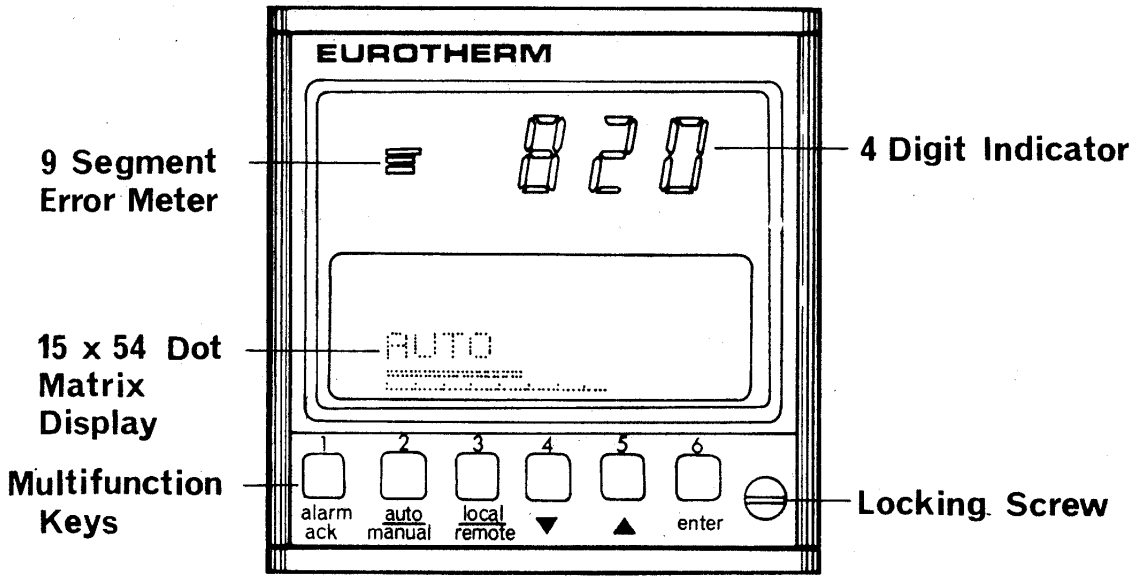
EUROTHERM

SINGLE LOOP

COMMUNICATING CONTROLLER,

TYPE 820

OPERATING AND INSTALLATION INSTRUCTIONS



Part No. HA018897

820W-2

CONTENTS

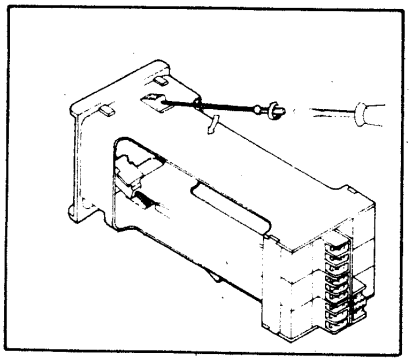
Note: Software Versions

This operating booklet covers the following software versions of the 820 instrument:

Main microprocessor	—	up to version 1.5
Display microprocessor	—	up to version 4
Communications microprocessor	—	up to version 4

The version number is annotated on each microprocessor and is also displayed in the Configuration Read Mode.

INSTALLATION



The instrument plugs into a panel-mounting sleeve which requires a DIN-size 92mm by 92mm cut-out as illustrated. Remove the instrument from the sleeve by turning the screw, in the bottom right-hand corner, counter-clockwise. (If the screw is already at its maximum counter-clockwise position it should be possible to extract the instrument from the sleeve by turning the screw fully clockwise and then counter-clockwise.) The instrument will start to withdraw from the sleeve and once the screw has been turned to its furthest extent the instrument can be withdrawn by hand. Remove the top and bottom mounting clamps from the sleeve by gently levering outwards and easing downwards inside the sleeve. Insert the sleeve through the cut-out via the front of the panel. Fit the mounting clamps in the slots from inside the sleeve and from the rear of the mounting panel tighten with a screwdriver.

By hand, ease the instrument into the sleeve until the top and bottom edges of the bezel meet the sleeve moulding. Turn the screw in the bottom right-hand corner clockwise until tight. The instrument will be pulled completely into the sleeve, engaging the rear terminals and be fully secured.
Note: Do not attempt to dismantle the instrument without referring to the Maintenance Manual.

WARNING

When wiring up this instrument please bear in mind that it is microprocessor based and therefore under exceptional circumstances may be susceptible to transient voltages from external connections. Sensible precautions should therefore be taken in routing of wiring so as to minimise any interference. Refer to the instructions on external connections.

External Connections

For the optimum instrument performance to be guaranteed it is recommended that the following are adhered to:

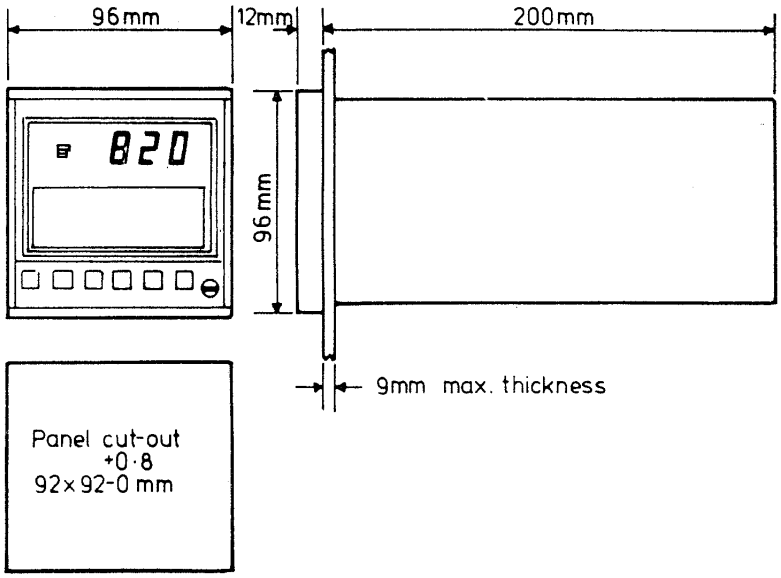
Supply voltages — connections to ancillary equipment, such as contactors, must be taken directly from the supply and NOT from the supply terminals of the 820 instrument.

Earthing — an effective earth system must be provided. If more than one 820 instrument is installed each instrument must be separately earthed to a common earth point and NOT linked together and then taken to an earth point.

Inputs and Outputs — the wiring of inputs and outputs MUST be kept separate from the other instrument wiring. Where possible screened leads should be used with the screen being connected to the earth terminal on the instrument, terminal 18. The maximum permissible lead length is 0.5m.

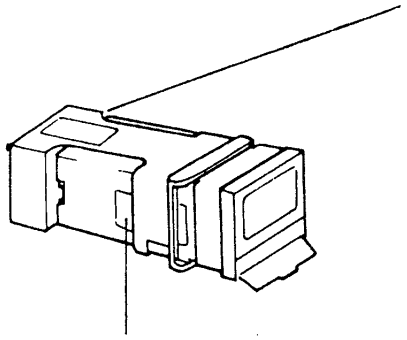
General — All low level inputs and outputs such as thermocouple, resistance thermometer and logic should be kept separate from supply and relay output cabling.

DIMENSIONAL DETAILS



CONNECTIONS AND WIRING

Electrical connections are made via 3-way terminal blocks on the rear of the instrument. All connections are low current and a 16/0.20mm wire size is adequate. Labels on the instrument and sleeve indicate the specific connections for the instrument. The versions of software in this instrument are identified on the label on the side of the instrument. The instrument supply is fused with a 250mA fuse located top rear of the inside of the instrument on the power supply board.



EUROTHERM
WORTHING ENGLAND (0903)68500 TLX 87114

820-003-047-003-614-
212-312-210-00
Serial No : RB1234-5-1-84.

Software : Main = 1.1
: Disp = 1.0
: Comm = 1.0

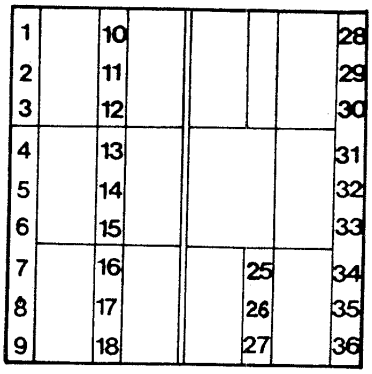
Fuse Rating : 250V, 250mA ANTI-SURGE
ANY OTHER FUSE INVALIDATES GUARANTEE

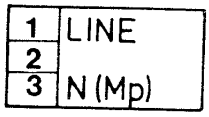
EUROTHERM

820-003-047-003-614-
212-312-120-00
Serial No: RB1234-5-1-84.

Fuse Rating: 250V, 250mA ANTI-SURGE

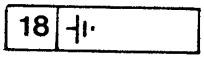
1.	85V - 264V	
2.		
3.	NEUTRAL	
4.	O/P 1 N/O	
5.	O/P 1 N/C	
6.	O/P 1 COM	
7.	EARTH (RFI)	25. T/C +
8.		26.
9.		27. T/C -
10.	DIGITAL IN	28.
11.	DIGITAL IN	29. LOGIC O/P2+
12.	COMMON	30. LOGIC O/P2-
13.	DIGITAL OUT	31. ALARM 1 COM
14.	RX (RS232)	32. ALARM 1 N/C
15.	DATALOG IN1	33. ALARM 1 N/O
16.	TX	34. ALARM 2 COM
17.		35. ALARM 2 N/C
18.	INSTR EARTH	36. ALARM 2 N/O





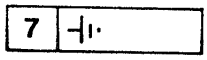
Supply

Power supply 85V to 264V, for the instrument is connected to terminals 1 and 3. The LINE is connected to terminal 1 and the Neutral to terminal 3.



Instrument Earth

This terminal is the safety earth for the instrument and MUST be connected to an external ground at all times.

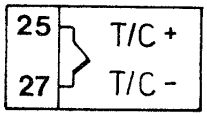


Suppression Earth

To suppress radio frequency interference terminal 7 is taken to earth. (Normally connected to the instrument earth terminal 18).

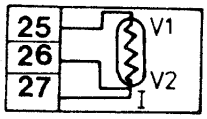
INPUTS

Note: On this instrument a filter module is fitted above the input terminal block. Ensure that the GREEN lead is connected to terminal 18 and the BLUE lead is connected to terminal 26 for RTD inputs or to terminal 27 for all other inputs.



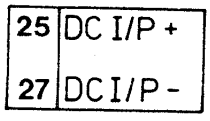
Thermocouple

Thermocouple connections are made to terminals 25 and 27, positive lead to 25 and negative lead to 27. Compensating cable of the correct type must be used between the thermocouple and the instrument and must be connected in the correct polarity. To check compensating lead polarity lift the leads off the thermocouple, twist them together and apply heat to the junction. The digital readout value should increase.



Resistance Thermometer

Platinum resistance three-wire thermometers are connected to terminals 25, 26 and 27. Connect the single connection side of the bulb to terminal 25 and the double connection to terminals 26 and 27.

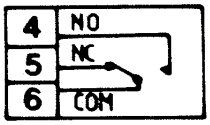


DC Signals

Inputs are connected to the terminals as shown. Maximum input acceptable is 50V dc.

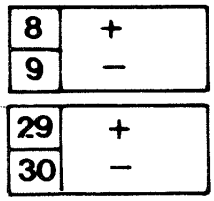
OUTPUTS

Relay



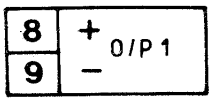
The controller is fitted with an output relay, which has a single changeover contact connected internally between terminals 4, 5 and 6. With no supply to the instrument the relay is de-energised and terminal 4 is normally open (N/O). The relay is energised to apply power to the load and the voltage at terminal 6 is switched through to terminal 4. The contact is rated 2A/264V rms. Slow cycle time-proportioning or on-off control is available. Contact suppression is provided between the N/O contacts and the wiper.

Logic



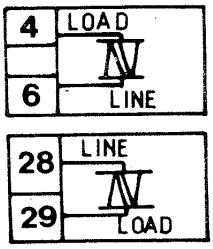
A logic output is provided at terminals 8 and 9 for output 1 and at terminals 29 and 30 for output 2. These outputs are isolated dc signals with time proportioning or on off action.

Isolated DC



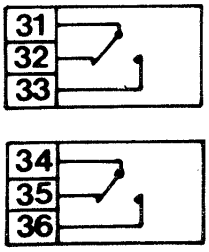
An isolated dc output is provided at terminals 8 and 9 for output 1 and at terminals 29 and 30 for output 2. These dc outputs share a common isolated power supply rail.

Triac



With controllers provided with triac output, connections are made to terminals 4 and 6 for output 1 and to terminals 28 and 29 for output 2. The live supply is connected to LINE terminals 6 and 28 respectively. One side of the load is connected to the LOAD terminals, the other side of the load should be connected to the neutral line. The triac is rated at 1A/264V rms.

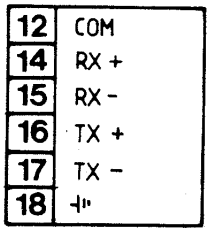
ALARMS



Controllers are provided with relay alarm outputs which are internally connected to terminals 31, 32 and 33 for Alarm 1 and to 34, 35 and 36 for Alarm 2. Terminals 32 and 35 are N/C when the relays are de-energised. When energised, the voltages at terminals 31 and 34 are switched through to the output terminals 33 and 36 respectively. Relay contact rating is 1A/264V rms. Contact suppression is provided between the N/C contacts and the wiper with the relay de-energised in alarm (fail safe). Suppression is provided between the N/O contacts and wiper with the relay 'energised in alarm'.

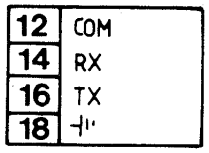
COMMUNICATIONS

Digital Communications — RS 422



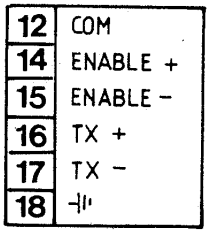
Terminal 12 is the common and is normally connected internally to earth terminal 18.
The RS 422 interface utilises terminals 14 and 15 for the positive and negative receiver lines and terminals 16 and 17 for the positive and negative transmitter lines.

Digital Communications — RS 232



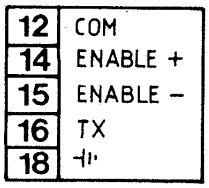
Terminal 12 is the common line. Terminal 14 and 16 are the receiver and transmitter lines for the RS 232 interface.
Terminals 12 and 18 are not normally internally linked.

Data Logger — RS 422



Data Logging is initiated by connecting terminal 15 to terminal 12 OR by driving terminal 14, ENABLE +, 2V positive with respect to terminal 12, and logging will continue at specified rate until the condition is removed.
Terminal 12 is normally internally linked to terminal 18.

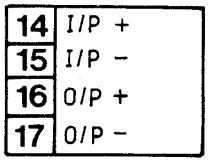
Data Logger — RS 232



Data Logging is initiated by connecting terminal 15 to terminal 12 OR by driving terminal 14, ENABLE +, 2V positive with respect to terminal 12, and logging will continue at specified rate until the condition is removed.
Terminal 12 is not normally internally linked to terminal 18.

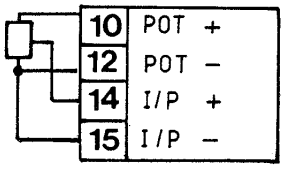
Analogue Communications

Inputs and Outputs



Terminals 14 and 15 are for the remote analogue inputs, positive and negative respectively (±20V max.). Common mode range is 20V dc against any terminals on this communications board. Terminal 16 and 17 are for the analogue outputs, positive and negative respectively.

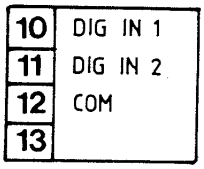
External Potentiometer



When an external potentiometer is used as remote input, the positive of the potentiometer is connected to terminal 10 and the negative side to the common terminal 12. The slider of the potentiometer should be taken to terminal 14, the remote I/P positive, and link terminal 12 to remote I/P negative, terminal 15.

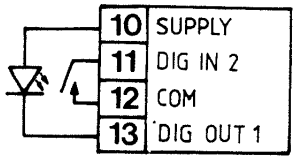
Communication Options

Digital I/O



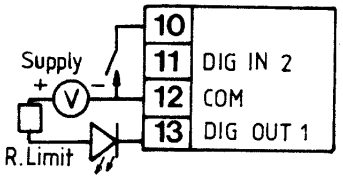
For digital inputs the switch is made by linking terminal 10, DIG IN 1,/11, DIG IN 2, to terminal 12, the COMMON.

Remote Switch and Indication



When a remote switch and LED are used with remote inputs the anode of the LED is connected to terminal 10 and the cathode to terminal 13. The switch is connected across terminals 11 and 12.

External Supply for Indication



If extra drive, up to 50mA, is required or when terminal 10 is not available, indication can be achieved by connecting the negative of an external supply (up to +20V) to terminal 12 and the positive of the supply, via a limiting resistor, to the indicator. The other end of the indicator is then connected to terminal 13.

NOTE: Inputs and outputs share the isolated power supply rail used for dc outputs.

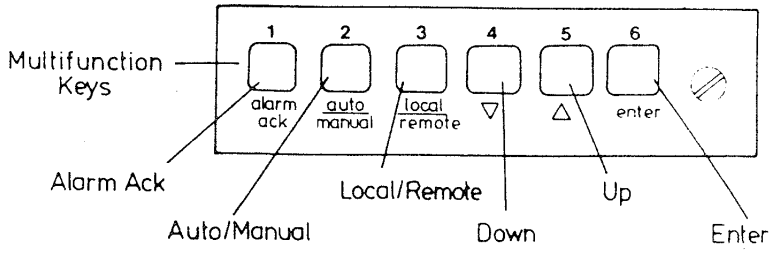
OPERATION

There are four modes of operation providing different levels of access for security.

1. Operating mode — for normal (limited) access
2. Supervisor mode — for supervisor access
3. Commissioning mode — for engineer access
4. Configuration mode — for configuration of the instrument contact your nearest Eurotherm engineer.

All operations are conducted by use of the six front panel keys 1 to 6.

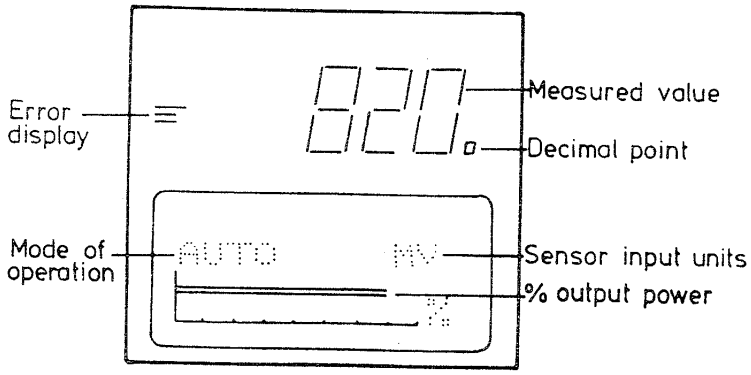
Key 1 — to acknowledge an alarm
Key 2 — toggle between automatic and manual output power
Key 3 — toggle between local and remote signals
Key 4 — to decrease parameter value
Key 5 — to increase parameter value
Key 6 — enter parameter value



Note: From Software Version 1.5 both outputs are defined as "Direct" when the output rises as the process variable rises.
Therefore "Heat" outputs are configured "Reversed" and "Cool" outputs are configured "Direct".

INDICATIONS

Measured Value



When power is connected, the instrument will be in the Operating mode and the upper fluorescent indicator panel will display the measured value in digital form with the associated analogue error indicator bars. The lower display indicates that the instrument is in automatic operation giving a continous indication of the mean output power.

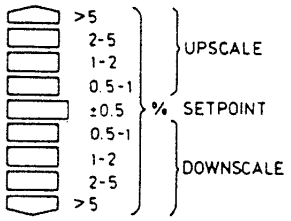
Note: When switching off, or a power failure occurs, the selected lower display will be retained on power-up.

Setpoint

To access the setpoint press the ENTER key (6) and the setpoint will appear on the lower display. To change the setpoint, press the respective △▽ keys and enter the new setpoint by pressing the ENTER key (6). Setpoint will not change until key 6 has been pressed. To return to the normal display press key 6 again. For instruments with dual PID two setpoints are displayed. Press key 6 to display setpoint 1. To display setpoint 2 press and hold in key 6 and press key 3; press key 3 again to return to setpoint 1. Changes to eithe setpoint is carried out by pressing the respective △▽ keys followed by the ENTER key (6).
If a setpoint from a remote source is input this can be monitored by pressing the Local/Remote key, key 3. Press key 1 to return to the normal operating display.

Error Indications

The nine segment bars, situated to the left of the upper digital readout provide error indications of measured value with respect to the setpoint as a percentage of the full range. Illumination of the centre bar alone indicates that the controlled value is within 0.5% of full scale setpoint.

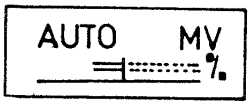


Change of Parameters

All applicable parameters and their values are displayed on the lower display. Alarms and maximum power levels can be changed in the Supervisor mode only. In order to change control parameters it is necessary to put the instrument into the commissioning mode. All changes are only accepted by operation of the ENTER key.
Below are listed all the possible indications which can be displayed in the lower display for each mode of operation. Only those parameters applicable to the instrument configuration are displayed.
Eg. Output 2 parameters are not displayed for instruments configured with only output 1.

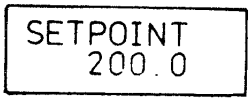
Operator Mode

Single output units: bargraph indicates mean output power. Engineering units for the measured input value are shown. When in the automatic mode the display is being updated continuously, which causes the display to blink on each update. To change the remote setpoint (if configured) enter the Supervisor Mode and press key 3.

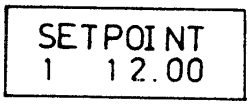


A unit with outputs: bargraph indicates mean output power for each output. Output 1 indicates 0 to +100% and output 2 indicates 0 to −99.8%. Engineering units for the measured input value are shown.

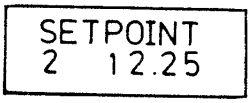
Indicating that a remote setpoint is selected. To change to the local setpoint enter the Supervisor Mode and press key 3.



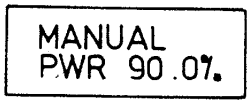
Setpoint is selected by pressing key 6. Setpoint is adjustable between the setpoint high and low settings which are preset in the Commissioning mode.



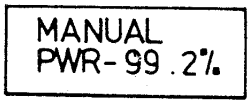
Only displayed when dual PID selected. To toggle between the two setpoints press both 6 and 3 keys. To change a setpoint press the respective △▽ keys when on the selected setpoint and enter the new setpoint by pressing the ENTER key.



Remote setpoint setting is indicated. Monitored by pressing the Local/Remote key (3). Remote setpoint is selected in the Supervisor Mode.

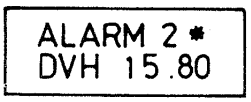


Select by pressing key 2. Manual power when output 1 on.

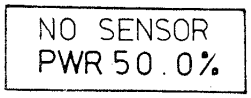


Manual power when output 2 on.

Indicates alarm 1 triggered. Type of alarm is shown and its setting.



Indicates alarm 2 triggered. Type of alarm is shown and its setting.
Note: The symbol * refers to a triggered alarm. If both alarms are triggered, then the last alarm activated is displayed. Acknowledge an alarm by pressing key 1. This is indicated by the display reverting to the AUTO mode and the error bars flash, signifying that the alarm has not been cleared.



When an open circuit sensor is detected the preset power setting is indicated. This occurs when the measured value exceeds the setpoint high limit by 5% or is more than 5% below the display minimum. The upper display will indicate 9999 and the error bars flash once per second. This power is output until the fault is rectified.

This is a fault message stating that the CONFIGURATION has been incorrectly set and requires checking. Contact your nearest Eurotherm Engineer if this message is displayed.

This is a fault message stating that the CALIBRATION has been incorrectly-or not carried out. Contact your nearest Eurotherm Engineer if this message is displayed.

This is a fault message stating that the parameters in the Commissioning mode have been incorrectly set, return to the Commissioning mode and check again.

Supervisor Mode

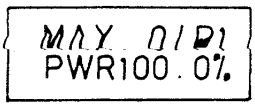
To access the Supervisor Mode press and hold in key 6 and press key 1, the first display will now appear. Press key 6 to scroll through all the displays. (Use either multiple single presses or continuous pressure on key 6.) The supervisor has access to alarm and power settings.

NB. All alarms can be set within the span of the instrument but please note that a deviation band alarm is limited to above 1% of the span.

Note: Local/Remote setpoints can be toggled by operation of key 3 in the Supervisor Mode (if remote setpoint configured).

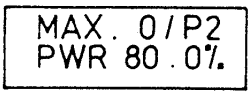
The alarm 1 parameter can be changed by pressing the △▽ keys. For deviation low/high alarms, setting adjustable from 0% to 10% below/above S/P. Deviation band alarm, adjustable from ±1% to ±10% of S/P. Full scale low/high, adjustable from display min to display max.

The alarm 2 parameter can be changed by pressing the △▽ keys.



The maximum output 1 power limit can be changed by pressing the △▽ keys. Adjustable from 0 to 100%.

Note: This parameter is not displayed if ON/OFF control has been selected.

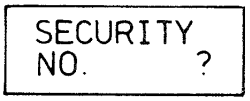


The output 2 power limit can be changed by pressing the △▽ keys. Adjustable from 0 to −99.8%.
Note: This parameter is not displayed if ON/OFF control is selected or if output 2 is not selected.

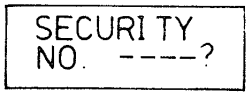
Commissioning Mode

This level has two modes of access.
1) When in the Supervisor mode, if no security code has been requested, press and hold in key 6 and press key 1.
If a security code has been set in this instrument, when keys 6 and 1 are pressed the security number will be requested. To proceed into the commissioning mode this number must be entered. See first two displays below.

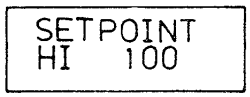
To scroll through the commissioning mode press key 6. All changes are effected by pressing the △▽ keys to alter the setting and key 6 to enter the new value. Press key 6 to scroll to the next parameter. For access back to the Operating Mode at any time press key 1.



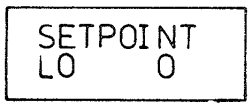
When the security number is requested enter by pressing the appropriately numbered keys 1 to 6.



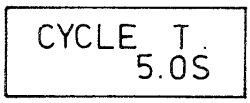
Each figure entered is acknowledged by the symbol "-".
When all four figures have been entered, press key 6 to enter the code.



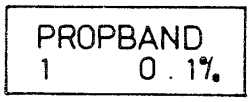
The setpoint high stop. Adjustable between setpoint low and the maximum display range.



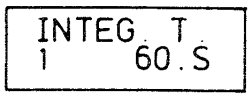
The setpoint low stop. Adjustable between display minimum and setpoint high.



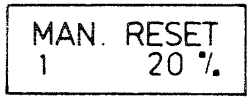
Cycle time for output 1. Adjustable between 0.1 and 65 seconds at half power, and for slow cycle between 5 and 65 seconds.
Note: Not displayed if ON/OFF control or analogue output configured.



Proportional band for output 1. Adjustable between 0.1% and 100%. For software versions 1.3 onwards, adjustable between 0.1 and 999.5%.
Note: Not displayed if ON/OFF control configured.

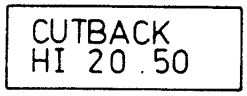


Integral time adjustable between 0 and 9995 seconds. Zero setting = no integral.
Note: Not displayed if ON/OFF control configured.

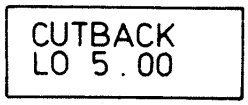


Manual reset for output 1. Adjustable between 0 and 100%.
Note: Only displayed when integral time is set to zero.

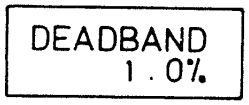
Derivative time adjustable between 0 and 999.5 seconds. Zero setting = derivative off.
Note: Not displayed if ON/OFF control configured.



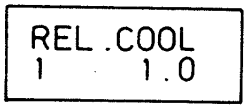
High cutback point. Adjustable between 0 and display range.
Zero setting = cutback off.
Note: Not displayed if ON/OFF control configured.



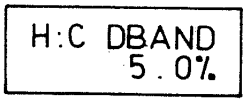
Low cutback point. Adjustable between 0 and display range.
Zero setting = cutback off.
Note: Not displayed if ON/OFF control configured.



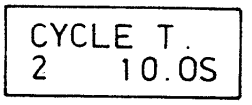
Deadband for ON/OFF control. Adjustable between 0.1 and 10.0%.



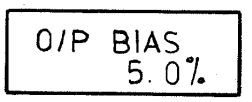
Cool gain for output 2 relative to output 1. Adjustable between 0.1 and 10. Only displayed if output 2 configured.



Heat/Cool deadband. Adjustable between 0.0 and 5.0% of the proportional band selected. Only displayed if output 2 configured.

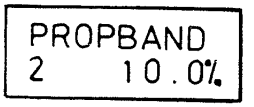


Cycle time for output 2. Adjustable between 0.1 and 65 seconds at half power. Only displayed if output 2 configured.
Note: Not displayed if ON/OFF control or analogue output configured.

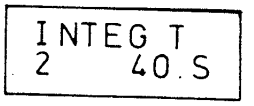


Provides rapid changes of output. Adjustable between −99.8% and 100.0%.
Note: Not displayed if ON/OFF control configured.

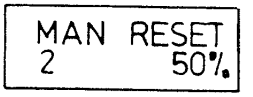
Dual PID only



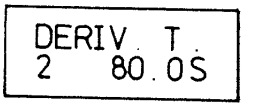
Proportional band at setpoint 2 in dual setpoint mode.
Adustable between 0.1 and 100%. For software versions 1.3 onwards adjustable between 0.1 and 999.5%.



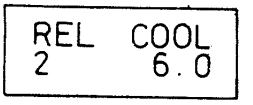
Integral time at setpoint 2 in dual setpoint mode. Adjustable between 1 and 9995 seconds. Note: Only displayed when integral time for output 1 is not zero.



Manual reset at setpoint 2 in dual setpoint mode. Adjustable between 0 and 100%.
Note: Only displayed when integral time on output 1 is set to zero.



Derivative time at setpoint 2 in dual setpoint mode.
Adjustable between 0 and 999.5 seconds.



Relative cool gain at setpoint 2 in dual setpoint mode.
Adjustable between 0.1 and 10.

NO SENSOR PWR	The percentage power that is output when a sensor is open circuit or the input is 5% greater than display max. or 5% less than display min. Adjustable between 0 and 100% for output 1 only and −99.8% to +100% for an instrument with two outputs.
LOG RATE 10	Rate at which data is logged when acting as a data logger. Adjustable between 0 and 20 minutes, with one minute resolution, where 0 = off.

Configuration Read Mode

The level below the commissioning mode is a CONFIGURATION READ level and allows the user to read the current instrument configuration.
Note: No changes can be effected, it is an inspection mode only.

To read the configuration press and hold in key 6 and press key 1 when in the Commissioning mode. A banner will run across the lower display:

'INSTRUMENT CONFIGURATION — READ ONLY"

Scroll through the parameters by pressing key 6.
Press key 1 at any time to return to the Operator Mode.
The parameters listed vary according to how the instrument is configured.
Below are listed the range of displays applicable:

I/P TYPE —	indicating what input is being used followed by the type of input.
O/P 1 —	indicating what type of output is being used on channel 1 followed by how it functions.
O/P 2 —	indicating what type of output, if any, is being used on channel 2 followed by how it functions.
DUAL PID —	indicates if selected or not for dual PID.
SETPOINT HOLD	—indicates if selected that the setpoint will stay at the value last set in the auto mode.
COMMS —	indicates what type and functions of communications.
ALARM HYS —	indicates the alarm hysteresis setting.
ALARM 1 —	indicates the type of alarm on channel 1 followed by how it functions.
ALARM 2 —	indicates the type of alarm on channel 2 followed by how it functions.
5 DIGIT —	indicates 5 instead of 4 digits lower display.
D.P. POS. —	indicates the decimal point position on the upper display.
UNITS —	indicates what sensor input units are being used.
D. SCALER —	indicates the multiplication factor that gives the required display range from the selected input.
D. OFFSET —	indicates the factor set to move the display range, + or −, to the range required.
DISP MAX —	indicates the maximum display range set.
DIS MIN —	indicates the minimum display range set.
S/W VERS —	indicates the microprocessor software versions in the order Main — Display — Communications.

Security Code

A security code can be inserted in this instrument so inhibiting access to the Commissioning mode unless the code is known.
Access to the security level is achieved by pressing and holding in key 6 and pressing key 1 when in the Configuration Read mode. A banner will run across the lower display:

"SECURITY CODE ENTRY NONE = 6666"

Press key 6 and **"NEW CODE NO. ?"** is displayed.

If no security code is required on the instrument, enter 6666 by pressing key 6 four times. To enter this code press key 6 again and the display will revert back to the Operator mode. Access to the Commissioning mode is now entered by pressing and holding in key 6 and pressing key 1 in the Supervisor mode.

*If a security code is required, enter the code, which must be four digits, using the 1 to 6 keys. (If after entering the fourth digit you wish to alter what you have selected press any of the keys 1 to 5 and the display will revert to "NEW CODE NO. ?". Now enter your required code). After the fourth digit, press key 6 to enter the code. The display will now revert back to the Operator mode. Access to the Commissioning Mode is now by this new code number which must be entered when the display indicates:

"SECURITY NO. ?"

The security code can be changed at any time by following the above procedure.

*** N.B. It will be seen that access to the security level requires knowledge of the current security code. In order to avoid problems requiring a visit by the Eurotherm service engineer, we recommend that a note is made of any security number used and that this is stored in a secure place on the plant.**

Setting-Up Procedures

1. PID Parameters

The 820 is a three term controller with additional features built-in to optimise start up characteristics and response to large system disturbances. The control terms can be derived by either monitoring the plant's natural response under on/off control (Ziegler-Nicholis) or the reaction curve under full power start up (Cohn & Coon).

Typically, a slightly longer Ti/Td ratio of say 6 to 8 gives a better start up response since this reduces the natural 'wind-up' of the integral in the proportional region. The controller will then operate giving good large and small signal responses, due to the in-built integral bleed back in the control algorithm.

2. Cutback Parameters

Two further control parameters, 'cutback low' and 'cutback high', have been provided for special start-up requirements. Setting these parameters to zero switches off cutback action and the controller behaves in the normal manner described above. A typical start-up under these conditions is shown in figure 1.

The 'cutback low' parameter permits the user to achieve a faster start-up with very exact control over the amount of overshoot. Similarly, the 'cutback high' parameter lets the user optimise the sytem response for large negative changes in setpoint so that the undershoot characteristics are optimised.

The cutback feature is designed to hold power at its limit setting until the measured value passes inside the cutback limit. The 'cutback low' parameter determines the point, below setpoint, up to which the output is held at the maximum heat power limit until the measured value becomes greater than setpoint minus the 'cutback low'. Likewise the 'cutback high' parameter determines the point, above setpoint, at which the output is held at max. cool power limit until the measured value becomes less than the setpoint plus 'cutback high' limit. Below this point normal 3-term control again takes over.

Having derived the correct P, I and D parameters for best small signal performance, the optimum cutback parameter can be derived as described below.

Initiate a start-up with the P, I and D parameters set correctly and with 'cutback high' and 'cutback low' each set to about one third of the propband (in engineering units). For example, with a 400 degree span instrument and a 200 degree setpoint (or that appropriate to the process), a 6% propband equates to 24 degrees so set 'cutback high' and 'low' at 8 degrees.

The start-up will now continue under maximum power until the low cutback point is reached at 192 degrees (200-8). The 820 will then switch to normal 3-term control and probably overshoot (see figure 2) — note the amount of overshoot. Add this overshoot figure to the cutback parameter and enter this as the new 'cutback low' value — this will then give a fast response with a minimal overshoot (see figure 3). Reducing the setpoint to significantly more than the 'cutback high' parameter e.g. from 200 degrees to 160 degrees will then result in maximum cool power being applied, until the 'cutback high' limit is reached at 168 degrees. (160 + 8). (If no cool channel is fitted the power will be fixed at 0% until the 'cutback high' point).

Below this temperature normal 3-term control will take over and the system may undershoot. As before add the undershoot to the existing 'cutback high' value and enter the modified 'cutback high' parameter.

With these techniques, the 820 can give both optimum 3-term control for small signal operation and independently optimised start-up responses. Note however that for processes with significantly varying load characteristics, which will cause errors exceeding the cutback limits, the non-linearities produced at the cutback points may result in best overall performance being obtained with wider cutback limits or cutback switched off.

Fast Loads

The controller samples the measured value every 80 ms. and consequently can handle fast control loops. For the fastest applications the analogue (dc) output should be used giving a maxium controller time constant of 100 ms. In this instance, the fastest meaningful derivative time would be 0.2 seconds and the integral time can be 1 second or more. Loads with time constants of the order of 1 second or less can be controlled, but with the penalty of very large proportional bands.

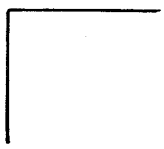


Fig 1

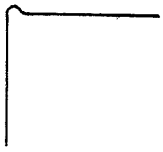


Fig 2

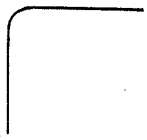
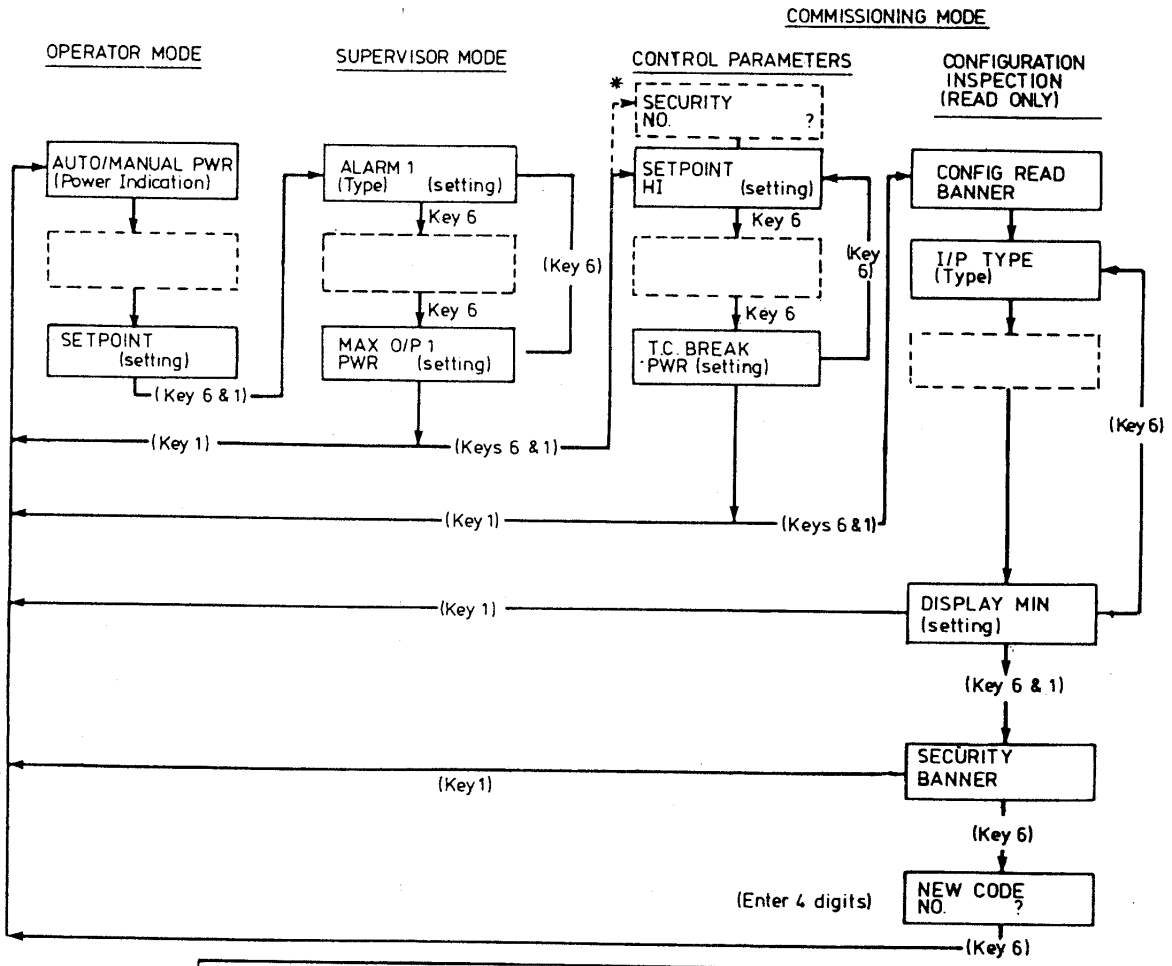


Fig 3

MODES AND ACCESS USING FRONT PANEL KEYS



*This display appears if the 'NEW CODE NO' at the end of the configuration inspection list is selected. Whatever code is selected MUST be entered in 'SECURITY NO.....?' to gain access to the control parameters. If code 6666 is entered as the 'NEW CODE NO' the 'SECURITY NO ?' is defaulted and does not appear.

Default Configuration

Except where the instrument code indicates otherwise, the following configuration will be used:—

T/C Input:	CJC internal		
Linear Inputs:	25—100mV		
Output 1:	Relay / Logic / Triac	Time proportioning Constant power Power feedback Reversed output	
	Analogue	No offset Reversed output	
Output 2:	Logic / Triac	Time proprtioning Constant power Linear Direct output	
	Analogue	No offset Direct output	
	Retransmission	Process value No offset Direct output	
Dual PID:	No.		
Setpoint:	Hold.		
Communications:	Analogue	Remote I/P	: setpoint
		Remote O/P	: process value
		Digital I/P 2	: remote
		Digital O/P	: none
	Digital	Baud rate	: 9600
		Address	: 0.0
		Remote I/P	: none
		Digital I/P 2	: none
		Digital O/P	: none
	Datalog	Baud rate	: 9600
		Address	: 0.0
		Digital I/P 2	: none
		Digital O/P	: none
Alarm Hysteresis:	0.1%		
Alarm 1:	Full Scale High, non-latching, de-energised		
Alarm 2:	Full Scale Low, non-latching, de-energised		
D.P.:	XXX.X		
5 Digit:	No.		
Units:	%		
Scaler:	1.25		
Offset:	—25		

Calibrate to give 20—100mV for 0—100.0%, (with a 5 ohm shunt this is a 4—20mA input).

Default Parameter Values

Setpoint 1 and 2:	Room temperature or Display min.
Alarms 1 and 2:	Full Scale High: Display max.
	Full Scale Low: Display min.
	Deviation High / Deviation Low / Deviation Band: Display max.
Max O/P power 1:	100%
Max O/P power 2:	—99.8%
Setpoint hi:	Display max.
Setpoint lo:	Display min.
Cycle time:	20 seconds.
Propband:	4%
Intergral time:	300 seconds.
Derivative time:	60 seconds.

Manual Reset:	0%
Cutback Hi:	0
Cutback Lo:	0
Deadband (on/off):	0.5%
Relative Cool:	1
H.C. Deadband:	0
No sensor Power:	0%
Log Rate:	1 minute.
O/P Bias:	0%