

Installation Instructions

General Instructions

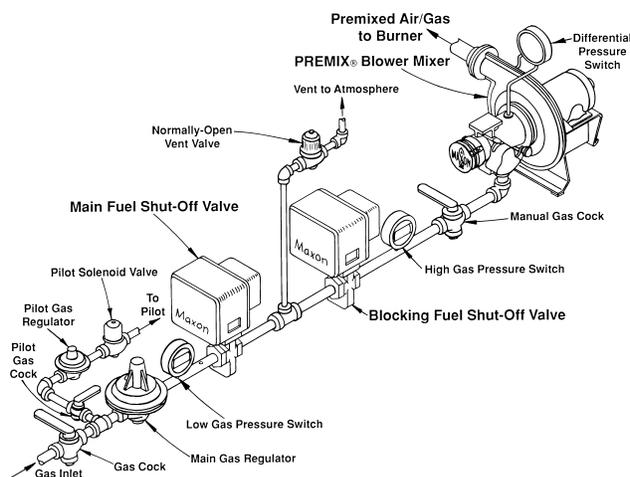
Important: Do not discard packing materials until all loose items are accounted for.

To prevent damage in transit, spark ignitors, flame rods, connecting linkage components, and filter housings/elements may be packed separately and shipped loose with your new Maxon PREMIX® Blower Mixer.

The blower mixer itself is normally only a part of your complete combustion system. Additional pipe train accessories and control components may be required for a complete combustion system installation.

The sketch below shows a typical gas train as might be used with a PREMIX® Blower Mixer.

Typical Piping Layout



Maxon assumes no responsibility for the use or misuse of the piping layouts shown. Specific piping and wiring diagrams should always be submitted to the appropriate agencies for approval on each application.

1. **PREMIX® Blower Mixer** provides the air supply to your combustion system and is essential to the inspiration and mixing of fuel gas. It should be located in the coolest, cleanest position that you can find near the burner itself. It must not be exposed to direct radiant heat or positioned where it might draw in inert gases or hot air rising from a furnace or oven. If such conditions exist, consider filters, relocation and/or ducting of an outside air supply.

2. **Electrical service** must match the voltage, phase, and cycle of all electrical system components and be compatible with burner nameplate ratings. Insure that all normal control safeguards are satisfied. Blower mixer air should continue to run after shutdown to allow burner to cool.
3. **Gas supply piping** must be large enough to maintain required fuel pressures (approximately 2" - 8" wc) at the ratio valve inlet while burner is operating at full capacity. The use of non-standard gases or long, complicated piping may necessitate "oversizing" piping runs to keep pressure drops within acceptable ranges.
4. **Clean fuel lines** are essential to prevent blockage of pipe train components or burner gas ports. All dirt, scale and pipe dope should be blown out of any new gas line before actually connecting to the burner system.
5. **Main shut-off cock** should be upstream of both main gas regulator and pilot line take-off. Use it to shut off fuel to both pilot and main burner during shutdown periods of more than a few hours. **The ratio valve of your PREMIX® Blower Mixer is not intended for tight shut-off.**
6. **Main gas regulator** is essential to maintain a uniform system supply pressure. A separate regulator should be provided in the branch leading to each mixer if more than one is served by a common main. Size regulator for full system capacity at required pressure, including pipe train losses. Follow the instructions attached to the regulator during installation.
7. **Pilot take-off** should be upstream of the main gas regulator, but downstream of the main gas cock. It should normally include its own pilot gas regulator, a solenoid valve and shut-off cock. A pilot adjustable orifice at the pilot inlet simplifies adjustment.
8. **Pilot piping** must be large enough to provide for the full flow and pressures shown in the catalog for your particular burner size.

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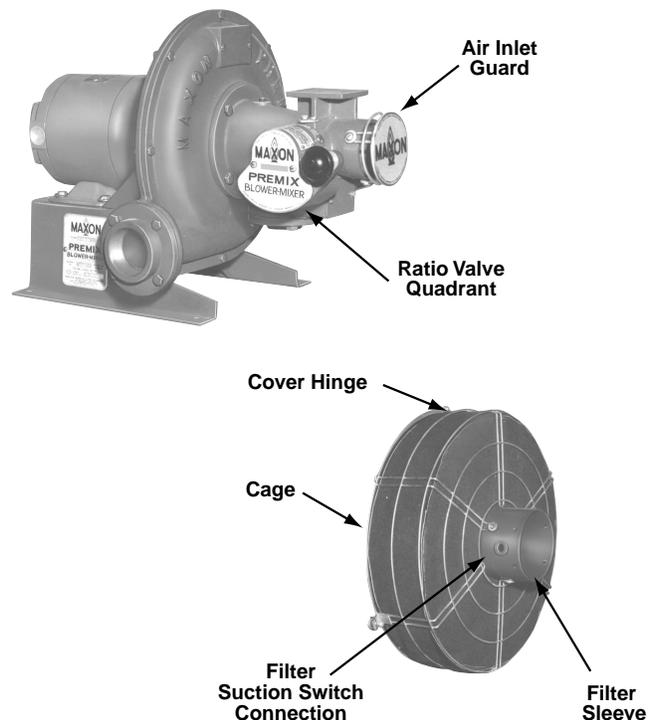
9. **Fuel shut-off valves** (when properly connected to a safety control system) are designed to shut the fuel supply off when a hazardous operating condition is sensed. **Manual reset valves** require operator attendance each time the system is started up (or restarted after a trip-out). **Motorized shut-off valves** permit automatic start/restart when used with appropriate control system.
10. **Ratio valve** (part of mixer) controls burner heat release by throttling air and gas flows. It includes provision for an adjustable minimum and throttling over a turndown range that matches burner capabilities.
11. **Downstream piping** from blower mixer to burner should be kept as short as possible.
12. **Inlet pipe leading to any burner** should be at least four pipe diameters in length. If the mixer is supplying multiple burners or multiple inlets to a single burner element, care should be taken so that air/gas mixing piping gives minimal pressure drop and maximum uniformity. **Do not install any shut-off device in the air/gas mixture line.**
13. **Test connections** are essential for burner adjustment. They should be provided (at a minimum) downstream of the mixer and at each burner inlet. Test connections in elbows or tees should be avoided. Test connections must be plugged except when readings are being taken.
14. **Vent dampers and pressure controllers** should be used to maintain balanced or slightly positive furnace or chamber pressures (0.0" to 0.5" wc) for maximum efficiency. Excessive back pressure will reduce burner capacity. Negative pressures allow infiltration of secondary air and will affect efficiency and temperature uniformity.

New Filter Assembly Installation

To install a new filter assembly, refer to the photos below, then:

1. Remove existing air inlet guard, saving screws removed.
2. Place sleeve of new filter assembly over the open end of mixer air inlet, turning so that filter suction switch connection is opposite ratio valve quadrant.
3. Align holes in filter sleeve with those in mixer air inlet, then secure filter assembly in place with screws removed in step 1.
4. Check position of filter assembly cover hinge. If it is not at top, remove sheet metal screws holding wire cage to filter sleeve and rotate as necessary, then re-fasten. Three unused holes must be plugged with remaining sheet metal screws.

Warning: The filter material used is approved by UL as Class II (fire retardant). Hot welding beads or direct flame can ignite filter material.



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Premixed Air/Gas Manifolding Suggestions

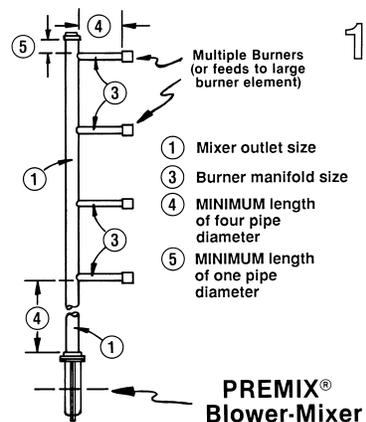
1. Always design air/gas manifold piping for **uniform** distribution to multiple-feed or multiple-burner systems. Select manifold piping sizes by starting at the burner/nozzle end and working backward to the blower mixer outlet.
2. Always make sure that any distribution header is greater in cross-sectional area than the **total** cross-sectional area(s) of any and all pipes being fed.
3. **Never** install a throttling or shut-off device in any air/gas mixture line between the blower mixer and its burner(s).
4. If necessary to have a smaller size manifold, use alternate discharge flanges available from Maxon for most PREMIX® Blower Mixers.

The chart below gives typical pipe data for use in designing air/gas distribution manifolds.

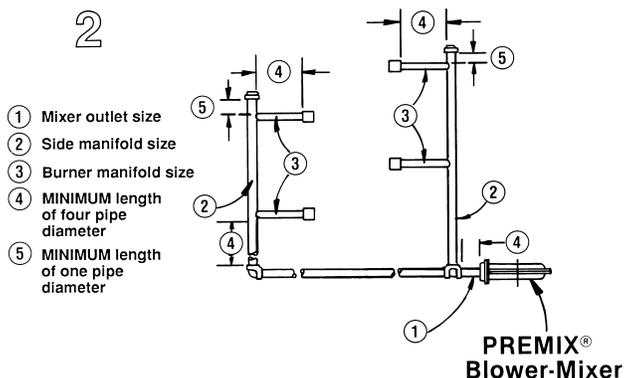
General Pipe Data

Nominal Pipe Diameter	Inside Diameter (inches)	Outside Diameter (inches)	Inside Area (square inches)
1/8	0.269	0.405	0.057
1/4	0.364	0.54	0.104
3/8	0.493	0.675	0.191
1/2	0.622	0.84	0.304
3/4	0.824	1.05	0.533
1	1.049	1.315	0.864
1-1/4	1.38	1.66	1.496
1-1/2	1.61	1.9	2.036
2	2.067	2.375	3.356
2-1/2	2.469	2.875	4.788
3	3.068	3.5	7.393
3-1/2	3.548	4	9.887
4	4.026	4.5	12.73
5	5.047	5.563	20.006
6	6.065	6.625	28.89
8	7.981	8.625	50.027
10	10.02	10.75	78.854
12	12	12.75	113.097

Sketch 1 shows four burners fed from one end-fed header. Note that full mixer size is continued past all burner take-offs, and outlet extended and capped one pipe diameter length beyond last take-off. Always keep blower mixer a minimum of four pipe diameters in length from first take-off.



Sketch 2 shows a system with the two side manifolds sized so their total combined cross-sectional areas do not exceed that of blower mixer outlet. If a manifold must be center-fed, then provisions may be required to connect both ends of the side manifolds together to form a complete looped distribution header to insure uniform distribution to the multiple burners.



Installation Instructions

Bringing in outside combustion air to blower mixers

In exceptionally dirty locations, or where a local code or plant regulation requires external-source combustion air, a separate supply duct from outside the room or building may be necessary.

The air inlet of a PREMIX® Blower Mixer is sized to accept round sheet metal ducting for this purpose. The accompanying table lists all available PREMIX® Blower Mixers together with a suggested maximum duct run that will allow development of full-rated mixer capacity.

Two columns are shown: a **standard size** which matches the PREMIX® Blower Mixer inlet diameter, and an **oversize** column which reflects the length made possible by enlarging the entire duct one size. A sheet metal transition could reduce duct to the standard size at ratio valve air inlet.

Because of the additional friction involved in duct elbows, **treat each turn in direction as if it added an additional 10 pipe diameters in length.**

Outside Air Supply Duct Sizes

Blower Mixer Type			Maximum Duct Footage	
PL	PM	PH	Standard Size	Oversize
			3" dia.	4" dia.
PL-8-			30 ft.	---
PL-130	PM-200	PH-190		
PL-165	PM-260	PH-250		
PL-195		PH-330		
	PM-350	PH-400	20 ft.	30 ft.
PL-380			18 ft.	
PL-490			11 ft.	
PL-540			4-1/2 ft.	
			4" dia.	5" dia.
		PH-500	30 ft.	---
	PM-525	PH-700		
PL-630		PH-900	28 ft.	30 ft.
PL-750			20 ft.	
PL-850			16 ft.	
PL-1000			11 ft.	
PL-1350			3 ft.	
			5" dia.	7" dia.
		PH-1220	30 ft.	---
	PM-690	PH-1400		
	PM-920	PH-1650		
	PM-1080			
	PM-1200		24 ft.	30 ft.
PL-1700			12 ft.	
		PH-2350	9-1/2 ft.	
PL-1440			9 ft.	
	PM-2000		8-1/2 ft.	
PL-2650			5 ft.	25 ft.
PL-3500			3 ft.	15 ft.
PL-4250			2 ft.	10 ft.
			7" dia.	10" dia.
	PM-3200		27 ft.	30 ft.
	PM-4000		18 ft.	
PL-4600			13 ft.	
	PM-4800		12 ft.	
	PM-5750		11 ft.	
PL-8500			2-1/2 ft.	15 ft.
PL-10500				



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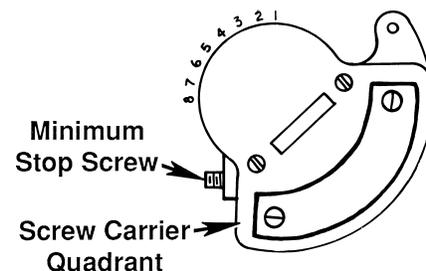
Start-Up Instructions

Read complete instructions before proceeding, and familiarize yourself with all the system's components. Verify that your equipment has been installed in accordance with the manufacturer's current instructions.

CAUTION: Initial adjustment and light-off should be undertaken only by trained and experienced personnel familiar with combustion systems, with control/safety circuitry, and with knowledge of the overall installation. Instructions provided by the company and/or individuals responsible for the manufacture and/or overall installation of complete system incorporating Maxon burners take precedence over these provided by Maxon. If Maxon instructions conflict with any codes or regulations, contact Maxon Corporation before attempting start-up.

For initial PREMIX® Blower Mixer start-up:

1. **Check all electric circuitry.** Verify that all control devices and interlocks are operable and functioning within their respective settings/ranges. Be sure all air and gas manifolds are tight and that test ports are plugged if not being used.
2. **Close all burner fuel valves and cocks.** Remove pilot and main gas regulators' adjusting screw covers. Turn adjusting screw down (clockwise) to approximately mid-position. Close pilot gas adjustable orifice screw by turning in clockwise until it stops. (Do not over-tighten.) Then back out the adjustable orifice (counter-clockwise) approximately 2-3 turns.
3. **Check that all duct and chamber dampers are properly positioned** and locked into operating positions.
4. **Disconnect the automatic control motor's linkage** from your blower mixer's screw carrier by loosening the control motor's connecting rod from the toggle linkage.
Initial start-up adjustment should only be accomplished during a "manual" burner control mode.
5. **Start all system-related fans and blowers.** Check for proper motor rotation and impeller direction. Verify that all control interlocks are working. Allow air handling equipment to run for adequate purge of your manifolds and combustion chamber plenums. With main gas shut off, manually advance blower mixer's screw carrier to "high fire" position so that air only flows through burner and combustion chamber.
6. **Determine minimum differential mixture pressure.** Depending on the type of burner and its application, a method must be developed to connect a manometer between the combustion chamber static pressure and into a **straight** manifold going to the burner (at a point farthest from the PREMIX® Blower Mixer).
 This method must take into consideration all of the frictional pressure drops in the distribution manifolding. You must maintain at least +0.25" wc differential mixture pressure (with natural gas) between the burner and the combustion chamber to avoid potential backfire conditions. (For VF LINOFLAME® Burners, differential mixture pressure should be +0.1" wc.)
Do not try to take a differential mixture pressure reading from a test port at or near an elbow in the piping manifolds due to potentially erroneous readings caused by turbulence set up within the pipe by such pipe fittings. Measure in a **straight** manifold with at least four pipe diameters in length before and after the test port location.
7. **Set minimum differential mixture pressure** with minimum stop screw located on the side of the screw carrier quadrant of blower mixer ratio valve (see sketch below).



Start-Up Instructions

This minimum stop screw creates a mechanical block which prohibits the screw carrier quadrant and its direct-connected air butterfly valve from closing completely. Thus a "minimum" volume of air is allowed in through the ratio valve to be delivered down the distribution manifold(s) to the burner(s). This air is used to establish the minimum differential pressure.

Screwing in (clockwise) on the minimum stop screw through its lock nut will open up the air butterfly and increase the minimum differential pressure.

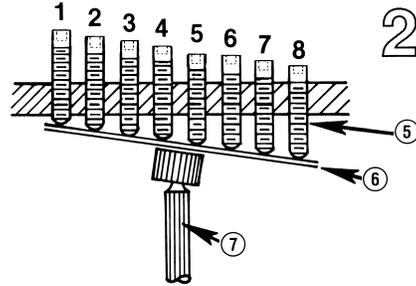
Once your manometer readings confirm the minimum differential mixture readings, lock the minimum stop screw in that position so the ratio valve cannot be moved back below this minimum firing position. Regardless of what numerical value the indicator strip shows, this becomes the minimum firing position for your specific system in this application.

8. Adjusting the ratio valve of your PREMIX® Blower Mixer: The heart of each PREMIX® Blower Mixer is its ratio valve. The description and accompanying sketches summarize its operation.

A quadrant (shown in Sketch 1) is rotated either manually or by a control operator to change firing rate as indicated by a position indicator strip ① and position pointer ②. A minimum stop screw ③ limits rotation and establishes a minimum air flow.

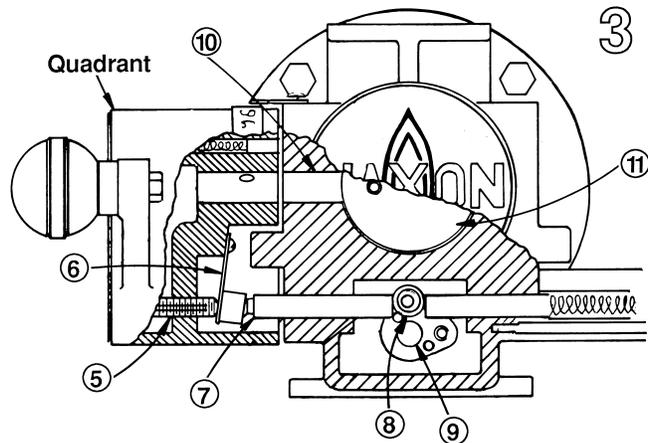
Removing a cover strip ④ reveals a numbered series of adjusting screws ⑤ which bear on a set of cam strips beneath the quadrant.

Turning in the adjusting screws ⑤ (clockwise) gives a contour to flexible steel cam strips (see Sketch 2). These cam strips bear on a plunger and cap assembly ⑦ that determines opening of the gas butterfly valve. Cam strips serve to provide a continuous gradient.

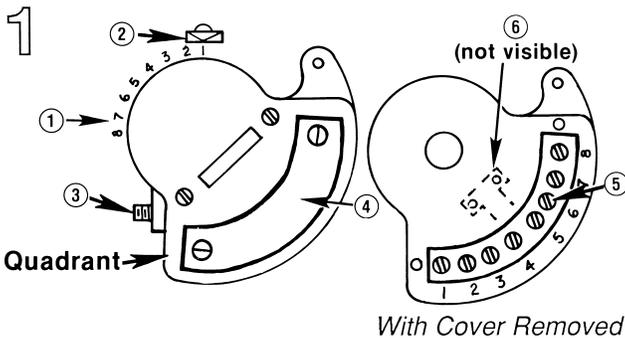


As shown in Sketch 3, the plunger and cap assembly ⑦ acts upon a roller/crank ⑧ to rotate a valve shaft ⑨ to which the gas butterfly is attached.

Turning adjusting screw in until it is flush with quadrant opens gas butterfly fully. **Do not attempt to force screw further.**



Directly connected to the quadrant by a shaft ⑩ extending through its point of rotation is the air control butterfly ⑪, also shown in Sketch 3. Note that at #1 position of quadrant, air butterfly may be "closed" but deliberately undersized to provide a required minimum air flow. Air butterfly is fully open with quadrant at highest numbered position. (Number varies with mixer size.)



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Start-Up Instructions

9. **Prepare to adjust the ratio valve** by removing the cover plate from the quadrant screw carrier and turn all adjusting screws out until they are all flush with the outer surface of the screw carrier casting. (New equipment is shipped from factory with all screws already backed out to this level.)
10. **Return blower mixer quadrant to “low fire” position** when air purge of system is complete.
11. **Open main and pilot gas cocks**, then attempt to light burner pilot while slowly turning pilot gas regulator and/or adjusting orifice screw to increase fuel flow. Repeat procedure as necessary until pilot ignites as air might have to be bled out of fuel supply lines before reliable pilot flame is established. Pilot gas regulator should normally be set for as low a pressure as possible, using fuller opening of pilot gas adjustable orifice (if used.)
12. **After ignition, adjust pilot flame** for good stable flame shape. A “rule of thumb” is that any pilot over a tennis ball size is probably too large. This assumes you have visual access to the pilot flame. If this is not possible, then adjust pilot to give the strongest and most stable flame signal through your flame safety circuit. The signal strength (or range) will be determined by the specific type of flame safeguard instrument you have with your burner system.
13. **Re-check pilot ignition** by closing pilot gas cock or otherwise causing pilot outage. Re-light and refine pilot gas adjustment as necessary to get reliable ignition. The flame safeguard relays should now power your main fuel Shut-Off Valve(s).
14. **Light main burners at minimum**, as follows:
First, make sure ratio valve is at its minimum setting (which may be at position 1 or 2 after completing step 6). With gas pilot established and flame supervision system operational, opening the main fuel Shut-Off Valve(s) will allow fuel flow to the blower mixer’s ratio valve. Turn corresponding screw in (clockwise) until flame ignites at all burner nozzles. (This may take several turns of the screw.)
NOTE: At this point, it is more important to get any kind of a flame as soon as possible. The flame geometry can be adjusted and refined as needed later.
Continue turning in slowly until flame becomes noticeably rich (usually purple or green with a slight yellow tip). Then slowly back the screw out until the flame becomes bright blue.
15. Once your flame is established and refined at this position, and without advancing the screw carrier quadrant higher, screw all remaining screws down to at least the same level as your first adjusted screws.
NOTE: A preliminary setting can be established with all the remaining adjusting screws. Generally, each succeeding screw needs to be screwed in approximately one additional full turn from the preceding screw. A smooth “stair step” gradient pre-set at this point from low to high will simplify the remaining adjustment steps.
16. Without advancing the ratio valve quadrant, screw down on #2 screw (one or two turns). Then slowly advance the ratio valve quadrant to the #2 position. Adjust flame appearance at this new position #2.
NOTE: If firing chamber is of refractory construction, allow your burner system to operate at this low setting for the necessary dry/cure out time period recommended by the chamber or refractory manufacturer. Then continue adjustment of ratio valve.
Again, without moving ratio valve, bring #3 and all remaining adjusting screws down to the same level as #2 screw.
NOTE: If approximate pre-set gradient was made earlier, the remaining screws will already be at or below appropriate levels.

CAUTION: After completing steps above, re-check all interlocking safety components and circuitry to prove that they are properly installed, correctly set, and fully operational. If in doubt, shut the system down, close pilot cock and contact responsible individual before proceeding further.

Start-Up Instructions

Progressively work your way up through each adjusting screw position, developing a smooth progression slope from your first screw to the "maximum" position. As each is adjusted, you must turn the remaining unadjusted screws in at least that far to prevent possible damage to flexible cam strips inside the ratio valve.

NOTE: To adjust the flame at any position, you must move the ratio valve to the number you desire to adjust. This aligns the adjusting screw directly on top of the fuel valve plunger. A resulting adjustment of the screw is directly applied to the fuel valve plunger and its interconnected valve body linkage. **Always adjust only the screw corresponding to the position at which the ratio valve has been set.**

CAUTION: If flame is extinguished, immediately return ratio valve to minimum position and shut off fuel (if flame safeguard has not already done so). Turn in slightly on adjusting screw at point where ignition was lost, then return ratio valve to minimum position, re-establish pilots, open fuel valve and verify ignition.

17. **Refine main gas regulator adjustment** (if necessary) to give the required pressure. If a major adjustment is made, you may then need to re-adjust the screw(s) just set.
18. **After adjusting through the full range**, allow furnace or oven to reach operating temperature and refine adjustment as needed for hot conditions.
19. **Cycle burner from minimum to maximum** and refine adjustment, if necessary.
For operation with interrupted pilot (as recommended), shut off pilots and cycle burner from minimum to maximum and back several times to verify the flame is maintained. When satisfied with adjustment, replace ratio valve cover plate.

20. **When burner performance is satisfactory** and stable throughout the firing range, reconnect linkage to control motor.

Control linkage travel must be such that burner quadrant is moved throughout its complete travel, or cataloged capacities and turndowns will not be achieved.

If less than full-rated burner capacity is required, linkage can be adjusted to limit maximum output. **With interrupted pilot**, it may be necessary to set control for somewhat higher than minimum burner setting to permit hold-in of flame detection system without pilot.

CAUTION: Internal drive mechanism within the control motor may be damaged if linkage is adjusted so as to cause binding with burner in high or low fire position.

21. **Plug all test connections not in use to avoid fuel leakage.** Replace equipment cover caps and tighten linkage screws.
22. **Check out overall system operation** by cycling through light-off at minimum, interrupting pilot, and allowing temperature control system to cycle burner from minimum to maximum and return.
23. **Recheck all safety system interlocks** for proper setting and operation.

WARNING: Test every UV installation for dangerous spark excitation from ignitors and other possible sources of direct or reflected UV radiation. Use only gas-tight scanner connections.

24. **Before system is placed into full service**, instruct operator personnel on proper start-up, operation, and shut-down of system. Establish written instructions for their future reference.



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Start-Up Instructions

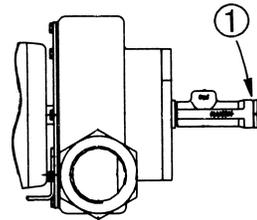
Miniature PREMIX® Blower Mixers

Before proceeding, verify that all system equipment has been installed in accordance with the general instructions found on pages 3100-S-1 and 2.

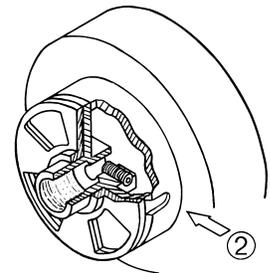
Initial adjustment and light-off should be undertaken only by trained and experienced personnel familiar with combustion systems, control/safety circuitry, and overall installation. Instructions provided by the company or individual responsible for the overall installation of complete system take precedence over those provided by Maxon. If Maxon instructions conflict with local codes or regulations, contact us before start-up.

For initial system start-up:

1. **Start blower mixer** and check for proper impeller rotation. Correct if necessary.
2. **Close mixer fuel port.** For M-100 and M-250 sizes, see illustration above, then remove cap ① and lightly turn orifice screw "in" (clockwise) until it seats.
For the M-500, see sketch above. Insert 5/16" Allen wrench through slot ② and turn gas adjusting screw "in" (clockwise) until it bottoms.
3. **Open air shutter fully.** Verify burner differential air pressure is at least +0.25" wc. Verify that it meets required minimum for that specific burner nozzle(s).



M-100/M-100-U
M-250



M-500

4. **Light pilot(s)** at the burner nozzle(s).
5. **Open main gas cock** and the adjustable orifice cock (where applicable).
6. **Turn gas adjusting screw** slowly "out" (counter-clockwise) until ignition occurs, then refine setting as necessary. You will find most adjustment occurs within the first three turns of gas adjusting screw.

Allow time for remaining air to bleed out of gas line, but if ignition does not occur with reasonable promptness, close the gas cock and check for:

- A. Insufficient gas supply, possibly due to gas regulator incorrectly installed, closed gas cock, etc.
- B. Too much gas as a result of turning the adjusting screw too fast or too far.
- C. Improper piloting or insufficient spark.

Notes



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