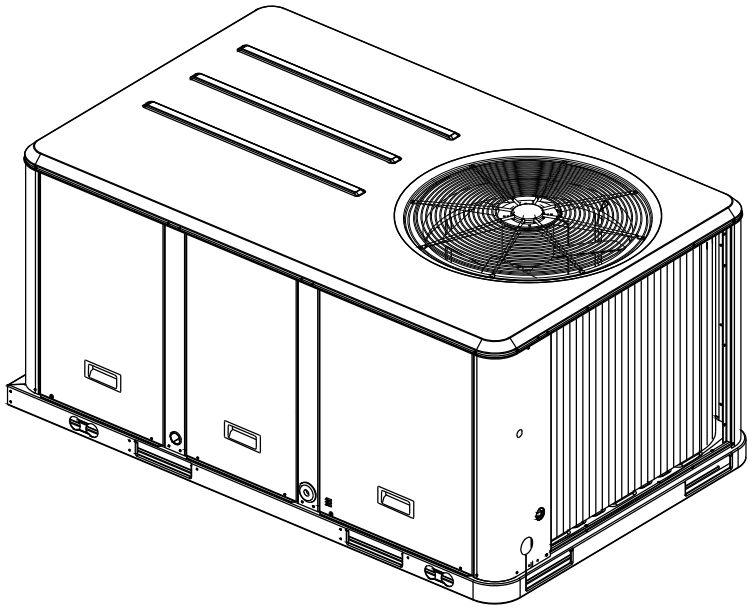
Installation, Operation, and Maintenance

Packaged Rooftop Air Conditioners Precedent™ with eFlex™ Technology, Electric/Electric

3 to 10 Tons - 60 Hz



Model Numbers:	TZC036E	TZC072F
Model Numbers:	TZC048F	TZC090F
Model Numbers:	TZC060E	TZC102F
Model Numbers:		TZC120F

⚠ 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.

April 2020 **RT-SVX45F-EN**

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

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

The three types of advisories are defined as follows:

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

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

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

Important Environmental Concerns

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

Important Responsible Refrigerant Practices

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

⚠WARNING

Proper Field Wiring and Grounding Required!

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

⚠WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

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

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Trademarks

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Revision History

- Update includes addition of 6 to 10 ton eFlex™ models

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Model Number Descriptions

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T DX Cooling
Y DX Cooling, Gas Heat

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Z Ultra High Efficiency

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C Convertible

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036 3 Ton
048 4 Ton
060 5 Ton
072 6 Ton
090 7.5Ton
102 8.5 Ton
120 10 Ton

Digit 7 - Major Design Sequence

E R-410A Refrigerant
F Microchannel Type Condenser Coils with R-410A Refrigerant[11]

Digit 8 - Voltage Selection

3 208-230/60/3
4 460/60/3
W 575/60/3

Digit 9 - Unit Controls

R ReliaTel™ Microprocessor

Digit 10 - Heating Capacity

Note: *Applicable to Digit 1, T models only*

0 No Electric Heat
B 6 kW (3 phase)
C 9 kW (3 phase)
E 12 kW (3 phase)
G 18 kW (1&3 phase)
J 23 kW (3 phase)
K 27 kW (3 phase)
N 36 kW (3 phase)
P 54 kW (33 phase)

Note: *Applicable to Digit 1, Y models only*

L Low Heat
M Medium Heat
H High Heat
X Low Heat, Stainless Steel Heat Exchanger
Y Medium Heat, Stainless Steel Heat Exchanger
Z High Heat, Stainless Steel Heat Exchanger
V Modulating Gas Heat

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** Factory Assigned

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G Economizer, Comparative Enthalpy 0-100% without Barometric Relief[2]
H Economizer, Comparative Enthalpy 0-100% with Barometric Relief[2]
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M Low Leak Economizer with Reference Enthalpy with Barometric Relief
P Low Leak Economizer with Comparative Enthalpy with Barometric Relief

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6 Single Zone VAV[10]
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B Through-the-Base Gas Piping[7]
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D Plenum Smoke Detector

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2 Fan Failure Switch
4 Clogged Filter Switch and Fan Failure Switch
A Condensate Drain Pan Overflow Switch
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C Fan Failure Switch and Condensate Drain Pan Overflow Switch
E Clogged Filter Switch, Fan Failure Switch and Condensate Drain Pan Overflow Switch

Digit 26 - System Monitoring Controls

0 No Monitoring Controls
A Demand Control Ventilation (CO_2)[9,13]
B Low Leak Economizer with FDD (Fault Detection & Diagnostics)
C FDD (Fault Detection & Diagnostics) with DCV (Demand Control Ventilation)

Digit 27 - Unit Hardware Enhancements

0 No Enhancements
1 Stainless Steel Drain Pan

Digit 31 - Advanced Unit Controls

0 Standard Unit Controls
1 Human Interface

Model Number Notes

1. Standard on all eFlex™ and eDrive™ units.
2. 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.
3. Through the base electric required when ordering disconnect/circuit breaker options.
4. Requires use of Disconnect or Circuit Breaker.
5. Standard metering devices are TXVs.
6. 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.
7. Includes gas piping and shutoff (field assembly required).
8. Not available with high temperature duct sensor accessory.
9. Demand Control Ventilation Option includes wiring only. The CO_2 sensor is a field-installed only option.
10. Discharge Air Temperature Sensor is also standard equipment on units with Single Zone.
11. Standard on T/YZC 4 ton models.
12. Epoxy coil and epoxy with hail guard option not available for units with microchannel condenser coil.
13. Requires selection of 2″ pleated filters (option B or C) for Digit 16.
14. Discharge Air Sensing Tube is standard.
15. Field installed only.
16. Must be used with BACnet® open protocol.

General Information

Unit Inspection

As soon as the unit arrives at the job site

- Verify that the nameplate data matches the data on the sales order and bill of lading (including electrical data).
- Verify that the power supply complies with the unitRT-SVX45F-EN nameplate specifications.
- Visually inspect the exterior of the unit, including the roof, for signs of shipping damage.

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

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

Storage

Take precautions to prevent condensate from forming inside the unit's electrical compartments and motors if:

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

Note: *Do not use the unit's heater for temporary heat without first completing the startup procedure detailed in the Unit Startup chapter.*

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

Unit Nameplate

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

Compressor Nameplate

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

Variable speed compressors are not marked with a RLA. This value is derived from testing.

Microchannel Condenser Barcode ID

Barcode decal used for condenser coil part identification can be located on the vertical header and top of coil's inlet/outlet side.

Unit Description

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

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

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

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

These modules through Proportional/Integral control algorithms perform specific unit functions that 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 are achieved by starting and stopping the compressors.

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

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.

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.

Compressor/Inverter Protection

The ReliaTel™ control receives input from the inverter drive for any errors encountered by the drive (refer to RT-SVD05*-EN and RT-SVD007*-EN for VF-S15 inverter error code details). If an error is encountered before the compressor has run for 3 minutes, ReliaTel begins counting errors. The drive will automatically reset when the error condition clears and ReliaTel will try to start the compressor again, if a call for cooling remains and 3 minutes have passed since the compressor last ran.

If ReliaTel counts 4 such errors within 30 minutes, the system will go to manual lock out mode. Refer to RT-SVD05*-EN (for VF-S15 inverters, refer to RT-SVD007*-EN) for potential causes.

Condensate Drain Pan Overflow Switch (Optional) - ReliaTel™

This input incorporates the Condensate Overflow Switch (COF) mounted on the drain pan and the ReliaTel™ Options Module (RTOM). When the condensate level reaches the trip point for 6 continuous seconds, the RTOM will shut down all unit functions until the overflow condition has cleared. The unit will return to normal operation after 6 continuous seconds with the COF in a non-tripped condition. If the condensate level causes unit shutdown more than 2 times in a 3 days period, the unit will be locked-out of operation requiring manual reset of diagnostic system through Zone Sensor or Building Automation System (BAS). Cycling unit power will also clear the fault.

Discharge Line Temp Switch (DLTS)

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

Duct Mounted Relative Humidity Sensor (BAYSENS037*)

Field installed, duct mounted humidity sensor is used to control activation of Enhanced Dehumidification and the hot gas reheat dehumidification options. Humidity set points can be selected for relative humidity levels between 40% and 60% by adjusting the DEHUMID setting on the ReliaTel™ Options Module. See Figure 54, p. 32.

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, CO_2 setpoint, CO_2, 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.

Evaporator Frost Control (Standard)

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

If this circuit is closed before the compressor is started, the compressor will not be allowed to operate. Anytime this circuit is closed 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 open.

Frostat™ is standard on single zone VAV products (SZVAV).

High Pressure Control - ReliaTel™

The high pressure controls are wired in series between the compressor outputs on the VSM and the compressor contactor coils (3 to 5 ton eFlex™) or compressor drive (7.5 to 10 ton eFlex™). If the high pressure control switch opens, the VSM 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.

High Temperature Sensor (BAYFRST001*)

This sensor connects to the RTRM Emergency Stop Input on the LTB and provides high limit "shutdown" of the unit. The sensor is used to detect high temperatures due to a

high thermal event in the air conditioning or ventilation ducts. The sensor is designed to mount directly to the sheet metal duct. Each kit contains two sensors. The return air duct sensor (X1310004001) is set to open at 135°F. The supply air duct sensor (X1310004002) is set to open at 240°F. The control can be reset after the temperature has been lowered approximately 25°F below the cutout setpoint.

Human Interface - 5 Inch Color Touchscreen (Optional)

Note: *For more information, see RT-SVX49*-EN.*

The 5 inch color touchscreen human interface provides an intuitive user interface to the rooftop unit that speeds up unit commissioning, shortens unit troubleshooting times, and enhances preventative maintenance measures.The human interface includes several features including:

- Data trending capabilities by means of time series graphs
- Historical alarm messages
- Real-time sensor measurements
- On board system setpoints
- USB port that enables the downloading of component runtime information as well as trended historical sensor data
- Customized reports

Low Pressure Control - ReliaTel™

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.

Multiple-Zone VAV Control

Multiple-zone VAV (MZVAV) control shall vary the speed of the indoor fan to maintain the duct static pressure at a setpoint. In cooling mode, the compressors shall be cycled (or economizer modulated) to maintain the supply air temperature (SAT) at the desired setpoint. In heating mode, the indoor fan shall operate at maximum speed whenever the heater is operating.

Phase Monitor

Note: *Not available on T/YZC072-120.*

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.

Power Exhaust Control (Optional) - ReliaTel™

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

With the optional ventilation override accessory, the power exhaust fan is independent of the indoor fan.

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

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 ° F. The heating set point ranges between 43 and 96°F.

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

The option menu is used to enable or disable applicable functions, 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.

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.

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 (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 (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.

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.

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.

RTOM - ReliaTel™ Options Module (Standard)

The RTOM monitors the supply fan proving, clogged filter, supply air temperature, exhaust fan setpoint, supply air tempering, Frostat™, smoke detector, and Variable Speed Fan Control (17 Plus units only). Refer to system input devices and functions for operation.

Single Zone Variable Air Volume (Standard), Displacement Ventilation (Optional)

This sensor offers full supply fan modulation across the available airflow range. In addition to full supply fan modulation, the unit controls the discharge air temperature to a varying discharge air temperature setpoint in order to maintain space temperature.

Smoke Detector Sensor (Optional)

This sensor provides high limit "shutdown" of the unit and requires a manual reset. The sensor is used to detect smoke in the air conditioning or ventilation ducts.

Notes:

- *Consult smoke detector manufacturer if daisy chaining is required.*
- *The supply air smoke detector samples supply air. The return and plenum air smoke detectors sample return air. The smoke detectors are designed to shut off the unit if smoke is sensed. 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 its design function.*
- *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.*

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 in accordance with manufacturers recommended airflow limits.

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.

Supply Fan Failure Input (Optional)

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

FFS (Fan Failure Switch) If air flow through the unit is not proven by the differential pressure switch connected to the RTOM (factory 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.

System Input Devices & Functions

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

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

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

Wall Mounted Relative Humidity Sensor (BAYSENS036*)

Field installed, wall mounted humidity sensor is used to control activation of Enhanced Dehumidification and the Hot Gas Reheat Dehumidification options. Humidity set points can be selected for relative humidity levels between 40% and 60% by adjusting the DEHUMID setting on the ReliaTel™ Options Module. See Figure 54, p. 32.

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.

Zone Sensor Module (ZSM) (BAYSENS106*)

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

Zone Sensor Module (ZSM) (BAYSENS108*)

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

Zone Sensor (BAYSENS110*)

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

Pre-Installation

⚠WARNING

Fiberglass Wool!

Exposition 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. 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, a NIOSH approved dust/mist respirator, long sleeves and pants when working with products containing fiberglass wool.

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.

⚠WARNING

Hazardous Voltage!

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

Remove power to the unit and gain access to the electric heat elements by removing the horizontal supply cover. Visually inspect the heater elements for the following:

1. Elements that are no longer secured to the white ceramic insulator.
2. Elements touching each other or touching metal.
3. Severely kinked, drooping, or broken elements.

If an element has detached from its ceramic insulator, carefully put it back into place.

Replace the heater elements if they present symptoms noted in item Step 2 or Step 3 above.

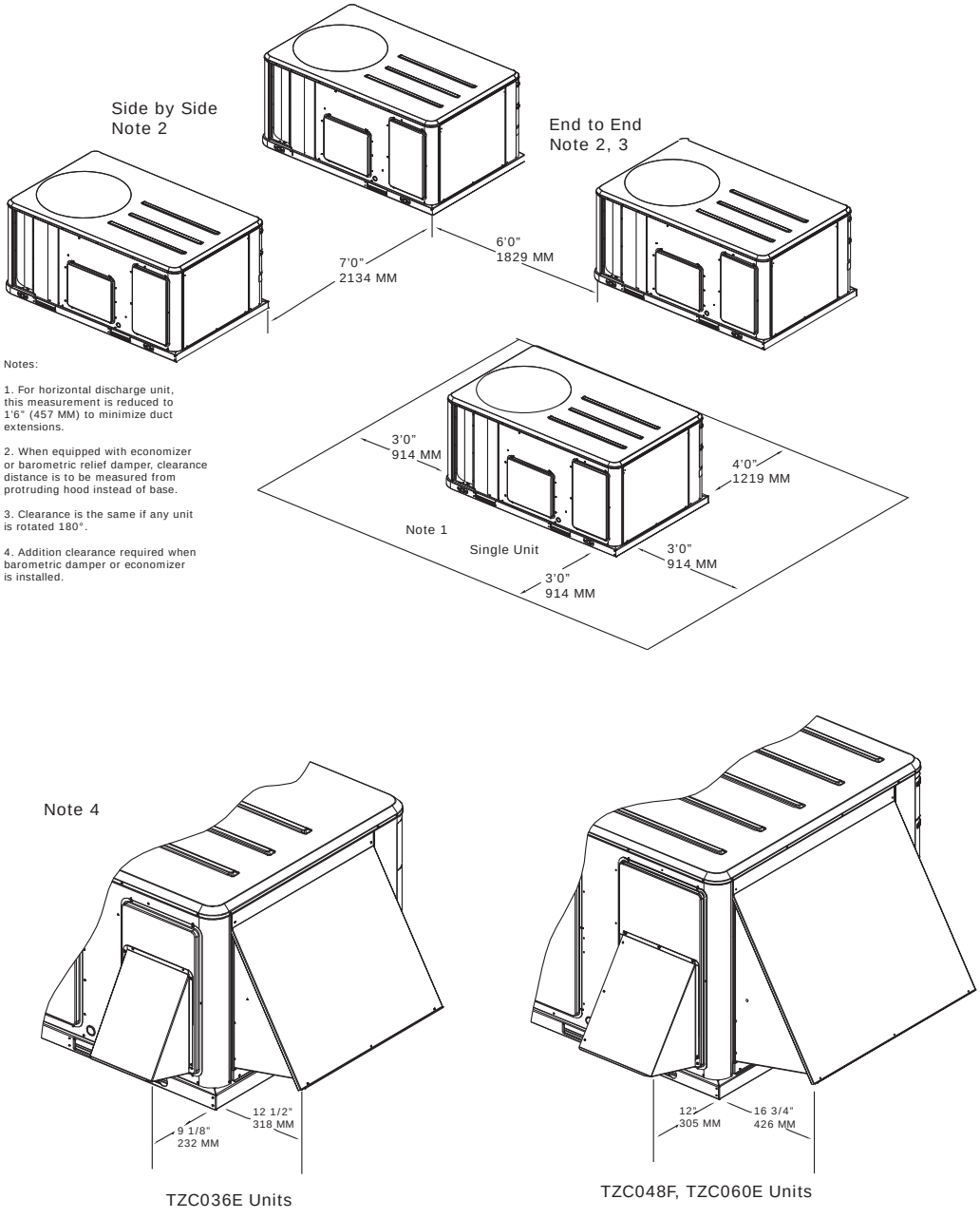
Dimensions and Weights

Unit Clearances

Figure 1, p. 14 illustrates the minimum operating and service clearances for either a single or multiple unit installation. These clearances are the minimum distances necessary to assure adequate serviceability, cataloged unit capacity, and peak operating efficiency.

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

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

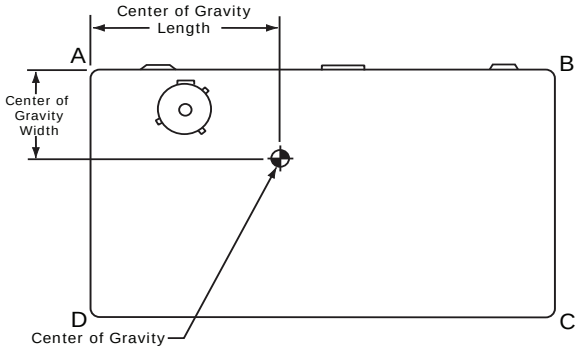


⚠WARNING

Heavy Objects!

Failure to follow instructions below or properly lift unit could result in unit dropping and possibly crushing operator/technician which could result in death or serious injury, and equipment or property-only damage. 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.

Figure 2. Corner weights



⚠WARNING

Improper Unit Lift!

Failure to properly lift unit could result in unit dropping and possibly crushing operator/technician which could result in death or serious injury, and equipment or property-only damage. 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.

Table 1. Maximum base unit & corner weights (lbs) and center of gravity dimensions (in.) - cooling models

Tons	Unit Model No.	Maximum Base Model Weights[a]		Corner Weights[b]				Center of Gravity (in.)	
		Shipping	Net	A	B	C	D	Length	Width
3	TZC036E	628	553	133	183	61	176	32	18
4	TZC048F	777	682	176	238	112	156	39	22
5	TZC060E	873	778	181	274	102	221	39	22
6	TZC072F	893	795	300	165	242	88	65	22
7.5	TZC090F	908	810	223	186	235	166	52	26
8.5	TZC102F	908	810	223	186	235	166	52	26
10	TZC120F	1302	1108	316	299	275	218	56	28

(a) Weight are approximate for 1st 10 digit model number.
(b) Corner weights are given for information only.

Figure 3. Rigging and center of gravity

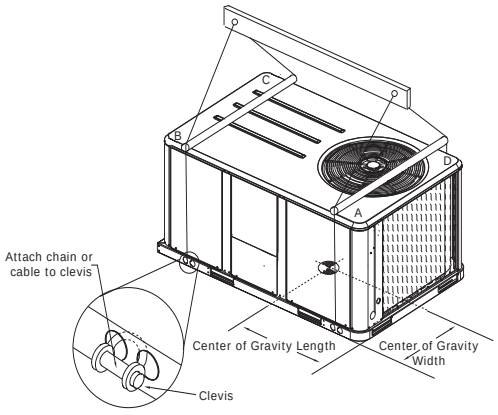
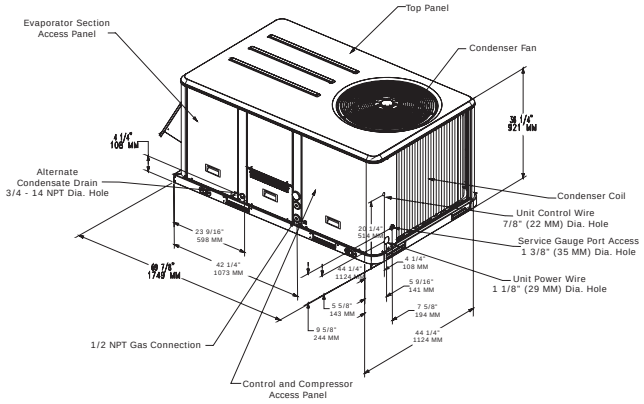


Table 2. Factory installed options (fiops)/accessory net weights (lbs)[a],[b]

Accessory	T/YZC036E Net Weight 3 Tons	T/YZC048F-060E Net Weight 4 to 5 Tons	T/YZC072F Net Weight 6 Tons	T/YZC090-102F Net Weight 7.5 to 8.5 Tons	T/YZC120F Net Weight 10 Tons
Barometric Relief	7	10	10	10	10
Coil Guards	12	20	20	20	30
Economizer	26	36	36	36	36
Electric Heaters[c]	15	30	30	44	50
Hinged Doors	10	12	12	12	12
Low Leak Economizer	68	93	93	93	93
Powered Convenience Outlet[d]	38	38	38	38	50
Powered Exhaust	40	40	80	80	80
Roof Curb	61	78	78	78	89
Smoke Detector, Supply	5	5	5	5	5
Smoke Detector, Return	7	7	7	7	7
Stainless Steel Heat Exchanger[e]	4	6	6	6	6
Through-the-Base Electrical	8	13	13	13	13
Through-the-Base Gas	5	5	5	5	5
Unit Mounted Circuit Breaker	5	5	5	5	5
Unit Mounted Disconnect	5	5	5	5	5

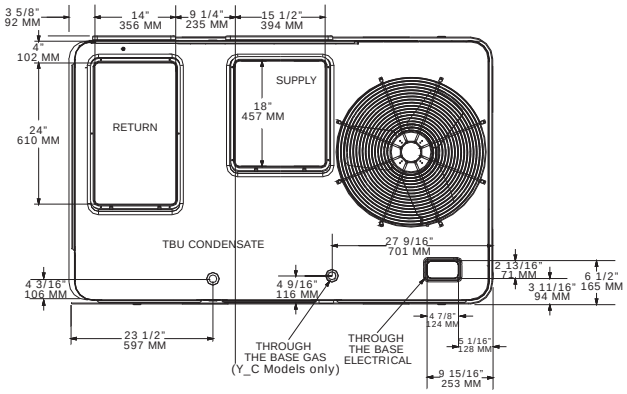
(a) Weights for options not listed are <5 lbs.
(b) Net weight should be added to unit weight when ordering factory-installed accessories.
(c) Applicable to cooling units only.
(d) Applicable for 208-230V 3-10 Ton units and 460V 6-10 Ton units only.
(e) Applicable to gas/electric units only.

Figure 4. Cooling and gas/electric - 3 tons ultra high efficiency[a],[b]



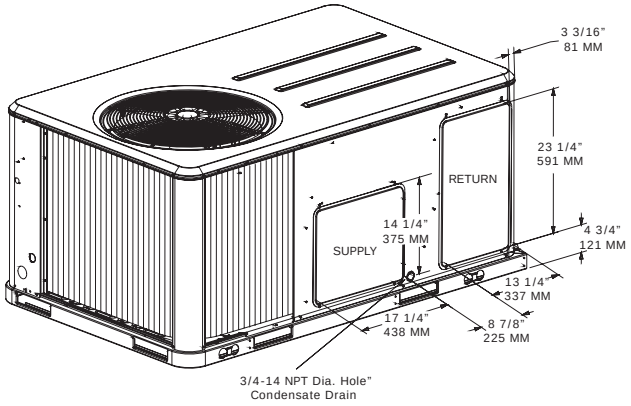
(a) All dimensions are in inches/millimeters.
(b) ½ NPT Gas Connection = (Y_C Models only); 2" Electrical Connection: Single Point Power When Heat Installed (T_C Models only.)

Figure 5. Cooling and gas/electric - 3 tons - downflow airflow supply/return - through-the-base utilities[a]



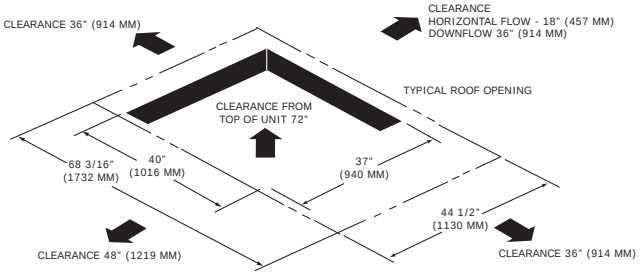
(a) All dimensions are in inches/millimeters.

Figure 6. Cooling and gas/electric - 3 tons - horizontal airflow supply/return[a]



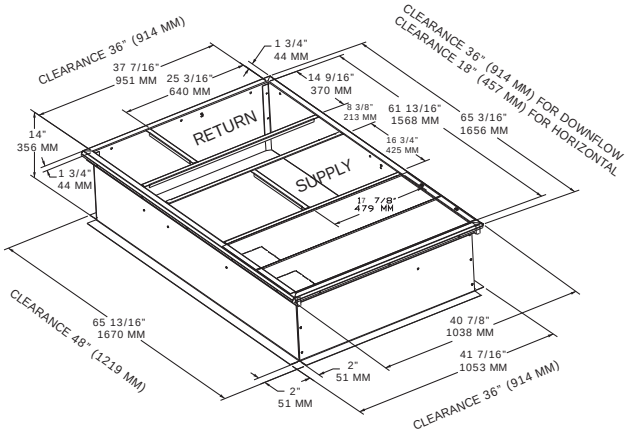
(a) All dimensions are in inches/millimeters.

Figure 7. Cooling and gas/electric - 3 tons ultra high efficiency - unit clearance and roof opening[a]



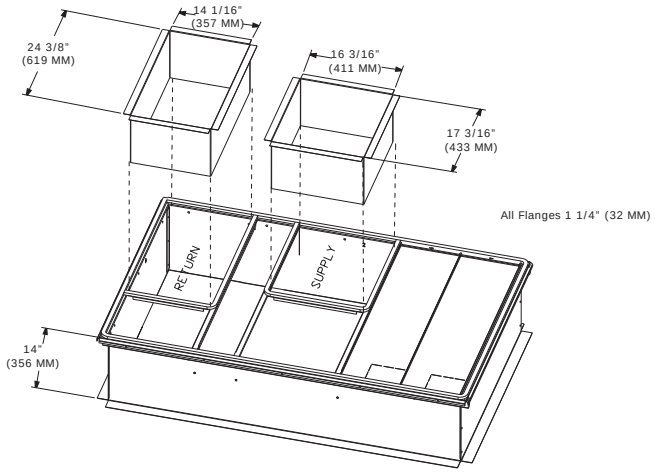
(a) All dimensions are in inches/millimeters.

Figure 8. Cooling and gas/electric - 3 tons ultra high efficiency - roof curb[a]



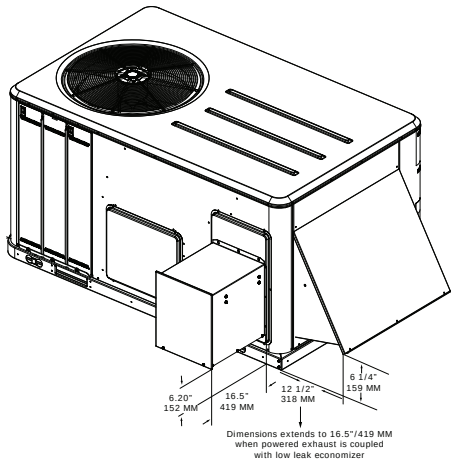
(a) All dimensions are in inches/millimeters.

Figure 9. Cooling and gas/electric - 3 tons ultra high efficiency - downflow duct connections - field fabricated[a]



(a) All dimensions are in inches/millimeters.

Figure 10. Cooling and gas/electric - 3 tons ultra high efficiency- economizer, manual or motorized fresh air damper; power exhaust[a]



(a) All dimensions are in inches/millimeters.

Figure 11. Cooling and gas/electric - 3 tons ultra high efficiency- economizer & barometric relief damper hood(a)

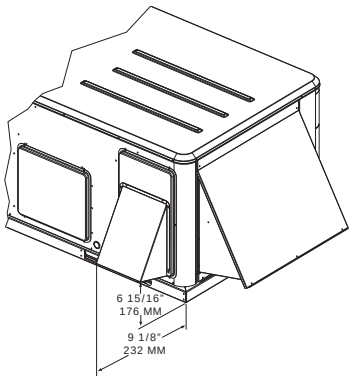
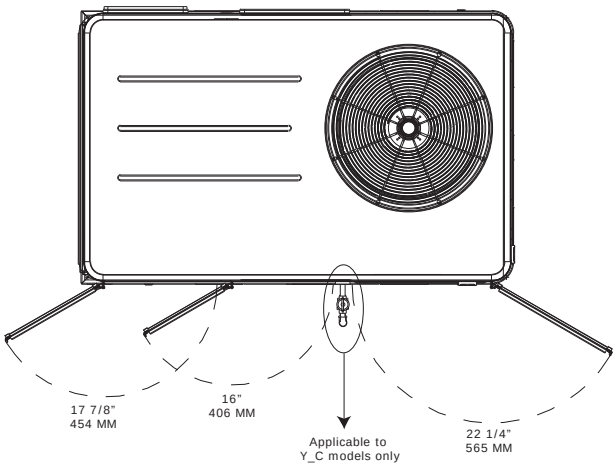


Figure 12. Cooling and gas/electric models - 3 tons ultra high efficiency- swing diameter for hinged door(s) option[a]



(a) All dimensions are in inches/millimeters.

Figure 13. Gas/electric models - 3 tons ultra high efficiency- height of gas pipe required from inside base of unit to gas shut off assembly (factory provided) - Y_C models only

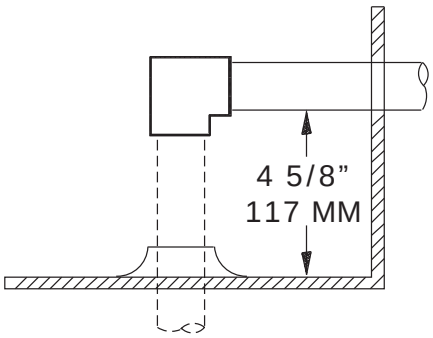
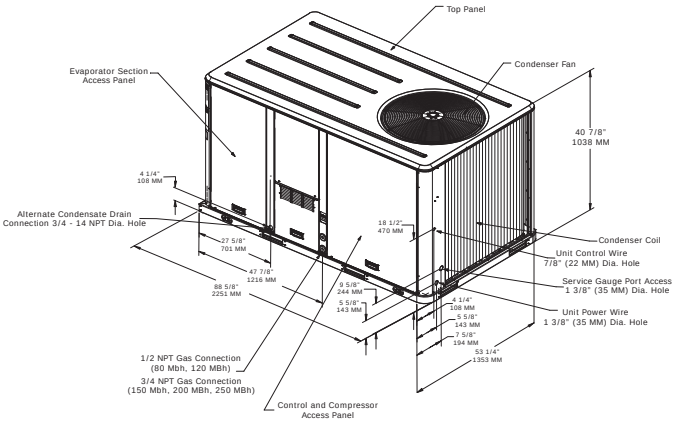
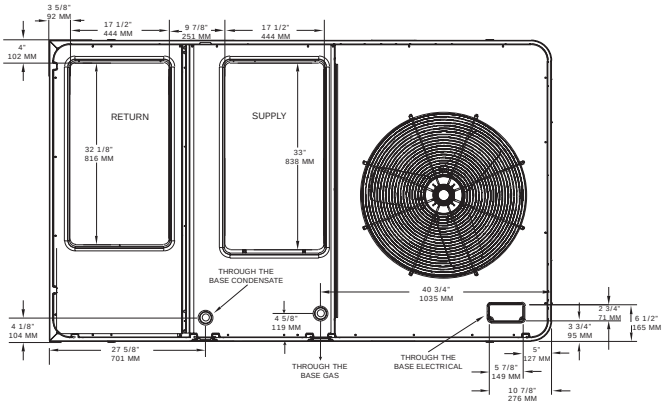


Figure 14. Cooling and gas/electric - 4 to 5 tons ultra high efficiency[a]



(a) All dimensions are in inches/millimeters.

Figure 15. Cooling and gas/electric - 4 to 5 tons ultra high efficiency- downflow airflow supply/ return - through-the-base utilities[a]



(a) All dimensions are in inches/millimeters.

Figure 16. Cooling and gas/electric - 4 to 5 tons ultra high efficiency- horizontal airflow supply and return

Note: All dimensions are in inches/millimeters.

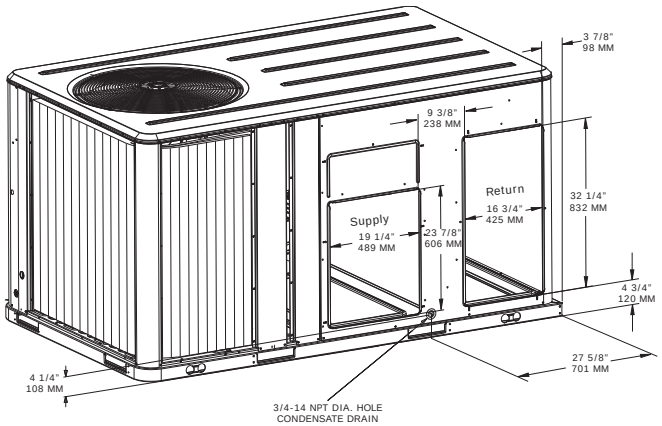


Figure 17. Cooling and gas/electric - 4 to 5 tons ultra high efficiency- unit clearance and roof opening

Note: All dimensions are in inches/millimeters.

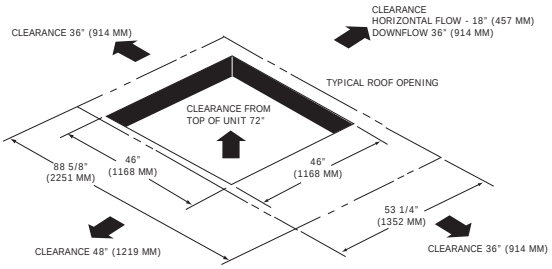
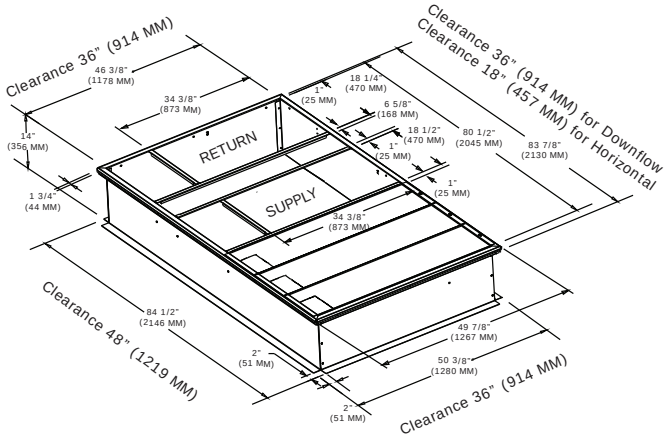
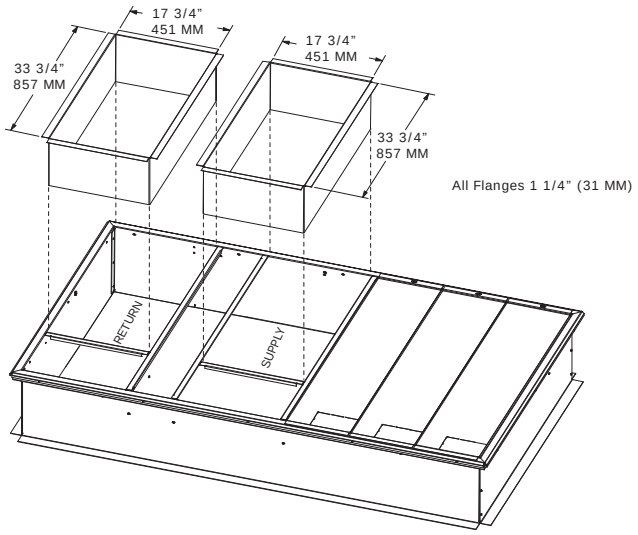


Figure 18. Cooling and gas/electric - 4 to 5 tons ultra high efficiency - roof curb[(a)]



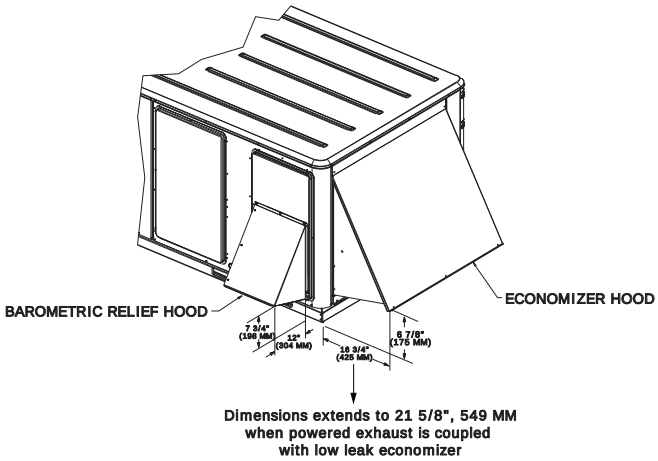
(a) All dimensions are in inches/millimeters.

Figure 19. Cooling and gas/electric - 4 to 5 tons ultra high efficiency- downflow duct connections field fabricated[(a),(b)]



(a) All dimensions are in inches/millimeters.
(b) See the clearance requirement table in the Application Consideration chapter for duct clearance to combustible materials.

Figure 20. Cooling and gas/electric - 4 to 5 tons ultra high efficiency - economizer, manual or motorized fresh air damper[(a)]



(a) All dimensions are in inches/millimeters.

Figure 21. Cooling and gas/electric - 4 to 5 tons ultra high efficiency- swing diameter for hinged door(s) option

Note: All dimensions are in inches/millimeters.

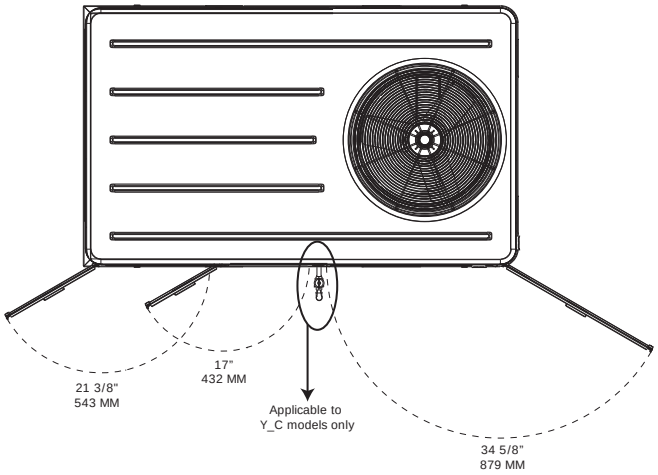


Figure 22. Cooling and gas/electric - 6 to 8.5 tons ultra high efficiency

Note: All dimensions are in inches/millimeters.

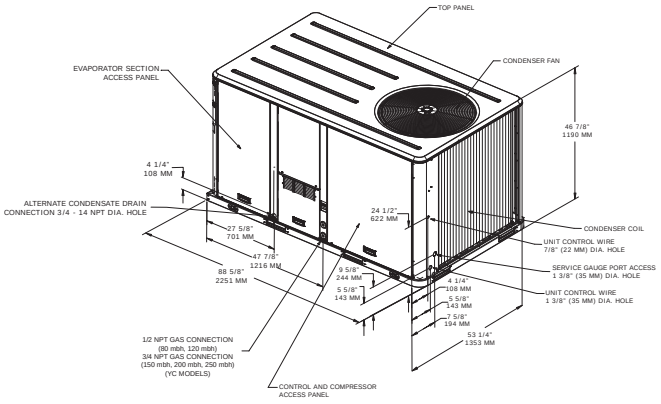


Figure 23. Cooling and gas/electric - 6 to 8.5 tons ultra high efficiency - downflow supply/return through-the-base utilities

Note: All dimensions are in inches/millimeters.

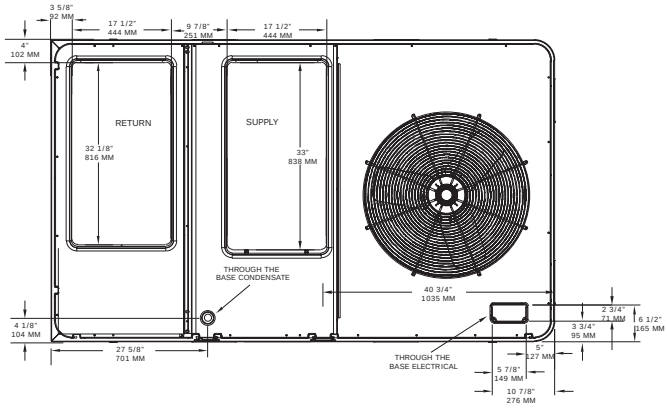


Figure 24. Cooling and gas/electric - 6 to 10 tons ultra high efficiency - horizontal airflow supply and return

Note: All dimensions are in inches/millimeters.

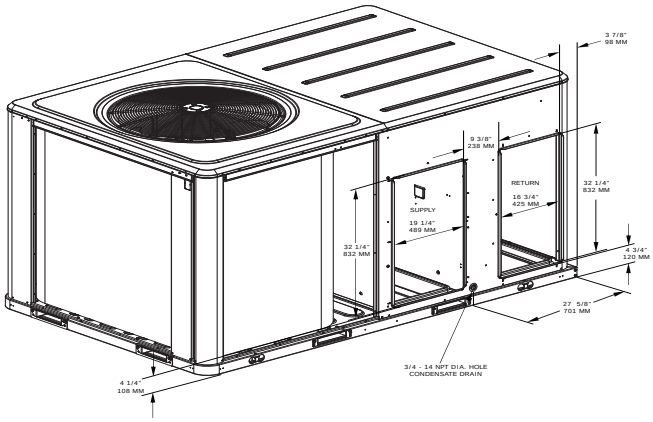


Figure 25. Cooling and gas/electric - 6 to 8.5 tons ultra high efficiency - unit clearance and roof opening

Note: All dimensions are in inches/millimeters.

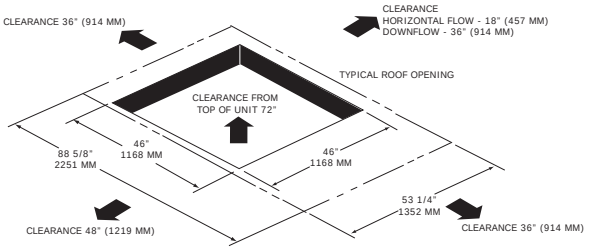


Figure 26. Cooling and gas/electric - 6 to 8.5 tons ultra high efficiency - roof curb

Note: All dimensions are in inches/millimeters.

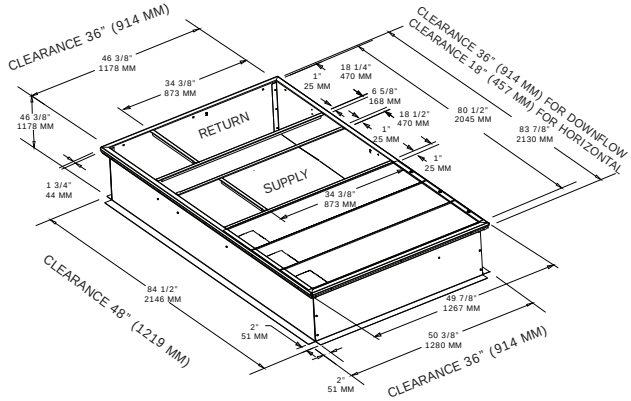


Figure 27. Cooling and gas/electric - 6 to 10 tons ultra high efficiency - duct connections field fabricated

Note: All dimensions are in inches/millimeters.

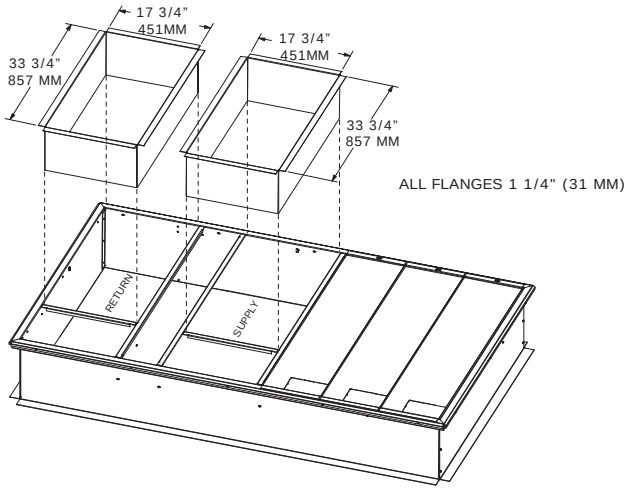


Figure 28. Cooling and gas/electric - 6 to 8.5 tons ultra high efficiency - power exhaust

Note: All dimensions are in inches/millimeters.

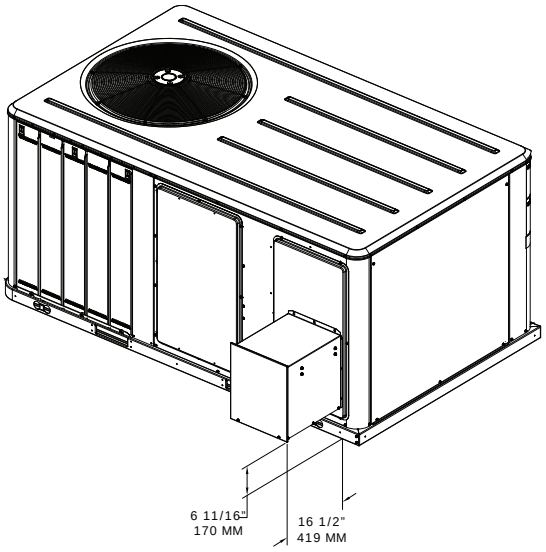


Figure 29. Cooling and gas/electric - 6 to 8.5 tons ultra high efficiency - swing diameter for hinged door(s) option

Note: All dimensions are in inches/millimeters.

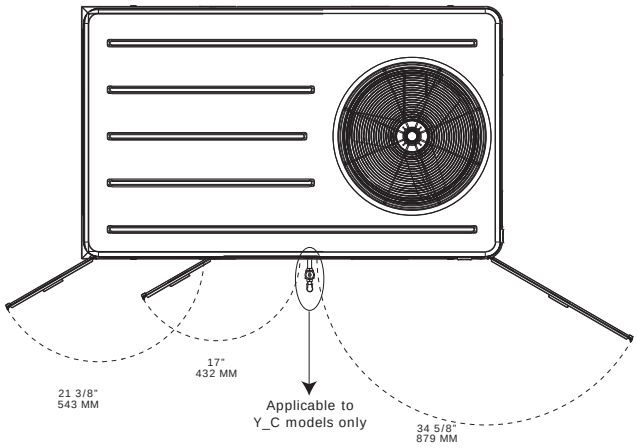


Figure 30. Cooling and gas/electric - 6 to 10 tons ultra high efficiency - economizer, manual or motorized fresh air damper

Note: All dimensions are in inches/millimeters.

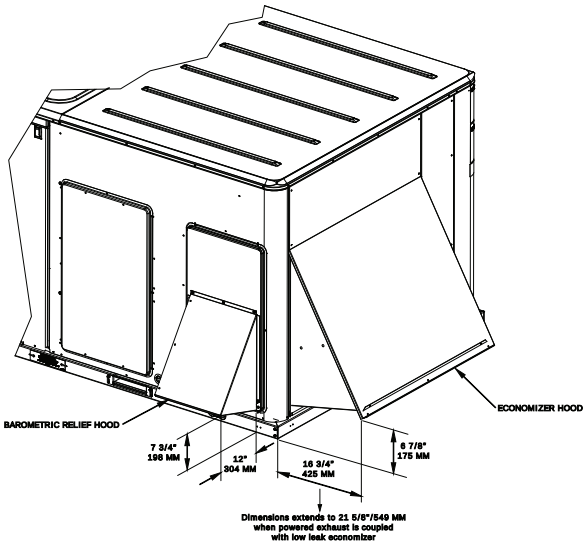


Figure 31. Gas/electric - 6 to 10 tons ultra high efficiency - height of gas pipe required from inside of base of unit to gas shut-off assembly (factory provided) YZC models only

Note: All dimensions are in inches/millimeters.

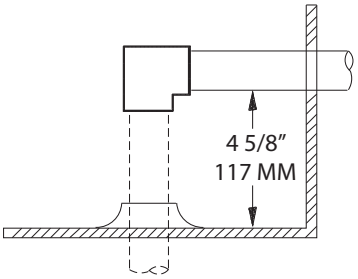


Figure 32. Cooling and gas/electric - 10 tons ultra high efficiency

Note: All dimensions are in inches/millimeters.

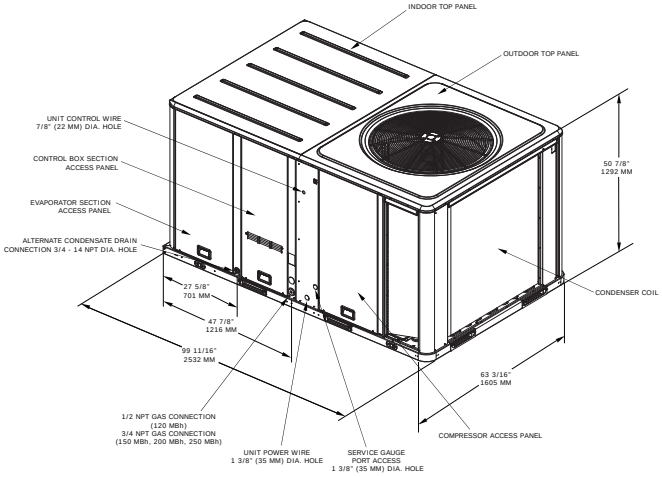


Figure 33. Cooling and gas/electric - 10 tons ultra high efficiency - downflow airflow supply/return, through-the-base utilities

Note: All dimensions are in inches/millimeters.

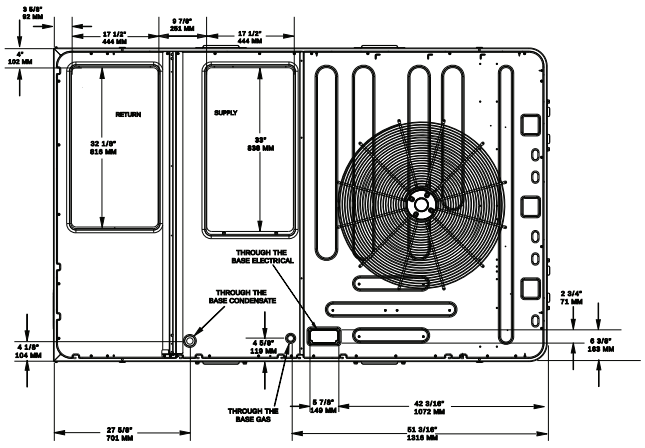


Figure 34. Cooling and gas/electric - 10 tons ultra high efficiency - unit clearance and roof opening

Note: All dimensions are in inches/millimeters.

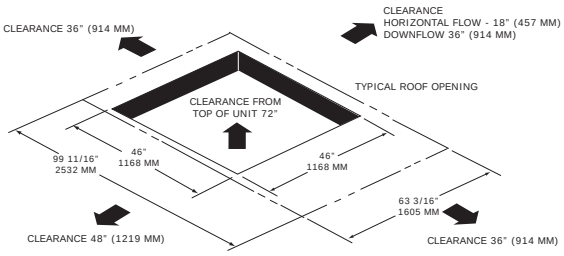


Figure 35. Cooling and gas/electric - 10 tons ultra high efficiency - roof curb

Note: All dimensions are in inches/millimeters.

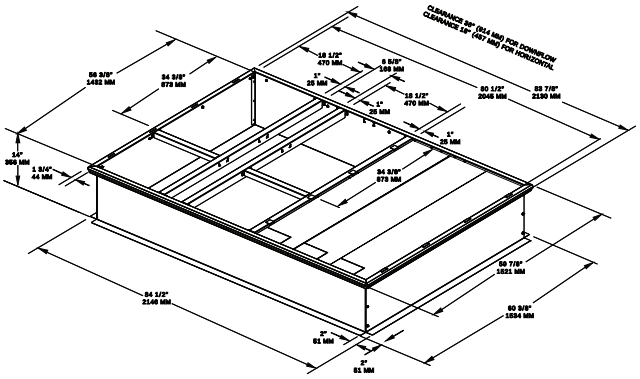


Figure 36. Cooling and gas/electric - 10 tons ultra high efficiency - power exhaust

Note: All dimensions are in inches/millimeters.

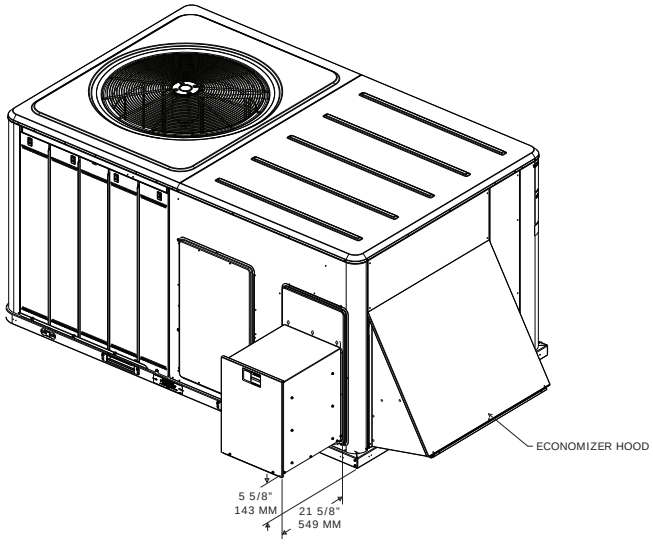
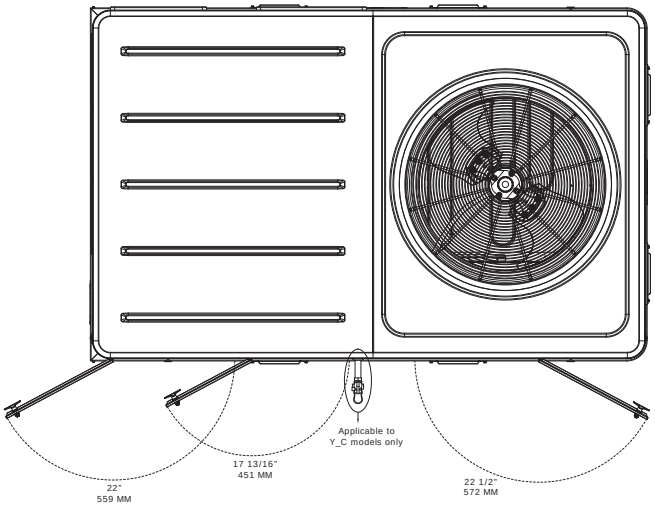


Figure 37. Cooling and gas/electric - 10 tons ultra high efficiency - swing diameter for hinged door(s) option

Note: All dimensions are in inches/millimeters.



Installation

Foundation

Horizontal Units

If the unit is installed at ground level, elevate it above the snow line. Provide concrete footings at each support location with a "full perimeter" support structure or a slab foundation for support. For the unit's operating and point loading weights when constructing a footing foundation, refer to the maximum unit/corner weights table in the weights section of this manual.

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!

Failure to ensure proper structural roof support could cause the roof to collapse, which could result in death or serious injury and property damage. 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 the weights section for typical unit and curb weights.

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 procedures.

Ductwork

Supply and return air openings as viewed from the rear of the unit are shown in the following drawings.

Figure 38. 3 tons ultra high efficiency - horizontal supply & return air openings

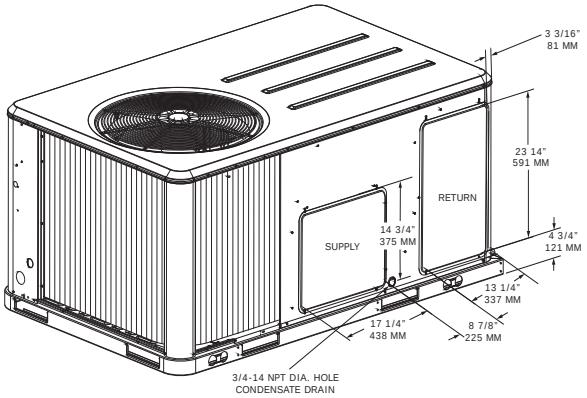


Figure 39. 4, 5 tons ultra high efficiency - horizontal supply & return air openings

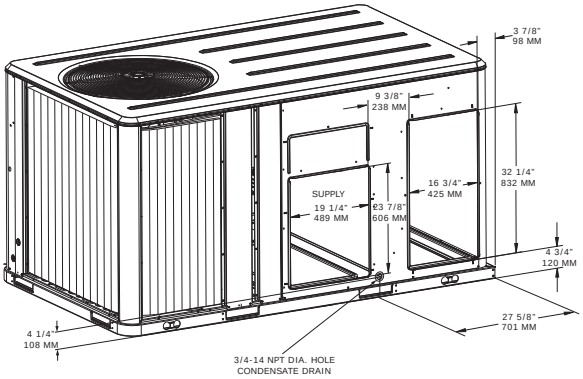
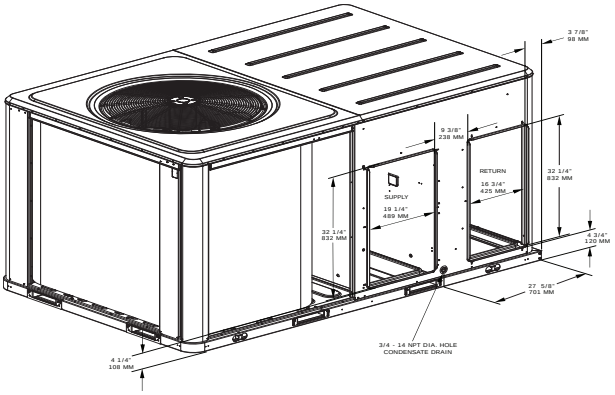


Figure 40. 6 to 10 tons ultra high efficiency - horizontal airflow supply and return air openings



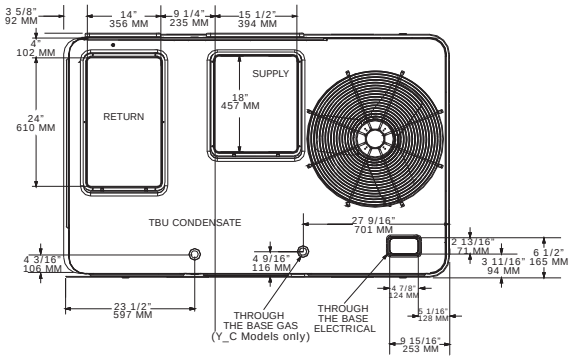
Supply and return air openings as viewed from a downflow configuration are shown in the following drawings.

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.

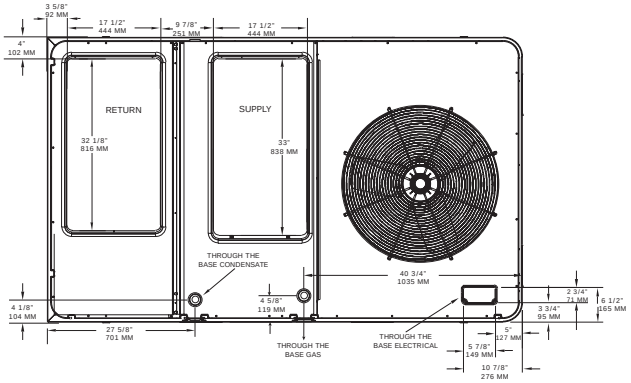
All outdoor ductwork between the unit and the structure should be weather proofed after installation is completed.

Figure 41. 3 tons ultra high efficiency - downflow airflow supply/return - through-the-base utilities[a]



(a) All dimensions are in inches/millimeters.

Figure 42. 4 to 5 tons ultra high efficiency- downflow airflow supply/return - through-the-base utilities[a]



(a) All dimensions are in inches/millimeters.

Figure 43. Cooling and gas/electric - 6 to 8.5 tons ultra high efficiency - downflow supply/return through-the-base utilities

Note: All dimensions are in inches/millimeters.

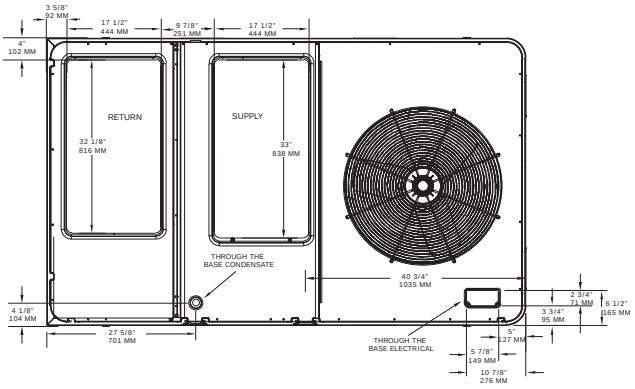
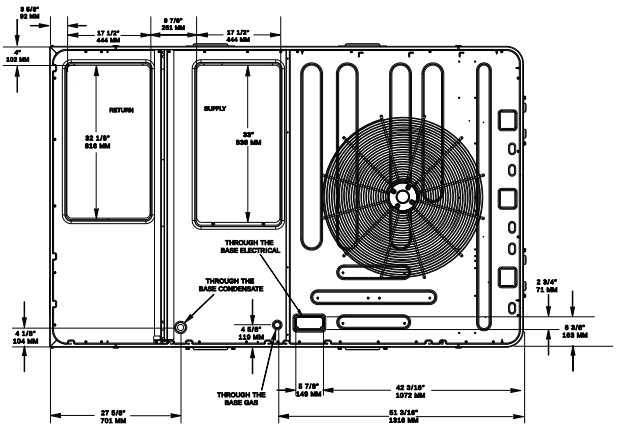


Figure 44. Cooling and gas/electric - 10 tons ultra high efficiency - downflow airflow supply/return, through-the-base utilities

Note: All dimensions are in inches/millimeters.



Roof Curb

Downflow

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

Before installing any roof curb, verify;

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

⚠WARNING

Combustible Materials!

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

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

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

Note: *To assure proper condensate flow during operation, the unit (and curb) must be level.*

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

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

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

If a curb accessory kit is not used:

- The ductwork can be attached directly to the factory-provided flanges around the unit's supply and return air openings. Be sure to use flexible duct connections at the unit.
- For "built-up" curbs supplied by others, gaskets must be installed around the curb perimeter flange and the supply and return air opening flanges.

Rigging

⚠WARNING

Heavy Objects!

Failure to follow instructions below or properly lift unit could result in unit dropping and possibly crushing operator/technician which could result in death or serious injury, and equipment or property-only damage. 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.

A rigging illustration and center-of-gravity dimensional data table is shown in the weights section. Refer to the typical unit operating weights table before proceeding.

1. Remove all drill screws fastening wood protection to metal base rail. Remove all screws securing wooden protection to wooden top crate.
2. Remove wooden top crate.

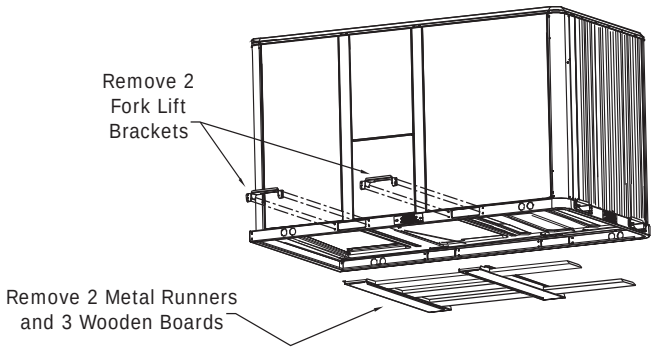
⚠WARNING

Improper Unit Lift!

Failure to properly lift unit could result in unit dropping and possibly crushing operator/technician which could result in death or serious injury, and equipment or property-only damage. 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.

3. Rig the unit as shown in the weights section. 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 the weights section, 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.

Figure 45. Fork pockets



6. Lift the unit enough to allow the removal of base fork pocket protection components as shown in the following figures.
7. Downflow units; align the base rail of the unit with the curb rail while lowering the unit onto the curb. Make sure that the gasket on the curb is not damaged while positioning the unit.

General Unit Requirements

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

- Check the unit for shipping damage and material shortage; file a freight claim and notify appropriate sales representative.
- Verify correct model, options and voltage from unit nameplate.
- Verify that the installation location of the unit will provide the required clearance for proper operation.
- If applicable, assemble and install the roof curb. Refer to the latest edition of the curb installers guide that ships with each curb kit.
- Fabricate and install ductwork; secure ductwork to curb.

- If applicable, install pitch pocket for power supply through building roof.
- 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.

Horizontal Discharge Conversion

Note: *3 ton unit supply cover to base supply opening and return cover to base return opening. 4 and 5 ton unit return cover to base supply opening and supply cover to base return opening.*

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

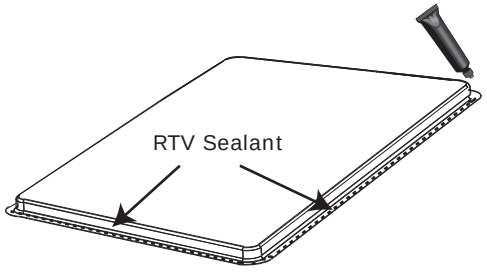
Note: *Failure to use recommended sealant could result in unit performance loss.*

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. Apply ¼ in. (6mm.) continuous bead of 500°F RTV sealant to the flange of the duct cover to be installed in the base supply opening.

Note: *Perform the same task for the 3 ton duct cover to be installed in the return opening.*

Figure 46. RTV sealant application



3. For the 3 ton unit, slide each duct cover with insulation side up into corresponding base 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.
4. For the 4 and 5 ton units, slide return duct cover (insulation side up) into base 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. Place the supply duct cover over the base return opening (insulation side down). Secure the cover with 4 screws using the dimples on the top surface to initiate screw engagement.

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.*

Return Air Smoke Detector

Note: *Consult smoke detector manufacturer if daisy chaining is required.*

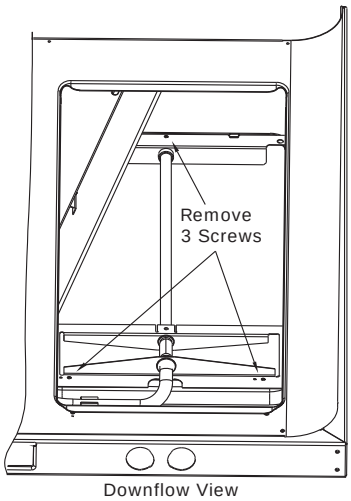
The factory installed return air smoke detector is installed in the downflow discharge position. No additional field setup is required.

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.

Note: *Refer to downflow view for screw locations.*

Figure 47. Downflow view



Downflow View

3. Lift the tube and bracket from the downflow duct opening. Rotate the tube and bracket assembly 180° ensuring that the holes on the copper sensing tube

face away from the unit and face the return air ductwork.

Note: *Refer to Figure 48, p. 28 and Figure 49, p. 28 for screw location.*

Figure 48. Horizontal view 1

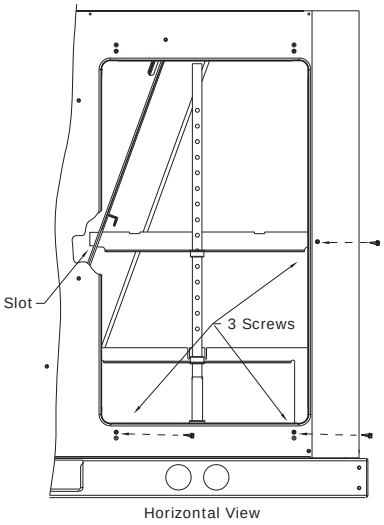
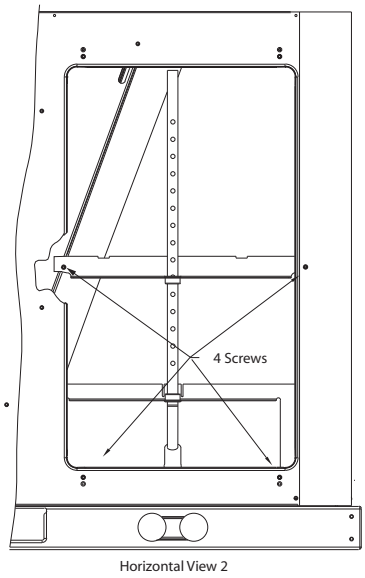


Figure 49. Horizontal view 2



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. For TZC036E units insert the tab on the left side into the slot on the indoor coil block off and secure the right side of the bracket with one of the 3 screws removed in step 2. Refer to Figure 48, p. 28. For TZC048F and TZC060E units secure the tab on left side to the indoor coil block off with one of the screws removed in step 2 and secure the right side of the bracket with one of the screws removed from the access panel. Refer to Figure 49, p. 28.
5. Using the remaining 2 screws removed in step 2, secure the bottom bracket. Refer to Figure 48, p. 28.

Note: *Larger diameter holes on bottom bracket line up with the dimples on the rear panel. The smaller diameter holes line up with the screw holes in the rear panel.*

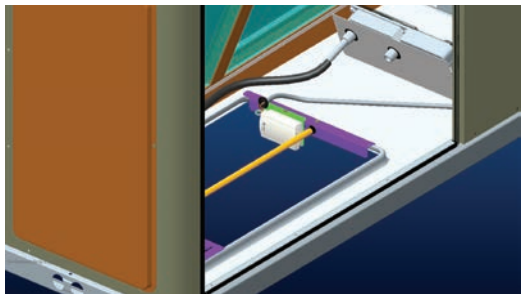
Air-Fi™ Wireless Communication Interface

The factory installed wireless communications interface is installed in the downflow discharge position.

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

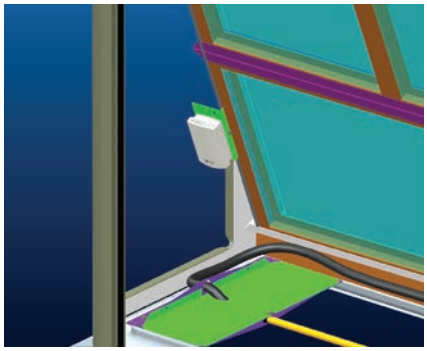
1. If the unit has an economizer, it must be pulled out in the operating position.
2. Remove the screw from the mounting bracket. Refer to downflow view for screw and bracket location.

Figure 50. Wireless communication interface - downflow



3. Mount the bracket in the horizontal discharge location. Refer to horizontal view for screw and bracket location.

Figure 51. Wireless communication interface - horizontal



Note: *Cable ties must be removed to allow the cable to extend to the horizontal mounting location.*

Main Electrical Power Requirements

⚠WARNING

Hazardous Voltage w/Capacitors!

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

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

⚠WARNING

Proper Field Wiring and Grounding Required!

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

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.

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!

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

An evaporator condensate drain connection is provided on each unit. Refer to Figure 38, p. 24 and Figure 39, p. 24 for the appropriate drain location.

The condensate drain pan is factory installed to drain condensate to the back side of the unit. See Figure 38, p. 24 and Figure 39, p. 24. It can be converted to drain condensate out the front side of the unit or through the base.

To convert drain condensate out the front of unit:

1. Remove evaporator access panel and supply air access panels.
2. Remove the support panel that the condensate drain pan exits through.
3. Slide the condensate drain pan out of the unit and rotate 180°.
4. Slide the condensate drain pan back into the unit, align the drain with the grommeted opening in the rear support panel and push until the coupling is seated in the grommet.
5. Replace the front support panel by aligning the panel with tabs in the raceway. Align the condensate drain pan support in the grommeted hole as the panel is put in place.
6. Replace evaporator access panel and supply air access panels.

To convert drain condensate through the base of unit:

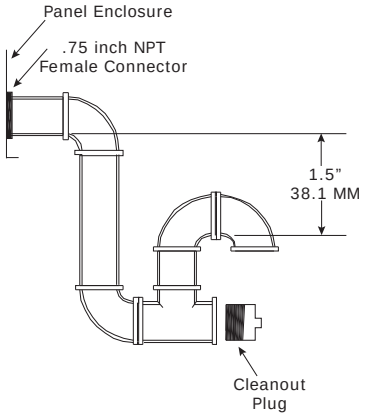
1. Remove evaporator access panel and supply air access panels.
2. Remove the support panel that the condensate drain pan exits through.
3. Slide the condensate drain pan out of the unit.
4. Place on a level surface in the position it was removed from the unit.
5. Remove the plug knockout in the bottom of the drainpan to convert it to through the base drainage.
6. Plug the original condensate drain opening with a field supplied 3/4" NPT plug.
7. Slide the condensate drain pan back into the unit, align the drain support with the grommeted opening in the rear support panel and push until the support is seated in the grommet.

8. Replace the front support panel by aligning the panel with tabs in the raceway. Align the plugged condensate drain pan coupling in the grommeted hole as the panel is put in place.
9. Replace evaporator access panel and supply air access panels.

A condensate trap must be installed at the unit due to the drain connection being on the "negative pressure" side of the fan. Install the P-Trap using the guidelines in Figure 52, p. 30.

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 52. 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!

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

An overall dimensional layout for the field installed wiring entrance into the unit is illustrated in the Dimensions and Weights chapter. To insure that the unit's supply power wiring is properly sized and installed, follow the following guidelines.

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

NOTICE

Use Copper Conductors Only!

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

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

Main Unit Power

⚠WARNING

Proper Field Wiring and Grounding Required!

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

⚠WARNING

Hazardous Voltage!

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

Standard Wiring

Location of the applicable electrical service entrance is illustrated in the Dimensions and Weights chapter. 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

Provide proper grounding for the unit in accordance with local and national codes.

Optional TBUE Wiring (Through the Base Electrical Option)

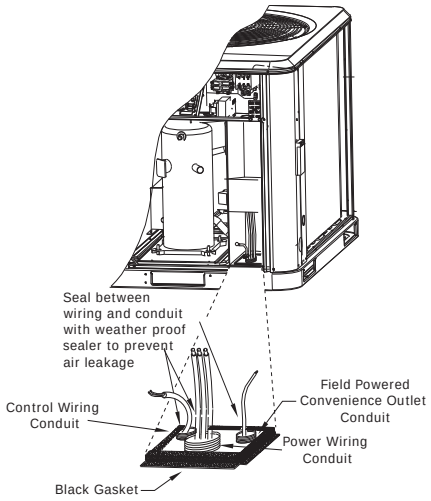
Location of the applicable electrical service is illustrated below. Refer to the customer connection diagram that is shipped with the unit for specific termination points. The termination points, depending on the customer option selected would be a factory mounted non-fused disconnect switch (UDC) or circuit breaker (UCB). If neither a factory mounted non-fused 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).

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 53. 3 to 8.5 ton ultra high efficiency units



Field Installed Control Wiring

⚠WARNING

Hazardous Voltage!

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

⚠WARNING

Proper Field Wiring and Grounding Required!

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

An overall layout of the various control options available with the required number of conductors for each control device is illustrated in Figure 58, p. 34.

Control Power Transformer

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

⚠WARNING

Hazardous Voltage!

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

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 DC Analog Input/Outputs (Standard Low Voltage Multi conductor Wire)

Before installing any connecting wiring between the unit and components utilizing a DC analog input/output signal, refer to the Dimensions and Weights chapter for the electrical access locations provided on the unit.

- Table 3, p. 32 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.*

Note: *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.*

- Do not run the electrical wires transporting DC signals in or around conduit housing high voltage wires.
- Route low voltage wiring per illustrations on page 32.

Note: *If digit 9 in the unit model number equals "E" (electromechanical control), accessory relay BAY24X042 is required if the thermostat does not energize the fan circuit in the heating mode.*

Table 3. Zone sensor module wiring

Distance from Unit to Control	Recommended Wire Size
0 - 150 feet	22 gauge
0 - 45.7 m	.33 mm2
151 - 240 feet	20 gauge
46 - 73.1 m	.50 mm2
241 -385 feet	18 gauge
73.5 - 117.3 m	.75 mm2
386 - 610 feet	16 gauge
117.7 - 185.9 m	1.3 mm2
611 - 970 feet	14 gauge
186.2 - 295.7 m	2.0 mm2

Figure 54. ReliaTel™ options module

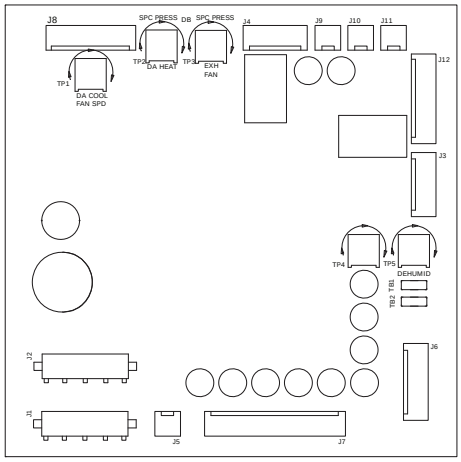
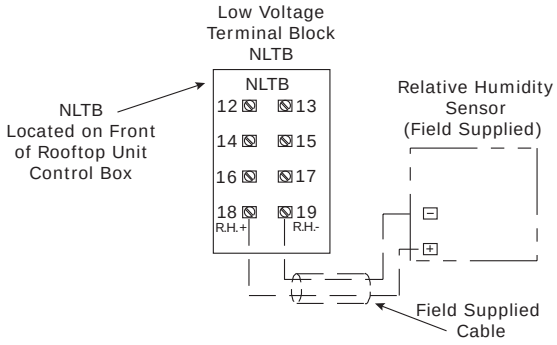
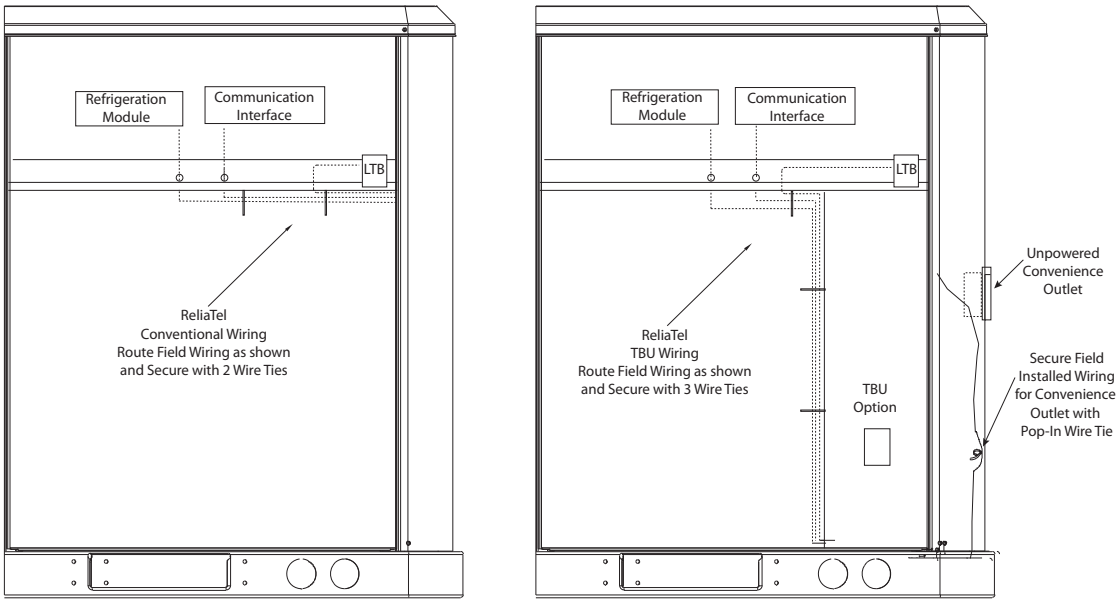


Figure 56. ReliaTel™ control customer low voltage routing

Figure 55. ReliaTel™ relative humidity sensor (enhanced dehumidification operation)





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 4, p. 35 lists the temperature versus resistance coefficient for all sensors.

Figure 57. Examples

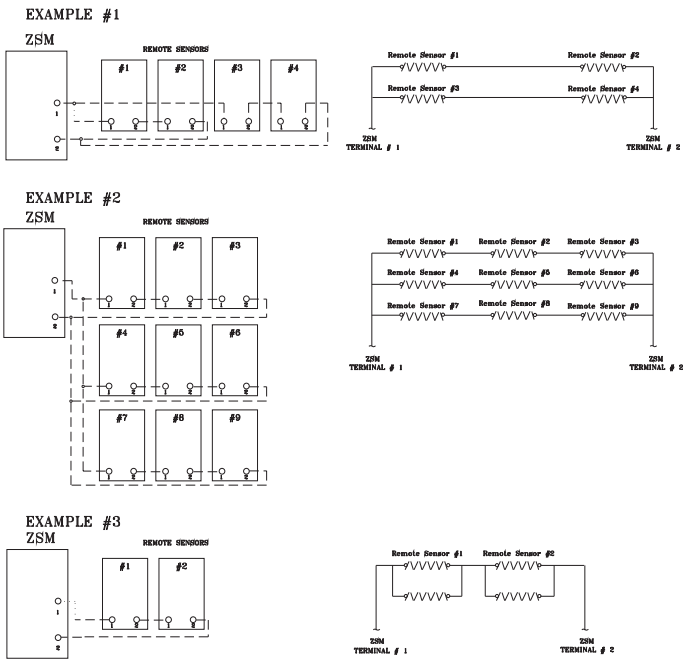
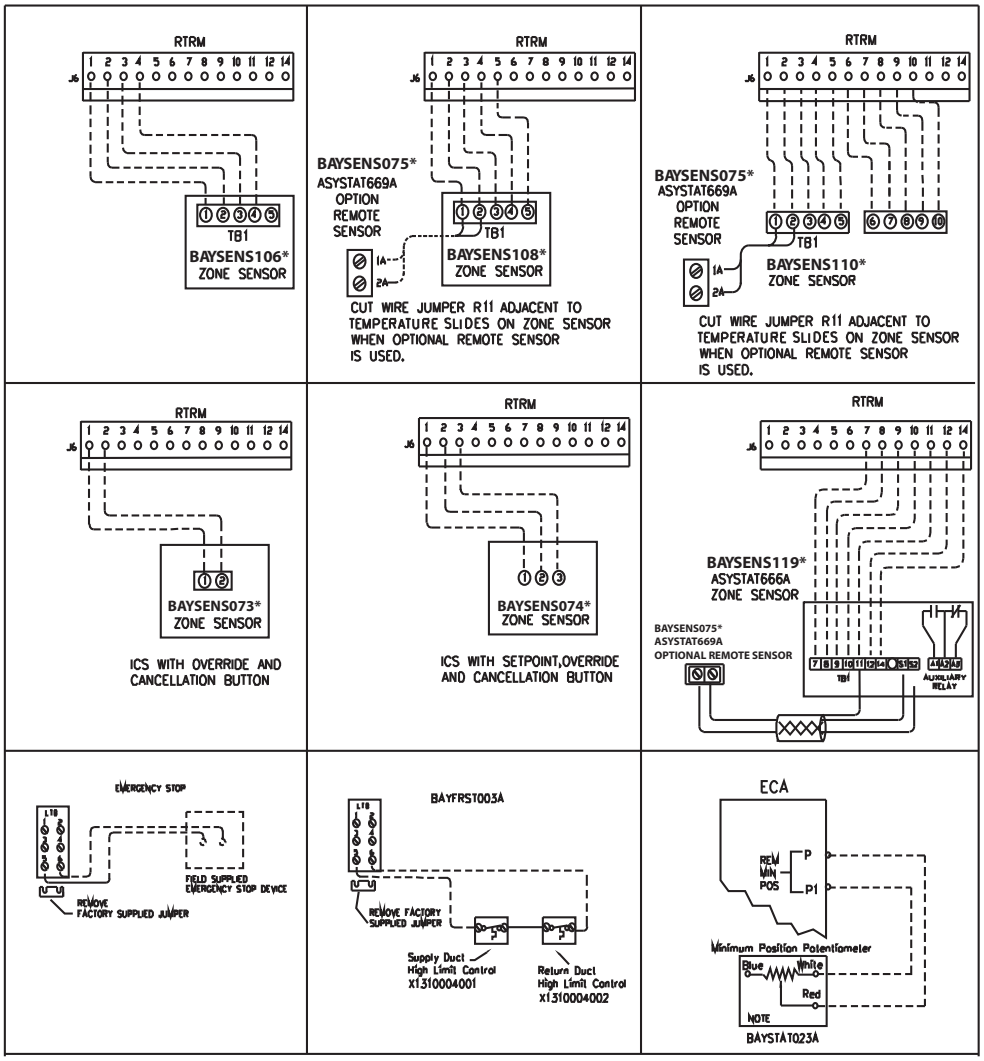


Figure 58. Typical field wiring diagrams for optional controls (ReliaTel™ only)



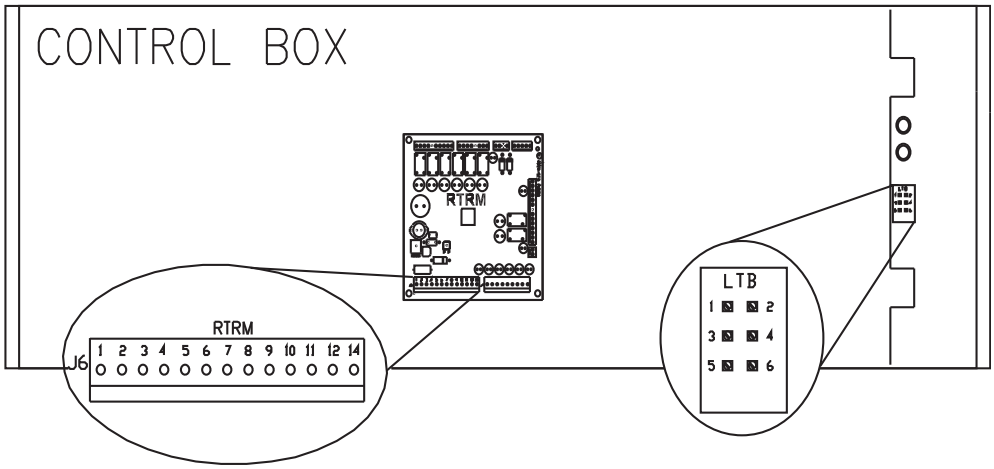


Table 4. Temperature vs. resistance

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

Pre-Start

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 w/Capacitors!

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

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

- 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.
- Verify that a condensate trap is installed and the piping is properly sized and pitched.
- Verify that the correct size and number of filters are in place.
- Inspect the interior of the unit for tools and debris and install all panels in preparation for starting the unit.

Voltage Imbalance

Three phase electrical power to the unit must meet stringent requirements for the unit to operate properly.

Measure each leg (phase-to-phase) of the power supply. Each reading must fall within the utilization range stamped on the unit nameplate. If any of the readings do not fall within the proper tolerances, notify the power company to correct this situation before operating the unit.

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

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

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

V1, V2, V3 = Line Voltage Readings

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

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

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

VD (reading farthest from average) = 221

The percentage of Imbalance equals:

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

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:

⚠WARNING

Hazardous Voltage w/Capacitors!

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

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

- 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!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury. When 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.

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

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

Compressor Crankcase Heaters

Each compressor 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.

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

⚠WARNING

Live Electrical Components!

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

ReliaTel™ Controls

Upon power initialization, the RTRM performs self-diagnostic checks to 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.

Table 5. Service test guide for component operation

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

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

Test Modes

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

- Step Test Mode - This method initiates the different components of the unit, one at a time, by temporarily shorting across the two test terminals for two to three seconds.

  For the initial startup of the unit, this method allows the technician to cycle a component "On" and have up to one hour to complete the check.
- Resistance Test Mode - This method can be used for startup 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.
- Auto Test Mode - This method is not recommended for startup 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 5, p. 38.

Unit Startup

Verifying Proper Air Flow

⚠WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury. When 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.

Sequence of Operation

General Standby Mode

During normal occupied periods, when there is no space cooling or heating demands, the user will be able to choose Constant or Cycling supply fan operation. During this period, if the supply fan is operating due to a Constant Fan Mode selection or due to a ventilation request, the supply fan will operate at 50% of the user selected, application specific, maximum airflow. The unit controls will be compatible with BACnet™ and LonTalk™ Building Automation System communication interfaces.

Cooling Operation

Default Operation: During Cooling operation, the control will monitor the Space Temperature and Space Cooling setpoint and with a PI control algorithm determine if active cooling capacity is required. As the Space Temperature deviates from the Space Cooling Setpoint, the unit controller will calculate an active Discharge Air Cooling setpoint that the economizer (if installed) and compressor and outdoor fan outputs will be modulated to meet. This active Discharge Air Cooling setpoint will be calculated between the Space Cooling setpoint and a user adjustable minimum (65°F default for Single Zone Variable Air Volume SZVAV). Once the control determines that a discharge air temperature equal to the user selected minimum (65°F default) is required to meet the space cooling demand, if the space demand continues to increase, the supply fan speed will be allowed to increase above its minimum speed proportionally to meet the additional demand.

Alternate Economizer Operation: Under the Default Operation, as described above, the supply fan speed will remain at minimum speed, as determined by the active cooling stages, until the space demand requires an increase in supply airflow. The customer will have the ability to choose to allow the supply fan speed to increase when the economizer is enthalpy enabled in order to realize the maximum cooling capacity of the economizer, prior to energizing compressor outputs, when the space requires active cooling capacity. All cooling capacity demand decisions will function as described in the "Default Operation" section above with the exception of the supply fan speed when the unit has an active cooling demand and the economizer is enthalpy enabled.

Heating Operation

During Heating operation, the control will monitor the Space Temperature and Space Heating setpoint and with a PI control algorithm determine if active heating capacity is required. As the Space Temperature deviates from the Space Heating Setpoint, the unit controller will increase the supply airflow up to the user selected, application specific, maximum airflow and begin to stage heating outputs (gas or electric) to meet the space demand. The customer will also have the ability to enable Supply Air Tempering control which will allow the unit to bring on one stage of heating when the discharge air temperature falls below the Space Heating Setpoint - 10°F and the unit is operating in a minimum ventilation state with the supply fan running (not actively heating or cooling). The supply fan output will increase to the user selected, application specific, maximum airflow during Supply Air Tempering operation.

Enhanced Dehumidification

Enhanced Dehumidification will be available on all units equipped with a Space Humidity sensor. Once the Space Humidity value exceeds the Dehumidification Setpoint and dehumidification is enabled the unit will maintain the compressor operation and reduce the indoor fan airflow to increase latent capacity. If the Space Humidity value exceeds the Dehumidification Setpoint during no active call for cooling, the unit will energize the compressor and fans to an optimum capacity for dehumidification. If during active enhanced dehumidification the Space Humidity falls below the Dehumidification Setpoint – 2%, Dehumidification will be terminated and the unit will transition back to normal Cooling or Heating control.

Supply Air Temperature Control with an Economizer

The economizer is utilized to control the supply air cooling at +1.5°F around the supply air temperature setpoint range of 40°F and 90°F providing the outside air conditions are suitable. To reduce the risk of evaporator coil freeze-up supply air temperature should not be set below 50° F. While economizing, the mechanical cooling is disabled until the economizer dampers have been fully open for three minutes. If the economizer is disabled due to unsuitable conditions, the mechanical cooling will cycle as though the unit had no economizer.

Note: *The RTRM is designed to maintain a selectable supply air temperature of 40°F to 90°F with a +/- 3.5°F deadband. However, to reduce the risk of evaporator coil freeze-up in Precedent and Voyager Light Commercial applications, supply air temperature should not be set below 50°F.*

Zone Temperature Control without a Night Setback Panel or ICS - Unoccupied Cooling

When a field supplied occupied/unoccupied switching device is connected between RTRM J6-11 and RTRM J6-12, both the economizer and the mechanical cooling will be disabled.

Zone Temperature Control without a Night Setback Panel or ICS - Unoccupied Heating

When a field supplied occupied/unoccupied switching device is connected between RTRM J6-11 and J6-12 and DWU is enabled, the zone temperature will be controlled at 10°F below the Morning Warm-up setpoint, but not less than 50°F, by cycling one or two stages of either gas or electric heat, whichever is applicable.

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 in accordance with manufacturers recommended limits.

Economizer Startup

⚠WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury. When 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.

Minimum Position Setting

⚠WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury. When 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.

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 0-75%.
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.

⚠WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury. When 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.

ReliaTel™ Control: Using the Service Test Guide in the Pre-Start chapter, momentarily jump across the Test 1 & Test 2 terminals on LTB1 one time to start the Minimum Ventilation Test below.

⚠WARNING

Rotating Components!

Failure to follow all safety precautions below could result in rotating components cutting and slashing technician which could result in death or serious injury. 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.

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

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

ReliaTel™ Control. Momentarily jump across the Test 1 & Test 2 terminals on LTB1 one additional time if continuing from previous component startup or until the desired startup component Test is started.

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

Compressor Startup

⚠WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury. When 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.

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

ReliaTel™ Control. Momentarily jump across the Test 1 & Test 2 terminals on LTB1 one additional time if continuing from previous component startup or until the desired startup component Test is started.

Scroll Compressors. a.Once each compressor has started, verify that the rotation is correct. If a scroll compressor is rotating backwards, it will not pump and a loud rattling sound can be observed.

b. If the electrical phasing is correct, before condemning a compressor, interchange any two leads (at the compressor Terminal block) to check the internal phasing. If the compressor runs backward for an extended period (15 to 30 minutes), the motor winding can overheat and cause the motor winding thermostat to open.

2. After the compressor and condenser fan have started and operated for approximately 30 minutes, observe the operating pressures. Compare the operating pressures to the operating pressure curve in the Service Facts.
3. Check system superheat. Follow the instruction listed on the superheat charging curve in the Service Facts.

   Superheat should be within ±5°F of the superheat chart value.
4. Repeat steps 1 through 4 for each refrigerant circuit.
5. To stop the SERVICE TEST, turn the main power disconnect switch to the "Off" position or proceed to the next component startup procedure. Remove electro mechanical test mode connections (if applicable).

Dip Switch Settings

Verify that the dip switch settings match the unit model as indicted in Figure 59 through Figure 61.

Figure 59. 3T ultra high efficiency unit

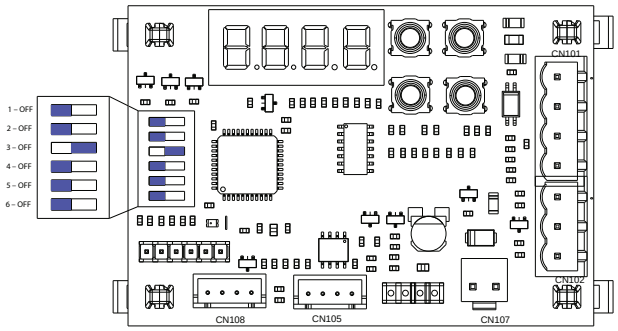


Figure 60. 4T ultra high efficiency unit

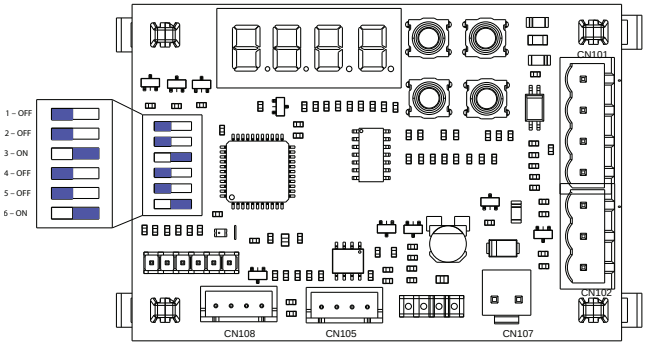
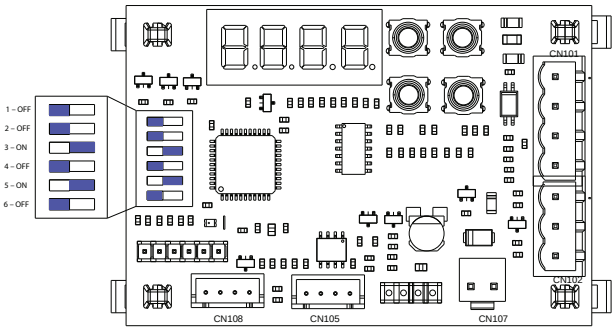


Figure 61. 5T ultra high efficiency unit[a]



(a) For TZC060E3 dip switch settings, reference RT-SVD007*-EN.

Final System Setup

After completing all of the pre-start and startup 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.

Maintenance

Monthly Maintenance

⚠WARNING

Hazardous Service Procedures!

Failure to follow all precautions in this manual and on the tags, stickers, and labels could result in death or serious injury.
Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the following instructions: Unless specified otherwise, disconnect all electrical power including remote disconnect and discharge all energy storing devices such as capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks.

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

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

Note: *Consult smoke detector manufacturer if daisy chaining is required.*

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.
- 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 6, p. 45. If the operating pressures indicate a refrigerant shortage, measure the system superheat. For guidelines, refer to the "Compressor Startup" section.

Important: *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

- Unlatch hail guard.
- 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.

Microchannel (MCHE) Coils

NOTICE

Coil Damage!

Failure to follow instructions below could result in coil damage.
DO NOT use any detergents with microchannel condenser coils. Use pressurized water or air ONLY, with pressure no greater than 600psi.

For additional information regarding the proper microchannel coil cleaning procedure, refer to service bulletin RT-SVB83-EN.*

Due to the soft material and thin walls of the MCHE coils, the traditional field maintenance method recommended for Round Tube Plate Fin (RTPF) coils does not apply to microchannel coils.

Moreover, chemical cleaners are a risk factor to MCHE due to the material of the coil. The manufacturer does not recommend the use of chemical cleaners to clean microchannel coils. Using chemical cleaners could lead to warranty claims being further evaluated for validity and failure analysis.

The recommended cleaning method for microchannel condenser coils is pressurized water or air with a non-pinpoint nozzle and an ECU of at least 180 with pressure no greater than 600 psi. To minimize the risk of coil damage, approach the cleaning of the coil with the pressure washer aimed perpendicular to the face of the coil.

Note: *For more details on Microchannel coil cleaning, please refer to bulletin RT-SVB83*-EN.*

Round Tube Plate Fin (RTPF) Coils

⚠WARNING

Hazardous Chemicals!

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

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 BUT DO NOT EXCEED 150°F maximum to improve its cleansing capability.

⚠WARNING

Hazardous Pressures!

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

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.

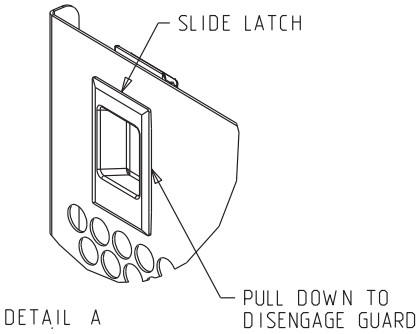
Note: *For units equipped with hail guards follow reinstallation procedure listed below.*

Hail Guard Reinstallation

10. 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.*

Figure 62. Hail guard



11. Restore the unit to its operational status and check system operation.

Annual Maintenance

Clean and repaint any corroded surface.

Final Process

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

Complete Model Number: _____

Unit Serial Number: _____

Wiring Diagram Numbers (from unit control panel): _____

Connections: _____

Schematics: _____

Table 6. Sample maintenance log

		Refrigerant Circuit #1					
Date	**Current Ambient Temp. 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					

Note: *Check and record the data requested above each month during the cooling season with the unit running.*

Troubleshooting

⚠WARNING

Hazardous Service Procedures!

Failure to follow all precautions in this manual and on the tags, stickers, and labels could result in death or serious injury.
Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the following instructions: Unless specified otherwise, disconnect all electrical power including remote disconnect and discharge all energy storing devices such as capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks.

ReliaTel™ Control

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!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury. When 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.

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

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 4. If 24 VAC 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 status

   If 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 Step 1 and Step 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 Startup" 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 Step 7 and Step 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.

Zone Sensor LED 1 (System)

"On" during normal operation.

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

"Flashing" indicates test mode.

Zone Sensor 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.

Zone Sensor 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.

Zone Sensor LED 4 (Service)

"On" indicates a clogged filter.

"Off" during normal operation.

"Flashing" indicates an evaporator fan or condensate overflow 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

- Cooling and heating set point (slide pot) on the zone sensor has failed. Refer to the "Zone Sensor Test Procedure" section.
- Zone temperature thermistor ZTEMP on ZTS failed. Refer to the "Zone Sensor Test Procedure" section.
- 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).
- LPC1 has opened during the 3 minute minimum "on time" during 4 consecutive compressor starts, check LPC1 or LPC2 by testing voltage between the J1-1 & 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

- 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.
- Clogged filter switch has closed, check the filters.
- If the condensate overflow switch is closed, the unit will not operate. Make sure the float switch is not in a tripped condition, and check for an "open" between wires connecting to RTOM J6-1, J6-2 (ReliaTel™ controls).

Simultaneous Heat and Cool Failure

- 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*, or BAYSENS023A), the LED indicators will not function while the BAYSENS110* is connected.*

Resetting Cooling and Ignition 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 Ignition 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 (±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 (±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.

Condensate Overflow Switch

When the "Condensate Overflow Switch" is closed, a drain pan overflow condition is indicated and it will shut 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 7. Cooling setpoint and heating setpoint

Zone Temperature		Nominal ZTEMP Resistance
50° F	10.0°C	19.9 K-Ohms
55° F	12.8°C	17.47 K-Ohms
60° F	15.6°C	15.3 K-Ohms
65° F	18.3°C	13.49 K-Ohms
70° F	21.1°C	11.9 K-Ohms
75° F	23.9°C	10.50 K-Ohms
80° F	26.7°C	9.3 K-Ohms
85° F	29.4°C	8.25 K-Ohms
90° F	32.2°C	7.3 K-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.

Relative Humidity Sensor Test

This component is measured by measuring the mA output signal on the Relative Humidity Sensor. Verify accuracy of the sensor annually. If the output reading is 0 mA, first verify that power is applied to the sensor. A reading of 4

mA corresponds to 0% RH and 20 mA corresponds to 100% RH.

% RH	mA
30	8.8
40	10.4
50	12.0
60	13.6
70	15.2
80	16.8

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.
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 19 VDC, while the voltage on the high end will measure from approximately 24 to 38 VDC.
4. Verify all modes of operation, by running the unit through all of the steps in the service test guide in the Pre-Start chapter.
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.

⚠WARNING

Hazardous Voltage!

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

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.

Table 8. Fault detection and diagnostic codes

	Primary Fault Codes								Information Code		
Failures	**Mixed Air Temp Sensor Fail**	**Outdoor Temp Sensor Fail**	**Economizer Actuator Fault**	**RTEM Comm Fail**	**Pressure Dead band Fail (If Used)**	**Temp Sensor Fail (If Used)**	**Airflow Sensor Fail (If Used)**	**Space Press Dead band Fail (If Used)**	**Unit Fails to Economize**	**Unit Economizing When It Should Not**	**Damper Position % Indicated**
Damper stuck at Minimum			X		X(a)		X(a)*	X(a)	X		X
Damper Stuck Open			X		X(a)		X(a)	X(a)		X	X
Mixed Sensor Failure	X										X
Supply Air Sensor Failure						X					X
Outdoor Air Temperature Fail		X									X
Power loss to RTEM				X							
Failed or Power Loss to Actuator			X								X
Mechanical Failure of Actuator							X				

(a) If goes out of range.

Table 9. Low leak economizer sensor values

Sensor Values Data					
Temp °F	**Resistance (K ohms)**	**Temp °F**	**Resistance (K ohms)**	**Temp °F**	**Resistance (K ohms)**
40	26.097	54	17.847	68	12.435
41	25.383	55	17.382	69	12.126
42	24.690	56	16.930	70	11.827
43	24.018	57	16.491	71	11.535
44	23.367	58	16.066	72	11.252
45	22.736	59	15.654	73	10.977
46	22.132	60	15.253	74	10.709
47	21.530	61	14.864	75	10.448
48	20.953	62	14.486	76	10.194
49	20.396	63	14.119	77	9.949
50	19.854	64	13.762	78	9.710
51	19.330	65	13.416	79	9.477
52	18.821	66	13.078	80	9.250
53	18.327	67	12.752	81	9.030

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: CO_2 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: MA Temp Sensor
- 9 Flashes: RAM Fault
- 10 Flashes: ROM Fault
- 11 Flashes: EEPROM Fault

⚠WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury. When 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.

Compressor Inverter Drive

Refer to RT-SVD05*-EN (for VF-S15 inverters, refer to RT-SVD007*-EN) for compressor inverter drive troubleshooting information.

Unit Wiring Diagrams Numbers

Note: *Wiring diagrams can be accessed using e-Library by entering the diagram number in the literature order number search field or by contacting technical support.*

Table 10. Unit wiring diagram numbers

Schematic Type			Drawing Number	Description
Control	**ReliaTel™**	**230,460V**	4366-8317	Diagram Power TZC(036E, 048F, 60E)3 Ultra High Efficiency - Variable Speed Comp
			4366-8315	Diagram Power TZC(036E, 048F, 060E)4 Ultra High Efficiency - Variable Speed Comp
			1213-1645	Diagram Power - TZC060E3
			4366-8323	Diagram Controls TZC(036E, 048F, 060E) Ultra High Efficiency
			1213-1646	Diagram Control - TZC060E3
			4366-8504	Diagram Connection - TZC036E3
			4366-8505	Diagram Connection - TZC036E4
			4366-8506	Diagram Connection - TZC048F3
			4366-8507	Diagram Connection - TZC(048F,060E)4
			4366-8961	Diagram Connection - TZC060E3
			4366-8323	Diagram Controls - TZC(036E, 048F, 060E)
			1213-1646	Diagram Control - TZC060E3
		230,460,575V	1213-1928	Diagram Controls - TZC(072,090,102,120)F(3,4,W)
Power	**ReliaTel™**	**230, 460V**	1213-1923	Diagram Power - TZC(072,090,102,120)F(3,4)
			4366-8317	Diagram Power - TZC(036E, 048F, 60E)3
			4366-8315	Diagram Power - TZC(036E, 048F, 060E)4
			1213-1645	Diagram Power - TZC060E3
		575V	1213-1926	Diagram Power - TZC(072,090,102,120)FW
Connection	**ReliaTel™**	**230V**	1213-2073	Diagram Connection - TZC(072,090,102,120)F(3,4,W)
		230, 460V	4366-8504	Diagram Connection - TZC036E3
			4366-8505	Diagram Connection - TZC036E4
			4366-8506	Diagram Connection - TZC048F3
			4366-8507	Diagram Connection - TZC(048F,060E)4
			4366-8961	Diagram Connection - TZC060E3
		460,575V	1213-2076	Diagram Connection - TZC(072,090,102,120)F(3,4,W)
Gas Heat	**ReliaTel™**	**230,460,575V**	1213-2104	Diagram Label - TZC(072,090,102,120)F(3,4,W)

Limited Warranty

Electric Air Conditioner

TZC (Parts Only)

Models Less Than 20 Tons for Commercial Use*

This warranty is extended by Trane to the original purchaser and to any succeeding owner of the real property to which the Electric/ Electric Air Conditioner 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 Electric/ Electric Air Conditioner 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 at Warrantor designated shipping point, freight allowed to Buyer's city, 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-606-4800

* 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.

**A 5 year limited warranty is provided for the optional "Low Leak" economizer when combined with the additional FDD (Fault Detection & Diagnostics) option.

Trane and American Standard create comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit trane.com or americanstandardair.com.

RT-SVX45F-EN 02 Apr 2020
Supersedes RT-SVX45E-EN (Jan 2017)