

SPEEDY MELT MODEL MP-36 AND MP-47 MULTI-PURPOSE FURNACES

INSTALLATION

Locate the furnace in the General Metals shop across the room opposite to the windows or fresh air openings. Fresh air, entering through the windows, will sweep across the shop and over the furnace, be drawn into the hood, and exhausted to the outside. This will prevent accumulation of smoke and fumes over the rest of the shop area. A four foot square, or conical hood should be mounted over the furnace and connected to ventilating system. The hood should be suspended by rigid mounting from the ceiling with seven to eight feet clearance from the floor. The exhaust system should be capable of changing total volume of air under the hood at least six times a minute. State or local codes may vary from the above suggested recommendation and should be considered prior to installing an exhaust system. If the furnace is to remain in a permanent location, it may be secured to the floor with lag bolts. A properly fused, conduit protected electric circuit should be installed by a licensed electrician. The gas valve size for the furnace is $3/4$ " NPS, but the gas service line to the furnace should be at least 1" NPS for the MP-36 and $1\frac{1}{4}$ " for the MP-47, reduced to $3/4$ " NPS at the gas shut off cock. If the length of the service run exceeds fifteen feet, the service line size should be increased to the next pipe size larger. Natural gas line pressure should be at least four inch pressure at the shut off cock with the furnace operating. Low gas pressure or inadequate volume will cause flame fluctuation, improper firing and pilot flame outage. *THE GAS UTILITY COMPANY SHOULD BE CONSULTED AS TO THE ADEQUATE PIPE SIZE ON INITIAL INSTALLATION*, or where there is a pressure dropping problem.

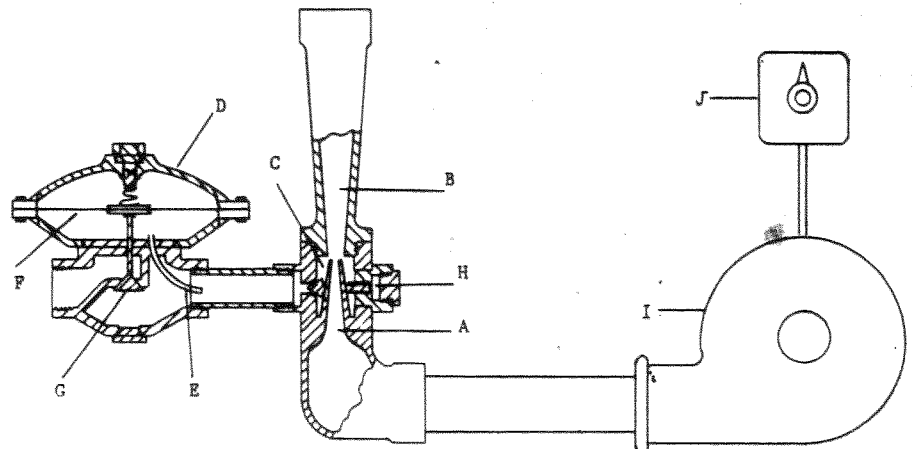
When using manufactured or LP bottled gas, the Gas Service Company should be advised of the furnace BTU rating, so proper gas supply lines can be installed. A high flow, low pressure regulator must be used in addition to a tank regulator, and set to hold at least six inch W.C. with the furnace operating at maximum input. The gas line size from the regulator to the furnace should be at least $3/4$ " NPS.

MAINTENANCE AND OPERATION

All multi-purpose furnaces are preadjusted and fired at the factory. They are tested and adjusted with natural gas unless otherwise specified. *FURTHER ADJUSTMENT IS USUALLY REQUIRED AT THE SITE OF INSTALLATION, EITHER DUE TO A DIFFERENCE IN BTU RATING OR SERVICE LINE PRESSURE OF THE GAS SUPPLY LINE.*

STANDARD MULTI-PURPOSE FURNACE WITH 4UV

The standard multi-purpose furnace is furnished with a No. 4UV Ultra Violet combustion safety system and a manual rheostat control. Both multi-purpose furnaces are designed with an industrial type automatic proportioning gas-air mixer with zero governor. Air is supplied by the motor-blower unit "I". As the air flows through jet "A" into the venturi tube "B", a high suction is created within chamber "C". This suction will vary with volume and velocity of air flowing through the jet. The suction passes through the connecting nipple into the zero governor "D", then through bleed tube "E", and to the top of the diaphragm "F". Movement of the spring counterbalanced diaphragm opens the poppet valve "G" in proportion to the suction generated in chamber "C". Flow of gas for the mixture is set by the ratio adjuster "H". The slight adjustment of the mixer may be required on initial start-up due to variation on BTU contents of fuel gases. *SIMPLE ADJUSTMENT IN THE SETTING OF THE*



RATIO ADJUSTER "H" WILL AGAIN PROVIDE THE CORRECT MIXTURE. The volume of air is controlled by a variable speed rheostat "J". Furnace heating rate is controlled by adjusting the rheostat.

THE SPECIAL MODEL MP-47 WITH AUTOMATIC TEMPERATURE CONTROL

The Special Multi-Purpose Model MP-47 can be furnished with automatic temperature control. This system includes a temperature indication controlling instrument and a motorized air valve with a No. 6UV Ultra Violet system, instead of the manually adjusting rheostat and the No. 4UV Ultra Violet safety system. The gas air mixer operates the same, but the volume is increased or decreased by opening or closing an air butterfly valve. The opening or closing of the air valve is controlled by the automatic temperature controlling instrument. If the furnace temperature is below control set point, the instrument causes the valve motor to open the butterfly valve, increasing the volume of air to the mixer and increasing the firing rate of the furnace. When the furnace reaches temperature, the instrument causes the valve motor to close the butterfly valve, shutting down the main burners. When the furnace temperature falls below set point temperatures, the burners reignite, the air valve opens and the heating increases.

Since the main burners are extinguished when temperature set point is reached, *THERE MUST BE SOME PROVISION FOR REIGNITING THE MAIN BURNERS.* Consequently we use the No. 6UV piloted system so there will be a constant pilot flame, regardless of firing rate. The No. 6UV system is covered in Bulletin 1003. *BOTH THE PILOT MIXER AND THE MAIN GAS AIR MIXER MUST BE ADJUSTED ON INITIAL SET UP AND FIRING.*

CRUCIBLE MELTING BRASS AND ALUMINUM WITH STANDARD UNIT

Remove the flat silicon carbide hearth plate from the furnace and set the crucible rest in the center of the furnace chamber. Close both drop doors. Ignite the furnace and raise the furnace to a red heat. Remove the plug type lid and place crucible on crucible rest with crucible tongs. Replace plug lid and increase firing rate of furnace by adjusting rheostat setting. Remove lid and check progress of melt periodically. A lance type pyrometer can be used to check molten metal temperature. When charge has melted, remove crucible with a tong and pour mold. To prevent the crucible from sticking to the crucible rest, place a piece of damp cardboard on the rest before setting the crucible. The paper will burn or char, leaving a layer of ash between the block and crucible. A crucible of aluminum will melt in 20 minutes, a crucible of brass in 35 minutes.

OPERATION OF MODEL MP-47 AUTOMATIC TEMPERATURE CONTROL-- CRUCIBLE MELTING ALUMINUM

Set the temperature control instrument at the desired set point for melting and pouring aluminum. Do not insert the thermocouple into the pot or crucible until the tip can be submerged in molten aluminum. After the aluminum has started to melt, the temperature control system can be used.

CAST IRON MELTING LADLE

Aluminum is melted in the cast iron pot in about 30 minutes. The pot is designed with lifting bars so it can be picked up with the lock type pouring handle and tilted to pour the molds. To use melting pot, remove crucible rest and hearth plate. Close the drop type doors. Start furnace by adjusting the rheostat. Remove plug type lid and set pot into furnace chamber. Fill pot with small scrap aluminum and increase firing rate of furnace. *DO NOT HEAT THE CAST IRON POT HIGHER THAN APPROXIMATELY 1500°F.* This temperature would be an approximate dull cherry red. If cast iron is heated to a bright red, it reaches a temperature where a portion of the Gray Iron matrix starts to melt. This weakens the overall structure of the iron and can cause premature pot failure. Molten aluminum at elevated temperatures will also attack and absorb iron. This is commonly referred to as a "thermite reaction". When this occurs, the failure has the appearance of a casting defect in the pot. It may look like a cold shut or void in the casting. It is actually caused by the aluminum attacking and absorbing iron in that particular section of the casting. *POT LIFE CAN BE EXTENDED BY COATING THE INSIDE OF THE POT WITH A CERAMIC OR CLAY TYPE COATING.* This is available from your distributor as Foseco Terrapaint. Coating the inside of the pot with a ceramic or clay type material forms an inert barrier between the gray iron pot and the molten aluminum. This helps to prevent the thermite reaction.

Coating the outside diameter of the pot retards oxidation and scaling. *THE MAJOR FACTOR WHICH CAUSES PRE-MATURE FAILURE IN CAST IRON POT LIFE IS OVER HEATING.* As soon as the puddle of molten aluminum forms in the bottom of the pot, add large pieces of dry pig or scrap. *CAST IRON POTS WILL LAST ABOUT TWICE AS LONG IF A PUDDLE IS FORMED BEFORE ADDING HEAVY PIG.* The small scrap will melt rapidly, then in turn melt the heavy pig and prevent overheating the cast iron. *DO NOT MELT BRASS IN THE CAST IRON POT.*

FORGING AND HOT FORMING

The crucible rest and the hearth plate should be removed from the furnace chamber, since they deteriorate with use and should be used for their specific purpose. Start the furnace and heat to red temperature. A heavy rod and bar can be end heated by using one of the drop door openings. The door will serve as a work rest. Bars or rods can be center heated for hot forming by using both front and rear openings. Smaller sections of rod or bar can be heated by closing the drop doors, removing the plug lid and laying the bar across the top opening. Rod up to 1/2" in diameter can be end or center heated by closing the furnace doors and top lid and using the four triangular exhaust ports in the furnace top. The furnace should be set at maximum firing rate for forging.

HARDENING

The furnace is used for hardening steel by placing the hearth plate in the furnace chamber to support the work. Start the furnace and set the control rheostat at a low setting to preheat the hearth plate for at least 15 minutes. Increase heating rate slowly until furnace chamber is a uniform red heat. Adjust rheostat until furnace holds an even temperature.

Place dies on hearth plate and leave in furnace until they reach a uniform red heat. Then quench and temper. An indicating lance or wall type pyrometer can be used to check furnace temperature by inserting the pyrometer tip into the furnace chamber through one of the four exhaust ports. The blower rheostat can then be adjusted to maintain the desired temperature.

PRESSED STEEL POT

The pressed steel pot can be used for liquid salt, lead or cyanide hardening, or for melting lead, zinc or aluminum. The steel pot is placed in the furnace chamber identical to using the cast melting ladle. The temperature of the furnace is controlled in the same manner used for conventional hardening. Pressed steel pots should not be used for temperatures in excess of 1600°F. The same conditions apply to using steel pots as those for cast iron pots when melting aluminum.

LIGHTING INSTRUCTIONS

FURNACE WITH MANUAL RHEOSTAT CONTROL AND NO. 4UV ULTRA VIOLET SAFETY SYSTEM:

1. Set rheostat pointer at lowest setting. Turn counter-clock-wise to stop post.
2. Open furnace doors and main gas shut off cock.
3. Press start button. Ignition and operation is automatic. Adjust rheostat setting to desired heating rate. On initial start up it may be necessary to adjust main burner per paragraph - "Adjusting Main Burners".
4. Refer to Bulletin 1002 for details on No. 4UV Ultra Violet Safeguard Systems.
5. To shut down - press stop button and close gas shut off cock.

FURNACE WITH AUTOMATIC TEMPERATURE CONTROL SYSTEM AND NO. 6UV ULTRA VIOLET SAFETY SYSTEM:

1. Open furnace doors and main gas shut off cock. Press start button. Pilot burner will ignite and burn constantly. (Pilot mixer may require adjustment on initial light up. Refer to Bulletin 1003 for detailed instruction on No. 6UV Ultra Violet Safety Systems).
2. Set automatic temperature control instrument at desired control point.
3. Press "gas start" button on panel. Main burners will ignite. On initial start up it may be necessary to adjust main burners per previous paragraph "Adjusting Main Burners".
4. To shut down - press stop button and close gas shut off cock.

ULTRA VIOLET COMBUSTION SAFEGUARD WITH SPARK IGNITION

MIFCO COMBUSTION SAFEGUARD SYSTEM No. 4

SAFE STARTING:

1. Open the lid and swing away from the burner. (WARNING - DO NOT SWING THE HOT LID OVER BURNER EQUIPMENT.)
2. Open main gas line shut off cock leading to the furnace. This does not include the gas adjusting valve at the mixer.
3. Be sure both mixer gas and air adjusting valves are closed.

IGNITION:

4. Press the start button. This energizes the flame protection circuit.
5. There will be a 10 second self diagnostic period when the unit receives power. During this time, the unit checks all circuits for continuity before powering the blower.
6. After the blower starts, there is a 10 second purge cycle prior to the spark transformer and main gas coming on.
7. When the purge cycle is finished, the spark transformer and main gas solenoid will receive power. This will be indicated by the PILOT and MAIN indicator lights on the flame supervision chassis. At that time, you have 10 seconds to achieve ignition before the unit shuts down for flame failure. Open the gas adjusting valve slowly (smaller adjusting valve which enters the side of the mixer) until main burner ignites. When the flame is established and is being seen by the flame scanner, the FLAME indicator light on the chassis will be lit. The ignition trial period only lasts for 10 seconds, so burner flame must be established within this time.
8. Adjust the mixer to about 1/3 firing rate. Adjusting any two valve burner system is identical to adjusting an oxy-acetylene torch. Increase the gas slightly until the flame shows a slight excess of gas, then open the air valve to form the flame cone at burner tunnel. IMPORTANT THE MAIN BURNER FLAME MUST BE HELD NEAR THE BURNER TUNNEL OPENING SO THE ULTRAVIOLET SCANNER CAN SEE THE FLAME.

ADJUSTING:

9. Close the furnace lid and continue opening the gas and air valves per step '8' until the air valve is wide open. There should NEVER BE MORE THAN 5 inches of flame coming out of the exhaust port at any time during adjustment of burner. See the Operating Manual for adjusting the atmosphere for melting.
10. To decrease heat, close the air valve until the exhaust flame at the exhaust port is about 5 inches long. Next, close the gas valve until the flame disappears into the furnace. Repeat the turn down sequence to the desired firing rate. Idle is about one fourth open.

SHUT DOWN FOR POURING OR TEMPERATURE CHECK:

11. IDLE FURNACE PER STEP '10', then press the stop button. This closes the gas solenoid shut off valve and stops the blower. DO NOT CHANGE IDLE ADJUSTMENT OF VALVES. To restart the furnace, press the start button and the furnace will re-ignite at the idle position.

SHUT DOWN TO SECURE FURNACE AT END OF MELTING PERIOD:

12. Press the stop button. Close both of the mixer adjusting valves. Close the gas line shut off cock. Close the furnace cover.

RE-IGNITION AFTER FLAME FAILURE:

- a. Turn off all burner adjusting valves.
- b. Press the stop button on the start-stop station.
- c. Wait 50 to 60 seconds for safety timers to cool off.
- d. Depress the RESET button on the flame supervision chassis.
- e. Open the furnace cover. Repeat ignition steps 4 through 8.

TROUBLE SHOOTING FOR INITIAL START-UP:

A. FURNACE WILL NOT RESTART AFTER MELTING CYCLE AND SHUTDOWN: The gas valve was closed, extinguishing the flame before the stop button was pressed. This simulates a flame failure and initiates the flame failure shutdown cycle. Follow the steps in RE-IGNITION AFTER FLAME FAILURE, to restart the furnace.

B. FURNACE IGNITES SATISFACTORILY, BUT SHUTS DOWN WHEN HEATING RATE IS INCREASED: Too much gas in the mixture. The flame blows away from the burner tunnel, simulating a flame failure. Refer to the information in STEP 8 of IGNITION.

C. FURNACE SHUTS DOWN WHEN FURNACE IS ADJUSTED TO MAXIMUM FIRING: Insufficient gas supply. The excess air extinguished the flame. Have a gas utility company check the gas regulator and size of installation against the BTU rating of furnace.

D. SLOW MELTING: Insufficient gas supply. The operator should be able to open the air valve all the way and still have excess gas available. See the Operating Manual on: OPERATION.

E. FURNACE WILL NOT START AFTER FLAME FAILURE SHUTDOWN: The flame relay has not been reset. See STEP "d" in RE-IGNITION. Insufficient waiting period for cool down of timers. See STEP "c" RE-IGNITION.

SERVICING - TROUBLE SHOOTING:

Problems with MIFCO furnaces with Fireye Controls can be easily isolated by following the approved procedure in the sequence given below. Before starting any trouble shooting, however, make sure of the following:

1. Installation and wiring has been made in accordance with the manufacturer's instructions.
2. The Fireye Chassis is securely plugged in and the top and bottom retaining screws are tightened. The Lockout Switch (red pushbutton) is reset.

In the following list, problems are listed first, and the possible causes are listed below in numerical order. Refer to the manufacturer's instruction manual included in this operating manual for proper component and contact identification. It is necessary to have a 20,000 ohm, DC volt meter to perform signal testing. This meter, set on 150 volt AC scale, may be used to check line and load voltages at the identified terminal studs on the components.

A. FURNACE WILL NOT START:

1. No voltage at start button or at UV terminals S1 and S2:
 - a. Power cord not plugged into outlet.
 - b. No power at outlet, (check with meter).
 - c. Disconnect switch is off that feeds outlet.

A. FURNACE WILL NOT START: - (cont.)

- d. Broken wire between outlet and control box.
 - e. Blown fuse that feeds circuit breaker.
 - f. Check the 2 amp control fuse.
2. Insufficient voltage at UV terminals S1 and S2:
- a. Minimum voltage is 102 volt - 50/60 cycle.
 - b. Maximum voltage is 132 volt - 50/60 cycle.
3. No voltage to coil of motor starting relay R-1:
- a. With volt-meter, check wires to relay coil from start / stop buttons.
4. Unit not properly grounded.

B. MOTOR STARTING AND HOLDING RELAY WILL NOT OPERATE:

1. No action when start button is activated:
- a. Check for voltage on either side of start button. If there is no voltage, replace the bad switch.
 - b. Check relay coil, gray wire, for voltage.

C. HOLDING RELAY WORKS BUT MOTOR DOES NOT RUN:

1. Check motor overload:
- a. Check with voltmeter to see if power is passing through to motor. Check from ground to overload.
 - b. Push the reset button on the motor overload.
 - c. Check the heater element on the top of the motor overload to see if it is burnt in half.
 - d. Examine relay contacts.

D. THE MOTOR RUNS, BUT THE SPARK DOES NOT COME ON:

1. Check the spark plug for power:
- a. Remove the spark plug cap. Hold this cap by the outside corner and hold the cap up to a metal part of the furnace and push the start button to see if there is a spark at the cap.
2. Check the air pressure switch:
- a. Remove the junction box cover on the top of the air pressure switch (004226). Place both wires inside on the same terminal, this will by-pass the switch. If you get a spark when you press the start button, you know the switch is bad.
 - b. With the air switch by-passed and the motor running, check UV terminals 2 & 4 for line voltage, 120V. If no voltage is present, replace UV chassis.
3. Check the spark plug:
- a. Pull off the spark wire and hold by the outside corner of the connector cap. Hold the metal part of the cap close to the burner and press the start button. If it sparks, the transformer is OK. If not, check the spark wire connections on both ends and try again. If there is still no spark and there is 120 volts-on terminals 2 & 4, then you should replace the spark transformer.
4. The spark plug does not fire:
- a. Remove the plug and look for cracks in the porcelain insulator. If it is cracked, replace with the same electrode.

4. (cont.)

- b. If the plug is not cracked, install it back in the furnace. The gap between the wire tip of the plug and the end of the burner nozzle should be 1/16" to 1/8". This can be adjusted by bending the electrode wire, swiveling the electrode, and then tightening the clamping nut to hold it in place. Observation can be made with a mirror inside the furnace or through the UV Scanner observation port. In either case, **BE SURE THE GAS IS OFF.**

E. THE MOTOR RUNS, THERE IS A SPARK, BUT NO GAS:

1. Scanner does not see spark:
 - a. Remove the scanner to see if the sight tube is blocked.
 - b. Wipe off scanner bulb with soft cloth or tissue and replace.
2. Broken Scanner wire:
 - a. Check for cuts or mashed conduit.
3. Ignition signal testing using a 20,000 ohm per volt DC volt meter:
 - a. Connect the meter to terminals S1 & S2.
 - b. Set the volt meter on the 10 volt DC scale and initiate a normal start up, but with the gas valve CLOSED. The meter should read between 4 1/2 and 5 volts. If the meter goes backwards, reverse the leads. If the reading is less than 4 1/2 volts, the scanner needs to be replaced.

F. GAS SOLENOID WILL NOT OPEN:

1. After checking all of the above, check terminals 2 & 3 on UV Chassis for line voltage:
 - a. Put the volt meter back on the AC-250 volt scale and put the leads on terminals 2 & 3. Start the furnace, and when the unit goes to Main Flame, terminal 3 should be energized, reading 120 volts. If it is not, and every thing else proves out, the chances are that the UV Chassis is bad and needs replacing.
2. Terminal 3 is powered but the solenoid still will not open:
 - a. Check for broken wires or loose connections.
 - b. The solenoid wires can be taken loose by a qualified electrician and powered with 120 volts to see if it will open. If it does not open, it will have to be replaced.
 - c. Check to see that the gas pressure is not higher than the rating on the valve nameplate.

G. MAIN FLAME SIGNAL TESTING:

1. Same procedure as STEP "E" - "3".

H. MAIN FLAME DOES NOT LIGHT:

1. Gas valve shutoff someplace in building.

I. MAIN FLAME LIGHTS AND GOES OUT AFTER 10 SECONDS:

1. Flame not adjusted properly:
 - a. It is best to get the furnace flame at least half way open before the spark goes off, especially on a cold start up.

J. FURNACE SHUTS DOWN WHEN IT IS ADJUSTED TO MAXIMUM FIRE:

1. Insufficient gas supply:
 - a. Excess of air extinguishes the flame. Have the gas utility company check the gas pressure with the furnace running. If the pressure drops to "0", the gas supply is inadequate.
 - b. Not enough gas in adjustment, the flame should come out of the exhaust port about 3 inches.
2. Too much gas:
 - a. The flame is burning away from the burner port. The UV Scanner cannot see flame and turns off gas.

K. SLOW MELTING:

1. Insufficient gas supply:
 - a. The operator should be able to open the air valve all the way and still have an excess of gas after the flame has been balanced.
2. Low service line voltage:
 - a. The voltage on the service line should be 115 volts. Low voltage causes the rpm of the motor to drop, which results in a reduced volume of air.
 - b. Bad bearings will also slow down a motor.

L. FURNACE WILL NOT RESTART AFTER STOPPING:

1. Gas valve was shut off before stop button was pressed:
 - a. The reset has kicked out. Push the Reset Button on the UV Chassis and then restart.
2. UV Chassis may be going out.
3. Gas supply marginal and / or fluctuates:
 - a. When starting with the valves in a set position and the gas supply or pressure changes, like when a boiler comes on, the valve setting would not be right and the unit would not start.

M. FURNACE WILL NOT START AFTER FLAME FAILURE:

1. Not enough time has elapsed for blower to stop spinning and allow the air switch to reset:
 - a. Allow blower to stop spinning then press reset button on UV Chassis.
2. Bad UV Chassis.
3. Bad UV Scanner.
 - a. Check and replace if necessary.

N. ELECTRICAL SEQUENCE:

1. Press the start button and the system performs- self check.
2. Holding coil pulls in and motor starts.
3. Air switch closes powering terminal 6 in UV Chassis.
4. Terminals 4 and 3 powered. Ignition transformer powered and ignition timing starts. Main gas solenoid powered.

N. ELECTRICAL SEQUENCE - (cont.):

5. Gas in scanner ionized, allowing power to flow between electrodes.
6. Main flame is proven and stays on.
7. Flame failure for any reason cuts off power to terminal 4 and 3 in 3 seconds.
8. Alarm light comes on.
9. Push reset button.
10. Blower failure, air switch opens - cutting power to gas solenoid. Blower runs another 10 seconds and turns off.

RELINING INSTRUCTIONS FOR MP-47

The relining kit contains all the refractory shapes and the pre-mixed insulation necessary to recondition your furnace. It is not necessary to remove the burners or the manifold. Break out the old lining, remove the door blocks by loosening door frame clamps, discard top plug lid and remove layer of cast insulation from bottom of furnace. If equipped with a piloted safety system, disconnect the pilot burner tip and remove from the pilot tunnel.

1. Mix one third of the dry insulation with water to the consistency of stiff plaster. Add water slowly. Pour insulation into bottom of furnace chamber until it is level with steel piers.

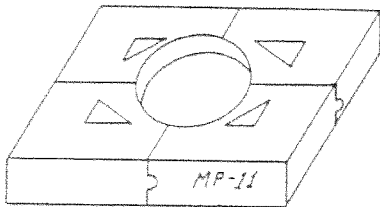


FIG. 1

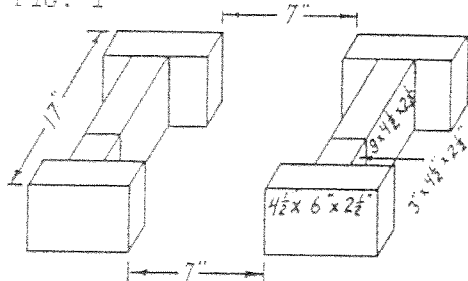


FIG. 2

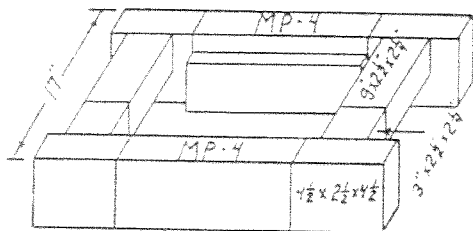


FIG. 3

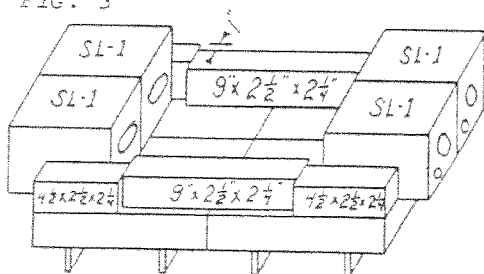


FIG. 4

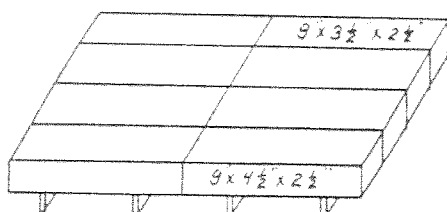


FIG. 5

2. Mix refractory mortar with water to consistency of heavy paint.
3. Center bottom bricks (Fig. 5) on top of piers and layer of insulation. Center carefully to be sure side clearance between bottom brick and furnace burner side wall are equal. Dip all adjoining surfaces in mortar as furnace is assembled.
4. Fill 2 1/2" space on sides of bottom bricks with insulation, then strike-off level with top of bottom brick.
5. Dip liner (SL-1) at ends, bottom back side and adjoining sides in mortar. Set in place on burner tips (Fig. 4). Be sure to clear burner tunnels and burner tip of any mortar. Using dip joints, set balance of brick in Fig. 4 in place.
6. Mortar 3rd layer bricks in place, see Fig. 3. Center MP-4 bricks between burner bricks and maintain 17" outside dimension. Use dip joints, set balance of brick in Fig. 3 in place.
7. Using dip joints, set brick per Fig. 2. Be sure 7" door opening is in center of furnace, and that outside surfaces of the door are flush with MP-4 bricks so that the door will close tight.
8. Place mortar on tops of fourth row of liners and press four banded MP-1 top liners in place, flat side up (Fig. 1).
9. Thin mortar with water and paint all exposed brick surfaces to seal the joints.
10. Mix remainder of insulation with water. Fill the sides of furnace over burners to the top of the steel shell.
11. Place door brick in door frames and raise doors to closed position. Press against the door opening and tighten door frame clamps. Do Not Over-Tighten.

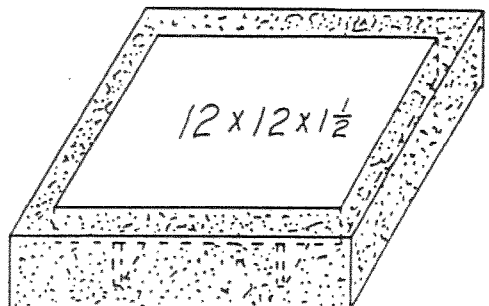
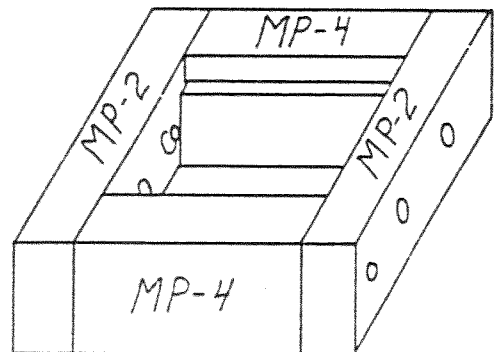
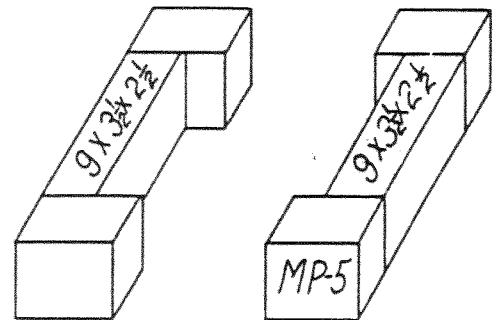
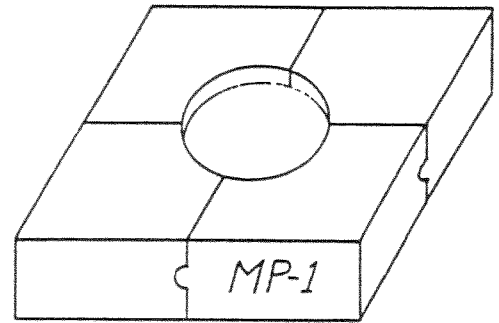
When wash coating has dried and set, cut exposed steel band from the MP-1 liners and break off at edge of door opening.

RELINING INSTRUCTIONS FOR MP-36

The relining kit contains all the refractory shapes and pre-mixed insulation necessary to re-condition your furnace. It is not necessary to remove the burners or manifolds. Break out the old lining, remove the door blocks by loosening door frame clamps, discard top plug lid and remove layer of cast insulation from bottom of furnace. If it is equipped with a piloted safety system, disconnect pilot burner tip and remove from the pilot tunnel.

1. Mix the pre-mixed insulating material with water to the consistency of stiff plaster. Add water slowly. Pour insulation in bottom of furnace chamber until it is level with steel piers.
2. Center the 12" X 12" X 1-1/2" bottom brick on top of piers and layer of insulation. Center carefully to be sure side clearance between bottom brick and furnace side wall are equal.
3. Fill 1" space around bottom brick with insulation, then strike off level with top of bottom brick.
4. Mix refractory mortar with water to consistency of heavy paint.
5. Dip burner liner (MP-2) brick ends, bottom and back side in mortar and set in place on burner tips. Be sure to clear burner tunnels and burner tips of any mortar.
6. Dip end liner (MP-4) brick on both ends, bottom and back and place in position per diagram. Steps must be to inside of furnace chamber.
7. Dip corner liner (MP-5) side liner 9 X 3 X 2-1/2 bricks and mortar in place per diagram.
8. Place mortar on tops of third row of liners and press four banded MP-1 top liners in place, flat side up.
9. Thin mortar with water and paint all exposed brick surfaces to seal the joints.
10. Place door brick in door frames and raise doors to closed position. Press against the door opening and tighten door frame clamps. Do not over-tighten.

When wash coating has dried and set cut exposed steel band from the MP-1 liners and break off at edge of door opening.



032024 MP-47 RELINING KIT CONTENTS 10/20/2008

Qty	Description
2	008083 Hearth rest MP-4
4	008064 Burner brick SL-1
2	008161 Small 9 x 3 ½" x 2 ½" clipper dp
4	008085 Top exhaust brick MP-11
4	008160 9 x 2 ½ x 2 ¼ clipper brick
10	008160-A 4 ½ x 2 ½ x 2 ¼ side brick
2	008160-B 3" x 2 ½" x 2 ¼" side brick
1	008086 MP47 top plug and bail
2	008162 9" x 4.5" x 2.5" clipper brick
8	008162-A 4 ½" x 4 ½" x 2 ½" side brick
2	008162-B 3" x 4 ½" x 2 ½" side brick
2	008163 Door brick 9 x 6 ¾ x 2 ½
1	008173 20# box refractory sealer
2	008141 Bags of matrilite 28 – 55# ea

032023 MP-36 RELINING KIT CONTENTS 10/20/2008

Qty	Description
2	008083 Hearth rest MP-4
4	008081 Burner brick MP-2
1	008166 Clipper DP sq edge 1 ½ x 12" x 12"
2	008161 Small 9 x 3 ½" x 2 ½" clipper dp
4	008080 Top exhaust brick MP-1
2	008084 ½ of 9 x 3 ½" x 2 ½" brick
1	008082 MP36 top plug and bail
2	008163 Straight clipper D 9 x 6 ¾ x 2 ½"
1	008173 20# box refractory sealer
1	Bag of matrilite 28 in 55# bag

MP-36
PARTS LIST

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>NO. PCS.</u>
200030	STEEL SHELL BASE ASSEMBLY	
200031	INSTRUMENT PANEL	1
200033	BURNER GUIDE TUBES	4
200032	FURNACE CHAMBER BOTTOM	1
200035	UPPER FRONT & BACK PLATE	2
200036	FEET	4
200037	BACK PANEL	1
200038	RIGHT SIDE PANEL	1
200039	LEFT SIDE PANEL	1
200040	DOOR HINGE BRACKET	2
200041	PLUG HOLDING ARM PIVOT	1
200042	PLUG HOLDING ARM	1
200043	DOOR HINGE BRACKET PIVOT PINS	4
200050	TOP RIM ASSEMBLY	
200051	LONG ANGLE IRON SIDES	2
200052	SHORT ANGLE IRON SIDES	2
200060	DOOR BRACKET ASSEMBLY	
200061	DOOR SUPPORT	2
200062	HANDLE BRACKET	2
200063	HANDLE	2
200070	DOOR BRICK CLAMP ASSEMBLY	
200071	LOWER DOOR BRICK CLAMP	2
200072	TOP HALF DOOR BRICK CLAMP	2
200073	DOOR PIVOT PIN	4
200074	DOOR PIVOT LUG	4
102051	DOOR BAND CLAMP EAR	4
001208	DOOR BAND CLAMP BOLT	4
002015	DOOR BAND CLAMP NUTS	4
200080	PLUG BAIL ASSEMBLY	
200081	PLUG BAIL	1
200082	PLUG CLAMP RING	1
200100	MANIFOLD ASSM WITHOUT UV PORT	
200101	MANIFOLD TUBE	2
010091	MANIFOLD ENDS	2
003213	1" PIPE HALF COUPLINGS	1
200093	INTAKE PIPE	1
200010	BURNER ASSEMBLY	
006640	BURNER NOZZLE	4
003378	1½" 90 DEGREE ELBOW	3
003127	1½" X 5½" NIPPLE	2
003369	1½" RAILROAD UNION	2
003122	1½" X 2½" NIPPLE	2
003280	1½" TEE	1
003121	1½" CLOSE NIPPLE	2

MP-36
CONT.

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>NO. PCS.</u>
006001	#65-3 MIXER FOR MP36 W/RHEOSTAT	1
006040	GM75 MIXER FOR MP36 W/MANUAL CONTROL	1
003062	3/4" X 2" PIPE NIPPLE	2
004244	3/4" ZERO GOVERNOR	1
003066	3/4" X 4" NIPPLE	1
003452	3/4" SHUT OFF COCK	1
004135	C1F1M BLOWER WITH MOTOR	1
003662	START BUTTON	1
003663	STOP BUTTON	1
004201	RHEOSTAT KNOB	1
004104	CHASSIS	1
004214	3/4" GAS SOLENOID VALVE	1
003932	2 POLE RELAY	1
003705	7/8" BUSHING	1
003987	6' POWER CORD	1
003707	POWER CORD BUSHING	1
006665	1 1/2" PIPE PLUG	1
004106	UV1A3 SCANNER	1
004198	LUTRON SPEED CONTROL	1
004069	STRAIGHT CONNECTOR	1
004070	ANGLE CONNECTOR	1
003744	SPARK IGNITION WIRE	30"
008083	MP4 HEARTH REST	2
008081	MP2 BURNER BRICK	4
008166	FURNACE BASE	1
008084	MP5 1/2 OF 9 X 3 1/2 X 2 1/2 EMPIRE	4
008080	MP1 TOP EXHAUST	4
008082	MP3 TOP PLUG	1
008161	9 X 3 X 2 1/2 EMPIRE BRICK	4
008163	9 X 6 3/4 X 2 1/2 DOOR BRICK	2
008250	6 X 9 HEARTH PLATE	1

MP-47 SPEEDY MELT FURNACE PARTS LIST

<u>OUR PART NUMBER</u>	<u>DESCRIPTION</u>	<u>NO. PCS.</u>
200300	Manifold assembly w/o UV port	1
200301	Manifold tube	2
010091	Manifold ends	2
003213	1" pipe half coupling	2
006660	Burner nozzle	4
003378	1½" 90 degree elbow	2
003131	1½" x 8½" nipple	2
003369	1½" railroad union	2
003385	1½" x 2" reducing 90 deg elbow	1
003379	2" 90 deg elbow	1
003123	1½" x 3" nipple	1
003124	1½" x 3½" nipple	1
003121	1½" close nipple	2
003145	2" x 4½" nipple	1
003061	3/4" close nipple	2
003066	3/4" x 4" nipple	1
003062	3/4" x 2" nipple	1
006001	1½" mixer	1
004244	7218-0 North American Zero Governor 3/4"	1
004214	3/4" main solenoid valve	1
003064	3/4" x 3" nipple	1
003452	3/4" gas shut off cock	1
004136	B1G2M blower with motor	1
004166	B1G2M motor only	
003662	Start button	1
003663	Stop button	1
004200	PCA-1000 Ohmite rheostat	1
003932	2 pole relay 45CA20AF	1
003987	6' power cord	1
003707	Power cord bushing	1
006665	1½" UV plug	1
003280	1½" tee	1
008083	Hearth rest	2
008064	Burner brick	4
008085	MP-11 Top exhaust section	4
008086	MP-12 top exhaust plug	1
008159	9 x 2½" x 2½" soap brick	7
008162	9" x 4½" x 2½" straight empire brick	11
008152	13½" x 4½" x 2½" straight empire brick	2
008161	9 x 3½" x 2½" straight empire brick	2
008163	9 x 6 3/4" x 2½" door brick	2
008300	paint	
032024	MP47 relining kit complete	

MP-47 SPEEDY MELT FURNACE PARTS LIST

<u>OUR PART NUMBER</u>	<u>DESCRIPTION</u>	<u>NO. PCS.</u>
200230	Steel shell base assembly	1
200231	Instrument panel	1
010081	Burner guide tubes	4
200232	Furnace chamber bottom	1
200233	Upper front and back plate	2
200036	Feet	4
200235	Back panel	1
200236	Side panel right	1
200237	Side panel left	1
200040	Door hinge bracket	2
200044	Brick support bars	4
200041	Plug holding arm pivot	1
200042	Plug holding arm	1
200043	Door hinge bracket pivot pins	4
200250	Top rim assembly	
200251	Long angle iron sides	2
200252	Short angle iron sides	2
200060	Door bracket assembly	
200061	Door support	2
200062	Handle bracket	2
200063	Handle	2
200070	Door brick clamp assembly	
200071	Lower door brick clamp	2
200072	Top half door brick clamp	2
200273	Door pivot pin	4
200074	Door pivot pin lug	4
102051	Door band clamp ear	4
001208	3/8" x 1 3/4" hex hd bolt	4
002015	Door nut 3/8"	4
200280	Bail assembly for plug	
200281	Plug bail	1
200282	Plug clamp	1
200290	Manifold assembly w/uv port	
200291	Manifold tube	1
200092	UV cover support	2
010091	Manifold ends	2
003213	1" pipe half couplings	2
003215	1 1/2" pipe half couplings	1
000603	UV cover mounting screws	2
002008	UV cover mounting nuts	2
200093	Intake pipe	1
200293	UV cover	1

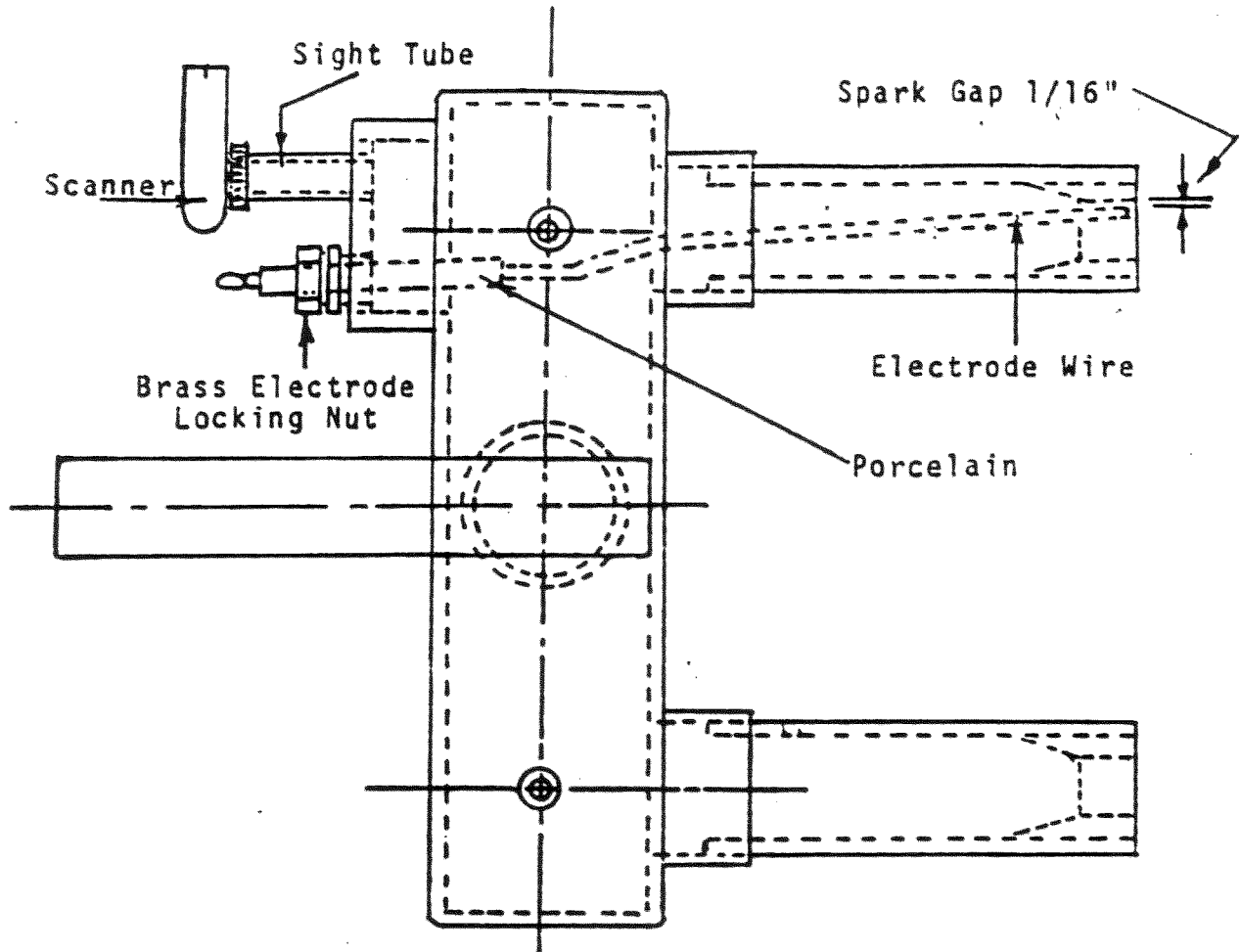
MP-47 SPEEDY MELT FURNACE PARTS LIST

<u>OUR PART NUMBER</u>	<u>DESCRIPTION</u>	<u>NO. PCS.</u>
003892	Solid state time delay relay	1
004104	UV chassis	1
004105	UV base	1
004226	Dwyer air switch	1
004204	Rhostat knob	1
003687	Large fork terminal C241-10x	6
003683	Small fork terminal 2-322777-1	26
003685	Large push on connector P8142	6
003682	Small push on connector 61765-2	12
003688	Blue butt connectors B-231-X	4
003689	Splice caps NC1610	4
003705	7/8" bushings	1
003704	3/4" bushings	1
000435	10-24 x 1/2" truss head screws	4
002006	10-24 nuts	4
000605	1/2" x 5/8" rd hd screws	2
002008	1/2" nuts	2
002112	1/2" lock washers	2
000453	#12 x 1/2" TEK screws	14
003925	Single overload relay	1
003949	E-56 heater	1
003624	2 amp fuse	1
003600	HKP fuse holder	1
003906	Red indicator light	1
003885	14 position terminal block	1
003760	7265V Appleton fitting	1
004106	UV1A3 scanner	1
003744	3' of spark wire	1
004070	Angle connector	1
004069	Straight connector	1
003915	6000V spark transformer	1

PIPE PARTS

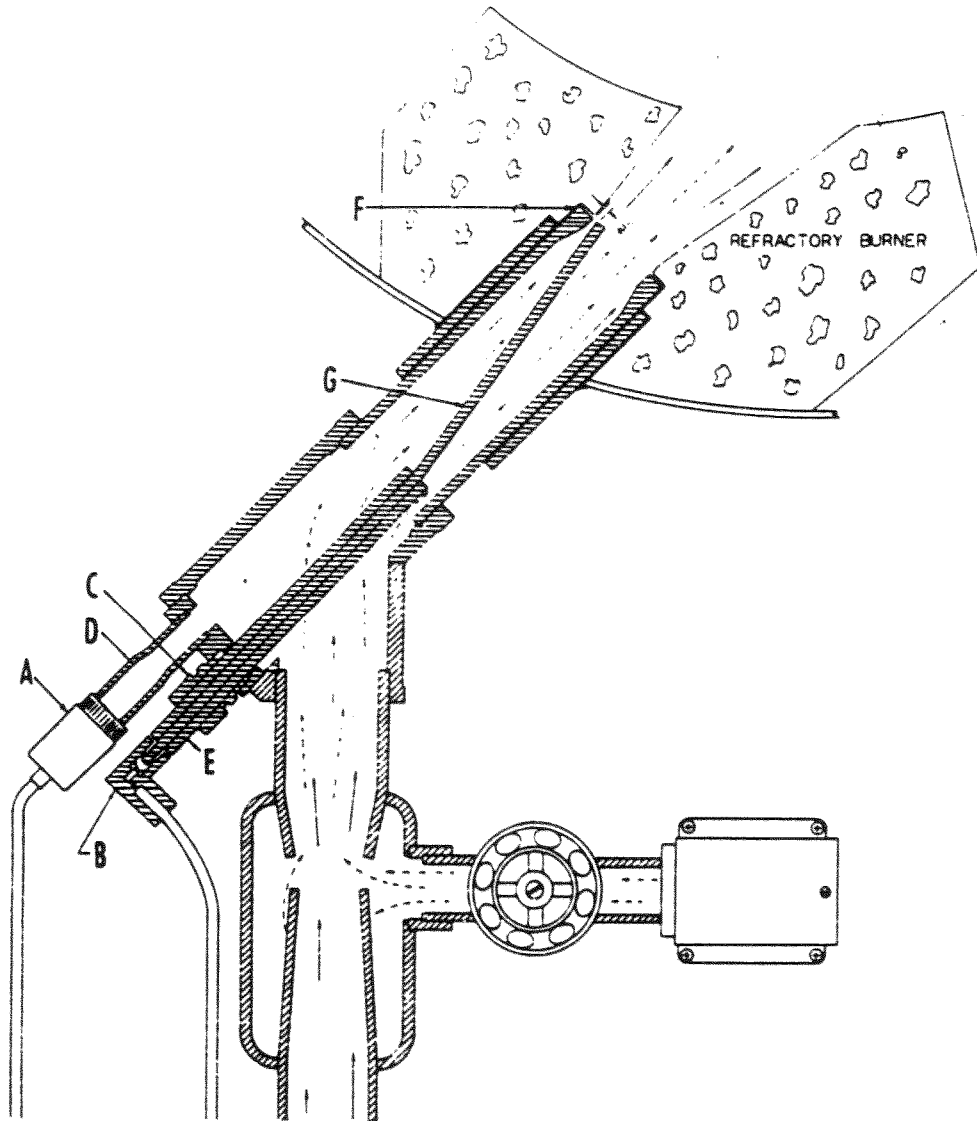
003024	1/2" x 3/8" reducing nipple	1
003408	1/2" compression fitting	1
004067	4" spark electrode	1

INSTALLATION OF SPARK ELECTRODE
NO. 4 UV ULTRA VIOLET SAFETY SYSTEM
MODELS - MP36, MP47, F512, F812,
F526, F826, F37, F312 AND FHT57



- Step 1. Remove metal shield on left manifold.
- Step 2. Remove the Ultra Violet Scanner from the burner manifold.
- Step 3. Put light inside furnace at the end of burner tunnel which has the spark electrode and UV Scanner.
- Step 4. Loosen Brass electrode locking nut then sight through sight tube and revolve electrode until spark gap is 1/16 inch.
- Step 5. Tighten the brass locking nut just tight enough to keep the electrode from moving. Overtightening cracks the porcelain.
- Step 6. Replace the spark wire, press the start button and observe the spark. The spark arcs only at the electrode tip.
- Step 7. If spark electrode shorts inside manifold or at any point other than between electrode tip and burner tip, revolve electrode to eliminate short. The electrode is pre-formed at the factory. However, it may be necessary to bend the electrode slightly to get correct spark location and spark gap.
- Step 8. Loosen lock nut and pull electrode from the brass fitting. Inspect porcelain for cracks or indication of spark leakage. Hold electrode wire with both hands and bend electrode as required. The shape of the bend in the electrode should be similar to the illustration. **DO NOT HOLD PORCELAIN COVER WHILE BENDING ELECTRODE WIRE.** This will break the porcelain.

INSTALLATION OF SPARK ELECTRODE
NO. 4 UV ULTRA VIOLET SAFETY SYSTEM



- Step 1. Remove scanner shield covering burner tip assembly.
- Step 2. Remove the Ultra Violet Scanner head "A".
- Step 3. Remove spark connector "B" and brass electrode lock nut "C". Remove old electrode from burner tip assembly.
- Step 4. Put light inside furnace at the end of burner tunnel and insert new spark electrode element "E".
- Step 5. The steel electrode "G" is bent at an angle. Look through scanner tube "D" and revolve electrode until spark gap "F" is $\frac{3}{32}$ " maximum. Be sure porcelain extends beyond brass lock nut at least one inch.
- Step 6. Tighten the brass locking nut just tight enough to prevent the electrode from moving. (Tightening the nut too tightly will break the porcelain.)
- Step 7. Replace spark wire electrode, press start button and observe spark by looking through scanner tube "D".
- Step 8. If spark is satisfactory, replace scanner head "A", press start button and start the furnace.

CARE AND MAINTENANCE OF CRUCIBLE FURNACE LININGS

All McEnglevan furnaces are constructed with hard, preburned sectional refractory shapes. Each brick is made by air ramming the granular refractory particles into a steel mold, forming the desired shape. The shape is removed from the mold, dried to remove all moisture, then fired to a white heat in a brick kiln. The kiln temperature exceeds the operating temperature of the furnace. Defective bricks fail during the final kiln burning and are discarded. This assures controlled quality refractory for all McEnglevan furnaces before assembly into a furnace lining.

The sectional shapes permit the lining to move during heating and cooling of the furnace. Certain burned refractories are highly stabilized, so thermal size change is negligible. However, the steel body of the furnace structure does move, causing the lining to shift. Our sectional lining, being flexible, can move with the furnace. A solid precast lining, being rigid, will crack and break up.

We can control quality through the point of manufacture of the furnace, but preventative maintenance is necessary for maximum productive life of the furnace lining. The exposed surfaces of the refractory lining should be resealed when scuffing and wear takes place.

RS Refractory Sealer for Furnace Linings

The base material for our refractory sealer is a high grade of calcined Indian Kyanite. The Kyanite is calcined to develop stable crystalline mullite. This material is more stable than clay base mixtures, and can be used under more severe service conditions. The mullite used for our sealer is ground to a very fine powder. It is then mixed with a water soluble bonding agent which develops a mechanical bond to the refractory. When the furnace is fired to a high temperature, the bonding agent burns out and the mullite forms a ceramic bond with the furnace lining. It is available in twenty pound bags and should be stored in a dry, warm area. Prepare only the quantity to be used at one time for one application. Twenty pound bags will average ten applications for a No. 16 size crucible furnace.

RP Plastic Refractory Plastic Patching Material

If the refractory lining has been chipped or broken, and the damaged areas are to be filled with refractory sealer, they should be filled with patching material. The plastic patching material consists of the same refractory as the sealer, except a coarser grain size of mullite crystalline is used. It is a damp, medium grained heat setting mix that has been thoroughly tempered with water and is shipped ready for use. It is available in ten and twenty pound cans. The material must be kept moist to prevent hardening. After the can of patching material has been opened, the remaining plastic should be covered with a wet piece of heavy cloth and the lid tightly sealed to prevent drying out during storage.

(over)

Application of Sealer and Patching Material

Remove all loose scale and foreign material from the surface to be sealed. Wire brush to remove flux and old loose sealer. Excessive flux and spilled metal are detrimental to refractory and should be removed prior to resealing. Prepare the surface by priming with a saturated solution of sodium silicate (water glass). This material is available from drug supply houses. Brush or sponge the solution liberally on the refractory.

The refractory patching material should be used at this point to fill larger holes. Saturate damaged areas with primer or water. Work a thin layer of plastic into the damaged section. This forms a strong bond between the refractory and patching plastic. Press or pound additional plastic into the area to the original contour of the furnace lining.

After the primer has been applied, and severely damaged sections have been repaired with plastic patching, prepare the sealer as follows:

Use one pint of warm water in a metal container.
Sift the refractory into the water while stirring constantly.
Mix to the consistency of heavy paint.
Allow the mixture to set about ninety minutes to completely dissolve the bonding agent.
Brush the mixture well into the surface of the refractory.
(Light coatings applied often, are more satisfactory than one heavy application.)
Allow the furnace to dry for a period of at least two hours.
Light furnace and fire slowly for about five minutes, then shut furnace down.
(This provides heat to expel moisture from the patching plastic.)
Allow the furnace to dry an additional three hours, then light furnace and increase heat slowly to red heat.
The furnace chamber should be inspected and cleaned of any accumulation of slag or split metal while the furnace is cold, prior to start up. Proper cleaning and the use of sealer should triple the life of the refractory in your furnace.

THE USE AND CARE OF FOUNDRY CRUCIBLES

COMPOSITION - TYPES OF MATERIAL:

Crucibles are manufactured in two basic compositions; the CLAY GRAPHITE-CERAMIC BONDED, AND THE SILICON CARBIDE-CARBON BONDED TYPES. Both types utilize the refractory materials, graphite and silicon, as conductors of heat and for structural strength. Graphite is predominant in the composition of the clay graphite crucible, while silicon carbide predominates in the silicon carbide crucible. Due to its higher heat conductivity and greater strength, the silicon carbide crucible is more popular in industry. The less expensive clay graphite crucible is generally used in the School Shop. Crucible failure in School Shops is generally due to mishandling by inexperienced students, so the benefits of the more expensive silicon carbide crucible would not be realized.

Either type crucible can be used for melting aluminum, brass, or grey iron. However, different metals should not be melted in the same crucible. This practice will cause contamination of each melt and it will be very difficult to get good castings. Different crucibles should be used for each type of metal melted. If grey iron is to be melted in appreciable quantity, a special clay lined silicon carbide crucible is recommended. DO NOT USE JUST "ANY SIZE" CRUCIBLE IN YOUR FURNACE, USE THE SIZE FOR WHICH THE FURNACE WAS DESIGNED.

RECEIVING AND STORAGE:

A great deal of stress has been put on the proper care of graphite crucibles for maximum service life and safety. Several factors are important and should be carefully considered.

DO NOT STORE crucibles as received in their original container. Examine the container, UNPACK CRUCIBLES IMMEDIATELY, and inspect each crucible for cracks or damage. "SOUND" each crucible by tapping lightly with a hammer handle. If cracked, the crucible will have a dull sound. Undamaged crucibles will have a clear ring. If the shipment contains damaged pieces, have the delivering carrier acknowledge the damage on your delivery receipt, or notify the carrier of hidden damage and call for immediate inspection.

After inspecting crucibles, they should be STORED IN A WARM, DRY PLACE. If it is necessary to stock the crucibles in an exposed, unheated location, they should be moved to a warm area for two or three days prior to using. EXCESS MOISTURE SHOULD BE REMOVED PRIOR TO TEMPERING. Some shops use the top of core ovens, or build drying racks near the melting furnaces, for drying. This is an acceptable practice, provided the crucibles are not subjected to a direct furnace exhaust to force the drying. Forced drying usually results in uneven heating and sets up strains which will eventually cause cracking and premature failure.

ANNEALING NEW CRUCIBLES:

All clay graphite crucibles should be properly annealed before being put into production. Annealing relieves all strains set up in the crucible during manufacture. This also DEVELOPS A FULL ELASTIC PROPERTY TO WITHSTAND THERMAL SHOCK during service. The crucible should be dried as outlined previously, and placed in a warm furnace. Adjust the furnace burners at idle, or lowest heat input, for the first ten minutes. Increase burner setting gradually to raise furnace temperature to a red heat. Total heating cycle should cover a period of forty to forty-five minutes. After the crucible has reached a red heat, it can be removed from the furnace, charged with metal, and put into immediate service.

CHARGING THE CRUCIBLE WITH METAL:

Crucibles are usually charged with metal before they are placed in the furnace chamber. The part of the charge consisting of gates and risers, or of clean scrap of equivalent size, is charged first. Ingots and bars are charged last. Turnings or very light scrap should be added into the crucible after the initial charge has become molten. Otherwise, the turnings and light sections will be attacked by the furnace atmosphere, and will be oxidized excessively before the melting temperature is reached. These oxides and impurities are carried into the casting metal, resulting in porous and unsound castings. Heat is transmitted to the light scrap more rapidly by the molten metal with a minimum of oxidation. ALWAYS BE POSITIVE THAT ANY METAL ADDED TO A MOLTEN BATH IS DRY, otherwise explosion will occur, because of steam generation in the molten bath. Ingots should be thoroughly dry, and added to the molten charge with long handled pick up tongs.

ADDING INGOT OR PIG TO THE CRUCIBLE:

Heavy sections of the charge should not protrude above the lip of the crucible or they will be subjected to furnace atmosphere and excessive oxidation. THE INGOTS AND BARS SHOULD BE CUT TO A LENGTH SHORTER THAN THE INSIDE DIAMETER OF THE CRUCIBLE. This is particularly true when adding bars or pig to crucibles of molten metal. Long pieces, when added, will sink and come to rest in a horizontal position. They then expand before melting and press out the sides of the crucibles, causing cracks and premature failure.

PREHEATING CHARGE METAL:

It is very poor practice to preheat scrap or bars by placing them across the exhaust port in the lid of the furnace. Such practice causes excess oxidation of the metal and will result in poor castings. For the same reason, LONG BARS SHOULD NOT PROTRUDE THROUGH THE EXHAUST PORT INTO THE CRUCIBLE. In extreme cases, some of the bars will reach melting temperature, allowing the molten metal to run down inside the furnace lid and walls. This molten metal is oxidized very rapidly and attacks the refractory lining, causing premature replacement of the lid and lining. INGOT CAN BE PLACED AROUND THE LID, WELL AWAY FROM THE EXHAUST PORT.

PROPANE OR BUTANE INSTALLATION

SPECIFICATIONS

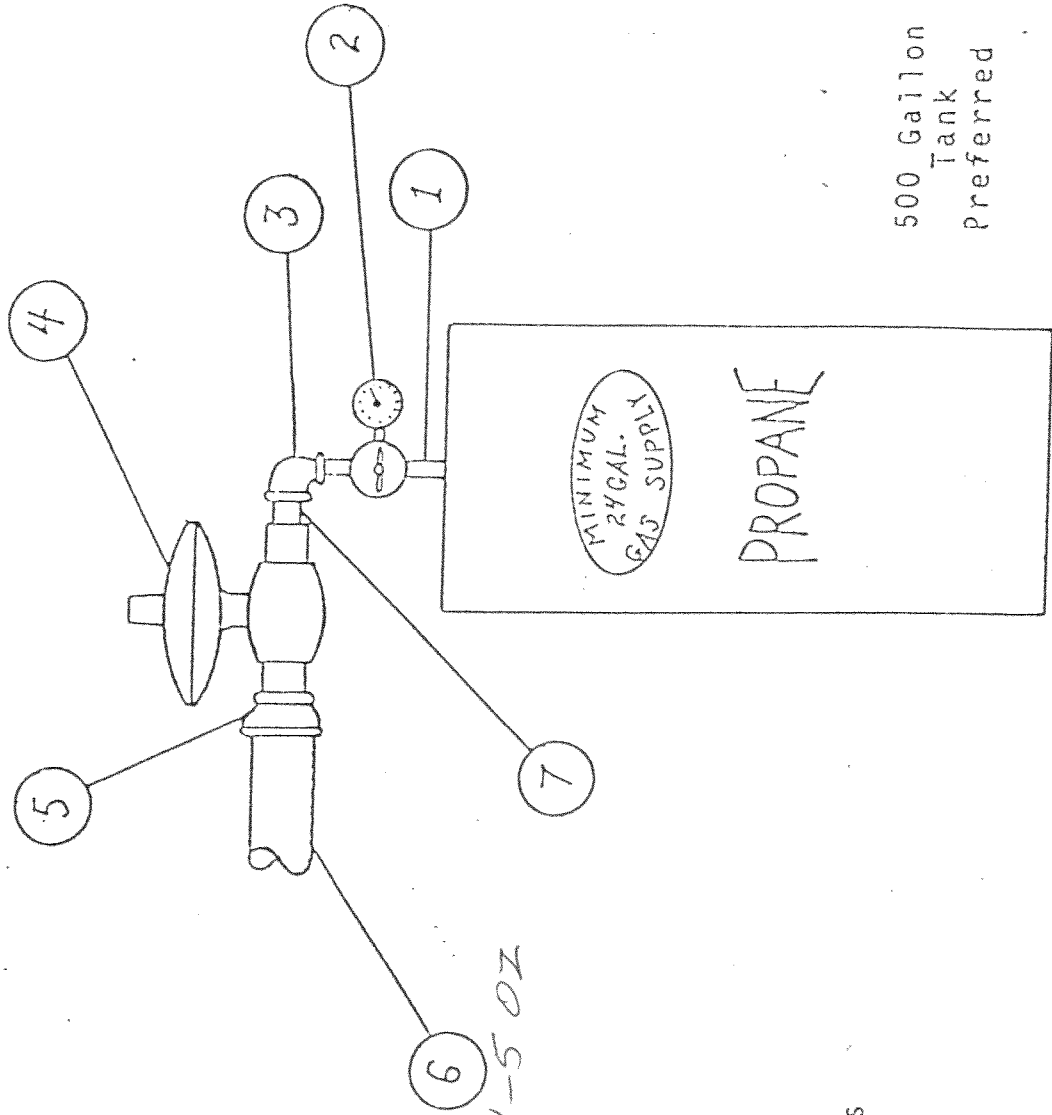
1. 1/4" Pipe from Tank to Regulator
2. Fisher Regulator Type 67
3. 1/4" to 1/2" Reducing Ell
4. Fisher Regulator Type 932-1
5. 3/4" to 1" Reducing Coupling
6. 1" Pipe 10 Feet to Furnace
7. 1/2" Pipe Between Regulators

GAGE SETTINGS

2. Set This Gage at 4 Lbs.
4. Set This (Gage) at 7 Inches. *OR 4-5 OZ Regulator.*

RECOMMENDATIONS

- A. Propane Tank Should Be Outside of Building.
- B. (2) Regulator Should Be Outside of Building, Covered & Locked.
- C. (4) Regulator Should be 10 Feet From Furnace to Protect Diaphragms Inside Regulator From Heat.

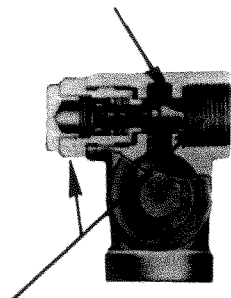


500 Gallon
Tank
Preferred

NOTE:

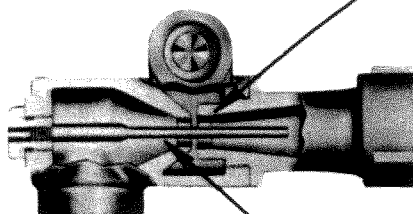
Gas Utility Company Must Be Advised of BTU Rating of Furnace So Regulators of Correct Capacity May Be Substituted For Those Listed In Specifications.

Sensitive V-Port Adjustment for positive setting of gas/air ratio with any gas from 500 to 3200 Btu/ft³ (20 turns, open to closed).



Compact, flexible construction for greatest ease of installation. Mount in any position. Gas adjustment cartridge and gas inlet are interchangeable. Overall mixer length is not excessive.

Efficient Design and precision manufacture of internal parts enable air flowing through the mixer to entrain gas and mix intimately with it. Mixture is delivered to burners at workable pressures.



Interchangeable displacement rods permit altering mixer orifice size to provide optimum mixture pressure and suction ratio for a given job. Rods can be changed, without breaking piping, to give greater mixture pressure with lower suction or lower mixture pressure with greater suction.

Series 3065 Aspirator Mixers employ blower air passing through a venturi to entrain a proportional flow of gas. Gas normally is supplied at atmospheric (zero gauge) pressure (use a North American Atmospheric Regulator) and air at 6 psi minimum (to allow for some turndown). Because the entrained flow of gas is proportional to air flow, air and gas input to a burner can be controlled by a single butterfly air valve.

Gas/air ratio is easily set by adjusting (with a screwdriver) a sensitive V-port valve in the mixer's gas cartridge (3065-9 Mixers have a separate 1127-7-FG Limiting Orifice Butterfly Valve for installation in the gas line upstream of the mixer). Once gas/air ratio is set, it remains constant from high to low fire.

3065 Mixers are suitable for all fuel gases from 500 to 3200 Btu/ft³. For coke oven gas and others corrosive to brass, however, specify 3065- -K Mixer with all iron parts.

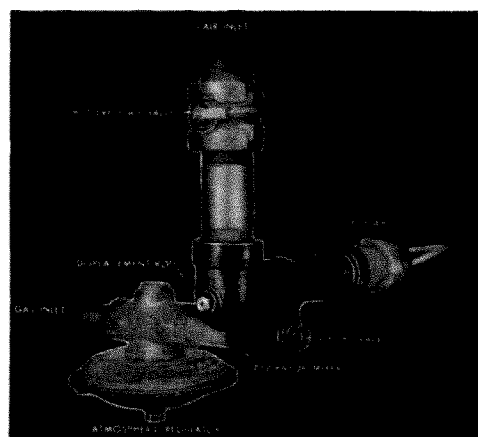


Figure 1. Typical arrangement of Aspirator Mixer, Burner, Atmospheric Regulator, and Butterfly Air Valve.

For piping convenience, the gas valve cartridge can be installed in either of the threaded inlets on the sides of the mixer. The remaining opening is the gas inlet.

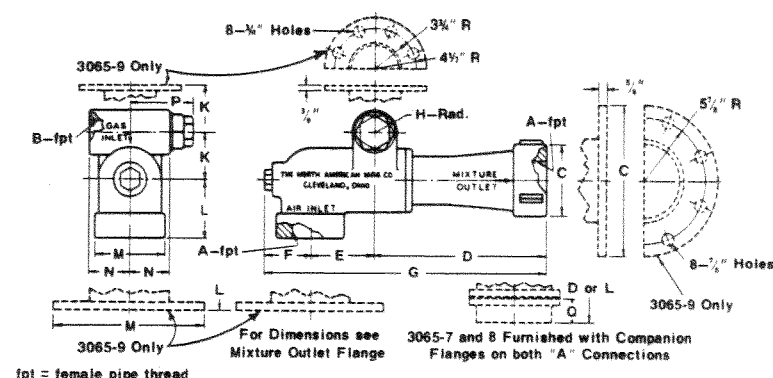
A definite relationship must be maintained between mixer orifice size and burner port size. Within limits, the mixer orifice size can be altered by exchanging displacement rods.

Several rods are available for each size mixer -- see Supplement 30.65-1. Rod diameter, in 1/32 of an inch, is stamped on the rod nut.

Optimum rod sizes for given size burners are listed in Tables I and II, page 2. These selections are adequate for most applications. Where rod size designation is 0, no rod is required.

Metric Conversions

1 Btu/ft ³	= 8.899 kcal/m ³
1 psi	= 43.94 mm H ₂ O = 0.004 39 kg/cm ²
1 lb	= 0.4536 kg
1"	= 25.40 mm
1 cfm	= 0.028 32 m ³ /h
1 Btu/hr	= 0.2522 kcal/h
1"wc	= 25.40 mm H ₂ O



Mixer Designation	A	B	C	D	E	F	G	H	K	L	M	N	P	Q	wt in lb
3065-0	3/4	1/2	1 1/16	4 1/32	1 1/4	1 1/2	7 1/32	3/8	1 1/16	1 1/32	1 1/16	1 1/4	2	—	4
3065-1	1	3/4	1 1/16	4 1/8	1 1/2	1 1/2	7 1/16	3/4	1 1/8	1 1/8	1 1/8	1 1/2	2 1/32	—	5
3065-2	1 1/4	1	2 1/4	5 1/8	2 1/8	1 1/2	9 1/8	7/8	1 1/2	2 1/32	2 1/8	1 1/2	2 1/32	—	7
3065-3	1 1/2	1	2 1/2	6 1/8	2 1/4	1 1/2	10 1/8	1 1/2	1 1/2	2 1/32	2 1/8	1 1/2	2 1/32	—	8
3065-4	2	1 1/4	3	8 1/8	3 1/4	2 1/4	13 1/16	1 1/2	2 1/8	2 1/8	3	1 1/2	2 1/8	—	14
3065-5	2 1/2	1 1/2	3 1/4	10 1/8	4 1/4	2 1/4	16 1/16	1 1/2	2 1/8	3 1/8	3 1/4	1 1/2	2 1/8	—	18
3065-6	3	2	4 1/2	10 1/2	4 1/4	3 1/8	18 1/16	1 1/2	2 1/8	3 1/8	4 1/8	2	3 1/8	—	27
3065-7	4	2 1/2	7 1/4	13 1/8	5 1/4	3 1/8	22 1/16	1 1/2	4 1/8	4 1/8	5 1/8	2 1/4	3 1/8	1 1/2	48
3065-8	6	3	10 3/8	17 1/8	8 1/4	4 1/4	31 1/16	2 1/8	6	6 1/8	8 1/4	2 1/8	4 1/8	1 1/4	125
3065-9	8	4	13 1/2	27 1/8	10 1/2	6 1/4	44 1/16	—	8 1/4	6 1/4	13 1/2	—	—	—	170

To order, specify: "3065-(pipe code size)-(rod size preceded by K or S if applicable) (pipe size) Mixer."

Example: 3065-1-K5 1" Aspirator Mixer

Selection. Size and number of burners determine mixer selection. North American Premix Burners can be sized from either the capacity tables in the burner bulletins or from Table I. Table II lists proper mixer selection if several nozzles are fed from a single mixer. To use this table, find burner size in left-hand column, then read across to the

mixer designation that appears under the number of nozzles to be fed. The table is limited to 4" pipe size and smaller mixers--larger mixture lines may be prone to flashback. If size and number of nozzles require a mixer outside the range of the table, divide the burners among two or more mixers, and select the mixers from Table II.

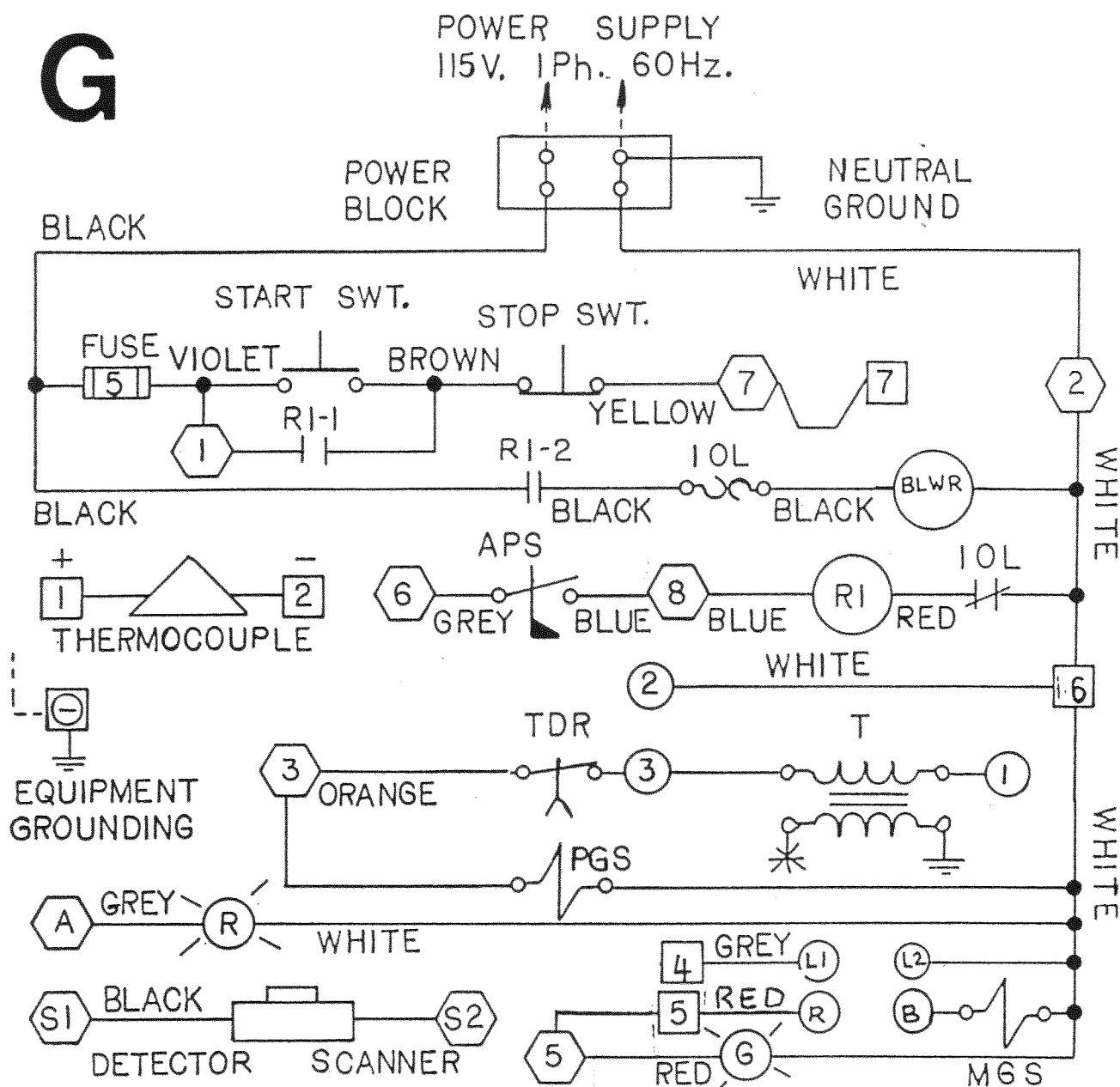
TABLE I. Air Capacities, cfh, of North American Premix Burners with 100% Air through Burner (For Btu/hr, multiply by 100). Burner capacities can be increased by burning rich mixtures in the presence of secondary air. For 90% primary air, multiply capacities below by 1.11; for 80% primary air, multiply by 1.22.

Complete Mixer Designation		North American Premix Burner Size	Required Air Pressure in psi for Natural Gas							
			2	5	6	8	10	12	14	16
			Required Air Pressure in psi for Manufactured or Coke Oven Gas							
			2.3	5.7	6.8	9.1	11.4	13.7	16.00	18.3
Manufactured or Coke Oven Gas	Natural Gas		Mixture Pressure in inches of Water Column							
			1	2.5	3	4	5	6	7	8
-	-	-01	130	210	220	260	290	320	340	360
3065-0-8	3065-0-7	-0-A	200	320	340	390	440	480	520	550
3065-0-7	3065-0-5	-0-B	250	400	430	500	560	610	660	710
3065-0-5	3065-0-0	-0-C	280	450	490	570	640	700	750	810
3065-1-11	3065-1-9	-1-A	350	560	600	700	790	860	920	990
3065-1-9	3065-1-6	-1-B	440	700	760	880	990	1 070	1 160	1 240
3065-2-13	3065-2-12	-2-A	560	880	960	1 120	1 260	1 370	1 480	1 580
3065-2-12	3065-2-10	-2-B	650	1 030	1 120	1 300	1 460	1 590	1 720	1 840
3065-2-10	3065-2-6	-2-C	780	1 230	1 340	1 560	1 750	1 910	2 060	2 190
3065-2-6	3065-2-0	-2-D	880	1 390	1 510	1 760	1 980	2 150	2 320	2 480
3065-3-14	3065-3-11	-3-A	980	1 550	1 690	1 960	2 200	2 390	2 590	2 760
3065-3-11	3065-3-6	-3-B	1 200	1 900	2 060	2 400	2 690	2 930	3 170	3 380
3065-4-18	3065-4-16	-4-A	1 500	2 380	2 580	3 000	3 360	3 660	3 960	4 240
3065-4-14	3065-4-10	-4-B	1 900	3 010	3 280	3 800	4 270	4 650	5 000	5 350
3065-4-12	3065-4-8	-4-C	2 050	3 240	3 530	4 100	4 610	5 000	5 400	5 800
3065-5-18	3065-5-14	-5-A	2 450	3 880	4 220	4 900	5 500	5 990	6 500	6 900
3065-5-13	3065-5-10	-5-B	2 900	4 600	5 000	5 800	6 500	7 100	7 650	8 200
3065-6-24	3065-6-20	-6-A	3 200	5 050	5 500	6 400	7 200	7 800	8 450	9 000
3065-6-18	3065-6-10	-6-B	3 850	6 100	6 600	7 700	8 650	9 400	10 200	10 800
3065-6-16	3065-6-0	-6-C	4 250	6 700	7 300	8 500	9 550	10 300	11 200	12 000
3065-7-38	3065-7-34	-7-A	4 750	7 500	8 500	9 500	10 600	11 600	12 600	13 400
3065-7-32	3065-7-26	-7-B	6 000	9 500	10 300	12 000	13 400	14 700	15 800	16 900
3065-7-26	3065-7-18	-7-C	7 050	11 100	12 100	14 100	15 800	17 200	18 600	19 800
3065-8-68	3065-8-64	-8-A	10 500	16 600	18 100	21 000	23 600	25 600	27 700	29 600
3065-8-60	3065-8-56	-8-B	13 000	20 600	22 400	26 000	29 300	31 800	34 400	36 800
3065-8-52	3065-8-36	-8-C	18 000	28 400	31 100	36 000	40 500	44 000	47 500	51 000
3065-8-28	3065-8-0	-8-D	21 500	34 000	37 000	43 000	48 400	52 500	56 500	60 500
3065-9-64	3065-9-56	-9	37 000	58 500	64 000	74 000	82 500	90 000	98 000	104 000

TABLE II. Recommended Mixer Selections for Multiple Burners Using Natural Gas.

Burner Size Designation	Number of Burners per Aspirator Mixer									
	1	2	3	4	5	6	7	8	9	10
-01	-	3065-0-5	3065-1-9	3065-1-6	3065-2-12	3065-2-10	3065-2-6	3065-2-0	3065-3-11	3065-3-6
-0-A	3065-0-7	3065-1-10	3065-1-5	3065-2-8	3065-3-13	3065-3-9	3065-3-5	3065-4-16	3065-4-14	3065-4-12
-0-B	3065-0-5	3065-1-8	3065-2-8	3065-3-12	3065-3-7	3065-4-16	3065-4-14	3065-4-10	3065-5-18	3065-5-16
-0-C	3065-0-0	3065-2-10	3065-3-13	3065-3-6	3065-4-15	3065-4-11	3065-5-18	3065-5-15	3065-5-10	3065-6-24
-1-A	3065-1-9	3065-2-9	3065-3-10	3065-4-17	3065-4-13	3065-4-5	3065-5-15	3065-5-10	3065-6-22	3065-6-20
-1-B	3065-1-6	3065-2-4	3065-3-4	3065-4-13	3065-5-18	3065-5-13	3065-6-24	3065-6-20	3065-6-15	3065-6-10
-2-A	3065-2-12	3065-3-9	3065-4-14	3065-5-17	3065-5-9	3065-6-20	3065-6-15	3065-6-6	3065-7-36	3065-7-34
-2-B	3065-2-10	3065-4-18	3065-4-8	3065-5-12	3065-6-22	3065-6-14	3065-7-38	3065-7-34	3065-7-32	3065-7-28
-2-C	3065-2-6	3065-4-15	3065-5-15	3065-6-24	3065-6-13	3065-7-36	3065-7-32	3065-7-28	3065-7-24	3065-7-18
-2-D	3065-2-0	3065-4-11	3065-5-9	3065-6-18	3065-7-38	3065-7-32	3065-7-28	3065-7-20	3065-7-12	-
-3-A	3065-3-11	3065-4-8	3065-6-24	3065-6-13	3065-7-36	3065-7-30	3065-7-24	3065-7-15	-	-
-3-B	3065-3-6	3065-5-15	3065-6-18	3065-7-36	3065-7-30	3065-7-20	3065-7-4	-	-	-
-4-A	3065-4-16	3065-6-22	3065-7-38	3065-7-28	3065-7-18	-	-	-	-	-
-4-B	3065-4-10	3065-6-14	3065-7-30	3065-7-16	-	-	-	-	-	-
-4-C	3065-4-8	3065-6-9	3065-7-28	3065-7-4	-	-	-	-	-	-
-5-A	3065-5-14	3065-7-34	3065-7-16	-	-	-	-	-	-	-

Note: Multiple burners above size -5-A not recommended for use with single mixer.



COMBUSTION SAFEGUARD SYSTEM NO. 6UV

LEGEND



TEMPERATURE CONTROL TERMINALS
ULTRA VIOLET CONTROL TERMINALS
TIME DELAY RELAY TERMINAL
CONTROL LIGHTS

SPARK TRANSFORMER, PRIMARY 115V.
SECONDARY 6000V.

TDR	TIME DELAY RELAY
PGS	PILOT GAS SOLENOID
APS	AIR PRESSURE SWITCH
1 OL	MOTOR OVERLOAD PROTECTION
R1	BLOWER MOTOR & CONTROL
R1-1,-2	RELAY CONTACTS
MGS	MAIN GAS SOLENOID

NOTES

1. THE WIRE SELECTION WERE BASED ON CONDUCTORS FOR HIGH TEMPERATURE RATING PER N.E.C. TABLE 310-12.
2. FIELD MUST PROVIDE GROUNDED POWER SUPPLY PER O.S.H.A. REQUIREMENTS.
3. IN CASE OF POWER FAILURE, THE SAFETY SYSTEM WILL AUTOMATICALLY SHUT DOWN AND WILL NOT RE-START UNTIL IT IS ENERGIZED BY THE START SWITCH.

FACTORY FIELD ----- WIRED

REVISION DATE.

PART NAME

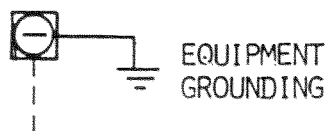
QUANTITY PER UNIT

PART NUMBER

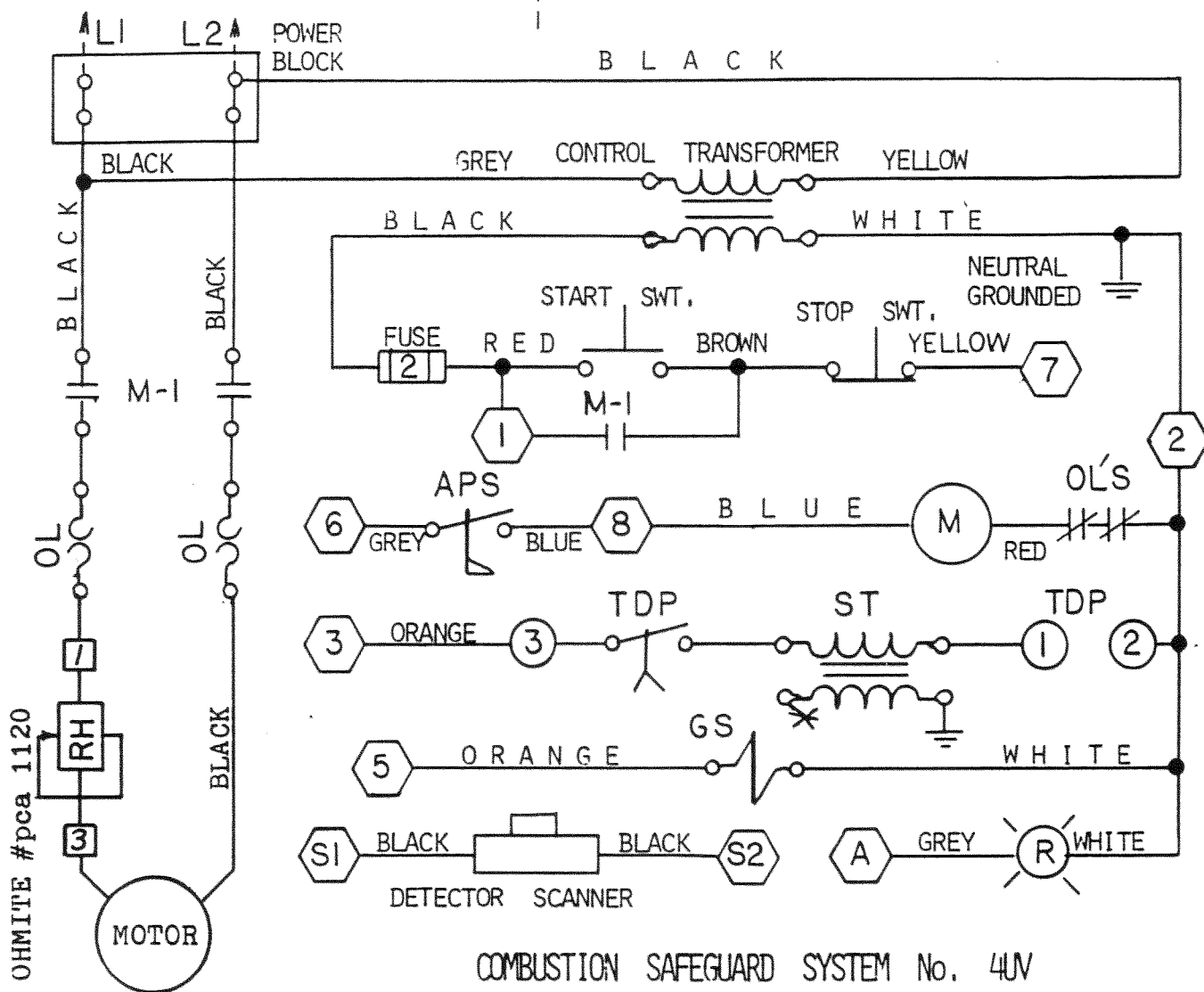
MATERIAL

MATERIAL DIMENSION




FUSED POWER SUPPLY
230V/ 1PH / 60 HZ



H MP 47



LEGEND

- | | |
|-------------------------------------------------------------------------------------|--------------------------------|
|  | ULTRA VIOLET CONTROL TERMINALS |
|  | TIME DELAY RELAY TERMINAL |
|  | CONTROL ALARM LIGHT |
| TDR | TIME DELAY RELAY |
| GS | GAS SOLENOID |
| APS | AIR PRESSURE SWITCH |
| OL | MOTOR OVERLOAD RELAY |
| M | MOTOR STARTER |
| M-I | MOTOR STARTER CONTACTS |
| RH | RHEOSTAT - SPEED CONTROL |
| ST | SPARK TRANSFORMER |

NOTES

- I THE WIRE SELECTION FOR BASED ON CONDUCTORS FOR HIGH TEMPERATURE RATING PER N.E.C. TABLE 312-12
- II FIELD MUST PROVIDE GROUNDED POWER SUPPLY PER O.S.H.A. REQUIREMENTS.
- III IN CASE OF POWER FAILURE THE SAFETY SYSTEM WILL AUTOMATICALLY SHUT DOWN AND WILL NOT RE-START UNTIL IT IS ENERGIZED BY THE START SWITCH.
- IIII FACTORY WIRED _____
FIELD WIRED _ _ _ _ _

MCENGLEVAN
Heat Treating & Mfg. Co., INC.



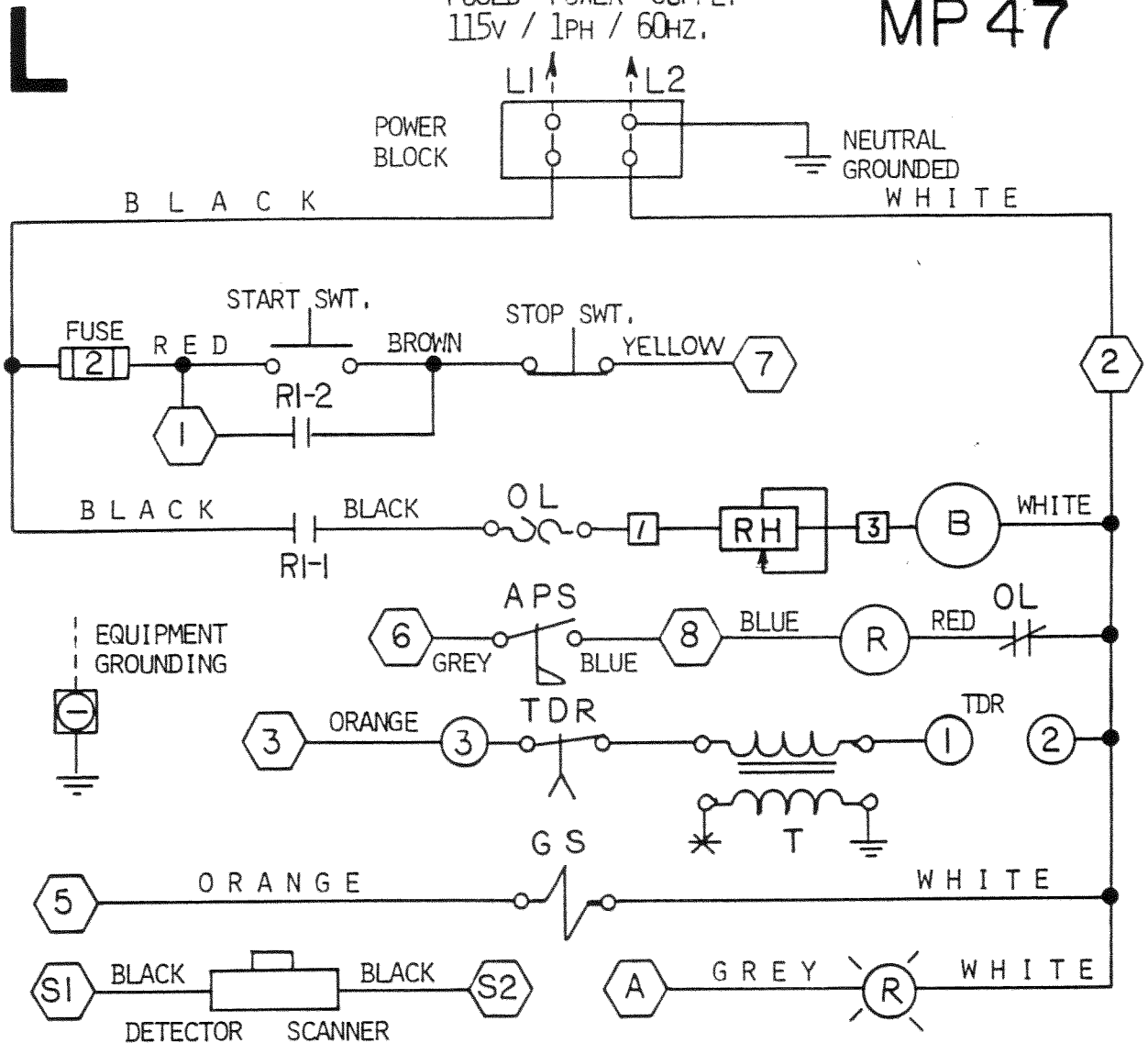
NOTES:

1. THE WIRE SELECTIONS WERE BASED ON CONDUCTORS FOR HIGH TEMPERATURE RATING PER N.E.C. TABLE 312-12
2. FIELD MUST PROVIDE GROUNDED POWER SUPPLY PER O.S.H.A. REQUIREMENTS.
3. IN CASE OF POWERFAILURE THE SAFETY SYSTEM WILL AUTOMATICALLY SHUT DOWN AND WILL NOT RE- START UNTIL IT IS ENERGIZED BY THE START SWITCH.
4. FACTORY WIRED _____
FIELD WIRED - - - - -

K

FUSED POWER SUPPLY
115V / 1PH / 60HZ.

MP 47



McENGLEEVAN

COMBUSTION SAFEGUARD SYSTEM No. 4UV

LEGEND

- ULTRA VIOLET CONTROL TERMINALS
- TIME DELAY RELAY TERMINALS
- CONTROL ALARM LIGHT
- T SPARK TRANSFORMER, PRI. 115V SEC. 6000V
- TDR TIME DELAY RELAY - SOLID STATE
- GS GAS SOLENOID
- OL MOTOR OVERLOAD RELAY
- RI RELAY CONTACTS
- R BLOWER MOTOR AND CONTROL RELAY
- B BLOWER MOTOR
- APS AIR PRESSURE SWITCH
-

NOTES

- 1 THE WIRE SELECTION WERE BASED ON CONDUCTORS FOR HIGH TEMPERATURE RATING PER N.E.C. TABLE 312-12
- 2 FIELD MUST PROVIDE GROUNDED POWER SUPPLY PER O.S.H.A. REQUIREMENTS.
- 3 IN CASE OF POWER FAILURE THE SAFETY SYSTEM WILL AUTOMATICALLY SHUT DOWN AND WILL NOT RE-START UNTIL IT IS ENERGIZED BY THE START SWITCH.
- 4 FACTORY WIRED _____
FIELD WIRED - - - -

PART NUMBER
PART NAME
DRAWING NUMBER

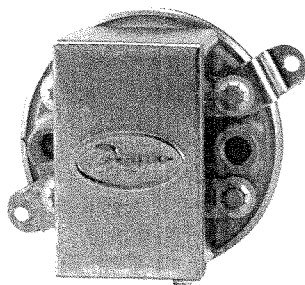
DATE

REVISION DATE

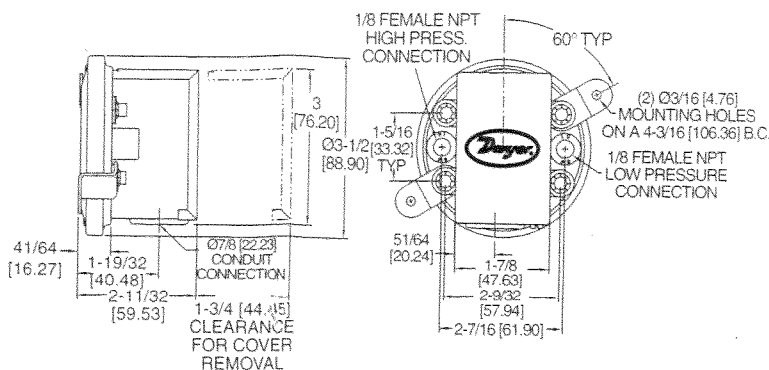
QUANTITY PER UNIT

McENGLEEVAN
Heat Treating & Mfg. Co., INC.

Specifications - Installation and Operating Instructions



Series 1910 switch with conduit enclosure off. Shows electric switch and set point adjustment screw.



The Dwyer-engineered force-motion amplifier increases the leverage of diaphragm movement and results in a switch with excellent sensitivity and repeatability.

Technical drawings of the Weatherproof Electric Connection Hub, showing front, side, and top views with dimensions and specifications.

Front View (Top Left):

- Top flange: 7/8" [22.23"]
- Top flange hole: 4-101/16" SO
- Mounting holes: 4-1/8" [7.94"] DIA
- Internal hole: 2-1/8" [50.8"]
- Internal hole: 3-1/8" [76.2"]
- Bottom flange: 3/4" [19.05"]
- Bottom flange hole: 4-3/4" [120.65"]
- Internal hole: 5-1/2" [139.7"]
- Internal hole: 1-1/4" [31.75"]

Side View (Top Right):

- Top flange: 1-1/8" [28.58"]
- Internal hole: 3-1/8" [76.2"]
- Bottom flange: 3-3/8" [92.08"]

Top View (Bottom Left):

- Outer diameter: 4-1/4" [107.95"]
- Inner hole: 5-3/4" [146.16"]
- Internal hole: 3-3/4" [95.18"]
- Internal hole: 4-1/4" [107.95"]
- Internal hole: 1-1/8" [28.58"]
- Internal hole: 1-1/2" [38.10"]
- Internal hole: 2-1/8" [50.8"]
- Internal hole: 2-5/8" [66.68"]
- Internal hole: 3-1/8" [76.2"]
- Internal hole: 3-3/8" [92.08"]

Bottom View (Bottom Right):

- Outer diameter: 4-1/4" [107.95"]
- Inner hole: 5-3/4" [146.16"]
- Internal hole: 3-3/4" [95.18"]
- Internal hole: 4-1/4" [107.95"]
- Internal hole: 1-1/8" [28.58"]
- Internal hole: 1-1/2" [38.10"]
- Internal hole: 2-1/8" [50.8"]
- Internal hole: 2-5/8" [66.68"]
- Internal hole: 3-1/8" [76.2"]
- Internal hole: 3-3/8" [92.08"]

Labels and Specifications:

- WEATHERPROOF ELECTRIC CONNECTION HUB
- 1/2" NPT FEMALE
- 1/8" NPT HIGH PRESSURE CONN.
- LOW PRESS CONN. 1/8" NPT
- 1/2" ELECTRICAL CONDUIT CONN.
- 1/8" NPT LOW PRESSURE CONN.

Model Number	Operating Range, Inches W.C.	Approximate Dead Band	
		At Min. Set Point	At Max. Set Point
1910-00	0.07 to 0.15	0.04	0.04
1910-0	0.15 to 0.55	0.10	0.10
1910-1	0.40 to 1.6	0.15	0.16
1910-5	1.40 to 5.5	0.30	0.30
1910-10	3.0 to 11.75	0.40	0.40
1910-20	4.0 to 20.0	0.40	0.50

INSTALLATION

1. Select a location that is free from excessive vibration, corrosive atmosphere and where the ambient temperature is within the limits for these switches.
2. Mount standard switches with the diaphragm in a vertical plane and with switch lettering and Dwyer nameplate in an upright position. Some switches are position sensitive and may not reset properly unless they are mounted with the diaphragm vertical. (Special units can be furnished for other than vertical mounting arrangements if required.)
3. Connect switch to source of pressure, vacuum or differential pressure. Metal tubing with 1/4" O.D. is recommended, but any tubing which will not restrict the air flow can be used. Connect to the two 1/8" female NPT pressure ports as noted below:
 - Differential pressures - connect pipes or tubes from source of greater pressure to high pressure port marked HI-PR and from source of lower pressure to low pressure port marked LO-PR.
 - Pressure only (above atmospheric) - connect tube from source of pressure to high pressure port. The low pressure port is left open to atmosphere.
 - Vacuum only (below atmospheric pressure) - connect tube from source of vacuum to low pressure port. The high pressure port is left open to atmosphere.
4. Electrical connections to the standard single pole, double throw snap switch are provided by means of screw terminals marked "common", "norm open", and "norm closed". The normally open contacts close and the normally closed contacts open when pressure increases beyond the set point.
5. Switch loads should not exceed the maximum specified current rating of 15 amps resistive. Switch capabilities decrease with high load inductance or rapid cycle rates. Whenever an application involves either of these factors, the user may find it desirable to limit the switched current to 10 amps or less in the interest of prolonging switch life.

OPERATION

Pressure acting on the power diaphragm rotates the amplifying lever, which in turn extends the range spring and rotates the snap switch input lever. When the set point is reached, the snap switch is actuated and the electrical contacts make or break.

ADJUSTMENT

To change the set point, proceed as follows:

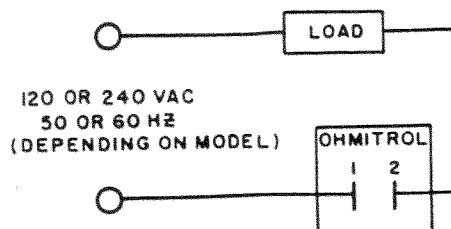
- A. Remove the snap-on cover from the conduit enclosure by loosening its retaining screw and pulling firmly at its bottom end. Turn the slotted adjustment screw at the top of range spring housing clockwise to raise the set point pressure and counter clockwise to lower the set point.
- B. The recommended procedure for calibrating or checking calibration is to use a "T" assembly with three rubber tubing leads, all as short as possible and the entire assembly offering minimum flow restriction. Run one lead to the pressure switch, another to the manometer of known accuracy and appropriate range, and apply pressure through the third tube. Make final approach to the set point very slowly. Note that manometer and pressure switch will have different response times due to different internal volumes, lengths of tubing, fluid drainage etc. Be certain the switch is checked in the position it will assume in use, i.e. with diaphragm in a vertical plane and switch lettering and Dwyer nameplate in an upright position.
- C. For highly critical applications it is a good idea to check the set point adjustment and reset it as necessary once or twice in the first few months of operation. This will compensate for any change in initial tension which may occur in the spring and diaphragm. For most applications this change will not be significant and no resetting will be required.

MAINTENANCE

Moving parts of these switches are sealed in and are permanently tamper proof. The single adjustment is that of the set point. Care should be taken to keep the switch reasonably dry and free from dust or dirt. No lubrication or unusual precautions are required for normal use.

Component
Style

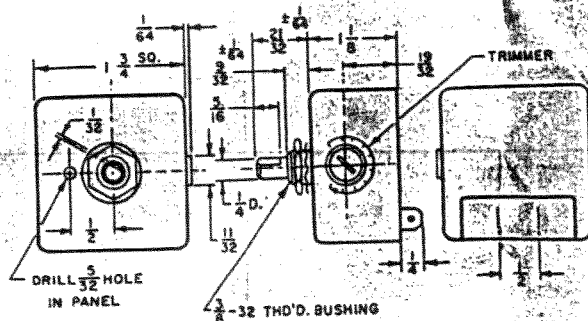
CONNECTION - Wiring diagram, Fig. 1, specifies connecting the Ohmitrol power in series with the load. Two-way terminals at the rear of the control will accept either quick-connectors or soldering.



(Fig. 1) Wiring Diagram—Component Style.

TRIMMER ADJUSTMENT - Position knob shaft to extreme counter-clockwise position without turning control "off". Insert screwdriver into recessed hole to engage slot of trimmer screw. Rotate trimmer clockwise until desired actuation of load is reached. Example: If trimmer is being adjusted to start a motor, adjust trimmer until motor runs at desired starting speed. Use volt meter if starting voltage under load is known.

SURGE LIMITS - Certain loads such as motors or incandescent lamps cause a resultant inrush current which must be considered in application of the power control. The Ohmtron is capable of withstanding starting surge currents as specified in Fig. 5, (p. 4). Overloads within these limits should not be repeated more than once per minute.



	PCA-1000 (60 Hz) PCA-1100 (50 Hz)	PCA-1020 (60 Hz) PCA-1120 (50 Hz)	PCA-1050 (60 Hz)
Ratings			
Input	120 VAC	240 VAC	120 VAC
Output (RFI filtered)	0-120 VAC	0-240 VAC	0-120 VAC
Max. Load Rating (see Fig. 4)	1 KW, 8.3 A	2KW, 8.3 A	1.8 KW, 15 A
Trimmer Voltage Range	10-50 Volts	20-100 Volts	10-75 Volts

SERVICING - TROUBLE SHOOTING

McENGLEVAN SPIRO-THERM HEAT TREATING FURNACES WITH NO. 6 UV ULTRAVIOLET COMBUSTION SAFEGUARD SYSTEMS

Troubles with McEnglevan furnaces with Fireye UVM-D Flame Safeguard Control Systems can be easily isolated by following the approved procedure in the sequence given below. Before starting any trouble shooting, however, make sure of the following:

1. Installation and wiring has been made in accordance with the manufacturer's instructions and recommendations.
2. The UVM-1D Chassis is securely plugged in and the top and bottom retaining screws are tightened. The lockout switch (red pushbutton) is reset.

The following tabulation is a sequential check out and it is recommended it be followed whenever servicing is required step by step. Refer to the manufacturer's instruction manual for proper component and contact identification. It is necessary to have a DC voltmeter with a minimum of 20,000 ohm/volt DC impedance to perform flame signal testing. The same meter set on the 150 volt AC scale may be used to check line and load voltages at the identified terminal studs on the components.

A. Furnace will not start.

1. No voltage at terminals 1 and 2 on UVM-1D.
 - a. Line cord is not plugged into outlet.
 - b. No power at outlet, check with meter.
 - c. Disconnect switch off that feeds outlet.
 - d. Blown fuse or circuit breaker.
 - e. Broken wire between outlet and control.

2. Insufficient voltage at terminals 1 and 2.
 - a. Minimum operating voltage is 102 volts, 50/60 cy.
 - b. Maximum operating voltage is 132 volts, 50/60 cy.

3. No voltage at terminals 5 and 1 on start.

Stop pushbutton station. (Manual control furnaces.)

- a. Same as steps listed under No. 1, above.

4. No voltage between stop (black wire) pushbutton and magnetic contactor holding coil (white wire) ground leg.

(Automatic temperature control furnaces.)

- a. Same as steps listed under No. 1, above.

B. No action when start pushbutton is depressed, with cover removed check the following.

1. Push in the start mechanism. It should retain its inward position. If it does not:
 - a. On manual control furnaces, it may be defective and need replacement. Check to see if you have voltage between terminals 1 and 5, 2 and 5, and 6 and 5. There should be zero voltage between terminals 6 and 5 when the stop button is depressed.
 - b. On automatic temperature control furnaces, the holding coil may be defective and need replacement. You should have voltage between the black and white leads to the contactor when the start button is depressed. If you do have voltage but the contactor does not latch in, the coil is defective.

C. Pushbutton operates, unit does not start.

1. Check for minimum voltage between terminals 7 and 2 on UVM-1D.
 - a. If none is found, you have broken or loose connection.
 - b. Control is defective.
2. When power is applied to terminal 7, the blower motor should start.
 - a. If it does not, the motor or motor relay are defective.
 - b. The lockout switch needs resetting.
 - c. Contact LS-1 open or dirty.

NOTE: When cleaning contacts, never use anything more abrasive than an ordinary business card or dollar bill. Spray type cleaners may also be used, however, only the type that do not leave a residue. When using a spray cleaner you must direct the spray away from the control circuit board.

D. Master relay RL on UVM-1D does not pull in.

1. Lockout switch needs resetting.
2. Air flow switch (optional) is not making. Check by jumping terminals on air flow switch.
3. Flame relay (RF) is energized.
4. Open or dirty contacts, LS-1, SC-1 (Safe start check), RL-2 and RF-2.
5. Defective control.

E. Master relay (RL) pulls in, but drops out before ignition.

1. Dirty or open contact RL-1
2. Defective control.

F. Master relay (RL) energized, but ignition does not come on.

1. Dirty or open contact RL-3.
2. Check if you have power between terminals 3 and 2. Terminal 3 feeds power to the pilot valve and through the time delay relay to the ignition transformer.

G. Power on terminal 3 - pilot does not ignite.

1. Defective pilot valve.
2. Defective time delay relay (minimum cooling period 60 seconds).
 - a. Check for voltage between red wire and white wire on the time delay relay.
 - b. Check for voltage between black wire and white wire on the time delay relay. The black wire feeds power to the ignition transformer.
3. Defective ignition transformer.
 - a. Clean and/or adjust ignition electrode.
 - b. Broken or loose connection.
 - c. Turn off main gas supply. Start unit and check for spark by looking up the pilot port from inside the furnace.

H. Pilot lights but flame relay (RF) does not pull in.

1. UV-1 scanner does not see pilot.
 - a. Pilot too small. Adjust.
 - b. Blocked sight tube, dirty scanner.
 - c. Moisture covering scanner. On initial start moisture may collect on scanner tube until furnace insulation is dried out. Remove and clean scanner, with dry cloth.
2. Broken detector wire or loose connection.
3. Defective control.
4. Defective scanner.
 - a. Remove scanner and hold a match in front of it, the flame relay (RF) will pull in if the scanner is operational.

I. Flame relay (RF) pulls in, master relay (RL) drops out.

1. Dirty or open contact RL-1.

J. Main flame does not light (Manual control furnaces).

1. Defective main gas valve.
2. No fuel supply or burner out of adjustment.
3. Contact RF-4 open or dirty.
 - a. Voltage should be found between terminals 5 and 2 on the UVM-1D.

K. Main flame does not light (Automatic temperature control furnaces).

1. Same as steps 1, 2 and 3 for "J", above.
2. Defective temperature controller and/or temperature setting is too low.
 - a. Defective thermocouple sensing element. Temperature indicator does not show increase in temperature - thermocouple may be defective.
3. Defective air valve motor.

L. Main flame does not light. (Automatic temperature control furnaces with "Gas Start" pushbutton.

1. Same as steps listed under "J" and "K" above.
2. Dirty or open contact on "Start Gas" pushbutton relay.
3. Defective coil on "Start Gas" pushbutton relay.

M. Furnace will not restart after normal shutdown.

1. Gas manual valve was closed, extinguishing flame before stop button was depressed.
 - a. This simulates flame failure. Follow steps in operating instructions for re-ignition for flame failure.

N. Furnace will not start after flame failure shutdown.

1. Lockout switch not reset.
2. Insufficient waiting period for cool down of timers.
 - a. 60 seconds minimum should be allowed between attempts to start.

O. Flame signal testing - using a 20,000 ohm/volt DC minimum voltmeter.

1. Connect test meter to test jacks located on the right side of the UVM-1D circuit board and marked + and - .
2. Set meter on 25 volt DC scale.
3. Initiate a normal start-up.
4. When the pilot is sighted the meter should read between 2 to 6 volts DC, if the meter reads down scale during the test, reverse the meter leads at the test jacks.
 - a. If no reading is obtained, check if the scanner is good by holding a match in front of it. With a match present a reading will be obtained if the scanner is good, provided the control is also good.
 - b. The scanner will also have a blue arcing effect across its electrodes which you can see if you view the scanner with the match in front of it. If arcing is present, the scanner is good.
 - c. The minimum DC voltage reading necessary to pull in the flame relay is 2 volts. The pilot should be adjusted, however, to obtain a reading of approximately 4 to 5 volts DC, if anything less than this is obtained you have a marginal condition and may have nuisance shut-downs.

NOTE: Consult McEnglevan's operating and adjusting manual for burner adjustment information and Fireye bulletin C-40 for proper component and contact identification.

SAFETY WARNINGS

FOR MAXITROL GAS PRESSURE REGULATORS

SW0283

NOTE: Gas pressure regulators will *not* turn off the flow of gas.

SPECIAL WARNING

**NO UNTRAINED PERSON SHOULD ATTEMPT
TO INSTALL, MAINTAIN, OR SERVICE
GAS PRESSURE REGULATORS**

To minimize the possibility of FIRE, EXPLOSION, and OTHER HAZARDS:

1. All products, including gas pressure regulators, used with combustible gas *must* be installed and used *strictly* in accordance with the instructions of the manufacturer, with government codes and regulations, and plumbing codes and practices.
2. Do *not* use a gas pressure regulator if it appears to have been subjected to high temperatures, damaged in any way, or to have been taken apart or tampered with. Any of these may be signs of possible leakage or other damage that may affect proper operation and cause potentially dangerous combustion problems.
3. Check carefully for gas leaks immediately after the regulator has been installed and the gas turned on. *Do this before attempting to operate the appliance or other gas burning device.* Use a rich soap solution (or other accepted leak tester) around the diaphragm flanges, bottom plate or plug, vent opening, seal cap, pipe connections, and all other joints. It is good practice to periodically check for leakage during use of the appliance. *Absolutely no leakage should occur, otherwise there is a danger of fire or explosion depending upon conditions. Never use if leakage is detected.*
4. Very high pressure surges in the gas supply line (or as a result of exposing the system to high pressure) may result in serious internal damage and cause leakage or affect regulator operation. If you suspect that a Maxitrol regulator has been exposed to more than twice the maximum inlet pressure of paragraph 8, turn off the gas and have the system checked by an expert.
5. Venting *must* be controlled in accordance with government and plumbing codes and regulations to avoid the danger of escaping gas should there be internal leakage. Vent pipes *must* be open and the open end protected against entry of foreign matter including water.
6. The outlet pressure of the regulator must be measured to make sure it is in accordance with intended usage. If a spring change is required to develop the required outlet pressure, the spring must be one specified by MAXITROL and the new outlet pressure recorded on the regulator.
7. Caution should be used to guarantee that there is sufficient inlet pressure to achieve the desired outlet pressure and no readjustment of the outlet pressure setting should be made unless the inlet pressure is within the proper limits for the regulator. Failure to follow this may result in overfiring of the appliance or other gas burning device. The MAXITROL Bulletin for the regulator should be consulted for specific inlet and outlet pressure relationships.

OVER

8. A MAXITROL regulator must be used within the temperature range and not in excess of the maximum inlet pressure shown in the table below and should be in the mounting position indicated:

Model No.	Temp. Range	Max. Inlet Pressure	Mounting Position
RV10, 42, 52 & 53	-40° F to 205° F	½ PSI	All Positions
R400, R500, & R600	-40° F to 205° F	1 PSI	All Positions
RV60	-40° F to 205° F	1 PSI	All Positions
RV81 & 91	-40° F to 205° F	1 PSI	From Upright to 90°
RV110	-40° F to 125° F	1 PSI	
RV131	-40° F to 125° F	2 PSI	Upright Only
R400S, 500S & 600S	-40° F to 205° F	5 PSI	All Positions
210D, E, G & J	-40° F to 205° F	10 PSI	Upright Only
220D, E, G & J			
RV35A, 43 & 47	32° F to 205° F	½ PSI	All Positions
RV43T & 47T	32° F to 275° F	½ PSI	All Positions
325-3 & 325-5	-40° F to 205° F	10 PSI	All Positions*

* NOTE: To insure fast response of the 325-3 when equipped with the 12A09 automatic safety vent limiting device, regulator *must* be in upright position with 12A09 installed directly into vent threads. Any other mounting position may interfere with lockup or cause pilot outage. The 325-5H is recommended for upright positioning only.

9. It is also important to do the following:

- Install the regulator properly with gas flowing as indicated by the arrow on the regulator.
- Use pipe compound or thread sealant, properly threaded pipes and careful assembly procedure so that there is no cross threading, etc., which could cause leakage.
- Apply wrench or vise pressure only to the flat areas around the pipe tapping at the end being threaded to the pipe to avoid possible fracture of the regulator body which could result in leakage.
- Make sure that markings or wording on the regulator are not painted over or obliterated.

10. In case of any doubt, please contact the Service Manager, Maxitrol Company, 23555 Telegraph Road, P.O. Box 2230, Southfield, Michigan 48037. Phone: 313/444-1500

MAXITROL company

23555 Telegraph • P.O. Box 2230 • Southfield, MI 48037 • 313/444-1500

Litho in U.S.A. 10MSP0383