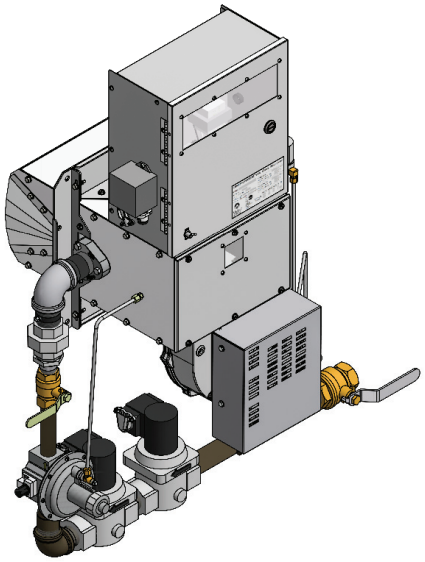
OEM Installation & Start Up Instructions

Midco® INTERNATIONAL

Unipower VA Series

Variable Air Gas Burners OEM Start Up



⚠ WARNING: If the information in these instructions is not followed exactly, a fire or explosion may result, causing property damage, personal injury or death.

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.
- Immediately phone your gas supplier from another 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.

- In the United States, installation must conform with local codes or in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1-latest edition available from American National Standard Institute. Further reference should be made to the recommendation of your fuel supplier.
- In Canada, installation must conform with local codes or in the absence of local codes, with Installation Codes for Gas Burning Appliances and Equipment, Standard CAN/CGA 1-B-149.1 or 2.

- **⚠ WARNING: Additions, changes, conversions and service must be performed by an authorized Midco representative, service agency or the fuel supplier. Use only MIDCO specified and approved parts.**

- **INSTALLER**: Inform and demonstrate to the user the correct operation and maintenance of the gas utilization equipment. Inform the user of the hazards of storing flammable liquids and vapors in the vicinity of this gas utilization equipment and remove such hazards. Affix this manual and associated literature to the burner.
- **CODE COMPLIANCE IS THE SOLE RESPONSIBILITY OF THE INSTALLER.**

- **USER**: Retain this manual for future reference. If other than routine service or maintenance as described in this manual and associated literature is required, contact a qualified service agency. **DO NOT ATTEMPT REPAIRS.** An inadvertent service error could result in a dangerous condition.

BURNER MODEL: _____

BILL OF MATERIAL NUMBER: _____

SERIAL NUMBER #: _____

WIRING DIAGRAM: _____

FOR SERVICE CONTACT

Name: _____

Address: _____

_____

Phone: _____

Date of Installation: _____

AVOID ERROR IN PARTS SELECTION. When ordering use complete MIDCO Part Number and Description. Furnish Burner Model Number, Bill of Material Number and Serial Number (if available) from the specification plate found on the product IMPORTANT: Availability of parts as well as specifications are subject to change without notice. Please consult factory for item availability.

SAFETY INFORMATION TERMS: The following terms are used to identify hazards, safety precaution of special notations and have standard meanings throughout this manual. They are printed in all capital letters using a bold type face as shown below, and preceded by the exclamation mark symbol. When you see the safety alert symbol and one of the safety information terms as shown below, be aware of the hazard potential.

⚠ **DANGER**: Identifies the most serious hazards which will result in severe personal injury or death.
WARNING: Signifies a hazard that could result in personal injury or death.
CAUTION: Identifies unsafe practices which would result in minor personal injury or product and property damage.

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Specifications [1]

The VA Series, Models V1 to V 6 burners with intermittent spark ignited pilots and V7 to V10 with interrupted pilots are adaptable to most gas utilization equipment, including gravity and forced circulation furnaces, heat exchangers and process ovens. They are particularly recommended for firing high efficiency and high turndown applications.

Burner Model	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
Maximum Input at 10″ (MBH/hr) [2,3]	670	1,250	2,000	2,000	2,500	2,500	3,000	3,000	3,800	3,800
Maximum Input at 7″ (MBH/hr) [2,3]	550	1,150	1,890	1,890	2,500	2,500	2,800	2,800	3,300	3,330
Minimum Input (MBH/hr) [2,3]	36	48	80	80	100	100	120	120	150	150
Turndown	19-1	26-1	25-1	25-1	25-1	25-1	25-1	25-1	25-1	25-1
Inlet Gas [4] pressure for maximum firing rate (NG)	10.0″	10.0″	10.0″	10.0″	10.0″	10.0″	10.0″	10.0″	10.0″	10.0″
Manifold gas pressure for maximum firing rate (NG)	4.9″	3.5″	4.1	4.1″	4.3″	4.3″	4.4″	4.4″	5.1″	5.1″
Approximate Air Delivery at Zero Draft (CFM)	115	210	360	360	440	440	620	620	720	720
Minimum Recommended Chamber Size										
Width in inches	18	24	34	28	42	30	48	36	54	36
Height in inches	18	24	26	28	26	36	28	42	28	42
Depth in inches	42	48	54	54	60	60	66	66	72	72

Table 1. Burner Specifications

1 Standard burners are shipped as NATURAL gas models. Contact Midco for PROPANE gas burners.
2 1 MBH = 1,000 Btu/hr
3 All Ratings Based on 1000 BTU/Cu. Ft. NATURAL, 2500 BTU/Cu. Ft. PROPANE at sea level. Derate burner for altitude over 2,000 feet by 4% for each 1,000 feet above sea level.
4 Lower gas inlet pressure may be used when maximum input is not required. Burner input based on 0.5″ W.C. back pressure.

Burner Model	Control amps	Motor amps	TOTAL amps	Motor HP
V1	1.3	3.5	4.8	.32
V2	1.6	4.0	5.6	.50
V3	1.5	10.5	12	1.10
V4	1.5	10.5	12	1.10
V5	2	10.5	12.5	1.10
V6	2	10.5	12.5	1.10
V7	2.1	13	15.1	1.75
V8	2.1	13	15.1	1.75
V9	2.1	13	15.1	1.75
V10	2.1	13	15.1	1.75

I
Confirm Inlet Pressure

- **Before** opening the main supply gas valve, see Figure 3 - item # 9, verify that the inlet pressure is below the maximum inlet pressure specified on the Burner Rating Label, see Figure 1.
- Exposing components to pressure above the maximum inlet pressure can cause damage.

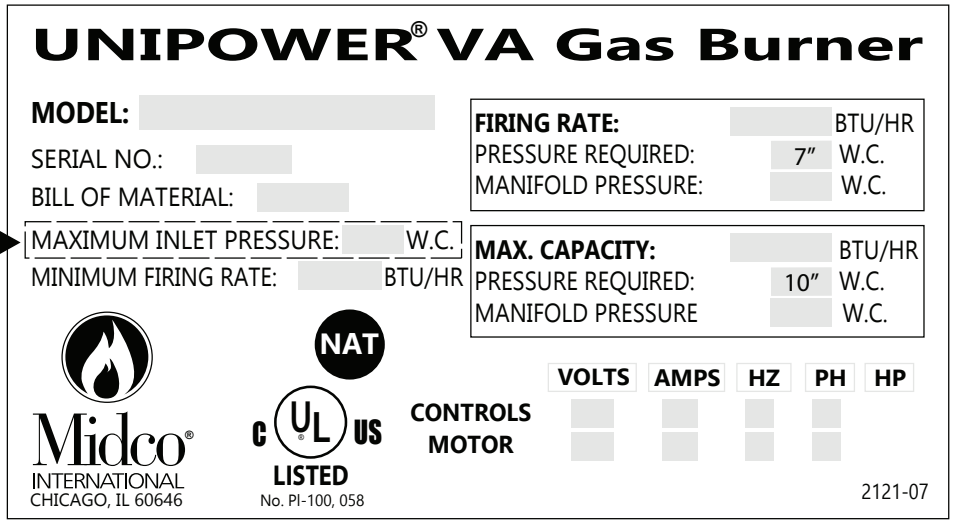


Figure 1. Burner Rating Label - Maximum Inlet Pressure

II
Check Air Damper

- Confirm that the air damper, see Figure 2, is completely open and has not been inadvertently moved during packing, shipping, or installation.
- To open, loosen the nut that secures the damper and pull it outward. Then retighten the nut.

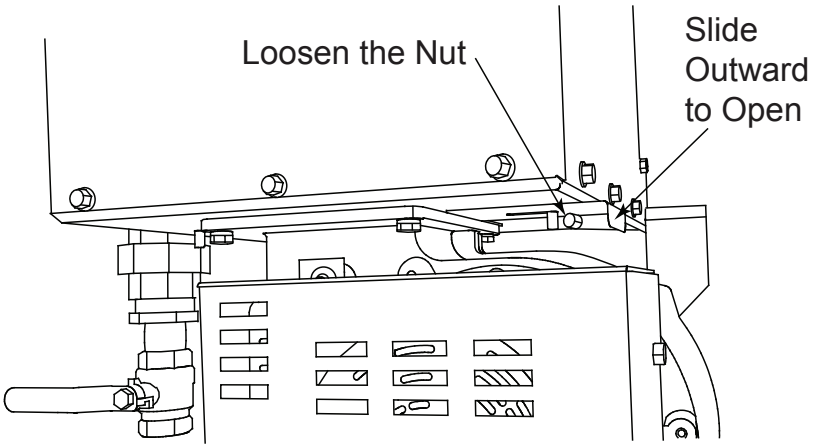
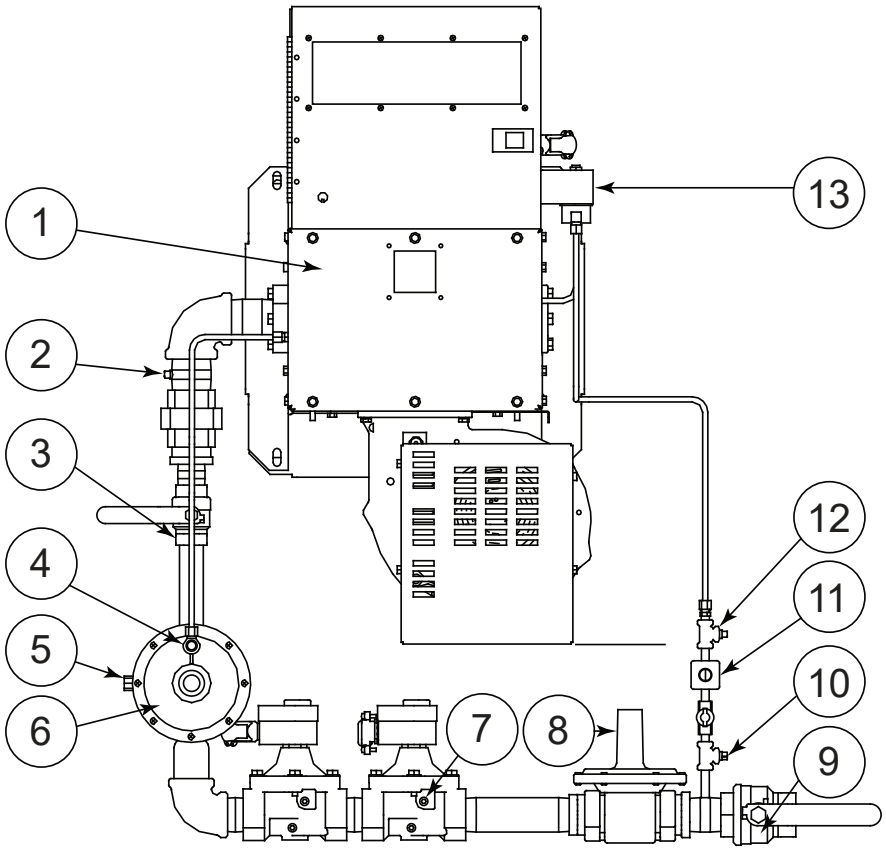


Figure 2. Air Damper

III
Install Shut-Off Type Pressure Fittings

- Install the necessary fittings so that pressure can be measured at five points listed below ...

  Refer to Figure 3:
  a. Manifold pressure - item # 2
  b. Load line pressure - item # 4
  c. Main gas regulator outlet pressure - item # 7
  d. Inlet pressure - item # 10
  e. Pilot pressure - item # 12



Item #	Description
1.	Back Plate
2.	Main Gas Manifold Pressure Tap
3.	Manual Firing Valve
4.	Load Line Pressure Tap
5.	Low Fire Bypass
6.	Ratio Regulator
7.	Main Gas Regulator Outlet Pressure Tap
8.	Main Gas Regulator
9.	Main Supply Gas Valve
10.	Inlet Gas Pressure Tap
11.	Pilot Gas Regulator
12.	Pilot Gas Manifold Pressure Tap
13.	Pilot Solenoid Valve

Figure 3. Component and Pressure Tap Locations

IV
Ignite Burner Pilot

- Close manual firing valve - see Figure 3, item # 3
- Open main Supply gas valve - see Figure 3, item # 9
- Initiate burner operation

a. The following are required to initiate burner operation:
   1. 120V AC power supply
   2. The on/off switch on the front of the burner needs to be in the on position
   3. There needs to be at least a 2.0V DC signal from a temperature control or a DC Volt generator.
b. The call for heat signal needs to be closed. With a call for heat the burner will enter Purge Mode - see page 8, SCEBM-2 Module, paragraph a.
c. After the purge time specified by the control the burner will attempt to ignite the pilot
d. After the pilot is established, the burner will ignite the main flame
e. When the main flame ignites the burner will be in Run Mode

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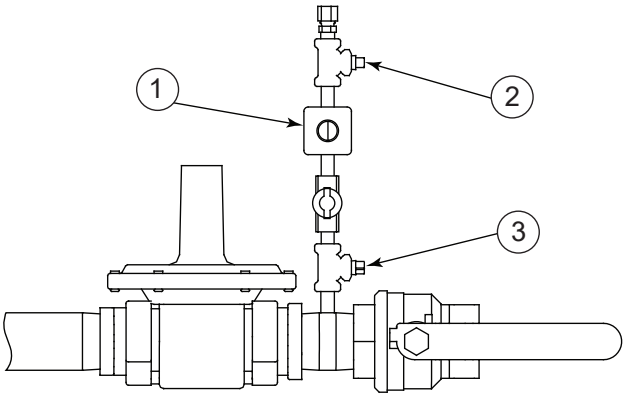
V
Adjust Pilot Pressure

- Use a manometer to check the pilot pressure on the tee downstream of the pilot regulator, see Figure 4 - item # 2.
- For intermittent pilot systems
  a. **3.2″ to 3.5″ W.C.** pressure (internal pilot).
- For interrupted pilot systems
  a. **1.5″ to 2.0″ W.C.** pressure (external pilot).
- **Note:** If adjustment is necessary the adjustment must be made while the pilot solenoid valve is open and pilot gas is flowing. Keep in mind that on interrupted pilot systems the pilot solenoid valve closes after a set period of time after the main gas is turned on.



1. Pilot Pressure Regulator
2. Pilot Pressure Tap
3. Inlet Gas Pressure Tap

Figure 4. Pilot Gas Pressure Tap and Regulator

VI
Adjust Low Fire

- Open Manifold Gas Shut-off Valve, see Figure 3 - item # 3
- Adjust the input signal to 2.0V DC
- Use the sight glass on the back plate of the burner to look at the low fire. If light is visible through all of the holes in the burner plate, the low fire is set within the range of operation of the burner. If light is not visible coming through all of the holes, then the low fire is too low and the low fire bypass located on the side of the ratio regulator, see Figure 3 - item # 5, needs to be opened (counter-clockwise to open, clockwise to close).

VII
Adjust the Main Gas Regulator

- Use a manometer to check the inlet pressure on the tee on the upstream side of the pilot regulator, see Figure 4 - item # 3.
- Use another manometer to check the main gas regulator outlet pressure on the upstream side of the most upstream solenoid valve, see Figure 3 - item # 7.
- Turn the burner up to its actual firing rate applying an input signal of 10V DC for maximum firing rate
- Confirm that the inlet pressure remains between the maximum and minimum values specified on the Burner Rating Label, see Figure 5.

VII
Adjust the Main Gas Regulator Continued

- The main gas regulator outlet pressure should be 1″ W.C. lower than the minimum pressure required figure on the Burner Rating Label.
  a. When “Pressure Required” is 7.0″ set the main gas regulator outlet pressure at 6.0″
  b. When “Pressure Required” is 10.0″, set the main gas regulator outlet pressure at 9.0″

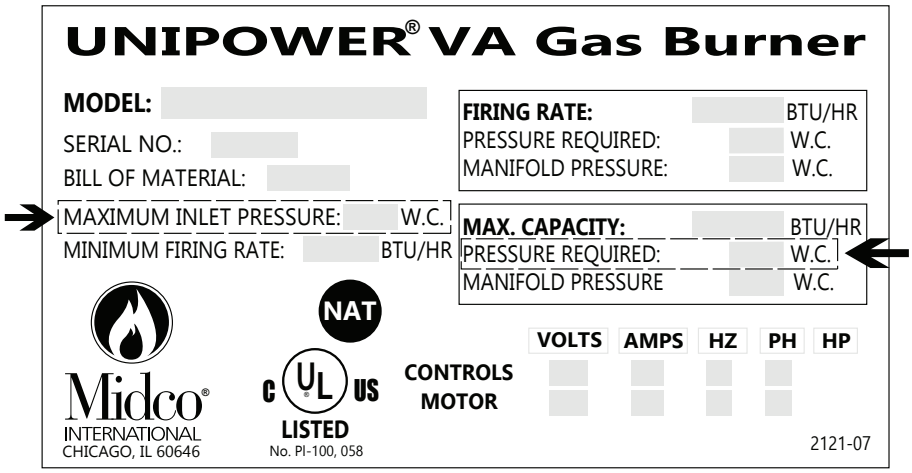


Figure 5. Burner Rating Label - Maximum and Minimum Pressure Required

VIII
Verify the Ratio Regulator Adjustment

- Use a manometer to check the manifold pressure near where the valve train attaches to the burner, see Figure 3 - item # 2.
- Use another manometer to check the load pressure on the ratio regulator, see Figure 3 - item # 4.
- Modulate the burner until the load line pressure is 2.0″ W.C. by adjusting the input voltage to the burner. See page 9, Figure 8 for manual adjustments.
- Verify that the manifold pressure is within the values given in Table 2.
- If necessary turn the screw on the ratio regulator, see Figure 4, in order to adjust the manifold pressure.

Model	Pressure
V1-V4	0.8-0.9″ W.C.
V5-V6	0.2-0.3″ W.C.
V7-V10	0.5-0.6″ W.C.

Table 2.

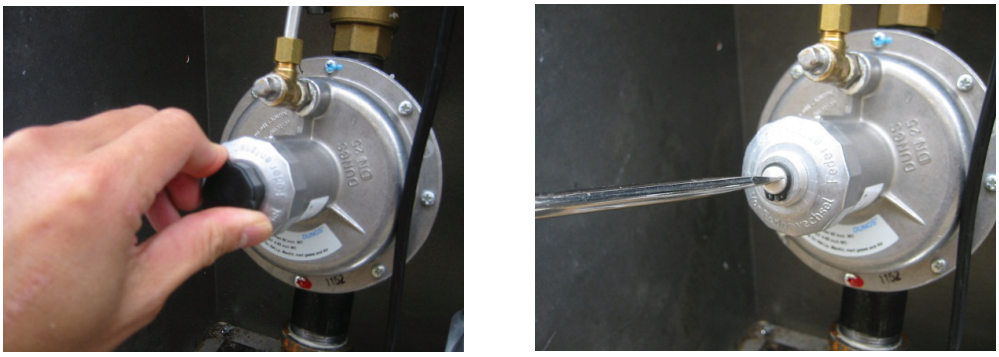


Figure 4. Ratio Regulator

IX
Verify High Fire Input Adjustment

Note: Burners are not always set up to maximum capacity. Refer to the "Firing Rate" portion of the Burner Rating Label or the Label of the heating equipment for the actual firing rate.

- Modulate the burner to high fire by applying a 10V DC input signal. See page 9, Figure 8 for manual adjustments.
- Verify that the manifold pressure is the same as marked on the Burner Rating Label(s) for the actual firing rate.
- If necessary adjust the fHi (fan high) setting on the SCEBM-2 module until the desired manifold pressure is achieved. Use Figure 7 to determine desired manifold pressure.
  a. For information on how to adjust the fHi setting refer to page 9, the SCEBM-2 Module section of this manual.

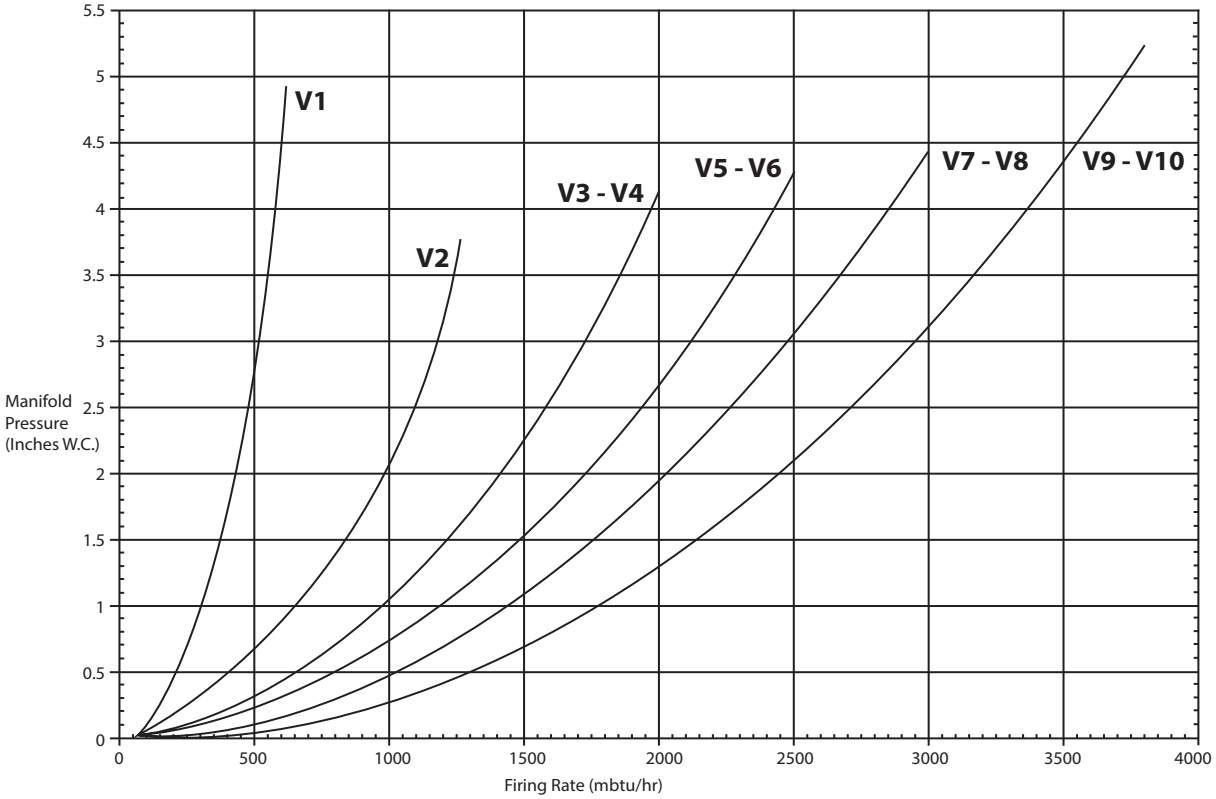


Figure 7. Manifold Pressure vs. Firing Rate - VA 120V Burners

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X
Check Emissions

- Use a combustion analyzer to confirm that the high fire oxygen (O_2) level is between 3.0 to 5.0% and the carbon dioxide (CO_2) level is between 8.5 to 10.0%. The carbon monoxide (CO) should be less than 100 ppm while the flue gas temperature should be below 550° F.
- Confirm that at low fire the oxygen level is between 16.0 to 18.5% and the carbon monoxide (CO) level is less than 400 ppm corrected to 3% O_2.

XI
Shut Down

- Remove call for heat (open heat enable contact).
- Close main supply gas valve, see Figure 3 - item # 9.
- Turn off main power disconnect and burner control panel switch.
- Remove pressure tap fittings and gauges for pressure measurements. Replace pipe plugs.
- Reinstall the caps to the pilot regulator, main regulator, low-fire bypass and ratio regulator.

XII
Normal Operation

- Open all manual gas valves
- Turn on power at disconnect switch
- Turn on power switch on burner control panel door
- Set heat enable and temperature controller to desired operating condition and temperature
- Burner will start and operate based on 2 to 10V DC analog input provided

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I SCEBM-2 Module

SCEBM-2 Module is designed to control the speed of the combustion blower based on three input signals and several programmable parameters.

- The inputs

a. 2-10V DC control signal
   i. Controls the speed of the combustion blower whenever the burner is in run mode.
   ii. Also, there needs to be at least 2.0 V DC signal to this input in order for the burner to turn on.

b. Main valve input
   i. When power is supplied to the main valves it is also supplied to the SCEBM-2 control. Along with the pilot valve input, this determines what mode the burner is in.

c. Pilot valve input
   i. When power is supplied to the pilot valve(s) it is also supplied to the SCEBM-2 control. Along with the main valve input, this determines what mode the burner is in.

	Inputs				
Application	*Pilot*	*Main*	*Display*	*Relay*	*PWM Output*
Intermittent Pilot VA-A	Off	Off	PRGE	Open	100%
	On	Off	PIL	Closed	Min
	On	On	RUN	Open	Modulate
	Off	On	ERR	Open	Min
Interrupted Pilot VA-B	Off	Off	PRGE	Open	100%
	On	Off	PIL	Open	Min
	On	On	IGN	Open	Min
	Off	On	RUN	Open	Modulate

PRGE=Purge mode. Before the burner starts or after the burner stops the combustion blower is modulated to high speed to purge the combustion chamber with air.

PIL=Pilot mode. The period where the pilot valve is on but the main valve is not on yet during which the pilot flame is established. In this mode the combustion blower is modulated to low speed.

IGN=Ignition mode. On interrupted pilot systems, the time where both valves are open is the period where the main flame is ignited by the pilot flame. During this time the combustion blower will remain at low speed.

RUN=Run mode. After the ignition sequence is complete, the burner will be in run mode. Only in this mode will the combustion blower modulate based on the 2-10V DC temperature control signal.

Table 3.

II Accessing the Program Menu

- Refer to the Figure 8, page 9, for an overview of the program menu. To enter the program menu, hold the enter key down for 3 seconds until “APP” is displayed. Use the up and down arrow keys to navigate to the desired parameter as shown in column 1. To edit a menu parameter, press the right arrow key once on the desired parameter. The current value of the parameter will be displayed. Use the up and down arrow keys again to edit the parameter. Press the enter key to save changes made or press the left arrow key to cancel without saving and return to column 1. If a key is not pressed for 20 seconds or the enter key is held for 3 seconds while in program mode, the control will return to normal mode.

SCEBM-2 Menu Map

What you want to do	What you see	What it means
	Column 1 / Column 2	
Control applications for Variable Air or NOX	APP: vA-A, vA-b, noX	Column 1 shows the menu parameters Column 2 shows the factory set defaults for each parameter. Temperature defaults are shown in °F.
Set the lowest the user can adjust the temperature to in normal mode for setpoint.	tLo: 40	Arrow Keys: Up and Down: to navigate or adjust a menu parameter Right: to access column 2 for editing a parameter Left: to return to column 1 without saving a parameter Enter: to return to column 1 with saving a parameter
Set the highest the user can adjust the temperature to in normal mode for setpoint.	thi: 90	Low (tLo) can be set from 40°F - 240 °F and must be at least 10°F less than the High. High (thi) can set be from 50°F - 250°F and must be at least 10°F greater than the Low. These will limit how far the user can change the temperature outside of programming mode.
Set the minimum percentage the user can adjust the Fan to in normal mode	FLo: 10	
Set the maximum percentage the user can adjust the Fan to in normal mode	Fhi: 100	
Control input modes	inPt: dC, rE, tS	
Override allows the user to manually control the Fan percentage	ovEr: dAbL, EnAb	Setpoint may be adjusted on the main screen with the up and down arrows, then pressing enter to save the selected setpoint.
Select the desired aggression/speed of the PID curve for the valve (Standard, Low, or High).	Pid: Lo, hi, Std	Applications (APP): VA-A is the intermittent piloted burners VA-B is burners with an interrupted pilot NOX is for low nox burners
Set a temperature offset. For examples, to correct for duct losses or sensor calibration errors.	oFS: 0	
Set the control to convert the temperature to display either °F or °C.	ForC: ° F, ° C	Input (inPt) modes: dC: Allows the user to directly control the fan speed with a 2-10V input rE: Allows the user to use an external remote 2-10V input tS: Allows the user to use the built-in onboard setpoint and ignores the 2-10V input
The password may either be enabled or disabled.	PASS: dAbL, EnAb	
View the software version number.	vEr: 1.0	

Figure 8.

- There are several parameters that can be adjusted for the specific application. The adjustable parameters are as follows.

- APP
  a. Determine the functionality of the inputs by specifying which type of burner the control is being used on.
  b. VA-A is for VA series burners that use an intermittent pilot
  c. VA-b is for VA series burners that use an interrupted pilot
  d. NOx is for Midco Low-NOx series burners

III
Setting the Parameters

III
Setting the Parameters Continued

- tLo and thi
  a. Use these parameters to adjust the minimum and maximum temperature set point that a user can set while outside of programming mode.
  b. **NOTE**: These parameters only have an effect on the operation of the burner when the burner is operated by temperature control. See section inPt below.
- FLo and Fhi
  a. Use these parameters to adjust the minimum and maximum speed that the combustion blower can achieve (displayed as a percentage of the maximum capacity of the blower).
  b. Adjusting FLo will change the speed of the combustion air blower during ignition and when in run mode at 2.0V DC. This effectively changes the minimum firing rate. The default setting is 10% of maximum fan speed.
  c. Adjusting Fhi will change the speed of the combustion air blower while in run mode with a 10.0V DC input signal. This effectively changes the maximum firing rate of the burner. The default setting is 100% of maximum fan speed.
- inPt
  a. The inPt (input) parameter is used to specify which type of input is used to control the modulation of the burner.
  b. DC is for using a 2-10V DC input signal sent from an external temperature controller.
  c. tS is the setting used when one connects a discharge temperature sensor directly to the SCEBM-2 module. The SCEBM-2 then modulates the burner based on the discharge temperature and the temperature set point.
  d. rE is used when one connects a discharge temperature sensor as well as an external thermostat. The SCEBM-2 still modulates the burner based on the discharge temperature and the temperature set point, but in this mode the temperature set point is set from an external device.
- ovEr
  a. Enables or disables the manual override function. When enabled, the user can adjust the combustion fan speed manually using the up and down arrows. The input signal from the external temperature controller or the discharge temperature sensor will be overridden.
- Pid
  a. The Pid parameter is used to adjust how aggressively the SCEBM-2 module tracks the discharge temperature. **NOTE**: This parameter only has an effect on the operation of the burner when the burner is operated by temperature control.
- oFS
  a. The oFS (offset) parameter is used to adjust the discharge air sensor. **NOTE**: This parameter only has an effect on the operation of the burner when the burner is operated as a temperature control.
- ForC
  a. This parameter is used to choose whether the SCEBM-2 module displays the temperature in degrees Fahrenheit or degrees Celsius. **NOTE**: This parameter only has an effect if there is a temperature discharge sensor hooked up to the SCEBM-2
- PASS
  a. The user can use this parameter to enable or disable the password. If the password is enabled, one must enter it in order to access the program menu.
- vEr
  a. The installed version of the software.

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