YEAR 2000 COMPLIANT

User's Guide


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# CN3410 SERIES
## 1/8 DIN Panel Mount Universal Temperature & Process Controller

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It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.


**WARNING:** These products are not designed for use in, and should not be used for, patient-connected applications.

# GETTING STARTED

This manual is divided into 5 sections which contain all the information needed to install, configure, set up and operate the instrument. Each section is identified clearly by a symbol as shown below.


**Displays and Function Keys**

- Displays and function keys
- LED Indication
- Error Messages

**Operator Mode (Level 1)**

- Operator menus for:
  - *Standard controller*
  - *Heat/Cool controller*
  - *Remote Set Point controller*
  - *Profile controller*
  - *Multiple Fixed Set Points controller*
- Auto tuning

**Set Up Mode (Levels 2, 3 and 4)**

- Level 2 – Tuning
- Level 3 – Set Points
- Level 4 – Profile

**Configuration Mode (Levels 5 and 6)**

- Level 5 – Basic hardware and control functions
- Level 6 – Ranges and passwords

**Installation**

- Siting
- Mounting
- Electrical connections

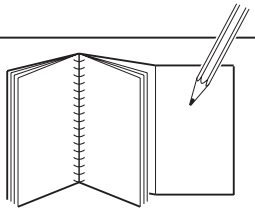
**Symbol Identification and Section Contents**

# CONTENTS



***i*** **Information.**

The fold-out page inside on the back cover of this manual shows all the frames in the programming levels. Space is provided on the page for writing the programmed setting or selection for each frame.



# 1 DISPLAYS AND FUNCTION KEYS

## 1.1 Introduction – Fig. 1.1

The instrument front panel displays, function keys and LED indicators are shown in Fig. 1.1.

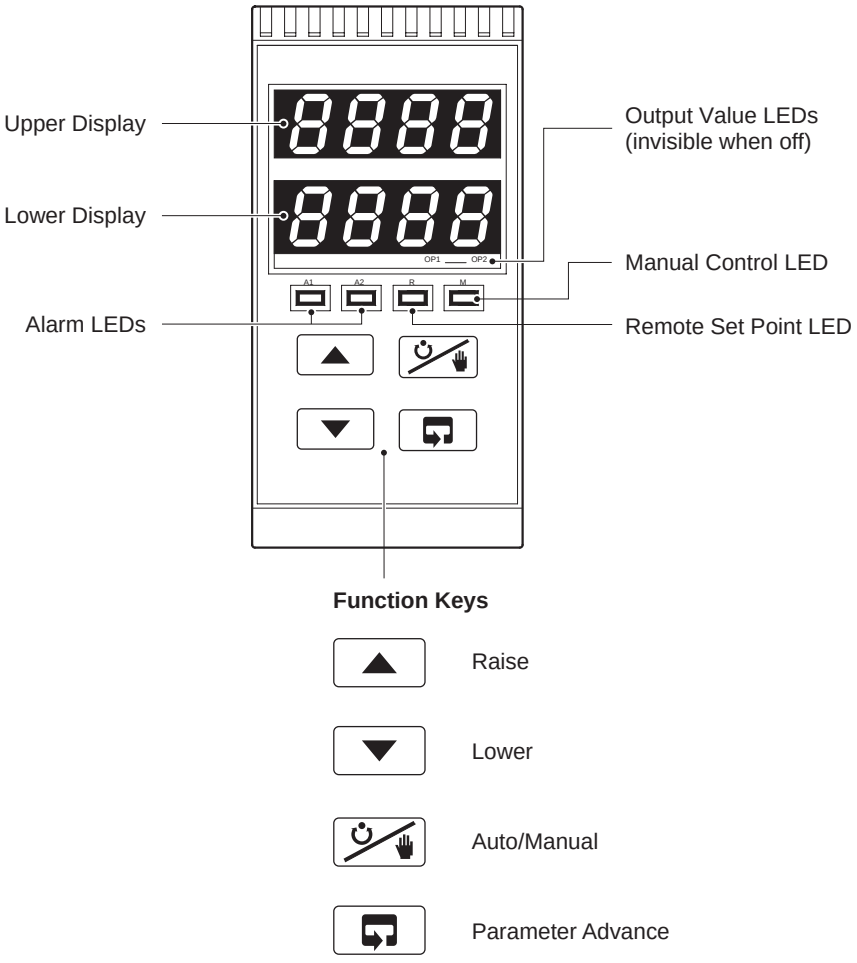
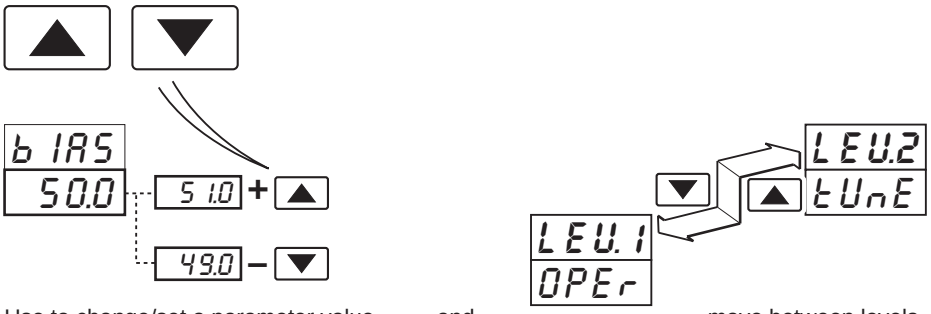



**Fig. 1.1 Front Panel Displays, Function Keys and Indicators**

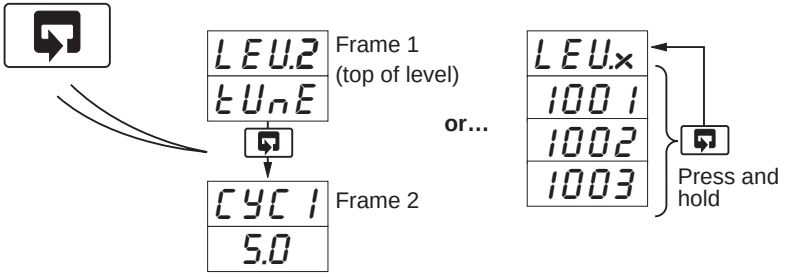
## 1.2 Use of Function Keys – Fig. 1.2

**A – Raise and Lower Keys**




Use to change/set a parameter value… and… …move between levels

**B – Parameter Advance Key**

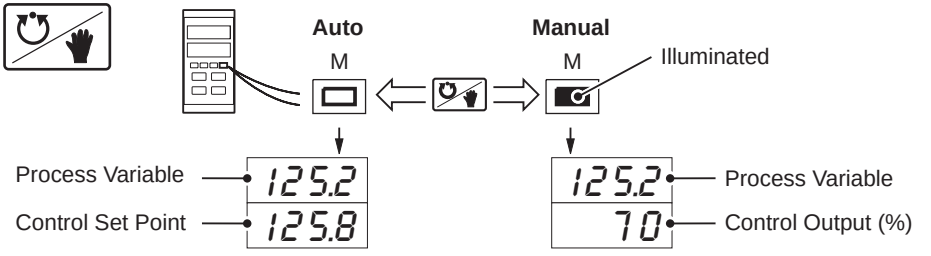



Use to advance to the next frame within a level…

…select the top (LEUEL) frame from within a level

**Note.** This key also stores any changes made in the previous frame

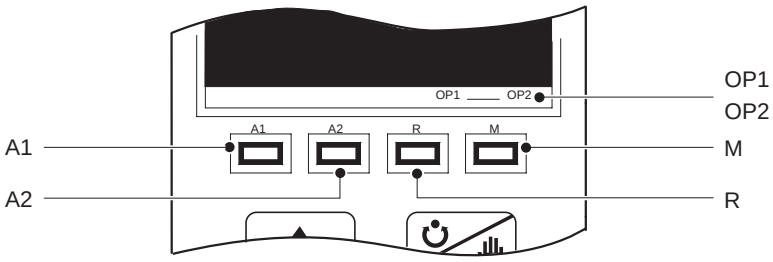
**C – Auto/Manual Key**




Use to select Auto or Manual control mode

**Fig. 1.2 Use of Function Keys**

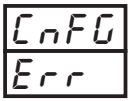
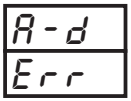
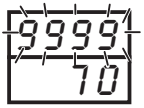
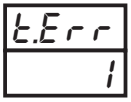
## 1.3 LED Alarms and Indicators




| LED | Status |
|---|---|
| **All** | • **All LED's flashing – controller is in the Configuration Mode.** |
| **A1** | • Flashes when Alarm 1 is active (off when inactive). |
| **A2** | • Flashes when Alarm 2 is active (off when inactive). |
| **R** | • On when the controller is operating on the remote set point value.<br>• Off when the controller is operating using the local set point value or one of the four fixed set points (in multiple set point mode).<br>• Flashes when a Ramp/Soak profile is running. |
| **M** | • On when the controller is operating in Manual control mode.<br>• Off when the controller is operating in Auto control mode.<br>• Flashes when the controller is performing an auto-tune. |
| **OP1** | • Indicates output 1 (heat) value is displayed in the lower display. |
| **OP2** | • Indicates output 2 (cool) value is displayed in the lower display. |

**Fig. 1.3 LED Alarms and Indicators**

## 1.4 Error Messages

| Display | Error/Action | To Clear Display |
|---|---|---|
|  | **Calibration error**<br>Turn power off and on again (if the error persists contact the Supplier). | Press the ▲ key |
|  | **Configuration error**<br>The configuration and/or setup data for the instrument is corrupted. Turn power off and on again (if the error persists, check configuration/ setup settings). | Press the ▲ key |
|  | **A to D Converter Fault**<br>The analog to digital converter is not communicating correctly. | Turn power off and on again, if the problem persists contact the Supplier |
|  | **Process Variable Over/Under Range** | Restore valid input |
|  | **Remote Set Point Over/Under Range**<br>The remote set point value is over or under range. Flashing stops automatically when the remote set point input comes back into range. | Select the local set point (rSP.n) in the Operating Page or the Set Points Level |
|  | **Option error**<br>Communications to the option board have failed. | Contact the Supplier |
|  | **Auto-tune error**<br>The number displayed indicates the type of error present – see Table 2.1 in Section 2.7. | Press any key |

# 2 OPERATOR MODE

## 2.1 Introduction

Operator Mode (Level 1) is the normal day-to-day mode of the instrument.

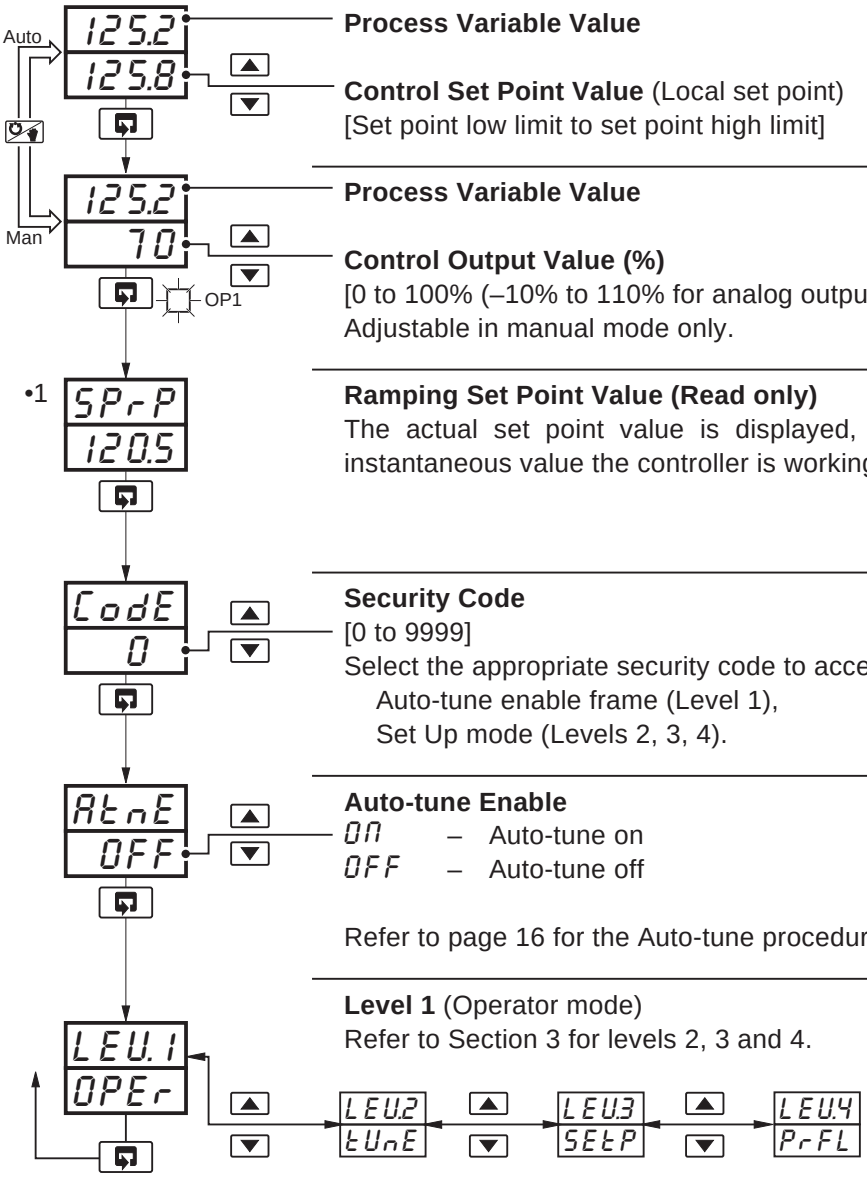
Frames displayed in level 1 are determined by the control strategy which is selected during configuration of the instrument – see Section 4.

**Note.** Only the operating frames relevant to the configured strategy are displayed in Operator Mode.

The five control strategies are:

- **Standard controller** – page 8
- **Heat/Cool controller** – page 9
- **Remote Set Point controller** – page 10
- **Profile controller** – page 12
- **Multiple Fixed Set Points controller** – page 14

## 2.2 Standard Controller




**Process Variable Value**

**Control Set Point Value** (Local set point)
[Set point low limit to set point high limit]

**Process Variable Value**

**Control Output Value (%)**
[0 to 100% (–10% to 110% for analog output)]
Adjustable in manual mode only.

**Ramping Set Point Value (Read only)**
The actual set point value is displayed, i.e. the instantaneous value the controller is working to.

**Security Code**
[0 to 9999]
Select the appropriate security code to access:
Auto-tune enable frame (Level 1),
Set Up mode (Levels 2, 3, 4).

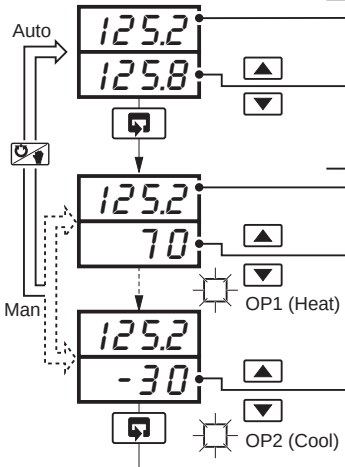
**Auto-tune Enable**
ON – Auto-tune on
OFF – Auto-tune off

Refer to page 16 for the Auto-tune procedure.

**Level 1** (Operator mode)
Refer to Section 3 for levels 2, 3 and 4.

•1 Not displayed if the ramping set point facility is turned off – refer to Section 3.3.

## 2.3 Heat/Cool Controller




**Process Variable Value**

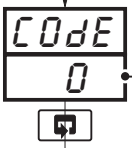
**Control Set Point Value** (Local set point)
[Set point low limit to set point high limit]

**Process Variable Value**

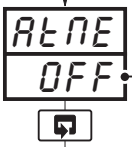
**Control Output Value (Heat %)**
[0% to 100% (0% to 110% for analog output)]
If adjusted below 0% the 'Cool' frame is displayed.

**Control Output 2 Value (Cool %)**
[0% to –100% (0% to –110% for analog output)]
If adjusted above 0% the 'Heat' frame is displayed.


**Ramping Set Point Value (Read only)**
The actual set point value is displayed i.e. the instantaneous value the controller is working to.

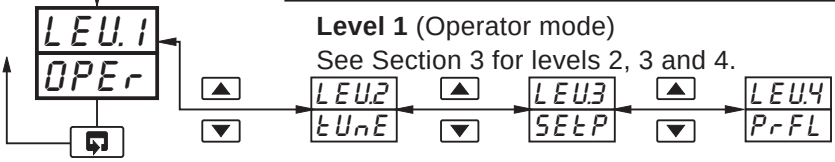



**Security Code**
[0 to 9999]
Select the appropriate security code to access:
Auto-tune enable frame (Level 1),
Set Up mode (Levels 2, 3, 4).




**Auto-tune Enable**
ON – Auto-tune on
OFF – Auto-tune off

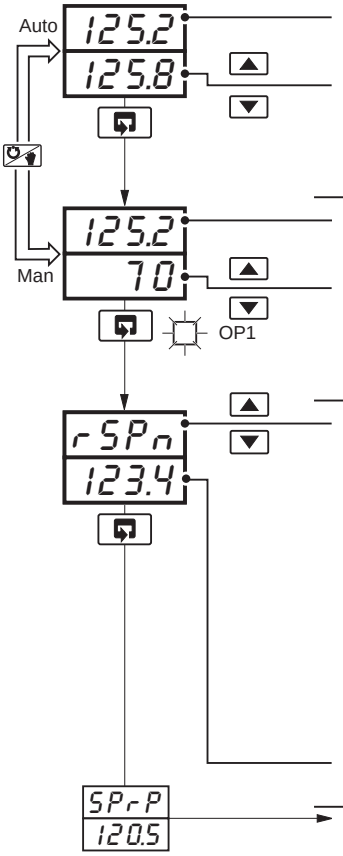
Refer to page 16 for the Auto-tune procedure.




**Level 1** (Operator mode)
See Section 3 for levels 2, 3 and 4.

•1 Not displayed if the ramping set point facility is turned off – refer to Section 3.3.

## 2.4 Remote Set Point Controller




**Process Variable Value**

**Control Set Point Value**
[Set point low to set point high limit]
Adjustable in local Set Point Mode only.

**Process Variable Value**

**Control Output Value (%)**
[0% to 100% (–10% to 110% for analog output)]
Adjustable in manual mode only.

**Remote Set Point Selection**
rSPY – Remote Set Point
rSPn – Local Set Point

Local or remote set point can also be selected using a digital input.

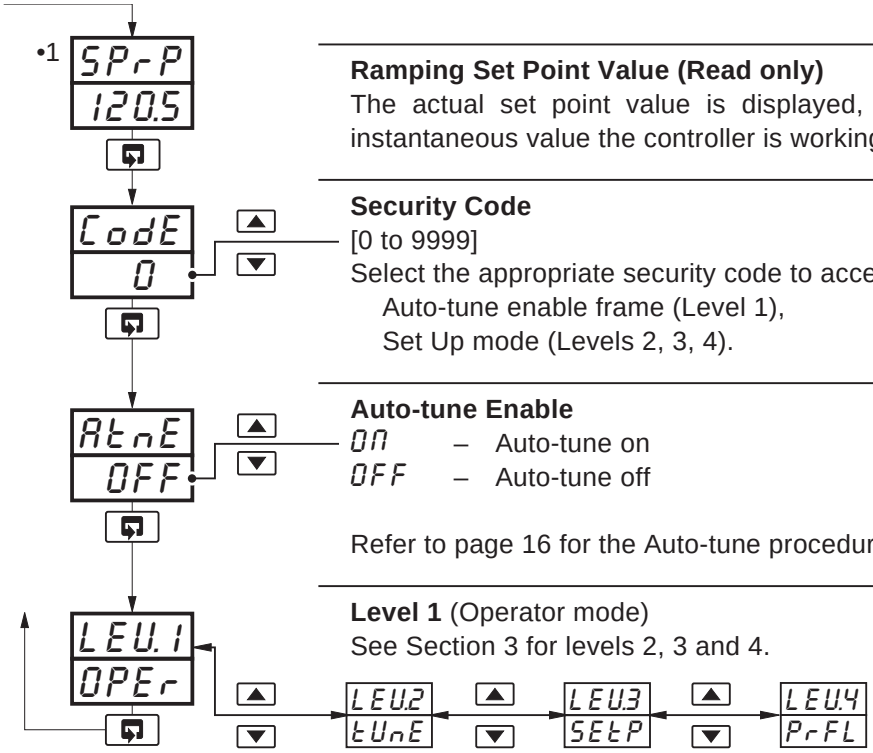
The option to change the set point selection at this frame can be disabled in the configuration level.

**Remote Set Point Value (Read only)**

Continued on next page…

**Note**.
If the remote set point input fails while selected, the controller automatically selects the local set point value. The upper display changes to rSP.F and the lower display flashes. When the fault condition is removed, the remote set point is re-selected automatically. To clear the error condition while the remote set point input is still outside its allowed range, select the local set point by pressing the ▼ key (rSP.n is displayed).

## …2.4 Remote Set Point Controller




**Ramping Set Point Value (Read only)**
The actual set point value is displayed, i.e. the instantaneous value the controller is working to.

**Security Code**
[0 to 9999]
Select the appropriate security code to access:
Auto-tune enable frame (Level 1),
Set Up mode (Levels 2, 3, 4).

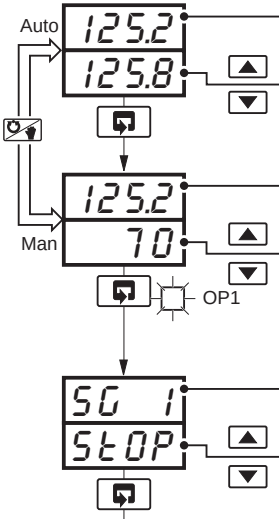
**Auto-tune Enable**
ON – Auto-tune on
OFF – Auto-tune off

Refer to page 16 for the Auto-tune procedure.

**Level 1** (Operator mode)
See Section 3 for levels 2, 3 and 4.

•1 Not displayed if the ramping set point facility is turned off – refer to Section 3.3.

## 2.5 Profile Controller




**Process Variable Value**

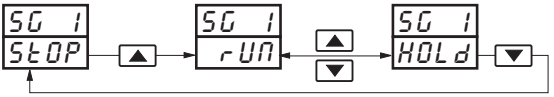
**Control Set Point Value**
[Set point low limit to set point high limit]

**Process Variable Value**

**Control Output Value (%)**
[0% to 100% (–10% to 110% for analog output)]
Adjustable in manual mode only.

**Profile Segment Number** (1 to 4) currently active

**Profile Status**




StOP – **Profile inactive** – the control set point is equal to the local set point value when the profile is not running.

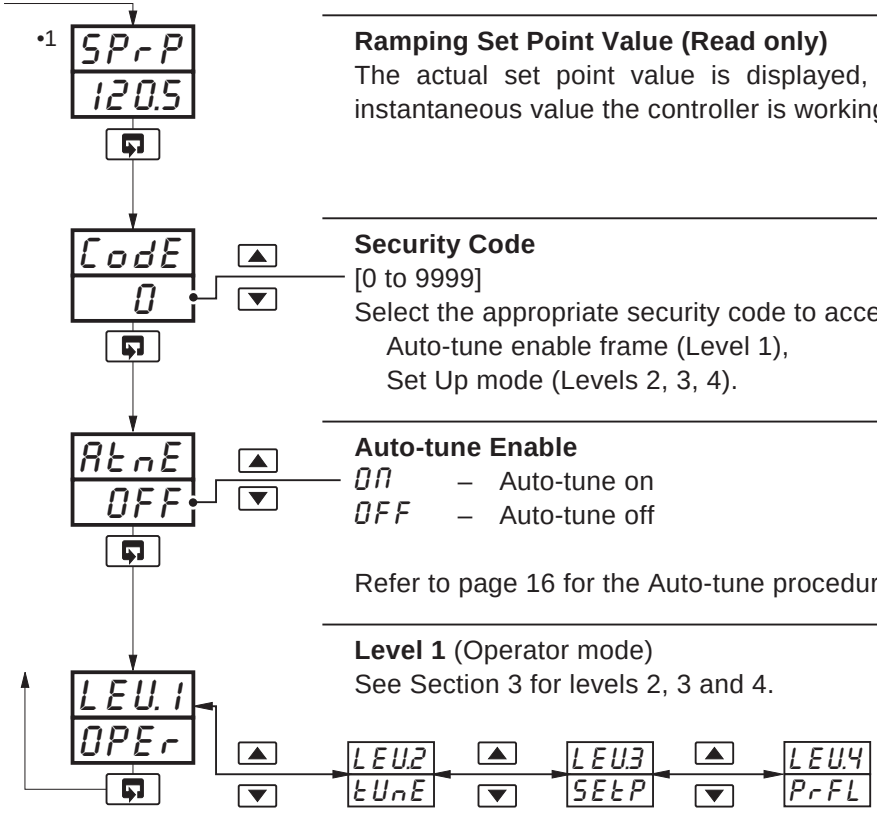
rUn – **Profile active** – currently operating on the segment indicated.

HOLd – **Profile hold** – pauses the current ramp or soak mode by putting it into 'Hold' mode. The guaranteed ramp soak feature can also be used to put the profile into a 'Hold' mode until the process variable comes back within the hysteresis band.

**Note.** The profile status can be changed using a digital input.

Continued on next page…

## …2.5 Profile Controller




**Ramping Set Point Value (Read only)**
The actual set point value is displayed, i.e. the instantaneous value the controller is working to.

**Security Code**
[0 to 9999]
Select the appropriate security code to access:
Auto-tune enable frame (Level 1),
Set Up mode (Levels 2, 3, 4).

**Auto-tune Enable**
ON – Auto-tune on
OFF – Auto-tune off

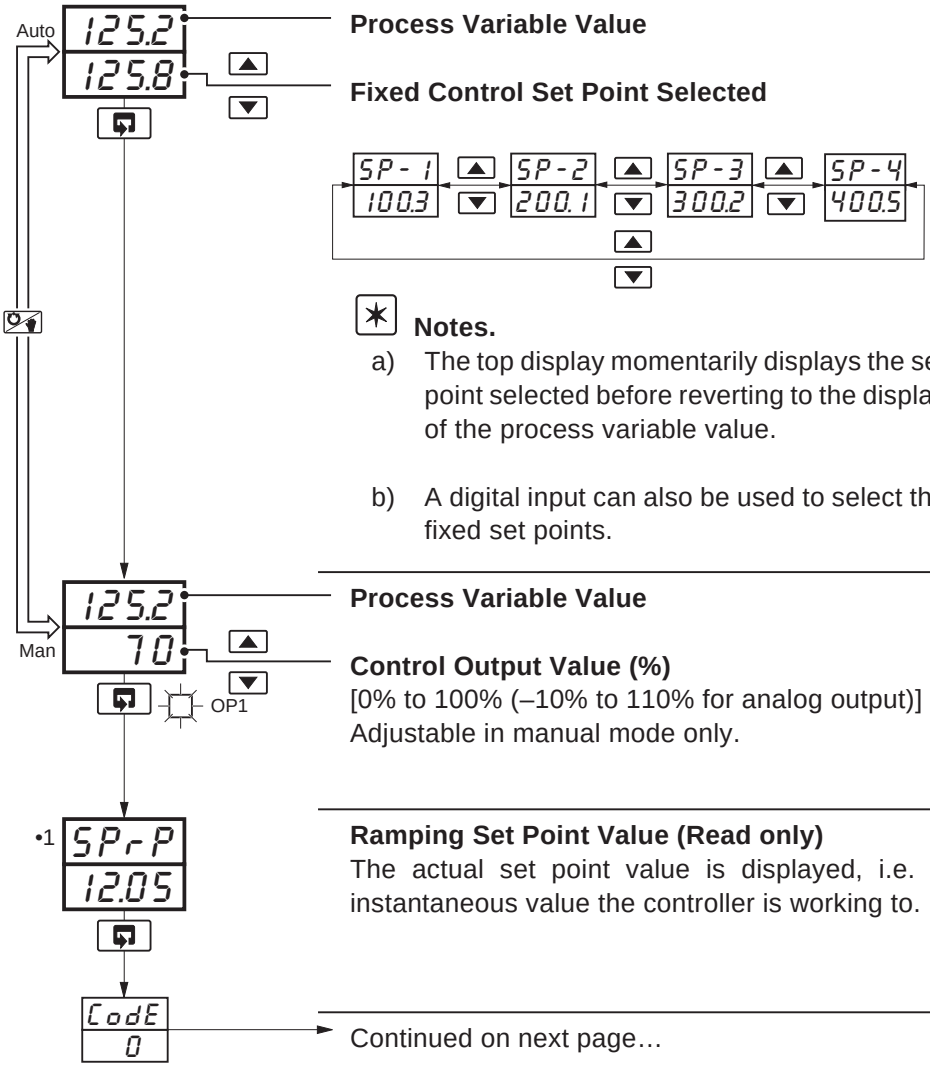
Refer to page 16 for the Auto-tune procedure.

**Level 1** (Operator mode)
See Section 3 for levels 2, 3 and 4.

•1 Not displayed if the ramping set point facility is turned off – refer to Section 3.3.

## 2.6 Multiple Fixed Set Points Controller

If the Multiple Fixed Set Points Controller type is selected during configuration, four fixed control set points can be set – see Section 4.4.




**Process Variable Value**

**Fixed Control Set Point Selected**

**Notes.**

a) The top display momentarily displays the set point selected before reverting to the display of the process variable value.

b) A digital input can also be used to select the fixed set points.

**Process Variable Value**

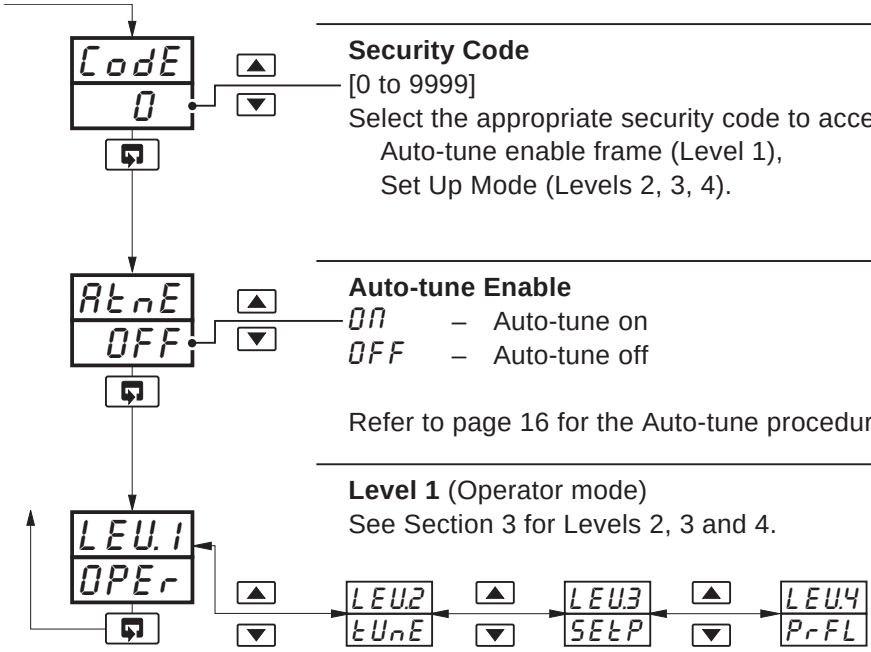
**Control Output Value (%)**
[0% to 100% (–10% to 110% for analog output)]
Adjustable in manual mode only.

**Ramping Set Point Value (Read only)**
The actual set point value is displayed, i.e. the instantaneous value the controller is working to.

Continued on next page…

•1 Not displayed if the ramping set point facility is turned off – refer to Section 3.3.

## …2.6 Multiple Fixed Set Points Controller




**Security Code**
[0 to 9999]
Select the appropriate security code to access:
Auto-tune enable frame (Level 1),
Set Up Mode (Levels 2, 3, 4).

**Auto-tune Enable**
ON – Auto-tune on
OFF – Auto-tune off

Refer to page 16 for the Auto-tune procedure.

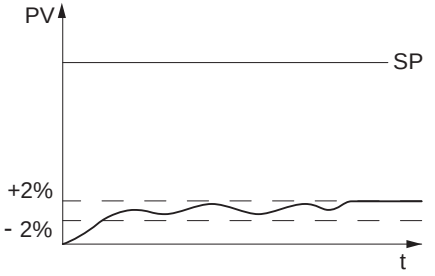
**Level 1** (Operator mode)
See Section 3 for Levels 2, 3 and 4.

## 2.7 Auto-tune

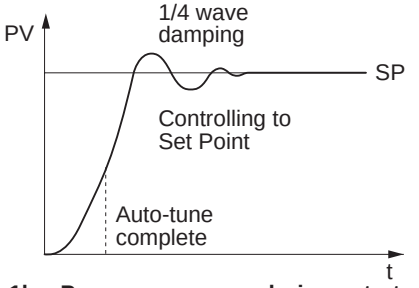
**Information.**

- Auto-tune optimizes process control by monitoring process performance and automatically updates the control parameters.
- Before starting auto-tune, the process variable must be stable (±2% of engineering range).

**1 – 'At start up' auto-tune (from manual mode)**

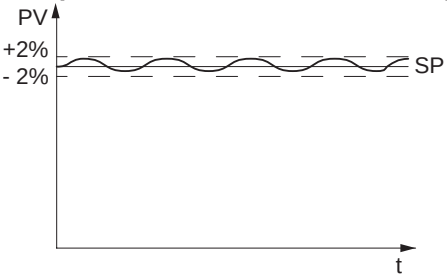



**1a – Stable process before auto-tune**

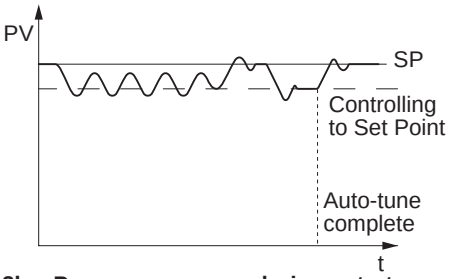



**1b – Process response during auto-tune**

**2 – 'At set point' auto-tune (from manual or automatic mode)**

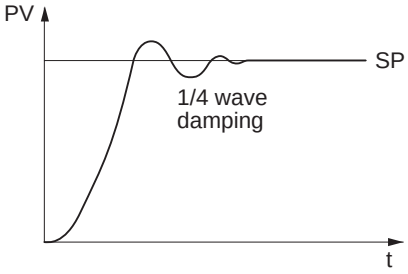



**2a – Stable process before auto-tune**




**2b – Process response during auto-tune**

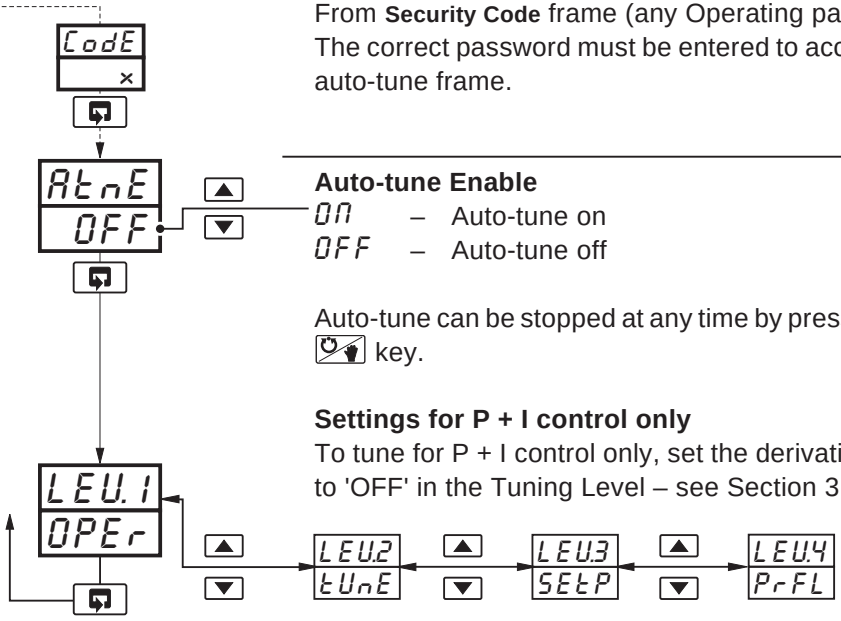
**Note.** The time taken to complete auto-tune depends upon the system response time.




**Process response after auto-tune**

**Fig 2.1 Typical Auto-tune Cycles**

## …2.7 Auto-tune




From **Security Code** frame (any Operating page). The correct password must be entered to access the auto-tune frame.

**Auto-tune Enable**

ON – Auto-tune on

OFF – Auto-tune off

Auto-tune can be stopped at any time by pressing the key.

**Settings for P + I control only**

To tune for P + I control only, set the derivative term to 'OFF' in the Tuning Level – see Section 3.2.

**Notes.**

- On completion, the controller enters auto control mode and begins to control the process using the new PID values. For fine tuning – see Section 3.
- For heat/cool control the cool proportional band is set to the same value as the heat proportional band (this value may need modification).
- If an error occurs during auto-tune, the controller reverts to manual mode with the control output set to the configured output value. An error message is displayed – see Table 2.1.

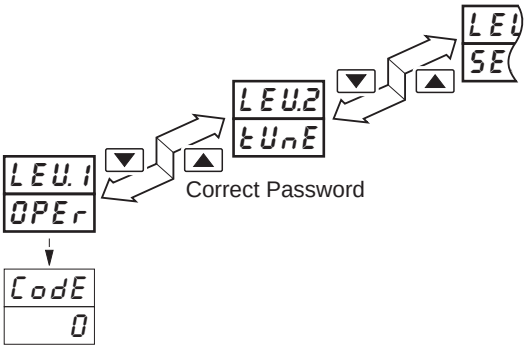
| Error | Description | Error | Description |
|---|---|---|---|
| 1 | PV failed during auto-tune | 7 | A resultant P, I or D value was calculated out of range |
| 2 | Auto-tune has timed out during an auto-tune step | 8 | PV limit exceeded (At start up auto-tune) |
| 3 | Process too noisy to auto-tune | 9 | Controller put into configuration mode |
| 4 | Process too fast to auto-tune | 10 | Auto-tune terminated by user |
| 5 | Process too slow to auto-tune | 11 | PV is changing in the wrong direction during step test |
| 6 | PV deviated from set point by >25% eng. span during frequency response test | | |

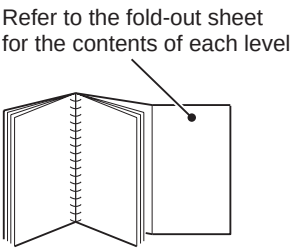
**Table 2.1 Auto-tune Error Codes**

# 3 SET UP MODE

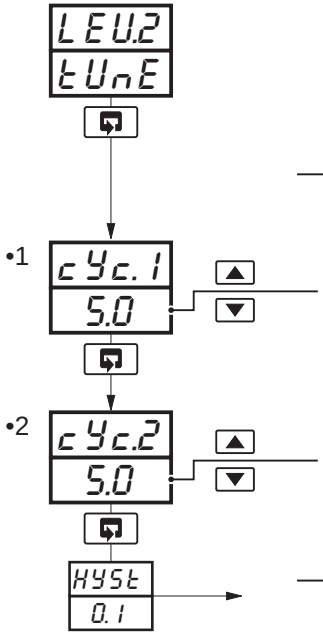
## 3.1 Introduction

To access the Set Up Mode (Levels 2, 3 and 4) the correct password must be entered in the security code frame (the default password code is 0). Refer to the fold-out sheet at the back of this manual for the contents of these levels.




## 3.2 Tuning (Level 2) – Fig. 3.2




**Level 2 – Tuning Level**

✶ **Note.** To select this frame from anywhere in this page, press the ↺ key for a few seconds.

**Cycle Time**

**Heat Time Proportioning Output**
[1.0 to 300.0 seconds (<1.0 = 'On/Off' control)]

**Cool Time Proportioning Output**
[1.0 to 300.0 seconds (<1.0 = 'On/Off control)]

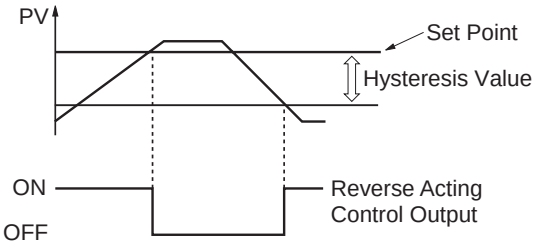
Continued on next page.

•1 Only displayed if Output 1 is assigned to a relay or logic output.
•2 Only displayed if heat/cool hardware configuration is selected.

## ...3.2 Tuning (Level 2) – Fig. 3.2

•1 HYST 0.1

**On/Off Hysteresis Value**
**(used for both heat and cool outputs)**
[In engineering units]




**Proportional Band**
Enter the proportional band value for the heat and cool outputs.

Pb-h 100.0

**Heat Output (Output 1)**
[0.1% to 999.9%]

•2 Pb-c 100.0

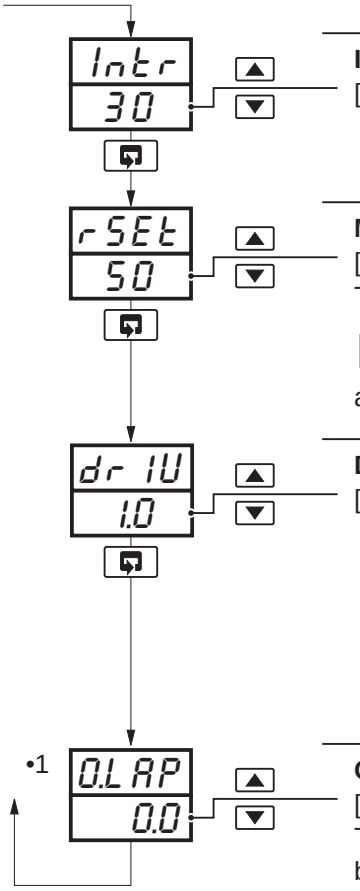
**Cool Output (Output 2)**
[0.1% to 999.9%]

Intr 30

Continued on next page.

•1 Only displayed if On/Off control is selected for either output.
•2 Only displayed if heat/cool hardware configuration is selected.

## ...3.2 Tuning (Level 2)




**Integral Action Time**
[1 to 7200 seconds or OFF (OFF=0)]

**Manual Reset Value**
[0% to 100% or –100% to +100% for heat/cool]
This value is applied as a bias to the control output.

**Note.** Manual reset is applied with integral action both on and off.

**Derivative Action Time**
[0.1 to 999.9 seconds or OFF (OFF=0)]

**Overlap for Heat/Cool Control**
[–20.0% to +20.0%]
This frame defines the portion of the proportional band (Proportional band heat + Proportional band cool) over which both outputs are active – see Fig. 3.1. Neither output is active in the deadband.

A positive value gives an overlap and a negative value a deadband.

•1 Only displayed if a heat/cool hardware configuration is selected.

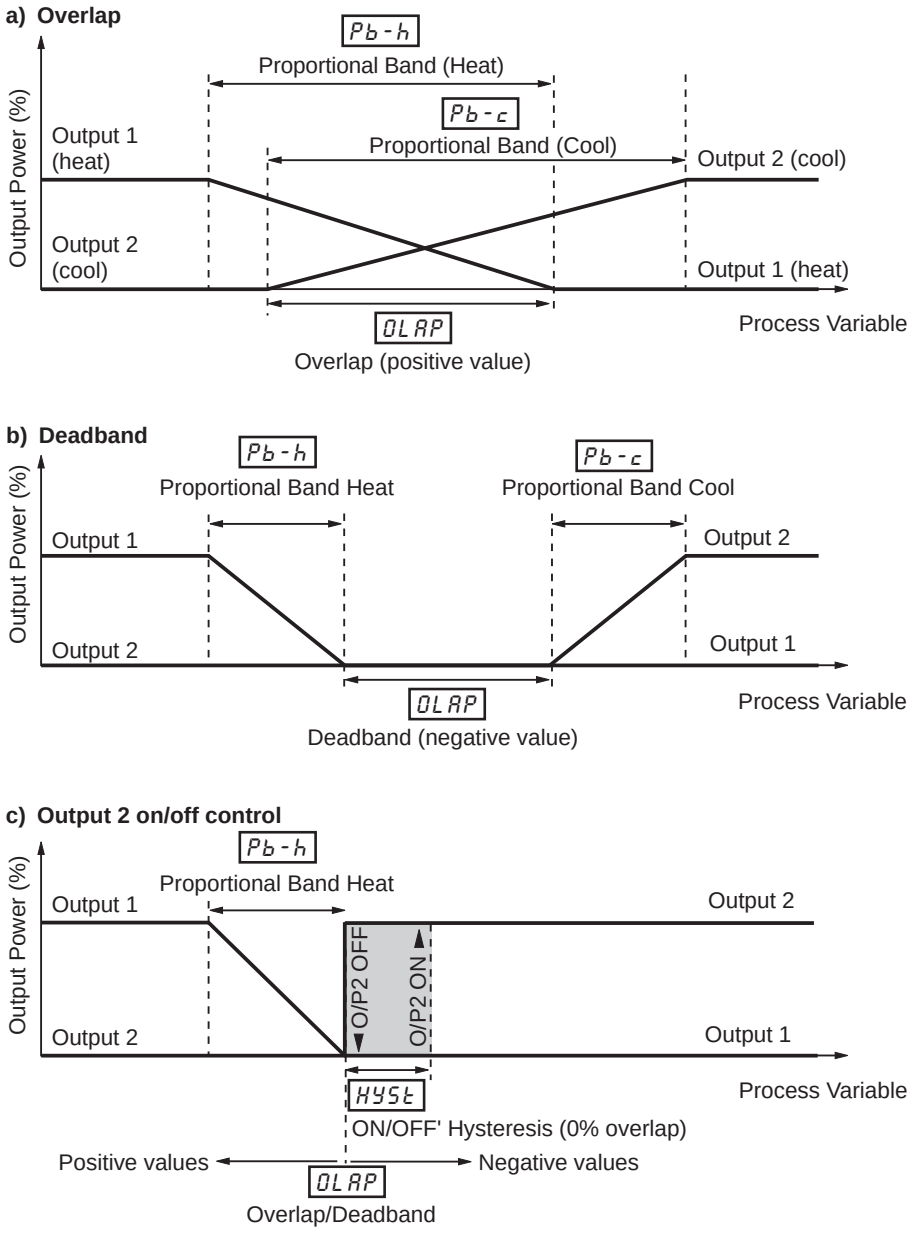
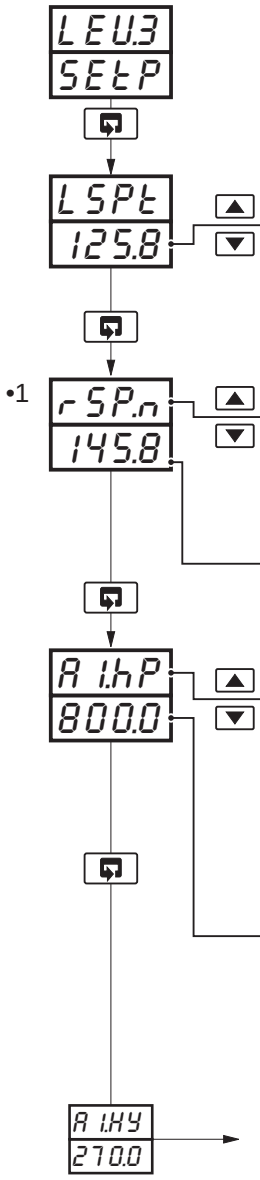



**Fig. 3.1 Proportional Band & Deadband/Overlap – Heat/Cool Control Only**

## 3.3 Set Points (Level 3)




**Level 3 – Set Points Level**

**Note.** To select this frame from anywhere in this page, press the key for a few seconds.

**Local Set Point Value**

[Within set point high and low limits, in engineering units]

**Remote Set Point Selection**

Set Point Type:

- rSP.Y – remote set point
- rSP.n – local set point

Remote set point value.

**Alarm 1 Trip Point**

Alarm type:

- AI.hP = High process alarm
- AI.LP = Low process alarm
- AI.hd = High deviation alarm
- AI.Ld = Low deviation alarm
- AI.Lb = Loop break alarm

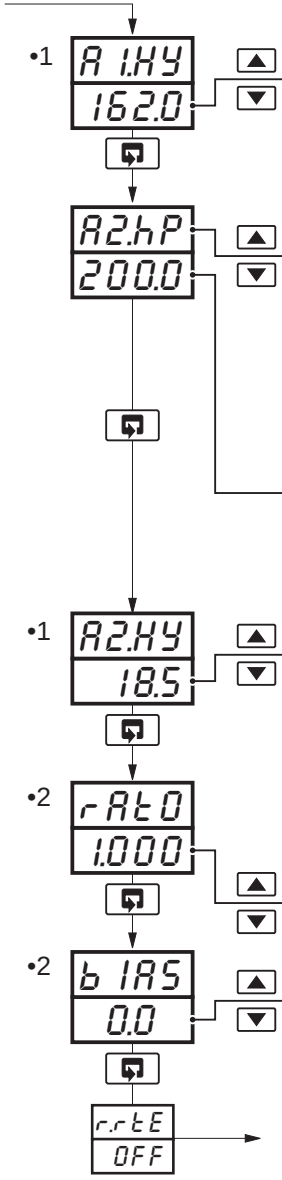
Trip Point:

Process & deviation alarms [in engineering units]
Loop break alarm [1 to 9999 seconds]

Continued on next page.

•1 Only displayed if the remote set point option is selected.

## …3.3 Set Points (Level 3)




**Alarm 1 Hysteresis Value**
[in engineering units]

**Alarm 2 Trip Point**
Alarm type:
- A2.hP = High process alarm
- A2.LP = Low process alarm
- A2.hd = High deviation alarm
- A2.Ld = Low deviation alarm
- A2.Lb = Loop break alarm

Trip Point:
Process & deviation alarms [in engineering units]
Loop break alarm [1 to 9999 seconds]

**Alarm 2 Hysteresis Value**
[in engineering units]

**Remote Set Point Input Ratio and Bias**
The remote set point value =
ratio x remote set point input + bias.

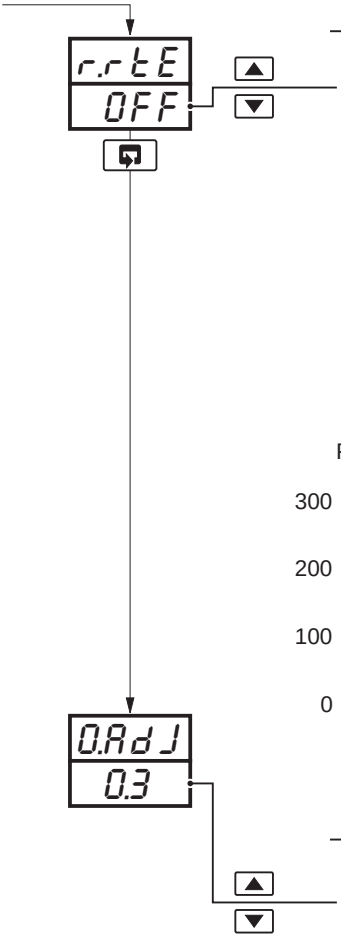
**Ratio**
[0.001 to 9.999]

**Bias**
[in engineering units]

Continued on next page.

•1 Only displayed if custom alarm hysteresis is selected – see section 4.3.2, not displayed if Loop Break Alarm type selected.
•2 Only displayed if the remote set point option is selected.

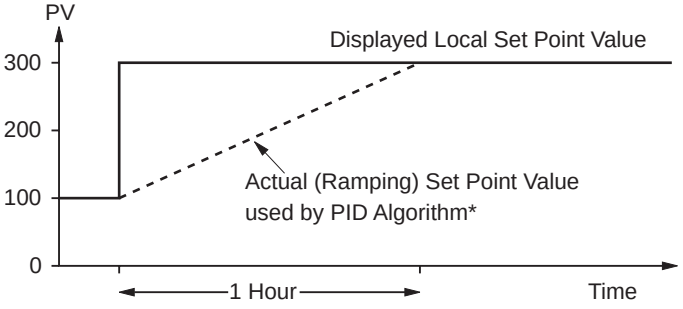
## …3.3 Set Points Level




**Ramp Rate (for ramping set point facility)**
[1 to 9999 engineering units per hour, or OFF]

The ramping set point facility can be used to prevent a large disturbance to the control output when the set point value is changed. This only applies to the local and multiple fixed set points.

**Note.** For remote set points the ramp rate is applicable when switching from remote to local, not local to remote



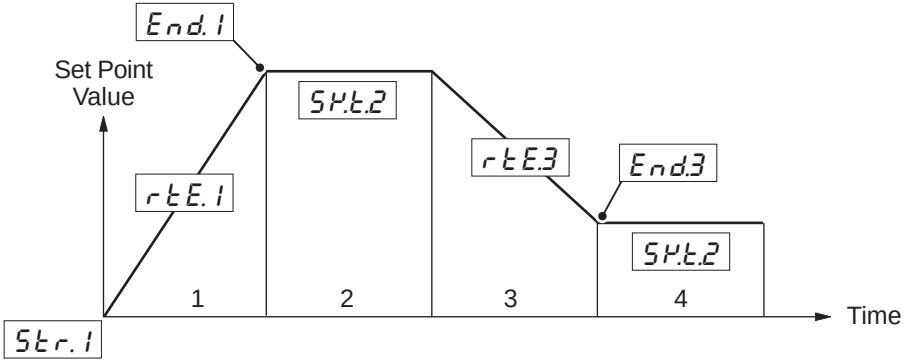

* e.g. Ramp Rate = 200 Increments/Hour

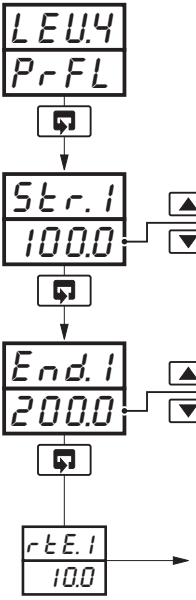
**Offset Adjustment**
An offset can be applied to the process variable input to enable spot calibration or the removal of system errors.

[±10% of engineering range in engineering units]

## 3.4 Profile (Level 4)

A four-segment ramp/soak profile facility is provided. This level can only be accessed if the profile option is selected in the configuration level. The four segments are fixed as ramps or soaks as follows:




**Level 4 – Profile Level**

**Note.** To select to this frame from anywhere in this page, press the key for a few seconds.

•1

**Start Value for 1st Segment (ramp).**
[Within display range (in engineering units)]

Enter the start value required.

**End Value for 1st Segment (ramp).**
[Within display range (in engineering units)]

Enter the end value required.

Continued on next page.

•1 With the self-seeking set point facility enabled, the first ramp starts at the current process variable value instead of the start value for the 1st segment.

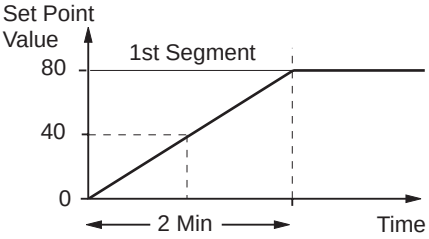
## ...3.4 Profile (Level 4)

•1 rtE.1 / 40.00

**Ramp Rate for 1st Segment.**
[Engineering units* ]

Enter the ramp rate required.

* The time option Eng Units/hr or Eng Units/min is set in the configuration level – see section 4.3.2.




**Example.** Required Ramp Rate 40°C/min
Ramp Rate set to 40, Time Option set to 'Min' – see section 4.3.2

SP.t.2 / 60.00

**Soak Time for 2nd Segment.**
[0 to 999.9 minutes or hours]*

End.3 / 100.0

**End Value for 3rd Segment (ramp).**
[Within display range (in engineering units)]

rtE.3 / 20.00

**Ramp Rate for 3rd Segment.**
[Engineering units/hour or /minute]*

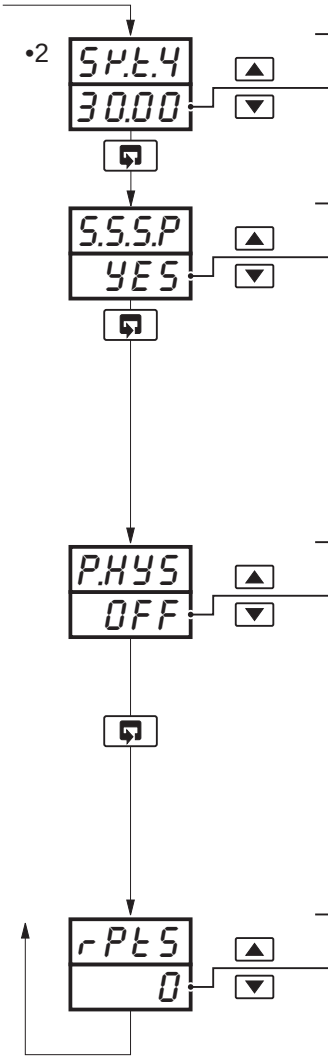
* Depending on the time option selected in the configuration level.

SP.t.4 / 30.00

Continued on next page.

•1 The engineering value is shown with an extra decimal place (up to a maximum of 3) for greater accuracy in setting the ramp rate.

## …3.4 Profile (Level 4)




**Soak Time for 4th Segment.**
[0 to 999.9 minutes or hours]*
* Depending on the time option selected in the configuration level.

**Self-Seeking Set Point Enable.**
YES – enable self-seeking set point
nO – disable self-seeking set point

When enabled, the controller inserts the current process variable value as the starting point on initiation of the profile (instead of the start value for segment 1).

**Profile Hysteresis for Guaranteed Ramp/Soak.**
[In engineering units or OFF = 0]

If the process variable deviates from the set point by more than the value set, the program is suspended but continues automatically when the process variable returns within the set limits. The hysteresis value applies above and below the set point under all program conditions.

**Number of Program Repeats**
[0 to 99 or infinite ( InFt > 100)]

•2 The engineering value is shown with an extra decimal place (up to a maximum of 3) for greater accuracy in setting the ramp rate.

# 4 CONFIGURATION MODE

## 4.1 Introduction

The Configuration Mode comprises two levels (5 and 6) as shown in Fig. 4.2.

Level 5 is divided into four frames. For most simple applications, it is only necessary to set up the parameters in the first frame.

**Note.**

When in the configuration level:

- All the LED indicators flash.
- All relays and logic outputs are turned off.
- The analog output reverts to 0% (4mA) output level.

## 4.2 Accessing the Configuration Mode – Fig. 4.1

To access the Configuration Mode, set the security switch to the 'Configure' position (levels 1 to 4 cannot be accessed from this setting). When the configuration parameters are programmed, reset the security switch to the 'Normal' position and the Operating page is displayed automatically .

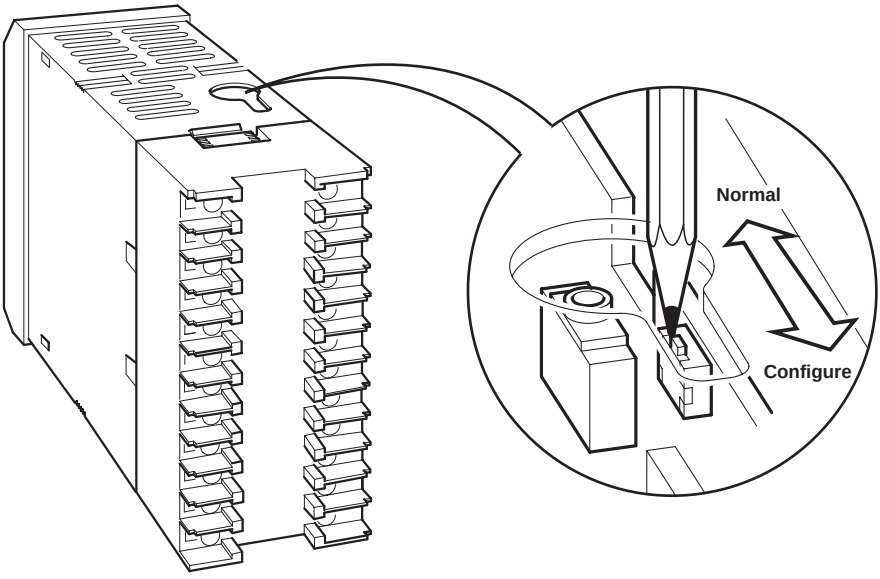



**Fig. 4.1 Accessing the Configuration Mode (Config/Normal Switch)**

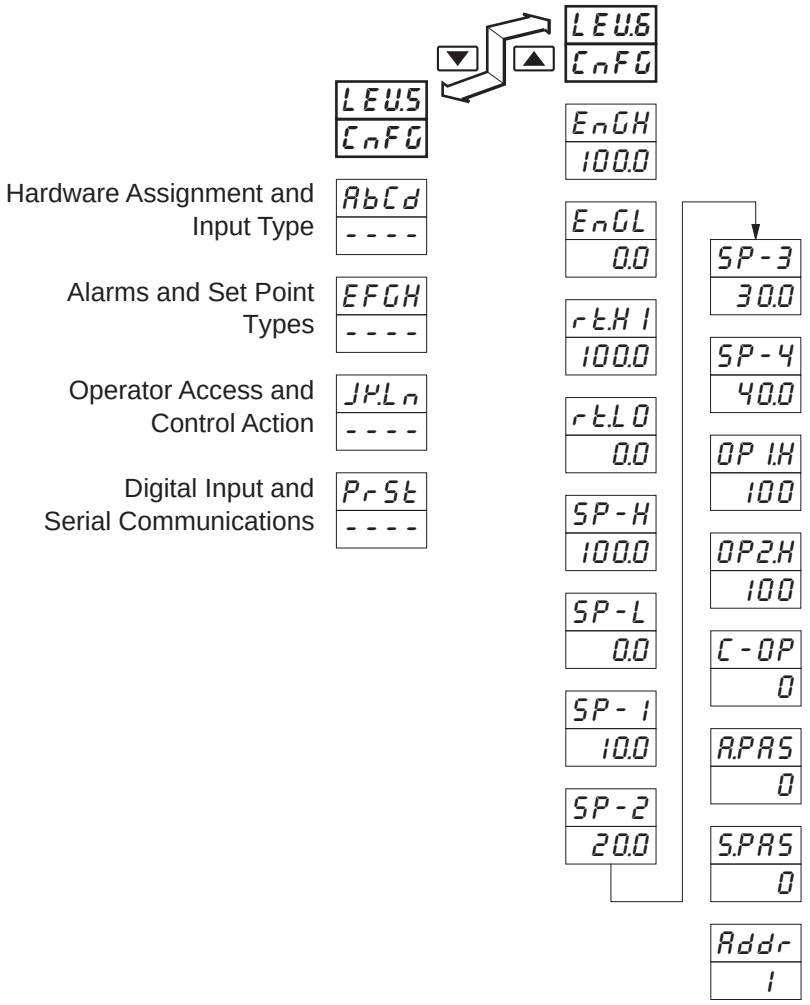
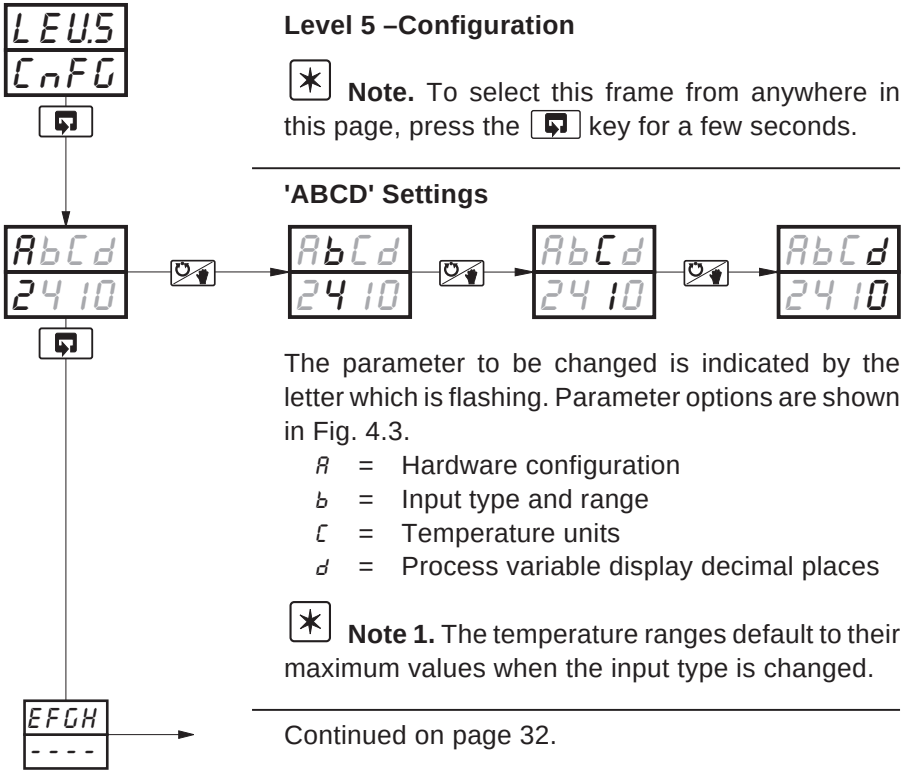



**Fig. 4.2 Configuration Frames (Levels 5 and 6)**

## 4.3 Basic Hardware and Configuration (Level 5)

### 4.3.1 Hardware Assignment and Input Type – Fig. 4.3




**Level 5 –Configuration**

**Note.** To select this frame from anywhere in this page, press the key for a few seconds.

**'ABCD' Settings**

The parameter to be changed is indicated by the letter which is flashing. Parameter options are shown in Fig. 4.3.

- A = Hardware configuration
- b = Input type and range
- C = Temperature units
- d = Process variable display decimal places

**Note 1.** The temperature ranges default to their maximum values when the input type is changed.

Continued on page 32.


**A – Hardware Configuration**

| Freq. | | Relay 1 | Relay 2* | Relay 3* | Logic O/P | An. O/P | Control Type |
|---|---|---|---|---|---|---|---|
| 50Hz | 60Hz | | | | | | |
| 1 | A | Output 1 | Alarm 1 | Alarm 2 | Output 1 | PV | Time Prop. or On/Off |
| 2 | b | Alarm 1 | Alarm 2 | None | None | Output 1 | Analog Prop. |
| 3 | C | Output 1 | Output 2 | Alarm 1 | Output 1 | PV | Heat – Time Prop.<br>Cool – Time Prop. |
| 4 | d | Output 2 | Alarm 1 | Alarm 2 | Output 2 | Output 1 | Heat – Analog<br>Cool – TP or On/Off |
| 5 | E | Alarm 1 | Alarm 2 | None | Output 1 | PV | Alarm Unit or Logic O/P<br>Time Prop. |
| U | | Custom | Custom | Custom | Custom | Custom | Custom |

* Only available if option board is fitted


**B – Input Type and Range Configuration**

| Display | | Display | |
|---|---|---|---|
| b | T/C Type B | 1 | 0 to 20 mA |
| E | T/C Type E | 2 | 4 to 20 mA |
| J | T/C Type J | 3 | 0 to 5 V |
| K | T/C Type K | 4 | 1 to 5 V |
| n | T/C Type N | 6 | 0 to 50 mV |
| r | T/C Type R | 7 | 4 to 20 mA (square root linearizer) |
| S | T/C Type S | U | Custom Configuration |
| t | T/C Type T | | |
| P | PT100 RTD | | |


**C – Temperature Units**

| Display | Temperature Units |
|---|---|
| C | Degrees C* |
| F | Degrees F* |
| 0 | No temperature units |

* Temperature inputs only

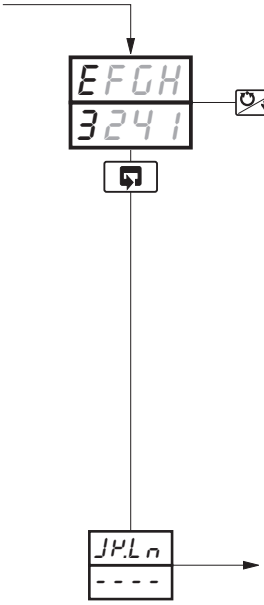

**D – Process Variable Display Decimal Places**

| Display | |
|---|---|
| 0 | xxxx |
| 1 | xxx . x |
| 2 | xx . xx |
| 3 | x . xxx |

**Fig. 4.3 Hardware Assignment and Input Type**

### 4.3.2 Alarms and Set Point Types – Fig. 4.4

**Note.** All relays are **de-energized** in the alarm state.




**'EFGH' Settings**

The parameter to be changed is indicated by the letter which is flashing. Parameter options are shown in Fig. 4.4.

- E = Alarm 1 type
- F = Alarm 2 type
- G = Alarm Hysteresis
- H = Set Point type

Continued on page 36.

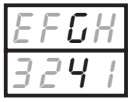

**E – Alarm 1 Type***

| Display | |
|---|---|
| 0 | None |
| 1 | High Process |
| 2 | Low Process |
| 3 | High Deviation |
| 4 | Low Deviation |
| 5 | Loop Break |


**F – Alarm 2 Type***

| Display | |
|---|---|
| 0 | None |
| 1 | High Process |
| 2 | Low Process |
| 3 | High Deviation |
| 4 | Low Deviation |
| 5 | Loop Break |

* Refer to Figs. 4.5 and 4.6 for alarm action




**G – Alarm Hysteresis**

| Display | |
|---|---|
| 0 | None |
| 1 | 0.1% |
| 2 | 0.2% |
| 3 | 0.5% |
| 4 | 1.0% |
| 5 | 2.0% |
| 6 | 5.0% |
| U | Custom |

Value in % of engineering range

Value in engineering units ✶1

✶ **Note 1.** When custom alarm hysteresis is selected, the alarm hysteresis values are set individually in the **set up level** – see section 3.3


**H – Set Point Type**

| Display | |
|---|---|
| 0 | Local Set Point Only |
| 1 | Local + Remote Set Point (no Remote Set Point Tracking)** ✶2 |
| 2 | Local + Remote Set Point (with Remote Set Point Tracking)** |
| 3 | Multiple Fixed Set Points |
| 4 | Ramp/Soak (Time Units in Minutes) |
| 5 | Ramp/Soak (Time Units in Hours) |

**Only available if option board is fitted. Remote set point input is 4 to 20 mA

✶ **Note 2.** With remote set point tracking enabled, the local set point tracks the remote set point when in the remote set point mode.

**Fig. 4.4 Alarms and Set Point Types**

### …4.3.2 Alarms and Set Point Types – Fig. 4.4

**Note.** All relays are **de-energized** in the alarm state.

#### Loop Break Alarm

The loop break alarm indicates a fault in the control loop (e.g. failure of a heating element in a furnace). If the control output remains at maximum or minimum for a time exceeding the trip value (in seconds) without any response in the process value, the loop break alarm is activated.

#### Process and Deviation Alarms (High/Low) – Figs 4.5 and 4.6

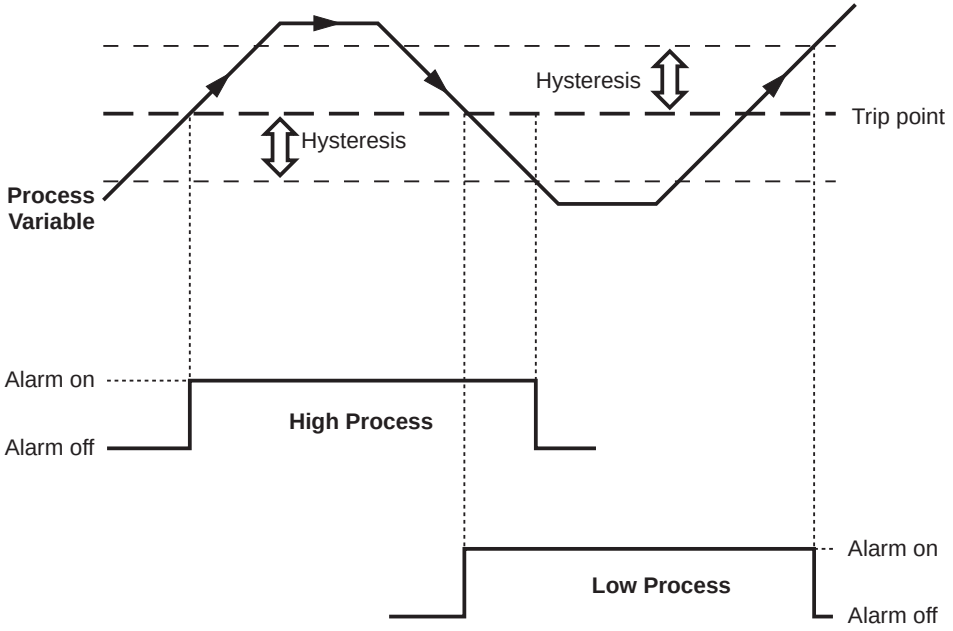
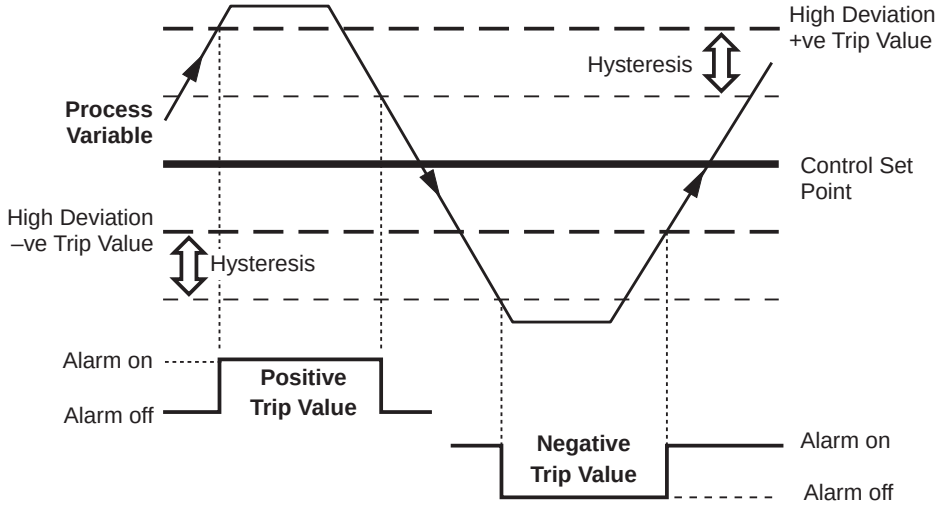
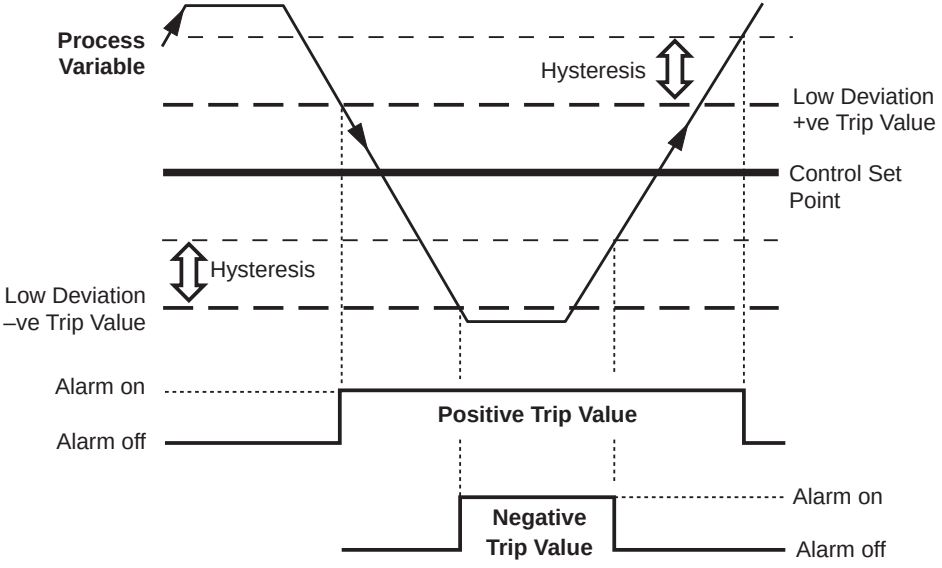



**Fig. 4.5 High and Low Process Alarm Action**




**High Deviation Alarm**

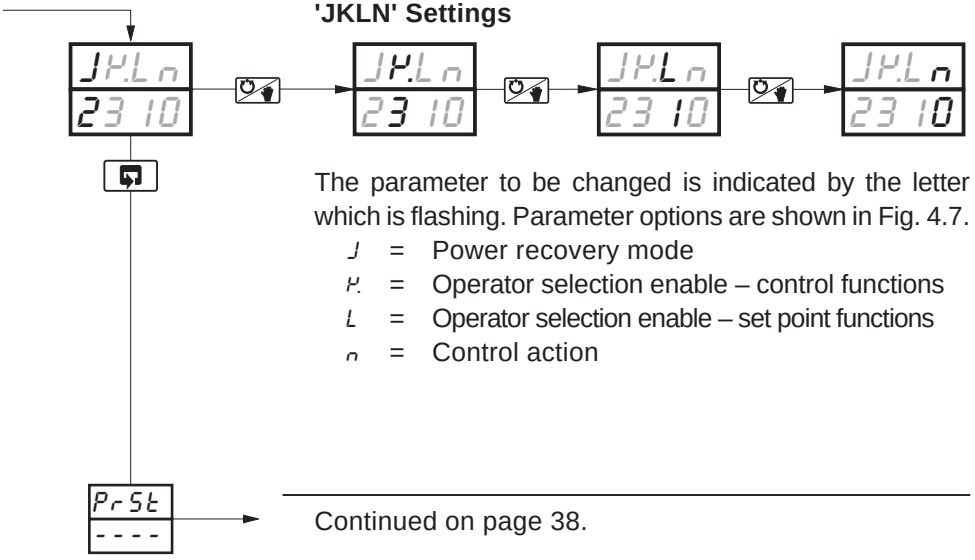



**Low Deviation Alarm**

**Fig. 4.6 High and Low Deviation Alarm Action**

### 4.3.3 Operator Access and Control Action – Fig. 4.7

**'JKLN' Settings**




The parameter to be changed is indicated by the letter which is flashing. Parameter options are shown in Fig. 4.7.

- J = Power recovery mode
- K = Operator selection enable – control functions
- L = Operator selection enable – set point functions
- n = Control action

Continued on page 38.


**J – Power Recovery Mode**

| Display | Mode |
|---|---|
| 0 | Last Mode |
| 1 | Manual with Last Output |
| 2 | Manual with 0.0% Output |
| 3 | Manual with 100.0% Output |
| 4 | Auto |
| U | Custom |


**K – Operator Selection Enable Control Functions**

| Display | Auto/Manual and Auto-tune |
|---|---|
| 0 | Enable Both Functions |
| 1 | Disable A/M, Enable Auto-tune |
| 2 | Enable A/M, Disable Auto-tune |
| 3 | Disable Both Functions |


**L – Operator Selection Enable – Set Point Functions**

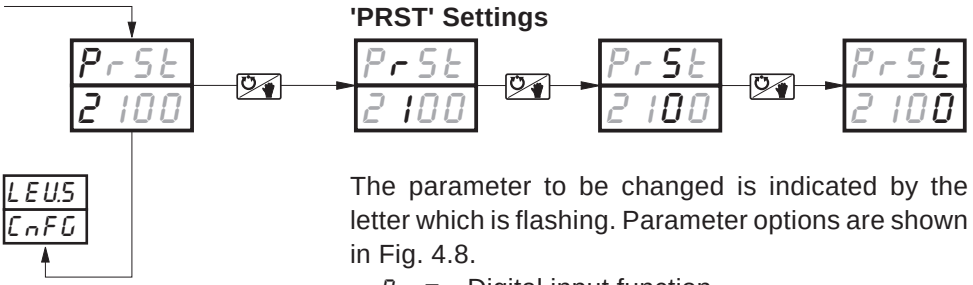
| Display | Local Set Point Adjustment and Local/Remote Set Point Selection |
|---|---|
| 0 | Enable Both Functions |
| 1 | Disable Set Point Adjust, Enable Local/Remote Selection |
| 2 | Enable Set Point Adjust, Disable Local Remote Function |
| 3 | Disable Both Functions |


**N – Control Action**

| Display | Heat Action | Cool Action |
|---|---|---|
| 0 | Reverse | Direct |
| 1 | Direct | Reverse |

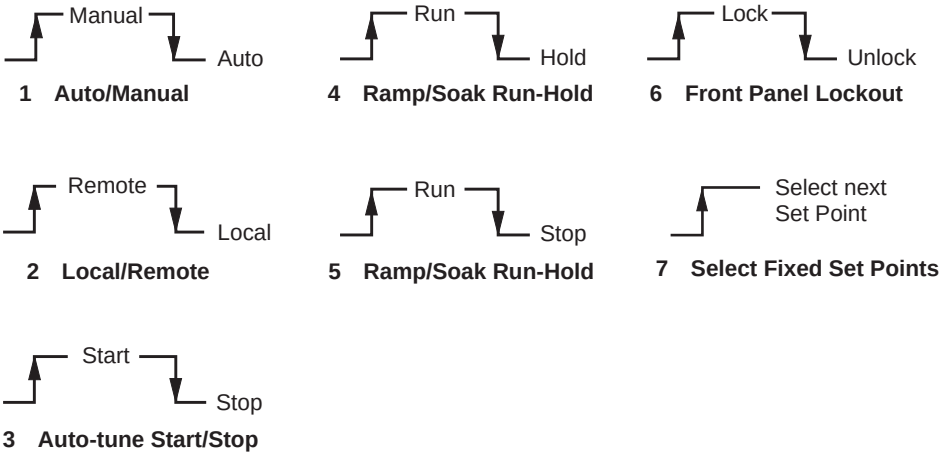
**Fig. 4.7 Operator Access and Control Action**

### 4.3.4 Digital Input and Serial Communications – Fig. 4.8




The parameter to be changed is indicated by the letter which is flashing. Parameter options are shown in Fig. 4.8.

- P = Digital input function
- r = Analog input digital filter
- S = Serial communications configuration
- t = Serial communication parity




*i* **Information.** All digital input functions except Front Panel Lockout are edge-triggered to enable the front panel keys to change the function when the digital input is operational.

**Fig. 4.8 Digital Inputs**

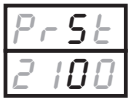

**P – Digital Input Functions**

| Display | Function |
|---|---|
| 0 | None |
| 1 | Auto/Manual |
| 2 | Local/Remote |
| 3 | Auto-tune Start |
| 4 | Ramp/Soak Run-Hold |
| 5 | Ramp/Soak Run-Stop |
| 6 | Front Panel Lockout |
| 7 | Select Fixed Set Points |


**R – Analog Input Digital Filter**

| Display | |
|---|---|
| 0 | 0 seconds |
| 1 | 1 second |
| 2 | 2 seconds |
| 5 | 5 seconds |
| A | 10 seconds |
| B | 20 seconds |
| C | 40 seconds |
| D | 60 seconds |

Input filter averages the process variable input values over the time set




**S – Serial Communication Configuration**

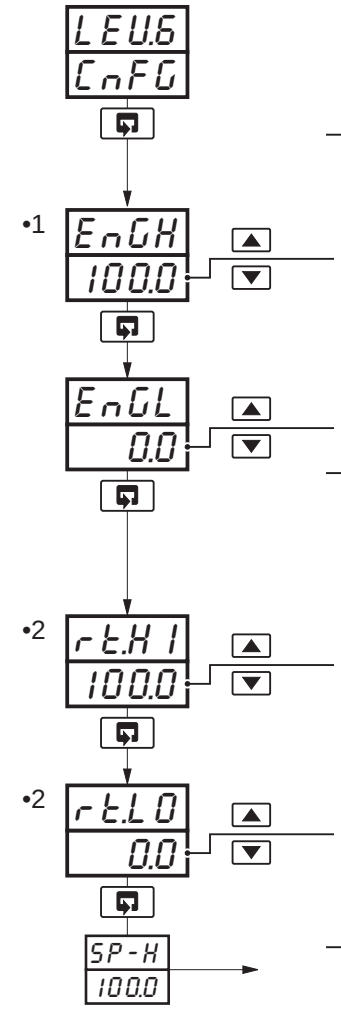
| Display | Baud Rate, 2/4 Wire |
|---|---|
| 0 | Off |
| 1 | 2400, 2 Wire |
| 2 | 2400, 4 Wire |
| 3 | 9600, 2 Wire |
| 4 | 9600, 4 Wire |


**T – Serial Communications Parity**

| Display | |
|---|---|
| 0 | None |
| 1 | Odd |
| 2 | Even |

**Fig. 4.9 Digital Input and Serial Communications**

## 4.4 Ranges and Passwords (Level 6)




**Ranges and Limits**

**Engineering (Display) Range**

**High Value**
[–999 to 9999]

**Low Value**
[–999 to 9999]

**Retransmission Range**
The retransmission range defines engineering range to be transmitted

**High (20mA output)**
[–999 to 9999 (in engineering units)]

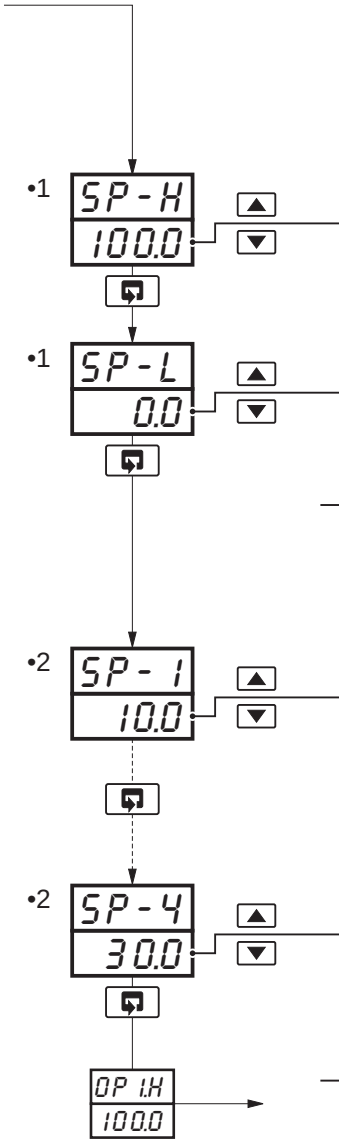
**Low (4mA output)**
[–999 to 9999 (in engineering units)]

Continued on next page…

•1 The engineering range high and low values are automatically set to the maximum allowed value when thermocouple or RTD is selected in the configuration level – see Section 4.3.1. This value can be modified if required.

•2 Only displayed if the analog output is configured to retransmit the process variable or control set point value.

## …4.4 Ranges and Passwords (Level 6)




**Set Point Limit**
The Set Point Limit defines limits within which the local set point can be adjusted (these limits also apply to remote set point).

**High Limit**
[–999 to 9999]

**Low Limit**
[–999 to 9999]

**Fixed Set Point Values (1 to 4)**
Select the set point values required in the multiple fixed set point facility.

**Fixed Set Point 1**
[–999 to 9999 (in engineering units)]

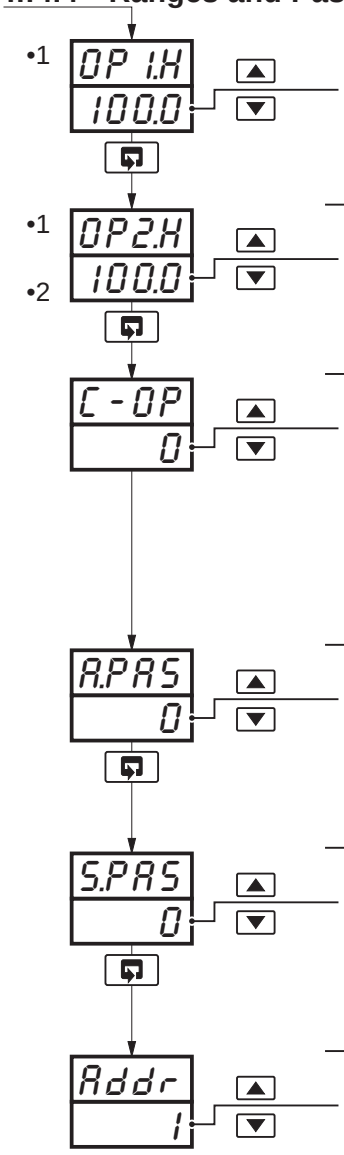
**Fixed Set Point 4**
[–999 to 9999 (in engineering units)]

Continued on next page…

•1 This limit applies to the local and remote set point values.

•2 Only displayed if the multiple fixed set point facility is selected.

## ...4.4 Ranges and Passwords (Level 6)




**Output 1 (Heat) High Limit**
[0% to 110%]

**Output 2 (Cool) High Limit**
[0% to 110%]

**Configured Output**
[–10% (–110% for heat/cool) to 110% or LAST (default)]
This output value is used when:
- – Manual control is selected using a digital input,
- – the process variable input fails,
- – the auto-tune fails.

**Auto-Tune Password**
[0 to 9999 (default 0)]

Enables access to the auto-tune facility in the operating level (Level 1).

**Setup Password**
[0 to 9999 (default 0)]

This password enables access to the setup levels (levels 2, 3, and 4) and to the auto tune facility.

**MODBUS Address**
[1 to 99]

This frame allows the MODBUS address to be set.

•1 This value only applies in automatic mode.
The low limit is automatically set to 0.0% (–10% for analog outputs).

•2 Only displayed if a heat/cool hardware configuration is selected.

# 5 INSTALLATION

## 5.1 Siting – Figs. 5.1 and 5.2

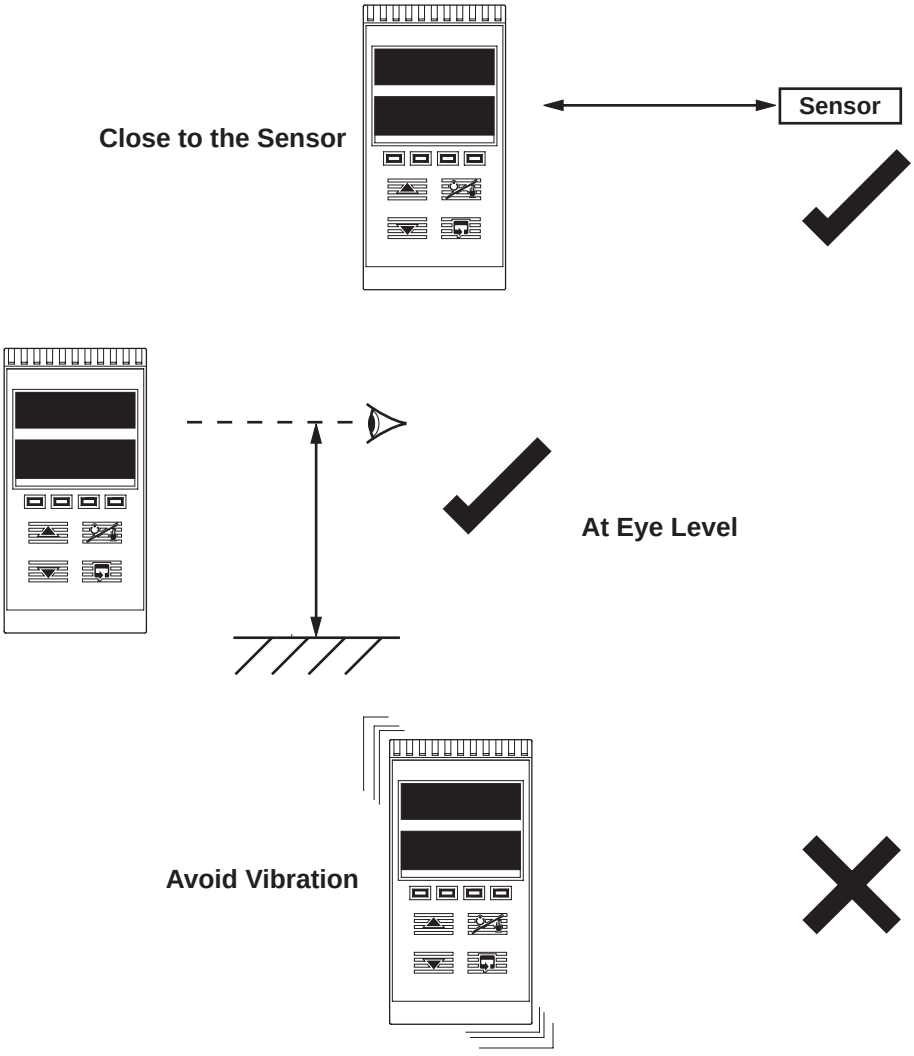



**Fig. 5.1 General Requirements**

## …5.1 Siting – Figs. 5.1 and 5.2

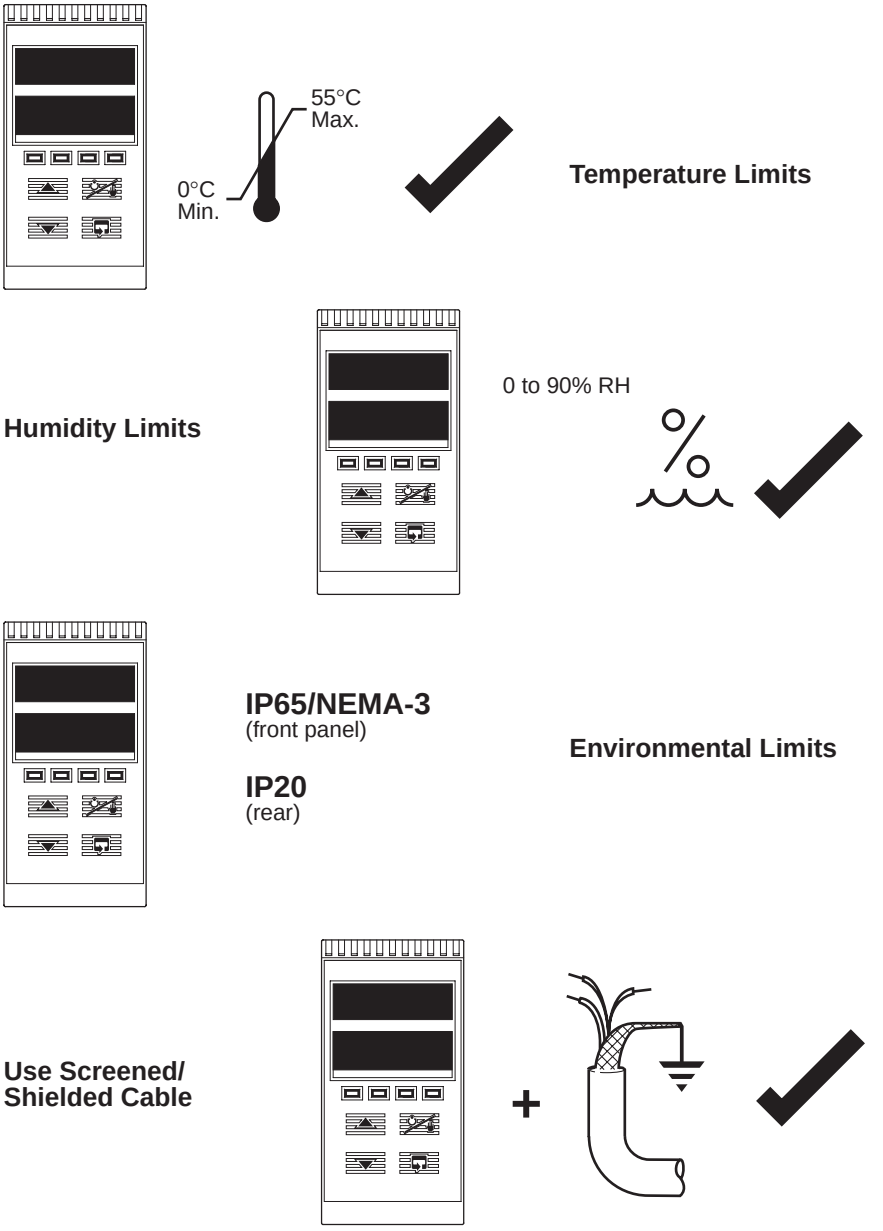



**Fig. 5.2 Environmental Requirements**

## 5.2 Mounting – Figs. 5.3 and 5.4

The instrument is designed for panel mounting (see Fig. 5.4). Overall dimensions are shown in Fig. 5.3.

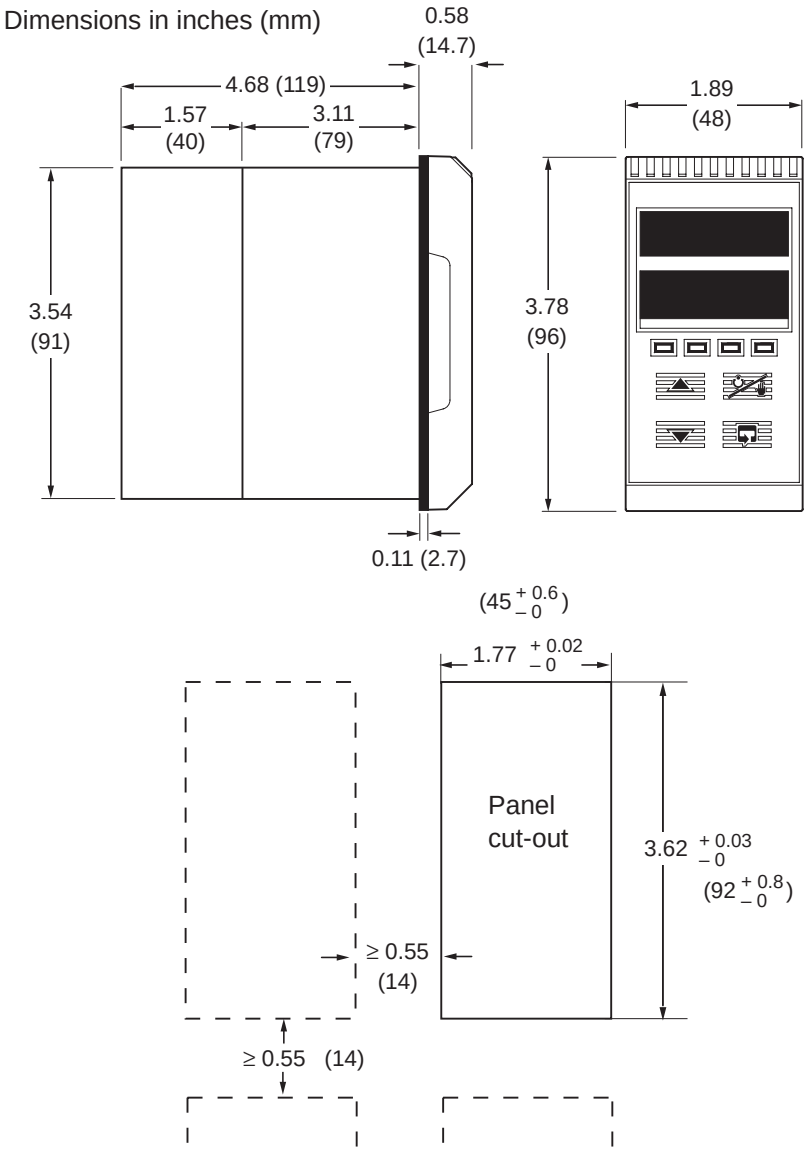



**Fig. 5.3 Overall Dimensions**

## …5.2 Mounting – Figs. 5.3 and 5.4

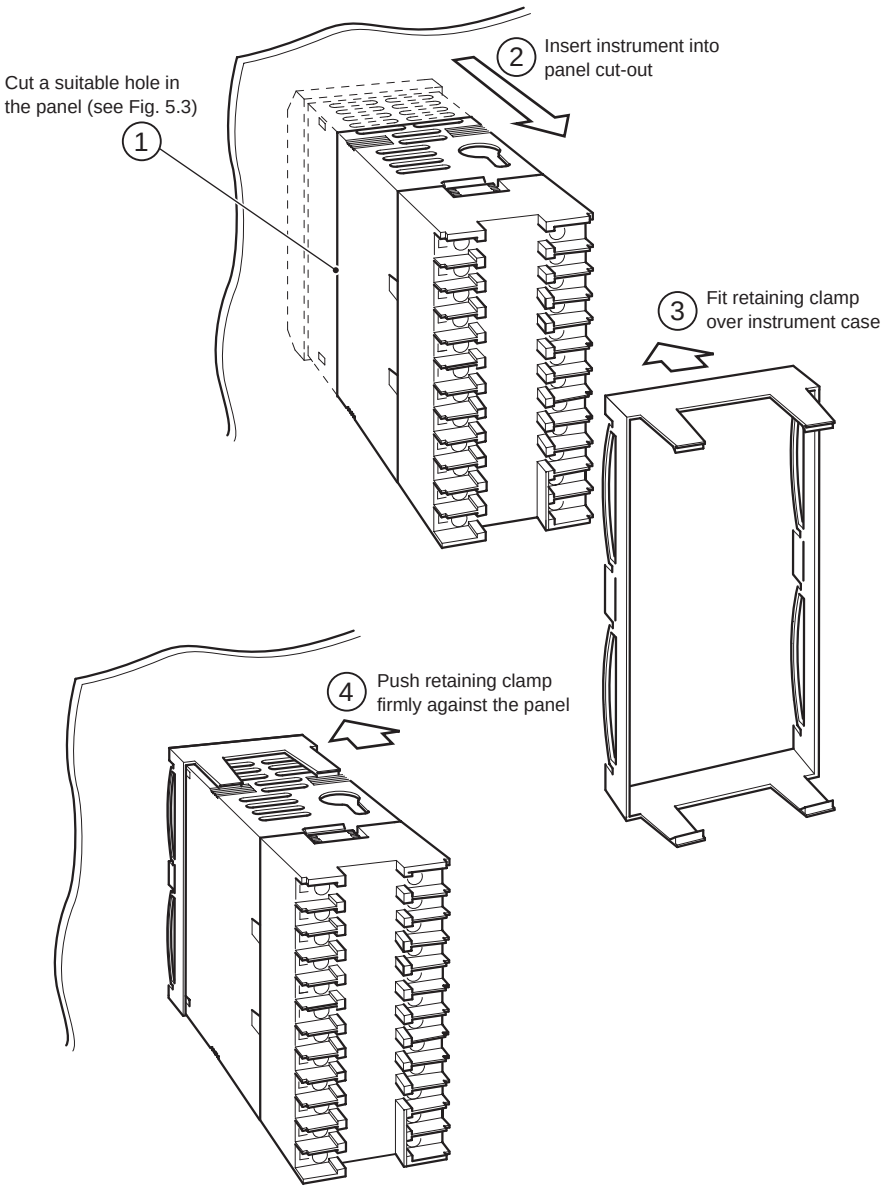



**Fig. 5.4 Mounting Details**

## EC Directive 89/336/EEC

In order to meet the requirements of the EC Directive 89/336/EEC for EMC regulations, this product must not be used in a non-industrial environment.

## 5.3 Electrical Connections – Figs. 5.5 and 5.6 (overleaf)

**Warning.** Before making any connections, ensure that the power supply, any powered control circuits and high common mode voltages are switched off. The instrument must be connected in accordance with local regulations and have an external means of disconnection. External fuse rating must not exceed 5A.

**Note.** If it is not possible to avoid strong electrical and magnetic fields, screened cables within earthed/ grounded metal conduit must be used.

## 5.4 Relays, Arc Suppression and Outputs

### 5.4.1 Relay Contact Ratings

Relay contacts are rated at:

115/230V AC at 5A (non-inductive).
250V DC 25W max.

### 5.4.2 Arc Suppression – Fig. 5.5

Arc suppression components are fitted to relays 2 and 3 only. If relay 1 is required to switch inductive loads, the arc suppression component supplied must be fitted across the contacts used.

### 5.4.3 Logic Output

18V DC at 20mA.

Min load 900Ω.

Isolation from Analog Output (not isolated from Retransmission Output). Dielectric strength – 500V d.c. for 1 minute.

### 5.4.4 Control or Retransmission Analog Outputs

Max. load 15V (750Ω at 20mA).

Isolation from Analog Output (not isolated from Logic Output). Dielectric strength – 500V d.c. for 1 minute.

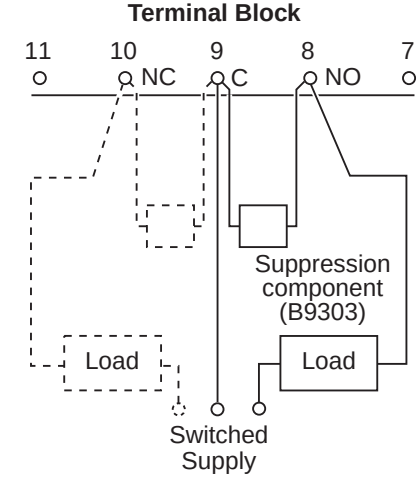
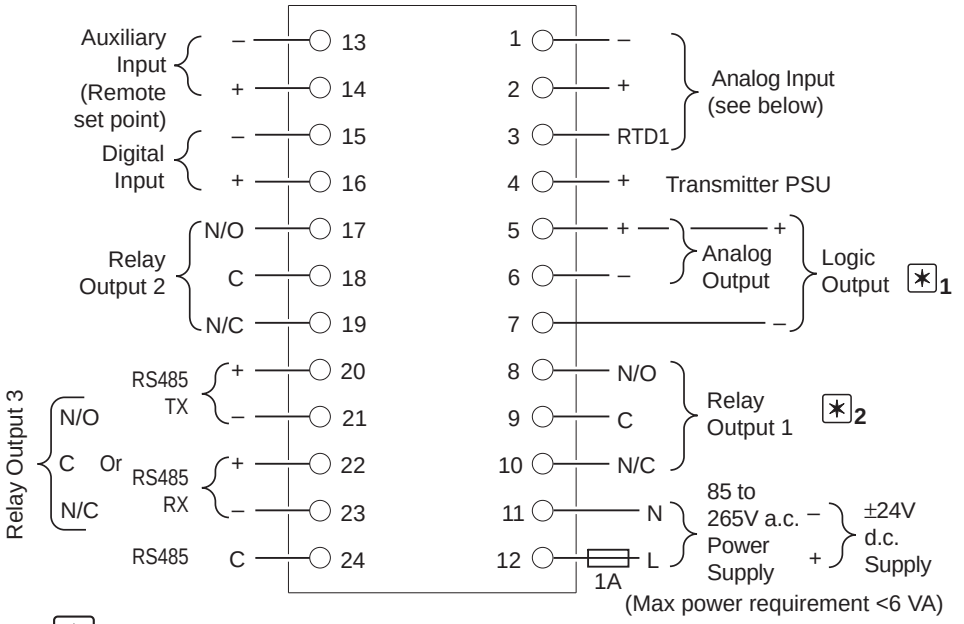
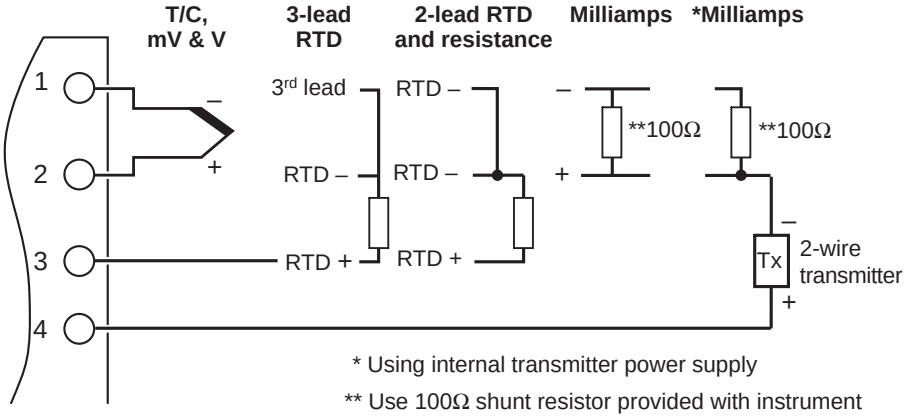



**Fig. 5.5 Fitting Arc Suppression Components**




**Note 1.** The Analog Output and Logic Output use a common positive terminal that is capable of driving both outputs simutaneously.

**Note 2.** Fit arc suppression components if switching inductive loads.

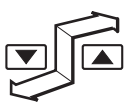



* Using internal transmitter power supply

** Use 100Ω shunt resistor provided with instrument

**Fig. 5.6 Electrical Connections**

# CUSTOMER CONFIGURATION LOG



LEU.5 CnFG

AbCd ----

EFGH ----

JK.Ln ----

PrSt ----

LEU.6 CnFG

EnGH 100.0

EnGL 0.0

rt.H 1 100.0

rt.L 0 0.0

SP-H 100.0

SP-L 0.0

SP-1 10.0

SP-2 20.0

SP-3 30.0

SP-4 40.0

OP 1.H 100

OP2.H 100

C-OP 0

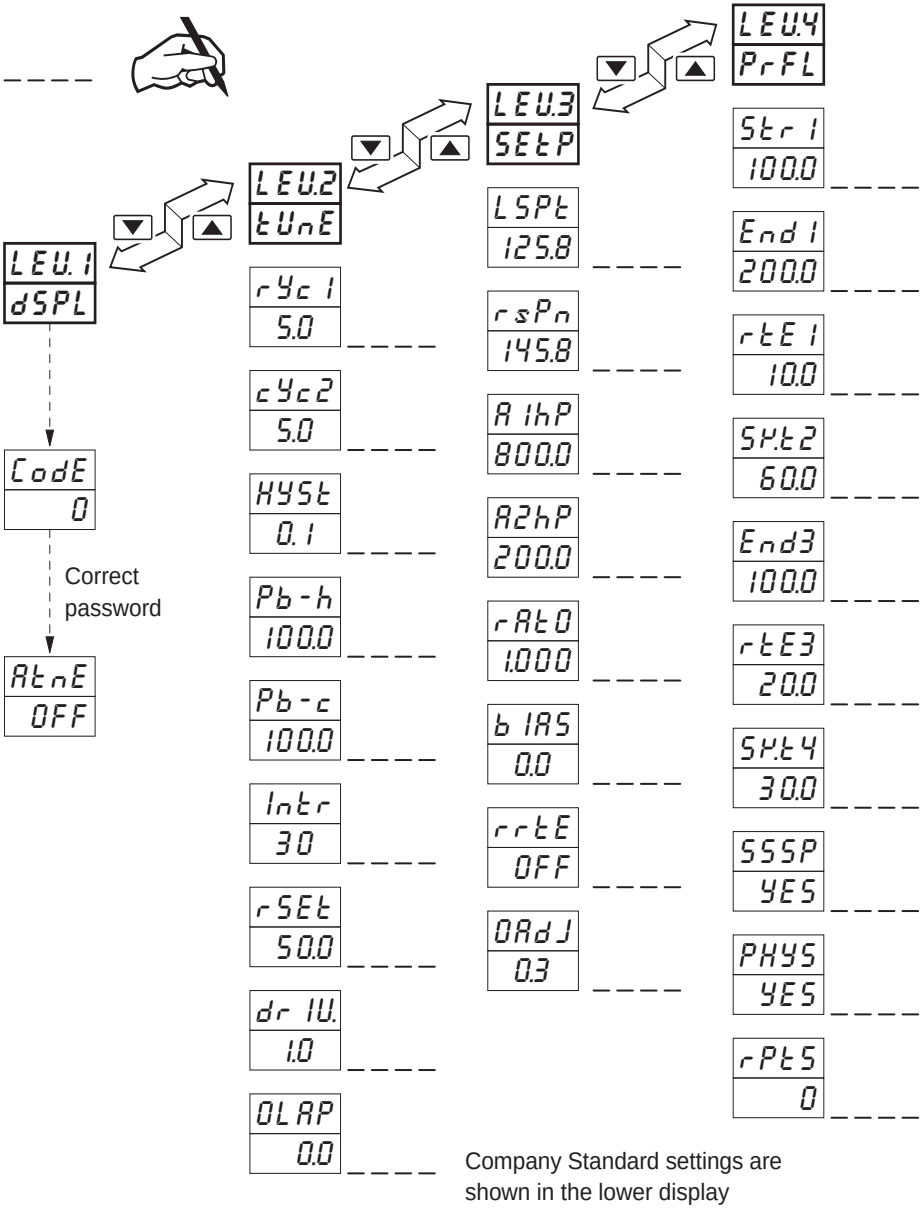
A.PAS 0

S.PAS 0

Addr 1

Default settings are shown in the lower display

# CUSTOMER SETUP LOG




Company Standard settings are shown in the lower display

**Instrument Serial Number:** _____

## WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of 37 months from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal three (3) year product warranty to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

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Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to product.

FOR NON-WARRANTY REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the products, and
3. Repair instructions and/or specific problems relative to the product.

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