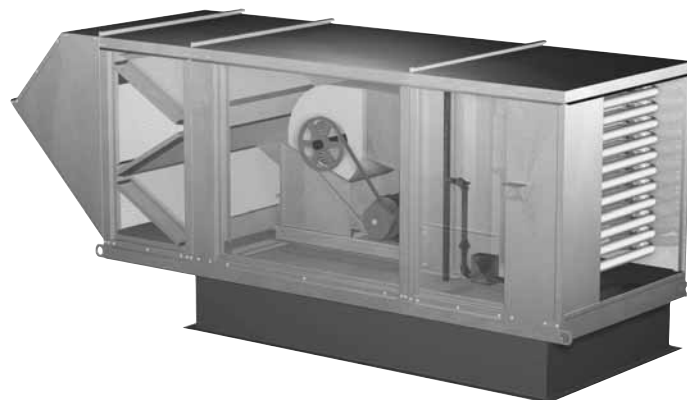
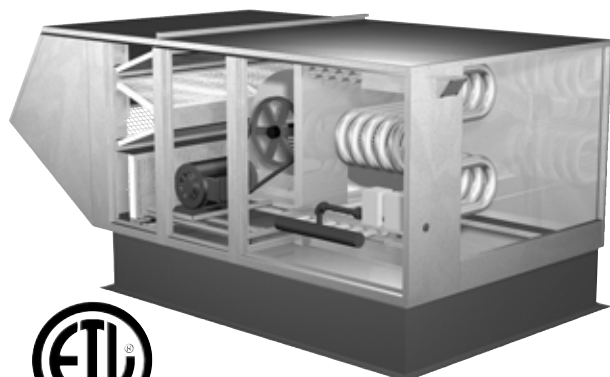


# MODELS IG / IGX

## Make-Up Air Unit



### Installation, Operation and Maintenance Manual



Installation

Start-Up

Operation

#### **\*\*WARNING\*\***

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

#### **\*\*FOR YOUR SAFETY\*\***

If you smell gas:

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

#### **\*\*FOR YOUR SAFETY\*\***

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

Troubleshooting

Maintenance

Reference

#### **Indirect Gas Fired Unit Installations**

Units are listed for installation in the United States and Canada

- Installation of gas fired duct furnaces must conform with local building codes. In the absence of local codes, installation must conform to the National Fuel Gas code, ANSI Z223.1 or in Canada, CAN/CGA-B149 installation codes.
- All electrical wiring must be in accordance with the regulation of the National Electric Code, ANSI/NFPA No. 70.
- Unit is approved for installation downstream from refrigeration units. In these conditions, condensate could form in the duct furnace and provision must be made to dispose of the condensate.

### **Report any damaged equipment to the shipper immediately!**

All units are shipped on a skid or packaged to minimize damage during shipment. The transporting carrier has the responsibility of delivering all items in their original condition as received from Greenheck. The individual receiving the equipment is responsible for inspecting the unit for obvious or hidden damage, recording any damage on the bill of lading before acceptance and filing a claim (if required) with the final carrier. Some accessory items are stored inside the unit during shipping. Care must be taken during installation to prevent damage to units.

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## STORAGE

When a unit is not going to be in service for an extended period of time, certain procedures should be followed to keep the unit in proper operating condition:

- Plug all piping
- Rotate fan wheel monthly and purge bearings once every one to three months (depending on environment)
- Energize fan motor once every three months
- Store belts flat to keep them from warping and stretching
- Store unit in location without vibration
- Cover unit with tarp to protect from dirt and moisture
- After storage period, purge grease before putting fan into service

### NOTE!

Do not cover unit with a black tarp, this would promote condensation.

### NOTE!

Improper storage which results in damage to the unit will void the warranty.

# Installation - Indoor

## NOTE!

To prevent premature heat exchanger failure, do not locate units where chlorinated, halogenated, or acid vapors are present.

Installation

### Step 1 Install Hangers

Install threaded hangers from ceiling supports. When locating hangers, allow enough room to open access panel(s). Two nuts must be used on the end of each threaded hanger. Ceiling supports are supplied by others.

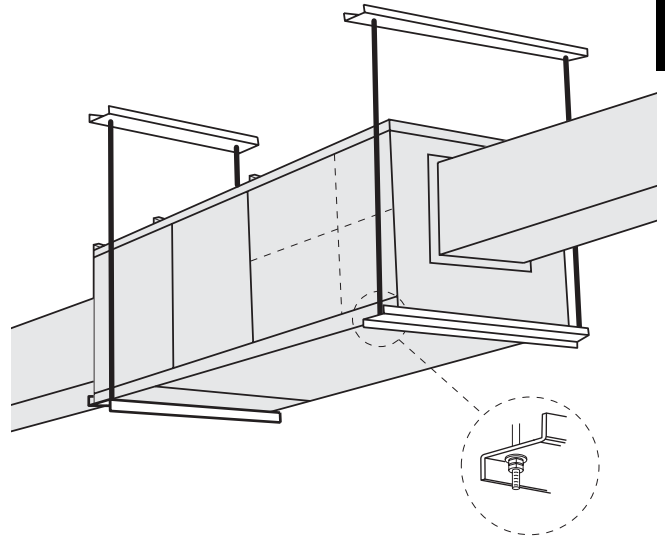
### Step 2 Install Unit

Raise the unit into place.

Using two nuts per hanger, fasten the unit supports to hangers under the unit. Appropriate unit supports, such as the optional Greenheck hanging bracket kit or c-channel and angle iron (supplied by others) should be used.

Using self tapping screws, attach ductwork to unit.

In order to prevent the unit from swinging and to provide a safe environment for service and maintenance, additional measures must be taken to secure the unit in all directions.



## NOTE!

Two nuts must be used on each end of each threaded hanging rod for proper support.

## WARNING!

All factory provided lifting lugs must be used when lifting any unit. Failure to comply with this safety precaution could result in property damage, serious injury or death.

## NOTE!

Good duct practices should be followed for all ductwork. Ductwork should be installed in accordance with SMACNA and AMCA guidelines, NFPA 96 and any local codes. Reference the CAPS submittal for duct sizes.

### Step 3 Install Vent Piping

Refer to the indoor venting instructions I-6. Refer to your unit submittal to determine the correct venting option.

## NOTE!

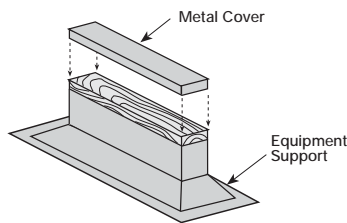
Vent piping is supplied by others and not supplied by Greenheck.

# Installation - Arrangement DB / HZ

## Step 1 Install Curb/Equipment Support(s)

Installation

Position curb/equipment support(s) on the roof (reference the CAPS submittal for placement of curb/equipment support(s) in relation to the unit). Verify that all unit supports are level, shim if necessary. Attach curb to roof and flash into place. When attaching the equipment support(s) to the roof, remove metal cover, flash to wooden nailer and reinstall cover.



### NOTE!

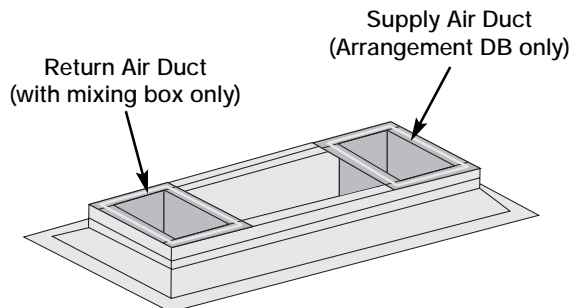
Refer to the outdoor venting instructions when locating the unit.

## Step 2 Install Ductwork

Good duct practices should be followed for all ductwork. All ductwork should be installed in accordance with SMACNA and AMCA guidelines, NFPA 96 and all local codes. Reference the CAPS submittal for ductwork sizes.

### NOTE!

The use of a duct adapter is recommended on a downblast (DB) arrangement to align the ductwork with the supply unit and is only a guide and is not support for the ductwork.



## Step 3 Apply Sealant

Apply an appropriate sealant around the perimeter of the curb and duct adapter(s) to isolate fan vibration and prevent water penetration.

## Step 4 Install Unit

Use a crane and a set of spreader bars hooked to the factory lifting lugs to lift and center the unit on the curb/equipment support(s).

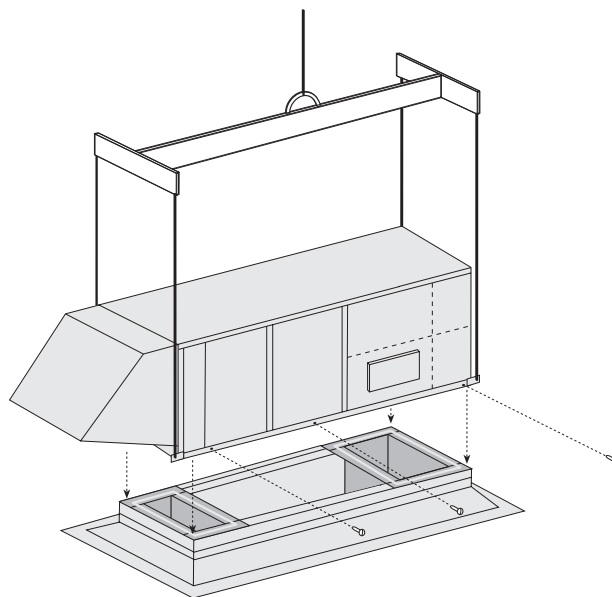
Use self-tapping sheet metal screws to fasten the unit to the curb/equipment support(s).

### NOTE!

The use of all lifting lugs and a set of spreader bars is mandatory when lifting the unit.

### NOTE!

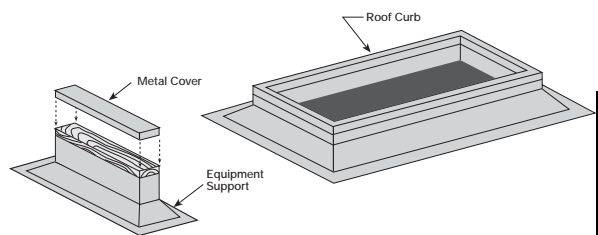
Be sure to complete the outdoor venting installation instructions.



# Installation - Arrangement DBC

## Step 1 Install Curb/Equipment Support(s)

Position curb/equipment support(s) on the roof (reference the CAPS submittal for placement of curb/equipment support(s) in relation to the unit). Verify that all unit supports are level, shim if necessary. Attach curb to roof and flash into place. Attach the equipment support(s) to the roof, remove metal cover, flash to wooden nailer and reinstall cover.



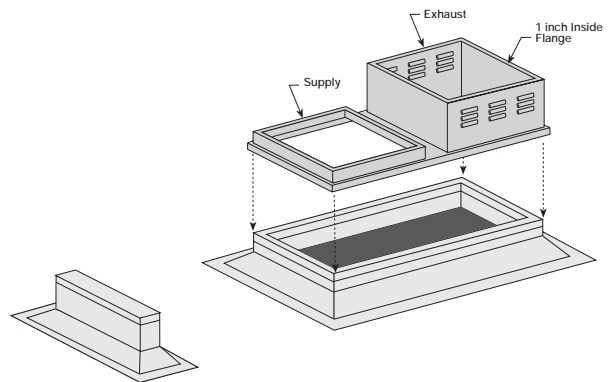
Installation

### NOTE!

Refer to the outdoor venting instructions when locating the unit.

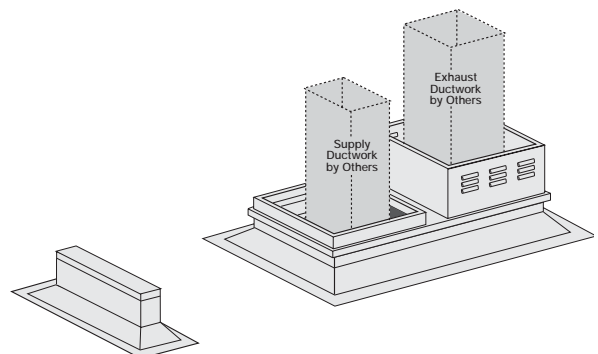
## Step 2 Install Combination Extension

Install combination extension over curb. Lag into place using wood screws. Locate the extension so the tall, vented-side is over the exhaust opening.



## Step 3 Install Ductwork

Good duct practices should be followed for all ductwork. All ductwork should be installed in accordance with SMACNA and AMCA guidelines, NFPA 96 and any local codes. Reference the CAPS submittal for ductwork size and location.



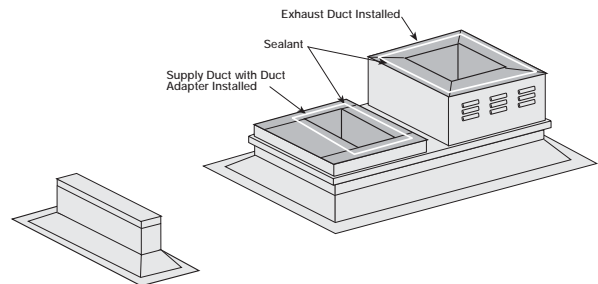
### NOTE!

The use of a duct adapter is recommended on a downblast (DBC) arrangement to align the ductwork with the supply unit and is only a guide and is not support for the ductwork.

# Installation - Roof Mounted Unit Arrangement DBC

## Step 4 Apply Sealant

Apply an appropriate sealant around the perimeter of the curb and duct adapter(s) to isolate fan vibration and prevent water penetration.

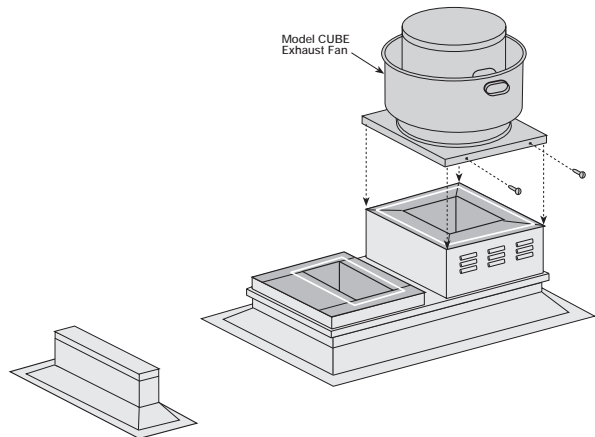


## Step 5 Install Exhaust Fan

Fasten exhaust fan to curb extension with self-tapping sheet metal screws.

### NOTE!

Installing the exhaust fan prior to the supply unit will allow for easier installation of options.



## Step 6 Install Exhaust Options

Install optional Greenheck hinge kit with restraining cables and grease trap with drain connection.

## Step 7 Install Supply Unit

Use a crane and a set of spreader bars hooked to the factory lifting lugs to lift and center the unit on the curb/equipment support(s).

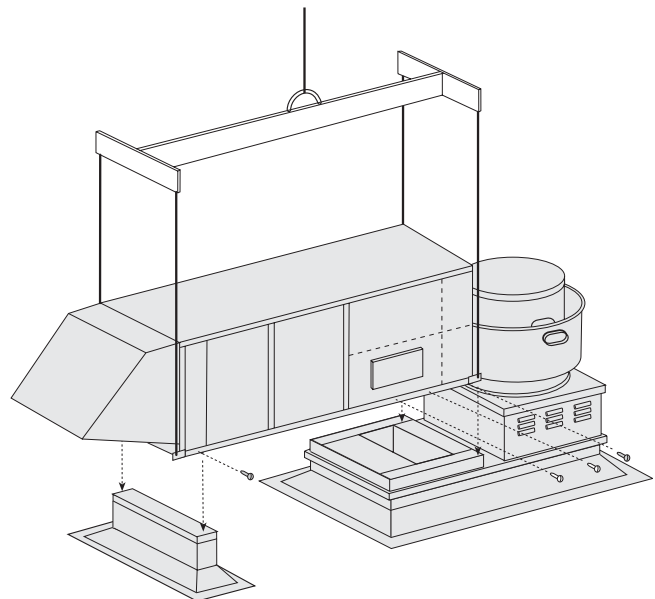
Use self-tapping sheet metal screws to fasten the unit to the curb/equipment support(s).

### NOTE!

The use of all lifting lugs and a set of spreader bars is mandatory when lifting unit.

### NOTE!

Be sure to complete the outdoor venting installation instructions.



# Installation - Venting for Outdoor Units

## Step 1 Follow Guidelines

All of the following guidelines must be followed when installing the unit.

### WARNING!

Do not install units in locations where flue products can be drawn into adjacent building openings such as windows, fresh air intakes, etc. Distance from vent terminal to adjacent public walkways, adjacent buildings, operable windows, and building openings shall conform with the local codes. In the absence of local codes, installation shall conform with the National Fuel Gas Code, ANSI Z223.1, or the CAN/CGA B-149 Installation Codes.

### WARNING!

The following guidelines must be followed for all outdoor units:

1. Building materials that will be affected by flue gases should be protected.
2. Maintain minimum horizontal clearance of 4 feet from electric meters, gas meters, regulators, and relief equipment. In Canada, the minimum clearance is 6 feet.
3. The combustion blower discharge on outdoor units must be located a minimum of 42 inches from any combustible materials.
4. Do not modify or obstruct the combustion air inlet cover or the combustion blower weatherhood.
5. Do not add vents other than those supplied by the manufacturer.
6. During the winter, keep the unit clear of snow to prevent any blockage of the combustion venting.

### NOTE!

Clearances from combustible material for indoor units are determined by the National Fuel Gas Code and/or other local codes.

## Step 2 Install Stack (Optional)

Clearance may require an exhaust stack. Install an exhaust stack as needed to the exhaust connection on the unit. Install a vent terminal on the exhaust pipe.

# Installation - Venting for All Indoor Units

## WARNING!

The following guidelines must be followed for all indoor units:

1. Installation of venting must conform with local building codes. In the absence of local codes, installation must conform with the National Fuel Gas Code, ANSI Z223.1 or in Canada, CAN/CGA-B149 installations codes.
2. For the exhaust pipe, use pipe approved for a category III appliance or single wall, 26 gauge or heavier galvanized vent pipe. The piping is required to be gas tight by ANSI.
3. For the combustion air pipe on separated combustion units, sealed single-wall galvanized air pipe is recommended.
4. The joints must be sealed with a metallic tape or silastic suitable for temperatures up to 350°F.
5. A minimum of 12 inches of straight vent pipe is recommended after the exhaust connection and before any elbows.
6. Vertical combustion air pipes should be fitted with a tee, drip leg and clean-out cap to prevent any moisture in the combustion air pipe from entering the unit.
7. To reduce condensation, insulate any vent runs greater than 5 feet.
8. All vent pipe connections should be made with at least three corrosion resistant sheet metal screws.
9. Refer to the National Fuel Gas Code for additional piping guidelines.

## NOTE!

Vent piping is supplied by others and not supplied by Greenheck.

## NOTE!

The drip leg should be cleaned out periodically during the heating season.

## Venting Methods

There are three venting method for indoor mounted units. Specific venting instructions are provided for each method. Refer to the specific instructions for the venting method listed in the CAPS submittal.

The venting method options are:

- Standard Indoor Venting (uses building air for combustion, vents outdoors, one roof or wall penetration)
- Separated Combustion 2-Pipe Venting (uses outside air for combustion, vents outdoor, two exterior roof or wall penetrations)
- Separated Combustion Concentric Venting (uses outside air for combustion, vents outdoors, one exterior roof or wall penetration)

## NOTE!

For each method, the units can be vented horizontally through an exterior wall or vertically through the roof. Refer to the specific venting instructions for your unit. Construct the vent system as shown in these instructions.



# Installation - Standard Indoor Venting

## NOTE!

Standard indoor venting uses one penetration through an exterior wall or roof for venting the flue exhaust. The combustion air is supplied from the air inside the building. Units must not be installed in a potentially explosive, flammable, or corrosive atmosphere. To prevent premature heat exchanger failure, do not locate units where chlorinated, halogenated, or acid vapors are present.

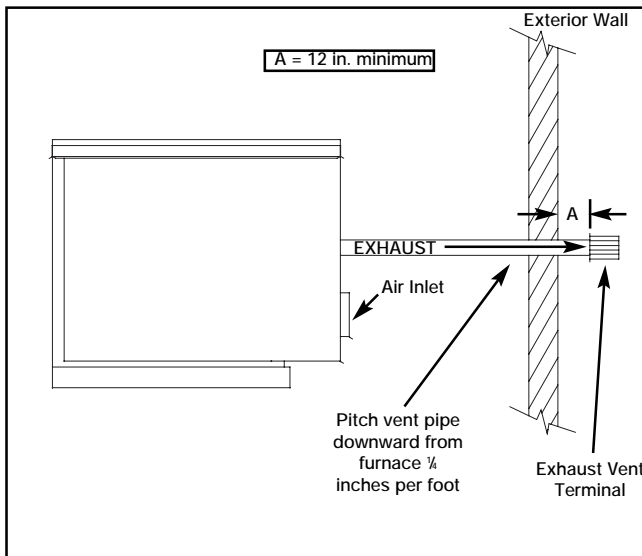
## NOTE!

When units are installed in tightly sealed buildings, provisions should be made to supply adequate amount of infiltration air from the outside. The rule of thumb is that an opening of one square inch should be provided for every 1000 BTU per hour of input rating.

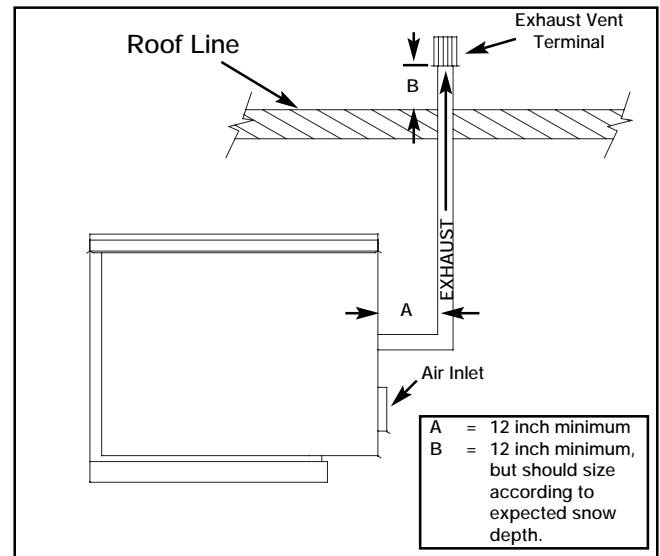
## IMPORTANT!

Vent terminals must be used. Construct the vent system as shown in drawings and reference the tables for the correct vent pipe diameters. The minimum vent length is 5 feet for horizontal and 10 feet for vertical. The maximum vent length is 70 feet. The total equivalent vent length must include elbows. The equivalent length of a 4 inch elbow is 6 feet and the equivalent length of a 6 inch elbow is 10 feet.

## Standard Horizontal Venting



## Standard Vertical Venting



## Step 1 Select Vent Pipe Size

Select the vent pipe size from the table to the right. Use only the specified pipe size.

Furnace Size (MBH)	Exhaust Pipe Diameter
75-175	4 inches
200-400	6 inches

## Step 2 Install Exhaust Vent Pipe

Install the vent pipe with minimum downward slope (from the unit) of 1/4 inch per foot. Securely suspend the pipe from overhead structures at points no greater than 3 feet apart. Attach the vent terminal to the end of the exhaust pipe.

# Installation - Concentric Venting (General)

## NOTE!

Concentric venting allows the exhaust pipe and combustion air pipe to pass through a single hole in the roof or wall of the building. A concentric venting adapter is required for concentric venting.

## WARNING!

The concentric venting adapter is designed for indoor installations and should never be installed on the exterior of the building.

## NOTE!

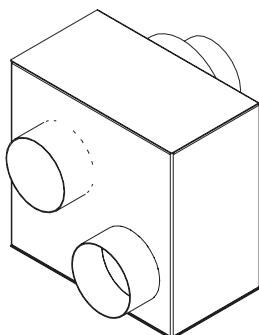
The exhaust pipe must terminate with the vent terminal. The combustion air pipe must terminate with the combustion air guard (horizontal venting) or terminal (vertical venting). Both are provided in the optional venting kit along with the concentric venting adapter (CVA).

## NOTE!

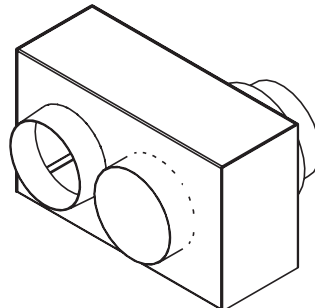
Vent piping is supplied by others and not supplied by Greenheck.

## NOTE!

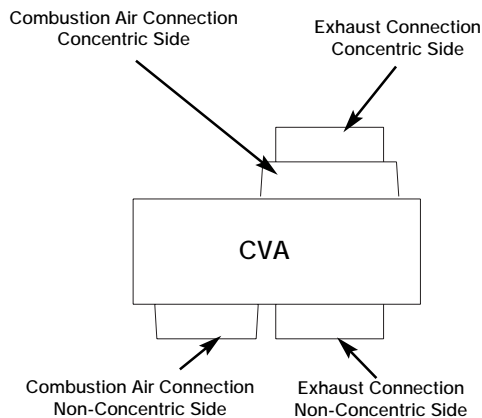
If venting vertically through the roof, refer to the vertical concentric venting instructions. If venting horizontally through the wall, refer to the horizontal concentric venting instructions.



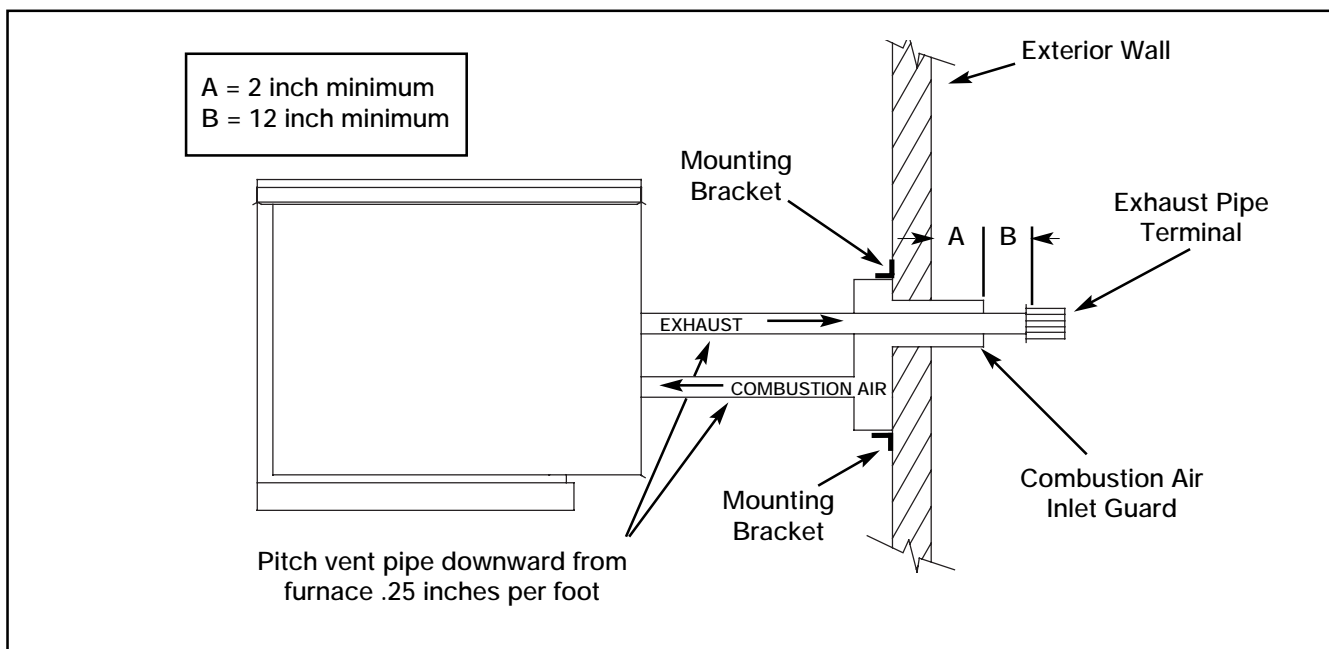
CVA-4  
(4 inch Concentric Venting Adapter)



CVA-6  
(6 inch Concentric Venting Adapter)



# Installation - Concentric Venting (Horizontal)



## NOTE!

Maintain at least 12 inches from the combustion air inlet guard to the vent terminal.

## NOTE!

To prevent water from running into the combustion air pipe and to allow for easy installation of the combustion air guard, the combustion air pipe must terminate at least 2 inches from the exterior surface of the outside wall.

## NOTE!

All vent piping is FIELD SUPPLIED by others and is not supplied by Greenheck.

## NOTE!

The optional venting kit includes a concentric venting adapter (CVA), vent terminal and guard.

## IMPORTANT!

Vent terminals must be used. Construct the vent system as shown in drawings and reference the tables for the correct vent pipe diameters. The minimum vent length is 5 feet and the maximum vent length is 70 feet. The total equivalent vent length must include elbows. The equivalent length of a 4 inch elbow is 6 feet and the equivalent length of a 6 inch elbow is 10 feet.

Furnace Size (MBH)	Non-Concentric Vent Connection Diameter		Concentric Vent Connection Diameter	
	Exhaust (Inches)	Combustion Air (Inches)	Exhaust (Inches)	Combustion Air (Inches)
75 -175	4	4	4	6
200 -400	6	6	6	8

## Step 1 Determine Venting Location

Determine the location of the concentric venting adapter (CVA) based on any clearances that must be maintained (follow all codes referenced in these instructions).

## Step 2 Attach Mounting Brackets

Attach field supplied, corrosion resistant mounting brackets to the CVA using corrosion resistant sheet metal screws.

# Installation - Concentric Venting (Horizontal)

## Step 3 Install Exhaust Pipe

Slide the exhaust pipe through the CVA.

Installation

Be sure to provide enough exhaust piping to pass through the wall and provide the minimum clearance of 12 inches between the exhaust pipe termination and the combustion air intake.

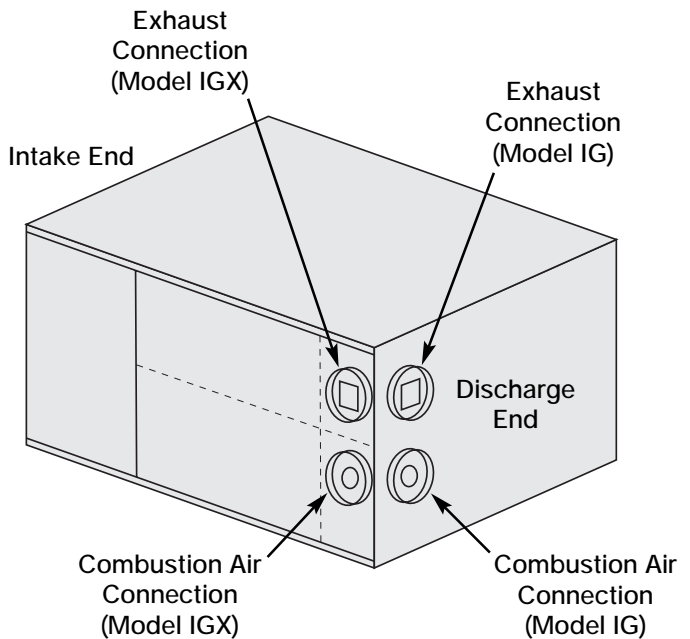
With all required clearances satisfied, attach the exhaust pipe to the CVA.

## Step 4 Install Combustion Air Pipe

Attach a field supplied combustion air pipe to the concentric side of the CVA.

Be sure to provide enough combustion air piping to pass through the wall and provide the minimum clearance of 2 inches between the combustion air intake and the exterior surface of the outside wall.

Be sure to maintain the minimum clearance of 12 inches between the exhaust pipe termination and the combustion air intake.



## Step 5 Install CVA Assembly

Place the entire CVA assembly through the wall and verify that all minimum clearance requirements as specified in these instructions are met. Secure the CVA assembly to the wall with corrosion resistant sheet metal screws through the mounting brackets.

## Step 6 Attach CVA Assembly to Unit

Attach the exhaust pipe to the unit's combustion exhaust. Using an additional combustion air pipe, connect the unit's combustion air supply intake to the combustion air connection on the CVA.

## Step 7 Install Combustion Air Inlet Guard and Exhaust Vent Terminal

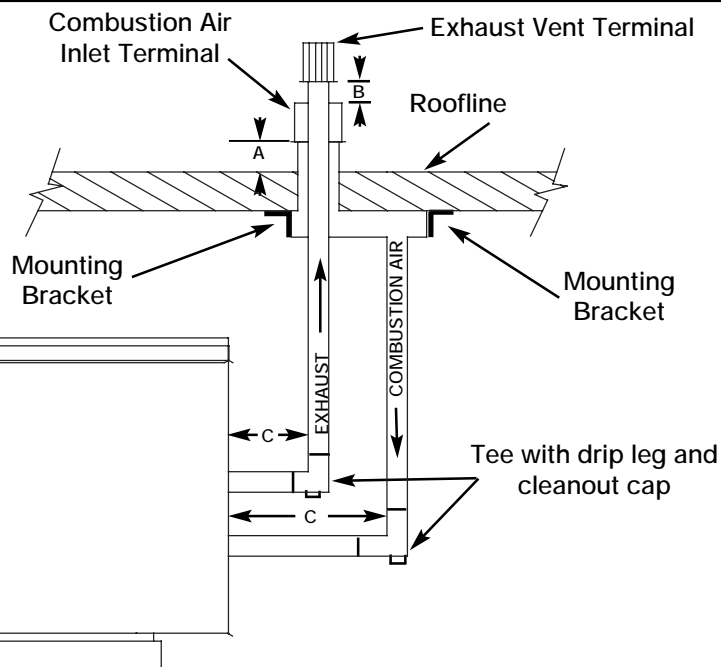
Slide the combustion air inlet guard over the exhaust pipe and fasten it to the combustion air pipe. Attach the exhaust vent terminal to the discharge end of the exhaust piping on the outside of the building.

## Step 8 Seal Opening

Seal the opening between the wall and the air intake pipe using an appropriate method.

# Installation - Concentric Venting (Vertical)

A = 12 inch minimum, but should size according to expected snow depth.  
B = 12 inch minimum  
C = 12 inch minimum



Installation

## NOTE!

Maintain at least 12 inches of clearance between the top of the combustion air inlet terminals and the bottom of the exhaust terminal.

## NOTE!

The bottom of the combustion air intake pipe must terminate above the snow line, or at least 12 inches above the roof, whichever is greater.

## NOTE!

The optional venting kit includes a concentric venting adapter (CVA), and two terminals.

## NOTE!

All vent piping is FIELD SUPPLIED by others.

## NOTE!

A tee with clean-out must be provided on the combustion air and exhaust pipe to prevent debris from entering the heat exchanger.

## IMPORTANT!

Vent terminals must be used. Construct the vent system as shown in drawings and reference the tables for the correct vent pipe diameters. The minimum vent length is 10 feet and the maximum vent length is 70 feet. The total equivalent vent length must include elbows. The equivalent length of a 4 inch elbow is 6 feet and the equivalent length of a 6 inch elbow is 10 feet.

Furnace Size (MBH)	Non-Concentric Vent Connection Diameter		Concentric Vent Connection Diameter	
	Exhaust (inches)	Combustion Air (inches)	Exhaust (inches)	Combustion Air (Inches)
75 -175	4	4	4	6
200 -400	6	6	6	8

## Step 1 Determine Venting Location

Determine the location of the concentric venting adapter (CVA) based on any clearances that must be maintained (follow all codes referenced in these instructions).

## Step 2 Attach Mounting Brackets

Attach field supplied corrosion resistant mounting brackets to the CVA.

## Installation - Concentric Venting (Vertical)

### Step 3 Install Exhaust Pipe

Slide the exhaust pipe through the CVA.

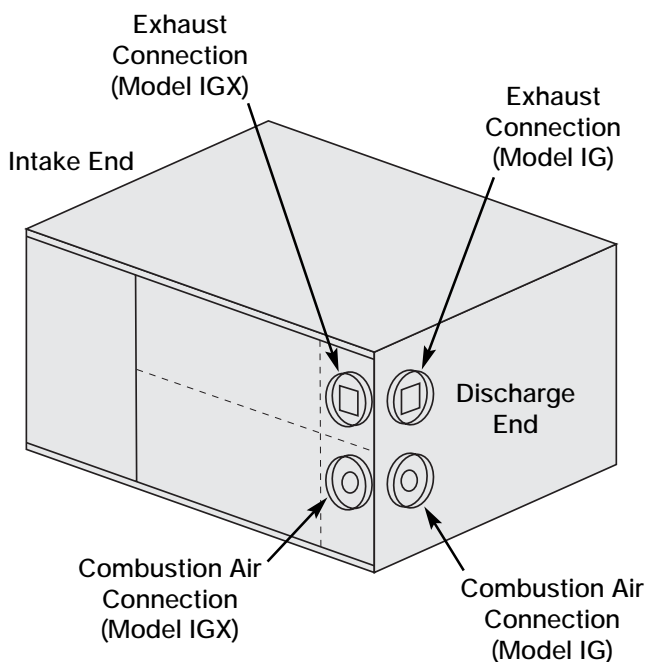
Installation

Be sure to provide enough exhaust piping to pass through the roof and provide the minimum clearance of 12 inches between the exhaust pipe termination and the combustion air intake.

With all required clearances satisfied, attach the exhaust pipe to the CVA.

### Step 4 Install Combustion Air Pipe

Attach a field supplied combustion air pipe to the concentric side of the CVA. Be sure to provide enough combustion air piping to pass through the roof and provide the minimum clearance of 12 inches between the combustion air intake and the exterior surface of the roof. This clearance may need to be increased to allow for snow accumulation. Be sure to maintain the minimum clearance of 12 inches between the exhaust pipe termination and the combustion air intake.



### Step 5 Install CVA Assembly

Place the entire CVA assembly through the roof and verify that all minimum clearance requirements as specified in these instructions are met. Secure the CVA assembly to the ceiling with corrosion resistant sheet metal screws through the mounting brackets.

### Step 6 Attach CVA Assembly to Unit

Attach the exhaust pipe to the unit's combustion exhaust. Using an additional combustion air pipe, connect the unit's combustion air supply intake to the combustion air connection on the CVA. Be sure to include the required tee's with drip legs and clean outs.

### Step 7 Install Terminals

Slide the combustion air terminal over the vent pipe and fasten it to the combustion air pipe. Attach the exhaust vent terminal to the discharge end of the exhaust piping.

### Step 8 Seal Opening

Seal the opening between the roof and the air intake pipe using an appropriate method.

# Installation - Two Pipe Venting (Horizontal)

## NOTE!

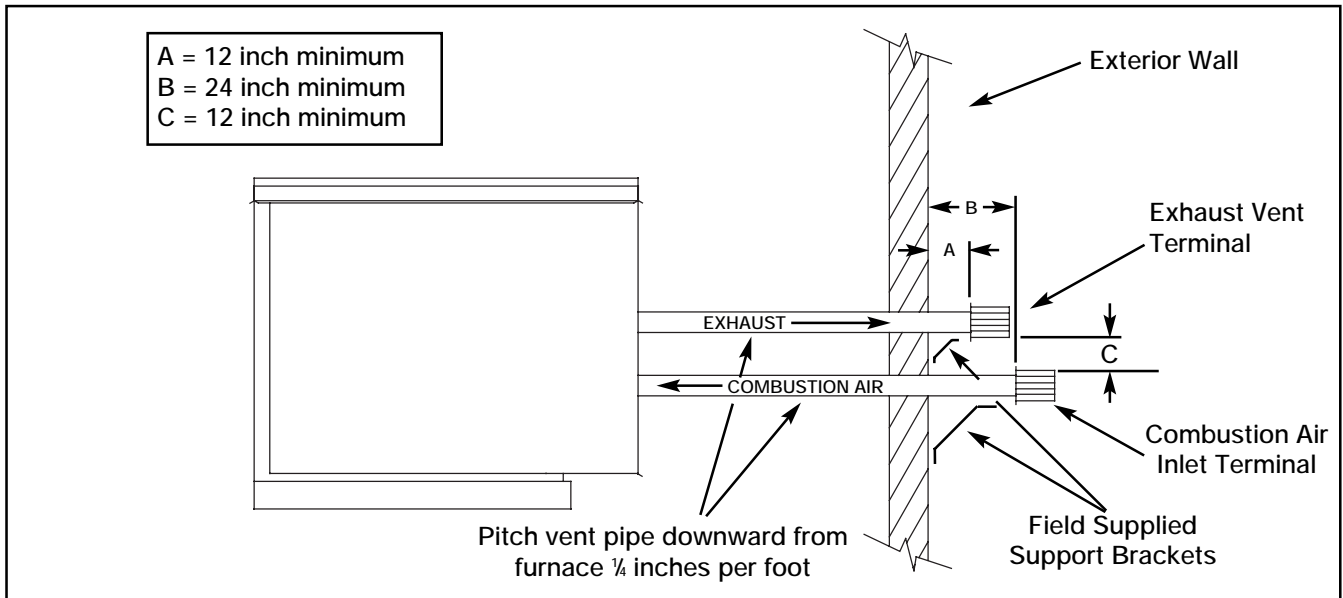
Maintain at least 12 inches of clearance between the exhaust pipe termination and the exterior surface of the exterior wall.

## NOTE!

The combustion air pipe must be a minimum of 12 inches from the exhaust pipe and 24 inches from the exterior surface of the outside wall.

## NOTE!

A minimum of 1 inch and a maximum of 48 inch of building wall thickness is required for separated combustion vent pipe.



## NOTE!

Optional venting kit includes two vent terminals.

## NOTE!

All vent piping is FIELD SUPPLIED by others.

## IMPORTANT!

Vent terminals must be used. Construct the vent system as shown in drawings and reference the tables for the correct vent pipe diameters. The minimum vent length is 5 feet and the maximum vent length is 50 feet. The total equivalent vent length must include elbows. The equivalent length of a 4 inch elbow is 6 feet and the equivalent length of a 6 inch elbow is 10 feet.

Furnace Size (MBH)	Vent Connection Diameter	
	Exhaust (Inches)	Combustion Air (Inches)
75 - 175	4	4
200 - 400	6	6

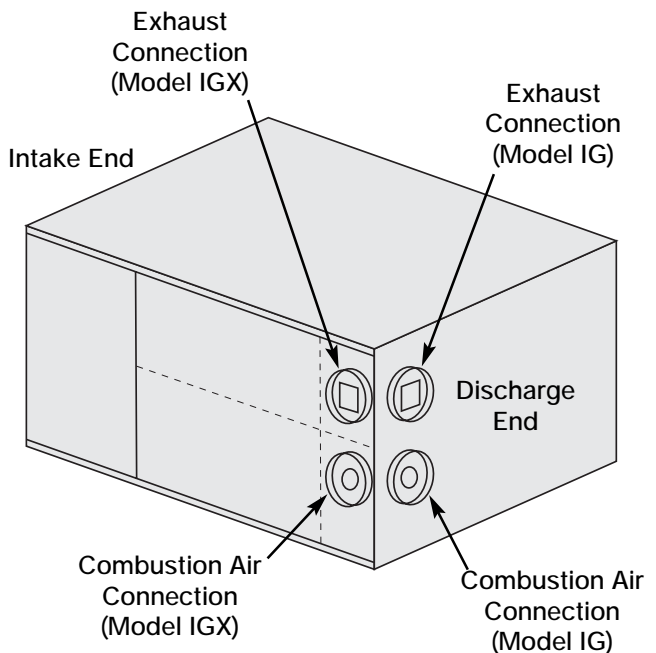
# Installation - Two Pipe Venting (Horizontal)

## Step 1 Install Exhaust Pipe

Run an exhaust pipe from the unit's combustion exhaust through the exterior wall to the outdoors. The exhaust pipe must terminate at least 12 inches from the outside surface of the outside wall. Attach exhaust vent terminal to the end of the exhaust pipe. Using field supplied mounting brackets, support the exhaust pipe as needed.

## Step 2 Install Combustion Air Pipe

Run a combustion air pipe from the unit's combustion air intake through the exterior wall to the outdoors. The combustion air pipe must terminate at least 12 inches from the combustion vent pipe and 24 inches from the exterior surface of the outside wall. Attach the combustion air inlet guard to the end of the combustion air pipe. Using field supplied mounting brackets, support the combustion air pipe as needed.



## Step 3 Seal Wall Openings

Using an appropriate method, seal the wall openings around the piping.



# Installation - Two Pipe Venting (Vertical)

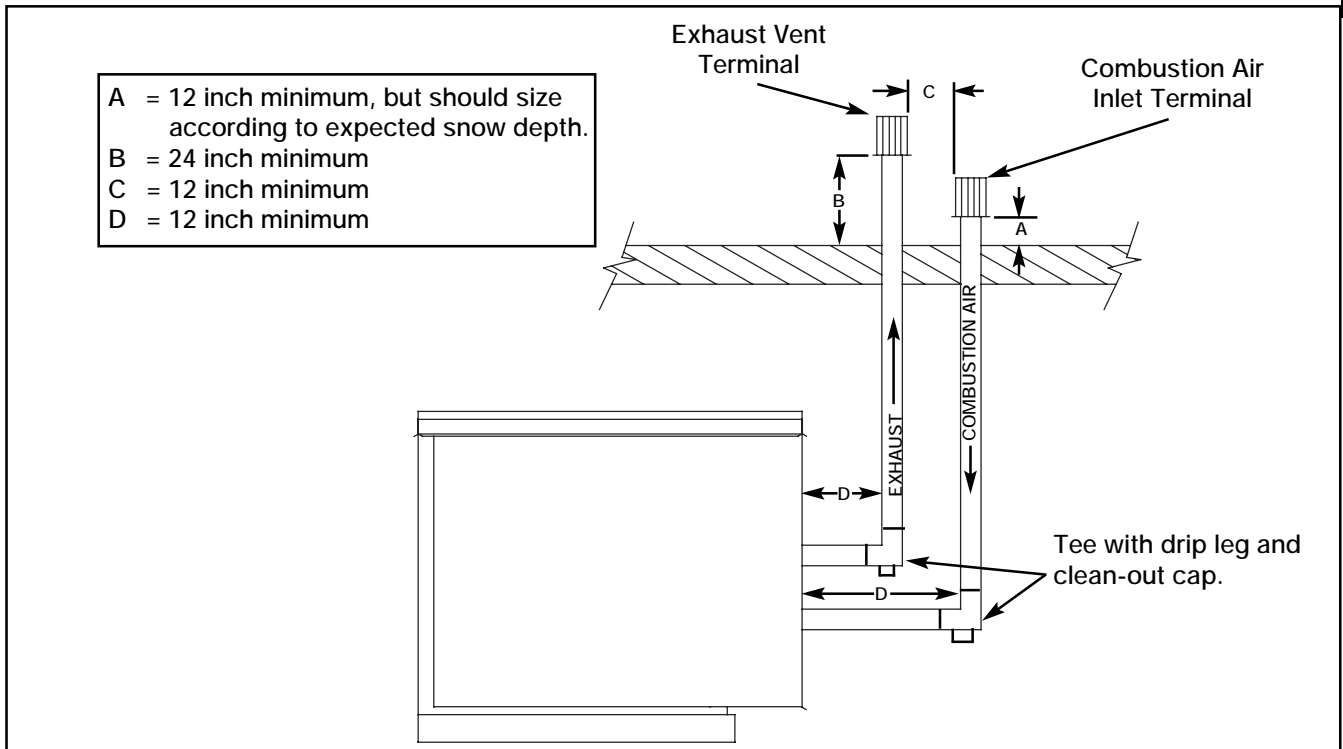
## NOTE!

The combustion air pipe must terminate at least 12 inches above the roof. This clearance may need to be increased to accommodate for snow accumulation.

## NOTE!

The exhaust must terminate at least 12 inches above and 12 inches horizontally from the combustion air inlet.

Installation



## NOTE!

The optional vent kit includes two terminals.

## NOTE!

All vent piping is FIELD SUPPLIED by others.

## IMPORTANT!

Vent terminals must be used. Construct the vent system as shown in drawings and reference the tables for the correct vent pipe diameters. The minimum vent length is 10 feet and the maximum vent length is 70 feet. The total equivalent vent length must include elbows. The equivalent length of a 4 inch elbow is 6 feet and the equivalent length of a 6 inch elbow is 10 feet.

Furnace Size (MBH)	Vent Connection Diameter	
	Exhaust (Inches)	Combustion Air (Inches)
75 - 175	4	4
200 - 400	6	6

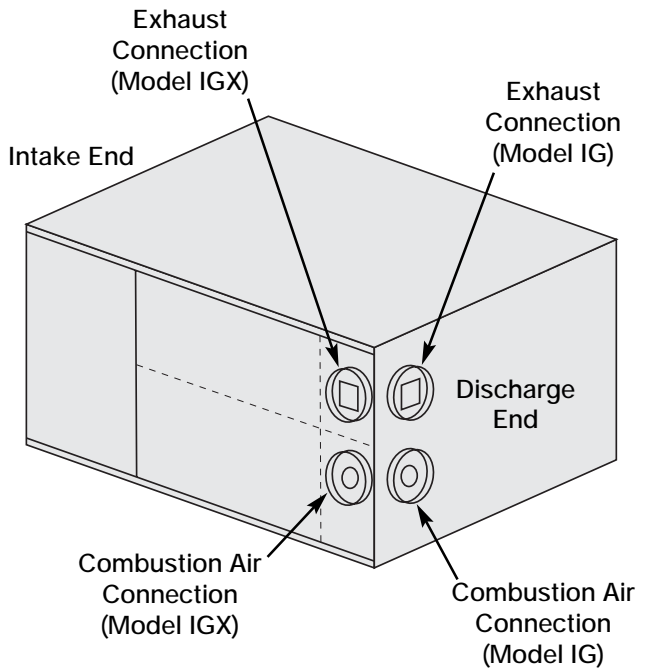
# Installation - Two Pipe Venting (Vertical)

## Step 1 Install Exhaust Pipe

Run an exhaust pipe from the unit's combustion exhaust through the roof to the outdoors. The exhaust pipe must terminate at least 12 inches above the outside surface of the roof. This clearance may need to be increased to accommodate snow accumulation. Attach the exhaust vent terminal to the end of the exhaust pipe.

## Step 2 Install Combustion Air Pipe

Run a combustion air pipe from the unit's combustion air intake through the roof to the outdoors. The combustion air pipe must terminate at least 12 inches horizontally and vertically from the combustion exhaust pipe and at least 24 inches from the exterior surface of the roof. These clearances may need to be increased to accommodate for expected snow accumulation. Attach the combustion air terminal to the end of the combustion air pipe.



## Step 3 Seal Roof Penetration

Using an appropriate method, seal the roof openings around the vent pipes.

# Installation - Electrical Wiring

## IMPORTANT!

Before connecting power to the unit, read and understand the following instructions and wiring diagrams. Complete wiring diagrams are attached on the inside of the control center door(s).

## IMPORTANT!

All wiring should be done in accordance with the latest edition of the National Electric Code ANSI/NFPA-70 and any local codes that may apply. In Canada, wiring should be done in accordance with the Canadian Electrical Code.

## CAUTION!

If replacement wire is required, it must have a temperature rating of at least 105°C, except for energy cut-off or sensor lead wire which must be rated to 150°C.

## IMPORTANT!

The equipment must be properly grounded. Any wiring running through the unit in the airstream must be protected by metal conduit, metal clad cable or raceways.

## DANGER!

High voltage electrical input is needed for this equipment. This work should be performed by a qualified electrician.

## CAUTION!

Any wiring deviations may result in personal injury or property damage. Greenheck is not responsible for any damage to, or failure of the unit caused by incorrect final wiring.

## IMPORTANT!

Greenheck's standard control voltage is 24 VAC. Control wire resistance should not exceed 0.75 ohms (approximately 285 feet total length for 14 gauge wire; 455 feet total length for 12 gauge wire). If the resistance exceeds 0.75 ohms an industrial-style, plug-in relay should be wired in place of the remote switch. The relay must be rated for at least 5 amps and have a 24 VAC coil. Failure to comply with these guidelines may cause motor starters to chatter or not pull in, resulting in contactor failures and/or motor failures.

### Step 1 Determine the Size of the Main Power Lines

The unit nameplate states the voltage and the unit's total amps. The main power lines to the unit should be sized accordingly.

Unit's Total Amps		Voltage, Hertz, and Phase	
MODEL	<input type="text"/>	<input type="text"/>	
VOLTS	<input type="text"/>	HTZ	<input type="text"/> PH <input type="text"/>
AMPS	<input type="text"/>	S/N	<input type="text"/>
SUP HP	<input type="text"/>	EXH HP	<input type="text"/>
MARK	<input type="text"/>		

### Step 2 Provide the Opening(s) for the Electrical Connections

Electrical openings vary by unit size and arrangement and are field supplied.

### Step 3 Connect the Main Power

Connect the main power lines to the disconnect switch and main grounding lug(s). Torque field connections to 20 in-lbs. See the blower control center layout in the reference section for main disconnect and grounding lug(s) locations.

# Installation - Electrical Wiring

## Step 4 Wire the Convenience Outlet (Optional)

The optional convenience outlet requires a separate 115V power supply circuit with short circuit protection by others.

Installation

## Step 5 Wire the Accessories

Reference the ladder diagram in the control center for correct wiring of the following accessories:

- Selectrstat
- Room Override
- Blower Switch
- Heat Switch
- Indicating Lights
- Dirty Filter Indicator
- TSCP
- KSCP
- Mixing Box Actuator
- Room Stat

### NOTE!

Wiring to the Selectrstat or room override should be in separate conduit or run with shielded cable.

### NOTE!

The TSCP and KSCP remote panels have number-to-number wiring.

## Step 6 Wire Optional Evaporative Cooler

Reference the ladder diagram on the inside of the control center door for correct wiring of the pump and the optional auto-drain and flush. If the Water Wizard was selected, the temperature sensor may need to be wired, refer to the Water Wizard start-up.

### NOTE!

Large evaporative coolers may require a separate power supply.

## Step 7 Install Optional Economizer Sensors

All economizer options (EC) require an outdoor air temperature or enthalpy sensor to be field installed inside of the weatherhood and field wired to terminals *SO+* and *SO-* on the economizer.

Economizer options EC-3 and EC-4 require an outdoor air temperature or enthalpy sensor to be field installed in the return air duct and field wired to terminals *SR+* and *SR-* on the economizer.

The sensors are provided by the factory and ship with the unit.

# Installation - Electrical Wiring

## Step 8 Install Discharge Air Sensor (Optional)

For units with 8:1, 16:1 or 24:1 staged turndown, install the discharge air sensor at least three duct diameters downstream of the heat exchanger. The discharge air sensor can be found in the unit's control center.

## Step 9 Check Recirculation / VAV Operation (Optional)

### NOTE!

Blower start-up (S-1), steps 1-4 should be performed before the blower is run.

### Two Position Damper Control

Confirm that the return damper adjusts to each position of the recirculating switch. The damper actuator may take a few minutes to open or close.

### Two Speed

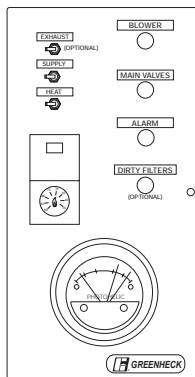
Confirm that the fan speed adjusts to each position of the fan speed switch.

### Potentiometer Control

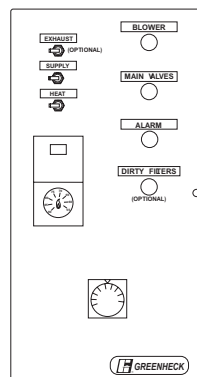
To test potentiometer operation, turn the potentiometer to the two extremes. With recirculation, confirm that the return air damper fully opens and fully closes. The damper actuator may take a few minutes to open or close. With variable volume, make sure the fan goes to maximum and minimum speed.

### Building Pressure Control

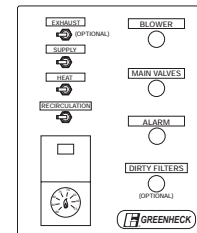
See page 31 for building pressure set-up and operation check.



Photohelic Control



Potentiometer Control



2-Position Damper Control

### NOTE!

For maintenance issues associated with variable frequency drives, consult the drive's manual supplied with the unit. The drives are programmed at the factory and should not need any adjustment during installation or start-up. For kitchen applications, the drive may be located in the kitchen or in the unit.

## Step 10 Install DDC Interface (Optional)

Some units may use an external signal from a building management system to control the dampers and/or discharge air temperature. Reference the unit ladder diagram for the correct wiring.

# Installation - Gas Piping

## IMPORTANT!

All gas piping must be installed in accordance with the latest edition of the National Fuel Gas Code ANSI/Z223.1 and any local codes that may apply. In Canada, the equipment shall be installed in accordance with the Installation Code for Gas Burning Appliances and Equipment (CGA B149) and Provincial Regulations for the class. Authorities having jurisdiction should be consulted before installations are made.

## IMPORTANT!

All piping should be clean and free of any foreign material. Foreign material entering the gas train can cause damage.

## IMPORTANT!

Do NOT connect the unit to gas types other than what is specified and do NOT connect the unit to gas pressures that are outside of the pressure range shown on the label.

## WARNING!

When leak testing pressures equal to or less than 14 in. wc ( $\frac{1}{2}$  psi), first close the field-installed shutoff valve to isolate the unit from the gas supply line.

## WARNING!

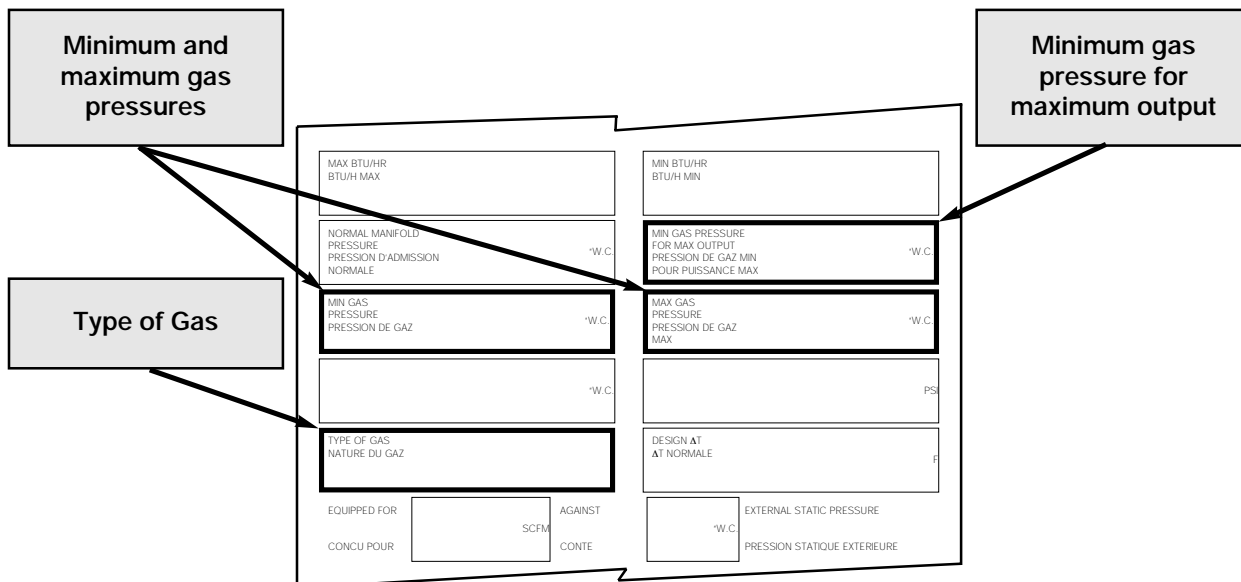
When leak testing pressures above 14 in. wc ( $\frac{1}{2}$  psi), close the field installed shutoff valve, disconnect the furnace and gas train from the gas supply line and plug the supply line before testing.

## NOTE!

When connecting the gas supply, the length of the run must be considered in determining the pipe size to avoid excessive pressure drop. Refer to a Gas Engineer's Handbook for gas pipe capacities.

## NOTE!

Furnaces have a single  $\frac{3}{4}$  inch connection.



## Step 1 Determine the Supply Gas Requirements

The unit's nameplate states the requirements for the gas being supplied to the unit.

# Installation - Gas Piping

## Step 2 Install Additional Regulator if Required

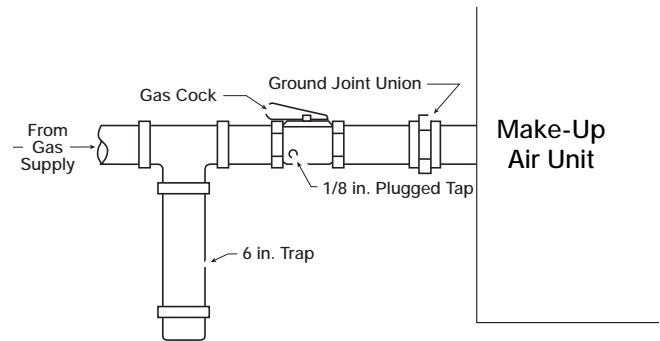
When the supply gas pressure exceeds the maximum gas pressure shown on the unit's nameplate, an additional regulator (by others) is required to reduce the pressure. The regulator must have a listed leak limiting device or it must be vented to the outdoors.

	Supply Gas Pressure Range (in. wc.)	
	Minimum	Maximum
Natural	6	14
LP	10	14

Installation

## Step 3 Connect the Supply Gas Line

A manual shut off valve (gas cock), 1/8 inch plugged test port and 6 inch drip leg must be installed prior to the gas train. The valve and the test port must be accessible for the connection of a test gauge. Supply gas connections must be made by a qualified installer and are not furnished by Greenheck.



## Step 4 Test the System for Leaks

Check both the supply lines and the factory piping for leaks. Apply a soap and water solution to all piping and watch for bubbling which indicates a leak.

**WARNING!**  
**NEVER test for a gas leak with an open flame.**

**WARNING!**  
The factory piping has been checked for leaks, but should be rechecked due to shipping and installation.

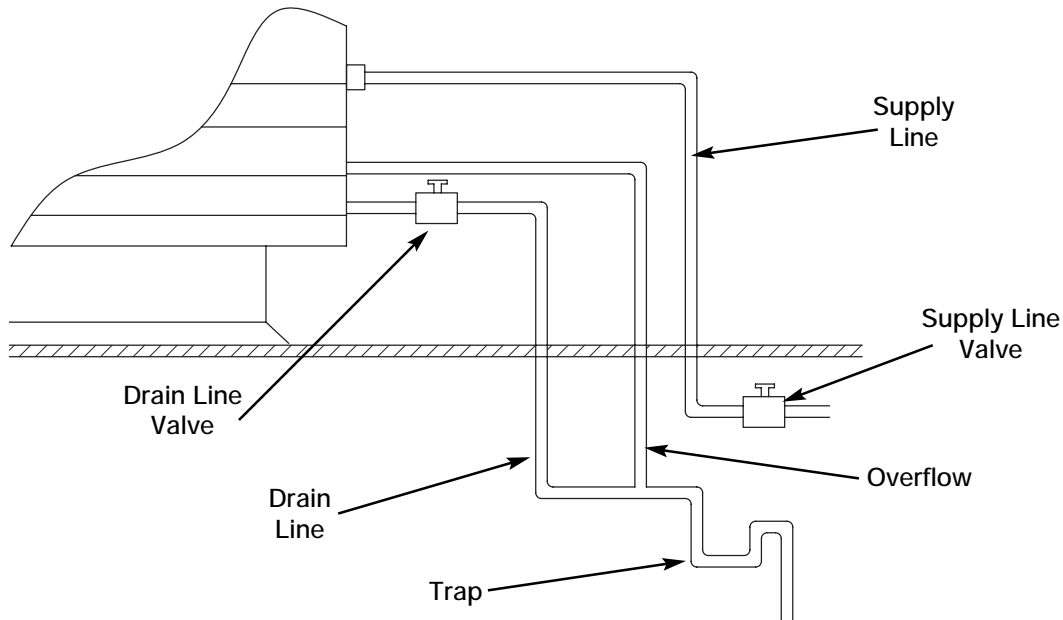
# Installation - Evaporative Cooling Piping (Optional)

## Evaporative Cooling with Bleed-Off

Installation

### NOTE!

The following instructions are provided for evaporative coolers with bleed-off only. Additional instructions are provided for evaporative coolers equipped with the Water Wizard or auto-drain and fill.



### IMPORTANT!

The supply line should be of adequate size and pressure to resupply the amount of water lost due to bleed-off and evaporation. The drain line should be the same size or larger than the supply line.

### CAUTION!

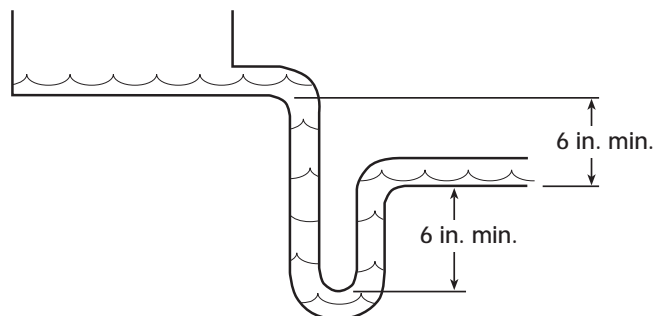
All solenoids, valves and traps must be installed below the roof to protect the water supply line from freezing. If they cannot be installed below the roof, an alternative method must be used to protect the lines from freezing.

### Step 1 Install the Water Supply Line

Connect the water supply line to the float valve in the evaporative cooling unit. Install a manual shutoff valve in the supply line as shown above.

### Step 2 Install the Drain Line

Connect an unobstructed drain line with a manual shut-off valve from the sump drain to the main drain line as shown above. A trap should be used to prevent sewer gas from being drawn into the unit.



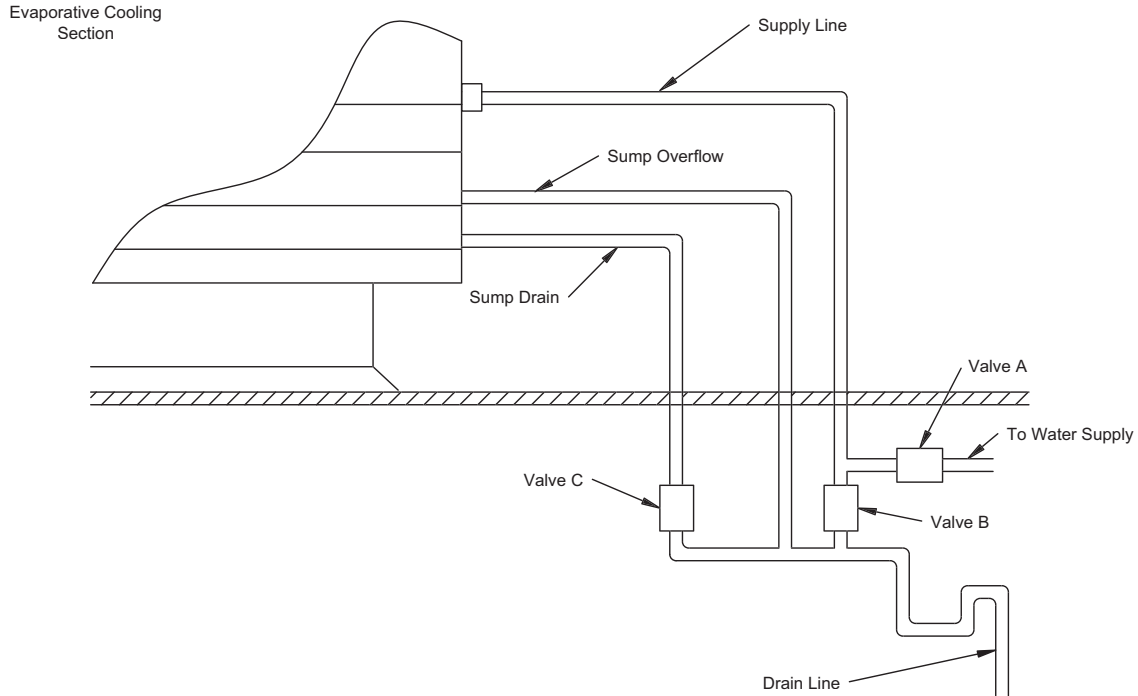


# Installation - Evaporative Cooling Piping (Optional)

## Evaporative Cooling with Auto Drain and Fill

### NOTE!

The following instructions are provided for evaporative coolers with auto-drain and fill only. Additional instructions are provided for evaporative coolers equipped with the Water Wizard or bleed-off.



Installation

### IMPORTANT!

The supply line should be of adequate size and pressure to resupply the amount of water lost due to bleed-off and evaporation. The drain line should be the same size or larger than the supply line.

### CAUTION!

All solenoids, valves and traps must be installed below the roof to protect the water supply line from freezing. If they cannot be installed below the roof, an alternative method must be used to protect the lines from freezing.

### IMPORTANT!

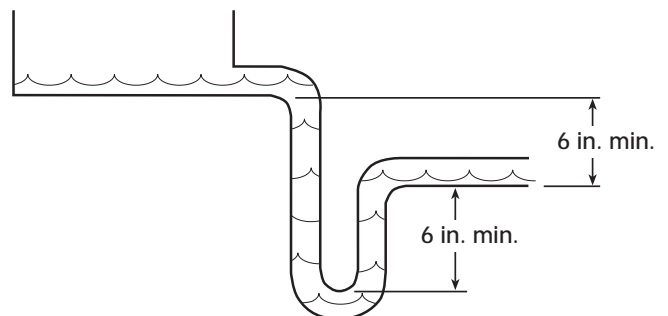
The supply solenoid (Valve A) is NOT the same as the drain solenoids (Valve B and Valve C). Make sure to use the proper solenoid for each location. Check your local code requirements for proper installation of this type of system.

### Step 1 Install the Water Supply Line

Connect the water supply line to the float valve in the unit. Install the  $\frac{1}{2}$  inch normally closed solenoid (Valve A) in the supply line as shown above. Install the  $\frac{1}{4}$  inch normally open solenoid (Valve B) between the supply line and the drain line as shown above.

### Step 2 Install the Drain Line

Connect an unobstructed drain line to the sump drain. Install the  $\frac{1}{4}$  inch normally open solenoid (Valve C) between the sump drain connection and the drain line. A trap should be used to prevent sewer gas from being drawn into the unit.



# Installation - Water Wizard (Optional)

## Evaporative Cooling with the Water Wizard

Installation

### NOTE!

The following instructions are provided for evaporative coolers equipped with the Water Wizard only. Additional instructions are provided for evaporative coolers equipped with the auto-drain and fill or bleed-off.

### WARNING!

Disconnect and lock-out all power and gas before performing any maintenance or service to the unit. Failure to do so could result in serious injury or death and damage to equipment.

### Step 1 Install Supply Line/Solenoid

Connect the water supply line to the manual supply valve in the unit. Install the supply solenoid in the supply line, upstream of the manual supply valve and below the roofline.

### Step 2 Install Drain Line/Solenoid

Connect the drain line to the supply line between the manual supply valve and the supply solenoid. Install a drain solenoid in the drain line, below the roof line.

### NOTE!

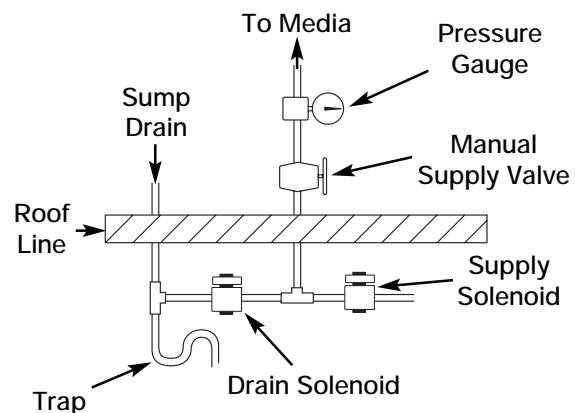
Solenoid(s) may be provided by Greenheck (if ordered) or by others.

### CAUTION!

Any wiring deviations may result in personal injury or property damage. Greenheck is not responsible for any damage to, or failure of the unit caused by incorrect final wiring.

### Step 3 Wire the Solenoid(s)

Wire the supply solenoid to terminals X and 25 in the control center. Wire the drain solenoid to terminals X and 26 in the control center.



### Step 4 Wire the Temperature Sensor

If the evaporative cooler shipped separate from the unit, the temperature sensor must be wired. The sensor wire is bundled inside the discharge end of the evaporative cooler. Wire the sensor wire to terminals AI2 and AIC on the terminal strip in the unit's control center.

### NOTE!

The Water Wizard start-up must be completed for proper performance.

# Installation - Direct Expansion Coil Piping (Optional)

## IMPORTANT!

Guidelines for the installation of direct expansion cooling coils have been provided to ensure proper performance and longevity of the coils. These are general guidelines that may have to be tailored to meet the specific requirements of any one job. As always, a qualified party or individual should perform the installation and maintenance of any coil. Protective equipment such as safety glasses, steel toe boots and gloves are recommended during the installation and maintenance of the coil.

Installation

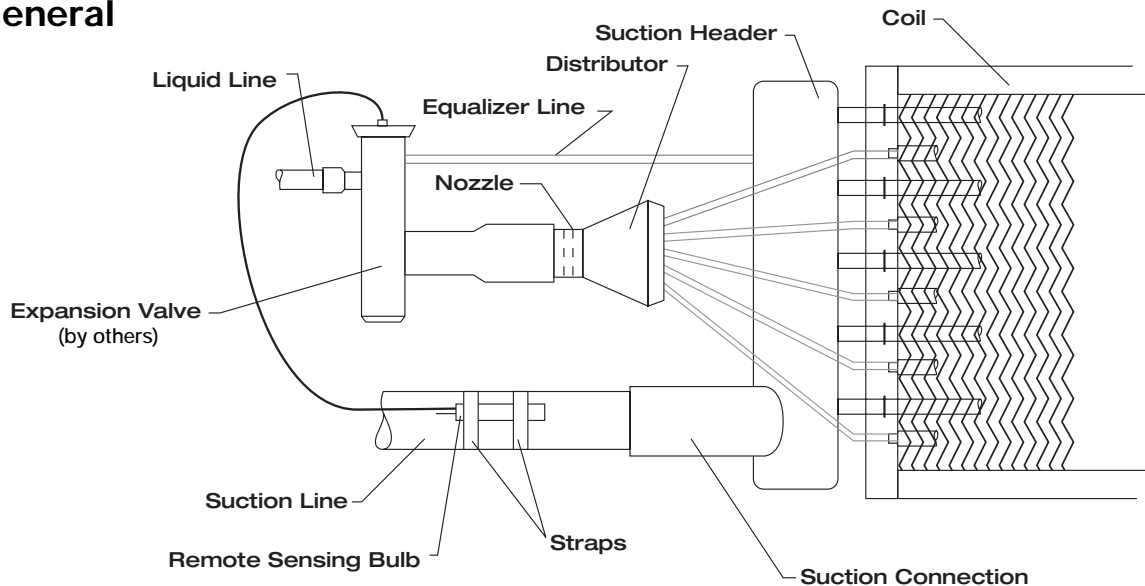
## IMPORTANT!

All field brazing and welding should be performed using high quality materials and an inert gas purge (such as nitrogen) to reduce oxidation of the internal surface of the coil.

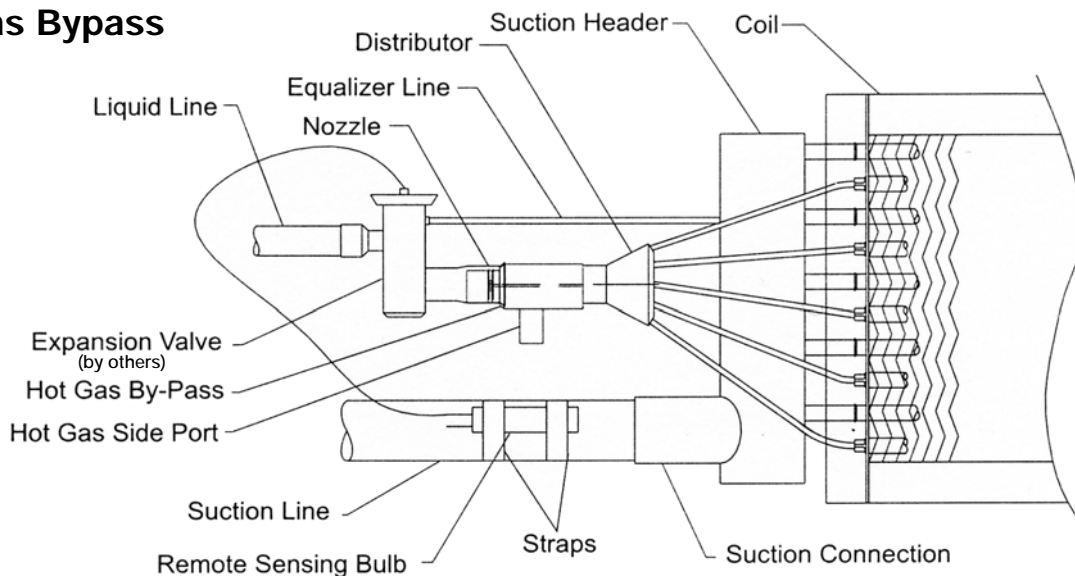
## IMPORTANT!

All field piping must be self-supporting and flexible enough to allow for the thermal expansion of the coil.

## General



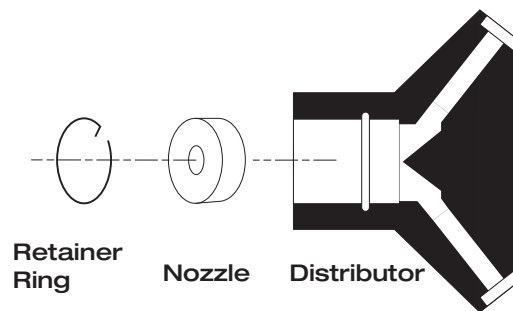
## Hot Gas Bypass



# Installation - Direct Expansion Coil Piping (Optional)

## Step 1 Verify Nozzle Placement

Inspect the refrigerant distributor and verify that the nozzle is in place. The nozzle is generally held in place by a retaining ring or is an integral part of the distributor itself.



### NOTE!

If a hot gas bypass kit was ordered, the nozzle will not be located in the distributor, it will be located in the hot gas bypass kit.

## Step 2 Install the Optional Hot Gas Bypass Kit (By Others)

If a hot gas bypass kit was ordered with the coil, install it now. Consult the IOM from the bypass kit supplier for complete installation instructions. Align the side port with the hot gas line prior to brazing into place.

## Step 3 Install Suction Line

Install a suction line from the compressor to the suction connection.

## Step 4 Install the Thermal Expansion Valve (TEV) (By Others)

Follow the TEV manufacturer's recommendations for installation to avoid damaging the valve. If the valve is externally equalized, use a tubing cutter to cut off the plugged end of the factory installed equalizer line. Use a de-burring tool to remove any loose metal from the equalizer line and attach it to the TEV. If the valve is internally equalized, the factory installed equalizer line can be left as is.

## Step 5 Mount the Remote Sensing Bulb (By Others)

The expansion valve's remote sensing bulb should be securely strapped to the horizontal run of the suction line at the 3 or 9 o'clock position and insulated.

# Installation - Direct Expansion Coil Piping (Optional)

## Step 6 Check Coil Piping for Leaks

Pressurize the coil to 100 psig with dry nitrogen or other suitable gas. The coil should be left pressurized for a minimum of 10 minutes. If the coil holds the pressure, the hook-up can be considered leak free. If the pressure drops by 5 psig or less, re-pressurize the coil and wait another 10 minutes. If the pressure drops again there is likely one or more small leaks which should be located and repaired. Pressure losses greater than 5 psig indicate a large leak that should be isolated and repaired.

Installation

## Step 7 Evacuate and Charge the Coil

Use a vacuum pump to evacuate the coil and any interconnecting piping that has been open to the atmosphere. Measure the vacuum in the piping using a micron gauge located as far from the pump as possible. Evacuate the coil to 500 microns or less then close the valve between the pump and the system. If the vacuum holds to 500 microns or less for one minute, the system is ready to be charged or refrigerant in another portion of the system can be opened to the coil. A steady rise in microns would indicate that moisture is still present and that the coil should be further vacuumed until the moisture has been removed.

### NOTE!

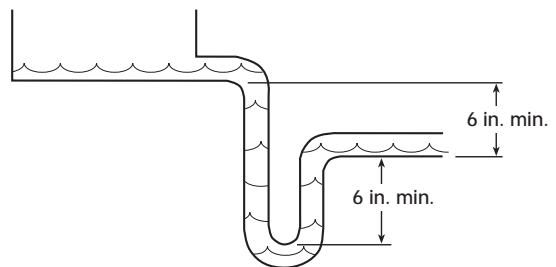
Failure to obtain a high vacuum indicates a great deal of moisture or a small leak. Break the vacuum with a charge of dry nitrogen or other suitable gas and recheck for leaks. If no leaks are found, continue vacuuming the coil until the desired vacuum is reached.

## Step 8 Install the Drain Line

Connect an unobstructed drain line to the drain pan. A trap should be used to prevent sewer gas from being drawn into the unit.

### IMPORTANT!

All traps must be installed below the roofline or be otherwise protected from freezing.



# Installation - Chilled Water Coil Piping (Optional)

Installation

## IMPORTANT!

Guidelines for the installation of the cooling coil have been provided to ensure proper performance of the coils and their longevity. These are general guidelines that may have to be tailored to meet the specific requirements of any one job. As always, a qualified party or individual should perform the installation and maintenance of the coil. Protective equipment such as safety glasses, steel toe boots and gloves are recommended during the installation and maintenance of the coil.

## IMPORTANT!

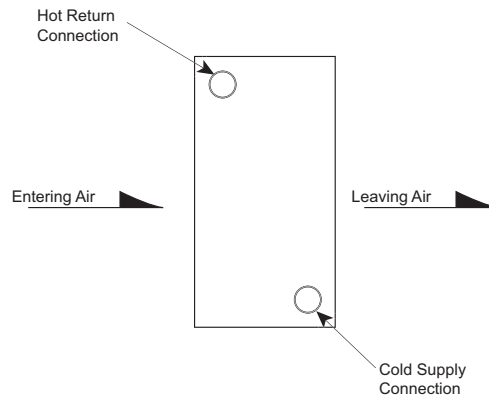
When installing couplings, do not apply undue stress to the connection. Use a backup pipe wrench to avoid breaking the weld between the coil connection and the header.

## IMPORTANT!

All field piping must be self-supporting. System piping should be flexible enough to allow for the thermal expansion and contraction of the coil.

### Step 1 Verify Coil Hand Designation

Check the coil hand designation to ensure that it matches the system. Coils are generally plumbed with the supply connection located on the bottom of the leaving air-side of the coil and the return connection at the top of the entering air-side of the coil. This arrangement provides a counter flow heat exchanger and positive coil drainage.



### Step 2 Check the Coil for Leaks

Pressurize the coil to 100 psig with dry nitrogen or other suitable gas. The coil should be left pressurized for a minimum of 10 minutes. If the coil holds the pressure, the hook-up can be considered leak free. If the pressure drops by 5 psig or less, re-pressurize the coil and wait another 10 minutes. If the pressure drops again there is likely one or more small leaks which should be located and repaired. Pressure losses greater than 5 psig indicate a large leak that should be isolated and repaired.

### Step 3 Connect the Supply and Return Lines

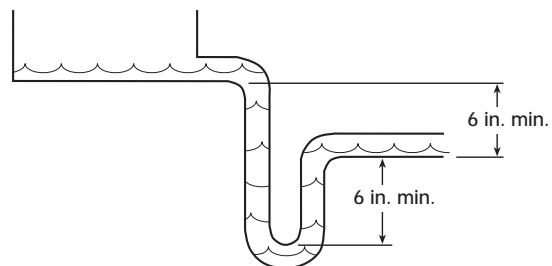
Connect the supply and return lines as shown above.

### Step 4 Install the Drain Line

Connect an unobstructed drain line to the drain pan. A trap should be installed to prevent sewer gas from being drawn into the unit.

## IMPORTANT!

All traps must be installed below the roofline or be otherwise protected from freezing.



# Installation - Building Pressure Control (Optional)

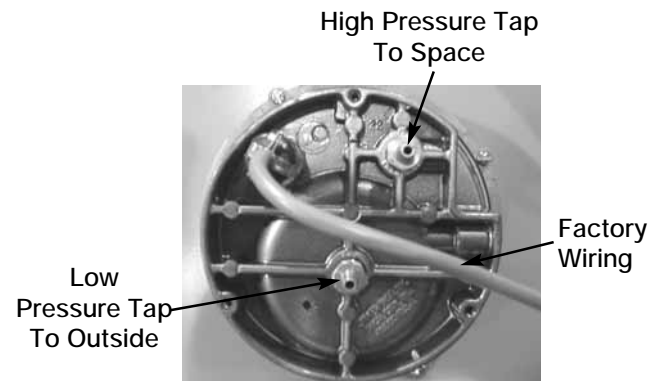
## Step 1 Mount Pressure Tap

Using the factory provided bracket, mount the pressure tap to the outside of the unit. Choose a location out of the prevailing winds and away from supply or exhaust fans to assure accurate readings.



## Step 2 Run Pressure Tap Lines

Run a pressure tap line from the pressure tap on the outside of the unit to the low pressure tap on the back of the photohelic gauge. Run a second pressure tap line from the high pressure tap on the back of the photohelic gauge to the space. Fifty feet of tubing is supplied with the unit.



## Step 3 Set the Building Pressure

The pressure gauge (pictured bottom right) is used to set the desired building pressure. The pressure is set by adjusting the knobs for the upper and lower pressure limits. Typical settings are 0.0 inch wc for the lower and 0.10 inch wc for the upper pressure setting.

## Step 4 Check Control System

Before the unit is left in service, the recirculation control system should be tested.

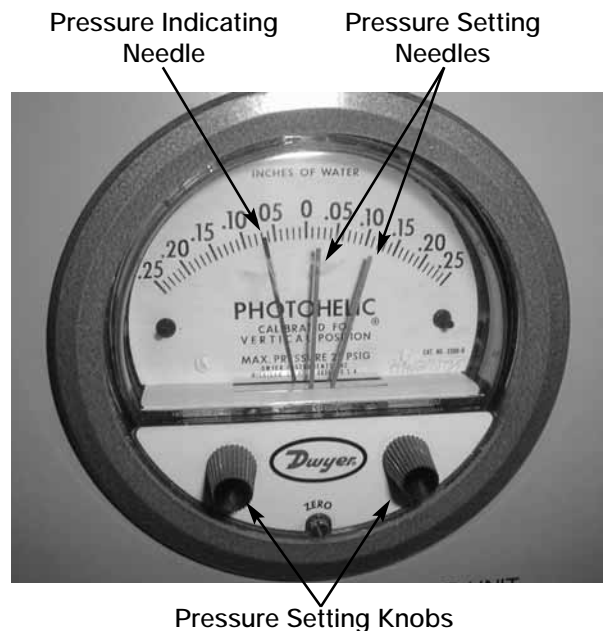
Turn both knobs to the upper most pressure setting. You may have to remove the outdoor pressure tap tubing. The return air damper should close (VAV systems should go to max speed).

Set both knobs at the lowest setting, and the damper should open (VAV systems should go to minimum speed). It may take one to two minutes for the damper to reach the desired position.

Reset the correct pressure limits before starting the unit.

The picture on the bottom right shows a typical photohelic setting. The needle in this photo indicates a negative building pressure. During correct operation the indicating needle will remain between or near the setting needles.

**NOTE!**  
Blower start-up (S-1), steps 1-4 should be performed before the blower is run.



# Start-Up - Blower

## Pre Start-Up Check

Rotate the fan wheel by hand and make sure no parts are rubbing. Check the V-belt drive for proper alignment and tension (a guide for proper belt tension and alignment is provided in the belt maintenance section). Check fasteners, set screws and locking collars on the fan, bearings, drive, motor base and accessories for tightness. Remove any shipping fasteners from the blower vibration isolators.

### WARNING!

Disconnect and lock-out all power and gas before performing any maintenance or service to the unit. Failure to do so could result in serious injury or death and damage to equipment.

### WARNING!

Check the housing, blower, weatherhood, filter section and ductwork for foreign objects and debris before the blower is run.

## SPECIAL EQUIPMENT REQUIRED

Below is a list of special tools that are required. A recommended model is shown, but equivalent products may be used.

Description	Manufacturer-Model	Phone	Website
Voltage Meter	Fluke-23	1-800-44-FLUKE	www.fluke.com
Amperage Meter	Fluke-23	1-800-44-FLUKE	www.fluke.com
Thermometer	Fluke-50	1-800-44-FLUKE	www.fluke.com
U-Tube manometer	Dwyer-Slack Tube	1-219-897-8000	www.dwyer-inst.com
Tachometer	Monarch-Pocket Tach 100	1-800-999-3390	www.monarchinstruments.com

## Step 1 Check the Voltage

Before starting the unit, compare the supplied voltage, hertz, and phase with the unit and motor's nameplate information.

Voltage, Hertz, and Phase	MODEL	<input type="text"/>				
	VOLTS	<input type="text"/>	HTZ	<input type="text"/>	PH	<input type="text"/>
	AMPS	<input type="text"/>	S/N	<input type="text"/>		
	SUP HP	<input type="text"/>	EXH HP	<input type="text"/>		
	MARK	<input type="text"/>				

## Step 2 Check the Blower Rotation

Open the blower access door and run the blower momentarily to determine the rotation. Arrows are placed on the blower scroll to indicate the proper direction.

### IMPORTANT!

If the blower is rotating in the wrong direction, the unit will move some air, but will not perform as designed. Be sure to perform a visual inspection to guarantee the correct blower rotation.

### NOTE!

To reverse the rotation on three phase units, disconnect and lock-out the power, then interchange any two power leads.

### NOTE!

To reverse the rotation on single phase units, disconnect and lock-out the power, then rewire the motor per the manufacturer's instructions.



# Start-Up - Blower

## Step 3 Check for Vibration

Check for unusual noise, vibration or overheating of the bearings. Reference the troubleshooting section for corrective actions.

### IMPORTANT!

Excessive vibration may be experienced during the initial start-up. Left unchecked, it can cause a multitude of problems including structural and/or component failure.

### IMPORTANT!

Generally, fan vibration and noise is transmitted to other parts of the building by the ductwork. To minimize this undesirable effect, the use of heavy canvas duct connectors is recommended.

## Step 4 Motor Check

Measure the motor's voltage, amps and RPM's and compare to the specifications on the motor's nameplate. Check the overload setting and make sure it matches the motor's amperage rating. If the motor's actual amps are greater than the nameplate amps, check and correct the supply voltage or air volume of the blower.

### NOTE!

Additional starters and overloads may be provided in the make-up air control center for optional exhaust blowers. Any additional overloads must be checked for proper voltage, amps and RPM's.

## Step 5 Air Volume Measurement and Check

Measure the unit's air volume (CFM) and compare it with its rated air volume. If the air volume is off, adjust the fan's RPM's by changing the drive.

### NOTE!

The most accurate way to measure the air volume is by using a pilot traverse method downstream of the blower. Other methods can be used but should be proven and accurate.

### IMPORTANT!

Changing the air volume can significantly increase the motor's amps. If the air volume is changed, the motor's amps must be checked to prevent overloading the motor.

## Step 6 Set-up Optional Components

Adjust the settings on the optional components. See the control center layout in the reference section for location of optional components.

- Heating Inlet Air Sensor (typical setting: 60-70°F)
- Cooling Inlet Air Sensor (typical setting: 75°F)
- Building Freeze Protection (typical setting: 5 min at 45°F)
- Dirty Filter Gauge (typical setting: settings vary greatly for each unit)
- Solid Fuel Time Delay (typical setting varies per application)

### NOTE!

If your unit is equipped with a 4:1 modulating or 8:1 staged control, the inlet air sensor and building freeze protection may be included in furnace controller. If this is the case, instructions for setting the inlet air sensor and building freeze protection are included in the furnace start-up.

## Start-up - Furnace (All Units)

### IMPORTANT!

For the unit to function properly, all stage or modulating valves must be set for high and low fire.

### NOTE!

There are four furnace control options available. Be sure to refer to the specific instructions for your control type.

### IMPORTANT!

Multi furnace units may use a combination of the available control options. Each furnace must be set-up per the specific instructions for its control type.

### IMPORTANT!

Multi furnace units will use one stage or modulation controller per unit and one or two ignition controller(s) per furnace. Each furnace will have its own gas valve(s). Each valve must be set for high and low fire.

### NOTE!

To force the unit to light for set-up purposes, the heat switch must be closed or jumpered out. See the ladder diagram on the inside of the control center door for proper terminals to jumper out.

### NOTE!

If the unit is equipped with an independent inlet air sensor (not incorporated into the stage or modulation controller), the unit will not light unless the outside air temperature is less than the inlet air sensor setting. If the outside air is greater than the inlet air sensor setting, turn the setting to its maximum position. When set-up is complete, reset the inlet air sensor to the proper temperature. If the unit is equipped with a stage or modulation controller that includes an inlet air sensor function, the inlet air sensor will be overridden when the unit is forced to high fire.

## Available Control Options

### Single Furnace Units

- 1:1 Staged (one 1-stage furnace)
- 2:1 Staged (one 2-stage furnace)
- 8:1 Staged (one 8-stage furnace)
- 2:1 Electronic Modulation (one 2:1 modulating furnace)
- 4:1 Electronic Modulation (one 4:1 modulating furnace)

### Two Furnace Units

- 1:1 Staged (two 1-stage furnaces)
- 2:1 Staged (two 1-stage furnaces)
- 4:1 Staged (two 2-stage furnaces)
- 16:1 Staged (one 8-stage and one 1-stage furnace)
- 8:1 Electronic Modulation (one 4:1 modulating and one 2-stage furnace)

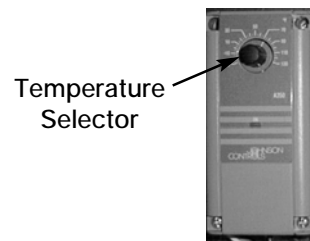
### Three Furnace Units

- 1:1 Staged (three 1-stage furnaces)
- 3:1 Staged (three 1-stage furnaces)
- 6:1 Staged (three 2-stage furnaces)
- 24:1 Staged (one 8-stage and two 1-stage furnaces)
- 12:1 Electronic Modulation (one 4:1 modulating, one 2-stage and one 1-stage furnace)

# Start-Up - Single Stage Control

## Step 1 Send Unit to High Fire

Send the unit to high fire by setting the temperature selector to its maximum setting.



## Step 2 Check the High Fire Manifold Pressure

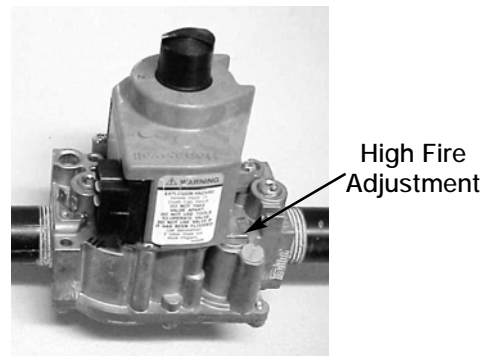
Using a manometer, measure the burner manifold pressure at the manifold pressure test port. Refer to the gas train layout in the reference section for the test port location.

The pressure on high fire should be 3½ inches wc for natural gas and 10 inches wc for LP gas.

If needed, use the high fire adjustment screw on the staged gas valve to adjust the high fire manifold pressure. Counterclockwise rotation will decrease the gas pressure and clockwise rotation will increase the gas pressure.

Start-Up

Single Stage Manifold Pressure (inches wc)		
	Natural Gas	LP
High Fire	3½	10



## Step 3 Reset the Temperature Setting

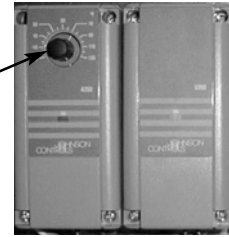
Reset the temperature setting on the temperature selector to the desired setting.

## Start-Up - 2:1 Staged Control

### Step 1 Send Unit to High Fire

Send the unit to high fire by setting the temperature selector to its maximum setting.

Temperature  
Selector



### Step 2 Check the High Fire Manifold Pressure

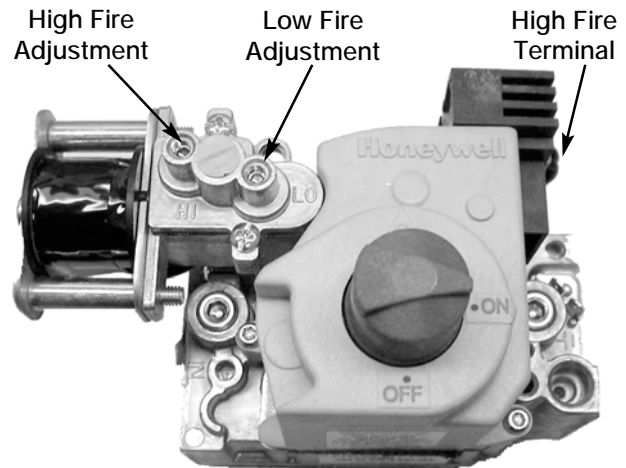
Using a manometer, measure the burner manifold pressure at the manifold pressure test port. Refer to the gas train layout in the reference section for the test port location.

Start-Up

The pressure on high fire should be  $3\frac{1}{2}$  inches wc for natural gas and 10 inches wc for LP gas.

If needed, use the high fire adjustment screw on the combination gas valve to adjust the high fire manifold pressure. Counterclockwise rotation will decrease the gas pressure and clockwise rotation will increase the gas pressure.

	Two Stage Manifold Pressure (inches wc)	
	Natural Gas	LP
Low Fire	$\frac{7}{8}$	$2\frac{1}{2}$
High Fire	$3\frac{1}{2}$	10



### Step 3 Send Unit to Low Fire

Remove and isolate the wire from the high fire terminal on the combination gas valve to send the unit to low fire.

### Step 4 Check the Low Fire Manifold Pressure

Using a manometer, measure the burner manifold pressure at the manifold pressure test port. Refer to the gas train layout in the reference section for the test port location.

The pressure on low fire should be  $\frac{7}{8}$  inches wc for natural gas and  $2\frac{1}{2}$  inches wc for LP gas.

If needed use the low fire adjustment screw on the combination gas valve to adjust the low fire manifold pressure. Counterclockwise rotation will decrease the gas pressure and clockwise rotation will increase the gas pressure. Once the low fire manifold pressure is set, reattach the high fire wire to the high fire terminal.

### Step 5 Reset the Temperature Setting

Reset the temperature setting on the temperature selector to the desired setting.

# Start-Up - 8:1 Staged Control

## IMPORTANT!

8:1 staged furnaces use two manifolds and two staged gas valves per furnace. The high and low fire manifold pressure must be checked and properly set on each manifold.

## IMPORTANT!

Confirm that the discharge air sensor is installed in the duct, at least three duct diameters downstream of the furnace

### Step 1 Send the Unit to High Fire

For the furnace to light, the heat switch must be closed or jumpered out. Reference the unit ladder diagram for proper terminals to jumper.

To send the unit to high fire, press and hold the up, down and enter keys. "HIF" will flash on the screen when the unit is forced to high fire.

The unit will remain at high fire until the escape key is pressed ("HIF" will stop flashing).



Start-Up

## WARNING!

Once the unit is forced to high fire, it will remain at high fire until the escape key is pressed.

## NOTE!

Forcing the unit to high fire during warm or hot weather conditions may cause the high limit switch to trip. If the switch trips, it will reset once the discharge air temperature has reached a safe level.

## NOTE!

A second high limit with manual reset is located in the control center of the unit.

### Step 2 Check the High Fire Manifold Pressure

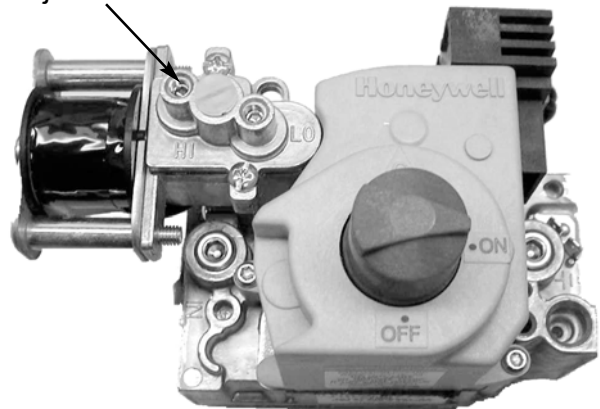
Using a manometer, measure the high fire burner manifold pressure for each furnace at the pressure test port. Refer to the gas train layout in the reference section for the test port location.

The recommended high fire manifold pressure is 3½ inch wc for natural gas and 10 inch wc for LP Gas.

If needed, adjust the high fire screws on each staged gas valve to set both high fire manifold pressures. Counterclockwise rotation will decrease the gas pressure and clockwise rotation will increase the gas pressure.

	Eight Stage Manifold Pressure (inches wc)	
	Natural Gas	LP
Low Fire	7½	2½
High Fire	3½	10

High Fire Adjustment



## Start-Up - 8:1 Staged Control

### Step 3 Send the Unit to Low Fire

Disconnect and isolate the wire from the high fire terminal to send the unit to low fire.

Start-Up

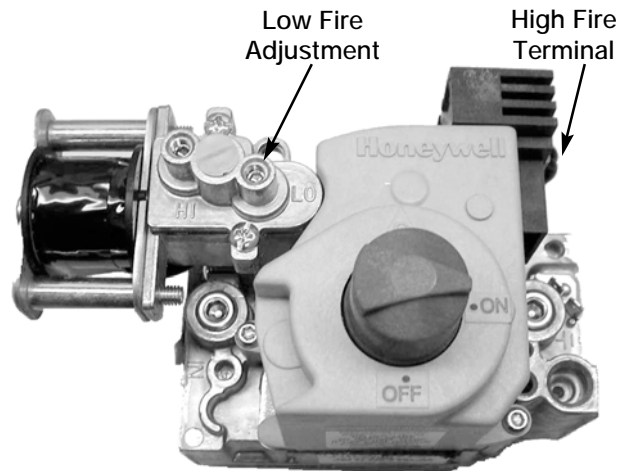
### Step 4 Check the Low Fire Manifold Pressure

Measure each valve's low fire manifold pressure.

The recommended low fire manifold pressure is  $\frac{7}{8}$  inch wc for natural gas and  $2\frac{1}{2}$  inches wc for LP.

If needed, use the low fire adjustment screw on each staged gas valve to properly set both low manifold settings. Counterclockwise rotation will decrease the gas pressure and clockwise rotation will increase the gas pressure.

When the low fire manifold pressure is properly set, reattach the disconnected wire to the high fire terminal, allow the heat switch to close or remove the jumper (see step #1).



Eight Stage Manifold Pressure (inches wc)		
	Natural Gas	LP
Low Fire	$\frac{7}{8}$	$2\frac{1}{2}$
High Fire	$3\frac{1}{2}$	10

### WARNING!

Once the high and low fire have been set, be sure to press the escape key to end high fire mode. The display will stop flashing "HIF" when high fire mode is off.

## Start-Up - 8:1 Staged Control

### NOTE!

Step 5-7 are for adjusting the discharge air setting. The discharge air temperature setting is factory set to the recommended 70°F. Only adjust the setting if needed.

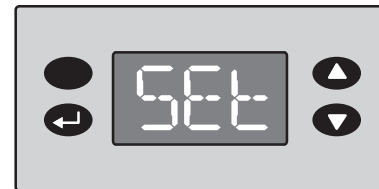
### NOTE!

After modifying a setting, the enter key must be pressed to save the change. If the enter key is not pressed the display will return to the program menu without saving the change.

Start-Up

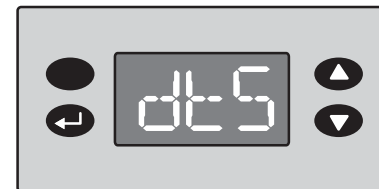
### Step 5 Access the Program Menu

Press and hold the escape key for three seconds to access the program menu. The display will read "SEt."



### Step 6 Access the Discharge Air Temperature Setting

Using the up or down key, scroll through the program menu until the display reads "dtS," then press the enter key. The display will change to the discharge air temperature setting.



### Step 7 Edit the Setting

Use the up or down keys to change the discharge air temperature setting. When the correct setting is displayed, press the enter key to save the setting and return to the program menu.

## Start-Up - 8:1 Staged Control

### NOTE!

Steps 8 - 9 are provided for adjusting the inlet air set point. The inlet air sensor is preset to the factory recommended 65°F, only adjust if needed.

### NOTE!

The inlet air sensor monitors the temperature of the inlet air. If the inlet air is above the sensor's set point, the inlet air sensor shuts off the furnace and continues to supply the warm outside air.

Start-Up

### Step 8 Access the Inlet Air Sensor Setting

From the program menu, use the up or down key to navigate through the menu options until the display reads "iAS." Once the display reads "iAS," press the enter key. The display will change to the inlet air sensor setting.



### Step 9 Edit the Setting

Use the up or down keys to change the inlet air setting. When the correct setting is displayed, press the enter key to save the setting and return to the program menu.

### NOTE!

After modifying a setting, the enter key must be pressed to save the change. If the enter key is not pressed the display will return to the program menu without saving the change.

### NOTE!

Steps 10 - 11 are provided for adjusting the room override setting. Only adjust the setting if the room override function is desired.

### NOTE!

The room override function temporarily changes the discharge air temperature to the room override setting if the room thermostat is not satisfied.

### Step 10 Access the Room Override Setting

From the program menu, use the up or down key to navigate through the menu options until the display reads "rot." Once the display reads "rot," press the enter key. The display will change to the room override setting.



### NOTE!

The room override function requires a field supplied thermostat to be installed in the space and to be wired between terminal 31 and 32 in the unit's control center. Reference the unit ladder diagram.



## Start-Up - 8:1 Staged Control

### Step 11 Edit the Setting

Use the up or down keys to change the room override setting. When the correct setting is displayed, press the enter key to save the setting and return to the program menu.

#### NOTE!

After modifying a setting, the enter key must be pressed to save the change. If the enter key is not pressed the display will return to the program menu without saving the change.

#### NOTE!

The freeze temperature and time delay setting are set to the factory recommended 45°F and 300 seconds respectfully. Only follow steps 12 - 13 if you wish to change the recommended settings.

Start-Up

#### NOTE!

If the discharge temperature drops below the freeze temperature setting and remains below the setting for longer than the time delay setting, the blower and burner will shut down to prevent the discharge of cold air into the building.

### Step 12 Access the Freeze Temperature Setting

From the program menu, use the up or down key to navigate through the menu options until the display reads "FtS". Once the display reads "FtS," press the enter key. The display will change to the freeze temperature setting.

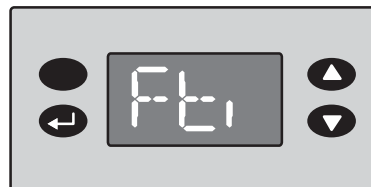


### Step 13 Edit the Setting

Use the up or down keys to change the freeze temperature setting. When the correct setting is displayed, press the enter key to save the setting and return to the program menu.

### Step 14 Access Time Delay Setting

From the program menu, use the up or down key to navigate through the menu options until the display reads "Fti." Once the display reads "Fti," press the enter key. The display will change to the time delay setting. The time is displayed in ten second increments (1 = 10 sec).



### Step 15 Edit the Setting

Use the up or down keys to change the time delay setting. When the correct setting is displayed, press the enter key to save the setting and return to the program menu.

## Start-Up - 2:1 Electronic Modulation

### Step 1 Send Unit to High Fire

Turn the temperature selector to its maximum setting to send the unit to high fire.

### Step 2 Check the High Fire Manifold Pressure

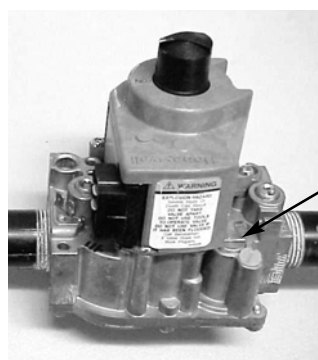
With the unit at high fire, use a manometer to measure the burner manifold pressure at the manifold pressure test port. See the gas train layout in the reference section for the manifold pressure test port location.

The recommended high fire manifold pressure is  $3\frac{1}{2}$  inches wc for natural gas and 10 inches wc for LP Gas.

If needed, use the high fire adjustment screw on the shut-off gas valve to adjust the high fire manifold pressure. Counterclockwise rotation will decrease the gas pressure and clockwise rotation will increase the gas pressure.

Start-Up

2:1 Manifold Pressure (inches wc)		
	Natural Gas	LP
Low Fire	$\frac{7}{8}$	$2\frac{1}{2}$
High Fire	$3\frac{1}{2}$	10



High Fire Adjustment

### Step 3 Send Unit to Low Fire

Remove and isolate one wire from the modulating gas valve terminal to send the unit to low fire.

### Step 4 Check the Low Fire Manifold Pressures

With the unit at low fire, use a manometer to measure the burner manifold pressure at the manifold pressure test port. See the gas train layout in the reference section for the manifold pressure test port location.

The recommended low fire manifold pressure is  $\frac{7}{8}$  inch wc for natural gas and  $2\frac{1}{2}$  inches wc for LP Gas.

If needed use the low fire adjustment screw on the modulating gas valve to adjust the low fire manifold pressure. Counterclockwise rotation will decrease the gas pressure and clockwise rotation will increase the gas pressure.

Once the low fire is set, reattach the disconnected wire to the modulating valve and reset the temperature selector.

#### NOTE!

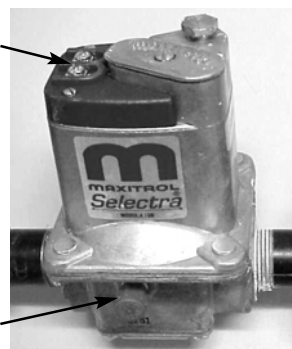
The low fire manifold pressure should always be rechecked after adjusting the high fire.

#### IMPORTANT!

Once the high and low fire manifold pressures are properly set, reset the discharge air temperature to the desired setting.

Terminal

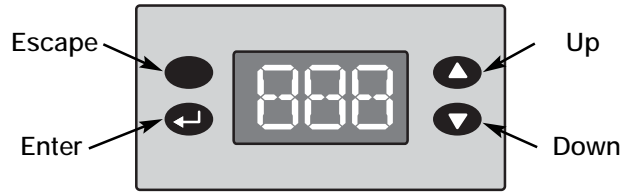
Low Fire Adjustment



# Start-Up - 4:1 Electronic Modulation

## Step 1 Send the Unit to High Fire

To send the unit to high fire, press and hold the up, down and enter keys. The unit will remain at high fire until the escape key is pressed.



### WARNING!

If the unit is forced to high fire, it will remain at high fire until the escape key is pressed.

### NOTE!

After modifying a setting, the enter key must be pressed to save the change. If the enter key is not pressed the display will return to the program menu without saving the change.

### NOTE!

Forcing the unit to high fire in mild weather conditions may cause the high limit switch to trip. If the switch trips, it will reset once the discharge air temperature is at a safe level.

### NOTE!

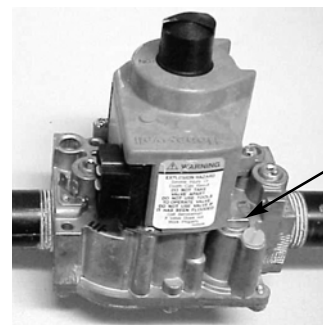
A second high limit with a manual reset is located in the control center.

## Step 2 Check the High Fire Manifold Pressure

Using a manometer, measure the high fire manifold pressure at the pressure test port. Refer to the gas train layout in the reference section for the test port location.

The recommended high fire manifold pressure is 3½ inches wc for natural gas and 10 inches wc for LP Gas.

If needed, adjust the high fire screw on the shut-off valve to set the high fire manifold pressure. Counterclockwise rotation will decrease the gas pressure and clockwise rotation will increase the gas pressure.



4:1 Modulation Manifold Pressure (in. wc)		
	Natural Gas	LP
Low Fire	½	1
High Fire	3½	10

## Step 3 Send Unit to Low Fire

Remove and isolate one wire from the modulating gas valve terminal to send the unit to low fire.

# Start-Up - 4:1 Electronic Modulation

## Step 4 Check the Low Fire Manifold Pressures

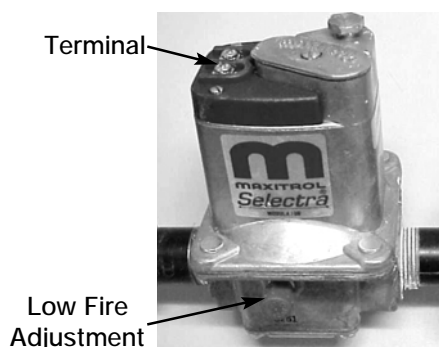
With the unit at low fire use a manometer to check the manifold pressure. Refer to the gas train layout in the reference section for the test port location.

The recommended low fire manifold pressure is  $\frac{1}{2}$  inches wc for natural gas and 1.0 inches wc for LP Gas.

If needed, use the low fire adjustment screws on the modulating valve to adjust the low fire manifold pressure. Counterclockwise rotation will decrease the gas pressure and clockwise rotation will increase the gas pressure. Once the low fire manifold pressure is set, reattach the wire to the modulating gas valve terminal.

Start-Up

4:1 Modulation Manifold Pressure (in. wc)		
	Natural Gas	LP
Low Fire	$\frac{1}{2}$	1
High Fire	$3\frac{1}{2}$	10



## Step 5 Exit High Fire Mode

Press the escape key to exit high fire mode

### NOTE!

The low fire manifold pressure must be rechecked after adjusting the high fire.

### NOTE!

The following steps are for adjusting the discharge air setting. The discharge air temperature setting is factory set to the recommended 70° F. Only adjust the setting if needed.

## Step 6 Access the Program Menu

Press and hold the escape key for three seconds to access the program menu. The display will read "SEt" when program mode is active.



## Step 7 Access the Discharge Air Temperature Setting

Use the up and down key to scroll through the program menu options until the display reads "dtS," then press the enter key. The display will change to the discharge air temperature setting.



## Step 8 Edit the Setting

Use the up or down keys to change the discharge air temperature setting. When the correct setting is displayed, press the enter key to save the setting and return to the program menu.

### NOTE!

After modifying a setting, the enter key must be pressed to save the change. If the enter key is not pressed the display will return to the program menu without saving the change.

# Start-Up - 4:1 Electronic Modulation

## NOTE!

Steps 8 - 10 are provided for adjusting the inlet air set point. The inlet air sensor is preset to the factory recommended 60°F, only adjust if needed.

## NOTE!

The inlet air sensor monitors the temperature of the inlet air. If the inlet air is above the sensor's set point, the inlet air sensor shuts off the furnace and continues to supply the warm outside air.

### Step 9 Access the Inlet Air Sensor Setting

From the program menu, use the up or down key to navigate through the menu options until the display reads "iAS." Once the display reads "iAS," press the enter key. The display will change to the inlet air sensor setting.



Start-Up

### Step 10 Edit the Setting

Use the up or down keys to edit the inlet air setting. When the correct setting is displayed, press the enter key to save the setting and return to the program menu.

## NOTE!

After modifying a setting, the enter key must be pressed to save the change. If the enter key is not pressed the display will return to the program menu without saving the change.

## NOTE!

Steps 11 - 12 are provided for adjusting the room override setting. Only adjust the setting if the room override function is desired.

## NOTE!

The room override function temporarily changes the discharge air temperature to the room override setting if a room thermostat is not satisfied.

### Step 11 Access the Room Override Setting

From the program menu, use the up or down key to navigate through the menu options until the display reads "rot." Once the display reads "rot," press the enter key. The display will change to the room override setting.



## NOTE!

The room override function requires a field supplied thermostat to be installed in the space and to be wired between terminal 31 and 32 in the unit's control center.

## Start-Up - 4:1 Electronic Modulation

### Step 12 Edit the Setting

Use the up or down keys to change the room override setting. When the correct setting is displayed, press the enter key to save the setting and return to the program menu.

#### NOTE!

After modifying a setting, the enter key must be pressed to save the change. If the enter key is not pressed the display will return to the program menu without saving the change.

#### NOTE!

The freeze temperature and time delay setting are set to the factory recommended 45°F and 300 seconds respectively. Only follow steps 13-16 if you wish to change the factory settings.

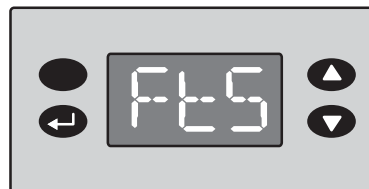
#### NOTE!

If the discharge temperature drops below the freeze temperature setting and remains below the setting for longer than the time delay setting, the blower and burner will shut down to prevent the discharge of damagingly cold air into the building.

Start-Up

### Step 13 Access the Freeze Temperature Setting

From the program menu, use the up or down key to navigate through the menu options until the display reads "FtS". Once the display reads "FtS," press the enter key. The display will change to the freeze temperature setting.



### Step 14 Edit the Setting

Use the up or down keys to change the freeze temperature setting. When the correct setting is displayed, press the enter key to save the setting and return to the program menu.

### Step 15 Access Time Delay Setting

From the program menu, use the up or down key to navigate through the menu options until the display reads "Fti." Once the display reads "Fti," press the enter key. The display will change to the time delay setting. The time is displayed in ten second increments (1 = 10 sec).



### Step 16 Edit the Setting

Use the up or down keys to change the time delay setting. When the correct setting is displayed, press the enter key to save the setting and return to the program menu.

## Start-Up - Mixing Box (Optional)

### NOTE!

To prevent premature heat exchanger failure, do not locate units where chlorinated, halogenated, or acid vapors are present.

### NOTE!

Units with a mixing box are designed for either 0-30% outside air (HV-1), 31-75% outside air (HV-2) or 100% return air (HV-3). Refer to the CAPS submittal for the unit's ventilation type.

### NOTE!

HV-1 and HV-2 use economizer controls (EC) or mixing box controls (MB).

Start-Up

### NOTE!

Economizer control may use outside air temperature reference (EC-1), outside enthalpy reference (EC-2), differential temperature reference (EC-3) or differential temperature reference (EC-4).

### NOTE!

Mixing box control may use a potentiometer (MB-1), 2-10VDC signal (MB-2), 4-20mA signal (MB-3) or a manual quadrant (MB-4).

### Step 1 Verify Sensor Installation

All economizer options (EC) require an outdoor air temperature or enthalpy sensor to be field installed inside of the weatherhood and field wired to terminals *SO+* and *SO-* on the economizer.

Economizer options EC-3 and EC-4 require an outdoor air temperature or enthalpy sensor to be field installed in the return air duct and field wired to terminals *SR+* and *SR-* on the economizer.

Verify that all economizer sensors needed for your application are properly installed and wired.

### Step 2 Set Minimum Outside Air

Set the minimum outside air position. HV-1 is designed for 0-30% outside air and HV-2 is designed for 31-75% outside air.

All economizer options (EC-1, EC-2, EC-3 and EC-4) and mixing box option MB-1 use a potentiometer to set the minimum outside air damper position. The potentiometer is located on the economizer for options EC-1, EC-2, EC-3 and EC-4. The potentiometer may be factory mounted in the unit control center or field mounted in the space for option MB-1.

MB-2 and MB-3 use an external signal from a building management system to position the dampers

MB-4 uses a manual quadrant located on the inlet damper to position the dampers.

### IMPORTANT!

The outside air volume must be measured and compared to the total air volume when setting the minimum outside air. The minimum outside air should never be set based on the inlet damper or potentiometer position.

## Start-Up - Mixing Box (Optional)

### Step 3 Set the Enthalpy Changeover Set Point (Optional)

If using an economizer, the enthalpy changeover setting must be set. If differential temperature or differential enthalpy control is used, set the enthalpy changeover set point to *D*. If outside air temperature or enthalpy reference is used, set the enthalpy changeover set point to the desired setting from the following table.

Enthalpy Changeover Setting	
Setting	Changeover Temperature* (°F)
A	73
B	70
C	67
D	63

\* Temperature at 50% relative humidity, see the Honeywell W7212 Economizer instructions for set points at other humidities.

#### NOTE!

For options EC-3 and EC-4 the enthalpy changeover set point is the temperature at which the economizer will send the dampers to the minimum outside air position.

### Step 4 Program Optional Room Stat

Program the optional room stat. Separate detailed instructions for programming the room stat ship with the optional room stat.



# Start-Up - Water Wizard (Optional)

## Step 1 Open the Solenoid



Confirm that the manual water supply valve is closed. Press and hold the function button for one second. L3 (refer to Water Wizard operation in the reference section) will begin blinking (short on, long off), indicating that flow test mode is active and the supply solenoid is open.

### WARNING!

Opening the manual supply valve will allow water to pass to the media. Be sure the sump is safely draining before opening the manual supply valve.

## Step 2 Set the Water Pressure



With the solenoid open, set the supply water pressure to the correct setting from the following tables. Use the manual supply valve to adjust the supply pressure. A pressure gauge is provided between the manual supply valve and the media.

### NOTE!

The recommended water pressure for the model IGX is set based on media width, model IG is set based on air volume. A table is provided for each. Be sure to refer to the correct table.

### NOTE!

The manual supply valve ships closed and must be adjusted for proper performance.

IGX Housing	Media Width (inches)	Water Pressure (in. w.c.)
12	30	20
22	43 <sup>3</sup> / <sub>4</sub>	36
	48	42
	60	61
32	66	72
	96*	42
35	120*	61
38	180*	37
42	216*	51

\*Multiple media sections. Values represents total media width.

Start-Up

## Step 3 Break-in Media

Leave the supply solenoid open to saturate and break-in the media for 20 minutes with the blower off.

Model IG CFM Range	Water Pressure (in w.c.)
800 - 3500	50
3501 - 7000	74

## Step 4 Close Solenoid



With the pressure set, press the function key for one second to deactivate flow test mode and allow the supply solenoid to close.

## Step 5 Check Media

Start the cooling cycle and check the media after one hour of operation. If the media is continuously dry or if too much water is draining from the sump tank, refer to Water Wizard troubleshooting.

### NOTE!

Steps 6-8 are provided to adjust the minimum cooling temperature. The minimum cooling temperature is preset to the factory recommended 75°F. Only adjust if needed.

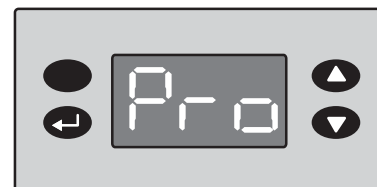
### NOTE!

The inlet air sensor function overrides and shuts down the evaporative cooler if the outside temperature falls below the minimum cooling temperature.

## Step 6 Enter Program Mode



Press and hold the enter key for three seconds. The display will read "Pro" when program mode is active.

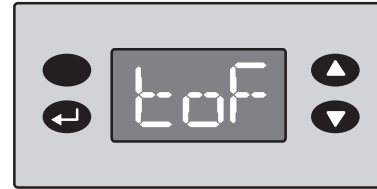


## Start-Up - Water Wizard (Optional)

### Step 7 Adjust the Minimum Cooling Temperature



While in the program menu, use the up and down keys to navigate the menu options until "toF" is displayed. Press the enter key to access the selected menu option setting. Use the up and down keys to adjust the minimum cooling temperature as needed. Press the enter key to save the new minimum cooling temperature setting and return to the program menu.



#### IMPORTANT!

The enter key must be pressed to save the new minimum cooling temperature.

### Step 8 Exit Program Mode

After ten seconds of idle time the controller will exit program mode.

#### NOTE!

Steps 9-11 are provided to adjust the freeze temperature setting. The freeze temperature is preset to the factory recommended 45°F. Only adjust if needed.

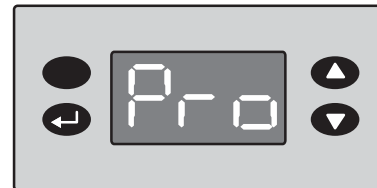
#### NOTE!

The freeze temperature is the temperature at which the supply solenoid closes and the drain solenoid opens to drain the supply line, preventing possible freeze damage.

### Step 9 Enter Program Mode



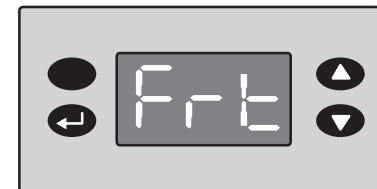
Press and hold the enter key for three seconds. The display will read "Pro" when program mode is active.



### Step 10 Adjust the Freeze Temperature



While in program mode, use the up and down keys to navigate through the menu options until "Frt" is displayed. Press the enter key to access the selected menu option setting. Use the up and down keys to adjust the freeze temperature setting as needed. Press the enter key to set the freeze temperature and return to the program menu.



#### IMPORTANT!

The enter key must be pressed to save the new freeze temperature.

### Step 11 Exit Program Mode

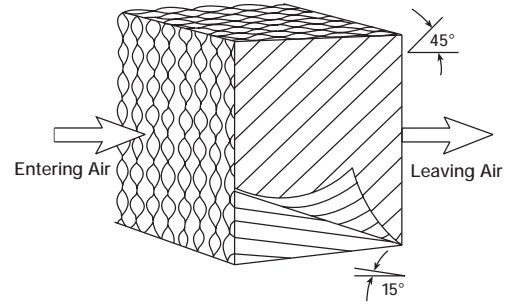
After ten seconds of idle time the controller will exit program mode.

# Start-Up - Evaporative Cooling (Optional)

## Step 1 Check the Installation

The media may have been removed during installation, so its orientation should be double checked. The media should be installed with the steeper flute angle sloping down towards the entering air side.

Verify that the stainless steel caps and distribution headers are in place. The headers should be located over the media towards the entering air side. The caps should be placed over the headers.



## Step 2 Check the Pump Filter

Check that the pump filter is around the pump inlet.

## Step 3 Fill the Sump and Adjust the Float

Turn on the water supply and allow the sump tank to fill. Adjust the float valve to shut-off the water supply when the sump is filled to within 1 in. of the bottom of the overflow.

## Step 4 Break-in the Media

Open the bleed-off valve completely and saturate the media with the blower(s) off for no less than 20 minutes.

### NOTE!

A jumper will need to be installed in the control center to power the evaporative pumps with the blower(s) off. Reference the unit's ladder diagram to determine proper terminals.

## Step 5 Check the Flow Rate

The pumps should provide enough water to saturate the media in 45 to 60 seconds. Consult the factory, if adequate flow is not achieved.

## Step 6 Adjust the Water Bleed-Off Rate

The water bleed-off rate is dependent on the water's mineral content. The bleed-off should be adjusted based on the media's mineral deposits after two weeks of service.

## Step 7 Set the Optional Auto Drain and Fill

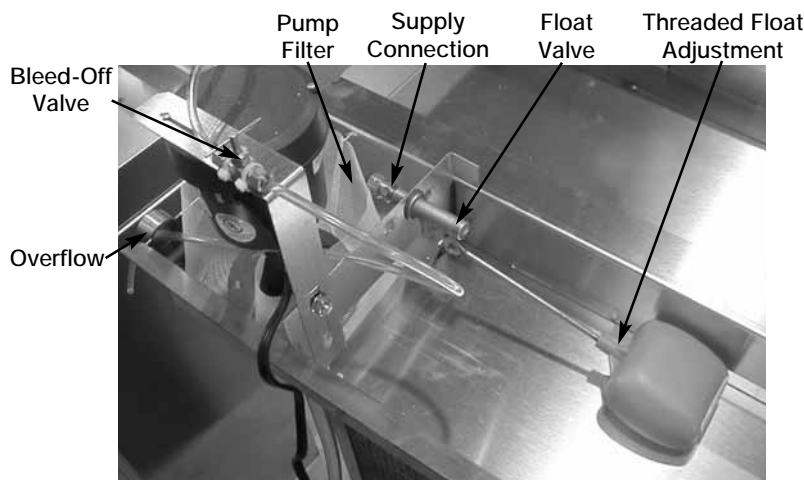
Set the auto drain and fill timer and temperature settings. Timer settings are t1: 1.0, 10min and t2: 0.4, 60h. Temperature is typically set to 45°F.

## Step 8 Put the Unit into Service

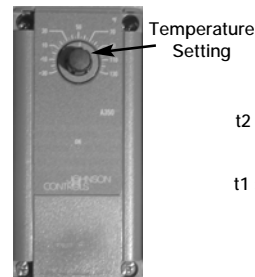
Remove the jumper, and energize the blower(s). Verify proper operation.

### IMPORTANT!

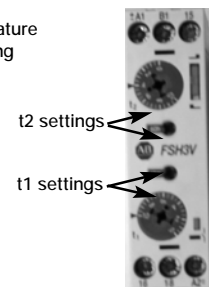
Check the media for minerals after two weeks of service and adjust the bleed-off rate accordingly.



### Evaporative Freeze Protection



### Evaporative Timer



# Operation - 2:1 Staged Sequence

## Sequence of Operation

Optional Exhaust fan switch (S1) manually closed

- Power passes through N.C. exhaust fan overload (ST2 O.L.) which is closed if exhaust fan (M2) has not overloaded
- Power passes to exhaust fan starter (ST2)
- N.O. Exhaust fan starter contactor (ST2) is energized and closed
- Power passes to and energizes exhaust fan (M2)

Supply fan switch (S2) manually closed

- Power passes through N.C. field supplied fire contact (FSC)
- Power passes through the optional N.O. exhaust fan contact (ST2) which is energized and closed
- Power passes to the optional freeze protection (FZ1) and through N.C. freeze protection contact (FZ1) which is closed if temperature has remained above set point
- Power passes to and energizes optional inlet damper (D1) which opens. Power also reaches optional return air damper (D3) which will now modulate or open depending on control
- Power passes through damper limit switch (DL1) which is energized and closed if the inlet damper is open. It may take several minutes for the damper to fully open and for the damper limit switch to close.
- Power passes through N.C. supply starter overload (ST1 O.L.) which is closed if the supply fan has not overloaded
- Power reaches supply fan starter (ST1)
- N.O. supply fan starter (ST1) is energized and closed
- Power reaches and energizes supply fan (M1)

Heat switch (S3) manually closed

- Power passes through N.O. supply fan starter (ST1) which is energized and closed
- Power passes through the optional N.O. inlet air sensor (TS1) which is closed if inlet air temperature has remained below set point
- Power passes to the discharge air sensor (TS2)
- If the discharge air temperature is less than the discharge air sensor (TS2) set point, the furnace stage one N.O. contact (SC1-1) will close, powering the ignition controller (IC1)
- If the discharge air temperature is also less than the discharge air sensor (TS2) set point, the furnace stage two N.O. contact (SC1-2) will also close
- The ignition controller (IC1) will begin its sequence of operation

Ignition Controller (IC1) Sequence of Operation

- The N.O. low air proving switch (PS2) is open
- The ignition controller (IC1) energizes the combustion blower (CM1)
- The N.O. low air proving switch (PS2) closes
- The ignition controller completes a 15 second pre-purge
- The high fire relay (T2) is energized and the high fire contact (T2) closes
- The main gas valve (MV1) fully opens (100%)
- 10 second trial for ignition period begins
- Igniter begins sparking
- The furnace will light at high fire (100%)
- When the flame is detected the igniter stops sparking
- The furnace will remain at high fire (100%) for 10 seconds
- High fire contact (T2) will open

High Fire – Low Fire Sequence of Operation

- The furnace lights at high fire (100%), and remains at high fire for 10 seconds
- If the discharge temperature sensor (TS2) is above the discharge air sensor (TS2) set point, the furnace stage two contact (SC1-2) will open and the furnace will go to low fire (50%)
- If the furnace is at low fire (50%) and the discharge temperature is above the discharge air sensor (TS2) set point, the furnace stage one contact (SC1-1) will open and the furnace will shut down
- If the furnace is at low fire (50%), and the discharge temperature sensor (TS2) remains below the discharge air sensor (TS2) set point, the furnace stage two contact (SC2-1) will close and the furnace will go to high fire (100%)

# Operation - 2:1 Modulating Sequence

## Sequence of Operation

Optional Exhaust fan switch (S1) manually closed

- Power passes through N.C. exhaust fan overload (ST2 O.L.) which is closed if exhaust fan (M2) has not overloaded
- Power passes to exhaust fan starter (ST2)
- N.O. Exhaust fan starter contactor (ST2) is energized and closed
- Power passes to and energizes exhaust fan (M2)

Supply fan switch (S2) manually closed

- Power passes through N.C. field supplied fire contact (FSC)
- Power passes through the optional N.O. exhaust fan contact (ST2) which is energized and closed
- Power passes to the optional freeze protection (FZ1) and through N.C. freeze protection contact (FZ1) which is closed if temperature has remained above set point
- Power passes to and energizes the optional inlet damper (D1) which opens. Power also reaches the optional return air damper (D3) which will now modulate or open depending on control
- Power passes through damper limit switch (DL1) which is energized and closed if the inlet damper is open. It may take several minutes for the damper to fully open and for the damper limit switch to close.
- Power passes through N.C. supply starter overload (ST1 O.L.) which is closed if the supply fan has not overloaded
- Power reaches supply fan starter (ST1)
- N.O. supply fan starter (ST1) is energized and closed
- Power reaches and energizes supply fan (M1)

Heat switch (S3) manually closed

- Power passes through N.O. supply fan contact (ST1) which is energized and closed
- Power passes to the amplifier
- If the discharge air sensor (TS2) reading is less than the temperature selector (TS3) setting, the amplifier sends a call for heating to the ignition controller (IC1)

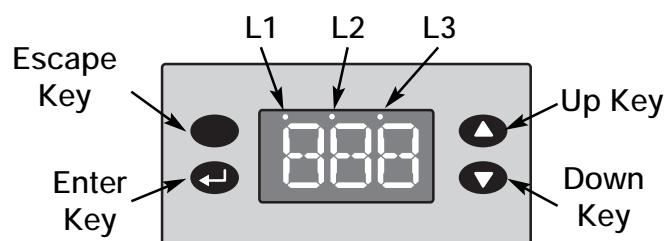
Ignition Controller (IC1) Sequence of Operation

- The N.O. low air proving switch (PS2) is open
- The ignition controller (IC1) energizes the combustion blower (CM1)
- The N.O. low air proving switch (PS2) closes
- The ignition controller completes a 15 second pre-purge
- The high fire relay (T2) is energized and the high fire contact (T2) closes
- The main gas valve (MV2) fully opens (100%)
- 10 second trial for ignition period begins
- Igniter begins sparking
- The furnace will light at high fire (100%)
- When the flame is detected the igniter stops sparking
- The furnace will remain at high fire (100%) for at least 10 seconds
- High fire contact (T2) will open

High Fire – Low Fire Sequence of Operation

- The furnace lights at, and remains at high fire (100%) for 10 seconds
- If the discharge temperature sensor (TS2) is above the temperature selector (TS3) set point, and the furnace is not at low fire, the amplifier will modulate the gas valve (MDV) down until the discharge air sensor (TS2) reading equals the temperature selector (TS3) setting
- If the discharge temperature sensor (TS2) is below the temperature selector (TS3) set point, and the furnace is not at high fire, the amplifier will modulate the gas valve (MDV) up until the discharge temperature sensor (TS2) reading equals the temperature selector (TS2) set point
- If the furnace is at low fire and the discharge air sensor (TS2) is above the temperature selector (TS3) set point the amplifier will end the call for heat and the ignition controller (IC1) will shut down the furnace

## Operation - 4:1 Modulation & 8:1 Staged User Interface



### Program Mode

Program mode allows the user to view the program menu and edit the factory default settings. To access program mode and view the program menu press and hold the escape key for three seconds. While viewing the program menu press the up and down keys to scroll through the menu options. To view the setting of the selected menu option press the enter key. To edit the setting, press the up or down key while viewing the setting. To save the setting and return to the program menu press the enter key. To return to the program menu without saving the change, wait 10 seconds. To exit program mode from the program menu, wait 10 seconds.

Operation

#### WARNING!

Changing the default settings will significantly affect performance. Only change a setting after reading and understanding this entire manual.

#### NOTE!

The enter key must be pressed to save any changes made to a setting.

### Inlet Air Sensor (IAS)

The inlet air sensor monitors the temperature of the inlet air. If the inlet air is above the sensor's set point, the inlet air sensor shuts off the furnace and continues to supply the warm outside air. The inlet air sensor is preset to the factory recommended 65°F for 8:1 and 60°F for 4:1.

### Outside Air Temperature (OAt)

To temporarily display the outside air temperature, use the up and down keys until the display reads "OAt," then press the enter key.

### Optional Freeze Protection (FtS)

If the discharge temperature drops below the freeze temperature setting (default 45°F) and remains below the setting for longer than the time delay setting (default 300 sec), the blower and burner will shut down to prevent the discharge of cold air into the building.

### Program Revision Number

To access the program revision number from the default display, press the up or down keys until the display reads *F##*, *J##* or *I##*. The two numbers following the letter indicate the revision number. For example, *F12* indicates program *F*, revision twelve.

### Discharge Air Temperature (DtS)

The discharge air temperature setting is the temperature that the unit will discharge. The discharge air temperature is preset to the factory recommended 70°F. The actual discharge air temperature is the default display.

### Optional Room Override (ROt)

When the room override function is triggered, the discharge air temperature (70°F default) is temporarily changed to the room override setting (90°F default). When the room override function is released the discharge air temperature returns to the default temperature.

# Operation - 4:1 Modulation & 8:1 Staged User Interface

## Indicating Lights

Three indicating lights are located across the top of the display to indicate the status of the furnace.

Light	4:1 Electronic Modulation	
	On	Off
L1	Call for Heat	No Call for Heat
L2	Supply Fan On	Supply Fan Off
L3	Freeze Protection Tripped	Freeze Protection Satisfied

Light	8:1 Staged Control (Single Furnace Units)	
	On	Blinking
L1	Call for Heat	n/a
L2	n/a	Furnace at High Fire
L3	Burner Locked Out	Freeze Protection Tripped

Operation

Light	8:1 Staged Control (Multi Furnace Units)	
	On	Blinking
L1	n/a	n/a
L2	n/a	Alarm
L3	Program Mode	Saving New Settings

# Operation - 4:1 Electronic Modulation

## Sequence of Operation

Optional Exhaust fan switch (S1) manually closed

- Power passes through N.C. exhaust fan overload (ST2 O.L.) which is closed if exhaust fan (M2) has not overloaded
- Power passes to exhaust fan starter (ST2)
- N.O. Exhaust fan starter contactor (ST2) is energized and closed
- Power passes to and energizes exhaust fan (M2)

Supply fan switch (S2) manually closed

- Power passes through N.C. field supplied fire contact (FSC)
- Power passes through optional N.O. exhaust fan contact (ST2) which is energized and closed
- Power passes through optional N.O. freeze protection contact (FZ1) which is closed if temperature has remained above freeze protection set point
- Power passes to and energizes optional inlet damper (D1) which opens. Power also reaches optional return air damper (D3) which will now modulate or open depending on control
- Power passes through damper limit switch (DL1) which is energized and closed if the inlet damper is open. It may take several minutes for the damper to fully open and for the damper limit switch to close.
- Power passes through N.C. supply starter overload (ST1 O.L.) which is closed if supply fan has not overloaded
- Power reaches supply fan starter (ST1)
- N.O. supply fan starter (ST1) is energized and closed
- Power reaches and energizes supply fan (M1)

Heat switch (S3) manually closed

- Power passes through N.O. supply fan contact (ST1) which is energized and closed
- Power passes through call for heat relay (CH) which energizes and closes the N.O. call for heat contactor (Call for Heat Contactor)
- The modulating controller (FX) compares the discharge temperature or space temperature to the set point and sends a call for heat to the ignition controller (IC1)

Ignition Controller (IC1) Sequence of Operation

- The N.O. low air proving switch (PSL) is open
- The ignition controller (IC1) energizes the combustion blower (CM1)
- The N.O. low air proving switch (PSL) closes
- The ignition controller completes a 15 second pre-purge
- The main gas valve (MV1) is powered open
- 10 second trial for ignition period begins
- Igniter begins sparking
- The furnace will light at high fire
- When a flame is detected the igniter stops sparking
- The furnace will remain at high fire for 30 seconds
- The modulation controller (FX) will modulate the gas valve (MDV) and the combustion blower (CM1) as needed between low fire and high fire
- The modulating controller (FX) will monitor the high pressure switch (PSH) and shut down the furnace if the furnace is at high fire and the high pressure switch is not satisfied

High Fire – Low Fire Sequence of Operation

- The furnace lights at, and remains at high fire (100%) for 30 seconds
- If the discharge temperature is above the discharge temperature set point, and the furnace is not at low fire, the modulation controller (FX) will modulate the gas valve (MDV) down until the discharge temperature equals the discharge temperature setting.
- If the discharge temperature is below the discharge temperature set point, and the furnace is not at high fire, the modulation controller (FX) will modulate the gas valve (MDV) up until the discharge temperature equals the discharge temperature set point



# Operation - 8:1 Staged Control

## Sequence of Operation

Optional Exhaust fan switch (S1) manually closed

- Power passes through N.C. exhaust fan overload (ST2 O.L.) which is closed if supply fan (M1) has not overloaded
- Power passes to exhaust fan starter (ST2)
- N.O. Exhaust fan starter contactor (ST2) is energized and closed
- Power passes to and energizes exhaust fan (M2)

Supply fan switch (S2) manually closed

- Power passes through N.C. field supplied fire contact (FSC)
- Power passes through N.O. exhaust fan contact (ST2) which is energized and closed
- Power passes through optional N.O. freeze protection contact (FZ1) which is closed if temperature has remained above freeze protection set point
- Power passes to and energizes inlet damper (D1) which opens. Power also reaches optional return air damper (D3) which will now modulate or open depending on control
- Power passes through damper limit switch (DL1) which is energized and closed if the inlet damper is open. It may take several minutes for the damper to fully open and for the damper limit switch to close.
- Power passes through N.C. supply starter overload which is closed if the supply fan has not overloaded
- Power reaches supply fan starter (ST1)
- N.O. supply fan starter (ST1) is energized and closed
- Power reaches and energizes supply fan (M1)

Heat switch (S3) manually closed

- Power passes through N.O. supply fan starter (ST1) which is energized and closed
- Power passes through call for heat relay (CH) which energizes and closes the N.O. call for heat contactor (CH)
- The modulating controller (FX) compares the discharge temperature or space temperature to the set point and sends a call for heat to the ignition controller (IC1) when needed

Ignition Controller (IC1) Sequence of Operation

- The N.O. air proving switch (PSH#) is open
- The ignition controller (IC1) energizes the combustion blower (CM1)
- The N.O. air proving switch (PSH#) closes
- The ignition controller completes a 30 second pre-purge
- The main gas valve (MV1) is powered open
- 10 second trial for ignition period begins
- Igniter begins sparking
- The furnace will light
- The controller will choose which stage to light the furnace at, based on the discharge air temperature set point and the outside air temperature
- When a flame is detected the igniter stops sparking
- The furnace will remain at high fire for 20 seconds
- The stage controller (FX) will stage the gas valves (MV#) as needed between low fire, high fire and off
- The stage controller (FX) will monitor the pressure switch (PSH#) and shut down the furnace if the furnace is at high fire and the high pressure switch is not satisfied
- If the furnace is at low fire and the discharge temperature remains above the set point for more than six minutes the furnace will shut down

Staging Sequence of Operation

- If the temperature is more than 1°F below the discharge air temperature setting the furnace will stage up
- If the temperature is more than 1°F above the discharge air temperature setting the furnace will stage down
- If the temperature is above the set temperature and the furnace is at low fire, the furnace will shut off
- The furnace will not stage consecutively in the same direction more than once every six minutes
- If the furnace is at high fire and the discharge air temperature setting is not satisfied, the furnace will remain at high fire
- If the furnace is at low fire and the discharge air temperature setting is satisfied, the furnace will shut off

# Operation - Recirculating / VAV Units

## Recirculation (Optional)

### Manual Quadrant Damper Control

A manual quadrant damper in the return air flow controls the amount of recirculated air. This damper can be adjusted by hand and locked in position for either 100% outside air or maximum recirculation air.

### 2-Position Damper Control

A 2-position spring return actuator is used to control the return air amounts. The damper moves from open to closed. If power is cut to the unit, the damper will fail close. The volume of recirculation air is set in the factory by baffles in the return air opening. These baffles should not be removed or adjusted in the field.

### Potentiometer Control

A modulating spring return actuator is used to control the return air amounts. The damper moves from fully open to fully closed. The amount of return air is determined by the position of a remote potentiometer.

### Building Pressure Control

A modulating spring return actuator is used to control the return air amounts according to input from a pressure sensing device. The recirculation damper moves from fully open to fully closed.

## Variable Volume Operation (Optional)

### 2-Speed Control

A 2-speed motor is used to control air volumes. The motor can be switched to low or high speed from a remote control panel. One-half or one-third reduction motors are used.

### Potentiometer Control

A variable frequency drive is controlled by input from a remote speed selector (potentiometer). This unit allows easy manual adjustment of make-up air volumes.

### Building Pressure Control

A variable frequency drive is controlled according to input from a pressure sensing device.

### Variable Frequency Drives

For maintenance issues associated with the variable frequency drives, please consult the drive's manual supplied with the unit. The drives are programmed in the factory and should not need any adjustment during installation and start-up. For kitchen applications, the drive is located in the kitchen, not in the unit.

# Operation - Economizer

## NOTE!

Only models IG-HV and IGX-HV with options EC-1, 2, 3 or 4 use an economizer.

### Option EC-1 (Outside Air Temperature Reference)

This option uses one dry bulb temperature sensor, field installed in the inlet of the unit. A second dry bulb temperature sensor is factory installed in the discharge of the unit.

After a call for cooling, the outside air temperature is compared to the economizer set point. If the outside air temperature is above the economizer set point, the economizer sends the dampers to the minimum outside air position and calls for mechanical cooling. If the outside air temperature is between the economizer set point and 55°F, the economizer sends the dampers to the 100% outside air position. If the outside air is less than 55°F, the economizer modulates the dampers to achieve a 55°F mixed air temperature.

### Option EC-2 (Outside Air Enthalpy Reference)

This option uses one enthalpy sensor field installed in the inlet of the unit. A dry bulb temperature sensor is installed in the discharge of the unit.

After a call for cooling, the outside air enthalpy is compared to the field adjustable enthalpy changeover set point. If the outside air enthalpy is less than the set point, the dampers will modulate to provide a 55°F mixed air temperature. If the outside air enthalpy is greater than the set point, the economizer sends the damper to the minimum outside air position and sends a call for mechanical cooling.

Operation

### Option EC-3 (Differential Temperature Control)

This option uses one dry bulb temperature sensor, field installed in the inlet of the unit. A second dry bulb temperature sensor is factory installed in the discharge of the unit. A third dry bulb temperature sensor is field installed in the return air duct.

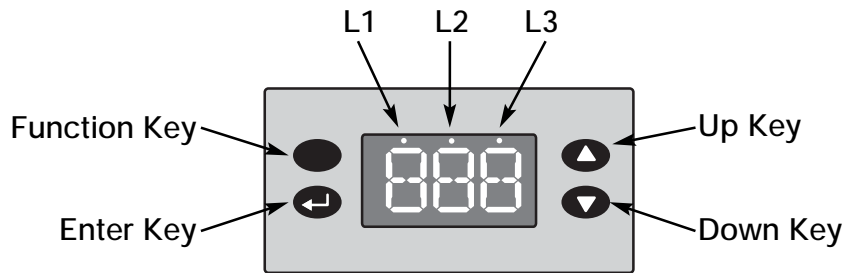
After a call for cooling the economizer compares the outdoor and return air temperatures. If the outdoor air temperature is greater than the return air dry bulb temperature, the economizer sends the dampers to the minimum outside air position and sends a call for mechanical cooling. If the outside air temperature is less than the return air temperature, the economizer will modulate the dampers to achieve a 55°F mixed air temperature. If the outside air temperature is less than the return air temperature, but a 55°F mixed air temperature cannot be achieved, the programmable room thermostat may call for mechanical cooling.

### Option EC-4 (Differential Enthalpy Control)

This option uses one enthalpy sensor, field installed in the inlet of the unit. A second enthalpy sensor is factory installed in the return air duct. A dry bulb temperature sensor is field installed in the discharge of the unit.

After a call for cooling the economizer compares the outdoor and return air enthalpies. If the outdoor air enthalpy is greater than the return air enthalpy, the economizer sends the dampers to the minimum outside air position and sends a call for mechanical cooling. If the outside enthalpy is less than the return air enthalpy, the economizer will modulate the dampers to achieve a 55°F mixed air temperature. If the outside enthalpy is less than the return air temperature, but a 55°F mixed air temperature cannot be achieved, the programmable room thermostat may call for mechanical cooling.

# Operation - Water Wizard



## Key Functions

### Drain Mode

Drain mode locks open the drain solenoid and drains the supply line between the supply solenoid and the media. To activate drain mode simultaneously press the function and enter keys (L2 will light). To deactivate drain mode and unlock the drain solenoid, simultaneously press the function and enter keys again.

### Flow Test Mode

Activating flow test mode opens the supply solenoid and allows water to pass to the manual supply valve. To activate flow test mode, press and hold the function key for one second (L3 will flash). To deactivate flow test mode and allow the supply solenoid to close, press and hold the function key again for one second.

#### CAUTION!

The sump drain line must be clear and draining to a safe location before using flow test mode.

#### CAUTION!

Be aware of the water level in the sump tank at all times when using the flow test mode.

### Program Mode

Program mode allows the user to view the program menu and edit the factory default settings. To access program mode and view the program menu press and hold the enter key for three seconds. While viewing the program menu press the up and down keys to scroll through the menu options. To view the setting of the selected menu option press the enter key. To edit the setting, press the up or down key while viewing the setting. To save the setting and return to the program menu press the enter key. To return to the program menu without saving the change, wait 10 seconds. To exit program mode from the program menu, wait 10 seconds.

#### WARNING!

Changing the default settings will significantly affect performance. Only change a setting after reading and understanding this entire manual.

#### NOTE!

The enter key must be pressed to save any changes made to a setting.

### Dry Bulb Temperature

The default display is the dry bulb temperature of the outside air.

### Wet Bulb Temperature

To view the wet bulb temperature, simultaneously press and hold the up and down keys.

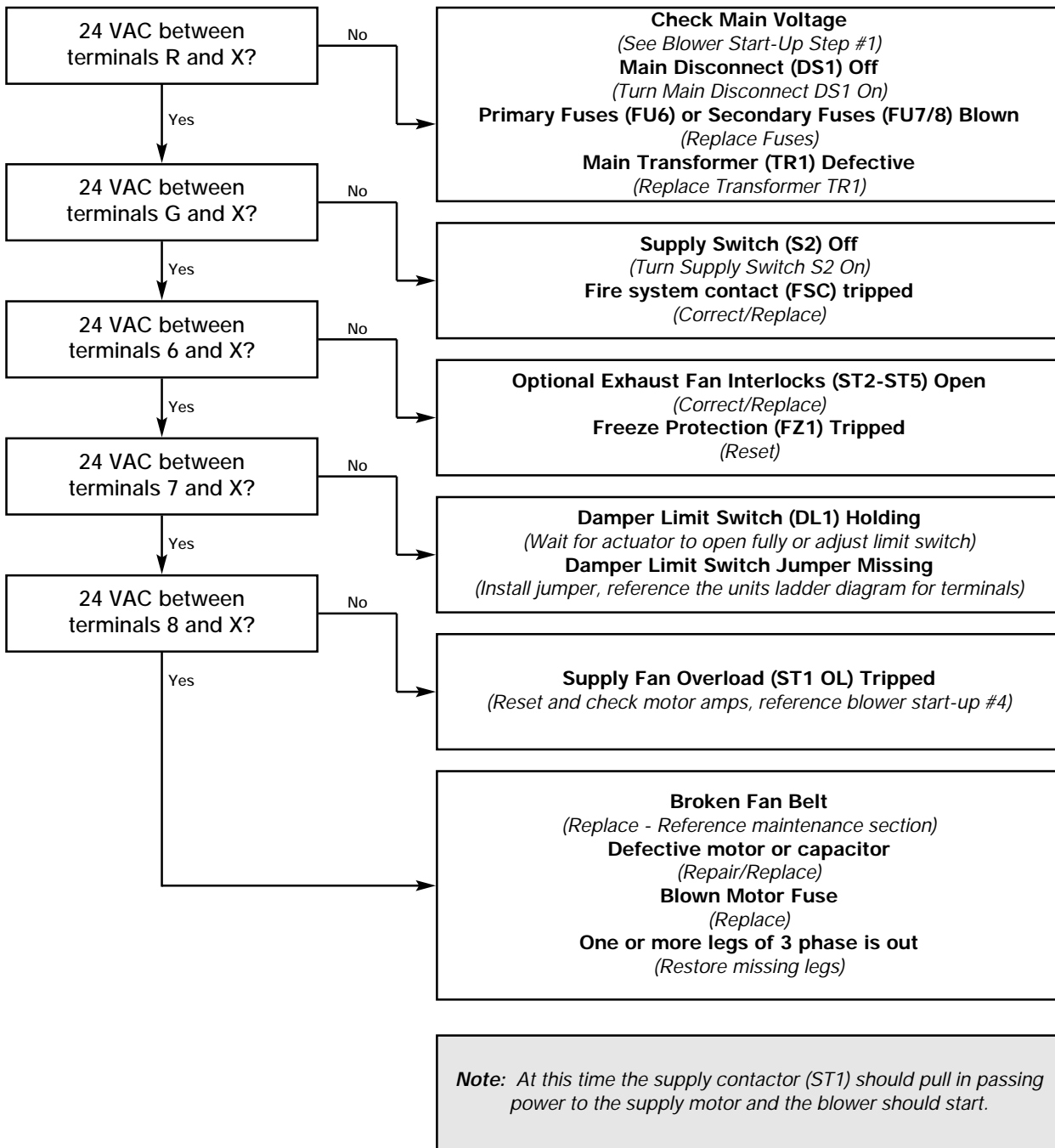
### Indicating Lights

Three indicating lights are located across the top of the display to indicate the status of the Water Wizard.

	Light Status			
	On	Off	Blinking (Long on, short off)	Blinking (Short on, long off)
L1	Call For Cooling	No Call For Cooling	N/A	N/A
L2	Drain Solenoid Open	Drain Solenoid Closed	N/A	N/A
L3	Cooling On	Cooling Off	Supply Solenoid Locked Closed	Flow Test Mode Active

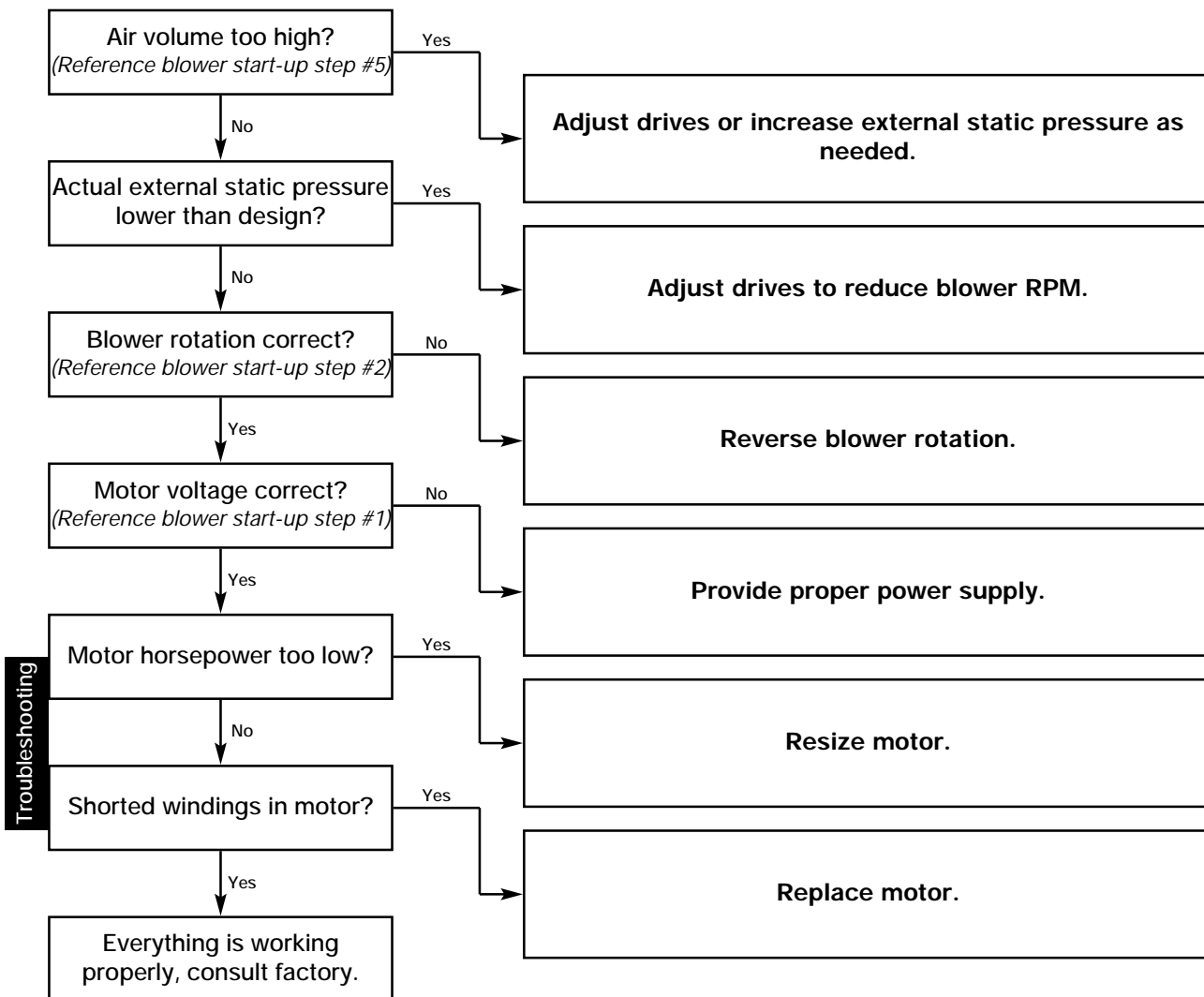
# Troubleshooting

## Blower Does Not Operate



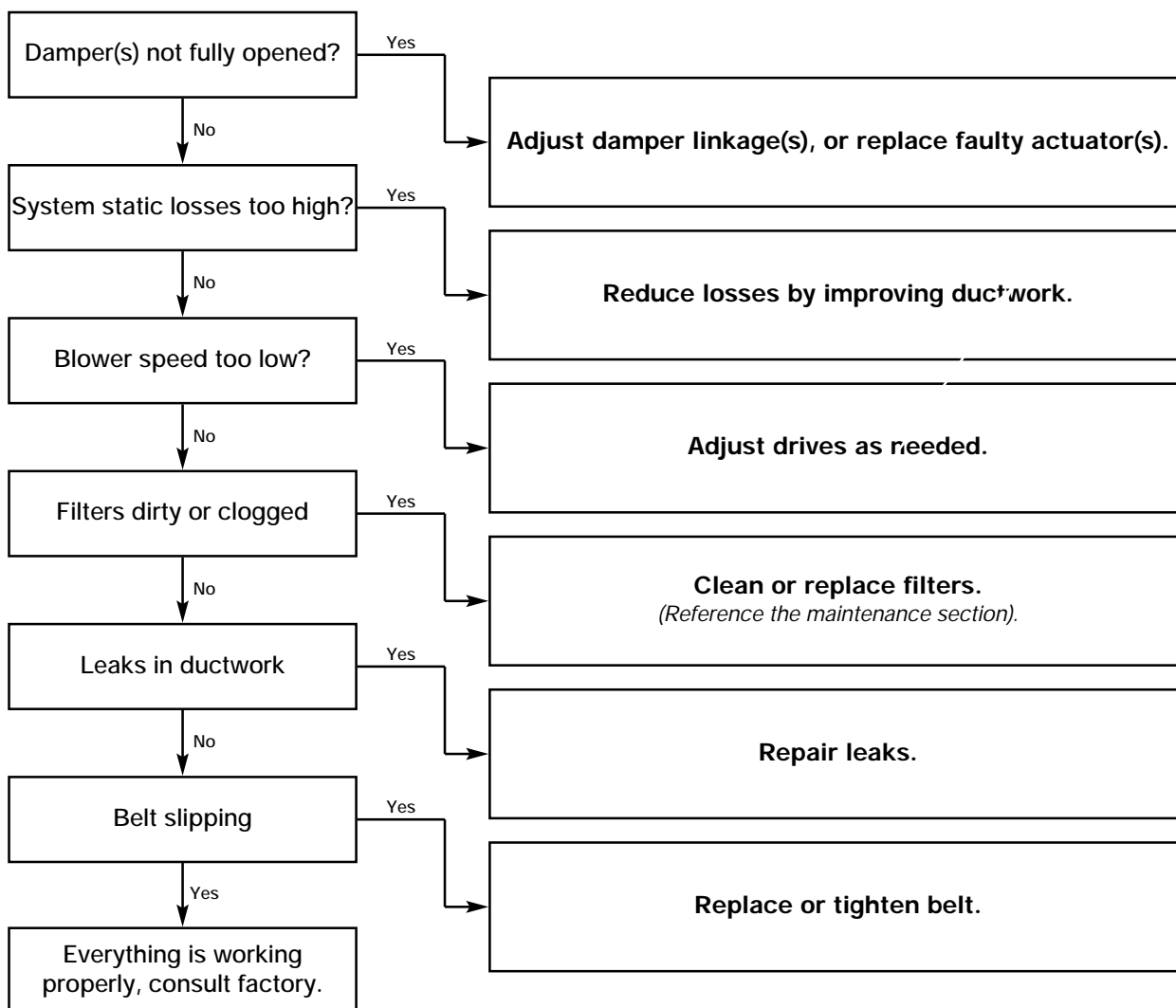
# Troubleshooting

## Motor Overamps



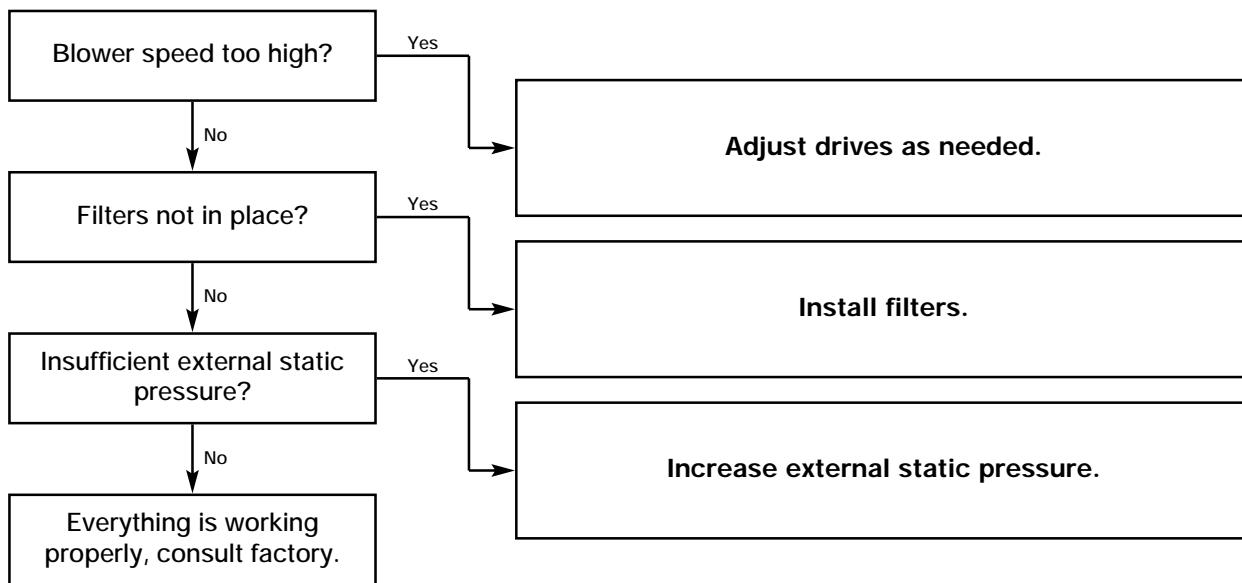
# Troubleshooting

## Insufficient Airflow



# Troubleshooting

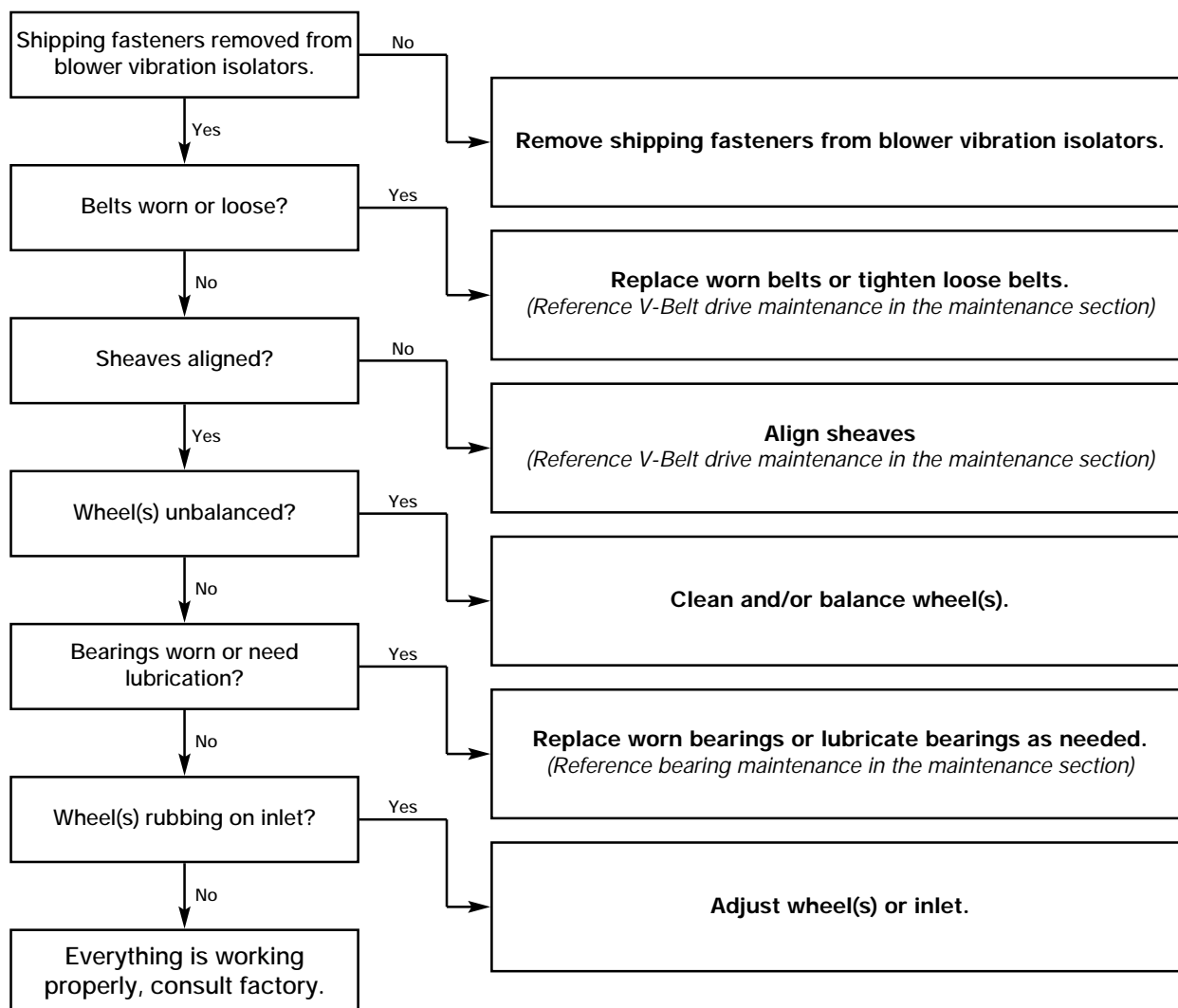
## Too Much Airflow





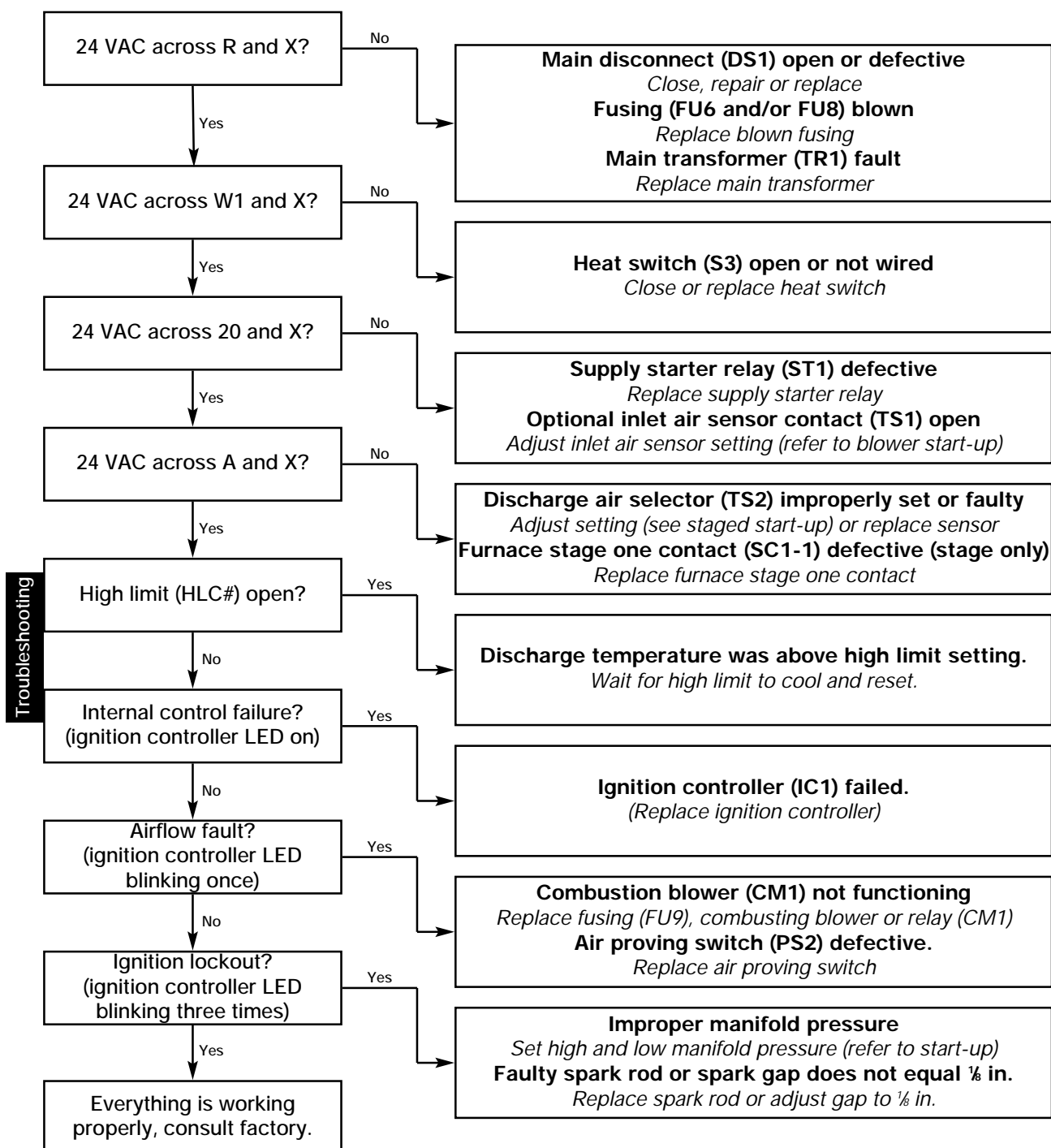
# Troubleshooting

## Excessive Noise or Vibration



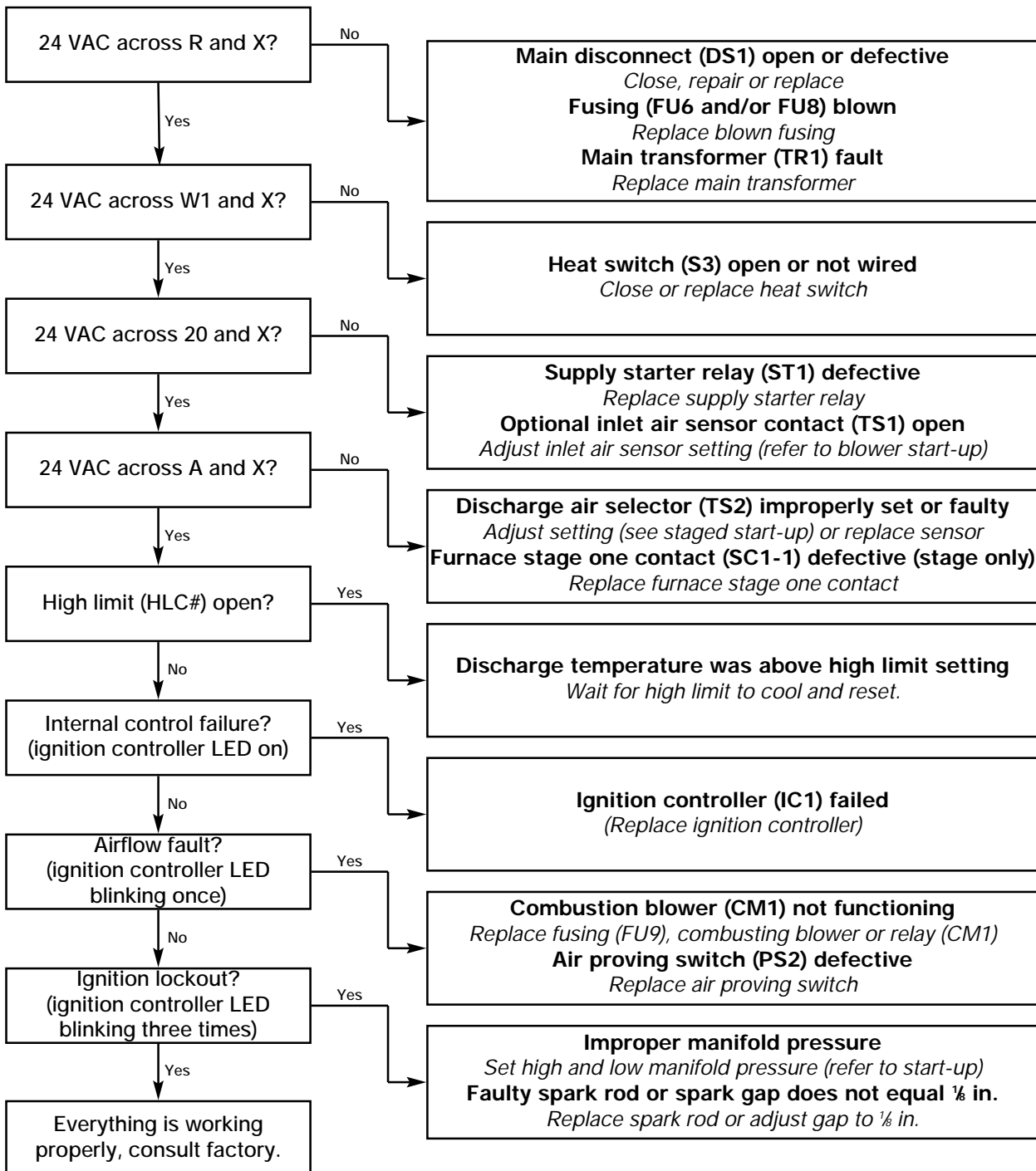
# Troubleshooting

## Single Stage or 2:1 Staged Furnace Will Not Light



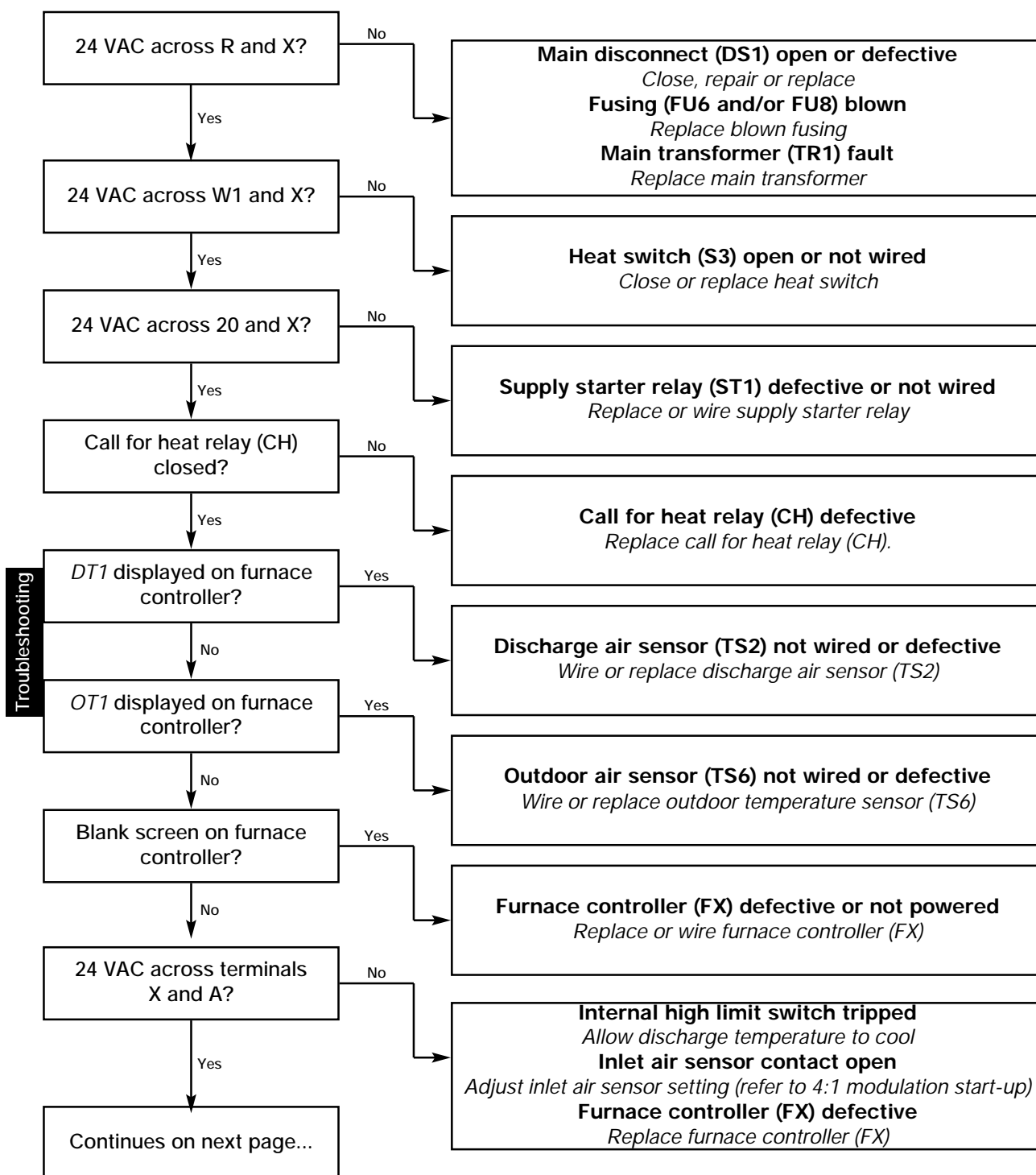
# Troubleshooting

## 2:1 Modulating Furnace Will Not Light



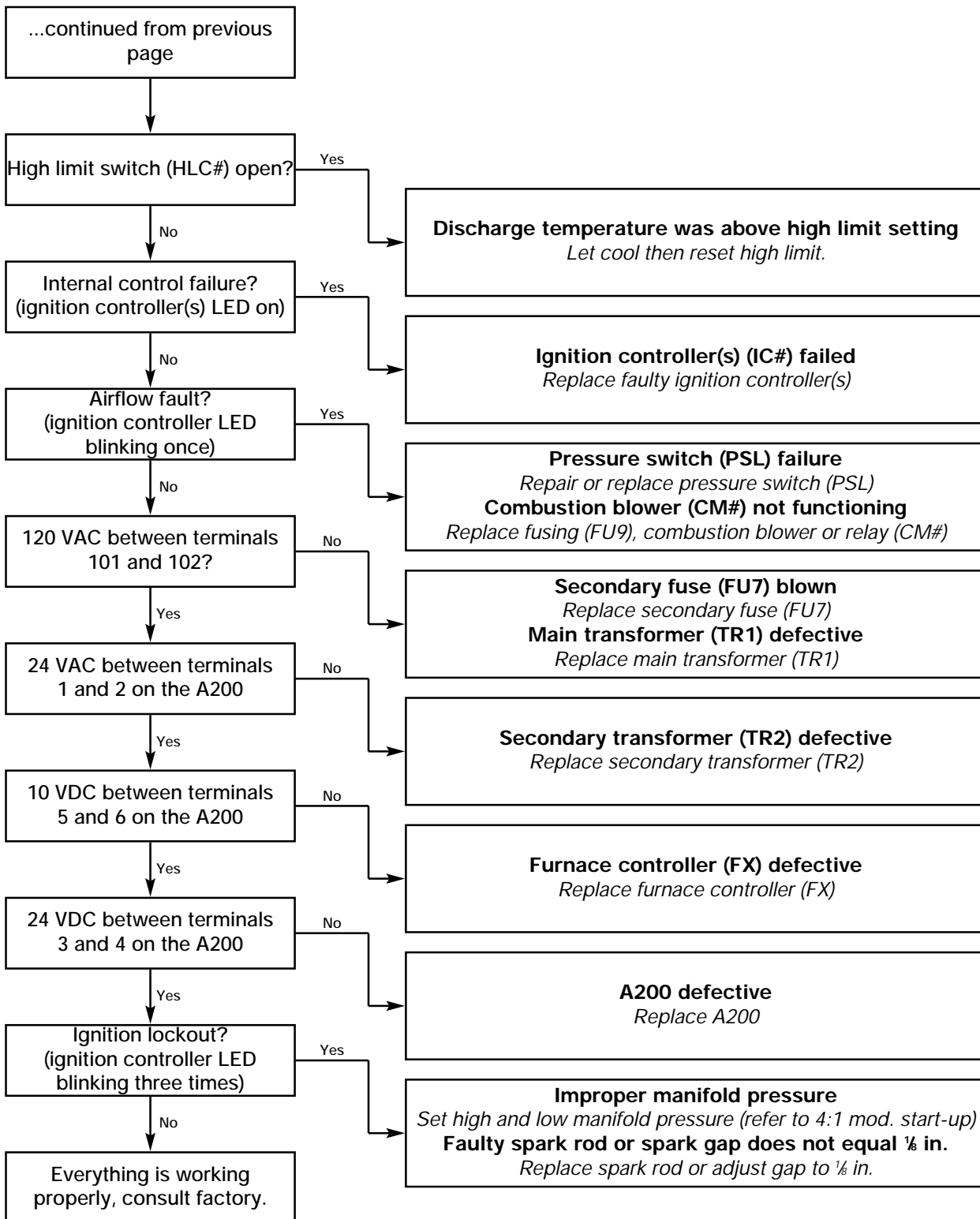
# Troubleshooting

## 4:1 Modulating Furnace Will Not Light



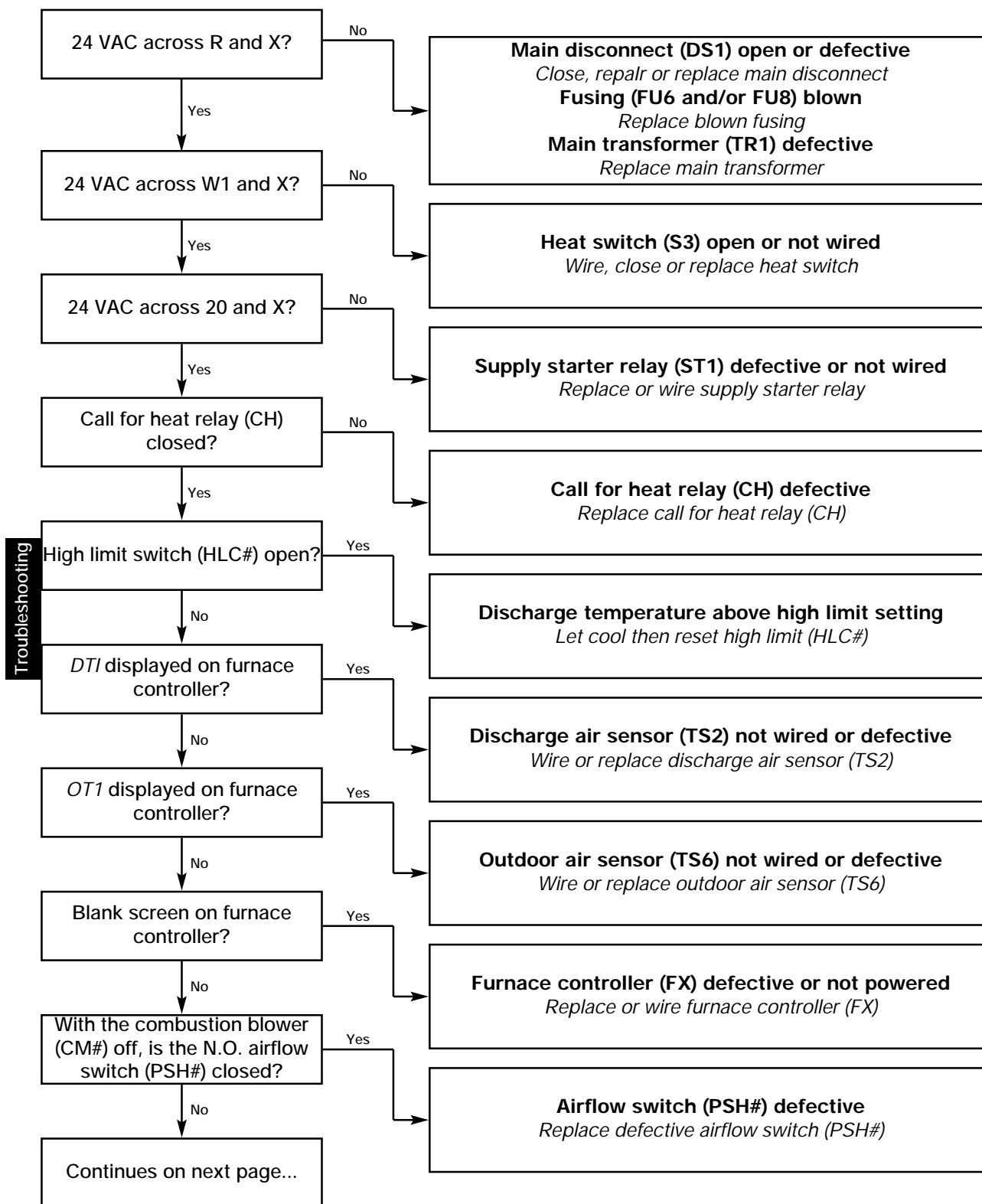
# Troubleshooting

## 4:1 Modulating Furnace Will Not Light



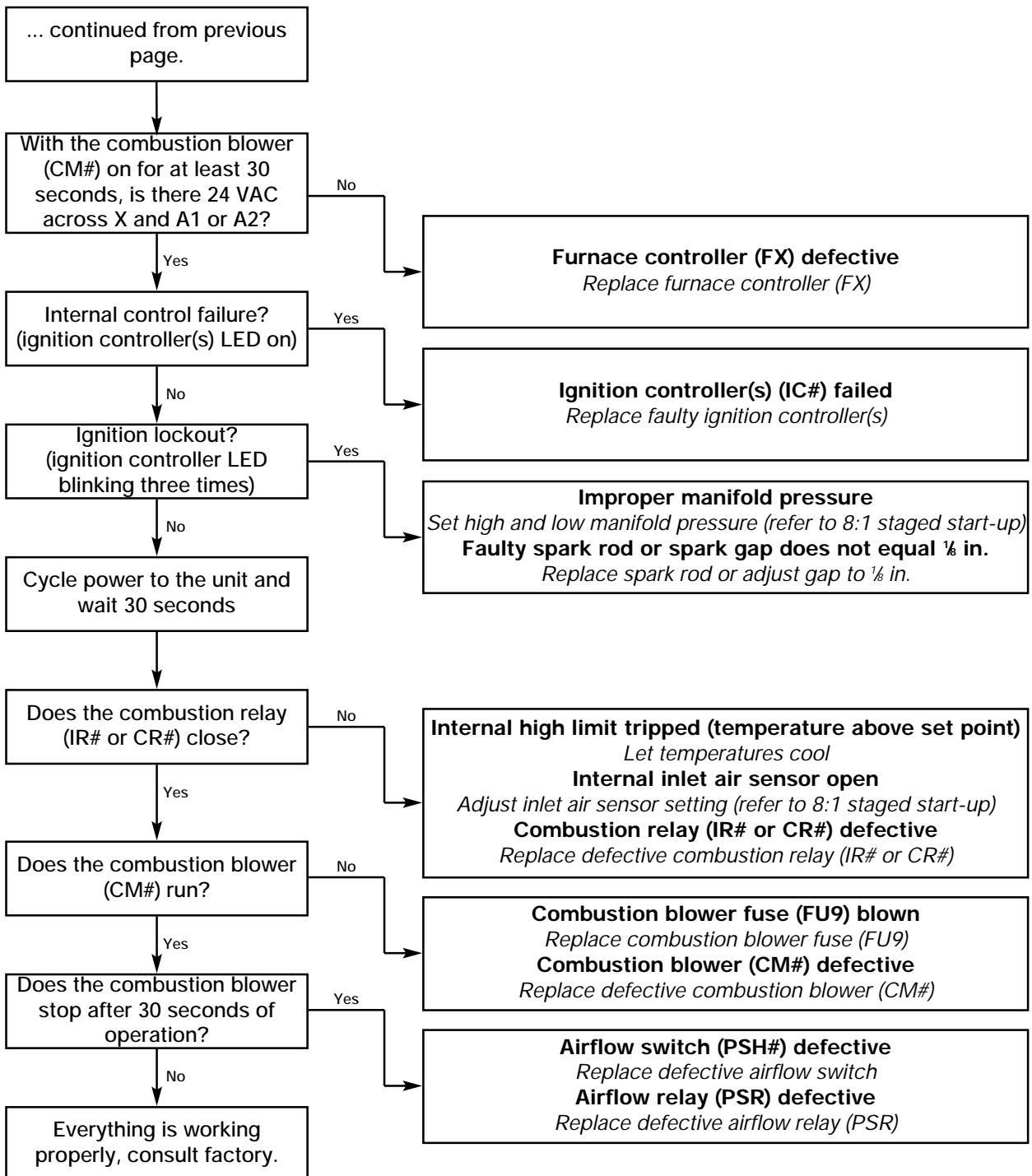
# Troubleshooting

## 8:1 Staged Furnace Will Not Light



# Troubleshooting

## 8:1 Staged Furnace Will Not Light



# Troubleshooting

## Water Wizard Water Supply

### NOTE!

If the water supply is too low, the media will continuously appear dry.

### NOTE!

If the water supply is too high, the media will be saturated and excessive water will be draining from the sump tank.

### NOTE!

Some water drainage is desired to keep the media flushed, but it should be minimized to utilize the Water Wizard.

### Step 1 Adjust the Manual Supply Valve

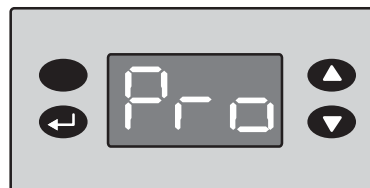
Adjust the manual supply valve (refer to Water Wizard Start-Up Step #2). If the recommended water pressure does not provide enough water, increase the pressure until the desired water supply is achieved. If the recommended water pressure provides too much water, decrease the water pressure until the desired water supply is achieved.

### CAUTION!

Only proceed to steps two and three if step one does not correct the problem.

### Step 2 Enter Program Mode

Press and hold the enter key for three seconds to enter program mode. The display will read "Pro" when program mode is active.



### Step 3 Adjust the On Time Factor

While in the program menu, use the up and down keys to navigate through the menu options until "ont" is displayed.

With "ont" displayed, press the enter key to access the setting.

With the setting displayed, use the up and down keys to adjust the setting as needed.

Increase the factor to increase the water supply or decrease the factor to decrease the water supply.

Press the enter key to save the new on time factor and return to the program menu.



### NOTE!

Changing the on time factor by (1) will change the water supply by approximately 3%.

### IMPORTANT!

The enter key must be pressed to save the new on time factor.

### Step 4 Exit Program Mode

After ten seconds of idle time the controller will automatically exit program mode.



# Maintenance - Routine

## CAUTION!

Lock-out the gas and the electrical power to the unit before performing any maintenance or service operations to this unit.

### V-Belt Drives

V-belt drives must be checked on a regular basis for wear, tension, alignment and dirt accumulation.

Check the alignment by using a straight edge across both sheaves as shown below.

Check the tension by measuring the deflection in the belt as shown below.

## IMPORTANT!

Premature or frequent belt failures can be caused by improper belt tension or misaligned sheaves.

Abnormally high belt tension or drive misalignment will cause excessive bearing loads and may result in failure of the fan and/or motor bearings.

Abnormally low belt tension will cause squealing on start-up, excessive belt flutter, slippage and overheated sheaves

## IMPORTANT!

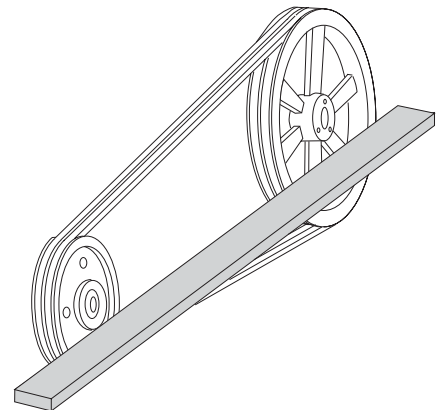
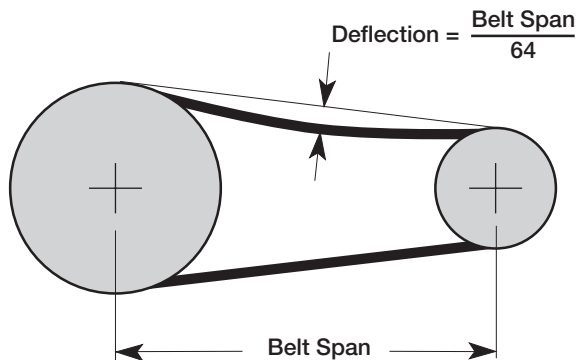
Do not pry belts on or off the sheave. Loosen belt tension until belts can be removed by simply lifting the belts off the sheaves.

## IMPORTANT!

When replacing V-belts on multiple groove drives, all belts should be changed to provide uniform drive loading.

## IMPORTANT!

Do not install new belts on worn sheaves. If the sheaves have grooves worn in them, they must be replaced before new belts are installed.



Maintenance

### Snow Accumulation

Clear snow away from roof mounted units. Keep the snow clear of the intake, access doors and any vent piping.

# Maintenance - Routine

## Motors

Motor maintenance is generally limited to cleaning and lubrication (where applicable).

Cleaning should be limited to exterior surfaces only. Removing dust and grease build-up on the motor assures proper motor cooling.

Motors supplied with grease fittings should be greased in accordance with the manufacturer's recommendations.

### CAUTION!

Do not allow water or solvents to enter the motor or bearings. Motors and bearings should never be sprayed with steam, water or solvents.

### WARNING!

Greasing motors is only intended when fittings are provided. Many motors are permanently lubricated, requiring no additional lubrication.

## Wheels

Wheels require little attention when moving clean air. Occasionally oil and dust may accumulate on the wheel causing imbalance. When this occurs the wheel and housing should be cleaned to assure proper operation.

## Bearings

The bearings for Greenheck fans are carefully selected to match the maximum load and operating conditions of the specific class, arrangement and fan size. The instructions provided in this manual and those provided by the bearing manufacturer will minimize any bearing problems.

### WARNING!

Lubricate bearings prior to periods of extended shutdowns or storage and rotate shaft monthly to aid in corrosion prevention. If the fan is stored more than three months, purge the bearings with new grease prior to start-up.

## Recommended Bearing Lubrication Schedule for Greenheck Fans

Relubrication Schedule in Months\*

Fan RPM	Bearing Bore Size (inches)				
	1/2 - 1	1 1/8 - 1 1/2	1 5/8 - 1 7/8	1 15/16 - 2 3/16	2 7/16 - 3
250	6	6	6	6	6
500	6	6	6	5	4
750	6	5	4	3	3
1000	5	3	2	1	1
1250	5	3	2	1	1
1500	5	2	1	1	0.5
2000	5	1	1	0.5	0.25

\* Suggested initial greasing interval is based on 12 hour per day operation and 150°F maximum housing temperature. For continuous (24 hour) operation, decrease greasing interval by 50%

- If extended grease lines are present, relubricate while in operation, only without endangering personnel.
- For ball bearings (operating) relubricate until clean grease is seen purging at the seals. Be sure not to unseat the seal by over lubricating.
- For ball bearings (idle) add 1-2 shots of grease up to 2 inch bore size, and 4-5 shots above 2 inch bore sizes with a hand grease gun.
- For roller bearings add 4 shot of grease up to 2 inch bore size, and 8 shots for 2 inch - 5 inch bore size with a hand grease gun.
- Adjust relubrication frequency based on condition of purged grease.
- A high quality lithium based grease conforming to NLGI Grade 2 consistency, such as those listed below should be used:

Mobil 532  
Mobilux #2

Texaco Multifak #2  
Texaco Premium #2

B Shell Alavana #2  
Exxon Unirex N2

# Maintenance - Routine

## Filters

Filter maintenance is generally limited to cleaning and replacement.

If aluminum mesh filters are installed, they can be washed in warm soapy water.

An adhesive spray can be added to aluminum mesh filters to increase their efficiency.

If disposable filters are installed, they can be checked by holding up to a light source. If light cannot pass through the filter, it should be replaced.

### IMPORTANT!

When reinstalling filters be sure to install them with the airflow in the correct direction. An airflow direction arrow is located on the side of the filters.

### IMPORTANT!

Replacement filters should be from the same manufacturer and the same size as the original filters provided with the unit.

## Evaporative Coolers

The media should be periodically brushed lightly with a soft bristle brush in an up and down motion while flushing with water. This aids in reducing the amount of mineral build-up.

For large amounts of mineral build-up, clean or replace the media and increase the water bleed-off or flush rate.

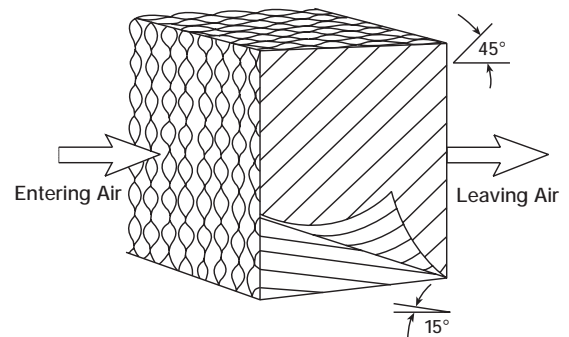
The cooling media has a useful life of 3 to 5 years depending on the water quality and the bleed-off or flush rate.

### IMPORTANT!

Replacement media should be from the same manufacturer and be the same size as the original media provided with the unit.

### IMPORTANT!

When reinstalling the evaporative media, make sure that it is installed correctly. Reference the drawing shown below.



## Cooling Coils

Inspect the coil for signs of corrosion and/or leaks. Repair any leaks as required.

Inspect the coil's surface for foreign material. If the coil surface needs cleaning, clean the coil from the leaving air-side so that foreign material will be washed out of the coil rather than pushed farther in.

Inspect and clean the drain pan to prevent the growth of algae and other organisms.

### WARNING!

Repair and replacement of the coil and the connecting piping, valves, etc., should be performed by a qualified individual.

### IMPORTANT!

Be sure to read and follow the manufacturer's recommendations before using any cleaning fluid.

## Chilled Water Coils

Test the circulating fluid for sediment, corrosive products, biological contaminants and make the necessary corrective measures.

Maintain adequate fluid velocities and proper filtering of the fluid.

If automatic air vents are not utilized, periodic venting of the coil is recommended to remove accumulated air.

### CAUTION!

Caution should be used to avoid injury when venting the coil. High pressure and/or high temperature fluids can cause serious injuries.

# Maintenance - Fall

## Evaporative Coolers

The water should be shut off and all the lines drained when the outside temperature drops below 45°F.

Remove drain plugs for the winter.

Clean all interior parts of any mineral deposits or foreign materials that may have built-up during the cooling season.

Replace any worn or non-functioning parts.

### CAUTION!

**Lock-out the gas and the electrical power to the unit before performing any maintenance or service operations to this unit.**

## Gas Line

Remove the drip leg and clean any liquid or debris that may have accumulated. Once the drip leg is cleaned, reattach it.

## Vent Piping

Remove any debris from the drip legs on the combustion air and exhaust pipes.

## Burners and Orifices

Before each heating season, examine the burners and gas orifices to make sure they are clear of any debris such as spider webs, etc. Clean burner as follows:

- Turn off both electrical and gas supplies to the unit.
- Disconnect union between manifold and gas valve.
- Remove manifold and burner assembly.
- Inspect and clean orifices and burners as necessary. Avoid using any hard or sharp instruments which could cause damage to the orifices or burners.
  - Remove any soot deposits from the burner with a wire brush.
  - Clean the ports with an aerosol degreaser or compressed air.
  - Wipe the inside of the burner clean. Cleaning the burner with a degreaser will slow the future build-up of dirt.
- Before reinstalling the burner assembly, look down the heat exchanger tubes to make sure they are clear of any debris.
- Reinstall manifold and burner assembly, reconnect wire leads and gas supply piping.
- Turn on the electrical power and gas supply.
- Follow the start-up procedure to light the burners and verify proper operation.

Maintenance

## Heat Exchanger

The heat exchanger should be checked annually for cracks. If a crack is detected, the heat exchanger should be replaced before the unit is put back into operation. Also, airflow across the heat exchanger should be checked to make sure the blower is operating properly.

## Flue Collector Box

The flue passageway and flue collector box should be inspected prior to each heating season and cleared of any debris.

## Electrical Wiring

The electrical wiring should be checked annually for loose connections or deterioration.

## Replacement Parts

When ordering replacement parts, include the complete unit model number and serial number listed on the unit rating plate.

# Maintenance - Log

### Job Information

Job Name: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

Contact Person: \_\_\_\_\_

Service Organization: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

Work Done By: \_\_\_\_\_

### Name Plate Information

Model: \_\_\_\_\_

Volts: \_\_\_\_\_ Hertz: \_\_\_\_\_ Phase: \_\_\_\_\_

Amps: \_\_\_\_\_ Mark: \_\_\_\_\_

Supply hp: \_\_\_\_\_ Exhaust hp: \_\_\_\_\_

Serial Number:\_\_\_\_\_

Motor Voltage: \_\_\_\_\_

Motor Amperage: \_\_\_\_\_

Fan rpm: \_\_\_\_\_

### Field Start-Up Documentation

Actual Voltage: \_\_\_\_\_ Hertz: \_\_\_\_\_ Phase: \_\_\_\_\_

Actual Amperage: \_\_\_\_\_

Blower Rotation \_\_\_\_\_

Air Volume	Design	cfm
------------	--------	-----

Actual \_\_\_\_\_ cfm

High Fire Manifold Pressure: \_\_\_\_\_

Low Fire Manifold Pressure: \_\_\_\_\_

## Maintenance

[illegible]

## Maintenance - Log

## Maintenance

# Maintenance - Log

[illegible]

## Maintenance

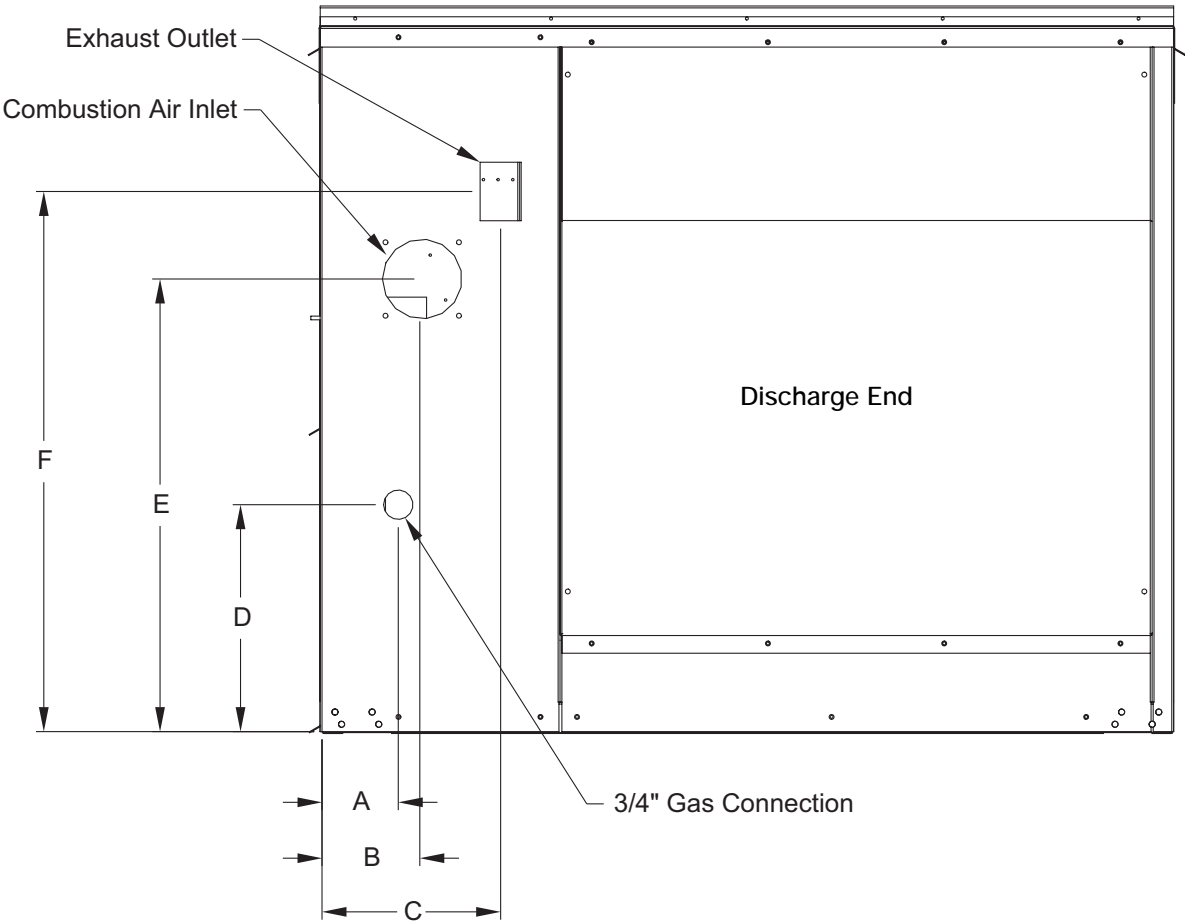
# Reference - Venting Connection Location

## Model IG

### NOTE!

All dimensions are in inches. Dimensions *B* and *E* are not needed for standard venting. A round adapter should be used for the exhaust connection.

IG Housing	A	B	C	D	E	F	Flue Connection Size (Diameter)				
							Standard	Non-Concentric		Concentric	
							Exhaust	Exhaust	Intake	Exhaust	Intake
10	3.89	5.12	9.12	11.59	23.11	27.58	4.0	4.0	4.0	4.0	6.0
20	3.91	3.89	7.89	11.62	25.34	32.27	6.0	6.0	6.0	6.0	8.0
30	3.91	3.89	7.89	11.62	25.34	32.27	6.0	6.0	6.0	6.0	8.0



Reference



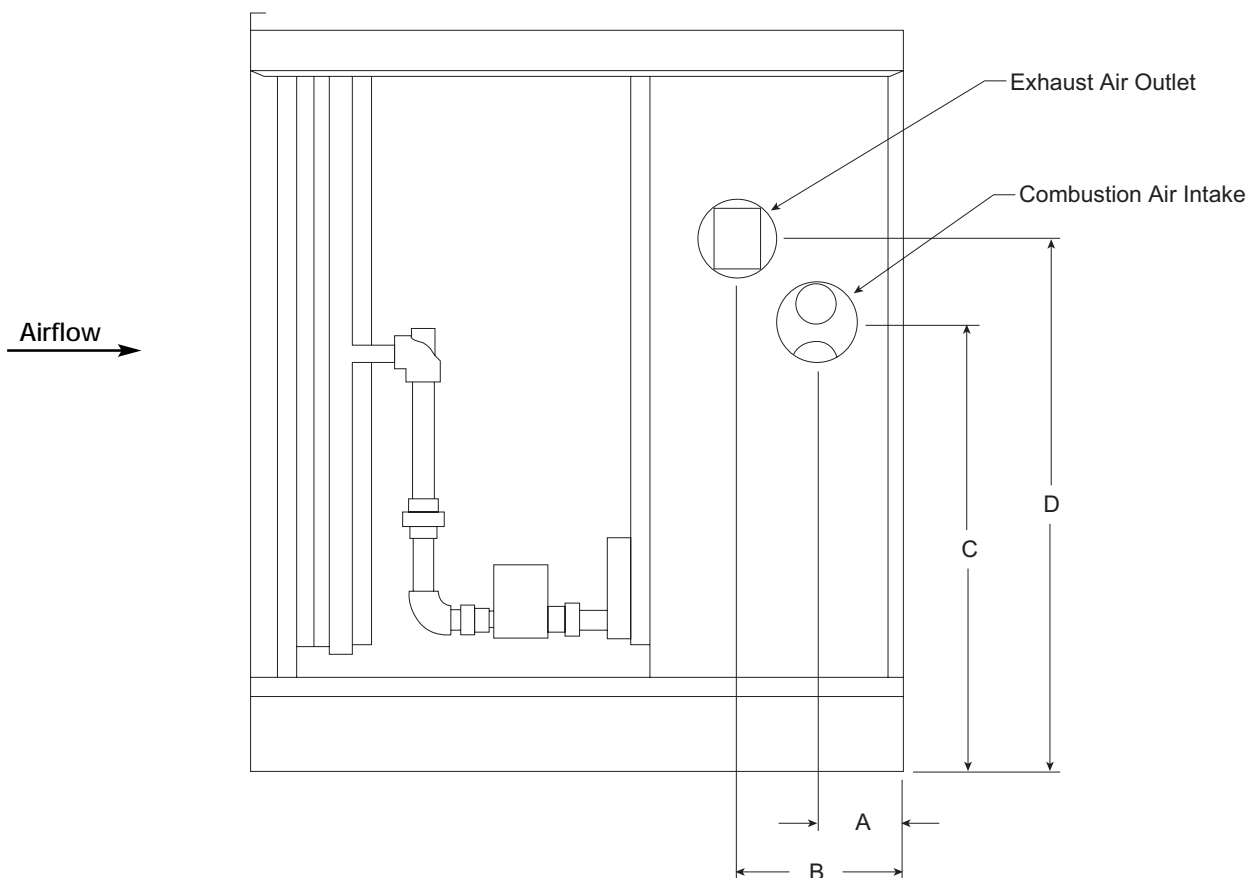
# Reference - Venting Connection Location

## Model IGX

### NOTE!

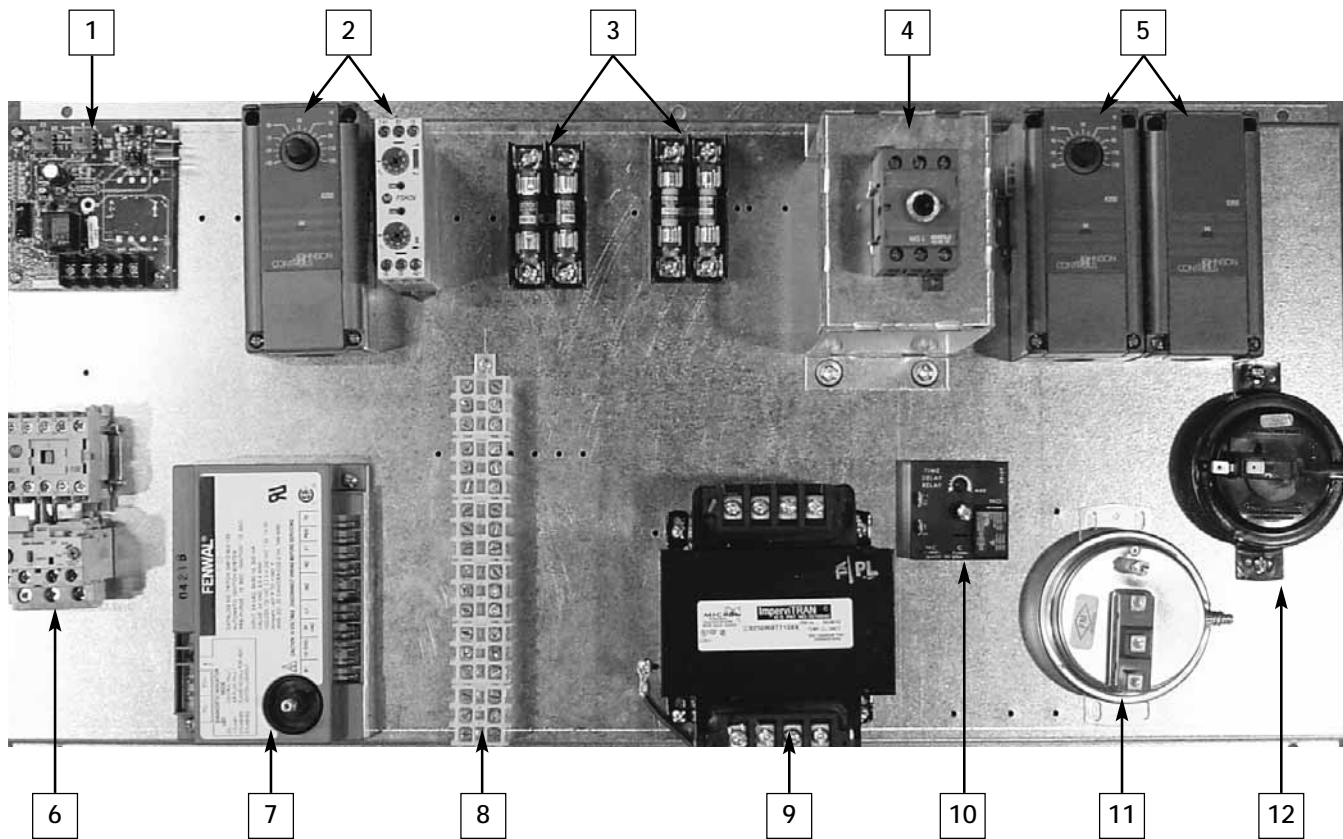
All dimensions are in inches. Dimensions A and C are not needed for standard venting.

Housing IGX	Furnace Size (MBH)	A	B	C	D	Flue Connection Size (Diameter)				
						Standard	Non-Concentric		Concentric	
						Exhaust	Exhaust	Intake	Exhaust	Intake
12	100	4.45	8.45	23.43	27.90	4.0	4.0	4.0	4.0	6.0
	150	4.45	8.45	23.43	27.90	4.0	4.0	4.0	4.0	6.0
	200	5.64	9.64	23.97	30.90	6.0	6.0	6.0	6.0	8.0
	250	5.64	9.64	23.97	30.90	6.0	6.0	6.0	6.0	8.0
22	150	4.45	8.45	29.38	33.85	4.0	4.0	4.0	4.0	6.0
	200	5.67	9.67	24.97	31.90	6.0	6.0	6.0	6.0	8.0
	250	5.67	9.67	24.97	31.90	6.0	6.0	6.0	6.0	8.0
	300	5.67	9.67	24.97	31.90	6.0	6.0	6.0	6.0	8.0
	350	5.67	9.67	19.01	25.94	6.0	6.0	6.0	6.0	8.0
	400	5.67	9.67	19.01	25.94	6.0	6.0	6.0	6.0	8.0
	500	5.67	9.67	24.97	31.90	6.0	6.0	6.0	6.0	8.0
	600	5.67	9.67	24.97	31.90	6.0	6.0	6.0	6.0	8.0
32	350	5.96	9.71	28.31	35.24	6.0	6.0	6.0	6.0	8.0
	400	5.96	9.71	28.31	35.24	6.0	6.0	6.0	6.0	8.0
	500	5.96	9.71	28.31	35.24	6.0	6.0	6.0	6.0	8.0
	600	5.96	9.71	28.31	35.24	6.0	6.0	6.0	6.0	8.0
	700	5.96	9.71	28.31	35.24	6.0	6.0	6.0	6.0	8.0
	800	5.96	9.71	28.31	35.24	6.0	6.0	6.0	6.0	8.0
	1050	5.96	9.71	28.31	35.24	6.0	6.0	6.0	6.0	8.0
	1200	5.96	9.71	28.31	35.24	6.0	6.0	6.0	6.0	8.0



Reference

## Reference - Model IG (Single or 2 Stage)

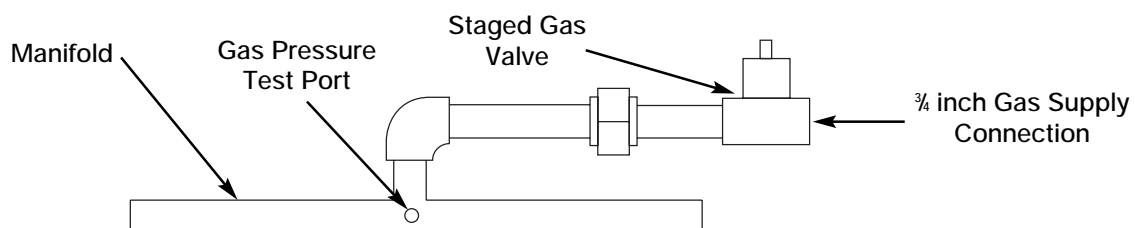


### NOTE!

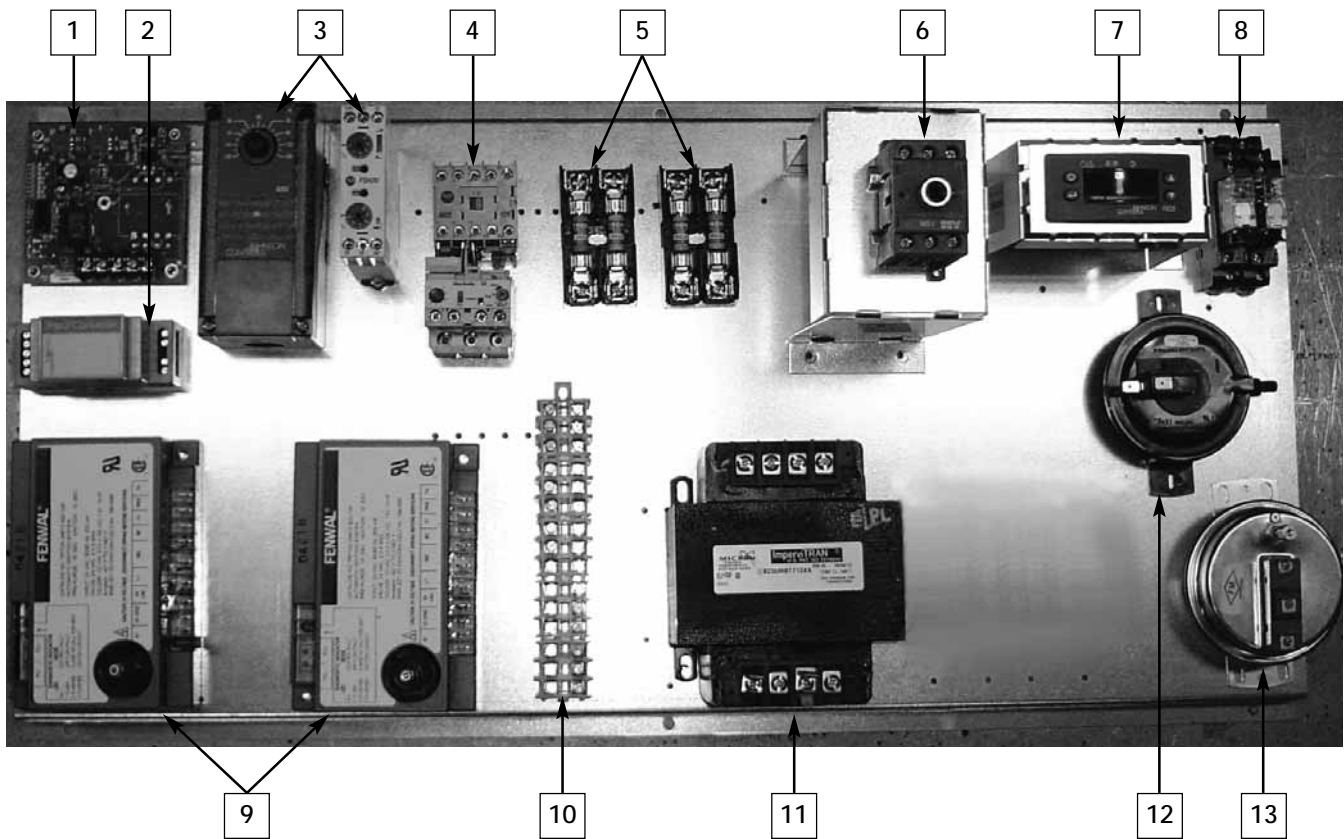
This is a typical blower control center, the control center in your unit may be different. Reference the ladder diagram on the inside of the control center door for a unit specific wiring diagram.

1. **Building Freeze Protection** - Prevents the discharge of cold air into the building
2. **Evaporative Cooling Controls (Optional)** - Controls the evaporative cooler.
3. **Fusing** - Provides 24 VAC fusing for controls and fusing for the combustion blower.
4. **Main Disconnect** - Provides single point power connection to the unit.
5. **Stage Controller** - Provides single or two stage control of the furnace.
6. **Motor Starter(s)** - Magnetic contact(s) for starting motor(s). Comes standard with electronic overload, auxiliary contact(s) optional.
7. **Ignition Controller** - Controls the ignition of the furnace. Maintains safe operation of the furnace.
8. **Terminal Strip** - Provides easy, number coded wiring of the control.
9. **Main Transformer** - Provides 24 VAC for controls.
10. **Time Delay** - Temporarily runs the combustion blower after the furnace has shut down (post-purge).
11. **Dirty Filter Switch** - Switch trips when filter are dirty and pressure loss is higher than set point.
12. **Airflow Switch** - Monitors the airflow inside the heat exchanger.
13. **Inlet Air Sensor (not shown)** - Shuts down furnace when the outside air is above the set point.
14. **Grounding Lugs (not shown)** - Completes electrical circuit.
15. **Heat/Cool Relay (not shown)** - Passes power to the furnace or cooling controls.

Reference



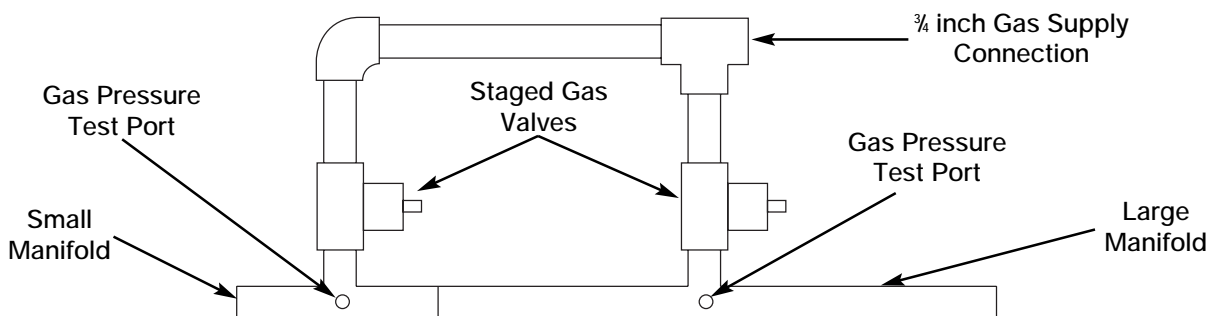
## Reference - Model IG (8:1 Staged)



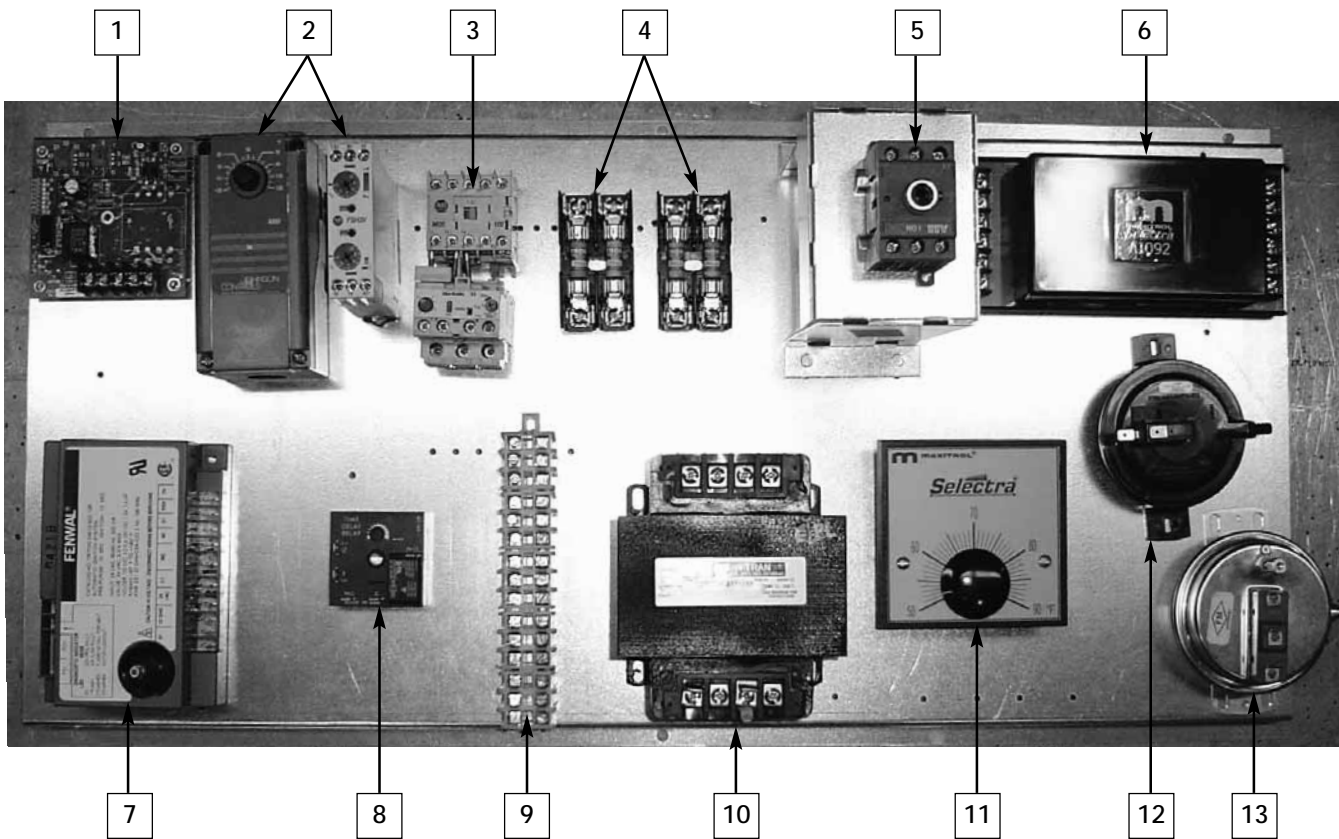
### NOTE!

This is a typical blower control center, the control center in your unit may be different. Reference the ladder diagram on the inside of the control center door for a unit specific wiring diagram.

1. **Building Freeze Protection** - Prevents the discharge of cold air into the building.
2. **Input Converter** - Receives and converts signal from building management system.
3. **Evaporative Cooling Controls (Optional)** - Controls the evaporative cooler.
4. **Motor Starter(s)** - Magnetic contact(s) for starting motor(s). Comes standard with electronic overload, auxiliary contact(s) optional.
5. **Fusing** - Provides 24 VAC fusing for controls and fusing for the combustion blower.
6. **Main Disconnect** - Provides single point power connection to the unit.
7. **Stage Controller** - Provides 8-stage control of the furnace.
8. **Relays** - Call for heat and airflow switch relays.
9. **Ignition Controllers** - Controls the ignition of the furnace. Maintains safe operation of the furnace.
10. **Terminal Strip** - Provides easy, number coded wiring of the control.
11. **Main Transformer** - Provides 24 VAC for controls.
12. **Airflow Switch** - Monitors the airflow inside the heat exchanger.
13. **Dirty Filter Switch** - Switch trips when filters are dirty and pressure loss is higher than set point.
14. **Grounding Lugs (not shown)** - Completes electrical circuit.



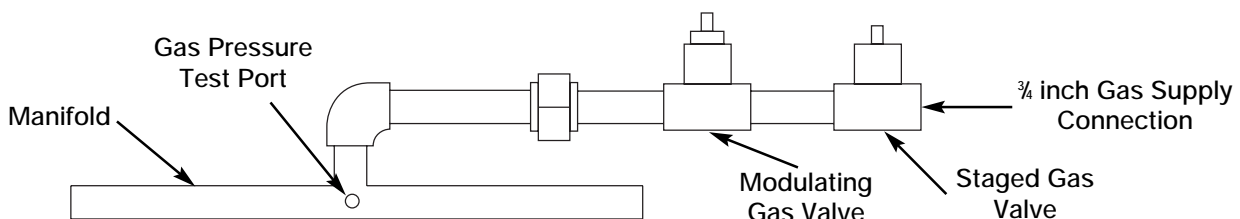
## Reference - Model IG (2:1 Modulating)



### NOTE!

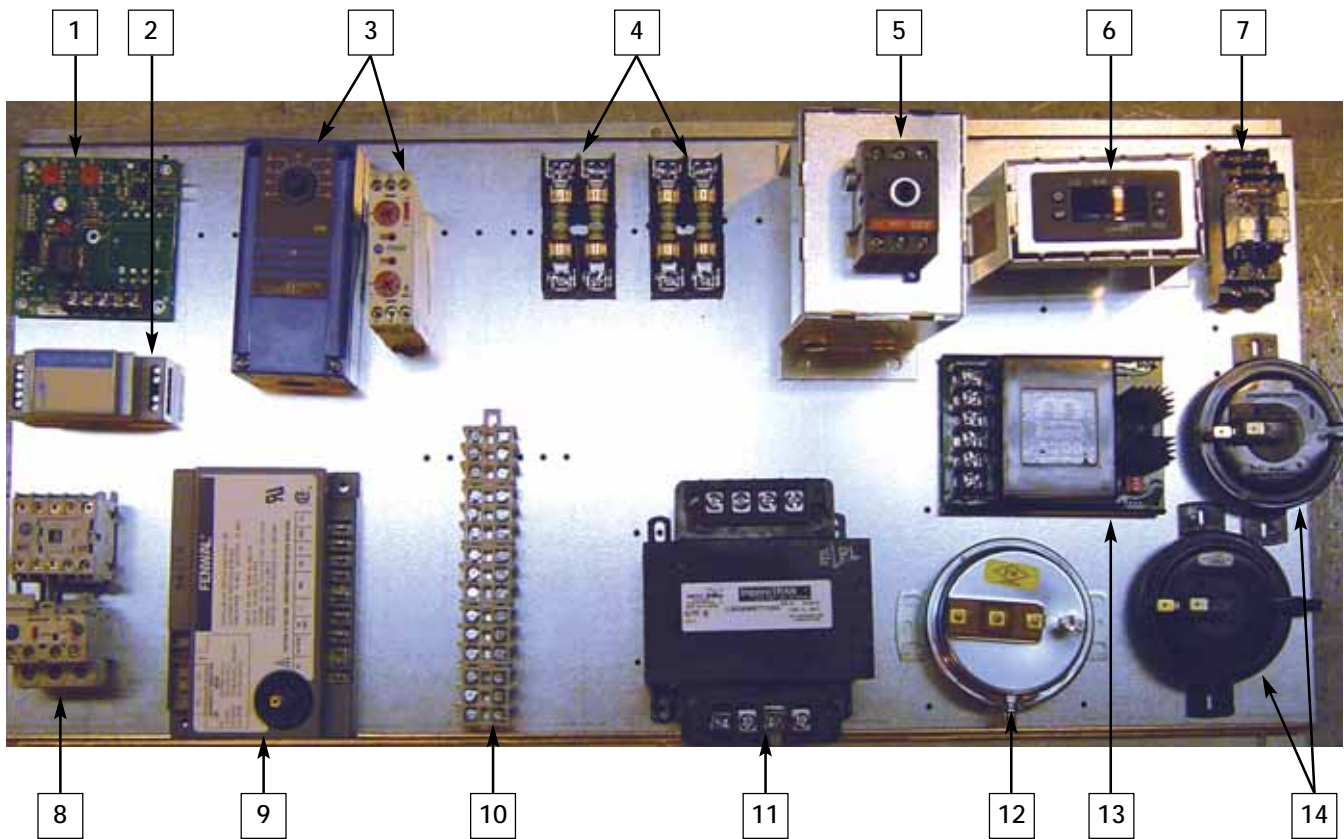
This is a typical blower control center, the control center in your unit may be different. Reference the ladder diagram on the inside of the control center door for a unit specific wiring diagram.

1. **Building Freeze Protection** - Prevents the discharge of cold air into the building.
2. **Evaporative Cooling Controls (Optional)** - Controls the evaporative cooler.
3. **Motor Starter(s)** - Magnetic contact(s) for starting motor(s). Comes standard with electronic overload, auxiliary contact(s) optional.
4. **Fusing** - Provides 24 VAC fusing for controls and fusing for the combustion blower.
5. **Main Disconnect** - Provides single point power connection to the unit.
6. **Amplifier** - Controls the modulating valve based on input from the temperature selector and the discharge air sensor.
7. **Ignition Controller** - Controls the ignition of the furnace. Maintains safe operation of the furnace.
8. **Time Delay** - Temporarily runs the combustion blower after the furnace has shut down (post-purge).
9. **Terminal Strip** - Provides easy, number coded wiring of the control.
10. **Main Transformer** - Provides 24 VAC for controls.
11. **Temperature Selector** - Allows the user to adjust the discharge air temperature.
12. **Airflow Switch** - Monitors the airflow inside the heat exchanger.
13. **Dirty Filter Switch** - Switch trips when filters are dirty and pressure loss is higher than set point.
14. **Inlet Air Sensor (not shown)** - Shuts down furnace when the outside air is above the set point.
15. **Grounding Lugs (not shown)** - Completes electrical circuit.





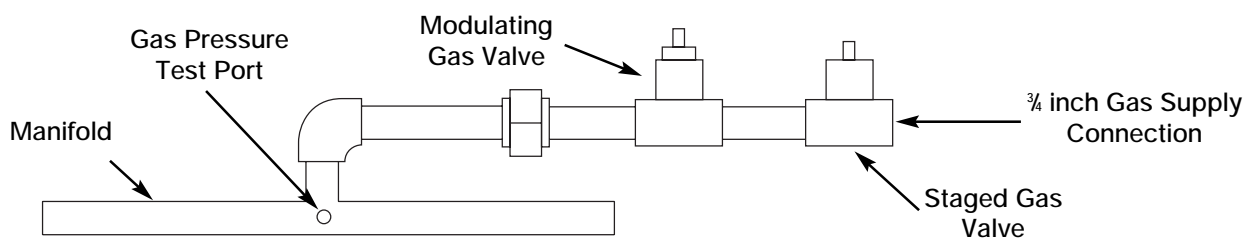
## Reference - Model IG (4:1 Modulating)



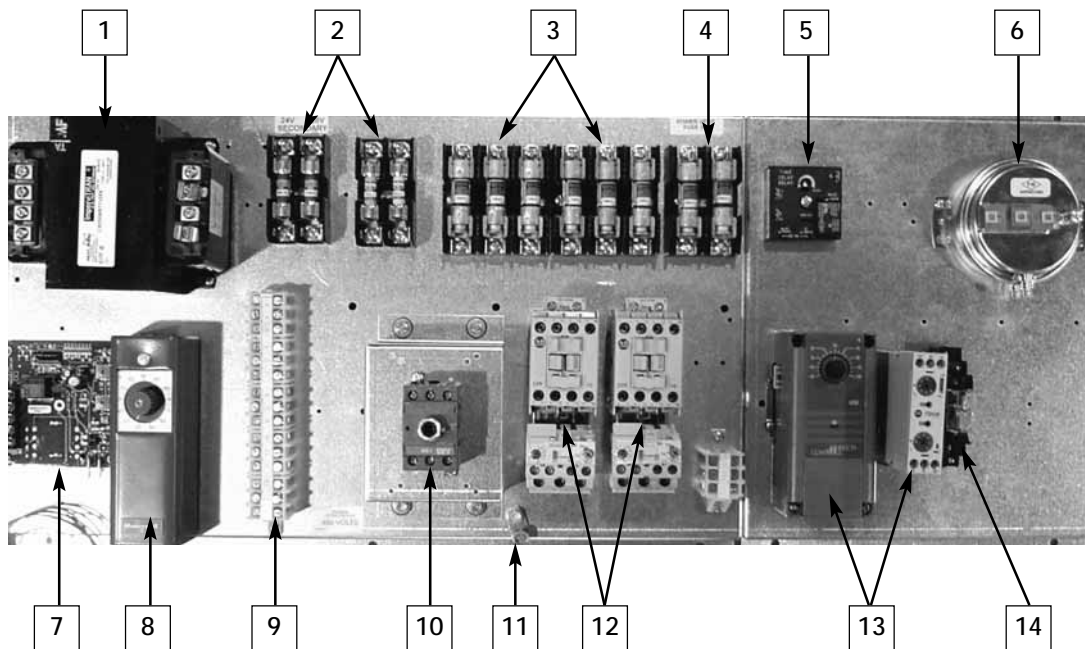
### NOTE!

This is a typical blower control center, the control center in your unit may be different. Reference the ladder diagram on the inside of the control center door for a unit specific wiring diagram.

1. **Building Freeze Protection** - Prevents the discharge of cold air into the building.
2. **Input Converter** - Receives and converts signal from building management system.
3. **Evaporative Cooling Controls (Optional)** - Controls the evaporative cooler.
4. **Fusing** - Provides 24 VAC fusing for controls and fusing for the combustion blower.
5. **Main Disconnect** - Provides single point power connection to the unit.
6. **Modulation Controller** - Provides 4:1 modulating turndown control of the furnace.
7. **Relays** - Call for heat and pressure switch relays.
8. **Motor Starter(s)** - Magnetic contact(s) for starting motor(s). Comes standard with electronic overload, auxiliary contact(s) optional.
9. **Ignition Controller** - Controls the ignition of the furnace. Maintains safe operation of the furnace.
10. **Terminal Strip** - Provides easy, number coded wiring of the control.
11. **Main Transformer** - Provides 24 VAC for controls.
12. **Dirty Filter Switch** - Switch trips when filters are dirty and pressure loss is higher than set point.
13. **Amplifier** - Controls the modulating valve based on input from the temperature selector and the discharge air sensor.
14. **Airflow Switches** - Monitors the airflow inside the heat exchanger.
15. **Grounding Lugs (not shown)** - Completes electrical circuit.



## Reference - Model IGX (Blower Control Center)

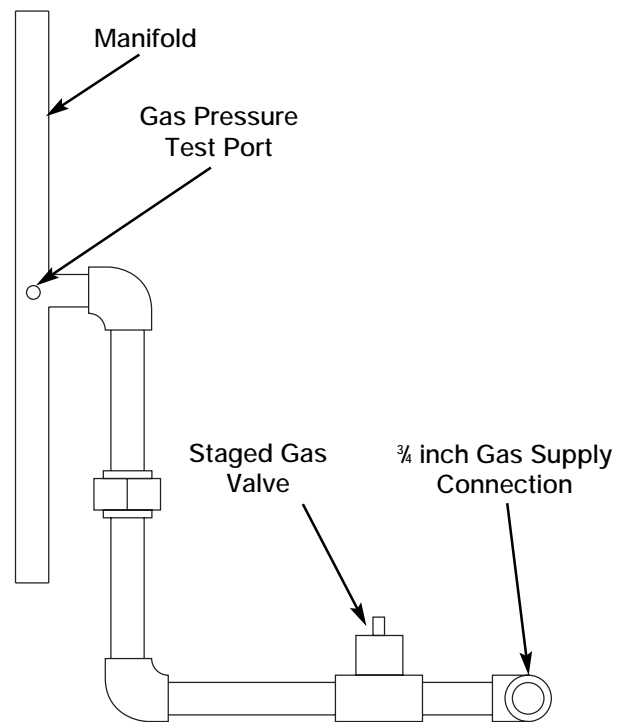
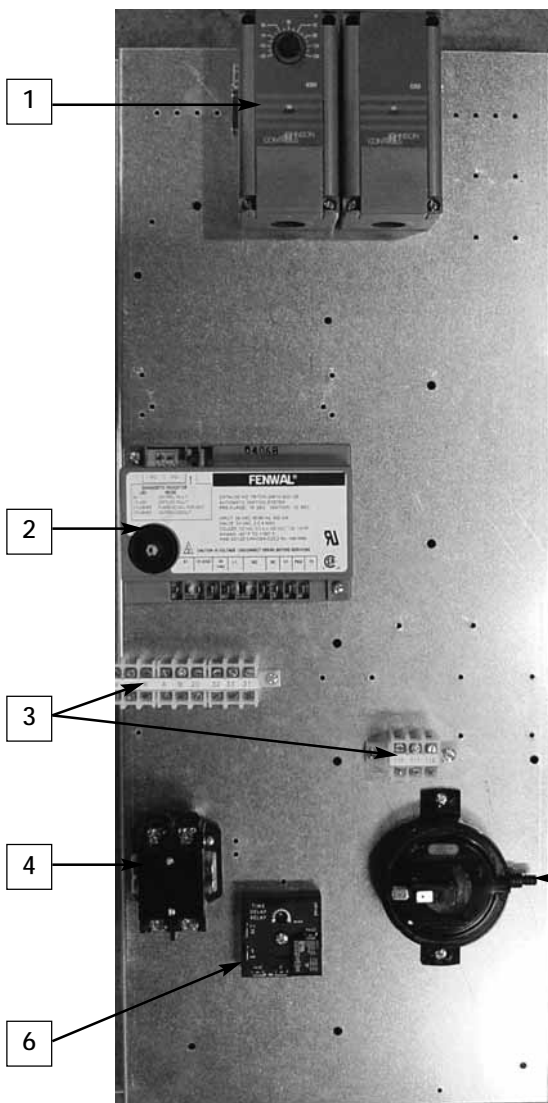


### NOTE!

This is a typical blower control center, the control center in your unit may be different. Reference the ladder diagram on the inside of the control center door for a unit specific wiring diagram.

1. **Main Transformer** - Provides 24 VAC for controls.
2. **Control Fusing** - Provides 24 VAC fusing for controls.
3. **Blower Fusing** - Provides fusing for supply and optional exhaust blower(s).
4. **Combustion Blower Fusing** - Provides fusing for combustion blower(s).
5. **Solid Fuel Time Delay** - Temporarily runs blower(s) after the unit has been manually shutdown.
6. **Dirty Filter Switch** - Switch trips when filters are dirty and pressure loss is higher than set point.
7. **Building Freeze Protection** - Shuts down blower when discharge air temperature drops below set point and remains below set point for longer than the time delay. Prevents the discharge of cold air into the building.
8. **Inlet Air Sensor** - Shuts down furnace when the outside air is above the set point.
9. **Terminal Strip** - Provides easy, number coded wiring of the control.
10. **Main Disconnect** - Provides single point power connection to the unit.
11. **Grounding Lugs** - Completes electrical circuit.
12. **Motor Starter(s)** - Magnetic contact(s) for starting motor(s). Comes standard with electronic overload, auxiliary contact(s) optional.
13. **Evaporative Cooling Controls (Optional)** - Controls the evaporative cooler.
14. **Heat/Cool Relay** - Passes power to the furnace or cooling controls.

## Reference - Model IGX (Single or 2 Stage)

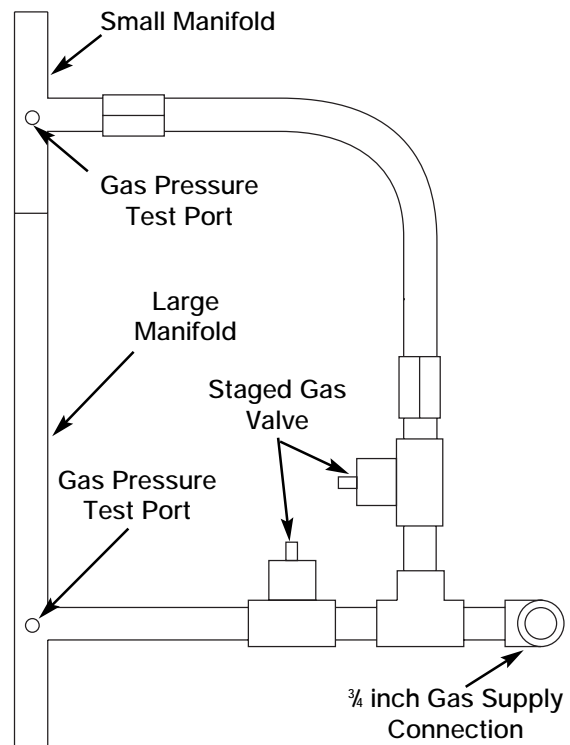
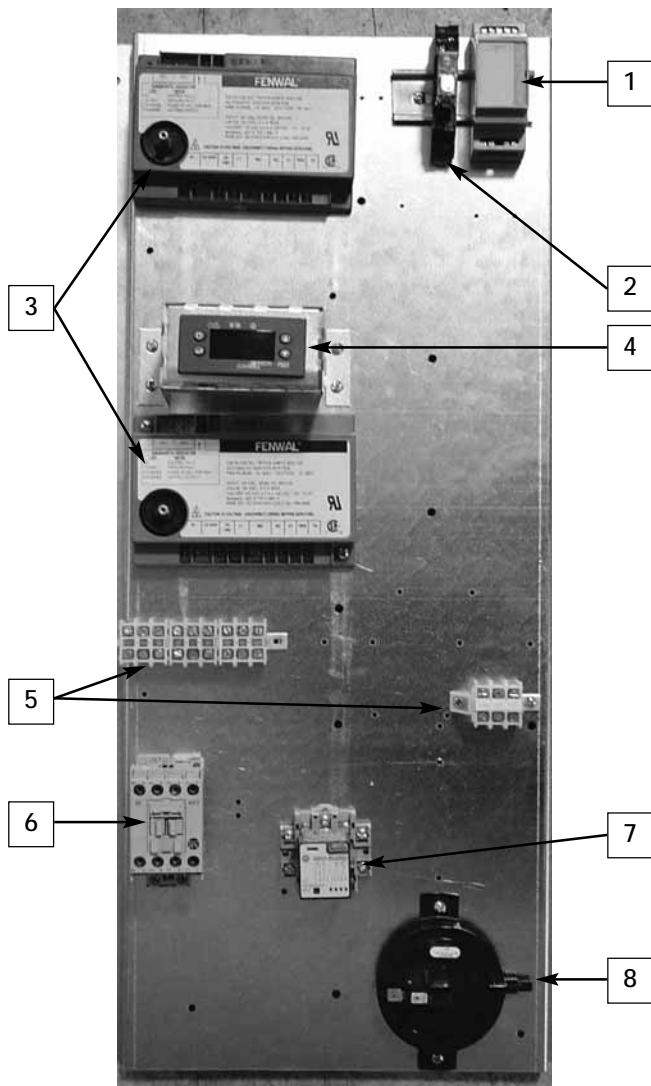


### NOTE!

This is a typical furnace control center, the control center in your unit may be different. Reference the ladder diagram on the inside of the control center door for a unit specific wiring diagram.

1. **Stage Control** - Provides single or 2-stage control of the furnace.
2. **Ignition Controller** - Controls the ignition of the furnace. Maintains safe operation of the furnace.
3. **Terminal Strip** - Provides easy, number coded wiring of the control.
4. **Combustion Blower Contact** - Passes power to the combustion blower.
5. **Airflow Switch** - Monitors the airflow inside the heat exchanger.
6. **Time Delay** - Temporarily runs the combustion blower after the furnace has shut down (post-purge).

## Reference - Model IGX (8:1 Staged)



### NOTE!

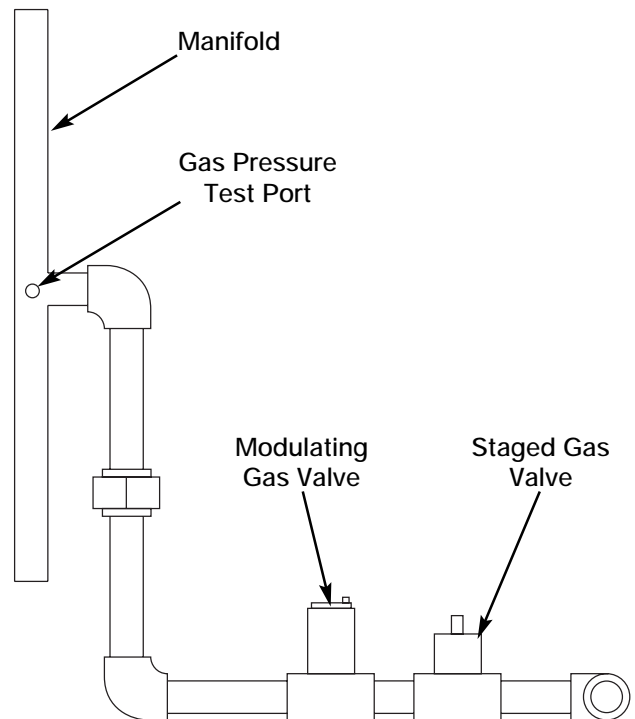
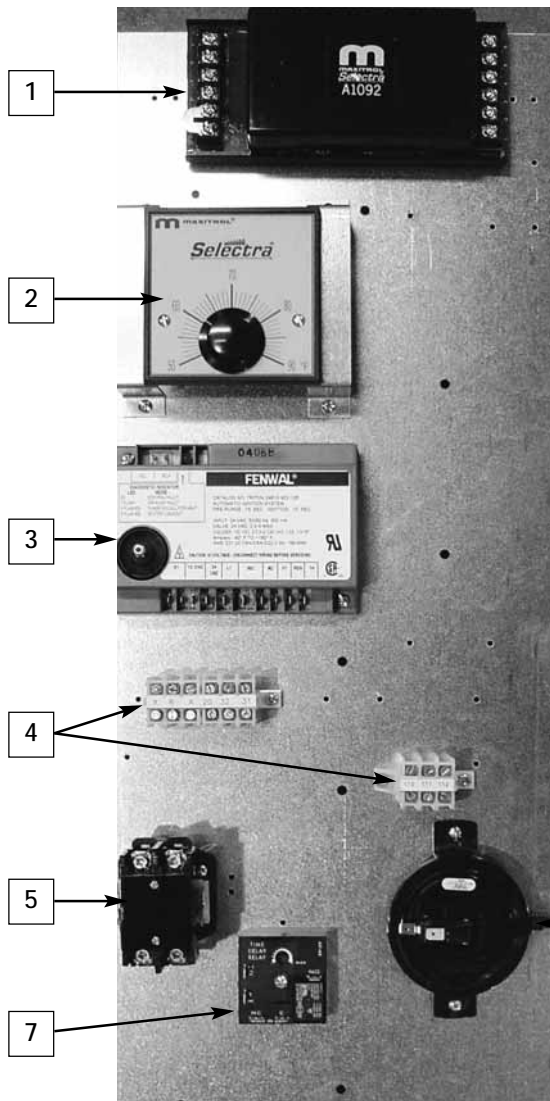
This is a typical furnace control center, the control center in your unit may be different. Reference the ladder diagram on the inside of the control center door for a unit specific wiring diagram.

Reference

1. **Input Converter** - Receives and converts signal from a building management system.
2. **Call for Heat Relay** - Passes power to furnace controls when there is a call for heat.
3. **Ignition Controllers** - Controls the ignition of the furnace. Maintains safe operation of the furnace.
4. **Stage Controller** - Provides 8-stage control of the furnace.
5. **Terminal Strip** - Provides easy, number coded wiring of the control.
6. **Combustion Blower Contact** - Passes power to the combustion blower.
7. **Pressure Switch Relay** - Functions as a relay for the pressure switch.
8. **Airflow Switch** - Monitors the airflow inside the heat exchanger.



## Reference - Model IGX (2:1 Modulation)

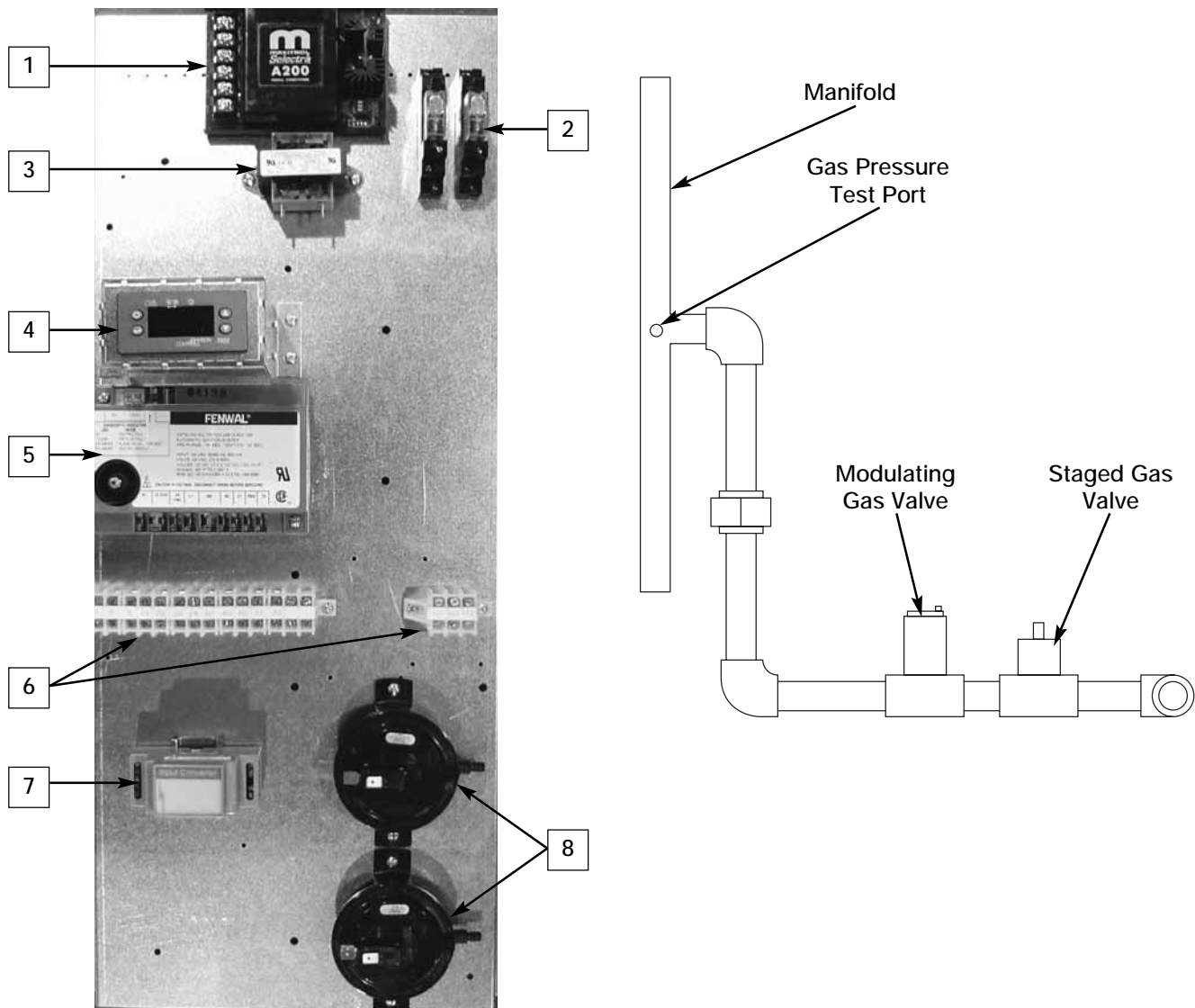


### NOTE!

This is a typical furnace control center, the control center in your unit may be different. Reference the ladder diagram on the inside of the control center door for a unit specific wiring diagram.

1. **Amplifier** - Controls the modulating valve based on input from the temperature selector and the discharge air sensor.
2. **Temperature Selector** - Allows the user to adjust the discharge air temperature.
3. **Ignition Controllers** - Controls the ignition of the furnace. Maintains safe operation of the furnace.
4. **Terminal Strip** - Provides easy, number coded wiring of the control.
5. **Combustion Blower Contact** - Passes power to the combustion blower.
6. **Airflow Switch** - Monitors the airflow inside the heat exchanger.
7. **Time Delay** - Temporarily runs the combustion blower after the furnace has shut down (post-purge).

## Reference - Model IGX (4:1 Modulation)



### NOTE!

This is a typical furnace control center, the control center in your unit may be different. Reference the ladder diagram on the inside of the control center door for a unit specific wiring diagram.

Reference

1. **Amplifier** - Controls the modulating valve based on input from the temperature selector and the discharge air sensor.
2. **Combustion Blower Relays** - Pass power to the variable speed combustion blower.
3. **Transformer** - Provides 24V power to the amplifier.
4. **Modulation Controller** - Provides 4:1 modulation control of the furnace.
5. **Ignition Controller** - Controls the ignition of the furnace. Maintains safe operation of the furnace.
6. **Terminal Strip** - Provides easy, number coded wiring of the control.
7. **Input Converter** - Receives and converts signal from a building management system.
8. **Airflow Switch** - Monitors the airflow inside the heat exchanger.

# Reference - Performance Table

## Performance Table

The following table gives the air volume in cubic feet per minute that is required to provide the desired temperature rise for a given heating input. Model IG has a maximum 7,000 CFM capacity.

Input (MBH)	Output (MBH)	Temperature Rise (°F)															
		25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
100	80	2963	2469	2116	1852	1646	1481	1347	1235	1140	1058	988	926	871	823	780	741
150	120	4444	3704	3175	2778	2469	2222	2020	1852	1709	1587	1481	1389	1307	1235	1170	1111
200	160	5926	4938	4233	3704	3292	2963	2694	2469	2279	2116	1975	1852	1743	1646	1559	1481
250	200	7407	6173	5291	4630	4115	3704	3367	3086	2849	2646	2469	2315	2179	2058	1949	1852
300	240	8889	7407	6349	5556	4938	4444	4040	3704	3419	3175	2963	2778	2614	2469	2339	2222
350	280	10370	8642	7407	6481	5761	5185	4714	4321	3989	3704	3457	3241	3050	2881	2729	2593
400	320	11852	9877	8466	7407	6584	5926	5387	4938	4558	4233	3951	3704	3486	3292	3119	2963
500	400	14815	12346	10582	9259	8230	7407	6734	6173	5698	5291	4938	4630	4357	4115	3899	3704
600	480	N/A	14815	12698	11111	9877	8889	8081	7407	6838	6349	5926	5556	5229	4938	4678	4444
700	560	N/A	N/A	14815	12963	11523	10370	9428	8642	7977	7407	6914	6481	6100	5761	5458	5185
800	640	N/A	N/A	N/A	14815	13169	11852	10774	9877	9117	8466	7901	7407	6972	6584	6238	5926
1,050	840	N/A	N/A	N/A	N/A	N/A	N/A	14141	12963	11966	11111	10370	9722	9150	8642	8187	7778
1,200	960	N/A	N/A	N/A	N/A	N/A	N/A	N/A	14815	13675	12698	11852	11111	10458	9877	9357	8889

*This manual is the property of the owner and is required for future maintenance.  
Please leave it with the owner when you complete the job.*

### **Warranty**

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of one year from the purchase date. Any units or parts which prove defective during the warranty period will be replaced at our option when returned to our factory, transportation prepaid.

Motors are warranted by the motor manufacturer for a period of one year. Should motors furnished by Greenheck prove defective during this period, they should be returned to the nearest authorized motor service station. Greenheck will not be responsible for any removal or installation costs.

As a result of our commitment to continuous improvement,  
Greenheck reserves the right to change specifications without notice.



IG/IGX IOM FS  
Rev 2 May 2005  
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