MIFCO

McEnglevan Industrial Furnace Company, Inc.

WE HIGHLY RECOMMEND THAT A GAS PRESSURE GAUGE BE INSTALLED ON YOUR INCOMING GAS LINE

NEVER LOCATE A FURNACE WHERE WORKING ROOM IS RESTRICTED OR THE AREA IS HARD TO VENTILATE PROPERLY.

Dear MIFCO Customer:

We would like to thank and congratulate you on the purchase of the McEnglevan machine and accessories, and to share with you our confidence in the quality and reliability of our equipment.

The enclosed operating manual is important. Proper instruction on the maintenance of your machine is very important. Please read your instruction manual completely for best results and maximum machine tool life.

Should you ever need service, it is available through our distributors or directly from the factory. It is the obligation of our distributor who sells you this equipment to conduct field service where possible. Please contact your local distributor first and they will assist you in resolving any problems you may encounter.

We take pride along with you in your purchase of this equipment.
We will be happy to assist you in any way possible to receive optimum results in its operation and use.

DO NOT REMOVE THIS PAGE 10/19

For all B, C & T series MIFCO gas fired melting furnaces and MIFCO forges:

In accordance with the National Electric Code, A.G.A., Canadian Standard Association and O.S.H.A. recommendations, this specification sheet must remain a part of this manual. Most of the components are U.L. and A.G.A. listed. The control panel wiring and the ultra-violet combustion safeguard systems are designed to conform to the specifications of the National Electric Code.

Furnaces manufactured beginning in the year 2015 are compliant with NFPA 86 minimum guidelines per below:

1) Two valves are required on pilot and main burners
2) Visual indication of valve position required for burners above 150,000 BTU/HR
3) High and low gas pressure switches required
4) Burners above 400,000 BTU/HR require Visual Indication and Proof of Closure

This manual contains the electrical wiring schematic applicable to this particular piece of equipment. If there are any questions, please contact your distributor or the factory. Only licensed electricians or qualified factory representatives should troubleshoot the electrical system of this equipment.

All furnace electric power must be connected to electrical disconnects.

All fuel lines must have manual shut off valves.

This manual contains a separate MC-5000 Fireye-Flame Safeguard Controls booklet.

Purchased from _____ Date _____

City _____ State_____

Model Number _____ Serial Number _____

Electrical Service Specifications

_____ volts _____ Phase _____Hertz

Note: Schematic drawings showing different voltages, phase and hertz may be included in this manual. SDS sheets are located in the manual.

Maximum incoming gas pressure and required operating pressure for this unit are listed on a test tag attached to the gas gate valve of the burner system.

IMPORTANT NOTICE:

When connecting the blower to the furnace body, run the scanner cable and the spark wire on opposite sides of the manifold pipe so that they do not touch each other. Should the wire and the cable come within 2 inches of each other, the scanner could obtain a bad reading resulting in start failure.

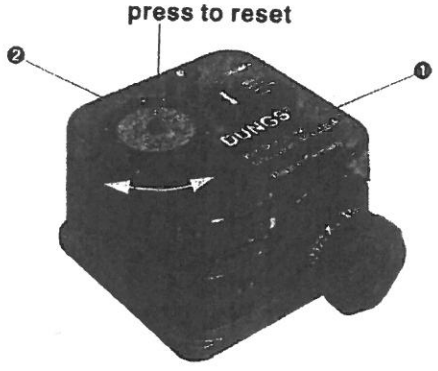
GAS SERVICE LINE: (updated 1/2015 with dual valve information)

The gas connecting line should be one pipe size larger than the gas inlet size of the mixer and be equipped with a gas regulator and gauge. Main gas line shut off valves must be full flow design to insure maximum gas flow. **Be sure to purge air out of lines before operation**. Low or high gas pressure or inadequate volume will result in flame fluctuation, improper firing, low and high pressure switch activation and slow heating. The easiest method of determining whether or not you have sufficient gas supply to operate the furnace correctly is to operate the furnace with the blower air adjusting valve completely open. At this setting, there should be excess gas available. If excess gas is not available, the utility company may be able to increase gas line pressure, and use a step down pressure regulator at the furnace dual safety shut off valve. Maximum gas pressure allowable by the dual safety shut off valve manufacturer is 7 lbs. THE GAS COMPANY SHOULD BE CONSULTED FOR ADEQUATE PIPE SIZING ON INITIAL INSTALLATION, or where pressure drop is a problem.

The Speedy Melt gas-air mixers will operate efficiently on natural, manufactured, or bottled fuel gas. There are no metering jets, orifices, or spuds to change or remove. When using MANUFACTURED OR BOTTLE GAS as fuel, the utility company should be advised of the furnace BTU rating, so adequate service can be installed. A HIGH FLOW GAS REGULATOR should be set to hold at least eight inches minimum W/C with the furnace operating at minimum input.

GMH High Gas Pressure Switch GML Low Gas Pressure Switch

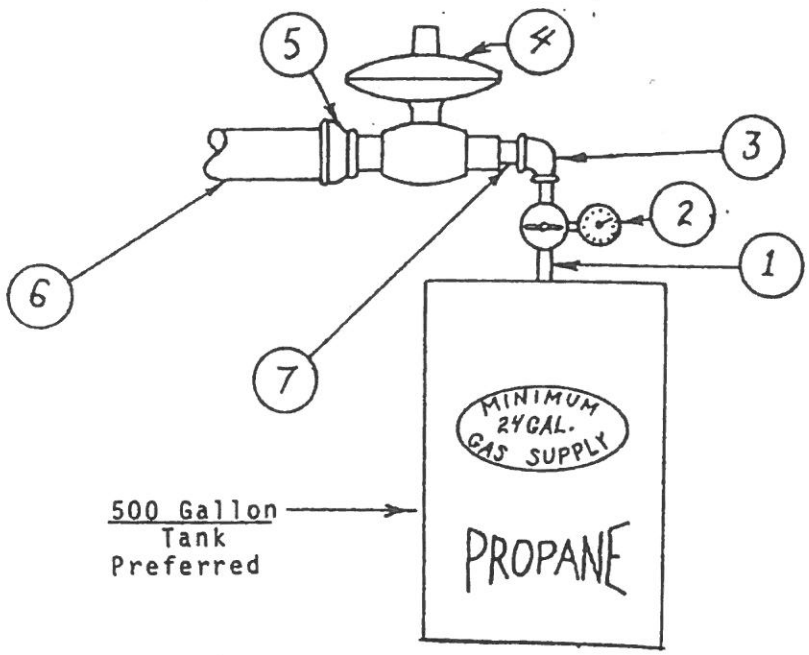
(Gas pressures are preset at the factory.)



Manual Reset
The NC contact of the GMH breaks when pressure rises above the set point. The NO contact of the GML breaks when pressure falls below the set point. Neither of the switches will return to their former position automatically. To reset, wait until the pressure returns to the normal operating level. Then press and release the clear cover over the red reset button in the center of the yellow dial face; it is not necessary to remove the cover. The neon light indicates a fault condition for the GML and GMH series.

Sample propane setup for B301:

1. 1/4" pipe from tank to regulator.
2. Tank regulator for required BTU for each furnace.
3. 1/4" to 1/2" reducing elbow
4. Regulator for required BTU for each furnace (B301 uses 1" gas solenoid).
5. 3/4" to 1" reducing coupling.
6. 1" pipe 10 feet to furnace.
7. 1/2" pipe between regulators.



GAUGE SETTING:

2. Set this gauge at 4 lbs.
4. Set this regulator at pressure on furnace test tag.

RECOMMENDATIONS:

A. Propane tank should be outside of building.
B. (2) Regulator should be outside of building, covered and locked.
C. (4) Regulator should be 10 feet from furnace to protect diaphragms inside regulator from heat.
D. Purge air from lines.

POURING FLOOR:

It is a good practice to install the furnace on a "pad" of tamped molding sand, clay, or loam, since molten metal or constant heat will damage a concrete floor. By extending the size of the pad into a pouring floor - a safe pouring area can be added to the casting area. A satisfactory pad can be made in the shop by welding a rectangular framework of angle iron. Size will depend on the room available and the instructor's preference, but the pad should be large enough for the furnace plus eight molds. The inner area is then piled and tamped with old molding sand or foundry clay. The pad should be at least two inches thick. Expanded metal, laid on the surface of the earthen pad will help prevent tracking earth or clay through the shop area.

PIT INSTALLATION:

The larger B-702 and B-1501 series furnaces are usually installed in a furnace pit to simplify handling the crucible of metal. Illustrations of the Speedy-Melt Model B-1501 illustrate such installation. Overall furnace dimensions are found in the Relining Section of this manual. Diagrams show both pit and surface installation. THE BLOWER, GAS/AIR MIXER, AND CONTROL SYSTEMS SHOULD ALWAYS BE LOCATED AT FLOOR LEVEL AND NEVER IN THE FURNACE PIT. The controls should be located in a safe, accessible location.

BURNER ADJUSTMENT:

The Speedy Melt furnace is designed with two valve control. This makes it possible to obtain a reducing, oxidizing, or neutral flame depending on the metal being melted. Experience is gained by lighting and observing the flame. Adjusting all two valve burner systems is identical to adjusting an oxyacetalyne torch. After the main burner flame has been initiated, the firing rate of the furnace is increased by opening the gas valve slightly until there is an excess of gas in the mixture burning within the furnace chamber. Then open the air valve until the flame draws back to burner tunnel and burns with a blue flame. Continue the adjusting sequence to obtain the maximum burning rate.

FURNACE OPERATION AND STARTUP:

Locate the crucible block in the center of the furnace chamber. ALWAYS use the correct size block and NEVER place the crucible on the floor of the furnace over the drain hole. Doing so causes a cold spot at the bottom of the crucible and retards melting. The block locates the crucible at the proper height for the hottest combustion and reflected heat. If the crucible sticks to the base block, apply fine graphite or silica flour to the top of the block, or wet a piece of corrugated cardboard and drop on the base block just before the crucible is set in place. If the furnace is cold, use the cardboard dry. The paper will char and form a parting layer between the block and the crucible. DO NOT CHARGE METAL THROUGH, OR OBSTRUCT THE LID EXHAUST HOLE IN ANY MANNER WHILE IN OPERATION. If the crucible breaks while in the furnace, the molten metal will flow out the drain at the bottom of the furnace. Included with your new furnace is a circle of 1"thick, ceramic fiber blanket, the diameter of the furnace lid -(NOTE:not needed on the B1501 furnace).
Place this on top of the furnace lid for the first 2 or 3 firings / melts. After the lid bricks have been heated to a yellowish color, all the way through, this blanket can be discarded. It is provided to insure that the lid bricks are completely cured.
A layer of high temperature refractory insulation is cast between the pre-burned brick lining and the steel furnace shell. This increases melting efficiency and holds heat loss through the furnace walls to a minimum. Since the insulation is a castable material, a certain amount of moisture is absorbed by the furnace lining. It is recommended that the initial firing periods should not exceed fifteen minutes, to allow the lining to expel the moisture slowly. The moisture may appear as steam or drops of water. Two or three short firing periods will be sufficient to remove excess moisture.

Instructions in the section USE AND CARE OF GRAPHITE CRUCIBLES should be followed as closely as possible. This practice is routine in the foundry trade, and will increase crucible life and prevent failure due to cracking and spalling.

FLAME ADJUSTMENT:

Adjust the firing to low fire, raise the lid, and swing it to the rear. Place the crucible in the center of the furnace chamber. Close the lid, being sure it seats inside the seal ring. Adjust firing rate to full open. IF SUFFICIENT GAS VOLUME IS AVAILABLE, IT SHOULD BE POSSIBLE TO ADJUST THE AIR VALVE TO FULL OPEN WITH AN EXCESS OF GAS SHOWING AT THE LID EXHAUST HOLE. Final adjustment for furnace atmosphere depends on the metal being melted. Aluminum and copper should be melted with as near a neutral atmosphere as possible. This type of atmosphere is obtained by adjusting the gas / air valves until the exhaust shows two to three inches of yellow flame, then close the gas valve until the yellow flame disappears. Melt brass with a slightly rich or reducing flame - have about one inch yellow flame showing in the exhaust. Insufficient or excessive gas pressure will trip the high or low gas pressure switches causing them to need to be reset.

NOTE OF CAUTION WHEN MELTING ALUMINUM:

Due to the high velocity of the flame and the light weight of molten aluminum, THE FURNACE SHOULD BE THROTTLED TO HALF FIRING RATE DURING THE LAST HALF OF THE MELTING CYCLE, or after the aluminum has reached the PLASTIC or MUSHY state.

If the furnace is fired at maximum rate when the aluminum is molten and ready to pour, THE HIGH VELOCITY FLAME WILL PICK UP ALUMINUM PARTICLES FROM THE CRUCIBLE AND EXPEL THEM THROUGH THE TOP EXHAUST HOLE. This condition will not be experienced with heavier metals such as brass or gray iron.

At maximum firing rate, the Speedy Melt Series of furnaces are noisy. This is due to the high velocity flame and the amount of BTUs generated within the combustion chamber to obtain the rapid melting cycles. If the noise is objectionable, the furnace can be operated at a lower input rate with slightly slower melting cycles. However, for melting gray iron, the furnace must be fired at maximum input.

The exposed refractory should periodically be cleaned thoroughly and coated with a refractory sealer.

MAINTENANCE:

All MIFCO furnaces are constructed with hard, pre-burned, 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. Defective bricks that fail during the final burning are discarded. This assures controlled quality refractory for all MIFCO furnaces before assembly into a furnace lining.

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.

MINRO-WASH REFRACTORY SEALER FOR FURNACE LININGS:

The basic refractory 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 refractory sealer 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.

REFRACTORY PLASTIC PATCHING MATERIAL:

If the refractory lining has been chipped or broken, and the damaged areas are too large 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 is used. It is a medium grained, heat setting mix that should be thoroughly tempered with water before use. The material not used must be discarded. Mix with water only the amount needed each time.

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. Prepare the surface by priming with a saturated solution of sodium silicate. This material is available from drug or foundry 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. This forms a strong bond between the refractory and patching plastic. Place a layer of patching plastic with a maximum thickness of 1/8" into the area being filled. The thin patch should be allowed to dry for one hour, then heat the area to a red temperature by using the furnace. When the furnace has cooled, add another thin layer, not exceeding 1/8" thickness over the original layer, using the above instructions for the second patch. Successive thin layers should be applied and burned until the patch conforms to the original contour of the furnace lining. If the procedure of applying and burning in the successive thin layers is not followed, and a heavy patch is used to fill the damaged area, the moisture retained in the center of the heavy patch will generate sufficient steam to cause it to rupture and peel.

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

Step 1. Use one pint of warm water in a metal container.
Step 2. Sift the refractory into the water while stirring constantly.
Step 3. Allow the mixture to set overnight to completely dissolve the bonding agent.
Step 4. Remove the lid from the furnace so both the bottom and top surfaces can be sealed. With the use of a sponge, saturate exposed refractory with water and immediately brush the prepared sealer into the surface of the refractory lining and lid. Unless the refractory is pre-saturated with water, it will draw the moisture from the sealer, preventing a tight bonding action and the seal coating will peel. (LIGHT COATINGS APPLIED OFTEN, ARE MORE SATISFACTORY THAN ONE HEAVYAPPLICATION.)
Step 5. Allow the furnace to dry for a period of at least two hours.
Step 6. Light furnace and fire slowly for about five minutes, then shut furnace down. (THIS PROVIDES HEAT TO EXPEL MOISTURE FROM THE PATCHING PLASTIC.)
Step 7. Allow the furnace to dry an additional hour, then light furnace and increase heat slowly to red heat. The furnace chamber should be inspected and cleaned of any accumulation of slag or spilled metal while the furnace is cold, prior to startup. 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.

COMPOSITION - TYPES OF MATERIAL: - (cont.)

Either type of crucible can be used for melting aluminum, brass, or gray 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 gray 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 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..

DRYING AND ANNEALING NEW CRUCIBLES:

All 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 fortyfive 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 AN EXPLOSION WILL OCCUR. This is because of steam generation in the molten bath. Ingots should be thoroughly dry, and added to the molten charge with long handled pickup 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 against 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.

MELTING CAST GRAY IRON:

If cast iron ingot material is used, we suggest that you purchase a Class 25 or a Class 30 iron. This type of cast iron melts at a slightly lower temperature and has better fluidity than the higher class irons. If new ingot is not available, good cast iron scrap can be used. One type which has good casting features is the scrap cast iron in steam radiators. The original ingot used to produce this quality of casting had to have good casting characteristics and high fluidity. Otherwise, it would not produce the thin walled, steam tight castings required in steam systems.

Cast iron motor blocks and other machinery products should not be used as scrap for remelting in a gas fired crucible type furnace. The pouring temperature of alloyed scrap iron is usually 100 -150∞ higher than the Class 25 or the Class 30 Iron. The higher temperature needed to melt this alloy is very detrimental to both crucibles and the furnace linings. Pieces of steel or malleable iron scrap should not be added to the crucible charge because they also raise the melting temperature of the iron. In addition to having less desirable casting properties and being harder to pour, the finished castings may be hard and very difficult to machine.

Standard clay graphite or silicon carbide crucibles can be used for melting gray iron, however, the clay or alumina lined silicon carbide crucible is more suitable. Molten iron has an extremely high affinity for carbon, and it will leach or absorb carbon from the inner wall of the crucible during the melt. This will erode the inner surface of the crucible and shorten crucible life. The alumina or clay lined crucible has an inner lining of alumina refractory; which acts as an inert barrier between the molten iron and the carbon in the crucible. The cost of the clay lined silicon carbide crucible is slightly higher than the standard silicon carbide crucible. Availability is the problem, so ample lead time must be considered when purchasing this type of crucible.

Graphitic Carbon should be added to the cast iron scrap when the crucible is filled, prior to setting in the furnace. Certain types of Graphitic Carbon are absorbed rapidly by the molten iron, so care must be taken in selection of the correct Graphitic Carbon Raiser. Approximately three percent, by weight, of Graphitic Carbon Raiser should be added with the charge metal. A suitable material is charcoal briquettes, but they do not furnish the same form of carbon. It is not as readily absorbed by the iron as is the Graphitic type of carbon raiser. Approximately six charcoal briquettes should be added to a #30 size crucible and it should be mixed with the scrap iron. This crucible will hold about 75 lbs. of iron. When charging the crucible with iron, thin sections should be added along with heavier pieces and the ingot.

Melting Cast Gray Iron - (cont.)

The thin sections will melt rapidly and form a molten puddle, which will transfer heat to the heavier sections more rapidly and reduce the over-all melting time. Additional scrap can be added to the crucible as the charge melts down. The Graphitic Carbon will generate additional heat as it burns, but more important, it will protect the molten metal from oxidation during the melt and maintain the carbon content of the cast iron.

It is imperative that both students and operators use cobalt blue goggles when melting iron, to protect their vision from the high temperature radiation. They must check the melt periodically to determine the fluidity of the melt preparatory to pouring the mold. There is usually a heavy slag formation over the surface of the melt so a rod should be used to penetrate the heavy slag to check the fluidity of the molten bath. DO NOT USE A LANCE PYROMETER WITH THERMOCOUPLE TO CHECK THE TEMPERATURE. THE MOLTEN IRON WILL MELT THE TIP OF THE LANCE.

An optical pyrometer or a replaceable thermocouple tip, lance type pyrometer should be used to check the temperature of the molten iron. The replaceable tip pyrometer is equipped with a socket type receptacle to which the thermocouple tip is attached. The thermocouple tip, when immersed in molten iron, will resist melting and destruction long enough to get a high temperature reading. A NEW TIP MUST BE USED FOR EACH TEMPERATURE READING. This equipment is quite expensive to purchase, and to maintain, except in industrial use.

After the melt has attained the proper temperature and fluidity, remove it from the furnace, then add a cast iron flux material to the crucible. This will change the plastic condition of the slag and make it easier to skim. After the molten iron has been skimmed, it is advisable to add ferro-silicon shot to replace the silicon lost during the melt. Ferro-silicon is usually wrapped in a paper envelope, and plunged beneath the surface of the molten cast iron with a bell plunger. A stainless steel bell plunger is more satisfactory because of the high temperature. It is extremely important that the ferro-silicon is added just prior to the pour. Adding this alloy at an earlier time in the melt will retard or prevent carbon absorption. About one and one half percent, by weight, should be used for crucible melting.

As an added precaution against chill, or, hard spots in the gray iron casting, it is advisable to place an inoculating agent in the mold. One such agent is in the form of a small tablet called Inotab, and is made up of a compound which combines with the iron. It inoculates the iron to prevent the formation of chills and hard spots. The Inotab is placed in the sprue-well of the mold prior to pouring. IT IS VITALLY IMPORTANT THAT THE MOLD BE POURED CONTINUOUSLY ONCE POURING HAS STARTED.

Another important factor in pouring gray cast iron is to design the feeding system with larger runners, gates, and risers. The feeding system which would be used for aluminum or brass casings, will not permit a fast enough flow of molten iron into the mold cavity. The molten iron must be free to fill the mold cavity rapidly and completely. Risers will be used more frequently in iron castings than in either brass or aluminum, due to shrinkage normally found in iron solidification. We do not recommend pouring cast iron into petroleum bonded sand, due to the smoke and gas evolution. If petroleum bonded sand is used, the mold should be designed with additional venting. The smoke and gases formed when the hot metal contacts the petroleum bonded sand can then leave the mold cavity freely. It is also important to delay casting shake-out to be sure the hot casting has cooled sufficiently so the oil bonded sand does not ignite and burn.

Melting Cast Gray Iron - (cont.)

The melting furnace should be adjusted so that the air valve is completely open, utilizing the total output of the blower. The gas valve is adjusted so there is a reducing or slightly gas-rich atmosphere in the melting chamber of the furnace. The different pouring temperatures for different classes of cast gray iron and temperatures for malleable irons and steels are as follows:

Metal	Melting Point	Pouring Temperature
Gray Iron Class 20	2150 F	2550 F
Gray Iron Class 25	2270 F	2625 F
Gray Iron Class 60	2370 F	2650 F
Malleable Iron*	2585 F	2800 F Avg.
Steel*	2700 F	2800 F Avg.

*Alloyed Gray Cast Iron, Malleable Iron, and Steel, should be melted in a Cupola or an Electric Induction or Arc Furnace.

The lower two classes of gray iron, #20 and #25, can be poured at lower temperatures, and are the most suitable for crucible melting. Cast Gray Iron alloyed with chromium or nickel, such as the grade used for gasoline engine blocks, transmission housings, etc., will have a casting temperature range which is slightly higher than the Class 60 Grey Iron. Such elevated temperatures are extremely detrimental to the furnace and crucible. These metals SHOULD NOT BE USED for crucible melting.

ACCESSORIES:

Correctly designed tongs and shanks should be used, both for safety and to minimize crucible failure. **MIFCO** Tongs and Shanks are designed especially for use with our furnaces.

The **MIFCO** Crucible Tong is designed and manufactured according to the recommendations of crucible manufacturers. Each gripper pad is die coined to uniform shape, and nests the crucible below the bilge diameter. Adjustable stops prevent excessive pressure being exerted on the crucible walls, thus avoiding crushing. All Tongs are equipped with a lifting eye and a safety bar lock.

The **MIFCO** Safety Shank was developed by our engineers at the request of School Shop Instructors and Educational Administrators. It is simple in design, easy to operate, and holds the crucible securely. This prevents accidental dropping and dumping a crucible of molten metal. The holding ring is die coined and formed to insure proper size and shape for secure seating of the crucible.

Automatic temperature control of most of our B, C, and small T series furnaces is not practical from a cost standpoint. These crucible furnaces are designed for fast melting and are fired with high input burners. Consequently, the furnace chamber develops a high thermal head that makes automatic control extremely difficult and cost prohibitive. Normal foundry practice is to use a portable lance pyrometer to check the furnace temperature periodically. When the metal approaches pouring temperature, the burners are throttled down, and the thermal head in the furnace finishes the heat. The crucible should be pulled, fluxed, and poured immediately.

ULTRA VIOLET COMBUSTION SAFEGUARD WITH SPARK IGNITION

MIFCO COMBUSTION SAFEGUARD SYSTEM No. 4 –updated 8/2017

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 valve 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. Press the red reset button on the high or low pressure switch that has the light lit up on the multi valve gas valve.

5. There will be a 2 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, the OPR control and INTRLCK lights light up. There is a 30 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 PTFI indicator light 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.

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 valve. 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 (white pushbutton) is reset and the high & low pressure switches have been reset and have no lights on.

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 and interlock circuit, making sure the lights on the gas pressure switches are not on.

   a. Replace the air switch. If you get a spark when you press the start button, you know the old switch is bad.
   b. With the air switch replaced 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:
   Remove the scanner to see if the sight tube is blocked.
   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:
   Connect the meter to terminals S1 & S2.
   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. DUAL MULTI VALVE WILL NOT OPEN:

1. Check interlock light on chassis. If it is flashing, check high & low pressure switches for light.
   If light is on, press switch reset button.
2. 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.

3. 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 too low, 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 low pressure switch.

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. Check for lights on high & low gas pressure switches. If lights are on, press reset button.
2. Bad UV Chassis.

3. Bad UV Scanner.
   a. Check and replace if necessary.

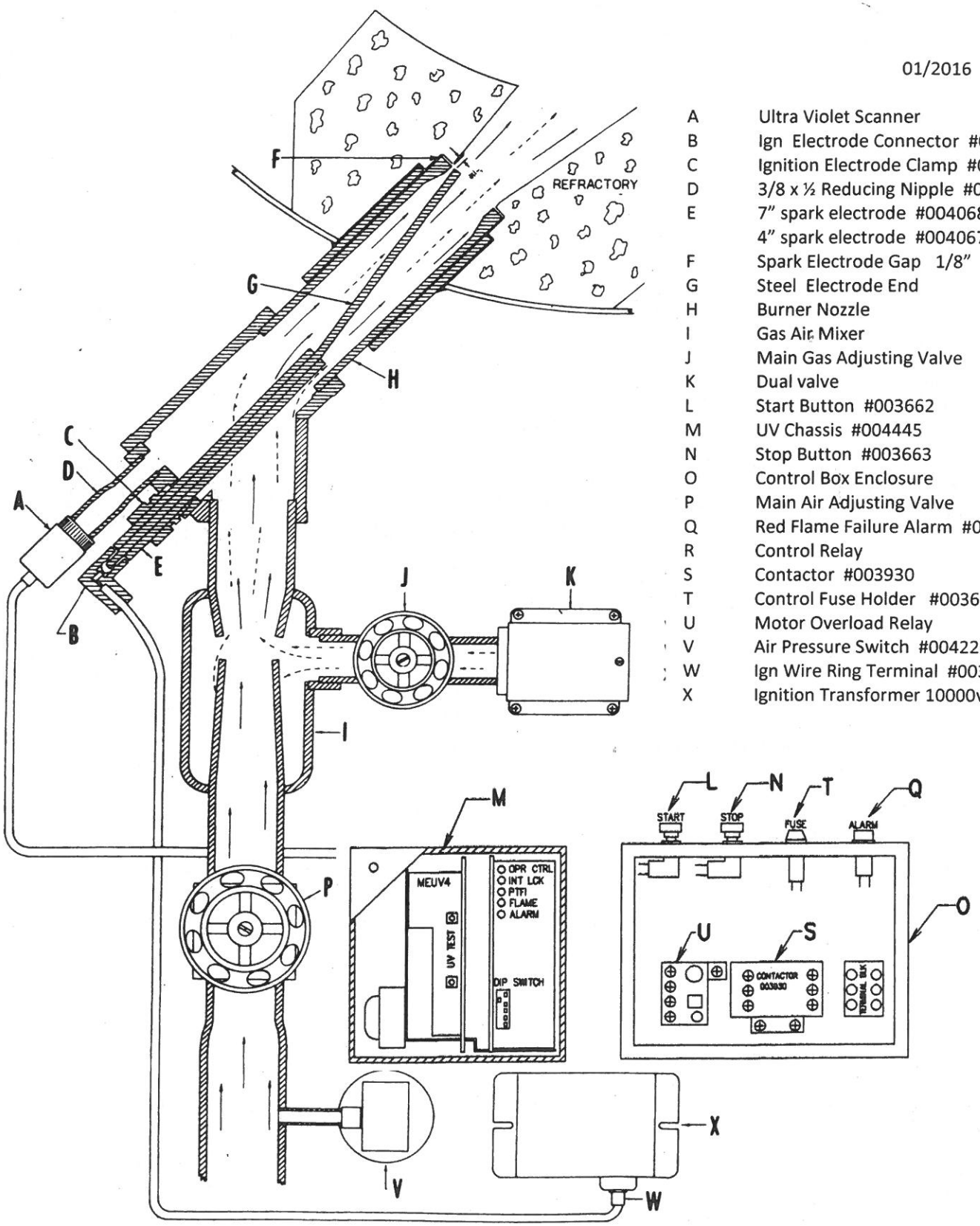
N. ELECTRICAL SEQUENCE:

1. Press the start button and the system performs- self check.
2. Holding coil pulls in and motor starts.
3. Air switch closes, powering high then low pressure gas switches and then powers 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 dual multi valve. Blower runs another 10 seconds and turns off.

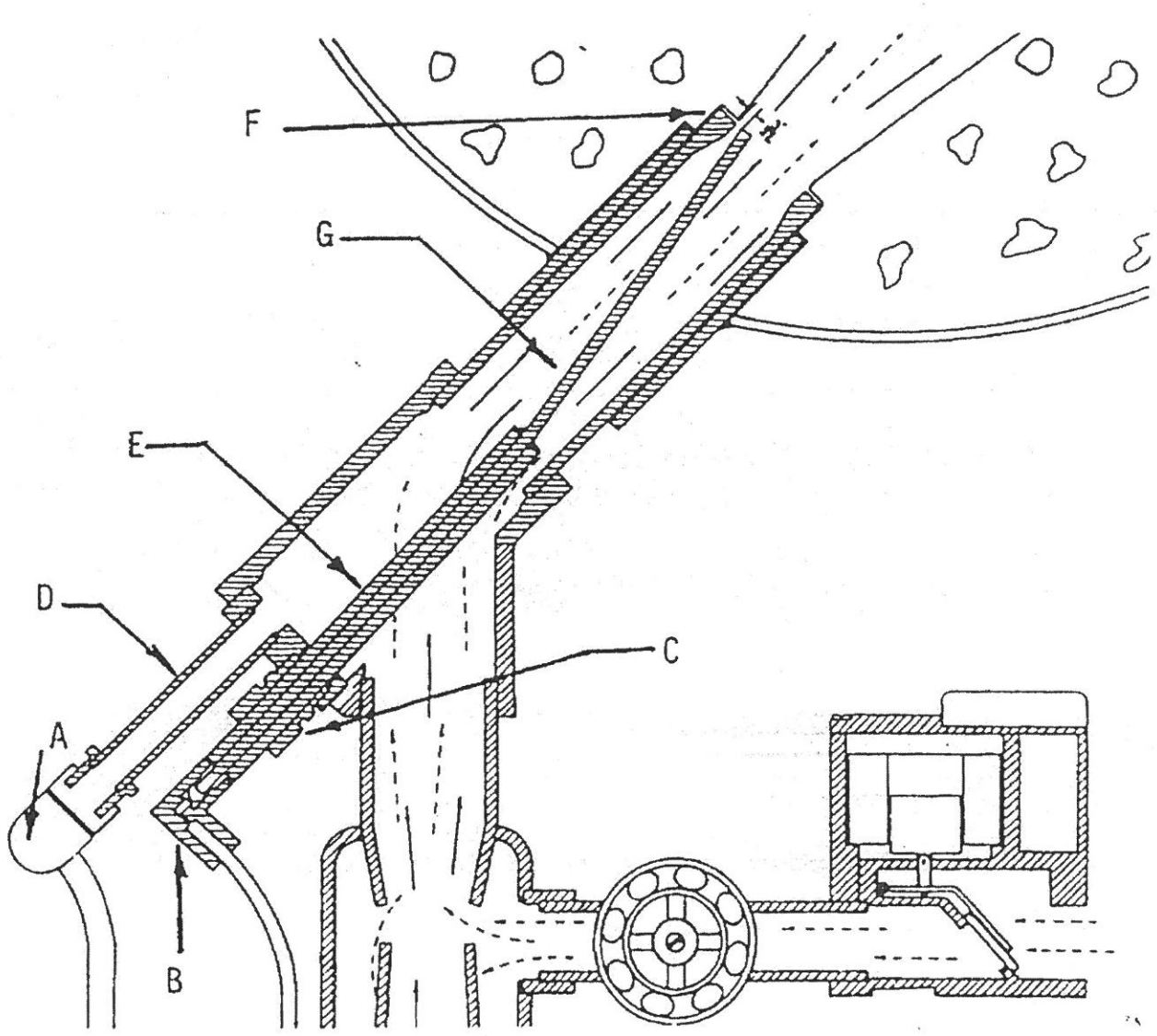
01/2016



A	Ultra Violet Scanner
B	Ign Electrode Connector #004070
C	Ignition Electrode Clamp #003408
D	3/8 x ½ Reducing Nipple #003024
E	7" spark electrode #004068 or 4" spark electrode #004067
F	Spark Electrode Gap 1/8"
G	Steel Electrode End
H	Burner Nozzle
I	Gas Air Mixer
J	Main Gas Adjusting Valve
K	Dual valve
L	Start Button #003662
M	UV Chassis #004445
N	Stop Button #003663
O	Control Box Enclosure
P	Main Air Adjusting Valve
Q	Red Flame Failure Alarm #003906
R	Control Relay
S	Contactor #003930
T	Control Fuse Holder #003600
U	Motor Overload Relay
V	Air Pressure Switch #004226
W	Ign Wire Ring Terminal #003712
X	Ignition Transformer 10000v #004300

SAFETY SYSTEM NO. 4 UV

Installation of Spark Electrode 4
UV 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".
Step 4. Remove old spark electrode.
Step 5. Put a light inside the furnace chamber, at the end of the tunnel, and insert new spark electrode.
Step 6. The steel electrode "G" is bent at an angle. Look through the scanner tube "D" and revolve spark until spark gap "F" is 3/32" maximum. Be sure the porcelain extends beyond the brass lock nut at least an inch.
Step 7. Tighten the brass locking nut just tight enough to prevent the electrode from moving. (Tightening the nut too tightly will break the porcelain.)
Step 8. Replace spark wire to the electrode. Press the start button and observe the spark by looking through the scanner tube "D".
Step 9. If the spark is satisfactory, replace the scanner head "A", press the start button and light the furnace.

PREVENTATIVE MAINTENANCE
For Model C-10, C-20 Speedy Melt

Electrical System

Always check start stop buttons, to make sure they remain tight in the control box. Loose buttons can cause the wire connectors inside to pull away from the buttons, thus causing a short or other failures.
Make sure that the UV cover is always in position. If the cover were missing, this would allow for the bumping of the spark wire and possible disconnection of the wire, and also damage to the scanner cable.

Make monthly checks of the spark wire to make sure that the angle connector is tight on the wire, and also pushed up tight on the electrode. At the same time, remove the scanner from the swaged nipple and clean the glass glove with a clean cloth.

Lid & Lid Lift Assembly

The jack tube assembly should be greased at least once a month. This will allow for easy rotation of the assembly. This unit is equipped with two lids. The top can be left open allowing you to melt within a cast iron pot. The pot rests on top of the four section lid. When melting within the chamber using a crucible, always make sure that the top cover is closed down at all times, while firing the furnace. This unit is supplied with a chimney on the side to allow for exhaust escape. Always remember to remove the lid handle from the fulcrum pin, while the furnace is in operation. Leaving the handle in position, could result in serious burns to the hands.

Shell Assembly

Always make it a practice to check the furnace shell for what we call hot spots. Be mainly concerned with the area around the burner guide tube. You will notice discoloration of the paint in this area, but only be alarmed if you should see a red glow to the shell. This may indicate that the end has burned off the burner nozzle, allowing the flame to direct itself back into the insulation and thus causing damage to the shell. If you should notice this, shut the furnace down at once. Your first step would be to remove the bolt holding the blower nozzle to the side of burner guide tube. Then pull the blower unit away from the side of the furnace, and check the condition of the burner nozzle. If the end of the nozzle is burnt away, replace it. Simply place the unit up in a vice, or use two pipe wrenches to remove the old nozzle. It would also be advisable to remove the top cast iron seals, and chisel your way down into the insulation, just above the burner guide tube. Recast new insulation in this area , as it has a tendency to deteriorate from the high heat. Then you can place the blower unit back into the side of the furnace shell, and be sure to put the bolt back in position holding the blower to the shell.

Firing Chamber

Make regular checks for cracks in the liner bricks, and also for loose mortar between the rows of brick. If there are open gaps between the brick, the flame can penetrate and erode the insulation, thus causing hot spots on the side of the shell.

Firing Chamber - cont.

At least once a month, take a putty knife and scrape the loose refractory, allowing it to fall to the bottom of the chamber. Then, remove with a vacuum. After the removal of all the loose materials, find an old paint brush and a can of water. Brush a liberal coat of water on your bricks to allow your new application of sealer to adhere to the bricks. **Keep in mind that thin applications of sealer are better than one heavy coat.** A thick coat of sealer will flake off on the first firing, and fall to the bottom of the chamber. It is best to fill all large openings with thick material then thin your mixture down and apply at least tree very thin coats with a low firing between each application. Pull the lid assembly up out of the jack pipe, and turn the lid upside down on the floor, to allow you to apply the sealer to the bottom side of the bricks. You can then place the lid back in position and apply a coat of sealer to the upper surfaces. **Keep in mind that continued maintenance of the chamber is to your advantage, as it prolongs the life of the brick.** Always keep any loose metals out of the chamber. If liquid metal is allowed to run down in and around the bottom brick, it will work its way under the liners, thus causing the liner bricks to start working their way upward, as the metal hardens up.

It is advisable to make sure that the drain hole in the bottom of the furnace is always open and not blocked with hardened metal. This is an escape route for the metal, in case of a crucible break. The metal is supposed to flow into the small valley, under the base block, and out on the floor. The bottom is designed in this manner to prevent all the metal from backing up into the burner port in case the crucible should break. Metal in the burner port, can cause major repair costs.

Reline kits are available for this unit. The shipping is usually two weeks from the receipt of your purchase order. Shipped by truck, freight collect.

Preventative Maintenance
For Model B-160

Electrical Systems

Always check start stop buttons, to make sure they remain tight in the control box. Loose buttons can cause the wire connectors inside to pull away from the buttons, thus causing a short or other failures.
Make sure that the UV cover is always in position. If the cover were missing, this would allow for the bumping of the spark wire and possible disconnection of the wire, and also damage to the scanner cable.
Make monthly checks of the spark wire to make sure that the angle connector is tight on the wire, and also pushed up tight on the electrode, At the same time, remove the scanner from the swaged nipple and clean the glass glove with a clean cloth.

Lid & Lid Lift Assembly

The jack tube assembly should be greased at least once a month. This will allow for easy rotation of the assembly. Make sure that when the lid is raised, that it raises level. After a period of time, the lid will have a tendency to raise in the back before it raises in the front. If the lid isn't raising level, loosen the lock nuts on the lifting rods and back them off a couple of turns, then tighten the bottom nuts which will raise the lid up. Continue to tighten the nuts until the lid raises properly. Always remember to remove the lid handle from the fulcrum rod after the furnace has ignited and the lid is closed. If the handle is left in that position, it will become very hot. Lay the handle aside for easy access.

Shell Assembly

Make it a practice to always check the furnace for what we call hot spots. Be mainly concerned with the area around the burner guide tube. You will notice a discoloration of the paint in this area, but only be alarmed if you should see a red glow to the shell. This may indicate that the end has burned off the burner nozzle, allowing the flame to direct itself back into the insulation and thus causing damage to the shell. If you should notice this red glow, shut the furnace down at once. The first step would be to loosen the small bolt that is holding the blower to the side of the shell. Pull the blower away from the side of the furnace, you may have to use a twisting motion, if there is a problem with the exterior of the nozzle. The nozzle might be in such bad shape, that you may have to cut it off flush with the burner guide tube. If you are able to pull the whole assembly away with out problems, place the pipe assembly in a vise, and proceed to remove the old nozzle, and install the new one. After the new nozzle is installed, you may have to re-adjust your spark plug. Then place your pipe work back in position as you removed it, and reattach your bolt to the side of the shell.

Firing Chamber

Make regular checks for cracks in the liner bricks, and also for loose mortar between the rows of brick. If there are open gaps between the brick, the flame can penetrate and erode the insulation, thus causing hot spots on the side of your furnace shell.
At least once a month, take a putty knife and scrape the loose refractory, allowing it to fall to the bottom of the chamber, and remove with a vacuum. After the removal of all the loose materials, find an old paint brush and a can of water. Brush a liberal coat of water on your bricks to allow your new application of sealer to adhere to the bricks. **Keep in mind that thin applications of sealer are better than one heavy coat.** Thick coats of sealer will flake off and fall to the bottom of the chamber. It is best to fill all large openings with thick material, then thin the mixture down and apply at least three very thin coats, with a low firing between each application.
Make sure that the drain hole in the bottom of the furnace chamber is always open and not blocked with hardened metal. Do not allow spilled metals to get down in around the wall area where the bottom and side liner bricks come together. Continuous melting and re-hardening of this metal will cause your side liner bricks to rise. If this is allowed to happen, the next thing you will experience, will be that your lid will not open or close as it should. At this point you will have to re-line the furnace chamber.

Electrical System

Make frequent checks in your control box to see the lock nuts on the back sides of your stop and start buttons are tight. Loose buttons can cause the wire connectors inside to pull away from the buttons, thus causing a short or other failures.
Do not run the unit without the UV protection cover in position. If the cover is missing, this will allow for bumping of the stark wire, and possible disconnection. The scanner cable must also be protected at all times.

Make monthly checks of the spark wire to make sure that the connectors are tight on the wire, and pushed up tight on the electrode. At the same time, remove the scanner from the swaged nipple, and clean the glass with a clean cloth. If the glass on the scanner is dirty, it will not be able to see the spark, thus causing ignition failure.
Do not allow the conduit going from the ultra violet controller to the motor to be loose from their connectors. Exposure of the wire from the conduit, could cause the wire to get burnt, or cut, thus causing failure of the equipment. One last thing is to make sure that the scanner and spark cables are fastened up around the manifold pipe. Do not allow the cables to lie on the floor, being walked on, and getting mashed. This can also be cause for machine failure.

Lid & Lid Lift Assembly

Make it a practice to grease the jack tube assembly at least once a month, allowing for easy rotation of the assembly. Make sure that when the lid is raised, that it raises level. After a period of time, the lid will have a tendency to raise in the back before it raises in the front. Do not allow the lid to drag across the top of your side liners or the cast iron top seals. This will cause damage to the front edge of your lid brick. In order to correct this problem, loosen the lock nuts on the lifting rods and back them off a couple of turns, then tighten the bottom nuts up, which will raise the lid upward. Continue to tighten the nuts until the lid raises level.
If you notice that your lid bricks are uneven, when the lid is closed, loosen the lid band and take a rubber mallet and very carefully hammer the bricks down flush on top of the side liners, then tighten the nut on the bolt. Do not over tighten the nut, as to much pressure will cause the lid sections to break and fall down into the chamber.
Always remember to remove the lid handle from the fulcrum rod after the furnace has ignited and the lid is closed. If the handle is left in position, it will become very hot, and could cause a sever burn to the hands, if you are not wearing gloves. Lay the handle aside for easy access.

Shell Assembly

Frequently check your furnace shell for what we call hot spots. Be mainly concerned with the area around the burner guide tubes. You will notice the paint will turn brown in this area. This discoloration is ok as the temperature is only 500 degrees. If the shell discolors anywhere else there may be a problem with the brick lining. Check the joints of the bricks for any spaces. The inside of the furnace may need a coating of refractory sealer.

It is our suggestion that you check in the furnace chamber with a mirror and look at the burner ports for any sign of damage of the burner nozzles. If there is deterioration we advise pulling the nozzles out and checking them. Replace if need be. There is a union at the back of the manifold. Loosen this union and the burner nozzles and manifold will pull out of the furnace shell. The nozzles can then be replaced. It is a advisable to always keep a spare set of nozzles on hand.

Firing Chamber

Make regular checks of your chamber lining, looking for cracks in the bricks, or loose mortar between the rows of bricks. If you find open gaps between the brick, they must be filled at once, as the flame can penetrate and erode the insulation, thus causing hot spots to the side of the furnace shell.

At least once a month, take a putty knife and scrape the loose refractory from the sides of your chamber, and remove with a vacuum. After the removal of all loose materials, find an old paint brush, or sponge, and a can of water. Brush a liberal coat of water on your brick to prepare them for the new application of RS sealer. The application of the water will keep the brick from soaking all the moisture out of your sealer before you cover the whole inside of the chamber. **Keep in mind that a thin application of sealer is better than one heavy coat.** Thick coats of sealer will flake off and fall to the bottom of the chamber. It is best to fill large openings with thick material, then thin your mixture down, and apply at least three thin coats over the entire chamber, with a low firing between each application.

Always make sure that the drain hole in the bottom of the furnace chamber is open and not blocked with hardened metals. It is also a good idea to work your drain plug bricks back and forth, to make sure that they work freely. Do not allow spilled metals to block the drain escapes. Also, do not allow spilled metals to penetrate down in and around the area where the bottom brick and the side liners come together. If this is allowed to happen, the melting and re hardening of the metals will cause your side liners to rise upward, thus causing a major problem with the opening and closing of your lid. Continuous rubbing of the brick surfaces, under pressure, will cause major damage to your lid brick, as well as the top of your liner brick.

Relining kits are available for all furnaces that we manufacture. The delivery on any reline kit would be at least two weeks from the time of order placement. All reline kits will have to be shipped by truck, because of their weight, and size.

Always remember that continued maintenance will prolong the life of your furnace, and in the long run, cost you less in repairs.

RELINING INSTRUCTIONS

INSTRUCTIONS FOR REPLACING THE LINING AND LID FOR SPEEDY MELT STATIONARY CRUCIBLE FURNACES.

MODELS: B-16, B-160, B-30, B-70 SINGLE BURNER SERIES
MODELS: B-301, B701, B-702, B-1500, B-1501 DOUBLE BURNER SERIES

EACH RELINING KIT CONTAINS ALL REFRACTORY SHAPES, REFRACTORY MORTAR AND INSULATION, AND COMPLETE INSTRUCTIONS TO RELINE AND RENOVATE YOUR FURNACE.

LOCATE THE SPECIFIC PAGES OF THIS SECTION OF THE SERVICE MANUAL COVERING YOUR MODEL FURNACE. IT SHOWS LINE DRAWINGS AND MATERIAL LISTS.

PREPARING THE REFRACTORY CASTABLE INSULATION:

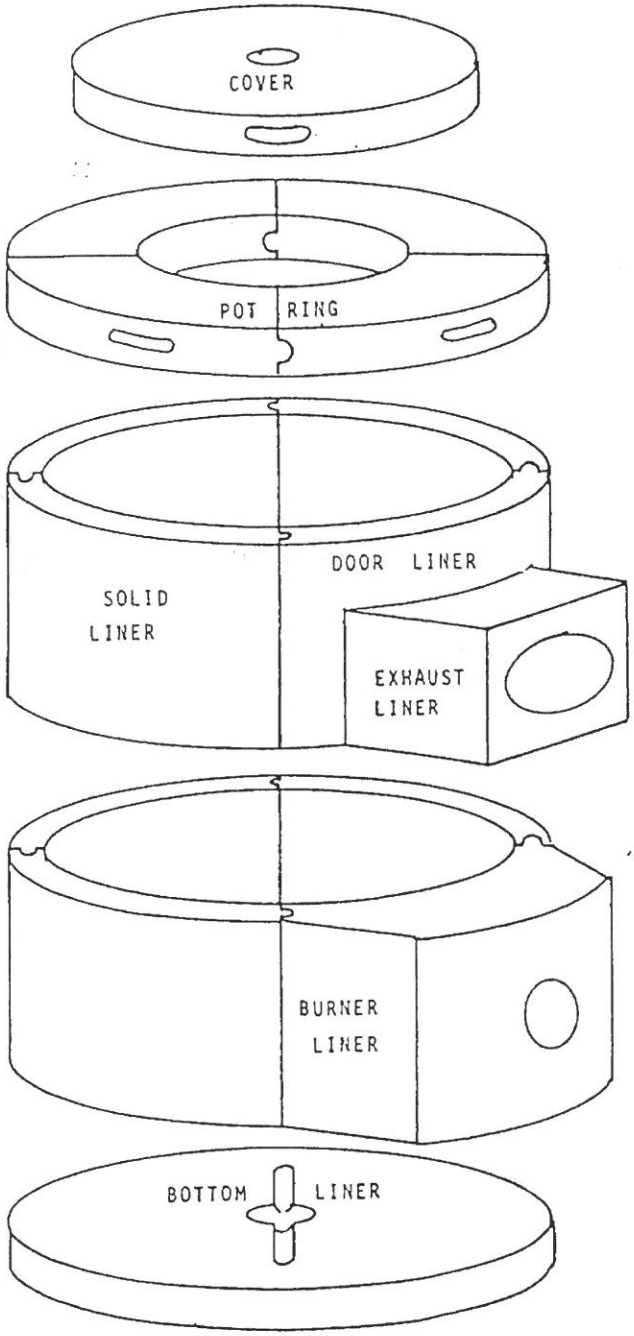
Each relining kit contains enough insulation to pour between the hard brick lining and the steel shell of the furnace. Dump the pre-mixed components into a box similar to a plaster mixing box. Add water so that the insulation will have about the same consistency as plaster. Pour the mixture between the refractory lining and the steel shell. Vibrate or rod the insulation to remove any trapped air from the space between the brick and the shell. This is extremely important around burner ports and the furnace bottom. Further information is contained in the instruction sections.

RELINING INSTRUCTIONS FOR
C-9, C-10, C-20 Soft Metal Melters

The Speedy Melt furnaces have been designed so that relining is easily and rapidly done. Complete relining kits are available as a package unit. These kits include all replacement refractory shapes, insulation and correct type mortar.

Structural parts of the furnace which are subject to normal abuse and may need replacement are available. See the operating and maintenance instructions for these parts reference. Relining procedure is as follows:

1. Remove blower, mixer-burner and pilot assembly from furnace. Remove lid lift assembly by lifting out of base tube.
2. Remove lid ring bolt and remove lid brick. Remove front bolt from ring band clamp and remove four ring brick sections. Replace lid band if damaged or burned.
3. Remove four segments of top cast iron seal by removing four hex nuts on top of furnace chamber. Remove all insulation and refractory from furnace shell. Remove and replace the seal hold down bolts if broken. Support the ears, or use gear puller to prevent bending, hold down ear.
4. Mix part of refractory sealer to consistency of heavy cream to use for mortaring joints.
5. Model C-10 - Place bottom row of liners in center of the shell, locating burner brick on burner guide tube and cement into place. Cement I.D. of burner tunnel and O.D. of guide tube to seal against flame leakage. Insert finger in burner guide tube and remove excess cement. Model C-20 - Place row one of liner bricks down in the bottom of the shell and center, making sure burner brick is in line with hole on side of shell.
6. Place a hand full of sealer in the bottom of the shell, and place the bottom brick down in place with grooves up.
7. Place a row of sealer on top of row one bricks. Place second row of bricks on top of row one and align the exhaust liner with the chimney. Cement exhaust sleeve liner in place even with I.D. of furnace chamber. Press row of bricks down to be sure of a good seal. Be sure top ring of liners is level to form seat for cover.
8. Mix pre-mixed insulation with enough water to make a pouring consistency. Pour insulation between shell and refractory lining. Prod while pouring to form an even distribution of insulation. Fill to height of liners. Let insulation set for approximately 20 minutes. Now take a rubber mallet, and tap all around the side of the shell. The insulation will settle down. Now, add more insulation to fill gap back up to the top of the bricks.
9. Replace top seal segments and bolt down in place. Replace lid lift assembly after applying a thin layer of grease to tube.
10. Locate the pot ring bricks. Dip the tongue and groove ends in the sealer, then place the bricks on top of the liners forming your circle. Now spread the lid band, placing it around the bricks aligning the lugs with the notch in the bricks. Do not over tighten. Now, place your cover brick in place and put band around it.
11. Apply small amount of refractory sealer to burner nozzle and reassemble. Be sure burner enters to bumper lock. Replace pilot unit, (if unit has one), and seal with plastic sealer.
12. Mix balance of refractory sealer to consistency of latex paint and cover all exposed refractory with a single coat of sealer. It is better to brush several light coats on instead of one heavy coat. A heavy coat will peel off. Furnace should set for 24 hours to cure insulation, then fire for one hour to remove moisture. The following day, fire as desired.



OPN 032030 List of Contents for C-9 Relining Kit

Part No.	Qty.	Description
008056	1	Bottom Brick
008050	6	Solid Liner
008051	1	Burner Brick
008052	1	Exhaust Side Liner
008053	1	Exhaust Liner Tile
008059	1	Cover Brick
008057	1	Chimney Brick
008173		Refractory Sealer
008141		Matrilite 28

OPN 032002 List of Contents for C-10 Relining Kit

Part No.	Qty.	Description
008056	1	Bottom Brick
008050	6	Solid Liner
008051	1	Burner Brick
008052	1	Exhaust Side Liner
008053	1	Exhaust Liner Tile
008054	4	Pot Ring Bricks
008055	1	Cover Bricks
008057	1	Chimney Brick
008173		Refractory Sealer
008141		Matrilite 28

OPN 032003 List of Contents for C-20 Relining Kit

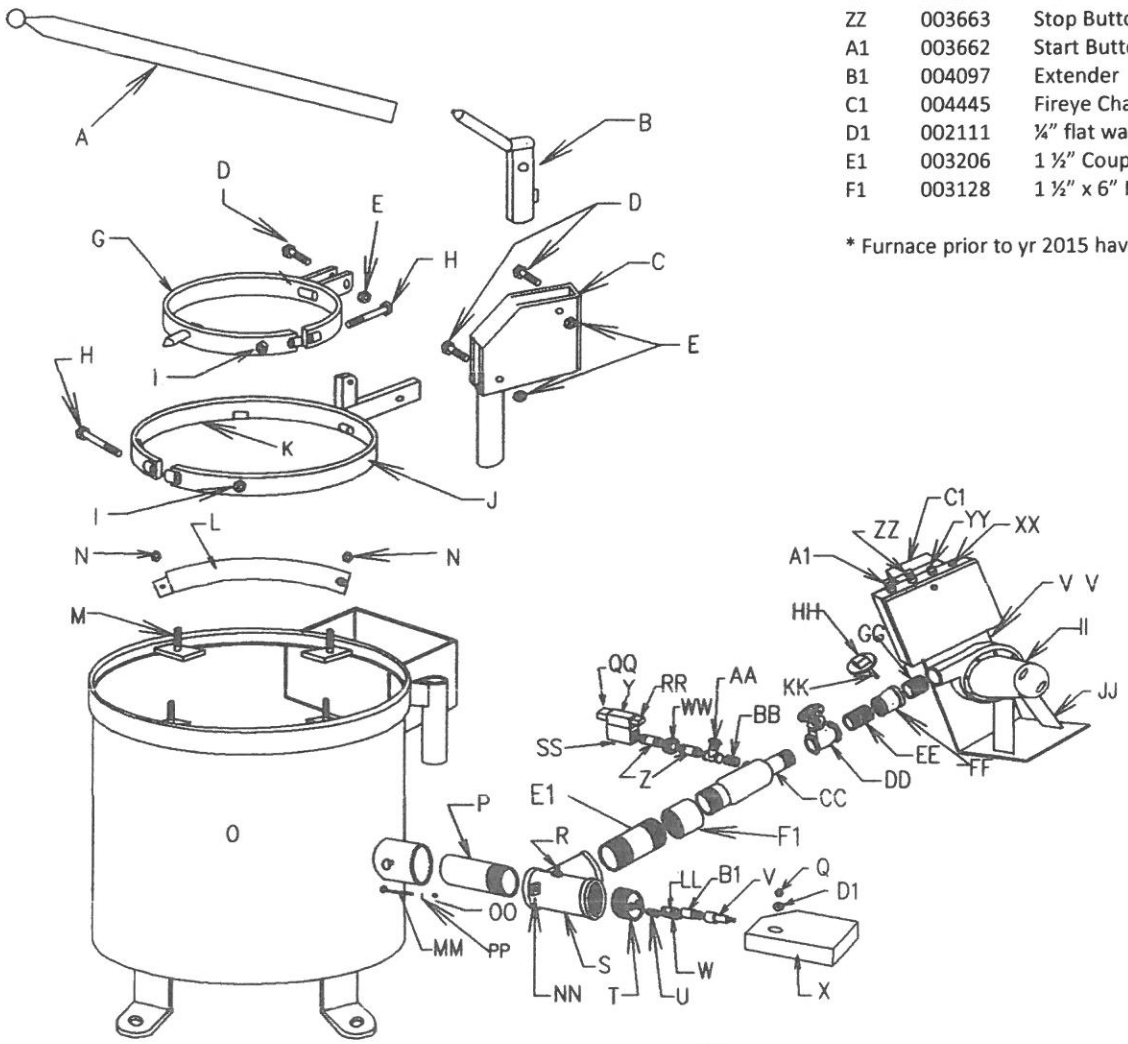
Part No.	Qty.	Description
008007	1	Bottom Brick
008005	6	Solid Liner
008009	1	Burner Brick
008061	1	Exhaust Side Liner
008062	1	Exhaust Liner Tile
008060	4	Pot Ring Bricks
008059	1	Cover Brick
008058	1	Chimney Brick
008173		Refractory Sealer
008141		Matrilite 28

C-9 and C10

10/28/2016

	OPN	DESCRIPTION	QTY
A	010070	Lid Lift Handle Assembly	1
B	010025	Lever Handle Assembly	1
C	010020	Lid Lift Housing Assembly	1
D	001207	3/8 x 1 ½" hex hd bolt	2
E	002017	3/8" Lock Nut	3
G	100050	C10 (only)- cover band	1
H	001213	3/8-16 x3" Hex Hd Bolt	2
I	002015	3/8-16 Hex Nut	2
J	100041	C10 (only)- Pot Ring Assembly	1
K	100090	C9 (only)- Cover Assembly	1
L	008600	Top Seal Segment	4
M	000908	5/16"x 1 ¾" Hex Hd Bolt	4
N	002012	5/16" Jam Nut	4
O	100021	Shell Assembly	1
P	006600	1 ½"x 6" Burner Nozzle	1
Q	002008	¼-20 Hex Nut	2
R	000606	¼" x 3/4" Slotted Rd Hd Screw	1
S	003362	1 ½" Y Branch	1
T	006665	1 ½" UV Plug	1
U	003408	½" to 3/8" brass fitting	1
V	004106	UV1A3 Flame Scanner	1
W	004068	7" Spark Electrode	1
X	006690	UV Protection Cover	1
Y	*003789	Dual valve-no proof of closure	1
		Dungs#DMV-D 701/602 224-842	
Z	003044	½" x 3" Nipple	2
AA	003427	½" Gate Valve	1
BB	003043	½" x 2" Nipple	1
CC	006030	GM50 Gas Air Mixer	1
DD	003429	1" Gas Gate Valve	1
EE	003086	1" x 2" Nipple	1
FF	003222	1 ½" x 1" Reducing Coupling	1
GG	003107	1 ½" x 2" nipple	1
HH	004226	Air Pressure Switch	1
II	004134	F1M Blower with Motor	1
JJ	006200	6 ¼" Blower Stand	1
KK	003002	1/8" x 2" Nipple	1
LL	003024	½" x 3/8" Reducing Nipple	1
MM	002360	Eye Bolt	1
NN	100655	Burner Retention Tab	1
OO	002008	¼" FHN Nut	1
PP	002112	¼" Lock Washer	1
QQ	003816	Low Gas Pressure Switch	1
		Dungs# GML-A2-4-4 266942	1
RR	003780	High Gas Pressure Switch	1
		Dungs #GMH-A2-4-4 266924	
SS	003836	Visual Indicator	1
		Dungs# 217-665A	
VV	004300	Ignition Transformer 10000v	1
WW	003365	½" Black Union	1
XX	003906	Red Light	1
YY	003600	Fuse Holder	1
ZZ	003663	Stop Button	1
A1	003662	Start Button	1
B1	004097	Extender	1
C1	004445	Fireye Chassis Complete MEC120	1
D1	002111	¼" flat washer	1
E1	003206	1 ½" Coupling	1
F1	003128	1 ½" x 6" Nipple	1

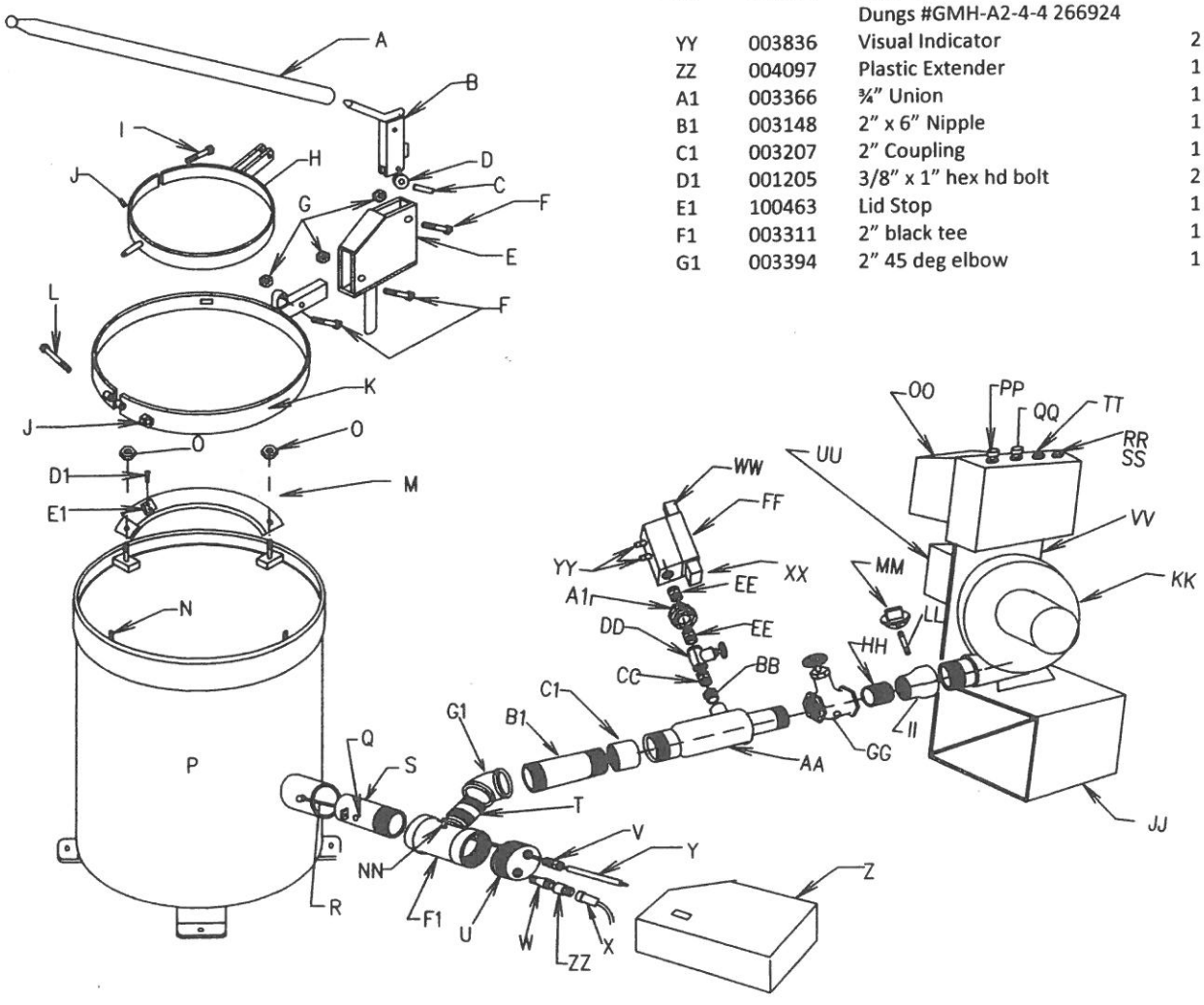
* Furnace prior to yr 2015 have 004213 ½" solenoid valve



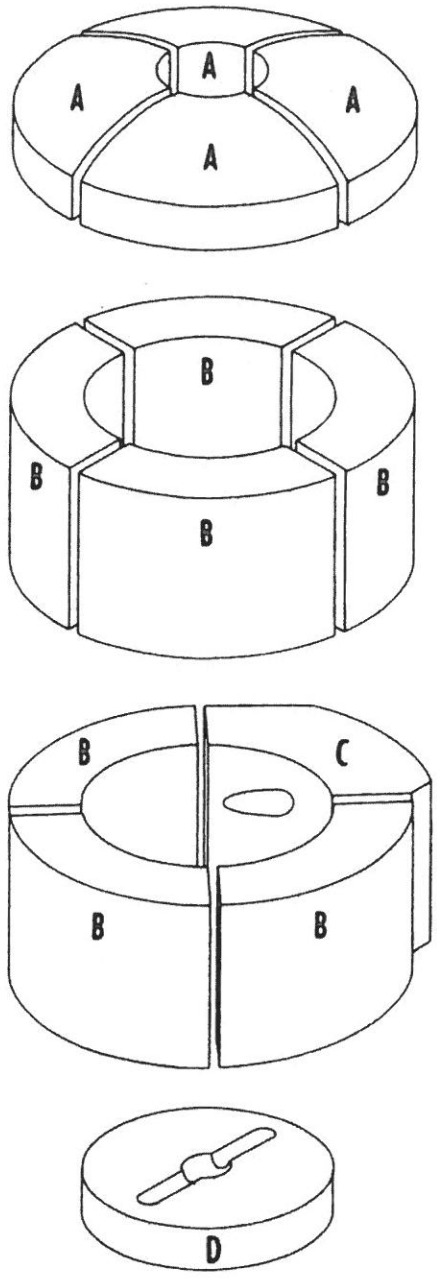
McEnglevan C-20 Parts Listing 04/2019

	OPN	DESCRIPTION	QTY
A	010070	Lid Lift Handle Subassm	1
B	010045	Lever Handle Assembly	1
C	002423	3/8" x ¾" Spring Pin	1
D	002467	R8ZZ Bearing and	1
	010009	Bushing	1
E	010040	Lid Lift Housing Subassm	1
F	001209	3/8" x 2" Hex Hd Capscrew	3
G	002017	3/8" Lock Nut	3
H	100250	Cover Subassm Lid Ring	1
I	001213	3/8-16 x 3" hex Hd Bolt	1
J	002015	3/8-16 Hex Nut	2
K	100241	Pot Ring Subassm	1
L	001215	3/8-16 x 3 ½" Hex Hd Bolt	1
M	008602	Top Seal Segments	4
N	000908	5/16" x 1 ¾" Hex Hd Bolt	4
O	002012	5/16" Jam Nut	4
P	100221	Shell Subassm	1
Q	002008	¼-20 FHN Hex Nut	1
R	002360	Eye Bolt	1
S	006607	2" x 6" Burner Nozzle	1
T	003141	2" x 2 ½" nipple	1
U	006686	2" UV Plug	1
V	003408	½" to 3/8" Fitting	1
W	003024	½" TO 3/8" reducing nipple	1
X	004106	UV1A3 flame scanner	1
Y	004068	7" Spark Electrode	1

	OPN	DESCRIPTION	QTY
Z	006690	UV Protection Cover	1
AA	006060	GM100 Gas Air Mixer	1
BB	003341	1" x ¾" Bushing	1
CC	003062	¾" x 2" Nipple	1
DD	003428	3/4" Gas Gate Valve	1
EE	003064	¾" x 3" Black Nipple	2
FF	003789	Dual valve-Dungs#	1
		DMV-D 701/602,224-842	
		Without proof of closure	
GG	003431	1 ½" Air Gate Valve	1
HH	003107	1 ½" x 2" Nipple	1
II	003224	2" x 1 ½" Reducing Coupling	1
JJ	006220	10" Blower Stand	1
KK	004331	#175 blower with impeller	1
		Less motor	
LL	003002	1/8" x 2" Black Nipple	1
MM	004226	Air Pressure Switch	1
NN	000606	¼ x ¾" Slotted Rd Hd Screw	1
OO	004445	Fireye Chassis	1
PP	003662	Start Switch	1
QQ	003663	Stop Switch	1
RR	003600	Fuse Holder	1
SS	003624	5 Amp Fuse	1
TT	003906	Red Light	1
UU	004300	Ignition Transformer 10000 v	1
VV	003914	Step Down Transformer	1
		(If not 115V)	
WW	003816	Low Gas Pressure Switch	1
		Dungs# GML-A2-4-4 266942	1
XX	003780	High Gas Pressure Switch	1
		Dungs #GMH-A2-4-4 266924	
YY	003836	Visual Indicator	2
ZZ	004097	Plastic Extender	1
A1	003366	¾" Union	1
B1	003148	2" x 6" Nipple	1
C1	003207	2" Coupling	1
D1	001205	3/8" x 1" hex hd bolt	2
E1	100463	Lid Stop	1
F1	003311	2" black tee	1
G1	003394	2" 45 deg elbow	1



RELINING INSTRUCTIONS FOR SPEEDY MELT B-16, B-160 AND B-30 FURNACES



B-16 and B-160 Furnaces

QTY.	OPN	DESCRIPTION	
A	008002	Lid Section	4
B	008000	Solid Side Liner	7
C	008003	Piloted Burner Brick	1
D	008004	Bottom Brick	1
	008141	Matrilite 55# bag	2
	008173	Sealer 20# box	1

B-30 Furnace

QTY.	OPN	DESCRIPTION	
A	008008	Lid Section	4
B	008005	Solid Side Liner	7
C	008009	Piloted Burner Brick	1
D	008007	Bottom Brick	1
	008141	Matrilite 55# bag	

The material used in the manufacture of the lining and lid for these Speedy Melt Furnaces is High-Alumnia refractory. This material is one of the best available, designed to withstand the extreme temperatures, drastic temperature changes and high velocity circulation encountered in top performing crucible melting furnaces. The fusion point of this material is near 3300°F. DOMESTIC FIRE CLAY REFRACTORY, NORMALLY USED, IS ENTIRELY UNSATISFACTORY. All shapes are compressed under extreme pressures, and kiln burn. The MIFCO Furnaces have been designed so that relining is rapidly and easily done. Complete relining kits are available as a package unit. These kits include all replacement refractory shapes, insulation, and the correct type of High-Alumnia refractory mortar. Structural parts of the furnaces which are subject to normal abuse and may need replacement are available. Relining procedure is as follows:

1. Remove blower and mixer-burner assembly from furnace.

2. Remove front bolt from lid band, spread lid band, remove the four lid brick sections, "A".

3. Remove lid lift assembly by lifting out of the base tube. Replace lid band if damaged or burned, being careful not to lose collar bushings in jack tube. Replace both lid support rods if bent or burned.

4. Remove the four top cast iron segments by removing hex nuts on top of furnace. Remove all insulation and refractory from the furnace shell. Remove and replace seal hold down bolts if broken.

Relining Instructions for B-16, B-160 and B-30 (cont)

5. Mix part of your refractory sealer to the consistency of heavy cream for mortaring joints. With your fingers, place a ring of sealer all around the outer surface of the burner guide tube, and also some all around the inside of the burner opening in the brick. This is to prevent flame leakage.

6. Now pick up the banded group of bricks and place the burner brick over the guide tube. It should drop all the way to the bottom of the shell. Measure to make sure the bricks are centered in the shell.

7. Take a hand full or approx a cup full of mortar and dump it down in the bottom all around the center hole in the bottom of the shell. Spread out with a paint brush. Now take the bottom brick with the drain grooves up, and drop it down within the side liner. Twist the brick to spread mortar under the brick.

8. Pour a goodly amount of water all over the top of row one and let it run down the inside and outside of the bricks. Take a one pound coffee can and fill with your sealer and pour at least a ¼" layer of sealer all around the top of row one of the liner. Next, take your second row of bricks with the smooth surface up, and set them down on top of row one, breaking the joints. Tap with a rubber mallet to make sure the bricks are seated level. Pour some more water down over the top of the second row allowing it to run down both inside and out.

9. Mix the Matrilite insulation with sufficient water to the consistency of plaster. Pour the insulation down between the inner shell and the brick lining. Either use a vibrator or a stick to prod the insulation while pouring, especially in the area of the burner. Fill the insulation up to about 1" above the top of the liner, as it will settle. With a rubber mallet tap lightly all around the shell which will also help the insulation to settle. You will notice water dripping on the floor, this is to be expected.

10. Prior to replacing your top seals, add what ever amount of insulation is required to bring it back up to about ½" above the brick again so when you replace the seals, the insulation will mash back down , guaranteeing a good seal. Tap lightly on each top seal as you tighten the nuts down.

11. Spread the lid band and place the four lid sections on top of the chamber lining. Align the grooves on the outside of the bricks to match the holding lugs on the inside of the band. Press down with a mallet to make sure each brick is seated on the top of your liner. Replace lid band bolt, and just snug up- do not over tighten as it will cause the brick to expand and break with heat.

12. Pull your entire lid assembly up out of the slide pipe and turn the lid upside down on the floor. Again, moisten with water and paint the under surface with sealer.

13. Now is a good time to put grease on the jack tube prior to placing it back into the slide pipe. Swing the lid to the side paint on some water on the upper surface and cover with sealer closing up any cracks between bricks.

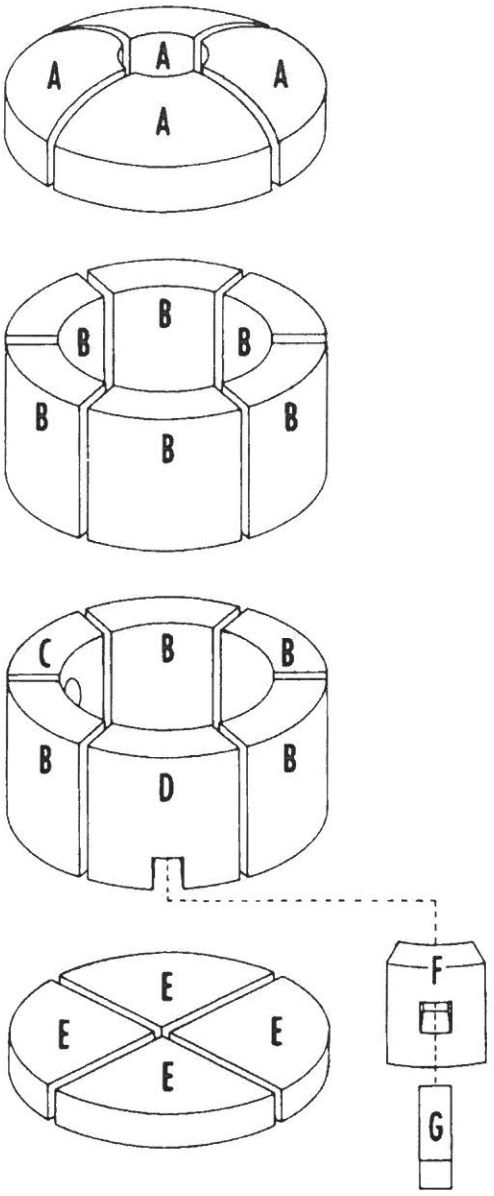
14. With the lid open, take a wet paint brush and moisten all the liner bricks one more time, and take the balance of sealer and paint on the whole inner chamber. Also fill in around between the bottom brick and the side liner.

15. Prior to putting your burner nozzle back into the guide tube, take a flash light and make sure there is no mud blocking the inside of the burner opening, then place a light layer of sealer around the edge of your nozzle prior to putting it into the guide tube. This will insure a good seal.

16. Furnace should set for 24 hours to cure the insulation, fire at low fire for one hour to remove moisture. The following day, fire as desired. Firing at HIGH FIRE right away after insulating will cause steam to form in the bricks and blow them apart.

Included with the relining kit is a circle of 1" thick ceramic fiber blanket, the diameter of the furnace lid. Place this on top of the furnace lid for the first 2 or 3 firings/melts. After the lid bricks have been heated to a yellowish color all the way through, discard the blanket. It is provided to ensure that the lid bricks are completely cured.

RELINING INSTRUCTIONS FOR SPEEDY MELT MODEL B-70 FURNACE



OPN	DESCRIPTION	QTY
A	008022 Lid Section	4
B	008010 Solid Side Liner	10
C	008011 Piloted burner brick	1
D	008104 Drain Side liner brick	1
E	008013 Bottom brick	4
F	008103 Drain Tile	1
G	008160 Drain Tile Plug	1
	008141 Matrilite	

The MIFCO Furnaces have been designed so that relining is rapidly and easily done. Complete relining kit are available as a package unit. These kits include all replacement refractory shapes, insulation, and the correct type of high alumina refractory. Structural parts of the furnace which are subject to normal abuse and may need replacement, are available. Relining procedure is as follows:

1. Remove blower and mixer-burner assembly from furnace.

2. Remove front bolt from lid band, spread lid band, remove the four lid sections.

3. Remove lid lift assembly by lifting out of the base tube. Replace lid band if damaged or burned, being careful not to lose collar bushings in jack tube. Replace both lid support rods if bent or burned.

4. Remove the six top cast iron segments by removing hex nuts on top of furnace. Remove all insulation and refractory from furnace shell. Remove and replace seal hold down bolts if broken. Remove burner guide tube.

5. Mix part of refractory sealer to consistency of heavy cream for mortaring joints.

6. Place four segments of Bottom Bricks **E** in center of furnace chamber. Measure side clearance between brick and shell to locate bottom correctly. Wet brick surfaces to be mortared, with water. This improves mortar joints. Dry bricks absorb moisture from mortar too rapidly resulting in weak joints. Use brush or sponge to saturate surfaces with water.

7. Set banded burner ring in place, lining up the burner hole with the burner guide tube when they are in place. DO NOT REMOVE THESE BANDS. This burner ring should be cemented in place by pouring a ring of cement where the bottom row of bricks are to set. Be sure to wet the mating surfaces before applying mortar. Put mortar inside of burner hole, insert burner guide tube, and bolt into place. Wipe excess mortar from inside of burner tunnel.

8. Mortar drain tile **F** in place and line up drain hole by inserting drain tile plug **G**.

9. Mix patching plastic per instructions on container and build up all around the burner guide tube. This build up should be about 1" thick and next to the burner brick **C**, there should be a heavy fillet working the castable well against the brick to assure a good bond.

10. Cement second ring of six solid liner bricks **B** in place. Put the smooth side up to mate with the lid. If the bricks are loose, turn the smooth side down on a flat surface and make wooden wedges to drive between the bands and the bricks. This will tighten the bands. DO NOT OVER-TIGHTEN. Over-tightening will cause the bricks to crack when they expand from heating. Wet the bottom of this row and the top of the bottom row well and then pour a ring of cement on the top of the bottom row. Lower the top row of bricks in place and revolve ring of bricks to get the cement thinned out and seat the bricks. The vertical joints should be staggered.

11. Mix pre-mixed insulation with sufficient water to the consistency of plaster. Pour insulation between shell and refractory lining. Prod while pouring to form even distribution of insulation. Fill to height of liners, wait approximately 30 minutes and fill to top again.

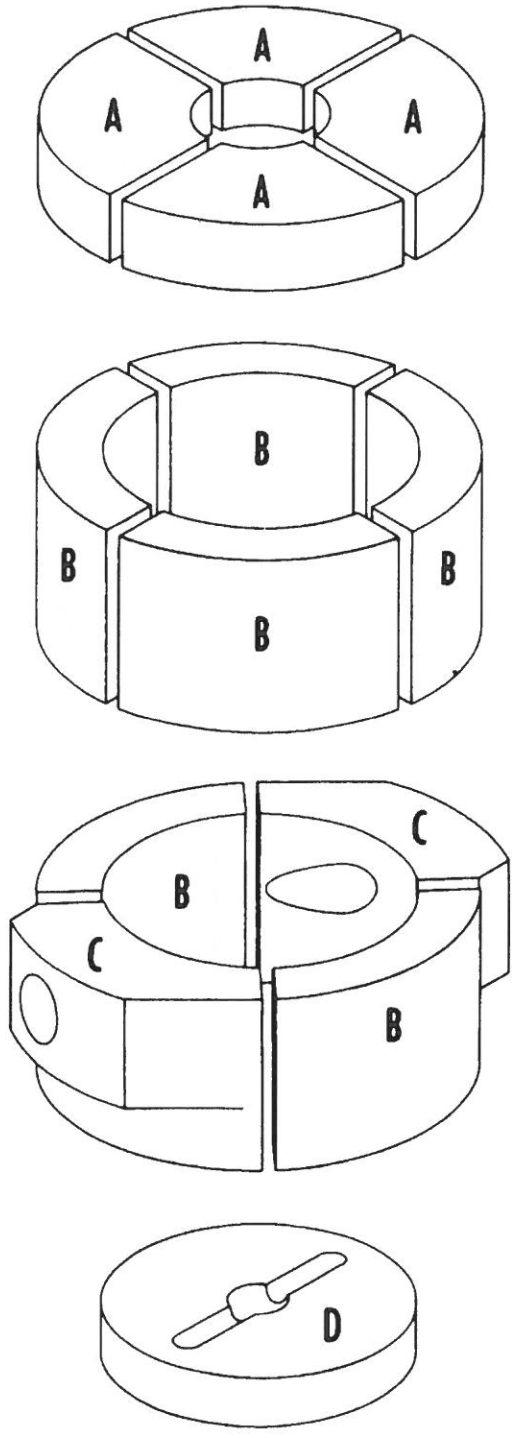
12.Replace top seal segments and bolt down in place. Replace lid lift assembly after applying thin layer of grease to tube.

13. Spread lid band and place four lid segments **A** on top of furnace chamber lining. Align the grooves on the outside of the lid bricks to match the holding lugs in the lid band. Press or tap each top segment down to seat against the chamber lining. Replace the front lid band bolt and tighten snug. DO NOT OVER-TIGHTEN.

14.Apply small amount of refractory sealer to burner nozzle and reassemble. Be sure burner enters to refractory stop. Thin mortar with water to consistency of a paint and paint all exposed brick surfaces.

15.Furnace should set for 24 hours to cure insulation, then fire at low fire for one hour to remove moisture. The following day, fire as desired. Firing at HIGH-FIRE right away will cause steam to form in the bricks and blow them apart.

RELINING INSTRUCTIONS FOR SPEEDY-MELT MODEL B-301 FURNACE



	OPN	DESCRIPTION	QTY.
A	008008	Lid Section	4
B	008005	Solid Side Liner	6
C	008009	Piloted burner	2
D	008007	Bottom Brick	1
	008141	Matrilite-55#	2
	008173	Sealer-20#	1

The MIFCO Furnaces have been designed so that relining is rapidly and easily done. Complete relining kits are available as a package unit. These kits include all replacement refractory shapes, insulation, and the correct type of High Alumina refractory. Structural parts of the furnace which are subject to normal abuse, and may need replacement, are available. Relining procedure is as follows:

1. Remove blower, gas-air mixer assembly, ignition and combustion safeguard system from manifold. Disassemble manifold and unbolt burner guide tubes from furnace shell.

2. Remove front bolt from lid band, spread lid band and remove the four lid brick sections,

3. Remove lid lift assembly by lifting out of the base tube. Replace lid band if damaged or burned, being careful not to lose collar bushings in jack tube. Replace both lid support rods if bent or burned.

4. Remove the four top cast iron segments by removing hex nuts on top of furnace. Remove all insulation and refractory from furnace shell. Remove and replace seal hold down bolts if broken. Remove burner guide tubes.

5 Mix part of refractory sealer to consistency of heavy cream for mortaring joints. Wet the brick surfaces to be mortared with water to improve mortar joints. Dry bricks absorb moisture from mortar too rapidly, which results in weak joints. Use brush or sponge to saturate brick surfaces with water.

6 Locate the bottom row of two burner bricks **C** and two solid side liners **B** to match up with burner guide tubes. If bands are loose, turn the row upside down on flat surface and drive wooden wedges between straps and bricks to tighten up the bands. DO NOT REMOVE BANDS. Line the hole in the brick where the burner guide tube goes with mortar and insert the burner guide tube. Do this to the other side and then tighten all four bolts on the burner guide tubes. DO NOT OVERTIGHTEN.

7. Cement the bottom brick "D" in place with the drain grooves up.

8. Cement the second row of four solid side liners "B" in place and stagger the joints so that they don't line up with the bottom row. Also, DO NOT BREAK THE BANDS. If they are loose, put the smooth side of the bricks down on the floor or flat surface and tighten bands with wedges of wood driven between bands and bricks. DO NOT OVER TIGHTEN. Wet the joints between the top and bottom rows and then, pour a row of mortar on top of the bottom row. Next sit the top row in place, moving it around a little to line up sides and flatten out mortar. Be sure you cement the top row with the smooth side up.

9. Mix pre-mixed insulation with sufficient water to the consistency of plaster. Pour the mixed insulation between the furnace shell and the brick lining. Prod while pouring to assure even distribution of insulation. Fill to the height of the furnace shell. Wait approximately 30 minutes and finish filling.

10. Replace top seal segments and bolt down in place. Replace lid lift assembly after applying thin layer of grease to inside lifting tube.

11. Spread lid band and place four lid segment sections "A" on top of furnace chamber lining. Align the grooves in the outside of the lid bricks to match the holding lugs in the lid band. Press or tap each top segment down to seat against chamber lining. Replace the front lid band bolt and tighten snug. DO NOT OVER TIGHTEN. OVERTIGHTENING WILL CAUSE THE LID BRICKS TO CRACK WHEN THEY EXPAND FROM HEATING.

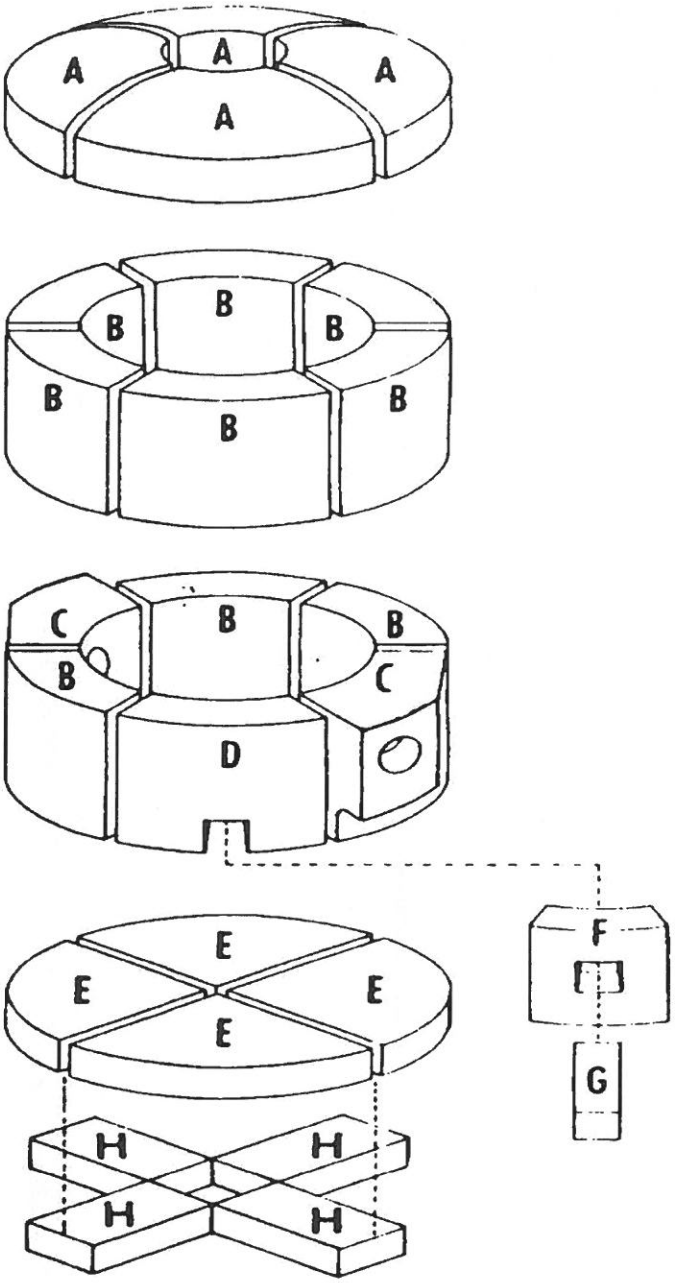
12. Apply a small amount of refractory cement to the outside of the main burner tips and re-assemble burner manifold. Thin the mortar with water to the consistency of paint and cover all exposed brick surfaces. As explained above, wet the brick surfaces before coating.

13. Re-connect blower, gas-air mixer unit, ignition and combustion safeguard leads to furnace body.

14. Furnace should set for 24 hours to cure insulation, then fire at low fire for one hour to remove moisture. The following day, fire as desired. Firing at HIGH-FIRE right away will cause steam to form in the bricks and blow them apart. The furnace will emit steam and water from the lining when first fired. This is normal until the furnace is completely dry.

Included with your relining kit is a circle of 1" thick ceramic fiber blanket, the diameter of the furnace lid. Place this on top of the furnace lid for the first 2 or 3 firings/melts. After the lid bricks have been heated to a yellowish color, all the way through, this blanket can be discarded. It is provided to insure that the lid bricks are completely cured.

RELINING INSTRUCTIONS FOR SPEEDY MELT MODEL B-702 FURNACE



	OPN	DESCRIPTION	QTY.
A	008022	Lid Section	4
B	008010	Solid Side Liner	9
C	008011	Piloted Burner	2
D	008104	Drain Side Liner	1
E	008013	Bottom Brick	4
F	008103	Drain Tile	1
G	008160	Drain Tile Plug	1
H	008162	Bottom Support Brick	4
	008141	Matrilite Insulation Bags	6
	008173	Refractory sealer -2 boxes	

The MIFCO Furnaces have been designed so that relining is rapidly and easily done. Complete relining kits are available as a package unit. These kits include all replacement refractory shapes, insulation, and the correct type of High-Alumina refractory. Structural parts of the furnace which are subject to normal abuse and may need replacement are available. Relining procedure is as follows:

1. Remove blower, gas-air mixer assembly, ignition and combustion safeguard system from manifold. Dis-assemble manifold and unbolt burner guide tubes from furnace shell.

2. Remove front bolt from lid band, spread lid band, remove the four lid brick sections A.

3. Remove lid lift assembly by lifting out of the base tube. Replace lid band if damaged or burned, being careful not to lose collar bushings in jack tube. Replace both lid support rods if bent or burned.

4. Remove the six top cast iron segments by removing hex nuts on top of furnace. Remove all insulation and refractory from furnace shell. Remove and replace seal hold down bolts if broken.

5. In a flat bottom pan, mix part of your refractory sealer to a consistency that will spread but not run. Locate the 4 bricks letter (H), and dip them in to a pan or bucket of water. Then, just dip the flat bottom of each brick into the sealer. Locate them in the bottom of the shell as shown.

6. Now locate a couple bags of Matrilite 2800 and mix according to the instructions. The consistency should be of flowing plaster. Trowel in and around the bricks, letter (H). Fill to the top of the bricks and strike off flush. Let set 24 hours. Proceed with the bottom row, letter (E). Do not cut the bands. Place the four seams on top of the letter (H) bricks.

7. Locate the burner row of bricks down over the bottom, aligning the burner holes with the holes in the side of the shell. The drain brick (D) should line up with the hole in the center of the shell. Place a thin layer of sealer around the front edge of the burner guide tube and place the tube through the hole in the shell until it touches the ledge on the inside of the burner brick. Tighten the bolts.

8. Mortar Drain Tile, (F), in alignment with the drain hole. Insert Drain Tile Plug, (G), in place to complete bottom ring.

9. Saturate matching surfaces of top and bottom rings with water to prevent rapid drying of mortar. Place a layer, of mortar on top surface of the bottom ring of bricks, already located in the furnace. Next, lower the banded top ring of solid side-liners, (B), into position over the bottom ring, flat side up. Rotate top ring to get a tight mortar joint, making sure to stagger brick joints in top and bottom rows. Level top surface of second ring with top of furnace so lid will seat properly.

10. Mix the remainder of insulation with sufficient water to the consistency of plaster. Pour the insulation between the furnace shell and the brick lining. Prod while pouring to assure an even distribution. Fill to the height of the furnace shell, wait approximately 30 minutes and finish filling.

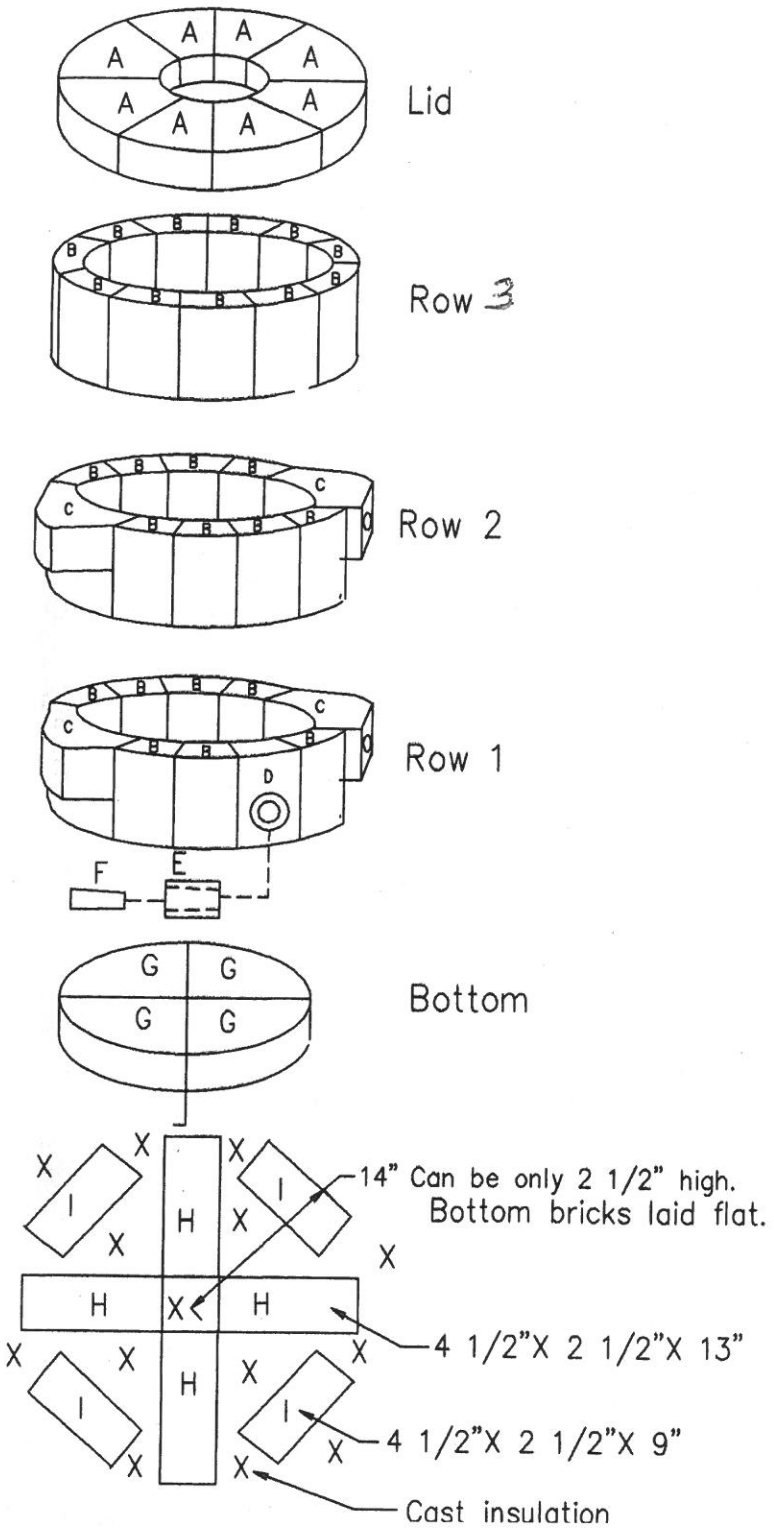
11. Replace top seal segments and bolt down in place. Replace lid lift assembly after applying thin layer of grease to tube.

12. Spread lid band and place four Lid Segment Sections, (A), on top of furnace chamber lining. Align the grooves in the outside of the lid bricks to match the holding lugs in the lid band. Press or tap each top segment down to seat against chamber lining. Replace the front lid band bolt and tighten snug. DO NOT OVER TIGHTEN. OVER-TIGHTENING WILL CAUSE THE LID BRICKS TO CRACK WHEN THEY EXPAND FROM HEATING. Swing lid to side and coat upper and lower surfaces with sealer.

13. Apply a small amount of refractory cement to the outside of the burner nozzles and re-assemble burner manifold. Thin the mortar with water to the consistency of heavy paint and cover all exposed brick surfaces. As explained above, wet the brick surfaces before coating.

14. Re-connect blower, gas-air mixer unit, ignition and combustion safeguard leads to furnace body. Furnace should set for 24 hours to cure insulation, then fire at low-fire for one hour to remove moisture. The following day, fire as desired. Firing at HIGH-FIRE right away will cause steam to form in the bricks and blow them apart. The furnace will emit steam and water from the lining when first fired. This is normal until the furnace is completely dry. Place enclosed circle of fiber blanket onto the lid for first melt. You can then keep or discard the fiber blanket.

RELINING INSTRUCTIONS FOR SPEEDY-MELT MODEL B-1501 FURNACE



	OPN	DESCRIPTION	QTY.
A	008089	Lid Section	8
B	008087	Solid Side Liner	26
C	008090	Piloted Burner Liner	4
D	008093	Side Drain Liner.	1
E	008092	Drain Tile	1
F	008088	Drain Tile Plug	1
G	008096	Bottom Brick	4
H	008164	Bottom Support 13 1/2"	4
I	008162	Bottom Support 9"	4
		Matrilite Insulation Bags	
		Refractory Sealer Bag	

The MIFCO Furnaces have been designed so that relining is rapidly and easily done. Complete relining kits are available as a package unit. These kits include all replacement refractory shapes, insulation and the correct type of High Alumnia refractory. Structural parts of the furnace which are subject to normal abuse, and may need replacement, are available. Relining procedure is as follows:

1. Remove blower and mixer / burner assembly from furnace by disconnecting the pipe union at the manifold and the spark ignition and ultra violet scanner leads to the burner tee fitting. Scanner leads and spark ignition lead wires are with furnaces with safety systems.

2. Disconnect manifold union and remove the manifold and burners from furnace body.

3. Remove burner guide tubes from burner shell.

4. Remove the front clamp bolt from the lid band, spread the lid band, and remove the eight lid sections, (A).

5. Remove lid lift assembly by lifting out of the base tube. Replace lid band if damaged or burned, being careful not to lose the collar bushings in the jack tube. Replace both lid support rods if bent or burned.

Relining Instructions for B-1501 - (cont.)

6. Remove the six top iron segments by removing the hex nuts on furnace top. Remove all insulation and refractory from furnace shell. Replace seal hold down bolts if broken.

7. The three rows of bricks come banded together in rows. DO NOT REMOVE THESE BANDS. If the bricks are loose, place on flat surface with top side down and drive a wooden wedge between the band and the bricks. This will tighten the bands. DO NOT OVERTIGHTEN.

8. Remove the burner guide tube from the furnace shell.

9. Locate the 8 insulating support bricks "H" and "I" . Soak each brick in water and place in bottom of the furnace shell in pattern shown. The bricks should all be level 2 1/2" high.

10. Mix enough insulation material to cover the bottom of the furnace in between the insulating bricks (H) & "I". Add enough water to the insulation until it is just wet enough to pour-1 gal per 25 lbs. Strike off level.

11. Locate the Bottom Row of bricks, made up of Burner Liner (C), Solid Side Liners (B), and Side Drain Liner (D), on top of the insulating support bricks, and align the burner holes with the burner guide tubes. Put some mortar in the burner holes of the brick and bolt the burner guide tube in place. Clean the excess from the inside of the burner guide tube holes. Mortar Drain Tile (E) in place with the SMALL end in first. Insert Drain Tile Plug (F) in drain tile hole to help hold tile in place.

12. Mix the refractory mortar with water to consistency of paste. DO NOT USE INSULATING CEMENT. USE THE REFRACTORY SEALER TO MORTAR BRICKS TOGETHER.

13. The four bottom bricks "G" are now ready to put in place. These sections sit right on top of the insulating support bricks "H" and "I" and the insulation.

14. The center row is to be placed in position next. DO NOT REMOVE THE BANDS. Wet the top of row one and the bottom of row two with water and then pour a ring of sealer on top of row one. Lower the second row in place, aligning the burner holes, also moving the row of bricks so you will get a tight bond between the rows. The burner guide tubes should now be put in place following the same procedure before. It would be advisable to put in the burner assembly before tightening the burner guide tube bolts.

15. Repeat the above step for top Row 3. Mix the balance of the insulation aggregate, the same as before. Finish filling the cavity between the shell and furnace lining. Fill to the top of the furnace shell.

16. Tap the furnace shell to help make the insulation settle. Allow approximately 30 minutes for the insulation to settle, then add enough insulation to top off.

17. Replace sectional cast iron ring plates and secure with bolts.

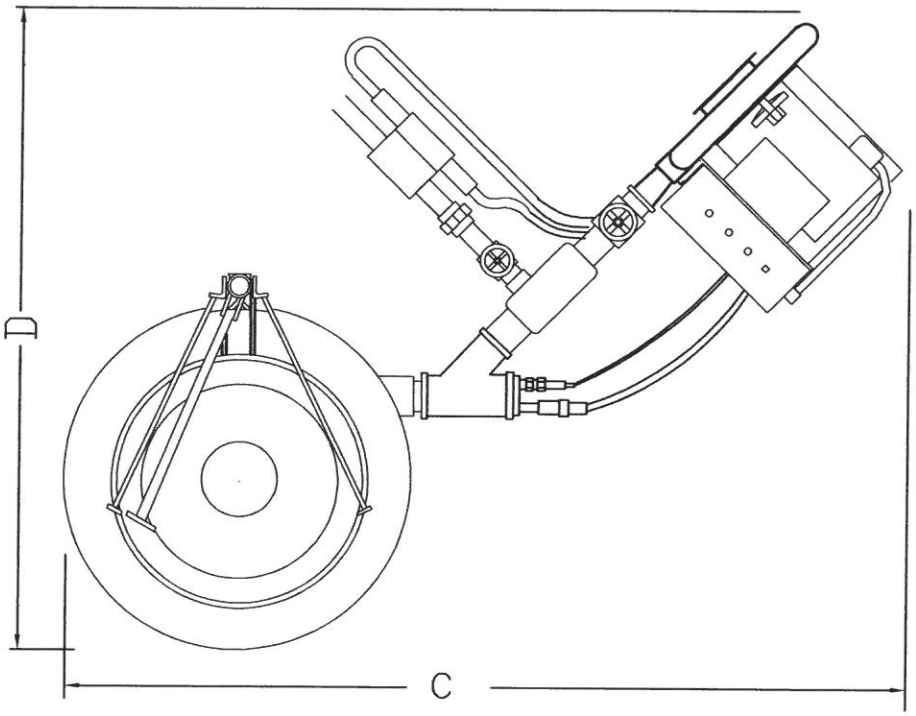
18. Apply a layer of grease to lid lift tube and replace the lid lift assembly in the lower guide tube. Grease the lid lift unit through the grease fitting.

19. Spread the lid lift brick ring and replace the Lid Bricks (A). Align the slots in the lid bricks to match the brick keys in the lid ring. Replace the lid band bolt and tighten bolt until just snug. Tap the lid band with a mallet or wooden bar. Lid sections will shift slightly and allow for re-tightening of the lid band bolt. Continue this procedure until all bricks have been aligned and the ring is tight, then loosen nut about one turn. OVERTIGHTENING WILL CAUSE THE LID BRICKS TO CRACK WHEN THEY START TO EXPAND FROM HEATING.

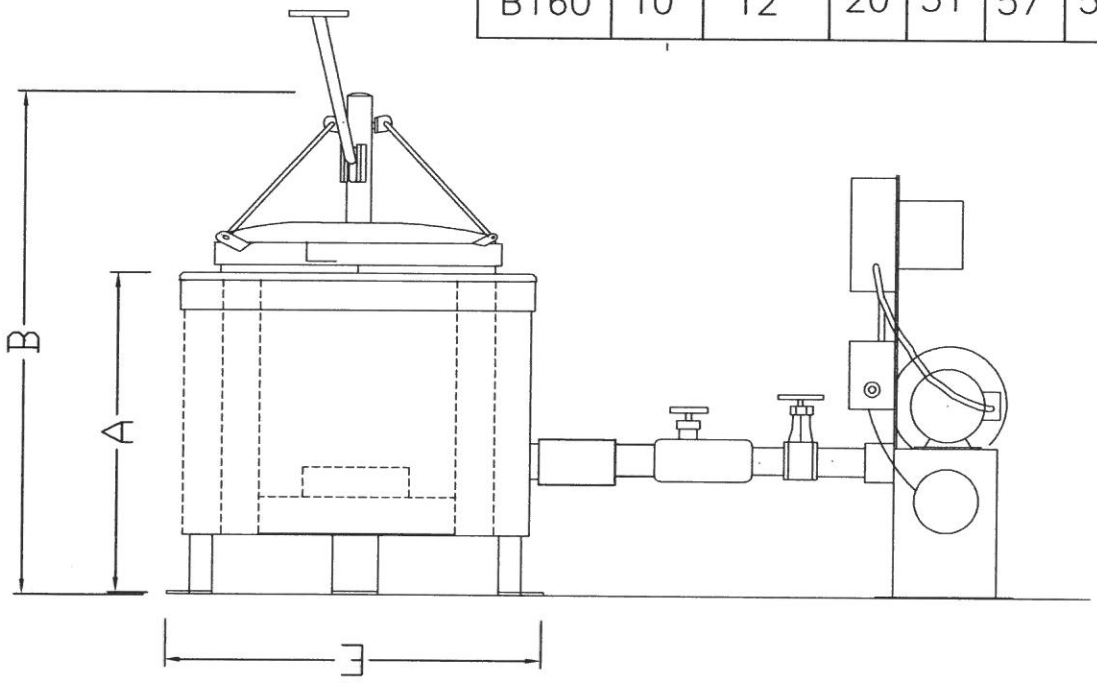
20. Add some water to the refractory sealer until you are able to brush it on. DO NOT GET IT TOO THIN OR THE BINDER IN THE SEALER WILL BE SO DILUTED THAT THE COATING WILL JUST BRUSH OFF WHEN IT DRIES. Brush on a coating of water to get the brick surfaces and all joints soaked . Brush on the sealer coating to all brick surfaces and work into all cracks. Be sure to do the bottom and top of the lid.

21. The furnace should set at least 24 hours to allow the insulation to set up and cure. After this period of time, the furnace can be fired slowly to drive off all moisture and water vapor from the insulation and lining. The following day, fire as desired. Firing at HIGH-FIRE right away will cause steam to form in the bricks and blow them apart. The furnace will emit steam and water from the lining when first fired. This is normal until the furnace is completely dry.

HIGH SPEED MELTER
MODEL B–160

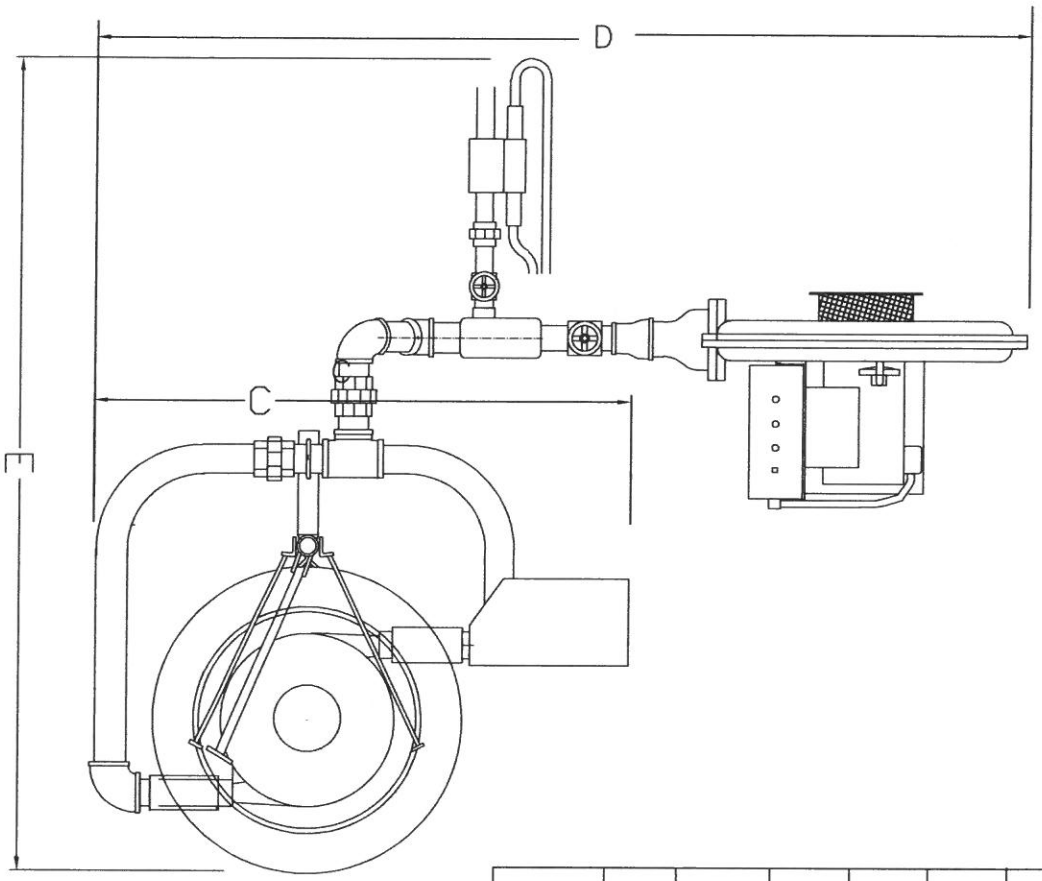


Model	Dia.	Depth	A	B	C	D	E
B160	10"	12"	20"	31"	57"	50"	21.5"

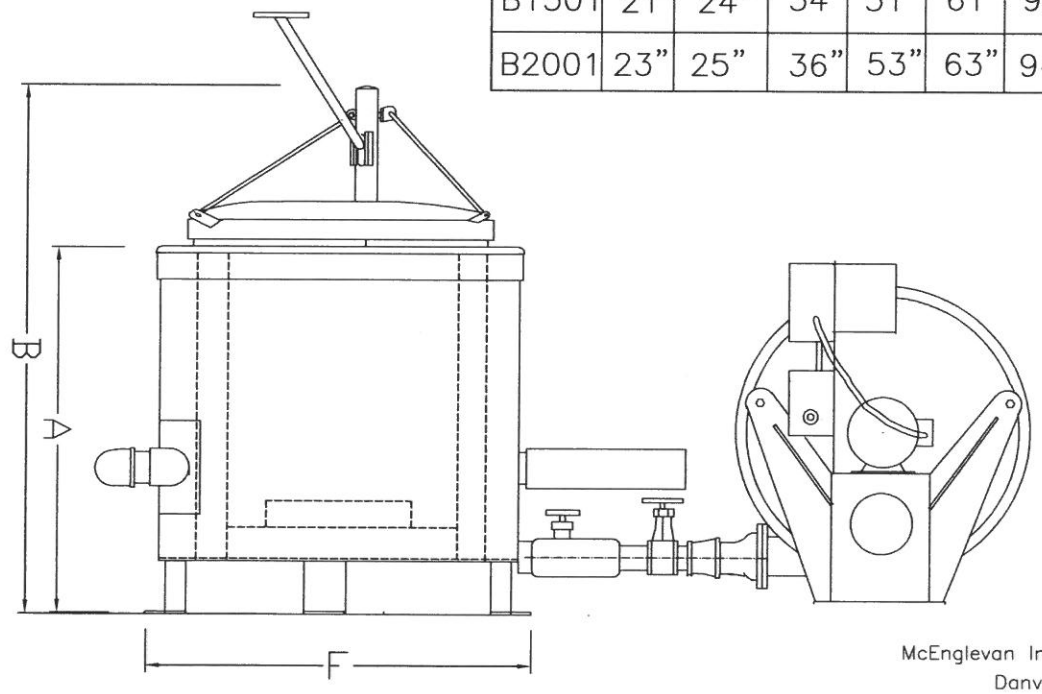


McEnglevan Ind. Furnace Mfg. Co. Inc.
Danville Il. 61832

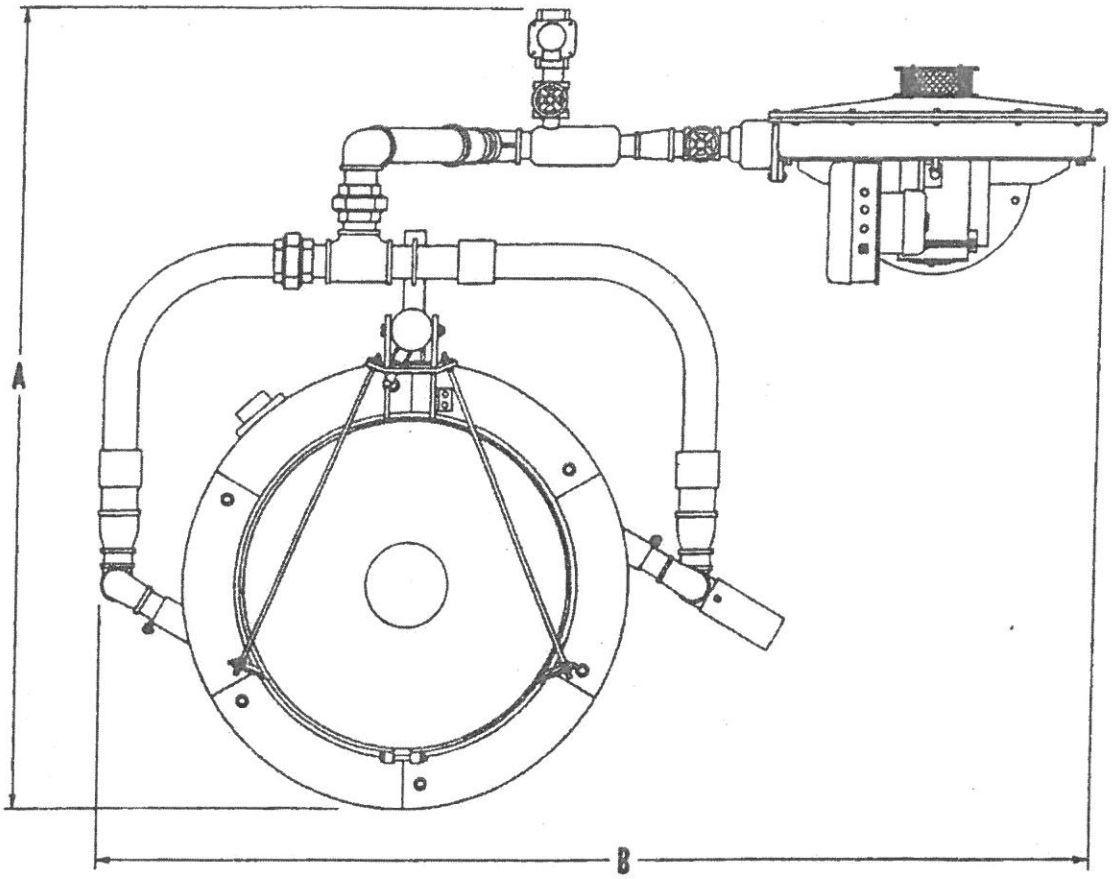
Dim.View 12/19



Model	Dia.	Depth	A	B	C	D	E	F
B301	13"	15"	23"	34"	39"	76"	66"	24.5"
B702	17"	20"	28"	43"	47"	79"	68"	32.5"
B1501	21"	24"	34"	51"	61"	90"	80"	40"
B2001	23"	25"	36"	53"	63"	94"	80"	40"

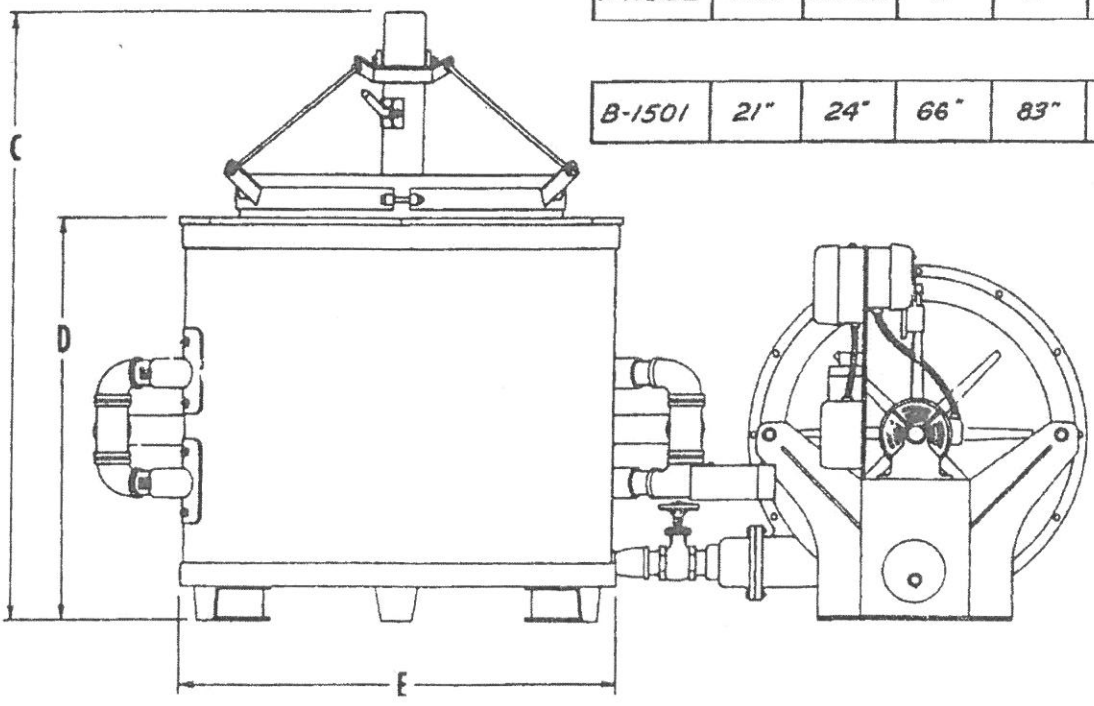


McEnglevan Ind. Furnace Mfg. Co. Inc.
Danville Il. 61832

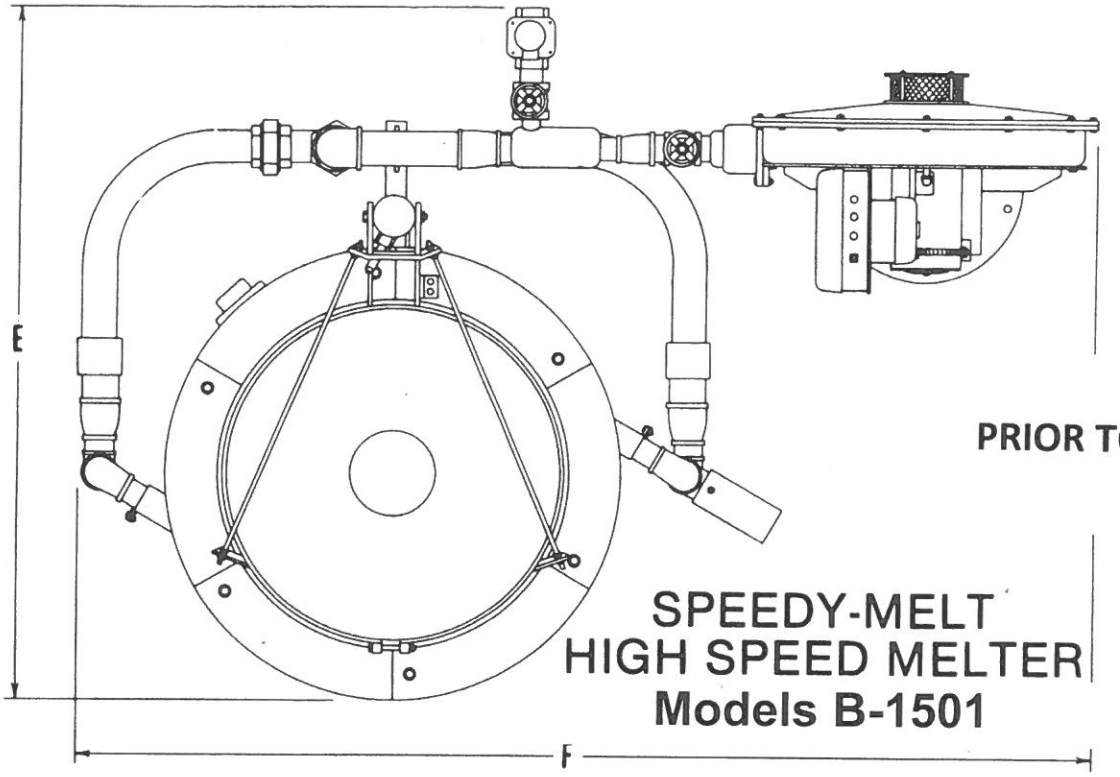


SPEEDY-MELT
HIGH SPEED MELTER
Models B-1501

PRIOR TO YEAR 2015



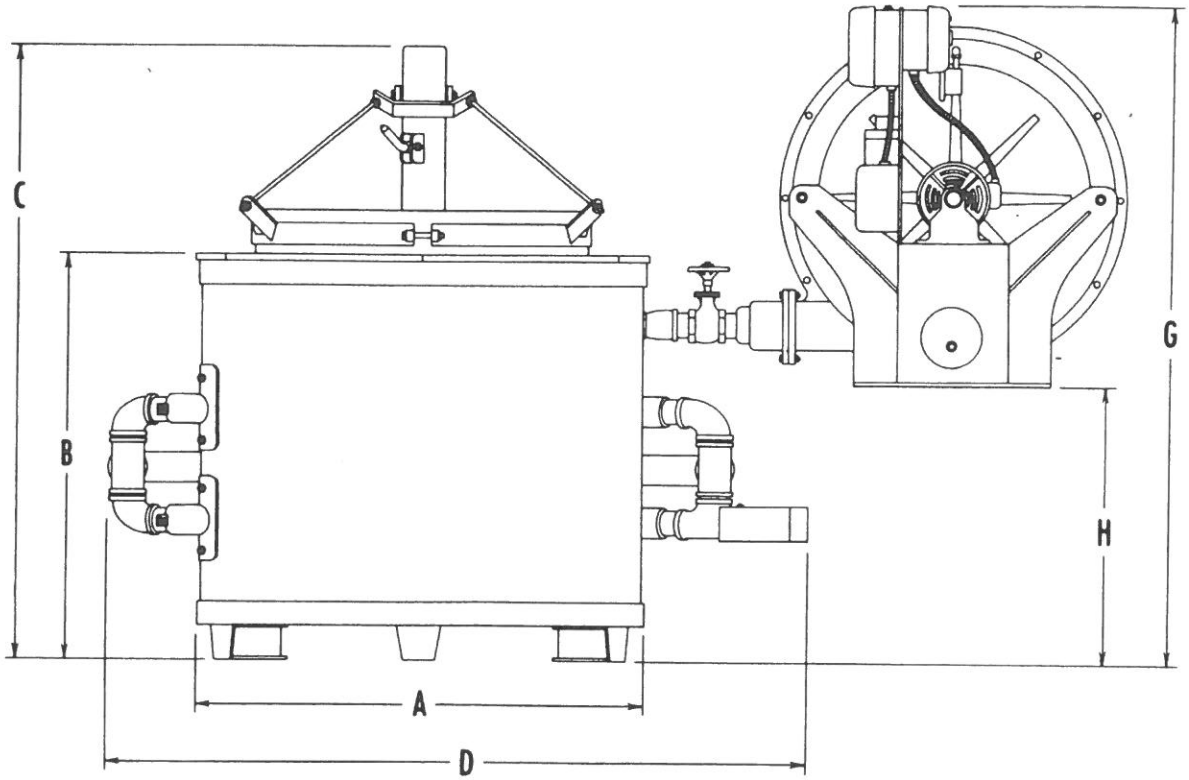
	COMBUSTION CHAMBER		FLOOR INSTALLATION				
MODEL	DIA.	DEPTH	A	B	C	D	E
B-1501	21"	24"	66"	83"	51"	35"	38"



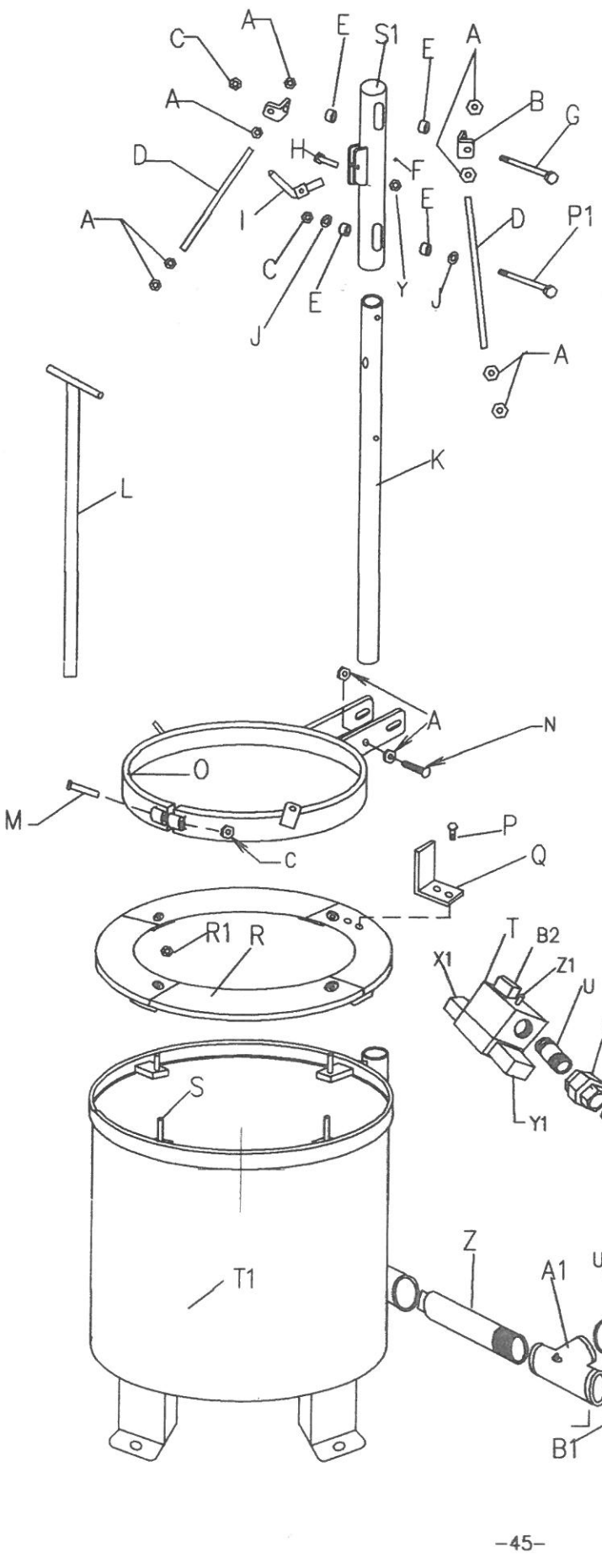
PRIOR TO YEAR 2015

SPEEDY-MELT HIGH SPEED MELTER
Models B-1501

	COMBUSTION CHAMBER		PIT TYPE INSTALLATION							
MODEL	DIA.	DEPTH	A	B	C	D	E	F	G	H
B-1501	21"	24"	38"	35"	51"	58"	57"	85"	59"	23"



B-160

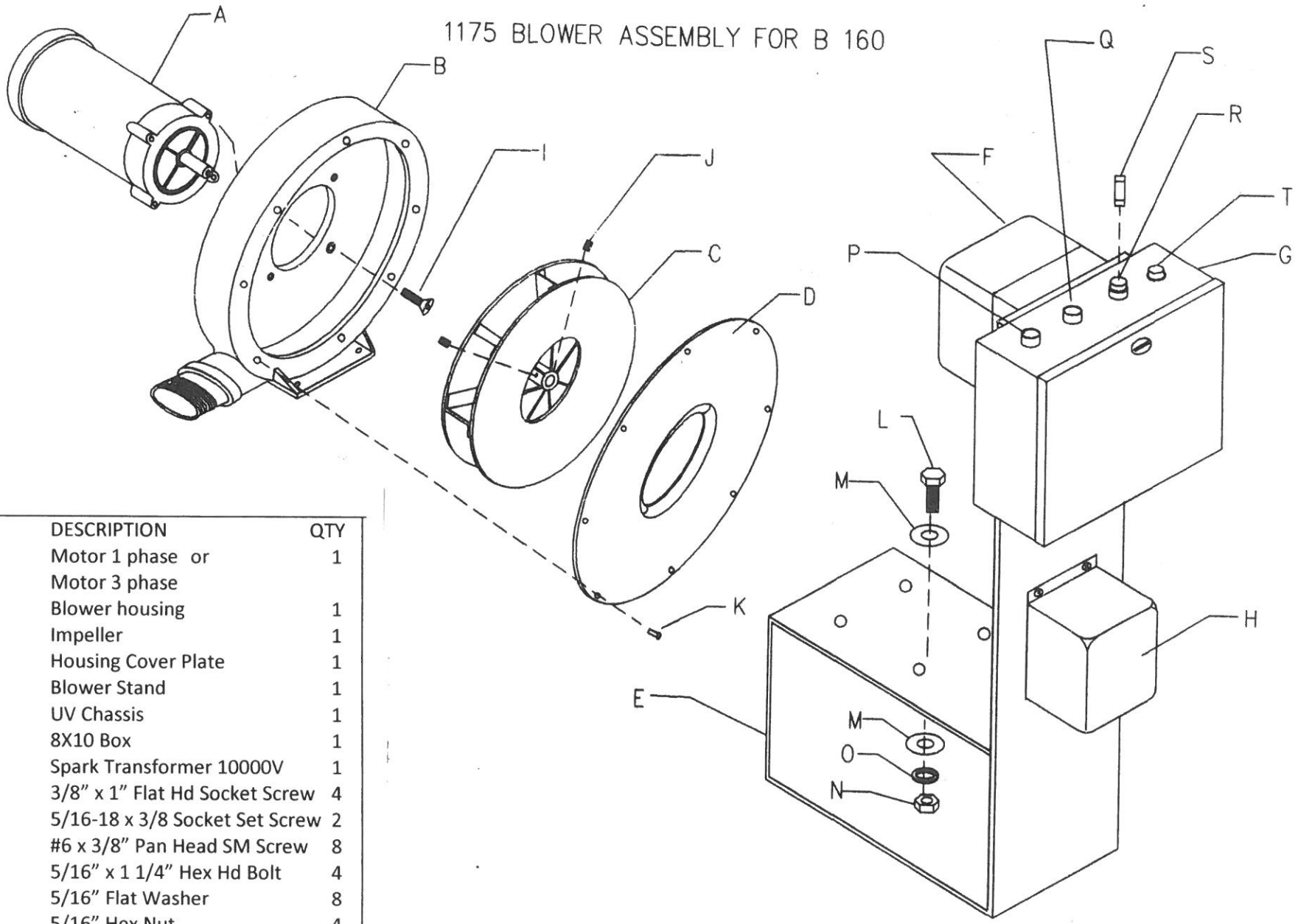


10/16	OPN	DESCRIPTION	QTY
A	002016	3/8" Jam Nut	10
B	010008	Support Rod Bracket	2
C	002017	3/8" Hex Lock Nut	3
D	100475	Lid Support Rod	2
E	010009	Lid Lift Bushings	4
F	010005	Drive In Grease Fitting	1
G	001213	3/8" x 3" Hex Head Bolt	1
H	000711	¼-20 x 1 ¾" bolt	1
I	010006	Fulcrum Rod	1
J	002121	3/8" flat washer	2
K	010007	Jack Tube	1
L	010070	Lid Lift Handle Assembly	1
M	001211	3/8" x 2 ½" hex head bolt	1
N	001304	3/8" x 1 ½" carriage bolt	1
O	100470	Lid Band Assembly	1
P	001205	3/8" x 1" hex head bolt	2
Q	100463	Lid Stop	1
R	008601	Top Seal Segment	4
S	000908	5/16" x 1 ¾" hex head bolt	4
T*	003790	Dual multi valve Dungs# DMV-D701/622 243-761P With proof of closure	1
U	003064	¾" x 3" Nipple	2
V	003428	¾" Gate Valve	1
W	003062	¾" x 2" nipple	1
X	006040	GM-75 Gas/Air Mixer	1
Y	002009	¼-20 lock nut	1
Z	006600	1 ½" Burner Nozzle	1
A1	003362	1 ½" Y Branch	1
B1	006665	1 ½" UV Plug	1
C1	003408	½" x 3/8" Comp. Fitting	1
D1	003024	½" X 3/8" Reducing Nipple	1
E1	004106	3' UV scanner	1
F1	004068	7" spark electrode	1
G1	003430	1 ¼" Gate Valve	1
H1	004226	Air Pressure Switch	1
I1	003002	1/8" x 2" Pipe Nipple	1
J1	003103	1 ¼" x 2" Nipple	1
K1	003220	2" x 1 ¼" Reducing Coupling	1
O1	006690	UV Scanner Cover	1
P1	001214	3/8-16 x 3 ¼" bolt	1
R1	002012	5/8" Jam Nut	4
S1	010001	Swivel Pipe	1
T1	100430	Steel Shell Assembly	1
U1	003132	1 ½" x 5" Nipple	1
V1	003206	1 ½" Coupling	1
W1	003366	¾" Union	1
X1	003816	Low gas pressure switch Dungs#GML-A2-4-4 266942	1
Y1	003780	High gas pressure switch Dungs#GMH-A2-4-4 266924	1
Z1	003836	Visual Indicator Dungs# 217-665A	1
A2	004097	Extender	1
B2		Proof of closure	1

**units prior to year 2015 had 004214 ¾" gas solenoid

See next page for drawing of B160 blower

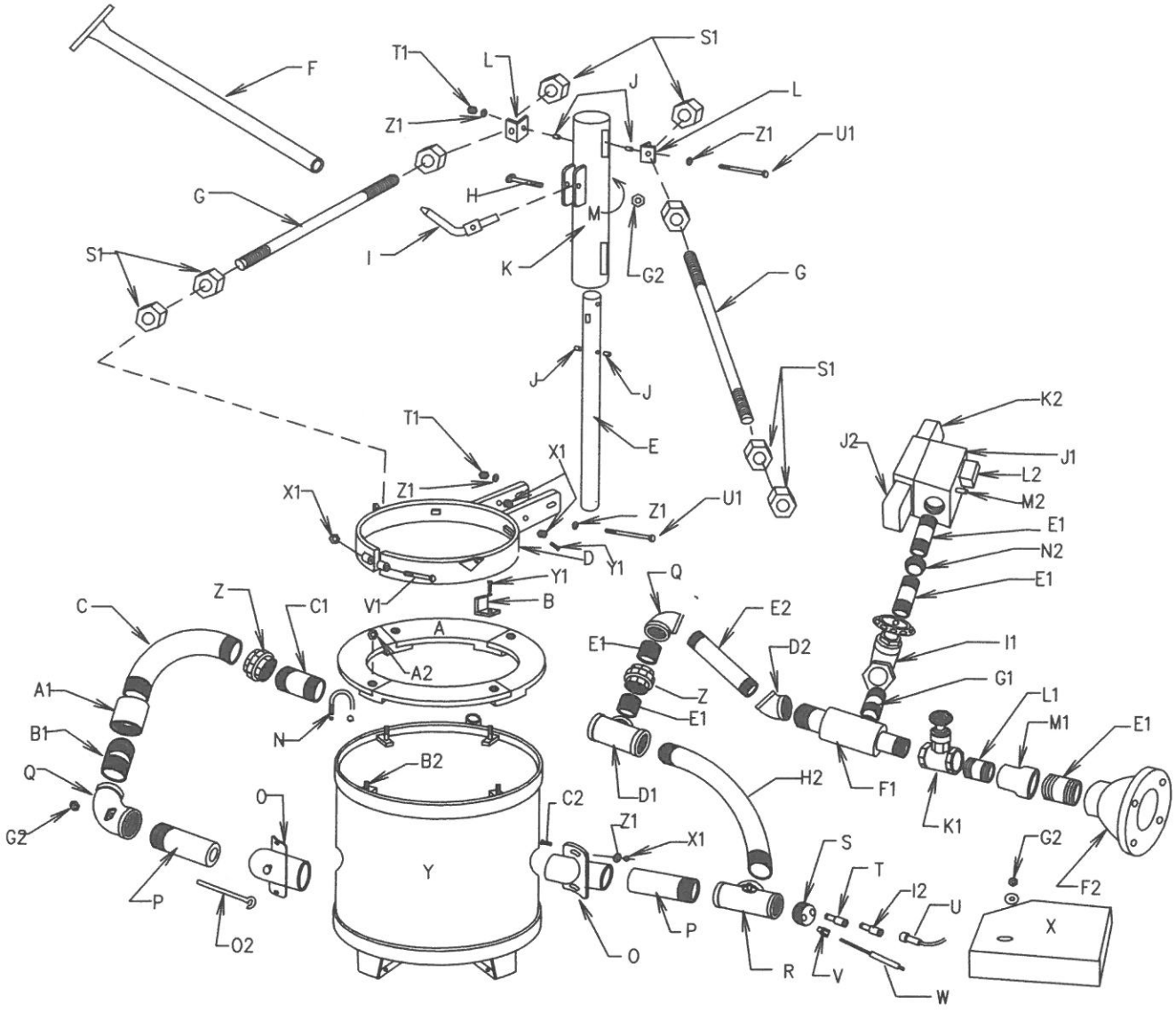
1175 BLOWER ASSEMBLY FOR B 160



11/2017	OPN	DESCRIPTION	QTY
A	004117	Motor 1 phase or	1
	004118	Motor 3 phase	
B	008612	Blower housing	1
C	004326	Impeller	1
D	008621	Housing Cover Plate	1
E	006210	Blower Stand	1
F	004445	UV Chassis	1
G	003852	8X10 Box	1
H	004300	Spark Transformer 10000V	1
I	001254	3/8" x 1" Flat Hd Socket Screw	4
J	001053	5/16-18 x 3/8 Socket Set Screw	2
K	000107	#6 x 3/8" Pan Head SM Screw	8
L	000930	5/16" x 1 1/4" Hex Hd Bolt	4
M	002115	5/16" Flat Washer	8
N	002011	5/16" Hex Nut	4
O	002116	5/16" Lock Washer	4
P	003663	Red Stop Button	1
Q	003662	Black Start Button	1
R	003600	Fuse Holder	1
S	003624	5 Amp Fuse	1
T	003906	Red Indicator Light	1

B301

See Page 48 and 49 for parts list

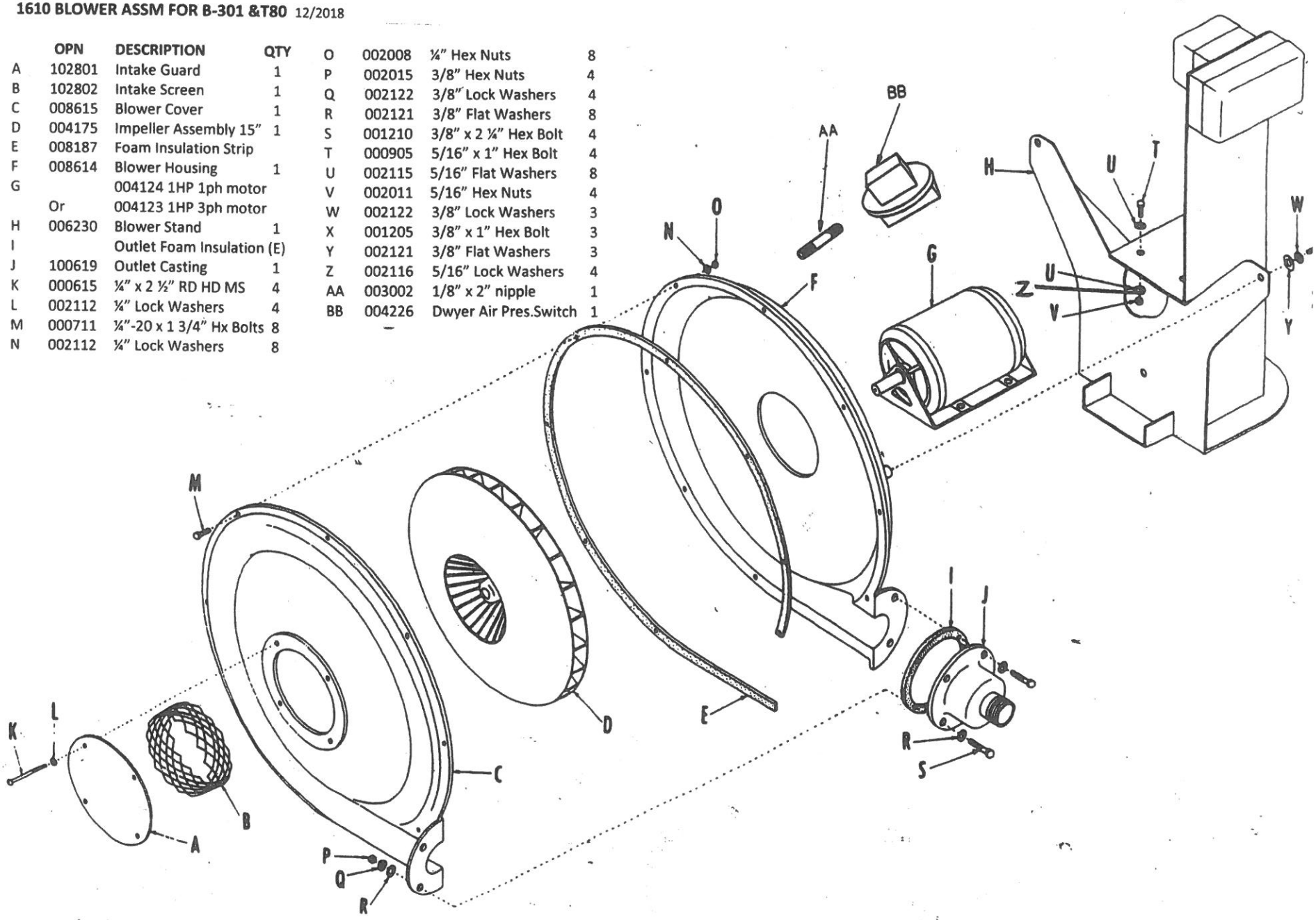


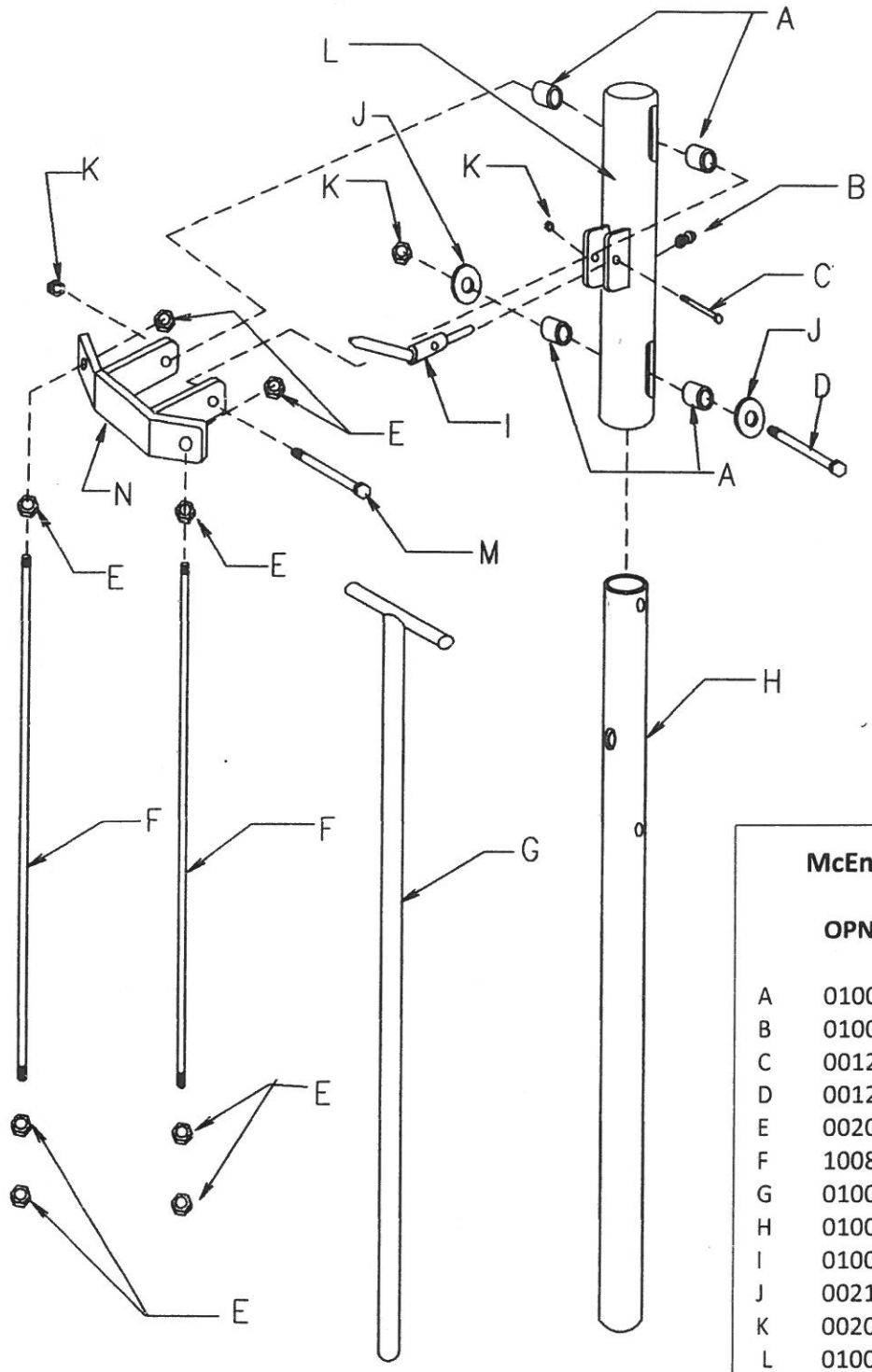
McEnglevan Parts List B-301 (02/2017)

A	008602	Top Seal Segment	4
B	100463	Lid Band Stop	1
C	100625	2" Manifold long side	1
D	100660	Lid Band Assembly	1
E	010007	Jack Tube	1
F	010070	Lid Lift Handle	1
G	100476	Support Rod	2
H	000711	¼ -20 x 1 ¾ bolt	1
I	010006	Lid Lift Fulcrum	1
J	010009	Lid Lift Bushings	4
K	010001	Swivel Pipe	1
L	010008	Support Rod Brackets	2
M	010005	Drive in Grease Fitting	1
N	000986	3/8" x 2"ubolt	1
O	100673	Burner Guide Tube	2
P	006608	Burner Nozzle	2
Q	003379	2" Elbow 90 deg.	2
R	003309	2" UV Tee Assembly	1
S	006686	2" UV Plug	1
T	003024	½" x 3/8" Red.Nipple	1
U	004107	6'UV Scanner	1
V	003408	½" x 3/8" Comp.Fitting	1
W	004068	7" Ignition Electrode	1
X	006690	UV Scanner Cover	1
Y	100620	Steel Shell Assembly	1
Z	003370	2" std union	2
A1	003207	2" Pipe Coupling	1
B1	003148	2" x 6" Nipple	1
C1	003142	2" x 3" Nipple	1
D1	003311	2" Tee	1
E1	003141	2" x 2 ½" Nipple	3
F1	006060	GM100 Gas/Air Mixer	1
G1	003086	1" x 2" Nipple	1
H1	003088	1" x 3" Nipple	2
I1	003429	1" Gate Valve	1
J1	003790	Dual Valve Dungs#DMV-D 701/622 243-761	1
K1	003431	1 ½" Gate Valve	1
L1	003107	1 ½" x 2" Nipple	1
M1	003224	2" x 1 ½""Red.Coupling	1
S1	002016	3/8" Hex Jam Nut	8
T1	002017	3/8" Hex Lock Nut	2
U1	001213	3/8" x 3" Hex Hd Bolt	2
V1	001211	3/8" x 2 ½"HxHd Bolt	1
W1	001304	3/8" x 1 ½" Carriage Blt	1
X1	002015	3/8" Hex Nut	8
Y1	001205	3/8" x 1" Hex Hd Bolt	2
Z1	002121	3/8" Flat Washer	7
A2	002012	5/16" Jam nut	4
B2	000908	5/16" x 1 ¾" Hx Bolt	4
C2	001305	3/8" x 1" Carriage Bolt	4
D2	003394	2" 45 deg Elbow	1
E2	003146	2" x 5" Nipple	1
F2	008616	Blower Flange	1
G2	002009	¼-20 Locknut	1
H2	100629	2" Manifold short side	1
I2	004097	Extender	1
J2	003780	High Press.Gas Switch Dungs# GMH-A2-4-4	1
K2	003816	Low Press.Gas Switch Dungs# GML-A2-4-4	1
L2	003836	Visual Indicator	1
M2		Proof of Closure (part of Dual Valve)	1
N2	003367	1" Blk Union	1
O2	002360	Eyebolt	2

1610 BLOWER ASSM FOR B-301 &T80 12/2018

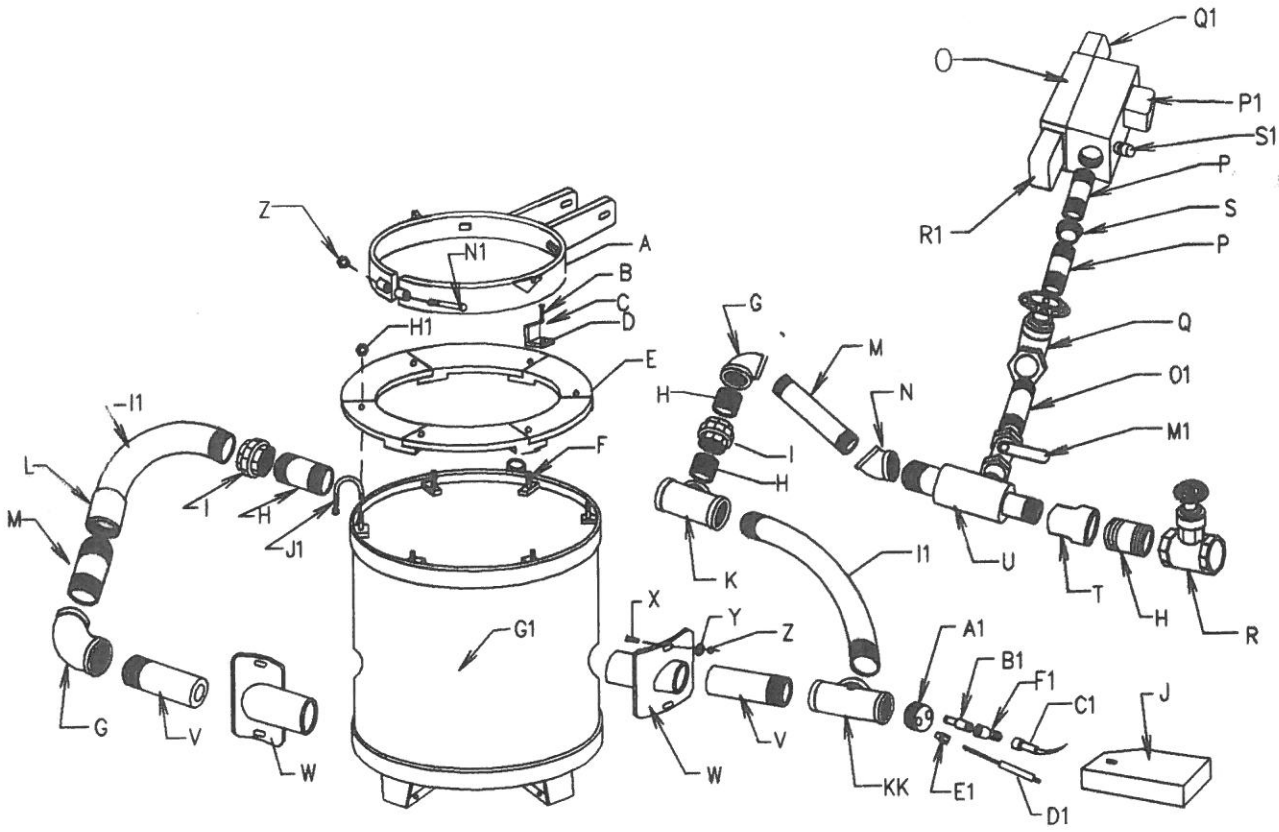
	OPN	DESCRIPTION	QTY
A	102801	Intake Guard	1
B	102802	Intake Screen	1
C	008615	Blower Cover	1
D	004175	Impeller Assembly 15"	1
E	008187	Foam Insulation Strip	
F	008614	Blower Housing	1
G		004124 1HP 1ph motor	
	Or	004123 1HP 3ph motor	
H	006230	Blower Stand	1
I		Outlet Foam Insulation (E)	
J	100619	Outlet Casting	1
K	000615	¼" x 2 ½" RD HD MS	4
L	002112	¼" Lock Washers	4
M	000711	¼"-20 x 1 3/4" Hx Bolts	8
N	002112	¼" Lock Washers	8
O	002008	¼" Hex Nuts	8
P	002015	3/8" Hex Nuts	4
Q	002122	3/8" Lock Washers	4
R	002121	3/8" Flat Washers	8
S	001210	3/8" x 2 ¼" Hex Bolt	4
T	000905	5/16" x 1" Hex Bolt	4
U	002115	5/16" Flat Washers	8
V	002011	5/16" Hex Nuts	4
W	002122	3/8" Lock Washers	3
X	001205	3/8" x 1" Hex Bolt	3
Y	002121	3/8" Flat Washers	3
Z	002116	5/16" Lock Washers	4
AA	003002	1/8" x 2" nipple	1
BB	004226	Dwyer Air Pres.Switch	1





McEnglevan Parts List B-702 Lid Lift

	OPN	Description	Qty
A	010009	Lid Lift Bushings	4
B	010005	Drive In Grease Fitting	1
C	001208	3/8" x 1 3/4" Hex Hd Bolt	1
D	001217	3/8" x 4" Hex Hd Bolt	1
E	002023	½" Jam Nut	8
F	100874	Support Rods	2
G	010068	Lid Lift Handle	1
H	010066	Jack Tube	1
I	010065	Fulcrum Rod	1
J	002121	3/8" flat washer	2
K	002017	3/8" Hex Lock Nut	3
L	010063	Swivel Pipe	1
M	001219	3/8" x 3 ¾" hex hd bolt	1
N	100950	Support Rod Bracket	1



McEnglevan Parts List B-702 – revised 09/5/2016

	OPN	Description	Qty
A	100875	Lid Band Assembly	1
B	001205	3/8" x 1" Hex Hd Bolt	2
C	002122	3/8" lock washer	2
D	100878	Lid Band Stop	1
E	008603	Top Seal Segment	6
F	000911	5/16" x 2 1/4" Hx Bolt	6
G	003379	2" 90 deg elbow	2
H	003141	2" x 2 ½" nipple	4
I	003370	2" Standard Union	2
J	006690	UV Scanner Cover	1
K	003311	2" Tee	1
L	003207	2" pipe coupling	1
M	100876	2" x 11 ¾" nipple	2
N	003394	2" 45 deg elbow	1
O**	003823	Dual Valve-Dungs# DMV-D 702/622 230-791P With proof of closure	1
P	003109	1 ¼" x 3" nipple	2
Q	003430	1 ¼" Gate Valve	1
R	003432	2" Gate Valve	1
S	003352	1 ¼" union	1
T	003224	2" x 1 ½ red. coupling	1
U	006070	GM-125 Gas/Air Mixer	1
V	006610	2" Burner Nozzle	2
KK	003309	UV tee assm	1

	OPN	Description	Qty
W	100835	Burner Guide Tube	2
X	001304	3/8" x 1 ½" Carriage Bolt	4
Y	002121	3/8" flat washer	4
Z	002015	3/8" hex nut	5
A1	006686	2" UV Plug	1
B1	003024	½" x 3/8" swedged nipple	1
C1*	004107	6' UV Scanner	1
D1	004068	7" Ignition Electrode	1
E1	003408	½" x 3/8" Comp.Fitting	1
F1	004097	Insulator	1
G1	100815	Shell	1
H1	002012	5/16" jam nut	6
I1	003390	2" Long Radius Elbow	2
J1	000987	3/8" x 2 ½" U bolt	1
M1	003455	1 ¼" ball valve (M1 on Canadian furnaces only)	1
N1	001215	3/8-16 x 3 ½" bolt	1
O1	003113	1 ¼" x 6" nipple (O1 on Canadian furnaces only)	1
P1		Proof of closure switch (part of O)	1
Q1	003816	Low gas pressure switch Dungs # GML-A2-4-4 266942	1
R1	003780	High gas pressure switch Dungs #GMH-A2-4-4 266924	1
S1	003836	Visual indicator Dungs# 217-665A	1

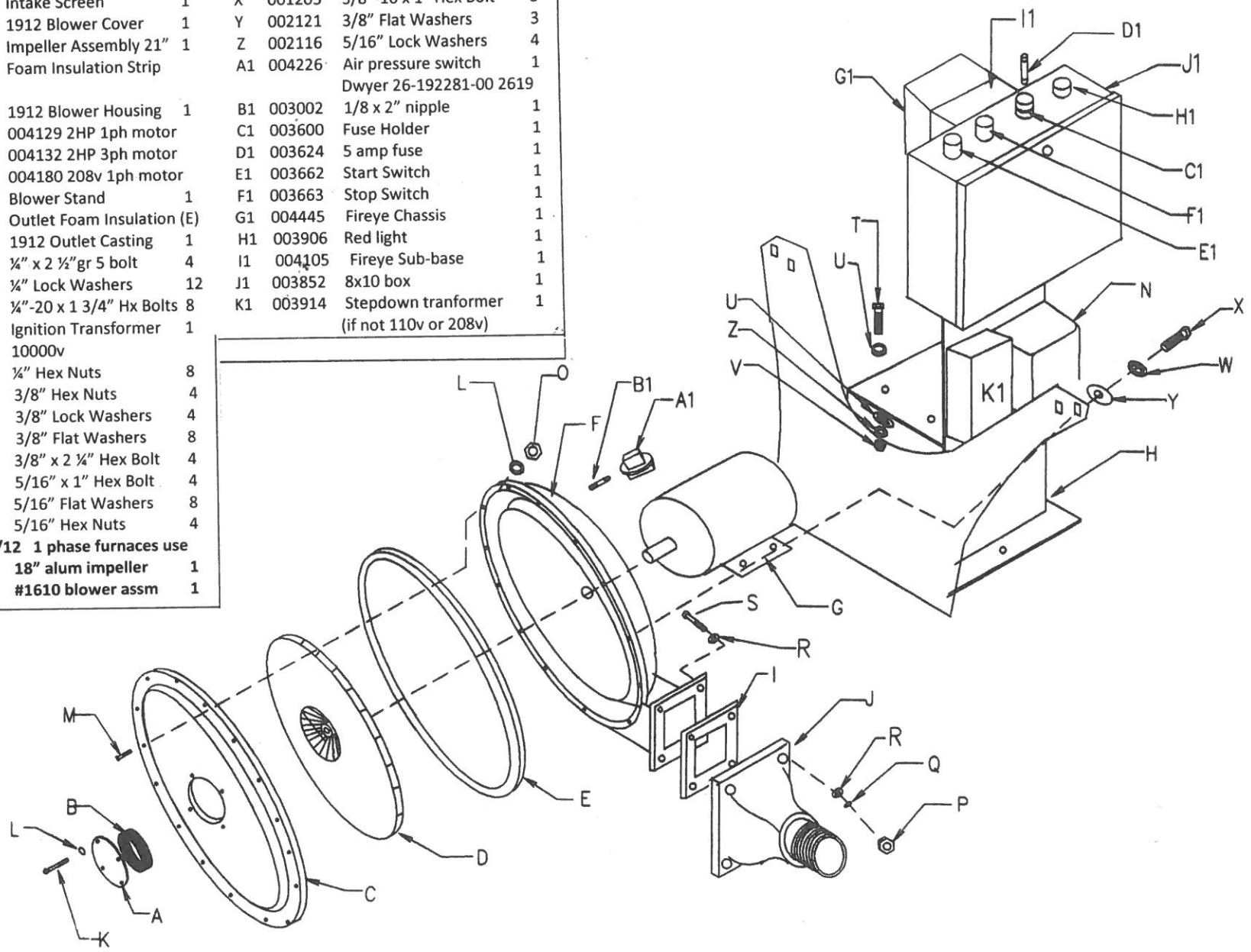
***Pit installations require UV8A scanner and extra conduit/wire-call for correct item**

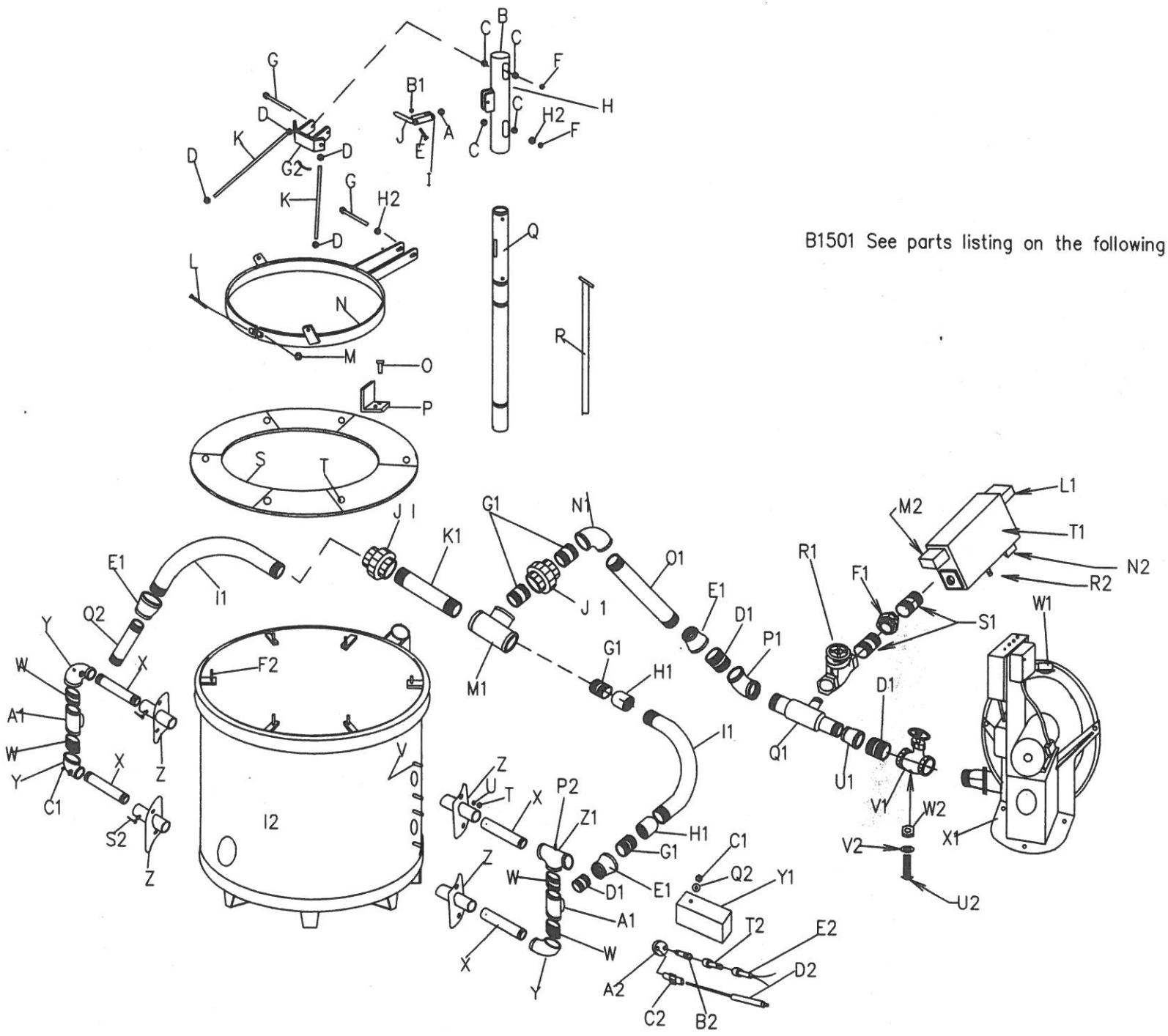
** Models manufactured prior to 2015 have 004216 1 ¼" Gas Solenoid Valve

1912 (if 3 ph) or 1610 (if 1 ph) BLOWER ASSEMBLY FOR B-702 12/2018

	OPN	DESCRIPTION	QTY
A	102801	Intake Guard	1
B	102802	Intake Screen	1
C*	008609	1912 Blower Cover	1
D*	004177	Impeller Assembly 21"	1
E	008187	Foam Insulation Strip	
F*	008610	1912 Blower Housing	1
G		004129 2HP 1ph motor	
	Or	004132 2HP 3ph motor	
	Or	004180 208v 1ph motor	
H	006230	Blower Stand	1
I		Outlet Foam Insulation (E)	
J*	400501	1912 Outlet Casting	1
K	000615	¼" x 2 ½"gr 5 bolt	4
L	002112	¼" Lock Washers	12
M	000711	¼"-20 x 1 3/4" Hx Bolts	8
N	004300	Ignition Transformer 10000v	1
O	002008	¼" Hex Nuts	8
P	002015	3/8" Hex Nuts	4
Q	002122	3/8" Lock Washers	4
R	002121	3/8" Flat Washers	8
S	001210	3/8" x 2 ¼" Hex Bolt	4
T	000905	5/16" x 1" Hex Bolt	4
U	002115	5/16" Flat Washers	8
V	002011	5/16" Hex Nuts	4
*** As of 11/01/12**		**1 phase furnaces use**	
	004176	**18" alum impeller**	**1**
		#1610 blower assm	**1**

	OPN	DESCRIPTION	QTY
W	002122	3/8" Lock Washers	3
X	001205	3/8"-16 x 1" Hex Bolt	3
Y	002121	3/8" Flat Washers	3
Z	002116	5/16" Lock Washers	4
A1	004226	Air pressure switch Dwyer 26-192281-00 2619	1
B1	003002	1/8 x 2" nipple	1
C1	003600	Fuse Holder	1
D1	003624	5 amp fuse	1
E1	003662	Start Switch	1
F1	003663	Stop Switch	1
G1	004445	Fireye Chassis	1
H1	003906	Red light	1
I1	004105	Fireye Sub-base	1
J1	003852	8x10 box	1
K1	003914	Stepdown tranformer (if not 110v or 208v)	1





B1501 See parts listing on the following page

McEnglevan B1501 Parts Listing

revised 6/28/2019

	Part #	Description	Qty
A	002467	Seal Bearing	1
B	101081	Swivel Pipe	1
C	002473	Radial Bearing	4
D	002023	½" Jam Nut	8
E	001208	3/8" x 1 ¾" Hex Hd Bolt	1
F	002024	½" Hex Lock Nut	2
G	001518	½ "x 5 ½" Hex Hd Bolt	2
H	010005	Drive In Grease Fitting	2
I	002423	Fulcrum Spring Pin	1
J	101075	Fulcrum Handle	1
K	101063	Support Rod	2
L	001215	3/8 x 3 1/2" Hex Hd Bolt	1
M	002015	3/8" Hex Nut	9
N	101064	Lid Band	1
O	001205	3/8" x 1" Hex Hd Bolt	2
P	101052	Lid Band Stop	1
Q	101095	Jack Tube	1
R	010068	Lid Lift Handle	1
S	101070	Top Seal Segment	6
T	002015	3/8" Nut	6
U	002121	3/8" Flat Washer	8
V	001305	3/8" x 1" Carriage Bolt	8
W	003159	2" Butt Nipple	4
X	006611	Burner Nozzle	4
Y	003385	1 ½" x 2" Elbow	3
Z	101035	Burner Guide Tube	4
A1	003311	2" Tee	2
B1	002017	3/8" Lock Nut	1
C1	002008	¼" Hex Nut	5
D1	003141	2" x 2 1/2"Nipple	3
E1	003230	2 ½" x 2" Reducing Coupling	1
F1	003352	1 ¼" Union	1
G1	003166	2 ½" x 3"Nipple	4
H1	003208	2 ½" Coupling	1
I1	003795	2 ½" Lg Radius Elbow	2
J1	003368	2 ½" Standard Union	2
K1	101157	2 ½" x approx. 6" Nipple	1
L1	003816	Low Gas Pressure Switch KDI#GML-A2-4-4	1
M1	003118	2 ½" Tee	1

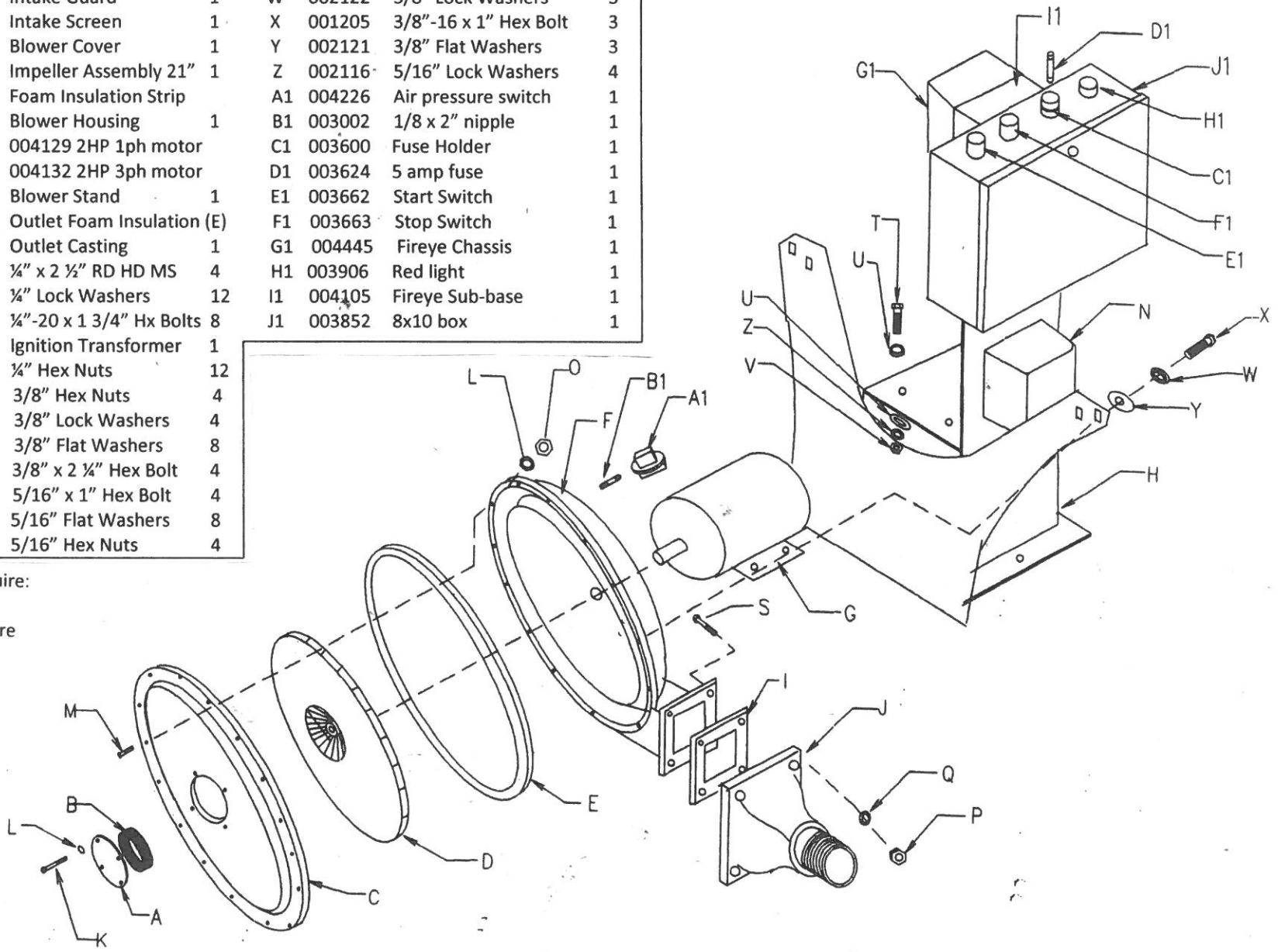
Part #		Description	Qty
N1	003407	2 ½" 90 deg Elbow	1
O1	003168	2 ½" x 8" Nipple	1
P1	003394	2" 45 deg Elbow	1
Q1	006070	GM-125 Gas/Air Mixer	1
R1	003430	1 ¼" Gate Valve	1
S1	003109	1 ¼" x 3" Nipple	2
T1	003823	Dual Valve With Proof Of Closure KDI#267016 DMV-D 702/622	1
U1	003224	2" x 1 ½" Reducing Cpling	1
V1	003432	2" Gate Valve	1
W1	004226	Air Pressure Switch	1
X1	900515	Blower Assembly #1912	1
Y1	101153	UV Scanner Cover	1
Z1	003293	1 ½" x 1 ½" x 2" UV Tee	1
A2	006665	1 ½" UV Plug	1
B2	003024	½" x 3/8" Reducing Nipple	1
C2	003408	½" x 3/8" Comp.Fitting	1
D2	004068	7" Ignition Electrode	1
E2	004109	UV8A Scanner	1
F2	001209	3/8" x 2" Hex Head Bolt	6
G2	101090	Support Rod Bracket	1
H2	002131	½" Flat Washer	1
I2	101031	Steel Shell Assembly	1
M2	003780	High Pressure Gas Switch KDI#GMH-A2-4-4	1
N2		Proof of Closure Switch (Part of T1)	1
O2	003148	2" x 6" Nipple	1
P2	000606	¼ -20 x ¾" PPH mach screw	1
Q2	002111	¼" Flat Washer	1
R2	003836	Visual Indicator	1
S2	002360	Eyebolt	4
T2	004097	Extender	1
U2	000709	¼-20 x 1 ¼"capscrew	1
V2	002112	¼" lock washer	1
W2	002008	¼-20 nut	1

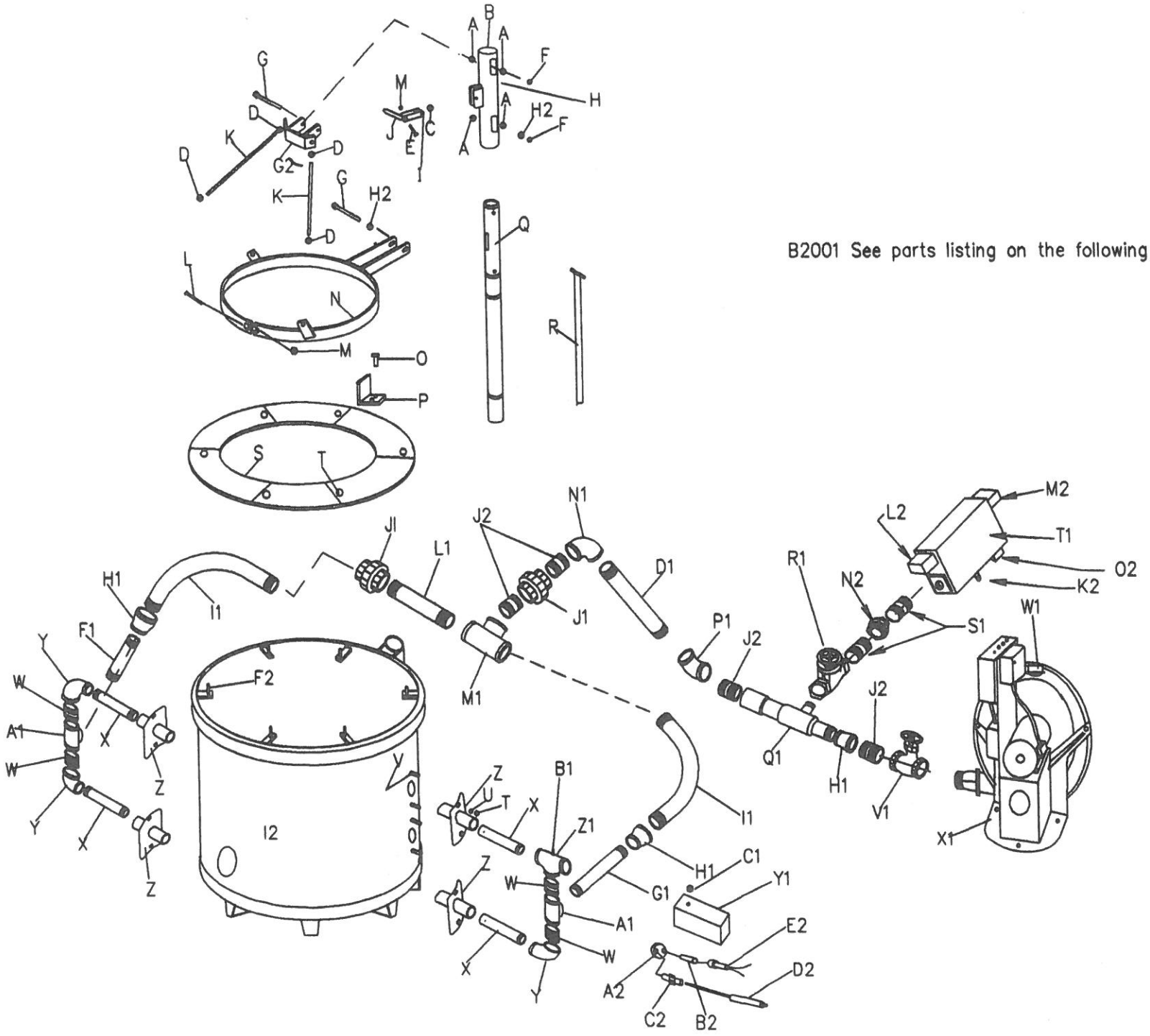
1912 BLOWER ASSEMBLY FOR B-1501 and B-2001 12/2018

	OPN	DESCRIPTION	QTY		OPN	DESCRIPTION	QTY
A	102801	Intake Guard	1	W	002122	3/8" Lock Washers	3
B	102802	Intake Screen	1	X	001205	3/8"-16 x 1" Hex Bolt	3
C	008609	Blower Cover	1	Y	002121	3/8" Flat Washers	3
D	004177	Impeller Assembly 21"	1	Z	002116	5/16" Lock Washers	4
E	008187	Foam Insulation Strip		A1	004226	Air pressure switch	1
F	008610	Blower Housing	1	B1	003002	1/8 x 2" nipple	1
G		004129 2HP 1ph motor		C1	003600	Fuse Holder	1
	Or	004132 2HP 3ph motor		D1	003624	5 amp fuse	1
H	006230	Blower Stand	1	E1	003662	Start Switch	1
I		Outlet Foam Insulation (E)		F1	003663	Stop Switch	1
J	400501	Outlet Casting	1	G1	004445	Fireye Chassis	1
K	000615	¼" x 2 ½" RD HD MS	4	H1	003906	Red light	1
L	002112	¼" Lock Washers	12	I1	004105	Fireye Sub-base	1
M	000711	¼"-20 x 1 3/4" Hx Bolts	8	J1	003852	8x10 box	1
N	004300	Ignition Transformer	1				
O	002008	¼" Hex Nuts	12				
P	002015	3/8" Hex Nuts	4				
Q	002122	3/8" Lock Washers	4				
R	002121	3/8" Flat Washers	8				
S	001210	3/8" x 2 ¼" Hex Bolt	4				
T	000905	5/16" x 1" Hex Bolt	4				
U	002115	5/16" Flat Washers	8				
V	002011	5/16" Hex Nuts	4				

1/2013 Single phase furnaces require:

D 004177-1/8" Impeller 1 1/8" bore
G 004161 Motor 3HP
H 006230SP Blower stand
J1 003788 Enclosure 12x10x6




B2001 See parts listing on the following page

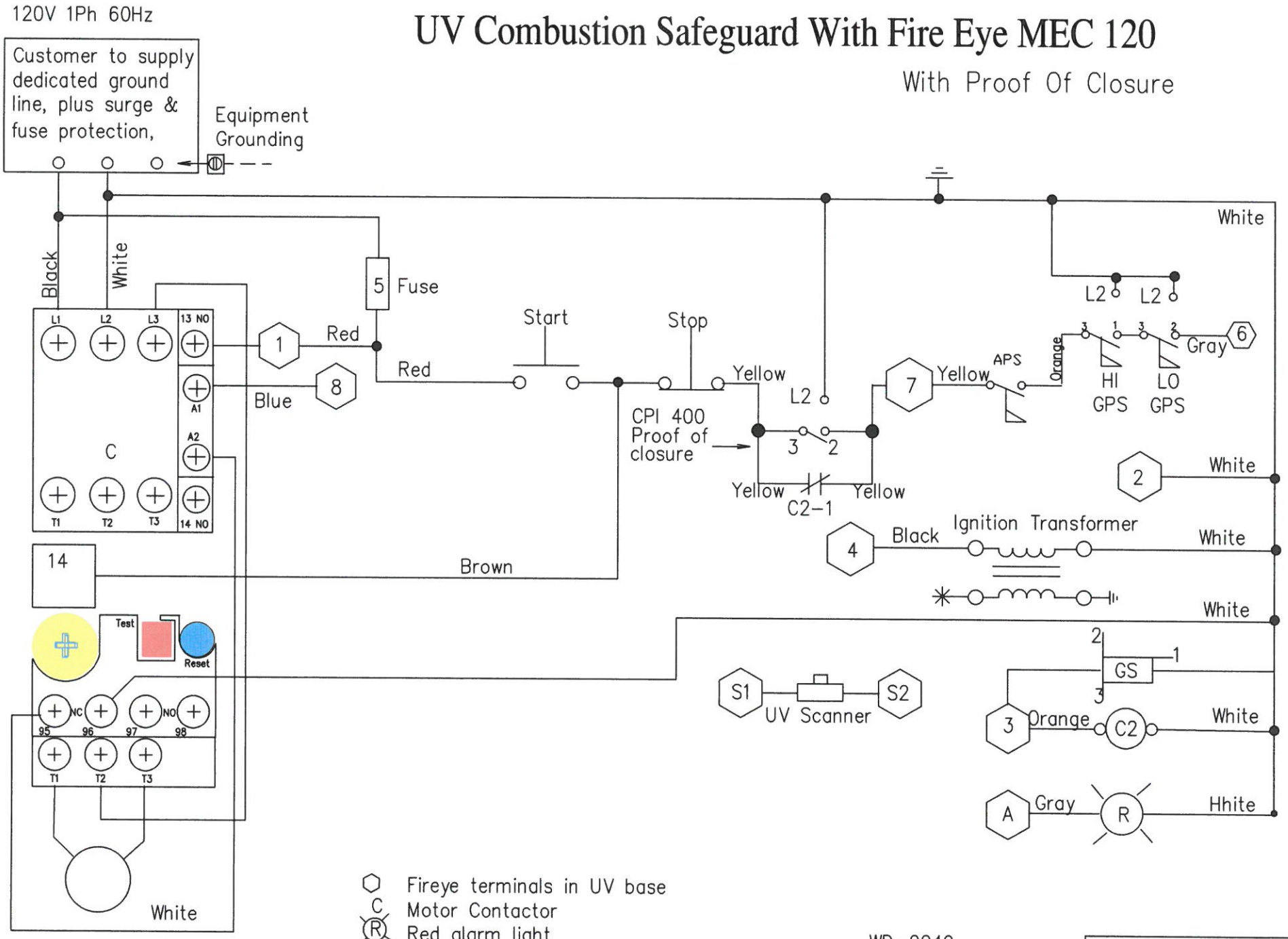
B2001 Std Model Parts Listing 10/16

A	002473 Radial bearing	4
B	101081 Swivel pipe	1
C	002467 Sealed bearing	1
D	002023 1/2" jam nut	8
E	001208 3/8 x 1 3/4" hex bolt	1
F	002024 1/2" hex lock nut	2
G	001518 1/2" x 5 1/2" hex bolt	2
H	010005 Grease fitting	2
I	002423 Fulcrum spring pin	1
J	101087 Hand Fulcrum	1
K	102586 Support rods	2
L	001215 3/8" x 3 1/2" hex bolt	1
M	002015 3/8" hex nut	10
N	102581 Lid band	1
O	001205 3/8" x 1" hex bolt	2
P	101052 Lid Band Stop	1
Q	101095 Jack tube	1
R	010068 Lid lift handle	1
S	103211 Top seal segment	6
T	002016 3/8" Jam nut	6
U	002121 3/8" flat washer	8
V	001304 3/8" x 1 1/4"carr.bolt	8
W	003159 2" butt nipple	4
X	006611 8 1/2" buner nozzle	4
Y	003385 1 1/2" x 2" 90 deg elb	3
Z	101035 Burner guide tube	4
A1	003311 2" tee	2
B1	000606 1/4 x 3/4 RD HD MS	4
C1	002008 1/4" hex nut	5
D1	103253 2 1/2" x 16" nipple	1
F1	103252 2" x 8 1/4" nipple	1
G1	103255 2" x 12" nipple	1
H1	003230 2 1/2" x 2" red.coupling	3
I1	003795 2 1/2" lg radius elbow	2
J1	003368 2 1/2" standard union	2
L1	103254 2 1/2" x 11" nipple	1
M1	003118 2 1/2" tee	1
N1	003407 2 1/2" 90 deg elbow	1
P1	003396 2 1/2" 45 deg elbow	1
Q1	006080 GM150 mixer	1
R1	003430 1 1/4" gate valve	1
S1	003109 1 1/4" x 3" nipple	2
T1	* 003823 Dual valve with proof of closure KDI# DMV-D 702/622 230-79	1
V1	003434 2 1/2" gate valve	1
W1	004226 Air pressure switch	1
X1	400429 Blower assm #1912	1
Y1	101153 UV scanner cover	1
Z1	003293 1 1/2" x 1 1/2" x 2" tee	1
A2	006665 1 1/2" UV plug	1
B2	003024 1/2" x 3/8" reducing nipple	1
C2	003408 1/2" x 3/8" comp.fitting	1
D2	004068 7" electrode	1
E2	004109 UV8A scanner	1
F2	001209 3/8" x 2" hex bolt	6
G2	101090 Support rod bracket	1
H2	002131 1/2" flat washer	5
I2	Steel shell assembly	1
J2	003120 2 1/2" close nipple	3
K2	003836 Visual indicator	1
L2	003780 High pressure gas switch KDI#GMH-A2-4-4, 266924	1
M2	003816 Low pressure gas switch KDI# GML-A2-4-4, 266942	1
N2	003352 1 1/4" union	1
O2	Proof of closure switch (part of T1)	1

**004216 1 1/4" solenoid valve on units prior to year 2015

UV Combustion Safeguard With Fire Eye MEC 120

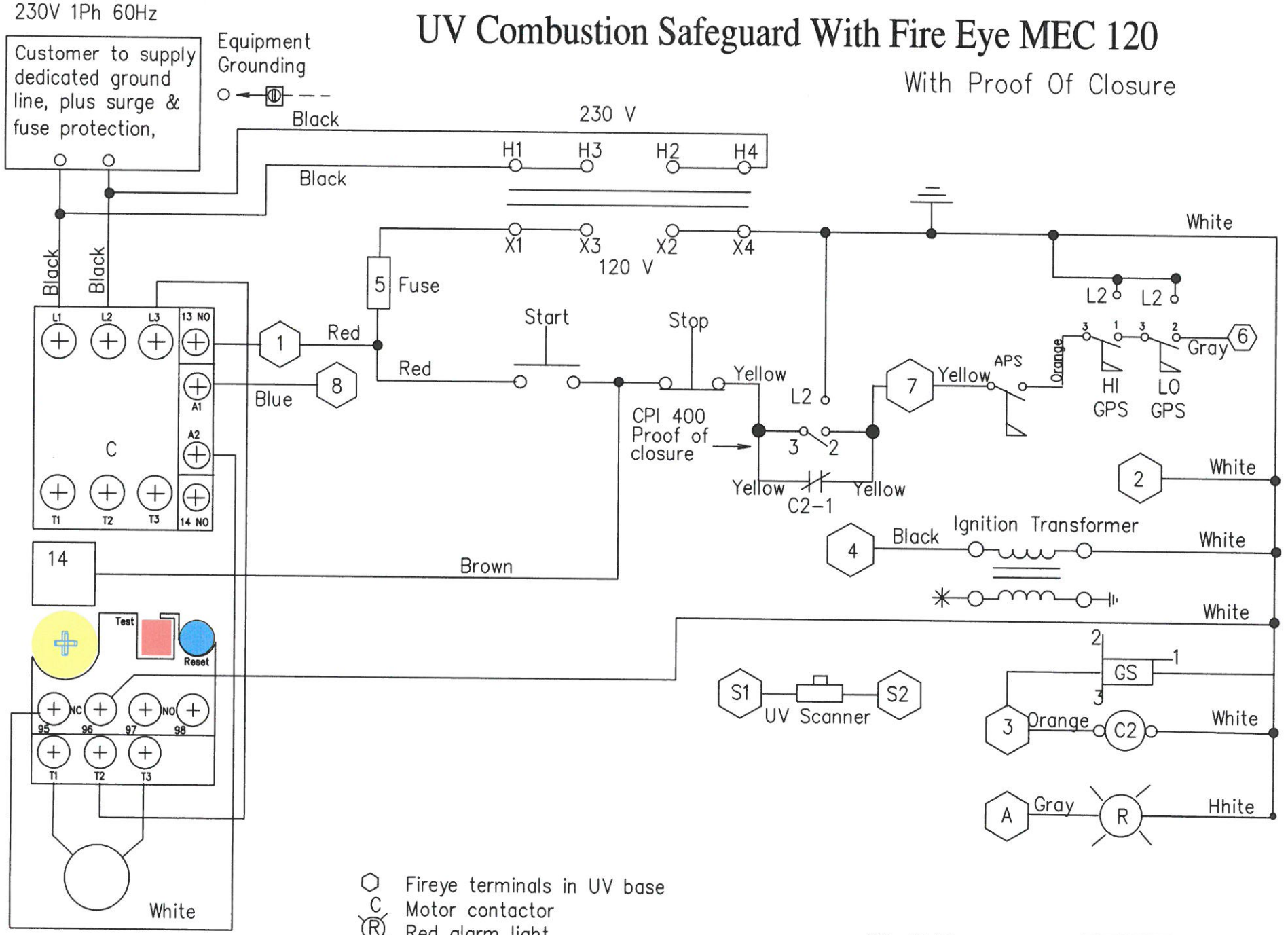
With Proof Of Closure



WD-0049	Drawn By Bill Walter
4 UV Combustion Safe Guard With Proof Of Closure	
120 V 1 ph-60 Hz	
MIFCO	1/21/15

UV Combustion Safeguard With Fire Eye MEC 120

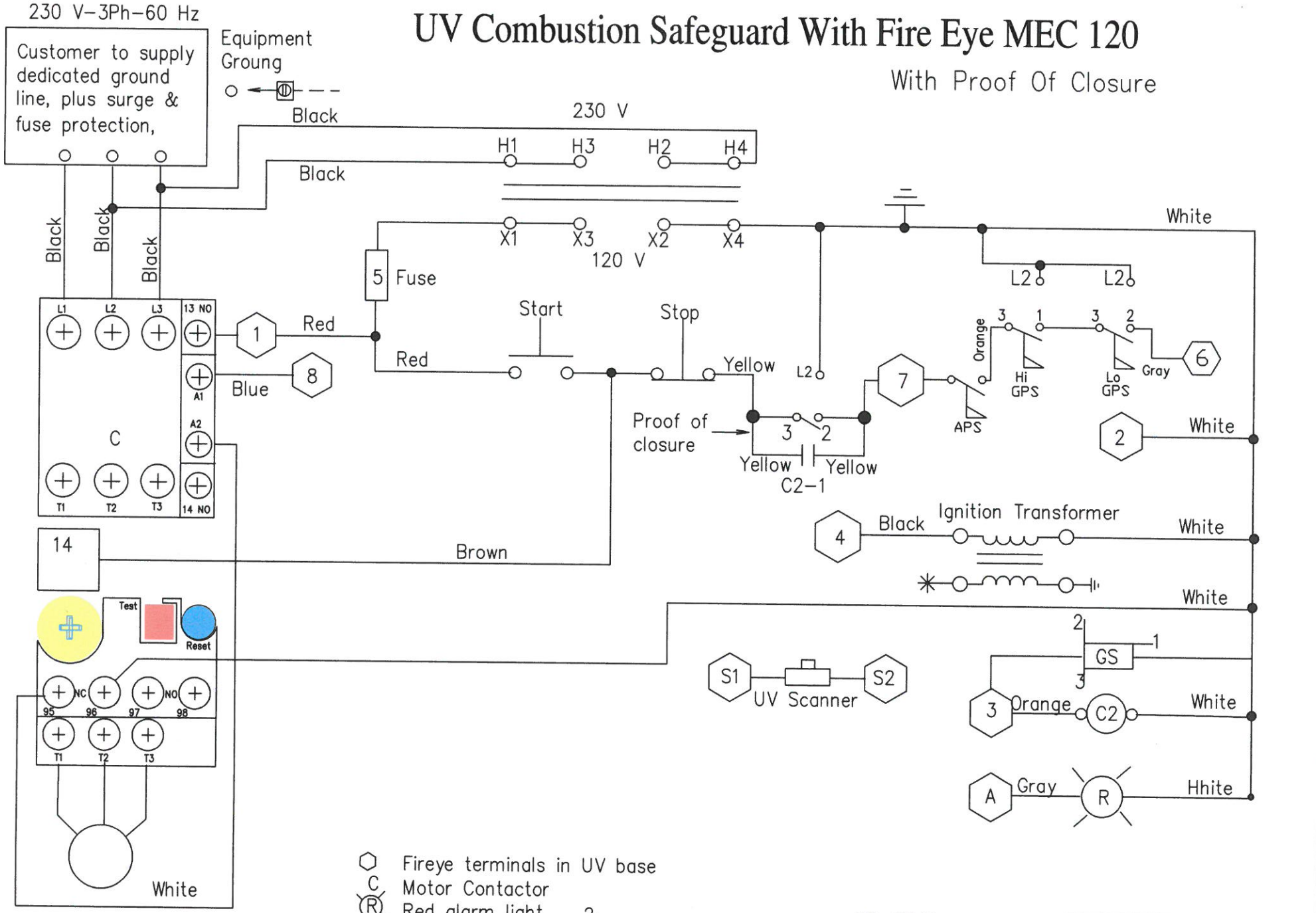
With Proof Of Closure



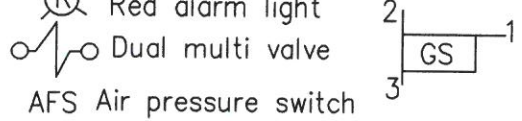
WD-0046	Drawn By Bill Walter
4 UV Combustion Safe Guard With Proof Of Closure	
230 V 1 ph-60 Hz	
MIFCO	1/21/15

UV Combustion Safeguard With Fire Eye MEC 120

With Proof Of Closure



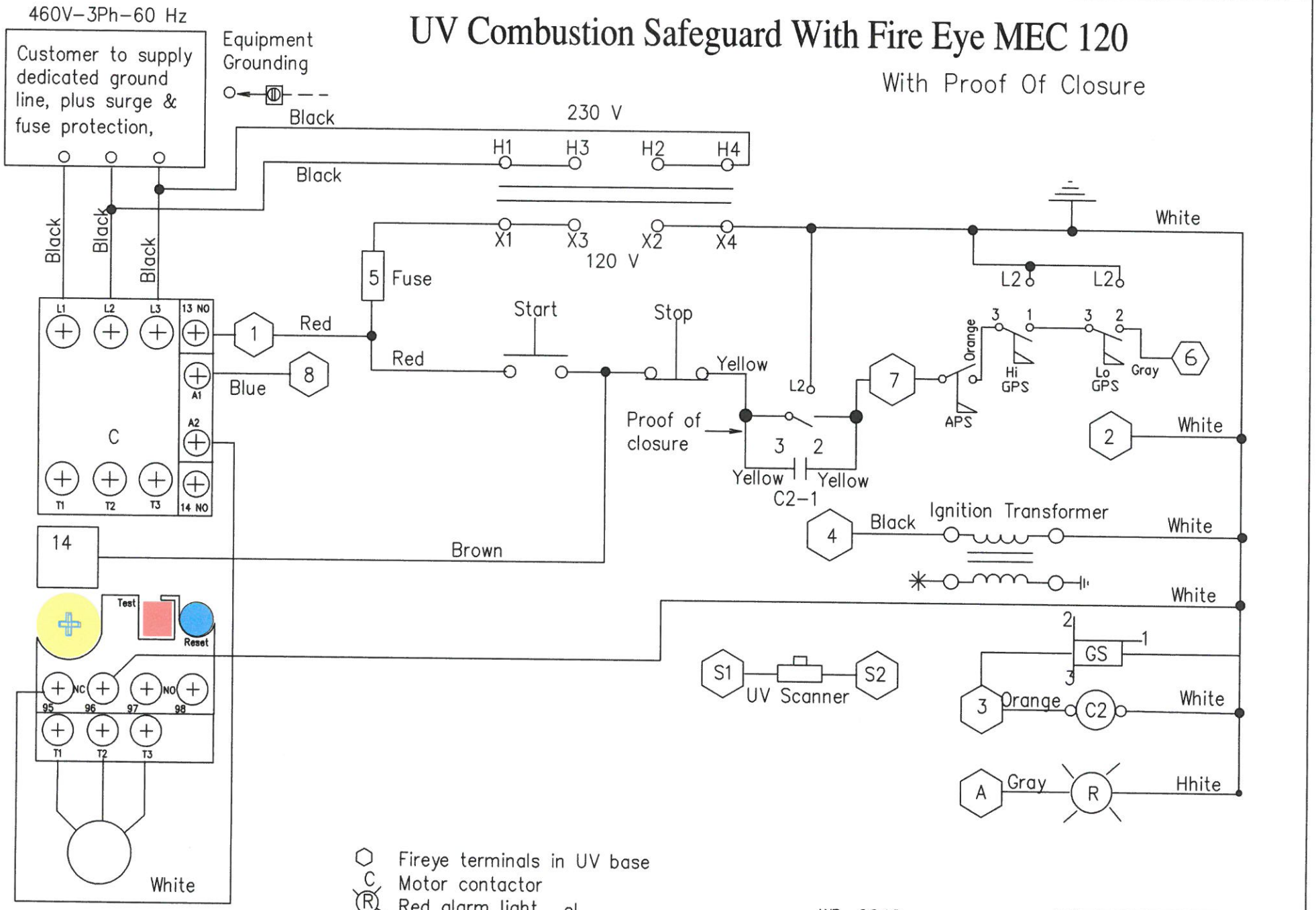
⬡ Fireye terminals in UV base
C Motor Contactor
Ⓡ Red alarm light
Dual multi valve
AFS Air pressure switch



WD-0045	Drawn By Bill Walter
4 UV Combustion Safe Guard With Proof Of Closure	
230 V 3 ph-60 Hz	
MIFCO	1/21/15

UV Combustion Safeguard With Fire Eye MEC 120

With Proof Of Closure



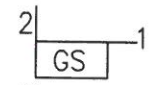
⬡ Fireye terminals in UV base

C Motor contactor

Ⓡ Red alarm light

Dual multi valve

AFS Air pressure switch

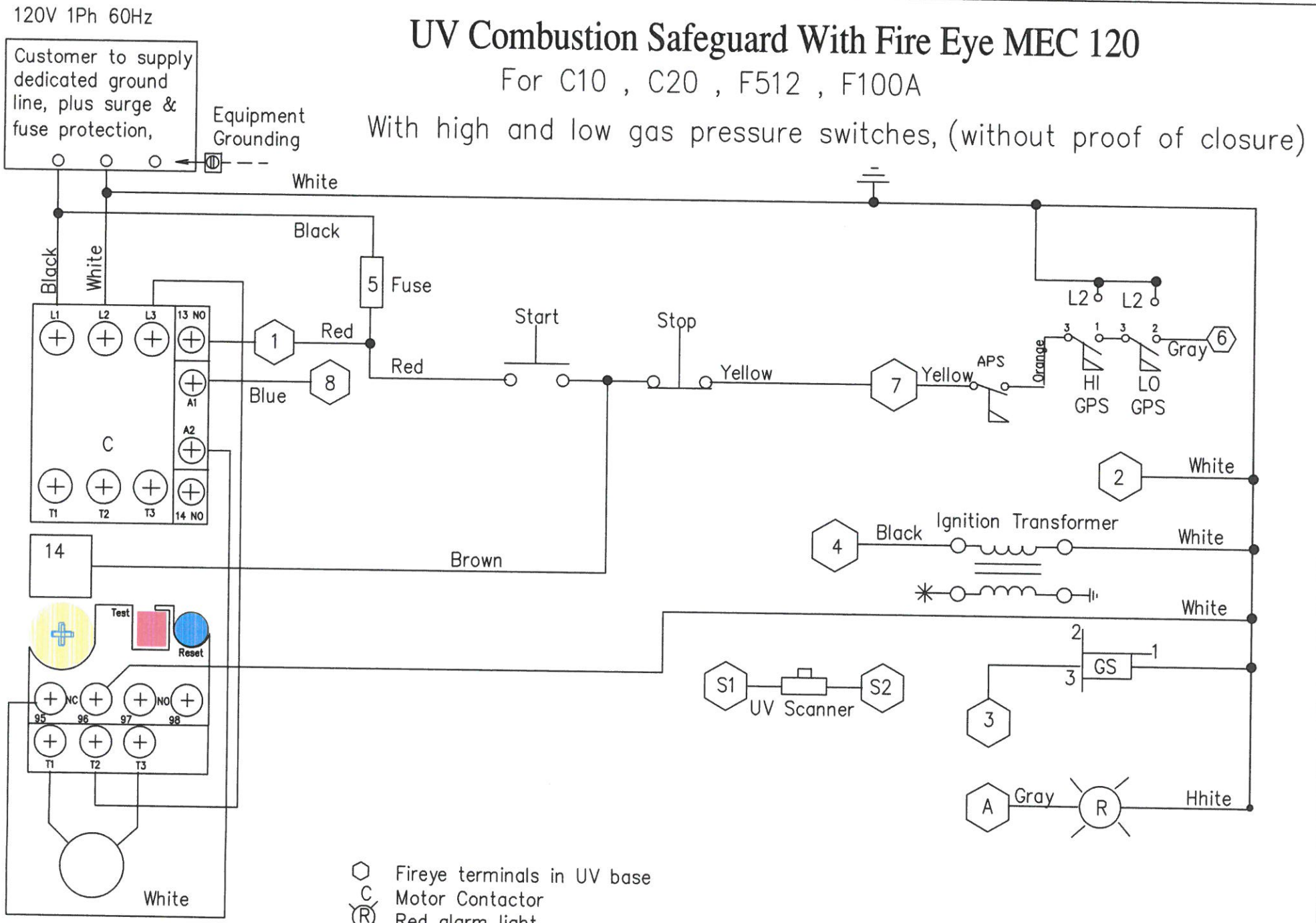


WD-0048	Drawn By Bill Walter
4 UV Combustion Safe Guard With Proof Of Closure	
460 V 3 ph-60 Hz	
MIFCO	1/21/15

UV Combustion Safeguard With Fire Eye MEC 120

For C10 , C20 , F512 , F100A

With high and low gas pressure switches, (without proof of closure)



WD-0053	Drawn By Bill Walter
4 UV Combustion Safe Guard	
120 V 1 ph-60 Hz	
MIFCO	1/21/15

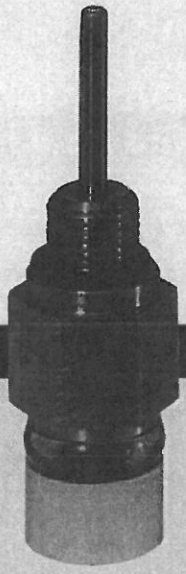
Visual Indicator
Installation Instruction

USA CDN

DUNGS®
Combustion Controls

Table of Contents

Table of Contents ..... Page 1
Approvals ..... Page 1
Attention ..... Page 1
Specification ..... Page 2
Models Designations and Ranges ..... Page 2
Mounting ..... Page 2
Function ..... Page 2



Approvals

Approval for this part is covered under the safety valve certification.

FM APPROVED

Attention

The installation and maintenance of this product must be done under the supervision of an experienced and trained specialist. Never perform work if gas pressure or power is applied, or in the presence of an open flame.

Safety first O.K.

On completion of work on the Visual Indicator, perform a leakage and function test.

Please read the instruction before installing or operating. Keep the instruction in a safe place. You find the instruction also at www.dungs.com. If these instructions are not heeded, the result may be personal injury or damage to property.

IFGC CSA UL ANSI NFPA

This product is intended for installations covered by, but not limited to, the following codes and standards: NFPA 86, CSD-1, ANSI Z21.13, UL 795, NFPA 85, or CSA B149.3.

Any adjustment and application-specific adjustment values must be made in accordance with the equipment manufacturers instructions.

Explanation of symbols

1, 2, 3 ... = Action
• = Instruction

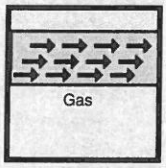
M/CD • Karl Dungs Inc. • VI • Edition 2012.05 • P/N 261 409

DUNGS®
Combustion Controls

Specification

Visual Indicator The Visual Indicator (VI) is for use with the DUNGS SV (DLE), MV (D) (DLE), DMV-D(LE), and DMV-ZRD(LE) series of shutoff valves. The indicator mounts to the bottom of the valve and visually displays when the valve is open or closed.

Pressure Rating
10 PSI



Gases
Natural gas, propane, butane, non-corrosive gases, and air.

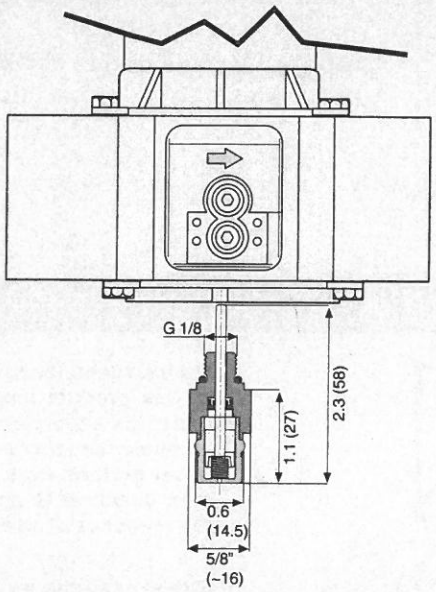
Models Designations and Ranges

Type	Order No.
VI Visual Indicator	217 655

Mounting

1. Remove the plug and the o-ring on the bottom of the valve with a 5 mm hex key wrench.
2. Insert the Visual Indicator and its o-ring; using a 5/8" (16 mm) open end wrench, turn clockwise until the Visual Indicator is sufficiently tightened. DO NOT overtighten, or the o-ring can be damaged. An additional 1/8 to 1/4 turn after finger-tight is typically sufficient.
3. Be certain that the valve area where the stickers will be placed is clean before applying the stickers. Install the two aluminum adhesive-backed stickers (one on each side) of the valve body so the operator can refer to either of them while viewing the indicator.
4. Before putting the valve into service, test the indicator by opening and closing the valve to visually verify the indicator is working properly.
5. Apply a soapy water solution between the indicator and the valve body to verify that no leakage occurs.

⚠ The shutoff valve must be de-energized and its gas supply shut off before installing the visual indicator.



Function

The valve position is indicated through the clear plastic cover.
Red: the valve is open

⚠ Reducing the main flow adjustment may limit the ability of the VI to indicate the opened position of the valve. At least 5/32" (3.5 mm) of stroke is required for the visual indicator to indicate an opened valve.

We reserve the right to make modifications in the course of technical development.

Karl Dungs Inc.
3890 Pheasant Ridge Drive NE
Suite 150
Blaine, MN 55449, U.S.A.
Phone 763 582-1700
Fax 763 582-1799
e-mail info@karldungsusa.com
Internet http://www.dungs.com/usa/

Karl Dungs GmbH & Co. KG
P.O. Box 12 29
D-73602 Schorndorf, Germany
Phone +49 (0)7181-804-0
Fax +49 (0)7181-804-166
e-mail info@dungs.com
Internet http://www.dungs.com

M/CD • Karl Dungs Inc. • VI • Edition 2012.05 • P/N 261 409

GAO-A2, GMH-A2, and GML-A2 Gas Pressure Switch Installation Instructions

USA CDN

DUNGS®
Combustion Controls

Table of Contents

Table of Contents ..... Page 1
Approvals ..... Page 1
Attention ..... Page 1
Specification ..... Page 2
Model Description & Part Number ..... Page 2
Mounting ..... Page 3
Wiring ..... Page 3
Operation ..... Page 4
Operation & Adjustment ..... Page 4
Installation Position ..... Page 4
Maintenance & Testing ..... Page 5
Mounting to Safety Valves ..... Page 6
Mounting to Safety Valves or FRI Regulator .. Page 7
Accessories & Replacement ..... Page 8

Approvals

UL Listed: UL 353
File # MH16628

CSA Certified: CSA C22.2 No. 14
File # 201527

FM APPROVED
FM Approved: Class 3510, 3530
File # J.I. 1Y9A9.AF

Commonwealth of Massachusetts Approved Product Approval code G3-0106-191

Attention

The installation and maintenance of this product must be done under the supervision of an experienced and trained specialist. Never perform work if gas pressure or power is applied, or in the presence of an open flame.

Check the ratings in the specifications to verify that they are suitable for your application.

Please read the instruction before installing or operating. Keep the instruction in a safe place. You find the instruction also at www.dungs.com. If these instructions are not heeded, the result may be personal injury or damage to property.

On completion of work on the pressure switch, perform a leakage and function test.

Any adjustment and application-specific adjustment values must be made in accordance with the equipment manufacturers instructions.

This product is intended for installations covered by, but not limited to, the following codes and standards: NFPA 86, ANSI Z83.4/CSA 3.7, ANSI Z83.18/CSA 4.9, ANSI Z21.13, CSD-1, UL 795, CSA B149.1 or CSA B149.3

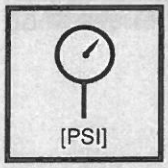
Explanation of symbols

1, 2, 3 ... = Action
• = Instruction

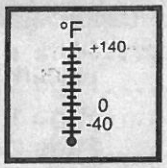
M/CD • Karl Dungs Inc. • GAO-A2, GMH-A2, GML-A2 • Edition 2014.11 • P/N 261 394

Specification

GAO-A2, GMH-A2, GML-A2 High/low ventless gas pressure switch (SPDT) with automatic or manual reset. Includes visual indication of switch position. Mounts directly to various ports on the SV, DMV and MB series valves and FRI series regulators.

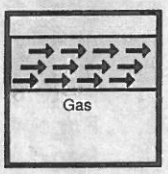


Max. Operating Pressure
MOP = 7 PSI (500 mbar)



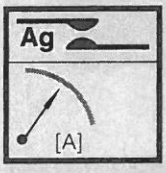
Ambient / Fluid Temperature
Versions
-2, -3, -4, -5 & -6; -40 °F to +140 °F;
(-40 °C to +60 °C)
Versions
-8; -20 °F to +140 °F;
(-30°C to +60 °C)

Electrical Connection
Screw terminals via 1/2" NPT conduit connection

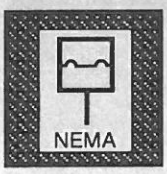


Gases
Dry, natural gas, propane, butane; other noncorrosive gases. Suitable for up to 0.1% by volume, dry H_2S. A "dry" gas has a dew point lower than +15 °F and its relative humidity is less than 60 %.

Materials in contact with Gas
Housing: Aluminum & Steel
Diaphragm: NBR-based rubber



Contact Rating
10 A resistive @ 120 VAC
3 A inductive @ 120 VAC
1 A @ 12 - 48 VDC



Enclosure
NEMA Type 4

Vent Limiter
Incorporates a vent limiter as per UL 353 and limits the escape of gas less than 1.0 CFH of natural gas at 7 PSI if internal switch diaphragm rupture. No vent line required, when accepted by the authority having jurisdiction.

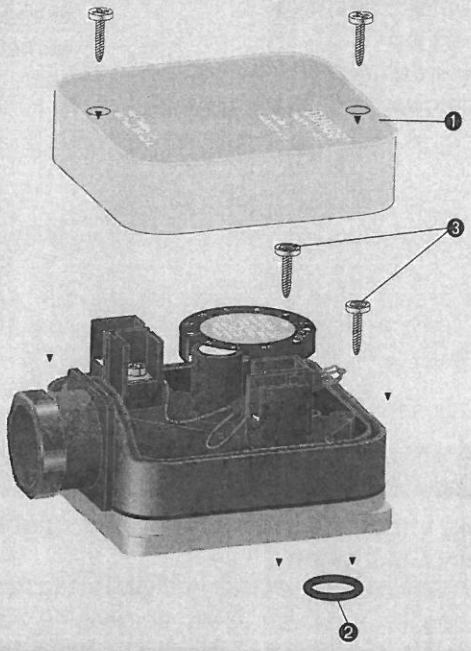
Model Description & Part Number

Type	Version	Order No.	Setting range in. W.C.	Switching hysteresis in. W.C.	Factory Calibration
GAO-A2-... pressure switch	GAO-A2-4-2	217-085A	0.16 - 1.20	≤ 0.12	
	GAO-A2-4-3	217-086A	0.40 - 4.00	≤ 0.20	
	GAO-A2-4-5	217-087A	2.00 - 20.00	≤ 0.40	
	GAO-A2-4-6	217-088A	12.00 - 60.00	≤ 1.2	
	GAO-A2-4-8	217-089A	40.00 - 200.00	≤ 4.0	
GMH-A2-... pressure switch	GMH-A2-4-4	217-323A	1.00 - 20.00	--	
	GMH-A2-4-6	217-324A	12.00 - 60.00	--	
	GMH-A2-4-8	217-325A	40.00 - 200.00	--	
GML-A2-... pressure switch	GML-A2-4-4	217-337A	1.00 - 20.00	--	
	GML-A2-4-6	217-338A	12.00 - 60.00	--	
	GML-A2-4-8	217-339A	40.00 - 200.00	--	

Mounting

Recommended Mounting Procedure

1. Remove the clear cover ❶ of the switch in order to remove the thread forming socket head screws.
2. Verify that the O-ring ❷ and the groove, in which the O-ring is placed, are clean and free of notches or burrs.
3. Place the O-ring into the groove on the back of the pressure switch. This is located on the flate side of the aluminum housing.
4. Using a 3 mm hex wrench, remove the G 1/8 plug from the port on which the switch is to be mounted. This will be either a flange, the side of the FRI regulator, or a G1/8 port of Dungs safety shutoff valve.
5. Mount the switch onto the port using the thread-forming socket head screws ❸.
6. The O-ring ❷ can slide during the mounting process, so it is recommended that as the switch is pressed onto the port, visually verify that the O-ring remains in the groove.
7. Tighten the screws ❸ but do not exceed 22 lb-in. Perform a leak test to verify that no leakage occurs around the o-ring.

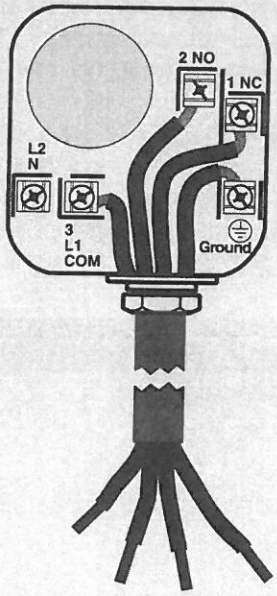


Wiring

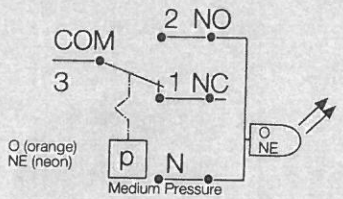
Wiring Procedure

1. Remove the clear cover from the switch.
2. Use 14 or 16 AWG wire rated for at least 75 °C
3. Route the wires through the conduit connector.
4. Install a conduit plug at some point in the conduit run between the switch and closest panel that contains switching contacts or other sparking devices (see NFPA 86 requirements about potential risks of gas leaking down conduit).
5. Connect the wiring to the appropriate screw terminals.

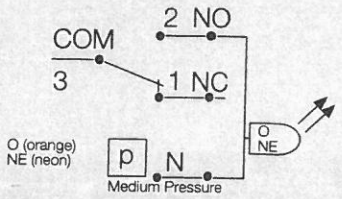
Wiring terminal illustration



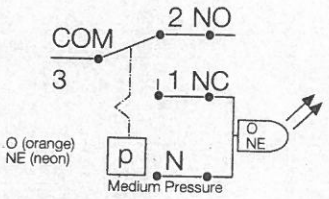
GMH High Gas Switch (Operating state shown) As pressure rises above setpoint, 2 NO closes, 1 NC opens, and Neon light ON (fault), switch trips and locks out.



GAO Low or High Gas Switch (Operating state shown as a high limit). As pressure rises above set point, 1 NC opens, 2 NO closes, Neon light ON. **As pressure falls** below set point, switch resets: 1 NC closes and 2 NO opens, Neon light off.



GML Low Gas Switch (Operating state shown)
As pressure falls below setpoint, 2 NO opens, 1 NC closes, Neon light ON (fault), switch trips and locks out.

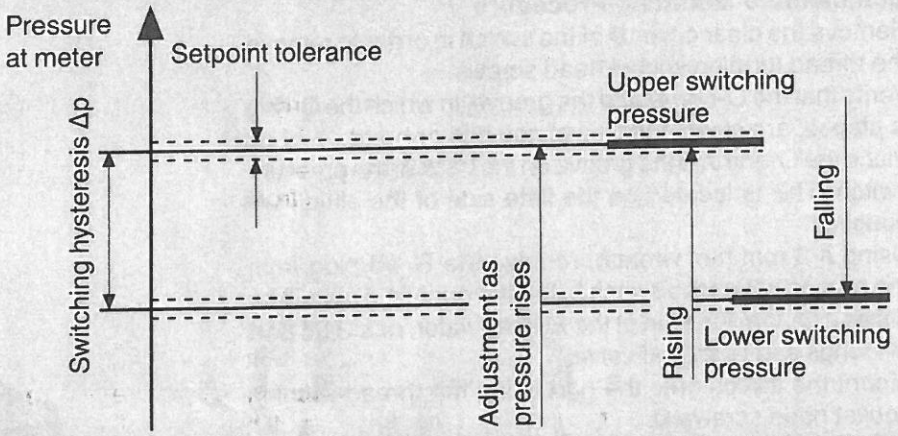


All wiring must comply with local electrical codes, ordinances and regulations.

Do not exceed the switch ratings given in the specifications and on the switch

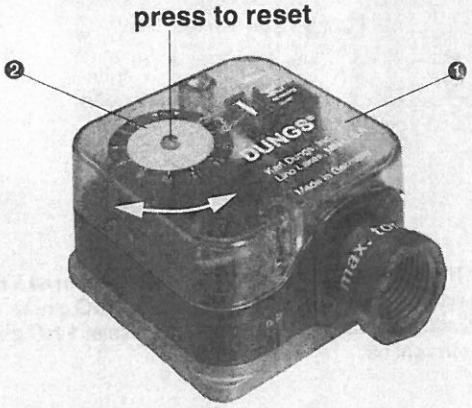
Operation

Definition of switching hysteresis Δp
The pressure difference between the upper and lower switching pressures.



Operation & Adjustment

Annually check the switch for proper operation
Set Point Calibration
The set point dial of the GAO and GMH is factory calibrated with increasing pressure (GML: decreasing pressure). Due to hysteresis, the GAO switch will actuate at a slightly lower point as the pressure decreases.

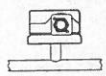
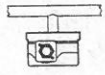
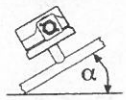


Adjusting the Set Point
1. Remove the clear cover ❶ from the switch.
2. Turn the dial ❷ until the desired trip pressure is opposite the white arrow (mark) on the yellow dial face.
3. After adjusting the set point for normal operation check to see that the gas pressure switch operates as intended.
4. Use an accurate pressure gauge connected upstream from the switch to measure the actual pressure.
5. Replace the clear cover.

Automatic Reset
The NC contact of the GAO breaks when pressure rises above the set point. It makes automatically when pressure returns to the normal operating level.

Manual Reset
The NC contact of the GMH breaks when pressure rises above the set point. The NO contact of the GML breaks when pressure falls below the set point. Neither of the switches will return to their former position automatically. To reset, wait until the pressure returns to the normal operating level. Then press and release the clear cover over the red reset button in the center of the yellow dial face; it is not necessary to remove the cover. The neon light indicates a fault condition for the GML and GMH series and for the GAO series when used as a high gas limit. The lead for the light wired to terminal #2 on the GAO series should be wired to terminal #1 when used as a low gas limit.

Installation Position

	Standard installation position is **vertical** upright diaphragm.
	When installed **horizontally**, the pressure switch switches at a pressure higher by approx. 0.2 in. W.C.
	When installed **upside down**, the pressure switch switches at a pressure lower by approx. 0.2 in. W.C.
	When installed in **other positions**, the pressure switch switches at pressure deviating from the set reference value by max. ± 0.2 in. W.C.

Annually check the switch for proper operation

Low Gas Pressure Switch:

1. First, connect a meter capable of reading +/- 0.1 ohms to the NO and COM contacts, and verify that the NO and COM contacts are made. Measure the resistance, and if the resistance is more than 1.0 ohm, remove switch from service. (See terminal illustration below for guidance).
2. Then, verify that the low gas pressure switch will change state when a low gas condition is sensed by connecting a meter capable or reading +/- 0.1 ohms to the NC and COM contacts and then by causing the switch to go into a fault condition. Once the fault occurs, Measure the resistance, and if the resistance is more than 1.0 ohm, remove switch from service.
3. To cause the fault, perform one of the two procedures:
   1. Turn the pressure switch setpoint counterclockwise until the switch trips.
   2. Depressurize the volume of gas the low gas pressure switch is sensing. For FRI/6 regulators, this can be done by opening the side tap on the oppositive side of the FRI/6 regulator. For DMV and MBC safety shutoff valves, this can be done opening the port 1 pressure tap. For SV valves, open port 1 of the upstream valve.
4. Allow the burner to go through a startup sequence, and then verify that the burner faults and is not allowed to light off.
5. Close all test taps (ports) and open upstream ball valve.
6. When finished, close all pressure test points used, and then open the upstream ball valve **SLOWLY** to allow gas pressure to gradually bleed into the system.

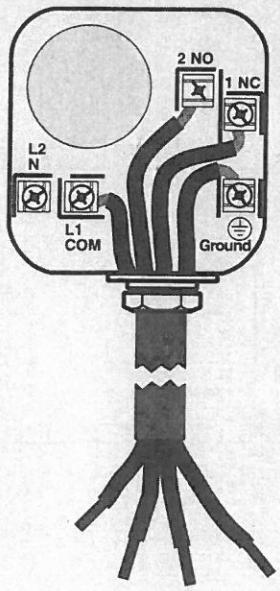
⚠ **Opening the upstream manual valve too fast can permanently damage the pressure switch.**

⚠ **Do not similate fault conditions while the burner is firing.**

High Gas Pressure Switch:

1. First, connect a meter capable of reading +/- 0.1 ohms to the NC and COM contacts, and verify that the NC and Measure the resistance, and if the resistance is more than 1.0 ohm, remove switch from service.
2. Then, verify that the high gas pressure switch will change state when a high gas condition is sensed by connecting a meter to the NO and COM contacts and then by causing the switch to go into a fault condition.
3. To cause the fault, perform one of the two procedures:
   1. Turn the pressure switch setpoint clockwise until the switch trips.
   2. Pressurize the volume of gas the high gas pressure switch is sensing. This can be done by closing the downstream ball valve, opening port 3 tap on a DMV and MBC safety shutoff valves, or port 2 or 3 of the downstream SV valve, and then using a pump to pressurize the test chamber.
4. Measure the resistance across the NO and COM contacts. If the resistance is more than 1.0 ohm, remove switch from service.
5. Allow the burner to go through a startup sequence, and then verify that the burner faults and is not allowed to light off.
6. When finished, close all test taps (ports) and open the dowmstream ball valve.

NOTE: A resistance of more than 1.0 ohm indicates that the switch contacts are starting to either corrode or carbonize.



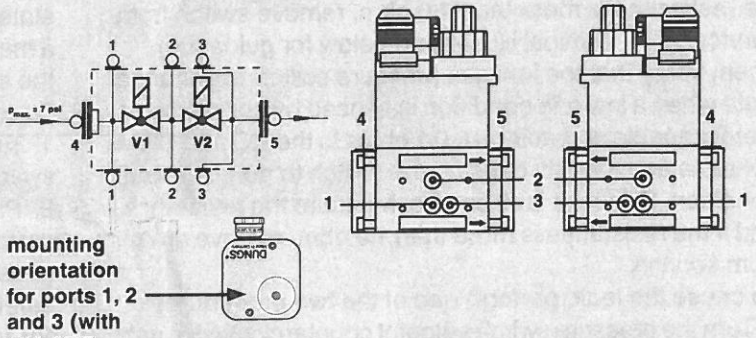
Mounting to Safety Valves

Location

Model series GAO-A2-4, GMH-A2-4, and GML-A2-4 can be mounted directly to various ports on a DUNGS valve. The pressure switch should be mounted in locations meeting the requirements of the applicable code. Order mounting kit 214-975 for DMV port 3 mount and MBC port 3 mounting, and kit 225-047 for mounting switch vertically on a valve flange.

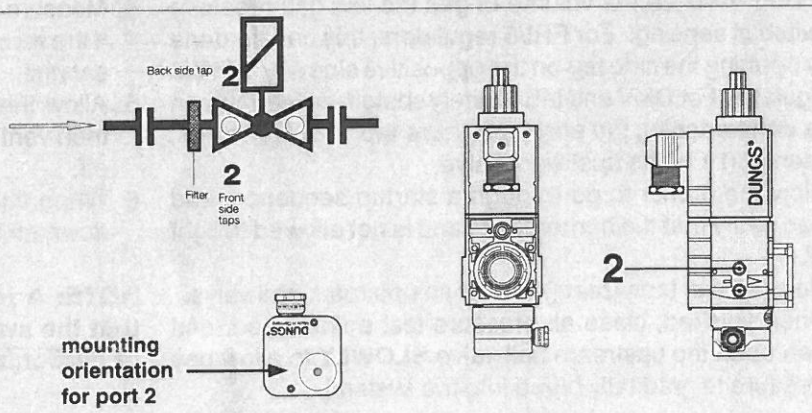
A2 mounting options
DMV 701-703 Dual modular valve

Pressure tap	Mounting possible?
1	yes
2	yes
3	yes, with #214-975
4	yes, horizontal yes, vertical with #225-047
5	yes, horizontal yes, vertical with #225-047



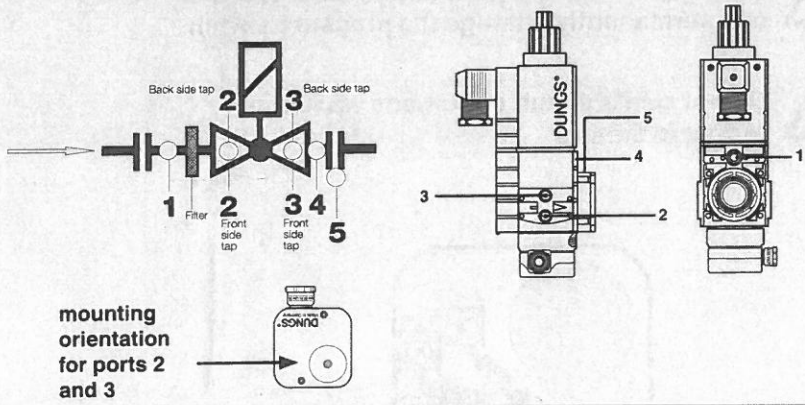
A2 mounting options
SV 1005 and SV 1007 series safety valve

Pressure tap	Mounting possible?
1	no
2	yes
3	no
4	no



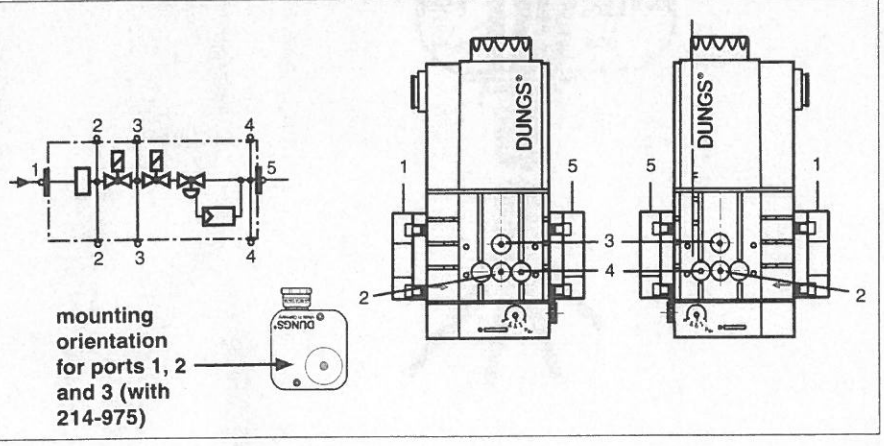
A2 mounting options
SV 1010, SV 1012, SV 1015 and SV 1020 series safety valve

Pressure tap	Mounting possible?
1	yes
2	yes
3	yes
4	no
5	yes



A2 mounting options
MBC series multifunctional control

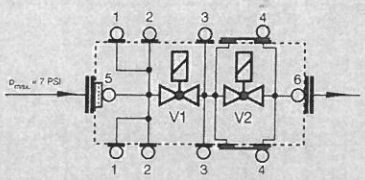
Pressure tap	Mounting possible?
1	yes, horizontal yes, vertical with #225-047
2	yes
3	yes
4	yes, with #214-975
5	yes, horizontal yes, vertical with #225-047

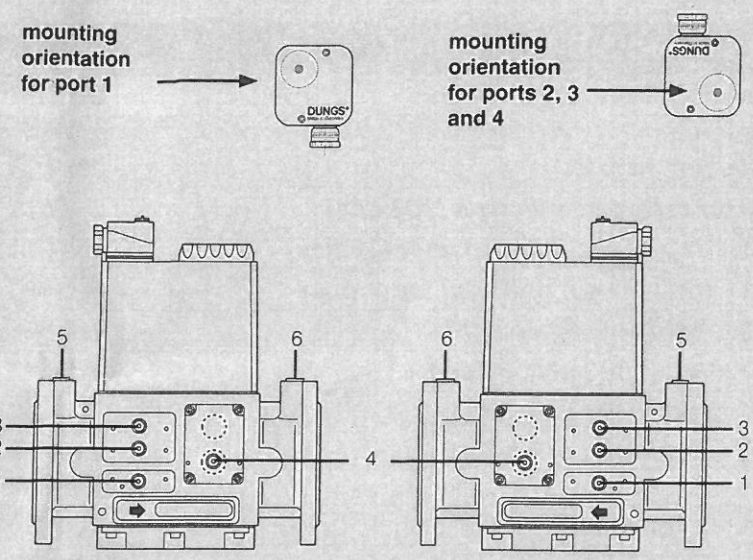


Mounting to Safety Valves or FRI Regulator

A2 mounting options
DMV 525, 5040-5125/11
Dual modular valve

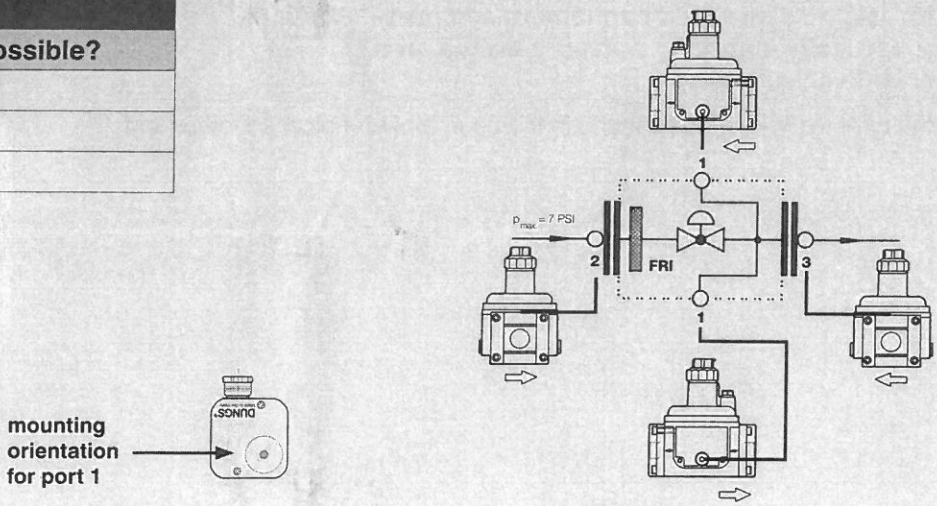
Pressure tap	Mounting possible?
1	yes
2	yes
3	yes
4	yes
5	no
6	no





A2 mounting options
FRI gas pressure regulator

Pressure tap	Mounting possible?
1	yes
2	yes
3	yes



Accessories & Replacement	
Accessory for pressure switch	**Order No.**
Replacement cover (screws not included)	228-732 (for GAO switches) and 233-113 (for GMH and GML switches)
Screw for replacement cover (100 pcs)	237-675
PG 11 - 1/2" NPT conduit adapter (10 pcs)	231-214
PG 11 - 1/2" NPT conduit adapter (1 pcs)	220-566
120 VAC light only (yellow)	244-156 (for switches with kit 231-772 already installed)
24 VDC/VAC light only (yellow)	244-157
DIN connector (female plug)	210-318
Male plug for DIN connector	219-659 (for GAO switches) and 227.644 (for GMH and GML sitches)
Mounting screw kit	226-188 (includes o-ring and two M4 thread forming screws)
M20 - 1/2" NPT Adapter	240-671
Port 3 adapter	214-975 (for MBC 1000-4000 series and DMV 701-703 series)
Adapter with 1/4" NPT threaded connection and pressure tap for vertically mounting pressure switch on a SV, DMV or MBC valve flange.	225-047

We reserve the right to make modifications in the course of technical development.

Karl Dungs Inc.
3890 Pheasant Ridge Drive NE
Suite 150
Blaine, MN 55449, U.S.A.
Phone 763 582-1700
Fax 763 582-1799
e-mail info@karldungsusa.com
Internet http://www.dungs.com/usa/

Karl Dungs GmbH & Co. KG
P.O. Box 12 29
D-73602 Schorndorf, Germany
Phone +49 (0)7181-804-0
Fax +49 (0)7181-804-166
e-mail info@dungs.com
Internet http://www.dungs.com

M/CD • Karl Dungs Inc. • GAO-A2, GMH-A2, GML-A2 • Edition 2014.11 • P/N 261 394

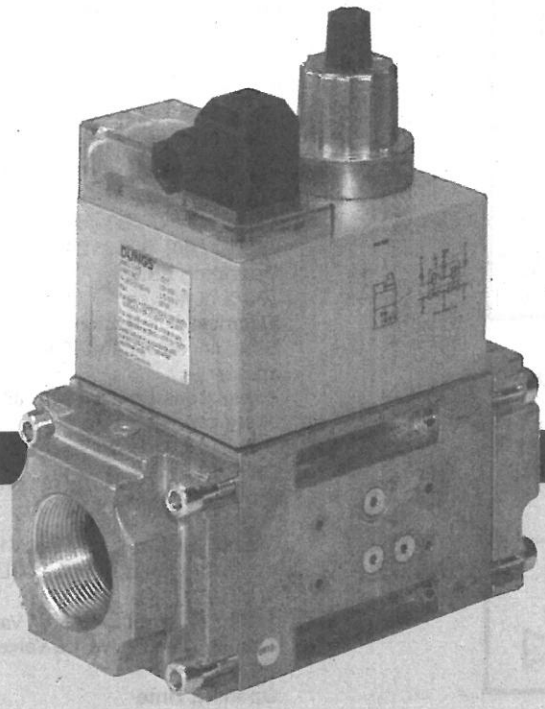
DMV-D(LE) 7../602
Dual Safety Shutoff Valve
Installation Instructions

USA CDN

DUNGS®
Combustion Controls

Table of Contents

Table of Contents . . . . . Page 1
Approvals . . . . . Page 1
Attention . . . . . Page 1
Specification . . . . . Page 2
Mounting . . . . . Page 3
Painting Valve . . . . . Page 3
Protection from Radiant Heat . . . . . Page 4
Wiring . . . . . Page 4
Valve Adjustment . . . . . Page 4
Test Ports . . . . . Page 5
Rated Capacity . . . . . Page 5
Pulse Fired Applications . . . . . Page 5
Valve Leakage Test . . . . . Page 6
Flow Curve . . . . . Page 7
Pressure Drop for other Gases . . . . . Page 7
Accessories & Replacement . . . . . Page 8



Approvals

UL Recognized Component:
File No. MH16727

CSA:
Certified File No.157406

FM Approved:
Report J.1.1Z6A0.AF

Commonwealth of Massachusetts Approved Product Approval code G1-1107-35

Attention

The installation and maintenance of this product must be done under the supervision of an experienced and trained specialist. Never perform work if gas pressure or power is applied, or in the presence of an open flame.

Check the ratings in the specifications to make sure that they are suitable for your application.

Please read the instruction before installing or operating. Keep the instruction in a safe place. You find the instruction also at www.dungs.com If these instructions are not heeded, the result may be personal injury or damage to property.

On completion of work on the safety valve, perform a leakage and function test.

Any adjustment and application-specific adjustment values must be made in accordance with the appliance-/boiler manufacturers instructions.

This product is intended for installations covered by, but not limited to, the following fuel gas codes and standards: NFPA 54, IFGC (International Fuel Gas Code), or CSA B149.1 (for Canada) or the following equipment codes and standards: CSD-1, UL 795, NFPA 86, NFPA 37, ANSI Z83.4/CSA 3.7, ANSI Z83.18, ANSI Z21.13/CSA 4.9, or CSA B149.3 (for Canada).

Explanation of symbols

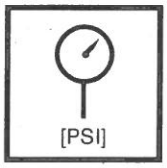
1, 2, 3 ... = Action
• = Instruction

M/CD • Karl Dungs, Inc. • DMV-D(LE) 7../602 • Edition 2015.09 • P/N 261421

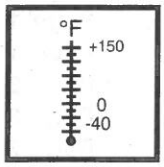
Specification

DMV-D/602 Two normally closed safety shutoff valves in one housing. Fast opening, fast closing. Adjustable max. flow on valve 2.

DMV-DLE/602 Two normally closed safety shutoff valves in one housing. Valve 1 fast opening, fast closing. Valve 2 slow opening, fast closing. Adjustable max. flow and initial lift on valve 2.

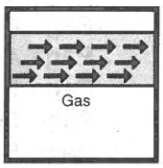


Max. Operating Pressure
MOP = 7 PSI (500 mbar)

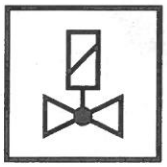


Ambient Temperature
-40 °F ... +150 °F
(-40 °C ... +65 °C)

Electrical Ratings
110 - 120 VAC / 50 - 60 Hz;
220 - 240 VAC / 50 - 60 Hz
24 VAC / 50 - 60 Hz; 24 VDC
Operating time
100 % duty cycle
Electrical Connection
DIN-Connector with 1/2" NPT conduit adapter.
Power Consumption with all coils energized
DMV-D(LE) 701: 45 VA
DMV-D(LE) 702: 65 VA
DMV-D(LE) 703: 80 VA

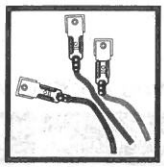


Gases
Dry, natural gas, propane, butane; other noncorrosive gases. A "dry" gas has a dew point lower than +15 °F and its relative humidity is less than 60 %.
Materials in contact with Gas
Housing: Aluminium, Steel, free of nonferrous metals. Sealings on valve seats: NBR-based rubber.



Classification of Valve V1 and V2 Safety Shutoff Valve: UL 429, FM 7400
ANSI Z21.21 • CSA 6.5 C/I Valves
Closing Time (Valve 1 & Valve 2)
< 1 s
Opening Time
DMV-D/602: V1 & V2 < 1 s
DMV-DLE/602: V1< 1 s;
V2 10 to 20 s at 70 °F
Main Flow Setting (DMV-D/602 & DMV-DLE/602)
Adjustable on V2:
<10 to 100 % of total flow
Initial Lift Adjustment (DMV-DLE/602)
Adjustable on V2:
0 to 70 % of total flow

Strainer
23 Mesh, installed in the housing upstream V1



Electrical Connection
DIN-connector (Order No. 210319) required. M20 - 1/2 NPT Adapter (Order No. 240671) required for a conduit connection. Order parts separately.

Enclosure Rating
IP 65/NEMA Type 12

Additionally Required Electrical Parts

Description	Order No.
DIN Connector	210319
Conduit Adapter	240671

Mounting

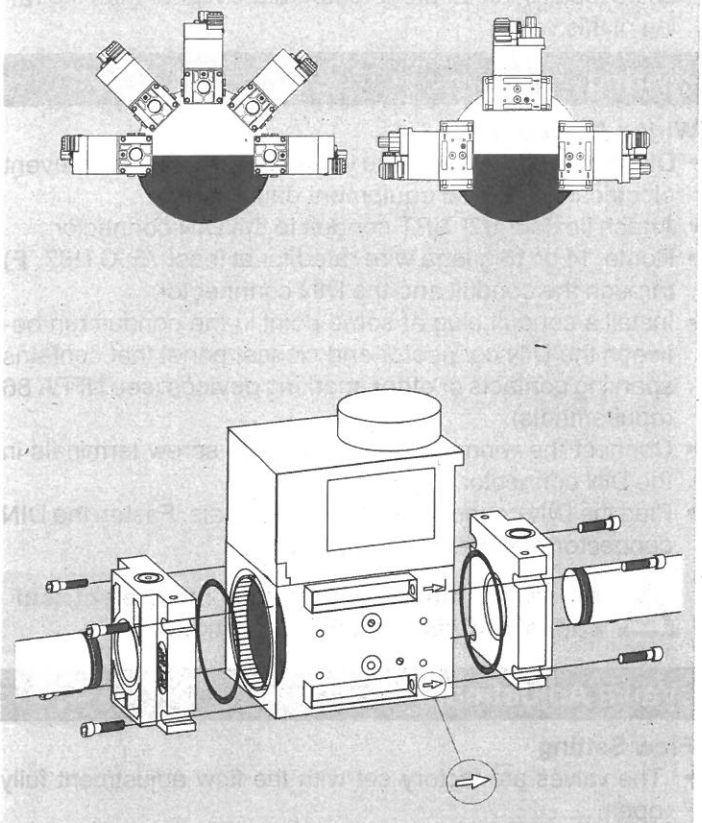
Setup

1. Examine the DMV valve for shipping damage.
2. The main gas supply must be shutoff before starting the installation.
3. The inside of the DMVvalve, the flanges, and piping must be clean and free of dirt. Remove all dirt and debris before installing the DMV valve. Failure to remove dirt / debris could result in valve damage or improper performance.

Recommended Procedure to Mount the Flanges

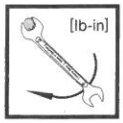
1. Unpack the DMV valve and remove the socket cap head screws.
   For DMV 701: use 5 mm hex wrench for M6 screws
   For DMV 702/703: use 6 mm hex wrench for M8 screws
2. Remove the two white protective plastic covers.
3. Verify the o-rings and the grooves are clean and in good condition.
4. Install the DMV valve with the gas flow matching the direction indicated by the arrows on the casting.
5. Mount the DMV solenoid valve from vertically upright to horizontal.
6. Clean the mounting surface of the flanges.
7. Mount the flanges to the DMV valve.
8. Tighten the screws in a crisscross pattern. See table for recommended torque!

Installation position



Do not overtighten the screws. Follow the maximum torque values below.

If the flow is not in the same direction of the arrows, the valves will not operate properly.



Recommended Torque System Accessories	M6	M8	Screw Size
	62 lb-in	134 lb-in	[lb-in]

Recommended Piping Procedure

- Use new, properly reamed and threaded pipe free of chips.
- Apply good quality pipe sealant, putting a moderate amount on the male threads only. If pipe sealant lodges on the valve seat, it will prevent proper operation. If using LP gas, use pipe sealant rated for use with LP gas.
- Do not thread pipe too far. Valve distortion and/or malfunction may result from excess pipe in the valve body.
- Apply counter pressure only a parallel jaw wrench only to the flats on the flange when connecting to pipe.
- Do not overtighten the pipe. Follow the maximum torque values listed below.

Recommended Torque for Piping	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	NPT pipe
	375	560	750	875	940	1190	[lb-in]

- **On completion of work on the DMV valve, perform a leakage test. (See "Valve Leakage Test")**

Painting Valve

- It is not recommended that this valve be painted. Painting covers date codes and other labels that identify this valve.
- If the valve needs to be painted, a paint free of volitile organic componants (VOC's) must be used. VOC's can damage valve o-rings, resulting in external gas leakage over time.
- During the painting process, use measures that will allow the valve's date code and other labeling information to be legible after the paint is dry.

Protection from Radiant Heat

- Radiant heat must be considered as a heat source that could result in an ambient temperature higher than the rating of this valve.
- Provide proper shielding to protect against radiant heat.

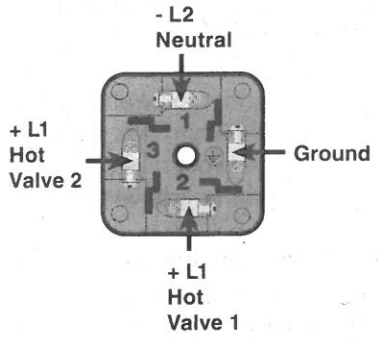
Wiring

Wiring Procedure

- Disconnect all power to the valves before wiring to prevent electrical shock and equipment damage.
- Attach flexible 1/2" NPT conduit to the DIN connector.
- Route 14 or 16 guage wire rated for at least 75 °C (167 °F) through the conduit and the DIN connnector.
- Install a conduit plug at some point in the conduit run between the DIN connector and closest panel that contains sparking contacts or other sparking devices (see NFPA 86 requirements).
- Connect the wiring to the appropriate screw terminals in the DIN connector.
- Plug the DIN connector onto the terminals. Fasten the DIN connector with the screw supplied.

⚠ All wiring must comply with local electrical codes, ordinances and regulations.

DIN Connector screw terminal connections

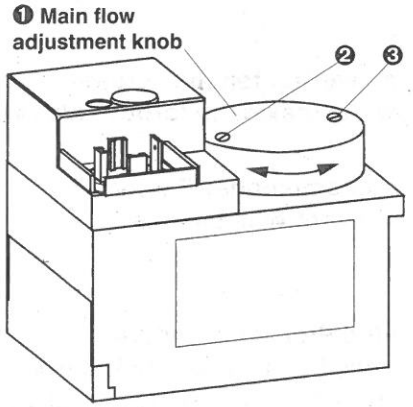


Valve Adjustment

Flow Setting

- The valves are factory set with the flow adjustment fully open.
- **CAUTION**: Make sure the flow of gas does not create a hazard.

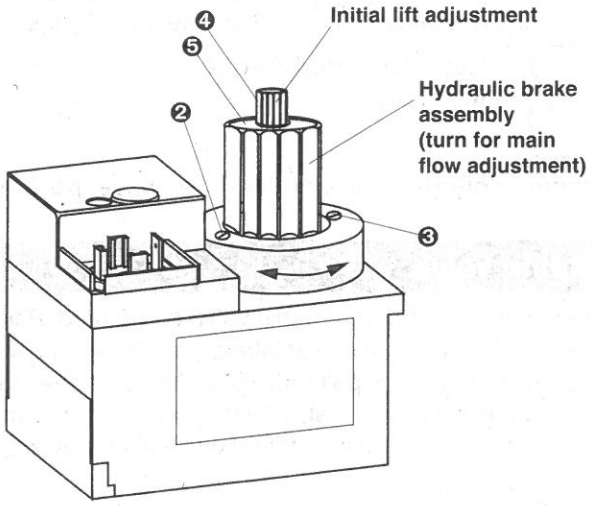
1. Locate the flow adjustment knob on top of valve 2 on the DMV-D/602 (❶ black knob) DMV-DLE/602 (base of the hydraulic brake). There are two screws ❷, ❸ the holding screw is recessed and has a blue sealing compound on it, while the pan head screw ❷ protrudes from the cap.
2. Loosen the pan head screw ❷ until you can freely rotate the flow adjustment ❶.
3. Turn clockwise for less gas or counterclockwise for more gas.
4. Check the flow at the burner with an orifice or flow meter.
5. Tighten the pan head screw ❷ on the adjustment cap ❶.



Initial Lift Adjustment (DMV-DLE/602 only)

The initial lift adjustment varies the initial gas flow through the valve as the valve seat begins to open. This adjustment can vary the initial flow between 0 % and 70 % of the total gas flow; 0 to 25 % of stroke. All DMV-DLE/6 valves are factory set with no initial lift. To adjust the lift proceed as follows:

1. Unscrew the small black cap ❹ on top of the flow adjustment cap to expose the initial lift adjustment knob.
2. The black cap ❹ also serves as tool; turn the cap over and insert it on the slot on the adjustment knob.
3. Turn the knob ❺ clockwise for a min. initial lift or counterclockwise for a max. initial lift.
4. Once the desired initial fast lift has been achieved, reinstall the black cap ❹.

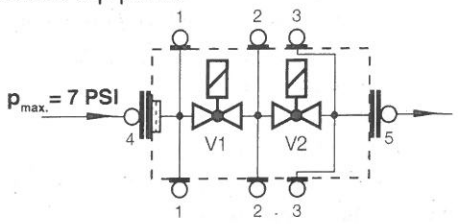


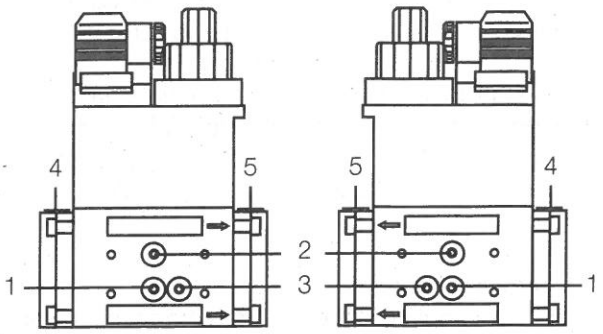
⚠ Do not adjust or remove any screws or bolts which are sealed with a Red or Blue colored compound. Doing so will void all approvals and warranties.

Test Ports

Test Ports

The G ⅛ ISO 228 taps are available on both sides upstream V1, between V1 and V2, downstream V2, and on both flanges. The G ⅛ test nipple (P/N 219008) can be screwed in any of these pressure tap ports.





Rated Capacity

	Capacity in CFH at pressure drop of 1 inch water column; natural gas, sp.gr.= 0.64					
	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DMV D(LE) 701/602	345	429	457	-	-	-
DMV-D(LE) 702/602	-	-	1065	1277	1368	1430
DMV-D(LE) 703/602	-	-	1230	1532	1698	1795

Pulse Fired Applications

When using these valves on pulse fired applications, the following apply:

- Before installing the valve, the inside of all gas piping upstream to the nearest filter shall be cleaned and that filter shall have an insert with mesh no larger than 50 micron.
- The valve shall be installed in the upright position.
- The valve shall be applied within all of its ratings. The type of gas, the ambient temperature and the cycle rate of the valve are critical.
- The valve shall be leak tested at least annually.
- After the cycle life has been exceeded, the valve shall be immediately replaced.

Valve Leakage Test

This leak test procedure tests the external sealing and valve seat sealing capabilities of the DMV automatic safety shutoff valve. Only qualified personnel should perform this test.

It is required that this test be done on the initial system startup, and then repeated at least annually. Possibly more often depending on the application, environmental parameters, and the requirements of the authority having jurisdiction.

Setup

This test requires the following:

A) Test nipples installed in the downstream pressure tap port of each automatic safety shutoff valve to make the required 1/4" hose connection in step 4.

B) A transparent glass of water filled at least 1 inch from the bottom.

C) A proper leak test tube. An aluminum or copper 1/4" rigid tube with a 45˚ cut at the end that is then connected to a 1/4" flexible hose of some convenient length provides for a more accurate leakage measurement.
However, a 45˚ cut at the end of the 1/4" flexible hose will suffice, but it will not likely be as accurate as the rigid tube.

D) For detecting external leakages, an all purpose liquid leak detector solution or a soapy water solution is required.

Leak Test Procedure

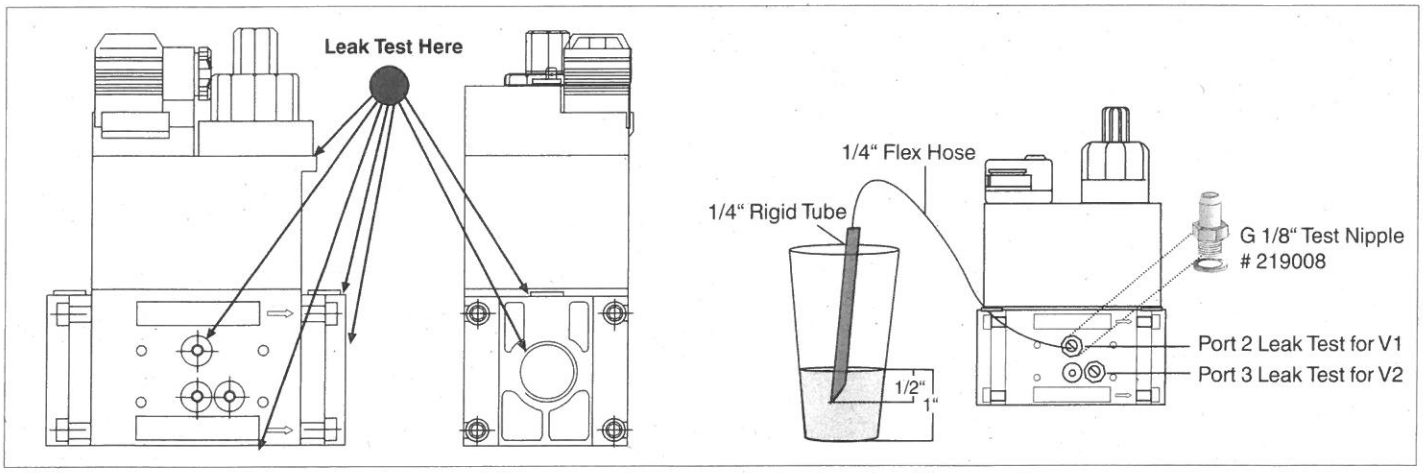
Use the illustration below as a reference.

1. With the upstream ball valve open, the downstream ball valve closed and both valves energized, apply an all purpose liquid leak detector solution to the "External Leakage Test Areas" indicated in the illustration below, to any accessories mounted to the safety valve, and to all gas piping and gas components downstream the equipment isolation valve, and the inlet and outlet gas piping of the automatic safety shutoff valve. The presence of bubbles indicates a leak, which needs to be rectified before proceeding.
2. Then, de-energize the burner system and verify that both automatic safety shutoff valves are closed.
3. Close the upstream and downstream manual ball valve.
4. Using a screwdriver, slowly open the V1 test nipple (port 2) by turning it counter clockwise to depressurize the volume between the two valves, and connect the 1/4" flexible hose to the test nipple.
5. Slowly open the upstream manual ball valve, and then provide for some time to allow potential leakage to charge the test chamber before measuring the valve seat leakage.
6. Immerse the 1/4 in. tube vertically 1/2 in. (12.7 mm) below the water surface. If bubbles emerge from the ¼" tube and after the leakage rate has stabilized, count the number of bubbles appearing during a 10 second period. (See chart below for allowable leakage rates.)
7. Repeat the same procedure for valve V2 (port 3). (Energize terminal 2 on the DIN connector to open valve 1)

After completing the above tests proceed as follows:

8. Verify that the downstream manual ball valve is closed, and both automatic safety shutoff valves are de-energized.
9. Remove the flexible hose, and close all test nipples.
10. With the upstream manual ball valve open, energize both automatic safety shutoff valves.
11. Use soapy water to leak test all test nipples to ensure that there are no leaks.
12. If no leakage is detected, de-energize all automatic safety shutoff valves, and open the downstream manual ball valve.

⚠ If leakage values are exceeded, replace valve immediately.

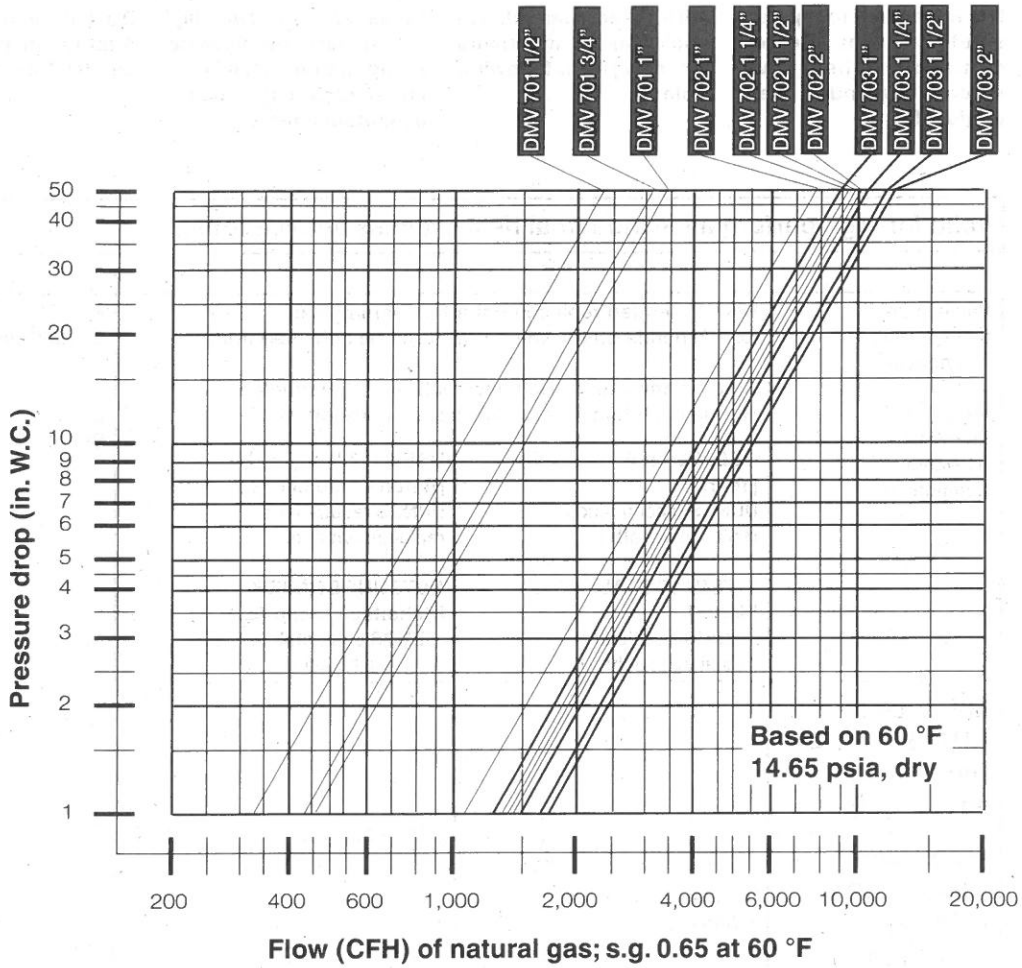


Type	Allowable Valve Seat Leakage* up to 7 PSI inlet	# of Bubbles in 10 s		
		Air	Natural Gas	LP
DMV D(LE) 701/602	239 cc/hr	5	6	4
DMV-D(LE) 702/602	464 cc/hr	9	11	7
DMV-D(LE) 703/602	464 cc/hr	9	11	7

*Based on air and test conditions per UL 429 Section 29. (Air or inert gas at a pressure of 1/4 psig and also at a pressure of one and one-half times maximum operating pressure differential, but not less than 1/2 psig. This test shall be applied with the valve installed in its intended position.) Volume of bubble defined in Table 2 of FCI 70-2-1998.

M/CD • Karl Dungs, Inc. • DMV-D(LE) 7../602 • Edition 2015.09 • P/N 261421

Flow Curve



Pressure Drop for other Gases

To determine the pressure drop when using a gas other than natural gas, use the flow formula below and f value located in the table below to determine the "corrected" flow rate in CFH through the valve for the other gas used. For example, when using propane, divide the volume (CFH) of propane required for the application by the calculated value f (f = 0.66 for propane). Use this "corrected" flow rate and the flow curve on the next page to determine pressure drop for propane.

Determining equivalent flow through valves using another gas

$$\dot{V}_{\text{gas used}} = \dot{V}_{\text{Natural gas}} \times f$$

$$f = \sqrt{\frac{\text{Density of Natural gas}}{\text{Density of gas used}}}$$

Type of gas	Density [kg/m³]	s.g.	f
Natural gas	0.81	0.65	1.00
Butane	2.39	1.95	0.58
Propane	1.86	1.50	0.66
Air	1.24	1.00	0.80

Accessories & Replacement

Coil for	Magnet Type	Order No. for 120 VAC	Order No. for 24 VAC	Order No. for 24 VDC
DMV-D(LE) 701/602	1111	232401	238554	238829
DMV-D(LE) 702/602	1211	232402	238825	238826
DMV-D(LE) 703/602	1212	232403	238822	238823
Printed Wiring Board	**Magnet Type**			
DMV-D(LE) 701/602	1111	238803	238803	238804
DMV-D(LE) 702/602	1211	238806	238806	238807
DMV-D(LE) 703/602	1212	238806	238806	238807

Accessories/Adapter	Order No.	Description
Electrical DIN Connector (DUNGS)	210319	
M20 - ½ NPT Adapter	240671	
Visual Indicator	266949	The indicator mounts to the bottom of the valve and visually displays when the valve is open or closed.
Valve Switch CPI 400	266968	Valve switch with visual indication.
1/4" NPT port 1 or port 2 adapter (reduced port)	225047	
1/2" NPT port 2 pilot / vent adapter (reduced port)	225043	
G 1/8" Test nipple with gasket	219008	
Port 3 pressure switch mounting adapter	214975	
Hydraulic Brake	240458	
Max. Flow Adj. Knob	240457	

Valve Description	Flange	NPT P/N	Rp P/N	O-ring and bolt kit P/N*	FRI mounting Kit P/N**	Integral strainer and Filter replacement
DMV-701	1/2"	222371	222341	224093	219967	230440
DMV-701	3/4"	222368	222342	224093	219967	230440
DMV-701	1"	221999	222001	224093	219967	230440
DMV-702 & 703	1"	222369	222343	224094	219968	230441
DMV-702 & 703	1 1/4"	222370	222344	224094	219968	230441
DMV-702 & 703	1 1/2"	222003	221884	224094	219968	230441
DMV-702 & 703	2"	221997	221926	224094	219968	230441

*Includes two o-rings and two sets of bolts (one set of four bolts for each flange).

**Includes four bolts and one o-ring.

Karl Dungs, Inc.
3890 Pheasant Ridge Drive NE
Suite 150
Blaine, MN 55449, U.S.A.
Phone 763 582-1700
Fax 763 582-1799
e-mail info@karldungsusa.com
Internet http://www.dungs.com/usa/

Karl Dungs GmbH & Co. KG
P.O. Box 12 29
D-73602 Schorndorf, Germany
Phone +49 (0)7181-804-0
Fax +49 (0)7181-804-166
e-mail info@dungs.com
Internet http://www.dungs.com

USA CDN

Replacement safety relevant components
Austausch sicherheitsrelevanter Komponenten

DUNGS®
Combustion Controls

It is necessary to replace safety-relevant components after they have reached the end of their useful life.

DUNGS recommends replacing such components according to the following table:

Es besteht die Notwendigkeit sicherheitsrelevante Komponenten nach Erreichen ihrer Nutzungsdauer auszutauschen.

DUNGS empfiehlt den Austausch gemäss folgender Tabelle:

Valid only for domestic, residential and industrial* heating applications.

***Not valid for high performance industrial heat process applications. See page 2**

Gültig nur für häusliche Heizungsanlagen

Nicht gültig für Thermprozessanwendungen mit Taktbetrieb

Valve Type Safety relevant component Ventil Typ Sicherheits-relevante Komponente	Recommended replacement after years/cycles: ➔ Depends on the value which will be achieved first Empfohlener Austausch nach Jahren/Schaltspielen: ➔ Je nachdem welcher Wert zuerst erreicht wird		Max. Cycle Rate Max. Schalthäufigkeit
	USEFUL LIFE [Years] DUNGS recommends replacement after: NUTZUNGSDAUER [Jahre] DUNGS empfiehlt den Austausch nach:	USEFUL LIFE [Rated Cycle Life (cycles)] DUNGS recommends replacement after: NUTZUNGSDAUER [Schaltspiele (auf/zu)] DUNGS empfiehlt den Austausch nach:	
DMV-(D) SV-(D) MV(D)/602	10 Years 10 Jahre	1,000,000 cycles	500 /h
DMV/MV/SV: LE-Ausführungen (mit Hydraulikbremse) DMV/MV/SV: LE-Versions (with hydraulic brake)	10 Years 10 Jahre	500,000 cycles	20 /h
Gasventil *mit* DUNGS-Ventil-prüfsystem Gas valve *with* DUNGS valve proving system	Austausch nach erkanntem Fehler Replacement after error detection		
VPS 504*	10 Years 10 Jahre	250,000 cycles	20 /h
VDK 200*			15 /h
CPI 400		1,000,000 cycles @ 1 A and 120 VAC 100,000 cycles @ 10 A and 120 VAC	1,000 /h
CPI 401			

* Valve proving system values shown are expected lifetime. NFPA 86 does not require replacing if the expected life has been exceeded.

Änderungen, die dem technischen Fortschritt dienen, vorbehalten
We reserve the right to make modifications in the course of technical development.

Karl Dungs, Inc.
3890 Pheasant Ridge Drive NE
Suite 150
Blaine, MN 55449, U.S.A.
Phone 763 582-1700
Fax 763 582-1799
e-mail info@karldungsusa.com
Internet http://www.dungs.com/usa/

Karl Dungs GmbH & Co. KG
P.O. Box 12 29
D-73602 Schorndorf, Germany
Phone +49 (0)7181-804-0
Fax +49 (0)7181-804-166
e-mail info@dungs.com
Internet http://www.dungs.com

M/CD • Karl Dungs, Inc. • DMV-D(LE) 7../602 • Edition 2015.09 • P/N 261421

USA CDN

Replacement safety relevant components
Austausch sicherheitsrelevanter Komponenten

DUNGS®
Combustion Controls

It is necessary to replace safety-relevant components after they have reached the end of their useful life.

DUNGS recommends replacing such components according to the following table:

Es besteht die Notwendigkeit sicherheitsrelevante Komponenten nach Erreichen ihrer Nutzungsdauer auszutauschen.

DUNGS empfiehlt den Austausch gemäss folgender Tabelle:

Valid for high performance industrial heat process applications!

Valve Type Safety relevant component Ventil Typ Sicherheits-relevante Komponente	Recommended replacement after years/cycles: ➔ Depends on the value which will be achieved first Empfohlener Austausch nach Jahren/Schaltspielen: ➔ Je nachdem welcher Wert zuerst erreicht wird		Max. Cycle Rate Max. Schalthäufigkeit
	USEFUL LIFE [Years] DUNGS recommends replacement after: NUTZUNGSDAUER [Jahre] DUNGS empfiehlt den Austausch nach:	USEFUL LIFE [Rated Cycle Life (cycles)] DUNGS recommends replacement after: NUTZUNGSDAUER [Schaltspiele (auf/zu)] DUNGS empfiehlt den Austausch nach:	
MV ... /602 **NPT ½ - NPT 2** (**no** main flow adjustment)	3 Years 3 Jahre	3,000,000 cycles	1,000 /h
MVD ... /602 **NPT ½ - NPT 1** (**with** main flow adjustment)			
MVD ... /602 **NPT 1¼ - NPT 3** (**with** main flow adjustment)		1,000,000 cycles	
Conditions	**Clean gas (NG, LNG, LPG): maximum 50 micron gas filter required!** **Dry Gas:** ■ **relative humidity** < 60 % ■ **dew point of the gas** < –14 °F		} "dry"

➔ **Not valid for MV(D).../602 valves delivered before 2011/01**

Änderungen, die dem technischen Fortschritt dienen, vorbehalten
We reserve the right to make modifications in the course of technical development.

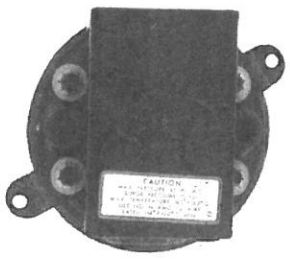
Karl Dungs, Inc.
3890 Pheasant Ridge Drive NE
Suite 150
Blaine, MN 55449, U.S.A.
Phone 763 582-1700
Fax 763 582-1799
e-mail info@karldungsusa.com
Internet http://www.dungs.com/usa/

Karl Dungs GmbH & Co. KG
P.O. Box 12 29
D-73602 Schorndorf, Germany
Phone +49 (0)7181-804-0
Fax +49 (0)7181-804-166
e-mail info@dungs.com
Internet http://www.dungs.com

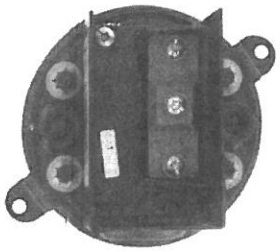
M/CD • Karl Dungs, Inc. • DMV-D(LE) 7../602 • Edition 2015.09 • P/N 261421

Series 1900 Pressure Switch

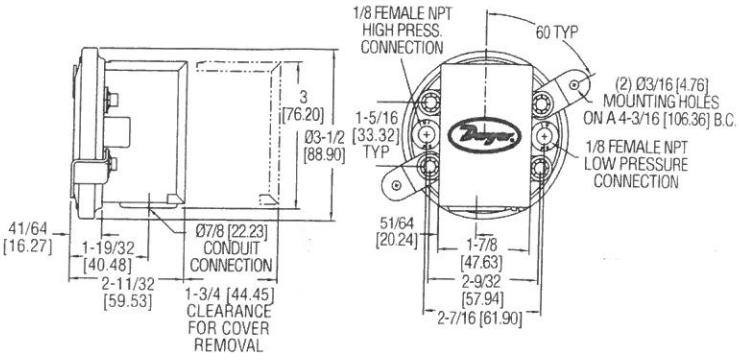
Specifications - Installation and Operating Instructions



Series 1910 pressure switch. All pressure and electrical connections and set point adjustments are on one side for easy installation.



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.

Advanced design and precision construction permit these switches to perform many of the tasks of larger, costlier units. Designed for air conditioning service, they also serve many fluidics, refrigeration, oven and dryer applications. For use with air and non-combustible gases. Series 1900 switches are available with set points of 0.07 to 20 inches water column. Set point adjustment can be made easily - before or after installation. Range screw is inside conduit enclosure to help prevent tampering. For easy mounting and access, pressure and electrical connections and set point adjustment are located on one side. This permits installation in corners or spaces too small for other switches.

SPECIAL MODELS & ACCESSORIES

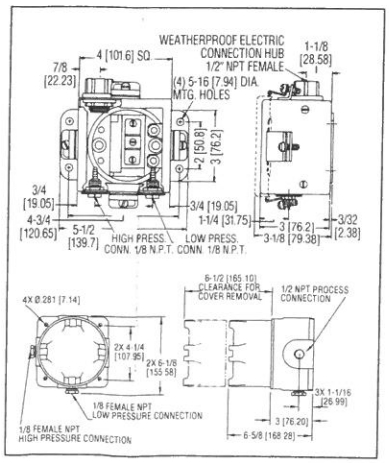
Special close coupled street elbow for right angle pressure connections. Can be installed on switch anytime. Zinc plated aluminum.

Weatherproof Housing

16 ga. steel enclosure with gasketed cover (NEMA 4) for wet or oily conditions. Withstands 200 hour salt spray test. Wt. 5 lbs. (2.3 kg). Switch must be factory installed. Change 1910 base number to 1911 and add -WP suffix. Example: 1911-1-WP.

Explosion-Proof Housing

NEMA 7, 9 NEMA 3. (7 lbs). Switch must be factory installed. Change model to 1911 and add -EXPL suffix. Example: 1911-1-EXPL. Aluminum base and cover rated Class I, Groups C & D, Div. 1. Class II, Groups E, F, & G, Div. 1.



SPECIFICATIONS

Service: Air and non-combustible, compatible gases.
Wetted Materials: Consult Factory.
Temperature Limits: -30 to 180°F (-34 to 82.2°C) (32°F for non dry air).
Pressure Limits: 45″ w.c. (11.2 kPa) continuous, 10 psig (68.95 kPa) surge.
Switch Type: Single-pole double-throw (SPDT).
Repeatability: ±3%.
Electrical Rating: 15 A @ 120-480 VAC, 60 Hz. Resistive 1/8 HP @125 VAC, 1/4 HP @ 250 VAC, 60 Hz. Derate to 10 A for operation at high cycle rates.
Electrical Connections: 3 screw type, common, normally open and normally closed.
Process Connections: 1/8″ female NPT.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Set Point Adjustment: Screw type inside conduit enclosure.
Weight: 1lb. 4.5 oz. (581 g).
Agency Approvals: CE, UL, CSA, FM.
ATEX: For ATEX compliant model change the Series Number to 1911 and add a "-CN" suffix. These versions follow Directive 94/9/EC ATEX compliant for CE Ex II 2 G EEx d IIB T6.

NOTE: For ATEX units wire in accordance with local electrical codes. Cable should enter enclosure housing through an approved EX cable gland (not supplied).

SERIES 1910 SWITCHES — MODELS OPERATING RANGES, DEADBANDS

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

DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, IN 46361, U.S.A.
Phone: 219/879-8000
Fax: 219/872-9057
www.dwyer-inst.com
e-mail: info@dwyer-inst.com

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 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 desireable 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 switcch is actuated and the electrical contacts make or break.

ADJUSTMENT

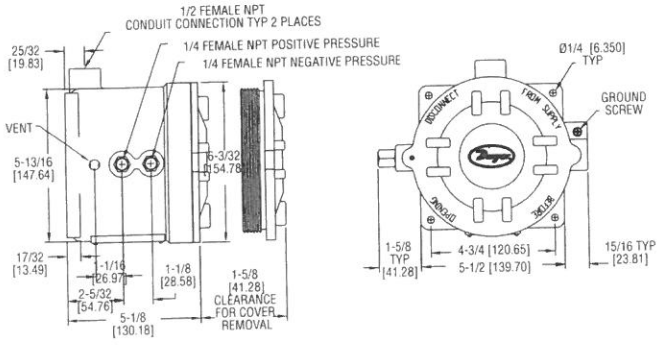
To change the set point, proceed as follows:
A. Remove the snap-on cover from the conduit enclosure by loosening its retaining screw and pulling firmly at its bottom end. Turn the slotted adjustment screw at the top of range spring housing clockwise to raise the set point pressure and counter-clockwise 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 nameplate in an upright position.

C. For highly critical applicaitons 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.

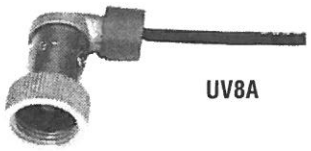


ATEX Compliant Housing
Base number 1911 with -CN suffix.

DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, IN 46361, U.S.A.
Phone: 219/879-8000 **www.dwyer-inst.com**
Fax: 219/872-9057 **e-mail: info@dwyer-inst.com**

UV90

UV1A



UV8A

45UV3

FIREYE®
FLAME SCANNERS

UV non self-checking Scanner Models: UV1A3, UV1A6, UV8A, UV2, UV2A6, 45UV3, UV90-3. UV90-6, UV90-9

For UV self-check Scanners refer to SC-101
For Infrared Photocell Scanners refer to SC-103

c UL us LISTED

FM APPROVED

DESCRIPTION

The UV1A3/6, UV2/UV2A6, 45UV3, UV90-3/6/9 Scanners are used with the M-Series, M-Series II, MicroM, FlameWorx, MB-2 and D-Series controls as well as the Fireye FLAME-MONITOR™, BurnerLogix and Nexus System. The UV1A3/6 scanners come with 3 ft. and 6 ft. cables rated for Tray Cable - Exposed Run (TC-ER) and complies with the crush and impact requirements of the standard for metal clad cable, UL 1569. The UV2 (36 inch) and UV2A6 (72 inch) are fitted with a 3/8" NPT female to 1/2" NPT male adapter fitted into the 1/2" threaded coupling of the UV1A3/6 respectively. The UV90-3/6/9 is available with 3 ft., 6 ft. and 9 ft. shielded flexible cables.

The UV8A Scanner is a 90° right angle ultraviolet flame scanner used in conjunction with the M-Series, M-Series II, MicroM, FlameWorx, MB-2 and D series controls as well as the Fireye® FLAME-MONITOR™, BurnerLogix and the Nexus System. It is available only with 72 inch (1830mm) unshielded lead wires.

The 45UV3 Scanner has a rugged cast housing that mounts on a 3/4 inch pipe with sleeve and set-screw. The replaceable UV tube is mounted in a vertical position for greater sensitivity. Non self-checking.

The UV90 Series Scanners are designed for front and lateral (90°) mounting which, in some applications allow the scanners to obtain a clearer view of the flame. The UV90, with its exclusive snug-fit mounting block, eliminates the need for a threaded sight pipe.

The UV tube is made of quartz and is filled with a gas that ionizes when struck by UV radiation from the flame. In the absence of UV radiation, the gas acts as an insulator between two electrodes which are mounted inside the tube. These electrodes are energized continuously by a high voltage. During combustion, UV radiation ionizes the gas, causing current pulses to flow between the electrodes. These current pulses result in a flame signal which is transmitted to the amplifier in the control, where it is processed to energize or hold in the flame relay.

WARNING: When installing or replacing UV scanners, a minimum pilot turndown test on pilot ignited burners and a spark pickup test on all burners must be performed. Refer to bulletins E-1101, C-4000, MC-5000 or BurnerLogix for recommended procedures.

APPLICATION

UV scanners are recommended for detecting flames from standard fuel gases, some waste gases and light oil fuels such as No. 2 oil. Flames from heavier oils can be detected with UV scanners but the unburned fuel shroud and/or atomization shroud can block passage of the UV from the flame zone to the UV tube, causing nuisance burner/boiler trips. Infrared detection is recommended for fuel oil heavier than No. 2, and some installations where waste gases are burned together with natural gas as a main flame.

NOTE: Certain safety codes and regulations require the use of self-checking ultraviolet scanners. For information on self-checking UV scanners, refer to Bulletin SC-101.

SPECIFICATIONS

Operating Voltage: (S1-S2): 560 VAC @120V (230V) 50/60 Hz applied

Operating Temperature Limits: Maximum: 200° F (94° C)
Minimum: -40° F (-40° C)

Humidity: 85% RH maximum non-condensing

UV1A3: *	$^1/_2$" NPT, 36" (915mm) shielded leads
UV1A6: *	$^1/_2$" NPT, 72" (1830mm) shielded leads
UV8A:	$^1/_2$" NPT, 72" (1830mm) unshielded leads, 90° right angle mount
UV2: *	$^3/_8$" NPT, 36" (915mm) shielded leads
UV2A6: *	$^3/_8$" NPT, 72" (1830mm) shielded leads
45UV2-1020	1" NPT mount 60 Hz, 72" (1830mm) unshielded leads - **OBSOLETE**
45UV3-1050	$^3/_4$" Sleeve/setscrew mount, 72" (1830mm) unshielded leads
UV90-3	36" (915mm) shielded leads
UV90-6	72" (1830mm) shielded leads
UV90-9	108 " (3660mm) shielded leads

For scanner dimensions refer to Figures 2 and 4.
Consult factory for custom lead lengths.

*** Comply with NEMA 4X**

IMPORTANT NOTE

The information provided in this bulletin is directed to assist boiler and combustion service technicians who are experienced in the installation and operation of Fireye Flame Safety equipment. Persons not familiar with Fireye products should contact the nearest Fireye representative or other qualified service group.

The UV1A, UV2, UV8A, 45UV3 and UV90 as well as all other Fireye scanners, are designed to be used exclusively with the appropriate Fireye Flame safeguard and Burner Management controls. The application of these scanners to other than Fireye equipment should be reviewed for approval by Fireye.

APPLICATION REFERENCE

UV1A, UV2, UV8A, 45UV3 and UV90 can be used only with the following FIREYE flame safeguard controls.

FIREYE FLAME-MONITOR	MB-2 SERIES	MicroM & M-SERIES II	D SERIES	PFM ADAPTOR KITS	FLAMEWORX	NEXUS	BURNERLOGIX
To be used with EUV1 Amplifier Card	Use with 61-3359 UV Amplifier	MAUV1 MAUV1T MEUV1 MEUV4	All D-Series using 72DUV1 Amplifier	PFM2UV PFM3UV	MBUV-300D MBUV-310D	NX3000 NX3100 NX4000 NX4100	YB110UV YB230UV

CAUTION: The UV1A, UV2, UV8A, 45UV3 and UV90 ultra-violet flame scanners and associated amplifier modules are non-self checking UV systems and should be applied only to burners that cycle often (e.g.: a minimum of once per 12 hours) in order for the safety checking circuit to be exercised. If component checking is required during burner operation for constantly fired burners, utilize the self-checking ultra-violet flame scanners (45UV5) with associated amplifier module (EUVS4), (MEUVS, (MBUVS) or YB110UVSC or the infrared flame scanner (48PT2) with associated Auto Check amplifier (E1R1, E1R2, E1R3, MEIR1, MEIR4, YB110IR).

FIGURE 1. TYPICAL SCANNER MOUNTING

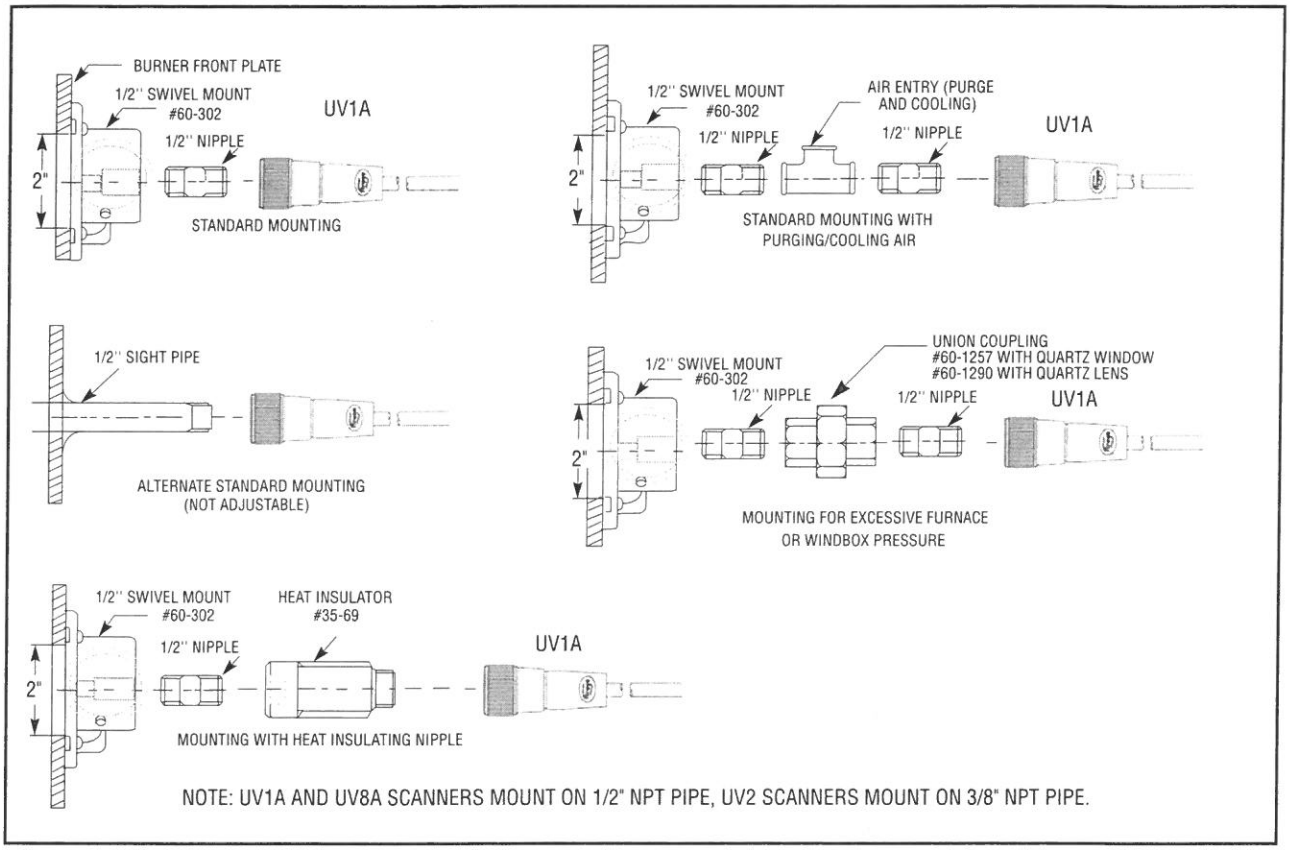
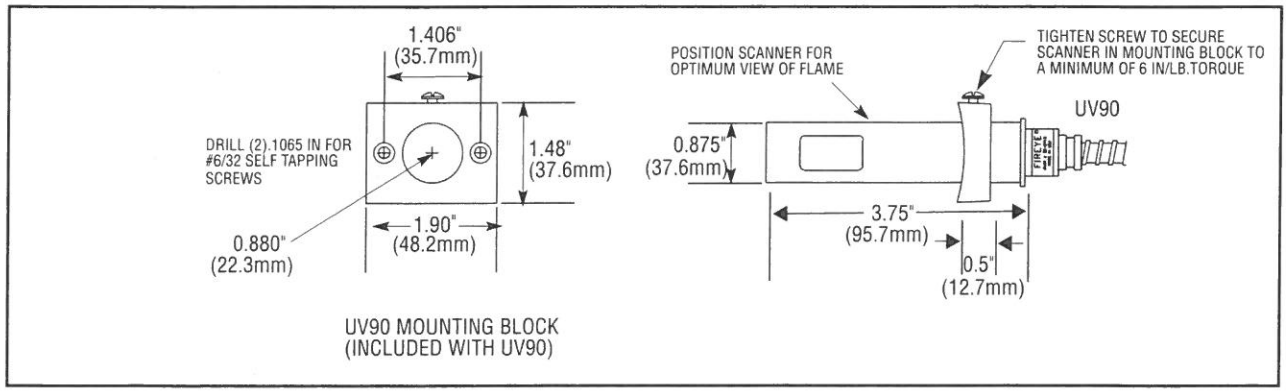


FIGURE 2. SCANNER MOUNTING FOR UV90



ACCESSORIES

PART NUMBER	DESCRIPTION
60-302	$^1/_2$" Swivel Union
35-69	Heat Insulator $^1/_2$" NPT threads each end, (male x female).
60-1257	$^1/_2$" NPT Union with quartz window
60-1290	$^1/_2$" NPT Union with quartz lens to increase sensitivity
4-314-1	Replacement UV tube for 45UV3

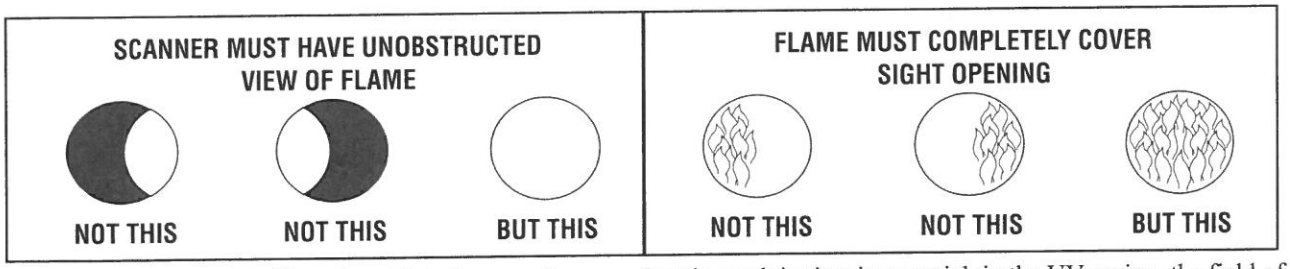
INSTALLATION OF UV1A, UV2, UV8A, 45UV3, UV90 SCANNERS

WARNING: THE LEADS FROM THE UV8A SCANNER TO THE CONTROL MUST BE SHIELDED TO PREVENT ELECTRICAL NOISE FROM GENERATING A FALSE FLAME SIGNAL TO THE CONTROL.
Where possible, obtain the Burner Manufacturer's Instructions for mounting the scanner. This information is available for most standard burners. The scanner mounting should comply with the following General Instructions:

The following UL standards have been revised and now allow the use of TC-ER rated cable on Commercial boilers and burners:

- UL 295: Commercial - Industrial Gas Burners – Sections 10.1.6, 10.1.9, and 11.2.2.
- UL 296: Oil Burners – Sections 31.1.8, 31.1.11, and 32.2.2.
- UL 726: Oil fired Boiler Assemblies – Sections 15.1.6, 15.1.9, and 16.1.6.
- UL 795: Commercial - Industrial Gas Heating Equipment – Section 12.5.

1. The quartz UV tube is brittle. Care must be exercised to avoid dropping or otherwise striking the scanner with force. Keep the scanner protected until mounted.
2. Position the UV scanner within 36 inches of the flame to be monitored.
3. Select a scanner location that will remain within the ambient temperature limits of the UV Scanner (200°F). If cooling is required, use an insulating coupling (Fireye P/N 35-69).
4. The UV Scanners are designed to seal off against pressures up to 1 PSI. To seal against higher pressures, install a union coupling with quartz window (P/N 60-1257). Add cooling air to reduce the scanner sight pipe temperature. (Not applicable to UV90).
5. Install the scanner on a standard 1/2 in. NPS (3/8 in. for UV2/UV2A6, 3/4 in. NPT for 45UV) pipe whose position is rigidly fixed. If the scanner mounting pipe sights through the refractory, do not extend it more than halfway through. Swivel flanges are available if desired (P/N 60-302). The sight pipe must permit an unobstructed view of the pilot and/or main flame, and both pilot and main flames must completely cover the scanner field of view. Oil and gas flames radiate more ultraviolet energy from the base of the flame than from further out in the flame. This fact should be considered when installing the scanner sight pipe.



6. Since the radiated energy from an electric spark ignitor is very rich in the UV region, the field of view should be aimed so that it does not see an electric spark ignitor nor any reflector that is close to the spark.

CAUTION: The unprotected leads must be run in electrical conduit in order to eliminate pickup of electrical noise which could present an unsafe condition.

To prevent spark pickup by the UV detector, close and/or disconnect all pilot and main fuel valves. Operate the control through a burner startup cycle to determine that ignition spark cannot be detected. Burner will not ignite if spark is detected.

7. Avoid running the scanner cables or conduit in close proximity to hot surfaces at the burner.
8. Avoid running the scanner conduit in close proximity to high energy ignition wires.
9. Smoke or unburned combustion gases absorb ultraviolet radiation. On installations having negative pressure combustion chamber, a small hole drilled in the scanner sight pipe will assist in keeping the pipe clean and free of smoke. For positive pressure furnaces, provide clean air to pressurize the sight pipe, if necessary.
10. Two UV Scanners may be installed on one burner if it is necessary to view two areas to obtain reliable detection of the flame. They should be wired in parallel.
11. To increase scanner sensitivity with the UV Scanners, a quartz lens permits location of the scanner at twice the normal distance. (Union w/quartz lens P/N 60-1290).
12. Request the assistance of any Fireye Field Office for recommendations of a proper scanner installation on a non-standard application.

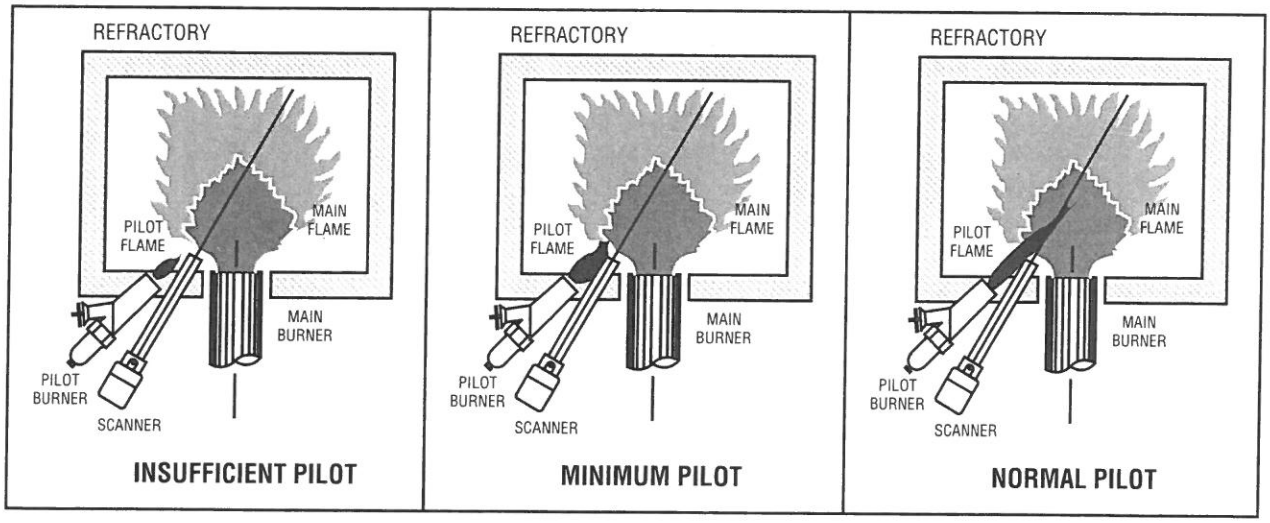
CAUTION: Ultra-violet tubes can simulate flame when exposed to high levels of "X" and GAMMA radiation. The table below indicates the maximum dose of radiation that a UV tube can be exposed to safely.

SOURCE	MAXIMUM DOSE	
Cobalt 60 (CO_{60})	7.5mR/Hr	
Iridium 192 (IR_{192})	1.0mR/Hr	
X-Ray	4mR/Hr	150kV @ 0.2mA
X-Ray	1mR/Hr	150kV @ 5mA

Minimum Pilot Test

This test assures that the flame detector will not detect a pilot flame too small to reliably light off the main flame. The test should be made on every new installation and following any repositioning of the flame detector. THE MINIMUM PILOT TESTS MUST BE ACCOMPLISHED BY A TRAINED AND QUALIFIDED BURNER TECHNICIAN.

FIGURE 3.



SPARK REJECTION TEST. CAUTION: The scanner must not sight the ignition spark directly or any part of the burner that can reflect the spark back to the scanner. the scanner must not see a pilot flame that is too small to reliably ignite the main flame. Test procedures vary according to the control used. See procedures as described in the technical bulletin for the control being installed.

WIRING - UV SCANNERS

To connect the scanner to the control, the UV1, UV2 and UV90 Scanners are supplied with up to 96" of flexible cable. Consult factory for custom lead lengths.

Wiring Instructions:

Wire the black and red wires (18 AWG) on the UV1A / UV2 flame scanner to terminals S1 and S2 on the Fireye flame safeguard control. **There is no polarity associated with the wire colors. Either wire (red or black) can be wired to either terminal (S1 or S2).**

Shield and Drain Wire:

The scanner provides a shield and drain wire that are internally bonded to the metal threaded ½" NPT coupling nut. This allows a conduit clamp to provide an electrical ground around the exposed shield when entering a metal junction box or control cabinet, or connect the drain wire to a suitable ground connection when using a non-metalic (or metallic) junction box or control cabinet.

Conduit required:

On those applications where conduit is required for the UV1A/UV2 scanner, Fireye recommends the Thomas and Betts 449-TB (or suitable) fitting which is used to couple 3/8" flexible metal conduit to 1/2" EMT conduit. The set screw on the fitting bites into the plastic on the UV1A / UV2 scanner and seats onto the metal casing below, providing a secure connection.

The 45UV3 is supplied with 72 in. (1830mm) lead wires. Install them in a suitable length of flexible armor cable and connect it to the control. A conduit connector is supplied with the scanner. Connect black wires (UV tube) of the 45UV3 to terminals S1 & S2 of the appropriate P-Series.

If it is necessary to extend the scanner wiring, the following instructions apply:
Scanner wires should be installed in a separate conduit. The wires from several scanners may be installed in a common conduit.

The voltage applied to UV scanners is nominally 560 VAC with no flame present.

Selection of Wire

1. Use #14, 16, or 18 wire with 75° C, 600 volt insulation for up to 100 foot distances (signal loss approximately 20% at 100 feet).
2. For extended scanner wiring up to 500 feet, or for shorter lengths to reduce signal loss, use a shielded wire (Belden 8254, RG-62/U coaxial cable, or equal) for ***each*** scanner wire. The ends of the shielding must be taped and **not** grounded.
3. Asbestos insulated wire should be avoided.
4. Multiconductor cable is not recommended.
5. High voltage ignition wiring should **not** be installed in the same conduit with flame detector wires.

CAUTION: Keep scanner leads well clear of ignition high voltage wiring or any other high voltage or high current wiring in order to prevent false signal pickup in the scanner leads.

WARNING: Protective filtered lenses should be worn when viewing flame. Infrared and ultraviolet energy can be damaging to the eyes.

MAINTENANCE

Ultraviolet Scanners

The viewing area of the scanner must be kept clean. Even a small amount of contamination on the lens will reduce the flame signal reaching the detector by a measurable amount. Wipe the viewing area routinely using a soft cloth dampened with concentrated detergent, then wipe dry.

Flame Signal Strength

Routine observation of the flame signal strength will forewarn any deterioration in the capability of the flame detector or its application.

Periodic Safety Check

It is recommended that a procedure be established to test the complete flame safeguard system at least once a month,. This test should verify the proper operation of all limit switches and safety interlocks as well as flame failure protection and fuel safety shutoff valve tightness.

Rotation

It is recommended that control and scanner units purchased as spares be installed periodically to ensure proper operation.

TROUBLESHOOTING NON SELF-CHECKING UV SCANNERS

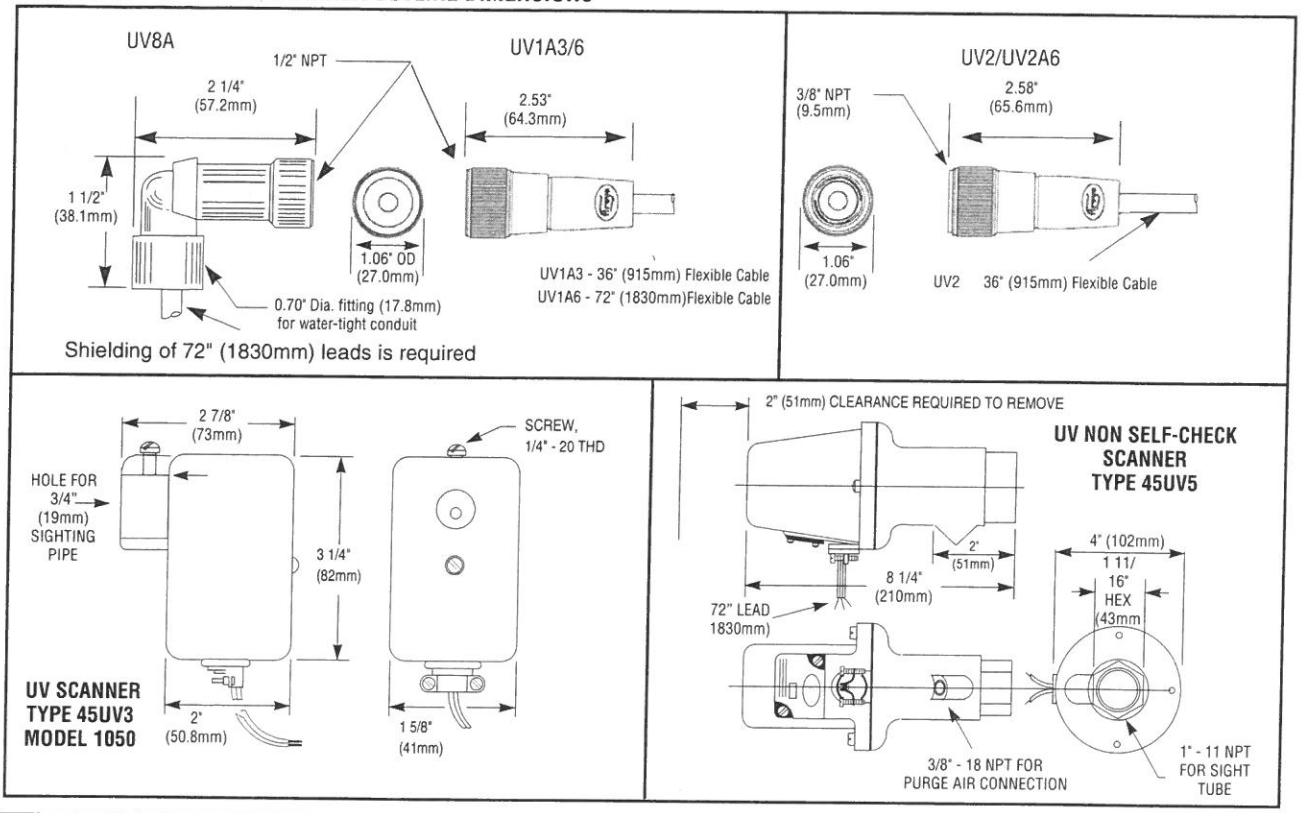
ZERO OR LOW FLAME SIGNAL

1. Zero volts at test jacks on control.
   — Make sure scanner has good view of the first $^1/_3$ of flame. Reposition scanner for best flame signal. If no signal . . .
2. Check for approximately 560 VAC across S1-S2 on control, with no flame present, as follows:
   — Use meter with 20k ohms/volt sensitivity.
   — Deenergize control.
   — Close and secure all fuel valves.
   — Energize control and measure voltage across S1-S2.
3. If voltage across S1-S2 is acceptable . . .
   — With control energized, remove scanner from burner and bring it to within a few inches of a UV source such as a gas lighter or propane torch.
   — Check for flame signal at control.
4. If no flame signal . . .
   — Make sure scanner lens is clean and dry.
   — Deenergize control and check continuity of leads between scanner and control.
   — Replace scanner
   — Replace amplifier or control.
5. If voltage across S1-S2 is low, check L1-L2 for proper line voltage. If line voltage is good:
   — Deenergized control, remove scanner lead wires from terminals S1 and S2.
   — Energize control and recheck for proper voltage across S1 and S2.
   — If voltage across S1 and S2 is good, replace scanner or lead wires.
   — If voltage across S1 and S2 is low, replace amplifier or control.

FALSE FLAME SIGNAL

1. Control will not start burner.
   — Check control wiring, all limits and interlocks.
   — Verify flame signal at test jacks upon energizing control.
2. Flame signal appears at test jacks when no flame is in combustion chamber.
   — Deenergize control to remove scanner leads from S1-S2.
   — Close and secure all fuel valves.
   — Energize control.
   — Check for induced voltage pickup to amplifier.
3. Burner starts up with scanner removed from S1-S2.
   — Deenergize control and connect scanner to S1-S2.
   — Energize control.
   — Check scanner for runaway condition. Look for a blue glow in the UV tube.
   — If glow is present, replace scanner.
   — If no glow is present, check to see that scanner leads are well clear of ignition or other noise carrying lines.
4. Burner does not start up even with scanner removed from S1-S2.
   — Check control wiring, all limits and interlocks.
   — Replace control/amplifier.

FIGURE 4. UV SCANNER OUTLINE DIMENSIONS



WARNING: The leads from the UV1A, UV8A and UV90 Scanners to the control must be shielded to prevent electrical noise from generating a false flame signal to the control.

NOTICE

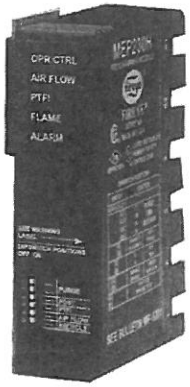
When Fireye products are combined with equipment manufactured by others and/or integrated into systems designed or manufactured by others, the Fireye warranty, as stated in its General Terms and Conditions of Sale, pertains only to the Fireye products and not to any other equipment or to the combined system or its overall performance.

WARRANTIES

FIREYE guarantees for *one year from the date of installation or 18 months from date of manufacture* of its products to replace, or, at its option, to repair any product or part thereof (except lamps, electronic tubes and photocells) which is found defective in material or workmanship or which otherwise fails to conform to the description of the product on the face of its sales order. **THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES AND FIREYE MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.** Except as specifically stated in these general terms and conditions of sale, remedies with respect to any product or part number manufactured or sold by Fireye shall be limited exclusively to the right to replacement or repair as above provided. In no event shall Fireye be liable for consequential or special damages of any nature that may arise in connection with such product or part.

FIREYE
3 Manchester Road
Derry, New Hampshire 03038 USA
www.Fireye.com

SC-102
JUNE 17, 2015
Supersedes March 28, 2013



MEP230, MEP230H, MEP235, MEP236, MEP237, MEP238, and MEP290 PROGRAMMER MODULES

FOR USE WITH THE FIREYE® MODULAR MicroM™ CONTROL TO BE USED WITH WITH MEC120 AND MEC230 CHASSIS

C UL US LISTED

FM APPROVED

DESCRIPTION

The Fireye MEP230, MEP230H, MEP235, MEP236, MEP237, MEP238 and MEP290 Programmer Modules are used with the Fireye Modular MicroM control. The operational characteristics of the control are determined by the selection of the programmer module. The programmer module incorporates a plug-in design for easy installation.

These programmer modules are equipped with a series of dipswitches to select Purge Timing, Pilot Trial for Ignition (PTFI) Timing, Air Flow Proven, Open at Start, and Recycle or Non-Recycle operation. LED indicator lights are on all programmer modules, indicating the operating status of the control as well as providing diagnostic codes during lockout.

Flame Failure Response Time (FFRT) is determined by the selection of the amplifier module. Test jacks are also provided on the flame amplifier module to permit flame signal measurement during operation. For proper and safe application of this product, you must refer to Fireye bulletin MC-5000 for a detailed description of the various programmer modules, including installation instructions, amplifier selection, operating sequences for each programmer module, etc.

WARNING: Selection of this control for a particular application should be made by a competent professional, licensed by a state or other government agency. Inappropriate application of this product could result in an unsafe condition hazardous to life and property. Installation should not be considered complete until pilot turndown and other appropriate performance tests have been successfully completed.

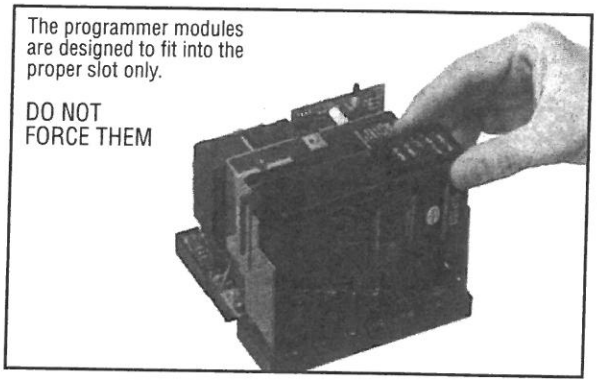
PROGRAMMER MODULE SELECTION

MicroM Programmer Models (For use with MEC120 and MEC 230 Chassis)	
MEP230	Selectable purge timing (7, 30, 60, 90 seconds) PTFI timing, recycle/non-recycle, post purge, prove air open at start.
MEP230H	Same as MEP230 with 8 second pilot stabilization.
MEP235	Same as MEP230 with lockout on air flow open 10 seconds after the start of a cycle, selectable recycle/nonrecycle lockout on air flow open after flame is proven and dedicated lockout after loss of flame.
MEP236	Same as MEP230 with additional 6 second igniter on time with main fuel. To be used with intermittent pilot only.
MEP237	Same as MEP230 with check/run switch. Provides operation with 85UVF4-1WR Phoenix scanner and MEDC2 amplifier.
MEP238	Same as MEP230. Ignition de-energized 3 seconds after pilot flame detected. Provides 8 second pilot stabilization period.
MEP290	Same as MEP230 except selectable post purge is 0 or 90 seconds.

WARNING: Remove power from the control and remove the control from its wiring base before proceeding.

INSTALLATION

The Programmer Modules are used with the Fireye modular MicroM Chassis (P/N MEC120, MEC120RC, MEC120R, MEC120D, MEC120RD and MEC120C for 120VAC and MEC230 for 230 VAC). They are installed in the chassis by grabbing hold of the programmer module by the ridged finger grips on the side on the module, aligning the module with the guide slots on the opening farthest from the transformer, and inserting the module into the pin connectors.



PROGRAMMER DIPSWITCH SETTINGS

NOTE: The dipswitch settings become permanently stored within the programmer's eeprom memory after 8 hours of continuous electrical operation. This allows sufficient opportunity to make the appropriate selection, test and checkout the system. Once stored, the settings cannot be altered.

The MEP200 series programmers have a series of 6 dipswitches which allow the user to program the purge timing, trial for ignition timing, enable post purge, enable proof of air flow open proven and start and select recycle/non-recycle operation.

MicroM Programmer Dip Switch Configuration

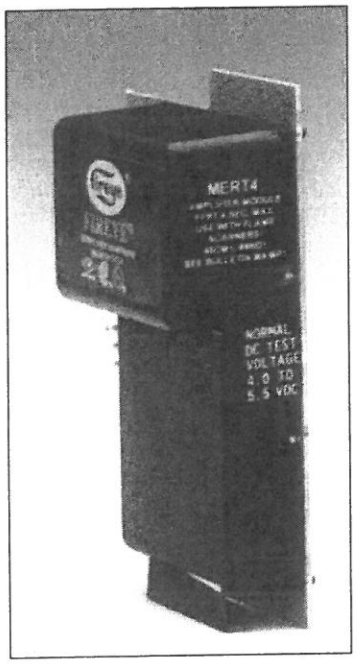
SWITCH						FUNCTION	
6	5	4	3	2	1		
				C	C	7	PURGE TIME SECONDS
				C	O	30	
				O	C	60	
				O	O	90	
			C			DISABLED	POST* PURGE
			O			15 SECONDS	
		C				5	PTFI TIME
		O				10	
	C					DISABLE	PROVE AIR FLOW
	O					ENABLE	
C						RECYCLE	
O						NON-RECYCLE	

* The MEP290 Programmer module has selectable post purge of 90 seconds.

Note: C refers to switch closed position, and closed position is when the switch is toward the printed circuit board. O refers to open switch position or when the switch is moved away from the printed circuit board.

FIREYE
3 Manchester Road
Derry, New Hampshire 03038 USA
www.fireye.com

MP-5201
APRIL 3, 2013
Supersedes April 2004



MEUV1, MEUV4,MEUVS1, MEUVS4, MEIR1, MEIR4, MERT1, MERT4, MECD1 and MECD4

AMPLIFIER MODULES FOR USE WITH THE FIREYE® MODULAR MicroM™ CONTROL

c UL US LISTED

FM APPROVED

DESCRIPTION

The Fireye MEUV1, MEUV4, MEUVS1, MEUVS4, MERT1, MERT4, MEIR1, MEIR4, MECD1 and MECD4 are Amplifier Modules used with the Fireye Modular MicroM control. These amplifier modules provide flame scanning capabilities using any of the Fireye standard ultraviolet scanners, self-check scanners, infrared scanners, cadmium sulfide scanners and flame rods. The Flame Failure Response Time (FFRT) of the control is determined by the selection of the amplifier module (see Ordering Information). Test jacks are provided on the amplifier modules to permit flame signal measurement during operation and is a uniform 0-10 vdc for all models.

After scanner selection, the proper amplifier module **must** be used in the Modular MicroM chassis (see Ordering Information). The amplifier module incorporates a plug-in design for ease of installation.

The programmer module determines the operational characteristics of the control (e.g. relight, purge timing, etc.).

For proper and safe application of this product, you must refer to bulletin MC-5000 for a detailed description of the operation of the Modular MicroM control, including installation instructions, operating sequences for the programmer modules, etc. Also follow the scanner installation and wiring instructions found in bulletins MC-5000 for proper flame scanning operation.

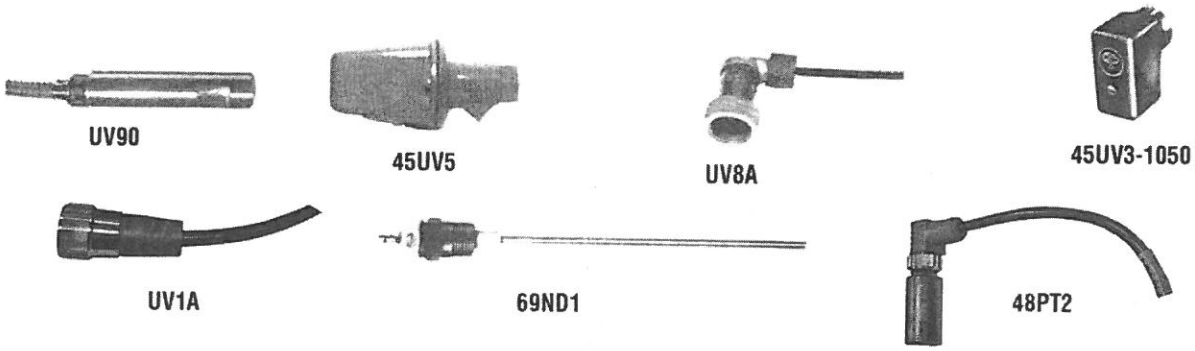
WARNING: Selection of this control for a particular application should be made by a competent professional, licensed by a state or other government agency. Inappropriate application of this product could result in an unsafe condition hazardous to life and property. Installation should not be considered complete until pilot turndown and other appropriate performance tests have been successfully completed.

ORDERING INFORMATION

Flame Amplifier Selection:

MicroM Amplifier Models:	
MEUV1	UV amplifier,0.8 second FFRT, uses UV1A, UV2, UV8A and 45UV3-1050 scanners.
MEUV4	UV amplifier, 4 second (max) FFRT, uses UV1A, UV2, UV8A and 45UV3-1050 scanners.
MEUVS1	UV Self-Check amplifier,0.8 second FFRT, uses 45UV5-1009 scanner.
MEUVS4	UV Self-Check amplifier, 4 second (max) FFRT, uses 45UV5-1009 scanner.
MERT1	Flame Rod / Photocell amplifier,0.8 second FFRT, uses 69ND1 or 45CM1 (obsolete).
MERT4	Flame Rod / Photocell amplifier, 4 second (max) FFRT, uses 69ND1 or 45CM1 (obsolete).
MEIR1	Infrared amplifier0,.8 second FFRT, uses 48PT2 scanner.
MEIR4	Infrared amplifier, 4 second (max) FFRT, uses 48PT2 scanner.
MECD1	Cadmium sulfide amplifier,0.8 second FFRT, uses CS1A5 scanner.
MECD4	Cadmium sulfide amplifier, 4 second (max) FFRT, uses CS1A5 scanner.

FLAME SCANNERS



CAUTION: The UV1, UV2, UV8A, UV90 and 45UV3 ultra-violet flame scanners and associated amplifier modules are non self-checking UV systems and should be applied only to burners that cycle often (e.g.: a minimum of once per 12 hours) in order for the safety checking circuit to be exercised. If component checking is required during burner operation for constantly fired burners, utilize the self-checking ultra-violet flame scanners (45UV5) with associated amplifier module (MEUVS1, MEUVS4) or the infrared flame scanner (48PT2) with associated Auto Check amplifier (MEIR1, MEIR4).

UV SCANNERS:		BULLETIN
UV1A3	1/2" NPT connector, 3 ft. (914mm) TC-ER cable, non self-checking.	SC-102
UV1A6	1/2" NPT connector, 6 ft. (1828mm) TC-ER cable, non self-checking.	SC-102
UV2	3/8" NPT connector, 3 ft. (914mm) TC-ER cable, non self-checking.	SC-102
UV8A	1/2" NPT 90° head, 6 ft. unshielded leads.	SC-102
45UV3-1050	3/4" sleeve/set screw mount. Non self-checking.	SC-102
45UV5-1009	UV self-check scanner 8 ft. (2400mm) leads. 1" NPT threads. 120 VAC shutter. Use with MEUVS type amplifier.	SC-101
UV90-3	UV, 90° lateral view, 3 ft. (914mm) flex conduit	SC-102
UV90-6	UV, 90° lateral view, 6 ft. (1828mm) flex conduit	SC-102
UV90-9	UV, 90° lateral view, 9 ft. (2742mm) flex conduit	SC-102

FLAME DETECTORS:		BULLETIN
45CM1-1000	Photocell with filter.	OBSOLETE
45CM1-1000Y	Photocell without filter.	OBSOLETE
69ND1-1000K4	12 inch flame rod, 1/2" NPT connector.	SC-103
69ND1-1000K6	18 inch flame rod, 1/2" NPT connector.	SC-103
69ND1-1000K8	24 Inch flame rod, 1/2" NPT connector.	SC-103

INFRARED SCANNERS:		BULLETIN
48PT2-1003	Infrared scanner 8 ft. (2400mm) TC-ER cable, straight head.	SC-103
48PT2-1007	Infrared scanner 4 ft. (1200mm) TC-ER cable, straight head.	SC-103
48PT2-9003	Infrared scanner 8 ft. (2400mm) TC-ER cable, 90° head.	SC-103
48PT2-9007	Infrared scanner 4 ft. (1200mm) TC-ER cable, 90° head.	SC-103
48PT2-9007W	Infrared scanner 4 ft. (1200mm) shielded cable, 90° head, water repellent. OBSOLETE, Replaced by 48PT2-9007	SC-103

CADMIUM SULPHIDE:	
CS1A5	Cadmium sulfide 5', with mounting bracket

Parts and Accessories

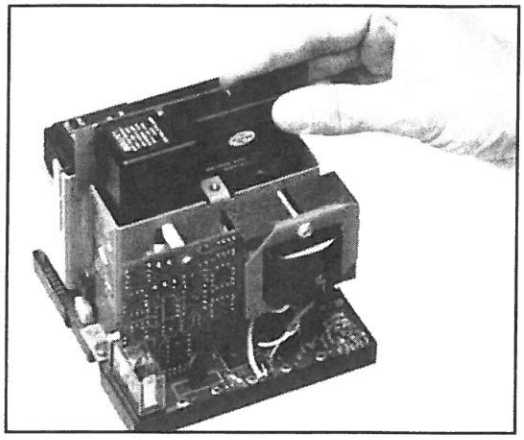
Part Number	Description
4-263-1	Firetron cell for 48PT2 only.
4-314-1	UV tube for 45UV5-1005-1009, 45UV2, 45UV3.
10-88	Set of 3 orifice plugs ($^1/_{16}$", $^1/_8$", $^3/_{16}$") for 48PT1, 48PT2.
19-30	Pyrex window for 60-801 union.
35-69	Heat insulator, $^1/_2$" connection for 48PT, UV1A.
35-75	Water cooled adapter for 48PT, UV1A.
35-127-1	Heat insulator. 1" NPT for 45UV5.
46-38	Replacement lens (1.25" dia.) for 45UV5,.
46-56	Quartz magnifying lens for 45UV3, (1" dia.).
46-58	Quartz (1"dia.) lens for 60-1290 union.
60-302	Swivel mtg. adapter, $^1/_2$" NPT for 48PT1, 48PT2, UV1A.
60-801	$^1/_2$" union with Pyrex window for 48PT1, 48PT2.
60-1199-1	Coupling with quartz window, 1" NPT for 45UV2, 45UV3, 45UV5.
60-1199-2	Coupling with quartz window, 1" BSP for 45UV2, 45UV3, 45UV5.
60-1257	Union with quartz window, $^1/_2$" NPT for UV1A.
60-1290	Union with quartz lens, $^1/_2$" NPT for UV1A.
60-1664-3	Swivel mount adapter, 1" NPT for 45UV5 scanners.
61-436	Lens cap (standard) for 48PT scanners.
61-2914	Shutter and bracket assembly only for 45UV5-1009.
61-3263	Shutter, bracket and lens assembly with lens holder and gasket for 45UV5-1005-1009, 1105 (includes a 61-2914).
82-95	Lens holder for 45UV5 scanner.
92-45	Quartz window used in 45UV3-1050 and 60-1237 union.
92-48	Quartz window used in 60-1199 union.
124-13	"O" Ring used in 60-1199 union.
124-14	"O" Ring used in 60-801, 60-1257, 60-1290.

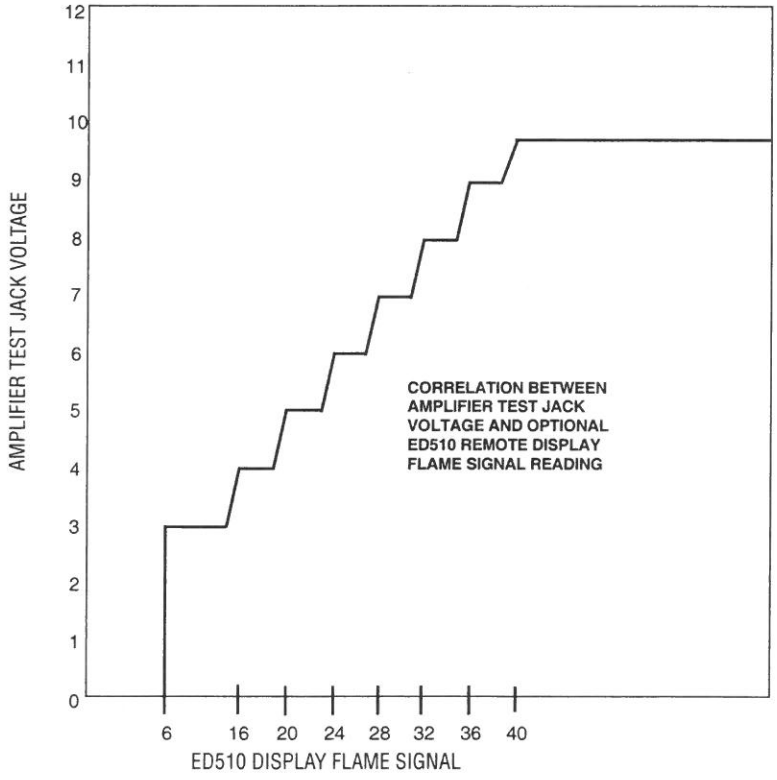
Remove power from the control and remove the control from its wiring base before proceeding.

INSTALLATION

The amplifier modules are used with the Fireye Modular MicroM Base Chassis (P/N MEC120, MEC120C, MEC120R, MEC120D, MEC120RC for 120VAC, P/N MEC230, for 230VAC). They are installed in the chassis by grabbing hold of the amplifier module by the edges of its printed circuit board, aligning the module with the guide slots on the opening in the middle of the chassis, and inserting the module into the pin connectors.

The amplifier modules are designed to fit in the proper slot only. **DO NOT FORCE THEM.**





WARRANTIES

FIREYE guarantees for *one year from the date of installation or 18 months from date of manufacture* of its products to replace, or, at its option, to repair any product or part thereof (except lamps, electronic tubes and photocells) which is found defective in material or workmanship or which otherwise fails to conform to the description of the product on the face of its sales order. **THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES AND FIREYE MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.** Except as specifically stated in these general terms and conditions of sale, remedies with respect to any product or part number manufactured or sold by Fireye shall be limited exclusively to the right to replacement or repair as above provided. In no event shall Fireye be liable for consequential or special damages of any nature that may arise in connection with such product or part.

FIREYE®
3 Manchester Road
Derry, New Hampshire 03038 USA
www.fireye.com

MAMP-1
APRIL 3, 2013
Supersedes September 10, 2012