# 3500

**SERIES**
**User guide**

ENG

invensys
EUROTHERM

# 3508 and 3504 Process Controllers

## Contents

## Issue status of this manual

Issue 6 applies to software versions 2.30 and includes Dual Analogue Output module, Profibus D type connector option, User Text and Loop Naming.

# 3508 and 3504 Process Controllers

## 1. Chapter 1 Installation

### 1.1 What Instrument Do I Have?

Thank you for choosing this Controller.

The 3508 controller is supplied in the standard 1/8 DIN size (48 x 96mm front panel). The 3504 controller is supplied in the standard ¼ DIN size (96 x 96mm front panel). They are intended for permanent installation, for indoor use only, in an electrical panel which encloses the rear housing, terminals and wiring on the back.


**3508 Controller**


**3504 Controller**

Whenever the symbol ☺ appears in this handbook it indicates a helpful hint

## 1.1.1 Contents of Package

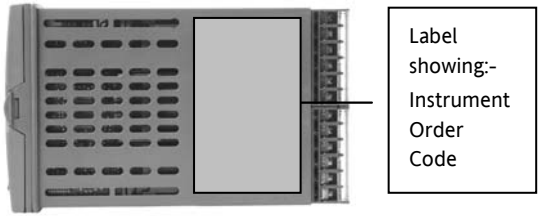
When unpacking your controller please check that the following items have been included.

### 1.1.1.1 3508 or 3504 Controller Mounted in its Sleeve

The 3504 contains up to six plug-in hardware modules; the 3508 has up to three. Additionally digital communications modules can be fitted in two positions.

The modules provide an interface to a wide range of plant devices and those fitted are identified by an ordering code printed on a label fixed to the side of the instrument. Check this against the description of the code given in section 1.2 to ensure that you have the correct modules for your application. This code also defines the basic functionality of the instrument which may be:-

- Controller only
- Programmer and controller
- Control type – Standard PID, valve positioner
- Digital communications type
- Options



#### 1.1.1.2 Panel Retaining Clips

Two clips are required to secure the instrument sleeve in the panel. These are supplied fitted to the sleeve.

#### 1.1.1.3 Accessories Pack

For each input a 2.49Ω resistor is supplied for mA measurement. This will need to be fitted across the respective input terminals

#### 1.1.1.4 This User Guide

Issue 6 of this guide applies to instrument software versions, V2.30+, and explains:-

- How to install the controller
- Physical wiring to the plant devices
- First switch on - 'out of the box'.
- Principle of operation using the front panel buttons
- Introduction to configuration through iTools PC software
- Ethernet adaptor if Ethernet communications has been ordered

### 1.1.2 Accessories

The following accessories may be ordered:-

| | |
|---|---|
| Engineering Manual This may also be downloaded from www.eurotherm.co.uk | HA027988 |
| 2.49Ω Precision resistor | SUB35/ACCESS/249R.1 |
| Configuration IR Clip | ITools/None/30000IR |
| Configuration Clip | ITools/None/30000CK |
| 10In,10Out IO Expander | 2000IO/VL/10LR/XXXX |
| 20In,20Out IO Expander | 2000IO/VL/20LR/20LR |

## 1.2 3504 and 3508 Ordering Code

The controller may have been ordered in accordance with the hardware code listed below. Alternatively, it may have been ordered by quoting the 'Quick Code' listed in section 1.4. If ordered to the quick code the controller will be configured in the factory. If it is not ordered using the quick code then it will be necessary to configure the controller when it is first switched on. This is described in Chapter 2.

**Hardware/Options Coding**

| Model Number | Function | Supply Voltage | Number of Loops | Application | Programs | Recipes | Toolkits | Fascia |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

| Model Number | |
|---|---|
| 3504 | 3504 Standard |
| 3508 | 3508 Standard |

| Function | |
|---|---|
| CC | Standard |
| F | Profibus |

(1) Provides Valve Position option in Heat/Cool applications. Single channel VP included as standard.

| Supply Voltage | |
|---|---|
| VH | 100-240Vac |
| VL | 20-29Vac/dc |

| Loops | |
|---|---|
| 1 | One loop |
| 2 | Two loops |

| Application | |
|---|---|
| XX | Standard |
| ZC | Zirconia |
| VP | Dual Valve Position (1) |

| Programs | |
|---|---|
| X | No programs |
| 1 | 1 prog 20 segments |
| 10 | 10 prog 500 segments |
| 25 | 25 prog 500 segments |
| 50 | 50 prog 500 segments |

| Recipes | |
|---|---|
| X | No recipe |
| 1 | 1 recipe |
| 4 | 4 recipes |
| 8 | 8 recipes |

| Toolkit Wires | |
|---|---|
| XXX | Std 30 wires |
| 60 | 60 wires |
| 120 | 120 wires |
| 250 | 250 wires |

| Fascia | |
|---|---|
| G | Eurotherm green |
| S | Silver |

**Example (order code)**

***3504/CC/VH/2/XX/50/X/S/R2/D4/AM/XX/XX/XX/A2/XX/XX/ENG/ENG/XXXXX/XXXXX***

*This code describes a two loop 3504 with 50 programs. Additionalmodules for dual relay, analogue control, analogue input and EIA232 communications. English language and manuals with silver fascia.*

## Input and Output Modules

| I/O Slot 1 | I/O Slot 2 | I/O Slot 3 | I/O Slot 4 (2) | I/O Slot 5 (2) | I/O Slot 6 (2) | H Comms Slot | J Comms Slot | Config Tools | Product Language | Manuals Language | Warranty | Calibration Certificate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |

| IO Slots 1, 2, 3, 4 (2), 5 (2), 6 (2) | |
|---|---|
| XX | None fitted |
| R4 | Change over relay |
| R2 | 2 pin relay |
| RR | Dual relay |
| T2 | Triac |
| TT | Dual triac |
| D4 | DC control |
| DO | Dual DC output 4-20mA OP/24Vdc. Slots 1, 2 and 4 only |
| AM | Analogue input (not slot 2 or 5) |
| D6 | DC retransmission |
| TL | Triple logic input |
| TK | Triple contact input |
| TP | Triple logic output |
| VU | Potentiometer input |
| MS | 24Vdc transmitter PSU |
| G3 | Transducer PSU 5 or 10Vdc |
| LO | Isolated single logic output |

| H Comms Slot | |
|---|---|
| XX | Not Fitted |
| A2 | 232 Modbus |
| Y2 | 2-wire 485 Modbus |
| F2 | 4-wire 485 Modbus |
| AE | 232 EI-Bisynch |
| YE | 2-wire 485 EI-Bisynch |
| FE | 4-wire 485 EI-Bisynch |
| ET | Ethernet 10base |
| PB | Profibus (3) |
| PD | Profibus with D type connector (3) |
| DN | Devicenet |

| J Comms Slot | |
|---|---|
| XX | Not Fitted |
| A2 | 232 Modbus |
| Y2 | 2-wire 485 Modbus |
| F2 | 4-wire 485 Modbus |
| EX | IO Expander |

| Config Tools | |
|---|---|
| XX | None |
| IT | Standard iTools (CD only) |

| Product Language | |
|---|---|
| ENG | English |
| FRA | French |
| GER | German |
| SPA | Spanish |
| ITA | Italian |

| Manuals Language | |
|---|---|
| ENG | English |
| FRA | French |
| GER | German |
| SPA | Spanish |
| ITA | Italian |
| XXX | None |

| Warranty | |
|---|---|
| XXXXX | Standard |
| WL005 | Extended 5 year |

| Calibration Certificate | |
|---|---|
| XXXXX | None |
| CERT1 | Cert of conformity |
| CERT2 | Factory input calibration per input |

(2). I/O slots 4, 5 and 6 are only available on the 3504

(3). Only available with the Profibus Controller

## 1.3 Configuration Code (Quick Start Code)

### Loop 1

| Config | Loop 1 Units | Loop 1 Function | Loop 1 PV | Loop 1 Range Lo | Loop 1 Range Hi |
|---|---|---|---|---|---|
| | | | | | |

| Config | |
|---|---|
| **STD** | Standard config (1) |
| **CFG** | Factory configured |

| Loop 1 units | |
|---|---|
| **C** | Centigrade |
| **F** | Fahrenheit |
| **%** | Percent |
| **H** | %RH |
| **P** | PSI |
| **B** | Bar |
| **M** | mBar |
| **X** | None |

| Loop 1 Function | |
|---|---|
| **PX** | Single Chan. PID |
| **FX** | Single Chan. VP with Feedback |
| **VX** | Single Chan. VP without Feedback |
| **NX** | Single Chan. On/Off |
| **PP** | Dual Chan. PID |
| **PN** | Dual Chan. PID/OnOff |
| **FF** | Dual Chan. VP with Feedback |
| **VV** | Dual Chan. VP without Feedback |
| **PF** | Dual Chan. PID/VP with Feedback |
| **PV** | Dual Chan. PID/VP without |

| Loop 1 PV | |
|---|---|
| **X** | Unconfigured |
| **J** | J Thermocouple |
| **K** | K Thermocouple |
| **T** | T Thermocouple |
| **L** | L Thermocouple |
| **N** | N Thermocouple |
| **R** | R Thermocouple |
| **S** | S Thermocouple |
| **B** | B Thermocouple |
| **P** | Platinell II |
| **C** | C Thermocouple |
| **Z** | Pt 100 |
| **A** | 4-20mA Linear |
| **Y** | 0-20mA Linear |
| **W** | 0-5Vdc Linear |
| **G** | 1-5Vdc Linear |
| **V** | 0-10Vdc Linear |
| **Q** | Custom Curve |

| Loop 1 Range Low | |
|---|---|
| **XXXXX** | Enter value with decimal point |

| Loop 1 Range High | |
|---|---|
| **XXXXX** | Enter value with decimal point |

*1. If standard config is selected an instrument without configuration will be supplied.*

## Loop 2

| Loop 2 Units | Loop 2 Function | Loop 2 PV | Loop 2 Range Lo | Loop 2 Range Hi |
|---|---|---|---|---|
| | | | | |

| Loop 2 Units | |
|---|---|
| **C** | Centigrade (2) |
| **F** | Fahrenheit (2) |
| **%** | Percent |
| **H** | %RH |
| **P** | PSI |
| **B** | Bar |
| **M** | mBar |
| **X** | None |

| Loop 2 Function | |
|---|---|
| **XX** | Single Loop Only |
| **PX** | Single Chan. PID |
| **FX** | Single Chan. VP with Feedback |
| **VX** | Single Chan. VP without Feedback |
| **NX** | Single Chan. On/Off |
| **PP** | Dual Chan. PID |
| **PN** | Dual Chan. PID/OnOff |
| **FF** | Dual Chan. VP with Feedback |
| **VV** | Dual Chan. VP without Feedback |
| **PF** | Dual Chan. PID/VP with Feedback |
| **PV** | Dual Chan. PID/VP without |

| Loop 2 PV | |
|---|---|
| **X** | Unconfigured |
| **J** | J Thermocouple |
| **K** | K Thermocouple |
| **T** | T Thermocouple |
| **L** | L Thermocouple |
| **N** | N Thermocouple |
| **R** | R Thermocouple |
| **S** | S Thermocouple |
| **B** | B Thermocouple |
| **P** | Platinell II |
| **C** | C Thermocouple |
| **Z** | Pt 100 |
| **A** | 4-20mA Linear |
| **Y** | 0-20mA Linear |
| **W** | 0-5Vdc Linear |
| **G** | 1-5Vdc Linear |
| **V** | 0-10Vdc Linear |
| Q | Custom Curve |

| Loop 2 Range Low | |
|---|---|
| **XXXXX** | Enter value with decimal point |

| Loop 2 Range High | |
|---|---|
| **XXXXX** | Enter value with decimal point |

*(2). If C or F units are selected they must be the same for both loops.*
*If C or F are not selected for Loop 1 they cannot be selected for Loop 2*

## Alarms and Input/Outputs

| Alarm 1 | Alarm 2 | Alarm 3 | Alarm 4 | Logic LA | Logic LB | Relay AA | I/O Slot 1 | I/O Slot 2 | I/O Slot 3 | I/O Slot 4 (3) | I/O Slot 5 (3) | I/O Slot 6 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |

| Alarm 1 | |
|---|---|
| **XXX** | Unconfigured |
| **1_ _** | **Loop 1** |
| **2_ _** | **Loop 2** |
| **_FH** | Full scale high |
| **_FL** | Full scale low |
| **_DH** | Deviation high |
| **_DL** | Deviation low |
| **_DB** | Deviation band |

| Alarm 2 | |
|---|---|
| **XXX** | Unconfigured |
| **1_ _** | **Loop 1** |
| **2_ _** | **Loop 2** |
| **_FH** | Full scale high |
| **_FL** | Full scale low |
| **_DH** | Deviation high |
| **_DL** | Deviation low |
| **_DB** | Deviation band |

| Alarm 3 | |
|---|---|
| **XXX** | Unconfigured |
| **1_ _** | **Loop 1** |
| **2_ _** | **Loop 2** |
| **_FH** | Full scale high |
| **_FL** | Full scale low |
| **_DH** | Deviation high |
| **_DL** | Deviation low |
| **_DB** | Deviation band |

| Alarm 4 | |
|---|---|
| **XXX** | Unconfigured |
| **1_ _** | **Loop 1** |
| **2_ _** | **Loop 2** |
| **_FH** | Full scale high |
| **_FL** | Full scale low |
| **_DH** | Deviation high |
| **_DL** | Deviation low |
| **_DB** | Deviation band |

| Logic LA | |
|---|---|
| **XX** | Unconfigured |
| **1_** | **Loop 1** |
| **2_** | **Loop 2** |
| **_B** | Sensor Break |
| **_M** | Manual Select |
| **_H** | Control Ch1 OP |
| **_C** | Control Ch2 OP |
| **_R** | Remote SP |
| **_S** | Setpoint 2 Enable |
| **A_** | **Alarm** |
| **_A** | Acknowledge All Alarms |
| **_1** | Alarm 1 OP |
| **_2** | Alarm 2 OP |
| **P_** | **Programmer** |
| **_R** | Run |
| **_H** | Hold |
| **_A** | Reset |
| **_1** | Prg Ch1 Event 1 |
| **_2** | Prg Ch1 Event 2 |

| Logic LB | |
|---|---|
| **XX** | Unconfigured |
| **1_** | **Loop 1** |
| **2_** | **Loop 2** |
| **_B** | Sensor Break |
| **_M** | Manual Select |
| **_H** | Ch1 OP |
| **_C** | Ch2 OP |
| **_R** | Remote SP |
| **_S** | Setpoint 2 Enable |
| **A_** | **Alarm** |
| **_A** | Acknowledge All Alarms |
| **_1** | Alarm 1 OP |
| **_2** | Alarm 2 OP |
| **P_** | **Programmer** |
| **_R** | Run |
| **_H** | Hold |
| **_A** | Reset |
| **_1** | Prg Event 1 |
| **_2** | Prg Event 2 |

| Relay AA | |
|---|---|
| **XX** | Unconfigured |
| **1_** | **Loop 1** |
| **2_** | **Loop 2** |
| **_H** | Control Ch1 OP |
| **_C** | Control Ch2 OP |
| **_B** | Sensor Break |
| **SB** | Sensor Break (any loop) |
| **A_** | **Alarm** |
| **_A** | Any Alarm Active |
| **_N** | New Alarm Active |
| **_1** | Alarm 1 OP |
| **_2** | Alarm 2 OP |
| **P_** | **Programmer** |
| **_1** | Prg Event 1 |
| **_2** | Prg Event 2 |

*(3). I/O slots 4, 5 and 6 are only available on the 3504.*

| Slot Functions 1 – 6 CH1 = Heat, CH2 = Cool | |
|---|---|
| **XXX** | Unconfigured |
| **1_ _** | **Loop 1** |
| **2_ _** | **Loop 2** |
| **Changeover Relay** | |
| **_HX** | Control Ch1 OP |
| **_CX** | Control Ch2 OP |
| **_BX** | Sensor Break |
| **2-Pin Relay** | |
| **_HX** | Control Ch1 OP |
| **_CX** | Control Ch2 OP |
| **_BX** | Sensor Break |
| **Single Logic** | |
| **_HX** | Control Ch1 OP |
| **_CX** | Control Ch2 OP |
| **Single Triac** | |
| **_HX** | Control Ch1 OP |
| **_CX** | Control Ch2 OP |
| **Dual Relay** | |
| **_HC** | Ch1 OP & Ch2 |
| **_VT** | VP Ch1 |
| **_VR** | VP Ch2 |
| **P12** | Prg Event 1 & 2 |
| **P34** | Prg Event 3 & 3 |
| **P56** | Prg Event 5 & 6 |
| **P78** | Prg Event 7 & 8 |
| **A12** | Alarm 1 & 2 OP |
| **A34** | Alarm 3 & 4 OP |
| **HHX** | Ch1 OP for loops 1 & 2 |
| **CCX** | Ch2 OP for loops 1 & 2 |
| **SBR** | Sensor Break both loops |
| **Dual Triac** | |
| **_HC** | Ch1 OP & Ch2 |
| **_VT** | VP Ch1 |
| **_VR** | VP Ch2 |
| **P12** | Prg Ch1 Event 1 & 2 |
| **P34** | Prg Ch1 Event 3 & 3 |
| **P56** | Prg Ch1 Event 5 & 6 |
| **P78** | Prg Ch1 Event 7 & 8 |
| **A12** | Alarm 1 & 2 OP |
| **A34** | Alarm 3 & 4 OP |
| **HHX** | Ch1 OP for loops 1 & 2 |
| **CCX** | Ch2 OP for loops 1 & 2 |
| **DC Control** | |
| **_H_** | Ch1 OP |
| **_C_** | Ch2 OP |
| **DC Retransmission *** | |
| **_T_** | PV Retransmission |
| **_S_** | SP Retransmission |
| **Analogue Input *** | |
| **2PV** | Loop 2 PV |
| **_R_** | Remote SP |
| **Potentiometer Input *** | |
| **_RS** | Remote SP |
| **_VF** | VP Feedback Ch1 |
| **_VG** | VP Feedback Ch2 |
| **Triple Logic Input** | |
| **_ _ _** | Select function below for each channel |
| **X** | Unconfigured |
| **M** | Loop 1 Manual |
| **N** | Loop 2 Manual |
| **Q** | Loop 1 Remote SP |
| **V** | Loop 2 Remote SP |
| **S** | Loop 1 Setpoint 2 |
| **T** | Loop 2 Setpoint 2 |
| **E** | Acknowledge All Alarms |
| **P** | Program Run |
| **R** | Program Reset |
| **H** | Program Hold |
| **Triple Logic OP** | |
| **_ _ _** | Select function below for each channel |
| **X** | Unconfigured |
| **F** | Loop 1 Ch1 OP |
| **G** | Loop 1 Ch2 OP |
| **K** | Loop 2 Ch1 OP |
| **L** | Loop 2 Control Ch2 OP |
| **A** | Alarm 1 OP |
| **B** | Alarm 2 OP |
| **C** | Alarm 3 OP |
| **D** | Alarm 4 OP |
| **1** | Program Event 1 |
| **2** | Program Event 2 |
| **3** | Program Event 3 |
| **4** | Program Event 4 |
| **5** | Program Event 5 |
| **6** | Program Event 6 |
| **7** | Program Event 7 |
| **8** | Program Event 8 |

* For range, select from Table A below

| Table 1 | |
|---|---|
| A | 4-20mA Linear |
| Y | 0-20mA Linear |
| W | 0-5Vdc Linear |
| G | 1-5Vdc Linear |
| V | 0-10Vdc Linear |

## 1.4 How to Install the Controller

This instrument is intended for permanent installation, for indoor use only, and to be enclosed in an electrical panel.

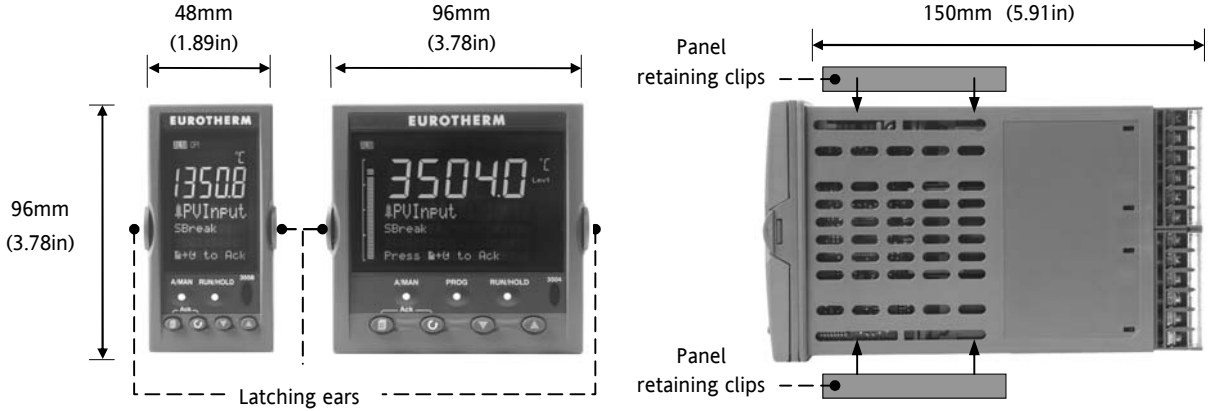
Select a location where minimum vibrations are present and the ambient temperature is within 0 and 50°C (32 and 122°F).

The instrument can be mounted on a panel up to 15mm thick.

To assure IP65 and NEMA 4 front protection, use a panel with smooth surface texture.

Please read the safety information, at the end of this guide, before proceeding and refer to the EMC Booklet part number HA025464 for further information. This and other relevant manuals may be downloaded from www.eurotherm.co.uk.

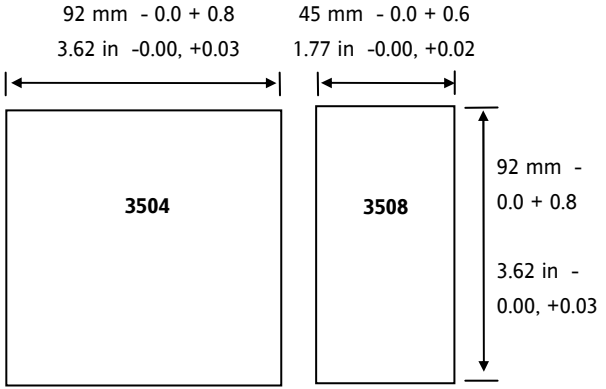
### 1.4.1 Dimensions



## 1.4.2 To Install the Controller

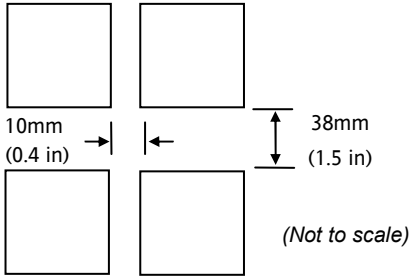
### 1.4.2.1 Panel Cut-out

1. Prepare the panel cut-out to the size shown in the diagram
2. Insert the controller through the cut-out.
3. Spring the panel retaining clips into place. Secure the controller in position by holding it level and pushing both retaining clips forward.
4. Peel off the protective cover from the display




### 1.4.2.2 Recommended Minimum Spacing

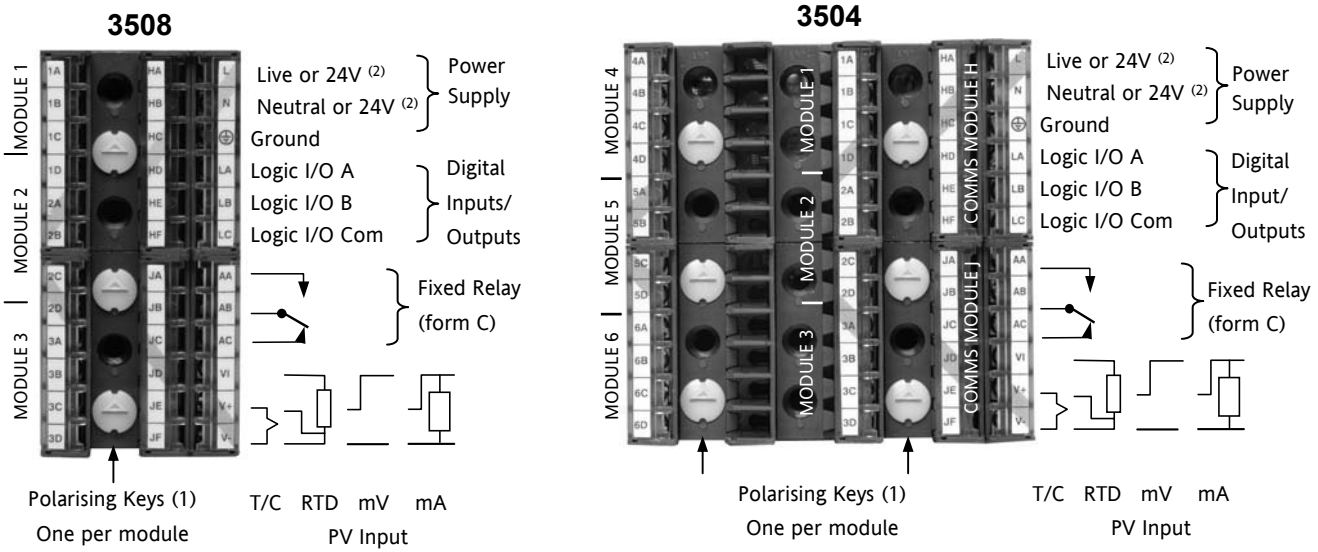
5. The recommended minimum spacing between controllers shown here should not be reduced to allow sufficient natural air flow




## 1.4.3 Unplugging the Controller

The controller can be unplugged from its sleeve by easing the latching ears outwards and pulling it forward out of the sleeve. When plugging it back into its sleeve, ensure that the latching ears click back into place to maintain the IP65 sealing.

## 1.5 Electrical Connections




(1) Polarising keys are intended to prevent modules which are not supported in this controller from being fitted into the controller. An example might be an unisolated module (coloured red) from a 2400 controller series. When pointing towards the top, as shown, the key prevents a controller, fitted with an unsupported module, from being plugged into a sleeve which has been previously wired for isolated modules. If an unisolated module is to be fitted, it is the users responsibility to ensure that it is safe to install the controller in the particular application. When this has been verified the polarising key may be adjusted with a screwdriver to point in the down direction.

(2) High or low voltage versions are orderable. Ensure you have the correct version

### 1.5.1 Wire Sizes

The screw terminals accept wire sizes from 0.5 to 1.5 mm (16 to 22AWG). Hinged covers prevent hands or metal making accidental contact with live wires. The rear terminal screws should be tightened to 0.4Nm (3.5lb in).

## 1.6 Standard Connections

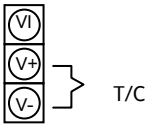
These are connections which are common to all instruments in the range.

### 1.6.1 PV Input (Measuring Input)

Notes:

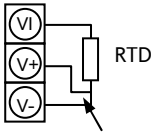
1. Do not run input wires together with power cables
2. When shielded cable is used, it should be grounded at one point only
3. Any external components (such as zener barriers, etc) connected between sensor and input terminals may cause errors in measurement due to excessive and/or un-balanced line resistance or possible leakage currents
4. Not isolated from logic I/O A and logic I/O B

#### 1.6.1.1 Thermocouple or Pyrometer Input




Use the correct type of thermocouple compensating cable, preferably shielded, to extend wiring

### 1.6.1.2 RTD Input



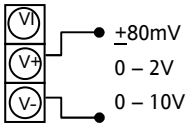

For 2-wire this is a local link

The resistance of the three wires must be the same

The line resistance may cause errors if it is greater than 22Ω

Note: the RTD wiring is not the same as 2400 series instruments. It is the same as 26/2700 series

### 1.6.1.3 Linear Input V, mV and High Impedance V



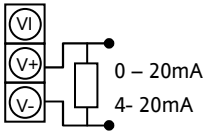

mV range ±40mV or ±80mV

High level range 0 – 10V

High Impedance mid level range 0 – 2V

A line resistance for voltage inputs may cause measurement errors

### 1.6.1.4 Linear Input mA




Connect the supplied load resistor equal to 2.49Ω for mA input

The resistor supplied is 1% accuracy 50ppm

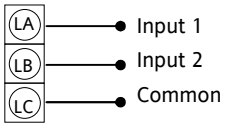
A resistor 0.1% accuracy 15ppm resistor can be ordered as a separate item

## 1.6.2 Digital I/O

These terminals may be configured as logic inputs, contact inputs or logic outputs in any combination. It is possible to have one input and one output on either channel.

⚠ **The Digital IO is not isolated from the PV input**

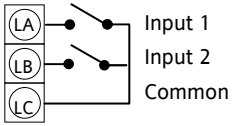
### 1.6.2.1 Logic Inputs




Voltage level logic inputs, 12V, 5-40mA

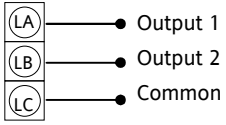
Active > 10.8V
Inactive < 7.3V

### 1.6.2.2 Contact Closure Inputs




Contact open > 1200Ω
Contact closed < 480Ω

## 1.6.3 Digital (Logic) Outputs

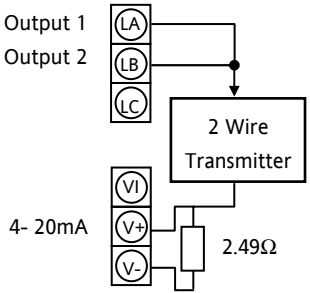



The logic outputs are capable of driving SSR or thyristors up to 9mA, 18V
It is possible to parallel the two outputs to supply 18mA, 18V.

Note : The Digital IO terminals are not isolated from the PV.

The fixed digital logic outputs may be used to power remote 2 wire transmitters. The fixed digital I/O are, however, not isolated from the PV input circuit, so this does not allow the use of 3 or 4 wire transmitters. An isolated module must be used for the 3 and 4 wire types.

### 1.6.4 Digital (Logic) Outputs used to power a remote 2 wire transmitter.

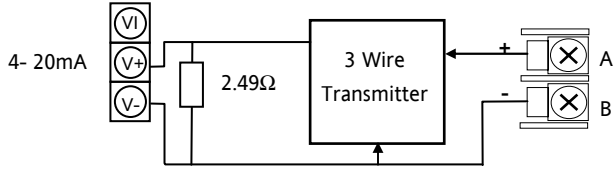



The parallel logic outputs supply >20mA, 18V.

Note : The Digital IO terminals are not isolated from the PV.

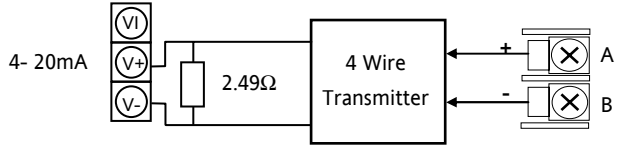
Connect the supplied load resistor equal to 2.49Ω for mA input

### 1.6.5 Digital (Logic) Outputs used to power a remote 3 wire transmitter.



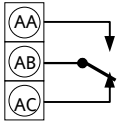

Isolated Transmitter Option module +24V >20mA

### 1.6.6 Digital (Logic) Outputs used to power a remote 4 wire transmitter.




Isolated Transmitter Option module +24V >20mA

## 1.6.7 Relay Output




Relay rating, min: 1V, 1mAdc. Max: 264Vac 2A resistive

Relay shown in de-energised state

Isolated output 240Vac CATII

### 1.6.7.1 General Note About Inductive Loads

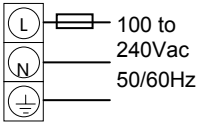
High voltage transients may occur when switching inductive loads such as some contactors or solenoid valves.

For this type of load it is recommended that a 'snubber' is connected across the contact of the relay switching the load. The snubber typically consists of a 15nF capacitor connected in series with a 100Ω resistor and will also prolong the life of the relay contacts.

⚠ When the relay contact is open and it is connected to a load, the snubber passes a current (typically 0.6mA at 110Vac and 1.2mA at 240Vac. It is the responsibility of the installer to ensure that this current does not hold on the power to an electrical load. If the load is of this type the snubber should not be connected.

See also section 1.7.9.

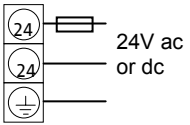
### 1.6.8 Power Supply Connections




1. Before connecting the instrument to the power line, make sure that the line voltage corresponds to the description on the identification label
2. For supply connections use 16AWG or larger wires rated for at least 75ºC
3. Use copper conductors only
4. For 24V the polarity is not important
5. It is the Users responsibility to provide an external fuse or circuit breaker.

   For 24 V ac/dc fuse type T rated 4A 250V

   For 100/240Vac fuse type T rated 1A 250V




Safety requirements for permanently connected equipment state:

- a switch or circuit breaker shall be included in the building installation
- it shall be in close proximity to the equipment and within easy reach of the operator
- it shall be marked as the disconnecting device for the equipment

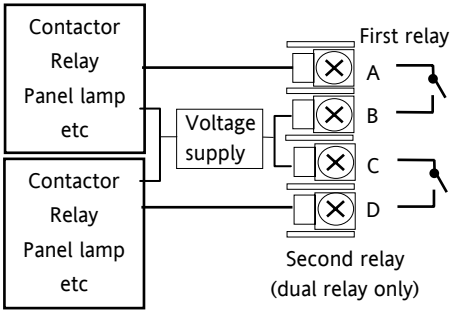
Note: a single switch or circuit breaker can supply more than one instrument

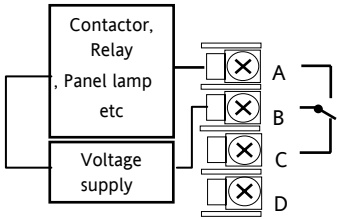
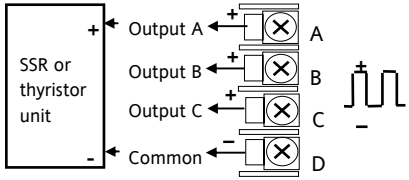
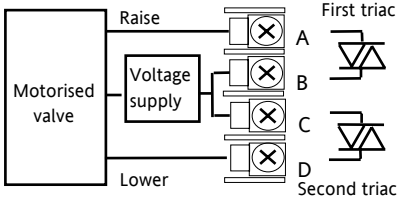
## 1.7 Plug in I/O Module Connections

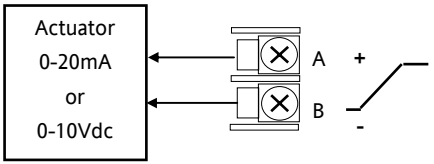
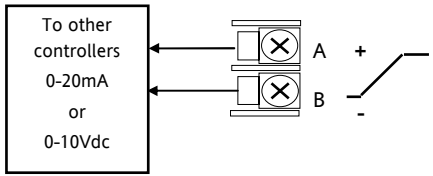
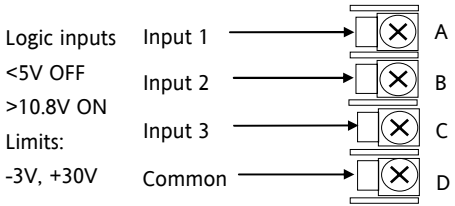
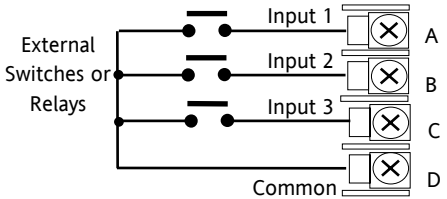
Plug in I/O modules can be fitted in three positions in the 3508 and six positions in 3504. The positions are marked Module 1, 2, 3, 4, 5, 6. With the exception of the Analogue Input module, any other module listed in this section, can be fitted in any of these positions. To find out which modules are fitted check the ordering code printed on a label on the side of the instrument. If modules have been added, removed or changed it is recommended that this is recorded on the instrument code label.

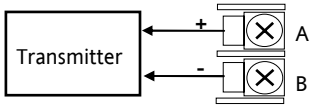
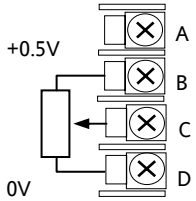
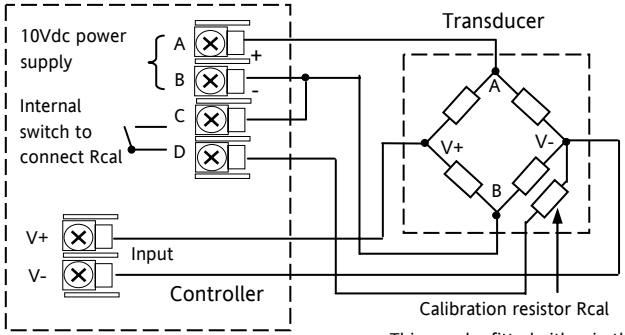
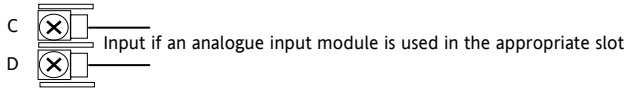
The function of the connections varies depending on the type of module fitted in each position and this is shown below. All modules are isolated.

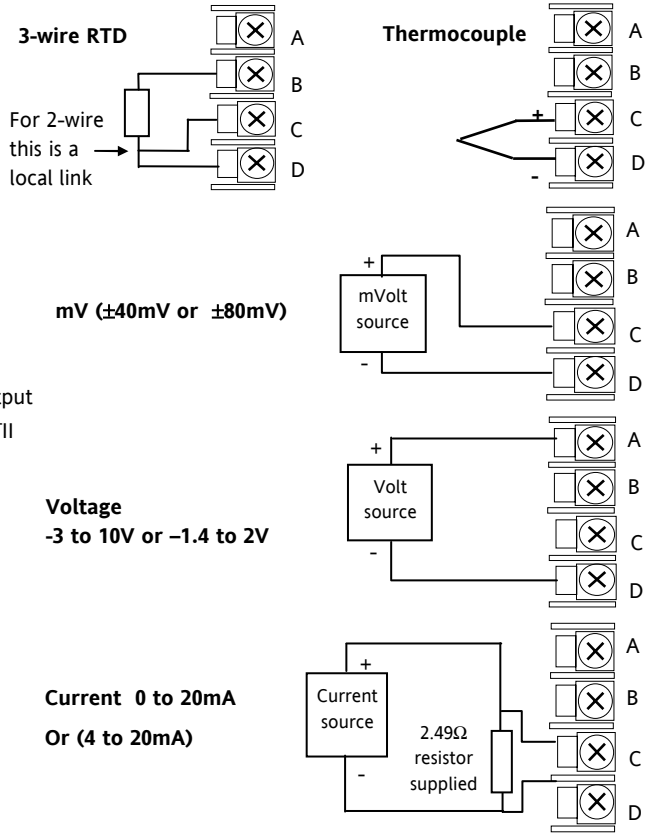
### 1.7.1 I/O Modules

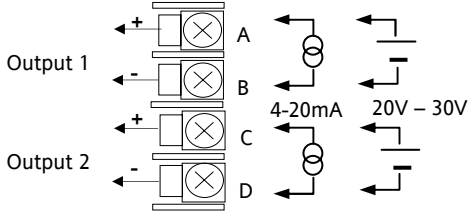
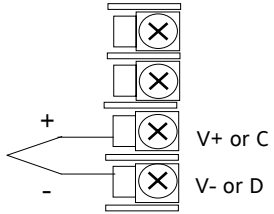
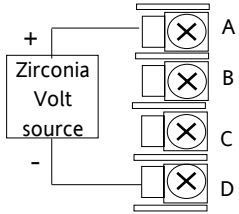
| I/O Module | Typical usage | H/W Code | Connections and examples of use |
|---|---|---|---|
| Note: The order code and terminal number is pre-fixed by the module number.<br>Module 1 is connected to terminals 1A, 1B, 1C, 1D; module 2 to 2A, 2B, 2C, 2D, etc. | | | |
| Relay (2 pin) and Dual Relay<br><br>2A, 264Vac max<br>1mA 1V min | Heating, cooling, alarm, program event, valve raise, valve lower | R2 and RR |  <br>Isolated output 240Vac CATII |

| I/O Module | Typical usage | H/W Code | Connections and examples of use |
|---|---|---|---|
| Change Over Relay<br>(2A, 264Vac max)<br>1mA 1V min | Heating, cooling, alarm, program event, valve raise, valve lower | R4 |  <br>Isolated output 240Vac CATII |
| Triple Logic<br>and<br>Isolated Single Logic Output<br>(18Vdc at 8mA max.) | Heating, cooling, program events | TP and LO | Single Logic Output connections are:-<br>D – Common<br>A – Logic Output<br>  <br>Isolated output 240Vac CATII |
| Triac<br>and Dual Triac<br>(0.7A, 30 to 264Vac combined rating) | Heating, cooling, valve raise, valve lower | T2<br>and TT |  <br>Isolated output 240Vac CATII<br>Note 1: Dual relay modules may be used in place of dual triac.<br>**Note 2:- The combined current rating for the two triacs must not exceed 0.7A.** |

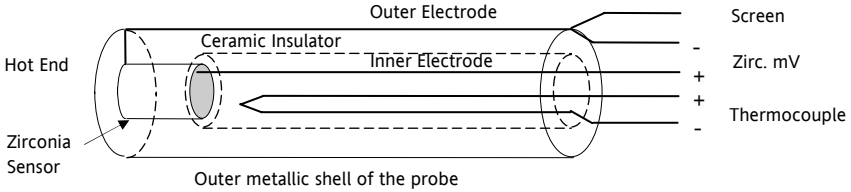
| I/O Module | Typical usage | H/W Code | Connections and examples of use |
|---|---|---|---|
| DC Control<br><br>(10Vdc, 20mA max) | Heating, cooling<br>e.g. to a 4-20mA process actuator | D4 | Isolated output 240Vac CATII<br>  |
| DC Re-transmission<br><br>(10Vdc, 20mA max) | Logging of PV, SP, output power, etc.,<br>(0 to 10Vdc, 0 to 20mA) | D6 | Isolated output 240Vac CATII<br>  |
| Triple Logic Input | Events<br><br>e.g. Program Run, Reset, Hold | TL | Isolated output 240Vac CATII<br>  |
| Triple Contact Input | Events<br><br>e.g. Program Run, Reset, Hold | TK | Contact inputs<br><100Ω ON<br>>28KΩ OFF<br>Isolated output 240Vac CATII<br>  |

| I/O Module | Typical usage | H/W Code | Connections and examples of use |
|---|---|---|---|
| 24V Transmitter Supply (20mA) | To power an external transmitter | MS |  Isolated output 240Vac CATII |
| Potentiometer input 100Ω to 15KΩ | Valve position feedback Remote setpoint | VU |  Isolated output 240Vac CATII |
| Transducer Power Supply Configurable 5V or 10Vdc Minimum load resistance 300Ω | | G3 |  Isolated output 240Vac CATII  |

| I/O Module | Typical usage | H/W Code | Connections and examples of use |
|---|---|---|---|
| Analogue Input<br>(T/C & RTD)<br><br>**Modules 1, 3, 4 & 6 only**<br><br>(mV, V and mA) | Second PV input<br>Remote setpoint | AM |  |

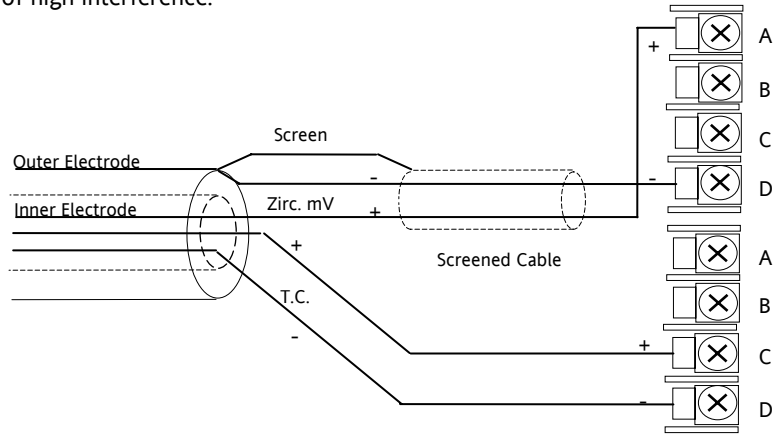
| I/O Module | Typical usage | H/W Code | Connections and examples of use |
|---|---|---|---|
| **Dual DC Output**<br><br>(each channel can be 4-20mA or 24Vdc power supply) | Control output 12 bit resolution<br><br>Can only be fitted in slots 1, 2 and 4 | DO |  |
| Analogue Input<br>(T/C & RTD)<br><br>**Modules 1, 3, 4 & 6 only** | Zirconia Probe | AM | The temperature sensor of the zirconia probe can be connected to the Fixed PV input, terminals V+ and V-, or to an Analogue Input module, terminals C & D. The Volt Source connected to an Analogue Input module, terminals A & D.<br>  <br>Fixed PV (or an Analogue Input Module)<br>  <br>Analogue Input Module<br><br>Isolated output 240Vac CATII |

### 1.7.2 Zirconia Probe Construction




### 1.7.3 Zirconia Probe Screening Connections

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.



## 1.8 Digital Communications Connections

Digital Communications modules can be fitted in two positions in both 3508 and 3504 controllers. 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 'iTools' configuration package on one position, and to a PC running a supervisory package on the second position.

Communications protocols may be ModBus, EIBisynch, DeviceNet, Profibus or ModBus TCP.

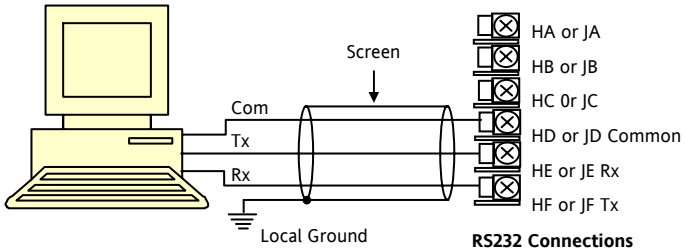
Note:- In order to reduce the effects of RF interference the transmission line should be grounded at both ends of the screened cable. However, if such a course is taken care must be taken to ensure that differences in the earth potentials do not allow circulating currents to flow, as these can induce common mode signals in the data lines. Where doubt exists it is recommended that the Screen (shield) be grounded at only one section of the network as shown in all of the following diagrams.

- Digital communications modules isolated 240Vac CATII

### 1.8.1 Modbus Slave (H or J Module) or EIBisynch

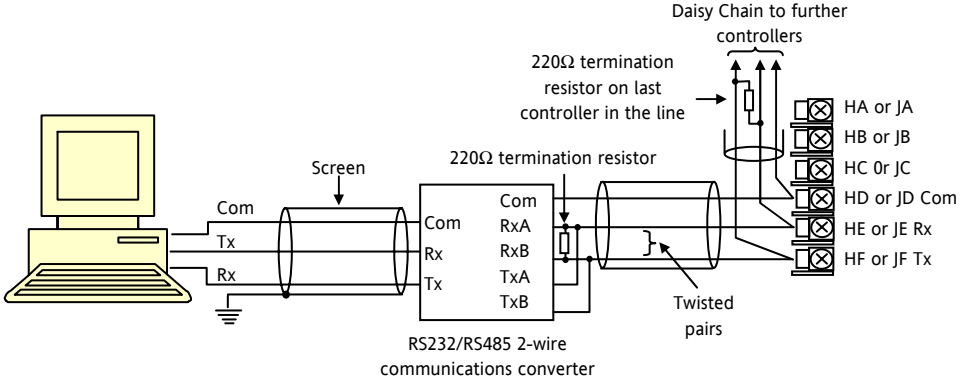
A further description of ModBus and EIBisynch communications is given in 2000 series Communications Handbook, Part No. HA026230, which can be downloaded from www.eurotherm.co.uk.

**RS232 Connections**



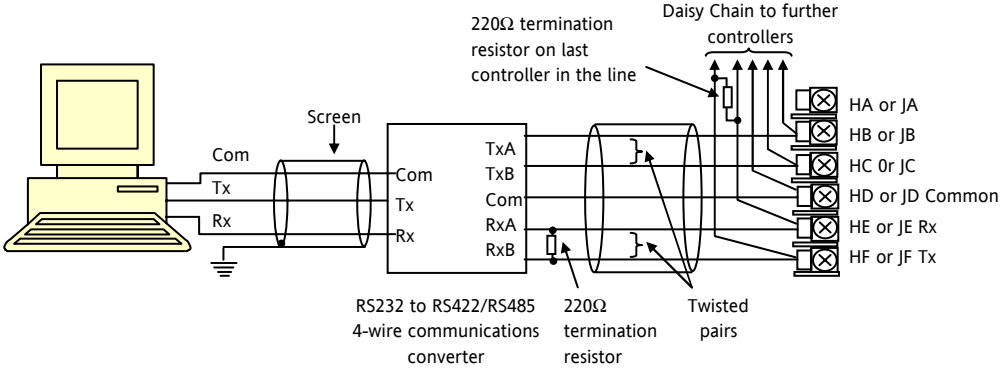

**RS232 Connections**

## RS485 2-Wire Connections




The KD485 communications converter is recommended for interfacing to RS485. This unit is also used to buffer an RS485 network when it is required to communicate with more than 32 instruments on the same bus, and may also be used to bridge 2-wire RS485 to 4-wire RS422.

## RS422/RS485 4-Wire Connections




The 261 or KD485 communications converter is recommended for:

Interfacing 4-wire to 2-wire connections.

To buffer an RS422/485 network when more than 32 instruments on the same bus are required

To bridge 2-wire RS485 to 4-wire RS422.

### 1.8.2 DeviceNet Wiring

A description of DeviceNet is given in the DeviceNet Communications Handbook Part No HA027506 which can be downloaded from www.eurotherm.co.uk.

| Terminal Reference | CAN Label | Color Chip | Description |
|---|---|---|---|
| HA | V+ | Red | 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. |
| HB | CAN_H | White | DeviceNet CAN_H data bus terminal. Connect the white wire of the DeviceNet cable here. |
| HC | SHIELD | None | Shield/Drain wire connection. Connect the DeviceNet cable shield here. To prevent ground loops, the DeviceNet network should be grounded in only one location. |
| HD | CAN_L | Blue | DeviceNet CAN_L data bus terminal. Connect the blue wire of the DeviceNet cable here. |
| HE | V- | Black | 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. |
| HF | | | Connect to instrument earth |

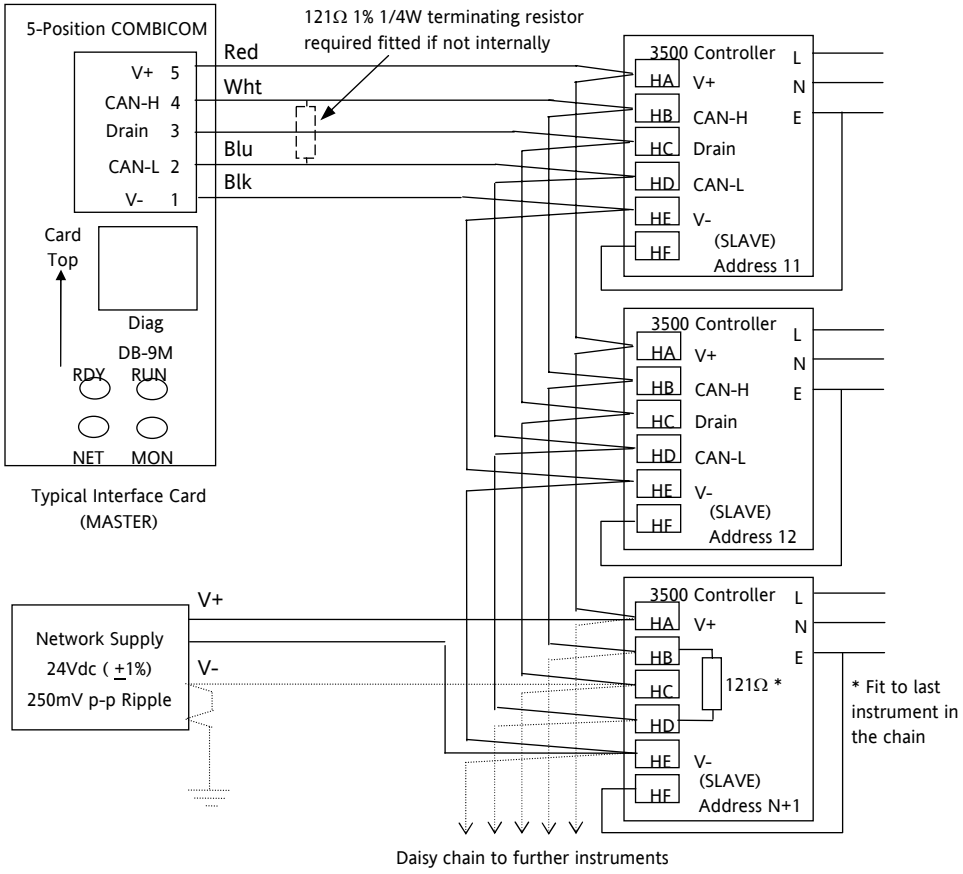
Note: Power taps are recommended to connect the DC power supply to the DeviceNet trunk line. Power taps include:

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.

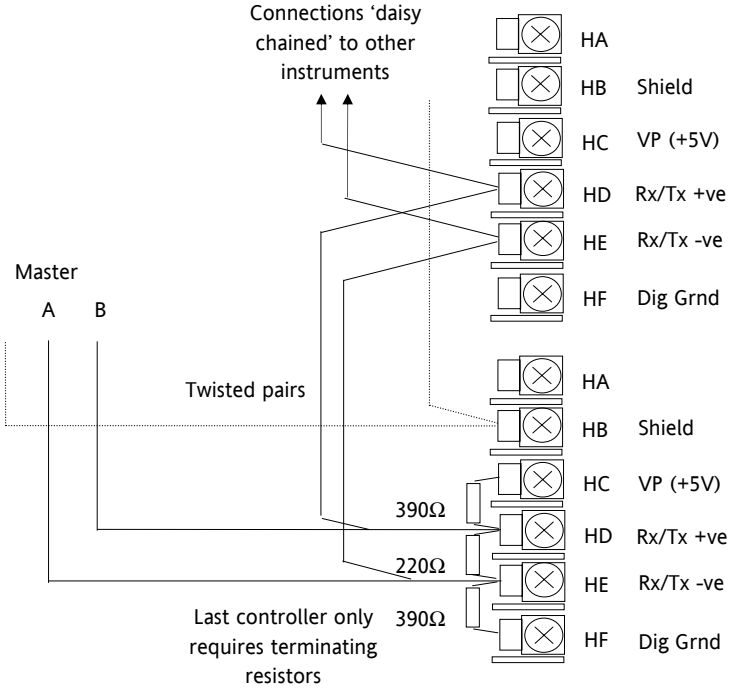
### 1.8.3 Example DeviceNet Wiring Diagram



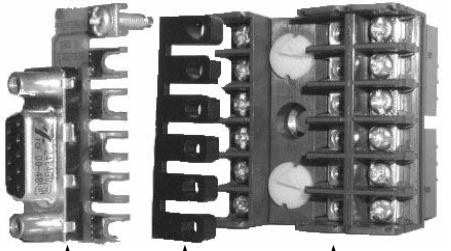
### 1.8.4 Profibus

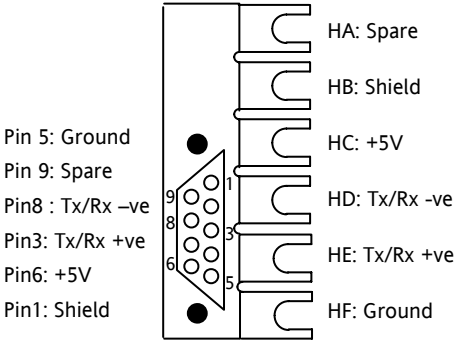
A description of Profibus is given in the Profibus Communications Handbook Part No HA026290 which can be downloaded from www.eurotherm.co.uk.

### 1.8.5 Example Profibus Wiring




D Type Connector for rear terminal mounting if digital communications options code PD is ordered

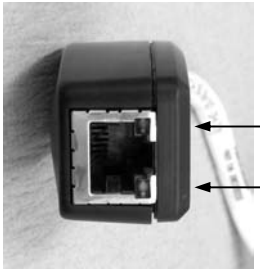


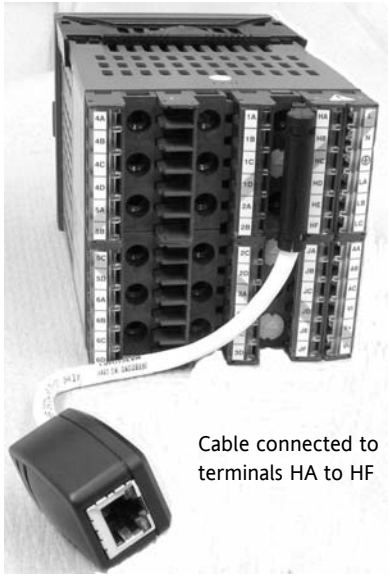
### 1.8.6 Ethernet (ModBus TCP)

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.

View of cable which may also be ordered separately as Part No SUB3500/COMMS/EA



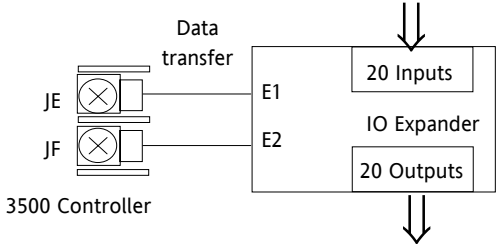
Activity and transmit data LED indicators



Cable connected to terminals HA to HF

### 1.8.7 I/O Expander

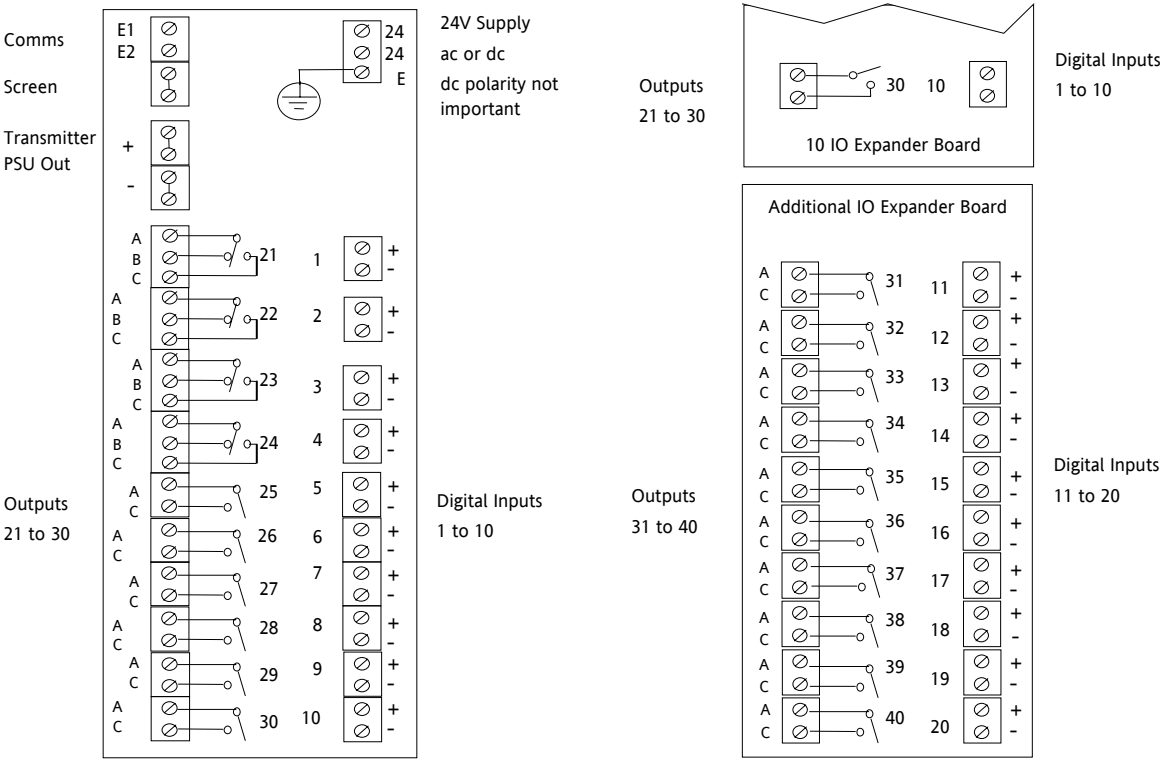
An I/O expander (Model No 2000IO) can be used with 3500 series controllers to allow the number of I/O points to be increased by up to a further 20 digital inputs and 20 digital outputs. Data transfer is performed serially via a two wire interface module which is fitted in digital communications slot J.



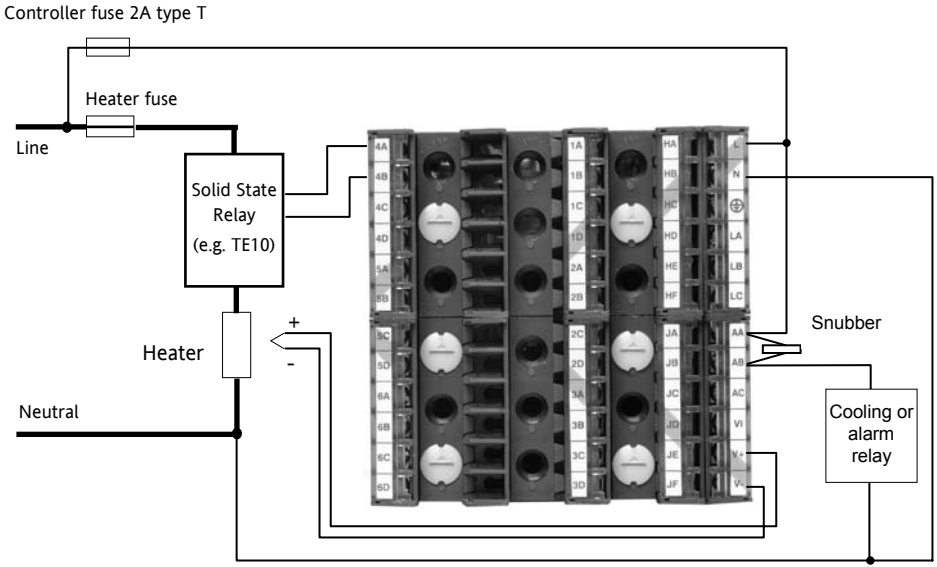

A description of the IO Expander is given in Handbook Part No HA026893 which can be downloaded from www.eurotherm.co.uk.

The connections for this unit are reproduced below for convenience.

## 1.8.8 IO Expander Connections



### 1.8.9 Example Wiring Diagram




Please refer to the EMC Electromagnetic Compatibility Handbook Part No. HA025464 for details of good wiring practice. This can be downloaded from www.eurotherm.co.uk.

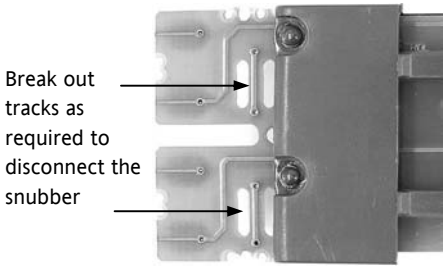
### 1.8.10 Snubbers

Snubbers are used to prolong the life of relay contacts and to reduce interference when switching inductive devices such as contactors or solenoid valves. The fixed relay (terminals AA/AB/AC) is not fitted internally with a snubber and it is recommended that a snubber be fitted externally, as shown in the example wiring diagram. If the relay is used to switch a device with a high impedance input, no snubber is necessary.

All relay modules are fitted internally with a snubber since these are generally required to switch inductive devices. However, snubbers pass 0.6mA at 110V and 1.2mA at 230Vac, which may be sufficient to hold on high impedance loads. If this type of device is used it will be necessary to remove the snubber from the circuit.

The snubber is removed from the relay module as follows:-

1. Unplug the controller from its sleeve
2. Remove the relay module
3. Use a screwdriver or similar tool to snap out the track. The view below shows the tracks in a Dual Relay Output module.



# 2. Chapter 2: Getting Started

A brief start up sequence consists of a self test in which all elements of the display are illuminated and the software version is shown. What happens next depends on one of two conditions;-

1. Power up out of the box – when the controller has no preset configuration and is switched on for the very first time it will start up in 'QuickStart mode. This is an intuitive tool for configuring the controller and is described in section 2.1 below.
2. The controller has been powered up previously and is already configured. In this case go to section 2.3.

## 2.1 Quick Start - New Controller (Unconfigured)

Quick Start is a tool which enables the controller to be matched to the most common processes without the need to go to full configuration level described in the Engineering Manual Part No. HA027988.

Manual mode, section 2.6, is always selected when in Quick Start mode because the controller resets to cold start when Quick Start is selected.

When the controller is switched on for the very first time it will display the 'Startup' screen shown below.


**3504 Display**


**3508 Display**

⚠ **Incorrect configuration can result in damage to the process and/or personal injury and must be carried out by a competent person authorised to do so. It is the responsibility of the person commissioning the controller to ensure the configuration is correct**

### 2.1.1 To Configure Parameters in Quick Start Mode

With 'QckStart' selected, press ⟳ to scroll through the list of parameters

Edit the parameters using the ▲ or ▼ buttons

Each time ⟳ button is pressed a new parameter will be presented

This is illustrated by the following example:- (The views shown are taken from the 3504 controller).

☺ From the Startup view, shown in the previous section, you can press ▲ or ▼ to select Configuration Mode. To fully configure the controller refer to the Engineering Handbook Part No HA027988.

☺ Backscroll – to scroll back through parameters press and hold ⟳ then press ▲ to go back through the list of parameters. You can also press and hold ⟳ + ▼ to go forward - this has the same effect as pressing ⟳ alone.

## Example

| Do This | Display | Additional Notes |
|---|---|---|
| 1. From the Start view press ⟳<br>2. Press ▲ or ▼ to change the **'Units'**<br>3. A different parameter is selected each time ⟳ is pressed. |  | The first parameter to be configured is **'Units'**. It resides in the '**PV Input List'** because it is associated with the process variable.<br>When the required choice is selected a brief blink of the display indicates that it has been accepted |
| 4. Continue setting up the parameters presented until the **'Finished'** view is displayed.<br>5. If all parameters are set up as required press ▲ or ▼ to **'Yes'** |  | If you wish to scroll around the parameters again do not select Yes but continue to press ⟳.<br>When you are satisfied with the selections select 'Yes'.<br>The 'HOME' display - section 2.3 is then shown. |

The following table summarises all the parameters which can be set up by the above procedure.

### 2.1.2 Quick Start Parameters

Parameters shown in **Bold** are defaults.

| Group | Parameter | Value | Availability |
|---|---|---|---|
| LP1<br>PV Input | Units<br>Used to select the engineering units for the PV. (C, F, K options also change the displayed units) | **C**, F, K<br>V. mV, A, mA, pH, mmHg, psi, Bar, mBar, %RH, %, mmWG, inWG, inWW, Ohms, PSIG, %O2, PPM, %CO2, %CP, %/sec, Vacuum, sec, min, hrs, None | Always |
| LP1<br>PV Input | Resolution<br>Used to select the required decimal point position for the PV | **XXXXX**, XXXX.X, XXX.XX, XX.XXX, X.XXXX | Always |
| LP1<br>PV Input | Range Type<br>Used to select the linearisation algorithm required and the input sensor. | Thermocouple: J, **K**, L, R, B, N, T, S, PL2, C, CustC1(2&3)<br>RTD: Pt100<br>Linear: 0-50mV, 0-5V, 1-5V, 0-10V, 2-10V, 0-20mA, 4-20mA | Always |
| LP1<br>PV Input | IO Type<br>Only shown if custom curve is selected | Thermocpl, RTD, Pyrometer, mV40, mV80, mA, Volts, HIZVolts, Log10 | |
| LP1<br>PV Input | Range High/Low<br>Configures the maximum/minimum display range and SP limits | Depends on Range type selected. Default **1372/-200** | Always |
| LP1<br>Loop | Control Channel 1. Sets the control type for channel 1 (normally Heat) | **PID,** VPU, VPB, Off, OnOff | Always |
| LP1<br>Loop | Control Channel 2. Sets the control type for channel 2 (normally Cool) | PID, VPU, VPB, **Off,** OnOff | Always |
| LP2<br>PV Input | Source<br>Defines where the PV input is wired to | **None,** FixedPV, Module6. Available only if an analogue input module is fitted. | If a dual loop controller |
| **The LP1 parameters listed above are repeated for LP2 if the LP2 PV Input is configured** | | | |

| Group | Parameter | Value | Availability |
|---|---|---|---|
| Init<br>LgcIO LA | Logic function (input or output)<br>The LA Logic I/O port can be an output or an input. This parameter is used to select its function. | **Not Used,** Lp1 Ch1, Lp1 Ch2, Lp2 Ch1, Lp2 Ch2, Alarm 1 to 8, Any Alarm, New Alarm, ProgEvnt1 to 8, LP1SBrkOP, LP2SBrkOP*, LPsSBrk*, (outputs)<br>LP1 A-M, LP1 SPsel, LP2 A-M, LP2 SPsel, AlarmAck, ProgRun, ProgReset, ProgHold (Inputs) | [Note 1]<br>[Note 2]<br>* LP2 and LPs (both loops) only shown if the second loop is configured<br>Programmer options only available if the controller is a programmer/controller |
| Init<br>LgcIO LA | Min OnTime<br>This applies to both LA and LB inputs | **Auto**<br>0.01 to 150.00 | [Note 2]<br>[Note 3] |
| **The above two parameters are repeated for the LB Logic I/O (LgcIO LB)** | | | |
| Init<br>RlyOP AA | Relay function<br>This relay is always fitted. | **Not Used,** Lp1 Ch1, Lp1 Ch2, Lp2 Ch1, Lp2 Ch2, Alarm 1 to 8, Any Alarm, New Alarm, ProgEvnt1 to 8, LP1SBrkOP, LP2SBrkOP*, LPsSBrk*. | Always.<br>[Note 4]<br>Programmer options only available if the controller is a programmer/controller) |
| Init<br>RlyOP AA | Min On Time | **Auto**<br>0.01 to 150.00 | [Note 2]<br>[Note 3] |

Note 1) Parameters only appear if the function has been turned on, eg If 'Control Channel 1' = 'Off', 'Chan 1' does not appear in this list. When a control channel is configured for valve positioning, LgcIO LA and LgcIO LB act as a complementary pair. If, for example, Chan 1 is connected to LgcIO LA (valve raise) then LgcIO LB is automatically set to Chan 1 (valve lower). This ensures the valve is never raised and lowered simultaneously.

The same complementary behaviour also applies to dual output modules and channels A and C of triple output modules

Note 2) If any input function, for example Chan 1, is connected to another input it will not appear in this list

Note 3) Is available if the Control Channel is not On/Off and is allocated to the LA, LB or AA output as applicable

Note 4) For valve position control Chan 1 or Chan 2 will not appear in this list. Valve position outputs can only be dual outputs such as LA and LB or dual relay/triac output modules

### 2.1.2.1 Modules

The following parameters configure the plug in I/O modules. I/O Modules can be fitted in any available slot in the instrument (6 slots in 3504, 3 slots in 3508). The controller automatically displays parameters applicable to the module fitted - if no module is fitted in a slot then it does not appear in the list.

Each module can have up to three inputs or outputs. These are shown as A, B or C after the module number and this corresponds to the terminal numbers on the back of the instrument. If the I/O is single only A appears. If it is dual A and C appears if it is triple A, B and C appear.

Note 1: If a Dual DC Output module is fitted, it cannot be configured using the Quick Start Code. To configure this module refer to the Engineering Manual part no. HA027988 which can be downloaded from www.eurotherm.co.uk.

Note 2: If an incorrect module is fitted the message 'Bad Ident' will be displayed.

| Module type | Parameter | Value | Availability |
|---|---|---|---|
| Change over relay (R4)<br>2 pin relay (R2)<br>Triac output (T2) | Relay (Triac) function | Not Used<br>All parameters the same as RlyOP AA, including Min OnTime if the OP is a relay | Always (if the module is fitted) |
| Dual Relay (RR) | Relay (Triac) function | | |
| Dual triac output (TT) | Relay function | | |
| Single Logic Output (LO) | Logic Out function | Not Used<br>All parameters the same as RlyOP AA | Always (if the module is fitted) |
| Triple Logic Output (TP) | | | |

| Module type | Parameter | Value | | Availability |
|---|---|---|---|---|
| DC Output (D4)<br>DC Retransmission (D6) | DC Output function | Not Used<br>LP1 Ch1OP<br>LP1 Ch2OP<br>LP2 Ch1OP<br>LP2 Ch2OP<br>LP1 SP Tx<br>LP1 PV Tx<br>LP1 ErrTx<br>LP1 PwrTx<br>LP2 SP Tx<br>LP2 PV Tx<br>LP2 ErrTx<br>LP2 PwrTx | Module fitted but not configured<br>Loop 1 Channel 1 control output<br>Loop 1 Channel 2 control output<br>Loop 2 Channel 1 control output<br>Loop 2 Channel 2 control output<br>Loop 1 setpoint retransmission<br>Loop 1 PV retransmission<br>Loop 1 error retransmission<br>Loop 1 output retransmission<br>Loop 2 setpoint retransmission<br>Loop 2 PV retransmission<br>Loop 2 error retransmission<br>Loop 2 output retransmission | Always (if the module is fitted) |
| | Range Type | 0–5V, 1-5V, 1–10V, 2–10V, 0-29mA, 4-20mA | | |
| | Display High | 100.0 | | |
| | Display Low | 0 | | |
| Triple Logic Input (TL)<br>Triple Contact Input (TK) | Logic In function | Not Used<br>LP1 A-M<br>LP1 SPsel<br>LP1 AltSP<br>LP2 A-M<br>LP2 SPsel<br>LP2 AltSP<br>AlarmAck<br>ProgRun<br>ProgReset<br>ProgHold | Module fitted but not configured<br>Loop 1 Auto/manual<br>Loop 1 SP select<br>Loop 1 Alternative SP select<br>Loop 2 Auto/manual<br>Loop 2 SP select<br>Loop 2 Alternative SP select<br>Alarm acknowledge<br>Programmer run<br>Programmer reset<br>Programmer hold | A function can only be allocated to one input. eg if AlarmAck is configured on X*A it is not offered for the other inputs<br>* is the module number.<br>LP2 does not appear if loop 2 is not configured. |

| Module type | Parameter | Value | | Availability |
|---|---|---|---|---|
| Analogue Input (AM) | Analogue IP function | Not Used | Module fitted but not configured | LP1 V1Pos and LP1 V2Pos only appear if the control channel 1 or control channel 2 is set to VPB.<br>Remote SP does not appear if the programmer option is supplied.<br>LP2 does not appear if loop 2 is not configured. |
| | | LP1 AltSP | Loop 1 alternative setpoint | |
| | | LP1 OPH | Loop 1 remote OP power max | |
| | | LP1 OPL | Loop 1 remote OP power min | |
| | | LP2 AltSP | Loop 2 alternative setpoint | |
| | | LP2 OPH | Loop 2 remote OP power max | |
| | | LP2 OPL | Loop 2 remote OP power min | |
| | | LP1 V1Pos<br>LP1 V2Pos | To read valve position from the feedback potentiometer loop 1 | |
| | | LP2 V1Pos<br>LP2 V2Pos | To read valve position from the feedback potentiometer loop 2 | |
| | Range Type | Thermocouple: J, K, L, R, B, N, T, S, PL2, C.<br>RTD: Pt100<br>Linear: 0-50mV, 0-5V, 1-5V, 0-10V, 2-10V, 0-20mA, 4-20mA | | Not shown if analogue IP function not used |
| | Display High | 100.0 | | These parameters only appear for Linear Range |
| | Display Low | 0.0 | | |

| Module type | Parameter | Value | | Availability |
|---|---|---|---|---|
| Potentiometer Input (VU) | Pot Input function | Not Used | Module fitted but not configured | Ch1VlvPos/Ch2VlvPos only appear if the channel = VPB<br>Remote SP does not appear if the programmer option is supplied.<br>LP2 does not appear if loop 2 is not configured. |
| | | LP1 AltSP | Loop 1 Alternative setpoint | |
| | | LP1 OPH | Loop 1 output power maximum | |
| | | LP1 OPL | Loop 1 output power minimum | |
| | | LP2 AltSP | Loop 2 Alternative setpoint | |
| | | LP2 OPH | Loop 2 output power maximum | |
| | | LP2 OPL | Loop 2 output power minimum | |
| | | LP1 V1Pos | To read valve position from the feedback potentiometer loop 1 | |
| | | LP1 V2Pos | | |
| | | LP2 V1Pos | To read valve position from the feedback potentiometer loop 2 | |
| | | LP2 V2Pos | | |
| Transducer Power Supply (G3) | TdcrPSU function | 5 Volts<br>10 Volts | | Always (if the module is fitted) |
| Transmitter power supply (MS) | No parameters. Used to show the ID of the module if fitted | | | |

### 2.1.2.2 Alarms

| Group | Parameter | Value | | Availability |
|---|---|---|---|---|
| Init<br>Alarm 1 to 8 | Type | None<br>Abs High<br>Abs Low<br>Dev High<br>Dev Low<br>Dev Band | No alarm type configured<br>Absolute high<br>Absolute low<br>Deviation high<br>Deviation low<br>Deviation band | Always |
| Init<br>Alarm 1 to 8 | Source | **None**<br>PV Input<br><br>LP1 PV<br>LP2 PV<br>Module1 to Module6 | Not connected<br>Connected to current process variable does not appear if Alarm Type = Deviation<br>Connected to Loop 1 process variable<br>Connected to Loop 2 process variable<br>Connected to an analogue input module and only of the Alarm Type is not a deviation alarm | Always if Type ≠ None<br>PV Input and ModX Ip do not appear if Type = Deviation |
| Init<br>Alarm 1 to 8 | Setpoint | To adjust the alarm threshold within the range of the source. | | Always if Type ≠ None |
| Init<br>Alarm 1 to 8 | Latch | **None**<br>Auto<br>Manual<br>Event | No latching<br>Automatic latching see section 2.7.1<br>Manual latching see section 2.7.1<br>Alarm beacon does not light but any output associated with the event will activate and a scrolling message will appear. | Always if Type ≠ None |
| Finished | Exit | **No**<br>Yes | Continue back around the quick configuration list<br>Go to normal operation. The loop(s) are set to Auto on exit from quickstart mode and the controller re-starts in Level 2. | |

## 2.2 To Re-enter Quick Start Mode

If you have exited from Quick Start mode (by selecting 'Yes' to the 'Finished' parameter) and you need to make further changes, the Quick start mode can be entered again at any time. The action which takes place depends on one of two previous conditions as follows:-

### 2.2.1 Power up After a Quick Start Configuration

1. Hold ▤ down then power up the controller. Keep this button pressed until the Quick start screen as shown in section 2.1 is displayed.
2. Press ↵ to enter the quick start list. You will then be asked to enter a passcode.
3. Use ▲ or ▼ to enter the passcode – default 4 – the same as the configuration level passcode. If an incorrect code is entered the display reverts to the 'Quick Start' view section 2.1.

It is then possible to repeat the quick configuration as described previously.
The Quick Start view shown in section 2.1 now contains an additional parameter - **'Cancel'**. This is now always available after a power up, and, if selected, will take you into normal operating mode, section 2.3.

### 2.2.2 Power up After A Full Configuration

Repeat 1,2 and 3 above.

Full configuration allows a greater number of parameters to be configured in a deeper level of access. This is described in the Engineering Handbook Part No. HA027988.

If the controller has been re-configured in this level, a **'WARNING'** message, **'Delete config?'** - **'No'** or **'Yes'**, will be displayed. If 'No' is selected the display drops back to the 'GoTo' screen.

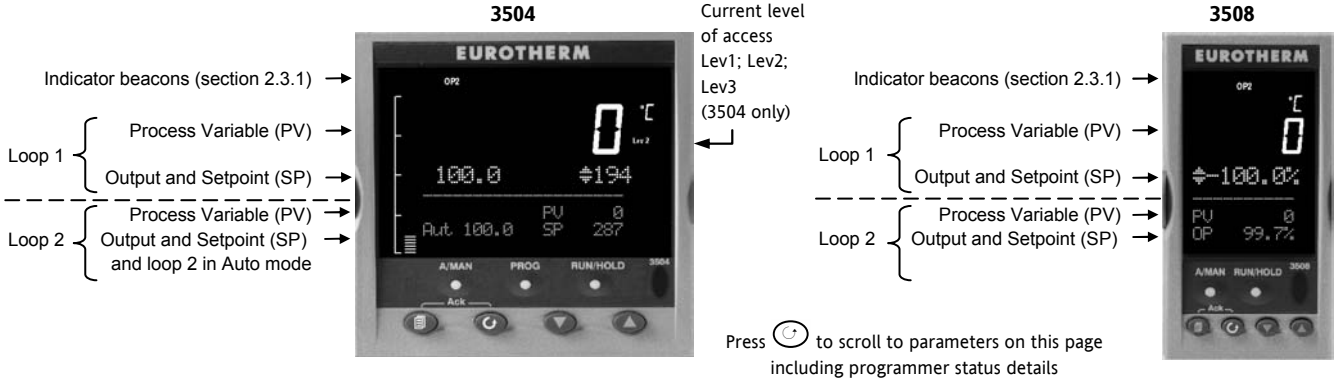
1. Use ▲ or ▼ to select 'Yes'
2. Press ↵ to confirm or ▤ to cancel. (If no button is pressed for about 10 seconds the display returns to the WARNING message).

If 'Yes' is selected the **Quick start defaults** will be re-instated. A**ll** the Quick start parameters must be reset.

## 2.3 Normal Operation

Switch on the controller. Following a brief self-test sequence, the controller will start up in AUTO mode (see AUTO/MAN section 2.6) and Operator Level 2 (following Quick Start).

If the controller is configured as a dual loop instrument the start up view shows a summary of the two loops. This is called the HOME display.




If the controller is configured as a single loop the HOME displays will vary as shown below:-


Other views may be configured as the HOME display and other summary displays can be selected using button. See Message Centre section 2.8.

### 2.3.1 Beacon Display and Description

| Beacon | Description |
|---|---|
| **OP1** | Illuminates when output 1 is ON (normally heating) |
| **OP2** | Illuminates when output 2 is ON (normally cooling or alarm) |
| **MAN** | Illuminates when manual mode active. If the HOME display is showing the dual loop overview, MAN illuminates if Loop 1 is in manual. If the Loop 1 or Loop 2 overviews are being displayed MAN applies to the loop being displayed. |
| **REM** | Illuminates when remote setpoint active |
| **SPX** | Illuminates when alternative setpoint active |
| **ALM** | If an alarm occurs the red alarm beacon flashes. This is accompanied by a message showing the source of the alarm, for example 'Boiler overheating'.<br>To acknowledge press ⟳ and ▼. The message disappears. If the alarm condition is still present the beacon lights continuously. When cleared it will extinguish. A full description of the alarm operation is given in section 2.7 |
| **RUN** | Illuminates when programmer running – flashing indicates End |
| **HLD** | Illuminates when programmer held |
| **J** | Flashes when J Channel comms active |
| **H** | Flashes when H Channel comms active |
| **IR** | Flashes when infra red communications active |

In general throughout this handbook instrument views will use the 3504. The displayed information is similar for the 3508 but in some cases is shortened due to display limitations.

## 2.4 The Operator Buttons


Page Scroll Lower Raise

| | |
|---|---|
| A/MAN<br>This button can be disabled | Toggles the selected loop between Auto and Manual operation. The action of this button is described in section 2.6.<br>Manual operation means that the controller output power is adjusted by the user. The input sensor is still connected and reading the PV but the control loop is open.<br>Auto means that the controller is automatically adjusting the output to maintain control, ie the loop is closed.<br>If the controller is in manual mode, 'MAN' light will be indicated.<br>If the controller is powered down in Manual operation it will resume this mode when it is powered up again. |
| PROG | To select the programmer summary page |
| RUN/HOLD<br>This button can be disabled | Press once to start a program. 'RUN' will be indicated<br>Press again to hold a program. 'HLD' will be indicated<br>Press and hold for at least two seconds to reset a program.<br>'RUN' will flash at the end of a program<br>'HLD' will flash during holdback<br>Programmer operation is fully described in chapter 21 of the Engineering Manual |
| | Press to select new PAGE headings |
| | Press to select a new parameter in the page |
| | Press to decrease an analogue value, or to change the state of a digital value |
| | Press to increase an analogue value, or to change the state of a digital value |

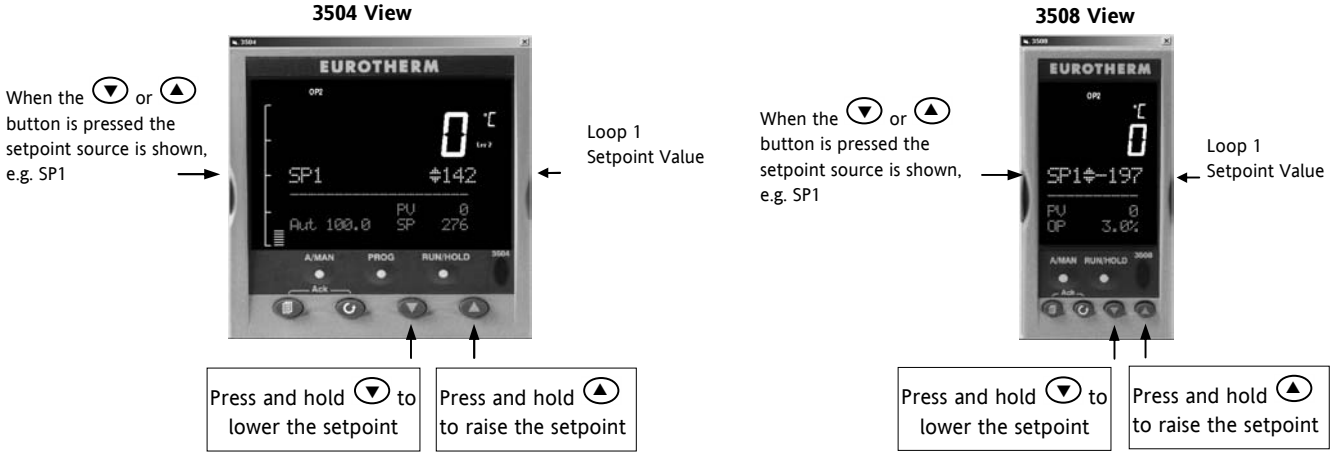
### 2.4.1 Shortcut Key Presses

The following Short Cut Key presses are provided:-

| Action | Key Presses |
|---|---|
| Backpage | Press (page) followed by (▲). With (page) held down continue to press (▲) to scroll page headers backwards.<br>(With (page) still pressed you can press (▼) to page forward. This action is the same as pressing (page) alone). |
| Backscroll | When in a list of parameters, press (↻) followed by (▲). With (↻) held down continue to press (▲) to scroll parameters backwards.<br>(With (↻) still pressed you can press (▼) to page forward. This action is the same as pressing (↻) alone). |
| Jump to HOME display | Press (page) + (↻) |
| Alarm Ack/reset | Press (page) + (↻) when the HOME screen is being displayed to jump to the 'Acknowledge All alarms' page. Pressing (↻) acknowledges all alarms if it can, see section 2.7.1. Pressing (page) cancels the operation. |

## 2.5 To Set The Required Temperature (Setpoint)

A parameter value can be changed if it is preceded by ⬍. In the example shown below this is the setpoint for loop 1.
To change the value, press ▼ or ▲. The output level shown in the HOME display will change to indicate the source of the setpoint while either of the buttons is pressed, in this example SP 1.




To change Loop 2 setpoint, press ⟳. Loop 2 SP value is preceded by ⬍. Press ▼ or ▲ as above to change the value. The action is then the same as for loop 1. A momentary press of either button will show the setpoint in use eg SP1.

**The new setpoint is accepted when either ▼ or ▲ is released and is indicated by a brief flash of the setpoint display**

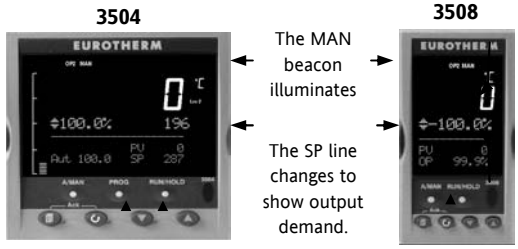
If a single loop is configured (or the individual loop summary is selected – see section 2.8.1) pressing ▼ or ▲ will change the setpoint in the same way as described above.

## 2.6 To Select Manual Operation

Press  (A/MAN) button.

If two loops are enabled and the dual loop overview is being displayed, pressing the A/MAN button will toggle loop 1 between Auto and Manual. The beacon 'MAN' will light and the indication of output power is preceded by ⇕.

Press and hold ▼ or ▲ to decrease or increase the output power.




**The output power will change continuously while either ▼ or ▲ is pressed**

To switch loop 2 between Auto and Manual, press ○ to scroll into the loop 2 section, then press A/MAN.


If loop 1 overview is being displayed, press the A/MAN button to toggle loop 1 between Auto and Manual.
If loop 2 overview is being displayed, press the A/MAN button to toggle loop 2 between Auto and Manual.
If any other overview is being displayed, the first press of the A/MAN button will select the dual loop overview and the action is as described above.

☺ Summary pages may be disabled in configuration level. If none of the above summary pages are enabled:-

- For a dual loop controller, Auto/Manual cannot be selected.
- If loop 1 is enabled and loop 2 disabled, pressing A/MAN toggles Auto/Manual for loop 1.
- If loop 2 is enabled and loop 1 disabled, pressing A/MAN toggles Auto/Manual for loop 2.

☺ For a single loop controller, Auto/Manual will apply regardless of whether summary pages are enabled or not.

☺ If the controller is switched off in either Auto or Manual operation it will resume the same mode when powered up again.

## 2.7 Alarm Indication


If an alarm occurs it is indicated as follows:-

The red alarm (ALM) beacon in the top left of the display flashes

Alarm number is indicated together with the flashing

A default or pre-programmed message appears showing the source of the alarm

Invitation to acknowledge the new alarm

### 2.7.1 To Acknowledge an Alarm Press and (Ack) together.


The action, which now takes place, will depend on the type of latching, which has been configured

#### Non Latched Alarms

If the alarm condition is present when the alarm is acknowledged, the alarm beacon will be continuously lit. This state will continue for as long as the alarm condition remains. When the alarm condition disappears the indication will also disappear.

If a relay has been attached to the alarm output, it will de-energise when the alarm condition occurs and remain in this condition until the alarm is acknowledged **AND** it is no longer present.

If the alarm condition disappears before it is acknowledged the alarm indication disappears as soon as the condition disappears.

#### Automatic Latched Alarms

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

#### Manual Latched Alarms

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 condition causing the alarm is removed.

### 2.7.2 Sensor Break Indication

An alarm condition (5.br) is indicated if the sensor or the wiring between sensor and controller becomes open circuit or the input is over-range. The message 'Sbreak' is shown in the message centre together with the source of the sensor connection. This may be 'PVInupt' or 'Modx' if an analogue module is fitted.

For a resistance thermometer input, sensor break is indicated if any one of the three wires is broken.

For mA input sensor break will not be detected due to the load resistor connected across the input terminals.

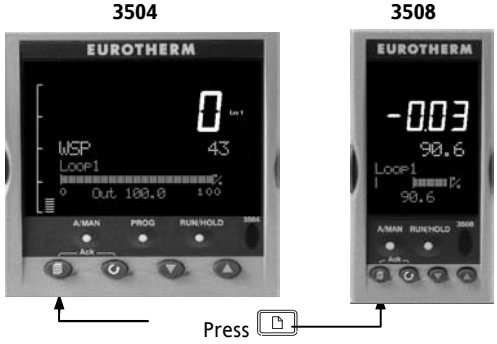
For Volts input sensor break may not be detected due to the potential divider network connected across the input terminals.

## 2.8 Message Centre

The lower section of the HOME display contains an alpha-numeric set of messages. These messages change between different controller types and operating modes and are grouped in summary pages. The 3504 contains more information than the 3508, and generally the parameter descriptions are longer due to the larger display..

### 2.8.1 Summary Pages

Press . A set of pre-defined summary pages are shown at each press - the following views show examples. These are typically a summary of programmer, loops and alarm operation. A further eight customised pages can be programmed off line using iTools programming software. The level in which the Summary Pages are shown may also be defined using iTools.




#### 2.8.1.1 Loop Summary

If two loops are configured the display shown in section 2.3 is shown.

Press to display a summary for Loop1 and again for Loop 2.

The horizontal bar graph shows output power demand for the loop. For **heat/cool** the bar graph is bi-directional (± 100%) as shown:-


For **valve position** control the user interface will display either heat only or heat/cool summary pages.

A timeout to the dual loop overview may be changed in configuration level, see Engineering Handbook, Part No HA027988 which can be downloaded from www.eurotherm.co.uk..

### 2.8.1.2 Program Status

| | 3504 | 3508 |
|---|---|---|
| This display is only shown if the Programmer option has been enabled | | |
| SyncAll and single programmers → |  |  |
| SyncStart programmer → |  |  |

### 2.8.1.3 Program Edit

Allows the program to be created or edited.

| | | |
|---|---|---|
| SyncAll and single programmers → |  |  |
| SyncStart programmer → |  |  |

A full list of parameters is given in section 2.8.3.

Note:- For a SyncStart programmer it is possible to select between Channel 1 and Channel 2.

### 2.8.1.4 Alarm Summary

Press ⟳ to scroll through the alarms.

A New Alarm occurs when any new alarm becomes active. This parameter may be used to activate a relay output to provide external audible or visual indication.

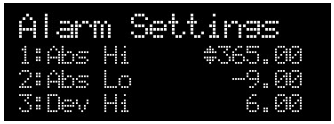


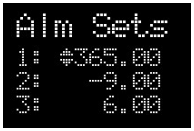
### 2.8.1.5 Alarm Settings

All configured alarms (up to eight) will be listed.

Press ⟳ to scroll through the alarms.

Press ▲ or ▼ to set the threshold values




### 2.8.1.6 Control

To set parameters which define the operation of the loops. A full list of parameters is given in section 2.8.4.



### 2.8.1.7 Transducer

This display is only shown if the Transducer option has been enabled.

For further details see the 3500 Engineering Manual HA027988.

Further customised pages may be available if they have been configured.


## 2.8.2 How to Edit Parameters

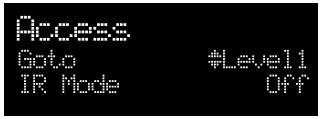
In the above summary pages, press ⟳ to scroll to further parameters (where applicable).

Press ▼ or ▲ to change the value of the parameter selected.

Any parameter preceded by ⬍ is alterable provided the system is in a safe state to allow the parameter to be changed. For example, 'Program Number' cannot be changed if the program is running - it must be in 'Reset' or 'Hold' mode. If an attempt is made to alter the parameter its value is momentarily replaced by '---' and no value is entered.

Some parameters are protected under a higher level of security – Level 2. In these cases it will be necessary to select 'Access Level 2'. This is carried out as follows:-

1. Press and hold ☰ until the display shows




2. Press ▲ to select Level 2
3. Press ▲ again to enter a security code. This is defaulted to 2. If an incorrect code is entered the display reverts to that shown in 1 above. If the default of 2 is not accepted this means that the code has been changed on your particular controller. It will be necessary to refer to the Engineering Handbook.
4. 'Pass' is displayed momentarily. You are now in Level 2.

### 2.8.3 Program Status Page

Provided it has been ordered and enabled the 3500 series controllers can program the rate of change of setpoint. Two program channels are available which can be run as two separate programmers or as a pair. Up to 50 programs and up to a maximum of 500 segments can be stored and run. Setpoint programming is explained in more detail in the 3500 Engineering Manual HA027988.

#### 2.8.3.1 To Select a Parameter


Press ⟳ to scroll through a list of parameters. On the 'Programmer Summary' shown here, the list of parameters which can be selected are:-

| Parameter Name | Parameter Description | Value | | Default | Available in Level |
|---|---|---|---|---|---|
| Program | Program number (and name if this has been configured) | 1 to max number of programs | | 1 | L1 Alterable when prog in reset |
| Segment | Segment number (and type on 3504)<br>Only appears when the programmer is running | 1 to max number of segments | | 1 | L1 |
| Seg Time Left | Segment Time Left<br>Only appears when the programmer is running | hrs:mins:secs | | Read only | L1 |
| Delayed Start | Program will run after a set time has elapsed | 0:00 to 499:99 | | 0:00 | L1 if configured |
| Status | Program Status | End<br>Run<br>Hold<br>Holdback | Prog ended<br>Prog running<br>Prog held<br>In holdback (1) | | L1 |

| Parameter Name | Parameter Description | Value | Default | Available in Level |
|---|---|---|---|---|
| Ch1 PSP (or PSP) | Profile setpoint value channel 1 | Can be changed in Hold | | L1 |
| Ch2 PSP | Profile setpoint value channel 2 | Can be changed in Hold | | L1 |
| Fast Run | This allows the program to be run at a fast rate and may be used for testing the program. It can only be selected before the program is run. | No/Yes | No | |
| Rst UsrVal | User value to be used in reset state. Defines the value for 'UsrValOP'. In segments that specify 'PVEvent', 'UsrValOP' is set to this value<br>Only appears when the program is in reset mode. | | | |
| Ch1 Seg Target (or Segment Target) | Requested setpoint at end of segment | | | |
| Ch2 Seg Target | | | | |
| Seg. Duration (or Segment Rate) | Segment time – Time to Target programmer<br>Rate of change of SP – Ramp Rate programmer | | | |
| Cur. Seg Type | Single programmer only | | | |
| Cycles Left | Number of repeat cycles left to run<br>Can only be changed in Hold or Reset | 1 to maximum number of cycles set | | L1 R/O in Run |
| Events<br>or<br>Rst Events | State of the event outputs when the program is running or when in reset | ☐ Event inactive<br>■ Event active | | L1 |
| PrgTimeLeft | Time remaining to end of selected program | hrs:mins:secs | | L1 |
| GoBackCyclesLeft | The number of cycles left if Go Back is configured and active | 1 to maximum number of cycles set | | |

## Note 1:- Holdback

Holdback freezes the program if the process value (PV) does not track the setpoint (SP) by more than a user defined amount. The instrument will remain in HOLDBACK until the PV returns to within the requested deviation from setpoint. The display will flash the HOLD beacon.

In a **Ramp** it indicates that the PV is lagging the SP by more than the set amount and that the program is waiting for the process to catch up.

In a **Dwell** it freezes the dwell time if the difference between the SP and PV exceeds the set limits.

In both cases it maintains the correct soak period for the product. A more detailed description of Holdback is given in the 3500 Engineering Handbook which may be downloaded from www.eurotherm.co.uk.

In addition to the usual PV Holdback, Holdback is also the state when synchronisation is taking place.

- For a SyncAll programmer, this occurs if Holdback has caused one PSP to be held back while the other has progressed to completion.
- For a SyncStart programmer, this occurs when Ch1/2 is waiting for the other channel.
- In both models, it occurs when a Wait segment has been configured and is active. When one channel has reached the end of the first cycle and is waiting fro the other channel to complete its first cycle. Both channels will start cycle 2 only when they have both completed. (Implied Sync point at the end of each cycle).

### 2.8.3.2 To Select and Run a Program

In this example it is assumed that the program to be run has already been entered. Setpoint programming is described in detail in Chapter 22 of the Engineering Handbook.

| Do This | The Display You Should See | Additional Notes |
|---|---|---|
| 1. Press RUN/HOLD<br>2. Press ▲ or ▼ to choose the program number to be run |  | In this example Program Number 1. It may also have a user defined name.<br>In the 3504 Program names can be entered using the off-line programming package 'iTools' |
| 3. Press RUN/HOLD again |  | If a delayed start has been configured the program will start to run after the delay period set.. The 'RUN' beacon is illuminated at the top of the display.<br>The view shown here shows program being run, segment number and type and time left to complete this segment. |
| 4. Repeated pressing of ⟳ will scroll through parameters associated with the running program. The parameters are listed in the above table |  | These show current value of channel 1 setpoint and current value of channel 2 setpoint. The target value of channel 1 is also shown. |
| 5. To Hold a program press RUN/HOLD | | Press RUN/HOLD again to continue the program.<br>When the program is complete 'RUN' will flash |
| 6. To Reset a program press and hold RUN/HOLD for at least 3 seconds | | 'RUN' will extinguish and the controller will return to the HOME display shown in section 2.3. |

Alternatively, run, hold or reset a program by scrolling to 'Program Status' using ⟳ and select 'Run', 'Hold' or 'Reset' using ▲ or ▼.

The PROG button (3504 only) provides a short cut to the Program Status page from any view.

### 2.8.3.3 Program Edit Page

A program can be edited in any level. A summary of the Edit Page is given here but for a full description refer to Chapter 22 in the Engineering Manual HA027988. A program may be only edited when it is in Reset or Hold. Press ⓘ until the Program Edit page is shown. Then press ⓒ to scroll through a list of parameters shown in the following table – parameters only appear in this table if the relevant option has been configured:-

| Para Name | Parameter Description | Value | |
|---|---|---|---|
| Program | Program number (and name if this has been configured) | 1 to max number of programs | |
| Segments Used | Displays the number of segments in the program. This value automatically increments each time a new segment is added | 1 to max number of segments | |
| Cycles | Number of times the whole program repeats | Cont<br>1 to 999 | Continuous<br>Repeats 1 to 999 times |
| Segment | To select the segment number | 1 to 50 | |
| Segment Type | Defines the type of segment. The type of segment varies depending on whether the program is Single, SyncAll or SyncStart.<br>Call only available in single programmer<br>Rate, Dwell, Step not available in SyncAll programmer | Rate<br>Time<br>Dwell<br>Step<br>Wait<br>GoBack<br>Call<br>End | Rate of change of SP<br>Time to target<br>Soak at constant SP<br>Step change to new SP<br>Wait for condition<br>Repeat previous segs<br>Insert new program<br>Final segment |
| Target SP | Value of SP required at the end of the segment | Range of controller | |
| Ramp Rate | Rate of change of SP | Units/sec, min or hour | |
| Holdback Type | Deviation between SP and PV at which the program is put into a hold condition to wait for the PV to catch up.<br>Only appears if configured | Off<br>Low<br>High<br>Band | No holdback<br>PV<SP<br>PV>SP<br>PV<>SP |

| Para Name | Parameter Description | Value | |
|---|---|---|---|
| PV Event | To set the analogue PV event in the selected segment.<br>If PV Event ≠ None it is followed by 'PV Threshold' which sets the level at which the event becomes active.<br>Only appears if configured | None<br>Abs Hi<br>Abs Lo<br>Dev Hi<br>Dev Lo<br>Dev Band | No PV Event<br>Absolute high<br>Absolute low<br>Deviation high<br>Deviation low<br>Deviation band |
| Time Event | To allow an On Time and an Off Time to be set in the first program event output. If set to 'Event1' an On time parameter and an Off Time parameter follow.<br>Only appears if configured | Off<br>Event1 | |
| UsrVal | Sets the value of an analogue signal which can be used in the segment.<br>Only appears if configured. Using iTools configuration package, it is possible to give this parameter an 8 character name. | Range | |
| PID Set | To select the PID set most relevant to the segment.<br>Only appears if configured | Set1, Set2, Set3 | |
| Event Outs | Defines the state of up to eight digital outputs. 1 to 8 can be configured | □□□□□□□□ to ■■■■■■■■<br>or<br>T□□□□□□□ to ■■■■■■■■<br>T = Time event:<br>□ = event off; ■ = event on | |
| Duration | Time for a Dwell or Time segment | 0:00:00 to 500.00 secs, mins or hours | |
| GSoak Type | Applies a guaranteed soak in a Dwell segment. If configured is followed by a G.Soak Value | Off, Low, High, Band | |
| End Type | Defines the action to be taken at the end of the program | Dwell<br>SafeOP<br>Reset | Contiue at current SP<br>Go to a defined level<br>Reset to start of prog |

| Para Name | Parameter Description | Value | |
|---|---|---|---|
| Wait For | Only appears if the segment is set as Wait. Defines the condition that the program should wait for. | PrgIn1<br>PrgIn2<br>PrgIn1n2<br>PrgIn1or2<br>PVWaitIP<br>Ch2Sync | The first four parameters are digital values which can be wired to suitable sources<br>Analogue wait value<br>A Ch2 segment input |
| PV Wait | Only appears if 'PVWaitIP' is configured and defines the type of alarm which can be applied.<br>If this parameter is configured it is followed by 'Wait Val' which allows the trip level to be set for the condition to become true | None<br>Abs Hi<br>Abs Lo<br>Dev Hi<br>Dev Lo<br>Dev Band | No wait<br>Absolute high<br>Absolute low<br>Deviation high<br>Deviation low<br>Deviation band |
| GoBack Seg | Only appears if the segment type is 'GoBack'. It defines the segment to return to to repeat that part of the program | 1 to the number of segments defined | |
| GoBack Cycles | Sets the number of times the chosen section of the program is repeated | 1 to 999 | |
| Call Program | Only applies to single program and only if the segment is 'Call'. Enter the program number to be inserted in the segment | Up to 50 (current program number excluded | |
| Call Cycles | Defines the number of times the called program repeats | Cont<br>1 to 999 | Continuous<br>Once to 999 times |

### 2.8.4 Control Summary Page

On the Control Summary page the following parameters are available:-

| Para Name | Parameter Description | Value | Default | Availability |
|---|---|---|---|---|
| SP Select | To select SP1 or SP2 | Between range limits set in higher levels of access | As order code | Lev1 |
| SP1 | To set the value of SP1 | | | Lev1 |
| SP2 | To set the value of SP2 | | | Lev1 |
| SP Rate | To set the rate at which the setpoints change | | | Lev 1 alterable in Lev2<br><br>* Parameter does not appear if control is configured for On/Off |
| Tune* | To start self tuning | Off, On | Off | |
| PB* | To set proportional band | 0 to 99999 | | |
| Ti* | To set integral time | Off to 99999 | | |
| Td* | To set derivative time | Off to 99999 | | |
| R2G* | To set relative cool gain | 0.1 to 10.0 | | |
| CBH* | To set cut back high | Auto to 99999 | | |
| CBL* | To set cut back low | Auto to 99999 | | |
| Output Hi | To set a high limit on the control output | -100.0 to 100.0% | 100.0 | |
| Output Lo | To set a low limit on the control output | -100.0 to 100.0% | 0.0 | |
| Ch1 OnOff Hyst | Channel 1 hysteresis (Only if configured and for On/Off control) | 0.0 to 200.0 | | Lev 1- alterable in Lev2 |
| Ch2 OnOff Hyst | Channel 2 hysteresis (Only if configured and for On/Off control) | 0.0 to 200.0 | | |
| Ch2 DeadB | Channel 2 deadband. To set the period in which there is no output from either channel. (This does not appear if channel 2 is not configured) | Off to 100.0 | | |
| Ch1 TravelT | Motor travel time if valve control output on channel 1 | 0.0 to 1000.0 sec | | |
| Ch1 TravelT | Motor travel time if valve control output on channel 1 | 0.0 to 1000.0 sec | | |
| Safe OP | To set an output level under sensor break conditions | -100.0 to 100.0% | 0.0 | |

## 2.9 Introduction to Configuration using iTools

iTools is a PC based configuration package which is used to configure instruments. The controller may be connected to the PC in three ways:-

1. Using an infra red clip (IR) attached to the front fascia. Set the parameter 'IR Mode' in the 'Access' list to 'On'.



2. Using a configuration clip which plugs into the side of the controller.
**NOTE:- Any Ethernet or DeviceNet module must be removed before connecting the configuration clip**.

Both items are available from your supplier

3. Using a RS232, RS485 or RS422 digital communications interface connected to the H or J terminals

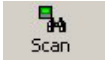
**iTools provides:-**

- Parameter Set up
- Device Operation
- Device Recipe
- Program Editing
- Configuration of User Pages
- Graphical Wiring
- Cloning

Further details are explained in the 3500 Engineering Handbook HA027988 and iTools Handbook part no HA026179.

Both handbooks and iTools software can be downloaded from www.eurotherm.co.uk.

### 2.9.1 To Scan For Connected Instruments

With the controller connected, press 

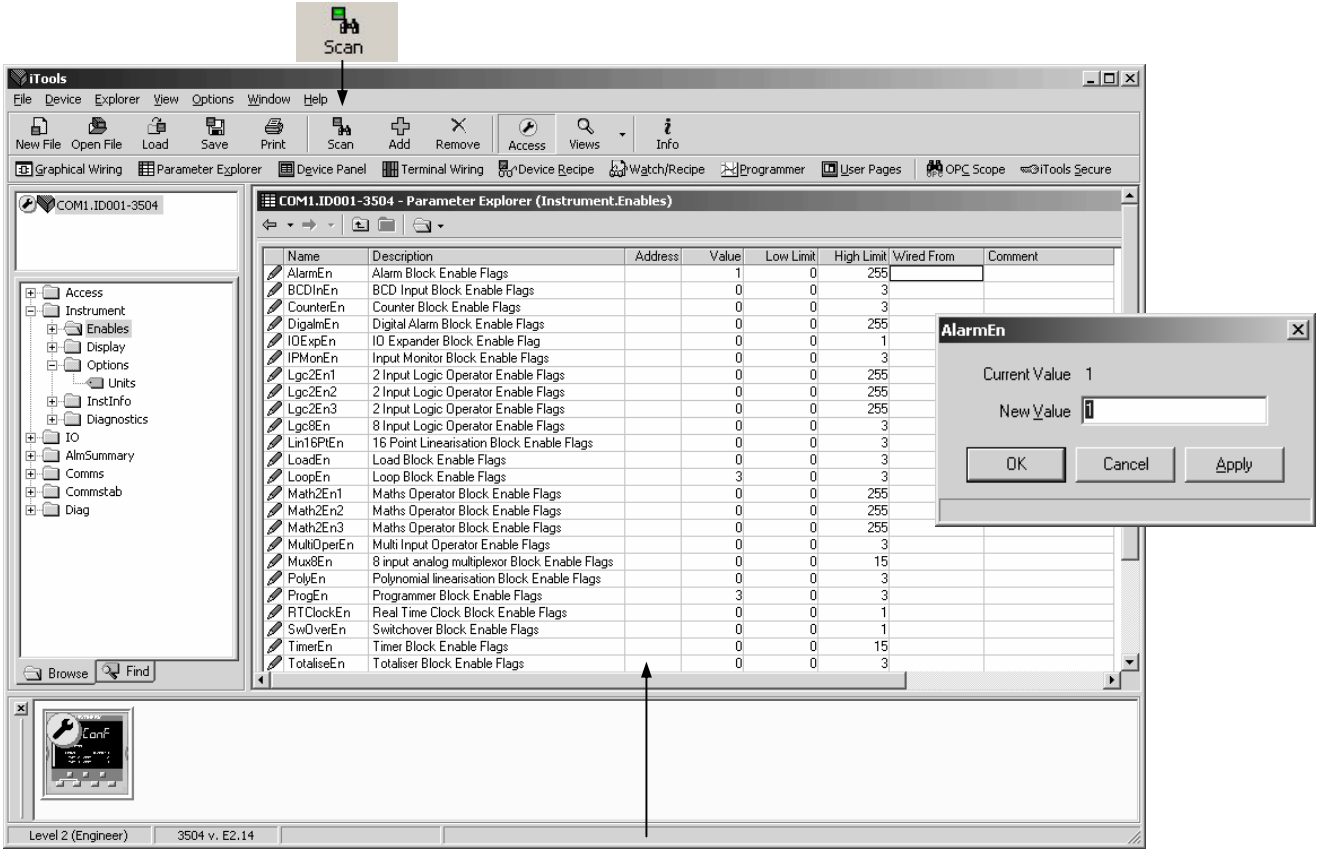
on the iTools menu bar. iTools will search the communications ports and TCPIP connections for recognisable instruments. Controllers connected with the configuration clip (CPI), will be found at address 255 regardless of the address configured in the controller.

### 2.9.2 Parameter Set Up

Allows parameters to be configured.

1. Press 

to get this view or open up the parameter list by double clicking the required folder.
2. Right click in the parameter list to reveal or hide columns.
3. To change the value of a parameter, double click the parameter and change its value using the pop-up window
4. The 'Access' button puts the controller into configuration mode. In this mode the controller can be set up without its outputs being active. Press 'Access' again to return to operating level.
5. The instrument view is optional. Select 'Panel Views' in the 'View' menu.
6. To find a parameter select the 'Find' tab.

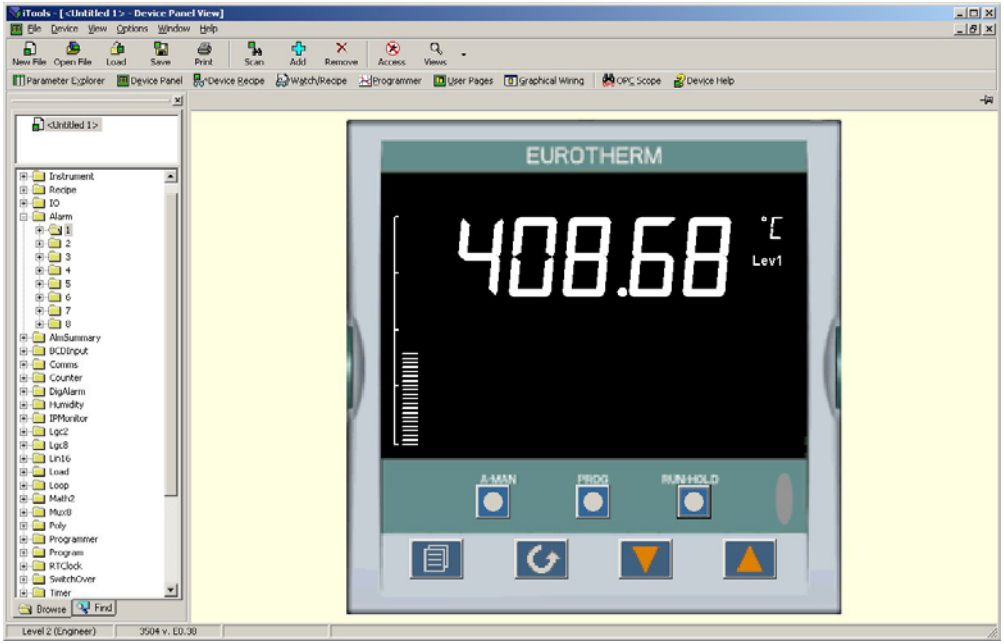



Note:- iTools now displays the fixed SCADA addresses for those parameters that are included in the SCADA table by default. For all other parameters nothing is displayed.

## 2.10 Device panel

Press Device Panel for this feature. The Panel displays the active instrument panel. This can be used for remote viewing, diagnostics or Training. iTools can be used OFF-LINE to configure the product. The panel view gives an indication of how the instrument will appear when the configuration is downloaded.

The front panel control buttons, shown in the Device Panel display, are active and clicking on them with the mouse will cause the display to behave as a real instrument.




☺ Clicking on the Page button with Ctrl pressed emulates pressing the page and scroll buttons together.

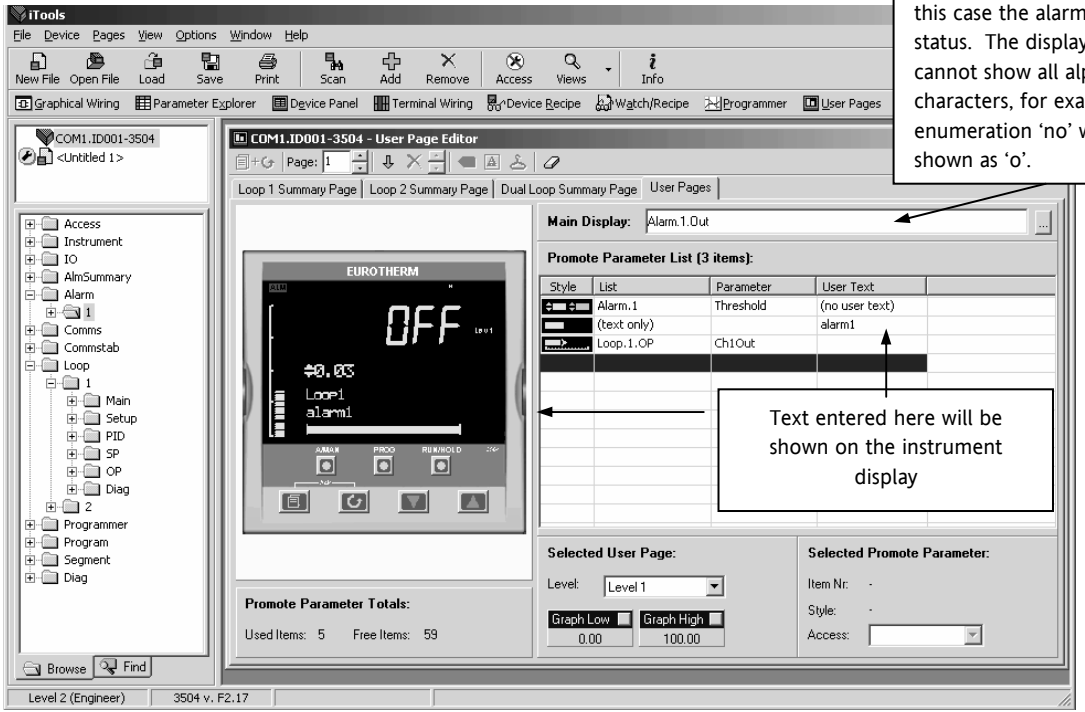
## 2.11 User Pages Editor

Up to 8 User Pages with a total of 64 lines can be created and downloaded into the controller so that the controller display shows only the information which is of interest to the user.

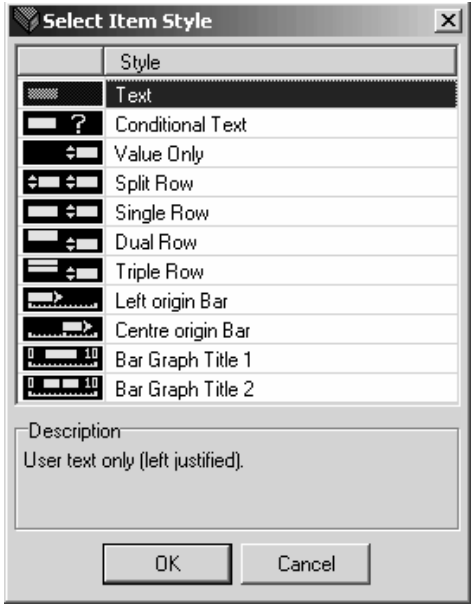
Press 

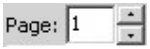
to select this feature

The main display can show any parameter on a User Page – in this case the alarm 1 output status. The display, however, cannot show all alpha-numeric characters, for example the enumeration 'no' will only be shown as 'o'.

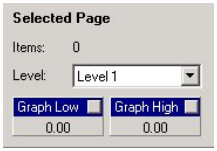


### 2.11.1 To create a User Page




1. Press  to select the page number 1 to 8

2. Drag and drop parameters from the browser to create the user parameter list
3. Choose the required style. The format is shown in the pop up window
4. Right click in the list to:
    a. Insert an item
    b. Remove an item
    c. Edit Wire. allows you to change the parameter selected
    d. Edit Text. Allows you to enter your own text for the parameter displayed
    e. Edit Style. This is shown in the pop up window
    f. Read Parameter Properties
    g. Open Parameter Help
5. Select the operator level at which the user page will be displayed
6. If a bar graph is displayed, set the low and high graph axes




The format of the user page is shown in the instrument view

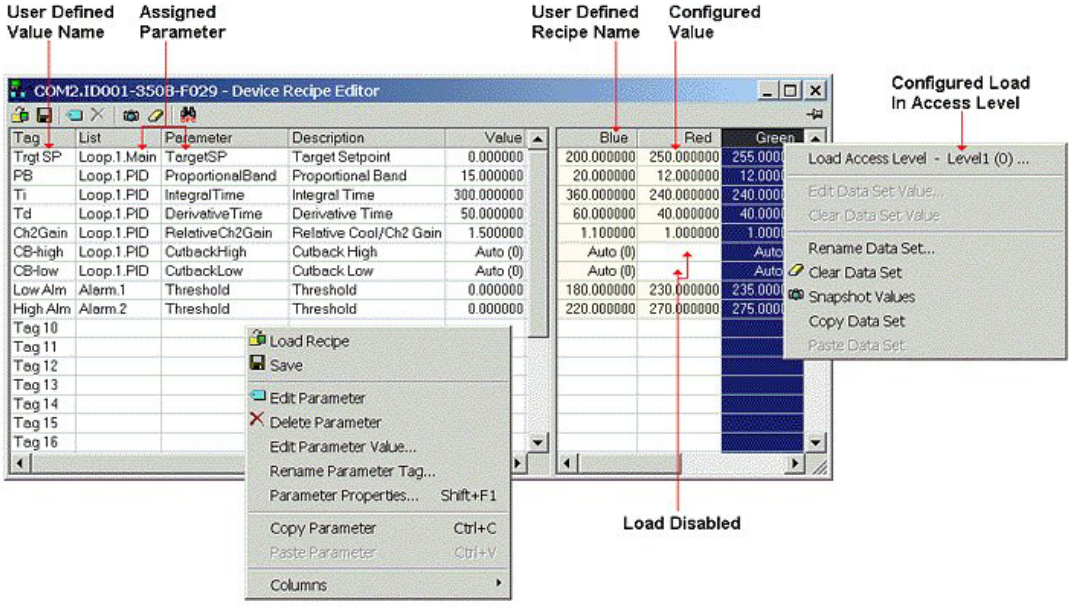
The user page can now be saved and downloaded to the instrument.

## 2.12 Recipe Editor in iTools

Press 

for this feature. Up to 8 recipes can be stored. They can also be named by the user. Recipes allow the operator to change the operating values of up to 24 parameters in an instrument for different batch items/processes by simply selecting a particular recipe to load. Recipes are important for reducing error in setup and they remove the need for operator instructions fixed to the panel next to the instrument.

The Recipe Editor is used during configuration to assign the required parameters and to set up the values to be loaded for each recipe.



### 2.12.1.1 Recipe Menu Commands

| | |
|---|---|
| **Load Recipe** | Used to load a recipe file into the instrument |
| **Save** | Used to save the current recipe configuration into a file |
| **Edit Parameter** | Used to assign a parameter to a Tag. Parameters can also be assigned by 'drag and drop' from the iTools parameter list |
| **Delete Parameter** | Used to delete an assigned parameter from the recipes |
| **Edit Parameter Value** | Used to edit the current value of the assigned parameter |
| **Rename Parameter Tag** | Allows the user to rename the Tag of the associated parameter. This tag is used on the instrument to identify assigned parameters (default Value1 - Value24) |
| **Parameter Properties** | Used to find the properties and help information of the selected parameter |
| **Copy Parameter** | Used to copy the currently selected parameter |
| **Paste Parameter** | Used to assign a previously copied parameter to the selected Tag |
| **Columns** | Used to hide/show the Description and Comment Columns |
| **Load Access Level** | Used to configure the lowest access level in which the selected recipe is allowed to load |
| **Level1** | Permitted to load when the instrument is in any of the access levels |
| **Level2** | Permitted to load when the instrument is in Level2, Level3 or Config access levels |
| **Level3** | Permitted to load when the instrument is in Level3 or Config access levels |
| **Config** | Permitted to load when the instrument is in the Config access level |
| **Never** | Never permitted to load |

Note: Over comms, whilst the instrument is in operator mode, recipes that have been configured to load in Levels 1, 2 and 3 can be loaded. Whilst the instrument is in Config mode all recipes can be loaded.

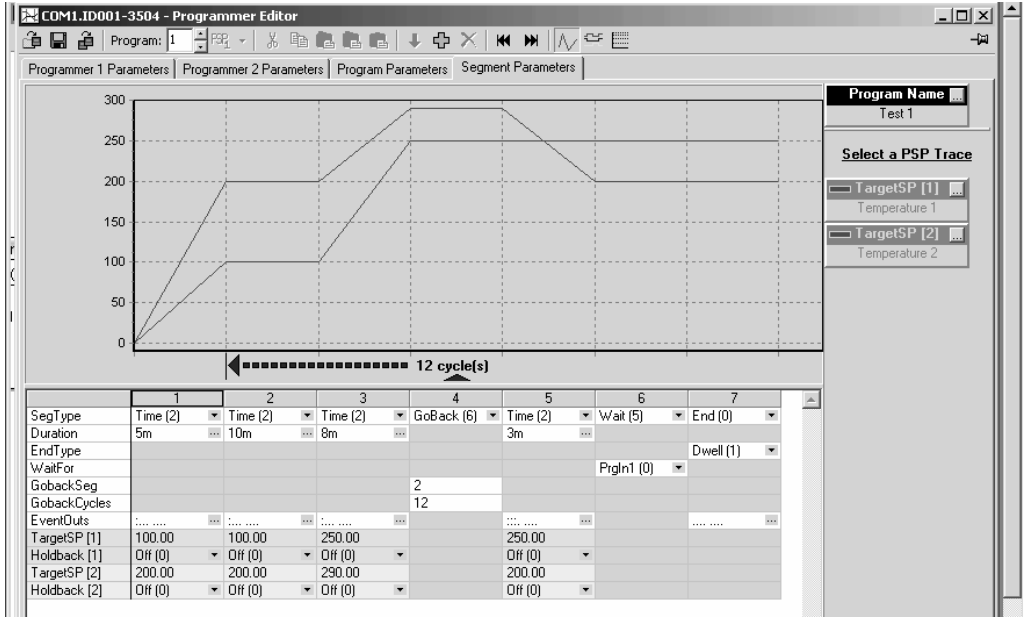
| | |
|---|---|
| **Edit Data Set Value** | Used to edit the value of the selected assigned parameter within the selected recipe. Values can also be edited via double left clicking the value itself |
| **Clear Data Set Value** | Used to clear the value of the selected assigned parameter within the selected recipe, thus disabling it from loading when the recipe is selected to load |
| **Rename Data Set** | Allows the user to rename the selected recipe. This name is used to identify individual recipes (default Set1 - Set8). Note: Number of recipes dependent upon features |
| **Clear Data Set** | Used to clear all values in the selected recipe, thus disabling all from loading when the recipe is selected to load |
| **Snapshot Values**  | Used to copy all of the assigned parameters current values into the selected recipe |
| **Copy Data Set** | Used to copy all values of the selected recipe |
| **Paste Data Set** | Used to paste all values of a previously copied recipe into the selected recipe |

## 2.13 Program Editor

Setpoint programs can be created graphically, stored and downloaded into the controller. The view below is for a dual programmer.

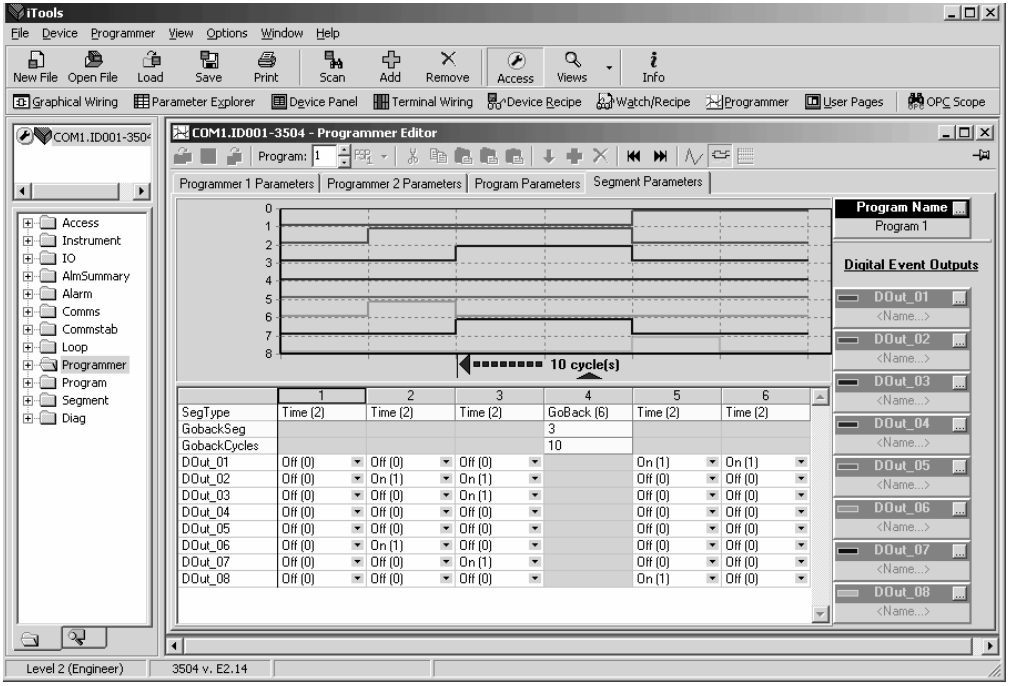
### 2.13.1 Analog View

1. Press Programmer to edit the analog setpoints
2. Select a program number using Program: 1
3. Double click Program Name and enter a name for the program
4. Right click in the blank area and choose 'Add Segment'
5. Select 'Segment Type' from the drop down and enter the segment details
6. Repeat for all required segments



### 2.13.2 Event Outputs

1. Press  to select the digital events view.
2. Right click in the blank area to ‘Add Segment’
3. Use the pull downs to turn the digital event On or Off in the selected segment



### 2.13.3 To Copy a Program

- In the display shown above, to copy the complete program, right click in the spreadsheet section and ‘Select All’.
- Right click again in the spreadsheet section and ‘Copy’.
- Select the program number to be copied to, e.g. Program 2.
- Right click in the new section and ‘Paste All’.

### 2.13.4 To Copy a Segment of a Program

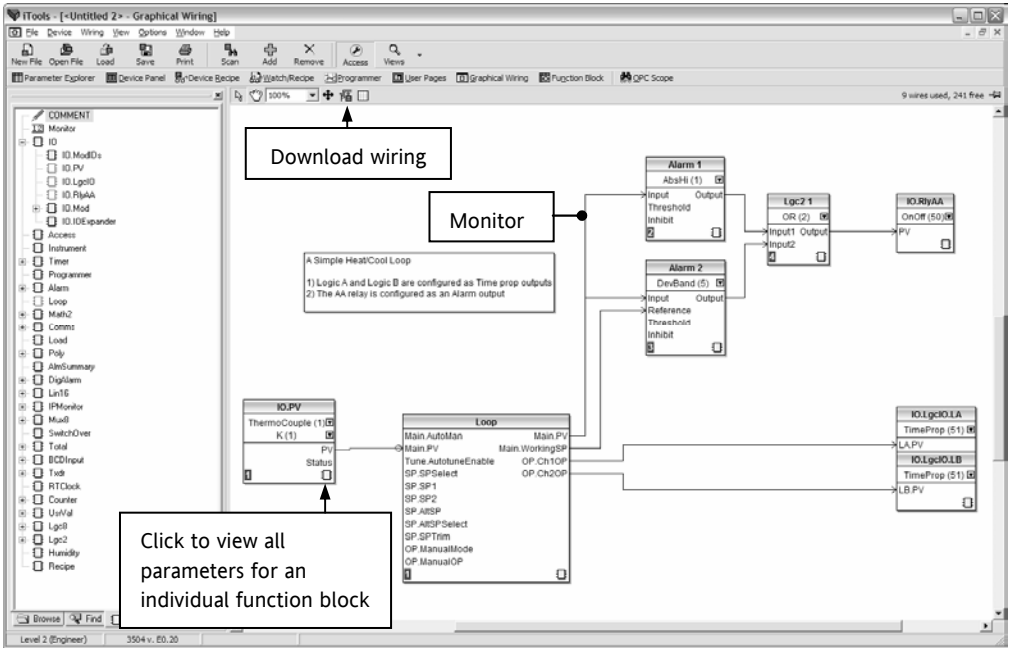
- Right click in the segment to be copied and select ‘Copy’.
- To add the segment at the end of the program, right click outside the segments and ‘Paste Add’
- To insert, right click in the preceeding segment and ‘Paste Insert’
- To over-write a segment, right click in the segment and ‘Paste Over’

Segments will be added to the Event Outputs at the same time.

## 2.14 Graphical Wiring Editor

Select Graphical Wiring (GWE) to view and edit instrument wiring. You can also add comments and monitor parameter values.

1. Drag and drop required function blocks into the graphical wiring from the list in the left pane
2. Click on parameter to be wired from and drag the wire to the parameter to be wired to (do not hold mouse button down)
3. Right click to edit parameter values
4. Add comments and notes
5. Add monitor points



### 2.14.1 Function Block

A Function Block is an algorithm which may be wired to and from other function blocks to make a control strategy. The Graphical Wiring Editor groups the instrument parameters into function blocks. Examples are: a control loop and a mathematical calculation.

Each function block has inputs and outputs. Any parameter may be wired from, but only parameters that are alterable may we wired to.

A function block includes any parameters that are needed to configure or operate the algorithm.

### 2.14.2 Wire

A wire transfers a value from one parameter to another. They are executed by the instrument once per control cycle.

Wires are made from an output of a function block to an input of a function block. It is possible to create a wiring loop, in this case there will be a single execution cycle delay at some point in the loop. This point is shown on by a || symbol and it is possible to choose where that delay will occur.

Dotted lines around a function block show that it requires downloading.

### 2.14.3 Using Function Blocks

If a function block is not faded in the tree then it can be dragged onto the diagram. The block can be dragged around the diagram using the mouse.

A labelled loop block is shown here. The label at the top is the name of the block.

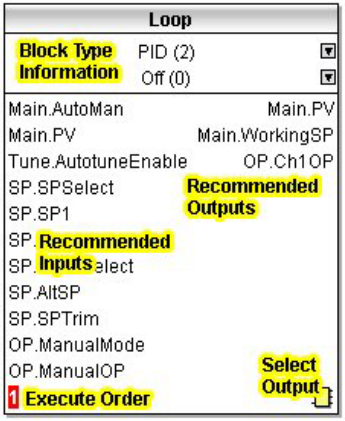
When the block type information is alterable click on the box with the arrow in it on the right to edit that value.

The inputs and outputs which are considered to be of most use are always shown. In most cases all of these will need to be wired up for the block to perform a useful task. There are exceptions to this and the loop is one of those exceptions.

If you wish to wire from a parameter which is not shown as a recommended output click on the icon in the bottom right and a full list of parameters in the block will be shown, click on one of these to start a wire.

To start a wire from a recommended output just click on it.

Click 'Select Output' to wire new parameters



## 2.15 User Text

User defined text can be applied to selected parameters in controllers from software versions 2.30+, and is particularly useful when used in conjunction with User Pages, see section 2.11. It is configured using iTools configuration package – it cannot be configured through the controller user interface, and is implemented in two ways:-

1. A fixed set of boolean parameters, shown in the table below, have dedicated user strings. The 'Value' of these parameters may be customised and it will then be shown as such in the enumeration of that parameter.

| Function block | Default Text | Dedicated User String | iTools Browser |
|---|---|---|---|
| Two Input Logic Operators, see logic operators section 18.1 in the Engineering Manual | Off<br>On | OutUsrTxtOff<br>OutUsrTxtOn | Lgc2 (1 to 24) |
| Eight Input Logic Operators, see logic operators section 18.1.1 in the Engineering Manual | Off<br>On | OutUsrTxtOff<br>OutUsrTxtOn | Lgc8 (1 To 2) |
| Programmer Event Outputs 1 to 8, see programmer section 22.4 in the Engineering Manual | Off<br>On | EO1UsrTxtOff to EO8UsrTxtOff<br>EO1UsrTxtOn to EO8UsrTxtOn | Programmer (1 to 2) |
| Programmer PV Event Outputs 1 to 8, see programmer section 22.4.1 in the Engineering Manual | Off<br>On | PVEOUsrTxtOff<br>PVEOUsrTxtOfn | Programmer (1 to 2) |

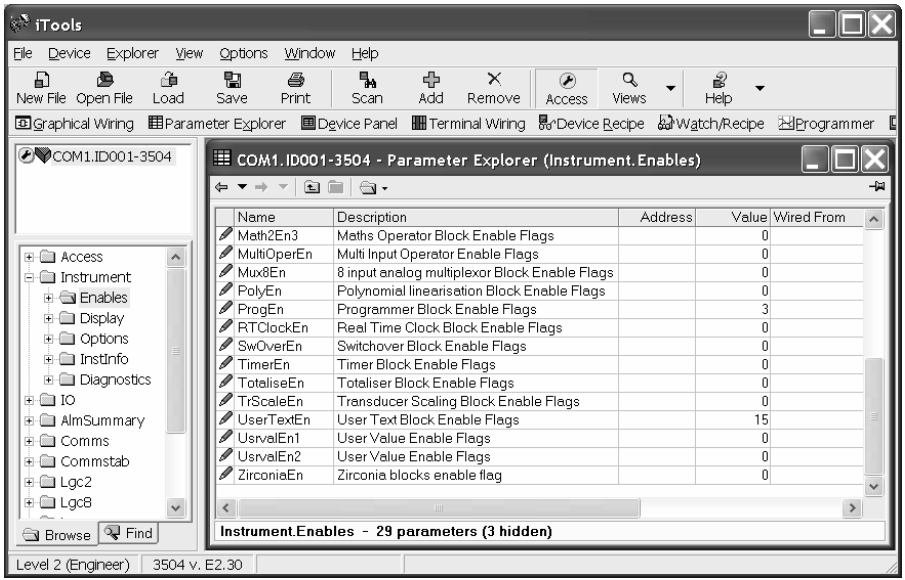
2. Eight user text blocks are available in which user defined text can be applied to both Boolean and Analogue parameters. Boolean parameters, not listed in 1 above, may be wired to Two Input Logic Operator blocks when user text blocks are in full use.

The parameter list for the User Text block is as follows:-

| Parameter | Upper Limit | Lower Limit | Availability | Description |
|---|---|---|---|---|
| Input | 32767 | -32766 | iTools configuration package, but can be wired through the controller | Input to be enumerated |
| Output | 8 characters | - | iTools configuration package, or read only in the controller display but can be wired through the controller interface. | String from custom list with a value field that matches the current input |
| Custom list | 100 characters | | Comma separated list of values and strings | Configured by iTools |

### 2.15.1 To Enable User Text

This is done in configuration level and is described in the Engineering Manual HA027988. It may also be done in iTools. The controller must be placed in configuration level by pressing 

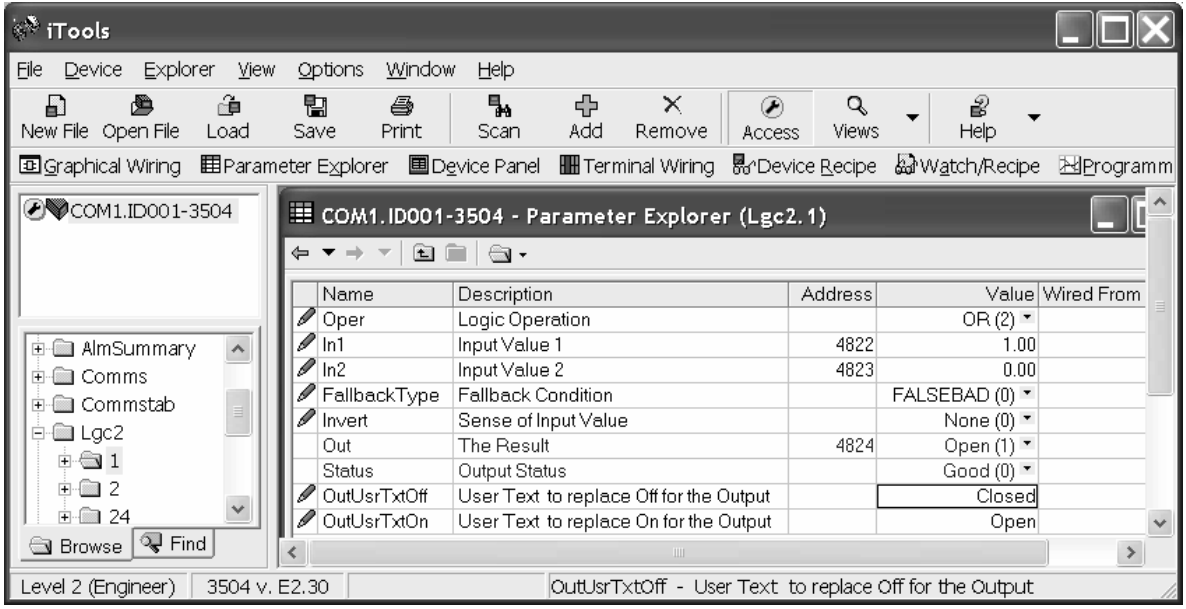

| Enable block number | | | | | | | | Value |
|---|---|---|---|---|---|---|---|---|
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 5 |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 6 |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 7 |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 8 |
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 15 |
| 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 31 |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 63 |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 127 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 255 |

Select Instrument → Enables. Each user text block can be enabled by entering the decimal number corresponding to the bit map shown in the table. The table shows how to select any one of the first 4 blocks individually followed by all 4, 5, 6, 7 and 8 blocks.

### 2.15.2 Example 1: To Configure Lgc2 Operator 1

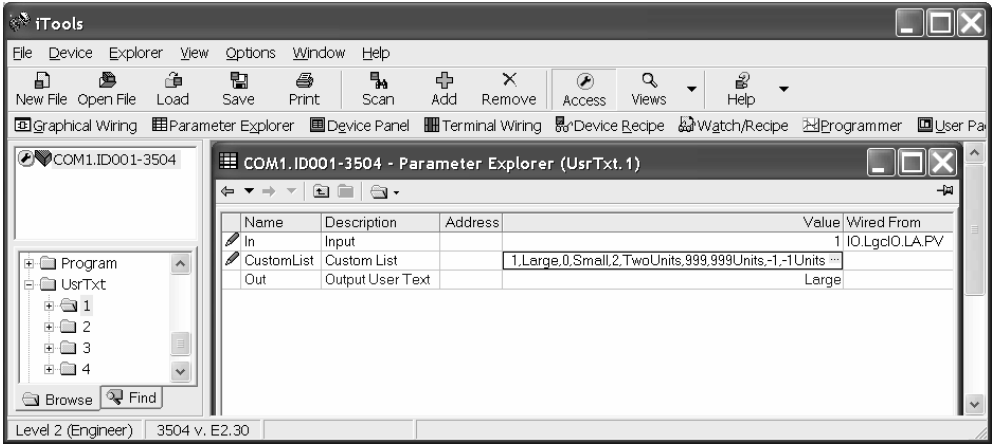
In this example when either input 1 or 2 is true (OR) the output text will read 'Open'. When neither input is true it will read 'Closed'

1. Select Lg2 → 1
2. Select either OutUsrTxtOff or OutUsrTxtOn and enter the required text in the 'Value' column

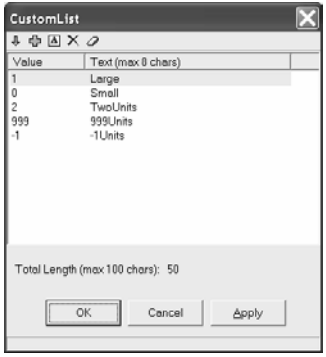


### 2.15.3 Example 2: Configure User Text Block 1

In this example the output user text will show 'Large' or 'Small' depending on the state of a digital input (in this case the LA input). It can also be used to read 'TwoUnits', '999Units' or '-1Units' depending on the value of an analogue input i.e. 2, 999 or -1 respectively.




1. Select UsrTxt → 1
2. Press the ellipsis button in 'CustomList'.
3. A pop up window is shown



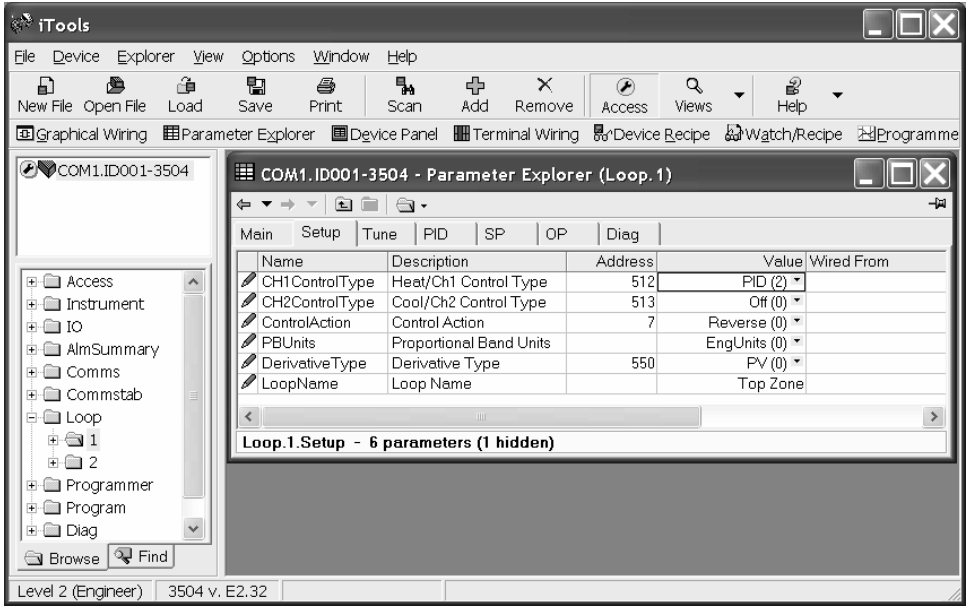

In the pop up, enter a value. 1 and 0 are used for Booleans or Analogue values. Any analogue value can be entered between 32767 and -32766. Enter text against the chosen value. In this example when the input is true 'Large' will be displayed. When false, 'Small' is displayed.

The user text can also be wired to a source parameter. In the above example the 'UsrTxt1 Input' is wired to the LA logic input. When the logic input is true (1) the user text will display 'Large'. When it is false (0) it will call up 'Small'.

These values may be promoted to a user page. Select User Pages in iTools. Use the 'Style' Value only, Split Row, Single Row, Dual Row or Triple Row.

## 2.16 Loop Naming

An additional parameter 'LoopName' has been added to the Loop Setup page for use controllers fitted with software versions 2.30+. This parameter is only available in iTools and will allow names to be given to each loop. The name will show on the loop summary pages only (it is not shown in the dual loop summary page since there is insuffcient space for meaningful text.





In this example the name 'Top Zone' will be applied to loop 1. The numbers of characters is limited to 11 for both 3504 and 3508 (although truncated to 10 for the 3508).

☺ Custom loop names are over written when the loop is being auto-tuned by the default text 'Loop 1/Loop 2'.

# 3. Chapter 3 Safety and EMC Information

This controller is manufactured in the UK by Eurotherm 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. If the instrument is used in a manner not specified in this manual, the safety or EMC protection provided by the instrument may be impaired. The installer must ensure the safety and EMC of any particular installation.

## 3.1 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.

### 3.1.1 Safety

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

### 3.1.2 Electromagnetic compatibility

This controller conforms with the essential protection requirements of the EMC Directive 89/336/EEC, by the application of appropriate product specific international standards. This instrument satisfies the general requirements of the commercial and industrial environments defined in EN 61326. For more information on product compliance refer to the Technical Construction File.

### 3.1.3 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 -10°C to +70°C.

## 3.2 Service and repair

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

### *3.2.1 Caution:* Charged capacitors

Before removing an instrument from its sleeve, disconnect the supply and wait at least two minutes to allow capacitors to discharge. It may be convenient to partially withdraw the instrument from the sleeve, then pause before completing the removal. 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.

### 3.2.2 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.

### 3.2.3 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.

## 3.3 Installation Safety Requirements

### 3.3.1 Safety Symbols

Various symbols are used on the instrument, they have the following meaning:

 Caution (refer to the accompanying documents  Protective Conductor Terminal

### 3.3.2 Personnel

Installation must only be carried out by suitably qualified personnel.

### 3.3.3 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.

### 3.3.4 *Caution:* Live sensors

The controller is designed to operate with the temperature sensor connected directly to an electrical heating element. However, you must ensure that service personnel do not touch connections to these inputs while they are live. With a live sensor, all cables, connectors and switches for connecting the sensor must be mains rated.

The logic IO is not isolated from the PV inputs and all cables, connectors and switches for connecting the sensor must be mains rated.

### 3.3.5 Wiring

It is important to connect the controller in accordance with the wiring data given in this guide. 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.

### 3.3.6 Power Isolation

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

### 3.3.7 Overcurrent protection

The power supply to the system should be fused appropriately to protect the cabling to the units.

### 3.3.8 Voltage rating

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

- relay output to logic, dc or sensor connections;
- any connection to ground.

The controller must 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.

### 3.3.9 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, install 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.

This product has been designed to conform to BSEN61010 installation category II, pollution degree 2. These are defined as follows:-

### 3.3.10 Installation Category II

The rated impulse voltage for equipment on nominal 230V supply is 2500V.

#### 3.3.10.1 Pollution Degree 2

Normally only non conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation shall be expected.

### 3.3.11 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.

### 3.3.12 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.

## 3.4 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 outputs it may be necessary to fit a filter suitable for suppressing the conducted emissions. The filter requirements will depend on the type of load. For typical applications we recommend Schaffner FN321 or FN612.
- If the unit is used in table top equipment which is plugged into a standard power socket, then it is likely that compliance to the commercial and light industrial emissions standard is required. In this case to meet the conducted emissions requirement, a suitable mains filter should be installed. We recommend Schaffner types FN321 and FN612.

### 3.4.1 Routing of wires

To minimise the pick-up of electrical noise, the low voltage DC connections and the sensor input wiring 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. In general keep cable lengths to a minimum.

# 4. Chapter 4 Technical Specification

All figures quoted at an ambient temperature from 0 to 50°C unless otherwise stated.

## 4.1 Control Options

| | |
|---|---|
| No. of Loops | 2 |
| Control Loops | On/Off, single PID |
| Control Outputs | Analogue, Time proportioned or |
| | Motorised Valve control with or without feedback. |
| Cooling Algorithms | Linear, Water, Fan, Oil |
| Auto/Manual Control | Bumpless transfer or forced manual output. |
| Setpoint rate Limit | Off to 9999.9 engineering units per minute |
| Motorised Valve Control | Valve Position bounded or unbounded. Individual |
| | Valve Positions for heat and cool |
| Tuning | One-shot Auto tune or Manual. |
| Loop Alarms | High absolute, Low absolute, Deviation high, Deviation low, Deviation band, |
| | All with separate hysteresis. |
| Application Specific | Humidity control |

## 4.2 Display

| | |
|---|---|
| 3504 | Primary Large 5 digit display, Information centre 16 character header and 3 lines of 20 characters |
| 3508 | Primary Large 41/2 digit display, |
| | Information centre 8 character header and 3 lines of 10 characters |
| Technology | LCD with yellow/green backlight |
| | Red alarm beacon |

## 4.3 Standard Digital I/O

| | |
|---|---|
| Allocation | 2 Off. Not isolated from each other. Not isolated from the PV inputs |
| | Logic Bi-directional input/outputs |
| | Logic or Contact closure input |
| Digital inputs | Voltage level: input Inactive 0 to 7.3Vdc, Active 10.8V to 24Vdc |
| | Contact closure: input active <480ohms, inactive >1200ohms |
| Digital outputs | 18Vdc at 15mA drive capability, 9mA minimum |
| Changeover relay | Contact rating<br>Min Load 1mA at 1V<br>Max Load 2A at 264Vac resistive |
| | 1,000,000 operations with addition of external snubber |

## 4.4 All Analogue and PV Inputs

| | |
|---|---|
| Sample rate | 9Hz (110msec.) |
| Input filtering | OFF to 999.9 seconds of filter time constant (f.t.c.). Default setting is 1.6 seconds |
| User calibration | Both the user calibration and a transducer scaling can be applied. |
| Sensor break | a.c. sensor break on each input (i.e. fast responding and no dc errors with high impedance sources). |
| Ranges | mV, mA, volts -2V to +10V, -1V to +2V or RTD (pt100), pyrometer inputs |
| Thermocouple types | Most linearisations including K, J, T, R, B, S, N, L, PII, C, D, E with linearisation error < ±0.2°C |
| | CJC: Automatic (internal), external, 0°C, 45°C, 50°C reference blocks |
| General | Resolution (noise free) is quoted as a typical figure with f.t.c. set to the default value = 1.6 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. |

## 4.5 PV Input

| | | |
|---|---|---|
| Accuracy | ±0.1% ±1lsd | |
| Sample rate | 9Hz | |
| Input filter | Off, 0.2s to 60s filter time constant. Default setting 1.6s. | |
| 40mV Range | Range | -40mV to +40mV |
| | Resolution | 1.9µV (unfiltered) |
| | Measurement noise | 1.0µV peak to peak with 1.6s input filter. |
| | Linearity error | 0.003% (best fit straight line) |
| | Calibration error | ±4.6µV ±0.053% of measurement, at 25C ambient. |
| | Temperature coefficient | ±0.2µV/C ±28ppm/C of measurement, from 25C ambient. |
| | Input leakage current | ±14nA |
| | Input resistance | 100MΩ |
| 80mV Range | Range | -80mV to +80mV |
| | Resolution | 3.2µV |
| | Measurement noise | 3.3µV peak to peak with 1.6s input filter. |
| | Linearity error | 0.003% (best fit straight line) |
| | Calibration error | ±7.5µV ±0.052% of measurement, at 25C ambient. |
| | Temperature coefficient | ±0.2µV/C ±28ppm/C of measurement, from 25C ambient. |
| | Input leakage current | ±14nA |
| | Input resistance | 100MΩ |
| 2V Range | Range | -1.4V to +2.0V |
| | Resolution | 82µV |
| | Measurement noise | 90µV peak to peak with 1.6s input filter. |
| | Linearity error | 0.015% (best fit straight line) |
| | Calibration error | ±420µV ±0.044% of measurement, at 25C ambient. |
| | Temperature coefficient | ±125µV/C ±28ppm/C of measurement, from 25C ambient. |
| | Input leakage current | ±14nA |
| | Input resistance | 100MΩ |
| 10V Range | Range | -3.0V to +10V |

| | | |
|---|---|---|
| | Resolution | 500µV |
| | Measurement noise | 550µV peak to peak with 1.6s input filter. |
| | Linearity error | 0.007% for zero source resistance (best fit straight line)<br>Add 0.003% for each 10Ω of source + lead resistance. |
| | Calibration error | ±1.5mV ±0.063% of measurement, at 25C ambient. |
| | Temperature coefficient | ±66µV/C ±60ppm/C of measurement, from 25C ambient. |
| | Input resistance | 62.5kΩ to 667kΩ depending on input voltage. |
| PT100 | Range | 0 to 400Ω (-200C to +850C) |
| | Resolution | 50mC |
| | Measurement noise | 50mC peak to peak with 1.6s input filter. |
| | Linearity error | 0.033% (best fit straight line) |
| | Calibration error | ±310mC ±0.023% of measurement in C, at 25C ambient. |
| | Temperature coefficient | ±10mC/C ±25ppm/C of measurement in C, from 25C ambient. |
| | Lead Resistance | 0Ω to 22Ω, matched lead resistances. |
| | Bulb current | 200µA |
| Thermocouple | Uses 40mV and 80mV ranges. | |
| | Types | J, K, L, R, B, N, T, S, PL2 and C. |
| | Linearisation error | ±0.2C |
| | Internal Cold Junction | |
| | Calibration error | ±1.0C at 25C ambient. |
| | Ambient rejection ratio | 40:1 from 25C ambient. |
| | External Cold Junction | 0C, 45C and 50C. |

## 4.6 Analogue Input Module

| | |
|---|---|
| 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: CJC rejection ratio >25:1 typical. |
| | CJ Temperature calibration error at 25°C: <± 2°C |
| | 0°C, 45°C and 50°C external compensation available. |

## 4.7 Digital Input Modules

| | |
|---|---|
| Module type | Triple contact input, Triple logic input |
| 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 |

## 4.8 Digital Output Modules

| | |
|---|---|
| Module types | Single relay, dual relay, single triac, dual triac, triple logic module (isolated) |
| Relay rating | 2A, 264Vac resistive (100mA, 12V minimum) |
| Single Logic drive | 12Vdc at 24mA |
| Triple logic drive | 12V at 9mA per output |
| Triac rating | 0.75A, 264Vac resistive |

## 4.9 Analogue Output Modules

| | |
|---|---|
| Module types | 1 channel DC control, 1 channel DC retransmission (5 max.) and dual channel |
| 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 |

## 4.10 Transmitter PSU

| | |
|---|---|
| Transmitter | 24Vdc at 20mA |

## 4.11 Transducer PSU

| | |
|---|---|
| Bridge voltage | Software selectable 5 or 10Vdc |
| Bridge resistance | 300Ω to 15KΩ |
| Internal shunt resistor | 30.1KΩ at 0.25%, used for calibration of 350Ω bridge at 80% |

## 4.12 Potentiometer Input

| | |
|---|---|
| Pot resistance | 100Ω to 15KΩ, excitation of 0.5 volts |

## 4.13 Digital communications

| | |
|---|---|
| Allocation | 2 modules fitted in slots H & J (isolated) |
| Modbus: EIBisynch | 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 (**Slot H only**) |
| Ethernet (Modbus TCP) | Modbus TCP at IO Base T - slot H only |
| DeviceNet | Maximum baud rate 500KB - slot H only |

## 4.14 Master communications

| | |
|---|---|
| Allocation | Slot J |
| Modbus | RS485 4-wire or RS232 |
| Parameters | Single parameter master communications |

## 4.15 Alarms

| | |
|---|---|
| No of Alarms | 8 Analogue, 8 digital. Can be wired to any internal parameter. Sensor break alarms are independent from Analogue Alarms. Digital alarms can be + edge, - edge or edge triggered. |
| Alarm types | Full scale, deviation, sensor break plus application specific |
| Modes | Latching or non-latching, blocking, time delay |

## 4.16 Setpoint programmer

| | |
|---|---|
| Programmer modes | Dual programmer – can be configured as two individual single programmers, synchronised start programmer or synchronise in all segments programmer |
| Programmer types | Time to Target or Ramp Rate |
| No of programs | A maximum of 50 programs. Programs can be given user defined 16 character names |
| No of segments | 500 segments total or 50 maximum per program |
| Event outputs | Up to 8, can be assigned individually to segments or called as part of an event group |

## 4.17 I/O Expander

| | |
|---|---|
| 10 I/O version | 4 changeover relays, 6 normally open relay contacts, 10 logic inputs |
| 20 I/O version | 4 changeover relays, 16 normally open relay contacts, 20 logic inputs |

## 4.18 Advanced functions

| | |
|---|---|
| Timers | 4, On Pulse, Off delay, one shot and min-On |
| Totalisers | 2, trigger level & reset input |
| Counters | 2, up or down counters |
| Real time clock | Day of week and time |
| Application blocks | 24 digital operations |
| | 24 analogue operations |
| | 2 eight input logic operators, 2 eight input analogue operators |
| | 16 user values |
| | BCD input |
| | Customised input linearisations |
| | Mathematical Add, Subtract, Multiply, Divide, Constant, Absolute difference, Maximum, Minimum, Sample and Hold, Input 1 to the power of input 2, Square root, Log(10), Ln, 10 to the power of input 1, i.e. to the power of input 1 |
| | Logical AND, OR, XOR, Latch, Equal, Not Equal, Greater than, Less than, Greater than or |
| | equal to, Less than or equal to. |
| | Humidity Wet and dry bulb technique |
| | Multi operator block – minimum, maximum, average and sum |

| | |
|---|---|
| Software Tools | iTools Configuration Tool |
| | OPC Scope Trending and Data logging |
| | iClone Lite Lightweight configuration cloning |
| | Graphical Wiring Editor Drag and drop wiring tool, self-documenting |
| | View Builder Custom Animation Screens |
| | iTools Wizard Question and Answer configuration screens |

## 4.19 General specification

| | |
|---|---|
| Supply | 100 to 240Vac -15%, +10%. 48 to 62Hz. 20 watts max |
| | Low voltage supply: 24Vac/dc, -15%, +10% |
| Inrush Current | High Voltage controller – 30A duration 100µs |
| | Low Voltage controller – 15A duration 100µs |
| Operating ambient | 0°C - 50°C (32°F to 131°F) and 5 to 95% RH non condensing |
| Storage temp | -10°C to +70°C (14°F to 158°F) |
| Panel sealing | IP65, plug in from front panel |
| Dimensions and weight | |
| 3504 | 96H x 96W x 150D (mm) 0.6kg |
| 3508 | 96H x 48W x 150D (mm) 0.4kg |
| Electromagnetic compatibility | EN61326-1 Suitable for domestic, commercial and light industrial as well as heavy industrial environments. (Class B emissions, Industrial Environment immunity). |
| | With Ethernet module fitted product is only suitable for industrial environments, (class A emissions). |
| Safety standards | EN61010, installation category II (voltage transients must not exceed 2.5kV), pollution degree 2. |
| Atmospheres | Not suitable for use above 2000m or in explosive or corrosive atmospheres |

CE This controller meets the European directives on safety and EMC

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