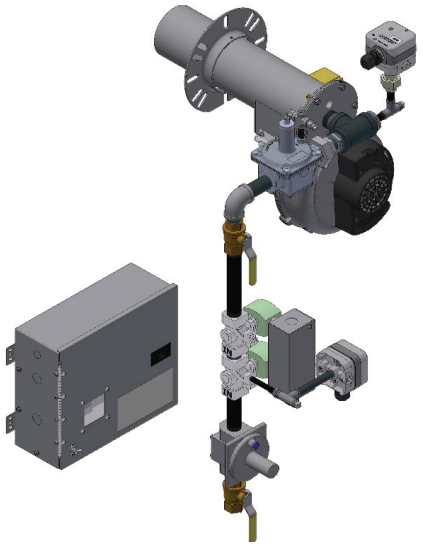
Installation and Service Instructions



Unipower MHTD Series

120V High Turn Down Power Gas Burners - Models MHTD 4″ and 6″

⚠ 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 the 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 typeface 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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Quality Designed for Proven Performance

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Specifications

The MHTD Series are direct spark burners that offer modulation of both air and gas. Currently offering options with blast tube diameters of 4″ or 6″, they are adaptable to most gas utilization equipment, including gravity and forced circulation furnaces, heat exchangers, and process ovens. They are particularly recommended for firing into high efficiency and high turndown applications. Certified for use in a vestibule. Before any work is done on the unit, whether installing or servicing, it is recommended to have a combustion analyzer to measure emissions, manometers to measure gas and air pressure, and a set of wrenches to install the gas train, fittings, and nuts.

Burner Model [1]	**MHTD 4″**	**MHTD 6″**
Maximum Input at 7″ (MBH/hr) [2,3]	500	1000
Minimum Input (MBH/hr) [2,3]	50	90
Turndown	10-1	11-1
Inlet Gas[4] Pressure for Maximum Firing Rate (NG)	7.0″ W.C.	7.0″ W.C.
Manifold Gas Pressure for Maximum Firing Rate (NG)	2.6″ W.C.	2.7″ W.C.
Approximate Air Delivery at Zero Draft (CFM)	165	340
Approximate Flame Length	34″	41″
Approximate Weights	Call Midco	Call Midco
Minimum Recommended Chamber Size		
Width	18″	24″
Height	18″	24″
Depth	42″	48″

Table 1. Burner Specifications

[1] Standard burners are shipped as NATURAL gas models. Contact Midco for PROPANE gas models.
[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″ W.C. back pressure. Can be adjusted for certain back pressures, contact Midco when required.

Burner Model	**Control Amps**	**Motor Amps**	**Total Amps**	**Motor HP**
MHTD 4″	1.1	3.4	4.5	2/5
MHTD 6″	1.3	4.3	5.6	2/3

Table 2. Amp & HP Specifications

Installation

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

Ventilation

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

Ventilation - Continued

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.

Preparation for Combustion Chamber and Gas Utilization Equipment

Prepare the equipment front plate to have a circular hole for the insertion of the burner that is at least 1/2″ larger in diameter than the outside diameter of the blast tube. If any insulation extends beyond the burner head position, taper the insulation around the blast tube at a minimum 45° angle. To fasten the burner to the equipment, either create at least four tapped holes on the front plate and use bolts to fasten the burner, or install at least four threaded studs and fasten the burner with a washer and nut. The approximate dimensions and locations of the holes or studs are shown in Figure 1.

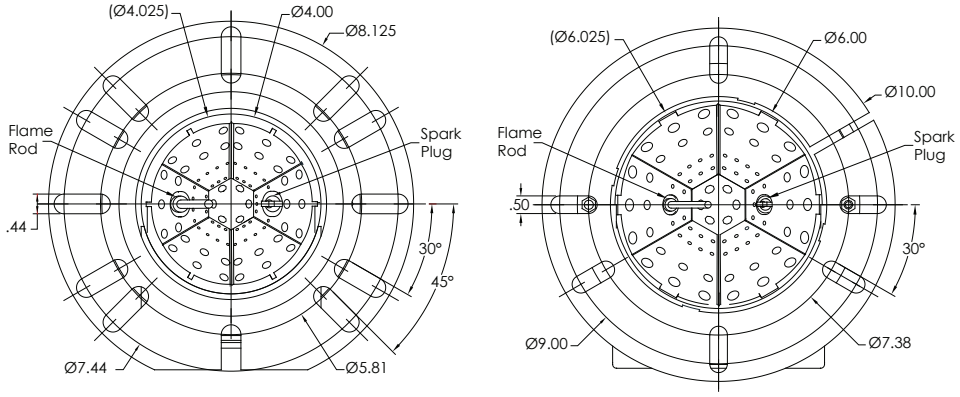
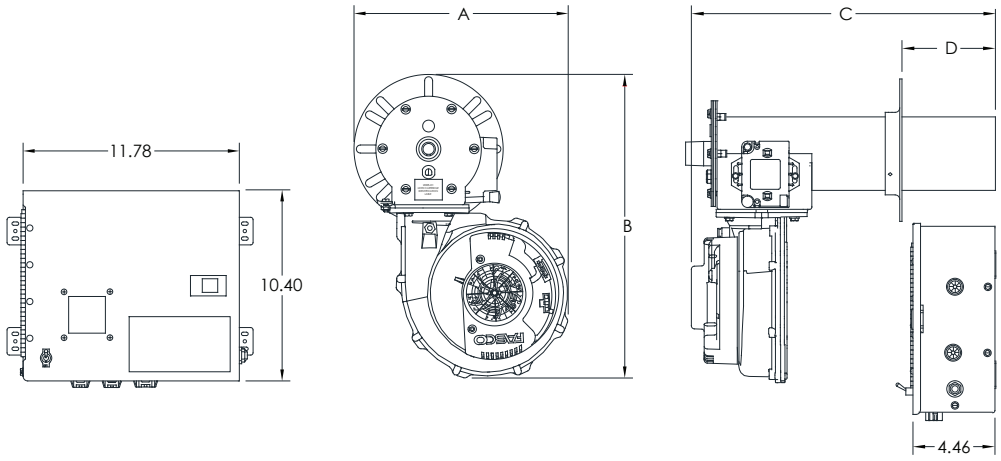


Figure 1. Mounting Flange Dimensions (MHTD 4″ & MHTD 6″)

Refer to the appendix file supplied with the burner for information regarding your specific unit. General dimensions are shown in Figure 2. Ensure a minimum insertion depth of 3″.



Model	A - Width	B - Height	C - Depth	D - Insertion Depth
MHTD 4″	11.7″	16.5″	16.6″	Adjustable up to 8″
MHTD 6″	13.9″	20.0″	16.1″	Adjustable up to 7″

Figure 2. MHTD Dimensions

- 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.

Burner Mounting Instructions

⚠ CAUTION: The MHTD Burner must be protected from excessive moisture. Provide adequate enclosure to protect it 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 circular hole until the mounting flange is tight to the exchanger's front plate.
- Tighten the flange. During the tightening process, the gasket will be compressed creating the seal 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 of the gasket may be oxidized and some white smoke and burning odor will be 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.

-The control box is to be remotely mounted. Refer to Figure 3 for mounting flange dimensions. The standard cables and tubing provided are 5 feet in length. If additional length is needed to mount the control box further from the burner, please contact Midco.

Piping

The standard MHTD Series burner valve train is pre-assembled and pre-wired, but it will need to be installed to the burner. Some parts need to be connected: the main gas valve train and the air pressure tubing lines. The 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. Connect the union on the high gas pressure switch to the union on the main gas valve train if shipped detached.
2. Connect the gas supply line to the Main Supply Gas Valve.
3. Connect the air pressure tubing line from the compression fitting on the blower to the back side of the cross fitting on the ratio regulator. Ensure fittings are fully tightened. There should be an audible click once the tubing is seated fully. Ensure no kinks or cuts in the tubing line.
4. Connect the air pressure tubing line from the front side of the cross fitting on the ratio regulator to the compression fitting on the control box. Ensure fittings are fully tightened. There should be an audible click once the tubing is seated fully. Ensure no kinks or cuts in the tubing line.

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

Pipe Size	*Type of Gas*	*Approximate Capacity – MBH Pipe Length*				
		10'	*20'*	*40'*	*75'*	*100'*
1″	Propane	1075	730	500	360	300
1 ¼″	Natural	900	600	450	325	275
1 ¼″	Propane	-	-	1040	750	630
1 ½″	Natural	900	650	475	400	-
1 ½″	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 3. Schedule 40 NPT Pipe - Capacity Chart

- Automatic reset high and low gas pressure switches (required) are included.
- 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.

Piping - Continued

⚠ 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 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 7.0″ W.C. pressure to the Inlet Pressure Tap when the burner and all other gas utilization equipment are on and at running at full capacity.
- If the burner piping must be rearranged because of space limitations, be sure to carry out the general arrangement shown in Figure 6. 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 (Solenoids) be left adjacent to the burner within the vestibule and the Main Supply Gas Valve be installed outside.
- Run full-size pipe or tubing from regulator vent openings to outside of the 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. Leakage will be indicated by the appearance of soap bubbles. Locate and correct all gas leaks before proceeding.

⚠ WARNING: DO NOT USE OPEN FLAME.

⚠ DANGER: Explosion hazard. Do not use oxygen for pressure testing. An explosion could occur during the 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 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.

Electrical Safety

⚠ CAUTION: Refer to the wiring diagram located on the inside of the control box door. Before proceeding verify burner model number for correct wiring diagram. Refer to Figure 9.

- 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 a correctly sized circuit breaker. Refer to Table 2 for the 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 the control box for positive grounding where insulated pipe couplings are used or where any doubt exists regarding grounding sufficiency.
- Confirm that the polarity is correct – hot wire to strip terminal 8, neutral to strip terminal 6 – and that the neutral line is not subject to induced low voltage (check 6 to 4 earth ground).
- Each installation must include suitable safety and limit controls.

Enclosure

MHTD 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 fully enclosed in conduit. MHTD 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 ¼" rabbet or the equivalent.
e. The enclosure has louvers or openings that are sufficient to bring in enough air for combustion as per the Ventilation section of this document.
f. Any louvers or openings must not be capable of letting in a 3/4" diameter rod.

Wiring

⚠ CAUTION: Label all wires before 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 3 for the component's location inside the control box. Refer to the appendix file supplied with the burner for information regarding your specific unit.
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 (On-Off switch), 6 (Neutral), and 4 (Ground).
2. Modulation signal input (0-10VDC): Connect the signal input wires from the temperature controller to the appropriate terminals on the terminal strip. Two wires need to be connected: 2 positive (+) and 1 negative (-).
3. Ignition transformer wiring: Connect the P1 cable from the ignition transformer to the 1x3 control box housing.
4. Main gas solenoid valve wiring: Connect the P2 cable from the main gas solenoid valves/gas pressure switches to the 2x3 control box housing.
5. Flame rod wiring: Connect the flame rod white woven wire to the P2 cable's white woven wire connector.
6. Motor wiring: Connect the P3 cables from the motor to the 2x4 control box housing.
7. Call for Heat: The call for heat circuit should be wired between: terminal 7 to terminal 3. The switch should be capable of handling the full current load of the burner.

Wiring - Continued

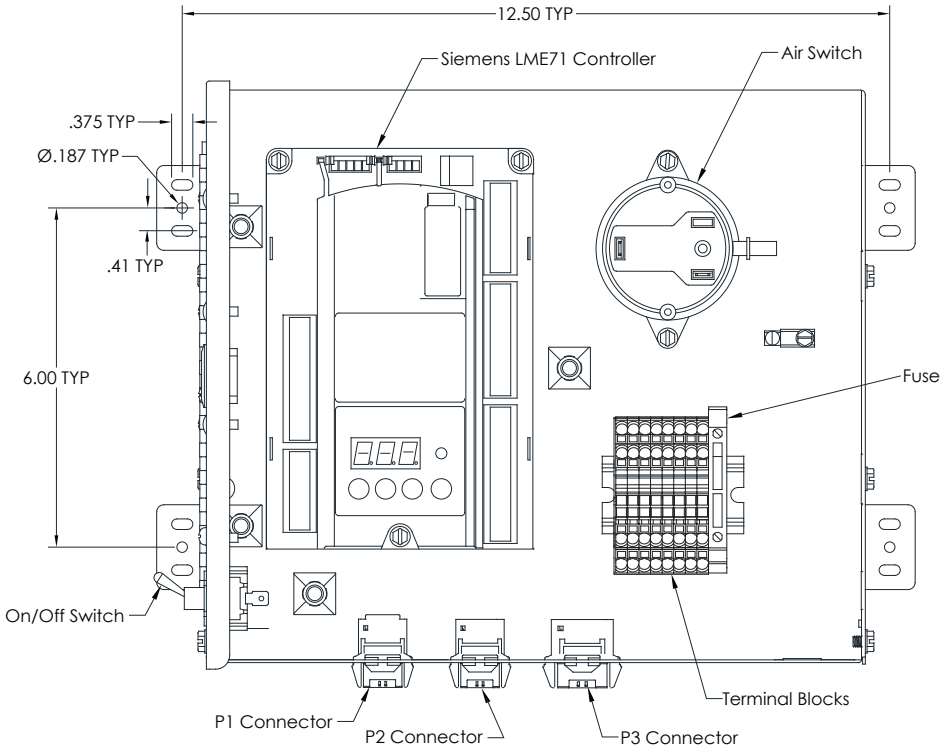


Figure 3. Control Box Component Locations

Confirm Inlet Pressure

Before opening the Main Supply Gas Valve (Figure 6), verify the inlet pressure is below the maximum inlet pressure specified on the burner specification label (Figure 4). Exposing components to pressures above the maximum inlet pressure can cause damage.

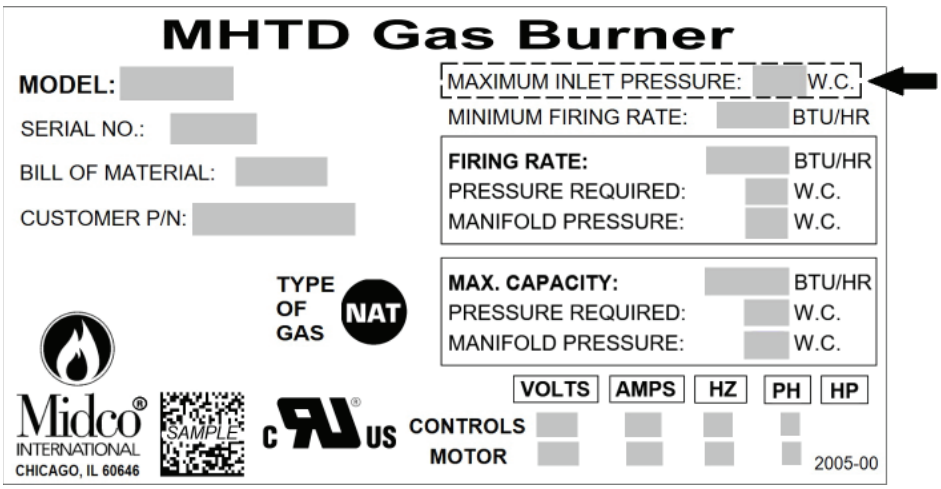


Figure 4. Burner Specification Label - Maximum Inlet Pressure

Check Air Shutter

Confirm the air shutter (Figure 5) is secured in place and has not been inadvertently moved during packing, shipping, or installation.

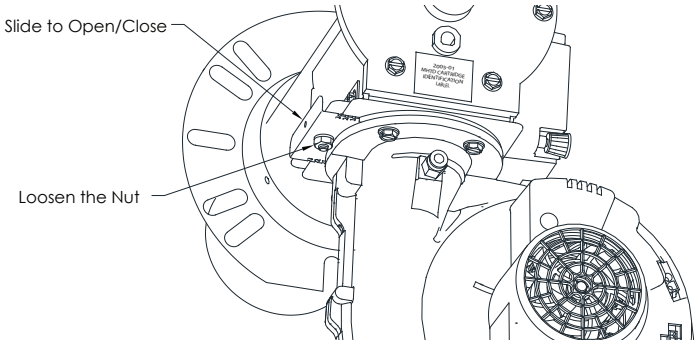


Figure 5. Air Shutter

Install Shut-Off Type Pressure Fittings

Install the necessary fittings so that pressure can be measured at the three points listed below. Reference Figure 6. Refer to the appendix file supplied with the burner for information regarding your specific unit.

- Manifold Pressure Tap (1/4″ NPT)
- Load Line Pressure Tap (1/8″ NPT)
- Inlet Pressure Tap (1/4″ NPT)

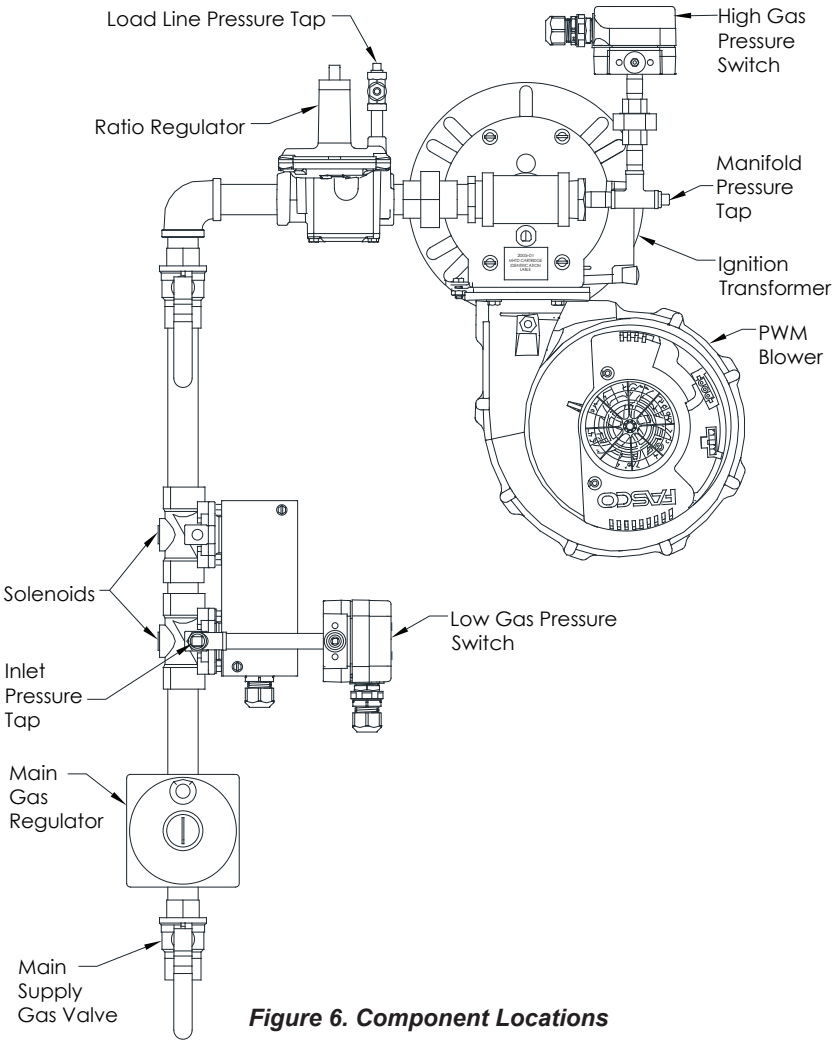


Figure 6. Component Locations

Ignite Burner

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

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

Purging the air from the gas supply line will expedite the first light-off. IMPORTANT: Purge outside the building. Do not purge into the gas utilization equipment. To purge the gas utilization equipment and chimney of any accumulated gases, turn the Main Supply Gas Valve to OFF, turn the burner power ON, and set the 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 Table 1.

Open all ball valves in the gas train. Initiate burner operation.

a. The following is required:
   1. 120V AC power supply
   2. The on/off switch on the burner control panel door needs to be in the ON position
   3. The controller reads OFF when it is waiting for a Call for Heat signal
b. Reset the LME71 flame safeguard by holding down the info button for one second. Apply 120V to the call for heat circuit on the Siemens controller. This will initiate the burner ignition sequence as seen in Table 4.

Phase	Description
21	Test - Air Pressure Switch Open
22	Blower On
24	Drive to Prepurge Speed
22	Test - Air Pressure Switch Closed
30	Prepurge
36	Drive to Ignition Speed
38	Preignition
40	Trial For Ignition
42	Flame Detection
44	Main Stabilization
oP	Operation

Table 4. Call for Heat Phases

c. After oP is reached, the controller will show the firing rate as a percentage of the blower's high fire rpm speed. For example, if the blower's high fire speed is 5000 rpm and low fire speed is 2000 rpm, the controller will show "40" for 40% (2000 rpm/5000 rpm). Refer to the Flame Signal section for instructions on displaying flame signal.
d. If there is a failure to light, a Loc code will appear on the Siemens controller. Refer to Table 6 for more information on Loc codes.

Adjust Main Regulator

Use a manometer to check the inlet pressure at the Inlet Pressure Tap (Figure 6). Turn the burner up to high fire by applying an input signal of 10V DC. The inlet pressure should be 7″ W.C. while the burner is running at high fire. Adjust the main regulator in small increments if the inlet pressure is different.

Adjust Low Fire

Measure the manifold pressure at the Manifold Pressure Tap and the load line pressure at the Load Line Pressure Tap as shown in Figure 6. Turn the burner down to low fire by applying an input signal of 0V DC. Let the burner run for a few minutes, then adjust the ratio regulator (Figure 6) as shown in Figure 7 until the manifold pressure and O_2 match the values in Table 5. Adjusting the ratio regulator CW will increase manifold pressure and decrease O_2. Adjusting the ratio regulator CCW will decrease manifold pressure and increase O_2. Make these changes in small increments until the required manifold pressure and O_2 are achieved. If there are issues with achieving the desired rate or if a different rate than listed is required, contact Midco. Refer to the Check Emissions section for additional information regarding emission reading.

Adjust Low Fire - Continued

Burner Model	Manifold Pressure	Low Fire O_2	Load Line Pressure
MHTD 4″	0.01 – 0.03″ W.C.	13-15%	0.13 – 0.17″ W.C.
MHTD 6″	0.01 – 0.02″ W.C.	12-14%	0.15 – 0.19″ W.C.

Table 5. Low Fire Adjustments

Figure 7. Low Fire Ratio Regulator Adjustment

Adjust High Fire

Burners may not always be set to maximum capacity. Refer to the firing rate on the burner specification label or the heating equipment's label for the actual firing rate.

Once low fire is set per the Adjust Low Fire section, turn the burner up to high fire by applying an input signal of 10V DC. Measure the O_2. To decrease O_2, loosen the nut that secures the air shutter (Figure 5) and push it inward then retighten the nut. To increase O_2, loosen the nut that secures the air shutter and pull it outward then retighten the nut. The air shutter adjustment is very sensitive, so make any adjustments in small increments until the setpoint is achieved. Once the O_2 level is achieved, refer to Figure 8 for the expected manifold pressure. Refer to the Check Emissions section for additional information regarding emission reading.

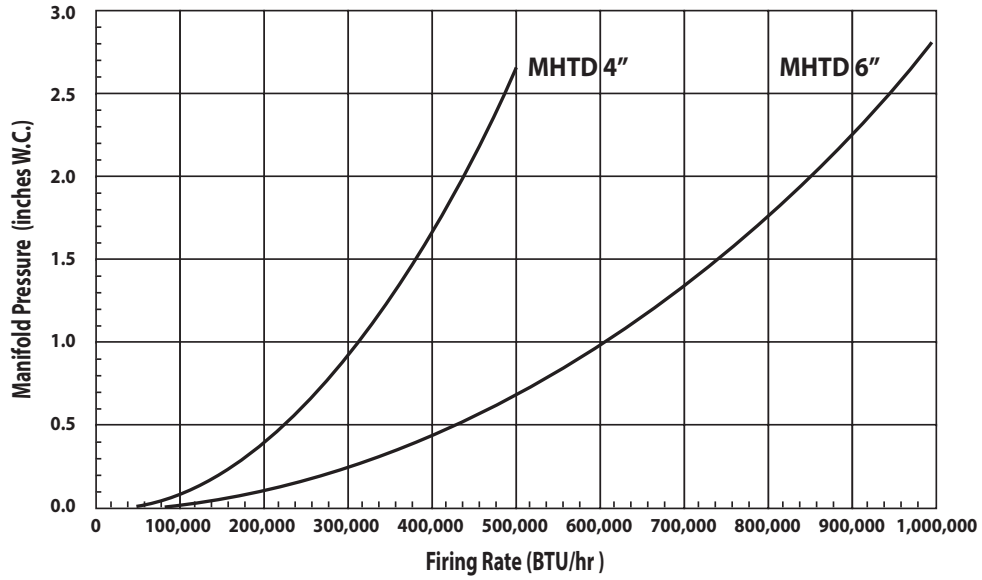


Figure 8. Manifold Pressure vs Firing Rate

Adjust High Fire - Continued

If the shutter required adjustment, repeat the Adjust Low Fire section to ensure there have not been any major changes at low fire. Iterate through the Adjust Low Fire & Adjust High Fire sections until both low fire and high fire are reached.

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 the low fire oxygen (O_2) level is between 13 to 15% and the carbon monoxide (CO) level is less than 400 ppm when corrected to 3% O_2.

Shut Down

Remove the call for heat (open heat enable contact) and wait for the post-purge to finish. Once the controller reads OFF close the Main Supply Gas Valve (Figure 6). Turn off the main power disconnect. Turn OFF the on/off switch on the burner control panel door. Remove pressure tap fittings and replace pipe plugs.

Normal Operation

Open all manual gas valves. Turn on the main power disconnect. Turn ON the on/off switch on the burner control panel door. Set heat enable and temperature controller to desired operating condition and temperature. The burner will start and operate based on 0 to 10V DC analog input provided.

Controller

Siemens LME71 Controller

The Siemens LME71.901A1 controller is designed to control almost all functions of the burner, from safety loops and blower speed to general burner operation. The controller has been specifically programmed for optimal use with the MHTD. For further modifications contact Midco.

Wiring Diagram

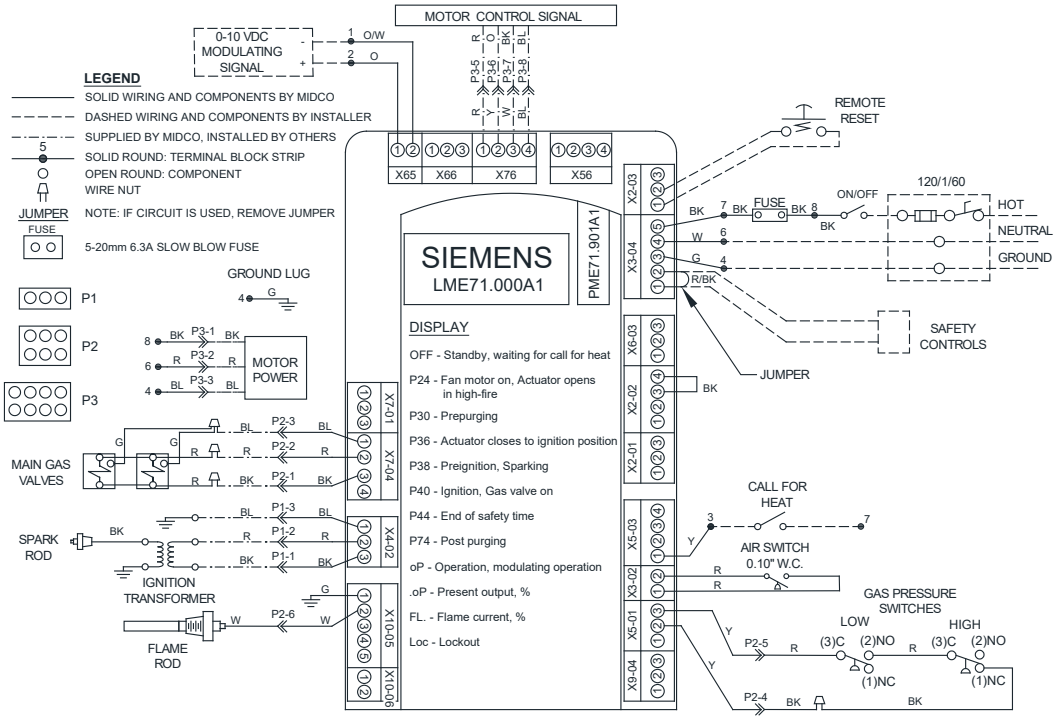


Figure 9. Typical MHTD Wiring Diagram

Phase Diagram

Figure 10 shows the controller's expected sequence of normal burner ignition and operation (summarized in Table 4). Refer to the terminal notation in Figure 9. The sequence includes safety checks such as verifying airflow through air switch continuity and ensuring the flame is detected at the correct time.

PME71.901A1 Phase Diagram

	Terminal	Description	Notes	Lockout	Standby, Waiting for Call for Heat	Test - Air Pressure Switch Open	Blower On	Drive to Prepurge Speed	Test - Air Pressure Switch Closed	Prepurge (Note 2)	Drive to Ignition Speed	Preignition	Trial for Ignition	Flame Detection	Interval: Main Stabilization	Operation	Drive to Postpurge Speed	Postpurge (Note 3)	Home Run	Evacuate	Atmospheric Test	Fill	Pressure Test
	Phase			LOC	OFF	21	22	24	22	30	36	38	40	42	44	oP	72	74	10	80	81	82	83
	Param.								224	225		226	257			240		234		242	243	244	245
						STARTUP										OPER-ATION	SHUTDOWN			VALVE PROVING			
													SAFETY TIME 1										
INPUTS	X3-04.5	Main Voltage		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	X3-04.1	Safety Loop			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	X5-03.1	Burner On			M	■	■	■	■	■	■	■	■	■	■	■							
	X3-02.1	Air Pressure Switch				X			M	■	■	■	■	■	■	■	■	■		■	■	■	■
	X5-01.2	Gas Pressure Switch(es)				■	■	■	■	■	■	■			■	■				■	■	■	■
	X9-04.2	Valve Proving Pressure Switch																			X		■
	X10-05.2 X10-06.1/2	Flame Signal			X					X	X			■	■	■							
	X2-02.4	POC				■																	
OUTPUTS	X2-02.3	POC Source		X	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	X6-03.3	Safety Valve		X	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	X2-01.3	Blower		X	X	X	■	■	■	■	■	■	■	■	■	■	■	■	X	■	■	■	■
	X4-02.3	Ignition Transformer		X	X	X	X	X	X	X	X	■	■	X	X	X	X	X	X	X	X	X	X
	X7-04.3	Main Valve V1		X	X	X	X	X	X	X	X	X	■	■	■	■	X	X	X	X	X	■	X
	X7-04.4	Main Valve Indication Light		X	X	X	X	X	X	X	X	X	■	■	■	■	X	X	X	X	X	■	X
	X7-01.3	Main Valve V2		X	X	X	X	X	X	X	X	X	■	■	■	■	X	X	X	■	X	X	X
	X2-03.3	Alarm		■	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	PWM Blower Speed			S	S	S	S	T	P	P	T	I	I	I	I	O	T	P	T	P	P	P	P

Legend :

- ■ Energized
- Energized or de-energized
- X De-energized
- M Must be energized by end of phase
- S Standby speed
- P Prepurge/postpurge speed
- I Ignition speed
- O Operation - speed determined by input signal
- T Speed transitioning/modulating

Figure 10. Siemens Controller Phase Diagram

Sequence of Operation

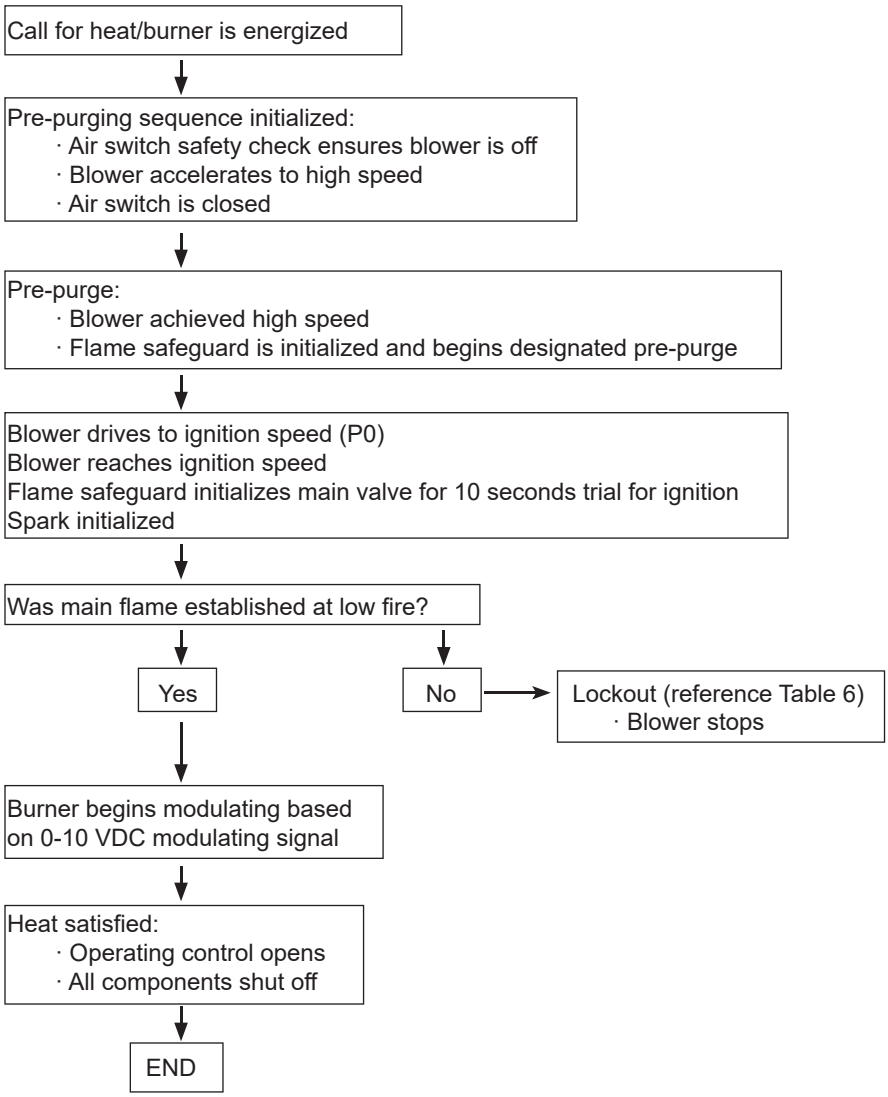


Chart 1. Sequence of Operation

Lighting Instructions

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

To shut off:
1. Close manual gas valves.
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.

Loc Codes

Table 6 includes common Loc codes shown on the built-in controller display. This table should act as a starting point for any troubleshooting.

Fault Code	Fault Description	Corrective Action
Loc 2	No flame at start-up	A flame failure occurred during lightoff. 1. Check the wiring of the ignition transformer and main valves. 2. Ensure manual shutoff valves are open. 3. Check the fuel/air ratio at lightoff. 4. Check the flame detector signal in the presence of a known flame source. Replace the flame detector if it does not produce the anticipated signal.
Loc 3	Air pressure switch open	The air pressure switch connected to terminal X3-02.1 is open, causing a fault. Ensure the setpoint of the switch is set to an appropriate value. Check the wiring of the air pressure switch.
Loc 4	Extraneous light	An extraneous light (flame signal present when there should be none) fault occurred. 1. Ensure that the source of light is not a flame. If it is, take corrective action immediately. 2. Ambient light can cause an extraneous light fault. Ensure the flame scanner is viewing a dark area.
Loc 7	Loss of flame	A flame failure occurred during normal operation. 1. Check the fuel/air ratio. 2. Check the flame detector signal in the presence of a known flame source. Replace the flame detector if it does not produce the anticipated signal.
Loc 10	Wiring or other error	This fault is a catchall and can be caused by a variety of issues. Review all wiring on the LME7 and check to see if a wire is landed on an incorrect terminal.
Loc 22	Safety loop open	Check all the switches wired into the safety loop on terminal X3-04.1. One of the switches opened, causing the fault. Fix the condition that caused the switch to open and reset the fault.
Loc 83	PWM blower speed fault	The speed of the PWM blower does not match the expected speed. The blower speed fell outside of tolerance band 1 (parameter 650.00) for a time longer than the maximum speed deviation allowed (parameter 660), or the blower speed fell outside of tolerance band 2 (parameter 650.01). 1. Increase ramp time up (parameter 522) and/or ramp time down (parameter 523) to allow the blower more time to achieve the expected speed. 2. Increase the setting of tolerance band 1 (parameter 650.00) and/or tolerance band 2 (parameter 650.01). 3. Ensure that the maximum fan speed (parameter 519) and the number of pulses per revolution (parameter 644) are set correctly for the blower being used. 4. Inspect wiring from PWM blower to LME7 to ensure the tachometer speed feedback signal is wired correctly.

Table 6. Loc Codes

Flame Signal

1. Press and hold the + button on the LME7 burner control. “FL1” will be displayed briefly, followed by the flame signal from 0-100%.
2. Holding the + button for less than three seconds will briefly display the flame signal. Upon releasing the + button, the display will return to normal.
3. Holding the + button for more than three seconds will leave the flame signal displayed for two minutes. This is indicated by the point after the flame signal value flashing. After two minutes, or after pressing the + and - buttons together (escape), the display will return to normal.

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.

Troubleshooting

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.

Blower Will Not Run

- Confirm wiring to blower:
  - o Confirm 120V between strip terminals 7 and 6;
  - o Verify the circuit polarity and electrical ground between strip terminal 4 and burner ground.
    - No voltage: open circuit in operating controls.
    - Voltage present: the motor is defective.
- Check the Loc code on Siemens control. Reference Table 6 for descriptions and corrective actions to take. Loc 3, P90 or Loc 20, Loc 22, or Loc 10 are most common.
- Check that there is a 0-10 VDC control signal.
  - o Ensure wiring is correct, properly installed, and polarity matches the provided documentation.

Blower Runs but Burner Does Not Light

- Confirm that ALL manual shut-off valves are open.
- If the flame is not proven within the flame establishing period or if the proof of flame is lost during the burner run and the flame is not re-established after the pre-purge, the ignition control module will lock out. Reference Table 6 for descriptions and corrective actions to take. RESET the flame safeguard.
- Visually inspect the spark plug for any cracks or carbon build-up.
  - o Defective spark electrode.
  - o Ensure the spark plug’s gap is facing the burner head. A ring gasket may be needed to position it correctly.
- Check power to the ignition transformer during the ignition attempt.
  - o Defective ignition transformer or spark wire.
  - o Incorrect wiring of ignition transformer or spark plug.
- Defective blower air switch.
- Visually inspect the flame rod for any cracks or dirtiness.
  - o Defective flame sensing rod or wire.
  - o Incorrect wiring of flame rod.
  - o Ensure terminal X10-05.1 has a direct path to ground.
- Low gas pressure.
  - o Air in line.
  - o Defective main gas valve(s).
  - o Ratio regulator needs adjusting.
- Ensure the burner is grounded properly.

Troubleshooting

Low Fire Flame is Weak or Unstable

- Adjust the ratio regulator CW per Figure 7 to increase the gas flow.

Burner Goes Out when Cycled to High Fire

- Not enough gas pressure into the ratio regulator.
- Air load line to ratio regulator leaking.
- Main Supply Gas Valve not open enough.

Burner Cannot Achieve Full Capacity

- Gas pressure going into the ratio regulator is too low. Gas pressure to the ratio regulator should be at least 2" W.C. above the air load line pressure. Adjust gas pressure if necessary.
- If the Main Supply Gas Valve is somewhat closed, open it until input achieved.
- Positive chamber pressure may reduce capacity.
- Verify supply gas pressure:
  - o Main regulator setting.
  - o Inlet pressure reading.
  - o Other units on same manifold could reduce max capacity of line.
  - o Capacity issues could result if incorrect pipe sizing is used.

Maintenance

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 Main Supply Gas Valve and burner power. A dangerous condition has developed and must be corrected. CONTACT A QUALIFIED SERVICE TECHNICIAN FOR CLEANING, READJUSTMENT OR REPAIR.**

Periodic Check List

Perform the following checks every 6 to 12 months.

- Combustion Air:
  - o Check sources are clean and open
  - o Verify original settings
- Ignition System:
  - o Check for strong spark
  - o Clean spark plug of any carbon build-up if necessary
  - o Check gap position
- Main Gas Valves:
  - o Perform periodic leak tests
- Flame Signal:
  - o Check signal strength at high fire
- Flame Failure:
  - o Close the manual valve to confirm safety shutdown timing
- Firing Rate:
  - o Periodically check settings to confirm no changes
  - o Annually check with combustion test

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