

SERVICE MANUAL

OIL-FIRED HEATERS

HO-4-1118

AND

HO-7-1114A

SAMUEL JACKSON
DRYAIR HEATER

17400 TEMPERATURE CONTROL ASSEMBLY

OPERATION NOTES

This assembly incorporates UDC 3000 digital temperature controllers. To keep control outputs from increasing during the preburn routine, they take their power from the flame signal. If the heater is equipped with the 16910 Modulating High Temperature Limit to control temperature before the mix point, there will be two digital controllers (one on the left and one on the right). If the 16910 is not used, there will be a single controller mounted on the left. The same assembly is used on all heaters, whether they have relay or microprocessor combustion controls.

This assembly has two indicator lights, STATUS and FLAME. Their operation is as follows:

STATUS LIGHT -- When used with the HG-3-1110 heater, this light will be ON during preburn routine and operation.

On all other heaters, which have microprocessor combustion controls, this light will be ON while in operation and preburn and OFF during postburn routine. It will indicate alarm and error conditions by blinking as explained below.

FLAME LIGHT -- With all heaters, this light will be ON when flame is established.

ALARMS AND ERRORS

ALARMS -- Problems not serious enough to shut down operation.

ERRORS -- Problems which require that operations cease.

ALARM PROCEDURE -- During operation, the STATUS light will blink at the rate of one pulse every two seconds for 5 minutes then revert to ON. During the 5-minute interval, the ALARM light on the local panel will be ON. The counter will display the code number corresponding to the alarm problem, and will reset to zero at the end of the interval.

ERROR PROCEDURE -- The burner will shut down and cannot be restarted unless the RESET button on the local panel is pushed. The counter will display the appropriate code number and the ALARM light will be ON until the RESET button is pushed. The STATUS light will blink at the rate of one pulse per second for 5 minutes, then go OFF. If an attempt is made to start the burner before RESET, the STATUS light will blink for 10 seconds then go OFF.

USING THE 17400 DIGITAL TEMPERATURE CONTROL

(WITH THE 16910 MODULATING HIGH TEMPERATURE LIMIT)

The 17400 Temperature Control Assembly for Samuel Jackson Dryaire Heaters can be used with the 16910 Modulating High Temperature Limit to prevent high temperatures which can harm cotton quality and, in extreme cases, cause fires. These instructions will provide operating guidelines for use of this control arrangement with all Samuel Jackson Dryaire Heaters.

PRINCIPLE OF OPERATION

The 17400 control assembly uses two Honeywell UDC-3000 digital temperature controllers. The controller on the left as you face the control assembly is designated the "PRIMARY" controller. The controller on the right is designated the "HIGH LIMIT" controller. The PRIMARY controller has its thermocouple temperature sensor mounted DOWNSTREAM of the mixpoint in the drying system. The HIGH LIMIT controller has its thermocouple mounted upstream of the mixpoint. The PRIMARY controller watches the temperature after cotton has mixed with the air. If wet cotton is fed into the system, the air is cooled and the PRIMARY controller signals the HIGH LIMIT controller that more heat is needed to compensate for this cooling. The HIGH LIMIT controller operates the burner's gas valve to supply this heat, but in no case will the temperature be permitted to exceed the limit which the ginner has previously specified. If dry cotton is fed into the system the reverse occurs. In the case of a choke or large air leak, the HIGH LIMIT controller may not be able to contain the temperature within the specified limits and it will then shut down the burner to prevent a fire (with an appropriate ERROR code on burners with microprocessor combustion controls).

NORMAL OPERATION PROCEDURE

There is a spring return selector switch located below the PRIMARY controller with a "1" on the right and a "0" on the left. These are symbols for START-STOP operations. Turn the switch to "1" and release it to start the burner. Turn the switch to "0" to shut down the burner. After turning the switch to "1", please note that there is a preset time delay to allow the burner head and piping to be purged with air. Following this delay, ignition is tried and should occur immediately. If ignition is not successful and your model has microprocessor combustion controls, observe the STATUS light to see if it is flashing. If it is, go to the burner's control cabinet and note the ERROR/ALARM code displayed on the local panel. There is a decal at the control cabinet and a page in each service manual explaining the numbers. It will be necessary to press the RESET button on the burner's local panel in order to clear the ERROR and restart the burner. In the case of failure in ignition or failure in operation, the burner will automatically attempt to restart itself for a maximum of three attempts. Neither digital temperature controller will come on until flame has been established in the burner. This is to prevent the highly responsive controls from "winding up" during the air purge delay time and causing the burner to come on with a roar. When they do energize, the controllers will take 12 seconds to perform self-check operations and then display the temperatures.

There are four temperatures displayed at all times during burner operation. The PRIMARY control on the left shows two and the HIGH LIMIT control on the right shows two as well. The lower display on the PRIMARY is the temperature which the ginner sets and is the only one he will adjust under normal circumstances. It is the temperature desired after the mixpoint. It is raised and lowered with the orange buttons below it. The upper display shows the actual temperature being reported by the downstream thermocouple. On the HIGH LIMIT controller, the lower display is the temperature which the PRIMARY control is feeding it (See "Principle of Operation" Section). The upper display on the right is the actual temperature before the mixpoint. By observing the upper display on both controllers, it is possible to estimate the wetness of the incoming cotton as they will move farther apart as the cotton gets wetter.

17600 CONTROL INTERFACE OPTION

When the 17400 control is used with the 17600 Control Interface Option, it is not necessary for the ginner to use the arrow buttons on the PRIMARY controller to adjust the desired temperature downstream. The PRIMARY will obtain this value from the 17600 (which is coming from a Granberry Series 800 Moisture Monitor). If the ginner disagrees with the suggested temperature coming from the 17600, he should use the arrow buttons on the 17600 to adjust it to his preference. Pressing the DOWN ARROW button on the 17600 tells the control that he desires a lower cotton moisture content at the feeder apron and it will turn UP the temperature on the 17400 control to achieve it. Pressing the UP ARROW button works in reverse to this.

If it is ever desired to bypass the Series 800 and the 17600 Control Interface, operating the burner with manual setpoint entry by the ginner can be done easily. Remove the button cover on the upper left button on the PRIMARY control. This is the FUNC button. Pressing this button will tell the PRIMARY controller to ignore the incoming signal from the 17600 (designated "RSP" on the lower display) and take its temperature commands from the ginner. The new lower display will be designated "SP". "RSP" stands for Remote Set Point and "SP" stands for Set Point.

ADJUSTING THE MODULATING LIMIT

The modulating limit is the temperature before the mixpoint which the control is programed not to exceed. Please note that the burner will not be killed, it will simply not be allowed to go over this setting. This setting is factory preset at 350 F (176 C) as there is general agreement in the industry that temperatures in excess of this level permanently damage cotton fibers. The procedure for changing this setting follows.

The programming is done on the HIGH LIMIT controller. Remove the button covers on the lefthand top and bottom buttons. These are labelled FUNC and SETUP. First, unlock the controller by pressing SETUP 1 time and FUNC 4 times. LOCKOUT should be displayed in the lower display. Press either ARROW button until the upper display says NONE. Press LOWR DISP one time to unlock the control.

Now press SETUP 5 times until INPUT 2 is displayed in the lower display area. Press FUNC 2 times until IN2 HI is in the lower display. This is your modulating high limit value. Use the ARROW buttons to set it at the desired level. Please note that the controller will not operate correctly if this value is set higher than 400 F (204 C) or lower than 200 F (93 C). Press LOWR DISP to set the new value.

Relock the control by repeating the above procedure but pressing the ARROW buttons until MAX LOCKOUT is displayed. Replace the button covers to discourage use by unauthorized personnel.

ADJUSTING THE CUTOFF SAFETY LIMIT

This limit is set on the HIGH LIMIT controller in a similar fashion to the modulating limit. Remove the button covers on the lefthand top and bottom buttons. These are labelled FUNC and SETUP. First, unlock the controller by pressing SETUP one time and FUNC 4 times. LOCKOUT should be displayed in the lower display. Press either ARROW button until the upper display says NONE. Press LOWR DISP one time to unlock the control.

Now press SETUP 8 times until ALARMS is displayed in the lower display area. Press FUNC 1 time until A1S1 VAL is in the lower display. This is your cutoff high limit value. Use the ARROW buttons to set it at the desired level. We recommend setting this value approximately 25-50 degrees F above the modulating limit. Press LOWR DISP to set the new value.

Relock the control by repeating the above procedure but pressing the ARROW buttons until LOCKOUT MAX is displayed. Replace the button covers to discourage use by unauthorized personnel.

**HO-4-1118 AND HO-7-1114A OIL-FIRED HEATERS
WITH 16910 HIGH TEMPERATURE LIMIT**

STUB-UPS

<u>NO.</u>	<u>DESCRIPTION</u>	<u>ROUTING AND NOTES</u>
1	BURNER POWER	FROM ELECTRIC SERVICE TO BURNER 3 WIRES 380 V 50 HZ OR 3 WIRES 415 V 50 HZ OR 3 WIRES 480 V 60 HZ 6 HP 4.5 KW MOTOR STARTERS AND 120 V CONTROL TRANSFORMER ARE IN BURNER CABINET
2	BURNER TEMPERATURE CONTROL	FROM BURNER CABINET TO TEMPERATURE CONTROL AT CONSOLE 9 - 16 GA WIRES
3	THERMOCOUPLES PRIMARY HIGH LIMIT	FROM CONSOLE TO ENTRANCE OF TOWER OR EXIT OF FOUNTAIN AND TO HOT AIR BEFORE MIX POINT 2 PAIRS TYPE-J THERMOCOUPLE WIRE. DO NOT RUN WITH A-C WIRES. O K WITH OTHER T/C OR DC WIRES.
4	FUEL OIL SUPPLY FOR BURNER	1/2" PIPE NO. 2 DIESEL OR KEROSENE

FOR DUAL-FUEL VERSIONS ONLY:

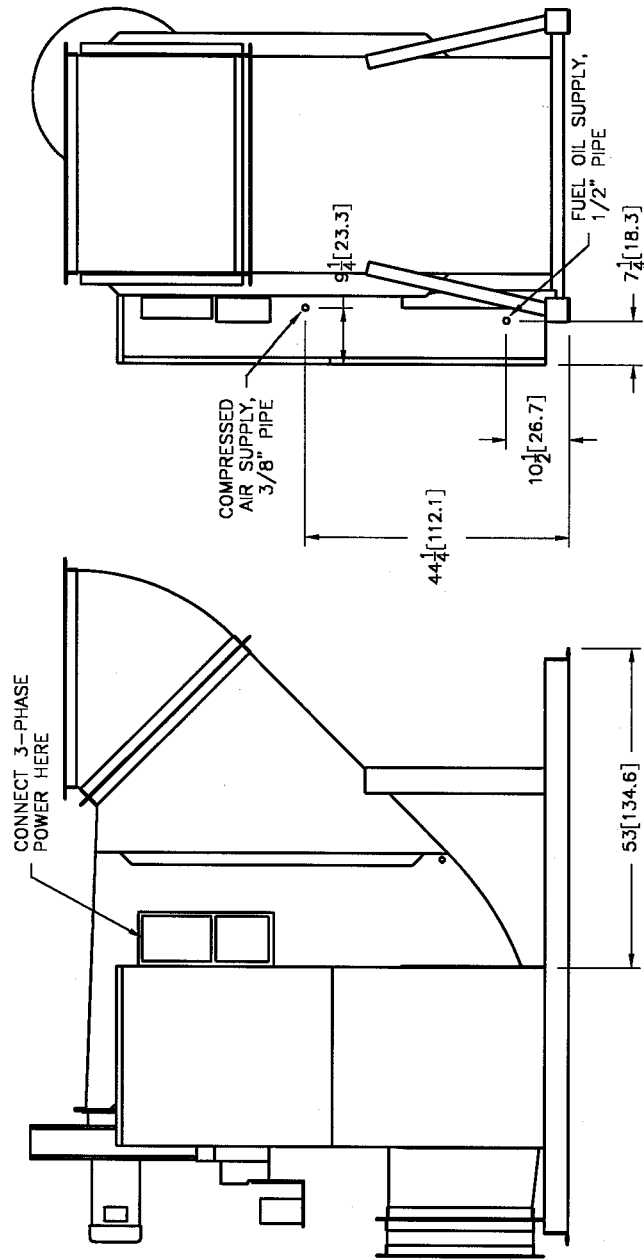
5	BURNER GAS SUPPLY	1 1/2" PIPE FOR HO-4-1118 2" PIPE FOR HO-7-1114A NATURAL GAS OR PROPANE 5 TO 20 PSI, .3 TO 1.4 BARS
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IF 16910 HIGH LIMIT NOT USED:

3	OMIT T/C WIRE GOING TO THERMOCOUPLE BEFORE MIX POINT.	
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INSTALLATION STUB-UPS HO-7-1114B OIL-FIRED HEATER

CAT3650
8-98



SCALE: 3/8" = 1' 0"
DIMENSIONS IN INCHES [CENTIMETERS]

EXTERNAL ELECTRICAL CONNECTIONS

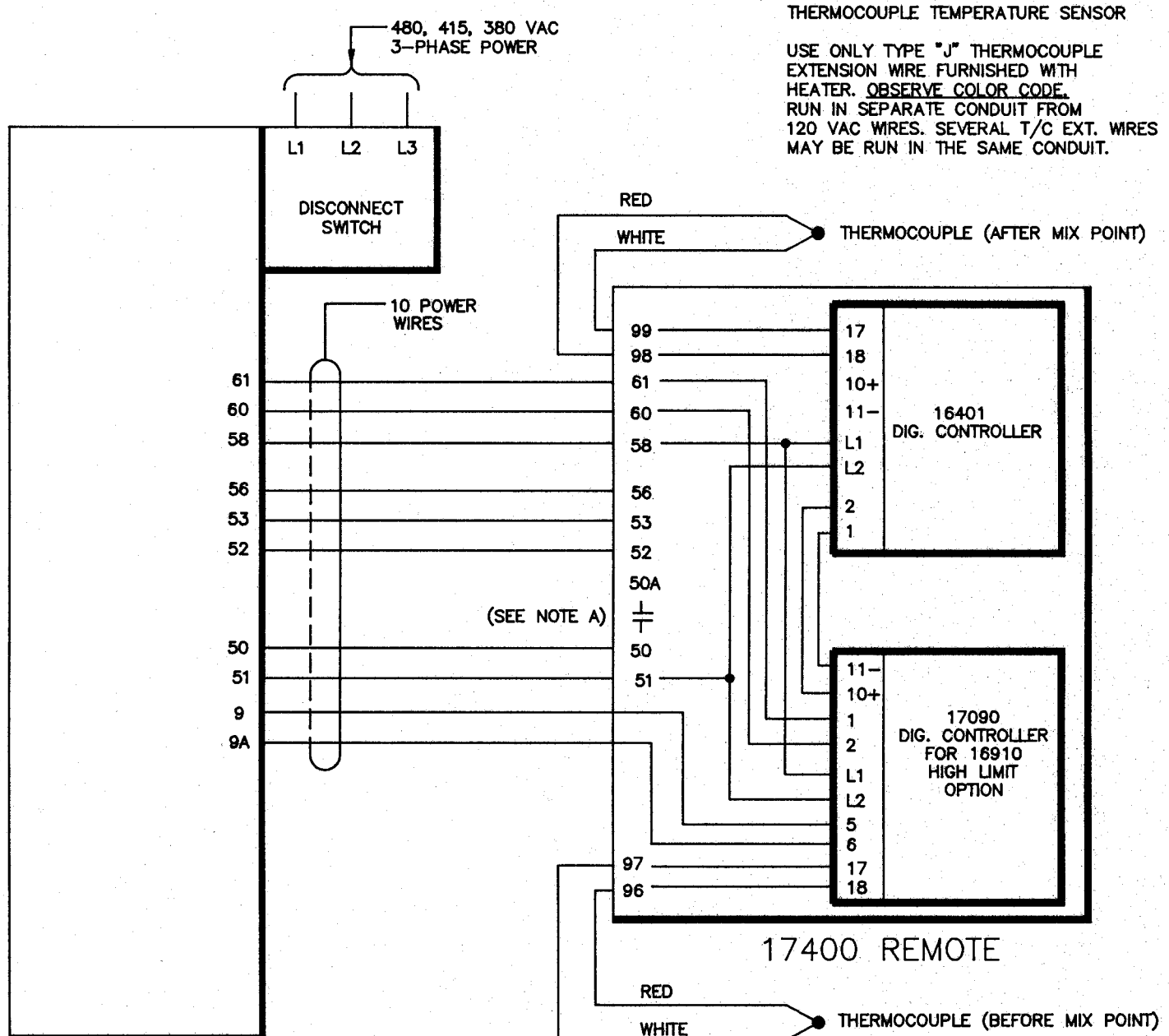
HO-7-1114B/HO-4-1118

3622A

OIL-FIRED HEATERS WITH 17400 CONTROL

12-90

AND 16910 MODULATING HIGH LIMIT



THERMOCOUPLE TEMPERATURE SENSOR

USE ONLY TYPE "J" THERMOCOUPLE
EXTENSION WIRE FURNISHED WITH
HEATER. OBSERVE COLOR CODE.
RUN IN SEPARATE CONDUIT FROM
120 VAC WIRES. SEVERAL T/C EXT. WIRES
MAY BE RUN IN THE SAME CONDUIT.

HO-7/HO-4 HEATER
COMBUSTION CONTROL
ASSEMBLY

NOTE A: INSTALLING ELECTRICIAN MUST CONNECT COIL OF
FAN SAFETY RELAY TO THE TERMINALS OF THE PILOT
LIGHT FOR THE PUSH OR PULL FAN MOTOR. MAKE SURE
RELAY COIL VOLTAGE AGREES WITH PILOT LIGHT VOLTAGE.

EXTERNAL ELECTRICAL CONNECTIONS

HO-7-1114A/HO-4-1118

3621A

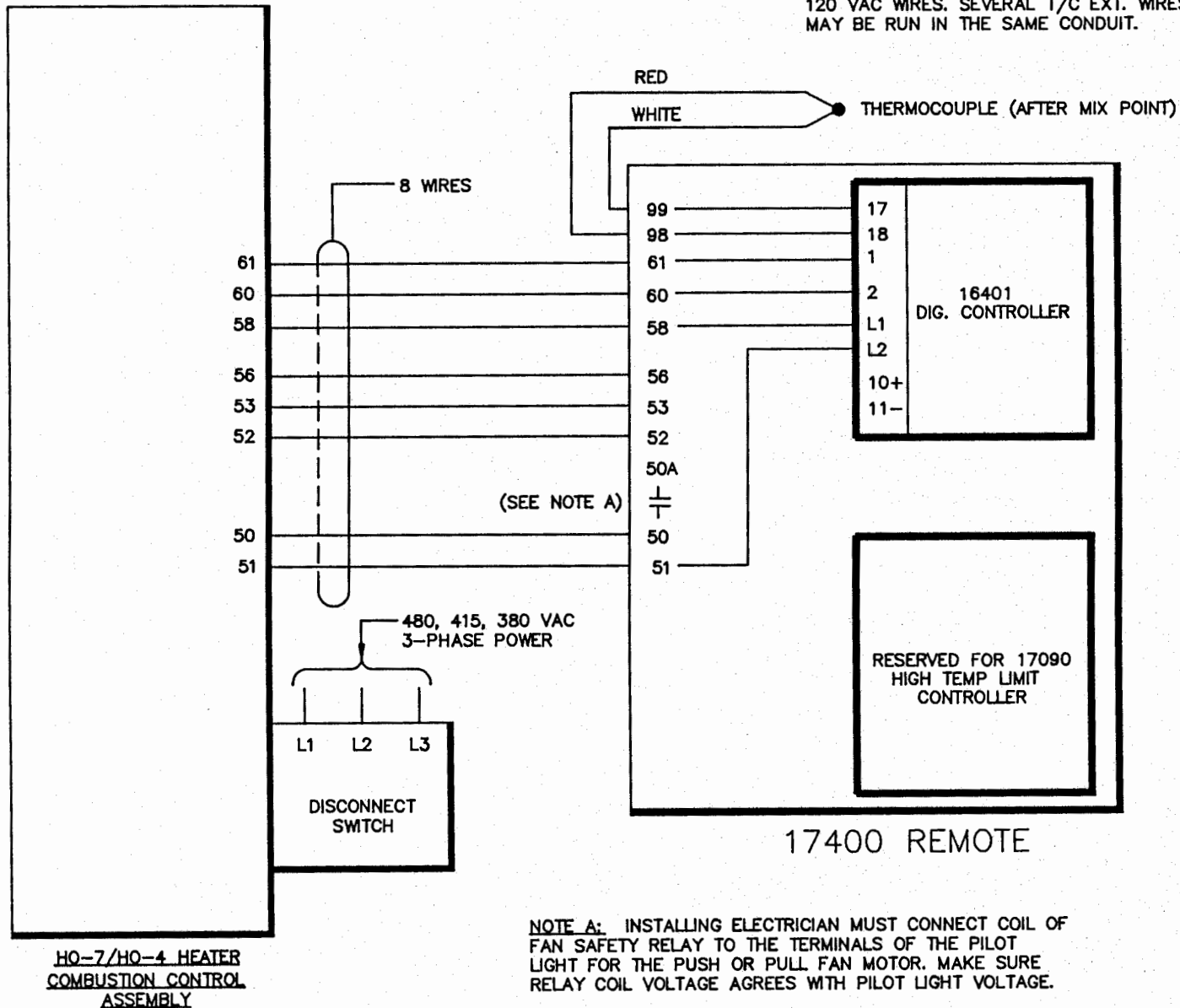
12-90

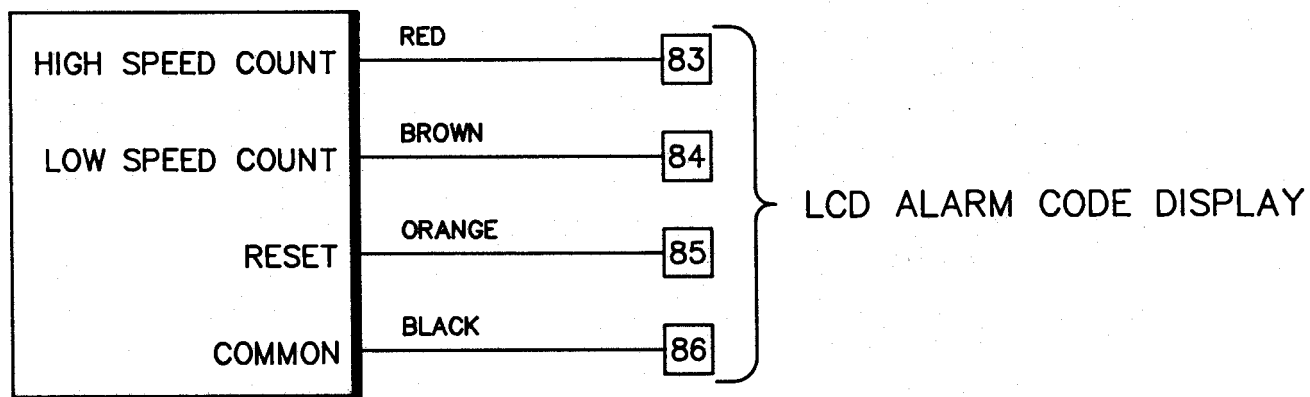
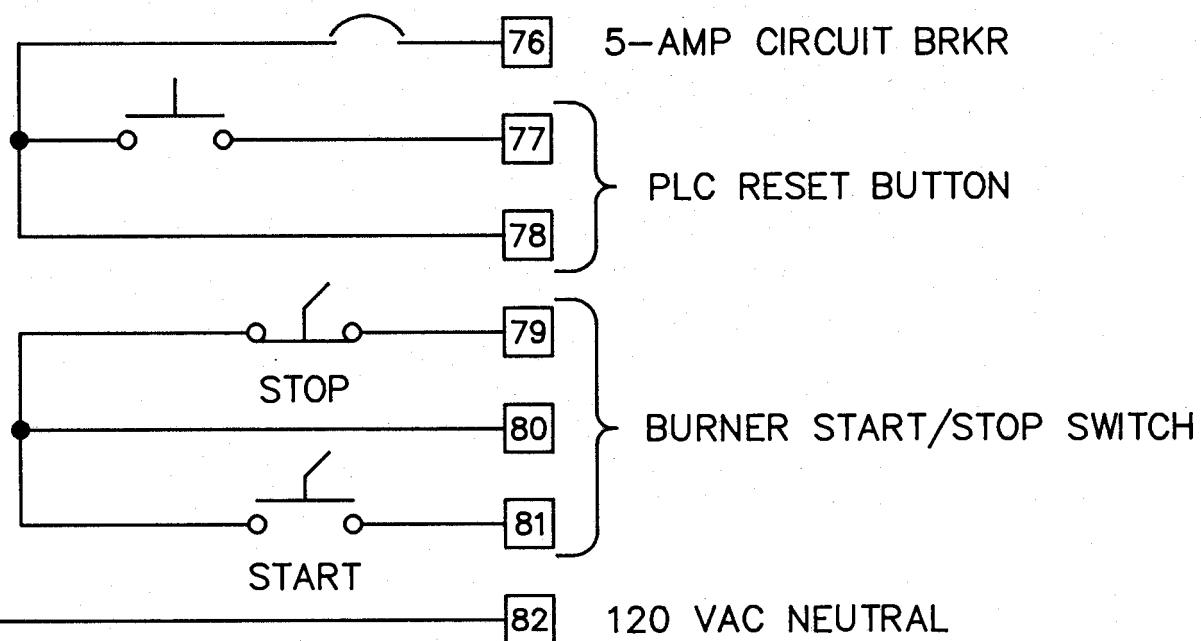
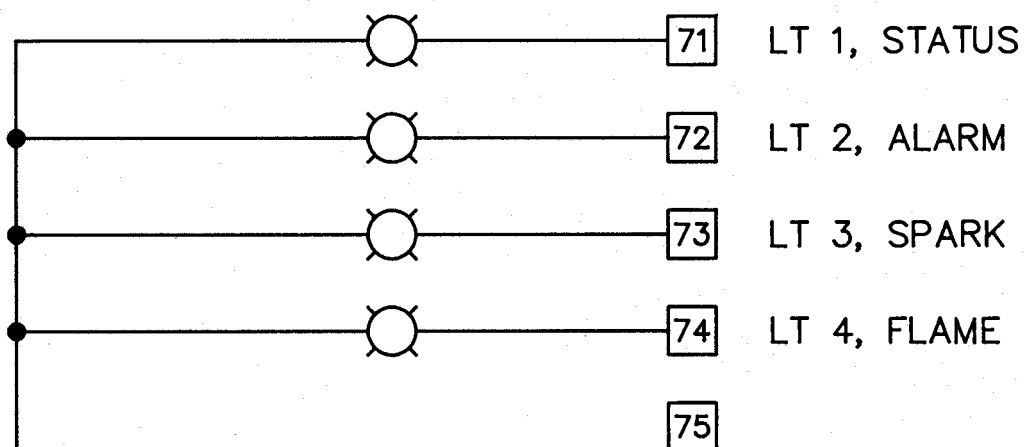
OIL-FIRED HEATERS

WITH 17400 CONTROL

THERMOCOUPLE TEMPERATURE SENSOR

USE ONLY TYPE "J" THERMOCOUPLE
EXTENSION WIRE FURNISHED WITH
HEATER. OBSERVE COLOR CODE.
RUN IN SEPARATE CONDUIT FROM
120 VAC WIRES. SEVERAL T/C EXT. WIRES
MAY BE RUN IN THE SAME CONDUIT.





SAMUEL JACKSON MFG. CO.

ELECTRICAL SCHEMATIC FOR

LOCAL PANEL ASSY.

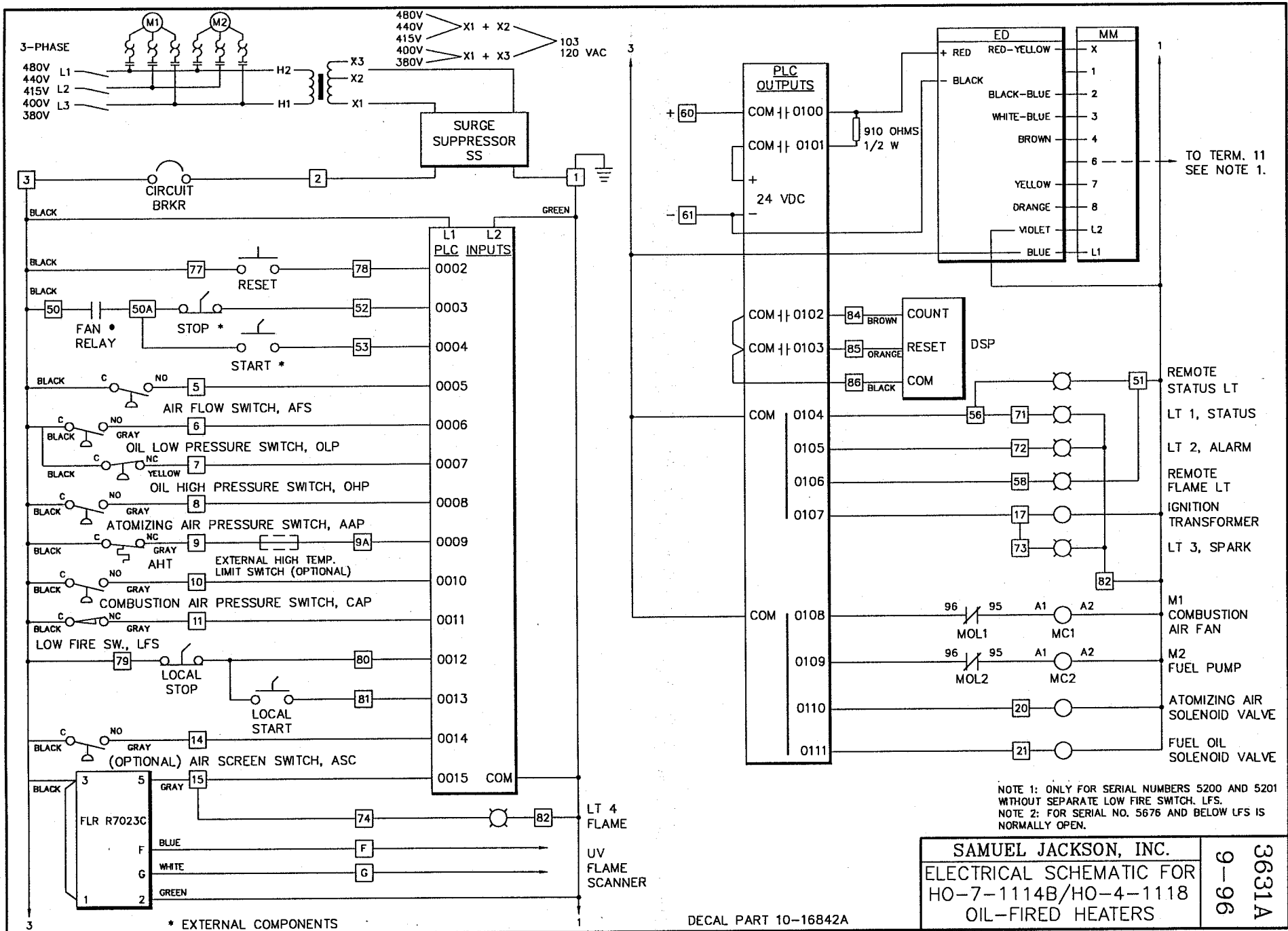
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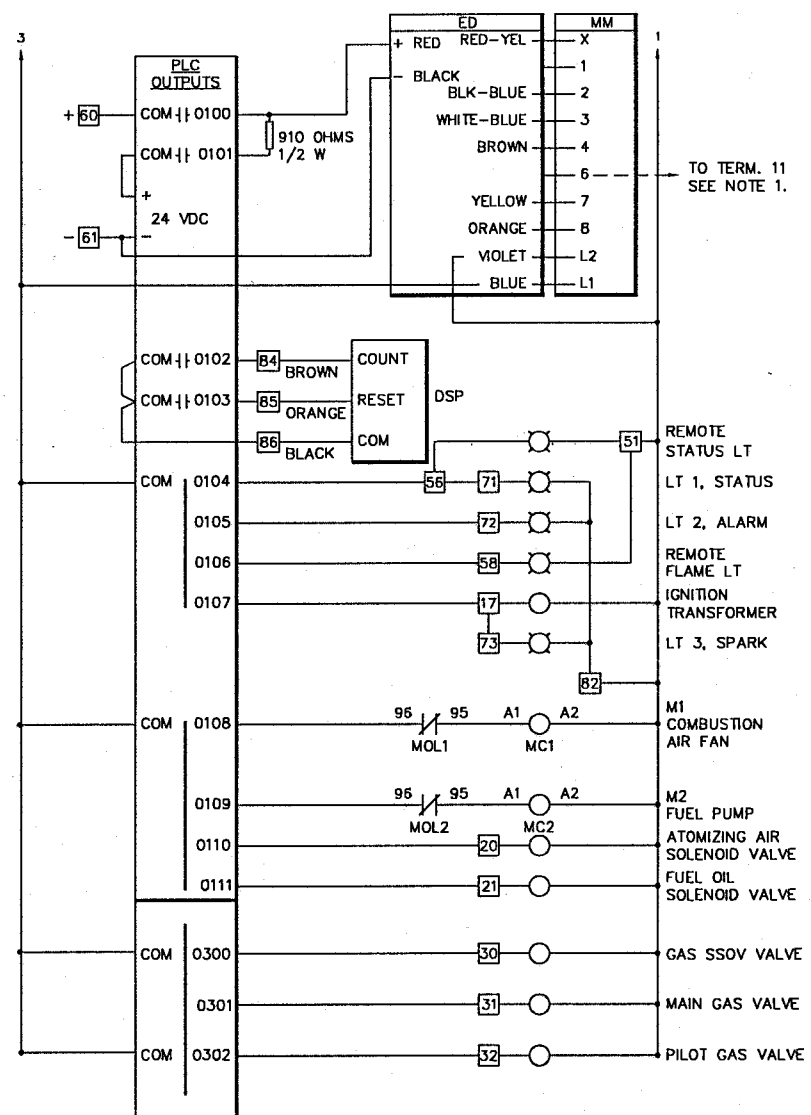
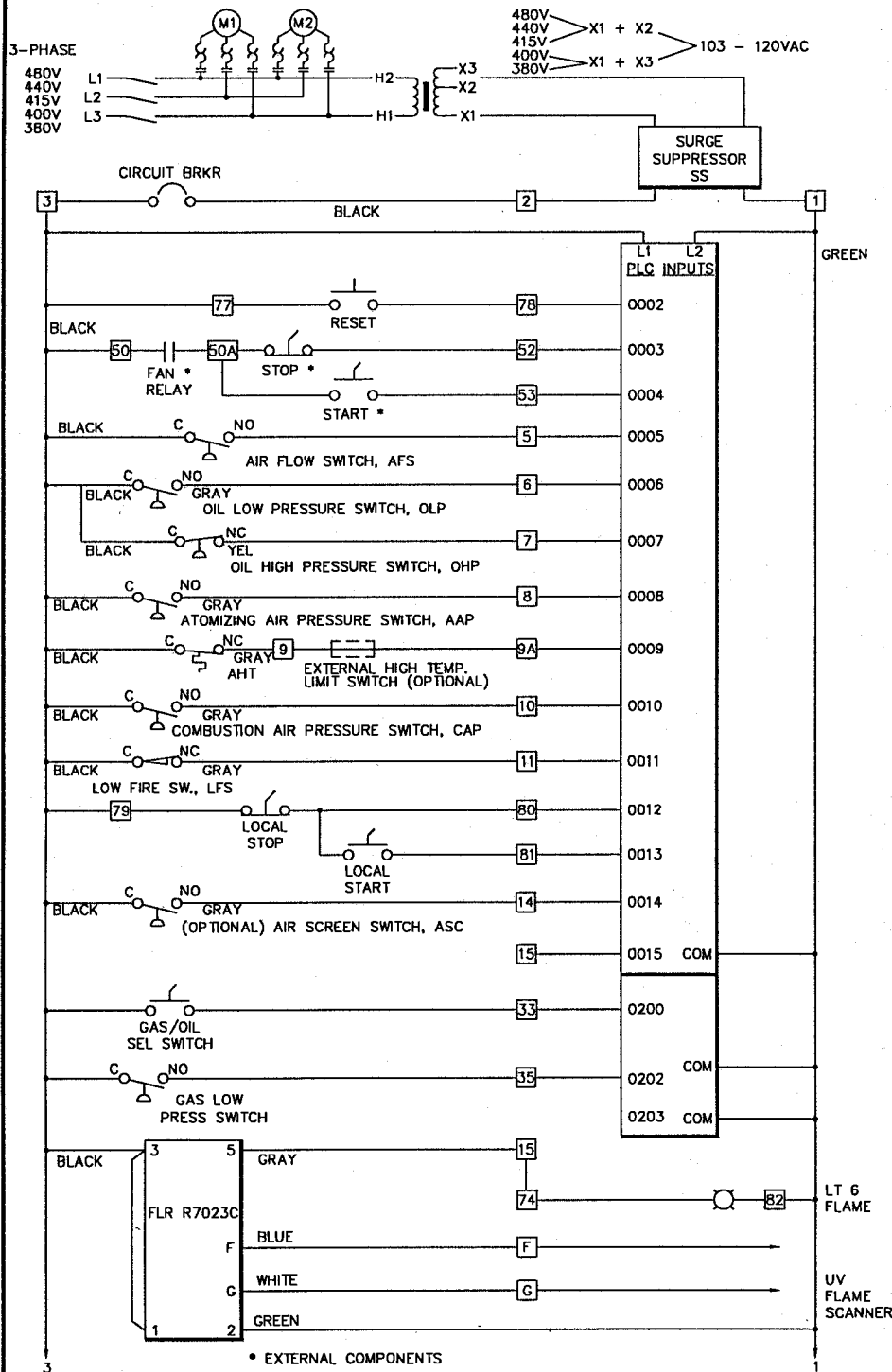
DRAWING NO.

BY G.F.E.

DATE 11-88

14-2528





NOTE 1: ONLY FOR SERIAL NUMBERS 5200 AND 5201 WITHOUT SEPARATE LOW FIRE SWITCH, LFS.

SAMUEL JACKSON, INC.

ELECTRICAL SCHEMATIC FOR
HO-7-1114B/HO-4-1118
WITH DUAL FUEL OPTION

3640B
9-96

DECAL PART 10-17268A

ERRORS AND ALARMS

HO-7-1114B/HO-4-1118

ERROR 20	AIR FLOW SWITCH NOT OFF IN 24 HOURS.
ALARM 21	LOW AIR FLOW FOR LESS THAN 3 SECONDS.
ERROR 22	LOW AIR FLOW FOR MORE THAN 3 SECONDS.
ERROR 23	AIR INLET SCREEN CLOGGED (PULL-THROUGH ONLY).
ERROR 24	OIL HIGH PRESSURE.
ERROR 25	OIL LOW PRESSURE.
ERROR 26	OIL LOW PRESSURE SWITCH NOT WORKING.
ERROR 27	OIL PUMP RAN 20 MINUTES WITH OIL VALVE SHUT.
ERROR 28	LOW ATOMIZING AIR PRESSURE.
ERROR 29	ATOMIZING AIR PRESSURE SWITCH NOT WORKING.
ERROR 30	MODULATING MOTOR FAILS TO GO TO LOW FIRE.
ERROR 31	MODULATING MOTOR FAILS TO OPEN.
ERROR 32	LOW COMBUSTION AIR PRESSURE.
ERROR 33	COMBUSTION AIR PRESSURE SWITCH NOT WORKING.
ALARM 34	HIGH TEMPERATURE LIMIT TURNED BURNER DOWN.
ERROR 35	HIGH TEMPERATURE CONDITION LASTED TOO LONG.
ERROR 36	EXCESSIVE FLAME FAILURES.
ALARM 37	FLAME WAS NOT ESTABLISHED.
ALARM 38	FLAME FAILED DURING OPERATION.
ERROR 39	FLAME SIGNAL BEFORE FUEL BEFORE SPARK.
ERROR 40	FLAME SIGNAL BEFORE FUEL DURING SPARK.
ERROR 41	FLAME STAYS TOO LONG AFTER SHUTDOWN.
ERROR 42	GAS LOW TEMPERATURE.
ERROR 43	GAS LOW PRESSURE.
ERROR 44	MISSING FAN INTERLOCK.
ERROR 50	CALL FACTORY.

NOTE: PLEASE SEE THE SERVICE MANUAL FOR A DETAILED DESCRIPTION OF EACH ALARM/ERROR.

1118ALM

EXPLANATION OF ERROR AND ALARM CODES HO-7-1114B/HO-4-1118

(FOR SOFTWARE VERSIONS 2.2 AND LATER)

PRELIMINARIES -- As explained in the Operation Notes for the 17400 Temperature Control, **ERRORS** will cause the burner to shut down. **ALARMS** will permit the burner to continue operation, but will warn of conditions which may become serious. In each case, a number will be shown on the digital display inside the burner's control cabinet. This number will refer either to an **ALARM** or an **ERROR**. The number displayed will be the **FIRST** alarm or error to occur in a five minute time interval. This could mean that an **ALARM** code is displayed, yet the burner may have shut down due to an **ERROR**.

* **ERROR 20 -- AIR FLOW SWITCH NOT OFF IN 24 HOURS.** The air flow switch must be operated periodically to test its proper operation. If the burner and fans have run continuously for over 24 hours, the burner will **NOT** shut down due to this **ERROR**. However, if the burner is turned off and an attempt is then made to restart it without turning off the fans, it will not start and will display **ERROR 20**. The **RESET** button will **NOT** allow restart. The fans must be turned off and then back on to allow the burner to start again.

ALARM 21 -- LOW AIR FLOW. This **ALARM** is an indication that a partial choke of the air flow is occurring. It is displayed when the air flow switch goes off and comes back on in less than 3 seconds.

ERROR 22 -- LOW AIR FLOW. The air flow was interrupted for more than 3 seconds. Verify proper air flow and adjust switch if necessary.

ERROR 23 -- AIR INLET SCREEN CLOGGED. This applies only to pull-through systems. The air inlet screen is choked and requires cleaning.

ERROR 24 -- OIL HIGH PRESSURE. It may be that the Fuel Pressure Relief Valve FPR has jammed shut or its discharge connection has been closed off. It may be that it is simply adjusted to a pressure higher than the setting of the Oil High Pressure Switch OHP.

ERROR 25 -- OIL LOW PRESSURE. See if fuel pump rotates when restart is attempted. If not, press white reset button on motor overload relay MOL2. If fuel pump runs, check the following: Check for empty oil supply tank. Look for a closed valve in supply pipe. Clean both of the oil filter screens (in the lower cabinet and on the burner). Check for oil leaks which could let air leak into supply pipe and cause pressure to fluctuate. Run the test program to adjust the oil pressure. Remember that the oil pressure determines the maximum heat output and that the oil pressure should be adjusted equal to the air pressure. Oil pressure higher than air pressure can result in smoky operation.

* **ERROR 26 -- OIL LOW PRESSURE SWITCH NOT WORKING.** The oil low pressure switch OLP failed to turn off when the fuel pump was off. Check the OLP to see that its contacts have not been bridged and that it is adjusted properly. Run the test program to check its adjustment.

ERROR 27 -- OIL PUMP RAN 20 MINUTES WITH OIL VALVE SHUT. There is no oil return pipe on this burner. For this reason, prolonged running of the fuel pump with the fuel valve shut can cause overheating of the fuel line in the lower cabinet.

ERROR 28 -- LOW ATOMIZING AIR PRESSURE. The atomizing air pressure fell below 45 psi (3 bars). This may be caused by an inadequate air compressor, a closed valve in the supply line or an unusual usage of compressed air elsewhere in the plant. Dependable atomizing air pressure is essential for the proper operation of the burner. The pressure shown on the air pressure gauge on the burner head should be equal to the oil pressure, normally about 60 psi (4.0 bars).

* **ERROR 29 -- ATOMIZING AIR PRESSURE SWITCH NOT WORKING.** In Step 5, the atomizing air pressure switch AAP told the PLC that air pressure was present although the air valve had not been opened. Check for a leaking air valve or defective AAP.

ERROR 30 -- MODULATING MOTOR FAILS TO GO TO LOW FIRE. There is a limit switch indicating when the burner is in the low fire position. On older units, this switch is inside the motor. Now it is a separate limit switch. The PLC demands that this switch be ON in the low fire position and OFF as the valve opens. If burner throttle is in low fire position, check low fire switch adjustment. If low fire position is not attained, run the test program to Step 5 and test the operation of the modulating motor MM. Check for proper voltage on terminals L1 and L2 of MM.

* **ERROR 31 -- MODULATING MOTOR FAILS TO OPEN.** This is similar to ERROR 30, and the same things should be checked.

ERROR 32 -- LOW COMBUSTION AIR PRESSURE. This error occurs when the combustion air pressure switch CAP sees insufficient combustion air pressure during certain steps of the operating program. Check for proper rotation of the combustion air fan motor M1, and make sure the overload relay MOL1 for this motor is not tripped. Reset it with the white push button. After verifying good combustion air pressure (through the tubes going to CAP), check for proper operation of CAP.

ERROR 33 -- COMBUSTION AIR PRESSURE SWITCH NOT WORKING. In Step 13, the combustion air fan is killed prior to trial for ignition. The pressure must fall to 1" (25 mm) and turn off combustion air pressure switch CAP within 15 seconds or this error will be activated. Look for wrong adjustment of CAP or bridging of its contacts.

ALARM 34 -- HIGH TEMPERATURE LIMIT TURNED BURNER DOWN. This alarm is valid only for combustion control software versions prior to version 2.0. Its purpose is to give notice that the throttling valve is reducing burner output in response to a high temperature condition.

ERROR 35 -- HIGH TEMPERATURE CONDITION. The PLC shut the burner down because of a high temperature condition which occurred either at the burner head or before the blowbox. If the 16910 High Temperature Limit Option is being used, it means that a high temperature condition occurred ahead of the blowbox which the controls were unable to constrain. This would normally be caused by a chokeup or large air leak into the system.

ERROR 36 -- EXCESSIVE FLAME FAILURES. The burner was shut down because more than three flame failures (in ignition or operation) occurred after the burner was started. Normally, the burner will attempt to restart on a flame failure of any kind. If the last flame failure occurred less than five minutes before the shutdown, ALARM 37 or ALARM 38 may be displayed for this ERROR.

ALARM 37 -- FLAME WAS NOT ESTABLISHED. Step 15 reached the end of its maximum time, but flame was not established. Reset the PLC and start the program again. Look for a proper spark through the viewing port in the burner body opposite the spark electrode. If you do not see a spark, look for oil on the spark igniter or wrong adjustment of the spark igniter. See drawing of proper clamping position of igniter. If you see a spark but no flame, observe the oil flow meter for inadequate oil flow at low fire or air or water in the oil. If you see a flame in the viewing window of the burner, but the flame light does not come on, we can suspect a defective UV Flame Detector MP or a defective Flame Relay FLR. Unscrew MP and test it with a lighted match while watching input light 15 on the PLC.

ALARM 38 -- FLAME FAILED DURING OPERATION. Flame was established then failed. This can be caused by air or water in the oil line or atomizing air pressure higher than oil pressure.

ERROR 39 -- FLAME SIGNAL BEFORE FUEL BEFORE SPARK. This error is usually caused by tampering with the Flame Relay FLR. Check to see that the contacts of FLR have not been bridged or jammed.

ERROR 40 -- FLAME SIGNAL BEFORE FUEL DURING SPARK. This error is caused by the UV Flame Scanner MP seeing the spark as a flame. Remove the scanner and verify that the small orifice disk is in front of the lens. If the disk is there, the 3 mm hole may need to be smaller.

ERROR 41 -- FLAME STAYS TOO LONG AFTER SHUTDOWN. This error occurs when flame is still present at the end of Step 20, the tolerated afterburn period. Normally, one should stop the burner as described in Step 19 of the operation sequence. Look at the flowmeter to see if the Fuel Oil Valve FOV in the lower cabinet is closing properly. See if oil pressure is within the recommended range (60 to 80 psi or 4 to 5.4 bars).

ERROR 42 -- GAS LOW TEMPERATURE. This error is valid only for heaters equipped with the DUAL-FUEL OPTION to burn both oil and gas. It occurs when a propane vaporizer fails and allows liquid propane to reach the gas piping of the burner. The low temperature of the liquid propane causes the switch to open, killing the burner, and preventing a fire.

ERROR 43 -- GAS LOW PRESSURE. This error is valid only for heaters equipped with the DUAL-FUEL OPTION to burn both oil and gas. It occurs when gas pressure is too low for proper heater operation. Check all gas supply valves to verify that they are open and check the operation of the propane vaporizer.

ERROR 44 -- MISSING FAN INTERLOCK. This ERROR is caused when an attempt is made to start the burner when no fan interlock relay is present. A fan interlock relay is supplied with the 17400 remote control to provide instant shutdown of the burner when the fans are stopped. The installing electrician is responsible for wiring the coil of this relay to the fan circuits.

ERROR 50 -- CALL FACTORY. 800-862-9966 (U.S. Only) or 806-795-5218. Telefax: 806-795-8240. Refer to heater model HO-4-1118 or HO-7-1114B and provide serial number of machine when calling.

* Indicates an ERROR condition that can be temporarily bypassed. To bypass the ERROR, perform the following steps. These steps will have to be performed in order to bypass the ERROR each time the heater is started until the condition is fixed. While the ALARM light is ON and the STATUS light is flashing:

- Turn the local START-STOP switch to the left (STOP) 3 times.
- Press the RESET button to clear the ERROR and attempt to restart the heater.

TEST SEQUENCE EXPLANATION

HO-7-1114A/HO-4-1118

(FOR COMBUSTION CONTROL SOFTWARE VERSION 2.1 OR LATER)

PRELIMINARIES -- To test a new installation, first check that all necessary connections are made. Standard three-phase electrical power supplies are 380 V 50 HZ, 415 V 50 HZ, 380 V 60 HZ and 480 V 60 HZ. The compressed air supply should be 80 psi (5.4 bars) minimum. The fuel supply may be either No. 2 fuel oil, diesel oil or kerosene. If you try to use a lower grade of oil, you may smoke the cotton. Loosen the fuel filter assembly in the lower cabinet and carefully drain enough fuel to wash out any debris accumulated in the pipe.

The explanation below refers to the Test Sequence Outline. The factory has made the adjustments described before shipment. It will be advisable to repeat Step 6 after installation to purge air from the fuel line and make sure motors are running in proper direction.

The procedure can be used as a methodical way to correct problems.

TO ENTER TEST SEQUENCE -- Press RESET button while turning local selector switch to "0" (STOP). Hold both in for 5 seconds. Watch the STATUS light for seconds count. While still pressing RESET button, briefly operate START switch. This puts you in Step 0 of the test sequence. The STATUS light will confirm this by blinking once per second. The presence of various inputs can be verified by observing the numbered lights at the right end of the heater's PLC. INPUTS are at the bottom. OUTPUTS are at the top. The STEP NUMBER will be shown on the LCD digital display on the sequence panel SP.

STEP 0 -- After releasing RESET button, press it once to proceed.

STEP 1 -- Observe the condition of inputs outlined in TEST SEQUENCE. The operation of the remote and local start-stop switches and other inputs can be tested while observing the input LED's. Turning the start-stop switch to the "1" will test lights 1, 2, and Remote Flame.

Press RESET to proceed.

STEP 2 -- This step tests the modulating motor on the fuel valve at the burner head. In addition, it tests the electronic drive for the motor. Turning the local start-stop switch to the start position applies 20mA DC to the drive, which should open the valve to the full fire position. Releasing the switch or turning it to stop removes the DC current from the drive, which should bring it to the low fire position. As the valve approaches the low fire position, observe input light 11 (low fire switch) on the PLC to make sure that it turns on only at the low fire position. The operation of the low fire switch LFS is checked by the PLC during the preburn routine. As with the combustion air switch, the PLC will not permit the burner to start unless LFS operates properly. Adjust the switch by rotating its cam on the shaft.

Press RESET to proceed to Step 3.

STEP 3 -- The fuel pump is started at this step. Verify that the motor is turning in the proper direction (indicated by the arrow on the motor). If not, kill power and reverse two of the leads at the motor starter (assuming that the combustion air fan motor is running in the proper direction). Return to this step in the test program.

If this is a new installation, it will be necessary to purge the fuel line. Open the cock at the burner head and place a container beneath the clear plastic tube coming from the cock. Turn the START-STOP selector switch at the burner control panel to the start position. This will open the fuel valve in the lower cabinet and begin opening the fuel valve at the burner head. Earlier software versions do not open the valve at the burner head. If this is the case, use a 7/16 wrench to disconnect the linkage at the head and manually move it by hand. Watch the fuel rise in the flowmeter and spill into the container. When it becomes clear with no air bubbles, release the switch, then close the cock. The oil

TEST SEQUENCE EXPLANATION -- PAGE 2

pressure should be steady. Reconnect the linkage.

Observe the oil pressure, which normally should be 60 psi (4 bars) but may be raised as high as 80 psi (5.4 bars) if you cannot get sufficient heat output in actual operation. This pressure determines the maximum heat output of the burner. If necessary, adjust the pressure with the fuel pressure relief valve FPR in the lower cabinet. FPR has an adjusting screw under its cap.

The oil low pressure switch OLP should turn OFF input light 6 on the PLC when the pressure falls below 45 psi (3 bars). Adjust OLP if necessary.

Press RESET to proceed to Step 4.

STEP 4 -- Step 4 opens the atomizing air valve. Adjust air pressure regulator APR so air pressure at the gauge on the burner head is equal to the fuel pressure. Now, slowly close the gate valve in the air supply pipe to reduce the air pressure. Atomizing air pressure switch AAP should turn OFF input light 8 on the PLC when the pressure falls below 45 psi (3 bars). Adjust AAP if necessary.

Press RESET to proceed to Step 5.

STEP 5 -- This step will start the combustion air fan. Verify that the fan motor is turning in the proper direction (arrow on fan motor). If not, reverse any two leads at the main disconnect switch on the side of the control cabinet. The combustion air pressure switch CAP has been adjusted to operate at a pressure of 1" (25 mm) pressure. Input 10 on the PLC should be ON when the combustion air fan is ON, and be OFF when combustion air pressure is not present. In the operation sequence, the PLC tests this switch for Error 33. If the switch is stuck closed, the burner will not start.

Press RESET to proceed to Step 6.

STEP 6 -- Start the main fan. Verify that all push and/or pull fans are running in the proper direction and that there is sufficient air flow. If the heater is attached to a push fan it may need to be isolated or stabilized to minimize vibration. A flexible connection to the push fan is preferred. Adjust the air flow switch AFS so PLC input light 5 shows it to be ON with the main fans running.

Press RESET to proceed to step 7. (Input 5 and 3 must be ON.)

STEP 7 -- (Dual Fuel Only) Test gas valves. Turn the Start-Stop switch to the "1" (start) to open the slow opening gas safety shut-off valve. Note the reading on the gas pressure gage located between the valves. Turn the Start-Stop switch to the "0" (stop) to close the safety shut-off valve and open the pilot gas valve. This exhausts the gas trapped in the cavity and the gage should now read 0 PSI. If the gage shows a pressure increase when neither valve is energized, it is an indication of a gas leak in the safety shut-off valve and should be corrected before operation of the heater. If the gage shows an pressure decrease when neither valve is energized, it is an indication of a gas leak in the main gas valve or pilot valve. Although this is not as serious as a leaking safety shut-off valve, the problem does require correction.

Adjust the gas pressure at the regulator to read approximately 3.5 PSI using the method just described. The gas pressure is adjusted by unscrewing the top cap of the gas pressure regulator and, using a 1/2" drive on a socket wrench, turning the adjustment clockwise to increase the pressure and counterclockwise to decrease it.

Press RESET to proceed to step 8. (Input 5 and 3 must also be ON.)

STEP 8 -- If this heater is equipped with the dual fuel option, turn the fuel selector switch to the desired fuel source. If this option is not applicable, do nothing.

Press RESET to proceed to step 9.

TEST SEQUENCE EXPLANATION -- PAGE 3

STEP 9 -- This step will test the ignition transformer and the ignition light. Turn the start-stop selector switch to START to test the ignition transformer and light. The flame light must remain OFF with the spark ON or the PLC will, during the operating sequence, shut down the burner with Error 40. If the flame light is ON, the orifice disk in the UV Flame Scanner MP is missing or is too large.

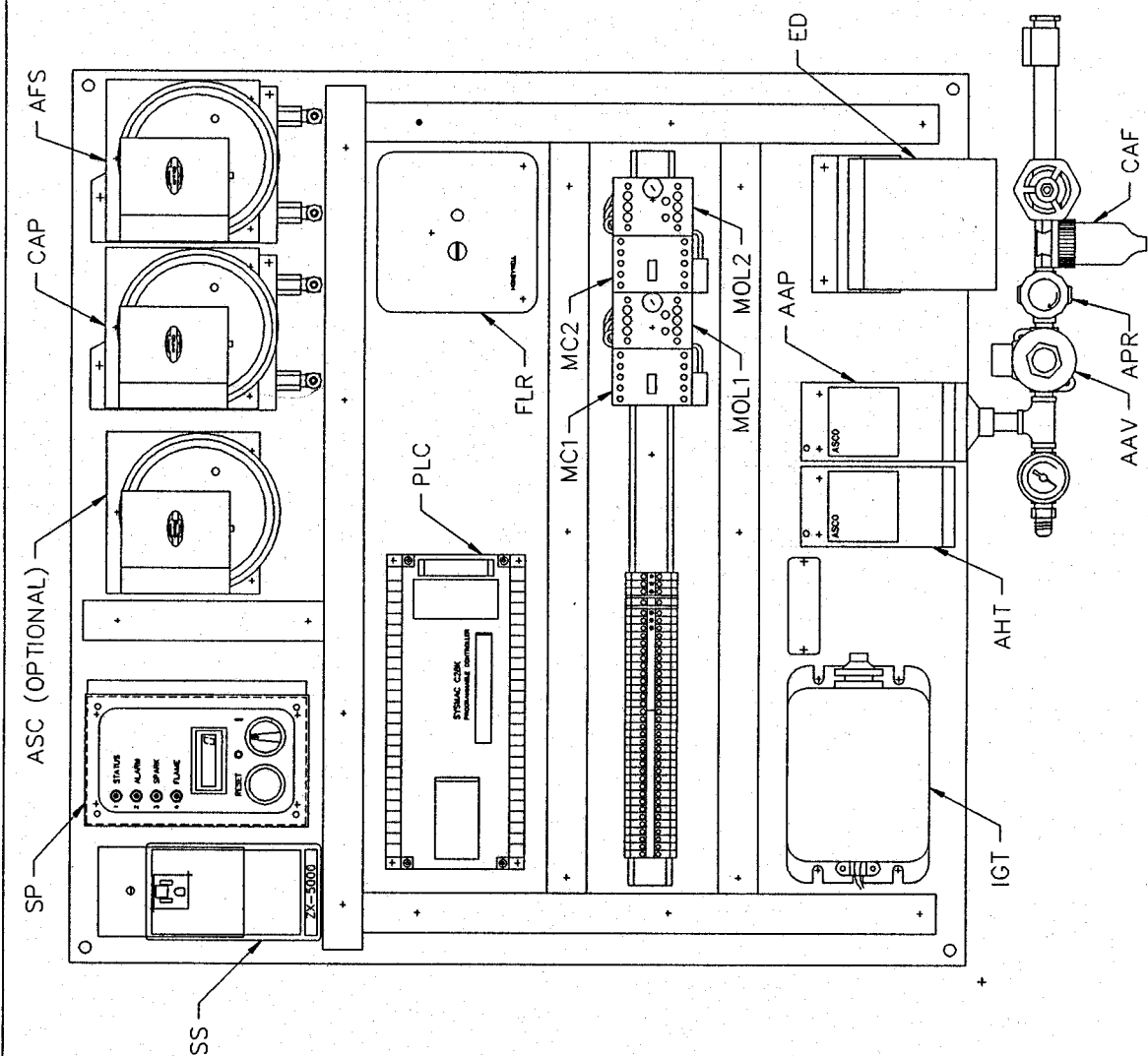
Press RESET to proceed to step 10. (Input 5 and 3 must also be ON.)

STEP 10 -- Steps 10 through 13 will be done automatically by the PLC. The combustion air fan is turned OFF in Step 10 (Oil operation only). Input 10 on the PLC must go OFF for the sequence to proceed.

STEP 11 -- The fuel oil valve is opened and ignition is started. There is a limit of 15 seconds permitted for this step.

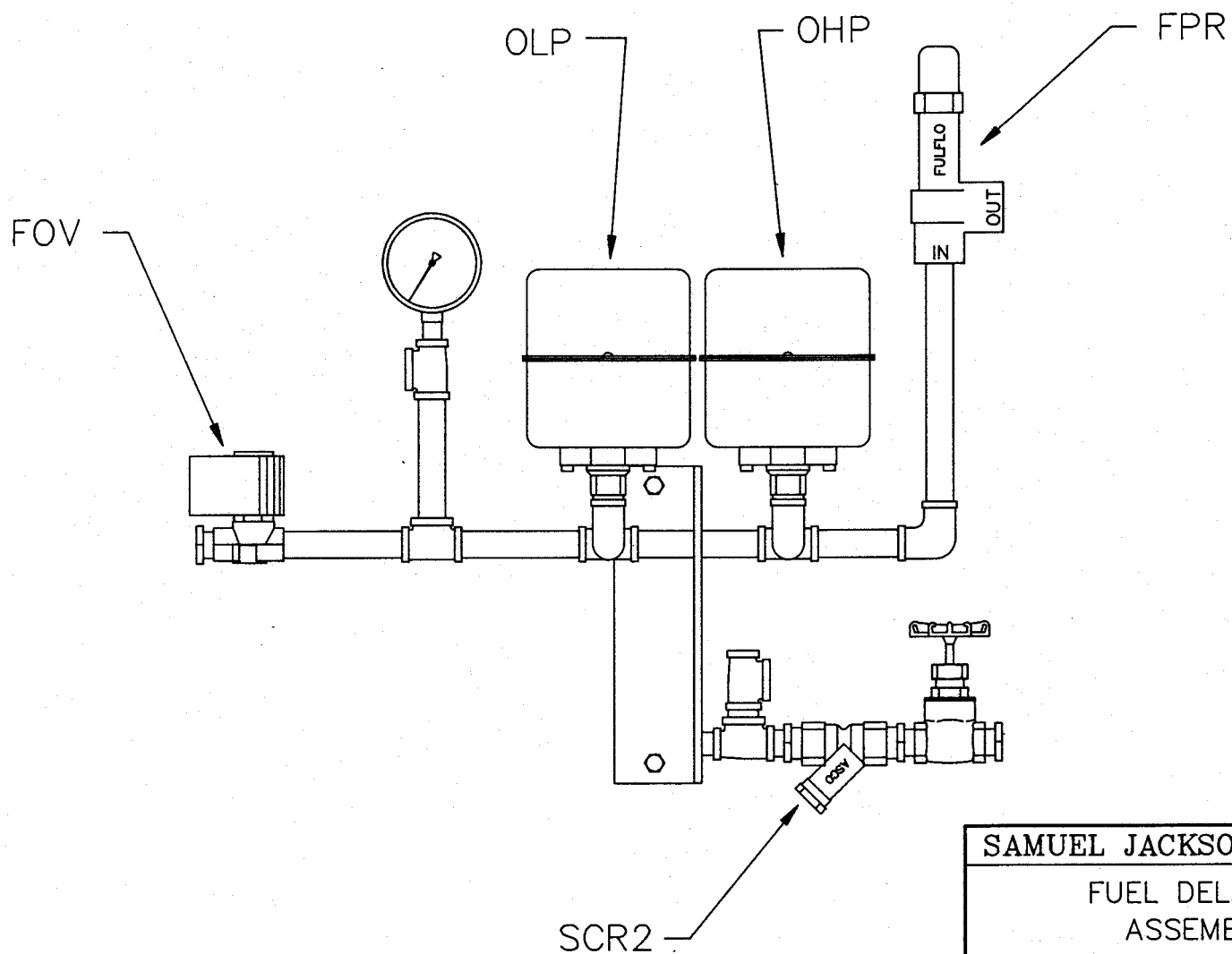
STEP 12 -- The combustion air fan is restarted when flame is established.

STEP 13 -- The modulating motor on the fuel valve is freed to respond to the digital temperature controller. Key in temperature set point high enough to make burner valve go to maximum. Observe fuel flow rate at maximum. Btu/hr output will be 132,000 for each gallon/hr or 35,000 for each liter/hr. The burner will run a maximum of 10 minutes on this step. It will also shut down on loss of flame, STOP, or RESET.



SAMUEL JACKSON, INC.	
CONTROL PANEL ASSEMBLY	
REF: 1114B, 1118	DRAWING NO.
DWN. SK	20-16800B
BY	
DATE 12-14-93	

JOB NO. _____ SCALE: _____



SAMUEL JACKSON MFG. CO.

FUEL DELIVERY
ASSEMBLY

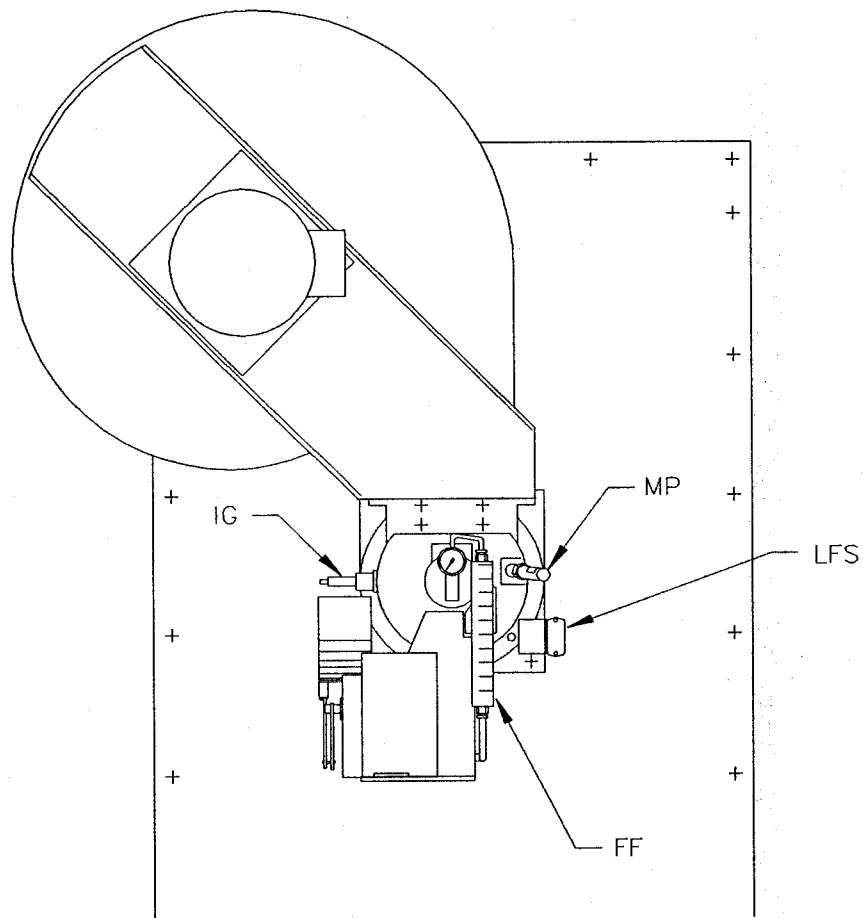
REF: 1114A, 1118

DWN. SK
BY

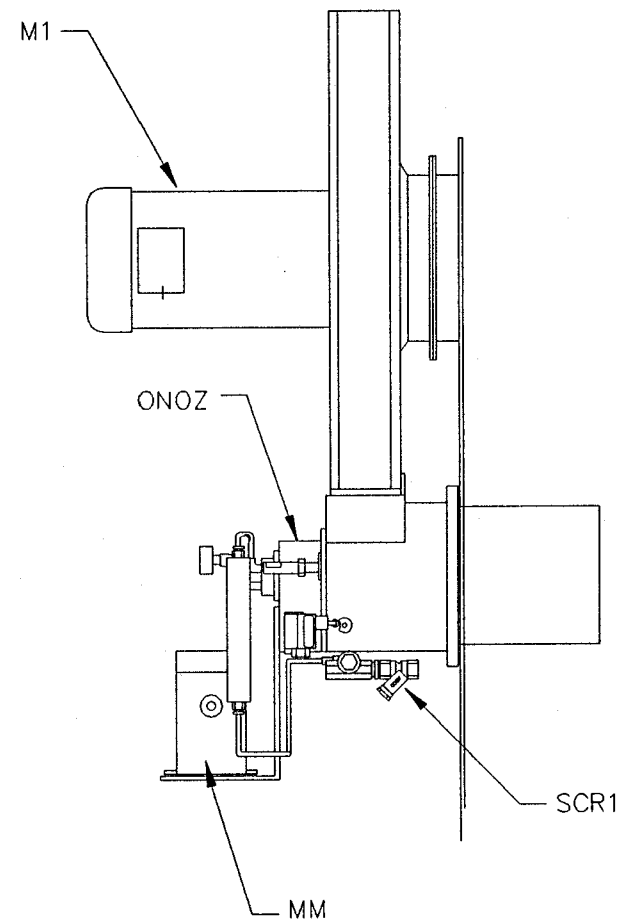
DATE 7-13-89

DRAWING NO.

10-16942



FRONT VIEW



SIDE VIEW

OIL BURNER ASSEMBLY

3560A
12-93

COMPONENT LIST
HO-7-1114B AND HO-4-1118

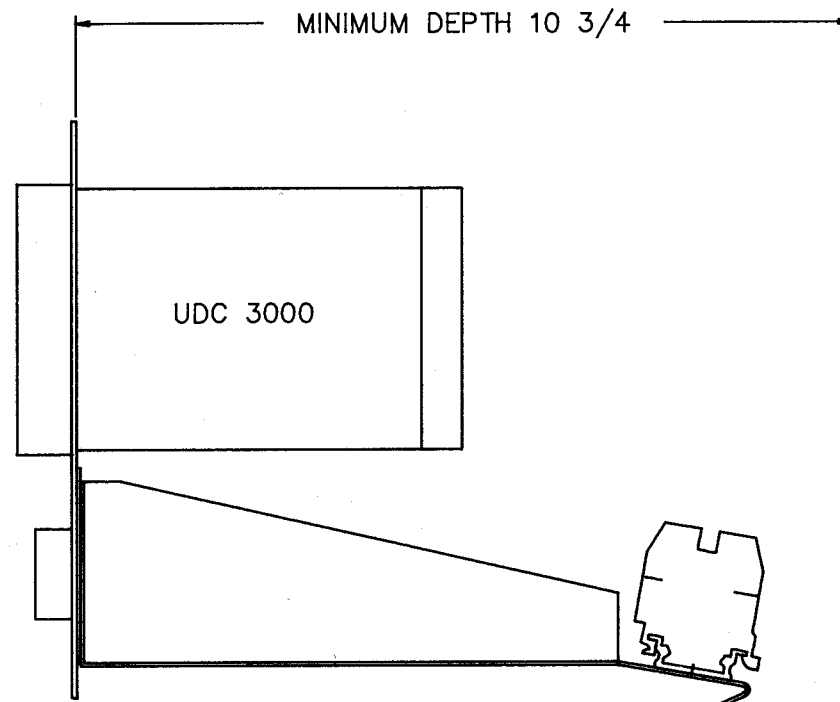
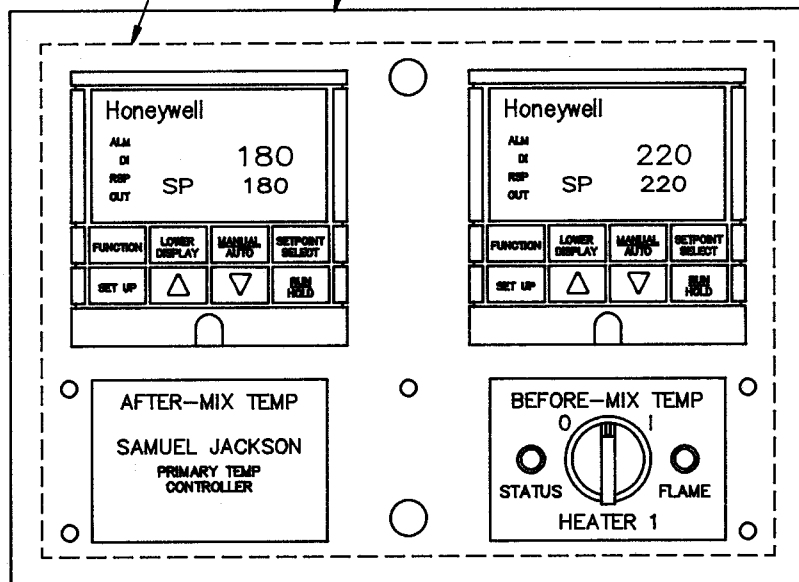
<u>SYMBOL</u>	<u>NAME</u> <u>PART NUMBER, MFR'S TYPE</u>	<u>LOCATION</u>
AAP	ATOMIZING AIR PRESSURE SWITCH 14392 SWITCH UNIT PB-10A 14391 PRESSURE TRANSDUCER RF10A11	UPPER CABINET
AAV	ATOMIZING AIR VALVE 13598, 25005	UPPER CABINET
AFS	AIR FLOW SWITCH 16188, PC-301	UPPER CABINET
AHT	AIR HIGH TEMPERATURE SWITCH 14392 SWITCH UNIT PB-10A 14393 TEMPERATURE TRANSDUCER KJ-11A1	UPPER CABINET
APR	AIR PRESSURE REGULATOR 16830, R-16-02-000	UPPER CABINET
AVP	AIR VELOCITY PROBE 16416	BODY
CAF	COMPRESSED AIR FILTER 16831, F-16-02-000	UPPER CABINET
CAP	COMBUSTION AIR PRESSURE SWITCH 16188, PC-301	UPPER CABINET
ED	ELECTRONIC DRIVE, 4-20 14845, CP-8391	UPPER CABINET
FF	FUEL FLOW METER 16690, 26991 (HO-7) 14501, 26990 (HO-4)	BURNER
FLR	FLAME RELAY 16236, R7023C1001	UPPER CABINET
FOV	FUEL OIL VALVE 16384, M8263B206V	LOWER CABINET
FP	FUEL PUMP 14753, 1300099	LOWER CABINET
FPR	FUEL PRESSURE RELIEF VALVE 12385, VJ-2W/WS	LOWER CABINET
IG	IGNITION ELECTRODE 12796, IP-19	BURNER
IGT	IGNITION TRANSFORMER 11172, 612-6A7	UPPER CABINET
LFS	LOW FIRE SWITCH 16848, BZE6-2RN80	BURNER
M1	FAN MOTOR, 5HP 14376, VM3613	BURNER
M2	FUEL PUMP MOTOR, 1/3 HP 14735, M3458	LOWER CABINET
MC1	COMBUSTION FAN MOTOR STARTER 14854, PD2.10E	UPPER CABINET

COMPONENT LIST - HO-7-1114B AND HO-4-1118
PAGE 2

MC2	FUEL PUMP MOTOR STARTER 14854, PD2.10E	UPPER CABINET
MM	MODULATING MOTOR FOR TCV 16614, MP5-2150 (50 HZ) 14824, MP-2150 (60 HZ) (SERIALS 5200 & 5201 USE 16613, MP5-2110-500)	BURNER
MOL1	COMBUSTION FAN OVERLOAD 14856, TR5.5	UPPER CABINET
MOL2	FUEL PUMP OVERLOAD 14737, TR.55	UPPER CABINET
MP	MINIPEEPER, UV FLAME DETECTOR 12794, C7027A	BURNER
OHP	OIL HIGH PRESSURE SWITCH 16647, PB-11A TRANSDUCER FOR OHP 16668, RF10A42	LOWER CABINET
OLP	OIL LOW PRESSURE SWITCH 16647, PB-11A TRANSDUCER FOR OLP 16668, RF10A42	LOWER CABINET
ONoz	OIL NOZZLE SUBASSEMBLY 16381, 36548535SPEBC-5SP (HO-7) 16511, 36546515SPEBC-3SP (HO-4)	BURNER
PLC	PROGRAMMABLE LOGIC CONTROLLER 16708, C28K	UPPER CABINET
SP	SEQUENCE PANEL COMPLETE 16725, SJMC	UPPER CABINET
SS	SURGE SUPPRESSOR 16191, ZX-5000	UPPER CABINET
TRN	TRANSFORMER 380V, 480 TO 120 16480, 5802 SBE 320 VA	SIDE OF CABINET
SCR1	FUEL STRAINER SCREEN, 1/4 INCH 09992, 88-282-1	BURNER
SCR2	FUEL STRAINER SCREEN, 1/2 INCH 16383, 186-156-2B	LOWER CABINET

10 1/8 X 7 1/8 CUTOUT
REQUIRED FOR CONSOLE MOUNTING

FACE 11 WIDE X 8 HIGH



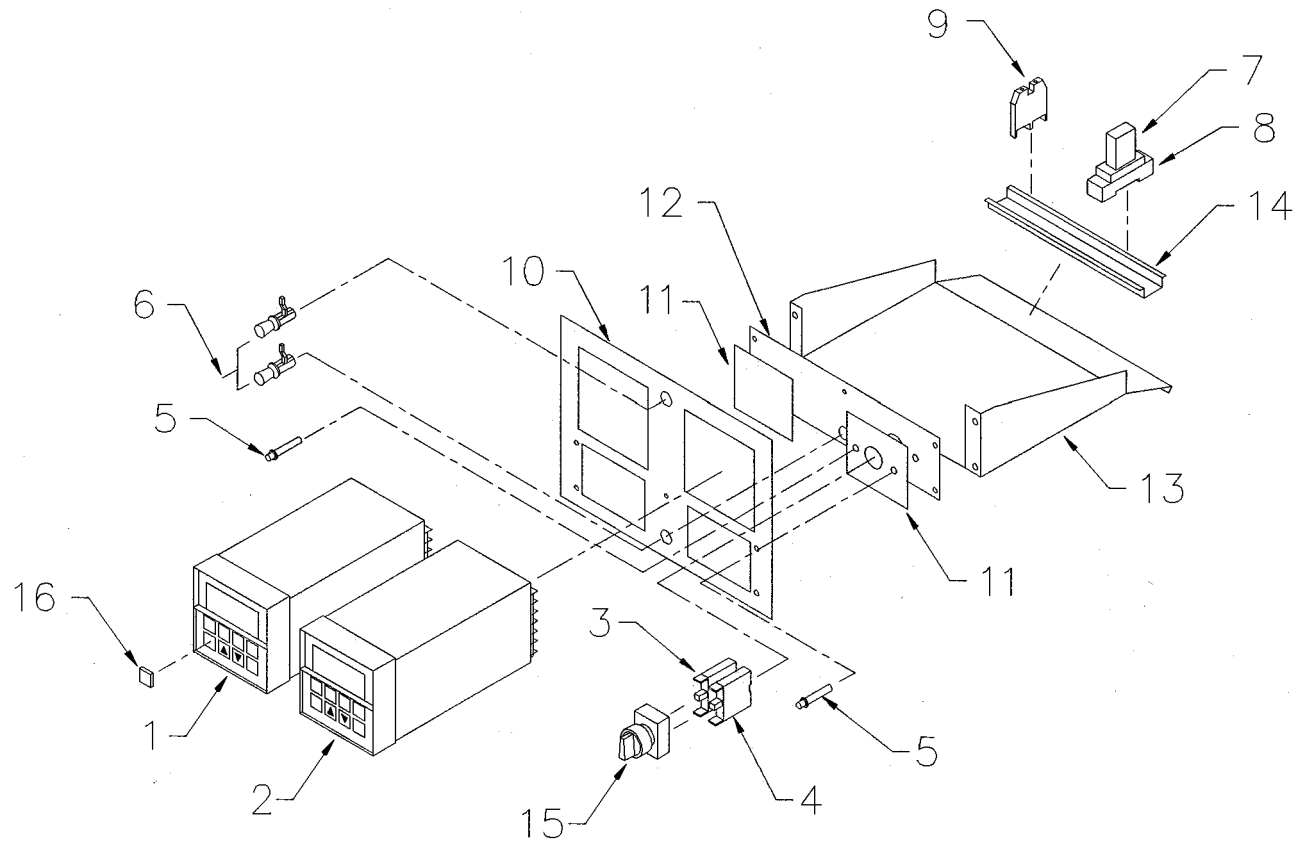
SAMUEL JACKSON, INC.

17400B TEMPERATURE CONTROL
DIMENSION SHEET

3960A
3-94

17400 DIGITAL TEMPERATURE CONTROL

(WITH 16910 MODULATING HIGH TEMPERATURE LIMIT)



<u>REF</u>	<u>PART NO.</u>	<u>QTY. USED</u>	<u>DESCRIPTION</u>
1	16401	1	Digital Temperature Control, UDC 3000
2	17090	1	Digital Temperature Control, UDC 3000 with Alarm and RSP
3	14449	1	1 NC Contact
4	14448	1	1 NO Contact
5	14839	2	Red Indicator Light
6	13811	2	Latch, Adjustable Grip
7	17446	1	Fan Relay
8	17447	1	Socket for 17446
9	16176	13	Terminal Block
10	17104	1	Panel Plate
11	18729	1	Face Plate Decal
12	18723	1	Face Back Plate
13	18726	1	Chassis
14	17405	1	Din Track
15	14445	1	3-Position Selector Switch, Spring Return
16	17091	12	Button Cover

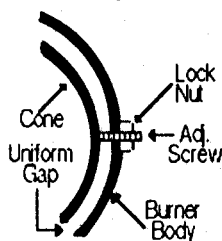
Suggested Maintenance/Inspection Procedures

Discharge sleeve and cone alignment

Centering of the mixing cone provides a small annular opening for the flow of some cooling combustion air along and inside the discharge sleeve wall. We suggest periodic inspection from the discharge side of the burner to assure this critical alignment is maintained.

Inside Inspections (from discharge end of burner) can spot possible mixing cone or discharge sleeve deterioration before performance is drastically affected.

Check specifically that mixing cone is centered within burner body and discharge sleeve, so as to give the intended flow of cooling air along the sleeve. If necessary, re-adjust by loosening the four lock nuts (see sketch) and turning the four adjusting screws to center cone within the opening.



Back each screw off 1/4 turn (to allow for thermal expansion of hot mixing cone) then hold in position and turn all four lock nuts down snugly.

CAUTION: OVER-TIGHTENING ADJUSTING SCREWS CAN GREATLY REDUCE CONE AND DISCHARGE SLEEVE LIFE.

Critical check points in oil line

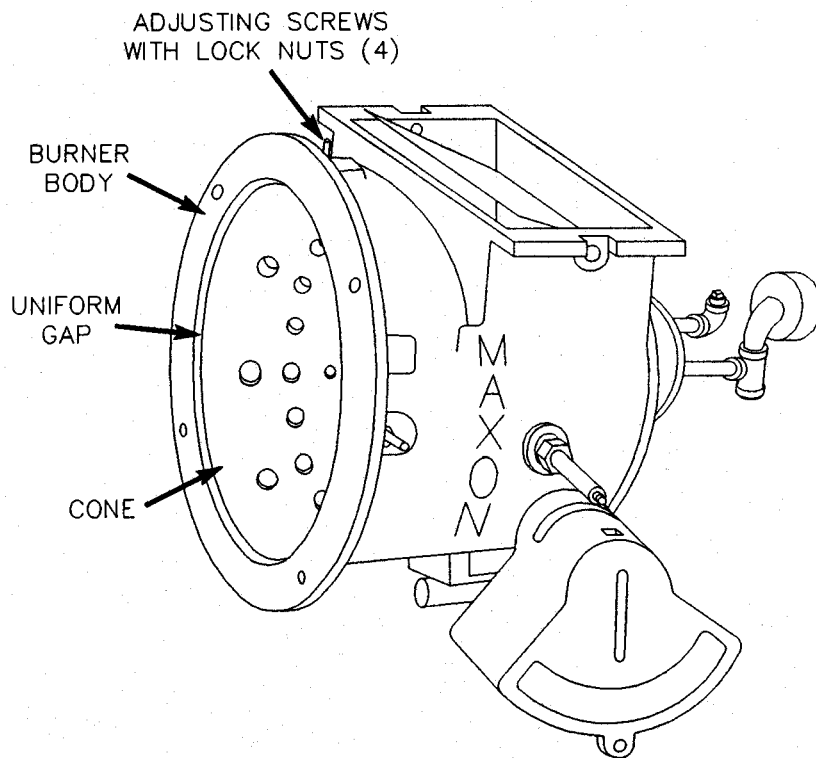
1. Pump (wear, lubrication)
2. By-pass valve (loose packing)
3. Strainer (filled with scale, etc.)
4. Filters (plugged)
5. Regulator (not bottomed)
6. Viscosity no higher than 50 SSU (about 45°F with #2 oil)

Critical check points in compressed air line

1. Compressor (lubrication, water accumulation)
2. Filters (plugged)
3. Water traps (full)

Critical check points on burner

1. Oil control valve (working smoothly)
2. Oil nozzle (clean, no nicks or scratches)
3. Oil insert (plugged)
4. Universal screw carrier snug on operating shaft
5. Set collar tight and snug on operating shaft
6. Set screws holding cone backed off 1/4 turn and locked
7. Cone mounted concentrically in housing
8. Cam strips and/or plunger cap wear



WARNING: If burner is run on oil, but subject to long intervals of gas-only firing, the oil line, components and piping should be blown clear at shutdown to prevent start-up difficulties during later oil light-off.

Filter maintenance

Filters **MUST** be kept clean for optimum burner performance. They should be inspected regularly (experience will dictate the required frequency) and cleaned as needed.

To clean washable/replaceable elements, remove from burner, then vacuum to remove dry accumulations. Wash in warm soapy water, wring gently and dry before replacing in filter assembly.

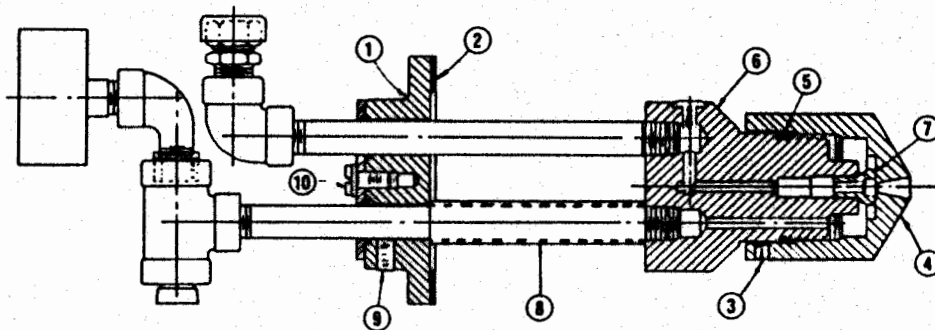
To clean permanent elements, remove from burner, vacuum or blow clean of excess dirt, then wash in soap and water (or solvent, if necessary), dry, re-coat (if desired) and re-install.

Model "500-SP" OVENPAK® Gas/Oil Burners

Suggested Maintenance/Inspection Procedures

To clean oil nozzle sub-assembly

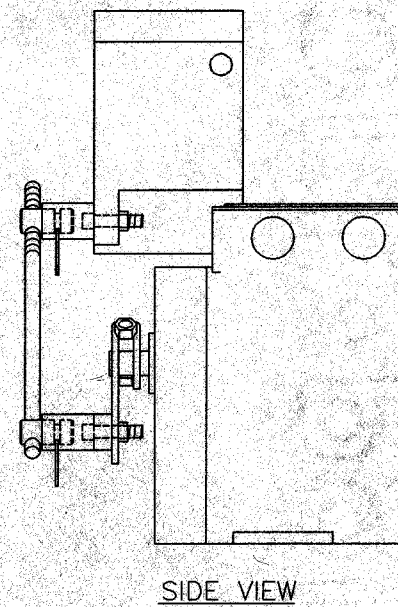
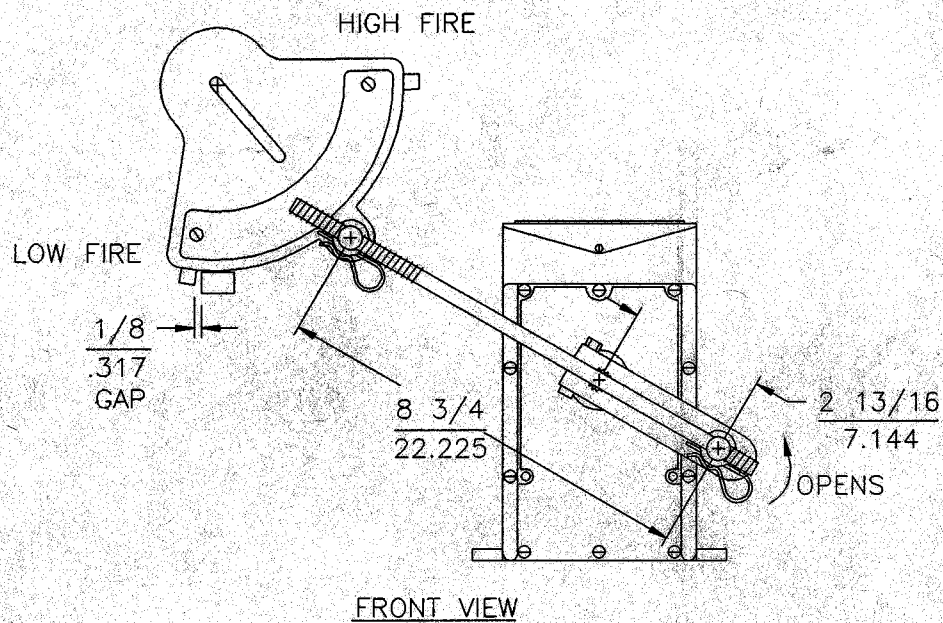
1. Disconnect the oil and compressed air lines at burner and remove the four socket head cap screws holding tube retainer ① to burner.
2. Carefully withdraw the oil nozzle sub-assembly. Save the gasket ②.
3. If a new nozzle sub-assembly is to be installed, replace gasket ② and reverse steps 1 and 2. If the nozzle itself is to be changed or cleaned, loosen the set screw ③.
4. Unscrew nozzle ④ from nozzle sub-assembly. Be careful not to damage the O-ring ⑤ or the insert ⑦. Remove the O-ring ⑤ and save if undamaged.
5. Clean nozzle ④ and insert ⑦. Do not nick or dent the leading edge. Use compressed air or a solvent that will remove all foreign particles. Do not use an abrasive.
6. Re-install VITON O-ring ⑤ or replace if damaged. For a replacement, use a VITON O-ring, size #122 (1-1/8" x 3/32") on 508, 515, EBC-2, and EBC-3 burners (including older versions). On larger burners, such as the 525, 535, 550, EBC-5, and EBC-6, use size #126 (1-3/8" x 1-9/16" x 3/32").
7. Spacer bushing ⑧ should be tightly held between nozzle body ⑥ and tube retainer ①. If adjustment is necessary, loosen Allen screw ⑨ and cap screw ⑩, then slide tube retainer ① towards nozzle body ⑥ as far as possible. Re-tighten Allen screw ⑨ and cap screw ⑩.
8. Re-install oil nozzle ④ on the body ⑥. A drag will be felt when the nozzle contacts O-ring. Continue to screw the nozzle onto the body until insert ⑦ is contacted. **Do not exceed 150 in-lbs torque under any circumstances.** (If nozzle is seated too hard on the insert or if oil nozzle does not contact, poor burner performance will result.) **Do not use pipe dope, permatex, etc. on threads.**
9. Tighten set screw ③; it must not protrude from nozzle.
10. Insert oil nozzle sub-assembly in burner. Make sure gasket ② is in place, then re-install and tighten the four socket head cap screws, holding tube retainer ① in place.
11. Reconnect the oil and compressed air lines, then fire burner and check compressed air pressure and oil flow to insure that nothing has changed. Following established light-off procedure, check pressures, oil flow, main flame, etc.



SAMUEL JACKSON INCORPORATED

P. O. BOX 16587 / LUBBOCK, TX 79490 / U S A

TELEPHONE 806-795-5218 FAX 806-795-8240



MODULATING MOTOR SHOWN IN CLOSED POSITION
WITH CORRESPONDING VALVE POSITION AT LOW FIRE.

SAMUEL JACKSON, INC.

LINKAGE ASSEMBLY

REF: 1200, 1118

DWN.
BY SK

DRAWING NO.

DATE 12-17-93

14-3243

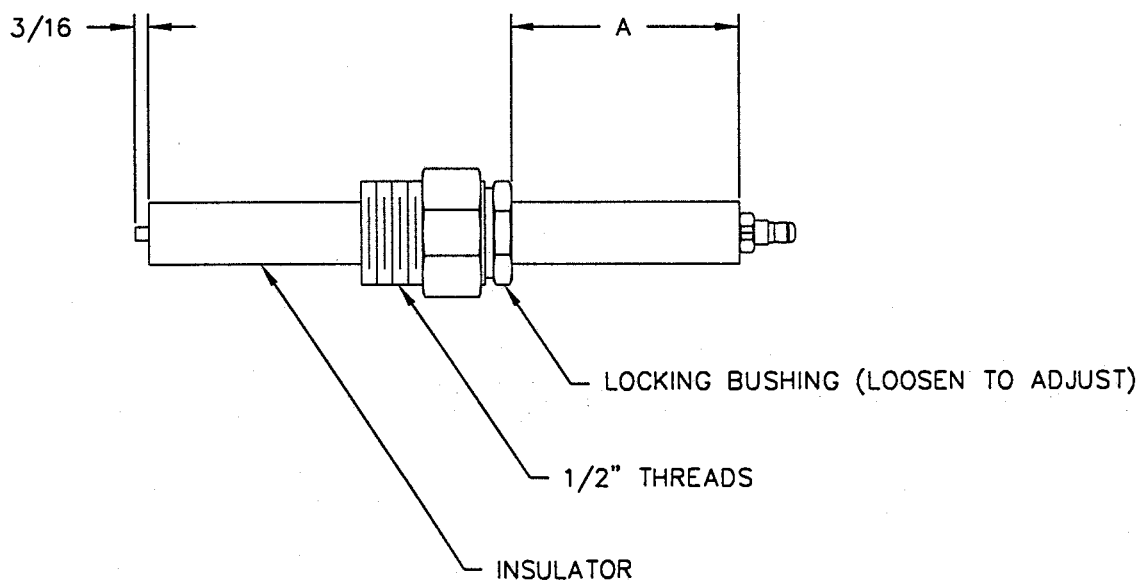
FOR:

SCALE: 1/4

ADJUSTMENT OF 12796 AND 14200 SPARK IGNITORS

14-2378B

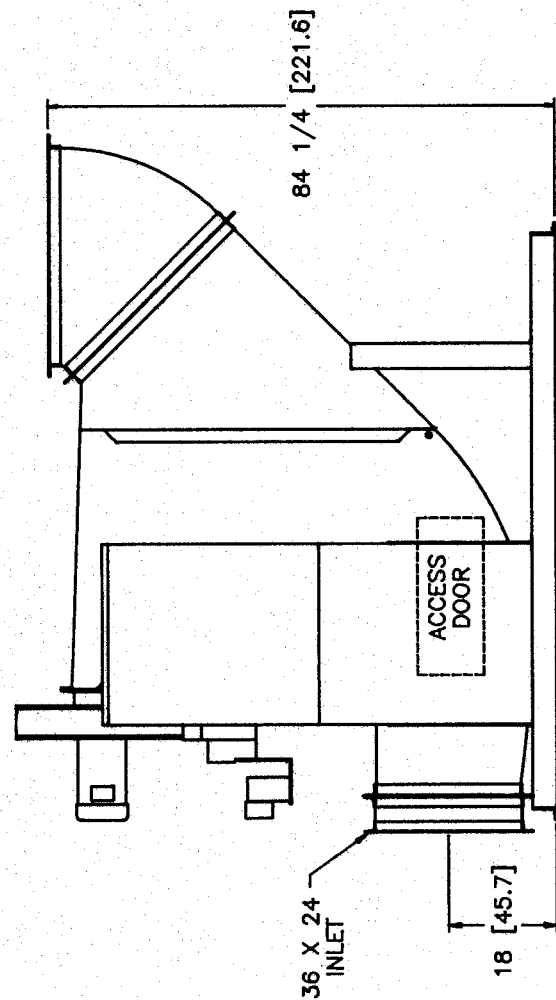
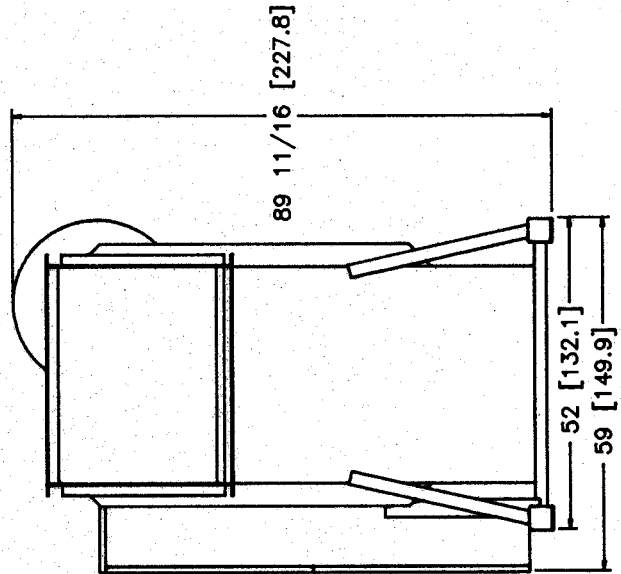
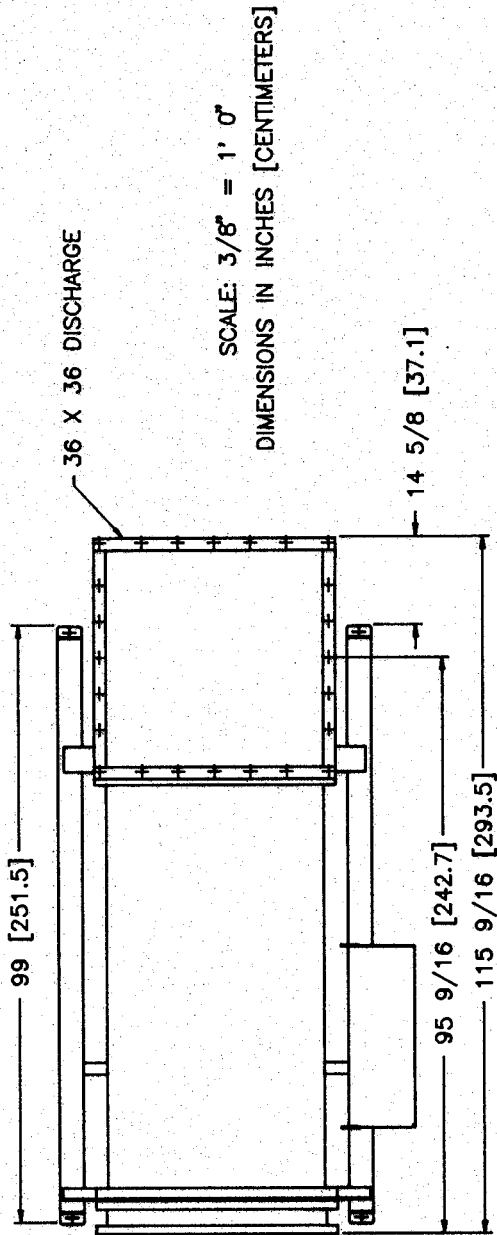
6-96



PART NO.	FOR SAMUEL JACKSON MACHINES	DIMENSION A	
		MM	INCHES
12796	HU-60-1065	25	1.00
	HO-7-1114		
14200	HU-60-1105	40	1.56
	HO-4-1112		
	HO-4-1118		
	HU-60-1200		
	HU-60-1260		

DIMENSION SHEET FOR HO-7-1114B
7 MILLION BTU/HR OIL-FIRED HEATER
VERTICAL DISCHARGE

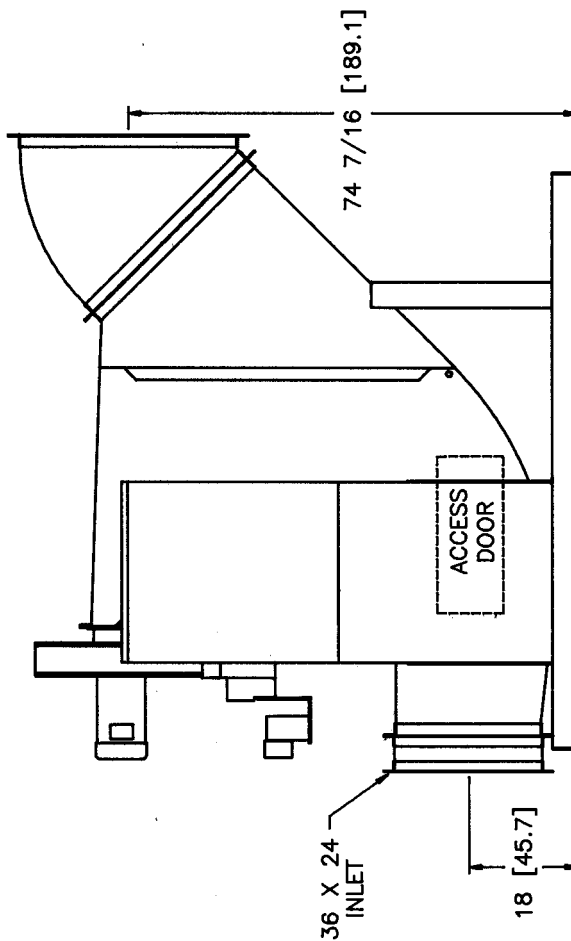
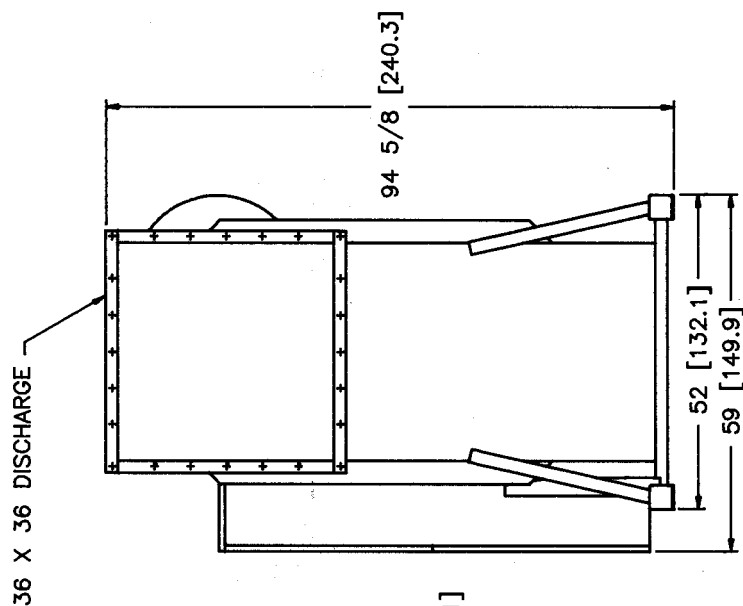
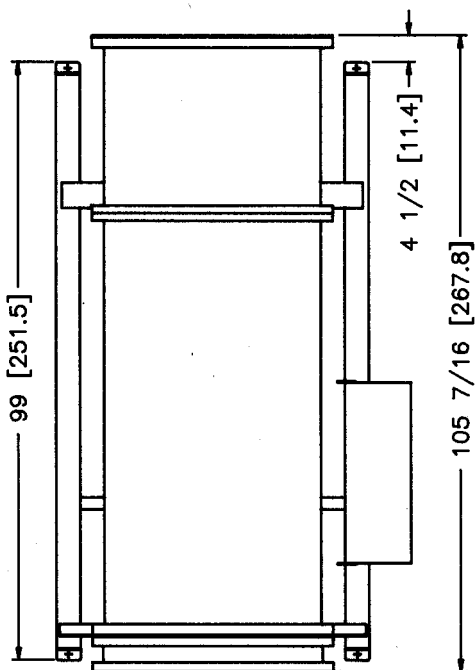
CAT-3612A
 12-90



DIMENSION SHEET FOR HO-7-1114B
7 MILLION BTU/HR OIL-FIRED HEATER
(HORIZONTAL DISCHARGE)

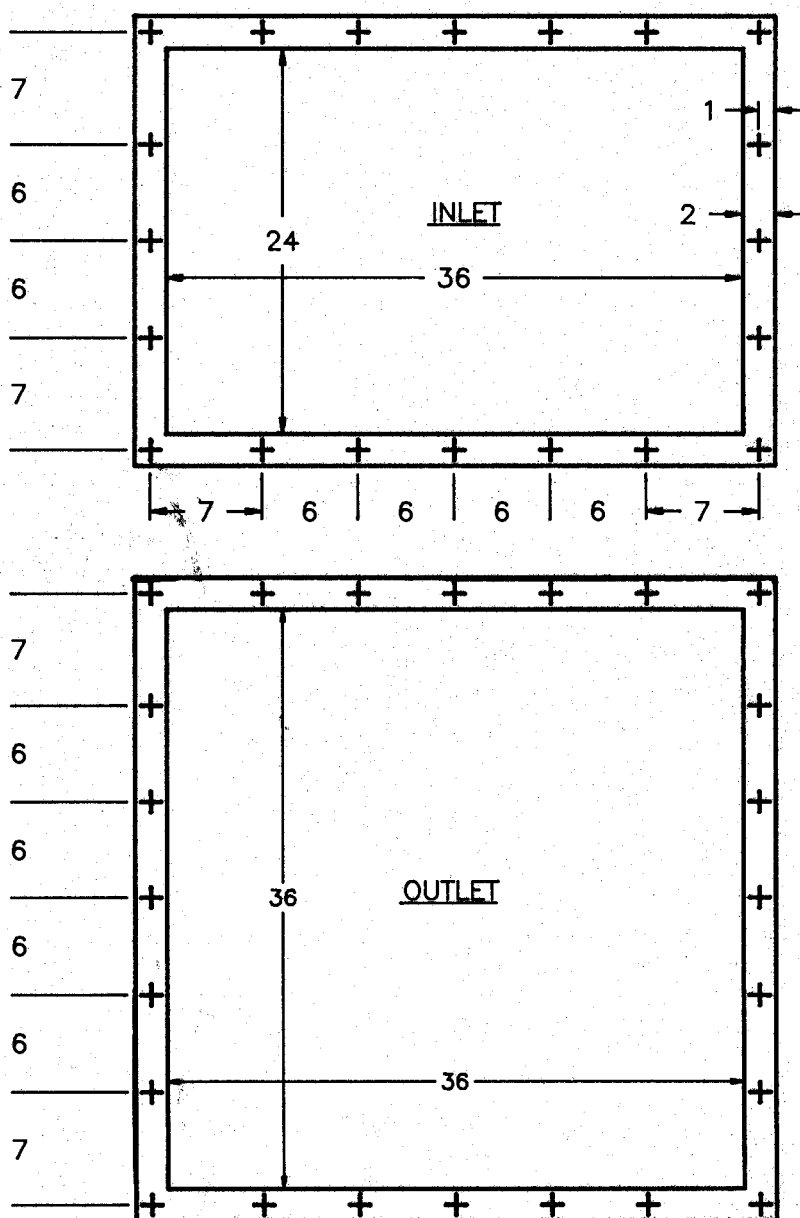
CAT-3612B
12-90

SCALE: $3/8" = 1' 0"$
 DIMENSIONS IN INCHES [CENTIMETERS]



INLET AND OUTLET
HOLE PATTERN
FOR HO-7-1114B

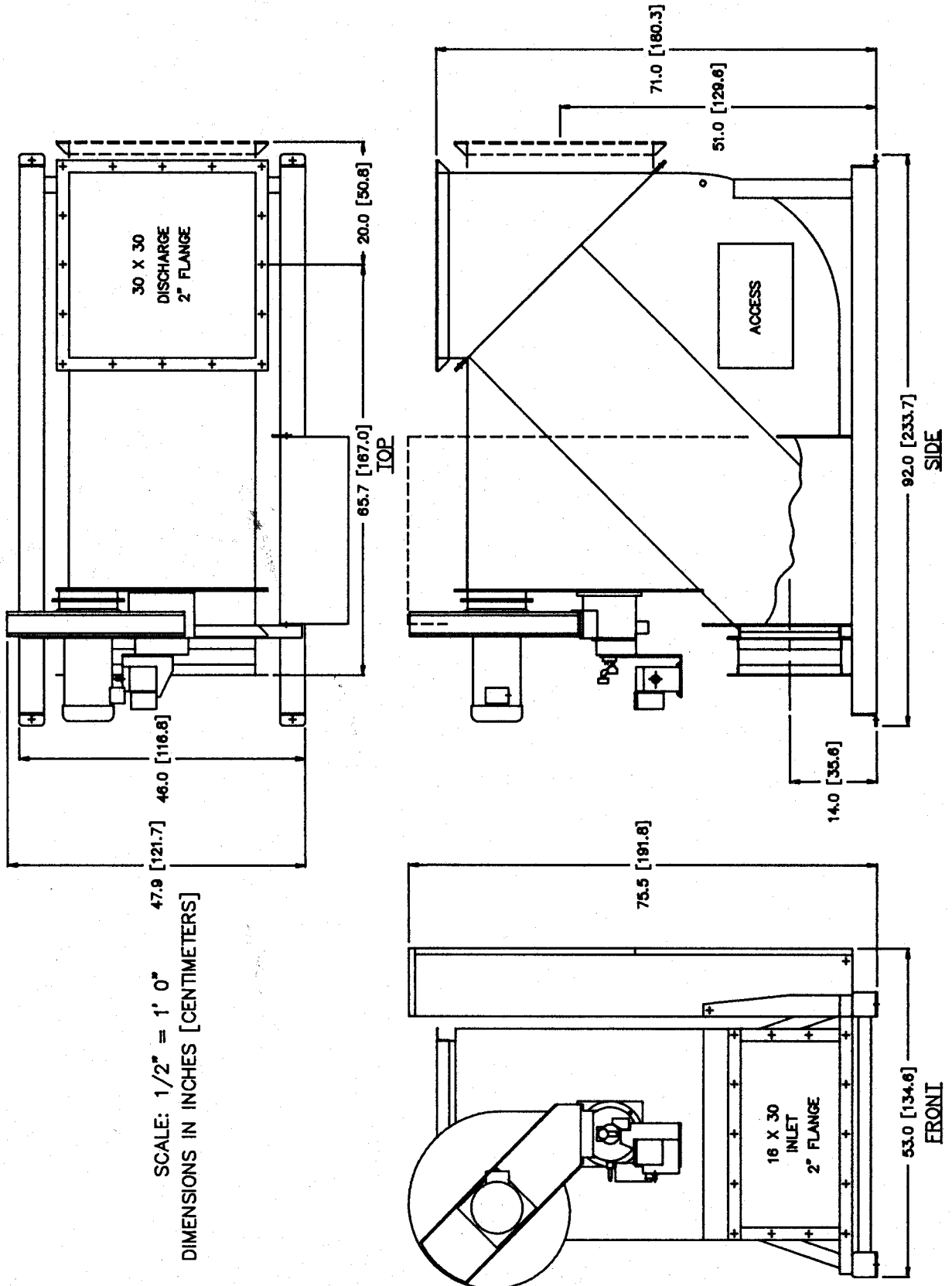
CAT3652
5-91



HOLES $3/8\phi$
2 X 2 X $1/8$ ANGLES
SCALE: 1" = 1' 0"

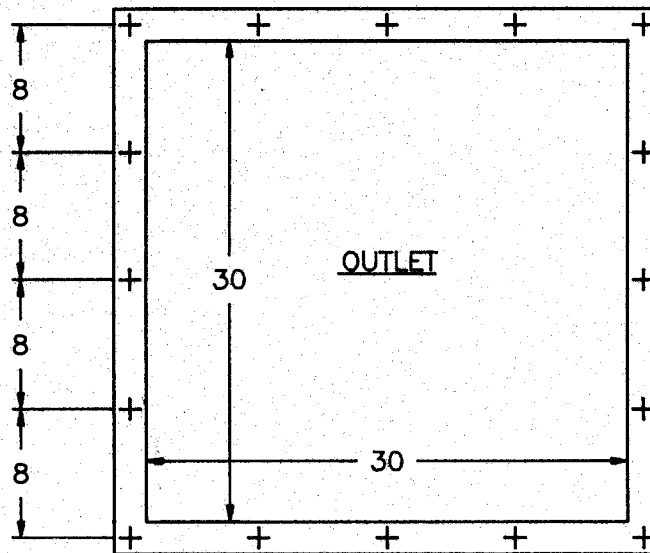
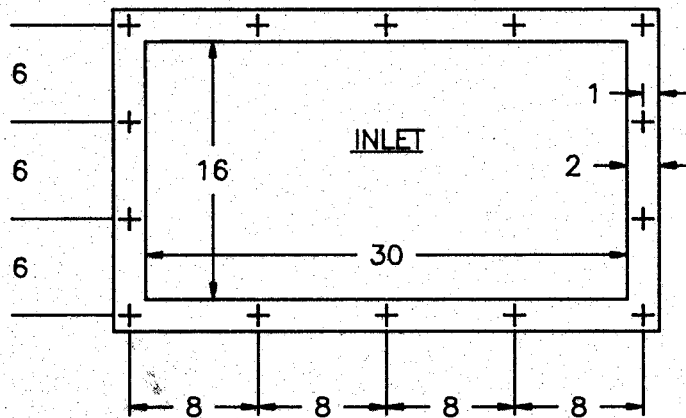
DIMENSION SHEET FOR HO-4-1118 4 MILLION BTU/HR OIL-FIRED HEATER

CAT-3510
12-90



INLET AND OUTLET
HOLE PATTERN
FOR HO-4-1118

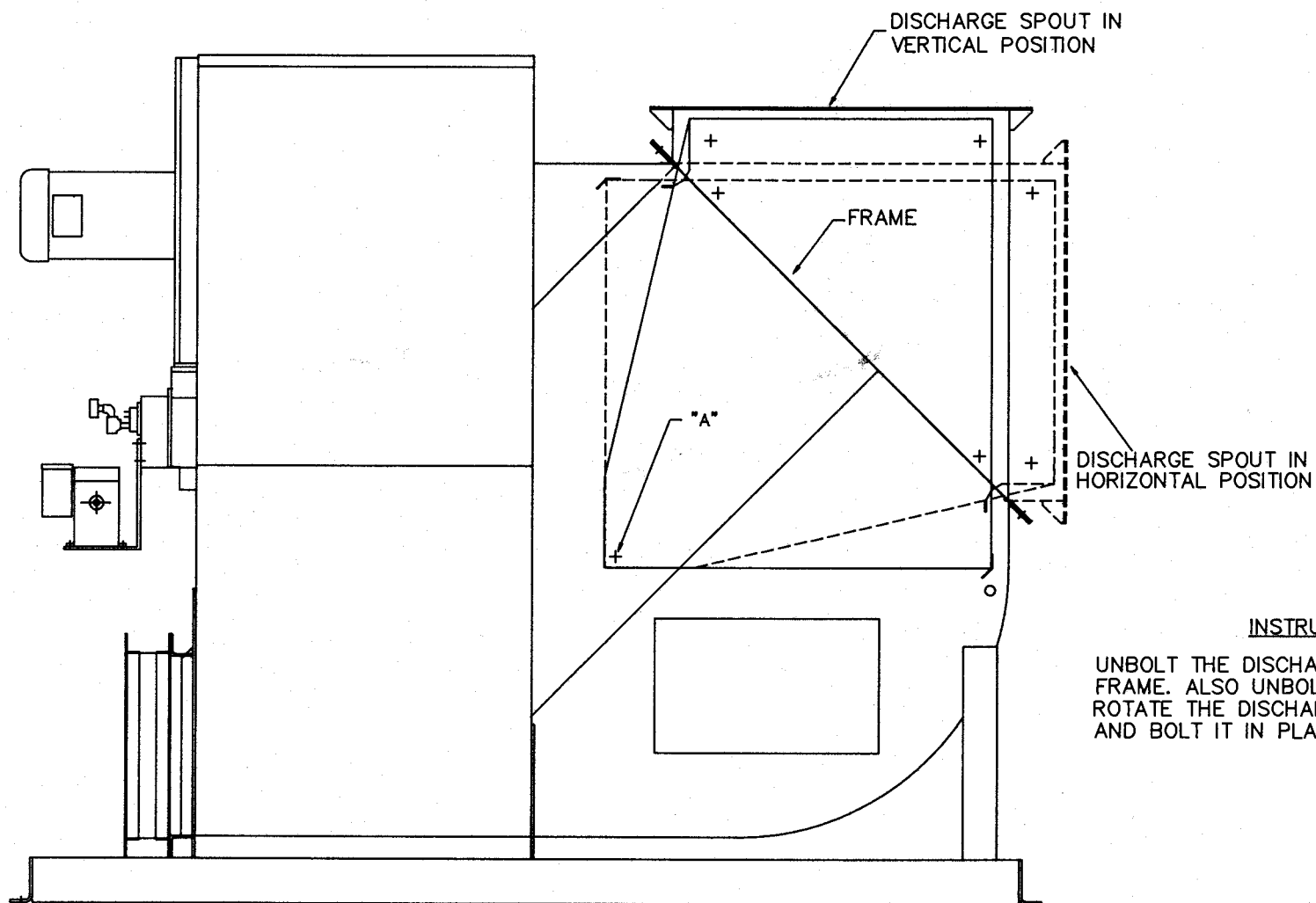
CAT3580
5-91



HOLES $3/8\phi$

2 X 2 X $1/8$ ANGLES

SCALE: 1" = 1' 0"



INSTRUCTIONS

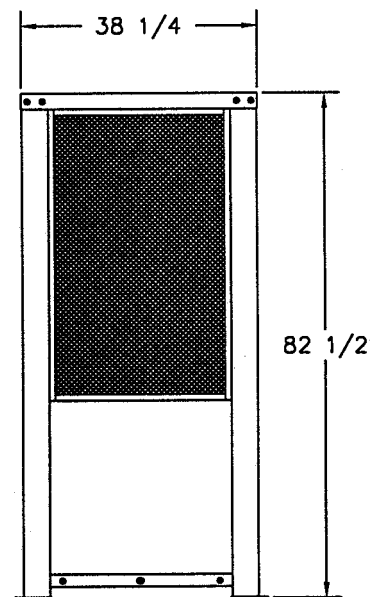
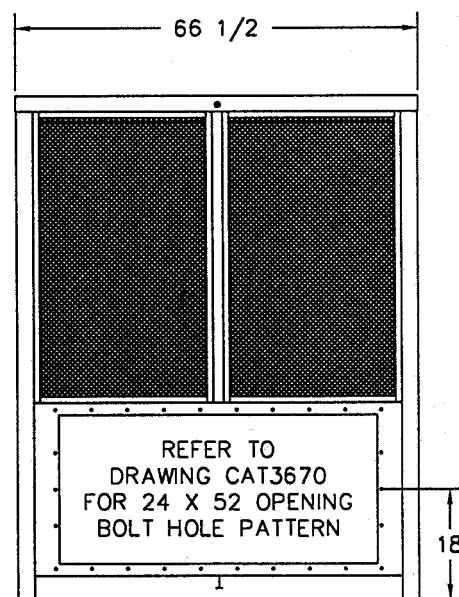
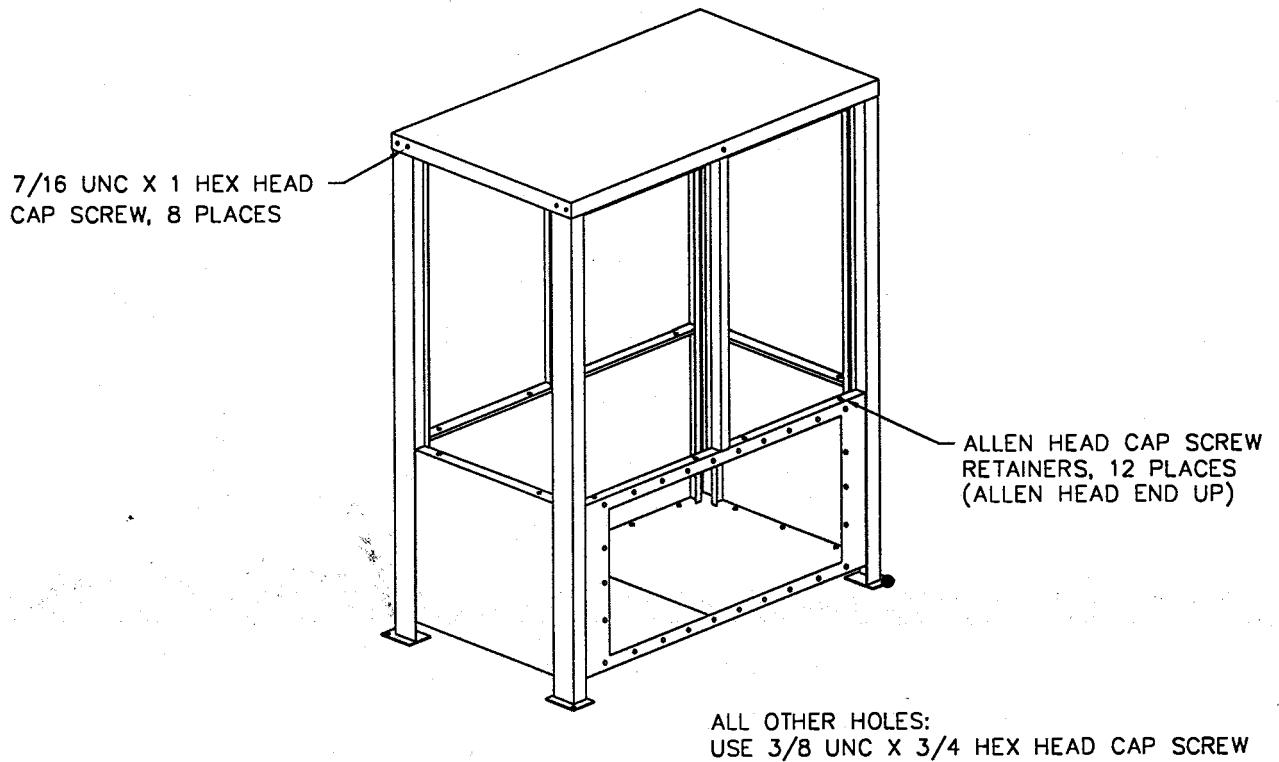
UNBOLT THE DISCHARGE SPOUT ALONG THE FRAME. ALSO UNBOLT SCREW "A" (SEE FIGURE). ROTATE THE DISCHARGE SPOUT AS SHOWN AND BOLT IT IN PLACE USING THE SAME HOLES.

DISCHARGE SPOUT OPTIONS FOR HO-4-1118

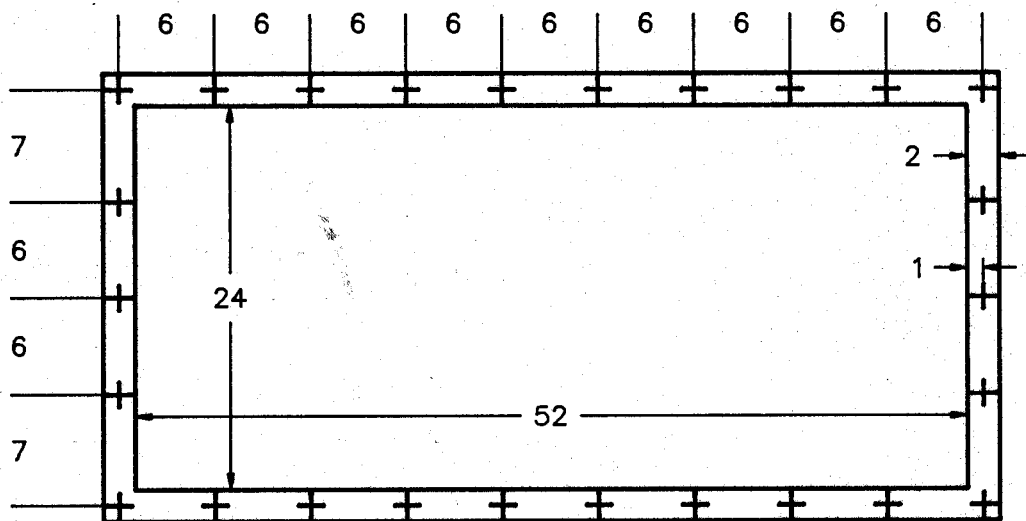
3570
7-89

ASSEMBLY DETAIL OF
80080 INLET SCREEN ASSEMBLY FOR
HO-7-1114B AND HO-4-1118

3660A
9-95



CAT3670
8-91



HOLES 3/8"
2 X 2 X 1/8" ANGLES
SCALE: 1" = 1' 0"