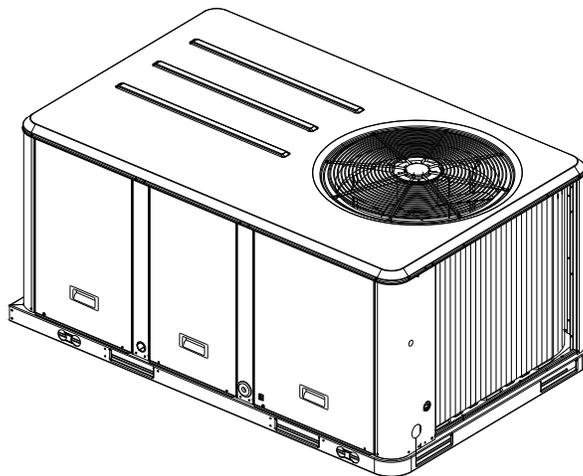


Installation, Operation, and Maintenance

Packaged Rooftop Air Conditioners Precedent™ — Heat Pump 5 – 10 Tons – 50 Hz



Model Numbers

WSC060ED - WSC120ED

⚠ 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.

Warnings, Cautions and Notices

Warnings, Cautions and Notices. Note that warnings, cautions and notices appear at appropriate intervals throughout this manual. Warnings are provide to alert installing contractors to potential hazards that could result in death or personal injury. Cautions are designed to alert personnel to hazardous situations that could result in personal injury, while notices indicate a situation that could result in equipment or property-damage-only accidents.

Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

Read this manual thoroughly before operating or servicing this unit.

ATTENTION: Warnings, Cautions and Notices appear at appropriate sections throughout this literature. Read these carefully:

⚠ 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

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.

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!

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

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 Personal Protective Equipment (PPE) recommended for the work being undertaken. **ALWAYS** refer to appropriate MSDS sheets and OSHA guidelines for proper PPE.
- When working with or around hazardous chemicals, **ALWAYS** refer to the appropriate MSDS sheets and OSHA guidelines for information on allowable personal exposure levels, proper respiratory protection and handling recommendations.
- If there is a risk of arc or flash, technicians **MUST** put on all Personal Protective Equipment (PPE) in accordance with NFPA 70E or other country-specific requirements for arc flash protection, **PRIOR** to servicing the unit.

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

Revision Summary

RT-SVX39B-EN (11 September 2012)

- MERV 8 filter with filter removal tool
- Stainless steel drain pan, condensate overflow switch
- Updated Model Number Description, Maintenance, Troubleshooting

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Model Number Description

W	S	C	1	2	0	E	4	R	0	A	*	*
1	2	3	4	5	6	7	8	9	10	11	12	13
Digit 1 - Unit Type W Packaged Heat Pump ³			Digit 15 - Supply Fan/Drive Type/ Motor			Digit 23 - Refrigeration Controls			0 No Refrigeration Control ³			
Digit 2 - Efficiency S Standard Efficiency			0 Standard Drive ⁴			1 Oversized Motor			1 Frostat ¹³			
Digit 3 - Airflow C Convertible			2 Optional Belt Drive Motor			2 Single Zone Variable Air Volume (SZVAV)			2 Crankcase Heater ¹¹			
Digit 4,5,6 - Nominal Gross Cooling Capacity (MBh)			6 Single Zone Variable Air Volume (SZVAV)			7 Multi-Speed Indoor Fan ¹⁴			3 Frostat and Crankcase Heater ^{11,13}			
036 3 Ton			Digit 16 - Hinged Service Access/Filters			0 Standard Panels/Standard Filters			Digit 24 - Smoke Detector			
048 4 Ton			A Hinged Access Panels/Standard Filters			B Standard Panels/2" MERV 8 Filters			0 No Smoke Detector			
060 5 Ton			B Standard Panels/2" MERV 8 Filters			C Hinged Access Panels/2" MERV 8 Filters			A Return Air Smoke Detector ⁹			
072 6 Ton			D Standard Panels/2" MERV 13 Filters			E Hinged Access Panels/2" MERV 13 Filters			B Supply Air Smoke Detector			
090 7½ Ton, Single Compressor			Digit 17 - Condenser Coil Protection			0 Standard Coil			C Supply and Return Air Smoke Detectors ⁹			
120 10 Ton			1 Standard Coil with Hail Guard			2 Black Epoxy Pre-Coated Condenser Coil			D Plenum Smoke Detector			
Digit 7 - Major Design Sequence E R-410A Refrigerant			2 Black Epoxy Pre-Coated Condenser Coil with Hail Guard			3 Black Epoxy Pre-Coated Condenser Coil with Hail Guard			Digit 25 - System Monitoring Controls			
Digit 8 - Voltage Selection			Digit 18 - Through the Base Provisions			0 No Through the Base Provisions			0 No Monitoring Control			
1 208-230/60/1			0 No Through the Base Provisions			A Through the Base Electric ⁶			1 Clogged Filter Switch			
3 208-230/60/3			Digit 19 - Disconnect/Circuit Breaker (three-phase only)			0 No Disconnect/No Circuit Breaker			2 Fan Failure Switch			
4 460/60/3			0 No Disconnect/No Circuit Breaker			1 Unit Mounted Non-Fused Disconnect ⁶			3 Discharge Air Sensing Tube			
W 575/60/3			1 Unit Mounted Non-Fused Disconnect ⁶			2 Unit Mounted Circuit Breaker ⁶			4 Clogged Filter Switch and Fan Fail Switch			
Digit 9 - Unit Controls R ReliaTel™ Microprocessor			2 Unit Mounted Circuit Breaker ⁶			Digit 20 - Convenience Outlet			5 Clogged Filter Switch and Discharge Air Sensing Tube			
Digit 10 - Heating Capacity			Digit 21 - Communications Options			0 No Convenience Outlet			6 Fan Fail Switch and Discharge Air Sensing Tube			
0=No Electric Heat F=14 kW (1 phase) ¹			0 No Communications Interface			A Unpowered Convenience Outlet			7 Clogged Filter and Fan Fail Switches and Discharge Air Sensing Tube			
A=5 kW (1 phase) ¹ G=18 kW (1&3 phase)			1 Trane Communications Interface			B Powered Convenience Outlet (three-phase only) ⁷			A Condensate Drain Pan Overflow Switch			
B=6 kW (3 phase) J=23 kW (3 phase)			2 LonTalk® Communications Interface			Digit 22 - Refrigeration System Option			B Clogged Filter Switch and Condensate Drain Pan Overflow Switch			
C=9 kW (3 phase) K=27 kW (3 phase)			6 BACnet™ Communications Interface			0 Standard Refrigeration System ⁸			C Fan Failure Switch and Condensate Drain Pan Overflow Switch			
D=10 kW (1 phase) ¹ N=36 kW (3 phase)			Digit 26 - System Monitoring Controls						D Discharge Air Sensing and Condensate Drain Pan Overflow Switch			
E=12 kW (3 phase) P=54 kW (3 phase)			0 No Monitoring Controls						E Clogged Filter Switch, Fan Failure Switch and Condensate Drain Pan Overflow Switch			
Digit 11 - Minor Design Sequence			A Demand Control Ventilation (CO ₂) ¹⁵						F Clogged Filter Switch, Discharge Air Sensing Tube and Condensate Drain Pan Overflow Switch			
A First Sequence			Digit 27 - Unit Hardware Enhancements						G Fan Failure Switch, Discharge Air Sensing Tube and Condensate Drain Pan Overflow Switch			
Digit 12,13 - Service Sequence ** Factory Assigned			0 No Enhancements						H Clogged Filter Switch, Fan Failure Switch, Discharge Air Sensing and Condensate Drain Pan Overflow Switch			
Digit 14 - Fresh Air Selection			1 Stainless Steel Drain Pan									
0 No Fresh Air												
A Manual Outside Air Damper 0-50% ²												
B Motorized Outside Air Damper 0-50% ¹²												
C Economizer, Dry Bulb 0-100% without Barometric Relief ⁵												
D Economizer, Dry Bulb 0-100% with Barometric Relief ⁵												
E Economizer, Reference Enthalpy 0-100% without Barometric Relief ⁵												
F Economizer, Reference Enthalpy 0-100% with Barometric Relief ⁵												
G Economizer, Comparative Enthalpy 0-100% without Barometric Relief ⁵												
H Economizer, Comparative Enthalpy 0-100% with Barometric Relief ⁵												

Model Number Description

Model Number Notes

CO₂ sensor is a field-installed only option.

1. Available on 3-5 ton models.
2. Manual outside air damper will ship factory supplied within the unit, but must be field installed.
3. High pressure control is standard on all units.
4. Multispeed direct drive standard on single-phase products. Belt drive standard on three-phase 3-7½ ton. Variable speed direct drive standard on 10 ton.
5. 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.
6. Through the base electric required when ordering disconnect/circuit breaker options.
7. Requires use of Disconnect or Circuit Breaker.
8. Standard metering devices are TXVs.
9. The return air smoke detector may not fit up or work properly on the Precedent units when used in conjunction with 3rd party accessories such as bolt on heat wheels, economizers and power exhaust. Do not order the return air smoke detectors when using this type of accessory.
10. Requires hinged access panels.
11. Crankcase heaters are only available as option on WSC036E, WSC048E1, & WSC060E1. CCH are standard on all other units.
12. Motorized outside air damper is not available on Multi-Speed or SZVAV (Single Zone Variable Air Volume) products.
13. Froststat standard on Multi-speed and SZVAV (Single Zone Variable Air Volume) products.
14. Multi-speed indoor fan only available on 10 ton products.
15. Demand Control Ventilation Option includes wiring only. The

General Information

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 aluminum fin, mechanically bonded to copper tubing.

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

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 governs 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 is 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 interpret information from other unit modules, sensors, remote panels, and customer binary contacts to satisfy the applicable request for cooling.

Economizer Control Actuator (Optional)

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

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.

This module is standard on 10 ton products.

System Input Devices & Functions

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

General Information

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 RTRM (factory set point 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 6 continuous seconds with the COF in a non-tripped condition. If the condensate level causes unit shutdown more than 2 times in a 3 days 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

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.

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

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)

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, i.e. after a power failure, the control will default to the number one circuit compressor.

Zone Sensor Module (ZSM) (BAYSENS107*)

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) (BAYSENS109*)

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*.

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 and 98 degrees Fahrenheit. The heating set point ranges between 43 and 96 degrees Fahrenheit.

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, i.e.; 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 @ 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 (4) operating status signals from the RTRM (HEAT, COOL, SYSTEM "ON", SERVICE). Four (4) wires from the RTRM should be connected to the appropriate terminals (7, 8, 9 & 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) and with 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 will be 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 located on the LTB and provides high limit "shutdown" of the unit and requires a manual reset. The sensor is used to detect high temperatures due to fire 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

This input incorporates the Froststat™ control (FOS) located on the indoor coil 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 is immediately turned "Off". The compressor will not be allowed to restart for a minimum of 3 minutes should the FOS close.

Phase Monitoring protection

Precedent units with 3-phase power are equipped with phase monitoring protection as standard. These devices protect motors and compressors against problems caused by phase loss, phase imbalance, and phase reversal indication.

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 Clearances

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

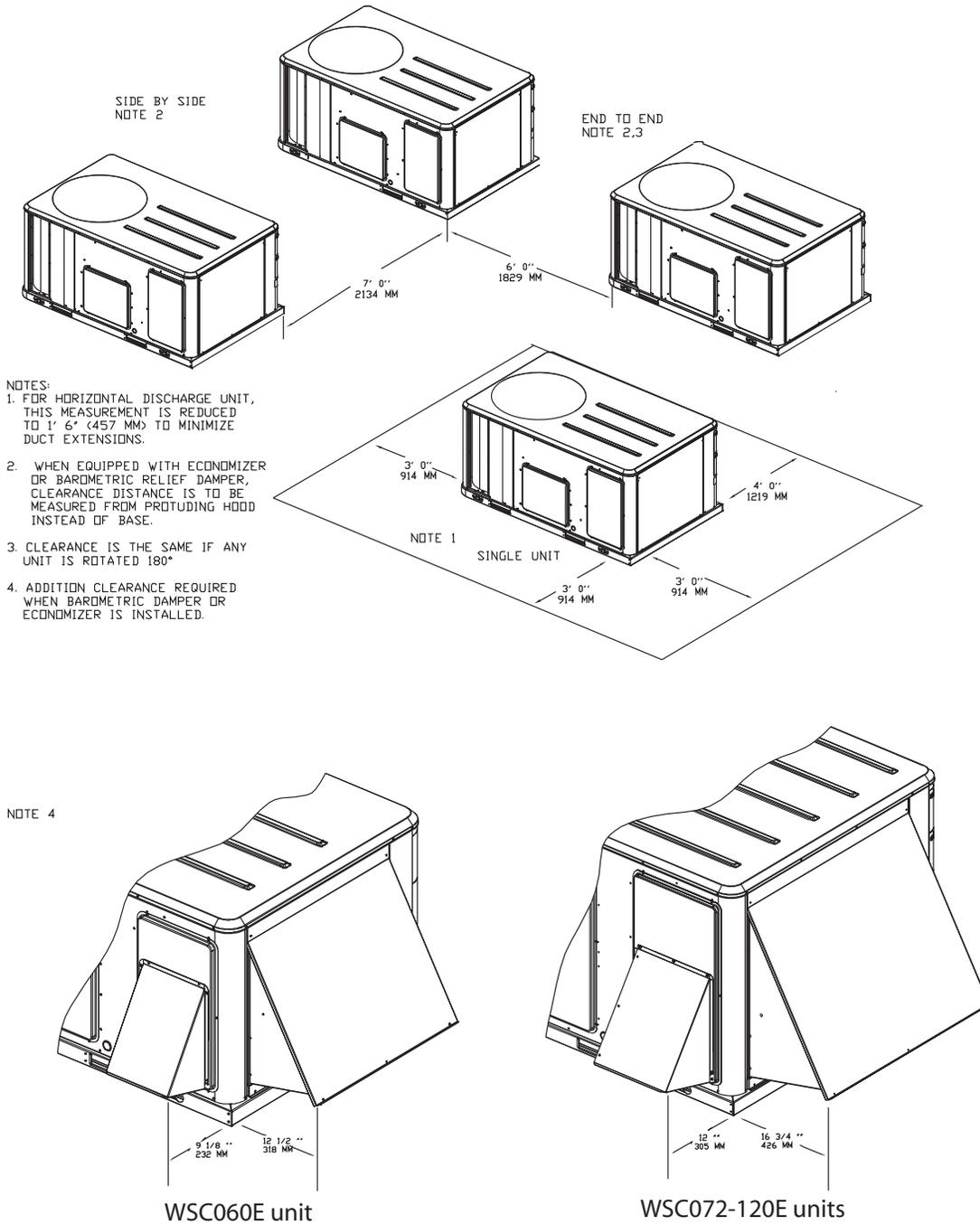


Figure 2. Heat pump - 5 ton

Note: All dimensions are in inches/millimeters.

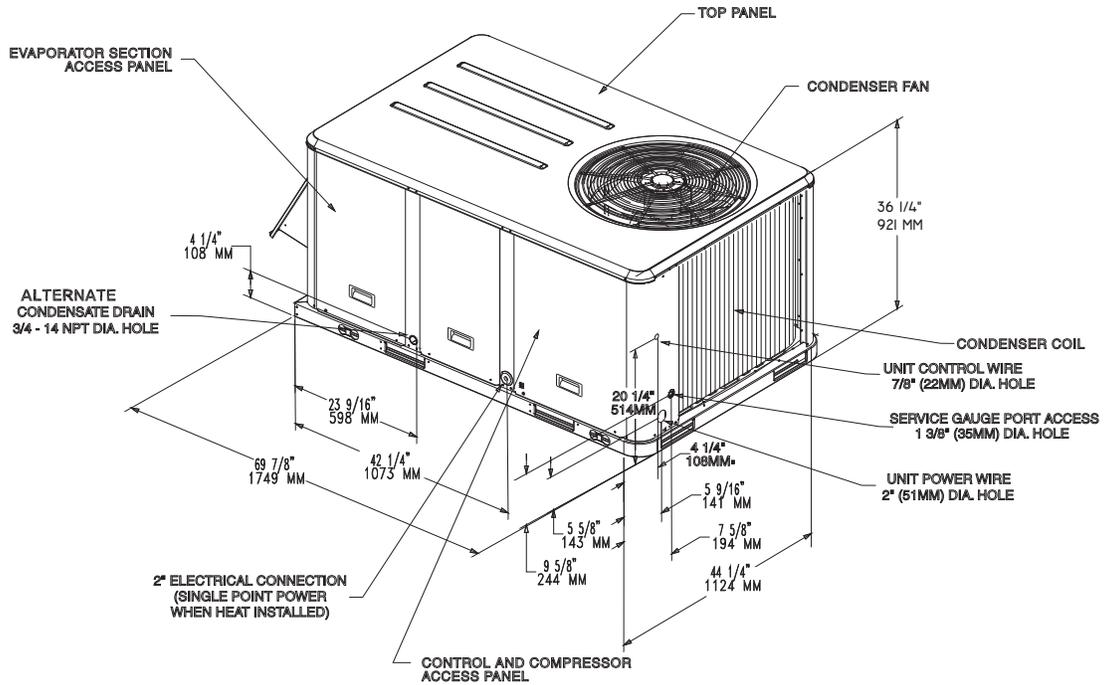
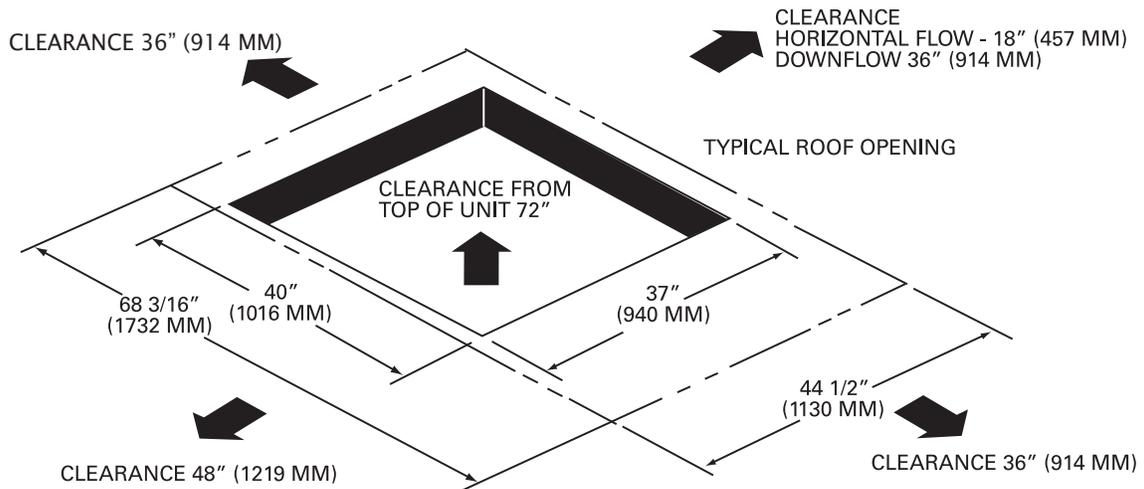


Figure 3. Heat pump - 5 ton - unit clearance and roof opening

Note: All dimensions are in inches/millimeters.



Unit Clearances

Figure 4. Heat pump - 5 ton - roof curb

Note: All dimensions are in inches/millimeters.

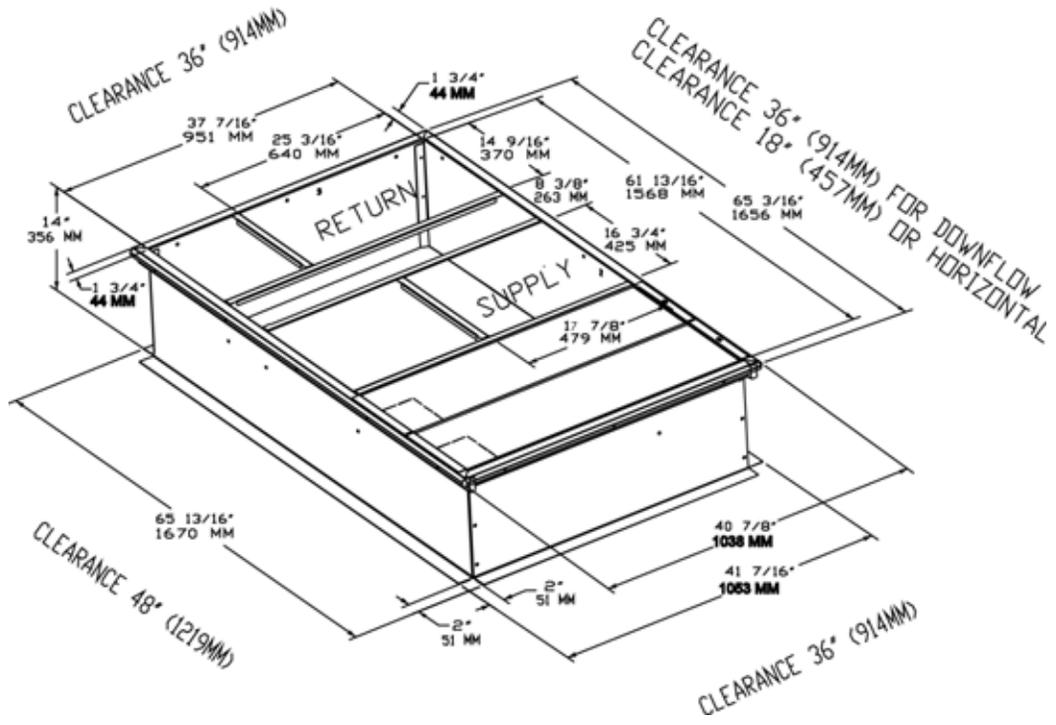


Figure 5. Heat pumps - 6-7½ tons

Note: All dimensions are in inches/millimeters.

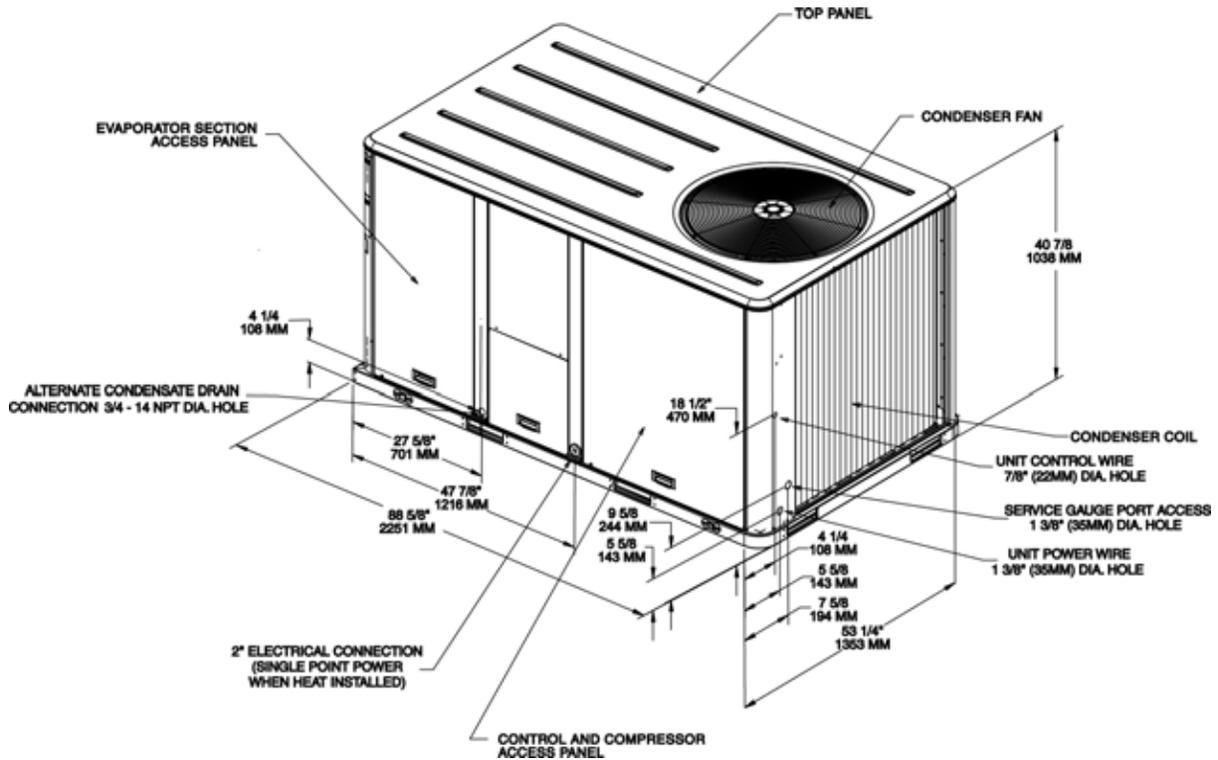


Figure 6. Heat pump - 10 ton

Note: All dimensions are in inches/millimeters.

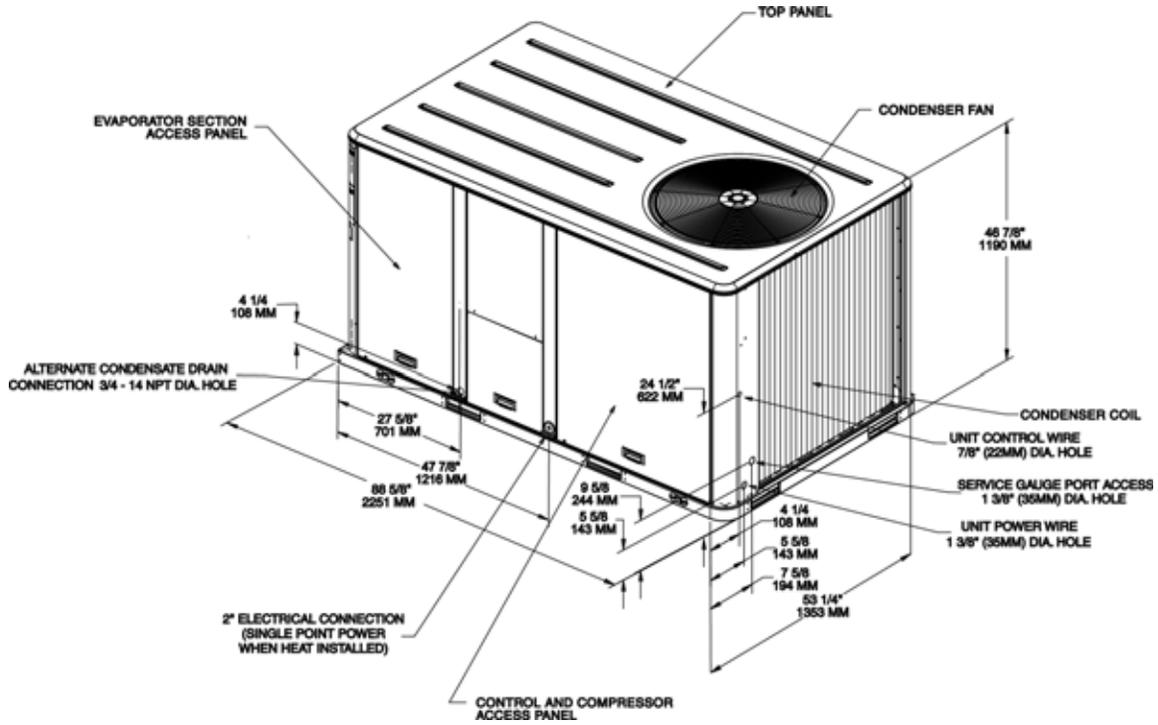
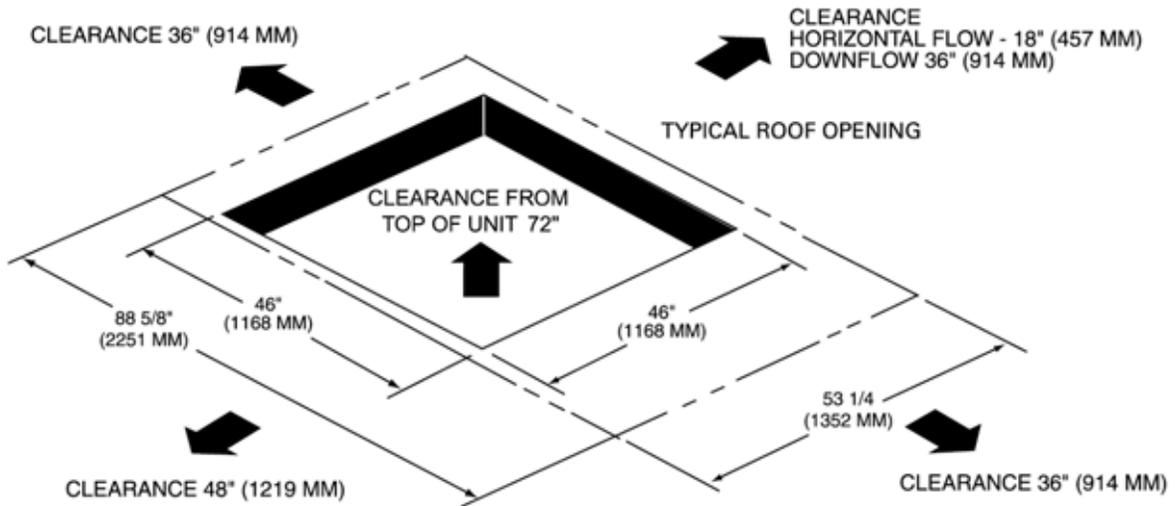


Figure 7. Heat pump - 6-10 ton - unit clearance and roof opening

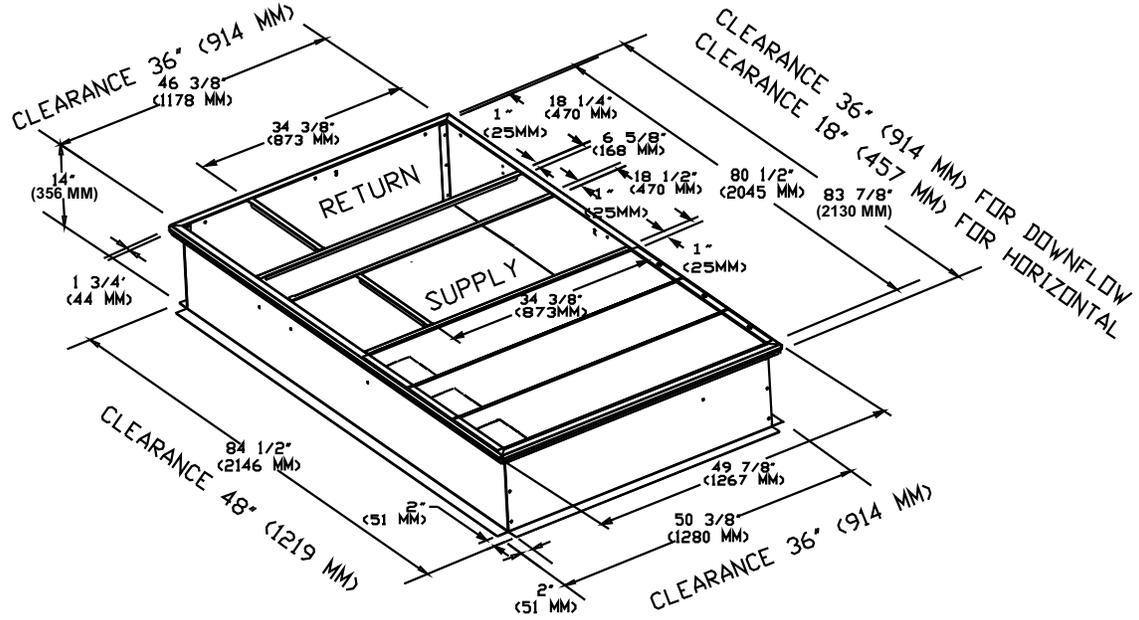
Note: All dimensions are in inches/millimeters.



Unit Clearances

Figure 8. Heat pump - 6-10 ton - roof curb

Note: All dimensions are in inches/millimeters.



Pre-Installation

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.

⚠ 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.**

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 if:

- the unit is stored before it is installed; or,
- 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, S/A and R/A 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 "Starting the Unit".

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

Unit Clearances

p. 10 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.

Important: 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.

Installation

⚠ WARNING

Heavy Objects!

Do not use cables (chains or slings) except as shown. Each of the cables (chains or slings) 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 may cause equipment or property-only damage. Failure to properly lift unit 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 death or serious injury or possible equipment or property-only damage.

Figure 9. Corner weights

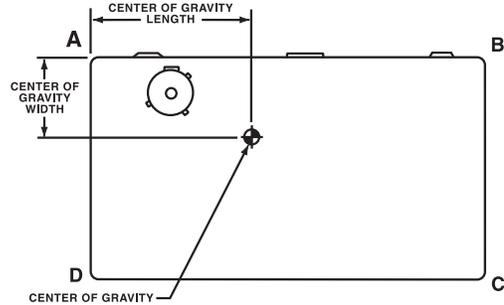


Table 1. Maximum unit & corner weights (lbs/kgs) and center of gravity dimensions (in./mm)

Tons	Unit Model No.	Maximum Model Weights ^(a) (lbs/kgs)		Corner Weights ^(b)				Center of Gravity (in./mm)	
		Shipping	Net	A	B	C	D	Length	Width
5	WSC060ED	667/304	562/256	169/77	140/64	96/44	157/71	945/37	609/24
6	WSC072ED	873/397	741/337	251/114	185/84	145/66	160/73	1003/39	557/22
7½	WSC090ED	968/439	836/379	282/128	196/89	150/68	207/94	933/37	578/23
10	WSC120ED	1124/511	986/448	332/151	255/116	173/78	226/103	977/38	547/22

(a) Weights are approximate.
 (b) Corner weights are given for information only.

Figure 10. Rigging and center-of-gravity data

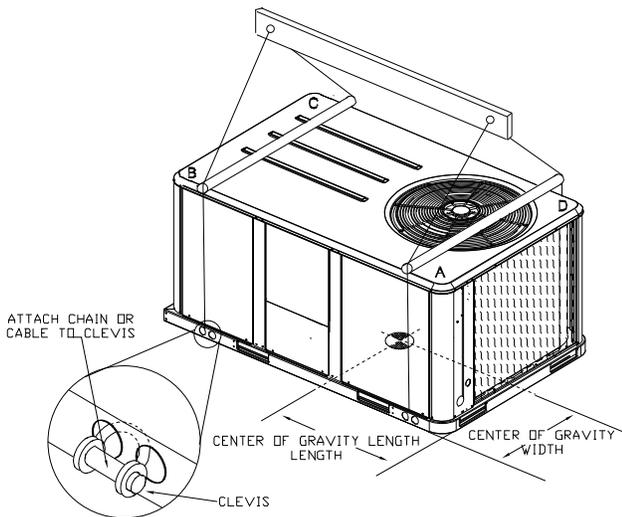


Table 2. Factory installed options (fiops)/accessory net weights (lbs/kgs)^{(a),(b)}

Accessory	WSC060E	WSC072E-120E
	Net Weight	Net Weight
	5 Ton	6-10 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

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. 16](#) 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.

⚠ WARNING

Heavy Unit!

Ensure the roof is strong enough to support the combined unit and support structural weight. Refer to [Table 1, p. 16](#) for the unit operating weights. If unsure, contact a structural engineer. Failure to follow recommendations could result in roof collapsing under the unit’s heavy weight which could result in death or serious injury and property damage.

For rooftop applications, ensure the roof is strong enough to support the combined unit and support structural weight. If anchoring is required, anchor the unit to the roof with hold-down bolts or isolators. Check with a roofing contractor for proper waterproofing.

Ductwork

[Figure 9, p. 16](#) and [Figure 12, p. 17](#) illustrate the supply and return air openings as viewed from the rear of the unit.

Elbows with turning vanes or splitters are recommended to minimize air noise due to turbulence and to reduce static pressure.

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.

Horizontal Units

Figure 11. Heat pump - 5 ton - horizontal airflow supply/return

Note: All dimensions are in inches/millimeters.

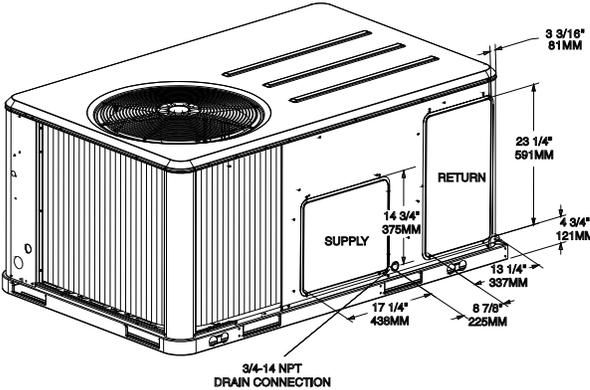
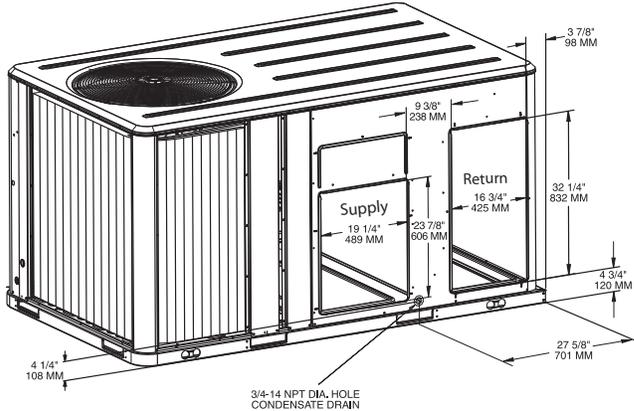


Figure 12. Heat pumps - 6-10 ton - horizontal airflow supply and return

Note: All dimensions are in inches/millimeters.



Installation

Downflow Units

Figure 13. Heat pump - 5 ton - downflow airflow supply/return - through the base utilities

Note: All dimensions are in inches/millimeters.

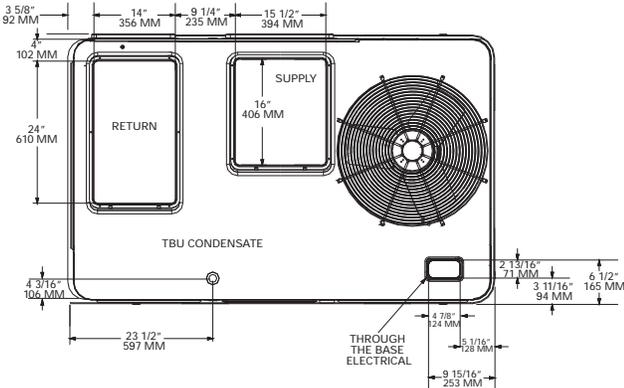
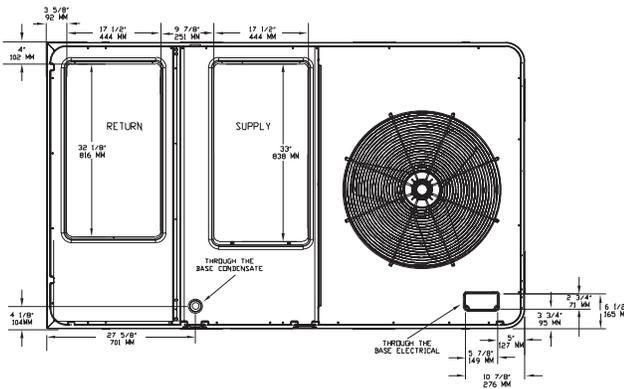


Figure 14. Heat pumps - 6-10 ton - downflow airflow supply/return - through the base utilities

Note: All dimensions are in inches/millimeters.



Roof Curb

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:

1. That it is the correct curb for the unit,
2. That it includes the necessary gaskets and hardware,
3. That the purposed installation location provides the required clearance for proper operation.
4. Insure that 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 a fire hazard. Failure to maintain proper clearances could result in death or serious injury or property damage.

5. 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. Condensate Overflow Switch will not work if unit is not level or slightly sloped toward switch.

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 a Curb Accessory Kit is not used:

- a. 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.
- b. 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

A Rigging illustration and Center-of-Gravity dimensional data table is shown in [Figure 10, p. 16](#). 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.
2. Remove Wooden Top Crate.

⚠ WARNING

Heavy Objects!

Do not use cables (chains or slings) except as shown. Each of the cables (chains or slings) 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 may cause equipment or property-only damage. Failure to properly lift unit could result in death or serious injury.

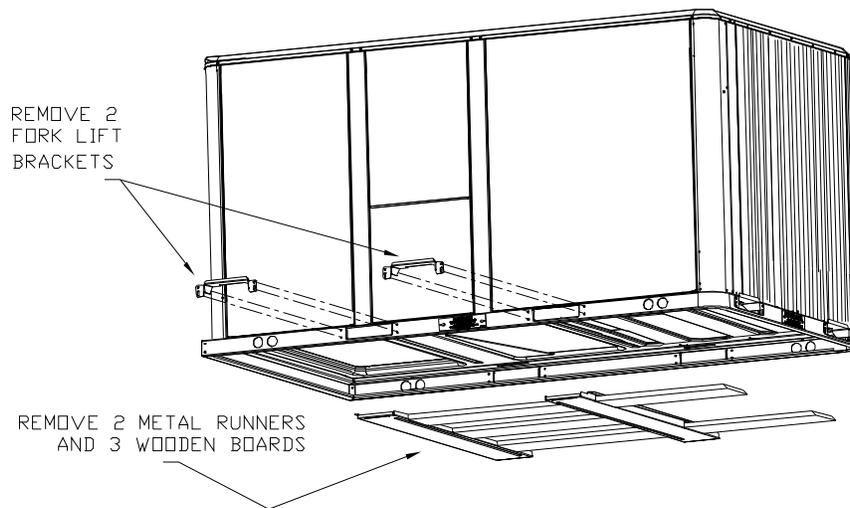
⚠ WARNING

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 death or serious injury or possible equipment or property-only damage.

3. Rig the unit as shown in [Figure 10, p. 16](#). 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 10, p. 16](#), 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 15. Fork lift 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 checklist listed below is a summary of the steps required to successfully install a commercial unit. This checklist is intended to acquaint the installing personnel with what is required in the installation process. It does not replace the detailed instructions called out in the applicable sections of 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.
- Rigging the unit.
- Set the unit onto the curb; check for levelness.
- Ensure unit-to-curb seal is tight and without buckles or cracks.

Installation

- Install and connect a condensate drain line to the evaporator drain connection.

Note: Condensate Overflow Switch will not work if unit is not level, or slightly sloped toward switch.

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.

Horizontal Discharge Conversion WSC060E

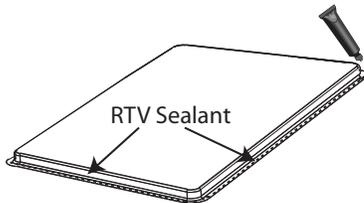
- Supplies Needed by Installer for Conversion: 3 oz. tube of High Temperature RTV sealant. (500°F/260°C: Similar to Dow Corning 736)

Note: 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:

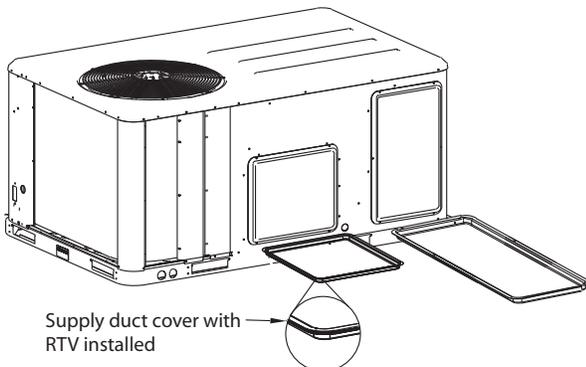
1. Remove RETURN and SUPPLY duct covers.
2. Locate supply cover. Apply ¼ in. (6mm.) continuous bead of 500°F RTV sealant to the flange as shown.

Figure 16.



3. Position SUPPLY DUCT COVER as shown, rotate 90 degrees to allow entrance into supply opening.
4. Slide SUPPLY DUCT COVER 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.

Figure 17.



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.

Horizontal Discharge Conversion WSC072-120E

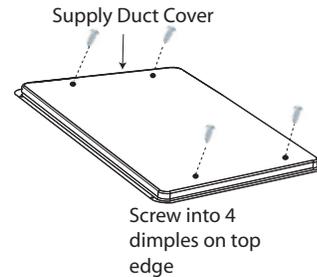
- Supplies Needed by Installer for Conversion: 3 oz. tube of high Temperature RTV sealant. (500°F/260°C: Similar to Dow Corning 736)

Note: 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:

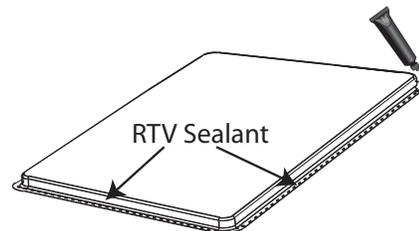
1. Remove RETURN and SUPPLY duct covers.
2. Place SUPPLY DUCT COVER over down-flow return opening. (insulation side down)
3. Using self-drilling screws, (or screws removed from duct cover), screw through dimples to attach DUCT COVER to base.

Figure 18.



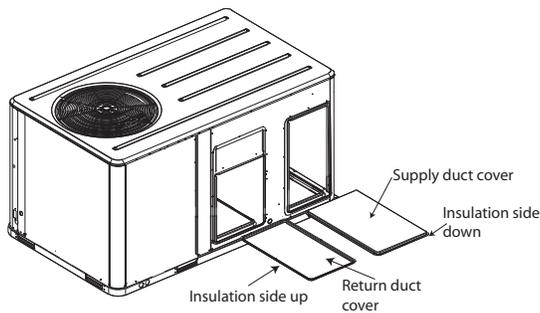
4. On original RETURN DUCT COVER, apply ¼" (6mm.) continuous bead of 500°F RTV sealant around flange (opposite insulation side), as shown.

Figure 19.



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.

Figure 20. Duct cover



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

Low Voltage Wiring (AC & DC) Requirements

- Install the zone thermostat, with or without switching subbase.
- Connect properly sized control wiring to the proper termination points between the zone thermostat and the unit control panel.

Condensate Drain Configuration

⚠ 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.

An evaporator condensate drain connection is provided on each unit. Refer to [Figure 10, p. 16](#) - [Figure 11, p. 17](#) for the appropriate drain location.

The condensate drain pan is factory installed to drain condensate to the back side of the unit. See [Figure 10, p. 16](#) - [Figure 11, p. 17](#). It can be converted to drain condensate out the front side of the unit or through the base.

To convert drain condensate out the 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 grommeted 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 grommeted hole as the panel is put in place.
6. Replace evaporator access panel and supply air access panels.

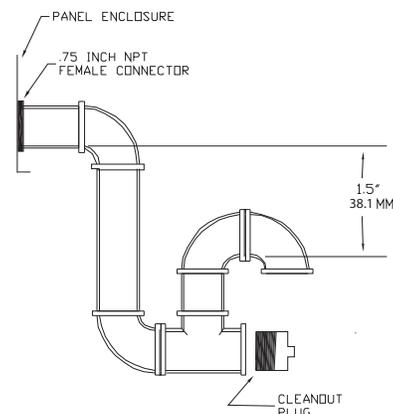
To convert drain condensate through the base of unit:

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 drainpan 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 grommeted 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 grommeted 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 21](#).

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 21. Condensate trap installation



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-installed wiring must be completed by qualified personnel. All field-installed wiring must comply with NEC and applicable local codes.
- Follow proper local and state electrical code on requirements for grounding.

Failure to follow this instructions could result in death or serious injuries.

An overall dimensional layout for the field installed wiring entrance into the unit is illustrated in “Unit Clearances,” p. 10. To insure that the unit’s supply power wiring is properly sized and installed, follow the guidelines outlined below.

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!

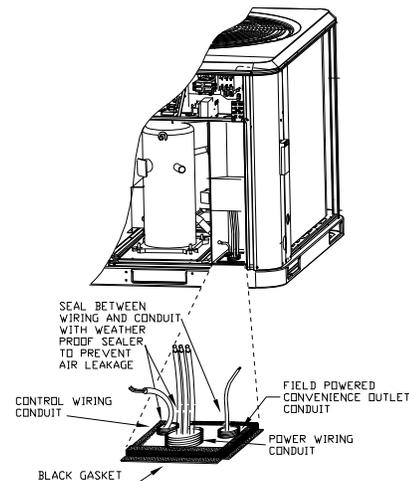
Unit terminals are not designed to accept other types of conductors. Failure to use copper conductors may result in equipment damage.

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 Standard Wiring

1. Location of the applicable electrical service entrance is illustrated in “Unit Clearances,” 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 22. All units



Field Installed Control Wiring

⚠ 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.

⚠ WARNING

Proper Field Wiring and Grounding Required!

- All field-installed wiring must be completed by qualified personnel. All field-installed wiring must comply with NEC and applicable local codes.
- Follow proper local and state electrical code on requirements for grounding.

Failure to follow this instructions could result in death or serious injuries.

An overall layout of the various control options available with the required number of conductors for each control device is illustrated in Figure 26, p. 25.

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.

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

Controls using 24 VAC

Before installing any connecting wiring, refer to “Unit Clearances,” p. 10 for the electrical access locations provided on the unit and Table 3, p. 23 for AC conductor sizing guidelines, and;

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

NOTICE:

Use Copper Conductors Only!

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

- c. Be sure to check all loads and conductors for grounds, shorts, and mis-wiring.
- d. Do not run the AC low voltage wiring in the same conduit with the high voltage power wiring.
- e. Route low voltage wiring per Figure 25, p. 24.

Table 3. AC conductors

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

Controls using DC Analog Input/Outputs (Standard Low Voltage Multiconductor Wire)

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

- 1. Table 4 lists the conductor sizing guidelines that must be followed when interconnecting the DC binary output devices and the system components utilizing a DC analog input/output signal to the unit.

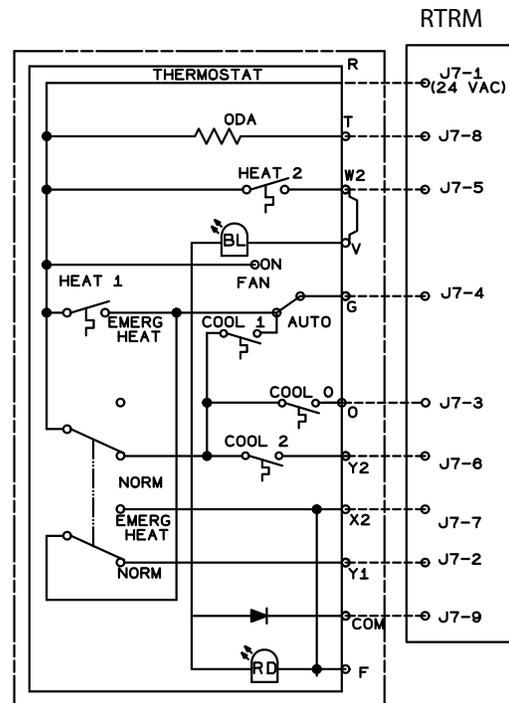
Note: Resistance in excess of 2.5 ohms per conductor can cause deviations in the accuracy of the controls.

- 2. Ensure that the wiring between controls and the unit’s termination point does not exceed two and a half (2.5) ohms/conductor for the length of the run.
- 3. Do not run the electrical wires transporting DC signals in or around conduit housing high voltage wires.
- 4. Route low voltage wiring per Figure 22, p. 22.

Table 4. DC conductors

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

Figure 23. ReliaTel conventional thermostat field wiring diagram



Installation

Figure 24. ReliaTel refrigeration module

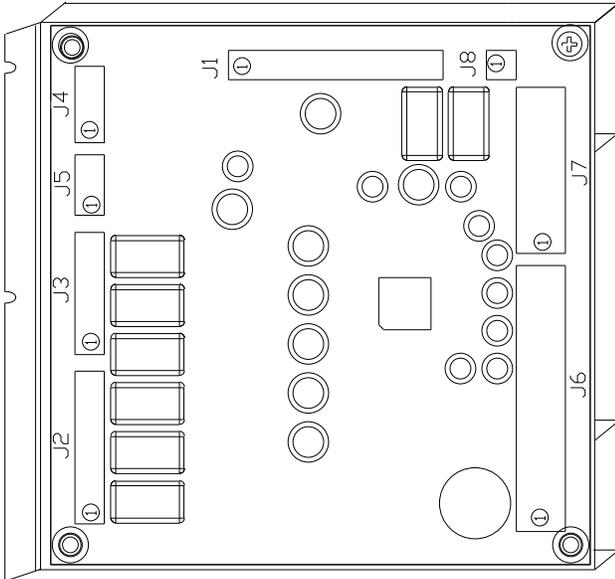
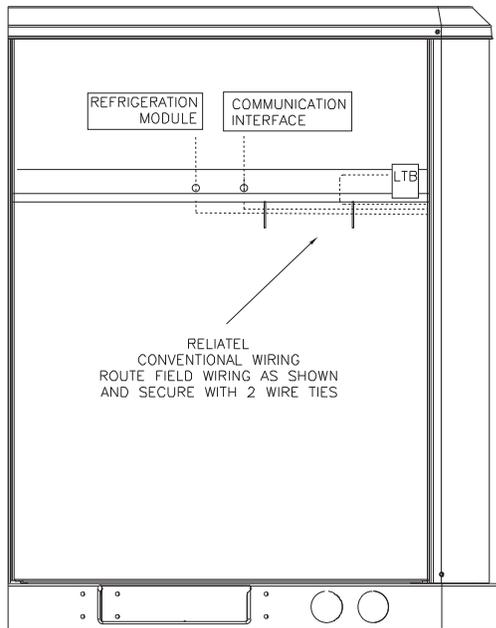


Figure 25. Customer control low voltage routing



Pre-Start

Space Temperature Averaging (ReliaTel™ only)

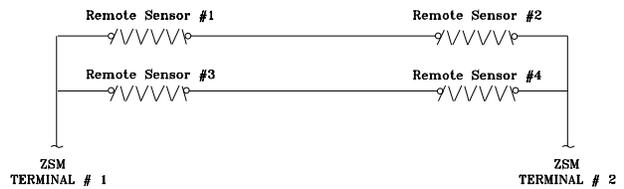
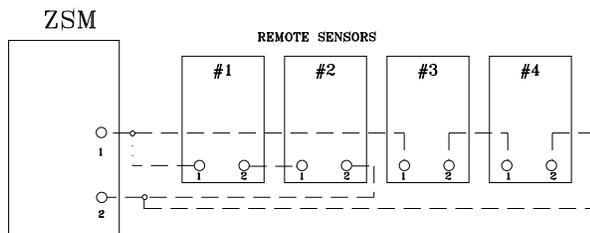
Space temperature averaging is accomplished by wiring a number of remote sensors in a series/parallel circuit.

Using the BAYSENS016* or BAYSENS077*, at least four sensors are required to accomplish space temperature averaging. Example #1 illustrates two series circuits with

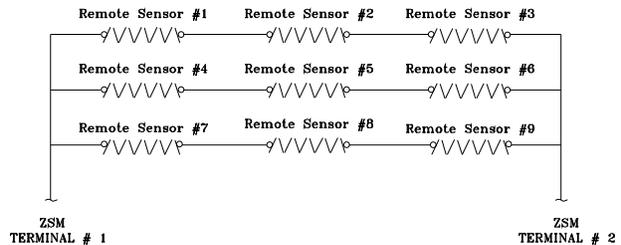
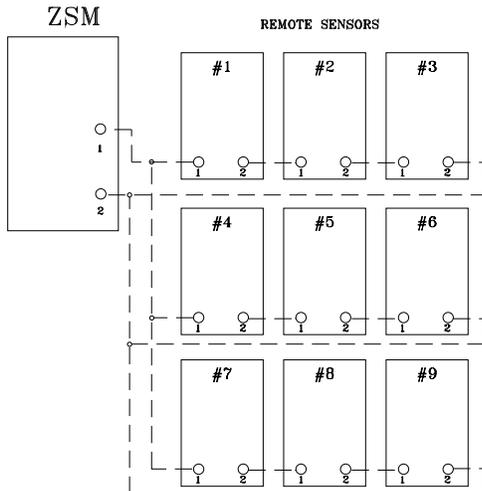
two sensors in each circuit wired in parallel. The square of any number of remote sensors is required. Example #2 illustrates three sensors squared in a series/parallel circuit. Using BAYSENS077*, two sensors are required to accomplish space temperature averaging. Example #3 illustrates the circuit required for this sensor. Table 5, p. 27 lists the temperature versus resistance coefficient for all sensors.

Figure 26. Examples

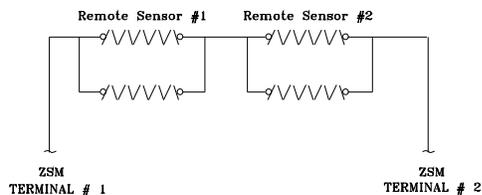
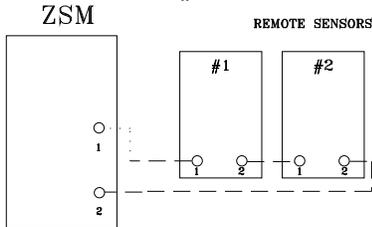
EXAMPLE #1



EXAMPLE #2



EXAMPLE #3



Pre-Start

Figure 27. Typical field wiring diagrams for optional controls

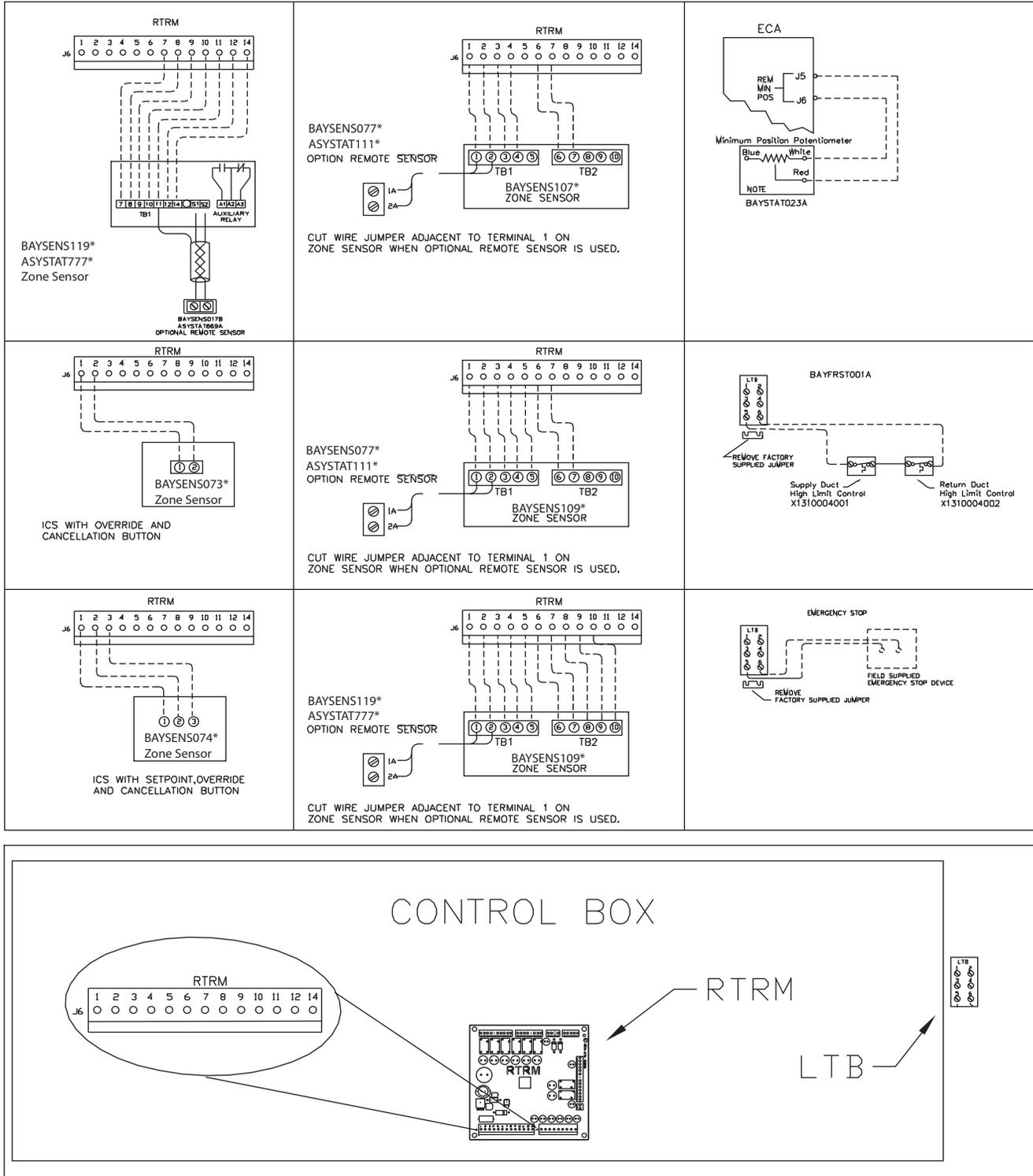


Table 5. Temperature versus resistance (temperature vs. resistance is negative)

Temperature		Nominal Resistance
Degrees F°	Degrees C°	
-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
100°	37.8°	5.824 K - Ohms

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

⚠ 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.

- Check all electrical connections for tightness and "point of termination" accuracy.
- Verify that the condenser airflow will be unobstructed.
- 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:

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

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

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:

$$\frac{100 \times 226 - 221}{226} = 2.2\%$$

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.

Pre-Start

Proper electrical supply phasing can be quickly determined and corrected before starting the unit by using an instrument such as an Associated Research Model 45 Phase Sequence Indicator and following the steps below:

- 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

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.

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

Each compressor is equipped with a crankcase heater. 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, insure 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.

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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.

Upon power initialization, the RTRM performs self-diagnostic checks to insure 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 is turned "On" within one second of power-up if internal operation is okay.

Use one of the following "Test" procedure 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.

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 6, p. 30](#).

ReliaTel Controls

Upon power initialization, the RTRM performs self-diagnostic checks to insure 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 is turned "On" within one second of power-up if internal operation is okay.

Use one of the following "Test" procedure 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.

Start-Up

Table 6. Service test guide for component operation

Test Step	Mode	Fan	Econ ^(a)	Comp1	Comp 2	Heat 1	Heat 2	Ohms
1	Fan	On	Minimum Position Setpoint 0%	Off	Off	Off	Off	2.2K
	Minimum Ventilation	On	Selectable	Off	Off	Off	Off	
2	Economizer Test Open	On	Open	Off	Off	Off	Off	3.3K
3	Cool Stage 1	On	Minimum Position	On ^(b)	Off	Off	Off	4.7K
4 ^(c)	Cool Stage 2	On	Minimum Position	On ^(b)	On	Off	Off	6.8K
5 ^(c)	Reheat	On	Minimum	On	On	Off	Off	33K
6 ^(c)	Heat Stage 1	On	Minimum	Off	Off	On	Off	10K
7 ^(c)	Heat Stage 2	On	Minimum	Off	Off	On	On	15K

(a) The exhaust fan will turn on anytime the economizer damper position is equal to or greater than the exhaust fan setpoint.
 (b) The condenser fans will operate any time a compressor is "On" providing the outdoor air temperatures are within the operating values.
 (c) Steps for optional accessories and non-applicable modes in unit will be skipped.

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 6, p. 30](#), momentarily jump across the Test 1 & Test 2 terminals on LTB1 one time to start the Minimum Ventilation Test.

Once the supply fan has started, check for proper rotation. The direction of rotation is indicated by an arrow on the fan housing.

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 table in the unit Service Fact, plot the actual RPM ([Step 1](#)) and the BHP ([Step b](#)) 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

⚠ 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.

Using the Service Test Guide in [Table 6, p. 30](#), momentarily jump across the Test 1 & 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.

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.
3. ReliaTel Control
Momentarily jump across the Test 1 & 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.
4. Verify that the dampers stroked to the full open position.
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.

Compressor Start-Up

Using the Service Test Guide in [Table 6, p. 30](#), continue the SERVICE TEST start-up procedure for each compressor circuit.

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.
2. Momentarily jump across the Test 1 & Test 2 terminals on LTB 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.
3. 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.
 4. 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.
 5. Repeat steps 1 through 4 for each refrigerant circuit.
 6. To stop the SERVICE TEST, turn the main power disconnect switch to the "Off" position or proceed to the next component start-up procedure.

Heating Start-Up

Using the Service Test Guide in [Table 6, p. 30](#), continue the SERVICE TEST start-up procedure for each compressor circuit.

1. Clamp an amp meter around one of 1st stage heater power wires at the heater contactor.
2. Momentarily jump across the Test 1 & Test 2 terminals on LTB one additional time if continuing from previous component start-up or until the desired start-up component Test is started.
3. Verify that the heater stage is operating properly.
4. Clamp an amp meter around one of 2nd stage heater power wires at the heater contactor (if applicable).
5. Momentarily jump across the Test 1 & Test 2 terminals on LTB one additional time if continuing from previous component start-up or until the desired start-up component Test is started.
6. Verify that the heater stage is operating properly.
7. To stop the SERVICE TEST, turn the main power disconnect switch to the "Off" position or proceed to the next component start-up procedure.

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

Start-Up

available stages of cooling & 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.

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

Fan Belt Adjustment - Belt Drive Units

⚠ WARNING

Live Electrical Components!

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⚠ WARNING

Rotating Components!

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 fan belts must be inspected periodically to assure proper unit operation.

Replacement is necessary if the belts appear frayed or worn. Units with dual belts require a matched set of belts to ensure equal belt length.

When removing or installing the new belts, do not stretch them over the sheaves. Loosen the belts using the belt tension adjustment bolts on the motor mounting base.

Once the new belts are installed, using a Browning or Gates tension gauge (or equivalent) illustrated in [Figure 28, p. 32](#); adjust the belt tension as follows:

1. To determine the appropriate belt deflection;

- a. Measure the center-to-center shaft distance (in inches) between the fan and motor sheaves.
 - b. Divide the distance measured in Step 1a by 64; the resulting value represents the amount of belt deflection that corresponds to the proper belt tension.
2. Set the large O-ring on the belt tension gauge at the deflection value determined in Step 1b.
 3. Set the small O-ring at zero on the force scale of the gauge plunger.
 4. Place the large end of the gauge at the center of the belt span; then depress the gauge plunger until the large O-ring is even with the top of the next belt or even with a straightedge placed across the fan and motor sheaves. Refer to [Figure 28, p. 32](#).
 5. Remove the belt tension gauge. The small O-ring now indicates a number other than zero on the plunger's force scale. This number represents the force (in pounds) required to give the needed deflection.
 6. Compare the "force" scale reading ([Step 5](#)) with the appropriate "force" value listed in [Table 7, p. 33](#). If the "force" reading is outside the range, readjust the belt tension.

Note: Actual belt deflection "force" must not exceed the maximum "force" value shown in.

7. Recheck the belt tension at least twice during the first 2 to 3 days of operation. Belt tension may decrease until the new belts are "run in"

Figure 28. Belt tension gauge

$$\text{Deflection} = \frac{\text{Belt Span (in)}}{64}$$

$$\text{Deflection} = \frac{\text{Belt Span (mm)}}{152}$$

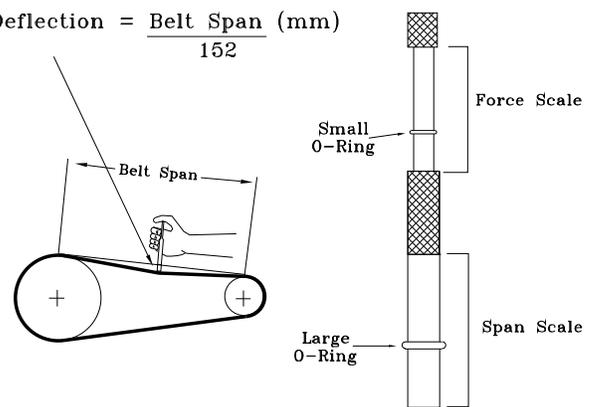


Table 7. Belt tension measurement and deflection ranges

Belts Cross Section	Small P.D Range	Deflection Force (Lbs.)					
		Super Gripbelts		Gripnotch		Steel Cable Gripbelts	
		Min.	Max.	Min.	Max.	Min.	Max
A	3.0 - 3.6	3	4 1/2	3 7/8	5 1/2	3 1/4	4
	3.8 - 4.8	3 1/2	5	4 1/2	6 1/4	3 3/4	4 3/4
	5.0 - 7.0	4	5 1/2	5	6 7/8	4 1/4	5 1/4
B	3.4 - 4.2	4	5 1/2	5 3/4	8	4 1/2	5 1/2
	4.4 - 5.6	5 1/8	7 1/8	6 1/2	9 1/8	5 3/4	7 1/4
	5.8 - 8.8	6 3/8	8 3/4	7 3/8	10 1/8	7	8 3/4