



Installation, Operation, and Maintenance

Packaged Rooftop Arrangements For Heating, Cooling and Ventilating Systems

Model Numbers:

GRAA	GRDA
GRBA	AHAA
GRCA	AHBA

▲ 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.



Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

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

The three types of advisories are defined as follows:



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



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



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

Important Environmental Concerns

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

Important Responsible Refrigerant Practices

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

<p style="text-align: center;">⚠ WARNING</p> <p>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.</p>

⚠ WARNING**Personal Protective Equipment (PPE) Required!**

Failure to wear proper PPE for the job being undertaken could result in death or serious injury.

Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, **MUST** follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

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

⚠ WARNING**Toxic Fumes and Fibers!**

Install, operate and maintain unit in accordance with manufacturer's instructions to avoid exposure to fuel substances or substances from incomplete combustion which could result in death or serious illness. The State of California has determined that these substances may cause cancer, birth defects, or other reproductive harm. Install and Service this product to avoid exposure to airborne particles of glasswool fibers and/or ceramic fibers known to the State of California to cause cancer through inhalation.

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Table of Contents

Receiving Instructions	6
Pre-Installation Instructions.....	6
General Safety Requirements.....	7
Rigging	9
Combustion Air Considerations	10
Location	10
Mounting/Locations.....	12
Installation.....	13
Installation Clearances	13
Mounting on Field Furnished Supports	13
Mounting on Roof Curb	14
Venting	22
Duct Connections	23
Gas Piping†	23
Modulating Gas Control (Optional)*	24
Electrical Connections.....	25
DX Coil Equipped Units (Optional).....	27
Chilled Water Coil Equipped Units (Optional).....	28
Evaporative Cooler Equipped Units (Optional).....	28
Operation.....	29
General Information	29
Gas Control System.....	29
Optional Gas Controls	30
Air Handling Requirements and Adjustments	30
Lighting.....	32
Gas Input Adjustment.....	32
Pilot Adjustment.....	33
Primary Air Shutter Adjustment.....	33
Controls.....	33
Start-Up	35
Maintenance.....	37
General Information	37
Filters.....	38
Air Blower.....	39
Blower RPM Adjustment.....	39

Troubleshooting	42
Troubleshooting Guide — Air Blower	42
Troubleshooting Guide — Electric Motors	44
Troubleshooting Guide — Fan Assembly	46
Troubleshooting Guide — DX Cooling Coil	47
Troubleshooting Guide — Chilled Water Cooling Coil	48
Unit Net & Ship Weights	49
Double Wall Construction Adder	50
Cooling Coil Weight Adder	50
Approximate Motor Shipping Weights	51
Center of Gravity	52
Center of Gravity Data	52
Model Number Description	56
AH Model Number Description	56
GR Model Number Description	58
Engineered Products Rooftop Arrangements (RA)*	60
Gas Equipment Start-Up	61



Receiving Instructions

Inspect shipment immediately when received to determine if any damage has occurred to the crate during shipment.

After the unit has been uncrated, check for any visible damage to the unit. Check motor position and turn blower wheel to determine if damage has occurred to these critical parts.

If any damage is found, the cosignee should sign the bill of lading indicating such damage and immediately file claim for damage with transportation company.

Pre-Installation Instructions

Installer Please Note: This equipment has been test fired and inspected. It has been shipped free from defects from our factory. However, during shipment and installation, problems such as loose wires, leaks or loose fasteners may occur. It is the installer's responsibility to inspect and correct any problems that may be found.

When the unit is received and uncrated, check the external data plate and all labels on the unit for type of gas, electrical, and operational specifications to confirm that these agree with those at point of installation. If the unit is equipped with an Outdoor Duct Furnace, also check the data plate and all labels located inside each furnace.

Every rooftop unit will include an informational packet which will include the following: The blower manual, outdoor duct furnace and evaporative cooler/cooling coil manuals (if applicable to the unit order), wiring diagram(s), factory installed service convenience options manual (if applicable to unit order) and special controls/data sheets.

Note: *It is the owner's responsibility to provide any scaffolding or other apparatus required to perform emergency service or annual/periodic maintenance to this equipment.*



General Safety Requirements

⚠ 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.

Important:

1. *Open all disconnect switches before installing the unit. Failure to do so may result in personal injury or death from electrical shock.*
 2. *Failure to comply with the general requirements may result in extensive property damage, severe personal injury or death.*
 3. *This product must be installed by a licensed plumber or gas fitter when installed within the Commonwealth of Massachusetts.*
 4. *Do not alter the duct furnace in any way or damage to the unit, severe personal injury or death will occur.*
 5. *Never service any component without first disconnecting all electrical and gas supplies to the unit or severe personal injury or death may occur.*
 6. *Insure that all power sources conform to the unit requirements or damage to the unit may result.*
- The use or storage of gasoline or other flammable vapors or liquids in open containers in the vicinity of this appliance is hazardous.
 - If you smell gas:
 - Do not touch electrical switches.
 - Extinguish any open flames.
 - Immediately call your gas supplier.
 - For all units that are equipped with gas fired outdoor duct furnaces (certified by ETL) installation must be made in accordance with local codes, or in the absence of local codes, with the latest edition of ANSI Standard Z223.1 (N.F.P.A. No. 54) National Fuel Gas Code. All of the ANSI and NFPA Standards referred to in these installation instructions are those that were applicable at the time the design was certified. The ANSI Standards are available from the American National Standards Institute, Inc., 11 West 42nd Street, New York, NY, 10036 or www.ansi.org. The NFPA Standards are available from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.
 - If installed in Canada, the installation must conform with local building codes, or in the absence of local building codes, with CSA B149.1 "Installation Codes for Natural Gas Burning Appliances and Equipment" or CSA B149.2 "Installation Codes for Propane Gas Burning Appliances and Equipment". These outdoor duct furnaces have been designed for and certified to comply with CSA 2.8.
 - These units have been designed certified for outdoor use only, and may be located on the roof of the building or at any convenient location external to the building to be heated.
 - Make certain that the power sources conform to the requirements of the heater.
 - Follow installation instructions CAREFULLY to avoid creating unsafe conditions. All wiring should be done and checked by a qualified electrician, using copper wire only. All gas

General Safety Requirements

connections should be made and leak-tested by a suitably qualified individual, per instructions in this manual.

- Use only the fuel for which the heater is designed (see nameplate). Using LP gas in a heater that requires natural gas, or vice versa, will create the risk of gas leaks, carbon monoxide poisoning and explosion.

⚠ WARNING

Proper Fuel Required!

Failure to follow instructions below could create unsafe conditions such as gas leaks, carbon monoxide poisoning and explosion, which could result in death or serious injury.

Use only the fuel for which the heater is designed (see nameplate). Do not attempt to convert the heater for use with a fuel other than the one intended.

- Make certain that power source conforms to electrical requirements of heater. Disconnect power before installing or servicing heater. If power disconnect is out of sight, lock it in open position and tag it to prevent unexpected application of power. Failure to do so could result in fatal electric shock.

⚠ WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

- Special attention must be given to any grounding information pertaining to this heater. To prevent the risk of electrocution the heater must be securely and adequately grounded. This should be accomplished by connecting a grounded conductor from the service panel to the conduit box of the heater. To ensure proper ground, the grounding means must be tested by qualified field technician.
- Do not insert fingers or foreign objects into the heater or its air moving device. Do not block or tamper with the heater in any manner while in operation or just after it has been turned off, as some parts may be hot enough to cause injury.
- This heater is intended for general heating applications ONLY. It must NOT be used in potentially dangerous locations such as flammable explosive, chemical-laden or wet atmospheres.
- In cases in which property damage may result from malfunction of the heater, a backup system or a temperature sensitive alarm should be used.
- The venting is an integral part of the unit and must not be altered in the field. The Natural Vented units are equipped with a vent cap which is designed for natural draft venting. Air for combustion enters the base of the vent cap through a protective grill and products of combustion are discharged at the upper section of the vent cap. This vent cap is shipped in a separate carton and should be installed per the Venting section of the Outdoor Rooftop Gas-Fired Duct Furnace Installation and Service Manual. The Power Vented unit has a induced draft venting system. The combustion air inlet and products of combustion discharge grills are located in the upper section of the Duct Furnace side access panel.
- A pilot burner plate is provided in the Duct Furnace for access to the pilot burner and ignition system without removing the burner drawer. Clearance between the external unit and any obstruction must be sufficient for proper servicing of pull out burner drawer. See [Figure 2, p. 11](#) and [Figure 3, p. 11](#) for this clearance.
- These units are certified for operation on either natural or propane gases. If a unit is to be installed at an altitude exceeding 2000 feet (610 m) above sea level, derate the unit input of each duct furnace by 4% for each 1000 feet (305 m) above sea level. Special main burner gas orifices are required for installations above 2000 feet (610 m).

- In Canada, if unit is to be installed at altitudes of 2000 feet (610 m) to 4500 feet (1372 m), each duct furnace must have the main burners re-orificed to give 90% of the normal altitude input rating.
- If the unit was ordered from the factory for high altitude operation, confirm input rating. See Gas Input Adjustment.

Unless otherwise specified, the following conversions may be used for calculating SI unit measurements:

- 1 inch = 25.4 mm
- 1 foot = 0.305 m
- 1 gallon = 3.785 L
- 1 pound = 0.454 kg
- 1 psig = 6.894 kPa
- 1 cubic foot = 0.028 m³
- 1000 Btu/Cu. Ft. = 37.5 MJ/m³
- 1000 Btu per hour = 0.293 kW
- 1 inch water column = 0.249 kPa
- liter/second = CFM × 0.472
- meter/second = FPM ÷ 196.8

Rigging

⚠ WARNING

Heavy Object!

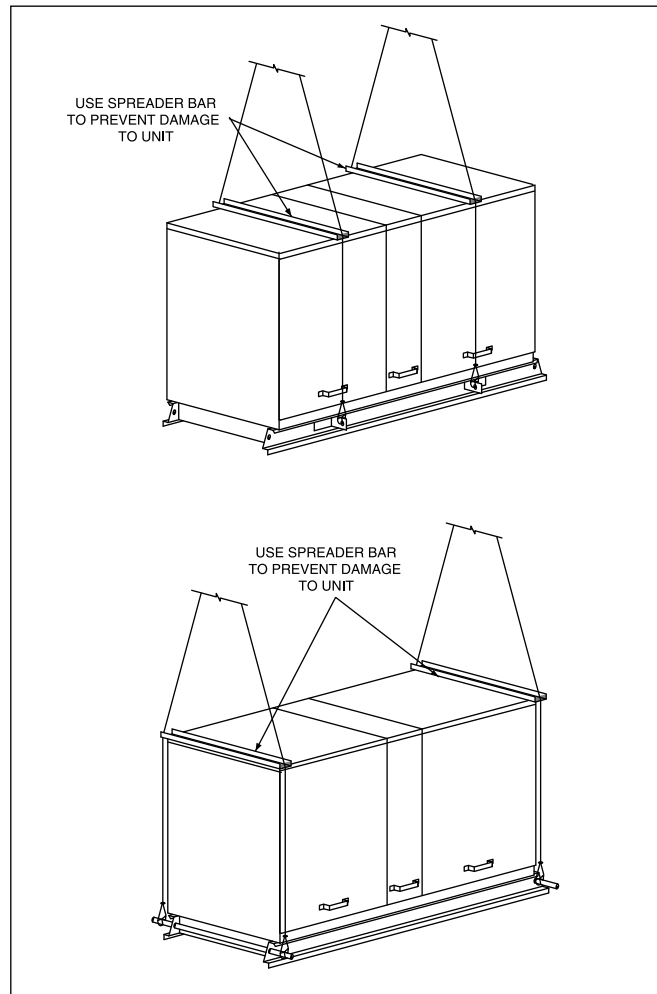
Failure to follow these instructions could result in death, serious injury, and property damage.

Make certain that the lifting methods used to lift the duct furnace are capable of supporting the weight of the heater during installation. Ensure that all hardware used in the suspension of each duct furnace is properly rated for the job. Make certain that the structure to which the duct furnace is to be mounted is capable of safely supporting its weight. Under no circumstances must the gas lines, venting system, or the electrical conduit be used to support the duct furnace. Do not allow objects (i.e. ladder) or people to lean against the gas lines, venting system, or electrical conduit for support.

Rig unit using either belt or cable slings. Use spreader bars to protect the top of the unit when it is lifted. See [Figure 1, p. 10](#)

On units with a total length of less than 104 inch (2642 mm), excluding evaporative cooler, two holes are provided in the base rail on each side of the unit. Slide pipes beneath the unit through these holes and attach rigging to pipes for lifting the unit.

On units with a total length of a 104 inch (2642 mm) or greater, excluding evaporative cooler, lifting lugs attached to the base rail are provided. Attach rigging to lugs for lifting the unit. For distance between lifting lugs and total unit lengths, refer to original Submittal Sheets supplied specified for the unit. Also see Center of Gravity and Weights Sections in this manual.

Figure 1. Rigging

Combustion Air Considerations

The presence of chlorine vapors or other corrosive vapors in the combustion air supply for gas-fired heating equipment presents a potential corrosive hazard. Chlorine will, when exposed to flame, precipitate from the compound (usually freon or degreaser vapors) and go into solution with any condensation that is present in the heat exchanger or associated parts. The result is hydrochloric acid which will readily attack all metals, including 300 grade stainless steel. Care should be taken to separate these vapors from the combustion process. This may be done by wise location of the unit with regard to exhausters or prevailing wind direction.

Location

⚠ WARNING

Mounting Integrity!

Failure to follow instruction below could result in death or serious injury or possible equipment or property-only damage.

Ensure the roof structure supports are strong enough to support the weight of the unit and any accessories.

Before placing rooftop unit in its permanent location, make certain that the roof is capable of carrying the additional load of this equipment. Check the unit weight given at the end of this manual.

Refer to [Figure 2, p. 11](#) and [Figure 3, p. 11](#) for required clearances to combustible material.

⚠ WARNING

Proper Installation Location Required!
 Failure to follow instructions below could result in death or serious injury.
 Do not place unit in a location where service personnel can not safely service this equipment (i.e. roof edge, skylights, etc.).

Note: If your unit is equipped with through the base utilities and/or service convenience package - refer to Submittal, review in entirety before mounting the unit.

Figure 2. Minimum Clearances to Combustible Material or Obstructions

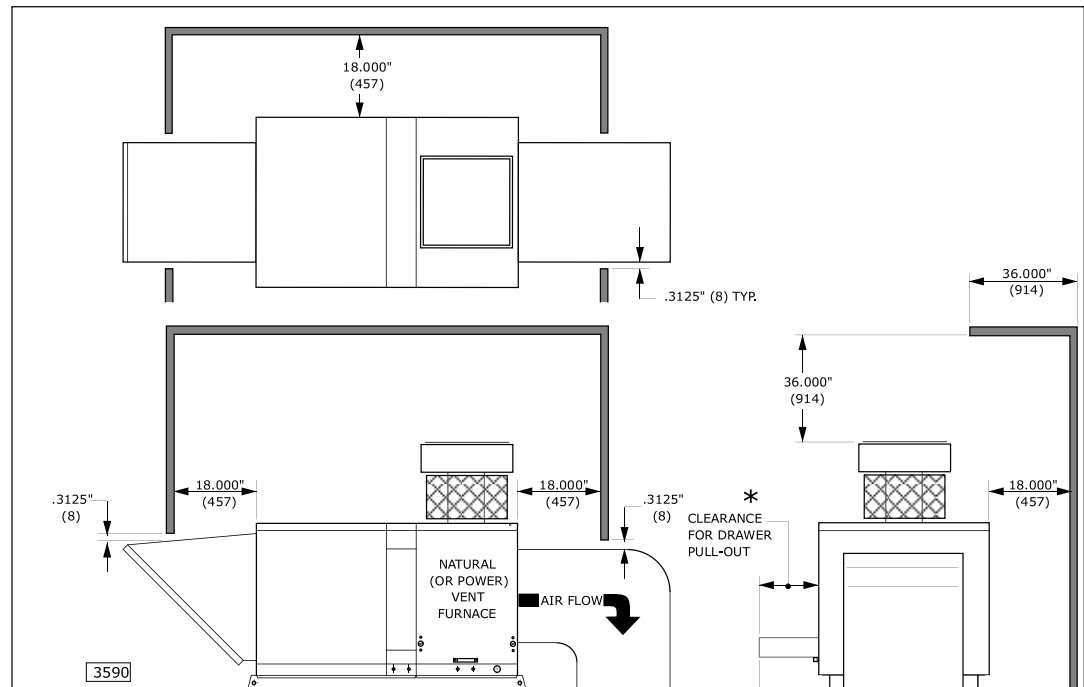
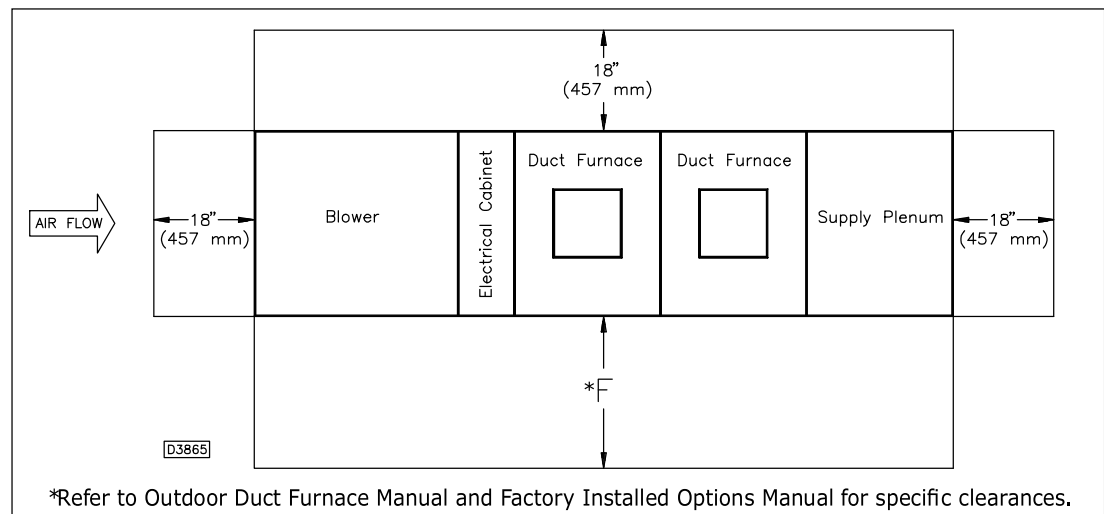


Figure 3. Minimum Clearances to Combustible Material or Obstructions



Note: The unit is equipped with hinged access doors: allow 36 inches minimum for clearance (on access side) to fully open door and lock in an open position.



General Safety Requirements

Mounting/Locations

These units are suitable for installation on combustible flooring.

Single, double and triple duct furnace only models have base rails which can be mounted either on solid planking or steel channels. All other units installed on field furnished supports must use the recommended method shown in Mounting on Field Furnished Supports or equivalent.

Roof curb kits for rooftop units are shipped unassembled. Included with the roof curb kit are insulated or uninsulated curb rails, bolts and screws needed for assembly, sealant, a roll of self-adhering rubber gasketing, and installation instructions. Roof insulation, cant stripping, flashing, roof felts, caulking, and nails must be furnished by the installer. See , separate roof curb specifications.

If a variable frequency drive (VFD) has been ordered with the unit, consideration should be made for the VFD operating temperature range: 14°F to 130°F. For temperatures below 14°F, VFD must be factory-installed within the VFD Enclosure accessory (Model Digit 22, option 9), or field-mounted indoors.



Installation

⚠ WARNING

Hazardous Voltage!
Failure to disconnect power before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

Installation must conform with local building codes or in the absence of local codes with the latest edition of the National Fuel Gas Code ANSI Z223.1 (N.F.P.A. No. 54) National Fuel Gas Code.

A heat loss study and a complete layout of the system should be made first.

When locating the unit in its permanent location, make certain that the roof is capable of carrying the additional load of the equipment. **Check the unit net weights section of this manual.**

Make certain that clearances are provided for service, minimum clearance to combustible material and to venting cap. See [Figure 2, p. 11](#) for this information.

Ducts connected to units which do not have either a blower section or a supply plenum must have a removable access panel in the duct, which is connected to a duct furnace. The duct openings shall be accessible when the unit is installed in service and shall be of such size that smoke or reflected light may be observed inside the casing to indicate the presence of leaks in the heating element. The covers for the panels shall be attached in such manner as to prevent leaks. Ducts exposed to the outdoors must be insulated and sealed to prevent water from entering either the unit or building through the duct.

If a single, double or triple duct furnace only unit is connected to a return air duct or any other inlet air restriction, the appliance shall be installed on the positive pressure side of the air circulating blower.

NOTICE

Unit Damage!
Failure to follow instructions below could result in unit damage.
Remove wooden shipping support from beneath blower housing of blower Section.

Installation Clearances

⚠ WARNING

Combustible Materials!
Failure to maintain proper clearance between the unit and combustible materials could cause a fire which could result in death or serious injury or property damage.
Refer to unit nameplate and installation instructions for proper clearances.

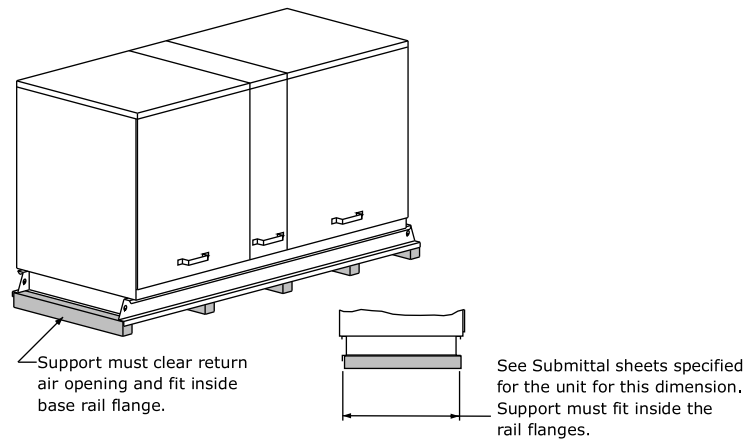
Minimum clearances to combustible material are shown on the unit data plate. It is important that clearances be maintained for servicing the unit (refer to Submittal Insert for service clearances), and that minimum clearances are provided from the unit (including vent cap, if Natural Vent model) to combustible material. Clearances around the outside air hood (if unit is so equipped) must be unobstructed. See [Figure 2, p. 11](#).

Mounting on Field Furnished Supports

Single, double, triple duct furnace only models have base rails which are suitable for mounting either directly on solid planking or steel channels. Never install the unit on a soft roof where the rails could sink, reducing clearance between the bottom panel and the roof, or cause damage to the roofing surface.

All other models must use the following method or an equivalent when unit supports are field furnished: Each section of the Rooftop unit must be supported, which includes supports located at both ends. If the unit consists of a High CFM Blower section, a DX Coil, a Duct Furnace and a Supply Plenum, five supports are required. See [Figure 4, p. 14](#).

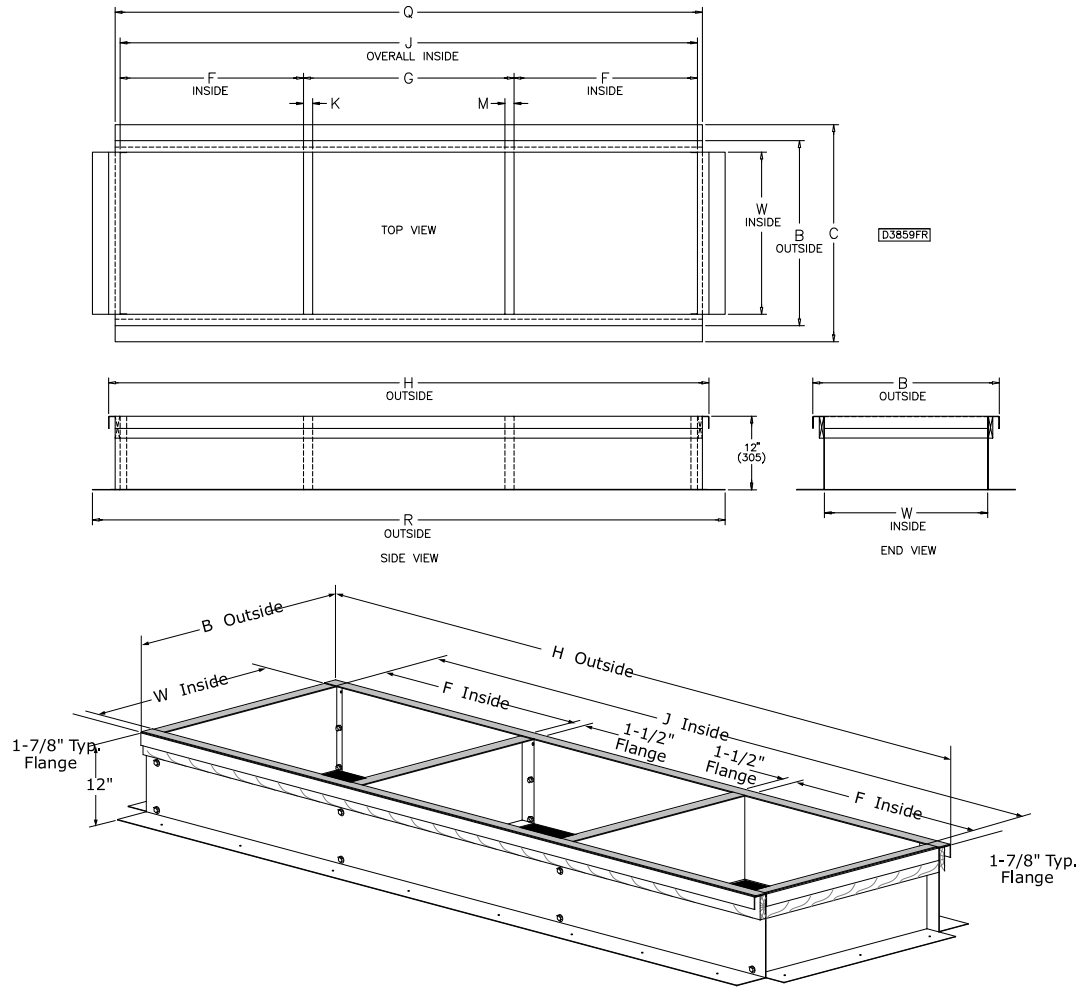
Figure 4. Mounting On Field-Furnished Supports



Mounting on Roof Curb

Assemble and install roof curb per Roof Curb Installation Instructions. See [Figures Figure 5, p. 15, Figure 6, p. 21, Figure 7, p. 21, and Figure 8, p. 22](#) for roof opening sizes, distance between openings and unit relationship to roof curb.

Figure 5. Roof Curb Kits Dimensional Data





Installation

Table 1. GR Roof Curb Kit Dimensions

Roof Arrangement	Capacity	Trane P/N	F	G	H	J	Q	R	K	M	W	B	C
B	10/15	0134-0205-01	29-5/8	8-1/8	71-1/8	67-3/8	69	76-3/8	1-1/2	1-1/2	26-7/16	30-3/16	35-7/16
			(752)	(206)	(1,806)	(1,711)	(1,753)	(1,940)	(38)	(671)	(900)		
B	20/25	0134-0205-02	29-5/8	8-1/8	71-1/8	67-3/8	69	76-3/8	1-1/2	1-1/2	37-7/16	41-3/16	46-7/16
			(752)	(206)	(1,806)	(1,711)	(1,753)	(1,940)	(38)	(951)	(1,179)		
B	30/35	0134-0205-03	29-5/8	8-1/8	71-1/8	67-3/8	69	76-3/8	1-1/2	1-1/2	48-7/16	52-3/16	57-7/16
			(752)	(206)	(1,806)	(1,711)	(1,753)	(1,940)	(38)	(1,230)	(1,459)		
B	40	0134-0205-04	29-5/8	8-1/8	71-1/8	67-3/8	69	76-3/8	1-1/2	1-1/2	53-15/16	57-11/16	62-15/16
			(752)	(206)	(1,806)	(1,711)	(1,753)	(1,940)	(38)	(951)	(1,599)		
C	10/15	0134-0205-05	29-5/8	34-1/8	97-1/8	93-3/8	95	102-3/8	1-1/2	1-1/2	26-7/16	30-3/16	35-7/16
			(752)	(867)	(2,467)	(2,371)	(2,413)	(2,600)	(38)	(671)	(900)		
C	20/25	0134-0205-06	29-5/8	34-1/8	97-1/8	93-3/8	95	102-3/8	1-1/2	1-1/2	37-7/16	41-3/16	46-7/16
			(752)	(867)	(2,467)	(2,371)	(2,413)	(2,600)	(38)	(951)	(1,179)		
B	50	0134-0205-06	29-5/8	34-1/8	97-1/8	93-3/8	95	102-3/8	1-1/2	1-1/2	37-7/16	41-3/16	46-7/16
			(752)	(867)	(2,467)	(2,371)	(2,413)	(2,600)	(38)	(951)	(1,179)		
C	30/35	0134-0205-07	29-5/8	34-1/8	97-1/8	93-3/8	95	102-3/8	1-1/2	1-1/2	48-7/16	52-3/16	57-7/16
			(752)	(867)	(2,467)	(2,371)	(2,413)	(2,600)	(38)	(1,230)	(1,459)		
C	40	0134-0205-08	29-5/8	34-1/8	97-1/8	93-3/8	95	102-3/8	1-1/2	1-1/2	53-15/16	57-11/16	62-15/16
			(752)	(867)	(2,467)	(2,371)	(2,413)	(2,600)	(38)	(1,370)	(1,599)		
C	50	0134-0205-09	30-1/8	59	123	119-1/4	120-7/8	128-1/4	1-1/2	1-1/2	37-7/16	41-3/16	46-7/16
			(765)	(1,499)	(3,124)	(3,029)	(3,070)	(3,257)	(38)	(951)	(1,179)		
C	60/70	0134-0205-10	30-1/8	59	123	119-1/4	120-7/8	128-1/4	1-1/2	1-1/2	48-7/16	52-3/16	57-7/16
			(765)	(1,499)	(3,124)	(3,029)	(3,070)	(3,257)	(38)	(1,230)	(1,459)		
C	80	0134-0205-11	30-1/8	59	123	119-1/4	120-7/8	128-1/4	1-1/2	1-1/2	53-15/16	57-11/16	62-15/16
			(765)	(1,499)	(3,124)	(3,029)	(3,070)	(3,257)	(38)	(1,370)	(1,599)		
D	10/15	0134-0205-12	29-5/8	8-1/8	71-1/8	67-3/8	69	76-3/8	1-1/2	1-1/2	26-7/16	30-3/16	35-7/16
			(752)	(206)	(1,806)	(1,711)	(1,753)	(1,940)	(38)	(671)	(900)		

Table 1. GR Roof Curb Kit Dimensions (continued)

Roof Arrangement	Capacity	Trane P/N	F	G	H	J	Q	R	K	M	W	B	C
D	20/25	0134-0205-13	29-5/8	8-1/8	71-1/8	67-3/8	69	76-3/8	1-1/2	1-1/2	37-7/16	41-3/16	46-7/16
			(752)	(206)	(1,806)	(1,711)	(1,753)	(1,940)	(38)	(951)	(1,046)	(1,179)	
D	30/35	0134-0205-14	29-5/8	8-1/8	71-1/8	67-3/8	69	76-3/8	1-1/2	1-1/2	48-7/16	52-3/16	57-7/16
			(752)	(206)	(1,806)	(1,711)	(1,753)	(1,940)	(38)	(1,230)	(1,325)	(1,459)	
D	40	0134-0205-15	29-5/8	8-1/8	71-1/8	67-3/8	69	76-3/8	1-1/2	1-1/2	53-15/16	57-11/16	62-15/16
			(752)	(206)	(1,806)	(1,711)	(1,753)	(1,940)	(38)	(1,370)	(1,465)	(1,599)	
D	50	0134-0205-16	29-5/8	34-1/8	97-1/8	93-3/8	95	102-3/8	1-1/2	1-1/2	37-7/16	41-3/16	46-7/16
			(752)	(867)	(2,467)	(2,371)	(2,413)	(2,600)	(38)	(951)	(1,046)	(1,179)	
E	20/25	0134-0205-17	29-5/8	34-1/8	97-1/8	93-3/8	95	102-3/8	1-1/2	1-1/2	48-7/16	52-3/16	57-7/16
			(752)	(867)	(2,467)	(2,371)	(2,413)	(2,600)	(38)	(1,230)	(1,325)	(1,459)	
D	80	0134-0205-18	29-5/8	34-1/8	97-1/8	93-3/8	95	102-3/8	1-1/2	1-1/2	53-15/16	57-11/16	62-15/16
			(752)	(867)	(2,467)	(2,371)	(2,413)	(2,600)	(38)	(1,370)	(1,465)	(1,599)	
E	40	0134-0205-19	29-5/8	34-1/8	97-1/8	93-3/8	95	102-3/8	1-1/2	1-1/2	26-7/16	30-3/16	35-7/16
			(752)	(867)	(2,467)	(2,371)	(2,413)	(2,600)	(38)	(671)	(767)	(900)	
E	50	0134-0205-20	30-1/8	59	123	119-1/4	120-7/8	128-1/4	1-1/2	1-1/2	37-7/16	41-3/16	46-7/16
			(765)	(1,499)	(3,124)	(3,029)	(3,070)	(3,257)	(38)	(951)	(1,046)	(1,179)	
E	60/70	0134-0205-21	30-1/8	59	123	119-1/4	120-7/8	128-1/4	1-1/2	1-1/2	48-7/16	52-3/16	57-7/16
			(765)	(1,499)	(3,124)	(3,029)	(3,070)	(3,257)	(38)	(1,230)	(1,325)	(1,459)	
E	80	0134-0205-22	30-1/8	59	123	119-1/4	120-7/8	128-1/4	1-1/2	1-1/2	53-15/16	57-11/16	62-15/16
			(765)	(1,499)	(3,124)	(3,029)	(3,070)	(3,257)	(38)	(1,370)	(1,465)	(1,599)	
G	20/25	0134-0205-23	37-3/16	29-3/16	107-5/16	103-9/16	105-3/16	112-9/16	1-1/2	1-1/2	37-7/16	41-3/16	46-7/16
			(944)	(741)	(2,726)	(2,631)	(2,672)	(2,859)	(38)	(951)	(1,046)	(1,179)	
G	30/35	0134-0205-24	37-3/16	29-3/16	107-5/16	103-9/16	105-3/16	112-9/16	1-1/2	1-1/2	48-7/16	52-3/16	57-7/16
			(944)	(741)	(2,726)	(2,631)	(2,672)	(2,859)	(38)	(1,230)	(1,325)	(1,459)	
G	40	0134-0205-25	37-3/16	29-3/16	107-5/16	103-9/16	105-3/16	112-9/16	1-1/2	1-1/2	53-15/16	57-11/16	62-15/16
			(944)	(741)	(2,726)	(2,631)	(2,672)	(2,859)	(38)	(1,370)	(1,465)	(1,599)	



Installation

Table 1. GR Roof Curb Kit Dimensions (continued)

Roof Arrangement	Capacity	Trane P/N	F	G	H	J	Q	R	K	M	W	B	C
G	50	0134-0205-26	37-1/8	55-1/4	133-1/4	129-1/2	131-1/8	138-1/2	1-1/2	1-1/2	37-7/16	41-3/16	46-7/16
J & K	20/25		(943)	(1,403)	(3,385)	(3,289)	(3,331)	(3,518)	(38)	(38)	(951)	(1,046)	(1,179)
G	60/70	0134-0205-27	37-1/8	55-1/4	133-1/4	129-1/2	131-1/8	138-1/2	1-1/2	1-1/2	48-7/16	52-3/16	57-7/16
J & K	30/35		(943)	(1,403)	(3,385)	(3,289)	(3,331)	(3,518)	(38)	(38)	(1,230)	(1,325)	(1,459)
G	80	0134-0205-28	37-1/8	55-1/4	133-1/4	129-1/2	131-1/8	138-1/2	1-1/2	1-1/2	53-15/16	57-11/16	62-15/16
			(943)	(1,403)	(3,385)	(3,289)	(3,331)	(3,518)	(38)	(38)	(1,370)	(1,465)	(1,599)
G	12	0134-0205-29	37-5/16	80-15/16	159-5/16	155-9/16	157-1/4	164-1/2	1-1/2	1-1/2	53-15/16	57-11/16	62-15/16
J & K	80		(948)	(2,056)	(4,046)	(3,951)	(3,994)	(4,178)	(38)	(38)	(1,370)	(1,465)	(1,599)
L	40												
J & K	50	0134-0205-30	37-5/16	80-15/16	159-5/16	155-9/16	157-1/4	164-1/2	1-1/2	1-1/2	37-7/16	41-3/16	46-7/16
L	20/25		(948)	(2,056)	(4,046)	(3,951)	(3,994)	(4,178)	(38)	(38)	(951)	(1,046)	(1,179)
J & K	60/70	0134-0205-31	37-5/16	80-15/16	159-5/16	155-9/16	157-1/4	164-1/2	1-1/2	1-1/2	48-7/16	52-3/16	57-7/16
L	30/35		(948)	(2,056)	(4,046)	(3,951)	(3,994)	(4,178)	(38)	(38)	(1,230)	(1,325)	(1,459)
K	10/15	0134-0205-32	37-1/8	55-1/4	133-1/4	129-1/2	131-1/8	138-1/2	1-1/2	1-1/2	26-7/16	30-3/16	35-7/16
			(943)	(1,403)	(3,385)	(3,289)	(3,331)	(3,518)	(38)	(38)	(671)	(767)	(900)
J	12	0134-0205-33	36-15/16	107-11/16	185-5/16	181-9/16	183-1/4	190-1/2	1-1/2	1-1/2	53-15/16	57-11/16	62-15/16
L	80		(938)	(2,735)	(4,707)	(4,612)	(4,655)	(4,839)	(38)	(38)	(1,370)	(1,465)	(1,599)
L	50	0134-0205-34	36-15/16	107-11/16	185-5/16	181-9/16	183-1/4	190-1/2	1-1/2	1-1/2	37-7/16	41-3/16	46-7/16
			(938)	(2,735)	(4,707)	(4,612)	(4,655)	(4,839)	(38)	(38)	(951)	(1,046)	(1,179)
L	30/70	0134-0205-35	36-15/16	107-11/16	185-5/16	181-9/16	183-1/4	190-1/2	1-1/2	1-1/2	48-7/16	52-3/16	57-7/16
			(938)	(2,735)	(4,707)	(4,612)	(4,655)	(4,839)	(38)	(38)	(1,230)	(1,325)	(1,459)
L	10/15	0134-0205-36	37-5/16	80-15/16	159-5/16	155-9/16	157-1/4	164-1/2	1-1/2	1-1/2	26-7/16	30-3/16	35-7/16
			(948)	(2,056)	(4,046)	(3,951)	(3,994)	(4,178)	(38)	(38)	(671)	(767)	(900)

Note: Dimensions listed apply to both insulated and uninsulated roof curb types. Roof curb kit part numbers listed are the insulated roof curb type; contact customer service for uninsulated part numbers.

Table 2. AH Roof Curb Kit Dimensions

Air Handler Arrangement	Capacity	Trane P/N	F	G	H	J	Q	R	K	M	W	B	C
B	20	0134-0214-01	N/A	N/A	45-1/4	41-1/2	43-1/8	50-1/2	N/A	N/A	37-7/16	41-3/16	46-7/16
					(1,149)	(1,054)	(1,095)	(1,283)			(951)	(1,046)	(1,179)
B	40	0134-0214-02	N/A	N/A	45-1/4	41-1/2	43-1/8	50-1/2	N/A	N/A	53-15/16	57-11/16	62-15/16
					(1,149)	(1,054)	(1,095)	(1,283)			(1,370)	(1,465)	(1,599)
C	20	0134-0214-03	29-5/8	8-1/8	71-1/8	67-3/8	69	76-3/8	1-1/2	1-1/2	37-7/16	41-3/16	46-7/16
					(1,806)	(1,711)	(1,753)	(1,940)	(38)	(38)	(951)	(1,046)	(1,179)
C	40	0134-0214-04	29-5/8	8-1/8	71-1/8	67-3/8	69	76-3/8	1-1/2	1-1/2	53-15/16	57-11/16	62-15/16
					(1,806)	(1,711)	(1,753)	(1,940)	(38)	(38)	(1,370)	(1,465)	(1,599)
D	20	0134-0214-05	N/A	N/A	45-1/4	41-1/2	43-1/8	50-1/2	N/A	N/A	37-7/16	41-3/16	46-7/16
					(1,149)	(1,054)	(1,095)	(1,283)			(951)	(1,046)	(1,179)
D	40	0134-0214-06	N/A	N/A	45-1/4	41-1/2	43-1/8	50-1/2	N/A	N/A	53-15/16	57-11/16	62-15/16
					(1,149)	(1,054)	(1,095)	(1,283)			(1,370)	(1,465)	(1,599)
E	20	0134-0214-07	29-5/8	8-1/8	71-1/8	67-3/8	69	76-3/8	1-1/2	1-1/2	37-7/16	41-3/16	46-7/16
					(1,806)	(1,711)	(1,753)	(1,940)	(38)	(38)	(951)	(1,046)	(1,179)
E	40	0134-0214-08	29-5/8	8-1/8	71-1/8	67-3/8	69	76-3/8	1-1/2	1-1/2	53-15/16	57-11/16	62-15/16
					(1,806)	(1,711)	(1,753)	(1,940)	(38)	(38)	(1,370)	(1,465)	(1,599)
G	20	0134-0214-09	38-1/8	N/A	81-7/16	77-11/16	79-5/16	86-11/16	1-1/2	N/A	37-7/16	41-3/16	46-7/16
					(2,069)	(1,973)	(2,015)	(2,202)	(38)	(951)	(1,046)	(1,179)	
G	40	0134-0214-10	38-1/8	N/A	81-7/16	77-11/16	79-5/16	86-11/16	1-1/2	N/A	53-15/16	57-11/16	62-15/16
					(2,069)	(1,973)	(2,015)	(2,202)	(38)	(1,370)	(1,465)	(1,599)	
J	20	0134-0214-11	37-3/16	29-3/16	107-5/16	103-9/16	105-3/16	112-9/16	1-1/2	1-1/2	37-7/16	41-3/16	46-7/16
					(2,726)	(2,631)	(2,672)	(2,859)	(38)	(951)	(1,046)	(1,179)	
J	40	0134-0214-12	37-3/16	29-3/16	107-5/16	103-9/16	105-3/16	112-9/16	1-1/2	1-1/2	53-15/16	57-11/16	62-15/16
					(2,726)	(2,631)	(2,672)	(2,859)	(38)	(1,370)	(1,465)	(1,599)	
K	20	0134-0214-13	37-3/16	29-3/16	107-5/16	103-9/16	105-3/16	112-9/16	1-1/2	1-1/2	37-7/16	41-3/16	46-7/16
					(2,726)	(2,631)	(2,672)	(2,859)	(38)	(951)	(1,046)	(1,179)	



Installation

Table 2. AH Roof Curb Kit Dimensions (continued)

Air Handler Arrangement	Capacity	Trane P/N	F	G	H	J	Q	R	K	M	W	B	C
K	40	0134-0214-14	37-3/16	29-3/16	107-5/16	103-9/16	105-3/16	112-9/16	1-1/2	1-1/2	53-15/16	57-11/16	62-15/16
			(944)	(741)	(2,726)	(2,631)	(2,672)	(2,859)	(38)	(38)	(38)	(1,370)	(1,465)
L	20	0134-0214-15	37-1/8	55-1/4	133-1/4	129-1/2	131-1/8	138-1/2	1-1/2	1-1/2	37-7/16	41-3/16	46-7/16
			(943)	(1,403)	(3,385)	(3,289)	(3,331)	(3,518)	(38)	(38)	(38)	(951)	(1,046)
L	40	0134-0214-16	37-1/8	55-1/4	133-1/4	129-1/2	131-1/8	138-1/2	1-1/2	1-1/2	53-15/16	57-11/16	62-15/16
			(943)	(1,403)	(3,385)	(3,289)	(3,331)	(3,518)	(38)	(38)	(38)	(1,370)	(1,465)

Figure 6. Roof Opening Dimensional Data

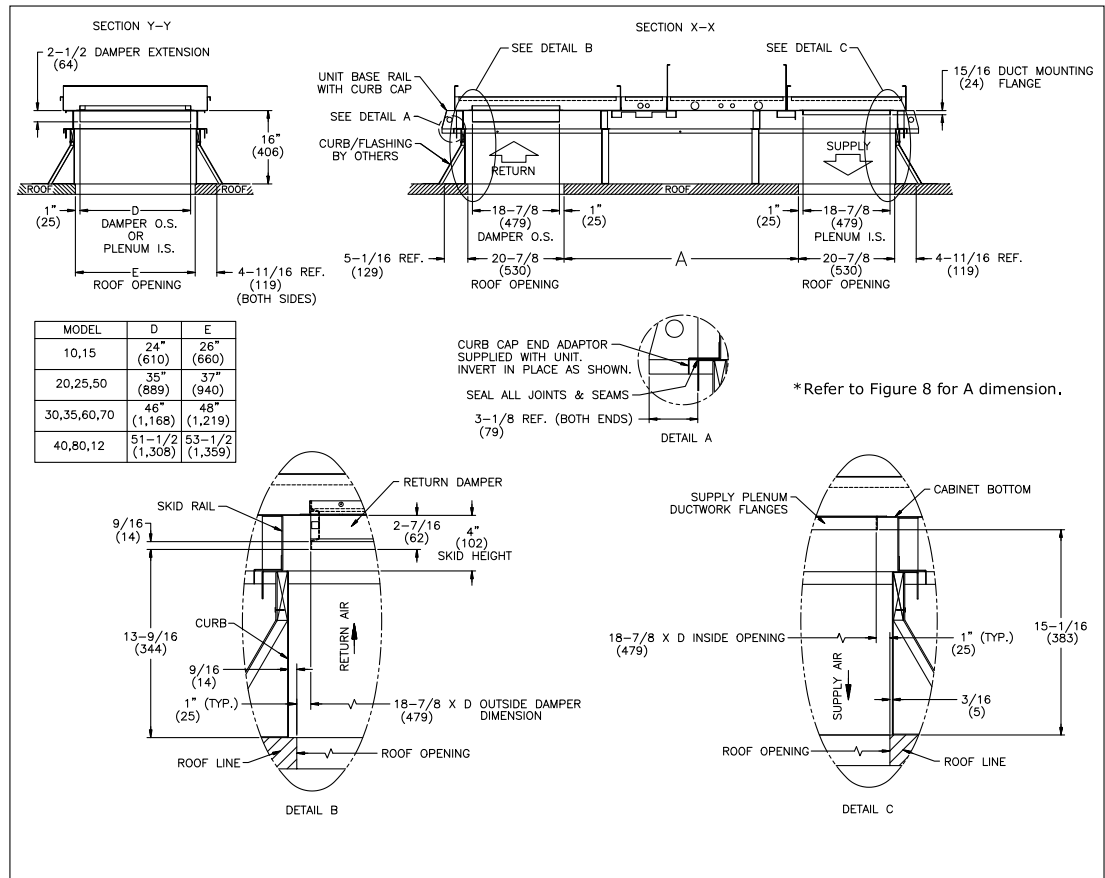


Figure 7. Unit/Curb End Rail Assembly

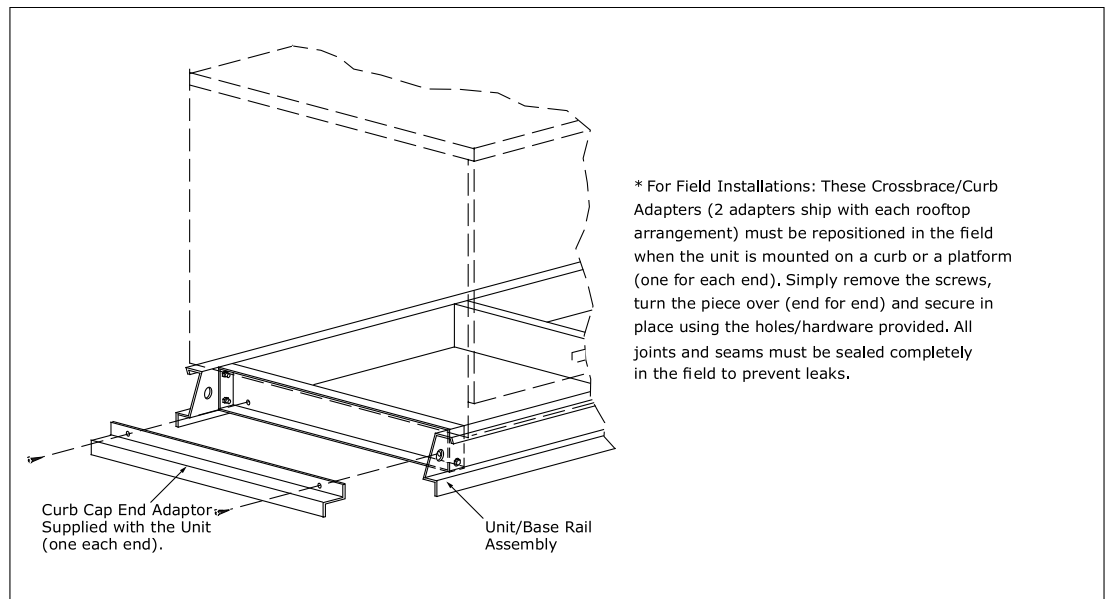
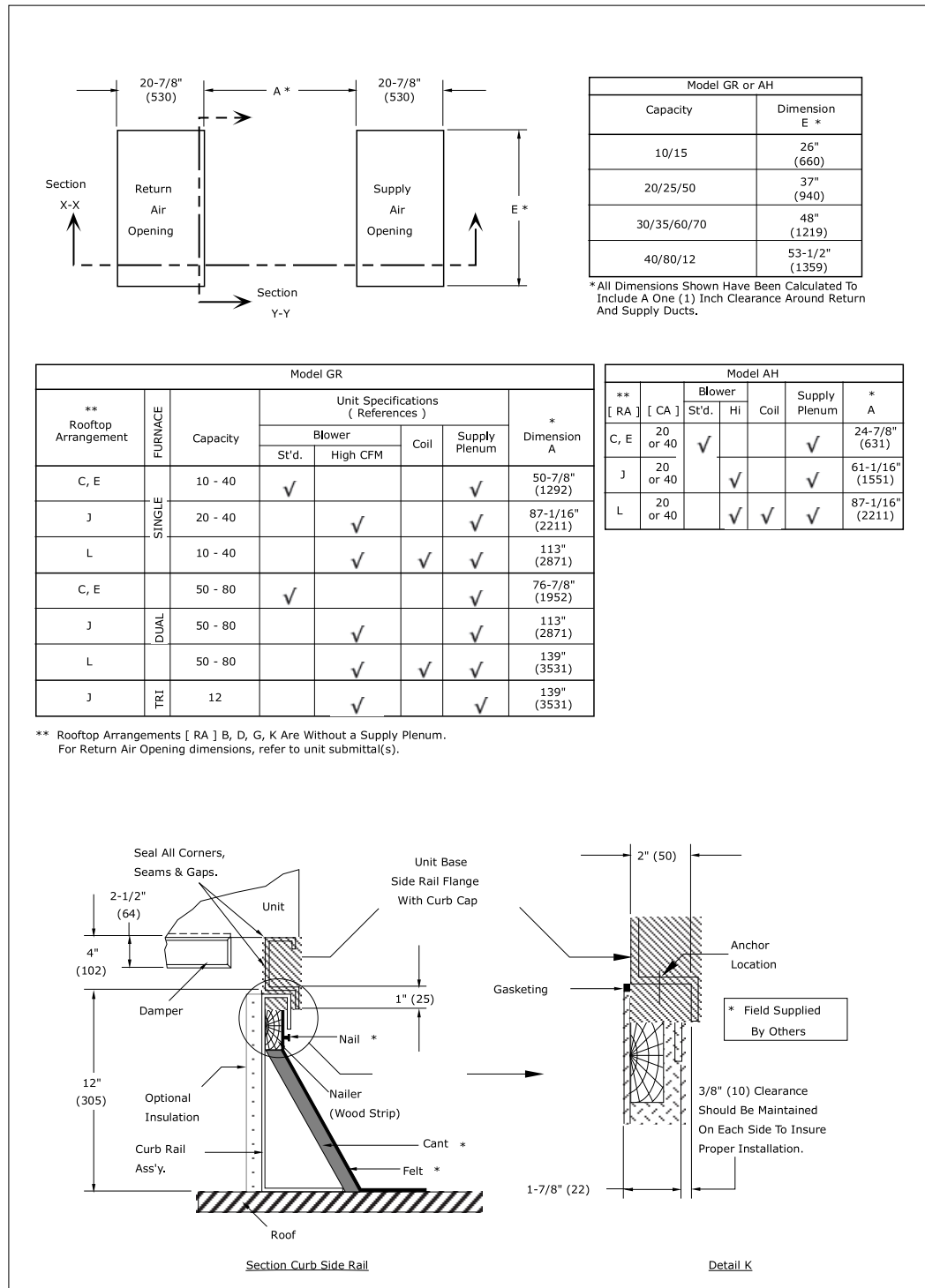


Figure 8. Roof Curb Specifications



Venting

All venting installations shall be in accordance with the latest edition of Part 7, "Venting of Equipment", of the National Fuel Gas Code, ANSI Z223.1 or applicable provisions of local building codes.

⚠ WARNING

Proper Venting Required!

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

All venting installations shall be in accordance with the National Fuel Gas Code, ANSI Z223.1 or applicable provisions of local building codes.

Venting is an integral part of the unit and must NOT be altered in the field.

The Natural Vented units are equipped with a vent cap which is designed for natural draft venting. Air for combustion enters the base of the vent cap through a protective grill and products of combustion are discharged at the upper section of the vent cap. **This vent cap is shipped in a separate carton and should be installed per the Venting section of the Outdoor Rooftop Gas-Fired Duct Furnace Installation and Service Manual.**

The Power Vented unit has a induced draft venting system. The combustion air inlet and products of combustion discharge louvers are located in the upper section of the Duct Furnace side access panel. **Never locate these units in an area where the flue products discharge outlet may be directed at any fresh air vents. See the Outdoor Rooftop Gas-Fired Duct Furnace Installation and Service Manual for installation and servicing requirements.**

Duct Connections

All ductwork must be properly supported so that no strain is put on the unit. Do not alter or bend the discharge duct flanges supplied on your furnace/air handler.

Ducts connected to units which do not have either a blower section or a supply plenum must have a removable access panel in the duct which is connected to a duct furnace. The duct openings shall be accessible when the unit is installed in service, and shall be of such size that smoke or reflected light may be observed inside the casing to indicate the presence of leaks in the heating element. The covers for the panels shall be attached in such a manner as to prevent leaks. Ducts exposed to the outdoors must be insulated and sealed to prevent water from entering either the unit or building through the duct.

If a single, double or triple duct furnace only unit is connected to a return air duct, or any other inlet air restriction, the appliance shall be installed on the positive pressure side of the air circulating blower.

When connecting return air duct to Standard or High CFM cabinets, attach duct to return air opening flange when no dampers are used. Otherwise, if dampers are used, attach return air duct around collar at bottom of damper assembly. Also refer to the Submittal Data Sheets specified for your unit.

When connecting supply air duct to Supply Plenum, attach duct to supply air opening flange when no dampers are used. Otherwise, if dampers are used, attach supply air duct around collar at bottom of damper assembly.

Gas Piping†

All gas piping must be installed in accordance with local codes. It is required that a ground union be installed adjacent to the gas valve of each duct furnace, and a ground union be installed just external of each duct furnace for unit servicing. On vertical runs, a drip leg should be provided upstream of any control manifold. A gas shutoff valve should be, or may be required by local codes, installed upstream of the external ground union for each duct furnace. A 1/8 inch N.P.T. plugged tapping, accessible for test gauge connection, must be installed immediately upstream of the unit gas supply connection.

† **For complete Gas Piping installation, see Outdoor Rooftop Gas-Fired Duct Furnace Installation and Service Manual, and if applicable the Factory Installed Options Manual.**

It is recommended that the gas piping not be installed through the bottom of the duct furnace bottom panel. If piping must penetrate the duct furnace bottom panel, it must be sealed to prevent water leakage.

Gas piping must be installed to allow for removal of burner drawer for unit maintenance.

⚠ WARNING**Fire Hazard!**

Failure to follow instructions below could result in damage to the unit gas valve and cause a fire hazard which could result in death or serious injury.

- Do NOT connect gas piping to this unit until a supply line pressure/ leak test has been completed.
- Do NOT rely on a gas shutoff valve to isolate the unit while conducting gas pressure/leak tests. These valves may not be completely shutoff, exposing the unit gas valve to excessive pressure.
- Do not over-tighten the inlet gas piping at unit gas valve.

⚠ WARNING**Explosion Hazard!**

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.

The gas line should be supported so that no strain is placed on the unit. Pipe compounds which are not soluble to liquid petroleum gases must be used on threaded joints.

The appliance and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psi (3.5 kPa).

The appliance must be isolated from the gas supply piping system by closing the individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psi (3.5 kPa).

For additional gas piping information, including pipe sizing and drip leg installation, refer to Outdoor Rooftop Gas-Fired Duct Furnace Installation and Service Manual.

For additional piping information, refer to the National Fuel Gas Code Z233.1 (latest edition).

Before any connection is made to an existing line supplying other gas appliances, contact the local gas company to make certain that the existing line is of adequate size to handle the combined load.

Check all connections for leaks with soap solution.

⚠ WARNING**Explosion Hazard!**

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

In order to prevent a possible explosion, DO NOT heat the refrigerant container to speed up the charging process.

Modulating Gas Control (Optional)*

Note: *Also refer to Outdoor Duct Furnace Installation Manual supplied with your unit.

Electronic: On units equipped with electronic modulating control, follow control manufacturer's installation instructions for sensing of outlet air temperature.

Electrical Connections

⚠ WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

All electrical connections must conform to the latest edition of ANSI/NFPA No. 70 National Electrical Code and applicable local codes. In Canada, to the Canadian Electrical Code, Part I CSA Standard C22.1.

The rooftop packaged unit is wired at the factory and ready to be connected. Actual unit wiring will differ according to the options chosen. Each unit is shipped with its own wiring diagram; refer to this wiring diagram for all electrical connections to the unit.

All electrical connections, line voltage and thermostat, are made in the Electrical Cabinet (See [Figure 10, p. 26](#)). Line voltage connections are made at the High Voltage Terminal Block. Thermostat connections are made at the Main Connection Board (See [Figure 10, p. 26](#)).

⚠ WARNING

Risk of Electrocution!

Failure to follow instructions below could result in death or serious injury. DO NOT use any tools (i.e. screwdriver, pliers, etc.) across the terminals to check for power. You MUST use a voltmeter.

Figure 9. Standard Blower Cabinet, Single Duct Furnace with Supply Plenum & Various Options Shown

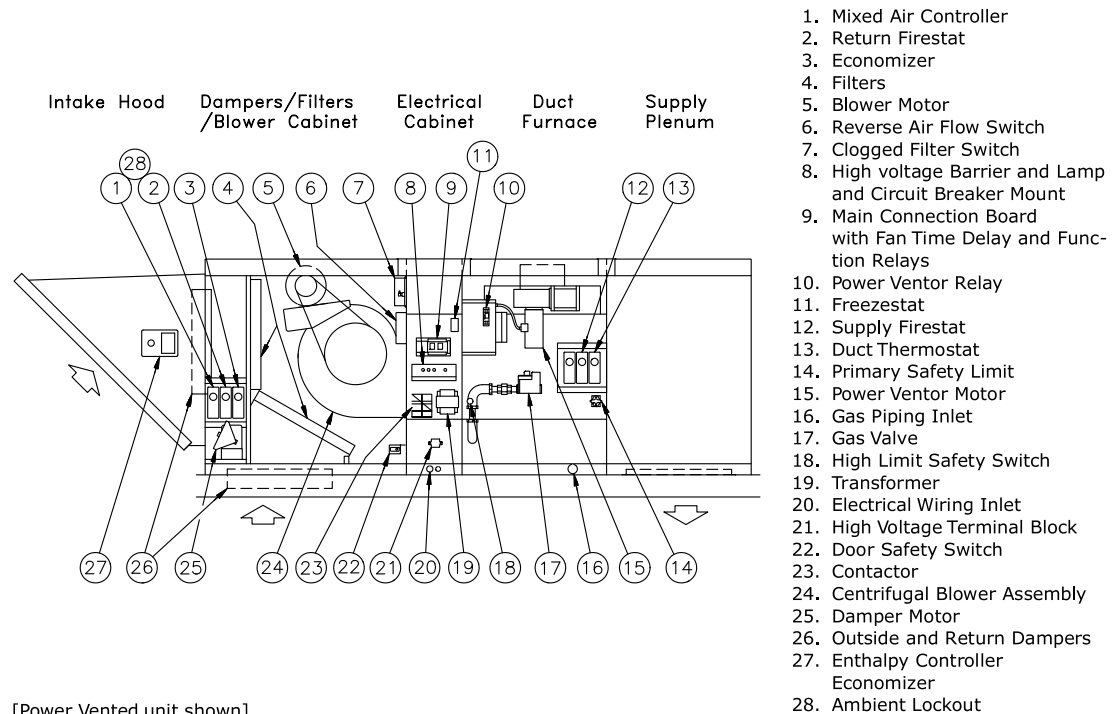
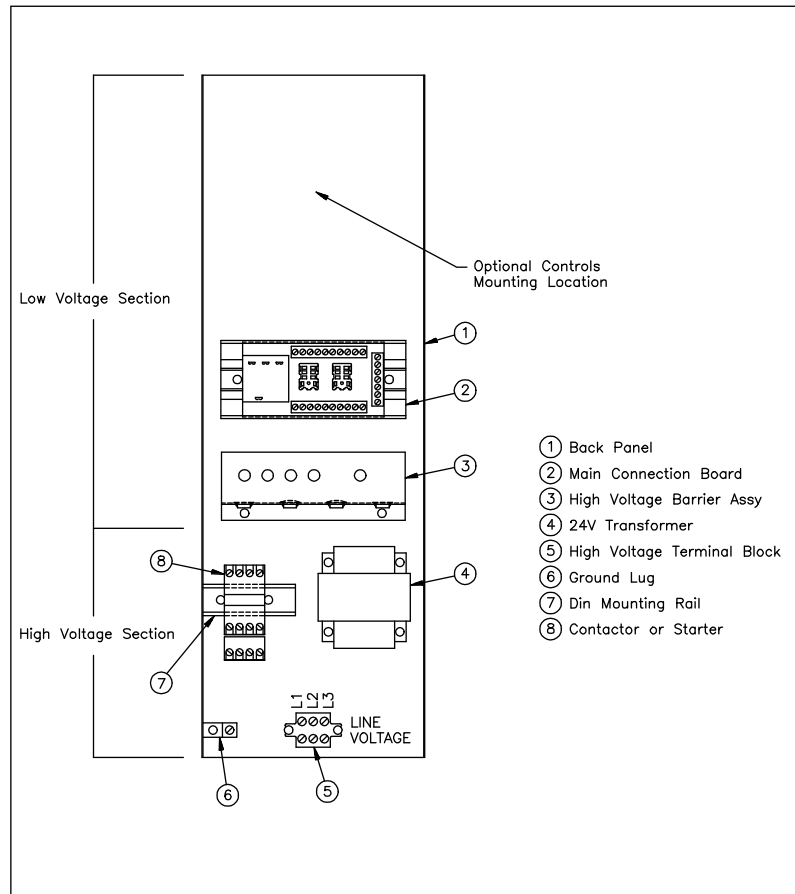


Figure 10. Electrical Cabinet


Outdoor line voltage conduits leading into the unit should be installed to prevent rain from wetting any high voltage wire. Locate the thermostat in accordance with the instructions supplied with the thermostat. All field wiring must have a minimum temperature rating of 185°F (85°C). Control wiring must be a minimum of 18 gauge wire size. Control wiring must be sized for the length of run.

Locate line voltage disconnect box per local codes. If mounting the disconnect box to the unit, never mount it to an unit access panel. Possible locations include the front of the blower or filter section, the outdoor air hood or the rear of the supply plenum (See [Figure 11, p. 27](#)). Electrical conduit must be routed so as not to interfere with removal of any access panel.

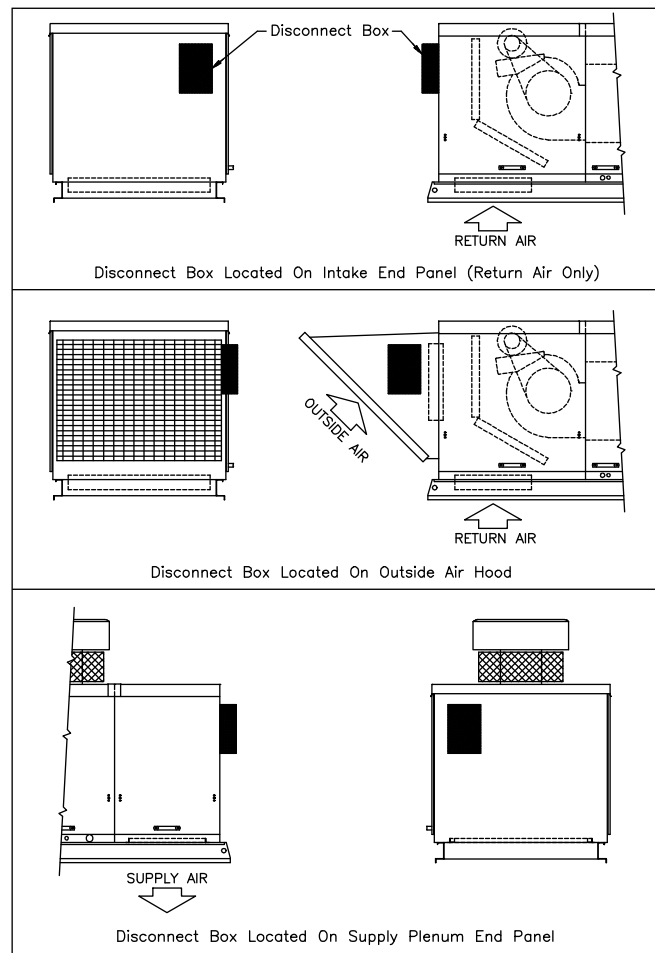
⚠ WARNING

Fire Hazard!

Failure to follow instructions below could cause a fire which could result in death or serious injury, and property damage.

DO NOT jumper factory wiring! Mis-wiring of safety circuits could cause a fire. For all wiring connections, refer to the wiring diagram shipped with the unit. Should any original wire supplied with the unit have to be replaced, it MUST be replaced with wiring material having a temperature rating of at least 221°F (105°C).

Figure 11. Disconnect Box Locations



DX Coil Equipped Units (Optional)

See Coil Installation/Maintenance Manual for Refrigerant Piping, Liquid and Suction Line Components, Refrigerant Charging and Thermal Expansion Valve Adjustment. Remove coil cabinet access door located next to blower section. Cut holes in fixed door to allow suction and liquid line passage. Provide weatherproof seal around suction and liquid lines at piping plate when installed.

The DX Coil has a 300 ft/min. (1.524 m/s) minimum and a 600 ft/min. (3.048 m/s) maximum velocity through the coil requirement. This is due to prevention of coil icing or condensate blow-off. To calculate the velocity through the coil, apply the following formula:

$$\text{Velocity through the coil} = \frac{\text{Cooling Air Flow in CFM (m}^3\text{/s)}}{\text{Coil Surface Area in ft}^2\text{(m}^2\text{)}}$$

Condensate Drain piping must have a P-trap in line immediately downstream of drain pan connection, external to the unit, to prevent possible outside air leakage into unit. The P-trap shall be of sufficient differential to overcome negative pressure of the indoor air blower. A minimum height difference of 2 inch is required (See [Figure 12, p. 28](#)). Before unit operation begins, the P-trap must be primed with either water (summer) or glycol (winter).

Chilled Water Coil Equipped Units (Optional)

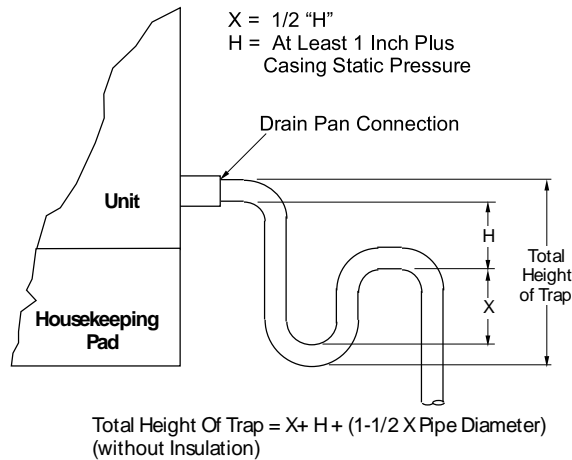
See Coil Installation/Maintenance Manual for General Coil Piping Recommendations. Remove the coil cabinet door and cut holes in door to allow chilled water piping passage. Provide weatherproof seal around chilled water pipes at piping plate when installed.

The Chilled Water Coil has a 600 ft/min (3.048 m/s) maximum velocity through the coil requirement. This is due to prevention of condensate blow-off. To calculate the velocity through the coil apply the following formula:

$$\text{Velocity through the coil} = \frac{\text{Cooling Air Flow in CFM (m}^3\text{/s)}}{\text{Coil Surface Area in ft}^2\text{(m}^2\text{)}}$$

Condensate Drain piping must have a P-trap in line immediately downstream of drain pan connection, external to the unit, to prevent possible outside air leakage into unit. The P-trap shall be of sufficient differential to overcome negative pressure of the indoor air blower. A minimum height difference of 2 inch is required (See [Figure 12, p. 28](#)). Before unit operation begins, prime P-trap with either water (summer) or glycol (winter).

Figure 12. Drain Pan Connection



Evaporative Cooler Equipped Units (Optional)

Refer to Evaporative Cooler Installation and Service Manual for water and electrical connections.



Operation

General Information

Refer to Outdoor Rooftop Gas-Fired Duct Furnace Installation and Service Manual for specific information regarding the heating operation of this unit.

All units are equipped with a intermittent pilot ignition system. The pilot is lit and extinguished each cycle of unit heating operation.

On natural gas units, the ignitor will continue to spark and pilot gas will continue to flow until the pilot flame is proven.

LP (propane) units are equipped with 100% lockout. The lockout function shuts off the main and pilot gas valves if the pilot gas fails to ignite within 90 seconds of the onset of trial for ignition.

The gas control system operates at 24 VAC and is supplied by a step-down transformer found in the electrical cabinet that will match the unit line voltage specified. See [Figure 10, p. 26](#) for unit controls location.

Do not use a thermostatic fan control switch when either two-stage firing or modulated gas controls are used.

Gas Control System

The standard unit comes equipped for single stage operation. Unit heating operation is accomplished at full input. Each duct furnace is equipped with an individual ignition control system which consists of the following components: ignition control module, gas valve and pilot burner.

The **ignition control module** is the heart of the ignition control system. This control initiates all gas flow, provides means to light the pilot burner, proves and monitors the pilot burner operation.

The **gas valve** consists of two operators which provide gas to the pilot and main burners. Both operators are energized and de-energized by the ignition control module each heating cycle.

The **pilot burner** includes an ignitor and flame sense probe. The ignitor provides the spark, originating at the ignition control module, to light the pilot. The ignition control module proves and monitors the pilot flame through the flame sensing probe.

All units follow the same basic sequence of operation and is as follows:

1. Thermostat calls for heat. **Power vented units only:** Drafter relay energizes drafter with call for heat.
2. Ignition control module energizes pilot operator of gas valve and initiates spark at ignitor of the pilot burner.
3. Pilot burner ignition is proven to the ignition control by the flame sense probe and sparking of the ignitor is discontinued.
4. Once pilot burner operation is proven, the ignition control module energizes the main burner operator of the gas valve, allowing gas flow to the main burners. **Power vented units only:** In addition, drafter operation must be proven by drafter end switch before ignition control module energizes main burner operator of gas valve.
5. Approximately 60 seconds after the main burners light the fan time delay initiates fan operation.
6. Thermostat is satisfied and call for heat is removed. **Power vented units only:** Drafter relay de-energizes drafter with removal of call for heat.
7. Ignition control module de-energizes pilot and main burner operators of the gas valve, ceasing all gas flow.
8. Approximately two minutes after satisfying the thermostat, fan operation ceases.



Optional Gas Controls

These units are available with optional gas controls which will give either multi-stage or modulating operation. The sequence of operation of those units equipped with these optional gas controls differs only at what rate each duct furnace’s main burners ignite and operate at or the order of duct furnace firing for those units equipped with two or three duct furnaces.

Two Stage Units: Two stages of heating; first stage is 40% of full rate, second stage is 100% of full rate. Main burner ignition is at first stage only.

Three Stage Units: Dual duct furnace models: First furnace is equipped with two stage heating; second furnace is equipped with a single stage heating but fired independently giving three stages of heating. Triple duct furnace models: Each duct furnace is equipped with single stage heating but fired independently, giving three stages. Each stage is 33% of the unit’s full input rate. Duct furnace one will always light first and disengage last.

Four Stage Units: Dual duct furnace models only. Each duct furnace is equipped with two stage heating but fired independently, giving four stages. Each stage is 25% of the units full input rate. Duct furnace one will always light first and disengage last.

Six Stage Units: Triple duct furnace models only. Each duct furnace is equipped with two stage heating but fired independently giving six stages. Each stage is 16.5% of the units full input rate. Duct furnace one will always light first and disengage last.

Electronic Modulation Units: These units are equipped with a electronic modulating control which provides unit firing capabilities of 40 to 100% of the units full input rate. This control is found in the gas train downstream of the gas valve and allows main burner ignition only at the maximum rate. A thermostat with remote setpoint adjustment modulates the gas input.

Multi-Stage w/ Electronic Modulation Units: These dual and triple duct furnace models are equipped with an electronic modulating control on duct furnace one and single or two stage heating on each successive duct furnace. Furnace one (modulated) will fire first and disengage last. Additional stages of heat will engage after furnace one has fired at maximum modulation capability for the duration of the delay setting. The amount of modulation and each stage size depends upon unit size and the number of stages. See following chart:

Number of Stages	Modulation Capabilities (% of full input)	Stage Size (% of full input)
2	25 - 50	50
3	16.5 - 33	33
4	25 - 50	25
6	16.5 - 33	16.5

Air Handling Requirements and Adjustments

NOTICE

Unit Damage!

Failure to follow instructions below could result in unit damage.

Remove wooden shipping support from beneath blower housing of blower Section.

Static Pressure through the unit should never exceed 2.0 inch W.C. (0.50 kPa). The standard unit is operated at a temperature rise range of 20 to 60°F (11 to 33°C). The high temperature rise model is operated at a temperature rise range of 60 to 90°F (33 to 50°C).

Important: *It is important that the final temperature leaving the unit does not exceed 160°F (71°C). When final air throughput adjustments are being made, a check of the discharge air temperature should be made after unit has operated for 15 to 20 minutes.*

⚠ WARNING

Fire Hazard!

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

A unit should never be allowed to cycle on the primary limit for a prolonged period of time. It is a safety control to prevent a fire. If cycling on the primary limit is noted, corrective measures should be taken immediately.

Important: At initial unit installation, unit should be started momentarily to confirm proper blower wheel rotation as the unit will deliver some air with the blower wheel running backwards.

Two basic air control systems can be used to deliver conditioned air to the occupied space: intermittent or constant fan operation.

Intermittent Fan Operation: The unit employs an air control system which utilizes a fan time delay relay to operate the fan while heating and the thermostat while cooling. Refer to unit wiring diagram.

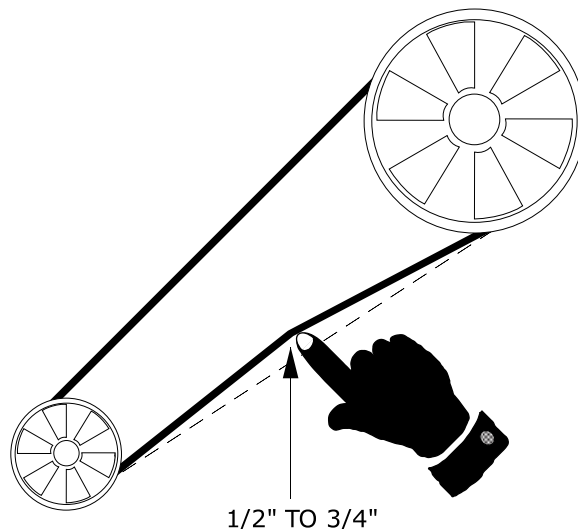
Constant Fan Operation: The unit can be wired to give an air control system which constantly circulates air through the unit and occupied space with constant fan operation. Refer to unit wiring diagram.

Important: Check blower belt tension. Proper belt tension is important to the long life of the belt and motor. Proper belt tension will allow the belt to be depressed 1/2 inch to 3/4 inch.

It is important that the blower motor and the blower wheel pulleys be in good alignment, with the motor and blower shafts parallel.

Belt tension must be adjusted to give approximately 3/4 inch deflection of the belt when finger pressure is applied to the middle of the belt (See Figure 13). Small changes in this tension may be necessary for optimum operation. Belts will stretch over a period of time, requiring an adjustment to this tension. See MAINTENANCE section for belt and pulley adjustments.

Figure 13. Belt Tension Guide



These units are set at the factory for the RPM required to meet the air volume (CFM) and external static pressure ordered. If the estimated external static is incorrect, or changes were made to the duct system, the blower RPM may need to be changed.

Both the Standard and High CFM Blowers use motors which are equipped with adjustable pitch pulleys. After removing belt(s), loosen the pulley set screw and remove the key, turn adjustable half of a pulley clockwise to increase RPM, or counter-clockwise to decrease RPM. Insert key,



tighten set screw and replace belt(s). Adjust belt tension to give 1/2 inch to 3/4 inch belt play when depressed.

NOTICE

Blower Motor Failure!

Failure to follow instructions below could result in improper unit operation and motor failure.

Blower motor full load amps should never be exceeded. Refer to motor data plate for maximum full load amps.

After changing blower RPM, confirm blower motor full load amps have not been exceeded. See motor data plate for maximum full load amps.

Lighting

(Refer to Outdoor Duct Furnace Manual for all heating functions - general comments are as follows.) Purge the gas line to the unit of air before attempting to light the pilot. Check for gas leaks.

⚠ WARNING

Explosion Hazard!

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.

This unit is equipped with an intermittent ignition system. A lighting instruction is attached to the unit. To set the intermittent ignition system into operation proceed as follows:

1. Turn on the gas valve(s) main manual valve.
2. Turn on electrical power. The unit is now under thermostat control.
3. Set thermostat to highest level. This will initiate the sequence of operation detailed in the Gas Control System section. Check main burners for operation.
4. Set thermostat to lowest level. This will interrupt power to the ignition control and shut off gas. Confirm pilot and main burners have been extinguished.
5. Set the thermostat to the desired setting.

For complete unit shutdown, proceed as follows:

1. Turn off the gas valve(s) main manual valve.
2. Set thermostat to lowest setting.
3. Shut off all electric power.

Gas Input Adjustment

When shipped from the factory, all units are equipped for the average heat content of the gas which is stamped on the unit rating plate.

NOTICE

Heat Exchanger Damage!

Failure to follow instructions below could result in heat exchanger damage.

Heat content of gas varies by locality; check the gas input after installation of the unit to ensure proper input. Never exceed the input on the rating plate.

For an accurate input rate measurement the following meter method should be used to determine unit input rate. If the meter method is not possible, a manifold pressure check should be made.

Meter Method of Checking Input Rate

1. Obtain the heating value of the gas from the local utility or gas dealer. This should be in units of Btu/ft³ (MJ/m³).
2. Determine the gas flow rate as shown in the following example. EXAMPLE: Assume this unit has a input rate of 250,000 Btu/hr (73.2 kW) and the heating value of the gas is 1000 Btu/ft³ (37.3 MJ/m³).

$$\begin{aligned} \text{Gas Flow Rate} &= \frac{250,000 \text{ Btu/hr}}{1000 \text{ Btu/ft}^3 \times 60 \text{ min/hr}} \\ &= 4.17 \text{ ft}^3/\text{min} \end{aligned}$$

3. Before determining the gas flow rate to the unit, all other gas appliances connected to the same meter must be turned off.
4. Fire unit according to instructions.
5. After approximately 15 minutes of unit operation, determine volume of gas used in five minutes of unit operation. For the Example above the unit should use 4.17 ft³/min x 5 min or 20.8 ft³ (1.97 L/s x 5 min x 60 s/min = 591L) of gas. Minor input adjustments can be made by removing pressure regulator cap and turning regulator clockwise to increase input or counter clockwise to decrease input. Any appreciable adjustment in input rate should be made by reorificing.

Method to Check Manifold Pressure

1. Close the manual valve of unit gas valve.
2. Install a 1/8 inch pipe connection in the tapped hole provided in the gas valve body near outlet of the valve.
3. Attach manometer to 1/8 inch pipe connection by means of a rubber hose.
4. Fire unit according to instructions and observe the pressure and confirm it matches the unit manifold pressure from the unit rating plate.
5. Small variations in the manifold pressure can be made by means of the gas valve pressure regulator. Remove pressure regulator cap and turn regulator clockwise to increase pressure or counter-clockwise to decrease pressure.

Pilot Adjustment

1. Disconnect wire from terminal marked MV at gas valve.
2. Provide call for heat.
3. Pilot adjustment is found on the gas valve. Remove pilot adjustment cap.
4. Adjust the pilot screw to provide properly sized flame.
5. A proper pilot burner flame is a soft steady flame that envelopes 3/8 to 1/2 inch (9.5 to 12.7mm) of the flame sense probe tip.
6. Replace the pilot adjustment cap.
7. Reconnect wire to terminal MV.

Primary Air Shutter Adjustment

After the unit has been in operation for at least 15 minutes, adjust the primary air flow to the burners. Turn the friction-locked manually rotated air shutters clockwise to close, counter clockwise to open. For correct air adjustment, close the air shutter until yellow tips in the flame appear. Then open the air shutter to the point just beyond the position where yellow tipping disappears.

Controls

Primary Limit Control: The primary limit control is a factory installed component surface mounted in the inlet airstream at the end of the heat exchanger. When the temperature reaches



the limit set point, normally caused by insufficient air throughput, all gas is shutoff. The limit control has an automatic reset and once the unit has cooled, it will reset itself. This is a safety control and if cycling on the primary limit is noted, corrective action must be taken. See unit wiring diagram for electrical location. This control must never be bypassed. Upon completion of unit installation, the primary limit must be checked for proper operation. This can be accomplished by removing power to the indoor air blower and a call for heat.

Draftor End Switch (Power vented units only): This switch is located at the end of the draftor motor and is integral to the motor. The switch, which is normally open, will close when draftor motor attains the minimum speed for proper combustion allowing main burner operation. The pilot burner will light without a proven draftor end switch. See unit wiring diagram for electrical location.

Clogged Filter Switch:(Optional) The clogged filter switch monitors the pressure differential across the air filters. If this pressure differential becomes too great, the switch will alert of this condition. At this point the air filters must either be cleaned or replaced. The switch will reset itself.

Firestat: (Optional) Located in either the return airstream, the supply airstream, or both, this control monitors temperatures with set points which are field adjustable. If the temperature exceeds the set point, the control will cease unit operation. To resume unit operation, a manual reset of this control is required.

Freezestat: (Optional) Located in either the return airstream, the supply airstream, or both, this control monitors temperatures with set points which are field adjustable. If the temperature does not exceed the set point, the control will cease unit operation.



Start-Up

Before starting the unit, use the "Gas Equipment Start Up Sheet" (located at the end of this manual) and read the Outdoor Duct Furnace Manual entirely in conjunction with the procedures outlined below to ensure that the unit is completely and properly installed and ready for start up.

⚠ WARNING

Check of Safety Devices Required!
Failure to do follow instructions below could cause unsafe conditions and result in death, serious injury or property damage.
All safety controls **MUST** be checked before starting the unit and during regular maintenance! Check and test the operational functions of all safety devices supplied with this unit.

1. Inspect all wiring connections; connections should be clean and tight. **Trace circuits to insure that actual wiring agrees with the "as wired" diagrams provided with the unit.** Information in the wiring diagram title block should match the data appearing on the unit nameplate.
2. Lubricate all electrical motors according to the manufacturer's recommendations.
3. Verify that the system switch is in the OFF position.
4. Check unit supply voltage to ensure that it is within the utilization range.
5. Inspect the interior of the unit; remove any debris or tools which may be present.

Starting the Unit in Heating Mode

1. Close the unit disconnect switch which provides power to the unit.

***Important:** High voltage is present in some areas of the unit (primarily the main electrical cabinet) with the unit disconnect switch closed. Failure to exercise caution when working in the presence of energized electrical components may result in injury or death from electrical shock.*

⚠ 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.

2. Set the thermostat/switching subbase as indicated below:
 - a. Position the heating system switch at either HEAT or AUTO;
 - b. Set the fan switch to AUTO.
3. Place the system switch in the ON position.

***Note:** With the thermostat calling for heat, unit operation is automatic.*

Starting Unit in Cooling Mode

1. Close the unit disconnect switch which provides power to the unit.

***Important:** High voltage is present in some areas of the unit (primarily the main electrical cabinet) with the unit disconnect switch closed. Failure to exercise caution when working in the presence of energized electrical components may result in injury or death from electrical shock.*

2. Set the thermostat/switching subbase as indicated below:
 - a. Position the cooling system switch at either COOL or AUTO;
 - b. Set the fan switch to AUTO.



Start-Up

3. Place the system switch in the ON position.

Note: *With the thermostat calling for cooling, unit operation is automatic.*

Final Checkout

Run the unit sequentially through its stages of heating and cooling. Once proper unit operation is verified, perform these final steps:

1. Inspect unit for debris and/or misplaced tools and hardware.
2. Be sure all gas valves and controls are in the operating position if the unit will be operating immediately.
3. Cycle unit on all safety controls to verify proper unit operation.
4. Confirm proper operating control (thermostat or ductstat) operation by cycling unit.
5. Secure all exterior panels in place.



Maintenance

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 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.

⚠ WARNING

Explosion Hazard!

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.

To check gas tightness of the safety shut-off valves, turn off the manual valve upstream of the appliance combination control. Remove the 1/8 inch pipe plug on the inlet side of the combination control and connect a manometer to that tapping. Turn the manual valve on to apply pressure to the combination control. Note the pressure reading on the manometer, then turn the valve off. A loss of pressure indicates a leak. If a leak is detected, use a soap solution to check all threaded connections. If no leak is found, combination control is faulty and must be replaced before putting appliance back in service.

Note: Gas tightness of the safety shutoff valves must be checked on at least an annual basis.

These units have been developed for outdoor installation. Maintenance is required and it is suggested that the following unit servicing and inspections be performed routinely. Also read in entirety and refer to the Outdoor Duct Furnace Manual for maintenance requirements.

Inspect area near unit to be sure that there is no combustible material located within the minimum clearance requirements (See Figure 2, p. 11). Service panels provide easy access to the gas controls (located in duct furnace section), the blower compartment, the electrical cabinet and the supply plenum. To remove the service door from any of these compartments, refer to access panel removal section in beginning of this manual.

The pilot burner can be serviced by removing the pilot plate from the main burner drawer assembly.

Main Burner Drawer Assembly Removal (Also refer to Outdoor Rooftop Duct Furnace manual).

1. Shut off the gas supply at the gas shutoff valve and electrical power to the unit.
2. Break the union upstream of duct furnace gas valve and loosen the union external to the furnace; swing downward the piping to clear drawer.
3. Disconnect duct furnace gas valve wiring taking note of all wire locations. Disconnect ignitor and flame sensing probe wires at ignition control module and any other wires.
4. Remove the locking screws holding the burner drawer assembly in position.
5. Slide the burner drawer out of the duct furnace.
6. Removal of burners is accomplished by sliding burner towards manifold, compressing locating spring, until the rear of the burner clears slot in back of burner drawer.
7. With burner drawer removed from duct furnace, inspect the inside surfaces of the heat exchanger. Wire brush if necessary.

8. Remove any dirt, dust or other foreign matter from the burners using a wire brush and/or compressed air. Insure all parts of the burner are unobstructed. Inspect and clean pilot burner if necessary.
9. Reassemble the duct furnace by replacing all parts in order.
10. Light unit per the unit lighting instructions.
11. Check the burner adjustment. See the [Primary Air Adjustment](#) section of this manual.
12. Check all gas control valves and pipe connections for leaks.

⚠ WARNING

Combustible Materials!
Failure to maintain proper clearance between the unit and combustible materials could cause a fire which could result in death or serious injury or property damage.
Refer to unit nameplate and installation instructions for proper clearances.

13. Check the operation of the duct furnace gas valve by lowering the setting of the thermostat, stopping the operation of the duct furnace. The duct furnace gas valve should close, extinguishing the pilot and main burner flames.
14. Inspect and service the blower section of the system.

Routine Maintenance

The unit should be thoroughly checked before the start and at the end of each heating and cooling season.

1. Motors and belts should be inspected.
2. Tighten belts if loose.
3. Check and clean DX or Chilled Water coil twice yearly, if unit is so equipped per manufacturer’s service manual. Chilled Water coil must be winterized at beginning of heating season (i.e. drain water from coil per manufacturer’s instructions).
4. Check air throughput at beginning of heating season to confirm unit operation is within the specified temperature rise range.
5. At beginning of heating season clear Condensate Drain Pan and P-trap of water if unit is equipped with DX or Chilled water coil. Clean out drain pan and fill P-trap with a non-toxic glycol solution.
6. Evaporative cooler must be cleaned and maintained per manufacturer’s instruction frequently during the operating season.
7. Inspect Control Dampers during periodic maintenance. Damper pivot points should be cleaned to ensure free damper operation.
8. Blower wheels should be checked periodically for dirt build-up on blades. Clean as required.

Filters

It is recommended that air filters be changed or cleaned at least four times a year. More frequent attention to filters is required if the air being handled by the unit is unusually dirty. Air flow reduction, caused by the dirty air filters, will increase the discharge air temperature and may cause unit cycling on the primary limit.

Filters (by others) should be serviced regularly and changed or washed when necessary to maintain the required air throughput. In a dusty environment, filters may clog up in less than one month.

Table 3. High CFM Blower Air Filter Size Requirements

Unit Input	Number of Filters Required	
	16 x 20 (in)	20 x 20 (in)
200 MBtuh (58.6 kW)		8

Table 3. High CFM Blower Air Filter Size Requirements (continued)

Unit Input	Number of Filters Required	
	16 x 20 (in)	20 x 20 (in)
250 MBtuh (73.2 kW)		8
300 MBtuh (87.9 kW)	8	4
350 MBtuh (102.6 kW)	8	4
400 MBtuh (117.2 kW)		12
500 MBtuh (146.5 kW)		8
600 MBtuh (175.8 kW)	8	4
700 MBtuh (205.1 kW)	8	4
800 MBtuh (234.4 kW)		12
1,200 MBtuh (351.6kW)		12

Table 4. Standard CFM Blower Air Filter Size Requirements

Unit Input	Number of Filters Required	
	16 x 20 (in)	20 x 20 (in)
100 MBtuh (29.3 kW)	4	
150 MBtuh (44.0 kW)	4	
200 MBtuh (58.6 kW)		4
250 MBtuh (73.2 kW)		4
300 MBtuh (87.9 kW)	4	2
350 MBtuh (102.6 kW)	4	2
400 MBtuh (117.2 kW)		6
500 MBtuh (146.5 kW)		4
600 MBtuh (175.8 kW)	4	2
700 MBtuh (205.1 kW)	4	2
800 MBtuh (234.4 kW)		6

Air Blower

Belt Tension Adjustment Standard CFM Blower belt tension can be adjusted by loosening motor mounting bolts marked A (See Figure 14). To tighten belt, slide motor down motor mounting bracket and re-fasten motor to mounting bracket.

High CFM Blower belt(s) tension can be adjusted by first loosening motor mounting plate bolts marked A (See Figure 14). To tighten belt tension, turn belt tension adjustment screws marked B (See Figure 14) counter-clockwise. To loosen belt tension, turn clockwise. Once belt tension has been adjusted, re-fasten motor mounting plate bolts.

Blower RPM Adjustment

1. Loosen and remove belt(s).
2. Match driver pulley to one found in Figure 15.
3. Loosen setscrew(s) marked A.
4. If driver pulley is equipped with external key, marked B, remove.

5. Adjust driver pulley pitch diameter for desired speed by opening (slower) or closing (faster) moving parts by half or full turns. Do not open sheave past point where flange projects past the hub end.
6. If driver pulley is equipped with external key, marked B, replace.
7. Tighten setscrew(s) marked A.
8. Replace and retension belt(s).
9. Realign drive if necessary.

Figure 14. Blower Belt Tension

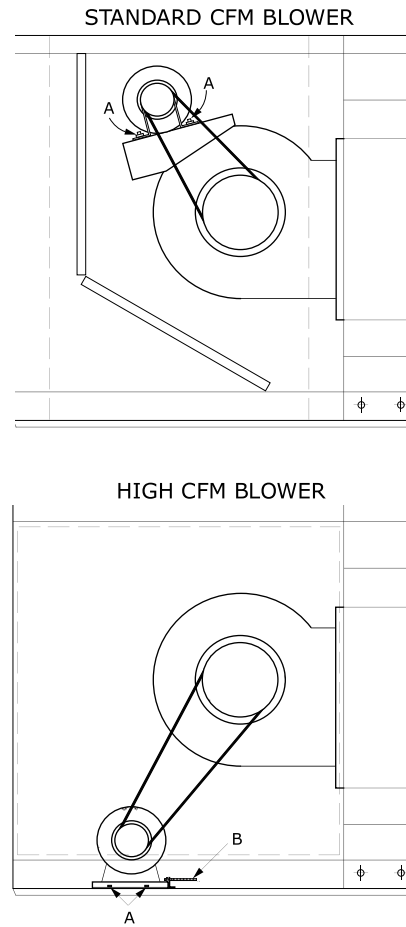
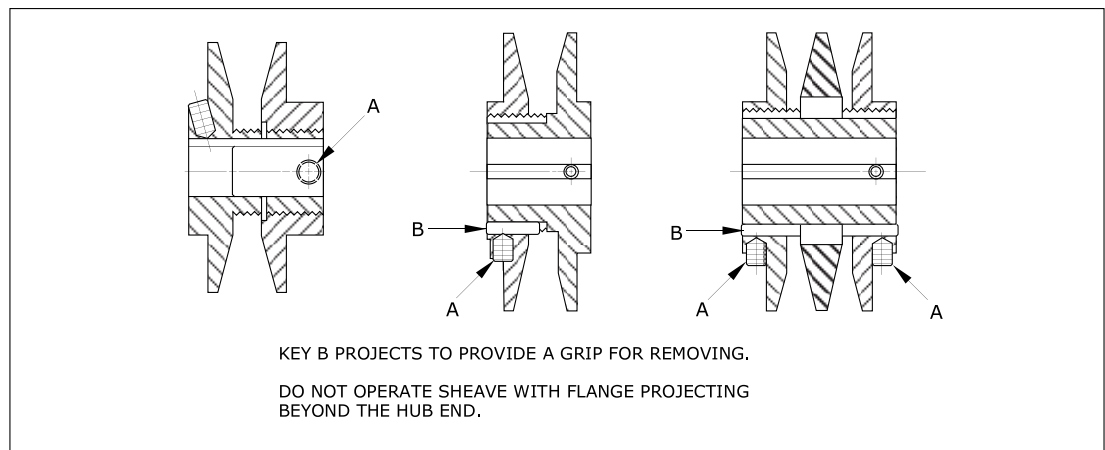


Figure 15. Blower RPM Adjustment





Troubleshooting

For troubleshooting of the duct furnace, refer to Indoor Rooftop Gas-Fired Duct Furnace Installation and Service Manual. For Evaporative Cooler/Cooling Coil equipped units, refer to these specific manuals for additional troubleshooting guides.

For additional troubleshooting, see following Troubleshooting Guide.

Troubleshooting Guide – Air Blower

Problem	Probable Cause	Solution
Noise	Blower Wheel Hitting Scroll Side	<ol style="list-style-type: none"> 1. Blower Wheel not centered in blower housing. 2. Damaged blower housing. 3. Damaged blower wheel. 4. Shaft loose in blower bearing. 5. Blower Wheel loose on shaft. 6. Blower bearing loose in bearing support.
	Blower Wheel Hitting Cutoff	<ol style="list-style-type: none"> 1. Cutoff not secure in blower housing. 2. Cutoff damaged. 3. Cutoff improperly positioned.
	Drive	<ol style="list-style-type: none"> 1. Pulley not tight on shaft (motor and/or blower wheel). 2. Belts too loose. Adjust for belt stretching after 48 hours of operation. 3. Belts too tight. 4. Belts wrong cross section. 5. Belts not matched in length on multi-belt drive. 6. Variable pitch pulleys not adjusted so each pulley has same pitch diameter (multi-belt drives). 7. Misaligned pulleys. 8. Belts worn. 9. Motor or motor base loose. 10. Belts oily or dirty 11. Improper drive selection
	Bearing	<ol style="list-style-type: none"> 1. Defective bearing. 2. Needs lubrication. 3. Loose on bearing support. 4. Loose on shaft. 5. Seals misaligned. 6. Foreign material in bearing. 7. Worn bearing. 8. Fretting corrosion between inner race and shaft.
	Shaft Seal Squeal	<ol style="list-style-type: none"> 1. Needs lubrication. 2. Misaligned.

Problem	Probable Cause	Solution
	Blower Wheel	<ol style="list-style-type: none"> 1. Loose on shaft 2. Defective blower wheel. Do not run blower. Contact manufacturer. 3. Unbalanced. 4. Worn as a result of contact with abrasive or corrosive material.
	Housing	<ol style="list-style-type: none"> 1. Foreign material in housing. 2. Cutoff of other part loose (rattling during operation).
	Electrical	<ol style="list-style-type: none"> 1. Lead-in cable not secure. 2. AC hum in motor or relay 3. Starting relay chatter. 4. Noisy motor bearings. 5. Single phasing a 3-phase motor.
	Shaft	<ol style="list-style-type: none"> 1. Bent. 2. Undersized. May cause noise at blower wheel, bearings or pulley. 3. If more than two bearings are on a shaft, they must be properly aligned.
	High Air Velocity	<ol style="list-style-type: none"> 1. Duct work too small for application. 2. Blower selection too small for application. 3. Registers or grilles too small for application. 4. Cooling coil with insufficient face area for application.
	Obstruction in High Velocity Air Stream may cause Rattle or Pure Tone Whistle	<ol style="list-style-type: none"> 1. Dampers. 2. Registers. 3. Grilles. 4. Sharp elbows. 5. Sudden expansion in duct work. 6. Sudden contraction in duct work. 7. Turning vanes.
	Pulsation or Surge	<ol style="list-style-type: none"> 1. Blower too large for application. 2. Ducts vibrate at same frequency as blower pulsations.
	Rattles and/or Rumbles	<ol style="list-style-type: none"> 1. Vibrating duct work. 2. Vibrating cabinet parts. 3. Vibrating parts not isolated from building.
CFM Low - Insufficient Air Flow	Blower	<ol style="list-style-type: none"> 1. Forward curved blower wheel installed backwards. 2. Blower operating backwards. 3. Cutoff missing or improperly installed. 4. Blower wheel RPM too low.

Problem	Probable Cause	Solution
	Duct System	<ol style="list-style-type: none"> 1. Actual system is more restrictive than expected. 2. Dampers closed. 3. Registers closed. 4. Leaks in supply duct.
	Filters	Dirty or clogged.
	Coil - DX or Chilled Water	Dirty or clogged.
	Obstructions in High Velocity Air Stream	<ol style="list-style-type: none"> 1. Obstruction near unit outlet. 2. Sharp elbows near unit outlet. 3. Improperly designed turning vanes. 4. Projections, dampers or other obstructions in part of duct system where air velocity is high.
CFM High - Too Much Air Flow	System	<ol style="list-style-type: none"> 1. Oversized duct work. 2. Access door open. 3. Registers or grilles not installed. 4. Filters not in place. 5. System resistance lower than anticipated.
	Blower	Blower RPM is too great.
Blower Does Not Operate	Installation	<ol style="list-style-type: none"> 1. Incorrect electrical connection. 2. Wrong voltage. 3. Blown fuse.
	Unit	<ol style="list-style-type: none"> 1. Broken belt(s). 2. Loose pulleys. 3. Power to unit is disconnected. 4. Motor overload protector has broken circuit. 5. Optional thermostats, firestats, freezestats may lockout blower operation if set incorrect.

Troubleshooting Guide – Electric Motors

Problem	Probable Cause	Solution
Motor	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker.
	Overload trip	Check and reset, if manual.
	Improper line connections	Check connections to unit wiring diagram.
	Improper current supply	Check to determine that power supply agrees with motor nameplate specifications.
	Mechanical failure.	Determine that motor and drive turn freely. Check bearings

Problem	Probable Cause	Solution
	Motor overloaded	Reduce load or replace motor.
	With a 3 phase power source, one phase may be open	Check line for open phase.
	Defective capacitor	Replace capacitor.
Motor Stalls	Wrong application	Consult manufacturer.
	Overloaded motor	Reduce load or replace motor.
	Low line voltage.	Check across AC line and correct if possible.
Motor runs and then dies down	Partial loss of line voltage	Check for loose connections. Determine adequacy of main power supply.
Motor does not come up to speed	Motor undersized for application	Replace with larger motor.
	Voltage too low at motor terminals	Check across AC line and correct if possible.
	Line wiring to motor is too small	Install larger line wiring.
Motor takes too long to accelerate	Excessive load. Loose connection	Replace with larger motor.
	Loose connection	Check connections and tighten where necessary.
Wrong Rotation (3 Phase)	Improperly wired to AC line (wrong sequence of phases)	Check unit wiring diagram. Reverse any two line voltage connections.
Motor Overheats	Motor overloaded	Replace with larger motor.
	Motor ventilation clogged	Clean motor.
	Motor (3 phase) may have open phase	Check to insure that all connections are tight.
	Line voltage too high or too low	Check across AC line and correct if possible.
	Worn blower bearings.	Replace blower bearings.
Motor Vibrates	Motor mounting bolts loose	Tighten mounting bolts.
	Driven equipment unbalanced	Balance driven equipment.
	Worn motor bearings.	Replace motor.
	3 phase Motor running on single phase	Check for open circuit and correct.



Troubleshooting

Problem	Probable Cause	Solution
	Bent motor shaft	Replace motor.
Rapid Motor Bearing Wear	Excessive overhung load due to over-tensioned belt	Reduce belt tension.

Troubleshooting Guide – Fan Assembly

Problem	Probable Cause	Solution
Short Belt Life	Spin burns from belt slippage	Tension belt.
	High ambient temperature	Use Gripnotch belts.
	Grease or oil on belts	Clean belts and pulleys.
	Worn pulleys	Replace pulleys.
	Belt Misalignment	Realign drive.
Belts turn over in grooves	Damaged belt	Replace belt.
	Excessive vibration	Tension belts. Replace belts if damaged.
	Worn pulleys	Replace pulleys.
	Pulley Misalignment	Realign drive.
Belt Squeal	Excessive load	High starting load. Retension drive.
Belt Breakage	Foreign material in drive	Provide drive guard.
	Belts damaged during installation	Replace belts.
	Extreme Overload	Eliminate overload.
Excessive Vibration	Damaged belt cord section	Replace belts.
	Loose belts	Tension drive.
	Belts improperly tensioned	Tension drive with slack of each belt on the same side of drive.
Belts mismatched after service	Belts improperly tensioned, causing more stretch of some belts than others	Replace belts and tension drive with slack of each belt on the same side of the drive.
	Old belts and new belts used on same drive	Replace with new belts.
	Different brand name belts used on same drive	Replace with a set of machine-matched belts.

Problem	Probable Cause	Solution
	Driver and driven shafts shifted from parallel	Realign drive.
	Belt cord section damaged during installation	Replace belts and install properly.
Drive fails to adjust	Fretting corrosion (drive allowed to operate at one speed over a period of time)	Driver pulley must be disassembled, cleaned and lubricated, then reassembled.

Troubleshooting Guide – DX Cooling Coil

Problem	Probable Cause	Solution
No or Insufficient Cooling	Coil icing	<ol style="list-style-type: none"> 1. Low liquid line pressure.* 2. Thermal expansion valve.** 3. Low air flow across coil.
	Air binding	Purge and charge system.
	Thermal expansion valve**	<ol style="list-style-type: none"> 1. Bulb mounted at incorrect location. 2. Bulb not secured properly.
	Insufficient air flow	<ol style="list-style-type: none"> 1. See air blower troubleshooting. 2. Clogged coil
	Air bypassing coil	Caulk safe off.
	Undersized system, demand exceeding cooling system capacity	Replace system.*
	Too much outside air	Check outside air dampers.
	Refrigerant leak	Determine leak location and correct.
	Low liquid pressure	Determine cause and correct.*
Water in Conditioned Air	Exceeding coil face velocity - 600 fpm.	Reduce unit air flow.
	Drain pan p-trap clogged.	Clean pan and p-trap.

Note: *Refer to condensing unit installation and service manual.
 **Refer to thermal expansion valve installation instruction.



Troubleshooting Guide – Chilled Water Cooling Coil

Problem	Probable Cause	Solution
No or Insufficient Cooling	Circulating pump failure.	Repair or replace pump.*
	Chilled water temperature not cool enough.	Check chiller.*
	Air binding (air in coil).	Bleed coil.
	Insufficient chilled water flow.	1. Circulating pump capacity is inadequate.* 2. System piping losses too great.
	Insufficient air flow.	1. See air blower troubleshooting. 2. Clogged coil
	Air bypassing coil.	Caulk safe off.
	Undersized system, demand exceeding cooling system capacity.	Replace system.*
	Too much outside air.	Check outside air dampers.
Water in Conditioned Air	Exceeding coil face velocity - 600 fpm.	Reduce unit air flow.
	Drain pan p-trap clogged.	Clean pan and p-trap.

Note: *Refer to Manufacturer's Installation and Service Manual.



Unit Net & Ship Weights

Note: All unit weights are less motor, outside air hood and cooling coils with drain pan. For units ordered with double wall construction (Optional) add an additional 10% of the base unit weight. GR-G = Vent Type G, Natural Vent; GR-P = Vent Type P, Power Vent (Refer to model number description)

ROOF TOP ARRANGEMENT "A"					ROOF TOP ARRANGEMENT "B"						
NET WT.		SHIP.WT.	NET WT.		SHIP.WT.	NET WT.		SHIP.WT.	NET WT.		SHIP.WT.
GR-G-10	256	367	GR-P-10	262	373	GR-G-10	576	742	GR-P-10	583	749
GR-G-15	307	418	GR-P-15	298	409	GR-G-15	627	793	GR-P-15	619	785
GR-G-20	365	484	GR-P-20	356	475	GR-G-20	740	916	GR-P-20	731	907
GR-G-25	405	524	GR-P-25	395	514	GR-G-25	781	957	GR-P-25	771	947
GR-G-30	469	596	GR-P-30	455	582	GR-G-30	907	1092	GR-P-30	893	1078
GR-G-35	510	637	GR-P-35	495	622	GR-G-35	958	1143	GR-P-35	943	1128
GR-G-40	558	690	GR-P-40	543	675	GR-G-40	1032	1222	GR-P-40	1018	1208
GR-G-50	795	952	GR-P-50	777	934	GR-G-50	1195	1423	GR-P-50	1175	1403
GR-G-60	914	1081	GR-P-60	885	1052	GR-G-60	1377	1616	GR-P-60	1349	1588
GR-G-70	994	1161	GR-P-70	964	1131	GR-G-70	1468	1707	GR-P-70	1438	1677
GR-G-80	1087	1259	GR-P-80	1058	1230	GR-G-80	1589	1833	GR-P-80	1561	1805
GR-G-12	1617	1820	GR-P-12	1573	1776						

ROOF TOP ARRANGEMENT "C"					ROOF TOP ARRANGEMENT "D"						
NET WT.		SHIP.WT.	NET WT.		SHIP.WT.	NET WT.		SHIP.WT.	NET WT.		SHIP.WT.
GR-G-10	705	923	GR-P-10	712	930	GR-G-10	705	904	GR-P-10	712	911
GR-G-15	756	974	GR-P-15	748	966	GR-G-15	757	956	GR-P-15	749	948
GR-G-20	884	1112	GR-P-20	875	1103	GR-G-20	893	1102	GR-P-20	884	1093
GR-G-25	925	1153	GR-P-25	915	1143	GR-G-25	935	1144	GR-P-25	925	1134
GR-G-30	1068	1307	GR-P-30	1054	1293	GR-G-30	1083	1301	GR-P-30	1069	1287
GR-G-35	1117	1356	GR-P-35	1102	1341	GR-G-35	1134	1352	GR-P-35	1119	1337
GR-G-40	1201	1445	GR-P-40	1187	1431	GR-G-40	1220	1443	GR-P-40	1206	1429
GR-G-50	1345	1598	GR-P-50	1325	1578	GR-G-50	1348	1595	GR-P-50	1328	1575
GR-G-60	1546	1811	GR-P-60	1518	1783	GR-G-60	1554	1812	GR-P-60	1526	1784
GR-G-70	1636	1901	GR-P-70	1606	1871	GR-G-70	1644	1902	GR-P-70	1614	1872
GR-G-80	1765	2034	GR-P-80	1737	2006	GR-G-80	1777	2040	GR-P-80	1749	2012

ROOF TOP ARRANGEMENT "E"					ROOF TOP ARRANGEMENT "G"						
NET WT.		SHIP.WT.	NET WT.		SHIP.WT.	NET WT.		SHIP.WT.	NET WT.		SHIP.WT.
GR-G-10	835	1072	GR-P-10	842	1079	GR-G-20	982	1206	GR-P-20	973	1197
GR-G-15	886	1123	GR-P-15	878	1115	GR-G-25	1025	1249	GR-P-25	1015	1239
GR-G-20	1037	1284	GR-P-20	1028	1275	GR-G-30	1218	1452	GR-P-30	1204	1438
GR-G-25	1078	1325	GR-P-25	1068	1315	GR-G-35	1261	1495	GR-P-35	1246	1480
GR-G-30	1244	1502	GR-P-30	1230	1488	GR-G-40	1343	1583	GR-P-40	1329	1569
GR-G-35	1294	1552	GR-P-35	1279	1537	GR-G-50	1427	1689	GR-P-50	1407	1669
GR-G-40	1389	1652	GR-P-40	1375	1638	GR-G-60	1677	1951	GR-P-60	1649	1923
GR-G-50	1499	1785	GR-P-50	1479	1765	GR-G-70	1759	2033	GR-P-70	1729	2003
GR-G-60	1722	2020	GR-P-60	1694	1992	GR-G-80	1886	2166	GR-P-80	1858	2138
GR-G-70	1812	2110	GR-P-70	1782	2080	GR-G-12	2420	2741	GR-P-12	2376	2697
GR-G-80	1953	2257	GR-P-80	1925	2229						

ROOF TOP ARRANGEMENT "J"					ROOF TOP ARRANGEMENT "K"						
NET WT.		SHIP.WT.	NET WT.		SHIP.WT.	NET WT.		SHIP.WT.	NET WT.		SHIP.WT.
GR-G-20	1116	1378	GR-P-20	1107	1369	GR-G-10	886	1137	GR-P-10	893	1144
GR-G-25	1157	1419	GR-P-25	1147	1409	GR-G-15	937	1188	GR-P-15	929	1180
GR-G-30	1367	1641	GR-P-30	1353	1627	GR-G-20	1132	1394	GR-P-20	1123	1385
GR-G-35	1409	1683	GR-P-35	1394	1668	GR-G-25	1174	1436	GR-P-25	1164	1426
GR-G-40	1499	1779	GR-P-40	1485	1765	GR-G-30	1385	1659	GR-P-30	1371	1645
GR-G-50	1597	1898	GR-P-50	1577	1878	GR-G-35	1428	1702	GR-P-35	1413	1687
GR-G-60	1863	2177	GR-P-60	1835	2149	GR-G-40	1519	1799	GR-P-40	1505	1785
GR-G-70	1944	2258	GR-P-70	1914	2228	GR-G-50	1614	1915	GR-P-50	1594	1934
GR-G-80	2079	2400	GR-P-80	2051	2372	GR-G-60	1881	2195	GR-P-60	1853	2207
GR-G-12	2620	2981	GR-P-12	2576	2937	GR-G-70	1964	2278	GR-P-70	1934	2288
						GR-G-80	2099	2420	GR-P-80	2071	2432



Unit Net & Ship Weights

ROOF TOP ARRANGEMENT "L"						OUTSIDE AIR HOOD W/BIRD SCREEN WEIGHT ADDER	
	NET WT.	SHIP.WT.		NET WT.	SHIP.WT.	Capacity	Weight
GR-G-10	1055	1344	GR-P-10	1062	1351	10	43
GR-G-15	1106	1395	GR-P-15	1098	1387	15	43
GR-G-20	1316	1617	GR-P-20	1307	1608	20	51
GR-G-25	1358	1659	GR-P-25	1348	1649	25	51
GR-G-30	1589	1903	GR-P-30	1575	1889	30	59
GR-G-35	1630	1944	GR-P-35	1615	1929	35	59
GR-G-40	1730	2051	GR-P-40	1716	2037	40	63
GR-G-50	1756	2096	GR-P-50	1736	2076	50	51
GR-G-60	2043	2397	GR-P-60	2015	2369	60	59
GR-G-70	2125	2479	GR-P-70	2095	2449	70	59
GR-G-80	2269	2630	GR-P-80	2241	2602	80	63

ROOF TOP ARRANGEMENT "B"			ROOF TOP ARRANGEMENT "C"			ROOF TOP ARRANGEMENT "D"		
AH Capacity	NET WT.	SHIP.WT.	AH Capacity	NET WT.	SHIP.WT.	AH Capacity	NET WT.	SHIP.WT.
20	403	616	20	529	705	20	609	822
40	513	744	40	665	855	40	769	1000

ROOF TOP ARRANGEMENT "E"			ROOF TOP ARRANGEMENT "G"			ROOF TOP ARRANGEMENT "J"		
AH Capacity	NET WT.	SHIP.WT.	AH Capacity	NET WT.	SHIP.WT.	AH Capacity	NET WT.	SHIP.WT.
20	735	959	20	635	847	20	788	1012
40	921	1161	40	793	1023	40	967	1207

ROOF TOP ARRANGEMENT "K"			ROOF TOP ARRANGEMENT "L"		
AH Capacity	NET WT.	SHIP.WT.	AH Capacity	NET WT.	SHIP.WT.
20	797	1021	20	936	1198
40	987	1227	40	1152	1432

Double Wall Construction Adder

For units ordered with double wall construction: add an additional 10% to the base unit weight.

Cooling Coil Weight Adder

Table 5. Cooling Coil Weight Adder

Capacity	DX Coil		Chilled Water Coil	
	4 Row	6 Row	4 Row	6 Row
10, 15	97 lbs.	132 lbs.	75 lbs.	102 lbs.
20, 25, 50	126 lbs.	177 lbs.	98 lbs.	135 lbs.
30, 35, 60, 70	165 lbs.	229 lbs.	125 lbs.	176 lbs.
40, 80	177 lbs.	249 lbs.	135 lbs.	196 lbs.

Approximate Motor Shipping Weights

Table 6. Approximate Motor Shipping Weights (lbs)

	A - (115/1/60)				B - (208/1/60)				C - (230/1/60)			
	1	2	3	4	1	2	3	4	1	2	3	4
	ODP	TE	PEODP	PETE	ODP	TE	PEODP	PETE	ODP	TE	PEODP	PETE
1/2 HP	20	21	29	30	21	21	29		21	21	29	30
3/4 HP	28	31	38	41	23	23	38		23	31	38	41
1 HP	32	32	40	44	32	32			32	32	40	44
1-1/2 HP	35	48	47	57		48			35	48	47	57
2 HP	42	67	65	64		67			42	48	65	64
3 HP	78	86			78	72			78	72		90
5 HP					87				87	99	95	
7-1/2 HP					134	138			134	138		
10 HP										161		
15 HP												
	D - (208/3/60)				E - (230/3/60)				F - (460/3/60)			
	1	2	3	4	1	2	3	4	1	2	3	4
	ODP	TE	PEODP	PETE	ODP	TE	PEODP	PETE	ODP	TE	PEODP	PETE
1/2 HP	20	22	22	22	20	22	22	22	20	22	22	22
3/4 HP	27	26	27		27	26	27	31	27	26	27	31
1 HP	24	26	36	37	24	26	36	37	24	26	36	37
1-1/2 HP	31	34	40	42	31	34	40	42	31	34	40	42
2 HP	39		46	49	39		46	49	39		46	49
3 HP	47		69	69	47		69	69	47		69	69
5 HP			76	77			76	77			76	77
7-1/2 HP			117	136			117	136			117	136
10 HP			128	158			128	158			128	158
15 HP			217	255			217	255			217	255
	G - (575/3/60)											
	1	2	3	4								
	ODP	TE	PEODP	PETE								
1/2 HP	22	22										
3/4 HP	20	22										
1 HP	28	27	33	38								
1-1/2 HP			40	42								
2 HP			46	48								
3 HP			66	100								
5 HP			74	91								
7-1/2 HP			114	143								
10 HP			145	153								
15 HP			234	348								

Motor Type Legend:

ODP - Open Drip Proof

TE - Totally Enclosed

PEODP - Premium Efficiency Open Drip Proof

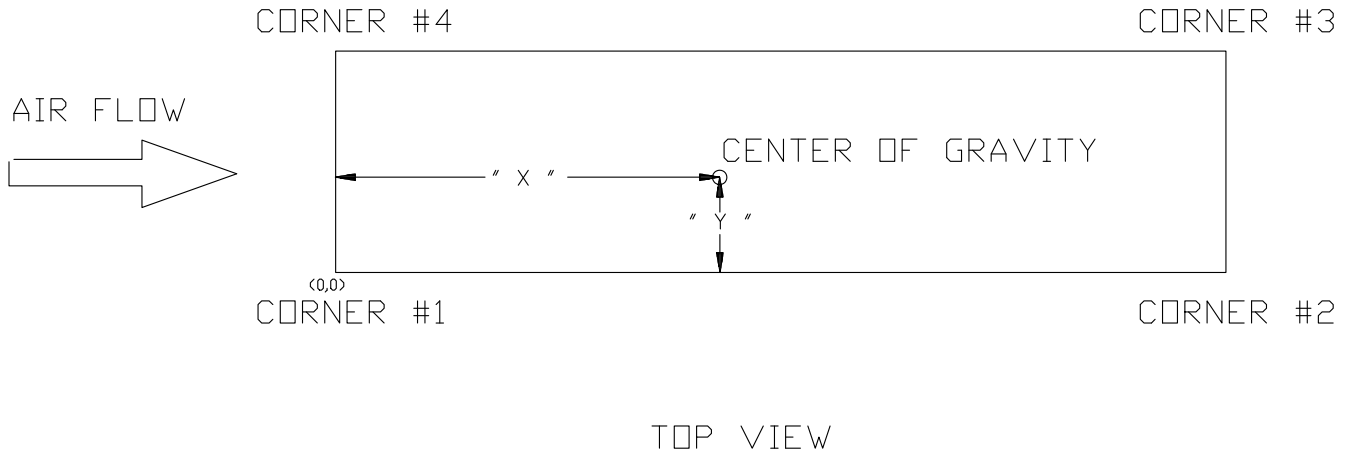
PETE - Premium Efficiency Totally Enclosed



Center of Gravity

Figure 16. Center of Gravity

G = NATURAL VENT P = POWER VENT



Note: Values based on Average Motor Weight (Actual Center of Gravity and Corner Weights for Specific Motor Size are Available Upon Request)

Center of Gravity Data

Vent Type, Capacity	Width	Length	ARRANGEMENT "B" Without Outside Air Hood Center of Gravity Corner Weights (lbs)				ARRANGEMENT "B" With Outside Air Hood Center of Gravity Corner Weights (lbs)							
			X-Coor	Y-Coor	Corner #1	Corner #2	Corner #3	Corner #4	X-Coor	Y-Coor	Corner #1	Corner #2	Corner #3	Corner #4
G10	32.75	72	35.9	15.4	161	160	141	142	32.6	15.4	187	154	138	167
P10	32.75	72	35.8	15.4	161	159	141	142	32.5	15.4	187	154	137	167
G15	32.75	72	36.9	15.4	163	171	153	145	33.7	15.5	190	166	149	170
P15	32.75	72	36.7	15.4	163	169	150	145	33.5	15.5	189	164	147	170
G20	43.75	72	36.6	20.6	196	202	179	174	33.3	20.7	227	196	175	203
P20	43.75	72	36.2	20.6	195	196	174	173	32.9	20.7	226	190	170	202
G25	43.75	72	37.3	20.6	198	213	190	177	34.1	20.7	230	207	186	206
P25	43.75	72	37.0	20.6	197	207	185	175	33.7	20.7	229	201	181	205
G30	54.75	72	37.7	25.3	232	255	218	198	34.5	25.4	269	247	214	232
P30	54.75	72	37.2	25.2	230	246	209	196	33.9	25.3	267	238	205	230
G35	54.75	72	37.7	25.1	245	269	228	207	34.6	25.3	282	261	224	241
P35	54.75	72	37.2	25.1	243	260	219	205	34.1	25.2	280	252	215	239
G40	60.25	72	38.2	27.9	254	287	248	219	35.1	28.0	294	279	243	256
P40	60.25	72	37.8	27.9	253	278	239	217	34.6	28.0	292	270	234	253
G50	43.75	98	51.2	20.8	278	304	276	253	48.3	20.9	308	299	274	281
P50	43.75	98	50.7	20.8	275	294	267	250	47.8	20.9	305	290	264	278
G60	54.75	98	51.4	25.7	324	356	315	286	48.5	25.8	359	351	312	319
P60	54.75	98	50.7	25.6	318	340	299	280	47.7	25.7	353	335	296	313
G70	54.75	98	51.6	25.6	341	378	333	300	48.8	25.7	376	373	329	332
P70	54.75	98	50.9	25.6	336	362	317	294	48.0	25.6	371	356	314	326
G80	60.25	98	52.2	28.4	358	407	363	319	49.4	28.5	396	401	360	354
P80	60.25	98	51.6	28.3	353	391	347	313	48.7	28.4	390	385	344	348
G12	60.25	124	65.7	28.7	467	525	476	423	63.1	28.7	503	520	474	457
P12	60.25	124	65.0	28.6	456	503	454	412	62.3	28.7	493	498	452	447



Center of Gravity

Vent Type,	Capacity	Width	Length	ARRANGEMENT "G" Without Outside Air Hood					ARRANGEMENT "G" With Outside Air Hood						
				Center of Gravity		Corner Weights (lbs)				Center of Gravity		Corner Weights (lbs)			
				X-Coor	Y-Coor	Corner #1	Corner #2	Corner #3	Corner #4	X-Coor	Y-Coor	Corner #1	Corner #2	Corner #3	Corner #4
G20	43.75	108		60.0	20.7	223	279	252	201	56.3	20.8	253	275	249	229
P20	43.75	108		59.6	20.7	223	274	246	200	55.8	20.8	252	269	244	228
G25	43.75	108		61.0	20.8	230	298	270	208	57.3	20.8	259	293	267	236
P25	43.75	108		60.5	20.8	229	292	264	207	56.9	20.8	259	288	262	235
G30	54.75	108		62.1	25.4	267	361	313	232	58.4	25.5	302	355	310	264
P30	54.75	108		61.5	25.4	266	351	304	230	57.7	25.5	301	346	301	262
G35	54.75	108		61.5	25.1	284	375	318	240	58.0	25.2	319	369	315	272
P35	54.75	108		60.9	25.1	283	365	308	239	57.3	25.2	318	359	306	271
G40	60.25	108		61.7	27.9	297	395	341	256	58.1	28.0	334	389	338	290
P40	60.25	108		61.1	27.9	295	385	332	255	57.5	28.0	333	379	329	289
G50	43.75	134		75.6	20.9	303	392	360	278	72.3	21.0	332	389	358	305
P50	43.75	134		75.0	20.9	301	382	350	275	71.6	20.9	330	378	348	303
G60	54.75	134		76.3	25.7	352	465	413	313	72.9	25.8	386	461	411	344
P60	54.75	134		75.4	25.7	348	448	396	308	72.0	25.8	382	443	394	340
G70	54.75	134		76.1	25.5	372	489	427	325	72.9	25.6	406	484	425	356
P70	54.75	134		75.2	25.5	368	471	410	320	72.0	25.6	402	466	408	352
G80	60.25	134		76.2	28.3	393	518	460	349	73.0	28.4	430	514	458	383
P80	60.25	134		75.4	28.3	389	500	443	344	72.1	28.3	426	496	441	378
G12	60.25	160		90.4	28.6	492	640	577	444	87.5	28.6	527	636	575	477
P12	60.25	160		89.5	28.5	485	615	553	435	86.5	28.6	520	611	551	469
Vent Type,	Capacity	Width	Length	ARRANGEMENT "J" Without Outside Air Hood					ARRANGEMENT "J" With Outside Air Hood						
				Center of Gravity		Corner Weights (lbs)				Center of Gravity		Corner Weights (lbs)			
				X-Coor	Y-Coor	Corner #1	Corner #2	Corner #3	Corner #4	X-Coor	Y-Coor	Corner #1	Corner #2	Corner #3	Corner #4
G20	43.75	134		66.8	20.9	283	281	257	259	63.1	20.9	312	278	255	286
P20	43.75	134		66.4	20.9	282	277	252	257	62.7	20.9	311	273	250	284
G25	43.75	134		67.3	20.9	294	296	271	269	63.8	21.0	323	293	269	297
P25	43.75	134		67.0	20.9	292	292	267	267	63.4	20.9	321	288	265	295
G30	54.75	134		68.1	25.6	344	356	313	303	64.6	25.7	378	351	311	334
P30	54.75	134		67.7	25.6	341	348	306	299	64.1	25.7	375	344	304	331
G35	54.75	134		67.3	25.4	363	366	316	313	63.9	25.4	397	362	314	344
P35	54.75	134		66.9	25.3	360	358	309	310	63.4	25.4	394	354	307	341
G40	60.25	134		67.5	28.2	380	386	339	334	64.0	28.2	416	381	336	367
P40	60.25	134		67.1	28.1	377	378	331	330	63.6	28.2	413	373	329	364
G50	43.75	160		81.4	21.0	372	385	356	344	78.2	21.0	400	383	354	371
P50	43.75	160		81.0	21.0	368	377	348	339	77.7	21.0	396	374	346	367
G60	54.75	160		82.7	25.9	430	459	412	385	79.4	25.9	463	456	410	417
P60	54.75	160		82.0	25.8	423	445	397	378	78.6	25.9	456	441	396	409
G70	54.75	160		81.8	25.7	454	475	419	401	78.7	25.7	487	471	417	432
P70	54.75	198		81.1	25.6	447	460	405	393	77.9	25.7	480	456	403	425
G80	60.25	160		81.9	28.5	482	505	452	431	78.8	28.5	517	501	451	465
P80	60.25	160		81.3	28.4	475	490	438	424	78.1	28.5	510	486	436	458
G12	60.25	186		96.0	28.7	584	624	566	530	93.1	28.7	619	620	564	563
P12	60.25	186		93.2	28.5	544	547	491	488	90.0	28.6	579	543	489	521
Vent Type,	Capacity	Width	Length	ARRANGEMENT "K" with Chilled Water Coil Without Outside Air Hood					ARRANGEMENT "K" with Chilled Water Coil With Outside Air Hood						
				Center of Gravity		Corner Weights (lbs)				Center of Gravity		Corner Weights (lbs)			
				X-Coor	Y-Coor	Corner #1	Corner #2	Corner #3	Corner #4	X-Coor	Y-Coor	Corner #1	Corner #2	Corner #3	Corner #4
G10	32.75	134		70.1	15.8	254	279	260	237	66.7	15.8	278	276	258	260
P10	32.75	134		70.0	15.8	254	278	259	237	66.7	15.8	278	276	257	260
G15	32.75	134		71.4	15.9	254	291	274	240	68.1	15.9	279	288	272	263
P15	32.75	134		71.2	15.9	254	288	271	239	67.8	15.9	278	286	270	263
G20	43.75	134		72.2	21.1	287	336	312	267	68.7	21.1	316	332	310	295
P20	43.75	134		71.7	21.1	287	330	306	266	68.2	21.1	315	327	304	294
G25	43.75	134		73.2	21.1	293	354	330	274	69.8	21.1	322	351	328	301
P25	43.75	134		72.8	21.1	293	348	324	273	69.3	21.1	322	345	322	301
G30	54.75	134		74.6	26.1	331	417	380	302	71.1	26.2	365	412	377	334
P30	54.75	134		73.9	26.1	330	407	370	301	70.4	26.1	364	402	368	333
G35	54.75	134		74.6	25.9	344	432	389	309	71.2	26.0	378	428	386	341
P35	54.75	134		73.9	25.9	343	422	379	308	70.5	26.0	377	418	377	340
G40	60.25	134		74.9	28.7	358	454	413	326	71.4	28.8	394	450	410	360
P40	60.25	134		74.3	28.7	357	444	403	324	70.8	28.7	393	440	401	358
G50	43.75	160		87.9	21.1	379	462	431	353	84.8	21.1	407	459	429	380
P50	43.75	160		87.2	21.1	377	452	420	351	84.1	21.1	405	449	418	378
G60	54.75	160		88.6	26.0	433	536	486	392	85.4	26.1	466	533	484	423
P60	54.75	160		87.5	26.0	430	518	468	388	84.2	26.0	463	514	466	419
G70	54.75	160		89.5	25.8	446	566	505	398	86.4	25.9	479	562	504	429
P70	54.75	160		88.5	25.8	443	548	488	394	85.3	25.8	476	544	486	426
G80	60.25	160		90.2	28.6	465	601	543	420	87.0	28.6	500	597	541	454
P80	60.25	160		89.2	28.6	462	582	525	416	86.0	28.6	479	578	523	450



Model Number Description

AH Model Number Description

A	H	A	20	O	A	O	F0	O	O	C	F	1	O	5	H	O	P
1	2	4	5, 6	7	8	9	10, 11	12	13	14	15	16	17	18	19	20	21

Digits 1, 2 — Unit Type

AH — Air Handling Unit

Digit 3 — Connection Side

A — Left-hand access
B — Right-hand access

Digit 4 — Development Sequence

A — First Generation

Digits 5, 6 — Unit Size

20 — 1500 - 8000 Cfm
40 — 4000 - 14000 Cfm

Digit 7 — Venting Type

O — None

Digit 8 — Main Power Supply

A — 115/60/1
B — 208/60/1
C — 230/60/1
D — 208/60/3
E — 230/60/3
F — 460/60/3
G — 575/60/3

Digit 9 — Gas Control Option

O — No gas control option

Digits 10, 11 — Design Sequence

F0 — Design Sequence

Digit 12 — Fuel Type

O — No selection

Digit 13 — Heat Exchanger Material

O — No selection

Digit 14 — Air Handler Arrangements

B — Blower (Standard)
C — Blower (Standard) Plenum
D — Blower (Standard) Evaporative Cooler
E — Blower (Standard) Evaporative Cooler/Plenum
G — Blower (High CFM)
J — Blower (High CFM)/Plenum
K — Blower (High CFM)/Coil Cabinet
L — Blower (High CFM)/Coil Cabinet/ Plenum

Digit 15 — Motor Selection

A — 1/2 HP. w/Contactor
B — 3/4 HP. w/Contactor
C — 1 HP. w/Contactor
D — 1-1/2 HP. w/Contactor
E — 2 HP. w/Contactor
F — 3 HP. w/Contactor
G — 5 HP. w/Contactor
H — 1/2 HP. w/Magnetic Starter
J — 3/4 HP. w/Magnetic Starter
K — 1 HP. w/Magnetic Starter
L — 1-1/2 HP. w/Magnetic Starter
N — 2 HP. w/Magnetic Starter
P — 3 HP. w/Magnetic Starter
Q — 5 HP. w/Magnetic Starter
R — 7-1/2 HP. w/Magnetic Starter
T — 10 HP. w/Magnetic Starter
U — 15 HP. w/Magnetic Starter
V — 1 HP. w/VFD
W — 1-1/2 HP. w/VFD
X — 2 HP. w/VFD
Y — 3 HP. w/VFD
Z — 5 HP. w/VFD
1 — 7-1/2 HP. w/VFD
2 — 10 HP. w/VFD
3 — 15 HP. w/VFD

Digit 16 — Motor Speed

1 — Single Speed ODP 1800 RPM
2 — Single Speed TEFC 1800 RPM
3 — Single Speed High Efficiency ODP 1800 RPM
4 — Single Speed High Efficiency TEFC 1800 RPM

Digit 17 — Coil Options

O — No cooling coil selection
A — DX coil, 4 Row, Single Circuit
B — DX coil, 4 Row, Dual Circuit
C — DX coil, 6 Row, Single Circuit
D — DX coil, 6 Row, Dual Circuit
E — Chilled Water Coil, 4 Row, Single Circuit
G — Chilled Water Coil, 6 Row, Dual Circuit

Digit 18 — Air Inlet Configuration

1 — Outside Air (OA) Horizontal Inlet
2 — Outside Air W/Air Hood, Horizontal Inlet
3 — Bottom Return Air (RA)
4 — Outside and Return Air (OA/RA)
5 — Outside and Return Air W/Air Hood

Digit 19 — Air Control and Damper Arrangements

O — No selection
A — Outside Air 2 Pos. Motor / SR
B — Return Air 2 Pos. Motor / SR
C — OA/RA 2 Pos. / SR
Q — OA/RA Mod. Mtr. w/CO₂Sensor
E — OA/RA Mod. Mtr. w/Mixed Air Control / Min. Pot. / SR
H — OA/RA Mod. Mtr. w/Mixed Air Control / SR
K — OA/RA Mod. Mtr. w/Min. Pot. / SR
M — OA/RA Mod. Mtr. w/Dry Bulb / Mixed Air Control / Min. Pot. /SR
N — OA/RA Mod. Mtr. w/Enthalpy Controlled Economizer / SR
P — OA/RA Mod. Mtr. w/Pressure Control (Space Pressure)
R — OA/RA Mod. Mtr. w/S-350-P Proportional Mixed Air Control/SR
U — OA/RA MTR. W/External 0-10 VDC and 4-20 mA Analog Input/SR (External Input)
W — ASHRAE Cycle I (OA/RA 2 pos. w/warm-up stat/SR)
X — ASHRAE Cycle II (OA/RA Mod W/Warm-up Stat/Mixed Air/min pot/SR)
Y — ASHRAE Cycle III (OA/RA Mod. W/Warm-up Stat/Mixed Air/SR)
Z — Manual Dampers

Digit 20 — California Shipment

O — Non-California Shipment
1 — California Shipment

Digit 21 — Miscellaneous Options

- B** — 12" Evaporative Media (Celdek)
- C** — Moisture Eliminators
- D** — Horizontal Return
- E** — Air Flow Proving Switch
- F** — Freezestat
- H** — Return Air Firestat
- J** — Supply Air Firestat
- K** — Manual Blower Switch
- N** — Double Wall Construction
- P** — Low Leak Dampers
- Q** — Clogged Filter Switch
- T** — Status Indicator Lights (Elec Cabinet)
- W** — 8" Evaporative Media (Glasdek)
- X** — 12" Evaporative Media (Glasdek)
- Y** — Ambient Lockout
- Z** — Freezestat for Evap. Cooler
- 0** — No Filters Selected
- 1** — 1" Washable (Standard) Filters
- 2** — 2" Washable Filters
- 3** — 2" Throwaway Filters
- 4** — 1" Pleated Media Filters
- 5** — 2" Pleated Media Filters

Digit 22 — VFD Accessories

- 1** — Field Installed VFD
- 2** — Factory Installed VFD
- 3** — VFD Remote Keypad (Field Installed)
- 4** — CO₂ Sensor, 100% Outside Air
- 5** — CO₂ Sensor, Mixed Air
- 6** — Pressure Sensor
- 7** — 2-Speed VFD Relays
- 8** — 3-Speed VFD Relays
- 9** — VFD Enclosure



Model Number Description

GR Model Number Description

G	R	A	A	40	G	D	C	C	0	N	2	B	Q	1	0	2	A	0	+
1	2	3	4	5,6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

Digit 1 — Gas Heating Equipment

G — Gas

Digit 2 — Unit Type

F — Rooftop Duct Furnace
R — Rooftop Heating Unit
S — Special Unit Type

Digit 3 — Furnace Type

A — Standard Temp Rise (20-60 F) LH
B — Standard Temp Rise (20-60 F) RH
C — High Temp Rise (60-90 F) LH
D — High Temp Rise (60-90 F) RH
S — Special Furnace Type

Note: LH = Left Hand, RH = Right Hand

Digit 4 — Development Sequence

A — First Generation

Digit 5, 6 — Input Capacity

Single Furnace

10 — 100 MBh Input
15 — 150 MBh Input
20 — 200 MBh Input
25 — 250 MBh Input
30 — 300 MBh Input
35 — 350 MBh Input
40 — 400 MBh Input
Double Furnace
50 — 500 MBh Input
60 — 600 MBh Input
70 — 700 MBh Input
80 — 800 MBh Input

Triple Furnace

12 — 1200 MBh Input
SS — Special Unit

Digit 7 — Venting Type

G — Gravity Venting
P — Power Venting
S — Special Venting

Digit 8 — Main Power Supply

A — 115/60/1
B — 208/60/1
C — 230/60/1
D — 208/60/3
E — 230/60/3
F — 460/60/3
G — 575/60/3
S — Special Main Power Supply

Digit 9 — Main Power Supply Gas Control Option (Intermittent Pilot Ignition)

A — Single-Stage
B — Two-Stage
G — Electronic Modulating With Room T-Stat
H — Electronic Modulating With Duct T-Stat
J — Electronic Modulating With Duct T-Stat and Override Room Thermostat
K — Electronic Modulating W/External 4-20 mA Input (Furnace 1)
L — Electronic Modulating W/External 4-20 mA Input (All furnaces)
M — Electronic Modulating W/External 0-10 VDC Input (Furnace 1)
N — Electronic Modulating W/External 0-10 VDC Input (All furnaces)
P — Two-Stage Remote Temperature Control
R — Three-Stage Remote Temperature Control
T — Four-Stage Remote Temperature Control
U — S-350 2 Stage Modular Electronic Control System
W — S-350 3 Stage Modular Electronic Control System
X — S-350 4 Stage Modular Electronic Control System
Y — S-350 6 Stage Modular Electronic Control System
S — Special Gas Control

Digits 10,11 — Design Sequence

F0 — Design Sequence

Digit 12 — Fuel Type

N — Natural Gas
P — LP (Propane) Gas
L — Natural Gas with 100% Lockout
S — Special Fuel Type

Digit 13 — Heat Exchanger Material

1 — Aluminized Steel
2 — #409 Stainless Steel (First Furnace Only)
3 — #409 Stainless Steel (All Furnace Sections)
4 — #321 Stainless Steel (First Furnace Only)
5 — #321 Stainless Steel (All Furnace Sections)
6 — #409 Stainless Steel Package (First Furnace Only)
7 — #409 Stainless Steel Package (All Furnace Sections)
8 — #321 Stainless Steel Package (First Furnace Only)
9 — #321 Stainless Steel Package (All Furnace Sections)
S — Special Heat Exchanger Package

Digit 14 — Rooftop Arrangements

A — Duct Furnace
B — Blower (Standard)
C — Blower (Standard) Plenum
D — Blower (Standard) Evaporative Cooler
E — Blower (Standard) Evaporative Cooler/Plenum
G — Blower (High CFM)
J — Blower (High CFM)/Plenum
K — Blower (High CFM)/Coil Cabinet
L — Blower (High CFM)/Coil Cabinet/ Plenum
S — Special Rooftop Arrangement

Digit 15 — Rooftop Heating Unit Motor Selection

0 — None (Rooftop duct furnace)
A — 1/2 HP. w/Contactor
B — 3/4 HP. w/Contactor
C — 1 HP. w/Contactor
D — 1-1/2 HP. w/Contactor
E — 2 HP. w/Contactor
F — 3 HP. w/Contactor
G — 5 HP. w/Contactor
H — 1/2 HP. w/Magnetic Starter
J — 3/4 HP. w/Magnetic Starter
K — 1 HP. w/Magnetic Starter
L — 1-1/2 HP. w/Magnetic Starter
N — 2 HP. w/Magnetic Starter
P — 3 HP. w/Magnetic Starter
Q — 5 HP. w/Magnetic Starter
R — 7-1/2 HP. w/Magnetic Starter
T — 10 HP. w/Magnetic Starter
U — 15 HP. w/Magnetic Starter
V — 1 HP. w/VFD
W — 1-1/2 HP. w/VFD

Digit 15 — Rooftop Heating Unit Motor Selection (cont.)

- X** — 2 HP. w/VFD
- Y** — 3 HP. w/VFD
- Z** — 5 HP. w/VFD
- 1** — 7-1/2 HP. w/VFD
- 2** — 10 HP. w/VFD
- 3** — 15 HP. w/VFD
- S** — Special Motor

Digit 16 — Motor Speed

- 1** — Single Speed ODP 1800 RPM
- 2** — Single Speed TEFC 1800 RPM
- 3** — Single Speed High Efficiency ODP 1800 RPM
- 4** — Single Speed High Efficiency TEFC 1800 RPM
- S** — Special Motor Speed

Digit 17 — Coil Options

- O** — No cooling coil selection
- A** — DX coil, 4 Row, Single Circuit
- B** — DX coil, 4 Row, Dual Circuit
- C** — DX coil, 6 Row, Single Circuit
- D** — DX coil, 6 Row, Dual Circuit
- E** — Chilled Water Coil, 4 Row, Single Circuit
- G** — Chilled Water Coil, 6 Row, Dual Circuit
- S** — Special Coil

Digit 18 — Air Inlet Configuration

- O** — None (Rooftop Duct Furnace)
- 1** — Outside Air (OA) Horizontal Inlet
- 2** — Outside Air W/Air Hood, Horizontal Inlet
- 3** — Bottom Return Air (RA)
- 4** — Outside and Return Air (OA/RA)
- 5** — Outside and Return Air W/Air Hood
- S** — Special Air inlet configuration

Digit 19— Air Control and Damper Arrangements

- O** — No selection
- A** — Outside Air 2 Pos. Motor / SR
- B** — Return Air 2 Pos. Motor / SR
- C** — OA/RA 2 Pos. / SR
- D** — OA/RA Mod. Mtr. w/CO₂Sensor
- E** — OA/RA Mod. Mtr. w/Mixed Air Control / Min. Pot. / SR
- H** — OA/RA Mod. Mtr. w/Mixed Air Control / SR
- K** — OA/RA Mod. Mtr. w/Min. Pot. / SR
- M** — OA/RA Mod. Mtr. w/Dry Bulb / Mixed Air Control / Min. Pot. /SR

Digit 19— Air Control and Damper Arrangements (cont.)

- N** — OA/RA Mod. Mtr. w/Enthalpy Controlled Economizer / SR
- P** — OA/RA Mod. Mtr. w/Pressure Control (Space Pressure)
- Q** — OA/RA Mod. Mtr. w/CO₂Sensor
- R** — OA/RA Mod. Mtr. w/S-350-P Proportional Mixed Air Control/SR
- U** — OA/RA MTR. W/External 0-10 VDC and 4-20 mA Analog Input/SR (External Input)
- W** — ASHRAE Cycle I (OA/RA 2 pos. w/warm-up stat/SR)
- X** — ASHRAE Cycle II (OA/RA Mod W/Warm-up Stat/Mixed Air/min pot/SR)
- Y** — ASHRAE Cycle III (OA/RA Mod. W/Warm-up Stat/Mixed Air/SR)
- Z** — Manual Dampers
- S** — Special Air Control and Damper Arrangement

Digit 20 — California Shipment

- 0** — Non-California Shipment
- 1** — California Shipment

Digit 21 — Miscellaneous Options

- A** — Orifices For Elevation Above 2000 Feet (Specify Elevation)
- B** — 12" Evaporative Media (Celdek)
- C** — Moisture Eliminators
- D** — Horizontal Return
- E** — Air Flow Proving Switch
- F** — Freezestat
- G** — Fan Time Delay Control (Duct Furnace Only)
- H** — Return Air Firestat
- J** — Supply Air Firestat
- K** — Manual Blower Switch
- L** — 409 Stainless Steel Furnace Drip Pan
- M** — Input De-rate
- N** — Double Wall Construction
- P** — Low Leak Dampers
- Q** — Clogged Filter Switch
- R** — High/Low Gas Pressure Limit Switches
- T** — Status Indicator Lights (Elec Cabinet)
- V** — Manual Reset High Limit Switch
- W** — 8" Evaporative Media (Glasdek)
- X** — 12" Evaporative Media (Glasdek)
- Y** — Ambient Lockout
- Z** — Freezestat for Evap. Cooler
- 0** — No Filters Selected
- 1** — 1" Washable (Standard) Filters
- 2** — 2" Washable Filters
- 3** — 2" Throwaway Filters
- 4** — 1" Pleated Media Filters
- 5** — 2" Pleated Media Filters
- 6** — Service Convenience Package
- 7** — Through the Base Utilities

Digit 22 — VFD Accessories

- 1** — Field Installed VFD
- 2** — Factory Installed VFD
- 3** — VFD Remote Keypad (Field Installed)
- 4** — CO₂ Sensor, 100% Outside Air
- 5** — CO₂ Sensor, Mixed Air
- 6** — Pressure Sensor
- 7** — 2-Speed VFD Relays
- 8** — 3-Speed VFD Relays
- 9** — VFD Enclosure

Engineered Products Rooftop Arrangements (RA)*

NATURAL VENT	(RA)	POWER VENT	AIR HANDLERS	(RA)
	A			B
	B			C
	C			D
	D			E
	E			G
	G			J
	J			K
	K			L
	L			

Notes: *

1. Arrangements are shown with the maximum number of furnaces available.

2. Optional air inlet hood shown in dotted lines.

Legend: B/F/D = Standard Blower/Filter/Damper, SP = Supply Plenum, EV = Evaporative Cooler, F/D = Filter/Damper, B = High CFM Blower, CC = Cooling Coil

Capacity: 10/40 = 1 furnace 50/80 = 2 furnaces 12 = 3 furnaces



Gas Equipment Start-Up

Customer _____ Job Name & Number _____

PRE-INSPECTION INFORMATION

With power and gas off.

Type of Equip: Unit Heater Duct Furnace Indoor Rooftop

Serial Number _____ Model Number _____

Name Plate Voltage: _____ Name Plate Amperage: _____

Type of Gas: Natural LP Tank Capacity _____ lbs. Rating: _____ BTU @ _____ °F
_____ kg _____ kw @ _____ °C

- Are all panels, doors, vent caps in place?
- Has the unit suffered any external damage? Damage _____
- Does the gas piping and electric wiring appear to be installed in a professional manner?
- Has the gas and electric been inspected by the local authority having jurisdiction?
- Is the gas supply properly sized for the equipment?
- Were the installation instructions followed when the equipment was installed?
- Have all field installed controls been installed?
- Do you understand all the controls on this equipment? If not, contact your wholesaler or rep.

(DO NOT START this equipment unless you fully understand the controls.)

GENERAL

With power and gas off.

- Make certain all packing has been removed.
- Tighten all electrical terminals and connections.
- Check damper linkages for tightness.
- Check all fans & blowers for free movement.
- Check all controls for proper settings.
- Check all set screws on blowers and bearings.
- Check belt tightness.

BLOWER

With power on and gas off.

- Check voltage L1 _____ L2 _____ L3 _____
- Check rotation of main blower.
- Check motor amps L1 _____ L2 _____ L3 _____
- Blower RPM _____
- Check air filters (Record quantity & size.)

GAS HEATING

With power and gas on.

- Inlet gas pressure. _____ in. W.C. or _____ kPa
- Pilot & main burner ignition.
- Manifold gas pressure. _____ in. W.C. or _____ kPa
- Cycle on HIGH LIMIT.
- Cycle firestat and/or freezestat.
- Check electronic modulation. Set at: _____
- Cycle and check all other controls not listed.
- Check operation of remote panel.
- Entering air temp. _____ °F or _____ °C
- Discharge air temp. (high fire) _____ °F, or _____ °C
- External static pressure _____ in. W.C. or _____ kPa
- Cycle by thermostat or operating control.
- Combustion Reading.
Carbon Monoxide _____ PPM
Carbon Dioxide _____ %



Notes



Ingersoll Rand (NYSE: IR) advances the quality of life by creating comfortable, sustainable and efficient environments. Our people and our family of brands — including Club Car®, Ingersoll Rand®, Thermo King® and Trane® — work together to enhance the quality and comfort of air in homes and buildings; transport and protect food and perishables; and increase industrial productivity and efficiency. We are a global business committed to a world of sustainable progress and enduring results.



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