INTRODUCTION

Thank you for selecting the 2704 high performance Programmer/Controller.

ABOUT THIS USER GUIDE

This User Guide describes installation and the principle of operation of the controller, and is intended as a ‘Getting Started Guide’. It also includes the operation of a setpoint programmer and how to handle alarms.

For a detailed description of process specific features and how to configure these to a particular application, an Engineering handbook is also available, part no. HA026933. This may be ordered separately or downloaded from www.eurotherm.co.uk.

Because this controller can be supplied in different ways, it is important to note that the actual displays shown in this guide may not be identical to those shown on your particular controller.

Issue 6 of this User Guide includes features available in software versions up to and including 6.30.

Other related handbooks also available from the above web site are:
- iTools, Part no. HA028838. iTools is a PC based package designed to configure Eurotherm controllers.
- EMC Installation Guide Part no. HA025464.

Contents

The following subjects are included in this user guide

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Issue status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 OVERVIEW</td>
<td>This chapter provides a general description of the controller, the operator interface, rear terminal layout and I/O modules</td>
</tr>
<tr>
<td>2 INSTALLATION</td>
<td>This chapter describes panel mounting of the controller, terminal connections and wiring</td>
</tr>
<tr>
<td>3 GETTING STARTED</td>
<td>This chapter describes the functions of the operator buttons, how to navigate to and change the value of parameters</td>
</tr>
<tr>
<td>4 PROGRAMMER OPERATION</td>
<td>This chapter describes the features of a setpoint programmer and how to set up and run programs using these features</td>
</tr>
<tr>
<td>5 ALARM OPERATION</td>
<td>This chapter explains the types of alarm used in this controller, how to set up and acknowledge alarms for a particular installation</td>
</tr>
<tr>
<td>Appendix A</td>
<td>The ordering code</td>
</tr>
<tr>
<td>Appendix B</td>
<td>Safety and EMC information</td>
</tr>
<tr>
<td>Appendix C</td>
<td>Technical specification</td>
</tr>
</tbody>
</table>
1. Chapter 1  OVERVIEW ...................................................... 2

1.1. WHAT IS 2704 ................................................................. 2

1.2. BEFORE YOU BEGIN ..................................................... 3
   1.2.1. Unpacking ................................................................. 3
   1.2.2. Contents of Packaging .............................................. 3
   1.2.3. Does the Controller Match the Process? .................... 3

1.3. OPERATOR INTERFACE - OVERVIEW .......................... 5
   1.3.1. Status Messages ...................................................... 6

1.4. INSTALLATION - OVERVIEW ......................................... 7

1.5. I/O MODULES ............................................................... 8
1. Chapter 1  OVERVIEW

Thank you for selecting the 2704 high performance Programmer/Controller.

1.1. WHAT IS 2704

The 2704 is a modular, fully configurable, high accuracy, high stability temperature and process controller available with single, dual or three loops. It is supplied in accordance with an ordering code which can be found printed on a label on the side of the instrument case. This should be checked against the order code description given in Appendix A of this guide. Alternatively, the controller can be supplied pre-configured for a specific application. Examples include: Vacuum Furnace, Carbon Potential, Humidity, Boiler (TDS), Melt Pressure control. In these cases a process specific handbook is also included.

Figure 1-1:  General View of 2704 Controller

Features include:

- A 120 x 160 pixel electroluminescent used to show all process information. The user interface is menu driven via the display and seven front panel keys.
- Advanced ramp/dwell programmer with storage of up to 60 programs.
- A wide variety of inputs which can be configured, including thermocouples, Pt100 resistance thermometers and high level process inputs.
- Each loop can be defined to be PID, On/Off or motorised valve position and can control using a variety of strategies including single, cascade, override and ratio control.
- PID control outputs can be relay, logic, triac or dc. Motorised valve position outputs can be relay, triac or logic.
- Auto tuning and PID gain scheduling are available to simplify commissioning and optimise the process
1.2. BEFORE YOU BEGIN

1.2.1. Unpacking

The packaging is designed to withstand reasonable transit shocks. It is suggested that each item is unpacked carefully and the contents inspected for damage.

If there is evidence of shipping damage, please notify your supplier within 72 hours. The packaging should be retained for inspection.

All packaging contains anti-static materials to prevent the build up of static which can damage electronic assemblies.

1.2.2. Contents of Packaging

Each box contains the following parts:

1. The 2704 controller fitted into its corresponding sleeve. Labels on the sleeve identify the controller code, its serial number, and the customer reference number.
2. Two panel retaining clips
3. Burden resistors for use with mA inputs
4. This User Guide

Please refer to Figure 1-2 showing a general view of the controller.

1.2.3. Does the Controller Match the Process?

Every controller is supplied with a specific hardware configuration to match the process which it is designed to control. For example, there are five ‘slots’ which can contain different plug in modules. These are defined by a hardware code as shown in Appendix A.

Where possible the controller is supplied with its software configured to match the process. This is defined by the configuration coding also given in Appendix A.

Before installing the 2704 controller check both the hardware code and configuration code to ensure that it is suitable for your process.
Figure 1-2: General View of 2704 Controller

KEY

1. Display screen
2. Latching ears
3. Panel sealing gasket
4. Panel retaining clips
5. Label
6. Sleeve
7. Terminal covers
8. Ratchets
1.3. OPERATOR INTERFACE - OVERVIEW

The front panel of the 2704 consists of a 120 x 160 pixel electroluminescent display, and seven operator push-buttons. See Figure 1-3.

- The display is used to show the process conditions.
- The seven operator buttons allow adjustments to be made to the controller.

---

**Figure 1-3: Operator Interface**

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page button</td>
<td>Press to select a new list of parameters.</td>
</tr>
<tr>
<td>Scroll button</td>
<td>Press to select a new parameter in a list.</td>
</tr>
<tr>
<td>Down button</td>
<td>Press to decrease a parameter value.</td>
</tr>
<tr>
<td>Up button</td>
<td>Press to increase a parameter value.</td>
</tr>
</tbody>
</table>

---
### 1.3.1. Status Messages

Messages appear on the display to show the current status of the controller. Table 1-1 below describes these messages:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LP1, LP2, LP3</td>
<td>Indicates which loop is being viewed</td>
</tr>
<tr>
<td>AUT</td>
<td>The selected loop is in automatic (closed loop) control</td>
</tr>
<tr>
<td>MAN</td>
<td>The selected loop is in manual (open loop) control</td>
</tr>
<tr>
<td>SP1, SP2, PO1 to P50, REM</td>
<td>Indicates where the SP is derived, i.e. Setpoint 1, Setpoint 2, Programmer, Remote</td>
</tr>
<tr>
<td>CSD</td>
<td>Indicates that the loop is in cascade.</td>
</tr>
<tr>
<td>OVR</td>
<td>Indicates that the loop is in override.</td>
</tr>
<tr>
<td>RAT</td>
<td>Indicates that the loop is in ratio (Ratio must be enabled from the parameter list at the bottom of the display)</td>
</tr>
<tr>
<td>🔔</td>
<td>Indicates a program is activated</td>
</tr>
<tr>
<td>🕵️‍♂️</td>
<td>Indicates a program is held at its current levels</td>
</tr>
<tr>
<td>🕯️</td>
<td>Indicates a program is in reset condition i.e. not running</td>
</tr>
<tr>
<td>☢️</td>
<td>When an alarm occurs an alarm symbol flashes in the header banner. When the alarm is acknowledged but is still active the symbol will be permanently lit. When the alarm is acknowledged but is no longer active the symbol will disappear. See Chapter 5 ‘Alarm Operation’ for further details.</td>
</tr>
<tr>
<td>[UNITS]</td>
<td>The process units are displayed in the right hand side of the banner</td>
</tr>
<tr>
<td>[SBY]</td>
<td>This symbol will flash in the right hand side of the banner in place of ‘units’ when the controller is in standby mode. In this state all interfaces to the plant are switched to a rest condition. For example, all control outputs = 0. When this symbol is on the controller is no longer controlling the process. This symbol will be on when:- • The controller is in configuration mode • Standby mode has been selected through the user interface or via an external digital input • During the first few seconds after start up</td>
</tr>
</tbody>
</table>

| Table 1-1: Status Messages |
1.4. INSTALLATION - OVERVIEW

The 2704 controller must be mounted and wired in accordance with the instructions given in Chapter 2.

The controller is intended to be mounted through a cut out in the front panel of an electrical control cabinet. It is retained in position using the panel mounting clips supplied.

All wires are connected to terminals at the rear of the instrument. Each block of six terminals is protected by a hinged cover which clicks into closed position.

![Diagram of Rear Terminals]

The functionality of the two outer rows of terminals is common to all instrument variants, as follows:

- **PV input** VH, VI, V+, V-
- **Analogue input** BA, BB
- **I/O expander** E1, E2
- **Fixed changeover relay** AA, AB, AC
- **Digital I/O channels** D1 to D8 and DC
- **Power supply** L, N, Earth

* Terminals 2A, 2B, 2C, 2D must not be wired to.

**Figure 1-4: Rear Terminals**
1.5. **I/O MODULES**

The 2704 controller has the facility to fit optional plug in modules. The connections for these modules are made to the inner three connector blocks as shown in Figure 1-4.

The modules are:
- Communications modules  
- I/O modules

These modules are fitted simply by sliding them into the relevant position as shown in Figure 1-5.

![Figure 1-5: View of the Plug-in Modules](image-url-here)
2. **CHAPTER 2  INSTALLATION................................................. 2

2.1. **MECHANICAL INSTALLATION............................................. 2

2.1.1. Positioning .............................................................................. 2

2.1.2. Outline dimensions Model 2704 ........................................... 2

2.1.3. Mounting the Controller ......................................................... 3

2.1.4. Unplugging and Plugging in the Controller ........................... 3

2.2. **WIRING.................................................................................. 4

2.2.1. Electrical Connections ............................................................ 4

2.2.2. Rear Terminal Layout ............................................................. 4

2.3. **STANDARD CONNECTIONS .............................................. 6

2.3.1. Power Supply Wiring ............................................................... 6

2.3.2. Relay Output ........................................................................... 6

2.3.3. Sensor Input Connections ....................................................... 7

2.3.4. Analogue Input Connections .................................................. 8

2.3.5. I/O Expander (or Additional Digital Input) ............................. 9

2.3.6. Digital I/O ............................................................................. 10

2.4. **OPTIONAL PLUG IN MODULE CONNECTIONS .............. 11

2.4.1. Digital Communications Connections ................................... 11

2.4.2. Devicenet Wiring ................................................................. 13

2.4.3. Ethernet Connections ............................................................. 15

2.4.4. I/O Modules ........................................................................... 16

2.5. **TO CONNECT ZIRCONIA (DUAL SIGNAL) PROBE........... 22

2.5.1. Zirconia Probe Screening ..................................................... 23
2. Chapter 2 INSTALLATION

2.1. MECHANICAL INSTALLATION

2.1.1. Positioning

The controller can be mounted vertically or on a sloping panel of maximum thickness 15mm (0.6in). Adequate access space must be available at the rear of the instrument panel for wiring and servicing purposes. The outline dimensions are shown in figure 2-1. Take care not to cover ventilation holes in the top, bottom and sides of the instrument.

Before proceeding please read Appendix B ‘Safety and EMC Information’.

2.1.2. Outline dimensions Model 2704

Figure 2-1: Outline Dimensions
2.1.3. Mounting the Controller

1. Prepare the panel cut-out to the size shown in Figure 2-2. Ensure that there is sufficient spacing between instruments as shown by the minimum dimensions given in Figure 2-2. Ensure also that the controller is not mounted close to any device which is likely to produce a significant amount of heat which may affect the performance of the controller.

2. Insert the controller through the panel cut-out.

3. Spring the upper and lower panel retaining clips into place. Secure the controller in position by holding it level and pushing both retaining clips forward.

Note:- If the retaining clips subsequently need removing, in order to extract the controller from the control panel, they can be unhooked from the side with either your fingers or a screwdriver.

![Figure 2-2: Panel Cut-out and Minimum Spacing Requirements]

2.1.4. Unplugging and Plugging in the Controller

If required, the controller can be unplugged from its sleeve by easing the latching ears outwards and pulling the controller forward out of the sleeve. When plugging the controller back into its sleeve, ensure that the latching ears click into place.

It is recommended that the power to the controller is switched off when un-plugging or plugging the controller into its sleeve. This is to prevent premature wear on the controller connectors when current is flowing through them.
2.2. WIRING

**WARNING**

You must ensure that the controller is correctly configured for your application. Incorrect configuration could result in damage to the process being controlled, and/or personal injury. It is your responsibility, as the installer, to ensure that the configuration is correct. The controller may either have been configured when ordered, or may need configuring now. See 2704 Engineering Manual Part Number HA026933 for details.

Before proceeding further, please read Appendix B, Safety and EMC information.

2.2.1. Electrical Connections

All electrical connections are made to the screw terminals at the rear of the controller. They accept wire sizes from 0.5 to 1.5 mm² (16 to 22 AWG) and should be tightened to a torque of 0.4Nm (3.5 lbin). If you wish to use crimp connectors, the correct size is AMP part number 349262-1. The terminals are protected by a clear plastic hinged cover to prevent hands, or metal, making accidental contact with live wires.

2.2.2. Rear Terminal Layout

The two outer terminal strips have fixed hardware for all versions of the instrument, as follows:-

- A Process Variable input which can be configured for:-
  - Thermocouple, RTD, Pyrometer, Voltage (e.g. 0-10Vdc) or Milliamp (e.g. 4-20mA) plus vacuum – log10
- Seven Digital I/O, configurable as input or output
  - Inputs are logic (-1 to 35Vdc) or contact closure, and can be configured for:- Manual, Remote, Run, Hold, Reset, etc,
  - Outputs are open collector requiring an external power supply, and can be configured as event, status time proportioning or valve position outputs.
- One digital input
- An I/O expander which allows additional digital I/O via an external unit, or an extra digital input
- A changeover relay which can be configured as an alarm or event output. It cannot be configured as a time proportioning output
- An analogue input for volts (e.g. 0-10Vdc) or Milliamp (e.g. 4-20mA) signals to a second PID loop, setpoint, etc,. (This input can be characterised to match a particular curve from a transmitter. It cannot accept thermocouple inputs directly)
- Power supply to the unit. The supply may be 85 - 264Vac 50 or 60 Hz

The three central terminal strips are for optional plug in modules, as follows:-
• Terminals marked 2A to 2D are reserved for a Memory Module only. No connections should be made to these terminals.

• Terminals marked HA to HF are connections for optional RS232, RS485, or RS422 communications modules.

• Terminals marked JA to JF are connections for an optional slave communications module or second communications port used to communicate with other instruments.

The modules fitted into the above two communications slots can be interchanged.

For a full list of available modules refer to the Ordering code - Appendix A and the Technical Specification - Appendix C.

⚠️ Warning: Take care that mains supplies are connected only to the power supply terminals (85 to 254Vac only), the fixed relay terminals or to relay or triac modules. Under no circumstances should mains supplies be connected to any other terminals.

Figure 2-3: Rear Terminal Connections
2.3. STANDARD CONNECTIONS

2.3.1. Power Supply Wiring
Controllers supplied with the VH Supply Voltage option are suitable for connection to a power supply of between 85 and 264Vac 50 or 60 Hz.

Controllers supplied with the VL Supply Voltage option are suitable for connection to a power supply of between 20 and 29Vac 50 or 60 Hz or 20 to 29Vdc.

It is the users responsibility to provide an external fuse or circuit breaker. Suitable fuses are:
- 85 to 264 volt supply T type (EN60127 time-lag type) rated at 1A
- 20 to 29 volt supply T type (EN60127 time-lag type) rated at 4A

2.3.2. Relay Output
A single changeover relay is provided as standard. It can be configured as a control output or an alarm or event output.
2.3.3. Sensor Input Connections

The fixed PV input can accept a range of sensors including Thermocouple, RTD (Pt100), Pyrometer, Voltage (e.g. 0-10Vdc) or Milliamp (e.g. 4-20mA) signals. These sensors are used to provide inputs to Control Loop 1.

* Note: This connection is shown for 26 and 2700 series controllers. It is not the same as 2400 and 2200 series controllers.

Figure 2-6: Wiring Connections For PV Input
### 2.3.4. Analogue Input Connections

The analogue input is supplied as standard and is intended to accept 0 to 10 Vdc from a voltage source. A milli-amp current source can be used by connecting a 100Ω resistor across terminals BA and BB. This input can be used as a remote setpoint input, remote setpoint trim or as a high level PV input to a control loop. This input is not isolated from the digital IO.

#### Non-isolated Voltage Source (0 to 10V)

**Symbol Diagram**

**Figure 2-7: Wiring Connections For Analogue Input**
2.3.5. I/O Expander (or Additional Digital Input)

An I/O expander (Model No 2000IO) can be used with the 2704 to allow the number of I/O points to be increased by a further 20 digital inputs and 20 digital outputs. Data transfer is performed serially via a two wire interface from instrument to expander.

If the expander unit is not required it is possible to use terminals E1 & E2 as a secondary digital input. These terminals are not part of the digital I/O terminals D1 to D8 and if used in this way connect a 2K2, ¼ W limiting resistor in series with the input, see Figure 2-8.

For details of the IO Expander refer to the Operating Instructions HA026893. The connections for this unit are reproduced below for convenience.

![I/O expander connections](image1)

**Figure 2-8: Wiring Connections for the I/O Expander**

![I/O expander connections](image2)

**Figure 2-9: IO Expander Connections**
2.3.6. Digital I/O

Eight digital I/O connections are provided as standard. They can be individually configured as:

1. Inputs  Run, Hold, Reset, Auto/Manual, etc. - logic or contact closure.
2. Outputs Configurable as Control outputs, Programmer Events, Alarms, etc.

Digital IO is not isolated from instrument ground.

**Digital Inputs (Logic Inputs or Contact Closure in any combination)**

- **Common**
- **Logic inputs (1)**
- **Contact closure inputs**

**Note 1:**
Logic inputs can accept drive signals from a voltage source where:

- $< 2V = \text{Active (1)}$  Limit $-1V$
- $> 4V = \text{Inactive (0)}$  Limit $+35V$

This action is reversed if the input has been configured as 'Inverted'.

**Digital Outputs (Relay, Thyristor or SSR Drive in any combination)**

- **Relay**
- **Thyristor Unit**
- **SSR**

External power supply 10 to 35 Vdc. Each output is current limited to 40mA.

Outputs are open collector.
2.4. OPTIONAL PLUG IN MODULE CONNECTIONS

2.4.1. Digital Communications Connections

Digital Communications modules can be fitted in two positions in the 2704 controller. The connections being available on HA to HF and JA to JF depending on the position in which the module is fitted. The two positions could be used, for example, to communicate with a configuration package, such as ‘iTools’, on one position and to a PC running a supervisory package on the second position.

The connections shown in the following diagrams show RS232, 2-wire RS485, 4-wire RS422 and master/slave comms to a second controller.

The diagrams show connections for ‘bench top test’ wiring. For a full description of the installation of a communications link, including line resistors, see Communications Handbook, Part No. HA026230, and EMC Installation Guide, part no. HA025464.

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**Figure 2-11: RS232 Communications Connections**

**Figure 2-12: RS485 2-Wire Communications Connections**
Figure 2-13: RS485 4-Wire Communications Connections

Figure 2-14: Profibus Wiring Connections
2.4.2. DeviceNet Wiring

This section covers the DeviceNet digital communications option. To configure DeviceNet communications refer to the 2704 Engineering Handbook Part No HA026933.

### 2.4.2.1. DeviceNet Terminal Functions

<table>
<thead>
<tr>
<th>Terminal Reference</th>
<th>CAN Label</th>
<th>Color Chip</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HA</td>
<td>V+</td>
<td>Red</td>
<td>DeviceNet network power positive terminal. Connect the red wire of the DeviceNet cable here. If the DeviceNet network does not supply the power, connect to the positive terminal of an external 11-25 Vdc power supply.</td>
</tr>
<tr>
<td>HC</td>
<td>SHIELD</td>
<td>None</td>
<td>Shield/Drain wire connection. Connect the DeviceNet cable shield here. To prevent ground loops, the DeviceNet network should be grounded in only one location.</td>
</tr>
<tr>
<td>HE</td>
<td>V-</td>
<td>Black</td>
<td>DeviceNet network power negative terminal. Connect the black wire of the DeviceNet cable here. If the DeviceNet network does not supply the power, connect to the negative terminal of an external 11-25 Vdc power supply.</td>
</tr>
<tr>
<td>HF</td>
<td></td>
<td></td>
<td>Connect to instrument earth</td>
</tr>
</tbody>
</table>

Note: Power taps are recommended to connect the DC power supply to the DeviceNet trunk line. Power taps include:

- A Schottky Diode to connect the power supply V+ and allows for multiple power supplies to be connected.
- 2 fuses or circuit breakers to protect the bus from excessive current which could damage the cable and connectors.
- The earth connection, HF, to be connected to the main supply earth terminal.

⚠️ A Schottky Diode to connect the power supply V+ and allows for multiple power supplies to be connected.
2.4.2.2. Wiring Interconnections for DeviceNet Communications

121 Ω terminating resistor required if not internally

Network Supply 24Vdc (±1%) 250mV p-p Ripple

Daisy chain to further instruments

* Fit to last instrument in the chain

* Termination resistor required if not internally
2.4.3. Ethernet Connections

When the controller is supplied with the Ethernet communications option a special cable assembly is also supplied. This cable must be used since the magnetic coupling is contained within the RJ45 connector. It consists of an RJ45 connector (socket) and a termination assembly which must be connected to terminals HA to HF.

Use standard CAT5 cable to connect to the Ethernet 10BaseT switch or hub. Use cross-over cable only if connecting one-to-one with a PC acting as network master.
2.4.4. I/O Modules

The 2704 controller contains five positions in which 4-terminal I/O modules can be fitted. These positions are marked Module 1, Module 3, Module 4, Module 5, Module 6, in Figure 2-3. Module 2 is reserved for the Memory Module which can only be fitted in this position. To find out which modules are fitted check the ordering code which is found on a label on the side of the instrument.

Any module, listed in this section, can be fitted in any position, except the PV input - limited to positions 3 and 6 only; and the Analogue Input module - cannot be fitted in slot 5. Care should be taken, therefore, to ensure that modules are fitted as expected from the order code.

The instrument can be interrogated in “View Config” level to locate the positions in which the modules are fitted. See Chapter 4, Access Levels. If modules have been added, removed or changed it is recommended that this is recorded on the instrument code label.

<table>
<thead>
<tr>
<th>I/O Module</th>
<th>Typical usage</th>
<th>H/W Code</th>
<th>Connections and examples of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relay (2 pin) and</td>
<td>Heating, cooling, alarm, program event, valve raise, valve lower</td>
<td>R2 and</td>
<td>First relay</td>
</tr>
<tr>
<td>Dual Relay</td>
<td>max 264Vac, 2A, min 12V, 100mA</td>
<td>RR</td>
<td></td>
</tr>
<tr>
<td>Change Over Relay</td>
<td>Heating, cooling, program event, valve raise, valve lower</td>
<td>R4</td>
<td>Second relay</td>
</tr>
<tr>
<td>max 264Vac, 2A,</td>
<td>min 12V, 10mA</td>
<td></td>
<td>(dual relay only)</td>
</tr>
<tr>
<td>Isolated Single</td>
<td>Heating, Cooling, Program events</td>
<td>LO</td>
<td></td>
</tr>
<tr>
<td>Logic Output</td>
<td>18Vdc at 24mA max</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The order code and terminal number is pre-fixed by the module number.

Module 1 is connected to terminals 1A, 1B, 1C, 1D; module 3 to 3A, 3B, 3C, 3D, etc.
<table>
<thead>
<tr>
<th>I/O Module</th>
<th>Typical usage</th>
<th>H/W Code</th>
<th>Connections and examples of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triple Logic Output</td>
<td>Heating, cooling, program events</td>
<td>TP</td>
<td><img src="image1" alt="" /></td>
</tr>
<tr>
<td></td>
<td>(18Vdc at 8mA max, per channel)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triac and Dual Triac</td>
<td>Heating, cooling, valve raise, valve lower</td>
<td>T2 and TT</td>
<td><img src="image2" alt="" /></td>
</tr>
<tr>
<td></td>
<td>(0.7A, 30 to 264Vac combined rating)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Control</td>
<td>Heating, cooling e.g. to a 4-20mA process</td>
<td>D4</td>
<td><img src="image3" alt="" /></td>
</tr>
<tr>
<td></td>
<td>actuator</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(10Vdc, 20mA max)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Re-transmission</td>
<td>Logging of PV, SP, output power, etc.,</td>
<td>D6</td>
<td><img src="image4" alt="" /></td>
</tr>
<tr>
<td></td>
<td>(0 to 10Vdc, or 0 to 20mA)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Dual relay modules may be used in place of dual triac.

**Note:** The combined current rating for the two triacs must not exceed 0.7A.
### I/O Module

<table>
<thead>
<tr>
<th>I/O Module</th>
<th>Typical usage</th>
<th>H/W Code</th>
<th>Connections and examples of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual DC Output</td>
<td>Control output 12 bit resolution. Can only be fitted in slots 1, 4 or 5.</td>
<td>DO</td>
<td><img src="image" alt="Diagram" /></td>
</tr>
<tr>
<td>(each channel can be 4-20mA or 24Vdc power supply)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Resolution DC Output</td>
<td>Retransmission in 'feedback mode'. Fitted in slots 1, 4 or 5 only.</td>
<td>HR</td>
<td><img src="image" alt="Diagram" /></td>
</tr>
<tr>
<td>(one 15 bit 4-20mA plus one 24V power supply)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### TDS Module

- **TDS Control in boilers**

The diagrams show general wiring connections.

- Connection terminals vary from supplier to supplier.
- Particular attention must be made to grounding and screen connections as recommended by the supplier.

---

1. **2 Electrode TDS Probe**
   - ![Diagram](image)
   - Probe tip
   - Probe
   - Boiler Earth
   - Earth

2. **3 Electrode TDS Probe**
   - ![Diagram](image)
   - Driver tip
   - Sensor tip
   - Earth feedback
   - Earth
   - Boiler Earth

3. **4 Electrode TDS Probe**
   - ![Diagram](image)
   - Current electrode 1
   - Voltage electrode 1
   - Voltage electrode 2
   - Current electrode 2
   - Probe
   - Current electrode 1
   - Voltage electrode 1
   - Voltage electrode 2
   - Current electrode 2

---
<table>
<thead>
<tr>
<th>I/O Module</th>
<th>Typical usage</th>
<th>Order Code</th>
<th>Connections and examples of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV Input (Modules 3 &amp; 6 only)</td>
<td>Second or third PV input mV, V, mA, TC, RTD (Pt100) Zirconia probe</td>
<td>PV</td>
<td>Thermocouple</td>
</tr>
<tr>
<td>and</td>
<td>Second or third PV input mV, mA, TC, RTD (Pt100)</td>
<td>AM</td>
<td>3-wire RTD</td>
</tr>
<tr>
<td>Analogue Input (Modules 1, 3, 4 &amp; 6 only)</td>
<td>PV (Modules 3 &amp; 6 only) and Analogue Input (Modules 1, 3, 4 &amp; 6 only)</td>
<td></td>
<td>AM (up to 100mV)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Voltage 0 to 10V or 0 to 2V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Current 0 to 20mA (4 to 20mA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>For 2-wire this is a local link</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Thermocouple:
- 3-wire RTD:
- AM (up to 100mV):
- Voltage 0 to 10V or 0 to 2V:
- Current 0 to 20mA (4 to 20mA):

For 2-wire this is a local link.
## 4-Wire PRT Input
(Modules 3 & 6 only)

<table>
<thead>
<tr>
<th>PH</th>
<th>PL</th>
</tr>
</thead>
</table>

Two special versions of the PV Input module provide high accuracy, high stability temperature measurement. Code PH is PRT 100Ω Code PL is PRT 25.5Ω

Use screened wires if longer than 30 metres

### I/O Module | Typical usage | Order Code | Connections and examples of use
---|---|---|---
**Triple Logic Input** | Events  
e.g. Program Run, Reset, Hold | TL | ![Triple Logic Input Diagram](image)

Logic inputs  
Input 1  
<5V ON  
>10.8V OFF  
Limits:  
-3V, +30V  
Common

**Triple Contact Input** | Events  
e.g. Program Run, Reset, Hold | TK | ![Triple Contact Input Diagram](image)

External switches or relays  
Input 1  
Input 2  
Input 3  
Common

Contact inputs  
<100Ω ON  
>28KΩ OFF

**24V Transmitter Supply**  
(20mA) | To power an external transmitter | MS | ![24V Transmitter Diagram](image)
### Transducer Power Supply

- **Provide 5V or 10Vdc to power Strain Gauge Transducer**
- **+ Shunt Contact**

<table>
<thead>
<tr>
<th>Transducer Power Supply</th>
<th>G3 or G5</th>
<th>External calibration resistor (may be fitted in transducer).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transducer</strong></td>
<td><strong>Power</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Supply</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Provide 5V or 10Vdc</strong></td>
<td><strong>to</strong></td>
<td></td>
</tr>
<tr>
<td><strong>power</strong></td>
<td><strong>Strain</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Gauge</strong></td>
<td><strong>Transducer</strong></td>
<td></td>
</tr>
<tr>
<td><strong>+ Shunt</strong></td>
<td><strong>Contact</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** To minimise noise pick up it is recommended that screened cables are used for strain gauge power supply connections.

---

### Potentiometer Input

- **Motorised valve position feedback**
- **Remote SP**

<table>
<thead>
<tr>
<th>Potentiometer Input</th>
<th>VU</th>
<th>+0.5v</th>
</tr>
</thead>
<tbody>
<tr>
<td>(100Ω to 15KΩ)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 2-15:** Wiring Connections for IO Modules

---

### Dual PV Input

- **(Modules 3 & 6 only)**

<table>
<thead>
<tr>
<th>Dual PV Input</th>
<th>Current source</th>
<th>0-2V input</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Modules 3 &amp; 6 only)</td>
<td>Current source</td>
<td>0-20mA input</td>
</tr>
</tbody>
</table>

**Figure 2-15:** Wiring Connections for IO Modules

The common connections to terminal D must be returned separately to D as shown in the dual current example above.
2.5. TO CONNECT ZIRCONIA (DUAL SIGNAL) PROBE

A dual signal probe, such as a Zirconia probe, will normally be connected to a Dual PV Input module (Code DP). The module presents two channels, A and C, where A is the voltage input and C is the mV, thermocouple, RTD or mA input.

Example 1 shown below uses the Dual PV Input module with both channels configured. In this configuration the module runs at 4.5Hz. The two channels are un-isolated from one-another but isolated from the rest of the instrument.

Example 2 uses two modules. The modules can either be two PV Input modules (code PV) or a Dual PV Input module (code DP) with Channel C configured as ‘None’ plus a PV Input module. This combination runs at 9Hz and may be used if the loop is unusually fast.

<table>
<thead>
<tr>
<th>I/O Module</th>
<th>Typical usage</th>
<th>Order Code</th>
<th>Connections and examples of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual PV Input</td>
<td>Zirconia probe</td>
<td>DP</td>
<td>Example 1:- Using the Dual PV Input Module. Channel C is shown configured for thermocouple. The temperature sensor of a zirconia probe is connected to this input, terminals C &amp; D. The Volt Source is connected to the A channel, terminals A &amp; D.</td>
</tr>
<tr>
<td>Two PV Input Modules</td>
<td></td>
<td>PV</td>
<td>Example 2:- Using Two Modules. The temperature sensor of the zirconia probe can be connected to the precision PV input of one I/O module, connections C &amp; D, with the Volt Source connected to the second module, terminals A &amp; D.</td>
</tr>
</tbody>
</table>

Note: The +ve of the volt source must be connected to the -ve of the thermocouple.

Figure 2-16: Wiring Connections for Zirconia Probe
2.5.1. Zirconia Probe Screening

2.5.1.1. Zirconia Carbon Probe Construction

2.5.1.2. Screening connections when two modules are used

The zirconia sensor wires should be screened and connected to the outer shell of the probe if it is situated in an area of high interference.

2.5.1.3. Screening connections when a dual input module is used

Both the thermocouple and the zirconia sensor wires must be screened and connected to the outer shell of the probe if it is situated in an area of high interference. 

Note the reverse connection of the zirconia sensor.
3. CHAPTER 3 GETTING STARTED ........................................ 2
3.1. POWER UP .............................................................................................................. 3
3.1.1. The HOME Page .................................................................................................. 3
3.2. THE OPERATOR BUTTONS .................................................................................. 4
3.3. THE PROG BUTTON ............................................................................................ 5
3.4. THE LOOP SELECT BUTTON ............................................................................. 5
3.5. THE AUTO MANUAL BUTTON ........................................................................... 6
3.5.1. To Change Setpoint (when the loop is in Auto) .................................................. 7
3.5.2. To Change Output Power (when the loop is in Manual) ........................................ 7
3.6. PARAMETERS AND HOW TO ACCESS THEM ..................................................... 8
3.6.1. Pages...................................................................................................................... 8
3.7. NAVIGATION OVERVIEW .................................................................................. 9
3.7.1. To Select a Page Header...................................................................................... 9
3.7.2. To Navigate to a Parameter from a Page Header.................................................. 10
3.7.3. To Change the Next Parameter in the List............................................................. 11
3.7.4. To Change Any Parameter in the List................................................................. 11
3.8. BACKSCROLL ..................................................................................................... 12
3.8.1. Confirmation Mechanism ................................................................................. 12
3.8.2. Invalid key actions............................................................................................. 12
3.9. NAVIGATION DIAGRAM .................................................................................. 12
3.10. EXAMPLES OF ALTERNATIVE DISPLAYS ....................................................... 14
3.10.1. Cascade Controller ......................................................................................... 14
3.10.2. Override Controller ......................................................................................... 15
3.10.3. Ratio Controller ............................................................................................... 16
3.10.4. User Pages ......................................................................................................... 17
3. Chapter 3 GETTING STARTED

With the controller installed, as described in the previous chapter, this chapter explains the principle of how to locate and change values of parameters using the front panel buttons.

Operation of these buttons changes the information on the display by opening different pages. Each page is associated with a particular aspect of the operation of the controller. The navigation between the pages follows a set order and the principle of this navigation is described in this chapter.

Subsequent chapters describe the detail of each page and follow the order in which the pages appear on the controller.

Note: The 2704 controller is an application specific controller and can be configured to the preferences of a particular process, site or user. This means that the displays shown in this and following chapters may not be identical to those shown in your instrument. Where the text on a display is user configurable it is shown in italics, eg *Loop1*

About this chapter

This chapter describes:

◊ How to change setpoint
◊ The operator buttons
◊ Parameters and how to access them
◊ Pages
◊ How to step through pages
◊ How to step through parameters
◊ How to change parameter values
◊ The navigation diagram
◊ Parameter tables

The 2704 contains different levels of user access. Unless otherwise stated this Getting Started guide assumes operation in Level 1. This is the default level when the controller is first switched on. For operation in other levels refer to the 2704 Engineering Handbook. If the controller has been operating in a higher level this level will be retained if the controller is switched off and on again.
3.1. **POWER UP**

Install and wire up the controller in accordance with Chapter 2 and switch on. A short self test sequence takes place during which the controller identification is displayed together with the version number of software fitted.

3.1.1. **The HOME Page**

The controller then shows a default display, referred to as the HOME page. It is possible to configure the HOME page to suit the preferences of the process or the user, but the format is shown in Figure 3-1. This is also the default display on a new controller.

The HOME page will be displayed under the following conditions:-
1. When the controller is switched on
2. When the access mode is changed from configuration level to an operating level
3. When [F] and [C] are pressed together (see 3.10)
4. When a timeout (if configured) occurs

The HOME page can be configured as:-
1. Summary Page
2. The Program Run page
3. Loop Views - LP1 (as shown in Figure 3-1), LP2, LP3
4. The Access page
5. Cycle Each Loop. LP1 to LP3 pages are cycled in turn
6. All Loops (summary of 2 or 3 loops if configured)
7. LP1, LP2, LP3 Trend Charts (PV & SP for each loop)
8. Program Mimic
9. User Pages 1 to 8
10. Vacuum

The configuration of these displays is described in the Engineering manual, Part No. HA026933.

![Figure 3-1: The 'HOME' Page (default)]
### 3.2. THE OPERATOR BUTTONS

| AUTO | Auto/Manual button | When pressed, this toggles between automatic and manual mode:  
|      |                   | • If the controller is in automatic mode ‘AUT’ is displayed  
|      |                   | • If the controller is in manual mode, ‘MAN’ is displayed  
|      |                   | See Figure 3-1 |
| LOOP | Loop select button | Each press selects an overview of each loop configured. This includes trend charts, loop summaries or other customised displays if these have been configured. 
|      |                   | *The loop name is shown in the banner at the top of the display* |
| PROG | Programmer button | This button operates the programmer on all loops 
|      |                   | For further details see Chapter 6 ‘Programme r Operation’ 
|      |                   | The pop up window shown here is for the synchronous programmer. It allows you to select the program, set a delayed start time and run, hold and reset the program. 
|      |                   | • Press PROG again to RUN a program  
|      |                   | • Press PROG again to HOLD a program  
|      |                   | • Press PROG again to toggle between RUN & HOLD  
|      |                   | • Press PROG and hold for two seconds to reset  
|      |                   | If no button is pressed for approximately 6 seconds the pop-up disappears:- |
| Page button | Press to select the Page Header ‘Menu’. |
| Scroll button | Press to select a new parameter from the page heading. If held down it will continuously scroll through the parameters. |
| Down button | Press to decrease an analogue value, or to change the state of a digital value |
| Up button | Press to increase an analogue value, or to change the state of a digital value |

Note:- The AUTO, LOOP, or PROG may have been disabled in configuration level.

**Figure 3-2: Operator Buttons**
3.3. THE PROG BUTTON

If the controller is configured as a programmer this button has three functions:

- To put the programmer into **RUN** mode. This causes the working setpoint to follow the profile set in the program being used.
- To put the programmer into **HOLD** mode. This stops the program from running and maintains the setpoint at the current level.
- To put the programmer into **RESET** mode. This resets the programmer to the controller setpoint, the working setpoint can be changed manually using the Raise/Lower buttons.

This button operates all programmer setpoints simultaneously.

3.4. THE LOOP SELECT BUTTON

If more than one loop is configured, the Loop Select button allows you to select a summary of each loop from whatever page is being displayed at the time. Each press of the Loop Select button will change the display from the ‘ALL LOOPS’ view to ‘Loop 1’ summary to the ‘Loop 1 Trend’ chart, followed by the next loop summary, and so on.

By default a loop is designated by the mnemonic ‘LP’ followed by the loop number (1, 2 or 3). This is shown in the banner at the top of the display page. The default message may be replaced by a customised name for the loop.

To return to the original page view at any time, press the page button. Alternatively, a timeout may have been set which will return the display to the HOME page view after a set period. The timeout is set in configuration level, see Engineering Manual part no HA026933.

If only one loop is configured the display toggles between ‘LP1’ and ‘LP1 Trend’, (the ‘ALL LOOPS’ page is not shown).

If a programmer is configured the ‘Programmer Mimic’ display may also be selected using the Loop Select button.

![Diagram showing Loop Summary and Loop Trend Chart](image)

Figure 3-3: Loop Summary and Loop Trend Chart
3.5. THE AUTO MANUAL BUTTON

The controller has two basic modes of operation:

- **Automatic Mode** in which the control output is automatically adjusted to maintain the process value at the setpoint.
- **Manual Mode** in which you can adjust the output independently of the setpoint.

The Auto/Manual button can only be operated from the loop view. Press the Loop Select button to select the loop view, then press AUTO/MAN to toggle between auto and manual. When the controller is in AUTO, ‘AUT’ will be displayed on the page (see Figure 3-4). The middle readout will default to the Working Setpoint in a standard controller.

When the controller is in MANUAL, ‘MAN’ will be displayed on the page (see Figure 3-5). The middle readout will default to Output Power in a standard controller.

If the loop summary page is not being viewed when the AUTO/MAN button is pressed, the display will change to the first available loop summary. Subsequent presses will change between Auto and Manual for the selected loop as above.

If the output is configured as On/Off, the output will be Off when the target output < 0.9 and On when the target output is > ±1.0.
3.5.1. To Change Setpoint (when the loop is in Auto)

Press and hold the button to decrease the setpoint

Press and hold the button to increase the setpoint

A flashing bar underlines the selected parameter (setpoint)

Figure 3-4: Changing Setpoint

3.5.2. To Change Output Power (when the loop is in Manual)

Press and hold the button to decrease the output

Press and hold the button to increase the output

A flashing bar underlines the selected parameter (output power)

Figure 3-5: Changing Output Power
3.6. PARAMETERS AND HOW TO ACCESS THEM

Parameters are settings, within the controller, which determine how the controller will operate. They are accessed, using the \( \text{down} \) and \( \text{up} \) buttons, and can be changed, to suit the process, using the \( \text{left} \) and \( \text{right} \) buttons. Selected parameters may be protected under different security access levels.

Examples of parameters are:

- **Values** - such as setpoints, alarm trip levels, high and low limits, etc.,
- or
- **States** - such as auto/manual, on/off, etc. These are often referred to as enumerated values.

3.6.1. Pages

The parameters are organised into different pages. A page shows information such as page headers, parameter names and parameter values.

Parameters are grouped in accordance with the function they perform. Each group is given a ‘Page Header’ which is a generic description of the parameter group. Examples are ‘The Alarm Page’, ‘The Programmer Page’, etc. A complete list of these is shown in the full navigation diagram, Section 3.9.

Where a function has many parameters associated with it, the Page Header may be further subdivided into ‘Sub-Headers’. The parameters are then found under this category.

![Figure 3-6: Page Types](image)

It is possible to configure different start up pages as the Home page, but the principle of navigation is the same for all pages.

**Note:**
A page only appears on the controller if the function has been ordered and has been enabled in Configuration mode. For example, if a programmer is not configured the RUN page and the EDIT PROGRAM pages will not be displayed.
3.7. NAVIGATION OVERVIEW

3.7.1. To Select a Page Header

<table>
<thead>
<tr>
<th>Do This</th>
<th>This Is The Display You Should See</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. From any display press ( \uparrow ) as many times as necessary to access the page header menu</td>
<td><img src="example.png" alt="Image" /></td>
<td>The cursor highlights the previously selected page name (e.g. PROGRAM MIMIC). The vertical bar on the right of the display indicates the position of the page header.</td>
</tr>
<tr>
<td>2. Press ( \downarrow ) to scroll down the list of page headers.</td>
<td><img src="example.png" alt="Image" /></td>
<td>When the cursor reaches the centre of the screen the text moves up. This feature allows you to see previous and following page header names.</td>
</tr>
<tr>
<td>3. Press ( \uparrow ) to scroll back up the list of page headers.</td>
<td><img src="example.png" alt="Image" /></td>
<td>When the last name in the Page Header list appears at the bottom of the display, the cursor will continue to move downwards.</td>
</tr>
</tbody>
</table>

The views shown above, and in subsequent sections, are taken at Level 3 to illustrate the way in which the cursor behaves when the page contains more lines or parameters than can be shown in a single view.

In level 1, for example, the page will only be full if headings have been promoted during configuration of the controller (see Engineering Handbook). When the page is not full the cursor simply moves up and down the page.
### 3.7.2. To Navigate to a Parameter from a Page Header.

<table>
<thead>
<tr>
<th>Do This</th>
<th>This Is The Display You Should See</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. From any page press [ ] as many times as necessary to select the list of Page Headers.</td>
<td><img src="image1" alt="Page Header Menu" /></td>
<td>The ▼ symbol indicates that the page header is followed by a list of sub-headers.</td>
</tr>
<tr>
<td>2. Press ▲ or ▼ to scroll up or down the list of page headers.</td>
<td><img src="image2" alt="Page Sub-Headers" /></td>
<td>Press ▼ to return to Page Header.</td>
</tr>
<tr>
<td>3. Press ❯ to select the list of Page Sub-Headers for the highlighted Page Header.</td>
<td><img src="image3" alt="Highlighted Page Header" /></td>
<td>If a page does not contain a Sub-Header the display goes directly to 5 below.</td>
</tr>
<tr>
<td>4. Press ▲ or ▼ to scroll up or down the list of page sub-headers.</td>
<td><img src="image4" alt="Parameter List" /></td>
<td>Press ▼ to return to Sub-Header.</td>
</tr>
<tr>
<td>5. Press ❯ to select the list of Parameters in the highlighted sub-header.</td>
<td><img src="image5" alt="Parameters List" /></td>
<td>Press ▼ to return.</td>
</tr>
<tr>
<td>6. Press ▲ or ▼ to scroll up or down the list of parameters.</td>
<td><img src="image6" alt="Parameter Selection" /></td>
<td>A flashing bar underlines the selected parameter. The parameter can only be altered if the value is preceded by ◆. If the value is read only it will be replaced by ‘-’ for as long as the raise or lower buttons are pressed.</td>
</tr>
<tr>
<td>7. Press ❯ to select the parameter which you wish to change.</td>
<td><img src="image7" alt="Parameter Selection" /></td>
<td></td>
</tr>
<tr>
<td>8. Press ▲ or ▼ to change the value.</td>
<td><img src="image8" alt="Parameter Change" /></td>
<td></td>
</tr>
</tbody>
</table>

---

3-10 User Guide Part No HA026502 Issue 6.0 May-06
### 3.7.3. To Change the Next Parameter in the List

This sections describes how to select further parameters in the list which you may wish to alter or to view.

<table>
<thead>
<tr>
<th>Do This</th>
<th>This Is The Display You Should See</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. From the previous display, press 💫 to select the next parameter you wish to change</td>
<td><img src="image1.png" alt="Display" /></td>
<td>The 💫 button will allow you to scroll down the list. If this button is held down it will continuously scroll around the list, which will enable you to change a previous parameter.</td>
</tr>
<tr>
<td>2. Press ↑ or ↓ to change the value</td>
<td><img src="image2.png" alt="Display" /></td>
<td></td>
</tr>
</tbody>
</table>

### 3.7.4. To Change Any Parameter in the List

As stated above you can keep pressing or hold down the 💫 button to continuously scroll around the list of parameters. There are two other alternatives. The first is to return to the highlight bar, described below. The second is ‘Backscroll’ described in the next section.

<table>
<thead>
<tr>
<th>Do This</th>
<th>This Is The Display You Should See</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. From the previous display, press 🍀 to highlight the parameter value and its name.</td>
<td><img src="image3.png" alt="Display" /></td>
<td></td>
</tr>
<tr>
<td>2. Press ↑ or ↓ to scroll up or down the list.</td>
<td><img src="image4.png" alt="Display" /></td>
<td></td>
</tr>
</tbody>
</table>
3.8. **BACKSCROLL**

In some cases it may be more convenient to scroll back up the list, for example, to select a new segment number when setting up a program.

A short cut is provided by holding down and pressing or .

Each press of will step back to the previous parameter. Each press of will step forward to the next parameter.

This function is provided as a short cut and is not necessary to navigate through the parameters.

3.8.1. **Confirmation Mechanism**

Having changed a value, when the or key is released, the display will blink after a period of 1.5 seconds, indicating that the new parameter value has been accepted. If any other key is pressed during the 1.5 second period the parameter value is accepted immediately.

There are exceptions for specific parameters. Examples of these are:-

**Output Power** adjustment when in Manual mode. The value is written continuously as the value is changed.

**Alarm Acknowledge**. If the Alarm Acknowledge is changed from ‘No’ to ‘Acknowledge’ a confirmation message appears. Press key to confirm the change. If no key is pressed for 10 seconds the value is restored to its previous value.

3.8.2. **Invalid key actions**

At any time some state transitions may be invalid, due, for example, to contention with digital inputs or to the current operating state of the instrument.

Examples are:-
1. Digital inputs have priority over the operator buttons.
2. If a parameter value cannot be changed the prompt is not shown
3. If the or button is pressed for a read only parameter a number of dashes, ----, is displayed.

3.9. **NAVIGATION DIAGRAM**

The Navigation Diagram shows an example of typical pages available at Levels 1 & 2.

For a particular configuration, additional pages may have been promoted to or removed. For example, the programmer pages do not appear if a programmer is not configured. The simplest view shows ACCESS and ALARMS page headers only.

A full Navigation Diagram is shown in the 2704 Engineering Manual Part No HA026933.
Further levels may be selected using or but are protected under security codes. For further information refer to the Engineering Handbook part number HA026933.

The Summary Page is only displayed if it has been configured. The view here shows an example of this page.

Figure 3-7: Navigation Diagram
3.10. EXAMPLES OF ALTERNATIVE DISPLAYS

3.10.1. Cascade Controller

The Loop Summary, displayed in previous views in this chapter, shows a controller configured as ‘Single’ loop. The Loop Summary view, for controllers configured as cascade, ratio, override or valve position varies as shown in this section.

For more information on these methods of control see Engineering Handbook.

Target Output Power

![Cascade Loop View](image)

This line may show different parameters

Press \( \rightarrow \) or \( \leftarrow \) to show alternatives. The defaults are:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Default Setting</th>
<th>Press</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Setpoint</td>
<td>The main SP</td>
<td></td>
</tr>
<tr>
<td>Target OP</td>
<td>Output demand</td>
<td>⬆</td>
</tr>
<tr>
<td>VPos</td>
<td>Valve position (VP controller only)</td>
<td>or</td>
</tr>
<tr>
<td>Local SP</td>
<td>Local (Slave) setpoint</td>
<td>⬇</td>
</tr>
<tr>
<td>Disable CSD</td>
<td>Allows cascade to be turned off eg for commissioning purposes</td>
<td>to adjust the value.</td>
</tr>
</tbody>
</table>

Note:

1. The parameter displayed first depends upon other settings. For example; if controller is in Auto the Target SP is displayed first; if the controller is in Manual the Target OP is displayed first.
2. In configuration level it is possible to hide or make individual parameters read only.

Figure 3-8: Cascade Loop View
3.10.2. Override Controller

Working Output Power (from the active loop)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Press</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target SP</td>
<td>The main setpoint</td>
<td></td>
</tr>
<tr>
<td>Target OP</td>
<td>Output demand</td>
<td>▲, ▼</td>
</tr>
<tr>
<td>VPos</td>
<td>Valve position (VP controller only)</td>
<td>▲, ▼</td>
</tr>
<tr>
<td>OvrSP</td>
<td>Override setpoint</td>
<td>▲, ▼</td>
</tr>
<tr>
<td>Disable OVR</td>
<td>Allows override to be turned off eg for commissioning purposes</td>
<td>▲, ▼</td>
</tr>
<tr>
<td>Active Loop</td>
<td>Displays the active loop - Main or Override</td>
<td>▼</td>
</tr>
<tr>
<td>Main OP</td>
<td>Reads the output demand for the main loop</td>
<td></td>
</tr>
<tr>
<td>Override OP</td>
<td>Reads the output demand for the override loop</td>
<td></td>
</tr>
</tbody>
</table>

Note:
1. The parameter displayed first depends upon other settings. For example; if controller is in Auto the Target SP is displayed first; if the controller is in Manual the Target OP is displayed first.
2. In configuration level it is possible to hide or make individual parameters read only.

Figure 3-9: Override Loop View
3.10.3. Ratio Controller

### Figure 3-10: Ratio Loop View

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target SP</td>
<td>The main setpoint</td>
</tr>
<tr>
<td>Target OP</td>
<td>Output demand</td>
</tr>
<tr>
<td>VPos</td>
<td>Valve position (VP controller only)</td>
</tr>
<tr>
<td>Ratio SP</td>
<td>Ratio setpoint</td>
</tr>
<tr>
<td>Enable Ratio</td>
<td>Allows ratio to be turned on eg for commissioning purposes</td>
</tr>
<tr>
<td>Ratio Trim</td>
<td>Applies a trim to the ratio SP</td>
</tr>
<tr>
<td>Lead PV</td>
<td>The measured flow 1</td>
</tr>
</tbody>
</table>

### Note:

1. The parameter displayed first depends upon other settings. For example; if controller is in Auto the Target SP is displayed first; if the controller is in Manual the Target OP is displayed first.

2. In configuration level it is possible to hide or make individual parameters read only.
3.10.4. User Pages

User Pages allow the user to place a pre-determined number of parameters onto a set of semi-custom screens. There are up to eight styles available and they are fully described in the 2704 Engineering Handbook Part No. HA026933.

Examples of these styles are shown below.

- **Parameter List User Page**
- **Single Loop User Page** (configured as Carbon)
- **Dual Loop User Page** (configured as Carbon/Temperature)
- **Triple Loop User Page 1**
- **Triple Loop User Page 2**
- **Status Grid User Page**
- **Bar Graph User Page**
- **Blank Page**
4. CHAPTER 4 PROGRAMMER OPERATION ................. 3

4.1. WHAT IS SETPOINT PROGRAMMING? ......................... 4
4.1.1. Synchronous Programmer ....................................... 4
4.1.2. Asynchronous Programmer ................................... 5

4.2. SETPOINT PROGRAMMER DEFINITIONS .................. 6
4.2.1. Run ................................................................. 6
4.2.2. Hold ............................................................... 6
4.2.3. Reset .............................................................. 6
4.2.4. Servo ............................................................. 6
4.2.5. Hot Start ......................................................... 6
4.2.6. HOLDBACK (GUARANTEED SOAK) ....................... 7
4.2.7. External Program Inputs ..................................... 7
4.2.8. Wait ............................................................... 8

4.3. PROGRAMMER TYPES ......................................... 9
4.3.1. Time To Target Programmer ................................. 9
4.3.2. Ramp Rate Programmer ..................................... 9

4.4. SEGMENT TYPES ............................................... 9
4.4.1. Profile ........................................................... 9
4.4.2. Go Back To Segment .......................................... 10
4.4.3. End Segment ................................................... 10

4.5. OTHER FEATURES NOT COVERED IN THIS USER GUIDE ... 10

4.6. PROGRAMMER OPERATION ................................... 11
4.6.1. To Access the Program Trend Screen ........................ 11
4.6.2. Parameters Available on the Programmer Mimic Screen .... 12

4.7. TO RUN, HOLD OR RESET A SYNCHRONOUS PROGRAM .. 13
4.7.1. To Hold a Program.............................................. 13
4.7.2. To Reset A Program ........................................... 13
4.7.3. From Digital Inputs .......................................... 13
4.7.4. From Digital Communications ............................. 13
4.7.5. From the PROGRAM RUN Page ............................ 13
4.7.6. Example: To View the State of a Running Program ......... 14
4.7.7. Run Parameter Tables ......................................... 15

4.8. TO EDIT A RUNNING PROGRAM ............................. 18
4.8.1. Example: To Change the Target Setpoint or Dwell Time ...... 18
4.8.2. PROGRAM RUN (PSP1 Page) ................................ 19

4.9. TO CREATE A NEW OR EDIT AN EXISTING PROGRAM .... 19
4.9.1. Fine and Coarse Holdback ................................... 19
4.9.2. Example: To Create or Edit Program 1 ....................... 20
4.9.3. PROGRAM EDIT (Program Page) Parameters ................ 21
4.9.4. Example: To Set Up Each Segment of a Program ............ 23
4.9.5. PROGRAM EDIT (Segment) Parameters ..................... 24
4.10. ASYNCHRONOUS PROGRAMMER .............................................. 26
4.11. PROGRAM GROUPS .......................................................... 27
4.11.1. PROGRAM GROUPS Group Edit Page ............................... 28
4.12. PROFILE SETPOINT PAGES ............................................... 29
4.12.1. PSP1 (2 OR 3) PROFILE Run General Pages ..................... 29
4.12.2. PSP1 (2 OR 3) PROFILE Run Segment Pages .................... 32
4.12.3. PSP1 (2 OR 3) PROFILE Program Edit Parameters .......... 33
4.12.4. PSP1 (2 or 3) PROFILE Segment Parameters .................. 35
4.13. EXAMPLE: TO SET UP AND RUN PROGRAM GROUPS ........ 37
4.14. EXAMPLE: TO COPY A PROGRAM ..................................... 38
4.15. EXAMPLE: TO INSERT A SEGMENT INTO A PROGRAM ....... 39
4.16. PROGRAMMER ERROR MESSAGES ................................. 40
4.17. RUNNING AN ASYNCHRONOUS PROGRAMMER ................. 40
4.17.1. Example: To Run a Program Using the PROG Button ...... 41
4.17.2. Asynchronous Programmer Status Bar ............................. 42
4. Chapter 4  PROGRAMMER OPERATION

This chapter explains:-

▪ The features of a setpoint programmer in general
▪ How to run and edit a Synchronous Programmer
▪ How to run and edit an Asynchronous Programmer (software versions 6 onwards)

Customisable Parameter Names

Throughout this chapter parameter names shown in *italics* are customisable by the user when in configuration access level. The name of the parameter may vary, therefore, from instrument to instrument.

Typical customisable parameter names are:

▪ Program names
▪ Profile Setpoint names
▪ Segment names
▪ Digital Event Names
4.1. WHAT IS SETPOINT PROGRAMMING?

In a setpoint programmer you can set up a profile in the controller in which the setpoint varies in a pre-determined way over a period of time. Temperature is a very common application where it is required to ‘ramp’ the process value from one level to another over a set period of time.

The 2704 controller will program up to three separate profiles. These may be temperature, pressure, light level, humidity, etc., depending on the application, and are referred to as Profiled Setpoints (PSPs).

The Program is divided into a flexible number of Segments - each being a single time duration, - and containing details for each profiled setpoint. The total number of segments available is **100 per program** with a **maximum of 600** for the Time to Target Programmer and **480** for the Ramp Rate programmer.

The 2704 programmer may store up to 20 programs as standard, with up to 60 if purchased.

It is often necessary to switch external devices at particular times during the program. Digital ‘event’ outputs can be programmed to operate during those segments.

4.1.1. Synchronous Programmer

In a synchronous programmer all PSPs are run on a common timebase. That is, they all start at the same time and the time duration of a segment is the same for each PSP. This is shown in Figure 6.1.

---

**Figure 4-1: An Example of a Synchronous Setpoint Program**

---
4.1.2. Asynchronous Programmer

In an asynchronous programmer up to three PSPs can be run with a different number of segments, based on an independent time base. Each PSP can start at the same time or can be started individually.

Figure 4-2: An Example of an Asynchronous Setpoint Program

The operation of the synchronous programmer is described in the first part of this chapter; the operation of the asynchronous programmer is described in the last part of this chapter where it differs from the synchronous programmer.
4.2. SETPOINT PROGRAMMER DEFINITIONS

This section defines the more common parameters to be found when running a 2704 programmer /controller. For an explanation of further features see the Engineering Handbook part no HA026933.

4.2.1. Run
In run the programmer varies the setpoint in accordance with the profile set in the active program.

4.2.2. Hold
In hold the programmer is frozen at its current point. In this state you can make temporary changes to program parameters such as a target setpoint, ramp rates and dwells (if programmer configured for ramp rate) or segment duration (if programmer configured as Time to Target). Such changes will only remain effective until the end of the currently running segment, when they will be overwritten by the stored program values.

4.2.3. Reset
In reset the programmer is inactive and the controller behaves as a standard controller, with the setpoint determined by the raise/lower buttons.

4.2.4. Servo
Servo can be set in configuration so that when a program is run the setpoint can start from the initial controller setpoint or from the current process value. Whichever it is, the starting point is called the servo point. This can be set in the program.
Servo to PV is the default and will produce a smooth and bumpless start to the process.
Servo to SP may be used in a Ramp Rate programmer to guarantee the time period of the first segment. In this case it is necessary to soft wire the Working Setpoint parameter to the PSP Reset Value parameter. (Note: in a Time to Target programmer the segment duration will always be determined by the setting of the Segment Duration parameter.)

4.2.5. Hot Start
When run is initiated Hot Start allows the program to automatically advance to the correct point in the profile which corresponds to the operating value of the process. It can occur in any segment type, for any PSP but is most useful to ramp segments. Hot start is enabled in configuration level and specifies which programmed variable to use when deciding the correct segment.
4.2.6. HOLDBACK (GUARANTEED SOAK)

Holdback freezes the program if the process value does not track the setpoint by an amount settable by the user. It may operate in any PSP type.

In a Ramp it indicates that the process value is lagging the setpoint by more than a settable amount and that the program is waiting for the process to catch up.

In a Dwell it will freeze the dwell time if the difference between SP and PV exceeds settable limits.

In both cases it guarantees the correct soak period for the product.

- Holdback can apply to the complete program or to each individual segment or it may have been turned off in the configuration of a particular controller.

**Example:**

Holdback applied to a ramp up and a dwell.

![Figure 4-3: Effect of Holdback to Produce Guaranteed soak](image)

4.2.7. External Program Inputs

Digital inputs may have been configured to operate the program from external sources.

- Run
  - Allows the program to be run from a pushbutton or other event.
- Hold
  - Allows the program to be held from a switch or other event.
- Reset
  - Allows the program to be reset from a pushbutton or other event.
- Run/Hold
  - Allows the program to be run or held from a single external source.
- Run/Reset
  - Allows the program to be run or reset from a single external source.
- Advance Segment
  - Selects the next segment from an external source.
- Advance Program
  - Selects the next program from an external source. When this event occurs, the controller display will change to programmer view. Subsequent changes of this source will cause the program number to increment.
- Holdback disabled
  - Disables holdback from an external source.
4.2.8. Wait

An event can be configured at the end of each segment, which, when active, will cause the program to wait before progressing to the next segment. Three wait conditions are provided which may be wired, in configuration level, to an external source using digital inputs or to internal sources, e.g. a loop alarm. Each segment may then select No-Wait, Wait on Event A, Wait on Event B or Wait on Event C. In a synchronous programmer the program will not proceed until all profile segments are complete.

Figure 4-4: Wait Events
4.3. PROGRAMMER TYPES

The programmer can be configured as **Time to Target** or **Ramp Rate**. A time to target programmer requires fewer settings and is simple to use since all segments are the same. A time to target programmer can, in general, contain more segments than a ramp rate.

4.3.1. Time To Target Programmer

Each segment consists of a single **duration parameter** and a set of **target values** for the profiled variables.

1. The **duration** specifies the time that the segment takes to change the profiled variables from their current values to the new targets.
2. A **dwell** type segment is set up by leaving the target setpoint at the previous value.
3. A **Step** type segment is set up by setting the segment time to zero.

4.3.2. Ramp Rate Programmer

Each segment can be specified by the operator as **Ramp Rate**, **Dwell** or **Step**.

1. Each profiled setpoint must complete its segment before the programmer will move to the next segment. If one ramp reaches its target setpoint ahead of the other variables, it will dwell at that value until the other variables have completed. The program will then move to the next segment.
2. The duration parameter for a segment is read only. In this case the dwell period can be changed when the program is in Hold.
3. The duration is determined by the longest profile setting.

4.4. SEGMENT TYPES

A segment type can be defined as **Profile**, **Go Back To** or **End**.

4.4.1. Profile

A profile segment may be set as:

<table>
<thead>
<tr>
<th>Segment Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ramp</strong></td>
<td>The setpoint ramps linearly, from its current value to a new value, either at a set rate (<strong>ramp-rate programming</strong>), or in a set time (<strong>time-to-target programming</strong>). You must specify the ramp rate or the ramp time, and the target setpoint, when creating or modifying a program.</td>
</tr>
<tr>
<td><strong>Dwell</strong></td>
<td>The setpoint remains constant for a specified period at the specified target. When creating programs the target is inherited from the previous segment.</td>
</tr>
<tr>
<td><strong>Step</strong></td>
<td>The setpoint steps instantaneously from its current value to a new value at the beginning of a segment.</td>
</tr>
</tbody>
</table>
4.4.2. Go Back To Segment

Go Back allows segments in a program to be repeated by a set number of times. It is the equivalent of inserting ‘sub-programs’ on some controllers. Figure 4-5 shows an example of a program which is required to repeat the same section a number of times and then continue the program.

A Go Back To segment is used to save the total number of segments required in a program and to simplify setting up. When planning a program it is advisable to ensure that the end and start setpoints of the program are the same otherwise it will step to the different levels. A Go Back To segment is defined when editing a program, see section 4.9.5.

Note:- If a second or more ‘Go Back’ segments are created, they cannot return to a segment before the previous ‘Go Back’ segment.

4.4.3. End Segment

The last segment in a program is normally defined as an End segment. The program either ends, repeats or resets in this segment. You specify which is the case when you create, or modify, the program. When the program ends, the programmer is put into either, a continuous dwell state with all outputs staying unchanged, or the reset state.

4.5. OTHER FEATURES NOT COVERED IN THIS USER GUIDE

Program User Values see section 6.7 of the Engineering Handbook
Pattern Generator see section 14.11 of the Engineering Handbook
User defined names for the Program, Segments, etc see Chapter 6, Programmer Configuration, of the Engineering Handbook
4.6. PROGRAMMER OPERATION

There are two pages associated with Programmer Operation. These are:-

1. PROGRAM MIMIC. This page shows a trend plot of a running program and is available by default in the Loop Summary page. It may also be turned off or made available in the Main Page in configuration level (see Engineering Handbook).

2. PROGRAM RUN. This shows a list of parameters associated with a running program

The Navigation Diagram, section 3.9, shows where these screens are found.

4.6.1. To Access the Program Trend Screen

<table>
<thead>
<tr>
<th>Do This</th>
<th>This Is The Display You Should See</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. From any display press LOOP button as many times as necessary until the Program Mimic page is displayed.</td>
<td></td>
<td>The mimic plots the working SP for each PSP configured.</td>
</tr>
<tr>
<td>2. Press Δ to scroll through parameters shown at the bottom of the display</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The value of a parameter prefixed by G can be changed using ▲ or ▼

The full list of parameters is shown in the following table.
### 4.6.2. Parameters Available on the Programmer Mimic Screen

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seg Time Rem</td>
<td>Segment time remaining</td>
<td>h: m: s</td>
<td>L1 R/O</td>
<td></td>
</tr>
<tr>
<td>PSP1 Target</td>
<td>PSP1 target setpoint for the current segment</td>
<td>Display range</td>
<td>L1 R/O</td>
<td></td>
</tr>
<tr>
<td>PSP1 Dwell Tm</td>
<td>Remaining dwell time for PSP1</td>
<td>h: m: s</td>
<td>L1 R/O</td>
<td></td>
</tr>
<tr>
<td>PSP1 Rate</td>
<td>PSP1 ramp rate</td>
<td>0.01 to display range</td>
<td>L1 R/O</td>
<td></td>
</tr>
<tr>
<td>PSP2 Target</td>
<td>PSP2 target setpoint for the current segment</td>
<td>Display range</td>
<td>L1 R/O</td>
<td></td>
</tr>
<tr>
<td>PSP2 Dwell Tm</td>
<td>Remaining dwell time for PSP2</td>
<td>h: m: s</td>
<td>L1 R/O</td>
<td></td>
</tr>
<tr>
<td>PSP2 Rate</td>
<td>PSP2 ramp rate</td>
<td>0.01 to display range</td>
<td>L1 R/O</td>
<td></td>
</tr>
<tr>
<td>PSP3 Target</td>
<td>PSP3 target setpoint for the current segment</td>
<td>Display range</td>
<td>L1 R/O</td>
<td></td>
</tr>
<tr>
<td>PSP3 Dwell Tm</td>
<td>Remaining dwell time for PSP3</td>
<td>h: m: s</td>
<td>L1 R/O</td>
<td></td>
</tr>
<tr>
<td>PSP3 Rate</td>
<td>PSP3 ramp rate</td>
<td>0.01 to display range</td>
<td>L1 R/O</td>
<td></td>
</tr>
<tr>
<td>Digital Outputs</td>
<td>Shows the state of each digital output configured</td>
<td>□□□□□□□□□□□□□□</td>
<td>L1 R/O</td>
<td></td>
</tr>
</tbody>
</table>

1 to 16

□ = Off

■ = On
4.7. TO RUN, HOLD OR RESET A SYNCHRONOUS PROGRAM

Press PROG.

1. The program status pop up window is displayed
2. Press ▲ or ▼ to select the program to be run
3. Press ▰ to edit Delayed Start if it is required to run the program after a set period
4. Press ▲ or ▼ to set a time period for the delayed start
5. Press the PROG button again to select ‘Run’

The symbol in the top left of the display changes to

4.7.1. To Hold a Program
A program can only be held from Run mode. Press the ‘PROG’ button once. The pop up window is again displayed showing ‘Run’. Press the ‘PROG’ button again. The message in the pop up window changes to ‘Hold’.

The symbol in the top left of the display changes to:

4.7.2. To Reset A Program
Press the ‘PROG’ button once. The pop up window is again displayed showing ‘Run’ or ‘Hold’. Press the ‘PROG’ button again and hold it pressed for 2 seconds. The message changes to ‘Reset’.

The symbol in the top left of the display changes to

4.7.3. From Digital Inputs
If digital inputs have been configured and wired for an external RUN, HOLD or RESET, activate the relevant digital input. This will normally be activated from an external switch.

4.7.4. From Digital Communications
If a PC running SCADA package or iTools is connected to the controller via the digital communications module, the programmer status may be changed from this package.

4.7.5. From the PROGRAM RUN Page
This page contains a parameter called ‘Program Status’. Its value can be changed to ‘Run’, ‘Hold’ or ‘Reset’. See the following section.
4.7.6. Example: To View the State of a Running Program

If you wish to know the state of the digital outputs or times remaining, for example, then you can access the ‘PROGRAM RUN’ pages:-

<table>
<thead>
<tr>
<th>Do This</th>
<th>This Is The Display You Should See</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. From any display press the page header menu.</td>
<td><img src="image1.png" alt="Display 1" /></td>
<td></td>
</tr>
<tr>
<td>2. Press ▲ or ▼ to select ‘PROGRAM RUN’</td>
<td><img src="image2.png" alt="Display 2" /></td>
<td></td>
</tr>
<tr>
<td>3. Press ▶ to show sub-headers</td>
<td><img src="image3.png" alt="Display 3" /></td>
<td></td>
</tr>
<tr>
<td>4. Press ▲ or ▼ (if necessary) to select ‘General’</td>
<td><img src="image4.png" alt="Display 4" /></td>
<td></td>
</tr>
</tbody>
</table>
| 5. Press ▶ to select the list of parameters for running the program.   | ![Display 5](image5.png)           | The parameters in this view include:-
|                                                                        |                                   | • Program Status – Run Hold or Reset can be selected from this list
|                                                                        |                                   | • Current segment
|                                                                        |                                   | • Program event outputs
|                                                                        |                                   | • Time & Days remaining to end of program
|                                                                        |                                   | • Fast Run
|                                                                        |                                   | The list may be different in a particular controller depending on how it was configured

**Warning!**

Fast Run allows the program to be tested by quickly running through the program segments. If the controller is connected to the process, ensure that the process is not affected if fast run is selected.

The default value, No, means that the program will run at the set rate.

The full list of possible parameters is shown in the following table.

---
### 4.7.7. Run Parameter Tables

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prog DOs</td>
<td>Digital outputs summary</td>
<td>□□□□□ (Up to 16)</td>
<td>□ = On, ■ = Off</td>
<td>L3</td>
</tr>
<tr>
<td></td>
<td>These are shown in this format if 'Named Dos' = 'No'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The number of DO values is set by 'Num of Prog DOs'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PROGRAM EDIT (Options)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not shown if Num of Prog DOs = 'None'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prog DO 1 (to 16)</td>
<td>If programmer event outputs have been configured, then, as an alternative to the previous presentation, the event can be given a name. [PROGRAM EDIT (Options) – Named Dos? = Yes]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delayed Start</td>
<td>Delay before the start of the program</td>
<td>h:mm:ss</td>
<td>0:00:00</td>
<td>L3</td>
</tr>
<tr>
<td>Time Remaining</td>
<td>Time remaining to end of program</td>
<td></td>
<td>Not Running or h:mm:ss</td>
<td>L3</td>
</tr>
<tr>
<td>Days Remaining</td>
<td>Number of days left for the programmer to run</td>
<td>0 to 255</td>
<td></td>
<td>L3</td>
</tr>
<tr>
<td>Fast Run</td>
<td>To fast run the program</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Program Status</td>
<td>Displays the status of the program</td>
<td>Reset, Run, Hold, Complete</td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td>Prog Run</td>
<td>Programmer run status</td>
<td>1=running</td>
<td></td>
<td>L3</td>
</tr>
<tr>
<td>Prog Hold</td>
<td>Programmer hold status</td>
<td>1=holding</td>
<td></td>
<td>L3</td>
</tr>
<tr>
<td>Prog Reset</td>
<td>Programmer reset status</td>
<td>1=reset</td>
<td></td>
<td>L3</td>
</tr>
<tr>
<td>Prog End</td>
<td>Programmer end status</td>
<td>1=end</td>
<td></td>
<td>L3</td>
</tr>
<tr>
<td>New Seg</td>
<td>New segment loaded</td>
<td>1=new segment for 100ms</td>
<td></td>
<td>L3</td>
</tr>
<tr>
<td>Prog Time Elap</td>
<td>Program time elapsed</td>
<td>h:mm:ss</td>
<td>up to 24Hrs</td>
<td>L3 R/O</td>
</tr>
<tr>
<td>Prog Cycle Rem</td>
<td>Remaining number of cycles</td>
<td>1 to 999</td>
<td></td>
<td>L1 R/O</td>
</tr>
</tbody>
</table>

**Table Number: 4.7.7a**

These parameters provide information on the running program.
<table>
<thead>
<tr>
<th><strong>Total Segments</strong></th>
<th>Number of segments in the running program</th>
<th>0 to 100</th>
<th>L1 R/O</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Segment Number</strong></td>
<td>The currently running segment number</td>
<td>1 to 100</td>
<td>L1 R/O</td>
</tr>
<tr>
<td><strong>Segment Type</strong></td>
<td>Current segment type</td>
<td>Profile = normal segment</td>
<td>Profile</td>
</tr>
<tr>
<td></td>
<td>End Segment = End of prog</td>
<td>Go Back = repeat part of prog</td>
<td>L1 R/O Alterable in Hold</td>
</tr>
<tr>
<td><strong>Segment Name</strong></td>
<td>A user defined name for the segment</td>
<td>User Text</td>
<td>Default Text</td>
</tr>
<tr>
<td><strong>Seg Time Rem</strong></td>
<td>Time remaining in the current segment</td>
<td>d: h: m: s</td>
<td>L1. R/O Alterable if Time To Target prog and in Hold</td>
</tr>
<tr>
<td><strong>Wait Status</strong></td>
<td>Wait Status</td>
<td>No Wait Event A Event B Event C</td>
<td>No Wait</td>
</tr>
<tr>
<td><strong>Wait Condition</strong></td>
<td>Wait condition for the running segment</td>
<td>No Wait Event A Event B Event C</td>
<td>No Wait</td>
</tr>
<tr>
<td><strong>Prog User Val 1</strong></td>
<td>Active User Val 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Prog User Val 2</strong></td>
<td>Active User Val 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Goback Rem</strong></td>
<td>Go back cycles remaining</td>
<td>1 to 999</td>
<td>L1 R/O</td>
</tr>
<tr>
<td><strong>End Action</strong></td>
<td>The state required in the end segment</td>
<td>Dwell Reset</td>
<td></td>
</tr>
<tr>
<td><strong>Prog Reset DO</strong></td>
<td>Digital event outputs in Reset</td>
<td>□ ■ ■ (up to 16)</td>
<td>□ ■ = Off □ ■ ■ = On</td>
</tr>
<tr>
<td><strong>Seg Edit 1 (to 16)</strong></td>
<td>If programmer event outputs have been configured, then, as an alternative to the previous presentation, the event can be given a name. [PROGRAM EDIT (Options) – Named Dos? = Yes]</td>
<td></td>
<td>The name of the event is shown with its state On or Off</td>
</tr>
<tr>
<td><strong>Reset UsrVal1</strong></td>
<td>Reset value for User Value 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reset UsrVal2</strong></td>
<td>Reset value for User Value 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
These parameters are associated with Profiled Setpoint number 1

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seg Time Rem</td>
<td>Segment time remaining</td>
<td>h:m:s</td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td>PSP1 Type</td>
<td>Running segment type for profiled setpoint 1</td>
<td>Not Used Step Dwell Ramp</td>
<td></td>
<td>L1 R/O - shown in Ramp Rate programmer only</td>
</tr>
<tr>
<td>PSP1</td>
<td>Working setpoint for profiled setpoint 1</td>
<td>Display range</td>
<td></td>
<td>L1. Alterable in Hold</td>
</tr>
<tr>
<td>PSP1 Target</td>
<td>Running segment target for profiled setpoint 1</td>
<td>Display range</td>
<td></td>
<td>L1. Alterable in Hold</td>
</tr>
<tr>
<td>PSP1 Dwell Tm</td>
<td>Time remaining in running segment for profiled setpoint 1</td>
<td>Display range</td>
<td></td>
<td>L1. Alterable in Hold</td>
</tr>
<tr>
<td>PSP1 Rate</td>
<td>Running segment rate for profiled setpoint 1</td>
<td>Display range</td>
<td></td>
<td>L1. Not in Time To Target prog</td>
</tr>
<tr>
<td>PSP1 HBk Appl</td>
<td>Holdback applied for profiled setpoint 1</td>
<td>No Yes</td>
<td></td>
<td>L1 R/O - shown if configured</td>
</tr>
</tbody>
</table>

1. Range limited by user defined upper and lower limits

The above table is repeated for PSP2 parameters and PSP3 parameters
### 4.8. TO EDIT A RUNNING PROGRAM

From time to time it may be necessary to make temporary changes to the currently running program, for example, to change the target setpoint or to add time to a segment. The current running program can only be edited under the following conditions:-

- The program must be put into ‘Hold’ or ‘Reset’. See previous section.
- Changes to the currently running segment are temporary and apply only to the current run.
- Permanent changes should be made in the ‘PROGRAM EDIT’ pages, see 4.9.5.
- Other programs can be created or edited when another program is running.

#### 4.8.1. Example; To Change the Target Setpoint or Dwell Time

In this example the changes will be made to ‘PSP1’. Place the program in ‘Hold’. Then:

<table>
<thead>
<tr>
<th>Do This</th>
<th>This Is The Display You Should See</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Select the ‘PROGRAM RUN (PSP1)’ page</td>
<td><img src="image1.png" alt="Image" /></td>
<td>PSP2 or PSP3 may be selected if the setpoint to be changed is in this profile. Parameters printed in italics may have been given a user defined name.</td>
</tr>
<tr>
<td>2. Press to select the list of parameters for running the program.</td>
<td><img src="image2.png" alt="Image" /></td>
<td>The next parameter is PSP1 Rate. Press to scroll to this and or to change the value.</td>
</tr>
<tr>
<td>3. Press to scroll to ‘PSP1 Target’</td>
<td><img src="image3.png" alt="Image" /></td>
<td>PSP Target can be set between high and low limits set in configuration level. The view shown here is for a Ramp Rate programmer.</td>
</tr>
<tr>
<td>4. Press or to change the value</td>
<td><img src="image4.png" alt="Image" /></td>
<td>The view shown here is for a Ramp Rate programmer.</td>
</tr>
<tr>
<td>5. Now place the program in ‘Run’</td>
<td><img src="image5.png" alt="Image" /></td>
<td>The full list of parameters is shown in the following table.</td>
</tr>
</tbody>
</table>
4.8.2. PROGRAM RUN (PSP1 Page)

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seg Time Rem</td>
<td>Segment time remaining</td>
<td>h: m: s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSP1 Type</td>
<td>Running segment type for profiled setpoint 1</td>
<td>Step</td>
<td></td>
<td>R/O - shown in Ramp Rate prog.</td>
</tr>
<tr>
<td>PSP1 may be a user defined name</td>
<td>Running segment type for profiled setpoint 1</td>
<td>Dwell Ramp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSP1</td>
<td>Working setpoint for profiled setpoint 1</td>
<td>Display range</td>
<td></td>
<td>L1. Alterable in Hold</td>
</tr>
<tr>
<td>PSP1 Target</td>
<td>Running segment target for profiled setpoint 1</td>
<td>Display range</td>
<td></td>
<td>L1. Alterable in Hold</td>
</tr>
<tr>
<td>PSP1 Dwell Tm</td>
<td>Time remaining in running segment for profiled SP 1</td>
<td>Display range</td>
<td></td>
<td>L1. Alterable in Hold</td>
</tr>
<tr>
<td>PSP1 Rate</td>
<td>Running segment rate for profiled setpoint 1</td>
<td>Display range</td>
<td></td>
<td>L1. Not in Time To Target prog</td>
</tr>
<tr>
<td>PSP1 HBk Appl</td>
<td>Holdback applied for profiled setpoint 1</td>
<td>No</td>
<td></td>
<td>R/O - shown if configured</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Range limited by user defined upper and lower limits

This table is repeated for PSP2 parameters and PSP3 parameters

4.9. TO CREATE A NEW OR EDIT AN EXISTING PROGRAM

To create or edit a program it is first necessary to define the parameters associated with the overall program. These parameters include parameters such as ‘Holdback Mode’ and ‘Rate Units’ and will be found under the page header ‘PROGRAM EDIT (Program)’, see section 4.9.3.

Then set up the parameters which define each individual segment. These parameters will be found in the page ‘PROGRAM EDIT (Segments)’, see section 4.9.5.

4.9.1. Fine and Coarse Holdback

Fine and Coarse Holdback values are only displayed when ‘Holdback Mode’ = ‘Per Segment’. They allow you to apply one value of holdback to selected segments and another value to other segments. For example, you could apply ‘Fine Holdback’ to one or more Dwell segments and ‘Coarse Holdback’ to one or more Ramp segments. The segments in which Fine and Coarse Holdback are applied are selected in ‘PROGRAM EDIT (Segments)’.
4.9.2. Example: To Create or Edit Program 1

<table>
<thead>
<tr>
<th>Do This</th>
<th>This Is The Display You Should See</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. From any display press ( \text{F} ) to access the page header menu.</td>
<td><img src="image" alt="Display" /></td>
<td></td>
</tr>
<tr>
<td>2. Press ( \text{or} ) to select PROGRAM EDIT</td>
<td><img src="image" alt="Display" /></td>
<td>This page allows the overall programmer parameters to be defined.</td>
</tr>
<tr>
<td>3. Press ( \text{to show sub-headers}</td>
<td><img src="image" alt="Display" /></td>
<td></td>
</tr>
<tr>
<td>4. Press ( \text{or} ) (if necessary) to select 'Program'</td>
<td><img src="image" alt="Display" /></td>
<td>The value of a parameter prefixed by ( \text{v} ) can be changed using ( \text{or} ).</td>
</tr>
<tr>
<td>5. Press ( \text{to show parameters}</td>
<td><img src="image" alt="Display" /></td>
<td>The view shown in this example shows ‘Holdback Mode’ = ‘Per Segment’, This reveals ‘CoarseHBk’ and ‘FineHBk’ as described in section 4.9.1.</td>
</tr>
<tr>
<td>6. Press ( \text{again to select ‘Program Number’}</td>
<td><img src="image" alt="Display" /></td>
<td>The view here shows how to set the 'Rate Units' to 'Minutes'</td>
</tr>
<tr>
<td>7. Press ( \text{or} ) (if necessary) to select ‘1’</td>
<td><img src="image" alt="Display" /></td>
<td>The full list of parameters is shown in the following table</td>
</tr>
</tbody>
</table>

The values of Fine and Coarse Holdback are selected in PROGRAM EDIT/Program.
### 4.9.3. PROGRAM EDIT (Program Page) Parameters

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Number</td>
<td>Selects the program number to be edited. If Profile Lock ≠ 'Unlocked', only those</td>
<td>1 to 20 or 1 to 60</td>
<td>1</td>
<td>L1</td>
</tr>
<tr>
<td></td>
<td>programs which were created prior to setting the 'Profile Lock' parameter can be</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>selected.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edit Function</td>
<td>Allows a program to be copied. The example in section 4.14 describes how this</td>
<td>None, Copy, Program</td>
<td>None</td>
<td>L1</td>
</tr>
<tr>
<td></td>
<td>feature is used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hbk Mode</td>
<td>Holdback mode</td>
<td>None</td>
<td>None</td>
<td>L1</td>
</tr>
<tr>
<td></td>
<td>None = no holdback</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Per prog = applied over the whole program</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Per seg = active in every segment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSP1 Hbk Type</td>
<td>Holdback type for PSP1 (per program)</td>
<td>Off, Fine Lo, Fine Hi, Fine Band, Course Lo, Course Hi, Course Band</td>
<td>Off</td>
<td>L1</td>
</tr>
<tr>
<td></td>
<td>These are deviations between SP and PV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fine and course holdback allows two levels of holdback to be applied to different</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>segments, see also 4.9.1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSP1 FineHbk</td>
<td>Fine holdback value for PSP1</td>
<td>Display Range</td>
<td>0</td>
<td>L1.</td>
</tr>
<tr>
<td></td>
<td>Fine Hbk Type = Off</td>
<td></td>
<td></td>
<td>Only shown if</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSP1 CourseHbk</td>
<td>Course holdback value for PSP1</td>
<td>Display Range</td>
<td>0</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Course Hbk Type = Off</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The above three parameters are repeated for PSP2 and for PSP3 if these are</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot Start PSP</td>
<td>Allows hot start to be applied to each PSP. See also section 4.2.5</td>
<td>None, None</td>
<td>None</td>
<td>L1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PSP1, PSP2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

User Guide. Part No HA026502 Issue 5.0 Dec-04 4-21
<table>
<thead>
<tr>
<th><strong>Rate Units</strong></th>
<th>Rate units for a Ramp Rate Programmer</th>
<th><strong>PSP3</strong></th>
<th><strong>L1. Only displayed if the programmer is Ramp Rate</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Program Cycles</strong></td>
<td>The number of times a program repeats.</td>
<td>Cont. to 999</td>
<td>Cont.</td>
</tr>
<tr>
<td><strong>End Action</strong></td>
<td>Defines the action in the end segment. Dwell - the program will dwell indefinitely at the conditions set in the end segment. Reset - the program will reset to the start conditions.</td>
<td>Dwell</td>
<td>Reset</td>
</tr>
<tr>
<td><strong>Program Name</strong></td>
<td>Allows a user defined name to be given to the program number</td>
<td>User string Each character can be set in turn</td>
<td></td>
</tr>
</tbody>
</table>
### 4.9.4. Example: To Set Up Each Segment of a Program

<table>
<thead>
<tr>
<th>Do This</th>
<th>This Is The Display You Should See</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. From any display press <img src="image1.png" alt="Diagram" /> to access the page header menu.</td>
<td><img src="image2.png" alt="Display" /></td>
<td></td>
</tr>
<tr>
<td>2. Press <img src="image3.png" alt="Diagram" /> or <img src="image4.png" alt="Diagram" /> to select 'PROGRAM EDIT'</td>
<td><img src="image5.png" alt="Display" /></td>
<td></td>
</tr>
<tr>
<td>3. Press <img src="image6.png" alt="Diagram" /> to show sub-headers</td>
<td><img src="image7.png" alt="Display" /></td>
<td></td>
</tr>
<tr>
<td>4. Press <img src="image8.png" alt="Diagram" /> or <img src="image9.png" alt="Diagram" /> to select 'Segment'</td>
<td><img src="image10.png" alt="Display" /></td>
<td>If the program is new, confirm as instructed on the display</td>
</tr>
<tr>
<td>5. Press <img src="image11.png" alt="Diagram" /> to select the segment parameters</td>
<td><img src="image12.png" alt="Display" /></td>
<td>If the program exists, the segment details are displayed</td>
</tr>
<tr>
<td>6. Press <img src="image13.png" alt="Diagram" /> or <img src="image14.png" alt="Diagram" /> to scroll up or down the list of parameters.</td>
<td><img src="image15.png" alt="Display" /></td>
<td>Create Prg: 2? <img src="image16.png" alt="Diagram" /> → Cancel <img src="image17.png" alt="Diagram" /> → OK</td>
</tr>
<tr>
<td>7. Press <img src="image18.png" alt="Diagram" /> again to edit the parameter.</td>
<td><img src="image19.png" alt="Display" /></td>
<td>Up to 100 segments are available per program</td>
</tr>
</tbody>
</table>

The value or state of a parameter prefixed by ![Diagram](image20.png) can be changed using ![Diagram](image21.png) or ![Diagram](image22.png).

**Additional Notes**

- A back and forward scroll is available by holding down ![Diagram](image23.png) and pressing ![Diagram](image24.png) or ![Diagram](image25.png) respectively.
- Further parameters may be accessed and adjusted in the same way. These are listed together with an explanation of their function in the following table.
4.9.5. PROGRAM EDIT (Segment) Parameters

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Number</td>
<td>Selects the program number to be edited</td>
<td>1 to 20 (or 60)</td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td>Segment Number</td>
<td>Selects the segment number to be edited</td>
<td>1 to 100</td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td>Edit Function</td>
<td>Allows a segment to be inserted</td>
<td>None Insert Segment</td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td></td>
<td>The example in section 4.15 describes</td>
<td>Delete Segment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>how this feature is used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Segment Type</td>
<td>Segment type</td>
<td>Profile End Segment</td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td></td>
<td>Profile = a normal segment</td>
<td>Go Back</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSP1 Type</td>
<td>Profile setpoint 1 type</td>
<td>Step Dwell Ramp</td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td>PSP1 Target</td>
<td>Profile setpoint 1 target value</td>
<td>SP1 lo limit to SP1 hi limit</td>
<td>0</td>
<td>L1</td>
</tr>
<tr>
<td>PSP1 Dwell Tm</td>
<td>Profile setpoint 1 dwell time</td>
<td>d : h : m : s</td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td>PSP1 Rate</td>
<td>Profile setpoint 1 rate</td>
<td></td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td>PSP1 Hbk Type</td>
<td>Profile setpoint 1 holdback type</td>
<td>Off Fine Lo Fine Hi</td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fine Band Course Lo</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Course Hi Course Band</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The above five parameters are repeated if PSP2 and PSP3 are configured.
<table>
<thead>
<tr>
<th>Seg Duration</th>
<th>Duration for Time to Target programmer only</th>
<th>d : h : m : s</th>
<th>L1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wait Event</td>
<td>Wait if selected event is true Only shown if wait events configured</td>
<td>No wait Event A Event B Event C</td>
<td>No Wait</td>
</tr>
<tr>
<td>Prog User Val 1</td>
<td>Allows a Programmer User Val to be chosen. User Values are described in the Engineering Handbook. Only shown if Prog User Val 1 is configured</td>
<td>0 to 100</td>
<td>0</td>
</tr>
<tr>
<td>Prog User Val 2</td>
<td>Same as Prog User Val1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prog DO Values</td>
<td>Sets programmer event outputs on or off. The number of DO values is set by ‘Num of Prog DOs’ PROGRAM EDIT (Options) Not shown if Num of Prog Dos = ‘None’</td>
<td>□□□■■ = Off □ = On</td>
<td>L1</td>
</tr>
<tr>
<td>Seg Edit 1 (to 16)</td>
<td>If programmer event outputs have been configured, then, as an alternative to the previous presentation, the event can be given a name. [PROGRAM EDIT (Options) – Named Dos? = Yes]</td>
<td>The name of the event is shown with its state On or Off</td>
<td>Off</td>
</tr>
<tr>
<td>GoBack to Seg</td>
<td>Allows repeat segments to be set up within a profile. Go back defines the point in the program where the repeat segments are entered. Only shown if segment. type is Go Back</td>
<td>1 to no. of segments See also Section 4.4.2</td>
<td></td>
</tr>
<tr>
<td>Go Back Cycles</td>
<td>Sets up the number of times the segments are repeated Only shown if segment. type is Go Back</td>
<td>1 to 999</td>
<td>1</td>
</tr>
<tr>
<td>Segment Name</td>
<td>Allows a user defined name to be chosen Default Text to 100:Usr 100</td>
<td>Default Text</td>
<td></td>
</tr>
</tbody>
</table>
4.10. ASYNCHRONOUS PROGRAMMER

The asynchronous programmer is described in section 4.1.2.

A summary of the functions available in the asynchronous programmer is given below:

- Creation of programs is the same as for the synchronous programmer, thus allowing for a different number of segments for each PSP.
- The number of available programs for each PSP is fixed at 20
- Twenty Program Groups are available. Program Groups are described in section 4.11
- Up to three programs may be configured into each program group
- Programs in each Program group are executed asynchronously. They may all start at the same time although PSP1, PSP2 or PSP3 may be run, held or reset independently.
- Each program can have up to 16 event outputs and two user values per segment
- The first press of the PROG button allows the user to select the program group to run
- The user may select and modify programs in the selected group when the program is in Hold or Reset mode in the same way as a synchronous programmer
- Changes made to programs, other than Group 0, are permanent
- A delayed start parameter is available
- Changes made to Program Group 0 will be overwritten by stored program combinations for other groups when one of these is selected
- The Run/Hold button acts as a global Program Group control, i.e. all programs in the program group are put into the requested state
- Individual status parameters are available for each program in the group
- There is a Group Status parameter to control the state of the active run group
- Three programmer blocks are utilised to service each Program Group
- Programs not running as part of an active group may be run under independent control, provided the programmer block is not already in use by the active Program Group
4.11. PROGRAM GROUPS

Up to three PSPs can be programmed into a single Program Group.

**Example 1: Run Group 1**

You may wish to run a Temperature program, a Pressure program and a Humidity program in a particular application. These are shown below as PSP1, PSP2 and PSP3 respectively. Each PSP program can store up to 20 profiles and each includes 16 event outputs. Any combination of these can be placed into a program group. Up to 20 program groups can be defined.

<table>
<thead>
<tr>
<th>Program Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSP1 - Temperature</td>
<td>PSP1 is allocated to the first 20 program numbers - default names PSP1:01 to 20</td>
</tr>
<tr>
<td>PSP2 - Pressure</td>
<td>PSP2 to the next 20 - default names PSP2:01 to 20</td>
</tr>
<tr>
<td>PSP3 - Humidity</td>
<td>PSP2 to the last 20 - default names PSP3:01 to 20</td>
</tr>
</tbody>
</table>

This is applicable over digital communications.

Each program can be run, held or reset individually or together as a group.

**Example Run Group 2**

This might consist of a Temperature Profile and a Humidity profile.

Up to 20 profiles can be stored in each PSP.
### 4.11.1. PROGRAM GROUPS  Group Edit Page

This page is available in operator and configuration level.

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
</table>
| Group Number   | To select the Group number
Load Programs allows a program to be entered and run directly | 'Load Programs' or select from 1 to 20 | Load Programs | L1 |
| Delayed Start  | To set a time delay before the program will run | h:mm:ss | 0:00:00 | L3 |
| Group Status   | The program group can be controlled from this parameter
The status of the program is also shown by text and symbols at the top of this display | Reset
Run
Hold
Complete | | L1 |
| PSP1           | To select the profile to be run in the group.
Not Used means PSP1 is not part of the group
01:PSP1:P1 means PSP1 is selected from program 1 to 20 | Not Used
01:PSP1:P1 to 20:PSP1;P20 | | L1 |
| PSP2           | As above | | L1 |
| PSP3           | As above | | L1 |
| Group Name     | A user configurable name
By default if Group Number = Load Programs then Group Name = USER SELECT.
To customise the name press ▲ or ▼ to change the digit with the flashing cursor.
Press ▲ to advance the cursor | USER
SELECT
Group 1 to 20 | GROUP
NAME | L1 |
| Group Run      | Group Run | Off
On | R/O | L3
R/O |
| Group Hold     | Group Hold | Off
On | R/O | L3
R/O |
| Group Reset    | Group Reset | Off
On | R/O | L3
R/O |
| Group End      | Group End | Off
On | R/O | L3
R/O |
4.12. PROFILE SETPOINT PAGES

These pages are similar to the PROGRAM EDIT page available in the synchronous programmer. They allow you to set up each PSP.

There are four pages:-
1. The Run General page available in Operator Level 1. Provides running information of the PSP
2. The Run Segment page available in Operator Level 1. Provides running information of each segment of the PSP
3. The Program Edit page available in Operator Level 1. Allows editing of the overall PSP
4. The Segment Edit page available in Operator Level 1. Allows editing of each segment in the PSP

4.12.1. PSP1 (2 OR 3) PROFILE Run General Pages

This page is similar to the ‘PROGRAM RUN’ page for the synchronous programmer and provides information on the running program.

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program</td>
<td>Number of the running program</td>
<td></td>
<td>PSP1:01 to PSP1:20 Or name from user text</td>
<td>L3</td>
</tr>
<tr>
<td>Prog DOs</td>
<td>Digital outputs summary (Up to 16) These are shown in this format if ‘Named Dos’ = ‘No’</td>
<td>□□□■ □ = Off ■ = On</td>
<td></td>
<td>L3</td>
</tr>
<tr>
<td>Prog DO 1 (to 16)</td>
<td>If programmer event outputs have been configured, then, as an alternative to the previous presentation the event can be given a name. [PROGRAM EDIT (Options) – Named Dos? = Yes]</td>
<td>The name of the event is shown with its state On or Off</td>
<td>Off</td>
<td>L3</td>
</tr>
<tr>
<td>Time Remaining</td>
<td>Time remaining to end of program (up to 24 hrs)</td>
<td>Not Running or h:mm:ss</td>
<td></td>
<td>L3</td>
</tr>
<tr>
<td>Days Remaining</td>
<td>Number of days left for the programmer to run</td>
<td>0 to 255</td>
<td></td>
<td>L3</td>
</tr>
<tr>
<td>Feature</td>
<td>Description</td>
<td>Values</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------</td>
<td>--------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Fast Run</td>
<td>Allows the program to fast run</td>
<td>No Yes</td>
<td>L3. Alterable in reset or complete</td>
<td></td>
</tr>
<tr>
<td>Delayed Start</td>
<td>Delay before the start of the program</td>
<td>h:mm:ss</td>
<td>L3</td>
<td></td>
</tr>
<tr>
<td>Program Status</td>
<td>Controls the program when not part of a group</td>
<td>Reset Run Hold Complete</td>
<td>L1</td>
<td></td>
</tr>
<tr>
<td>Prog Time Elap</td>
<td>Program time elapsed (up to 24 Hrs)</td>
<td>h:mm:ss</td>
<td>L3 R/O</td>
<td></td>
</tr>
<tr>
<td>Prog Cycle Rem</td>
<td>Remaining number of cycles</td>
<td>1 to 999</td>
<td>L1 R/O Alterable in Hold (only shown if 'Prog Cycles' &gt; 0)</td>
<td></td>
</tr>
<tr>
<td>Total Segments</td>
<td>Number of segments in the running program</td>
<td>0 to 100</td>
<td>L1 Alterable in Hold</td>
<td></td>
</tr>
<tr>
<td>Segment Number</td>
<td>The currently running segment number</td>
<td>1 to 100</td>
<td>L1 R/O</td>
<td></td>
</tr>
<tr>
<td>Segment Type</td>
<td>Running program segment type</td>
<td>Profile End Segment Go Back</td>
<td>L1 R/O</td>
<td></td>
</tr>
<tr>
<td>Segment Name</td>
<td>A user defined name for the segment</td>
<td>Default Text</td>
<td>L1 R/O</td>
<td></td>
</tr>
<tr>
<td>Seg Time Rem</td>
<td>Time remaining in the current segment</td>
<td>d: h: m: s</td>
<td>L1 R/O Alterable if Time To Target prog and in Hold</td>
<td></td>
</tr>
<tr>
<td>Wait Status</td>
<td>Wait Status</td>
<td>No Wait Event A Event B Event C</td>
<td>L1 R/O</td>
<td></td>
</tr>
<tr>
<td>Wait Condition</td>
<td>Wait condition for the running segment</td>
<td>No Wait Event A Event B Event C</td>
<td>L1 Alterable in Hold</td>
<td></td>
</tr>
<tr>
<td><strong>Prog User Val 1</strong></td>
<td>Active Programmer User Val 1: Name is user configurable</td>
<td>L1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------------------------------------------------</td>
<td>----</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Prog User Val 2</strong></td>
<td>Active Programmer User Val 2: Name is user configurable</td>
<td>L1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GoBack Rem</td>
<td>Number of repeat cycles remaining</td>
<td>1 to 999</td>
<td>L1 Alterable in Hold</td>
<td></td>
</tr>
<tr>
<td>End Action</td>
<td>The state required in the end segment</td>
<td>Dwell, Reset</td>
<td>L1 R/O</td>
<td></td>
</tr>
<tr>
<td><strong>Prog Reset DO</strong></td>
<td>These are the digital events in Reset and are shown in this format if 'Named Dos' = 'No'. The number of DO values is set by 'Num of Prog DOs'. PROGRAM EDIT (Options) Not shown if Num of Prog Dos = 'None'</td>
<td>(up to 16) = Off, □ = On</td>
<td>Only shown if configured. Alterable in Reset</td>
<td></td>
</tr>
<tr>
<td><strong>Prog DO 1 (to 16)</strong></td>
<td>If programmer event outputs have been configured, then, as an alternative to the previous presentation, the event can be given a name. [PROGRAM EDIT (Options) – Named Dos? = Yes]</td>
<td>The name of the event is shown with its state On or Off</td>
<td>Off</td>
<td>L1</td>
</tr>
<tr>
<td>Reset UsrVal1</td>
<td>Reset prog user 1 values. Name is user configurable</td>
<td>L1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reset UsrVal1</td>
<td>Reset prog user 1 values. Name is user configurable</td>
<td>L1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 4.12.2. PSP1 (2 OR 3) PROFILE Run Segment Pages

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seg Time Rem</td>
<td>Segment time remaining</td>
<td>h: m: s</td>
<td>L1</td>
<td></td>
</tr>
<tr>
<td>PSP1 Type</td>
<td>PSP1 type</td>
<td></td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td></td>
<td>Name is user configurable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Step Dwell Ramp</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSP1</td>
<td>Working setpoint for profiled setpoint 1.</td>
<td>Display range Note 1</td>
<td>L1. Alterable in Hold</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Name is user configurable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSP1 Target</td>
<td>Running segment target for profiled setpoint 1.</td>
<td>Display range Note 1</td>
<td>L1. Alterable in Hold</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Name is user configurable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSP1 Dwell Time</td>
<td>Remaining dwell time for PSP1</td>
<td>h: m: s</td>
<td>L1. Alterable in Hold</td>
<td></td>
</tr>
<tr>
<td>PSP1 Rate</td>
<td>PSP1 ramp rate</td>
<td></td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td>PSP1 HBk Appl</td>
<td>PSP1 holdback applied</td>
<td>No</td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1:- Range limited by user defined upper and lower limits. If HHHHH or LLLLL appear this indicates out of range high or low respectively.
### 4.12.3. PSP1 (2 OR 3) PROFILE Program Edit Parameters

This page is similar to the PROGRAM EDIT (Program Page) in the synchronous programmer.

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Number</td>
<td>Selects the program number to be edited. If 'Profile Lock' ≠ 'Unlocked', only those programs which were created prior to setting the 'Profile Lock' parameter can be selected.</td>
<td>PSP1:01 to PSP20:20 or name from user text</td>
<td>PSP1:01</td>
<td>L1</td>
</tr>
<tr>
<td>Edit Function</td>
<td>Allows a program to be copied and pasted. The example in section 4.14 describes how this feature is used</td>
<td>None Copy Program Paste Program</td>
<td>None</td>
<td>L1</td>
</tr>
<tr>
<td>Hbk Mode</td>
<td>Holdback mode None = no holdback Per prog = applied over the whole program Per seg = active in every segment</td>
<td>None Per Program Per Segment</td>
<td>None</td>
<td>L1</td>
</tr>
<tr>
<td>PSP1 Hbk Type</td>
<td>Holdback type for PSP1 (per program) These are deviations between SP and PV Fine and course holdback allows two levels of holdback to be applied to different segments.</td>
<td>Off Fine Lo Fine Hi Fine Band Course Lo Course Hi Course Band</td>
<td>Off Only displayed if Per Program configured</td>
<td>L1</td>
</tr>
<tr>
<td>PSP1 FineHbk</td>
<td>Fine holdback value for PSP1</td>
<td>Display Range</td>
<td>0</td>
<td>L1 Only shown if Hbk Type ≠ Off</td>
</tr>
<tr>
<td>PSP1 CourseHbk</td>
<td>Course holdback value for PSP1</td>
<td>Display Range</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Rate Units</td>
<td>Rate units Only if program Type = Ramp Rate</td>
<td>Per Second Per Minute Per Hour</td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td><strong>(PROGRAM GROUPS Options Page)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hot Start</strong></td>
<td>Allows hot start to be applied. Only appears if Hot Start = Yes (PROFILE SP1 Options Page)</td>
<td>Disabled</td>
<td>Enabled</td>
<td>None</td>
</tr>
<tr>
<td><strong>Program Cycles</strong></td>
<td>The number of times a program repeats.</td>
<td>Cont. to 999</td>
<td>Cont.</td>
<td>L1</td>
</tr>
<tr>
<td><strong>End Action</strong></td>
<td>Defines the action in the end segment. Dwell - the program will dwell indefinitely at the conditions set in the end segment. Reset - the program will reset to the start conditions.</td>
<td>Dwell</td>
<td>Reset</td>
<td>L1</td>
</tr>
<tr>
<td><strong>Program Name</strong></td>
<td>Allows a user defined name to be given to the program number</td>
<td>User string Each character can be set in turn</td>
<td></td>
<td>L1</td>
</tr>
</tbody>
</table>
### 4.12.4. PSP1 (2 or 3) PROFILE Segment Parameters

This page is similar to the PROGRAM EDIT (Segment Page) in the synchronous programmer.

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program</td>
<td>Selects the program number to be edited</td>
<td>PSP1:01 to PSP1:20 Or from user text</td>
<td>PSP1:01</td>
<td>L1</td>
</tr>
<tr>
<td>Segment Number</td>
<td>Selects the segment number to be edited</td>
<td>1 to 100</td>
<td></td>
<td>L1</td>
</tr>
<tr>
<td>Edit Function</td>
<td>Allows a segment to be inserted</td>
<td>None</td>
<td>Insert Segment Delete Segment</td>
<td>L1</td>
</tr>
<tr>
<td>Segment Type</td>
<td>Segment type</td>
<td>Profile End Segment Go Back</td>
<td>Profile</td>
<td>L1</td>
</tr>
</tbody>
</table>

**Profile** = a normal segment  
**End Segment** = the last segment in the program (press ∑ to confirm)  
**Go Back** = repeat part of program. Not shown for Segment 1.

<table>
<thead>
<tr>
<th>PSP1 Type</th>
<th>Profile setpoint 1 type</th>
<th>Step Dwell Ramp</th>
<th>L1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Only shown if Program Type = Ramp Rate and program not in End</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSP1 Target</td>
<td>Profile setpoint 1 target value</td>
<td>SP1 lo limit to SP1 hi limit</td>
<td>0</td>
</tr>
<tr>
<td>PSP1 Dwell Tm</td>
<td>Profile setpoint 1 dwell time</td>
<td>d : h : m : s</td>
<td>0:00:00.0</td>
</tr>
<tr>
<td></td>
<td>Only shown if Program Type = Ramp Rate; Segment Type = Dwell and program not in End</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSP1 Rate</td>
<td>Profile setpoint 1 rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Only shown if Program Type = Ramp Rate; Segment Type = Dwell and program not in End</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSP1 Hbk Type</td>
<td>Profile setpoint 1 holdback type</td>
<td>Off Fine Lo Fine Hi Fine Band Course Lo Course Hi Course Band</td>
<td>Off</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
<td>Setting</td>
<td>Example</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Seg Duration</td>
<td>Segment duration for Time to Target programmer only</td>
<td>d : h : m : s</td>
<td>0:00:00.0</td>
</tr>
<tr>
<td>Wait Event</td>
<td>Wait if selected event is true. Only shown if wait events configured</td>
<td>No wait</td>
<td>No Wait</td>
</tr>
<tr>
<td>Prog User Val 1</td>
<td>Allows a Programmer User Val to be chosen. User Values are described in the Engineering Handbook. Only shown if Prog User Val 1 is configured</td>
<td>0 to 100</td>
<td>0</td>
</tr>
<tr>
<td>Prog User Val 2</td>
<td>Allows a Programmer User Val to be chosen. User Values are described in the Engineering Handbook. Only shown if Prog User Val 2 is configured</td>
<td>0 to 100</td>
<td>0</td>
</tr>
<tr>
<td>Prog DO Values</td>
<td>Digital outputs summary. These are shown in this format if ‘Named Dos’ = ‘No’. The number of DO values is set by ‘Num of Prog DOs’. Not shown if Num of Prog Dos = ‘None’.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seg Edit 1 (to 16)</td>
<td>If programmer event outputs have been configured, then, as an alternative to the previous presentation the event can be given a name. PROGRAM EDIT (Options) – Named Dos? = Yes</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>GoBack to Seg</td>
<td>Allows repeat segments to be set up within a profile. Go back defines the point in the program where the repeat segments are entered. Go-back sees also Section 4.4.2</td>
<td>1 to no. of segments</td>
<td></td>
</tr>
<tr>
<td>Go Back Cycles</td>
<td>Sets up the number of times the segments are repeated</td>
<td>1 to 999</td>
<td>1</td>
</tr>
</tbody>
</table>

The above two parameters are only shown if segment type is Go Back

<table>
<thead>
<tr>
<th>Segment Name</th>
<th>Allows a user defined name to be chosen</th>
<th>Default Text to 50:Usr 50</th>
<th>Default Text</th>
</tr>
</thead>
</table>
### 4.13. Example: TO SET UP AND RUN PROGRAM GROUPS

Using the two examples from section 4.11 and the general navigation procedures:

<table>
<thead>
<tr>
<th>Do This</th>
<th>This Is The Display You Should See</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Set up a temperature program in PSP1:01</td>
<td><img src="image1" alt="Display" /></td>
<td>See section 4.12 for the full list of parameters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Set each parameter to suit your application</td>
</tr>
<tr>
<td>2. Set up each segment in the program</td>
<td><img src="image2" alt="Display" /></td>
<td>See Table 4.12 for the full list of parameters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Set each parameter to suit your application</td>
</tr>
<tr>
<td>3. Set up a pressure and Humidity program in PSP2:01 and PSP3:01</td>
<td><img src="image3" alt="Display" /></td>
<td>These are the same as Example 1 shown in section 4.11</td>
</tr>
<tr>
<td>4. Set up further programs as required in PSP1:02 (to 20), PSP2:02 (to 20), and PSP3:02 (to 20)</td>
<td><img src="image4" alt="Display" /></td>
<td>These are the same as Example 2 shown in section 4.11</td>
</tr>
<tr>
<td>5. When all PSPs have been set up, place them in Groups</td>
<td><img src="image5" alt="Display" /></td>
<td>In this example a delayed start of 3 hours has been placed on Group 2 which will run two profiles PSP1:P1 and PSP2:P6</td>
</tr>
<tr>
<td>6. Repeat for further groups</td>
<td><img src="image6" alt="Display" /></td>
<td></td>
</tr>
<tr>
<td>7. To run the program press <strong>PROG</strong></td>
<td><img src="image7" alt="Display" /></td>
<td>Select the group to run.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Press <strong>PROG</strong> again to run the selected group</td>
</tr>
</tbody>
</table>

This is also described in section 4.16
### 4.14. Example: TO COPY A PROGRAM

<table>
<thead>
<tr>
<th>Do This</th>
<th>This Is The Display You Should See</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. From any display press 📸 to access the page header menu.</td>
<td><img src="image1.png" alt="Display Image" /></td>
<td></td>
</tr>
<tr>
<td>2. Press 📸 or ⬇️ to select ‘PROFILE SP1’</td>
<td><img src="image2.png" alt="Display Image" /></td>
<td></td>
</tr>
<tr>
<td>3. Press 📸 to select sub-headers</td>
<td><img src="image3.png" alt="Display Image" /></td>
<td></td>
</tr>
<tr>
<td>4. Press 📸 or ⬇️ to select ‘Program Edit’</td>
<td><img src="image4.png" alt="Display Image" /></td>
<td></td>
</tr>
<tr>
<td>5. Press 📸 to select parameters and again to edit ‘Program Number’</td>
<td><img src="image5.png" alt="Display Image" /></td>
<td>In this case the program has been given a name by the user.</td>
</tr>
<tr>
<td>6. Press 📸 or ⬇️ to select the program number to be copied</td>
<td><img src="image6.png" alt="Display Image" /></td>
<td></td>
</tr>
<tr>
<td>7. Press 📸 to scroll to ‘Edit Function’</td>
<td><img src="image7.png" alt="Display Image" /></td>
<td>When the program is copied the display returns to ‘None’.</td>
</tr>
<tr>
<td>8. Press 📸 or ⬇️ to ‘Copy Program’</td>
<td><img src="image8.png" alt="Display Image" /></td>
<td></td>
</tr>
<tr>
<td>9. Press 📸 and ⬇️ to scroll back to ‘Program Number’</td>
<td><img src="image9.png" alt="Display Image" /></td>
<td></td>
</tr>
<tr>
<td>10. Press 📸 or ⬇️ to select the program to paste to – in this case program 2</td>
<td><img src="image10.png" alt="Display Image" /></td>
<td>Press 📸 or ⬇️ to confirm or cancel. If no button is pressed for 10 seconds the display reverts to previous and the paste is cancelled.</td>
</tr>
<tr>
<td>11. Press 📸 again to scroll to ‘Edit Function’</td>
<td><img src="image11.png" alt="Display Image" /></td>
<td></td>
</tr>
<tr>
<td>12. Press 📸 or ⬇️ to ‘Paste Program’</td>
<td><img src="image12.png" alt="Display Image" /></td>
<td></td>
</tr>
</tbody>
</table>
### 4.15. Example: TO INSERT A SEGMENT INTO A PROGRAM

<table>
<thead>
<tr>
<th>Do This</th>
<th>This Is The Display You Should See</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. From any display press ▲ to access the page header menu.</td>
<td><img src="image1" alt="Display" /></td>
<td></td>
</tr>
<tr>
<td>2. Press ▲ or ▼ to select 'PROFILE SP1'</td>
<td><img src="image2" alt="Display" /></td>
<td></td>
</tr>
<tr>
<td>3. Press ▼ to select sub-headers</td>
<td><img src="image3" alt="Display" /></td>
<td></td>
</tr>
<tr>
<td>4. Press ▲ or ▼ to select 'Segment Edit'</td>
<td><img src="image4" alt="Display" /></td>
<td></td>
</tr>
<tr>
<td>5. Press ▼ to select parameters and press again to edit 'Program Number'</td>
<td><img src="image5" alt="Display" /></td>
<td>In this case the program has been given a name by the user</td>
</tr>
<tr>
<td>6. Press ▲ or ▼ to select the program number to be edited</td>
<td><img src="image6" alt="Display" /></td>
<td>In this case segment 1 is inserted and the total segment count increases by one</td>
</tr>
<tr>
<td>7. Press ▲ or ▼ to scroll to 'Edit Function'</td>
<td><img src="image7" alt="Display" /></td>
<td>If no button is pressed for 10 seconds the display reverts to previous.</td>
</tr>
<tr>
<td>8. Press ▲ or ▼ to 'Insert Segment'</td>
<td><img src="image8" alt="Display" /></td>
<td></td>
</tr>
<tr>
<td>9. Press ▼ to confirm or ▲ to cancel</td>
<td><img src="image9" alt="Display" /></td>
<td>If all segments in the program are already configured the message ‘Program Full’ is shown</td>
</tr>
</tbody>
</table>
4.16. PROGRAMMER ERROR MESSAGES

If an invalid entry is made when setting up programs through the front panel, a pop up error message will appear. For example a pop up will occur if an attempt is made to copy and paste a program which has more segments than the controller has left. The messages are similar to those which are shown if the same action is implemented over digital communications – these messages are further described in section 18.3 of the Engineering handbook part no. HA026933.

4.17. RUNNING AN ASYNCHRONOUS PROGRAMMER

As with the synchronous programmer the group of programs can be run using:-

1. The ‘PROG’ button.
2. A digital input configured to activate all configured PSPs
3. Digital inputs configured to run each PSP separately
4. Via a command from digital communications

If the PROG button is used (as described in the following section), a pop-up window is shown which allows you to choose the format of the program. The other methods listed above are designed for remote or fixed operation in which case the pop-up window is not displayed.

The program may also be controlled using the relevant parameters in the lists. These are:-

5. ‘Group Status’ in the PROGRAM GROUPS Active Group list. This allows all configured PSPs to be started together
6. ‘Program Status’ in the PSP1 (2 or 3) PROFILE Run General list. This allows each PSP to be run separately.
4.17.1. Example: To Run a Program Using the PROG Button

<table>
<thead>
<tr>
<th>Do This</th>
<th>This Is The Display You Should See</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. From any display</td>
<td><img src="image1" alt="Run Group Status" /></td>
<td>The Run Group Status pop-up will be shown. The following conditions may be selected:- Group to run Group 1 to Group 20 or USER SELECT (Press ▲ or ▼ to choose) Group 1 to 20 selects pre-set profiles as set up in PROGRAM GROUPS Active Group page. If the user changes the profiles in this pop-up display the changes become permanent. USER SELECT will choose the last selected Program Group but if the profiles are changed they are only applicable to the current run</td>
</tr>
<tr>
<td>Press PROG</td>
<td><img src="image2" alt="Run Group Status" /></td>
<td>Profile SP1 Not Used or 01:PSP1:P1 to 20:PSP1:20 Not Used means that the profile will not be run in this program 01:PSP1:P1 will select PSP1 Program 1 to PSP1 Program 20 Profile SP2 Not Used or 01:PSP2:P1 to 20:PSP2:20 Profile SP3 Not Used or 01:PSP3:P1 to 20:PSP3:20</td>
</tr>
<tr>
<td>2. Press PROG again to Run the program</td>
<td><img src="image3" alt="Run Group Status" /></td>
<td>Delayed Start This can be set between 0:00:00 and 500:00:00 hrs. This value counts down when Run is selected. In the event of a power fail, delayed start retains its value prior to the power fail, but the request to run is cancelled.</td>
</tr>
<tr>
<td>3. Press PROG again to Hold the program</td>
<td><img src="image4" alt="Run Group Status" /></td>
<td></td>
</tr>
<tr>
<td>4. Press PROG and hold for 3 seconds to Reset the program</td>
<td><img src="image5" alt="Run Group Status" /></td>
<td></td>
</tr>
</tbody>
</table>

This is an example of an Overview display
Note the symbols shown on each of these displays as described in the following section

A running program may be interrogated and changes made to segments in the same way as a synchronous programmer.
The programmer mimic can also be displayed in the same way as a synchronous programmer.
4.17.2. Asynchronous Programmer Status Bar

The programmer status bar is shown in the top right hand corner of the loop overview displays (as selected by the LOOP button).

They are shown as

The view shown here is applicable when Groups are used. The number of displayed status symbols depends on the number of programmer blocks used, but the order of display is always left to right – with no gaps.

When Groups are not used the program status is associated with the individual loop pages.

Symbols Used

- Reset
- Run
- Hold

The current status is shown in inverse, e.g. PSP is in Hold

These symbols are also used on other views, for example, the Run Group Status pop-up shown in the previous section.
5. CHAPTER 5 ALARM OPERATION

5.1. DEFINITION OF ALARMS AND EVENTS

5.1.1. Customisable Parameter Names

5.2. TYPES OF ALARM USED IN 2704 CONTROLLER

5.2.1. Grouped Alarms

5.3. HOW ALARMS ARE INDICATED

5.3.1. To Acknowledge an Alarm

5.3.2. Alarm Delay Time

5.4. THE ALARM SUMMARY PAGE

5.4.1. Alarms (Summary) Parameters

5.5. ALARM ACKNOWLEDGEMENT

5.6. TO SET ALARM TRIP LEVELS

5.7. ALARM PARAMETERS

5.7.1. ALARMS (LP1 Page) Parameters

5.7.2. ALARMS (PV Input Page) Parameters

5.7.3. ALARMS (An Input Page) Parameters

5.7.4. ALARMS (Module 1 Page) Parameters

5.7.5. ALARMS (User 1 Page) Parameters
5. Chapter 5  ALARM OPERATION

5.1. DEFINITION OF ALARMS AND EVENTS

Alarms are used to alert an operator when a pre-set level has been exceeded. They are normally used to switch an output – usually a relay – to provide external actions to the process.

Soft Alarms are indication only and do not operate an output.

Events are generally defined as conditions, which occur as part of the operation of the plant. They do not require operator intervention and, therefore, do not cause an alarm message to be displayed. They can be attached to operate an output (relay) in the same way as an alarm.

5.1.1. Customisable Parameter Names

Throughout this chapter parameter names shown in *italics* are customisable by the user when in configuration access level. The name of the parameter may vary, therefore, from instrument to instrument.

Typical customisable parameter names are:
- Alarm names
- Loop names
- Module and input names
- Custom units
- Promoted parameters
5.2. TYPES OF ALARM USED IN 2704 CONTROLLER

This section shows graphically the operation of different types of alarm used in the controller. The graphs show changes in PV plotted against time.

Rate of change alarms detect if the rate of change in PV, set as units per minute or per second, exceeds the setpoint value. An alarm setpoint set + will detect positive rates of change. An alarm setpoint set - will detect negative rates of change. Therefore, if it is required to measure the rate of change in both directions then two alarms must have been configured. Since rate of change alarms are calculated over a period of time a small delay may be apparent before the alarm is indicated. This is generally only noticeable if the PV changes very quickly.
**Deviation Alarms.** The setpoint used for deviation alarms is normally derived as a remote input from another device - for example, a temperature controller. The setpoint can also be internally set within the controller - in this case called the local setpoint value.

**Blocking Alarms** only occur after the start up phase when the alarm has first entered a safe state. The alarm is only indicated the next time it is active. It is used, for example, to ignore start up conditions which are not representative of running conditions.

**Hysteresis** is the difference between the point at which the alarm switches ON and the point at which it switches OFF. It is used to prevent relay chatter.

**Delay** a settable time between an alarm occurring and it being displayed on the indicator.

**Latching Alarms** The alarm is indicated until it is acknowledged by the user. Acknowledgement of an alarm can be through the controller front buttons, from an external source using a digital input to the controller or through digital communications.

There are two ways that the alarm can be acknowledged:

1. **Automatic Reset.** The alarm continues to be active until both the alarm condition is removed AND the alarm is acknowledged. The acknowledgement can occur **BEFORE** the alarm condition is removed.

2. **Manual Reset.** The alarm continues to be active until both the alarm condition is removed AND the alarm is acknowledged. The acknowledgement can only occur **AFTER** the alarm condition is removed.

### 5.2.1. Grouped Alarms

Alarms can be associated with different aspects of the process. They are grouped in accordance with the functions they perform as follows:

**Loop Alarms** Alarms associated with each control loop. Examples are: High, Low, Deviation and Rate of Change. Two alarms are available for each loop. On a new controller these are the only alarms which are configured - those listed below must be enabled in configuration level, see 2704 Engineering Handbook HA026933.

**PV Input Alarms** Alarms which operate on the PV input. Examples are: High and Low. Two alarms are available with this input.

**Analogue Input Alarms** Alarms which operate on the analogue input. Examples are: High and Low. Two alarms are available with this input.

**Module Alarms** Alarms which operate on each plug in module. These can be input or output alarms depending upon the function of the module fitted. These alarms are associated with modules 1, 3, 4, 5, & 6, since module 2 is reserved as a an extra memory module.

**User Alarms** Eight undedicated alarms which can be wired to any variable.
5.3. HOW ALARMS ARE INDICATED

When an alarm occurs a message will appear on the display which will indicate the source and the type of alarm. The format of this alarm message is:

When the alarm has been acknowledged the message shown in the banner of the pop up window above will now be shown in the Loop Display page.

The symbol will be shown steady in the top banner of any page if any alarm is still present.

If a relay has been connected to the output of the alarm, it will operate to allow an external beacon or audible device to be activated.

Events will not cause either a message or the beacon to be illuminated.

5.3.1. To Acknowledge an Alarm

Press as instructed.

The action which follows depends upon the type of alarm configured.

### If the alarm is non latching

- Any relay connected to the alarm output will be reset
- The red alarm beacon will illuminate permanently if the alarm condition still exists
- The red alarm beacon will extinguish as soon as the alarm condition no longer exists

### Alarm is latching – ‘Auto’

- Any relay connected to the alarm output will remain set if the alarm condition still exists
- The red alarm beacon will illuminate permanently if the alarm condition still exists
- As soon as the alarm condition is no longer present the alarm beacon will extinguish and any relay will be reset

### Alarm is latching – ‘Manual’

- Any relay connected to the alarm output will remain set if the alarm condition still exists
- The red alarm beacon will illuminate permanently if the alarm condition still exists
- The alarm indication and any relay connected to it must now be reset. This may be done as described in section 5.4 ‘The Alarm Summary Page’, or by choosing the appropriate Alarm Page, select ‘Alarm Ack’ - set to ‘Yes’, Press as instructed.

This section describes the usual method to acknowledge an alarm. Section 5.5 describes alternative ways.
5.3.2. Alarm Delay Time

A delay time may have been set for each alarm between the occurrence of the alarm and the indication of the alarm in the controller. This is useful to prevent spurious alarms from being indicated in some noisy or rapidly changing processes.

To set delay time the controller must be placed in Configuration level. This is described in the 2704 Engineering Handbook Part No HA026933.

If you notice a delay between an alarm occurring and it being indicated by the controller then a delay may have been set in configuration level.
5.4. THE ALARM SUMMARY PAGE

The status of alarms is displayed in the Alarm Summary page. To inspect the status:

<table>
<thead>
<tr>
<th>Do This</th>
<th>This Is The Display You Should See</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. From any display press ( \uparrow ) as many times as necessary to access the page header menu.</td>
<td><img src="image1.png" alt="Display Showing Menu Options" /></td>
<td></td>
</tr>
<tr>
<td>2. Press ( \uparrow ) or ( \downarrow ) to select ‘ALARMS’</td>
<td><img src="image2.png" alt="Display Showing Alarms Section" /></td>
<td>The first sub-header is Summary. Further sub-headers only appear if the alarms have been configured.</td>
</tr>
<tr>
<td>3. Press ( \uparrow ) to display sub-headers</td>
<td><img src="image3.png" alt="Display Showing Summary of Alarm Parameters" /></td>
<td>The alarm message will alternate between the source of the alarm and the type of alarm. It can be acknowledged from either view.</td>
</tr>
<tr>
<td>4. Press ( \uparrow ) to display a ‘Summary’ of alarm parameters</td>
<td><img src="image4.png" alt="Display Showing Alarm Message" /></td>
<td>For a non-latched alarm, the message will disappear when the alarm is no longer present. For a latched alarm, the message will remain until the alarm condition is removed. See also section 5.5. Parameters shown ( \checkmark ) can be adjusted. For example, the alarm acknowledge parameter = ‘No’ or ‘Yes’</td>
</tr>
<tr>
<td>5. Press ( \uparrow ) or ( \downarrow ) to scroll down the list of alarm messages.</td>
<td><img src="image5.png" alt="Display Showing Scroll Down Option" /></td>
<td></td>
</tr>
</tbody>
</table>

The full list of parameters is shown in the following table.

---

User Guide    Part No HA026502    Issue 3.0    Apr-02

5-7
### 5.4.1. Alarms (Summary) Parameters

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Alarm</td>
<td>Only available over digital communications to flag that a new alarm has occurred</td>
<td>No</td>
<td>Yes</td>
<td>L1 R/O</td>
</tr>
<tr>
<td>LP1 Ack</td>
<td>Status and acknowledge loop 1 alarms</td>
<td>No</td>
<td>Yes</td>
<td>L1</td>
</tr>
<tr>
<td>LP2 Ack</td>
<td>Status and acknowledge loop 2 alarms</td>
<td>No</td>
<td>Yes</td>
<td>L1</td>
</tr>
<tr>
<td>LP3 Ack</td>
<td>Status and acknowledge loop 3 alarms</td>
<td>No</td>
<td>Yes</td>
<td>L1</td>
</tr>
<tr>
<td>PV Input Ack</td>
<td>Status and acknowledge PV input alarms</td>
<td>No</td>
<td>Yes</td>
<td>L1</td>
</tr>
<tr>
<td>An Input Ack</td>
<td>Status and acknowledge analogue input alarms</td>
<td>No</td>
<td>Yes</td>
<td>L1</td>
</tr>
<tr>
<td>Module 1 Ack</td>
<td>Status and acknowledge module 1 alarms</td>
<td>No</td>
<td>Yes</td>
<td>L1</td>
</tr>
<tr>
<td>Module 3 Ack</td>
<td>Status and acknowledge module 3 alarms</td>
<td>No</td>
<td>Yes</td>
<td>L1</td>
</tr>
<tr>
<td>Module 4 Ack</td>
<td>Status and acknowledge module 4 alarms</td>
<td>No</td>
<td>Yes</td>
<td>L1</td>
</tr>
<tr>
<td>Module 5 Ack</td>
<td>Status and acknowledge module 5 alarms</td>
<td>No</td>
<td>Yes</td>
<td>L1</td>
</tr>
<tr>
<td>Module 6 Ack</td>
<td>Status and acknowledge module 6 alarms</td>
<td>No</td>
<td>Yes</td>
<td>L1</td>
</tr>
<tr>
<td>User 1 Ack</td>
<td>Status and acknowledge User 1 alarm</td>
<td>No</td>
<td>Yes</td>
<td>L1</td>
</tr>
<tr>
<td>User 8 Ack</td>
<td>Status and acknowledge User 8 alarm</td>
<td>No</td>
<td>Yes</td>
<td>L1</td>
</tr>
<tr>
<td>Ack All</td>
<td>Acknowledges all alarms</td>
<td>No</td>
<td>Yes</td>
<td>L1</td>
</tr>
</tbody>
</table>
5.5. ALARM ACKNOWLEDGEMENT

A new alarm can be acknowledged in five ways:
1. By pressing \( \text{ and } \) simultaneously
2. Through the alarms ‘Summary’ page
3. Through the ‘Alarms’ page
4. From an external source, such as a pushbutton, connected to a suitably configured digital input
5. Through digital communications

The message will remain on the screen and the alarm symbol, \( \text{,} \) will continue to flash until the alarm is acknowledged - you are prompted to do this by pressing \( \text{ and } \) simultaneously. The symbol will stop flashing and remain illuminated until all alarm conditions are removed. If a further alarm occurs the symbol will start flashing again and a new alarm message will pop up.

The message displayed indicates the source of the alarm and may be customised to the users terminology. The source will inherit the name of the channel or the loop or the user alarm name.

The operation of the alarm acknowledgement depends whether the alarm is non-latching or latching, auto or manual reset. This is shown in the following tables:-

**Non Latched Alarms**

<table>
<thead>
<tr>
<th>Alarm Condition</th>
<th>Acknowledge</th>
<th>Symbol</th>
<th>Message</th>
<th>Ext relay (if fitted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>No</td>
<td>Flashing</td>
<td>Alarm message</td>
<td>On</td>
</tr>
<tr>
<td>Off</td>
<td>No</td>
<td>Off</td>
<td>Former display</td>
<td>Off</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alarm Condition</th>
<th>Acknowledge</th>
<th>Symbol</th>
<th>Alarm message</th>
<th>Ext relay (if fitted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>No</td>
<td>Flashing</td>
<td>Alarm message</td>
<td>On</td>
</tr>
<tr>
<td>On</td>
<td>Yes</td>
<td>Steady</td>
<td>Former display</td>
<td>Off</td>
</tr>
<tr>
<td>Off</td>
<td>Yes</td>
<td>Off</td>
<td>Former message</td>
<td>Off</td>
</tr>
</tbody>
</table>

**Latched Alarm - Auto**

<table>
<thead>
<tr>
<th>Alarm Condition</th>
<th>Acknowledge</th>
<th>Symbol</th>
<th>Message</th>
<th>Ext relay (if fitted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>No</td>
<td>Flashing</td>
<td>Alarm message</td>
<td>On</td>
</tr>
<tr>
<td>Off</td>
<td>No</td>
<td>Flashing</td>
<td>Alarm message</td>
<td>On</td>
</tr>
<tr>
<td>Off</td>
<td>Yes</td>
<td>Steady</td>
<td>‘Access Level’</td>
<td>Off</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alarm Condition</th>
<th>Acknowledge</th>
<th>Symbol</th>
<th>Message</th>
<th>Ext relay (if fitted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>No</td>
<td>Flashing</td>
<td>Alarm message</td>
<td>On</td>
</tr>
<tr>
<td>ON</td>
<td>Yes</td>
<td>Steady</td>
<td>‘Access Level’</td>
<td>Off</td>
</tr>
<tr>
<td>Off</td>
<td>-</td>
<td>Off</td>
<td>Normal display</td>
<td>Off</td>
</tr>
</tbody>
</table>
### Latched Alarm - Manual

<table>
<thead>
<tr>
<th>Alarm Condition</th>
<th>Acknowledge</th>
<th>Symbol</th>
<th>Message</th>
<th>Ext relay (if fitted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>No</td>
<td>Flashing</td>
<td>Alarm message</td>
<td>On</td>
</tr>
<tr>
<td>Off</td>
<td>No</td>
<td>Flashing</td>
<td>Alarm message</td>
<td>On</td>
</tr>
<tr>
<td>Off</td>
<td>Yes</td>
<td>Off</td>
<td>Access Level</td>
<td>Off</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alarm Condition</th>
<th>Acknowledge</th>
<th>Symbol</th>
<th>Message</th>
<th>Ext relay (if fitted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>No</td>
<td>Flashing</td>
<td>Alarm message</td>
<td>On</td>
</tr>
<tr>
<td>ON</td>
<td>Yes</td>
<td>Steady</td>
<td>Former display</td>
<td>Off</td>
</tr>
<tr>
<td>Off</td>
<td>-</td>
<td>Steady</td>
<td>Former display</td>
<td>Off</td>
</tr>
<tr>
<td>Off</td>
<td>To acknowledge see below</td>
<td>Off</td>
<td>Former display</td>
<td>Off</td>
</tr>
</tbody>
</table>
5.6. TO SET ALARM TRIP LEVELS

The alarm trip level (setpoint) is available in access level 1 and is adjusted by accessing the page header for the chosen alarm. The following example adjusts these parameters for Alarm 1/Loop 1:

<table>
<thead>
<tr>
<th>Do This</th>
<th>This Is The Display You Should See</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. From any display press [ ] as many times as necessary to access the page header menu</td>
<td>![Image of display for accessing page header menu]</td>
<td>The alarm type must have been selected in config level, otherwise the alarm parameters will not be available</td>
</tr>
<tr>
<td>2. Press [ ] or [ ] to select ‘ALARMS’</td>
<td>![Image of display showing ALARMS selection]</td>
<td></td>
</tr>
<tr>
<td>3. Press [ ] to display the list of sub-headers</td>
<td>![Image of display showing list of sub-headers]</td>
<td></td>
</tr>
<tr>
<td>4. Press [ ] or [ ] to select the source of the alarm, in this example ‘LP1’</td>
<td>![Image of display showing selection of source]</td>
<td></td>
</tr>
<tr>
<td>5. Press [ ] to display the list of alarm parameters for LP1</td>
<td>![Image of display showing list of alarm parameters]</td>
<td>Alm1 Type is read only</td>
</tr>
<tr>
<td>6. Press [ ] or [ ] to scroll to ‘Alm1 setpoint’</td>
<td>![Image of display showing scroll to Alm1 setpoint]</td>
<td></td>
</tr>
<tr>
<td>7. Press [ ] to select the AL1 Setpoint</td>
<td>![Image of display showing selection of Alm1 setpoint]</td>
<td>This example sets the alarm trip level to 173 units</td>
</tr>
<tr>
<td>8. Press [ ] or [ ] to adjust the value</td>
<td>![Image of display showing adjustment of value]</td>
<td></td>
</tr>
</tbody>
</table>
5.7. **ALARMS PARAMETERS**

The parameter tables listed in this section are only displayed if an alarm has been configured for the particular loop, input or module.

5.7.1. **ALARMS (LP1 Page) Parameters**

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alm1 Type</td>
<td>Alarm 1 Type</td>
<td>Off Full Scale Low Full Scale High Deviation Band Deviation High Deviation Low Rate of Change If True If False Goes True Goes False If Changed</td>
<td>R/O</td>
<td></td>
</tr>
<tr>
<td>Alm1 Setpoint</td>
<td>Alarm 1 Setpoint</td>
<td>Controller range</td>
<td>L1</td>
<td></td>
</tr>
<tr>
<td>Alm1 Output</td>
<td>Alarm 1 output</td>
<td>Off On</td>
<td>Off</td>
<td>R/O</td>
</tr>
<tr>
<td>Alm2 Type</td>
<td>Alarm 2 Type</td>
<td>As Alm1 Type</td>
<td>R/O</td>
<td></td>
</tr>
<tr>
<td>Alm2 Setpoint</td>
<td>Alarm 2 Setpoint</td>
<td>Controller range</td>
<td>L1</td>
<td></td>
</tr>
<tr>
<td>Alm2 Output</td>
<td>Alarm 2 output</td>
<td>Off On</td>
<td>Off</td>
<td>R/O</td>
</tr>
</tbody>
</table>

The above table is repeated for LP2 and LP3 if these control loops have been configured.
### 5.7.2. ALARMS (PV Input Page) Parameters

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV Alarm Ack</td>
<td>Alarm acknowledge for PV input</td>
<td>No Yes</td>
<td>No</td>
<td>L1</td>
</tr>
<tr>
<td>FS Hi Setpoint</td>
<td>Full Scale High Alarm (1) Setpoint</td>
<td>Controller range</td>
<td>L1</td>
<td></td>
</tr>
<tr>
<td>FS Hi Output</td>
<td>Full Scale High alarm (1) output</td>
<td>Off On</td>
<td>Off</td>
<td>R/O</td>
</tr>
<tr>
<td>FS Lo Setpoint</td>
<td>Full Scale Low Alarm (2) Setpoint</td>
<td>Controller range</td>
<td>L1</td>
<td></td>
</tr>
<tr>
<td>FS Lo Output</td>
<td>Full Scale Low alarm (2) output</td>
<td>Off On</td>
<td>Off</td>
<td>R/O</td>
</tr>
</tbody>
</table>

### 5.7.3. ALARMS (An Input Page) Parameters

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>An Alm Ack</td>
<td>Group alarm acknowledge for analogue input</td>
<td>No Yes</td>
<td>No</td>
<td>L1</td>
</tr>
<tr>
<td>FS Hi Setpoint</td>
<td>Full Scale High alarm (1) Setpoint</td>
<td>Controller range</td>
<td>L1</td>
<td></td>
</tr>
<tr>
<td>FS Hi Output</td>
<td>Full Scale High alarm (1) output</td>
<td>Off On</td>
<td>Off</td>
<td>R/O</td>
</tr>
<tr>
<td>FS Lo Setpoint</td>
<td>Full Scale Low Alarm (2) Setpoint</td>
<td>Controller range</td>
<td>L1</td>
<td></td>
</tr>
<tr>
<td>FS Lo Output</td>
<td>Full Scale Low alarm (2) output</td>
<td>Off On</td>
<td>Off</td>
<td>R/O</td>
</tr>
</tbody>
</table>
### 5.7.4. ALARMS (Module 1 Page) Parameters

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 1 Ack</td>
<td>Group alarm acknowledge for module 1</td>
<td>No</td>
<td>No</td>
<td>L1</td>
</tr>
<tr>
<td>FS Hi Setpoint</td>
<td>Full Scale High alarm (1) Setpoint</td>
<td>No</td>
<td>L1</td>
<td></td>
</tr>
<tr>
<td>FS Hi Output</td>
<td>Full Scale High alarm (1) output</td>
<td>Off</td>
<td>Off</td>
<td>R/O</td>
</tr>
<tr>
<td>FS Lo Setpoint</td>
<td>Full Scale Low Alarm (3) Setpoint</td>
<td>No</td>
<td>L1</td>
<td></td>
</tr>
<tr>
<td>FS Lo Output</td>
<td>Full Scale Low alarm (3) output</td>
<td>Off</td>
<td>Off</td>
<td>R/O</td>
</tr>
</tbody>
</table>

The above table is repeated for:
Module 3  Module 4  Module 5  Module 6

### 5.7.5. ALARMS (User 1 Page) Parameters

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Default</th>
<th>Access Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alm1 Type</td>
<td>Alarm 1 Type</td>
<td>Same as 5.7.1.</td>
<td>R/O</td>
<td></td>
</tr>
<tr>
<td>User 1 Ack</td>
<td>Group alarm acknowledge for user alarm 1</td>
<td>No</td>
<td>No</td>
<td>L1</td>
</tr>
<tr>
<td>Setpoint</td>
<td>Alarm 1 Setpoint</td>
<td>No</td>
<td>L1</td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td>Alarm 1 output</td>
<td>Off</td>
<td>Off</td>
<td>R/O at L1</td>
</tr>
</tbody>
</table>

The above table is repeated for:
User alarm 2  User alarm 3  User alarm 4  User alarm 5  User alarm 6  User alarm 7  User alarm 8
A. APPENDIX A ORDER CODE

A.1. HARDWARE CODE

A.2. QUICK START CODE

A.3. QUICK START CODE EXAMPLE:
A. Appendix A  Order Code

A.1. HARDWARE CODE

The 2704 has a modular hardware construction, which accepts up to six plug-in modules and two comms modules. Eight digital IO and a relay form part of the fixed hardware build.

Hardware Code Example

2704/VH/323/XX/RR/PV/D4/TP/PV/XX/A2/XX/ENG/11/IT

Three loop controller with capability to store 20 three profile programs. Supply voltage 85 - 264 Vac.

Modules: 2 x PV input, 1 x Dual relay, 1 x DC control, 1 x Triple logic output, EIA-232 Comms.

16 analogue and 32 digital operations and iTools supplied with controller.

Hardware notes:
1. Basic controller includes 8 digital registers, 10 user values, 4 timers, 4 totalisers and RT clock
2. Toolkit 1 includes 16 analogue, 16 digital, pattern generator, digital programmer, analogue switch, wiring block & 30 user values
3. Toolkit 2 includes Toolkit 1 plus extra 16 analogue, 16 digital and 20 user values
4. Dual analogue input suitable for one low level and one high level input (inputs not isolated from each other)
5. Each channel of the DO module can be 4-20mA control or 24V PSU
6. The HR module has 1 high resolution DC output and 1 24Vdc power supply
7. PH & PL modules use slots 3 & 6 only. ET module in H slot includes terminal adaptor

Hardware Code Example

2704/VH/323/XX/RR/PV/D4/TP/PV/XX/A2/XX/ENG/11/IT

Three loop controller with capability to store 20 three profile programs. Supply voltage 85 - 264 Vac.

Modules: 2 x PV input, 1 x Dual relay, 1 x DC control, 1 x Triple logic output, EIA-232 Comms.

16 analogue and 32 digital operations and iTools supplied with controller.
1. Loop 1 PV defaults to main input on microboard. Loop 2 and 3 PV inputs must be fitted in I/O slots 3 or 6 or be assigned to the analogue input.
2. This alarm configuration refers to loop alarms only. One selection per loop is allowed. Additional alarms are available for the user to configure.
3. Thermocouple and RTD inputs assume sensor min and max values with no decimal point.
4. Linear inputs are ranged 0-100%, no decimal point.
5. Temperature inputs will be C unless ordered by USA where F will be supplied.
6. Remote setpoints assume loop min & max ranges.
7. VP1, VP2, VP3 or VP4 not available with override function.
8. For cascade and override inputs only.
9. HR module should be used in feedback mode.
A.2. QUICK START CODE

An instrument delivered to the quick start code is partly configured. For simple applications the this may be sufficient to allow the instrument to be used without further configuration.

### 1 - 3 Loop function

<table>
<thead>
<tr>
<th>First Digit</th>
<th>Other Digit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XXX</td>
<td>None</td>
<td>Standard PID</td>
</tr>
<tr>
<td>S</td>
<td>C</td>
<td>Cascade</td>
</tr>
<tr>
<td>R</td>
<td>O</td>
<td>Ratio</td>
</tr>
<tr>
<td>O</td>
<td>On/Off control</td>
<td></td>
</tr>
<tr>
<td>PID</td>
<td>PID control</td>
<td></td>
</tr>
<tr>
<td>_ONF</td>
<td>OnOff control</td>
<td></td>
</tr>
<tr>
<td>_PIF</td>
<td>PID/OnOff control</td>
<td></td>
</tr>
<tr>
<td>_VP2</td>
<td>VP, w/feedback</td>
<td></td>
</tr>
<tr>
<td>_VP3</td>
<td>Dual VP, w/feedback</td>
<td></td>
</tr>
<tr>
<td>_VP4</td>
<td>Dual VP, w/feedback</td>
<td></td>
</tr>
</tbody>
</table>

### 4 - 6 PV Inputs

| X | J | K | T | L | N | R | S | B | P | C | Z | R/DPT/P100 | A | Y | V | W | G | 1-5Vdc line |
|---|---|---|---|---|---|---|---|---|---|---|---|-------------|---|---|---|---|---|---|---|
| None | J Thermocouple | K Thermocouple | T Thermocouple | L Thermocouple | N Thermocouple | R Thermocouple | S Thermocouple | B Thermocouple | P Thermocouple | C Thermocouple | Z RDT/P100 | A 4-20mA linear | Y 0-20mA linear | V 0-10Vdc | W 0-5Vdc | G 0-5Vdc line |

### 7 Analogue Input

<table>
<thead>
<tr>
<th>XXX</th>
<th>P2</th>
<th>P3</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>PV Loop 2</td>
<td>PV Loop 3</td>
<td>SP Loop 1</td>
<td>SP Loop 2</td>
<td>SP Loop 3</td>
<td>Aux PV Loop 1</td>
<td>Aux PV Loop 2</td>
<td>Aux PV Loop 3</td>
<td>Ratio lead PV Loop 1</td>
<td>Ratio lead PV Loop 2</td>
<td>Ratio lead PV Loop 3</td>
</tr>
</tbody>
</table>

### 8 - 12 Slot Function

<table>
<thead>
<tr>
<th>Loop number</th>
<th>XXX</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconfigured</td>
<td>Loop No 1</td>
<td>Loop No 2</td>
<td>Loop No 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Single relay or triac

<table>
<thead>
<tr>
<th>HX</th>
<th>Heat</th>
</tr>
</thead>
<tbody>
<tr>
<td>CX</td>
<td>Cool</td>
</tr>
</tbody>
</table>

#### Dual relay or triac

<table>
<thead>
<tr>
<th>HC</th>
<th>PID Heat &amp; Cool</th>
</tr>
</thead>
<tbody>
<tr>
<td>VH</td>
<td>VP Heat</td>
</tr>
<tr>
<td>AA</td>
<td>FSH &amp; FSH</td>
</tr>
<tr>
<td>AB</td>
<td>FSH &amp; FSL</td>
</tr>
<tr>
<td>AC</td>
<td>DH &amp; DL</td>
</tr>
<tr>
<td>AD</td>
<td>FSH &amp; DH</td>
</tr>
<tr>
<td>AE</td>
<td>FSL &amp; DL</td>
</tr>
<tr>
<td>AF</td>
<td>FSH &amp; FSL</td>
</tr>
<tr>
<td>AG</td>
<td>FSH &amp; DB</td>
</tr>
<tr>
<td>AH</td>
<td>FSL &amp; DB</td>
</tr>
<tr>
<td>AJ</td>
<td>DB &amp; DB</td>
</tr>
<tr>
<td>HHX</td>
<td>Heat O/P lps 1 &amp; 2</td>
</tr>
<tr>
<td>CCX</td>
<td>Cool O/P lps 1 &amp; 2</td>
</tr>
<tr>
<td>P12</td>
<td>Prog events 1 &amp; 2</td>
</tr>
<tr>
<td>P34</td>
<td>Prog events 3 &amp; 4</td>
</tr>
<tr>
<td>P56</td>
<td>Prog events 5 &amp; 6</td>
</tr>
<tr>
<td>P78</td>
<td>Prog events 7 &amp; 8</td>
</tr>
</tbody>
</table>

#### Triple logic output

<table>
<thead>
<tr>
<th>HX</th>
<th>Ch1 Heat</th>
</tr>
</thead>
<tbody>
<tr>
<td>CX</td>
<td>Ch1 Cool</td>
</tr>
<tr>
<td>HC</td>
<td>Ch1 Heat, Ch2 Cool</td>
</tr>
<tr>
<td>HHX</td>
<td>Heat O/P lps 1 &amp; 2</td>
</tr>
<tr>
<td>HHH</td>
<td>Heat O/P lps 1,2 &amp; 3</td>
</tr>
</tbody>
</table>

#### Single DC outputs

<table>
<thead>
<tr>
<th>H</th>
<th>PID Heat</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>PID Cool</td>
</tr>
<tr>
<td>T</td>
<td>PV Retransmission</td>
</tr>
<tr>
<td>S</td>
<td>SP Retransmission</td>
</tr>
</tbody>
</table>

For output range select third digit from table 1

#### Dual 4-20mA/24Vdc PSU output

<table>
<thead>
<tr>
<th>HX</th>
<th>Heat OP Lps 1 &amp; 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>HT</td>
<td>Ch 1 Heat, Ch 2 Tx</td>
</tr>
<tr>
<td>TTX</td>
<td>Both chs Txmtr</td>
</tr>
</tbody>
</table>

#### Changeover Relay

<table>
<thead>
<tr>
<th>HX</th>
<th>Heat</th>
</tr>
</thead>
<tbody>
<tr>
<td>CX</td>
<td>Cool</td>
</tr>
</tbody>
</table>

#### Potentiometer input

<table>
<thead>
<tr>
<th>VF</th>
<th>VP Heat Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS</td>
<td>Remote SP</td>
</tr>
</tbody>
</table>
A.3. QUICK START CODE EXAMPLE:

SVP1/SPID/SPID/K/Z/A/S1A/1VH/2PV/2HV/3HC/3PV

This code configures the hardware specified on page A2 to be:

Loop 1: Valve position control, Type K input, Ch1 VP output in slot 1, 4-20mA remote setpoint input.
Loop 2: PID control, RTD input in slot 3, 0-10Vdc Ch1 output in slot 4.
Loop 3: PID control, 4-20mA input in slot 6, Logic Ch1/Ch2 output in slot 5.
B. APPENDIX B  SAFETY AND EMC INFORMATION .. 2

B.1. Safety ................................................................. 2
B.1.1. Electromagnetic compatibility .............................. 2
B.2. GENERAL ............................................................ 2
B.3. Service and repair .................................................. 2
B.3.1. Electrostatic discharge precautions ...................... 3
B.3.2. Cleaning ......................................................... 3
B.4. Installation Safety Requirements ............................ 4
B.4.1. Safety Symbols .................................................. 4
B.4.2. Personnel .......................................................... 4
B.4.3. Enclosure of live parts ........................................ 4
B.4.4. Isolation ........................................................... 4
B.4.5. Wiring ............................................................... 5
B.4.6. Power Isolation .................................................. 5
B.4.7. Earth leakage current .......................................... 5
B.4.8. Overcurrent protection ........................................ 6
B.4.9. Voltage rating .................................................... 6
B.4.10. Conductive pollution ......................................... 6
B.4.11. Over-temperature protection ............................. 7
B.4.12. Grounding of the temperature sensor shield ......... 7
B.5. Installation requirements for EMC .......................... 7
B.5.1. Routing of wires .................................................. 7
B. Appendix B  Safety and EMC Information

This controller is manufactured in the UK by Eurotherm Controls Ltd.

Please read this section carefully before installing the controller

This controller is intended for industrial temperature and process control applications when it will meet the requirements of the European Directives on Safety and EMC. Use in other applications, or failure to observe the installation instructions of this handbook may impair the safety or EMC protection provided by the controller. It is the responsibility of the installer to ensure the safety and EMC of any particular installation.

B.1. SAFETY

This controller complies with the European Low Voltage Directive 73/23/EEC, amended by 93/68/EEC, by the application of the safety standard EN 61010.

B.1.1. Electromagnetic compatibility

This controller conforms with the essential protection requirements of the EMC Directive 89/336/EEC, amended by 93/68/EEC, by the application of a Technical Construction File. This instrument satisfies the general requirements for heavy/light industrial and residential/commercial environments as described by EN 61326. For more information on product compliance refer to the Technical Construction File.

B.2. GENERAL

The information contained in this manual is subject to change without notice. While every effort has been made to ensure the accuracy of the information, your supplier shall not be held liable for errors contained herein.

Unpacking and storage

The packaging should contain an instrument mounted in its sleeve, two mounting brackets for panel installation and an Installation & Operating guide. Certain ranges are supplied with an input adapter.

If on receipt, the packaging or the instrument are damaged, do not install the product but contact your supplier. If the instrument is to be stored before use, protect from humidity and dust in an ambient temperature range of -30°C to +75°C.

B.3. SERVICE AND REPAIR

This controller has no user serviceable parts. Contact your supplier for repair.

Caution: Charged capacitors

Before removing an instrument from its sleeve, disconnect the supply and wait at least two minutes to allow capacitors to discharge. Failure to observe this precaution will expose capacitors that may be charged with hazardous voltages. In any case, avoid touching the exposed electronics of an instrument when withdrawing it from the sleeve.

Failure to observe these precautions may cause damage to components of the instrument or some discomfort to the user.
**B.3.1. Electrostatic discharge precautions**

When the controller is removed from its sleeve, some of the exposed electronic components are vulnerable to damage by electrostatic discharge from someone handling the controller. To avoid this, before handling the unplugged controller discharge yourself to ground.

**B.3.2. Cleaning**

Do not use water or water based products to clean labels or they will become illegible. Isopropyl alcohol may be used to clean labels. A mild soap solution may be used to clean other exterior surfaces of the product.
B.4. INSTALLATION SAFETY REQUIREMENTS

B.4.1. Safety Symbols
Various symbols are used on the instrument, they have the following meaning:

⚠️ Caution, (refer to the accompanying documents)

Grounding symbol

The functional earth connection is not required for safety purposes but to ground RFI filters.

ℹ️ This symbol indicates Information

B.4.2. Personnel
Installation must only be carried out by qualified personnel.

B.4.3. Enclosure of live parts
To prevent hands or metal tools touching parts that may be electrically live, the controller must be installed in an enclosure.

B.4.4. Isolation
The fixed digital I/O and analogue input are not isolated. The PV Input and all plug in modules are fully isolated. This is shown in Figure B-1.

The Analogue Input is a self biased differential input suitable for either grounded or floating transducers of low output impedance generating signal in the range of +/-10V or +/-20mA (with a burden resistor of 100 Ohms across + and - terminals).

This input is neither isolated from the instrument ground (which can be earthed via fixed I/O ports) nor isolated from the instrument earth terminal, therefore, under no circumstances should mains potentials be applied to any of its inputs.

In order for the Input to operate safely the common voltage at the inputs measured with respect to instrument ground should not exceed +/-120Vdc or acrms. For actively enhanced common mode rejection (i.e. operation within the spec.) this voltage should be limited to +/-40Vdc.

Floating transducers will automatically be biased to +2.5V with respect to instrument ground upon connection.

Note: All the other I/Os are fully isolated from the instrument ground and each other.
B.4.5. Wiring
It is important to connect the controller in accordance with the wiring data given in this handbook. Take particular care not to connect AC supplies to the low voltage sensor input or other low level inputs and outputs. Only use copper conductors for connections (except thermocouple inputs) and ensure that the wiring of installations comply with all local wiring regulations. For example in the UK use the latest version of the IEE wiring regulations, (BS7671). In the USA use NEC Class 1 wiring methods.

B.4.6. Power Isolation
The installation must include a power isolating switch or circuit breaker. This device should be in close proximity to the controller, within easy reach of the operator and marked as the disconnecting device for the instrument.

B.4.7. Earth leakage current
Due to RFI Filtering there is an earth leakage current of less than 0.5mA. This may affect the design of an installation of multiple controllers protected by Residual Current Device, (RCD) or Ground Fault Detector, (GFD) type circuit breakers.
B.4.8. Overcurrent protection

To protect the internal PCB tracking within the controller against excess currents, the AC power supply to the controller and power outputs must be wired through the fuse or circuit breaker specified in the technical specification.

B.4.9. Voltage rating

The maximum continuous voltage applied between any of the following terminals must not exceed 264Vac:

- line or neutral to any other connection;
- relay or triac output to logic, dc or sensor connections;
- any connection to ground.

The controller should not be wired to a three phase supply with an unearthed star connection. Under fault conditions such a supply could rise above 264Vac with respect to ground and the product would not be safe.

Voltage transients across the power supply connections, and between the power supply and ground, must not exceed 2.5kV. Where occasional voltage transients over 2.5kV are expected or measured, the power installation to both the instrument supply and load circuits should include a transient limiting device.

These units will typically include gas discharge tubes and metal oxide varistors that limit and control voltage transients on the supply line due to lightning strikes or inductive load switching. Devices are available in a range of energy ratings and should be selected to suit conditions at the installation.

B.4.10. Conductive pollution

Electrically conductive pollution must be excluded from the cabinet in which the controller is mounted. For example, carbon dust is a form of electrically conductive pollution. To secure a suitable atmosphere in conditions of conductive pollution, fit an air filter to the air intake of the cabinet. Where condensation is likely, for example at low temperatures, include a thermostatically controlled heater in the cabinet.
B.4.11. Over-temperature protection

When designing any control system it is essential to consider what will happen if any part of the system should fail. In temperature control applications the primary danger is that the heating will remain constantly on. Apart from spoiling the product, this could damage any process machinery being controlled, or even cause a fire.

Reasons why the heating might remain constantly on include:

- the temperature sensor becoming detached from the process;
- thermocouple wiring becoming short circuit;
- the controller failing with its heating output constantly on;
- an external valve or contactor sticking in the heating condition;
- the controller setpoint set too high.

Where damage or injury is possible, we recommend fitting a separate over-temperature protection unit, with an independent temperature sensor, which will isolate the heating circuit.

Please note that the alarm relays within the controller will not give protection under all failure conditions.

B.4.12. Grounding of the temperature sensor shield

In some installations it is common practice to replace the temperature sensor while the controller is still powered up. Under these conditions, as additional protection against electric shock, we recommend that the shield of the temperature sensor is grounded. Do not rely on grounding through the framework of the machine.

B.5. INSTALLATION REQUIREMENTS FOR EMC

To ensure compliance with the European EMC directive certain installation precautions are necessary as follows:

- For general guidance refer to EMC Installation Guide, HA025464.
- When using relay or triac outputs it may be necessary to fit a filter suitable for suppressing the emissions. The filter requirements will depend on the type of load. For typical applications we recommend Schaffner FN321 or FN612.

B.5.1. Routing of wires

To minimise the pick-up of electrical noise, the wiring for low voltage dc and particularly the sensor input should be routed away from high-current power cables. Where it is impractical to do this, use shielded cables with the shield grounded at both ends.
C. APPENDIX C  TECHNICAL SPECIFICATION ........... 2
   C.1. ALL ANALOGUE, DUAL AND PV INPUTS ....................... 2
   C.2. PRECISION PV INPUT / MODULE .................................... 3
   C.3. DUAL (PROBE) INPUT MODULE ....................................... 4
   C.4. ANALOGUE INPUT ...................................................... 4
   C.5. ANALOGUE INPUT MODULE ........................................... 4
   C.6. STANDARD DIGITAL I/O ................................................. 5
   C.7. DIGITAL INPUT MODULES ............................................. 5
   C.8. DIGITAL OUTPUT MODULES ............................................ 5
   C.9. ANALOGUE OUTPUT MODULES ....................................... 6
   C.10. TRANSMITTER PSU .................................................... 6
   C.11. TRANSDUCER PSU ........................................................ 6
   C.12. DUAL DC OUTPUT ...................................................... 6
   C.13. HIGH RESOLUTION DC OUTPUT ..................................... 6
   C.14. POTENTIOMETER INPUT .............................................. 6
   C.15. TDS MODULE ............................................................. 6
   C.16. 4-WIRE RTD INPUT .................................................... 7
   C.17. DIGITAL COMMUNICATIONS .......................................... 8
   C.18. ALARMS ................................................................. 8
   C.19. USER MESSAGES ........................................................ 8
   C.20. CONTROL FUNCTIONS .................................................. 8
   C.21. SETPOINT PROGRAMMER ............................................. 8
   C.22. ADVANCED FUNCTIONS ................................................ 9
   C.23. GENERAL SPECIFICATION ............................................ 9
   C.24. GRAPHICAL REPRESENTATION OF ERRORS .................. 10
         C.24.1. mV Input .............................................................. 10
         C.24.2. Mid range high impedance Input ......................... 11
         C.24.3. High Level Input ................................................. 12
         C.24.4. 3-Wire RTD (Pt-100) Input type ...................... 13
         C.24.5. Thermocouple Input type .................................. 14
C. Appendix C  Technical Specification

All figures quoted at 0 to 50°C unless otherwise stated.

C.1. ALL ANALOGUE, DUAL AND PV INPUTS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample rate</td>
<td>9Hz (110msec.)</td>
</tr>
<tr>
<td>Input filtering</td>
<td>OFF to 999.9 seconds of filter time constant (f.t.c.). Default setting is 0.4 seconds unless stated otherwise</td>
</tr>
<tr>
<td>User calibration</td>
<td>Both the user calibration and a transducer scaling can be applied.</td>
</tr>
<tr>
<td>Sensor break</td>
<td>a.c. sensor break on each input (i.e. fast responding and no dc errors with high impedance sources).</td>
</tr>
<tr>
<td>Thermocouple Types</td>
<td>Most linearisations including K,J,T,R,B,S,N,L,PII,C,D,E with linearisation error &lt; ±0.2°C</td>
</tr>
<tr>
<td>General</td>
<td>Resolution (noise free) is quoted as a typical figure with f.t.c. set to the default value = 0.4 second. Resolution generally improves by a factor of two with every quadrupling of f.t.c. Calibration is quoted as offset error + percentage error of absolute reading at ambient temperature of 25°C Drift is quoted as extra offset and absolute reading errors per degree of ambient change from 25°C.</td>
</tr>
<tr>
<td>Allocation</td>
<td>One standard and up to two additional PV input modules can be fitted in I/O slots 3 and 6</td>
</tr>
<tr>
<td>Isolation</td>
<td>Fully isolated from the rest of the instrument</td>
</tr>
<tr>
<td>mV input</td>
<td>Two ranges: ±40mV &amp; ±80mV, used for thermocouple, linear mV source or 0 - 20mA with 2.49Ω. Calibration: ±(1.5µV + 0.05% of reading), Resolution: 0.5µV for 40mV range &amp; 1µV for 80mV range. Drift: &lt;±(0.05µV + 0.003% of absolute reading) per °C. Input impedance: &gt;100MΩ, Leakage: &lt;1nA</td>
</tr>
<tr>
<td>0 - 2V input</td>
<td>-1.4V to +2V, used for zirconia. Calibration: ±(0.5mV + 0.05% of reading). Resolution: 60µV. Drift: &lt;±(0.05mV + 0.003% of reading) per °C. Input impedance: &gt;100MΩ, Leakage: &lt;1nA</td>
</tr>
<tr>
<td>0 - 10V input</td>
<td>-3V to +10V, used for voltage input. Calibration: ±(0.5mV + 0.1% of reading). Resolution: 180µV. Drift: &lt;±(0.1mV + 0.01% of reading) per °C. Input impedance: 0.66MΩ</td>
</tr>
<tr>
<td>Pt100 input</td>
<td>0 to 400ohms (-200°C to +850°C), 3 matched wires - up to 22Ω in each lead without errors. Calibration: ±(0.1°C + 0.04% of reading in °C). Resolution: 0.02°C. Drift: &lt;±(0.006°C + 0.002% of absolute reading in °C) per °C. Bulb current: 0.2mA.</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>Internal compensation: CJC rejection ratio &gt;40:1 typical. CJC Temperature calibration error at 25°C: ±0.5°C. 0°C, 45°C and 50°C external compensation available.</td>
</tr>
<tr>
<td>Zirconia probes</td>
<td>Most probes supported. Continuous monitoring of probe impedance (100Ω to 100KΩ).</td>
</tr>
</tbody>
</table>
C.3. DUAL (PROBE) INPUT MODULE

General
The same specification as for the Precision PV Input module applies with the exception of the following:
Module offers two sensor/transmitter inputs, which share the same negative input terminal.
One low level (mV, 0-20mA, thermocouple, Pt100) and one high level (0-2Vdc, 0-10Vdc) can be connected

Isolation
The two inputs are isolated from the rest of the instrument but not from each other.

Sample rate 4.5Hz (220msec) - of each input

Input filtering Default setting is 0.8 seconds

C.4. ANALOGUE INPUT

No of inputs One fixed (Not isolated)
Can be used with either floating or ground referenced transducers of low impedance - see Isolation.

Input range -10V to +10V linear or 0 -20 mA with burden resistor of 100Ω.
Calibration: ±(1.5mV + 0.1% of reading)
Resolution: 0.9mV
Drift: < ±(0.1mV + 0.006% of reading) per °C
Input Impedance: 0.46MΩ (floating input), 0.23MΩ (ground referenced input)

Isolation Not isolated from standard digital I/O. Differential type input with common mode range of ±42Vdc (the average voltage of the two inputs with respect to ‘Screen’ or ‘Common’ terminals should be within ±42Vdc.

CMRR: >110dB at 50/60Hz, >80dB at DC

Functions Process variable, remote setpoint, power limit, feedforward, etc.

C.5. ANALOGUE INPUT MODULE

Allocation Up to 4 analogue input modules can be fitted in I/O slots 1,3,4 & 6

Isolation Fully isolated from the rest of the instrument

mV input 100mV range - used for thermocouple, linear mV source, or 0-20mA with 2.49Ω external burden resistor.
Calibration: ± 10µV + 0.2% of reading
Resolution: 6µV
Drift: < ± 0.2µV + 0.004% of reading per °C
Input impedance: >10MΩ, Leakage: <10nA

0 - 2Vdc input -0.2V to +2.0V range - used for zirconia.
Calibration: ± 2mV + 0.2% of reading
Resolution: 30µV
Drift: < ± 0.1mV + 0.004% of reading per °C
Input impedance: >10MΩ, Leakage: <20nA

0 - 10Vdc input -3V to +10.0V range - used for voltage input.
Calibration: ± 2mV + 0.2% of reading
Resolution: 200µV
Drift: < ±0.1mV + 0.02% of reading per °C
Input impedance: >69KΩ

Pt100 input
0 to 400ohms (-200°C to +850°C), 3 matched wires - up to 22Ω in each lead without errors.
Calibration: ±(0.4°C + 0.15% of reading in °C)
Resolution: 0.08°C
Drift: < ±(0.015°C + 0.005% of reading in °C) per °C
Bulb current: 0.3mA.

Thermocouple
Internal compensation: CJJC rejection ratio >25:1 typical.
CJ Temperature calibration error at 25°C: ≤±2°C
0°C, 45°C and 50°C external compensation available.

C.6. STANDARD DIGITAL I/O
 Allocation
 1 digital input standard and 7 I/O which can be configured as inputs or outputs plus 1 changeover relay
not isolated

Digital inputs
Voltage level: input active < 2Vdc, inactive >4Vdc
Contact closure: input active <100ohms, inactive >28kohms

Digital outputs
Open collector, 24Vdc at 40mA drive capability, requires external supply
Changeover relay
Contact rating 2A at 264Vac resistive
Functions Refer to Chapter 17
Operations 1,000,000 operations with addition of external snubber

C.7. DIGITAL INPUT MODULES
 Module type
Triple contact input, Triple logic input - (isolated as a group)
Allocation
Can be fitted into slots 1, 3, 4, 5 or 6
Contact closure
Active <100ohms, inactive >28kohms
Logic inputs
Current sinking: active 10.8Vdc to 30Vdc at 2.5mA
inactive -3 to 5Vdc at <-0.4mA
Functions Refer to Chapter 18

C.8. DIGITAL OUTPUT MODULES
 Module types
Single relay, dual relay, single triac, dual triac - (isolated as a group)
(individually isolated)
triple logic module - (isolated from instrument as a group)
Allocation
Can be fitted into slot 1, 3, 4, 5 or 6 (max. 3 triac modules per instrument)
Relay rating
2A, 264Vac resistive
Logic drive
12Vdc at 9mA
Triac rating
0.75A, 264Vac resistive
Functions Refer to Chapter 18
C.9. ANALOGUE OUTPUT MODULES

Module types 1 channel DC control, 1 channel DC retransmission (5 max.)
Allocation Can be fitted into slot 1, 3, 4, 5 or 6
Isolation Fully isolated from the rest of the instrument
Range 0-20mA, 0-10Vdc
Resolution 1 part in 10,000 (2,000-noise free) 0.5% accurate for retransmission
1 part in 10,000 2.5% accurate for control
Functions Refer to Chapter 18

C.10. TRANSMITTER PSU

Allocation Can be fitted into slots 1, 3, 4, 5 or 6 - (isolated)
Transmitter 24Vdc at 20mA

C.11. TRANSDUCER PSU

Bridge voltage Software selectable 5 or 10Vdc - (isolated)
Bridge resistance 300Ω to 15KΩ
Internal shunt resistor 30.1KΩ at 0.25%, used for calibration of 350Ω bridge

C.12. DUAL DC OUTPUT

Two Current Outputs 4-20mA, 20V output span (see section 21.3.13)
Isolation Fully isolated from the instrument and each other
Accuracy 1%, 11 bit noise free resolution
Speed 50ms response
Can be configured as 20V min at full 22mA current load. 30V max at open circuit.
Transmitter/logic PSU Short circuit protected at 22-24mA

C.13. HIGH RESOLUTION DC OUTPUT

Current Output 4-20mA, 20V output span (see section 21.3.14)
Accuracy 1%, 15 bit noise free resolution
Speed 40ms response
Transmitter/logic PSU 20V min at full 22mA current load. 30V max at open circuit.
Short circuit protected at 21-28mA
Isolation Fully isolated from the instrument and the PSU

C.14. POTentiometer INPUT

Pot resistance 100Ω to 15KΩ, excitation of 0.5 volts - (isolated)

C.15. TDS MODULE

Meas. Frequency 1KHz
Conductivity range 40µS to 500 000µS (equivalent resistance 25 KΩ to 2Ω)
Max. cable length 100m
Isolation Fully isolated from the rest of the instrument
### C.16. 4-WIRE RTD INPUT

<table>
<thead>
<tr>
<th>Parameter</th>
<th>PT100 Module</th>
<th>PT25 Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocation</td>
<td>Can be fitted to I/O slots 3 and 6</td>
<td></td>
</tr>
<tr>
<td>Isolation</td>
<td>Fully isolated from the rest of the instrument</td>
<td></td>
</tr>
<tr>
<td>Sample rate</td>
<td>9Hz Typical</td>
<td></td>
</tr>
<tr>
<td>Input filtering</td>
<td>OFF to 999.9 seconds of filter t.c. (default f.t.c. = 1.6 sesc.)</td>
<td></td>
</tr>
<tr>
<td>Measured temperature range</td>
<td>-200 to +850°C with Pt100 linearization</td>
<td>-200 to +850°C with Pt25.5 linearization -200 to +50°C with Pt100 linearization when Pt25 module is used for reading Pt100 sensor.</td>
</tr>
<tr>
<td>Measured resistance range</td>
<td>0 - 440Ω</td>
<td>0 – 125Ω</td>
</tr>
<tr>
<td>Maximum resistance between A and D terminals</td>
<td>500Ω</td>
<td>135Ω</td>
</tr>
<tr>
<td>Bulb Current - from A to D</td>
<td>200μA</td>
<td>735μA</td>
</tr>
<tr>
<td>Calibration Accuracy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>@ 23 (±3)°C</td>
<td>±4mΩ @ 20Ω</td>
<td>±1mΩ @ 5Ω</td>
</tr>
<tr>
<td>@ 50 (±15)%RH</td>
<td>±8mΩ @ 100Ω</td>
<td>±2mΩ @ 25.5Ω</td>
</tr>
<tr>
<td>/interpolate for other values/</td>
<td>±10mΩ @ 200Ω</td>
<td>±2.5mΩ @ 50Ω</td>
</tr>
<tr>
<td></td>
<td>±14mΩ @ 300Ω</td>
<td>±3.5mΩ @ 76Ω</td>
</tr>
<tr>
<td>Ambient temperature drift</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(within 15°C and 35°C)</td>
<td>± (5ppm of reading +0.25mΩ)/°C</td>
<td>± (5ppm of reading +0.07mΩ)/°C</td>
</tr>
<tr>
<td>Long term drift</td>
<td></td>
<td></td>
</tr>
<tr>
<td>@ 15°C to 35°C</td>
<td>± (70ppm of reading +25ppm of Span)/year</td>
<td></td>
</tr>
<tr>
<td>@ 50 (±20)%RH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f.t.c. = OFF</td>
<td>± 6mΩ (±16mK)</td>
<td>±1.5mΩ (±16mK, ±4mK*)</td>
</tr>
<tr>
<td>f.c.t. = 1.6 secs.</td>
<td>± 1.5mΩ (±4mK)</td>
<td>±0.4mΩ (±4mK, ±1mK*)</td>
</tr>
<tr>
<td>f.t.c. = 10 secs.</td>
<td>± 0.8mΩ (±2mK)</td>
<td>±0.2mΩ (±2mK, ±0.5mK*)</td>
</tr>
<tr>
<td>Linearization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>/within 0 to 80% of F.Span/</td>
<td>±2mΩ Typ.</td>
<td>±0.6mΩ Typ.</td>
</tr>
<tr>
<td>/Pt100 and Pt25.5/</td>
<td>±5mK - maximum deviation within –200°C to 850°C from the standard characteristic that assumes precise 100.000Ω and 25.500Ω PRT resistances at 0°C.</td>
<td></td>
</tr>
<tr>
<td>Other Features</td>
<td>a.c. sensor break detection. User Calibration.</td>
<td></td>
</tr>
<tr>
<td>Immunity to EM field interference (EN61326 Industrial levels)</td>
<td>Maximum deviation on measured values during the tests is within ±0.005% of Full Span.</td>
<td></td>
</tr>
</tbody>
</table>

For description and remedies of other possible sources of error see sections 25.6.6.1. & 25.6.6.3.
C.17. DIGITAL COMMUNICATIONS

Allocation  2 modules fitted in slots H & J (isolated)
Modbus    RS232, 2 wire or 4 wire RS485, max baud 19.2KB in H module &
         9.6KB in J module
Profibus-DP High speed, RS485, 1.5Mbaud. H slot only
DeviceNet/  H slot only
         EtherNet

C.18. ALARMS

No of Alarms  Input alarms (2), loop alarms (2) User alarms (8)
Alarm types   Full scale, deviation, rate of change, sensor break plus application
Modes        Latching or non-latching, blocking, time delay
Parameters   Refer to Chapter 7

C.19. USER MESSAGES

No of messages Maximum 100, triggered by operator or alarm or used for custom
Format       parameter names

C.20. CONTROL FUNCTIONS

No of loops   One, two or three
Modes         On/off, PID, motorised valve with or without feedback
Options       Cascade, ratio, override or feed forward
Cooling algorithms Linear, water, oil or fan
PID sets      3 per loop (Cascade loop includes master and slave parameters)
Manual mode   Bumpless transfer or forced manual output, manual tracking available
Setpoint rate limit Display units per second, minute or hour

C.21. SETPOINT PROGRAMMER

Programmer modes  Synchronous or asynchronous
Programmer types   Time to Target or Ramp Rate
No of programs    A maximum of 60 programs assignable over 600 segments for a time
to target programmer and 480 segments for a ramp rate programmer.
A program can consist of up to 3 variables. Programs can be given
user defined 16 character names
Event outputs    Up to 16, can be assigned individually to segments or called as part of
                 an event group
C.22. ADVANCED FUNCTIONS

Application blocks
- 32 digital operations
- 32 patch wiring operators
- 32 analogue calculations
- 3 multiple operators

Timers
- 4, On Pulse, Off delay, one shot and min-On

Totalisers
- 4, trigger level & reset input

Real time clock
- Day of week and time

Pattern generators
- 16 x 16, 2 off

C.23. GENERAL SPECIFICATION

Display range
- 5 digits including up to 3 decimal places

Supply
- 85-264Vac, 20Watts (max)

Operating ambient
- 0 - 50°C and 5 to 95% RH non condensing

Storage temp
- -10 to +70°C

Panel sealing
- IP65

Dimensions
- 96H x 96W x 150D (mm)

EMC standards
- EN61326 electrical equipment for measurement, control and laboratory use EMS requirements - suitable for, commercial and light industrial as well as heavy industrial environments
- With Ethernet or Devicenet module fitted product is suitable for heavy industrial environments only (class A emissions).

Safety standards
- Meets EN61010 installation category II, pollution degree 2

Atmospheres
- Not suitable for use above 2000m or in explosive or corrosive atmospheres

Inrush Current
- High Voltage controller – 30A duration 100µs
- Low Voltage controller – 15A duration 100µs
C.24. GRAPHICAL REPRESENTATION OF ERRORS

This section shows graphically the effects of adding all contributions of different errors for each input type and range. The errors are a combination of:

- Calibration accuracy
- Drift with ambient temperature
- Linearity error
- Leakage

C.24.1. mV Input

Two ranges:

- working range: ±40 mV
- full linear range: ±60 mV
- noise (resolution): 1 uV - OFF, 0.5 uV - 0.4 sec, 0.25 uV - 1.6 sec

- working range: ±80 mV
- full linear range: ±105 mV
- noise (resolution): 2 uV - OFF, 1 uV - 0.4 sec, 0.5 uV - 1.6 sec

Calibration accuracy @ 25°C:
< ± (1.5 uV + 0.05% of reading)

Drift with ambient temperature:
< ± (0.05 uV + 0.003% of reading) per °C

Linearity error:
< ± 0.002% of span (i.e. <1 uV, <2 uV)

Leakage:
< ± 1 nA (typically ± 200 pA)

Figure C-1: Error Graph - mV Input
C.24.2. Mid range high impedance Input

0 - 2V Input type

Range:
working range -1.4V to +2V
full linear range -1.8V to +2.4V
noise (resolution) 100uV - OFF, 50uV - 0.4sec, 35uV - 1.6sec

Calibration accuracy @ 25°C
< ± (0.5mV + 0.05% of |reading|)

Drift with ambient temperature
< ±(0.05mV + 0.003% of |reading|) per °C

Linearity error
< ± 0.01% of span (i.e. ± 200uV)

Input Impedance & Leakage
>100MΩ < 1nA

Figure C-2: Error Graph - 0 - 2V Input
C.24.3. High Level Input

0 - 10V Input type

Range:
- working range: -3V to +10V
- full linear range: -5V to +14V

Noise (resolution):
- 300uV - OFF
- 150uV - 0.4sec
- 100uV - 1.6sec

Calibration accuracy @ 25°C:
\[ < \pm (0.5mV + 0.1\% \text{ of reading}) \]

Drift with ambient temperature:
\[ < \pm (0.01mV + 0.006\% \text{ of reading}) \text{ per } ^\circ\text{C} \]

Linearity error:
\[ < \pm 0.02\% \text{ of span} \text{ (i.e. } \pm 2mV) \]

Input Impedance:
0.66 MΩ

![Error Graph - 0 - 10V Input](image)

Figure C-3: Error Graph - 0 - 10V Input
C.24.4. 3-Wire RTD (Pt-100) Input type

Resistance measurement specification in Ohms:
Range
0 to 400Ω with up to 22Ω in each connecting lead

Noise (resolution)
8mΩ - 0.4sec, 4mΩ - 1.6sec

Calibration accuracy limits @ 25°C
< ± (35mΩ @110Ω + 0.03% of |reading - 110Ω|)

Drift with ambient temperature
< ± (0.002% of |reading|) per °C

Linearity error
< ±15 mΩ

Pt-100 measurement specification in °C:
Range
-200 °C to +850 °C

Noise (resolution)
0.02 °C - 0.4sec, 0.01 °C - 1.6sec

Calibration accuracy limit @ 25°C
< ± (0.1 °C + 0.03% of |reading in °C|)

Drift with ambient temperature
< ± (0.0055 °C + 0.002% of |reading in °C|) per °C of ambient change

Linearity + Linearisation error
< ± 55 °mC  (i.e. 50 °mC + 5 °mC)

![Figure C-4: Error Graph - RTD Input](image-url)
C.24.5. Thermocouple Input type

Internal CJT sensing spec
Calibration error @ 25 °C (including temp. difference between top and bottom screws)
< ± 0.5 °C

Total CJT error
< ± (0.5 °C + 0.012 °C per 1 °C of ambient change)  
( i.e. CJT Rejection for measured temperatures above 0 °C is > 80:1 )

Noise (resolution)
0.01 °C

Figure C-5: Overall CJT Error at Different Ambient Temperatures
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