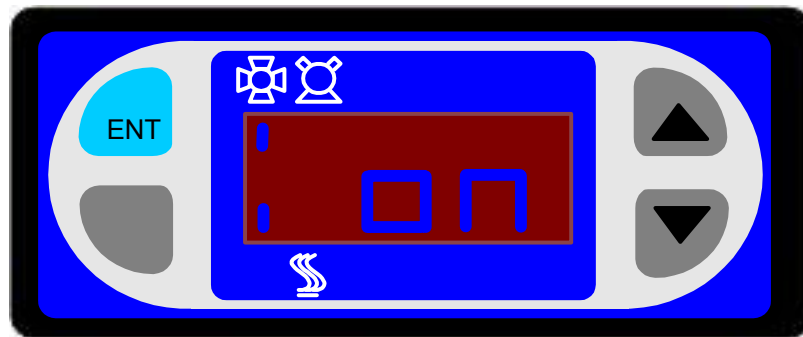


Multi-Stage Thermostat Controller

RDM Multi-Stage Thermostat User & Installation Guide

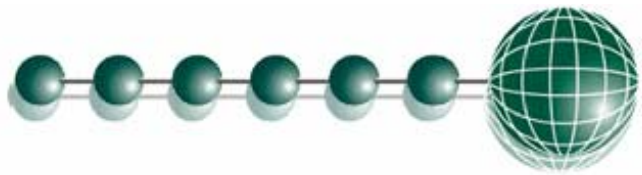


PR0101

Before installing or using this product, read the contents of this guide thoroughly to familiarise yourself with all the operating parameters and user interface.



Ensure that all power is switched off before installing or maintaining this product



Multi-Stage Thermostat Controller

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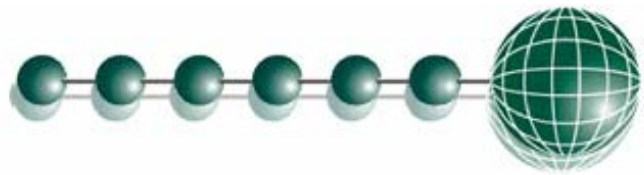
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Multi-Stage Thermostat Controller

Introduction

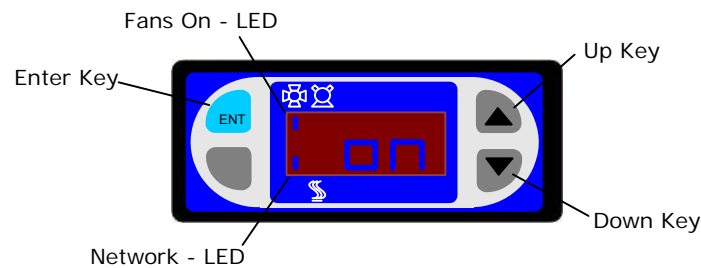
The RDM multi-stage thermostat controller is a four-stage thermostat with adjustable parameters that also incorporates an alarm handler. With the correct communications module the multi-stage thermostat can be networked back to an RDM Data Manager/Director. The User Interface is similar to that of the Mercury range.

The main features are: -

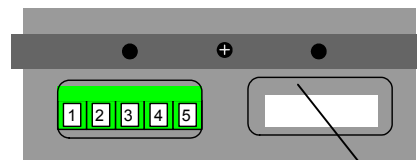
- Cooling and Heating applications
- Celsius or Fahrenheit temperature display
- Four stage thermostat
- Probe 1: Air probe (With alarm)
- Probe 2: Air probe (With alarm)
- Probe 3: Air probe (Monitoring Only)
- Programmable parameters
- 15A Fan control relay
- High volume Alarm buzzer
- Network connection to RDM IP network
- 1 Plant input
- Probe Type - 2K NTC Thermistor

Controller Module

Front View



Rear View

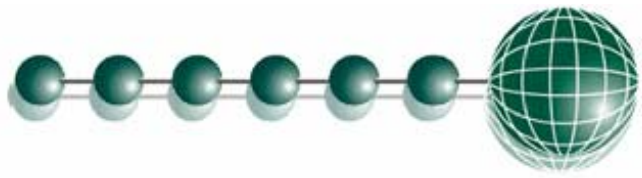


- Inputs: -
- 1 Probe 1
 - 2 Ground
 - 3 Probe 2
 - 4 Probe 3
 - 5 Plant Fault

Cable to relay board exits from here



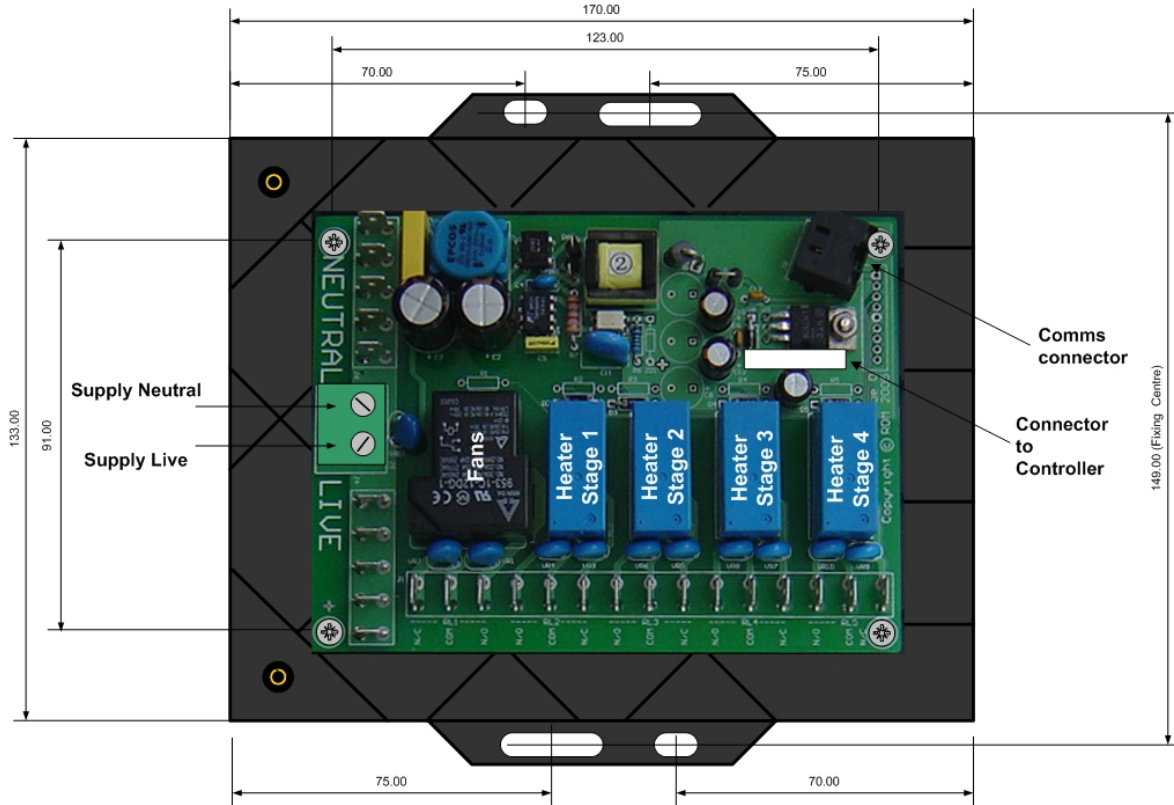
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Multi-Stage Thermostat Controller

Relay Module

The relay module includes the switched mode PSU for the controller, the 5 relays for control purposes and the mains input/output terminals. The relay board will provide for 230 Vac 50Hz or 110V 60Hz operation.



Connections:

NEUTRALS: Supply Neutral connections
 LIVE: Supply Live connections
 N/C: Relay normally closed contact
 N/O: Relay normally open contact
 COM: Relay Common contact

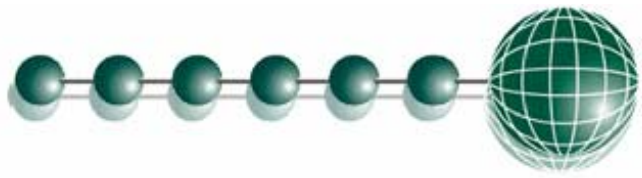
The relay board is fitted with wire links from each relay common to a live connector. (Not shown on the diagram)

Relay Board Mounting Instructions

1. Remove cable protector from the controller locating pins.
2. Remove the screw and detach the fixing bracket.
3. Fit the controller, with the gasket in a suitable DIN size hole. (71mm x 29mm)
4. Locate the fixing bracket in the slots, then slide to engage the pins.
5. Insert the screw then tighten until the fixing bracket secures the controller.
6. Attach the probe(s) and plant fault wiring.
7. Fix the cable protector by locating the pins and gently pushing until secure.
8. Fix the Relay/PSU module in an appropriate position using the slots provided.
9. Remove the cover and plug in the controller (use the knock-outs provided)
10. Fit the necessary control wiring using the knockouts provided.



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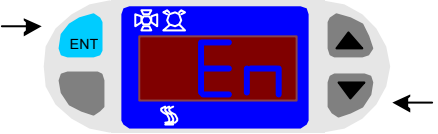








Multi-Stage Thermostat Controller

Setting-up

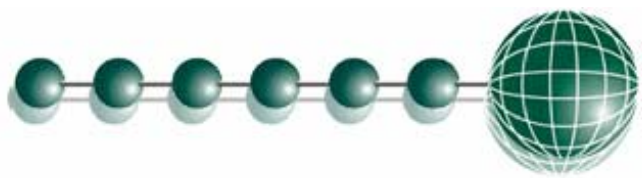
The controller has a set up method similar to that of the RDM Mercury. Typical set up screens are shown below.

Viewing/Changing Menu Items

<p>1. Press and hold "ENT" and "DOWN" for approx 3 seconds the display will read "En"</p>	
<p>2. Press and release "ENT", the display will indicate "IO" <i>This is the inputs and outputs viewing option</i></p>	
<p>3. Use the "UP" or "DOWN" keys to cycle round the menu items, press "Enter" at the desired item. <i>Note. If parameter "ES" is entered the controller will escape the set up and revert to normal operation.</i> <i>Example: pressing "Enter" at "PA" will allow you to view or change parameters</i></p>	
<p>4. Press and release "ENT" at the menu value to be changed.</p>	
<p>5. Use the "UP" or "DOWN" keys to cycle round the parameter values</p>	
<p>6. Press and release "ENT", to store the value in the controller. The display will revert to the parameter just set (e.g. "A1")</p>	
<p>7. Repeat steps 3 - 6 to complete all the parameter changes.</p>	
<p>Set and execute parameter "ES" to quit.</p>	



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Multi-Stage Thermostat Controller

Menu Items

IO	Displays the inputs and outputs
PA	View and change parameters
Un	Change the Units
nE	Network settings
So	View the software version
ES	Escape back to normal operation

Inputs and outputs

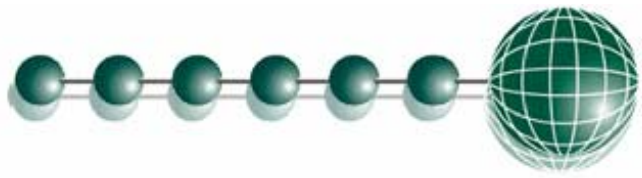
Selecting this menu option allows the user to view the inputs and outputs. Use the up/down button to select the desired input or output and then press "Enter". The value will be shown on the display.

Parameters

Parameter	Display	Min (^o C)	Max (^o C)	Default	Comments
Fans Mode	A1	0 = Off 1 = On	2 = Remote	2	Determines operation of fans.
Stat 1 Type	b1	0 = Off 1 = Cooling	2 = Heating	2	Select control application
Stat 1 Probe Weight * See note	b2	0%	100%	50%	Probe weighting
Stat 1 Set point	b3	-40 ^o	86 ^o	15 ^o	Value at which Stat 1 turns on
Stat 1 Diff	b4	0 ^o	50 ^o	1 ^o	Value above the set point at which Stat 1 turns off**
Stat 1 OT	b5	-40 ^o	86 ^o	30 ^o	Over temp set point
Stat 1 UT	b6	-40 ^o	86 ^o	-5 ^o	Under temp set point
Stat 1 Alarm Delay	b7	0 min	60 min	20 min	Delay before buzzer sounds
Stat 2 Type	C1	0 = Off 1 = Cooling	2 = Heating	2	Selecting control application
Stat 2 Probe Weight * See note	C2	0%	100%	50%	Probe weighting
Stat 2 Set point	C3	-40 ^o	86 ^o	18 ^o	Value at which Stat 2 turns on
Stat 2 Diff	C4	0 ^o	50 ^o	1 ^o	Value above the set point at which Stat 2 turns off**
Stat 2 OT	C5	-40 ^o	86 ^o	30 ^o	Over temp set point
Stat 2 UT	C6	-40 ^o	86 ^o	-5 ^o	Under temp set point
Stat 2 Alarm Delay	C7	0 min	60 min	20 min	Delay before buzzer sounds
Stat 3 Type	d1	0 = Off 1 = Cooling	2 = Heating	2	Selecting control application
Stat 3 Probe Weight * See note	d2	0%	100%	50%	Probe weighting
Stat 3 Set point	d3	-40 ^o	86 ^o	20 ^o	Value at which Stat 3 turns on
Stat 3 Diff	d4	0 ^o	50 ^o	1 ^o	Value above the set point at which Stat 3 turns off**
Stat 3 OT	d5	-40 ^o	86 ^o	30 ^o	Over temp set point
Stat 3 UT	d6	-40 ^o	86 ^o	-5 ^o	Under temp set point
Stat 3 Alarm Delay	d7	0 min	60 min	20 min	Delay before buzzer



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Multi-Stage Thermostat Controller

Parameter Table Contd:

Stat 4 Type	E1	0 = Off 1 = Cooling	2 = Heating	2	Selecting control application
Stat 4 Probe Weight * See note	E2	0%	100%	50%	Probe weighting
Stat 4 Set point	E3	-40 ⁰	86 ⁰	22 ⁰	Value at which Stat 4 turns on.
Stat 4 Diff	E4	0 ⁰	50 ⁰	1 ⁰	Value above the set point at which Stat 4 turns off**
Stat 4 OT	E5	-40 ⁰	86 ⁰	30 ⁰	Over temp set point
Stat 4 UT	E6	-40 ⁰	86 ⁰	-5 ⁰	Under temp set point
Stat 4 Alarm Delay	E7	0 min	60 min	20 min	Delay before buzzer sounds
Plant Fault	F1	0 = Off	1 = N/O 2 = N/C	0	Determine Status of Plant Input
Alarm Duration	F2	0 min	60 min	5 min	Duration of buzzer. 0 = buzzer off 61 = continuous buzzer
Factory Defaults	dt				Factory default values

*Note: If the probe weight is set to 100% then Stat will control on probe 1 only. If probe weight set to 0% then Stat will control on probe 2 only. If 70% is entered then the selected Stat will control using 70% of probe 1 and 30% of probe 2.

**Note: When used for a heating application. If cooling then it is the value below the set point which Stat turns off.

Units

0 = °C (Default); 1 = °F.

Note: If the controller is networked, changing this value will require the controller to be removed from the system and re-logged on before the new values are displayed.

Software version

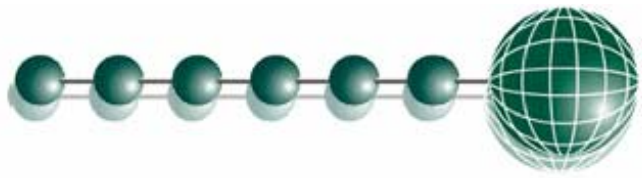
Press "Enter" at this display to show the software version.

Escape

Press "Enter" at this display to quit out of the menu.



Ensure that all power is switched off before installing or maintaining this product



Multi-Stage Thermostat Controller

Network Settings

There are 2 ways the Multi-Stage Thermostat controller can be used with an IP Ethernet network: -

1. IP-R Remote IP address given by the Data Manager (DHCP Server)
2. IP-L Local IP address and gateway is set up in the controller.

IP-R

To use the Multi-Stage Thermostat controller in IP-R mode, you will require either a PR0105 GP Comms Module or a PR0106 Multi-GP Hub.

When either of these 2 comms devices are used, set the rotary switches to a unique setting (000 on the GP comms module is not allowed for IP-R and 00 is not allowed on the Multi-GP Hub)

Once the comms module has been set up and connected to the controller and Data Manager, it will automatically log-on. Once it is online, the IP address given to the controller can be viewed by pressing enter at the "NE" display. Press enter at any one of the sub-menu option to read the value

n1 = IP address field 1
n2 = IP address field 2
n3 = IP address field 3
n4 = IP address field 4

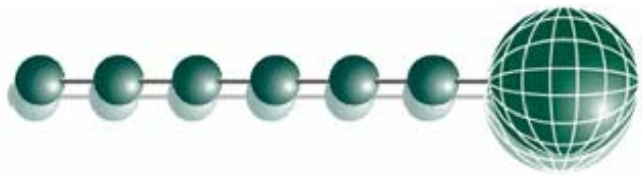
Note that these address values are displayed in hexadecimal.

Example. If the Data Manager is indicating a Multi-Stage Thermostat Controller has an IP address of 10.1.2.144; the following would be displayed in the Multi-Stage Thermostat controller: -

n1 = 0A
n2 = 01
n3 = 02
n4 = 90



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Multi-Stage Thermostat Controller

IP-L

To use the Multi-Stage Thermostat controller in IP-L mode, you will require either a PR0105 GP Comms Module or a PR0106 Multi-GP Hub.

The rotary switches set to 000; on the GP comms module or 00; on the Multi-GP Hub will force the connected controller(s) to operate in IP-L mode.

In this mode the IP address and gateway address must be set up manually in the controller.

Use the following table as a guide: -

Display	Option
n1	IP Address byte 1 (in Hexadecimal)
n2	IP Address byte 2 (in Hexadecimal)
n3	IP Address byte 3 (in Hexadecimal)
n4	IP Address byte 4 (in Hexadecimal)
n5	Network Mask Length (see table below)
n6	Gateway Address byte 1 (in Hexadecimal)
n7	Gateway Address byte 2 (in Hexadecimal)
n8	Gateway Address byte 3 (in Hexadecimal)
n9	Gateway Address byte 4 (in Hexadecimal)
ES	Exit network menu. N.B. this option must be selected to save any changes made in this menu

Setting n5

To ease setup, a single network mask length value is used. If the address has been specified with a network mask value in dotted IP format e.g. 255.255.255.0 then the table below gives the conversion:

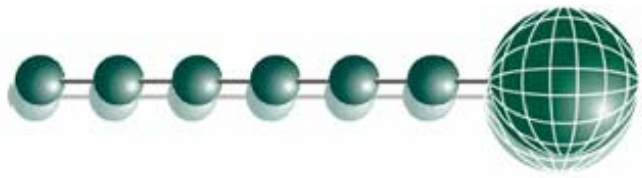
Mask	Length	Mask	Length	Mask	Length
		255.255.254.0	23	255.254.0.0	15
255.255.255.252	30	255.255.252.0	22	255.252.0.0	14
255.255.255.248	29	255.255.248.0	21	255.248.0.0	13
255.255.255.240	28	255.255.240.0	20	255.240.0.0	12
255.255.255.224	27	255.255.224.0	19	255.224.0.0	11
255.255.255.192	26	255.255.192.0	18	255.192.0.0	10
255.255.255.128	25	255.255.128.0	17	255.128.0.0	09
255.255.255.0	24	255.255.0.0	16	255.0.0.0	08

Network LED

The network led will start flashing as the controller is logging on to the network; once logged on, the LED stays on.



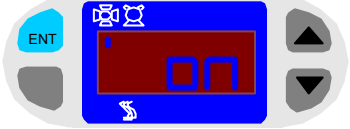
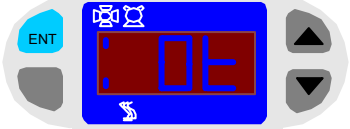



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Multi-Stage Thermostat Controller

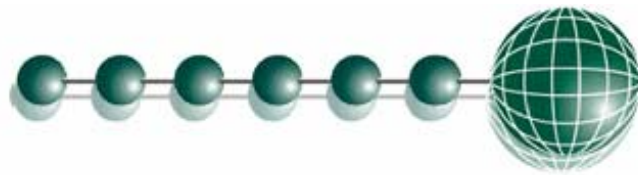
Front Panel Messages

Typical Front Panel messages: -

	<p>Normal Under normal operating conditions, i.e. no alarms, the display will show "on". It also shows the fans status.</p>
	<p>Over Temperature Alarm High temperature alarm. The buzzer will sound during an alarm. The buzzer can be muted by either the time-out (F2) elapsing or by pressing the "Enter" key for 3 seconds.</p>
	<p>Under Temperature Alarm Low temperature alarm. The buzzer will sound during an alarm. The buzzer can be muted by either the time-out (F2) elapsing or by pressing the "Enter" key for 3 seconds.</p>
	<p>Probe 1 Fault This indicates that probe 1 is faulty. Other probe faults follow this format.</p>
	<p>Plant Fault The Plant fault input has a fixed delay of 15 seconds. The buzzer will sound during an alarm. The buzzer can be muted by either the time-out (F2) elapsing or by pressing the "Enter" key for 3 seconds.</p>



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Multi-Stage Thermostat Controller

Remote Fans Operation

Parameter A1 allows for the fans to be permanently off, permanently on or set to remote operation. If remote operation is selected a GP Timer must be set up to control the fans on/off times. For GP Timer set up please refer to the Data Manager user guide found on the RDM website. The following settings should be followed in the GP Timer setup.

- Output Type – This should be set to “General”.
- Output Mask – This should match the “Controller Name”.
- Output Channel – This should be set to “0”. This will allow the GP Timer to control the status of the fans.

Each thermostat channel follows the fans on/off status. When the fans are off all the thermostat channels are off and will not heat/cool. When the fans are on the thermostat channels are enabled and will control to their temperature set points.

Fans Run on

When the GP timer turns off; each of the thermostat channels immediately turn off and cease to control. The fans however remain on for 20 minutes. The Multi-stage thermostat values page on the Data Manager will show the fans as off, however on viewing the IO , via the controller display, the fans are on and will remain on for 20 minute period before turning off. Please note fans run on applies only when the fans are set to remote operation.

Controller Offline

If the fans operation is set to on then the fans and stats remain on when the controller drops offline. If the operation is set to off when the controller drops offline then the fans and stats remain off.

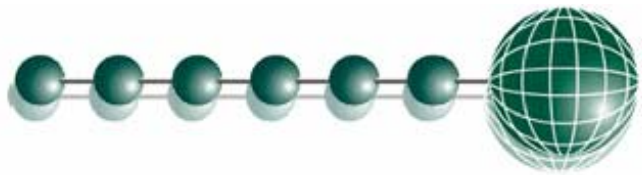
Note if the controller drops offline and the fans operation is set to remote then the following will occur. If the fans are on when the controller drops offline then they will remain on and the associated thermostats will control to their set points. If the fans are off when the controller drops offline then they will turn **on** and the associated thermostats will control to their set points. When communications with the front end are restored the controller will follow the GP timer on/off commands. Controller offline occurs when communications with the front end is lost for five minutes or more.

Probe Faults

Please note if a probe fault occurs and a thermostat is set to heating or cooling the thermostat turns off.



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Multi-Stage Thermostat Controller

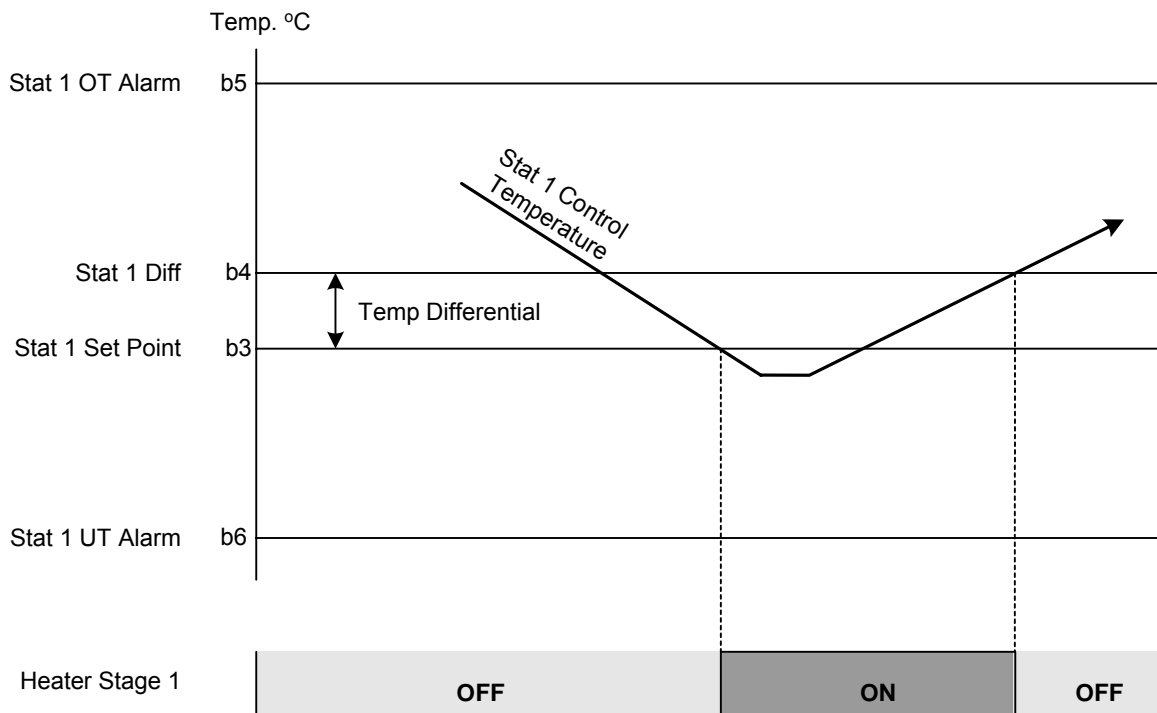
Operation:

During normal operation the controller display will show "on". The figure below illustrates the operation of the controller. The diagram shows an example where thermostat channel 1 is being used in a heating application. As the temperature drops below stat 1 set point, "Heater stage 1" is turned on. As the temperature rises and reaches the diff value the relay is turned off. If the control temperature reaches either of the two alarm levels, over temperature or under temperature, and exceeds the alarm limit for the "alarm delay" period, for thermostat channel 1, then the controller will sound the buzzer and indicate an alarm. Press and hold the "Enter" key for 2 seconds to de-activate the sounder.

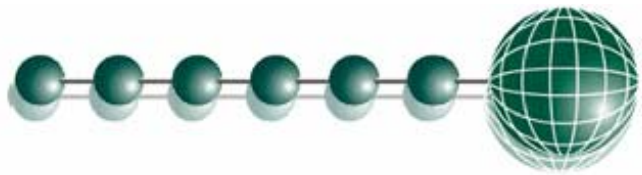
Temperature probe 3 is for monitoring purposes only and has no alarm action. Input 5 is for a general plant fault input. If the input is configured as N/O, a 0 Volt return on the input gives an immediate alarm (15 second delay), indicated on the display as "Pt" and the alarm sounder comes on. If set to a plant fault N/C, a 0 Volt break on the input gives an immediate alarm, indicated on the display as "Pt" and the alarm sounder comes on. Probe faults also give immediate alarms.

Note - If probe 2 is unused and no probe is connected then a probe fault alarm is generated. A fixed resistor of an appropriate value should be fitted to the input terminals of probe 2 to prevent this.

Operating Diagram



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Multi-Stage Thermostat Controller

Network Alarms

Alarm text	Type # (index)
Stat 1 & 3 Over Temperature	4
Stat 2 & 4 Over Temperature	5
Stat 1 & 3 Under Temperature	4
Stat 2 & 4 Under Temperature	5
Probe 1 Fault	6
Probe 2 Fault	6
Plant Fault	6

Please note it is possible to edit the alarm index numbers via the Data Manager.

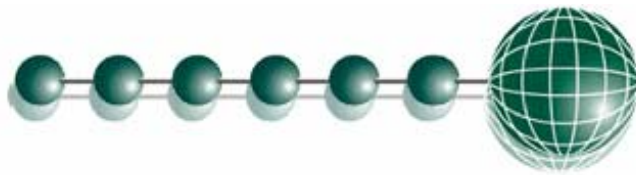
View I/O

Press "Enter" in the menu at "IO" to view the inputs and outputs.

Number	IO	Range °C or °F	Step	Units
C1	Probe 1	-40° to 86°	1	Deg
C2	Probe 2	-40° to 86°	1	Deg
C3	Probe 3	-40° to 86°	1	Deg
C4	Plant Fault	0 = off, 1= on	1	N/A
C5	Stat 1 Control Temp	-40° to 86°	1	Deg
C6	Stat 2 Control Temp	-40° to 86°	1	Deg
C7	Stat 3 Control Temp	-40° to 86°	1	Deg
C8	Stat 4 Control Temp	-40° to 86°	1	Deg
r1	Relay 1	0 = off, 1= on	1	N/A
r2	Relay 2	0 = off, 1= on	1	N/A
r3	Relay 3	0 = off, 1= on	1	N/A
r4	Relay 4	0 = off, 1= on	1	N/A
r5	Relay 5	0 = off, 1= on	1	N/A



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Multi-Stage Thermostat Controller

Specification:

General:

Supply Voltage Range:	90 - 270 Vac $\pm 10\%$	Controller only
Supply Frequency	50 - 60 Hz $\pm 10\%$	
Maximum Supply Current	55A	With relays 1 to 5 fully loaded
Typical Supply Current	<1A	With relays 1 to 5 off load
Operating temperature range	+5 °C to 50 °C	
Storage temperature	-20 °C to 65 °C	
Operating Humidity	80% maximum	
Environmental	Indoor use at altitudes up to 2000m, Pollution Degree 1 Installation Category II. Voltage fluctuations not to exceed $\pm 10\%$ of nominal voltage	
Controller Size	75mm x 35mm x 90mm WxHxD	
Relay Board Size	170mm x 130mm x 50mm LxWxH	
Maximum Weight (combined)	1.25kg	
Safety (Relay Board)	Class II LVD	This product is double insulated when used with the original enclosure
Safety (Controller)	Class II LVD	Only use the cable provided to connect the controller to the relay board.
EMC	EN61326; 1997 +Amdt. A1; 1998	
Ventilation	No requirement for forced ventilation	
Insulation	Class I for Relay board Class II for controller	

Inputs:

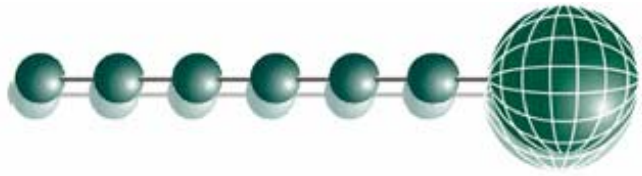
Input 1	Air Probe 1	(2K NTC thermistor type)
Input 2	Ground	
Input 3	Air Probe 2	(2K NTC thermistor type)
Input 4	Air Probe 3 (Monitoring Only)	(2K NTC thermistor type)
Input 5	Plant Fault (Normally open or Normally closed; 0 Volt return (Parameter selects))	

Relays

Relay 1 - Fans Relay	230 Vac/15A 230 Vac/8A(2HP)	Resistive Load Motor Load
Relay 2 - Heater Stage 1	230 Vac/10A 230 Vac/5A	Resistive Load Inductive Load $\text{Cos}\Phi = 0.4$
Relay 3 - Heater Stage 2	230 Vac/10A 230 Vac/5A	Resistive Load Inductive Load $\text{Cos}\Phi = 0.4$
Relay 4 - Heater Stage 3	230 Vac/10A 230 Vac/5A	Resistive Load Inductive Load $\text{Cos}\Phi = 0.4$
Relay 5 - Heater Stage 4	230 Vac/10A 230 Vac/5A	Resistive Load Inductive Load $\text{Cos}\Phi = 0.4$



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switched off before
installing or maintaining
this product



Multi-Stage Thermostat Controller

Revision History

Revision	Date	Changes
1.0	16/04/2007	1 st Copy.



Ensure that all power is switched off before installing or maintaining this product