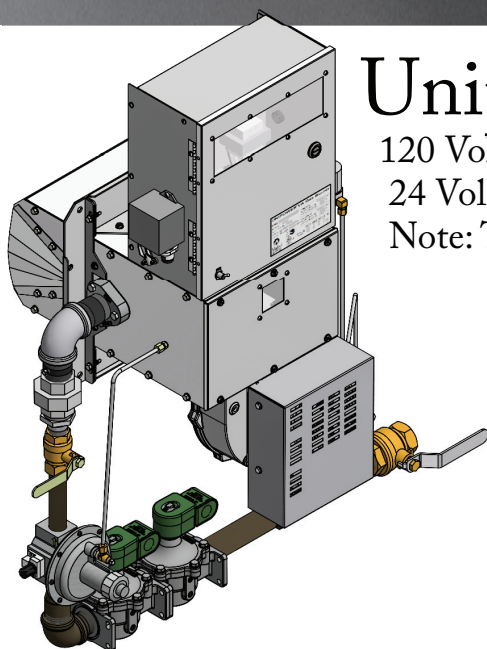


Installation and Service Instructions



Unipower VA Series

120 Volt Variable Air Gas Burners - Models V1 to V10

24 Volt Variable Air Gas Burners - Models V1 and V2

Note: The 24V is no longer available

! 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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Part 1 Installation

Specifications ¹

For 120 Volt Burners:

The VA Series - 120V, Models V1 to V6 burners with intermittent spark ignited pilots and V7 to V10 with interrupted pilots, are adaptable to most gas utilization equipment, including furnaces, heat exchangers and process ovens. They are particularly recommended for firing high efficiency and high turndown applications.

For 24 Volt Burners:

The VA Series - 24 Volt, Models V 1 and V 2 burners with intermittent spark ignited pilots are adaptable to most gas utilization equipment, furnaces, heat exchangers and process ovens. They are particularly recommended for firing high efficiency and high turndown applications.

Burner Model	120 V V1	120 V V2	120 V V3	120 V V4	120 V V5	120 V V6	120 V V7	120 V V8	120 V V9	120 V V10		24 V V1	24 V V2
Maximum Input at 10" (MBH) ^{2,3}	670	1,250	2,000	2,000	2,500	2,500	3,000	3,000	3,800	3,800		670	1250
Maximum Input at 7" (MBH) ^{2,3}	550	1,150	1,890	1,890	2,500	2,500	2,800	2,800	3,300	3,330		550	1150
Minimum Input (MBH) ^{2,3}	36	48	80	80	100	100	120	120	150	150		36	48
Turndown	19-1	26-1	25-1	25-1	25-1	25-1	25-1	25-1	25-1	25-1		19-1	26-1
Inlet Gas ⁴ (NG) pressure for maximum firing rate W.C.	10.0"	10.0"	10.0"	10.0"	10.0"	10.0"	10.0"	10.0"	10.0"	10.0"		10.0"	10.0"
Manifold gas (NG) pressure for maximum firing rate W.C.	4.9"	3.5"	4.1"	4.1"	4.3"	4.3"	4.4"	4.4"	5.1"	5.1"		4.9"	3.5"
Approximate Air Delivery at Zerog Draft (CFM)	115	210	360	360	440	440	620	620	720	720		115	210

Values given based on +0.5" W.C. combustion chamber pressure. (Maximum Firing Rate)

Minimum Recommended Chamber Size (Based on +0.5" Drafts) (Maximum Firing Rate) (Dimensions shown in inches)

Width in inches	18	24	34	28	42	30	48	36	54	36		18	18
Height in inches	18	24	26	28	26	36	28	42	28	42		24	24
Depth in inches	42	48	54	54	60	60	66	66	72	72		42	48

Control Amps	1.3	1.6	1.5	1.5	2	2	2.1	2.1	2.1	2.1		1.3	1.6
Motor Amps	3.5	4.0	10.5	10.5	10.5	10.5	13	13	13	13		3.5	5.2
Total Amps	4.8	5.6	12	12	12.5	12.5	15.1	15.1	15.1	15.1		4.8	6.8
Motor HP	.32	.50	1.10	1.10	1.10	1.10	1.75	1.75	1.75	1.75		.35	.40

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.

Table 1. Burner Specifications

CAUTION: The Unipower VA Series burners are not intended for outdoor installation and must be protected from excessive moisture. Provide adequate clearance for service and proper operation.

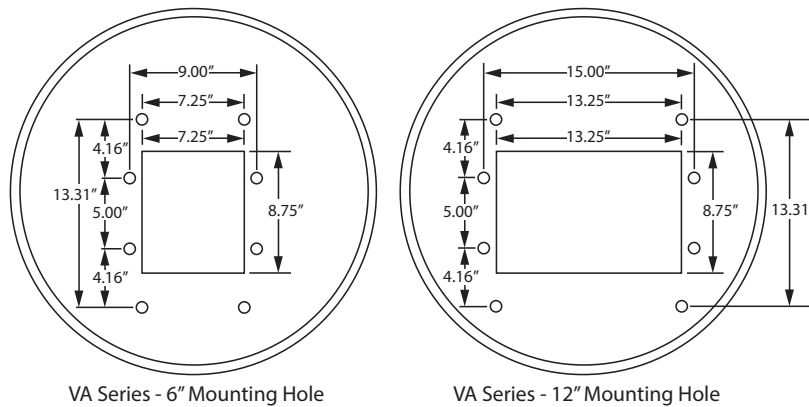
When installed indoors, the area must be checked for proper ventilation before installing.

Proper ventilation entails the following:

- Open areas of normal construction, without storm windows or tight doors, will generally allow sufficient air infiltration. However, if the heating appliance is located in a tight or separate room, ventilation to an open area as described below will be required. Install two permanently open grills, each sized on the basis of one square inch free area per 10,000 BTU/hr (but not less than 50 square inches) of the total input rating of all gas utilization equipment in the combined space. One grill should be located within 12" of the ceiling and the other within 12" of the floor.
- If the heating appliance is located in an area of unusually tight construction, or if an exhaust fan, kitchen ventilation system, clothes dryer and/or fireplace is installed in the building, provisions must be made for an outside air supply near the heating appliance area.
- In Canada, for detailed ventilation requirements, refer to standard CAN / CGA 1-B-149.1 or 2 and/or local codes.

Prepare the equipment front plate to have a rectangular hole for the insertion of the burner. To fasten the burner to the equipment, either create four tapped holes on the front plate and use bolts to fasten the burner, or install four threaded studs and fasten the burner with a washer and nut. The dimensions and locations of the holes or studs are shown in Figure 1.

- Clean the gas utilization equipment combustion chamber, heat exchanger interior, and flue connections. Remove all adhering tars, scale, dirt and soot. Inspect for actual or potential leaks.



VA Series - 6" Mounting Hole

VA Series - 12" Mounting Hole

Figure 1 - Mounting Hole/Stud Locations for standard VA Series (6" Mounting Hole) and the VA Series (12" Mounting Hole) burners

NOTE: Contact factory for actual hole/stud locations for other VA series models

120V Model Desc.	A-Width in Inches	B Height in Inches		C -Depth in Inches	Insertion* D-Depth in Inches
		Honeywell	Siemens		
V1 6" Straight	17"	28.5"	31.8"	19.25"	6"
V2 12" Straight	17"	30.75"	34"	19.5"	6"
V3 18" Straight	20.75"	33"	36.3"	23"	6"
V4 18" Tee	20.25"	34.75"	38"	23.25"	6"
V5 24" Straight	24.5"	33"	36.3"	23"	6"
V6 24" Tee	20"	40.75"	44"	23"	6"
V7 30" Straight	32.75"	37"	40.3"	22.5"	6"
V8 30" Tee	32"	33.5"	37"	25"	6"
V9 36" Straight	39"	37"	40.3"	22.5"	6"
V10 36" Tee	32"	31.5"	34.8"	22.5"	6"

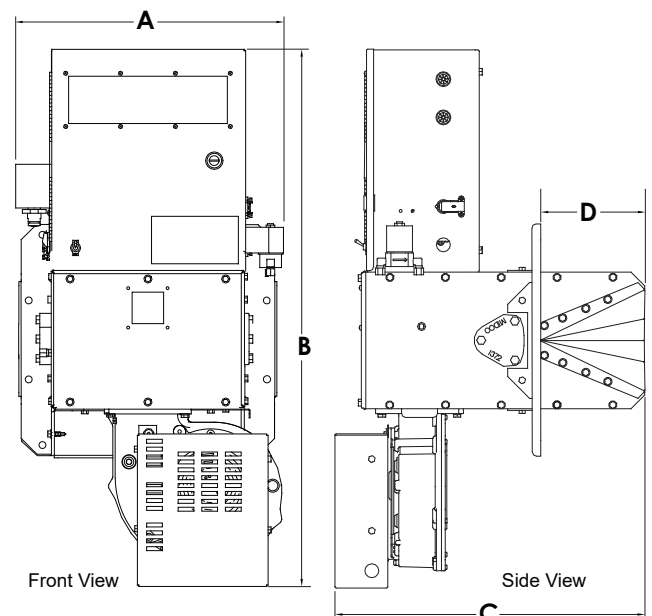
24 V

V1 6" Straight	16.97"	28.42"	19.11"	6"
V2 12" Straight	16.97"	30.6"	19.5"	6"

Dimensions are approximate - contact factory for additional information

* Longer insertion depth available - contact factory

Figure 2 - VA Dimensions Standard 120V V1 to V10 and 24V V1 & V2



Part 1 Installation

I Ventilation

II Preparation for Combustion Chamber and Gas Utilization Equipment

Part 1 Installation

III Burner Mounting Instructions

CAUTION: The VA Burner must be protected from excessive moisture. Provide adequate enclosure to protect from the weather.

- The burner mounting flange should be sealed to the combustion chamber by means of a ceramic based high temperature gasket (supplied with the burner).
- Make sure the gasket fits over the burner housing, flush against the mounting flange.
- Insert the burner into the rectangular hole until the mounting flange is tight to the exchanger front plate.
- Tighten flange. During the tightening process, the gasket will be compressed creating the seal that is needed.

CAUTION: Flue gas leakage will cause equipment damage and may affect the operation of the equipment.

NOTE: During the initial startup of the burner, a small portion the new gasket may be oxidized and some white smoke and burning odor will present. This is normal.

CAUTION: If the smoke persists and visible leakage of the flue gas is observed, recheck the seal. This may require removing the burner from the heat equipment.

IV Piping

The standard V Series burner valve train is pre-assembled and pre-wired, but it will need to be installed to the burner. There are three parts that need to be connected: the main gas valve train, the pilot gas supply line and the air pressure line. See Figure 3.

Following are the instructions for assembling the valve train:

1. Connect the union on the main gas valve train to the union on the burner (Figure 3 - #1).
2. Connect the gas supply line to the shut-off valve next to the main regulator (Figure 3 - #2).
3. Connect air pressure line from the compression fitting on the burner housing to the brass compression fitting on the ratio regulator (Figure 3 - #3).
4. Connect the Pilot Gas Supply Line to the brass compression fitting that is on pilot gas solenoid valve, which is mounted on the burner control box, and the other end to the tubing has to be connected to the brass fitting at the 1/8" Tee next to the pilot regulator (Figure 3 - #4). (Note: On some variations, the pilot gas solenoid valve is not mounted on the control box. In this case, refer to the assembly drawing provided with the VA burner.)
5. Low fire bypass (Figure 3 - #5).
6. Supply gas pressure tap (Figure 3 - #6).

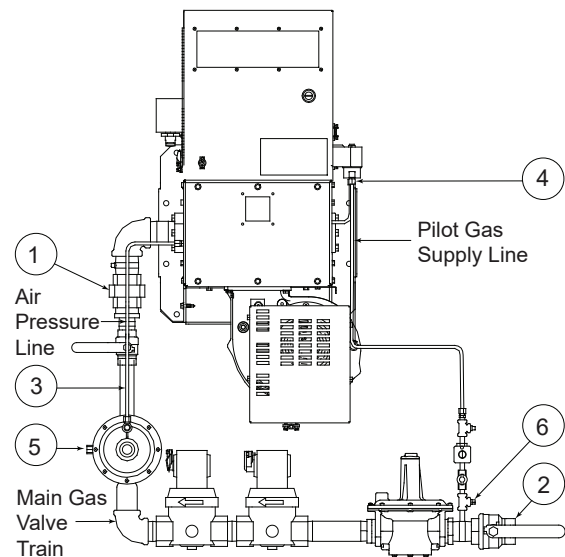


Figure 3 - Typical Valve Train Assembly, UL

CAUTION: The available gas pressure should be within the limits shown in the SPECIFICATIONS section, Table 1. Excessive pressure may damage safety shut-off valves, regulators or manual valves.

		Approximate Capacity -MBH				
Pipe Size	Type of Gas	10'	20'	40'	75'	100'
1"	Propane	1075	730	500	360	300
1 1/4"	Natural	900	600	450	325	275
1 1/4"	Propane	-	-	1040	750	630
1 1/2"	Natural	900	650	475	400	-
1 1/2"	Propane	-	-	-	-	975

Capacities shown are for a total pressure drop of 0.3" W.C.. For 0.5" W.C. pressure drop, multiply capacity shown by 1.3. Propane capacities shown are for a total pressure drop of 0.5" W.C.. For higher permissible pressure drops, consult your gas supplier.

Table 2: Schedule 40 NPT Pipe - Capacity Chart

- The burner gas supply piping should branch off from the main line as close to the gas meter as possible. Do not connect to the bottom of a horizontal section. Use new black pipe and malleable fittings free of cutting and threading burrs or defects.
- Use pipe joint compound approved for use with natural and propane gases.
- Piping must also comply with your local codes.
- When high supply gas pressure is encountered, as is the case in many industrial plants, the gas line size can be reduced to allow for a greater pressure drop; however, the size must be sufficient to deliver burner rating pressure.

⚠ CAUTION: High gas pressure supply lines require the proper pressure reducing regulators. Install a high pressure regulator of the Tight Shut-Off type upstream of the low pressure regulator sized for main gas input. .

⚠ CAUTION: Because it is difficult to accurately control pressure during supply pipe leak testing, it is recommended that all low pressure components, both main and pilot, be only exposed to 14.0" W.C. maximum. Exposing low pressure regulators and valves, including manual valves, to pressures over 1/2 PSIG (14.0" W.C.) will cause damage and void all warranties.

- To obtain the maximum firing rate of the burner, the gas supply piping must be sized to provide a minimum of 10.0" W.C. pressure to the inlet of the upstream automatic safety shut-off valve when the burner and all other gas utilization equipment are on.
- If the burner piping must be rearranged because of space limitations, be sure to carry out the general arrangement shown in Figure 9 on page 29. Refer to valve and regulator manufacturer specifications for acceptable mounting orientations.
- When the burner is installed in the vestibule of jacketed equipment, it is recommended that the Automatic Safety Shut-Off Valves be left adjacent to the burner within the vestibule and the Main Manual Shut-Off Valve be installed outside.
- Run full size pipe or tubing from regulator vent openings to outside of building. Provide no traps in the vent lines and terminate away from all doors and windows; also make provisions for keeping rain and foreign objects from entering the vent piping.
- When the gas supply line is about to be put into service it must be tested to ensure that it is gas tight. Use air or inert gas under pressure and test with soap and water to locate leaks.

**⚠ DANGER: Explosion hazard.
Do not use oxygen for pressure testing.
An explosion could occur during initial start up.**

- Before gas is turned on to the system, a check must be made to see that there are no open fittings and to make sure the burner main and pilot manual valves are closed.
- After checking for leaks, purge the gas line up to the burner inlet. Purging the air from the gas supply line at this step will expedite the first light-off.

⚠ WARNING: Explosion Hazard. Improper installation can cause fuel buildup and an explosion.

⚠ CAUTION: Refer to wiring diagram located on the inside of the burner housing cover. Before proceeding verify burner model number for correct wiring diagram. Refer to Figures 4A / 4B / 4C / 4D for 120V models and 4E for 24V models.

- Installation wiring and grounding to the burner must conform to local codes, or in their absence in the United States to National Electric Code ANSI/NFPA No. 70 latest edition and in Canada to Canadian Electrical Code Part 1 CSA Standard C22.1.
- Use copper wire not less than 16 gage for line voltage wiring. Hook up to a dedicated line with an on-off disconnect switch and correctly size circuit breaker for the 120V models and a 10 Amp breaker for 24V models. Refer to Table 1 for correct amp draw requirement.
- The frame of the burner should be well grounded. Normally the piping and/or electric conduit will provide sufficient grounding. However, a ground lug is located in control box for positive grounding where insulated pipe couplings are used or where any doubt exists regarding grounding sufficiency.

Part 1 Installation

V Electrical Continued *A - Safety Continued*

- Confirm that the polarity is correct:
120V Burner Models:
for **Honeywell control** - hot wire to strip terminal 10, neutral 6—and that the neutral line is not subject to induced low voltage (check 6 to 11 earth ground) (refer to Figures 4A and 4B) ...
for **Siemens control** - hot wire to strip terminal 3, neutral 6—and that the neutral line is not subject to induced low voltage (check 6 to 1 earth ground) (refer to Figures 4C and 4D) ...
 - Each installation must include suitable safety and limit controls.
-

B - Installation Enclosure

- The VA series burners are sold in standard and vestibule versions.
- Standard version VA burners utilize an enclosure around the motor and various methods of enclosure and strain relief on the wiring. Standard version VA burners must not be installed where they will be exposed to moisture, but they may be installed on the exterior of an appliance.
 - Vestibule version VA burners are designed to be used inside of a vestibule. They may be designed without extra enclosures around the motor and may have wiring connections that are not enclosed in conduit. Vestibule version VA burners must be installed such that:
 - a. The vestibule is designed with appropriate mechanical strength, resistance to impact, moisture-absorptive properties, combustibility, resistance to corrosion, and resistance to temperature distortion. For guidance on what is appropriate, reference UL295 Section 9 – Enclosures or contact Midco International.
 - b. Burners are not exposed to moisture.
 - c. Users are prevented from coming in contact with the burner unless doing service.
 - d. Doors or panels used to access the burner must:
 - 1. Have latches that require some effort to open.
 - 2. Be designed such that they are not subject to falling or swinging due to gravity or normal vibration.
 - 3. Shut closely against a 1/4" rabbet or the equivalent.
 - e. The enclosure has louvers or openings that are sufficient to bring in enough air for combustion as per Part 1, Section 1 - Ventilation on page 3 of this document.
 - f. Any louvers or openings must not be capable of letting in a 3/4" diameter rod.
-

C - Wiring Instructions



CAUTION: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.



WARNING: Electrical Shock Hazard. Can cause severe injury, death or equipment damage.

Most of the components have been pre-wired. There are a few things that the installer has to wire to integrate the burner into the system. Refer to Figure 15 for the component's location inside the control box.

1. **Main 120V power supply to the burner:** Locate the terminal strip inside the control box.

There are three wires that need to be connected:

120V Burner Models:

- for **Honeywell control** - 10 (Black), 6 (White), and 11 (Green) (refer to Figures 4A and 4B).
- for **Siemens control** - 120V (On Off switch), 8 (Neutral), and 1 (Ground) (refer to Figures 4C and 4D).

24V Burner Models:

- L1 (Black), L2 (White), and G (Green). (refer to Figures 4E)

Note: For 240 V versions, refer to the wiring diagram specific to your burner for main power wiring instructions. Refer to the specification label located on the control box door to determine whether your burner requires 120 or 240 VAC power.

2. **Modulation signal input (2-10VDC):** Connect the signal input wires from the temperature controller to the appropriate terminals on the terminal strip. There are two wires that need to be connected:

120V Burner Models:

- for **Honeywell control** - positive 13 (+) and 14 negative (-) (refer to Figures 4A and 4B).
- for **Siemens control** - positive 10 (+) and 9 negative (-) (refer to Figures 4C and 4D).

24V Burner Models:

- positive (+) and negative (-) (refer to Figures 4E)

3. **Main gas solenoid valve wiring:** Connect the main gas valve wires from the gas valves to the appropriate terminals on the terminal strip. There are three wires that need to be connected:

120V Burner Models:

for **Honeywell control** - 2 (Blue), 7 (Blue/White) and 12 (Green) (refer to Figures 4A and 4B).

for **Siemens control** - 8 (Blue), 5 (Blue/White) and 1 (Green) (refer to Figures 4C and 4D).

24V Burner Models:

L (Blue) N (Blue/White) and G (Green). (refer to Figures 4E)

4. **Call for Heat:** The call for heat circuit should be wired between:

for **Honeywell control** - terminals 8 and 15 (refer to Figures 4A and 4B).

for **Siemens control** - terminal 3 to Siemens X5-03 1 (refer to Figures 4C and 4D).

The switch should be capable of handling the full current load of the burner.

5. **(Optional) Gas pressure switch and proof of closure wiring:** If applicable, connect the wires from the gas pressure switches and/or proof of closure switch to the corresponding terminals inside the control box. Refer to the wiring diagram inside the control box door for additional information.

120V Intermittent Pilot Version with Honeywell Flame Safeguard

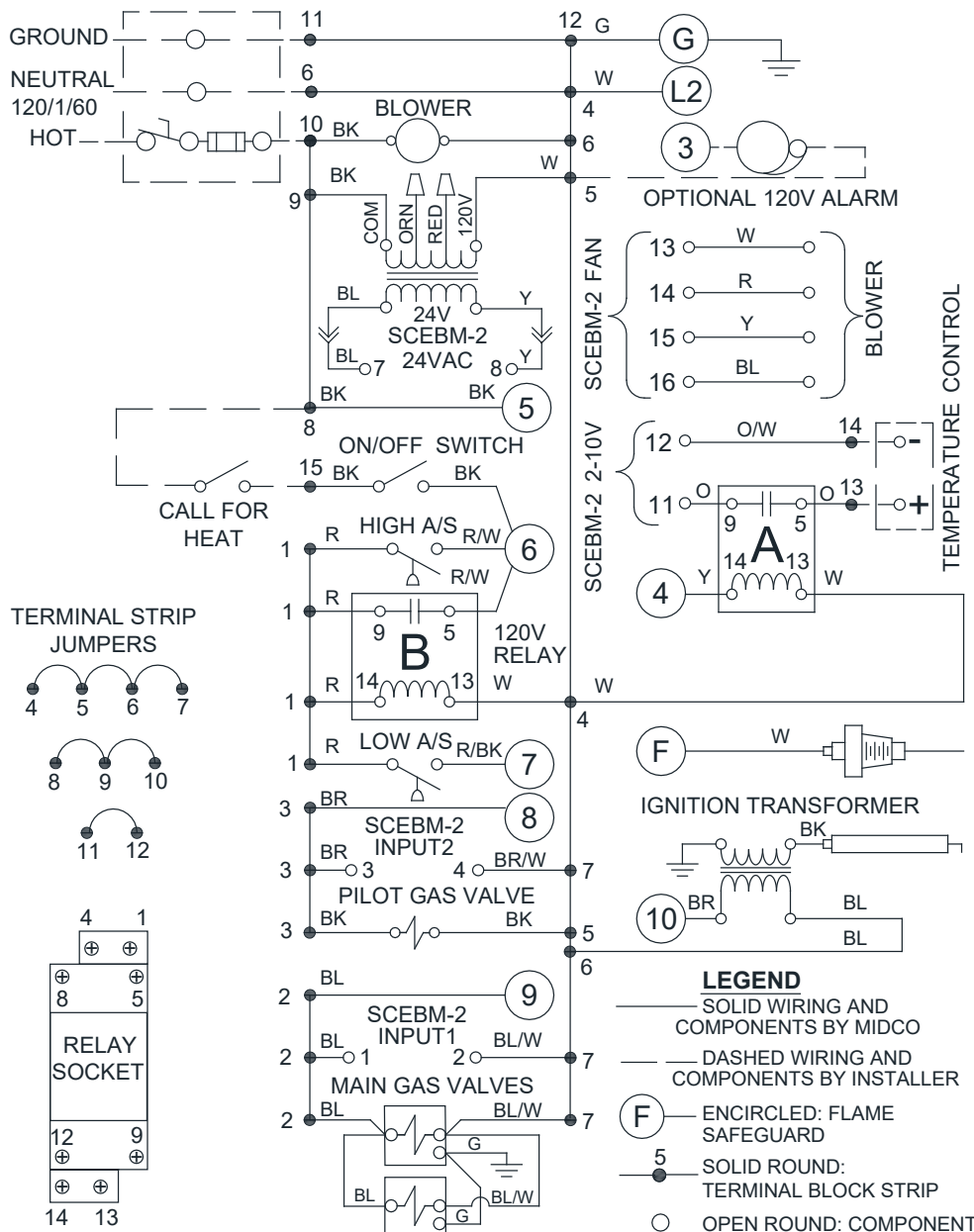


Figure 4A: Wiring Diagram for the VA series models
120V Intermittent Pilot Version with Honeywell Flame Safeguard
Midco International Inc.

Part 1 Installation

V Electrical Continued C - Wiring Instructions Continued

120V UV Interrupted Pilot Version with Honeywell Flame Safeguard

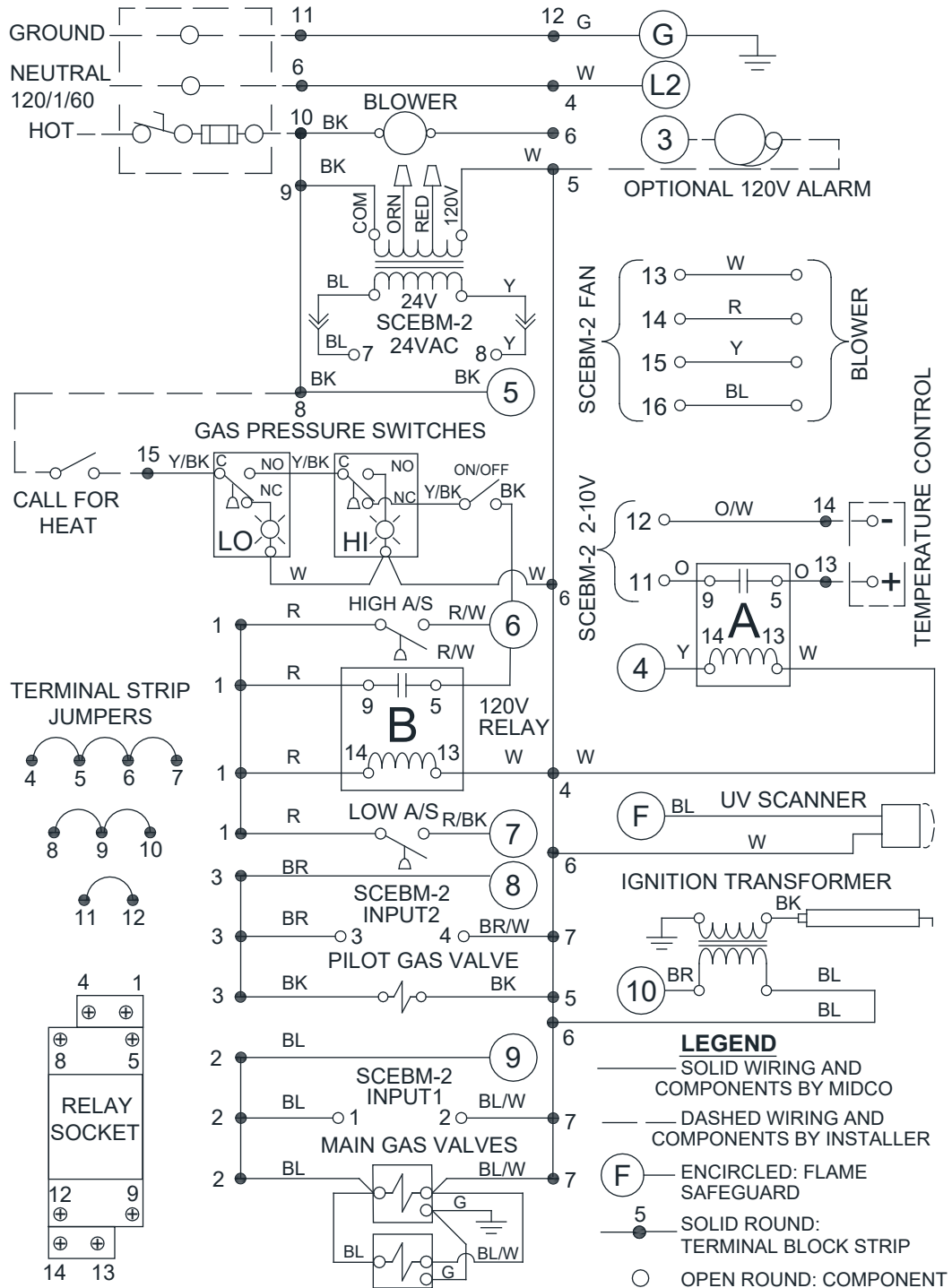
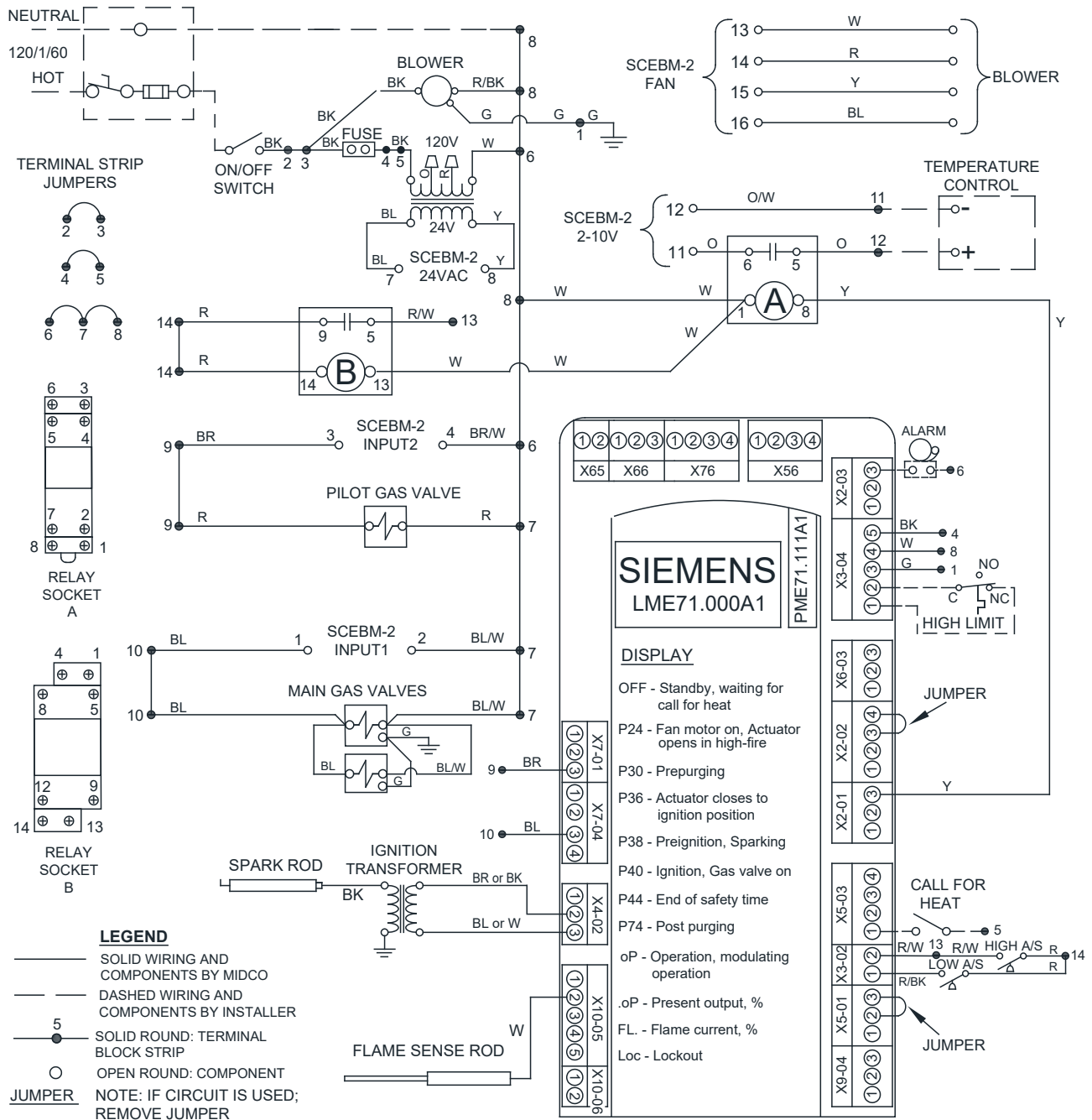


Figure 4B: Wiring Diagram for the VA series models
120V UV Interrupted Pilot Version with Honeywell Flame Safeguard

120V Intermittent Pilot Version with Siemens Flame Safeguard

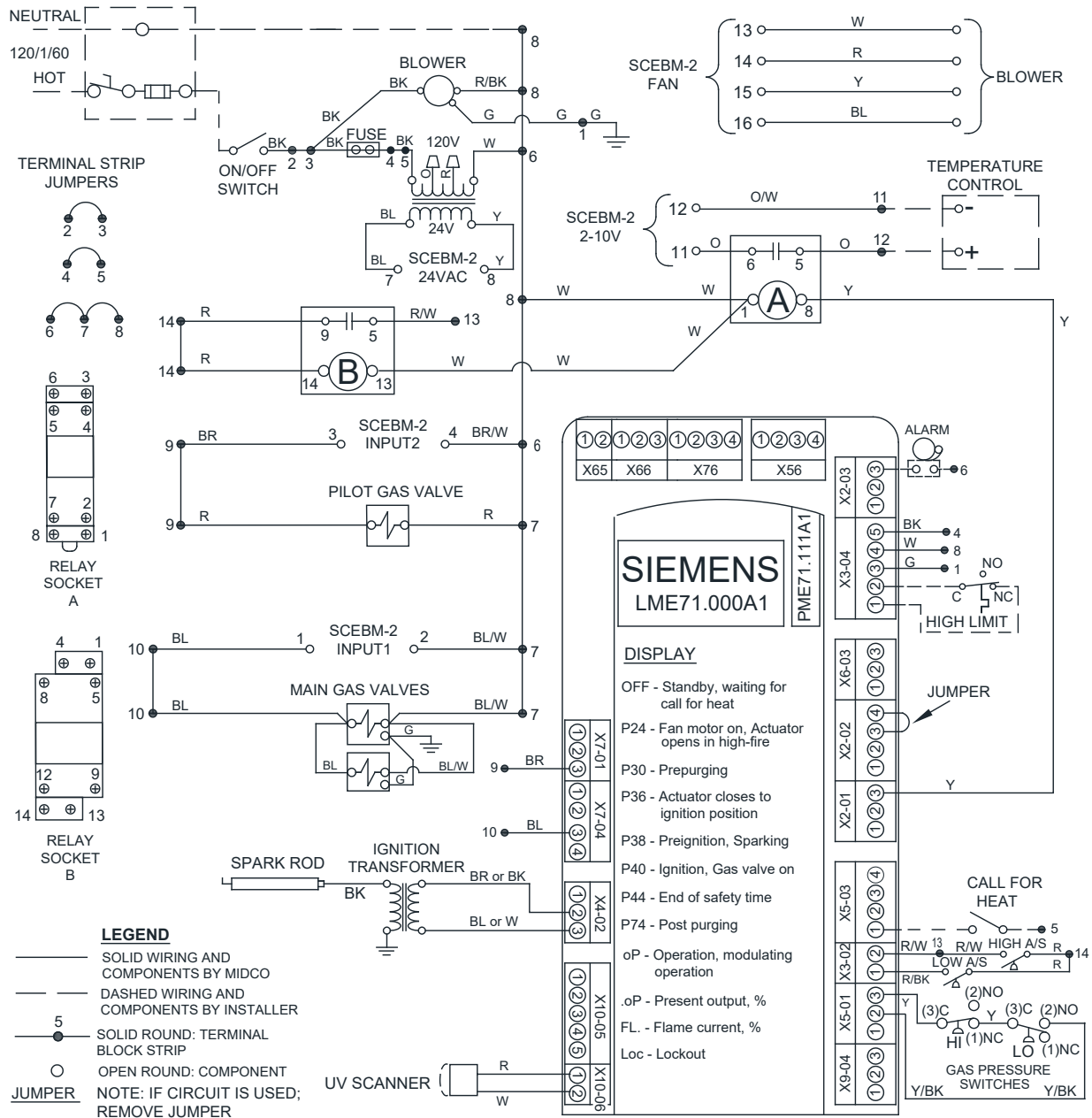


**Figure 4C: Wiring Diagram for the VA series models
120V Intermittent Pilot Version with Siemens Flame Safeguard**

Part 1 Installation

V Electrical Continued C - Wiring Instructions Continued

120V UV Interrupted Pilot Version with Siemens Flame Safeguard



**Figure 4D: Wiring Diagram for the VA series models
120V UV Interrupted Pilot Version with Siemens Flame Safeguard**

24V Intermittent Pilot Version

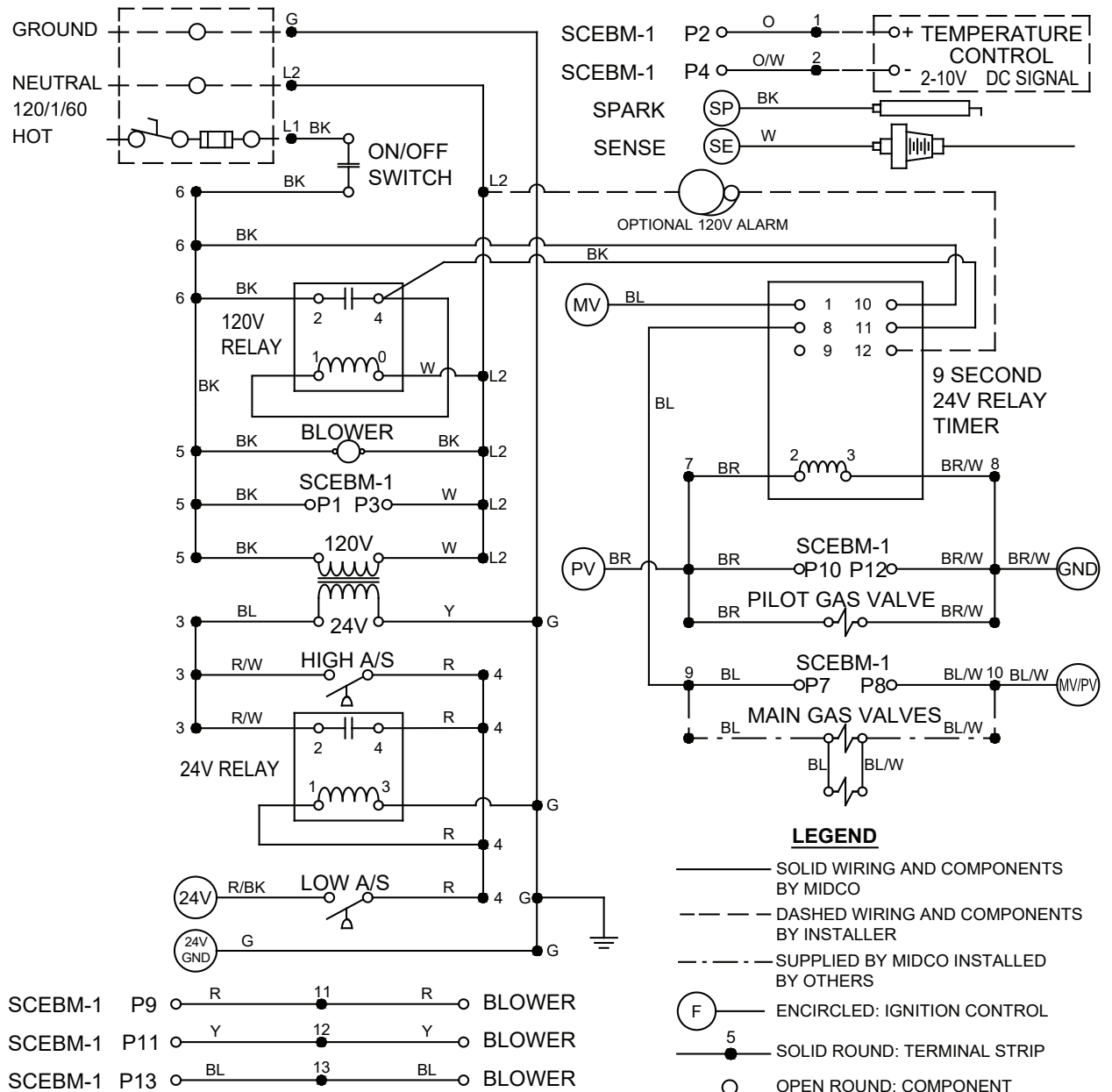


Figure 4E:
Wiring Diagram for the V1 and V2 models - 24V Intermittent Pilot Version

Part 1 Installation

VI Initial Start-up/Adjustment for 120V and 24V

A - Initial Light Up

i - Reset 120V

ii - Reset 24V

B - Pilot Pressure

C - Low Fire Adjustment

⚠ WARNING: Ignition is automatic. Confirm that gas utilization equipment does not contain any accumulated gases. Purge as described in step 3 below.

⚠ CAUTION: Cover plates, guards, and enclosures must be maintained in place at all times except during maintenance and service.

1. Check the burner piping and valves for gas leaks by applying a weak liquid soap solution to unions and joints with the gas supply on. Leakage will be indicated by the appearance of soap bubbles. Locate and correct all gas leaks before proceeding.

⚠ WARNING: DO NOT USE OPEN FLAME.

2. Purging the air from the gas supply line at this step will expedite first light-off.
IMPORTANT: Purge outside the building. Do not purge into the gas utilization equipment.
3. To purge the gas utilization equipment and chimney of any accumulated gases, turn main Manual Gas Shut-off Valve to **OFF**, close Pilot Manual Shut-Off Valve, turn burner power **ON**, and set operating control to **ON** to call for heat. Let the blower run long enough to accomplish four combustion chamber volume air changes, but for not less than two minutes.

⚠ CAUTION: Make sure that the capacity range of the burner is suitable for capacity rating of the gas utilization equipment. Refer to Specification Section page 2

4. **RESET** the 120 volt **RM7895** flame safeguard by pushing its reset button. **RESET** the **LME71** flame safeguard by holding down the info button for one second. See Section VIII.
5. Confirm that both the Main and Pilot Manual Shut-Off Valves are open. Turn main Manual Gas Shut-off Valve to **ON**.
6. Turn operating control to **ON**. After the prepurge is complete, the pilot should ignite. Whenever the burner pilot fails to light during the ignition trial, or if the flame is lost during the burner run and is not reestablished within 15 seconds after the prepurge, the ignition system will shut off the Automatic Safety Shut-off Valves and **LOCK OUT**. For the **120V models RESET** the flame safeguard as described above. If burner still fails to light, turn it off and repeat from step 4 above. For the **24V models RESET** the 24 volt ignition Control Module by setting the operating control to **OFF** for at least 30 seconds. Then if necessary, refer to **Section XII** to isolate the problem.

1. With the burner off, install a barb fitting on the $\frac{1}{8}$ " NPT pressure tap downstream of the pilot regulator.
2. Use flexible tubing to hook up a manometer to the barb fitting.
3. Turn the burner to **ON**. After the 30 second pre-purge, the pilot solenoid valve should open. With the pilot solenoid valve open, adjust the pressure with the pilot regulator based on the type of pilot that is installed. For internal pilots, set the pressure to 3.0" W.C.. For external pilots, set the pressure to 1.5" W.C..

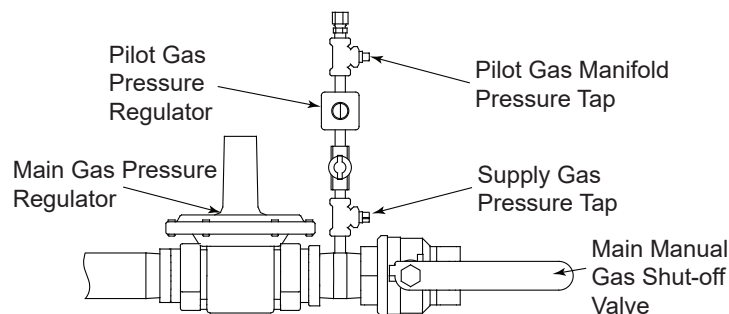


Figure 5 - Pilot Gas Pressure Tap and Regulator

1. Open Manifold Gas Shut-off Valve, see Figure 5.
2. Adjust the input signal to 2.0V DC.
3. 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 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 9 item # 6, needs to be opened (counter-clockwise to open, clockwise to close).

For 120V Burners:

1. Use a manometer to check the manifold pressure near where the valve train attaches to the burner, see Figure 9 - item # 3 page 29.
2. Use another manometer to check the load pressure on the ratio regulator, see Figure 9 - item # 5 page 29.
3. Modulate the burner until the load line pressure is 2.0" W.C. by adjusting the input voltage to the burner.
4. Verify that the manifold pressure is within the values given in Chart 1.
5. If necessary turn the screw on the ratio regulator, see Figures 6A and 6B below, in order to adjust the manifold pressure.

120V Burners

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 3A. - Pressure Load Settings

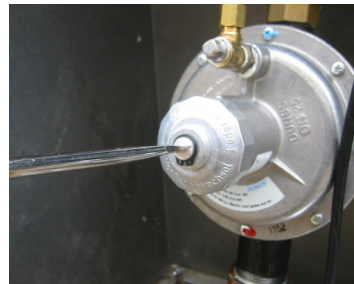


Figure 6A - Dungs FRG Ratio Regulator Adjustment - Figure 6B

Figure 6.

For 24V Burners:

1. Use a manometer to check the inlet pressure on the tee on the upstream side of the pilot regulator, see Figure 10 - item # 12, page 30.
2. Use another manometer to check the main gas regulator outlet pressure on the upstream side of the most upstream solenoid valve, see Figure 10, item # 9, page 30.
3. Turn the burner up to its actual firing rate applying an input signal of 10V DC for maximum firing rate
4. Confirm that the inlet pressure remains between the maximum and minimum values specified on the Burner Rating Label, see Figure 7 below.
5. The main gas regulator outlet pressure should be 1" W.C. higher than the minimum pressure required figure on the Burner Rating Label see Figure 7 below.
 - a. When "Pressure Required" is 7.0" set the main gas regulator outlet pressure at 8.0"
 - b. When "Pressure Required" is 10.0", set the main gas regulator outlet pressure at 11.0"

UNIPOWER® VA Gas Burner

MODEL:

SERIAL NO.:

BILL OF MATERIAL:

➔ **MAXIMUM INLET PRESSURE:** 14" W.C.

MINIMUM FIRING RATE: BTU/HR

FIRING RATE: BTU/HR

PRESSURE REQUIRED: 7" W.C.

MANIFOLD PRESSURE: W.C.

MAX. CAPACITY: BTU/HR

PRESSURE REQUIRED: 10" W.C.

MANIFOLD PRESSURE: W.C.



Midco
INTERNATIONAL
CHICAGO, IL 60646



NAT



LISTED
No. PL-100, 058

CONTROLS

MOTOR

VOLTS

AMPS

HZ

PH

HP

2121-07

Figure 7 Burner Rating Label

VI Initial Start-up/Adjustment for 120V and 24V Continued

D Verify the Ratio Regulator Adjustment i - Verify 120V

ii - Verify 24V

Part 1 Installation

VI Initial Start-up/Adjustment for 120V and 24V Continued

D Verify the Ratio Regulator Adjustment Continued

6. Use a manometer to check the manifold pressure near where the valve train attaches to the burner, see Figure 10 - item # 3 page 30.
7. Use another manometer to check the load pressure on the ratio regulator, see Figure 10 - item # 5 page 30.
8. Modulate the burner until the load line pressure is 2.0" W.C. by adjusting the input voltage to the burner.
9. Verify that the manifold pressure is within the values given in Chart 2 page 15.
10. If necessary turn the screw on the ratio regulator, see Figure 6A & 6B below, in order to adjust the manifold pressure.

24V Burners

Model	Pressure
V1- V2	0.8-0.9" W.C.

Table 3B. - Pressure Load Settings

E - High Fire Adjustment

i - Adjustment 120V

1. With the burner off, install a barb fitting on the 1/8" NPT pressure tap downstream of the ratio regulator. See Figure 9 item #3 (page 20) for location.
2. Use flexible tubing to hook-up a manometer to the barb fitting.
3. Turn the burner on and adjust the temperature controller to its maximum setting. Measure the manifold pressure and compare it to Chart 1 for 120V burners and Chart 2 & 3 for 24V burners.

For 120V Burner Models

4. Adjust the high fire by turning the span knob on the **120V burner SCEBM-2 board**. Measure the manifold pressure and refer to the **Chart 1 for the 120V burner** to match the manifold pressure to the desired firing rate.

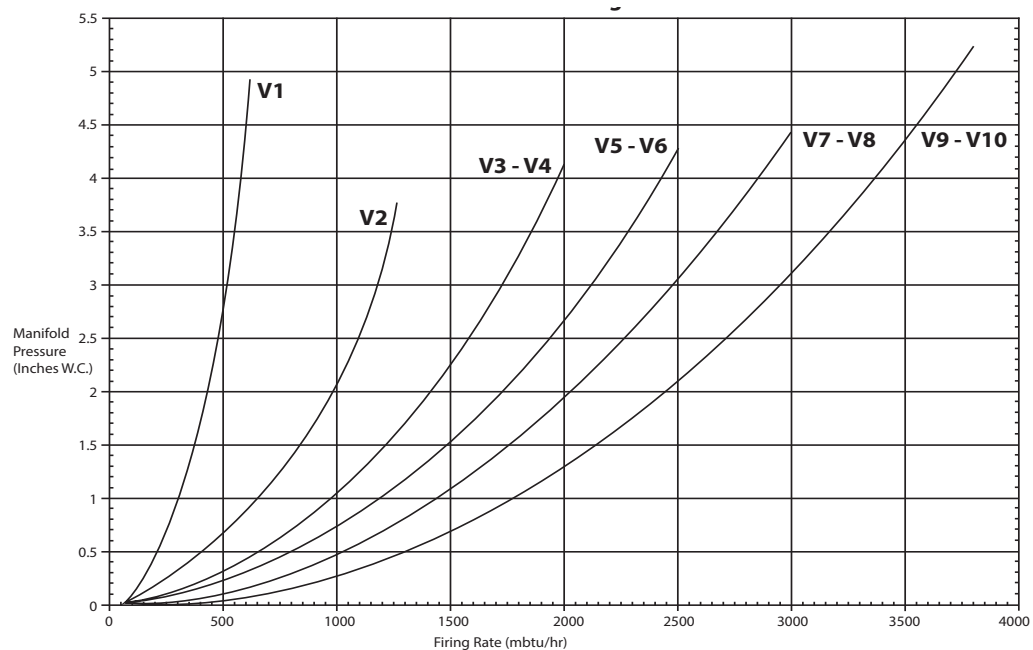


Chart 1 - Manifold Pressure vs. Firing Rate - VA 120V Burners

For 24V Burner Models

Adjust the high fire by turning the span knob on the **24V burner SCEBM-1 board**. Measure the manifold pressure and refer to the **Chart 2 and 3 for the 24V burner** to match the manifold pressure to the desired firing rate.

Chart 2
Manifold Pressure vs. Firing Rate
24 V models V1 and V2 Burners

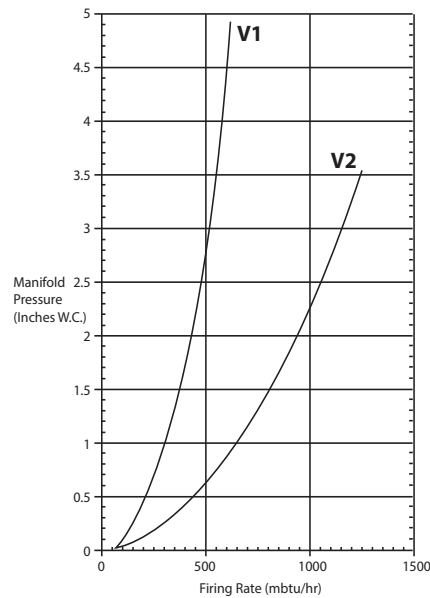
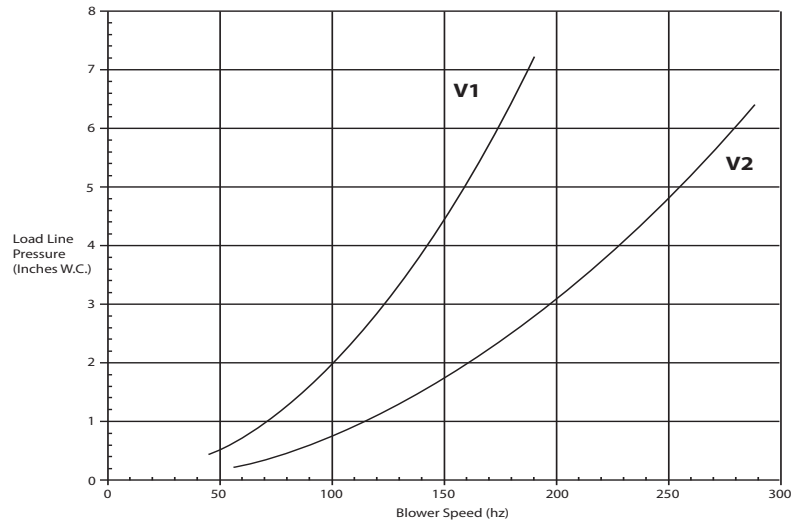


Chart 3
Load Line Pressure vs. Blower Speed
24V models V1 and V2 Burners



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.
- Verify that the manifold pressure is the same as marked on the Burner Rating Label(s) for the actual firing rate.

VI Initial Start-up/Adjustment for 120V and 24V Continued

E - High Fire Adjustment Continued

ii - Adjustment 24V

Part 1 Installation

VI Initial Start-up/Adjustment Continued

F - Excess Air Adjustment

If the burner is operated at any firing rate lower than the maximum capacity, there is a possibility to have too much excess air. See Figure 8.

1. To decrease excess air, loosen the nut on the air orifice plate and slide it inward.
2. To increase excess air, slide it outward.

The VA series burner is designed to operate as low as 1% O₂ (5% excess air). It is not recommended to adjust the excess air without using a combustion analyzer.

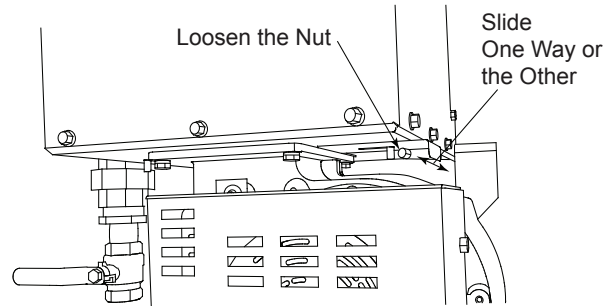


Figure 8 - Excess Air Adjustment

G - Final Checks

1. Check the operation of the burner; start and stop it several times with the operating control.
2. With the burner running, check the operation of all limit and associated controls.
3. Perform the following final adjustments for combustion and flue gas temperature. Take the flue gas samples and temperature immediately upstream of the draft control. Generally, the flue gas temperature should be above 325°F but not exceeding 550°F. Excessive flue gas temperatures will result in low efficiencies. Low flue gas temperature may cause excessive condensation. Reset gas input, if necessary, to adjust stack temperature.
4. Check the draft control, if equipped, to make sure there is no spillage of flue products into the room.
5. Fill out the installation adjustment data tag and affix to the burner or gas utilization equipment.

NOTE: For subsequent normal starting and shut off procedure, refer to CONSUMER INSTRUCTIONS, located in Section XX of this manual, or to the instruction plate mounted on the burner.

VII Check Emissions 24V Burners

- Use a combustion analyzer to confirm that the high fire oxygen (O₂) level is between 3.0 to 5.0% and the carbon dioxide (CO₂) level is between 8.5 to 10.0%. The carbon monoxide (CO) should be less than 100 ppm corrected to 3% O₂ 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% O₂.

VIII Shut Downs 24V Burners

- Remove call for heat (open heat enable contact).
- Close main supply gas valve, see Figure 3 - item # 2 page 4.
- 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.

IX Normal Operations 24V Burners

- 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

Part 2 - Service - SCEBM-2 Module

⚠ WARNING: Explosion hazard. Do not use any electronic device if it gets wet. It can malfunction and cause serious injury or death. Replace any device that has been wet.

⚠ DANGER: Do not tamper with the unit or controls. If trouble occurs contact the installing contractor, service agency, or fuel supplier. See front cover.

⚠ DANGER: Be sure that the main and pilot manual Shut-Off Valves are closed and the burner power supply is turned off before removing any parts for service.

The air-fuel modulation is achieved through the relationship of the supplied air pressure and the output gas pressure. The motor used in this burner is variable speed. By using this air pressure relation in the blower, output gas pressure can be varied relative to the air pressure through a ratio regulator.

Refer to Figure 9- (see page 29) which shows air pressure pickup at the blower outlet. The air sensing tube is connected to the ratio regulator. When the blower is modulating to a certain speed, the pressure in the housing causes the ratio regulator to open. It is a linear relationship between the air pressure and the gas pressure. The temperature control or operating control sends a heat input signal (2-10 VDC) to the blower; as a result, the blower pressure causes the gas to modulate through the ratio regulator.

*X Modulation
Methodology*

Part 2 Service - SCEBM-2 Module 120V

XI Burner Sequence of Operation for 120V Burners

A Intermittent Sequence Version 120V Burners

When there is a call for heat, 120V is supplied to the burner; the burner will go through its pre-purging sequence. The blower will accelerate to the highest speed and at that point it will stay at the highest speed for 30 seconds. After 30 seconds, the blower will decelerate to the lowest speed. At the same time the ignition controller will initiate the ignition of the pilot. Once the pilot flame is established, the main flame will turn on, and at the same time the heat input signal can now modulate the burner. Refer to Chart 4 and Chart 5 for the sequence of operation.

For 120V Models: Intermittent

Call for heat/Burner is Energized

Time Line in Seconds

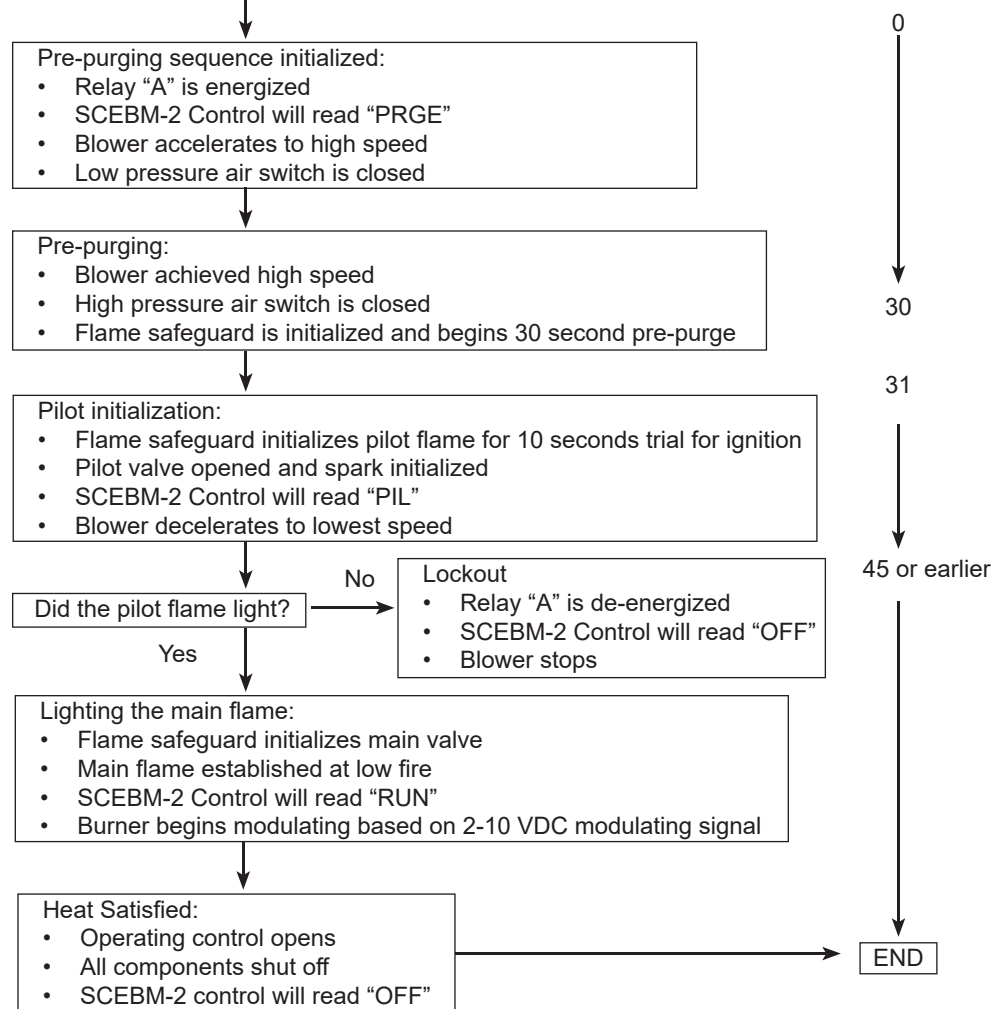


Chart 4 - Intermittent 120-V Sequence of Operation

XI Burner Sequence of Operation for 120V Burners Continued

B Interrupted Sequence Version 120V Burners

For 120V Models: Interrupted

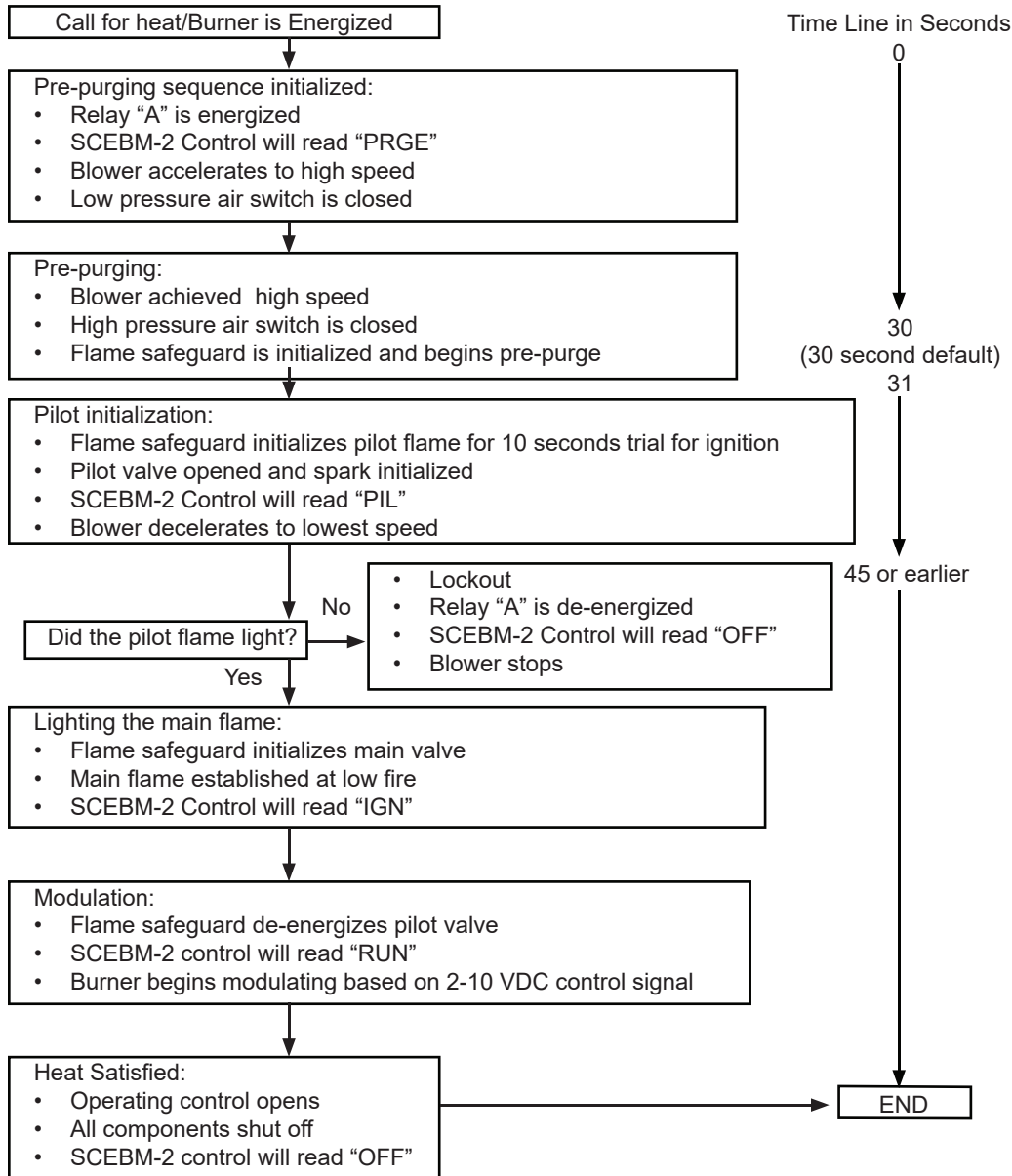


Chart 5 - Interrupted 120V Sequence of Operation

XII Burner Sequence of Operation for 24V Burners

For 24V Models: Intermittent

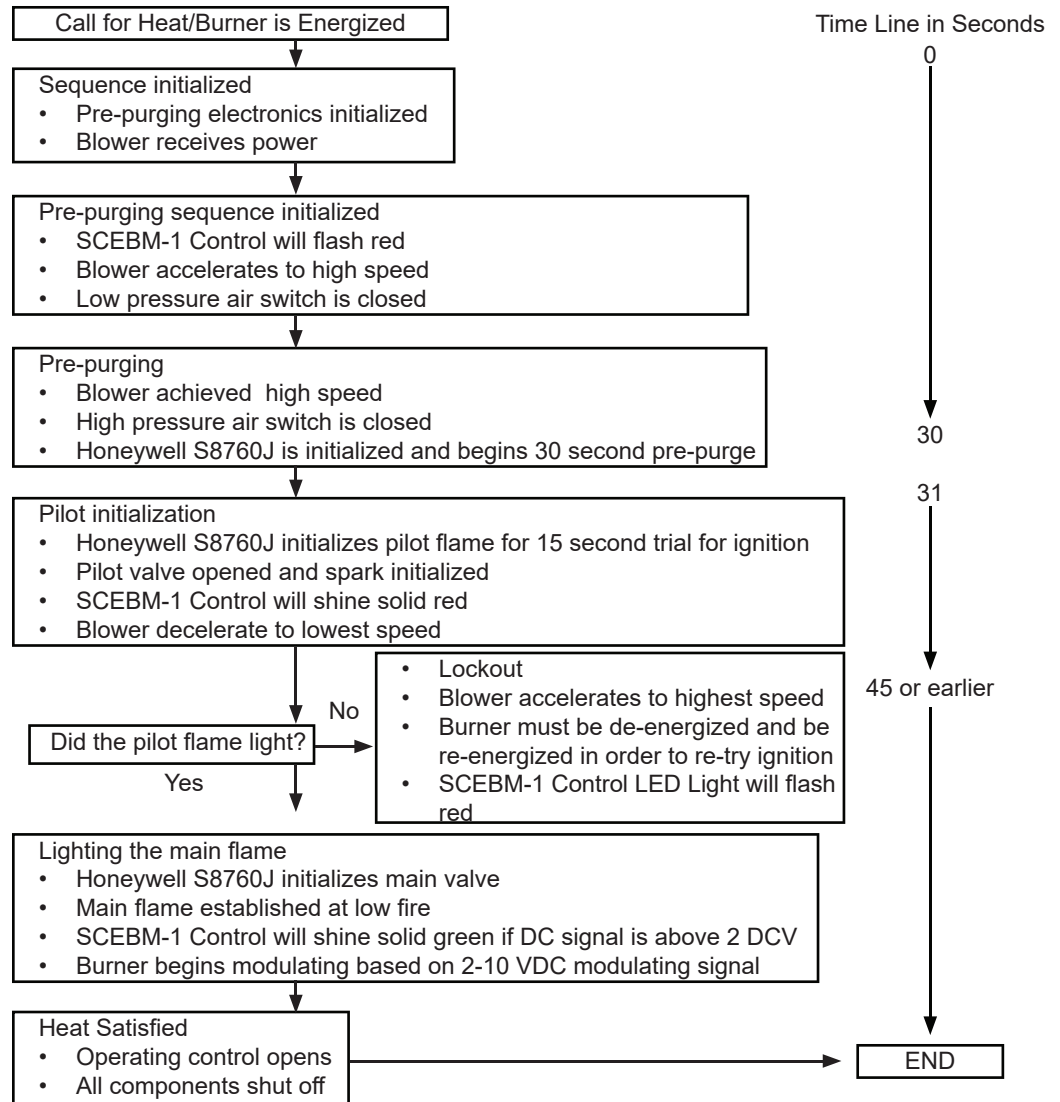


Chart 6 - 24V Sequence of Operation

The SCEBM-2 Module (for 120V Burners) 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. 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.

Application	Inputs		Display	Relay	PWM Output
	Pilot	Main			
Intermittent Pilot	Off	Off	PRGE	Open	100%
	On	Off	PIL	Closed	Min
	On	On	RUN	Open	Modulate
	Off	On	ERR	Open	Min
Interrupted Pilot	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 4 - SCEBM-2 Modulating Settings for 120V Burners

Part 2 Service - SCEBM-2 Module 120V Burner

XIII SCEBM-2 Module for 120V Burners Continued

A Accessing the Program Menu

- Refer to Chart 7 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

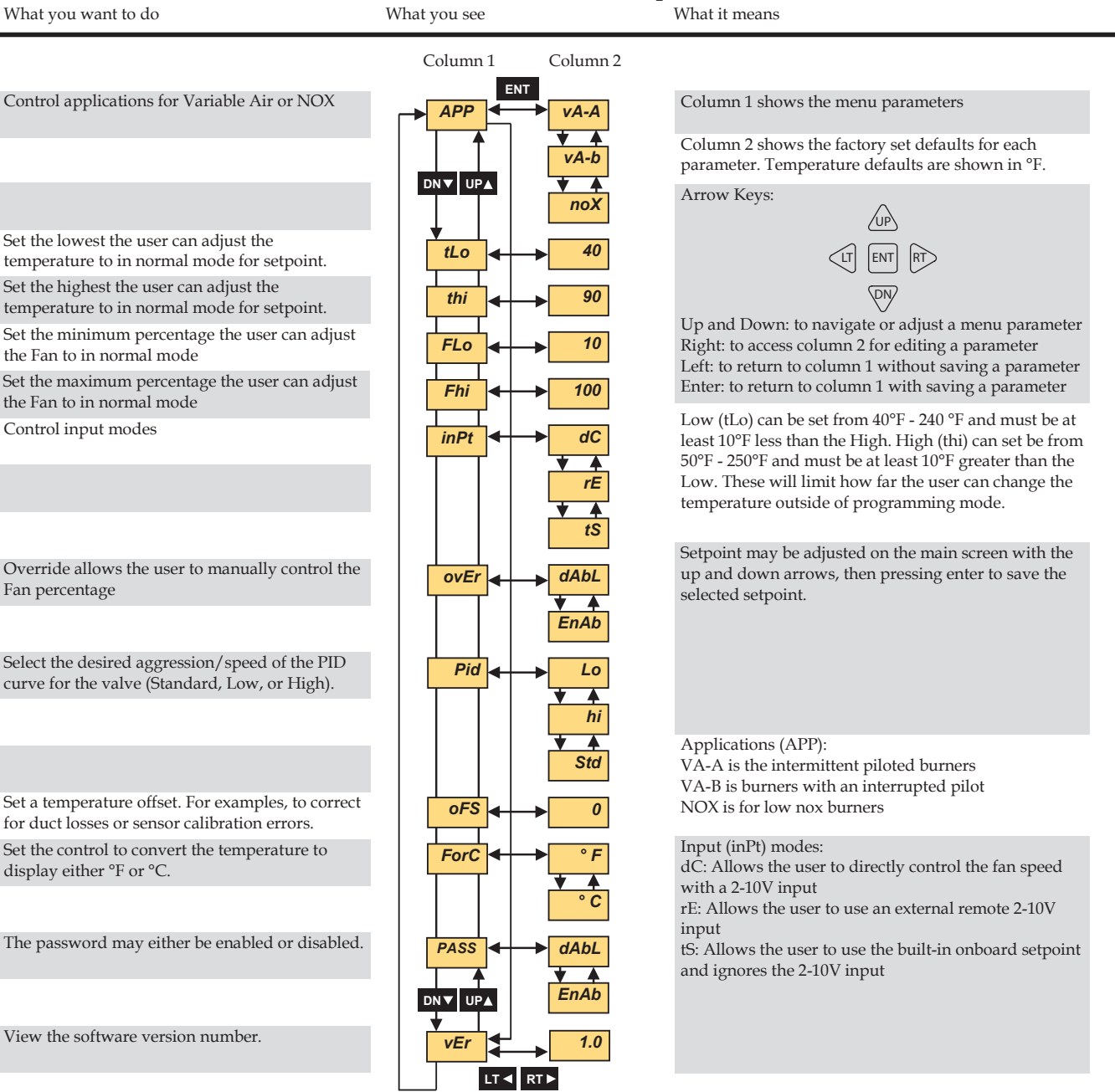


Chart 7 - Menu Map - 120V Burners

- 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.
- 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. **NOTE:** These parameters only have an effect on the operation of the burner when the burner is operated by a temperature control.
- 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. This 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. 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.
 - d. 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.
- 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. This 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 a temperature control.
- oFS
 - a. This 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 by 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. This parameter enables or disables 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.

XIII **SCEBM-2**
Module
120V Burners
Continued

B **Setting the**
Parameters

Part 2 Service - and Trouble Shooting 120V Burners

XIV *Special Equipment (OEM Versions)*

Special equipment, either factory or contractor installed, may cause variation in the procedures and descriptions given in this manual.

Consult the OEM's manual to identify the differences in the information.

XV *Canadian Specifications*

The major difference for the cUL version of the VA Series is the French / English specification plate and the firing valve for the pilot line.

Trouble Shooting for 120V Burners

XVI *Trouble Shooting for 120V Burners*

Make sure the thermostat and operating controls are calling for heat.

⚠ CAUTION: If a test indicates an electrical component may be defective, before replacing it make sure that its associated wiring is not at fault.

ELECTRICAL AND FLAME CHECKS MUST BE MADE IN THE ORDER LISTED BELOW.

A *Motor Will Not Run or Motor Runs in Repeated Cycles*

A. MOTOR WILL NOT RUN

1. Confirm 120V between strip terminals: ...
for **Honeywell control** - 10 and 6;
for **Siemens control** - 3 and 6;
a. Verify the circuit polarity and electrical ground between strip terminal:
for **Honeywell control** - 10 and burner Ground;
for **Siemens control** - 1 and burner Ground.
b. No voltage: open circuit in operating controls.
c. Voltage present: motor is defective.
2. Check that relay "A" is energized.
3. Check that there is a 2-10 VDC control signal.

B *Motor Runs Continuously, But no Flame*

B. MOTOR RUNS CONTINUOUSLY, PILOT WILL NOT LIGHT

1. Confirm that ALL Main Manual Shut-Off Valves are Open.
2. After pre-purge, if the pilot flame is not proven within the pilot flame re-establishing period, or if the proof of flame is lost during the burner run and the pilot is not re-established after the pre-purge, the Ignition Control Module will lock out. RESET the 120 Volt flame safeguard.
3. Clogged pilot orifice.
4. Pilot regulator mis-adjusted or defective.
5. Defective spark electrode.
6. Defective spark generator.
7. Defective spark wire.
8. Wrong pilot orifice.
9. Defective pilot valve.
10. Defective blower air switch.
11. Step down transformer is defective (if applicable).
12. Insufficient pilot flame sensing signal.

C *Pilot Lights, No Main Flame*

C. PILOT LIGHTS, NO MAIN FLAME

1. Poor pilot flame adjustment.
2. Mis-adjusted main gas.
3. Defective flame sensing rod or wire.
4. Flame sensing rod mis-located.
5. Pilot regulator vent clogged.
6. Defective main gas valve.
7. Low gas pressure.
8. Insufficient pilot flame signal.

D *Direct Spark*

D. BURNER DOES NOT LIGHT

1. Refer to page 25 for Siemens Lock/Error Codes

Part 2 Service - Trouble Shooting for 120V Burners

XVI Trouble Shooting for 120V Burners Continued

SIEMENS CONTROL - LOCK CODES / ERROR

Error code		Clear text	Possible cause
AZL2...	7-segment		
Loc: 2	Loc 2	No establishment of flame at end of safety time	- Faulty or soiled fuel valves - Faulty or soiled flame detector - Poor adjustment of burner, no fuel - Faulty ignition equipment
Loc: 3	Loc 3	Air pressure faulty (air pressure switch welded in no-load position, decrease to specified time) (air pressure switch flame-on response time)	Air pressure switch faulty - Loss of air pressure signal after specified time - Air pressure switch has welded in no-load position
Loc: 4	Loc 4	Extraneous light	Extraneous light during burner startup
Loc: 5	Loc 5	Air pressure faulty, air pressure switch welded in working position	Time supervision air pressure switch - Air pressure switch has welded in working position
Loc: 7	Loc 7	Loss of flame	Too many losses of flame during operation (Limitation of repetitions) - Faulty or soiled fuel valves - Faulty or soiled flame detector - Poor adjustment of burner
Loc: 10	Loc 10	Error not relatable (application) Internal error	Wiring error or internal error, output contacts, other faults
Loc: 12	Loc 12	Valve proving	Fuel valve 1 leak
Loc: 13	Loc 13	Valve proving	Fuel valve 2 leak
Loc: 14	Loc 14	POC error	Error valve closure control POC
Loc: 22	Loc 22	Safety loop open	- Gas pressure switch-max open - Safety limit thermostat cut out
Loc: 60	Loc: 60	Analog power source 4...20 mA, I <4 mA	Wire breakage
Loc: 83	Loc: 83	Faulty PWM fan	- PWM fan does not reach the target speed within the preset period of time, or - After reaching the target speed, the PWM fan leaves the tolerance band again (parameter 650) for a time exceeding the tolerance time speed deviation (parameter 660)
Loc: 138	Loc 138	Restore process successful	Restore process successful
Loc: 139	Loc 139	No program module detected	No program module plugged in
Loc: 167	Loc 167	Manual locking	Manual locking
Loc: 206	Loc 206	AZL2... incompatible	Use the latest version
Loc: 225	Loc 225	Faulty PWM fan	- Fan speed dropped the minimum prepurge PWM (parameter 675.00) after reaching the prepurge speed, or - After reaching the ignition load speed, the maximum ignition load PWM (parameter 675.01) was exceeded
Loc: 226	Loc: 226	Faulty PWM fan	Parameterization error: - Speed low-fire > speed high-fire, or - Low-fire = 0 rpm, or - Maximum speed = 0 rpm
Loc: 227	Loc 227	Faulty PWM fan	One or several parameters violate the minimum/maximum limit

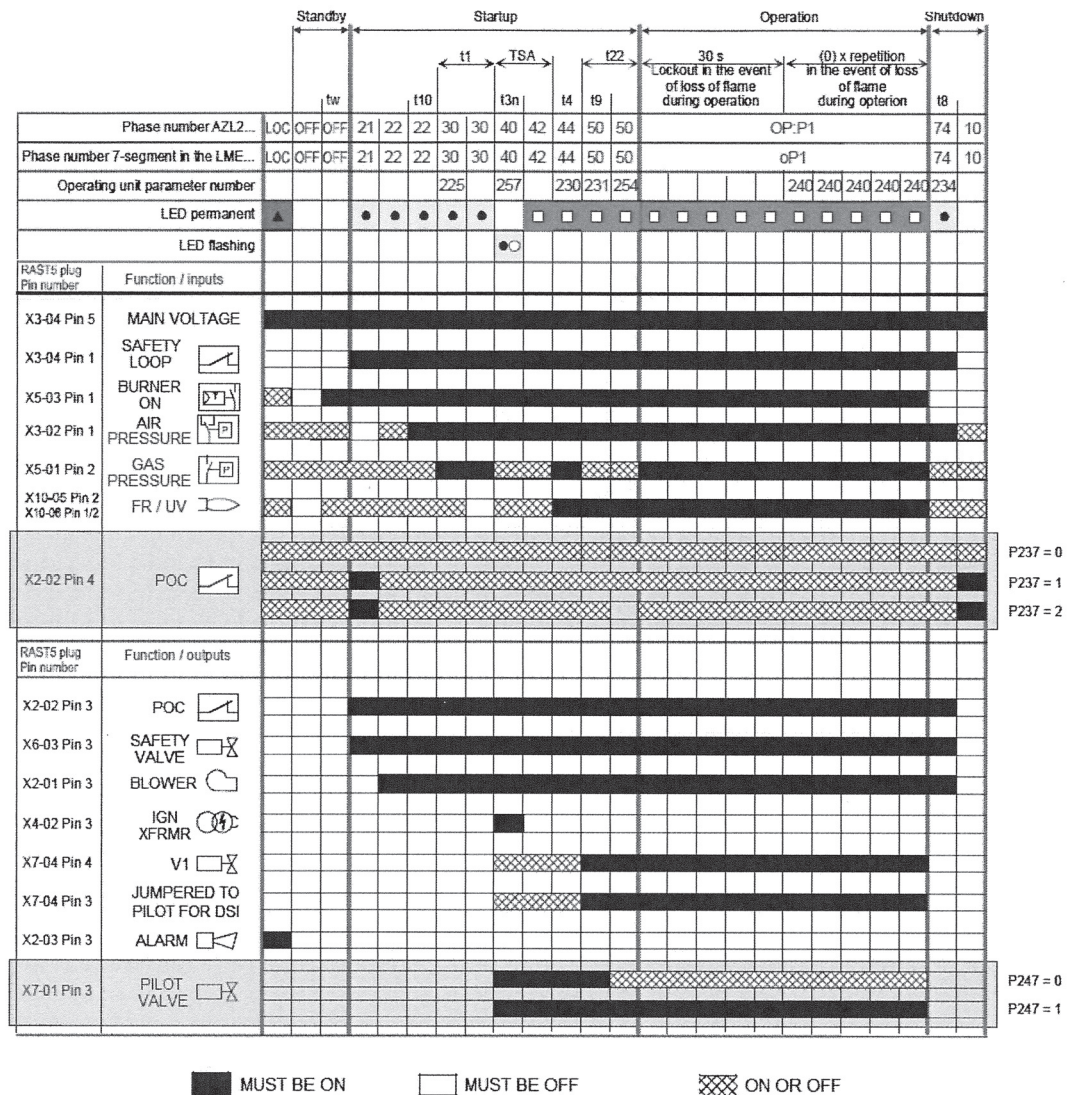
D Direct Spark - Siemens Control Lock/ Error Codes Continued

Chart 8 - Siemens Control - Lock Codes - Error Code List - 120V Burners

Part 2 Service - Trouble Shooting for 120V Burners

XVI Trouble Shooting for 120V Burners Continued

E Siemens Control Sequence of Operation for 120V Burners



DISPLAY

1. OFF - Standby, waiting for call for heat
2. P21 - Test; combustion air switch open, POC closed
3. P22 - Combustion air blower on, Test; combustion air switch closed
4. P30 - Purge (parameter 225), Test; gas pressure switches closed
5. P40 - Trial for ignition (parameter 257)
6. P42 - Flame detection (spark off, pilot stands alone)
7. P44 - Pilot stabilize time (parameter 230)
8. P50 - Main and pilot overlap time (parameter 231)
9. oP1 - Operate, main on, pilot off

Chart 9 - Siemens Control - Sequence of Operation - 120V Burners

Part 2 Service - Trouble Shooting - 120V Burners

NOTE: For meaning of the error and diagnostic codes, see Error code list in Chart 8



Note:

This display is only possible in operating mode or standby!

 +		 Press for display of the flame signal amplifier. Signal lamp blinks green. Display shows FL.1 .
 + 1...3 s		 When pressing (1...3 seconds), the flame signal current is displayed. Signal lamp blinks green. Example: 11 .
 + >3 s		 When pressing (>3 seconds), the point after the number begins to blink. When the button is released, the value is displayed for 2 minutes. Signal lamp blinks green. Then, the normal display appears. Display: Point . blinks, value 11 does not.

14.4.3 Reset

 Info < >1 s		 For reset the unit, press for 1...3 seconds. When the button is released, OFF is displayed. The basic unit is reset.
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Chart 10 - Siemens Control - Display of Flame Current - 120V Burners

XVI *Trouble Shooting for 120V Burners Continued*

F *Siemens Control Display of Flame Current for 120V Burners*

Part 2 Service - Trouble Shooting for 24V Burners

XVII Trouble Chart for 24V Burners

For 24V Burners:

TROUBLE CHART

Make sure the thermostat and operating controls are calling for heat.

⚠ CAUTION: If a test indicates an electrical component may be defective, before replacing it, make sure that its associated wiring is not at fault.

ELECTRICAL AND FLAME CHECKS MUST BE MADE IN THE ORDER LISTED BELOW.

A Motor Will Not Run or Motor Runs in Repeated Cycles

A. MOTOR WILL NOT RUN

1. Confirm 120V between strip terminals L1 and L2 and verify the circuit polarity and electrical ground between strip terminal L1 and burner Ground.
2. Check for 120V between strip terminals L1 and L2.
 - a. No voltage, open circuit in operating controls.
 - b. Voltage present, motor is defective.

B Motor Runs Continuously, But no Flame

B. MOTOR RUNS CONTINUOUSLY, PILOT WILL NOT LIGHT

1. Confirm that ALL Main Manual Shut-Off Valves are open.
2. After the pre-purge, if the pilot flame is not proven within the pilot flame establishing period, or if the proof of flame is lost during the burner run and the pilot is not re-established after the pre-purge, the Ignition Control Module will lock out. RESET the 24 volt ignition Control Module by setting the operating control to OFF or the thermostat below room temperature for at least 30 seconds.
3. Clogged pilot orifice.
4. Pilot regulator mis-adjusted or defective.
5. Defective spark electrode, Ignition Control Module or Transformer for 120V.
6. Defective spark wire.
7. Wrong pilot orifice.
8. Defective pilot valve.
9. Defective blower air switch.
10. Step down transformer is defective, (if applicable).
11. Insufficient pilot flame sensing signal.

C Pilot Lights, No Main Flame

C. PILOT LIGHTS, NO MAIN FLAME

1. Poor pilot flame adjustment.
 2. Defective flame sensing rod or wire.
 3. Flame sensing rod mis-located.
 4. Pilot regulator defective.
 5. Defective Ignition Control Module.
 6. Defective main gas valve.
 7. Low gas pressure.
 8. Grossly mis-adjusted main gas and air mixture.
 9. Insufficient pilot flame sensing signal.
-

This technical drawing shows a side view of a gas control valve assembly. The main body is a rectangular box with a control panel on the right side. The panel features a series of vertical slots and a small circular indicator. To the left of the main body is a gas inlet manifold with two valves, labeled 8A and 8B. A gas outlet pipe, labeled 10, extends from the bottom of the assembly. On the right side, there is a gas control valve, labeled 11, with a gas inlet pipe, labeled 12, and a gas outlet pipe, labeled 13. The assembly is mounted on a base plate, labeled 14. The callouts are as follows: 1A, 1B, and 1C point to the top of the main body; 2 points to the front panel; 3 points to the gas inlet manifold; 4 points to the gas inlet valve; 5 points to the gas inlet pipe; 6 points to the gas inlet valve handle; 7 points to the gas inlet valve body; 8A and 8B point to the gas inlet valves; 9A and 9B point to the gas inlet valve handles; 10 points to the gas outlet pipe; 11 points to the gas control valve; 12 points to the gas inlet pipe; 13 points to the gas outlet pipe; 14 points to the base plate; 15 points to the control panel; 16A and 16B point to the gas control valve handle.

Item #	Part #	Descriptions	Item #	Part #	Descriptions
1A	2120-12	Standard Honeywell Control Box - V7 to V10	8A	8402-06	Main Gas Solenoid Valve 1 - Honeywell
1B	2120-16	Siemens Control Box - V1 to V6	8B	8418-12	Main Gas Solenoid Valve 1 - ASCO
1C	2120-17	Siemens Control Box - V7 to V10	9A	8402-06	Main Gas Solenoid Valve 2 - Honeywell
2	2101-01	Burner Housing - V2	9B	8418-12	Main Gas Solenoid Valve 2 - ASCO
3	N/A	Main Gas Manifold Pressure Tap	10	8416-05	Main Gas Regulator
4	N/A	Manual Firing Valve	11	8404-67	Main Manual Gas Shut-off Valve
5	N/A	Air Pressure Tap	12	N/A	Supply Gas Pressure Tap
6	8416-14	Low Fire By Pass	13	8400-00	Pilot Gas Regulator
7	8416-04	Dungs FRG Ratio Regulator	14	N/A	Pilot Gas Manifold Pressure Tap
			15	2117-10	Variable Speed Blower
			16A	8402-00	Pilot Solenoid Valve
			16B	8402-50	Pilot Solenoid Valve

Part 2 Service - Burner Parts Locations - 24V Burners

XVIII Burner Part Locations for 24V Burners

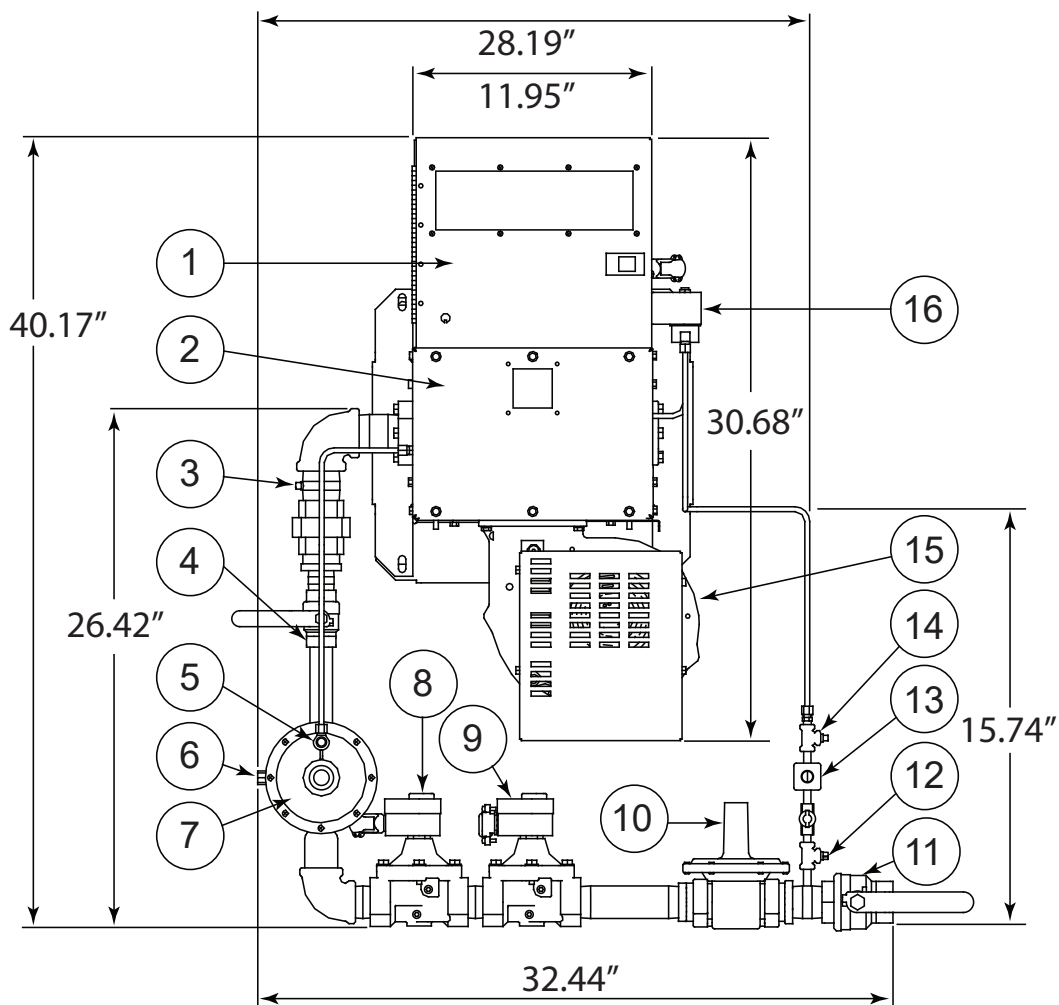


Figure 10 - Standard V2 Burner with Valve Train - 24V Burners

Item #	Part #	Descriptions
1.	2120-01	Control Box
2.	2101-01	Burner Housing
3.	N/A	Main Gas Manifold Pressure Tap
4.	N/A	Manual Firing Valve
5.	N/A	Air Pressure Tap
6.	8416-14	Low Fire By Pass
7.	8416-04	Dungs FRG Ratio Regulator
8.	8402-42	Main Gas Solenoid Valve 1
9.	8402-42	Main Gas Solenoid Valve 2
10.	8416-05	Main Gas Regulator
11.	8404-67	Main Manual Gas Shut-off Valve
12.	N/A	Supply Gas Pressure Tap
13.	8400-00	Pilot Gas Regulator
14.	N/A	Pilot Gas Manifold Pressure Tap
15.	2117-10	Variable Speed Blower
16.	8402-37	Pilot Solenoid Valve

XVIII Burner Part Locations for 120V Burners Continued

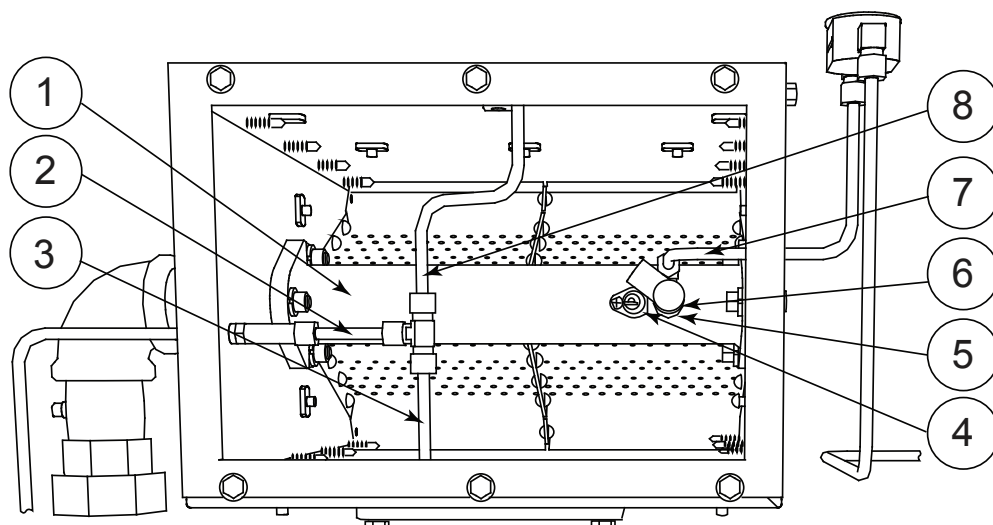


Figure 11A - V2 - Inside View of Burner Housing Rear - 120V Burner

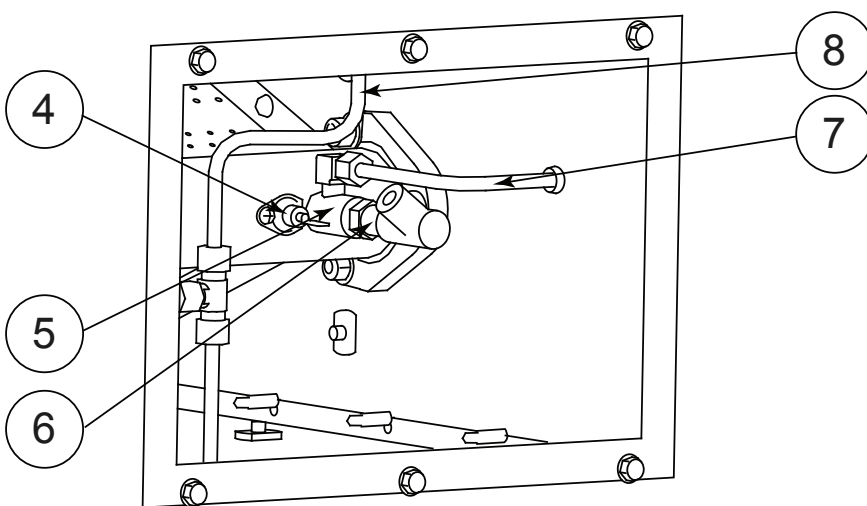


Figure 11B - Detail - V2 - Inside View of Burner Housing Rear - 120V Burner

Item #	Part #	Descriptions
1	N/A	Aluminum Manifold Casting
2	8699-30	Air Pressure Tubing to Dungs FRG
3	8699-30	Air Pressure Pickup Tube
4	8433-24	Spark Rod
5	2112-01	Pilot
6	8433-25	Flame Rod
7	8699-30	Pilot Gas Line
8	8699-30	Air Pressure Tubing to Air Switch
Not Shown		
	8456-07	High Voltage Spark Wire
	8484-24	Flame Sensing Wire

Part 2 Service - Burner Parts Locations - 24V Burners

XVIII Burner Part Locations for 24V Burners Continued

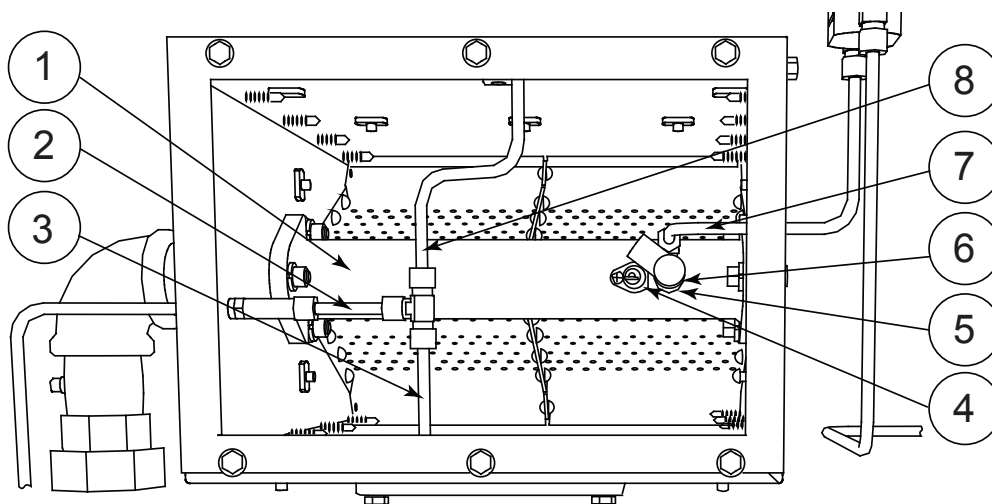


Figure 12A - Inside View of Burner Housing Rear - 24V Burners

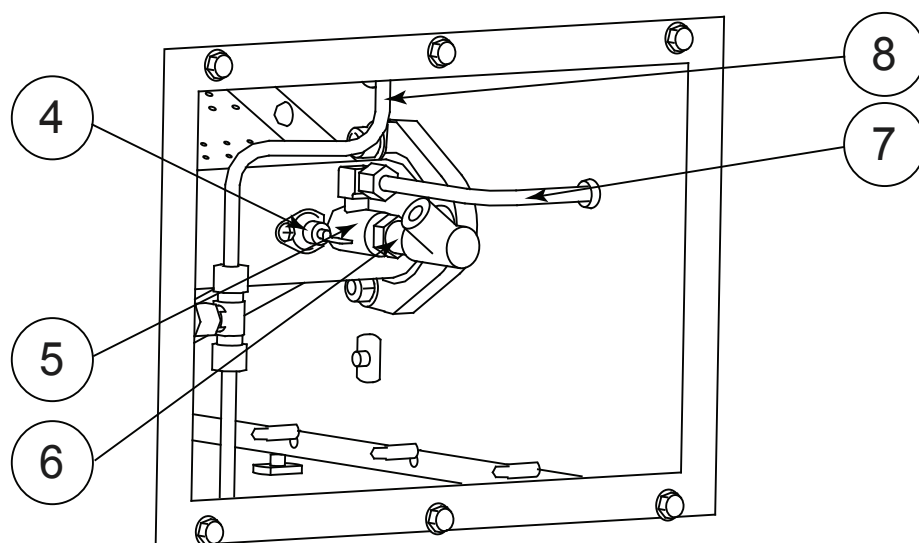


Figure 12B - Detail - Inside View of Burner Housing Rear - 24V Burners

Item #	Part #	Descriptions
1.	N/A	Aluminum Manifold Burner Casting
2.	8699-30	Air Pressure Tubing to Dungs FRG
3.	8699-30	Air Pressure Pickup Tube
4.	8433-24	Spark Rod
5.	2112-01	Pilot
6.	8433-25	Flame Rod
7.	8699-30	Pilot Gas Line
8.	8699-30	Air Pressure Tubing to Air Switch

Not Shown

8456-07	High Voltage Spark Wire
8484-24	Flame Sensing Wire

XVIII Burner Part Locations for 120V Burners Continued

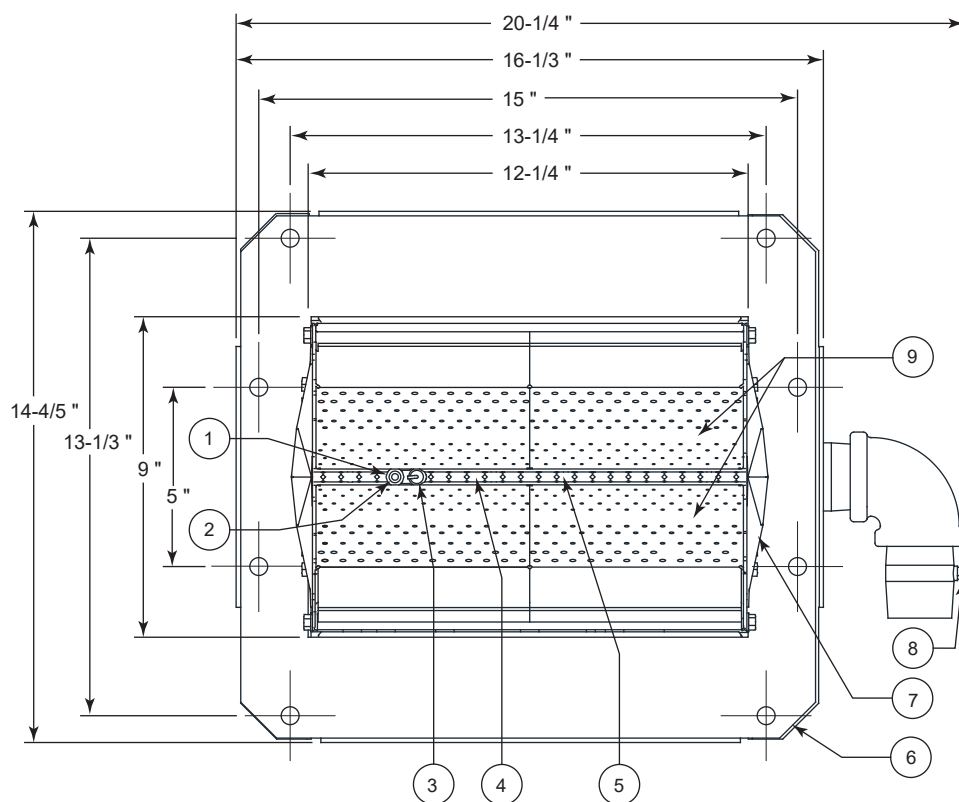


Figure 13 - Internal View of Typical V2 Burner Housing Front - Internal Pilot - 120V Burners

Item #	Part #	Descriptions
1	2112-01	Pilot
2	8433-25	Flame Rod
3	8433-24	Spark Rod
4	N/A	Burner Gas Manifold
5	N/A	Gas Orifices
6	2122-10	High Temperature Flange Gasket
7	2113-50	Side Plate
8	N/A	Main Gas Manifold Pressure Tap
9	2110-00	Baffle

Part 2 Service - Burner Parts Locations - 24V Burners

XVIII Burner Part Locations for 24V Burners Continued

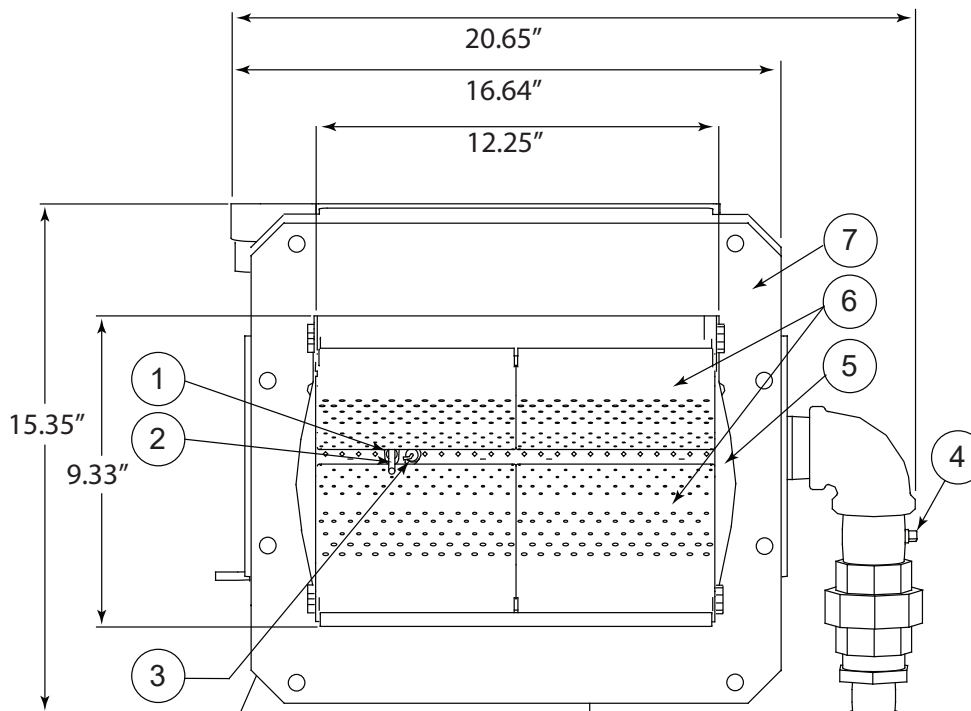


Figure 14 - Internal View of Burner Housing Front - 24V Burner

Item #	Part #	Descriptions
1.	2112-01	Pilot
2.	8433-25	Flame Rod
3.	8433-24	Spark Rod
4.	N/A	Main Gas Manifold Pressure Tap
5.	2113-50	Side Plate
6.	2110-00	Baffle
7.	2122-10	High Temperature Flange Gasket

XVIII Burner Part Locations for 120V Burners Continued

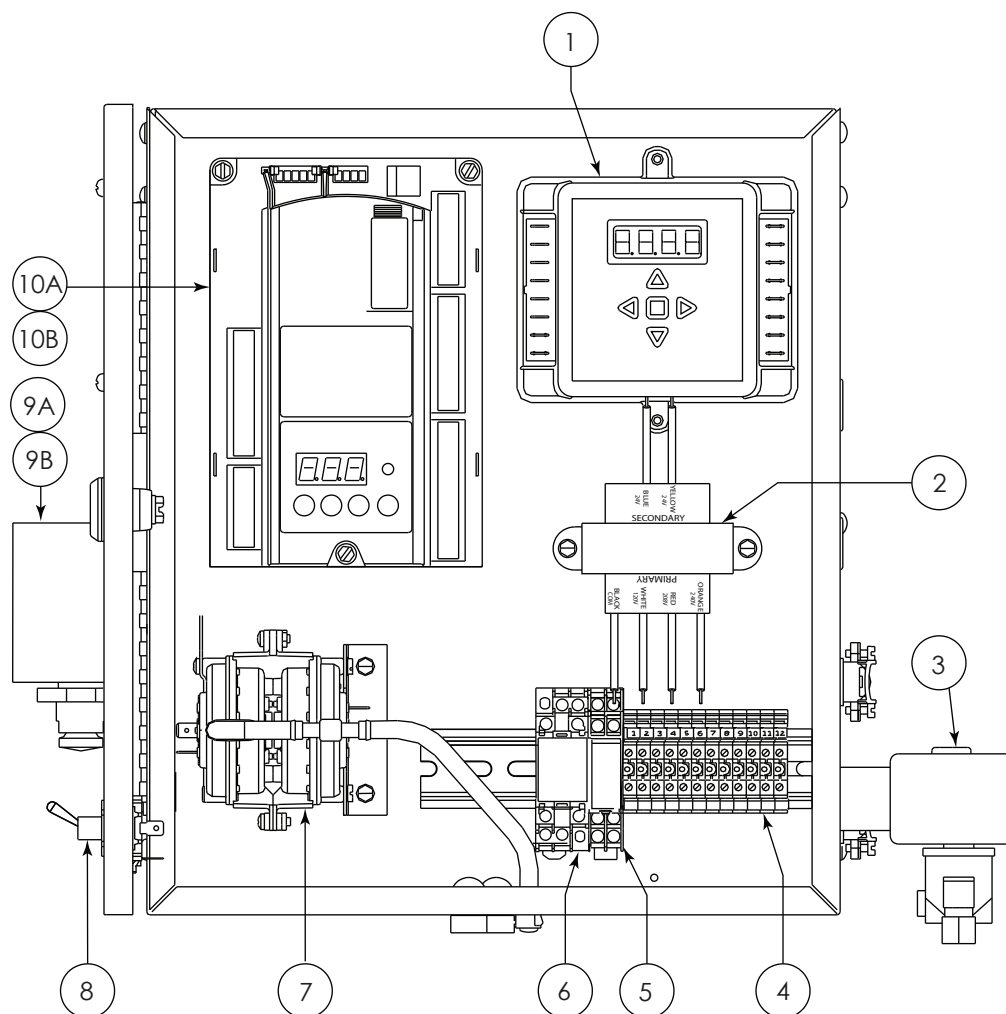


Figure 15 - Siemens Control Box - 120V Burner

Item #	Part #	Descriptions
1	8429-78	SCEBM-2 Fan Control
2	8447-28	120/208/24vac – 24V 40VA Transformer
3	8402-50	Pilot Solenoid Valve
4	8409-25	Terminal Block
5	8406-98/99	Relay "B"
6	8406-95/96	Relay "A"
7	8425-56	Air Pressure Switch
8	8423-05	On/Off Switch
9A	8447-22	Ignition Transformer
9B	8447-39	Ignition Transformer
10A	8429-69	Ignition Control
10B	8429-93	Ignition Control (UV)

Part 2 Service - Burner Parts Locations - 24V Burners

XVIII Burner Part Locations for 24V Burners Continued

NOTE:
The 24V box is no longer available. Call the manufacturer for available replacement parts

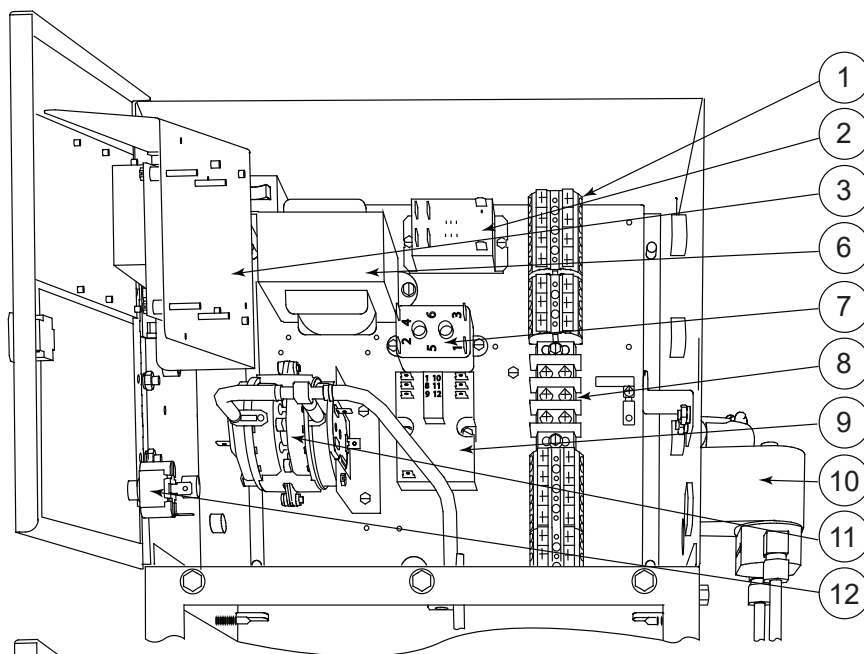


Figure 16A - Control 24V Box (Shelf Open)

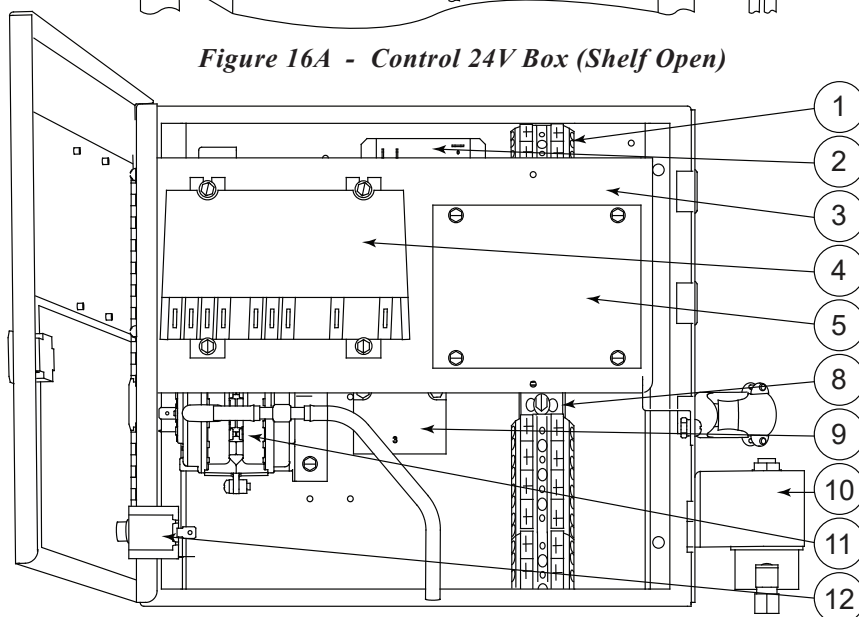


Figure 16B - Control Box 24V (Shelf Closed)

Item #	Part #	Descriptions
1.	8408-79/84	24VAC Terminal Block
2.	8406-68	120V Relay
3.	2121-06	Control Box Shelf
4.	8429-57	Ignition Control
5.	8429-02	SCEBM - 1
6.	8447-34	100VA Main 24VAC Transformer
7.	8409-37	24VAC Relay
8.	8408-78	120VAC Terminal Strip
9.	8406-83	Nine Second Relay Timer (no longer available)
10.	8402-37	Pilot Solenoid Valve
11.	8425-56	Air Pressure Switch High/Low
12.	8423-05	On/Off Switch

Part 2 Service - Consumer Instructions and Lighting Instructions

CONSUMER INSTRUCTIONS

- Keep the area around the burner clear and free of combustible material, gasoline or other flammable liquids or vapors. Do not obstruct burner air openings or ventilation grills for combustion air.
- The motor bearings require no maintenance.

⚠ WARNING: If any flame is observed when the burner is on standby, or if the ignition spark or valve operator is heard to come on before the motor reaches operating speed, immediately turn off the manual gas valve and burner power. A dangerous condition has developed and must be corrected. **CONTACT A QUALIFIED SERVICE TECHNICIAN FOR CLEANING, READJUSTMENT OR REPAIR.**

- Check that the pilot ignition spark does not come on before the motor reaches operating speed. If it does, the air switch is defective and must be replaced.

XVIX Consumer Instructions

Lighting Instructions

Lighting instructions For 120V Burners:

1. Set operating control to **OFF**.
2. Open manual gas valve.
3. Turn burner power **ON**.
4. Set operating control to **ON**.
5. If the pilot flame is not proven within 10 seconds after the pre-purge, the controller will shut off the automatic safety shut-off valves and lock out. If the proof of flame is lost and the pilot is not re-established within 10 seconds after the pre-purge, the controller will shut off the automatic safety shut-off valves and lockout.
6. **Reset** the flame safeguard.
7. Repeat step 4 for restart.

To shut off:

1. Close manual gas valve.
2. Turn burner power **OFF**.

Should overheating of the appliance occur:

1. Shut off the manual gas valve to the appliance.
2. **Do Not** shut off the electrical supply power to the blower.

Lighting instructions For 24V Burners:

1. Set operating control to **OFF** or thermostat below room temperature.
2. Open manual gas cock.
3. Turn burner power **ON**.
4. Set operating control to **ON** or thermostat to call for heat.
5. If the pilot flame is not proven within 15 seconds, after the pre-purge, the controller will shut off the automatic safety shut-off valves and lock out. If the proof of flame is lost during burner run and the pilot is not re-established within 15 seconds after the pre-purge, the controller will shut off the automatic safety shut-off valves and lockout.
6. **Reset** the 24 volt ignition control module by setting the operating control to off or the thermostat below room temperature for at least 30 seconds.
7. Repeat step 4 for restart.

To shut off

1. Close manual gas cock.
2. Turn burner power **OFF**.

Should overheating of the appliance occur

1. Close the manual gas valve to the appliance.
2. **Do Not** shut off the electrical supply power to the blower

XX Lighting Instructions

A For 120V Burners

B For 24V Burners

