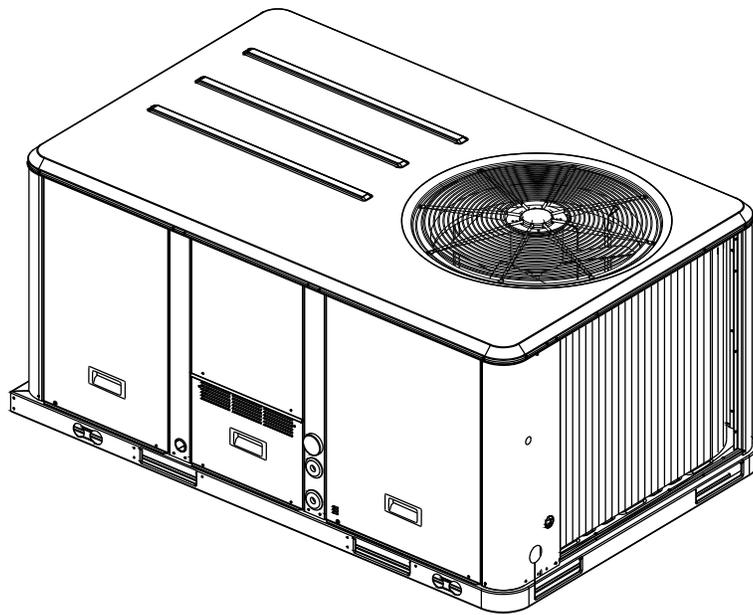




Installation, Operation, and Maintenance

Packaged Rooftop Air Conditioners Precedent™ – Gas/Electric 5 to 10 Tons—50 Hz



⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.



Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠ WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.

NOTICE: Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants-including industry replacements for CFCs such as HCFCs and HFCs.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified. The Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring **MUST** be performed by qualified personnel. Improperly installed and grounded field wiring poses **FIRE** and **ELECTROCUTION** hazards. To avoid these hazards, you **MUST** follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.

⚠ WARNING

Personal Protective Equipment (PPE) Required!

Installing/servicing this unit could result in exposure to electrical, mechanical and chemical hazards.

- Before installing/servicing this unit, technicians **MUST** put on all PPE required for the work being undertaken (Examples: cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). **ALWAYS** refer to appropriate Material Safety Data Sheets (MSDS)/Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.
- When working with or around hazardous chemicals, **ALWAYS** refer to the appropriate MSDS/SDS and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.
- If there is a risk of energized electrical contact, arc, or flash, technicians **MUST** put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, **PRIOR** to servicing the unit. **NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

Failure to follow instructions could result in death or serious injury.

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Revision History

RT-SVX38C-EN (15 March 2015)

- General data 6 to 10 ton updates



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Model Number Description

Y	S	C	0	6	0	E	3	R	L	A	*	*
1	2	3	4	5	6	7	8	9	10	11	12	13
Digit 1 – Unit Type			Digit 16 – Hinged Service Access/Filters						Digit 7			
T	DX cooling		0 Standard panels/standard filters						7 Clogged filter switch, fan failure switch and discharge air sensing tube			
Y	DX cooling, gas heat		A Hinged access panels/standard filters						A Condensate drain pan overflow switch			
W	Packaged heat pump		B Standard panels/2" MERV 8 filters						B Clogged filter switch and condensate drain pan overflow switch			
Digit 2 – Efficiency			C Hinged access panels/2" MERV 8 filters						C Fan failure switch and condensate drain pan overflow switch			
S	Standard Efficiency		D Standard panels/2" MERV 13 filters						D Discharge air sensing and condensate drain pan overflow switch			
Digit 3 – Airflow			E Hinged access panels/2" MERV 13 filters						E Clogged filter switch, fan failure switch and condensate drain pan overflow switch			
C	Convertible		Digit 17 – Condenser Coil Protection						F Clogged filter switch, discharge air sensing tube and condensate drain pan overflow switch			
Digit 4,5,6 – Nominal Gross Cooling Capacity (MBh)			0 Standard coil						G Fan failure switch, discharge air sensing tube and condensate drain pan overflow switch			
060	5 ton (17.6 kW)		1 Standard coil with hail guard						H Clogged filter switch, fan failure switch, discharge air sensing and condensate drain pan overflow switch			
072	6 ton (21.1 kW)		2 Black epoxy pre-coated condenser coil						Digit 26 – System Monitoring Controls			
090	7½ ton (26.4 kW)		3 Black epoxy pre-coated Condenser coil with hail guard						0 No monitoring controls			
102	8½ ton (29.9 kW)		4 CompleteCoat™ condenser coil ⁹						A Demand control ventilation (CO ₂) ¹⁰			
120	10 ton (35.1 kW)		5 CompleteCoat™ condenser coil with hail guard ⁹						Digit 27 – Unit Hardware Enhancements			
Digit 7 – Major Design Sequence			Digit 18 – Through the Base Provisions						0 No enhancements			
E	R-410A refrigerant		0 No through-the-base provisions						1 Stainless steel drain pan			
Digit 8 – Voltage Selection			Digit 19 – Disconnect/Circuit Breaker (three-phase only)						Model Number Notes			
D	380-415/50/3		0 No disconnect/no circuit breaker						1. Manual outside air damper will ship factory supplied within the unit, but must be field installed.			
Digit 9 – Unit Controls			Digit 20 – Convenience Outlet						2. High pressure control crankcase heaters are standard on all units.			
R	ReliaTel™ microprocessor		0 No convenience outlet						3. Belt drive is standard on all units.			
K	European		Digit 21 – Communications Options						4. Economizer with barometric relief is for downflow configured units only. Order economizer without barometric relief for horizontal configuration. Barometric relief for horizontal configured units must be ordered as field-installed accessory.			
Digit 10 – Heating Capacity			Digit 22 – Refrigeration System Option						5. Standard metering devices are TXVs.			
0	No electric heat ⁷		0 No refrigeration system ⁵						6. Frostat is available as factory-installed option only.			
L	Low heat ⁸		Digit 23 – Refrigeration Controls						7. Electric heaters are available only for field-installed options.			
H	High heat ⁸		Note: Applicable to digit 7 = E						8. Available only for gas heat models.			
Digit 11 – Minor Design Sequence			0 No refrigeration control ²						9. Not available on heat pumps.			
A	First sequence		1 Frostat™ ⁶						10. Demand control ventilation option includes wiring only. The CO ₂ sensor is a field-installed only option.			
Digit 12,13 – Service Sequence			Digit 24 – Smoke Detector									
**	Factory assigned		0 No smoke detector									
Digit 14 – Fresh Air Selection			Digit 25 – System Monitoring Controls									
0	No Fresh air		0 No monitoring control									
A	Manual outside air damper 0–50% ¹		1 Clogged filter switch									
B	Motorized Outside air damper 0–50%		2 Fan failure switch									
C	Economizer, dry bulb 0–100% without barometric relief ⁴		3 Discharge air sensing tube									
D	Economizer, dry bulb 0–100% with barometric relief ⁴		4 Clogged filter switch and fan failure switch									
E	Economizer, reference enthalpy 0–100% without barometric relief ^{3,4}		5 Clogged filter switch and discharge air sensing tube									
F	Economizer, reference enthalpy 0–100% with barometric relief ^{3,4}		6 Fan failure switch and discharge air sensing tube									
G	Economizer, comparative enthalpy 0–100% without barometric relief ^{3,4}											
H	Economizer, comparative enthalpy 0–100% with barometric relief ^{3,4}											
Digit 15 – Supply Fan/Drive Type/Motor												
0	Standard drive ³											
1	Oversized motor											



General Information

Unit Inspection

As soon as the unit arrives at the job site

- Verify that the nameplate data matches the data on the sales order and bill of lading (including electrical data).
- Verify that the power supply complies with the unit nameplate specifications.
- Visually inspect the exterior of the unit, including the roof, for signs of shipping damage.

If the job site inspection of the unit reveals damage or material shortages, file a claim with the carrier immediately. Specify the type and extent of the damage on the “bill of lading” before signing.

- Visually inspect the internal components for shipping damage as soon as possible after delivery and before it is stored. Do not walk on the sheet metal base pans.
- If concealed damage is discovered, notify the carrier’s terminal of damage immediately by phone and by mail. Concealed damage must be reported within 15 days.
- Request an immediate joint inspection of the damage by the carrier and the consignee. Do not remove damaged material from the receiving location. Take photos of the damage, if possible. The owner must provide reasonable evidence that the damage did not occur after delivery.
- Notify the appropriate sales representative before installing or repairing a damaged unit.

Storage

Take precautions to prevent condensate from forming inside the unit’s electrical compartments and motors in the following situations:

- The unit is stored before it is installed.
- The unit is set on the roof curb, and temporary heat is provided in the building. Isolate all side panel service entrances and base pan openings (e.g., conduit holes, Supply Air and Return Air openings, and flue openings) from the ambient air until the unit is ready for start-up.

Note: Do not use the unit’s heater for temporary heat without first completing the start-up procedure detailed under “Unit Start-Up,” p. 32.

The manufacturer will not assume any responsibility for equipment damage resulting from condensate accumulation on the unit’s electrical and/or mechanical components.

Unit Nameplate

A Mylar unit nameplate is located on the unit’s corner support next to the filter access panel. It includes the unit model number, serial number, electrical characteristics, refrigerant charge, as well as other pertinent unit data.

Compressor Nameplate

The nameplate for the compressors are located on the side of the compressor.

Unit Description

Before shipment, each unit is leak tested, dehydrated, charged with refrigerant and compressor oil, and run tested for proper control operation.

The condenser coils are either aluminum fin, mechanically bonded to copper tubing or all aluminum microchannel.

Direct-drive, vertical discharge condenser fans are provided with built-in thermal overload protection.

There are two control systems offered for these units. The electromechanical control option uses a thermostat to perform unit functions. The ReliaTel™ control module is a microelectronic control system that is referred to as “refrigeration module” (RTRM). The acronym RTRM is used extensively throughout this document when referring to the control system network.

These modules through proportional/integral control algorithms perform specific unit functions that govern unit operation in response to zone temperature, supply air temperature, and/or humidity conditions depending on the application. The stages of capacity control for these units are achieved by starting and stopping the compressors.

The RTRM is mounted in the control panel and is factory wired to the respective internal components. The RTRM receives and interprets information from other unit modules, sensors, remote panels, and customer binary contacts to satisfy the applicable request for cooling.

Economizer Control Actuator (Optional)

ReliaTel™ Control

The ECA monitors the mixed air temperature, return air temperature, minimum position setpoint (local or remote), power exhaust setpoint, CO₂ setpoint, CO₂, and ambient dry bulb/enthalpy sensor or comparative humidity (return air humidity against ambient humidity) sensors, if selected, to control dampers to an accuracy of +/- 5% of stroke. The actuator is spring returned to the closed position any time that power is lost to the unit. It is capable of delivering up to 25 inch pounds of torque and is powered by 24 VAC.

RTCI—ReliaTel™ Trane Communication Interface (Optional)

This module is used when the application calls for an ICSTM building management type control system. It allows the control and monitoring of the system through an ICS panel. The module can be ordered from the factory or ordered as a kit to be field installed. Follow the

installation instruction that ships with each kit when field installation is necessary.

RLCI—ReliaTel™ LonTalk® Communication Interface (Optional)

This module is used when the application calls for an ICSTM building management type control system that is LonTalk. It allows the control and monitoring of the system through an ICS panel. The module can be ordered from the factory or ordered as a kit to be field installed. Follow the installation instruction that ships with each kit when field installation is necessary.

RBCI—ReliaTel™ BACnet™ Communications Interface (Optional)

This module is used when the application calls for an open BACnet protocol. It allows the control and monitoring of the system through an ICS panel. The module can be ordered from the factory or as a kit to be field installed. Follow the installation instructions that ships with each kit when field installation is necessary.

RTOM—ReliaTel™ Options Module (Optional)

The RTOM monitors the supply fan proving, clogged filter, supply air temperature, exhaust fan setpoint, supply air tempering, Froststat™ and smoke detector. Refer to system input devices and functions for operation.

System Input Devices and Functions

The RTRM must have a zone sensor or thermostat input in order to operate the unit. The flexibility of having several mode capabilities depends upon the type of zone sensor or thermostat selected to interface with the RTRM.

The descriptions of the following basic Input Devices used within the RTRM network are to acquaint the operator with their function as they interface with the various modules. Refer to the unit's electrical schematic for the specific module connections.

The following controls are available from the factory for field installation.

Supply Fan Failure Input (Optional)

The Fan Failure Switch can be connected to sense indoor fan operation:

FFS (Fan Failure Switch) — If air flow through the unit is not proven by the differential pressure switch connected to the RTOM (factory setpoint 0.07" w.c.) within 40 seconds nominally, the RTRM will shut off all mechanical operations, lock the system out, send a diagnostic to ICS, and the SERVICE output will flash. The system will remain locked out until a reset is initiated either manually or through ICS.

Clogged Filter Switch (Optional)

The unit-mounted clogged filter switch monitors the pressure differential across the return air filters. It is mounted in the filter section and is connected to the

RTOM. A diagnostic SERVICE signal is sent to the remote panel if the pressure differential across the filters is at least 0.5" w.c. The contacts will automatically open when the pressure differential across the filters decreases to approximately 0.4" w.c. The clogged filter output is energized when the supply fan is operating and the clogged filter switch has been closed for at least 2 minutes. The system will continue to operate regardless of the status of the filter switch.

Note: *On units equipped with factory installed MERV 13 filters, a clogged filter switch with different pressure settings will be installed. This switch will close when the differential pressure is approximately 0.8' w.c. and open when the differential falls to 0.7" w.c.*

Condensate Drain Pan Overflow Switch (Optional)

ReliaTel Option

This input incorporates the Condensate Overflow Switch (COF) mounted on the drain pan and the ReliaTel options module (RTOM). When the condensate level reaches the trip point for 6 continuous seconds, the RTOM will shut down all unit functions until the overflow condition has cleared. The unit will return to normal operation after six continuous seconds with the COF in a non-tripped condition. If the condensate level causes unit shutdown more than two times in a 3-day period, the unit will be locked-out of operation requiring manual reset of diagnostic system through zone sensor or building automation system (BAS). Cycling unit power will also clear the fault.

Compressor Disable (CPR1/2)

This input incorporates the low pressure control (LPC) of each refrigeration circuit and can be activated by opening a field-supplied contact installed on the LTB.

If this circuit is open before the compressor is started, the compressor will not be allowed to operate. Anytime this circuit is opened for 1 continuous second during compressor operation, the compressor for that circuit is immediately turned "Off". The compressor will not be allowed to restart for a minimum of 3 minutes should the contacts close.

If four consecutive open conditions occur during the first three minutes of operation, the compressor for that circuit will be locked out, a diagnostic communicated to the remote panel (if installed), and a manual reset will be required to restart the compressor.

Low Pressure Control

ReliaTel Control

When the LPC is opened for 1 continuous second, the compressor for that circuit is turned off immediately. The compressor will not be allowed to restart for a minimum of 3 minutes.



General Information

If four consecutive open conditions occur during an active call for cooling, the compressor will be locked out, a diagnostic communicated to ICS™, if applicable, and a manual reset required to restart the compressor. On dual compressor units only the affected compressor circuit is locked out.

High Pressure Control

ReliaTel Control

The high pressure controls are wired in series between the compressor outputs on the RTRM and the compressor contactor coils. If the high pressure control switch opens, the RTRM senses a lack of current while calling for cooling and locks the compressor out.

If four consecutive open conditions occur during an active call for cooling, the compressor will be locked out, a diagnostic communicated to ICS, if applicable, and a manual reset required to restart the compressor. On dual compressor units only the affected compressor circuit is locked out.

Lead/Lag Control (Dual Circuit Only)

ReliaTel Control Only

Lead/Lag is a selectable input located on the RTRM. The RTRM is configured from the factory with the Lead/Lag control disabled. To activate the Lead/Lag function, simply cut the wire connected to J3-8 at the RTRM. When it is activated, each time the designated lead compressor is shut off due to the load being satisfied, the lead compressor or refrigeration circuit switches. When the RTRM is powered up, e.g., after a power failure, the control will default to the number one circuit compressor.

Zone Sensor Module (ZSM) (BAYSENS106*)

This electronic sensor features three system switch settings (Heat, Cool, and Off) and two fan settings (On and Auto). It is a manual changeover control with single setpoint. (Cooling Setpoint Only)

Zone Sensor Module (ZSM) (BAYSENS108*)

This electronic sensor features four system switch settings (Heat, Cool, Auto, and Off) and two fan settings (On and Auto). It is a manual or auto changeover control with dual setpoint capability. It can be used with a remote zone temperature sensor BAYSENS077*.

Zone Sensor (BAYSENS110*)

This electronic sensor features four system switch settings (Heat, Cool, Auto, and Off) and two fan settings (On and Auto) with four system status LEDs. It is a manual or auto changeover control with dual setpoint capability. It can be used with a remote zone temperature sensor BAYSENS077*.

Programmable Zone Sensor—(BAYSENS119*)

This 7-day programmable sensor features 2, 3, or 4 periods for Occupied or Unoccupied programming per day. If the

power is interrupted, the program is retained in permanent memory. If power is off for an extended period of time, only the clock and day may have to be reset.

The Zone Sensor allows selection of 2, 3, or 4 system modes (Heat, Cool, Auto, and Off), two fan modes (On and Auto). It has dual temperature selection with programmable start time capability.

The occupied cooling set point ranges between 45°F and 98°F. The heating set point ranges between 43°F and 96°F.

A liquid crystal display (LCD) displays zone temperature, temperature set points, day of the week, time, and operational mode symbols.

The Option Menu is used to enable or disable applicable functions, e.g., morning warm-up, economizer minimum position override during unoccupied status, Fahrenheit or Centigrade, supply air tempering, remote zone temperature sensor, 12/24 hour time display, smart fan, and computed recovery.

During an occupied period, an auxiliary relay rated for 1.25 amps at 30 volts AC with one set of single pole double throw contacts is activated.

Status Inputs (4 Wires Optional)

The ZSM can be wired to receive four operating status signals from the RTRM (HEAT, COOL, SYSTEM ON, SERVICE).

Four wires from the RTRM should be connected to the appropriate terminals (7, 8, 9, and 10) on the ZSM.

Remote Zone Sensor (BAYSENS073*)

This electronic sensor features remote zone sensing and timed override with override cancellation. It is used with a Trane Integrated Comfort™ building management system.

Remote Zone Sensor (BAYSENS074*)

This electronic sensor features single setpoint capability and timed override with override cancellation. It is used with a Trane Integrated Comfort™ building management system.

Remote Zone Sensor (BAYSENS016*)

This bullet type temperature sensor can be used for outside air (ambient) sensing, return air temperature sensing, supply air temperature sensing, remote temperature sensing (uncovered). Wiring procedures vary according to the particular application and equipment involved. Refer to the unit's wiring diagrams for proper connections.

Remote Zone Sensor (BAYSENS077*)

This electronic sensor can be used with BAYSENS106*, 108*, 110*, 119* remote panels. When this sensor is wired to a BAYSENS119* Remote Panel, wiring must be 18 AWG Shielded Twisted Pair (Belden 8760 or equivalent). Refer to the specific remote panel for wiring details.

Wireless Zone Sensor (BAYSENS050)

This electronic sensor features five system settings (Auto, Off, Cool, Heat, and Emergency Heat) as well as On and Auto fan settings. It is a manual or auto changeover control with dual setpoint capability. Other features include a timed override function, lockable system settings, and Fahrenheit or Celsius temperature display. Included with the wireless zone sensor is a receiver that is to be mounted inside the unit, a mounting bracket, and a wire harness.

High Temperature Sensor (BAYFRST001*)

This sensor connects to the RTRM emergency stop input on the LTB and provides high limit “shutdown” of the unit. The sensor is used to detect high temperatures due to a high thermal event in the air conditioning or ventilation ducts. The sensor is designed to mount directly to the sheet metal duct. Each kit contains two sensors. The return air duct sensor (X1310004001) is set to open at 135°F. The supply air duct sensor (X1310004002) is set to open at 240°F. The control can be reset after the temperature has been lowered approximately 25°F below the cutout setpoint.

Evaporator Frost Control

ReliaTel™ Option

This input incorporates the Frostat™ control (FOS) mounted in the indoor coil circuit and can be activated by closing a field-supplied contact installed in parallel with the FOS.

If this circuit is open before the compressor is started, the compressor will not be allowed to operate. Anytime this circuit is opened for 1 continuous second during compressor operation, the compressor for that circuit immediately turns off. The compressor will not be allowed to restart for a minimum of 3 minutes if the FOS closes.

Discharge Line Temp Switch (DLTS)

The DLTS is looped in series with HPC and LPC. It prevents compressor from overheating (over 300F° dome temp) in case of indoor fan failure (cooling) or outdoor fan failure (heating).

Phase Monitor

This sensor monitors voltage between the 3 conductors of the 3-phase power supply. Two LED lights are provided:

- The green light indicates that a balanced 3-phase supply circuit is properly connected.
- The red light indicates that unit operation has been prevented. There are two conditions that will prevent unit operation:
 - The power supply circuit is not balanced with the proper phase sequence of L1, L2, L3, for the 3 conductors of a 3-phase circuit.
 - The line to line voltage is not between 180 volts and 633 volts.

Unit Dimensions

Figure 1 illustrates the minimum operating and service clearances for either a single or multiple unit installation. These clearances are the minimum distances necessary to assure adequate serviceability, cataloged unit capacity, and peak operating efficiency.

Providing less than the recommended clearances may result in condenser coil starvation, "short-circuiting" of exhaust and economizer airflows, or recirculation of hot condenser air.

Figure 1. Typical installation clearances for single and multiple unit applications

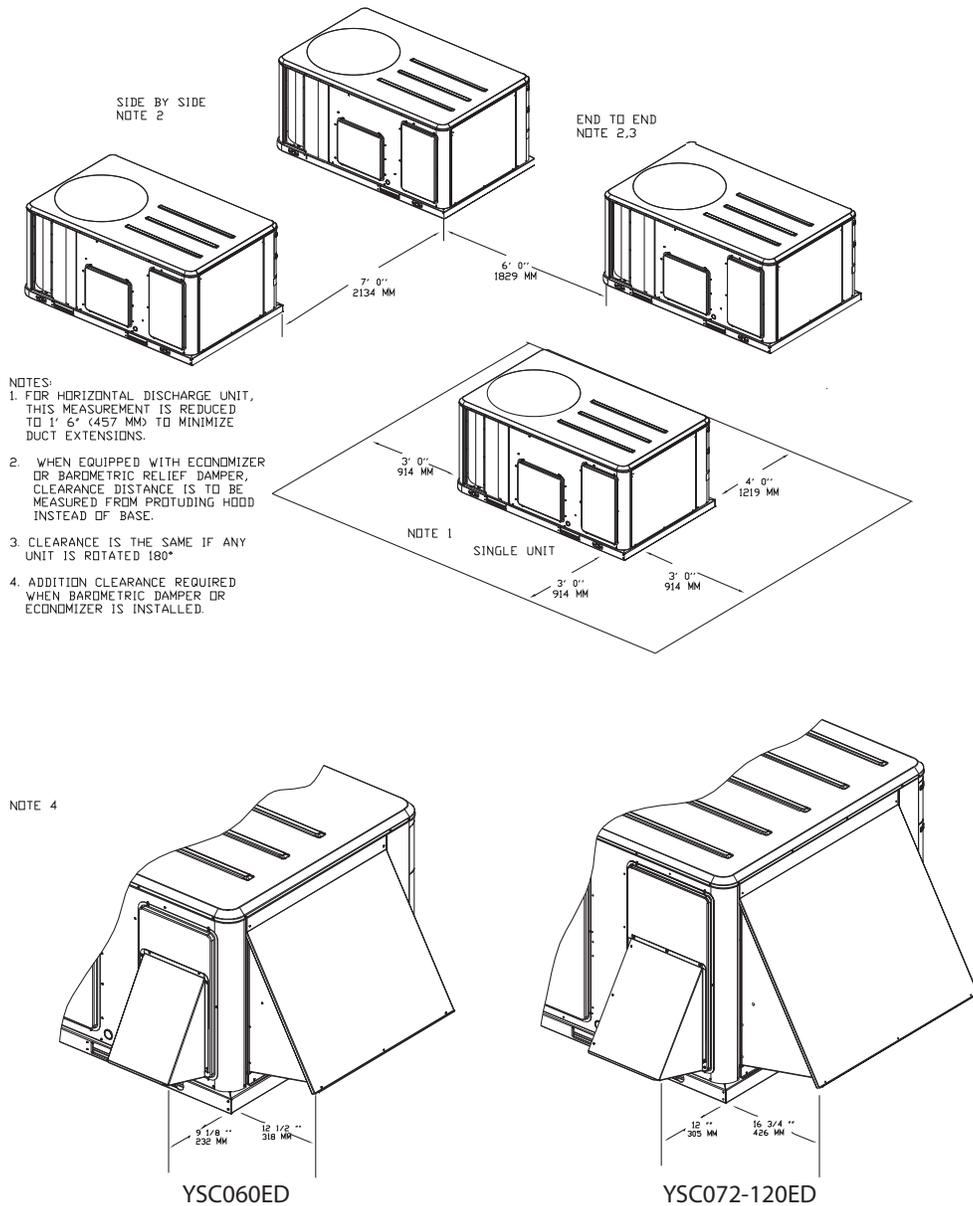


Figure 2. 5 tons standard efficiency

Notes:

1. All dimensions are in inches/millimeters.
2. 1/2 NPT Gas Connection

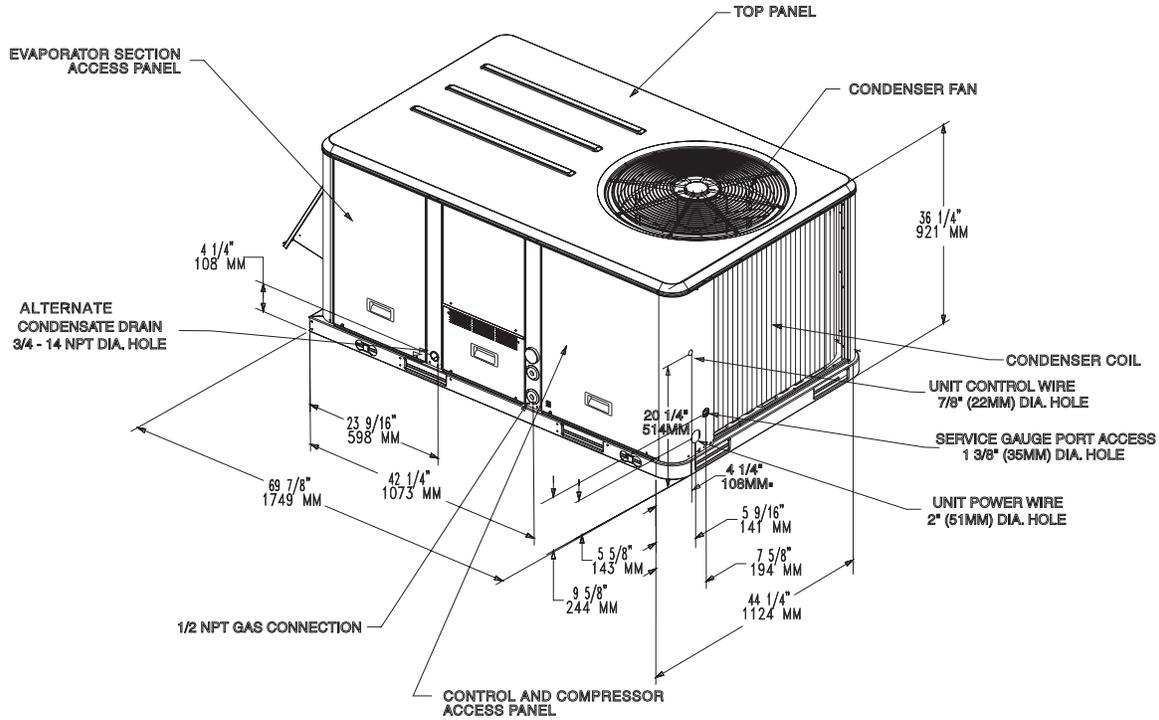
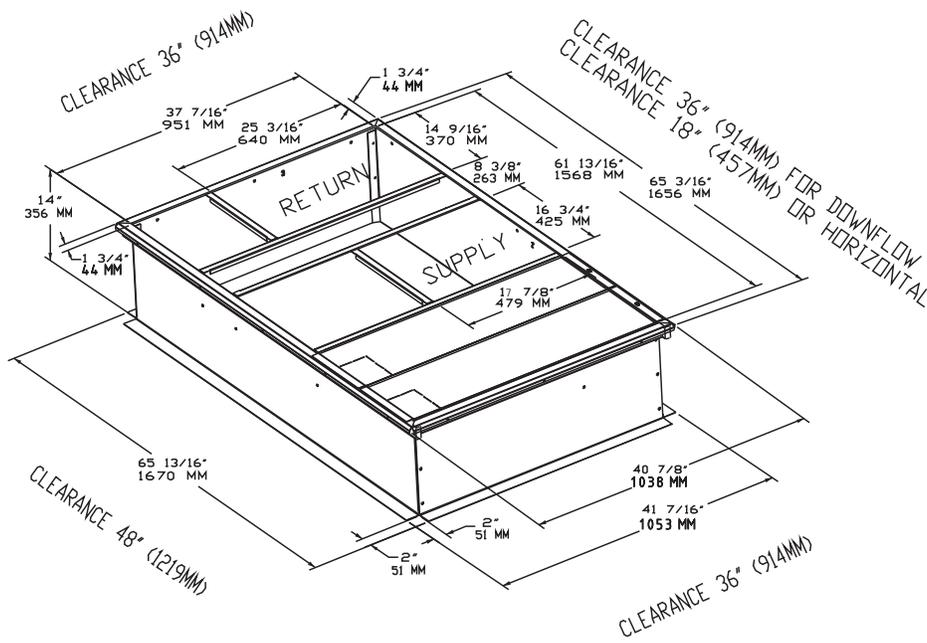


Figure 3. 5 tons standard efficiency—roof curb

Note: All dimensions are in inches/millimeters.





Unit Dimensions

Figure 4. 5 tons standard efficiency—unit clearance and roof opening

Note: All dimensions are in inches/millimeters.

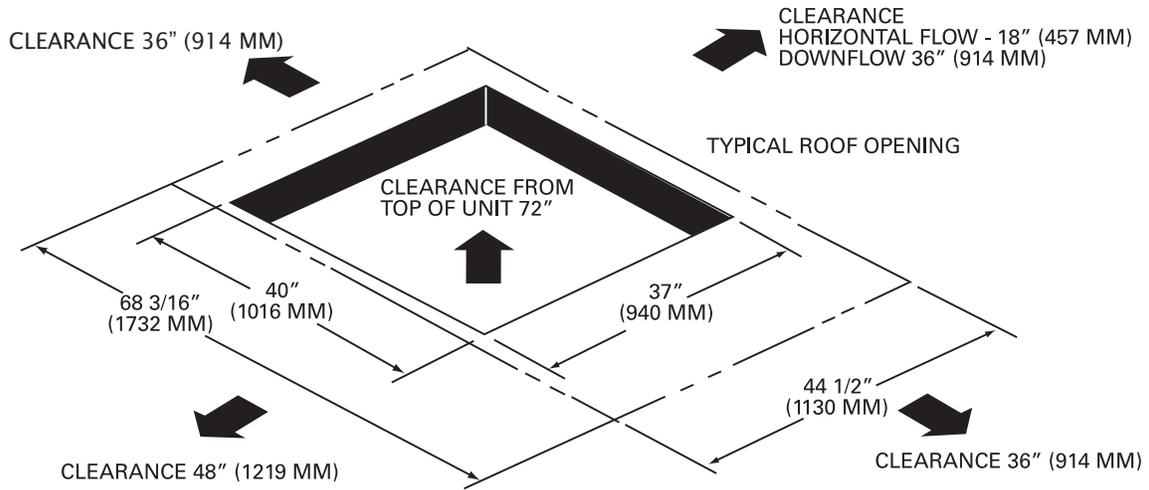


Figure 5. 6, 7½ tons standard efficiency

Note: All dimensions are in inches/millimeters.

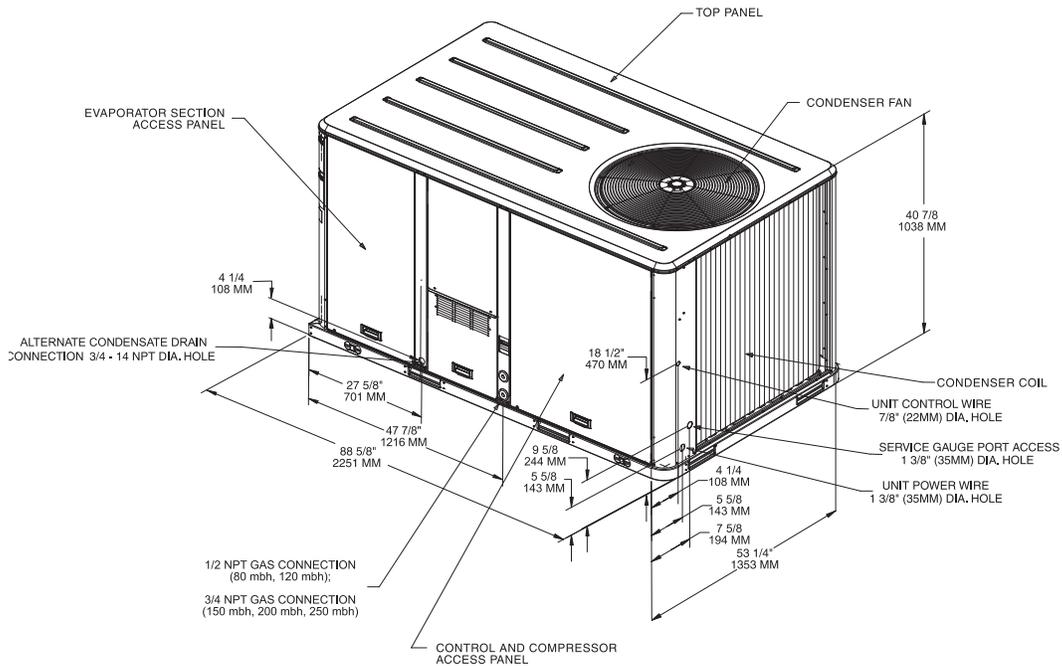


Figure 6. 6, 7½ tons standard efficiency—roof curb

Note: All dimensions are in inches/millimeters.

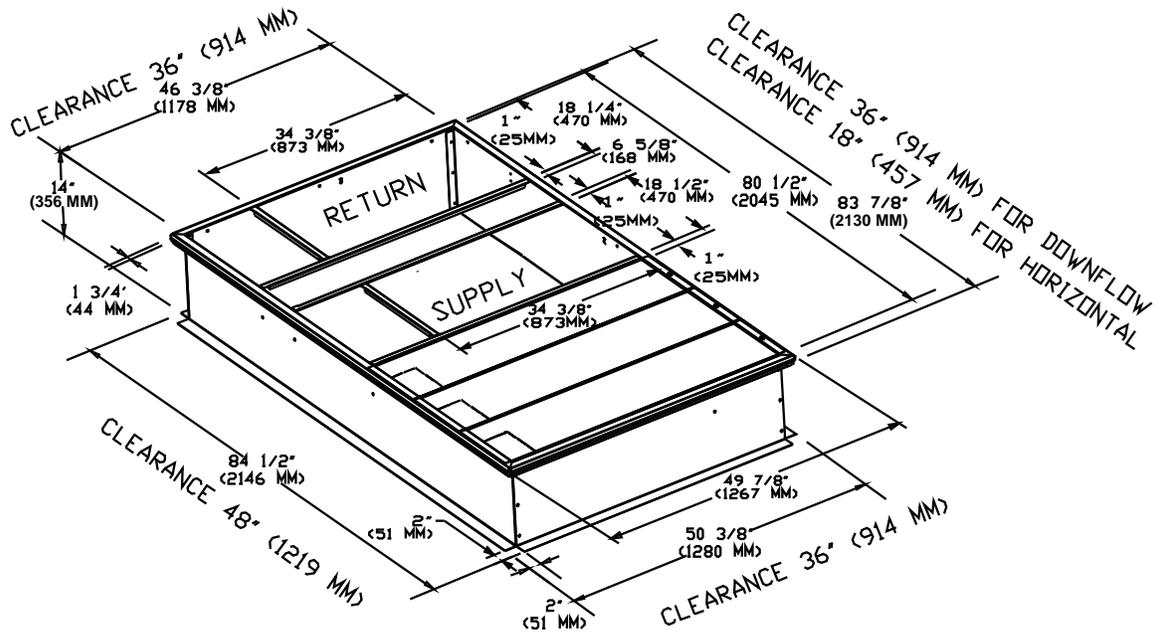
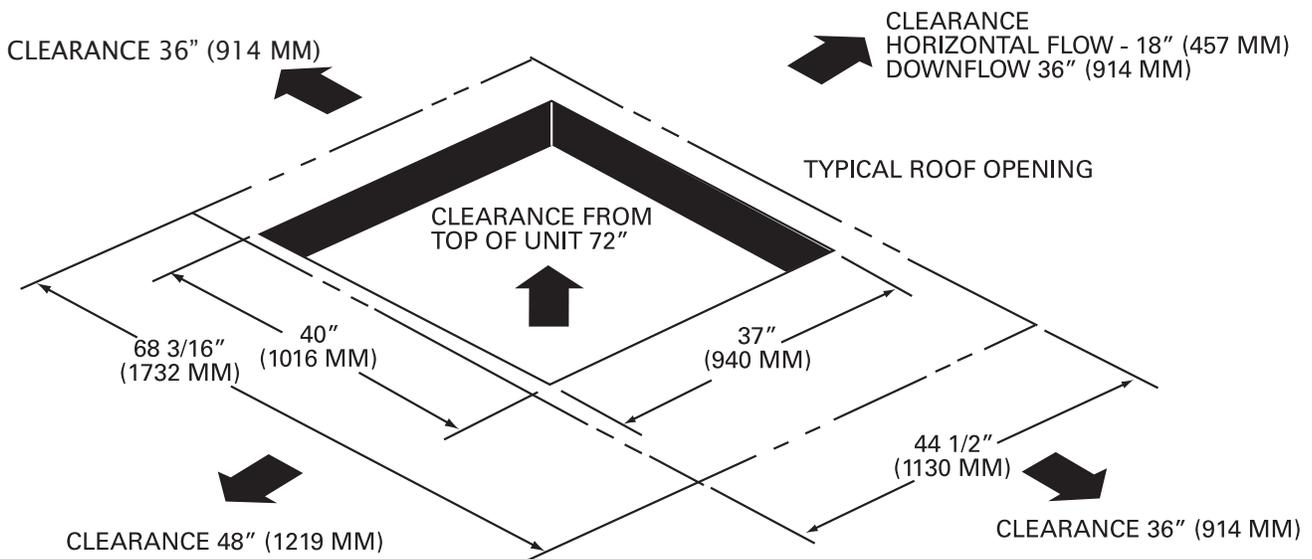


Figure 7. 6, 7½ tons standard efficiency—unit clearance and roof opening

Note: All dimensions are in inches/millimeters.





Unit Dimensions

Figure 8. 8½ to 10 tons standard efficiency

Note: All dimensions are in inches/millimeters.

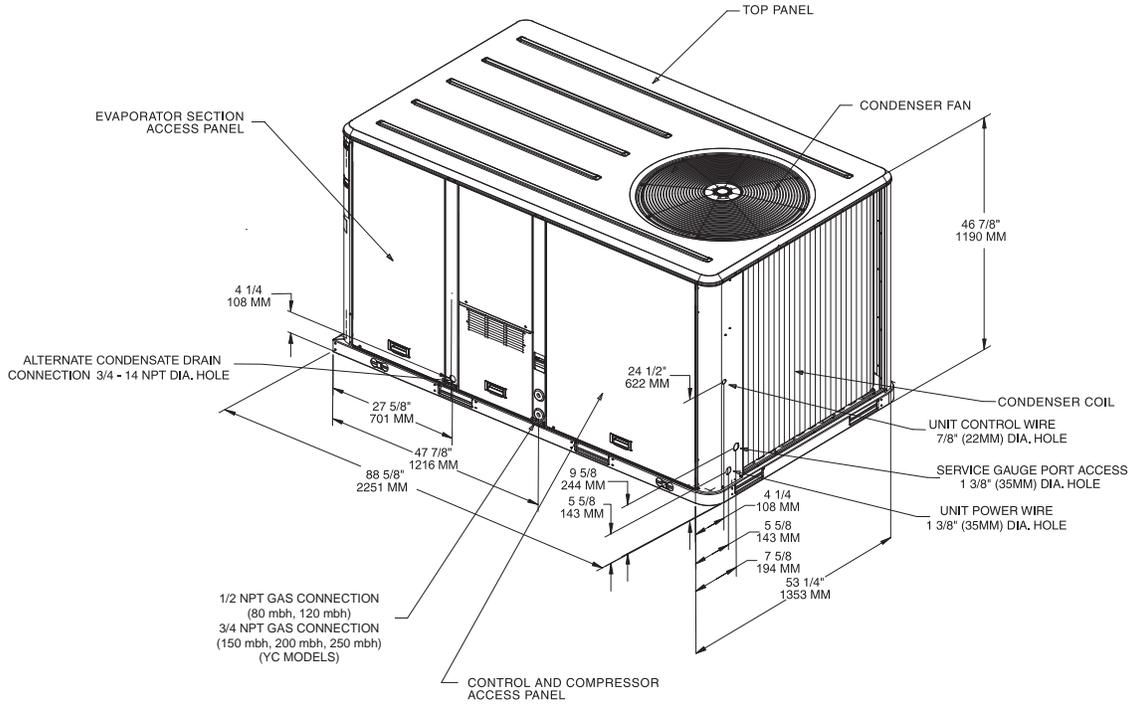


Figure 9. 8½ to 10 tons standard efficiency – roof curb

Note: All dimensions are in inches/millimeters.

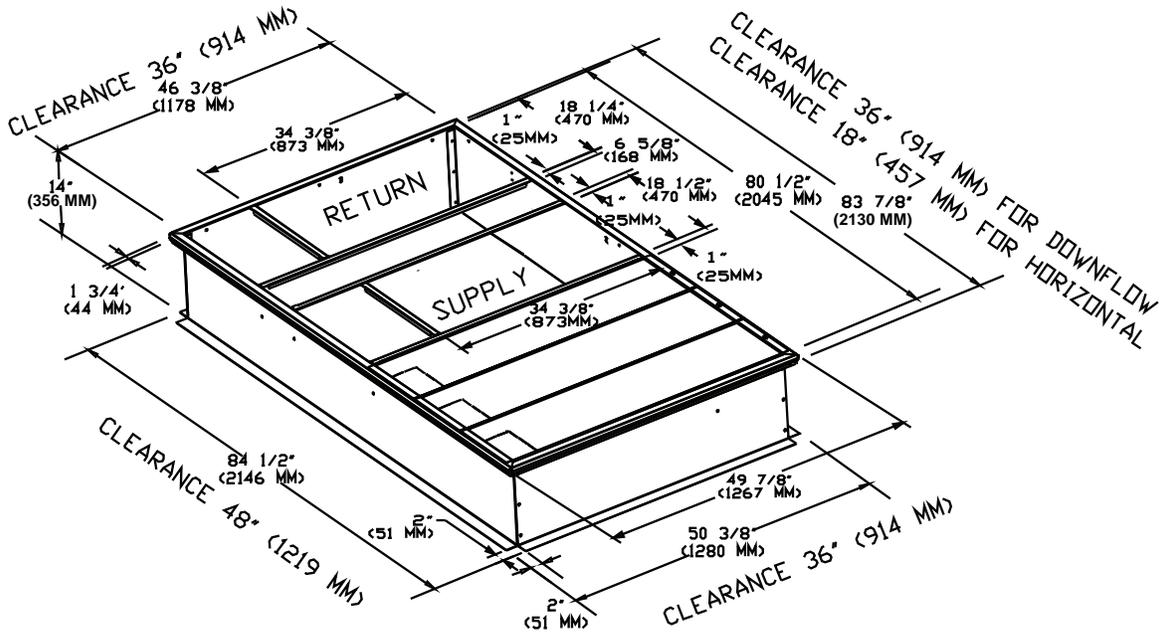
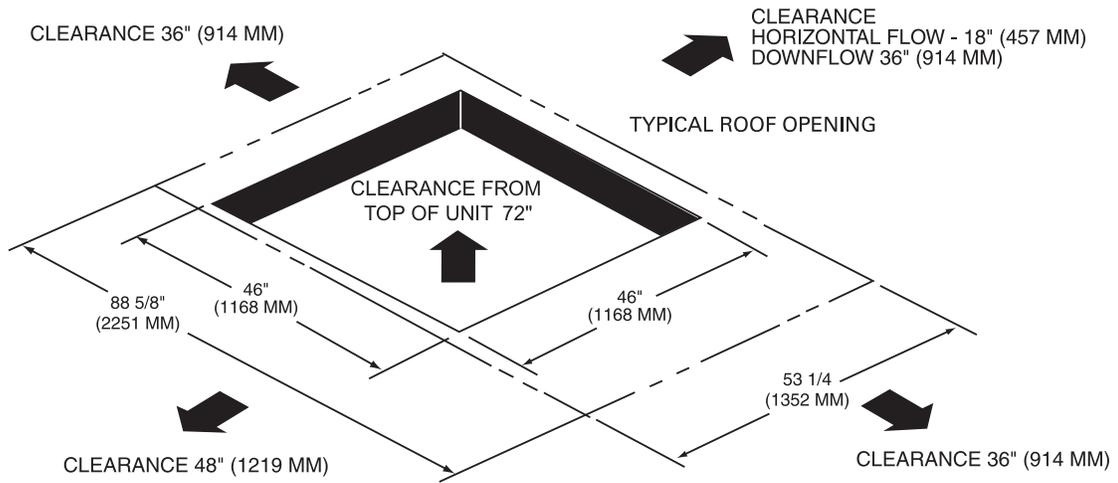


Figure 10. 8½ to 10 tons standard efficiency—unit clearance and roof opening

Note: All dimensions are in inches/millimeters.





Installation

Pre-Installation

⚠ WARNING

Fiberglass Wool!

Product contains fiberglass wool. Disturbing the insulation in this product during installation, maintenance or repair will expose you to airborne particles of glass wool fibers and ceramic fibers known to the state of California to cause cancer through inhalation. Glass wool fibers may also cause respiratory, skin or eye irritation.

Precautionary Measures

- Avoid breathing fiberglass dust.
- Use a NIOSH approved dust/mist respirator.
- Avoid contact with the skin or eyes. Wear long-sleeved, loose-fitting clothing, gloves, and eye protection.
- Wash clothes separately from other clothing: rinse washer thoroughly.
- Operations such as sawing, blowing, tear-out, and spraying may generate fiber concentrations requiring additional respiratory protection. Use the appropriate NIOSH approved respiration in these situations.

First Aid Measures

Eye Contact—Flush eyes with water to remove dust. If symptoms persist, seek medical attention.

Skin Contact—Wash affected areas gently with soap and warm water after handling.

Procedure

⚠ WARNING

Heavy Objects!

Ensure that all the lifting equipment used is properly rated for the weight of the unit being lifted. Each of the cables (chains or slings), hooks, and shackles used to lift the unit must be capable of supporting the entire weight of the unit. Lifting cables (chains or slings) may not be of the same length. Adjust as necessary for even unit lift. Other lifting arrangements could cause equipment or property damage. Failure to follow instructions above or properly lift unit could result in unit dropping and possibly crushing operator/ technician which could result in death or serious injury.

⚠ WARNING

Improper Unit Lift!

Test lift unit approximately 24 inches to verify proper center of gravity lift point. To avoid dropping of unit, reposition lifting point if unit is not level. Failure to properly lift unit could result in unit dropping and possibly crushing operator/technician which could result in death or serious injury and possible equipment or property-only damage.

Figure 11. Corner weights

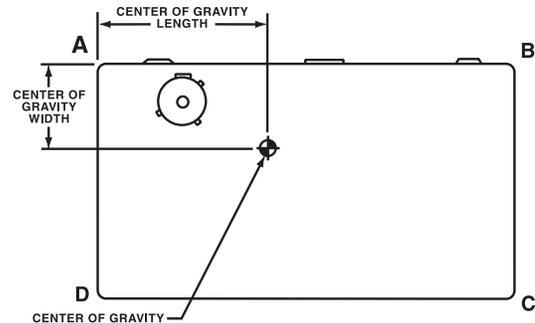
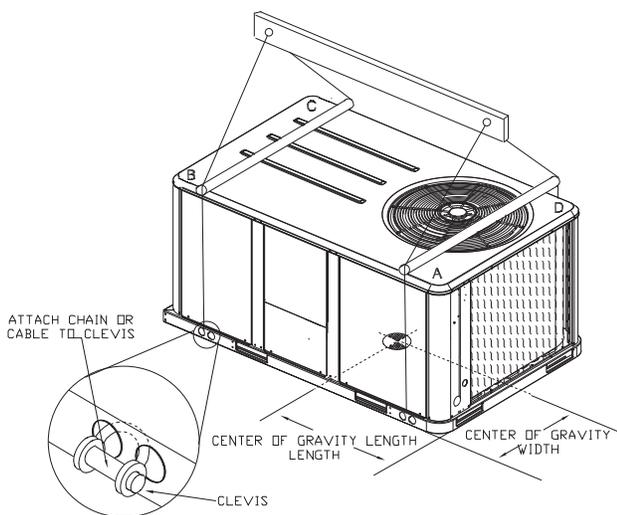


Table 1. Maximum unit and corner weights (lbs/kgs) and center of gravity dimensions (in/mm)—gas/electric models

Tons	Unit Model No.	Maximum Model Weights ^(a)		Corner Weights ^(b)				Center of Gravity (in/mm)	
		Shipping	Net	A	B	C	D	Length	Width
5	YSC060E	689/312	584/264	181/82	144/65	122/55	137/62	40/1025	24/600
6	YSC072E	975/443	843/383	296/134	209/95	158/72	180/82	39/980	21/542
7½	YSC090E	1016/461	884/401	346/157	198/90	159/72	181/82	36/909	20/519
8½	YSC102E	1125/510	987/447	325/147	278/126	174/79	210/95	41/1031	21/526
10	YSC120E	1149/522	1011/459	344/156	265/120	193/88	209/95	40/1020	21/538

(a) Weights are approximate.

(b) Corner weights are given for information only.

Figure 12. Rigging and center of gravity

Table 2. Factory-installed options (FIOPs)/accessory net weights (lbs)^{(a),(b)}

Accessory	YSC060ED	YSC072E-120ED
	Net Weight	Net Weight
	5 Ton	6 to 10 Ton
Barometric Relief	7/3	10/5
Coil Guards	12/5	20/9
Economizer	26/12	36/16
Hinged Doors	10/5	12/5
Manual Outside Air Damper	16/7	26/12
Motorized Outside Air Damper	20/9	30/14
Oversized Motor	—	8/4
Roof Curb	61/28	78/35

(a) Weights for options not listed are <5 lbs.

(b) Net weight should be added to unit weight when ordering factory-installed accessories.

Foundation

Horizontal Units

If the unit is installed at ground level, elevate it above the snow line. Provide concrete footings at each support location with a “full perimeter” support structure or a slab

foundation for support. Refer to [Table 1, p. 17](#) for the unit’s operating and point loading weights when constructing a footing foundation.

If anchoring is required, anchor the unit to the slab using hold down bolts or isolators. Isolators should be installed to minimize the transmission of vibrations into the building.

For rooftop applications, ensure the roof is strong enough to support the combined unit and support structural weight. Refer to [Table 1, p. 17](#) for the unit operating weights. If anchoring is required, anchor the unit to the roof with hold-down bolts or isolators.

Check with a roofing contractor for proper waterproofing procedures.

Ductwork

[Figure 13, p. 17](#), [Figure 14, p. 18](#), [Figure 15, p. 18](#), and [Figure 16, p. 18](#) illustrate the supply and return air openings as viewed from the rear of the unit.

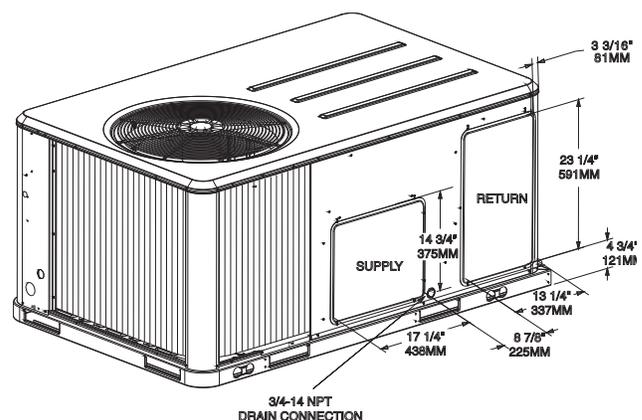
Figure 13. 5 ton unit—horizontal supply and return air openings


Figure 14. 6 to 10 tons high units—horizontal supply and return air openings

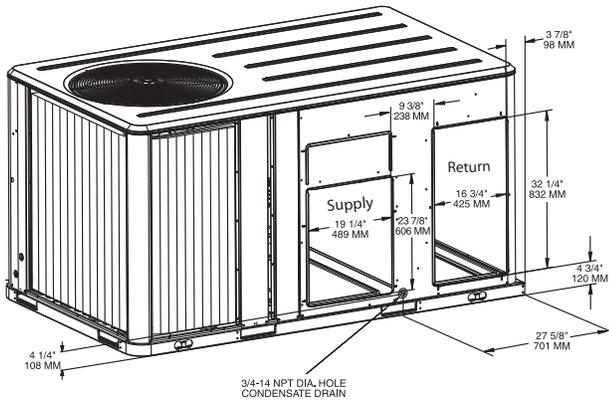


Figure 15, p. 18 and Figure 16, p. 18 illustrate the supply and return air openings in a downflow configuration.

To minimize air noise due to turbulence and to reduce static pressure, use elbows with turning vanes or splitters.

When attaching the ductwork to the unit, provide a water tight flexible connector at the unit to prevent operating sounds from transmitting through the ductwork.

All outdoor ductwork between the unit and the structure should be weather proofed after installation is completed.

Figure 15. 5 ton unit—downflow supply and return air openings with through-the-base utilities

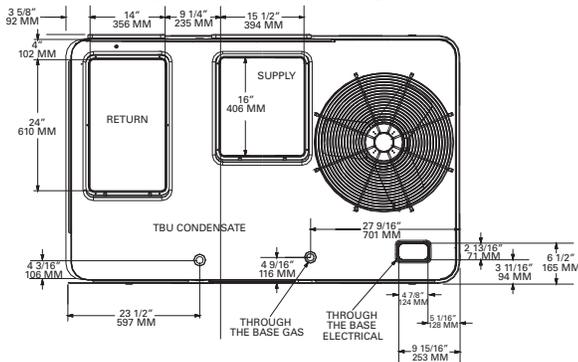
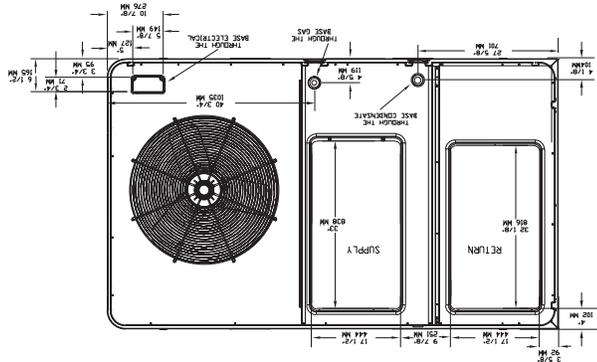


Figure 16. 6 to 10 tons units—downflow supply and return air openings with through-the-base utilities



Roof Curb

Downflow

The roof curbs for these units consists of a “full perimeter” enclosure to support the unit just inside of the unit base rail.

Before installing any roof curb, verify the following:

- It is the correct curb for the unit
- It includes the necessary gaskets and hardware
- The installation location provides the required clearance for proper operation
- The curb is level and square; the top surface of the curb must be true to assure an adequate curb-to-unit seal

WARNING

Combustible Materials!

Maintain proper clearance between the unit heat exchanger, vent surfaces and combustible materials. Refer to unit nameplate and installation instructions for proper clearances. Improper clearances could result in combustible materials catching on fire. Failure to maintain proper clearances could result in death or serious injury or property damage.

Verify that appropriate materials were used in the construction of roof and ductwork. Combustible materials should not be used in the construction of ductwork or roof curb that is in close proximity to heater elements or any hot surface. Any combustible material on the inside of the unit base should be removed and replaced with appropriate material.

Step-by-step curb assembly and installation instructions ship with each accessory roof curb kit. Follow the instructions carefully to assure proper fit-up when the unit is set into place.

Note: To assure proper condensate flow during operation, as well as proper operation of the condensate overflow switch (if equipped), the unit and curb must be level.

If the unit is elevated, a field constructed catwalk around the unit is strongly recommended to provide easy access for unit maintenance and service.

Recommendations for installing the Supply Air and Return Air ductwork joining the roof curb are included in the curb instruction booklet. Curb ductwork must be fabricated and installed by the installing contractor before the unit is set into place.

Note: For sound consideration, cut only the holes in the roof deck for the ductwork penetrations. Do not cut out the entire roof deck within the curb perimeter.

If Curb Accessory Kit Not Used

- The ductwork can be attached directly to the factory-provided flanges around the unit’s supply and

return air openings. Be sure to use flexible duct connections at the unit.

- For “built-up” curbs supplied by others, gaskets must be installed around the curb perimeter flange and the supply and return air opening flanges.

Rigging

⚠ WARNING

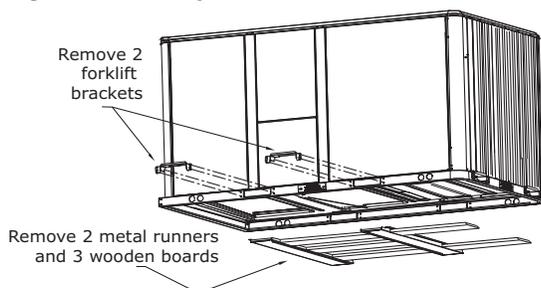
Heavy Objects!

Ensure that all the lifting equipment used is properly rated for the weight of the unit being lifted. Each of the cables (chains or slings), hooks, and shackles used to lift the unit must be capable of supporting the entire weight of the unit. Lifting cables (chains or slings) may not be of the same length. Adjust as necessary for even unit lift. Other lifting arrangements could cause equipment or property damage. Failure to follow instructions above or properly lift unit could result in unit dropping and possibly crushing operator/ technician which could result in death or serious injury.

A rigging illustration and center-of-gravity dimensional data table is shown in [Figure 12, p. 17](#). Refer to the typical unit operating weights table before proceeding.

1. Remove all drill screws fastening wood protection to metal base rail. Remove all screws securing wooden protection to wooden top crate.
On 7½ to 10 ton high efficiency units, remove wire ties from outdoor grill.
2. Remove wooden top crate.
3. Rig the unit as shown in [Figure 12, p. 17](#). Attach adequate strength lifting slings to all four lifting brackets in the unit base rail. Do not use cables, chains, or slings except as shown.
4. Install a lifting bar, as shown in [Figure 12, p. 17](#), to protect the unit and to facilitate a uniform lift. The minimum distance between the lifting hook and the top of the unit should be 7 feet.
5. Test-lift the unit to ensure it is properly rigged and balanced, make any necessary rigging adjustments.
6. Lift the unit enough to allow the removal of base fork pocket protection components as shown in the following figures.

Figure 17. Fork pockets



7. Downflow units: align the base rail of the unit with the curb rail while lowering the unit onto the curb. Make sure that the gasket on the curb is not damaged while positioning the unit.

General Unit Requirements

The following checklist is a summary of the steps required to successfully install a commercial unit. This checklist is intended to acquaint installing personnel with what is required in the installation process. It does not replace detailed instructions in this manual.

- Check the unit for shipping damage and material shortage; file a freight claim and notify appropriate sales representative.
- Verify correct model, options and voltage from unit nameplate.
- Verify that the installation location of the unit will provide the required clearance for proper operation.
- Assemble and install the roof curb (if applicable). Refer to the latest edition of the curb installers guide that ships with each curb kit.
- Fabricate and install ductwork; secure ductwork to curb.
- Install pitch pocket for power supply through building roof. (If applicable)
- Rigging the unit.
- Set the unit onto the curb; check for levelness.
- Ensure unit-to-curb seal is tight and without buckles or cracks.
- Install and connect a condensate drain line to the evaporator drain connection.

Note: *Condensate Overflow Switch (if equipped) will not work if unit is not level properly.*

Factory-Installed Economizer

- Ensure the economizer has been pulled out into the operating position. Refer to the economizer installers guide for proper position and setup.
- Install all access panels.

Temperature Limit Switch Usage for Gas Heat Units

Units are factory shipped in the down flow discharge configuration but can be field converted to a horizontal discharge configuration. Some, but not all, units require a different TCO1 limit switch, which is attached to the combustion blower motor if horizontal discharge configuration is used.

Note: *The following units require a limit switch change out for horizontal discharge. The additional limit switch is shipped attached to the combustion blower housing: YSC060ED*H, YSC072ED*H, YSC090ED*H, YSC102ED*H, YSC120ED*H.*



Installation

If any of the units listed in the previous note are installed in the down flow discharge configuration, remove and discard the additional TCO1 limit switch from the combustion blower motor.

Table 3. TCO1 tripping values

Unit Model (Standard Efficiency)	TCO1 Tripping Values Downflow/ Horizontal
YSC060ED*L	170F
YSC060ED*H	170F/200F
YSC072ED*L	200F
YSC072E*H	180F/220F
YSC090ED*L	200F
YSC090ED*H	180F/220F
YSC102ED*L	200F
YSC102ED*H	190F/260F
YSC120ED*L	200F
YSC120ED*H	190F/260F

Horizontal Discharge Conversion (5 Ton Units)

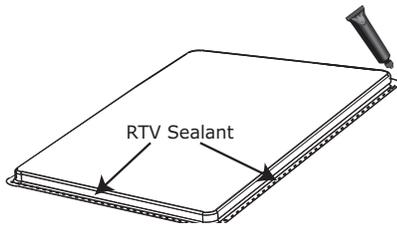
Supplies needed by installer for conversion: 3 oz. tube of high temperature RTV sealant. (500°F / 260°C: similar to Dow Corning 736)

Important: Failure to use recommended sealant could result in unit performance loss.

If a unit is to be converted to a horizontal discharge, the following conversion must be performed:

1. Remove RETURN and SUPPLY duct covers.
2. Locate supply cover. Apply ¼ inch (6mm) continuous bead of 500°F RTV sealant to the flange as shown.

Figure 18. Duct cover



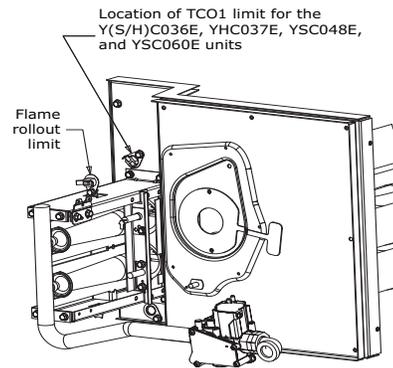
3. Position duct cover as shown and rotate 90 degrees to allow entrance into supply opening.
4. Slide duct covers into duct openings until inward edge of duct cover engages with the 2 retaining clips on the duct flanges. Secure the outward edge of each duct cover with 2 screws.
5. Slide RETURN DUCT COVER (insulation side up) into supply opening until inward edge of duct cover engages with the 2 retaining clips on the duct flange. Secure outward edge of the duct cover with two screws.

6. After completing installation of the duct covers for horizontal discharge, proceed to TCO-1 instructions.

TCO1 Instructions–Unit Model Number YSC060ED*H

If the unit being installed is YSC060ED*H, the limit control TCO1 must be replaced with the extra limit control shipped in the heater compartment. Replace TCO1 using steps 1 through 3 of the following instructions. If the unit being installed is not YSC060ED*H, skip steps 1 through 3 and go to the next step in the installation process.

Figure 19. TCO1 location (YSC060ED*H)



⚠ WARNING

Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

1. Remove the heat section access panel.
2. Remove TCO1 from shipping location, attached to the combustion blower.
3. Replace and discard the existing TCO1 originally installed at the factory for downflow operation with the TCO1, which was shipped attached to the combustion blower for horizontal operation.
4. Replace heat section access panel.

Horizontal Discharge Conversion (6 to 10 Ton Units)

Note: 6 to 10 ton units the supply cover to return opening and return cover to supply opening.

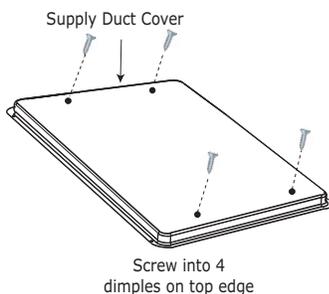
Supplies needed by installer for conversion: 3 oz. tube of high temperature RTV sealant (500°F/260°C: Similar to Dow Corning 736).

Important: Failure to use recommended sealant could result in unit performance loss.

If a unit is to be converted to a horizontal discharge, the following conversion must be performed:

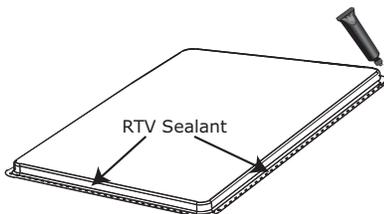
1. Remove RETURN and SUPPLY duct covers.
2. Place SUPPLY DUCT COVER over downflow return opening (insulation side down).
3. Using self-drilling screws (or screws removed from duct cover), screw through dimples to attach DUCT COVER to base.

Figure 20. Duct cover



4. On original RETURN DUCT COVER, apply ¼" (6mm.) continuous bead of 500°F RTV sealant around flange (opposite insulation side), as shown.

Figure 21. Duct cover



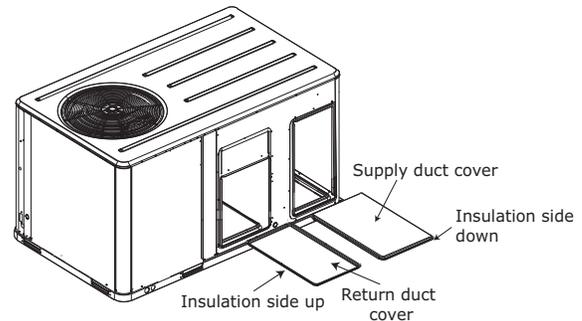
5. Slide RETURN DUCT COVER (insulation side up) into supply opening until inward edge of duct cover engages with the 2 retaining clips on the duct flange. Secure outward edge of the duct cover with two screws.

Note: If unit is equipped with Return Air Smoke Detector, refer to field conversion instructions for horizontal discharge before installing return air duct.

Note: If unit is equipped with Discharge Air Sensing option refer to the following figure for proper tube positioning based on unit tonnage.

6. After completing installation of the duct covers for horizontal discharge, proceed to TCO-1 instructions.

Figure 22. Supply and return covers



TCO1 Instructions—Unit Model Numbers YSC072ED*H, YSC090ED*H, YSC102ED*H, YSC120ED*H

If the unit being installed is one of these models, the limit control TCO1 must be replaced with the extra limit control shipped in the heater compartment. Replace TCO1 using steps 1 through 3 in the following instructions. If the unit being installed does not correspond to any of these models, skip steps 1 through 3 and go to the next step in the installation process.

⚠ WARNING

Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

1. Remove the heat section access panel.
2. Remove TCO1 from shipping location, attached to the combustion blower.
3. Replace and discard the existing TCO1 originally installed at the factory for downflow operation with the TCO1, which was shipped attached to the combustion blower for horizontal operation.
4. Replace heat section access panel.



Requirements for Gas Heat

Note: The unit gas train and optional through the base gas shut-off valve are rated at 1/2 PSIG maximum. A pressure reducing regulator is recommended to prevent this maximum from being exceeded. These components must be isolated during field gas piping test that exceed 1/2 PSIG. It is recommended that the field piping be capped prior to the unit gas train or optional through the base gas shut-off valve if present.

- Gas supply line properly sized and connected to the unit gas train.
- All gas piping joints properly sealed.
- Gas piping leak checked with a soap solution. If piping connections to the unit are complete, do not pressurize piping in excess of 0.50 psig or 14" W.C. to prevent component failure.
- Drip leg Installed in the gas piping near the unit.
- Minimum gas supply pressure should be 4.5" W.C.
- Maximum gas supply pressure must not exceed 14.0" W.C.
- Manifold pressure for single stage heaters should be set to 3.3" W.C.
- Manifold pressure for two stage heaters should be set to 3.5" W.C. on HIGH FIRE and 1.8" W.C. on LOW FIRE.
- Flue Exhaust clear of any obstruction.

Condensate Drain Configuration

An evaporator condensate drain connection is provided on each unit. Refer to [Figure 13, p. 17](#) and [Figure 14, p. 18](#) for the appropriate drain location.

The condensate drain pan is factory installed to drain condensate to the back side of the unit. See [Figure 13, p. 17](#) and [Figure 14, p. 18](#). It can be converted to drain condensate out the front side of the unit or through the base.

Before drain pan removal, switch wire must be disconnected from wire tie on panel and any tape before drain pan can be removed.

Care must be taken wire does not catch on bottom of Indoor coil or any protrusions when drain pan is removed.

To Convert Drain Condensate through Front of Unit

1. Remove evaporator access panel and supply air access panels.
2. Remove the support panel that the condensate drain pan exits through.
3. Slide the condensate drain pan out of the unit and rotate 180°.

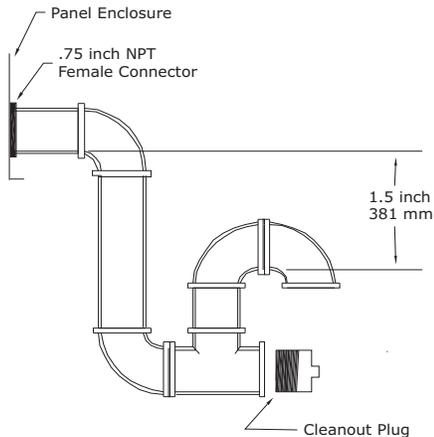
4. Slide the condensate drain pan back into the unit, align the drain with the grommated opening in the rear support panel and push until the coupling is seated in the grommet.
5. Replace the front support panel by aligning the panel with tabs in the raceway. Align the condensate drain pan support in the grommated hole as the panel is put in place.
6. Replace evaporator access panel and supply air access panels.

To Convert Drain Condensate through the Base of Unit

1. Remove evaporator access panel and supply air access panels.
2. Remove the support panel that the condensate drain pan exits through.
3. Slide the condensate drain pan out of the unit.
4. Place on a level surface in the position it was removed from the unit.
5. Remove the plug knockout in the bottom of the drain pan to convert it to through the base drainage.
6. Plug the original condensate drain opening with a field-supplied 3/4" NPT plug.
7. Slide the condensate drain pan back into the unit, align the drain support with the grommated opening in the rear support panel and push until the support is seated in the grommet.
8. Replace the front support panel by aligning the panel with tabs in the raceway. Align the plugged condensate drain pan coupling in the grommated hole as the panel is put in place.
9. Replace evaporator access panel and supply air access panels.

A condensate trap must be installed at the unit due to the drain connection being on the "negative pressure" side of the fan. Install the P-Trap using the guidelines in [Figure 23, p. 23](#).

A condensate drain line must be connected to the P-Trap. Pitch the drain lines at least 1/2 inch for every 10 feet of horizontal run to assure proper condensate flow. Do not allow the horizontal run to sag causing a possible double-trap condition which could result in condensate backup due to "air lock".

Figure 23. Condensate trap installation


Drain Pan Removal (Units with Condensate Overflow Switch Option)

Before drain pan removal, the switch wire must be disconnected from wire tie on panel and/or any tape before drain pan can be removed.

Care must be taken so the wire does not catch on the bottom of indoor coil or any protrusion.

Note: When reversing the drain pan, on some units, the condensate overflow switch will need to be moved to the second hole in its bracket to avoid contact with headers or indoor coil.

Filter Installation

The quantity of filters is determined by unit size. Access to the filters is obtained by removing the filter access panel. Refer to the unit Service Facts (shipped with each unit) for filter requirements.

Note: Do not operate the unit without filters.

Field-Installed Power Wiring

⚠ WARNING

Proper Field Wiring and Grounding Required!

All field wiring **MUST** be performed by qualified personnel. Improperly installed and grounded field wiring poses **FIRE** and **ELECTROCUTION** hazards. To avoid these hazards, you **MUST** follow requirements for field wiring installation and grounding as described in **NEC** and your local/state electrical codes. Failure to follow code could result in death or serious injury.

An overall dimensional layout for the field-installed wiring entrance into the unit is illustrated in “Unit Dimensions,” p. 10. To ensure that the unit’s supply power wiring is properly sized and installed, use the following guidelines.

- Verify that the power supply available is compatible with the unit’s nameplate ratings.
- The available supply power must be within 10% of the rated voltage stamped on the nameplate.
- Use only copper conductors to connect the power supply to the unit.

NOTICE:

Use Copper Conductors Only!

Unit terminals are not designed to accept other types of conductors. Failure to use copper conductors could result in equipment damage.

Note: If the unit is not equipped with an optional factory installed non-fused disconnect switch or circuit breaker, a field-supplied disconnect switch must be installed at or near the unit in accordance with the National Electrical Code (NEC latest edition).

Main Unit Power

⚠ WARNING

Proper Field Wiring and Grounding Required!

All field wiring **MUST** be performed by qualified personnel. Improperly installed and grounded field wiring poses **FIRE** and **ELECTROCUTION** hazards. To avoid these hazards, you **MUST** follow requirements for field wiring installation and grounding as described in **NEC** and your local/state electrical codes. Failure to follow code could result in death or serious injury.

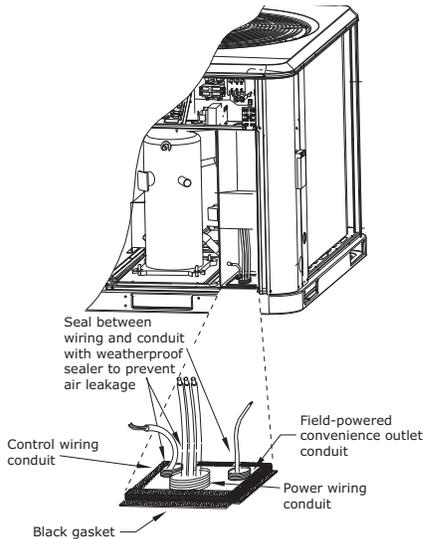
⚠ WARNING

Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

Standard Wiring

1. Location of the applicable electrical service entrance is illustrated in “Unit Dimensions,” p. 10. Complete the unit’s power wiring connections at Compressor Contactor # 1 (CC1) inside the unit control panel. Refer to the customer connection diagram that is shipped with the unit for specific termination points
2. Provide proper grounding for the unit in accordance with local and national codes.

Figure 24. All units


Field-Installed Control Wiring

Note: All field wiring must conform to NEC guidelines as well as state and local codes.

Control Power Transformer

The 24-volt control power transformers are to be used only with the accessories called out in this manual. Transformers rated greater than 50 VA are equipped with internal circuit breakers. If a circuit breaker trips, turn off all power to the unit before attempting to reset it.

⚠ WARNING

Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

The transformer is located in the control panel. The circuit breaker is located on the left side of the transformer; reset it by pressing the black reset button.

Controls Using 24 VAC

Before installing any connecting wiring, refer to “Unit Dimensions,” p. 10 for the electrical access locations provided on the unit, Table 4, p. 24 for AC conductor sizing guidelines, and the following guidelines:

- Use copper conductors unless otherwise specified.
- Ensure that the AC control wiring between the controls and the unit’s termination point does not exceed 3 ohms/conductor for the length of the run.

Note: Resistance in excess of 3 ohms per conductor may cause component failure due to insufficient AC voltage supply.

Note: Be sure to check all loads and conductors for grounds, shorts, and mis-wiring.

- Do not run the AC low voltage wiring in the same conduit with the high voltage power wiring.
- Route low voltage wiring per Figure 27, p. 25.

Table 4. Electromechanical thermostat 24V AC conductors with ReliaTel™

Distance from Unit to Control	Recommended Wire Size
000 to 460 feet	18 gauge
000 to 140 m	.75 mm ²
461 to 732 feet	16 gauge
141 to 223 m	1.3 mm ²
733 to 1000 feet	14 gauge
224 to 305 m	2.0 mm ²

Controls using DC Analog Input/Outputs (Standard Low Voltage Multi-Conductor Wire)

Before installing any connecting wiring between the unit and components using a DC analog input/output signal, refer to “Unit Dimensions,” p. 10 for the electrical access locations provided on the unit.

- Table 5, p. 24 lists the conductor sizing guidelines that must be followed when interconnecting the DC binary output devices and the system components using a DC analog input/output signal to the unit.

Note: Resistance in excess of 2.5 ohms per conductor can cause deviations in the accuracy of the controls.

Note: Ensure that the wiring between controls and the unit’s termination point does not exceed 2.5 ohms per conductor for the length of the run.

- Do not run the electrical wires transporting DC signals in or around conduit housing high voltage wires.
- Route low voltage wiring per Figure 27, p. 25.

DC Conductors

Table 5. Zone sensor module wiring

Distance from Unit to Control	Recommended Wire Size
0 to 150 feet	22 gauge
0 to 45.7 m	.33 mm ²
151 to 240 feet	20 gauge
46 to 73.1 m	.50 mm ²
241 to 385 feet	18 gauge
73.5 to 117.3 m	.75 mm ²
386 to 610 feet	16 gauge
117.7 to 185.9 m	1.3 mm ²
611 to 970 feet	14 gauge
186.2 - 295.7 m	2.0 mm ²

Figure 25. ReliaTel™ conventional thermostat field wiring diagrams

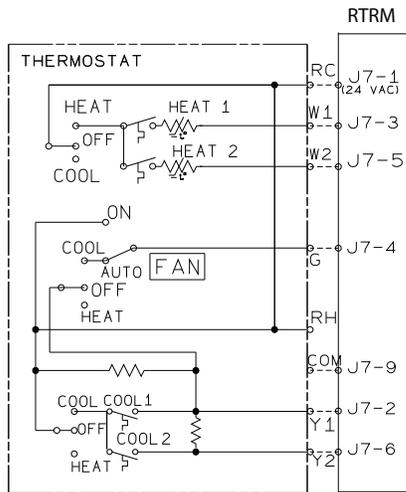


Figure 26. ReliaTel options module

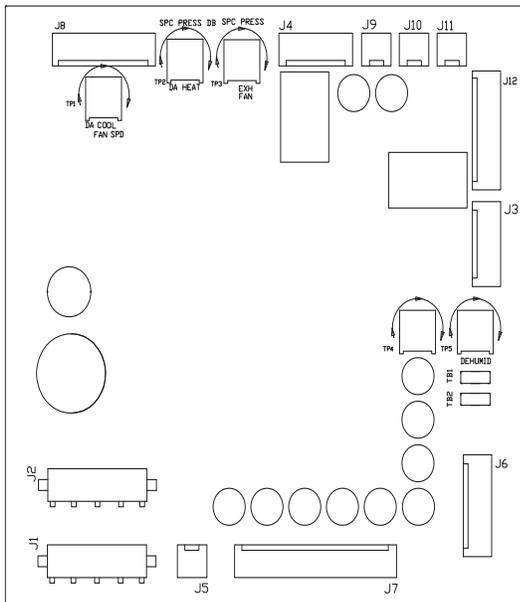
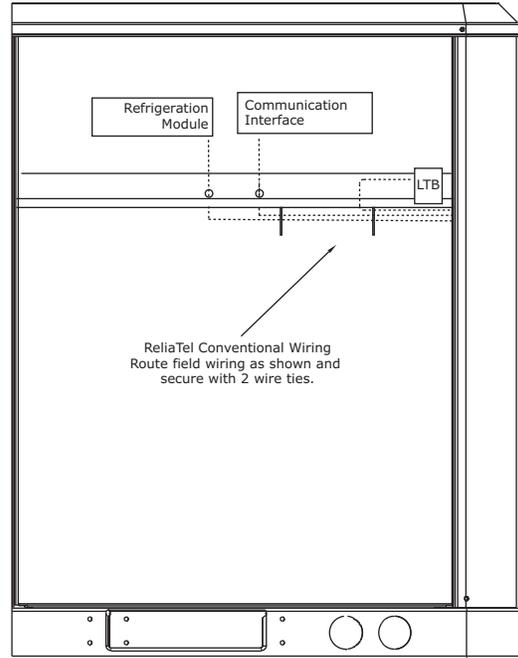


Figure 27. ReliaTel control customer low voltage routing



Space Temperature Averaging (ReliaTel™ Only)

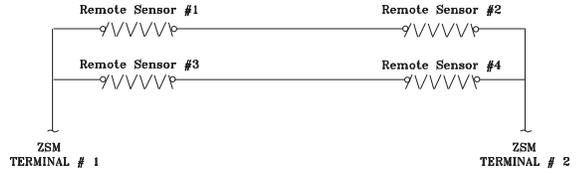
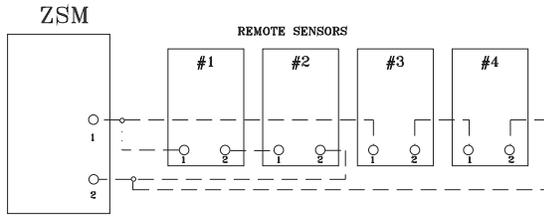
Space temperature averaging is accomplished by wiring a number of remote sensors in a series/parallel circuit.

Using the BAYSENS016* or BAYSENS077*, at least four sensors are required to accomplish space temperature averaging. See [Figure 28, p. 26](#).

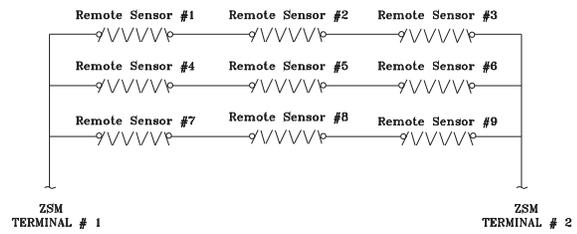
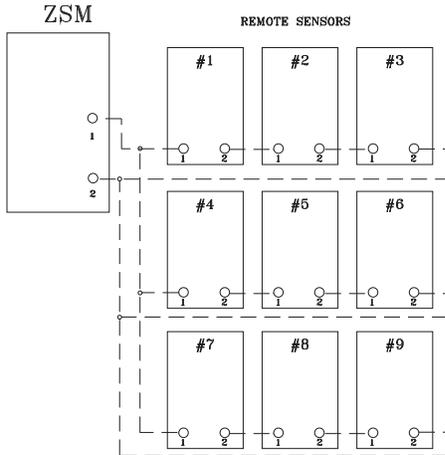
- Example #1 illustrates two series circuits with two sensors in each circuit wired in parallel. The square of any number of remote sensors is required.
- Example #2 illustrates three sensors squared in a series/parallel circuit. Using BAYSENS077*, two sensors are required to accomplish space temperature averaging.
- Example #3 illustrates the circuit required for this sensor. [Table 6, p. 28](#) lists the temperature versus resistance coefficient for all sensors.

Figure 28. Examples

EXAMPLE #1



EXAMPLE #2



EXAMPLE #3

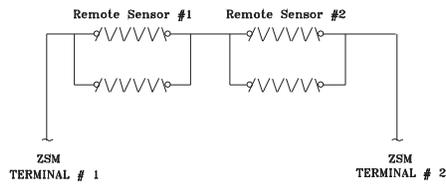
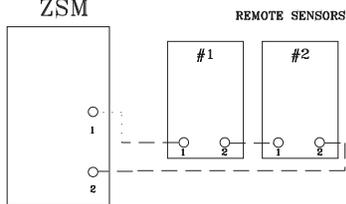
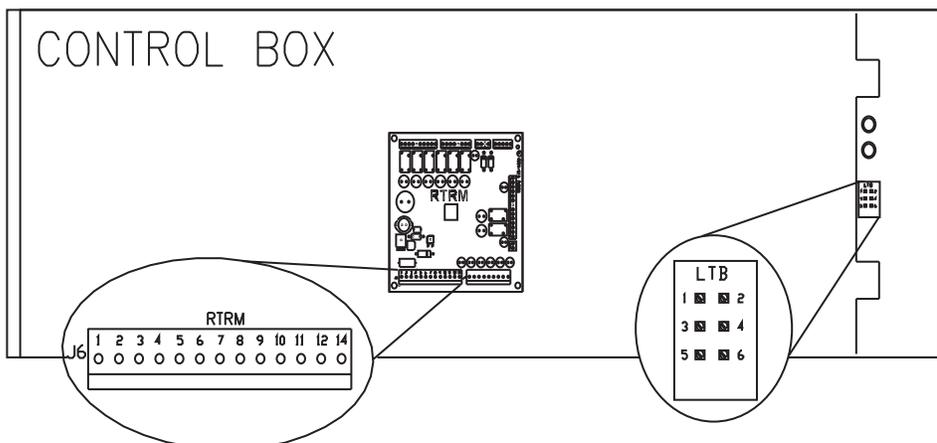
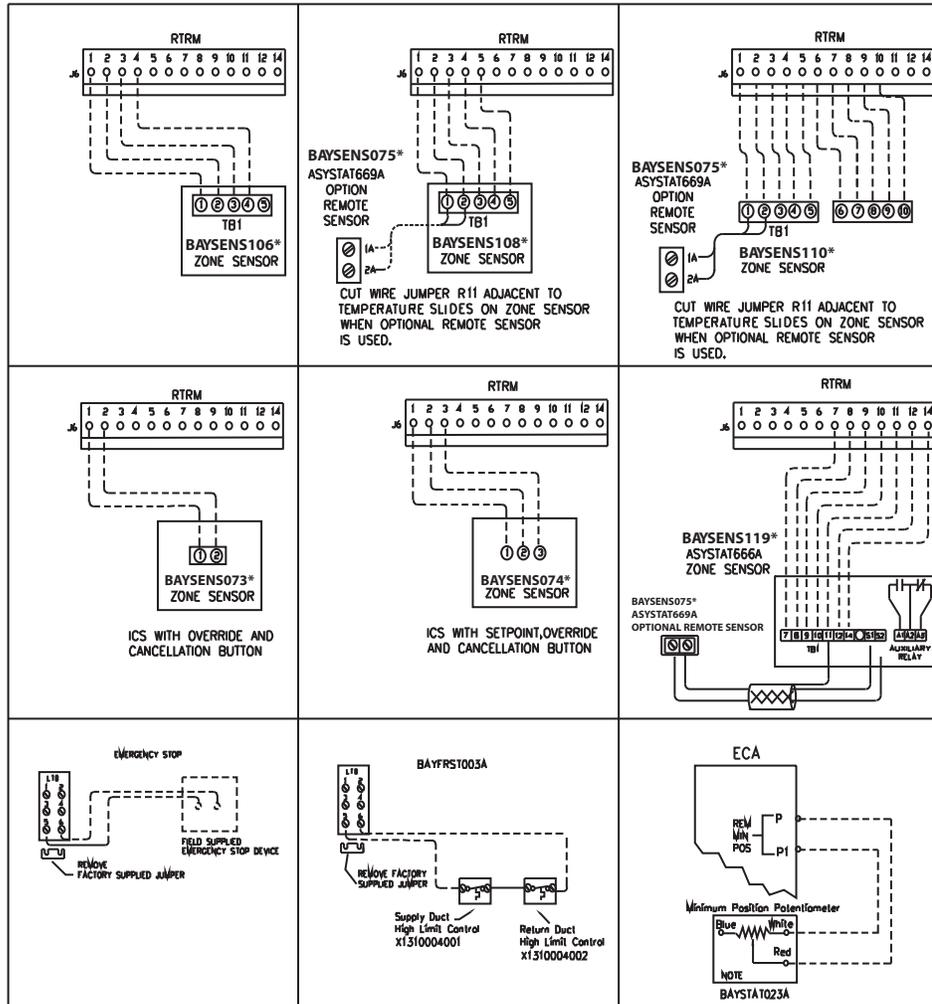


Figure 29. Typical field wiring diagrams for optional controls (ReliaTel™ only)



Installation

Table 6. Temperature vs. resistance

Temperature		
Degrees F°	Degrees C°	Nominal Resistance
-20°	-28.9°	170.1 K - Ohms
-15°	-26.1°	143.5 K - Ohms
-10°	-23.3°	121.4 K - Ohms
-5°	-20.6°	103.0 K - Ohms
0°	-17.8°	87.56 K - Ohms
5°	-15.0°	74.65 K - Ohms
10°	-12.2°	63.80 K - Ohms
15°	-9.4°	54.66 K - Ohms
20°	-6.7°	46.94 K - Ohms
25°	-3.8°	40.40 K - Ohms
30°	-1.1°	34.85 K - Ohms
35°	1.7°	30.18 K - Ohms
40°	4.4°	26.22 K - Ohms
45°	7.2°	22.85 K - Ohms
50°	10.0°	19.96 K - Ohms
55°	12.8°	17.47 K - Ohms
60°	15.6°	15.33 K - Ohms
65°	18.3°	13.49 K - Ohms
70°	21.1°	11.89 K - Ohms
75°	23.9°	10.50 K - Ohms
80°	26.7°	9.297 K - Ohms
85°	29.4°	8.247 K - Ohms
90°	32.2°	7.330 K - Ohms
95°	35.0°	6.528 K - Ohms

Table 7. Sizing natural gas pipe mains and branches

Length of Pipe (ft)	Iron Pipe Size (IPS) Inches				
	1/2" Pipe	3/4" Pipe	1" Pipe	1 1/4" Pipe	1 1/2" Pipe
15	76	176	345	750	1220
30	52	120	241	535	850
45	43	99	199	435	700
60	38	86	173	380	610
75		77	155	345	545

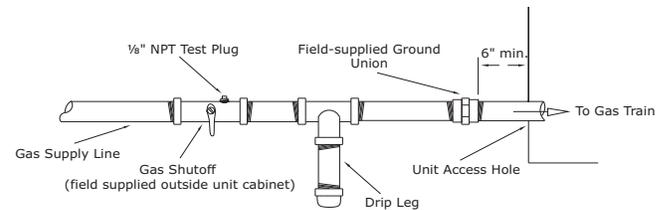
Note: Capacity of pipe of different diameters and lengths in cu. ft. per hr. with pressure drop of 0.3" and specific gravity of 0.60

Table 8. Iron pipe size (SI) millimeters

Length of Pipe (Meters)	Iron Pipe Size (SI) Millimeters				
	15 mm Pipe	20 mm Pipe	25 mm Pipe	32 mm Pipe	40 mm Pipe
4.6	2.15	4.98	9.76	21.23	34.54
9.1	1.47	3.39	6.82	15.14	24.06
13.7	1.21	2.80	5.63	12.31	19.82
18.3	1.07	2.43	4.89	10.76	17.27
22.9	—	2.18	4.38	9.76	15.40

Note: Capacity of pipe of different diameters and lengths in cu. meter per hr. with pressure drop of 74.6 pa and specific gravity of 0.60.

Figure 30. Schematic diagram for field gas piping to unit





Pre-Start

Use the following checklist in conjunction with the "General Unit Requirements" checklist to ensure that the unit is properly installed and ready for operation.

⚠ WARNING

Hazardous Voltage w/Capacitors!

Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN

- Verify that the condenser airflow will be unobstructed.

⚠ WARNING

Rotating Components!

During installation, testing, servicing and troubleshooting of this product it may be necessary to work with live and exposed rotating components. Have a qualified or licensed service individual who has been properly trained in handling exposed rotating components, perform these tasks. Failure to follow all safety precautions could result in rotating components cutting and slashing technician which could result in death or serious injury.

- Verify that the condenser fan and indoor blower turn freely without rubbing and are properly tightened on the shafts.
- Check the supply fan belts for proper tension and the fan bearings for sufficient lubrication. If the belts require adjustment, or if the bearings need lubricating, refer to the maintenance section of this manual for instructions.
- Verify that a condensate trap is installed and the piping is properly sized and pitched.
- Verify that the correct size and number of filters are in place.
- Inspect the interior of the unit for tools and debris and install all panels in preparation for starting the unit.

Voltage Imbalance

Three phase electrical power to the unit must meet stringent requirements for the unit to operate properly. Measure each leg (phase-to-phase) of the power supply. Each reading must fall within the utilization range stamped on the unit nameplate. If any of the readings do not fall

within the proper tolerances, notify the power company to correct this situation before operating the unit.

Excessive three phase voltage imbalance between phases will cause motors to overheat and eventually fail. The maximum allowable voltage imbalance is 2%. Measure and record the voltage between phases 1, 2, and 3 and calculate the amount of imbalance as follows:

$$\% \text{ Voltage Imbalance} = \frac{100 \times AV - VD}{AV} \text{ where:}$$

$$AV \text{ (Average Voltage)} = \frac{\text{Volt 1} + \text{Volt 2} + \text{Volt 3}}{3}$$

V1, V2, V3 = Line voltage readings

VD = Line voltage reading that deviates the farthest from the average voltage.

Example:

If the voltage readings of the supply power measured 221, 230, and 227, the average volts would be:

$$\frac{221 + 230 + 227}{3} = 226 \text{ Avg.}$$

VD (reading farthest from average) = 221

The percentage of imbalance equals:

$$\frac{100 \times 226 - 227}{226} = 2.2\%$$

The 2.2% imbalance in this example exceeds the maximum allowable imbalance of 2.0%. This much imbalance between phases can equal as much as a 20% current imbalance with a resulting increase in motor winding temperatures that will decrease motor life. If the voltage imbalance is over 2%, notify the proper agencies to correct the voltage problem before operating this equipment.

Electrical Phasing (Three-Phase Motors)

The compressor motor(s) and the supply fan motor are internally connected for the proper rotation when the incoming power supply is phased as A, B, C.

Before starting the unit, quickly determine and correct proper electrical supply phasing by using an instrument such as an Associated Research Model 45 Phase Sequence Indicator and the following steps:

- Turn the field-supplied disconnect switch that provides power to the main power terminal block or to the "Line" side of the optional factory-mounted disconnect switch to the OFF position.
- Connect the phase sequence indicator leads to the terminal block or to the "Line" side of the optional factory-mounted disconnect switch as follows:
Black (phase A) to L1
Red (phase B) to L2

Pre-Start

Yellow (phase C) to L3

- Close the field-supplied main power disconnect switch or circuit protector switch that provides the supply power to the unit.

Note: Upon closing main power disconnect and the unit-mounted disconnect switch or circuit breaker, the phase monitor will verify proper phasing. If LED on face of the monitor is red, correct supply power fault.

WARNING

Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

To prevent injury or death from electrocution, it is the responsibility of the technician to recognize this hazard and use extreme care when performing service procedures with the electrical power energized.

- Observe the ABC and CBA phase indicator lights on the face of the sequencer. The ABC indicator light will glow if the phase is ABC. If the CBA indicator light glows, open the disconnect switch or circuit protection switch and reverse any two power wires.
- Restore the main electrical power and recheck the phasing. If the phasing is correct, open the disconnect switch or circuit protection switch and remove the phase sequence indicator.

Compressor Crankcase Heaters (Optional)

Each compressor can be equipped with a crankcase heater (on some units the crankcase heater comes standard). The proper operation of the crankcase heater is important to maintain an elevated compressor oil temperature during the OFF cycle to reduce oil foaming during compressor starts. Oil foaming occurs when refrigerant condenses in the compressor and mixes with the oil. In lower ambient conditions, refrigerant migration to the compressor could increase.

When the compressor starts, the sudden reduction in crankcase pressure causes the liquid refrigerant to boil rapidly causing the oil to foam. This condition could damage compressor bearings due to reduced lubrication and could cause compressor mechanical failures.

Before starting the unit in the "Cooling" mode, set the system switch to the OFF position and turn the main power disconnect to the ON position and allow the crankcase heater to operate a minimum of 8 hours.

Before closing the main power disconnect switch, ensure that the "System" selection switch is in the OFF position and the "Fan" selection switch is in the "Auto" position.

Close the main power disconnect switch and the unit-mounted disconnect switch, if applicable.

Note: Upon closing main power disconnect and the unit-mounted disconnect switch or circuit breaker, the phase monitor will verify proper phasing. If LED on face of the monitor is red, correct supply power fault.

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To prevent injury or death from electrocution, it is the responsibility of the technician to recognize this hazard and use extreme care when performing service procedures with the electrical power energized.

ReliaTel™ Controls

Upon power initialization, the RTRM performs self-diagnostic checks to ensure that all internal controls are functional. It also checks the configuration parameters against the components connected to the system. The Liteport LED located on the RTRM module turns on within one second of power-up if internal operation is okay.

Use one of the following "Test" procedures to bypass some time delays and to start the unit at the control panel. Each step of unit operation can be activated individually by temporarily shorting across the "Test" terminals for two to three seconds. The Liteport LED located on the RTRM module will blink when the test mode has been initiated. The unit can be left in any "Test" step for up to one hour before it will automatically terminate, or it can be terminated by opening the main power disconnect switch. Once the test mode has been terminated, the Liteport LED will glow continuously and the unit will revert to the "System" control.

Table 9. Service test guide for component operation

Test Step	Mode	Fan	Econ (a)	Comp 1	Comp 2	Heat 1	Heat 2	Resistance	PWM Output ^(b)	Multi-Speed Fan Output
1	Fan	On	Minimum Position Setpoint 0%	Off	Off	Off	Off	2.2kΩ	50%	low
	Minimum Ventilation	On	Selectable	Off	Off	Off	Off			
2	Economizer Test Open	On	Open	Off	Off	Off	Off	3.3kΩ	50% ^(c)	low
3	Cool Stage 1	On	Minimum Position	On ^(d)	Off	Off	Off	4.7kΩ	82%	low
4 ^(e)	Cool Stage 2	On	Minimum Position	On ^(d)	On ^(d)	Off	Off	6.8kΩ	100%	High (2-step cooling) Low (3-step cooling)
5 ^(e)	Cool Stage 3	On	Minimum Position	On ^(d)	On ^(d)	Off	Off	8.2kΩ	100%	High
6 ^(e)	Reheat	On	Minimum	On	On	Off	Off	33kΩ	100% ^(f)	High
7 ^(e)	Heat Stage 1	On	Minimum	Off	Off	On	Off	10kΩ	100%	High
8 ^(e)	Heat Stage 2	On	Minimum	Off	Off	On	On	15kΩ	100%	High

(a) The exhaust fan will turn on anytime the economizer damper position is equal to or greater than the exhaust fan setpoint.
 (b) The PWM Output is in reference to the user selected maximum unit fan speed.
 (c) Regardless of the Economizer Mode configuration, the unit will run the Supply Fan at the minimum speed during the Economizer step of the Service Test.
 (d) The condenser fans will operate any time a compressor is on, providing the outdoor air temperatures are within the operating values.
 (e) Steps for optional accessories and non-applicable modes in unit will be skipped.
 (f) Units with Enhanced Dehumidification only will not perform this step during Service Test.

Test Modes

There are three methods in which the “Test” mode can be cycled at LTB-Test 1 and LTB-Test 2.

1. **Step Test Mode**—This method initiates the different components of the unit, one at a time, by temporarily shorting across the two test terminals for two to three seconds. For the initial start-up of the unit, this method allows the technician to cycle a component “On” and have up to one hour to complete the check.
2. **Resistance Test Mode**—This method can be used for start-up providing a decade box for variable resistance outputs is available. This method initiates the different components of the unit, one at a time, when a specific resistance value is placed across the two test terminals. The unit will remain in the specific test mode for approximately one hour even though the resistance is left on the test terminals.
3. **Auto Test Mode**—This method is not recommended for start-up due to the short timing between individual component steps. This method initiates the different components of the unit, one at a time, when a jumper is installed across the test terminals. The unit will start the first test step and change to the next step every 30 seconds.

At the end of the test mode, control of the unit will automatically revert to the applied “System” control method.

For unit test steps, test modes, and step resistance values to cycle the various components, refer to [Table 9, p. 31](#).

ReliaTel™ Controls

Upon power initialization, the Gas Ignition Module (IGN) performs self-diagnostic checks to ensure that all internal controls are functional. It also checks the configuration parameters against the components connected to the system. The System LED located on the IGN module is turned on within one second of power-up if internal operation is okay.



Unit Start-Up

Verifying Proper Air Flow

⚠ WARNING

Live Electrical Components!

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Units with Belt Drive Indoor Fan

Much of the systems performance and reliability is closely associated with, and dependent upon, having the proper airflow supplied both to the space that is being conditioned and across the evaporator coil.

The indoor fan speed is changed by opening or closing the adjustable motor sheave.

Before starting the SERVICE TEST, set the minimum position setpoint for the economizer to 0 percent using the setpoint potentiometer located on the Economizer Control (ECA), if applicable.

ReliaTel™ Control:

Using the Service Test Guide in [Table 9, p. 31](#), momentarily jump across the Test 1 and Test 2 terminals on LTB1 one time to start the Minimum Ventilation Test.

With the fan operating properly, determine the total system airflow (CFM) by:

1. Measuring the actual RPM,
 2. Measure the amperage at the supply fan contactor and compare it with the full load amp (FLA) rating stamped on the motor nameplate.
 - a. Calculate the theoretical BHP using (Actual Motor Amps/ Motor Nameplate Amps) X Motor HP.
 - b. Using the fan performance tables in the unit Service Facts, plot the actual RPM (step 1) and the BHP (step 2a) to obtain the operating CFM.
 3. If the required CFM is too low, (external static pressure is high causing motor HP output to be below table value),
 - a. Relieve supply and/or return duct static.
 - b. Change indoor fan speed and repeat steps 1 and 2.
- To increase fan rpm: Loosen the pulley adjustment set screw and turn sheave clockwise.
 - To decrease fan rpm: Loosen the pulley adjustment set screw and turn sheave counterclockwise.

- If the required CFM is too high, (external static pressure is low, causing motor HP output to be above table value), change indoor fan speed and repeat steps 1 and 2.
- To stop the SERVICE TEST, turn the main power disconnect switch to the OFF position or proceed to the next component start-up procedure.

Economizer Start-Up

ReliaTel Control:

Using the Service Test Guide in [Table 9, p. 31](#), momentarily jump across the Test 1 and Test 2 terminals on LTB1 one time to start the Minimum Ventilation Test.

1. Set the minimum position setpoint for the economizer to the required percentage of minimum ventilation using the setpoint potentiometer located on the Economizer Control (ECA).

The economizer will drive to its minimum position setpoint, exhaust fans (if applicable) may start at random, and the supply fan will start when the SERVICE TEST is initiated.

⚠ WARNING

Rotating Components!

During installation, testing, servicing and troubleshooting of this product it may be necessary to measure the speed of rotating components. Have a qualified or licensed service individual who has been properly trained in handling exposed rotating components, perform these tasks. Failure to follow all safety precautions when exposed to rotating components could result in death or serious injury.

The exhaust fan will start anytime the economizer damper position is equal to or greater than the exhaust fan setpoint.

2. Verify that the dampers stroked to the minimum position.

ReliaTel Control:

Momentarily jump across the Test 1 and Test 2 terminals on LTB1 one additional time if continuing from previous component start-up or until the desired start-up component Test is started.

3. Verify that the dampers stroked to the full open position.
4. To stop the SERVICE TEST, turn the main power disconnect switch to the OFF position or proceed to the next component start-up procedure. Remove electro mechanical test mode connections (if applicable).

Compressor Start-Up

1. Attach a set of service gauges onto the suction and discharge gauge ports for each circuit. Refer to the refrigerant circuit illustration in the Service Facts.

ReliaTel™ Control:

Momentarily jump across the Test 1 and Test 2 terminals on LTB1 one additional time if continuing from previous component start-up or until the desired start-up component Test is started.

Scroll Compressors

- a. Once each compressor has started, verify that the rotation is correct. If a scroll compressor is rotating backwards, it will not pump and a loud rattling sound can be observed.
 - b. If the electrical phasing is correct, before condemning a compressor, interchange any two leads (at the compressor terminal block) to check the internal phasing. If the compressor runs backward for an extended period (15 to 30 minutes), the motor winding can overheat and cause the motor winding thermostat to open.
2. After the compressor and condenser fan have started and operated for approximately 30 minutes, observe the operating pressures. Compare the operating pressures to the operating pressure curve in the Service Facts.
 3. Check system superheat. Follow the instruction listed on the superheat charging curve in the Service Facts. Superheat should be within $\pm 5^{\circ}\text{F}$ of the superheat chart value.
 4. Repeat steps 1 through 4 for each refrigerant circuit.
 5. To stop the SERVICE TEST, turn the main power disconnect switch to the OFF position or proceed to the next component start-up procedure. Remove electro mechanical test mode connections (if applicable).

Gas Heat Units

Open the main disconnect switch to shut the unit off and to reset the RTRM.

ReliaTel Control:

Follow the Test Guide in [Table 9, p. 31](#) to start the unit in the heating mode. Momentarily jump across the Test 1 and Test 2 terminals on LTB1 one additional time if continuing from previous component start-up or until the desired start-up component Test is started.

When starting the unit for the first time or servicing the heaters, it is a good practice to start the heater with the main gas supply turned off.

Once the ignition system and components have been checked, open the main power disconnect switch to reset the unit.

Final System Setup

After completing all of the pre-start and start-up procedures outlined in the previous sections (i.e., operating the unit in each of its Modes through all available stages of cooling and heating), perform these final checks before leaving the unit:

- Program the Night Setback (NSB) panel (if applicable) for proper unoccupied operation. Refer to the programming instructions for the specific panel.
- Verify that the Remote panel “System” selection switch, “Fan” selection switch, and “Zone Temperature” settings for automatic operation are correct.
- Inspect the unit for misplaced tools, hardware, and debris.
- Verify that all exterior panels including the control panel doors and condenser grilles are secured in place.
- Close the main disconnect switch or circuit protector switch that provides the supply power to the unit’s terminal block or the unit-mounted disconnect switch.

WARNING

Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Make sure all personnel are standing clear of the unit before proceeding. The system components will start when the power is applied.