



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 and Warranty Registration Card are important to both of us for two reasons:

1. Your Registration Card, with proper serial number, will be documented in our files and your written warranty will be forwarded to you upon the receipt of this card. Please complete and mail the return card now.
2. 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 the distributors, our factory representatives or directly from the factory. It is the obligation of our franchised 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.

Sincerely yours,

A handwritten signature in black ink that reads 'Matthew K. Walter'. The signature is written in a cursive, flowing style.

Matt Walter
CEO

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DO NOT REMOVE THIS PAGE

In accordance with the National Electric Code, A.G.A., Canadian Standard Association, O.S.H.A., N.F.P.A., and the F.I.A. recommendations, this specification sheet must remain a part of this manual. Most of the components are U.L. and A.G.A. listed.

This manual contains the Electrical Wiring schematic applicable to this particular equipment. If there are any questions, contact your distributor or the factory. Only licensed electricians or qualified factory representatives should trouble shoot the electrical system of this equipment.

The electrical portion of this equipment is built in compliance with the National Electric Code in effect as of this date.

Purchased from _____ Date _____

City _____ State _____ Zip Code _____

Model Number _____ Serial Number _____

Electrical Service Specifications

_____ Volts _____ Phase _____ Hertz

Note: Schematic drawings showing different voltages, phase and hertz data are included in the manual. Use the above Electrical Service Specifications as your guide in selecting the correct schematic drawing.

Furnace Installation and Set-Up

1. Cut all banding, remove shrink wrap and remove furnace from skid. Be sure to locate hearth plate in packing materials and set aside, if your furnace comes with one.
2. Set furnace in place, allowing at least 24 inches clearance around the unit on all sides. Larger units may require bolting the furnace shell to the floor.

Units with Car Bottoms:

If your unit is a car bottom style, locate the track into the furnace floor and bolt down - there will be pre-drilled holes. Anchor the outer end of the track to the floor of the building after the car travel has been tested. Be sure to attach and wire the safety switches to the car track on the inside end of the track. Attach hydraulic lines to the car drive unit and door lift and fill hydraulic pump unit with hydraulic fluid.

3. Install gas line to unit according to local codes and regulations.
4. Install electrical power according to local code and regulations. See page 3 for electrical specifications for your furnace model.
5. Attach ventilation or exhaust piping if required. (Some models have exhaust dampers installed per customer specifications.)
6. If your furnace has a water cooled bearing and a separate cooling unit, you will need to attach it to the furnace. The unit will have two hoses with quick disconnect fittings. Attach these to the cooling lines on the furnace. Plug the unit into a 120 volt AC outlet - some units will be wired directly into the control circuit to activate upon furnace starting. If the coolant is shipped separately, be sure to add it to the unit.
7. Check rotation of chamber recirculating fan.
8. Attach inert gas supply if furnace has atmosphere inlet and set regulators. See page 13 - 14.
9. Refer to next page for Start-Up procedure.

Furnace Start-Up Procedure

MIFCO Heat Treat Furnaces are very easy to operate. They have been thoroughly tested and calibrated at the factory. The following steps will get the furnace running and if you refer to the easy, one page start-up guides for your particular instrument, the setpoints and programs can be entered. Included in this manual are the instrument manuals for your particular furnace, from the manufacturer.

Start-Up

1. Press the start button or flip the toggle switch to on. The instrument will go through a brief self diagnostic and then display the current temperature. If the furnace has a separate cooling unit for the water cooled bearing, be sure to turn it on also.
2. If there is a circulating fan bypass switch for cooling the high temperature chamber, make sure that it is in the off position. This will insure that when the door is opened while the chamber is in operation, the fan will shut off to prevent accidents.
3. Enter a setpoint into the controlling instrument, per instructions for that instrument on the following pages.
4. If there is a high limit instrument, there must also be a setpoint entered into it that is 25 to 30 degrees higher than the controlling instrument setpoint. This can also be left at its maximum temperature setting (default setting from the factory). The primary purpose of the high limit instrument is to protect the heating panels from overheating in the event of a problem with the main temperature controller. That is why the default is set to the chamber maximum setpoint at the factory. The secondary purpose of the high limit is to protect parts being processed from going over a maximum setpoint, as a backup to the main temperature controller.
5. The chamber should proceed to the setpoint and hold at temperature with no further adjustments.

ATTENTION: READ ME FIRST!!!

Watlow F4 Temperature Controller Programming the Control Instrument

First of all, the Watlow Control Instrument is pre-programmed here at the factory and has tuning parameters entered into it that have been arrived at by extensive testing. Everyone's needs are different and the control parameters chosen were decided on for a mixture of speed, to get the load up to temperature as fast as possible, and to minimize overshoot of the setpoint. You may decide to tune the instrument to suit your needs more closely. This is a relatively easy process, but it is strongly suggested that you read the accompanying book on your particular Watlow Controller FIRST.

To enter a setpoint into the controller, look at the lower display of the instrument. You will notice that the Setpoint 1 is the first parameter displayed. Use the right arrow to enter the setpoint. Use the up or down arrows to determine the setpoint and right arrow again, after the setpoint is entered. The unit should begin heating. This is all that is required.

Entering a Ramp / Soak Profile

(If you ordered Programmable Option #1 with your unit.)

The instrument is shipped from our factory with a sample profile that is named PROCESS 1. It can be viewed by going down the Main Page list in the lower display to the line that says Go to Profiles. Use the right arrow to go into the group. The display will read Create Profile, Edit Profile, Delete Profile. Choose Edit Profile and use the right arrow to step through the existing profile. PROCESS 1 is a simple 4 step profile for ramping the furnace up at 6:00 am to a setpoint of 1800°F. Step 1 has a ramp time of 1 second, the lowest setting, to immediately change the setpoint. Step 2 is a 1 hour soak period to hold the load at the setpoint for a period of 1 hour. Step 3 is a 1 second ramp back down to a setpoint of 50°F. Step 4 is the end segment. This tells the controller what to do at the end of the profile. In this case, we have programmed it to hold at the final setpoint. We employ the feature called guaranteed soak, which delays timing of steps until the process temperature is within a specified range of the setpoint.

There are other questions that have to be answered for each step when a profile is being created that tell it to perform certain functions, or to observe certain parameters. Refer to the sample profile page on the next page of this manual to see the standard settings for these steps in this furnace. It is also strongly suggested that you refer to the chapter on page 4.1, entitled Profile Programming, of the Watlow manual supplied with this operating manual for further details pertaining to creating profiles.

To run the profile, press the profile button in the lower left corner of the instrument. It will ask which profile you wish to run. Select the profile, right arrow out of the group, and the profile will start. You can confirm this by referring to the lower display. Line 3 reads out the current step, line 4 tells the time remaining for that step, and line 5 tells the actual time in 24 clock readout. To stop a profile, press the profile button again and tell the instrument to terminate the profile. Right arrow out of the group and the profile terminates. The Setpoint 1 reading will say OFF. Arrow down to the Setpoint 1 line and right arrow into it, enter a setpoint again and right arrow out of the group and a new setpoint will be entered.

Watlow Series 97 High Limit Instrument

The high limit instrument supplied with your furnace is set at the factory to its maximum range setting. This is done to protect the heating elements in the furnace chamber. Should you wish to lower the setpoint of the high limit instrument, please refer to the Watlow Series 97 manual supplied with this manual.

OPERATION OF HONEYWELL UDC-2000 SERIES CONTROLLERS

THIS IS INTENDED AS A QUICK REFERENCE GUIDE AND SHOULD NOT BE SUBSTITUTED FOR READING THE PRODUCT MANUAL. THE PURPOSE OF THIS SHEET IS TO GET YOUR FURNACE RUNNING AND SIMPLIFY OPERATION IN THE BEGINNING.

Your instrument has been calibrated and tuned at the factory prior to shipping. There should be no need for further adjustment in the field.

To begin with, the UDC-2000 is relatively simple to operate. To start the furnace, press the start button or flip the toggle switch. Then your instrument will power up and you will see the Process Temperature displayed and either an "F" or "C" beside it, depending on the configuration requested. To enter a setpoint, press the display button marked **DISP**. The letters **SP** will appear in the lower left corner and the process temperature will be replaced by the setpoint value.

To enter the setpoint press the **up or down** arrows, and the value will begin to change in one degree increments. This process can be speeded up by pressing the opposite arrow while holding the first one in. Press once and the setpoint will increase by 10's; once again and it will increase by 100's.

Once you have obtained your desired setpoint, that is all you have to do. To return to Process or Chamber Temperature Display, press **RESET** once and the process value will be displayed. If you do nothing, it will return to Process value in about 1 minute. This is all you have to do. The furnace will begin heating immediately.

INDUSTRIAL FURNACES WITH HIGH LIMIT

Once you have followed the steps above, you must also enter a setpoint value in the High Limit instrument. If the instrument display reads **LIMIT** you must first press **RESET** button. Then press the display button marked **DISP**, and once again, as with the control instrument, **SP** will appear in the lower left of the display, and what was your process value or chamber temperature will now become your setpoint value. Enter a setpoint approximately 10° higher than the setpoint in the control instrument. Once you have obtained a setpoint value the display will return to Process value in about 1 minute. If the high limit instrument is engaged, the main contactor will be released and the display will read **LIMIT**. It must be reset after the process temperature goes below the setpoint to restart the furnace.

If you have any questions, please feel free to call McEnglevan or Honeywell's toll free number found inside the front cover of the instrument operating manual.

OPERATION OF HONEYWELL UDC-3000 SERIES CONTROLLERS

Entering a Single SetPoint

In order to set a single setpoint, the setpoint program must not be running. This would be indicated by an **H** in the upper display, to the left of the process temperature readout. To enter a setpoint, press the **LOWR DISP** button until **SP** is in the lower display. Press the up or down (arrow) buttons until the desired setpoint reads out in the lower display. The furnace will automatically start going to that setpoint.

Entering a Program

The setpoint program section of the UDC-3000 consists of 12 segments. These segments are divided into 6 ramps and 6 soaks. Each ramp and soak can be programmed to take up to or last for 99 hours. The UDC-3000 allows you to select the starting segment and ending segment so that a variety of 'mini' programs can be selected. For example, you could tell the instrument to start on segment 1 and end on segment 4. You must always end on a soak segment which are even numbered segments.

To program the ramps and soaks, press the **SET UP** key until **SP RAMP** appears in the lower display. Then press the **FUNC** (FUNCTION) key until **SP PROG** appears in the lower display. When it does, press either the up or down (arrow) button and enable it. This will appear in the upper display. When set point programming has been enabled, press the **FUNCTION** key until **SEG 1 RAMP** appears in the lower display. Then press the up or down keys until the desired hours or minutes are displayed in the upper read-out. Press **FUNC** again and **SEG 2 SP** will appear in the lower display. Now choose the temperature that the first ramp will go to. Then press **FUNC** again and **SEG 2 TIME** will appear below. Choose the desired time for the soak. Continue in this manner until you have programmed all the ramps and soaks desired. When you are finished, press **FUNC** until you arrive back at **STRT SEG** in the lower display. Now you can choose which segment to start on. Press **FUNC** again and **END SEG** will appear. Choose the ending segment desired. Press **FUNC** again and select the number of times you wish the program to run. If only once is required, choose '0' recycles. Press **FUNC** again and **SOAK DEV** will appear. Choose the number of degrees desired for deviation. If a value of 20 degrees is chosen, for example, the soak will be on hold as long as the process temperature is outside the 20 degree range above or below set point. This is helpful if too short a ramp time has been chosen. The soak will wait until the process temperature is close to the set point before it begins. This is called "**guaranteed soak**".

You are now ready to run the program. Press the **run/hold** button and an **R** will appear to the left of the process temperature. The lower read-out will display **SP** and a starting set point. To check your programming, press the **LOWR DISP** key and it will read-out first, the deviation from the current set point. Press it again and the segment number and time remaining will appear. Press it again and the percentage of power being applied to the elements will read-out. When the ramp set point is ahead of the process temperature, the power will be fluctuating. Press the display key one more time and the set point will re-appear.

OPERATION OF THE HONEYWELL UDC-2000 HIGH LIMIT

THIS IS INTENDED AS A QUICK REFERENCE GUIDE AND SHOULD NOT BE SUBSTITUTED FOR READING THE PRODUCT MANUAL. THE PURPOSE OF THIS SHEET IS TO GET YOUR FURNACE RUNNING AND SIMPLIFY OPERATION IN THE BEGINNING.

INDUSTRIAL FURNACES WITH HIGH LIMIT

Once you have started your furnace and entered a setpoint in the control instrument, you must also enter a setpoint value in the High Limit instrument. If the instrument display reads **LIMIT** you must first press **RESET** button. Then press the display button marked **DISP**, and once again, as with the control instrument, **SP** will appear in the lower left of the display, and what was your process value or chamber temperature will now become your setpoint value. Enter a setpoint approximately 20° to 25° higher than the setpoint in the control instrument. Once you have obtained a setpoint value the display will return to Process value in about 1 minute. If the high limit instrument is engaged, the main contactor will be released and the display will read **LIMIT**. It must be reset after the process temperature goes below the setpoint to restart the furnace.

If you have any questions, please feel free to call McEnglevan or Honeywell's toll free number found inside the front cover of the instrument operating manual.

RECORDING INSTRUMENT

The recording instrument is powered by a toggle switch located next to the instrument or, in some units, will be wired to come on with the control instruments. The instrument can record one or both chamber's processes. Input 1 is the upper chamber and input 2 is the lower chamber. To avoid a print-out on an unused chamber, the inputs can be disabled. All operating parameters have been entered here at the factory, but the time will have to be set upon arrival. Please refer to the instrument manual for procedures.

This instrument, as well as the programmable instruments, have internal lock-out features. These are used to prevent un-authorized tampering with control parameters. None of these lock-outs have been activated. To activate lock-out, please refer to the instrument manuals.

INSTRUMENTATION WITH AUDIBLE ALARM

Programming for Honeywell Instruments

A sample program is entered into the instrument memory at the factory to demonstrate how the audible alarm works. The sample program consists of 1 minute ramps and soaks. At the end of a soak segment, there is a 1 minute ramp used for the alarm segment. The audible alarm is a programmed “**event**” alarm. This means that at the beginning of the chosen alarm segment, the relay for the bell will close, and the bell will be energized. At the end of the segment, the relay will open and the bell will be de-energized. One minute is the shortest time that can be programmed, so a toggle switch is provided to turn the bell off. The operator **must** remember to turn the toggle switch back on so that the alarm will ring again in the next program. Power to the bell is indicated by a light below the toggle switch.

To change the alarm segment number, press the **set up** button until **alarms** appears in the lower display, then press the **function** button. **AISIVAL** will appear in the lower display. A number is entered. This is the segment that the alarm contact is energized at the **beginning** of. Press **function** again and **AIS2VAL** will appear. This is the segment that the alarm contact is de-energized at the end of.

A segment could probably be saved by changing the alarm values. To do this, change **AISIVAL** to the segment number needed for the alarm to sound on at the end. Then change **AISIHL** to end. This would allow the alarm to sound at the end of the desired segment, then it would have to be turned off by the toggle switch. Upon a new cycle start up, the toggle switch would have to be turned back on.

HTG-94 PARTS LIST

300012 HTG-94 burner assembly
003378 1½" 90 degree elbow
003280 1½" tee
300013 1½" pipe nipple 24¼" long
003126 1½" nipple x 4½" long
300014 1½" pipe nipple x 17¼" long
003122 1½" pipe x 5" long
003385 2 x 1½" 90 degree elbow
003121 1½" close nipple
003421 1½" air gate valve
003129 1½" nipple x 6 2" long
006001 1½" gas air mixer
003341 1" to 3/4" bushing
003072 3/4" nipple x 7" long
003375 3/4" 90 degree elbow
003061 3/4" close nipple
003064 3/4" x 3" nipple
004244 3/4" zero governor
003066 3/4" nipple x 4" long
003452 3/4" gas shut off cock
003369 1½" union
#175 blower
004249' 1½" butterfly valve
003519 P100 observation port
006620 1" x 6½" burner nozzle assm
003885 Amp terminal block -14 terminals
003987 6' power cord
003600 Buss fuse holders
003624 2A glass fuse
003662 Black start switch
003663 Red stop switch
004104 Fireeye chassis
004105 Fireeye base unit
004107 UV-1A6 flame scanner
003707 7/8 cord bushing
004024 UDC-2000 Honeywell digital controller
003932 2 pole contactor 45CA20AF
003925 single overload relay
004041 8" Marshall tip
004050 Thermocouple head assm
004226 Low pressure air switch
003892 Solid state timer 17 second
003915 Ignition transformer
004212 ¼" solenoid valve
003906 Red indicator light
004172 Honeywell damper motor
003908 Indicator light, amber
004214 3/4" gas solenoid valve
004069 Straight connector for spark wire
004070 Angle connector for spark wire
003744 Spark wire - 6ft
003689 Lodan connector ETC NC1610
003705 7/8" snap bushing
003704 3/4" anti short bushing
003758 3/8" screw in connector
003757 3/8" 90 degree elbow
003811 29/64 conduit 3/8" flexible
004205 control box knob

HTG-94 PARTS LIST

008065 Burner brick
008050 Section side liner brick -8
008070 Side spacer brick-6
008069 5" flat spacer- 5
008074 Exhaust liner brick-1
008068 End Section top-4
008071 5" tip end spacer-2
008072 Side end spacer-4
008073 5" bottom end spacer - 2
008066 Left hand end section-2
008067 Right hand end section-2
008075 Back wall liner brick-2
008190 25# Matrilite insulation cement
008253 11" w x 14½" long hearth plate
032017 HTG-94 relining kit complete with hearth plate

**HTG-96 HEAT TREAT FURNACE
PARTS LIST**

PART NO.	DESCRIPTION	NO. PCS.
300091	Right Door Guide Angle	1
300092	Door Guide Stop	1
300100	Left Door Guide Stop Assembly	
300101	Left Door Guide Angle	1
300092	Door Guide Stop	1
300110	Door Pivot Assembly	
300111	Large Arc	1
300112	Large Arc Legs	2
300113	Pivot Hub	1
300114	Small Arc Legs	2
300115	Small Arc	2
300116	Hub Bushing,	1
300117	Frame Spacer	1
001217	Door Pivot Bolt	1
002015	Door Pivot Nut	1
000408	Chain Lock Bolt	1
002006	Chain Lock Nut	1
300120	Chain Assembly	
002459	Chain Clevis	2
300121	Chain	64½"
300122	Chain Handle	1
000408	Chain Bolt for Handle	1
002006	Chain Bolt Nut	1
300130	Foot Lift Assembly	
300131	Foot Pedal	1
300132	Foot Pedal Support Bar	1
300133	Door Lift Pipe	1
300134	Door Lift Rod	1
300135	Door Lift Spring	1
002460	Rod Eye 2" Thread	1
002126	Door Lift Pipe Washer	1
300440	Short Manifold Assembly	
300441	Manifold Pipe	1
002452	Freeze Plug E	1
003213	Half Coupling	3
006620	Burner Nozzle Assembly	3
300450	Long Manifold Assembly	
300441	Manifold Pipe	1
002452	Freeze Plug	1
003213	1" Half Coupling	3
006620	Burner Nozzle	3
008065	HB-1 Burner Brick	6
008050	B10-SL Solid Side Liner Brick	9
008070	F-14 Side Spacer Brick	8
008069	F-13 Top & Bottom Spacer Brick	6
008074	F-18 Exhaust Brick	2

**HT-96 HEAT TREAT FURNACE
PARTS LIST**

PART NO.	DESCRIPTION	NO. PCS.
008068	F-12 Upper End Bricks	4
008071	F-15 Upper End Spacers	2
008072	F-16 Side Spacers	2
008073	F-17 Bottom End Spacers	2
008074	F-11 Bottom Right Hand Ends	2
008066	F-10 Bottom Left Hand Ends	2
008075	F-19 Rear Wall	2
008171	Pearlite Insulation	20#
008170.	Vermiculite Insualtion.	15#
008175	Incore Cement	354
008172	Castable for Door	20#
008254	Hearth Tile 11 x 19	1
008300	Paint	1/10 Gal.
300310	HT-96 Burner Assembly	
004320	#175 Blower	1
003378	1½" 90 Degree Elbow	2
003293	1½" x 2 x 1½" Tee	1
003131	1½" Pipe Nipple 25¼" Long	1
003126	1½" Pipe Nipple 4½" Long	2
003161	2" Pipe Nipple 17" Long	1
003141	2" Pipe Nipple 2½" Long	1
003148	2" Pipe Nipple 6" Long	1
003379	2" 90 Degree Elbow	3
003140	2" Close Nipple	2
003432	2" Air Valve Brass Gate	1
003148	2" Nipple 6" Long	1
006002	65-4 North American Gas air Mixer	1
003342	1¼" to 1" Reducing Bushing	1
003376	1" 90 Degree Elbow	2
003085	1" Close Nipple	1
003086	1" x 2" Nipple	2
006020	1" Zero Govenor	1
903096	1" x 9" Nipple	1
003453	1" Gas Shut Off Cock	1
004002	10 AMP Snap Switch	1
004001	6' Power Cord	1
004060	Power Cord Bushing	1
004086	Wire Nuts	5
004027	16 Ga. MTW Ware	5'
004068	Wiring Ties Panuit SST 1.5M	4
002457	Pressed Steel Valve Handle	1
003369	1½" Railroad Union	1
003370	2" Railroad Union	1
006007	½" Air Volume Control Rod	1

HTG-98 GAS FURNACE PARTS LIST

<u>Part #</u>	<u>Qty.</u>	<u>Description</u>
300620	1	Steel assembly-includes shell, base, front /back plate
300630	1	Base assembly
300650	1	Shell assembly-includes shell, burner guide tubes, sleeve, ring, front /back plate
300060	1	Front plate assembly
300070	1	Back plate assembly
401856	1	Thermocouple collar assembly
010096	8	Burner guide tubes 1 5/8" tube x 4.75" lg
003519	1	P-100 observation port
300120	1	Chain assm
300130	1	Foot lift assembly
300660	1	Short manifold assembly-includes pipe, freeze plug, couplings, burner nozzle
002452	2	1 3/4" expansion plug
003213	8	1" blk half coupling
006620	8	1" x 6 1/2" burner nozzle
300670	1	Long manifold-includes pipe, ends, couplings, nozzle
003211	1	1/2" half coupling
004250	1	2" butterfly valve
006002	1	2" gas air mixer 3065-4-14
004245	1	1" zero governor R600SZ-88
003453	1	1" gas cock
004117	1	1/2 HP Baldor motor #VL1303 for 115/230 volt 1 phase furnaces only
004118	1	1/2 HP Baldor motor #VM3107 for 230/460 volt 3 phase furnaces only
003885	1	AMP terminal block 14 terminals
003987	1	6' power cord
003600	1	Buss fuse holders, HKP-HH
003624	1	2A Glass fuse Buss AGC
003662	2	Black start switch
003663	2	Red stop switch
004104	1	Fireye Chassis UVMID
004105	1	61 3060 Fireye Base Unit only
004107	1	UV-1A6 Fireye flame scanner
004024	1	UDC-2000 digital Honeywell controller
003932	1	Contacto 2 poles, 120V, 20amp, 45CA20AF
003925	1	Single overload relay 48DA17AA4, 30 amp
004031	1	Type K 12" Thermocouple
004050	1	Thermocouple head assembly
004226	1	Dwyer low pressure air switch
003892	1	Solid state time, 17 second FIS-5117
003915	1	Ignition transformer
004212	1	1/4" Solenoid valve
003906	1	Red indicator light
004174	1	Honeywell damper motor M436A 1090 with bag assembly #7640 JL
003908	1	Amber indicator light
004215	1	1" low pressure solenoid valve
004069	1	Straight connector for spark wire
004070	1	Angle connector for spark electrode
004071	1	6UV spark igniter
003689	2	NTC 1610 Lodan connector
003705	3	7/8" snap bushing
003704	2	3/4" anti short bushing
003758	1	3/8 screw in connector
003757	2	3/8 90 degree elbow 7380V
003811	2'	29/64 conduit F500 3/8" flexible
004205	1	Control box knob
400150	1	Control box assembly
004048	5'	Thermocouple wire J-20-7-502

HTG-98 Parts List cont.

<u>Part #</u>	<u>Qty.</u>	<u>Description</u>
003502	2	Superior ball joint
008065	8	Burner. bricks
008050	11	Side liner bricks
008070	10	Spacer bricks
008069	8	5" flat spacer brick
008074	2	Exhaust liner brick
008071	2	5"top end spacer
008073	2	5" bottom end spacer
008067	2	Right hand end section
008066	2	Left hand end section
008068	4	End section
008075	2	Back wall liner brick
008072	4	Side end spacer brick
008190	5	25# Bags of Matrilite insulation
008255	1	Hearth plate

RELINING INSTRUCTIONS
FOR HTG-94, 96, 98

STEP 1

Place furnace shell on its back. Find row 6 of brick lower down into the bottom of shell. Note that insulation is in place. Line up the hole in bricks with the hole in the bottom of shell.

STEP 2

Find enclosed two boxes of RS Sealer. Mix both boxes together. This must be pretty thick to start with. After all bricks are in place, you will thin down the remainder of the mix, and paint the entire liner, filling all cracks.

STEP 3

Be aware that one burner brick has a pilot hole. Be sure that it is located, in row 2 in alignment with the pilot hole in side of shell.

STEP 4

Locate bricks which make up row 5. Start by cementing burner brick in place over the guide tube. Then place in the exhaust brick F-18 as shown. Cement rest of row in place as shown in drawing.

STEP 5

Special note on row 4: Find three special bricks which are used to make the hearth support rest in center of this row in the bottom. This brick must not be any higher than the hearth ledge found in the bottom row 6.

STEP 6

Continue cementing rows 3 and 2 in place. Make sure that row 1 is placed in position level across the bottom so that face plate will go down over the bricks. Make sure there is cement between all rows of, bricks.

STEP 7

Let the furnace sit for 24 hours so that the sealer will set up. Mix all together the pre-mixed insulation, found in one drum. Use 10 gallons of water. Do not allow this mixture to be very thin, otherwise the cement will separate and will not bond together. Prod insulation down around the burner bricks, make sure there is no air pockets. Insulate up to the top of row 1. Let stand until it settles down, add more insulation up to the edge of the shell, then place top plate of furnace in position with care. Bolt in place.

STEP 8

Now thin down your remaining sealer mixture with water, like latex paint. Paint entire inside of chamber with this mixture. Let set up overnight, then place back on its stand.

Note: In between layers of bricks make sure that RS Sealer is not too thick. Otherwise the layers of bricks will gain height.

SERVICING - TROUBLE SHOOTING:

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

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

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

A. FURNACE WILL NOT START:

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

B. MOTOR STARTING AND HOLDING RELAY WILL NOT OPERATE:

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

C. HOLDING RELAY WORKS BUT MOTOR DOES NOT RUN:

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

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

1. Check the spark plug for power:
 - a. Remove the spark plug cap. Hold this cap by the outside corner and hold the cap up to a metal part of the furnace and push the start button to see if there is a spark at the cap.
2. Check the air pressure switch:
 - a. Remove the junction box cover on the top of the air pressure switch (004226). Place both wires inside on the same terminal, this will by-pass the switch. If you get a spark when you press the start button, you know the switch is bad.
 - b. With the air switch by-passed and the motor running, check UV terminals 2 & 4 for line voltage, 120V. If no voltage is present, replace UV chassis.
3. Check the spark plug:
 - a. Pull off the spark wire and hold by the outside corner of the connector cap. Hold the metal part of the cap close to the burner and press the start button. If it sparks, the transformer is OK. If not, check the spark wire connections on both ends and try again. If there is still no spark and there is 120 volts-on terminals 2 & 4, then you should replace the spark transformer.
4. The spark plug does not fire:
 - a. Remove the plug and look for cracks in the porcelain insulator. If it is cracked, replace with the same electrode.
 - b. If the plug is not cracked, install it back in the furnace. The gap between the wire tip of the plug and the end of the burner nozzle should be 1/16" to 1/8". This can be adjusted by bending the electrode wire, swiveling the electrode, and then tightening the clamping nut to hold it in place. Observation can be made with a mirror inside the furnace or through the UV Scanner observation port. In either case, **BE SURE THE GAS IS OFF**.

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

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

F. GAS SOLENOID WILL NOT OPEN:

1. After checking all of the above, check terminals 2 & 3 on UV Chassis for line voltage:
 - a. Put the volt meter back on the AC-250 volt scale and put the leads on terminals 2 & 3. Start the furnace, and when the unit goes to Main Flame, terminal 3 should be energized, reading 120 volts. If it is not, and every thing else proves out, the chances are that the UV Chassis is bad and needs replacing.

F. GAS SOLENOID WILL NOT OPEN: (cont.)

2. Terminal 3 is powered but the solenoid still will not open:
 - a. Check for broken wires or loose connections.
 - b. The solenoid wires can be taken loose by a qualified electrician and powered with 120 volts to see if it will open. If it does not open, it will have to be replaced.
 - c. Check to see that the gas pressure is not higher than the rating on the valve nameplate.

G. MAIN FLAME SIGNAL TESTING:

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

H. MAIN FLAME DOES NOT LIGHT:

1. Gas valve shutoff someplace in building.

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

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

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

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

K. SLOW MELTING:

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

L. FURNACE WILL NOT RESTART AFTER STOPPING:

1. Gas valve was shut off before stop button was pressed:
 - a. The reset has kicked out. Push the Reset Button on the UV Chassis and then restart.
2. UV Chassis may be going out.

L. FURNACE WILL NOT RESTART AFTER STOPPING: (cont.)

3. Gas supply marginal and / or fluctuates:
 - a. When starting with the valves in a set position and the gas supply or pressure changes, like when a boiler comes on, the valve setting would not be right and the unit would not start.

M. FURNACE WILL NOT START AFTER FLAME FAILURE:

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

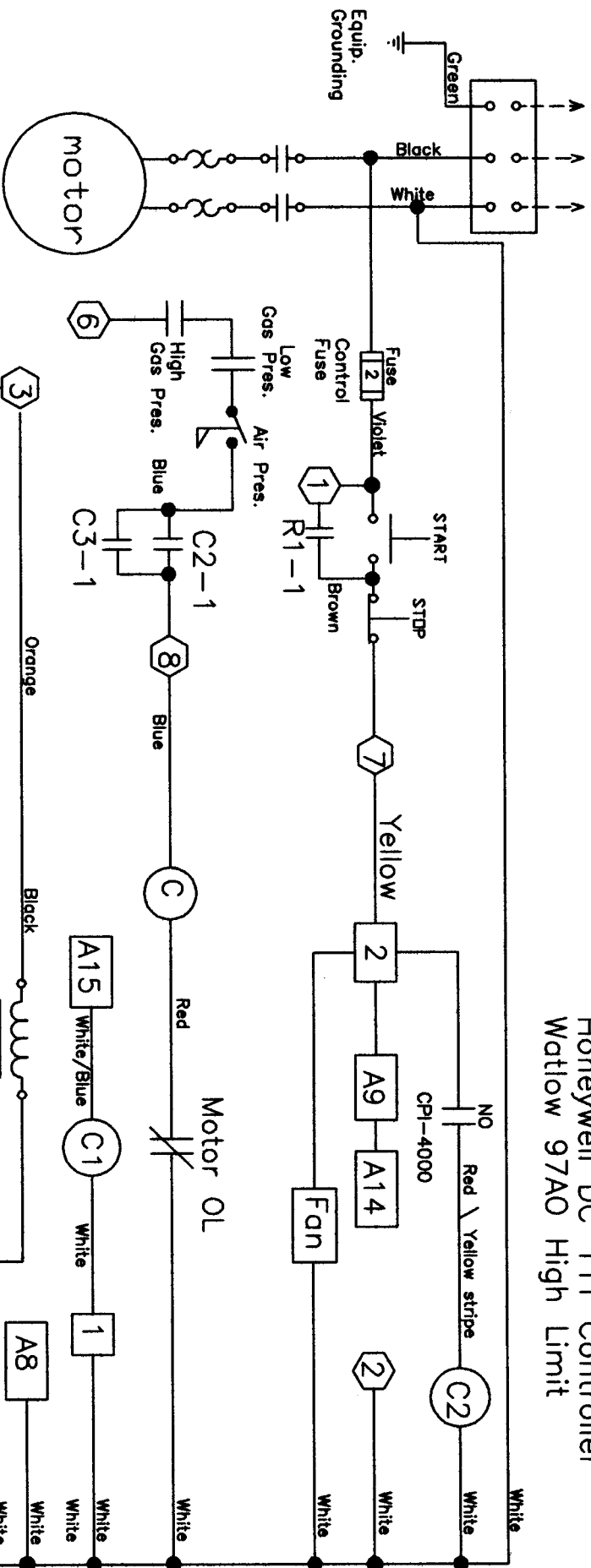
N. ELECTRICAL SEQUENCE:

1. Press the start button and the system performs- self check.
2. Holding coil pulls in and motor starts.
3. Air switch closes powering terminal 6 in UV Chassis.
4. Terminals 4 and 3 powered. Ignition transformer powered and ignition timing starts. Main gas solenoid powered.
5. Gas in scanner ionized, allowing power to flow between electrodes.
6. Main flame is proven and stays on.
7. Flame failure for any reason cuts off power to terminal 4 and 3 in 3 seconds.
8. Alarm light comes on.
9. Push reset button.
10. Blower failure, air switch opens - cutting power to gas solenoid. Blower runs another 10 seconds and turns off.

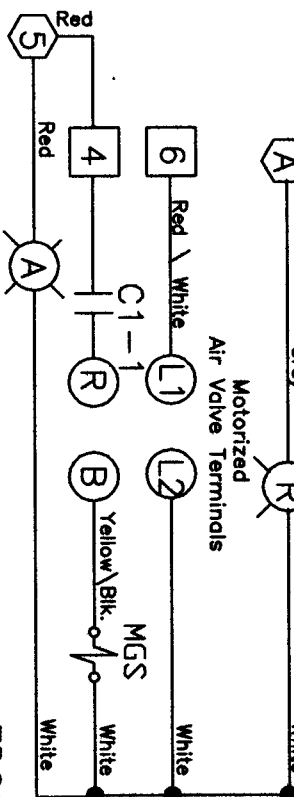
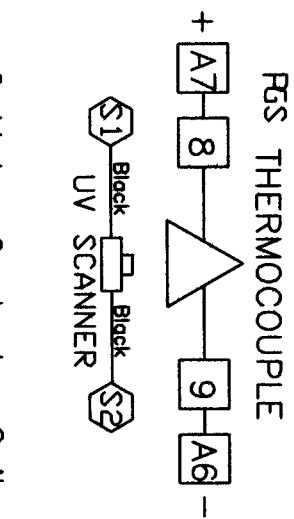
COMBUSTION SAFEGUARD SYSTEM NUMBER 6

With FM proof of closure switch.
 Fireye MC 120
 Honeywell DC 11T Controller
 Watlow 97AO High Limit

POWER BLOCK
 120 V \ 1 Ph \ 60 Hz



- [A1] High limit term.
- [] Temp. control term.
- [] Flame safety term.
- [] Contactor coils
- [] Pilot lights
- PGS PilotGas Solenoid
- APS Air Pressure Switch
- 1 OL Air Pres. Switch
- R1 Blower Contactor



- C Motor Contactor Coil
- R-1, R-2 Relay Contacts
- MGS Main Gas Solenoid

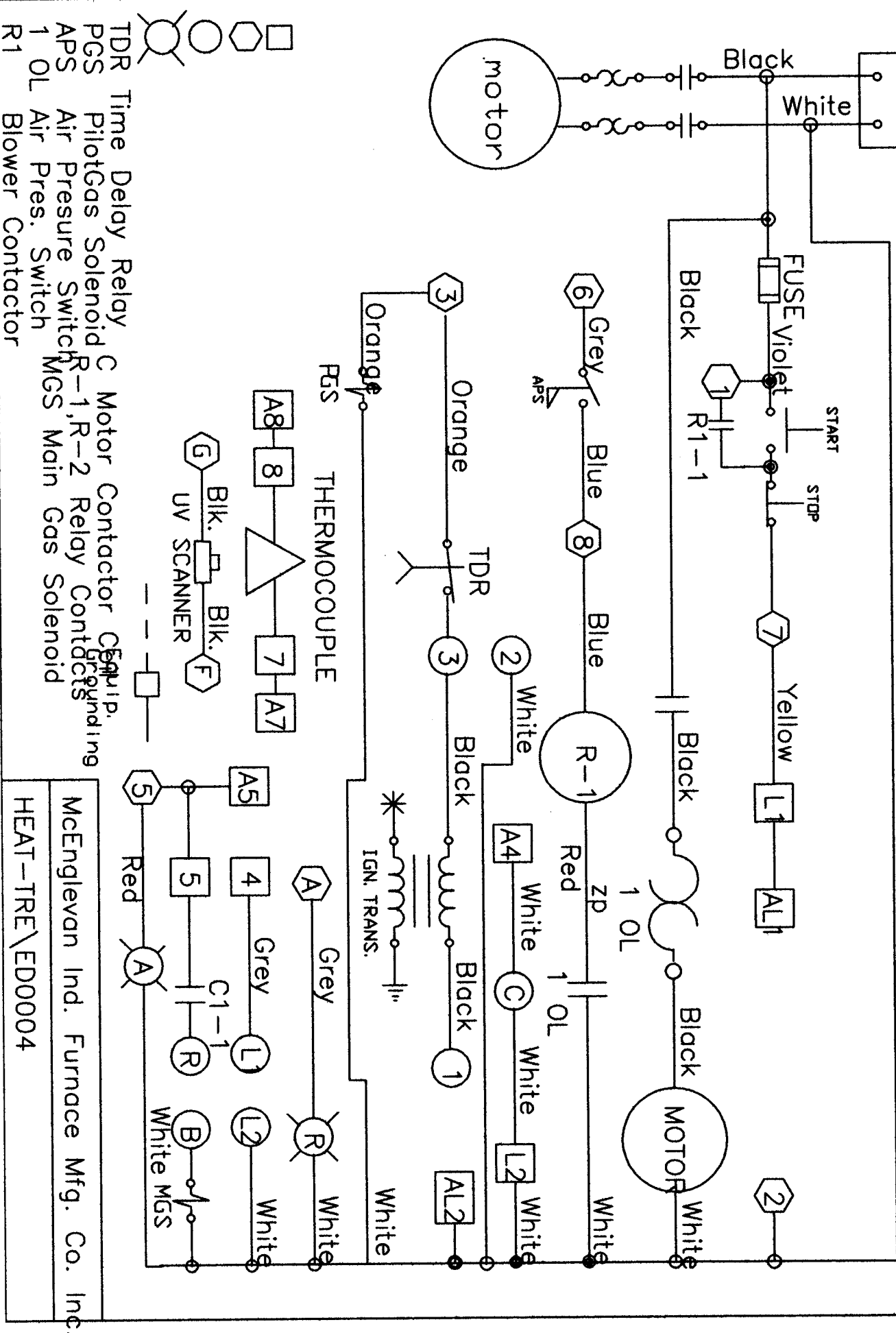
POWER BLOCK

COMBUSTION SAFEGUARD SYSTEM

NUMBER 6

White

120 V 1 PH 60 HZ



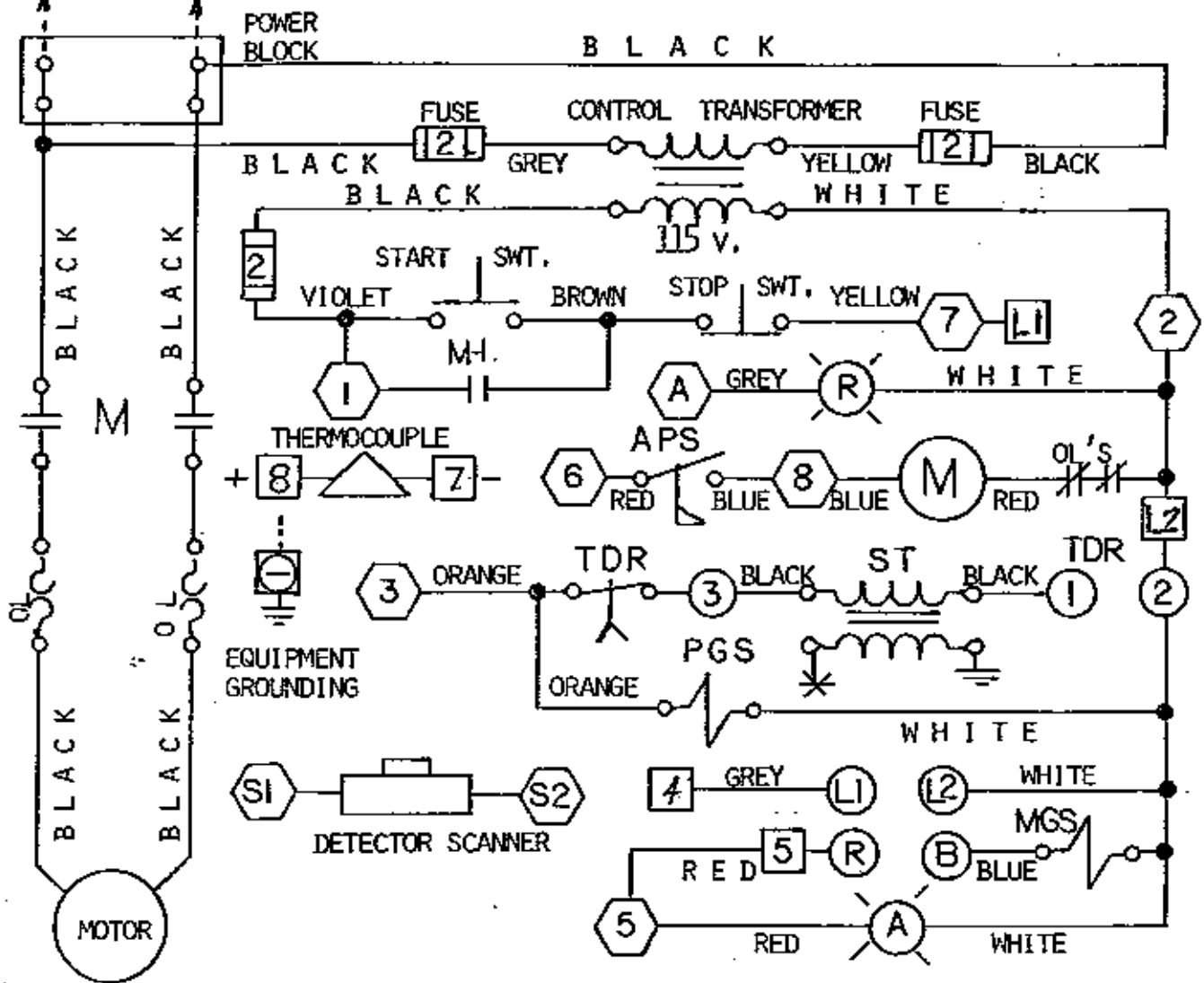
- TDR Time Delay Relay
- PGS Pilot Gas Solenoid
- APS Air Pressure Switch
- 1 OL Air Pres. Switch
- R1 Blower Contactor

- C Motor Contactor
- R-1, R-2 Relay Contacts
- MGS Main Gas Solenoid
- Thermocouple
- UV Scanner

- Ign. Trans.
- Motor Winding
- McEnglevan Ind. Furnace Mfg. Co. Inc.
- HEAT-TRE\ED0004

PART NUMBER _____
 PART NAME _____
 DRAWING NUMBER _____
 DATE _____
 REVISION DATE _____
 QUANTITY PER UNIT _____
 MATERIAL DIMENSION _____

FUSED POWER SUPPLY
 230 V / 1 PH / 60 HZ



COMBUSTION SAFEGUARD SYSTEM No. 6UV

LEGEND

- TEMPERATURE CONTROL TERMINALS
- ULTRA VIOLET CONTROL TERMINALS
- TIME DELAY RELAY TERMINALS
- CONTROL LIGHTS
- ST SPARK TRANSFORMER
- PGS PILOT GAS SOLENOID
- APS AIR PRESSURE SWITCH
- OL'S MOTOR OVERLOAD RELAYS
- M BLOWER MOTOR MAGNETIC STARTER
- M I STARTER CONTACTS
- MGS MAIN GAS SOLENOID
- T CONTROL TRANSFORMER .250KVA

NOTES

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

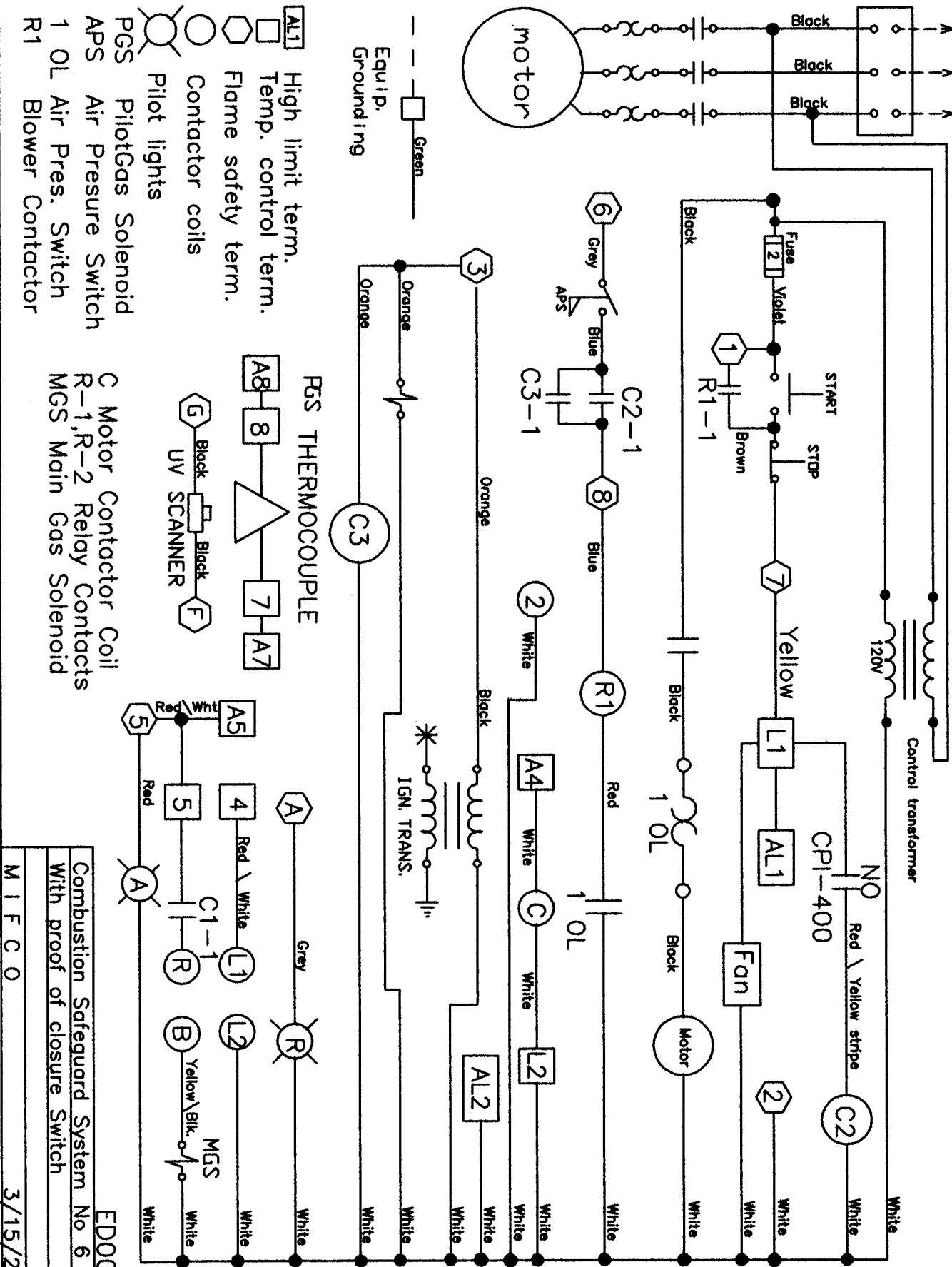
F

MCENGLEEVAN
 Heat Treating & Mfg. Co., INC.

COMBUSTION SAFEGUARD SYSTEM NUMBER 6

With proof of closure switch.

POWER BLOCK
230 V \ 3 Ph \ 60 Hz



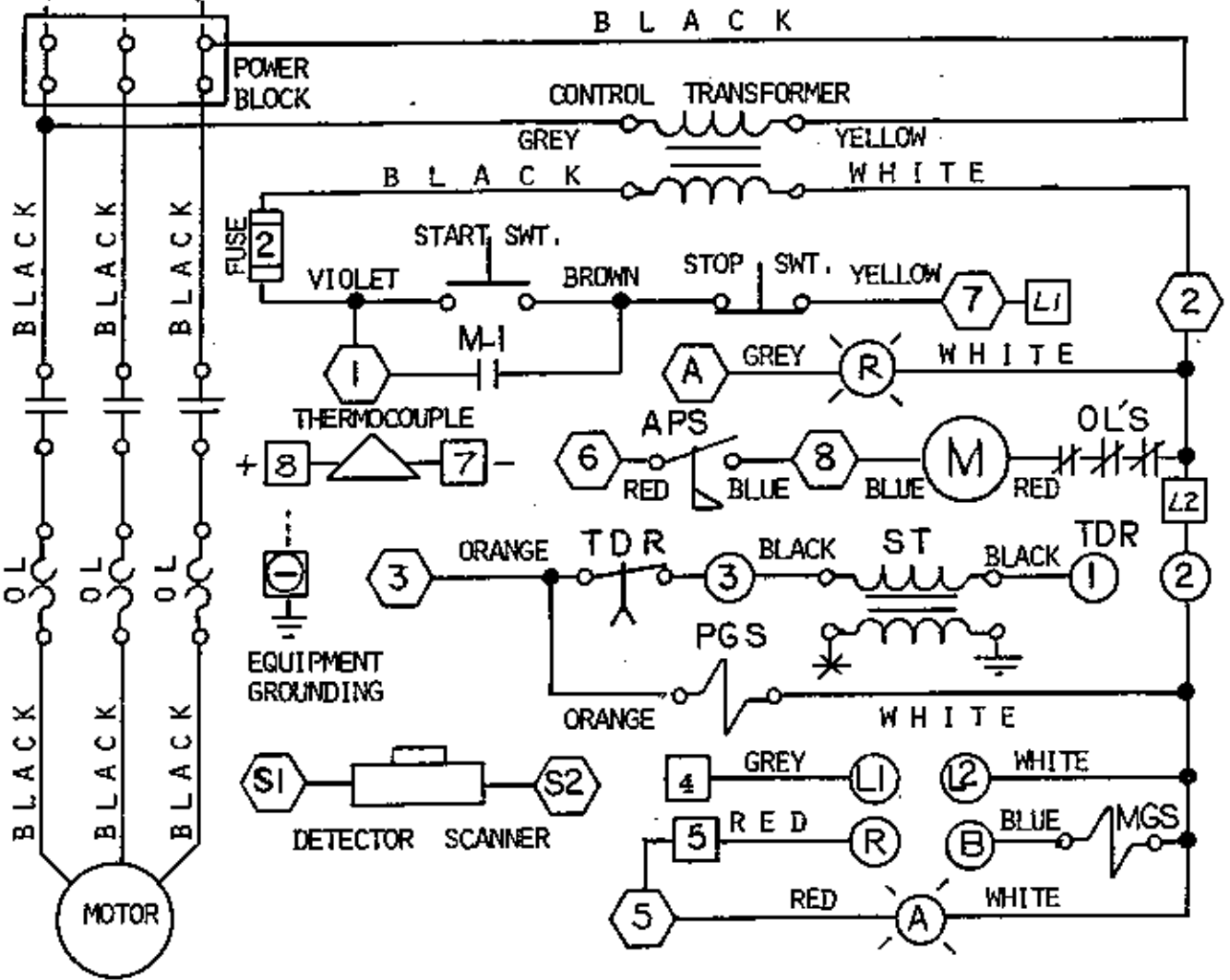
- AL1 High limit term.
- Temp. control term.
- Flame safety term.
- Contactors coils
- Pilot lights
- PGS PilotGas Solenoid
- APS Air Pressure Switch
- 1 OL Air Pres. Switch
- R1 Blower Contactor

- A8 8
- A7 7
- G Black UV SCANNER
- C3 THERMOCOUPLE
- C2-1
- R1
- CPI-400
- Fan
- Motor
- IGN. TRANS.
- MGS
- PGS
- APS
- 1 OL
- R1

ED00068
Combustion Safeguard System No 6
With proof of closure Switch
M I F C O
3/15/2000

PART NAME
DRAWING NUMBER
DATE
REVISION DATE
QUANTITY PER UNIT
MATERIAL
DIMENSION

FUSED POWER SUPPLY
230 V / 3 PH / 60 HZ



COMBUSTION SAFEGUARD SYSTEM 6UV

LEGEND

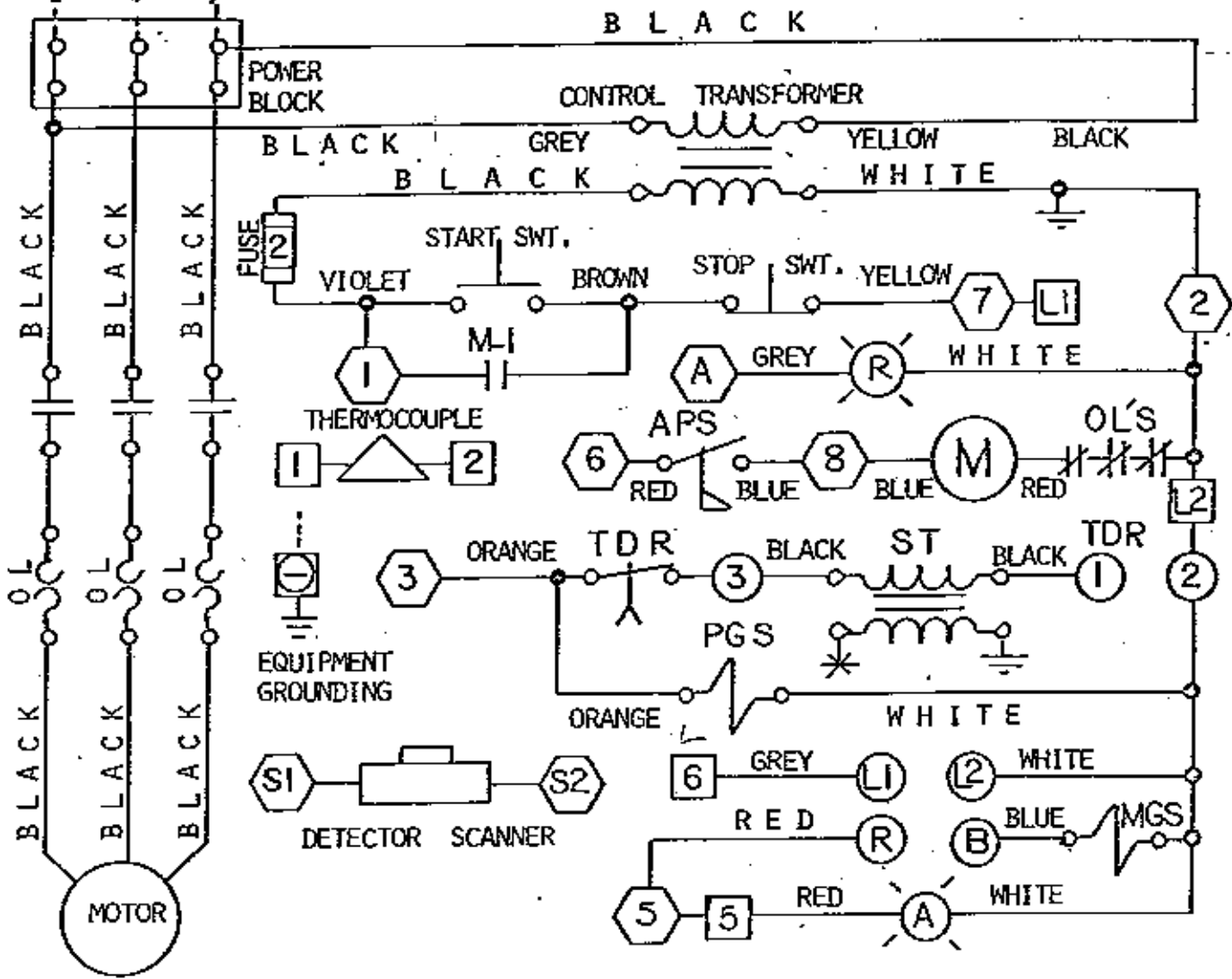
- TEMPERATURE CONTROL TERMINALS
- ULTRA VIOLET CONTROL TERMINALS
- TIME DELAY CONTROL TERMINALS
- CONTROL LIGHTS
- ST SPARK TRANSFORMER
- PGS PILOT GAS SOLENOID VALVE
- OL'S MOTOR OVERLOAD RELAYS
- M MOTOR MAGNETIC STARTER
- M I STARTER CONTACTS
- MGS MAIN GAS SOLENOID VALVE
- APS AIR PRESSURE SWITCH

NOTE

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- II FIELD MUST PROVIDE GROUNDED POWER SUPPLY PER O.S.H.A. REQUIREMENTS.
- III IN CASE OF POWER FAILURE THE SAFETY SYSTEM WILL AUTOMATICALLY SHUT DOWN AND WILL NOT RE-START UNTIL IT IS ENERGIZED BY THE START SWITCH.
- IIII FACTORY WIRED _____
FIELD WIRED - - - - -

E

FUSED POWER SUPPLY
460 V / 3 PH / 60 HZ



COMBUSTION SAFEGUARD SYSTEM 6UV

LEGEND

- TEMPERATURE CONTROL TERMINALS
- ULTRA VIOLET CONTROL TERMINALS
- TIME DELAY CONTROL TERMINALS
- CONTROL LIGHTS
- ST SPARK TRANSFORMER
- PGS PILOT GAS SOLENOID VALVE
- OL'S MOTOR OVERLOAD RELAYS
- M MOTOR MAGNETIC STARTER
- M I STARTER CONTACTS
- MGS MAIN GAS SOLENOID VALVE
- APS AIR PRESSURE SWITCH

NOTE

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- IIII FACTORY WIRED _____
FIELD WIRED _____

PART NUMBER
PART NAME
MATERIAL
QUANTITY PER UNIT
MATERIAL DIMENSION
MCCENGLEEVAN
Steel Tanking & Mfg. Co., INC.