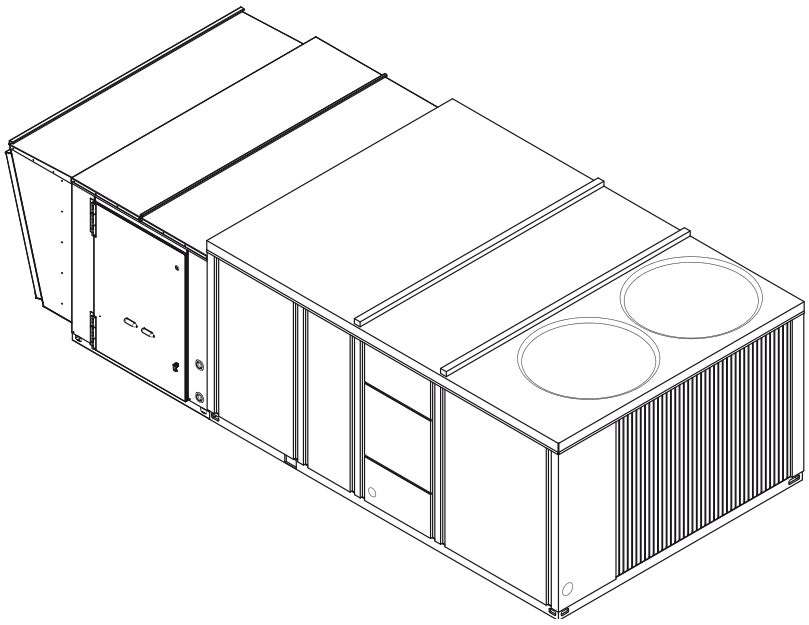
Installation, Operation, and Maintenance

Direct Gas-Fired Dedicated Outdoor Air Rooftop Unit



Models: RRU120**D*B, RRU150**D*B, RRU180**D*B, RRU240**D*B, RRU300**D*B

⚠ 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.

November 2021 **RRU-SVX01F-EN**

Introduction

FOR YOUR SAFETY

If you smell gas:
1. Open windows.
2. Don't touch electrical switches.
3. Extinguish any open flame.
4. Immediately call your gas supplier.

WARNING: Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

FOR YOUR SAFETY

The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.

POUR VOTRE SÉCURITÉ

Si vous sentez une odeur de gaz:
1. Ouvrez les fenêtres.
2. Ne touches à aucun interrupteur.
3. Éteignez toute flamme nue.
4. Avertissez immédiatement votre fournisseur de gaz.

AVERTISSEMENT: Une installation, un réglage, une modification, une réparation ou un entretien incorrect peut entraîner des dommages matériels, des blessures ou la mort. Lisez attentivement les instructions d'installation, de fonctionnement et d'entretien avant de procéder à l'installation ou à l'entretien de cet équipement.

POUR VOTRE SÉCURITÉ

Il est dangereux d'utiliser ou d'entreposer de l'essence ou autres liquides ou vapeurs inflammables dans des récipients ouverts à proximité de cet appareil.

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

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

The three types of advisories are defined as follows:

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

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

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

Important Environmental Concerns

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

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified 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.

⚠ATTENTION

Câblage et Mise à la Terre Appropriés Champs Obligatoires!

Le non-respect du code pourrait entraîner la mort ou grave blessure. Tout le câblage sur le terrain DOIT être effectué par des personnes qualifiées personnel. Terrain mal installé et mis à la terre le câblage pose des risques de FIRE et d'ÉLECTROCUTION. À evitez ces risques, vous devez suivre les exigences pour l'installation et la mise à la terre du câblage de terrain comme décrit dans NEC et vos codes électriques locaux/étatiques/ nationaux.

⚠WARNING

Personal Protective Equipment (PPE) Required!

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

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

⚠ATTENTION

Équipement de Protection Individuelle (EPI) Champs Obligatoires!

Défaut de porter un EPI approprié pour le travail entrepris Pourrait entraîner la mort ou des blessures graves. Techniciens, en afin de se protéger des risques électriques, les risques mécaniques et chimiques, DOIT suivre des précautions dans ce manuel et sur les étiquettes, les autocollants, et les étiquettes, ainsi que les instructions ci-dessous:

- **Avant d'installer/entretenir cet appareil, les techniciens DOIT mettre tous les EPI requis pour le travail entrepris (exemples: gants/manches résistant à la coupe, gants de butyle, lunettes de sécurité, casquette / bonnet, automne protection, EPI électrique et arc flash). TOUJOURS se référer aux données de sécurité appropriées sheets (MSDS)/ fiches de données de sécurité (SDS) et OSHA lignes directrices pour les EPI appropriés.**
- **Lorsque vous travaillez avec ou autour de produits chimiques dangereux, TOUJOURS se référer à la MSDS/SDS appropriée et OSHA/GHS (Global Harmonized System of classification et étiquetage des produits chimiques) pour des informations sur l'exposition personnelle admissible niveaux, protection respiratoire et manipulation appropriés instructions.**
- **S'il existe un risque de contact électrique sous tension, d'arc ou flash, les techniciens doivent mettre tous les EPI en conformité avec OSHA, NFPA 70E ou d'autres pays spécifiques exigences relatives à la protection contre l'arc, avant l'entretien de l'unité. NE JAMAIS EFFECTUER TOUT COMMUTATION, DÉCONNEXION OU TENSION ESSAIS SANS PETITE ÉLECTRIQUE PROPRE ET ARC FLASH CLOTHING. S'ASSURER À L'ÉLECTRIQUE les compteurs et les équipements sont classés POUR LA TENSION INTÉGRÉE.**

⚠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.**

⚠ATTENTION

Suivre les Procédures de l'EHS!

Lenon-respect des consignes suivantes peut être à l'origine de blessures graves,voire mortelles.

- **Tous les membres du personnel externes à l'entreprise sont tenus de respecter les règles établies par l'entreprise en matière d'environnement, de santé et de sécurité (EHS) lors d'une intervention, notamment en cas de travail à chaud, risque de choc électrique et de chute, procédures de verrouillage / déclassement, manipulation de fluide frigorigène, etc. Si les réglementations locales sont plus strictes que les règles imposées par le groupe, elles deviennent prioritaires.**
- **Le personnel extérieur à l'entreprise est, quant à lui, systématiquement tenu d'observer les réglementations en vigueur à l'échelle locale.**

⚠WARNING

Hazardous Gases and Flammable Vapors!

Failure to observe the following instructions could result in exposure to hazardous gases, fuel substances, or substances from incomplete combustion, which could result in death or serious injury. The state of California has determined that these substances may cause cancer, birth defects, or other reproductive harm. Improper installation, adjustment, alteration, service or use of this product could cause flammable mixtures or lead to excessive carbon monoxide. To avoid hazardous gases and flammable vapors follow proper installation and setup of this product and all warnings as provided in this manual.

⚠ATTENTION

Gaz Dangereux et Vapeurs Inflammables!

Le non-respect des instructions suivantes peut entraîner une exposition à des gaz dangereux, à des substances combustibles ou à des substances résultant d'une combustion incomplète, ce qui peut entraîner la mort ou des blessures graves. L'État de Californie a déterminé que ces substances peuvent causer le cancer, des malformations congénitales ou d'autres problèmes de reproduction. Une installation, un réglage, une modification, un entretien ou une utilisation inappropriés de ce produit peuvent provoquer des mélanges inflammables ou conduire à un excès de monoxyde de carbone. Pour éviter les gaz dangereux et les vapeurs inflammables, suivez l'installation et la configuration correctes de ce produit et tous les avertissements fournis dans ce manuel

General Safety Information

Information Specific to Direct Gas-Fired Heating

⚠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**

⚠ATTENTION

Alerte de Sécurité!

Le non-respect des instructions ci-dessous peut entraîner la mort ou des blessures graves. En plus des tâches suivantes, vous DEVEZ:

- **Suivez toutes les instructions du manuel d'installation, d'utilisation et d'entretien de l'unité, y compris les avertissements, les mises en garde et les avis.**
- **Effectuer toutes les tâches requises dans les alertes de service et les bulletins de service applicables**
- **Examiner et comprendre toutes les informations fournies dans les soumissions et les spécifications de conception**

- **If installed in airplane hangers, this unit shall be installed in accordance with the Standard for Aircraft Hangers, ANSI/NFPA 409.**
- **If installed in public garages, this unit shall be installed in accordance with the standard for Parking Structures, ANSI/NFPA 88A, or the Standard for repair Garages, ANSI/NFPA 88B, and with CAN/CSA B149.1 Natural Gas and Propane Installation Codes.**
- **Refer to marking on unit nameplate for unit voltage and ampacity. If this unit is not supplied with a factory-installed disconnect switch, a switch shall be installed in accordance with Article 430 of the National Electrical Codes, ANSI/NFPA 70.**
- **Adequate building relief or exhaust shall be provided so as to not over pressurize the building when the heating system is operating at its rated capacity. It should be noted that this can be accomplished by taking into account, though standard engineering methods, the structure's design infiltration rate; by**

providing properly sized relief openings; by interlocking a powered exhaust system; or by a combination of these methods.

- Refer to the heater rating name plate for determining the minimum gas supply pressure for obtaining the maximum gas capacity for which this heater is specified.
- Service personal shall perform a gas leak check during the hearer start up, to verify the gas-tightness of the heater's components and piping under normal operating conditions. Refer to "Maintenance," p. 43 for instructions.
- The installation shall conform with local codes, or in the absence of local codes, in accordance with the National Fuel Gas Code, ANSI/NFPA 54, or the CAN/CSA B149.1 Natural Gas and Propane installation Code.
- Where duct work is attached to the inlet of the heater installing contractor shall confirm blower operation provides a minimum of four air changes through heater and inlet duct before ignition can occur.
- If the failure or malfunction of this heater creates a hazard to other fuel burning equipment in the building, (e.g. when the heater is providing the make-up air to a boiler room), the unit is to be interlocked to open inlet air dampers or other such devices.

Information Specific to Heater Installation

⚠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**

⚠ATTENTION

Alerte de Sécurité!

Le non-respect des instructions ci-dessous peut entraîner la mort ou des blessures graves. En plus des tâches suivantes, vous DEVEZ:

- **Suivez toutes les instructions du manuel d'installation, d'utilisation et d'entretien de l'unité, y compris les avertissements, les mises en garde et les avis.**
- **Effectuer toutes les tâches requises dans les alertes de service et les bulletins de service applicables**
- **Examiner et comprendre toutes les informations fournies dans les soumissions et les spécifications de conception**

- **The heater inlet shall be located in accordance with the applicable building code provisions for ventilation air.**
- **Consult factory before installing any accessories designed to minimize the entry of snow and rain.**
- **When operating in heating mode, the unit controller will prevent recirculation of air to the heater. Recirculation of room air to the unit is not permitted when the unit it operating in a heating mode.**
- **If in doubt regarding the application, consult the manufacturer.**

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Revision History

- Updated Model Number Descriptions chapter.
- Updated System Configuration and Pre-Start chapter.
- Updated Alarms and Troubleshooting chapter.
- Running edits.

Table of Contents

Model Number Descriptions

DIGIT 1, 2, 3 — UNIT TYPE

RRU

DIGIT 4, 5 — COOLING CAPACITY

10 = 10 Tons
12 = 12.5 Tons
15 = 15 Tons
17 = 17.5 Tons
20 = 20 Tons
25 = 25 Tons

DIGIT 6— CABINET DESIGN

H = High Efficiency

DIGIT 7— MAJOR DESIGN SEQUENCE

F
G

DIGIT 8— UNIT VOLTAGE

3 = 208/230
4 = 460
5 = 575

DIGIT 9— HEAT TYPE

D = Direct Fired Heat

DIGIT 10 — RESERVED FOR FUTURE USE

DIGIT 11 — MINOR DESIGN SEQUENCE

B = 5 SCCR
C = 65 SCCR

DIGIT 12 — HEAT CAPACITY

	IF	DF	ER
0	N/A	N/A	
A	250	6-inch Precedent	
B	350	12-inch Voyager	2 STAGE
C	400	18-inch	3 STAGE

DIGIT 13 — FUEL TYPE

1 = Natural Gas
2 = Propane

DIGIT 14 — CAPACITY CONTROL

0 = None
A = APR

DIGIT 15 — CONDENSER TYPE

0 = Air Cooled
1 = Water Cooled

DIGIT 16 — DRAIN PAN

0 = None
A = Drain Pan
B = S/S Drain Pan

DIGIT 17 — INTAKE DESIGN

0 = Standard
1 = Drain Pan
B = Elevated Snow Design

DIGIT 18 — RESERVED FOR FUTURE USE

DIGIT 19 — CONTROLS

0 = No Controls
A = Non - DDC Controls
B = 4.8aL - MP581 with Display
G = 4.9.1L - MP581 with Display
H = 4.8aL - UC600 with Display
J = 4.8aL - MP581 without Display
P = 4.9.1L - MP581 without Display
Q = 4.9.1L- UC600 with Display
R = 4.8aL - UC600 without Display
S = 5.3L - MP581 with Display
T = 5.3 - UC600 with Display
U = 5.3L - MP581 without Display
V = 5.3L - UC600 without Display
W = Custom Controller

DIGIT 20 — DP SWITCH

0 = None
1 = DP Switch

DIGIT 21 — DAMPER OPTIONS

0 = No Return Air Damper
B = Outdoor Air Low Leak Damper - Title 24

DIGIT 22 — DRIVE SELECTION

0 = Factory Installed
1 = Low Static Drive
2 = Low Static Drive with Motor
3 = Pulley Mod

DIGIT 23 — MOTOR DRIVE

0 = Factory Installed
A = Belt Drive with VFD
B = Belt Drive with VFD and Oversized Motor

DIGIT 24 — BIRD SCREEN

0 = None
1 = Bird Screen
2 = Filter Screen

DIGIT 25 — REMOTE PANEL

0 = None
A = Terminal Strip without Remote Panel
B = Terminal Strip with Remote Panel

General Information

⚠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 cannot 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.

Overview of Manual

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

This booklet describes proper installation, operation, and maintenance procedures for air cooled systems. By carefully reviewing the information within this manual and following the instructions, the risk of improper operation and/or component damage will be minimized.

It is important that periodic maintenance be performed to help assure trouble free operation. A maintenance schedule is provided at the end of this manual. Should equipment failure occur, contact a qualified service organization with qualified, experienced HVAC technicians to properly diagnose and repair this equipment.

Model Number Description

All products are identified by a multiple character model number that precisely identifies a particular type of unit. An explanation of the alphanumeric identification code is provided below. Its use will enable the owner/operator, installing contractors, and service engineers to define the operation, specific components, and other options for any specific unit.

When ordering replacement parts or requesting service, be sure to refer to the specific model number and serial number printed on the unit nameplate.

Unit Nameplate

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

Compressor Nameplate

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

Unit Description

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

The condenser coils are aluminum fin, mechanically bonded to copper tubing.

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

The Rooftop Unit Main Control Module (RRUCM) and ReliaTel™ Control Module (RTRM) are microelectronic control systems. The acronyms RRUCM and RTRM are used extensively throughout this document when referring to the control system network.

The RRUCM is mounted in the Direct Fired Burner Control Panel and the RTRM is mounted in the Main Control Panel. The RRUCM and RTRM receive information from sensors and customer binary contacts to satisfy the applicable request for ventilation, cooling, dehumidification and heating.

Supply Fan Failure Input

The fan failure switch (FFS) is connected to verify indoor fan operation.

If air flow through the unit is not proven by the differential pressure switch connect to the RRUCM within 90 seconds nominally, the RRUCM will shut off all mechanical operations, lock the system out and send a diagnostic alarm to the Remote Operator Display (ROD). The system will remain locked out until a reset is initiated either manually or through the RRUCM via the Alarm Reset function on the ROD.

Compressor Disable (CPR1/2)

This input incorporates the low pressure control (LPC) of each refrigeration circuit and can be activated by opening a field supplied contact installed on the LTB.

If this circuit is open before the compressor is started, the compressor will not be allowed to operate. Anytime this circuit is opened for 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 three minutes of operation, the compressor for that circuit

will be locked out, and a manual reset will be required to restart the compressor.

Low Pressure Control ReliaTel Control

When the LPC is opened for one continuous second, the compressor for that circuit is turned off immediately. The compressor will not be allowed to restart for a minimum of three minutes.

If four consecutive open conditions occur during the first three minutes of operation, the compressor will be locked out, and a manual reset will be required to restart the compressor.

Dual Refrigerant Circuits

The two independent refrigerant circuits incorporate a split face coil with thermal expansion valves (TXVs), service pressure ports and refrigerant line filter driers as standard. An area will be provided for replacement suction line driers. Refrigerant circuit one (1st Stage) is equipped with a factory installed and preset refrigerant capacity control (RCC) to prevent evaporator coil temperatures below approximately 38°F (109 lb suction).

High Pressure Control ReliaTel Control

The high pressure controls are wired in series between the compressor outputs on the RTRM and the compressor contactor coils. If the high pressure control switch opens, the RTRM senses a lack of current while calling for cooling and locks the compressor out.

On dual circuit units, if the high pressure control opens, the compressor on the affected circuit is locked out. A manual reset for the affected circuit is required.

Space RH Sensor (Optional) (4190-7019)

Field installed, wall mounted humidity sensor is used to control activation of the hot gas reheat dehumidification option. Humidity set points can be selected for relative humidity levels between 40 percent and 60 percent.

Space Temperature Sensor (Optional) (4190-1094)

Field installed, wall mounted temperature sensor with adjustable cooling setpoint thumb wheel is used to control space cooling and heating setpoints.

High Temperature Sensor (BAYFRST001A)

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

Outdoor Air Temperature and Relative Humidity Sensor

This factory installed combination outdoor air sensor located in the outdoor air hood is designed to sense both outdoor air temperature and relative humidity for use by the microprocessor controller to make required ventilation, cooling, dehumidification and heating decisions. Refer to "Sequence of Operation," p. 19 for detailed unit control and operational modes.

Control Input (Occupied/Unoccupied)

Terminals are provided on the terminal strip labeled RRUTS for a field installed dry contact or switch closure to put the unit in the Occupied or Unoccupied modes.

Hot Gas Reheat

This option shall consist of a hot-gas reheat coil located on the leaving air side of the evaporator coil pre-piped and circuited with a low pressure switch. Refer to "Sequence of Operation," p. 19 for detailed unit control and operational modes.

100 Percent Outdoor Air Hood with Damper and Filters

Factory installed and integrated 100 percent outdoor air hood with damper controlled by a direct coupled actuator and 2-in. [50.80-mm] permanent and washable aluminum mesh filters accessible through a hinged access panel. The unit is factory equipped with provisions to accept an optional field installed 100 percent return air damper controlled by a direct coupled actuator that is electrically interlocked with the outdoor air damper to allow 100 percent return air recirculation in the Unoccupied cooling mode. The standard damper tray is blocked off to allow 100 percent outdoor airflow.

Modulating Direct Gas-Fired Burner

The unit will have fully modulating, high turndown direct gas-fired heat. The heating section will have a direct gas-fired burner constructed with a corrosion resistant aluminum burner casting and stainless steel baffles. On an initial call for heat, proper airflow must be verified (sensed) through a dual action, factory preset high/low burner differential air pressure switch prior to initiation of the ignition process. After proving airflow, an electronic ignition controller will begin a 30-second burner chamber pre-purge. Following pre-purge a direct spark igniter will ignite the fuel air mixture during a 15 second single-try lock out ignition trial. The microprocessor based RRUCM will enable gas to the burner through a direct acting, fully modulating gas valve at a preprogrammed initial firing rate for 45 seconds following successful ignition. At the end of the 90-second total pre- and post-ignition cycles, the gas burner will modulate to maintain required temperature set points controlled by the RRUCM. After one unsuccessful ignition attempt the entire heating system will be locked out until manually reset at controller,

through a remoter operator display or by removing and reapplying power to the unit.

Units will be suitable for use with natural gas only.

Through the Base Electrical with Disconnect Switch

Factory installed three-pole, molded case disconnect switch with provisions for through the base electrical connections will be included. The disconnect switch will be installed in the unit in a water tight enclosure with access through a hinged door. Factory wiring will be provided from the switch to the unit high voltage terminal block. The switch will be UL/CSA agency recognized.

Important: *The disconnect switch will be sized per NEC. UL guidelines and cannot be used in place of unit over current protection.*

Through the Base Gas Piping

The unit will include provisions for installing through the base gas piping. The factory installed option will have all piping necessary including an external shutoff piping yoke including pre-assembled, manual gas shut-off valve, elbows, and union. The three manual shut-off valves will each include a 1/8-in. [3.17-mm] NPT pressure tap. This assembly will require minor field labor to install.

Hinged Access Doors

Sheet metal hinges and latches with hold down hooks will be factory installed on the Evaporator, Compressor/ Control, and Direct Gas-Fired Burner Control Access Doors.

Unit Inspection

As soon as the unit arrives at the job site:

- ☐ Verify that the nameplate data matches the data on the sales order and bill of lading (including electrical data).
- ☐ Verify that the power supply complies with the unit nameplate specifications.
- ☐ Visually inspect the exterior of the unit, including the roof, for signs of shipping damage.
- ☐ Visually inspect the internal components for shipping damage as soon as possible after delivery and before it is stored. Do not walk on the sheet metal base pans.
- ☐ If concealed damage is discovered, notify the carrier's terminal of damage immediately by phone and by mail. Concealed damage must be reported within 15 days.

  Request an immediate joint inspection of the damage by the carrier and the consignee. Do not remove damaged material from the receiving location. Take photos of the damage, if possible. The owner must provide reasonable evidence that the damage did not occur after delivery.
- ☐ Notify the appropriate sales representative before installing or repairing a damaged unit.

⚠WARNING

Fiberglass Wool!

Exposition to glass wool fibers without all necessary PPE equipment could result in cancer, respiratory, skin or eye irritation, which could result in death or serious injury. Disturbing the insulation in this product during installation, maintenance or repair will expose you to airborne particles of glass wool fibers and ceramic fibers known to the state of California to cause cancer through inhalation. You MUST wear all necessary Personal Protective Equipment (PPE) including gloves, eye protection, a NIOSH approved dust/mist respirator, long sleeves and pants when working with products containing fiberglass wool.

Precautionary Measures

- Avoid breathing fiberglass dust.
- Use a NIOSH approved dust/mist respirator.
- Avoid contact with the skin or eyes. Wear long-sleeved, loose-fitting clothing, gloves, and eye protection.
- Wash clothes separately from other clothing: rinse washer thoroughly.
- Operations such as sawing, blowing, tear-out, and spraying may generate fiber concentrations requiring additional respiratory protection. Use the appropriate NIOSH approved respiration in these situations.

First Aid Measures

Eye Contact

Flush eyes with water to remove dust. If symptoms persist, seek medical attention.

Skin Contact

Wash affected areas gently with soap and warm water after handling.

Storage

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

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

Note: *Do not use the unit's heater for temporary heat without first completing the startup procedure detailed in* "Startup," p. 34

The manufacturer will not assume any responsibility for equipment damage resulting from condensate

accumulation on the unit's electrical and/or mechanical components.

Unit Clearances

⚠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.

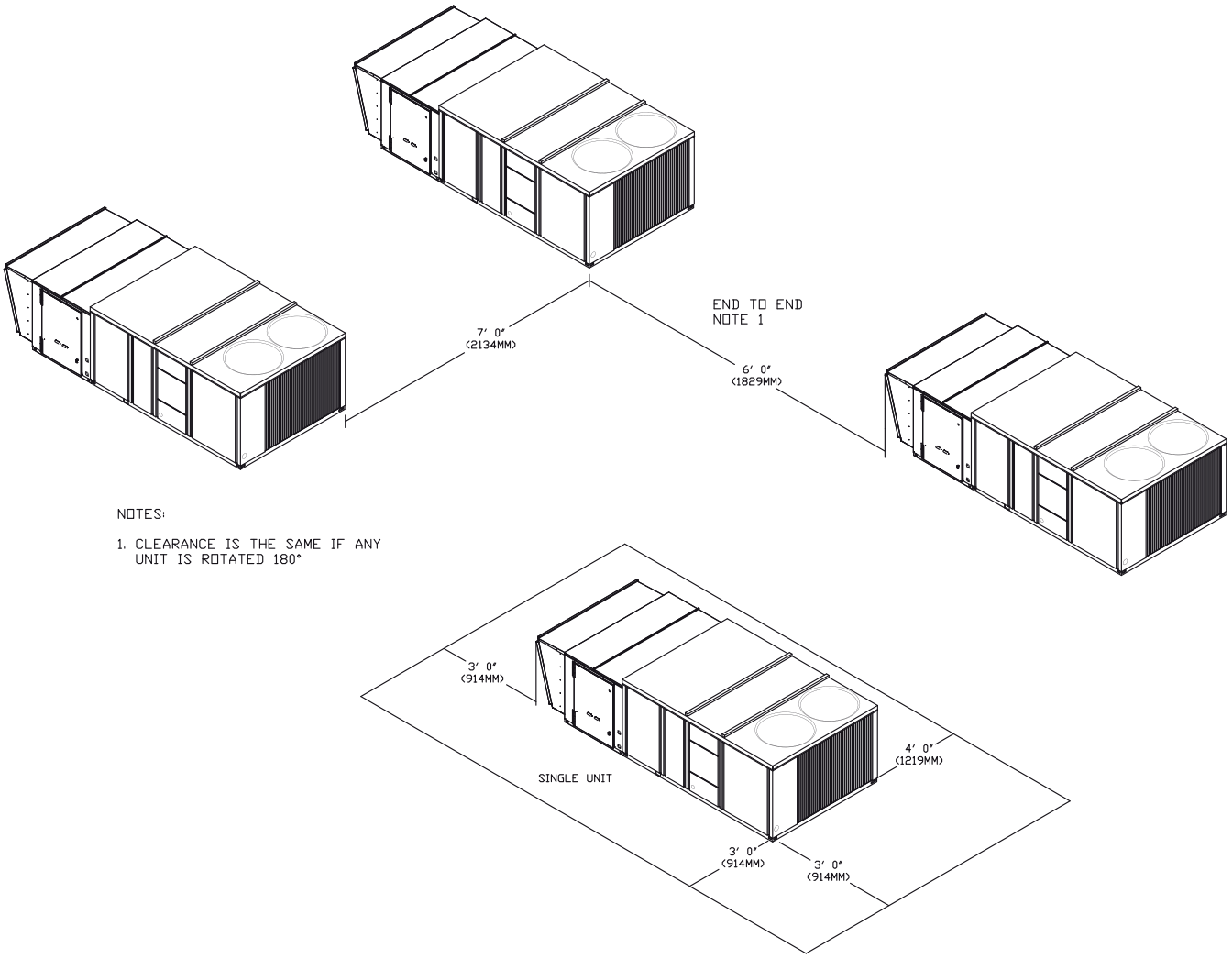
Refer to unit nameplate and installation instructions for proper clearances.

Figure 1, p. 13 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 or recirculation of hot condenser air.

Unit Clearances

Figure 1. Typical installation clearances for single- and multiple-unit applications



Unit/Curb Dimensions

Figure 2. Unit dimensional data 10-ton high efficiency

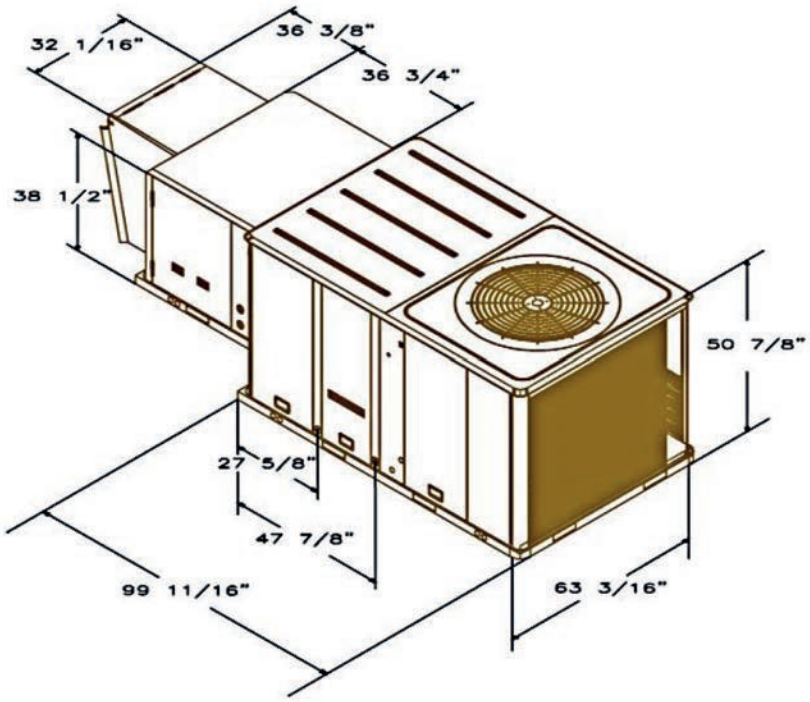


Figure 3. Roof curb dimensional data 10-ton high efficiency

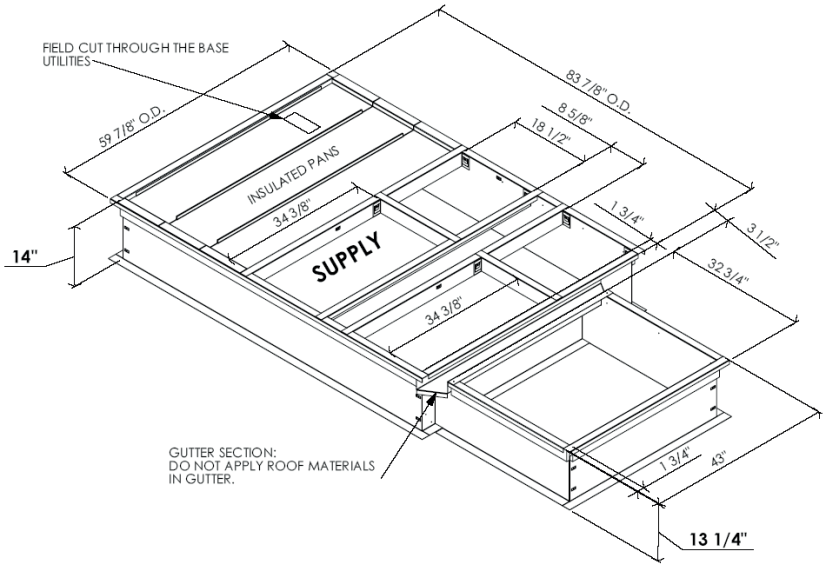


Figure 4. Unit dimensional data 12.5- and 15-ton high efficiency

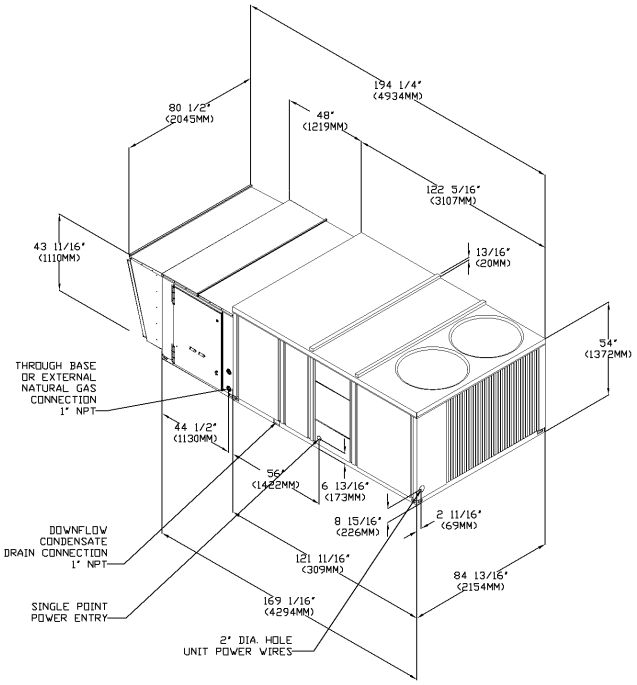


Figure 5. Roof curb dimensional data 12.5- and 15-ton high efficiency

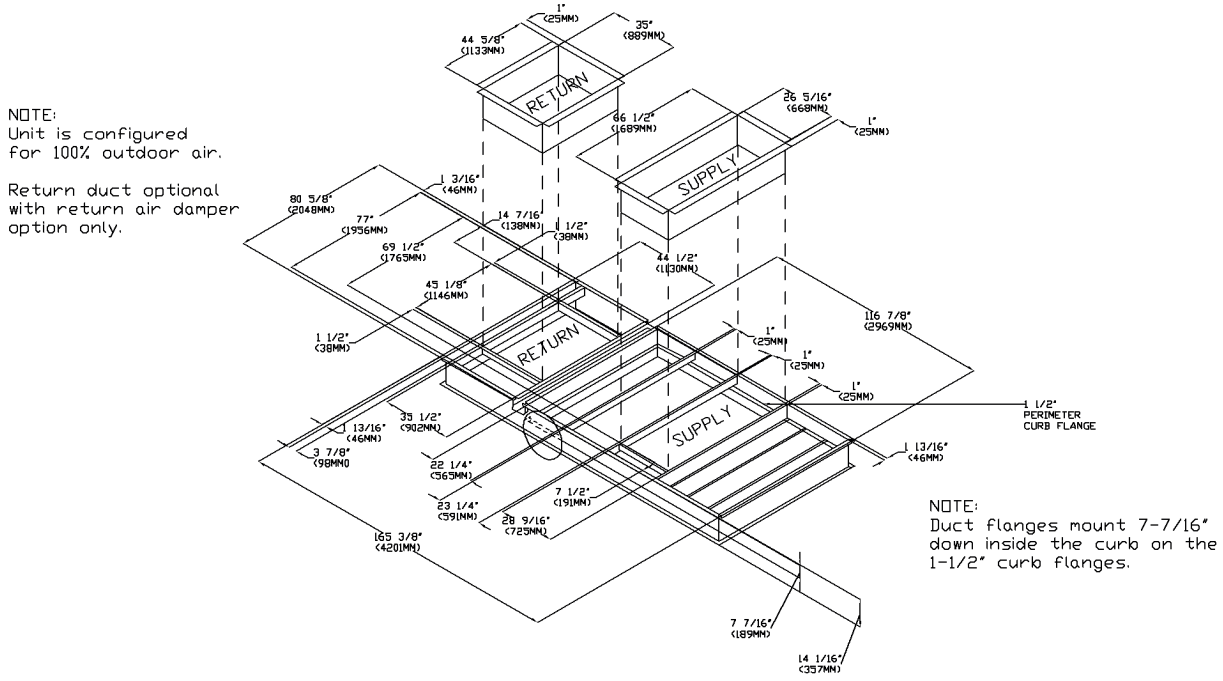


Figure 6. Unit dimensional data 20- and 25-ton high efficiency

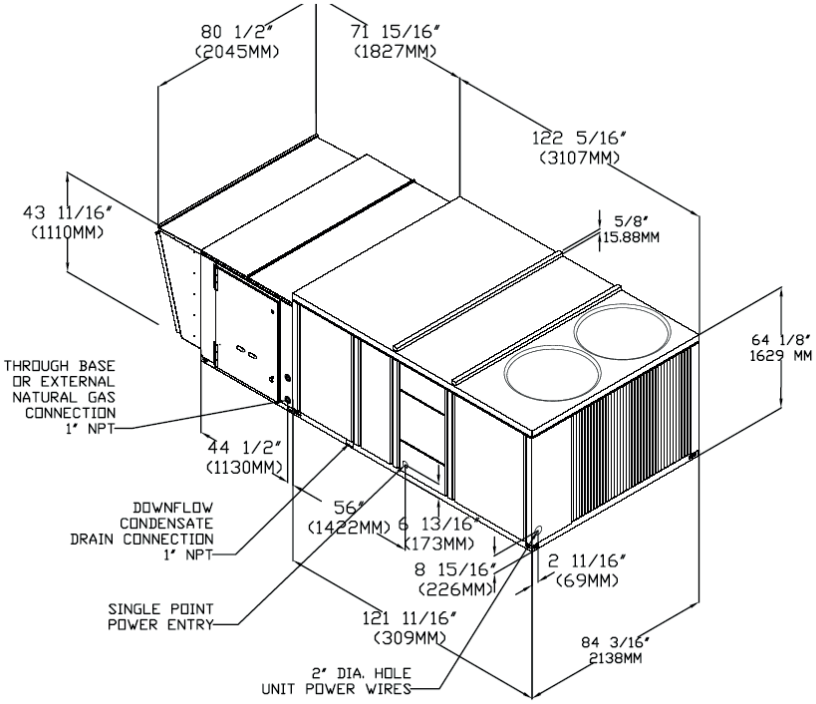
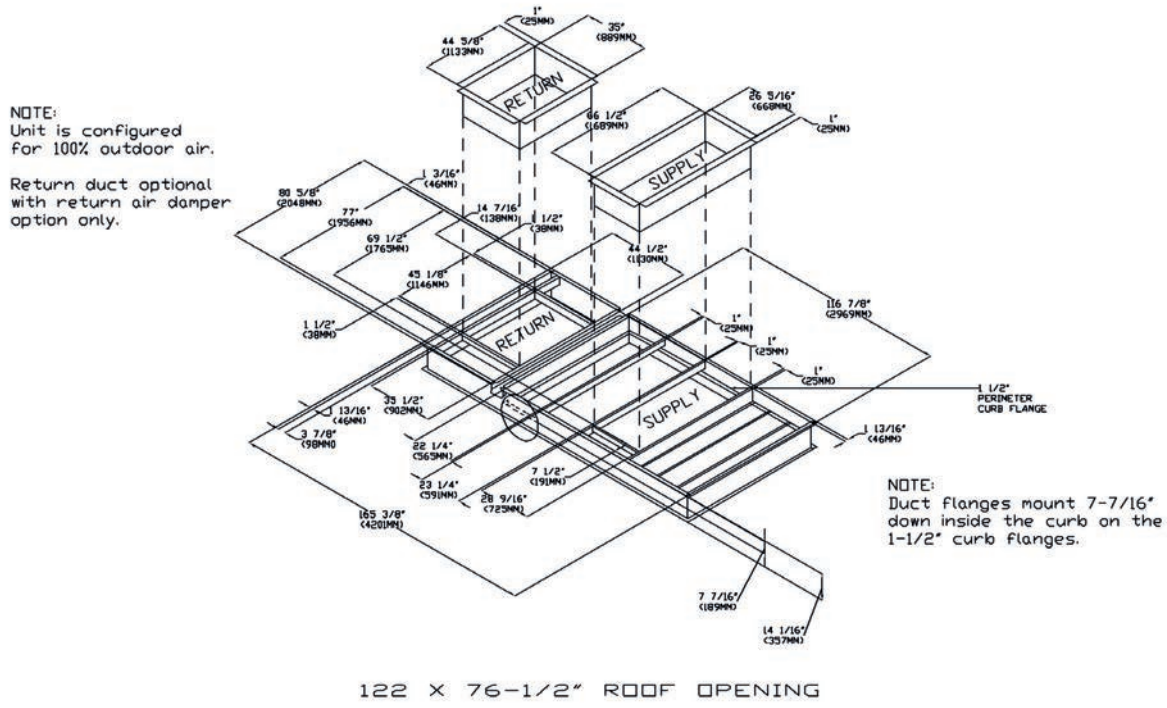
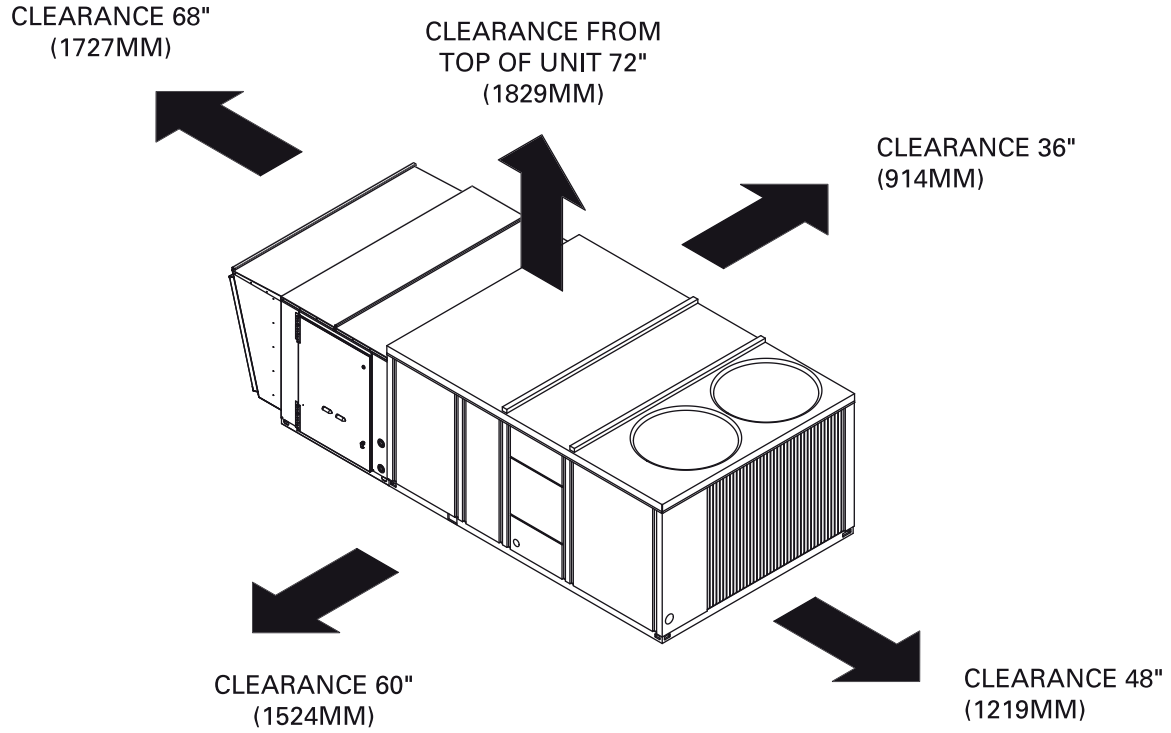


Figure 7. Roof curb dimensional data 20- and 25-ton high efficiency



Unit Service Clearances

Figure 8. Unit dimensional data 12.5-, 15-, and 20-ton high efficiency



Unit Weight/Rigging

⚠WARNING

Heavy Objects!

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

⚠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.

Rigging

Refer to Figure 9 and Table 1 for typical unit operating weights rigging before proceeding.

Figure 9. Rigging and center-of-gravity data

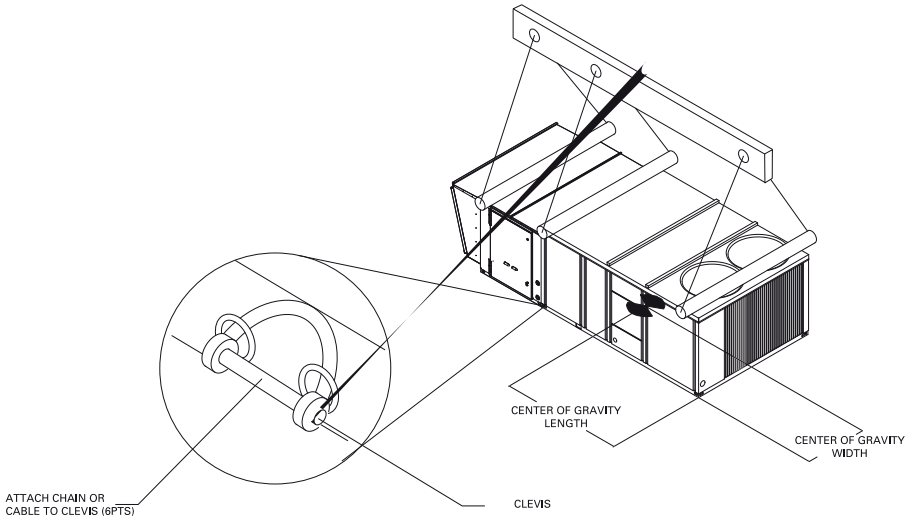


Table 1. Typical unit weights

Tons	Unit Model Number	Weight (lb)		Center of Gravity (in.)	
		Shipping	Net	Length	Width
10	RRU120F*DQA	1772	1617	62	22
12.5	RRU150F*DBA	3182	2775	76	36
15	RRU180F*DCA	3250	2777	76	36
20	RRU240F*DCA	3321	2876	76	35
25	RRU300F*DCA	3460	2982	76	35

3. Remove the shipping crate from around the unit. Do not remove the crating from the top of the unit.
4. Rig the unit as shown in Figure 9. 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.
5. Install a lifting bar, as shown in Figure 9, to protect the unit and to facilitate a uniform lift. The minimum distance between the lifting hook and the top of the unit should be 7 feet.
6. Test-lift the unit to ensure it is properly rigged and balanced, make any necessary rigging adjustments.
7. Lift the unit and position it into place.
8. Down flow units; align the base rail of the unit with the curb rail while lowering the unit onto the curb. Make sure that the gasket on the curb is not damaged while positioning the unit.

Sequence of Operation

Terminology

Controls

RRUCM	RRU Main Control Module
ROD	Remote Operator Display
DES	Outdoor Damper End Switch
APS	Air Proving Switch
FFS	Fan Failure Switch
RCC	Refrigeration Capacity Controller
MGA	Modulating Gas Actuator
GV	Gas Valve
IGN	Ignition Control Module
TNS5	Gas Ignitor
TNS6	Gas Ignitor Power Transformer
HTC	High Temperature Cutout
RTRM	ReliaTel Refrigeration Module
RHV	Reheat Valve
SSP	Space Temperature Set Point (Dial)
ODA	Outdoor Air Damper Actuator
RDA	Return Air Damper Actuator
R	24VAC Power - Terminal R (RTRM)
G	Indoor Fan Motor – Terminal G (RTRM)
Y1	Cooling Stage 1 – Terminal Y1 (RTRM)
Y2	Cooling Stage 2 – Terminal Y2 (RTRM)
LTB	Low Voltage Terminal Block
RRUTS	Control Terminal Strip (Field Connections)

Relays

R1	ODR / RDR (O/Air & R/Air Damper Actuator)
R2	IDM (Indoor Fan Motor)
R3	COOL 1 (Cooling – Stage 1)
R4	COOL 2 (Cooling – Stage 2)
R5	HGRH (Hot Gas Reheat Valve)
R6	HEAT (Heat Relay)
R7	PV (Gas Valve & Gas Ignitor)
R8	MV (Gas Ignitor Disconnect)
R9	ESR (Emergency Stop Relay)

Sensors

OTS	Outdoor Air Temperature (OAT)
STS	Supply Air Temperature (SAT)
STC	Space Temperature (ST)
ORH	Outdoor Humidity (ORH)
SHC	Space Humidity (SRH)

Operator Set Points

CSP	Y1 – O/Air Cooling Enable
OES1	Y1 – O/Air Dehumid Enable
OES2	Y2 – O/Air Dehumid Enable
HESP	O/Air Heating Enable
HSP	Occupied S/Air Heating
MHSP	Minimum Supply Air Heating
SLC	S/Air Low Cutoff (Time)
SLT	S/Air Low Cutoff (Temperature)
SHC	S/Air High Cutoff (Time)
SHT	S/Air High Cutoff (Temperature)

Optional—Requires Hot Gas Reheat (HGRH)

HGRHD	HGRH Control Dead Band

Optional—Requires Space Temperature & RH Sensors

OSSP	Occupied Space Cooling
OSHO	Occupied Space Heating Offset
OSRS	Occupied Space Humidity
NHSP	Unoccupied Space Heating
NCSP	Unoccupied Space Cooling
NRSP	Unoccupied Space Humidity
NSAS	Unoccupied S/Air Heating

Power On—Control Input "Occupied"

Three Phase Unit Disconnect ON

RRUCM and RTRM Initialize

Control Input Contact CLOSED at RRUTS – 7 & 8

"Occupied" Ventilation Mode

RRUCM Energizes the O/Air Damper Actuator (ODA) through ODR / RDR Relay R1

O/Air Damper OPENS

R/Air Damper (Optional) CLOSES through ODR / RDR Relay R1

O/Air Damper makes the Outdoor Damper End Switch (DES)

RRUCM Energizes the Indoor Fan Motor (IDM) through IDM Relay R2

R2 Energizes RTRM Terminal G and IDM STARTS

Fan Failure Switch (FFS) Proves Airflow

VENTILATION MODE Established

"Occupied" Conditioning Modes

Outdoor Air Temperature (OTS) and Outdoor Air Relative Humidity (ORH) sensors located in the Outdoor Air Inlet controls call for the following operational modes based on Outdoor Air conditions.

COOLING MODE

Compressor 1 ON

DEHUMIDIFICATION MODE

Compressor 1 or Compressor 1 & 2 ON

HOT GAS REHEAT (OPTIONAL)

Compressor 1 or Compressor 1 & 2 ON

HEATING MODE

Modulating Heat

"Occupied" Cooling Mode

Call for cooling is based on Outdoor Air Temperature (OAT) sensed at the Outdoor Air Temperature Sensor (OTS). Y1 – O/Air Cooling Enable Set Point (CSP) is operator adjustable between 68 F and 80°F.

Y1 - O/AIR COOLING ENABLE SET POINT (CSP):	68°F–80°F 78°F DEFAULT

COOL 1 is activated through RTRM Y1 by the RRUCM through the COOL 1 R3 Relay when the OAT rises above the CSP and the Outdoor Air Enthalpy (OE) is below the Y1 – O/Air Dehumid Enable Set Point (OES1). The Refrigeration Capacity Control (RCC) is enabled when COOL 1 is active. COOL 2 is disabled during cooling mode.

RCC Operation

The Refrigeration Capacity Control (RCC) monitors COOL 1 evaporator suction pressure and meters compressor discharge gas into a de-superheating chamber where it is mixed with refrigerant introduced through an integral TXV providing cooling of the hot gas. Cooled gas is then bypassed to the suction line between the evaporator and compressor. An integral pressure controller modulates the quantity of hot gas bypassed to maintain desired suction pressure-temperature and prevent frosting indoor coil. The RCC is factory set and field adjustment is typically not required.

RCC PRE-SET SUCTION PRESSURE SETTING: 38°F SATURATED SUCTION TEMPERATURE (APX.)	114 LB

The RCC effectively reduces compressor nominal capacity and energy consumption when active.

"Occupied" Dehumidification Mode

Call for dehumidification is based on the Outdoor Air Enthalpy (OE) relative to Y1 – O/Air Dehumid Enable Set Point (OES1) and Y2 – O/Air Dehumid Enable Set Point (OES2). Y1 – DEHUMID is activated when the OE is above OES1.

Y2 – DEHUMID is activated when the OE rises above OES2. OES1 and OES2 set points are operator adjustable within a preset range at the ROD. The RCC will operate anytime the suction pressure drops below the RCC pressure set point.

DEHUMIDIFICATION SET POINTS (OES1 & OES2):	23–30 BTU (OES1)
28 BTU (OES1) & 34 BTU (OES2) DEFAULT	32–40 BTU (OES2)

Y2 – DEHUMID is deactivated after OE drops 1 Btu below OES2 set point.

Y1 – DEHUMID is deactivated after OE drops 1 Btu below OES1 set point.

Hot Gas Reheat (Optional)

Use of this option requires the optional hot gas reheat coil and requires the operator to INSTALL the HGRH Option at the ROD.

Call for reheat is controlled by the Supply Air Temperature (SAT) sensed at the factory mounted Supply Air Temperature Sensor (STS) located in the supply air discharge plenum. Reheat is controlled by the operator adjustable HGRH (Hot Gas Reheat) Control Dead Band (HGRHD) set point at the RRUCM. On call for reheat, the RRUCM energizes the Reheat Valve (RHV) through the R5 Relay when the SAT falls below Occupied S/Air Heating Set Point (HSP) minus HGRHD and is de-energized when the SAT rises above HSP plus HGRHD.

HGRH HEATING DEAD BAND (HGRHD):	±4–20°F ±5°F DEFAULT
HGRH SUPPLY AIR TEMPERATURE SETPOINT:	68°F DEFAULT

"Occupied" Heating Mode

Call for heat is based on Outdoor Air Temperature (OAT) sensed by the Outdoor Air Temperature Sensor (OTS). When the Supply Air Temperature (SAT) sensed by the Supply Air Temperature Sensor (STS) drops below the O/Air Heating Enable Set Point (HESP) a call for HEAT is initiated by the RRUCM through the R6 HEAT Relay. R6 energizes the Ignition Control Module (IGN) through the Air Proving Switch (APS) and High Temperature Cutout (HTC) burner safety circuit.

The IGN begins a 30-second purge cycle and the RRUCM drives the Modulating Gas Actuator (MGA) to a low fire start position and holds that position for 60 seconds. Following the 30-second purge the IGN opens the gas valve (GV) and begins a 15-second "single-try" ignition. The IGN "single-try" energizes the Gas Ignitor (TNS5) through PV Relay R7, MV Relay R8 and Gas Ignitor Power Transformer (TNS6). At the end of the 15-second "single-try" ignition, the IGN ends the ignition trial by energizing R8.

The RRUCM monitors SAT at the STS and varies the 2–10 Vdc output signal from the RRUCM Analog Output (AO1) to the MGA modulating gas flow to the burner to maintain HSP.

Burner operation will LOCK-OUT if either the ignition trial fails to prove flame signal at the burner flame sensing rod within the 15-second ignition trial or following successful ignition any time a failure to maintain flame signal occurs. To retry ignition after ignition failure, power must be turned off for 30 seconds and then powered up. The ignition process and timing sequences begin upon re-establishment of power. Loss of flame signal following successful ignition will permit a SINGLE RETRY following a IGN 30-second purge time delay.

O/AIR HEATING ENABLE SET POINT (HESP):	50°F–80°F 60°F DEFAULT
OCCUPIED S/AIR HEATING SET POINT (HSP):	40°F–90°F MINIMUM HEATING SET POINT 45°F DEFAULT
S/AIR LOW CUTOFF TEMPERATURE (SLT):	25°F–40°F 34°F DEFAULT
S/AIR LOW CUTOFF TIME (SLC):	15–30 MIN 15 MIN DEFAULT
S/AIR HIGH CUTOFF TEMPERATURE (SHT):	70°F–125°F 125°F DEFAULT
S/AIR HIGH CUTOFF TIME (SHC):	5–30 MIN 15 MIN DEFAULT

The active supply air heating setpoint will be displayed on the System Heating Status Screen on the ROD.

"Occupied" Space Temperature Override Control (Optional)

Use of this option requires the optional Space Temperature (STC) sensor and requires the operator to INSTALL the STC Option at the ROD.

RRU operation in HEATING or COOLING modes is based solely on outdoor air conditions. The use of this option permits space conditions to either reset the Y1 - O/Air Cooling Enable Set Point (CSP) or changes the Occupied S/Air Heating Set Point (HSP).

This option controls space cooling temperature based on the Occupied Space Cooling Set Point (OSSP) and heating temperature based on the OSSP minus Occupied Space Heating Offset Set Point (OSHO).

The OSSP can be controlled by either the Space Temperature Set Point Dial (SSP) or the ROD.

The operator must select SSP or RRUCM control at the ROD.

COOLING CONTROL: A Space temperature above OSSP resets the Y1 - O/Air Cooling Enable Set Point (CSP). CSP can only be reset downwards until OSSP is satisfied. The reset set point will return to the initial set point when the OSSP set point is satisfied. Compressor 1 will de-energize when space temperature falls to Space Cooling Setpoint - 3°F.

HEATING CONTROL: A Space temperature above OSSP lowers the SAT. Space temperatures below the OSSP minus OSHO raise the SAT. SAT will modulate between the upper and lower Occupied S/Air Heating Set Points (HSP) through the RRUCM in an attempt to maintain the desired space temperature. If space temperature = Space Heating Setpoint + 1°F, RRUCM will reduce burner output to maintain supply air Minimum Heating Setpoint.

OCCUPIED SPACE COOLING SET POINT (OSSP):	65°F–80°F 72°F DEFAULT
OCCUPIED SPACE HEATING OFFSET SET POINT (OSHO):	2°F–20°F 4°F DEFAULT
OCCUPIED S/AIR HEATING SET POINT (HSP):	40°F–90°F
LOWER HSP = 40°F	60°F DEFAULT
UPPER HSP = 80°F	OR LOCAL
MINIMUM (SUPPLY AIR) HEATING SET POINT	45°F–70°F 45°F DEFAULT

"Occupied" Space Humidity Override Control (Optional)

Use of this option requires the optional Space Humidity (SHC) sensor and requires the operator to INSTALL the SHC Option at the ROD.

RRU operation in DEHUMIDIFICATION mode is based solely on outdoor air conditions. The use of this option permits space conditions to reset Y1 & Y2 – O/Air Dehumid Enable Set Points (OES1 & OES2).

The SHC inputs space relative humidity readings to the RRUCM. The RRUCM resets OES1 and OES2 set points in an attempt to maintain the space humidity. The Occupied Space Humidity Set Point (OSRS) can be adjusted between the OSRS low and high limit set points as defined by the operator at the ROD. When the space humidity rises above the OSRS the RRUCM will reset OES1 and or OES2 set points. These reset set points can be viewed at the ROD as Y1 & Y2 – Active O/Air Dehumid Set Points. DEHUMID 1 and DEHUMID 2 will operate as describe in the Dehumidification Mode of this document. OES1 and OES2 can only be reset downwards until OSRS is satisfied. The reset is factory set to reduce OES1 and OES2 up to 5 Btu each in 1 Btu increments. When the OSRS set point is satisfied, the reset set points will return to initial set points.

OCCUPIED SPACE HUMIDITY SET POINT (OSRS):	40%–75% RH 60% RH DEFAULT

Power On—Control Input "Unoccupied"

Change control Input at RRUTS – 7 & 8 from OCCUPIED (CLOSED) to UNOCCUPIED (OPEN)

Cooling, Dehumidification or Heating modes De-Energize

IDM De-Energized

O/Air Damper CLOSES following 30-second Off-Delay

"Unoccupied" Operation (Optional)

Use of this option for unoccupied heating and cooling control requires the optional Space Temperature (STC) sensor and requires the operator to INSTALL the STC Option at the ROD.

Use of this option for unoccupied space humidity control requires the optional Space Humidity (SHC) sensor and requires the operator to INSTALL the SHC Option at the ROD.

Use of the optional R/Air Damper for unoccupied 100 percent recirculating cooling and dehumidification requires the operator to INSTALL the R/Air Damper at the ROD. On call for heating the R/Air Damper remains CLOSED and the O/Air Damper OPENS. The O/Air Damper will OPEN on call for unoccupied heating, cooling or dehumidification if the R/Air Damper is NOT INSTALLED.

"Unoccupied" Indoor Fan and Damper Sequence

Space conditions control RRU "Unoccupied" operation based on "Unoccupied" RRUCM set points. Set points include Unoccupied Space Cooling Set Point (NCSP), Unoccupied Space Humidity (NRSP) and Unoccupied Space Heating Set Point (NHSP).

"Unoccupied" Heating Mode

"UNOCCUPIED" Contact OPEN at RRUTS – 7 & 8

"Unoccupied" Cooling and Dehumidification Mode With R/Air Damper

RRUCM Energizes the Indoor Fan Motor (IDM) through IDM Relay R2 R2 Energizes RTRM Terminal G and IDM STARTS Fan Failure Switch (FFS) Proves Airflow UNOCCUPIED COOLING or DEHUMIDIFICATION MODE Established

RRU operates in UNOCCUPIED COOLING MODE until NCSP is satisfied or UNOCCUPIED DEHUMIDIFCATION MODE until the NRSP is satisfied. IDM R2 and ODR / RDR R1 de-energize.

Recirculating (100 Percent Return Air)

When enabled by the operator at the ROD, call for UNOCCUPIED Cooling or Dehumidification is based on the Space Temperature (ST) and Space Humidity (SRH) measured at the Space Temperature Sensor (STC) and Space Humidity Sensor (SHC). On call for UNOCCUPIED Cooling or Dehumidification, the IFM is energized and cooling or dehumidification with optional Hot Gas Reheat is provided based on operator defined Night Setback Cooling Set Point (NCSP) and Night Setback Relative Humidity (NRSP) through the RRUCM.

Once the NCSP and NRSP are satisfied, the IFM is de-energized.

NIGHT SETBACK UNOCCUPIED SPACE COOLING SET POINT (NCSP):	75°F–90°F 85°F DEFAULT
NIGHT SETBACK UNOCCUPIED SPACE HUMIDITY SET POINT (NRSP):	60%–75% RH 65% RH DEFAULT

"Unoccupied" Cooling and Dehumidification Mode Without R/Air Damper

UNOCCUPIED COOLING or DEHUMIDIFICATION MODE Disabled

"Unoccupied" Heating Mode With or Without R/Air Damper

RRUCM Energizes the O/Air Damper Actuator (ODA) through ODR / RDR Relay R1. O/Air Damper OPENS. R/Air Damper (Optional) CLOSES through ODR / RDR Relay R1. O/Air Damper makes the Outdoor Damper End Switch (DES). RRUCM Energizes the Indoor Fan Motor (IDM) through IDM Relay R2. R2 Energizes RTRM Terminal G and IDM STARTS. Fan Failure Switch (FFS) Proves Airflow. UNOCCUPIED HEATING MODE Established. RRU operates in HEATING MODE until the NHSP is satisfied. IDM R2 and ODR / RDR R1 de-energize.

NIGHT SETBACK HEATING SET POINT (NHSP):	50°F–60°F 50°F DEFAULT

"Unoccupied" Cooling Or Dehumidification Mode

"UNOCCUPIED" Contact OPEN at RRUTS – 7 & 8

"Unoccupied" Heating Mode— Non-recirculating (100 Percent Outdoor Air)

Call for UNOCCUPIED Heating is based on the Space Temperature (ST) measured at the Space Temperature Sensor (STC). On call for UNOCCUPIED Heating, the "OCCUPIED" VENTILATION MODE STARTING SEQUENCE is initiated. Heating is provided based on the operator defined Night Setback Heating Set Point (NHSP) through the RRUCM.

Once the NHSP is satisfied, the IFM is de-energized.

NIGHT SETBACK HEATING SET POINT (NHSP):	50°F–60°F 55°F DEFAULT

Power On—"Emergency Stop"

Three Phase Unit Disconnect ON

EMERGENCY STOP is Initiated by OPENING Contact at LVB – 4 & 5

ALL Modes and Indoor Fan Motor (IFM) STOP

Installation

⚠WARNING

Refrigerant under High Pressure!

Failure to follow instructions below could result in an explosion which could result in death or serious injury or equipment damage.

System contains refrigerant under high pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives.

⚠WARNING

Hazardous Voltage w/Capacitors!

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

⚠WARNING

Harmful Ultraviolet (UV) Lights!

Failure to follow instructions below could result in death or serious injury and equipment damage. Do not field install ultraviolet lights in Trane air handling equipment for the intended purpose of improving indoor air quality. High intensity C-band ultraviolet light is known to severely damage polymer (plastic) materials and poses a personal safety risk to anyone exposed to the light without proper personal protective equipment (can cause damage to eyes and skin). Polymer materials commonly found in HVAC equipment that may be susceptible include insulation on electrical wiring, fan belts, thermal insulation, various fasteners and bushings. Trane accepts no responsibility for the performance or operation of our air handling equipment in which ultraviolet devices were installed outside of the Trane factory.

Supply Ductwork

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

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

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

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

If a Curb Accessory Kit is not used:

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

General Unit Requirements

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

- ☐ Check the unit for shipping damage and material shortage; file a freight claim and notify appropriate sales representative.
- ☐ Verify correct model, options and voltage from nameplate.
- ☐ Verify that the installation location of the unit will provide the required clearance for proper operation.
- ☐ Assemble and install the roof curb (if applicable). Refer to the latest edition of the curb installers guide that ships with each curb kit.
- ☐ Fabricate and install ductwork; secure ductwork to curb.
- ☐ Rigging the unit.
- ☐ Set the unit onto the curb; check for levelness.
- ☐ Ensure unit-to-curb seal is tight and without buckles or cracks.
- ☐ Install and connect a condensate drain line to the evaporator drain connection.

Main Electrical Power Requirements

- ☐ Verify that the power supply complies with the unit nameplate specifications.
- ☐ Inspect all control panel components; tighten any loose connections.

- ☐ Connect properly sized and protected power supply wiring to a fieldsupplied/installed disconnect switch and to the main power terminal block (HTB1) in the unit control panel.
- ☐ Install proper grounding wires to an earth ground.

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

Condensate Drain Configuration

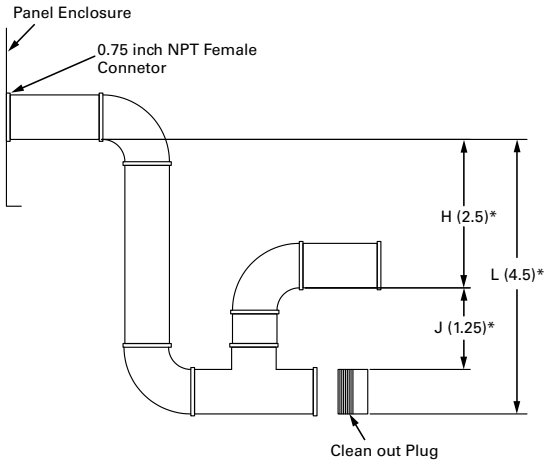
An evaporator condensate drain connection is provided on each unit. Refer to Figure 2 to Figure 7 for the appropriate drain location.

A condensate trap must be installed at the unit due to the drain connection being on the "negative pressure" side of the fan. Install the P-Trap using the guidelines in Figure 10.

A condensate drain line must be connected to the P-Trap. Pitch the drain lines at least 1/2 inch for every 10 feet of horizontal run to assure proper condensate flow. Do not allow the horizontal run to sag causing a possible double-trap condition which could result in condensate backup due to "air lock".

RRU units are selected based on dehumidification capability. As such, condensate can form at an enormous rate. Therefore, the RRU drain pan and condensate line are sized and designed accordingly. However, an often overlooked element of proper condensate is trapping. An incorrectly designed and installed trap on the piping exiting the drain pan can restrict condensate flow or cause condensate to "spit" or "geyser." This can dampen the air handler interior and, or ductwork, creating an opportunity for mold infestation. Carefully install and trap the drain pan to ensure adequate condensate removal under all conditions.

Figure 10. Condensate trap installation



Important: *For internal static pressure above 1.5 in. wg, use the following for P-Trap dimensions:*

- *H = Internal Static Pressure (in. wg) + 1 in.*
- *J = H*0.5*
- *L = H + J + 0.75 in.*

Notes:

1. Pitch drain at least 1/2 in. per 10 in. horizontal run.
2. Condensate drain pan will not drain properly if P-Trap is not primed and of adequate height to allow for cabinet operating negative pressure.

Filter Installation

Each unit ships with 2-inch permanent filters installed. The quantity of filters is determined by unit size. Access to the filters is obtained lifting the access panel on the outdoor air intake hood.

Note: *Do not operate the unit without filters.*

Field Installed Power Wiring

An overall dimensional layout for the standard field installed wiring entrance into the unit is illustrated in Figure 2 to Figure 7. To insure that the unit's supply power wiring is properly sized and installed, follow the guidelines outlined below.

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

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.

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

Main Unit Power

⚠WARNING

Hazardous Voltage w/Capacitors!

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

Standard Wiring

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

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

1. Location of the applicable electrical service entrance is shown in "Unit/Curb Dimensions," p. 14. Complete the unit's power wiring connections onto either; the main terminal block HTB1 inside the unit control panel, the factory mounted nonfused disconnect switch (UCD) or circuit breaker (UCB), or the electric heat terminal block. Refer to the customer connection diagram that shipped with the unit for specific termination points.
2. Provide proper grounding for the unit in accordance with local and national codes.
3. If not provided as part of this unit, an electric disconnect switch (see unit nameplate for rated voltage and ampacity) shall be installed in accordance with Article 430 of the National Electric Code ANSI/NFPA 70.

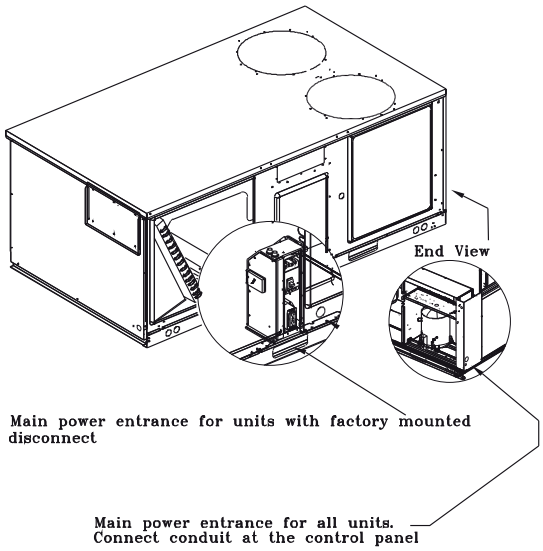
Installation Standards

Information for installation of the heater:

1. In Airplane Hangars in accordance the Standard for Aircraft Hangars ANSI/NFPA 409.
2. In Public Garages in accordance with the Standard for Parking Structures ANSI/NFPA 88A or the Standard for Repair Garages ANSI/NFPA 88B and with CAN/CSA B149.1 Natural Gas and Propane Installation Codes.

Main Unit Power

1. Location of the applicable electrical service is illustrated below. Refer to the customer connection diagram that is shipped with the unit for specific termination points. The termination points, depending on the customer option selected would be a factory mounted nonfused disconnect switch (UDC).
2. Provide proper grounding for the unit in accordance with local and national codes.



Field Installed Control Wiring

An overall layout of the various control options available with the required number of conductors for each control device is illustrated in Figure 11 and Figure 12.

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

Control Power Transformer

⚠WARNING

Hazardous Voltage w/Capacitors!

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

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

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

Controls Using 24 Vac

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.

Before installing any connecting wiring, refer to Figure 2 to Figure 7 for the electrical access locations provided on the unit and Table 2 for AC conductor sizing guidelines, and;

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

   Note: *Resistance in excess of 3 ohms per conductor may cause component failure due to insufficient AC voltage supply.*
3. Be sure to check all loads and conductors for grounds, shorts, and mis-wiring.
4. Do not run the AC low voltage wiring in the same conduit with the high voltage power wiring.

Table 2. 24V AC conductors

Distance from Unit to Control	Recommended Wire Size
000–460 feet	18 gauge
000–140 m	0.75 mm^2
461–732 feet	16 gauge

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

⚠WARNING

Hazardous Voltage w/Capacitors!

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

Before installing any connecting wiring between the unit and components utilizing a DC analog input\output signal, refer to Figure 2 to Figure 7 for the electrical access locations provided on the unit.

1. Table 3 lists the conductor sizing guidelines that must be followed when interconnecting the DC binary output devices and the system components utilizing a DC analog input\output signal to the unit.

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

2. Ensure that the wiring between controls and the unit's termination point does not exceed two and a half (2.5) ohms/conductor for the length of the run.
3. Do not run the electrical wires transporting DC signals in or around conduit housing high voltage wires.

DC Conductors

Table 3. Zone sensor module wiring

Distance from Unit to Control	Recommended Wire Size
000–150 feet 0–45.7 m	22 gauge 0.33 mm^2
151–240 feet 46–73.1 m	20 gauge 0.50 mm^2
241–385 feet 73.5–117.3 m	18 gauge 0.75 mm^2
386–610 feet 117.7–185.9 m	16 gauge 1.3 mm^2
611–970 feet 186.2–295.7 m	14 gauge 2.0 mm^2

Figure 11. Space sensor field wiring (optional)

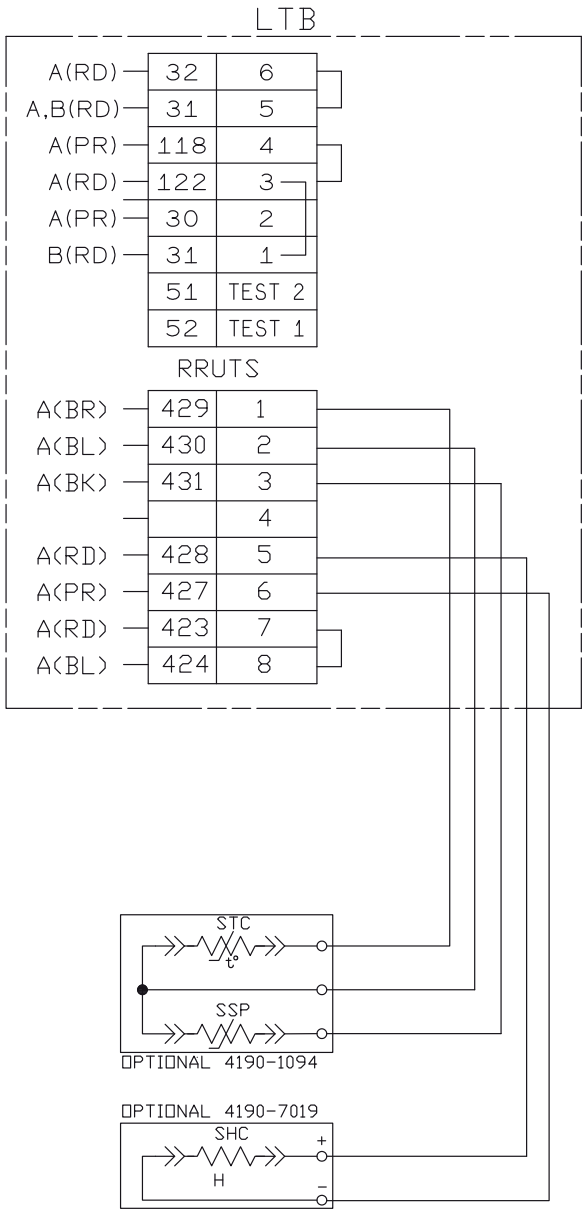
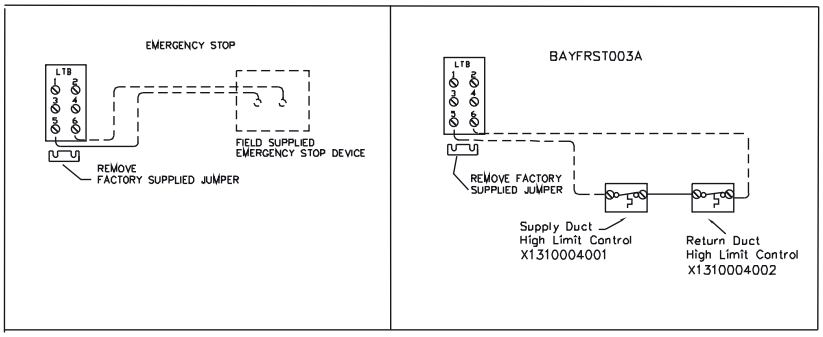
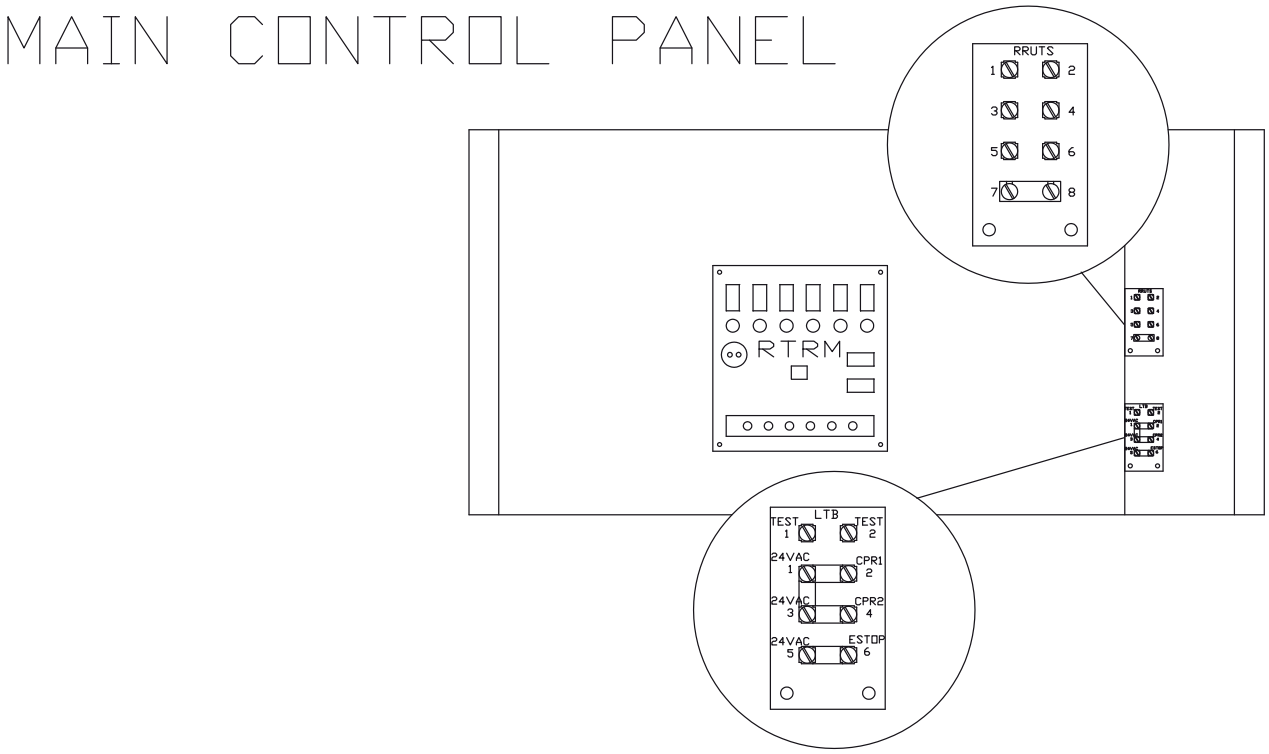


Figure 12. Typical field wiring diagrams for optional controls





Use the following checklist in conjunction with "General Unit Requirements," p. 23 to ensure that the unit is properly installed and ready for operation.

⚠WARNING

Hazardous Voltage w/Capacitors!

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

- ☐ Check all electrical connections for tightness and "point of termination" accuracy.
- ☐ Verify that the condenser airflow will be unobstructed.
- ☐ Verify that the condenser fan and indoor blower turn freely without rubbing and are properly tightened on the shafts.
- ☐ Check the supply fan belts for proper tension and the fan bearings for sufficient lubrication. If the belts require adjustment, or if the bearings need lubricating, refer to the maintenance section of this manual for instructions.
- ☐ Verify that a condensate trap is installed and the piping is properly sized and pitched.

- ☐ Verify that the correct size and number of filters are in place.
- ☐ Inspect the interior of the unit for tools and debris and install all panels in preparation for starting the unit.

Voltage Imbalance

⚠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.

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

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

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

where

AV (Average Voltage) =

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

V1, V2, V3 = Line Voltage Readings

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

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

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

VD (reading farthest from average) = 221

The percentage of Imbalance equals:

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

The 2.2 percent imbalance in this example exceeds the maximum allowable imbalance of 2.0 percent. This much imbalance between phases can equal as much as a 20 percent current imbalance with a resulting increase in motor winding temperatures that will decrease motor life. If the voltage imbalance is over 2 percent, notify the proper agencies to correct the voltage problem before operating this equipment.

Electrical Phasing (Three Phase Motors)

The compressor motor(s) and the supply fan motor are internally connected for the proper rotation when the incoming power supply is phased as A, B, C.

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

⚠WARNING

Hazardous Voltage w/Capacitors!

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

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

  Black (phase A) to L1
  Red (phase B) to L2
  Yellow (phase C) to L3
- ☐ Close the field supplied main power disconnect switch or circuit protector switch that provides the supply power to the unit.

⚠WARNING

Live Electrical Components!

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

When 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.

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

Compressor Crankcase Heaters

Each compressor can be equipped with a crankcase heater. The proper operation of the crankcase heater is important to maintain an elevated compressor oil temperature during the "Off" cycle to reduce oil foaming during compressor starts. Oil foaming occurs when refrigerant condenses in the compressor and mixes with the oil. In lower ambient conditions, refrigerant migration to the compressor could increase.

When the compressor starts, the sudden reduction in crankcase pressure causes the liquid refrigerant to boil rapidly causing the oil to foam. This condition could damage compressor bearings due to reduced lubrication and could cause compressor mechanical failures.

Before starting the unit in the "Cooling or Dehumidification" mode, remove the jumper on terminals 5 and 6 (Energy Stop) and turn the main power disconnect to the "On" position and allow the crankcase heaters to operate a minimum of 8 hours.

Before closing the main power disconnect switch, insure that the "Control Input" input is in the "Unoccupied" or connection on RRUTS 7 an 8 is "Open."

Close the main power disconnect switch and the unit mounted disconnect switch, if applicable.

RRUCM and ReliaTel Controls

Upon power initialization, the controls perform self-diagnostic checks to insure that all internal controls are functional. The Status LED located on the RRUCM and the Liteport LED located on the RTRM module is turned "On" within one second of power-up if internal operation is okay.

System Configuration and Pre-Start

Standard Unit Controller Model UC600

The Tracer® UC600 is a BACnet® unit controller that is designed to work with the Tracer SC and third-party BACnet MS/TP systems. Additional expansion modules including the XM30, XM32, and/or XM70 may be factory installed and wired as supplied options require.

ROD: The TD7 display is supplied when the ROD option is selected with UC600 controls. The color screen is touch-sensitive.

Figure 13. TD7 and Tracer UC600

Figure 14. Tracer UC600: System Status

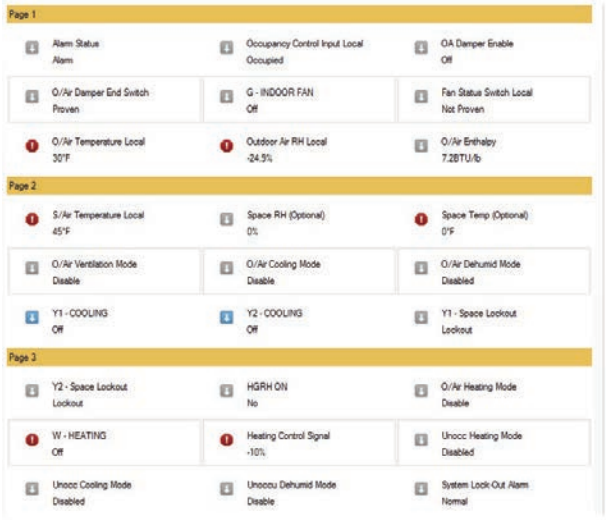


Figure 15. Tracer UC600: System Setup

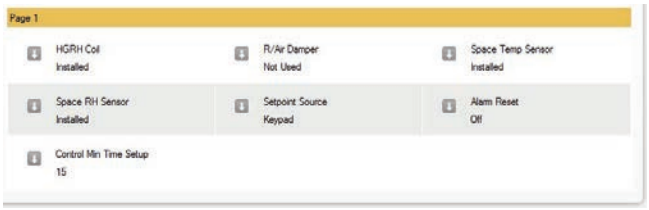


Figure 16. Tracer UC600: System Setpoints

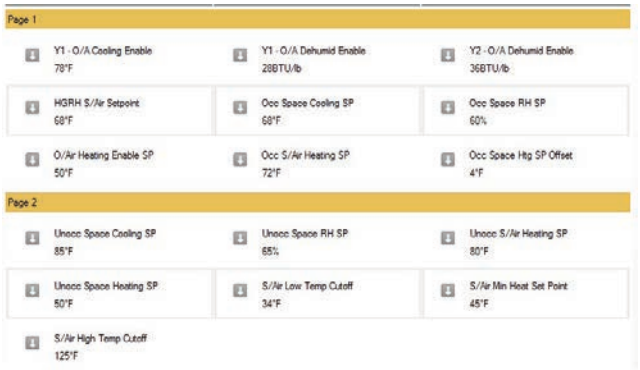


Table 4. RRU UC600 points list

Point Type	Point Instance	Point Name	Value	Unit	Reference	Active Priority	Priority Owner	Rel Def
AI	1	S/Air Temperature Local	45	°F	UI1.analogValue			
AI	2	O/Air Temperature Local	30	°F	UI2.analogValue			
AI	3	Outdoor Air RH Local	-24.91	%	UI3.analogValue			
AI	5	Space RH (Optional)	0	%	AO1/UI09.analogValue			
AI	6	Space Temp (Optional)	0	°F	AO2/UI10.analogValue			
AI	7	Space Sp Dial (Optional)	0	°F	AO3/UI11.analogValue			
AO	1	Heating Control Signal	-10	%	AO4/UI12.analogValue	9	BurnerControlIFV48aBacNet	25
AO	2	Combustion Blower Motor	0	%	AO5/UI13.analogValue	9	BurnerControlIFV48aBacNet	0
AO	3	OA/RA Damper	0	%	AO6/UI14.analogValue	Default		0
AV	1	Space Temp Setpt (BAS)	0	°F		Default		0
AV	2	Occ Space Cooling SP	68	°F		Default		68
AV	3	Eff Occ Cool SP	68	°F		9	ModeandSetpointsDFandIFV48aPart1BacNet	0
AV	4	Eff Occ Heat SP	64	°F		9	ModeandSetpointsDFandIFV48aPart1BacNet	0
AV	5	Occ Space Htg SP Offset	4	°F		Default		4
AV	6	HGRH Control Deadband	4	°F		Default		4
AV	7	Active S/Air Heat SP	72	°F		9	SupplyAirSetpointDFandIFV48aBacNet	60
AV	8	S/Air Low Temp Cutoff	34	°F		Default		34
AV	9	S/Air High Temp Cutoff	125	°F		Default		125
AV	10	O/Air Enthalpy	7.2	BTU/lb		9	ModeandSetpointsDFandIFV48aPart1BacNet	0
AV	11	Occ Space RH SP	60	%		Default		60
AV	12	Occ S/Air Heating SP	72	°F		Default		72
AV	13	Space Cooling SP	68	°F		9	ModeandSetpointsDFandIFV48aPart1BacNet	70
AV	14	Active Space Heating SP	64	°F		9	ModeandSetpointsDFandIFV48aPart1BacNet	72
AV	15	Y1 - O/A Dehumid Enable	28	BTU/lb		Default		28
AV	16	Y2 - O/A Dehumid Enable	36	BTU/lb		9	[9, ModeandSetpointsDFandIFV48aPart1BacNet] [13, User Low]	34
AV	17	Unocc Space Heating SP	50	°F		Default		50
AV	18	Unocc Space Cooling SP	85	°F		Default		85
AV	19	Unocc Space RH SP	65	%		Default		65
AV	20	O/Air Heating Enable SP	50	°F		Default		50
AV	21	Y1 - O/A Cooling Enable	78	°F		Default		78
AV	22	Y1 - Active 0A Dehumid SP	28	BTU/lb		9	ModeandSetpointsDFandIFV48aPart1BacNet	0
AV	23	Y2- Active 0A Dehumid SP	0	BTU/lb		Default		0
AV	24	Unocc S/Air Heating SP	80	°F		Default		80
AV	25	Htg Failure Temp Deadbnd	1.8	°F		Default		1.8
AV	26	Htg Failure TD	5			Default		5
AV	27	Active O/A Dehum Y1 Enab	28	BTU/lb		9	EnthalpySetpointResetDFandIFV48aBacnet	26
AV	28	Active O/A Dehum Y2 Enab	36	BTU/lb		9	EnthalpySetpointResetDFandIFV48aBacnet	29
AV	29	S/Air High Cutoff TD	3			Default		3
AV	30	S/Air Low Cutoff TD	15			Default		15
AV	31	Heat Circuit Timer	0			9	BurnerControlIFV48aBacNet	1
AV	32	O/Air Clg Enable Stg1	78	°F		Default		78
AV	33	Active O/Air Cool Setpt	78	°F		9	SupplyAirSetpointDFandIFV48aBacNet	78
AV	34	System Delta T	15	°F		9	FanControlIFV48aBacNet	0
AV	35	Control Min Time Setup	15			Default		15
AV	36	HGRH S/Air Setpoint	68	°F		Default		68
AV	37	Space Pressure Setpoint	0	in(H_2O)		Default		0
AV	38	O/Air Dpr Min Position	100	%		Default		100
AV	39	S/Air Min Heat Set Point	45	°F		Default		45

Table 4. RRU UC600 points list (continued)

Point Type	Point Instance	Point Name	Value	Unit	Reference	Active Priority	Priority Owner	Rel Def
BI	1	O/Air Damper End Switch	1		UI4.binaryValue			
BI	2	Occupancy Control Input Local	1		UI5.binaryValue			
BI	3	Fan Status Switch Local	1		UI6.binaryValue			
BI	4	Emergency Stop Input	1		UI7.binaryValue			
BO	1	2-Position OA Damper	0		BO1 (Relay).binaryValue	9	FanControlIFV48aBacNet	0
BO	2	G - INDOOR FAN	0		BO2 (Relay).binaryValue	9	FanControlIFV48aBacNet	0
BO	3	Y1 - COOLING	0		BO3 (Relay).binaryValue	8	[8, Manual Operator] [9, DXCoolingControlDFV48aBacNet]	0
BO	4	Y2 - COOLING	0		BO4 (triac).binaryValue	8	[8, Manual Operator] [9, DXCoolingControlDFV48aBacNet]	0
BO	5	HOT GAS REHEAT	0		XM.32.1.BO1 (Relay).binaryValue	9	BurnerControlIFV48aBacNet	0
BO	6	W - HEATING	0		XM.32.1.BO2 (Relay).binaryValue	9	BurnerControlIFV48aBacNet	0
BV	1	Fan Failure Reset (BAS)	0			Default		0
BV	2	Alarm Reset (BAS)	0			Default		0
BV	3	Occupancy Input (BAS)	0			Default		0
BV	4	Sensor Failure	1			9	AlarmsDFandIFV48aBacNet	0
BV	5	R/Air Damper	0			Default		0
BV	6	OA Damper Failure	0			9	FanControlIFV48aBacNet	0
BV	7	S/Air High Temp Cutout	0			9	AlarmsDFandIFV48aBacNet	0
BV	8	Clg HGRH Duty Mode	0			9	DutyCycleDFandIFV48aBacNet	0
BV	9	Alarm Reset	0			9	FanControlIFV48aBacNet	0
BV	10	Space SP Thumbwheel	0			Default		0
BV	11	Heating Failure	0			9	BurnerControlIFV48aBacNet	0
BV	12	Space Heat/Cool Mode	0			9	ModeandSetpointsDFandIFV48aPart1BacNet	0
BV	13	System Lock-Out Alarm	0			9	AlarmsDFandIFV48aBacNet	0
BV	14	S/Air Low Temp Cutout	0			9	AlarmsDFandIFV48aBacNet	0
BV	15	O/Air Cooling Mode	0			9	ModeandSetpointsDFandIFV48aPart1BacNet	0
BV	16	O/Air Heating Mode	0			9	ModeandSetpointsDFandIFV48aPart1BacNet	0
BV	17	O/Air Ventilation Mode	0			Default		0
BV	18	Space Temp Sensor	1			Default		1
BV	19	Space RH Sensor	1			Default		1
BV	20	Info Alarm Active	1			9	AlarmsDFandIFV48aBacNet	0
BV	21	HGRH Coil	1			Default		1
BV	22	Reset Duty Cycle Timer	0			9	DutyCycleDFandIFV48aBacNet	0
BV	23	Unoccu Dehumid Mode	0			9	ModeandSetpointsDFandIFV48aPart1BacNet	0
BV	24	Cooling Stage 1 Allowed	0			9	ModeandSetpointsDFandIFV48aPart1BacNet	0
BV	25	Cooling Stage 2 Allowed	0			9	ModeandSetpointsDFandIFV48aPart1BacNet	0
BV	26	S/A Temp Sensor Failure	1			9	AlarmsDFandIFV48aBacNet	0
BV	27	O/A Temp Sensor Failure	1			9	AlarmsDFandIFV48aBacNet	0
BV	28	O/A RH Sensor Failure	1			9	AlarmsDFandIFV48aBacNet	0
BV	29	Setpoint Source	0			Default		0
BV	30	Heating is Running	0			9	DutyCycleDFandIFV48aBacNet	0
BV	31	Cooling is Running	0			9	DutyCycleDFandIFV48aBacNet	0
BV	32	HGRH Purge Mode	0			9	DutyCycleDFandIFV48aBacNet	0
BV	33	Alarm Status	1			9	AlarmsDFandIFV48aBacNet	0
BV	34	O/Air Dehumid Mode	0			9	ModeandSetpointsDFandIFV48aPart1BacNet	0
BV	35	Indoor Fan Failure	0			9	FanControlIFV48aBacNet	0
BV	36	Fan Failure Reset	0			Default		0

Table 4. RRU UC600 points list (continued)

Point Type	Point Instance	Point Name	Value	Unit	Reference	Active Priority	Priority Owner	Rel Def
BV	37	Unocc Cooling Mode	0			9	ModeandSetpointsDFandIFV48aPart1BacNet	0
BV	38	Unocc Heating Mode	0			9	ModeandSetpointsDFandIFV48aPart1BacNet	0
BV	39	Space Heat Lockout	0			9	ModeandSetpointsDFandIFV48aPart1BacNet	0
BV	40	Space Temp Sensor Failure	1			9	AlarmsDFandIFV48aBacNet	0
BV	41	Space RH Sensor Failure	0			9	AlarmsDFandIFV48aBacNet	0
BV	42	Y2 - Space Lockout	1			9	DXCoolingControlDFV48aBacNet	0
BV	43	HGRH Required	1			9	BurnerControlIFV48aBacNet	0
BV	44	Space Pressure Used	0			Default		0
BV	45	OA Damper Enable	0			9	FanControlIFV48aBacNet	0
BV	46	Y1 - Space Lockout	1			9	DXCoolingControlDFV48aBacNet	0
BV	47	Ignition	0			9	BurnerControlIFV48aBacNet	0
BV	48	HGRH ON	0			9	BurnerControlIFV48aBacNet	0
BV	49	Control Input /w Min time	1			9	FanControlIFV48aBacNet	0
MI[a]	1	tov_S/Air Temperature	Idle		UI1.mode			

(a) State Text:
[1, Idle]
[2, Timed Override Requested]
[3, Timed Override Request Cancelled]

Startup

Compressor Startup

⚠ 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.

NOTICE

Compressor Failure!

Unit must be powered and crankcase heaters energized at least 8 hours BEFORE compressors are started. Failure to follow these instructions could cause premature compressor failure.

1. Before initial start up, or if main power has been off for an extended period of time, compressor crankcase heater(s) must be operated for a minimum of 8 hours prior to compressor operation. With main power OFF, remove jumper between RRUTS Terminals 7 and 8 (Run-Command). Turn main power ON to energize crankcase heater(s). At end of warm up period turn main power off, install 7–8 jumper or run command wires, turn main power on, and resume normal operation.
2. Attach a set of service gauges onto the suction and discharge gauge ports for each circuit.
3. Using the **Override** button located on the Main Display, select **Override** and then select **Override a Binary Output**. Using the parameters guide in Table 5, locate compressor overrides. Enable and check each compressor circuit by selecting **Compressor 1** or **Compressor 2 – ON**.

Table 5. Override (at Home screen)

Override Occupancy			
1 of 4	**Override Occupancy**		
Adj.	Occupied		
Adj.	Unoccupied		
Adj.	OCC-Bypass		
Adj.	OCC-Standby		
Override a Binary Output			
(On-Off or Open-Closed)			
1 of 4	**Binary Outputs**	**2 of 4**	**Binary Outputs**
Adj.	OA Damper	***Adj.***	Hot Gas Reheat
Adj.	Indoor Fan Motor	***Adj.***	Heating
Adj.	Compressor 1		
Adj.	Compressor 2		
Override an Analog Output			
(%)			
1 of 4	**Analog Outputs**	**2 of 4**	**Analog Output**
Adj.	Heat Modulation Signal		***NOT USED***
	NOT USED		***NOT USED***
Adj.	ERCC Capacity Control		
Adj.	S/Fan VFD (Optional)		

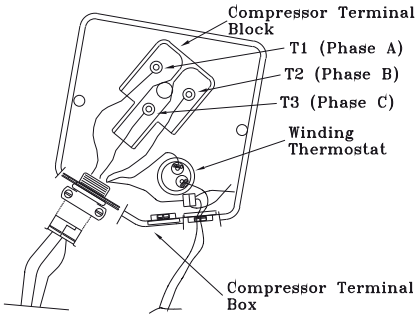
Note: All overrides set must be manually released.

4. To return the unit to normal operation, release all overrides.

   Note: *Overrides do not time out. Overrides must be manually released when startup function is complete.*

Scroll Compressors

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



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

7. Check the compressor oil levels. The oil level in each compressor sight glass should be 1/2 to 3/4 full when they are "Off".
8. After the compressor and condenser fan have started and operated for approximately 30 minutes, observe the operating pressures. Compare the operating pressures to the operating pressure curve in the Service Facts.
9. Check system superheat. Follow the instruction listed on the superheat charging curve in the Service Facts.

   Superheat should be within ±5°F of the superheat chart value.
10. Repeat Step 2 through Step 9 for each refrigerant circuit.

Direct Gas-Fired Heating Startup

⚠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.**
- **Do not attempt the following procedures until all electrical and gas connections to the unit have been completed and the outdoor air damper and evaporator fan operation have been verified and are operating correctly.**

⚠WARNING

Hazard of Explosion!

Failure to follow safe leak test procedures below could result in death or serious injury or equipment or property-only-damage.

Never use an open flame to detect gas leaks. Use a leak test solution for leak testing.

Notes:

- *BEFORE OPERATING, leak test all gas piping up to heater gas valve. Smell around the unit area for gas. If gas is smelled, do NOT attempt to place heater in operation until source of gas leak is identified and corrected.*
- *Use only hand force to operate the gas control lever to the "ON" position. NEVER use tools. If lever does not operate by hand, replace gas valve prior to staring the unit. Forcing or attempting to repair the gas valve may result in fire or explosion.*
- *Do not attempt to operate unit, if there is indication that any part or control has been under water. Any control or component that has been under water must be replaced prior to trying to start the unit.*

Refer to "Sequence of Operation," p. 19 for additional information.

The following procedure must be followed for the unit heating section to function properly. The following procedures are to be performed after all electrical and gas connections to the unit have been completed and the outdoor air damper and evaporator fan operation have been verified and are operating satisfactorily.

Refer to "Sequence of Operation," p. 19 for additional information.

Tools Required

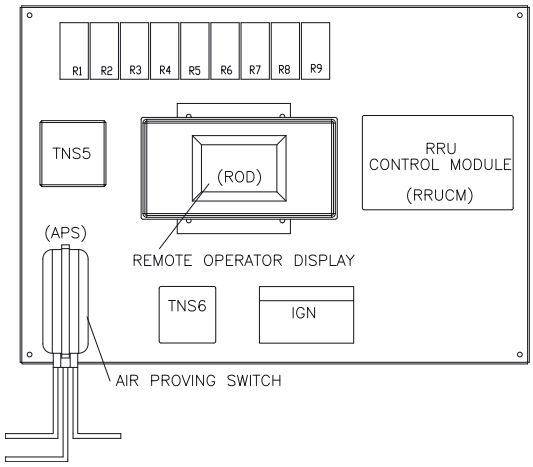
- Voltage meter (µA)
- Amp meter
- Gas pressure gauge
- Tachometer
- Temperature probe
- Anemometer
- Service mirror
- Small refrigeration screwdriver
- 5/16-in. Nut driver
- 1/2-in. Open end wrench

1. Confirm Unit Airflow

Important: *Accurate airflow readings require clean inlet filters. If required clean or replace filters before proceeding.*

All Horizon direct gas-fired heaters are factory-adjusted to achieve design airflow pressure drop (ΔP) of -0.625 in. wc across the burner profile opening at ordered unit SCFM airflow. The burner baffles should not be adjusted. Outdoor Air conditions will cause the measured ΔP to vary. Refer to Table 6, p. 36 to see the acceptable measured pressures that may be read at various outdoor air conditions. Measure and record burner pressure drop.

Figure 17. Air proving switch location



2. Check Inlet Gas Pressure

Check to insure the inlet gas pressure is within the pressure requirement listed on the nameplate. DO NOT expose gas controls to pressures above 1/2 psi (14 in. wc). The gas supply line should be installed with an external manual shutoff and pressure tap.

Table 6. Acceptable measured pressures

OAT (°F)	Burner Pressure Drop (in. wc)
0	0.720
5	0.712
10	0.705
15	0.697
20	0.690
25	0.683
30	0.676
35	0.669
40	0.663
45	0.656
50	0.650
55	0.643
60	0.637
65	0.631
70	**0.625[a]**
75	0.619
80	0.613
85	0.608
90	0.602
95	0.597
100	0.592

(a) 0.625-in. design pressure drop at standard air conditions. Allowable pressure range at 70°F is 0.55 to 0.75 in. wc.

Note: *If burner pressure drop is not within the range shown in Table 6, refer to "Alarms and Troubleshooting," p. 50.*

3. Check Inlet Gas Pressure and Confirm Gas Flow to Unit

⚠WARNING

Hazard of Explosion!

Failed gas components could explode or leak flammable gas which could cause a fire resulting in death or serious injury or property damage. Do NOT expose gas controls to pressures above 1/2 psi (3.5 kPa).

- **Heater main gas shut-off valve and controls MUST be isolated when testing gas supply piping at pressures in excess of 1/2 psi (3.5 kPa).**
- **Heater main gas shut-off valve MUST be closed when testing gas supply piping at pressures equal to or less than 1/2 psi (3.5 kPa).**

Refer to "General Safety Information," p. 5.

Confirm gas flow and gas supply pressure to heater. The Manual Shut-Off valve (MSO1) can be used to bleed the supply line as needed.

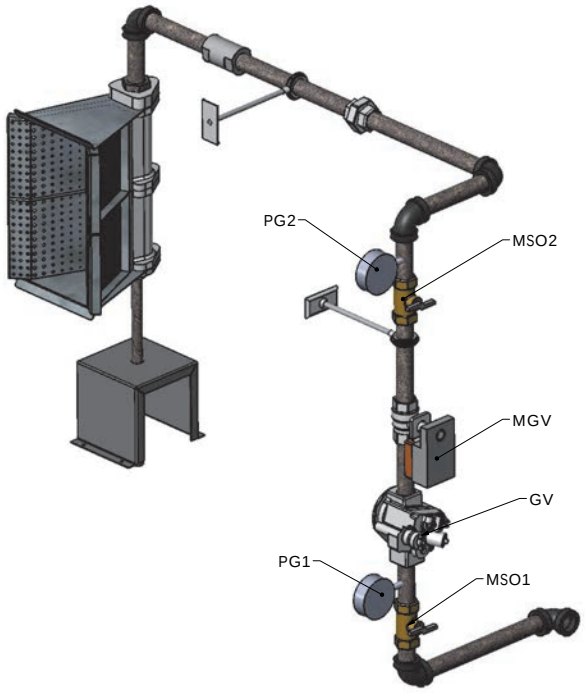
After confirming gas flow to unit, verify and record gas pressure at PG1.

4. Heating Starting Sequence for Gas Input Rating ≤ 400 MBh

Important: *Open shut off vales at MSO1, MSO2, and Main Gas Valve (MGV) before proceeding.*

Refer to Figure 18.

Figure 18. Burner gas train

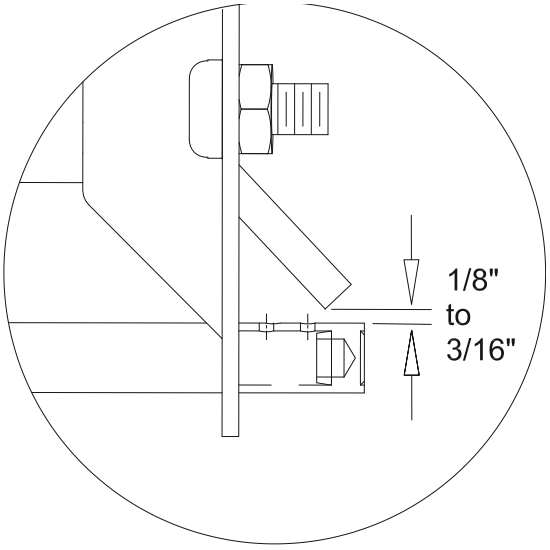


Burner Gas Train

- Manual Shut-off Valves (2) (MSO1 and MSO2)
- Main Gas Valve—Automatic Safety On-Off with Main Gas Regulator
- Modulating Gas Valve (MGV)
- Gas Pressure Gauges
- Main Gas Inlet Pressure (PG1)
- Burner Inlet Pressure (PG2)

- The Main Gas Valve/Pressure Regulator (GV) and Modulating Gas Valve (MGV) have been factory set to achieve both proper maximum and proper minimum fuel input to the direct gas-fired burner.
- Gas supply train includes (2) factory installed pressure gauges. Gauge 1 (PG1) reads the main gas supply pressure. Gauge 2 reads the outlet pressure to the burner from the MGV.
- See Heater Burner Data Plate for factory pressure settings.
- Electrical control panel includes control relays with pilot lights which, when illuminated, indicate the relay is energized. For this starting sequence relays controlling Outdoor Air Damper (R1), Indoor Fan (R2), Heating Call (R6), Burner Proving (R7) and Burner ON (R8) will be used.

Figure 19. Direct gas-fired electrode and flame rod alignment



- **Starting Sequence**

Note: *In the event Outdoor Air Conditions or Unit Controls are such that the unit will not automatically enter the desired operating modes, refer to "Alarms and Troubleshooting," p. 50 for Control Override Procedures. For initial heating startup, it may be necessary to remove and repeat the call for heat until the internal gas piping system is bled.*

- R1 ON—OA damper OPEN
- R2 ON—Indoor Fan ON
- R6 ON—Call for Heating ON
- R7 ON—Ignition Process begins and requires proof of flame at burner to continue
- R8 ON—Ignition Process Proven

5. Test Operating Heating Modes

Note: *Heating default control signal is 25 percent for 90 seconds following successful ignition.*

Important:

- *This test is designed to assure adequate stable gas pressure is available when burner is firing at maximum capacity. Refer to unit nameplate rating for "Minimum Gas Supply Pressure Required to Achieve Maximum Temperature Rise."*
- *Depending on outdoor temperature, it may be necessary to bypass the manual reset High Temperature Limit control during this test.*

a. High Fire Test Following Normal Burner Starting Sequence

i. At ROD override, Heating Control Signal to 100 percent.

ii. When pressure at PG2 stabilizes, confirm PG1 and PG2 pressures are within ±5 percent of the pressures shown on Burner Data Plate.

⚠WARNING

Hazard of Explosion!

Failed gas components could explode or leak flammable gas which could cause a fire resulting in death or serious injury or property damage. To avoid damage to unit if PG1 or PG2 exceed data plate pressures +5 percent, disable incoming gas using the manual shutoff valves and ensure incoming pressure is within nameplate data BEFORE enabling the gas.

iii. Record Gas Pressures

–PG1

–PG2

iv. At ROD, read and record

–Outdoor Air Temperature

–Discharge Air Temperature

–Burner ΔP

v. Release Heating Control Signal Override

b. Low Fire Test Following Normal Burner Starting Sequence

i. Override Heating Control Signal to 0 percent

ii. Confirm PG1 and PG2 pressures are within ±5 percent of the pressures shown on Burner Data Plate

iii. Allow a minimum of 5 minutes of operation at 0 percent heating signal

iv. At ROD read and record

–Outdoor Air Temperature

–Discharge Air Temperature

–Burner ΔP

v. Record Gas Pressures

–PG1

–PG2

c. Ignition Cycle Test

i. Release Heating Control Signal Override

ii. Complete at least (5) calls for heat

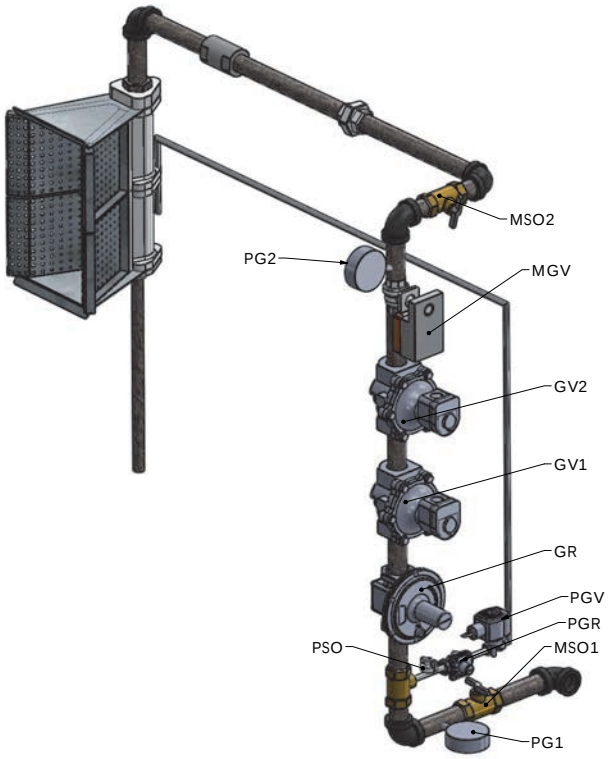
–At each call for heat default heating startup, signal is 25 percent

–Following each ignition test and before attempting the next test monitor analogue Heating Control Signal at ROD to be sure heat signal is released at end of each 90-second warm-up period

6. Burner Gas Train, Ignition Controls and Starting Sequence for Gas Input Rating > 400 MBh

Refer to Figure 20.

Figure 20. > 400 MBh Gas train



a. Pilot Gas Train

i. Manual Shut-Off Valve (PSO)

ii. Pilot Gas Regulator (PGR)

iii. Pilot On-Off Valve (PGV)

b. Burner Gas Train

i. Manual Shut-off Valves (2) (MSO1 and MSO2)

ii. Main Gas Regulator (1) (GR)

iii. Main Gas Valves—Automatic Safety On-Off Control (2) (GV1 and GV2)

iv. Modulating Gas Valve (MGV)

v. Gas Pressure Gauges

–Gas Supply Pressure (PG1)

–Burner Inlet Pressure (PG2)

c. Burner Control Operation

The RM7895, EC7895, and RM7896 have the operating sequence as shown in Figure 21 and Figure 22, p. 40. The LED provides positive visual indication of the program sequence for power, pilot, flame, main, and alarm.

Initiate

The relay module enters the initiate sequence when it is powered. The RM7895A/B/C/D, EC7895A/C and RM7896A/B/C/D can also enter the initiate sequence if the relay module verifies voltage fluctuations of +10/-15 percent or frequency fluctuations of ±10 percent during any part of the operating sequence. The initiate sequence lasts for 10 seconds unless the voltage or frequency tolerances are not met. When not met, a hold condition is initiated and displayed on the optional KDM for at least five seconds. When met, the initiate sequence restarts. If the condition is not corrected and the hold condition exists for 4 minutes, the flame relay module locks out.

Causes for a hold condition in the initiate sequence are as follows:

- AC line dropout detection.
- AC line noise that can prevent a sufficient reading of the line voltage inputs.
- Low line voltage brownouts.

Standby

The flame relay module is ready to start an operating sequence when the operating control input determines a call for heat is present. The burner switch, limits, operating limit control and all microcomputer-monitored circuits must be in the correct state for the relay module to continue into the "pre-purge" sequence.

Normal Startup Pre-purge

The module provides 30-second "pre-purge" timing with power applied and the operating control indicating a call for heat.

- The airflow interlock, burner switch, and all microcomputer-monitored circuits must also be in the correct operating state.
- The pre-purge sequence begins on call for heating.
- Failure to establish airflow at unit airflow proving switch within 15 seconds of indoor fan enable discontinues ignition.

Ignition Trials

The pilot flame establishing period (PFEP) begins when:

- The pilot valve and ignition transformer, terminals 8 and 10, are energized. The RM7895A/B, EC7895A, and RM7896A/B modules have an intermittent pilot valve, (terminal 8). The RM7895C/D, EC7895C, and RM7896C/D modules have an interrupted pilot valve (terminal 8).
- Flame must be proven by the end of the 15-second PFEP (4 seconds if configuration jumper, JR1, is clipped) to allow the sequence to continue. If a flame is not proven by the end of PFEP, a safety shut down occurs.

With flame proven, the ignition, terminal 10, is energized. This main flame establishing period (MFEP) begins when:

- After ignition trials, and with the presence of flame, the main fuel valve, terminal 9, is powered. If a flameout occurs, the relay module locks out or recycles (depending on status of jumper JR2) within 0.8 or 3 seconds, depending on the flame failure response time (FFRT) of the amplifier.
- The RM7895C/D, EC7895C, and RM7896C/D modules have a 10-second MFEP. After ignition trials and with the presence of flame, the main fuel valve, terminal 9, is powered. If the flameout occurs, the relay module locks out within 0.8 or 3 seconds, depending on the amplifier FFRT.

Run

The RM7895C/D, EC7895C, RM7896C/D has a delayed main valve that is energized once the "run" period is entered.

The relay module is now in "run" and remains in "run" until the controller input, terminal 6, opens, indicating that the demand is satisfied or a limit has opened.

Run/Test Switch (RM7895C/D, EC7895C, RM7896C/D only). The "run/test switch" is located on the top side of the relay module. This switch allows the burner sequence to be altered as follows:

- In the measured "pre-purge" sequence, the "run/test switch," placed in the "test" position, causes the pre-purge timing to stop.
- In the "pilot flame establishing period" sequence, the "run/test switch," placed in the "test" position, stops the timer during the first 8 seconds of a 10-second PFEP selection, or during the first 3 seconds of a 4-second PFEP.
- It also allows for pilot turn-down test and other burner adjustments. This activates a 15-second flameout timer that permits pilot flame adjustment without nuisance safety shutdowns. The run/test/switch is ignored during PFEP for the C and D relay modules if terminals 8 and 9, or 9 and 21 are jumpered.

Note: *When the relay module is switched to the "test" mode, it stops and holds at the next run/test switch point in the operating sequence. Ensure that the run/test switch is in the "run" position before leaving the installation.*

Figure 21. Sequence status LEDs

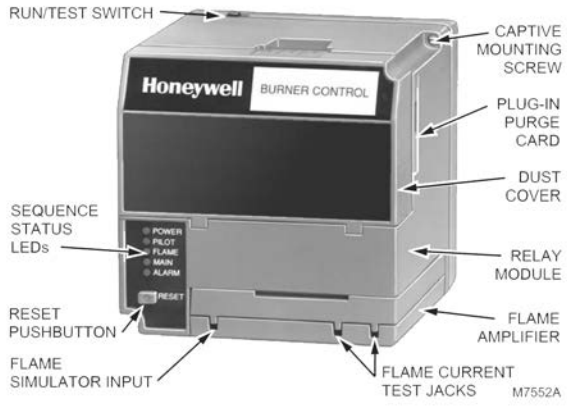
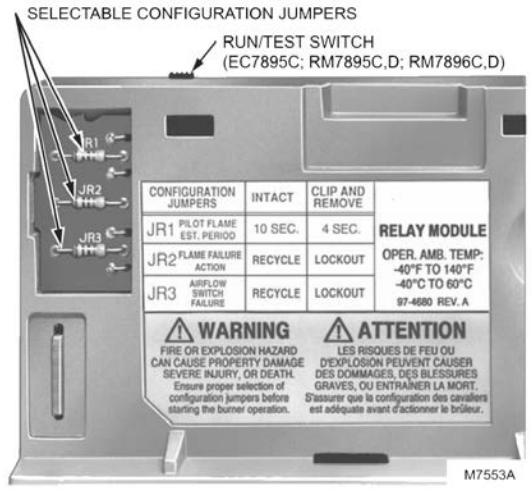


Figure 22. Selectable site-configurable jumpers



Settings and Adjustments

The relay module has three site-configurable jumper options.

Table 7. Jumper options

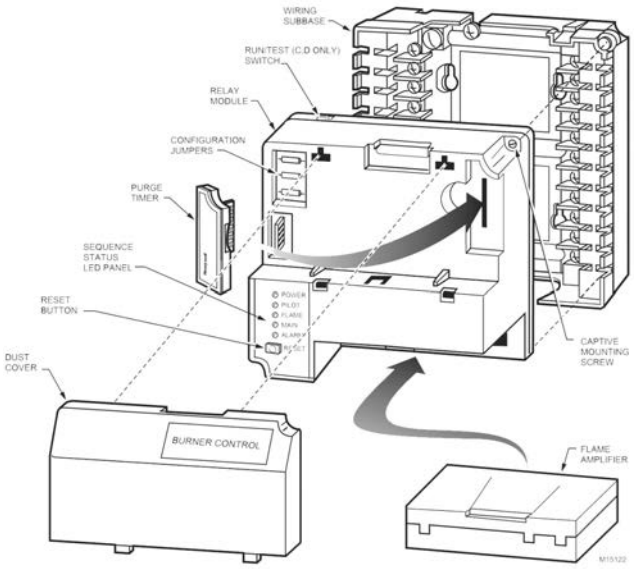
Jumper #	Description	Intact	Clipped
JR1	Pilot Flame Establishing Period (PFEP)	10 seconds	4 seconds
JR2	Flame Failure Action	Recycle	Lockout
JR3	Airflow Switch (1LK) Failure	Recycle	Lockout

If necessary, clip the site-configurable jumpers with side cutters and remove the resistors from the relay module.

Notes:

- *Clipping and removing a site-configurable jumper enhances the level of safety.*
- *Clipping and removing a jumper after 200 hours of operation causes a non-resettable fault 100. The relay module must then be replaced.*

Figure 23. Relay module plug-in diagram



Operation of the Direct Spark Ignition Control Gas Valve

⚠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.

On a call for heat, a 30-second pre-purge is initiated. Upon completion of the pre-purge, the gas valve and 60 Hz spark are energized. When flame is detected, the control enters the steady state heating condition. Steady state heating will continue until the call for heat is satisfied.

If ignition is not achieved within 10 seconds, the control valve shuts off the gas and locks out. If the trial for ignition has been accomplished without ignition, the control shuts off all outputs and enters lockout. Reset is accomplished by cycling the power off for a minimum of 5 seconds.

If flame is lost once it has been established, the control will shut off the gas valve within 0.8 seconds and locks out.

If flame is sensed during a purge period when no flame should be present, the control will remain in a purge with the gas valve off until the false flame disappears.

If the gas valve is found to be powered when it should be off, or not powered when it should be on, the control will

enter lockout with all outputs off. Reset is accomplished by cycling the power off for a minimum of 5 seconds.

- **High Fire Test Following Normal Burner Starting Sequence**
  - At ROD override, Heating Control Signal to 100 percent.
  - When pressure at PG2 stabilizes, confirm PG1 and PG2 pressures are within ±5 percent of the pressures shown on Burner Data Plate.

⚠WARNING

Hazard of Explosion!

Failed gas components could explode or leak flammable gas which could cause a fire resulting in death or serious injury or property damage. To avoid damage to unit if PG1 or PG2 exceed data plate pressures +5 percent, disable incoming gas using the manual shutoff valves and ensure incoming pressure is within nameplate data BEFORE enabling the gas.

  - Record Gas Pressures
    - PG1
    - PG2
  - At ROD, read and record
    - Outdoor Air Temperature
    - Discharge Air Temperature
    - Burner ΔP
  - Release Heating Control Signal Override
- **Low Fire Test Following Normal Burner Starting Sequence**
  - Override Heating Control Signal to 0 percent
  - Confirm PG1 and PG2 pressures are within ±5 percent of the pressures shown on Burner Data Plate
  - Allow a minimum of 5 minutes of operation at 0 percent heating signal
  - At ROD read and record
    - Outdoor Air Temperature
    - Discharge Air Temperature
    - Burner ΔP
  - Record Gas Pressures
    - PG1
    - PG2
- **Ignition Cycle Test**
  - Release Heating Control Signal Override
  - Complete at least (5) calls for heat
    - At each call for heat default heating startup, signal is 25 percent
    - Following each ignition test and before attempting the next test monitor, analogue Heating Control Signal at ROD to be sure heat signal is released at end of each 90-second warm-up period

Final System Setup

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

- ☐ Program all user set points in the System Set Points screen via the ROD.
- ☐ Configure optional accessories in the System Setup screen via the ROD.
- ☐ Return the unit to normal operation by releasing all overrides.
- ☐ Set Date and Time via the Setup (Home Screen) via the ROD.
- ☐ Inspect the unit for misplaced tools, hardware, and debris.
- ☐ Verify that all exterior panels including the control panel doors and condenser grilles are secured in place.
- ☐ Close the main disconnect switch or circuit protector switch that provides the supply power to the unit's terminal block or the unit mounted disconnect switch.
- ☐ **Verify that all overrides have been released.**

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.

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

Fan Belt Adjustment—Belt Drive Units

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

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

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

Once the new belts are installed, using a Browning or Gates tension gauge (or equivalent) illustrated in Figure 24; adjust the belt tension as follows:

1. To determine the appropriate belt deflection:
   a. Measure the center-to-center shaft distance (in inches) between the fan and motor sheaves.
   b. Divide the distance measured in Step 1a by 64; the resulting value represents the amount of belt deflection that corresponds to the proper belt tension.
2. Set the large O-ring on the belt tension gauge at the deflection value determined in Step 1b.
3. Set the small O-ring at zero on the force scale of the gauge plunger.
4. Place the large end of the gauge at the center of the belt span; then depress the gauge plunger until the large Oring is even with the top of the next belt or even with a straightedge placed across the fan and motor sheaves. Refer to Figure 24.
5. Remove the belt tension gauge. The small O-ring now indicates a number other than zero on the plunger's force scale. This number represents the force (in pounds) required to give the needed deflection.
6. Compare the "force" scale reading (Step 5) with the appropriate "force" value listed in Table 8. If the "force" reading is outside the range, readjust the belt tension.

Note: *Actual belt deflection "force" must not exceed the maximum "force" value shown in Table 8.*

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

Figure 24. Belt tension gauge

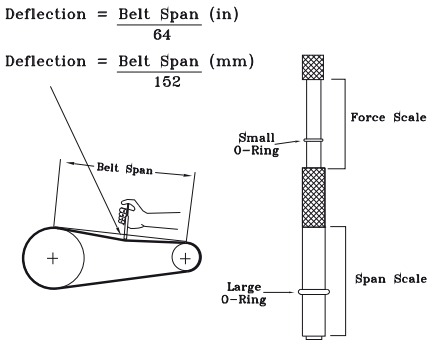


Table 8. Belt tension measurement and deflection ranges

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

Monthly Maintenance

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

⚠WARNING

Hazardous Voltage w/Capacitors!

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

Filters

- ☐ Inspect the outdoor air filters. Clean or replace them if necessary.

Cooling Season

- ☐ Check the unit's drain pans and condensate piping to ensure that there are no blockages.

⚠WARNING

Hazardous Pressures!

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

- ☐ 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," p. 46.
- ☐ Manually rotate the condenser fan(s) to ensure free movement and check motor bearings for wear. Verify that all of the fan mounting hardware is tight.
- ☐ Inspect the Outdoor and Return Dampers (optional) to ensure that all moving parts are securely mounted. Keep the blades clean as necessary.
- ☐ Verify that all damper linkages move freely; lubricate with white grease, if necessary.
- ☐ Check supply fan motor bearings; repair or replace the motor as necessary.
- ☐ Check the fan shaft bearings for wear. Replace the bearings as necessary.
- ☐ Check the supply fan belt. If the belt is frayed or worn, replace it. Refer to "Fan Belt Adjustment—Belt Drive Units," p. 43 for belt replacement and adjustments.
- ☐ Verify that all wire terminal connections are tight.
- ☐ Remove any corrosion present on the exterior surfaces of the unit and repaint these areas.
- ☐ Generally inspect the unit for unusual conditions (e.g., loose access panels, leaking piping connections, etc).
- ☐ Make sure that all retaining screws are reinstalled in the unit access panels once these checks are complete.
- ☐ With the unit running, check and record the: ambient temperature; compressor suction and discharge pressures (each circuit); superheat (each circuit).

  Record this data on an "operator's maintenance log" like the one shown in Table 10, p. 49. If the operating pressures indicate a refrigerant shortage, measure the system superheat. For guidelines, refer to "Compressor Startup," p. 34.

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

Heating Season

- ☐ Inspect the unit's outdoor air filters. If necessary, clean or replace them.
- ☐ Check supply fan motor bearings; repair or replace the motor as necessary.
- ☐ Inspect both the Main Unit Control Panel and Burner Control Panel for loose electrical components and terminal connections, as well as damaged wire insulation. Make any necessary repairs.

Heater Annual Maintenance

⚠WARNING

Hazardous Gases and Flammable Vapors!

Failure to observe the following instructions could result in exposure to hazardous gases, fuel substances, or substances from incomplete combustion, which could result in death or serious injury. The state of California has determined that these substances may cause cancer, birth defects, or other reproductive harm. Improper installation, adjustment, alteration, service or use of this product could cause flammable mixtures or lead to excessive carbon monoxide. To avoid hazardous gases and flammable vapors follow proper installation and setup of this product and all warnings as provided in this manual.

At least a yearly inspection is recommended for heating installations and more frequently for process applications in year-round operation. Experience is the best guide in determining frequency of inspect but as a minimum, the following procedure should be followed.

1. Inspect the tightness of the gas safety shut-off valves for the furnace by turning off the manual valve upstream of the appliance combination control.
2. Remove the 1/8 in. pipe plug on the inlet side of the combination control and connect a manometer to the tapping.
3. Turn the manual valve ON to apply pressure to the combination control.
4. Record the pressure reading on the manometer, then turn the valve OFF.
5. **Leak check gas train gas train components.**
6. Use a soap solution to check all threaded connections. If no leak is found, the combination control may be faulty and must be replaced before placing the appliance back in service.

Burner Cleaning

⚠WARNING

Hazardous Voltage and Gas!

Failure to turn off gas or disconnect power before servicing could result in an explosion or electrocution which could result in death or serious injury.

Turn off the gas supply and disconnect all electric power, including remote disconnects, before servicing the unit. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

1. Shut the system down totally, disconnecting or locking out gas and electrical power supply.
2. Inspect the burner carefully, including upstream and downstream sides of mixing plates as well as burner body face.

Note: *The complete burner assembly may have to be removed for proper inspection and cleaning. Any accumulation of scale or foreign material on either side of the mixing plates should be removed with a wire brush. Visually check that no holes in the mixing plates are blocked. If burner ports are plugged (even partially) clear with a piece of wire. Refer to Figure 25.*

To clean the burner plates, use a stiff wire brush. Scrub both sides of the stainless steel burner plates to remove any soot or other crud, which may be on the burner. All of the burner plate holes must be clear so air can pass through them unrestricted. The holes in the burner plate allow air to mix with the gas in increasing amounts, as the flame gets longer. With brush in hand, scrub the rust, soot and other foreign material from the burner orifice area. Clean the burner gas and air ports using a drill bit or piece of wire of the appropriate size. See Table 9 for drill size. After the orifices are drilled to the correct size and using compressed air or a vacuum, remove any debris from the manifold. Debris left in the manifold will prematurely clog the orifices in the future.

Table 9. Port drill sizes

Gas Port Drill Size		Air Port Drill Size	
Wire Gauge	**Decimal**	**Wire Gauge**	**Decimal**
1/8 in.	0.125	42	0.093

Note: HIMA-2A burner sections, natural/propane

Important: *Do NOT enlarge burner ports; doing so could adversely affect equipment performance.*

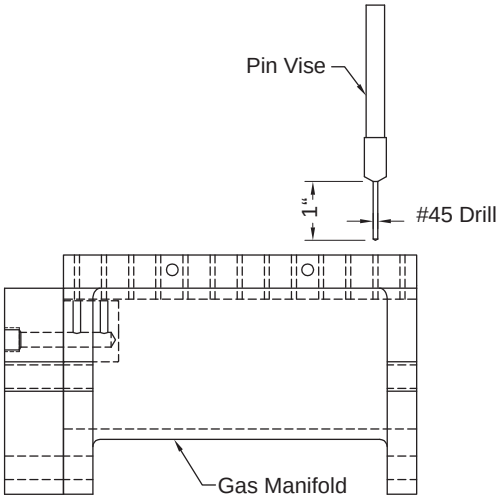
3. If any mixing plates are loose or missing fasteners, tighten/replace as necessary. Always use zinc plated or stainless fasteners

Note: *The missing plates on the burner may display hairline cracks. These cracks are normal and caused by thermal stresses occurring during combustion. The presence of these hairline cracks in no significant way affects the combustion efficiency or performance of the heater. Should a large opening develop, the specific mixing plate or plates must be replaced. Otherwise, it may cause difficulties in cross ignition of flame across the face of the burner.*

4. Inspect the flame rod and ignition electrode for dirt and moisture. Wipe off if necessary. Examine for any evidence of premature arcing. If in doubt, check continuity of flame rod to be sure it is not grounding out. Replace if required.
5. The porcelain on the ignition electrode must be intact (not cracked). The spark gap should be 1/8 in.
6. Inspect the support means to be sure that everything is firmly anchored in-place.

7. Replace all access panels which have been removed and operate the unit for a test period.
8. Check all gas piping for possible leaks using a soap bubble solution.
9. Place the system back into operation and view burner while cycling through full firing range. This will give a visual check for blocked burner spots.
10. Check for normal response and function of all controls.
11. Confirm air pressure drop across burner profile plate is within design see Table 6, p. 36.

Figure 25. Gas port inspection



12. Clean the burner plates.
13. Clear the burner gas and air ports.
14. Inspect the spark rod igniter and replace if required.
15. Ensure the flame sensor is in good condition.

Coil Cleaning

⚠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.

Units with Formed Coil Bends

The outdoor coils on all air conditioning equipment will need periodic cleaning. The construction of the outdoor coils of the units is somewhat different than normally anticipated. On multi-row coils, starting from the coil manifold end, construction consists of a section (slab) of multi-row fins up to the coil bend and a section of single row fins in and after the bend. The single row fins are held apart by a piece of formed sheet metal acting as the end support. This construction was adopted to make it possible to clean the outdoor coil without removing the roof of the unit. To thoroughly clean these coils the following procedure can be used:

⚠WARNING

Hazardous Voltage w/Capacitors!

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

1. Ensure that power to the unit is turned "OFF".
2. Remove the outdoor section access panel.
3. Remove small access panel on top of outdoor coil section to expose the separated coils.
4. Straighten coil fins with fin rake if necessary.
5. Use a soft brush to remove base debris from both sides of the coil.
6. The coil is now ready for the cleaning application: The wash solution is best applied first in reverse direction of the airflow by back flushing in a downward direction and then in the direction of the airflow in a downflow direction.
7. Washing the coil in a downward fashion through the outdoor coil access panel opening located over the separated coil fins will flush any debris from between the rows of fin.
8. Turn power back on to the unit.

This procedure can be followed annually if needed to maintain adequate condenser airflow. Chemicals Required: High Quality Detergent.

Note: *If the detergent is strongly alkaline (more than 8.5 pH) after mixing, it must contain an inhibitor. Suggested detergent brand is "COILOX" (part number CHM00051).*

Evaporator and General Coil Cleaning Procedures for Slab Coils

⚠WARNING

Hazardous Voltage w/Capacitors!

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

1. Disconnect unit power.
2. Remove enough panels and parts to gain access to the coil.
3. Straighten coil fins with a fin rake if necessary.
4. Use a soft brush to remove loose debris from both sides of the coil.
5. **Mix detergent with water** according to the manufacturers instructions.

   The mixed solution may be heated to a maximum of 150°F to improve its cleansing action.

NOTICE

Equipment Damage!

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 could cause it to burst.

6. Place the mixed solution in the sprayer. If a high-pressure sprayer is used, note the following:
   a. Minimum nozzle spray angle of 15°.
   b. Spray perpendicular to the coil face.
   c. Keep the nozzle at least 6 inches from the coil.
   d. Do not exceed 600 psi.
7. Spray the leaving side of the coil first, then the entering air side. Allow the solution to stand on the coil for 5 minutes.
8. Rinse both sides of the coil with cool, clean water.
9. If the coil remains dirty, repeat Step 7 and Step 8.
10. Replace all panels and parts and restore electrical power.

Microchannel Coil Cleaning

Note: *For additional information on Microchannel coil cleaning, refer to RT-SVB83*-EN (*General Service Bulletin: Microchannel Coil Servicing Guidelines*).*

Recommended Cleaning Procedures

Regular coil maintenance, including annual cleaning-enhances the unit's operating efficiency by minimizing compressor head pressure and amperage draw. The condenser coil should be cleaned at least once each year or more if the unit is located in a "dirty" or corrosive environment. Cleaning with cleansers or detergents is strongly discouraged due to the all aluminum construction; straight water should prove sufficient. Microchannel coils can be more susceptible to corrosion if the cleanser or detergent used is not thoroughly washed or rinsed off. Any breach in the tubes can result in refrigerant leaks.

⚠WARNING

Hazardous Voltage w/Capacitors!

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

1. Disconnect power to the unit.

⚠CAUTION

Personal Protective Equipment (PPE) Required!

Failure to follow all safety instructions below could result in minor to moderate injury.

ALWAYS wear Personal Protective Equipment (PPE) including goggles or face shield, chemical resistant gloves, boots, apron or suit as required. If it becomes necessary to use cleaning agent, refer to the manufacturer's Materials Safety Data Sheet and follow all recommended safe handling practices.

2. Wear proper personal protection equipment such as a face shield, gloves and waterproof clothing.
3. Remove enough panels from the unit to gain safe access to the microchannel coil.
4. Use a soft brush or vacuum to remove base debris or surface loaded fibers from both sides of the coil.
5. **Using a sprayer and water ONLY,** clean the coil following the guidelines below.

Note: *It is better to clean the coil from the opposite direction of normal air flow (inside of unit out) because this allows the debris to be pushed out rather than forced further into the coil.*

⚠WARNING

No Step Surface!

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

Do not walk on the sheet metal base.Walking on the base could cause the supporting metal to collapse and result in the operator/technician falling.

Important: *Bridging between the main supports required before attempting to enter the unit. Bridging may consist of multiple 2 by 12 boards or sheet metal grating.*

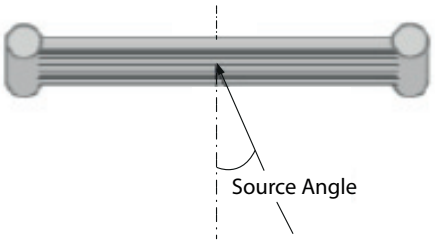
a. Sprayer nozzle pressure should not exceed 600 psi.

b. The maximum source angle should not exceed 25° to the face of the coil (see Figure 26). For best results spray the microchannel perpendicular to face of the coil.

c. Spray nozzle should be approximately 1–3 in. from the coil surface.

d. Use at least a 15° fan type of spray nozzle.

Figure 26. Source Angle

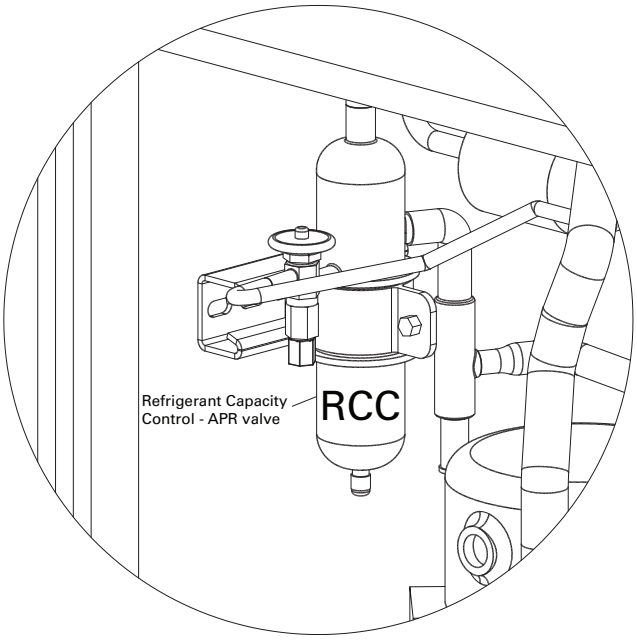


Refrigerant Capacity Controller Operation and Adjustment

The Refrigerant Capacity Control (RCC) is factory set at 114 psig and should not require adjustment. To check or adjust the RCC, attach refrigeration gauges to Circuit 1.

As the damper closes, the suction pressure will fall. When the suction pressure reaches approximately 114 psig the refrigeration gauge will fluctuate rapidly, indicating the RCC opening point. The gauge will stabilize quickly. If this rapid fluctuation occurs at approximately 114 psig the RCC is properly set. To adjust the RCC pressure setting, unscrew the cap shown in Figure 27 at the base of the RCC hot gas pressure regulator to access the adjustment screw. A 5/16-in. standard or hex wrench is used to adjust the pressure setting. Turning the wrench counter-clockwise (out) increases the pressure setting. The RCC will continue by passing enough hot-gas discharged from the compressor to keep the system capacity in balance with the system load; and the system energy draw consistent with the system capacity.

Figure 27. Refrigerant capacity controller



Final Process

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

1. Complete Unit Model Number:

_____

2. Unit Serial Number:

_____

3. Wiring Diagram Numbers (from unit control panel)

- schematic(s)

_____

_____

_____

_____

- connection(s)

_____

_____

_____

_____

_____

_____

_____

_____

Table 10. 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	Disch. Press. psig/kPa	Liquid Press. psig/kPa	Super-heat °F/°C	Sub-cool. °F/°C
		- ok - low						- ok - low						
		- ok - low						- ok - low						
		- ok - low						- ok - low						
		- ok - low						- ok - low						
		- ok - low						- ok - low						
		- ok - low						- ok - low						
		- ok - low						- ok - low						
		- ok - low						- ok - low						
		- ok - low						- ok - low						
		- ok - low						- ok - low						
		- ok - low						- ok - low						

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

Alarms and Troubleshooting

Standard Unit Controller Model UC600 (RRUCM)

Microprocessor Control

The Main Unit Display and RTRM have the ability to provide the service personnel with some unit diagnostics and system status information.

⚠WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

1. Verify that the Liteport LED on the RTRM is burning continuously. If the LED is lit, go to Step 3.
2. If the LED is not lit, verify that 24 Vac is presence between J1-1 and J1-2. If 24 Vac is present, proceed to Step 3. If 24 Vac is not present, check the unit main power supply, check transformer (TNS1). Proceed to Step 3 if necessary.
3. Utilizing "Method 1" in the RTRM "System Status Checkout Procedure", check the following:
   - System status
   - Cooling status

   If a System failure is indicated, proceed to Step 4. If no failures are indicated, proceed to Step 5.
4. If a System failure is indicated, recheck Step 1 and Step 2. If the LED is not lit in Step 1, and 24 Vac is present in Step 2, the RTRM has failed. Replace the RTRM.
5. If no failures are indicated, use one of the override options to start the unit. Following the Override procedure will allow you to check all of the operating modes, and all of the external controls (relays, contactors, etc.) for each respective mode.
6. Refer to the sequence of operations for each mode, to assist in verifying proper operation. Make the necessary repairs and proceed to Step 7.
7. If no abnormal operating conditions appear in the Override mode, release the override and turn the power "Off" at the main power disconnect switch.

System Alarms

The Main Unit Display has built in alarms to help the operator troubleshoot system failures. This section will describe these alarms and provide a guide to troubleshooting the all unit operating modes.

Comprehensive system alarms and diagnostics are accessed through the Alarms icon at the unit display discussed later in the section, or through Tracer TU programming on connected computer. Sensor failures may be viewed through the Alarms icon.

If an alarm is present, the main indicator light on the UC600 will blink red. If the optional unit display is installed, the Alarm icon on the display will register ALARM, illuminate red and flash.

Important: *The space temperature sensor (SPTC) and space relative humidity sensor (SPHC) will read failed if they are not connected; they will Alarm as "In Fault."*

Sensor Failure Alarm Display

Press the Alarm button on the Home display of the Unit Display to display system sensor status as described in Table 11 and Table 12, p. 51.

Table 11. UC600 alarms

Point	Diagnostic	Possible Cause
1	Indoor Fan Failure	VFD not operating
		Outdoor and/or Return Air Dampers not Operating Properly
		Indoor Fan Motor Failure
		Indoor Fan Failure Switch IFFS (pressure) Failure
		IFFS Tubing damaged or not properly connected
		Refer to startup procedure
3	OAD Proving Switch	No voltage at actuator
		Failed OAD power transformer
		No continuity thru end switch (check at UC)
		Note: If unit optional RA damper is installed, send switch on OAD is always proven
6	Discharge Air Temp Source Failure	BAS communication down
		Failed sensor or improper sensor installation
8	Fire Shutdown	BAS ONLY
10	Low Temp Lockout	Heat Overridden OFF
		Compressor(s) Overridden ON
		Setpoint Failures Incorrect
		DAT sensor malfunction
		Reference Table 12, p. 51 for heat failure issues
11	Space Temp Source Failure	BAS communication down
		Failed sensor or improper sensor installation
13	OA Temp Source Failure	BAS communication down
		Failed sensor or improper sensor installation

Table 11. UC600 alarms (continued)

Point	Diagnostic	Possible Cause
14	OA Humidity Source Failure	BAS communication down
		Failed sensor or improper sensor installation
		Humidity Wiring is polarity sensitive
15	High Temp Lockout	Heat Overridden ON
		Low discharge air volume
		Dirty air filters
		High gas heater manifold pressure
		OA/RA damper position incorrect
		High temp limit not properly installed or wired
		DAT sensor malfunction
17	System Lockout	Check all Alarms
		External safety device failed open
19	Space RH Source Failure	BAS communication down
		Failed sensor or improper sensor installation
		Humidity Wiring is polarity sensitive
42	Heat Failure	Applies to 5:1 and 10:1 Gas Heaters Only
		Trips after heat command “ON” and no GV status offer 1 minute
		Refer to unit “Service Facts” heat control LED status legend
		No gas, low gas pressure or high gas pressure to unit
		Unit Manual shutoffs closed
		Heater inducer failure
		Heat relay failure
		Loose or incorrect wiring

Table 12. UC600 troubleshooting

Trouble	Possible Cause
Unit Not Running	No power supply to unit disconnect switch
	Power disconnect tripped
	Lockout alarm mode
	Emergency Stop condition exists
	Unit in Unoccupied mode
	Discharge air sensor failed or not installed and connected to unit
No Heat	No gas supply to unit
	Unit manual gas valve(s) closed
	Heater high limit tripped
	Heat relay not energized
	Conditions do not warrant call for heat
	Heater control module malfunction
	Roll out switch trip
	Main gas on-off switch OFF
	Inducer fan failure
	Heater air proving switch not making or failed

Table 12. UC600 troubleshooting (continued)

Trouble	Possible Cause
No Compressor	Compressor limit switch(es) open
	Compressor relay not energized or failed
	Conditions do not warrant call for cooling or dehumidification
Wide Discharge Temp Swings	Discharge air sensor position must be at least 4 ft.-0 in. away from unit outlet
	Min and Max gas heater manifold pressures not set correctly
Space too Hot, Cold or Humid	Setpoints not adjusted properly
	Space sensors not correctly located or wired
	Malfunctioning space sensor
IFM or PEX VFD OC Trip	Overcurrent alarm requires max Hz setting on VFD be checked and set to not exceed motor nameplate amps
EX VFD only run to Min HZ Setting	If supplied with RA pressure transducer and modulating damper setup is not installed or properly wired.
Unit Trips Heater High Limit	High fire gas manifold pressure too high
	Supply fan speed too low
	Dirty or clogged filters
	Restricted discharge air duct
	Temperature of air entering heater too high
	Defective high limit
Protonode Not Communicating	Change Baud rate on UC600 to 38,400

RTRM Failure Modes

⚠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.

Following is the listing of RTRM failure indication causes.

System Failure

Check the voltage between RTRM terminals 6 and 9 on J6, it should read approximately 32 Vdc. If no voltage is present, a System failure has occurred. Refer to Step 4 in “Microprocessor Control,” p. 50 for the recommended troubleshooting procedure.

Cooling Failure

- CLP1 has opened during the 3 minute minimum “on time” during four consecutive compressor starts, check CLP1 by testing voltage between the J1-8 and J3-2 terminals on the RTRM and ground. If 24 Vac is

present, the CLP has not tripped. If no voltage is present, CLP has tripped.

System Failure

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

- Normal Operation = approximately 32 Vdc
- System Failure = less than 1 Vdc, approximately 0.75 Vdc

Cool Failure

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

- Cool Operating = approximately 32 Vdc
- Cool Off = less than 1 Vdc, approximately 0.75 Vdc
- Cooling Failure = voltage alternates between 32 Vdc and 0.75 Vdc

Airflow Troubleshooting

Table 13. Airflow troubleshooting[a]

Airflow	Profile Opening Width (in.)		
	6-in. Burner	12-in. Burner	18-in. Burner
1250	10		
1500	11-1/4		
1750	12-1/2		
2000	13-3/4		
2250	14-3/4		
2500	16	14	
2750	17-1/4	15	
3000	18-1/2	15-3/4	14-1/4
3250	19-3/4	16-3/4	15
3500	21	17-1/2	15-1/2
3750	22	18-1/4	16-1/4
4000	23-1/4	19-1/4	17
4250	24-1/2	20	17-1/2
4500	25-3/4	21	18-1/4
4750	27	21-3/4	18-3/4
5000		22-1/2	19-1/2
5250		23-1/2	20-1/4
5500		24-1/4	20-3/4
5750		25	21-1/2
6000		26	22
6250		26-3/4	22-3/4
6500		27-3/4	23-1/2
6750		28-1/2	24
7000		29-1/4	24-3/4
7250		30-1/4	25-1/4
7500		31	26

(a) Design Burner Air Pressure Drop across burner profile opening is 0.625 in; refer to Table 6, p. 36. Air pressure drop may be read at ROD.

Gas Ignition Controls

Direct-Fired Unit Flame Relays ≤ 400 MBh

⚠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.

Table 14. Lockout models B, H D, and J only—Green LED status codes

Green LED Flash Code[a]	Indicates	Next System Action	Recommended Service Action
OFF	No “Call for Heat”	Not applicable	None
Flash Fast	Power up - internal check	Not applicable	None
Heartbeat	Normal startup - ignition sequence started (including prepurge)	Not applicable	None
4 Seconds ON then “x” flashes	Device in run mode. “x” = flame current to the nearest µA.	Not applicable	None
2	Lockout - Failed trial for ignition	Remain in lockout until “Call for Heat” is cycled.	Check gas supply, pilot burner, spark and flame sense wiring, flame rod contaminated or out of position, burner ground connection.
3	Recycle - Flame failed during run	Initiate new trial for ignition. Flash code will remain through the ignition trial until flame is proved.	If system fails to light on next trial for ignition, check gas supply, pilot burner, flame sense wiring, contamination of flame rod, burner ground connection.
4	Flame sensed out of sequence	If situation self corrects within 10 seconds, control returns to normal sequence. If flame out of sequence remains longer than 10 seconds, control will resume normal operation 1 hour after error is corrected.	Check for pilot flame. Replace gas valve if pilot flame present. If no pilot flame, cycle “Call for Heat.” If error repeats, replace control.
6	Control Internal Error	Control remains in wait mode. When the fault corrects, control resumes normal operation.	Cycle “Call for Heat”. If error repeats, replace control.
7	Flame rod shorted to ground	Control remains in wait mode. When the fault corrects, control resumes normal operation.	Check flame sense lead wire for damage or shorting. Check that flame rod is in proper position.Check flame rod ceramic for cracks, damage or tracking.
8	Low secondary voltage supply	Control remains in wait mode. When the fault corrects, control resumes normal operation.	Check transformer and AC line for proper input voltage to the control. Check with full system load on the transformer.

(a) Flash Code Descriptions:
- Flash Fast: Rapid blinking.
- Heartbeat: Constant 1/2 second bright, 1/2 second dim cycles.
- 4 second solid on pulse followed by “x” 1 second flashes indicates flame current to the nearest µA. This is only available in run mode.
- A single flash code number signifies that the LED flashes X times at 2 Hz, remains off for two seconds, and then repeats the sequence.

Flame Current Measurement

Flame current of the device can be measured using a standard micro-ammeter by simply inserting the meter probes into the holes labeled FLAME CURRENT.

- Flame current must be measured with pilot valve lit but no main gas flowing.
- Disconnect MV leadwire from the control before measuring flame current.
- Set meter to DC µAmp scale.
- Ensure meter leads are positioned correctly [+/-].

Note: *Trying to measure the pilot flame current in series with the wiring will not be accurate.*

Recommended Minimum Pilot Only Flame Current:

- Must read steady 1 µAmp DC minimum.
- Flame current should be 2 µAmp or greater for reliable appliance operation.

Direct-Fired Unit Flame Relays > 400 MBh

⚠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.

Table 15. Troubleshooting guide for flame relays during problem of safety shutdown (lockout)

Occurs In	Occurs If
Initiate Period	• Purge card is not installed or removed • Purge card is bad • Configuration jumpers have been changed (after 200 hours) • AC line power errors occurred • Four minute INITIATE period has been exceeded
Standby Period	• Airflow lockout feature is enabled and the airflow switch does not close after ten seconds or within the specified purge card timing • Flame signal is detected after 30 seconds • Ignition/pilot valve/intermittent pilot valve terminal is energized • Main valve terminal is energized • Delayed (2nd stage) main valve terminal is energized (RM7895C, D/EC7895C, RM7896C/D) • Internal system fault occurred • Purge card is removed • Purge card is bad
Prepurge Period	• Airflow lockout feature is enabled and the airflow switch opens • Ignition/pilot valve terminal is not energized • No flame present at end of PFEP • Main valve terminal is energized • Delayed main valve terminal is energized (RM7895C/D) • Internal system fault occurred • Purge card is removed • Purge card is bad
Pilot Flame Establishing Period (PFEP)	• Airflow lockout feature is enabled and the airflow switch does not close after 10 seconds or within the specified purge card timing • Flame signal is detected after 30 seconds • Ignition/pilot valve/intermittent pilot valve terminal is energized • Main valve terminal is energized. • Delayed (2nd stage) main valve terminal is energized (RM7895C/D, EC7895C, RM7896C/D) • Internal system fault occurred • Purge card is removed • Purge card is bad

Warranty

Central Air Conditioner

RRU (Parts Only)

Models Up To and Including 25 Tons for Commercial Use*

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

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

If the heat exchanger fails because of a manufacturing defect within five years from the date of startup, Warrantor will furnish without charge a replacement heat exchanger.

In addition, if the optional, factory installed, stainless steel heat exchanger fails because of a manufacturing defect within ten years from the date of start-up, Warrantor will furnish without charge a replacement heat exchanger. Any local transportation, related service labor and diagnosis calls are not included.

In addition, if the sealed motor-compressor fails because of a manufacturing defect within the second through fifth year from the date of original purchase, Warrantor will furnish without charge the required replacement compressor.

Warrantor's obligations and liabilities under this warranty are limited to furnishing F.O.B. Warrantor factory or warehouse replacement parts for Warrantor's products covered under this warranty.

Warrantor shall not be obligated to pay for the cost of lost refrigerant.

No liability shall attach to Warrantor until products have been paid for and then liability shall be limited solely to the purchase price of the equipment under warranty shown to be defective.

THE WARRANTY AND LIABILITY SET FORTH HEREIN ARE IN LIEU OF ALL OTHER WARRANTIES AND LIABILITIES, WHETHER IN CONTRACT OR IN NEGLIGENCE, EXPRESS OR IMPLIED, IN LAW OR IN FACT, INCLUDING BUT NOT SPECIFICALLY LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR USE, AND IN NO EVENT SHALL WARRANTOR BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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

Trane
2701 Wilma Rudolph Blvd.
Clarksville, TN 37040-1008
Attention: Manager, Product Service
GW-602-4800

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

Trane - by Trane Technologies (NYSE: TT), a global climate innovator - creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit trane.com or tranetechnologies.com.

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