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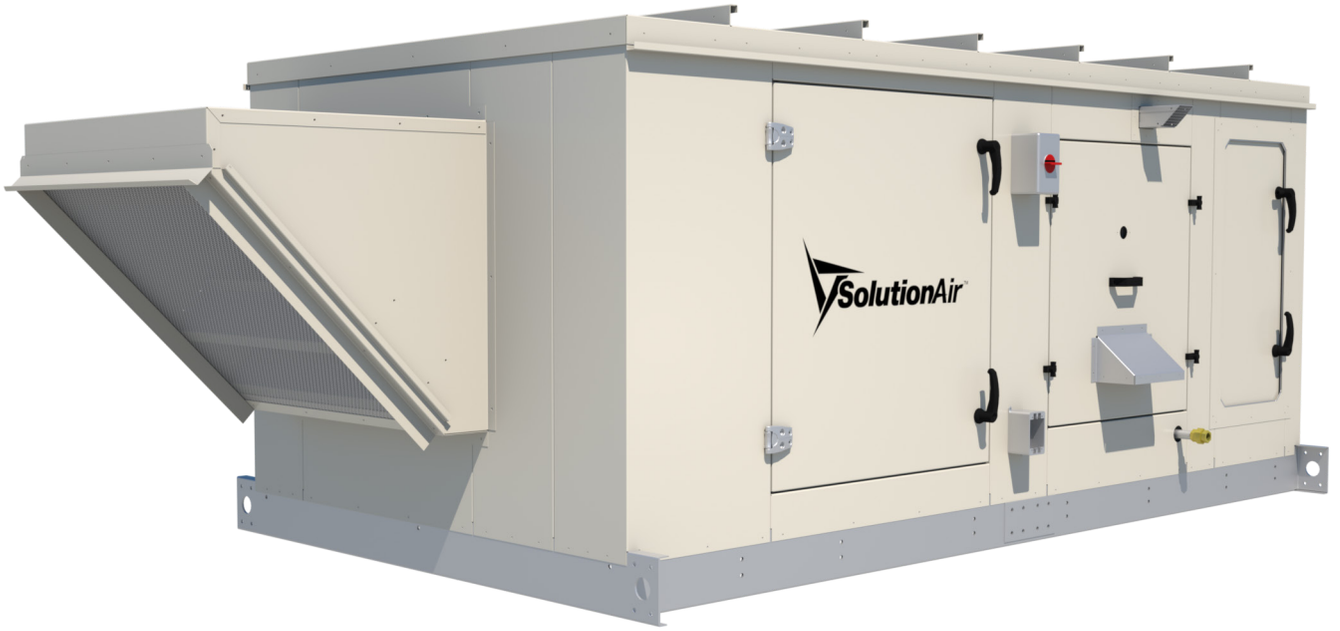

PMI-IF

Indirect Fired Gas Heaters

MANUAL – INSTALLATION, OPERATION AND MAINTENANCE

v002 – Issue Date: 01/29/21

PMI-IF

Table of Contents

Product Overview
- Unit Description 1
- Unit Nameplate 1
- Unit Inspection 1

Installation
- Installer's Responsibility 2
- Receiving and Warehousing 2
- General Handling Instructions 2
- General Installation Notes 2
- Connecting the Flue (Venting) for Outdoor Installations 4
- Connecting the Flue (Venting) for Indoor Installations 5
- Vertically Vented Furnaces – Category I 6
- Horizontally Vented Furnaces - Category III 7
- Indirect Fired Gas Heaters 7
- Special Considerations 9
- Electrical Connections 9
- Gas Piping 9
- Gas Vent 9
- Duct Furnaces 10
- Cooling 10
- High Altitude 10
- Indoor Units 10

General Operating Instructions
- Prior to Start-Up 11
- Start-Up Procedures Precautions 11
- Start-Up 11
- Manifold Pressure Adjustment 12
- Shut Down 12

Maintenance
- Recommended Quarterly Maintenance 13
- Recommended Yearly Maintenance 13
- Limited Warranty 14

Standard Sequences & Wiring
- Utec 1016-xxx Direct Spark Ignition Control 16
- Troubleshooting Guide for UTEC 1016-xxx Ignition Board 17
- PMI-IF Troubleshooting Guide 18
- PMI-IF Indirect Fired Heater: 2 Stage 19
- PMI-IF Indirect Fired Heater: Modulating 20
- BMS Points List 21
- PMI-IF Start-Up Report 25

Appendices
- Appendix A: Assembly of Split Units 32

ATTENTION: Read this manual, heater submittal sheets and all labels attached to the heater carefully before attempting to install, operate or service these heaters! Check heater data plates for type of gas, model number and serial numbers. Retain this document for future reference.

WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, severe personal injury or death. Please read this installation, operation and maintenance manual thoroughly before installing or servicing this equipment.

For your safety, if you smell gas, follow these instructions,

1. Open windows
2. Do not touch electrical switches
3. Extinguish any open flames
4. Call the gas supplier immediately

For your safety the use of gasoline or other flammable vapours and liquids in open containers in the vicinity of this heater is hazardous.

NOTE: Reference to Codes & Standards within this manual are correct as at the date this manual was prepared and may not be accurate at the time the heater(s) is/are installed.

MANUFACTURED BY

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ANSI Z83.8-2009
Commercial Industrial
Gas Heating Equipment

CSA 2.6-2009
Industrial Package Gas Fired Package Furnaces

PMI-IF

Product Overview

Unit Description

The PMI-IF model is an indirect fired gas heating unit with a convoluted type heat exchanger. The unit can be either indoor or outdoor and may include supplemental cooling and/or energy recovery.

A: Unit model

B: Heat exchanger configuration

C: Nominal heating capacity in kBtu/h

D: Heat exchanger model

A = 80% Standard efficiency

D = 80% Standard efficiency

H = 90% High efficiency

UNIT DESCRIPTION TABLE ▼

A		B		C	D
PMI-IF	-	XX		X, XXX	H

Unit Nameplate

Figure 1 shows a typical nameplate for a PMI-IF unit. The nameplate is generally located in the gas train weather housing. The nameplate includes model number, serial number, electrical characteristics and other pertinent data.

Unit Inspection

This unit has been inspected and test fired prior to shipment to make sure the unit is free from defects from the manufacturer. It is possible that damage may occur during shipping, rigging and installation.

Upon receiving the unit, check that all items have been delivered by comparing the Bill of Lading to the equipment received. If anything is missing or damaged, notify the carrier immediately. The carrier should note this on the packing slip or other form of documentation and provide a copy.

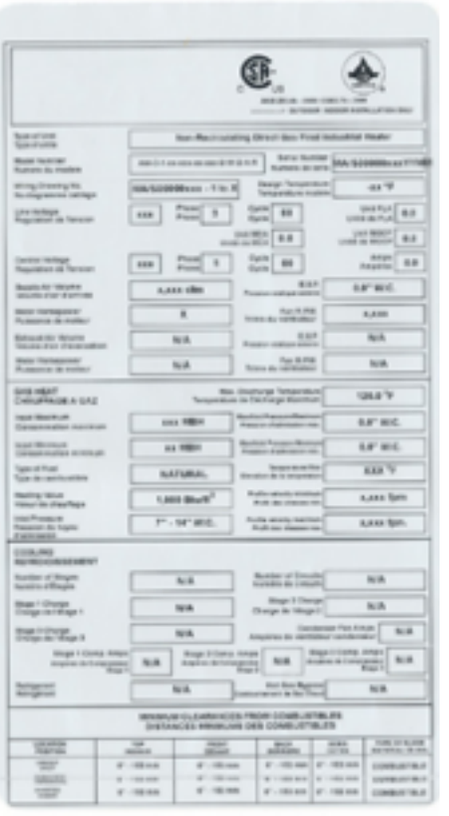
NOTE: it is a good idea to take a photograph of any possible damage for record purposes.

Check the unit model number, heater size and electrical characteristics to make sure they are correct. If there are any issues, do not proceed with the installation. Contact your sales representative.

Storage

If the unit is to be stored, take precautions to prevent condensate from forming inside the unit's electrical compartments. Make sure the equipment is protected from weather and dust from site conditions by temporarily sealing all openings to the air tunnel for outdoor units and completely covering indoor units.

FIGURE 1: TYPICAL NAMEPLATE ▼



Do not use the unit for temporary heat without first completing the start-up procedure. SolutionAir will not assume any responsibility for equipment damage resulting from condensate accumulation on the unit's electrical and /or mechanical components.

PMI-IF

Installation

Installer's Responsibility

INSTALLER PLEASE NOTE: This equipment has been test fired and inspected. It has been shipped free of defects from the manufacturer. However, as a result of shipping, unpacking or installation, damage to the heater may occur. It is the licensed installer's responsibility to inspect the heater and safely correct any defects that may be found. It is also the licensed installer who must identify the particular codes, standards and/or ordinances that may affect the installation of the heater.

Receiving and Warehousing

Inspect the heater upon arrival for any shipping damage. If any part is missing or damaged, mark the bill of lading as to damage and notify the carrier and manufacturer at once. If the heater is not installed immediately, store the unit in a clean and dry place.

General Handling Instructions

A qualified and experienced crane operator must do all rigging. General rigging methods should be followed in all cases:

a) Spreader bars must be used when lifting equipment.

b) Equipment must be lifted simultaneously by all "eye" bolts or channel slots provided on each section at the same time to distribute the load properly. Damage or injury may result if all provisions for lifting are not utilized at time of lift. When multiple lifting eyes are furnished they are to share the weight of the lift evenly via spreader bar(s).

c) Lifting eyes and channel slots are designed to be lifted vertically. The MAXIMUM angle from a vertical lift, which is permitted, is 30 degrees. Single sections only are to be lifted at one time and stacked from the lowest section upward. Sections are designed to be self - supporting in compression only. Do not attempt to hang multiple sections from any structure. The total perimeter base and all frame structure must be supported, and levelled, on high-density concrete or sufficient I-beam steel.

d) SPLIT UNITS: Some PMI-IF units may be shipped in multiple sections for field assembly by the installing contractor. For proper assembly of split units, refer to Appendix A of this manual. Failure to follow the instructions in this manual may void your warranty.

WARNING

Failure to comply with the general handling instructions requirements may void warranty and may result in extensive property damage, severe personal injury or death.

General Installation Notes

a) In Canada the heater installation must conform with local building codes or, in the absence of local building codes, to the current CAN/CSA-B149.1 or B149.2 "Installation Codes for Gas Burning Appliances and Equipment". Indoor duct furnaces have been designed for, and certified to comply with, CAN/CSA2.8.

b) In USA the heater installation must be made in accordance with local codes or in absence of local codes with ANSI Standard Z223.1-1992 (N.F.P.A. No.54) "National Fuel Gas Code" or the latest edition of all ANSI and NFPA standards. Standards referred to in these installation instructions are in effect at the time of certification. ANSI Standards are available from the American Gas Association 1515 Wilson Boulevard, Arlington, Virginia 22209. NFPA standards are available from the National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02169-7471. Heaters referred to in this manual are designed for use in airplane hangers when installed in accordance with ANSI/NFPA No.409 and in public garages when installed in accordance with the NFPA No. 88a and NFPA No.88b.

c) No alterations are to be made to this equipment.

d) For suspended heaters that are installed in aircraft hangers, parking structures and repair garages same must be installed in accordance with the standard on aircraft hangers. In Canada follow current CAN/CSA-B149 codes and in the USA follow ANSI/NFPA 409, the standard for parking structures. ANSI/NFPA 88a, the standard for repair garages, ANSI/NFPA 88b.

Installation

Clearance to Combustible Materials in inches (mm)

TOP	FRONT	BACK	FLOOR	SIDES	ACCESS SIDE
6" (152mm)	6" (152mm)	6" (152mm)	3" (76mm)	6" (152mm)	24" (610mm)

All heaters installed on the floor must have a minimum clearance of 3" (76mm) which is provided by the heaters base frame.

For service it is advisable to maintain a minimum 24" (610mm) clearance on the side opposite the controls side. If this heater is to be operated within a confined space or within a building of unusually tight construction, air for combustion and ventilation must be obtained from outdoors or other spaces that have unhindered ventilation with the outdoors. Refer to applicable Canadian and United States Fuel Gas Codes.

Ducts connected to the furnace shall have removable access panels on both the upstream and downstream sides of the heater. These openings shall be accessible when the heater is installed and shall be sized to allow for the observation of smoke or reflected light inside the casing to indica te the presence of leaks in the heat exchanger. The covers for the openings shall be attached in such manner as to prevent leaks.

WARNING

a) The heater must not be operated in the presence of hazardous atmospheres containing flammable vapours or combustible dust, chlorinated vapours or halogenated hydrocarbons or in applications with airborne substances containing silicone. When such vapours mix with products of combustion, highly corrosive compounds result, which will result in the premature failure of the heat exchanger and other components. In such an event the warranty is void.

b) The heater is not certified or suitable for use in drying process applications. Use in such applications voids any warranty and the manufacturer disclaims any responsibility for the duct furnace and/or application.

c) The use and storage of gasoline or other flammable liquids in the vicinity of the heater is hazardous.

Connecting the Flue (Venting) for Outdoor Installations

Air for Combustion

The heat exchanger module must have an adequate supply of air for proper combustion of gas. Never locate the heater so that supply of air to the combustion air openings is obstructed. Combustion air inlet and flue gas outlet must be located in the same pressure zone. Refer to appropriate installation codes for required clearances to combustion air openings and flue gas outlets.

Venting

The vent termination must be located in accordance with the CAN/CSA-B149 Installation Code in Canada or the National Fuel Codes (ANSI Z223.1) in the US.

The venting system for outdoor units is a Category III, with vent products at positive pressure and up to 550°F (288°C). The cross-sectional area of the vent duct or pipe must be at least equal to the discharge area of the draft inducer.

The discharge opening must always be located in the same pressure zone as the combustion air inlet. Flue gases must be directed away from combustion air inlets to avoid recirculation into combustion air supply.

a) For horizontal discharge, the outlet must be located on the same side of the heater as the combustion air inlet opening. Never locate the vent outlet on the opposite side from the combustion air inlet opening. The vent duct should extend about an inch past the cabinet to minimize the potential of recirculation. Vent duct should be pitched down toward the outlet to insure proper drainage. The duct opening should be protected by a ½ in. x ½ in. (12mm x 12mm) mesh screen. A rain cap or cover may be used over the discharge opening, but should not intersect the flue gas discharge path (**See Fig. 1 below**).

b) For horizontal discharge where flue gases need to be vented vertically, the preferred flue gas discharge should terminate in an exterior flue riser that extends at least to the top of the cabinet and is open at top and bottom. This riser must be located on the same side of the heater as the combustion air inlet opening. An open riser should never be located in the heater vestibule as this could result in recirculation of flue gases into the combusti

FIGURE 1: HORIZONTAL VENTING ▼

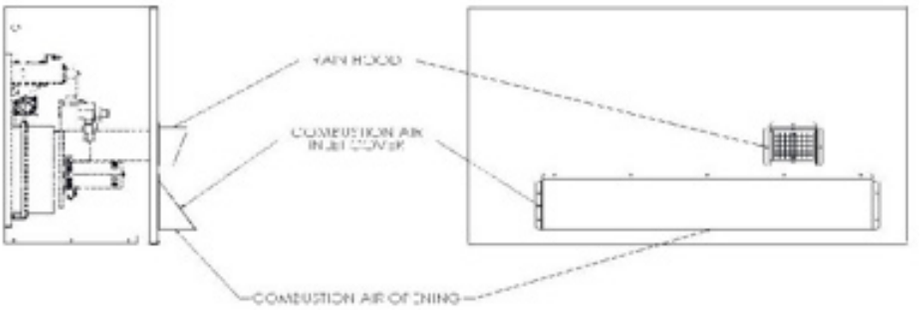
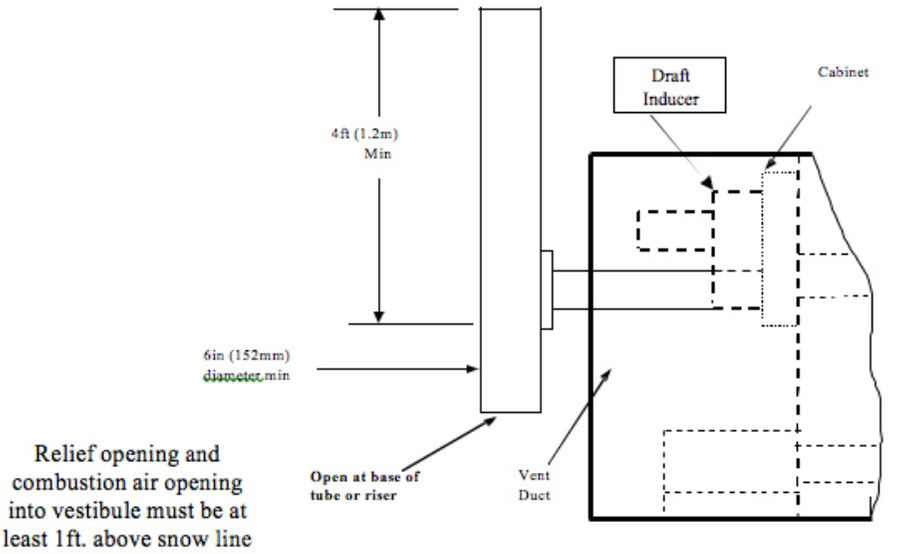


FIGURE 2: VERTICAL VENTING - EXTERIOR FLUE RISER ▼



on air supply for the burners (**See Fig. 2 on page 7**).

c) For vertical discharge, employ a 90° elbow and sufficient vent pipe so that the vent terminates at least 1 to 2 feet above the cabinet. An approved rainproof vent cap must be applied to the termination.

d) For flue vent sizing consult the applicable National Fuel Gas Code.

Connecting the Flue (Venting) for Indoor Installations

Air for Combustion

The heater must be installed in a location with adequate clearances for combustion air supply, service and inspection, and proper distances from combustible materials. The heater shall be located in such a manner that it does not interfere with the circulation of air in the heated space.

All fuel burning equipment must be supplied with air that enters into the combustion process and is then vented outdoors. Sufficient air must enter the heater location to replace the air exhausted through the vent system. Do not install heater in a confined space without providing wall openings to and from this space. If building construction is such that the normal infiltration does not provide sufficient air for combustion and venting, o utside air must be introduced in accordance with ANSI Z223.1, sections 1.3.4.2 and 1.3.4.3. Install air openings that provide a total free area in accordance with the following:

a) Air from inside the building – Opening of 1 sq. in. (645mm^2) per 1,000 Btuh (293W) of input, but never less than 100 sq. in. (.06 m^2)

b) Air from outside (ducted) – Opening of 1 sq. in. (645mm^2) per 2,000 Btuh (586W)

Venting

All heaters must be vented outside of the heated space. In Canada all venting installations shall be in accordance with the latest editions CAN/CSA-B149 and in the USA all venting installations shall be in accordance with the latest editions of ANSI Z223.1, the National Fuel Gas Codes, Part 7 “Venting of Equipment”, or applicable provisions of local codes and ordinances.

The heater must be connected to a factory-built chimney or vent complying with the applicable code, standard or ordinance, or a masonry or concrete chimney lined with a material acceptable to the authority having jurisdiction.

The heater modules will be classified, and will be identified on the heater’s rating plate, in accordance with ANSI standards as follows:

Category I – Non-condensing appliance with negative vent pressure.

Category III – Non-condensing appliance with positive vent pressure.

Vertically Vented Furnaces – Category III

Please see **figure 3**.

a) Use single wall or double wall (Type B) vent pipe of a diameter listed in the following table for the appropriate model Btu/hr:

National Fuel Gas Code Venting Pipe requirement

i. nput ratings of 75,000 Btuh (21,980 W) to 149,999 Btuh (43,958 W) - 5 in. diameter (126mm)

ii. Input ratings of 150,000 Btuh (43,960 W) to 400,000 Btuh (11,7228 W) - 6 in. diameter (152mm)

b) Maximize the height of the vertical run of vent pipe. A minimum of five (5) feet (1.5m) of vertical pipe is required. The top of the vent pipe must extend at least two (2) feet (0.61m) above the highest point on the roof. Use Listed Type B vent for external runs. An approved weatherproof vent cap must be installed on the vent termination.

c) Horizontal runs must not exceed 75% of the vertical height of the vent pipe, up to a maximum of ten (10) feet (3m). Horizontal runs should be pitched upward ¼ in. per foot (21mm/m) and should be supported at three (3) foot (1m) maximum intervals.

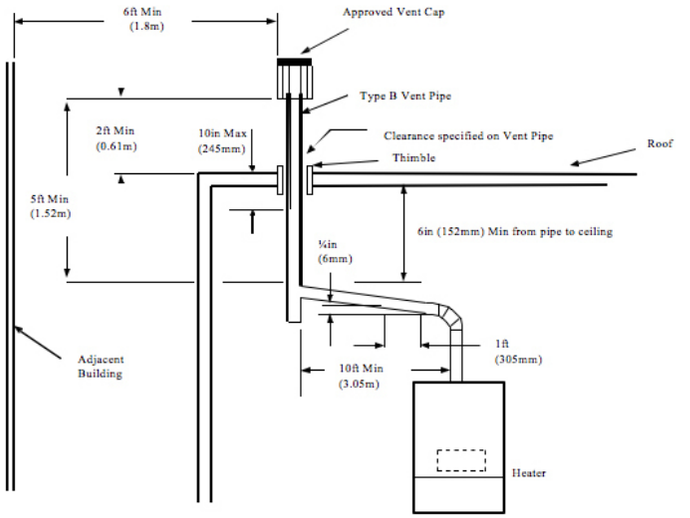
d) Design vent pipe runs to minimize the use of elbows. Each 90° elbow is equivalent to five (5) feet (1.5m) of straight vent pipe.

e) Vent pipe should not be run through unheated spaces. If such runs cannot be avoided, insulate the vent pipe to prevent condensation. Insulation should be a minimum of ½ in. (12.7mm) thick foil faced fibreglass minimum of 1 ½ lb density.

f) Dampers must not be used in vent piping runs, as spillage of flue gases into the occupied space could result.

g) Vent connectors serving Category I heaters must not be connected into any portion of a mechanical draft system operating under positive pressure.

FIGURE 3: VERTICAL VENTING – CATEGORY III ▼



Horizontally Vented Furnaces - Category III

Please see **figure 4**.

Pressures in Category III venting systems are positive and therefore care must be taken to prevent flue products from entering the heated space. Use only venting materials and components that are UL listed and approved for Category III venting systems.

WARNING

Do not use Type B vent within a building on horizontally vented units.

All vent pipe joints must be sealed to prevent leakage. Follow the instructions provided with the approved venting materials. Vent pipe shall be sized as follows:

a) Input ratings of 75,000 Btuh (21,980 W) to 149,999 Btuh (43,958 W) - 5 in. diameter (126mm)

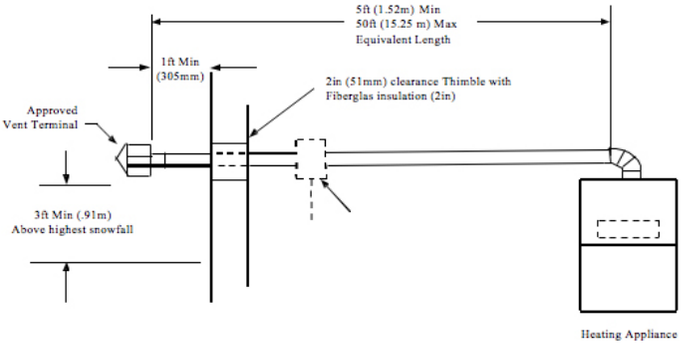
b) Input ratings of 150,000 Btuh (43,960 W) to 400,000 Btuh (11,7228 W) - 6 in. diameter (152mm)

The total equivalent length of vent pipe must not exceed 50 ft. (15.25m). Equivalent length is the total length of straight sections, plus 5 ft. (1.52m) for each 90° elbow and 2.5 ft. (0.76m) for each 45° elbow.

The vent system must also be installed to prevent collection of condensate. Pitch horizontal pipe runs downward ¼ in. per foot (21mm per meter) toward the outlet to permit condensate drainage. Insulate vent pipe exposed to cold air or routed through unheated areas. Insulate vent pipe runs longer than 10 ft. (3m). Insulation should be a minimum of ½ in. (12mm) thick foil faced fibreglass of 1 ½ lb density. Maintain 6 in. (152mm) clearance between vent pipe and combustible materials.

An approved Breidert Type L, Field Starkap or equivalent vent cap must be provided. Vent cap inlet diameter must be the same as the vent pipe diameter. The vent terminal must be at least 12 in. (305mm) from the exterior wall that it passes through to prevent degradation of building mate rial by flue gases. The vent terminal must be located at least 12 in. (305mm) above grade, or in snow areas, at least 3 ft. (1m) above snow line to prevent blockage. Additionally, the vent terminal must be installed with a minimum horizontal clearance of 4 ft. (1.2m) from electric meters, gas meters, regulators or relief equipment.

FIGURE 4: HORIZONTAL VENTING – CATEGORY III



Through-the-wall vents shall not terminate over public walkways or over an area where condensate or vapour could create a nuisance or hazard. Provide vent termination clearances to building or structure features as follows:

Structure	Minimum Clearance
Door, Window or gravity inlet	4 ft. (1.2m) below 4 ft. (1.2m) horizontally 1 ft. (305 mm) above
Forced air inlet within 10 ft. (3m)	3 ft. (.91m) above
Adjoining building or parapet	6 ft. (1.8m)
Adjacent public walkways	7 ft. (2.1m) above grade

WARNING

Each heater must have its own individual vent pipe and terminal.

Do not connect vent system from horizontally vented units to other vent systems or a chimney.

INDIRECT FIRED GAS HEATERS

Installation

Vertically and Horizontally Vented Furnaces - Category IV

Pressures in Category IV venting systems are positive and therefore care must be taken to prevent flue products from entering the heated space. Use only venting materials and components that are UL listed and approved for Category IV venting systems.

WARNING

The vent materials (piping, fittings and cement) must meet the listed requirements in this manual. Failure to comply with these material requirements could result in severe personal injury, death or substantial property damage.

All vent pipe joints must be sealed to prevent leakage. Follow the instructions provided with the approved venting materials. Vent pipe shall be sized as follows:

a) Input ratings of 50,000 Btuh (14,650 W) to 150,000 Btuh (43,960 W) - 3 in. NPS diameter

b) Input ratings of 150,005 Btuh (43,961 W) to 400,000 Btuh (11,728 W) - 4 in. NPS diameter

The total equivalent length of vent pipe must not exceed 50 ft. (15.25m); with a total horizontal run not exceeding 35ft. (10.67m). Equivalent length is the total length of straight sections, plus 5 ft. (1.52m) for each 90° elbow and 2.5 ft. (0.76m) for each 45° elbow.

The vent system must utilize PVC material as follows:

PVC Schedule 40 - ANSI/ASTM D1785

PVC-DWV - ANSI/ASTM D2665

with cement and primer as follows:

PVC - ANSI/ASTM D2564.

NOTICE

For installations in Canada, all piping, fittings and cement/primer materials must be crtified and listed to ULC-S636. Ipex Inc. is an approved manufacturer of ULC-S636 vent components.

See supplimentary attached "HEG SERIES HIGH EFFICIENCY DUCT FURNACE - Installation Instructions And Maintenance Manual" Sections 6, 6.2, 6.3 and 6.4 for Venting in indoor applications. These tables are specifically applicable to indoor installations of the units with HEG heating module(s) (condensing, 90% efficient) as part of the PMI-IF product.

WARNING

DO NOT mix a PVC vent system components with other vent systems materials and components. Use only PVC pipe or fittings and seal with the appropriate primer and cement. Failure to comply with this requirement could cause vent failure resulting in leakage of flue products into the space.

WARNING

Each heater must have its own individual vent pipe and terminal.

Do not connect vent system from horizontally vented units to other vent systems or a chimney.

Special Considerations

In cases where malfunction of the heater may result in property damage or loss, a backup system or temperature sensitive alarm should be provided.

Electrical Connections

a) This unit has been examined and tested for compliance with Canadian Electrical Code CSA C22.2 no.0, CSA C22.2 no.3 and USA's National Electrical Code.

b) All electrical work must conform to the requirements of CSA standard C22.1, Canadian Electric Code Part I, or the current NEC codes and/or local ordinances.

c) Control voltage is as indicted on the rating plate.

d) Follow the wiring diagram supplied with the heater.

e) If a space thermostat is used with the heater, locate the thermostat so the cold drafts and hot discharge air streams do not affect the performance of the thermostat. Do not mount the thermostat on the casing of the heater, as it will be affected by radiated and conducted heat. Refer to the instruction furnished with the thermostat for further details.

f) If any of the original wires as supplied with the heater must be replaced, they must be replaced with type TEW 105 degrees or its equivalent except where noted.

g) Temperature controllers, limit controllers, remote selector switches, door switches or any other auxiliary electrical items must be connected to the terminals provided as shown on the wiring diagram.

h) For heaters shipped in multiple sections, electrical connections between sections are to be made by the installer in the field.

i) Field wiring to be done by the installer is denoted by doted lines on the wiring diagram. Solid lines on the wiring diagram indicate factory wiring by the manufacturer.

j) The heater must be electrically grounded in accordance with local codes, or in the absence of local codes, with the CSA.C22.1 Canadian Electrical code and/or the National Electrical Code, ANSI/NFPA 70.

NOTE: Due to the nature of transport, check all bolts and fasteners for tightness.

Gas Piping

a) All gas piping shall conform with local codes and ordinances, or in the absences of local codes in Canada, installation must be in accordance with CAN/CSA- B149.1 for Natural Gas and B149.2 for Propane Gas and in the USA to the National Fuel Gas Code or ANSI Z223.1.

b) A manual gas shut-off valve must be installed immediately adjacent to the point where the gas supply enters the cabinet. The heater must be isolated from the gas supply system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than ½ psi. Always use clean, scale -free pipe and malleable iron fittings, and remove all cutting and threading debris prior to connecting pipes. Firmly support the gas piping so that it cannot be dislodged from its installed position.

c) Gas piping must be sized for the total Btu input of the heater. Refer to the heater rating plate for total input.

d) Regulators used must be sized for the total Btu input of the heater.

e) For the unit to operate properly, the inlet gas pressure must be maintained at 5.0" W.C. for Natural Gas and 11.0" W.C. for Propane. Maximum inlet pressure must not exceed 13.0" W.C. to prevent damage to the gas valve.

f) A 1/8" NPT tap is provided on the inlet of the gas valve. A fitting suitable for connection to a pressure gauge capable of measuring gas pressure should be connected to each heater. Check pressures with all of the units operating at the same time.

g) A drip-leg shall be provided at any point in the gas line where condensate and sediment could collect.

Gas Vent

High gas pressure regulator (if required), low pressure regulator, pilot pressure regulator, gas pressure switch (if supplied), and normally open vent valve (if supplied) must be vented outside of building for an indoor heater (check with authorities having jurisdiction).

Duct Furnaces

a) A duct furnace shall be installed with an inlet duct, which will provide air distribution equivalent to a straight run of duct having the same cross-section area as the inlet connection and not less than two equivalent diameters in length.

b) The ducts connected to the duct furnace must have removable access panels on both upstream and downstream sides of the duct. The opening must be accessible, 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 cover for the opening shall be attached in such a manner as to prevent leaks.

c) The installation of the duct furnace must be adjusted to obtain an air throughout within the range specified on the appliance rating plate.

d) If a duct furnace is connected to a return air duct or any other inlet air restoration; the duct furnace shall be installed on the positive pressure side of the air-circulating blower.

Cooling

When installed downstream from a refrigeration system, condensation will form and provisions shall be made to dispose of condensate.

High Altitude

Inputs are derated 4% for each 1,000 ft (305m) elevation above 2,000 ft (610m).

Indoor Units

Install an indoor unit such that the gas ignition control system is not directly exposed to water spray, rain or dripping water.

General Operating Instructions

Prior to Start-Up

a) Refer to the rating plate for fuel input and supply pressures.

b) Do not attempt to start the burner if the heater is full of vapour gas, or if the combustion chamber is very hot.

c) Do not leave combustible material near the heater.

d) Shut off the manual fuel supply valve if the burner has been shut down for an extended period of time.

e) Ensure access doors are in place before starting the burner.

f) Do not start the burner unless the blower access doors are securely in place.

g) Refer to literature regarding controls, gas valves and other components.

Start-Up Procedure Precautions

a) Ensure the main disconnect switch is in the "off" position.

b) Ensure the burner on-off switch is in the "off" position.

c) Check all electrical and gas connections and tighten if necessary.

d) Check main fans (by rotating fan shaft by hand), bearing setscrews, and pulley set screws. Ensure blowers are free to turn, vibration isolation shipping blocks are removed (if equipped), and shipped loose items (if supplied) are removed from inside blower sections.

e) Lubricate (if necessary) main fan motors. The specification on the motors and bearings shall be adhered to.

f) Check heater outlets for obstruction.

g) Check all fuse blocks to determine that all fusing is installed.

h) Set the operating controls and correct (e.g. thermostat, remote panel switches) so as to allow proper operation of the heater.

i) Reset the motor starter by pushing the reset button, if so equipped. Ensure all blowers are rotating in the correct rotation.

j) Check gas supply pressure is correct, piping correctly sized and purged.

k) Ensure all shipping materials have been removed.

WARNING

GAS UNITS

a) At maximum input the supply gas pressure must fall within the range specified on the heaters rating plate.

b) Check all piping for tightness and correct any signs of leaks.

Start-Up

a) Refer to start-up checklist and field report for correct settings that are to be checked on the heater.

b) Check the supply fan motor thermal overload setting against the rating plate figure.

c) Ensure burner on-off switch is in the "off" position.

d) Check supply fan motor amps against rating plate figure. If actual figure varies by +/- 20% from rating plate value, take corrective actions with respect to ductwork and accessories external to the heater or blower/motor drive adjustments making sure to follow manufactures rating for blower rotational speeds.

e) The thermal overloads must be set to appropriate motor performance after all adjustments have been made.

f) Follow sequence of operation supplied with the heater and perform necessary steps to initiate burner activation.

g) On Carel Controller, use burner setup page in "Commissioning Mode."

h) Use Carel commishioning mode to:

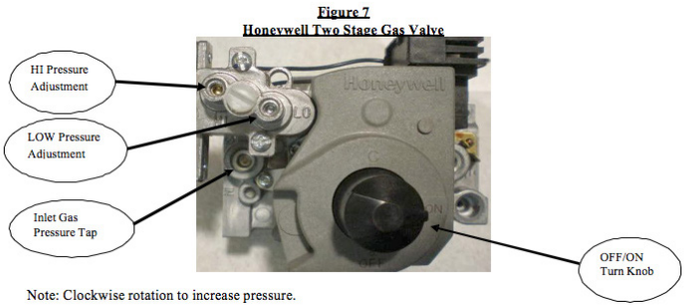
- Test dampers
- Set current sensors
- Run blowers
- Run burner
- Run cooling

Manifold Pressure Adjustment

a) The manifold pressure for high fire second stage should be at 3.5" W.C. can also be confirmed on the unit rating plate. If it needs adjustment, adjust the HI Regulator on the two stage gas valve. (**See Fig. 7 below**).

b) The manifold pressure for Low Fire First Stage should be set at 1.2" W.C and can also be confirmed on the unit rating plate. If it needs adjustment, adjust the LO Regulator on the two stage gas valve. (**See Fig. 7 below**).

FIGURE 7: HONEYWELL TWO STAGE GAS VALVE ▼



Shut Down

1. **Emergency Shut Down**
   - i. Set disconnect switch to "off" position.
   - ii. Close the manual main fuel valve.
   - iii. Set the burner on-off switch to "off" position.
2. **Service Shut Down**
   - i. Set the burner toggle switch to "off" position.
   - ii. Close the manual main fuel valve.
   - iii. Set the operating controls, (e.g. thermostat, remote panel switches), so as to prevent heating operation.

Maintenance

Regular maintenance is necessary to ensure the efficient operation and long life of this unit. This maintenance should be preformed by, or supervised by, qualified service personnel. A maintenance schedule should be prepared for the unit based on its application and location.

Recommended Quarterly Maintenance

1. Check for loose connections in the wiring.
2. Check the voltage at the heater while it is in operation.
3. Check motor amperage draws against rating plate values.
4. Inspect all contactors to ensure that they are clean and making good contact.
5. Check all fittings, valves and lines for leaks.
6. Check for proper combustion. Adjust if necessary.
7. Check the flame sensor signal (1.5-6.0mA), and clean if necessary.
8. Check the fuel supply pressure to the heater.
9. Check the heaters manifold pressure.
10. Clean or replace air filters if necessary. Replace filters only with type equivalent to those supplied with the heater by the manufacturer.
11. Check all dampers, linkages and damper actuators; adjust and tighten as required.
12. Check all belts. Adjust or replace as necessary.
13. Check all bearings and lubricate if necessary.
14. Check operation of all safety controls.
15. Oil burner fan.
16. Check all bearings to ensure tightness on shaft and lubricate if necessary.
17. Check ignition spark and clean as necessary.
18. Check burners for smooth light off. Check/clean orifices and in shot burners.

Recommended Yearly Maintenance

1. Perform the monthly quarterly maintenance recommended.
2. Inspect blower wheel and housing, clean if necessary.
3. Inspect all set screws on blower wheel and pulleys to ensure that they are secured to their respective shafts
4. Check flame supervisor controller.
5. Inspect all operating and safety controls. Clean and replace if necessary.
6. Inspect and clean the collection and disposal systems to ensure proper drainage.

NOTE: If ignition controller is replaced, ensure the control system is not exposed to water spray, rain or dripping water. Refer to individual manufacturer's literature provided for maintenance requirements of optional equipment.

PMI-IF HEAT EXCHANGER LIMITED WARRANTY

Maintenance

Limited Warranty

(a) SolutionAir warrants and guarantees for a period limited to twelve (12) months from date of installation / commissioning or eighteen (18) from date of shipment - whichever comes first, that the Products are manufactured in accordance with SolutionAir's quotation and submittal drawing specifications and of specified material unless otherwise expressly stated.

(b) SolutionAir will manufacture the goods to be supplied in accordance with the product specifications supplied by Purchaser. SolutionAir shall not be liable for any loss or damages of any kind resulting from errors, omissions or untimely notification of changes to the specifications that have been provided. In the event that changes to the product specifications arise, SolutionAir must be notified immediately and in writing. The Purchaser will assume liability for the cost of all material and resources, work-in-progress and finished goods that have become obsolete or that can no longer be used due to any such changes in the specifications supplied.

(c) In the event the Products supplied do not comply with quotation and submittal drawing specifications and/or material quality standards within the warranty period, SolutionAir will either repair the Products supplied or provide replacement of such Products that conform to the quotation and submittal drawing specifications. This decision is made at the sole discretion of SolutionAir. In either case, SolutionAir will not be responsible for labor and freight charges incurred in replacing Products except as agreed to by SolutionAir in writing, nor will SolutionAir be responsible for incidental, consequential or punitive damages. In the event SolutionAir elects to repair the Products supplied, Purchaser will assist by providing SolutionAir with all details of the problem and a written quotation for the costs of such work to be carried out. If the repair is authorized by SolutionAir, then Purchaser will assist by coordinating and supervising the repair work. In the event SolutionAir elects to replace the Products, SolutionAir may either (i) direct the Purchaser to return such Products to SolutionAir or (ii) provide replacement Products to the Purchaser without the return of the original Products, in which case Purchaser will be responsible for the disposal of such original Products. Such election is at the sole discretion of SolutionAir, and all returns of Products to SolutionAir must be approved in advance by SolutionAir. In the event SolutionAir directs Purchaser to return the Products to SolutionAir for repair or replacement, Purchaser agrees to return such Products to SolutionAir in a manner consistent with the original packaging in order to prevent damage. All freight back to SolutionAir's factory and return freight to Purchaser must be agreed upon prior to return of the Products.

(c) SolutionAir makes no warranty whatsoever with respect to components or items supplied which may be warranted separately by their manufacturer. SolutionAir does not warrant factory mounted controls and components of Products supplied and owned by a third party for mounting by SolutionAir. Back charges to SolutionAir for Products under warranty by others will only be accepted if prior written approval is given by SolutionAir.

(d) THE WARRANTIES AND LIABILITIES SET FORTH IN THE PRIOR PARAGRAPHS ARE THE ONLY WARRANTIES OR LIABILITIES OF SOLUTIONAIR. ALL OTHER GUARANTEES, WARRANTEES, CONDITIONS AND REPRESENTATIONS, EITHER EXPRESS OR IMPLIED, WHETHER ARISING UNDER ANY STATUTE, LAW, COMMERCIAL USAGE OR OTHERWISE, INCLUDING IMPLIED WARRANTIES FOR FITNESS OF MERCHANTIBILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY EXCLUDED.

(e) The foregoing warranty shall not take effect unless Purchaser shall inform SolutionAir in writing of any flaw, defect or deficiency in the Products promptly after such flaw, defect or deficiency becomes apparent and, in any case, not later than one (1) year from date of shipment. The warranty provided for under these Terms shall be void upon the following: (i) the unauthorized repair or modification by any person other than SolutionAir of Products claimed to be defective; or (ii) the improper installation, maintenance or operation of the Products other than in strict accordance with standard industry practices and compliance with the specific recommendations of SolutionAir respecting the Products; or (iii) the misuse, negligence, or operation of the Products other than for their intended purpose.

The SolutionAir warranty is void if;

1. **The unit is not installed and serviced in accordance with manufacturer's recommendations.**
2. **Operation, maintenance, start-up and shut down are not in accordance with manufacturer's instructions.**
3. **Unit is operated in conditions not specified by the manufacturer.**
4. **The unit is operated while the building is under construction.**
5. **Unit is used for application which it was not intended.**

PMI-IF HEAT EXCHANGER LIMITED WARRANTY

Maintenance

Heat Exchanger Warranty

Convoluted tube heat exchangers used in SolutionAir PMI-IF units are warrantied for a period of 10 years from date of shipment. If, during this period, a heat exchanger fails because of a defect in manufacture or material, SolutionAir Industries will contribute to the cost of replacing the part in accordance with the following table;

Years from Manufacture	SolutionAir's Responsibility	Purchaser's Responsibility	Years from Manufacture	SolutionAir's Responsibility	Purchaser's Responsibility
1st Year	100%	0%	6th Year	50%	50%
2nd Year	90%	10%	7th Year	40%	60%
3rd Year	80%	20%	8th Year	30%	70%
4th Year	70%	30%	9th Year	20%	80%
5th Year	60%	40%	10th Year	10%	90%

SolutionAir will not be responsible for labor and freight charges incurred in replacing parts.

The SolutionAir warranty is void if;

1. The unit is not installed and serviced in accordance with manufacturer's recommendations.
2. Operation, maintenance, start up and shut down are not in accordance with manufacturer's instructions.
3. Unit is operated in conditions not specified by the manufacturer.
4. The unit is operated while the building is under construction.
5. Unit is used for application which it was not intended.

Utec 1016-xxx Direct Spark Ignition Control

Sequence of Operation

a) Thermostat closes on call for heat providing 24 VAC to Ignition Control.

b) Draft Inducer is energized (@ line voltage).

c) Air Switch closes initiating 30-second pre-purge.

d) At end of pre-purge period, Spark and Gas Valve are energized for up to a 5-second ignition trial.

e) Burners ignite and carryover.

f) Flame is detected by flame sensor and control operates in steady state heating condition.

g) Heater continues in operation until the thermostat is satisfied.

h) Thermostat opens interrupting power to control and shutting unit off.

i) If ignition is not achieved within 5 seconds, the gas valve is shut off; the inducer continues to run for an inter-purge period. Additional ignition trials follow the specified sequence. If all trials (3) for ignition have occurred without proper ignition and flame detection, the control locks out.

j) Control may be brought out of lockout by cycling the thermostat or shutting off power for a minimum of 5 seconds.

k) If flame is lost once it has been established, the control will shut off the gas supply within 0.8 second and enter the inter-purge period. Control will initiate up to 3 additional trials per normal operation sequence. (To restart, refer to Item "j" above)

l) If flame sensor indicates presence of flame during purge period, when no flame should be present, the inducer will remain energized, but the gas valve will remain off until the cause of the "false flame" is removed.

m) If the air pressure switch is closed when the inducer is energized, or does not close after the inducer is energized, the control will wait 1 minute for the sir switch to open o r close, and then lock out. (To restart, refer to Item "j" above)

n) If the control detects power to the gas valve when it should be off, or not powered when it should be on, the control will go into lockout with all outputs off. (To restart, refer to item "j" above)

NOTE: Refer to control "Flash Code Key" if control is provided with LED indicator light.

LED Flash Code Key

On-Steady	Control operation normal
1 Flash	Open pressure switch, limit switch or flame rollout switch
2 Flashes	Pressure switch stuck closed
3 Flashes	Ignition / flame sense failure
4 Flashes	Repeated flame losses
5 Flashes	Internal control fault

Troubleshooting Guide for UTEC 1016-xxx Ignition Board

LED Code	System	Description	Actions
Steady On	Normal	LED is Lit	24VAC is applied to the control.
LED off	Lockout	LED is Off	1. Check 120V is supplied to heater and transformer. 2. Check to see if 24V is coming out of secondary side of transformer; if not change transformer.
1 Flash	Lockout	Open Pressure switch with induced draft blower energized	1. Check pressure hose connection between the draft inducer and pressure switch. 2. Check rollout switch manual reset to see if tripped. 3. Check for open high limit. 4. Replace pressure switch.
2 Flashes	Lockout	Pressure switch closed when induced draft blower is off	1. Check wiring between PS1 & PS2 on the ignition controls for proper connection. 2. Check pressure switch function. 3. If pressure switch contacts remain closed, replace pressure switch.
3 Flashes	Lockout	Ignition Lockout from too many trials	1. Verify that gas supply available. 2. Verify that the gas valve is working properly and manifold pressure is adequate. 3. Check if spark igniter is cracked or dirty. 4. Check flame sensor wiring. 5. Check to see if the flame sensor is grounded.
4 Flashes	Lockout	Ignition Lockout from too many flame losses within a single call for heat	1. Check pressure switch hose for leaks or poor connection. 2. Check pressure switch hose for condensate in line. 3. Check pressure tap in the combustion blower for blockage. 4. Check the induced draft blower.
5 Flashes	Lockout	Control hardware fault detected	1. Change ignition control board.

PMI-IF Troubleshooting Guide

System	Possible Cause	Corrective Action
No power	Disconnect "OFF"	Verify disconnect switch in "ON" position.
	Short circuit	Check transformer fuses and replace if necessary
	Motor overload tripped	Check motor starter overloads – reset if required
Power OK heater won't start	Low limit activated	Cycle power to Zelio controller (turn system switch to "OFF" position and then to "WINTER" position. Resets internal low limit timer. Verify heater starts up and turns on burners. If not see "Low limit alarm" below.
Low limit alarm	Loose wire	Check Input "I6" on Zelio controller. Control voltage must be present for heater to operate. If not, verify wire connections at low limit controller.
	Flame failure	Check Zelio screen for "FLAME FAILURE ALARM". Cycle power to Zelio to reset alarm. If flame failure alarm presets follow Utec Troubleshooting guide on page 21 of this manual.
Blower won't start	Damper actuator end switch not made	With system switch in "SUMMER" position, check to make sure damper opens 100%. Verify that end switch makes. Follow manufacturers check procedures in supplied actuators literature.
No heat	Low Limit Activated	Follow corrective action above for "Low limit alarm" above.
	Blower air proving switch not made	After start up delay, verify that there is control voltage present at Input "I7" on Zelio controller. If not, with heater "OFF", check wires to/from air proving switch (located beside heaters blower). Using a tube connected to the high side of air switch, GENTLY blow into the tube to verify that the switch works properly.
	Low fire cut off activated	Check the set point of the controller (located 10 feet downstream of discharge). If set point is lower than ambient temperature heat will be locked out. Turn set point higher then ambient and verify that heat turns on.

PMI-IF Indirect Fired Heater

Standard 2 Stage with Modulation Sequence Of Operation

A) System Switch "Winter" with carel controllers this is done automatically
1ST STAGE HEAT CALL

The fresh air damper opens fully. Once end switch makes starts supply fan. When heat demand has reached 20% the heater will run.

Heater pre purges for 30sec and fires on low fire. Once flame establishes the 1st stage modulates to maintain supply setpoint.

2ND STAGE HEAT CALL

Once heat demand reaches near 50% second stage heat is energized. Inducer motor ramps up to high speed.

B) System Switch "Summer"
Damper & blower operate as "A" above, burner is DE-ENERGIZED.

C) System Switch "Off"
Unit inoperative. Fresh air dampers closed.

Additional Controls:

- The burner will try for ignition up to 3 times on initial start-up.
  - If main flame is not proven there is a 30 second purge cycle before the next 15-second trial for re-ignition
  - After the 3rd attempt, if the flame is not proven, the burner will shut down
  - The system switch must then be cycled before the heater will start again
  - If main flame is lost during operation the burner will try for ignition up to 3 times
- Low limit set at 40°F to shut down the heater (after a 5 minute (adjustable) time delay on start-up) if the supply air temperature below its set point is sensed.
  - Burner cool down
  - Burner warm-up
  - Room reset

BMS Points List

BACnet		Modbus			Variable	Units	Read / Write	Description
Instance	Type	Instance	Size	Type				
AI 1	Analog Input	0	2	InputRegister	FreshAirTemp	°F	Read Only	Measured temperature of outside/fresh air
AI101		100	2		FreshAirTemp_C	°C		
AI 2	Analog Input	2	2	InputRegister	SupplyAirTemp	°F	Read Only	Measured Discharge/Supply air temperature
AI 102		102	2		SupplyAirTemp_C	°C		
AI 3	Analog Input	4	2	InputRegister	ReturnAirTemp	°F	Read Only	Measured return air temperature
AI 103		104	2		ReturnAirTemp_C	°C		
AI 4	Analog Input	6	2	InputRegister	MixedAirTemperature	°F	Read Only	Measured temperature after mixing fresh & return air
AI 104		106			MixedAirTemperature_C	°C		
AI 5	Analog Input	8	2	InputRegister	EvaporatorLeavingAirTemp	°F	Read Only	(Reheated systems only) dewpoint of supply air
AI 105		108			EvaporatorLeavingAirTemp_C	°C		
AI 6	Analog Input	10	2	InputRegister	ExhaustAirTemp	°F	Read Only	(Dual air path only) exhausted return air leaving temp
AI 106		110			ExhaustAirTemp_C	°C		
AI 7	Analog Input	12	2	InputRegister	SpaceTemp	°F	Read Only	Measured Room / Space temperature
AI 107		112			SpaceTemp_C	°C		
AI 10	Analog Input	18	2	InputRegister	SpaceCO2	PPM	Read Only	Measured Room / Space CO2 level in PPM
AI 11	Analog Input	20	2	InputRegister	SupplyCO	PPM	Read Only	Actual Discharge/Supply air carbon monoxide in PPM
AI 12	Analog Input	22	2	InputRegister	SupplyCO2	PPM	Read Only	Measured Supply / Discharge CO2 level in PPM
AI 20	Analog Input	38	2	InputRegister	FreshAirHumidity	%RH	Read Only	Measured RH of outside air
AI 21	Analog Input	40	2	InputRegister	SupplyAirHumidity	%RH	Read Only	Measured RH of supply/ discharge air
AI 22	Analog Input	42	2	InputRegister	ReturnAirHumidity	%RH	Read Only	Measured RH of return air (room sample)
AI 23	Analog Input	44	2	InputRegister	MixedAirHumidity	%RH	Read Only	Measured RH of air after mixing fresh and supply air
AI 24	Analog Input	46	2	InputRegister	SpaceHumidity	%RH	Read Only	Measured RH of room/space air
AI 30	Analog Input	58	2	InputRegister	FreshAirAirflow	CFM	Read Only	Measured CFM of fresh air path
AI 31	Analog Input	60	2	InputRegister	SupplyAirAirflow	CFM	Read Only	Measured CFM of supply / unit discharge
AI 32	Analog Input	62	2	InputRegister	ReturnAirAirflow	CFM	Read Only	Measured CFM of return air path
AI 33	Analog Input	64	2	InputRegister	SupplyDuctStaticPress	"WC	Read Only	Measured DSP of the supply duct
AI 34	Analog Input	66	2	InputRegister	ReturnDuctStaticPress	"WC	Read Only	Measured DSP of the return duct
AV 1	Analog Value	0	2	HoldingRegister	SP_SupplyAirTemp	°F	Commandable	Discharge/Supply Air Temperature setpoint in °F (or °C)
AV 101		100	2		SP_SupplyAirTemp_C	°C		
AV 2	Analog Value	2	2	HoldingRegister	SP_SpaceTemp	°F	Commandable	Room/Space temperature setpoint (for reset)
AV 102		102	2		SP_SpaceTemp_C	°C		
AV 3	Analog Value	4	2	HoldingRegister	SP_SpaceDewpoint	°F	Commandable	Room/Space dewpoint setpoint (max. target)
AV 103		104	2		SP_SpaceDewpoint_C	°C		
AV 4	Analog Value	6	2	HoldingRegister	SP_MaxFreshAirPcnt	%	Commandable	Maximum fresh air setpoint in %
AV 5	Analog Value	8	2	HoldingRegister	SP_MinFreshAirPcnt	%	Commandable	Minimum fresh air setpoint in %
AV 6	Analog Value	10	2	HoldingRegister	SP_SupplyFanSpeedPcnt	%	Commandable	Supply Fan Speed

PMI-IF

Standard Sequences & Wiring

BACnet		Modbus			Variable	Units	Read / Write	Description
Instance	Type	Instance	Size	Type				
AV 7	Analog Value	12	2	HoldingRegister	SP_ReturnFanSpeedPcnt	%	Commandable	Return Fan Speed
AV 8	Analog Value	14	2	HoldingRegister	SP_SupplyDuctStaticPress	"WC	Commandable	Target supply duct static pressure
AV 9	Analog Value	16	2	HoldingRegister	SP_ReturnDuctStaticPress	"WC	Commandable	Target return duct static pressure
AV 10	Analog Value	18	2	HoldingRegister	BMSRoomAirTemp	°C	Commandable	Space Temperature, if sensor by BMS
AV 11	Analog Value	20	2	HoldingRegister	BMSFreshAirTemp	°C	Commandable	Fresh Air Temperature, if sensor by BMS
AV 12	Analog Value	22	2	HoldingRegister	BMSRoomAirDewpoint	°C	Commandable	Room Air Dewpoint Temperature, if sensor by BMS
AV 13	Analog Value	24	2	HoldingRegister	SP_MixboxAirTemp	°F	Commandable	Mixbox Air Temperature setpoint in °F (or °C)
AV 113		124	2		SP_MixboxAirTemp_C	°C		
AV 14	Analog Value	26	2	HoldingRegister	SP_MaxReturnAirPcnt	%	Commandable	Maximum Return air setpoint in %
AV 15	Analog Value	28	2	HoldingRegister	SP_MinReturnAirPcnt	%	Commandable	Minimum Return air setpoint in %
AV 16	Analog Value	30	2	HoldingRegister	SP_CO2_Threshold	PPM	Commandable	Threshold for CO2 Logic to become active
AV 17	Analog Value	32	2	HoldingRegister	SP_CO2_FADemand	%	Commandable	Fresh Air Demand for CO2 logic
AV 18	Analog Value	34	2	HoldingRegister	SP_SupplyAirflowCFM	CFM	Commandable	Target supply airflow
AV 19	Analog Value	36	2	HoldingRegister	SP_ReturnAirflowCFM	CFM	Commandable	Target return airflow
AV 40	Analog Value	78	2	InputRegister	FreshAirPcnt	%	Read Only	Current Fresh air damper position
AV 41	Analog Value	80	2	InputRegister	ReturnAirPcnt	%	Read Only	Current Return air damper position
AV 42	Analog Value	82	2	InputRegister	HeatingDemand	%	Read Only	Current Heating Demand from Heating PID
AV 43	Analog Value	84	2	InputRegister	CoolingDemand	%	Read Only	Current Cooling Demand from Cooling PID
AV 44	Analog Value	86	2	InputRegister	HeatWheelDemand	%	Read Only	Current Commanded Heatwheel Speed
AV 45	Analog Value	88	2	InputRegister	CubeBypassDamperDemand	%	Read Only	Current Cube Bypass Damper position
AV 56	Analog Value	56	2	HoldingRegister	RegenCore. HeatRecoveryCycleTime	seconds	Commandable	Time in Second for one complete cycle (2 damper changes) in ER mode
IV 54	Integer Value	54	2	HoldingRegister	RegenCore. FreeCoolingCycleTime	minutes	Commandable	Time in Minute for one complete cycle (2 damper changes) in FC mode
IV 31	Integer Value	90	2	InputRegister	Num_Alarms		Read Only	Number of active alarms
IV 32	Integer Value	92	2	InputRegister	Num_Warnings		Read Only	Number of active warnings

BACnet		Modbus			Variable	Inactive Text	Active Text	Read / Write	Description
Instance	Type	Instance	Size	Type					
BV 1	Binary Value	0	1	Coil	Unit_Run	OFF	ON	Commandable	Unit Run Command
BV 2	Binary Value	1	1	Coil	AlrmResByBMS	-	Reset	Commandable	Toggle Point to Reset Active Alarms
BV 10	Binary Value	9	1	DiscreteInput	Unit_InAlarm	OK	InAlarm	Read Only	When true, unit has alarm but may still be operational
BV 11	Binary Value	10	1	DiscreteInput	Unit_SeriousAlarm	OK	InAlarm	Read Only	When true, unit has shutdown due to a serious alarm
BV 12	Binary Value	11	1	DiscreteInput	Dirty_FreshAir_Filter_Alm	Clean	Dirty	Read Only	Pressure drop on Fresh Air filter high
BV 13	Binary Value	12	1	DiscreteInput	Dirty_FreshAir_Prefilter_Alm	Clean	Dirty	Read Only	Pressure drop on Fresh Air prefilter high
BV 14	Binary Value	13	1	DiscreteInput	Dirty_ReturnAir_Filter_Alm	Clean	Dirty	Read Only	Pressure drop on Return Air filter high
BV 15	Binary Value	14	1	DiscreteInput	Dirty_ReturnAir_Prefilter_Alm	Clean	Dirty	Read Only	Pressure drop on Return Air prefilter high
BV 21	Binary Value	20	1	DiscreteInput	Cooling_CircA_Fault	OK	FAULT	Read Only	Cooling Circuit A has a fault
BV 22	Binary Value	21	1	DiscreteInput	Cooling_CircB_Fault	OK	FAULT	Read Only	Cooling Circuit B has a fault
BV 23	Binary Value	22	1	DiscreteInput	Cooling_CircC_Fault	OK	FAULT	Read Only	Cooling Circuit C has a fault
BV 24	Binary Value	23	1	DiscreteInput	Cooling_CircD_Fault	OK	FAULT	Read Only	Cooling Circuit D has a fault
BV 30	Binary Value	30	1	DiscreteInput	Compressor_A1_Running	OFF	ON	Read Only	Compressor 1 of circuit A is running
BV 31	Binary Value	31	1	DiscreteInput	Compressor_A2_Running	OFF	ON	Read Only	Compressor 2 of circuit A is running
BV 32	Binary Value	32	1	DiscreteInput	Compressor_B1_Running	OFF	ON	Read Only	Compressor 1 of circuit B is running
BV 33	Binary Value	33	1	DiscreteInput	Compressor_B1_Running	OFF	ON	Read Only	Compressor 2 of circuit B is running
BV 34	Binary Value	34	1	DiscreteInput	Compressor_C1_Running	OFF	ON	Read Only	Compressor 1 of circuit C is running
BV 35	Binary Value	35	1	DiscreteInput	Compressor_C2_Running	OFF	ON	Read Only	Compressor 2 of circuit C is running
BV 36	Binary Value	36	1	DiscreteInput	Compressor_D1_Running	OFF	ON	Read Only	Compressor 1 of circuit D is running
BV 37	Binary Value	37	1	DiscreteInput	Compressor_D2_Running	OFF	ON	Read Only	Compressor 2 of circuit D is running
BV 50	Binary Value	50	1	DiscreteInput	Heat1_Running	OFF	ON	Read Only	Stage 1 Heat Running
BV 51	Binary Value	51	1	DiscreteInput	Heat2_Running	OFF	ON	Read Only	Stage 2 Heat Running
BV 52	Binary Value	52	1	DiscreteInput	Heat3_Running	OFF	ON	Read Only	Stage 3 Heat Running
BV 53	Binary Value	53	1	DiscreteInput	Heat4_Running	OFF	ON	Read Only	Stage 4 Heat Running
BV 54	Binary Value	54	1	DiscreteInput	SupplyFanCSR	OFF	ON	Read Only	Status of Supply Fan Current Sense Relay
BV 55	Binary Value	55	1	DiscreteInput	ReturnFanCSR	OFF	ON	Read Only	Status of Return Fan Current Sense Relay

BACnet		Modbus			Variable	Read / Write	Description
Instance	Type	Instance	Size	Type			
MSV 1	Multistate Value	1000	1	HoldingRegister	Unit_Mode_ Override *Unit_Mode_Override_ Default*	Commandable *RelinquishDefault*	Set to force unit into the following modes: 1=Auto (Normal) 2=ForceDehum 3=ForceEcono 4=ForceHeating 5=ForceCooling 6..9=Reserved 10=ForceOff
MSV 2	Multistate Value	1000	1	InputRegister	Unit_Status	Read Only	Unit Status: 1=Unit On 2=Off due to alarm 3=Off due to BMS 4=Off due to Schedule 5=Off due to System Switch 6=Off due to Keypad Enable 7=Off due to Interlock 8=Manual Mode 9=Unit in Startup Sequence
MSV 3	Multistate Value	1001	1	InputRegister	Unit_SystemStatus	Read Only	Unit mode enumeration: 1=Unit Off 2=Dehum 3=Econo 4=Heating 5=Cooling 6=Burner Warmup 7=Burner Cooldown 8=Damper Opening 9=Smoke Purge Sequence
MSV 11	Multistate Value	1010	1	HoldingRegister	PRC_ DamperMode_ Overide_BMS	Commandable	Set to force unit into the following modes: 1=Auto (Normal) 2=ForceEnergyRecovery 3=ForceFreeCooling 4=ForceRecirculation 5+=ForceOff Dampers Only (Fans ON, TEST ONLY)
MSV 13	Multistate Value	1010	1	InputRegister	PRC_ DamperMode_ Status	Read Only	RegenCore Damper Status: 1=Off 2=EnergyRecovery 3=FreeCooling 4=Recirculation 5=SmokePurge

PMI-IF START-UP REPORT

To enable the Limited Warranty, this form must be submitted to ***mechsupport@solutionairgroup.com***

General

Job Name _____ Order Number _____

Installation Address _____ City _____ State/Prov. _____

Name of Person performing Start-up _____ Start-up Date _____

Service Company Name _____ Service Company Phone Number _____

Unit Information

Unit Model Number _____ Serial Number _____ Nameplate Rating (volt/phase/frequency) _____

INSTRUCTIONS: Check off boxes (Yes, No, N/A). Not all units contain each option listed in this form. Check off N/A if the statement/question is not relevant to this product. Fill in blank spaces with required information, when applicable. If the statement/question is not relevant to this unit, mark N/A in the blank space.

Please make note of any issues that you encounter in the inside the "Comments" section.

CAUTION: High voltage may be present.
Disconnect all power supplies prior to performing initial inspection.

PMI-IF START-UP REPORT

To enable the Limited Warranty, this form must be submitted to ***mechsupport@solutionairgroup.com***

Initial Inspection

Exterior – look for damage to housing, doors, handles, fittings, etc. If damaged indicate where below.

Yes No _____

Interior – look for damage to housing, doors, handles, fittings, etc. If damaged indicate where below.

Yes No _____

Check that all ducts and dampers are secure	Yes	No	N/A
Check that all penetrations and openings are sealed	Yes	No	N/A
Remove all foreign material from unit	Yes	No	N/A
Are all shipping brackets removed?	Yes	No	N/A
Check and tighten any loose fasteners	Yes	No	N/A
Check and tighten all set screws, lock collars for all bearings, motors, dampers, etc.	Yes	No	N/A
Check all electrical connections and tighten any loose connections	Yes	No	N/A
Check and tighten all unit terminal strips	Yes	No	N/A
Are disconnects and fuses properly sized?	Yes	No	N/A
Does the disconnect mechanism function properly?	Yes	No	N/A
Do mechanical interlocks function properly?	Yes	No	N/A
Is drain pipe trapped properly?	Yes	No	N/A
Is gas piping installed correctly?	Yes	No	N/A

Fan Start-Up

Are fan shipping brackets removed? (3 per fan)	Yes	No	N/A
Do fans rotate freely?	Yes	No	N/A
Are fan pulleys aligned?	Yes	No	N/A
Are belts properly tensioned?	Yes	No	N/A
Is fan rotation correct?	Yes	No	N/A

Fans	Current @ 100% airflow			Voltage @ 100% airflow			Motor FLA	RPM
	L1	L2	L3	1-2	2-3	3-1		
Supply 1								
Supply 2								
Return 1								
Return 2								
Exhaust 1								
Exhaust 2								

PMI-IF START-UP REPORT

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Controls

Are remote sensors and controls installed?	Yes	No	N/A
Is there BAS connection? List the type of connection below.	Yes	No	N/A
_____			
Time clock operation verified?	Yes	No	N/A
Mixed air control operation verified?	Yes	No	N/A
Filter gauge operation verified?	Yes	No	N/A

Low limit setpoint (°F)	High limit setpoint (°F)	Discharge temp. setpoint (°F)	Space temp. setpoint (°F)
Minimum fresh air setpoint (%)	Filter gauge range	Occupied time	Unoccupied time

Dampers

Verify proper wiring for motorized dampers	Yes	No	N/A
Check that all dampers open and close properly	Yes	No	N/A
Check that all dampers have seals and shut tight	Yes	No	N/A

PMI-IF START-UP REPORT

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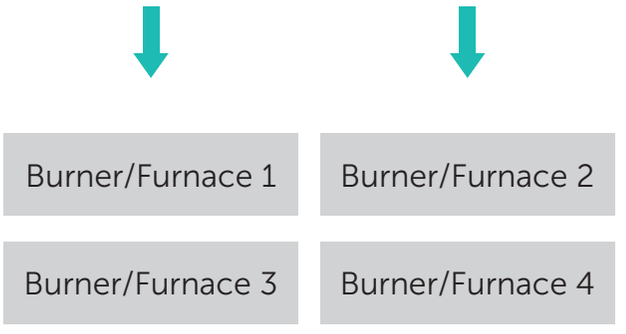
Convoluted Tube - Indirect Gas Heat

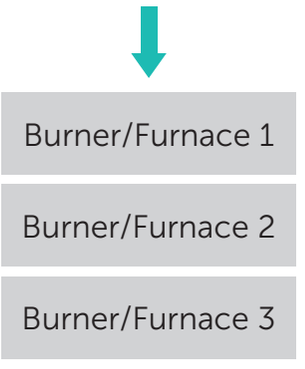
PMI-IF-2X
Parallel Configuration – Top View

Airflow Direction



PMI-IF-1X
Series Configuration – Top View

Airflow Direction



Burner Information

	Burner 1	Burner 2	Burner 3	Burner 4
Burner manufacturer				
Burner model				
Fuel type				
Rated supply pressure range (in. w.c.)				
Maximum input (MBH)				
Minimum input (MBH)				
Maximum output (MBH)				
Burner voltage (volts)				
Burner motor size (HP)				
Burner motor amp draw (amps)				

Burner Controls and Safeties

	Burner 1		Burner 2		Burner 3		Burner 4	
Combustion gas blower rotation correct?	Yes	No	Yes	No	Yes	No	Yes	No
Does the high limit lockout function properly?	Yes	No	Yes	No	Yes	No	Yes	No
Flame failure operation verified?	Yes	No	Yes	No	Yes	No	Yes	No
Roll out switch operation verified?	Yes	No	Yes	No	Yes	No	Yes	No
Combustion air switch operation verified?	Yes	No	Yes	No	Yes	No	Yes	No

PMI-IF START-UP REPORT

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Convoluted Tube Indirect Gas Fired Combustion Test Results

Furnace 1

	High Fire	Medium Fire	Low Fire
CO (ppm)			
CO_2 (%)			
O_2 (%)			
Manifold Pressure (in. w.c.)			
Exhaust Temperature (°C)			

Furnace 2

	High Fire	Medium Fire	Low Fire
CO (ppm)			
CO_2 (%)			
O_2 (%)			
Manifold Pressure (in. w.c.)			
Exhaust Temperature (°C)			

Furnace 3

	High Fire	Medium Fire	Low Fire
CO (ppm)			
CO_2 (%)			
O_2 (%)			
Manifold Pressure (in. w.c.)			
Exhaust Temperature (°C)			

Furnace 4

	High Fire	Medium Fire	Low Fire
CO (ppm)			
CO_2 (%)			
O_2 (%)			
Manifold Pressure (in. w.c.)			
Exhaust Temperature (°C)			

If possible, please attach analyzer printout(s) to start-up report.

PMI-IF START-UP REPORT

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DX Cooling

Is there any visible damage to evaporator and/or condenser coil(s)?	Yes	No	N/A
Are all compressor shipping brackets removed?	Yes	No	N/A
Does the drain pan drain properly?	Yes	No	N/A
Does the condenser fan(s) rotate freely?	Yes	No	N/A
Verify proper condenser fan rotation	Yes	No	N/A
Verify proper compressor rotation	Yes	No	N/A

Remote Condenser Only (For Installing Contractor)

Were all the refrigerant circuit's pressure tested and leak free?	Yes	No	N/A
Were all the refrigerant circuits evacuated to below 500 microns?	Yes	No	N/A

DX Cooling Performance Measurements

Outdoor DB air temperature (°F)

Outdoor WB air temperature (°F)

Let the cooling system run at 100% cooling demand (all stages on) for 15 minutes to achieve steady state prior to taking readings for refrigerant circuits, compressors, and condenser fans.

Refrigerant Circuit	Suction Pressure (psig)	Head Pressure (psig)	Subcool (°F)	Superheat (°F)	Total Ref. Charge Added or Removed (lb)
1					
2					
3					
4					
5					
6					

Compressor	Current			Voltage		
	L1	L2	L3	1-2	2-3	3-1
1						
2						
3						
4						
5						
6						

PMI-IF START-UP REPORT

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Condenser Fans	Current			Voltage		
	L1	L2	L3	1-2	2-3	3-1
1						
2						
3						
4						
5						
6						

Chilled Water

Is there any physical damage to the water coil(s)?	Yes	No	N/A
Coil piped for proper flow orientation?	Yes	No	N/A
Coil and pipes pressure tested and leak free?	Yes	No	N/A
Does the drain pan drain properly?	Yes	No	N/A

Fluid type (%/%) _____

Chilled Water Performance Measurements

Airflow (CFM)	Fluid flow rate (SFPM)	Coil entering air temperature (°F)
Fluid entering temperature (°F)	Coil leaving air temperature (°F)	Fluid leaving temperature (°F)

Energy Wheel

Is there any physical damage to the energy wheel(s)?	Yes	No	N/A
Does the wheel rotate freely?	Yes	No	N/A
Wheel rotation direction verified?	Yes	No	N/A
Is drain properly connected?	Yes	No	N/A
Is VFD operating properly?	Yes	No	N/A

Wheel rotation speed (RPM) _____

Appendix A: Assembly of Split Units

Purpose

To provide an overview and basic understanding of the process for on-site assembly of split air handling units.

Installer Supplied Tools and Material

- Exterior-grade caulking
- Rigging equipment sufficiently rated for the weights being hoisted
- Sufficiently long threaded rod, nuts and bolts to pull sections together
- Soapy water to lubricate between the roof curb and unit base (if required)
- Come-alongs (only to be used on the base frame as needed)

Factory Supplied Material

- Neoprene gasket
- Roof caps
- Fasteners

Instructions

These instructions apply to both vertically and horizontally split units. All joining hardware is provided by SolutionAir and is shipped with the unit unless noted otherwise.

1. Ensure the bottom of the first section's base is clean and free from debris and place it on the roof curb, aligning all edges. Connect and tighten the fasteners holding the section to the roof curb if applicable.
2. Sections with 6-point lifts may have removable center lugs (Figure 1). They can be removed

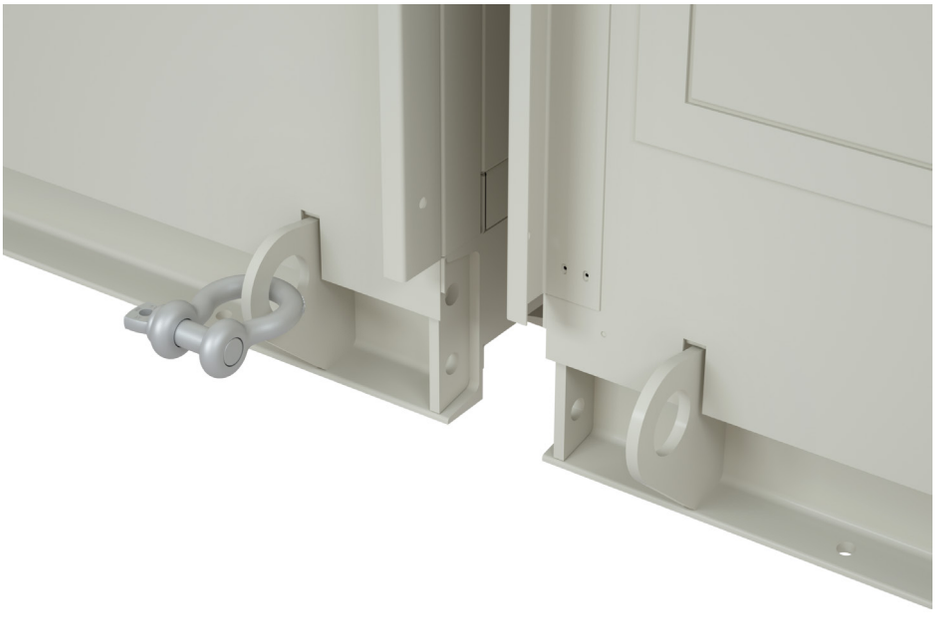
FIGURE 1: REMOVABLE CENTER LUG SHOWN ON BASE FRAME ▼

once the section is seated on the roof curb.

3. Apply the supplied ¼" thick gasket material to one side of the open face, ensuring it is placed as shown in Figure 2 and that it is well adhered.
4. It is recommended to spray soapy-water on the entire roof curb prior to placing the subsequent sections. This will help with pulling the sections together.
5. Move the second section into place on the roof curb as close as possible but no more than 2" from the already anchored section (Figure 3). Once the

FIGURE 2: GASKET APPLIED TO THE PERIMETER OF THE OPENING ▼

FIGURE 3: SECOND SECTION PLACED WITHIN 2" OF THE ANCHORED SECTION ▼



second section is on the curb, the center lug can be removed.

6. Use threaded rod, washers and nuts to slowly, and evenly pull Section 2 towards Section 1 from the base (Figure 4). Once the base is tight, verify that the gasket around the walls and roof splits is still in place and has not been damaged during the pull-in procedure.
7. The bases then need to be secured to one another (Figure 5), and then to the roof curb.
8. Once the bases are bolted

FIGURE 4: THREADED ROD, WASHERS AND NUTS FOR PULLING SECTIONS TOGETHER ▼

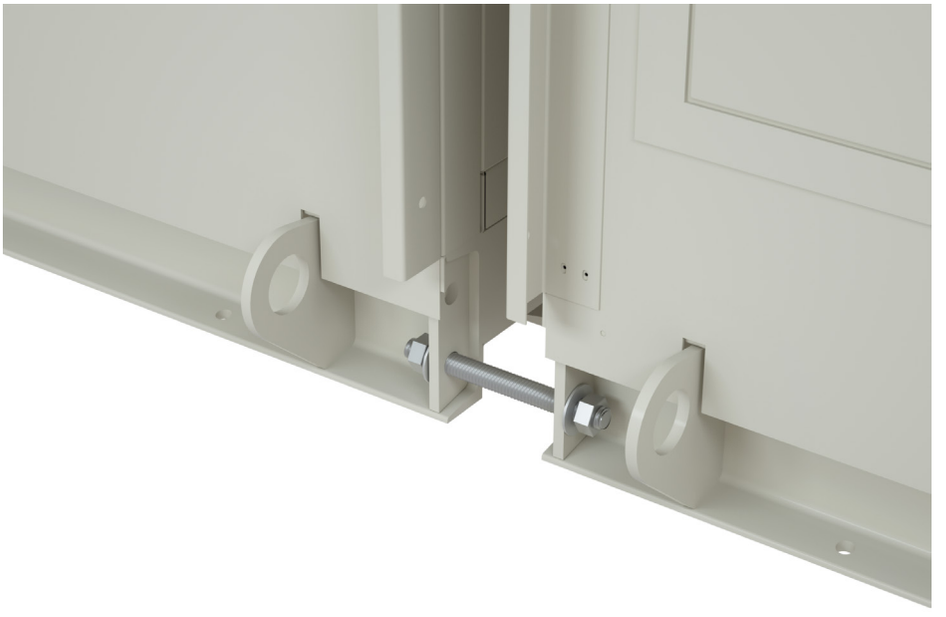


FIGURE 5: BOLTS, WASHERS AND NUTS USED TO FASTEN THE BASE TOGETHER ▼

together, the connecting flanges must be secured to one another using the supplied fasteners.

9. A bead of silicone caulking must then be run across the top of the bolting flange and down the side. If the roof is split, use the supplied roof cap to cover the joint shown in Figure 6.
10. Repeat steps 1 through 9 for all sections of the split air handler unit until all sections are joined.
11. Install all loose exterior features, which may include hood assemblies, exhaust flues and field sensors. Field sensors should be wired according to the supplied electrical diagram.

FIGURE 6: ROOF CAP INSTALLED TO COVER JOINTS AT SPLIT ▼

12. All high voltage wiring (such as fans, motors, blowers, compressors, etc.) is spooled by the factory and is to be pulled through the air handler unit upon assembly (Figure 7). Wires should be connected to the corresponding labeled terminals.
13. All low voltage control wiring (such as actuators, sensors, etc) is disconnected at the air handler unit splits. Spade connectors or junction boxes containing terminal blocks are installed at the splits. All control wiring and terminals are marked to aid with on-site assembly.
14. The unit is now ready to be connected to the main power source. This operation must be performed by a qualified electrician and done according to local codes and regulations.

FIGURE 7: HIGH VOLTAGE WIRES SPOOLED ▼

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