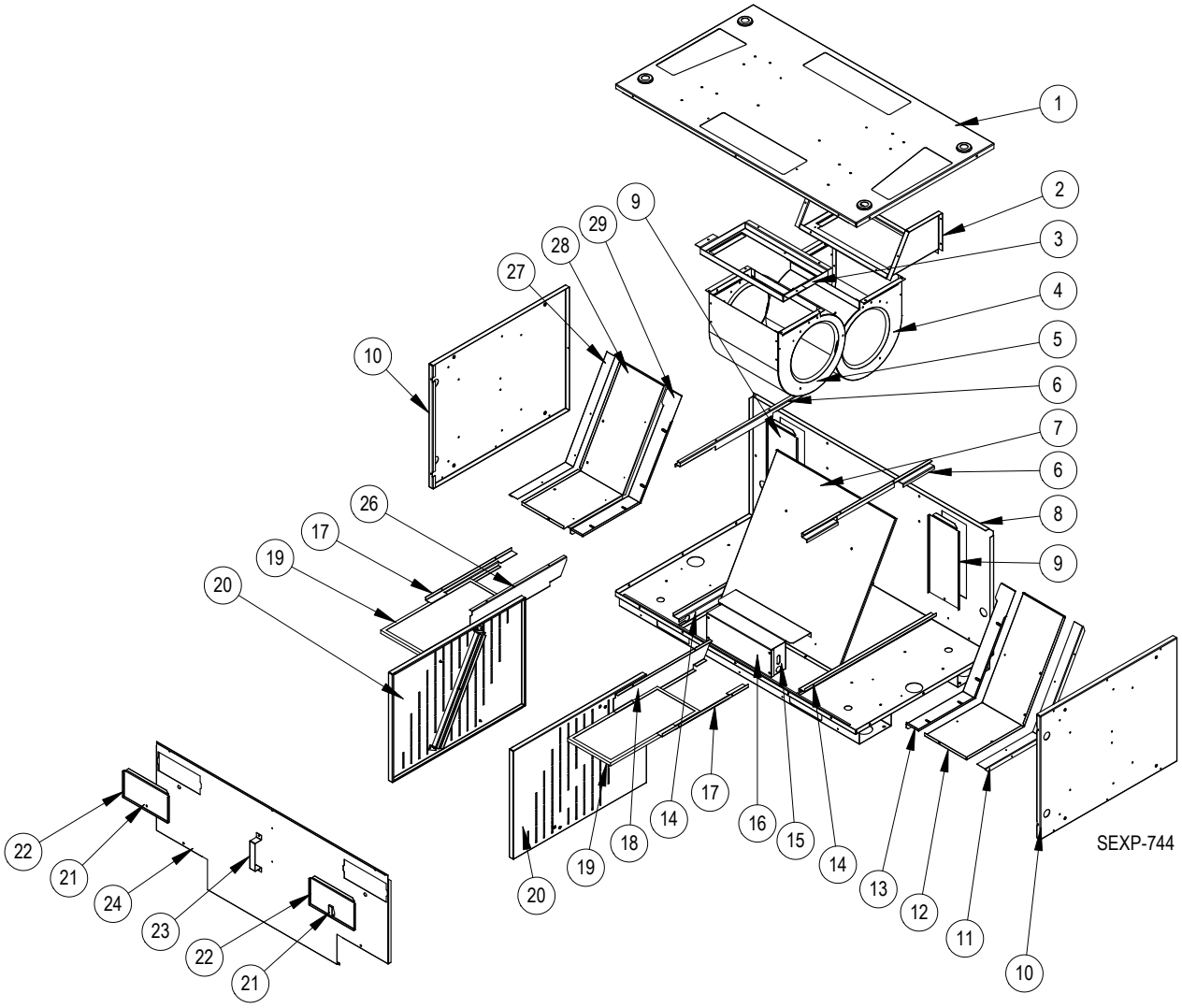
CRV COMPONENTS



Drawing No.	Part Number	Description	CRV 920-0012	ERV/ECON 920-0196
1	S507-297	Vent Box Top	X	X
2	103-489	Rear Blower Offset	X	X
3	103-488	Front Blower Offset	X	X
4 4	900-403-0264BX 900-403-0268BX	Exhaust Blower Assembly Exhaust Blower Assembly	X	 X
5 5	900-403-0265BX 900-403-0269BX	Intake Blower Assembly Intake Blower Assembly	X	 X
6	S527-419	Vent Box Base	X	X
7	521-459	Partition	X	X
8	543-158	Drain Access Plate	2	2
9	505X1260	Right Partition Angle	X	X
10	505Y1260	Left Partition Angle	X	X
11	S501-638	Vent Box Side	2	2
12	569-179	Baffle	X	X
13	S910-1809	Terminal Block Assembly	X	X
14	141X382	Right Lower Filter Bracket	X	X
15	141-381	Filter Angle	2	X
16	7003-064	Vent Intake Filter	2	2
17	1171-053	Swell Latch	2	2
18	S153-506	Filter Door	2	2
19	113-441	Door Latch Bracket	X	X
20	S553-507	Blower Door	X	X
21	141Y382	Left Lower Filter Bracket	X	X
NS	3000-1403	Intake/Exhaust Power Plug	X	X
NS NS	3000-1404 3000-1445	Intake/Exhaust Speed Plug Intake/Exhaust Speed Plug	2	 X
NS NS	3000-1406 3000-1446	Vent Section Plug Vent Section Plug	X	 X
NS NS	3000-1411 3000-1447	Unit Control Panel Plug Unit Control Panel Plug	X	 X
NS	8201-062	Relay (in unit control panel)	X	
NS	8201-130	Relay, SPDT (in unit control panel)		3
NS	8201-071	Relay, 3PDT (in unit control panel)		X
NS	8408-047	Outdoor Thermostat (beside outdoor coil)		X

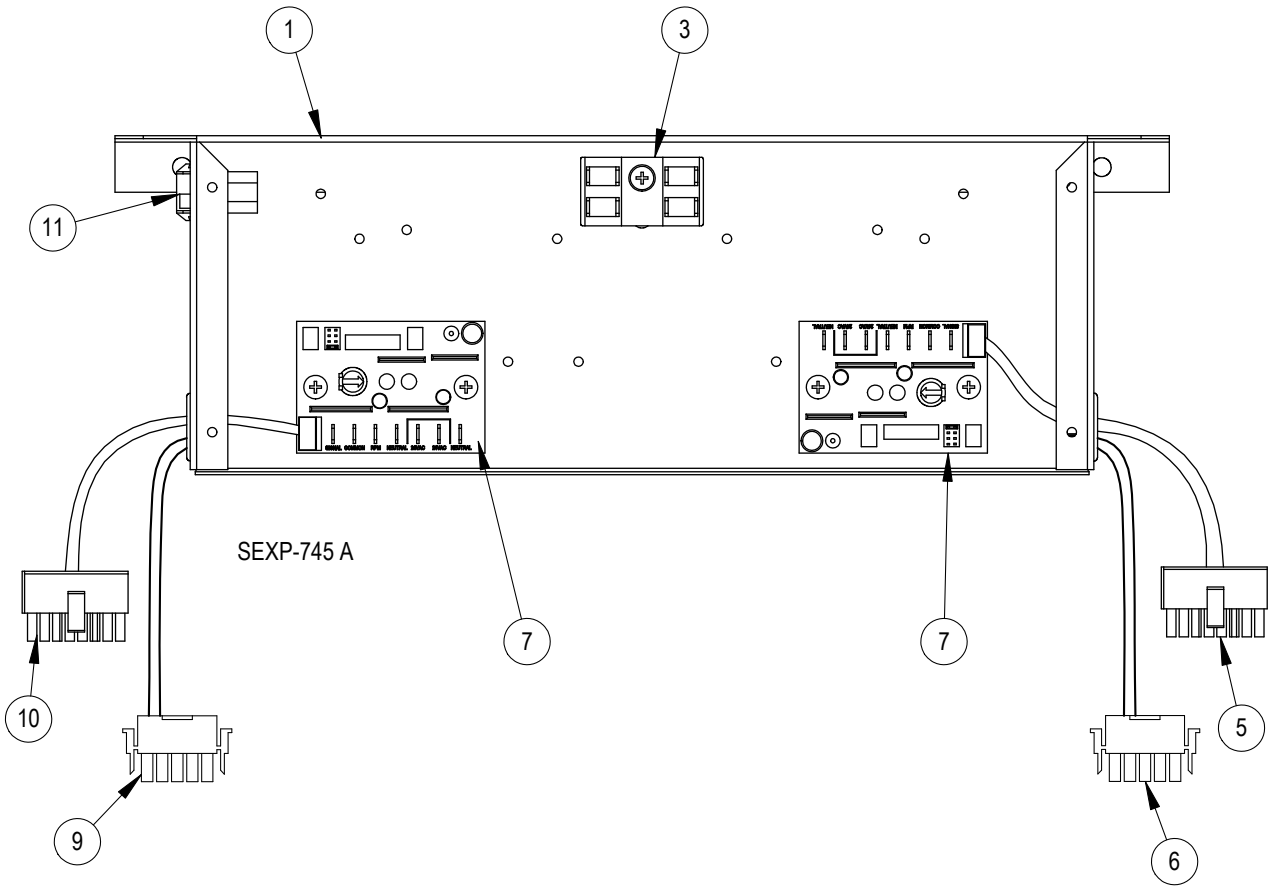
NS = Not Shown

MODULATING CRV COMPONENTS



Drawing No.	Part Number	Description	Modulating CRV
1	S507-297	Vent Box Top	X
2	103-489	Rear Blower Offset	X
3	103-488	Front Blower Offset	X
4	900-319-0140	Exhaust Blower Assembly	X
5	900-319-0141	Intake Blower Assembly	X
6	141-379	Cassette Upper Rail	2
7	521-457	Partition	X
8	S527-419	Vent Box Base	X
9	543-158	Drain Access Plate	2
10	S501-638	Vent Box Side	2
11	505X1260	Right Partition Angle	X
12	521-464	Right Side Partition	X
13	S105X1258	Right Cassette Seal Angle	X
14	141-380	Cassette Lower Rail	2
15	Control Panel	See Control Panel section	x
16	153-511	Control Panel Cover	X
17	141-381	Filter Angle	2
18	141X382	Right Lower Filter Bracket	X
19	7003-064	Vent Intake Filter	2
20	139-322	Restrictor Plate	2
21	1171-053	Swell Latch	2
22	S153-506	Filter Door	2
23	113-441	Door Latch Bracket	X
24	S553-505	Cassette Door	X
26	141Y382	Left Lower Filter Bracket	X
27	105Y1260	Left Partition Angle	X
28	521-465	Left Side Partition	X
29	S105Y1258	Left Cassette Seal Angle	X

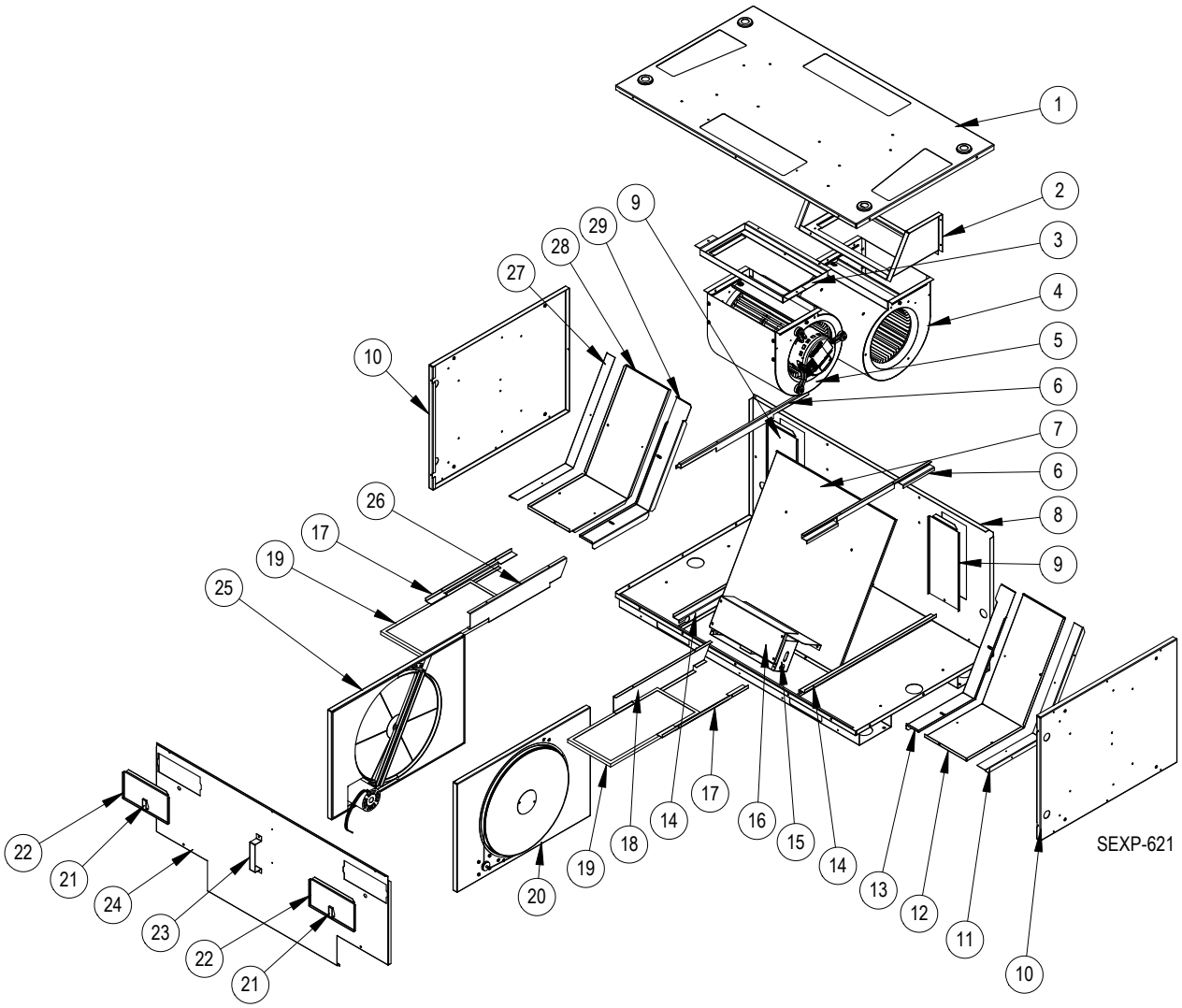
MODULATING CRV CONTROL PANEL COMPONENTS



Drawing No.	Part Number	Description	Modulating CRV Control Panel
1	117-323	Control Panel	X
3	8607-017	Terminal Block	X
5	3000-1358	Intake Speed Plug	X
6	3000-1331	Intake Plower Plug	X
7	8201-124	Blower Control Board	2
9	3000-1407	Exhaust Power Plug	X
10	3000-1356	Exhaust Speed Plug	X
11	3000-1409	Vent Section Plug	X
NS	3000-1408	Extension Plug	X
NS	3000-1405	Unit Control Panel Plug	X
NS	8201-013	Relay (in unit Control Panel)	X

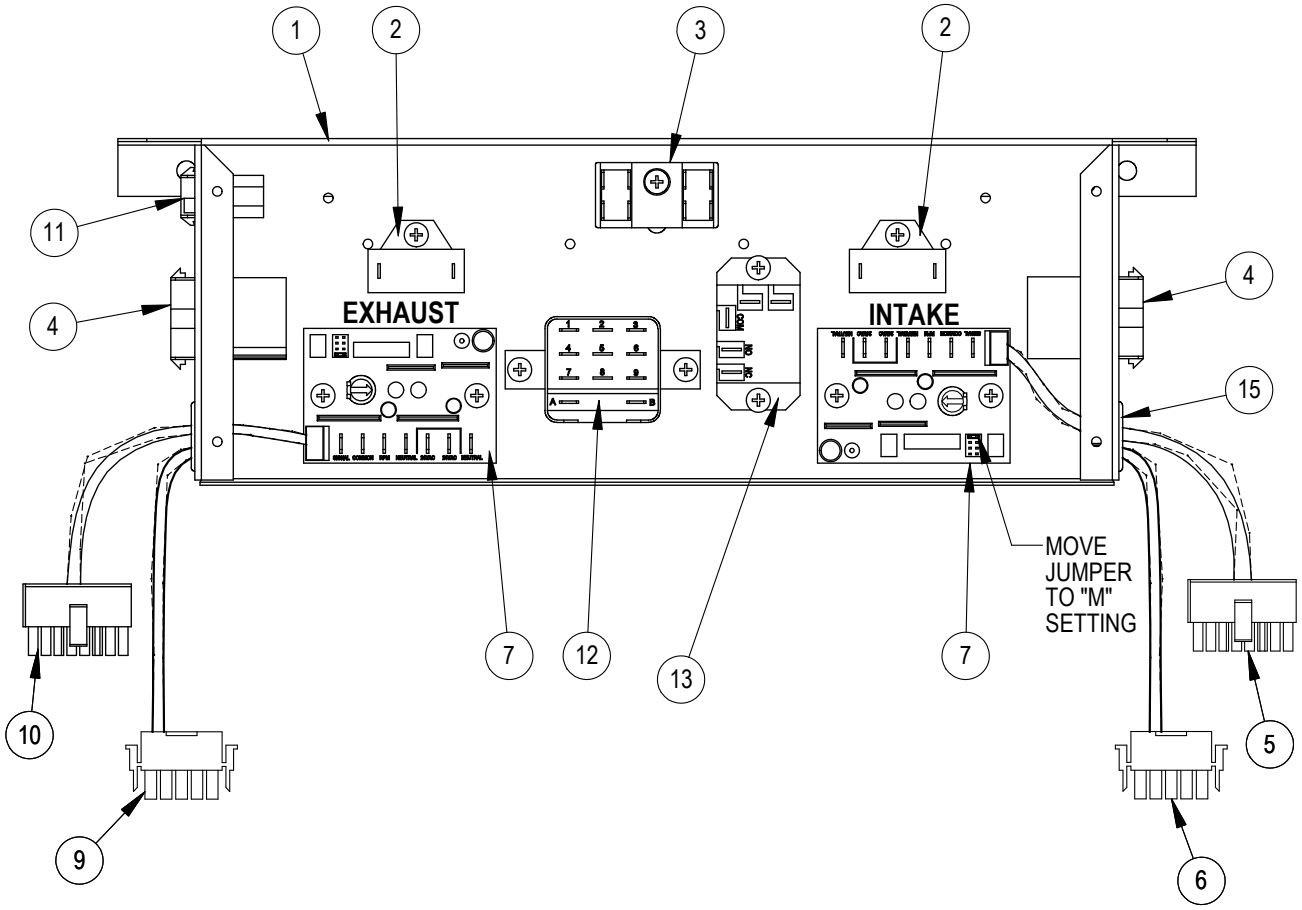
NS = Not Shown

ERV COMPONENTS



Drawing No.	Part Number	Description	ERV
1	S507-297	Vent Box Top	X
2	103-489	Rear Blower Offset	X
3	103-488	Front Blower Offset	X
4	900-319-0106	Exhaust Blower Assembly	X
5	900-319-0107	Intake Blower Assembly	X
6	141-379	Cassette Upper Rail	2
7	521-457	Partition	X
8	S527-419	Vent Box Base	X
9	543-158	Drain Access Plate	2
10	S501-638	Vent Box Side	2
11	505X1260	Right Partition Angle	X
12	521-464	Right Side Partition	X
13	S105X1258	Right Cassette Seal Angle	X
14	141-380	Cassette Lower Rail	2
15	Control Panel	See Control Panel section	x
16	153-511	Control Panel Cover	X
17	141-381	Filter Angle	2
18	141X382	Right Lower Filter Bracket	X
19	7003-064	Vent Intake Filter	2
20	5070-055	Right Cassette Assembly - Complete See cassette section for individual parts	X
21	1171-053	Swell Latch	2
22	S153-506	Filter Door	2
23	113-441	Door Latch Bracket	X
24	S553-505	Cassette Door	X
25	5070-056	Left Cassette Assembly - Complete See cassette section for individual parts	X
26	141Y382	Left Lower Filter Bracket	X
27	105Y1260	Left Partition Angle	X
28	521-465	Left Side Partition	X
29	S105Y1258	Left Cassette Seal Angle	X

ERV CONTROL PANEL COMPONENTS

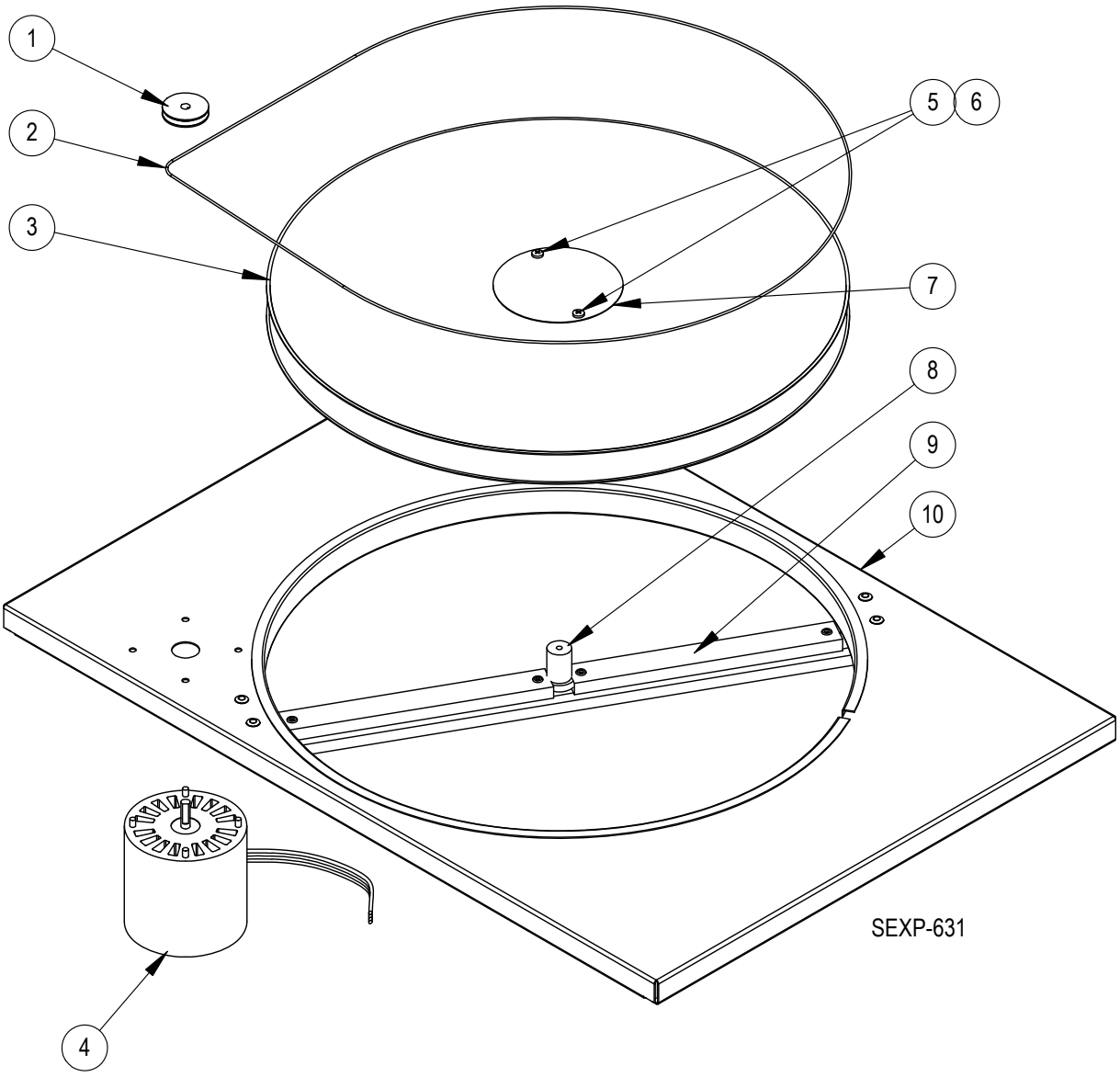


SEXP-1062

Drawing No.	Part Number	Description	920-0461 ERV	920-0539 ERV/ECON
1	117-323	Control Panel	X	X
2	8552-070	3MFD 250V Capacitor	2	2
3	8607-017	Terminal Block	X	X
4	3000-1410	Cassette Motor Plug	2	2
5	3000-1358	Intake Speed Plug	X	X
6	3000-1331	Intake Plower Plug	X	X
7	8201-124	Blower Control Board	2	2
9	3000-1407	Exhaust Power Plug	X	X
10	3000-1356	Exhaust Speed Plug	X	X
11	3000-1409	Vent Section Plug	X	X
12	8201-130	Relay, SPDT Pilot Duty		X
13	8201-159	Relay, SPDT Pilot Duty		X
NS	3000-1408	Extension Plug	X	X
NS	3000-1405	Unit Control Panel Plug	X	X
NS	8201-013	Relay (in unit Control Panel)	X	X
NS	4204-108	Wiring Diagram	X	
NS	4204-111	Wiring Diagram		X

NS = Not Shown

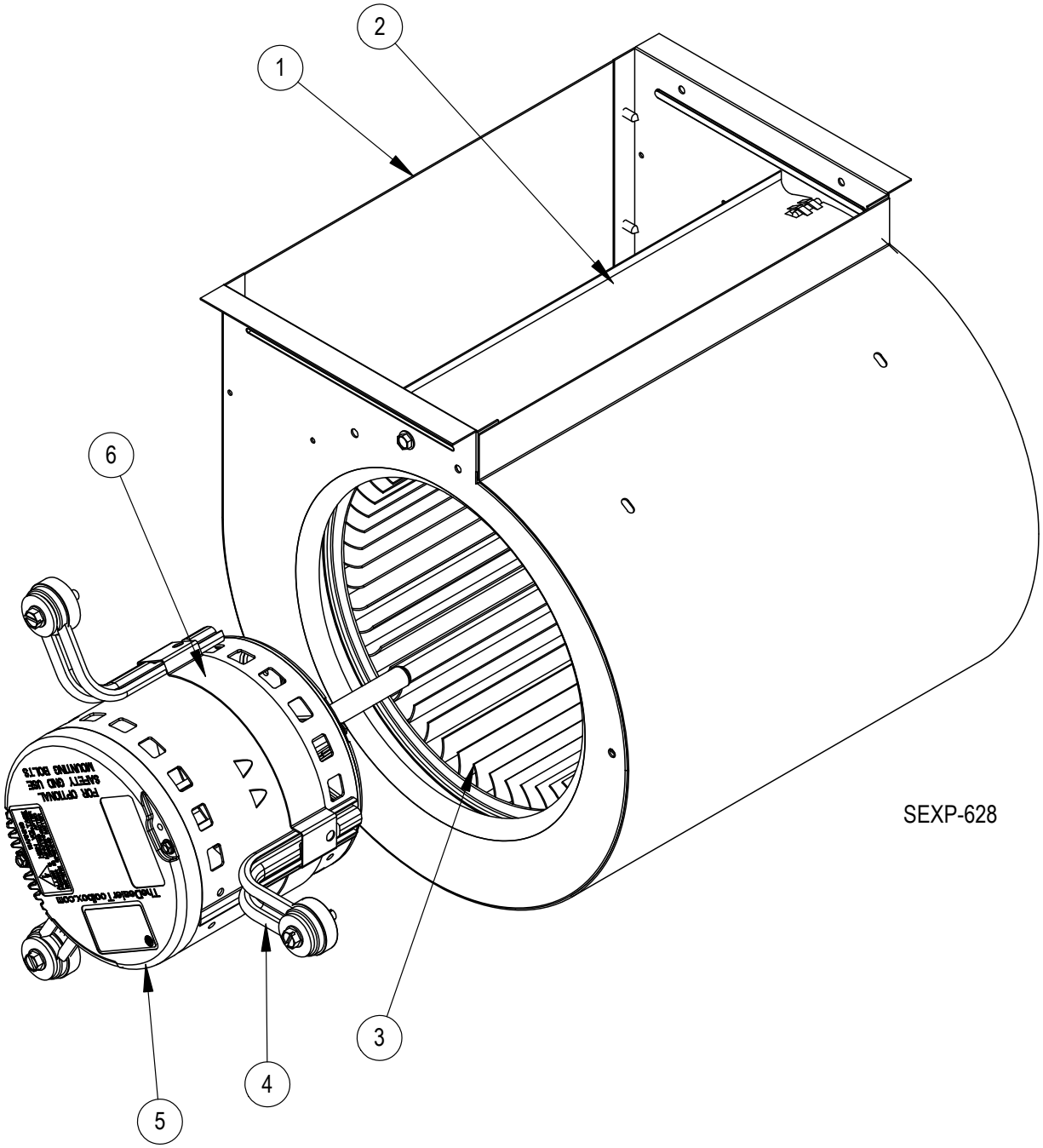
ERV CASSETTE COMPONENTS



Drawing No.	Part Number	Description	5070-055 Right Cassette	5070-056 Left Cassette
1	5501-018	Pulley	X	X
2	5070-054	Drive Belt	X	X
3	5070-043	Cassette Wheel	X	X
4	8101-016	Motor	X	X
5	1012-164	Machine Screw	2	2
6	8611-111	Nylon Spacer	2	2
7	142-104	Hub Cover	X	X
8	1912-012	Wheel Shaft	X	X
9	105-1259	Cassette Wheel Angle	X	X
10	539X275	Right Hand Cassette Plate	X	
10	539Y275	Left Hand Cassette Plate		X
NS	8620-204	ERV Bearing, Shaft & Hardware Kit	X	X
NS	8620-205	ERV Shaft & Hardware Kit	X	X

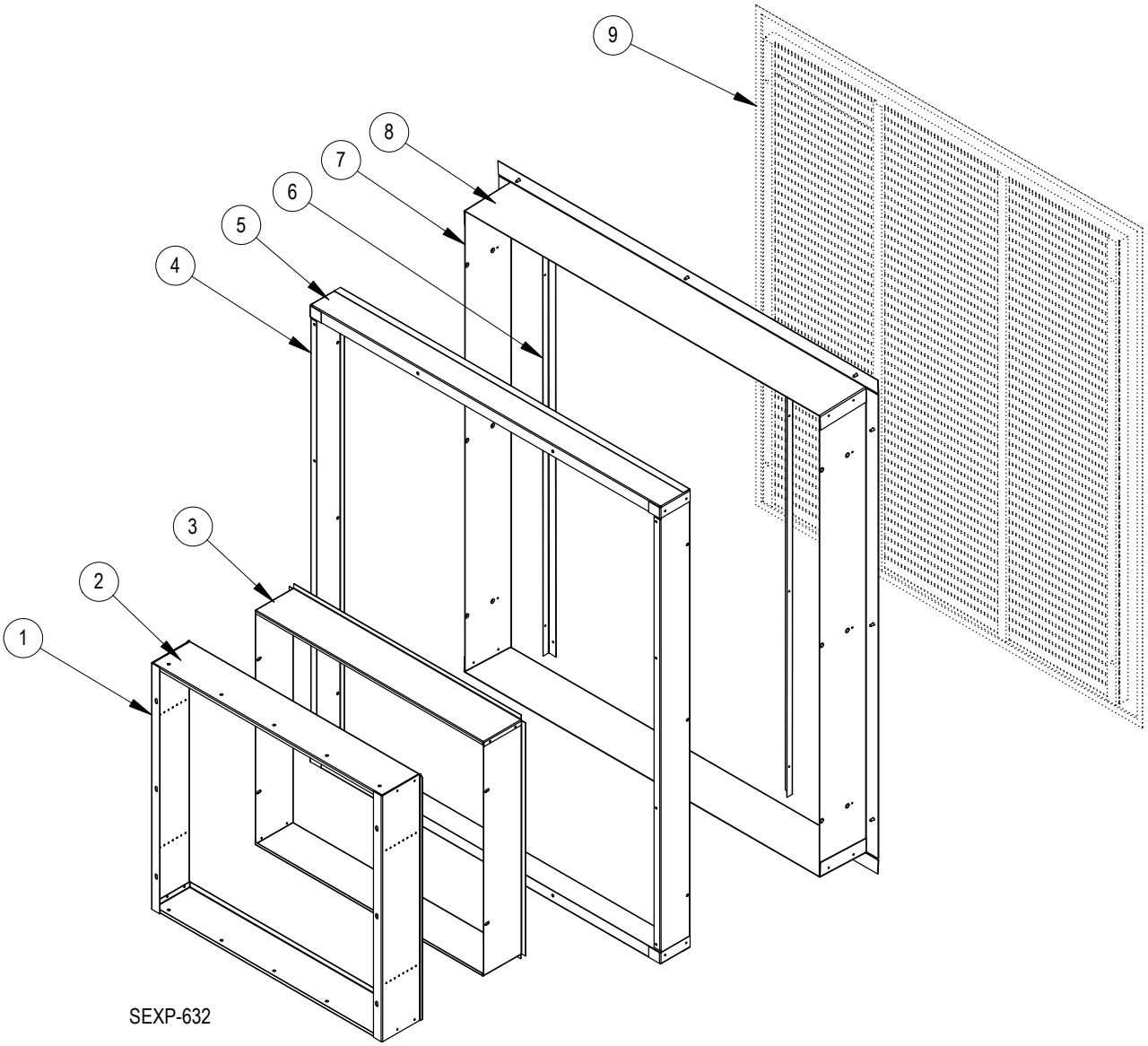
NS = Not Shown

CRV/ERV BLOWER COMPONENTS



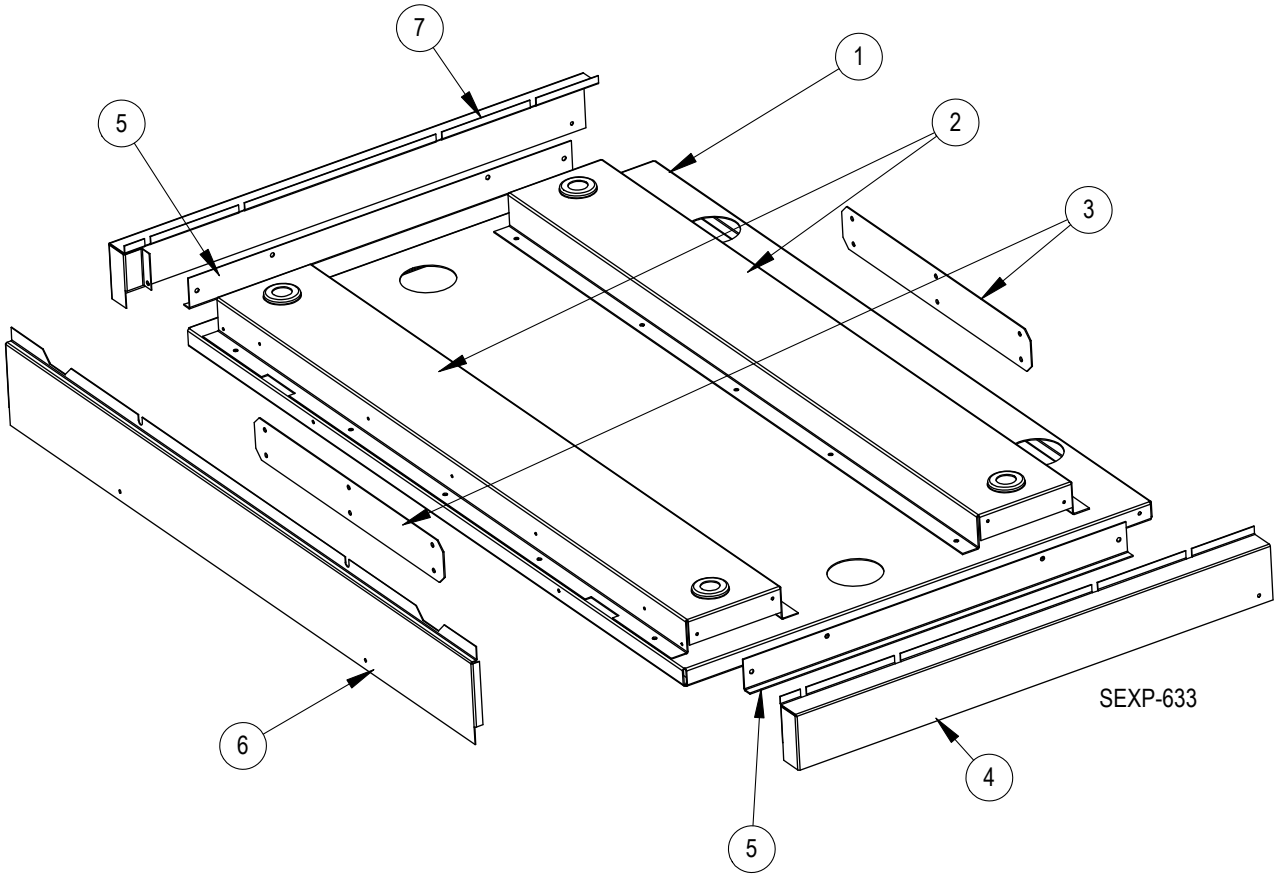
Drawing No.	Part Number	Description	900-403-0264BX	900-403-0265BX	900-403-0268BX	900-403-0269BX	900-319-0106BX	900-319-0107BX	900-319-0140BX	900-319-0141BX
1	151-124	Blower Housing	X	X	X	X	X	X	X	X
2	144-129	Diffuser	X	X	X	X	X	X	X	X
3	5152-067	Blower Wheel	X	X	X	X	X	X	X	X
4	8200-046	Motor Mount Arm	3	3	3	3	3	3	3	3
5	8105-079-0264BX	1/3 HP Programmed Motor – CRV Exhaust	X							
5	8105-079-0265BX	1/3 HP Programmed Motor – CRV Intake		X						
5	8105-079-0268BX	1/3 HP Programmed Motor – CRV Exhaust			X					
5	8105-079-0269BX	1/3 HP Programmed Motor – CRV Intake				X				
5	8105-076-0106BX	1/3 HP Programmed Motor – ERV Exhaust					X			
5	8105-076-0107BX	1/3 HP Programmed Motor – ERV Intake						X		
5	8105-076-0140BX	1/3 HP Programmed Motor – Mod. CRV Exhaust							X	
5	8105-076-0141BX	1/3 HP Programmed Motor – Mod. CRV Intake								X
6	8620-034	Motor Mount Band	X	X	X	X	X	X	X	X

SLEEVE COMPONENTS



Drawing No.	Part Number	Description	IWS-A	IWS-B	IWS-C
	S111-188-8 4½" Deep		X		
1	S111-195-8 7" Deep	Outer Sleeve Side		X	
	S111-202-8 12" Deep				X
	S111-187-8 4½" Deep		X		
2	S111-194-8 7" Deep	Outer Sleeve End		X	
	S111-201-8 12" Deep				X
	111-189-8 4½" Deep		2		
3	111-196-8 7" Deep	Inner Fan Sleeve Side		2	
	111-203-8 12" Deep				2
	111-186-8 3½" Deep		X		
4	111-193-8 6" Deep	Inner Sleeve Side		X	
	111-200-8 11" Deep				X
	111-185-8 3½" Deep		X		
5	111-192-8 6" Deep	Inner Sleeve End		X	
	111-199-8 11" Deep				X
6	105-1257-8	Grille Support Angle	2	2	2
	111-184-8 5½" Deep		X		
7	111-191-8 8" Deep	Outer Sleeve Side		X	
	111-198-8 13" Deep				X
	111-183-8 5½" Deep		X		
8	111-190-8 8" Deep	Outer Sleeve End		X	
	111-197-8 13" Deep				X
	ILG-10	Outdoor Louver Grille - Clear anodized	X	X	X
9	ILG-20	Outdoor Louver Grille - Medium Bronze	X	X	X
	ILG-30	Outdoor Louver Grille - Dark Bronze	X	X	X

RISER PLATFORM COMPONENTS



Drawing No.	Part Number	Description	IRP-3-*	IRP-6-*
1	127-420-X	Base Plate	X	X
2	141-384 3"	Base Rail	2	
	141-385 6"			2
3	112-447	Base Connection Plate	2	2
4	135-311-* 3"	Right Side Trim	X	
	135-314-* 6"			X
5	105-1263 3"	Side Support Angle	2	
	105-1264 6"			2
6	135-309-* 3"	Front Trim	X	
	135-312-* 6"			X
7	135-310-* 3"	Left Side Trim	X	
	135-313-* 6"			X

* *Exterior cabinet parts are manufactured with various paint color options. To ensure the proper paint color is received, reference the following codes:*

Beige	-X
White	-1
Buckeye Gray	-4

Bard®
SINCE 1914
Climate Control Solutions

Limited Warranty

For units applied within the United States, Puerto Rico, US Virgin Islands, Guam, Canada and Mexico

Limited Warranty To Original Purchaser:
Bard Manufacturing Company, Inc. Bryan, Ohio 43506 warrants to you, the original purchaser, that your Bard product will be free from defects in materials and workmanship when used under normal conditions from the installation date through the time periods outlined in the "Duration of Warranty" section (see reverse side).

Proof Of Purchase:
You must be able to show us the date on which you purchased your product when you make a claim under this warranty. Your owner's registration card filed online at www.wallmountwarranty.com or your contractor's invoice, bill of sale, or similar document is sufficient at time of warranty claim. This must be registered within 90 days of installation. If you can not show us the actual date of purchase, the time periods in this warranty will start on the date that we shipped your Bard product from our factory.

What This Warranty Does Not Cover: (Also see Duration of Warranty on reverse side.)
This warranty does not cover defects or damage caused by:

1. Alterations not approved by Bard; improper installation (including over or under sizing), improper repairs, or servicing; or improper parts and accessories not supplied by Bard.
2. Misuse or failure to follow installation and operating instructions (including failure to perform preventative maintenance) or limitations on the rating plate. This includes failure to use low ambient controls on all applications requiring compressor operation in cooling mode below 60F outdoor ambient.
3. Any corrosion from operation in a corrosive atmosphere (examples: acids, halogenated hydrocarbons or environmental conditions).
4. Parts that must be replaced periodically (such as filters, mist eliminators, ERV belts, pile seals, etc.).
5. Improper fuel or electrical supply (such as low voltage, voltage transients, power interruption, and units on generators with no brownout protection).
6. Accidents or other events beyond our reasonable control (such as storm, fire, or transportation damage).
7. Defects that happen after
   (a) Anyone has tampered with the product.
   (b) The product has been improperly serviced according to accepted trade practices;
   (c) The product has been moved from its original place of installation; or,
   (d) The product has been damaged by an event beyond Bard's control (See also No. 5 above).
8. Consequential damages (such as increased living expenses while the product is being repaired). Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.
9. This warranty has certain limitations for units installed on over-the-road trucks, vans and trailers. (See reverse side.)
10. Cost of service call at installation site to diagnose causes of trouble, labor to replace defective component or transportation costs for replacement parts.
11. This Limited Warranty does not apply to products installed or operated outside of the US, Puerto Rico, US Virgin Islands, Guam, Canada and Mexico. Units operated in coastal areas where the operating environment is exposed to airborne saline particles (typically 5 miles from coast line) must have corrosion protection or warranty claims will be declined on corrosion-based cabinet and part failures.
12. Bard does not endorse, approve or certify any online sales of its products through auction websites, online retailers, liquidators or any other method of online sales direct to consumers. Bard will not honor the factory warranty of any Bard equipment purchased over the Internet.

Your Responsibilities:
You are responsible for

1. Preventative maintenance of the product (such as cleaning coils and replacement of filters, nozzles and other consumable parts).
2. Ensuring that the instruction manual is followed for care and use of your product.
3. Ensuring that your product is installed by a competent, qualified contractor, following all local and national codes, and industry standards.

What Bard Will Do About A Defect:
Bard will either repair or replace the defective part only. Replacement parts may be reconditioned parts. The warranty for the repaired or replaced part will last only for the remainder of the warranty period for the original part.

Defective parts must be supplied to a Bard distributor who will then submit a parts warranty claim form. Credits are issued to the Bard distributor.

Bard will not pay or be responsible for labor or defective/replacement part transportation costs or delays in repairing or failures to complete repairs caused by events beyond our reasonable control.

What You Must Do

1. Tell your heating and air conditioning contractor as soon as you discover a problem and have the contractor make repairs.
2. Pay for all transportation, related service labor, diagnostic charges, refrigerant, refrigerant recovery and related items.

Service
If your product requires service, you should contact the contractor who installed it or the contractor that has been providing the product's preventative maintenance and repair service. You may find the installing contractor's name on the product or in your Owner's packet. If you do not know who that is, you should contact a competent, qualified contractor to make the repairs. If in doubt, you should contact the nearest distributor that handles Bard products (www.bardhvac.com). Please note that contractors and distributors that handle Bard products are independent contractors and distributors, and therefore, are not under the direction of Bard Manufacturing Company, Inc.

Only Warranty
There are no other express warranties. All implied warranties are limited in duration to the duration of the applicable written warranty made above.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation or exclusion may not apply to you.

Duration Of Warranty is limited to defects arising during the periods shown in the following table:

Model Number Series:	— Number of Years from Installation Date ① —			
	Compressor ④	Sealed System Components ②④⑤	All Other Functional Parts ③	Heat Exchangers
AIR CONDITIONERS W12A, W18A, W24A, W30A, W36A, W42A, W48A, W60A, W72A, W090A, W120A, W150, W180A, W18L, W24L, W30L, W36L, W3SA, W4SA, W5SA, Q36A, Q42A, Q48A, I30A, I36A, I42A, I48A, I60A	5	5	5	N/A
AIR SOURCE HEAT PUMPS W18H, W24H, W30H, W36H, W42H, W48H, W60H, C24H, C30H, C36H, C42H, C48H, C60H, T24H, T30H, T36H, T42H, T48H, T60H, T24S, T30S, T36S, T42S, T48S, T60S, Q24H, Q30H, Q36H, Q43H, Q48H, I30H, I36H, I42H, I48H, I60H, I36Z, I48Z, I60Z	5	5	5	N/A
ENVIRONMENTAL CONTROL UNITS W6RV, W6LV	5	5	1	N/A
AGRICULTURAL UNITS A36C and all HVAC equipment used in this application.	5	5	1	N/A
EQUIPMENT SHELTER UNITS MULTI-TEC, MEGA-TEC, FUSION-TEC, and all HVAC equipment used in this application.	5	5	1	N/A
GEOTHERMAL/WATER SOURCE HEAT PUMPS QW2S, QW3S, QW4S, QW5S, QC50 (No Compressor)	5	5	5	N/A
GAS/ELECTRIC WALL-MOUNT W24G, W30G, W36G, W42G, W48G, W60G, WG3S, WG4S, WG5S	5	5	5	10
ACCESSORIES Factory/Field Installed Bard Ventilation and Heater Packages, Bard branded Thermostats/ Temperature Controllers, UV-C LED Light Kits, LC6000, LV1000, MC4002, DC3003, TEC40, BG1000, PGD, PGDX, MC5300, MC5600, Humidistats, C02 Controllers, add-on controller/thermostat cards and all other field-installed accessories not listed separately	N/A N/A N/A N/A	N/A N/A N/A N/A	5 5 1 1	N/A N/A N/A N/A

① For equipment that does not have an online warranty registration, the warranty period starts when the product was shipped from the factory.

② Heat transfer coils (refrigerant to air coils for air source and coaxial coils for water source units) are covered for leaks for 5 years. Physical damage to air side coils resulting in leaks or insufficient airflow, or fin deterioration due to corrosive atmosphere (such as acids, halogenated hydrocarbons, agricultural or coastal environmental conditions) are not covered. Leaks in coaxial coils due to freezing of the coils are not covered. Copper coaxial coils for QW are not warranted for ground water/open loop installations.

③ Functional parts warranty is 1 year for all telecommunication, electric switch stations, pump stations, agricultural use, and similar applications. This also applies to all OTR (over the road) applications.

④ All OTR (over the road) applications that are moved from one location to another:
Factory Warranty applies up to the point of initial start-up and test at all OEM manufacturing locations or subsequent outfitting facility. Once it goes into OTR service, the warranty expires immediately for compressor and sealed system components. This OTR exemption does not apply to relocatable classrooms, construction, or office trailers.

⑤ Factory-coated coils have a "5" year warranty in corrosive environments that are listed as approved.

Internet Resources

Recognized as a leader in the HVAC industry, Bard combines quality products and outstanding service with innovation and technological advances to deliver high-performance heating and cooling products around the world. Please visit www.bardhvac.com for additional information regarding warranty and product information.

Literature Assembly
911-0616-2
BOOK 2 OF 2

Contains the following:

2100-034G	Users Guide

USER'S APPLICATION GUIDE AND TECHNICAL PRODUCT OVERVIEW

Manual: 2100-034G
Supersedes: 2100-034F
Date: 12-17-20

Bard Manufacturing Company, Inc.
Bryan, Ohio 43506
www.bardhvac.com

Bard®
SINCE 1914

BARDHVAC.COM

Climate Control Solutions

General Information

The User's Application Guide covers a wide range of heating and cooling products manufactured by Bard Manufacturing Company. It is intended to be a general guide for care and operation of typical systems and covers the most important features you should be aware of and are responsible for as the user of the equipment.

Because our product offerings are so varied and can be equipped with many features and options, it is not possible to cover all aspects of what your specific system may be configured for. Some systems may be quite simple in features to provide basic cooling and possibly heating, while other systems may also incorporate various ventilation technologies, dehumidification circuits and many different internal controls as well as room temperature controls. Therefore, you should request a detailed operation sequence and explanation of any special features from your installer and/or service company and also have them instruct you as to any routine maintenance procedures you are responsible for.

Contents

Overview

The User's Application Guide and Technical Product Overview covers the following products:

WALL MOUNT
Air Conditioners
and Heat Pumps

I-TEC®
Air Conditioners
and Heat Pumps

Q-TEC™
Air Conditioners
and Heat Pumps

The User's Application Guide and Technical Product Overview covers the following topics:

- Documentation provided by Bard for proper use of your new product.
- Unit installation guidelines.
- Routine unit maintenance.
- Unit operation.
- Unit troubleshooting.

Please use this guide as a general overview regarding unit application, maintenance and troubleshooting. Refer to product installation instructions and supplemental documentation provided with the unit or go to www.bardhvac.com for detailed individual product information.

Documentation

There are two sources of valuable information for your new Bard product:

- Documentation provided with your unit, normally located inside the unit control panel during shipping. This information should be saved once the unit is installed for future maintenance reference or to answer questions about equipment after installation.
- Documentation provided on the internet at www.bardhvac.com. This may be accessed from a desktop computer at the office, a laptop or an internet-capable cell phone at the worksite. Up-to-date documentation is available, along with specification sheets and other valuable resources regarding your new Bard product.

Unit Literature Assembly – Documentation Provided with Your Unit

Bard products are shipped with documentation that when used by a technician with cooling and heating knowledge, can ensure that your product is installed safely, performs optimally and achieves the longest life cycle possible.

Shipped literature includes the following:

- User Manual (this document)
- Installation Instructions
- Replacement Parts Manual
- Wiring Diagrams
- Warranty Information

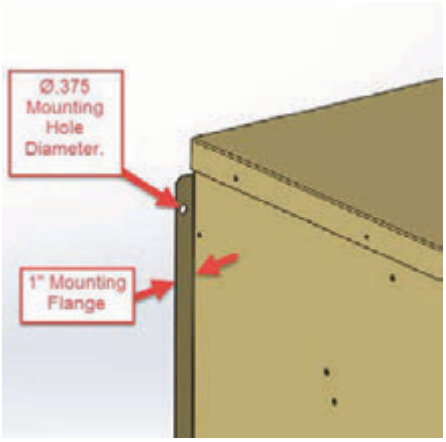
Installation plays a key part in unit functionality, performance and safety. Product securing and placement, duct design and supply/return location, electrical routing and condensate and defrost drainage all play key roles in making sure a unit will perform per the design specifications.

WALL MOUNT Products – Mounting the Product on a Wall Surface

Outdoor products are normally mounted to an exterior wall surface, including brick, cement block, metal or wood construction. These products are labeled as "WALL MOUNT" units. **Before installation begins, the wall surface should be inspected by a construction professional to ensure it will support the weight of the unit and accessory items.** Approximate weights are available from the product specification sheet, and a safety factor should be designed into the installation. Typical fasteners to attach the unit to the wall using the integrated mounting flanges on both sides of the unit include tap cons, bolts, studs and other fastening devices. The selection of the fasteners to be used needs to be reviewed by a construction professional and decided upon based on the wall construction and fastener strength required. It is important to follow all guidelines and procedures covered in the installation instructions manual provided for the product.

Built-In Mounting Flange Detail:

Outdoor WALL MOUNT products include a mounting flange that is part of the cabinet construction. Ø.375" holes are provided for unit mounting unless specified otherwise in installation instructions.



Specification Sheets:

Unit specification sheets provided at www.bardhvac.com include basic unit weights and dimensions (see example below). Ventilation options and other accessories must be added into the total weight of the unit.

Specification Sheet Example

w/Filter (Rated-Wet Coil)	
Filter Sizes (inches) STD.	16x25x1
Basic Unit Weight-LBS.	318
Barometric Fresh Air Damper	3.5
Blank-Off Plate	1.0
Motorized Fresh Air Damper	10.0
Commercial Room Ventilator	69.0
Economizer	69.0
Energy Recovery Ventilator	50.0

WALL MOUNT Products – Clearances for Outdoor Condenser Fan Airflow

Unit placement and avoidance of obstructions outside the structure are very critical to unit performance. **Avoid installing the unit in areas that will obstruct outdoor condenser fan airflow or create "pockets" of heated air being exhausted from the condenser coil.** Solid construction fences should not be placed directly in front of the unit without provisions for condenser airflow. Solid exterior walls need to be spaced as far away from units as possible to avoid pockets of heated air causing condenser air recirculation.

Solid barriers located too close to the face or side surfaces (condenser fan inlet and outlet) of the WALL MOUNT can both impede airflow and force heated air to short circuit (be returned) from the condenser outlet to the condenser inlet. Either condition will effectively raise the condensing temperature and pressure reducing cooling capacity and efficiency. In extreme cases, the unit may fail to operate due to high refrigerant pressures inside the unit, and compressor and/or fan motor failure may occur. Clearances given in installation instructions ensure components can be serviced and maintenance can be performed when needed.

National and local electrical codes must be reviewed before unit installation.

Always use common sense when installing products, follow unit clearances given in the installation instructions and contact local Bard distributors when additional knowledge is needed regarding unit clearances for proper unit functionality.

WALL MOUNT Products – Clearances for Indoor Supply and Return Airflow

The Bard unit should be placed in an area where the supply (leaving conditioned air) and return (unit air intake) air paths will be unrestricted. Avoid placing objects in the structure within 24" of the return (unit air intake) grille. Avoid placing objects directly in the path of the supply (conditioned) air grille. This will inhibit the "throw" of the supply air throughout the structure and reduce the cooling and/or heating ability of the unit; in extreme cases, this may cause evaporator coil freezing issues. Supply air must be able to freely circulate conditioned air throughout the structure. Adjustment of supply grille deflectors is often necessary to ensure proper room circulation.

Ducted applications should not exceed the rated duct static pressures given in the unit specification sheets. Special requirements for duct construction and distances to combustible materials need to be followed per the installation instructions when electric heating is used.

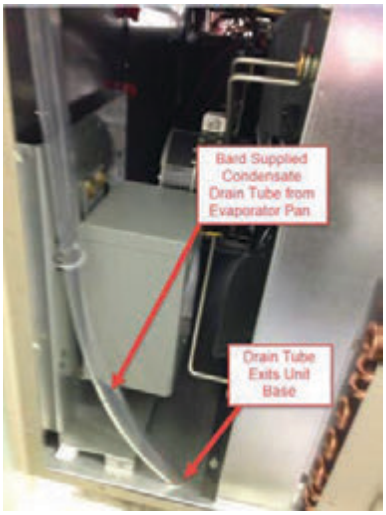
WALL MOUNT Products – Condensate and Defrost Drainage

Condensate drainage for air conditioning units needs to be planned before installation. Your new Bard WALL MOUNT product includes provisions to allow condensate water to exit the bottom of the unit. If condensate water is to be routed away from the unit, adequate drain sizing needs to be provided to allow proper drainage for condensate water generation. During normal air conditioning operation, large amounts of condensate water is generated inside the unit as moisture is extracted from the supply air. This is collected in an evaporator pan and drained to either a drainage system (indoor products) or outside the unit cabinet (outdoor products). Evaporator drain traps are not necessary for any of our wall mounted outdoor products, and the use of "standing water" U-shaped traps may be prone to freezing in certain climate zones.

Defrost water drainage from heat pump units needs to be planned before installation. During seasons requiring heating operation, the unit will need to warm the condenser coil to remove frost build-up (defrost). **Outdoor heat pump products include holes in the unit base under the condenser coil for proper water drainage when in the heating defrost cycle. Avoid placing the unit on a pad or blocking the base drainage holes under the condenser coil without proper allowances (6" recommended) for water drainage due to damage caused by freezing conditions.** Without proper drainage, defrost water may freeze causing ice build up and damage the lower portion of the condenser coil.

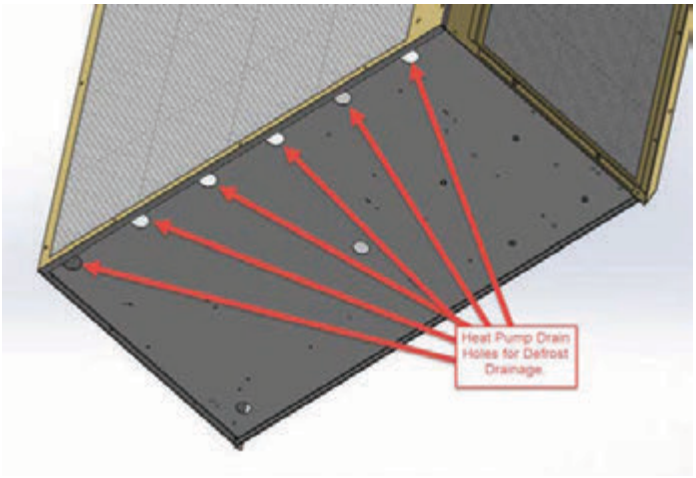
Condensate Water Drainage:

Unit condensate water exits the base of the unit during cooling operation.



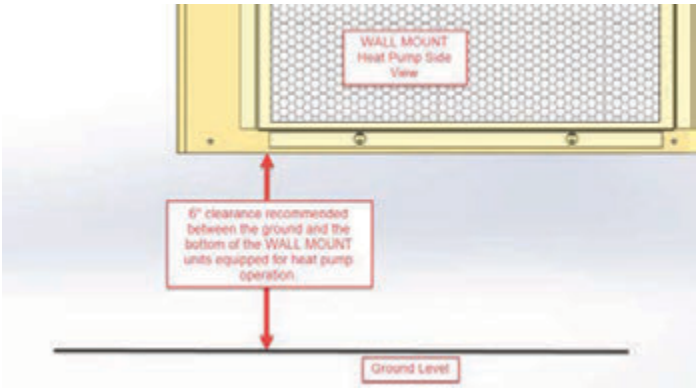
Defrost Water Drainage:

Holes are provided in the front of the unit base for heat pump condensate water drainage.



Defrost Water Drainage:

6" clearance is recommended under WALL MOUNT Heat Pump products to allow proper defrost water drainage.



I-TEC and Q-TEC Products – Installing the Product Inside a Room

I-TEC

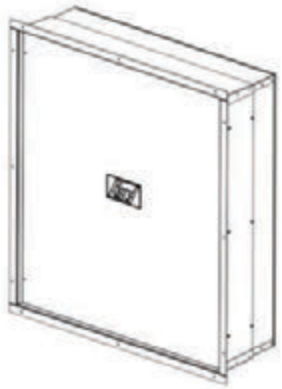
Q-TEC

Indoor products are normally supported by the floor surface and are adjacent to an interior wall surface, including brick, cement block, metal or wood construction. These products are normally labeled as "I-TEC" or "Q-TEC" units. **Before installation begins, the floor surface should be inspected by a construction professional to ensure it will support the weight of the unit and accessory items.** Approximate weights are available from the product specification sheet, and a safety factor should be designed into the installation.

A sheet metal sleeve is normally installed in the wall allowing vent and condenser fan air to enter and exit the unit. Different sleeve depths are available for installation into various wall depths. Typical fasteners to attach the sleeve to the outside surface of the wall include tap cons and other fastening devices. The I-TEC or Q-TEC unit is then slid up to the wall surface and connected to the sleeve using screws. Trim kits are available to enclose gaps between the wall surface and the unit. A louver grille is used to cover the external wall opening and fasteners used during sleeve installation.

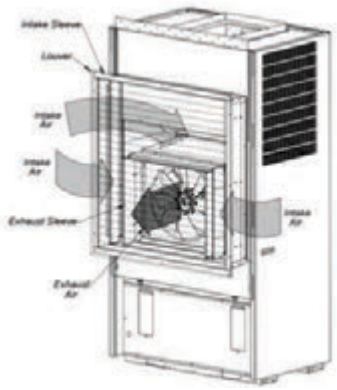
Wall Sleeve:

Wall sleeves allow for outdoor air to enter and exit the unit inside the room.



Air Paths:

Air paths through the unit allow for cooling operation and fresh air to enter the structure (I-TEC shown).



Louver Installation:

Outdoor louvers provide an esthetically pleasing look to the installation and cover the unit opening (I-TEC shown).

I-TEC and Q-TEC Products – Clearances for Outdoor Condenser Fan Airflow

Solid barriers located too close to the face of the outdoor louver of the I-TEC or Q-TEC can both impede airflow and force heated air to short circuit (be returned) from the condenser outlet to the condenser inlet. Either condition will effectively raise the condensing temperature and pressure reducing cooling capacity and efficiency. In extreme cases, the unit may fail to operate due to high refrigerant pressures inside the unit, and compressor and/or fan motor failure may occur. It is recommended to allow 15' (457.2 cm) in front of unit louver for proper condenser airflow. Always use common sense when installing products, follow unit clearances given in the installation instructions and contact local Bard distributors when additional knowledge is needed regarding unit clearances for proper unit functionality.

I-TEC and Q-TEC Products – Clearances for Indoor Supply and Return Airflow

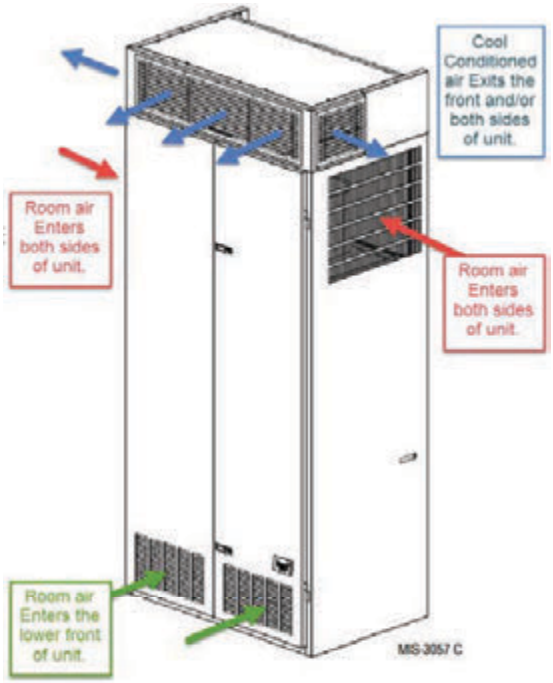
The Bard unit should be placed in an area where the supply (leaving conditioned air) and return (unit air intake) air paths will be unrestricted. Avoid placing objects inside the room within 24" of the return (unit air intake) louvers or grille. Avoid placing objects directly in the path of the supply (conditioned) air grilles. This will inhibit the "throw" of the supply air throughout the structure and reduce the cooling and/or heating ability of the unit and in extreme cases may cause evaporator coil freezing issues. Ducted applications should not exceed the rated duct static pressures given in the unit specification sheets. Special requirements for duct construction and distances to combustible materials need to be followed per the unit installation instructions when electric heating is used.

I-TEC Air Path

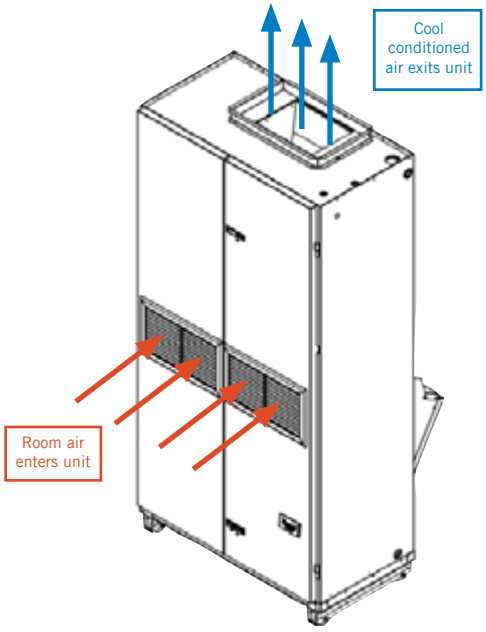
The I-TEC product has been engineered for extremely quiet unit operation and has multiple air paths for air entering and exiting the unit. Room air enters the upper sides to be conditioned (cooled) inside the unit and exits the unit top. The unit will either be ducted to supply registers or have a supply air plenum box installed. A supply air plenum box allows quiet operation without ducting the air leaving the unit. Room air also enters the bottom of both front doors during ventilation operation.

Q-TEC Air Path

The Q-TEC product has been engineered for efficient, economical unit operation and has a mid-mounted front grille for air entering the unit. The unit will either be ducted to supply registers or have a supply air plenum box installed. A supply air plenum box allows quiet operation without ducting the air leaving the unit.



Typical I-TEC Installation



Typical Q-TEC Installation

The I-TEC and Q-TEC product installation instructions contain additional information regarding unit air paths and required clearances. This information may be accessed at www.bardhvac.com.

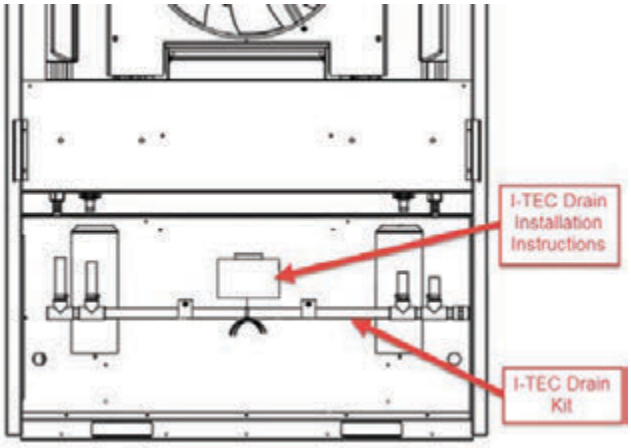
I-TEC and Q-TEC Products – Condensate Drainage

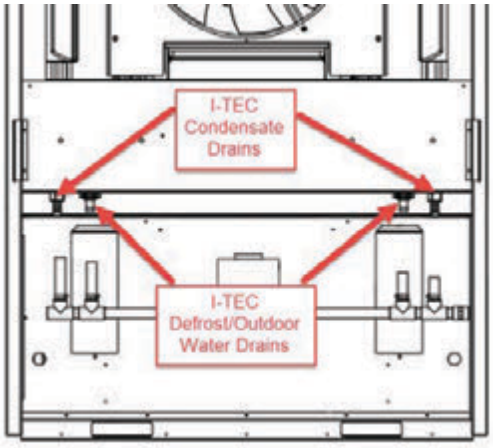
Condensate drainage for Bard indoor cooling units is a very important part of unit installation. During normal air conditioning operation, large amounts of condensate water are generated inside the unit as moisture is extracted from the supply air. This is collected in an evaporator pan and needs to be drained to an external drainage system. Your new Bard product includes provisions to allow condensate water to exit the unit and fittings will need to be field supplied to connect the unit drain to the building. Adequate drain sizing needs to be provided to allow proper drainage for condensate water generation and restriction in drain lines should be avoided. Evaporator drain traps are not necessary unless required by local codes.

Defrost water for heat pump operation and outdoor water entering the condenser area also needs to be drained out of the unit. The I-TEC product uses a combined defrost and outdoor water drainage system. The Q-TEC has a combined defrost and evaporator drain connection unless an optional in-wall drain box is used. Outdoor water exits the Q-TEC through the wall sleeve. Follow all instructions provided in the unit installation instructions regarding drain connections and sleeve installation to avoid water leakage inside the building or structure.

I-TEC Drain System:

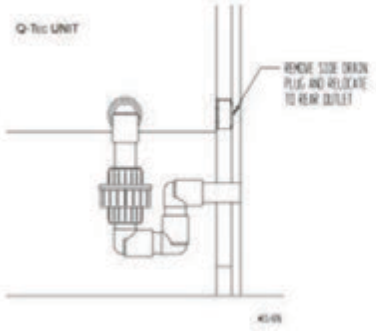
The I-TEC drainage system consists of a manifold drain kit that combines all drains behind the unit to allow connection to the building system.



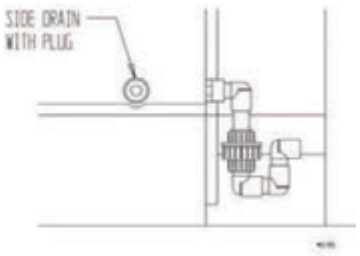


Q-TEC Drain System:

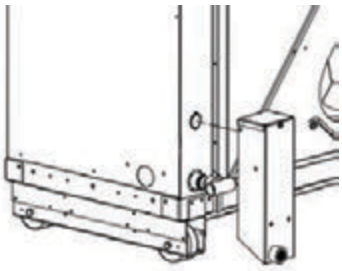
The Q-TEC drainage system consists of a lower right side or lower right rear connection fitting. An optional in-wall drain box may also be purchased as an accessory that allows separate evaporator and defrost water drainage.



Lower Right Side Drain



Lower Right Rear Drain



Optional In-Wall Drain Box

All Products – Power Supply Verification

It is very important to follow all electrical and mechanical safety guidelines and instructions provided in the product installation instructions. Failure to do so may result in death, injury or product damage.

A proper power supply to your new Bard unit is very important. Be sure to verify the following with a multi-meter or other power measuring device before applying power to your Bard product.

Field-Supplied Voltage

Electrical voltage ratings and proper voltage operating ranges are provided in the unit specification sheets and installation instructions. It is important that power supplied to the unit stay in the specified operating voltage range. Voltage above or below the minimum operating value given could result in improper unit startup, unit shutdown, low unit performance, improper thermostat and unit controller operation, compressor damage and premature failure of functional parts. As a general guideline, it is always best if the power source for the unit supplies the nominal electrical rating value given in the specification sheets, installation instructions and unit serial plate for the product being used. To do so will provide the best unit performance possible from your new Bard product.

Single and Three Phase Power

Bard products are available in single and three phase power options. It is important to connect the proper phase listed on the unit serial plate. Three phase power is often used to reduce energy usage, and units rated for 3 phase operation are equipped with a phase monitor safety device. The phase monitor will not allow unit operation with improper phase connection and a red LED light on the monitor indicates phase wiring issues. Connecting 3 phase power to a single phase unit will result in component damage and improper unit operation. Connecting single phase power to a 3 phase unit will also result in component damage and improper unit operation.

Hertz (Frequency)

Bard products are available in 50hz and 60hz power options. It is important to connect power with the proper hz value listed on the unit serial plate. 60hz power is often used in the United States and Canada and units rated for 50hz operation are normally for international sales outside of this area. Connecting 50hz power to a 60hz unit not rated for 50hz operation may result in component damage and improper unit operation. Some equipment may be rated for 50/60hz operation. Review the unit specifications and installation instructions for further information regarding the power requirements of the unit.

The product installation instructions and unit specification sheets contain additional information regarding unit electrical data. This information may be accessed at www.bardhvac.com.

Unit Maintenance

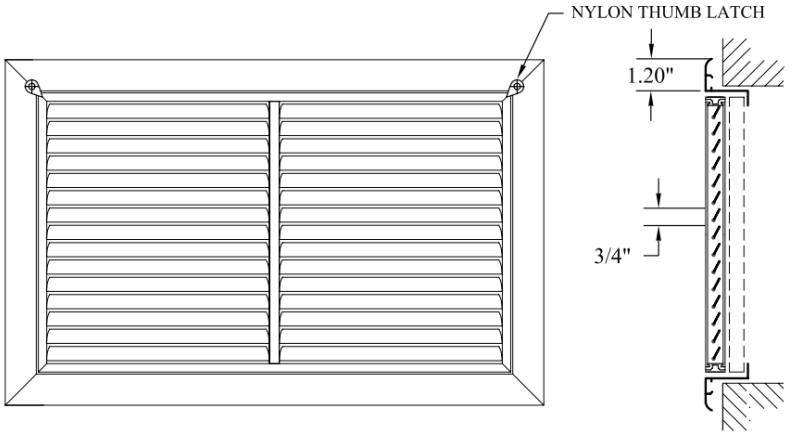
All Products – Filters and Filter Servicing

All Bard products contain air filters that must be cleaned or replaced on a regular basis.

Keeping air filter(s) clean is the single most important responsibility of the user of the equipment. Each type of system must be equipped with an air filter(s) in the indoor circulating air system to clean the air, keep the system itself clean for peak efficiency and capacity and prolong the useful life of the equipment. DO NOT operate the system without the proper air filters. Filters should be inspected at least monthly and replaced or cleaned (depending on type) as needed. The useful life of an air filter can vary widely depending upon application and use of the equipment, and it is critical to monitor filter condition and establish an acceptable maintenance schedule. Failure to do so will increase operating and repair costs, decrease capacity and efficiency and shorten the service life of the equipment. A common symptom of a dirty filter in the cooling mode is a freeze-up of the indoor coil. The air filters used may be a disposable (throwaway) type or may be a cleanable type that can be thoroughly cleaned, rinsed and reused many times. It is important to make sure that the correct filter size and type for your system is always used. If there is any question as to acceptable filter size or type, review the installation instructions for the specific equipment involved, if available. Otherwise, consult with your installing dealer or service company. Most equipment can have the filters inspected and serviced by the user with no problems. In some instances, because of equipment design or specific installation conditions, it may be necessary to have this procedure done by a qualified service company. Have your installer or service company show you where the filter(s) are and demonstrate the service procedure or make arrangements for them to provide this service on an as-needed basis.

Outdoor Unit Wall Mount Room Air Filters

Wall mount filters are normally accessed from the outside of the building. Bard does offer a return air grille with a filter frame built-in for indoor filter access. The return air filter grille is not acceptable as the only source of filtration if vent options are installed in the wall mount unit.



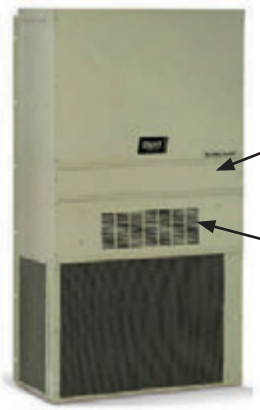
Return Air Filter Grille:

Bard offers the RFG return air filter grille, which may be used in applications where outdoor air is not brought into the structure through vent options. If vent options are used, the filter tray inside the Bard Wall Mount unit must be used.

The product installation instructions contain additional information regarding unit maintenance. This information may be accessed at www.bardhvac.com.

WALL MOUNT Products – Filters and Filter Servicing

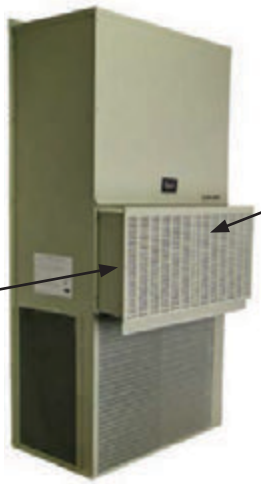
The built-in filter tray and room air filters in the wall mount are located in the middle of the cabinet below the indoor blowers. Units with vent options will have a washable screen behind the vent intake panel.



Filter Door:
The unit room air filter is located behind this panel for units without a vent hood.

Vent Intake Panel

Vent Hood Door:
The unit indoor filter is located behind this panel for units with a vent hood. The hood contains a washable pre-filter that needs to be cleaned regularly.



Vent Intake Panel

Filter Door:
The unit room air filter is located behind this panel.

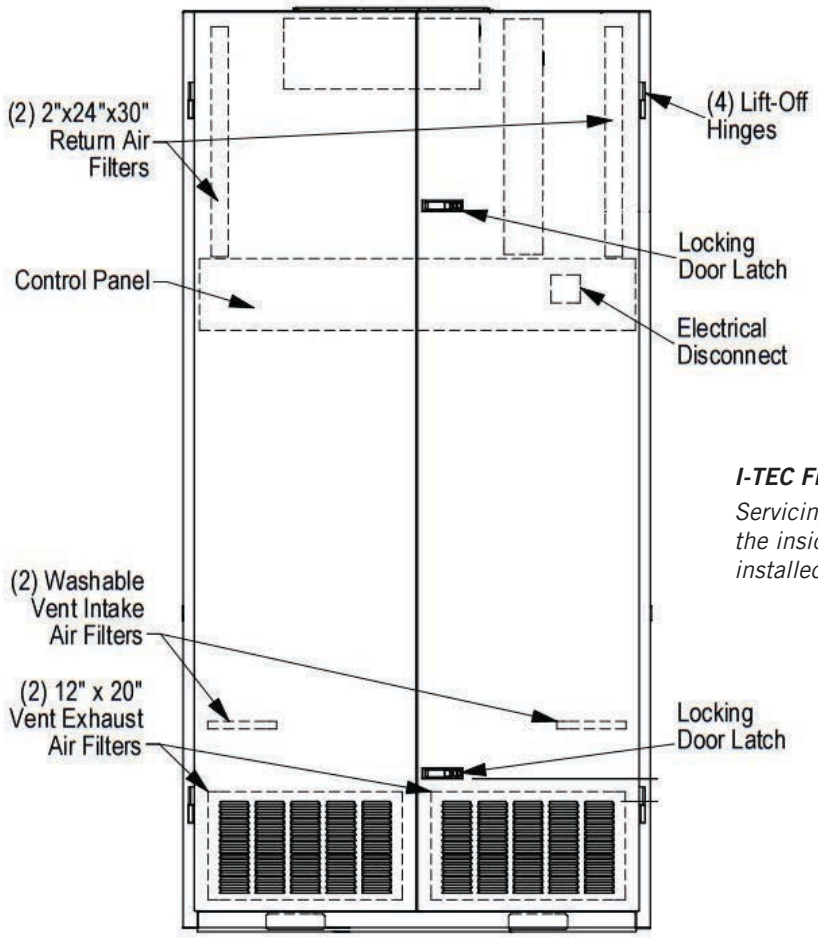
I-TEC Indoor Products – Filters and Filter Servicing

The I-TEC indoor air conditioners and heat pumps have multiple filters that must be maintained and inspected when servicing the unit. Filters play an important part in proper unit operation and prevent dirt and dust buildup inside the I-TEC and the room the unit is installed in. To access the unit filters, open the front hinged doors by unlocking the door latches. The doors fold outward and are on hinges with lift-off pins. Use care when opening doors. If doors are lifted off of the hinge pins, use care as the dense insulation used for sound reduction causes the doors to be heavy.

The upper section of the unit contains two 2" x 24" x 30" throwaway filters as standard with every unit. MERV ratings of the filter are available up to MERV13. These filters filter the air used for cooling inside the classroom or structure and should be changed regularly.

If the unit has an air intake vent option installed, two 1" x 12" x 20" filters are located in the lower section of the front doors behind the louvers. These filters help keep the vent option clean and operating properly.

Two washable filters are also installed in the air intake vent option. These should be inspected during servicing and cleaned when necessary. The washable filters are used to remove dirt and dust from outdoor air that is entering the vent area. If at any time these filters are damaged, they must be replaced with Bard-approved filters.



I-TEC Filter Locations:

Servicing the filters in your unit will help keep the inside of the unit clean and also the area it is installed in.

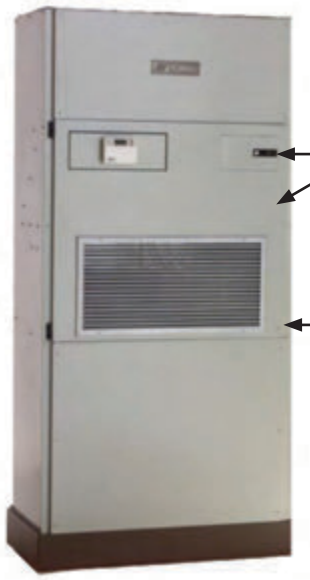
The I-TEC product installation instructions contain additional information regarding unit maintenance. This information may be accessed at www.bardhvac.com.

Q-TEC Indoor Products – Filters and Filter Servicing

The Q-TEC indoor air conditioners and heat pumps have two room air filters that must be replaced when servicing the unit. Filters play an important part in proper unit operation and prevent dirt and dust buildup inside the Q-TEC and the room the unit is installed in. To access the unit filters, open the front hinged door by unlocking the door latch. The door folds outward and is on hinges with lift-off pins. Use care when opening doors. If the door is lifted off of the hinge pins, use care as the insulation and louver grille cause the door to be heavy.

The upper section of the Q-TEC contains two 1" throwaway filters standard with every unit. These filters filter the air used for cooling inside the classroom or structure and should be changed regularly.

QWS Unit



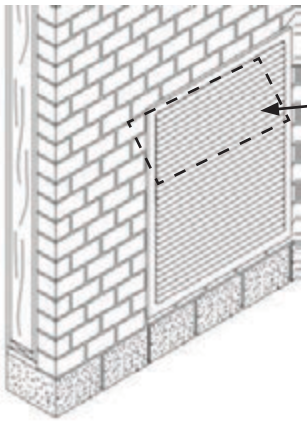
Q-TEC Filter Location:

The Q-TEC room air filters are located behind this hinged door. Unlock door latch and remove screw to open door.

Screw location

QH/QA Unit

Filter locations



Pre-filter location

The Q-TEC will have a permanent pre-filter installed inside the wall sleeve if air intake vent options are inside the unit. The pre-filter must be inspected and cleaned when necessary. The easiest way to remove the pre-filter is through the outdoor louver. Clean the pre-filter with soapy water.

The Q-TEC product installation instructions contain additional information regarding unit maintenance. This information may be accessed at www.bardhvac.com.

All Products – Coil Cleaning

The outdoor coil must be kept clean and free of any airborne debris, which can accumulate over time. Large volumes of air are circulated over the coil, and airborne debris such as lint, dust, materials shed from trees, paper or other types of airborne material that can become airborne can collect on the entering coil surface. The outdoor coil must dissipate heat during the cooling mode and for a heat pump, also absorb heat during the heating mode. If the coil is dirty and matted with debris, the airflow across the coil will be reduced causing poor performance, increased operating run time and associated utility bills and in extreme conditions can shorten the useful life of the equipment.

Depending on the specific equipment involved, the surface that can accumulate debris can be on the opposite side that is exposed to view when standing in front of the machine. Closely review the machine when operating to see which direction or path the airflow takes as it moves through the machine. If the air inlet side of the coil is hidden, try to observe the back (hidden) side by looking into the side grilles, using a flashlight if necessary. While the user of the equipment needs to be aware of the potential of clogging of the outdoor coil surface, actual cleaning of the outdoor coil should not be attempted under most circumstances. If the user should attempt this procedure on their own, never do so without first having the installing dealer or service company instruct you in the proper procedure and technique.

WARNING: Do not open or enter the equipment without first turning off the electrical service disconnect. Failure to do so can result in personal injury due to moving parts and/or electric shock hazard resulting in death.

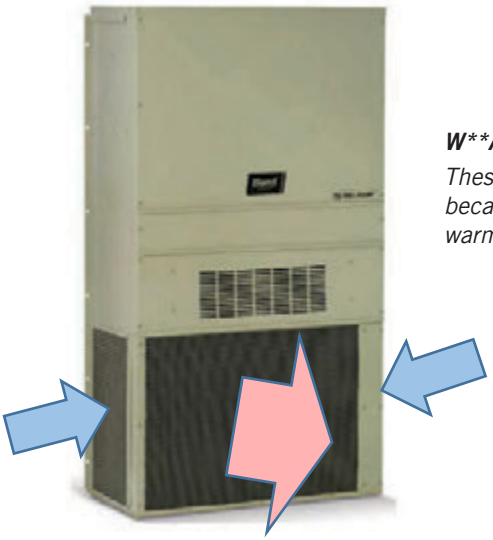
Other conditions that can cause reduction of airflow across the outdoor coil are flowers, shrubbery or other growth too near the outdoor coil air inlet and outlet openings. These living things, especially as they mature and grow, will be just as effective in blocking the airflow and create the same problems as will stacking things against the equipment. These conditions can be easily managed and controlled by the user, as they do not require actually entering into the equipment enclosure, which should only be done by qualified service technicians.

Equipment Corrosion Protection

1. Avoid having any lawn sprinkler spray directly on the equipment, especially if from a brackish water source.
2. In coastal areas or corrosive environments, locate equipment as far away from the corrosion source as feasible. Units exposed directly to salt spray should be coated by a secondary protective coating operation to reduce corrosion on copper tubing, fasteners, motors and other metal parts. Coils should be ordered with a corrosion protective coating. Contact Bard for coating options.
3. Frequent cleaning and waxing of the cabinet using a good automobile polish will help extend its original appearance and protect painted surfaces.

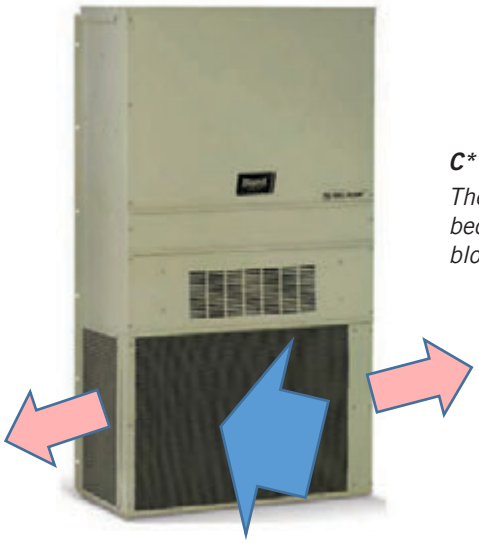
The product installation instructions contain additional information regarding unit coil cleaning. This information may be accessed at www.bardhvac.com.

All Products – Condenser Airflow



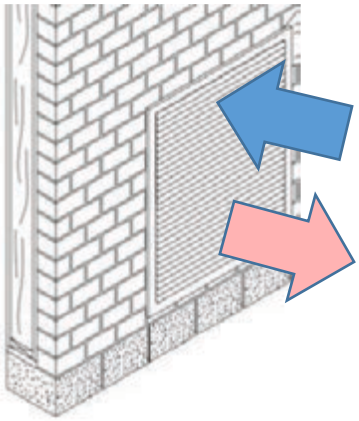
W**A, W**H, T**H, T**S, W*RV Wall Mount Units:

These units are called "blow through condenser airflow" units because they draw cool outdoor air from the sides and blow the warm condenser air exiting the coil through the front grille.



C**H Wall Mount Units:

These units are called "draw through condenser airflow" units because they draw cool outdoor air in the front through the coil and blow the exiting warm condenser air through the unit sides.



I-TEC and Q-TEC Units:

These units draw the cool outdoor air through the top section of the wall louver and exhaust the warmer condenser air out of the lower section of the louver. I-TEC units also draw a small amount of air through the outer right and left side of the louver.

Air-to-Air Cooling Products (Air Conditioners)

The cooling mode operates similar to a refrigerator, removing heat from inside the conditioned space and rejecting it outside of the space being controlled. There are three main parts of the system:

1. The evaporator (indoor) coil where cold refrigerant absorbs heat from the air, which circulates from the conditioned space through the machine and is returned to the space at a lower temperature and with some of the humidity (moisture) removed. The moisture exits through a condensate drain system. A motor/blower assembly moves the indoor air through the system.
2. The compressor, which is a sealed pump that moves the refrigerant through the system.
3. The condenser (outdoor) coil where the heat that was absorbed from the indoor space is discharged to the outdoor environment. A motor/fan system moves the outdoor air across the condenser coil. A properly sized air conditioner cannot cool a structure off rapidly and instead will pull down the temperature slowly. It also will remove a certain amount of moisture (humidity) from the circulating airstream in the process. It may take several hours to pull down a hot, moist building or structure on initial startup or anytime the system has been turned off for a long period of time. It is generally best to set the thermostat at a comfortable temperature and let it control the system as needed, rather than turning it on and off.

Moisture (humidity) removal with a conventional air conditioner (cooling) unit, or heat pump when operating in the cooling mode, is not directly controlled and is a by-product of the unit operating to control temperature in response to the temperature (thermostat) control device. **Oversized equipment can easily control temperature but will have short run-times, thus reducing its ability to remove moisture from the circulating air stream.**

There are also many additional influences that can affect humidity levels within the conditioned space such as laundry appliances, cooking, showers, exhaust fans and any other items that can generate moisture or affect its removal from the space. Therefore, while operation of the air conditioning or heat pump system in the cooling mode will remove some amount of moisture as it reduces the air temperature, precise humidity regulation in the conditioned space cannot be assured and additional equipment such as a dedicated dehumidifier may be required.

Air-to-Air Cooling and Heating Products (Heat Pumps)

A heat pump is a refrigerant-based system that has additional components and controls that both heats and cools using a compressor for both modes of operation. Most heat pumps will also be equipped with some amount of electric heat to supplement the heating capacity of the compressor system on an as-needed basis. This operation is entirely automatic and is controlled by the indoor thermostat and possibly also an outdoor thermostat.

Cooling Mode

The cooling mode of a heat pump is exactly the same as that described for an air conditioner in the above section.

Heating Mode

The system operates in reverse cycle, meaning that it absorbs and moves heat from the outdoors and transfers it indoors to be rejected into the circulating air stream. Even though it seems cold to humans, there is usable heat that can be extracted efficiently from the outdoor air down to 0ºF, although the colder the air is there is less heat to extract and the operating efficiency is diminished.

Defrost Cycle

When operating in the heating mode, the outdoor coil will be colder than the outdoor air that is forced over it by the fan system. When the outdoor air temperature is above approximately 40°F, moisture can accumulate on the coil and it will drain down and out the base of the unit. As the air temperature gets below approximately 40°F, the coil temperature will start to drop below 32°F, and frost or ice will begin to form on the coil.

An automatic defrost system keeps track of system run time when the outdoor coil temperature is in the freezing zone and will initiate a defrost cycle at the appropriate time. The unit continues to operate during the defrost cycle, but the outdoor fan motor will stop and the reversing valve will shift positions to flow hot refrigerant gas through the outdoor coil to melt the accumulated frost. Water will start to drain freely from the unit, and steam may be emitted from the unit.

The length of the defrost cycle will vary depending upon actual outdoor temperature, humidity levels and amount of accumulated frost. It could range from 1-2 minutes up to but not exceeding 8 minutes. When the defrost cycle

terminates, the reversing valve will shift back to heating mode and the outdoor fan will restart. There is typically a large puff of steam emitted as the fan restarts. When the heat pump shifts from cool to heating mode, from heating to cooling mode and especially during defrost cycles, there will be a pressure transfer sound heard as the reversing valve redirects the flow of refrigerant. This is commonly described as a hissing noise and is a normal sound for this type equipment.

For air source heat pumps, it is important to keep heavy snow from accumulating around the machine to the point of blocking the inlet and outlet openings to the outdoor coil section. For wall mounted or other equipment that is elevated, this should not be a factor; but for equipment installed on or near the ground, this can be an issue in areas prone to heavy and/or blowing snow. The air source heat pump cannot operate effectively and efficiently when snowbound just as a car cannot function well in heavy snow conditions.

Water-to-Air Cooling and Heating Products (Geothermal Heat Pumps)

These types of heat pumps are also commonly referred to as water source or geothermal systems. Just like the air source heat pump, they are refrigerant-based systems that both heat and cool using a compressor for both modes of operation. The primary difference is that the system uses water or antifreeze-protected water solution instead of an air-cooled outdoor heat transfer coil, and there is no outdoor motor/fan system but instead a water pump to provide adequate water flow to the system.

Cooling Mode

The cooling mode of a water-to-air heat pump is exactly the same as that described for an air conditioner in the previous Air Conditioner section, except that the outdoor coil uses water instead of air for the heat transfer medium.

Heat Mode

The system operates in reverse cycle, meaning that it acquires and moves heat from the water supply flowing through the water to refrigerant coil and transfers it indoors to be rejected into the circulating air stream.

Most water-to-air heat pumps (but not all) will also be equipped with some amount of electric heat to supplement the heating capacity of the compressor system on an as-needed basis. This operation is entirely automatic and is controlled by the indoor thermostat.

Because of the design of water-to-air heat pumps and the water temperatures involved, no defrost system is required as in air-to-air heat pumps.

Water Supply Systems

Depending upon the type and application of the water-to-air heat pump, the water side of the system could be one of the following:

1. Individual closed loop buried in a trench or vertical bore hole(s).
2. Individual loop submerged in a pond.
3. Water supplied from a well and discharged into pond, stream, ditch or another well.
4. Water supplied from a boiler/tower system, typically only in larger multi-unit installations.

Dehumidification and Ventilation Operation

Dehumidification (Air-to-Air or Water-to-Air Systems)

Many Bard systems, typically those used in schools or other commercial applications, have a dedicated dehumidification capability by having a special additional refrigeration circuit (factory-installed option only) in addition to the basic system. These special systems, sometimes also referred to as hot gas reheat, are designed to control humidity on demand from a humidity controller much the same as the basic cooling and/or heating system is controlled by a wall thermostat. Consult your installer and/or service company to determine if your installation has any of these devices and for any instructions or maintenance requirements you should be aware of as the user.

Ventilation Options (Air-to-Air or Water-to-Air Systems)

All Bard systems are available with factory-installed vent options. Most units can have ventilation field installed after unit installation.

Ventilation has multiple purposes:

- Outside air intake for occupied structures
- Positive pressurization
- Energy savings when outdoor air can be used for cooling
- Agricultural use of bringing in outdoor air and exhausting room air
- Equipment and electronics ventilation

Review product specifications and manuals for more details regarding available ventilation options and features. Product documentation is shipped with the product and also available at www.bardhvac.com.

All Units – Troubleshooting

Your Bard product is made to operate for many trouble-free years if installed properly and maintenance practices are followed. Be sure to verify that all filters are clean, and condenser coils are free of dirt and debris. Often these items may look clean at first, but upon closer inspection, show signs of dirt and debris build-up. New units on new structures may have dirt and dust in filters from the building construction process.

Thermostats and unit controllers often contain vent holes for proper sensor measurement inside the device. Make sure the thermostat or controller are not full of dirt and dust from building construction or years of use.

Verify all requirements in the installation instructions and specification sheets are met. Unit voltages, airflow clearance requirements and clean unit power without brownouts or spikes play a critical role in unit performance. If 208 VAC power is supplied to the unit, the 208V tap must be used on the 24 VAC transformer located inside the control panel. Common sense must also be used when installing the unit in an environment that may put the unit at risk of improper operation.

Helpful Hints and Good Operating Practices

The following information will help you enjoy the full comfort and benefits of your Bard cooling and heating system, maximize the performance and efficiency and help extend the life of your system.

1. Always keep the equipment in peak operating condition with routine scheduled maintenance, especially for the air filters, and to assure a clean outdoor coil.
2. For most efficient operation, set the thermostat at the temperature you prefer and then let it take control. If any changes to the settings are required, they should be made in small adjustments and the system be allowed time to respond. Rapid changes either up or down should not be done.
3. Setting the thermostat very high does not make the system heat faster and setting it very low does not make it cool faster.
4. It is not recommended to turn the system "Off" then back "On" when you need it. This can allow temperature and humidity to build up in warm weather conditions and force the system to run continuously to try and catch up. If the building is to be unoccupied for a lengthy period, it is best to adjust the thermostat to a reasonable higher (or lower—depending on the season) setting rather than turning it completely off. Upon return, the inside conditions will not be totally out of control and recovery time to desired conditions would be much shorter.
5. Airflow inside the room or building is very important. Keep all supply registers open and all returns free and unrestricted. Avoid placing objects in areas that will hinder unit airflow. The heating and cooling system is designed to have a certain amount of airflow for proper operation. Therefore, closing off registers, in unused rooms as an example, could reduce airflow below acceptable levels and should not be done without review by your service company who can assess the overall situation and advise you accordingly.
6. Heat pumps, especially air-to-air heat pumps, may have the system (compressor) run continuously at lower outdoor temperatures, and this is normal. The heat pump (compressor) mode is controlled by the beginning stages of the thermostat and delivers the most efficient heat. As the outdoor temperature drops off, the heat pump mode heat will also diminish (because there is less heat in the outdoor air to absorb) and must be supplemented by additional electric heat stages, which are not as efficient as the heat pump. The thermostat automatically controls everything and the backup heat will only operate on demand as needed to maintain the desired temperature.
7. The thermostat or controller is the user's primary connection to the system so it is very important to have a thorough understanding of how it works and how to use it properly. Have your installer or service company explain and demonstrate proper operation of the controls.
8. Make sure you thoroughly understand how the heating and cooling system itself is intended to operate and what to expect from it. Have your installer or service company explain and demonstrate proper operation of the heating and cooling system.