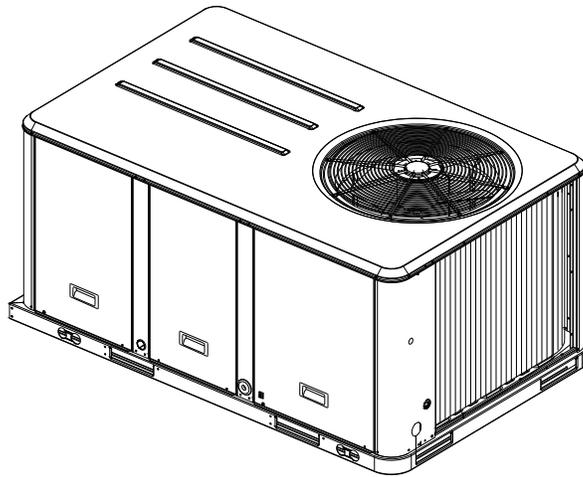


# Installation, Operation, and Maintenance

## Packaged Rooftop Air Conditioners Precedent™ – Heat Pump 3 – 10 Tons – 60 Hz



Model Numbers

WSC036E - WSC120E

### **⚠ 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.

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**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 accidents

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## 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.

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# 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) 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

The RTOM monitors the supply fan proving, clogged filter, supply air temperature, exhaust fan setpoint, supply air tempering, Frostat™ 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.

### 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.*

### 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.

## General Information

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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.

### Power Exhaust Control (Optional)

The power exhaust fan is started whenever the position of the economizer dampers meets or exceeds the power exhaust setpoint when the indoor fan is on.

The setpoint panel is located in the return air section and is factory set at 25%.

### 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 Frostat™ 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.

## General Information

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Frostat is standard on multi-speed indoor motors and single zone VAV products (SZVAV).

### Smoke Detector Sensor (Optional)

This sensor is only applicable on units equipped with a RTOM. It provides high limit "shutdown" of the unit and requires a manual reset. The sensor is used to detect smoke due to fire in the air conditioning or ventilation ducts.

**Important:** *The supply and return air smoke detectors are designed to shut off the unit if smoke is sensed in the supply air stream or return air stream. This function is performed by sampling the airflow entering the unit at the return air opening. Follow the instructions provided below to assure that the airflow through the unit is sufficient for adequate sampling. Failure to follow these instructions will prevent the smoke detectors from performing it's design function.*

**Important:** *Airflow through the unit is affected by the amount of dirt and debris accumulated on the indoor coil and filters. To insure that airflow through the unit is adequate for proper sampling by the return air smoke detector, complete adherence to the maintenance procedures, including recommended intervals between filter changes, and coil cleaning is required.*

**Important:** *Periodic checks and maintenance procedures must be performed on the smoke detector to insure that it will function properly. For detailed instructions concerning these checks and procedures, refer to the appropriate section(s) of the smoke detector Installation and Maintenance Instructions provided with the literature package for this unit.*

In order for the supply air smoke detector or return air smoke detector to properly sense smoke in the supply air stream or return air stream, the air velocity entering the smoke detector unit must be between 500 and 4000 feet per minute. Equipment covered in this manual will develop an airflow velocity that falls within these limits over the entire airflow range specified in the evaporator fan performance tables.

There are certain models, however, if operated at low airflow, will not develop an airflow velocity that falls within the required 500 to 4000 feet per minute range. For these models, the design airflow shall be greater than or equal to 1000 feet per minute MINIMUM.

### 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.

# 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. You MUST wear all necessary Personal Protective Equipment (PPE) including gloves, eye protection, mask, long sleeves and pants when working with products containing fiberglass wool. Exposure to glass wool fibers without all necessary PPE equipment could result in cancer, respiratory, skin or eye irritation, which could result in death or serious injury.**

**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 could 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.

## Pre-Installation

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### 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. 15 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.*

# Model Number Description - 3-10 Ton

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

## Model Number Description - 3-10 Ton

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### Model Number Notes

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.

# Unit Clearances

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

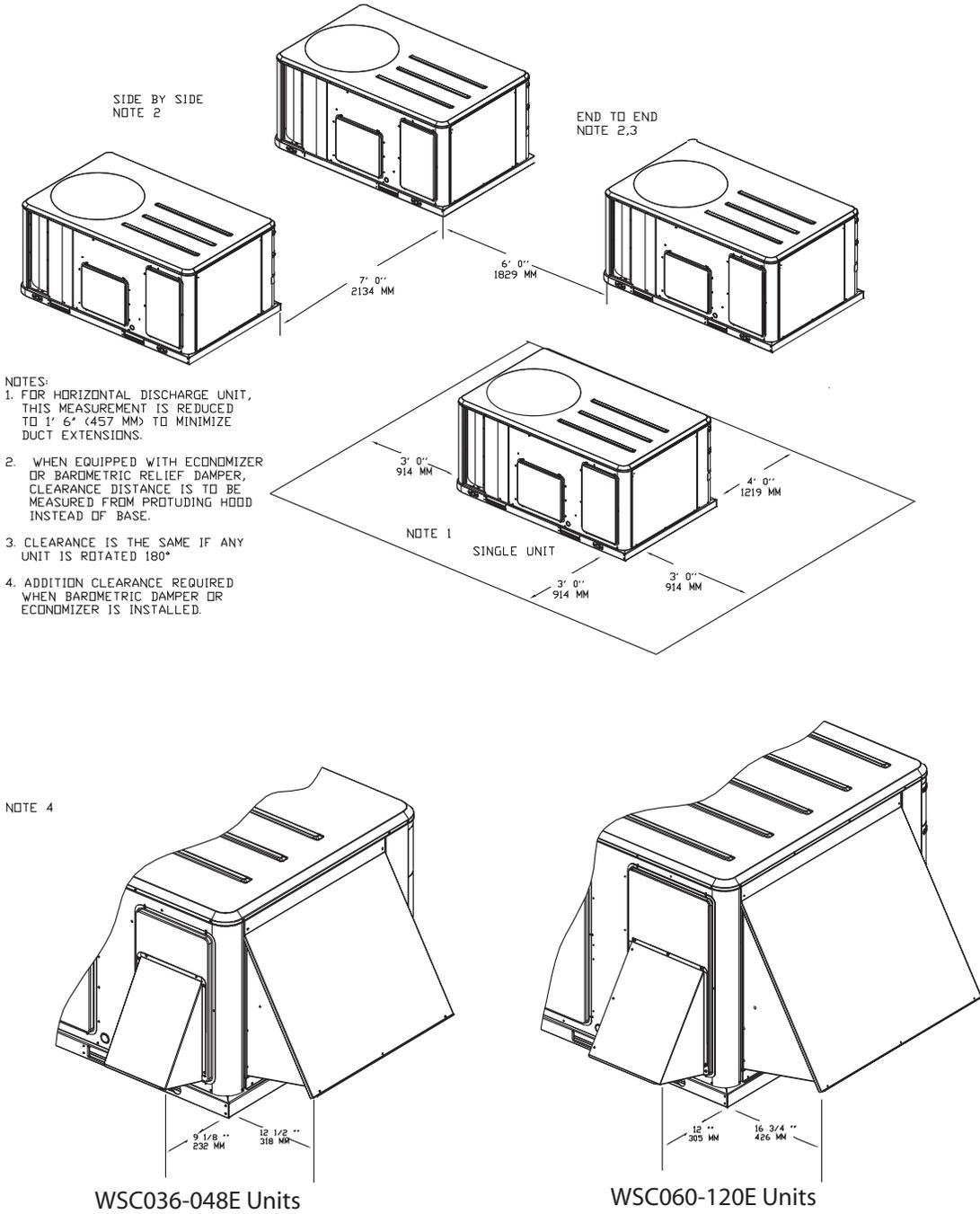
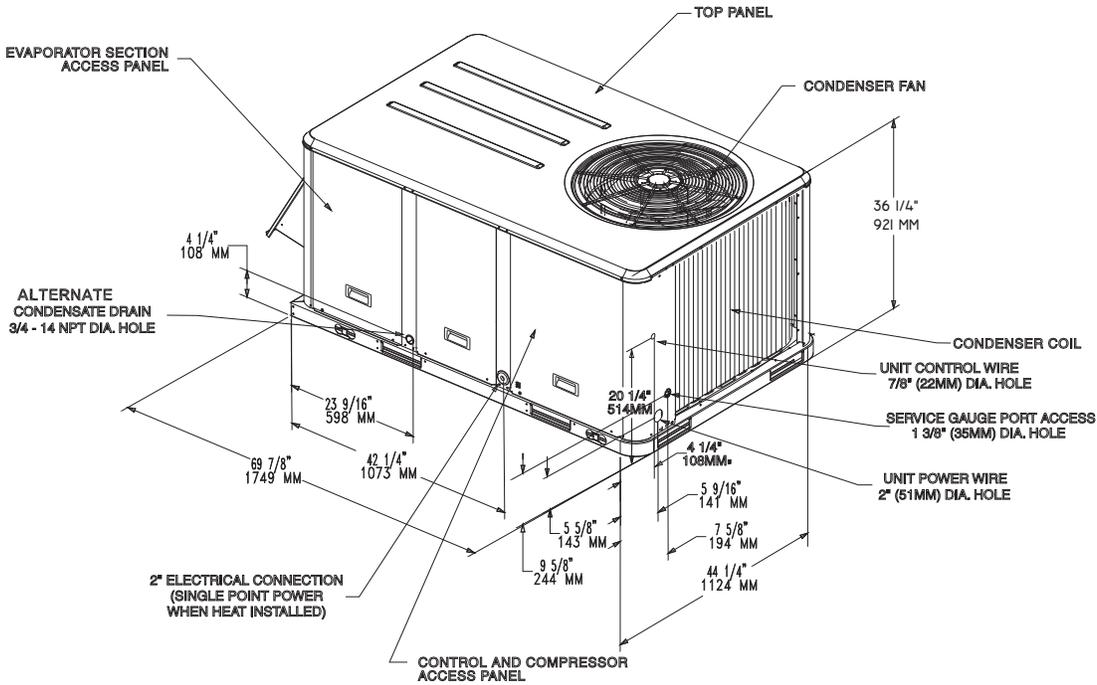


Figure 2. Heat pump - 3-4 ton standard efficiency

Note: All dimensions are in inches/millimeters.

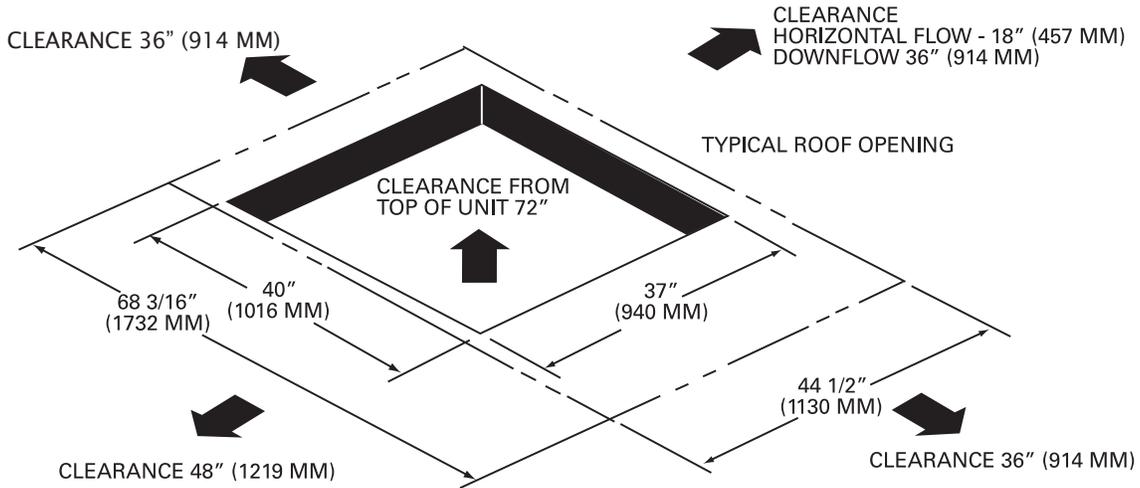
# Unit Clearances

**Figure 2. Heat pump - 3-4 ton standard efficiency**



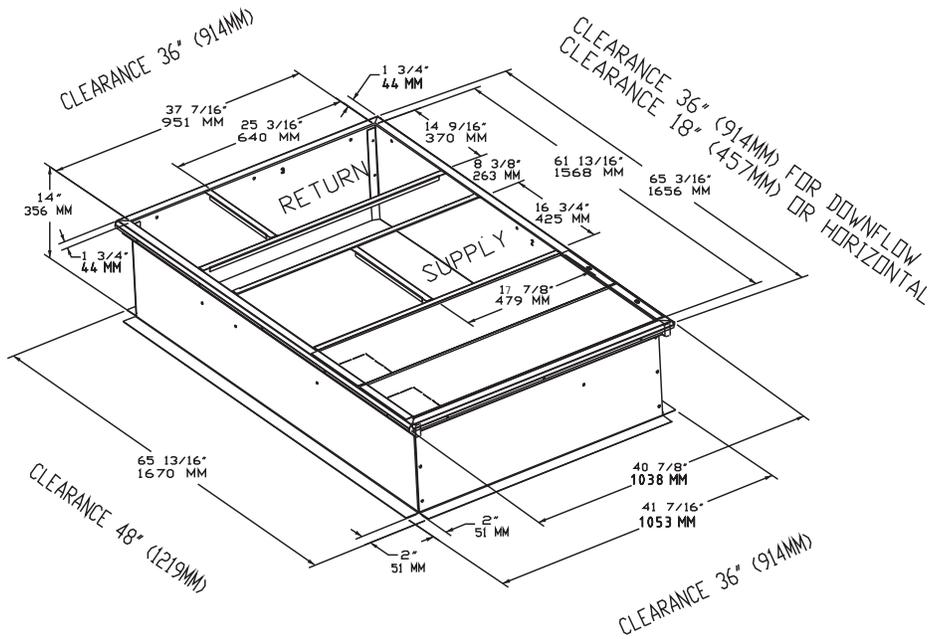
**Figure 3. Heat pump - 3-4 ton standard efficiency - unit clearance and roof opening**

**Note:** All dimensions are in inches/millimeters.



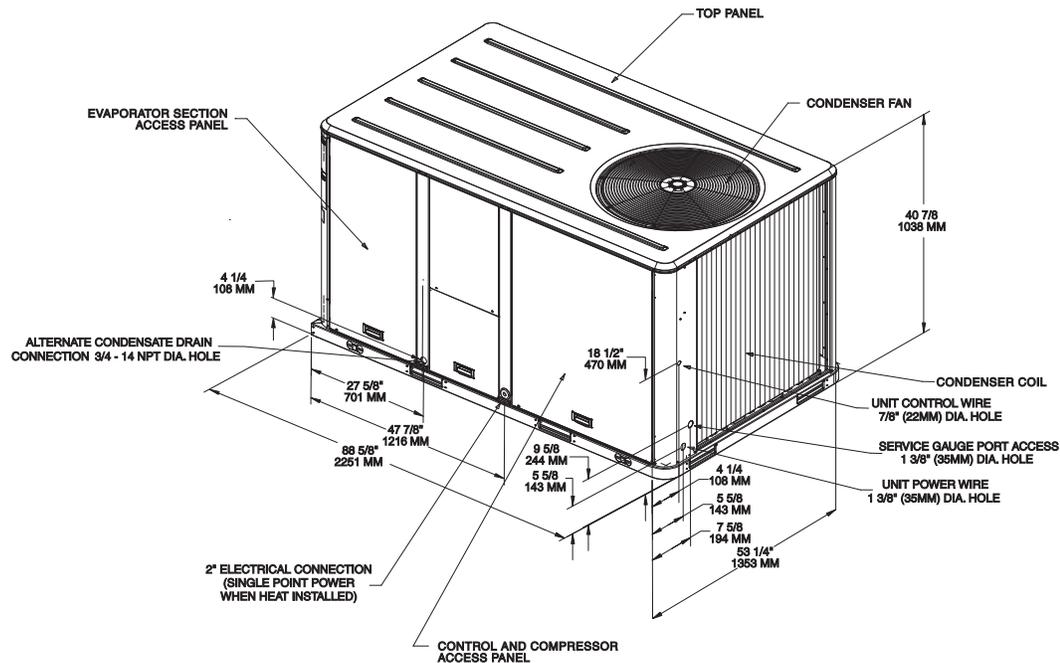
**Figure 4. Heat pump - 3-4 ton standard efficiency - roof curb**

Note: All dimensions are in inches/millimeters.



**Figure 5. Heat pumps - 5-6 ton standard efficiency**

Note: All dimensions are in inches/millimeters.

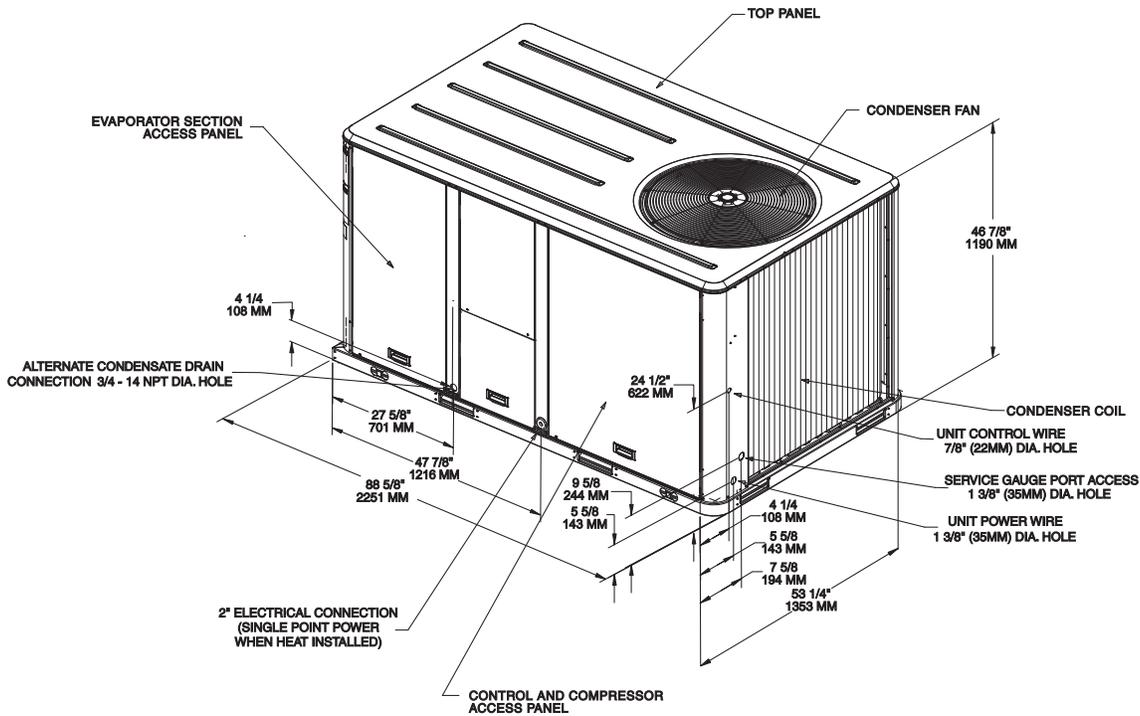


**Figure 6. Heat pump - 7 1/2 ton standard efficiency**

Note: All dimensions are in inches/millimeters.

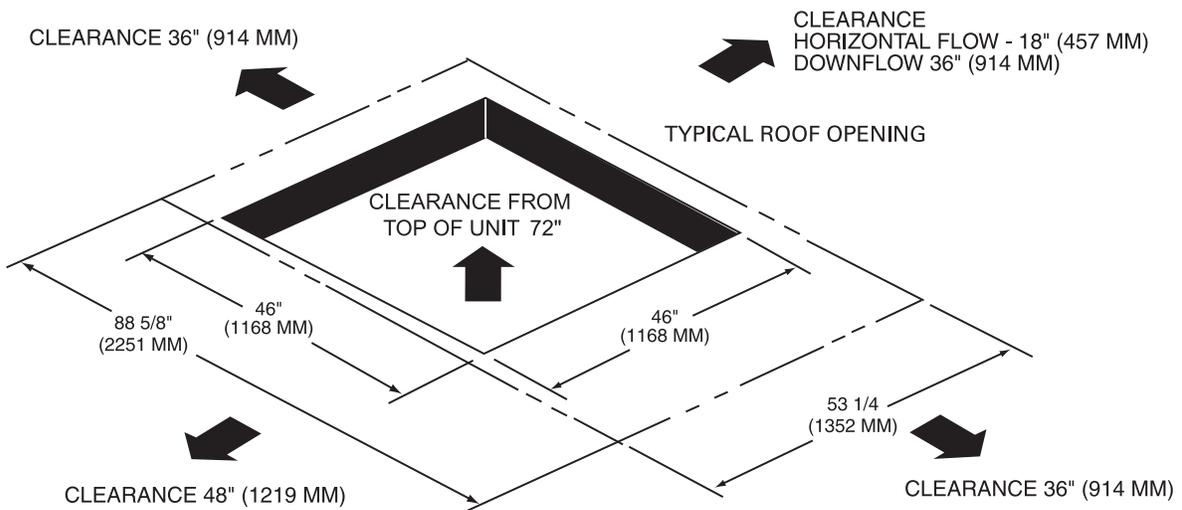
# Unit Clearances

**Figure 6. Heat pump - 7½ ton standard efficiency**



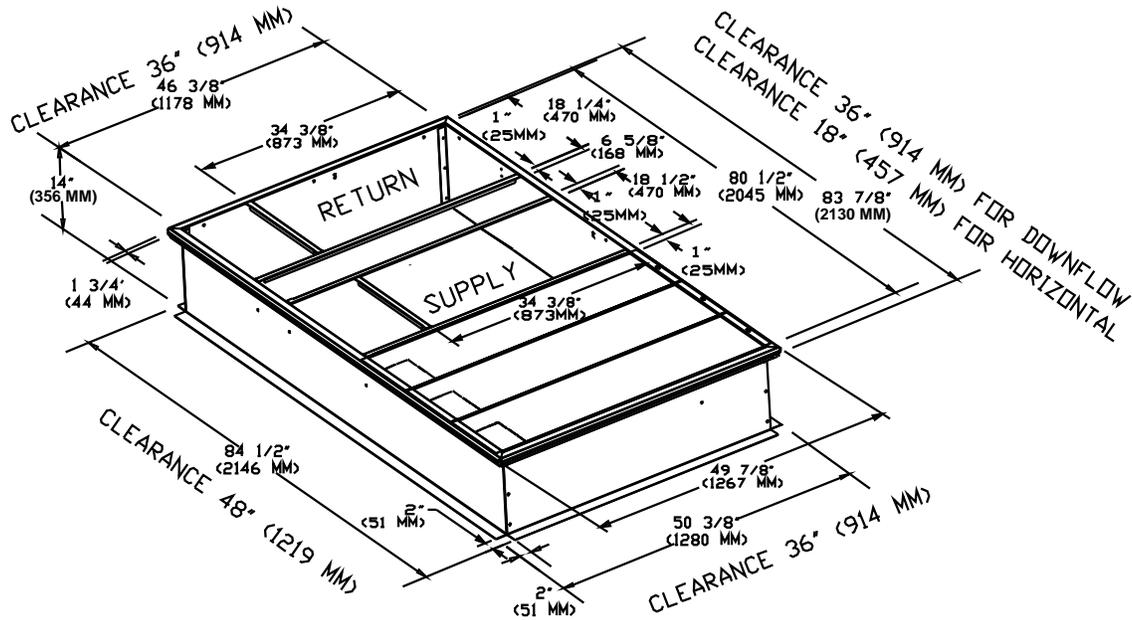
**Figure 7. Heat pump - 5-7½ ton - unit clearance and roof opening**

**Note:** All dimensions are in inches/millimeters.



**Figure 8. Heat pump - 5-7½ ton - roof curb**

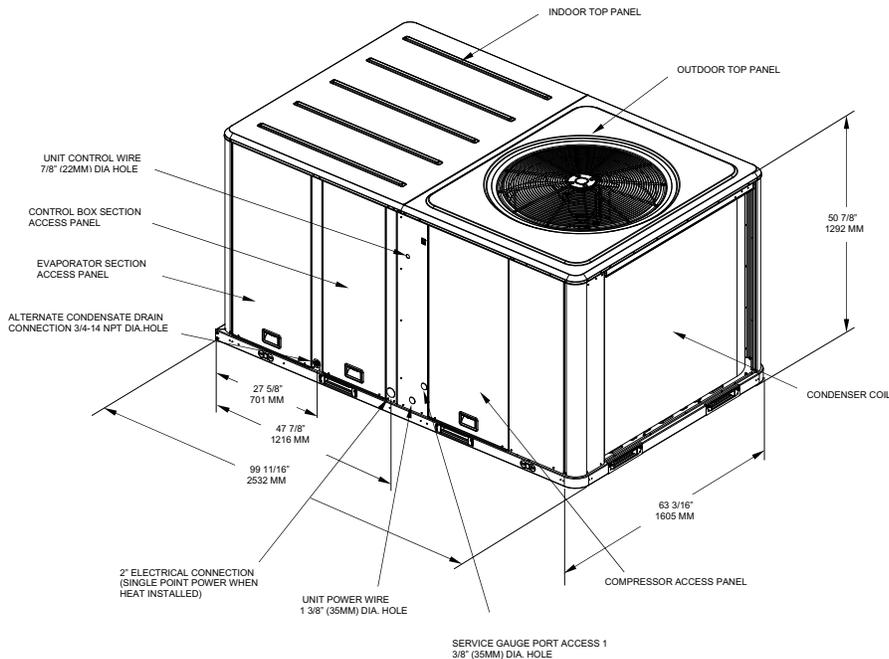
**Note:** All dimensions are in inches/millimeters.



**Figure 9. Heat pump - 10 ton standard efficiency**

**Notes:**

1. All dimensions are in inches/millimeters.
2. 2" Electrical Connection: Single Point Power When Heat Installed (WSC Models only.)

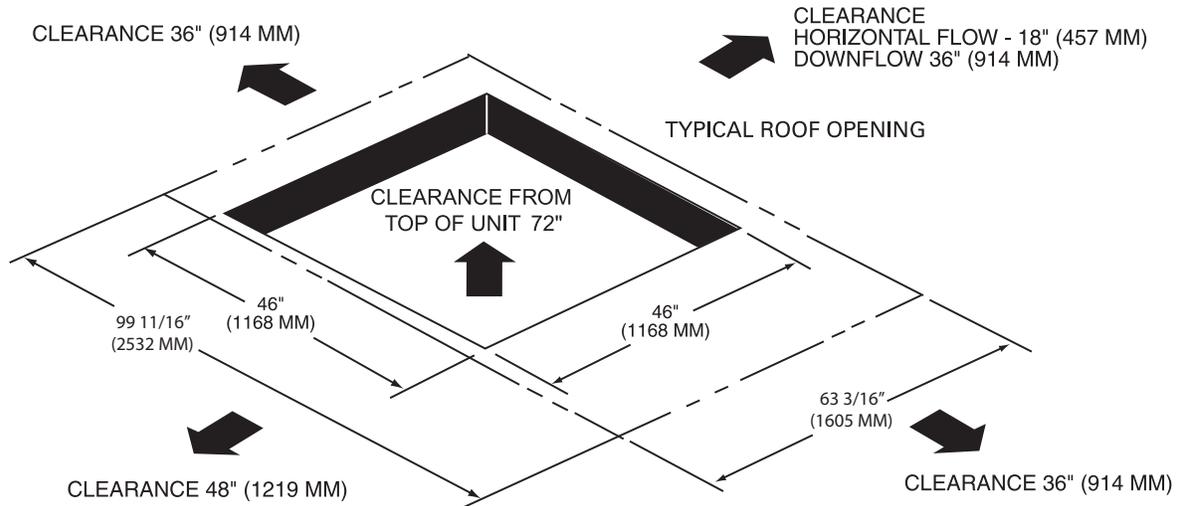


## Unit Clearances

**Figure 10. Heat pump - 10 ton standard efficiency - unit clearance and roof opening**

**Notes:**

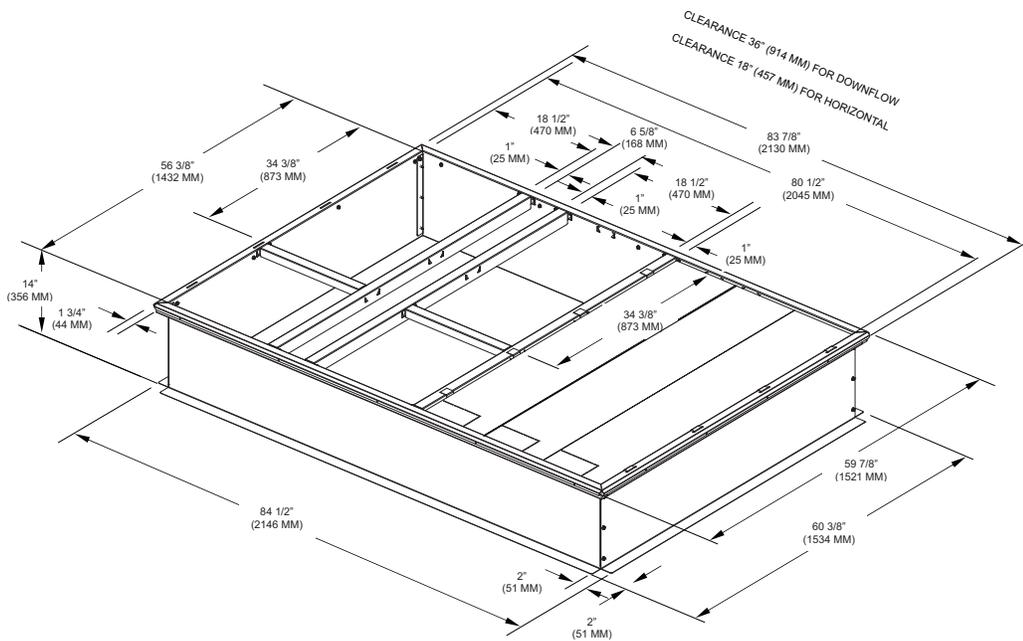
1. All dimensions are in inches/millimeters.



**Figure 11. Heat pump - 10 ton standard efficiency - roof curb**

**Notes:**

1. All dimensions are in inches/millimeters.



# Installation

## ⚠ 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.

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

Tons	Unit Model No.	Maximum Model Weights <sup>(a)</sup>		Corner Weights <sup>(b)</sup>				Center of Gravity (in.)	
		Shipping	Net	A	B	C	D	Length	Width
3	WSC036E	589	514	177	107	113	117	29	20
4	WSC048E	600	525	181	109	115	119	29	20
5	WSC060E	825	682	228	177	114	163	38	24
6	WSC072E	835	740	235	196	140	168	40	22
7½	WSC090E	902	804	255	217	153	180	41	22
10	WSC120E	1431	1219	355	333	257	274	48	28

(a) Weights are approximate.

(b) Corner weights are given for information only.

**Figure 12. Corner weights**

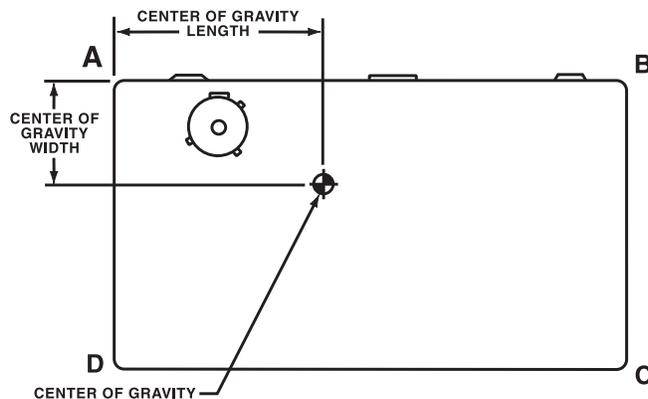


Figure 13. Rigging and center-of-gravity data

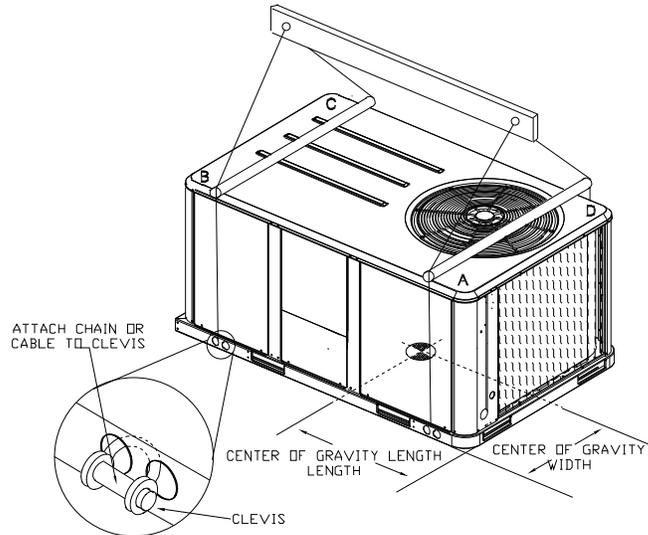


Table 2. Factory installed options (fiops)/accessory net weights (lbs)<sup>(a),(b)</sup>

Accessory	WSC036E-048E	WSC060E	WSC072E-090E	WSC120E
	Net Weight	Net Weight	Net Weight	Net Weight
	3-4 Ton	5 Ton	6-7½ Ton	10 Ton
Barometric Relief	7	10	10	10
Belt Drive Option (3 phase only)	31	31	—	—
Coil Guards	12	20	20	30
Economizer	26	36	36	36
Electric Heaters <sup>(c)</sup>	15	30	30	40
Hinged Doors	10	12	12	12
Manual Outside Air Damper	16	26	26	26
Motorized Outside Air Damper	20	30	30	30
Oversized Motor	5	8	8	—
Powered Convenience Outlet	38	38	38	50
Powered Exhaust	—	80	80	80
Roof Curb	61	78	78	89
Smoke Detector, Supply	5	5	5	5
Smoke Detector, Return	7	7	7	7
Through the Base Electrical	8	13	8	13
Unit Mounted Circuit Breaker	5	5	5	5
Unit Mounted Disconnect	5	5	5	5

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

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

<sup>(c)</sup> Applicable to Heat Pump units only.

## 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. 21](#) 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**

#### **Risk of Roof Collapsing!**

**Confirm with a structural engineer that the roof structure is strong enough to support the combined weight of the roofcurb and the unit. Refer to 'Weights' page \* [Table 1, p. 21](#) for typical unit and curb weights. Failure to ensure proper structural roof support could cause the roof to collapse, 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 14, p. 23](#) to [Figure 19, p. 26](#) 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.

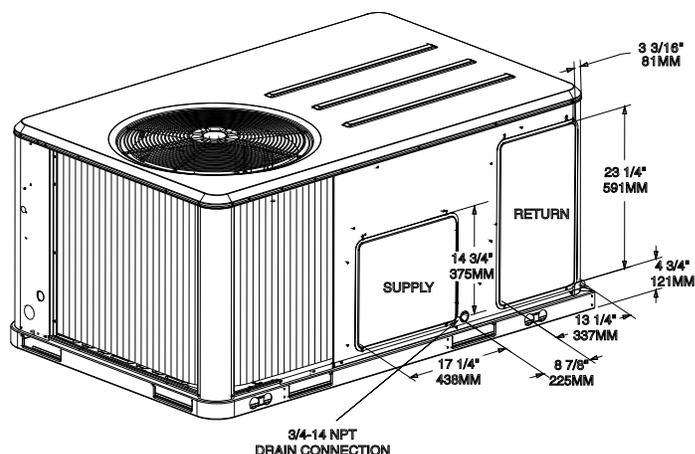
When attaching the ductwork to the unit, provide a water-tight flexible connector at the unit to prevent operating sounds from transmitting through the ductwork.

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

### Horizontal Units

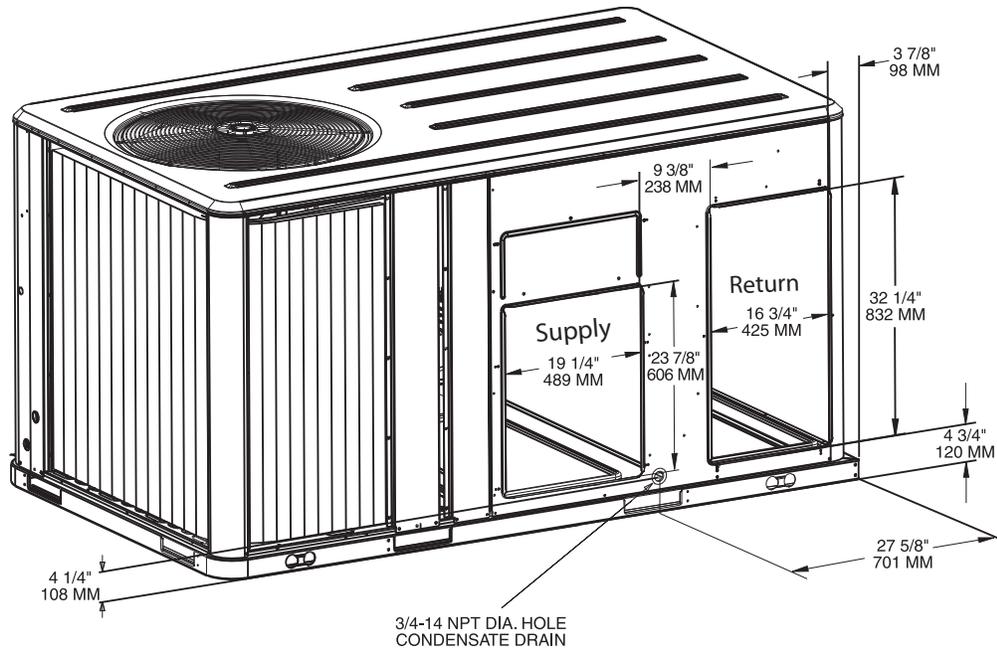
**Figure 14. Heat pump - 3-4 ton standard efficiency - horizontal airflow supply/return**

**Note:** All dimensions are in inches/millimeters.



**Figure 15. Heat pumps - 5-7½ ton - horizontal airflow supply and return**

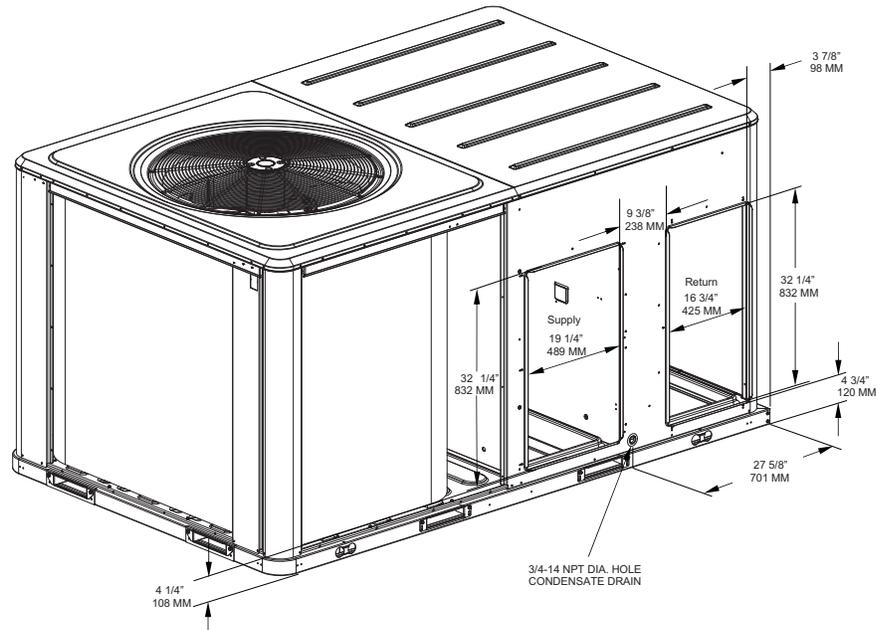
**Note:** All dimensions are in inches/millimeters.



**Figure 16. Heat pump - 10 ton standard efficiency - horizontal airflow supply/return**

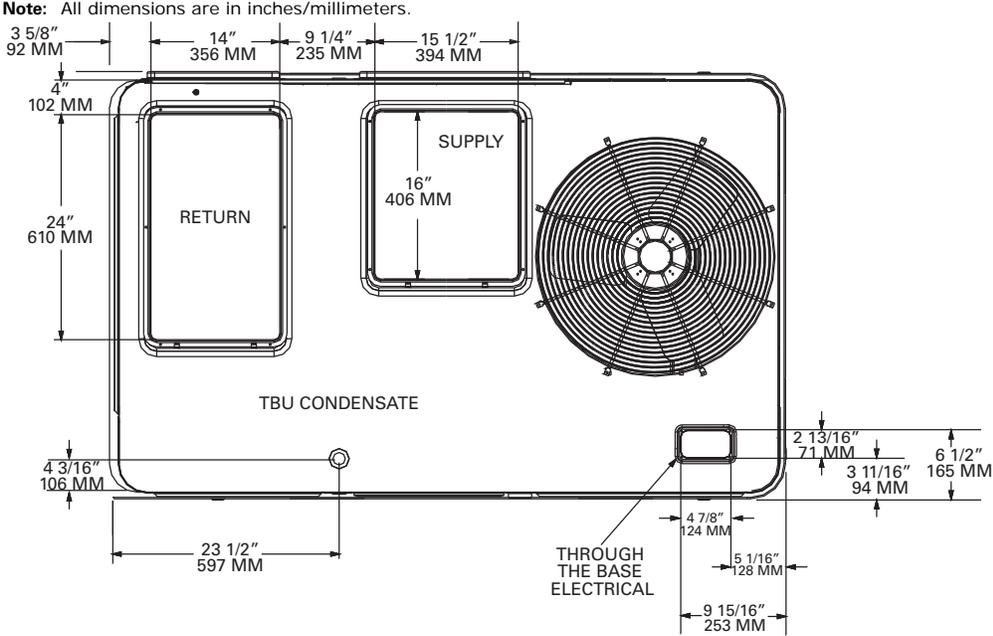
**Notes:**

1. All dimensions are in inches/millimeters.

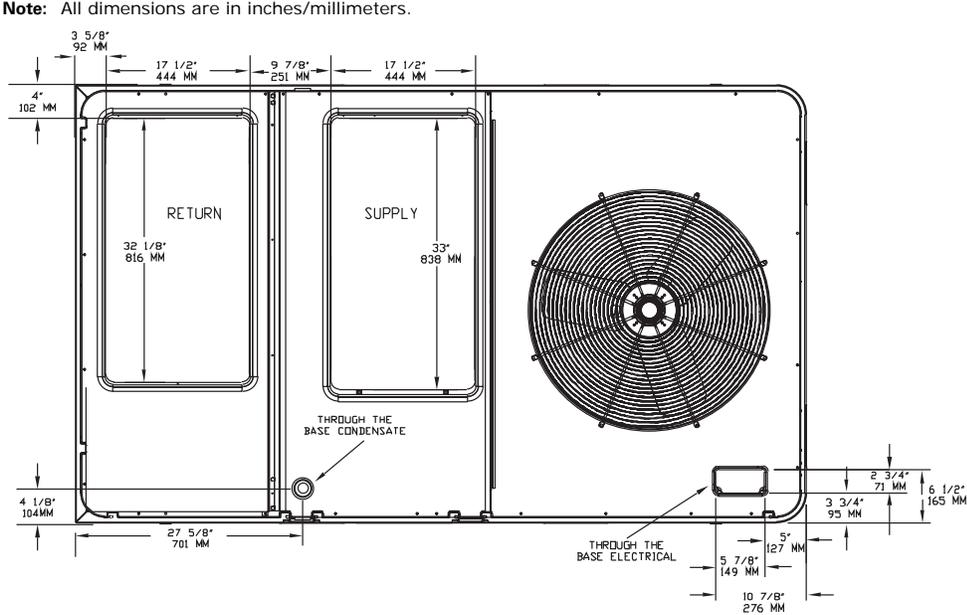


Downflow Units

**Figure 17. Heat pump - 3-4 ton standard efficiency - downflow airflow supply/return - through the base utilities**



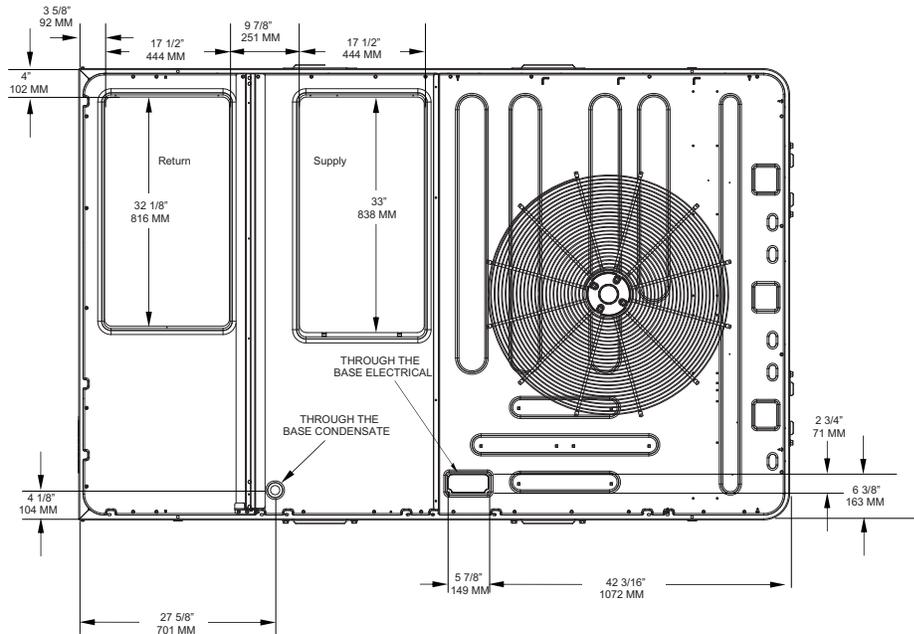
**Figure 18. Heat pumps - 5-7½ ton - downflow airflow supply/return - through the base utilities**



**Figure 19. Heat pump - 10 ton standard efficiency - downflow airflow supply/return through the base utilities**

**Notes:**

1. 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. The 7½ - 10 ton high efficiency units contain a support base alignment rail and will extend past the end of the roof curb as shown in figures below.

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 combustible materials catching on fire. 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.

Figure 20. View for base to roof curb alignment WSC120E on 50 x 84 roof curb

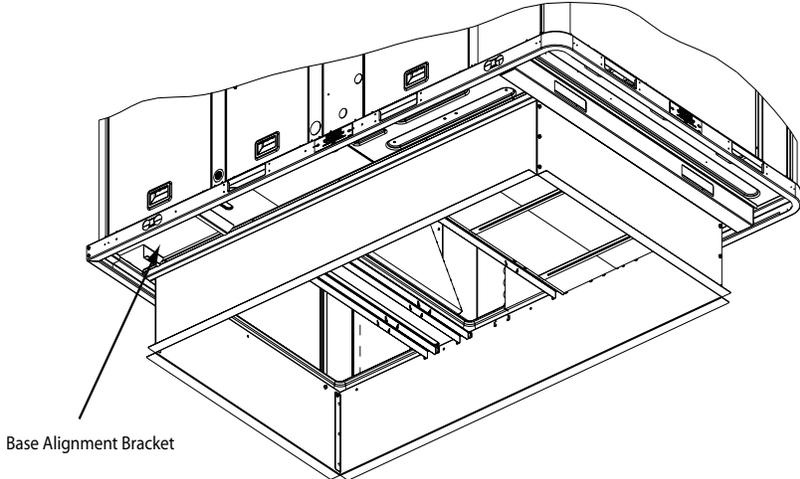


Figure 21. View for base to roof curb alignment WSC120E on 60 x 84 roof curb

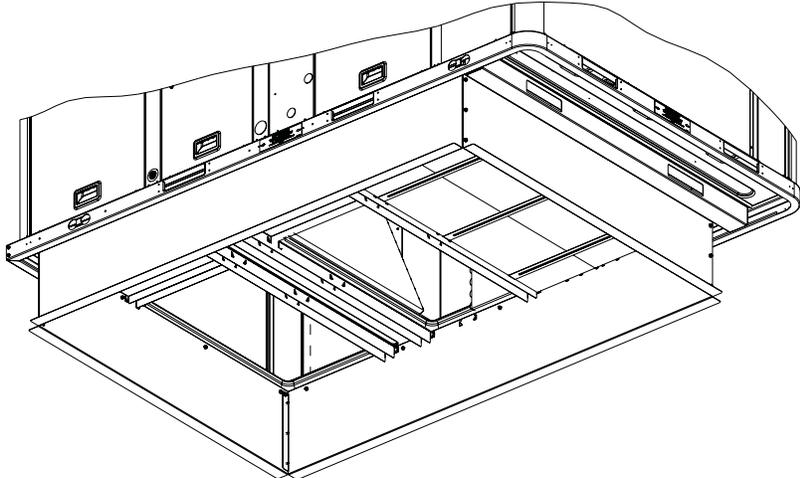


Table 3. Clearance required from duct to combustible surfaces

Model Number	Clearance required from duct to combustible surfaces (inches)
WSC036E	0
WSC048E	0
WSC060E	0
WSC072E	1
WSC090E	1
WSC120E	1

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, the unit (and curb) must be level.

## Installation

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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 13, p. 22](#). Refer to the typical unit operating weights table before proceeding.

1. Remove all drill screws fastening wood protection to metal baserail. Remove all screws securing wooden protection to wooden top crate.  
On 7½-10 ton high efficiency units, remove wire ties from outdoor grill.
2. Remove Wooden Top Crate.

### 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.

3. Rig the unit as shown in [Figure 13, p. 22](#). 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 13, p. 22](#), 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.
7. When 10 ton units are installed on smaller existing roof curb (50"x84") for replacement applications, do not remove alignment bracket. This bracket helps assure proper alignment of duct openings.

Figure 22. Fork lift pockets (all heat pump units except WSC120)

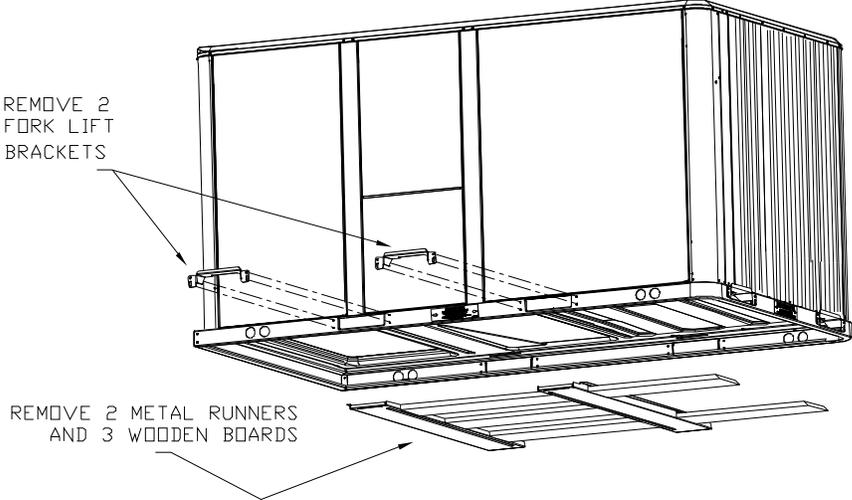
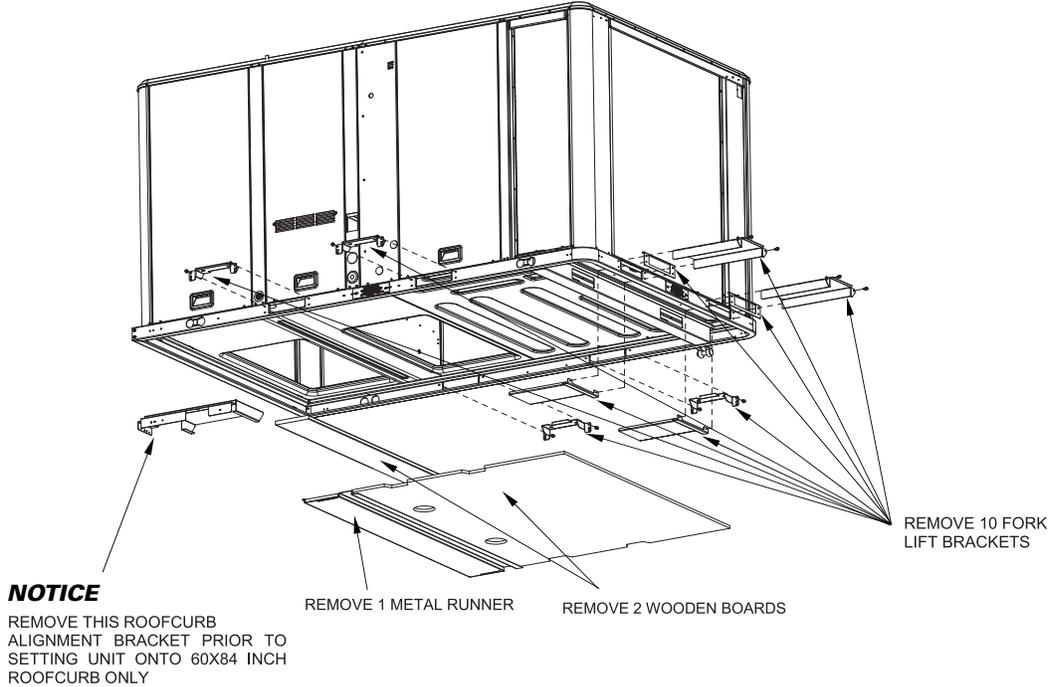


Figure 23. Fork lift pockets (WSC120)



- 8. 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.
- Install and connect a condensate drain line to the evaporator drain connection.

### 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 Electric Heat Units

Units are factory shipped in the downflow discharge configuration but can be field converted to a horizontal discharge configuration. Some, but not all units require a different TCO-A limit switch, which is wire tied near the terminal block in the heater compartment if horizontal discharge configuration is used. See [Figure 29, p. 33](#) for the location of TCO-A.

### Horizontal Discharge Conversion WSC036E, WSC048E

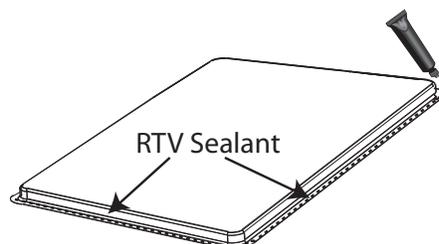
- Supplies Needed by Installer for Conversion: 3 oz. tube of High Temperature RTV sealant. (500°F/260°C: Similar to Dow Corning 736)

**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:

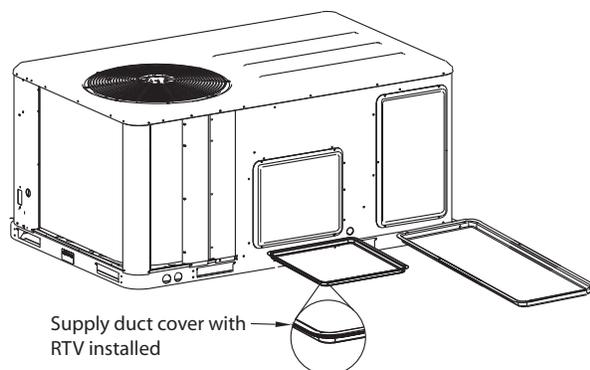
1. Remove RETURN and SUPPLY duct covers.
2. Locate supply cover. Apply ¼ in. (6mm.) continuous bead of 500°F RTV sealant to the flange as shown.

**Figure 24. Supply duct cover**



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 25. Supply & return openings**



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 out-ward edge of the duct cover with two screws.

**Note:** Certain unit/electric heater combinations require a limit switch change out for horizontal airflow applications. Refer to the following instructions to determine if this process is required for the unit undergoing installation.

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

## Horizontal Discharge Conversion WSC060-120E

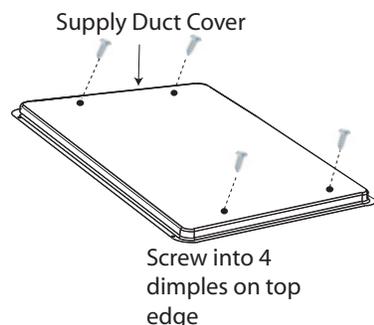
- Supplies Needed by Installer for Conversion: 3 oz. tube of high Temperature RTV sealant. (500°F/260°C: Similar to Dow Corning 736)

**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 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.

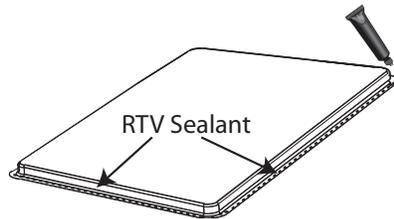
**Figure 26. Supply duct cover**



## Installation

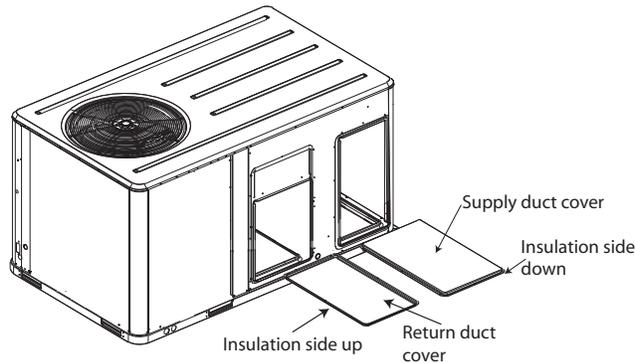
- On original RETURN DUCT COVER, apply ¼" (6mm.) continuous bead of 500°F RTV sealant around flange (opposite insulation side), as shown.

**Figure 27. Return duct cover**



- 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 28. Supply & return openings**



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

**Note:** Certain unit/electric heater combinations require a limit switch change out for horizontal airflow applications. Refer to the following instructions to determine if this process is required for the unit undergoing installation.

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

## TCO-A Instructions

If the unit being installed is listed in the following table and is equipped with the corresponding model number of factory installed electric heater package in the table, the limit control TCO-A must be replaced with the extra limit control shipped in the heater compartment. Replace TCO-A following the instructions in steps 1 through 3 below. If the unit being installed does not have a factory installed electric heater package or is equipped with a factory installed electric heater model that does not correspond to any in this table, skip steps 1 through 3 and go on to next step in the installation process.

**Table 4. TCO-A replaced for horizontal duct configuration**

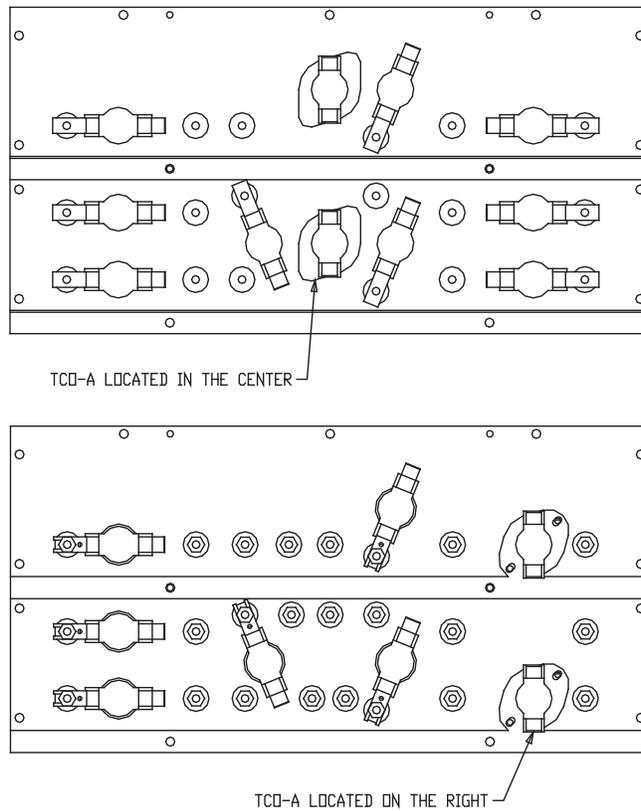
Unit Model Number	Electric Heater Model Number	TCO-A location
WSC120EW	BAYHTRBW36, W54	Right
WSC090E4	BAYHTRU427, 436	Center
WSC090EW	BAYHTRUW27, W36	Center

**Table 4. TCO-A replaced for horizontal duct configuration (continued)**

WSC072E3	BAYHTRW327, 336	Center
WSC072E4	BAYHTRW427, 436	Center
WSC072EW	BAYHTRWW27, W36	Center

1. Remove the heater section access panel and open the electric heater dead front panel.
2. TCO-A is the limit control located in the central or right part of the heater mounting plate and that is located on the bottom of the two heater element assemblies. See [Figure 29, p. 33](#). To replace this device, first remove the two wires connected to the terminals. Next, remove the two screws which secure it to the heater element mounting plate. Once TCO-A has been removed from the heater element mounting plate, discard this device.

**Figure 29. TCO-A location**



3. Obtain the replacement TCO-A which is secured by a wire tie near the electric heater terminal block in the heater compartment. Attach it to the heater element mounting plate with the two screws that were removed in step 2 above. Connect the two wires that were un-hooked in step 2 to the terminals on the new TCO-A. Refer to the heater package wiring diagram to assure that the wiring is connected properly.
4. Close the electric heater dead front panel and replace heat section access panel.

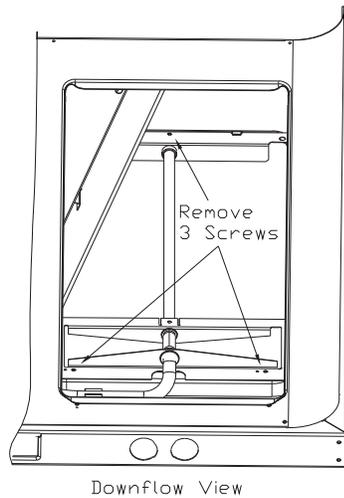
### Return Air Smoke Detector

The factory installed Return Air Smoke Detector is installed in the Downflow discharge position. No additional field setup is required.

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

1. If the unit has an economizer, it must be pulled out in the operating position.
2. Remove the 3 screws from the mounting brackets. Refer to Downflow View for screw locations.

**Figure 30. Downflow view**

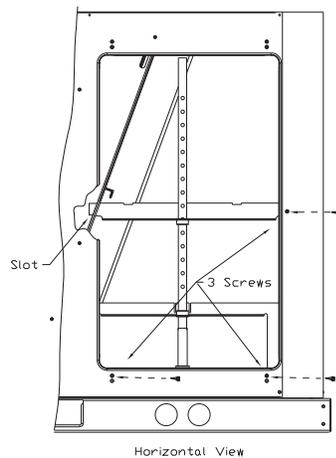


3. Lift the tube and bracket from the downflow duct opening. Rotate the tube and bracket assembly 180° degrees ensuring that the holes on the copper sensing tube face away from the unit and face the return air ductwork. Refer to Horizontal View.

**Note:** Check to insure that the flexible tubing lies flat on the base pan surface.

4. Slide the top bracket down the copper sensing tube, insert the tab on the left side into the slot on the indoor coil blockoff and secure the right side of the bracket with one of the 3 screws removed in step 2. Refer to Horizontal View.
5. Using the remaining 2 screws removed in step 2, secure the bottom bracket. Refer to Horizontal View

**Figure 31. Horizontal view**



## Main Electrical Power Requirements

### **⚠ 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 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.

- Verify that the power supply complies with the unit nameplate specifications.
- Inspect all control panel components; tighten any loose connections.
- Connect properly sized and protected power supply wiring to a field-supplied/installed disconnect switch and to the main power terminal block (HTB1) in the unit control panel.
- Install proper grounding wires to an earth ground.

**Note:** All field-installed wiring must comply with NEC and applicable local codes.

## Electric Heat Requirements

- Verify that the power supply complies with the electric heater specifications on the unit and heater nameplate.
- Inspect the heater junction box and control panel; tighten any loose connections.
- Check electric heat circuits for continuity.

## 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 14, p. 23](#) - [Figure 19, p. 26](#) for the appropriate drain location.

The condensate drain pan is factory installed to drain condensate to the back side of the unit. See [Figure 14, p. 23](#) - [Figure 19, p. 26](#). 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 grommetted 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 grommetted hole as the panel is put in place.
6. Replace evaporator access panel and supply air access panels.

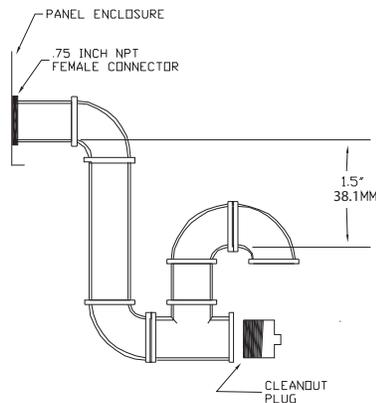
### To convert drain condensate through the base of unit:

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 grommetted 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 grommetted 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 32, p. 36](#).

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 32. Condensate trap installation**



## 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 Clearances,” p. 15. 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 could result in equipment damage.

**Note:** If the unit is not equipped with an optional factory installed nonfused 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. 15. 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.

## Main Unit Power Optional TBUE Wiring (Through the Base Electrical Option)

1. Location of the applicable electrical service is illustrated below. Refer to the customer connection diagram that is shipped with the unit for specific termination points. The termination points, depending on the customer option selected would be a factory mounted nonfused disconnect switch (UDC) or circuit breaker (UCB). If neither a factory mounted nonfused disconnect switch (UDC) or circuit breaker (UCB) was factory mounted, field wiring connections should be terminated in the control box at Compressor Contactor # 1 (CC1).
2. Provide proper grounding for the unit in accordance with local and national codes.

**Note:** Black Gasket is shipped from the factory and is located in the literature Ship With bag in the control box. Apply Black Gasket around conduit plate on all 4 sides after installation to prevent air leakage from the building entering the electrical enclosures.

**Note:** Seal between wiring and conduit with Black Gasket or weather proof sealer to prevent air leakage from the building entering the electrical enclosures. Also seal around conduit and wiring at all roof and curb penetrations.

Figure 33. All units except WSC120E

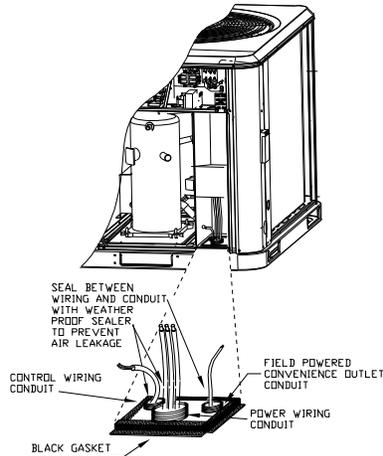
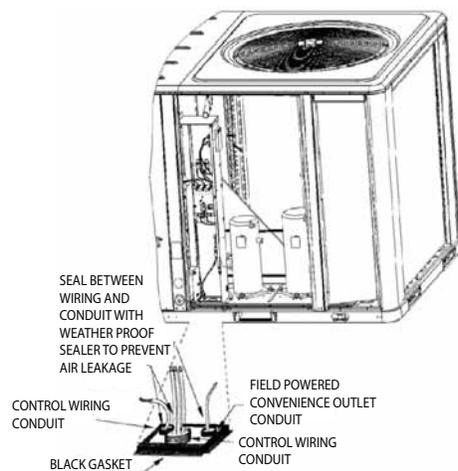


Figure 34. WSC120E



### 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 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 layout of the various control options available with the required number of conductors for each control device is illustrated in [Figure 42, p. 45](#).

### 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. 15](#) for the electrical access locations provided on the unit and [Table 5, p. 39](#) 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:**

**Controls Using 24 VAC!**

**Resistance in excess of 3 ohms per conductor could 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 illustrations on [Figure 37, p. 41](#).

**Table 5. AC conductors**

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

### 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. 15](#) for the electrical access locations provided on the unit.

1. [Table 6, p. 40](#) 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 illustrations on [Figure 37, p. 41](#).

**Table 6. DC conductors**

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

**Figure 35. ReliaTel conventional thermostat field wiring diagram**

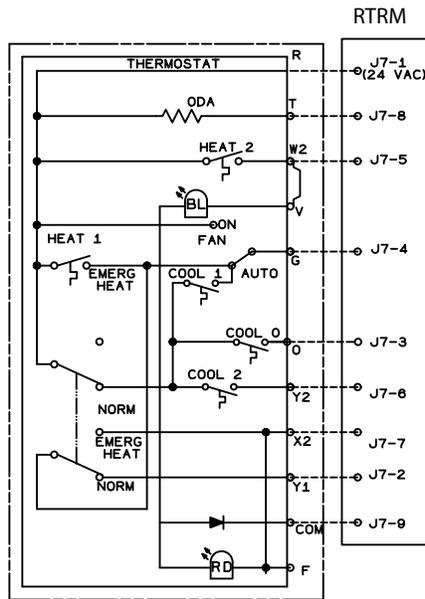


Figure 36. ReliaTel refrigeration module

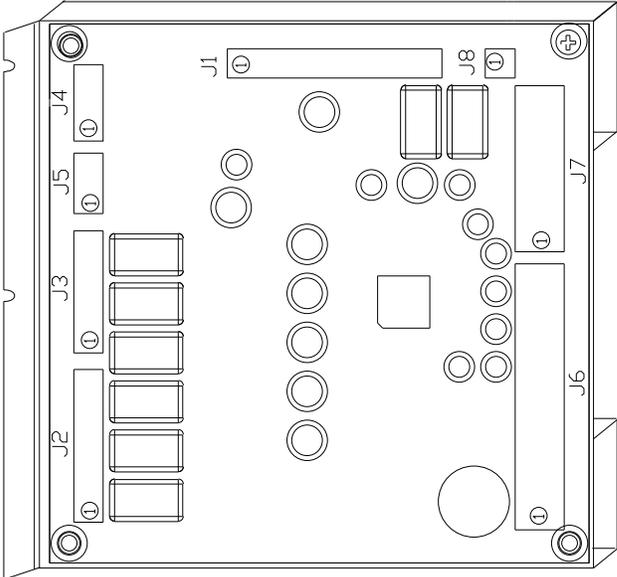


Figure 37. Customer control low voltage routing (all units except 10 ton)

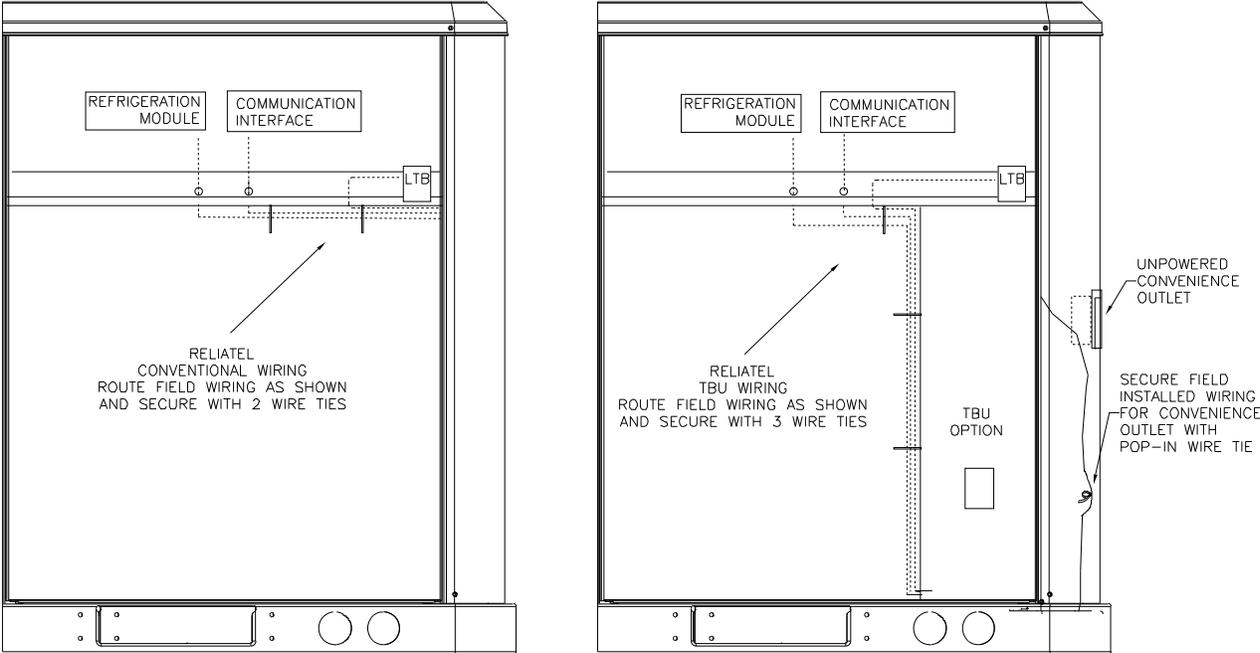


Figure 38. ReliaTel (without TBUE) control customer wire routing (10 ton)

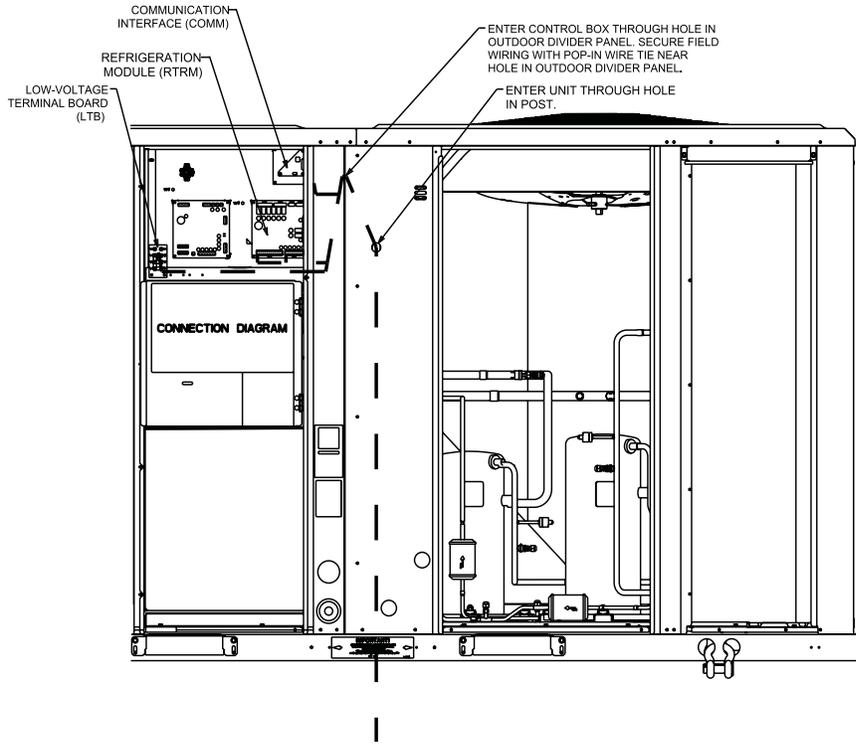
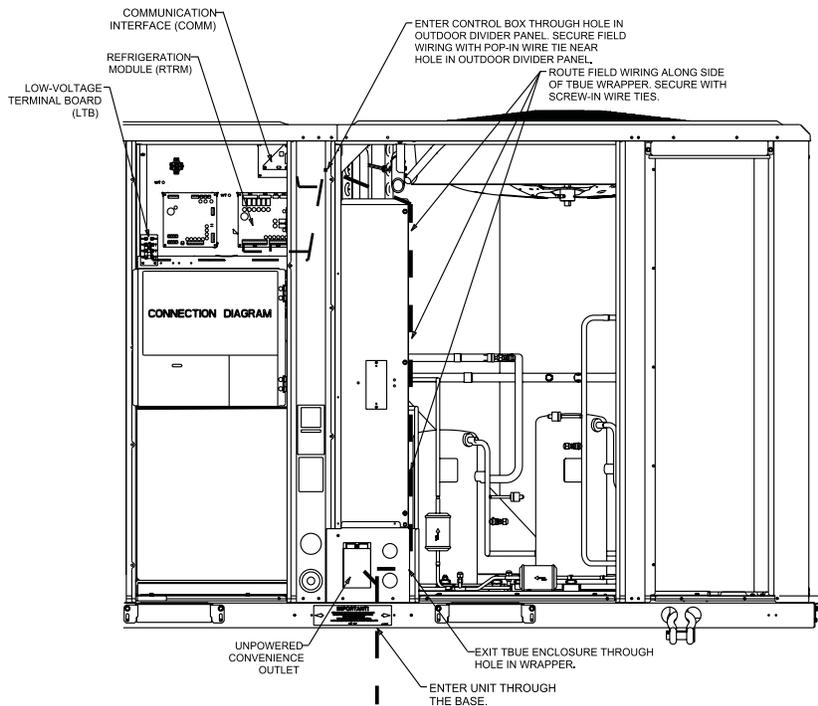


Figure 39. ReliaTel (with TBUE) control customer wire routing (10 ton)



### Smoke Detector - (ReliaTel™ only) Customer Low Voltage Wiring

When interlocking System Sensor smoke detectors together, all of the detectors must be powered from the same power supply. If multiple smoke detectors are required, all detectors must be disconnected from the HVAC unit power supply and connected together from another single source supply.

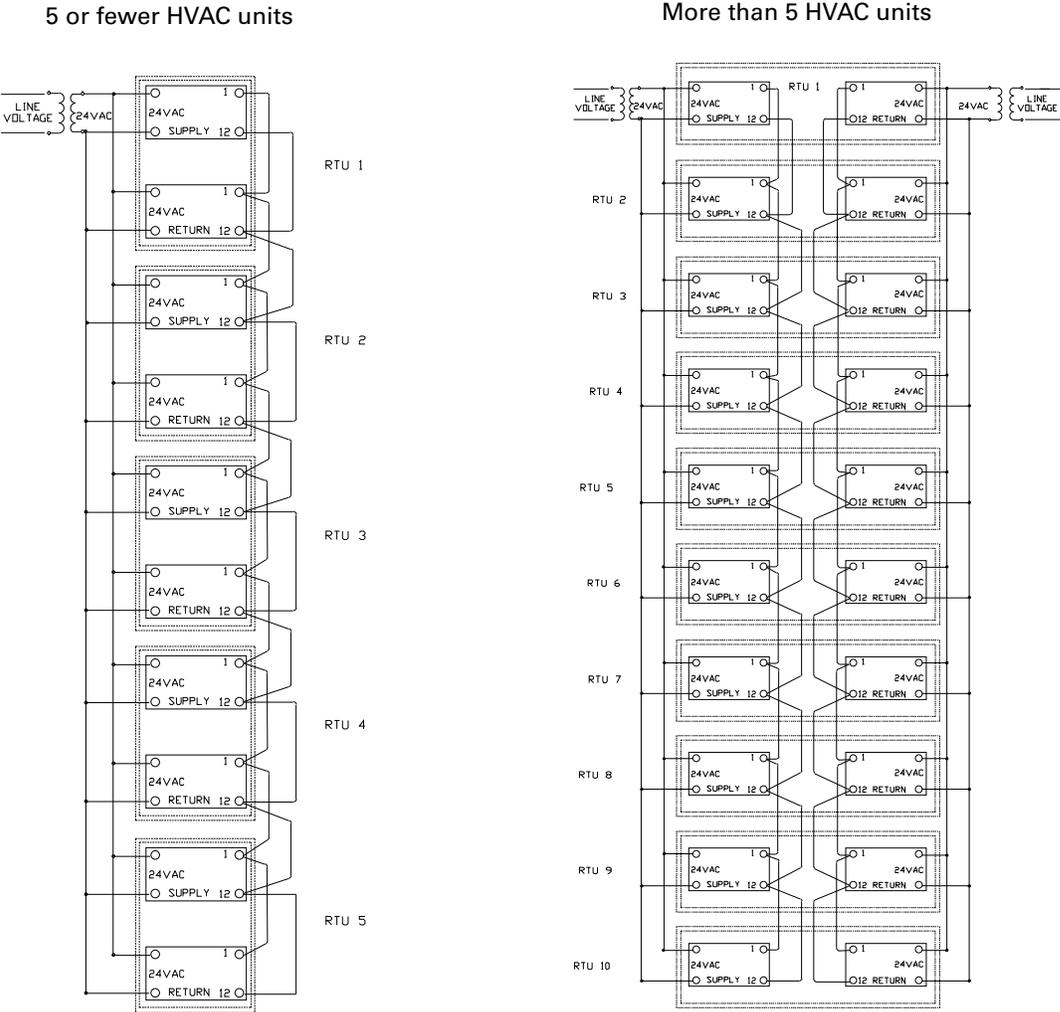
**Note:** Do not interconnect smoke detectors together that have separate power supplies. Do not exceed ten smoke detectors on one power supply.

**Note:** Multiple System Sensor smoke detectors are connected together using terminals 1 and 12 on each detector.

If you have supply and return smoke detectors in all HVAC units, you can connect a maximum of 5 HVAC units (10 detectors) up to one power supply. See the following field wiring example below.

If you have more than 5 HVAC units, you can connect all the supplies together on one power supply (up to 10 HVAC units), and all the returns together (up to 10 HVAC units) on another power supply. See the following field wiring example below.

Figure 40. Smoke detector field wiring examples



# Pre-Start

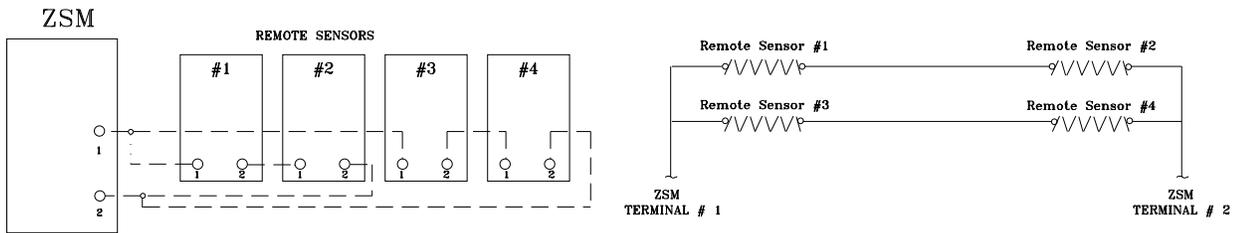
## Space Temperature Averaging (ReliaTel™ only)

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

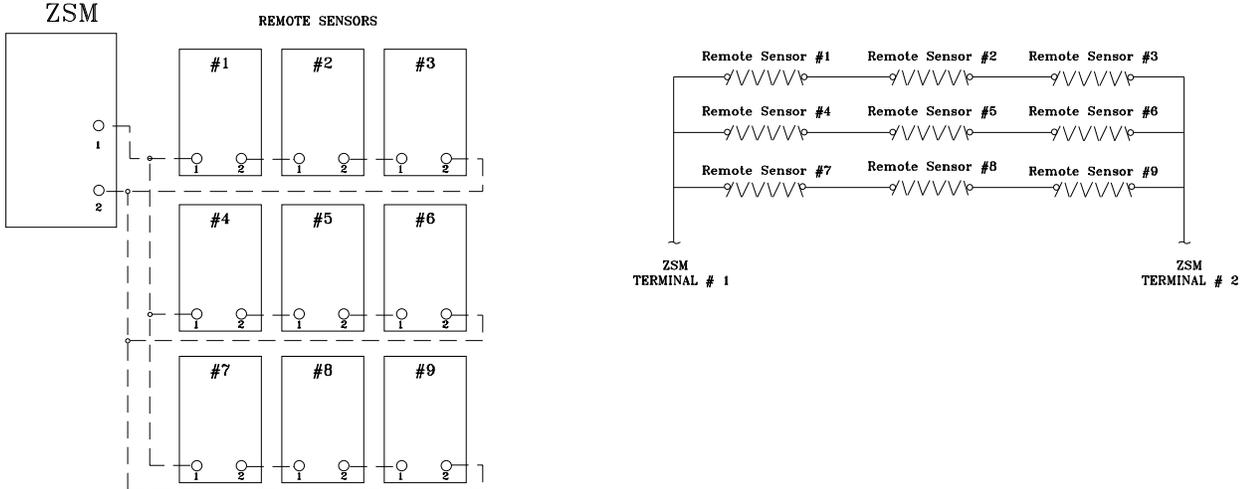
Using the BAYSENS016\* or BAYSENS077\*, at least four sensors are required to accomplish space temperature averaging. Example #1 illustrates two series circuits with two sensors in each circuit wired in parallel. The square of any number of remote sensors is required. Example #2 illustrates three sensors 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 7, p. 46](#) lists the temperature versus resistance coefficient for all sensors.

Figure 41. Examples

### EXAMPLE #1



### EXAMPLE #2



### EXAMPLE #3

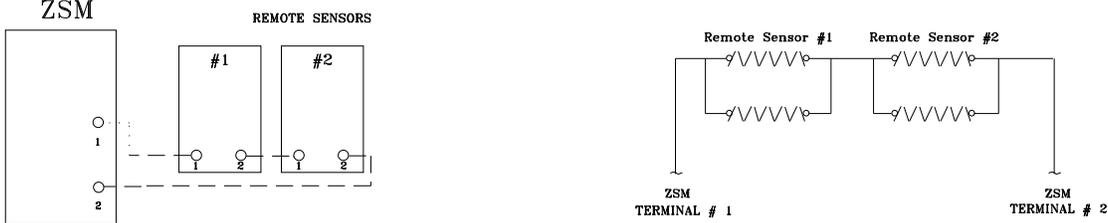
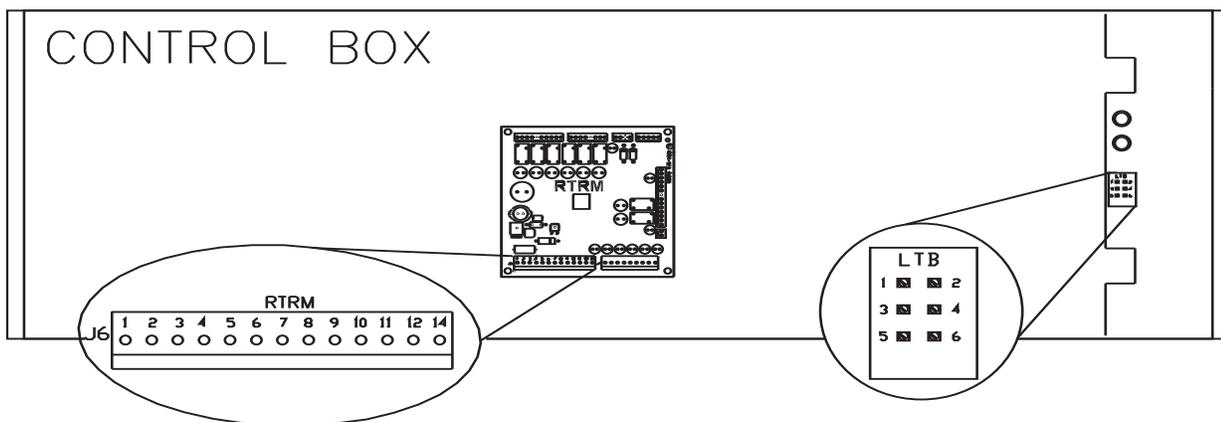
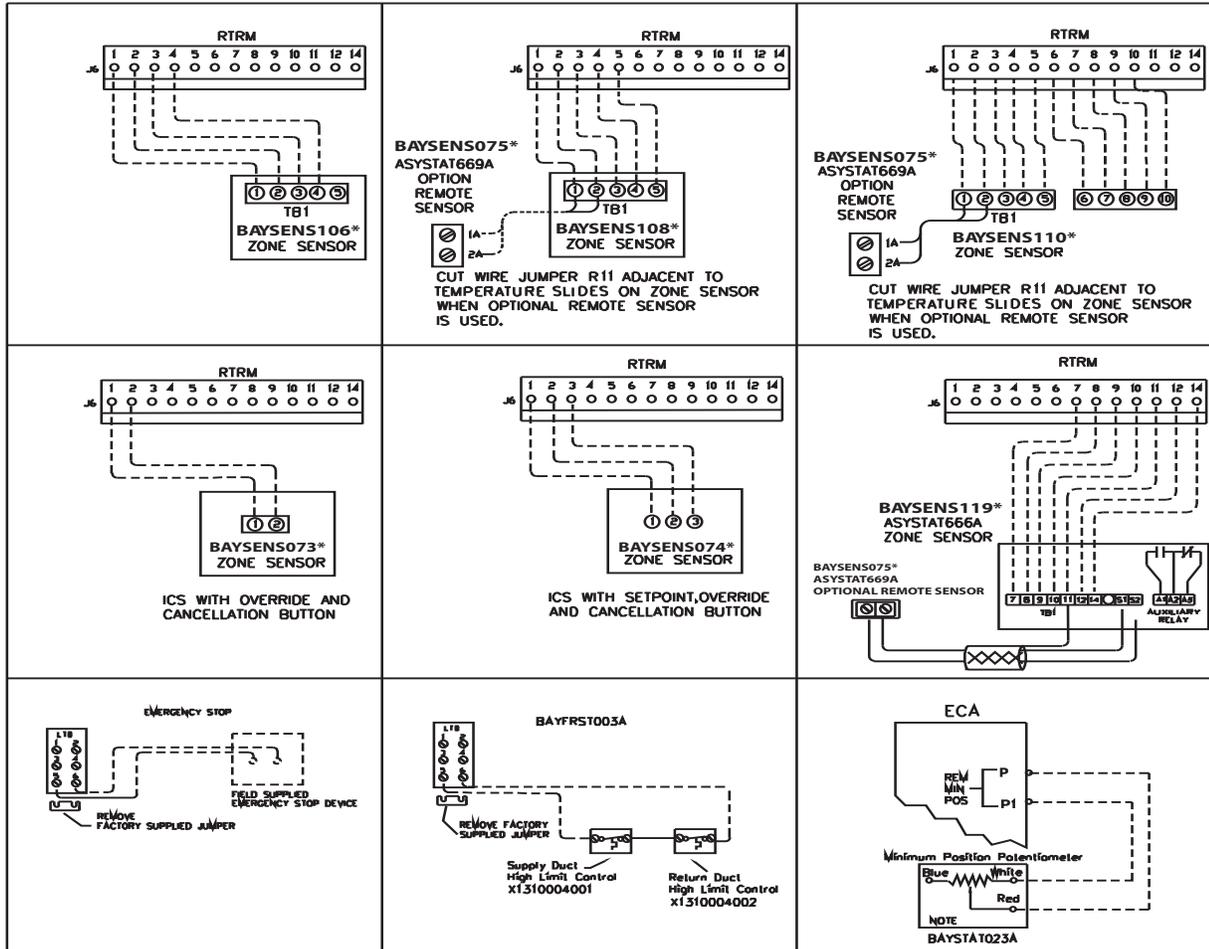


Figure 42. Typical field wiring diagrams for optional controls



**Table 7. 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.

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.**

- 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 on WSC036E\*, WSC048E1, and & WSC060E1 - Standard on remaining units)**

Each compressor can be 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.

### **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.**

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.

5. StepTest 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.

6. ResistanceTest 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.
7. AutoTest 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 8, p. 50](#).

## 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 8. Service test guide for component operation**

Test Step	Mode	Fan	Econ <sup>2</sup>	Comp1	Comp 2	Heat 1	Heat 2	Ohms	Multi-Speed Fan Output
1	Fan	On	Minimum Position Setpoint 0%	Off	Off	Off	Off	2.2K	Low
	Minimum Ventilation	On	Selectable	Off	Off	Off	Off		
2	Economizer Test Open	On	Open	Off	Off	Off	Off	3.3K	Low
3	Cool Stage 1	On	Minimum Position	On <sup>1</sup>	Off	Off	Off	4.7K	Low
4 <sup>3</sup>	Cool Stage 2	On	Minimum Position	On <sup>1</sup>	On	Off	Off	6.8K	High (2-step cooling) Low (2-step cooling)
5 <sup>3</sup>	Reheat	On	Minimum	On	On	Off	Off	33K	High
6 <sup>3</sup>	Heat Stage 1	On	Minimum	Off	Off	On	Off	10K	High
7 <sup>3</sup>	Heat Stage 2	On	Minimum	Off	Off	On	On	15K	High

<sup>1</sup>The condenser fans will operate any time a compressor is “On” providing the outdoor air temperatures are within the operating values.

<sup>2</sup>The exhaust fan will turn on anytime the economizer damper position is equal to or greater than the exhaust fan setpoint.

<sup>3</sup>Steps for optional accessories and non-applicable modes in unit will be skipped.

## Verifying Proper Air Flow

### 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.**

## Units with 5-Tap Direct 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 motors are specifically designed to operate within the BHP parameters listed in the fan performance tables of the unit Service Facts.

When verifying direct drive fan performance, the tables must be used somewhat differently than those of belt driven fans. Fan performance diagnostics can be easily recognized when these tables are used correctly.

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 8, p. 50](#), momentarily jump across the Test 1 & Test 2 terminals on LTB1 one time to start the Minimum Ventilation Test.

With the fan operating properly, determine the total system external static pressure (inches w.c.) by the following method:

1. Measure the supply and return duct static pressure and sum the resulting absolute values,

2. Use the accessory pressure drop table in the Service Facts, to calculate the total static pressure drop for all of the accessories installed on the unit; i.e., curb, economizer, etc.

**Note:** Accessory static pressure drop is based on desired CFM and may not be actual static pressure drop.

3. Add the total accessory static pressure drop (step 2) to the duct external static pressure (step 1). The sum of these two values represents the total system external static pressure.

Using the Fan Performance Tables in the Service Facts, look up the selected speed tap setting and match the measured ESP to determine the approximate CFM.

If the required CFM is too low, (external static pressure is high) do one or both of the following and repeat procedure:

- Relieve supply and/or return duct static.
- Change indoor fan speed tap to a higher value

If the required CFM is too high, (external static pressure is low), do one or both of the following and repeat procedure:

- Increase supply and/or return duct static.
- Change indoor fan speed tap to a lower value.

**Note:** Minimum setting for units with Gas or Electric Heat is 320 CFM per Ton. For 3 & 4 Ton Gas Heat units operating in heating mode the heat speed set cannot be lower than Speed Set 4.

To stop the SERVICETEST, turn the main power disconnect switch to the "Off" position or proceed to the next component start-up procedure.

## 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 8, p. 50](#), 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 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.

**ReliaTel units with Direct Drive Indoor Fan (7.5 - 10 Ton High Efficiency, 10 Ton)**

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 adjusting the voltage from the RTOM Indoor Fan Speed output to the direct drive plenum fan. If installed, before starting the SERVICE TEST disable the Economizer by disconnecting the 4 pin power connector located at the base of the Economizer Control (ECA).

Using the Service Test Guide in [Table 11, p. 62](#), momentarily jump across the Test 1 & Test 2 terminals on LTB1. Repeat process until Service Test Mode is at Cool 2 (2-Steps of Cooling Applications Only) or Cool 3 (3-Steps of Cooling applications). The indoor motor shall be operating @ 100%, to verify turn DA COOL\_FAN SPD potentiometer full clockwise, voltage should read ~7.5 Vdc across harness test terminals. The unit schematic illustrates location for measuring the indoor motor speed voltage.

**Table 9. RPM table**

T/YHC092F			
Potentiometer Voltage	Motor RPM	Potentiometer Voltage	Motor RPM
1.25	217	4.50	1061
1.50	312	4.75	1126
1.75	362	5.00	1191
2.00	427	5.25	1253
2.25	479	5.50	1315
2.50	543	5.75	1374
2.75	605	6.00	1432
3.00	668	6.25	1487
3.25	732	6.50	1539
3.50	797	6.75	1588
3.75	863	7.00	1633
4.00	929	7.25	1675
4.25	995	7.50	1700

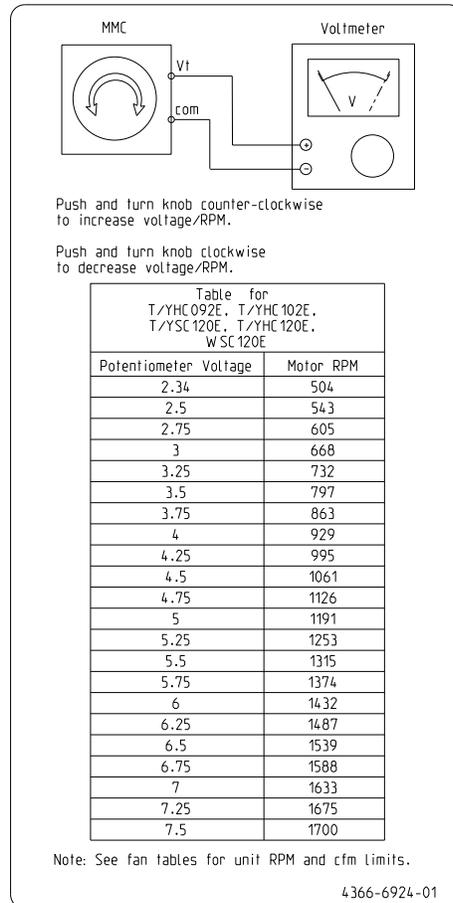
**Note:** Factory setting is 5V

Once the supply fan has started, determine the total system airflow (CFM)

1. Measure the DC voltage across harness test terminals. Using the fan rpm table shown above, determine RPM correlated to measured voltage.
  2. 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/Decrease Fan RPM turn DA COOL\_FAN SPD on the RTOM clockwise/counter-clockwise.

3. 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.
- Stop the SERVICE TEST, turn the main power disconnect switch to the "Off" position and reconnect Economizer 4-pin power connector if disconnected for this procedure.
  - Proceed to the next component start-up procedure.

**Figure 43. Plenum fan rpm label**



## Return Air Smoke Detector

The return air smoke detector is designed to shut off the unit if smoke is sensed in the return air stream. Sampling the airflow entering the unit at the return air opening performs this function.

In order for the smoke detector to properly sense smoke in the return air stream, the air velocity entering the unit must be between 500 and 4000 feet per minute. Equipment covered in this manual will develop an airflow velocity that falls within these limits over the entire airflow range specified in the evaporator fan performance tables.

There are certain models however, if operated at low airflow, will not develop an airflow velocity that falls within the required 500 to 4000 feet per minute range. For these models, the design airflow shall be greater than or equal to the minimum CFM specified in the table provided below. Failure to follow these instructions will prevent the smoke detector from performing its design function.

### Economizer Start-Up ReliaTel Control

#### **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.**

#### **Minimum Position Setting for 17 SEER with Multi-Speed, or Single Zone VAV**

1. Apply power to the unit
2. Using the Service Test Guide on unit access panel, momentarily jump across the Test 1 & Test 2 terminals on LTB1 one time to start indoor fan.
3. Turn the MIN POS - DCV potentiometer on the RTEM clockwise to open or counter-clockwise to close. The damper will open to this setting for low speed fan operation. When adjusting minimum position, the damper may move to the new setting in several small steps. Wait at least 15 seconds for the damper to settle at the new position. Range of damper for this setting is 0-100%.
4. Momentarily jump across the Test 1 & Test 2 terminals on LTB1, to cycle through test modes to Cool 1.
5. Turn the DCV SETPOINT - LL potentiometer on the RTEM clockwise to open or counter-clockwise to close. This will set the minimum damper position at an intermediate point of fan operation range of damper for this setting is 0-100%.
6. Momentarily jump across the Test 1 & Test 2 terminals on LTB1, to cycle through test modes to Cool 2.
7. Turn the MIN POS - DESIGN potentiometer on the RTEM clockwise to open or counter-clockwise to close. This will set the minimum damper position at maximum fan speed. Range of damper for this setting is 0-50%.
8. The economizer minimum damper position for all fan speeds is complete. The RTEM will control minimum damper position along an imaginary line between the 3 damper minimum positions based on fan speed. Note: The RTEM will limit intermediate minimum damper position to ensure proper ventilation based upon the low fan speed minimum damper position set in [Step 3](#).
9. Replace the filter access panel. The damper will close when the blower circuit is de-energized.

#### **Minimum Position Setting for 7.5 - 10 Ton with Multi-Speed, or Single Zone VAV**

1. Apply power to the unit
2. Using the Service Test Guide on unit access panel, momentarily jump across the Test 1 & Test 2 terminals on LTB1 one time to start indoor fan.
3. Turn the MIN POS - DESIGN potentiometer on the RTEM clockwise to open or counter-clockwise to close. The damper will open to this setting for low speed fan operation. When adjusting minimum position, the damper may move to the new setting in several small steps. Wait at least 15 seconds for the damper to settle at the new position.
4. Momentarily jump across the Test 1 & Test 2 terminals on LTB1, cycle through test modes to Cool 2 (2-Step Cooling applications) or Cool 3 (3-Step Cooling applications). Verify the indoor motor rpm is at 100% of the user selected airflow.

5. Turn the MIN POS - DCV potentiometer on the RTEM clockwise to open or counter-clockwise to close. This will set the minimum damper position for high speed fan operation.
6. The economizer minimum damper position for all fan speeds is complete. The RTEM will control minimum damper position along an imaginary line between the damper minimum positions based on fan speed.
7. Replace the filter access panel. The damper will close when the blower circuit is de-energized.

**⚠ 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.**

Using the Service Test Guide in [Table 8, p. 50](#), 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 8, p. 50](#), 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.

## Start-Up

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4. Check system superheat. Follow the instruction listed on the superheat charging curve in the Service Facts.  
Superheat should be within  $\pm 5$  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 8, p. 50](#), 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 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!**

**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.**

**⚠ 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.

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.

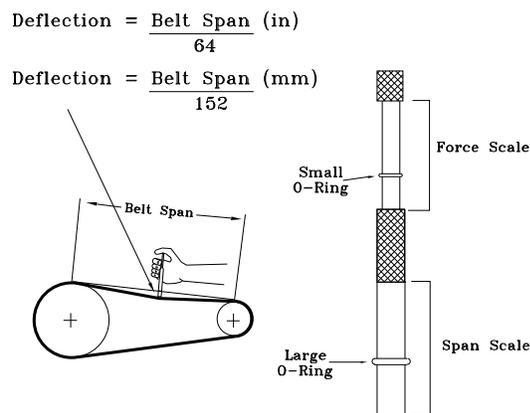
Once the new belts are installed, using a Browning or Gates tension gauge (or equivalent) illustrated in [Figure 44, p. 57](#); adjust the belt tension as follows;

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 44, p. 57](#).
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 10, p. 58](#). 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 44. Belt tension gauge**



**Table 10. 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

# Maintenance

## Monthly Maintenance

Before completing the following checks, turn the unit OFF and lock the main power disconnect switch open.

### 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.**

Failure to disconnect power before servicing can cause severe personal injury or death.

## Filters

- Inspect the return air filters. Clean or replace them if necessary. Refer to the unit Service Facts for filter information.

## Return Air Smoke Detector Maintenance

Airflow through the unit is affected by the amount of dirt and debris accumulated on the indoor coil and filters. To insure that airflow through the unit is adequate for proper sampling by the return air smoke detector, complete adherence to the maintenance procedures, including recommended intervals between filter changes, and coil cleaning is required.

Periodic checks and maintenance procedures must be performed on the smoke detector to insure that it will function properly. For detailed instructions concerning these checks and procedures, refer to the appropriate section(s) of the smoke detector Installation and Maintenance Instructions provided with the literature package for this unit.

## Cooling Season

- Check the unit's drain pans and condensate piping to ensure that there are no blockages.
- Inspect the evaporator and condenser coils for dirt, bent fins, etc. If the coils appear dirty, clean them according to the instructions described in "Coil Cleaning" later in this section.
- Manually rotate the condenser fan(s) to ensure free movement and check motor bearings for wear. Verify that all of the fan mounting hardware is tight.
- Inspect the F/A-R/A damper hinges and pins to ensure that all moving parts are securely mounted. Keep the blades clean as necessary.
- Verify that all damper linkages move freely; lubricate with white grease, if necessary.
- Check supply fan motor bearings; repair or replace the motor as necessary.
- Check the fan shaft bearings for wear. Replace the bearings as necessary.
- Check the supply fan belt. If the belt is frayed or worn, replace it. Refer to the "Fan Belt Adjustment" section for belt replacement and adjustments.
- Verify that all wire terminal connections are tight.
- Remove any corrosion present on the exterior surfaces of the unit and repaint these areas.
- Generally inspect the unit for unusual conditions (e.g., loose access panels, leaking piping connections, etc.).
- Make sure that all retaining screws are reinstalled in the unit access panels once these checks are complete.

## Maintenance

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- With the unit running, check and record the: ambient temperature; compressor suction and discharge pressures (each circuit); superheat (each circuit);

Record this data on an “operator’s maintenance log” like the one shown in [Table 11, p. 62](#). If the operating pressures indicate a refrigerant shortage, measure the system superheat. For guidelines, refer to the “Compressor Start-Up” section.

**Note:** Do Not release refrigerant to the atmosphere! If adding or removing refrigerant is required, the service technician must comply with all federal, state and local laws.

## Heating Season

- Inspect the unit’s air filters. If necessary, clean or replace them.
- Check supply fan motor bearings; repair or replace the motor as necessary.
- Inspect both the main unit control panel and heat section control box for loose electrical components and terminal connections, as well as damaged wire insulation. Make any necessary repairs.
- Verify that the electric heat system operates properly.

## Coil Cleaning

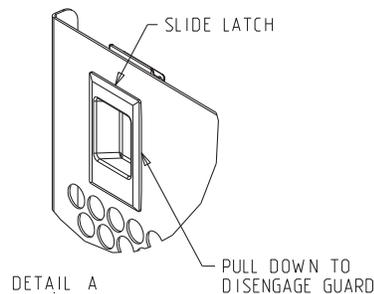
Regular coil maintenance, including annual cleaning, enhances the unit’s operating efficiency by minimizing: compressor head pressure and amperage draw; evaporator water carryover; fan brake horsepower, due to increase static pressure losses; airflow reduction.

At least once each year, or more often if the unit is located in a “dirty” environment, clean the evaporator and condenser coils using the instructions outlined below. Be sure to follow these instructions as closely as possible to avoid damaging the coils.

**Note:** For units equipped with hail guards follow removal procedure listed below.

### Hail Guard Removal

**Figure 45. Slide-style**



- Unlatch hail guards.
- Pull the top of the hail guard outward until the fastener studs are free of the retaining nuts.
- Lift the hail guard from the lower retaining bracket and set aside.

To clean refrigerant coils, use a soft brush and a sprayer (either a garden pump-up type or a high-pressure sprayer). A high-quality detergent is also required; suggested brands include “SPREX A.C.”; “OAKITE 161”; “OAKITE 166” and “COILOX.” If the detergent selected is strongly alkaline (ph value exceeds 8.5), add an inhibitor.

**⚠ WARNING****Hazardous Chemicals!**

Coil cleaning agents can be either acidic or highly alkaline and can burn severely if contact with skin occurs. Handle chemical carefully and avoid contact with skin. **ALWAYS** wear Personal Protective Equipment (PPE) including goggles or face shield, chemical resistant gloves, boots, apron or suit as required. For personal safety refer to the cleaning agent manufacturer's Materials Safety Data Sheet and follow all recommended safe handling practices. Failure to follow all safety instructions could result in death or serious injury.

1. Remove enough panels from the unit to gain access to the coil.
2. Protect all electrical devices such as motors and controllers from any over spray.
3. Straighten any bent coil fins with a fin comb.
4. Mix the detergent with water according to the manufacturer's instructions. If desired, heat the solution to 150°F maximum to improve its cleansing capability.

**⚠ WARNING****Hazardous Pressures!**

Coils contain refrigerant under pressure. When cleaning coils, maintain coil cleaning solution temperature under 150°F to avoid excessive pressure in the coil. Failure to follow these safety precautions could result in coil bursting, which could result in death or serious injury.

Do not heat the detergent-and-water solution above 150°F. Hot liquids sprayed on the exterior of the coil will raise the coil's internal pressure and may cause it to burst. Failure to follow proper procedures can result in personal illness or injury or severe equipment damage.

5. Pour the cleaning solution into the sprayer. If a high-pressure sprayer is used:
  - a. do not allow sprayer pressure to exceed 600 psi.
  - b. the minimum nozzle spray angle is 15 degrees.
  - c. maintain a minimum clearance of 6" between the sprayer nozzle and the coil.
  - d. spray the solution perpendicular (at 90 degrees) to the coil face.
6. Spray the leaving-airflow side of the coil first; then spray the opposite side of the coil. Allow the cleaning solution to stand on the coil for five minutes.
7. Rinse both sides of the coil with cool, clean water.
8. Inspect both sides of the coil; if it still appears to be dirty, repeat Steps 6 and 7.
9. Reinstall all of the components and panels removed in Step 1 and any protective covers installed in step 2.

**Note:** For units equipped with hail guards follow reinstallation procedure listed below.

**Hail Guard Reinstallation**

To reinstall the hail guard, locate the bottom of the hail guard in the lower bracket and secure it to the upper unit bracket with the attached fasteners.

**Note:** Secure hail guard latches.

# Maintenance

## Final Process

For future reference, you may find it helpful to record the unit data requested below in the blanks provided.

Complete Model Number

\_\_\_\_\_

Unit Serial Number

\_\_\_\_\_

Wiring Diagram Numbers (from unit control panel)

\_\_\_\_\_

Schematics

\_\_\_\_\_

Connections

**Table 11. Sample maintenance log**

Date	Current Ambient Temp. F/C	Refrigerant Circuit #1						Refrigerant Circuit #2					
		Compr. Oil Level	Suct. Press. Psig/kPa	Disch. Press. Psig/kPa	Liquid Press. Psig/kPa	Super-heat F/C	Sub-cool. F/C	Compr. Oil Level	Suct. Press. Psig/kPa	Disch. Press. Psig/kPa	Liquid Press. Psig/kPa	Super-heat F/C	Sub-cool. F/C
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					

# Trouble Shooting

The RTRM has the ability to provide the service personnel with some unit diagnostics and system status information.

Before turning the main power disconnect switch “Off”, follow the steps below to check the ReliaTel Refrigeration Module (RTRM). All diagnostics & system status information stored in the RTRM will be lost when the main power is turned “Off”.

## 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.**

1. Verify that the Liteport LED on the RTRM is burning continuously. If the LED is lit, go to Step 3.
2. If the LED is not lit, verify that 24 VAC is presence between J1-1 and J1-2. If 24 VAC is present, proceed to Step 3. If 24VAC is not present, check the unit main power supply, check transformer (TNS1). Proceed to Step 3 if necessary.
3. Utilizing “Method 1” or “Method 2” in the “System Status Diagnostic” section, check the following:
  - System status
  - Heating status
  - Cooling statusIf a System failure is indicated, proceed to Step 4. If no failures are indicated, proceed to Step 5.
4. If a System failure is indicated, recheck Steps 1 and 2. If the LED is not lit in Step 1, and 24 VAC is present in Step 2, the RTRM has failed. Replace the RTRM.
5. If no failures are indicated, use one of the TEST mode procedures described in the “Unit Start-Up” section to start the unit. This procedure will allow you to check all of the RTRM outputs, and all of the external controls (relays, contactors, etc.) that the RTRM outputs energize, for each respective mode. Proceed to Step 6.
6. Step the system through all of the available modes, and verify operation of all outputs, controls, and modes. If a problem in operation is noted in any mode, you may leave the system in that mode for up to one hour while troubleshooting. Refer to the sequence of operations for each mode, to assist in verifying proper operation. Make the necessary repairs and proceed to Steps 7 and 8.
7. If no abnormal operating conditions appear in the test mode, exit the test mode by turning the power “Off” at the main power disconnect switch.
8. Refer to the individual component test procedures if other microelectronic components are suspect.

# System Status Checkout Procedure

"System Status" is checked by using one of the following two methods:

## Method 1

If the Zone Sensor Module (ZSM) is equipped with a remote panel with LED status indication, you can check the unit within the space. If the ZSM does not have LED's, use Method 2. BAYSENS110\*, BAYSENS109\*, BAYSENS119\*, & BAYSENS023A all have the remote panel indication feature. The LED descriptions are listed below.

### LED 1 (System)

"On" during normal operation.

"Off" if a system failure occurs or the LED fails.

"Flashing" indicates test mode.

### LED 2 (Heat)

"On" when the heat cycle is operating.

"Off" when the heat cycle terminates or the LED fails.

"Flashing" indicates a heating failure.

### LED 3 (Cool)

"On" when the cooling cycle is operating.

"Off" when the cooling cycle terminates or the LED fails.

"Flashing" indicates a cooling failure.

### LED 4 (Service)

"On" indicates a clogged filter.

"Off" during normal operation.

"Flashing" indicates an evaporator fan failure

Below is the complete listing of failure indication causes.

## System failure

Check the voltage between terminals 6 and 9 on J6, it should read approximately 32 VDC. If no voltage is present, a System failure has occurred. Refer to Step 4 in the previous section for the recommended troubleshooting procedure.

## Cooling Failure

1. Cooling and heating set point (slide pot) on the zone sensor has failed. Refer to the "Zone Sensor Test Procedure" section.
2. Zone temperature thermistor ZTEMP on ZTS failed. Refer to the "Zone Sensor Test Procedure" section.
3. CC1 or CC2 24 VAC control circuit has opened, check CC1 & CC2 coils, and any of the controls below that apply to the unit (HPC1, HPC2).
4. LPC1 has opened during the 3 minute minimum "on time" during 4 consecutive compressor starts, check LPC1 or LPC2 by testing voltage between the J1-8 & J3-2 terminals on the RTRM and ground. If 24 VAC is present, the LPC's has not tripped. If no voltage is present, LPC's has tripped.

### Service Failure

1. If the supply fan proving switch has closed, the unit will not operate (when connected to RTOM), check the fan motor, belts, and proving switch.
2. Clogged filter switch has closed, check the filters.

### Simultaneous Heat and Cool Failure

1. Emergency Stop is activated.

## Method 2

The second method for determining system status is done by checking voltage readings at the RTRM (J6). The system indication descriptions and the approximate voltages are listed below.

### System Failure

Measure the voltage between terminals J6-9 & J6-6.

Normal Operation = approximately 32 VDC

System Failure = less than 1 VDC, approximately 0.75 VDC

Test Mode = voltage alternates between 32 VDC & 0.75 VDC

### Heat Failure

Measure the voltage between terminals J6-7 & J6-6.

Heat Operating = approximately 32 VDC

Heat Off = less than 1 VDC, approximately 0.75 VDC

Heating Failure = voltage alternates between 32 VDC & 0.75 VDC

### Cool Failure

Measure the voltage between terminals J6-8 & J6-6.

Cool Operating = approximately 32 VDC

Cool Off = less than 1 VDC, approximately 0.75 VDC

Cooling Failure = voltage alternates between 32 VDC & 0.75 VDC

### Service Failure

Measure the voltage between terminals J6-10 & J6-6.

Clogged Filter = Approximately 32 VDC.

Normal = Less than 1 VDC, approximately 0.75 VDC Fan Failure = voltage alternates between 32 VDC & 0.75 VDC.

To use LED's for quick status information at the unit, purchase a BAYSENS110\* ZSM and connect wires with alligator clamps to terminals 6 through 10. Connected each respective terminal wire (6 through 10) from the Zone Sensor to the unit J6 terminals 6 through 10.

**Note:** If the system is equipped with a programmable zone sensor, BAYSENS119\* the LED indicators will not function while the BAYSENS110\* is connected.

## Resetting Cooling and Heating Lockouts

Cooling Failures and Heating Lockouts are reset in an identical manner. Method 1 explains resetting the system from the space; Method 2 explains resetting the system at the unit.

**Note:** Before resetting Cooling Failures and Heating Lockouts check the Failure Status Diagnostics by the methods previously explained. Diagnostics will be lost when the power to the unit is disconnected.

### Method 1

To reset the system from the space, turn the "Mode" selection switch at the zone sensor to the "Off" position. After approximately 30 seconds, turn the "Mode" selection switch to the desired mode, i.e. Heat, Cool or Auto.

### Method 2

To reset the system at the unit, cycle the unit power by turning the disconnect switch "Off" and then "On".

Lockouts can be cleared through the building management system. Refer to the building management system instructions for more information.

### Zone Temperature Sensor (ZTS) Service Indicator

The ZSM SERVICE LED is a generic indicator, that will signal the closing of a Normally Open switch at any time, providing the Indoor Motor (IDM) is operating. This indicator is usually used to indicate a clogged filter, or an air side fan failure.

The RTRM will ignore the closing of this Normally Open switch for 2 ( $\pm 1$ ) minutes. This helps prevent nuisance SERVICE LED indications. The exception is the LED will flash 40 seconds after the fan is turned "On" if the Fan Proving Switch is not made.

### Clogged Filter Switch

This LED will remain lit the entire time that the Normally Open switch is closed. The LED will be turned off immediately after resetting the switch (to the Normally Open position), or any time that the IDM is turned "Off".

If the switch remains closed, and the IDM is turned "On", the SERVICE LED will be turned "On" again after the 2 ( $\pm 1$ ) minute ignore delay.

This LED being turned "On", will have no other affect on unit operation. It is an indicator only.

### Fan Failure Switch

When the "Fan Failure" switch is wired to the RTOM, the LED will remain flashing the entire time the fan proving switch is closed, indicating a fan failure, and it will shut the unit operations down.

## Zone Temperature Sensor (ZTS) Test

**Note:** These procedures are not for programmable or digital models and are conducted with the Zone Sensor Module electrically removed from the system.

### Test 1 Zone Temperature Thermistor (ZTEMP)

This component is tested by measuring the resistance between terminals 1 and 2 on the Zone Temperature Sensor. Below are some typical indoor temperatures, and corresponding resistive values.

## Test 2 Cooling Set Point (CSP) and Heating Set Point (HSP)

**Table 12. Cooling (CSP) and heating setpoint (HSP)**

Zone Temperature		Nominal ZTEMP Resistance	Nominal CSP or HSP Resistance
50 F°	10.0 C°	19.9 K-Ohms	889 Ohms
55 F°	12.8 C°	17.47 K-Ohms	812 Ohms
60 F°	15.6 C°	15.3 K-Ohms	695 Ohms
65 F°	18.3 C°	13.49 K-Ohms	597 Ohms
70 F°	21.1 C°	11.9 K-Ohms	500 Ohms
75 F°	23.9 C°	10.50 K-Ohms	403 Ohms
80 F°	26.7 C°	9.3 K-Ohms	305 Ohms
85 F°	29.4 C°	8.25 K-Ohms	208 Ohms
90 F°	32.2 C°	7.3 K-Ohms	110 Ohms

The resistance of these potentiometers are measured between the following ZSM terminals. Refer to the chart above for approximate resistances at the given setpoints.

Cool SP = Terminals 2 and 3

Range = 100 to 900 Ohms approximate

Heat SP = Terminals 2 and 5

Range = 100 to 900 Ohms approximate

## Test 3 System Mode and Fan Selection

The combined resistance of the Mode selection switch and the Fan selection switch can be measured between terminals 2 and 4 on the Zone Sensor. The possible switch combinations are listed below with their corresponding resistance values.

## Test 4 LED Indicator Test, (SYS ON, HEAT, COOL & SERVICE)

### Method 1

Testing the LED using a meter with diode test function. Test both forward and reverse bias. Forward bias should measure a voltage drop of 1.5 to 2.5 volts, depending on your meter. Reverse bias will show an Over Load, or open circuit indication if LED is functional.

### Method 2

Testing the LED with an analog Ohmmeter. Connect Ohmmeter across LED in one direction, then reverse the leads for the opposite direction. The LED should have at least 100 times more resistance in reverse direction, as compared with the forward direction. If high resistance in both directions, LED is open. If low in both directions, LED is shorted.

### Method 3

To test LED's with ZSM connected to unit, test voltages at LED terminals on ZSM. A measurement of 32 VDC, across an unlit LED, means the LED has failed.

**Note:** Measurements should be made from LED common (ZSM terminal 6 to respective LED terminal). Refer to the Zone Sensor Module (ZSM) Terminal Identification table at the beginning of this section.

## Programmable & Digital Zone Sensor Test

### Testing serial communication voltage

1. Verify 24 VAC is present between terminals J6-14 & J6-11.
2. Disconnect wires from J6-11 and J6-12. Measure the voltage between J6-11 and J6-12, should be about 32 VDC.

## Trouble Shooting

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3. Reconnect wires to terminals J6-11 and J6-12. Measure voltage again between J6-11 and J6-12, voltage should flash high and low every 0.5 seconds. The voltage on the low end will measure about 19VDC, while the voltage on the high end will measure from approximately 24 to 38VDC.
4. Verify all modes of operation, by running the unit through all of the steps in the "Test Modes" section discussed in "Unit Start-Up".
5. After verifying proper unit operation, exit the test mode. Turn the fan on continuously at the ZSM, by pressing the button with the fan symbol. If the fan comes on and runs continuously, the ZSM is good. If you are not able to turn the fan on, the ZSM is defective.

### ReliaTel Refrigeration Module (RTRM) Default Chart

If the RTCI loses input from the building management system, the RTRM will control in the default mode after approximately 15 minutes. If the RTRM loses the Heating and Cooling setpoint input, the RTRM will control in the default mode instantaneously. The temperature sensing thermistor in the Zone Sensor Module is the only component required for the "Default Mode" to operate.

### Unit Operation without a Zone Sensor

This procedure is for temporary operation only. The economizer and condenser fan cycling functions are disabled.

1. Open and Lock the unit disconnect switch.
2. Remove the Outside Air Sensor (OAS) from the condenser section of unit.
3. Use two (2) wire nuts, to individually cap the wires.
4. Locate the RTRM (J6). Connect two (2) wires to terminals J6-1 and 2.
5. Connect the sensor (OAS) using two wire nuts to the two (2) field supplied wires that were connected to terminals 1 and 2 on J6.

## Unit Economizer Control (ECA) Troubleshooting ReliaTel Control

Verify Economizer Status by Economizer Actuator (ECA) LED indicator:

OFF: No Power or Failure

ON: Normal, OK to Economize

Slow Flash: Normal, Not OK to Economize

Fast Flash - 1/2 Second On / 2 Seconds Off:

Error Code:

Communications Failure

Pulse Flash: 2 Seconds On / 1/2 Second Off:

Error Code:

1 Flash: Actuator Fault

2 Flashes: CO2 Sensor

3 Flashes: RA Humidity Sensor

4 Flashes: RA Temp Sensor

5 Flashes: OA Quality Sensor

6 Flashes: OA Humidity Sensor

7 Flashes: OA Temp Sensor

8 Flashes: MATemp Sensor

9 Flashes: RAM Fault

10 Flashes: ROM Fault

11 Flashes: EEPROM F

## Troubleshooting procedures for Direct Drive Plenum Fan

Prior to troubleshooting, verify all wiring and wiring connections. The motor has internal protections that will shut down the motor before damage occurs. A power cycle is required to reset some of the internal protections. Before proceeding, power down unit for 1 minute and then power on.

Please follow steps sequentially unless directed differently in solution.

**Table 13. Troubleshooting for Direct Drive Plenum Fan**

Step	Symptom or Test	Probable Cause and Solution
1	Obstruction blocking operation of evaporator fan.	If obstruction is present, remove power from unit and remove obstruction. Check fan wheel for damage. Remove wheel/motor assembly if damaged.
2	Check line to line voltage at pin 1, 2, and 3 of PPF-IDFP.	Voltage should be same as line to line voltage input to unit. If voltage is same go to step 4. If not, go to step 3.
3	Verify continuity across fuse FU31, FU32, and FU33.	Replace fuse if continuity is not present.
4	Measure DC voltage across pin Vt and com on MMC.	Voltage should be greater than 1.0 VDC. If voltage is greater the 1.0, go to step 8. If not, turn knob on MMC counter-clock wise 1 turn and check voltage again. If no change in voltage, go to step 5
5	Check for 24VAC across pins A and B on F relay.	If voltage is not present, verify thermostat wiring. Go to step 4. If voltage is present, go to step 6.
6	Check for 10VDC across pin 9 on F relay an pin 8 of PPM-IDFC.	If voltage is not present, check wiring to F relay. Correct wiring if needed. Go to step 4. If wiring is correct, replace relay.
7	Measure DC voltage across pin Vt and com on MMC.	Voltage should be greater than 1.0 VDC. If voltage not present, replace MMC.
8	Verify VDC is same across Vt and com on MMC and pin 1 and pin 8 on PPM-IDFC.	If voltage is not same, check for correct wiring. If voltage is the same go to step 9.
9	Verify correct wiring connections at KL3 in the motor.	If wiring is correct, replace motor.

# Wiring Diagrams

**Note:** For easier access, published unit wiring diagrams (individual, separate diagrams for unitary product lines) are via e-Library. For diagrams prior to 2008 please refer to wiring diagram book W\_C-SVE001B-EN for heat pump units.

Drawing number	Description
4366-1008	Power Schematic - 230v/60hz/1ph 2 - 5 Ton Heat Pump / Standard Drive Motor
4366-1021	Power Schematic - 230v/60hz/3ph 2 - 5 Ton Heat Pump / Direct Drive
4366-1014	Power Schematic - 230v/60hz/3ph 2 - 7.5 Ton Heat Pump / Belt Drive Motor
4366-1036	Power Schematic - 230v/60hz/3ph 10 Ton Heat Pump / Belt Drive Motor
4366-1024	Power Schematic - 2 - 5 Ton Heat Pump / Standard Drive Motor
4366-1010	Power Schematic - 460-575v/60hz/3ph 2 - 7.5 Ton Heat Pump / Belt Drive Motor
4366-1035	Power Schematic - 460-575v/60hz/3ph 10 Ton Heat Pump / Belt Drive Motor
4366-1510	Connection Diagram - 230v/60hz/1ph 2 - 5 Ton Heat Pump
4366-1511	Connection Diagram - 208-230,460,575v/60hz/3ph 2 - 5 Ton Heat Pump / Direct Drive
4366-1512	Connection Diagram - 208-230,460,575v/60hz/3ph 2 - 5 Ton Heat Pump / Belt Drive
4366-1542	Connection Diagram - 208-230,460,575v/60hz/3ph 6 - 7.5 Ton Heat Pump / Belt Drive
4366-1535	Connection Diagram - 208-230,460,575v/60hz/3ph 10 Ton Heat Pump / Belt Drive
4366-1007	Control Schematic - 2 - 7.5 Ton Heat Pump
4366-1043	Control Schematic - 10 Ton Heat Pump
4366-1099	Novar Schematic - 2024
4366-1047	Novar Schematic - 3051
4366-1031	Through The Base Utilities Schematic
4366-1048	CO2 / Ventilation Override Schematics
4366-1091	5.0 KW - 208-240v/60hz/1ph BAYHTRR105A
4366-1092	10.0 KW - 208-240v/60hz/1ph BAYHTRR110A
4366-1093	13.8 KW - 208-240v/60hz/1ph BAYHTRR114A
4366-1098	17.6 KW - 208-240v/60hz/1ph BAYHTRR118A
4366-1096	6.0 KW - 208-600v/60hz/3ph BAYHTRR306A, BAYHTRR406A, BAYHTRRW06A
4366-1084	9.0 & 18.0 KW - 208-240v/60hz/3ph BAYHTRS309A, BAYHTRS318A
4366-1094	12.0 & 17.4 KW - 208-240v/60hz/3ph BAYHTRR312A, BAYHTRR318A
4366-1095	23.0 KW - 208-240v/60hz/3ph BAYHTRR323A
4366-1089	27.0 & 36.0 KW - 208-240v/60hz/3ph BAYHTRS327A, BAYHTRS336A
4366-1086	54.0 KW - 208-240v/60hz/3ph BAYHTRT354A
4366-1097	9.0 & 18 KW - 480-600v/60hz/3ph BAYHTRS409A, BAYHTRSW09A, BAYHTRS418A, BAYHTRT418A, BAYHTRSW18A, BAYHTRTW18A
4366-1087	12.0, 17.4 & 23.0 KW - 480-600v/60hz/3ph BAYHTRR412A, BAYHTRR418A, BAYHTRR423A, BAYHTRRW12A, BAYHTRRW18A, BAYHTRRW23A
4366-1089	27.0 & 36.0 KW - 480-600v/60hz/3ph BAYHTRS427A, BAYHTRT427A, BAYHTRSW27A, BAYHTRTW27A, BAYHTRS436A, BAYHTRT436A, BAYHTRSW36A, BAYHTRTW36A
4366-1090	54.0 KW - 480-600v/60hz/3ph BAYHTRT454A, BAYHTRTW54A
4366-7427	Power and Controls Diagram - 230-460v/60Hz/3Ph - 10 Ton Heat Pump/ R410A
4366-7428	Power and Controls Diagram - 575v/60Hz/3Ph - 10 Ton Heat Pump/ R410A
4366-7446	Connection Diagram - 230-460v/60Hz/3Ph - 10 Ton Heat Pump/ R410A
4366-7447	Connection Diagram - 575v/60Hz/3Ph - 10 Ton Heat Pump/ R410A

# Limited Warranty

## Heat Pump WCC, WCD, WCH, WCM and WSC (Parts Only)

### Models Less Than 20 Tons for Residential Use\*

This limited warranty is extended by Trane Inc., to the original purchaser and to any succeeding owner of the real property to which the Heat Pump is originally affixed, and applies to products purchased and retained for use within the U.S.A. and Canada.

If any part of your Heat Pump fails because of a manufacturing defect within five years from the date of the original purchase, Warrantor will furnish without charge the required replacement part. Any local transportation, related service labor, diagnosis calls, refrigerant and related items are not included.

If the sealed motor-compressor fails because of a manufacturing defect within five years from the date of original purchase, Warrantor will furnish without charge the required replacement compressor. Any local transportation, related service labor, diagnosis calls, refrigerant and related items are not included.

This limited warranty does not cover failure of your Heat Pump if it is damaged while in your possession, failure attributable or caused by unreasonable use of the Heat Pump and/or failure to properly maintain the Heat Pump as set forth in the Use and Care manual.

This limited warranty applies to product installed on or after 10/1/2001 where product is manufactured after 1/1/2000. This limited warranty is not retroactive to any installations prior to 10/1/2001 or on product produced prior to 2000.

THE LIMITED WARRANTY AND LIABILITY SET FORTH HEREIN ARE IN LIEU OF ALL OTHER WARRANTIES AND LIABILITIES, WHETHER IN CONTRACT OR IN NEGLIGENCE, EXPRESS OR IMPLIED, IN LAW OR IN FACT, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR USE, AND IN NO EVENT SHALL WARRANTOR BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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

This limited warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Parts will be provided by our factory organization through an authorized service organization in your area listed in the yellow pages. If you wish further help or information concerning this limited warranty, contact:

Trane  
2701 Wilma Rudolph Blvd.  
Clarksville, TN 37040-1008  
Attention: Manager, Product Service  
GW-611-4001

\*This limited warranty is for residential usage of this equipment and not applicable when this equipment is used for a commercial application. A commercial use is any application where the end purchaser uses the product for other than personal, family or household purposes.

## Heat Pump WCZ, WCY, WCX, WCC, WCD, WCH, WCM, WCP and WSC (Parts Only)

### Models Less Than 20 Tons for Commercial Use\*

This warranty is extended by Trane Inc., to the original purchaser and to any succeeding owner of the real property to which the Heat Pump is originally affixed, and applies to products purchased and retained for use within the U.S.A. and Canada. There is no warranty against corrosion, erosion or deterioration.

If any part of your Heat Pump fails because of a manufacturing defect within one year from the date of the original purchase, Warrantor will furnish without charge the required replacement part.

In addition, if the sealed motor-compressor fails because of a manufacturing defect within the second through fifth year from the date of original purchase, Warrantor will furnish without charge the required replacement compressor. Warrantor's obligations and liabilities under this warranty are limited to furnishing F.O.B. Warrantor factory or warehouse replacement parts for Warrantor's products covered under this warranty. Warrantor shall not be obligated to pay for the cost of lost refrigerant. No liability shall attach to Warrantor until products have been paid for and then liability shall be limited solely to the purchase price of the equipment under warranty shown to be defective.

THE WARRANTY AND LIABILITY SET FORTH HEREIN ARE IN LIEU OF ALL OTHER WARRANTIES AND LIABILITIES, WHETHER IN CONTRACT OR IN NEGLIGENCE, EXPRESS OR IMPLIED, IN LAW OR IN FACT, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR USE, AND IN NO EVENT SHALL WARRANTOR BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

Some states do not allow limitations on how long an implied warranty lasts or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Trane

2701 Wilma Rudolph Blvd.

Clarksville, TN 37040-1008

Attention: Manager, Product Service

GW-604-4800

\*This warranty is for commercial usage of said equipment and not applicable when the equipment is used for a residential application. Commercial use is any application where the end purchaser uses the product for other than personal, family or household purposes.

The manufacturer optimizes the performance of homes and buildings around the world. A business of Ingersoll Rand, the leader in creating and sustaining safe, comfortable and energy efficient environments, the manufacturer offers a broad portfolio of advanced controls and HVAC systems, comprehensive building services, and parts. For more information, visit [www.IRICO.com](http://www.IRICO.com).

The manufacturer has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.