

Installation Instructions

General Instructions

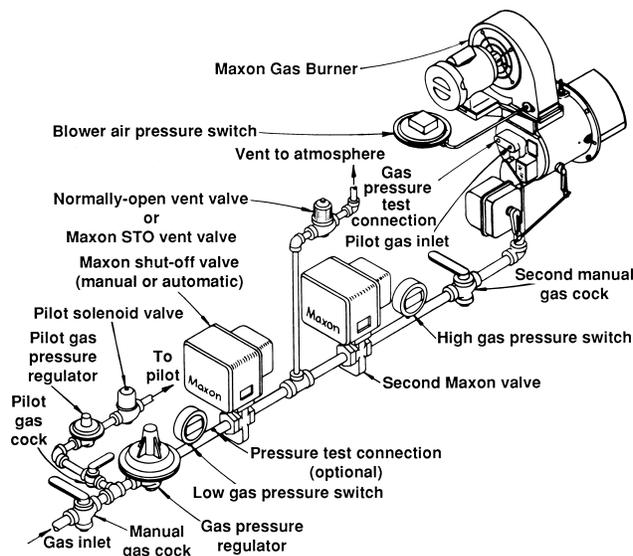
Important: Do not discard packing material until all loose items are accounted for.

To prevent damage in transit, the oil flowmeter, spark ignitor, discharge sleeve, mounting gaskets, flame rod and connecting linkage components may be packed separately and shipped loose with your new Maxon OVENPAK® Burner.

The burner itself is normally only a part of your complete combustion system. Additional pipe train accessories and control components will be required for a complete system installation. The sketch below shows a typical pipe train as might be used with a gas-fired Model "500-G" OVENPAK® Burner.

Piping Layout as sometimes required by insurance and standards groups

"Block and Bleed" gas train arrangement illustrated with Model "500-G" OVENPAK® Burner



Burner provides the air supply (unless it is "EB" version, which requires a separate combustion air blower). It also serves as a fuel flow control and fuel/air mixing device.

It should not be exposed to direct radiant heat or positioned where it might draw in inert gases. If problems exist, consider filters, relocation and/or use of the "EB" version and external air supply.

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. Combustion air blower should continue to run after shutdown to allow burner to cool.

Gas supply piping must be large enough to maintain the required fuel pressures cataloged for the particular burner size used with burner operating at full-rated capacity. Gas piping pressure drops to the gas regulator should not exceed 1/2" wc at full flow for supply pressures of 8 oz. or less (10% of initial pressure if supply is higher than 1/2" PSIG).

Anything more than minimal distance or piping turns may necessitate "oversizing" piping runs to keep pressure drops within acceptable ranges.

Oil and air piping should be sized for the pressure and volume requirements of the burner, with supply pressures high enough to permit subsequent regulation at each burner. Oil and compressed air should be available to the inlet of the train at 100 PSIG, with oil heated if necessary so that viscosity does not exceed 50 SSU.

Clean fuel lines are essential to prevent blockage of pipe train components or burner gas ports.

Main Shut-Off Cock should be upstream of both the 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 fuel throttling valve contained within a Maxon burner is not intended for tight shut-off.

Main gas regulator is essential to maintain a uniform system supply pressure. If one pipe train supplies multiple burners, provide a separate regulator in the branch leading to each burner system. Care should be taken to minimize pressure drop and give maximum uniformity.

Size the regulator for full system capacity at the required pressure, carefully considering pipe train losses. Follow the instructions attached to the regulator.

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.

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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Fuel Shut-Off Valves (when properly connected to a control system) 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 an appropriate control system.

Test connections are essential for burner adjustment. They should be provided immediately downstream of the regulator and are included in the burner itself. **Test connections must be plugged except when readings are being taken.**

Blower location must deliver a reasonably clean and cool air supply. Inlet filters and silencers are available as options. Where external blowers are used, care must be taken to keep pressure drops to a minimum and to independently support the weight of air piping.

Gas pipe train should be located reasonably close to the burner. As much as 4" wc pressure drop at full flow is acceptable, but pressure increase at low fire will cause increased minimum and reduced turndown.

Compressed air train should be located reasonably close to the burner. A union is necessary to permit withdrawal of the oil nozzle sub-assembly. For proper operation, a low air pressure switch interlocked with the oil shut-off valve should be installed downstream of the air regulator, with no valving between the switch and the burner itself.

Oil pipe train should be located reasonably close to the burner and below the burner inlet. The oil solenoid valve must be interlocked with the low pressure compressed air switch. The oil flowmeter (included with the burner) must be installed with flow vertically upward.

Use only UV flame sensor systems for oil firing. Flame rods may be used ONLY with specially adapted GAS-ONLY burners.

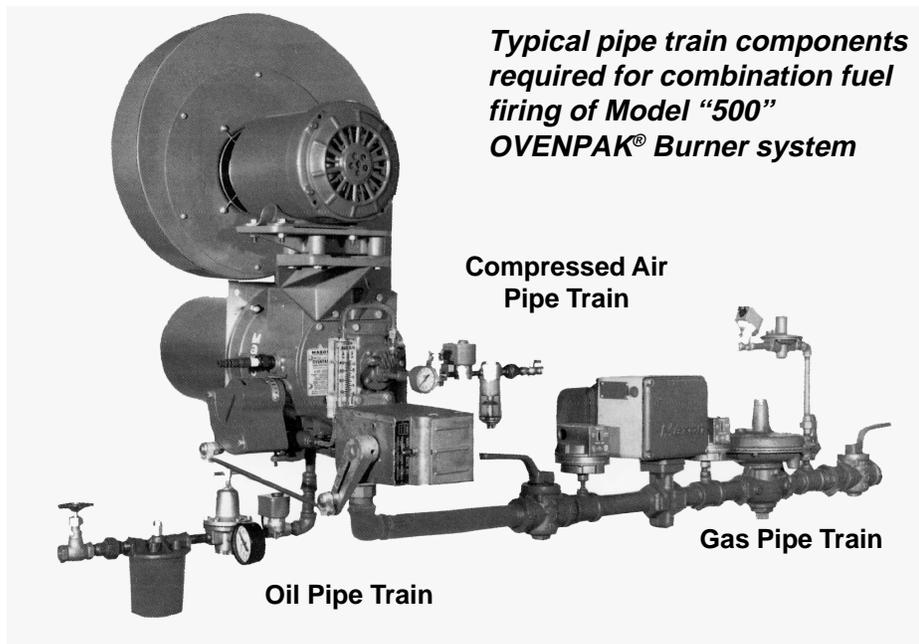
Control systems should provide all normally recommended interlocks (including operation of fuel shut-off valves). **Sequencing Control Systems** are available from Maxon that include provision for post-purge pilots during all but emergency shut-downs. This sequencing is essential to minimize risk of smoke during oil-fired shut-down.

Always re-establish pilot before shutting off oil.

For gas and oil combination firing, valves for both fuels must operate simultaneously on light-off and on shut-down.

For gas or oil firing, interlock fuel valves electrically so only one or the other can be used, **not** both together.

Low fire start and interrupted pilot are essential to obtain cataloged minimums.



Installation Instructions

Horizontal mounting is preferred, but burner may be mounted in any position suitable for automatic control motor and UV scanner.

OVENPAK® Burner will typically be installed through an oven wall or insulated air duct. Cut opening approximately 1" larger in diameter than discharge sleeve to allow for thermal expansion of sleeve.

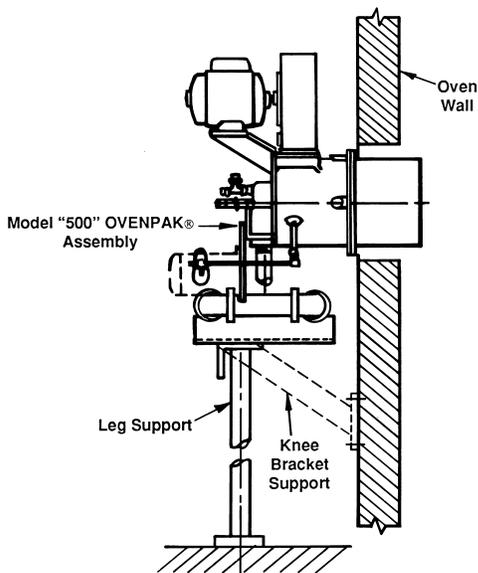
Burner mounting requires four studs and a flat mounting surface perfectly centered on the discharge sleeve. After placing burner in position over studs, add lock washers and nuts, then draw up all four hand-tight only. Check that burner is seated evenly all around the flange, filling any gaps to prevent air leakage, then tighten all nuts firmly.

For proper performance of any burner, air inlet and motor should be surrounded by clean, fresh, cool air.

Burner and pipe manifold support will be required to support weight of the burner and connected pipe train components. Air control motors, in particular, require additional support. Maxon connecting base and linkage assemblies are designed to position the control motors to work with the burner, **not** to support their weight.

The Model "500" OVENPAK® Burner requires external auxiliary support provided by the user. The support configuration may be similar to the leg support or knee bracket support illustrated below.

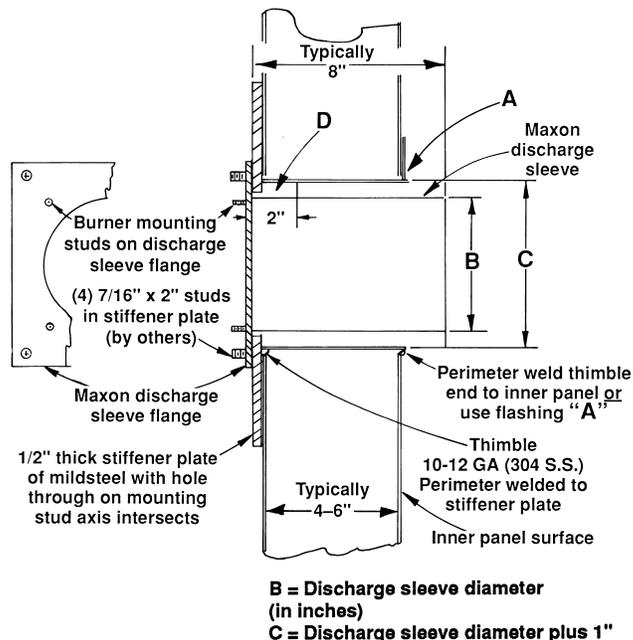
Suggested supporting arrangements for Model "500" OVENPAK® Burners:



Additional burner support may be required in conjunction with a "stiffener plate" when mounting OVENPAK® Burner (weighing 100-350 pounds) through typical thin wall of heater/oven panels.

For push-through systems, use Maxon special back pressure gasket between stiffener plate and discharge sleeve flange and use (2) ring gaskets between discharge sleeve flange and burner casting to prevent back flow of high temperature air. Fill area **D** (see sketch below) with **no more than 2"** of high temperature packing (too little will overheat mounting; too much will overheat sleeve).

Typical discharge sleeve mounting recommendations for Model "500" & "EB" OVENPAK® Burner applications



For pull-through systems, spacers may be installed on stud bolts and area **D** left empty to admit cooling air past the sleeve.

WARNING: Welding of burner flange to stiffener plate may cause warpage of burner flange and require additional seal material to prevent leakage.

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Four lock screws permit centering of mixing cone within burner body and sleeve. They should be drawn up hand-tight, then backed out 1/4 turn to allow for cone expansion. **They must be re-checked after start-up**, and loosened if necessary to prevent deformation of cone. See start-up instructions for details.

Over-tightening lock screws can lead to cone distortion and greatly reduce cone and discharge sleeve life.

Discharge sleeve must be flush with, or extend beyond, interior wall. Maxon can supply a 12" long discharge sleeve, but higher noise levels may result, particularly when firing on propane.

An external viewing port should be provided for flame observation, preferably in such a position that burner pilot and main flame can both be seen.

Flame sensing of oil must be accomplished by UV scanner and should be mounted as close to burner as feasible. **Do not use cooling air to scanner port:** sighting is through gas cavity. Heat block, if used, may affect signal strength with some brands of scanners.

Alternate fuels may require correction of supply pressures.

Specific piping and wiring diagrams should always be submitted to the appropriate agencies for approval on each application.

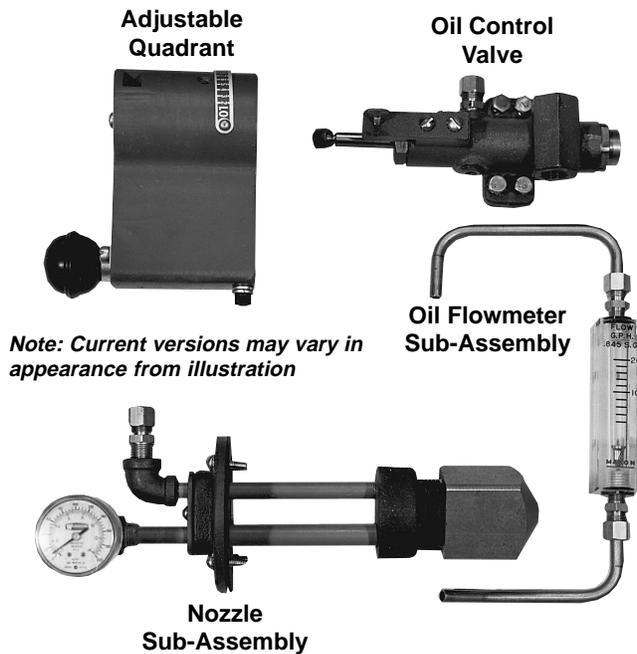
Multi-burner installations may require special piping considerations, if supplied by a common pipe train and/or air supply, to provide equal supply pressures to each burner.

Control system's circuitry must not allow main fuel shut-off valve to be opened unless combustion air is on, and must de-energize valve upon loss of combustion air pressure, along with the other usual system interlocks. Motor starter is to be interlocked with valve, whether or not a combustion air pressure switch is used.

Installation Instructions

Procedure required to convert gas-only Model "500-G" and "EB-G" OVENPAK® Burner to combination fuel version (Model "500-SP" and "EB-SP")

Oil conversion kits for Model "500-G" or "EB-G" OVENPAK® Burners include the components shown below.



Note: Current versions may vary in appearance from illustration

To make the conversion:

1. **Disconnect the automatic control linkage** from operating crank. Save the toggle, bolt, washer, nut, etc.
2. **Loosen set screw** in operating crank. Remove crank from operating shaft and discard.
3. Remove the four #10-24 x 5/8" socket head cap screws from the retainer and cover plate.
4. **Remove the gas nozzle sub-assembly** completely from the back plate and discard. **Gas nozzle sub-assembly is comprised of:**
 - a. Retainer and cover plate
 - b. Gas nozzle
 - c. Gasket
 - d. All thread support rod
 - e. 1/4" – 20 hex nuts (2)
5. **Mount oil control valve sub-assembly** to the boss on main housing, using four 1/4" – 20 x 5/8" hex head cap screws.
6. **Insert the oil nozzle sub-assembly** into the back plate and bolt into place firmly with four #10-24 x 5/8" socket head cap screws. Be sure the oil line (line with 90° reducing elbow) is closest to the fan and the compressed air line (line with the pipe tee) is closest to the oil control valve.
7. **Connect the end of the oil tube** to the oil control valve with a brass oil tube connector and the other end to the 90° reducing elbow with a brass oil tube connector, making sure that the flowmeter is right side up and in vertical position. Be sure these connector fittings are made up tight.
8. Verify the oil control valve plunger is inserted in the oil control valve and that it will depress into the oil control valve approximately 3/4".
9. **Loosen the set screw in the operating shaft set collar** so that the set collar is loose on the operating shaft. **DO NOT REMOVE THE SET COLLAR.**
10. **Slide the spacer onto the operating shaft** on the end from which the control crank was removed.
11. **Slide the screw carrier onto the operating shaft** and tighten the set screws in the screw carrier onto the "flat" on the operating shaft. Move the shaft back and forth if necessary to locate the "flat" and the set screws.
12. **Turn the screw carrier to the minimum position** (indicator arrow pointing to "LO") and push the screw carrier firmly against the brass spacer. Slide the set collar into the burner until it is snug against the burner and tighten the set screw. Operate the screw carrier a few times between minimum and maximum to assure smooth operation. If the set collar is not snug or the screw carrier is not firmly mounted, repeat step 12.
13. **Connect the automatic control linkage** to the screw carrier using the toggle, bolt, etc. from step 1.
14. **Connect the compressed air line** to the 1/8" pipe tee on the oil nozzle sub-assembly.
15. **Double check all oil line connections to make sure they are tight.**
16. **Adjust oil firing** of the burner per catalog start-up instructions and curves.

Start-Up Instructions

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

CAUTION: Initial adjustment and light-off should be undertaken only by trained and experienced personnel familiar with combustion systems, 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 OVENPAK® Burner gas-firing start-up:

1. **Close all burner fuel valves and cocks.** Make preliminary adjustments to fuel gas regulators. 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.
2. **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.
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 OVENPAK® Burner's operating crank arm by loosening the control motor's connecting rod from the burner's toggle linkage.
For Model "EBG-SP-MRV" OVENPAK® Burners, the connecting linkage on the separate

control valve must be similarly loosened and disconnected. Refer to specific adjusting procedures relating to control valve adjustment in Maxon catalog.

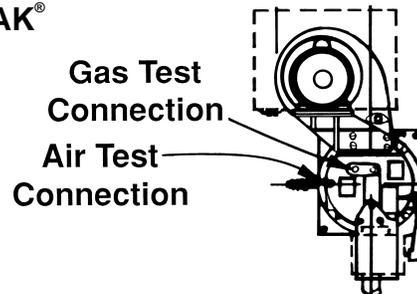
Initial start-up adjustment should only be accomplished during a "manual" burner control mode.

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 OVENPAK® Burner's operating crank to "high fire" position so that air only flows through burner and combustion chamber.

CAUTION: Do not by-pass control panel timers typically controlling sequential operations.

6. **Verify differential air pressure.** With combustion air blower "on", all volume air fans operating, and burner at "high fire" position, connect a manometer between the air test connection on backplate of OVENPAK® Burner and your combustion chamber static pressure test connection. This will give a **direct** differential air pressure reading.

Model "500" OVENPAK® Burners



If the combustion chamber does not have a static pressure test connection, measure combustion chamber static pressure by connecting a manometer between the **gas** pressure test port on the OVENPAK® Burner's backplate and to atmosphere with the burner at "low fire" position, fuel valves closed, and all air handling systems running. Determine differential air pressure reading by taking an additional reading with

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manometer connected between the burner's air pressure test port and atmosphere with the burner at high fire position, fuel valves closed, and all air handling systems running. Subtract the combustion chamber static pressure obtained above from this air pressure reading to determine the **differential air pressure reading**.

NOTE: The differential air pressure setting determines the burner's capacity and performance capabilities. Model EB and MA manual air OVENPAK® Burners, with their external air control valve(s), provide for the manual setting of this differential air pressure to the burner. Refer to specific adjusting procedures relating to MICRO-RATIO® and control valve adjustment in Maxon product line catalog. MA OVENPAK® Burners have an external locknut adjustment on the end of the air butterfly control valve. This lets you limit and set the differential pressure to the OVENPAK® Burner. Refer to Maxon specification tables in the catalog for the differential air settings required for your specific OVENPAK® Burner capacity.

7. **Determine the required differential gas pressure** using this differential air pressure reading obtained from step 6. High fire pressures are provided in Maxon product line catalog literature and/or read data stamped into burner nameplate.
8. **Verify that spark ignitor is properly positioned** and lines up with the appropriate dimensions required for your specific burner. (Refer to appropriate Maxon catalog specification table.) Check that spark ignitor arcs at the end of your properly positioned ignitor.
9. **Return burner control valve/crank to low fire position** when purge of system is complete.
10. **Open main and pilot gas cocks**, then attempt spark ignition to light pilot while slowly turning pilot gas regulator spring cap clockwise and/or adjustable orifice screw counter-clockwise 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).

11. **After ignition, adjust pilot flame** for good stable flame shape. A rule of thumb is any pilot over a tennis ball size is probably too large. This assumes 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. This signal strength can be read with a micro-amp meter. The signal strength (or range) will be determined by the specific type of flame safeguard instrument used with your burner system.
12. **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 ignition within a second or two. The flame safeguard relays should now power the main fuel Shut-Off Valve(s).

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.

To this point, gas firing and oil firing start-up procedures are identical. The gas-fired pilot that is required for both operating modes has been established.

To continue adjusting for **main gas firing only**, follow steps 13 through 20. To adjust for **combination oil firing**, follow steps 13 through 33. If OVENPAK® Burner is to fire with a **gas pilot and oil only main fuel**, proceed to steps 21 through 33.

For main gas firing only (steps 13 through 20)

13. **Establish main gas flame.** With burner at low fire position, open all manual fuel shut-off valves (automatic fuel shut-off valve should already be open) so gas flows to burner inlet. There should be little, if any, change in flame appearance. **Turn main regulator adjusting screw** in (clockwise) to obtain outlet pressure of about 4"-6" wc higher than combustion chamber pressure (2"-4" wc for propane, considerably higher for some EB versions). Main flame should now appear larger than pilot-only flame.

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14. **Establish high fire setting** on gas by slowly moving burner crank toward high fire position while observing gas pressure at burner gas test connection. Refine main gas regulator adjustment as necessary to provide correct differential gas pressure (gauge to combustion chamber, see step 7) at high fire. If pressure cannot be adjusted low enough, a different regulator or regulator spring may be necessary, or a limiting orifice valve (such as Maxon's Series BV) should be added. Do not, however, exceed 4" wc pressure drop between regulator outlet and burner inlet.

CAUTION: If burner(s) go out, close shut-off valve or shut main gas cock at once. Return to minimum setting, re-light pilots if necessary, then turn main gas on again. Check carefully that every burner is lit before proceeding.

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.

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

Control linkage travel must be such that burner crank 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.

16. **Re-check differential gas pressure** with unit at operating temperature. Refine high fire setting if necessary, considering differential pressure, flame length, and appearance. Natural gas flame should normally be predominantly clear blue, but possibly with semi-luminous tips. Dust or contaminants in the air stream may affect flame color.

17. **Check for contact between mixing cone and top-most centering screw** after system has reached maximum operating temperature. If set screw touches cone, back off an additional 1/8 turn on top and both side set screws.

18. **Plug all test connections not in use to avoid dangerous fuel leakage.** Replace equipment cover caps and tighten linkage screws.

19. **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.

Recheck all safety system interlocks for proper setting and operation.

NOTE: Typical gas firing control sequence for Maxon burners is provided only as a guide. Instructions provided by complete system manufacturer incorporating Maxon burners take precedence.

For gas firing Model "500-G" OVENPAK® Burner

Light-off:

1. Close cocks, shut-off valve(s)
2. Verify burner at low fire
3. Start recirculating/exhaust fans
4. Start burner blower
5. Purge system per appropriate NFPA standards and/or other applicable codes and standards
6. Open pilot & main gas cocks

Shut-down:

1. Close main & pilot gas cocks
2. Keep combustion air blower running after shut-down long enough to allow burner to cool

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.

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

Start-Up Instructions

For initial OVENPAK® Burner oil firing start-up:

Complete steps 1 through 12 to establish gas-fired pilot and steps 13 through 20 for main gas firing (if combination fuel firing is to be used).

21. **Prepare for initial oil firing start-up** by checking that all the burner valves are closed, the combustion chamber purged, combustion air is established, oil and compressed air is supplied at 90-125 PSIG, fuel selector switch is set for oil, control motor linkage is disconnected, and OVENPAK® Burner is set to "low fire" position.
22. **Set compressed air pressure** (using the regulator and gauge furnished as part of the pipe train) to the figure shown for your burner size in the table below. Re-adjust pilot gas if necessary.

Required Pressures

Burner Model		Compressed Air (PSIG) [1]		#2 Oil Pressure (PSIG)	
500-SP	EBC-SP	500-SP	EBC-SP	500-SP	EBC-SP
508-SP	EBC-2SP	60	60	35-60	35
515-SP	EBC-3SP				50
525-SP	EBC-4SP	70	70		70
535-SP	EBC-5SP				80
550-SP	EBC-6SP				

[1] Varies with air differential pressure

23. **Adjust low compressed air pressure switch** to break at about 5 PSIG below the desired supply pressure. (It should be electrically interlocked with the oil solenoid valve.)

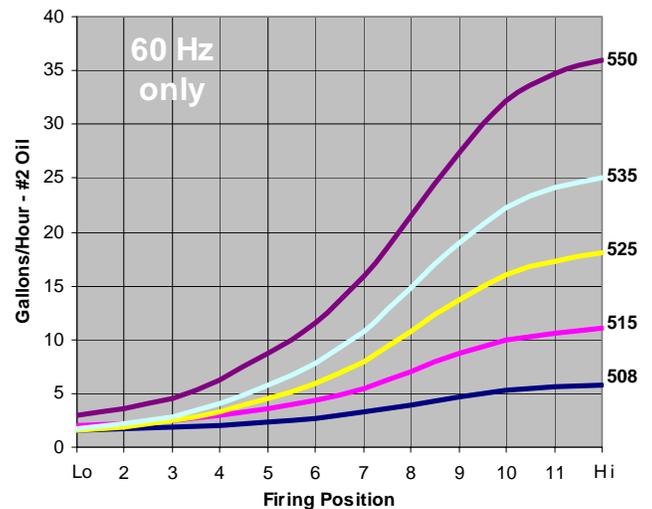
NOTE: All Model "500-SP" OVENPAK® Burners are adjusted and test-fired in the open at our factory before shipment, so simple setting of oil pressure regulator is normally sufficient to establish main flame once the manual oil valve is opened. Significant re-adjustment will normally be required only in cases of high back pressure or suction.

24. **Open manual oil valve.** When the burner lights, set the oil pressure (using the regulator and gauge furnished as part of the pipe train) to the figure shown for your burner size in the table above.

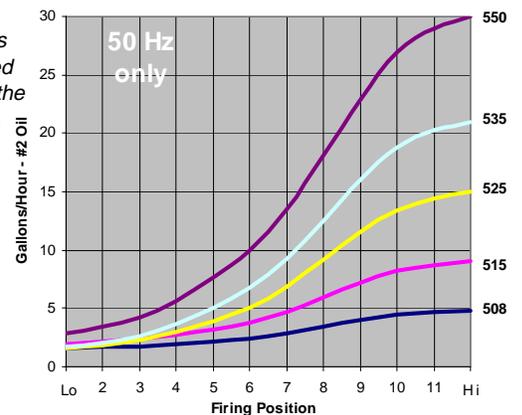
CAUTION: Oil flames are highly radiant. Use eye protection and minimize viewing.

25. **Refine main burner adjustment**, if necessary, using the flow/position curves shown below. Determine need by advancing linkage slowly from low-fire position while viewing main flame for satisfactory characteristics and the complete absence of smoke, soot, odor, or unvaporized oil. Certain firing conditions may require significantly higher or lower flows for optimal combustion.

Model "500-SP" OVENPAK® Burner



For 50 Hz operation, these burners are downrated as shown in the chart at right.



CAUTION: If burner(s) go out, close shut-off valve or main fuel cock at once. Return to minimum setting, re-light pilots if necessary, then turn main oil on again. Check carefully that every burner is lit before proceeding.

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26. **Cycle burner from minimum to maximum** and refine adjustment, if necessary.
For operation with interrupted pilot (as recommended): **Test burner operation** by cycling to low fire position and turning off oil, then pilot. Re-light pilot and main flame, then cycle burner through its firing range while checking for suitable flame signal. Repeat as necessary.
27. **Set low oil pressure switch** (if used) to break just below the established oil pressure at the sensing point. (It should be a manual reset switch, on the low pressure side of the oil pressure regulator).
28. **When burner performance is satisfactory** and stable throughout the firing range, reconnect linkage to control motor.
 Control linkage travel must be such that burner crank 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.

29. **Check for contact between mixing cone and top-most centering screw** after system has reached maximum operating temperature. If set screw touches cone, back off an additional 1/8 turn on top and both side set screws.
30. **Plug all test connections not in use to avoid dangerous fuel leakage.** Replace equipment cover caps and tighten linkage screws.

31. **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.
32. **Re-check all safety system interlocks** for proper setting and operation.
- NOTE:** Typical oil firing control sequence for Maxon burners is provided only as a guide. Instructions provided by complete system manufacturer incorporating Maxon burners take precedence.

For oil firing Model "500-SP" OVENPAK® Burners

Light-off:

1. *Purge system per appropriate NFPA standards and/or other applicable codes and standards*
2. *Combustion air on*
3. *Burner at low fire*
4. *Gas pilot lit*
5. *Compressed air on*
6. *Oil on main flame lit*
7. *Pilot gas off*
8. *Firing rate controlled to need*

Shut-down:

1. *Cycle to low fire*
2. *Re-establish pilot*
3. *Main oil off*
4. *Compressed air off*
5. *Pilot gas off*
6. *Cool down oven*
7. *Combustion air off*

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.

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



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