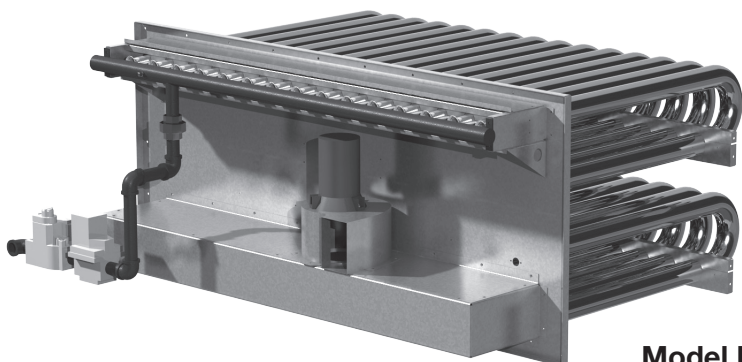


Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with these instructions will result in voiding of the product warranty and may result in personal injury and/or property damage.



Model PVG

Technical Support

Call: 1-800-343-3435

Email: appliedservice@greenheck.com

Recognized Component



General Safety Information

These indirect gas-fired furnaces are commonly used in many different manufacturer's ventilating products. For unit-specific information, refer to the Installation, Operation and Maintenance manual (IOM) for the unit in which this furnace is installed.

- Both the furnace units are listed for installation in the United States and in Canada.
- Installation of gas-fired duct furnaces must conform with local building codes. In the absence of local building 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 regulations of the National Electric Code, ANSI/NFPA-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.

WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow safety warnings exactly could result in serious injury, death or property damage.

Be sure to read and understand the installation, operation and service instructions in this manual.

Improper installation, adjustment alteration, service or maintenance can cause serious injury, death or property damages.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- WHAT TO DO IF YOU SMELL GAS
 - Do not try to light any appliance.
 - Do not touch any electrical switch; do not use any phone in your building.
 - Leave the building immediately.
 - Immediately call your gas supplier from a phone remote from the building. Follow the gas supplier's instructions.
 - If you cannot reach your gas supplier, call the fire department.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.

NOTE

Model PVG is an indirect gas-fired heat module that will be referred to in this manual as a furnace.

Receiving

Upon receiving the product, check to ensure all items are accounted for by referencing the delivery receipt or packing list. Inspect each crate or carton for shipping damage before accepting delivery. Alert the carrier of any damage detected. The customer will make notation of damage (or shortage of items) on the delivery receipt and all copies of the bill of lading which is countersigned by the delivering carrier. If damaged, immediately contact your manufacturer's representative. Any physical damage to the unit after acceptance is not the responsibility of the manufacturer.

Unpacking

If unit is to be installed, tested and operated right away, locate and remove all packing materials from the furnace, including any protective coverings that may be on the combustion air intake and on the furnace exhaust. Follow *Unpacking Instructions* as found in the unit-specific IOM.

Storage

If unit must be stored after it is received, take steps to protect furnace from damage, moisture, and extreme temperatures. Verify that gas piping is plugged.

Unit Identification

It is necessary to know the unit model number, the burner control turndown and the serial number. This information is needed when ordering replacement parts and is available on labels located on the unit.

Furnace Model Number

On the furnace access door or immediately next to the door is a Mylar data label. See images below. Locate the furnace model number at the top of the label and record it here:

Furnace Model Number: _____

MODEL NUMBER/NUMERO DO MODELE		PVG300
MIN. INPUT BTU/HR DEBIT CALORIFIQUE MIN BTU/HEURE		75000
MANIFOLD PRESSURE PRESSION A LA TUBULURE D'ALIMENTATION		3.5 IN.W.C. 0.87 KPA
MIN. GAS SUPPLY PRESS. FOR SAFE OPERATION PRESSION MINIMALE DE GAZ POUR UTILISATION SANS DANGER		3.5 IN.W.C. 0.87 KPA
MIN. GAS SUPPLY PRESS. FOR DESIGN OUTPUT PRESSION MINIMALE DE GAZ POUR LA CONCEPTION		6 IN.W.C. 1.49
AIR THROUGHPUT DEBIT D'AIR		0-2000 FT. 0 ET. 610 M.
2,250 MIN. CFM	11,250 MAX. CFM	(IN CANADA) 2000-4500 FT. 610 ET. 1370 M.
INPUT BTU/HR DEBIT CALORIFIQUE BTU/HEURE		300000
OUTPUT BTU/HR RENDEMENT BTU/HEURE		243000
ORIFICE SIZE DIM. DE L'INJECTEUR		42
		43

RECOGNIZED COMPONENT		CONFORMS TO ANSI STD Z83.8 CERTIFIED TO CSA STD 2.6 GAS-FIRED HEAT MODULE/FOR INDUSTRIAL/COMMERCIAL USE MODULE DE LA CHALEUR MIS LE FUE PAR GAZ/POUR USAGE INDUSTRIEL/COMMERCIAL	
115/208-230/460		60	1 1.3/0.7/0.35/0.28
VOLTS		HERTZ	PHASE
TYPE OF GAS/TYPO DE GAZ		Natural	
TEMPERATURE RISE RANGE		20-100°F	
ELEVATION DE TEMPERATURE		-6-37°C	
MAX. EXTERNAL STATIC PRESSURE		3 IN.W.C.	
PRESSION STATIQUE EXTERIEUR MAX.		0.75 KPA	
MAX. GAS PRESSURE		14 IN.W.C.	
PRESSION DE GAZ MAX.		3.5 KPA	
COMBUSTION EFFICIENCY		81%	
RENDEMENT DE COMBUSTION			

Typical Furnace Data Labels
each unit will be different

Burner Control Turndown

Burner turndown ratio is used in many places and must be calculated. On the data label, locate the INPUT BTU/HR (the largest number on the label) and also the MINIMUM INPUT BTU/HR. Calculate the burner turndown ratio and record it.

$$\frac{\text{INPUT BTU/HR}}{\text{MINIMUM BTU/HR}} = \text{Burner Control Turndown Ratio}$$

$$\text{Example: } \frac{150,000}{75,000} = 2$$

The turndown ratio is 2:1 in this example.

Burner Turndown: _____

Furnace Serial Number

On the furnace access door is a plate identifying the unit serial number. Record that information here.

Furnace/Unit Serial Number: _____

ETL Listing

Model PVG furnaces have been ETL tested as gas-fired heat modules intended for installation as a component within heating equipment in duct or cabinet mounted applications. **They are ETL Recognized Components.**

Product Overview

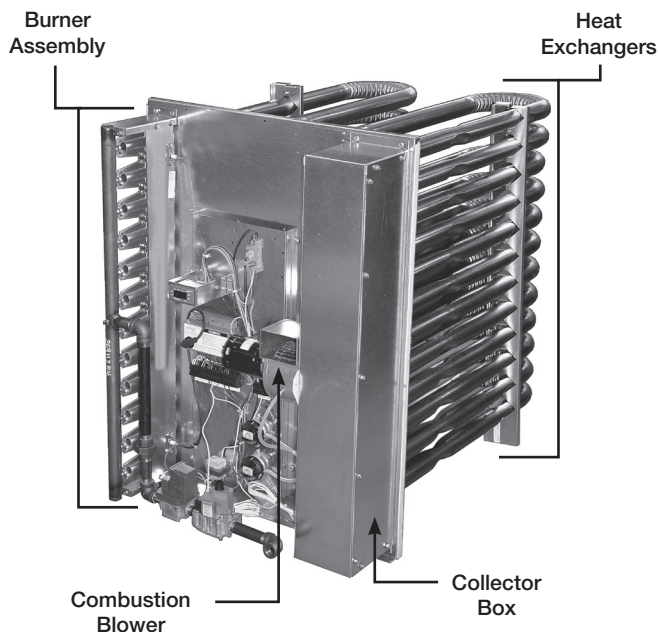


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Furnace Control Center

Each ventilating unit containing one or more furnaces will have a furnace control center located on the furnace vest plate. The control center receives high voltage AC from the main unit control center and in most cases, also receives low voltage control signals (call for heat) from the main unit control center. In all cases, see the unit-specific wiring schematic located inside the furnace door.

Furnace Control Center Components

(Components and their locations will vary.)

Components shown are for a typical 10:1 turndown electronic modulation configuration.

High Voltage Side

1. Inducer Relay (controls combustion fan)
2. Combustion Blower
3. Power Transformer

Low Voltage Side

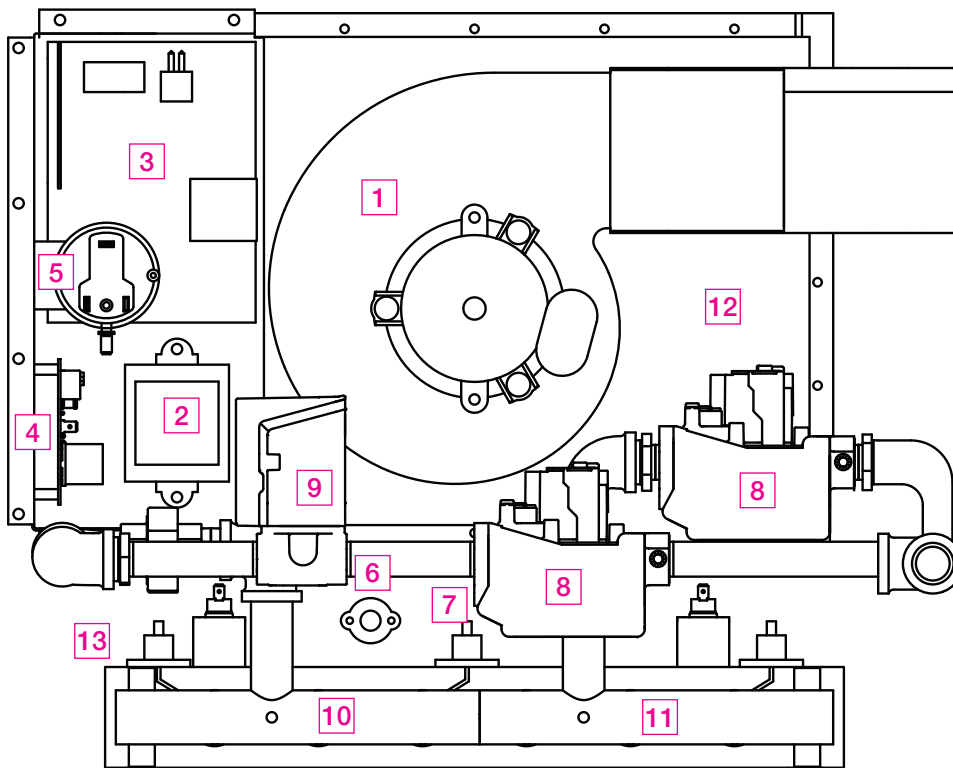
4. Ignition Controller (also has high voltage present)
5. Furnace Controller (modulates heat and switches entire furnace on/off)

Control Sensors

6. High Temperature Sensor (auto reset)
7. Airflow Switches
8. Flame Sensor

Gas Train

9. Combination Valve
10. Modulating Valve
11. Burner Manifold
12. Collector Box
13. Spark Rod

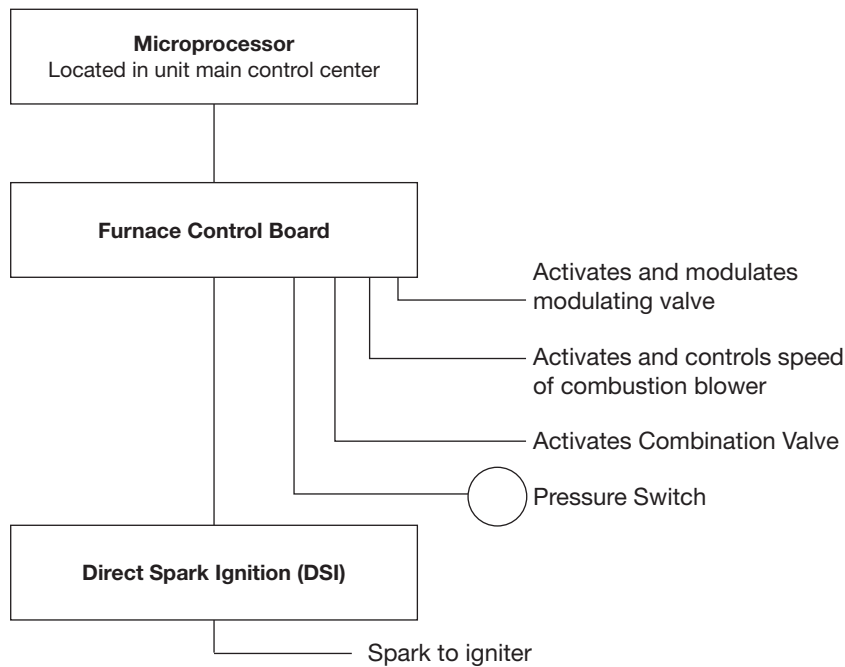


Typical Furnace Control Logic

In all cases, refer to the unit-specific wiring diagram located on the unit control center door.

This illustration is only for a typical 10:1 turndown electronic modulation configuration.

Typical Furnace Control Logic



1. Microprocessor senses low temperature from temperature sensor, then sends an enable signal and heating demand to the furnace control board over Modbus.
2. Furnace control board enables the combustion blower and verifies it is running. The furnace control board then activates the combination valve and sends a signal to the direct spark ignition (DSI) board, which sends spark to the igniter.
3. Flame sensor detects flame and the trial for ignition ends.

Typical Furnace, Electrical and Control Components

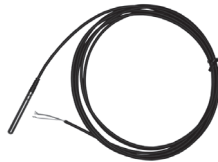
Microprocessor

The microprocessor provides the call for heat to the ignition controller and also monitors the discharge air temperature. It is found in the unit's main control center. On units with electronic modulation, it also determines the required burner firing rate.



Discharge Air Temp Sensor

This sensor is shipped with all units and must be field-installed in the discharge air duct. This may be shipped in the main unit control center or in the furnace control center, depending on the control type.



Furnace Control Board

Used in all 10:1 electronic modulating controls. The furnace control board provides power to the gas valves and electronically adjusts the modulating valve. It controls the speed of the combustion fan and monitors a pressure switch and pressure transducer to verify the combustion fan operation. The furnace control board sends a signal to the direct spark ignition (DSI) and monitors for flame using the flame sensors. The furnace control board also monitors the high temperature limit switch and flame rollout switches shutting down the furnace in the event of an alarm.

Direct Spark Ignition (DSI)

The direct spark ignition (DSI) board receives a signal from the furnace control board and sends spark to the igniter.

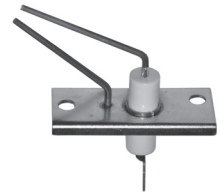
Airflow Switch

The airflow switch is used to verify combustion fan operation. The airflow switch is connected to the combustion blower by means of a vacuum tube. The internal switch is Normally Open (NO). The furnace monitors the pressure switch and confirms that it closes and opens at the appropriate pressure read by the transducer on the furnace control board. Failure of the switch to close, open or for the readings to align will cause the furnace control board to disable the furnace.



Flame Igniter

The igniter receives a high voltage input from the Direct Spark Ignition (DSI) to produce a spark between the two electrodes. It operates only during the ignition phase.



Flame Sensor

The flame sensor is identical to the flame igniter. It is located on the opposite end of the burner manifold from the igniter. On split burner manifolds, there will be two flame sensors.

Auto Reset High Temperature Limit Switch

This limit switch is installed through the vest plate into the supply air plenum.



Burner Manifold



Single Section
Burner Manifold



Split Burner
Manifold

Manual Reset Flame Rollout Switch

The flame rollout switches are located on the top of the burner assembly. In the event flames rollout of the flame rollout switches sense for high temperature and signal the furnace control board to disable the furnace. There may be a single or multiple flame rollout switches depending on the furnace size.

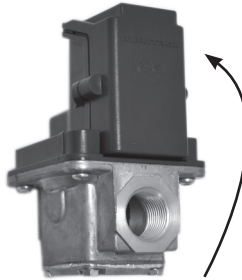
Gas-Fired Burner Turndown

Furnaces are available in electronically modulated configurations. Electronically modulated furnaces have continuously variable firing rates. Turndown is the capability of the furnace to operate at less than full capacity, accomplished by reducing the amount of gas flow when the unit is operating. The advantage of turndown is that at partial-load conditions, the furnace will not cycle as often. Turndown is expressed as a ratio and is found by dividing the maximum BTU input by the minimum BTU input.

Electronic Modulation

An electronically-controlled gas valve will modulate the combustion rate continuously dependent on the output from the furnace controller. This varies capacity output of each of the burners. The modulating valve is used in conjunction with a furnace control board and a combination valve which provides ON/OFF function.

The electronically-controlled gas valve provides 5:1 turndown for one half of the burner manifold. When less heat is needed, the other half of the manifold is turned off while the half with the modulating valve continues to modulate. This provides 10:1 turndown or greater. This allows the furnace to operate as low as 10% of its maximum capacity.



Low Fire and High Fire adjustments are made on printed circuit board behind removable cover

Installation of Venting for Outdoor Units

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 Canadian 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 48 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.

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 terminator on the exhaust pipe.

Exhaust transition and vent termination must be purchased from the factory for proper operation. Exhaust pipe is by others.

Installation of Control Wiring

Disconnect power supply before making any wiring connections to prevent electrical shock and equipment damage.

All appliances must be wired strictly in accordance with the wiring diagram furnished with the unit. Any wiring different from the diagram could result in a hazard to persons and property.

Any original factory wiring that requires replacement must be replaced with wiring material having a temperature rating of at least 105° C.

1. Installation of wiring must conform with local building codes. In the absence of local building codes, installation must conform to the National Electrical Code and ANSI/NFPA 70 - Latest Edition. Unit must be electrically grounded in conformance with this code. In Canada, wiring must comply with CSA C22.1, Canadian Electrical Code.
2. All furnaces are provided with a wiring diagram located on the inside of the access panel or door to the unit's furnace. Refer to this diagram for all wiring connections.

Installation of Discharge Air Sensor

Every furnace has a Discharge Air Sensor included. It is typically attached to the terminal strip on the furnace control center. If the ventilating unit has a microprocessor controller, the discharge air sensor will be connected to the microprocessor controller. See the unit-specific wiring diagram. Install sensor in the supply air duct, as far downstream as possible for accurate temperature measurement. Additional wire may be added to the sensor as necessary.

Installation of 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.

WARNING

All components of this or any other gas fired heating unit must be leak-tested prior to placing the unit into operation. A soap and water solution should be used to perform this test. NEVER test for gas leaks with an open flame.

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. wg (3.5 kPa), first close the field-installed shutoff valve to isolate the unit from the gas supply line.

WARNING

When leak testing pressures above 14 in. wg (3.5 kPa), close the field-installed shutoff valve, disconnect the furnace and its 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

Each furnace has a single 3/4-inch connection.

Determine the Gas Supply Requirements

The data label located on the face of the furnace lists the requirements for the gas being supplied to the unit.

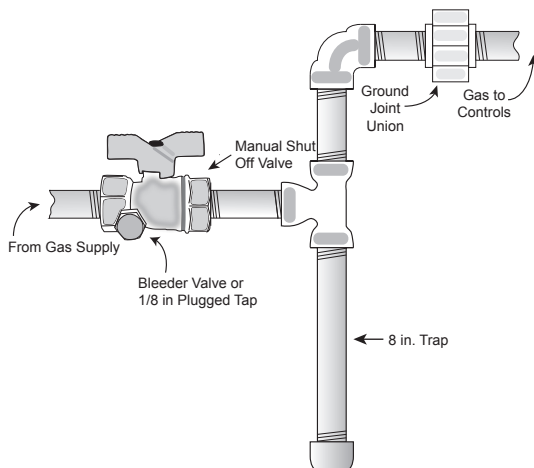
MODEL NUMBER/NUMERO DU MODELE	PVG3300
MIN. INPUT BTU/HR DEBIT CALORIFIQUE MIN BTU/HEURE	75000
MANIFOLD PRESSURE PRESSION A LA TUBULURE D'ALIMENTATION	3.5 IN.W.C. 0.87 KPA
MIN. GAS SUPPLY PRESS. FOR SAFE OPERATION PRESSION MINIMALE DE GAZ POUR UTILISATION SANS DANGER	3.5 IN.W.C. 0.87 KPA
MIN. GAS SUPPLY PRESS. FOR DESIGN OUTPUT PRESSION MINIMALE DE GAZ POUR LA CONCEPTION	6 IN.W.C. 1.49
AIR THROUGHPUT DEBIT D'AIR	0-2000 FT. 0 ET. 610 M.
2,250 MIN. CFM 11,250 MAX. CFM	(IN CANADA) 2000-4500 FT. 610 ET. 1370 M.
INPUT BTU/HR DEBIT CALORIFIQUE BTU/HEURE	300000 270000
OUTPUT BTU/HR RENDEMENT BTU/HEURE	243000 218700
ORIFICE SIZE DIM. DE L'INJECTEUR	42 43

RECOGNIZED COMPONENT	CONFORMS TO ANSI STD Z83.8 CERTIFIED TO CSA STD 2.6 GAS-FIRED HEAT MODULE/FOR INDUSTRIAL/COMMERCIAL USE MODULE DE LA CHALEUR MIS LE FUE PAR GAZ/POUR USAGE INDUSTRIEL/COMMERCIAL
115/208-230/460 60 1 1.3/0.7/0.35/0.28	
VOLTS HERTZ PHASE AMPS	
TYPE OF GAS/TYPE OF GAZ	Natural
TEMPERATURE RISE RANGE	20-100°F
ELEVATION DE TEMPERATURE	-6-37°C
MAX. EXTERNAL STATIC PRESSURE PRESSION STATIQUE EXTREMEUR MAX.	3 IN.W.C. 0.75 KPA
MAX. GAS PRESSURE PRESSION DE GAZ MAX.	14 IN.W.C. 3.5 KPA
COMBUSTION EFFICIENCY RENDEMENT DE COMBUSTION	81%

Typical Furnace Data Labels
each unit will be different

Connect the Supply Gas Line

A manual shut off valve, a 1/8 inch plugged test port and a drip leg must be installed between the gas supply pipe and the start of the gas train. The valve and 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 manufacturer.



Typical Gas Supply Piping Connection

IMPORTANT

Before applying gas to the valves, test the gas pressure to make sure it is less than 14 in. wg. Pressures greater than 14 in. wg will damage the gas valves.

Install Additional Regulator (if required)

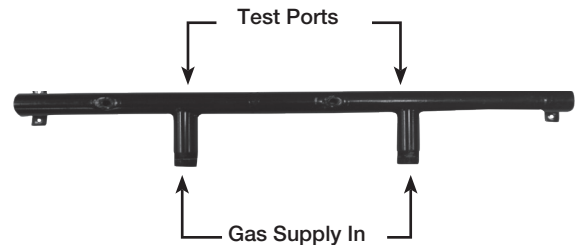
If the gas supply pressure exceeds 14 in. wg, an additional regulator must be installed to reduce the pressure. The additional regulator is to be provided and installed by others. The regulator must have a Listed leak limiting device or it must be vented to the outdoors.

Test the System for Leaks

After installing the gas supply piping, perform a leak test in accordance with the instructions in this manual. The leak test must be performed before placing the unit in service.

Gas Pressure Test Ports

Burner manifolds and gas valves used in the furnaces are supplied with test ports for temporary connection of a pressure gauge or a magnehelic gauge.



Typical Split Burner Manifold

Sequence of Operation

Start-Up / Standby

Prior to start-up, verify that all field-installed sensors have been installed. This includes a room temperature sensor (optional) and a discharge air temperature sensor (standard).

Heat Mode

When the unit or furnace controller calls for heat:

1. The furnace control board speeds up and slows down the combustion fan to verify pressure sensor operation. This will time out after 90 seconds maximum.
2. The combustion blower will energize and the 30 second pre-purge begins.
3. The gas valve is energized and the igniter will spark for up to 6 seconds. If a flame is not sensed during the trial for ignition, two additional tries will be attempted before going into lockout for one hour.
4. When a flame is sensed, sparking stops immediately. The gas valve and combustion blower remain energized.
5. Ignition

10:1 Electronic Modulation - The modulating section of the manifold will light at 100% and remain there for the warm up period. After warm up the furnace control board will enter run mode and modulate to the output signal from the microprocessor controller. If more than 57% heat output is signaled the second manifold section will ignite at 100%.

6. The ignition control constantly monitors the call for heat, the pressure switch and the burner flame to assure proper operation.
7. When the unit or furnace controls are satisfied, the main gas valve is then de-energized and the combustion blower shuts off following a 30 second post-purge period.

Recovery from Lockout

If the furnace goes into lockout, the ignition control will automatically reset after one hour if the thermostat is still calling for heat. If needed, a manual reset can be accomplished by cycling power.

Performance Data

		Supply Air Temperature Rise								
		20°F	30°F	40°F	50°F	60°F	70°F	80°F	90°F	100°F
Model	Input (BTU/hr)	CFM								
50	50,000	1875	1250	938	750	625	536	469	417	375
75	75,000	2813	1875	1406	1125	938	804	703	625	563
100	100,000	3750	2500	1875	1500	1250	1071	938	833	750
125	125,000	4688	3125	2344	1875	1563	1339	1172	1042	938
150	150,000	5625	3750	2813	2250	1875	1607	1406	1250	1125
175	175,000	6563	4375	3281	2625	2188	1875	1641	1458	1313
200	200,000	7500	5000	3750	3000	2500	2143	1875	1667	1500
225	225,000	8438	5625	4219	3375	2813	2411	2109	1875	1688
250	250,000	9375	6250	4688	3750	3125	2679	2344	2083	1875
275	275,000	10131	6875	5156	4125	3438	2946	2578	2292	2063
300	300,000	11250	7500	5625	4500	3750	3214	2831	2500	2250
325	325,000	12188	8125	6094	4875	4063	3482	3047	2708	2438
350	350,000	13125	8750	6365	5250	4375	3750	3281	2917	2625
400	400,000	15000	10000	7500	6000	5000	4286	3750	3333	3000
500	500,000	18750	12500	9375	7500	6250	5358	4688	4166	3750
600	600,000	22500	15000	11250	9000	7500	6429	5625	5000	4500

Start-Up - Furnaces (all units)

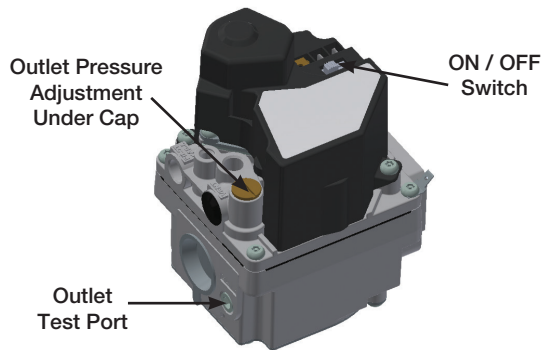
IMPORTANT

For the unit to function properly, ALL gas valves must have their high fire and low fire settings adjusted for field conditions.

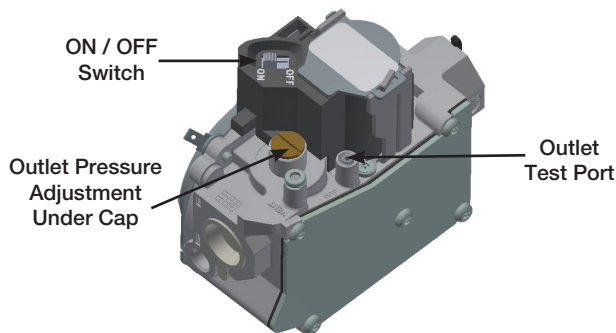
IMPORTANT

Confirm the discharge air sensor is installed at least three duct diameters downstream of the furnace.

After the gas piping has been installed and leak tested, verify that all field-installed components such as an air temperature sensor have been installed. Verify that ON/OFF gas control knob on each stage-type gas valve is turned to the "ON" position (see image).



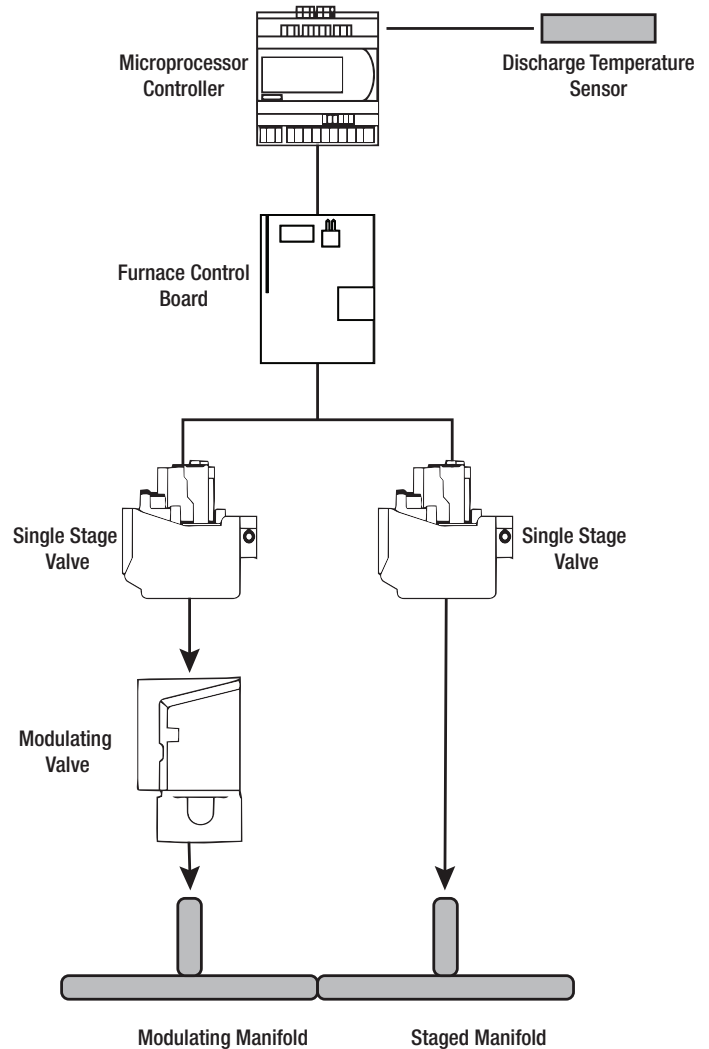
Typical Single Stage Gas Valve



Set Airflow

Airflow adjustment is done at the time of unit start-up. Refer to the unit-specific Installation, Operating and Maintenance manual (IOM) for instructions.

With 10:1 Turndown Electronic Modulation



Furnaces with electronically modulated 10:1 turndown use 2 combination valves for primary gas control. These valves control the high fire gas supply and act as on/off switching devices. The combination valve is normally closed. They require 24VAC to hold them open.

The modulating valve is located just after one of the combination valves. The modulating valve is the device that modulates or changes the gas volume that is being supplied to the modulating section of the furnace manifold. It has a built-in digital controller that will accept the user settings for High Fire and Low Fire. During normal use, the amount of combustion gas will vary constantly to regulate the heat output from the furnace. The modulation is controlled by the microprocessor through the furnace control board. The furnace control board sends 2-10 VDC analog signal to the modulating valve that causes the valve to send more or less gas to the furnace. The valve also requires 24 VAC power supply to operate.

When a call for heat is provided to the furnace control board, the board will first provide a 10 VDC signal to the modulating valve so that it will always start in a high fire condition. After the ignition and warm-up periods the furnace control board will change its output signal, causing the volume of combustion gas delivered to the modulating section of the manifold to be reduced to as little as 10% (10:1 turndown) of rated furnace capacity.

Both combination valves and the modulating valve valves require adjustment at the time of unit start-up.

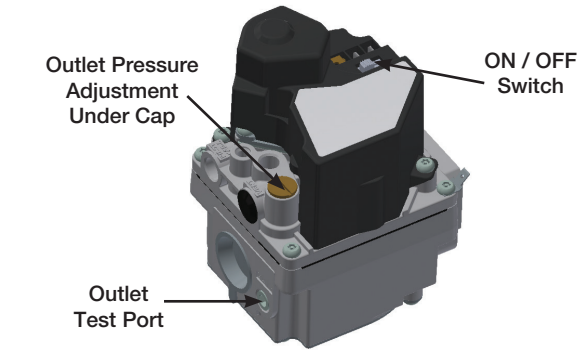
Before making furnace adjustments, enter the Commissioning Menu on the unit microprocessor controller. The Commissioning Menu is located Control Variables > Advanced > Manual Overrides. Reference the controller IOM for more information about navigating through the controller menus. The Commissioning Menu offers a step by step guide to setting up the furnace. Follow the instructions on the screen. The following sections of this IOM offer detailed information about setting the gas pressures.

Combination Valve Adjustments

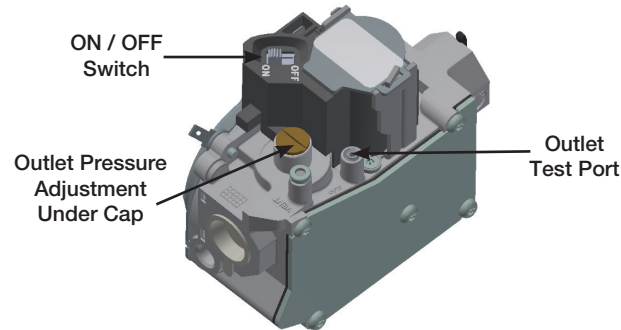
Conduct this step when the Commissioning Menu reaches the High Fire Setting screen.

Combination Valve Outlet Settings	
Natural Gas	5 in. wg
LP Gas	11.5 in. wg

Connect a manometer to the outlet pressure tap on the combination valve and remove the cover over the outlet pressure adjustment screw. Use the outlet pressure adjustment screw on the combination valve to adjust the outlet pressure to the value listed in the table.

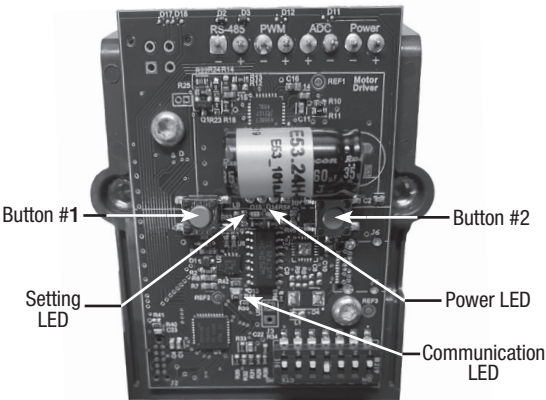


Typical Single Stage Gas Valve



Modulating Valve Adjustments

At start-up, remove the cover from the circuit board housing by loosening the two Phillips head retaining screws. Identify Button #1 and Button #2 and also locate the Setting LED indicator light.



EXA Modulating Gas Valve
(with cover removed)

Modulating Valve High Fire Setting

Conduct this step with the Commissioning Menu on the High Fire Setting screen.

1. Connect a manometer to the test port on the burner manifold.
2. Press and hold button #1 until the Setting LED lights solid green. Release the button. Observe the gas pressure on the manometer.
3. Adjust the modulating valve by pushing **button #1 to increase the pressure** or by pushing **button #2 to decrease the pressure**.
4. **Save the High Fire setting by simultaneously holding down buttons #1 and #2 until the Setting LED turns off.** If the new setting is not saved within five minutes, the modulating valve will default back to its last saved setting.

Modulating Valve High Fire Settings	
Natural Gas	3.5 in. wg
LP Gas	10.0 in. wg

NOTE

During the adjustment process, each push of either button will increase or decrease the pressure in steps. Holding down either button auto-steps and eliminates the need to repeatedly push the button. Use this feature to rapidly increase or decrease the gas flow.

Modulating Valve Low Fire Setting

Conduct this step when the Commissioning Menu reaches the Low Fire Setting screen.

1. With a manometer installed at the burner manifold test port, press and hold down button #2 until the Setting LED blinks green. Release the button. Observe the gas pressure on the manometer.
2. Adjust the Low Fire setting by pushing **button #1 to increase the pressure** or by pushing **button #2 to decrease the pressure**.
3. **Save the Low Fire setting by simultaneously holding down buttons #1 and #2 until the Setting LED turns off.** If the new setting is not saved within five minutes, the Modulating Valve will default back to its last saved setting.

Modulating Valve Low Fire Settings	
Natural Gas	0.2 in. wg
LP Gas	0.6 in. wg

Continue through the Commissioning Menu to verify proper furnace operation. If additional furnaces are present, the Commissioning Menu will step through setting up those furnaces as well. Reference the appropriate section in this IOM for detailed information about each furnace.

Reinstall the cover on the modulating valve, remove the manometer and reinstall the plug in the manifold test port.

Staged Manifold High Fire Setting

Conducts this step with the Commissioning Menu on the High Fire - Staged Manifold Screen.

Connect a manometer to the test port on the staged side of the burner manifold. Connect a manometer to the outlet pressure tap on the Honeywell combination valve and remove the cover over the outlet pressure adjustment screw. Use the outlet pressure adjustment screw on the combination valve to adjust the outlet pressure to the value listed in the table.

Staged Valve High Fire Settings	
Natural Gas	3.5 in. wg
LP Gas	10. in. wg

Troubleshooting - Furnace Control Board

Furnace Control Board

LED Display	Type	Description	Actions
888	Lockout (10s)	Board Failure (may occur briefly during power up)	None if brief If code persists replace board
OFF	Status	Furnace state = off	None
Pur	Status	Furnace state = Purge	None
I6n	Status	Furnace state = Ignition	None
HEA	Status	Furnace state = Warmup	None
run	Status	Furnace state = run	None
rEt	Status	Furnace state = Retry	None

Alert Codes

LED Display	Type	Description	Actions
A01	Alert	Failed ignition attempt <i>Modulating manifold failed to light and did not detect a flame. Furnace control board will retry.</i>	1. Check for flame during ignition period <i>*If flame is present but A01 persists, check flame sense wiring and sensor condition</i> <i>*Repair wiring and clean/replace sensor as needed</i> 2. Check for spark during ignition attempt <i>*If no spark present, check ignition board/igniter wiring and condition of igniter</i> <i>*Clean or replace igniter if damaged/corroded</i> 3. Check for gas flow/manifold pressure during ignition attempt <i>*Refer to start-up section for high fire gas pressures</i> <i>*If no gas present, check incoming gas pressure</i> <i>*If incoming gas pressure is OK, check valve wiring</i>
A02	Alert	Lost flame <i>Ignition of the modulating manifold was successful, flame was initially proven but flame signal was lost.</i>	1. Check manifold gas pressure during operation <i>*If no gas present, check valve wiring</i> <i>*Refer to start-up section for high and low fire gas pressures</i> 2. Check flame sensor wiring and condition <i>*If flame sensor is corroded/damaged, clean or replace</i> 3. Check flue gas leaks in vent ducting in and around burner compartment
A03	Alert	Insufficient combustion air-auto-derating <i>The furnace control board is running the combustion fan at full speed and is not about to reach the high-fire combustion air pressure setting. High fire will automatically be reduced to match the combustion airflow.</i>	1. Check flue vent for blockage 2. Check pressure tubing from combustion fan to air pressure switch and furnace control board for leaks or blockage 3. Confirm combustion fan wiring matches wiring diagram
A04	Alert	Limited low fire (due to lost flame auto adaptation) <i>If a lost flame occurred at low fire the furnace control board will increase minimum firing rate in attempt to avoid the lost flame. Increased minimum firing rate will stay in place until the call for heat is removed</i>	1. Cycle power to clear auto adoption 2. Check low fire gas pressure 3. if low fire gas pressure is correct and refer to steps in A02

Troubleshooting - Furnace Control Board

Alert Codes

LED Display	Type	Description	Actions
A05	Alert	Weak flame signal, modulating manifold <i>Flame signal on the modulating manifold sensor is 0.5 - 1.5 μA, minimum flame signal is 0.5 μA.</i>	1. Check flame sensor wiring and condition <i>*If flame sensor is corroded/damaged, clean or replace</i> 2. Check manifold gas pressure <i>*If no gas present, check valve wiring</i> <i>*Refer to start-up section for high and low fire gas pressures</i>
A07	Alert	Air modulation failure (combustion fan isn't modulating down) <i>The furnace control board is running the combustion fan at the minimum setting and the air pressure reading is still below target.</i>	1. Check draft inducer wiring from J2 board connector to draft inducer motor <i>*Compare against wiring diagram</i> <i>*Check for wiring continuity</i>
A08	Alert	Air sensor null pressure check (out of tolerance) <i>The air pressure transducer on the furnace control board is reading out of range.</i>	1. Check pressure tubing from combustion fan to pressure switch and furnace control board for leaks/blockage 2. Tee into the pressure tubing and measure pressure with a manometer during combustion fan operation. Reading should be between -0.2 and -2.0 in wg. <i>*If reading is correct replace furnace control board</i> <i>*If reading is out of range verify combustion fan wiring and operation</i>
A11	Alert	Failed ignition, staged manifold burner, retries exhausted <i>Staged manifold failed to light</i>	1. Check for flame during staged manifold ignition period <i>*If flame is present but A11 persists, check flame sense wiring and sensor condition</i> <i>*Repair wiring and clean/replace sensor as needed</i> 2. Check for gas flow/manifold pressure during staged manifold burner ignition period <i>*If pressure is OK, check valve wiring</i>
A15	Alert	Weak flame signal, staged manifold <i>Flame signal on the modulating manifold sensor is 0.5 - 1.5 μA, minimum flame signal is 0.5 μA.</i>	1. Check staged manifold gas pressure <i>*Refer to start-up section for high fire gas pressure</i> 2. Check staged manifold flame sensor wiring and condition <i>*If flame sensor is corroded/damaged, clean or replace</i>

Troubleshooting - Furnace Control Board

Alarm Lockout Codes

LED Display	Type	Description	Actions
E01	Lockout (1hr)	Failed ignition, retries have been exhausted <i>4 failed ignition attempts have occurred</i>	1. Check for flame during ignition period <i>*If flame is present but A01 persists, check flame sense wiring and sensor condition</i> <i>*Repair wiring and clean/replace sensor as needed</i> 2. Check for spark during ignition attempt <i>*If no spark present, check ignition board/igniter wiring and condition of igniter</i> <i>*Clean or replace igniter if damaged/corroded</i> 3. Check for gas flow/manifold pressure during ignition attempt <i>*Refer to start-up section for high fire gas pressures</i> <i>*If no gas present, check incoming gas pressure</i> <i>*If incoming gas pressure is OK, check valve wiring</i>
E02	Lockout (10s)	Primary limit failure (or open fuse) <i>The safety limit circuit is open, high limit or one of the rollout switches has tripped.</i>	1. Check 3 AMP fuse on furnace control board <i>*If fuse is blown, check 24V wiring for short to ground before replacing fuse</i> 2. If control is cycling on limit switch verify confirm supply temperature and airflow. <i>*Confirm correct supply fan rotation</i> <i>*Confirm supply temperature sensor is installed in the supply duct</i> <i>*Check ductwork for closed dampers or blockage</i> <i>*Verify low fire setting</i> 3. With furnace off and at ambient temperature, check for continuity through limit circuit and each switch in the circuit. <i>*Rollout switches have a manual reset</i>
E03	Lockout (10s)	Modulating valve failure <i>Modulating valve feedback signal does not match the position signaled by the 2-10VDC signal to the valve.</i>	1. Check modulating valve wiring 2. Confirm 24VAC received at modulating valve 3. Confirm 2-10VDC signal at modulating valve 4. Replace modulating valve if 1, 2, 3 are all confirmed
E04	Lockout (30s)	Air pressure sensor reading low (pressure switch failed to open or insufficient air/blocked vent)	1. With furnace control board unpowered, check continuity through the switch contacts. Switch should be open <i>*If closed replace pressure switch</i> 2. Ensure switch is mounted vertical with pressure tap pointed down <i>*Rotate switch if necessary</i> 3. Check air pressure switch wiring 4. Check flue vent for blockage
E05	Lockout (30s)	Air pressure sensor reading high (pressure switch fail to close)	1. Tee into the pressure tubing and measure pressure with a manometer during purge cycle and check for continuity across the pressure switch. <i>*If no continuity and pressure reading is greater than switch setting, replace the pressure switch</i> 2. Check pressure tubing from combustion fan to pressure switch and board for leaks/blockage 3. Check air pressure switch wiring

Troubleshooting - Furnace Control Board

Alarm Lockout Codes

E08	Lockout (10s)	Unexpected flame (modulating manifold) <i>Modulating manifold flame sensor is detecting flame when the modulating manifold main valve is closed</i>	1. Confirm no flame present when furnace is unpowered. <i>*If flame is present replace gas valve</i> 2. Check modulating and staged manifold gas pressure during ignition trial. Modulating manifold should get pressure first and staged manifold should not get pressure until after modulating manifold lights. <i>*If incorrect valve is opening check wiring to valves</i> 3. Check flame sensor wiring - confirm sensors are not swapped.
E09	Lockout	No R-W enable signal during call for heat	1. Confirm continuity between pin 6 and pin 3 on J4. Replace wiring if open.
E13	Lockout (10s)	Open fuse <i>3A fuse on furnace control board is open</i>	1. Check 3 AMP fuse on furnace control board <i>*If fuse is blown, check 24V wiring for short to ground before replacing fuse</i>
E18	Lockout (10s)	Unexpected flame (staged manifold) <i>Staged manifold flame sensor is detecting flame when the staged manifold valve is closed.</i>	1. Confirm no flame present when furnace is unpowered. <i>*If flame is present replace gas valve</i> 2. Check modulating and staged manifold gas pressure during ignition trial. Modulating manifold should get pressure first and staged manifold should not get pressure until after modulating manifold lights. <i>*If incorrect valve is opening check wiring to valves</i> 3. Check flame sensor wiring - confirm sensors are not swapped.
Eid	Lockout (10s)	Invalid ID chip installed	1. Ensure ID chip is installed and seated properly 2. Replace ID chip with correct part number if error persists
...	Lockout	Failed control	1. Cycle power 2. Replace furnace control board if code remains for extended period of time

Maintenance

Combustion Blower Motor

Motor maintenance is generally limited to cleaning. Cleaning should be limited to exterior surfaces only. Removing dust and grease build-up on the motor housing assures proper motor cooling. Use caution and do not allow water or solvents to enter the motor or bearings. Under no circumstances should motors or bearings be sprayed with water, steam or solvents. The motor bearings are pre-lubricated and sealed, requiring no further lubrication.

WARNING

Turn off all gas and electrical power to the unit before performing any maintenance or service operations to this unit. Remember that if the unit is equipped with electric heat, there may be a second high voltage source that must also be disconnected.

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 the union between manifold and gas valve.
- Remove burner 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.
 - a. Remove any soot deposits from the burner with a wire brush.
 - b. Clean the ports with an aerosol degreaser or compressed air.
 - c. Wipe the inside of the burner clean. Cleaning the burner with a degreaser will slow the future buildup 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.

Heat Exchanger

The heat exchanger should be checked annually for cracks and discoloration of the tubes. If a crack is detected, the heat exchanger should be replaced before the unit is put back into operation. If the tubes are dark gray, 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 inspected annually for loose connections or wiring deterioration.

Gas Train

The gas train connections, joints and valves should be checked annually for tightness.

Replacement Parts

When ordering replacement parts, include the complete unit model number and serial number as shown on the unit labels.

Maintenance Log

Date _____ Time _____ AM/PM
Notes: _____

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Our Commitment

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

Specific Greenheck product warranties are located on greenheck.com within the product area tabs and in the Library under Warranties.

AMCA Publication 410-96, Safety Practices for Users and Installers of Industrial and Commercial Fans, provides additional safety information. This publication can be obtained from AMCA International, Inc. at www.amca.org.

