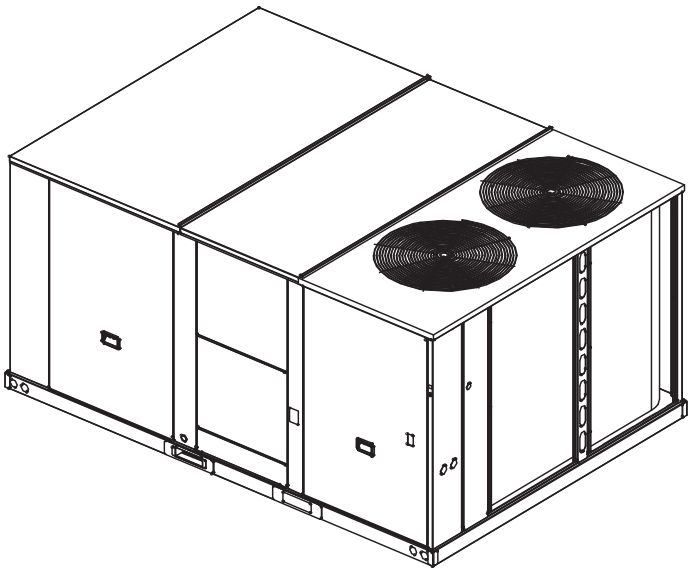
Installation, Operation, and Maintenance

Packaged Rooftop Air Conditioners
Foundation™ Electric/Electric
15 to 25 Tons, 60Hz



Model Numbers: EBC180-300

⚠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 2018 **RT-SVX50E-EN**

Ingersoll Rand

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

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

The three types of advisories are defined as follows:

⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.
NOTICE	Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

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

Important Responsible Refrigerant Practices

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

⚠WARNING

Proper Field Wiring and Grounding Required!

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

⚠WARNING

Personal Protective Equipment (PPE) Required!

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

⚠WARNING

Follow EHS Policies!

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

- **All Ingersoll Rand personnel must follow Ingersoll Rand Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. All policies can be found on the BOS site. Where local regulations are more stringent than these policies, those regulations supersede these policies.**
- **Non-Ingersoll Rand personnel should always follow local regulations.**

⚠WARNING

Proper Field Wiring and Grounding Required!

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

NOTICE:

Water Damage!

Non-factory penetrations through the base of this unit are not allowed. Any penetration in the base of the unit may affect the water tight integrity of the unit and lead to water leaks into the conditioned space. Failure to follow instructions could result in equipment and property damage.

Overview of Manual

Note: *One copy of this document ships inside the control panel of each unit and is customer property. It must be retained by the unit's maintenance personnel.*

This booklet describes proper installation, operation, and maintenance procedures for air cooled systems.

By carefully reviewing the information within this manual and following the instructions, the risk of improper operation and/or component damage will be minimized.

It is important that periodic maintenance be performed to help assure trouble free operation. A maintenance schedule is provided at the end of this manual.

Should equipment failure occur, contact a qualified service organization with qualified, experienced HVAC technicians to properly diagnose and repair this equipment.

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Revision Summary

- Updated 'Model Number Description', 'General Information', 'Dimensional Data', 'Factory-Mounted Unit Options', 'Start Up', and 'Installation' Sections.
- Added 'Sequence of Operation' to 'Start Up' Section.

Table of Contents

Model Number Description

Digit 1 — Unit Type
E = Packaged Cooling, Electric Heat

Digit 2 — Efficiency
B = ASHRAE 90.1 - 2013

Digit 3 — Airflow Configuration
C = Convertible

Digit 4, 5, 6 — Nominal Gross Cooling Capacity (MBh)
180 = 15 Tons
210 = 17½ Tons
240 = 20 Tons
300 = 25 Tons

Digit 7 — Major Design Sequence
A

Digit 8 — Voltage Selection
3 = 208-230/60/3
4 = 460/60/3
W = 575/60/3
K = 380/60/3[6]

Digit 9 — Unit Controls
E = Electromechanical

Digit 10 — Heating Capacity
0 = No Heat
G = 18 kW Electric Heat
N = 36 kW Electric Heat
P = 54 kW Electric Heat
R = 72 kW Electric Heat

Digit 11 — Minor Design Sequence

Digit 12, 13 — Service Sequence
00 = None

Digit 14 — Fresh Air Selection[3]
0 = No Fresh Air
A = Manual Outside Air Damper 0-25%
B = Motorized Outside Air Damper 0-50%
C = Economizer, Dry Bulb 0-100% without Barometric Relief[4]
D = Economizer, Dry Bulb 0-100% with Barometric Relief[1, 4]
E = Economizer, Reference Enthalpy 0-100% without Barometric Relief[4]
F = Economizer, Reference Enthalpy 0-100% with Barometric Relief[1, 4]
G = Economizer, Comparative Enthalpy 0-100% without Barometric Relief[4]
H = Economizer, Comparative Enthalpy 0-100% with Barometric Relief[1, 4]
J = Low Leak Economizer, Dry Bulb w/o Barometric Relief[4]
L = Low Leak Economizer, Reference Enthalpy w/o Barometric Relief[4]
N = Low Leak Economizer, Comparative Enthalpy w/o Barometric Relief[4]

Digit 15 — Supply Fan/Drive Type/Motor
0 = Standard Motor
1 = Oversized Motor[7]
7 = Multi-Speed Standard Motor
9 = Multi-Speed Oversized Motor

Digit 17 — Condenser Coil Protection
0 = Standard Coil
4 = CompleteCoat™ Condenser Coil

Digit 18 — Through The Base Provisions
0 = No Through The Base Provisions
A = Through The Base Electric

Digit 19 — Disconnect Switch
0 = No Disconnect
1 = Unit Mounted Non-Fused Disconnect Switch[2]

Digit 25 - System Monitoring Controls
0 = No Monitoring Controls
A = Condensate Drain Pan Overflow Switch

Digit 26
B = Economizer Fault Detection and Diagnostics (FDD)[5]

Model Number Notes

1. Some field set up required.
2. Must be ordered with Through-the-Base Electrical option.
3. All Factory Installed Options are Built-to-Order. Check order services for estimated production cycle.
4. Factory installed economizers only available in downflow configuration.
5. Fault Detection and Diagnostics (FDD) is available on Low Leak Economizers only.
6. Unit will operate reliably at 400VAC.
7. 10 hp oversized motor is factory installed only.

General Information

Unit Inspection

As soon as the unit arrives at the job site:

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

Precautionary Measures

⚠WARNING

Fiberglass Wool!

Product contains fiberglass wool. Disturbing the insulation in this product during installation, maintenance or repair will expose you to airborne particles of glass wool fibers and ceramic fibers known to the state of California to cause cancer through inhalation. You MUST wear all necessary Personal Protective Equipment (PPE) including gloves, eye protection, a NIOSH approved dust/mist respirator, long sleeves and pants when working with products containing 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.

- 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.

Storage

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

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

Note: *Do not use the unit's heater for temporary heat without first completing the start-up procedure detailed under "Start Up," p. 23.*

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

Unit Description

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

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

The stages of capacity control for these units are achieved by starting the Economizer Control Actuator (ECA).

Economizer Control Actuator Electromechanical 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 percent 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 in·lb of torque and is powered by 24 Vac.

JADE Economizer Control - Low Leak Economizer (LLE) Only

The JADE controller is a standalone economizer controller that provides outdoor air dry-bulb economizer control standard. With optional Sylk Bus sensors, the controller can provide comparative or reference enthalpy control. Dampers are controlled to an accuracy of ±3.2 percent of stroke. The actuator is spring returned to the closed position any time that power is lost to the actuator. It is capable of delivering up to 88 in·lb of torque and is powered by 24 Vac.

System Input Devices & Functions

The unit must have a thermostat input in order to operate. For units with Low Leak Economizer (LLE), the thermostat must be a smart thermostat as listed by the CEC (a list of thermostats can be found at http://www.energy.ca.gov/title24/equipment_cert/ocst/index.html).

The descriptions of the following basic input devices used within the unit are to acquaint the operator with their function as they interface with the various features.

Refer to the unit's electrical schematic for the specific device connections. The following controls are available from the factory for field installation.

Drain Pan Condensate Overflow Switch (Optional)

This input incorporates the Condensate Overflow Switch (COF) mounted on the drain pan. When the condensate level reaches the trip point, the COF relay energizes and opens the 24VAC control circuit, disabling the unit. A delay timer prevents the unit from starting for 3 minutes.

Phase Monitor

The Phase Monitor is a three-phase line monitor module that protects against phase loss, phase reversal and phase unbalance. It is intended to protect compressors from reverse rotation. It has an operating input voltage range of 190–600 Vac, and LED indicators for ON and FAULT. There are no field adjustments and the module will automatically reset from a fault condition.

Discharge Line Thermostat Control

The high pressure controls and discharge line thermostats are wired in series between the thermostat signal and the compressor contactors. If the high pressure control switch or the discharge line thermostat open, the 24VAC signal from the thermostat is interrupted and the compressor is disabled. There is no automatic lockout.

Power Exhaust Control (Optional)

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.

The setpoint panel is located in the return air section and is factory set at 25% (50% for LLE).

To configure the LLE controller, set EXH1 SET (or EXH1 L & EXH1 H with two-speed fan) in the SETPOINTS menu. 2-speed fan mode requires AUX2 I set as W.

Evaporator Frost Control

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

If this circuit is open before the compressor is started, the compressor will not be allowed to operate. Anytime this circuit is opened for 5 continuous seconds during compressor operation, the compressor for that circuit is immediately turned "Off". The compressor will not be allowed to restart for a minimum of 3 minutes should the FOS close.

Locking Safety Device with Anti-Short Cycle Timer

This device monitors compressor safety switch trips to prevent short cycling, protecting the compressor. A manual reset is required after a fourth safety switch trip.

Sensors

High Temperature Sensor (BAYFRST003*)

This sensor connects to the Emergency Stop Input on the LTB and provides high limit "shutdown" of the unit. The sensor is used to detect high temperatures due to fire in the air conditioning or ventilation ducts. The sensor is designed to mount directly to the sheet metal duct. Each kit contains two sensors. The return air duct sensor (X1310004001) is set to open at 135°F.

The supply air duct sensor (X1310004002) is set to open at 240°F. The control can be reset after the temperature has been lowered approximately 25°F below the cutout setpoint.

Thermostat (TCONT802AS32DA)

This thermostat is a multi-stage 3 heat/2 cool, auto-changeover digital display thermostat. It is a programmable thermostat, and a 7-day programmable stat with night setback shall be available. In addition, it is wall mounted.

Thermostat (TCONT402AN32DA)

This thermostat is a multi-stage 3 heat/2 cool, auto changeover digital display thermostat. It is a non-

programmable, wall-mounted thermostat, and it can be used for economizer operation.

CO_2 Sensor

This optional sensor can be added for Demand Control Ventilation (DCV) functionality.

On units with a low leak economizer, configure the JADE controller by setting the following parameters:

SETPOINTS Menu:

DCV SET = desired CO_2 ppm to start DCV

VENTMAX = desired maximum position w/DCV & occupied status (2-speed applications require LO & HI settings)

VENTMIN = desired minimum position w/DCV & occupied status (2-speed applications require LO & HI settings)

ADVANCED SETUP Menu:

CO2 ZERO = set to detector's start level

CO2 SPAN = detector's max level minus start level

Attach the sensor to the CO_2 and "R" terminals (at customer connections).

Note: *When using any 0-10 Vdc CO_2 sensor with the JADE you will need to set CO2 ZERO to 400 ppm and the CO2 SPAN to 1600 ppm in the ADVANCED SETUP menu.*

Occupancy Sensor

A customer-supplied occupancy sensor can also be added to provide damper control based on occupied/unoccupied conditions.

Low Leak Economizer Units

To configure the JADE controller, set:

SYSTEM SETUP menu: OCC = INPUT

Attach the occupancy sensor to the OCC SENSOR wire and "R" terminal (at customer connections). The occupancy sensor must utilize a normally open contact for proper operation.

If an occupancy sensor is not used, another option to controlling occupied and unoccupied status is to use the 'G' input (fan is running). Connect the G input to the OCC SENSOR wire (at customer connections). The controller will then operate in the occupied mode every time the indoor fan is running.

Initiation of Operating Modes - JADE Controller

The JADE controller is able to initiate the following modes: Compressor, Economizer, Fans, Heating System, and Cooling System.

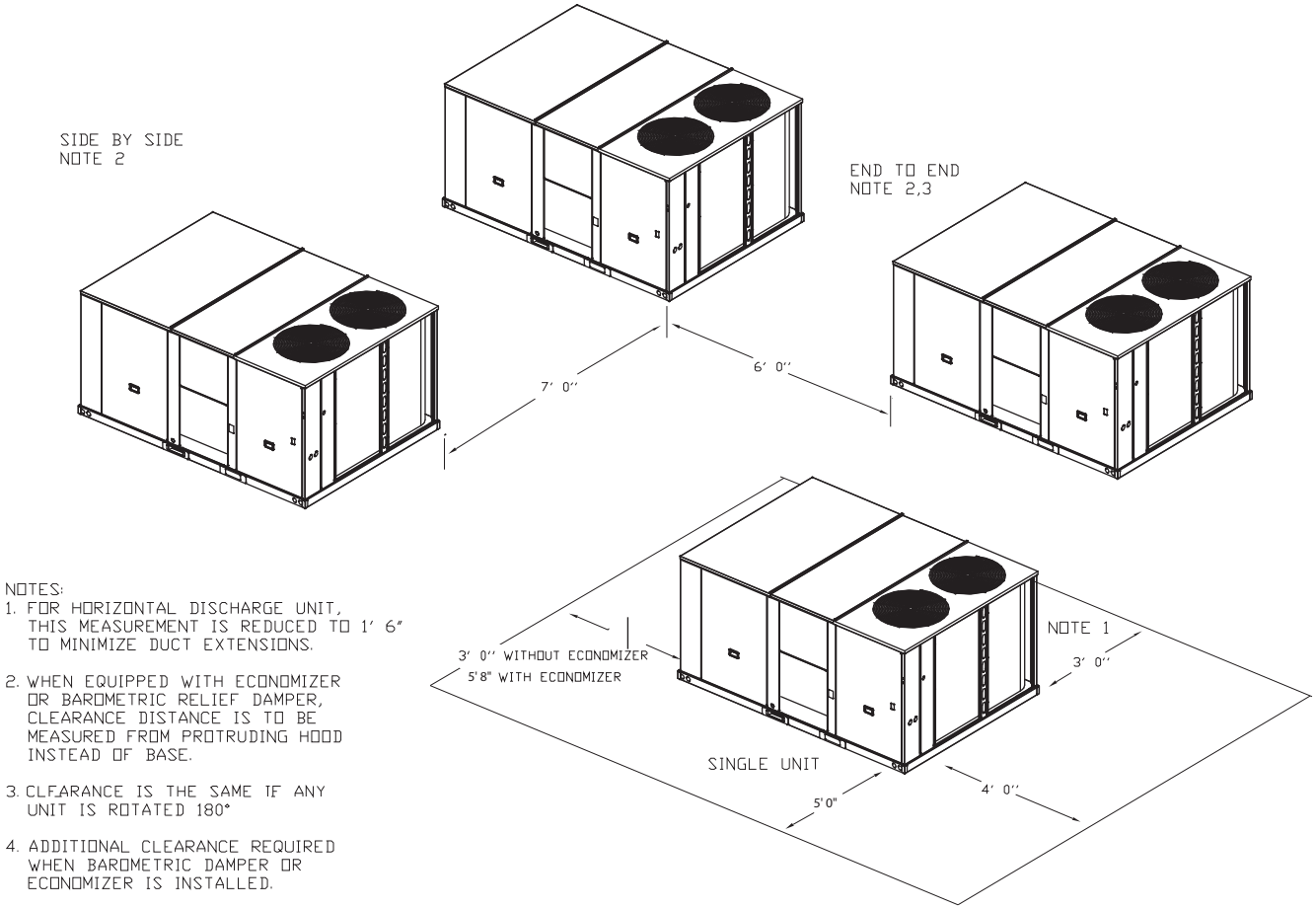
The Compressor mode is initiated by either the OAT going above the DRYBLB SET setting or by the thermostat initiating a call to cool when the damper is at 100% open. The Economizer mode is controlled by the MAT getting above the MAT SET setting while the OAT is below the DRYBLB SET setting. While the fans are not controlled by the controller, the Fan mode is dependent on what state the system is in (OCC or Y1 states will cause the damper to go to a LOW fan speed damper setting, while Y2 or W states will cause the controller to open the damper to the HIGH fan speed damper setting). The Heating System mode requires an input to the AUX2-1 terminal from the thermostat, and the Cooling System mode requires an input to the Y2 IN and/or the Y1 IN terminals from the thermostat.

Dimensional Data

Figure 1, p. 12 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 clearance for single and multiple unit applications



Dimensional Data

Figure 2. Cooling with optional electrical heat units — overview

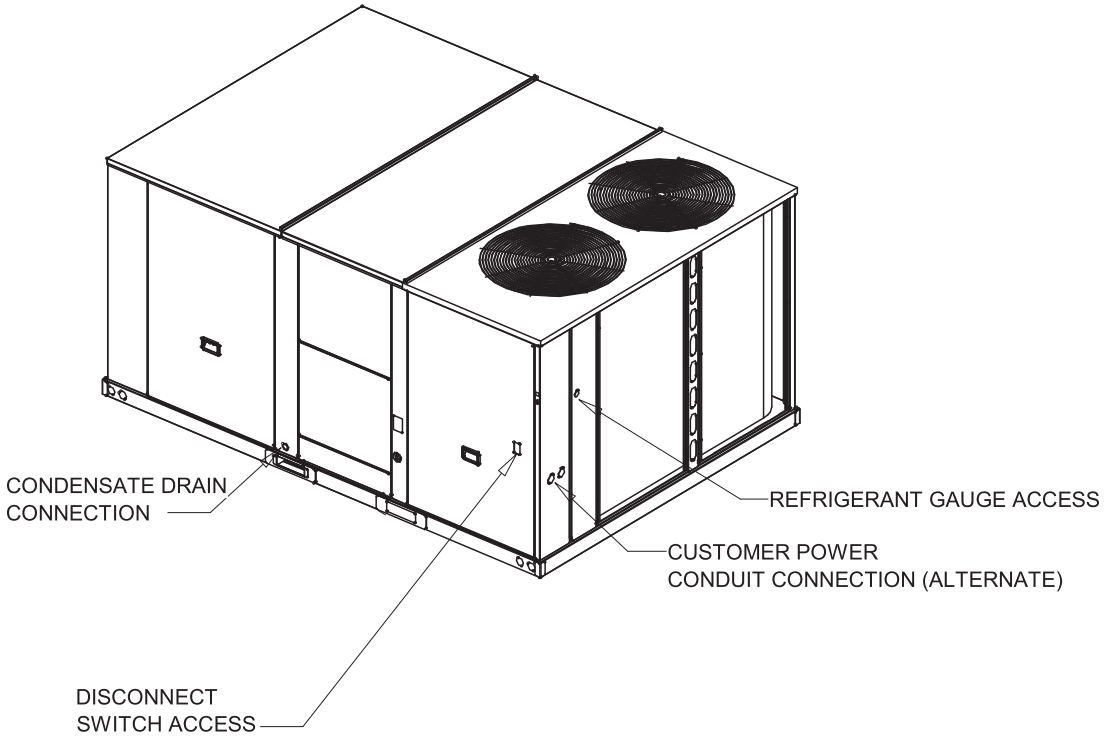
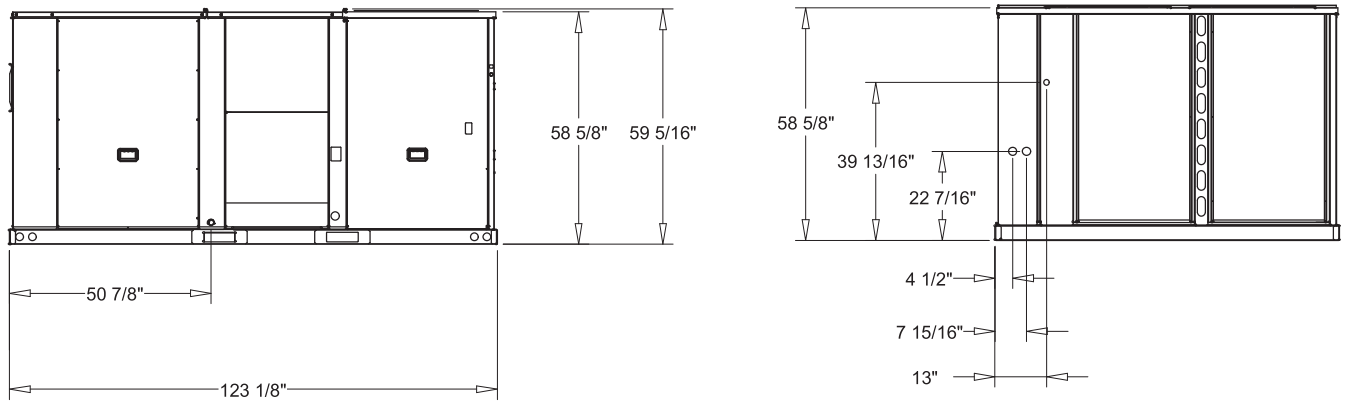
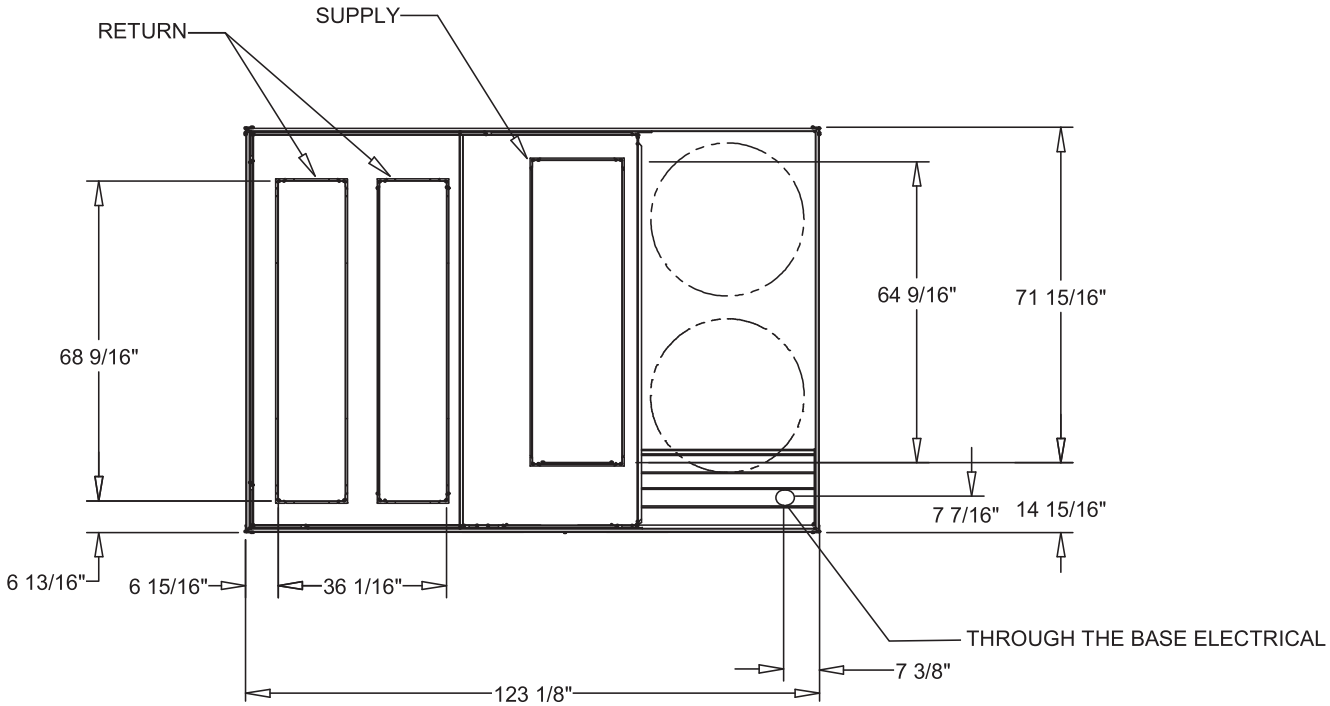


Figure 3. Cooling with optional electrical units — front & side views — 15–25 tons standard efficiency



NOTES:
1. THRU -THE -BASE ELECTRICAL IS NOT STANDARD ON ALL UNITS.
2. VERIFY WEIGHT, CONNECTION, AND ALL DIMENSION WITH INSTALLER DOCUMENTS BEFORE INSTALLATION

Figure 4. Cooling with optional electrical heat units — plan view — 15–25 tons standard efficiency



NOTES:
1. THRU -THE -BASE ELECTRICAL IS NOT STANDARD ON ALL UNITS.
2. VERIFY WEIGHT, CONNECTION, AND ALL DIMENSION WITH INSTALLER DOCUMENTS BEFORE INSTALLATION

Figure 5. Foundation units — back view (horizontal configuration) — 15–25 tons standard efficiency

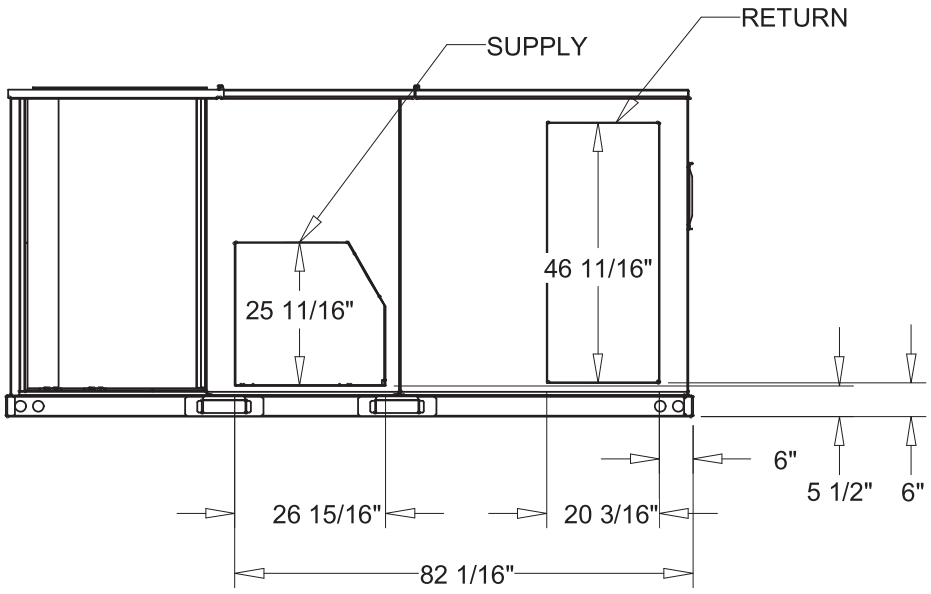


Figure 6. Roof curb —15–25 tons standard efficiency

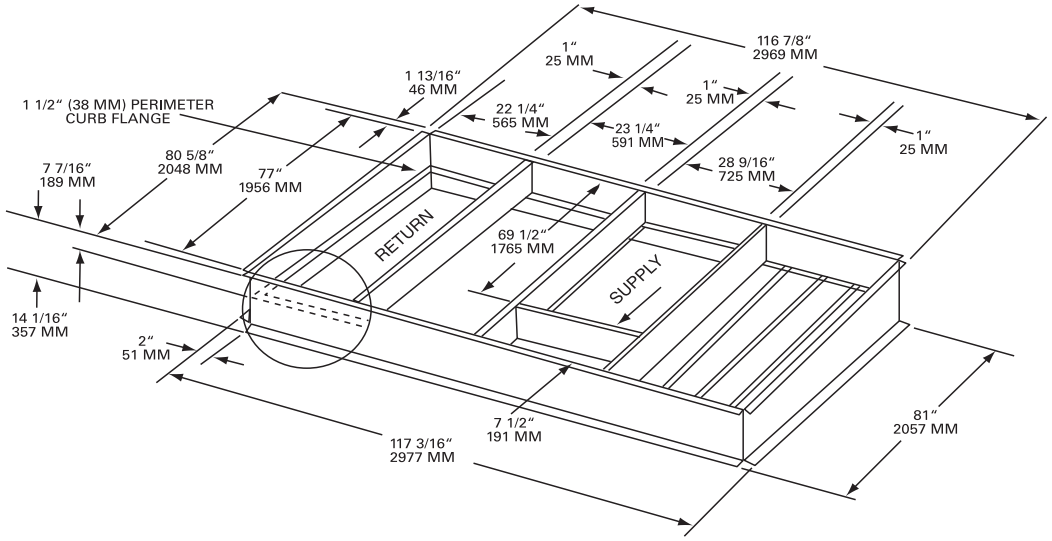
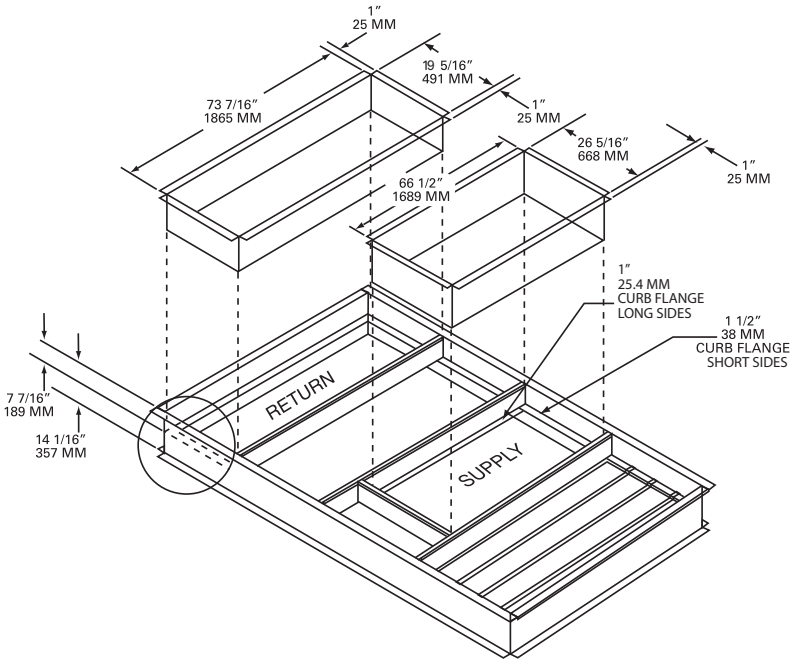


Figure 7. Downflow duct connections—field fabricated 15–25 tons standard efficiency



Notes:

- *Duct flanges mount 7-7/16" down inside the curb on the 1-1½" curb flanges.*
- *Roofcurb is intended for downflow use only.*

Figure 8. Downflow unit clearance — 15–25 tons standard efficiency

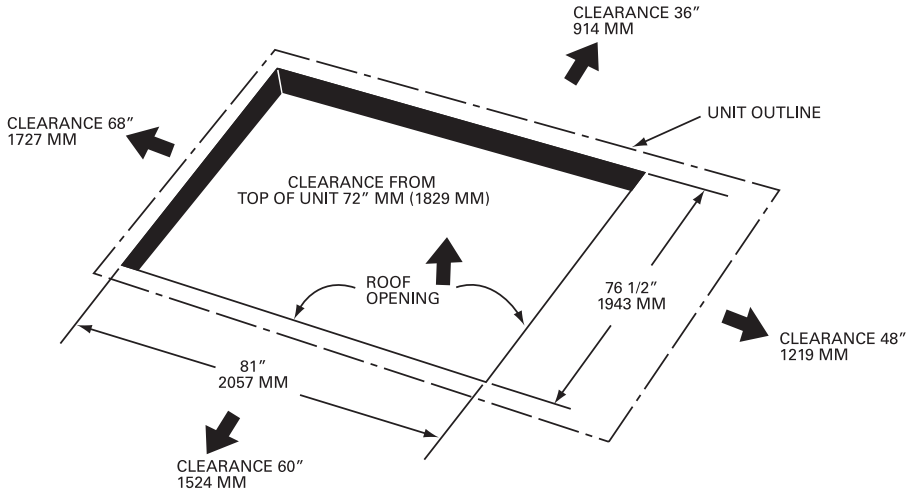
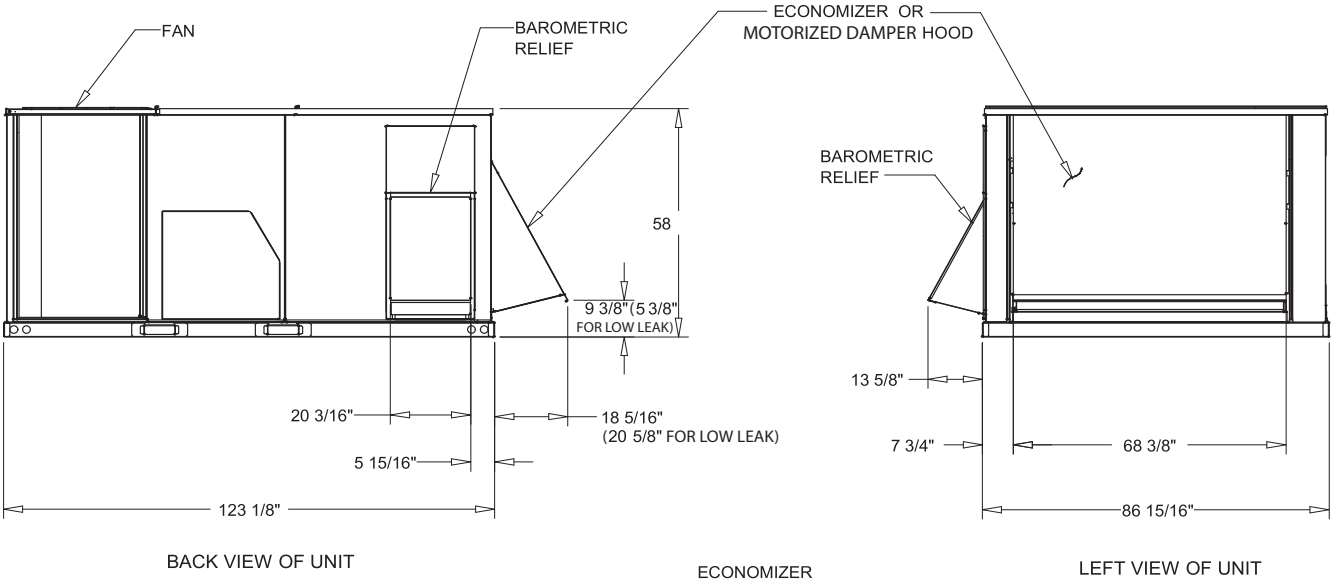
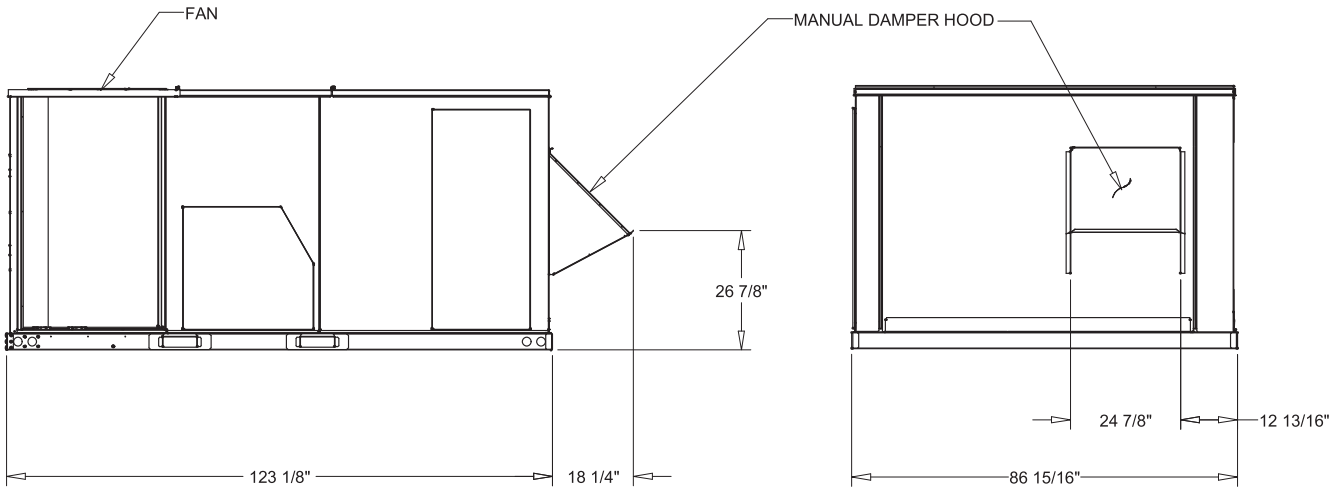


Figure 9. Barometric relief and economizer— 15–25 tons standard efficiency



NOTES:
1. VERIFY WEIGHT, CONNECTION, AND ALL DIMENSION
   WITH INSTALLER DOCUMENTS BEFORE INSTALLATION
2. BAROMETRIC RELIEF IS FOR USE WITH A DOWNFLOW ECONOMIZER ONLY

Figure 10. Manual damper — 15–25 tons standard efficiency



NOTE :
1. VERIFY WEIGHT, CONNECTION, AND ALL DIMENSION
   WITH INSTALLER DOCUMENTS BEFORE INSTALLATION

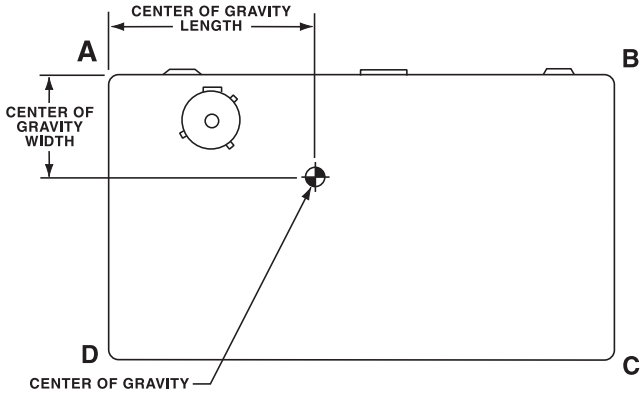
Unit Weights

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

Tons	Unit Model No.	Weights (lb)[a], [b]		Corner Weights[c]				Center of Gravity (in.)	
		Shipping	Net	A	B	C	D	Length	Width
15	EBC180	2146	1826	621	475	365	365	56	37
17½	EBC210	2155	1835	624	477	367	367	55	37
20	EBC240	2180	1860	632	484	372	372	55	37
25	EBC300	2206	1886	641	490	377	377	55	36

(a) Weights are approximate. Horizontal and downflow unit and corner weights may vary slightly.
(b) Weights do not include additional factory or field installed options/accessories.
(c) Corner weights are given for information only. 15–25 ton models must be supported continuously by a curb or equivalent frame support.

Figure 11. Corner weights



Rigging

⚠WARNING

Heavy Objects!

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

⚠WARNING

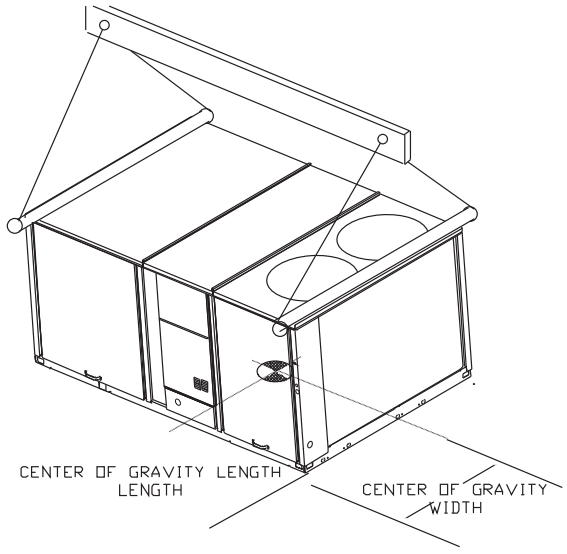
Improper Unit Lift!

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

Refer to Figure 12 and Table 1 for typical unit operating weights rigging before proceeding.

1. Remove the shipping crate from around the unit. Do not remove the crating from the top of the unit.
2. Rig the unit as shown in Figure 12, p. 15. 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.
3. Install a lifting bar, as shown in Figure 12, 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.
4. Test-lift the unit to ensure it is properly rigged and balanced, make any necessary rigging adjustments.
5. Lift the unit and position it into place.
6. 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.

Figure 12. Rigging and center of gravity data



Installation

Unit Foundation

⚠WARNING

Risk of Roof Collapsing!

Confirm with a structural engineer that the roof structure is strong enough to support the combined weight of the roofcurb and the unit. Refer to "Unit Weights," p. 15 for typical unit and curb weights. Failure to ensure proper structural roof support could cause the roof to collapse, which could result in death or serious injury and property damage.

NOTICE:

Water Damage!

Non-factory penetrations through the base of this unit are not allowed. Any penetration in the base of the unit may affect the water tight integrity of the unit and lead to water leaks into the conditioned space. Failure to follow instructions could result in equipment and property damage.

Horizontal Units

Notes:

- *For complete step by step instructions on how to install a Horizontal Conversion Kit, please refer to ACC-SVN159*-EN.*
- *For units with optional Condensate Overflow Switch (COF), the switch will not work properly if unit is not level or slightly sloped toward switch.*
- *To assure proper condensate flow during operation the unit and the curb must be level.*

If the unit is installed at ground level, elevate it above the snow line. Provide concrete footings at each support location with a "full perimeter" support structure or a slab foundation for support. Refer to Table 1, p. 15 for the unit's operating and point loading weights when constructing a footing foundation.

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

For rooftop applications, 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

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.

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

If a Curb Accessory Kit is not used:

a. The ductwork can be attached directly to the factory-provided flanges around the unit's supply and return air openings. Be sure to use flexible duct connections at the unit.

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

General Unit Requirements

⚠WARNING

Proper Field Wiring and Grounding Required!

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

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 nameplate.
- Verify that the installation location of the unit will provide the required clearance for proper operation.
- Assemble and install the roof curb (if applicable). Refer to the latest edition of the curb installers guide that ships with each curb kit.
- Fabricate and install ductwork; secure ductwork to curb.
- Rigging the unit.
- Set the unit onto the curb; check for levelness.

- Ensure unit-to-curb seal is tight and without buckles or cracks.
- Install and connect a condensate drain line to the evaporator drain connection.

Factory Installed Economizer

- Ensure the economizer has been pulled out into the operating position. Refer to the standard or low leak economizer Installation Instructions for proper position and setup.
- Install all access panels.

Controller Wiring Schematic - LLE

For additional information, go to the Installation Instructions ACC-SVN178*-EN.

Main Electrical Power Requirements

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

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

Note: *This procedure applies only to medium and high heat options, not to the low heat option.*

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 and 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

An evaporator condensate drain connection is provided on each unit. Refer to "Unit Dimensions," p. 12 for the appropriate drain location.

Note: *Use 1" PVC pipe to connect to the drain pan outlet provided in the unit. This is a slip fit joint (no threads) and can be sealed using PVC Cement or other suitable adhesive.*

A condensate trap must be installed at the unit due to the drain connection being on the "negative pressure" side of the fan.

A condensate drain line must be connected to the P-Trap. Pitch the drain lines at least ½-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".

Filter Installation

Each unit ships with 2-inch filters installed. 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

An overall dimensional layout for the standard field installed wiring entrance into the unit is illustrated in "Unit Dimensions," p. 12. To insure that the unit's supply power wiring is properly sized and installed, follow the guidelines outlined below.

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

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

NOTICE:

Use Copper Conductors Only!

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

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

Main Unit Power

⚠ WARNING

Proper Field Wiring and Grounding Required!

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

Standard Wiring

The electrical service must be protected from over current and short circuit conditions in accordance with NEC requirements.

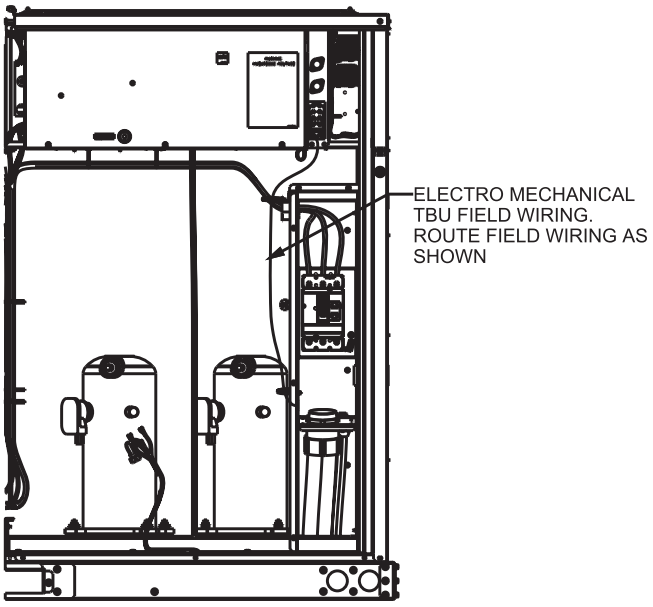
Protection devices must be sized according to the electrical data on the nameplate.

- If the unit is not equipped with an optional factory installed nonfused disconnect switch, a field supplied disconnect switch must be installed at or near the unit in accordance with the National Electrical Code (NEC latest edition).
- Location of the applicable electrical service entrance is illustrated in "Unit Dimensions," p. 12. Complete the unit's power wiring connections onto either; the main terminal block HTB1 inside the unit control panel, the factory mounted nonfused disconnect switch (UCD), or the electric heat terminal block. Refer to the customer connection diagram that 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 nonfused disconnect switch (UDC).
- Provide proper grounding for the unit in accordance with local and national codes.

Figure 13. Through the base electrical option



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 50VA are equipped with internal circuit breakers. If a circuit breaker trips, turn "Off" all power to the unit before attempting to reset it.

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

Controls using 24 Vac

Before installing any connecting wiring, refer to "Unit Dimensions," p. 12 for the electrical access locations provided on the unit and Table 2, p. 19 for AC conductor sizing guidelines.

NOTICE:

Use Copper Conductors Only!

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

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

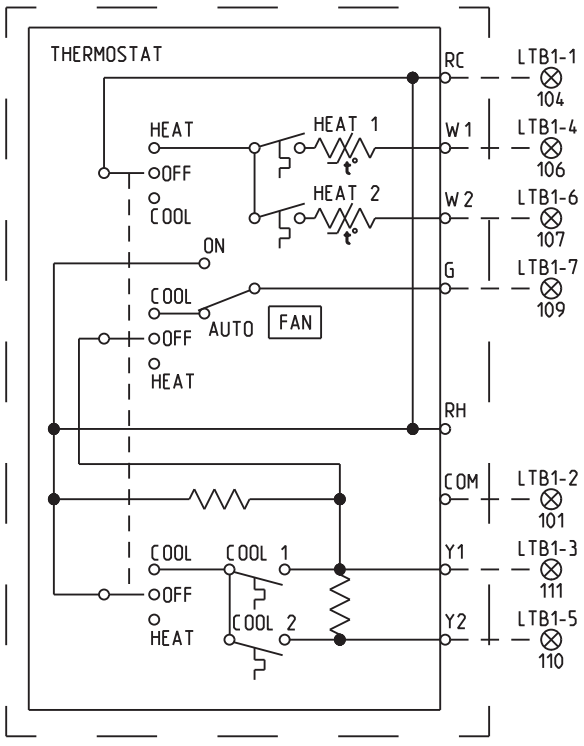
Note: *Resistance in excess of 3 ohms per conductor could cause component failure due to insufficient AC voltage supply.*

3. Be sure to check all loads and conductors for grounds, shorts, and mis-wiring.
4. Do not run the AC low voltage wiring in the same conduit with the high voltage power wiring.
5. Route low voltage wiring per illustrations on the next page.

Table 2. Electromechanical thermostat 24V AC conductors with electromechanical unit

Distance from Unit to Control	Recommended Wire Size
0 - 30 feet	22 gauge
0 - 9.1 m	.33 m2
31 - 50 feet	20 gauge
9.5 - 15.2 m	.50m2
51 - 75 feet	18 gauge
15.5 - 22.9 m	.75 m2
76 - 125 feet	16 gauge
23.1 - 38.1 m	1.3 m2
126 - 200 feet	14 gauge
38.4 - 60.9 m	2.0 m2

Figure 14. Conventional thermostat field wiring diagram



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 percent. Measure and record the voltage between phases 1, 2, and 3 and calculate the amount of imbalance as follows:

% Voltage Imbalance =

$$\frac{100 \text{ X AV - VD}}{\text{AV}}$$ where;

AV (Average Voltage) =

$$\frac{\text{Volt 1 + Volt 2 + Volt 3}}{3}$$

- 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:

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

The 2.2 percent imbalance in this example exceeds the maximum allowable imbalance of 2.0 percent. This much imbalance between phases can equal as much as a 20 percent current imbalance with a resulting increase in motor winding temperatures that will decrease motor life.

If the voltage imbalance is over 2 percent, 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!

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

- Turn the field supplied disconnect switch that provides power to the main power terminal block or to the "Line" side of the optional factory mounted disconnect switch to the "Off" position.
- Connect the phase sequence indicator leads to the terminal block or to the "Line" side of the optional factory mounted disconnect switch as follows;

  Black (phase A) to L1

  Red (phase B) to L2

  Yellow (phase C) to L3
- Close the field supplied main power disconnect switch or circuit protector switch that provides the supply power to the unit.

⚠WARNING

Live Electrical Components!

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

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

Compressor Crankcase Heaters

NOTICE:

Compressors Failure!

Unit must be powered and crankcase heaters energized at least 8 hours BEFORE compressors are started. This will protect the compressors from premature failure.

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.

Checklist

Use the following checklist in conjunction with the general checklist ("General Unit Requirements," p. 16) to ensure that the unit is properly installed and ready for operation.

⚠WARNING

Hazardous Voltage!

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

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

Factory-Mounted Unit Options

Unit Disconnect (FIYUDC)

⚠WARNING

Hazardous Voltage w/Capacitors!

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

For additional information regarding the safe discharge of capacitors, see PROD-SVB06-EN*

⚠WARNING

Proper Field Wiring and Grounding Required!

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

Important: *All phases of this installation must comply with NATIONAL, STATE, and LOCAL CODES. In addition to local codes, the installation must comply with National Electric Code - ANSI/NFPA NO. 70 LATEST REVISION.*

1. Field connections are made by first removing the compressor access panel on the front of the unit. Unscrew the assembly around the outside of the disconnect switch. This assembly is located in the condenser section of the unit.

   For down flow configurations, the hole in the base section is for both high and low voltage power wiring on down flow units. Horizontal units will route through the holes in the front corner post where the disconnect enclosure is mounted. The hole is sized for 1 1/2" conduit.

2. If the conduit required for your application is larger, remove the termination plate and connect to the larger hole using field supplied reducing washers.

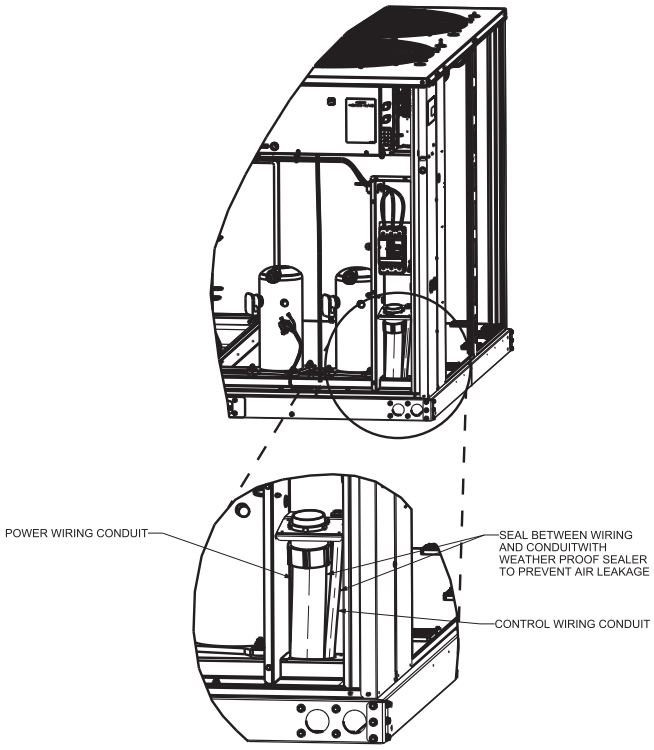
3. Route the power wires and ground conductor through conduit and into the bottom of the factory installed disconnect switch. Connect the power conductors to the lugs provided. Connect the ground wire to the unit ground lug.

   Note: *Wire size for the length of run should be determined using the circuit ampacity found on the unit nameplate and the N.E.C.*

4. Route low voltage (class II), control wiring through hole in base of unit but not through high voltage conduit. Feed control wiring through bushing provided on side panel. Route wires through loose wire ties provided.

5. Tighten the wire ties. Secure the excess wire bundle under the wire ties in the outdoor section. Do not leave excess wire in the electrical enclosure. Use the unit wiring diagram to make the low voltage connections.

Figure 15. Field wiring route



Pre Start

Verifying Proper Air Flow (Units with Belt Drive Indoor Fan)

Much of the systems performance and reliability is closely associated with, and dependent upon having the proper airflow supplied both to the space that is being conditioned and across the evaporator coil.
The indoor fan speed is changed by opening or closing the adjustable motor sheave.
Before starting the SERVICE TEST, set the minimum position setpoint for the economizer to 0% using the setpoint potentiometer located on the Economizer Control (ECA), if applicable.

Electromechanical Controls Test Procedure

See unit schematic for correct wire numbers.

Fan Test and Minimum Ventilation. Connect red thermostat wire (R) to black thermostat wire (G).

Economizer Cooling. Connect a jumper wire across OAT on Economizer Control (ECA).

Connect red thermostat (R) wire to yellow thermostat wire (Y1).

Cool 1. Connect red thermostat wire (R) to yellow thermostat wire (Y1).

Cool 2. Connect red thermostat wire (R) to yellow thermostat wire (Y2).

Heat 1. Connect red thermostat wire (R) to brown thermostat wire (W1).

Heat 2. Connect red thermostat wire (R) to brown thermostat wire (W2).

Start Up

Sequence Of Operation

These units are offered with electromechanical controls.

Note: *The Condensate Overflow Switch (COF) (optional) will shut the unit down if the float is raised and the switch is closed.*

Electromechanical Control Cooling without an Economizer

When the thermostat switch is set to the "Cool" position and the zone temperature rises above the cooling setpoint, the thermostat Y contacts close. The compressor contactor (CC1) coil is energized provided the low pressure control (LPC1), high pressure control (HPC1) and discharge line thermostat (DLT 1) are closed. When the (CC1) contacts close, compressor (CPR1) and both outdoor fan motors (ODM1 and ODM2) start. If the first stage of cooling cannot satisfy the cooling requirement, the thermostat closes Y2. The compressor contactor (CC2) coil is energized provided the low pressure control (LPC2), high pressure control (HPC2) and discharge line thermostat (DLT 2) are closed.

When the (CC2) contacts close, compressor (CPR2) starts.

Electromechanical Controls - Standard Economizers

Electromechanical Control Evaporator Fan Operation (for Gas Units)

When the thermostat fan selection switch is set to the "Auto" position, the Ignition Module (IGN) energizes the indoor fan relay (F) approximately 1 second after energizing the compressor contactor coil (CC1) in the cooling mode. In the heating mode, the Ignition Module (IGN) energizes the indoor fan relay (F) coil approximately 45 second after gas ignition. Closing indoor fan relay (F) coil starts the indoor fan motor (IDM). The (IGN) de-energizes the fan relay (F) approximately 80 seconds after the cooling requirement has been satisfied to enhance unit efficiency.

When the heating cycle is terminated, the indoor fan relay (F) coil is de-energized approximately 90 seconds after the heating requirement.

When the thermostat fan selection switch is set to the "On" position, the (IGN) keeps the indoor fan relay coil (F) energized for continuous fan motor operation.

Electromechanical Control Evaporator Fan Operation (for Cooling Only Units)

When the thermostat fan selection switch is set to the "Auto" position, the thermostat energizes the indoor fan relay coil (F) to start the indoor fan motor (IDM).The fan relay (F) de-energizes after the cooling requirement has been satisfied. When the heating cycle is terminated, the indoor fan relay (F) coil is de-energized with heater contactors.

When the thermostat fan selection switch is set to the "On" position, the thermostat keeps the indoor fan relay coil (F) energized for continuous fan motor operation.

Economizer Set-Up

Adjusting the minimum position potentiometer located on the unit economizer module (RTEM-EM) sets the required amount of ventilation air.

Ambient temperature is controlling the economizing cycle by sensing the outside air dry bulb temperature. Table 3, p. 23 lists the selectable dry bulb values by potentiometer setting.

Table 3. Potentiometer settings

Potentiometer Setting	Dry Bulb	Enthalpy
A	27 Btu/lb (63 kJ/kg)	73°F(22.8°C)
B	25 Btu/lb (58 kJ/kg)	70°F (21.1°C)
C[(a)]	23 Btu/lb (53 kJ/kg)	67°F (19.4°C)
D	22 Btu/lb (51 kJ/kg)	63°F (17.2°C)
E	19 Btu/lb (44 kJ/kg)	55°F (12.8°C)

(a) Factory setting

Electromechanical Control Cooling with an Economizer

The economizer is utilized to control the zone temperature providing the outside air conditions are suitable. Outside air is drawn into the unit through modulating dampers.

When cooling is required and economizing is possible, the unit economizer module (RTEM-EM) opens the economizer damper. The RTEM-EM continues to modulate the economizer damper open/closed to keep the mixed air temperature in the 50°F to 55°F range.

The thermostat will close the Y2 contacts to turn on contactor (CC1) if mechanical cooling is required.

If economizing is not possible, the RTEM-EM drives the damper to the minimum position setpoint when the indoor fan relay (F) is energized and allows mechanical cooling operation.

Electromechanical Control Heating Operation (Units with Electric Heat)

When the system switch is set to the "Heat" position and the zone temperature falls below the heating setpoint, the thermostat closesW1 contacts the first stage electric heat contactor (AH or AH & CH) is energized. If the first stage of electric heat cannot satisfy the heating requirement, the thermostat closes W2.

When the W2 contacts close, the second stage electric heat contactor (BH or BH & DH) is energized, if applicable. The thermostat cycles both the first and second stages of heat

"On" and "Off" as required to maintain the zone temperature setpoint.

Electromechanical Control Heating Operation (for Gas Units)

When the system switch is set to the "Heat" position and the zone temperature falls below the heating setpoint, the Ignition module (IGN) initiates a heat cycle.

Ignition Module Low, Medium and High Heat

Two-stage (IGN) runs self-check (including verification that the gas valve is de-energized). (IGN) checks the high-limit switches (TC01 &TC02) for normally closed contacts, the pressure switch (PS) for normally open contacts, and the flame rollout (FR) switch for continuity. (IGN) energizes inducer blower on high speed to check pressure switch closure. If the pressure switch is closed, the inducer blower starts a 20 second pre-purge (15 seconds on high speed followed by 5 seconds on low speed).

If the pressure switch (PS) is still open, the inducer blower will continue to be energized on high speed until pressure switch closure.

After pre-purge completes, the (IGN) energizes the first stage of the gas valve, initiates spark for 2 seconds minimum, 7 seconds maximum (ignition trial) and detects flame and de-energizes spark. From this point, a fixed 45 second indoor blower delay on timing starts.

After the indoor blower delay on is completed, the (IGN) energizes the indoor blower. The (IGN) enters a normal operating loop where all inputs are continuously monitored. If the first stage of gas heat cannot satisfy the heating requirement, the thermostat closes W2. The (IGN) energizes the second stage of the gas valve and the second stage of inducer blower.

When the zone thermostat is satisfied, the (IGN) de-energizes the gas valve. The (IGN) senses loss of flame. The (IGN) initiates a 5 second inducer blower post purge and 90 second indoor blower delay off at current speed. The (IGN) de-energizes the inducer blower at the end of the post purge. The (IGN) de-energizes the indoor blower at the end of the selected indoor blower delay off.

Table 4. Ignition module diagnostics

Steady light	Module is powered up, but no active call for heat.
Blinking at continuous steady rate	Active call for heat.
One blink	Loss of communication.
Two blinks	System lockout (failure to ignite, no spark, low/ no gas pressure, etc.)
Three blinks	Pressure switch (no vent air flow, bad CBM, closed at initial call for heat). Auto reset.
Four blinks	High limit (excessive heat in combustion chamber, low airflow). Auto reset.
Five blinks	Flame sensed and gas valve not energized or flame sensed and no call for heat.
Six blinks	Flame rollout (CBM failure, incorrect gas pressure, and incorrect primary air). Requires manual reset of the switch.
Seven blinks	W1& W2 swapped (electromechanical 3-10 tons units).

Drain Pan Condensate Overflow Switch (Optional)

The Condensate Overflow Switch (COF) is utilized to prevent water overflow from the drain pan. The float switch is installed on the corner lip of the drain pan. When the condensate level reaches the trip point, the COF relay energizes and opens the 24VAC control circuit which disables the unit. Once the 24VAC control circuit is opened, a delay timer will prevent unit start-up for three minutes.

Low Ambient Operation (Optional)

During low ambient operation, outside air temperature below 50°F, the Low Ambient Controller will cycle the outdoor fan motor "Off" and "On" based on discharge pressure. The indoor fan motor (IDM) will continue to operate and the outdoor fan will return to normal operation once the ambient temperature is above 50°F.

10 Horsepower Motor Overload

10HP indoor fan motors are not internally protected. For proper protection, ensure the adjustable dial on the front of the overload (located in the control box) is set to the nameplate FLA value of the indoor motor.

Two-Speed Indoor Fan Control

For units equipped with two-speed indoor fan control, standard unit operation for cooling and heating will continue and all unit functions will operate normally, except for the control of the indoor fan speed. All units configured with any type of heating will heat the supply air and space as normal utilizing full speed indoor fan by energizing the appropriate outputs. The two-speed indoor fan unit will only utilize two speeds during the cooling operation modes described below.

Cooling Operation

For cooling operation, the unit will operate at Low Fan Speed during Fan Only, Economizer Only, and the first stage of compressor unit modes by Default. When the unit receives a call for cooling, if the economizer is enabled, the unit will energize the associated Low Speed output and begin to modulate the OA Damper open above minimum position up to 100% as necessary. By default, the supply fan will remain at low speed for the duration of Economizer-Only cooling. If the supply fan is on when the first stage compressor is energized, it will remain energized or energize at low speed for the duration of Cool 1.

When there is a call for Cool 2, the second compressor is energized and the Supply Fan will switch to High Speed.

The unit will stage down compressors for cooling in reverse order that they were staged and the supply fan will follow the unit mode transitions. Once it is determined through normal cooling control that the second compressor is no longer necessary to meet cooling demand, the second compressor will be staged back and the supply fan will switch to Low Speed until the unit stages all cooling off or receives a call for Cool 2 again. Once the Supply Fan is no longer requested ON after a Cooling call is cleared, the Supply Fan will remain energized at Low Speed for 60 seconds as on traditional units.

If the economizer is enabled and is being utilized as the first stage of cooling (Y1 active), if the unit receives a Y2 request, the unit will energize the first compressor and will switch the supply fan to high speed until the Y2 request is cleared.

Economizer Minimum Position Handling for 2-Speed Fan

Due to the low and high speeds of the indoor fan, when the unit is in Fan Only, Cool 1, or Economizer Only and the indoor fan is at low speed, the unit will not be bringing in as much fresh air as normal. By setting a higher minimum damper position this problem could be solved, but that would mean more fresh air than may be desired when the supply fan is at high speed. To overcome these situations, the control will require the setting of two economizer minimum positions to be used when the fan is at low and high speed to compensate for the lower amount of fresh air at lower fan speeds and the potential for more fresh air than desired at higher fan speeds. These minimum positions will be obtained from the Bldg Design Min Position and DCV Min Position pots on the RTEM-EM. The economizer minimum position that will be utilized while the supply fan is at low speed will be set with the DCV Min Position pot with a range of 0-100% and the minimum position that will be utilized while the supply fan is at high speed will be set with the Building Design Min Position pot with a range of 0-50%. If the Building Design Min Position is set to be higher than the DCV Min Position, the setpoints will be capped at the DCV Min Position and the setpoint for the min position at low and high fan speed will be the DCV Min Position.

Phase Monitor

The phase monitor is a 3 phase line monitor module that protects against phase loss, phase reversal and phase unbalance. It is intended to protect compressors from reverse rotation. It has an operating input voltage range of 190-600 VAC, and LED indicators for ON and FAULT. There are no field adjustments and the module will automatically reset from a fault condition.

Low Pressure Cutout

The low pressure cutouts are wired in series with the high pressure cutouts and the temperature discharge limits. If this circuit is open before a compressor is started, the compressor in that circuit will not be allowed to operate.

Anytime this circuit is opened, the compressor in that circuit is turned off immediately.

High Pressure Cutout and Temperature Discharge Limit

The high pressure controls and temperature discharge limit are wired in series between the compressor outputs on the LTB and the compressor contactors. If the high pressure safety or temperature discharge limit opens, the compressor on the affected circuit is turned off.

Locking Safety Device with Compressor Anti Short Cycle Timer

This device monitors compressor safety switch trips to prevent short cycling, protecting the compressor. A manual reset is required after a fourth safety switch trip.

Coil Frost Protection

The Frostat™ control monitors the evaporator coil temperature to prevent the evaporator from freezing due to low operating temperatures whenever there is a demand for cooling. When a open circuit has occurred, the Frostat opens the 24VAC ground and opens all of the cooling contactors.

Heating Operation

Standard unit operation for heating will continue on units equipped with a two-speed indoor fan. During heat mode, all units configured with staged electric or gas heat will heat the supply air and space as normal utilizing full speed indoor fan.

Emergency Stop

This input de-energizes the 24VAC output from the phase monitor and can be activated by opening a field supplied device connected to the LTB.

Jade Controls - Low Leak Economizer

Sequence of Operation

Table 5. Dry bulb operation no DCV (CO_2 sensor) - 1 speed fan

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
None	No	Off	Off	High	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	High	24-v/On	0-v/Off	MIN POS	Closed
		On	On	High	24-v/On	24-v/On	MIN POS	Closed
None	Yes	Off	Off	High	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	High	0-v/Off	0-v/Off	MIN POS to Full- Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	MIN POS to Full- Open	Closed to Full-Open

(a) With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 -O after the delay if the call for Y1-I and Y2-I have not been satisfied.

Table 6. Dry bulb operation with DCV (CO_2 sensor) - 1 speed fan

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
Below CO2 set	No	Off	Off	High	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	High	24-v/On	0-v/Off	VENTMIN	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN	Closed
	Yes	Off	Off	High	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN to Full- Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	VENTMIN to Full- Open	Closed to Full-Open
Above CO2 set	No	Off	Off	High	0-v/Off	0-v/Off	VENTMIN to VENTMAX	Closed
		On	Off	High	24-v/On	0-v/Off	VENTMIN to VENTMAX	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN to VENTMAX	Closed
	Yes	Off	Off	High	0-v/Off	0-v/Off	VENTMIN to VENTMAX	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN to Full- Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	VENTMIN to Full- Open	Closed to Full-Open

(a) With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 -O after the delay if the call for Y1-I and Y2-I have not been satisfied.

Table 7. Enthalpy operation no DCV (CO_2 sensor) - 1 speed fan

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
None	No	Off	Off	High	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	High	24-v/On	0-v/Off	MIN POS	Closed
		On	On	High	24-v/On	24-v/On	MIN POS	Closed
None	Yes	Off	Off	High	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	High	0-v/Off	0-v/Off	MIN POS to Full- Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	MIN POS to Full- Open	Closed to Full-Open

(a) With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 -O after the delay if the call for Y1-I and Y2-I have not been satisfied.

Table 8. Enthalpy operation with DCV (CO_2 sensor) - 1 speed fan

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
Below set	No	Off	Off	High	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	High	24-v/On	0-v/Off	VENTMIN	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN	Closed
	Yes	Off	Off	High	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN to Full- Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	VENTMIN to Full- Open	Closed to Full-Open
Above set	No	Off	Off	High	0-v/Off	0-v/Off	VENTMIN to VENTMAX	Closed
		On	Off	High	24-v/On	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H to VENTMAX	Closed
	Yes	Off	Off	High	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN to Full- Open	Closed to Full-Open
		On	On	High	DELAY (b) 24-v/On	0-v/Off[a]	VENTMIN to Full- Open	Closed to Full-Open

(a) With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 -O after the delay if the call for Y1-I and Y2-I have not been satisfied.

Table 9. Dry bulb operation no DCV (CO_2 sensor) - 2 speed fan

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
None	No	Off	Off	Low	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	24-v/On	0-v/Off	MIN POS L	Closed
		On	On	High	24-v/On	24-v/On	MIN POS H	Closed
None	Yes	Off	Off	Low	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	0-v/Off	0-v/Off	MIN POS L to Full- Open	Closed to Full-Open
		On	On	High	DELAY 24-v/ On(a)	0-v/Off(b)	MIN POS H to Full- Open	Closed to Full-Open

(a) With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.
(b) With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 -O after the delay if the call for Y1-I and Y2-I have not been satisfied.

Table 10. Dry bulb operation with DCV (CO_2 sensor) - 2 speed fan

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
Below set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off(a)	VENTMIN H to Full-Open	Closed to Full-Open
Above set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H to VENTMAX	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	Low	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	DELAY 24-v/ On(b)	0-v/Off(a)	VENTMIN H to Full-Open	Closed to Full-Open

(a) With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 -O after the delay if the call for Y1-I and Y2-I have not been satisfied.
(b) With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

Table 11. Enthalpy operation no DCV (CO_2 sensor) - 2 speed fan

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
NO CO2 SENSOR	No	Off	Off	Low	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	24-v/On	0-v/Off	MIN POS L	Closed
		On	On	High	24-v/On	24-v/On	MIN POS H	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	0-v/Off	0-v/Off	MIN POS L to Full- Open	Closed to Full-Open
		On	On	High	DELAY 24-v/ On(a)	0-v/Off(b)	MIN POS H to Full- Open	Closed to Full-Open

(a) With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.
(b) With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 -O after the delay if the call for Y1-I and Y2-I have not been satisfied.

Table 12. Enthalpy operation with DCV (CO_2 sensor) - 2 speed fan

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
Below set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off(a)	VENTMIN H to Full-Open	Closed to Full-Open
Above set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H to VENTMAX	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	Low	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	DELAY 24-v/ On(b)	0-v/Off(a)	VENTMIN H to Full-Open	Closed to Full-Open

(a) With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 -O after the delay if the call for Y1-I and Y2-I have not been satisfied.
(b) With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

Economizer Set-Up

Adjusting the minimum position (MIN POS/VENTMAX on the SETPOINTS menu) sets the required amount of ventilation air.

Ambient temperature controls the economizing cycle by sensing the outside air dry bulb temperature. Table 13, p. 30 lists the five selectable dry bulb values (ENTH CURVE) on the SETPOINTS menu.

Table 13. Single enthalpy and dual enthalpy boundaries (parameters ES1 through ES5)

Enth. Curve	Temp. dry-Bulb (°F)	Temp. dewpoint (°F)	Enthalpy (btu/lb/da)	Point P1		Point P2	
				Temp. °F	Humid. %RH	Temp. °F	Humid. %RH
ES1	80.0	60.0	28.0	80.0	36.8	66.3	80.1
ES2	75.0	57.0	26.0	75.0	39.6	63.3	80.0
ES3	70.0	54.0	24.0	70.0	42.3	59.7	81.4
ES4	65.0	51.0	22.0	65.0	44.8	55.7	84.2
ES5	60.0	48.0	20.0	60.0	46.9	51.3	88.5
HL	86.0	66.0	32.4	86.0	38.9	72.4	80.3

Note: *For differential enthalpy there is a high limit boundary. The high limit boundary is ES1 when there are no stages of mechanical cooling energized and HL when a compressor stage is energized.*

Note: *To disable the economizer to do functional testing, use a 10 mm wrench to completely unsecure the shaft coupling. After testing, tighten shaft coupling securely onto damper shaft using minimum 120 lb-in. (13.6 Nm) to maximum 180 lb-in. (20.3 Nm) torque.*

Drain Pan Condensate Overflow Switch (Optional)

The Condensate Overflow Switch (COF) is utilized to prevent water overflow from the drain pan. The float switch is installed on the corner lip of the drain pan. When the condensate level reaches the trip point, the COF relay energizes and opens the 24VAC control circuit which disables the unit. Once the 24VAC control circuit is opened, a delay timer will prevent unit start-up for three minutes.

Low Ambient Operation (Optional)

During low ambient operation, outside air temperature below 50°F, the Low Ambient Controller will cycle the outdoor fan motor "Off" and "On" based on discharge pressure. The indoor fan motor (IDM) will continue to operate and the outdoor fan will return to normal operation once the ambient temperature is above 50°F.

10 Horsepower Motor Overload

10HP indoor fan motors are not internally protected. For proper protection, ensure the adjustable dial on the front of the overload (located in the control box) is set to the nameplate FLA value of the indoor motor.

Two-Speed Indoor Fan Control

The JADE controller does not control the supply directly but uses the following input status to determine the speed of the supply fan and controls the OA damper to the required position.

The W (heating mode) is not controlled by the controller but it requires the status to know where to position the OA damper for minimum position for the fan speed.

The 2 speed fan delay is available when FAN SPEED is set to 2 speed on the System Setup menu.

The 2 speed fan delay is defaulted to 5 minutes and can be changed in the Advanced Setup menu (2SP FAN DELAY). When the unit has a call for Y1 In and in the free cooling mode and there is a call for Y2 In, the 2-speed fan delay starts and the OA damper will modulate 100% open, the supply fan should be set to high speed by the unit controller. After the delay one of two actions will happen:

- The Y2 In call will be satisfied with the damper 100% open and fan on high speed and the call will turn off.

OR

- If the call for additional cooling in the space has not been satisfied then the first stage of mechanical cooling will be enabled through Y1 Out or Y2 Out.

Phase Monitor

The Phase Monitor is a 3 phase line monitor module that protects against phase loss, phase reversal and phase unbalance. It is intended to protect compressors from reverse rotation. It has an operating input voltage range of 190-600 VAC, and LED indicators for ON and FAULT. There are no field adjustments and the module will automatically reset from a fault condition.

Low Pressure Cutout

The low pressure cutouts are wired in series with the high pressure cutouts and the temperature discharge limits. If this circuit is open before a compressor is started, the compressor in that circuit will not be allowed to operate.

Anytime this circuit is opened, the compressor in that circuit is turned off immediately.

High Pressure Cutout and Temperature Discharge Limit

The high pressure controls and temperature discharge limit are wired in series between the compressor outputs on the LTB and the compressor contactors. If the high pressure safety or temperature discharge limit opens, the compressor on the affected circuit is turned off.

Coil Frost Protection

The Frostat™ control monitors the evaporator coil temperature to prevent the evaporator from freezing due to low operating temperatures whenever there is a demand for cooling. When an open circuit has occurred, the Frostat opens the 24VAC ground and opens all of the cooling contactors.

Initiation of Operating Modes

The JADE controller is able to initiate the following modes: Compressor, Economizer, Fans, Heating System, and Cooling System.

The Compressor mode is initiated by either the OAT going above the DRYBLB SET setting or by the thermostat initiating a call to cool when the damper is at 100% open. The Economizer mode is controlled by the MAT getting above the MAT SET setting while the OAT is below the DRYBLB SET setting. While the fans are not controlled by the controller, the Fan mode is dependent on what state the system is in (OCC or Y1 states will cause the damper to go to a LOW fan speed damper setting, while Y2 or W states will cause the controller to open the damper to the HIGH fan speed damper setting). The Heating System mode requires an input to the AUX2-1 terminal from the thermostat, and the Cooling System mode requires an input to the Y2 IN and/or the Y1 IN terminals from the thermostat.

Fault Detection & Diagnostics (FDD) Certification

The JADE controller is a certified FDD product (HJW10) by California Title 24, Part 6.

Standard Economizer Start-Up

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

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

   The Exhaust Fan will start anytime the economizer damper position is equal to or greater than the exhaust fan setpoint.
2. Verify that the dampers stroked to the minimum position.
3. Verify that the dampers stroked to the full open position.
4. To stop the SERVICE TEST, turn the main power disconnect switch to the “Off” position or proceed to the next component start-up procedure. Remove electro mechanical test mode connections (if applicable).

LLE Controls Test Procedure

See unit schematic for correct wire numbers.

Use the CHECKOUT menu in the Installation Instructions (ACC-SVN178*-EN) to test the damper operation and any configured outputs. Only items that are configured are shown in the Checkout menu.

To Perform Checkout Tests:

1. Scroll to the desired test in the checkout menu using the △ and ▽ buttons.
2. Press the ↵ button to select the item.
3. “RUN?” is displayed.
4. Press ↵ to start the test.
5. The unit pauses and then displays “IN PROGRESS”.
6. When the test is complete, “DONE” appears.
7. When all parameters have been tested, press ⓣ (Menu Up) to end the test (e.g. turn off the relay).

Notes:

- *The checkout tests can all be performed at the time of installation or any time during the operation of the system.*
- *JADE will be in "set up" mode for the first 60 minutes after powered. If OA sensor or Sylk Bus device (sensor or actuator) is disconnected during the set up mode, the JADE will not alarm that failure. The MA sensor is a system "critical" sensor, if the MA sensor is removed during the set up mode, the JADE will alarm. After 60 minutes the JADE controller will change to operation mode and all components removed or failed will alarm in the operation mode.*
- *Upon power up (or after a power outage or brownout), the JADE controller module begins a 5 minute power up delay before enabling mechanical cooling.*

Compressor Start-Up

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

   Using the Service Test Guide, perform the proper test mode connections.

   Scroll Compressors

   a. Once each compressor has started, verify that the rotation is correct. If wired correctly the suction pressure should drop and the discharge pressure should rise. 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. Refer to the following illustration for the compressor terminal/phase

identification. Do not allow the compressor to operate backwards for more than 5 seconds. Operation for a period of time longer than this will result in compressor damage.

Note: *Copeland ZP scroll compressors for R410A units use Trane OIL00094. Compressor types are listed in Table 14, p. 32. The appropriate oil charge is listed in Table 15, p. 32.*

Table 14. Compressor types

Tonnage	C1	C2
EBC180	ZP91KCE	ZP61KCE
EBC210	ZP104KCE	ZP76KCE
EBC240	ZP122KCE	ZP104KCE
EBC300	ZP137KCE	ZP122KCE

Table 15. POE Oil recharge amount (fl. oz.)

Model	C1	C2
EBC180	56	52
EBC210	81	56
EBC240	81	81
EBC300	106	81

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 subcooling. Follow the instruction listed on the subcooling charging curve in the Service Facts.
4. Repeat Step 1 through Step 3 for each refrigerant circuit.
5. To stop the SERVICE TEST, turn the main power disconnect switch to the “Off” position or proceed to the next component start-up procedure. Remove electro mechanical test mode connections (if applicable).

Heating Start-Up

1. Clamp an amp meter around one of 1st stage heater power wires at the heater contactor.
2. Verify that the heater stage is operating properly.
3. Clamp an amp meter around one of 2nd stage heater power wires at the heater contactor (if applicable).
4. Verify that the heater stage is operating properly.
5. To stop the SERVICE TEST, turn the main power disconnect switch to the “Off” position or proceed to the next component start-up procedure. Remove electro mechanical test mode connections.

Final System Set Up

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

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