

Installation, Operation, and Maintenance
**Packaged Rooftop Air
Conditioners**
Precedent™ Heat Pump
High Efficiency
12.5 to 25 Tons — 60 Hz



Model Numbers: WHJ150* - WHJ300*, DHJ150* - DHJ300*

⚠ 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.

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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:



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



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.

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 according to local rules. For the USA, 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/national 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 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 Trane personnel must follow the company's Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. Where local regulations are more stringent than these policies, those regulations supersede these policies.
- Non-Trane personnel should always follow local regulations.

⚠ WARNING**Hazard of Explosion or Fire!**

Failure to follow instructions could result in death or serious injury and equipment or property damage.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

IF YOU SMELL GAS, follow instructions below:

- Do not try to light any appliance.
- Do not touch any electrical switch.
- Do not use any phone in your building.
- Open windows and doors.
- Alert others and evacuate building immediately.
- From a phone outside of the building, immediately call your gas supplier. Follow the gas supplier's instructions. If you cannot reach your gas supplier, call the fire department.

⚠ WARNING**Safety Hazards!**

Failure to follow instructions below could result in death or serious injury and equipment or property damage.

- Do not use this furnace if any portion has been under water as it may have rendered the unit hazardous to operate. Immediately call a qualified service technician to inspect the furnace and to replace any part or the control system and any gas control which has been under water.
- Should overheating occur, or the unit gas valve fail to shut off, close the gas valve to the furnace before shutting off the electrical supply.

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Revision History

- Updated Door Handles topic in the General Information chapter.
- Updated digit 7 in the Unit model number in the document.
- Added TCO1 tripping values - Modulating gas table and Supply and Manifold Pressure Requirements - Modulating gas table to the Installation chapter.
- Updated condensate trap installation image in the Installation chapter.
- Added Furnace condensate drain section to the Installation chapter.
- Added Ignition Module - Modulating Gas section to the Unit Start-up chapter.
- Updated Wiring diagrams table.

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Model Number Description

Digit 1 — Unit Function

W = Packaged Heat Pump
D = Dual Fuel Heat Pump

Digit 2 — Cooling Efficiency

H = High Efficiency

Digit 3 — Refrigerant

J = R-410A

Digit 4,5,6 — Nominal Gross Cooling Capacity (MBh)

150 = 12.5 Ton
180 = 15 Ton
240 = 20 Ton
300 = 25 Ton

Digit 7 — Design Sequence

Digit 8 — Voltage Selection

3 = 208–230/60/3
4 = 460/60/3
W = 575/60/3

Digit 9 — Unit Controls

S = Symbio™ 700

Digit 10 — Heat Type

0 = Base Model (None or Electric)
A = Stainless Steel Gas Heat
B = Modulating Gas Heat

Digit 11 — Heating Capacity

0 = No Heat
G = 18 kW Electric Heat
K = 27 kW Electric Heat
N = 36 kW Electric Heat
P = 54 kW Electric Heat
R = 72 kW Electric Heat
L = Low Gas Heat
M = Medium Gas Heat
H = High Gas Heat

Digit 12, 13 — Service Sequence

****** = Factory Assigned

Digit 14 — Fresh Air Selection

0 = No Fresh Air
A = Manual Outside Air Damper 0–50%
B = Motorized Outside Air Damper 0–50%
C = Economizer, Dry Bulb 0–100% without Barometric Relief
D = Economizer, Dry Bulb 0–100% with Barometric Relief
E = Economizer, Reference Enthalpy 0–100% without Barometric Relief
F = Economizer, Reference Enthalpy 0–100% with Barometric Relief
G = Economizer, Comparative Enthalpy 0–100% without Barometric Relief
H = Economizer, Comparative Enthalpy 0–100% with Barometric Relief
K = Downflow Low Leak Economizer, Dry Bulb with Barometric Relief
M = Downflow Low Leak Economizer, Reference Enthalpy with Barometric Relief
P = Downflow Low Leak Economizer, Comparative Enthalpy with Barometric Relief
R = Downflow Low Leak Economizer, Differential Dry Bulb with Barometric Relief

Digit 15 — Supply Fan/Motor

0 = Multi-Speed Motor
1 = Optional Oversized/High Static Motor
2 = Single Zone Variable Air Volume with Standard Motor
3 = Single Zone Variable Air Volume with Oversized/High Static Motor
4 = Multiple Zone Variable Air Volume with Standard Motor
5 = Multiple Zone Variable Air Volume with Oversized/High Static Motor

Digit 16 — Hinged Access/Filters

0 = Standard Panels/Standard Filters
A = Hinged Access Panels/Standard Filters
B = Standard Panels/2 inch MERV 8 Filters
C = Hinged Access Panels/2 inch MERV 8 Filters
D = Standard Panels/2 inch MERV 13 Filters
E = Hinged Access Panels/2 inch MERV 13 Filters

Digit 17 — Coil Protection

0 = Standard Coil
1 = Condenser with CompleteCoat

Digit 18 — Through-the-Base Provisions

0 = No Through-the-Base Provisions
A = Through-the-Base Electric
B = Through-the-Base Gas Piping
C = Through-the-Base Electric and Gas Piping

Digit 19 — Disconnect/Circuit Breaker (three-phase only)

0 = No Disconnect/No Circuit Breaker
1 = Unit Mounted/Non-Fused Disconnect
2 = Unit Mounted Circuit Breaker

Digit 20— Convenience Outlet

0 = No Convenience Outlet
A = Unpowered 20A Convenience Outlet
B = Powered 15A Convenience Outlet (three-phase only)

Digit 21— Communications Options

0 = No Communications Interface
1 = Advanced Controller with BACnet® Communications Interface
2 = Advanced Controller with LonTalk® Communications Interface
3 = Advanced Controller with Air-Fi® Communications Interface

Digit 22— Refrigeration System Option

0 = Standard Refrigeration System
A = Dehumidification Option

Digit 23— Controls Expansion Module

0 = None
1 = XM-30 Expansion Module
2 = XM-32 Expansion Module
3 = XM-30 and XM-32 Expansion Module
4 = XM-30 Expansion Module (Qty 2)
5 = XM-32 Expansion Module (Qty 2)

Digit 24— Smoke Detector

0 = No Smoke Detector
A = Return Air Smoke Detector
B = Supply Air Smoke Detector
C = Supply and Return Air Smoke Detectors

Digit 25— System Monitoring Controls

- 0 = No Monitoring Control
- 1 = Clogged Filter Switch
- 2 = Condensate Overflow Switch
- 3 = Discharge Air Sensing Tube
- 4 = Clogged Filter Switch and Condensate Overflow Switch
- 5 = Clogged Filter Switch and Discharge Air Sensing Tube
- 6 = Condensate Overflow Switch and Discharge Air Sensing Tube
- 7 = Clogged Filter Switch, Condensate Overflow Switch and Discharge Air Sensing Tube

Digit 26— Not Used

Digit 27— Hardware Enhancements

- 0 = No Enhancements
- 1 = Stainless Steel Drain Pan

Digit 28— Short Circuit Current Rating

- 0 = Standard (5k) SCCR Marking
- A = Tier 2 (65K) SCCR Marking

Digit 29— Low Ambient

- 0 = None
- A = Low Ambient Cooling to 0°F

General Information

Unit Inspection

To protect against loss due to damage incurred in transit, perform inspection immediately upon receipt of the unit. Check carefully for shipping damage. If any damage is found, report it immediately, and file a claim against the transportation company.

Exterior Inspection

If the job site inspection 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. Notify the appropriate sales representative.

Important: Do not proceed with installation of a damaged unit without sales representative approval.

- Inspect the complete exterior for signs of shipping damages to unit or packing material.
- Verify that the nameplate data matches the sales order and bill of lading.
- Verify that the unit is properly equipped and there are no material shortages.
- Verify the power supply complies with the unit nameplate specifications.

Inspection for Concealed Damage

Inspect the components for concealed damage as soon as possible after delivery and before it is stored.

If concealed damage is discovered:

- Notify the carrier's terminal of the damage immediately by phone and by mail.
- Concealed damage must be reported within 15 days.
- Request an immediate, joint inspection of the damage with the carrier and consignee.
- Stop unpacking the unit.
- Do not remove damaged material from receiving location.
- Take photos of the damage, if possible.
- The owner must provide reasonable evidence that the damage did not occur after delivery.

Unit Storage

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

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

Note: Do not use the unit heater for temporary heat without first completing the start-up.

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

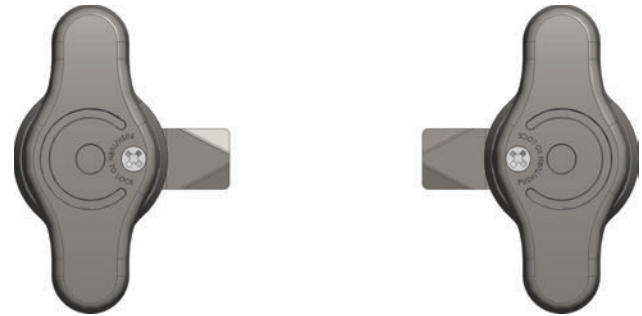
Unit Description

- Before shipment, each unit is leak tested, dehydrated, charged with refrigerant and compressor oil, and run tested for proper control operation.
- The condenser coils are all aluminum microchannel.
- Direct-drive, vertical discharge condenser fans are provided with built-in thermal overload protection.
- All units come with standard Symbio™ 700 control system with advanced diagnostics.

Door Handles

Door handles rotate 180 degrees for use on either left- or right-handed doors. Handles will be in the vertical position when latched, as shown in the following figure. After each use, return door handles to the latched and locked position..

Figure 1. Door handles



To lock:

1. Verify handle is in the vertical (latched) position.
2. Using a Phillips head screwdriver, push and rotate the handle screw clockwise 1/4 turn.

To unlock:

Use a Phillips head screwdriver to push and rotate handle screw counterclockwise 1/4 turn.

Unit Nameplate

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

Compressor Nameplate

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

LonTalk Communication Interface (Optional)

The Symbio™ controllers supports communication with LonTalk® open protocol applications. An advanced license is required to enable this feature. The LonTalk module is available factory supplied or as a field-installed kit. For more details, refer to *Integration Guide LonTalk® Integration to Precedent™ Packaged Rooftop Air-Conditioners with Symbio™ 700 Controls (BAS-SVP063*-EN)*.

BACnet Communications Interface (Optional)

The Symbio™ controller provides integrated communication with BACnet® open protocol applications. An advanced license is required to enable this feature. When enabled, the following selections are available: BACnet MS/TP, BACnet IP, or BACnet Zigbee® (Air-Fi®). For more details, refer to *BACnet® and Modbus™ Integration to Precedent™ Packaged Rooftop Air-Conditioners with Symbio™ 700 Controls Integration Guide (BAS-SVP062*-EN)*.

System Input Devices and Functions

The Symbio™ 700 controller requires a zone sensor or thermostat input to operate the unit in a CVZT or VVZT configuration.

Note: Use of a conventional thermostat will reduce unit functionality.

The number of available modes depends on the type of zone sensor or thermostat selected. Descriptions of the basic input devices used with the Symbio 700 network are provided to acquaint the operator with the various modules. Refer to the unit schematic for specific module connections. The following controls are available from the factory for field installation.

Supply Fan Failure

Supply fan proving is active when the supply fan is commanded **ON**. The supply fan speed must be greater than 30 rpm for 40 continuous seconds. If the supply fan speed falls below 30 rpm, supply fan failure diagnostic is generated, and operation is stopped.

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 Fresh

Air Options Module. A diagnostic signal is sent to the controller if the pressure differential across the filters is at least 0.5 inch w.c. The contacts will automatically open when the pressure differential across the filters decreases to approximately 0.4 inch 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. For further details, refer to ACC-SVN238*-EN.

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 inch w.c. and open when the differential falls to 0.7 inch w.c.

Condensate Drain Pan Overflow Switch

A condensate overflow condition will be detected by a condensate overflow float switch. When the condensate level reaches the trip point, the diagnostic condition will be detected. When the condensate overflow input **closes** for six continuous seconds, the following actions will be taken by the Symbio™ 700 controls:

- An auto-reset diagnostic will be generated. All compressor or heating operations will be disabled immediately. Condenser fans and compressors will be de-energized. Supply fan operation will be shutdown.
- Once the overflow condition has been cleared and the input is **open** for 6 seconds, all diagnostic conditions will be cleared. The unit will return to normal operation. Auto-reset clearing will occur twice each time the unit is powered up. On the third occurrence, the unit will initiate a lock-out and require manual reset. If an auto-reset overflow occurs once, but does not occur again for 72 hours, the trip counter will reset allowing more auto-resets to occur.

Compressor Disable (CPR1/2)

This input incorporates the low pressure control (LPC) of each refrigeration circuit.

If this circuit is open before the compressor is started, the compressor will not be allowed to operate. Anytime this circuit is opened for one 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 three minutes should the contacts close.

If four consecutive open conditions occur during the first 3 minutes of operation, the compressor for that circuit will be locked out, a diagnostic communicated to the remote panel (if installed), and a manual reset will be required to restart the compressor.

Low Pressure Control

When the LPC is opened for 1 continuous second, the compressor for that circuit is turned **OFF**. 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 generated, if applicable, and a manual reset required to restart the compressor.

High Pressure Control

The high pressure controls are wired in series between the compressor outputs on the Symbio™ controller and the compressor contactor coils. If the high pressure control switch opens, the controller 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 generated, if applicable, and a manual reset required to restart the compressor.

Zone Sensors

Manual Changeover (BAYSENS106*)

This 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.

Manual/Automatic Changeover (BAYSENS108*)

This 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*.

Wall Mounted Relative Humidity Sensor (BAYSENS036*)

Field installed, wall mounted humidity sensor that measures temperature and relative humidity. Relative humidity input is used to control activation of dehumidification

Duct Mounted Relative Humidity Sensor (BAYSENS037*)

Field installed, duct mounted humidity sensor that measures temperature and relative humidity. Relative humidity input is used to control activation of dehumidification.

Integrated Comfort System (BAYSENS073*)

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

Integrated Comfort System (BAYSENS074*)

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

Remote Zone Sensor (BAYSENS016*)

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

Remote Zone Sensor (BAYSENS077*)

This sensor can be used with BAYSENS106*, 108*, 110*, 800* Remote Panels. When this sensor is wired to a BAYSENS800* Remote Panel, wiring must be 18 AWG Shielded Twisted Pair (Belden 8760 or equivalent). Refer to the specific Remote Panel for wiring details.

Thermostat

The unit must have a thermostat to operate.

- BAYSTAT151
One Heat/One Cool Auto changeover digital display thermostat.
- BAYSTAT155
Three Heat/Two Cool Auto changeover display thermostat.
- BAYSENS150
Three Heat/Two Cool Auto changeover digital display thermostat. Seven day programmable thermostat with night setback.

High Temperature Sensor (FIAHTST001*)

This sensor connects to the Symbio™ 700 Emergency Stop Input 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 (X13100040010) is set to open at 135°F. The supply air duct sensor (X13100040020) 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.

Digital Display Zone Sensor (BAYSENS135*)

LCD display provides heat, cool, auto, on, and off status. Display includes two temperature setpoints, and a lockable setting with °F or °C indicators.

Touch Screen Programmable Zone Sensor (BAYSENS800)

This sensor uses a BACnet® MS/TP link to communicate zone temperature and setpoints. Sensor includes Auto, Heat, Cool, or Off system switch, as well as Fan Auto or On switch. This is a seven day programmable thermostat with night setback.

Notes:

- *Not compatible with VAV units. Requires BACnet® communications.*
- *For additional sensors, refer to the product catalog.*

Note: *BAYSSENS800* with BACnet® enabled on the Symbio™ controller will report fault detection and diagnostics at the zone sensor. This functionality is only applicable if the customer does not have a building management system, and the unit is running standalone with the BAYSSENS800.*

Evaporator Frost Control

Frostat is standard on all units.

Discharge Line Temp Switch (DLTS)

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

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:

- *The supply air smoke detector samples supply air. The return 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 between 500 and 4000 feet per minute. Equipment covered in this manual will develop an airflow velocity that falls within these limits over the entire airflow range specified in the evaporator fan performance tables.*

Phase Monitor

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

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

Pre-Installation

⚠ WARNING

Fiberglass Wool!

Exposure to glass wool fibers without all necessary PPE equipment could result in cancer, respiratory, skin or eye irritation, which could result in death or serious injury. 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 respirator.

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.

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. Verify that no power is present with a voltmeter.

1. Remove power to the unit and gain access to the electric heat elements by removing the horizontal supply cover.
2. Visually inspect the heater elements for the following:
 - a. Elements that are no longer secured to the white ceramic insulator.
 - b. Elements touching each other or touching metal.
 - c. Severely kinked, drooping, or broken elements.
3. If an element has detached from its ceramic insulator, carefully put it back into place.
4. Replace the heater elements if they present symptoms noted in the above Step 2.a and 2.c.

Dimensional Data

Figure 2. 12.5 to 15 tons high efficiency

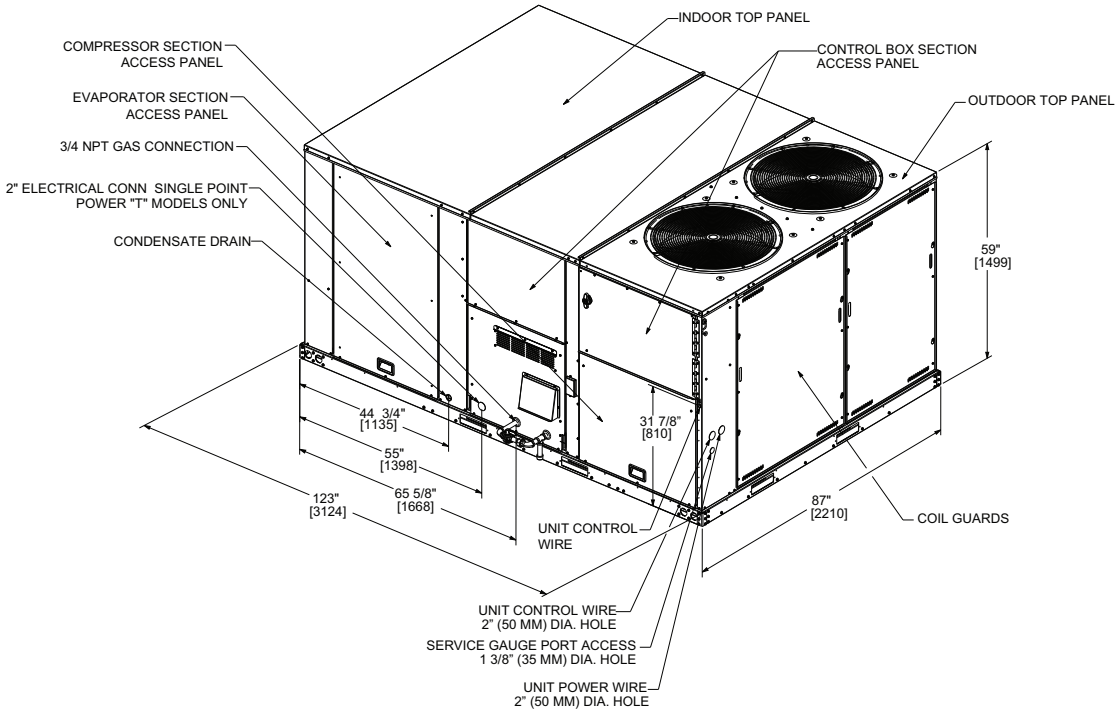
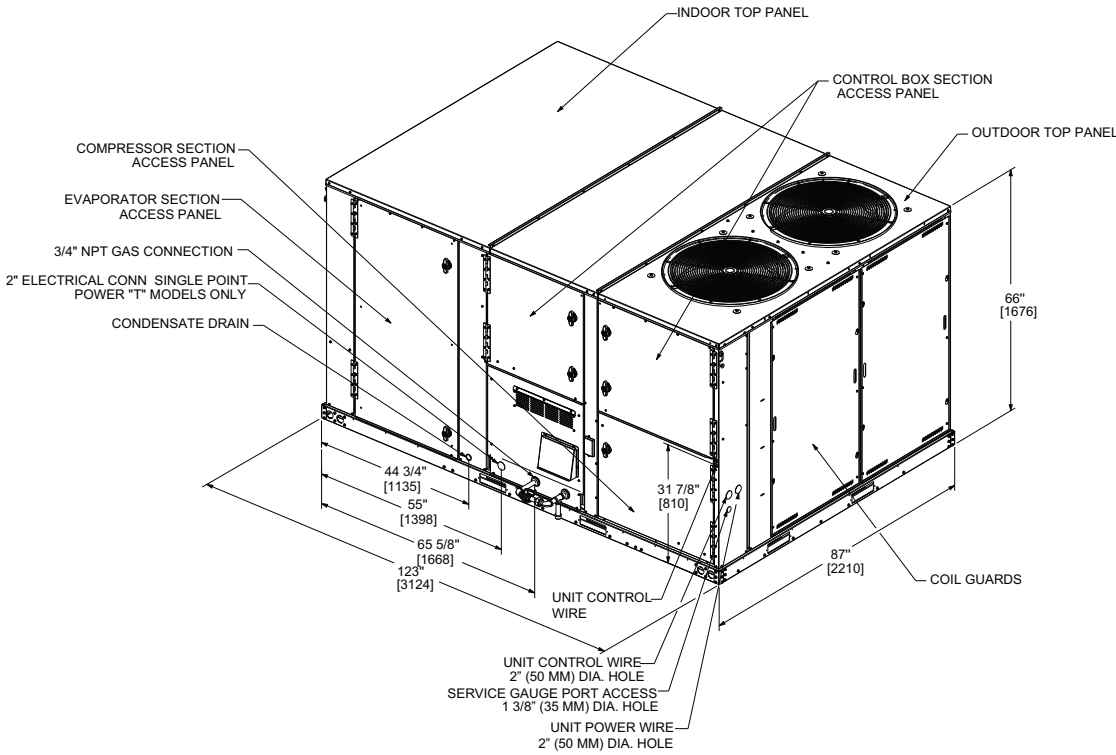


Figure 3. 20 to 25 tons high efficiency



Dimensional Data

Figure 4. 12.5 to 25 tons high efficiency – downflow airflow supply/return, through-the-base utilities

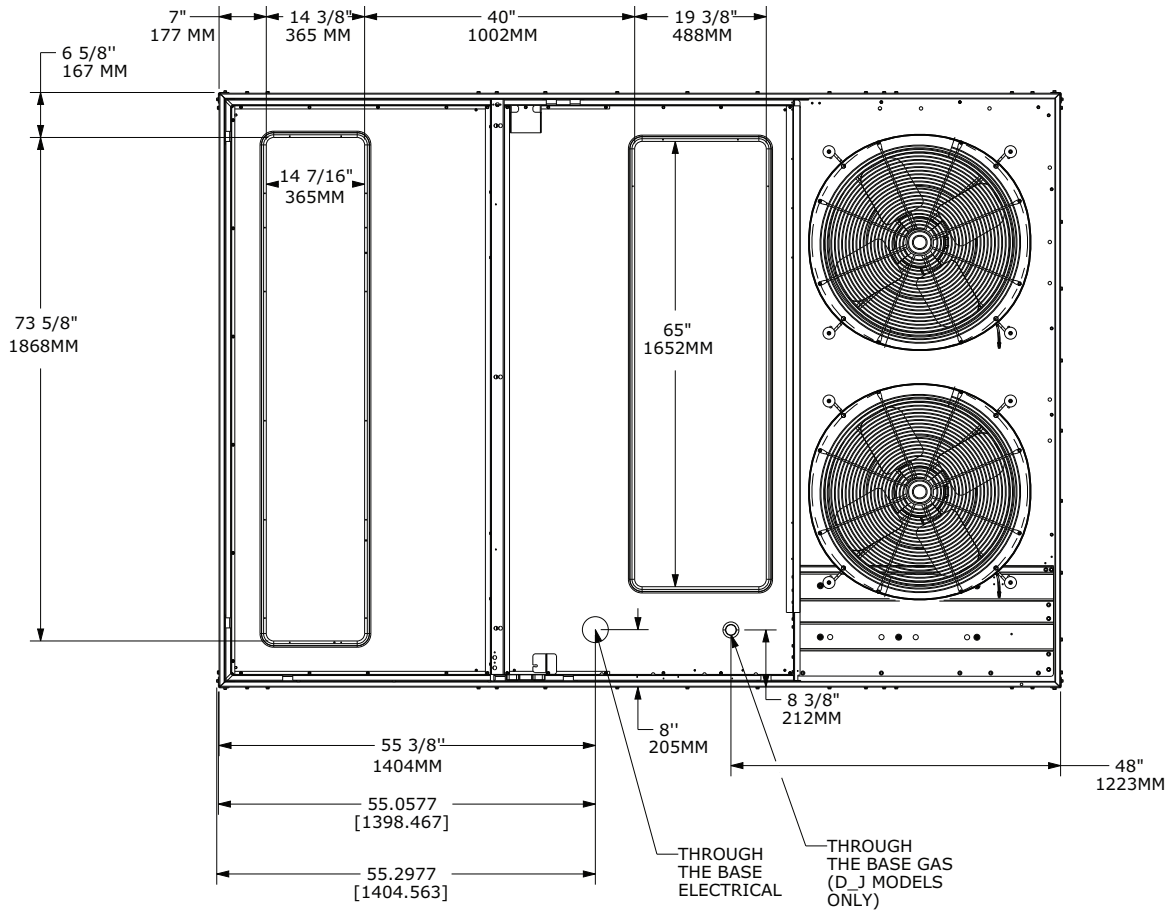


Figure 5. 12.5 to 25 tons high efficiency – horizontal airflow supply/return

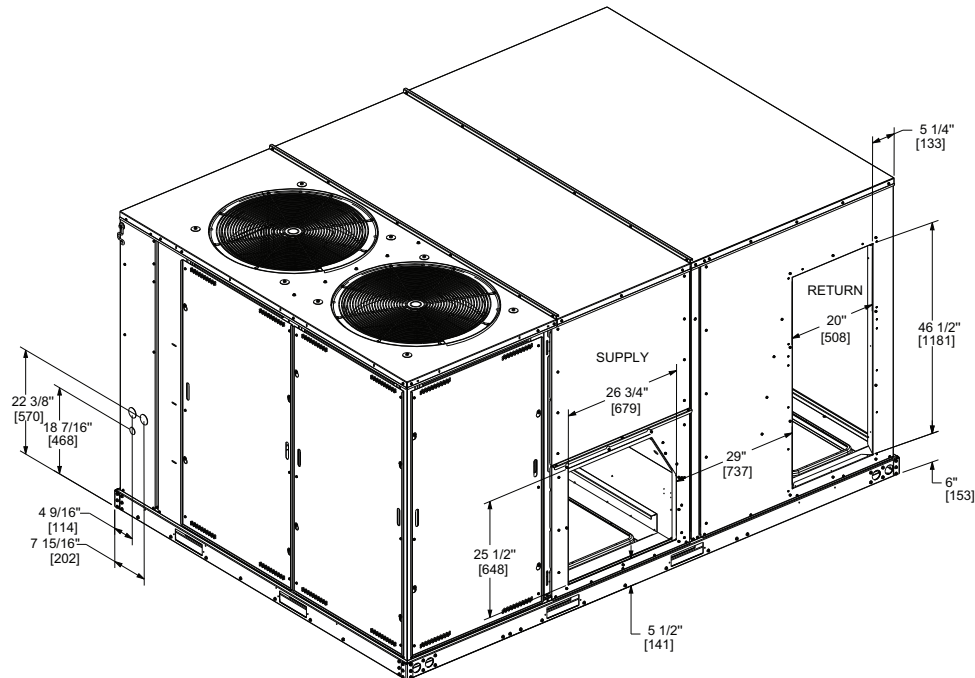


Figure 6. 12.5 to 25 tons high efficiency – power exhaust

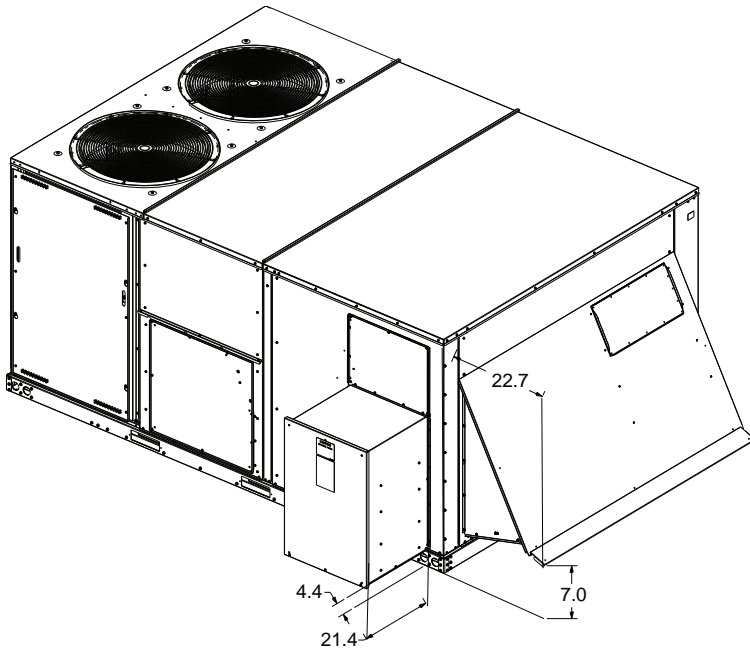
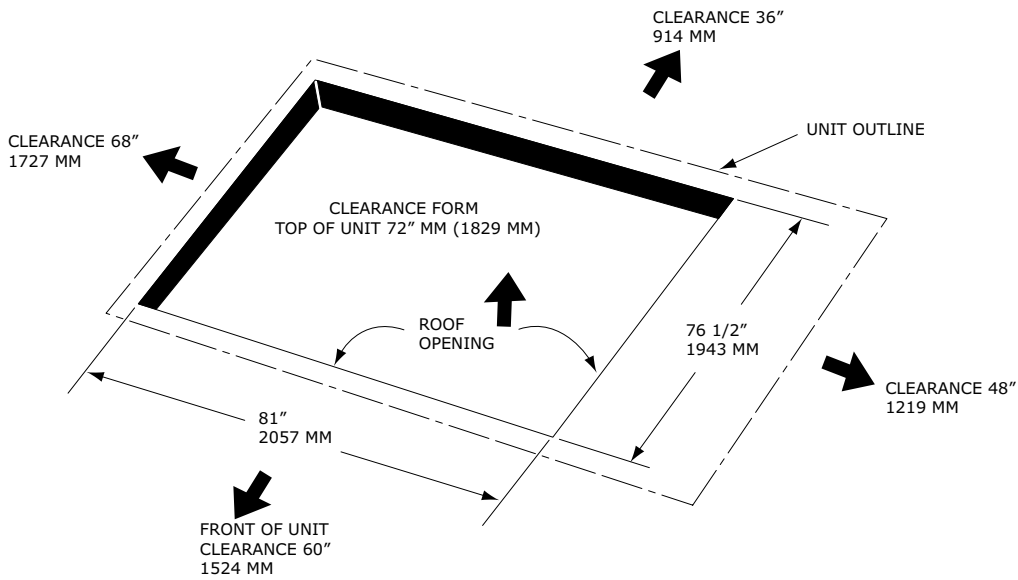


Figure 7. 12.5 to 25 tons high efficiency – unit clearance and roof opening



Dimensional Data

Figure 8. 12.5 to 25 tons high efficiency – roof curb

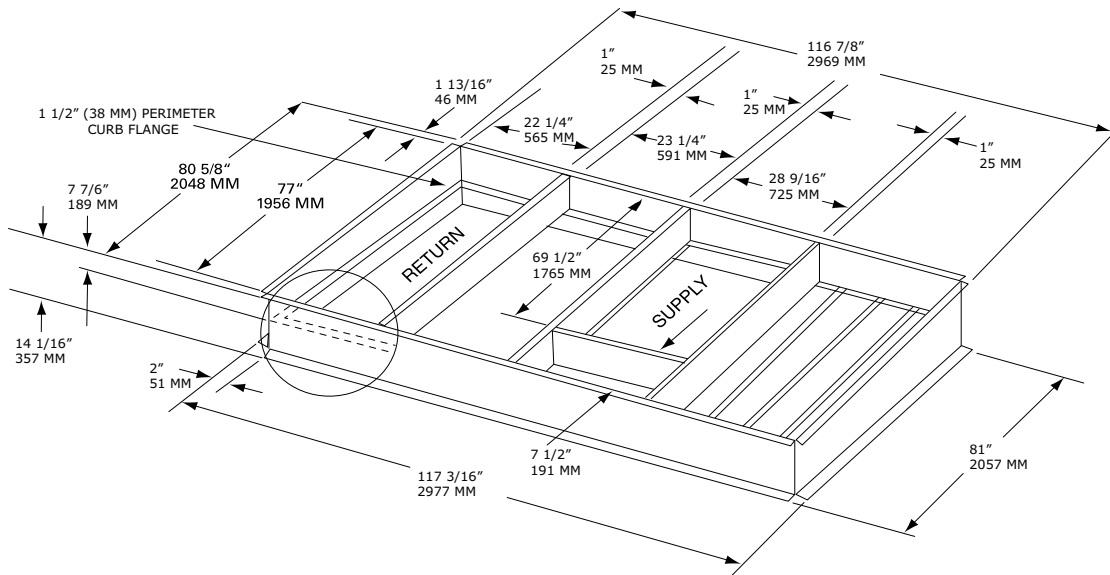


Figure 9. 12.5 to 25 ton high efficiency – swing diameter for hinged door(s) option

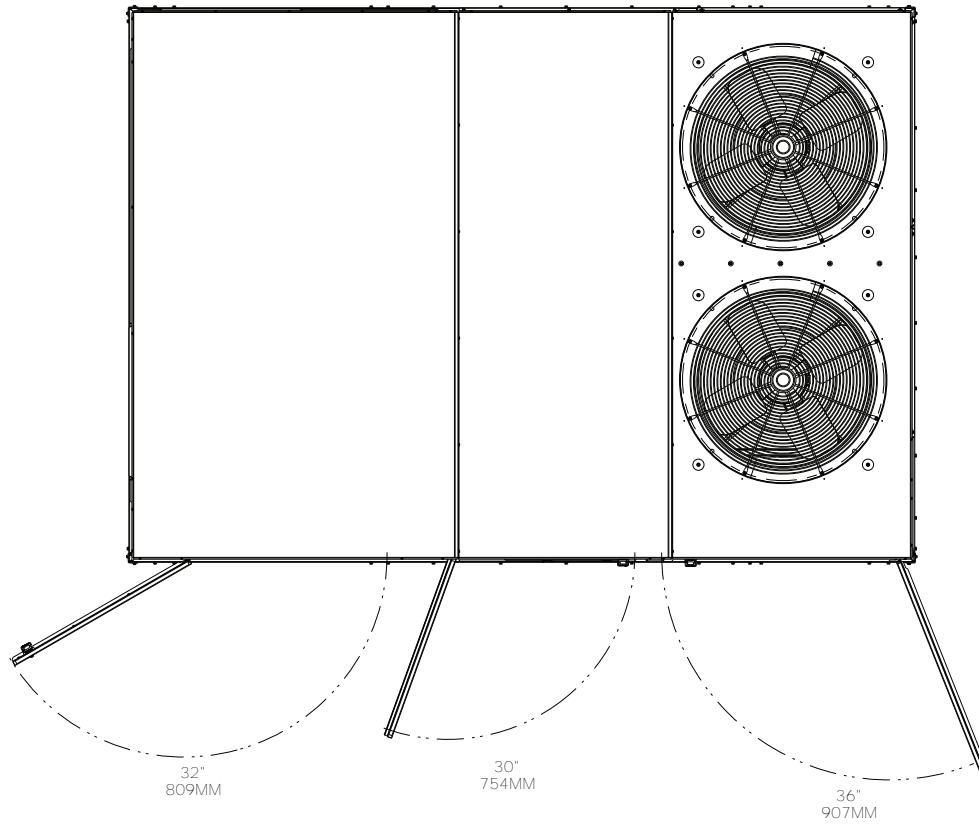
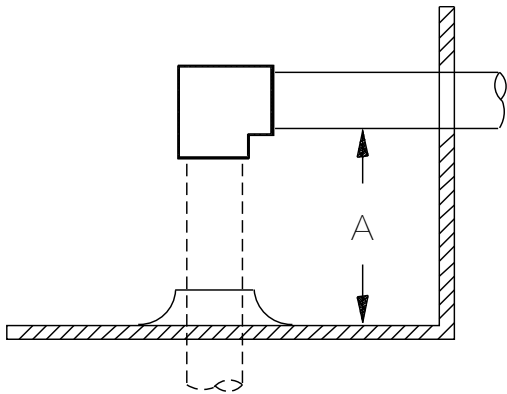


Figure 10. 12 to 25 tons duel fuel high efficiency - gas pipe height



Note: Height of gas pipe required from inside unit base to gas shut off assembly (factory provided).

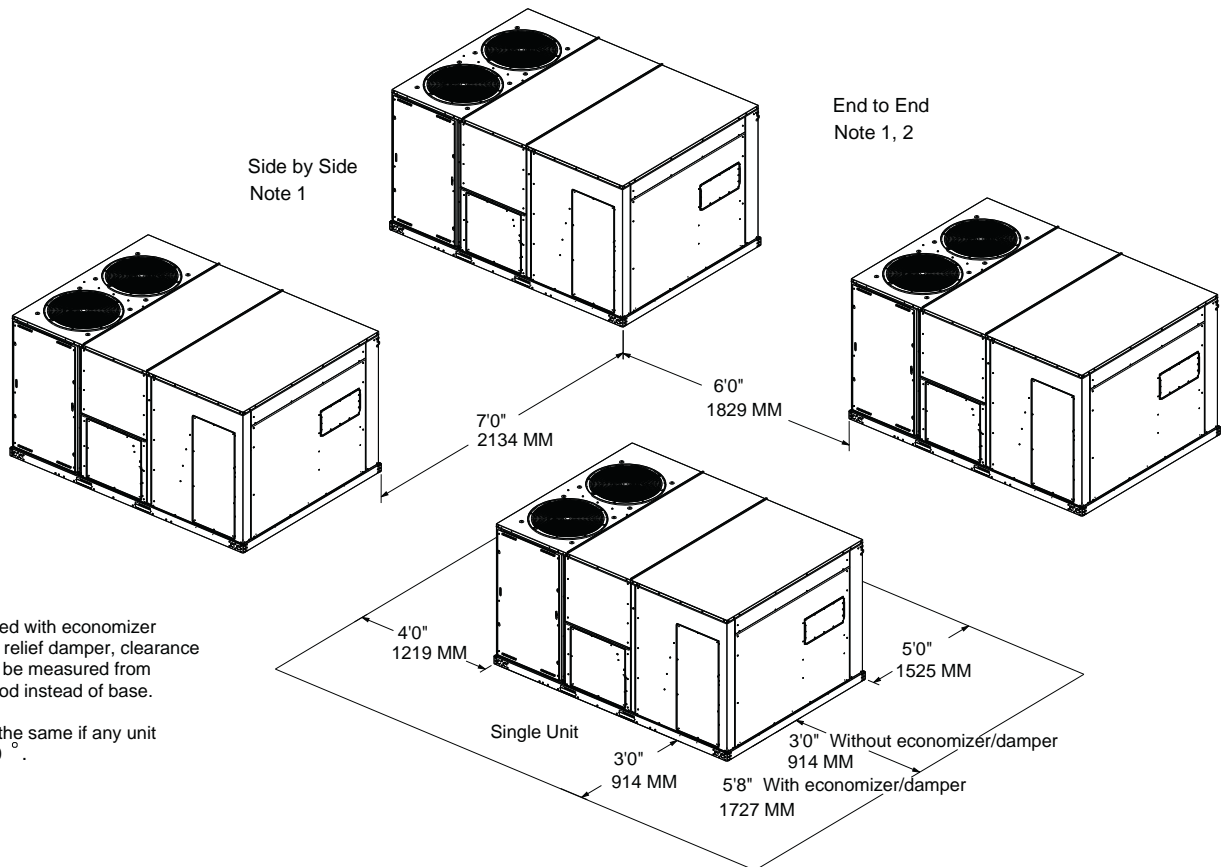
Model	Dimension A	
	inch	mm
DHJ (150 – 300)*	1 3/6	30

Clearances

Figure 11, p. 17 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 11. Typical installation clearances for single and multiple unit applications



Notes:

1. When equipped with economizer or barometric relief damper, clearance distance is to be measured from protruding hood instead of base.
2. Clearance is the same if any unit is rotated 180°.

Dimensional Data

Weights

Table 1. Model weights, corner weights (lbs) and center of gravity dimensions (in.)

Tons	Unit Model No.	Model Weights ^(a)		Corner Weights ^(b)				Center of Gravity (in.)	
		Shipping	Net	A	B	C	D	Length	Width
12.5	WHJ150	2225	2005	688	487	344	486	51	36
15	WHJ180	2246	2026	695	492	348	491	51	36
20	WHJ240	2403	2183	680	550	426	527	55	38
25	WHJ300	2405	2185	680	550	427	528	55	38
12.5	DHJ150	2407	2187	750	532	375	530	51	36
15	DHJ180	2427	2207	757	536	379	535	51	36
20	DHJ240	2697	2477	771	624	484	598	55	38
25	DHJ300	2700	2480	772	625	484	599	55	38

^(a) Weights are approximate. Weights do not include additional factory or field installed options/accessories. For option/accessory additional weights to be added to unit weight, reference the following table.

^(b) Corner weights are given for information only.

Figure 12. Corner weights

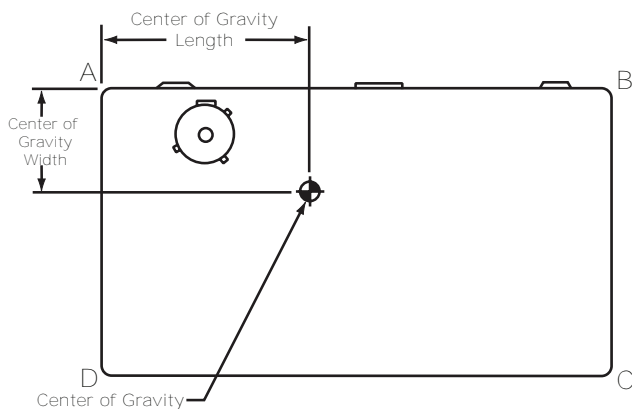


Table 2. Factory installed options (FIOPS)/accessory net weights (lb)

Accessory	W/D*J150-180	W/D*J240-300
	12.5, 15 Tons	20, 25 Tons
Barometric Relief	40	40
Economizer	91	91
Electric Heaters ^(a)	75	75
Hinged Doors	20	30
Low Leak Economizer - Downflow	150	150
Low Leak Economizer - Horizontal	180	180
Manual Outside Air Damper	15	15
Motorized Outside Air Damper	82	82
Oversized Motor	-	30
Powered Convenience Outlet	50	50
Powered Exhaust	110	110
Reheat Coil	100	100
Roof Curb	235	235
Smoke Detector, Supply	5	5
Smoke Detector, Return	5	5

Table 2. Factory installed options (FIOPS)/accessory net weights (lb) (continued)

Accessory	W/D*J150-180	W/D*J240-300
	12.5, 15 Tons	20, 25 Tons
Stainless Steel Heat Exchanger ^(b)	5	5
Through-the-Base Electrical	10	10
Through-the-Base Gas ^(b)	10	10
Unit Mounted Circuit Breaker	10	10
Unit Mounted Disconnect	10	10

Notes:

- Weights for options not listed are less than 5 pounds.
- Net weight should be added to unit weight when ordering factory-installed accessories.
- Weights are approximate.

^(a) Only applies to W*J models.

^(b) Only applies to D*J models.

Lifting and Rigging

⚠ WARNING

Heavy Object!

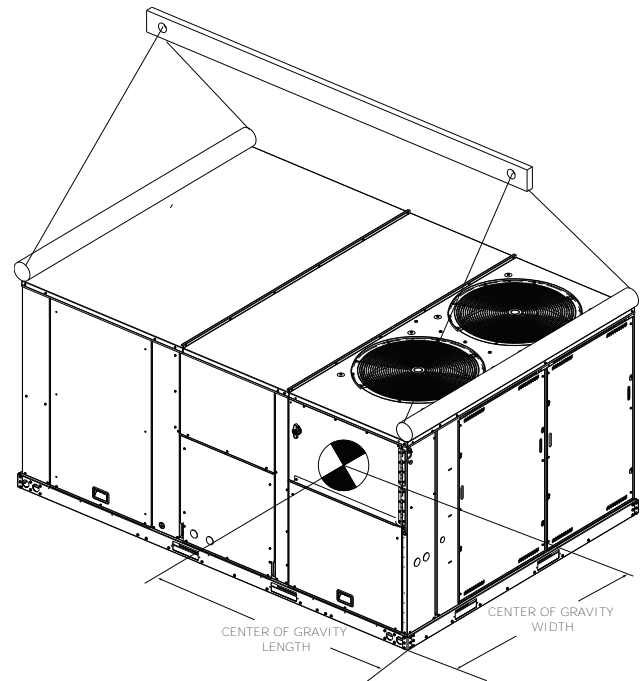
Failure to follow instructions below could result in unit dropping which could result in death or serious injury, and equipment or property-only damage. Ensure that all the lifting equipment used is properly rated for the weight of the unit being lifted. Each of the cables (chains or slings), hooks, 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.

⚠ WARNING

Improper Unit Lift!

Failure to properly lift unit in a LEVEL position 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 (61 cm) to verify proper center of gravity lift point. To avoid dropping of unit, reposition lifting point if unit is not level.

Figure 13. Rigging and center of gravity — 12.5 to 25 tons



Installation

⚠ WARNING

Heavy Object!

Failure to follow instructions below could result in unit dropping 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.

NOTICE

Roof Damage!

System contains oil and refrigerant under high pressure. Roofs should be protected from exposure to oils and refrigerant in the system. If rooftop is not protected, damage to the roof may occur.

Important: Refer to local building codes for proper installation. All installation must comply with local building codes.

Horizontal Units

If the unit is installed at ground level, elevate it above the snow line. Provide concrete footings at each support location with a **full perimeter** support structure or a slab foundation for support. Refer to the weights information in the Dimensions and Weights chapter for unit operating and point loading weights when constructing a footing foundation.

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

⚠ WARNING

Risk of Roof Collapsing!

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, the unit, and any accessories.

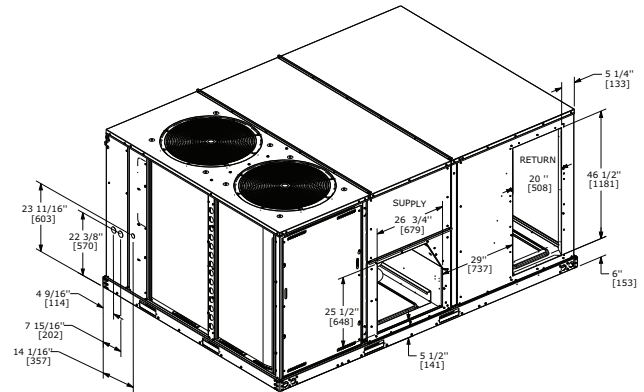
For rooftop applications, confirm the roof is strong enough to support the combined unit and support structural weight. Refer to maximum unit and corner weights (center of gravity) dimensions in the Dimensions and Weights section for the unit operating weights. If anchoring is required, anchor the unit to the roof with hold-down bolts or isolators.

Check with a roofing contractor for proper waterproofing procedures.

Ductwork

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

Figure 14. 12.5 to 25 tons high efficiency – horizontal airflow supply/return



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 15. 12.5 to 25 tons high efficiency – downflow airflow supply/return, through-the-base utilities

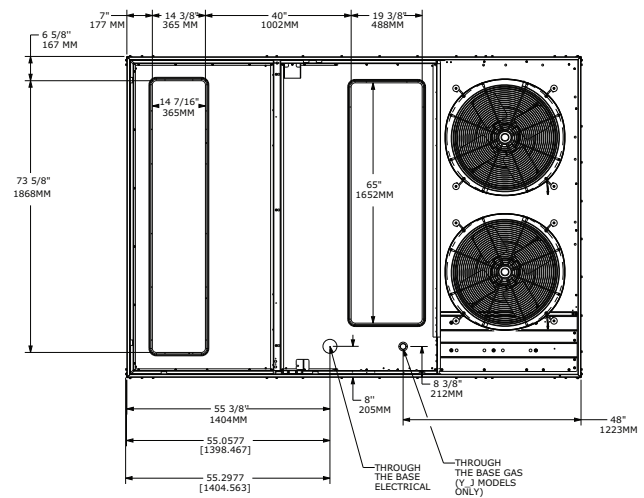


Table 3. Clearance required from duct to combustible surfaces

Model Number	Clearance required from duct to combustible surfaces (inches)
WHJ150	0
WHJ180	0
WHJ240	0
WHJ300	0

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 roof curb, verify:

- It is the correct curb for the unit.
- Necessary gaskets and hardware are available.
- Confirm required clearance for installation and operation.
- The curb should be level and square. The top surface of the curb must be level in order to confirm an adequate curb to unit seal.

⚠ WARNING

Combustible Materials!

Failure to maintain proper clearance between the unit and combustible materials could cause a fire which could result in death, 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 confirm proper fit-up when the unit is set into place.

Note: To verify 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 installation instructions. Curb ductwork must be fabricated

and installed by the installing contractor before the unit is set into place.

Important: 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 supply and return air openings. 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 Object!

Failure to follow instructions below could result in unit dropping 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.

See Dimensions and Weights section for rigging illustration, and center-of-gravity dimensional data. Refer to the typical unit operating weights table before proceeding.

1. Confirm unit does not need additional moves by fork lift.
2. For 12.5 to 25 ton units, prepare unit for rigging by removing the front and end base rail bumper protection.

Important: For unit protection, the top crate should remain in place during lifting. If it must be removed prior to lifting, protect unit from damage. Top crate must be removed prior to operation.

⚠ WARNING

Improper Unit Lift!

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

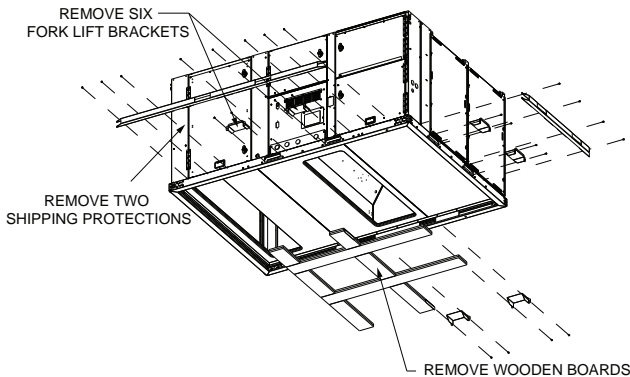
Test lift unit approximately 24 inches (61 cm) to verify proper center of gravity lift point. To avoid dropping of unit, reposition lifting point if unit is not level.

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.

Installation

4. Install a lifting bar, as shown in the Dimensions and Weights chapter, to protect the unit and 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 confirm it is properly rigged and balanced, make any necessary rigging adjustments.

Figure 16. Fork pockets — 12.5 to 25 ton high efficiency units



6. Lift the unit enough to allow the removal of base fork pocket protection components.
7. Downflow units: Align the base rail of the unit with the curb rail while lowering the unit onto the curb. Confirm the gasket on the curb is not damaged while positioning the unit.

General Unit Requirements

The following checklist is a summary of the steps required to successfully install a commercial unit. Installers should use this checklist to validate 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 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 version of the curb installation instructions 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.
 - Rig the unit.
 - Set the unit on the curb and verify the unit is level.
 - Confirm unit-to-curb seal is tight, without buckles or cracks.
- Install and connect a condensate drain line to the evaporator drain connection.

Factory Installed Economizer

- Confirm the economizer has been pulled out into the operating position. Refer to the economizer installation instructions for proper position and setup.
- Install all access panels.

External Vent Hood Installation

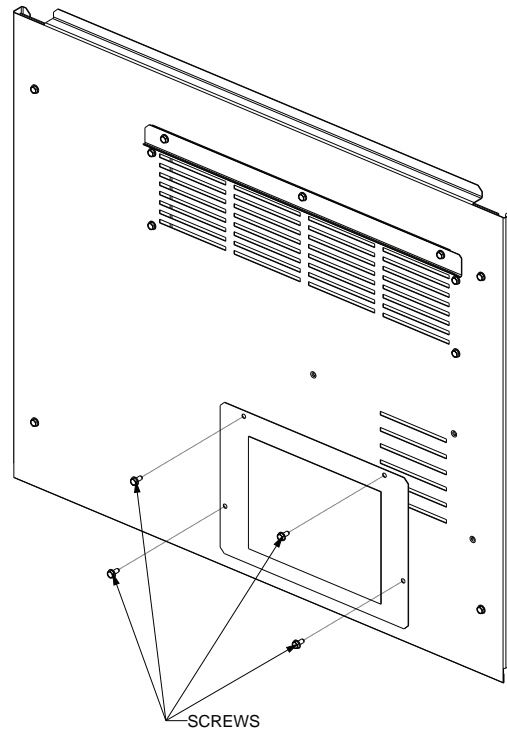
Note: This procedure applies to 12.5 to 25 tons dual fuel (gas heat) models.

1. Remove and discard the cover plate located on the gas heat panel.

Important:

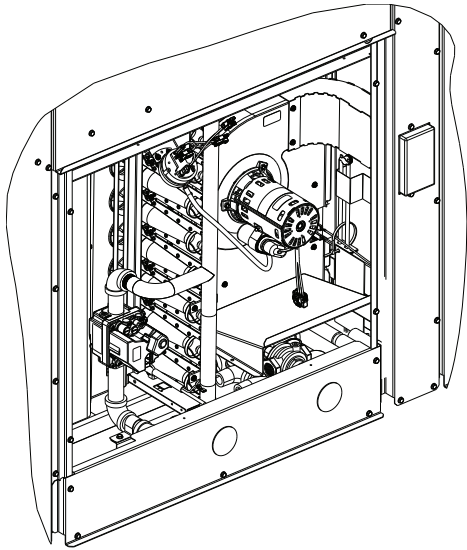
- Read the label located on the cover plate before discarding.
- Do not discard the fastening screws! They will be needed to install the vent hood.

Figure 17. Discard cover plate



2. Locate the vent hood behind the panel.

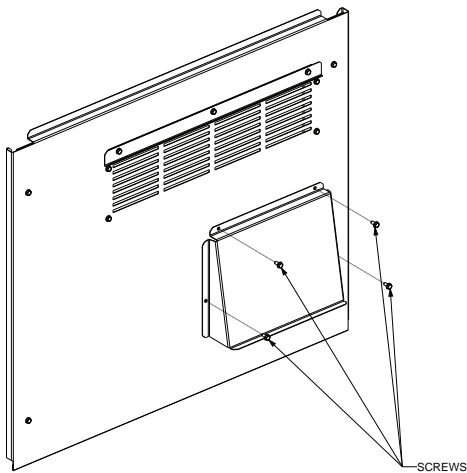
Figure 18. Vent hood shipping location



Note: The above figure shows two-stage gas. Modulating gas is similar.

3. Install the vent hood on the gas heat panel using the screws removed in Step 1 and secure to the panel.

Figure 19. Vent hood installation



Temperature Limit Switch Usage for Gas 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 TCO1 limit switch, attached to the installed TCO1 limit switch (12.5 to 25 tons) if a horizontal discharge configuration is used.

If any of the units are installed in the downflow discharge configuration and have the alternate TCO1 limit switch provided, remove the additional TCO1 limit switch attached to the installed TCO1 limit switch (12.5 to 25 tons) and discard.

For detailed instructions, refer to “TCO1 Instructions,” p. 23.

Table 4. TCO1 tripping values – two-stage gas

Tons	Unit Model Number	TCO1 Tripping Values - Downflow/Horizontal
12.5	DHJ150*** (0,A)L	135°F-3"/155°F-3"
	DHJ150*** (0,A)M	140°F-3"/160°F-3"
	DHJ150*** (0,A)H	160°F-3"/170°F-3"
15	DHJ180*** (0,A)L	140°F-3"/150°-7"
	DHJ180*** (0,A)M	150°F-3"/195°F-3"
	DHJ180*** (0,A)H	150°F-3"/200°F-3"
20	DHJ240*** (0,A)L	140°F-3"/150°F-3"
	DHJ240*** (0,A)M	125°F-3"/160°F-3"
	DHJ240*** (0,A)H	115°F-3"/155°F-3"
25	DHJ300*** (0,A)L	140°F-3"/150°F-3"
	DHJ300*** (0,A)M	125°F-3"/160°F-3"
	DHJ300*** (0,A)H	115°F-3"/155°F-3"

Table 5. TCO1 tripping values – modulating gas

Tons	Unit Model Number	TCO1 Tripping Values - Downflow/Horizontal
12.5	N/A	N/A
	DHJ150***BH	125° F - 3" stilt
15	DHJ180***BL	125° F - 3" stilt
	DHJ180***BH	140° F button
20	DHJ240***BL	125° F - 3" stilt
	DHJ240***BH	140° F button
25	DHJ300***BL	125° F - 3" stilt
	DHJ300***BH	140° F button

TCO1 Instructions

Note: For complete Gas Heat User information, Operation, Start-up, Shutdown and Maintenance refer to “Gas Heat Operation and Maintenance,” p. 53.

If the unit that being installed in horizontal configuration has a different TCO1 value than downflow configuration, then the limit control TCO1 must be replaced with the extra limit control shipped with the unit in the heater compartment. Refer . Replace TCO1 following the instructions in steps 1 through 3 below. If the unit being installed does not need to replace TCO1 limit switch, skip steps 1 through 3 and proceed to the next step in the installation process.

1. Remove the heat section access panel.
2. Remove TCO1 from shipping location, which is attached to the installed TCO1 limit switch (12.5 to 25 tons).
3. Replace and discard the existing TCO1 originally

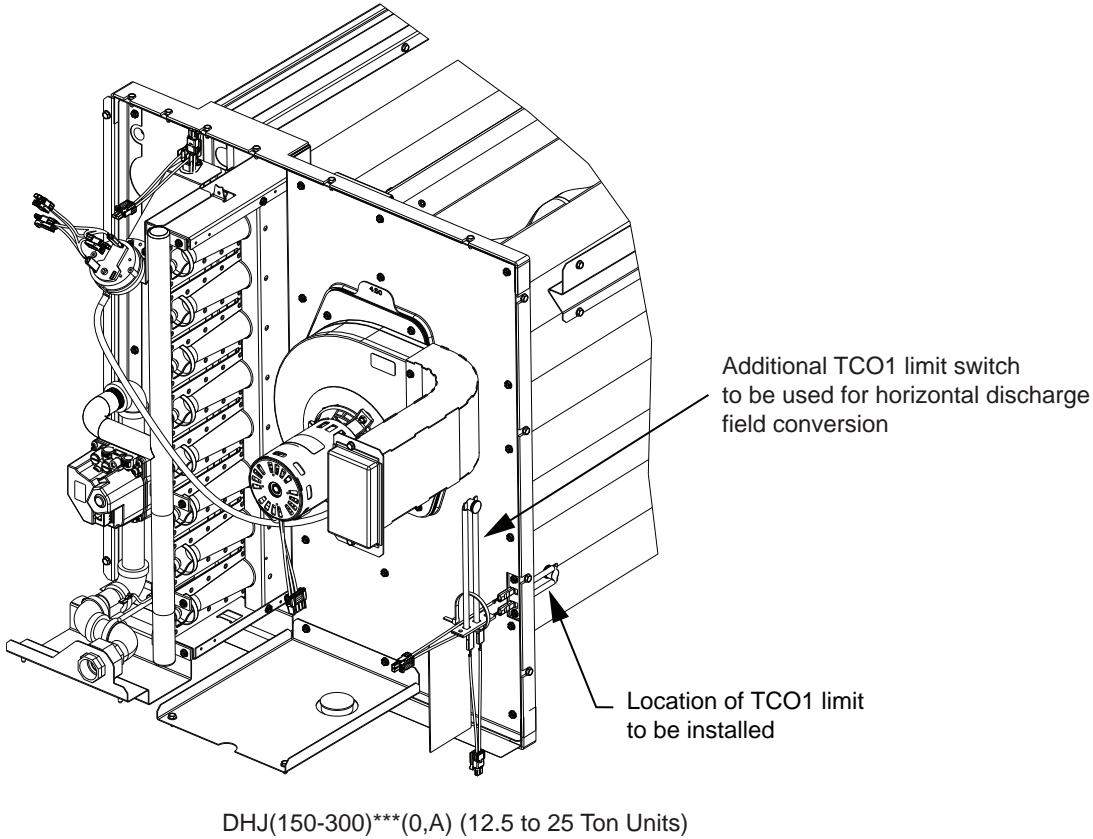
Installation

installed at the factory for downflow operation with the TCO1 shipped with the unit which is attached to the installed TCO1 limit switch (12.5 to 25 tons) for

horizontal operation.

4. Replace heat section access panel.

Figure 20. TCO1 instructions



Note: The TCO1 switch is attached by two screws in the location shown. The switch has short legs on it so use caution when sliding out of vestibule face during removal.

Return Air Smoke Detector

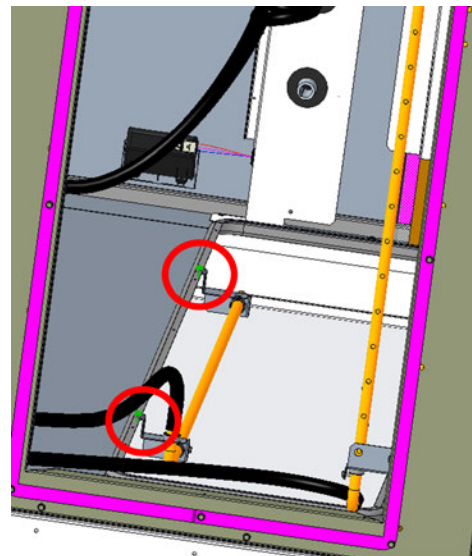
The factory installed return air smoke detector is installed in the downflow discharge position for 12.5 to 25 ton units. No additional field setup is required.

If a unit is to be converted to horizontal discharge, for 12.5 to 25 ton units, 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 two screws from the mounting brackets.

Note: Refer to downflow view for screw locations of 12.5 to 25 ton units.

Figure 21. Downflow bracket installation (view from horizontal return duct)

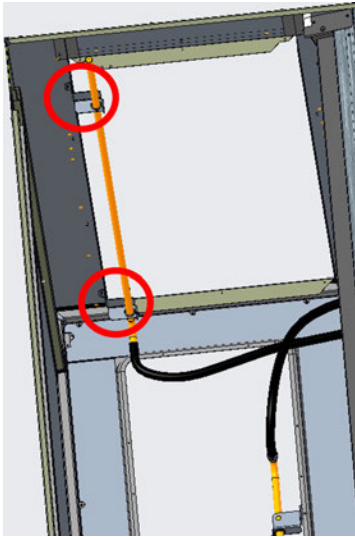


3. Lift the tube and bracket from the downflow duct opening. Rotate the tube and bracket assembly 90

degrees and confirm the holes on the aluminium sensing tube face away from the unit and face the return air ductwork.

Note: Refer to horizontal views below of the 12.5 to 25 ton units.

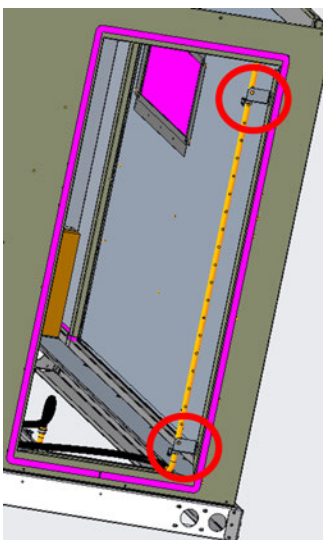
Figure 22. Horizontal bracket installation (top view of unit)



Note: Flexible tubing should lay flat on the base pan surface.

4. Slide the top bracket down the aluminium sensing tube.
 - For 12.5 to 25 ton units with standard or low leak economizers, secure the tube to the top right side of the horizontal opening flange (right side when viewed from outside unit facing horizontal supply). See Figure 23, p. 25.

Figure 23. Horizontal bracket installation (view from horizontal return duct)



5. Use the remaining two screws and bracket removed in step 2, secure the bottom bracket.

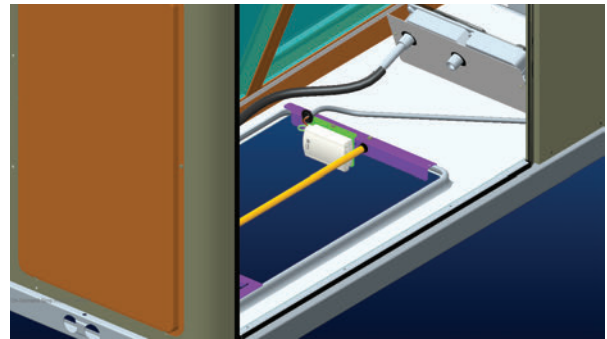
Air-Fi® Wireless Communication Interface

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

If converting to horizontal discharge, perform the following:

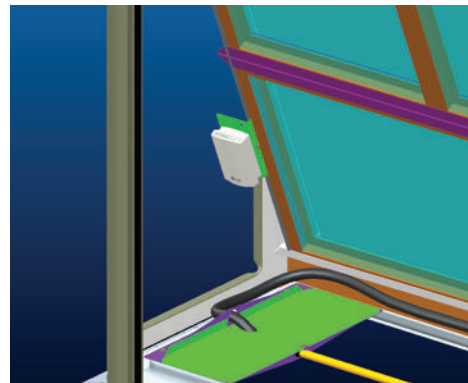
1. If the unit has an economizer, it must be pulled out in the operating position.
2. Remove the screw from the mounting bracket. Refer to downflow view for screw and bracket location.

Figure 24. Wireless communication interface - downflow



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

Figure 25. 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. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

⚠ 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/national electrical codes.

1. Verify that the power supply complies with the unit nameplate specifications.
2. Inspect all control panel components and tighten any loose connections.
3. 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.
4. Install proper grounding wires to an earth ground.

Electric Heat Requirements

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

Low Voltage Wiring

Mount the indoor thermostat, zone sensor, or programmable zone sensor in accordance with the corresponding thermostat installation instructions. Install

color-coded, weather-proof, multi-wire cable according to the field wiring instructions.

Note: Refer to thermostat or zone sensor wire installation guide for proper wire gauge.

Through-the-Base Gas Installation

Important: All phases of this installation must comply with national, state, and local codes. In absence of local codes, the installation must conform with American National Standard-Z223.1a-National Fuel Gas Code Latest Revision.

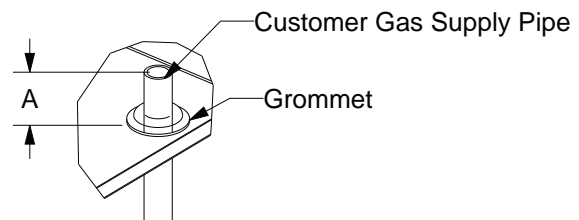
Note: For complete Gas Heat User information, Operation, Start-up, Shutdown and Maintenance refer to "Gas Heat Operation and Maintenance," p. 53.

1. Remove the access panel for the heat section on the front of the unit for field connections.
2. The gas piping assembly ships inside this section and includes the shut-off valve, a pressure tap for testing, and the necessary unions for field connection. For through the base access, remove the factory-provided cap from the base pan opening. See Figure 26, p. 26 and Figure 27, p. 27.
3. Route field piping through this hole to the dimension shown in Table 6, p. 26.
4. Place the assembly through the cabinet opening as shown in Figure 27, p. 27 and make the union connection to the field piping and to the gas train.

Table 6. Through-the-base gas piping dimension

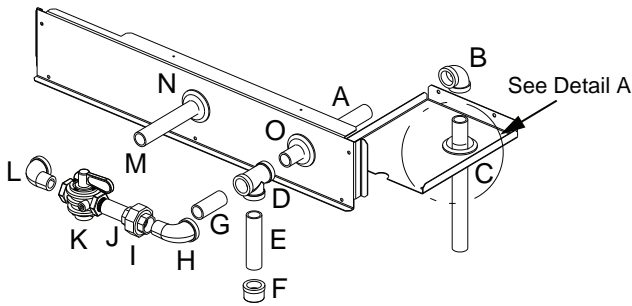
Model	Dimension A (inch)
DHJ(150-300)***(0,A)(L,M,H)	1 3/16

Figure 26. Through-the-base gas pipe height



DETAIL A

Figure 27. Through-the-base gas pipe assembly for DHJ(150-300)*



Component	Description
A	Pipe Nipple (3/4-in. x 8 1/2-in.)
B	90° Elbow
C	Support Plate
D	Tee
E	Pipe Nipple (3/4-in. x 4-in.)
F	Cap
G	Pipe Nipple (3/4-in. x 2 1/2-in.)
H	90° Street Elbow
I	Pipe Union
J	Pipe Nipple (3/4-in. x 2 1/2-in.)
K	Gas Shut-off Valve
L	90° Street Elbow
M	Pipe Nipple (3/4-in. x 6 1/2-in.)
N	Grommet
O	Grommet

For detailed through-the-base gas installation instructions, refer to the *Through-the-Base Gas Piping 3 to 25 Tons Gas/Electric Packaged Units Installation Instructions (ACC-SVN17*-EN)* provided with through-the-base gas installation kit.

Requirements of Gas Heat

The unit gas train and optional through-the-base gas shut-off valve are rated at 0.50 PSIG maximum. A pressure reducing regulator is recommended to prevent this maximum from being exceeded. These components must be isolated during field gas piping test that exceed 0.50 PSIG.

Important: *It is recommended that the field piping be capped prior to the unit gas train or optional through-the-base gas shut-off valve if present.*

- Gas supply line properly sized and connected to the unit gas train.
- All gas piping joints properly sealed.
- Gas piping leak checked with a soap solution. If piping connections to the unit are complete, do not pressurize piping in excess of 0.50 PSIG or 14-inch w.c. to prevent component failure.
- Drip leg installed in the gas piping near the unit.
- Flue exhaust clear of any obstruction.
- Supply and manifold pressures should be checked during unit commissioning. See [Table 7, p. 27](#) and [Table 8, p. 27](#).

Table 7. Supply and manifold pressure requirements – two-stage gas

	DHJ150*	DHJ(180-300)*		
Heating Input Rate – Btu/h	150,000-250,000	250,000	320,000	400,000
Minimum Supply Gas Pressure NG/LP (in. w.c.)	4.5/11.5	4.5/11.5		6/11.5
Maximum Supply Gas Pressure (in. w.c.)	14			
Manifold Gas Pressure – 1st Stage - NG (in. w.c.)	1.8	1.7	1.8	1.7
Manifold Gas Pressure – 2nd Stage - NG (in. w.c.)	3.5	3.3	3.5	3.3

Table 8. Supply and manifold pressure requirements – modulating gas

	Digit 10 = B models
Heating Input Rate – Btu/h	250,000 – 400,000
Minimum Supply Gas Pressure NG/LP (in. w.c.)	5/11.5
Maximum Supply Gas Pressure (in. w.c.)	14
Manifold Gas Pressure – Full Gas Input Rate - NG/LP (in. w.c.)	3.5/10

Condensate Drain Configuration

An evaporator condensate drain connection is provided on

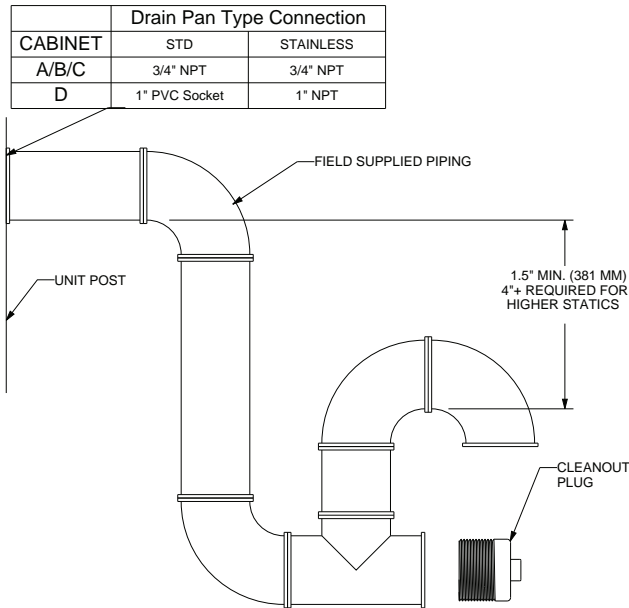
each unit. Refer to the ductwork section in the Installation chapter for the appropriate drain location.

Installation

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 .

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. This can result in condensate backup due to air lock.

Figure 28. Condensate trap installation



Drain Pan Removal (Units with Condensate Overflow Switch Option)

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

Avoid catching the wire on the bottom of indoor coil or any protrusion.

Furnace Condensate Drain

Modulating gas units are equipped with a furnace condensate drain system to evacuate any condensation (water) that may form inside the heat exchanger during cooling system operation. The unit does not condense during heating operation. Neutralization is not necessary as the condensate drainage is water only and is not acidic.

Filter Installation

The quantity of filters is determined by unit size. Refer to General Data section in *Packaged Rooftop Air Conditioners Precedent™ Heat Pump High Efficiency 12.5 to 25 Tons — 60 Hz product catalog* (PKGP-PRC021*-EN) Access to the filters is obtained by removing the filter access panel.

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/national electrical codes.

An overall dimensional layout for the field installed wiring entrance into the unit is illustrated in the Dimensions and Weights chapter. See the following guidelines to confirm the unit supply power wiring is properly sized and installed.

Verify the power supply available is compatible with unit 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!

Failure to use copper conductors could result in equipment damage as the equipment was not designed or qualified 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/national 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. Verify that no power is present with a voltmeter.

Standard Wiring

1. Location of the applicable electrical service entrance is illustrated in the Dimensions and Weights chapter. Complete the unit power wiring connections at HTB1 main power terminal block in unit control panel. Refer to the customer connection diagram shipped with the unit for specific termination points.
2. 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 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 main panel power terminal block (HTB1).
- Provide proper grounding for the unit in accordance with local and national codes.

Notes:

- *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 four sides after installation to prevent air leakage from the building entering the electrical enclosures.*
- *Seal any unused unit penetrations and around conduit and wiring at all unit and curb penetrations.*

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. Verify that no power is present with a voltmeter.

⚠ 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/national electrical codes.

An overall layout of the various control options available with the required number of conductors for each control device is illustrated in the wiring diagram located on main control box door.

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

Control Power Transformer

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

⚠ WARNING**Hazardous Voltage!**

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. Verify that no power is present with a voltmeter.

The transformers are located in the control panel. The circuit breaker is located on the right 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 the Dimensions and Weights chapter for the electrical access

Installation

locations provided on the unit and [Table 9, p. 31](#) for AC conductor sizing guidelines, and;

1. Use copper conductors unless otherwise specified.
2. AC control wiring between the controls and the unit termination point should not exceed 2.5 ohms/conductor for the length of the run.

Note: Check all loads and conductors for grounds, shorts, and mis-wiring.

3. Do not run the AC low voltage wiring in the same conduit with the high voltage power wiring.
4. Route low voltage wiring per illustrations below.

These illustrations are representative as some models may appear slightly different. The low voltage wiring routing is the same.

NOTICE

Component Failure!

Resistance in excess of two and a half (2.5) ohms per conductor could result in component failure due to insufficient AC voltage supply.

Do not exceed two and a half (2.5) ohms per conductor for the length of the run.

Figure 29. Low voltage wiring — D cabinet

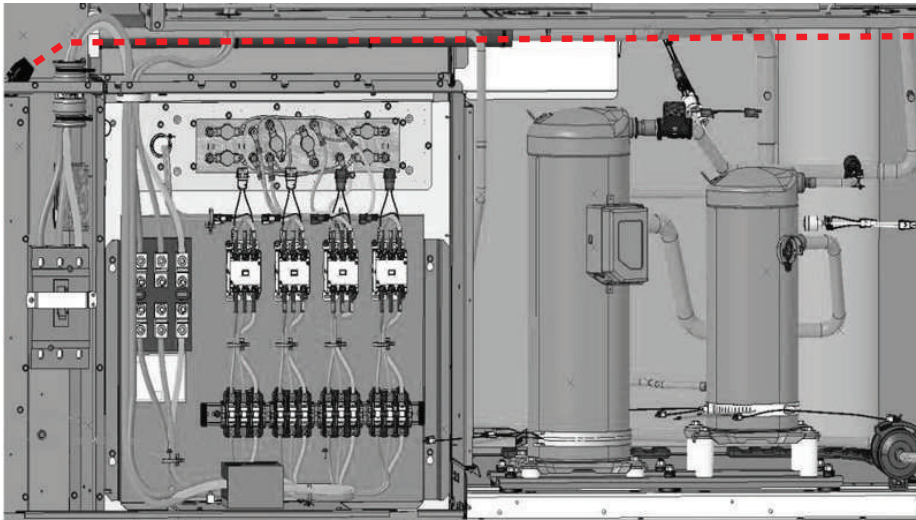


Figure 30. Main control panel low voltage wiring

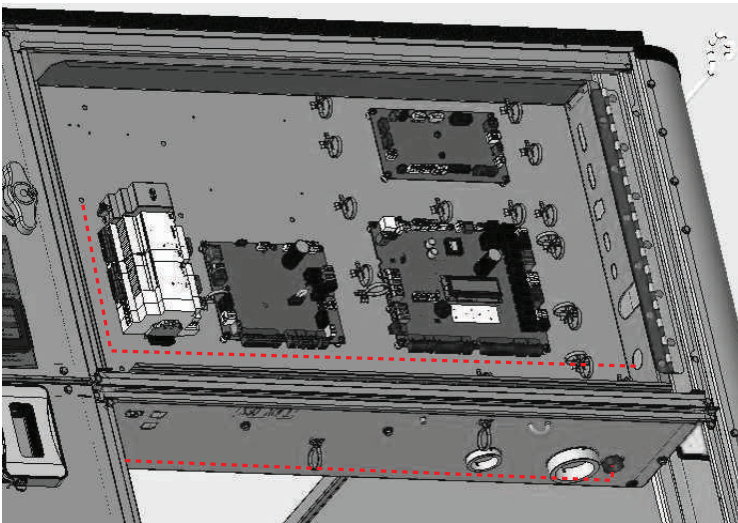


Table 9. Recommended wire lengths

Wire Size		Maximum recommended wire length from unit controller to sensor	
AWG	mm ²	Meters	Feet
22	0.33	0–46	0–150
20	0.50	47–73	151–240
18	0.75	74–117	241–385
16	1.30	118–185	386–610
14	2.00	186–296	611–970

Note: The total resistance of these low voltage wires must not exceed 2.5 Ω/conductor. Any resistance greater than 2.5 Ω may cause the control to malfunction due to an excessive voltage drop.

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 10, p. 31 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.

Notes:

- Resistance in excess of 2.5 ohms per conductor can cause deviations in the accuracy of the controls.
- Confirm the wiring between controls and the unit 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.

DC Conductors

Table 10. Zone sensor module wiring

Distance from Unit to Control	Recommended Wire Size
0 - 150 feet	22 gauge
0 - 45.7 m	0.33 mm ²
151 - 240 feet	20 gauge
46 - 73.1 m	0.50 mm ²
241 - 385 feet	18 gauge
73.5 - 117.3 m	0.75 mm ²
386 - 610 feet	16 gauge
117.7 - 185.9 m	1.3 mm ²
611 - 970 feet	14 gauge
186.2 - 295.7 m	0.2 mm ²

Note: See Symbio™ 700 unit controls schematic, 1213-4349, for controls wiring.

Space Temperature Averaging

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

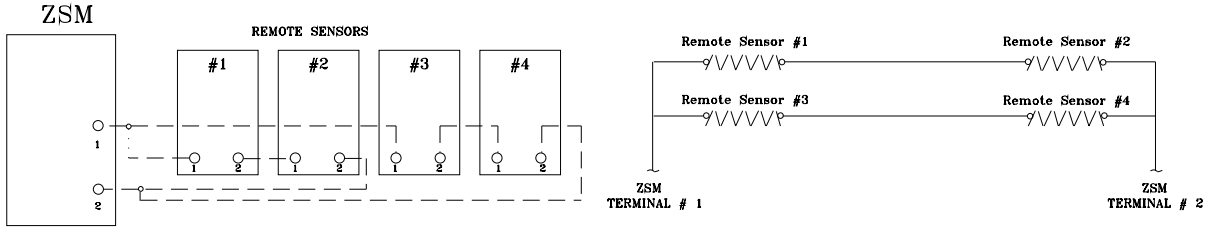
When using the BAYSENS016* or BAYSENS077*, at least four sensors are required to accomplish space temperature averaging.

- 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. lists the temperature versus resistance coefficient for all sensors.

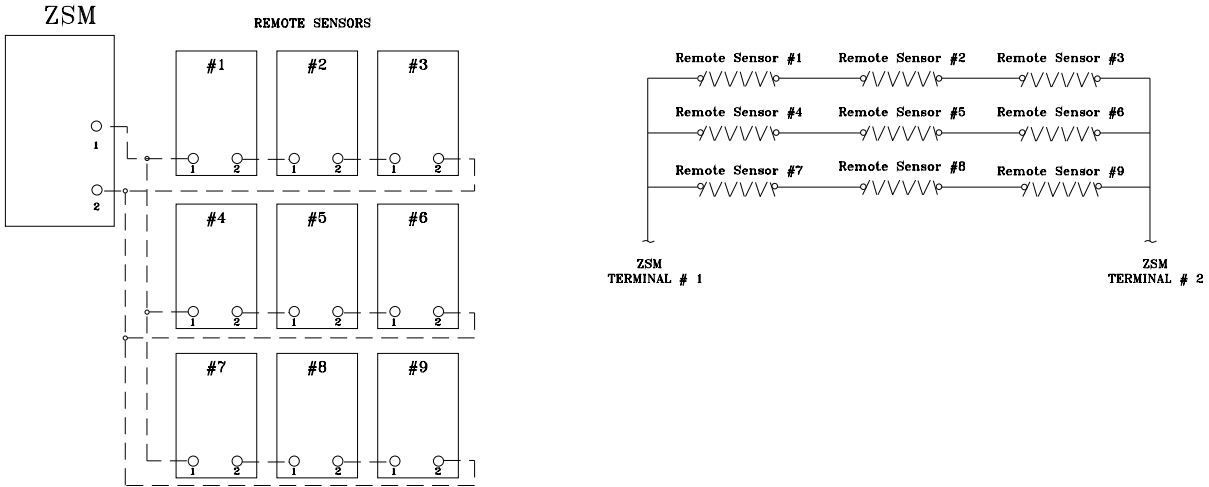
Installation

Figure 31. Examples

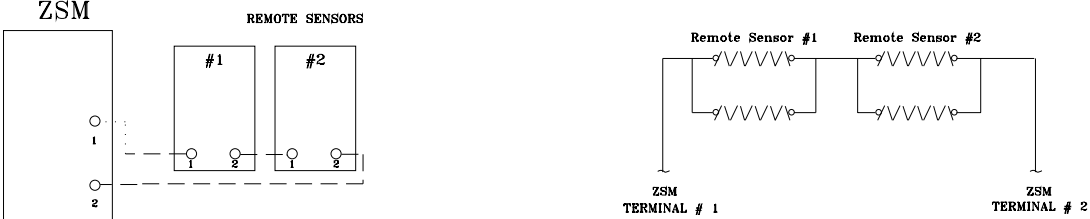
EXAMPLE #1



EXAMPLE #2



EXAMPLE #3



Note: Wiring pin numbers are for reference only. There are multiple smoke detector systems that could have differently numbered pins. For correct wiring details, refer to the specific smoke detector, ship-with literature.

Table 11. Temperature vs. resistance

Temperature		Nominal Resistance (kOhms)
Degrees °F	Degrees °C	
-20	-28.9	170.1
-15	-26.1	143.5
-10	-23.3	121.4
-5	-20.6	103.0
0	-17.8	87.56

Table 11. Temperature vs. resistance (continued)

Temperature		Nominal Resistance (kOhms)
Degrees °F	Degrees °C	
5	-15.0	74.65
10	-12.2	63.80
15	-9.4	54.66
20	-6.7	46.94
25	-3.8	40.40
30	-1.1	34.85
35	1.7	30.18
40°	4.4	26.22
45°	7.2	22.85

Table 11. Temperature vs. resistance (continued)

Temperature		Nominal Resistance (kOhms)
Degrees °F	Degrees °C	
50°	10.0	19.96
55°	12.8	17.47
60°	15.6	15.33
65°	18.3	13.4
70°	21.1	11.89
75°	23.9	10.50
80°	26.7	9.297
85°	29.4	8.247
90°	32.2	7.330
95°	35.0	6.528

Table 12. Sizing natural gas pipe mains and branches

Length of Pipe (Ft.)	Iron Pipe Size (IPS) Inches				
	1/2-in. Pipe	3/4-in. Pipe	1-in. Pipe	1¼-in. Pipe	1½-in. Pipe
15	76	176	345	750	1220
30	52	120	241	535	850
45	43	99	199	435	700
60	38	86	173	380	610
75	-	77	155	345	545

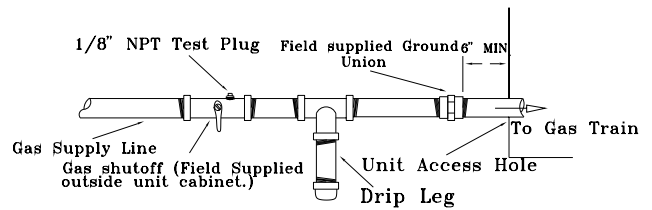
Note: Capacity of pipe of different diameters and lengths in Cu. Meter per Hr. with pressure drop of 74.6 Pa and specific gravity of 0.60.

Table 13. Iron pipe size (SI) millimeters

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

Note: Capacity of pipe of different diameters and lengths in Cu. Meter per Hr. with pressure drop of 74.6 Pa and specific gravity of 0.60.

Figure 32. Schematic diagram for field gas piping to Units



Pre-Start

Use the checklist provided below in conjunction with the General Unit Requirements checklist to confirm 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 a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

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

⚠ WARNING

Rotating Components!
Failure to disconnect power before servicing 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.

- 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.

1. 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.

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

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

$$AV \text{ (Average Voltage)} = \frac{\text{Volt1} + \text{Volt2} + \text{Volt3}}{3}$$

- 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:

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

VD (reading farthest from average) = 221

The percentage of Imbalance equals:

$$\frac{100 + 226 + 221}{226} = 2.2\%$$

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.

3. 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 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 a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

1. 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 **OFF**.
2. Connect the phase sequence indicator leads to the terminal block or to the line side of the optional factory mounted disconnect switch as follows:
 - a. Brown (phase A) to L1
 - b. Orange (phase B) to L2
 - c. Yellow (phase C) to L3
3. Close the field supplied main power disconnect switch or circuit protector switch that provides the supply power to the unit.

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

⚠ WARNING**Live Electrical Components!**

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

When it is 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.

Important: 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.

4. 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.
5. 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 (Some units include crankcase heater as standard). The proper operation of the crankcase heater is important to maintain an elevated compressor oil temperature during the **off** cycle to reduce oil foaming during compressor starts.
- Oil foaming occurs when refrigerant condenses in the compressor and mixes with the oil. In lower ambient conditions, refrigerant migration to the compressor could increase.
- When the compressor starts, the sudden reduction in crankcase pressure causes the liquid refrigerant to boil rapidly causing the oil to foam. This condition could damage compressor bearings due to reduced lubrication and could cause compressor mechanical failures.

1. Before starting the unit in the **cooling** mode, flip the system switch **OFF**.
2. Turn the main power disconnect **ON** and allow the crankcase heater to operate a minimum of 8 hours.
 1. Before closing the main power disconnect switch, confirm the system selection switch is **OFF** and the fan selection switch is in the **AUTO** position.
 2. Close the main power disconnect switch and the unit mounted disconnect switch, if applicable.

Note: When 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!**

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

When it is 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.

Important: 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.

Symbio Controls

The Symbio™ 700 supports a Service Test Mode that can be used to energize the various components of the system, either to support general system startup tasks or to support

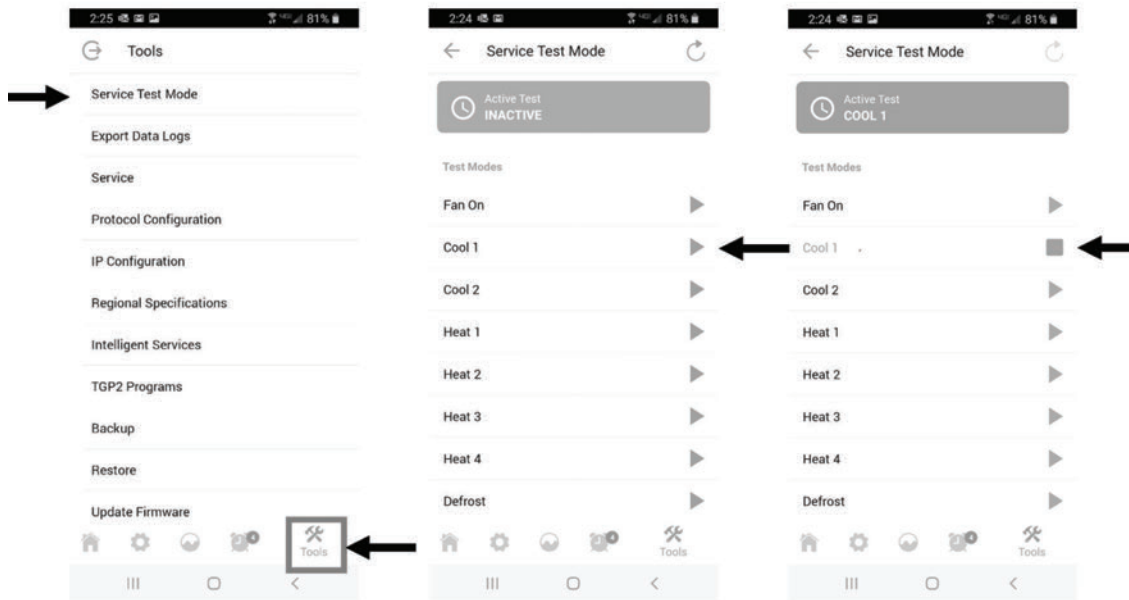
Pre-Start

troubleshooting. The user can initiate Service Test Mode through the controller user interfaces, including the Symbio Service and Installation mobile application.

The modes shown below can be initiated. Depending on the equipment configuration, the controller will energize the appropriate outputs. A user-selected timeout value will

determine how long the controller will remain in any given state once initiated. For detailed information on how each Service Test State is interpreted based on the equipment configuration, see ACC-APG002*-EN, *Symbio™ 700 for Precedent Packaged Rooftop Air-Conditioners Application Guide*.

Figure 33. Symbio 700 service test mode



Unit Start-Up

Sequence of Operation

See ACC-APG002*-EN, *Application Guide, Symbio™ 700 Controller with Precedent™ Packaged Rooftop Air-Conditioners.*

Heat Pump Heating Lockout Setpoint

Symbio™ 700 provides a heat pump heating lockout setpoint that allows the user to adjust the ambient temperature when compressor heating is disabled. If the unit is equipped with auxiliary heating (electric or gas), and it was not already active, the unit will automatically switch to auxiliary heating once ambient temperature drops below the lockout setpoint. The factory default setpoint is 0°F, but is user adjustable between -18 and 45°F. The setpoint can be adjusted via the Symbio 700 on-board user interface, the Symbio 700 Service and Installation mobile app, or building automation system.

Ignition Module – Two-stage

Two-stage (IGN) runs self-check (including verification that the gas valve is de-energized). (IGN) checks the high limit switches (TC01 and 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 gas output for first stage heat demand and energizes second stage gas output for second stage heat and detects flame and de-energizes spark.

At this point indoor fan would start with its minimum speed for the corresponding heat (first stage or second stage) demand.

The (IGN) enters a normal operating loop where all inputs are continuously monitored.

If a call for second stage heat is initiated after a call for first stage heat is established, 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. The Symbio™ 700 initiates a 90 second indoor blower-off delay at the current speed. The (IGN) de-energizes the inducer blower at the end of the post purge. The Symbio

700 de-energizes the indoor blower at the end of the selected indoor blower-off delay

Note: For complete Gas Heat User information, Operation, Start-up, Shutdown and Maintenance refer to “Gas Heat Operation and Maintenance,” p. 53.

Table 14. Ignition module diagnostics

Steady OFF	No Power/Failure/ Internal Failure
Steady ON	Normal – No Call for heat
Slow Flash Rate	Normal, call for heat (¾ second on, ¼ second off)
1 Flash	Loss of Communication
2 Flashes	System Lockout: Failed to detect or sustain flame. (failure to ignite, no spark, low/no gas pressure, etc.)
3 Flashes	Pressure switch problem detected. (no vent air flow, bad CBM, closed at initial call for heat). Auto reset.
4 Flashes	High Limit switch protection device open (excessive heat in combustion chamber, low airflow). Auto reset.
5 Flashes	Flame sensed and gas valve not energized, or flame sensed and no call for heat.
6 Flashes	Flame Rollout Switch open. (CBM failure, incorrect gas pressure, incorrect primary air). Requires manual reset of the switch.
7 Flashes	Weak Flame
8 Flashes	Internal Error
9 Flashes	Hardware Mismatch

Ignition Module – Modulating Gas

Call for Heat

1. Thermostat (or heat enable) contact closes providing call for heat.
2. The provided analog input is 2.0 Vdc (0.5% ModBus firing rate) or higher, the modulating actuator is placed in the park position and the draft inducer is energized, the air pressure transducer is calibrated, and the draft inducer is run to the **pre-purge** setting. A 15 to 30 second pre-purge is initiated. The display on the VB1285 will show *PUR*. See below.
3. The modulating actuator is moved to the ignition position during this time.
4. At the end of the pre-purge period, the ignition source is activated, and the main gas valve opens allowing gas to flow to the burners for the trial for ignition period [*PUR*].

Unit Start-Up

5. Burners ignite and cross light. Flame is sensed and control continues the heating cycle.
6. Control enters a **Warm-up** period [HER] that allows for burner stabilization prior to active modulation. Warm-up duration is program controlled.
7. At the end of the warm-up period, the 1st stage enters the run state characterized by normal burner modulation in response to the 2-6 Vdc analog input (1 - 56% ModBus firing rate) signal to the control [rUn].
8. The modulating gas valve is set as commanded by the analog FIRING RATE input signal:
 - a. < 1.5 Vdc (0% ModBus Firing Rate): OFF
 - b. 1.5 – 2.0 Vdc (0.5% ModBus Firing Rate): Minimum fire (Manifold pressure .20 to .30 in. w.c.)
 - c. 2.1 – 6.0 Vdc (1 - 56% ModBus Firing Rate): Modulation linearized to firing rate (Modulating Section Manifold pressure .25 to 3.50 in. w.c.)
9. If heating demand continues to increase and the analog input signal exceeds 6.0 Vdc (56% ModBus firing rate), and provided the air pressure switch is closed, the VB1285 initiates a trial for ignition of the 2nd stage.
10. Burners ignite and cross light. Flame is sensed and control continues the heating cycle.
11. Once the 2nd stage operation is verified, the 1st stage modulation is reset to its minimum input rate.
12. The modulating gas valve is set as commanded by the analog FIRING RATE input signal and will modulate between 6.1 and 10.0 Vdc analog input (57 - 100% ModBus firing rate), while maintaining operation of the 2nd stage at 3.50–inches w.c. manifold pressure.
13. The control remains in the high fire mode as long as the firing rate signal is above 5.0 Vdc (46% ModBus firing rate).
14. If the firing rate signal drops below 5.0 Vdc (46% ModBus firing rate), the 2nd stage section will shut-off and the 1st stage will continue to operate and modulate in response to changes in analog signal voltage.
15. System will continue in the run state until the heat enable contacts open or the analog input signal drops below 1.5 Vdc (0.5% ModBus firing rate) signal.
16. When call for heat is removed, 1st stage gas valve closes and modulating actuator is moved to **Park**

position, and the inducer is operated for a post purge period of 60 seconds [Pur].

17. Control returns to the standby mode [OFF].

Ignition and Operational Failures During a Call for Heat

1. If flame is not detected on the original ignition trial [RD I], the controller enters an inter-purge period of 30 seconds [rEt] and then will initiate another ignition trial. The control will repeat this sequence for up to 4 ignition trials.
2. If four consecutive failed ignition trials occur, control will go into lockout [E0 I].
3. If flame is lost during an operating cycle [RD2], the controller will operate same as in Step 1.
4. Limited low fire [RD4] will happen if flame loss at low fire results in an auto-adjustment that limits the burner turn down during the rest of the current call for heat.
5. Lockout will also occur for the following:
 - a. Open Limit or Rollout Switch [E02].
 - b. Low air pressure sensor reading is air pressure does not correspond to gas pressure [E04].
 - c. No R-W Enable [E09].
6. If the combustion air pressure switch opens (blocked vent or other airflow restriction) during heater operation with a continued call for heat, the control will lockout for one hour and then initiate a trial for ignition sequence.
7. Lockout will occur for any lockout error on either control and terminate heater operation for the duration of the lockout timing.
8. If no call for heat is present, controller is in the **Off** mode [OFF].

Recovery from Lockout (E Code)

1. If the call for heat (thermostat or heat enable closed) is still present one hour after a lockout occurs, the control will automatically reset and initiate a call for heat sequence.
2. Control may also be reset manually by removing power to the controller for 10 seconds and restoring power to controller.

Display Code	Code Type	Description	Additional Comments and Notes
BBB	10s L/O	Board Failure (Up to 10 seconds at power up)	Verify 24 Vac signal input at connector J6.
OFF	Status	UP Mode: Burner state = Off	
Pur	Status	UP Mode: Burner state = Purge	
I 5n	Status	UP Mode: Burner state = Ignition	
HER	Status	UP Mode: Burner state = Warm up	
rUn	Status	UP Mode: Burner state = Run	
rEt	Status	UP Mode: Burner state = Retry (with RD I or RD2)	Retry delay following either a failed ignition or a flame loss.

Display Code	Code Type	Description	Additional Comments and Notes
<i>R01</i>	Alert	Failed ignition attempt	
<i>R02</i>	Alert	Lost Flame	Ignition was successful but then flame disappeared.
<i>R03</i>	Alert	Insufficient Combustion Air	Blocked vent with actuator position derated by >20% from FRI setting
<i>R04</i>	Alert	Limited Low Fire (due to Lost Flame Auto-Adaptation)	Flame loss at low fire results in an auto-adjustment that limits the burner turn down during the rest of the current call for heat.
<i>R05</i>	Alert	Weak Flame Signal	Flame presence signal of less than 1.5µA indicates an aged flame rod.
<i>R07</i>	Alert	Loss of Inducer Motor Control	Air pressure is not modulating down at minimum inducer drive.
<i>R08</i>	Alert	Air Sensor Null Pressure Check out-of-tolerance	Air pressure sensor zero reading appears to be out-of-tolerance.
<i>R11</i>	Alert	Failed Ignition — split manifold burner	Failed Ignition, Split manifold burner, retries exhausted.
<i>R15</i>	Alert	Weak Flame Signal — split manifold	Weak Flame Signal, one or more split-manifold staged burners.
<i>E01</i>	1hr L/O	Failed Ignition	Four failed ignition attempts have occurred.
<i>E02</i>	10s L/O	Primary Limit Failure	Verify Primary Limit input at connector J8 and fuse at F1.
<i>E03</i>	10s L/O	Modulation Valve Failure	Valve Actuator did not reach a Park or Full On position.
<i>E04</i>	30s L/O	Air Sensor Failure — Pressure Reading Low	Includes insufficient air lockout due to blocked vent. Includes air switch failure to open during pre-purge switch check.
<i>E05</i>	30s L/O	Air Sensor Failure — Pressure Reading High	Includes air switch failure to close during pre-purge switch check.
<i>E08</i>	10s L/O	Improper Flame	
<i>E09</i>	0s L/O	No R-W Enable	An R-W open circuit is preventing the control from operating on a non-zero Firing Rate Demand or Firing Rate Input.
<i>E11</i>	10s L/O	1287 Lockout (L/O)	1287 L/O causes a 1285 L/O. Check 1287 control board LED state per the 1287 LED key below.
<i>E13</i>	10s L/O	Open fuse	
<i>E18</i>	10s L/O	1287 Improper Flame	Unexpected flame, Split manifold burner.
<i>E1d</i>	10s L/O	Invalid I.D. Plug Installed	

Return Air Smoke Detector

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

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

Compressor Start-Up

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 it is 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 on the suction and discharge gauge ports for each circuit.

Proceed to the next Service Test step if continuing from

previous component start-up or until the desired start-up component test is started.

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 label on the access panel.
3. Check system superheat. Follow the instruction listed on the superheat charging curve. Superheat should be within $\pm 5^{\circ}\text{F}$ of the superheat chart value.
4. Repeat steps 1 through 4 for each refrigerant circuit.
5. To stop the SERVICE TEST, flip the main power disconnect switch **OFF** or proceed to the next component start-up procedure. Remove electromechanical test mode connections (if applicable).

Hot Gas Reheat

⚠ 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 it is 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.

Set the unit to Service Test step Reheat. Once the unit is in the reheat test mode, verify that the 3 way valve has shifted to the reheat position and that the supply temperature rises 10°F more than when in cooling mode stage 2 (12.5-15 Tons) or stage 3 (20-25 Tons).

Monitor the suction pressure for 15 minutes. The suction pressure should remain within 5 psi of normal cooling operation. If the unit has a 2 speed outdoor fan and if the outdoor air temperature is below 80°F , verify that the OD fan is in low speed.

1. Clamp an amp meter around one of 1st stage heater power wires at the heater contactor.
2. Using the Service Test Guide in [Figure 33, p. 36](#), continue the SERVICE TEST start-up procedure for each compressor circuit.

Select the next desired Service Test Mode if continuing from previous component start up or exit Service Test if complete.

Gas Heat Units

1. Open the main disconnect switch to shut the unit off.
2. Follow the Test Guide in [Figure 33, p. 36](#) to start the unit in the heating mode.
3. Once the ignition system and components have been checked, open the main power disconnect switch to reset the unit.

Final System Setup

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

1. Program the Night Setback (NSB) panel (if applicable) for proper unoccupied operation. Refer to the programming instructions for the specific panel.
2. Verify that the Remote panel **system** selection switch, **fan** selection switch, and zone temperature settings for automatic operation are correct.
3. Inspect the unit for misplaced tools, hardware, and debris.
4. Verify all exterior panels including the control panel doors and condenser grilles are secured in place.
5. Close the main disconnect switch or circuit protector switch that provides the supply power to the unit's terminal block or the unit mounted disconnect switch.

⚠ WARNING

Safety Alert!

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

In addition to the following tasks, you MUST:

- **Follow all instructions in the unit's *Installation, Operation, and Maintenance* manual, including warnings, cautions, and notices.**
- **Perform all required tasks in any applicable Service Alerts and Service Bulletins.**
- **Review and understand all information provided in Submittals and Design Specifications.**

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.

Monthly Maintenance

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

⚠ 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. Verify that no power is present with a voltmeter.

Filters

Inspect the return air filters. Clean or replace them if necessary.

Return Air Smoke Detector Maintenance

Airflow through the unit is affected by the amount of dirt and debris accumulated on the indoor coil and filters. To verify 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.

Condensate Overflow Switch

During maintenance, the switch float (black ring) must be checked to confirm free movement up and down.

Cooling Season

- Check the unit 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 fans to confirm free movement and check motor bearings for wear. Verify all of the fan mounting hardware is tight.
- Inspect the F/A-R/A damper hinges and pins to verify all moving parts are securely mounted. Keep the blades clean.
- Verify all damper linkages move freely and lubricate with white grease, if necessary.
- Check supply fan motor bearings and repair or replace the motor as necessary.
- Verify 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.)
- Confirm that all retaining screws are reinstalled in the unit access panels once these checks are complete.
- With the unit running, check and record the following:
 - ambient temperature
 - compressor suction and discharge pressures (each circuit)
 - superheat (each circuit)

Record this data on an operator's maintenance log. See [Table 16, p. 43](#). If the operating pressures indicate a refrigerant shortage, measure the system superheat. For guidelines, see "[Compressor Start-Up](#)," [p. 39](#).

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 air filters. If necessary, clean or replace them.
- Check supply fan motor bearings and repair or replace the motor as necessary.
- Inspect both the main unit control panel and heat section control box for loose electrical components and

Maintenance

terminal connections, as well as damaged wire insulation. Make any necessary repairs.

- Verify the electric heat system operates properly.

Coil Cleaning

Regular coil maintenance, including annual cleaning, enhances the unit's operating efficiency by minimizing the following:

- Compressor head pressure and amperage draw
- Evaporator water carryover
- Fan brake horsepower
- Due to increase static pressure losses
- Airflow reduction

⚠ WARNING

Hazardous Chemicals!

Failure to follow this safety precaution 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 or eyes 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.

At least once each year, or more often if the unit is located in a dirty environment, clean the condenser coils using the instructions below. 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

1. Remove shipping screws (ones without washers).
 2. Lift hail guards up so screws with washers go to top of keyhole.
 3. Remove hailguard by sliding washer head screw through keyhole.
- 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.

Coil Cleaning Procedure

1. Remove enough panels from the unit to gain access to the coil. Remove the access panel from the roof located next to the rear condenser fan.

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

⚠ WARNING

Hazardous Pressures!

Failure to follow instructions below could result in a violent explosion, which could result in death or serious injury.

If a heat source is required to raise the tank pressure during removal of refrigerant from cylinders, use only warm water or heat blankets to raise the tank temperature. Do not exceed a temperature of 150°F. Do not under any circumstances apply direct flame to any portion of the cylinder.

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

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

Hail Guard Reinstallation

Reinstall hail guards by aligning the keyholes over the washer screw heads, and slide into place. If your installation requires seismic or special wind load compliance, reinstall shipping screws.

Hot Gas Reheat Additional Oil

NOTICE
Compressor Damage!
Use of incorrect refrigerant and oil could result in compressor damage and improper unit operation.
Use only refrigerant and oil specified on the unit nameplate.

Additional refrigerant oil has been added in the factory for all Hot Gas Reheat units. If major components (coil, valve assembly, etc.) are replaced or serviced, the following steps must be taken:

1. Measure the amount of oil removed during servicing.

2. When recharging the unit after servicing, replace the amount of oil removed, as measured in step 1. Verify oil added is the correct type.
3. For compressor replacements and/or additional questions, contact Technical Support.

Annual Maintenance

Clean and repaint any corroded surface.

Final Process

For future reference, record the unit data below in the blanks provided.

Table 15. Unit data log

Complete Unit Model Number	
Unit Serial Number	
Wiring Diagram Numbers (from unit control panel)	
Connections	
Schematics	

Table 16. Sample maintenance log

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

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

Troubleshooting

Refer to the *Application Guide Symbio™ 700 Controller with Precedent™ Packaged Rooftop Air-Conditioners* (ACC-APG002*-EN).

Wiring Diagrams

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 17. Wiring diagrams

Schematic Type	Controls	Voltage	Drawing Number	Description
Main Unit	Symbio 700	All	12134334	SCHEMATIC; SHEET 1, POWER, DUAL COMPRESSOR, DUAL CONDENSER FAN, STD SCCR
Main Unit	Symbio 700	All	12134335	SCHEMATIC; SHEET 1, POWER, DUAL COMPRESSOR, SINGLE CONDENSER FAN, HIGH SCCR
Main Unit	Symbio 700	All	12134336	SCHEMATIC; SHEET 1, POWER, DUAL COMPRESSOR, DUAL CONDENSER FAN, HIGH SCCR
Main Unit	Symbio 700	All	12134337	SCHEMATIC; SHEET 2, POWER, SINGLE INDOOR FAN, COOLING ONLY/ ELECTRIC HEAT, STD SCCR
Main Unit	Symbio 700	230V	12134338	SCHEMATIC; SHEET 2, POWER, SINGLE INDOOR FAN, 2-STAGE GAS HEAT, 230V, STD SCCR
Main Unit	Symbio 700	460V/575V	12134339	SCHEMATIC; SHEET 2, POWER, SINGLE INDOOR FAN, 2-STAGE GAS HEAT, 460V/575V, STD SCCR
Main Unit	Symbio 700	All	12134340	SCHEMATIC; SHEET 2, POWER, DUAL INDOOR FAN, COOLING ONLY/ ELECTRIC HEAT, STD SCCR
Main Unit	Symbio 700	230V	12134341	SCHEMATIC; SHEET 2, POWER, DUAL INDOOR FAN, 2-STAGE GAS HEAT, 230V, STD SCCR
Main Unit	Symbio 700	460V/575V	12134342	SCHEMATIC; SHEET 2, POWER, DUAL INDOOR FAN, 2-STAGE GAS HEAT, 460V/575V, STD SCCR
Main Unit	Symbio 700	All	12134343	SCHEMATIC; SHEET 2, POWER, SINGLE INDOOR FAN, COOLING ONLY/ ELECTRIC HEAT, HIGH SCCR
Main Unit	Symbio 700	230V	12134344	SCHEMATIC; SHEET 2, POWER, SINGLE INDOOR FAN, 2-STAGE GAS HEAT, 230V, HIGH SCCR
Main Unit	Symbio 700	460V/575V	12134345	SCHEMATIC; SHEET 2, POWER, SINGLE INDOOR FAN, 2-STAGE GAS HEAT, 460V/575V, HIGH SCCR
Main Unit	Symbio 700	All	12134346	SCHEMATIC; SHEET 2, POWER, DUAL INDOOR FAN, COOLING ONLY/ ELECTRIC HEAT, HIGH SCCR
Main Unit	Symbio 700	230V	12134347	SCHEMATIC; SHEET 2, POWER, DUAL INDOOR FAN, 2-STAGE GAS HEAT, 230V, HIGH SCCR
Main Unit	Symbio 700	460V/575V	12134348	SCHEMATIC; SHEET 2, POWER, DUAL INDOOR FAN, 2-STAGE GAS HEAT, 460V/575V, HIGH SCCR
Main Unit	Symbio 700	All	12134349	SCHEMATIC; SHEET 3, CONTROLS, SYMBIO 700 UNIT CONTROLS
Main Unit	Symbio 700	All	12134538	SCHEMATIC; SHEET 3, CONTROLS, SYMBIO 700 UNIT CONTROLS, HEAT PUMP
Main Unit	Symbio 700	All	12134443	SCHEMATIC; SHEET 4, CONTROLS, ADAPTER BOARD UNIT CONTROLS, DUAL COMPRESSOR, SINGLE FAN
Main Unit	Symbio 700	All	12134444	SCHEMATIC; SHEET 4, CONTROLS, ADAPTER BOARD UNIT CONTROLS, DUAL COMPRESSOR, DUAL FAN
Main Unit	Symbio 700	All	12134445	SCHEMATIC; SHEET 5, CONTROLS, INDOOR OPTIONS
Main Unit	Symbio 700	All	12134438	SCHEMATIC; SHEET 6, CONTROLS, FRESH AIR OPTIONS
Main Unit	Symbio 700	All	12134446	SCHEMATIC; SHEET 7, CONTROLS, CUSTOMER CONNECTION OPTIONS
Main Unit	Symbio 700	All	12134447	SCHEMATIC; SHEET 8, CONTROLS, STEPPER MOTOR CONTROLLER
Main Unit	Symbio 700	All	12134448	SCHEMATIC; SHEET 9, CONTROLS, XM30/XM32 EXPANSION MODULES

Wiring Diagrams

Table 17. Wiring diagrams (continued)

Schematic Type	Controls	Voltage	Drawing Number	Description
Main Unit	Symbio 700	All	X39004322	LABEL; FUSE TABLE
Component Location	Symbio 700	All	12134449	DIAGRAM; COMPONENT LOCATION, COOLING/ELECTRIC, B CABINET
Component Location	Symbio 700	All	12134450	DIAGRAM; COMPONENT LOCATION, GAS, B CABINET
Component Location	Symbio 700	All	12134451	DIAGRAM; COMPONENT LOCATION, COOLING/ELECTRIC, C CABINET
Component Location	Symbio 700	All	12134452	DIAGRAM; COMPONENT LOCATION, GAS, C CABINET
Component Location	Symbio 700	All	12134453	DIAGRAM; COMPONENT LOCATION, COOLING/ELECTRIC, D CABINET
Component Location	Symbio 700	All	12134454	DIAGRAM; COMPONENT LOCATION, GAS, D CABINET
Component Location	Symbio 700	All	12134539	DIAGRAM; COMPONENT LOCATION, COOLING/ELECTRIC, D CABINET, HEAT PUMP
Component Location	Symbio 700	All	12134540	DIAGRAM; COMPONENT LOCATION, GAS, D CABINET, DUAL FUEL
Electric Heat	Symbio 700	230V	12134301	SCHEMATIC; SHEET 1, ELECTRIC HEAT - 9 & 18 KW 240V
Electric Heat	Symbio 700	230V	12134302	SCHEMATIC; SHEET 1, ELECTRIC HEAT - 27 & 36 KW 240V
Electric Heat	Symbio 700	230V	12134303	SCHEMATIC; SHEET 1, ELECTRIC HEAT - 54 KW 240V
Electric Heat	Symbio 700	460V/575V	12134304	SCHEMATIC; SHEET 1, ELECTRIC HEAT - 9 & 18 KW 460V/575V
Electric Heat	Symbio 700	460V/575V	12134305	SCHEMATIC; SHEET 1, ELECTRIC HEAT - 27 & 36 KW 460V/575V
Electric Heat	Symbio 700	460V/575V	12134306	SCHEMATIC; SHEET 1, ELECTRIC HEAT - 54 KW 460V/575V
Electric Heat	Symbio 700	230V	12134307	SCHEMATIC; SHEET 1, ELECTRIC HEAT - 18 KW 240V
Electric Heat	Symbio 700	230V	12134308	SCHEMATIC; SHEET 1, ELECTRIC HEAT - 36 KW 240V
Electric Heat	Symbio 700	230V	12134309	SCHEMATIC; SHEET 1, ELECTRIC HEAT - 54 & 72 KW 240V
Electric Heat	Symbio 700	460V/575V	12134310	SCHEMATIC; SHEET 1, ELECTRIC HEAT - 18 KW 460V/575V
Electric Heat	Symbio 700	460V/575V	12134311	SCHEMATIC; SHEET 1, ELECTRIC HEAT - 36 KW 460V/575V
Electric Heat	Symbio 700	460V/575V	12134312	SCHEMATIC; SHEET 1, ELECTRIC HEAT - 54 & 72 KW 460V/575V
Electric Heat	Symbio 700	All	X39004311	LABEL; FUSE REPLACEMENT, ELECTRIC HEAT, 300V/600V
Supplemental	Symbio 700	All	12134327	DIAGRAM; POWER EXHAUST
Supplemental	Symbio 700	All	12134461	DIAGRAM; SCHEMATIC - CONVENIENCE OUTLET OPTION
Supplemental	Symbio 700	All	12134352	LABEL; DIAGRAM, LOW AMBIENT
Power	Symbio 700	230V	12134729	SCHEMATIC; SHEET 2, POWER, DUAL INDOOR FAN, MOD GAS HEAT, 230V, STD SCCR
Power	Symbio 700	460V/575V	12134730	SCHEMATIC; SHEET 2, POWER, DUAL INDOOR FAN, MOD GAS HEAT, 460V/575V, STD SCCR
Power	Symbio 700	230V	12134733	SCHEMATIC; SHEET 2, POWER, DUAL INDOOR FAN, MOD GAS HEAT, 230V, HIGH SCCR
Power	Symbio 700	460V/575V	12134734	SCHEMATIC; SHEET 2, POWER, DUAL INDOOR FAN, MOD GAS HEAT, 460V/575V, HIGH SCCR
Component Location	Symbio 700	All	12134742	DIAGRAM; COMPONENT LOCATION, MOD GAS, D CABINET, DUAL FUEL

Piping Diagrams

Figure 34. Piping diagram – cooling mode, 12.5 to 15 tons high efficiency (W/DHJ150–180)

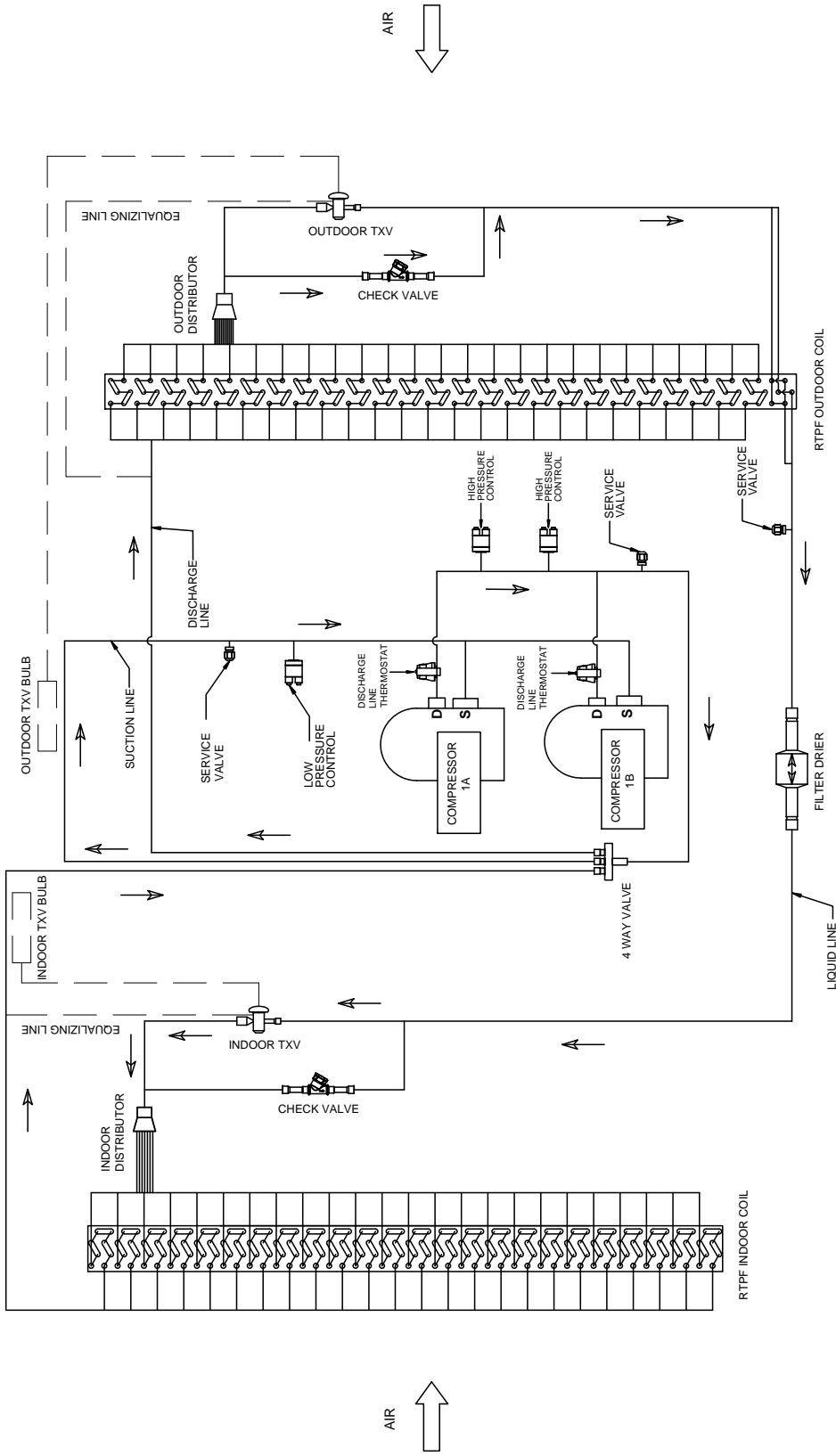


Figure 35. Piping diagram – cooling mode, 20 to 25 tons high efficiency (W/DHJ240–300)

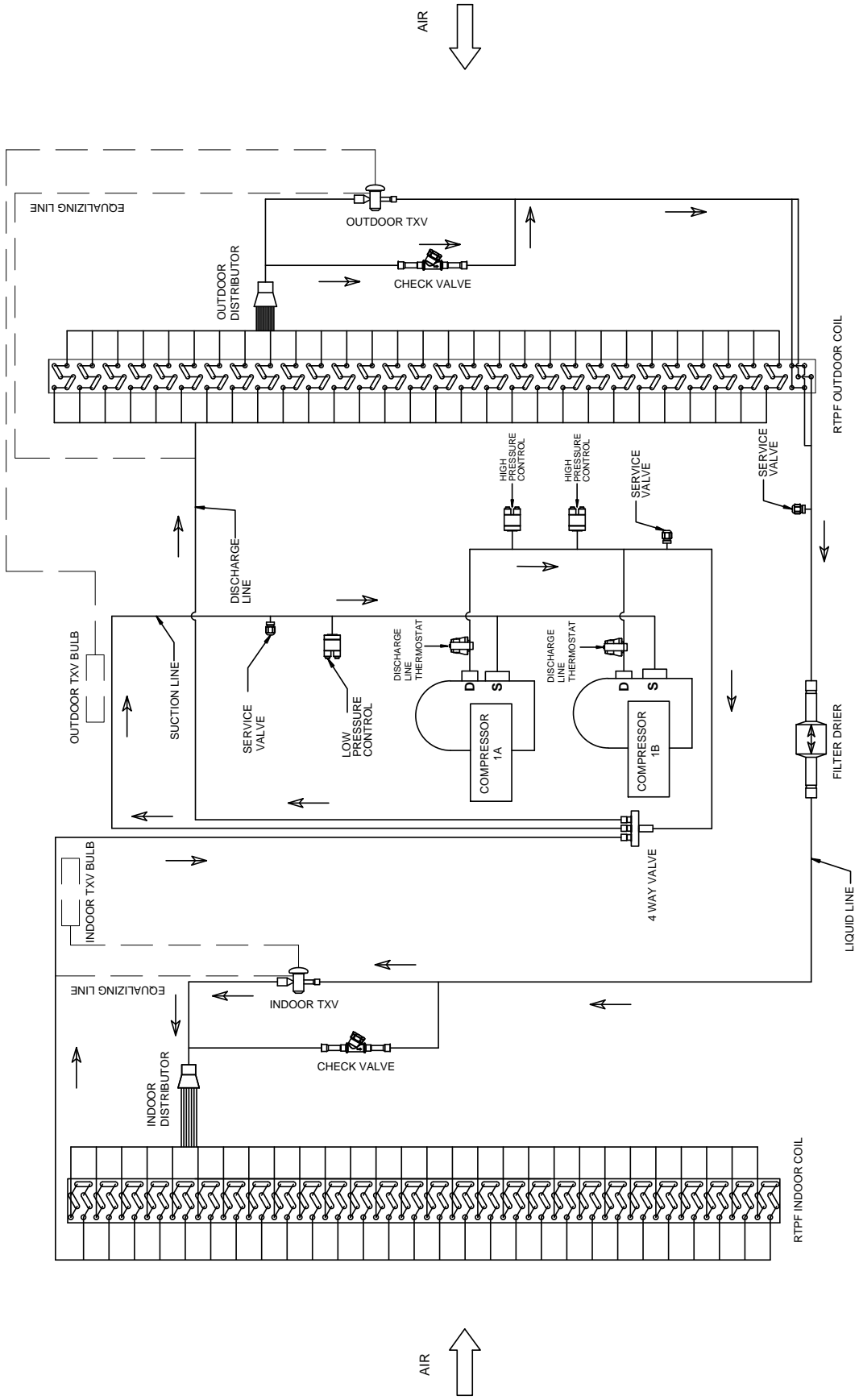


Figure 36. Piping diagram – heating mode, 12.5 to 15 tons high efficiency (W/DHJ150–180)

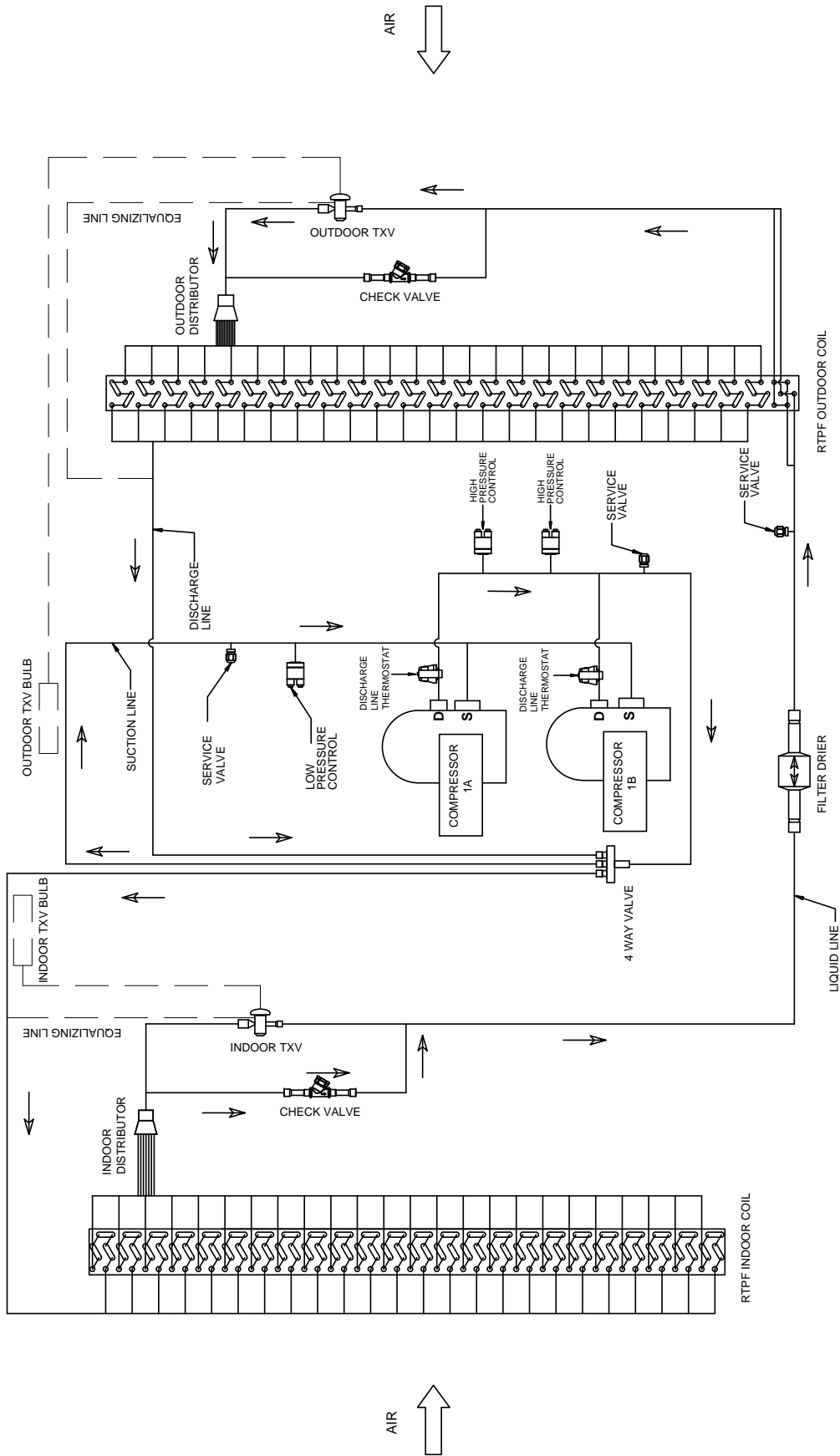


Figure 37. Piping diagram – heating mode, 20 to 25 tons high efficiency (W/DHJ240–300)

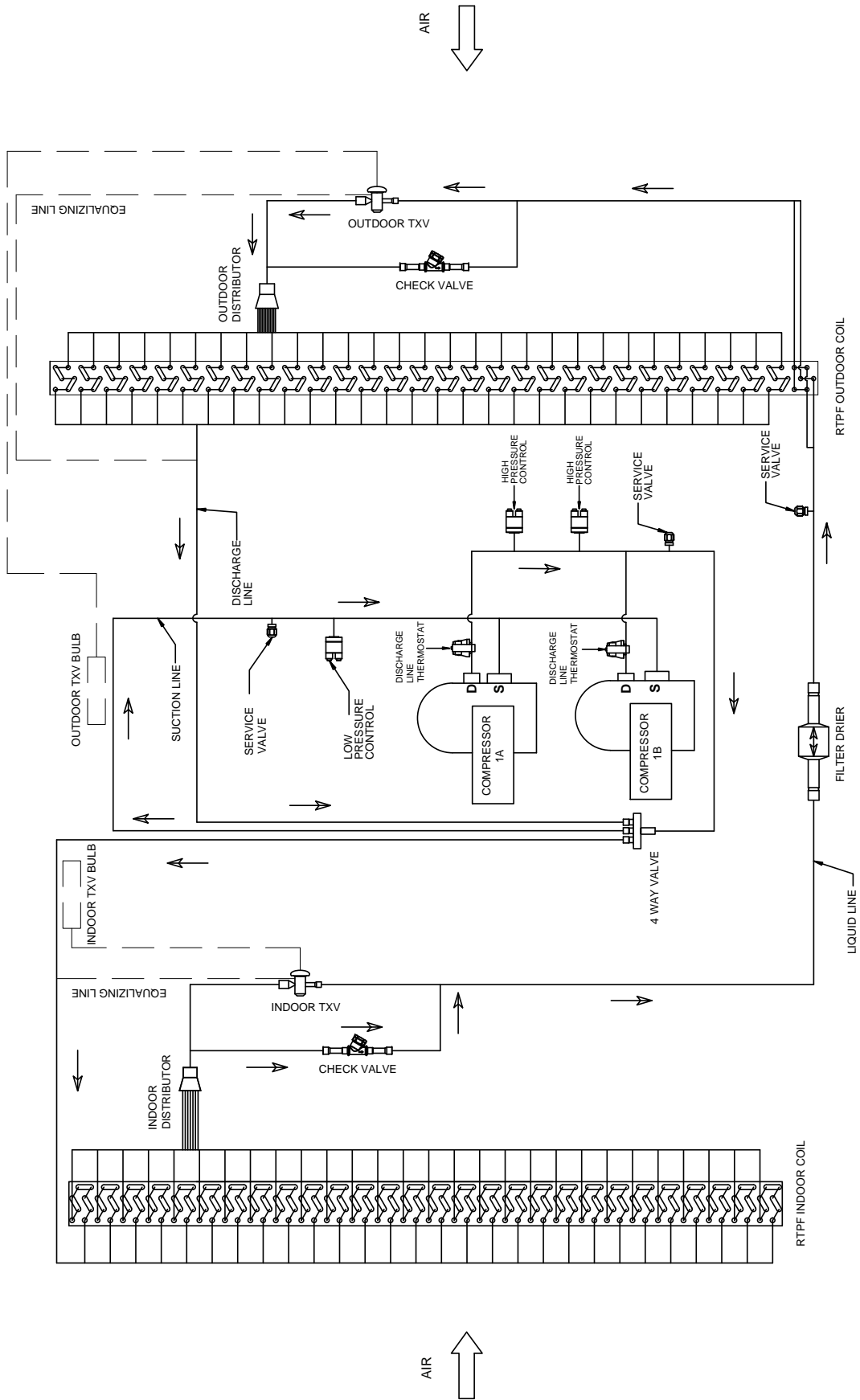


Figure 38. Piping diagram – cooling with HGRH mode, 12.5 to 15 tons high efficiency (W/DHJ150-180)

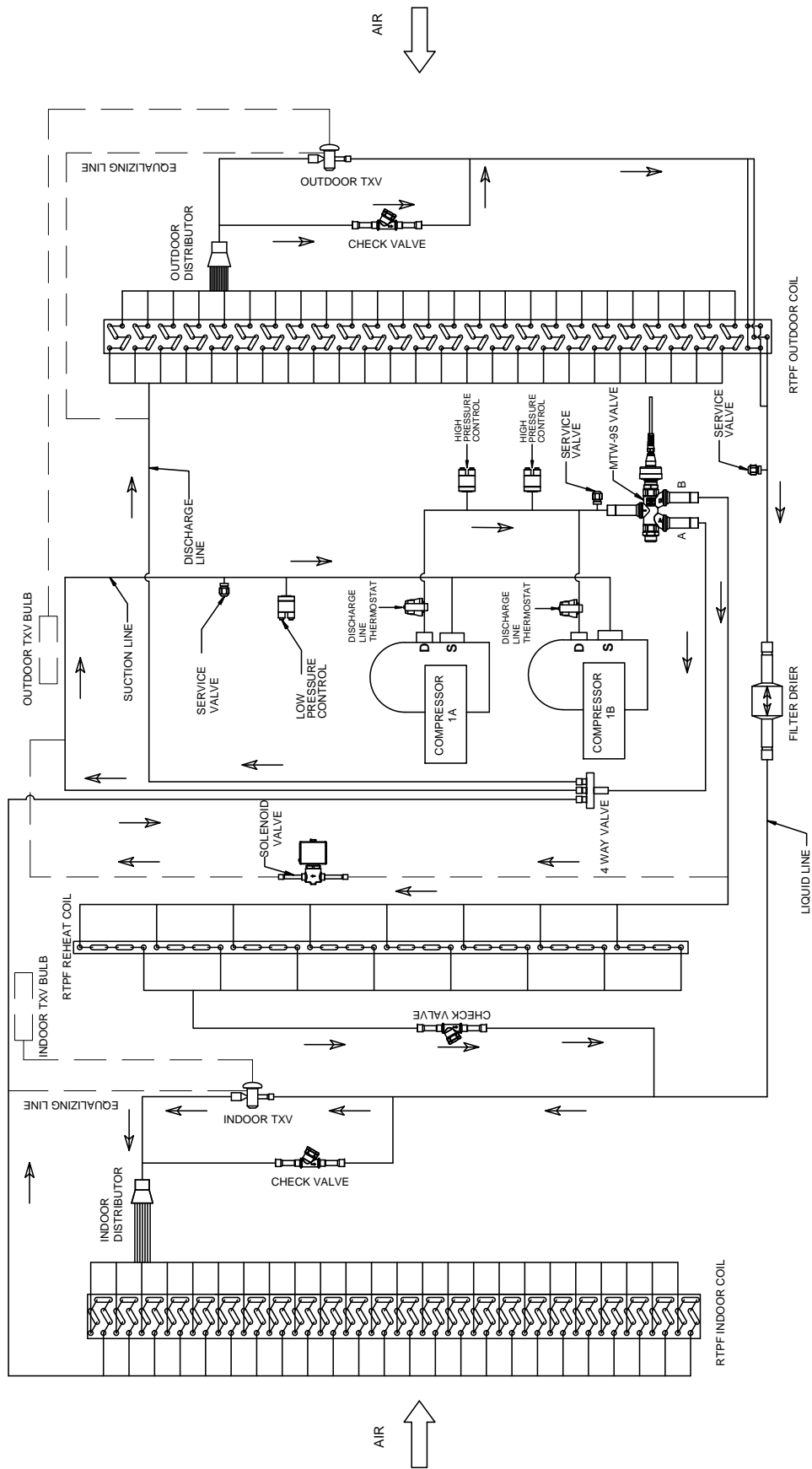
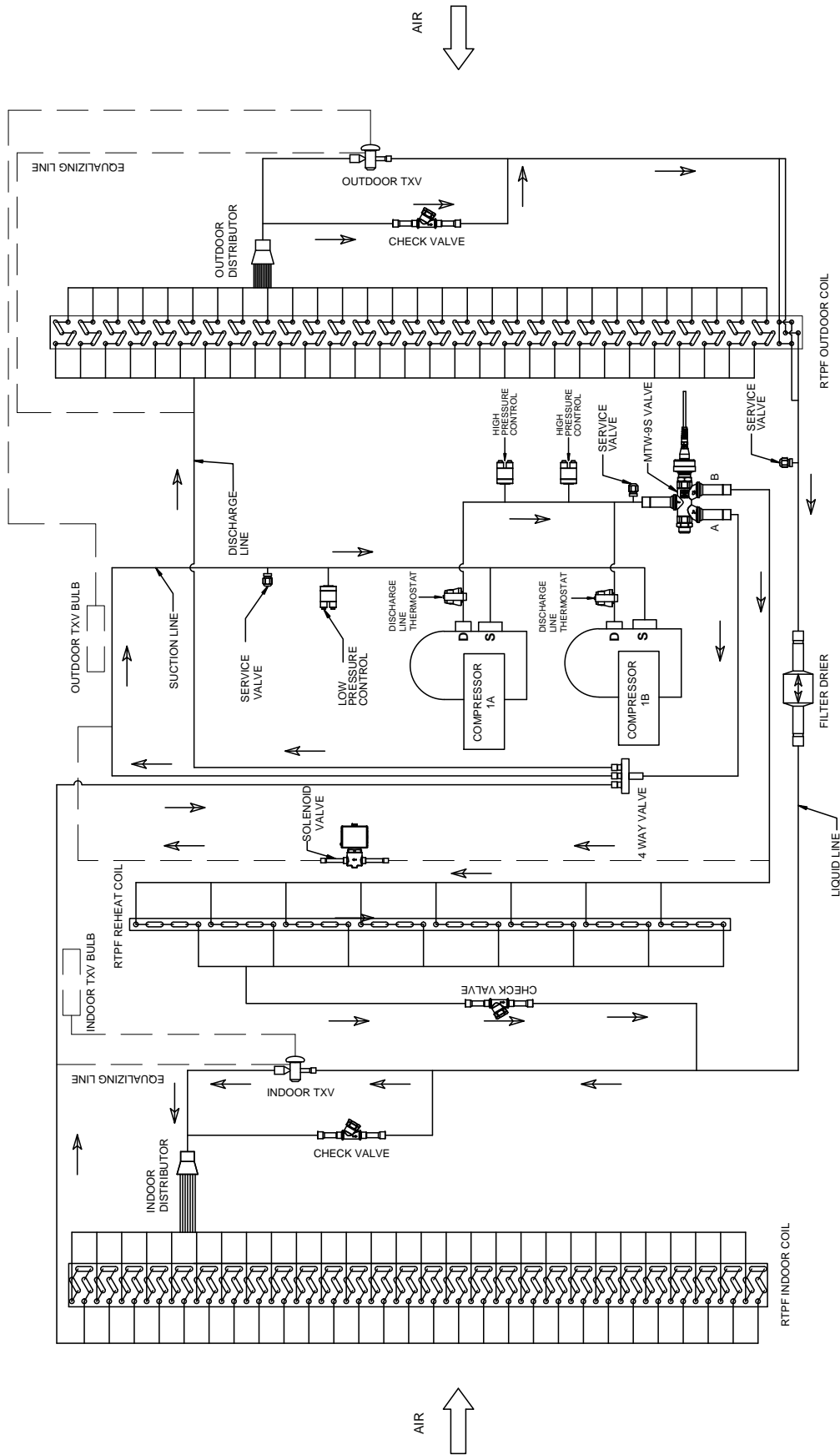


Figure 39. Piping diagram – cooling with HGRH mode, 20 to 25 tons high efficiency (W/DHJ240–300)



Gas Heat Operation and Maintenance

Gas Heat Unit General Information

⚠ WARNING

Hazard of Explosion or Fire!

Failure to follow instructions could result in death or serious injury and equipment or property damage.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

IF YOU SMELL GAS, follow instructions below:

- Do not try to light any appliance.
- Do not touch any electrical switch.
- Do not use any phone in your building.
- Open windows and doors.
- Alert others and evacuate building immediately.
- From a phone outside of the building, immediately call your gas supplier. Follow the gas supplier's instructions. If you cannot reach your gas supplier, call the fire department.

⚠ WARNING

Safety Hazards!

Failure to follow instructions below could result in death or serious injury and equipment or property damage.

- Do not use this furnace if any portion has been under water as it may have rendered the unit hazardous to operate. Immediately call a qualified service technician to inspect the furnace and to replace any part or the control system and any gas control which has been under water.
- Should overheating occur, or the unit gas valve fail to shut off, close the gas valve to the furnace before shutting off the electrical supply.

⚠ WARNING

Safety Hazards!

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

- Never perform any maintenance procedures until the electrical power to the unit is turned off.
- Never perform any maintenance procedures until the gas valve to the gas supply is turned off.
- Never remove any panels from the unit while it is operating.
- Never remove panels or parts from the unit that are not discussed in this manual.
- Never cover the unit, since it is designed to operate year round.

The unit has a complex design. To verify it performs safely and gives long lasting services, some of the maintenance work must be performed by a qualified service person.

When a service person is referred to in this manual, this is a service technician who has had special training or a number of years experience in servicing this type of equipment. It is your responsibility to select a qualified service company that can provide a service person of this caliber.

Thermostat

Room thermostats are delicate temperature sensing controls. Their main function is to energize and de-energize the heating or cooling circuit to maintain the temperature setting you select.

Many thermostats contain a room thermometer to indicate the approximate room temperature and a temperature scale at the adjustment indicator to select the desired indoor air temperature. In addition, most thermostats have a selector mode switch with Heat, Off and Cool positions and a fan switch with On and Off positions.

When the switch is positioned at Off your unit will not operate in either the heat or cool modes. If the selector switch is set at Heat the unit will automatically cycle on and off to maintain the desired temperature setting. The unit will also operate automatically when the selector switch is positioned at Cool.

The fan selector switch can be used to operate the indoor fan continuously by positioning it at On. When set to Auto the fan will only operate when required during the heating or cooling cycles.

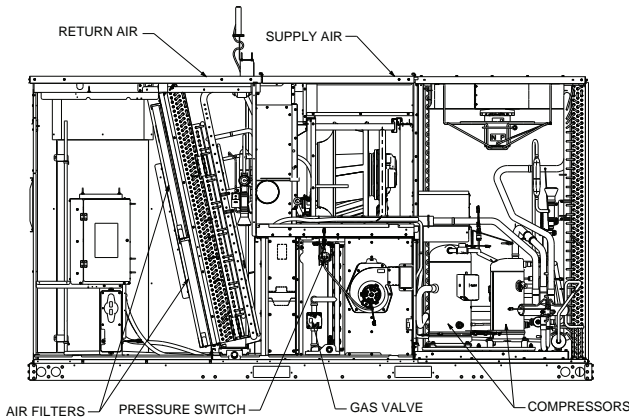
To ensure that the thermostat operates properly, it must be level and positioned to avoid the influence of such external heat sources as lamps, televisions or other heat producing appliances.

Notes:

- *Single zone VAV is designed to be used with a zone sensor. If a unit is configured for Single zone VAV operation but is connected to a thermostat, the control will revert to multi-speed (2-speed) indoor fan control and staged compressor control. This drastically reduces the energy savings available with this design.*
- *eFlex™ is designed to be used with a zone sensor. If a unit is configured for variable speed compressor operation but is connected to a thermostat, the control will revert to multi-speed indoor fan control and staged compressor control. This drastically reduces the energy savings available with this design.*

Air Filters

Figure 40. Gas unit overview



Filters are to be used with this unit. Units ship from the factory with filters installed.

It is very important to keep the central duct system air filters clean. Inspect them at least once each month when the system is in constant operation. (In new homes, check the filters every week for the first four weeks.) See the following table for the required filter size(s).

If the unit has disposable type filters, replace them with new filters of the same type and size. Do not attempt to clean disposable filters.

Permanent type filters can be cleaned by washing them with a mild detergent and water. Confirm the filters are thoroughly dry before reinstalling them in the unit (or duct system).

It may be necessary to replace permanent filters annually if washing fails to clean the filter. Use the same type and size as originally installed.

Table 18. Recommended standard filters

Tons	Unit Model Number	Qty	Filter Size (L x W x D)
12.5	DHJ150*** (0,A,B)(L,M,H)	8	20 x 24x 2
15	DHJ180*** (0,A,B)(L,M,H)	8	20 x 24x 2
20	DHJ240*** (0,A,B)(L,M,H)	4	20 x 24x 2
		4	20 x 30 x 2
25	DHJ300*** (0,A,B)(L,M,H)	4	20 x 24x 2
		4	20 x 30 x 2

Heating System

Heating Cycle Operation

The unit heating system is a solid-state electronic ignition control that lights the furnace burners each time the thermostat calls for heat. At the end of each heating cycle the furnace burners are extinguished. This type of system is called Direct Spark Ignition (DSI).

A normal heating cycle begins when the air temperature drops below the thermostat setting. The thermostat then energizes the heating electrical circuit that starts and controls the furnace burners. Shortly after the burners ignite the indoor fan starts and circulates warm air through the conditioned space.

When the air temperature rises to the thermostat setting the thermostat deenergizes the heating electrical circuit, which in turn extinguishes the burners. The indoor fan continues to circulate warm air until most of the heat is removed from the unit's combustion chamber.

Safety Controls

- The unit is equipped with an automatic reset safety limit control to prevent overheating. When the control opens, it shuts down the heating electrical circuit until the unit cools down sufficiently. Inadequate airflow (i.e., caused by dirty filters or defective fan motor) may cause the unit to cycle on and off as the limit trips and automatically resets. If the unit is cycling on its limit control, immediately contact a service person for instructions.
- If flames from the burner are not properly drawn into the heat exchanger, a flame rollout protection control will open causing the furnace to shut off. The cause must be investigated by a qualified service person.
- If installed, the condensate overflow switch will shut down the unit before a drain pan overflow occurs.

Heating System Start-Up

Because the unit has an automatic ignition system, it is easy to start the heating cycle at the beginning of the heating season. In order for the unit to operate properly and safely, the furnace needs air for both combustion and ventilation. Verify all air openings are unobstructed and

there is adequate clearance around the unit to provide good airflow.

⚠ 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. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

1. Set the thermostat heating adjustment lever to the lowest setting.
2. Flip the selector switch **OFF**.
3. Turn off all electric power to the unit.

⚠ WARNING

Risk of Burn!

Failure to follow instructions could result in serious injury.

NEVER attempt to manually light the burner.

4. This unit is equipped with an ignition device which automatically lights the burners.
5. Remove the access panel that contains the following label:

Figure 41. Label

REMOVE THIS PANEL
TO GAIN ACCESS TO
THE GAS VALVE

6. Flip the **ON/OFF** switch **OFF**.
Note: Some valves require the knob to be pushed in slightly before turning.

⚠ WARNING

Hazard of Explosion or Fire!

Failure to follow instructions could result in death or serious injury and equipment or property damage. Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

IF YOU SMELL GAS, follow instructions below:

- Do not try to light any appliance.
- Do not touch any electrical switch.
- Do not use any phone in your building.
- Open windows and doors.
- Alert others and evacuate building immediately.
- From a phone outside of the building, immediately call your gas supplier. Follow the gas supplier's instructions. If you cannot reach your gas supplier, call the fire department.

7. Wait (five) minutes to clear out any gas. If you then smell gas, **STOP** and proceed with the instructions as per above Warning. If you do not smell gas, go to the next step.
8. Change the **ON/OFF** switch **ON**.
9. Replace panel removed in [Step 5](#).
10. Turn on all electric power to unit.
11. Set thermostat to desired temperature and flip the selector switch **ON**. The unit will operate automatically.
12. If the unit will not operate, follow the instructions in "[Turning Off Gas to Unit](#)," p. 56 and call the service technician or gas supplier.

Important: The unit should be adjusted to obtain an air rise specified on the nameplate.

Heating System Shutdown

To shut down the heating system for brief periods of time slip the thermostat selector switch to the **OFF**.

NOTICE

Property Damage!

Furnace failure could cause property damage, such as frozen water pipes.

If the unit is shut down during the cold weather months, provisions must be taken to prevent freeze-up of all water pipes and water receptacles. Whenever your house or building is to be vacant, arrange to have someone inspect your structure for proper temperature. This is very important in below-freezing weather.

NOTICE

Coil Freeze-Up!

Failure to follow instruction below could result in equipment damage.

Drain and vent coils when not in use. Trane recommends glycol protection in all possible freezing applications. Use a glycol approved for use with commercial cooling and heating systems and copper tube coils.

Turning Off Gas to Unit

1. Set the thermostat to lowest setting.

⚠ 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. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

2. Turn off all electric power to the unit if service will be performed.
3. Remove the access panel that contains the label shown in [Figure 41, p. 55](#).
4. Change the **ON/OFF** switch to the **OFF**.
5. Replace panel removed in [Step 3](#).

Heating System Maintenance

⚠ WARNING

Hazard of Explosion or Fire!

Failure to follow instructions could result in death or serious injury and equipment or property damage. Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

IF YOU SMELL GAS, follow instructions below:

- Do not try to light any appliance.
- Do not touch any electrical switch.
- Do not use any phone in your building.
- Open windows and doors.
- Alert others and evacuate building immediately.
- From a phone outside of the building, immediately call your gas supplier. Follow the gas supplier's instructions. If you cannot reach your gas supplier, call the fire department.

Complete the following unit inspections and service routines at the beginning of each heating season.

Important: These steps should only be performed by a qualified service technician.

1. Inspect the control panel wiring and heating controls to confirm connections are tight and wiring insulation is intact.
2. Turn the unit on and off at the thermostat to be sure the ignition control and spark electrode are operating properly.
3. Turn off the gas supply with the unit operating to verify that the gas valves closes and that a re-ignition cycle is initiated by the ignition control.
4. Check the operation of the gas ignition system
5. Check the burner manifold pressure. A 1/8 inch pipe plug is provided in the gas valve for this purpose.
6. Visually inspect all of the unit's flue product passage ways for excessive deposit build up and corrosion. If build up or corrosion is apparent, perform the necessary repairs.
7. Arrange for a qualified serviceman to inspect the unit every other heating season to maintain safe and efficient operation.
8. Visually check the main burner flames. They should be bright blue flames extending into the heat exchanger sections.
9. Never store anything flammable or combustible around or near the unit.

Condensate Overflow Sensor (Optional)

If installed, the condensate overflow switch will shut down the unit before a drain pan overflow occurs.

Limited Warranty

Electric Air Conditioner

WHJ/DHJ Precedent Models

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. The company warrants for a period of 36 months from initial start-up or 42 months from date of shipment, whichever is less, that the company products covered by this order (1) are free from defects in material and workmanship and (2) have the capacities and ratings set forth in the company's catalogs and bulletins.

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 three years (36 months) 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 fourth 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 Technologies

2701 Wilma Rudolph Blvd.

Clarksville, TN 37040-1008

Attention: Manager, Product Service

GW-606-4800

The Company makes certain further warranty protection available on an optional extra-cost basis. Any further warranty must be in writing, signed by an officer of the company.

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. In no event shall the company be liable for any incidental or consequential damages.

* 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 five year limited warranty is provided for the optional "Low Leak" economizer.

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