Chromalox®

Installation, Operation

and

RENEWAL PARTS IDENTIFICATION

SERVICE REFERENCE	
DIVISION 4	SECTION
SALES REFERENCE	PE440
	161-058074-002
DATE DECEMBER, 2000	

intelliTHERM Screw Plug Heating Solution Control Panel Assembly for Screw Plug Heaters

RECORD SCREW PLUG INFORMATION HERE: (and on inside of panel)

Catalog Number: _____

Part Number: _____

Voltage: _____

KW: _____

PH: _____

Date Code: _____





GENERAL

Design Limitations:
Standard Model (I-3S) or Limit Controller Model (IL-3S):

Heater Selection - E1 General Purpose						Ambient Temp. Limit	Process Temp. Limit	Enclosure Rating	Circuits	Amps	Model	PCN
Phase	Single Phase			Three Phase		104F	250F	NEMA 1	1	48	I-3S or IL-3S	329682 or 329690
Volts	120	240	480	240	480							
max kW	5.7	11.5	23	19	39							

The intelliTHERM is designed for indoor non-hazardous (NEMA 1) areas. Use the intelliTHERM Kit with a standard Chromalox 2.5" screw plug heater with E1 electrical enclosure as defined in the catalog page.

Two separate packages are shipped for complete assembly. The intelliTHERM Kit (control panel, temperature sensing, and heater adapter) is sent in one package. The screw plug heater is shipped in a separate package under its normal purchasing part number. (to retrofit an existing screw plug heater, only intelliTHERM Kit is sent)

USE THIS INSTRUCTION SHEET IN CONJUNCTION WITH BELOW APPLICABLE INSTRUCTIONS:

A. Follow all SCREW PLUG HEATER INSTALLATION AND OPERATING INSTRUCTIONS received with the screw plug heater package.

B. Follow the general CONTACTOR POWER CONTROLLER MODEL(S) INSTRUCTIONS (included with the panel and adapter package) exceptions are:
- Design Limitations listed in this instruction.
- Lighted digital display is visible and replaces the "power on" indicator.
- Additional instructions included in this document

C. Follow the specific instructions for the 1604 CONTROLLER AND 1600 LIMIT CONTROLLER (used on IL-3S). (these instructions are also included with the panel and adapter package)

Qualified electrician required: The installation portion of this procedure requires wiring, in addition to mechanical installation. Electrical wiring to the heater must be installed in accordance with local National Electric Codes by a qualified person as defined in the NEC. All wiring cautions, warnings and instructions contained in the screw plug heater and controller instructions apply.

NOTE 1: Although removing the screw plug heater electrical enclosure or modifying the bussing voids the UL listing, this heater is designed for the safety features intended in the UL499 standard. Refer to NOTE 2 for details.

NOTE 2: This heater may be manufactured to several standards of safety as indicated by the Listing/Certification mark(s). Any modification to this heater voids the Listing/Certification. However to maintain the intent of these standards the following field wiring spacing requirements should be adhered to.

Parts Involved	Potential voltage	Through air, inch (mm)	Over the surface inch (mm)
Between live parts and opposite polarity, or grounded dead metal parts	0-600	⅜ (9.5)	½ (12.7)
Between live part and the enclosure	0-600	½ (12.7)	¼ (12.7)

Minimum acceptable spacing through air or over surface at points other than field wiring terminals.

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INSTALLATION & WIRING

Parts List for IntelliTherm Kit

- Control Panel
- Thermocouple and well adapter kit – per Figure 1
  - – Thermocouple
  - – Thermocouple Bayonnet Cap
  - – Bayonnet Adapter
  - – Compression Fitting
- Wire Kit – Seven wires per Figure 2
- Heater Adapter
  - – Two rings
  - – Three longer 8-32 screws
  - – Seven (minimum) shorter 8-32 screws

Required Instructions:

- Screw Plug Heater Installation and Operating Instructions
- Contactor Power Controller Model(s) Instructions
- 1604 Controller User's Manual
- Limit Controller (if part of package) User's Manual

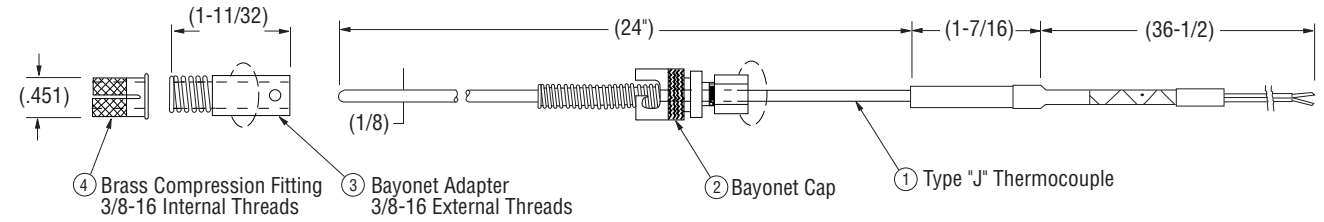
Note: you must have all of the above documents, in addition to this document to install the intelliTHERM. If you need to obtain them, call our service department at (800) 368-2493.

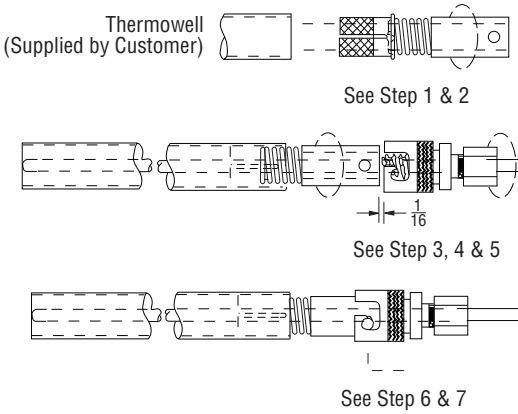
The objective of this part of this instruction is to adapt the screw plug and install the intelliTHERM panel so the assembly becomes a single unit as shown in Photo 1. (Note: Screw Plug not installed in application for photo). For remote mount installation, refer to the Remote Mount Panel Installation & Wiring section.

Ensure adequate space is available to install the intelliTHERM panel, to allow proper air flow around the panel, and to ensure the fan inlet and exit vent are not blocked. Failure to do so could inhibit installation or overheat the internal components during operation.



Photo 1 - intelliTHERM Assembly





Customer Assembly Instructions:

1. Thread Bayonet Adapter (3) into Compression Fitting (4) one full turn.
2. Using a small hammer, tap assembled Bayonet Adapter and Compression Fitting into Thermowell until Flange of Compression Fitting is flush with well.
3. Thread Bayonet Adapter the rest of the way into Compression Fitting or until tight.
4. Slide Thermocouple (1) through Bayonet Cap (2), Then slide both parts into Thermowell until the Thermocouple reaches the bottom.
5. With the Thermocouple firmly held against bottom of Thermowell, and the Bayonet Cap approximately 1/16" above the Bayonet Adapter, tighten the nut on the Bayonet Cap to lock the Bayonet Cap to the Thermocouple.
6. With the Bayonet Cap and the Thermocouple locked together, compress spring of the Bayonet Cap and twist to lock onto the Bayonet Adapter.
7. Verify that all connections are secure and tight.

Figure 1 - Thermocouple Adapter Kit

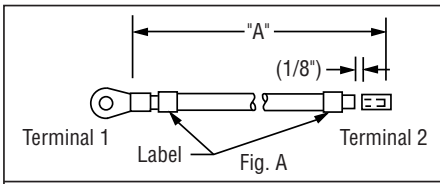
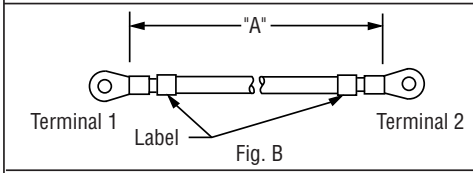
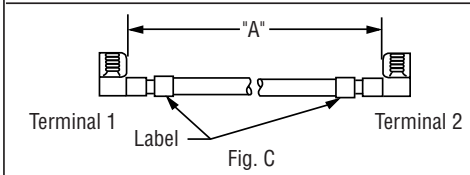
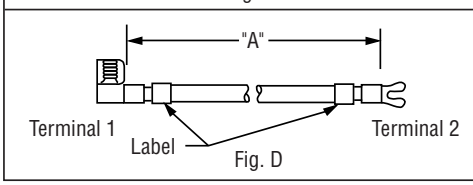
Label	Quantity		
1T1, 1T2, 1T3, GND	4		Power and Ground Wire (Control Panel to Heater)
JMP	1		'Delta' Jumper (2-1/2" Screwplug)
JMP	1		Transformer Jumper (Used in 120Vac Config.)
JMP	1		Transformer Jumper (Used in 120Vac Config.)

Figure 2 - Wire Kit

⚠WARNING

ELECTRIC SHOCK HAZARD. Disconnect all power before installing or servicing heater. Failure to do so could result in personal injury or property damage. Heater must be installed by a qualified person in accordance with the National Electrical Code, NFPA 70.

1. **Adapt Screw Plug Heater for intelliTHERM operation.**
   - **a.** Remove Screw Plug enclosure and enclosure base as in Photo 2. Record Screw Plug information on the label located on the inside of the panel. Also record this information on the page 1 of this instruction sheet.
   - **b.** If heater is three phase delta wired heater (center bus bar over the thermowell), remove the center buss bar. Save the nuts and washers for a later step.

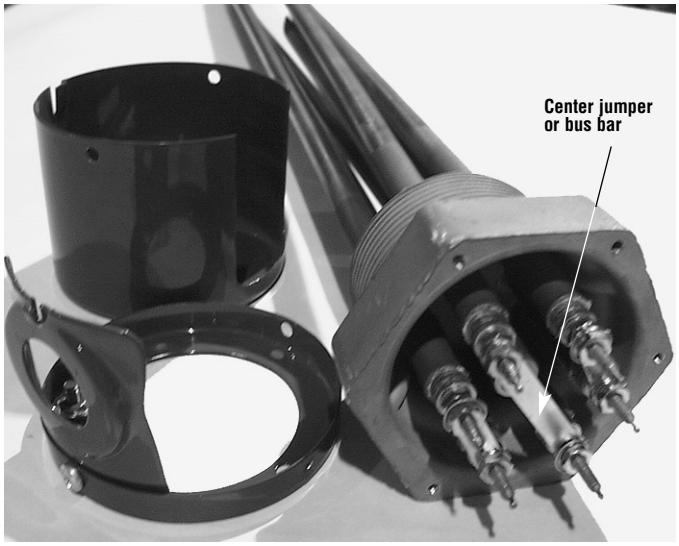


Photo 2 - Screw Plug Enclosure Removed

   - **c.** If bulb and capillary thermostat exists in the well, remove it at this time.
   - **d.** Install Thermocouple Adapter Kit per provided drawing 168-122571-067 (Figure 1). Then remove thermocouple for ease of installing the next few steps. Screw Plug should look like Photo 3 at this stage.

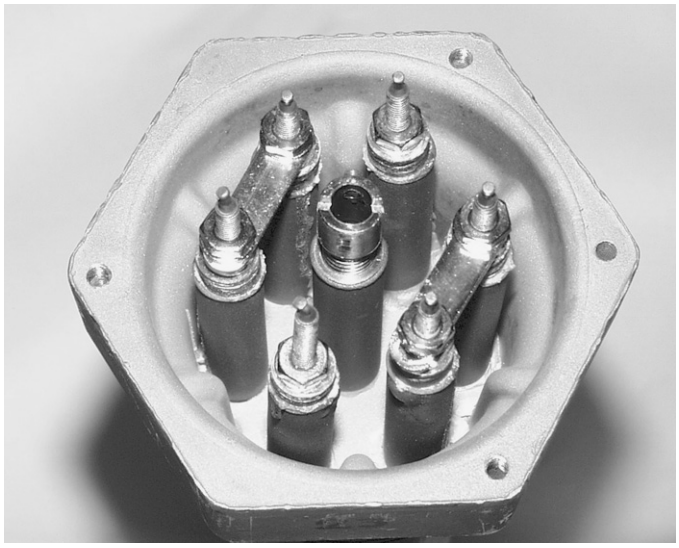


Photo 3 - Screw Plug with enclosure and center bus removed (3 phase Delta wired heater) and well adapter installed

   - **e.** Install smaller slip-on adapter to the Screw Plug. Use three of the provided longer 8-32 screws which fit existing holes in the Screw Plug. When inserting the third screw, attach the ground wire from the wire kit (Figure 2) to the Screw Plug. Ensure the metal connection on the ground wire points away from the electrical terminals.

Note: There are multiple sets of holes on the adapter. One set will match up on all our current standard designs. If while retrofitting an older screw plug design, the holes do not match up, drill and tap holes in the screw plug to match the adapter. Do not penetrate entire screw plug.

   - **f.** If step 1b was performed above, install the delta jumper from the wire kit per Figure 3 (use one set of nut and washer from step 2b for each terminal). Do not torque nuts at this time, since one will be removed in the next step. Ensure the metal connection on the jumper wire points away from the electrical terminals.

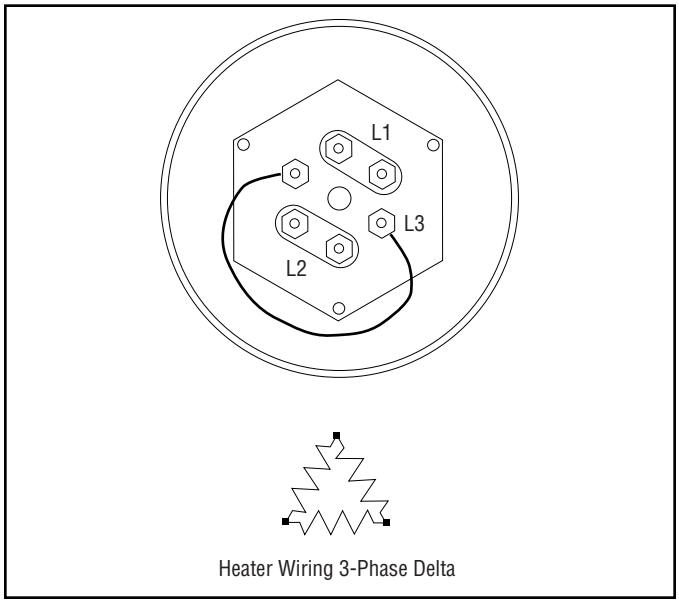


Figure 3 - Jumper for 3PH Delta wired heater

   - **g.** Remove one nut and washer from each power terminal (L1, L2, & L3) and attach power wires from the wire kit to the heater terminals per Figure 4. Ensure the metal connections on the power wires point away from the electrical terminals. See Photo 4. Torque all connections 8 to 15 in-lbs.

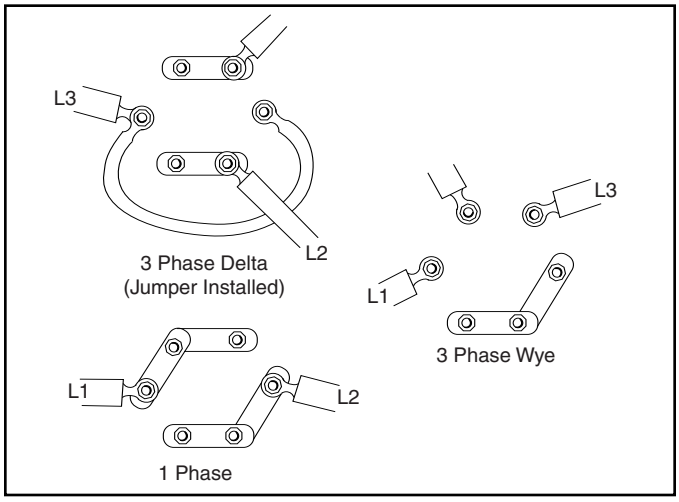


Figure 4 - Attaching Power Wires to the Screw Plug Terminals

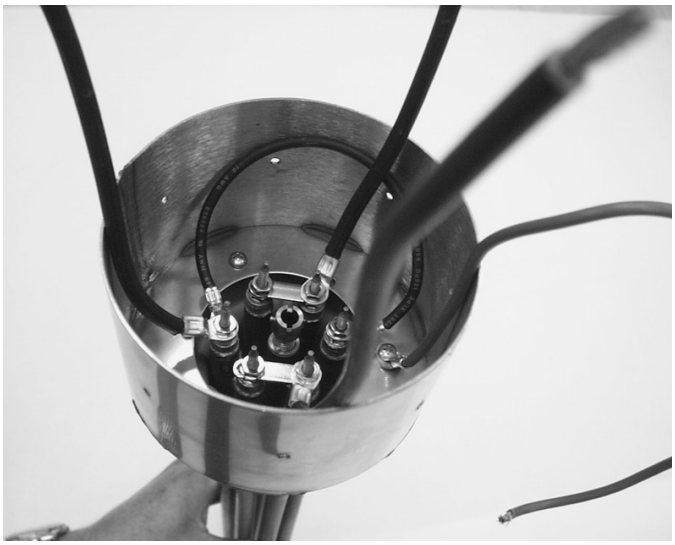


Photo 4 - Adapter installed on Screw Plug

h. Reinstall the thermocouple into the turn lock fitting (this step may be done after Screw Plug installation if preferred).The Screw Plug should look like Photo 5 at this point.

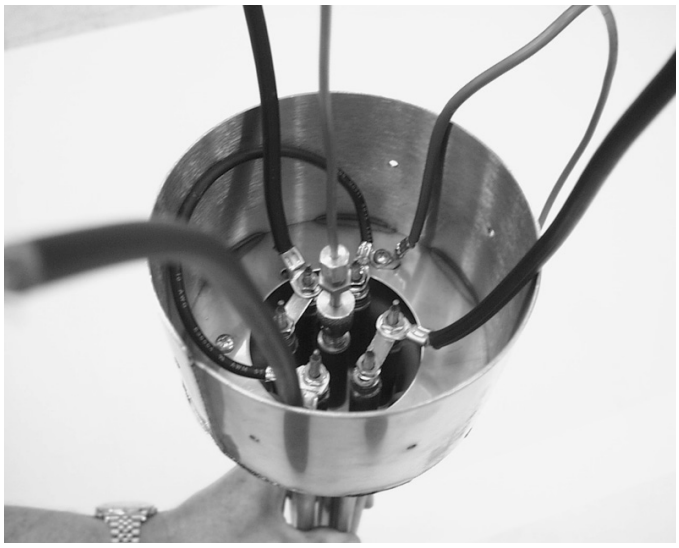


Photo 5 - Screw Plug adapted for intelliTHERM installation.

2. **Install Screw Plug.** Follow all warnings and applicable steps in the installation instructions provided with your 2.5" screw plug heater.

3. **Install Panel.**
   a. Mount larger slip-on adapter to the panel with 4 provided 8-32 screws. See Photo 6.

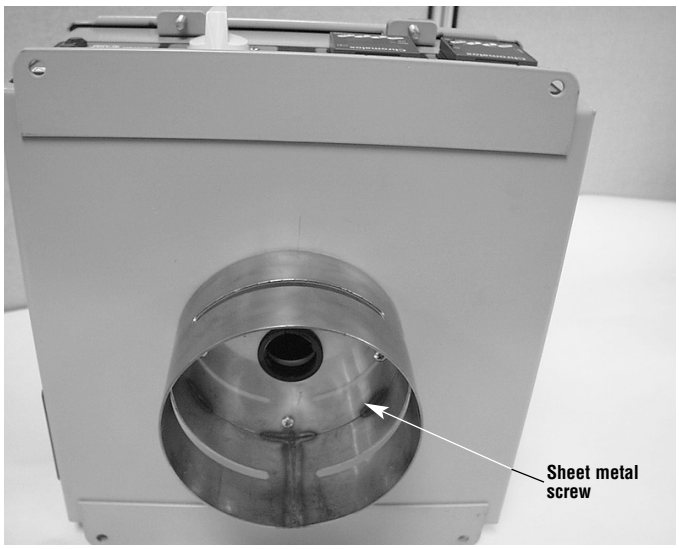


Photo 6 - Panel with adapter attached.

b. Straighten thermocouple lead wire. Bundle power and thermocouple wires together for easier installation. See Photo 7.

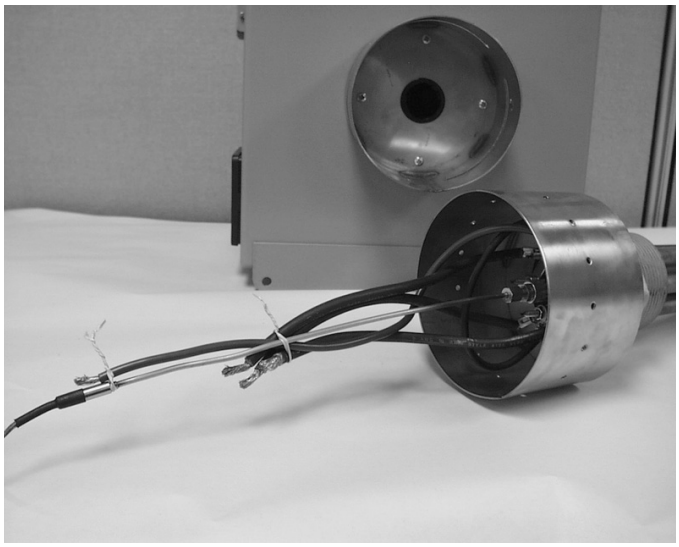


Photo 7 - Bundled Wires on Screw Plug next to back of Panel with Opening

c. Route power wires, ground wire, and thermocouple wire from the Screw Plug through the hole in the back of the panel and then install the panel on the Screw Plug with the the slip-on adapter. See Photo 8. Open the panel door and unbundle wires.

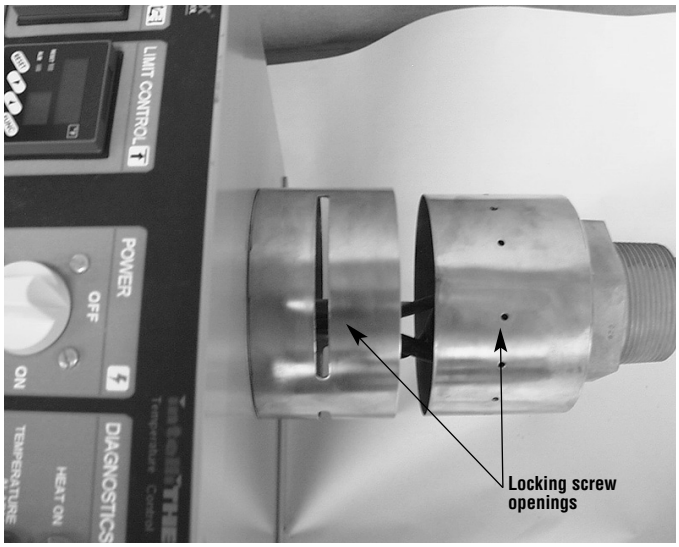


Photo 8 - Installing Panel on Screw Plug

d. Orient panel appropriately and apply one 8-32 screw per slot into the connections between the slip on adapters (3 total).

4. **Terminate wires inside the panel** per Figure 6 (this wiring diagram also shown on the inside of the panel door). The inside of the panel should look like Figure 5 for three phase wiring. For one phase wiring, refer to notes in Figure 6.

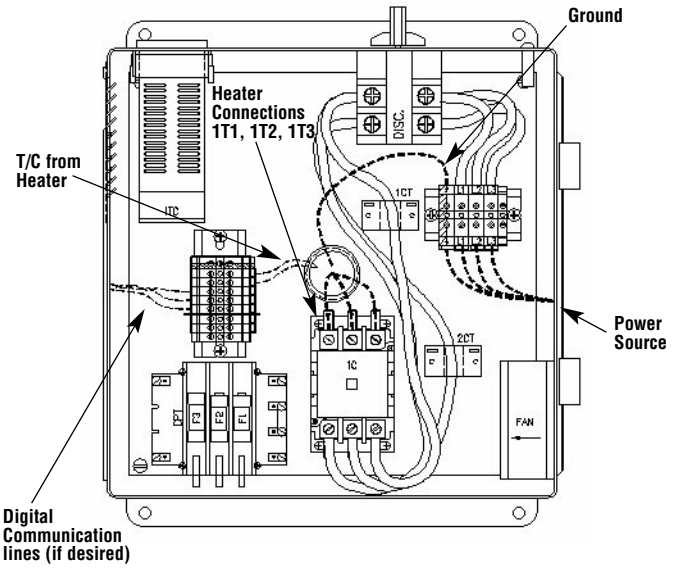


Figure 5 - Panel Wiring Arrangement

5. **Verify planned line voltage and adjust transformer set up** if necessary. It is pre-set up for 480V. See Figure 6 (wiring diagram also shown on the inside of the panel door) for instructions. See Figure 6 Notes for one phase and Figure 6 Detail A for 120V and 240V.
6. **Coil and secure the thermocouple wire** in a position away from the power wires.
7. **Close and secure panel door** with screws on latches.

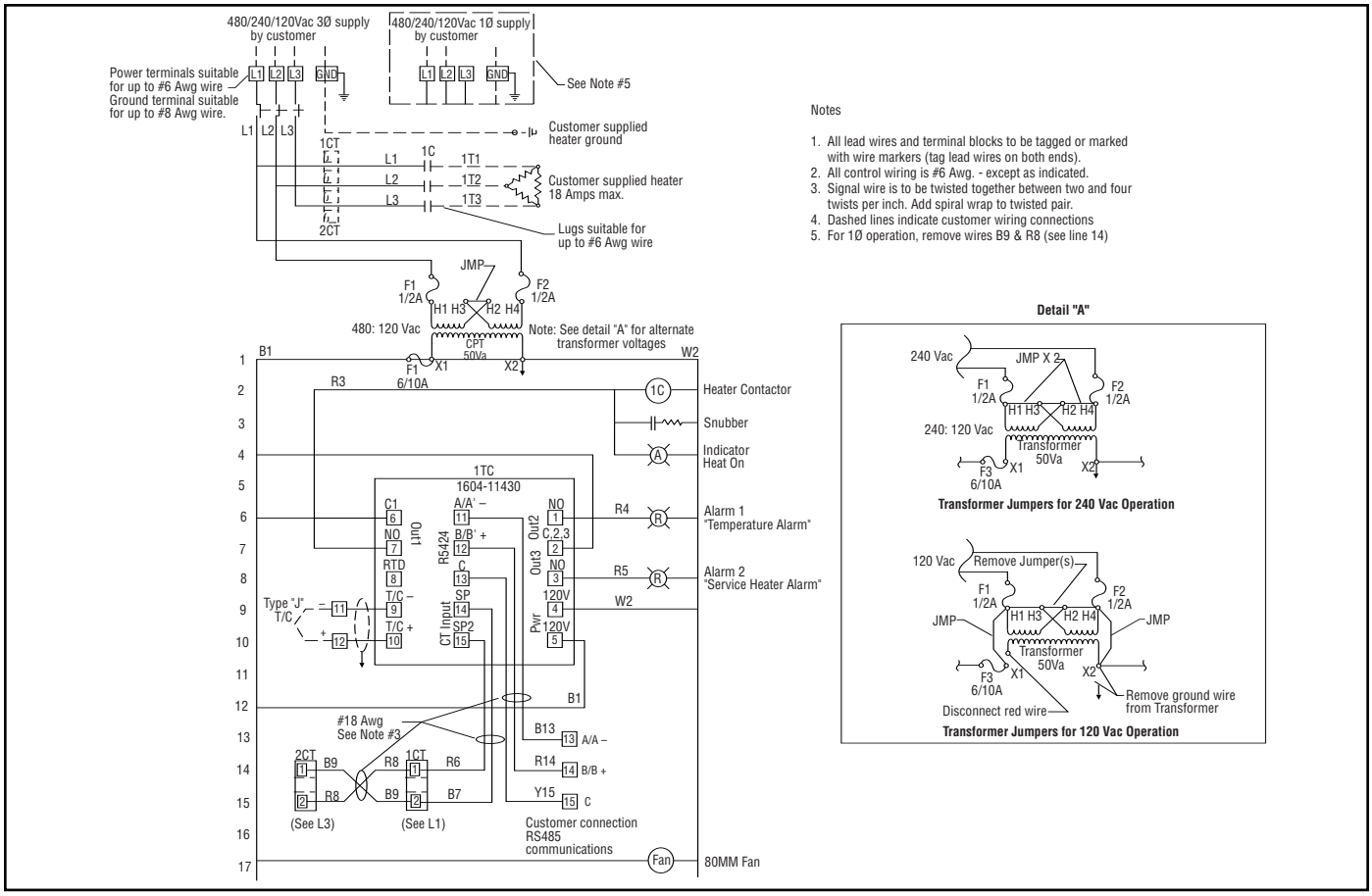


Figure 6 - Wiring Diagram

PRE-OPERATION / START-UP VERIFICATION

Follow all electrical safety precautions listed in the Screw Plug Instructions and the Contactor Power Controller Model(s) Instructions.

1. Verify all wire connections are tight.
2. Verify thermocouple is securely pressed into the thermowell and that the sheath of the thermocouple is positioned away from the bare metal contacts of the power contactor and disconnect.

OPERATION

1. Follow all applicable steps of the screw plug instructions, the general Contactor Power Controller Model instructions and any instructions from the 1604 temperature controller and the 1600 limit controller (used on IL-3S).
2. Refer to the design limitations in the general section of this instruction.
3. Refer to the DIAGNOSTICS/STATUS INDICATIONS section for set up and details on these indications.

DIAGNOSTICS / STATUS INDICATIONS

1. **Heat On Indication.** This function is preset. The light will indicate on the display when heat is being applied by the heater.
2. **Temperature Alarm.** For high temperature alarm, refer to the Alarm 1 setpoint the 1604 Operating Parameters. For low temperature alarm, refer to the Configuration Procedures in the 1604 instruction.
3. **Setting the "Heater Service Alarm" (Low Current Alarm).** This section programs the Heater Service Alarm to the correct setpoint based on your typical operating temperature.
   a. Completely immerse heating element. Energize heater/panel following appropriate instructions.
   b. Allow the process to come up to operating temperature following these and heater instructions.
   c. Depress and hold the temperature controller "FUNC" button until a value is displayed. See Photo 9.
   d. Multiply this value by 0.94 and round down to nearest whole number.
   e. Enter this value as the "Hbd' variable in 1604 Operator Parameters. Refer to Operator Parameters section in the 1604 instruction.

You are now set up for the Heater Service Alarm diagnostic. The troubleshooting section of this instruction details action if this alarm illuminates.

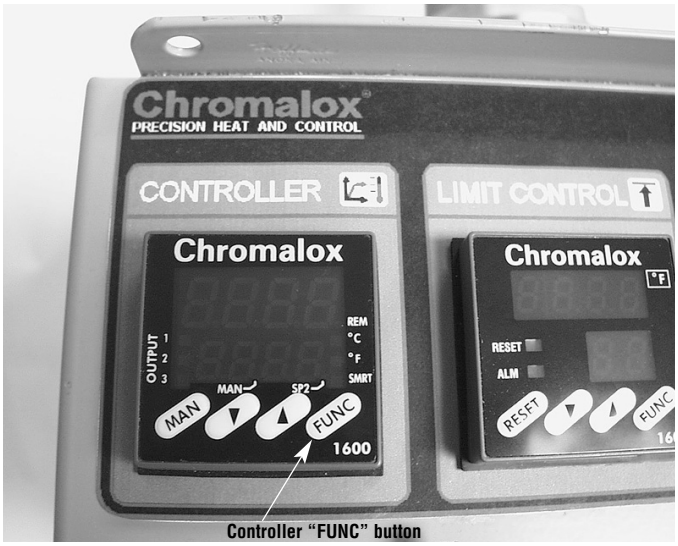


Photo 9 - 1604 Close-up

REMOTE MOUNT PANEL INSTALLATION & WIRING

If local panel mounting is desired, skip this section.

1. Do steps 1a-d, f of the Installation & Wiring section.
2. Run power wire from controller to screw plug per NEC code and replace screw plug electrical enclosure.
3. Proceed at step 4 and continue to the end.

TROUBLESHOOTING

Follow safety information, instructions and warnings in the Contactor Power Controller Model(s) Instructions along with this instruction.

Temperature Alarm: (if active)

1. Verify alarm settings per 1604 temperature controller manual.
2. Correct issue(s) which triggered alarm.
3. Reset alarm. (see 1604 manual)

Service Heater Alarm:

1. Record the measured load current from the 1604 Controller if running:
   a. While the unit is on and actively heating. ("Heat On" light is 'on' or 'blinking') Press and hold "FUNC" key on 1604 Controller until a value is displayed. Record this value. This measured amperage value relates to the line current.
2. Calculate Wattage status of the unit. (Wattage = Measure Amperage x Voltage). Record this value.
   a. Note: Due to the way line amperage is measured in this unit, the above calculation holds true for a fully operational heater regardless of whether it is Three Phase or Single Phase. However, if there is an element failure, the potential load imbalances of a three phase load may cause an incorrect calculated wattage value.
3. If the calculated wattage is less than the rated wattage of the unit:

TROUBLESHOOTING

⚠WARNING

Electric Shock Hazard. Measurements to be made by a qualified person with a meter that is adequate for the applied voltage. Follow all safety and operating instructions of the meter.

a. Verify adequate line voltage under full load. **Note:** If several loads are connected to the same circuit as the unit, all loads must be active to verify line voltage. Voltage may be measured at power terminals L1, L2, L3. A good location is the connection screws of the terminal block on the power source side.
- **i)** If the voltage is less than rating of unit or fluctuates under normal conditions: Reset the Alarm per "Setting the Service Alarm" under full load conditions or set the "Hbd" trip point to a lower value. This could be the only issue.
- **ii)** If the voltage rating of unit is normal: Continue to step b.

b. Measure the resistance of each heating element. Follow warning in the Maintenance Section and DISCONNECT POWER TO UNIT BEFORE CONTINUING and follow all electrical safety precautions.

Measure resistance between each of the 3 terminals (1T1, 1T2, 1T3 of Figures 5 and 6) for 3 phase wiring or the 2 terminals for 1 phase wiring. This may be done by opening the panel door and measure the resistance between each of the wire connection screws for 1T1, 1T2, 1T3 on the contactor.
- **i)** Measure the resistance from '1T1' to '1T2". Record value.
- **ii)** Measure the resistance from '1T2' to '1T3". Record value.
- **iii)** Measure the resistance from '1T3' to '1T1". Record value.
- **iv)** All values should be within 10% of each other.

c. If any value is greater or less than the others or any value is zero.
- **i)** Double-check resistance per "b)".
- **ii)** Remove enclosure from the screw plug and check condition of power wire, termination, insulation and heater elements. Replace any faulty component(s).

d. If:
- **i)** Heating element resistances are found to be within 10% of each other and,
- **ii)** Line Voltage is within limits, and
- **iii)** "Hbd" setting has been readjusted per "Setting the serivice heater alarm", and
- **iv)** The "Service Heater Alarm" remains on:

Then: Contact Customer service at 1-800-368-2493.

Note: Under normal load conditions, the alarm will reset the first time that the "heat on" light comes on.

Hi/Low Limit Controller alarm (for IL-3S): (see manual)

MAINTENANCE

⚠WARNING

ELECTRIC SHOCK HAZARD. Disconnect all power before installing or servicing heater. Failure to do so could result in personal injury or property damage. Heater must be installed by a qualified person in accordance with the National Electrical Code. NFPA 70.

1. Follow all applicable instructions of the screw plug instructions, the general Contactor Power Controller Model instructions and any instructions from the 1604 temperature controller and the limit controller (if purchased).
2. Clean the air filter as needed.

RENEWAL PARTS IDENTIFICATION

Thermowell adapter kit and thermocouple	168-122571-067
Local mounting power and ground wire adapter kit	168-122571-068
Local mounting physical adapter kit	168-122571-069
For control panel replacement	I-3S or IL-3S

For heater replacement, purchase a new Chromalox heater as specified on the front of this instruction or inside of the panel door.

Limited Warranty:
Please refer to the Chromalox limited warranty applicable to this product at http://www.chromalox.com/customer-service/policies/termsofsale.aspx.

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