

815

**CONTROLLER/
PROGRAMMER**

CE



**EUROTHERM
CONTROLS**

**Operating
instructions**

Every effort has been taken to ensure the accuracy of this specification. However in order to maintain our technological lead we are continuously improving our products which could, without notice, result in amendments or omissions to this specification. We cannot accept responsibility for damage, injury loss or expenses resulting therefrom.

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Note: 815P with programme controlled output relays.

If output relay assignments are set, (or changed), then the instrument will operate satisfactorily until power cycled. After power cycling the instrument will display Pch, (Parameter check sum error). To clear enter the configuration of the instrument, scroll to CLr and press the up and down buttons simultaneously. The parameter CLr will blink. Exit from the configuration and provided the assignments in the long scroll are not changed in any way, the instrument may now be continuously power cycled without any error.

WARNING

STANDARD PRECAUTIONS TO BE TAKEN WHEN USING TEMPERATURE CONTROLLERS.

When designing any control systems it is essential to consider what will happen if any individual part of the system malfunctions.'

In a temperature control application, for example, the danger is that for some reason the heating system remains permanently switched on.

This could happen if:

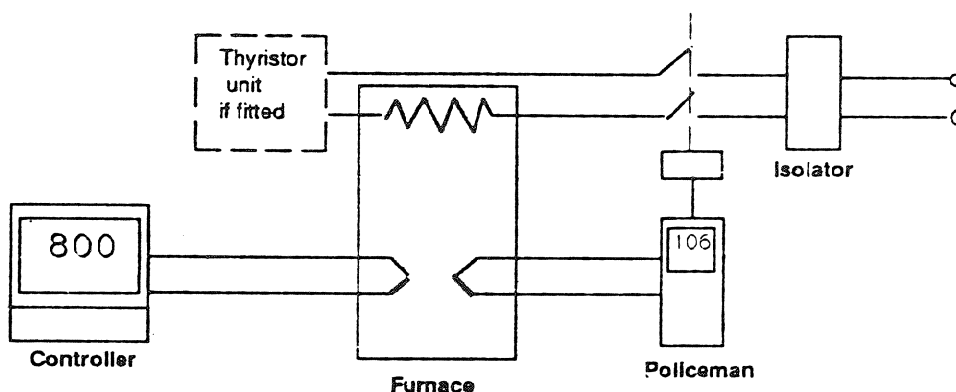
1. Thermocouple or sensor becomes "detached" from the system i.e. is no longer measuring the actual temperature achieved.
2. Thermocouple or thermocouple wiring becomes short circuited.
3. Component failure within the controller in such a way as to leave the output switched on.
4. Microprocessor or software failure in a system.
5. Failure of valve movement or valve linkage.
6. Remote setpoint to controller is faulty.
7. Operation by unauthorised personnel.
eg. (a) Controller left in Manual with high output power set.
(b) Setpoint set too high.
8. Any lack of maintenance in serviceable parts.

.....and many other unforeseen situations.

If leaving the heater on all the time can cause damage either to the plant itself or its contents, then an independent protection device must be provided.

The best form of protection is a completely independent 'policeman'. This is a separate overtemperature alarm with its own thermocouple or sensor and, on alarm will pull out the main contactor or shut off the valve to ensure the plant's safety.

e.g.



A suitable policeman is the Eurotherm 106 overtemperature alarm.

Note that an alarm relay in the controller is not sufficient protection for all eventualities.

Section 1.0 - General Operation

1.1 Software Versions

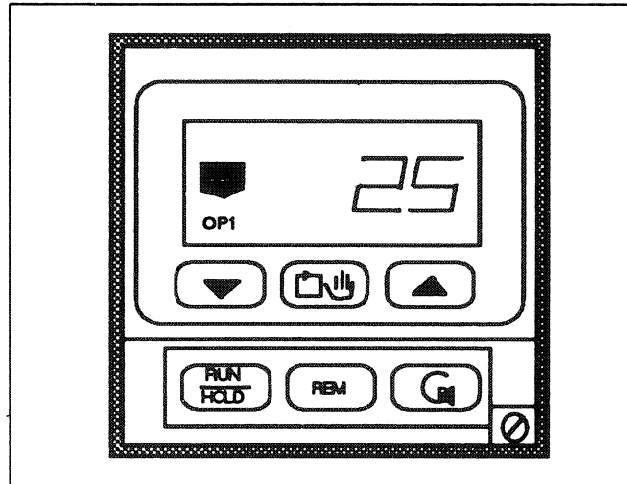
When switched on the controller momentarily shows the installed software version number. It then displays the current value of the process variable.


Note: 'Or' indicates the process variable is out of range.

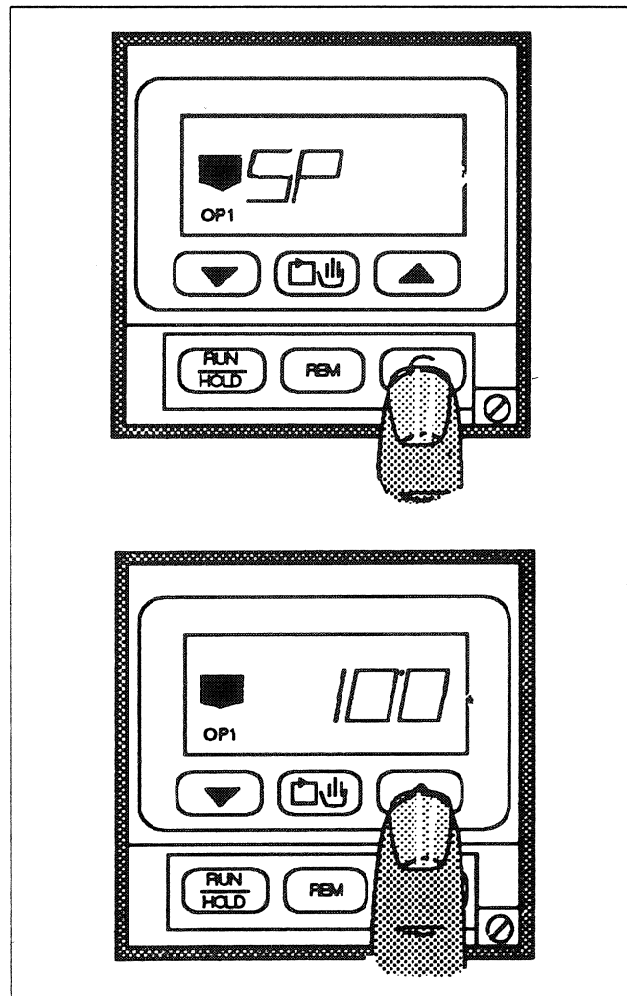
1.2 Setpoint Changes

On 'switch on' the display always shows the measured value.

SETPOINT CHANGES

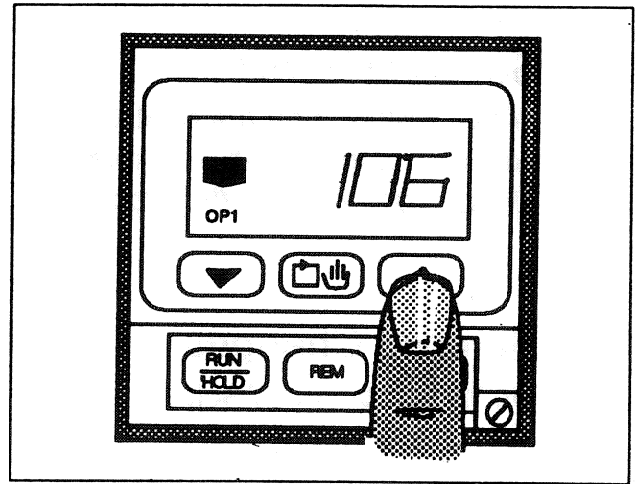


A single press of the  button will reveal 'SP', the setpoint mnemonic.

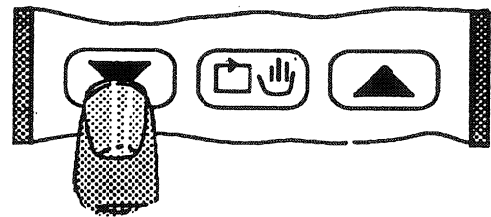


Pressing either the ' Δ ' or the ' ∇ ' button will reveal the current value of the setpoint.

A further press of either the 'Δ' or the '▽' button will change the setpoint value. Short presses step the setpoint by single units. Long presses accelerate the display for large changes.



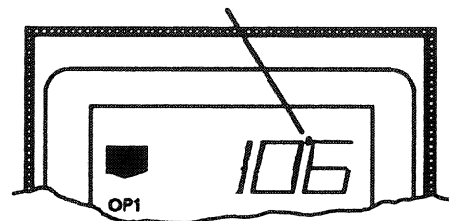
CHANGING VALUES



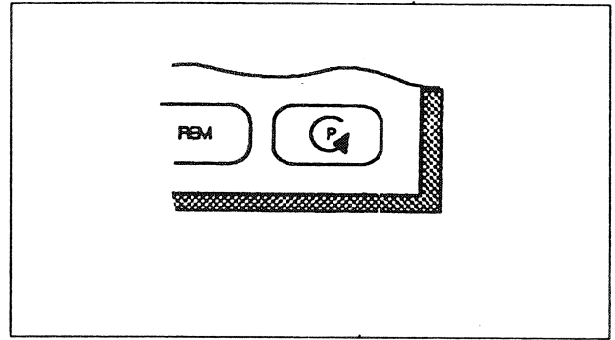
Keep button depressed until close to final value then depress and release button rapidly until final value is display.

The flashing dot indicates that the setpoint being displayed can be changed.

Flashing dot indicates parameter that can be changed.

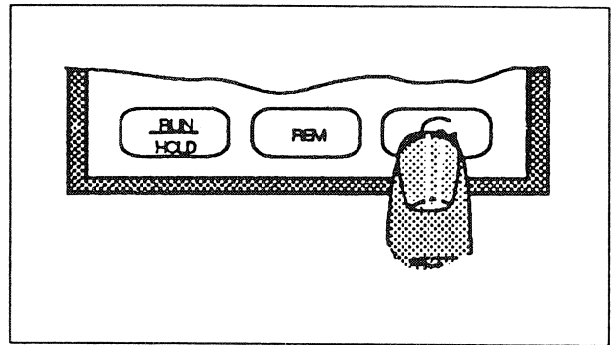


1.3 Scroll Button



1.4 Short Scroll

Short presses of this button will scroll the display between setpoint, power and measured value.



SHORT SCROLL

The value of the setpoint can be revealed by pressing the ' Δ ' or ' ∇ ' button.

The output power shown as a percentage e.g. 56%

Measured Value = 101

The 'SHORT SCROLL' section contains three sequential display screens. The first screen shows 'OP1' in the bottom left and 'SP' in the center. The second screen shows 'OP1' in the bottom left, 'P' in the middle left, and '56' in the center. The third screen shows 'OP1' in the bottom left and '101' in the center.

NOTE:- Parameter set in the short scroll will time out and the display revert to measured value.

1.5 Long Scroll

Note:

If some parameters and/or legends, illustrated in this booklet, do not appear this is not indicative of a fault on the instrument. These functions have been inhibited in the instrument configuration. (refer to section 2.1.2)

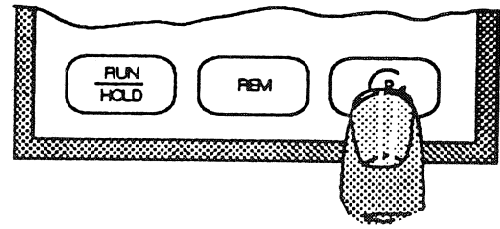
Holding the scroll button depressed causes the display to run through the short scroll (see section 1.4) and then jump into the long scroll.

The long scroll contains:-

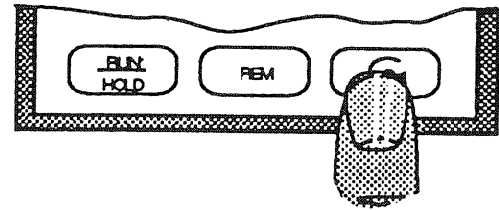
- i) The time remaining for the ramp to reach setpoint or the segment of a program to complete (only available if the programme or ramp is active).
 - ii) Loops of the program remaining (only available if program is running).
 - iii) Programmer/Ramp values (if fitted)
 - iv) All setpoints
 - v) Self Tune Selection
 - vi) Alarm Settings
 - vii) P.I.D. commissioning values.
- Within each section of the long scroll the scroll button auto repeats until the first mnemonic of the next section e.g. Pr or Pr1 and SP1.

When the required parameter is reached its value can be displayed by pressing either the '△' or '▽' buttons. The flashing dot indicates that the parameter can be changed.

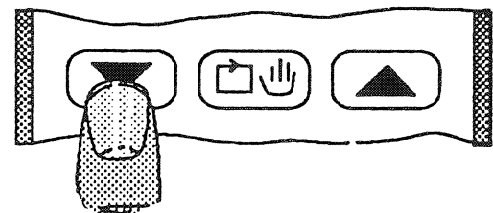
ADJUSTING COMMISSIONING VALUES



Hold the button depressed while the short scroll is displayed



As soon as the first mnemonic of the main scroll is displayed, release the button and depress the button repeatedly single stepping through until the desired parameter is displayed.

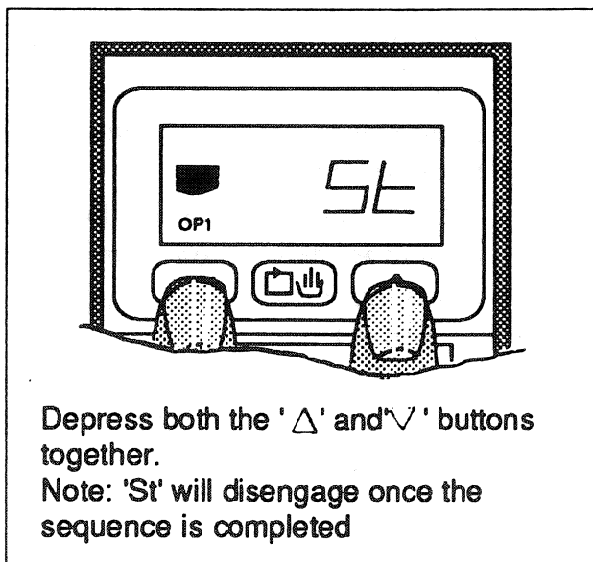


To view the value of any parameter press either the up or down buttons whilst viewing the parameter mnemonic.

1.6 Self Tune

This is selected by using the long scroll to reach the required mnemonic **St**.

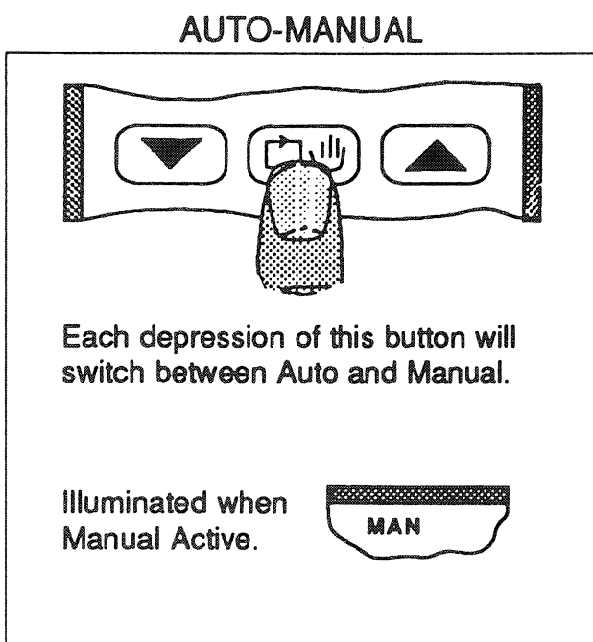
When this mnemonic is displayed, the function can be selected by pressing the ' Δ ' and ' ∇ ' buttons together. To de-select this function, re-scroll to the parameter and press both buttons again.



1.7 Auto/Manual

Each press of the button will toggle between auto and manual. When manual is selected the display is forced to indicate the output power.

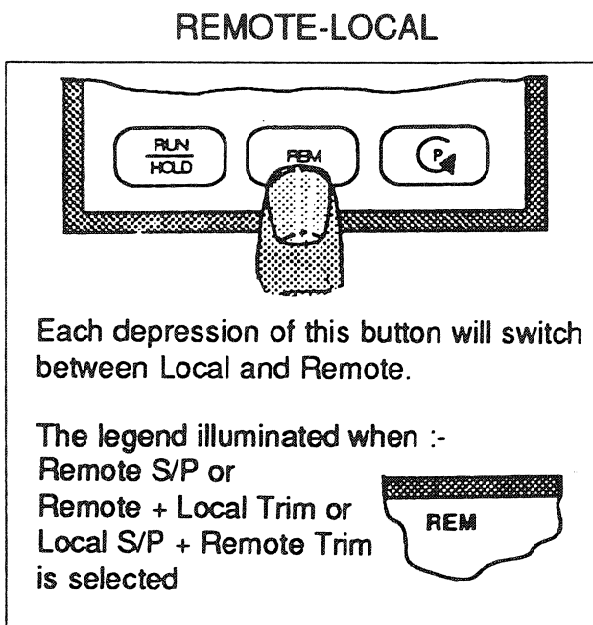
Note: In MANUAL the Instrument is NOT controlling so ensure that the power output is set at a safe level.



1.8 Local/Remote

If fitted and configured, remote is selected by a single press of the remote button

REM. The next press will return the controller to local.



1.9 Ramps

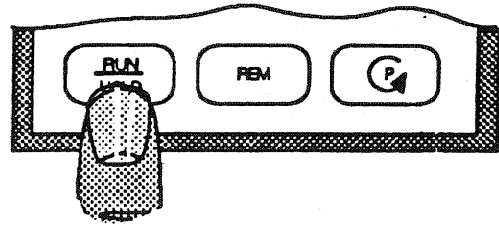
Depressing the **RUN/HOLD** button once will enable the ramp function, if fitted.

When a ramp is running the legend **RAMP** will be illuminated. At the conclusion of a ramp this legend will flash.

The setpoint **SP** on the short scroll cannot be changed if **RAMP** is engaged.

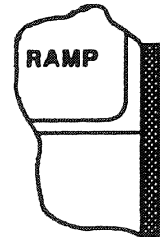
To change the target setpoint, scroll to **SP1** on the long scroll.

STARTING A RAMP

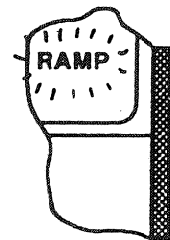


A single depression of this button will start the ramp.

For instruments configured for ramp function.

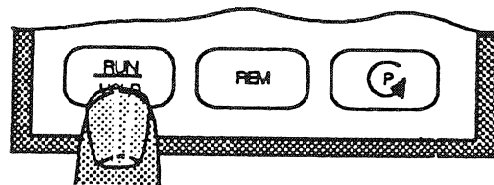


The conclusion of a running ramp will be indicated by the ramp legend flashing. It remains engaged and any further changes to the setpoint will be approached at the ramp rate



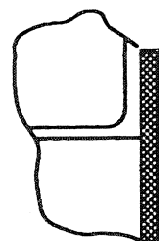
A running or completed ramp can be disengaged by depressing the **RUN/HOLD** button a second time. The **RAMP** legend will blank to indicate that this function is disabled.

TO DISENGAGE A RUNNING RAMP



Depress and release the button once

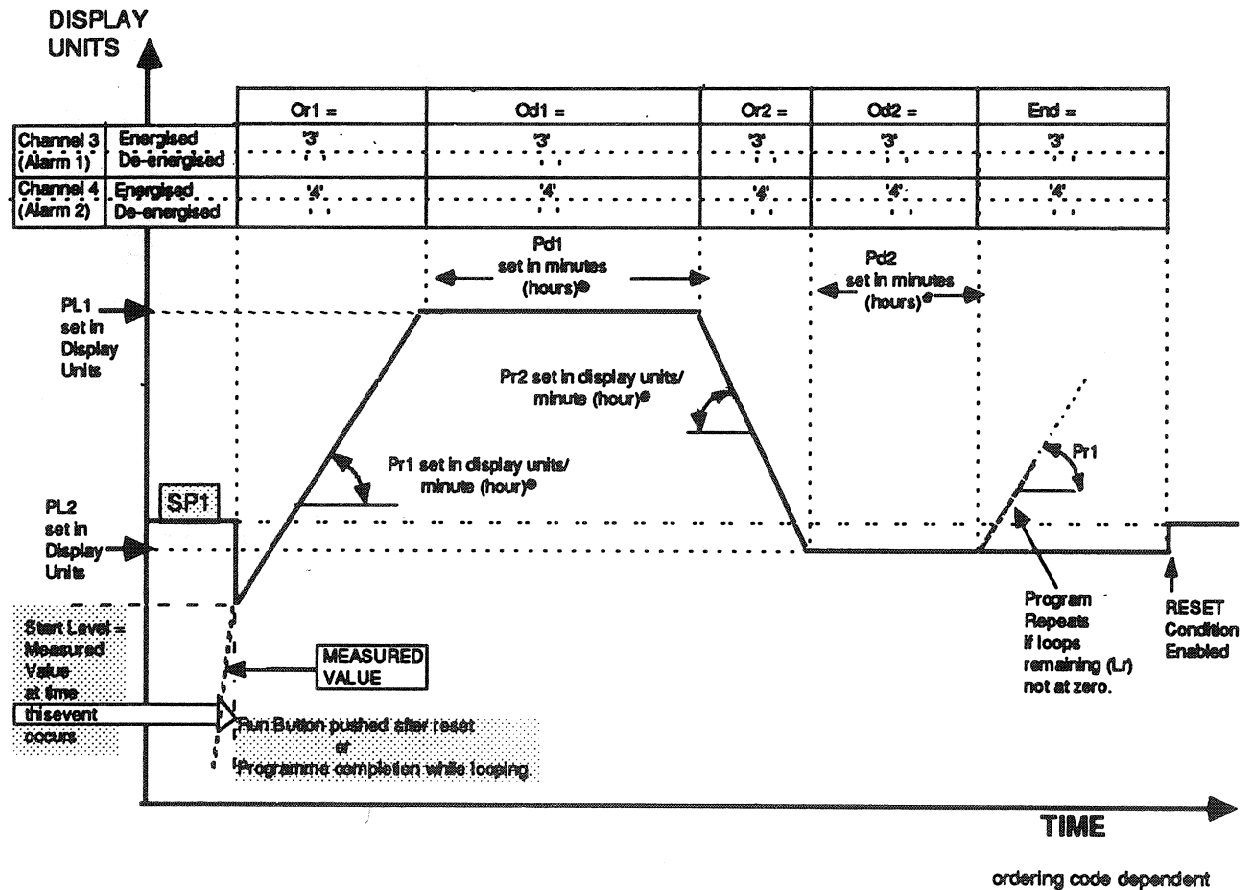
The lower right hand corner of the display will blank.



1.10 Programme Entry (Model 815P)

The maximum programming facilities consist of 2 ramp/dwell combinations with the ability to repeat (loop) the entered programme a maximum of 999 times as shown in the diagram below.

Either or both the alarm relays can be driven from segments of the programme instead of by alarm outputs, as shown below.



Setpoint Profile during Program

Note:- Programme parameters can be changed whilst the instrument is in the reset or hold condition and the security, section 1.12, has not been set or turned 'off'.

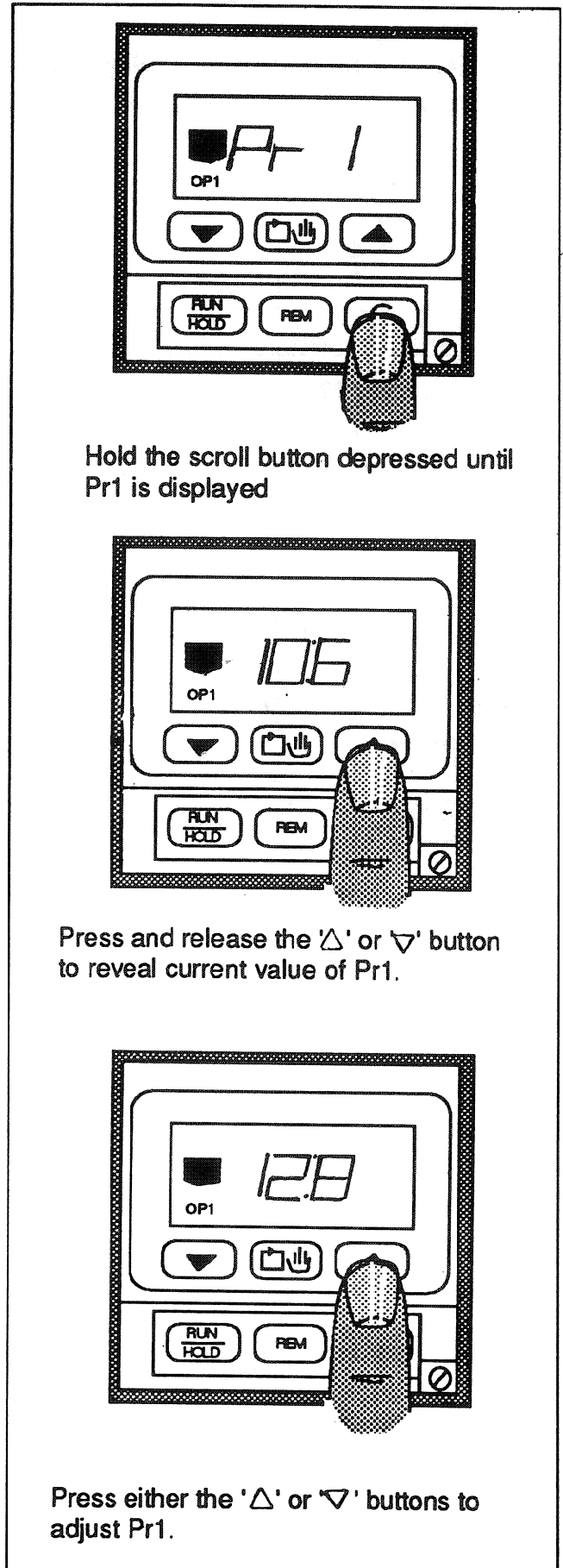
ENTERING RAMP RATE Pr (X)

Enter the long scroll by holding the "P" button depressed whilst the display runs through the short scroll. Release the button as soon as the first parameter of the long scroll (Pr1) appears.

Press and release either the 'Δ' or '▽' button to reveal the current value of Pr1 (Ramp 1 rate).
For the example 10.6 display units per minute (hour)*.

Press either the 'Δ' or '▽' button to adjust the ramp rate to desired value.

* Ordering Code Dependant



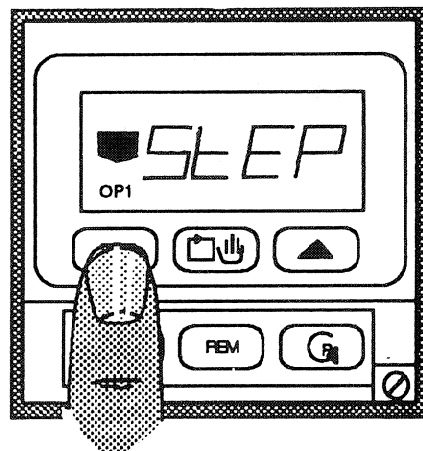
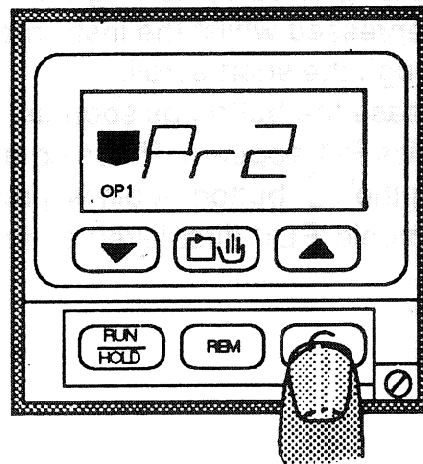
The other ramp rate, i.e. Pr 2, can be adjusted in a similar fashion. It can be found by pressing and releasing the 'P' button whilst in the long scroll until the relevant mnemonic is displayed.

Scrolling the value of any ramp rate down below zero will reveal three other options:

END - to terminate the programme at the end of the previous segment.

STEP - Immediate jump of setpoint from the original value to the new value.

NONE - The ramp segment is omitted.



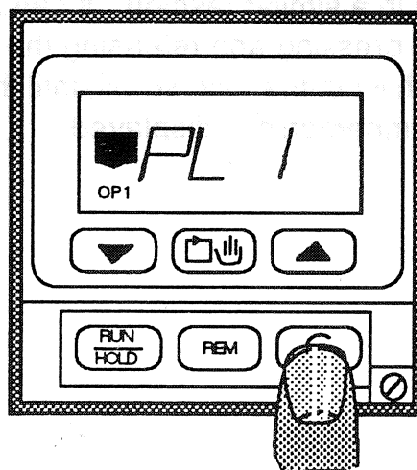
Scrolling a ramp rate (Prx) below zero gives END, STEP and NONE.

Enter the long scroll by holding the 'P' button depressed whilst the instrument runs through the short scroll. Then release the button as soon as the mnemonics Pr1 appears. Pressing and releasing the 'P' button again will reveal the mnemonic 'PL1' (first level) on the display.

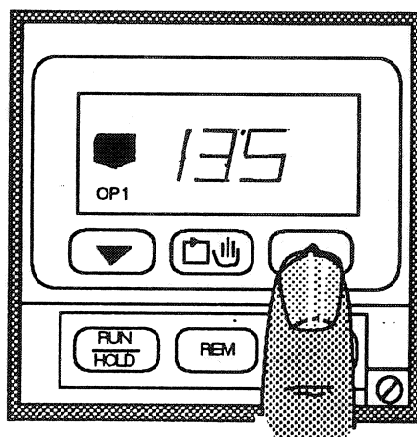
Press and release the 'Δ' or '∇' button to reveal the current value of PL1. In the example 135 display units.

Press the 'Δ' or '∇' buttons to adjust the level to the desired value.

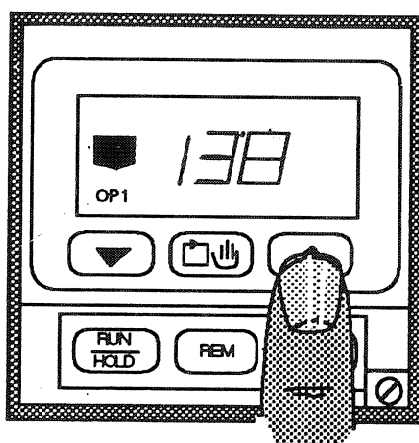
ENTERING A LEVEL PL(x)



Hold the 'P' button depressed until Pr1 is displayed then press and release the 'P' button to reveal PL1.

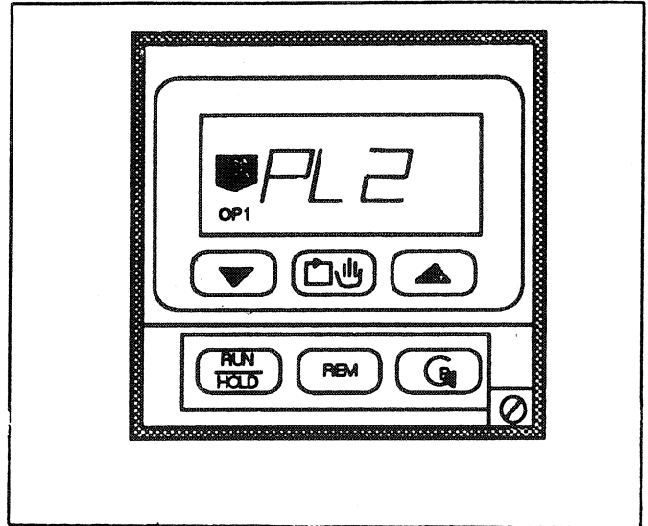


Press the 'Δ' or '∇' button to reveal the value of PL1.



Press the 'Δ' or '∇' button to adjust the value of PL1.

The other level, i.e. PL2 , can be adjusted in a similar fashion. This can be found by pressing and releasing the 'P' button until the relevant mnemonic is displayed.



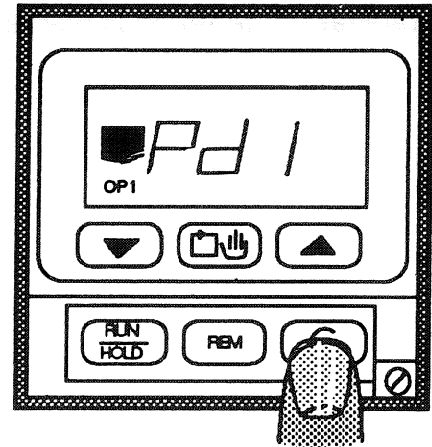
ENTERING A DWELL TIME Pd(x)

Enter the long scroll by holding the 'P' button depressed whilst the instrument runs through the short scroll. Then release the button. This gives the mnemonic Pr1. Press and release the 'P' button until the mnemonic Pd1 (first dwell) is on the display.

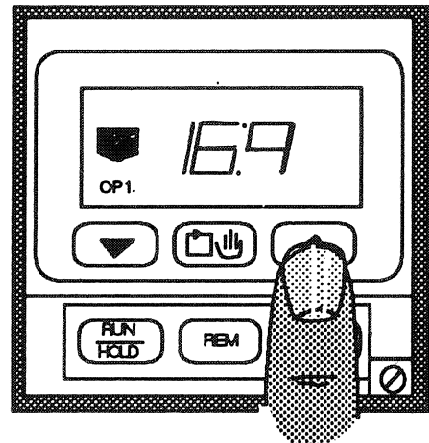
Press and release the 'Δ' or '▽' button to reveal the current value of Pd1. In the example 16.9 minutes (hours)*.

Press the 'Δ' or '▽' button to adjust the time to the desired value

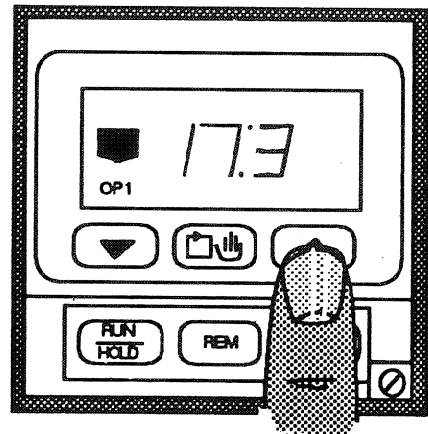
* Ordering Code dependant



Hold the 'P' button depressed until Pr1 is displayed. Release the button. Press and release the 'P' button until Pd1 is displayed.

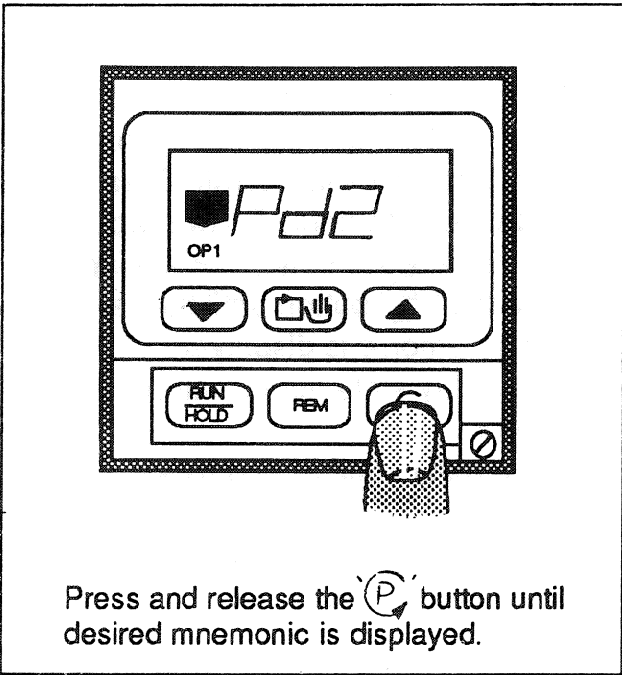


Press and release the 'Δ' or '▽' button to reveal the value of Pd1.

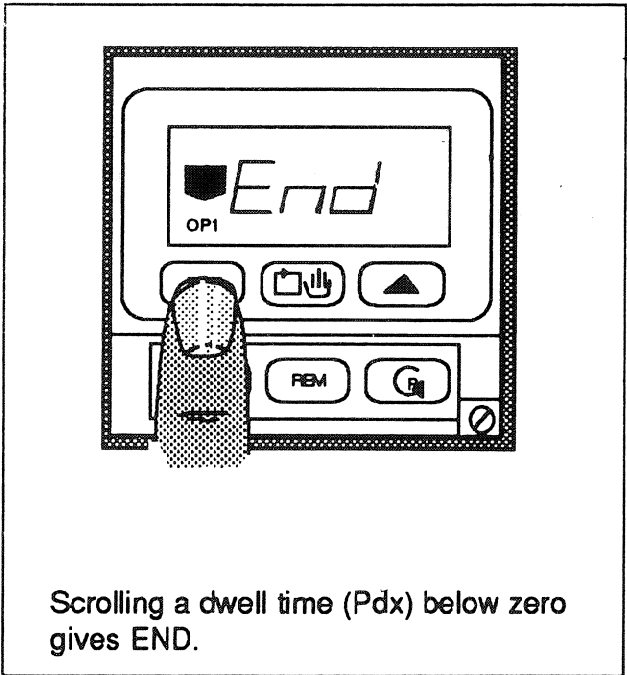


Adjust the value by pressing the 'Δ' or '▽' button.

The other dwell time, i.e. Pd2 can be adjusted in a similar fashion. This can be found by pressing and releasing the 'P' button whilst in the long scroll, until the relevant mnemonic is displayed.



Scrolling the value of any time down to below 0.0 will reveal.
END - The programme will terminate at the end of the previous segment.



SETTING THE OUTPUT RELAYS

Enter the long scroll by holding the 'P' button depressing whilst the instrument runs through the short scroll. Then as soon as the mnemonic Pr1 or tr appears, release the button. Press and release the 'P' button until the required mnemonic is displayed.

Or (x) = relay state during ramp number x

Od (x) = relay state during dwell number X

END = relay state during end state and before reset is enabled.

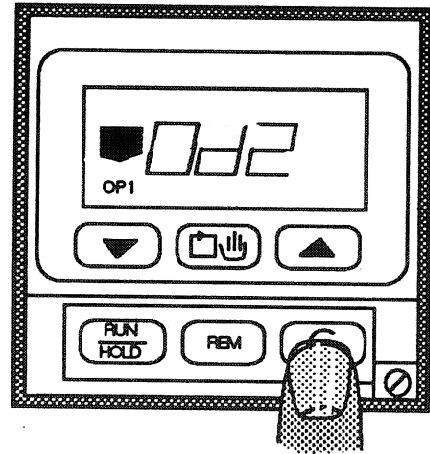
Press and release either the 'Δ' or '▽' button to reveal the current state of the

output relays in that segment of the programme. In the example this would be in segment dwell 2.

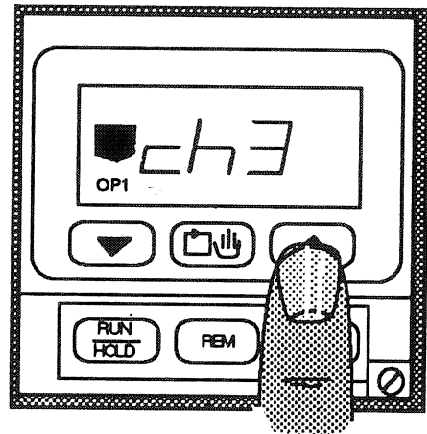
Repeatedly press and release either the 'Δ' or '▽' button to reset the condition of the output relays as:-

- ch both relays de-energised
- ch 3 channel 3 relay energise
channel 4 relay de-energised
- ch 4 channel 4 relay energised
channel 3 relay de-energised
- ch 3 4 both relay energised

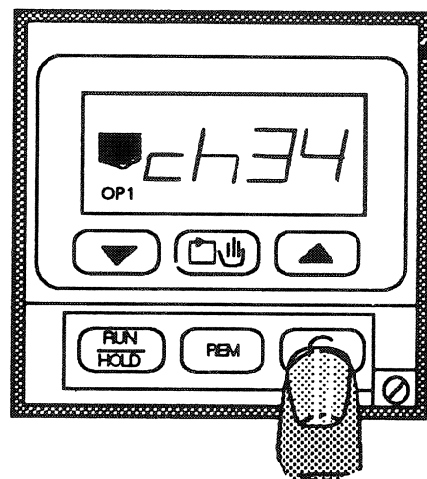
Note:- These conditions can be changed whilst the programme is running.



Press and hold the 'P' button to enter long scroll. Press and release the 'P' button until required mnemonic is displayed.



Press and release the 'Δ' or '▽' buttons to reveal the current value.



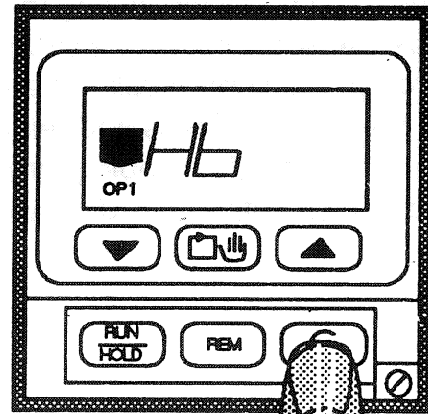
Adjust the value by pressing the 'Δ' or '▽' button.

SETTING HOLDBACK (Hb)

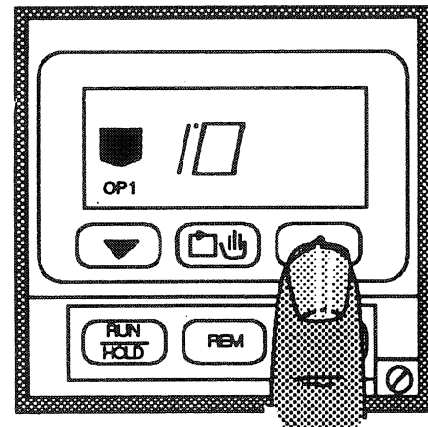
Enter the main scroll by holding the 'P' button depressed whilst the instrument runs through the short scroll. Then release the button. Press and release the 'P' button, single stepping through the mnemonics until Hb is displayed.

Press and release the '△' or '▽' button to reveal the current value of holdback.

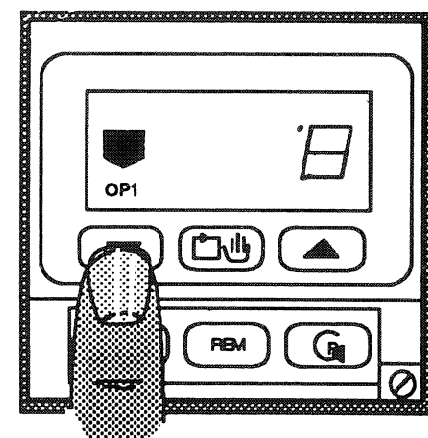
Press either the '△' or the '▽' button to adjust the value of holdback which is in display units.



Press and hold the 'P' button until Pr1 is revealed. Press and release the 'P' button until Hb is displayed.





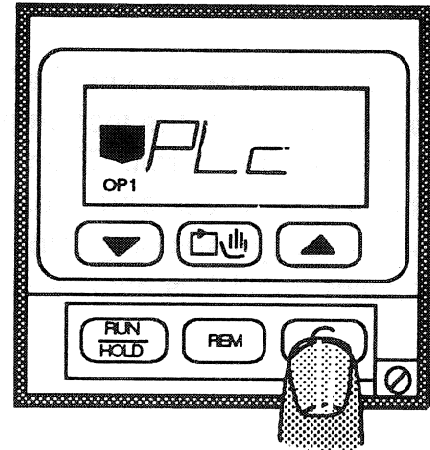
Press and release either the '△' or '▽' button.





Adjust the value by pressing the '△' or '▽' button.

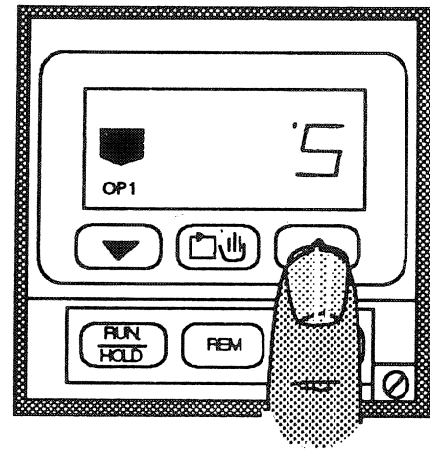
SETTING LOOP COUNT (PLC)

Enter the main scroll by holding the  button depressed whilst the instrument runs through the short scroll. Then release the button. Press and release the  button, single stepping through the mnemonics until PLc is displayed.



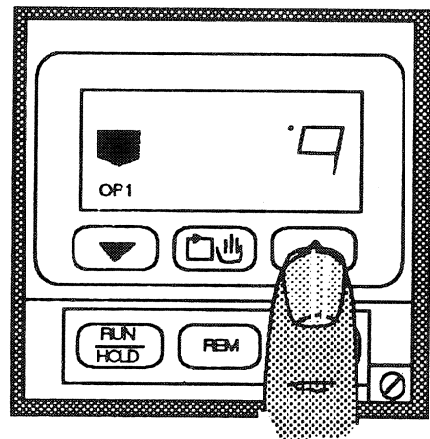
Press and hold the  button until Prl is revealed. Press and release the  button until PLc is displayed.

Press and release the ' Δ ' or ' ∇ ' button to reveal the current setting of loop count PLc.



Press and release the ' Δ ' or ' ∇ ' button to reveal the current value.

Press either the ' Δ ' or ' ∇ ' button to adjust the loop count value.



Adjust the value by pressing the ' Δ ' or ' ∇ ' button.

1.11 RUNNING PROGRAMMES (Model 815P)

Depressing the RUN/HOLD button once will start the programme.

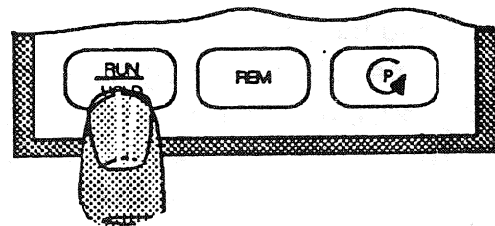
As soon as a program starts the legend RAMP will be illuminated and will remain illuminated for the entire length of the programme.

The segment of the program being performed at any instant of time will be flashed onto the display for approximately 2 seconds in every 20 seconds.

At the conclusion of a program the RAMP legend will flash and END will be flashed onto the display approximately 2 seconds in every 20 seconds.

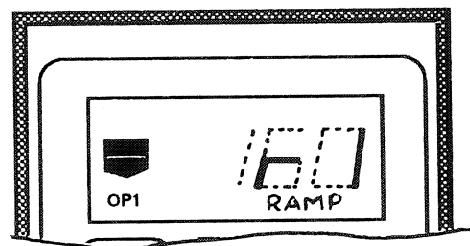
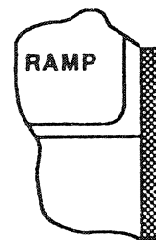
Two mnemonics (tr) time remaining in the current segment and (Lr) loops remaining appear at the head of the long scroll when a program is running.

STARTING A PROGRAMME

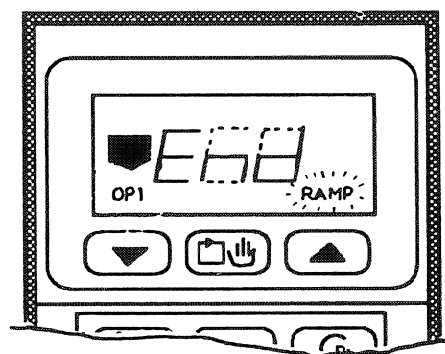


A single depression of this button will start the programme.

For 815P instruments configured for Programme functions.



While the program is running the current segment number and type is flashed onto the display.



The conclusion of a running programme will be indicated by the ramp legend flashing and END flashed on the display.

Depressing the Run/Hold button a second time, while the programme is running, will cause the programme to be held. This will be indicated by the **RAMP** legend flashing and **HOLD** flashed into the display. A further depression of this button will cause the programme to continue running.

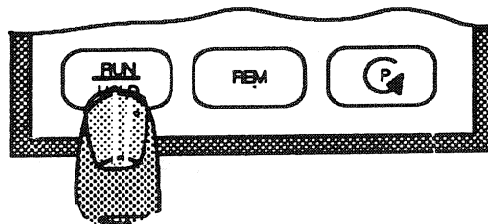
Note: The programme will automatically be placed into hold, if the holdback feature becomes active.

This feature is activated if the process variable deviates too far from the programme.

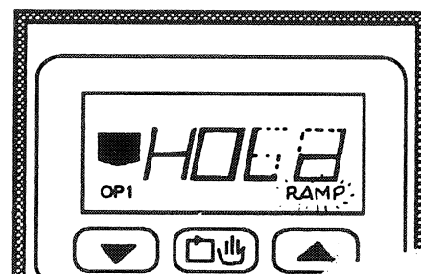
The **RAMP** legend will flash and 'Hb' will be flashed into the display if holdback becomes active.

It will automatically be de-activated when the process variable returns to the programme setpoint.

HOLDING A RUNNING PROGRAMME



On models 815P configured as a programmer a single depression of this button will enable hold. Further depressions of this button will switch the HOLD 'OFF' and 'ON'.



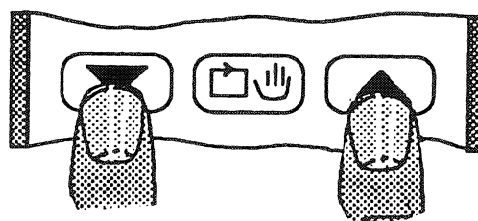
While in the hold state the ramp legend will flash and HOLD will be flashed onto the display.

TO RESET A RUNNING PROGRAMME

A running or completed programme can be reset by depressing the ' Δ ' and ' ∇ ' buttons together.

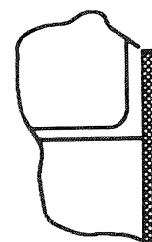
The reset condition will be indicated by the **RAMP** legend being extinguished. Under these conditions the controller will be running on either setpoint 1 or remote setpoint.

Note:- Ensure SP1 is set to a safe level before resetting the programme.



Depress both the up and down buttons together.

The lower right hand corner of the display will blank.

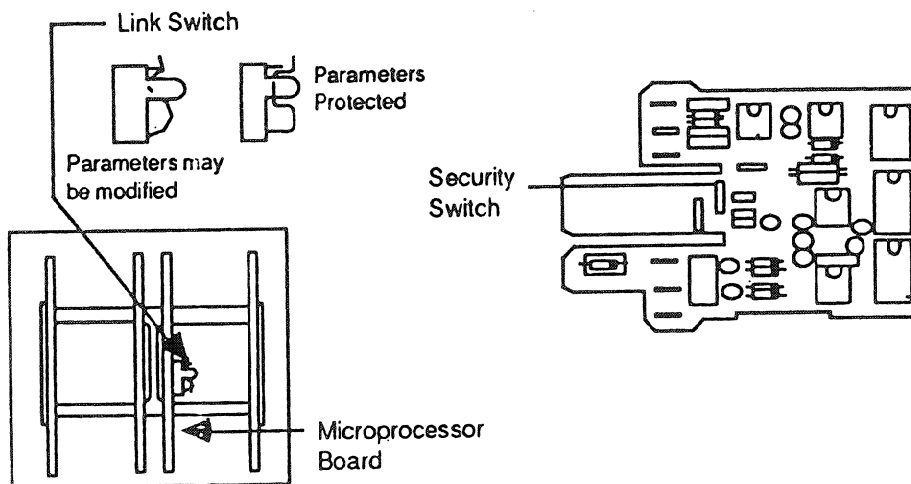


1.12 SECURITY

There are three levels of security available on this instrument to prevent its unauthorised use.

- a) Keylock enabled by either a digital input or digital communications
- b) Parameter Security Switch

By operation of a switch on the microprocessor board (see diagram below) the adjustment of the certain parameters or function, as selected in configuration (see 815 engineers book) are disabled.



c) Parameter Disabled

Some of the instruments functions can be disabled completely or made available as a digital input only within the configuration. The functions that can be inhibited in this way are:-

- Auto/Manual
- Remote/Local
- Run/Hold
- Reset
- Self Tune
- Ramp

For more information, refer to the 815 engineers book.

Section 2.0 - Commissioning

2.1 PID Controller

The instrument leaves the factory with commissioning values installed (see table 1) suitable for many typical applications.

On loops where these values are not suitable, confirmed by the measured value oscillating or recovering sluggishly from a disturbance, the commissioning values will have to be modified by one of the following methods:-

- 1) Self Tune
- 2) Manual Tune

2.1.1 Self Tune

The self-tuner is a one-shot algorithm which permits the user to tune the instrument control parameters to suit new process loop conditions.

Note: During self tune the controller will apply either full heat power or zero power or, if fitted full cool power during this sequence. Tuning at reduced power is possible by reducing 'HL' and/or 'CL' to the power required.

For best results:-

- a) The process value should be steady before commencing self tune.
- b) Use the usual start up situation

Self tune is initiated, by scrolling through to 'St' on the display and then simultaneously pressing both the raise and lower buttons.

The 'ST' indicator is then illuminated, and the display indicates the setpoint at which the self tune sequence will occur.

After selection the dot in the display will flash for 1 minute during which time the setpoint may be changed, if it is required to retune at a new setpoint either above or below the process value.

At the end of the minute the dot will be extinguished, indicating that the setpoint can no longer be changed and the display will revert to measured value. The 'ST' indicator will start flashing and continue to flash until the self-tune has completed.

On completion the following parameters will be automatically adjusted.

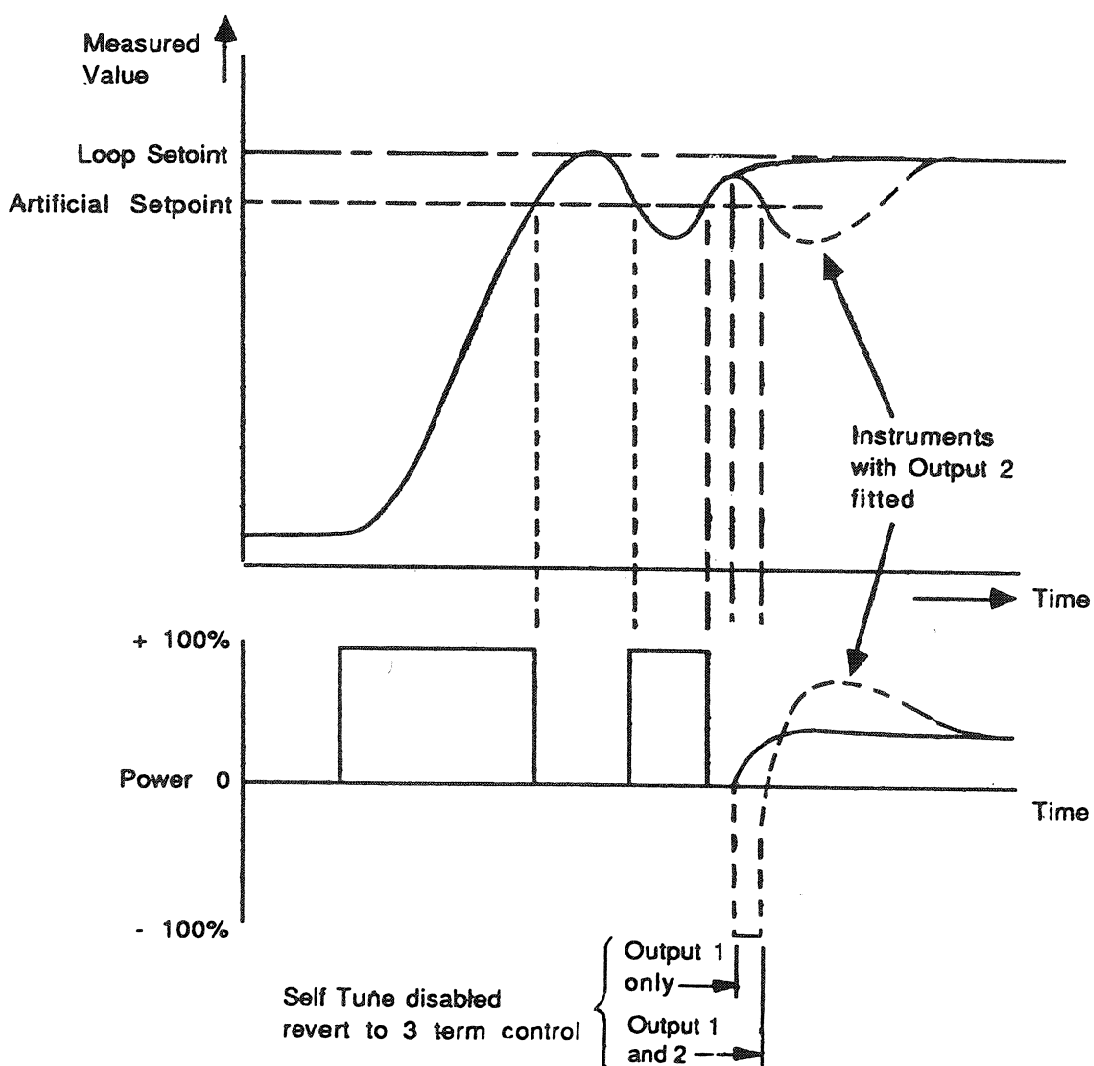
Parameters modified by the Self Tune Routine

| Parameter | Mnemonic |
|--------------------|----------|
| Proportional Band | Pb |
| Integral time | ti |
| Derivative time | td |
| Cutback low | Cb l* |
| Cutback high | Cbh * |
| Heat Cycle time | Hc ** |
| Cool Cycle time | Cc ** |
| Relative Cool Gain | Cr ** |

* One of these parameters only is modified by this routine and then only if the measured value was more than 5% of span away from the setpoint at the commencement of the self tune routine. If the measured value was lower than setpoint, Cbl is modified, and if higher Cbh is modified.

** All or some of these parameters may be missing from the commissioning list, in which case they will not be set by this routine.

Note: Whilst self tune is active the above parameters cannot be altered. Once the self tune sequence is completed the 'ST' legend is extinguished.



For more information on self tune ask for the 815 engineers book.

2.1.2 Manual Tune

The controller is dispatched from the factory with values installed into the commissioning parameters (see table 1 below) that will control satisfactorily in a majority of loops. The parameters can be modified by the manual tune method given below:-

| Parameter | Mnemonic on Secondary Display | Factory Set Value | Customer Changes to Factory Setting |
|---|-------------------------------------|--|-------------------------------------|
| Setpoint Output <i>Ramp Function Rate</i> <i>Output for Ramp</i> <i>Output for Dwell</i> <i>Output for End</i> | SP P Pr Or Od End | 25°C - Max ch - ch - ch - | |
| Main Setpoint (internal) <i>Local Setpoint</i> <i>Remote Setpoint</i> Self Tune Alarm 1 | SP1 LSP rSP St AL1 | 25°C Mid-span - Disabled Dev = 10 (Except Linear inputs with Span <100=1) | |
| Alarm 2 Proportional Band Integral time | AL2 Pb ti | Full scale High = display max. Full scale Low = display min 5.0% 300 secs | |
| <i>Manual reset</i> Derivative time Cutback low Cutback high Output 1 limit <i>Output 1 cycle time</i> | rES td cbL cbh HL Hc | 0% 60 secs Off Off 100% 10.0 secs | |
| <i>Relative cool</i> <i>Output 2 limit</i> Output 2 cycle time <i>Output 1/2 deadband</i> Sensor break power | Cr CL Cc db Sbr | 1.0 -100% 10.0 secs 0 0.00 for others 0% | |

Parameters in italics are only included in listing if applicable

Table No. 1 Factory setting of commissioning values in a P.I.D. controller

You are advised to record any change made to the factory setting on the previous page. In the unlikely event of the instrument being returned to a service centre for repair it can be sent back reset to these values.

The loop parameters can be set manually using the Ziegler-Nichols method. At normal running temperatures with the 'ti' and 'td' switched off, the proportional band (Pb) should be reduced until the system just goes unstable. This is best observed by looking at the output power.

The values required to give stable control can be calculated using the value of proportional band that just made the system unstable (XP1) and the period of oscillation (T) in the table values shown:-

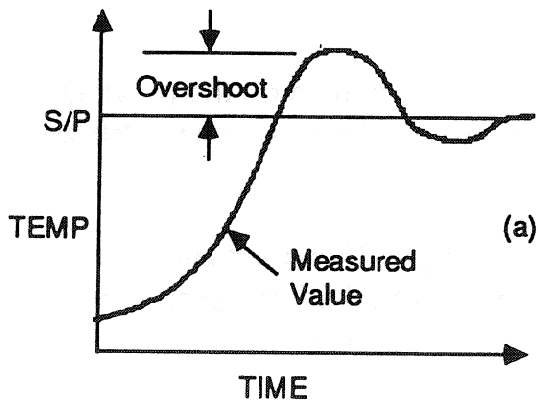
| FINAL CONTROL LOOP TYPE | SETPOINT OF CONTROLLER PARAMETERS FOR CRITICAL DAMPING | | |
|--------------------------------|--|-----------------------------|-------------------------------|
| | PROPORTIONAL BAND (Pb) | INTEGRAL TIME CONSTANT (ti) | DERIVATIVE TIME CONSTANT (td) |
| P PROPORTIONAL ONLY | 2.XP1 | - | - |
| P+I PROPORTIONAL PLUS INTEGRAL | 2.2XP1 | 0.8T | - |
| P.I.D. THREE TERM | 1.67XP1 | 0.5T | 0.12T |

Controller parameters calculated by the Ziegler-Nicholls method

CUTBACK

The above method sets the control parameters for optimum steady state control. Two extra parameters 'cbL' and 'cbh' are used to control the overshoot and under-shoot that normally occurs when the measured value approaches setpoint from a large offset.

If the start up conditions are not satisfactory with the parameters set as above, 'cbL' and 'cbh' should be set as follows.



Set the low and high cutback values ('cbL and cbh') to one proportional band width; e.g. $cbL = cbh = \frac{XP(\%)}{100} \times \text{instrument span}$

If the start up conditions produce unacceptable overshoot or undershoot

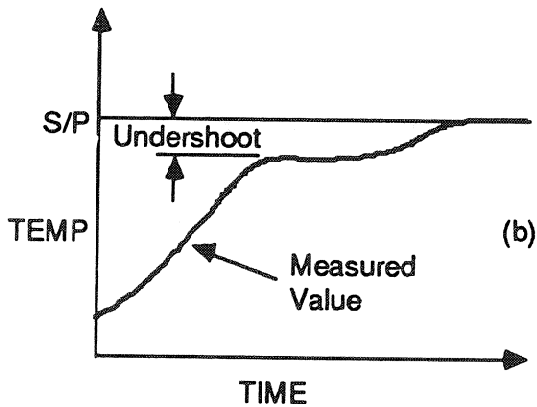
'cbL' and 'cbh' should be modified as follows:

In the example shown 'cbL' should be set to

(a) $cbL = \frac{Xp(\%)}{100} \times \text{span} + \text{overshoot}$

(b) $cbL = \frac{Xp(\%)}{100} \times \text{span} - \text{undershoot}$

'cbh' can be set in a similar manner for situations where the measured value approaches setpoint from above.



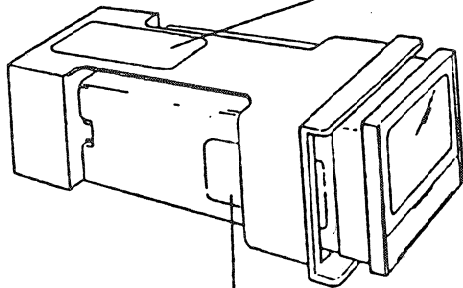
The cutback values are always set in engineering units. They define the point where the power starts "cutting back" from its maximum or minimum value as the process variable approaches the setpoint.

Section 3.0 - Reference Section

3.1 Labels and Coding

Instruments are configured to the ordering code before leaving the factory. Any changes made to the configuration of the instrument should be recorded for future reference.

To establish which features are included in the instrument the ordering code on the side cover of the instrument may be interpreted using the coding chart shown.



| | | |
|--|------------------|-------------|
| EI | EUROTHERM | (4.18) Std |
| Worthing, England | | :0703-68500 |
| Model No : 815S/TC/LGC/NONE/DHD/DLD/485/96/S/03/0/200/C/ | | |
| ND/NO/D/1N/S/N/ | | |
| Serial No: X00001-001-001-06-88 | | |
| | | |
| Software : 0105 | | |
| Made in UK | | |

| | |
|------------------------------------|------------|
| EI EUROTHERM | |
| Worthing, England :0703-68500 | |
| Model No : | |
| 815S/TC/LGC/NONE/DHD/DLD/485/96/S/ | |
| 03/0/200/C/ND/NO/D/1N/S/N/ | |
| Serial No: X00001-001-001-06-88 | |
| Made in UK | |
| 01.85 - 254V | 19. |
| 02.Filter Earth | 20. |
| 03.Neutral | 21. |
| 04. | |
| 05.0/P1 LOGIC+ | |
| 06.0/P1 LOGIC- | |
| 07.R.F.I. Earth | 25.T/C+ |
| 08. | 26.T/C- |
| 09. | 27. |
| 10.Comms Enable | 28. |
| 11. | 29. |
| 12.Switch Com | 30. |
| 13.RX+ (RS485) | 31.AL1 COM |
| 14.RX- | 32.AL1 N/C |
| 15.TX+ (RS485) | 33.AL1 N/D |
| 16.TX- | 34.AL2 COM |
| 17.COM | 35.AL2 N/C |
| 18.Safety Earth | 36.AL2 N/D |

Ordering Information for the 815

| Basic Product | |
|-----------------------|------|
| | Code |
| Basic Controller | 815S |
| Programmer Controller | 815P |

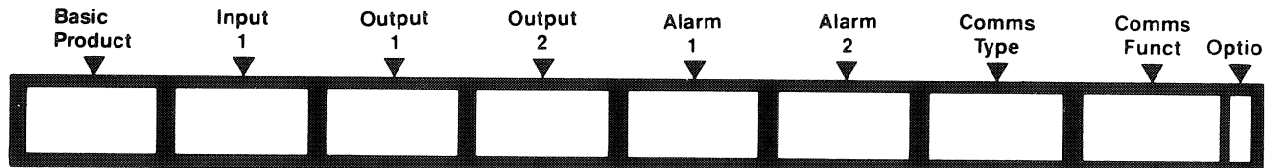
| Inputs | | |
|------------------------|-------------------------------|-------|
| | Available With Curves Coded | Code |
| Thermocouple | 01. 02. 03. 04. 05. 06. 45 | TC |
| Resistance Thermometer | 70 | RTD |
| 0-20mA | } | 0mA20 |
| 4-20mA | | 4mA20 |
| 0-5V | | 0V5 |
| 1-5V | | 1V5 |
| 0-10V | | 0V10 |

| Alarms | |
|-----------------|----------------------|
| Type | 1st & 2nd Digit Code |
| None | NONE |
| Deviation Band | DB |
| Deviation High | DH |
| Deviation Low | DL |
| Full Scale High | FH |
| Full Scale Low | FL |

| Relay State in Alarm | 3rd Digit Code |
|----------------------|----------------|
| Energised | E |
| De-energised | D |

In the Programmer version 815P the Alarm outputs may be assigned to the program segments. If this option is required specify the Alarm field as shown below

| Type | Code |
|------------------------|------|
| Assigned to Programmer | PROG |



| Outputs | |
|---|------------------------|
| Action | Output/ Input 2 Prefix |
| Control on Output 2 (Opposite action to output 1) | C |
| Retransmission of:- | |
| Process Variable | M |
| Setpoint | S |
| Remote Input of. | |
| Setpoint | X |
| Trim | T |
| S/P with Local Trim | L |

Note: Output 1, as Reverse Acting is ideal to drive a heat output stage on a temperature control loop. Output 2 is always the opposite action of output 1.

| | Output 1 | Output/ Input 2 |
|------------------|----------|-----------------|
| Relay linear | RLY | RLY |
| Relay Non Linear | — | RLYN |
| Relay ON/OFF | RLYF | RLYF |
| Logic Linear | LGC | LGC |
| Logic Non Linear | — | LGCN |
| Logic ON/OFF | LGCF | LGCF |
| Triac Linear | TRI | TRI |
| Triac Non Linear | — | TRIN |
| Triac ON/OFF | TRIF | TRIF |
| No output | NONE | NONE |
| Isolated 0-5V | 0V5 | 0V5 |
| Isolated 0-10V | 0V10 | 0V10 |
| Isolated 1-5V | 1V5 | 1V5 |
| Isolated 0-10mA | 0mA10 | 0mA10 |
| Isolated 0-20mA | 0mA20 | 0mA20 |
| Isolated 4-20mA | 4mA20 | 4mA20 |

With output/input 2 prefix M, S, X, T or L only D. C. output/Inputs apply. On/off on OP1 restricts output/input 2 to on/off unless prefix M, S, X, T or L.

| Communications | |
|----------------|------|
| Digital | |
| Type | Code |
| NONE | NONE |
| Digital RS232 | 232 |
| Digital RS485 | 485 |

| Function | Code |
|----------------|------|
| NONE | NONE |
| Baud Rate 9600 | 96 |
| Baud Rate 4800 | 48 |
| Baud Rate 3600 | 36 |
| Baud Rate 2400 | 24 |
| Baud Rate 1200 | 12 |
| Baud Rate 600 | 06 |
| Baud Rate 300 | 03 |

Input Coding

Curve

Select from the range list shown below

| | Recommended Min & Max ranges | Min Span | Code |
|-------------------------------|------------------------------|----------|------|
| Linear | - 1999 to 8000 | | 00 |
| Iron/Constantan J | 0C to 600C | 100C | 01 |
| Fe/Konst (DIN) J | 0C to 600C | 100C | 02 |
| Ni Cr/Ni Al K | 0C to 1200C | 125C | 03 |
| Cu/Con T | 250C to 400C | 150C | 04 |
| Pt 13 ϕ Rh/Pt R | 0C to 1600C | 600C | 05 |
| Pt 10 ϕ Rh/PT S | 0C to 1600C | 600C | 06 |
| Nicrosil/Nisil | 0C to 1300C | 150C | 45 |
| Rt 100 ohms at 0 $^{\circ}$ C | - 80C to 600C | 50C | 70 |

* Note For linear inputs sensitivity must not be less than 5 μ V/digit

Display Min/Display Max

These should be selected from the recommended minimum and maximum ranges shown in Curve

Include decimal point position - This is especially important on linear range

Units

NONE
 $^{\circ}$ C
 $^{\circ}$ F
 K
 mV
 V
 mA
 ϕ

(Or specify up to 5 characters)

Programmer 815P

All other models end code with software options

Ramp Scale/Dwell Scale

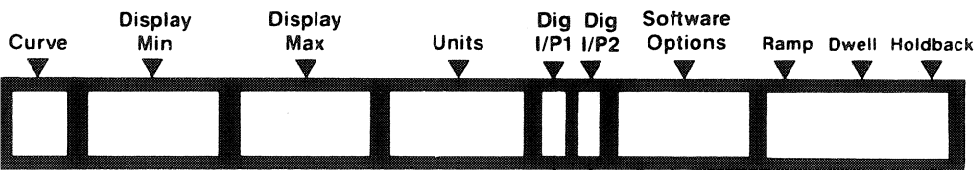
| Ramp Scale | Code |
|---------------------|------|
| SP units per minute | MN |
| SP units per hour | HR |

Holdback

| Holdback | Code |
|-------------|------|
| Holdback | H |
| No Holdback | N |

Dwell Scale

| Dwell Scale | Code |
|------------------|------|
| Dwell in minutes | MN |
| Dwell in hours | HR |



Option

| Option | Code |
|------------------|------|
| Faston Terminal | F |
| Screw Terminal | S |
| Faston 24V ac/dc | F24 |
| Screw 24V ac/dc | S24 |

Software Options

| Function | Code | Cold Junction | Code | Function | Code | Function | Code |
|---------------------|------|------------------------------|------|------------------------------------|------|-------------------|------|
| Manual Key Enabled | E | Non T/C Input | N | Integral and Derivative in Seconds | S | Power Feedback | P |
| Manual Key Disabled | D | Internal Compensation | IN | Integral and Derivative in Minutes | M | No Power Feedback | * N |
| | | External 0 $^{\circ}$ C Ref | 0 | | | | |
| | | External 45 $^{\circ}$ C Ref | 45 | | | | |
| | | External 50 $^{\circ}$ C Ref | 50 | | | | |

* Note Not available on dc outputs therefore enter N

Digital Inputs

| Input | Dig I/P |
|--------------------|---------|
| Auto Manual | AM |
| Self Tune | ST |
| Keylock | KL |
| Parameter Security | PS |
| Ramp | RP |

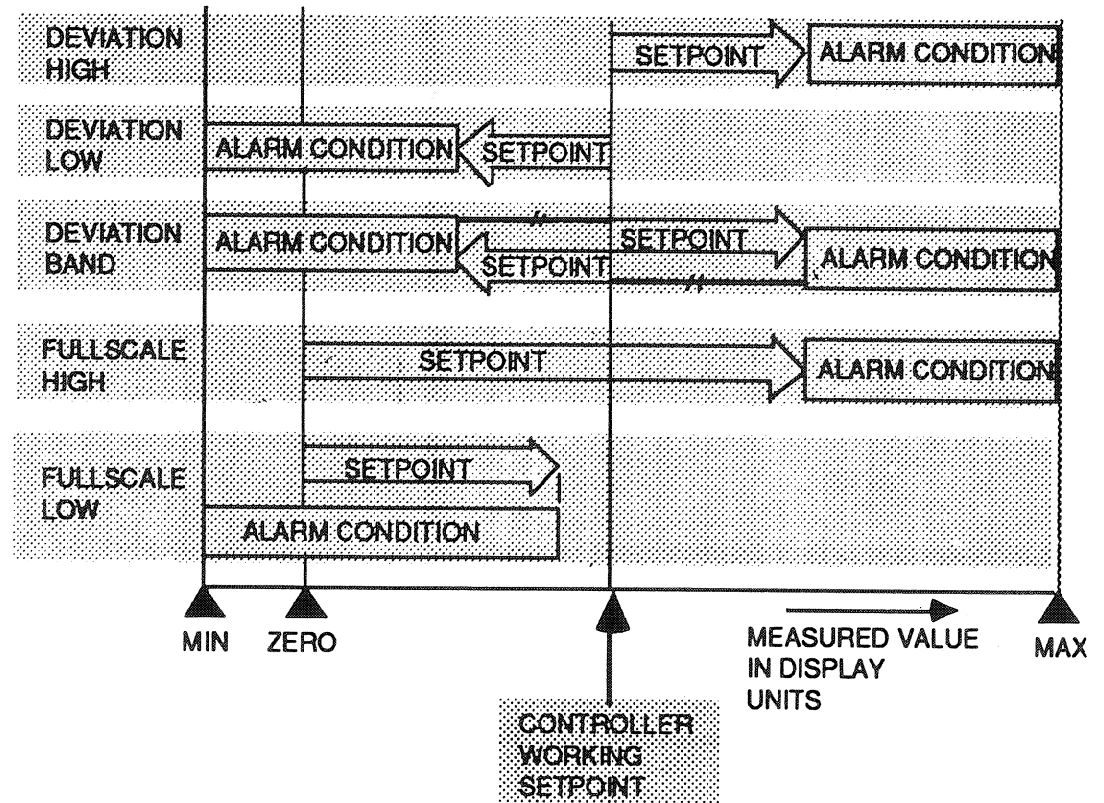
Additional Options : 15P Programmer Only

| | Dig I/P1 | Dig I/P2 |
|--------------|----------|----------|
| Skip Segment | SS | SS |
| Run/Hold | RH | - |
| Hold/Run | HH | - |
| Reset | | RS |

When code is being entered any field not required can be left blank.

3.2 Glossary of Terms

ALARM - A condition that exists if the process variable exceeds internally stored alarm setpoints. These setpoints can be:-



AUTO/MANUAL - Alternative control conditions that can be selected within the controller.

Manual - An open loop condition, in which the power to the process is manually set and not influenced by the sensor.

Auto - A closed loop condition, in which the power to the process is automatically computed and set by the sensor output relative to the setpoint.

AUTO/REPEAT - A time saving device to scroll quickly through a list with a hesitation at key mnemonics.

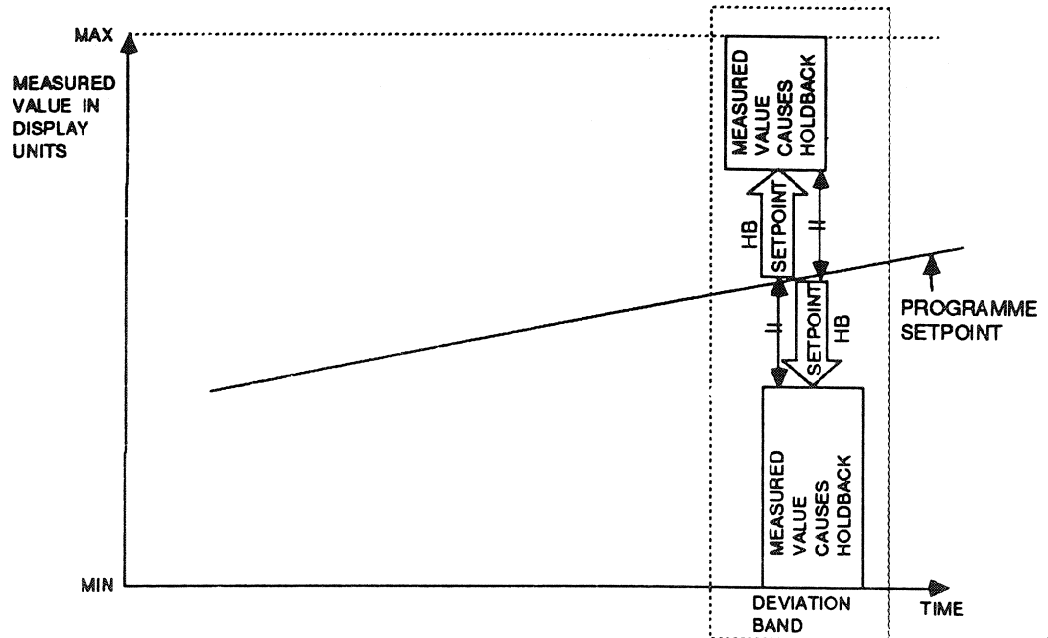
DWELL - A time entered into a programme during which the setpoint remains constant.

HOLD - The freezing of a running programme, in time, for the duration of the condition.

HOLDBACK -

A hold condition forced onto a running programme by the measured values deviation from the setpoint by more than a predetermined amount.

Holdback operates either side of the programme setpoint as illustrated below:-

**KEYLOCK -**

A condition enabled by a digital input or digital communications that disables the operation of all push buttons.

LOCAL/REMOTE -

Alternative selections of the working setpoint. Either a value stored within the controller (local) or an analogue signal brought into the controllers rear terminals (remote).

LOOP COUNT -

The number of times that an entered programme is repeated automatically before the 'END' condition becomes active.

OUTPUT RELAY -

Relays that are normally driven by the alarm output condition but can, as an alternative, be driven by segments of the programme.

PROGRAMME -

A preset profile of the controller setpoint made up of ramps and dwells, together with the sequence of states of the output relays.

RAMP -

One segment of a programme where the controller setpoint moves from one level to another linearly during a fixed period of time.

RESET -

An action which returns a completed or running programme to the start condition i.e. controlling on SP1 or remote S.P.

RUN -

An action which starts a programme running or restarts it from a hold condition.

SCROLL -

A method of presenting a large number of mnemonics or numerals, on the display, in sequence, so allowing the operator to make a choice.

- SELF TUNE -** A facility which, when enabled, performs a number of 'on' and 'off' sequences of the controller output, measuring the influence this has on the measured value. From these results the value of proportional band, integral time and derivative time plus, under certain circumstances, cut back low, cut back high, heat cycle, cool cycle time and relative cool gain, for optimum control, are calculated and written into the commissioning mnemonics.
- SERVO START -** A condition at the start of a programme where the first ramp starts from the current measured value instead of a fixed level.
- SINGLE STEP -** A form of scrolling where the rate at which the parameter or numeral changes is controlled to one at a time.
- TOGGLE -** The selection of two states (i.e. AUTO & MANUAL) using a single push button. The first press gives one state (AUTO) and the second press the other (MANUAL). A further press will return to the first state (AUTO).



Further Information

For information on the configuration, calibration, digital communication and detailed operating instructions on your 815 controller, fill in and return this form to the address over the page.

Name : _____

Title: _____

Company: _____

Address: _____

Date: _____

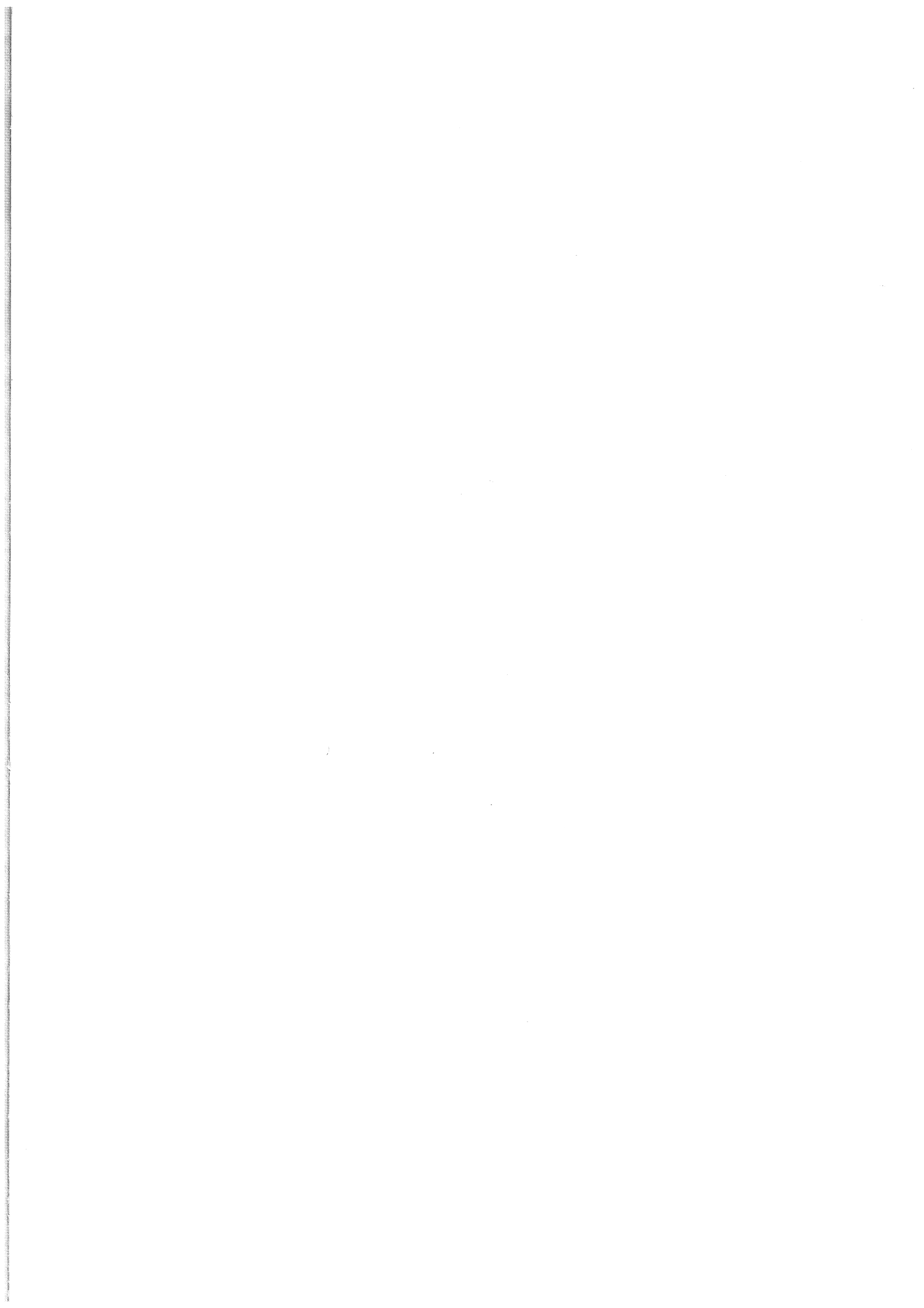
Please send me a copy of the 815 Engineers book (HA021454) containing details of the configuration, calibration and detailed operating procedure.

Please send me a copy of the Communication book (HA020161) containing the communication protocol and mnemonics.

TICK AS APPROPRIATE

Post this form to:-

**Eurotherm Ltd.
Sales Department
Faraday Close
Durrington
Worthing
West Sussex
BN13 3PL**



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