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OPERATION MANUAL

PC2007-12

AUTOMATIC 12 WAY HEAT TREATMENT CONSOLE



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PC2007-12 HEAT TREATMENT 12 WAY CONSOLE

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PC2007-6 Twelve Way Heat Treatment Console:

DESCRIPTION:

The PC2007-12 automatic heat treatment console is designed to control various heat treatment processes by closely monitoring and adjusting the temperature rate of rise and fall, the soak temperature, set point and duration, on up to 12 zones. It incorporates the latest microprocessor based technology and is simple to set up and operate. Control setting is by means of push switches and an LCD screen provides visual indication of program position and output status at any time.

SPECIFICATIONS – PC2007-12 Heat Treatment 12 way Console:

Length: 44"
Width: 36"
Height: 38"
Weight: Approx. 1275 lbs
Material: 12 gauge stainless steel cabinet
Wheels: 900 lbs capacity each with brake (4) (SS mounting brackets available upon request)
Handling: Forklift access.

Inputs:

- **Voltage:** 480-565-575-604, 3 Phase
- **Current:** 200 amp
- **Power:** 130 KVA Isolated Copper Wound
- **Frequency:** 60 Hz

Output Per Zone:

- **Zones:** 12
- **Voltage:** 80 VAC, single phase
- **Current:** 135 amps @ 80V
- **Power:** 10.8 KVA
- **Activation:** 200 amp contactor
- **Control per zone:** Digital temperature controller or P256 programmer

Control Circuit:

- **Voltage:** 110 VAC, single phase
- **Current:** 10 amp circuit breaker
- **Power:** 1650 VA winding on power transformer
- **Auxiliary:** 110 VAC supply, single phase

6 x Digital Temperature Controller (6600):

- **Temperature Range:** 0-2200°F or 0-1200°C
- **Thermocouple:** Type “K”
- **Resolution:** Measurement 0.1 degrees / Display 1.0 degree

2 x 6 Channel Temperature Programmer/Controller (P256):

- **Temperature Range:** 0-2000°F or 0-1200°C
- **Thermocouple:** Type “K”
- **Resolution:** Measurement 0.1 degrees / Display 1.0 degree

Amp Meter: Supplied by client**Protection:**

- **120-VAC Control Circuit:** 5 amp circuit breaker
- **Heater Power:** Isolation contactor for each zone
- **Console Power:** 200/250 amp main circuit breaker
- **Power Transformer:** 392°F (200°C) over temperature thermostat per phase
- **Cooling fan:** 2 x 340 CFM - Thermally protected

Maintenance Requirements:

Inspection and Cleaning:

<u>ITEM</u>	<u>INSPECTION</u>	<u>FREQUENCY</u>	<u>ACTION</u>
Contactors	Burned or Pitted	Every 6 months	Clean or replace contacts
Temperature Controllers (6600) / Programmer (P256)	Calibration	Every 12 months	Check accuracy and adjust if required
Recorder (OPTIONAL)	Calibration	Every 12 months	Check accuracy and adjust if required
Recorder (OPTIONAL)	Main shaft Lubrication and cleaning	Every 6 months	Refer to page 19-2 in AH3000 Series manual
System Cleanliness		Every 6 months	Vacuum with power disconnected
System Electrical	Loose connections	Every 6 months	Tighten all terminal connections
Air Vents and fan	Dust or dirt build up	Every 3 months	Clean with vacuum with power disconnected
Check bolts and screws	Loose	Every 6 months	Tighten

PC2007-6 Twelve Way Heat Treatment Console Operating Instructions:

1. Switch 200 amp main circuit breaker to the “ON” position.
2. Make sure zones used are indicating the actual temperature on the programmer (P256) prior to start and then turn rocker switches to the “PRG” position.
3. Decide on the heat treatment specification and set as follows for both programmers:

P256 Six Channel Digital Programmer

- a.) On start up. The display shows “Logo 256” and version number. It then reverts to the “Controller Overview”. The large number on the left hand side of each box shows the zone number. The small letter “a” or “m” on the right hand side indicates if the zone is in AUTO or MANUAL mode. The larger number below shows the temperature of the thermocouple in that zone.
- b.) By pushing the zone button once that display shows the manual set point for that zone. (It is recommended that this is set at about 10°C if no manual operation is required). The value is altered by use of the up - down buttons.
- c.) Push the zone button a second time, the display will show if the zone is in AUTO or MANUAL mode, this again can be altered by use of the up-down button. Set the zone in the “AUTO” mode.
- d.) Pushing the button a third time reverts the screen back to “Controller overview” (if no button is pushed for 20 seconds the screen automatically reverts to “Controller overview”). Set each zone to be used in the Automatic mode.
- e.) While in the “Controller Display” mode – push the “down” button once and the display will change to show the “Profile overview”.

Note: The six numbered buttons have now changed their function

4. Push No. 1 button to display heating rate, adjust to requirements with up – down buttons. Push No. 1 again to revert to “Profile”.
5. Push No. 2 button to display “Soak Temperature”, adjust to requirements with up – down buttons. Push No. 2 again to revert to “Profile”.
6. Push No. 3 button to display “Soak Time”, adjust to requirements with up – down buttons. Note this display indicates dwell time in hours i.e.: 1.1 = 1 hour 6 minutes, 1.5 = 1 hour 30 minutes. Etc. Push No. 3 again to revert to “Profile”.
7. Push No. 4 button to display “Cooling Rate”, adjust to requirements with up – down buttons. Push No. 4 again to revert to “Profile”.
8. Push No. 5 button to display program “End Temperature”, adjust to requirements with up – down buttons. Push No. 6 button to display “Ready” and then press the “up” button to start the program.

Note: P256 Programmer has a reverse thermocouple alarm feature which will turn off the zone if a thermocouple is accidentally reversed (this is a safety feature built-in to the P256 programmer/controller).

Note: Any zone in “manual” mode will control to its set point regardless of the program profile.

Starting the program will cause any zone set in “automatic” to follow the profile. The start temperature will be from the highest actual temperature of any zone in automatic. Any zone heating too slowly for the set heating profile will cause the program to go into a hold mode until that zone has caught up with the profile setting.

On delivery, the hold band is set to 20°C so any zone running a profile that lags the set point by 20°C will start the hold. Once the program has started, the ‘down’ button can be used to alternate between programs “Profile Overview” or the “Controller Overview”. If a hold situation arises it will be displayed on either screen.

For more detailed instructions refer to User Manual for 256 Programmer.

1. Make sure zones used are indicating the actual temperature on the controllers (6600) prior to start and then turn rocker switches to the “**MAN**” position.
2. Decide on the heat treatment specification and set as follows:

6600 Digital Temperature Controllers:

Step 1: Press the scroll key (O) until rP appears, then set degrees per hour (**Ramp-Rate**) by using the up or down key. (^, v)

Step 2: Press the up to down key (^, v) to set the **Final Set-Point** ie.) the bottom display
 Note When the controller temperature reaches the **Final Set-Point** it will hold that temperature continuously.

Step 3: Make sure the **SPrP (set point-ramp/Initial Set-Point)** is the same as the actual temperature of the controller. If not, turn controller off then back on (by toggling the rocker switch, to off position, then back on CONT position). This will change the SPrP (Initial Set-Point) to the actual temperature.

Step 4: For heating or cooling turn the **Final Set-Point** up or down and adjust **Ramp-Rate** (rP) as per requirements.

Step 5: Turn percentage timer between 7-10 on scale if equipped.

NOTE: When the controller is turned on, it automatically sets the **SPrP (set point-ramp/Initial Set-Point)** from the thermocouple (t/c) temperature. At this point in time it starts to count up or down to the **Final Set-Point**. The **SPrP (set point-ramp/Initial Set-Point)** cannot be changed manually, except by turning the controller off, then on. – **ALWAYS:** Change the **Ramp-Rate** before changing the **Final Set-Point** when changing stages. The controller **cannot** be **paused/held** at a temperature during the ramp stage, except by changing the **Final Set-Point**

to the desired temperature.

Step 1: Press the scroll key (O) until rP appears, then set degrees per hour (**Ramp-Rate**) by using the up or down key. (^, v)

Step 2: Press the up to down key (^, v) to set the **Final Set-Point** (ie.) the bottom display
 Note When the controller temperature reaches the **Final Set-Point** it will hold that temperature continuously.

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P256 PROGRAMMER CALIBRATION INSTRUCTIONS:

The P256 programmer has one common measuring circuit, which is used by all six of its thermocouple inputs. The measuring circuit is factory calibrated by the adjustment of two numbers that are held in the 256s non-volatile memory. One of the numbers, the zero constant, adjusts the measuring and cold-junction circuits zero offset. The other number, the span constant, adjusts the measuring circuits gain.

The measuring circuit uses high-stability components and so should not need any further adjustment for many months. From time to time, however, it will be necessary to perform routine calibration checks and make adjustments to the instruments calibration. The following procedure should be used to make these adjustments.

To calibrate the instrument on the bench you should connect a calibrator to thermocouple input 1 using type K compensating or extension wire. To calibrate the instrument in-situ you should disconnect thermocouple 1 and output 1 from the installation and connect the calibrator in its stead, again using type K wire.

In both cases, switch the instrument on and leave it energised for about fifteen minutes to reach its operating temperature. Then briefly switch the instrument off for a few seconds and then switch back on. It will then show the opening logo on the screen for twenty seconds. During these twenty seconds you must enter the password using the front-panel buttons. The password is a fixed, five digit number that cannot be changed by the user. It would be wise to keep this password secret from all unauthorised persons. The password at this time is 1 1 1 7 2 (using the up arrow button for 7). If you have entered this correctly the logo will immediately disappear and be replaced with the calibration mode-opening screen. If you enter the wrong password there will be no effect and you will have to start over by switching the instrument off briefly again. The calibration mode-opening screen shows the following prompt:

CALIBRATION MODE

Connect calibrator to I/P1
Use comp cable. Repeat zero
And span cal till both are OK

Use V to exit cal mode.
Use 1 for more....

To exit calibration mode press the down arrow button and normal instrument operation will resume. To continue with the calibration procedure press button 1 whereupon the screen changes to:

ZERO CALIBRATION

Value	Zk
00.7	05918

Set calibrator to 0 deg and
Use ^v unit value = 0000.0
Use 1 for more...

This shows the zero calibration screen for an instrument with a zero constant of 5918, which reads a temperature of +0.7 degrees for a calibrator input of 0.0 degrees. If this error is unacceptable it may be corrected by using the up or down buttons to change the zero constant until the value is shown as 0000.0. Note that the zero constant can only be set within the range 5700 to 6100. When you are sure that the zero calibration is correct then press button 1 and the screen will change to:

SPAN CALIBRATION

Value	Sk
999.1	33862

Set calibrator to 1000 deg and
 Use ^v until value = 1000.0
 Use 1 for more...

This shows the span calibration screen for an instrument with a span constant of 33862, which reads a temperature of 999.1 degrees for a calibrator input of 1000 degrees. If this error is unacceptable it may be corrected by using the up or down buttons to change the span constant until the value is shown as 1000.0. Note that the span constant can only be set within a range 32250 to 35650. When you are sure that the zero calibration is correct then press button 1 and the screen will change back to the operating screen.

You should repeat the above sequence at least once since any changes that you make to the zero constant will alter the value displayed at span. Similarly any changes made to the span constant may have a small effect on the value displayed at zero. Before you make any changes to the constants you must leave sufficient time for the value to settle after you have set the calibrator. The 256 takes several seconds to achieve a steady reading after a step change to its input. Note that the above values of 0 and 1000 are for instruments set for degrees C, instruments set for degrees F use the corresponding values of 32 and 1800.

When you are sure that the calibration is correct it is wise to make a note of both constants; a record is kept of the original constants at FGH. You may then leave calibration mode by going to the opening screen and then pressing the down button whereupon normal operation will resume. Note that there is no time-out in calibration mode so the instrument will remain in this mode indefinitely until you deliberately exit from it.

6600 CONTROLLER CALIBRATION INSTRUCTIONS:

$\frac{1}{4}$ -DIN, $\frac{1}{8}$ -DIN & $\frac{1}{16}$ -DIN Temperature Controllers - Input Calibration Procedure

$\frac{1}{4}$ -DIN, $\frac{1}{8}$ -DIN & $\frac{1}{16}$ -DIN TEMPERATURE CONTROLLERS INPUT CALIBRATION PROCEDURE

September 1996

NOTE: Calibration should be attempted only on Controllers on which calibration errors have been encountered (see **CALIBRATION CHECK**) and should only be performed by personnel who are technically competent and authorised to do so.

CALIBRATING THE UNIVERSAL INPUT

Equipment Required

1. Input source with an accuracy better than $\pm 0.05\%$ of reading:
 - (a) Thermocouple inputs - complete with 0°C reference facility, appropriate thermocouple functions and compensating leads (or equivalent).
 - (b) DC linear inputs - 0 - 5V and 0 - 20mA.
 - (c) RTD inputs - decade resistance box with connections for three-wire input (or equivalent)
2. Appropriate case assembly ($\frac{1}{4}$ -DIN, $\frac{1}{8}$ -DIN or $\frac{1}{16}$ -DIN) wired for appropriate input supply (90 - 264V AC 50/60Hz, 20 - 50V AC 50/60Hz or 22 - 65V DC).

Calibration Procedure

1. Ensure that the Controller is powered-off and that the mains (line) lead is disconnected. On the CPU PCB, fit the appropriate link jumpers (see Table 1 and Figure 1, Figure 2 or Figure 3 as appropriate to the type of Controller). Connect the appropriate input lead (see Figure 4 or Figure 5).
2. Connect the mains (line) lead to the Controller. Power-up the Controller and leave switched on for five minutes (for RTD and DC Linear inputs) or 30 minutes (for thermocouple inputs), then power-down.
3. Put the Controller in Calibration Mode by powering-up the Controller and, within 30 seconds of power-up, holding down the Lower and Function keys simultaneously for approximately five seconds. The upper display will then show Input Type Number, in the form:

IP_1

and the lower display will show:

CAL

Using the Raise/Lower keys, change the input type number as required (see Table 1).

NOTE: If required, only one input type may be calibrated. **Exception:** If it is required to calibrate the thermocouple input (Input Type 5), it is necessary first to calibrate the DC 0 - 50mV input (Input Type 1).

4. Press the Auto/Manual key to change the upper display to show:

After a few seconds, the upper display will either (a) return to the initial Input Type Number display if calibration was successful, or (b) display:

FAIL

In the latter case, the link jumpers and wiring should be checked.

Table 1 Universal Input Type Selection

Input Type No.	Input Type	Calibration Input	Link Jumper Settings		
			LJ1	LJ2	LJ3
1	DC - 0 - 50mV	50mV DC	Parked	Parked	Parked
2	DC 0 - 10V	10V DC	Fitted	Parked	Parked
3	DC 0 - 20mA	20mA DC	Parked	Fitted	Parked
4	RTD Three-wire	200Ω	Parked	Parked	Parked
5	Thermocouple	0°C "K"	Parked	Parked	Fitted

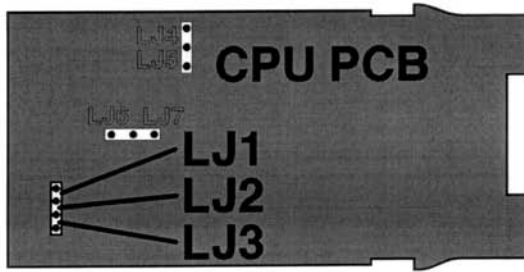


Figure 1 $\frac{1}{16}$ -DIN Link Jumpers (Relay/SSR Output 1)

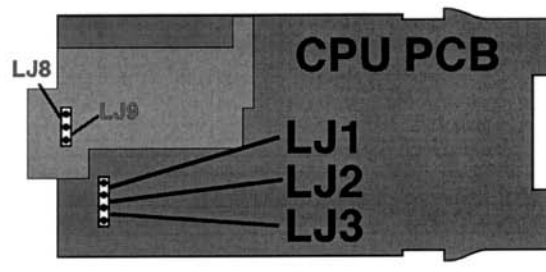


Figure 2 $\frac{1}{16}$ -DIN Link Jumpers (DC Output 1)

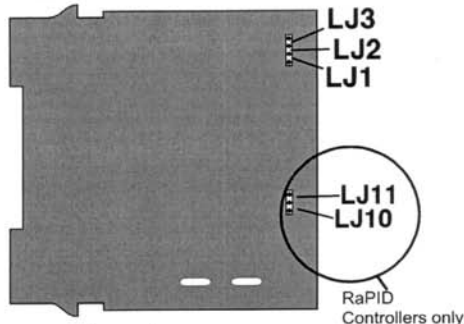


Figure 3 $\frac{1}{4}$ -DIN/ $\frac{1}{8}$ -DIN Series Link Jumpers

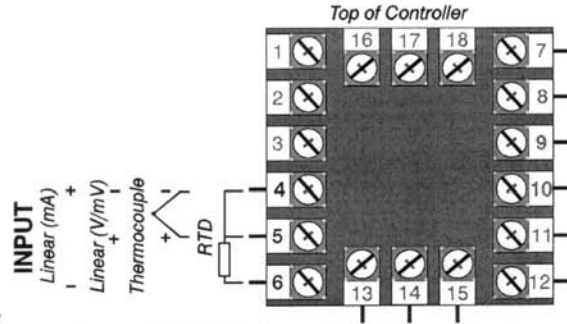


Figure 4 $\frac{1}{16}$ -DIN Universal Input Connections

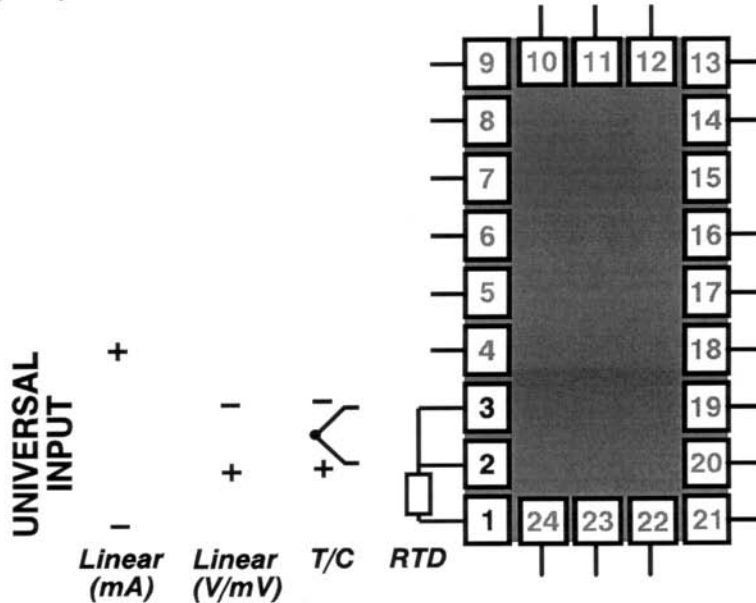


Figure 5 $\frac{1}{4}$ -DIN/ $\frac{1}{8}$ -DIN Universal Input Connections

$\frac{1}{4}$ -DIN, $\frac{1}{8}$ -DIN & $\frac{1}{16}$ -DIN Temperature Controllers - Input Calibration Procedure

5. To calibrate all inputs, repeat Steps 1 to 4 for each of the other input types (see Table 1) until all five input types have been successfully calibrated.

NOTE: Input Type 5 should be calibrated using the appropriate Type K compensating lead (between Terminals 2 & 3 on $\frac{1}{4}$ -DIN/ $\frac{1}{8}$ -DIN Controllers, Terminals 4 & 5 on $\frac{1}{16}$ -DIN Controllers.). The Controller should be powered-up and remain powered up for at least 30 minutes with this lead connected before the input is calibrated.

The universal input calibration procedure is now complete.

CALIBRATING THE SECONDARY ANALOGUE INPUT (RAPID CONTROLLERS ONLY)

Equipment Required

1. DC linear input source (0 - 5V and 0 - 20mA) with an accuracy better than $\pm 0.05\%$ of reading.
2. Appropriate case assembly ($\frac{1}{4}$ -DIN or $\frac{1}{8}$ -DIN) wired for appropriate input supply (90 - 264V AC 50/60Hz, 20 - 50V AC 50/60Hz or 22 - 65V DC).

Calibration Procedure

1. Ensure that the Controller is powered-off and that the mains (line) lead is disconnected. On the CPU PCB, configure link jumpers LJ10 and LJ11 (see Table 2 and Figure 3). Connect the remote set-point input lead (see Figure 6).
2. Connect the mains (line) lead to the Controller. Power-up the Controller and leave switched on for five minutes, then power-down.
3. Put the Controller in Calibration Mode by powering-up the Controller and, within 30 seconds of power-up, holding down the Lower and Function keys simultaneously for approximately five seconds. The upper display will then show Input Type Number, in the form:

The upper display shows the text "IP_1" in a digital font.

and the lower display will show:

The lower display shows the text "CAL" in a digital font.

Using the Raise/Lower keys, change the input type number as required (see Table 2).

NOTE: If required, only one input type may be calibrated.

4. Press the Auto/Manual key to change the upper display to show:

The upper display shows four dashes "----" in a digital font.

After a few seconds, the upper display will either (a) return to the initial Input Type Number display if calibration was successful, or (b) display:

The upper display shows the text "FAIL" in a digital font.

In the latter case, the link jumpers and wiring should be checked.

5. To calibrate all inputs, repeat Steps 1 to 4 for each of the other input types (see Table 2) until all three secondary analogue input types have been successfully calibrated.

Table 2 Secondary Analogue Input Type Selection

Input Type No.	Input Type	Calibration Input	Link Jumper Settings	
			LJ10	LJ11
7	Remote Setpoint, Linear DC mV	50mV DC	Parked	Parked
8	Remote Setpoint, Linear DC V	10V DC	Parked	Fitted
9	Remote Setpoint, Linear DC mA	20mA DC	Fitted	Parked

NOTE: No calibration is required if the secondary analogue input is to be used as a Remote Setpoint Potentiometer input or for Dual Setpoint switching.

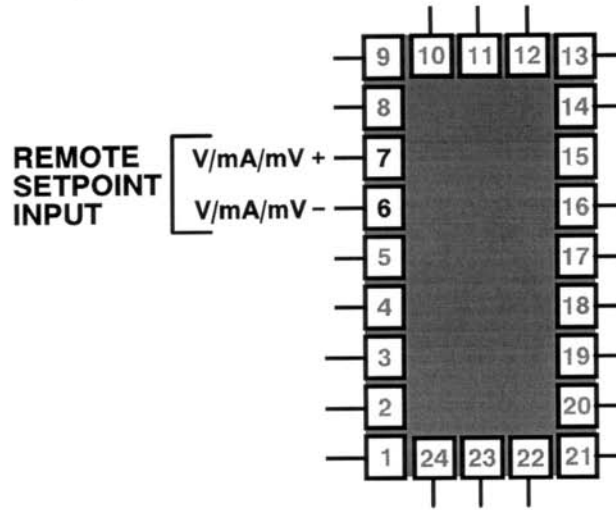


Figure 6 $\frac{1}{4}$ -DIN/ $\frac{1}{8}$ -DIN Controllers - Secondary Analogue Input

EXIT FROM CALIBRATION MODE

To exit from Calibration Mode, press the Lower and Function keys simultaneously.

NOTE: An automatic exit is made from Calibration Mode if there is no key activity for two minutes.

CALIBRATION CHECK

1. Set the Controller to the required configuration (using link jumpers and front panel entry) as described in the appropriate Product Manual.
2. After the appropriate delay for stabilisation has elapsed, check the calibration by connecting the appropriate input source and checking a number of cardinal points.
3. Power-up the Controller and leave it powered-up for at least five minutes (for RTD and DC linear inputs) or at least 30 minutes (for thermocouple inputs).

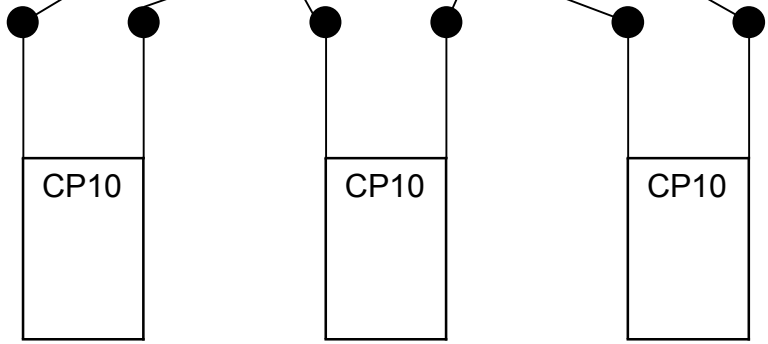


Thermocouple Cable

Secondary Cable

3 way splitter

3 way splitter



Parallel connection of heaters

Thermocouple Wire

Note:

The PC2007-12 connections for circuit number 1 shown. Circuit numbers 2 -12 are connected in the same manner

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TO CHANGE PRIMARY CONNECTIONS FOLLOWS THESE INSTRUCTIONS:

1. Switch off main breaker and disconnect primary power cable supply.
2. Loosen the primary power cable clamp.
3. Remove panel labelled "Back Panel" to change secondary and primary connections.
4. Change connections as per requirements and make sure the connections are tight.
5. Make sure nothing is left inside the enclosure.
6. Put the "Back Panel" back on.
7. Tighten the primary power cable clamp.
8. Hook up primary power cable supply and then switch on main breaker when ready.



REX MANUFACTURING R3 EM DIVISION OF TRANSFACTOR INDUSTRIES INC. REXDALE, ONT.			 LR34493
CAT. NO. BC130XX/X	KVA 130	ENCL. N/A	
SERIAL C 41787-2	HZ 60	TYPE ANN	
TRANSFORMER 3 PH. ISO.	% IMP. 5.5	AT 170 C.	
INSULATION CLASS 220	TEMPERATURE RISE	150 C.	
PRI. VOLTAGE: 480/575 DELTA H1-H2-H3	BIL. 10 KV.		
SEC. VOLTAGE: 85 (OPEN DELTA)	WT. 1100 LB.		

PRI. VOLTAGE	CONNECTION
604	1 - 1 - 1
575	2 - 2 - 2
546	3 - 3 - 3
480	4 - 4 - 4

SEC. VOLTAGE (OPEN DELTA)

X01-X1 = X02-X2 = X03-X3 = 85

*(1 PH.) 110 VOLT @ 1650 VA A1-A2

(D 07)

MS Part No.	Description Of Part
900Wheel	Wheels Swivel Caster (900 lb Capacity with brake)
Simultaneous (12)	12 Channel Chino Digital Temperature Recorder (Optional)
6600	Digital Temperature Controller
P256	6 Channel P256 programmer
130KVA #9	130 KVA - 3 Phase <i>Isolated</i> copper wound power transformer: Primary 480/575/600, 60 Hz Secondary 0/85 (Thermal trips per phase to prevent overload)
Amp Meter	Digital Amp Meter 0-200 amps
Selector Switch	Six Channel Selector Switch with Plate & Knob
CT	Current Transformer 0-200 amps
A10	300 amp Female Panel Mount Socket Complete
PP-20-KX	Thermocouple Extension Cable
A37-EL	200 amp contactor (100% Duty Cycle)
A38	110 Volt Neon
52F7431	ON/OFF/On Rocker Switch
Merlin 250 amp	250 amp - 3 phase Circuit Breaker with 120 volt uv Release
56F877	15 amp Circuit Breaker
56F876	10 amp Circuit Breaker
F-A18	Female Thermocouple Panel Mount (Type "K")
Fan	340 CFM Cooling Fan
120 V	120 V Receptacle
96F4496	3 Pole Terminal Block
#1 Tinned	#1 Tinned Cable with lugs (please specify length)
90F7177	Lug 1/0 - 3/8 Hole
84F1876	Aluminium Lugs 3/8" Hole for 250 amp circuit breaker