

OPERATING MANUAL



Stock Reference 17051

Rating : 70kVA

Style :StainlessSteel

No of Channels : 6

Programmiers : Adv 3's

Output Voltage : 42.5-0-42.5V

Supply Voltage : 440v, 480v, 600v

Serial Number

Date of Manufacture

CONTENTS

<i>Chapter</i>	<i>Page</i>
Specifications	3
Introduction	4
Functions	5
Pre commissioning checks	6
Installation and commissioning	6
General operation of components	7
General operating instructions	10
Temperature controller operating instructions	12
Maintenance	15
Fault finding	15

All rights reserved. No part of this document may be reproduced, stored in retrieval system, or transmitted in any form by any means, electronic, mechanical, photocopying, recording or otherwise without the prior, written permission of **Cooperheat**

SPECIFICATIONS

This unit features a 70 kVA, 3-phase, forced air cooled, double wound Class 'H' insulated, dry type, power transformer suitable for use in ambient temperatures not exceeding 40 Deg. C. and having a taped mesh (delta) primary winding suitable for connection to a 50/60Hz supply.

The secondary winding is 'Y' (star) connected, with the neutral point grounded (earthed), to provide a safe phase to neutral voltage for heating power.

Over-temperature protection of the transformer is by means of three sealed miniature (normally closed) thermostats, embedded in the windings of the transformer.

The main isolation switch is a 160 A triple pole molded case circuit breaker with magnetic and hysteresis trips for transformer thermal protection.

The unit is also fitted with remote sockets for controlling the channels with an external programmer selected by Auto/Manual selector switches on the front.

On the front the unit also has Data In and Data Out sockets for linking the Advantage 3 controllers of separate units using the link cable provided.

Rating	:	70 kVA
Frequency	:	60 Hz
Primary Volts	:	440/480/600V 3-Phase (as selected on tapping board)
Primary Amps	:	440V Primary : 92A 480V Primary : 84A 600V Primary : 67A
Secondary Open Circuit Voltage:	:	425V – 0V – 42.5V (Factory Setting) <i>For use with 40V and 80V heating elements</i>

Secondary Current : 274A Per Phase

Duty Cycle Rating : 100%

Two 110V, 10A Auxiliary Outlets are fitted as standard to the unit.



EC declaration of conformity available upon request.

(See contact details on page 14)

Ref: 17051 MANUAL
Issue: 04/01/2024

INTRODUCTION

The parameters appertaining to post weld heat treatment are clearly defined in the appropriate USA, British and European Standards. Postweld heat treatment to these codes may be affected by electrical resistance methods and the following represents the fundamental requirements for effective heat treatment.

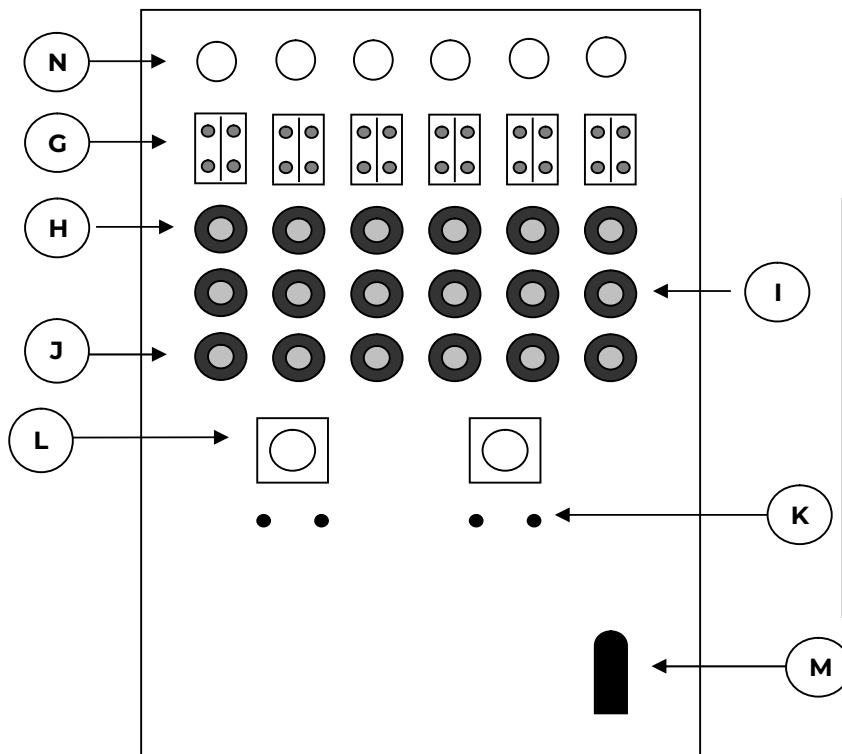
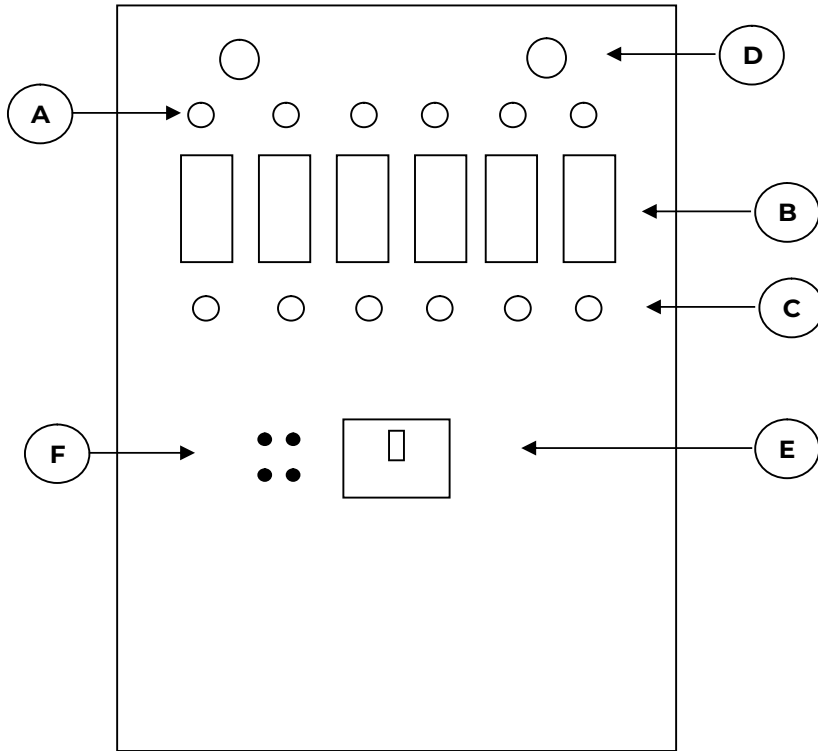
- The system must be fully capable of reaching and correctly recording the specific temperatures.
- Heating conditions must allow for various component thicknesses such that uniform temperatures result. Special provision often has to be made to control temperature gradients away from a heated zone in order to minimize additional stress.
- The operation has to be recorded and controlled within the limits of specification.

The oil refinery, petrochemical and power plant industries all utilise vast quantities of tubing and pipework, a substantial proportion of which has a preheat and/or postweld heat treatment requirement and this can be successfully achieved by the use of Cooperheat equipment.

The new Cooperheat 70kVA, 6 output, heat treatment power source has been developed to meet the real needs of the heat treatment engineering industry. Our design is based on almost 50 years experience as the worldwide market leader in the field of heat treatment.

FUNCTIONS

FRONT VIEW



REAR VIEW

- | | |
|-----|-------------------------|
| (A) | Channel power on neons |
| (B) | Temperature controllers |
| (C) | Selector Switches |
| (D) | Programmer Link Sockets |
| (E) | 125 A circuit breaker |
| (F) | 5A control fuses |
| (G) | Thermocouple sockets |
| (H) | 42.5V output camlocks |
| (I) | 42.5V output camlocks |
| (J) | 0V return camlocks |
| (K) | 10A auxillary fuses |
| (L) | 110V auxillary sockets |
| (M) | Input cable cutout |
| (N) | Remote Sockets |

PRE COMMISSIONING CHECKS

You should ensure that an electrically competent person carries out the pre-commissioning checks.

Check:-

- **IMPORTANT! That the primary transformer tapings are set to the correct voltage for the supply you are using. Unless the customer specifies otherwise the 70kVA power source is dispatched with the transformer primary tapping links set for an incoming supply of 400V.**
- General condition of the transformer.
- With panels removed check all connections are tight as vibration during shipment may cause some slackening which could result in overheating and failure during normal service.
- The tapping board and transformer windings are dry.
- Measure insulation resistance of primary winding to ground by means of a 500V insulation tester (megger). Minimum insulation resistance to ground at 20°C ambient should be not less than 10 Mega Ohms. For warranty purpose, it is important that your electrical inspector records the primary winding 'As new' insulation resistance measurements either in this manual or in your own equipment records date of the test.

INSTALLATION AND COMMISSIONING

You should ensure that an electrically competent person carries out installation and commissioning of the Power Source.



WARNING

To prevent contact with hazardous voltages inside the Power Source Unit, which may result in electrical shock or burns, never carry out any work inside the Power Source Unit until the unit has been isolated from the incoming supply.

- This Power Source is designed for general usage. However, as use on construction sites exposes electrical equipment, to damage from falling objects and the general movement of steelwork on the site, it is preferable to place the Power Source in a protected position. Also protect the equipment from adverse weather conditions and, in tropical situations, from the direct effects of the sun, as overheating could result under normal loading conditions.
- Connect a 415V, 480V, 600V -Phase and earth primary power supply to the supply input terminals which are accessed by removing the back panel from the power source and are located inside the unit on the left hand side of the base of the power source . Current rating of the supply conductors shall not be less than the rated primary current for the connected supply voltage (see Specifications on page 3)and of sufficient size to limit the voltage drop to a value permissible for the satisfactory performance ofthe Power Source.
- Check incoming power supply for correct voltage between phases and, if necessary, adjust primary tapings on the Power Source transformer to suit.
- Earthing (grounding) of the Power Source should be carried out to the requirements of the IEE Electrical Wiring Regulations (UK), the USA National Electrical Code, or other suitably equivalent National standard.

Ref: 17051 MANUAL
Issue: 04/01/2024

- Ensure that suitable HRC fuses or excess-current circuit breaker at your supply distribution point properly protects your service conductor and the Power Source.
- Once the pre-commissioning checks have been satisfactorily completed, the supply and earth conductors have been connected and the panels have been replaced the incoming supply can be energised. The Power Source unit can then be energised by switching the 160A circuit breaker (isolator) to the ON position.
- Connect a wire link between the positive and negative pins in six thermocouple plugs and insert one into each thermocouple socket. This is completely safe, as the thermocouple sockets are not connected to an electrical supply. Shorting out the thermocouple sockets will cause the temperature controllers to receive a signal equivalent to the ambient air temperature.
- Set the temperature controller so that the control temperature is set to a temperature above the ambient air temperature (for example 100°C)
- For each output, use an a.c. voltage test meter to measure the voltage between each 42.5V output twistlock socket and 0V twistlock socket. Readings of approximately 42.5V volts should be obtained. Next, for each output channel in turn, connect the voltage test meter between the 42.5V output twistlock socket and 42.5V twistlock socket. Readings of approximately 85V should be obtained.



WARNING

Caution should be used whilst taking the measurements, as 85V a.c. will be present between output sockets on each Channel.

- Upon completion of the foregoing test procedures, switch off the Power Source Unit by switching off the 160A circuit breaker.

GENERAL OPERATION OF COMPONENTS

OVERVIEW

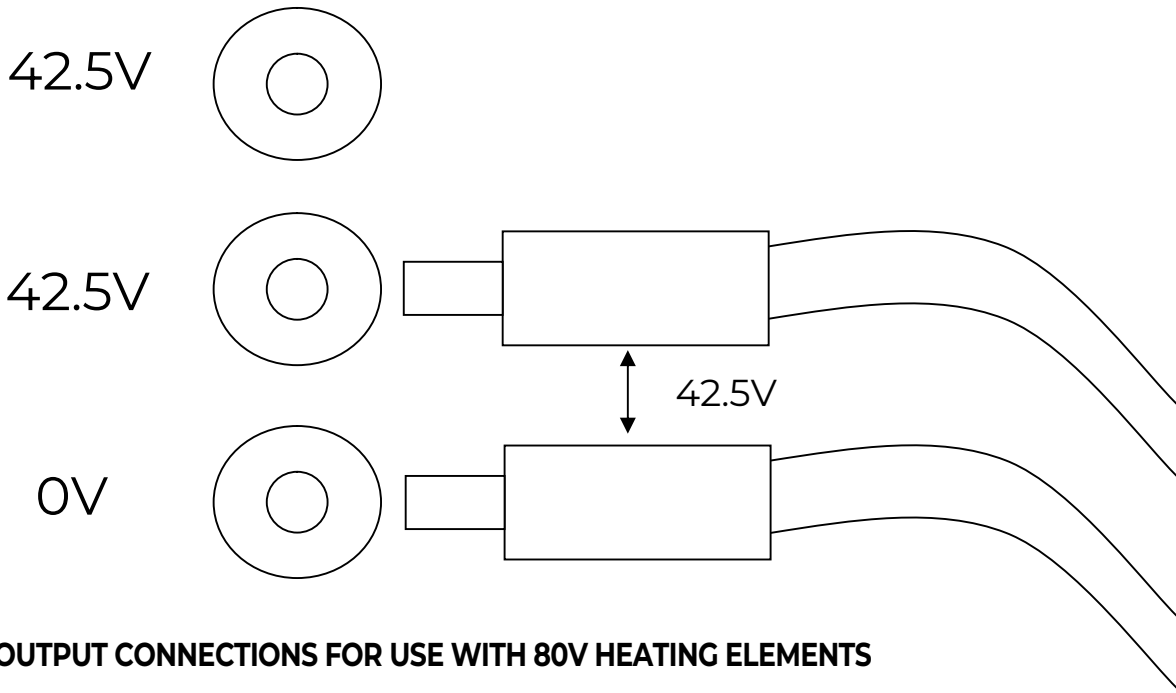
Each control channel has its own temperature controller, which requires a thermocouple transducer for automatically controlling the workpiece temperature within close limits. Paired thermocouple sockets are provided on each channel to receive a mV signal from the thermocouple in the hot control zone on the workpiece and, if necessary, to allow a parallel connection to a temperature recorder.

The thermocouple extension cables from the workpiece to the programmer are plugged into the thermocouple input sockets and if necessary linked out to a temperature recorder. The recorder may be powered from the 110V auxiliary supply sockets located on the rear panel of the Power Source Unit.

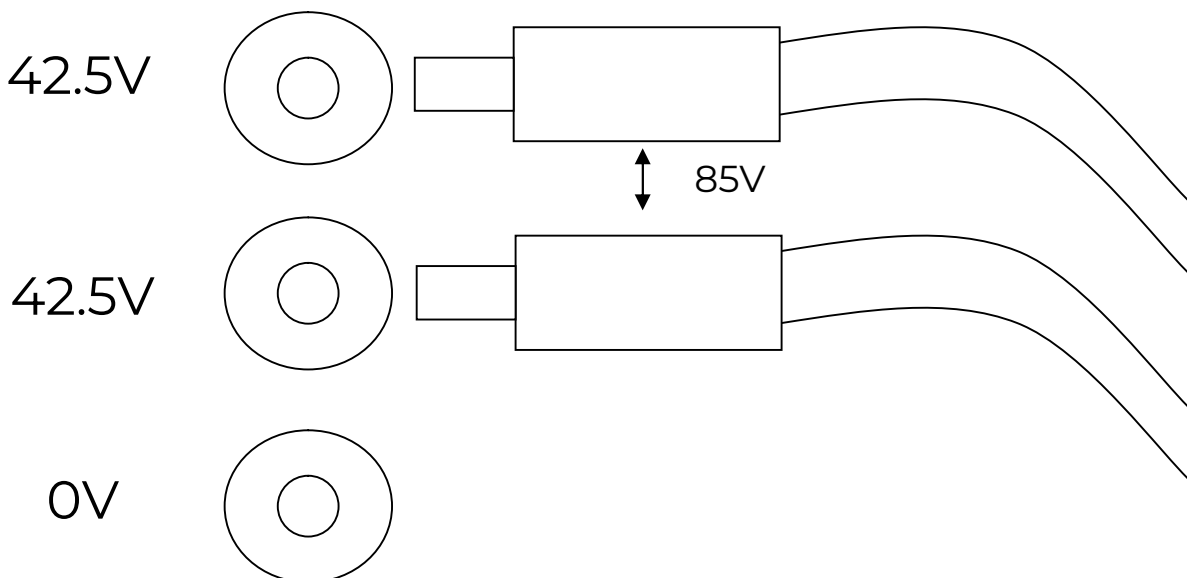
The output power for the heaters is by connection via feed and return cables to the 42.5V output and the 0V output twistlock sockets (for use with 40V heating elements) or one 42.5V output and the paired 42.5V twistlock sockets (for use with 80V heating elements).

Ref: 17051 MANUAL
Issue: 04/01/2024

OUTPUT CONNECTIONS FOR USE WITH 40V HEATING ELEMENTS



OUTPUT CONNECTIONS FOR USE WITH 80V HEATING ELEMENTS



Ref: 17051 MANUAL
Issue: 04/01/2024

CONTACTORS

The contactors supplied are adequately rated for the current taken at all permissible loads. They have double breaking main contacts with silver alloy contact tips, which are weld resistant, hard wearing and have excellent conductivity. The contactors are compact in size and are fully serviceable, with a range of spares available.

TEMPERATURE CONTROLLERS

When in Programmer mode, the temperature controller program is entered by means of the of the three face buttons. The Temperature controller will, via the contactors, control the heating elements and maintain the temperature of the workpiece thermocouple at the temperature, which has been set. Full instructions for the temperature controller are included in this manual.

THERMOCOUPLES

It is of the utmost importance that the polarity of the thermocouple and the compensating cable (thermocouple extension) is connected correctly, as incorrect polarity may result in over heating of the workpiece during the heat treatment.

The two pin polarised plugs and sockets are identified positive/negative with the large pin negative. Always use the special connectors for thermocouple circuits and no other types.

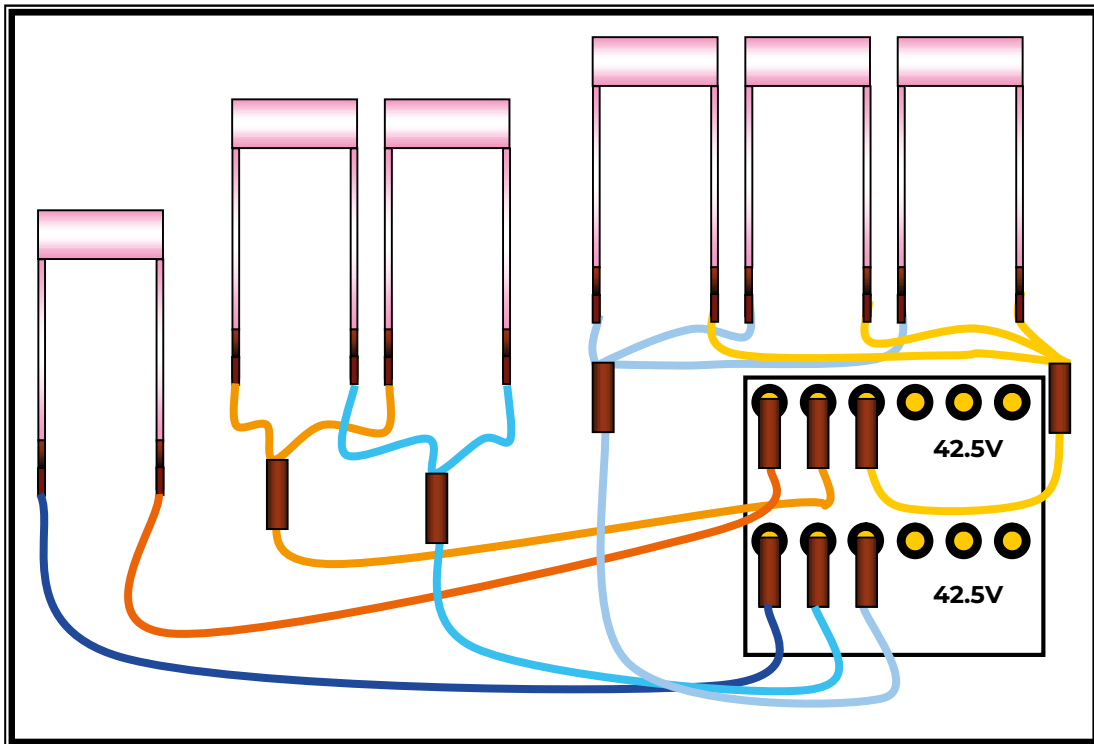
Type 'K', thermocouple wire, is of twisted pair pattern with one wire coloured yellow (+) and one wire coloured red (-)

Caution: To avoid serious damage to electronic temperature controlling and recording instruments, thermocouples must be disconnected from the unit whilst using a capacitance discharge unit (thermocouple attachment unit -TAU) to affix the thermocouple wire to the workpiece.

GENERAL OPERATING INSTRUCTIONS

CONTROL ZONES

When using a 70kVA, 6-way (6-channel or 6-output) Power Source for either preheating or post weld heat treatment, the Ceramic Pad Heaters are connected in groups of one, two, or three or per control channel (output). If there is more than one heater in a heater control group, the heaters in the control group are connected together in parallel across one of the output channels of the 70kVA power source. (see example diagram below)



- As shown in the above diagram 80V heating elements are connected, using splitters where necessary, into groups of one, two, or three heaters. The heater groups are then connected to the power source across the 42.5V and 42.5V output sockets on each channel.
- The control thermocouple for each group of heaters is connected to a compensating lead which is in turn connected to a thermocouple input socket on the power source, temperature controller or programmer unit. Ensuring that the channel corresponds to the output supply channel associated with that control thermocouple. i.e. thermocouple connected to channel one thermocouple input with channel one output supply camlocks.
- If a temperature recorder is being used to record the preheat then a thermocouple compensating cable link will be connected from the second of each pair of thermocouples to the corresponding thermocouple input socket on the temperature recorder. i.e. thermocouple input channel number one on power source, temperature controller or programmer unit to thermocouple input channel number one on the temperature chart recorder.
- Connect a 110V supply, from a 110V auxiliary output on the power source, to any recorders or separate temperature controller or programmer units being used

Ref: 17051 MANUAL
Issue: 04/01/2024

- Connect the power source 3 phase and earth supply plug to an appropriate 3 phase and earth supply output socket.



WARNING

Do not remove the 3 phase plug or attempt to make a hard wire connection to a 3 phase connection box, fuse board or generator etc. unless you have been trained, qualified and authorised to do.

- Energise the Power Source Unit using the 160A circuit breaker.
- Switch all controllers ON.
- Set all controllers to **programmer control** mode.
- Switch those required to **control only** mode
- Enter programs in temperature controllers
- The temperature controllers will energise the contactors as necessary to apply sufficient heating power to each zone of heaters to achieve and maintain the set temperature.

ADVANTAGE 3 OPERATING INSTRUCTIONS

Operating Modes

The Advantage 3 has 3 modes of operation;

- OFF (Indicator only)
- PROGRAMMER (master)
- CONTROLLER (slave)



OFF

Display toggles between thermocouple load temperature reading (°F) and OFF.

Heat output remains off (no control action).

Previous operation as programmer or controller is indicated by LED arrow.]

If previous mode was controller then any Set Point received on S.P. IN connector (from Master) is re-transmitted on S.P. OUT connector (to slave).

CONTROLLER

To select this mode from **OFF**, use **SET** button to toggle display to show **Cont**, push **ENTER**.

The unit is now set in controller mode with the display continuously showing load temperature.

The unit will now receive incoming set point; this value can be viewed by holding down **CHECK** button.

If set point is **0000** then no control action is performed.
Once the unit receives a set point between **0001-1200** control action commences.
Relay output on/off action is indicated by **HEAT LED**.
Perform **RESET** operation to end controller action and return to **OFF** mode.
Following manual reset operation, unit continues to pass incoming set point value to the next slave controller until programme is ended.

PROGRAMMER

Set mode display to **PROG**, push **SET** and **START LED** is lit with previous **START** temperature value flashing on display.
To keep this value push **ENTER** or change this value by pushing **SET**.
Value is changed one digit at a time using **SET** to increment a digit and **ENTER** to move to the next digit.
After entering the final digit the whole value flashes.
The value can be set to **0000** by pushing **RESET** button, then setting a new value digit by digit.
Once correct value is flashing push **ENTER** to store this setting.
Continue this procedure to enter new values for **UP** rate, **SOAK** temperature, **SOAK** time, **DOWN** rate and **OFF** temperature.
Once **OFF** temperature is stored, the display shows **run**.

To commence the program cycle, push **RUN** button.
Programmer unit (master) now runs the stored program and transmits Set Point value for additional slaves, with current programme segment LED lit and **HEAT LED** showing output relay condition.
Display shows actual load temperature, but will flash **HELD** if this unit's temperature or any slave channel's temperature is lower than the set point by a value exceeding the stored **HOLD-BACK** value.
When program cycle is completed, the master and slave units switch to the **OFF** mode.

Viewing Set Point Value during programme cycle

To show the set point on a programmer unit, push the **CHECK** button once. The display flashes the set point value 5 times (alternating between **SP** and value).
For a controller unit push and hold the **CHECK** button.
The set point value is displayed until the button is released.

Program Check/ Alter

While viewing set point on programmer unit (master), further pushes of **CHECK** button will display each program segment value in turn; **START**, **UP**, **SOAK**, **TIME**, **DOWN** and **OFF**.
While any value is flashing (except **START**) pushing the **SET** button allows this value to be altered.
Firstly, value flashes (fast) along with **Programmer LED** (arrow) to indicate **ALTER** mode.
During this stage, program is paused, with all channels controlling at present set point.
To change value, use **SET** and **ENTER** routine.
To ignore **Alter** and resume program cycle push **ENTER**.

Program Halt

The program cycle can be paused at any time using **HALT** function.
This is set by keeping **HALT** button pushed for 3 seconds (display shows - - -) until display flashes **HALT**.
To end **HALT** function push **HALT** button once.

Prop-Band and Hold Back setting.

With unit in **OFF** mode push **ENTER** and **RUN** switches together until display blanks.
Upon release, display shows **Pb** (Prop-band) setting.
Use **SET** button to select values; 10, 20 or 40.
Pushing **ENTER** stores desired value.
Display now shows **Hb** (Hold-Back) setting.
Use **SET** button to select; 10, 20, 40 or 60.
Pushing **ENTER** stores desired value. Unit returns to **OFF** mode.

Reset function.

To exit **PROGRAMMER** or **CONTROLLER** mode push **RESET** button once then, while display showing **rst**, push and hold **RESET** and release when display blanks.
This procedure ensures that the program is not ended accidentally.

Contact Details:

Cooperheat Equipment Ltd.
67a Compton Road, Southport, United Kingdom, PR8 4EG
+ 44 -1704 - 617626

MAINTENANCE



WARNING

To prevent contact with hazardous voltages inside the Power Source Unit, which may result in electrical shock or burns, never carry out any work inside the Power Source Unit until the unit has been isolated from the incoming supply.

- All electrical apparatus in constant use, particularly that subject to cyclic loading, must receive regular maintenance inspection in order to maintain trouble-free operation.
- The frequency of inspection will depend upon the operating conditions and the length of time that the equipment is in use. Under average conditions, inspections should be made every month to ensure the components are operating correctly, contacts are in good condition, camlok sockets are free from the effects of over-heating or arcing, due to improper locking of the plugs and that there is no visible sign of a fault developing.
- Inadequate attention to the connectors fitted to the heating units can only result in service difficulties during the heat treatment work. Contacts should be renewed before they become excessively worn and springs replaced.

FAULT FINDING

Fault finding should always be systematic commencing with the most likely faults first, such as a blown fuse. A visual inspection should always be made to ascertain that no obvious disconnections, broken components or over-heated connections are visible. Always ascertain the reason for the fault and check that a similar fault is not developing on other units.

Some possible fault symptoms and remedies are detailed below. You should also refer to the schematic layout.

160A Circuit Breaker (MCCB) will not close.

Causes

Action

Transient surge on closing switch	Repeat
Overheated transformer causing thermal trip to operate	Allow to cool and check loading
Short circuit on secondary between two outlets or outlet and earth	Remove short circuit
One or more thermostats are open circuit	Allow transformer to cool, or if cool, replace thermostats
Trip capacitor (CA) faulty	Replace
MCCB shunt trip unit faulty	Replace

Other problems could be experienced due to the following:-

- Failure of the main supply. Check that the correct voltage is available from each outlet. Check for loose or broken connections.
- Faulty temperature controller.