



BCS 6500 CONTROL SYSTEM WITH REMOTE I/O & FIBER-OPTIC LINK



WARNING

These instructions are intended for use only by experienced, qualified combustion start-up personnel. Adjustment of this equipment and its components, by unqualified personnel, can result in fire, explosion, severe personal injury, or even death.

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Attachments: Applicable Hauck Drawings

These instructions are intended to serve as guidelines covering the installation, operation, and maintenance of Hauck equipment. While every attempt has been made to ensure completeness, unforeseen or unspecified applications, details, and variations may preclude covering every possible contingency. **WARNING: TO PREVENT THE POSSIBILITY OF SERIOUS BODILY INJURY, DO NOT USE OR OPERATE ANY EQUIPMENT OR COMPONENT WITH ANY PARTS REMOVED OR ANY PARTS NOT APPROVED BY THE MANUFACTURER.** Should further information be required or desired or should particular problems arise which are not covered sufficiently for the purchaser's purpose, contact Hauck Mfg. Co.



WARNING

This equipment is potentially dangerous with the possibility of serious personal injury and property damage. Hauck Manufacturing Company recommends the use of flame supervisory equipment and fuel safety shutoff valves. Furthermore, Hauck urges rigid adherence to National Fire Protection Association (NFPA) standards and insurance underwriter's requirements. Operation and regular preventative maintenance of this equipment should be performed only by properly trained and qualified personnel. Annual review and upgrading of safety equipment is recommended.

A. GENERAL INFORMATION

The Hauck Burner Control System (BCS) provides burner management and temperature control of a single pilot ignited burner firing on natural gas, oil, or liquid propane (LP). The spark ignited, gas fired pilot is interrupted after the main burner flame has been established. Flame supervision is provided by a Honeywell RM7800 series flame relay combined with an amplifier module and one or two ultra-violet (UV) flame detectors.

A Programmable Logic Controller (PLC) supervises burner operation and provides three process control loops for material temperature, stack temperature, dryer draft. The PLC is coupled to a touchscreen display to supply the operator with system status and fault annunciation. The system includes Master and a Remote control panels with local and remote PLC inputs and outputs. Locating the Remote panel near the burner reduces field wiring. Communication between the local and remote I/O is via a fiber-optic cable.

Two Hauck P1161 series instruments are provided for temperature indication and over-temperature protection. The thermocouple of the MATERIAL TEMPERATURE instrument is positioned to read the temperature of the material as it exits the dryer, while the STACK TEMPERATURE instrument's thermocouple senses the temperature of the exhaust gases. The instruments display the process temperature and provide temperature inputs to the PLC. The PLC, in turn, is electronically linked to the burner control motors to automatically adjust the burner firing rate and maintain process temperature near setpoint. The Operator can assign control of the burner to either thermocouple.

The alarm contact of the STACK TEMPERATURE instrument is used to shut down the burner if the preset high temperature limit is exceeded. The PLC also provides high stack and material temperature alarms, which drive the burner to low fire if their alarm setpoints are exceeded.

The panel also includes special provisions for adjustable valve characterization which can be utilized to reduce stack emissions. Refer to Section F, Valve Characterization, for details.

NOTE

High temperature limits will not prevent baghouse fires. They will, when properly installed and adjusted, shut off the burner when a given temperature setpoint is exceeded. Outside factors such as chemicals, bag contamination or other ignition sources are beyond the control of the burner management system.

CAUTION

The STACK alarm setpoint is factory set at 400°F (240°C). If the system is equipped with a fabric dust collector (baghouse), consult the manufacturer for recommended baghouse temperature limitations. Refer to Appendix E for entering the desired alarm setpoint.

B. RECEIVING AND INSPECTION

Upon receipt, check each item on the bill of lading and/or invoice to determine that all equipment has been received. Examine all parts to determine if there has been any damage in shipment. If equipment is to be stored prior to installation, provide a dry storage area.

IMPORTANT

For optimum use of the BCS panel, it is suggested that the drawings provided by Hauck be referred to for limit switch and valve installation, and wiring. In the event that a recommended switch or valve is not used, it may be necessary to connect jumper wire(s) between appropriate terminals in the control panel or burner junction box. Such determination remains the responsibility of the Customer, based upon his application, accepted safe installation and operating procedures, and any applicable insurance guidelines or governmental regulations.

C. DRAWINGS AND SUPPLEMENTAL LITERATURE

Eco-StarII™ B	
Drop-in Master Panel Assembly	Y8824
Remote Panel Assembly	Y8825
System Schematic	Y8819

D. INSTALLATION

1. The drop-in Master panel is designed to install in an existing enclosure. Reference drawing Y8824 for required cutouts and mounting dimensions. Locate the Remote panel on a firm support free from vibration and protected from radiated heat.

IMPORTANT

Operating specifications of 32 to 131°F (0 to 55°C) and 30 to 95% relative humidity (non-condensing) should be considered in selecting a suitable location for the control panel.

2. Reference Y8819 system schematic for connection of field devices.
3. Provide 120Vac single phase **grounded neutral** power to the Master control panel. It is recommended that the customer provide a master disconnect switch to interrupt power service to the panel. Maintain polarity as indicated on the drawings provided when connecting the main power source to the panel.
4. Install a heavy gauge (No. 12 AWG minimum) ground wire between the Master panel ground connector and 'Earth' ground.

5. Install the stack temperature thermocouple in the dryer exhaust duct to sense exhaust gas temperature. See Appendix G. for installation instructions.
6. Install a Hauck Rapid Response material temperature thermocouple in the material discharge chute to sense the temperature of the material leaving the dryer. See Appendix H. for recommended installation.
7. Connect the thermocouples to the appropriate terminals in the Master control panel using thermocouple cable of the same type as the Material and Stack thermocouples.

IMPORTANT

Thermocouple cables must be separated from AC power and control wiring to avoid interference and nuisance shutdowns. Observe polarity when making thermocouple connections. Regardless of thermocouple type, **the red wire is always negative.**

8. Wire the applicable motor starter interlocks to the Master control panel.
9. Interconnect the Master and Remote panels via a four conductor power and limits cable and a 62.5/125 multimode fiber-optic cable with type ST connectors.
10. Install the exhaust fan flow limit switch in the dryer exhaust duct as shown in Appendix F. Wire the normally open contact of the exhaust flow limit to the Remote control panel.
11. A pressure tap for the dryer draft transmitter should be located in the 2 or 10 o'clock position on the dryer breech. Locate the tap midway between the outer edge of the breeching and the outer edge of the combustion chamber or shell. Cut a hole to accommodate a 1" (DN 25) pipe coupling angled downward at approximately 30° from horizontal.
12. Mount the draft transmitter on a vibration free support, shielded from direct flame radiation. The operating temperature range is -20 to 180°F (-29 to 82°C). Connect the transmitter manifold to the LOW pressure tap and leave the HIGH pressure tap open to atmosphere as a reference. The open tap must be shielded from wind and other disturbances and should not be in a position where it can collect dirt or water. The manifold moisture drain should be positioned vertically down.
13. Install the flame scanner(s) on the burner and wire them to the appropriate terminals in the burner junction box and Remote panel. Reference burner instructions for scanner installation details.

IMPORTANT

The flame scanner, draft transmitter, and control motor position feedback signals should be run in a separate harness from the burner junction box to the Remote control panel. These cables must be separated from all other AC power and control wiring. **If shielded cable is used, only one end of the cable shield should be grounded.** Use one of the ground terminals in the Remote control panel for this purpose.

14. Wire the fuel valves limit switches, pressure limit switches and remaining field components either directly to the Remote panel or through the burner junction box to the Remote panel.

15. Set the purge timer TD352 in the Remote panel for the required purge time.

IMPORTANT

Before igniting the burner, the dryer must be purged to remove possible accumulation of combustible gases. **A minimum of four complete air changes must be supplied.** Multiply the total system volume (dryer, baghouse and exhaust ducts) in cubic feet (meters) by four. Divide this value by the burner air capacity in cubic feet (meters) per minute. The result will be the required purge time in minutes.

16. Be sure that all equipment and components have been installed in accordance with the manufacturer's instructions.
17. Verify all wiring and tighten connections.
18. Clean all traps and filters.
19. Check all fuel and air supply lines for leaks.
19. Verify all pressure settings.

IMPORTANT

Periodic testing of the flame supervision components, safety limits and interlocks should be conducted to insure proper operation. Testing should be performed by personnel who are familiar with the equipment and the functions of the various controls. See Appendix J for a checklist and procedure.

E. ADJUSTMENTS & FINAL CHECKOUT:

Record all settings on the Configuration Record Sheet provided in Appendix B.

IMPORTANT

The burner control motors incorporate a position feedback slidewire. A 5 VDC supply voltage from the panel is connected to the slidewire in order to generate 0 to 5 VDC position feedback signals for the PLC. The following control motor calibration procedure must be performed before operating the burner for the first time. **Recalibrate annually or whenever a control motor is serviced or replaced.**

The touchscreen provides access to the system operating parameters. Note that touching any of the numeric displays with white text on a blue background will provide a pop-up keypad for numeric entry. The use of a pencil eraser, wooden or plastic stylus is recommended for more precise selection. In order to extend the life of the display, it has been programmed to enter a screen saver mode five minutes after the burner is stopped. Simply touch the display to deactivate the screen saver.

MOTOR CALIBRATION & SETUP Screen

Press the MAIN MENU key to access the menu screen, then press the MOTOR CALIBRATION & SETUP button to display the calibration screen.

MOTOR CALIBRATION

- The control motor DEADBAND settings determine the allowable deviation (+/-) of actual control motor position from setpoint without corrective action by the motor control outputs (minimum 0.2%, maximum 2.5%, typically set at 0.5% for fuel and 0.8% for air). These parameters should be set as low as possible without causing the control motors to 'hunt' excessively. Touch the numeric displays and use the popup keypad to enter a deadband setting for each motor.
- Press the ZERO button to drive all control motors closed for calibration and record the slidewire feedback signals. Confirm that all motors have reached their low fire positions before beginning span calibration.
- Press the SPAN button to drive the motors open and record the resulting feedback signals. Verify that all motors have fully opened before pressing the OFF button to store the span values and end motor calibration.

BURNER OPERATING PARAMETERS

- Set the BURNER OUTPUT LIMIT at 100.0% for normal operation. This value may need to be lowered to accommodate system limitations.
- The LIGHTOFF TIME setting determines how long the fuel valve will remain in its lightoff position before returning to its low fire setting. Timing begins as soon as the main flame has been proven.
- If the optional gas flow display and totalizer are installed, set the GAS PRESSURE to match the pressure, in osig, measured just upstream of the gas orifice flange assembly.

TEMPERATURE DISPLAY

- If the Material and Stack temperatures displayed on the touchscreen are significantly different from the UDC1200 instrument displays, a positive or negative BIAS value may be entered for each instrument.

CONTROL LOOP TUNING Screen

After setting and recording all parameters on the Motor Calibration & Setup screen, press MAIN MENU key to return to the menu screen then select the CONTROL LOOP TUNING button to display the loop tuning screen. This screen is used to enter tuning constants for each of the three PID control loops. MATERIAL or STACK temperature control may also be selected on this screen. Manual control of the burner firing rate and exhaust damper control motors are also provided.

- Enter a GAIN setting for each loop. Note that $\text{Gain} = 100/\text{Proportional Band\%}$ or $\text{Proportional Band\%} = 100/\text{Gain}$. For example, a Gain of 2 is equivalent to a Proportional Band setting of 50%. Note that the range of the PID control loops in the BCS6000 is 1000.
- Enter a DEADBAND setting ($^{\circ}\text{F}$ for temperature and "WC for draft) for each loop. This value should be as small as possible without excessive 'hunting' by the control actuators.
- Enter a RESET setting for the Material and Stack control loops. Note that Reset is expressed in **minutes per repeat** rather than repeats per minute. Therefore, the smaller the setting the more frequently reset action will be repeated.

- Enter a RATE setting (seconds) if desired for Material and Stack control. Note that Rate tends to de-stabilize the control and may be left at zero.
- Enter CYCLE time settings (seconds) for the Draft control loop. This loop provides duplex time proportional control outputs for the exhaust damper actuator and has separate Open and Close cycle times similar to the DPS instrument it replaces.

AUTO TUNE

The Material, Stack and Draft control PID loops are each equipped with an AUTO TUNE button. Please note the following before initiating the auto tune procedure:

- Make a note of the existing tuning parameters on the Control Loop Tuning Screen before beginning Auto Tune. Factory default settings are given in the Configuration Record Sheet.
- Only one loop at a time may be tuned.
- The process should be operating under normal conditions before beginning the Auto Tune procedure. Do not change material feed rate, mix or setpoint while Auto Tune is in progress.
- Stabilize the temperature or draft as close as possible to the setpoint in MANUAL, then switch the loop to AUTO and press the AUTO TUNE button to begin.
- For the Material and Stack temperature control loops, burner OUTPUT must be less than 60% for the Auto Tune sequence to be performed. Auto Tune will increase burner output by 10% and calculate new gain and reset values based on the process response. Auto Tune will be complete after the associated temperature has increased by approximately 40°F (4°C). Consult Hauck's Service department if a larger or smaller step is required.
- For Draft control, the loop will be cycled between 100% and 0% three times during the course of the Auto Tune procedure.
- Auto Tune may be interrupted, if necessary, by placing the control loop in manual.
- The resulting GAIN and RESET parameters (GAIN only for Draft control) will be automatically updated when the sequence is completed.
- For processes with significant dead time (such as a rotary dryer) it may be desirable to decrease the GAIN parameter.

RUN MENU Screen

After all loop tuning settings have been recorded, return to the MAIN MENU, then press RUN MENU to display the run menu screen. This screen provides control mode selection, startup ramp settings for automatic temperature control, low fire drive alarm settings, and draft control setpoints.

DRAFT CONTROL

- Enter a Draft Control PURGE SETPOINT for use during the burner purge sequence. This value is normally set higher than the normal draft setpoint in order to prevent dusting as the air damper drives open for purge.
- Enter LOW FIRE and HIGH FIRE SETPOINTS for Draft Control. The draft setpoint will automatically ramp from the low fire to the high fire setpoint as the burner firing rate increases.
- Enter a TRANSFER DELAY time in seconds to set the length of time after burner ignition is initiated that the purge setpoint remains active for Draft Control before transferring to the normal operating setpoint.

- To accommodate variations in material moisture or composition and prevent nuisance shutdowns, provisions are made for automatic draft setpoint increase. The PLC senses 'puffs' in the dryer drum and automatically increases dryer draft if a set number of 'puffs' occurs within a ten second time window. Set the desired increase via the INCREASE DRAFT BY __ __ "WC display and enter values in the IF DRAFT DROPS BELOW __ __ "WC and MORE THAN __ TIMES fields. For example, with settings of 0.02"WC, 0.10"WC and 2 Times, the dryer draft setpoint would be increased by 0.02"WC if dryer draft dropped below 0.10"WC more than two times within a ten second interval due to puffing. Note that the Draft Control setpoint returns to its original setting when the burner is shut off.

TEMPERATURE CONTROL

- Select MATERIAL or STACK temperature control.
- Set a START AT and RAMP AT percentage for startup. If automatic temperature control is selected, the burner will drive to the START AT __ % setting as soon as the main flame has been established. The control output will then begin to RAMP AT __ % per minute until the temperature is within 10°F (5.5°C) of setpoint or the output of the selected control loop is less than or equal to the ramp output. The ramp will then stop and the control loop will assume control of the burner firing rate.
- The burner will be forced to low fire if the stack temperature exceeds the LOW FIRE DRIVE IF STACK GREATER THAN __ F setting.
- Likewise, the burner will be forced to low fire if material temperature exceeds the LOW FIRE DRIVE IF MATERIAL GREATER THAN __ F setting.

LINKAGE SETUP

After motor calibration is completed and system setup parameters have been set, press the LINKAGE SETUP button to enter the Linkage Setup mode. The fuel and air control motors will be released from low fire and respond to the output of the temperature control loop. Return to the MAIN screen and place the temperature control loop in MANUAL. Drive the motors as required to adjust fuel and air control valve linkages. Confirm all linkage adjustments and insure that control arms and linkage rods are tight, then return to the RUN MENU screen and select either MATERIAL or STACK control to return to normal operation.

Verify that all low fire limit switch contacts are closed, i.e., slot 2, input 5 is ON when the burner is at 0%, and OFF when the burner leaves low fire. Refer to the burner operating instructions for switch adjustment.

TRANSMITTER ZERO

Allow the unit to warm up for at least five minutes before adjusting the Transmitter Zero. Use the shutoff cocks in the transmitter manifold to isolate the transmitter from the dryer, and to open the LOW pressure tap to atmosphere. The transmitter display and the touchscreen display of the BCS 6000 should both read 0.00. Reference Appendix I for transmitter adjustments, if necessary.

TIME AND DATE SETTING

Simultaneously press the upper left and lower left corners of the touchscreen to enter the screen setup mode then select CLOCK to access the Time and Date Settings. Use the keypad to enter the desired value, then press Sec, Min, Hr, Day, Mon, or Yr as applicable. For example, to set the month to September, use the keypad to enter '9', then press 'Mon'. Use the EXIT buttons to return to normal operation.

F. ELECTRONIC VALVE CHARACTERIZATION



WARNING

Adjustment of this equipment by unqualified personnel can result in fire, explosion, severe personal injury, or even death. This procedure requires the use of a stack analyzer to properly adjust air/fuel ratio and optimize burner performance. It is intended for qualified personnel, familiar with combustion systems and the interpretation of stack emission readings. Electronic Valve Characterization is designed to provide for minor adjustments to the air control valve position only. The low fire start positions and overall valve strokes must be set by adjustment of the valve/motor linkages.

To facilitate burner setup and optimize emissions of the Eco-StarII™ B burner, the BCS6000 system has been equipped with Electronic Valve Characterization (EVC). This feature provides for creation of separate motor response curves for the air and fuel control motors. Regardless of fuel selection, the air control motor directly follows the heat demand output of the temperature controller. For example, 15% output from the temperature controller will result in the air control motor driving 15% open. Meanwhile, the fuel control motor will follow a separate curve established by setting ten characterization (bias) points as shown in Figure 1.

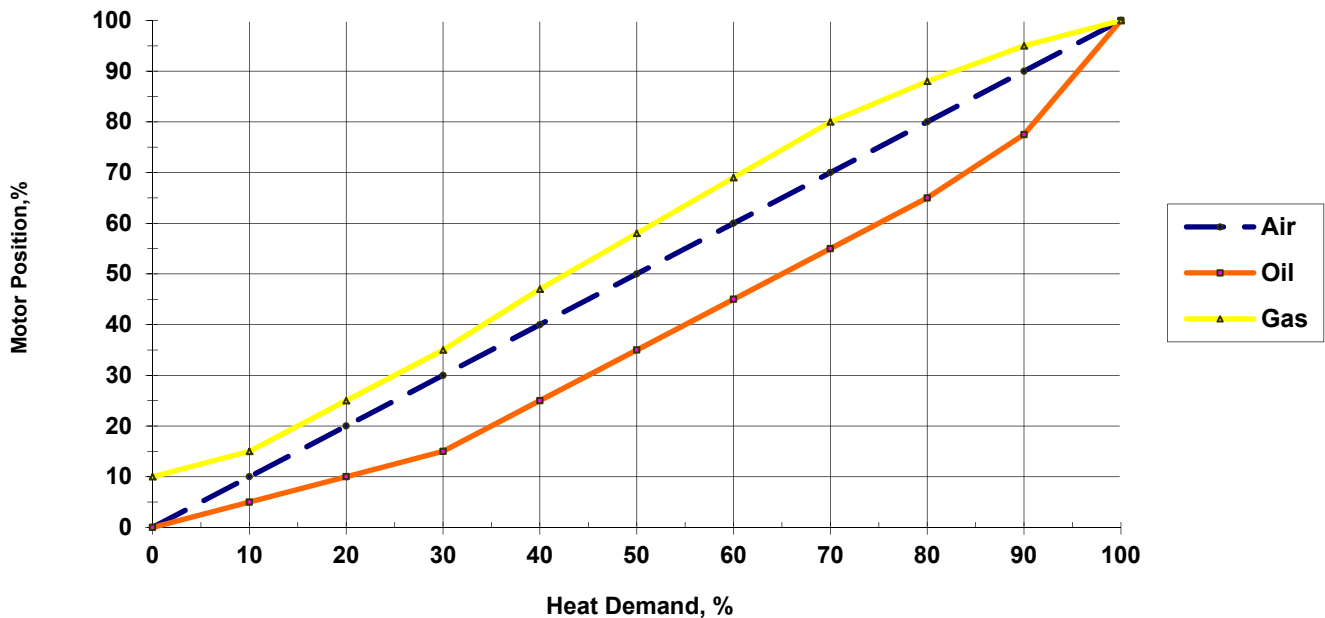


Figure 1. Example of EVC Fuel Bias Settings

BIAS POINT ADJUSTMENT

Bias adjusting screens are accessed via the MAIN MENU. Before firing the burner, verify the OIL FIRING BIAS POINTS and GAS FIRING BIAS POINTS are set to the default values listed below.

Point	Oil/LP	Gas
Light off	3.0	0.0
Low Fire	0.0	10.0
10%	5.0	15.0
20%	10.0	20.0
30%	15.0	30.0
40%	25.0	40.0
50%	35.0	50.0
60%	45.0	60.0
70%	55.0	70.0
80%	65.0	80.0
90%	77.5	90.0
100%	100	100

Setup an analyzer to monitor stack or drum emissions. With the burner firing in manual at approximately 10% output, select the bias point setting screen. Allow the analyzer readings to stabilize, then increase or decrease the fuel input, if required. Make small adjustments and allow readings to settle after each change. Increase the burner firing rate to approximately 20% and repeat the above adjustment procedure. Continue for the 30, 40, 50, etc or extrapolate settings by plotting them on the chart shown in Figure 2. Record the resulting settings in the Table provided in Appendix B. Press the MAIN button to exit and return to normal display.

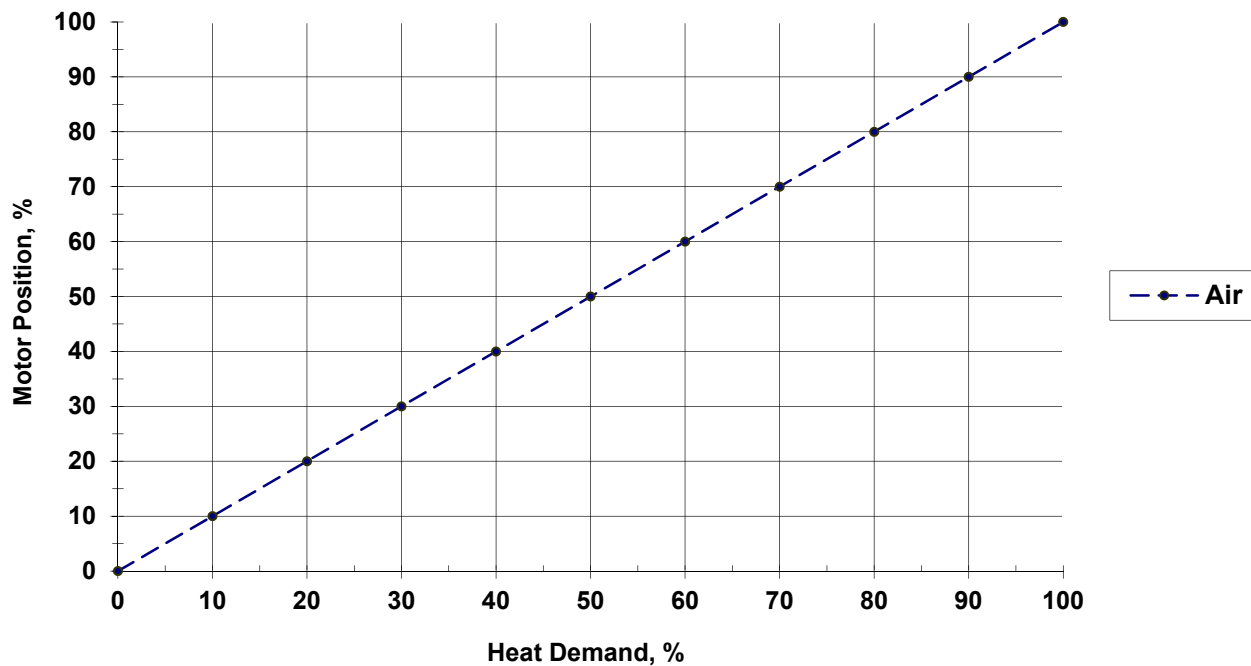


Figure 2. Blank Chart for Plotting EVC Fuel Bias Settings

G. PANEL OPERATION

1. Open all manual shutoff valves to supply air and fuel to the pilot and burner systems.
2. Move the panel POWER switch to ON and twist to release the EMERGENCY STOP button if necessary.
 - a. The temperature instruments, touchscreen display, flame relay and PLC will perform their self-test procedures.
 - b. The burner control motors will drive closed.
 - c. The RESET indicator will come on.
 - d. A limit fault or '*BURNER STOPPED*' message will be displayed.
3. Verify that the FUEL SELECT switch is in the desired position.
4. Start the exhaust fan, combustion air blower, and all other equipment required for plant operation. After the exhaust fan limits have closed, the HELD CLOSED indicator of the draft control will disappear and the exhaust damper will be released to control dryer draft.
5. Select MATERIAL or STACK control and verify the setpoints of both.
 - a. After all system limits are closed, the selected fuel motor will drive to its lightoff position.
6. Momentarily press the RESET button to initiate the system purge sequence.:
 - a. An '*OPENING AIR VALVE*' message will appear as the burner air control motor drives open.
 - b. After the air control motor has opened more than 50%, purge timer TD352 will be energized and begin timing and a '*PURGING*'. message will appear.
7. After the purge delay has been completed, TD352 timer will actuate and a '*LOW FIRE DRIVE*' message will appear as the air control motor drives closed to prepare for pilot ignition.
8. When the air and fuel motors have reached their light off positions and all burner low fire limit switches have closed, the START pushbutton will flash and a '*READY TO START*' message will be displayed.
9. Momentarily press the START pushbutton to begin the burner ignition sequence.
 - a. The flame relay will be energized and a 10 second pilot trial for ignition time will begin.
 - b. The ignition transformer and pilot solenoid valves will be energized and an '*IGNITING PILOT*' message will appear.
10. If a satisfactory pilot flame is detected by the UV scanner:
 - a. The START pushbutton will stop flashing and remain on and a '*PILOT ON*' message will be displayed.
 - b. Flame signal strength (0-5Vdc) will be displayed on the flame meter. Minimum acceptable signal is 0.5Vdc.
 - c. Power will be supplied to the main fuel valves.
11. After the pilot flame has been detected:
 - a. The ignition transformer will be de-energized.
 - b. A '*MAIN FLAME TRIAL FOR IGNITION*' message will be displayed.

12. After the trial for ignition timer has completed its delay:
 - a. The pilot solenoid valves will be de-energized and the pilot will go out.
 - b. The lightoff timer in the PLC will also begin its timed delay.
13. After the lightoff timer has completed its delay:
 - a. The burner control motors will be released to follow the temperature control output.
 - b. A *'MAIN FLAME ON...'* message will be displayed.
14. Start material flow to the dryer. If the temperature control loop is in AUTO, the burner will drive to the START AT percentage then begin ramping at the RAMP AT rate set on the RUN MENU screen. If MANUAL temperature control has been selected, use the INC and DEC buttons to manually control the burner firing rate or press the OUTPUT display and enter the desired output value via the popup keypad.
15. Note that the burner may be forced to low fire at any time by pressing the DRIVE TO LOW FIRE button.
 - a. The button will be highlighted and *'LOW FIRE SELECTED'* will appear in the message box.
 - b. Press the button a second time to release the burner from low fire.
16. To terminate burner operation, press the STOP pushbutton.
 - a. The flame relay and all fuel valves will be de-energized.
 - b. The air and fuel control motors will drive closed.
 - c. A *'BURNER STOPPED...'* message will be displayed and the RESET indicator will come on.

H. TROUBLESHOOTING

Use the HELP screens on the touch screen or refer to the following table.

MESSAGE	DIAGNOSTICS
<i>MAIN FUEL VCS FAULT. CLOSE MANUAL VALVES!</i>	Monitor REMOTE MODULE 2 INPUT 8, terminals 308 and 308A. This message appears if any of the fuel valve proof of closure switches fails to close.
<i>CONTROL MOTOR CALIBRATION REQUIRED</i>	The difference between the Zero and Span feedback values of each motor must be greater than 3300. Verify that the motors travel full stroke during the motor calibration procedure.
<i>HIGH STACK TEMPERATURE</i>	Monitor slot 1 input 2 in the Master panel. Check for power on terminals 50A and 50B. Observe the display and OUT indicator of the stack temperature instrument. A full scale reading (1000°F or 540°C) indicates an open TC or broken wire
<i>EXHAUST FAN INTERLOCK FAULT</i>	Monitor slot 1 input 6 in the Master panel. Check the exhaust fan motor starter interlock (power on terminal 56).
<i>BURNER AIR OR PRIMARY AIR INTERLOCK FAULT</i>	Monitor slot 1 input 3 in the Master panel. Check the primary air motor starter interlock (power on terminal 56A) and the burner air starter interlock (power on terminal 162).
<i>EXHAUST FLOW FAULT</i>	Monitor remote module 2 input 0 and CR215. Check the exhaust fan flow switch (power on terminal 215)
<i>LOW BURNER AIR PRESSURE</i>	Monitor remote module 2 input 1 and CR216. Check the combustion air pressure switch (power on terminal 216)
<i>LOW GAS PRESSURE</i>	Monitor remote module 2 input 2 and CR217. Verify that the manual gas shutoff valve is open and that the low gas pressure switch is made (power on terminal 217).
<i>HIGH GAS PRESSURE</i>	Monitor remote module 2 input 3 and CR218 and the high gas pressure switch (power on terminal 218).
<i>OIL or LP PRESSURE FAULT</i>	Monitor remote module 2 input 4 and CR219. Verify that the manual shutoff valve is open and that the low and high pressure switches are made (power on terminal 219).
<i>ATOMIZING AIR FAULT</i>	Monitor remote module 2 input 4 and CR220. Verify that the primary air pressure switch or compressed air supply pressure switch is made (power on terminal 220).
<i>OIL TEMPERATURE FAULT</i>	Monitor remote module 2 input 5 and CR221. For heavy oil systems, verify that the oil heater is operating and the oil temperature switches are made (power on terminal 221).
<i>CHECK PURGE AIR LIMITS</i>	Monitor remote module 2 input 9, terminals 309 and 309A. This message appears if the purge air pressure limit or exhaust damper open limit fails to close.
<i>CHECK LOW FIRE LIMITS</i>	Monitor remote module 2 input 10. Verify that all low fire limit switches are closed terminals 310, 310A and 310B when the control motors are in the low fire start position.

* Control motor faults indicate possible problems with the burner control motors or the position feedback circuits. Silence the alarm horn and **make note of the motor position values displayed on the MOTOR CALIBRATION screen**, then press the ALARM SILENCE button a second time to reset the fault. Shut off the burner and verify that all control motors drive to their ZERO and SPAN positions, and that the feedback signals change smoothly as the motors drive. If not, check fuse 209 and verify that 5Vdc exists between terminals 214 (+) and 210 (-).

MESSAGE	DIAGNOSTICS
<i>GAS CONTROL MOTOR FAULT</i>	* Indicates that the gas control motor has failed to respond to the motor positioning output signals of the PLC. Check the fuses on remote module 4 outputs 0 and 1.
<i>AIR CONTROL MOTOR FAULT</i>	* Indicates that the air control motor has failed to respond to the motor positioning output signals of the PLC. Check the fuses on remote module 4 outputs 2 and 3.
<i>OIL CONTROL MOTOR FAULT</i>	* Indicates that the oil or LP control motor has failed to respond to the motor positioning output signals of the PLC. Check the fuses on remote module 4 outputs 4 and 5.
<i>HIGH STACK TEMPERATURE: LOW FIRE HOLD</i>	Check the low fire alarm setting on the RUN MENU screen. The burner will be held at low fire until stack temperature falls below the alarm setpoint
<i>HIGH MATL. TEMPERATURE: LOW FIRE HOLD</i>	Check the low fire alarm setting on the RUN MENU screen. The burner will be held at low fire until material temperature falls below the alarm setting.
<i>FLAME RELAY RESET REQUIRED</i>	Monitor remote module 2 input 12 and the ALARM indicator of the Honeywell flame relay. This fault normally indicates that the pilot has failed to ignite within the trial for ignition period. Verify that air, fuel and spark are being supplied to the pilot. Other possibilities include: 1. Premature flame signal. If the flame meter indicates presence of a flame before the ignition sequence is started, the flame relay will lockout and the RESET indicator will come on. Check for fire in the dryer drum or for a failed UV scanner. 2. Bad or missing ground. The Honeywell flame relay requires a 120Vac grounded neutral power supply for proper operation. 3. Flame amplifier failure. The flame amplifier may need to be replaced.
<i>FLAME FAILURE</i>	Indicates that the flame relay has locked out due to a flame failure. Check burner setup.
<i>REPLACE SCREEN BATTERY</i>	Indicates low touchscreen battery voltage. Replacement batteries are available from Automation Direct (Part No. EZ-BAT). Consult the EZTouch Hardware User Manual for battery replacement instructions.
<i>REPLACE PLC BATTERY</i>	Indicates low PLC battery voltage. The battery compartment is located in the CPU. A replacement battery is available from Hauck (Part No. 62311) or Automation Direct (Part No. D2-BAT-1).

ALARM HISTORY Screen

An alarm history screen is also provided for use as a troubleshooting guide. From the MAIN MENU screen press ALARM HISTORY to view a list of the last 99 logged events and the order in which they occurred. Page up or down to view the entire list. Use the LINE UP or LINE DOWN button to select a particular item then press DETAILS to view the time and date information. Note that 'FLAME ON' and 'BURNER STOPPED' are included in the alarm list for monitoring purposes even though they are not alarm conditions.

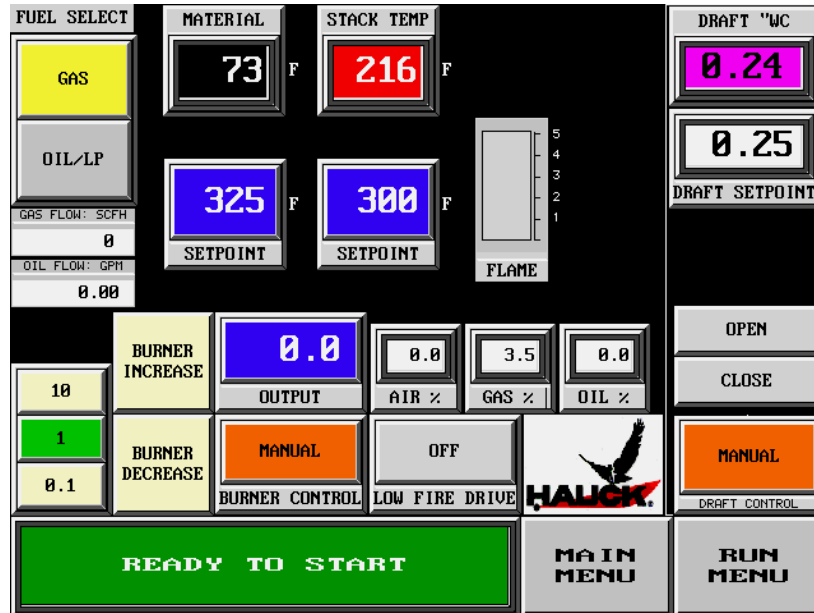
The ALARM COUNT screen shows how many times each alarm has occurred.

MANUAL BYPASS

In the event of a touchscreen display failure, the burner firing rate may be adjusted manually by the following procedure.

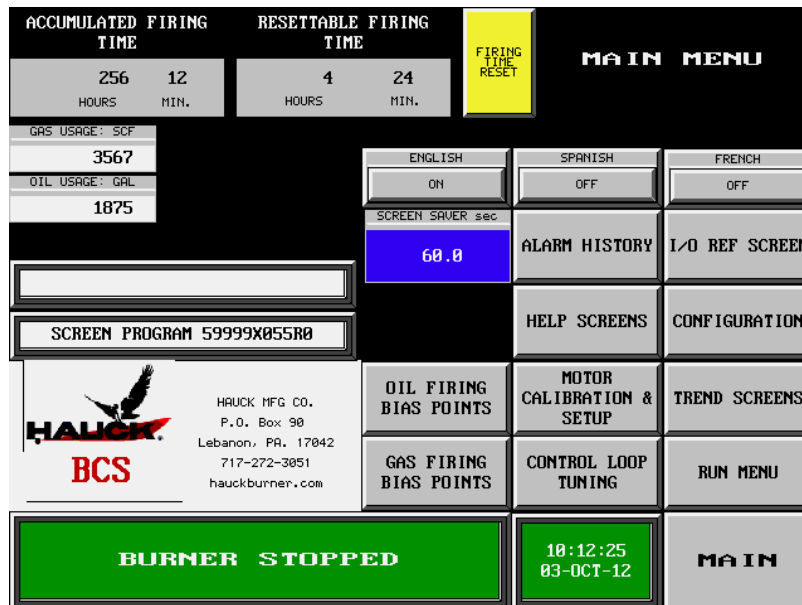
- Press the RESET button to initiate system purge. Wait for the START indicator to begin flashing, then press START to ignite the burner.
- As soon as the burner has ignited, press and hold **both** the START and ALARM SILENCE pushbuttons for two seconds to enter the manual bypass mode. The alarm horn will chirp to indicate that the manual bypass mode has been activated.
- Using the readouts of the MATERIAL and STACK temperature instruments, the burner firing rate may be manually adjusted by pressing the START button to increase, or the ALARM SILENCE button to decrease. Each chirp of the alarm horn indicates a 1% output change.
- Momentarily press the STOP pushbutton to shut off the burner and exit the manual bypass mode.

APPENDIX A: OPERATOR INTERFACE SCREENS



MAIN SCREEN

This screen displays overall system status and is the default screen on system power-up. It provides AUTO/MANUAL control selection and setpoint inputs for the temperature control loops. Note that the message box in the lower left corner of the screen appears on **all** screens to provide the operator with system status messages. The MAIN MENU and RUN MENU buttons provide quick access to other screens. Indicators below the MATERIAL and STACK temperature readouts indicate which thermocouple is being used for control.



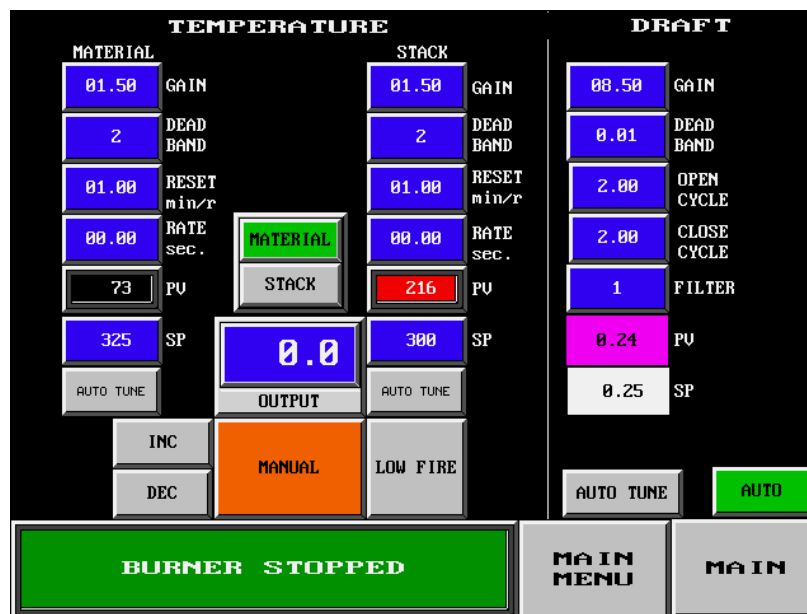
MAIN MENU SCREEN

Used to access other screens. Also provides language selection and accumulated and resettable (daily) firing times. If the system is equipped with the fuel flow option, totalized fuel usage is also displayed. Record the PLC and screen program numbers that appear on this screen as they will be required if service is requested.



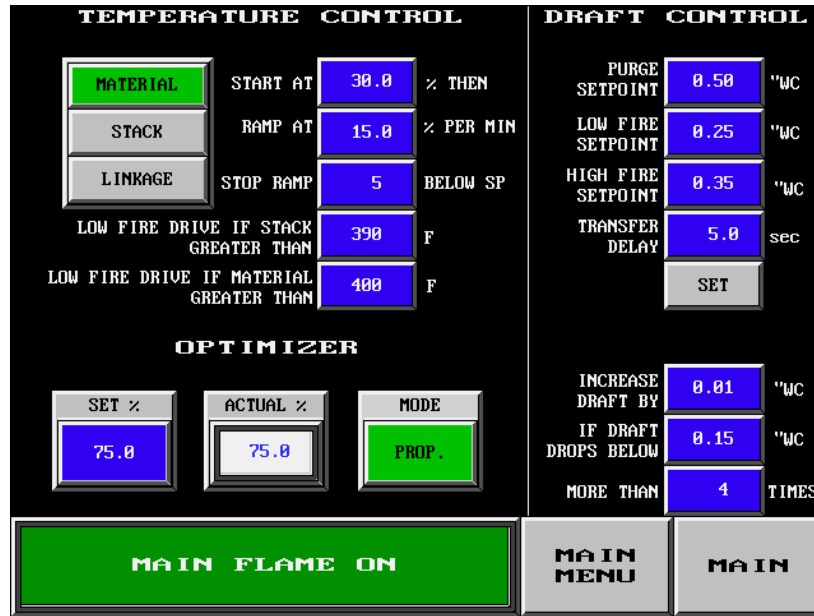
MOTOR CALIBRATION & SETUP

Reference Section E. Used to ZERO and SPAN the burner control motors and to enter motor deadband settings. Also provides numeric inputs for burner firing rate limits, gas pressure correction, and temperature bias settings.



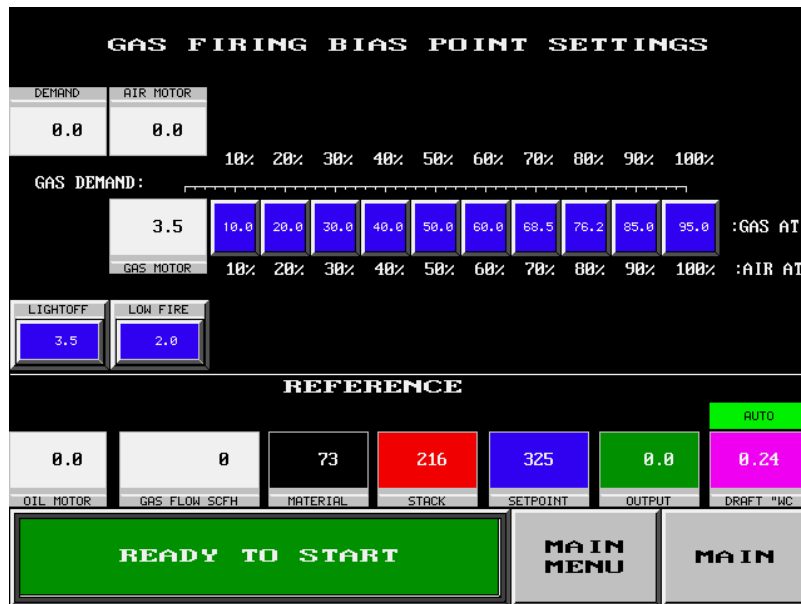
CONTROL LOOP TUNING

Reference Section E. Used to set PID control loop tuning constants for the Material and Stack temperature control and Dryer Draft control. Also provides temperature setpoint inputs, AUTO/MANUAL selection, and AUTO TUNE selection.



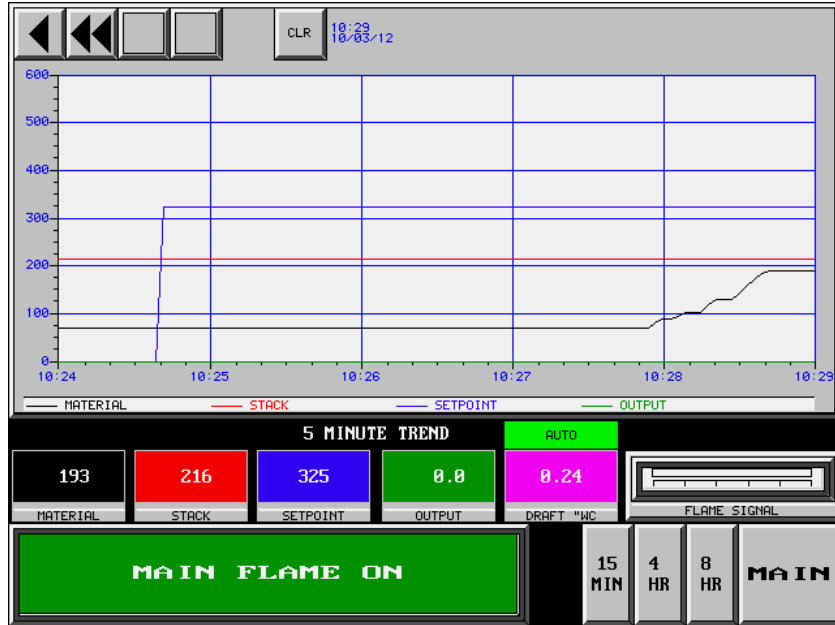
RUN MENU

Reference Section E. Used to set the burner startup percentage and ramp rate for automatic temperature control. Also provides for low fire drive alarms and draft setpoint inputs, selection of control mode and parameters for automatic draft increase control.



BIAS POINT SETTINGS

Reference Section F. Two separate screens (GAS and OIL/LP) are provided to setup the electronic valve characterization for the fuel valve. It provides inputs for fuel valve position for lightoff and eleven air valve positions (Low Fire, 10, 20, 30... thru 100%). It also displays pertinent data to aid in burner setup.



TRENDS

Four separate trend screens provide 5 minute, 15 minute, 4 hour and 8 hour trends of Material temperature; Stack temperature, Setpoint and burner firing rate.

APPENDIX B: CONFIGURATION RECORD

Factory set default values are shown in parenthesis, e.g.,(1.0)

MAIN MENU SCREEN

PLC PROGRAM: _____

SCREEN PROGRAM: _____

MOTOR CALIBRATION & SETUP SCREEN

MOTOR	ZERO	SPAN	DEADBAND
AIR			(1.0)
GAS			(1.0)
OIL			(1.0)

BURNER OUTPUT LIMIT: (100.0) _____

LOW FIRE AIR: (0.0) _____ %.

GAS PRESSURE: (24.0) _____ oz.

MATERIAL TEMPERATURE BIAS: (0.0) _____

STACK TEMPERATURE BIAS: (0.0) _____

CONTROL LOOP TUNING SCREEN

	MATERIAL	STACK	DRAFT
GAIN	(2.00)	(2.00)	(1.25)
DEADBAND	(1)	(1)	(0.10)
RESET	(1.00)	(1.00)	
RATE			
OPEN CYCLE			(1.00)
CLOSE CYCLE			(1.00)
FILTER			(1)

RUN MENU SCREEN

START AT (30.0) _____ % THEN

RAMP AT (50.0) _____ % PER MIN

LOW FIRE DRIVE IF STACK GREATER THAN (380) _____

LOW FIRE DRIVE IF MATERIAL GREATER THAN (400) _____

PURGE SETPOINT: _____ "WC

LOW FIRE SETPOINT: _____ "WC

HIGH FIRE SETPOINT: _____ "WC

SETPOINT TRANSFER DELAY: _____ SEC

REDUCE DRAFTBY (0) _____ "WC

IF DRAFT DROPS BELOW (0) _____ "WC

MORE THAN (10) _____ TIMES

BIAS POINTS

Firing Mode	Light Off	Low Fire	1 10%	2 20%	3 30%	4 40%	5 50%	6 60%	7 70%	8 80%	9 9%	10 100%
Gas	(3.0)	(0)	(10.0)	(20.0)	(30.0)	(40.0)	(50.0)	(60.0)	(70.0)	(80.0)	(90.0)	(100.0)
Oil or LP	(3.0)	(0)	(5.0)	(10.0)	(15.0)	(25.0)	(35.0)	(45.0)	(55.0)	(65.0)	(77.0)	(100.0)

APPENDIX C: RECOMMENDED SPARE PARTS

PART NO.	QTY	DESCRIPTION
302263	1	Flame relay, UV
56650	1	Amplifier, UV Flame Relay
20579	2	Scanner, UV
62232	4	Relay, SPDT, 120Vac
17292	1	Relay, 3PDT, 120Vac
61961	1	Timer, DPDT Purge
61818	1	Power Supply, 24Vdc, 1.2A
53763	1	Regulator, 5Vdc, 3-Terminal Solid State
58762	5	Fuse, 2A, 1/4 x 1-1/4
48044	5	Fuse, 10A, 1/4 x 1-1/4
400429	1	Module, CPU, W/Operating Program Installed (Reference MAIN MENU Screen For Program Number)
62311	1	Battery, CPU
58481	1	Module, 8-P AC Input
58479	1	Module, 8-Pt Relay Output
300344	1	Module, 8-Pt Current Input
300311	1	Operator Interface Touch Screen
	1	Switch, Ethernet w/Fiber-optic port Automation Direct SE-SW5U-ST
	1	Module, 8-Pt Voltage Input Automation Direct T1F-08AD-2
	1	Module, 16-Pt AC Input Automation Direct T1K-16NA-1
	1	Module, 8-Pt Relay Output Automation Direct T1K-08TRS
	1	Module, 8-Pt AC Output Automation Direct T1K-08TAS
	1	Module, Remote I/O Power Supply Automation Direct T1K-01AC
43508	1	Material Thermocouple, Type J, TC100
43868	1	Stack Thermocouple, Type J, TC200

APPENDIX D: DL250 PROGRAMMABLE CONTROLLER

MASTER PLC

BASE: **9-Slot Base w/8 I/O Modules. Part No. 58484**

CPU: **Central Processing Unit. Part No. 400429**

BATTERY: CPU 3V Battery. Part No. 62311

SLOT 0: 8-Point Analog Current Input Module. Part No. 300344

<u>Input</u>	<u>Wire</u>	<u>Function</u>
1	20	4-20mA Material temperature from Material instrument
2	53	4-20mA Stack temperature from Stack instrument
3	161	4-20mA from combustion air VFD if applicable
4	65	4-20mA auxiliary analog input 2
5	66	4-20mA ton per hour input
6	67	4-20mA auxiliary analog input 4
7	84	4-20mA auxiliary analog input 5
8	68	4-20mA auxiliary analog input 6
24V	12	24Vdc from Master panel power supply
0V	13	DC reference

SLOT 1: 8-Point AC Input Module. Part No. 58481

<u>Input</u>	<u>Wire</u>	<u>Function</u>
X20	101	RESET pushbutton
X21	103	START pushbutton
X22	50B	Stack temperature limit
X23	56B	Air interlocks
X24	102	ALARM SILENCE pushbutton
X25	104	STOP pushbutton (normally closed)
X26	56	Exhaust fan interlock
X27	50	E-STOP pushbutton
COM	L2	AC Neutral

SLOT 2: 8-Point Relay Output Module. Part No. 58479

<u>Output</u>	<u>Wire</u>	<u>Function</u>
Y0	113	Alarm horn
Y1	115	RESET indicator
Y2	117	Spare
Y3	119	Spare
Y4	114	START indicator
Y5	116	CR116 Primary interlock relay
Y6	118	Spare
Y7	120	Spare

SLOT 3: *Optional* 2-Point Analog Output Module. Part No 301017

<u>Output</u>	<u>Wire</u>	<u>Function</u>
1	155	4-20mA exhaust control output
2	159	4-20mA combustion air control output
24V	12	24Vdc from Master panel power supply
0V	13	DC reference

SLOT 7: Ethernet Remote Master Automation Direct H2-ERM

REMOTE I/O

POWER SUPPLY Automation Direct TiK-01AC

MODULE 0: Ethernet Base Controller Automation Direct T1H-EBC100

MODULE 1: 8-Point Analog Voltage Input Module Automation Direct T1F-08AD-2

Input	Wire	Function
0	401	0-5Vdc from StarJet or gas control actuator
1	410	0-5Vdc from air control actuator
2	451	0-5Vdc from oil/LP control actuator
3	366	0-5Vdc flame signal
4	264	1-5Vdc or 4-20mA from auxiliary analog input 1
5	265	4-20mA dryer draft signal
6	266	4-20mA optional gas DP transmitter signal
7	267	4-20mA optional oil/LP flow transmitter signal
V0	209	24Vdc from Remote panel power supply
V1, C0 & C1	210	DC reference

MODULE 2: 16-Point AC Input Module Automation Direct T1K-16NA-1

Input	Wire	Function
X300	215	Exhaust flow switch
X301	216	Combustion air pressure switch
X3022	217	Low gas pressure switch
X303	218	High gas pressure switch
X304	219	Low/High oil/LP pressure switch
X305	220	Atomizing air pressure switch
X306	307	Spare
X307	308A	Main fuel valves closed
X308	309A	Purge limits
X309	310B	Low fire limits
X310	311	TD352 Purge time completed
X311	364	Flame relay fault
X312	364	Flame relay fault
X313	365	Flame on
X314	314	Spare
X315	315	Spare

MODULE 3: 8-Point Isolated Relay Output Module. Automation Direct T1K-08TRS

Output	Wire	Function
Y300	254-351	Limits series
Y301	351-352	TD352 Purge timer
Y302	351-353	Start
Y303	100-354	Oil select relay
Y304	355-355A	Spare
Y305	356-356	Spare
Y306	G-357	Pilot scanner
Y307	368-358	Flame relay reset

MODULE 4: 8-Point Isolated AC Output Module. Automation Direct T1K-08TAS

Output	Wire	Function
Y310	404-404A	StarJet or Gas control motor CW
Y311	404-405	StarJet or Gas control motor CCW
Y312	413-413A	Air control motor CCW
Y313	413-414	Air control motor CW
Y314	415-415A	Oil or LP control motor CW
Y315	415-416	Oil or LP control motor CCW
Y316	7-418	120Vac Exhaust damper open
Y317	7-419	120Vac Exhaust damper close

APPENDIX E: HIGH TEMPERATURE LIMIT

Two high temperature limit instruments (P/N 402731) are provided for temperature indication and over-temperature protection. Each instrument receives a thermocouple input and provides a 0 to 5Vdc temperature signal to the PLC. The thermocouple of the MATERIAL CONTROL instrument is positioned to read the temperature of the material as it exits the dryer while the STACK TEMPERATURE instrument's thermocouple senses the temperature of the exhaust gases. The alarm contact of the STACK TEMPERATURE instrument is used to shut down the burner if the preset high temperature limit is exceeded.



Front Face of High Temperature Limit

Upper Display: Normally displays process temperature. Also displays parameter values or selections when in the set up mode.

Lower Display: Shows value of set point. Also displays function groups and parameters when in the set up mode.

Error / Fault Indications

Parameter	Upper Display	Lower Display	Description
Over Range	[HH]	Normal	Input > 5% over-range
Under Range	[LL]	Normal	Input > 5% under-range
Sensor Break	OPEN	Normal	Break in input sensor or wiring
Option 1 Error	ERR	OPn1	Option 1 module fault
Option 2 Error	ERR	OPn2	Option 2 module fault
Option 3 Error	ERR	OPn3	Option 3 module fault
Option A Error	ERR	OPnA	Auxiliary Option module fault

▼: Used to decrease the setpoint or configuration values.

▲: Used to increase the setpoint or configuration values.

SET UP: Used in conjunction with the ▲ key to enter the set up and configuration modes. Also used to advance through the parameters.

CONFIGURATION

The instruments are factory set for a type J thermocouple with a range of 32 to 842°F Use the following procedure to change thermocouple type or temperature units if required. Detailed information is given in the vendor literature supplied with the control panel.

Simultaneously press and hold the ▲ arrow and **SETUP** Keys. **OPtr** will appear in the Upper Display. Press the ▲ arrow key until the Upper Display reads **ConF**, then press **SETUP**.

ULoc will appear in the Lower Display. Press the ▲ arrow until Upper Display reads 20 then Press the **SETUP** key to enter the configuration mode.

The lower display should read **InPt**. Check the sales order for the thermocouple type: Use the ▼/▲ keys to change the value to the corresponding reading below.

J type: -199.9 to 999.9 °F = **J.F** (Note decimal point between J & F.)

K type: -199.9 to 999.9 °F = **┌┐ F** (Note **NO** decimal point between **┌┐** & F.)

Momentarily press the **RESET** key. The symbols should stop flashing.

Press the **SETUP** key to view the other configuration parameters. Use the ▼/▲ keys to change parameters if required. Press **RESET** after changes are made to accept the new values.

<u>LOWER DISPLAY (FUNCTION)</u>	<u>FACTORY CONFIGURATION</u>	<u>DEFAULT TYPE J</u>	<u>OPTIONAL TYPE K</u>
ruL	Range Max	999.9	2503
rLL	Range Low	-199.9	-400.0
OFFS	0.0	0.0	0.0
Ctrl	Hi	Hi	Hi
SPuL	Range Max	999.9	2503
SPLL	Range Low	-199.9	-400.0
ALA1	P_Hi	P_Hi	P_Hi
PhA1	Range Max	999.9	2503
AHY1	0.1	0.1	0.1
ALA2	P-Lo	P_Lo	P_Lo
PLA2	Range Low	-199.9	-400.0
AHY2	0.1	0.1	0.1
USE2	A1_d	A1_d	A1_d
retP	USE3	USE3	USE3
tyP3	0_10	0_5	0_5
ro3H	Range Max	842.0	1399
ro3L	Range Min	32.0	32.0
diSP	EnAb	EnAb	EnAb
CLoc	20	20	20

After your have completed the Configuration cycle power to reset or wait 2 minutes for the unit to reset to the run mode.

CHANGING THE SET POINT

After the instrument has completed its boot-up sequence, simultaneously press the ▲ and **SETUP** keys. **OPtr** will appear in the Upper Display. Press the ▲ arrow key until the Upper Display reads **SEtP**. Press **SETUP** key.

ULoc will appear in the Lower Display. Press the ▲ arrow until Upper display reads 10 then press the **SETUP** key to enter the setup mode.

CAUTION

The **STACK** alarm setpoint is factory set at 400°F (204°C). If the system is equipped with a fabric dust collector (baghouse), consult the manufacturer for recommended baghouse temperature limitations.

Set the parameters as shown in the following table.

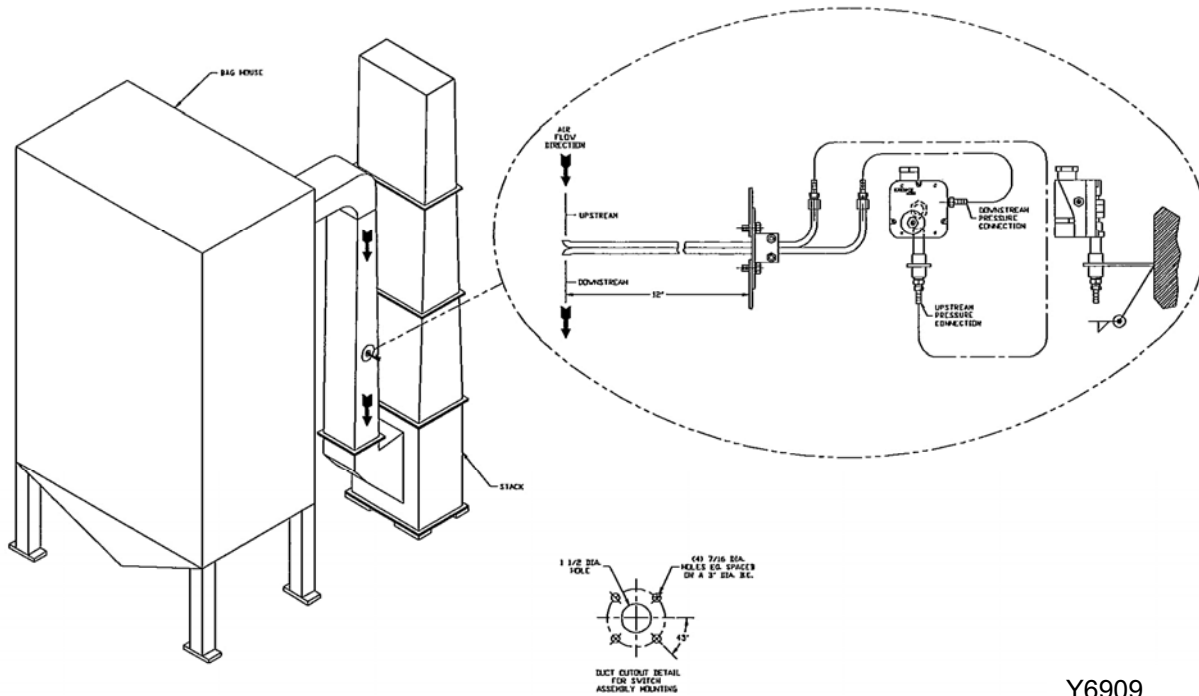
<u>LOWER DISPLAY (FUNCTION)</u>	<u>FACTORY CONFIGURATION</u>	<u>DEFAULT TYPE J</u>	<u>OPTIONAL TYPE K</u>
SP	R/min to R/max	400	400
HYS_t	0.1	0.1	0.1
FiL_t	2	2	2
PhA1	R/max	999.9	2503
AHY1	0.1	0.1	0.1
PLA2	R/min	-199.9	-400.0
AHY2	0.1	0.1	0.1
SLoc	10	0	0

Note: The instrument will remain in the setup mode for 2 minutes before returning to the run mode.

The ▲ key represents increase
The ▼ key represents decrease

APPENDIX F: EXHAUST FAN FLOW LIMIT SWITCH INSTALLATION

Mount the exhaust fan flow switch in the dryer exhaust duct as shown in Figure 1.



Y6909
(NOT TO SCALE)

Figure 1. Installation of Exhaust Fan Flow Switch

Wire the exhaust flow switch to the appropriate terminals. The exhaust flow switch is an interlock, which requires the exhauster to be operating prior to ignition of the burner.

APPENDIX G: STACK THERMOCOUPLE INSTALLATION

Install a Hauck stack temperature thermocouple in the dryer exhaust duct to sense exhaust gas temperatures as shown in Figure 1.

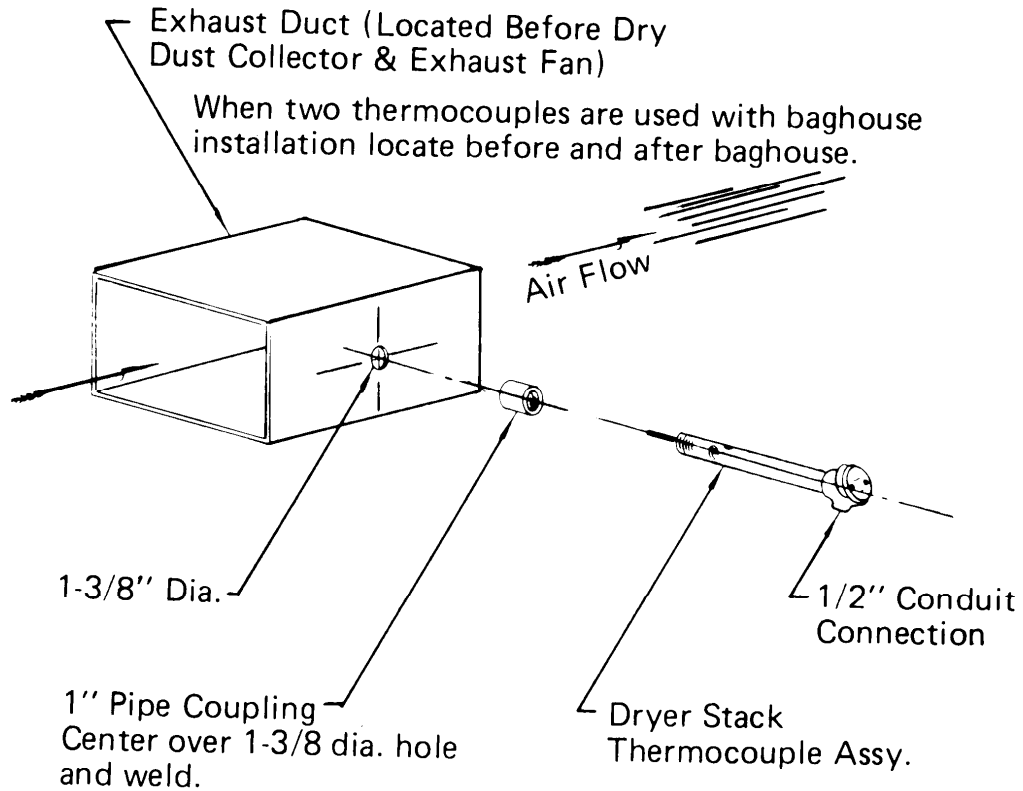


Figure 1. Installation of Thermocouple in Exhaust Duct

NOTE

Thermocouple cables must be separated from AC power and control wiring to avoid interference and nuisance shutdowns. Observe polarity when making thermocouple connections. Regardless of thermocouple type, the red wire is always negative.

APPENDIX H: MATERIAL THERMOCOUPLE INSTALLATION

Install a Hauck Rapid Response Material Temperature Thermocouple in the material discharge chute to sense the temperature of the material leaving the dryer as shown Figure 1. Wire the thermocouple to the proper terminals in the panel.

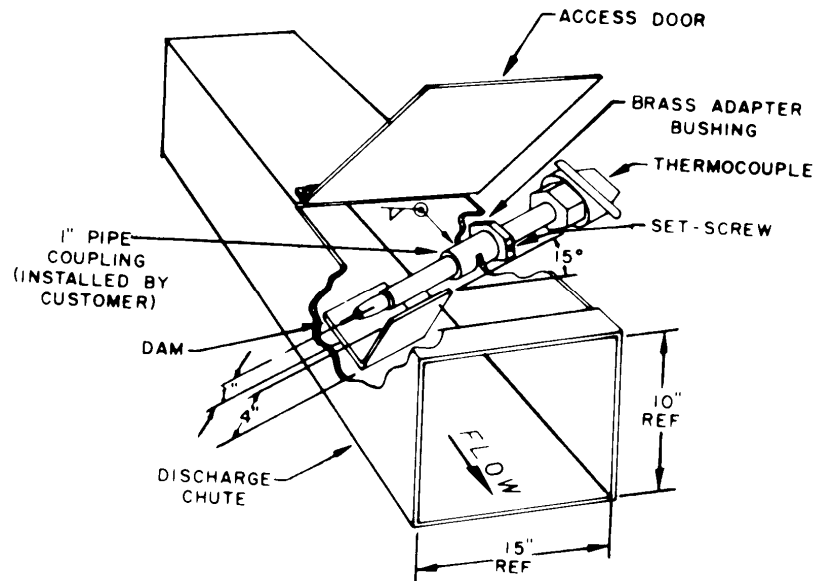


Figure 1. Installation of Thermocouple and “Dam” Dryer Discharge Chute

IMPORTANT

A small clearance of 1" (25mm) maximum should be provided under the thermocouple so material will not be trapped between the thermocouple and the chute. Trapped material will cause a heat loss path and the thermocouple will give erroneous readings.

The thermocouple should make good contact with the material but not be subject to severe abrasion caused by high velocities. If the material is moving so fast that it bounces and leaves air adjacent to the thermocouple, the temperature it senses will be lower than the material. It may be necessary to place a dam in the chute so that the thermocouple is in a relatively slow moving area next to the dam. The dam must only be wide enough and high enough to create a localized area of build-up where the material loses velocity **but does not stop flowing**. The thermocouple must not be located in a stagnant zone or erroneous temperature reading will result. Because of the large number of variables involved, it is impossible to set down any exact size or location of the dam that will always work. Field experimentation will be necessary if good results are to be obtained. It is advisable to tack weld the dam in place so that it can be easily modified if it fails to perform satisfactorily.

NOTE

During normal operation, the thermocouple should be rotated once a month to expose a different area of its surface to the abrasive forces of the material. This procedure will increase the effective life of the thermocouple. If excessive wear occurs, a protective tube may be added to shield the shaft in the region of the high velocity flow.

NOTE

Thermocouple cables must be separated from AC power and control wiring to avoid interference and nuisance shutdowns. Observe polarity when making thermocouple connections. Regardless of thermocouple type, the red wire is always negative.

APPENDIX I: DRAFT TRANSMITTER ADJUSTMENTS

The **NEXT** and **ENTER** buttons located below the LCD display may be used to adjust or reconfigure the draft transmitter if required. Wait one or two seconds between each button press to allow the display to update.

ZEROING

Allow the unit to warm up for at least five minutes before adjusting the transmitter zero. Refer to Figure 1 and use the shutoff cocks in the transmitter manifold to isolate the transmitter from the dryer and to open the LOW pressure tap to atmosphere.

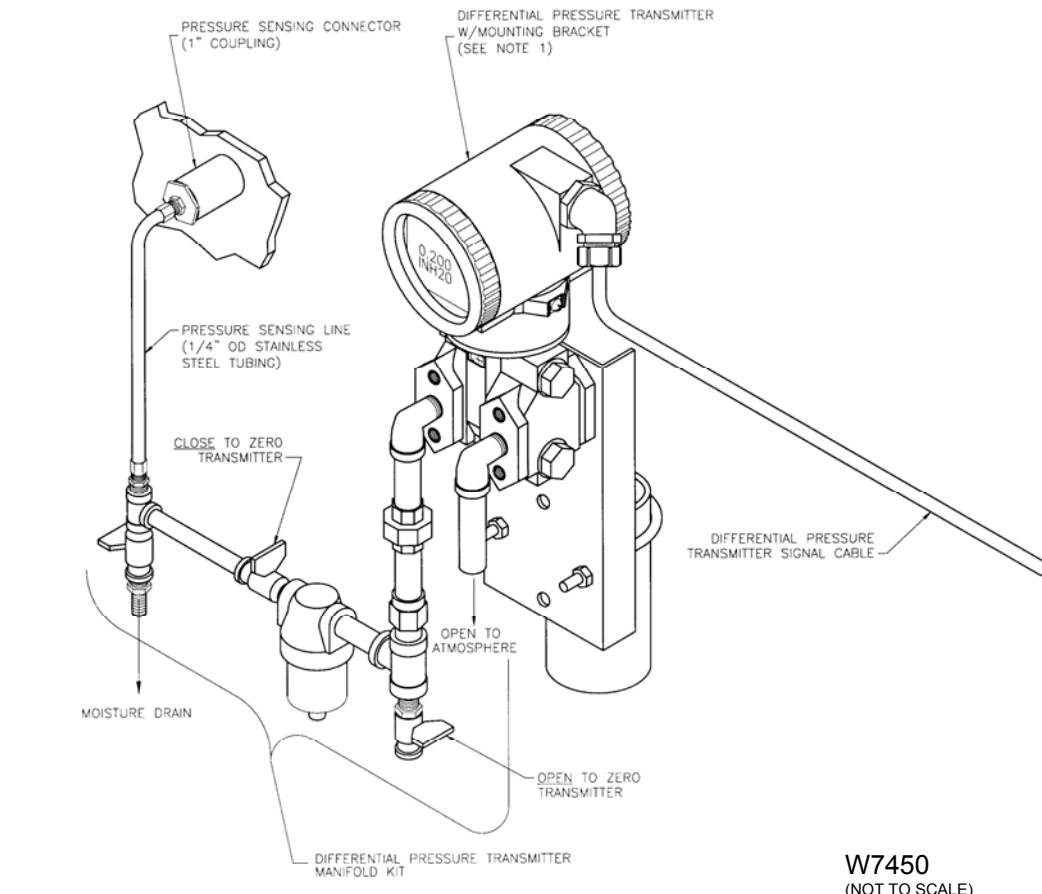


Figure 1. Transmitter and Manifold Layout

If the transmitter display does not read 0.00 IN H₂O use the following procedure to zero the transmitter.

- Press the **NEXT** button one time to change the lower display to **CALIB.**
- Press **ENTER** to change the lower display to **CAL AT0.**
- Press **ENTER** and the lower display will read **AT0 DONE.**
- Press **NEXT** to step through the remaining calibration options until the lower display reads **SAVE.**
- Press **ENTER** to save the new zero calibration and exit the calibration mode. Note that calibration changes can be discarded by pressing **ENTER** when the lower display reads **CANCEL** instead of **SAVE.**

4 MA ADJUSTMENT

Verify that when the transmitter reads 0.00, the BCS 6000 touchscreen display also reads 0.00.

If necessary, adjust the transmitter 4 mA value using the following procedure.

- Press the **NEXT** button one time to change the lower display to **CALIB**.
- Press **ENTER** to change the lower display to **CAL AT0**.
- Press **NEXT** until the lower display reads **ADJ 4MA**.
- Press **ENTER** and the lower display will read **A 4MA ^.^**.
- If the DPS display reads less than 0.00, increase the 4 mA calibrations as follows:
 - Press **NEXT** to change the lower display to **A 4MA ^**.
 - Each press of the **ENTER** button will slightly increase the transmitter output and the DPS display should increase until it reads 0.00.
- If the DPS display reads greater than 0.00, decrease the 4 mA calibrations as follows:
 - Press **NEXT** to change the lower display to **A 4MA ^**.
 - Each press of the **ENTER** button will now slightly decrease the transmitter output and the DPS display should decrease until it reads 0.00.
- Press **NEXT** to step through the remaining calibration options until the lower display reads **SAVE**.
- Press **ENTER** to save the new zero calibration and exit the calibration mode. Note that calibration changes can be discarded by pressing **ENTER** when the lower display reads **CANCEL** instead of **SAVE**.

CONFIGURATION PARAMETERS

The transmitter has been factory configured and should not require any field modifications. The following parameter settings are provided for reference only.

PARAMETER	LOWER DISPLAY	UPPER DISPLAY
External Zero (Not applicable)	EX ZERO	EXZ DIS
Output Direction	OUT DIR	FORWARD
Output Mode	OUTMODE	LINEAR
Output Failsafe	OUTFAIL	FAIL LO
Signal Dampening	DAMPING	NO DAMP
Display Engineering Units	DISP EGU	USE EGU
Select Engineering Units	EGU SEL	INH2O
Lower Range Value	EGU LRV	00.00
Upper Range Value	EGU URV	1.00, 3.00 or 5.00

APPENDIX J: FIELD WIRING REWORK

Component	Was	Now	Wire to	Note
Stack Thermocouple	T9 T10	T2+T2-	Master	
Mix Thermocouple	T1 T2	T1+T1-	Master	
Exhaust Fan Interlock	27-41	50B-56	Master	
Combustion Air Interlock	20-40	7-162	Master	
Exhaust Flow Switch	41-45	7-215	J-Box & Remote	
Combustion Air Pressure Switch	40-27	7-216	J-Box & Remote	
Low Gas Pressure Switch	16-33	7-217	J-Box & Remote	
High Gas Pressure Switch	12-16	7-218	J-Box & Remote	
Low Oil Pressure Switch	11-13	7-219	J-Box & Remote	
Low Oil Temperature Switch	13-33	7-221	J-Box & Remote	1
Primary Air Limit	74-10	7-220	J-Box & Remote	2
Main Oil Valve	10-3	370B-L2	J-Box & Remote	
Main Oil Valve VCS Switch	68-78	308-308A	J-Box & Remote	
Oil Blocking Valve	10-3	370B-L2	J-Box & Remote	
Oil Return Valve	10-3	370A-L2	J-Box & Remote	
Main Gas Valve VCS Switch	67-77	7-308	J-Box & Remote	
Main Gas Valve	4-3	367-L2	J-Box & Remote	
Gas Blocking Valve	4-3	366B-L2	J-Box & Remote	
Gas Vent Valve	4A-3	367-L2	J-Box & Remote	
Ignition Transformer	30-3	360-L2	J-Box & Remote	
Pilot Solenoid	30-3	361A-L2	J-Box & Remote	
Low Fire Start Limit Switch	6-5	7-310B	J-Box & Remote	
Burner Control Motor	L1 = 20B L2 = 3 X = 18B 2 = 19 3 = 17 4 = 23 7 = 24 8 = 22	L1 = 7 L2 = L2 X = G 2 = 404A 3 = 405 4 = 401 7 = 210 8 = 214	J-Box & Remote	3
Main Flame Scanner	White = 8 Blue = 7	White = G Blue = 370	J-Box & Remote	
Pilot Flame Scanner	White = 8 Blue = 59	White = 357 Blue = 370	J-Box & Remote	

Notes:

1. For heavy oil systems only. Jumper 7 to 221 if not used.
2. If applicable. Jumper 7 to 220 if not used.
3. Jumper 404 to ground for a medium torque motor (Barber-Colman EA57). Jumper 404 to 7 for a high torque motor (Barber-Colman EA71 or EA73). To reverse control motor rotation, interchange 7 with 8 and 2 with 3 on the control motor terminal strip.