CARBOLITE GERO 30-3000°C

Operating Instructions

nanodac™ recorder/controller/programmer

The contents of section 4 onward are extracted from Eurotherm nanodac manual HA030554/8 February 2014 for nanodac versions 5.00 and later

Sections not relevant to use in Carbolite Gero products have been removed. There is a possibility of references to notes that are not included.

For full operating instructions the nanodac manual is available on the product tools DVD

part of VERDER scientific

MEN-NANODAC-01

Contents

1. Nanodac password security

While in Logged out mode the control loop can be viewed but no alterations can be made. The program page can be viewed but no change in status or editing of the program can be made. Various chart pages can be viewed along with said history for charts. Operator notes can be viewed and written to charts and message log.
Password codes: Operator level: 9
Password codes: Supervisor level: 5
Password codes: Engineer level: 95

While in Operator mode all of the above is available plus you can change the set point of the control loop. Change the status of the program (i.e. Run, Hold or Reset). Edit, load or delete a program. Carry out a demand archive to a device and choose what device said archive should be sent to (USB or FTP server). See main manual for details.
While in supervisor mode the following can be changed: store a program
While in Engineer mode the following can be change: Time; Date; Communication setting.

2. Login and Quick Start Guide

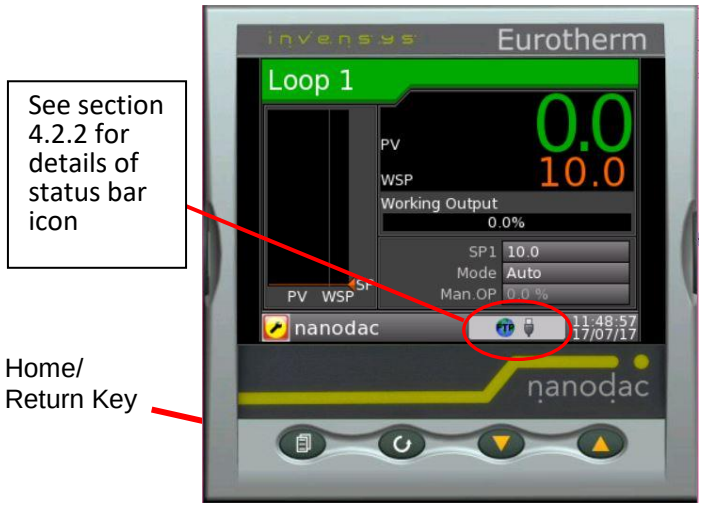
2.1 Login

Before a user can operate the Nanodac temperature controller they must log in. The procedure for log in is shown below. There are 3 levels of access and these are **Operato**r, **Supervisor** and **Engineer.** These provide different levels of access to parameters. Please determine who should be given access to the passwords for these levels to ensure safe operation of the equipment.

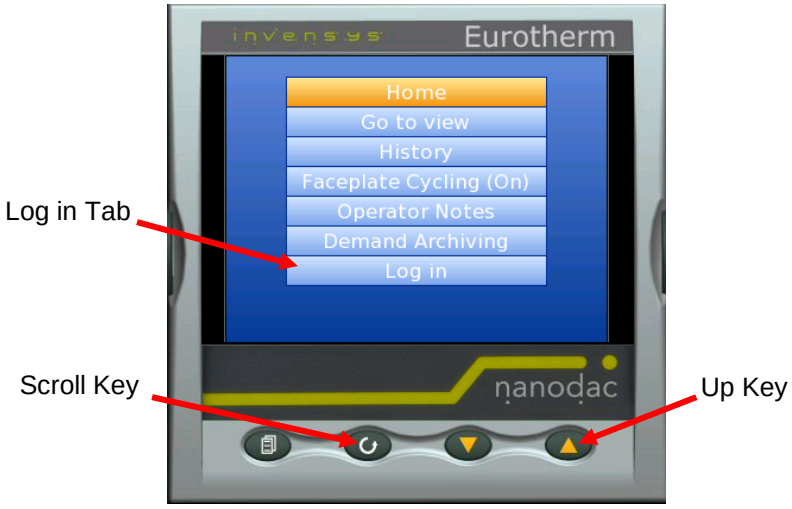
Switch on the Instrument. Also refer to section 4.3.8.

To run a program you must 'log in'. To log in, follow the instructions below.

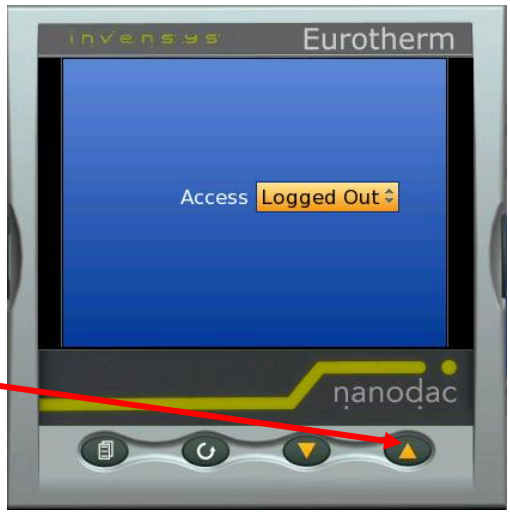
Press the Home button (Left hand button) to bring up the LOG IN screen as shown below. Highlight the Log in by using the up key and down key.



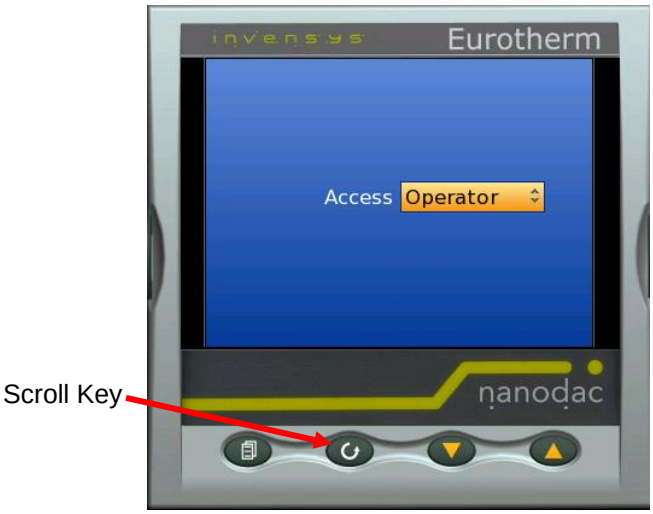
1. After turning the furnace on you will be presented with this default screen. Press the **'Home/Return Key'** to access the main menu.



2. Press the **'Up Key'** once, so the **'Log In'** tab is highlighted. Then press the **'Scroll Key'**.



3. You should then be presented with this screen. Press the **'Up Key'** once.



4. You should then be presented with this screen. Press the **'Scroll Key'**.

Note there are three levels of access as default. **'Engineer'** has the highest level of access allowing you to set features available to the supervisor and operator, change the time, date, IP address and the name of the product. As a default the **'supervisor'** will be able to edit the auto tune. The **'operator'** will only have access to the basic functionality of the product i.e. change the temperature set point, set a program running, saving an program and store data.

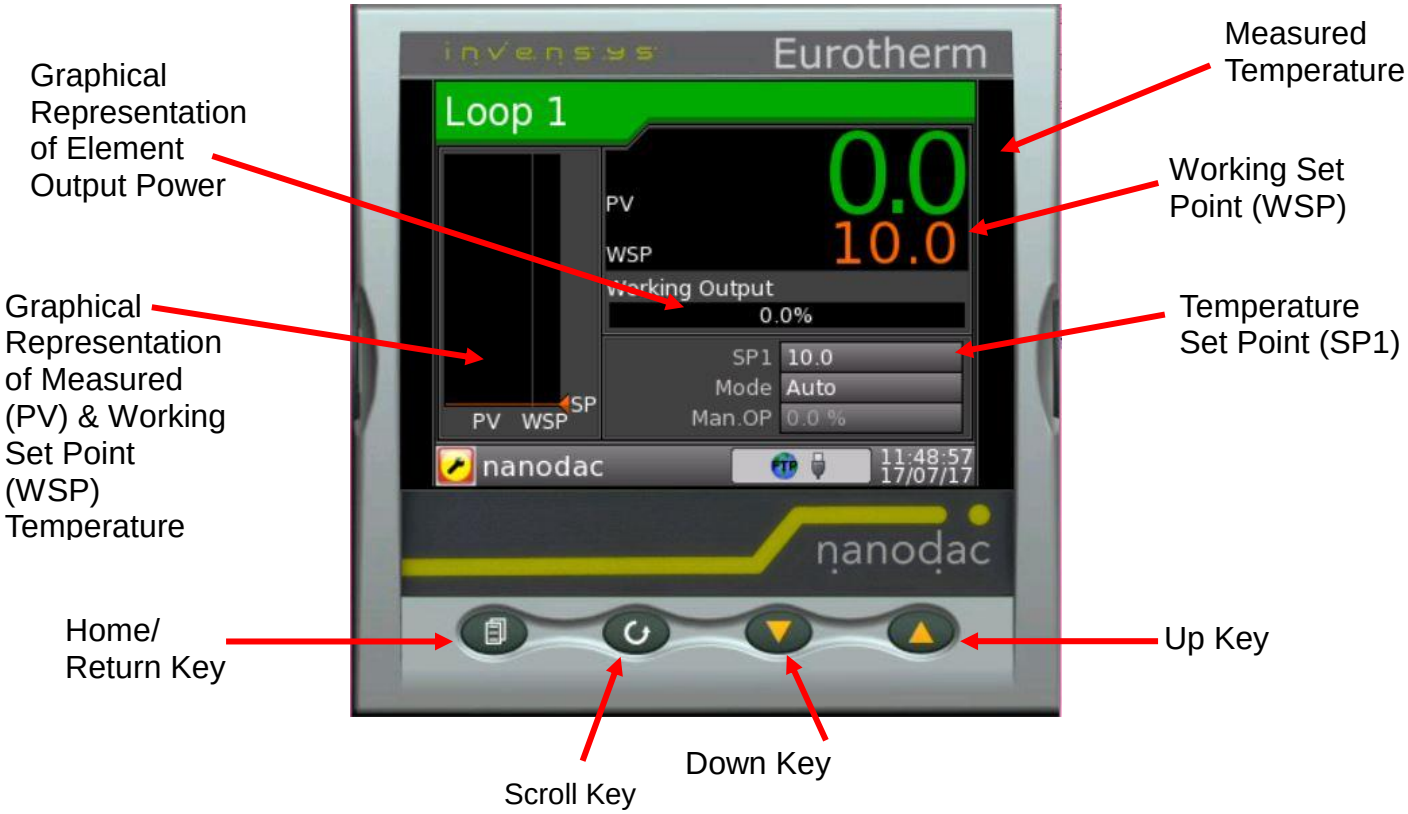
Once **'Scroll'** has been pressed a **'Password'** item will open, press **'Scroll'** again. You will then be prompted to enter the password. Scroll through the letters then press the **'Scroll Key'** on the **'Numeric'** button. Select '**9**' then press the '**Scroll' Key'**. A star should appear on the **'password'** box. Then press the **'Home/Return Key'**. You will be then asked to **'Accept?'** Highlight the **'Yes'** item and press the **'Scroll Key'**. You will then return to the main menu. Press the **'Home/Return Key'** one last time to return to the home screen. You are now logged on.

Note that LOGIN has now changed to LOG OUT as shown below. This is normal and correct.

Press any button to return to the home page (home page). It will now be possible to select and highlight the boxes in the program page and select "RUN" to run a program.

2.2 Quick Start Guide – Set a Temperature

2.2.1 Control home screen



2.2.2 Setting a Temperature

1. On the default screen press the **'Scroll Key'** once. This will highlight the **'SP1'** tab, then press the **'Scroll Key'** again.

2. Arrows will then appear on the **'SP1'** tab. You will then be able to use the **'Up Key'** & **'Down Key'** to select a temperature. Press the **'Scroll Key'** again to enter the temperature & the furnace will start heating.

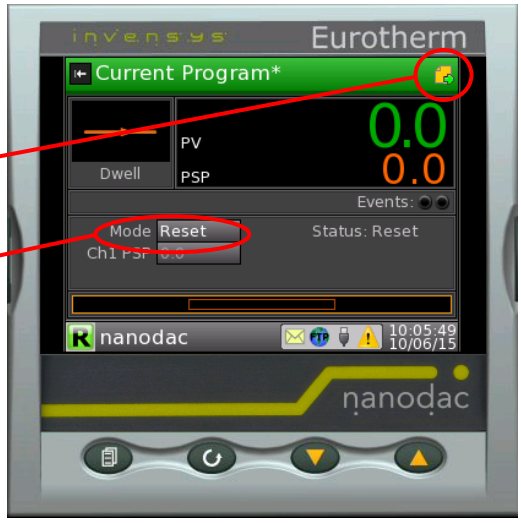
Once the furnace reaches temperature will stay there until you repeat the previous steps and select a new temperature. To turn off the heating set the set point to '0'.

2.3 Programming

2.3.1 Creating a Program

Up to 100 programs can be saved on the Nanodac controller. Each program can have up to 25 segments. There are 5 segment types that can be selected, which are **'Ramp'**, **'Step'**, **'Wait'**, **'Dwell'** & **'End'**. The following instructions will show you how to create & save a program.

1. On the default screen press the **'Up Key'** unit you reach the program screen



2. Once on the program screen, press the **'Scroll Key'**. This will highlight the **'Mode'** item. Then press the **'Up Key'** unit you reach the **'program edit'** item. Then press **'Enter'**.

3. Once on the program edit screen, scroll down until you reach the **'Segment Number'** item. To create a new program make sure you start on segment 1. To do this press **'Enter'** on the tab then scrolling until you reach the correct number. To select, press **'Enter'** again

4. Then scroll down to the **'Type'** item and press **'Enter'**. Select the required segment type and press enter again. If you choose 'Ramp', you then have to choose the set point **(Ch1 TSP)** and Ramp Rate **(Ch1 Rate)**. These are the two item directly below.
Note: Your final segment has to be **'End'**

Setting the segment types:

- Step: a set point, **'Ch1 TSP'**, must be set
- Dwell: a **'Duration'** must be set in the format HH:MM:SS
- Wait: no additional action
- End: no additional action

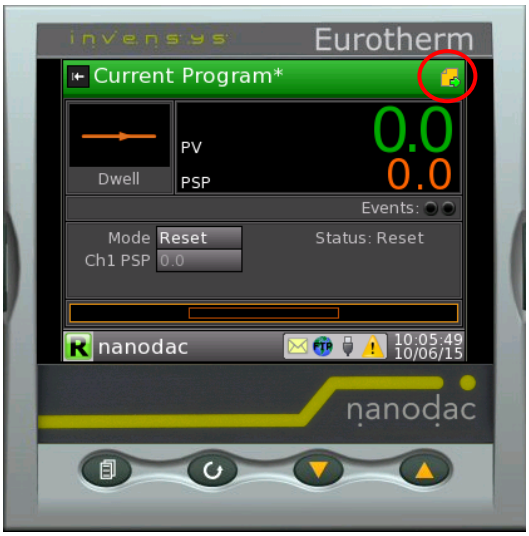
5. To add another segment scroll up to the **'Segment Number'** tabs & select the next number.

Note: each segment can be named by selecting **'Segment Name'** and entering in a new name.

6. Once the program is finished, you can **'Store'** it by highlighting the **'Operation'** tab & pressing **'enter'** and selecting **'Store'**
Note: You can **'Load'** or **'Delete'** any program through this tab too.

7. Scroll down and Highlight 'New File'. Select by pressing 'Enter'.

8. Then enter a program name. To save, press the '**Home/Return Key**'. Then select 'Yes on the '**Accept changes?**' screen



1. To select a program to run, select the **'Edit Program'** tab

2. Highlight and select the Operation tab press **'Enter'**. Then select **'Load'**, press **'Enter'** again.

3. Scroll down and select the Program you wish to run and press **'Enter'**.

4. Go back to the program screen and press **'Enter'**. This will highlight the **'Mode'** tab. Scroll up to **'Run'** and press **'Enter'**. The program will now run fully.

Note: you can cancel the program running at any time by selecting the mode tab and selecting **'Reset'**

2.4 Data Logging

The Nanodac is set up to continuously record logged data whenever it is turned on. Note, the Nanodac will not record data when logged in as **'Engineer'.**

It is set up to record data every 10 seconds and the internal storage of 50MB is capable of storing 85 days of data at this rate. When the Nanodac is recording the green **R** for record icon is displayed in the bottom left of the screen.

Nanodac records the controlled temperature and the % element power control and any other physical or virtual channels that have been setup.

The following instructions will show you how to archive this data onto a USB stick, to transfer onto a computer.

The first step is to insert your USB device (pen drive/hard drive) into the USB port located on the control panel of your furnace.

1. On the main menu select **'Demand Archiving'**.

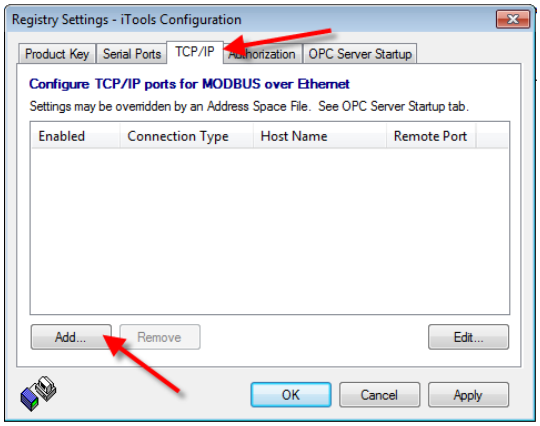
2. Make sure the **'Archive To'** item is on **'USB'.**

3. Then select the **'Archive'** item. This will give you 7 options: **'Bring To Date', 'All', 'Last Month', 'Last Week', 'Last Day', 'Last Hour'** & **'None'**. Select the option you'd like and press 'Enter'. The Data transfer will then begin.

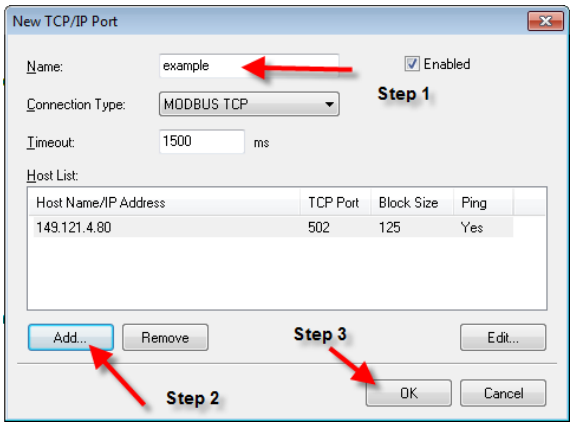
The 'Status' item will say 'Transferring' while the action is being performed & then 'Complete' once it is safe to remove the USB device.

2.5 Setting up nanodac™ for the use in iTools (via Ethernet TCP/IP)

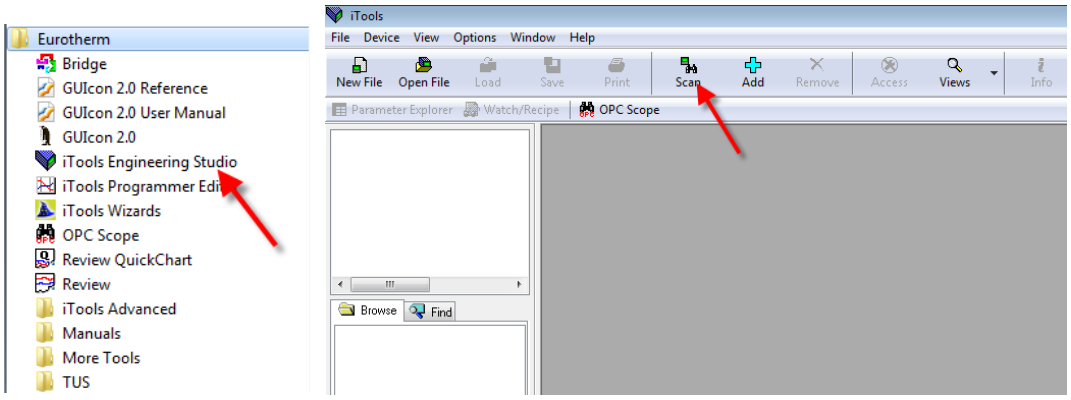
Using the Ethernet port on the back of the nanodac™ is simple to us but you will need to add a TCP/IP port within iTools in order for it to recognize the nanodac. Simply go to you windows operating system 'Control Panel', then click on the iTools icon.



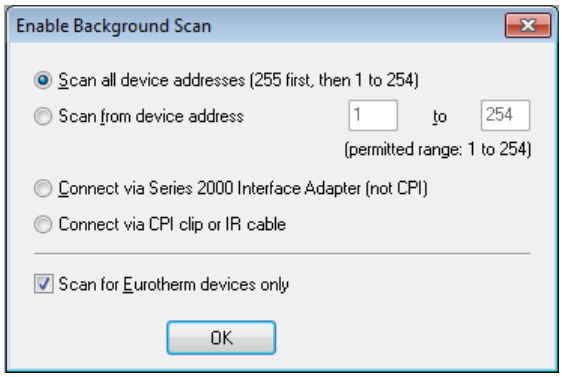
Click on the TCP/IP tab, then click Add…



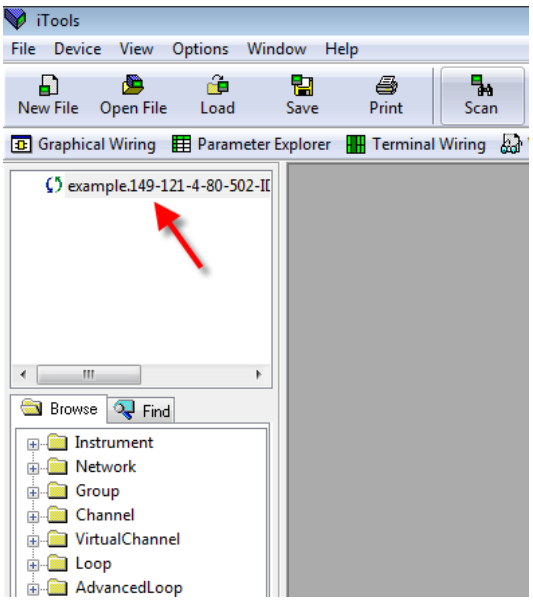
(1) Enter a name for your nanodac, (2) click on Add… to assign the IP address of the nanodac, and (3) click OK After completing, you can exit out of the configuration, now load iTools, and then click on "Scan"

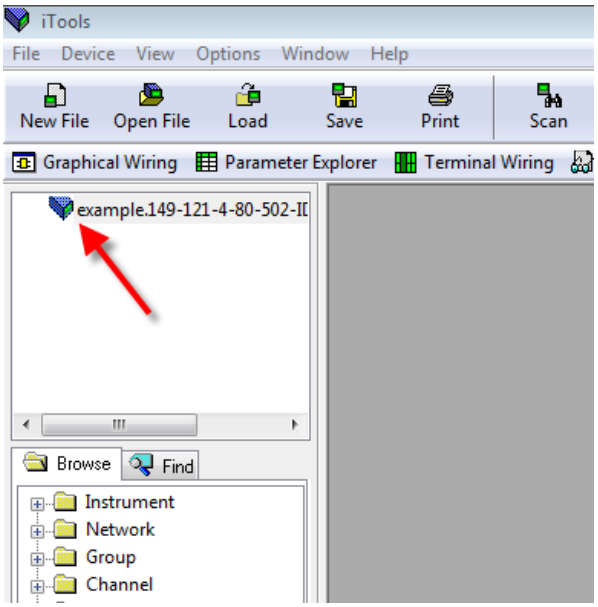


Be sure to choose the first option; “Scan all device addresses (255 first, then 1 to 255)”



After about 5-10 seconds, you will see the device pop up in the left hand side. The icon next to the name indicates its synchronizing.





Once you see the “book” icon, this means it’s fully synchronized and you cannot fully edit the configuration. Be advised that the first time you connect the nanodac™ via iTools, it could take upwards of a minute to synchronize.

2.6 Batch Control (Optional)

Batch control allows the user to give a unique identifier (Batch ID) to each run of the furnace/oven.
Any downloaded data logging files will include this Batch ID, allowing for the easy identification and organisation of data. The Batch ID can also be used to track any resulting product.

2.6.1 Batch Summary Page

- From the Home Display, press the arrow keys to scroll through the screens and access the Batch Summary page.

If the batch is active, the screen shows a summary of the current batch. If the batch is not active, the screen shows the details of the previous batch.

- Press the scroll key to highlight the “Page” icon in the top right hand corner of the screen. The “Page” icon is visible for all users logged into the nanodac™.

- When the “Page” icon is highlighted, press the scroll key again to access the “Batch Control” page.

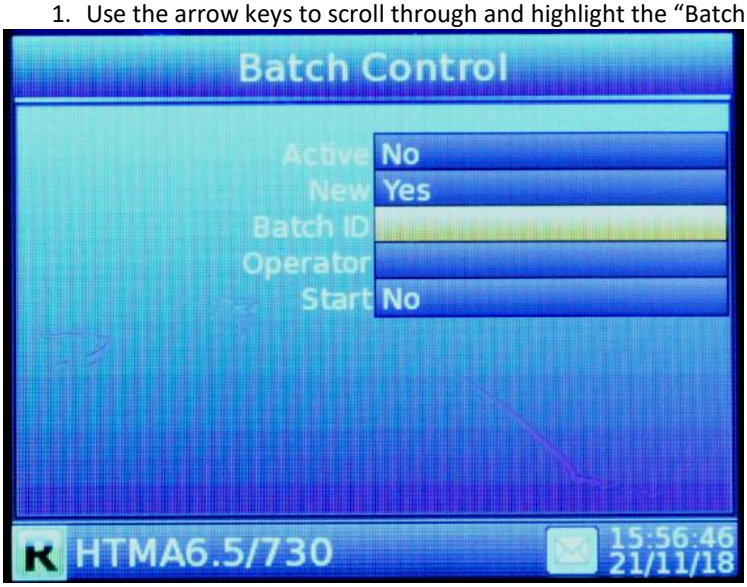
2.6.2 Batch Control Page

The Batch Control page allows the user to enter a new batch ID and operator details.

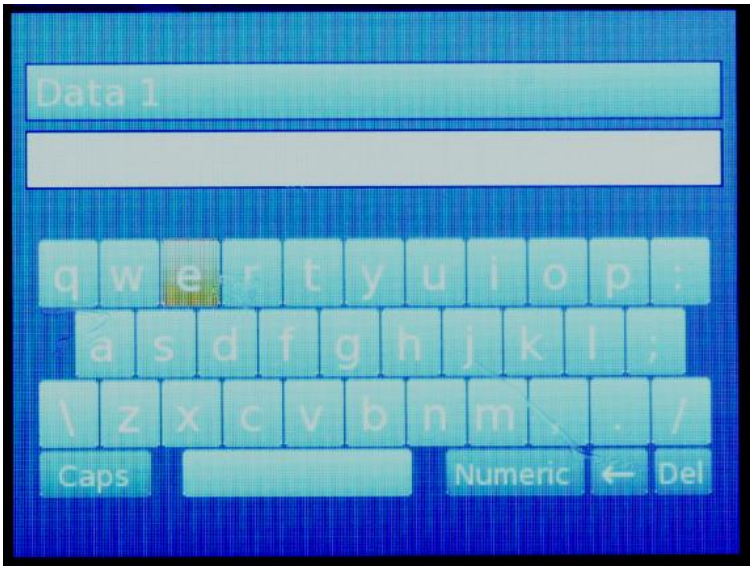
- Press the “down” arrow key to highlight the “New” parameter.
- Press the scroll key to select the “New” parameter.
- Press the arrow key to change the value to “Yes”.
- Press the scroll key to accept the change.

Setting the “New” parameter to “Yes” clears the “Batch ID” and “Operator” fields,
To enter new values into the Batch ID and Operator fields, highlight them using the arrow keys, then press the scroll key to enter a new text string of your choice, as shown in the example below:

1. Use the arrow keys to scroll through and highlight the “Batch ID” field.



2. Press the scroll key to open the keyboard and enter a value/identifier.



3. Follow the same process to set the “Operator” value.

Once you have set the “Batch ID” and “Operator” values, you can then start the batch.

- Use the arrow keys to highlight the “Start” parameter.
- Use the scroll key to select the parameter.
- Use the arrow keys to change the value to “Yes”.
- Press the scroll key to accept the value.

The “Start” field will change to say “Stop”.

To stop a batch:

- Press the arrow key to highlight the “Stop” parameter.
- Press the scroll key to select the parameter.
- Use the arrow keys to change the value to “Yes”.
- Press the scroll key to accept the new value.

Once the batch has stopped, the field will change to say “Start”.

- Press the page key to return to the “Batch Summary” page.

When the logged data is downloaded to a USB memory stick, then loaded into the Quickchart Lite software, it is possible to view all of the batches downloaded.

Data can be selected and viewed by individual Batch ID.

2.6.3 Batch Control Fields

Carbolite Gero has set two control fields: "Batch ID" and "Operator". It is possible to have a total of 6 batch control fields. To change the fields, you must log in as "Engineer", highlight the "Batch" option, and enter.

You will see the following list of parameters:

Mode	Use start/stop
Field	(#.) Set the number of required fields here, the maximum is 6
Field 1	Batch ID (this text can be modified as required)
Batch Field 1	Use Text. An alternative value of 'PV Start' is available. In this case the batch would start based on a temperature value
Field 2	Operator (this text can be modified as required)
Field (#)	There can be a maximum of 6 fields, depending of the value of the 'Field' parameter
On Start log	(#.) Set the number of required fields to log
On Stop log	(#.) Set the number of required fields to log
On new clear	(#.) Set the number of required fields to clear when a new batch is selected
Print versions	Yes
File by name	Yes
Start	No
Stop	No

- Change the number of fields (up to a maximum of 6) in the "Field" parameter. Additional fields will appear in the list.
- Name the fields as required.
- In the "On Start log", "On Stop log" and "On new clear" parameters, set the number of fields you want to activate
    - The nanodac™ will activate the fields in sequence, so if you set the number of fields as "3", it will only activate the first 3 fields in the list.

3. CASCADE

3.1 Principle of Cascade Control

When cascade control is fitted, the 'load' control loop in the nanodac senses the temperature of the workload, and the 'element' control loop in the nanodac senses the element temperature. Depending on the oven or furnace model, the load thermocouple may be in a fixed position, or may be movable. The element thermocouple is fixed in a predetermined position near the heating elements.

If movable, the load thermocouple should be placed as near as possible to the work to be heated.

The load control loop communicates with the element control loop, calling for heat according to the load temperature and the current program or setpoint. The element control loop regulates the heat according to element temperature and the requests from the load control loop.

The element temperature could, in principle, vary between the furnace or oven maximum and minimum, regardless of the working temperature of the load. In practice, the cascade control system is configured to limit the element temperature to a band around the load temperature, typically of $\pm 20^0$ C of the setpoint temperature.

In a three-zone furnace for which the "three zone cascade" option has been ordered there are three Element Controllers, all receiving the same control instructions from the Load Controller

3.2 Operation

The operator may ignore all the complications of the system, and program the Load Loop according to the standard programming instructions. The home display shows the load control loop at the top of the screen and the element control loop below. The Element Loop should never be adjusted. Note that the elements usually run at a higher temperature than the load. NOTE the load mode should be set to cascade and the instrument switch should be in the on position to heat the product. To do this you must be logged in as the **'Supervisor'**.

Note: enter a negative value for Cascade Trim Low

Because the details of the customer's cascade application (in particular the nature of the load) are generally not known, the feed forward parameter known as 'Cascade Trim' is made easily accessible on the cascade trim page. It is default setting is ±20 °C. If overshoot of the load temperature occurs – often a problem at low temperatures – then Cascade Trim can be reduced in order to limit the amount of overshoot. If Cascade Trim is reduced too much, however, the load may not reach the desired temperature. If the load does not reach the desired temperature or is slow in the final stages, Cascade Trim can be increased: a maximum of ±75 °C is suggested.

When attempting to control at very low temperatures it can become a problem to achieve stable control because of excessive power being supplied during heating. The available power can be limited by adjusting the power limit

parameter OP.Hi to a lower value; make a note of the original settings before adjusting. The manual for the furnace or oven may also list standard settings for this parameter.

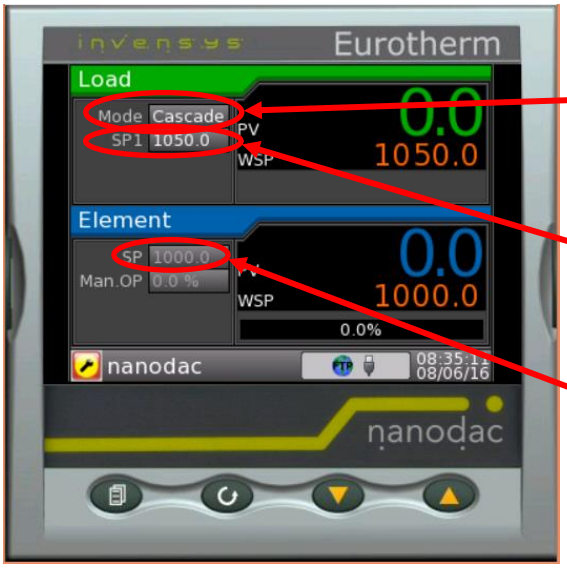
Nanodac Cascade – how to use without the Cascade thermocouple in the load

To use the nanodac cascade temperature controller without the cascade thermocouple the 'Mode' has to be set to 'Slave'. Please note that it is not possible to use the programmer functions when the mode is set to slave.

When the 'Mode' is set to 'Cascade' the Load setpoint 'SP1' is used.

When the 'Mode' is set to 'Slave' the Element setpoint 'SP' is used.

If a program is required but the load thermocouple is not to be positioned in the load then set the Mode to 'Cascade' and adjust the cascade trim values to zero (refer to the next page).



Use this button to set the 'Mode' to either Cascade or Slave. Do not use the 'Manual' option.

If the Cascade mode is used set the setpoint SP1 here.

If the Slave mode is used set the setpoint SP here.

There are two methods of using the Nanodac Cascade without the Cascade thermocouple located in the furnace load. Note: the cascade thermocouple must be connected otherwise a thermocouple error will be shown.

1. Set the 'Mode' to = Cascade.

   Go to the 'Trim' page and set both values to Zero. Make a note of the previous values so they can be reset later when the Cascade thermocouple is to be used.

Note: The Cascade Trim Low value is normally a negative value

Use the 'Load' setpoint SP1 or a program to heat the furnace. Please note that the 'holdback' feature of the program cannot be used unless the load thermocouple is in place.

Set the 'Mode' to = Slave.
Use the 'Element' setpoint 'SP' to heat the furnace. Please note: A program cannot be used in the 'Slave' mode. A program only controls the 'Load' setpoint not the Element setpoint.

3.3 Caution

If the Load Thermocouple is removable, leave it in the furnace or oven chamber whenever possible.

Operating with the Cascade Control active and with the Load Thermocouple in an unheated position (such as lying on the work bench) may cause the furnace or oven to heat up to its maximum temperature, wasting power and possibly shortening element life.

3.4 Over-temperature Control

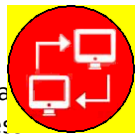
Where over-temperature control is fitted, it normally protects against failure of the control system or of a component such as a power control relay. The over-temperature controller must be set at a level higher than the greatest element temperature, typically 15°C above maximum.

If the working temperature is less than the maximum temperature, then it may be possible to set the over-temperature limit as follows:

Working Temperature + Cascade trim high (eg 50) +15°C

Example: for working at 800°C in a 1200°C furnace, the over-temperature limit could be set to 800+50+15=865°C.

4. OPERATION



On power up a default or custom splash screen appears and remains visible whilst the unit is initialising. If during this process a network broadcast storm is detected, the unit stops, displa network failure icon until the broadcast storm has cleared, after which the initialisation proces resumes.

4.1 INTRODUCTION

The operator interface consists of a display screen and four push buttons.

4.1.1 Display Screen

The display screen is used both to display channel information (in one of a number of display modes), and to display the various configuration screens which allow the user to setup the recorder to display the required channels, to set up alarms and so on. Display modes are described in Section 4.4 below; configuration is described in Section 5

In display mode, the screen is split horizontally into three areas (figure 1.1.1)

1. a faceplate giving channel details.
2. the main display screen showing channel traces etc.
3. the status area, displaying instrument name, the current time and date and any system icons.

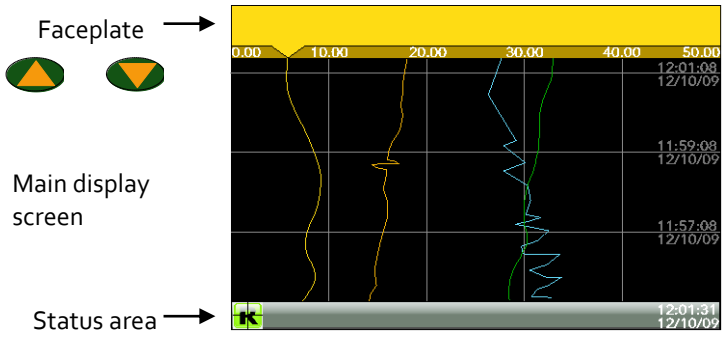


Figure 1.1.1 Display mode screen (vertical trend)

In configuration mode, the entire display screen is devoted to the selected configuration menu.

4.1.2 Navigation Pushbuttons

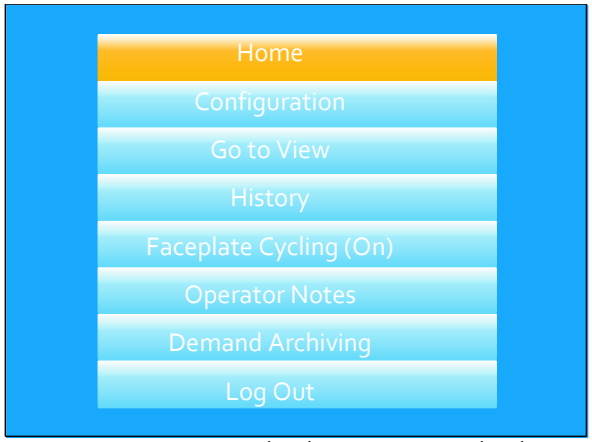


Figure 1.1.2 Top level menu (Engineer level access)

There are four navigation buttons, called 'Page', 'Scroll', 'Lower' and 'Raise' located below the screen. The general properties of these buttons are described in the remainder of this section, but some have additional, context sensitive functions, which, for the sake of clarity are not described here but in the relevant sections (e.g. 'Message summary') of the manual.

Navigation Pushbuttons (Cont.)

PAGE BUTTON

From any non-configuration page, pressing this push button causes the top level menu (figure 1.1.2) to appear. The figure shows the menu for a user logged in with 'Engineer' level access. Other access levels may have fewer menu items.

Within configuration pages, the Scroll button can be used as an enter key to select lower menu levels. In such cases the page button is used to reverse this action, moving the user up one menu level per operation.

SCROLL BUTTON

From trending pages, operation of the scroll push-button scrolls through the channels enabled in the group. The Faceplate cycling 'Off' selection can be used to keep a particular channel permanently displayed, and the scroll pushbuttons can then be used to select channels manually.

In configuration pages, the scroll key operates as an 'enter' key to enter the next menu level associated with the highlighted item. Once the lowest menu level is reached, operation of the scroll key allows the value of the selected item to be edited by the relevant means (for example, the raise/lower keys, or a keyboard entry).

The 'Page' key is used to move the user back up the menu structure, until the top level menu is reached, when the scroll key can be used again to return to the Home page.

The scroll button is also used to initiate user wiring as described in Section 7

RAISE/LOWER BUTTONS

Within trending displays, the Raise and Lower keys can be used to scroll through the enabled display modes in the sequence: vertical trend, horizontal trend, vertical bargraph, horizontal bargraph, numeric, vertical trend... and so on.

Within configuration pages, these pushbuttons act as cursor keys, allowing, for example, the user to highlight menu items for selection using the scroll button, and in many cases allowing the user to select one from a number of alternative values within menu items. These keys are also used to navigate through the virtual keyboards and number pads used to enter text or numeric strings.

4.1.3 On Screen Help

The top level configuration menu includes contextual help text on the right-hand half of the screen. Mostly this text fits within on screen height. Where this is not the case, the text can be moved up or down the screen by holding the Page button operated whilst using the up and down arrows to move the text.

The down arrow moves the text upwards on the screen; the up arrow moves it downwards.

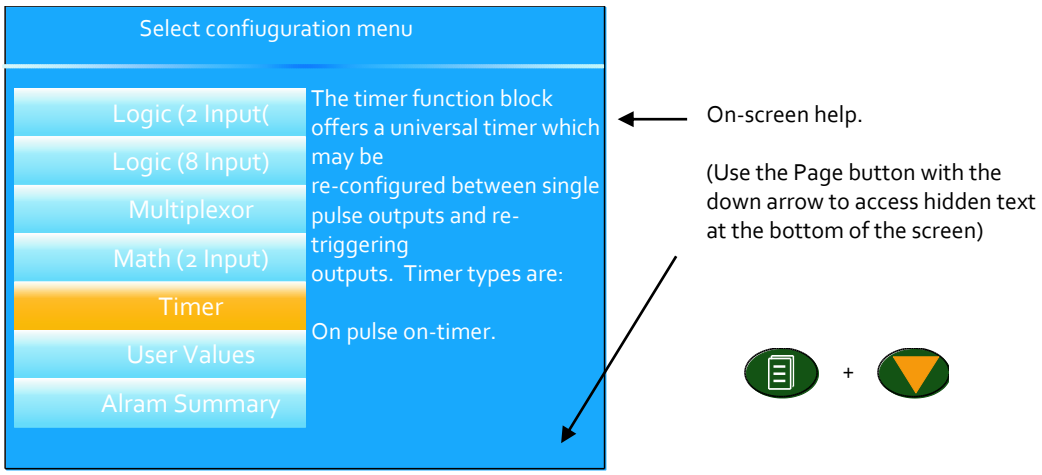


Figure 1.1.3 On-screen help (typical)

4.2 PROCESS VARIABLE DISPLAY

As discussed above, the operator interface consists of a display screen and associated push buttons. The display screen shows process variables in one of a number of formats, or operational details (notes or alarm history for example), or configuration details for use in setting up the recorder to produce the required displays and history formats. The remainder of section four discusses the process variable displays, alarm displays and so on; configuration details are to be found in Section 5.

Note: Some of the items below can be selected for use only by users with a suitable permission level as set up in the 'Instrument' 'Security'.

Figure 1.2 below, depicts a typical trend display and gives details of the various areas of the display page.

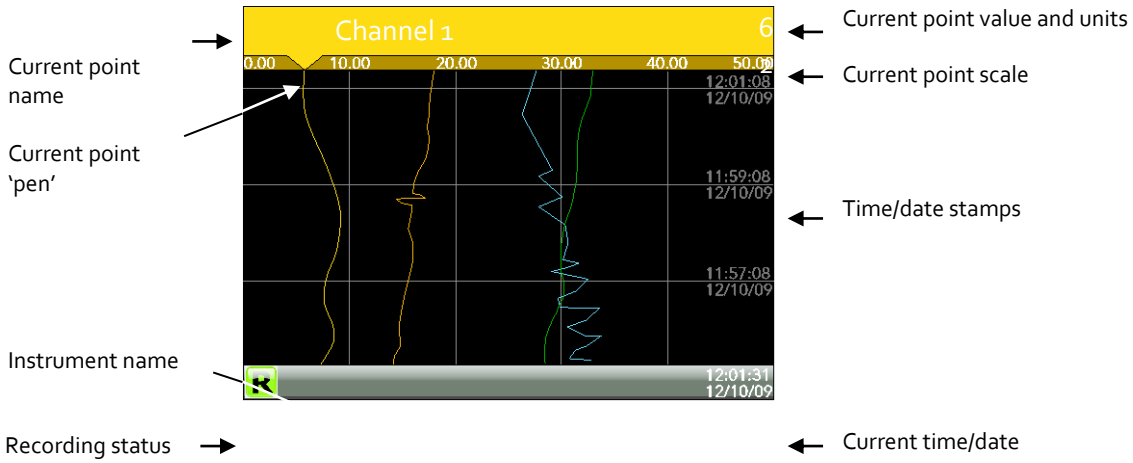


Figure 1.2 Typical display screen (Vertical trend)

Figure 1.2 shows a vertical trend page. Operating the Raise/Lower push-buttons allows the user to scroll through the other display modes: Horizontal trend, Vertical bargraph, horizontal bargraph, numeric, vertical trend... and so on. All these display modes are described in Section 4.4, below.

A display mode can also be selected from the Top level menu 'Go To View' item which appears when the 'Page' key is operated.

The scroll button can be used to scroll through the points in the group, overriding the 'Faceplate Cycling' on or off selection

4.2.1 Alarm Icons

Note:
Trigger alarms do not display threshold marks or bars, or faceplate symbols

The alarm icons shown below appear in some display modes. The icons on a channel faceplate show the status of that channel's alarm(s), as follows:

Icon is flashing	alarm is active but unacknowledged or it is an Auto alarm which is no longer active but which has not been acknowledged
Icon steadily illuminated	the alarm is active and has been acknowledged.

Alarm thresholds and deviation alarm bars appear for horizontal and vertical trend modes. For deviation bars, the bar stretches from (Reference - Deviation) to (Reference + Deviation). Vertical and Horizontal bargraph modes display only absolute alarm symbols.

Alarm Icons (Cont.)

▲	Absolute High
▼	Absolute Low
▲	Deviation High
▼	Deviation Low
▲▼	Deviation Band
◢	Rising Rate of change
◣	Falling Rate of change
▲	Digital High
▼	Digital Low

Table 1.2.1 Alarm icons

4.2.2 Status Bar Icons

The following items can appear in a dedicated window immediately to the left of the time and date, at the bottom right-hand corner of the display. The width of this window expands as the number of icons increases, and the instrument name is truncated, as necessary, to make room.

SYSTEM ALARMS 

This indicator appears, flashing, if any one or more of the alarms listed below is active. The System Alarms summary page (accessed from 'Go to View in the top level menu) allows the user to view such system alarms as are active. It is not possible to 'acknowledge' system alarms

Archive Disabled	An unattended archiving strategy has temporarily been disabled.
Archiving Failed	An unattended archiving strategy has failed to complete.
Archiving Timeout	A configured archiving strategy has timed out.
Battery failure	Indicates that the battery is approaching the end of its useful life, or that it is missing or is completely exhausted. Immediate battery replacement is recommended (Appendix C; section C1).
Broadcast Storm detected	Networking is limited until the storm has passed.
Clock failure	The internal clock was found to be corrupt at power up, or that the time has never been set. Time is forced to 00:00 1/1/1900. Can be caused by battery failure, in which case a battery failure message appears. The error is cleared by setting the time and date.
Channel error	Indicates a hardware failure in the channel circuit or in the internal cold junction temperature measurement.
Database failure	Corrupted EEPROM or flash memory.
DHCP Server failure	For units with 'IP Type' set to 'DHCP' (Network.Interface configuration) this alarm occurs if the instrument is unable to obtain an IP address from the server.
FTP Archiving file lost	A file has been deleted that had not yet been archived. Possible causes: Communications with the server could not be established,; archive is disabled; archive rate too slow.
FTP Archiving to slow	The archive rate is too slow to prevent the internal memory from overflowing. The recorder effectively switches to 'Automatic' (Section 5.1.2) to ensure that data is not lost.

Status Bar Icons (Cont.)

FTP Primary Server Failure	This error occurs if the recorder fails to establish connection with the primary server, after two attempts. After the second attempt fails, the recorder attempts to establish connection with the secondary server instead. Primary and secondary server details are entered in the Network. Archiving area of configuration (Section 5.1.2).
FTP Secondary Server Failure	This error occurs if the recorder fails to establish connection with the secondary server, after two attempts. Primary and secondary server details are entered in the Network.Archiving area of configuration (Section 5.1.2).
Maths channel failure	Appears if, for example, the divisor of a divide function is zero.
Media archiving file lost	A file has been deleted that had not yet been archived. Possible causes: Memory stick missing, full or write protected; archiving has been disabled; archiving rate too slow.
Media archiving to slow	The archive rate is too slow to prevent the internal memory from overflowing. The recorder effectively switches to 'Automatic' (Section 5.1.2) to ensure that data is not lost.
Media full	Archive storage device is full. The alarm becomes active only when an archive is in progress.
Media missing	No archive storage device present when archive attempted.
Non-volatile memory failure	RAM copy of non-volatile parameters is corrupted.
Non-volatile Write Frequency warning	One or more parameters are being written frequently to non-volatile memory. If this continues, it may lead to 'memory depletion' (i.e. the memory will no longer be able to store values correctly). A common cause of this problem is frequent writes over Modbus comms.
Recording failure (message)	Message explains reason for failure.
USB overcurrent	USB power fault - too much current (i.e. >100mA) is being drawn by a USB device.
Wiring failure	The user wiring has failed to verify, i.e. one or more wires has been detected that does not have both a source and a destination defined. This may be the result, for example, of power loss during a download from iTools.

CHANNEL ALARM

This indicator appears if any channel (including channels not in the display group) is in an alarm state. The symbol is illuminated continuously if all alarms are acknowledged or flashes if any one or more alarms is unacknowledged. Alarms are acknowledged from the Root menu 'Alarm summary' item,**Error! Reference source not found.** or in the Channel configuration area if the user's access permission is appropriate.

USB

This icon appears whenever a memory stick (max. capacity 8GB) or other supported USB device (section 8) is plugged into the USB port at the rear of the recorder.

When data transfer is in progress between the instrument and the memory stick, the icon changes to a 'busy' version.

CAUTION

The Memory stick must not be removed while archiving (demand or automatic) is in progress, as to do so may irreparably damage the file system of the memory stick, rendering it unusable. It is recommended that all archiving be suspended before the memory stick is removed.


Memory stick fitted


Transfer in progress

FTP ICON

The FTP icon appears whenever transfer activity is taking place.

Status Bar Icons (Cont.)

RECORD ICON

One of four icons appears at the bottom left corner of the display to indicate recording status.

Record 

This indicates that the recorder is recording the items selected in the Group Recording area of configuration (Section 5.2.2).

Stopped 

This means that 'Enable' has been set to 'no' in the Group Recording area of configuration (Section 5.2.2). Trending is not affected.

Paused (Suspended) 

This means that recording has been paused by a wire to the Suspend parameter (Group Recording area of configuration going true (high). Trending is not affected.

In Configuration 

The recorder has been placed in configuration mode either at the user interface, or via iTools. Recording is stopped until the recorder is no longer in configuration mode. For each non-recording state (Stopped, Paused or In Configuration). A new history file is created when the unit comes out of configuration mode.

Note: For recording to be enabled, configuration status must be 'logged out' both at the instrument and at iTools.

MESSAGE ICON 

This 'envelope' icon appears when a message is generated and it remains on display until the Message Summary is accessed, when it is removed from the display until the next new message is generated.

AUTOTUNE ICON 

For instruments fitted with the Loop option, this symbol appears during the Autotune process.

4.2.3 Breaks in recording

Breaks in recording can be caused by the unit being powered down, by the user entering configuration mode or when the recorder time is changed manually. In vertical and horizontal trend modes, a line is drawn across the width/height of the chart to indicate that recording has been interrupted.

On power up, a red line is drawn across the chart. In 'History', if messages are enabled the message:

`Date Time System power up`

is printed on the chart, together with the configuration and security revisions.

On exiting configuration mode, a blue line is drawn on the chart and in 'History', if messages are enabled, the messages:

`Date Time Logged out.`

`Date Time Config Revision: N was N-1` (assuming a configuration change was made)

`Date Time Logged in as: Engineer`

appear on the chart.

When the instrument time is changed (manually - not through daylight saving action) a green line is drawn on the chart and in 'History', if messages are enabled, the message:

`Date Time Time/Date changed` appears on the chart.

4.3 TOP LEVEL MENU

This menu appears when the page key is operated from any non-configuration page. The menu items displayed depend on the access permission of the user. One of the menu items is highlighted, and if the scroll key is operated, then it is the highlighted item that is 'entered'.

Figure 1.3 shows the top level menu for Engineer level access.

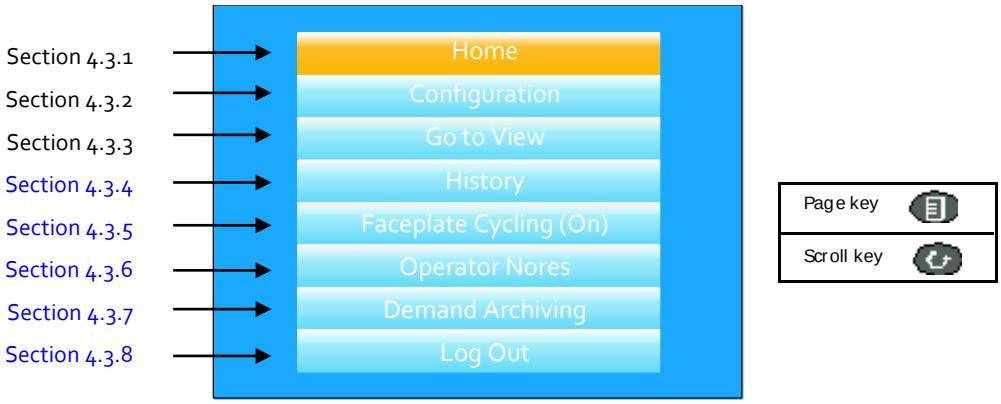


Figure 1.3 Top level menu

4.3.1 Home

Operating the scroll key whilst 'Home' is highlighted causes a return to the 'Home' page.

4.3.2 Configuration

Operating the down arrow key highlights the 'Configuration' item. Operating the Scroll key enters the configuration submenu described in Section 5 of this manual.

Note: 'Configuration' appears only if the user has an appropriate access level.

4.3.3 Go to View

Operating the scroll key whilst the 'Go to view' item is highlighted, calls the Go to view submenu (figure 1.3.3a). This allows the user to view channel alarms, system alarms, messages or to select a different display mode.

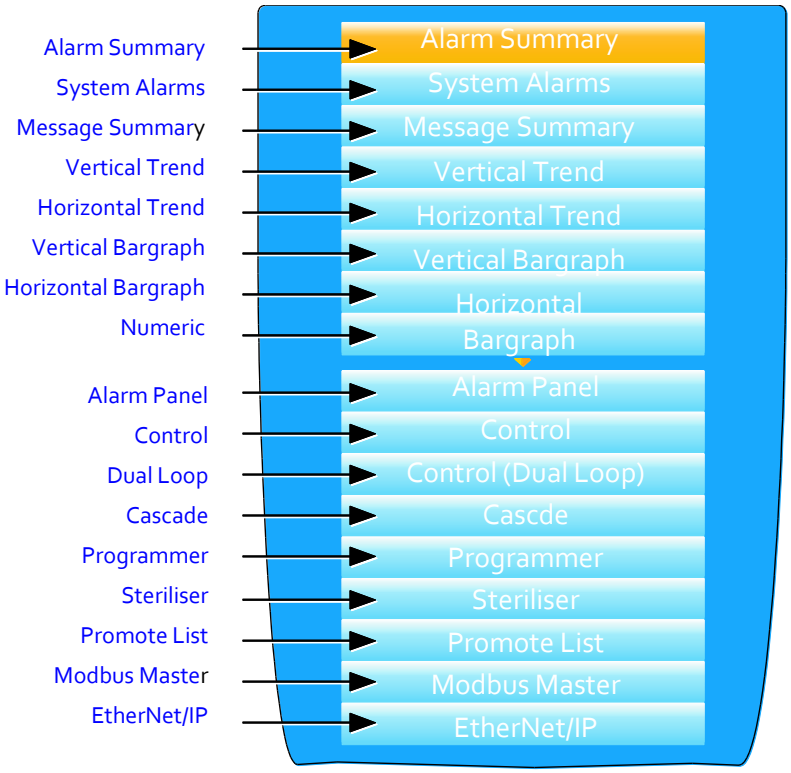


Figure 1.3.3a Go to view submenu

Notes:

1. If an option (e.g. 'Steriliser') is not fitted, its display mode does not appear in the list.
2. Some display modes must be enabled in Instrument. View configuration before they become available.

Go To View (Cont.)

ALARM SUMMARY

For each active alarm, this page displays the channel identifier with alarm number (e.g. C1(2) = channel 1; alarm 2), the channel descriptor, the alarm threshold the current process value and an alarm type symbol.

To return to the top level menu, operate the Page key.

Notes:

1. The background colour to the channel ID is the same as that chosen for the channel.
2. A prefix 'C' in the channel ID means that this is a measuring channel; A prefix 'V' means that this is a virtual channel (i.e. a totaliser, counter or maths channel)

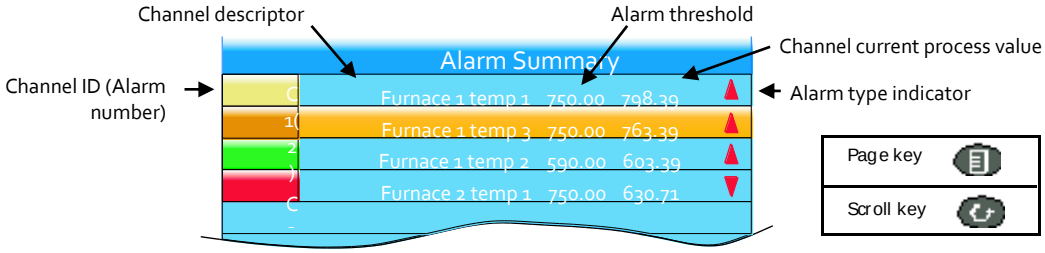
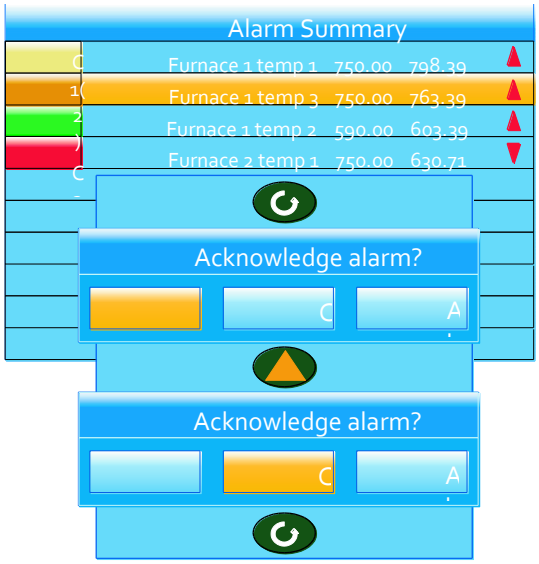


Figure 1.3.3b Alarm summary page with acknowledge confirmation display

ALARM ACKNOWLEDGEMENT

To acknowledge an alarm from this view:



1. Use the up and down arrows to highlight the required alarm
2. Operate the scroll button. The 'Acknowledge alarm' window appears.
3. Use the up arrow to highlight the relevant field (C2(1) in this example), or 'All' if all alarms are to be acknowledged.
4. Operate the scroll key to confirm. If the alarm fails to respond, this may be due to the fact that it has been configured as a 'Manual' alarm, and the trigger has not yet returned to a 'safe' (non-alarm) state, or it could be that the instrument is in a logged out state.

SYSTEM ALARMS

Operating the scroll button whilst the 'System Alarms' field is highlighted displays a list of all currently active system alarms. **Status Bar Icons** contains a list of system alarms and their interpretations. To return to the top level menu, operate the Page key.

A further operation of the scroll button displays a 'Help Information' page, giving the reason for the highlighted alarm.

Operate the scroll button again to return to the system alarm display.

Go To View (Cont.)

MESSAGE SUMMARY

Operating the scroll key whilst the 'Message summary' field is highlighted displays the10 most recent messages.

Operating the scroll key whilst a message is highlighted shows the selected message in more detail (and using the up/down keys allows the other messages to be scrolled through). Whilst in this mode, operating the scroll key again, allows the user to choose to jump to the message's location in trend history mode (Section 4.5) or to return to the summary page.

By default, the interface is set up such that:

1. all message types are included
2. the up and down arrow keys cause the highlighted selection to move up or down by one message at a time.

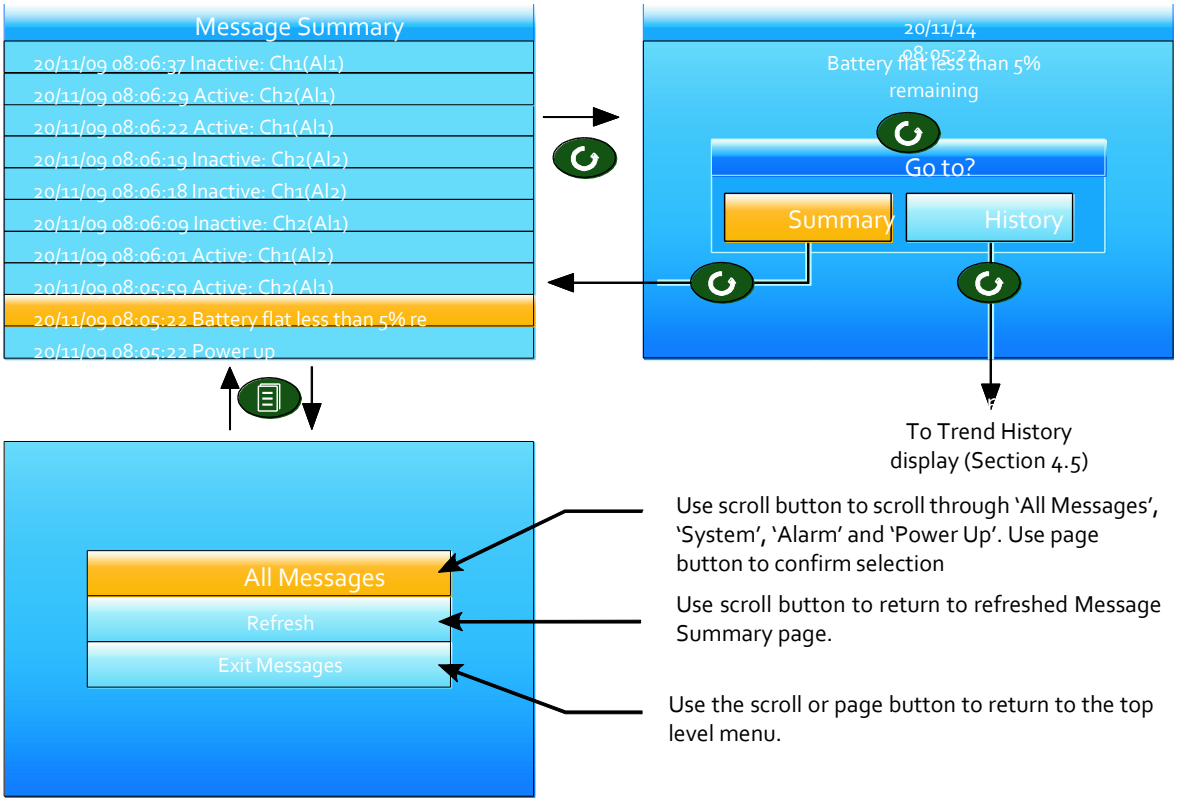


Figure 1.3.3c Message summary features

MESSAGE FILTERS

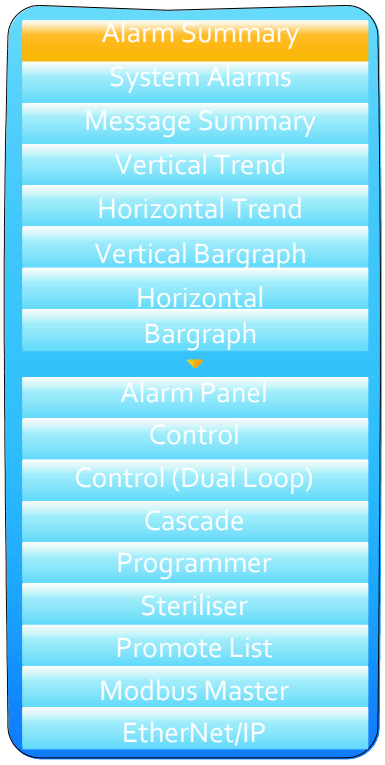
All Messages	Causes all messages to be displayed on the screen.
System	Shows only system alarms
Alarm	Shows only channel alarms
Power up	Shows only power up messages
Login/out	Limits the display to Log in and Log out events.

Go To View (Cont.)

DISPLAY MODE SELECTION

Use the up/down arrow buttons to highlight the required display mode. Once the required display mode is highlighted, operation of the scroll button causes the recorder to leave the 'Go to View' menu and to display channel values in the selected mode. See Section 4.4 for a description of the various display modes.

Alternatively the up and down arrow buttons can be used from any of the display modes to cycle through the available modes in the order listed in the figure.



Notes:

1. If an option (e.g. 'Steriliser') is not fitted, its display mode is not available for selection.
2. Some display modes must be enabled in Instrument. Display configuration before they become available.

4.3.4 History

This top level menu item allows the user to switch from real-time trending to review mode, where channel values, messages, alarm triggers etc. can be viewed back as far as the last significant configuration change. History is discussed in Section 4.5

4.3.5 Faceplate Cycling on/off

For the purposes of this document the channel whose faceplate is currently displayed and whose 'pen' symbol is visible is called the 'Active' channel.

By default, the recorder scrolls through all the channels in the display group, with each channel becoming the active channel in turn. This top level menu 'Faceplate Cycling' item allows the user to inhibit this scrolling action such that the currently active channel remains active permanently, or until a manual scroll is performed using the scroll button (or until Faceplate Cycling is re-enabled).

'Faceplate Cycling' is highlighted by using the up/down arrow buttons. Once highlighted, the status can be changed from 'On' to 'Off' or *vice-versa* using the scroll button. Operation of the 'Page' button returns the user to the trend display.

4.3.6 Operator Notes

This area allows up to 10 notes to be created when logged in as Engineer, using either the text entry techniques described in Section 4.6, or 'iTools' described in Section 6. Once logged out, operating the scroll button whilst a note is highlighted calls a selection box allowing the user either to send that note to the chart, or to write a Custom Note.

CUSTOM NOTE

The Custom Note is written using the text entry techniques described in Section 4.6. Once the note is complete, operation of the page button calls a confirmation display. The down arrow is used to highlight 'Yes', and when the scroll key is then operated, the message is sent to the chart. This custom message is not retained for further use, so if it is required on a regular basis, it is suggested that one of the Operator Notes 1 to 10 be configured (Engineer access level required) so that it may be used instead.

Note: Each note can contain up to 100 characters.

4.3.7 Demand Archiving

This allows a user, with a high enough access level, to archive a selected portion of the recorder history, either to a 'memory stick' plugged into the USB port at the rear of the recorder (Local Archiving), or to a pc, by means of the FTP protocol (Remote Archiving). The archived data remains in the flash memory of the instrument. When the flash memory is full, new data causes the oldest file(s) to be discarded.
The up and down arrow keys are used to navigate to the required field.

Demand Archiving (Cont.)

ARCHIVE MENU

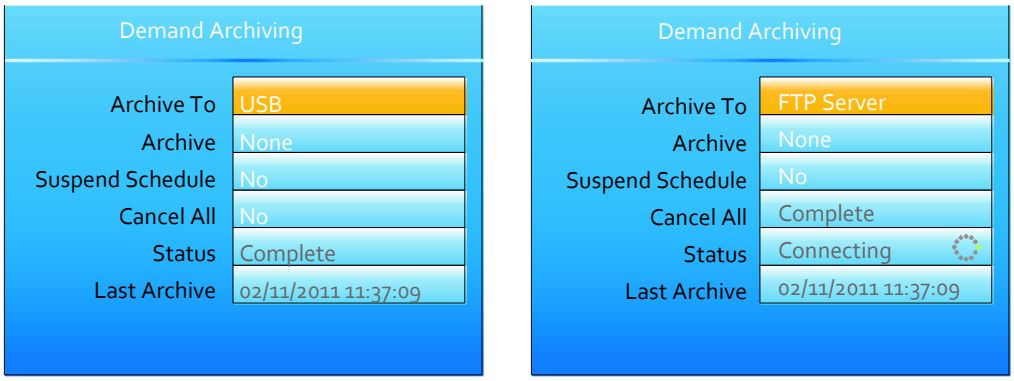


Figure 1.3.7 Demand Archiving menu (Local Archiving on left; Remote Archiving on right)

Archive To	With this item highlighted, the scroll button and the up/down arrows can be used to select 'USB' or 'FTP Server'. For 'USB', the archive will be made to the rear USB memory stick. For 'FTP Server' the archive will be made to the Primary or Secondary server (configured in the Network.Archive area of configuration described in Section 5.1.2. For more details about remote archiving, see 'Remote archiving', below.
Archive	In a similar way, select the archive period: None: No archiving to take place. (Not editable when logged out) Last Hour: Archives all files created within the last 60 minutes. Last Day: Archive all files created in the last 24 hours. Last Week: Archives all files created in the past seven days. Last Month: Archives all files created in the past 31 days. Archive All: Archives all the files in the recorder's history. Bring To Date: Archives all files created or updated since the 'Last Archive' date and time.
Suspend Schedule	When set to 'Yes', automatic (scheduled) archiving is stopped, once the transfer of the current file is complete. Suspend Schedule must be set to 'No' again, to restart the suspended archive. Suspend can be used to allow the memory stick to be removed and re-fitted safely.
Cancel All	When set to 'Yes', this cancels USB archiving activity immediately, or cancels FTP archiving once transfer of the current file (if any) is complete.
Last Archive	Shows the date and time at which the last archive (demand or automatic) was attempted. If a demand archive is requested, or is in operation when an automatic archive is triggered, the automatic archive takes precedence.
Status	For Archive to USB only 'Complete' means that no archiving is currently taking place. 'Transferring' indicates that an archiving is in progress. Accompanied by an animated circular display. 'Suspended' means that archiving has been suspended as requested.
PriStatus	For Archive to FTP Server only, this shows the transfer status between the instrument and the primary host computer.
SecStatus	For Archive to FTP Server only, this shows the transfer status between the instrument and the secondary host computer.

Demand Archiving (Cont.)

FTP SERVER ARCHIVING

This allows the archiving of recorder files to a remote computer via the RJ45 type connector at the rear of the recorder, either directly or via a network.

In order to carry out a successful transfer:

1. Details of the remote host must be entered in the Network.Archive area of configuration (Section 5.1.2).
2. The remote computer must be set up as an FTP server. Help from the user's IT department may be necessary in order to achieve this. Appendix C, Section C2 to this manual suggests one way, using Filezilla.
3. The remote computer must also be set up to respond to 'pings'. This is because the instrument pings the host whilst establishing connection, and if it does not receive a response the archive attempt fails.

When accessing files using Microsoft® Internet Explorer, the address (URL) field can be in one of two formats:

1. ftp://<instrument IP address>. This allows a user to log in as the anonymous user (if the recorder has any account with the user name set to 'anonymous' with a blank password.
2. ftp://<user name>:<password>@<instrument IP address> to log in as a specific user.

For IE5 users, Microsoft® Internet Explorer displays, by default, history files only. To quit the history folder, either uncheck the Tools/Internet Options/Advanced/Browsing/'Enable folder view for FTP sites' option, or check the Tools/Internet Options/Advanced/Browsing/'Use Web based FTP' option.

REVIEW SOFTWARE

'Review' is a proprietary software package which allows the user to extract 'archive' data from one or more suitable instruments* and to present this data on a host computer, as if on a chart, or as a spreadsheet. The host computer must be set up as an ftp server (see Appendix C section C2 for a description of one way of doing this).

As described in the Review help system, 'Review' allows the user to set up a regular transfer of data (using ftp) from connected instruments into a database on the pc, and then from this database to the chart or spreadsheet. The chart/spreadsheet can be configured to include one or more 'points' from one or all connected instruments (where a 'point' is an umbrella term for channel, totaliser, counter etc.).

It is also possible to archive instrument history files to a memory stick, Compact Flash card etc. (depending on instrument type) and to use this to transfer the data to the pc.

Each type of instrument has its own remote user name and password configuration - for this instrument, the user name and password are both 'history.

*Suitable instruments are connected instruments, the archive files of which have the suffix '.uhh'.

4.3.8 Login

Login allows the user to enter a password in order to gain access to areas of the unit's configuration which are not available when the user is logged out.

LOGGED OUT ACCESS LEVEL

Logged out mode allows the user to select viewing mode, to view history, to view alarms, to toggle faceplate cycling on and off, to send notes, to suspend/resume USB archiving and to access the login process.

OPERATOR ACCESS LEVEL

In addition to the logged out features, Operator access level allows the user to acknowledge alarms, to edit notes and to perform demand archive operations.

By default, no password is required in order to enter Operator level, but a password can be set either at Supervisor level or at Engineer level. (See section 1)

Login (Cont.)

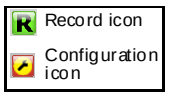
SUPERVISOR ACCESS LEVEL

In addition to the logged out level function, this access level allows the user to view the recorder's configuration, and to edit some values (such as alarm thresholds). By default, there is no password required to enter Supervisor level, but a password can be set in the Instrument area of configuration, either at Supervisor level or at Engineer level. (See section 1)

ENGINEER ACCESS LEVEL

This allows full access to all areas of the recorder configuration. The default password is 100, but this can be edited in the Instrument area of configuration (See section 1).

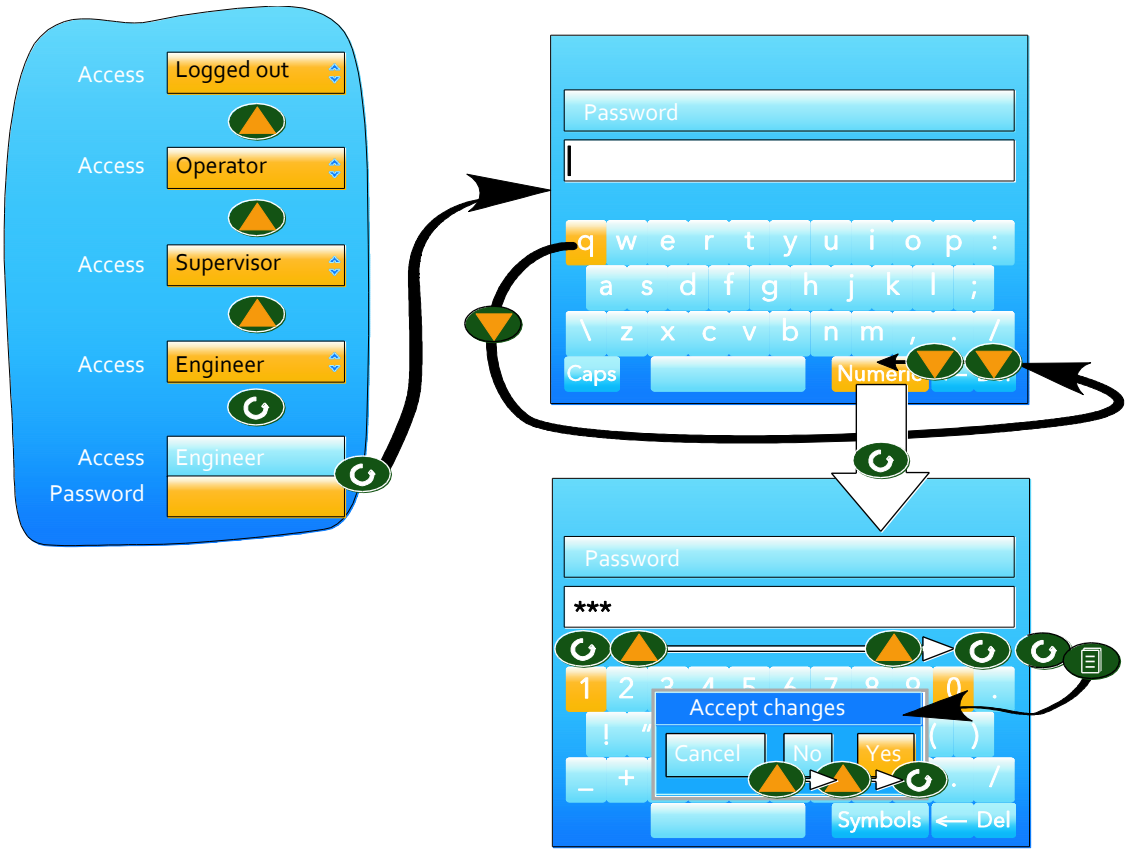
Note: recording is stopped for as long as the user is logged in at Engineer level, even if the recorder is not being configured. This is indicated by the Record icon at the bottom left corner of the process value display screen being replaced by the Configuration (wrench) icon.



LOGIN PROCEDURE

From the top level menu, use the up or down arrow keys as often as necessary in order to highlight 'Login', and then operate the Scroll key to produce the 'Access Logged out' display.

Note: this procedure describes how to login to an access level with a password associated with it. For non-password protected logins, the user needs only to select the required access level, and press the scroll key.



To log in as Engineer (See section 1):

1. Operate the up arrow key three times, to display 'Engineer'.
2. Press the scroll key to call the 'alpha' keyboard, with the letter 'q' highlighted.
3. Use the down arrow key three times to highlight 'Numeric'.
4. Operate the scroll key to display the numeric keyboard (numeral '1' highlighted.)
5. Use the up and down arrow keys to select the numbers and use the scroll key to enter them.
6. Use the Page key to call the confirmation display.
7. If the password entry is as required, use the up arrow twice (or the down arrow once) to highlight the word 'Yes' and operate the scroll key to confirm. The top level configuration menu appears. Otherwise, 'Cancel' can be used to clear the entry in order to start again, or 'No' can be used to quit login.

4.4 DISPLAY MODES

The following subsections describe the various display modes available to the user. By default, the 'Home' display mode is 'Vertical Trend', but this can be edited as a part of 'Instrument.Display' configuration. This configuration area also allows the user to disable one or more display modes should they not be required.

The current display mode can be chosen either by using the top level menu 'Go to View' item or, from any display mode, by scrolling through the enabled modes using the up or down arrow button.

Details of the various display modes are to be found in the following subsections:

Vertical trend	Section 4.4.1	Cascade	Section 4.4.8
Horizontal trend	Section 4.4.2	Programmer (inc. future trend)	Section 4.4.9
Vertical bargraph	Section 4.4.3		
Horizontal bargraph	Section 4.4.4	Promote list	Section 4.4.10
Numeric	Section 4.4.5	Modbus Master	Section 4.4.11
Alarm panel	Section 4.4.6	EtherNet/IP	Section 4.4.12
Control loop 1/2	Section 4.4.7		

4.4.1 Vertical Trend

In this mode, channel values are traced as though on a chart rolling downwards (i.e with the latest data at the top). The chart speed, and the number of major divisions are configured in the 'Group.Trend' area of configuration (5.2.1).

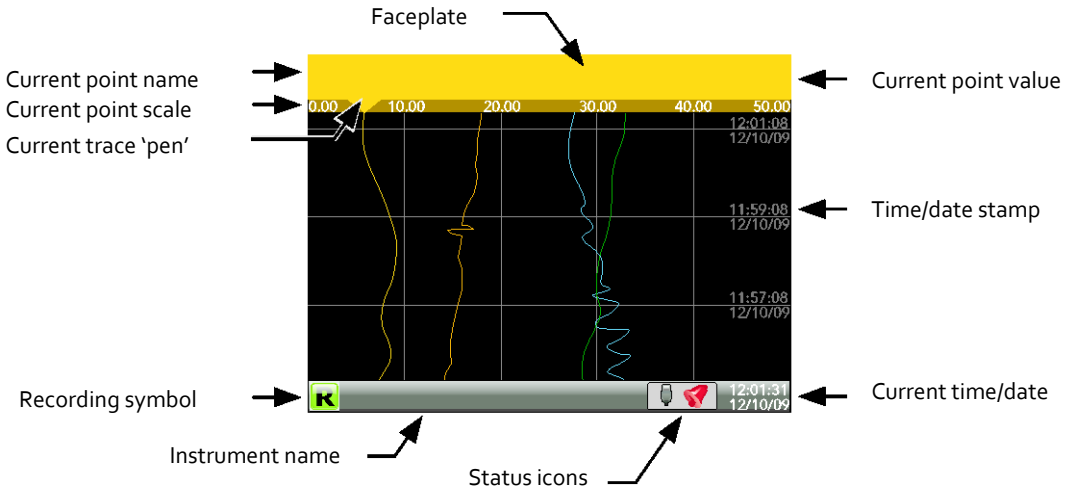


Figure 1.4 Vertical trend mode display elements

One of the channels is said to be the 'current' or 'scale' channel. This channel is identified by its pen icon being displayed, and by the channel descriptor, dynamic value and its scale being displayed on a 'faceplate' across the width of the display, above the chart.

Each channel in the Group becomes the 'current' channel in turn, for approximately five seconds -i.e. the channels are cycled through, starting with the lowest numbered channel. Once the final channel in the Group has been displayed for five seconds, the first channel is returned-to and the process repeats. This scrolling behaviour can be enabled/disabled from the top level menu 'Faceplate Cycling (Off)' item described in Section 4.3.5

The scroll button can be used to cycle through the channels manually in both Faceplate cycle on and off modes.

Use of the up arrow button causes the next enabled display mode to be entered (default = horizontal trend).

The page key calls the top level menu.

4.4.2 Horizontal Trend mode

This view is similar to the vertical trend mode described in section 3.4.1 above, except that the traces are produced horizontally rather than vertically. Initially, as each channel appears, its scale appears at the left edge of the display (as shown below), but in order to show the maximum amount of trend data, the scale is overwritten after a few seconds.

By default, after a few seconds, the 'chart' expands leftwards to hide the scale.

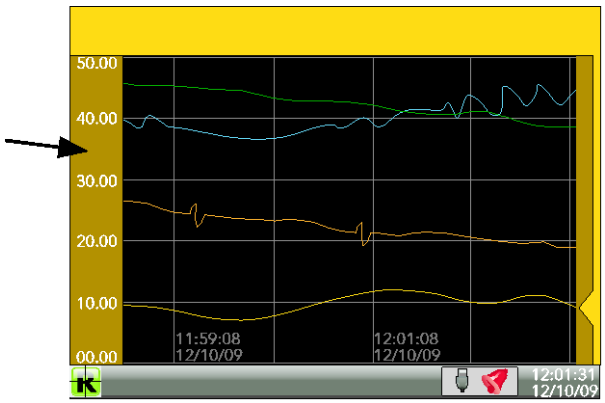


Figure 1.4.2 Horizontal trend display mode

Note: Timestamps appear to the right of the gridline to which they relate

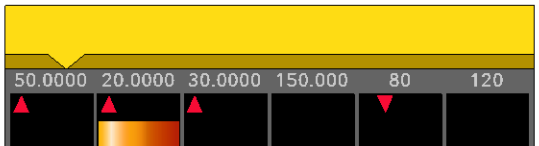
Use of the up arrow button causes the next enabled display mode to be entered (default = vertical bargraph). Use of the page key calls the top level menu.

4.4.3 Vertical Bargraph mode

This display mode shows the channel values as a histogram. Absolute alarm threshold values appear as lines across the bars, grey if the alarm is not triggered; red if the alarm is triggered. Alarm symbols appear for active alarms.

Bargraph widths for four to six channels divide the width of the display screen equally between them. For one and two channels, the width is fixed, and the bars are centred on the screen. Figure1.4.3 shows some examples (not to the same scale).

Full scale value
Active alarm symbol



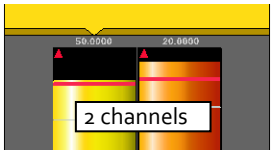


Figure 1.4.3 Vertical bargraph display mode

Use of the up arrow button causes the next enabled display mode to be entered (default = horizontal bargraph). Use of the page key calls the top level menu.

4.4.4 Horizontal Bargraph mode

Similar to the Vertical bargraph mode described in Vertical Bargraph mode above, but includes channel descriptors.

The scroll button toggles the text between point descriptor (as shown) and point value.

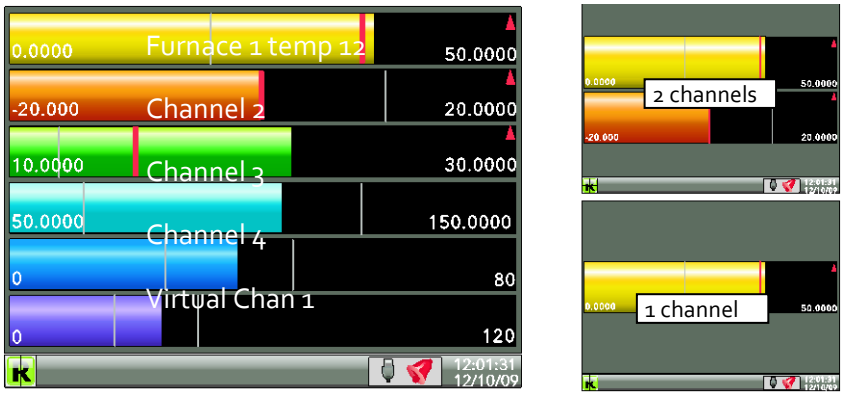


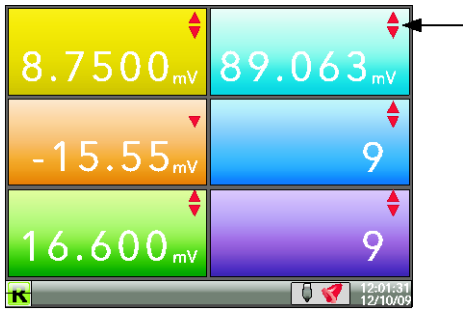
Figure 1.4.4 Horizontal bargraph mode

Use of the up arrow button causes the next enabled display mode to be entered (default = numeric).

Use of the page key calls the top level menu.

4.4.5 Numeric mode

Shows the enabled channels' values along with their descriptors and with indications of the type(s) of alarm configured for each channel.



Alarm type indication (table 1.2.1)

Figure 1.4.5a Numeric display mode (six enabled channels)

The figure above shows an example where the Trend group contains six channels. Figure 1.4.5b shows how the display appears for trend groups with fewer than six channels configured.

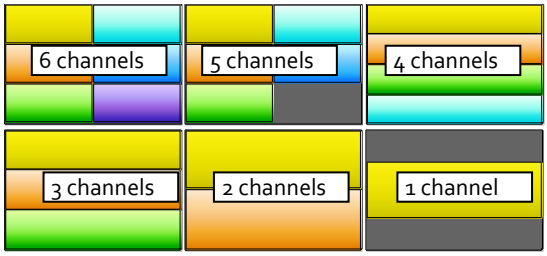


Figure 1.4.5b Display layout for different numbers of channels

The up arrow button returns to the vertical trend display mode; the page key calls the top level menu.

4.4.6 Alarm panel

This display appears only if enabled in the Instrument Display configuration. Alarm panel mode shows current value and alarm status for each channel enabled in the Trend Group. The status is shown in two ways, by the colour of the relevant bar, and by the alarm status indicators.

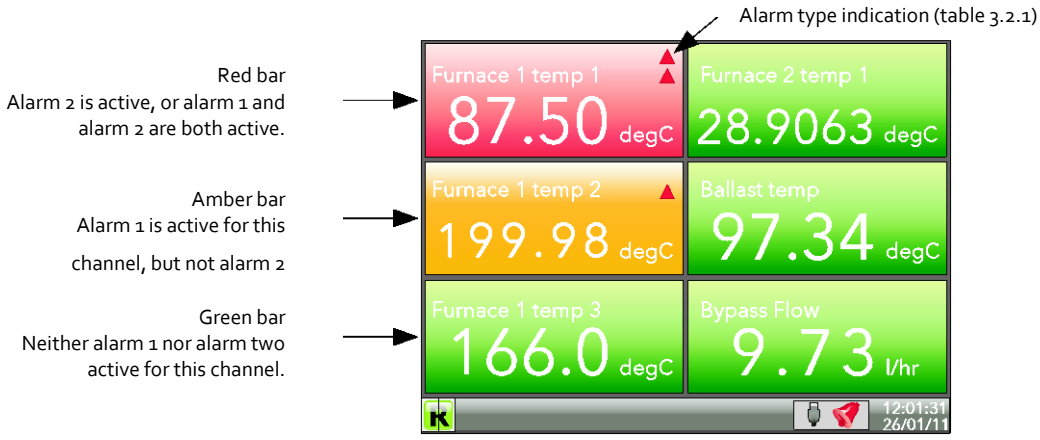


Figure 1.4.6a Alarm panel display (six channels)

The figure above shows an example where the Trend group contains six channels. Figure 1.4.6b shows how the display appears for trend groups with fewer than six channels configured.

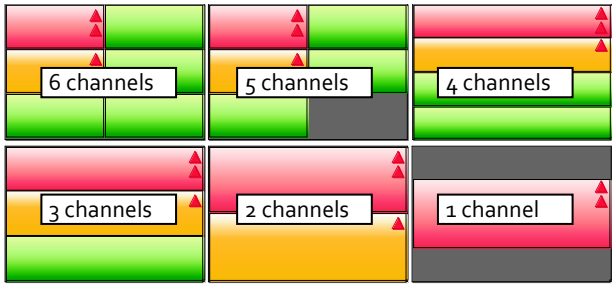


Figure 1.4.6b Alarm panel display layouts for trend groups with fewer than six channels

4.4.7 Control Loop1/Loop2

These displays appear only if the controller option is enabled.

The loop display modes are interactive, in that the setpoint, the Auto/Manual mode and the Manual Output value can be edited from the user interface. Full configuration is carried out in the Loop setup menus and a fuller description of control loops is to be found as Appendix B to this manual.

Figure 1.4.7 depicts a single loop display and the dual loop display. The up and down arrow keys are used as normal to scroll through Loop1, Loop2 and Dual loop pages.

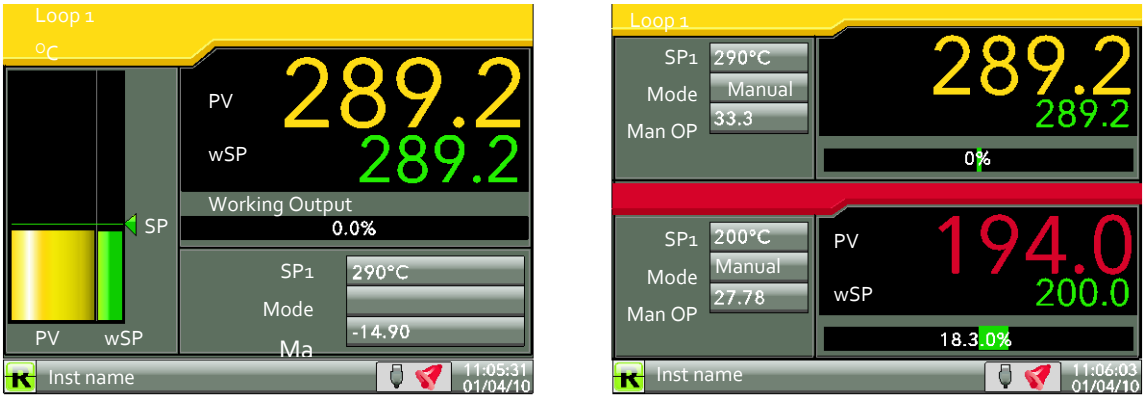
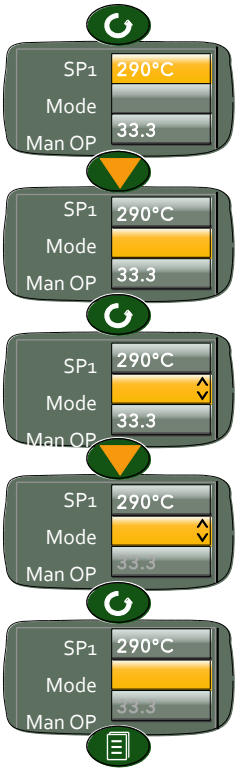


Figure 1.4.7 Loop displays

Note: The colours associated with the loops are those of the channels to which they are wired.

EDITING TECHNIQUES



1. With the loop page on display, operate the Scroll key. This highlights the first editable item (SP1). The scroll order includes both loop1 and loop 2 parameters in the dual loop display.

2. Use the up and down arrow keys to select the required field for editing. When the required field is highlighted, operate the scroll key again, to enter edit mode.

3. Use the up/down arrows to edit the current setting.

4. Operate the scroll key to confirm the edit.

5. Select a further parameter for editing, or operate the page key to return to normal operation.

Note: Edit permissions for Setpoint, Auto/Manual and Manual Output Access are set in the Loop Setup configuration menu.

4.4.8 Cascade Display Mode

This display mode appears only if 'Cascade' has been enabled in the Instrument.Display area of configuration. See also Advanced Loop configuration.

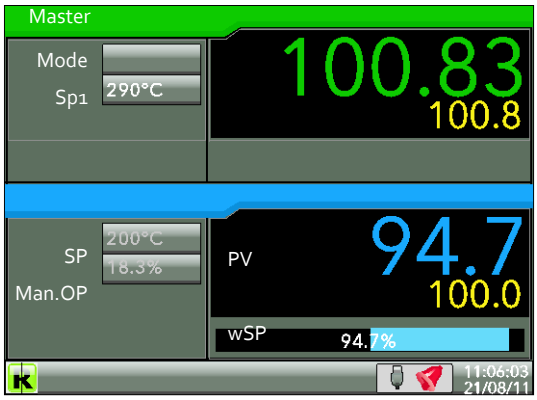


Figure 1.4.8a Cascade display mode

Operating the scroll button highlights the Master 'Mode' field. Operating the scroll button again, enters edit mode allowing the user to use the up/down arrow buttons to scroll through the available modes. Once the required mode appears, a further operation of the scroll button confirms the entry and quits edit mode.

Once out of edit mode, the down arrow key can be used to select Master 'SP1', Slave 'SP' and Slave 'Man OP'. The Mode selected determines how many of these items are editable by the operator.

Mode	Cascade: The master loop is in auto mode and provides the slave setpoint. Changing modes causes the slave to switch to the local slave setpoint. Slave: A simple single loop controlling with a local setpoint. Manual: Provides a single manual % power output.
SP1	Setpoint 1 is the primary setpoint of the controller. If the controller is in automatic control mode, then the difference between the setpoint and the process variable (PV) is continuously monitored by the control algorithm. The difference between the two is used to produce an output calculated to bring the PV to the setpoint as quickly as possible without causing overshoot.
SP	The slave setpoint, either local (Manual or Slave mode) in which case it can be edited, or supplied by the master loop (Cascade mode), in which case it is not editable.
Man.OP	The percentage output power to be applied when in Manual mode (100% = full on; 0% = off).

Note: The default loop names ('Master' and 'Slave') can be replaced by user-entered strings of up to 10 characters in Advanced Loop Setup configuration.

4.4.9 Programmer Display Mode

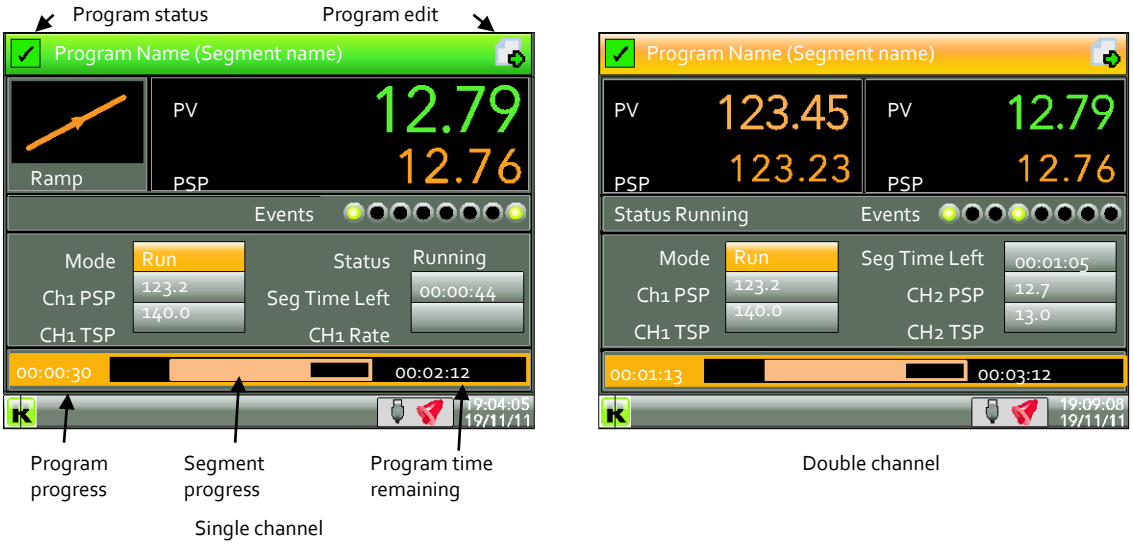


Figure 3.4.9a Programmer displays (typical)

This display mode (if enabled) allows the user to monitor the progress of a single or dual-channel setpoint program, and if logged-in as 'Operator*', to reset or run the program. The program itself is created in the Program edit page (described below) and in Programmer configuration or 'iTools'.

*Note: Operator is the default access level.

The displays contain the following features:

Program name	This is the name of the loaded program. If the program has been modified since being saved, an asterisk (*) appears after the name. Default background colour shown. This colour changes to that assigned to the input channel when this is configured.
Segment name	This is the name of the current segment. If not named in Segment configuration, then the segment number appears instead.
Program status	At the top right hand corner of the display, this can be any one of the following:  The program is running (or ran last time) without any PV 'Alarm' events or user intervention.  The user has intervened in the running of the program, by placing it in 'hold' or 'reset', or by advancing a segment, or by adjusting a duration, target setpoint, ramp rate or time-to-target value.  A PV 'Alarm' Event has activated. A PV 'Alarm' Event is an absolute high/low or a deviation alarm on the PV input.  There is no program loaded, or if a program is loaded, it has not yet run.
Program edit	 This icon appears for users with appropriate access permissions, to indicate that setpoint programs can be configured (as described in Program edit, below).
Segment type	For single channel displays, this indicates the type of segment currently being run:  Dwell. The segment value remains constant for the duration of the dwell period.  End (dwell). Displayed on completion of the program. The segment value remains at the final value until rese  End (reset). Displayed on completion of the program. The program resets.  Ramp. The segment value ramps at a fixed rate or over a fixed period to the Target setpoint. Ramp up icon shown; ramp down is similar but inverted.  Step. The segment value switches immediately to the new Target setpoint. Step down shown; step up similar but inverted.  Wait. The segment value remains constant until the wait criteria are satisfied

Programmer Display Mode (cont.)

PV	The current process value of the signal wired to Ch1(2) PV Input.
Ch1(2)PSP	This is the output setpoint from the programmer for the channel. In reset this value tracks the configured servo parameter.
Ch1(2)TSP	The channel target setpoint. The target set-point may be edited while the program is in hold (in such cases, for ramp rate segments the time remaining is recalculated.
Events	Up to eight events can be configured in the Program Edit page. Any one or more of these events may be deemed to be active for the duration of each individual segment.
Mode	Shows the current run mode of the program. If the user has the correct access level, the mode can be set to 'hold', reset' etc. by using the scroll key twice (first to highlight the run mode, then again to enter edit mode) and then using the up/down arrow keys to select the required mode. Run, reset, hold etc. can also be selected by inputs from other parameters, switch inputs etc.
Status	Shows the status of the current segment.
Ch1 Rate	The channel 1 rate-of-change of segment value for 'Rate' ramp segments.
Ch1 Time	Shows the channel 1 duration configured for the segment to ramp, dwell etc. for 'Time' ramp segments. For two-channel programs, see the note below.
Seg Time Left	Shows the time that the segment has to run before completion.
Program progress	The numerals show program elapsed time, and the bar gives an indication of progress so far. For two-channel programs, see the note below.
Segment progress	For each segment as it runs, this gives a visual indication of the proportion of total segment time which has elapsed so far. For two-channel programs, see the note below.
Program time remaining	Shows the time remaining until the program completes. For two-channel programs, see the note below.

Note: For two-channel programs, in 'Hold' mode, the 'program progress', 'segment progress' and 'program time remaining' areas of the display are replaced by 'Ch1 Time' and 'Ch2 Time', as shown below.

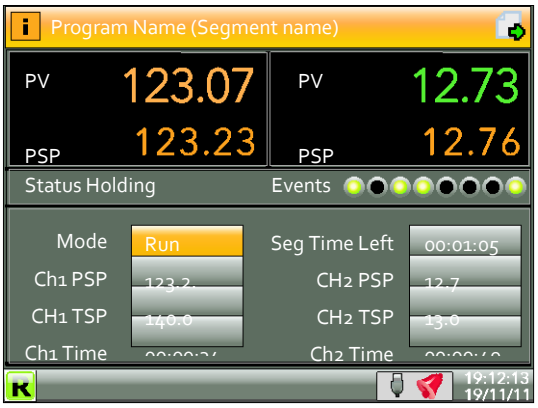


Figure 3.4.9b two channel program in Hold mode

Programmer Display Mode (cont.)

PROGRAM RUN/RESET/HOLD

Programs can be controlled by users with the correct access level (defined in Programmer configuration. The display page is placed in edit mode by operation of the scroll key ('Mode' highlights). A second operation of the scroll key followed by operation of the up/down arrows allows the user to select 'Run', 'Hold' or 'Reset'. A further operation of the scroll key initiates the selected action.

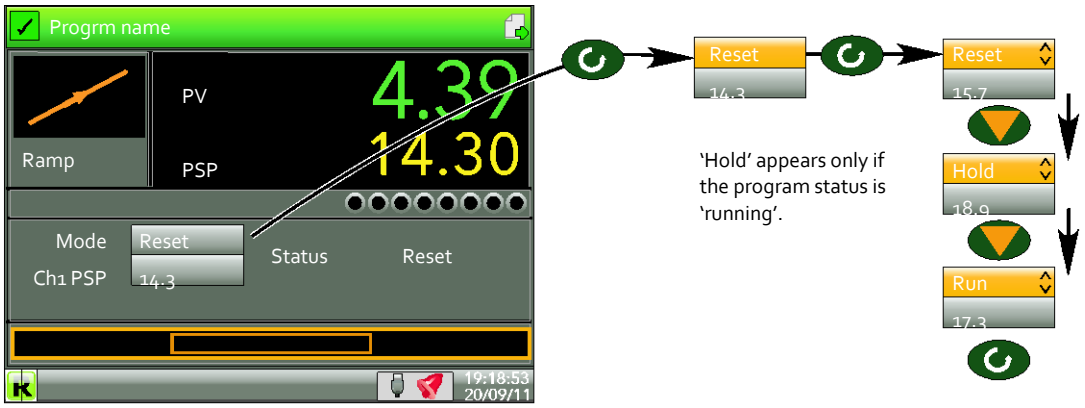


Figure 1.4.9c Setting the Mode

Notes:

1. These functions can also be carried out by wiring relevant inputs to the 'Run', 'Hold' or 'Reset' parameters in Programmer configuration.
2. The user must have either 'Logged off', 'Operator' or 'Supervisor' level access as defined in 'Prog Mode Access' in the Programmer. The program cannot run if the unit is logged into at 'Engineer' level.

Programmer Display Mode (cont.)

PROGRAM EDITING

The program edit page is accessed by operating the scroll button once to highlight the Mode, then using the up arrow key to highlight the page symbol at the top right hand corner of the display and then the scroll button again to enter the program editor.

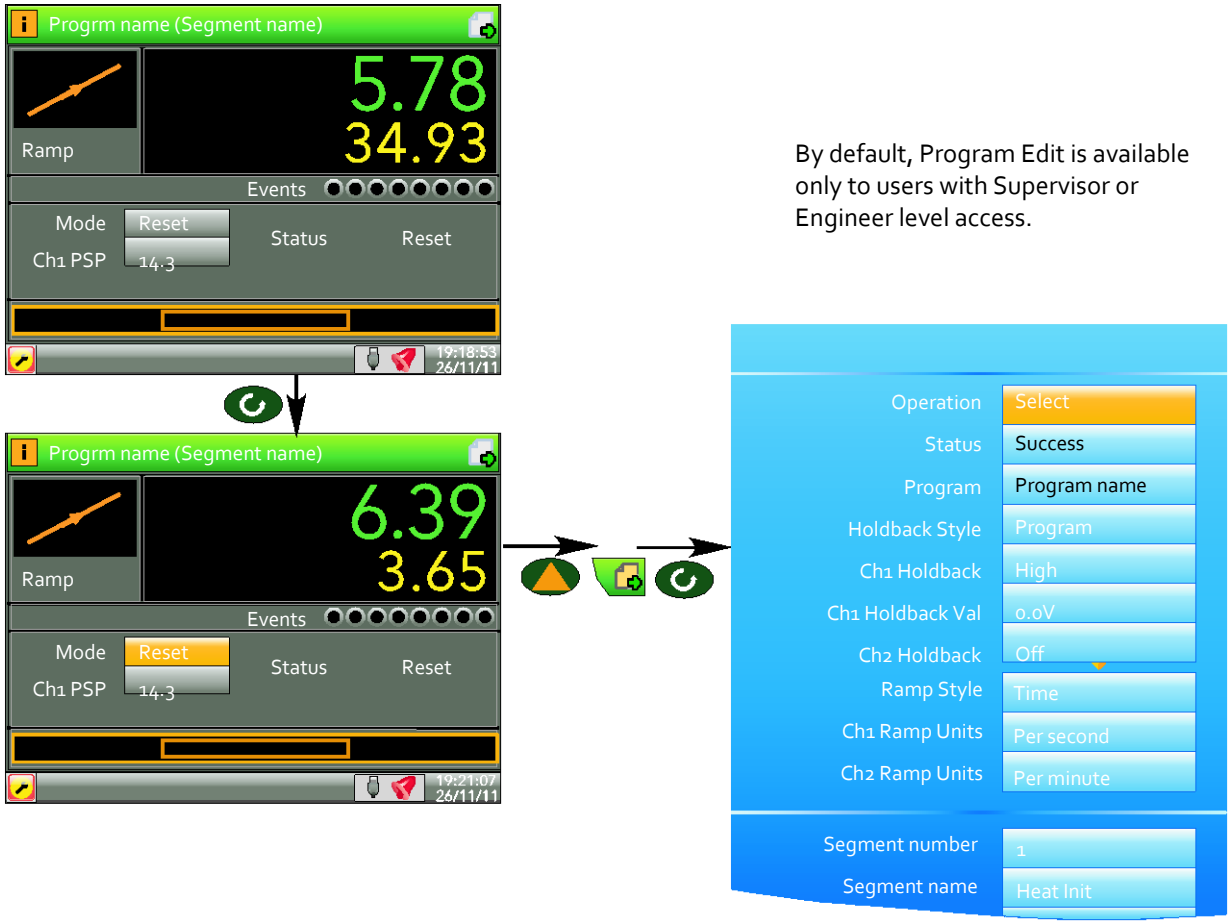


Figure 1.4.9d Access to the program editor

As can be seen from the figure above, the initial Program Edit page is divided into two areas - the top part contains program details; the lower part (figure 1.4.9f) contains individual segment details. The editable items that appear in the program details area depend on the features enabled in the Programmer Features configuration menu.

Note: Access to some program operations is restricted to users with the correct access level, as defined in the 'Prog Mode Access', the 'Prog Edit Access' and the 'Prog Store Access' parameters in the Programmer. Access to some items also depends on whether or not the program is running.

Programmer Display Mode (cont.)

PROGRAM DETAILS

Operation	This allows the user to select one of the following (see also 'Program Store): Load. Opens the program store and allows the user to select a program to be loaded. The program must have the same number of channels as defined in Programmer.Set Up Store. Allows the current program to be saved to the internal program drive. This is useful if you wish to snapshot the current program and store this under a different program name. Delete. Allows the selected program to be deleted. Delete All. Deletes all programs. Copy. Copies the selected program for 'pasting' either from the internal drive to the USB device, or *vice-versa*. This is useful if you wish to transfer a program to other nanodac instruments. Copy All. As above, for 'Copy', but copies all the programs in the selected directory.

Note: If a 'Store', 'Copy' or 'Copy All' operation would result in there being a total of more than 100 program files in the internal drive, the operation fails and an error message is displayed.

Status	Success. Previous operation was successful. Failed. Previous operation failed. Loading. The program is loading. Copying. The program copy process is underway. Deleting. The relevant program is being deleted.
Program	The name of the program currently loaded.
Holdback Style	Appears only if 'Holdback' is enabled in the Programmer Features configuration. See also 'Holdback', below. Program: Holdback applies to all appropriate segments. Per Segment: Holdback enabled on a segment by segment basis as described in 'Segment configuration below.
Ch1 Holdback	Appears only if 'Holdback Style' (above) is set to 'Program'. Off: Holdback is disabled Low: Holdback is entered when PV < (PSP - Holdback Value) High: Holdback is entered when PV > (PSP + Holdback Value) Band: Holdback is entered when PV < (PSP - Holdback Value) or PV > (PSP + Holdback Value)
Ch1 Holdback value	The value to be used in triggering holdback.
Ch2 Holdback	As for Ch1 Holdback, above but for channel 2. Appears only if 'Channels' is set to '2' in Programmer Set Up configuration.
Ch2 Holdback value	As for 'Ch1 Holdback value', above, but for channel 2. Appears only if 'Channels' is set to '2' in Programmer Set Up configuration.
Ramp Style	Ramp style applies to all ramp segments in the program. Ramp Style can be edited only when the program is in Reset mode. Setpoints, rates, times etc. are set in the individual segment configurations Rate. A Ramp Rate segment is specified by a target set-point and the rate at which to ascend/descend to that set-point. Time. A Ramp Time segment is specified by a target set-point and a time in which to achieve that set-point.
Ch1 Ramp Units	Select 'Per Second', 'Per Minute' or 'Per Hour' for ramp timing units. Ramp Units can be edited only when the program is in Reset mode.
Ch2 Ramp Units	As for 'Ch1 Ramp Units' above. Appears only for two channel programs and allows different ramp units to be selected for the two channels, if required. Ramp Units can be edited only when the program is in Reset mode.

Programmer Display Mode (cont.)

PROGRAM DETAILS (Cont.)

HOLDBACK

Holdback pauses the program (freezes the Programmer setpoint (PSP) and the time remaining parameters) if the difference between the Process value (PV) and the PSP exceeds a user-specified amount (Holdback value). The program remains paused until the PV returns to within the specified deviation.
In ramp or step segments, holdback indicates that the PV is lagging the SP by more than the specified amount and that the program is waiting for the process to catch up. In a dwell segment, holdback is used to guarantee that a work piece stays at set-point within a specified tolerance for the specified dwell duration.

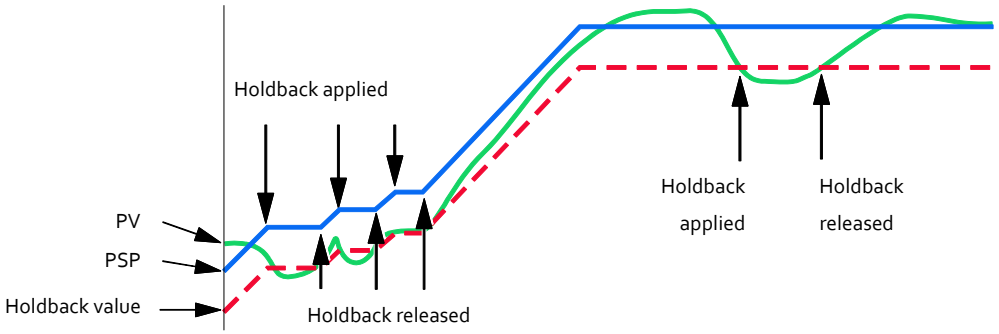


Figure 1.4.9e Holdback

SEGMENT CONFIGURATION

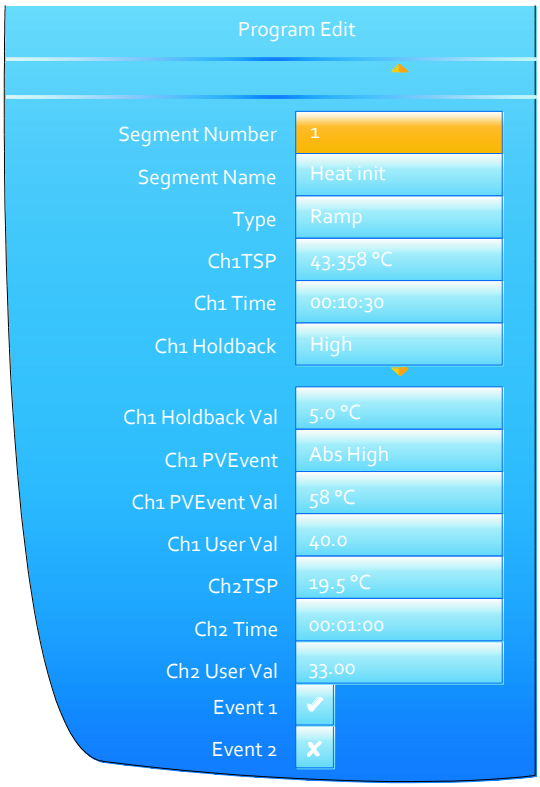


Figure 1.4.9f Segment configuration

Segment Number Select the relevant segment for configuration.

Segment Name	Enter a segment name of up to 20 characters. This name will be truncated on the display page if it, together with the program name are too long to fit the width of the display area.

Programmer Display Mode (cont.)

SEGMENT CONFIGURATION (Cont.)

Type	Select a segment type. Default is 'End'.
	Ramp. For any program, Ramp segments can be either 'Ramp Rate' segments or 'Ramp Time' segments according to the 'Ramp Style' setting described above. See also 'Ch1(2) Time' or 'Ch1(2) Rate', below.
	Dwell. The setpoint is maintained at its current value for the period defined in 'Duration' (see below).
	Step. A step segment allows a step change to be entered for the target set-points Ch1 TSP and Ch2 TSP.
	Wait. A wait segment causes the program to wait for a certain event to occur before continuing. See 'Wait For', below.
	Go Back. A Go Back segment allows a specifiable number of iterations to be performed of a group of segments. This could be used, for example, to cycle an entire program by having a Go Back segment immediately before the end segment and specifying segment 1 as the 'Go Back To' point. Setting 'Cycles' to 'Continuous' causes the program to loop indefinitely, until interrupted by the user. 'Nested' loops are not permitted i.e. 'Go Back' is not available as a segment type for segments inside an existing GoBack loop.
	End. The final segment of a program allows the user to select 'Dwell' or 'Reset' as the action to be taken at the end of the program (see 'End Type', below)
Ch1(2) TSP	Target setpoint. The value that Ramp or Step segments seek to attain, for channel 1(2).
Ch1(2) Rate	For Ramp Rate segments, this specifies the speed at which the process value ramps towards the target, for Channel 1(2). The ramp units (per second, per minute, per hour) are set in Ch1(2) ramp units described above.
Ch1(2) Time	For Ramp Time segments, this allows the user to specify the time to be taken by the segment for the process value to reach the target.
Duration	For Dwell segments, this allows the entry of the time for which the segment dwells.
Go Back To	For 'Go Back' segments, this defines the number of the segment to which the program is to return.
Cycles	The number of times the 'Go Back' instruction is to be carried out. If set to 'Continuous', the program continues until the user intervenes to stop it.
End Type	Allows the user to select the action to be taken at the end of the program:
	Dwell: the set-point is maintained indefinitely and event outputs remain at their configured state.
	Reset: the set-point reverts to the value used by the control loop before the program was started and the event outputs return to their default states.
Wait For	Digital High: Wait segments can be configured to wait for 'Wait Digital' to go 'high' before allowing the program to continue.
	Analog 1(2): The segment waits for 'Wait Analog1(2) to meet an Absolute High or Low, or Deviation High or Low condition before allowing the program to continue.
	Analog Both: As Analog 1(2) above, but waits for both Channels' conditions to be true before continuing.

Note: 'Wait Digital', Wait Analog 1' and 'Wait Analog 2' parameters are configured in the Programmer.Set Up menu.

Ch1 Wait	Select 'Abs High', 'Abs Low', 'Dev High' or 'Dev Low' as the wait criterion for channel 1. Appears only if 'Wait For' (above) is set to 'Analog 1' or 'Analog Both'.
Ch2 Wait	Select 'Abs High', 'Abs Low', 'Dev High' or 'Dev Low' as the wait criterion for channel 2. Appears only if 'Wait For' (above) is set to 'Analog 2' or 'Analog Both'.
Ch1(2) Wait Val	Enter the trigger value for 'Ch1(2) Wait'

Ch1(2) Holdback	Select 'Off', 'Low', High', or 'Band' (see description in Program details above).
Ch1(2) Holdback Val	The value to be used in triggering holdback.
Ch1(2) PV Event	Appear only if 'PV Events' have been enabled in the Programmer Features menu. A PV Event (an analogue alarm on the channel PV) is available for each channel in every segment (excluding Wait and Go Back segment types). The following PV Events are supported: Off: The PV Event is disabled Abs High: The event is triggered when the channel PV exceeds PVEvent Val for the relevant channel. Abs Low: Triggered when the channel PV becomes less than PVEvent Val for the relevant channel. Dev High: This event is triggered when the channel PV exceeds (PSP + PVEvent Val) for the relevant channel Dev Low: Triggered when the channel PV becomes less than (PSP - PVEvent Val) for the relevant channel. Dev Band - This event is triggered when the channel PV differs from the PSP by more than the configured deviation value (either above or below) In the following example, in segment 1 Ch1 PV Event has been configured as Dev Band and in segment 2 it has been configured as an Abs low:

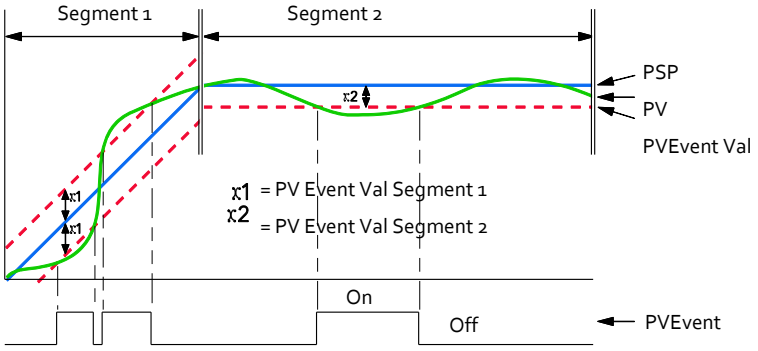


Figure 1.4.9g PV Events

Ch1 PVEvent Val	Appears only if 'Ch1 PVEvent' is not 'Off'. Sets the level at which Ch1 PV Event becomes active.
Ch2 PVEvent Val	Appears only if 'Ch2 PVEvent' is not 'Off' and if 'Channels' is set to '2' in Programmer Set Up configuration. Sets the level at which Ch2 PV Event becomes active.
Ch1 (2) Event Use	When PV events become active, they can be used either to Trigger a secondary process or as a simple analogue alarm on the PV input. Appears only if the relevant PV Event parameter is not set to 'Off'.
Ch1 (2) User Val	Specifies the User Value for this segment, for channel 1(2). Appears only if 'User Value' has been enabled in the Programmer Features menu. The example below (from iTools) shows this parameter wired to the trigger 1 input of the Custom Messages block, so that, if a User value >0 is entered, then every time the segment runs, Custom message 1 is generated.
Event 1 to 8	The number of Events available (Max Events) is defined in Programmer Set Up configuration. Enabling an event causes the relevant indicator on the display page to be illuminated for the duration of the segment. As with 'User Val', above, Events can be wired to the inputs of other parameters if required.

Programmer Display Mode (cont.)
SEGMENT CONFIGURATION (Cont.)

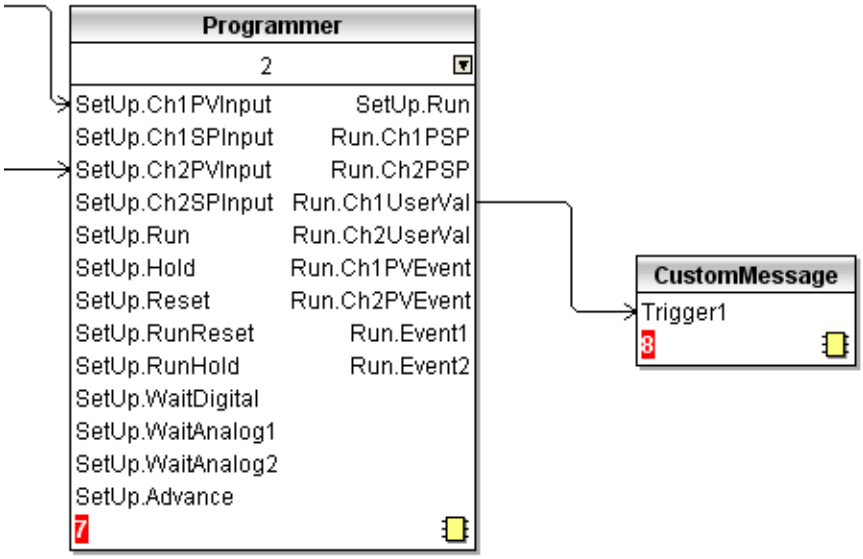


Figure 1.4.9h iTools example showing Ch1 UserVal being used to trigger custom message 1.

FUTURE TREND DISPLAY MODE

If enabled in Instrument.Display configuration, this allows the user to view the actual value of the PSP alongside the expected value, so the two can be compared to see how the process is performing.

Future trend is an enhancement of the horizontal trend mode, with the display being divided into two parts, with the instantaneous current value located at the divide, with past trends to the left and the next few program segments to come, to the right.

Notes:

1. For the future trend mode to appear, the programmer must be wired to the loop or advanced loop feature.
2. Both historic and future trends move from right to left with the present anchored at the screen centre.
3. The amount of history and of future trending displayed on the screen depends on the trend interval set in Group.Trend configuration (Section 5.2.1)

Figure 1.4.9i shows a typical future trend display

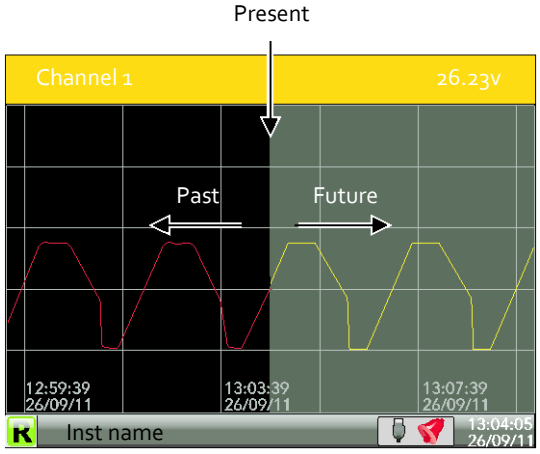


Figure 1.4.9i Future trend display

Programmer Display Mode (cont.)

PROGRAM STORE

Note: The access levels required for the operations described below are configured in the Programmer Set Up menu 'Prog Edit Access' and 'Prog Store Access' parameters.

The program store allows access to the instrument's local program storage area and to programs stored on a USB memory stick (if any) and to those stored in a pc (if any), via FTP. Programs may be saved to (Stored) or retrieved from (Loaded) from the program store, or they can be copied or deleted.

Selecting any of the program operations (except 'Delete All'), from the Program Edit page (Engineer access level required) opens the file explorer page. Figure 1.4.9j depicts this page, with just a couple of example entries after a 'Load' operation has been requested.

On entry, use the up/down arrow button to select 'User', 'USB' or 'FTP' (selection highlights yellow), then use the scroll button to confirm. Use the up/down arrow buttons to select the required file, and then use the scroll button again to confirm. Other operations are similar.

The file explorer supports 100 entries, which may be directories or files.

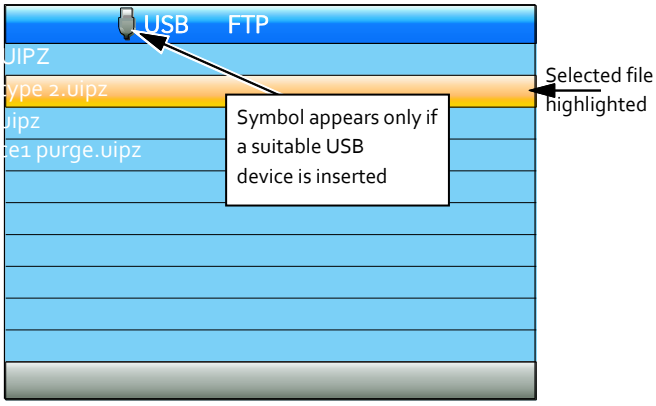


Figure 1.4.9j Program store display

Note: A 'busy' icon (rotating green flash) appears whilst directory listings are being accessed.

PROGRAM LOAD - QUICK ACCESS

From firmware version V5.00 and above a quick selection of an internally stored program may be made directly from the Program Summary page. The programmer must be in Reset. Press and hold the scroll key for 2 seconds. The page will go immediately to the file explorer page with the 'User' drive selected and the 'Operation' parameter set to 'Load'. The first program file will be selected (assuming different programs have been configured). Use the Up/Down keys to select the required program followed by the scroll key to load it.

If the selected file cannot be loaded (for example, the programmer file is for a different number of channels) then an error message is shown on the file explorer.

The Quick Access to load mode adheres to the access security settings set in configuration mode - Programmer set up.

Note: Quick load is disabled when in Edit mode. This is indicated by the highlighted parameter showing the raise/lower symbol to the right of its value.

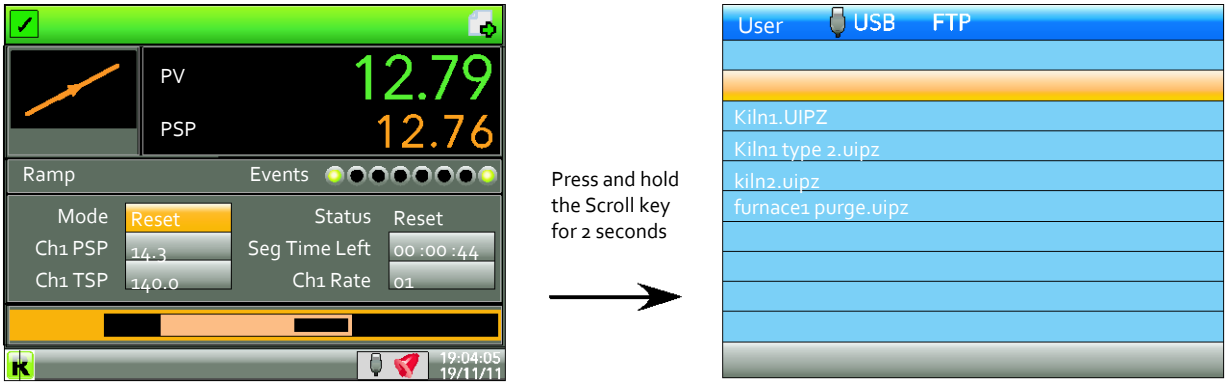


Figure 1.4.9k Program load display

PROGRAM LOAD VIA A PROGRAM NUMBER

This feature has been added to firmware versions V5.00 and above.

To allow a program (stored as a file) to be loaded, either via a BCD switch, wired to a set of digital inputs, or via a single comms transaction, it is necessary to prefix the progam name with a program number in the range 01 to 99. For example, 01kiln1.uipz, 01furnace.uipz, 02kiln2.uipz, 03kiln3.uipz etc. The program name can consist of up to 18 characters. Note that program numbers 1 to 9 must be entered as 01 to 09 otherwise they will not be recognised by the switch or via comms.

On value change of the program number, the first program file with the prefixed number in the instrument's internal User drive (listed lexographically) will be loaded. In the above example if program 01 is selected, 01furnace.uipz will be loaded, 01kiln1.uipz will not be loaded using the BCD switch or through comms. It can, of course, be loaded manually.

If no program number is prefixed it is not possible to load the program via the BCD switch or via comms. It is, however, still possible to load the program by selecting the file as described in the previous section.

Note: When a BCD switch is turned from its current value to another value, intermediate switch positions may be seen on the inputs of the BCD function block and could potentially be used by subsequent blocks wired from the BCD input. A Settle Time parameter has been introduced which will in effect filter out these intermediate values by applying a time in which the inputs can settle before their converted decimal value is seen on the output parameters of the block. The Settle Time can be set from 0-10seconds with a default of 0s i.e. no filtering as in previous firmware versions.

EXAMPLE BCD SWITCH WIRING

Figure 1.4.9l below shows an example of using digital input channels soft wired to the BCD function block using iTools.

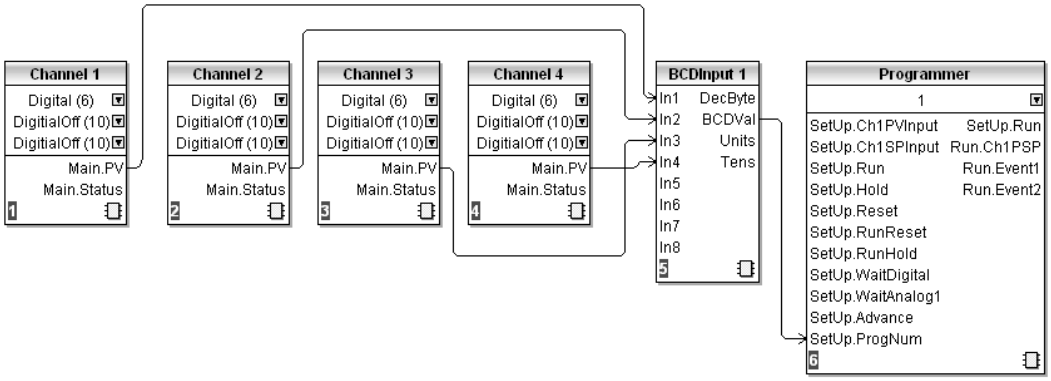


Figure 1.4.9m below shows the corresponding hard wiring of a BCD switch.

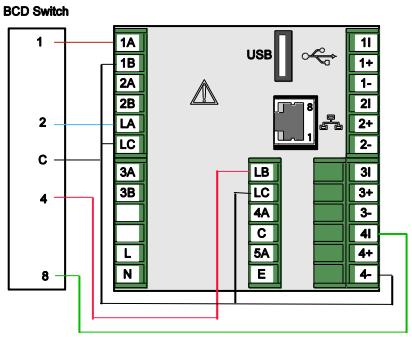


Figure 1.4.9m BCD Switch Physical Wiring

4.4.10 Promote List

This display page allows the user to display up to 10 of the parameters that appear anywhere in the operator interface. The parameters can be selected only by using iTools, as described below.

Notes:

1. 'Promote List' must be enabled (in 'Instrument.Display' configuration), before it appears in the 'Go to View' list.
2. There are more parameters visible in iTools than appear at the operator interface. If non-operator interface parameters are selected for inclusion in the promote list, they do not appear.
3. If parameters which appear only in certain circumstances are selected, then they appear in the promote list only when they appear in the Operator interface. For example, a channel PV is not visible unless that channel is enabled (i.e. it is not 'Off').

PARAMETER SELECTION

1. Open iTools and scan for the instrument, (see Section 6.2).
2. Once the instrument has been found, stop the scan. When the instrument has synchronised, click on the 'Access' button near the top of the display to set the unit into configuration mode (a password may be required).
3. Click on the '+' sign to the left of the Instrument folder in the tree list (left-most pane) to expand the folder. Double-click on 'Promote List', to display the Promote list in the main pane. The list contains 20 entries, 1 to 10 being for parameters, 11 to 20 being available to the user to add descriptors for parameters 1 to 10 respectively.
4. Expand further folders, as necessary, to access the required parameters, and click-drag these parameters into the promote list. Enter a descriptor for the parameter if the default is not as required. As each parameter is dragged into the list, it appears in the Promote list.
5. If the parameters are modified at the operator interface, the changes are reflected in iTools, and *vice-versa*.
6. Once all the parameters have been added, it is recommended that the Access button be used to quit configuration mode, as otherwise it will not subsequently be possible to quit from the operator interface.

Figure 1.4.11 shows typical displays.

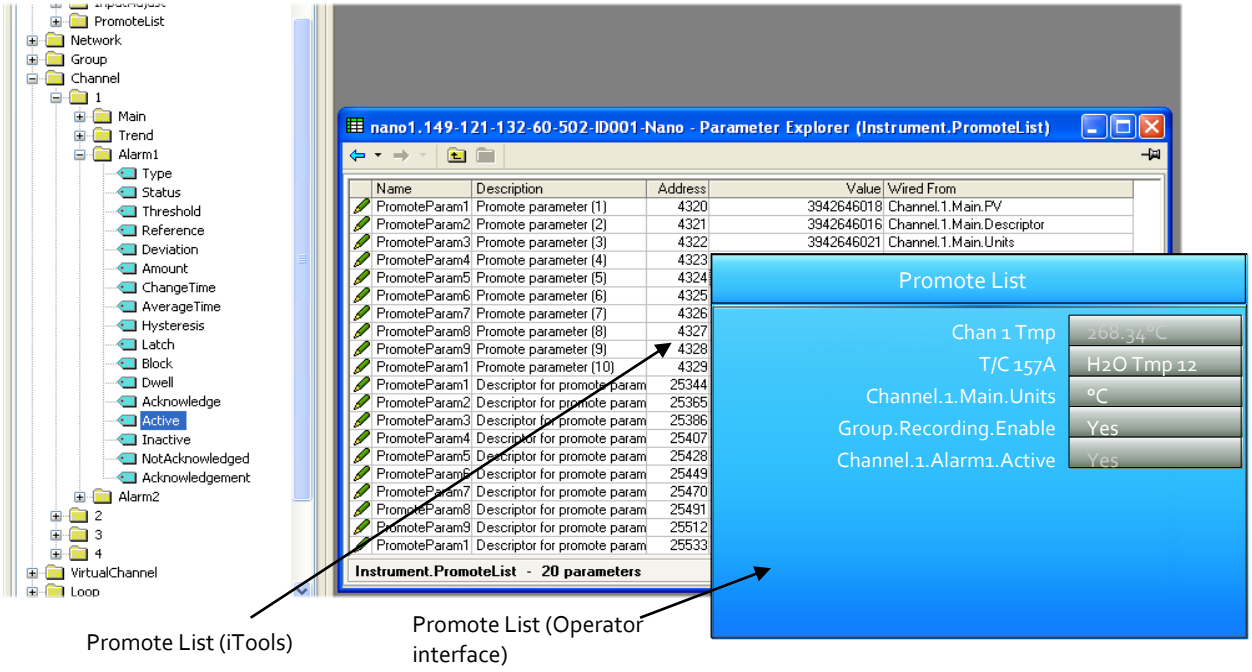


Figure 1.4.11 Promote list displays.

4.4.11 Modbus Master display mode

This display mode consists of two pages, as shown below.

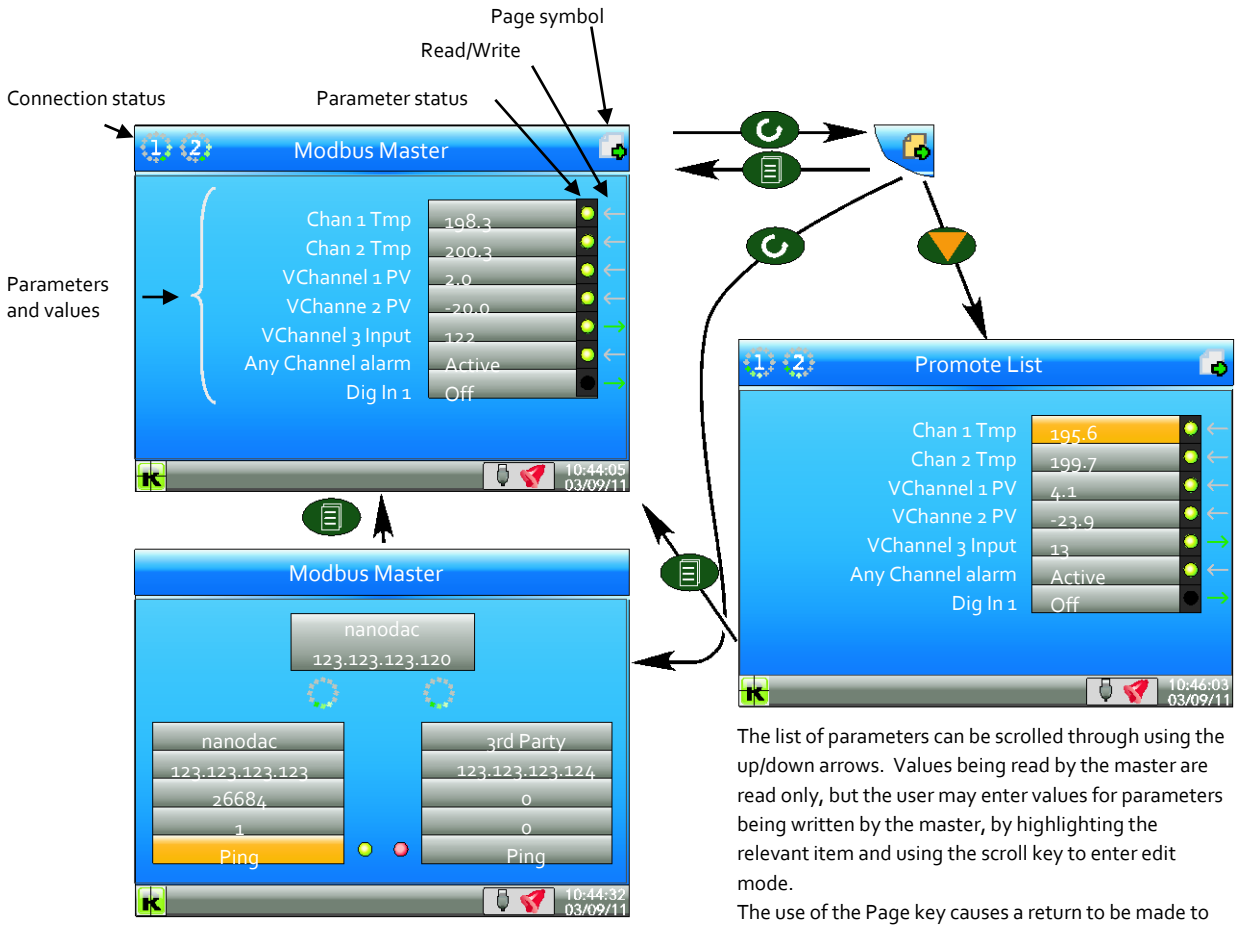
Page one opens by default and shows the first eight parameters being read from (left pointing arrow) or written to (right pointing arrow) the relevant slave. These items are configured in the Modbus Master configuration described in Section 5.1.4. Hidden parameters may be viewed by operating the scroll key, then using the arrow keys to scroll through the list. A green arrow means that the item may be edited by the user when logged in.

A pair of animated indicators in the top left-hand corner of the screen show the connection status of the two possible slaves. A green moving 'streak' indicates that successful communications are being carried out. A red flashing circle indicates that there is a break in the transmission line or that the slave is switched off. A grey, non-animated display indicates that that slave has not yet been configured as a part of the communications link (i.e it is 'off line').

A 'traffic light' indicator appears to the right of each parameter. Green indicates that the parameter is being read from or written to successfully. Orange indicates that a write of the value is pending. Red indicates that there is an error and that no value is currently being read or written; the value displayed is the last good value read or written depending on whether the data item is a read or write. If the indicator is black, the parameter is 'off'.

Operation of the scroll key highlights the page symbol in the top right-hand corner of the screen, and a further operation of the scroll key calls page two to the screen.

Page two contains the IP address of the Modbus master and of any slaves connected to it, together with some diagnostic information, as described in 'PING DETAILS' below.



The list of parameters can be scrolled through using the up/down arrows. Values being read by the master are read only, but the user may enter values for parameters being written by the master, by highlighting the relevant item and using the scroll key to enter edit mode.
The use of the Page key causes a return to be made to the initial Modbus Master display.

Figure 1.4.12a Modbus Master display pages

Modbus Master Display Mode (Cont.)

PING DETAILS

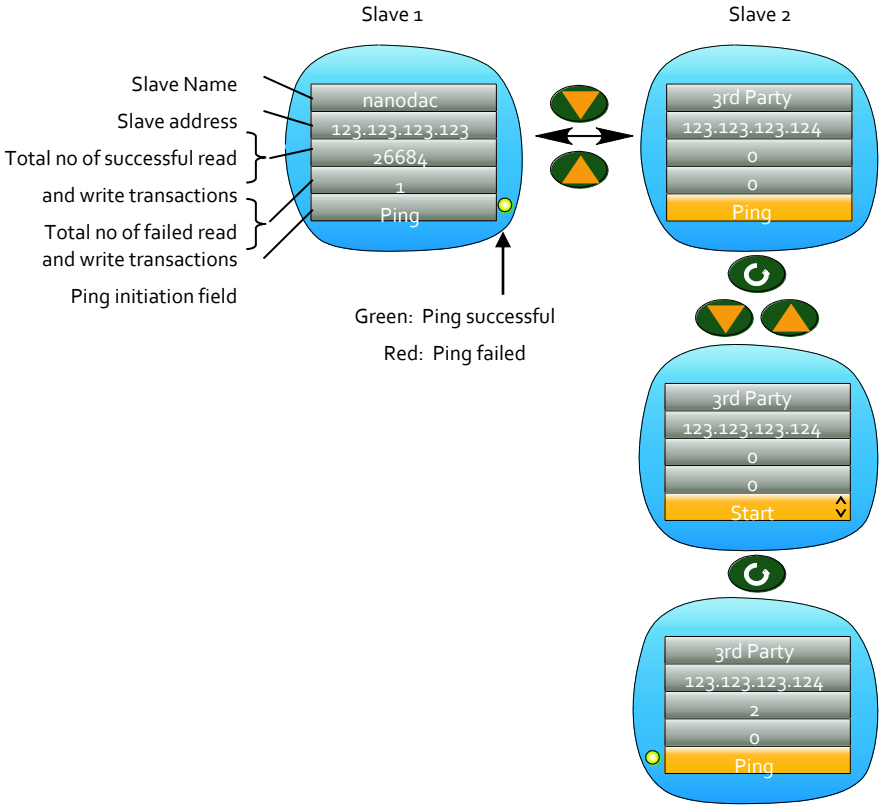


Figure 1.4.12b Slave 2 ping initiation (Slave 1 similar)

The 'Ping…' field of the first slave is highlighted by default. As shown above, the down (or up) arrow can be used to highlight the 'Ping…' field of the other slave instead.

Once the relevant 'Ping…' field is highlighted, the scroll key can be used to enter edit mode and the up/down arrow key used to select 'Start'. A further operation of the scroll key initiates the 'Ping' and if this is successful, a green indicator appears alongside the field (and the text returns to 'Ping…'). If the Ping is unsuccessful, then the indicator is coloured red.

The up or down arrow can now be used to return to slave 1, or the page key can be used to return to the previous parameter display page.

As shown in the figure above, some diagnostic information is given. This includes the total number of successful attempts that the master has made to communicate with the relevant slave, and the total number of failed attempts. Fuller diagnostic details are to be found in the Modbus Master Communications configuration description (Section 5.1.4.)

4.4.12 EtherNet/ IP display mode

This display mode appears only if enabled in Instrument.Display configuration and is used to display the input and output parameters assigned to the Client and Server input and output tables. Parameters which have been configured with descriptors are identified by these descriptors instead of their 'opc' names (shown below).

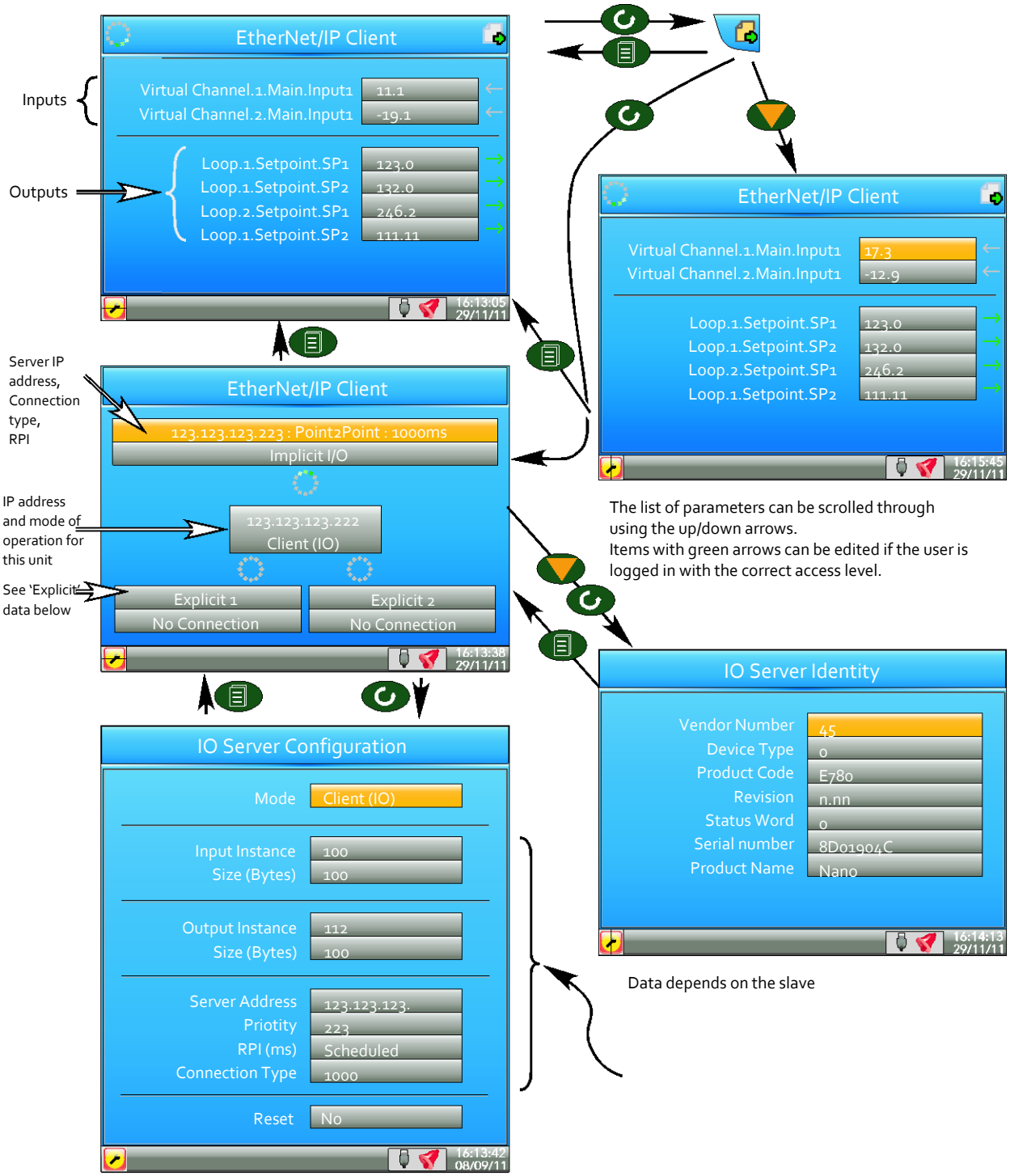


Figure 1.4.13a Typical EtherNet/IP display

Ethernet/IP Display Mode (Cont.)

If the EtherNet/IP option has been ordered and enabled, the nanodac can be configured as either a client (master) or a server (slave). The client and server displays are identical except that the configuration area of the client display is more extensive than that of the server display.

Figure 1.4.13a, above shows a typical set of display pages for an EtherNet/IP client.

CONFIGURATION OF IMPLICIT INPUT/OUTPUT TABLES

Configuration of the input and output tables is carried out via iTools drag and drop only by:

a. Entering the parameters to be read by the client into the server output table.

b Entering the destination parameter into the equivalent location in the client input table.

c. Entering the parameters to be written by the client into the client output table.

d Entering the destination parameter into the equivalent location in the server input table.

The example in figure 1.4.13b attempts to show this (using the nanodac as the client) in graphical form, using just a few parameters (there can be up to 50 in each table)

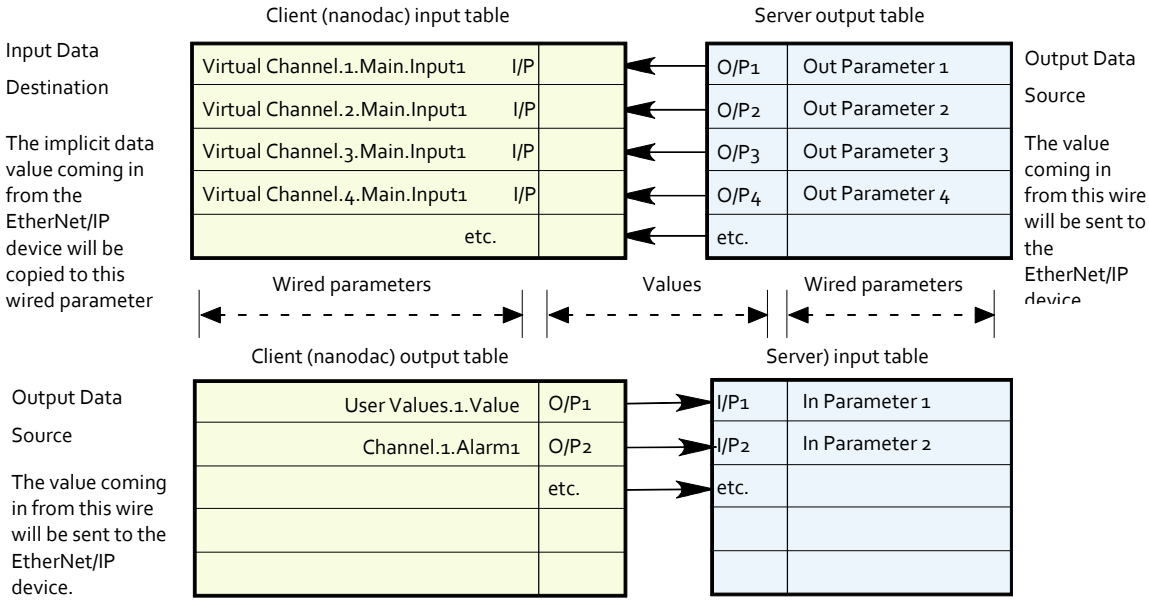


Figure 1.4.13b Input/Output table entries

Notes:

1. Channel values from the Server can be 'wired' into nanodac Virtual channel inputs (as shown above) so that they can be traced and/or recorded. In such cases the virtual channel 'Operation' must be set to 'Copy'.
2. Inputs and outputs would normally be given suitable descriptors (e.g. 'Reset timer' instead of 'Channel.1.Alarm1').

CONNECTION STATUS INDICATOR

A circular status indicator appears in a number of the EtherNet/IP display pages. This indicator can indicate the following states:

Green rotating 'flash': the instrument is on line and at least one CIP connection is established.

Green flashing circle: the instrument is on line but no CIP connections have been established.

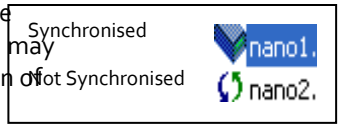
Red flashing circle: there is a break in the physical connection between the client and the server, or the remote unit is switched off or is initialising.

Ethernet/IP Display Mode (Cont.)

Adding parameters to the input and output tables can be achieved only through the proprietary software package 'iTools', running on a pc. It cannot be configured through the user interface. The following description assumes that the user is familiar with 'iTools'. Section 6 of this manual shows how to set up an iTools link to the unit and the iTools on-line help system and its pdf version (HA028838) should be referred-to as necessary.

Note: the client/server and the pc must all be on the same network.

Once iTools has started up and the 'Scan' process has 'found' the relevant instrument, the scan process should be stopped and the instrument (s) allowed to synchronise. (The scan may be left to run its course, but the speed at which iTools operates is reduced for the duration of the scan process.)



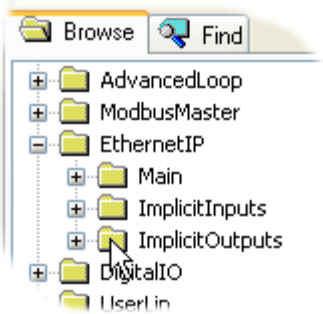
EXAMPLE

To add Loop 2 Setpoint 2 to Output 4 of the Client Output table.

In the example shown below, the instruments have both synchronised, and the 'Access' tool button clicked-on for both instruments to set them into configuration mode.

With the client selected, expand the EtherNet/IP folder in the Browse list, then double-click on the 'ImplicitOutputs' folder.

Locate and expand the Loop 2 SP folder in the Browse window, and click-drag SP2 to 'Output 4' and release.



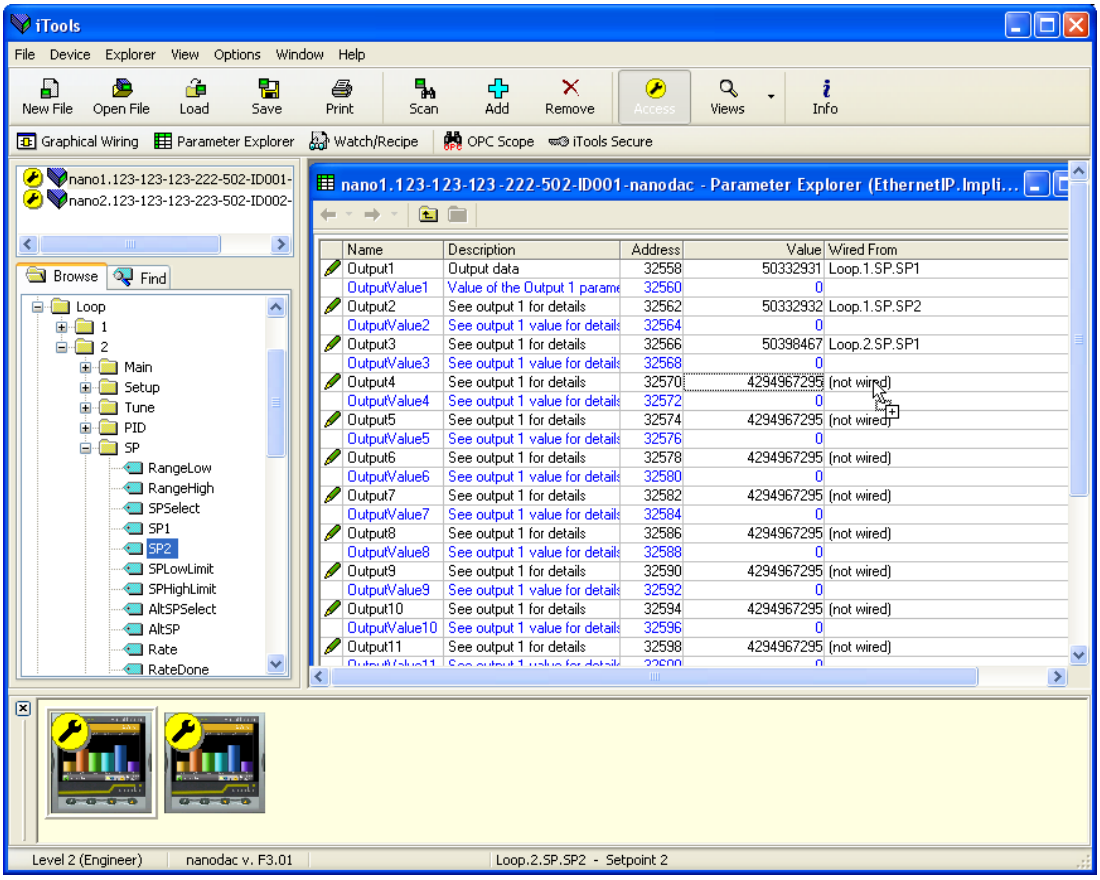


Figure 1.14.3c Dragging a parameter to the Output table

Ethernet/IP Display Mode (Cont.)

An alternative to the click-drag technique is to right click on the required output (five in the example below), and select 'Edit Wire…' from the context menu that appears. A browse window pops up, allowing the user to navigate to the required parameter. This technique can be used both on previously empty inputs or outputs and on those previously filled.

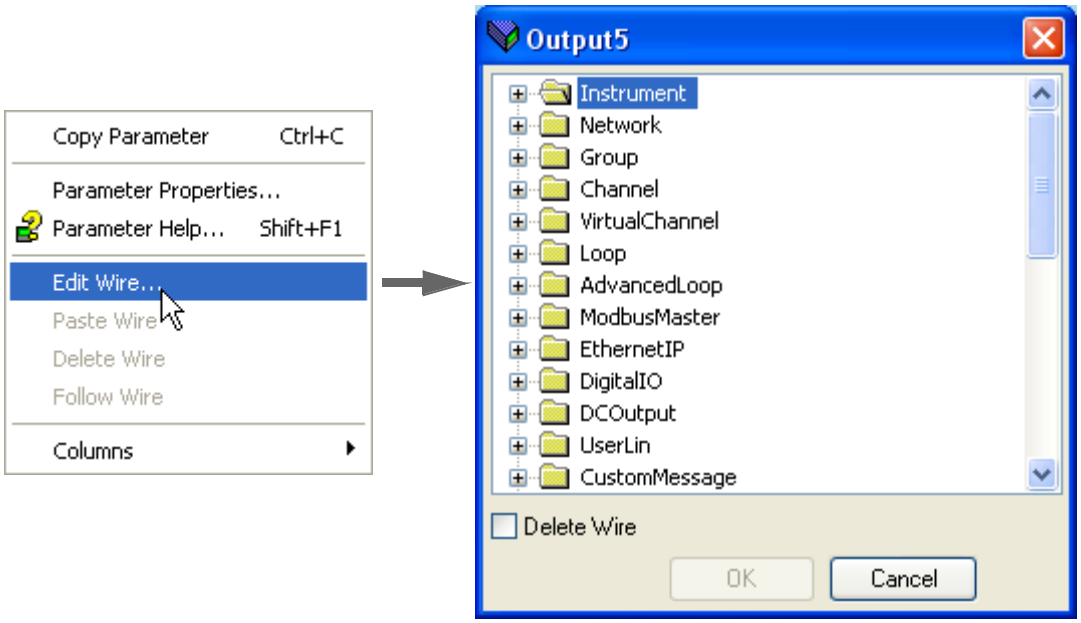


Figure 1.4.13d Context menu details

EXPLICIT DATA

As shown in table 3.4.13, when configured as a server, there is only one explicit application object, and that has the class ID= A2 (162 decimal). The instance ID is the Modbus address of the parameter and the Attribute is always = 1. Explicit service codes hex10 (decimal 16) and 0E (14) are both supported, for writing and reading single attributes respectively.

Service code		Class ID		Instance ID	Attribute
Hex	Dec	Hex	Dec	Decimal	
0010	16	A2	162	1-65535	1
000E	14	A2	162	1-65535	1

Table 1.4.13 Explicit data specification

When configured as a client, two separate connections are available allowing the user to produce two independent explicit read or write messages to different server devices.

Figure 1.4.13e below, shows an example of how to configure an explicit message request. The instance ID and the data type are taken from the server manufacturer's data. In this example a read request is configured to determine the Group recording status of a nanodac server, and it can be seen from table 5.3 that the decimal modbus address for this parameter is 4150 and the data type is int16. It is this address which is used as the instance ID.

Once all the information has been entered, the read is requested by setting 'Send' to 'Yes'. The Data field changes to '3' for this example and from table 5.3 it can be seen that the recording status is 'Recording enabled'.

Note: The nanodac supports only 16 bit data types for reading and writing of explicit messages.

Ethernet/IP Display Mode (Cont.)

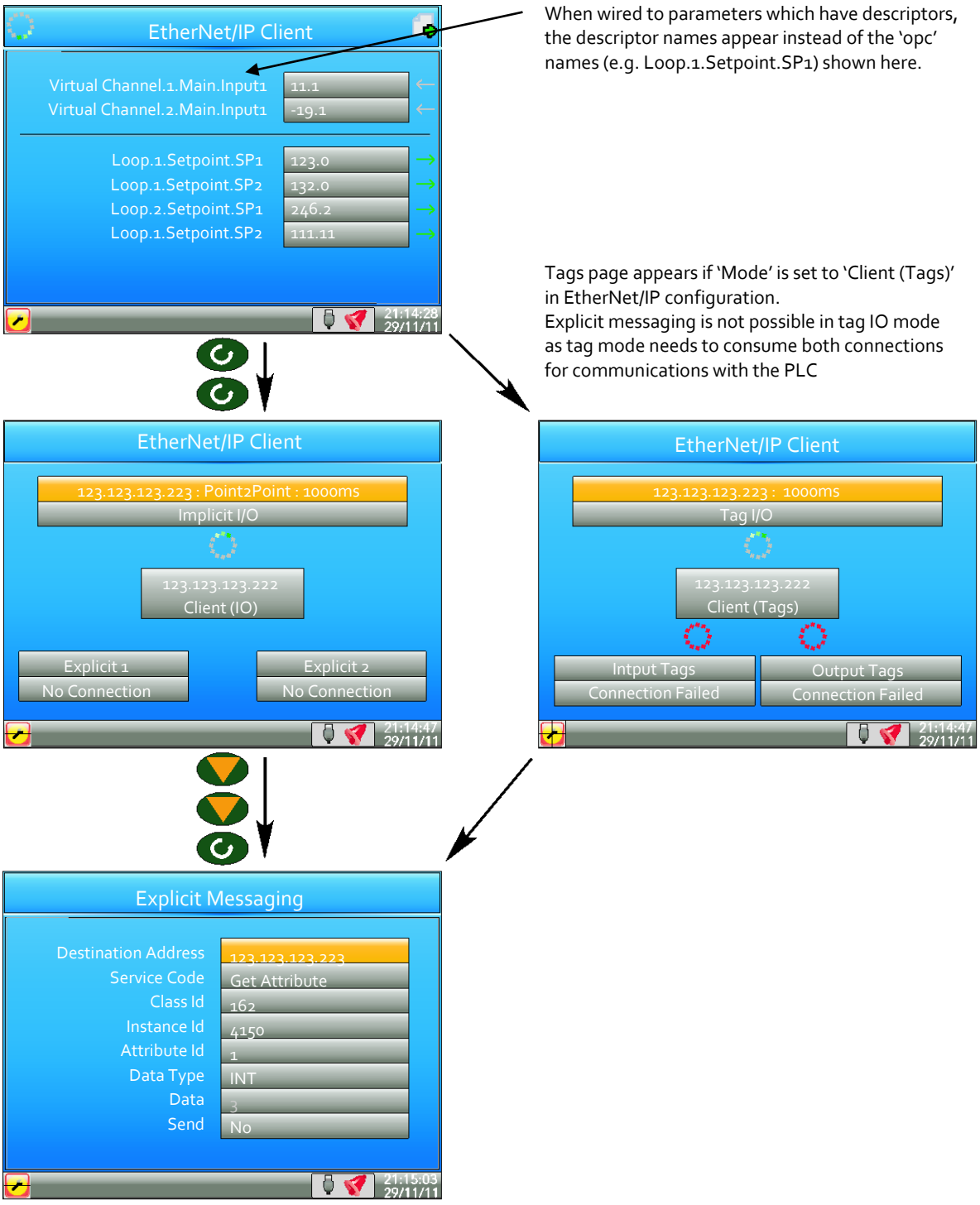


Figure 1.4.13e explicit messaging example

Ethernet/ IP Display Mode (Cont.)

USING TAGS

When acting as servers, many PLCs present their data in a tag format instead of implicit data format. For this reason, when the client is configured as 'Client (Tags)', 30 input and 30 output tags become available to the user via iTools (figure 1.4.13f).

This allows tag names to be typed in, input tags 1 to 30 being associated with implicit inputs 1to 30 respectively and output tags 1 to 30 being associated with implicit outputs 1to 30 respectively.

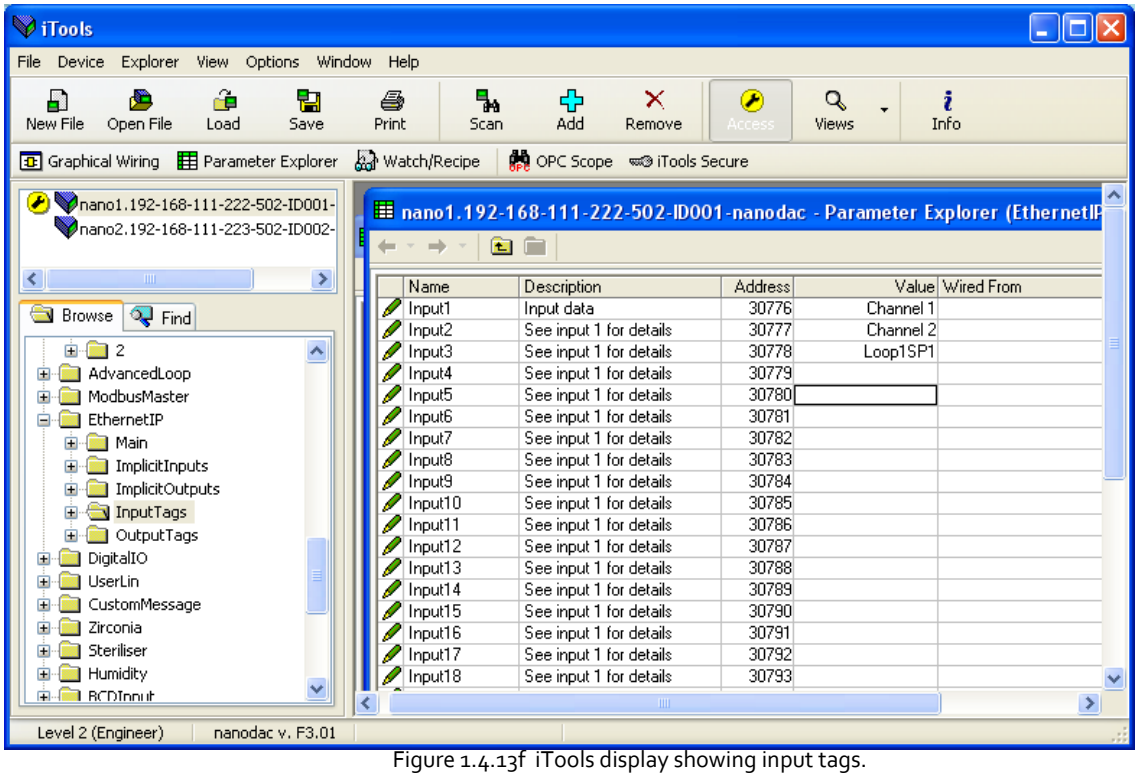


Figure 1.4.13f iTools display showing input tags.

In the example above, the value of the parameter with the tag 'Channel 1' will be written to implicit input 1.

Notes:

1. Most PLCs have a data buffer limit of 500 Bytes. The total number of bytes being used is given by the equation: Total number of data bytes = (tag length + 10) × the number of requested tags.
2. Input data direction is always to the nanodac:
   in server mode input data is written to the nanodac from the client
   in client mode, input data is read by the nanodac from the server device.
3. Output data direction is always from the nanodac:
   in server mode output data is written to the client from the nanodac
   in client mode, output data is read by the server from the nanodac.

4.5 TREND HISTORY

Entered from the top level menu (Section 4.1), this allows vertical and horizontal traces to be reviewed for Trend group channels. The amount of data displayed in one screen depends on the 'Zoom In/Out' setting in the History menu and on

the recording interval selected in Group Recording configuration (Section 5.2.2). It is also possible to enter a time and date to which the history then jumps.

The history display is identical in appearance with the trend display except:

1. History displays can include messages if so configured in the History menu.
2. For horizontal trends, the scale is displayed permanently at the left edge of the display.

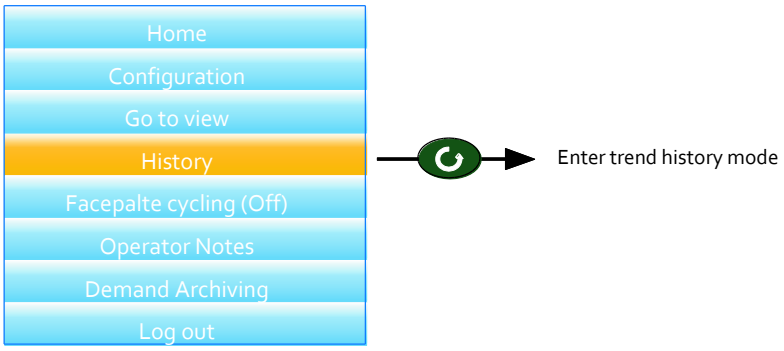
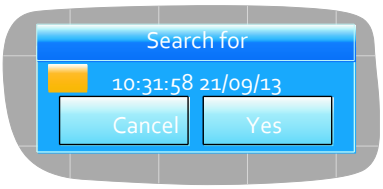


Figure 1.5a Top level menu

4.5.1 Navigation

SEARCH FOR

In the history display, holding the up or down arrow key operated for approximately two seconds produces a 'Search for' display which allows user to enter a time and date. Once a time and date have been entered, then causes the history display to jump to that time and date (if such exists).



the 'Yes' history

To enter a time and date:

1. Use the up/down arrows to highlight the item to be edited.
2. When highlighted (orange background), operate the scroll button. The highlighted text turns black.
3. Use the up and down arrow keys to scroll to the required value for the field, then operate the scroll button again. The text goes white.
4. Repeat the above editing process for all the remaining items which are to be edited.
5. Use the up/down keys to select 'Yes'. The 'Search for' window closes, and the history display jumps to the selected time and date.

Notes:

1. If no history exists for the selected time and/or date 'No History Available' is displayed.
2. The time and date format and Daylight Savings Time (DST) effects are as set in the 'Locale' area of Instrument configuration.

4.5.2 History Options Menu

Operating the page key from within a history display, causes the History Options menu to appear.

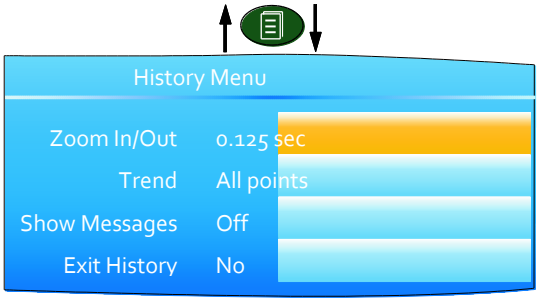


Figure 1.5.2 History Options menu

PARAMETERS

Zoom In/out	Allows the user to select the amount of history displayed on the screen.
Trend	Select either 'All Points' or 'Each Point'.
	'All points' displays all channels in the trend group, with the first channel emphasized on the screen and its faceplate displayed. The Scroll button is used to select the next channel in the group.
	'Each Point' initially displays only the first point in the trace group. The scroll key is used to cycle through individual group channels in turn.
Show Messages	'Off' disable the inclusion of messages in history display. 'On' causes messages to appear, superimposed upon the point traces (vertical trend mode only).
Exit History	Selecting 'Yes' for this item causes a return to the top level menu or to the message summary page.

Note: Operating the page key from the History menu causes a return to the history display.

4.6 TEXT ENTRY

The user is often required to enter text characters or numbers (when editing operator notes, for example). This is done using the pop-up keyboards which are displayed when required. When only numerals are required a special keyboard is presented which contains only numerals.

Figure 1.6 shows the three standard keyboards, along with a 'scan' direction for operations of both up arrow and down arrow keys. To change keyboards, use the arrow pushbuttons to highlight the keyboard name ('Numeric', 'Symbols' or 'Alpha'), and then operate the scroll button.

Generally, to enter text, the required character is highlighted using the up and down arrows and the scroll button is used as an 'Enter' key. Once text entry is complete, the Page button is used to confirm the edit (use the down arrow to select 'Yes' then operate the scroll button).

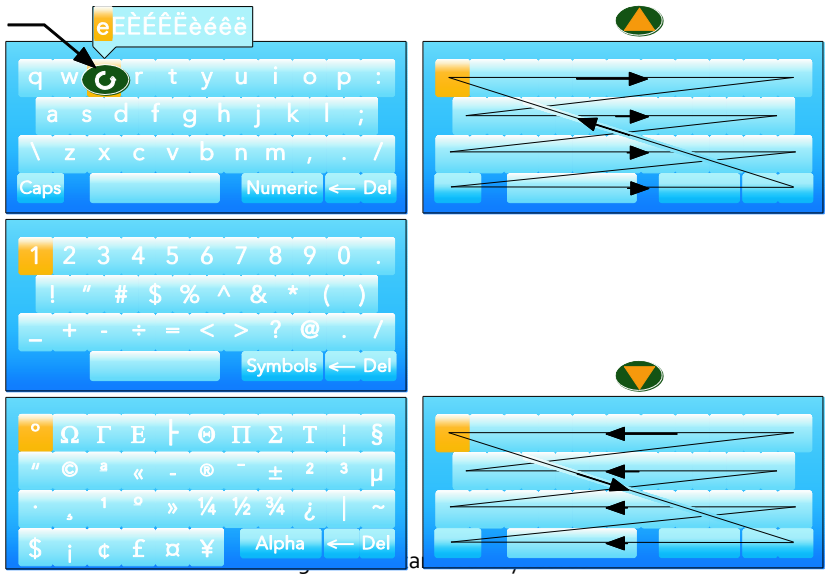
Pressing and holding the scroll button and then immediately operating the up or down arrow, causes the character insertion point to move to the left (down arrow) or to the right (up arrow).

The user can press and hold the scroll key to display variations on certain characters (the letter 'e' in the figure). Once displayed, the up and down arrows can again be used to scroll through auxiliary list, allowing capital letters, and characters with diacriticals (e.g. accents, umlauts, tildes, cedillas) to be selected and entered using the scroll button.

The backarrow key is used as a back space key - i.e. it deletes the character to the left of the cursor position. The 'Del' key deletes the character to the right of the cursor.

Note: Leading and trailing space characters are automatically removed from text strings.

Press and hold scroll button for alternative character set.



4.6.1 Numeric keyboard

As mentioned previously, for functions which can take only numerals, a special numeric keyboard appears, as depicted in figure 1.6.1.

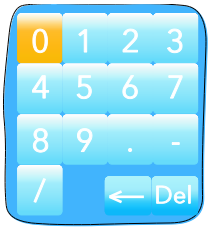


Figure 1.6.1 Numeric keyboard

4.6.2 USB keyboard

Text and numeric entry can also be carried out using a USB keyboard

.

5. CONFIGURATION

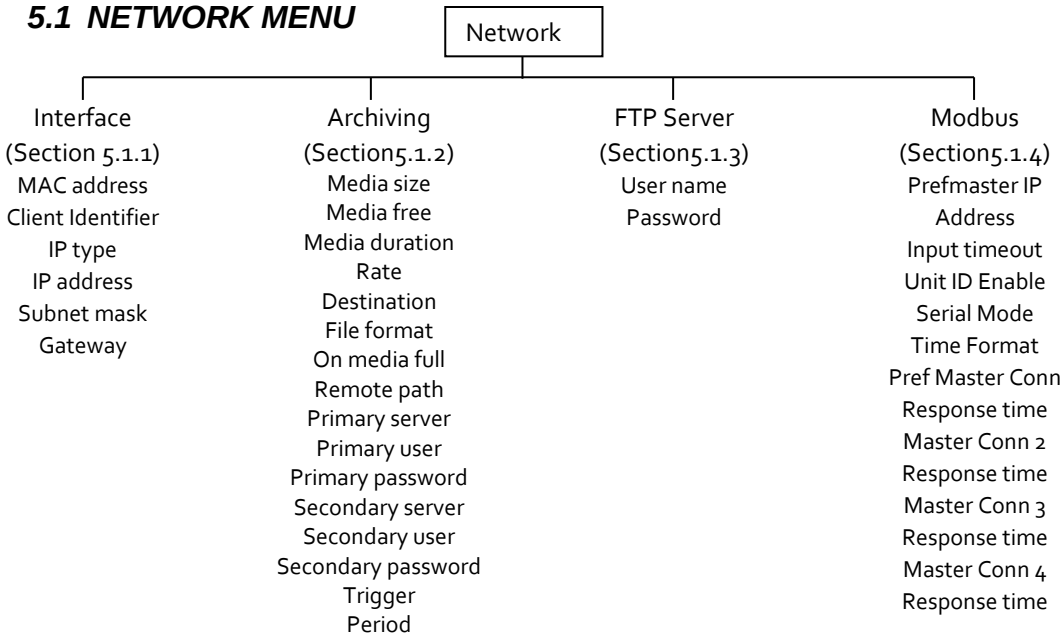
Entered from the top level menu (Section 4.3) this allows the recorder configuration to be accessed and edited ('Engineer' access level required for full editing).

CAUTION

Recording is stopped for as long as the recorder login is at Engineer level. This means that Input/output circuits are switched off during configuration.

As shown below, the recorder configuration is arranged in a number of 'areas', each of which is allocated its own sub-section.

5.1 NETWORK MENU



5.1.1 Interface

This area of configuration allows the user to set up an IP address for the instrument, either by typing one in (Fixed), or automatically (DHCP), assuming a DHCP server is running.

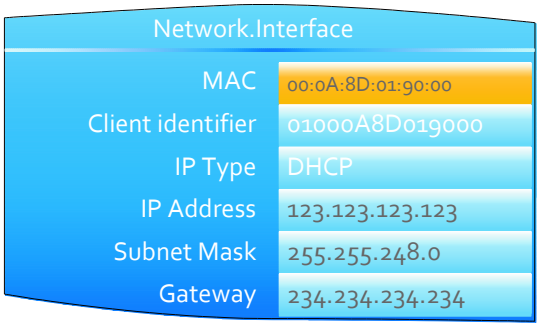


Figure 2.2.1 Network Interface menu

MAC	Read only. Media Access Control. A unique address for each instrument, entered at the factory.
Client Identifier	The client identifier is a unique id used by DHCP servers that implement option 61. Each nano product will have a unique ID built up from its MAC address. If the DHCP server is configured to use option 61, then it will use this id instead of the MAC address to assign a dynamic IP address.
IP Type	If 'Fixed', the user needs to enter an IP address and Subnet Mask in the following fields, and a Gateway address if required. If 'DHCP' the subsequent fields become read only, with the entries automatically generated by the DHCP server. When set to DHCP, it takes several seconds before the IP address is obtained from the DHCP server.
IP Address	Read only if 'IP Type' = 'DHCP'. If 'IP Type' = 'Fixed', the user may enter an IP address (IPV4 dot notation). This would normally be supplied by the user's IT department, or from the Network supervisor.
Subnet Mask	Read only if 'IP Type' = 'DHCP'. If 'IP Type' = 'Fixed', this sets a range of IP addresses that can be accessed. Normally supplied by the user's IT department, or from the Network supervisor.
Subnet Mask	Read only if 'IP Type' = 'DHCP'. If 'IP Type' = 'Fixed', this sets a range of IP addresses that can be accessed. Normally supplied by the user's IT department, or from the Network supervisor.

INTERFACE (CONT.)

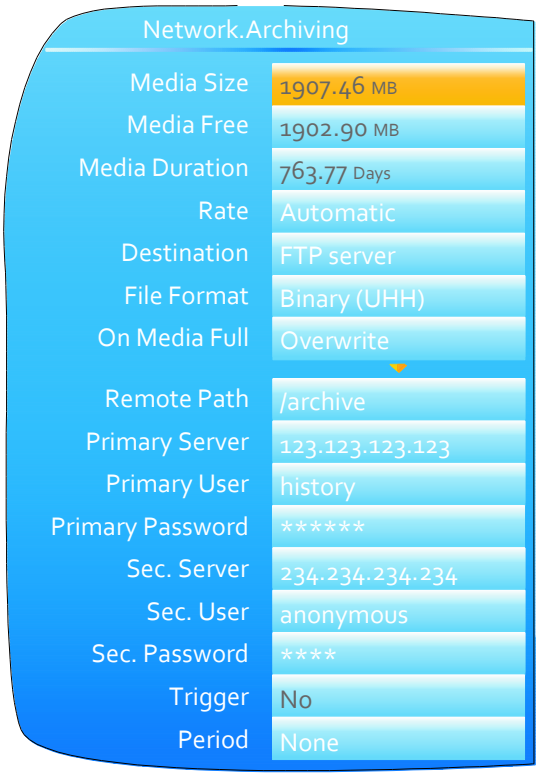
Gateway	Read only if 'IP Type' = 'DHCP'. If 'IP Type' = 'Fixed' this allows the user to enter a gateway address for use when the unit is to communicate outside the local network. Normally supplied by the user's IT department, or from the Network supervisor.

5.1.2 Archiving

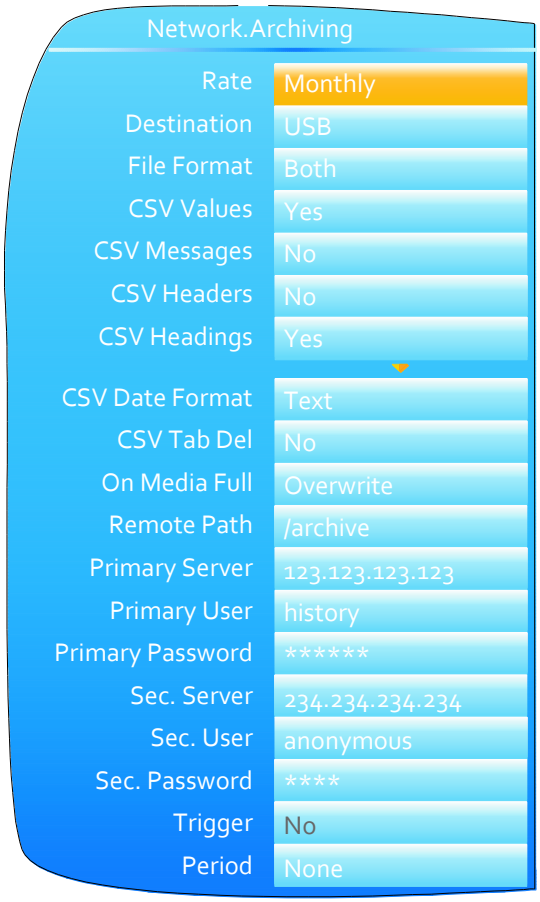
This area of configuration is used to set up the parameters for use during unattended archiving. Some of the fields appear only if other fields are set to a particular value. For example, the CSV fields appear only if 'File Format' is set to 'CSV' or to 'Both'.

The archived data is not removed from the flash memory of the instrument. When the flash memory is full, new data causes the oldest file(s) to be discarded.

Note: For remote archiving, the host computer must be set up to respond to 'pings'. This is because the nano pings the host whilst establishing connection, and if it does not receive a response the archive attempt fails.



Remote with Binary file format



Local with CSV files included

Figure 2.2.2a Unattended Archive configuration (typical settings)

Media Size	Appears only for File Format = 'Binary (UHH)'. A read only value showing the capacity of the memory stick inserted in the USB port at the rear of the unit. Shows zero if no memory stick is present.
Media Free	Appears only for File Format = 'Binary (UHH)'. A read only value showing the space remaining in the memory stick inserted in the USB port at the rear of the unit. Shows zero if no memory stick is present.
Media Duration	Appears only for File Format = 'Binary (UHH)'. A read only value showing the time it will take to fill the Memory stick if the recorder configuration remains unchanged.

Archiving (Cont.)

Rate — Allows the user to specify the frequency at which the contents of the Flash memory are archived to the USB port or, via FTP, to a pc. Scrollable settings are:

None	Automatic archiving is disabled. Any archiving must be initiated by the user using Demand Archiving, as described in Section 4.3.7
Hourly	Archive occurs on the hour, every hour.
Daily	Archive initiated at 00:00* each day
Weekly	Archive is initiated at midnight* every Sunday
Monthly	Archive is initiated at 00:00* on the 1st of every month.
Automatic	The recorder selects the least frequent of the above archive periods which is guaranteed not to lose data as a result of the internal flash memory's running out of space.

*Note: Archive times are not adjusted for daylight saving time (DST). Thus, if the archive is set to 'Daily', 'Weekly' or 'Monthly', then during summer time, the archive will be triggered an hour late (i.e at 01:00 hours instead of midnight).

Destination — Select 'FTP Server' for archive to a remote pc, or 'USB' to archive to the USB port device.

File format — Select 'Binary (UHH)' 'CSV' or 'Both'.

Binary (UHH)	A proprietary format used by the instrument that needs other software (e.g. Review', to interpret the data before it can be presented in spreadsheets etc. Binary files have the extension '.uhh'.
CSV	This format is a standard open-file format for numeric data. A simple ASCII-based format, it is readable by a wide range of pc applications as well as being suitable for direct import into many commercial databases. CSV files have the extension '.csv'.
Both	Archiving includes both .uhh and .csv files.

Note: CSV is ASCII based and cannot interpret Unicode characters. For this reason, some characters available to the user will not be displayed correctly in .csv files.

CSV Values	Appears only if 'File Format' is set to 'CSV' or 'Both'. If 'Yes' is selected, then process values are included in the file (see figure 2.2.2b for details).
CSV Messages	Appears only if 'File Format' is set to 'CSV' or 'Both'. If 'Yes' is selected, then messages are included in the file (see figure 2.2.2b for details).
CSV Headers	Appears only if 'File Format' is set to 'CSV' or 'Both'. If 'Yes' is selected, then Header details are included in the file (see figure 2.2.2b for details).
CSV Headings	Appears only if 'File Format' is set to 'CSV' or 'Both'. If 'Yes' is selected, then column headers are included in the file (see figure 2.2.2b for details).
CSV Date Format	Appears only if 'File Format' is set to 'CSV' or 'Both'. Allows 'Text' or 'Spreadsheet' to be selected. Text causes a time/date to appear in the spreadsheet. 'Spreadsheet Nu' displays the number of days since December 30th 1899. The decimal part of the number represents the latest six hours. For example: DDD--- --DD.25 represents 06:00 hours and DDD--- --DD.5 represents 12:00 hours. Spreadsheet Numeric format is more easily interpreted than 'Text' by some spreadsheet applications.
CSV Tab Del	Appears only if 'File Format' is set to 'CSV' or 'Both'. CSV (Comma Separated Variables) does not always use commas as separators. For example, in some countries the decimal point is represented by a full stop (period), whilst in others a comma is used. In order to avoid confusion between a comma as a decimal point and a comma as a separator, a different separator can be used. This field allows the 'tab' character (^t) to be used instead of a comma.

ARCHIVING (CONT.)

On Media Full — For 'Destination' = 'USB' only, this allows the user to select 'Overwrite' or 'Stop' as the action to be taken when the memory stick is full. 'Overwrite' causes the oldest data to be discarded from the memory stick to make room for newer data. 'Stop' inhibits archiving activity.

Remote Path — Left blank if the archive destination is the home folder. If the destination is to a subfolder within the home folder, then the name of the subfolder is entered here, preceded by a '/' character (e.g. '/history').

Primary Server — Allows the user to enter the IP address for the pc to be used as the primary FTP server.

Primary User/Password — These are the Login name and password of the remote host account, assigned either by the Network administrator, or set up in the 'Guest' account of the remote host's 'FTP server' or 'User Manager' configuration.

Sec. Server/user/password — As Primary server details above, but for the secondary FTP server used when the primary is not available for any reason.

Trigger — This parameter can be 'wired' to, say, an alarm going active, or a digital input, to allow an archive to be triggered remotely. Can also be set to 'yes' manually.

Period — Appears only if 'Trigger' is wired. Allows a period of history to be selected for archiving when 'Trigger' goes 'true. Selections are: None, Last Hour, Last Day, Last Week, Last Month, All, Bring to Date. ('Last Month' archives the last 31 days of history.)

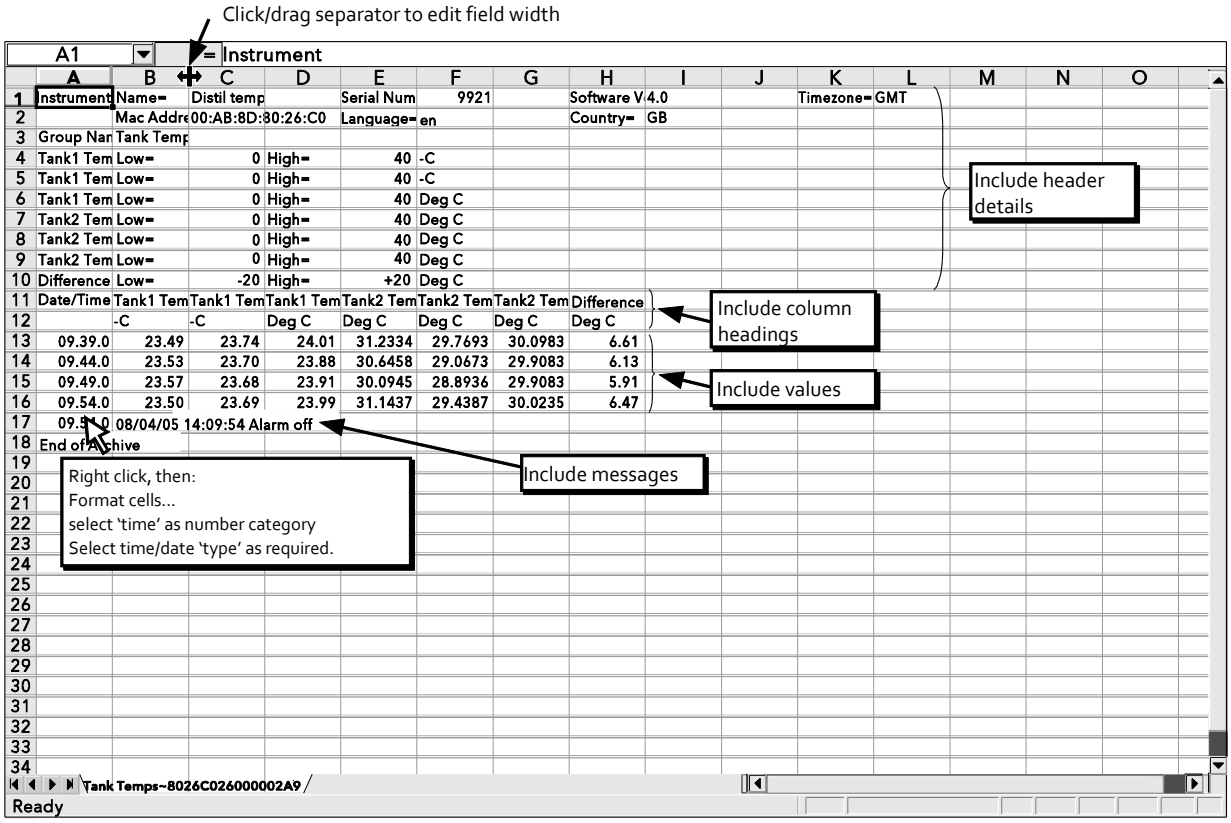


Figure 2.2.2b CSV data example

5.1.3 FTP Server

This area of configuration allows the user to enter the Username and Password used to access the instrument from a remote FTP client.

5.1.4 Modbus TCP

This allows the user to configure the recorder so as to allow it to communicate using Modbus Transmission Control Protocol.

Figure 2.2.4 Modbus TCP configuration menu

PrefMaster IP	The IP address of the relevant Modbus master. The Preferred master is guaranteed to be able to connect, even if all slave connections (max. = 4 for TCP) are in use.
Address	The Modbus address for this slave. This address must be unique for the network to which it is attached. The recorder will respond to this address and to Address 255.
Input Timeout	Allows a value of between 0 and 3600 seconds to be entered to set the timeout period for modbus input channels. If a modbus input is not written to within this period the value of the channel is set to -9999.0 with a 'No Data' status. A value of 0 disables the comms inactivity timeout feature.
Unit ID Enable	Enables/Disables the checking of the Modbus TCP unit identity field.
Strict	The Modbus TCP Unit Identity Field (UIF) does not have to match the instrument address. The instrument responds only to Hex value FF in the UIF. iTools finds this instrument only at location 255, and then stops scanning.
Loose	The Modbus TCP Unit Identity Field (UIF) does not have to match the instrument address. The instrument responds to any value in the UIF
Instrument	The Modbus TCP Unit Identity Field (UIF) must match the instrument address or no response will be made to messages.
Serial Mode	Slave communications via the side mounted configuration port interface (CPI) clip (for iTools use.) Parameters: Baud rate 19,200; Parity = none; Number of data bits = 8; Number of stop bits = 1; no flow control. Can be set to 'Modbus Slave' or 'Off'. The unit must be restarted before any change takes effect.
Time Format	Allows the user to choose milliseconds, seconds, minutes or hours as the time format. Sets the resolution for the reading and writing of time format parameters.
PrefMaster Conn	Read only. Shows the IP address of the preferred master, when connected.

Response Time	Read only. Shows the response time for a single communications request to the relevant master.
Master Conn 1 to 4	Read only. Shows the IP addresses of any other masters connected to this recorder.

5.2 GROUP CONFIGURATION

Group configuration is separated into two areas, one which defines trending characteristics (for display channels) the other defining the recording characteristics for saving data to the Flash memory ready for archiving.

5.2.1 Group Trend configuration

This allows the user to define which points are to be traced on the display and at what interval, and also allows the number of chart divisions to be set up. Figure 2.3.1 shows a typical configuration page.

Note: The background chart colour is set up as a part of Instrument Display configuration.

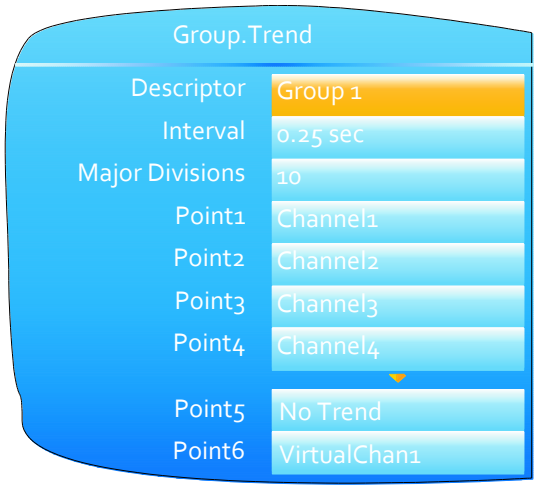


Figure 2.3.1 Group Trend Configuration

Descriptor	Allows the user to enter a descriptor (20 characters max.) for the group.
Interval	The trending interval which defines how much data appears on one screen height or width. A number of discrete intervals can be chosen between 0.125 seconds to 1 hour. The selection should be made according to how much detail is required, and how much data is to be visible on the screen.
Major Divisions	Allows the user to select the number of divisions into which the scale is divided and how many gridlines are displayed. Setting the value to 1 results in just the zero and full scale values appearing. Setting the value to 10 (the maximum) results in a scale with zero, full scale and nine intermediate values appearing, with associated grid lines.
Point1 to Point6	Allows the user to select which channels and virtual channels are to be traced. The maximum number of traces is six.

5.2.2 Group Recording configuration

Similar to Trend configuration, above, but for saving the data to Flash memory history files. Each point can individually be enabled or disabled for recording, or recording can be disabled for the whole group.

Figure 2.3.2 shows a typical page.

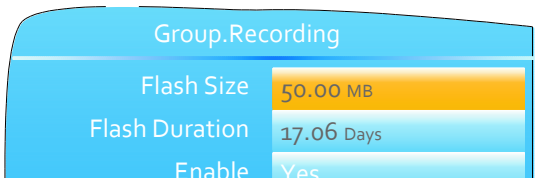


Figure 2.3.2 Group trend recording configuration

Flash Size	Read only. Shows the size of the Flash memory fitted in MB.
Flash Duration	Read only. Shows the time it will take to fill the Flash memory if the recorder configuration remains unchanged.
Enable	'Yes' enables group recording so that all points set to 'Yes' are stored in the recorder's flash memory. 'No' disables group recording.
Interval	Defines the rate at which data is saved to the recorder's Flash memory. The value affects how much trace history appears on the screen in trend history mode.
UHH Compression	Select 'Normal' or 'High'. 'Normal' compresses the data, but still provides an exact copy. 'High' compresses more, but values are saved only to 1 part in 10^8 resolution. See also note 1, below.
Channel 1 to VirtualChan 30 (see note 2, below)	Read only (greyed 'yes') for points being trended, (these are automatically recorded). For non-trending points the user may enable or disable each point individually.
Suspend	Ignored unless the user has wired to this field. If wired then when set to 'No' recording is active, when set to 'Yes' recording is paused.

Notes:

1. Where very high values are involved, such as in some totaliser values, 'High' compression may cause the value displayed at the recorder, and held in the history file, to be incorrect. The problem may be resolved by changing to 'Normal' compression, or, in the case of a totaliser, by re-scaling it (for example from MegaWatt hours to TeraWatt hours).
2. Virtual channels 1 to 15 are included in the standard build. Channels 16 to 30 are included only if the Modbus Master and / or EtherNet/IP option is fitted.

5.3 INPUT CHANNEL CONFIGURATION

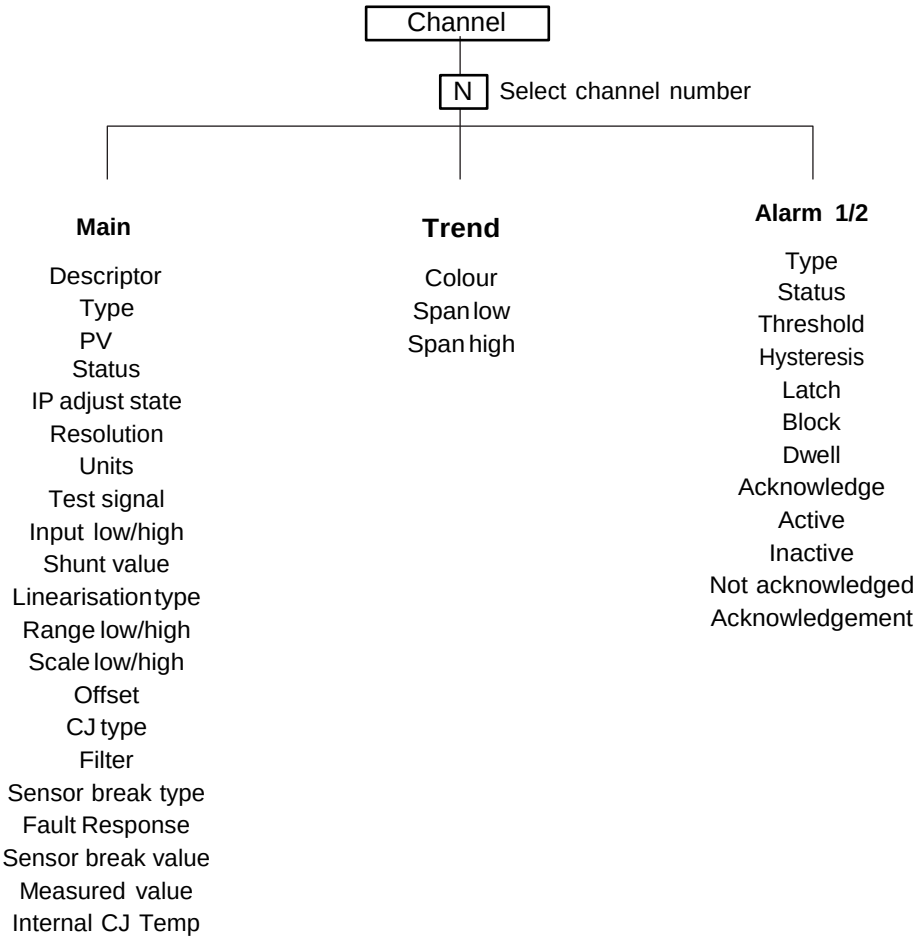


Figure 2.3.3 Channel configuration menu

5.3.1 Channel Main

This section describes all possible menu items, but it should be noted that some items are context dependent (e.g. Cold Junction settings appear only for Type = 'Thermocouple').

Channels one to four in the configuration relate to An In 1 (terminals 1I, 1+ and 1-) to An In 4 (terminals 4I, 4+ and 4-) respectively.

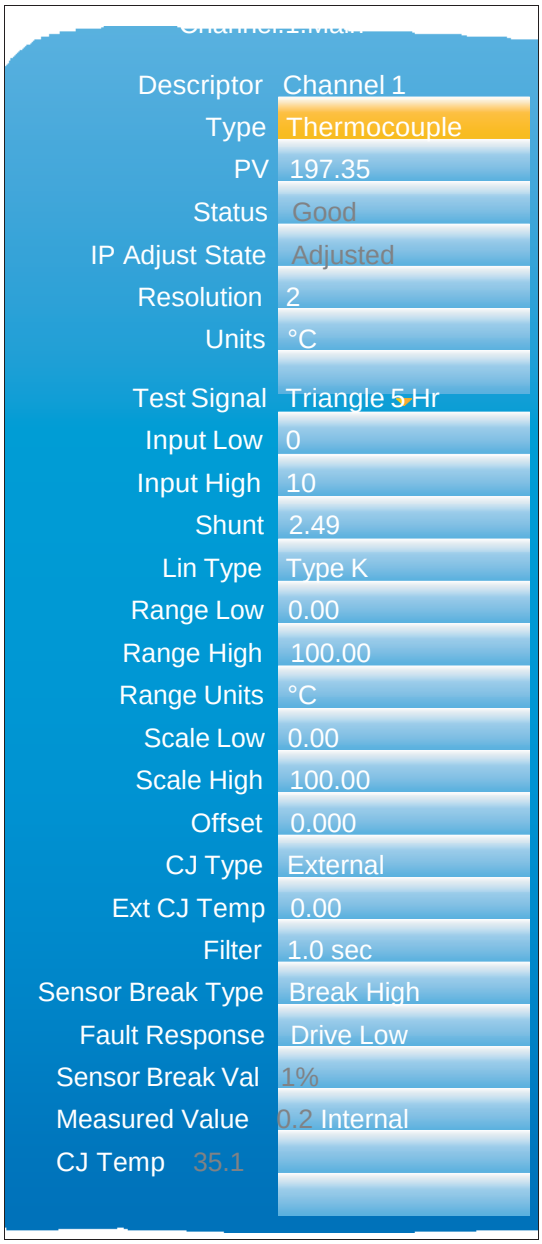


Figure 2.3.4 Channel main menu (expanded)

Note: For the sake of completeness, the figure above shows all possible fields, even though many are mutually exclusive. For example, 'Test signal' appears only when 'Test' is selected as Type. It would never appear when Type = thermocouple (as shown). Similarly, 'Shunt' would appear only for Type = mA.

5.3.2 Channel Main (Cont.)

Descriptor	Allows a (20 character max.) descriptor to be entered for the channel. Some thought should be given to ensure that the descriptor is meaningful because in some display screens it is truncated. For example, 'Furnace 1 area 1' and 'Furnace 1 area 2' might both appear as 'Furnace 1 a' and thus be indistinguishable from one another, except in background colour.
PV	Read only. Displays the current value of the channel.
Status	Read only. Shows the channel status as one of: 'Good', 'Channel Off', 'Over range', 'Un- der range', 'HW error', 'Ranging', 'HW (capability) exceeded'.
PV2	Read only. For dual inputs only, displays the current value of the secondary input.
Status2	Read only. For dual inputs only, shows the secondary input status (as 'Status' above).
IP Adjust State	Appears only for channels which have been included in the 'Adjust Input' procedure described in Section 4.1.9.
IP Adjust State2	As 'IP Adjust State', above but for secondary channels.
Resolution	Allows the number of decimal places to be defined for the channel. Valid entries are zero to nine.
Units	Allows a units string of up to five characters to be entered.
Type	Allows the user to select an input type for the channel. Available selections are: 'Off', 'Thermocouple', 'mV', 'V', 'mA', 'RTD', 'Digital', 'Test' or 'Ohms'. If the Dual Input option is fitted, Dual mV, Dual mA, Dual T/C (if enabled) are also available.

Note : If Dual T/C is selected then it is essential that the secondary T/C input is field calibrated using the Input Adjust procedure (Section 4.1.9)

Test signal	Appears only if 'Test' is selected as 'Type'. Allows either a sinusoidal or a triangular waveform to be selected at one of a number of cycle times between 40 seconds and five hours.
Input Low*	For Type = mV, Dual mV, V, mA, Dual mA or Ohms, the lowest value of the applied signal in electrical units.
Input High*	As 'Input Low', but the highest value of the applied signal in electrical units.
Shunt value	For mA and Dual mA input types only, this allows the value of the shunt resistor (in Ohms) to be entered. The recorder does not validate this value - it is up to the user to ensure that the value entered here matches that of the shunt resistor(s) fitted. For Dual mA input type, both primary and secondary inputs must have independent shunts each of the same value.
Lin type	Linear, Square root, x3/2, x5/2, User Lin. Thermocouple types (alphabetical order): B, C, D, E, G2, J, K, L, N, R, S, T, U, NiMo/ NiCo, Platinel, Ni/MiMo, Pt20%Rh/Pt40%Rh. User 1 to User 4 Resistance thermometer types: Cu10, Pt100, Pt100A, JPT100, Ni100, Ni120, Cu53. See Appendix A for input ranges, accuracies etc. associated with the above thermocouple and RTD types. See Section 4.14 for details of user linearisations.
Range Low*	For thermocouples, RTDs, User linearisations and retransmitted signals only, the lowest value of the required linearisation range.
Range High*	For thermocouples, RTDs, User linearisations and retransmitted signals only, the highest value of the required linearisation range.
Range Units	For thermocouples only and RTDs, Select °C, °F or K.
Scale Low/High	Maps the process value to (Scale High - Scale Low). For example, an input of 4 to 20mA may be scaled as 0 to 100% by setting Scale low to 0 and Scale High to 100.
Scale Low2/High2	As 'Scale Low/High but for the secondary input (PV2).
Offset	Allows a fixed value to be added to or subtracted from the process variable.

*Note: See Section 4.14 for details of the configuration of Range High/Low and Input High/Low when 'Type' = User 1 to User 4.

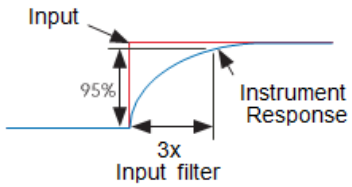
5.3.3 Channel Main (Cont.)

Offset2

The nature of the secondary input results in an offset being introduced into the process variable value.
For mA inputs this offset is removed automatically, without user intervention.
For mV inputs the offset depends on the value of the voltage source impedance and is equal to 199.9µV/Ω. This offset can be compensated for either by using this Offset2 parameter, or by carrying out the 'Input Adjust' procedure (Section 4.1.9).
For Dual T/C inputs, it is recommended that the 'Input Adjust' procedure be used in- stead of Offset2 as the use of Offset2 results in an offset which is non-linear over the thermocouple range.

Input filter

Damping can be used to filter out noise from slowly changing signals so that the underlying trend can be seen more clearly. Valid input values are be- tween 0 and 60 seconds.



Note: Applying a filter to an input channel can affect the operation of any Rate-of-change alarms configured to act on that channel.

CJC Type

For thermocouple input types only; this allows the user to select 'None', 'Internal', 'External' or 'Remote 1' to 'Remote 4'. For Dual T/C inputs, both primary and secondary inputs use the same cold junction.
None: No Cold junction compensation applied.
'Internal' uses the recorder's internal cold junction temperature measurement. 'External' means that the cold junction is to be maintained by the user, at a fixed, known temperature. This temperature is entered in the 'External CJ Temp' field which appears when 'External' is selected.
Remote 1 (2) (3) (4) means that the cold junction temperature is being measured by in- put channel 1 (2) (3) (4) respectively. (This must be a different channel from that currently being configured).

Ext. CJ Temp

Appears only if CJC type is set to 'External', and allows the user to enter the temperature at which the external cold junction is being maintained.

Sensor Break Type Defines whether the sensor break becomes active for circuit impedances greater than expected.
'Off' disables Sensor Break detection.
Break Low: Sensor break active if measured impedance is greater than the 'Break Low impedance' value given in table 4.4.1.
Break High: Sensor break active if measured impedance is greater than the 'Break High Impedance' value given in table 4.4.1.
For mA inputs, limits are applied, such that if the process value lies outside these limits, a sensor break is assumed to have occurred. These limits are (Input lo - 4% Span) and (Input high + 6% Span). For example, for a 4 to 20mA signal, an input below 3.36mA or above 20.96mA will trigger a sensor break event

Range	Break Low impedance	Break High Impedance
40mV	~5kΩ	~20kΩ
80mV	~5kΩ	~20kΩ
2V	~12.5kΩ	~70kΩ
10V	~12.5kΩ	~120kΩ

Table 2.3.5 Minimum impedances for sensor break detection

Note: Break High impedance values would be used typically for sensors which have a high nominal impedance when working normally

5.3.4 Channel Main (Cont.)

Sensor Break type (Cont.)

Input sensor break detection is not supported for secondary inputs. The internal circuit acts as a 'pull up' on the secondary input which therefore saturates high in the event of a sensor break.

Fault Response — Specifies the behavior of the recorder if a sensor break is detected or if the input is over driven (saturated high or low).
'None' means that the input drifts, with the wiring acting as an aerial.
'Drive High' means that the trace moves to (Scale High +10%). 'Drive Low' means that the trace moves to (Scale Low -10%), where the 10% values represent 10% of (Scale High - Scale Low).

Sensor Break Val — A diagnostic representation of how close the sensor break detection circuitry is to trip- ping.

Measured ValueThe (read only) input channel measured value before any scaling or linearisation is applied.

Measured Value2 — As 'Measured Value', above but for the secondary input.

Internal CJ temp — The (read only) temperature of the internal cold junction associated with this channel.

6. iTOOLS

iTools software running on a pc allows quick and easy access to the configuration of the unit. The parameters used are generally the same as those described in section 5 above, with the addition of various diagnostic parameters.

iTools also gives the user the ability to create software wiring between function blocks, such wiring being carried out using the Graphical wiring Editor feature.

A further feature - the display mode 'Promote List', is populated using iTools - see section 4.4.9 for details.

In addition to the guidance given here, there are two on-line Help systems available within iTools: Parameter help and iTools help. Parameter help is accessed by clicking on 'Help' in the toolbar (opens the complete parameter help system), by right-clicking on a parameter and selecting 'Parameter Help' from the resulting context menu, or by clicking on the Help menu and selecting 'Device Help'. iTools help is accessed by clicking on the Help menu, and selecting 'Contents'. iTools help is also available in manual format under part number HA028838, either as a physical manual or as a pdf file.

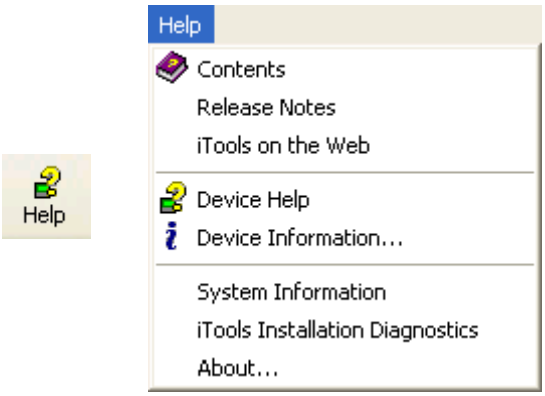


Figure 3 Help access

6.1 iTools CONNECTION

The following descriptions assume that iTools software has been correctly installed on the pc.

6.1.1 Ethernet (Modbus TCP) communications

Note: the following description is based on windows XP. Windows 'Vista' is similar.

It is first necessary to determine the IP address of the unit, as described under 'Network.Interface' in section 5.1.1.

Once the Ethernet link has been correctly installed, carry out the following actions at the pc:

1. Click on 'Start'
2. Click on 'Control Panel'. (If Control Panel opens in 'Category View' select 'Classic View' instead.)
3. Double-click on 'iTools'.
4. Click on the TCP/IP tab in the Registry settings configuration.
5. Click on 'Add...' The 'New TCP/IP Port' dialogue box opens.
6. Type-in a name for the port, then click 'Add...' again
7. Type the IP address of the unit in the 'Edit Host' box which appears. Click OK.
8. Check the details in the 'New TCP/IP Port' box, then click on 'OK'.
9. Click on 'OK' in the 'Registry settings' box to confirm the new port.

(Continued)

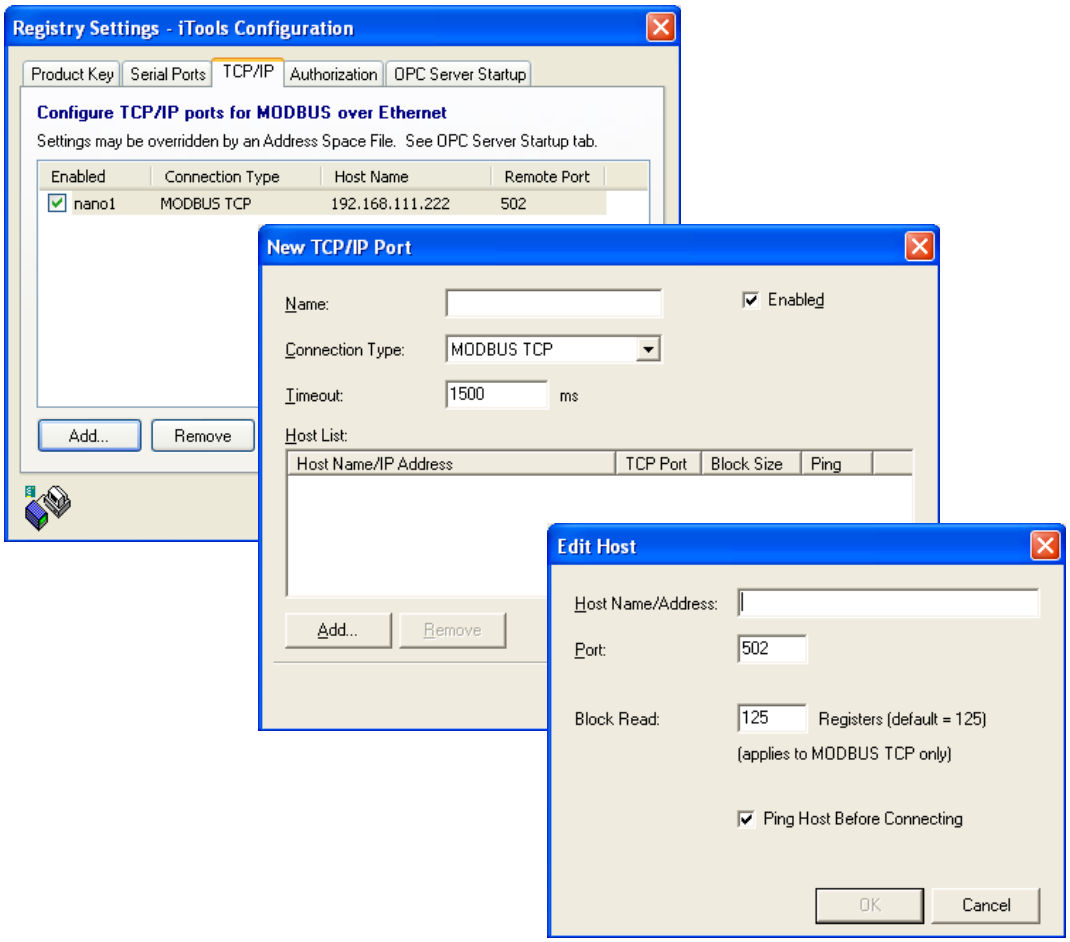


Figure 3.1.1a Adding a new Ethernet port

Ethernet (TCP/IP) Communications (Cont.)

To check that the pc can now communicate with the instrument, Click 'Start'. 'All Programs', 'Accessories', 'Command Prompt'

when the Command Prompt box appears, type in: Ping<Space>IP1.IP2.IP3.IP4<Enter> (where IP1 to IP4 are the IP address of the instrument).

If the Ethernet link to the instrument is operating correctly, the 'successful' reply arrives. Otherwise, the 'failed' reply arrives, in which case, the Ethernet link, IP address, and pc port details should be verified.

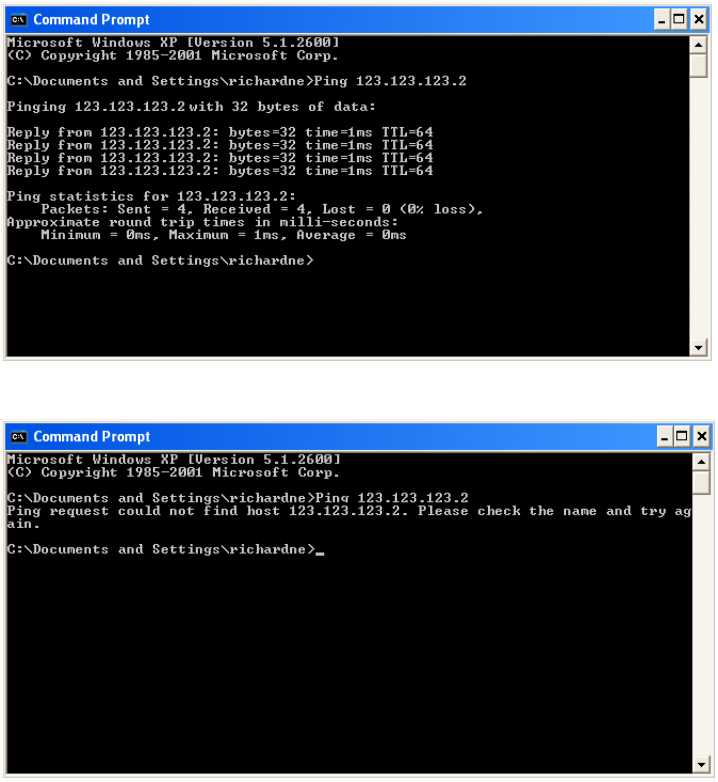


Figure 3.1.1b Command prompt 'Ping' screens (typical)

Once the Ethernet link to the instrument has been verified, iTools can be started (or shut down and restarted), and the Scan toolbar icon used, to 'find' the instrument. The scan can be stopped at any time by clicking on the Scan icon a second time.

See section 6.2 for more details of the scan procedure.

6.1.2 Direct Connection

PC Ethernet connector

This section describes how to connect a pc directly to the instrument.

WIRING

Connection is made from the Ethernet connector at the rear of the Instrument to an Ethernet RJ45 connector, usually located at the rear of the pc. The cable can be either a 'cross-over' or 'straight through' type.

Once wired correctly, and powered up, it is necessary to enter a suitable IP address and subnet mask into the Comms configuration of the Driver Module. This information can be found as follows:

1. At the pc, click 'Start'. 'All Programs', 'Accessories', 'Command Prompt'
2. When the Command Prompt box appears, type IPConfig<Enter>

   The response is a display, such as that shown below, giving the IP address and Subnet mask of the pc. Choose an address in the range covered by these two values.

   A subnet mask element of 255 means that the equivalent element of the IP address must be used unchanged. A subnet mask element of 0 means that the equivalent element of the IP address may take any value between 1 and 255 (0 is not allowed). In the example below, the range of IP addresses which may be chosen for the Driver Module is 123.123.123.2 to 123.123.123.255. (123.123.123.0 is not allowed and 123.123.123.1 is the same as the pc's address, and may therefore not be used.)

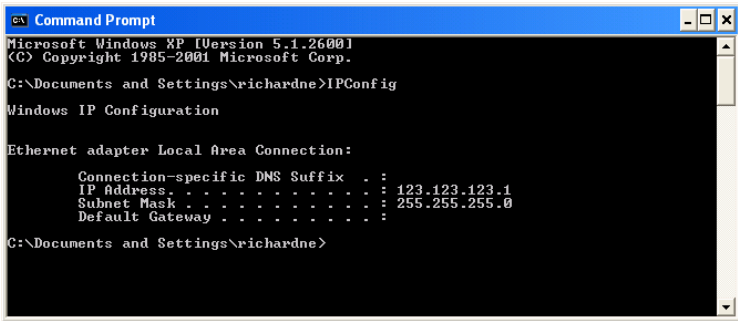
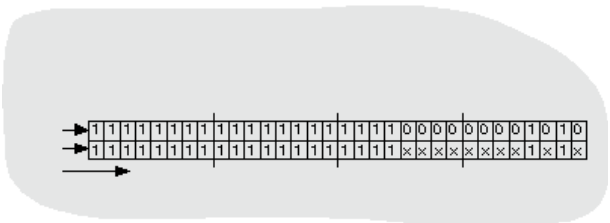


Figure 3.1.2b IP Config command

3. In Network.Interface configuration (section 5.1.1) enter the selected IP address and the subnet mask (as it appears in the command prompt window) in the relevant parts of the menu.
4. Check communications by 'pinging' as described in section 6.1.1, above.

Once the link to the instrument has been verified, iTools can be started (or shut down and re-started), and the Scan toolbar icon used, to 'find' the instrument. The scan can be stopped at any time by clicking on the Scan icon a second time.

See section 6.2 for more details of the scan procedure.



SCANNING FOR INSTRUMENTS

Clicking on the 'Scan' toolbar icon causes a dialogue box (shown below) to appear. This allows the user to define a search range of addresses.

Notes:

1. The relevant instrument address is that entered in the Network.Modbus configuration item (section 5.1.4, and it can take any value between 1 and 254 inclusive, as long as it is unique to the comms link.
2. The default selection (Scan all device addresses…) will detect any instrument on the serial link, which has a valid address.

As the search progresses, any instruments detected by the scan appear as thumbnails (faceplates) in the 'Panel Views' area, normally located at the bottom of the iTools screen. (options/Panel Views position allows this area to be moved to the top of the window, or the Close icon can be used to close it. Once closed it can be re-opened by clicking on 'Panel Views' in the 'View' menu.)

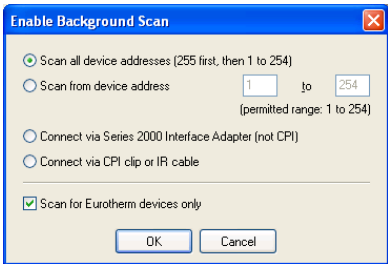


Figure 3.2a Scan range enable

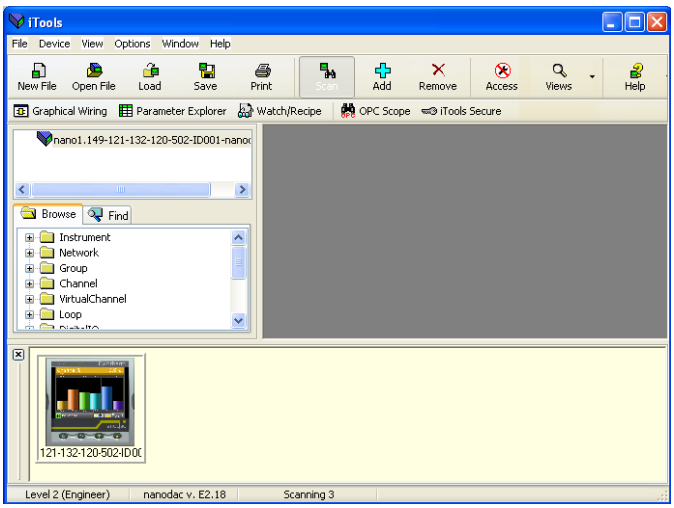


Figure 3.2b iTools initial window with one instrument detected

Once the instrument has been detected stop the scan. When the instrument has synchronised, click on the 'Access' button to enter configuration mode (a password might be required). Once the editing session is complete, click on the Access button again to quit configuration mode.

6.2 PARAMETER EXPLORER

This view can be displayed:

1. by clicking on the 'Parameter Explorer' toolbar icon,
2. by double clicking on the relevant block in the tree pane or in the graphical wiring editor
3. by selecting 'Function Block View' from the Function block context menu in the Graphical wiring Editor.
4. by selecting 'parameter Explorer from the 'View' menu
5. by using the short cut <Alt>+<Enter>

In each case the function block parameters appear in the iTools window in tabular form, such as the example in figure 3.4a, below.

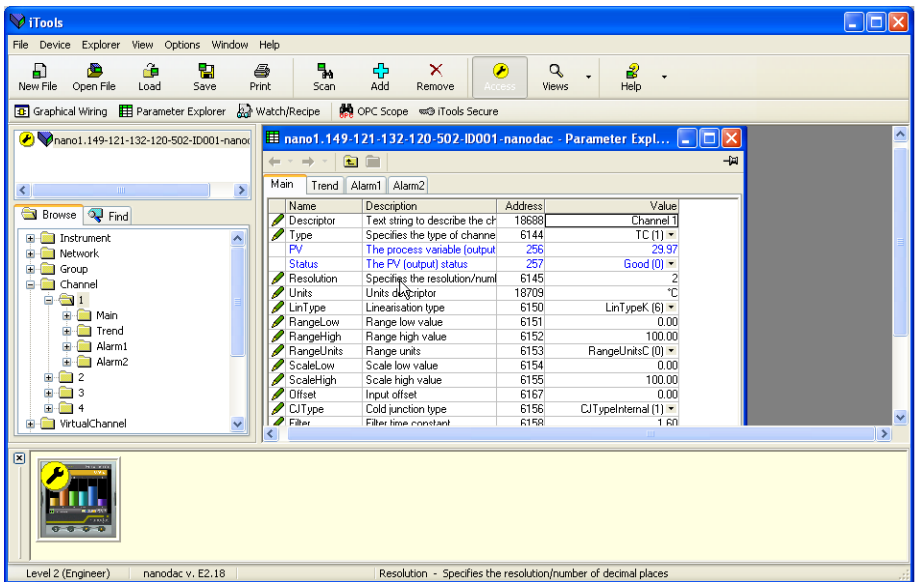


Figure 3.4a Parameter table example

The figure above shows the default table layout. Columns can be added/deleted from the view using the 'Columns' item of the Explorer or context menus (figure 3.4b).

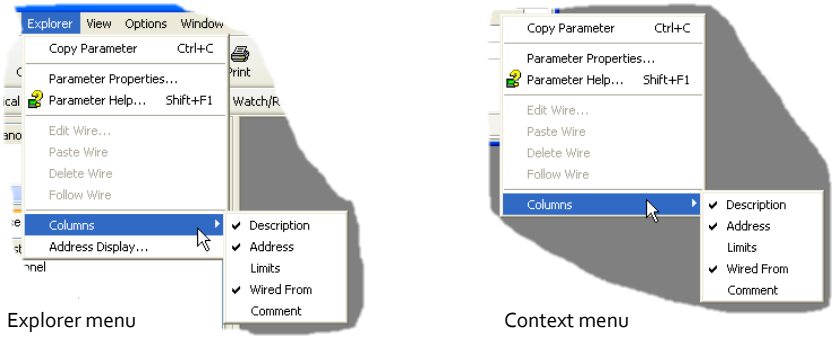
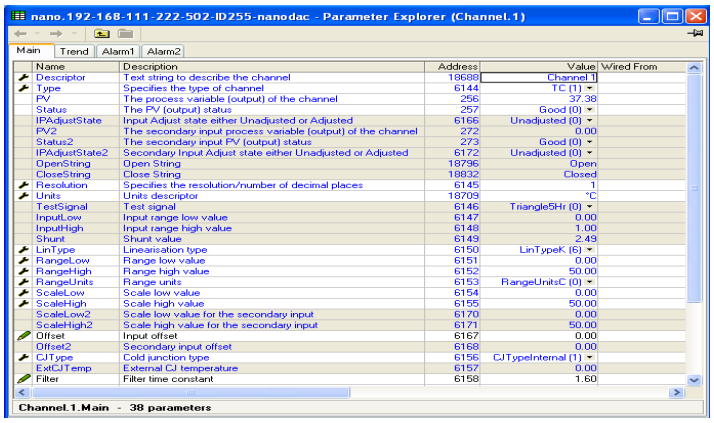


Figure 3.4b Column enable/disable

6.2.1 Parameter explorer detail

Figure 3.4.1a shows a typical parameter table. This particular parameter has a number of subfolders associated with it, and each of these is represented by a 'tab' across the top of the table.



Name	Description	Address	Value	Wired From
Descriptor	Text string to describe the channel	18688	Channel 1	
Type	Specifies the type of channel	6144	TC (1)	
PV	The process variable (output) of the channel	256	37.38	
Status	The PV (output) status	257	Good (0)	
IPAdjustState	Input Adjust state either Unadjusted or Adjusted	6166	Unadjusted (0)	
PV2	The secondary input process variable (output) of the channel	272	0.00	
Status2	The secondary input PV (output) status	273	Good (0)	
IPAdjustState2	Secondary Input Adjust state either Unadjusted or Adjusted	6172	Unadjusted (0)	
OpenString	Open String	18796	Open	
CloseString	Close String	18832	Closed	
Resolution	Specifies the resolution/number of decimal places	6145	1	
Units	Units descriptor	18709	°C	
TestSignal	Test signal	6146	Triangle5Hr (0)	
InputLow	Input range low value	6147	0.00	
InputHigh	Input range high value	6148	1.00	
Shunt	Shunt value	6149	2.49	
LinType	Linearisation type	6150	LinTypeK (6)	
RangeLow	Range low value	6151	0.00	
RangeHigh	Range high value	6152	50.00	
RangeUnits	Range units	6153	RangeUnitsC (0)	
ScaleLow	Scale low value	6154	0.00	
ScaleHigh	Scale high value	6155	50.00	
ScaleLow2	Scale low value for the secondary input	6170	0.00	
ScaleHigh2	Scale high value for the secondary input	6171	50.00	
Offset	Input offset	6167	0.00	
Offset2	Secondary input offset	6168	0.00	
CJType	Cold junction type	6156	CJTypeInternal (1)	
ExtCJTemp	External CJ temperature	6157	0.00	
Filter	Filter time constant	6158	1.60	

Figure 3.4.1a Typical parameter table

Notes:

1. Parameters in blue are non-editable (Read only). In the example above all the parameters are read only. Read/write parameters are in black and have a 'pencil' symbol in the 'read/Write access column at the left edge of the table. A number of such items are shown in figure 3.4.1a, above.
2. Columns. The default explorer window (figure 3.4a) contains the columns 'Name', 'Description', 'Address', 'Value', and 'Wired From'. As can be seen from figure 3.4b, the columns to be displayed can be selected, to a certain extent, using either the 'Explorer' menu or the context menu.
3. Hidden Parameters. By default, iTools hides parameters which are considered irrelevant in the current context. Such hidden parameters can be shown in the table using the 'Parameter availability' settings item of the options menu (figure 3.4.1b). Such items are displayed with a shaded background.
4. The full pathname for the displayed parameter list is shown at the bottom left hand corner of the window.

Parameter Explorer Detail (Cont.)

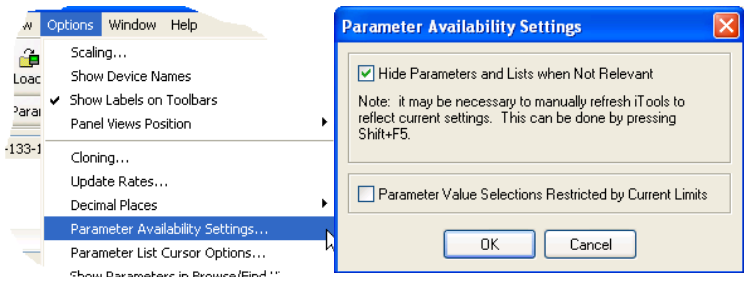


Figure 3.4.1b Show/Hide parameters

6.2.2 Explorer tools

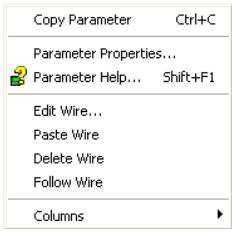
A number of tool icons appear above the parameter list:

Back to: and Forward to:. The parameter explorer contains a history buffer of up to 10 lists that have been browsed in the current instance of the window. The 'Back to: (list name)' and 'Forward to: (list name)' icons allow easy retracing or repeating of the parameter list view sequence.
If the mouse cursor is hovered over the tool icon, the name of the parameter list which will appear if the icon is clicked-on appears. Clicking on the arrow head displays a pick list of up to 10 previously visited lists which the user can select. Short cut = <Ctrl>+<B> for 'Back to' or <Ctrl>+<F> for 'Forward to'.

Go Up a Level, Go Down a Level. For nested parameters, these buttons allow the user to navigate 'vertically' between levels. Short cut = <Ctrl>+<U> for 'Go Up a Level' or <Ctrl>+<D> for 'Go Down a Level'.

Push pin to give the window global scope. Clicking on this icon causes the current parameter list to be permanently displayed, even if another instrument becomes the 'current device'.

6.2.3 Context Menu



Copy Parameter	Copies the clicked-on parameter to the clipboard
Parameter properties	Displays parameter properties for the clicked-on parameter
Parameter Help...	Displays help information for the clicked-on parameter
Edit/Paste/Delete/Follow Wire	Not used in this application
Columns	Allows the user to enable/disable a number of parameter table columns (figure 3.1.4b).

6.3 WATCH/RECIPE EDITOR Watch/Recipe

The watch/recipe editor is opened by clicking on the Watch/Recipe tool icon, by selecting 'Watch/Recipe' in the 'Views' menu or by using the short cut <Ctrl>+<A>. The window is in two parts: the left part containing the watch list; the right-hand part containing one or more data sets, initially empty and unnamed.

The Watch/Recipe window is used:

1. To monitor a list of parameters. This list can contain parameters from many different, and otherwise unrelated parameter lists within the same device. It cannot contain parameters from different devices.
2. To create 'data sets' of parameter values which can be selected and downloaded to the device in the sequence defined in the recipe. The same parameter may be used more than once in a recipe.

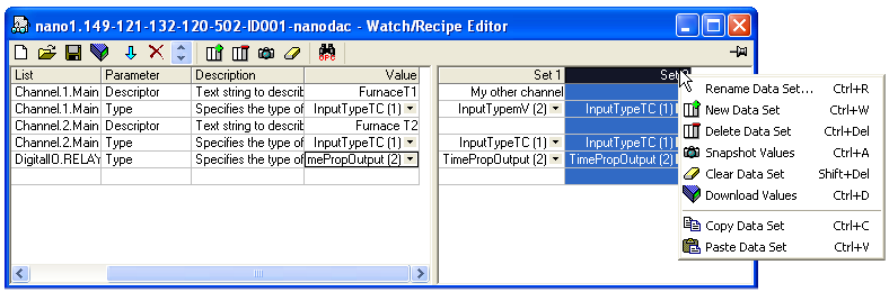


Figure 3.5 Watch/Recipe Editor window (with context menu)

6.3.1 Creating a Watch List

After opening the window, parameters can be added to it as described below. The values of the parameters update in real-time, allowing the user to monitor a number of values simultaneously.

ADDING PARAMETERS TO THE WATCH LIST

1. Parameters can be click-dragged into the watch list from another area of the iTools window (for example, the parameter explorer window, the graphical wiring editor, the browse tree). The parameter is placed either in an empty row at the bottom of the list, or if it is dragged on top of an already existing parameter, it is inserted above this parameter, with the remaining parameters being moved down one place.
2. Parameters can be dragged from one position in the list to another. In such a case, a copy of the parameter is produced, the source parameter remaining in its original position.
3. Parameters can be copied <Ctrl>+<C> and pasted <Ctrl>+<V> either within the list, or from a source external to it, for example the parameter browse window or the graphical wiring editor.
4. The 'Insert item. .' tool button the 'Insert Parameter' item in the Recipe or context menu or the short cut <Insert> can be used to open a browse window from which a parameter is selected for insertion above the currently selected parameter.

DATA SET CREATION

Once all the required parameters have been added to the list, select the empty data set by clicking on the column header. Fill the data set with current values using one of the following methods:

1. Clicking on the 'Capture current values into a data set' tool icon (also known as the 'Snapshot Values' tool).
2. Selecting 'Snapshot Values' from the Recipe or Context (right-click) menu.
3. Using the short cut <Ctrl>+<A>.

6.5.1 Creating A Watch List (Cont.)

Data Set Creation (Cont.)

Individual data values can now be edited by typing directly into the grid cells. Data values can be left blank or cleared, in which case, no values will be written for those parameters at download. Data values are cleared by deleting all the characters in the cell then either moving to a different cell or typing <Enter>.

The set is called 'Set 1' by default, but it can be renamed by either by using the 'Rename data set...' item in the Recipe or context menus, or by using the short cut <Ctrl>+<R>.

New, empty data sets can be added using one of the following:

1. Clicking on the 'Create a new empty data set' toolbar icon.
2. Selecting 'New Data Set' in the Recipe or context menus
3. Using the short cut <Ctrl>+<W>

Once created, the data sets are edited as described above.

Finally, once all the required data sets have been created, edited and saved, they can be downloaded the instrument, one at a time, using the Download tool, the 'Download Values' item in the Recipe or context menus, or the short cut <Ctrl>+<D>.

6.3.2 Watch Recipe toolbar icons

	Create a new watch/recipe list. Creates a new list by clearing out all parameters and data sets from an open window. If the current list has not been saved, confirmation is requested. Short cut <ctrl>+<N>
	Open an existing watch/recipe file. If the current list or data set has not been saved, confirmation is requested. A file dialogue box then opens allowing the user to select a file to be opened. Short cut <ctrl>+<O>
	Save the current watch/recipe list. Allows the current set to be saved to a user specified location. Short cut <ctrl>+<S>.
	Download the selected data set to the device. Short cut <ctrl>+<D>
	Insert item ahead of selected item. Short cut <Insert>.
	Remove recipe parameter. Short cut <ctrl>+<Delete>.
	Move selected item. Up arrow moves selected parameter up the list; down arrow move the selected parameter down the list.
	Create a new empty data set. Short cut <ctrl>+<w>.
	Delete an empty data set. Short cut <ctrl>+<Delete>
	Capture current values into a data set. Fills the selected data set with values. Short cut <ctrl>+<A>.
	Clear the selected data set. Removes values from the selected data set. Short cut <Shift>+<Delete>.
	Open OPC Scope. Opens a separate utility that allows trending, data logging and Dynamic Data Exchange (DDE). OPC Scope is an OPC explorer program that can connect to any OPC server that is in the windows registry. (OPC is an acronym for 'OLE for Process Control, where OLE stands for 'Object Linking and Embedding'.)

6.3.3 Watch/Recipe Context Menu

The Watch/Recipe Context menu items have the same functions as described above for toolbar items.

6.4 PROGRAMMER OPTION

Programmer

Clicking on the Programmer tool bar icon opens the programmer configuration window, displaying the program currently loaded in the instrument, in Segment Parameter view. If no program is loaded, the programmer display opens with just one segment, defined as an 'End' Segment.

Figure 3.6 shows a simple program for example purposes. Parameters are defined in section 4.4.??

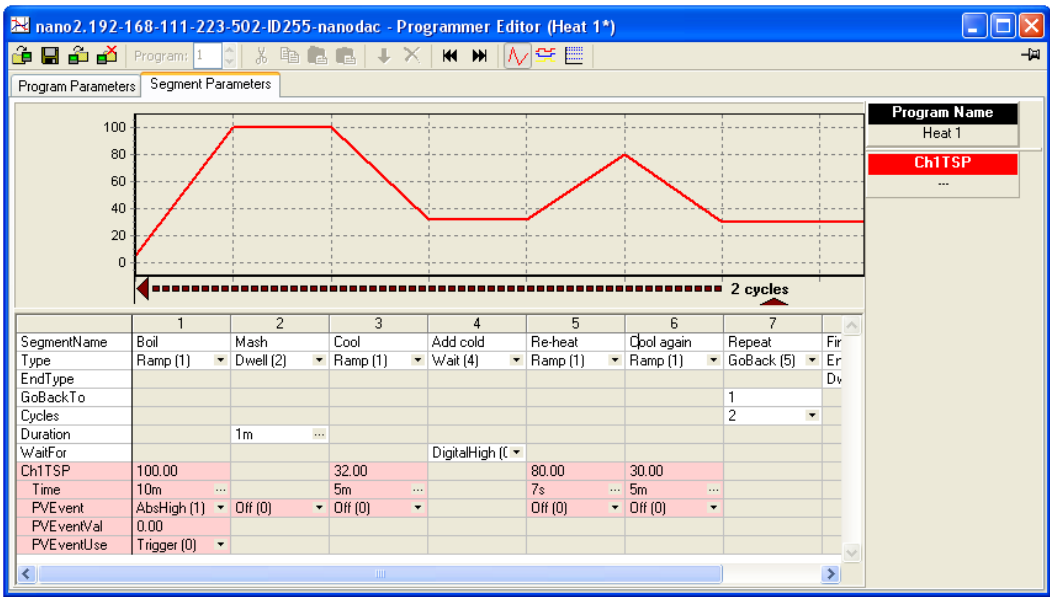


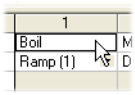
Figure 3.6 Programmer display

As can be seen from the example, the segments appear below a graphical representation of the program.

6.4.1 Segment parameter editing

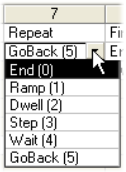
SEGMENT NAME

To edit the segment name, click in the segment name field (as shown), and type in the required text, of up to 20 characters. Alternatively, double click on the existing name and edit it as desired.



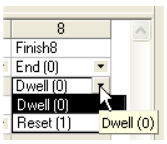
SEGMENT TYPE

Clicking on the down arrow symbol to the right of the existing segment type field, produces a pick list from which a segment type can be selected. The type of segment selected defines which configuration fields appear for that segment.



END TYPE

Allows the selection of 'Dwell' or 'Reset' as the action to be taken by the End segment.



Segment Editing (Cont.)

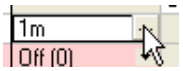
GO BACK TO

For GoBack segments only, this allows the user to enter a segment number for the program to return to.

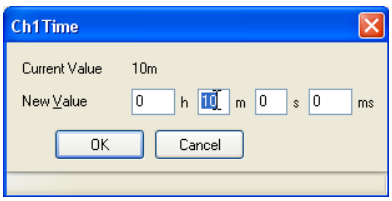
CYCLES

For GoBack segments only, this allows the number of times the program returns to the 'Go Back To' segment, before continuing.

DURATION

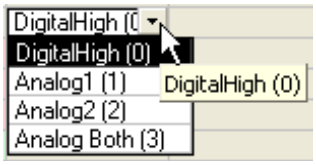


Sets the amount of time for which Dwell segments are to operate. Times are entered using a hours/minutes/seconds/milliseconds display which appears when the ellipsis button to the right of the duration field is clicked on.



WAIT FOR

Select an analogue or digital input as the wait criterion. For single channel programs only one analogue input is available; for two-channel programmers one digital and two analoge inputs are available, as shown.



CH1 (2) TSP

The channel 1 (2) target setpoint, editable by the user in a similar way as that used for segment name editing, described above. Ch2 TSP appears only for two channel programmers.

TIME

For programs where 'Ramp Style' = 'Time', this allows the user to enter time periods for ramp segments, in a similar way, as described for 'Duration', above. For two channel programmers, two times can be entered, and if the two times are different, the channel with the shorter time waits at its setpoint value until the other channel's time has elapsed.

RATE

For programs where 'Ramp Style' = 'Rate', this allows the user to eneter a rate value for Ramp segments. This value is entered in the same way as that used for segment name editing, described above. For two channel programmers, two rates can be entered.

OTHER PARAMETERS

Holdback, PV Event etc. parameters may or may not appear depending on the programmer features enabled, and they are all edited in the ways described above.

6.4.2 Digital Event display

Clicking on the 'Digital Events Output' tool bar icon produces a segment display, allowing the user to select the events on or off as required, for each segment. Figure 3.6.2 shows a programmer where the number of events is four.

The number of events which appear (maximum eight) is configured in the Programmer Setup menu.

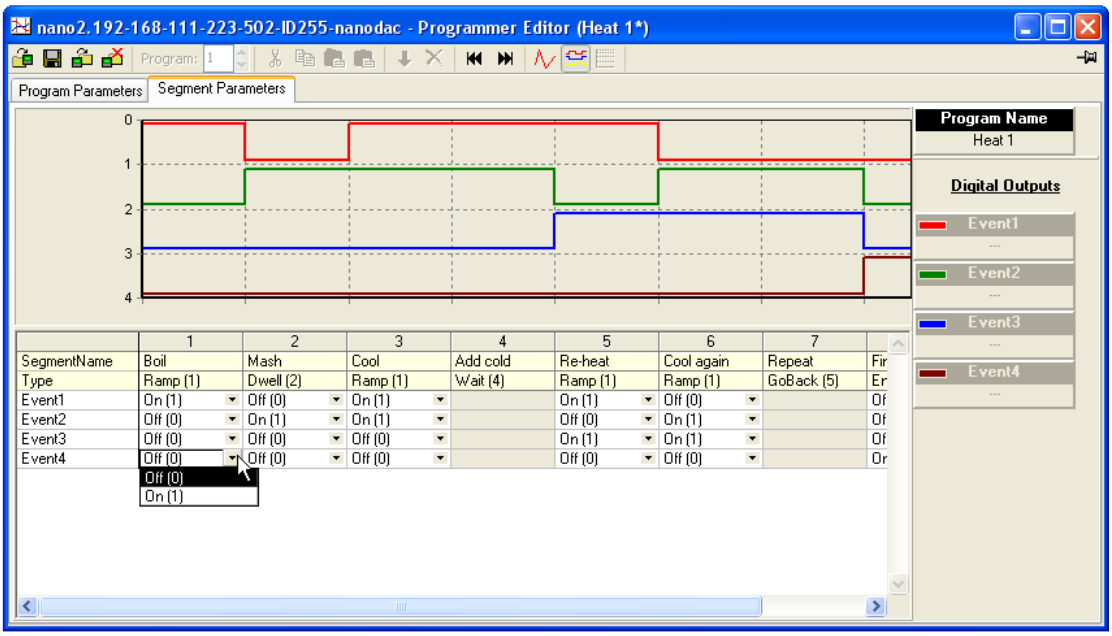


Figure 3.6.2 Event on/off configuration

6.4.3 Program parameters

The number of parameters which appear in this display depends on which program features are enabled. Figure 3.6.3 shows a basic set of parameters which allows the user to select Rate or Time as the Ramp style, and to select a value for Rate units.

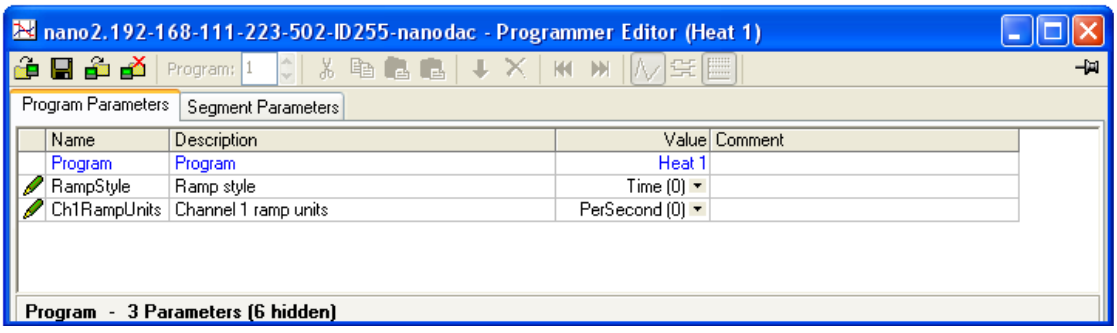


Figure 3.6.3 Program parameter display

6.4.4 Adding and deleting segments.

INSERT SEGMENT

As shown in figure 3.6.4, to insert a segment, click in the segment number field of the segment to the right of where the new segment is to be located. This causes the whole segment to highlight. Click on the blue down arrow tool icon to insert the new segment. The new segment name is the segment number, and the segment configuration is that of the segment to the right, unless that segment is a Goback or End segment, in which case the new segment is a ramp segment.

To insert more than one segment, operate the shift key whilst clicking on the range of contiguous segments to be copied.

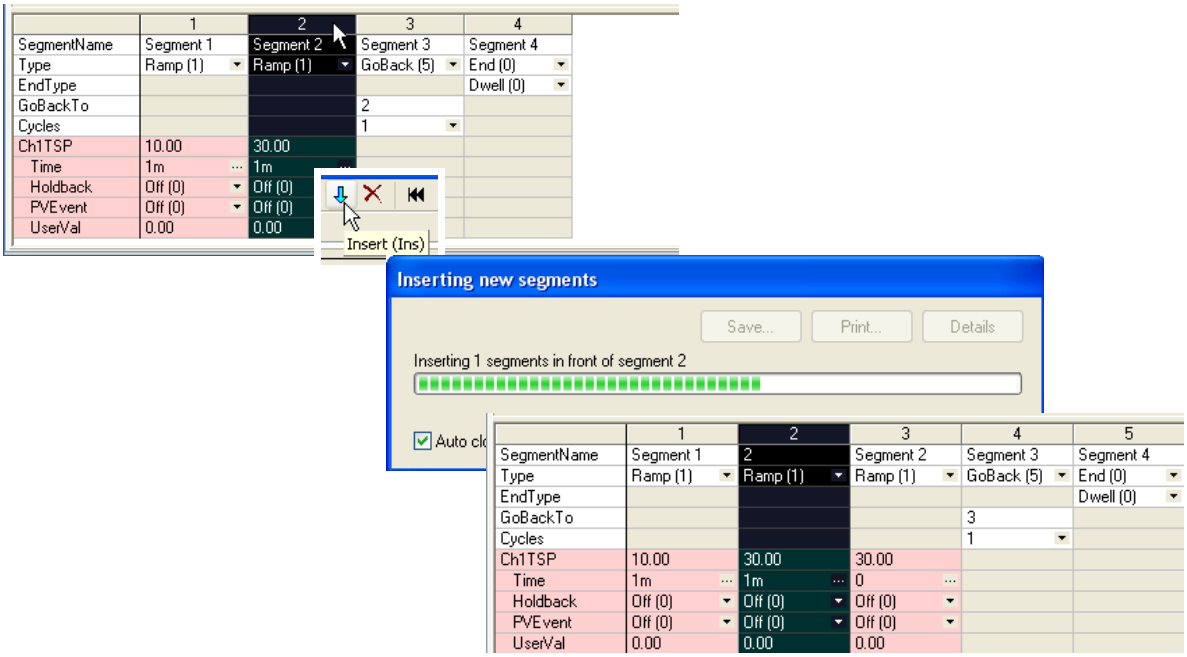


Figure 3.6.4 Insert a segment

Alternatively the mouse can be right-clicked anywhere in a segment, and the 'Insert segment' item selected, or one or more segment can be highlighted and the 'Insert' key on the pc keyboard used to initiate the process. See section 6.5.7 for more details of the right-click (context) menu.

CUTTING, COPYING AND PASTING SEGMENTS

The process of highlighting one or more segments causes the cut and copy toolbar icons to become active.

The cut tool removes the highlighted segments from the program and stores them on the pasteboard ready for re-use.

The copy tool copies the selected segment(s) to the paste board, leaving the original segment(s) in place.

Once one or more segments have been cut or copied, the 'Paste insert' and 'Paste over' icons become active allowing the user to paste the contents of the pasteboard in front of a selected segment (Paste insert), or to overwrite the existing highlighted segment(s) (Paste over). When using the Paste over tool, the number of segments being pasted over must match the number of segments on the paste board.

DELETING SEGMENTS

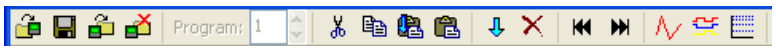
Once one or more segments have been highlighted, the highlighted segments can be removed using the Delete toolbar icon, by using the Delete Segment item in the right-click (context) menu, or by operating the pc keyboard 'Ctrl' and Delete' keys simultaneously.

6.4.5 Loading and Saving programs 

The four program operation keys at the top left of the programmer window allow the user to load a program from or save a program to either the currently connected instrument or to a pc.

The fourth icon allows the user to select a program to be deleted from the connected instrument.

See section 6.5.6 for more details.

6.4.6 Toolbar icons 

The toolbar icons appearing at the top of the programmer window have the following properties:

	Load Program. Opens a browser window allowing the user to select a program on the pc, or a program stored in the connected instrument to load. Short cut: <Ctrl> + <L>.
	Save current program to file. Opens a browser window allowing the user to select a location on the pc in which to save the current program. This file is saved with a '.upiz' extension and can be saved to a USB memory stick for downloading to an instrument, or it can be transferred to the instrument via an ftp server. Short cut: <Ctrl> + <S>.
	Store current program on device. Allows the user to save the program to the program store on the instrument. Short cut: <Shift key> + <Ctrl> + <S>.
	Delete Programs from Device. Allows the user to delete programs from the program store on the connected instrument. Short cut: <Ctrl> + <F>.
	Cut. Removes the highlighted segment(s) from the program and places them on the pasteboard. Short cut: <Ctrl> + <X>.
	Copy. Copies the selected segment(s) to the pasteboard, leaving the original segments in place. Short cut: <Ctrl> + <C>.
	Paste insert. Inserts the segments on the pasteboard into a location to the left of the highlighted segment. Short cut: <Ctrl> + <V>.
	Paste over. Overwrites the highlighted segment(s) with the segment(s) on the pasteboard. The number of segments on the pasteboard must match the number of segments being overwritten. Short cut: <Shift key> + <Ctrl> + <V>.
	Insert. Inserts a new segment to the left of the highlighted segment. If more than one segment is highlighted, then the same number of segments are inserted as are highlighted. Copies the segment type of the segment to the right of the insertion point except if that segment is an 'End' or 'GoBack' segment, when newly inserted segments are of type 'Ramp'. Short cut: <Insert>.
	Delete. Deletes the highlighted segment(s). Short cut: <Ctrl> + <Delete>.
	Go to first. Moves the user to the first segment. Useful in very long programs. Short cut: <Ctrl> + <Left arrow>.
	Go to last. Moves the user to the end segment. Useful in very long programs. Short cut: <Ctrl> + <Right arrow>.
	Analog. Selects the analogue trace chart for display and segment configuration. Short cut: <Ctrl> + <G>.
	Digital Event Outputs. Selects the Event output chart for display and configuration.Short cut: <Ctrl> + <D>.
	Logarithmic. Switches the vertical scale to logarithmic. Short cut: <Ctrl> + <M> (figure 3.6.6)

6.4.7 Toolbar Icons (Cont.)

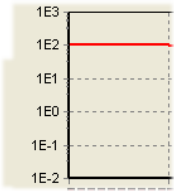
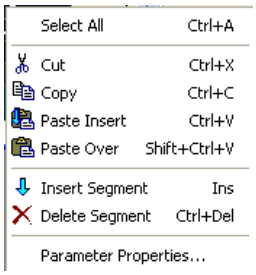


Figure 3.6.6 Logarithmic scale example

6.4.8 Context menus

SEGMENT CONTEXT MENU

Right-clicking when the mouse cursor is hovering over a segment in the analogue segment parameters view produces the segment context menu shown. The items copy the relevant tool bar icons described above, with the following additions:



various

Select All	Selects all parameters
Parameter properties	Displays the properties window for the parameter right-clicked on, including a 'Help' tag for that parameter.

PROGRAM CONTEXT MENU

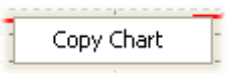
Right-clicking when the mouse cursor is hovering in the program parameters view produces the program context menu shown.

Parameter properties	Displays the properties window for the parameter right-clicked on, including a tag for that parameter.
Columns	Allows the user to enable/disable columns in the program parameters display.

'Help'

CHART CONTEXT MENU

Right-clicking when the mouse cursor is hovering over the analogue chart or the event chart produces the segment context menu shown. This allows the user to the chart to the pasteboard, from where it can be pasted into (for example) a standard word procesing document.



digital copy

6.4.9 Programmer menu

Clicking on the 'Programmer' menu item near the top of the iTools window causes the Programmer menu (figure 3.6.8) to appear. The items contained within this menu are described in the 'Toolbar icons' and 'Context menu' sections (sections 6.5.6 and 6.5.7 respectively) above.

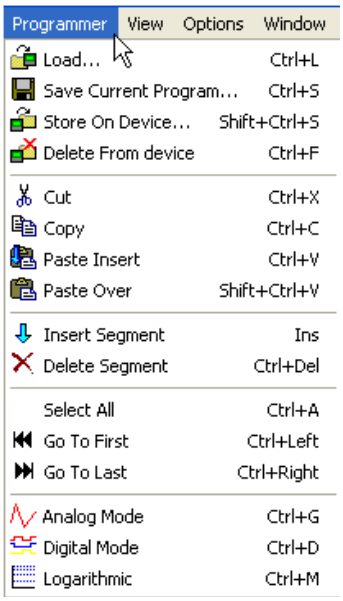


Figure 3.6.8 Programmer menu

6.4.10 Two channel programs

The display and editing of segment and program parameters for two-channel programmers is carried out in the same way as described above, for single channel programs. The major difference in apearance is that there are two sets of parameters for each segment, instead of one. The background colour for channel 1 parameters is pink; that for channel 2 parameters is green.

The number of channels and the program features enabled are set up at the instrument as desribed in section 4.4.??

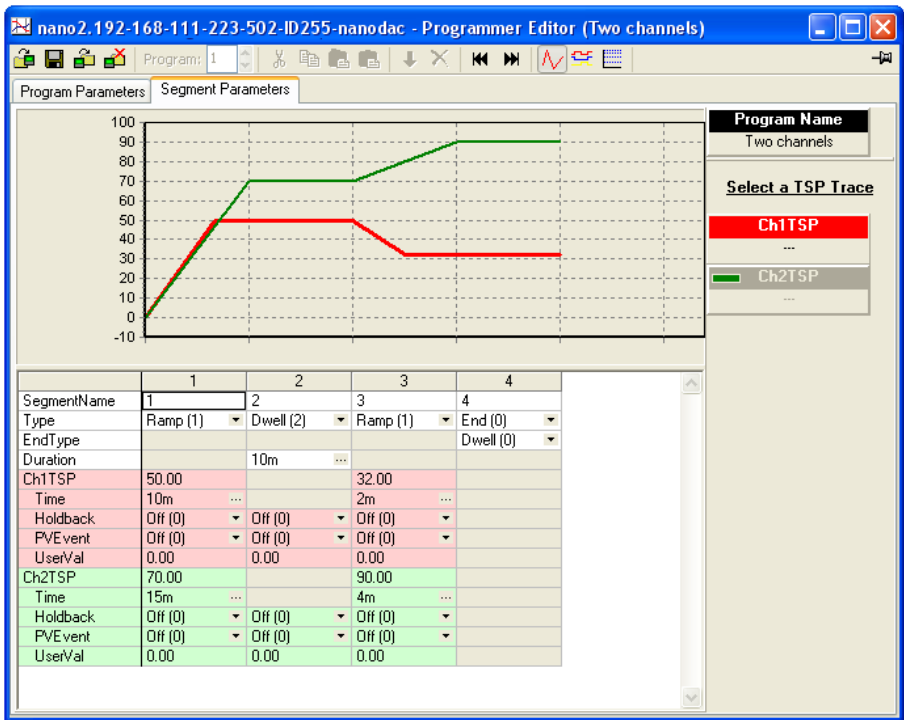


Figure 3.6.9 Two channel program display

6.4.11 To Set Up OEM Security

This will be illustrated by the following two examples:

EXAMPLE 1:

Make the parameter Network.Modbus.TimeFormat read/write when OEM security is enabled and the instrument is in Engineer access level and leave the remaining parameters in this list as read only.

Select Engineer (Configuration) access level

With OEM status unlocked set 'OEMParamsLists' to On.

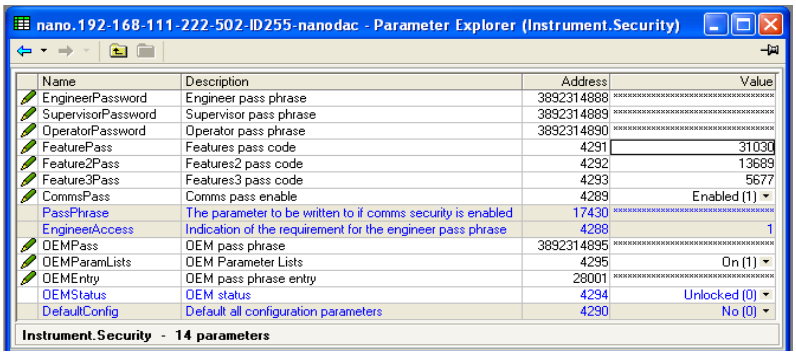


Figure 3.6.10a

Open 'Network.Modbus list

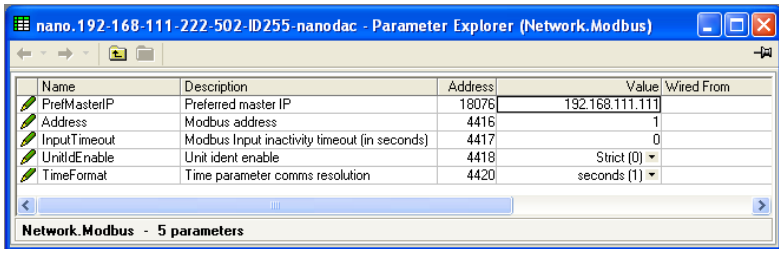


Figure 3.6.10b

Open 'Instrument.OEMConfigList'

Drag and drop the parameter(s) which are required to be read/write in Engineer level when OEM security is enabled.

In this example the parameter 'TimeFormat'.

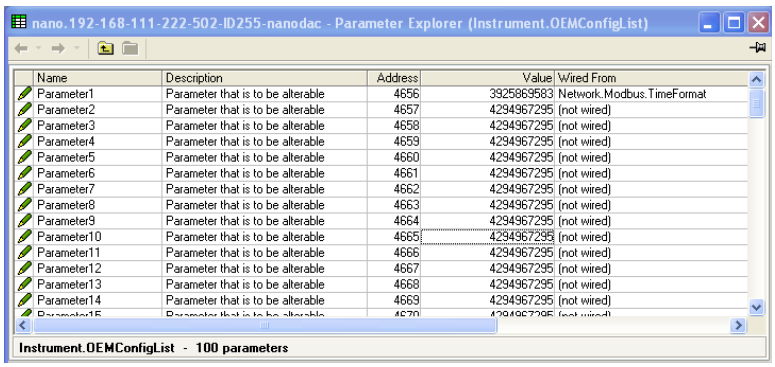


Figure 3.6.10c

EXAMPLE 2:

Make the parameter 'Loop1.PID.ProportionalBand' read only when OEM security is enabled and the instrument is in Supervisor access level and leave the remaining parameters in this list as read/write.

Open 'Loop1.PID list.

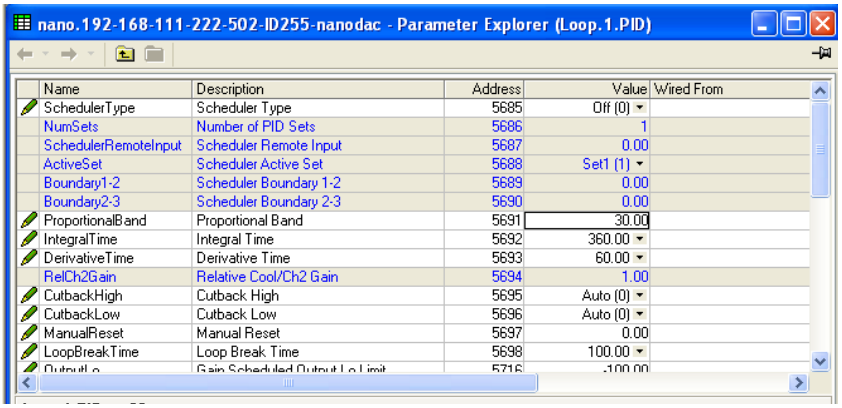


Figure 3.6.10d

Open

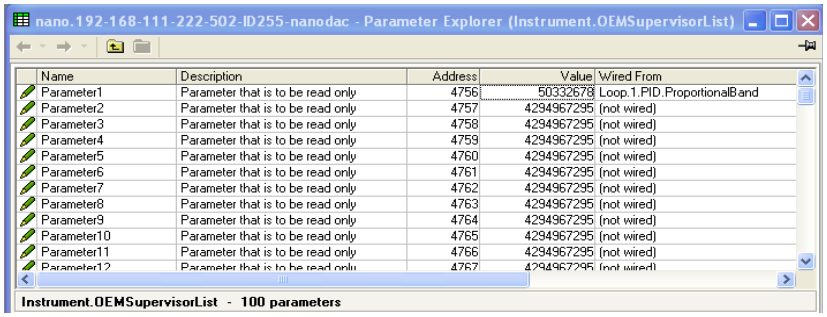


Figure 3.6.10e

Instrument.OEMSupervisorList

Drag and drop the parameter(s) which are required to be read only in Supervisor level when OEM security is enabled.

In this example the parameter Loop1 Proportional band.

TO ENABLE OEM SECURITY

In 'OEMEntry' enter the security code. This is the same code as entered in Engineer level in 'OEMPass'.

The 'OEMStatus' parameter will change to 'Locked'.

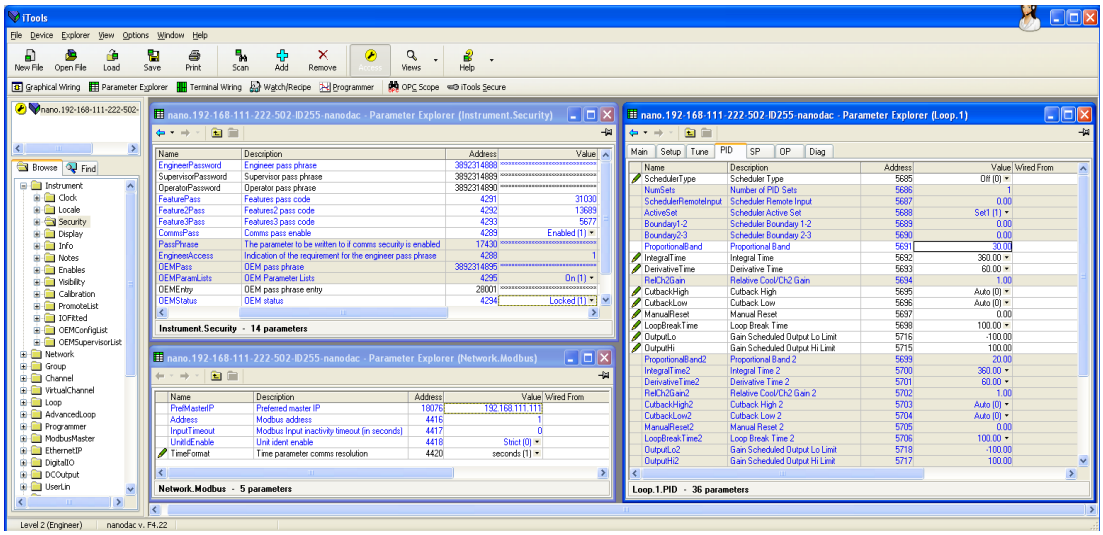


Figure 3.6.10f

As in Figure 3.6.10f above, the parameter 'TimeFormat' is alterable in Engineer level and the parameter 'Loop1 Proportional Band' is locked when OEM security is enabled.

7. USER WIRING

User wiring, created from the instrument front panel, allows parameters to be wired together so that, for example, a counter can be configured to be incremented when an alarm goes active. This can be used as an alternative to iTools.

This section is presented as two examples that show the general techniques used to create and delete wires from the instrument user interface.

Notes:

1. These examples refer to Channel Configuration and to Virtual Channel configuration.
2. The destination parameter field has a small green triangle at the top left corner to indicate that it has a wire routed to it.

7.1 COUNTER EXAMPLE

This example shows how to set up a counter to be incremented each time Channel 1 Alarm 1 becomes active, and reset each time channel 2, alarm 1 is acknowledged. For this example, Virtual Channel 3 will be configured as the counter, with a preset value of 0.

1. At Channel.1.Main, set:
   Type = test
   Test Signal = Sine 4 min.
   Scale Low = 0
   Scale High = 100
2. At Channel.1.Alarm1, set:
   Type = Abs Hi
   Threshold = 50
   Latch = None
3. At Channel.2.Main, set:
   Type = Test
   Test Signal = Sine 40 min.
   Scale Low = 0
   Scale High = 100
4. At Channel.2.Alarm 1, set:
   Type = Abs Hi
   Threshold = 90
   Latch = Manual
5. At Virtual Channel.3.Main, set:
   Type = Counter
   Operation = On
   Input = 1

All the other parameters can be left at their defaults.

6. Still at Virtual Channel 3 (Main), use the up/down arrow buttons to highlight 'Trigger'. Press and hold the scroll key. The top level User Wiring page appears, this time with a 'From Source' tab as well as the 'To Destination' tab of example 1. This is because this parameter is read/write, whereas Alarm Active is read only (i.e. its value may be read but not changed).
7. Use the up (or down) arrow button to select the 'From Source' tab.

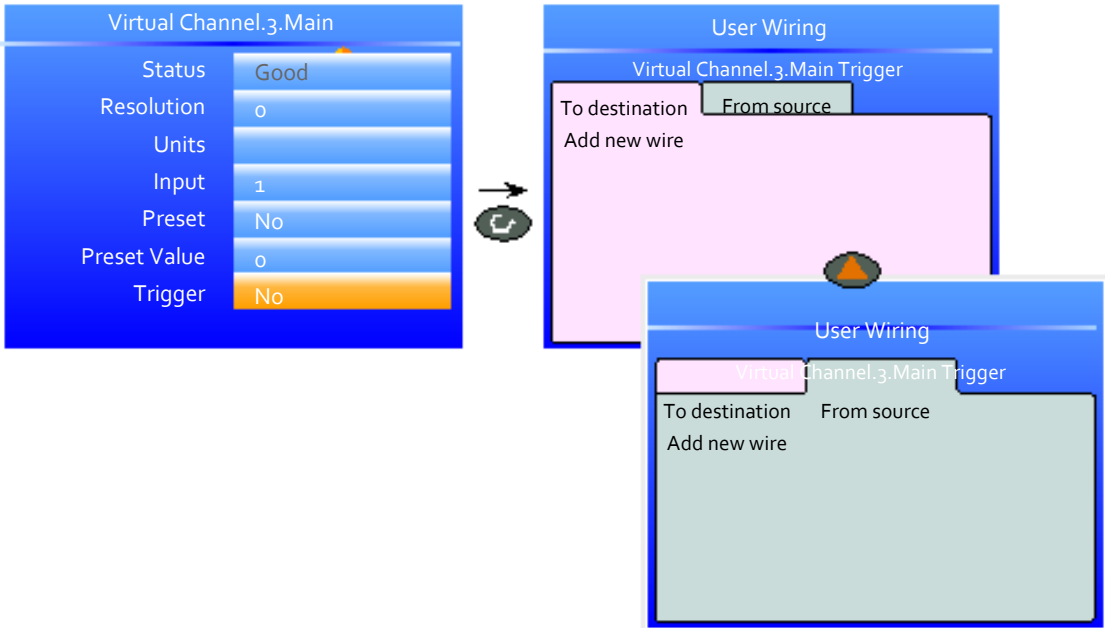


Figure 4.2a Wiring a counter: part 1

Counter Example (Cont.)

8. Operate the Scroll key to highlight 'Add new wire', then again to display the top level parameter list.
9. Use the down arrow button to highlight 'Channel' and operate the scroll button.
10. Operate the scroll button to select '1'.
11. Highlight 'Alarm 1' and operate the scroll button.
12. Use the down arrow button to highlight 'Active'. Operate the Scroll button again, and create the new wire.
13. Use the Page button twice to return to the Virtual Channel 3 menu.

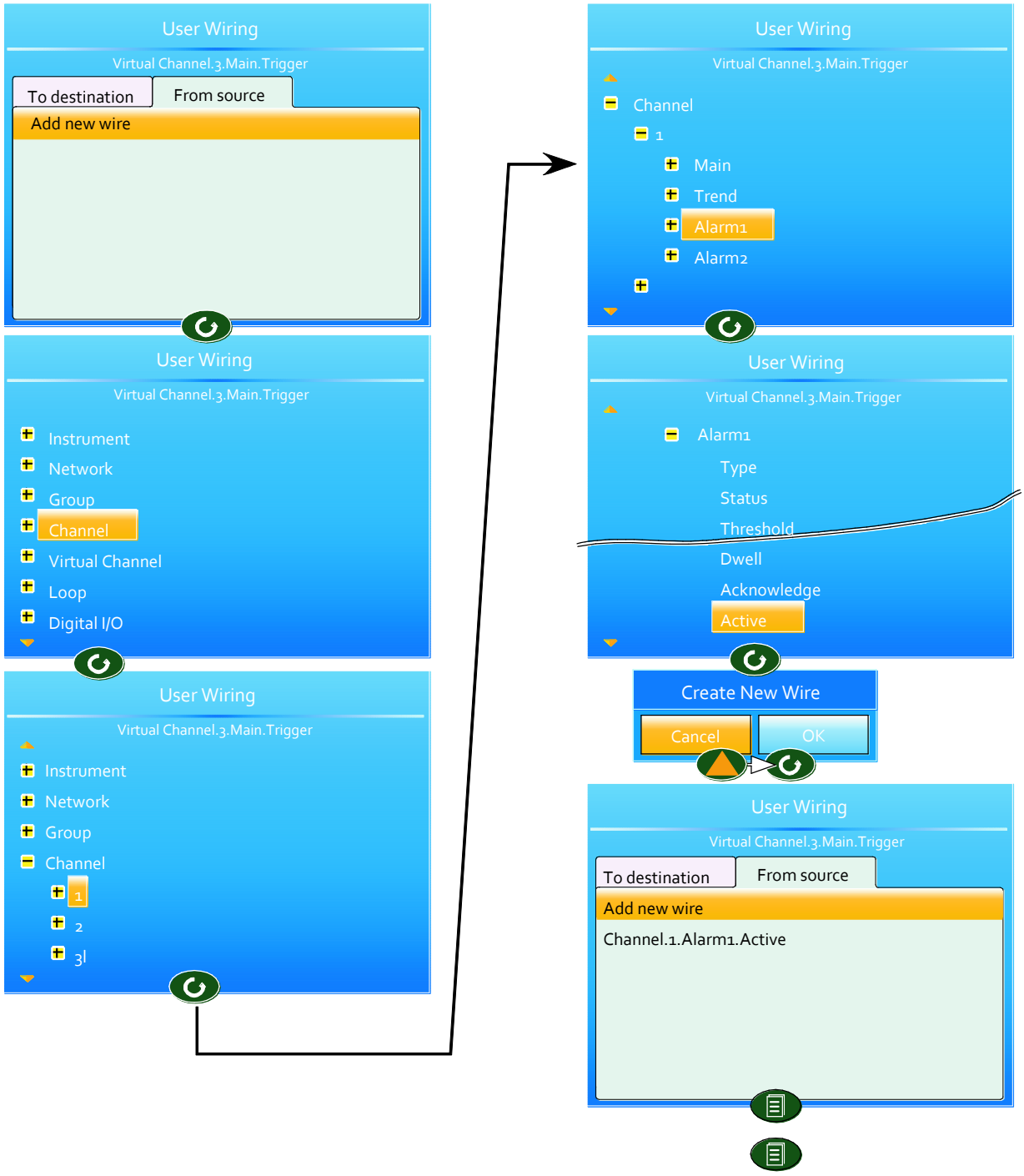


Figure 4.2b Wiring a counter: part 2

Counter Example (Cont.)

14. At Virtual Channel.3.Main, use the down arrow to select 'Preset'. Press and hold the scroll key. The top level User Wiring page appears.
15. Use the up (or down) arrow button to select the 'From Source' tab, if not already selected.
16. Operate the Scroll key to highlight 'Add new wire', then again to display the top level parameter list.
17. Use the down arrow button to highlight 'Channel' and operate the scroll button.
18. Use the down arrow button to highlight '2' and operate the scroll button.
19. Highlight 'Alarm 1' and operate the scroll button.
20. Use the down arrow button to highlight 'Acknowledgement' (not 'Acknowledge'). Operate the Scroll button again, and create the new wire.

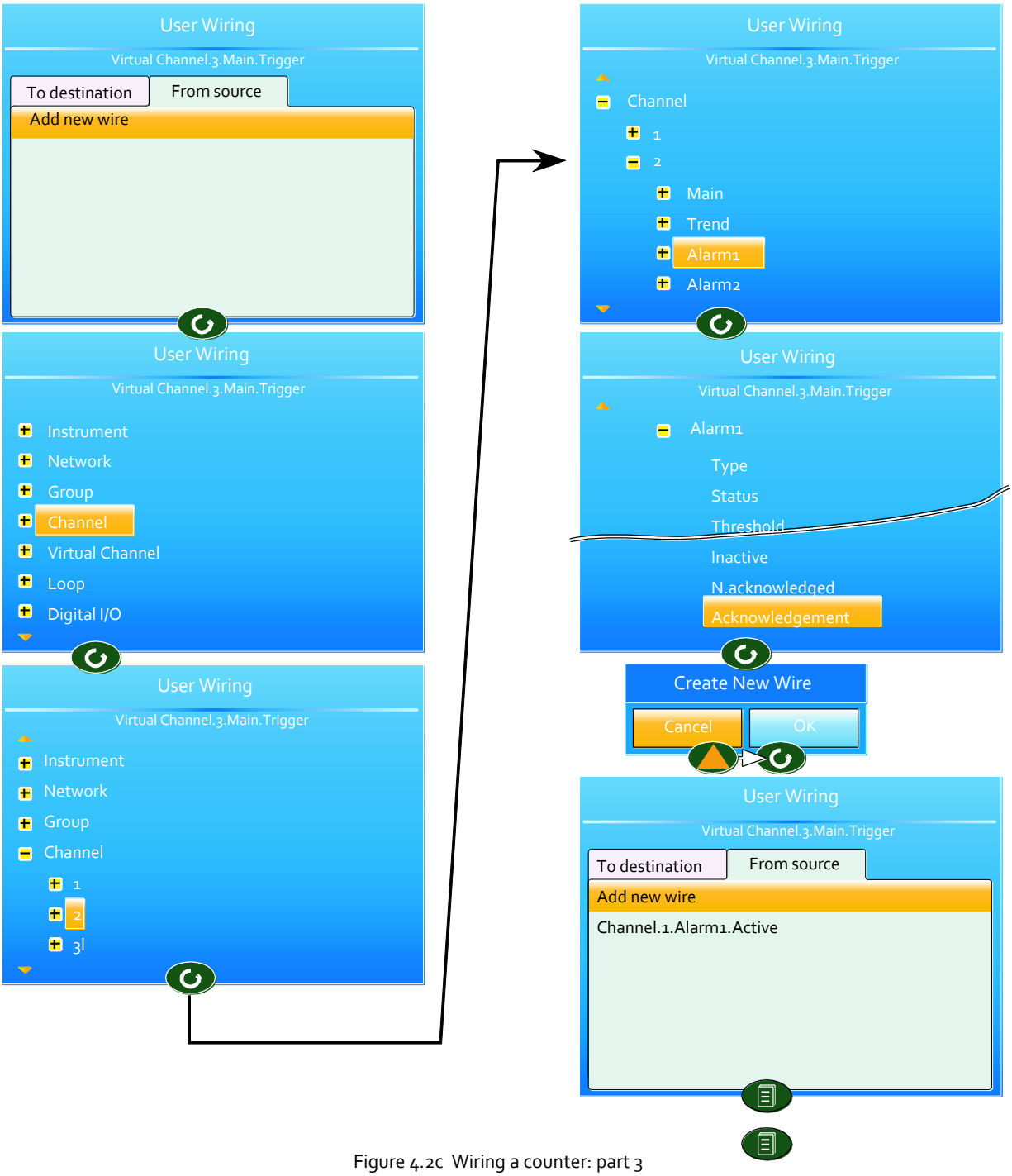


Figure 4.2c Wiring a counter: part 3

8. USB DEVICES

The devices listed below can be plugged into the USB connector at the back of the instrument, providing that the maximum current required is less than 100 mA.

1. Memory Stick
2 Bar code reader
3. Keyboard

Notes:

1. See 'USB device precautions' in the Safety Notes preamble section of the manual.
2. See Section A2 for the USB port specification
3. The use of USB hubs is not supported by this instrument.

8.1 MEMORY STICK

The use of the memory stick as an archiving device, or to facilitate software upgrades is well documented in the relevant sections of this manual.

8.2 BAR CODE READER

If 'USB Auto Scan is set to 'Yes' in Display Configuration then, with the bar code reader plugged into the USB port, the scanned data input stream is packaged into a general message displayed on the trend page and included in the .uhh history file. The format of the message is: DD/MM/YY HH:MM:SS 123--13 (where 123--13 represents the ASCII data read from the bar code.

If 'USB auto Scan' is set to 'No, the ASCII data read from the bar code is displayed as a message ready for editing prior to being sent to the display etc. Figure 5.2 shows an example.

Note: the bar code reader must be configured to use a carriage return (decimal 13) terminating character.

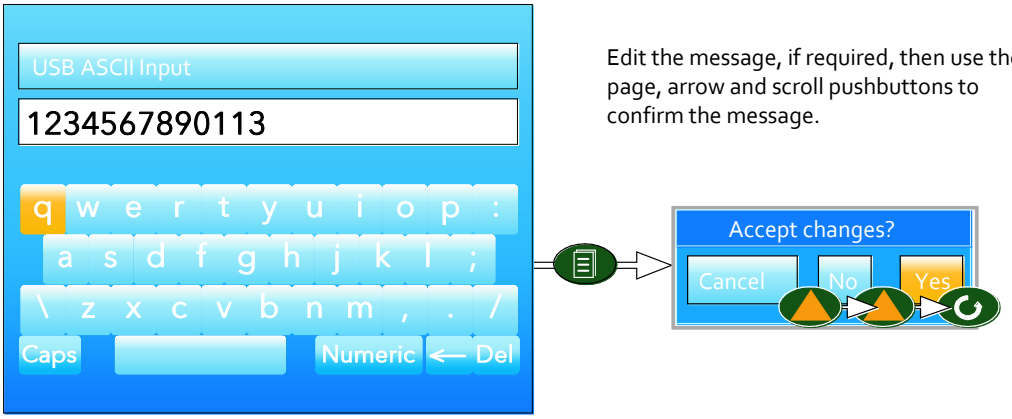


Figure 5.2 Bar Code reader display

8.3 USB KEYBOARD

A QWERTY keyboard may be plugged into the rear USB port to act in parallel with the virtual keyboard. The editing keys listed below are supported in addition to the standard alpha-numeric characters.

Left arrow	Moves the cursor left-wards through the text string (stops at the start of the string).
Right arrow	Moves the cursor right-wards through the text string (stops at the end of the string).
Backspace	Deletes the character immediately to the left of the cursor.
Delete	Removes the character immediately to the right of the cursor.
End	Moves the cursor to the end of the string
Home	Moves the cursor to the start of the string
Insert	Highlights the entire string, for overwriting
Esc	Exit without saving changes.

9. Appendix A: TECHNICAL SPECIFICATION

9.1 RECORDER SPECIFICATION

I/O types

	Analogue i/p	Four (eight if dual input option fitted)
	Digital i/p	Two
	Digital (logic) o/p	See table A2 for options
	Relay o/p	See table A2 for options
	DC output	See table A2 for options
Features		CSV archive format
		EtherNet/IP (Option)
		File transfer protocol (FTP)
		Messages
		Modbus Master (Option)
		Modbus TCP slave
		Set point programmer (option)
		uhh (history file) archiving
		USB port at rear of instrument
		User linearisation tables (four)
		Two control loops (optional)
		Advanced Loop (optional)
		Zirconia probe support (optional)
		15 Virtual channels (each configurable as maths, totaliser or counter).
		30 Virtual channels if Modbus Master or EtherNet/IPoptions fitted (no alarms on virtual channels 16 to 30)

IO1	OP2	OP3	OP4	OP5	
L	R	R	R	R	← Default
L	R	D	R	R	
L	L	R	R	R	← Options
R	D	D	R	R	
D	D	D	R	R	

L = Logic output; R = Relay; D = DC output

OP4 and OP5 share Common terminals

Table A2 Output options

Environmental performance

Ambient temperature range		
	Operating:	0 to 55°C
	Storage:	-20 to +70°C
Humidity range	Operating:	5% to 85% RH non condensing
	storage:	5% to 85% RH non condensing
Protection	Front panel (Standard):	IP65
	Front panel (Wash down):	IP66, NEMA12
	Behind panel:	IP10 (International)
Shock/Vibration		To BS EN61131-2 (5 to 150 Hz. at 1g; 1 octave per min.)
Altitude		<2000 metres
Atmosphere		Not suitable for use in explosive or corrosive atmospheres.
Electrical safety		BS EN61010-1 (Installation category II; Pollution degree 2)
Electromagnetic compatibility		
	Emissions (standard units):	BS EN61326 Class B - Light industrial.
	Emissions (Low voltage option):	BS EN61326 Class A - Heavy industrial
	Immunity	BS EN61326 Industrial

Other approvals and compliance details

	General:	CE and cUL, EN61010
	PV input	AMS2750D compliant
	RoHS	EU; China
Packaging		BS EN61131-2 section 2.1.3.3.

Physical

Panel mounting	1/4 DIN
Weight	0.44kg (15.52 oz.)
Panel cutout dimension	92 mm x 92 mm (both -0.0 +0.8) or 3.62 in x 3.62 in (both -0.00 +0.03 in)
Depth behind panel	90 mm (3.54 in) (excluding wiring.

Operator interface

Display	3.5" TFT colour display (320 pixels wide x 240 pixels high)
Controls	Four navigation pushbuttons below the display screen (Page, Scroll, Lower and Raise)

Power requirements

Supply voltage	Standard:	100 to 230Vac ± 15% at 48 to 62Hz.
	Low voltage option:	24Vac (+10% - 15%), at 48 to 62 Hz, or 24Vdc (+20% -15%)
Power dissipation		9 W
Fuse type		None
Interrupt protection	Standard:	Holdup >10ms at 85V RMS supply voltage.
	Low voltage option:	Holdup >10ms at 20.4V RMS supply voltage.

Battery backup

Stored data	Time, date.
Support time (for real-time clock)	Minimum of 1 year with unit unpowered.
Replacement period	Three years typical
Type	poly-carbonmonofluoride / lithium (BR2330) (PA260195)

Ethernet communications

Type:	10/100baseT Ethernet (IEEE802.3)
Protocols:	Modbus TCP/IP slave, FTP, DHCP
Cable type	Category 5
Maximum length	100metres (110 yards)
Termination	RJ45. Green LED illuminated = link connected; Amber LED flashing shows link activity.

RECORDER SPECIFICATION (Cont.)

USB port

Number of ports	One at rear of instrument
Standard	USB1.1
Transmission speeds	1.5Mbits/sec (low speed device)
Maximum current	<100mA
Peripherals supported	Memory stick (8GB max), Bar code reader, QWERTY keyboard

Update/Archive rates

Sample rate (input/output)	8Hz (4Hz for digital inputs) (4Hz for dual input channels)
Trend update	8 Hz max
Archive sample value	Latest value at archive time
Display value	Latest value at display update time.

9.2 ANALOGUE INPUT SPECIFICATION

General

Number of anaologue inputs		Four
Input types	Standard:	dc Volts, dc mV, dc mA (external shunt required), thermocouple, RTD (2-wire and 3-wire), digital (contact closure).
	Optional:	dual mA, dual mV, dual thermocouple.
Input type mix		Freely configurable
Sample rate		8Hz (125ms)
Conversion method		16 bit delta sigma.
Input ranges		See below.
Mains rejection (48 to 62Hz)		
	Series mode:	>95dB
	Common mode:	>179dB
Common mode voltage		250Vac max.
Series mode voltage		280mV at lowest range; 5V peak-to-peak, at highest range.
Input impedance		See relevant Range specification, below.
Overvoltage protection	Continuous:	± 30V RMS
	Transient (<1ms):	±200V pk-pk between terminals.
Sensor break detection	Type	ac sensor break on each input giving quick response with no associated dc errors.
	Recognition time:	<3 secs.
	Minimum break resistance:	40mV, 80mV ranges: 5kΩ; other ranges: 12.5kΩ
Shunt (mA inputs only)	Values	1Ω to 1kΩ, mounted externally.
	additional error due to shunt:	0.1% input
Isolation	Channel to channel:	300V RMS or dc (double insulation)
	Channel to common electronics:	300V RMS or dc (double insulation)
	Channel to ground:	300V RMS or dc (double insulation)
Dielectric strength	Test:	BS EN61010, 1 minute type test
	Channel to channel:	2500 Vac
	Channel to ground:	1500 Vac

DC input ranges

Ranges		40mv, 80mV, 2V; 10V (-4.0 to +10V)
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 25°C ambient
	Temperature coefficient:	±0.2µV/°C ± 13ppm/°C of measurement from 25°C ambient
	Input leakage current:	±14nA
	Input resistance:	100MΩ
80mV Range	Range:	-80mV to + 80mV
	Resolution	3.2µV (unfiltered)
	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 25°C ambient
	Temperature coefficient:	±0.2µV/°C ± 13ppm/°C of measurement from 25°C ambient
	Input leakage current:	±14nA
	Input resistance:	100MΩ
2V Range	Range:	±2V
	Resolution	82µV
	Measurement noise:	90µV peak-to-peak with 1.6s input filter
	Linearity error:	0.003% (best fit straight line)
	Calibration error:	±420µV ±0.044% of measurement at 25°C ambient
	Temperature coefficient:	±125µV/°C ± 13ppm/°C of measurement from 25°C ambient
	Input leakage current:	±14nA
	Input resistance:	100MΩ

ANALOGUE INPUT SPECIFICATION (Cont.)

DC Input ranges (Cont.)

10V Range

Range:	-3V to +10V
Resolution	500µV
Measurement noise:	550µV peak-to-peak with 1.6s input filter
Linearity error:	0.007% (best fit straight line) for zero source resistance. Add 0.003% for each 10Ω source and lead resistance
Calibration error:	±1.5mV ±0.063% measurement at 25°C ambient
Temperature coefficient:	±66µV/°C ± 45ppm/°C of measurement from 25°C ambient
Input resistance:	62.5kΩ for input voltages > 5.6V. 667kΩ for input ranges < 5.6V.

Note: 10V range not available for dual input channels

Resistance input ranges

Temperature scale	ITS90
RTD Types, ranges and accuracies	See table
Maximum source current	200µA

Resistance input figures

Range:	0 to 400Ω (-200 to +850°C)
Resolution:	0.05°C
Measurement noise:	0.05°C peak-peak with 1.6s input filter
Linearity error:	0.0033% (best fit straight line)
Calibration error:	±0.31°C ±0.023% of measurement in °C at 25°C ambient
Temperature coefficient:	±0.01°C/°C ±25ppm/°C measurement in °C from 25°C ambient
Lead resistance	0 to 22Ω matched lead resistances
Bulb current:	200µA nominal

RTD type	Overall range °C	Standard	Max. linearisation error
Cu10	-20 to + 400	General electric Co.	0.02°C
Cu53	-70 to + 200	RC21-4-1966	<0.01°C
JPT100	-220 to + 630	JIS C1604:1989	0.01°C
Ni100	-60 to + 250	DIN43760:1987	0.01°C
Ni120	-50 to + 170	DIN43760:1987	0.01°C
Pt100	-200 to + 850	IEC751	0.01°C
Pt100A	-200 to + 600	Eurotherm Recorders SA	0.09°C

Table A3a RTD type details

Thermocouple data

Temperature scale		ITS90
CJC	Types:	Off, internal, external, remote.
	Remote CJC source	Any input channel
	Internal CJC error	<1 °C max, with instrument at 25 °C
	Internal CJC rejection ratio:	40:1 from 25°C
Upscale/downscale drive		High, low or none independently configurable for each channel's sensor break detection.
Types, ranges and accuracies		See table A3b

T/C type	Overall range (°C)	Standard	Max. linearisation error
B	0 to + 1820	IEC584.1	0 to 400°C = 1.7°C 400 to 1820°C = 0.03°C
C	0 to + 2300	Hoskins	0.12°C
D	0 to + 2495	Hoskins	0.08°C
E	-270 to + 1000	IEC584.1	0.03°C
G2	0 to + 2315	Hoskins	0.07°C
J	-210 to + 1200	IEC584.1	0.02°C
K	-270 to + 1372	IEC584.1	0.04°C
L	-200 to + 900	DIN43710:1985 (to IPTS68)	0.02°C
N	-270 to + 1300	IEC584.1	0.04°C
R	-50 to + 1768	IEC584.1	0.04°C
S	-50 to + 1768	IEC584.1	0.04°C
T	-270 to + 400	IEC584.1	0.02°C
U	-200 to + 600	DIN43710:1985	0.08°C
NiMo/NiCo	-50 to + 1410	ASTM E1751-95	0.06°C
Platinel	0 to + 1370	Engelhard	0.02°C
Mi/NiMo	0 to + 1406	Ipsen	0.14°C
Pt20%Rh/Pt40%Rh	0 to + 1888	ASTM E1751-95	0.07°C

Table A3b Thermocouple types, ranges and accuracies

10. Appendix B TUNING CONSIDERATIONS

If a process includes adjacent interactive zones, each zone should be tuned independently with the adjacent zones at operating temperature.

It is recommended that a tuning process be initiated when the PV and setpoint are far apart. This allows start up conditions to be measured and cutback values to be calculated more accurately. Cutback is not set for 'Tune at setpoint'.

In a programmer/controller tuning should only be attempted during dwell periods and not during ramp stages. If a programmer/controller is tuned automatically the controller should be placed in 'Hold' during each dwell period whilst autotune is active.

Note: Tuning, carried out in dwell periods which are at different extremes of temperature may give different results owing to non linearity of heating (or cooling). This may provide a convenient way to establish values for Gain Scheduling.

If an auto tune is initiated there are two further parameters (High Output' and 'Low Output') which need to be set. These are found in the 'Tune' menu.

High Output	Sets a high output limit to be imposed during autotune. Must be ≤ Output High, set in the Output menu.
Low Output	Sets a low output limit to be imposed during autotune. Must be ≥ Output Low, set in the Output menu.

The above values must be set correctly, otherwise sufficient power to achieve SP might not be available during tuning, and the tune will eventually fail.

10.1 Autotune

Autotune automatically sets the following PID menu parameters:

PB	Proportional band.
Ti	Integral time. If previously set to 'Off' Ti will remain off after an autotune.
Td	Derivative time. If previously set to 'Off' Td will remain off after an autotune.
CBH, CBL	Cutback high and low values. If either is set to 'Auto', it will remain so after auto tuning. In order that Autotune set the cutback values for the user, a value other than 'Auto' must be selected before Autotune is initiated. Autotune never returns cutback values less than 1.6 × PB
R2G	Calculated only if the unit is configured as Heat/Cool. Following an Autotune, R2G lies between 0.1 and 10. If the calculated value lies outside this range, a 'Tune Fail' alarm is set.
LBT	Loop break time. Following an autotune, LBT is set to 2 × Ti (if Ti was not previously set 'Off'), or to 12 × Td (if Ti was previously set to 'Off').

AUTOTUNE (Cont.)

Autotune can be performed at any time, but normally it is performed only once, during the initial commissioning of the process. However, if the process under control subsequently becomes unsatisfactory (because its characteristics have changed), it may be necessary to tune again for the new conditions.

The auto tune algorithm reacts in different ways depending on the initial conditions of the plant. The explanations given later in this section are for the following example conditions:-

1. Initial PV is below the setpoint and, therefore, approaches the setpoint from below for a heat/cool control loop
2. As above, but for a heat only control loop
3. Initial PV is at the same value as the setpoint (tune at setpoint). That is, within 0.3% of the range of the controller if 'PB Units' (Setup menu) is set to 'Percent', or ±1 engineering unit (1 in 1000) if the 'PB Units' is set to 'Eng'. Range is defined as 'Range High' – 'Range Low' for process inputs or the thermocouple or RTD range defined in section A3 for temperature inputs. If the PV is just outside the range stated above the autotune will attempt a tune from above or below SP.

AUTOTUNE AND SENSOR BREAK

When the controller is autotuning and sensor break occurs, the autotune aborts and the controller outputs the sensor break output power 'Sbrk OP' set up in the Output menu. Autotune must be re-started when the sensor break condition is no longer present.

AUTOTUNE AND INHIBIT OR MANUAL

If the Loop Inhibit is asserted or the controller is put into Manual Mode, any tune in progress will be aborted and will need to be restart once the condition has been removed. Note that it is not possible to start an autotune sequence if the loop is inhibited or in Manual control.

AUTOTUNE AND GAIN SCHEDULING

When gain scheduling is enabled and an autotune is performed, the calculated PID values are written into the PID set that is active, on completion of the tune. Therefore, the user may tune within the boundaries of a set and the values will be written into the appropriate PID set. However, if the boundaries are close (because the range of the loop is not large), then, at the completion of the tune, it cannot be guaranteed that the PID values will be written to the correct set particularly if the schedule type is PV or OP. In this situation the scheduler ('Sched Type') should be switched to 'Set' and the 'active set' chosen manually.

INITIAL CONDITIONS

Configure the parameters described in sections B2.4.3 and B2.4.4, above.

Notes:

1. The 'tighter' power limit applies. For example, if 'High Output' is set to 80% and 'Output High' is set to 70% then the output power will be limited to 70%
2. The PV must oscillate to some degree to allow the tuner to calculate the relevant values. The limits must be set so as to allow oscillation about the setpoint.

INITIATING THE AUTOTUNE

In the Loop Tune menu for the relevant loop, set 'TuneEn' to 'On'.

AUTOTUNE (Cont.)

EXAMPLE 1: AUTOTUNE FROM BELOW SP (HEAT/COOL)

The point at which Automatic tuning is performed (Tune Control Point) lies just below the setpoint at which the process is normally expected to operate (Target Setpoint). This ensures that the process is not significantly overheated or overcooled. The Tune Control Point is calculated as follows:-

Tune Control Point = Initial PV + 0.75(Target Setpoint – Initial PV).

The Initial PV is the PV measured after a 1 minute settling period (point 'B' in the figure below).

Examples:

If Target Setpoint = 500°C and Initial PV = 20°C, then the Tune Control Point is 380°C.

If Target Setpoint = 500°C and Initial PV = 400°C, then the Tune Control Point is 475°C.

This is because the overshoot is likely to be less as the process temperature approaches the target setpoint.

Figure 6.4.5a shows the auto tune sequence.

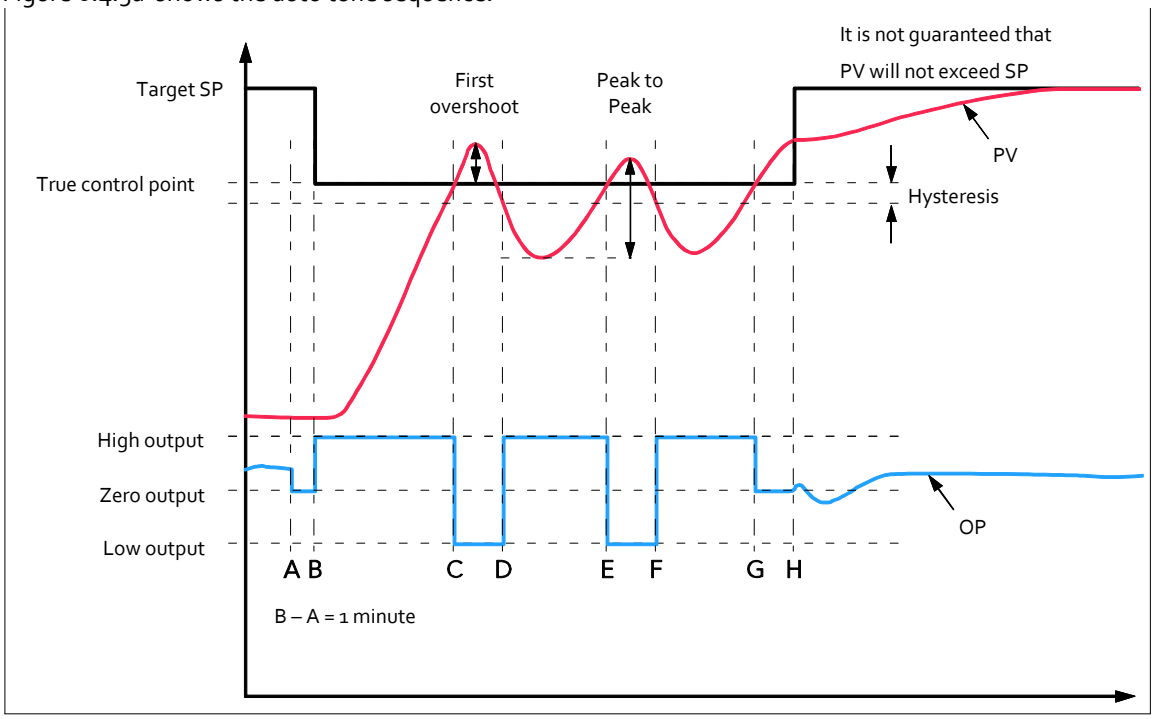


Figure 6.4.5a Autotune heat/cool process

KEY

A	Start of Autotune
A to B	Heating and Cooling off for one minute allows steady state conditions to be established.
B to D	First heat/cool cycle to establish first overshoot. Cutback low (CBL) value calculated from the overshoot magnitude (unless CBL set to 'Auto').
B to F	Two cycles of oscillation allow peak-to-peak value and oscillation period to be determined. PID terms are calculated.
F	Heating is switched on.
G	Heating (and cooling) are switched off allowing the plant to respond naturally. Measurements over the period F to G are used to calculate the Relative Cool Gain (R2G). Cutback High is calculated from the equation (CBH = CBL × R2G).
H	Autotune is turned off and the process is allowed to control at the target setpoint using the new control terms.

Note: Autotuning from above SP is identical except that heating and cooling are reversed.

AUTOTUNE (Cont.)

EXAMPLE 2: AUTOTUNE FROM BELOW SP (HEAT ONLY)

The sequence of operation for a heat only loop is the same as that described above for a heat/cool loop, except that the sequence ends at 'F' since there is no need to calculate 'R2G' (R2G is set to 1.0 for heat only processes). At 'F' autotune is turned off and the process is allowed to control using the new control terms.

For a tune from below setpoint 'CBL' is calculated on the basis of the size of the overshoot (assuming it was not set to Auto in the initial conditions). CBH is then set to the same value as CBL.

Note: Autotune can also occur when the initial PV is above SP. The sequence is the same as tuning from below setpoint except that the sequence starts with natural cooling applied at 'B' after the first one minute settling time. In this case CBH is calculated and CBL is then set to the same value as CBH.

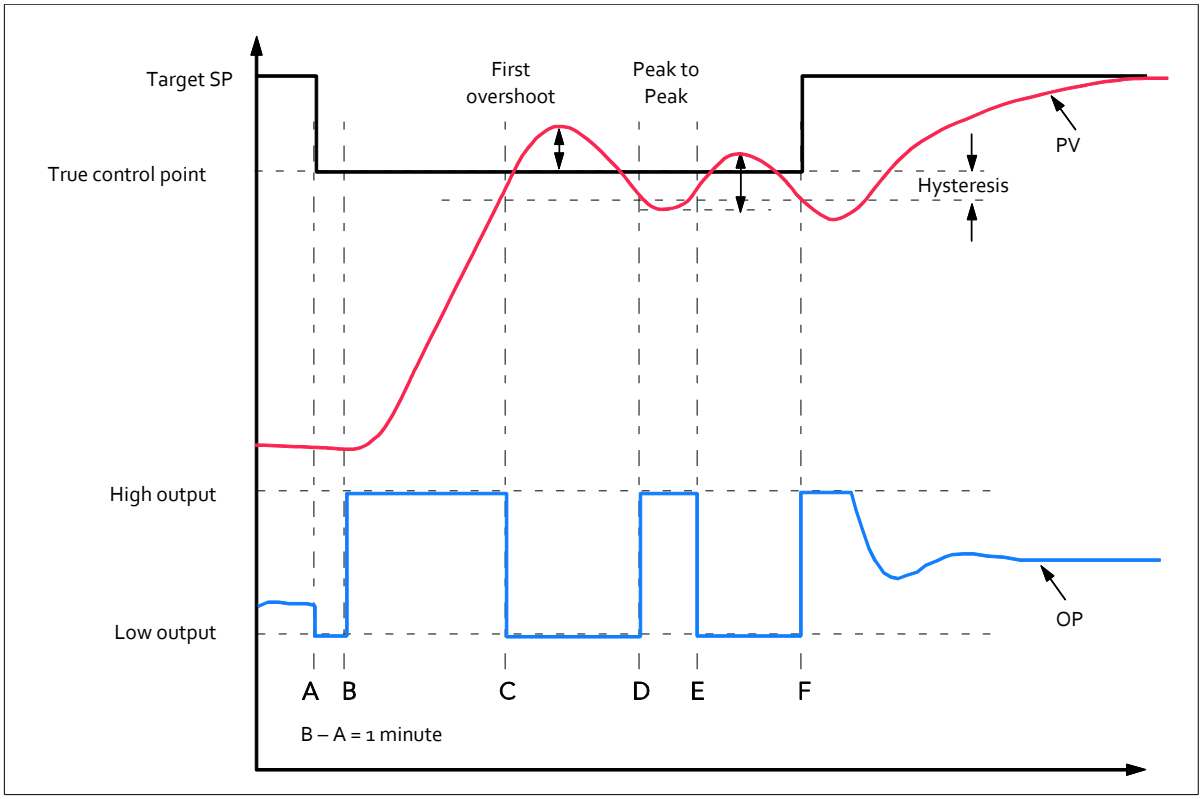


Figure 6.4.5b Autotune heat only process (from below SP)

A	Start of Autotune
A to B	Heating off for one minute to allow steady state conditions to be established.
B to D	First heat cycle to establish first overshoot. Cutback low (CBL) value calculated from the overshoot magnitude (unless CBL set to 'Auto').
D to F	Calculate PID terms.
F	Autotune is turned off and the process is allowed to control at the target setpoint using the new control terms.

AUTOTUNE (Cont.)

EXAMPLE 3: AUTOTUNE AT SP (HEAT /COOL)

It is sometimes necessary to tune at the actual setpoint being used as shown below.

For a tune at setpoint, autotune does not calculate cutback since there was no initial start up response to the application of heating or cooling. Cutback values of less than 1.6 × PB will not be returned.

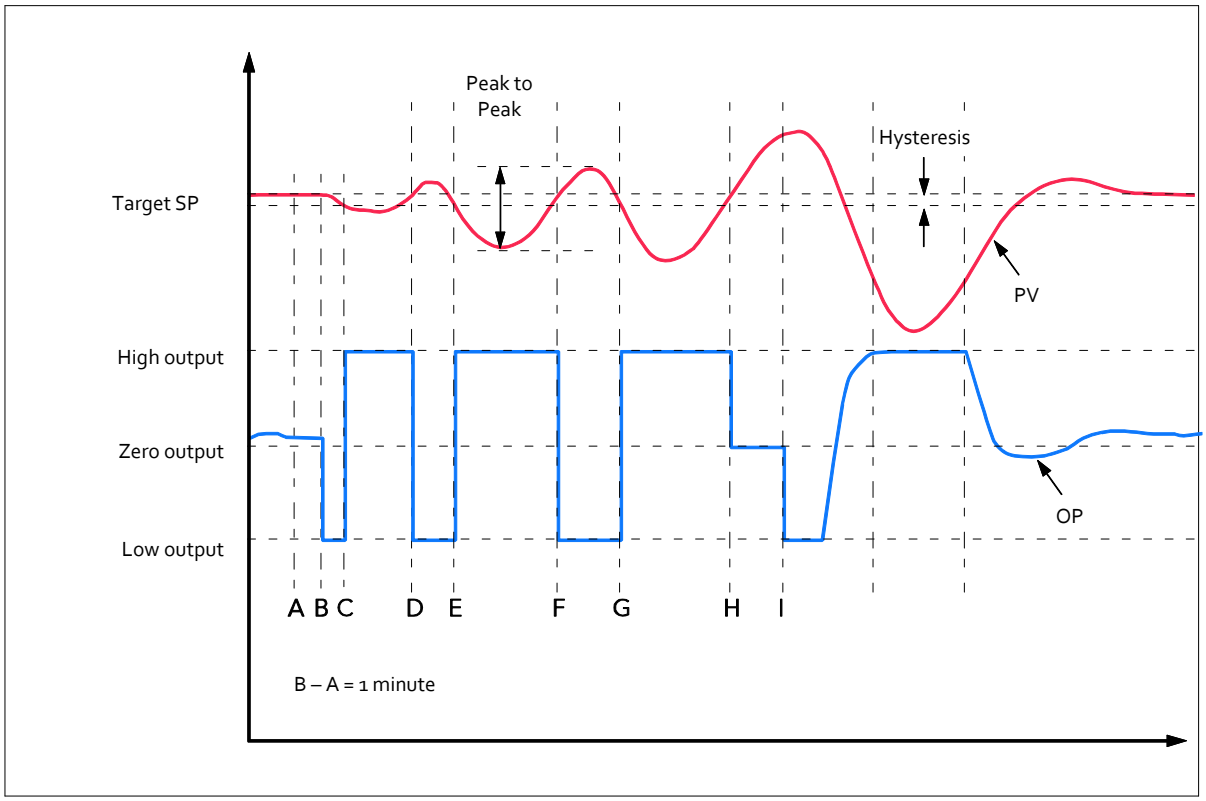


Figure 6.4.5c Autotune at setpoint

A	Start of Autotune. A test is done at the start of autotune to establish conditions for a tune at setpoint. Conditions are that SP must remain within 0.3% of the range of the controller if 'PB Units' (Setup menu) is set to 'Percent', or ±1 engineering unit (1 in 1000) if the 'PB Units' is set to 'Eng'. Range is defined as 'Range High' – 'Range Low' for process inputs or the thermocouple or RTD range defined in section A3 for temperature inputs.
A to B	The output is frozen at he current value for one minute, and the conditions are continuously monitored during this period. If the conditions specified above are met, then an autotune at setpoint is initiated at 'B'. If PV drifts outside the condition limits at any time during this period, tuning at SP is abandoned, and tuning resumes as a 'tune from above' or 'tune from below', depending on the direction of drift. Since the loop is already at setpoint, a Tune Control setpoint is not calculated; the loop is forced to oscillate about the Target SP.
C to G	The process is forced to oscillate by switching the output between the output limits. The oscillation period and the peak-to-peak response are determined, and the PID terms calculated.
G to H	An extra heating stage is initiated, then all heating and cooling are switched off at H, allowing the plant to respond naturally. The relative cool gain (R2G) is calculated.
I	Autotune is switched off and the process is allowed to control at the target setpoint using the newly calculated terms.

AUTOTUNE (Cont.)

AT.R2G

Some load types and process conditions can cause autotune to set an incorrect value for R2G resulting in an instability in the system after an autotune has completed, In such circumstances, the value of R2G should be checked, and if it is low (approaching 0.1) a manual entry should be made as follows:

1. In the Tune menu, set the AT.R2G parameter to 'No'.
2. In the PID menu, enter the new R2G value (calculated as described below)
3. In the Tune menu, enter a value for Low Output, calculated from: Low Output = -High Output x R2G
4. In the Tune menu, set 'TuneEn' On.

R2G CALCULATION

1. In the Main menu, set the controller to Manual mode
2. Turn heating on (limited by the value of 'Output High' in the Output menu) and measure the heating rate ('H' °C/minute).
3. Allow the process to heat to, say, 10% above the setpoint value then turn the heating off and allow the temperature to settle.
4. Turn cooling power on (limited by the value of 'Output Low' in the Output menu) and measure the cooling rate ('C' °C/minute) whilst allowing the temperature to fall below the setpoint value.
5. Calculate the value of R2G from the equation R2G = (H/C) x (Output Low/output High)

Example:

For a measured heating rate (H) of 10°C per min and a measured cooling rate (C) of 25° per minute and with, Output High = 80% and Output Low = 40%, then R2G = (10/25) x (40/80) = 0.4 x 0.5 = 0.2.

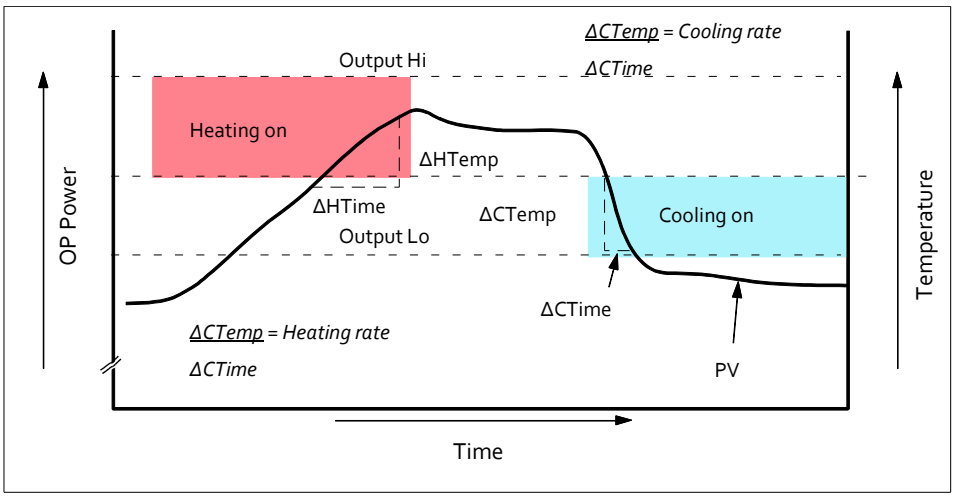


Figure 6.4.5d R2G calculation

Note: This is not a very accurate method as it does not take natural cooling into account. Its main advantage is that it is simple to achieve.

AUTOTUNE (Cont.)

FAILURE MODES

The conditions for performing an autotune are monitored by the Tune menu parameter 'State'. If autotune is not successful error conditions are read by this parameter as follows:

Timeout	Set if any one stage is not completed within an hour. Possible causes are the loop being open circuit, or not responding to the controller demands. Some heavily lagged systems may produce a timeout if the cooling rate is very slow.
TI Limit	This is set if Autotune calculates a value for the integral term which is greater than the maximum allowable (99999 seconds). This indicates that the loop is not responding or that the tune is taking too long.
R2G Limit	Error occurs if the calculate value of R2G is outside the range 0.1 to 10.0. R2G limit can occur if the gain difference between heating and cooling is too large, or if the controller is configured for heat/cool, but the heating and/or cooling device is turned off or not working correctly.

10.1.1 Relative Cool Gain in Well Lagged Processes

In the majority of processes Relative Cool Gain R2G is calculated by the autotune algorithm as described in the previous sections.

There are occasions, however, where an alternative algorithm may be preferred. These are processes which are heavily lagged, where the heat loss to ambient is very small so that natural cooling is extremely slow, and certain high order plants, those that need derivative, Td. This algorithm is known as R2GPD and has been added to controllers from firmware version V4.10.

The type of algorithm is selected using the parameter 'Tune R2G' found in the Auto-Tune list. The choices are:-

Standard	This is the default as described in example 2 in section B2.4.5. and is suitable for use on most processes. The benefit of this algorithm is that it is relatively quick. However, in the type of process described in the previous paragraph, it can produce values which are not ideal. These values are generally identified by R2G equal to or very close to 0.1.
R2GPD	If the process is known to be heavily lagged or produces values such as those above then R2GPD should be selected. This algorithm extends the autotune period by putting the controller into proportional plus derivative mode (PD) and uses the output power demand value during this period to determine the Relative Cool Gain.
Off	The automatic calculation of Relative Cool Gain can be turned off and the value entered manually as described in section B2.4.6.

EXAMPLE 4: WHEN TUNE R2G = R2GPD, AUTOTUNE FROM BELOW SETPOINT

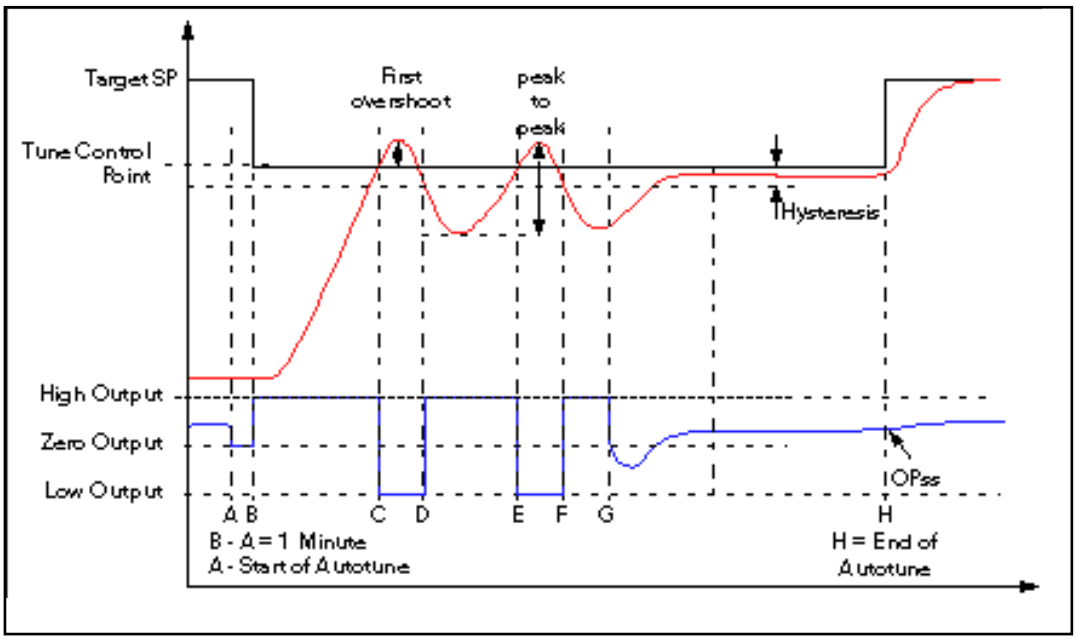


Figure 6.4.6 Autotune from below setpoint

Periods A-F are largely unchanged from the 'Standard' algorithm, example 2 in **A**, with the following exception:

- Changing the Target Setpoint during period A-B will not change the tuning setpoint.

Period F-H is replaced as follows:

F to G	Heat is applied for a period (F-G) of half the first heat cycle (D-E) to compensate for the last cool cycle.
G to H	This is a period in which the controller is put into PD control. The values of proportional term and derivative time for this period of PD control are determined by the algorithm.
H	OPss is the output demand value at the end of this period and is used in the determination of R2G.

B2.4.7 Manual tuning

If, for any reason, automatic tuning gives unsatisfactory results the controller can be tuned manually. There are a number of standard methods for manual tuning, the Zeigler-Nichols method being described here:

1. Adjust the setpoint to its normal running conditions (assumed to be above the PV so that 'heat only' is applied.
2. Set the integral and derivative times (Ti and Td) to 'Off'
3. Set High and Low cutback (CBH and CBL) to 'Auto'.
4. If the PV is stable (not necessarily at the setpoint), reduce the proportional band (PB) such that the PV just starts to oscillate, leaving time between adjustments to allow the loop to stabilise. Make a note of the PB at this point (PB′), and also note the oscillation period ('T').
   If the PV is already oscillating measure the oscillation period ('T') and then gradually increase PB to the point at which oscillation just ceases. Make a note of the PB (PB′) at this point.
5. If the controller is fitted with a cooling channel, enable this now.
6. Observe the oscillation waveform and adjust 'R2G' until a symmetrical wave form is observed (Figure 6.4.7).
7. Set PB, Ti and Td according to table B2.4.7

Control type	PB	Ti	Td
Proportional only	2 × PB′	Off	Off
P + I	2.2 × PB′	0.8 × T	Off
P + I + D	1.7 × PB′	0.5 × T	0.12 × T

Table 6.4.7 Calculate parameter values

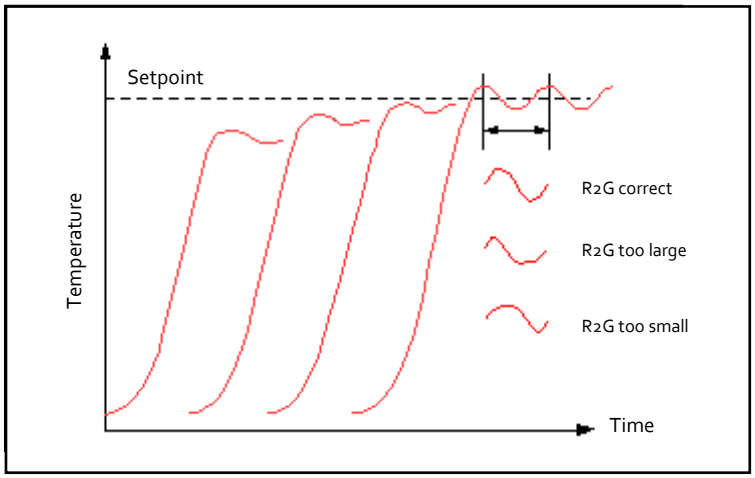


Figure 6.4.6a Relative Cool Gain

CUTBACK VALUES

The PID terms calculated from Table 6.4.7, above, should be entered before the cutback values are set.

The above procedure sets up the parameters for optimum steady state control. If unacceptable levels of overshoot or undershoot occur during start-up, or for large step changes in PV, then the cutback parameters should be set manually, as follows:

1. Initially set the cutback values to one proportional bandwidth converted into display units. This can be calculated by taking the value in percent that has been installed into the parameter 'PB' and entering it into the following formula:

   PB/100 × Span of controller = Cutback High and Cutback Low

   For example, if PB = 10% and the span of the controller is 0 to 1200°C, then

   Cutback High = Cutback Low = 10/100 × 1200 = 120

11. Appendix C: REFERENCE

C1 BATTERY

This instrument is fitted with a battery which has a minimum life of 1 year unpowered and when stored in an ambient temperature of around 25°C. The battery life may be reduced if it is consistently operated in an elevated ambient temperature environment. The battery is designed to retain configuration and other settings in the event of a failure of the instrument power supply.

The battery is not user serviceable and any instrument displaying the symptoms of a battery fail should be returned to your supplier for battery replacement at the earliest opportunity.

WARNING

It is strongly recommended that, with the instrument working normally, a clone file* is made and stored in a known safe location so that the settings can be uploaded to a spare instrument or restored to the instrument following replacement of the battery. Alternatively maintain a record of the instrument configuration and other important settings.

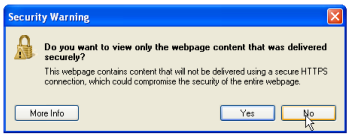
* A clone file is made using iTools, a proprietary package which may be downloaded from www.eurotherm.co.uk.

C2 SETTING UP AN FTP SERVER USING FILEZILLA

C2.1 DOWNLOADING

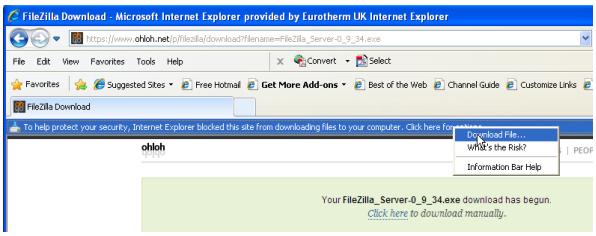
'FileZilla' is a free download from the internet (search for 'FileZilla server download').

1. Download the latest version, following the instructions on the screen.



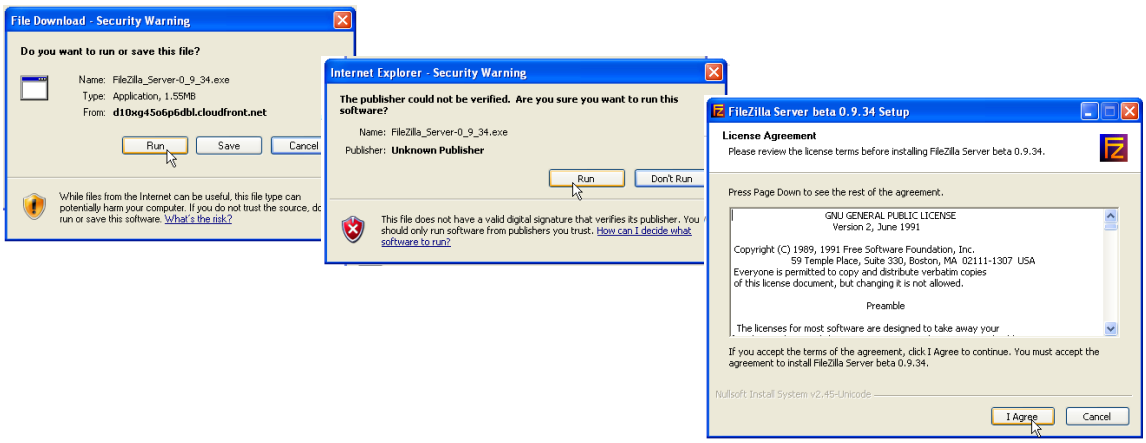
2. Answer 'No' to the question 'Do you want to view only the webpage content that was delivered securely'.

3. If necessary enable file download.

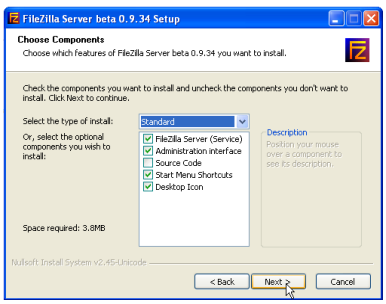


4. In the 'Do you want to run or save this file' Security Warning windowclick on 'Run'

5. In the 'The Publisher could not be verified...,' Security Warning window, click on 'Run'

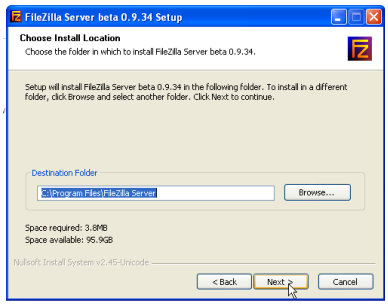


6. Agree or cancel the License agreement. If 'Agree', choose 'Standard' as the type of install.

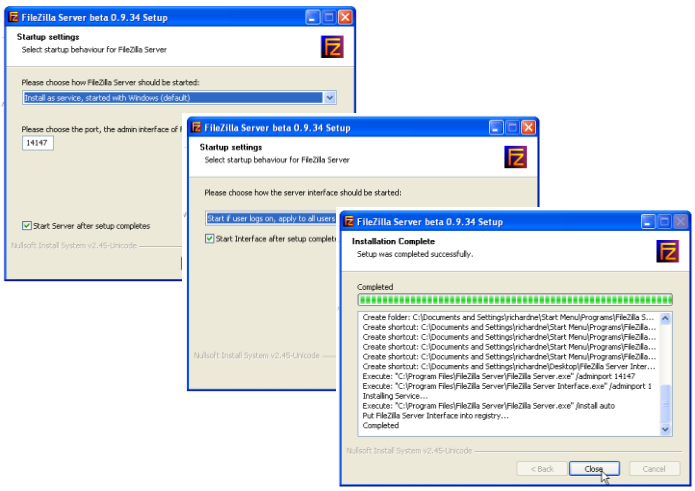


C2.1 DOWNLOADING (Cont.)

7. Choose the destination for the file

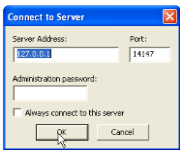


8. Select startup settings



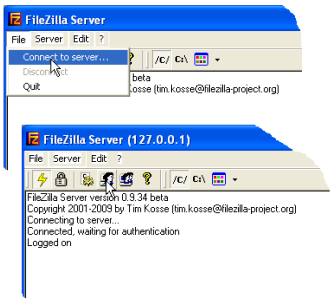
9. Click on Close when Installation is complete.

10. Click 'OK' in the 'Connect to Server' window.



C2.2 SERVER SETUP

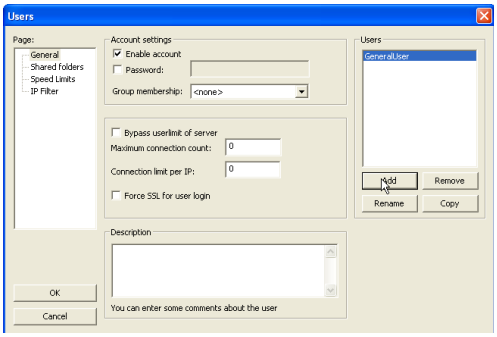
1. Create a new folder (directory) called, for this example, 'Archive' in a suitable location such as the C drive, or the desktop.



2. In the Filezilla server window, click on 'File' and select 'Connect to Server'.

   The 'Logged on' message appears

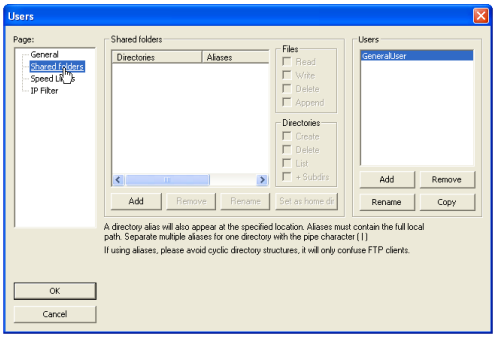
3 In the Edit menu, select 'Users' and in the 'General' page, click on 'Add' and enter a name for the user, then click 'OK'. For this example, 'GeneralUser' has been used, but it may be more advantageous to use 'Anonymous' because this is the default name in the recorder/controller. Click on 'OK'.



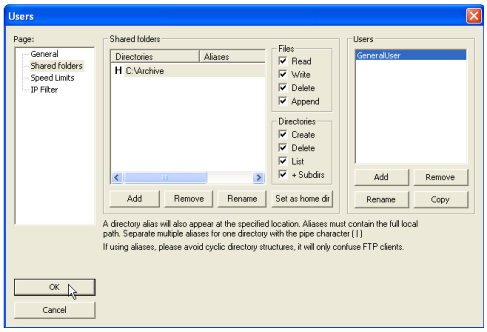
4 In the Edit menu, select 'Users' and in the 'Shared Folders' page, click on 'Add'

   A browse window opens allowing the user to select the new folder ('Archive') created in step 1, above.

   When OK has been clicked to confirm the selection, the new folder appears in the centre window (with an 'h' next to it to indicate that this is the home folder for this ftp user setup.

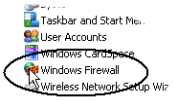


5. Click on the relevant folder to enable the tick boxes. Click on all the 'File' and 'Directory' enable tick boxes, then click OK

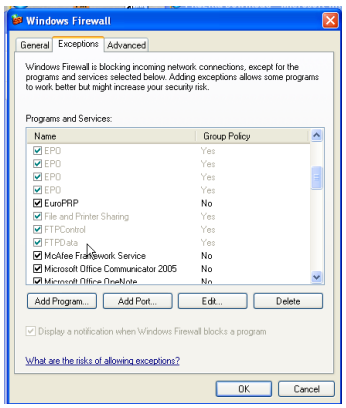


C2.3 PC SETUP

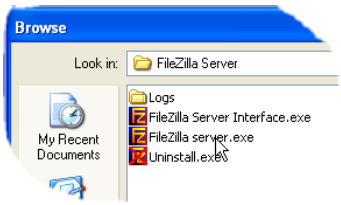
1. Operate the 'Start' button, and select 'Control Panel' from the window that appears. Double click on 'Windows Firewall'



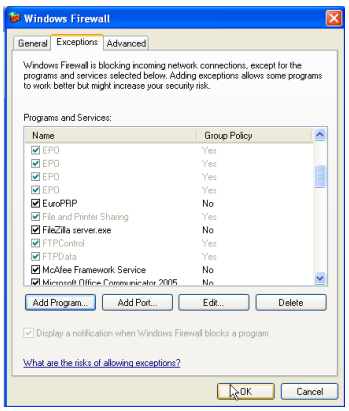
2. Click on the 'Exceptions' tab in the window that appears, and check that both 'FTPControl' and 'FTPData' are enabled (ticked). If not, the user's IT department should be contacted for advice.



3. Click on 'Add Program…' and browse to the Filezilla destination defined in step 7 of the download section (C2.1). Select 'FileZilla server.exe' and click on 'Open'



'FileZilla server.exe' appears in the Exceptions list.



Click on 'OK'

C2.4 RECORDER/CONTROLLER SET UP

In Network Archiving (section 5.1.2):

1. Enter the IP address of the pc in which the FTP server has been enabled in the 'Primary Server' field.
2. Enter the Primary User name, as entered in step three of the Server setup procedure (section C2.2) above (GeneralUser in this example).
3. Enter the IP address of another suitable pc which has been configured as an ftp server in the 'Sec. Server' field, and enter the relevant 'Sec. User' name.
4. Configure the other unattended archive parameters as required (section 5.1.2).

Note: For the example above, 'Password' was not enabled in the User Accounts setup page (section C2.2), so for this example any Primary (Sec.) password entry is ignored. If a password had been entered in the User Accounts setup, then the Primary (Sec.) Password field would have to contain this password.

C2.5 ARCHIVE ACTIVITY

Once a demand or unattended archive is initiated, the FileZilla Server page shows the activity status as the archive progresses. Figure C2.5 shows a typical page. The top of the page shows the transaction details between the server and any clients to which it is connected. The bottom portion shows details of the files currently being transferred. These files are archived to the 'Archive' folder.

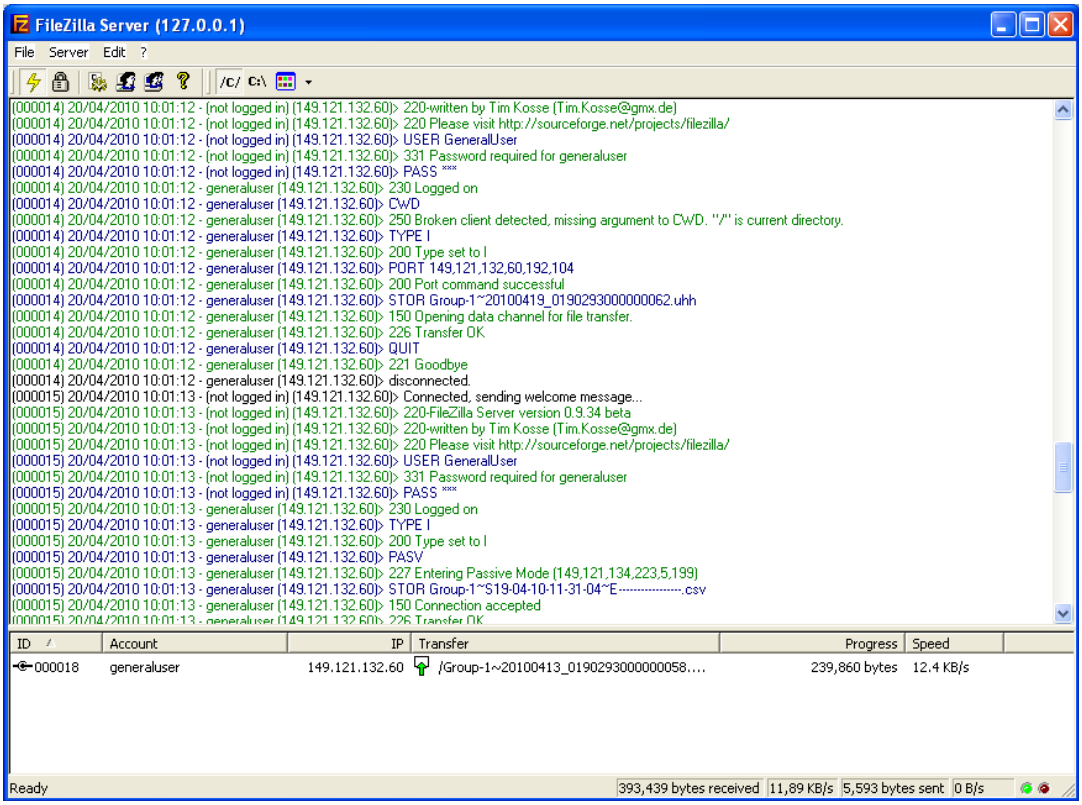


Figure C2.5 FileZilla Server archive activity page

12. Appendix E: WEB SERVER

The Web Browser has been added from firmware release V5.00.

12.1 Browsers

The following browsers are supported in the above firmware release:

- Google Chrome V22.0 or greater
- Google Mobile Chrome (Android Mobile technology running 'Ice cream sandwich' or greater
- Internet Explorer V9.0 or greater
- Mobile Safari (Apple Mobile technology running IOS 5.0 or greater)

All files are uploaded from the nanodac device to the browser, where all JS and JQuery files are executed locally.

Browsers should be configured to allow cookies, and support for file caching should also be enabled.

If cookies are not enabled this will have the following detrimental effects:

- Any web page configuration changes 'saved' by the user in the client browser will not be retained when navigating between web pages
- For the most efficient browsing make sure that caching is enabled in the browser being used.
- Web server supports standard ASCII character set. Any non displayable characters will, therefore, be replaced by an asterisk '*'.

12.2 Connecting to the Internet

Open the desired web browser.

Enter the ethernet address or other configured name of the instrument.

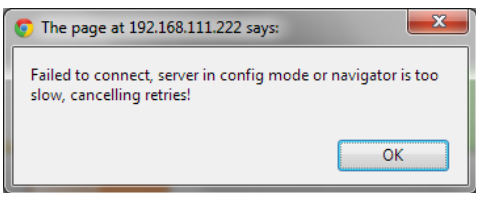
Note: the webserver requires up to 15 seconds before it becomes fully operational after it has been enabled.

12.3 Denied Page

This page will be displayed when there are no more available connections to the server. It does not use the same CSS theme as all other pages, so that this page does not rely on any other files being transferred up to the client browser, since to do this would require access to the server, which has just been denied.

12.4 Error Message

An error message can be displayed at any time if the following three conditions occur:



- A page fails to connect to the server. A retry will usually be sufficient to correct this condition
- The server is in configuration mode. To correct this put the instrument into run mode.
- A page stops trying to connect. A refresh is usually sufficient to correct this condition.

12.5 Home Page

The Home Page is the first page the user is directed to on completion of a successful log in.

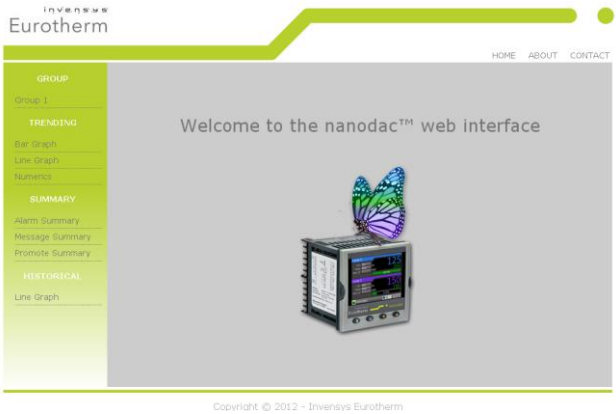
If Security has been set to Yes in the instrument (page 146) it will be necessary to enter a User name and a Password.

The defaults are:

Username: admin

Password: admin

These may be customised by the user up to 50 alpha/numeric characters.



12.6 About Page

This page contains the following target information:

- Instrument descriptor
- MAC address
- Application software version
- Bootrom software version
- Legal disclaimer

12.7 Contact Page

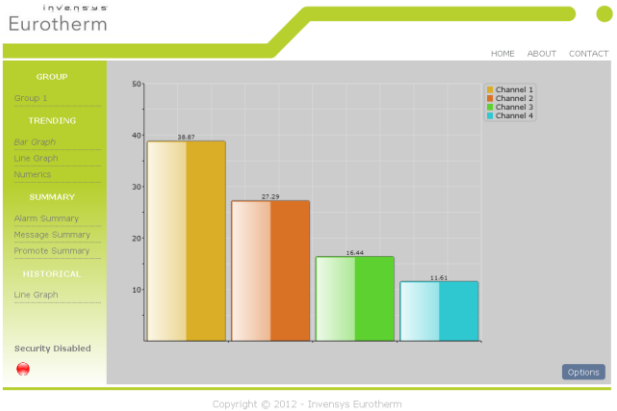
This page contains links to the following Eurotherm sites:

- Accredited Service
- Customer First & Technical Support
- Installation & Commisioning
- Repair & Support Services

Note: Links are only active if the browser has internet access.

12.8 Bar Graph Page

The channels that have been configured to be trended on the nanodac instrument will automatically be displayed on this page. The current configuration data for those channels will be used to render the values on the graph.



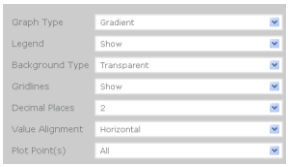
The graph will always use the largest scale high and the lowest scale low of all the channels being rendered.

Click on a channel on the graph to display the current channel status. To remove this, click out of the graph again. The channel status will either be 'Ok' or 'Error' for all other error conditions.

All channels will be represented in their configured RGB colours. Colour matching will very much depend on the display the browser is running on.

Options

The Options button allows the user some control over how the Bar Graph page is displayed.

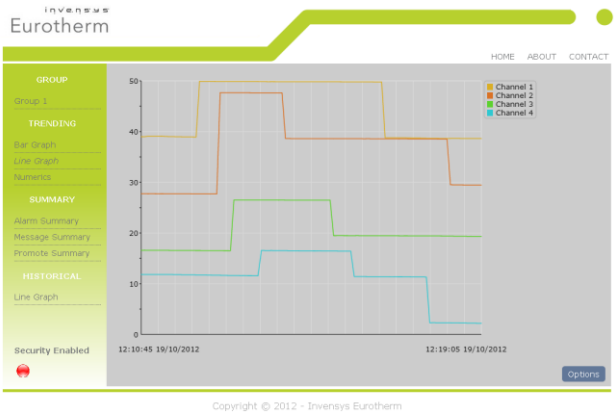


All data is stored as cookies.

Graph Type	Gradient (as shown in the above display)
	Flat
	3D
Legend	Show or Hide the Channel numbering legend in the top right hand corner
Background Type	Transparent or White
Gridlines	Show or Hide
Decimal Places	0 to 4
Value Alignement	Horizontal or Vertical
Plot Point	All (shows all available channels)
	Channel 1 only
	Channel 2 only
	Channel 3 only
	Channel 4 only

12.9 Line Graph Page

The channels that have been configured to be trended on the nanodac will automatically be displayed on this page. The current configuration data for those channels will be used to render the values on the graph.



The graph will always use the largest scale high and the lowest scale low of all the channels being rendered.

This graph is currently fixed at 100 samples. The first time that this page is opened it may take a little more time as the page will need to interrogate the web server for UHH history and render 100 samples of backfill.

As each new sample arrives the oldest historical sample is removed.

All channels will be represented in their configured RGB colours. Colour matching will very much depend on the display the browser is running on.

Options

The Options button allows the user some control over how Line Graph page is displayed.

All data is stored as cookies.

Plot Thickness	Narrow, Normal, Wide.
Legend	Show, Hide.
Background Type	Transparent, White.
Gridlines	Show, Hide.
Sample Period	1 second - 1 hour.
Plot Point	All, (shows all available channels)
	Channel 1 only
	Channel 2 only
	Channel 3 only
	Channel 4 only

12.10 Numeric Page

This page displays the process value and channel descriptor.

The process value (PV) will not be displayed if the channel is not in a good status. Instead the text for the channel status is displayed as one of the following

OFF	Channel is turned off
>RANGE	Over range
<RANGE	Under range
HW_ERROR	Hardware error
RANGING	Automatic range configuration (may appear briefly)
OVERFLOW	Value out of limits e.g. a maths channel may have returned a bad value
ERROR	Error, e.g. a maths channel divided by zero
NO_DATA	No data, e.g. nothing has been written to a Modbus input channel.

All channels will be represented in their configured RGB colours. Colour matching will very much depend on the display the browser is running on.

Options

The Options button allows the user some control over how Numerics page is displayed.

All data is stored as cookies.

Channel Font Size	Small, Normal, Large
PV Font Size	Small, Normal, Large

12.11 Alarm Summary Page

This page indicates if any process alarms are currently active

Status:

Red = unacknowledged alarm.

Green = Acknowledged alarm

12.12 Message Summary Page

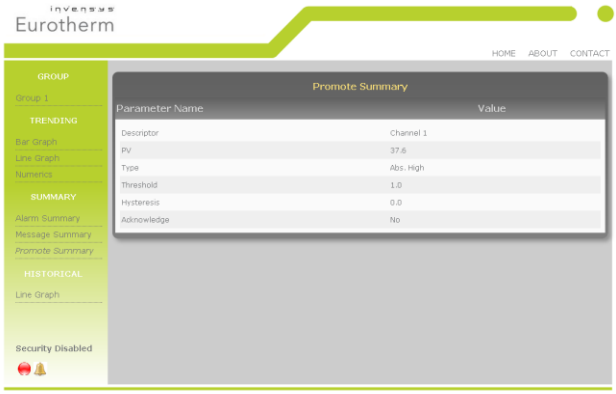
This page provides the last 30 messages in chronological order

This page does not auto-refresh.

To refresh this page press or go to another page and re-open the Message Summary page.

12.13 Promote Page

This page will show up to the 10 data items that have been configured by the user in the Promote page in the instrument display - see "Promote list" on page 45.



12.14 Historical Line Page

The channels that have been configured to be trended in the nanodac instrument will automatically be displayed on this page. The current configuration data for those channels will be used to render the values on the graph.

The graph will always use the largest scale high and the lowest scale low of all the channels being rendered

All channels will be represented in their configured RGB colours. Colour matching will very much depend on the display the browser is running on.

This graph is currently fixed at 100 samples, and the first time this page is accessed it may take a short time to load as the page will need to interrogate the web server for UHH history and render 100 samples of backfill.

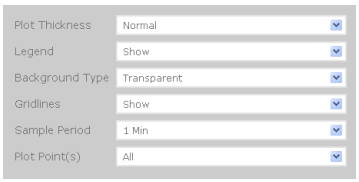
Use the 'Previous Data' button to navigate back in time for up to a maximum of five time periods of history. If there is an end to the history event or a configuration change event, then the request to navigate back may result in only part of the trend being populated up to that event time.

Use the 'Next Data' button to navigate back to the point in time when the web page was entered.

Options

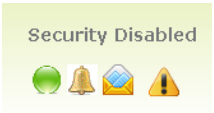
The Options button allows the user some control over how the Historical Line page is displayed.

All data is stored as cookies.



Plot Thickness	Narrow, Normal, Wide.
Legend	Show, Hide.
Background Type	Transparent, White.
Gridlines	Show, Hide.
Sample Period	1 second - 1 hour.
Plot Point	All (shows all available channels)
	Channel 1 only
	Channel 2 only
	Channel 3 only
	Channel 4 only

12.15 Status Icons



The Status icons are shown in the lower left of those pages that are automatically updated (i.e. not the Message Summary page).

They indicate the following:

Security Enabled or Disabled in the nanodac instrument.


Recording Status

Green shows recording enabled e.g. when the instrument is not in configuration mode.

Red shows recording disabled e.g. when the instrument is in configuration mode.


Any Channel Alarm Status. This flashes when any alarm is present, whether acknowledged or not.


Any new messages. Go to the Message Summary page to view any new messages. This icon is then removed from the other pages.


Any system alarm

Note: the update rate for the status icons is inherited from the current page.

12.16 DHCP Support

DHCP is managed in the web server in as much as the web server will not be allowed to come online until the nanodac has received a valid IP address. The server will continually monitor the IP address and, if at any point an invalid address is found, the server will shut down and re-start.

12.17 Network Protocols

The web server is in no way mutually exclusive with all other network protocols on the nanodac, however, to achieve the best results from the web server it is recommended that no other communication protocols are active at the same time.

12.18 Languages

The web server will only support English for all static text. Any channel descriptors or units that have been configured at the target in another language will be displayed in that language on all web pages where they are visible.

13. Appendix F: Labview Driver

The purpose of this section is to describe how to download, install and configure examples of LabVIEW driver for nanodac instruments.

The driver is designed to integrate with Labview, a graphical programming Environment developed by National Instruments. Labview allows users to create applications by wiring VI's from pre-existing libraries. VI's stands for Virtual Instruments and these are similar to function blocks found in Invensys Eurotherm products such as iTools or Lintools.

The user can also create their own VI's, save them and reuse them on future projects.

For more information on Labview go to http://www.ni.com/labview/whatis/.

Four working examples are available as free downloads by going to http://www.eurotherm.co.uk/labview/. They are intended to show users how to use the nanodac driver to build applications.

Each example is a collection of Virtual Instruments (VI's) that perform specific tasks and use Ethernet TCP for communications.

It is not intended to describe how to configure a LabVIEW application as it is assumed that the reader is generally familiar with this process.

To find the examples select the Help menu and 'Find Examples' to open the 'Example Finder' page. In the search field, enter any of the following keywords nanodac, InvensysEurotherm, Eurotherm, Steriliser, Environmental, Chambers, Controller, Instrument or Driver and the corresponding examples will appear in the search results. Just select and Double click to open an example.

13.1 Application Example 1 - Heat/Cool Control

The "HeatCoolControl.vi" is an application example for Environmental chambers. The user can change the target setpoint, monitor temperature and instrument alarms.

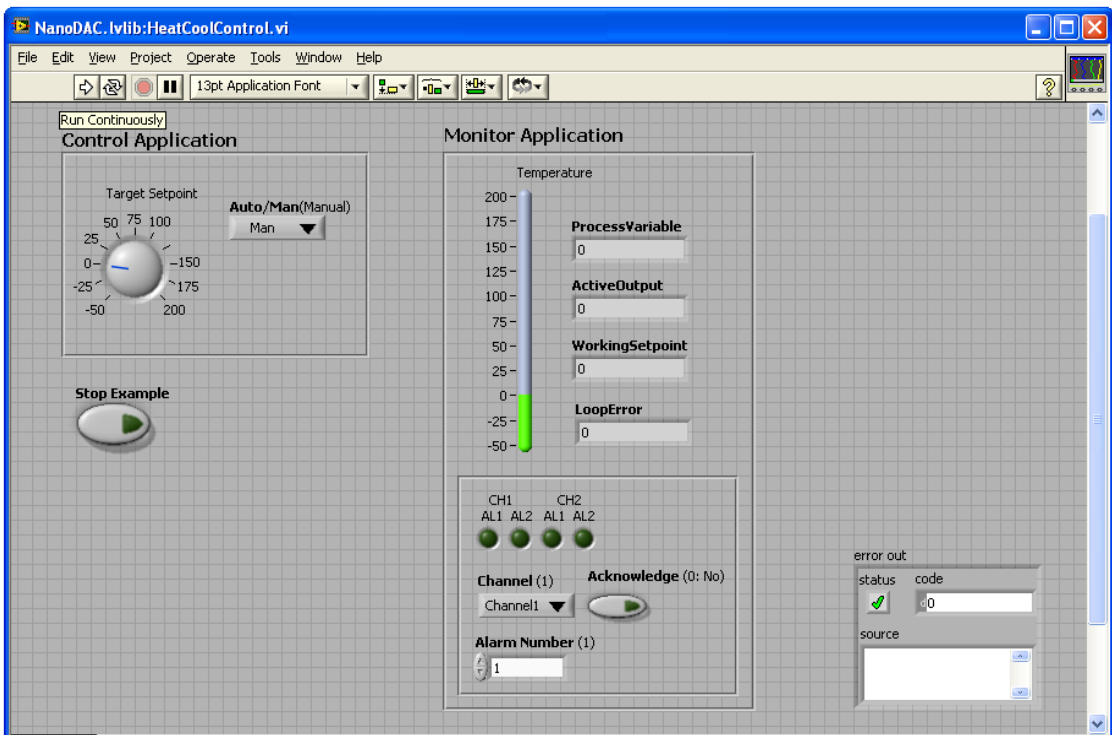


Figure F1 Heat/Cool Control Opening View

From the opening view, Figure F1;

press Run 

Enter the IP address of the nanodac instrument.

Enter the Modbus address of the nanodac instrument. This depends on the setting of the Unit ident enable in the instrument;

If this is 'Strict' enter 255.

If this is 'Instrument' enter the modbus address as set in the instrument from 1 to 99.

If this is 'Loose' then the ModbusTCP Unit Identity field does not have to match the instrument address. The instrument will respond to ANY value in the Unit Identity field.

Press 'Accept'.

Note: further information is available from the Help menu.

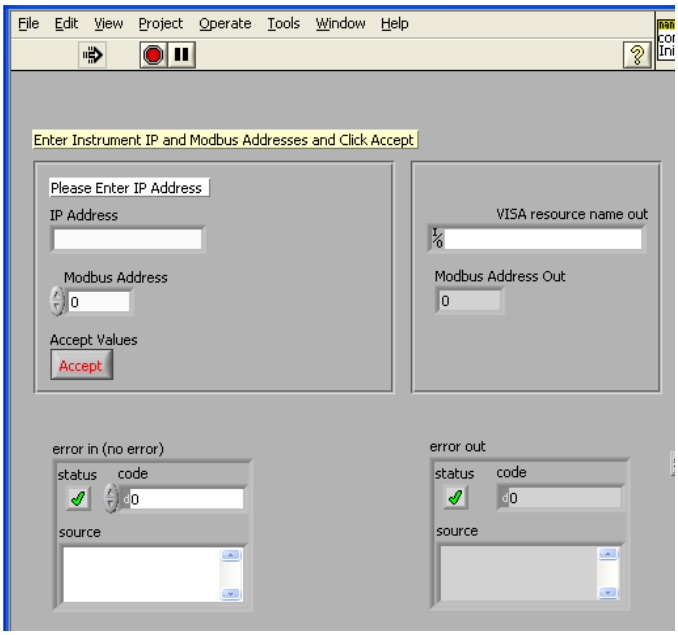


Figure F1a Enter Instrument Address

It is then necessary to select the firmware version which is supported for the instrument in use. Certain functions will not be available if the firmware version of the instrument is not in this list.

Press 'Current Folder'.

If a password has been entered in the instrument it will be necessary to enter this.

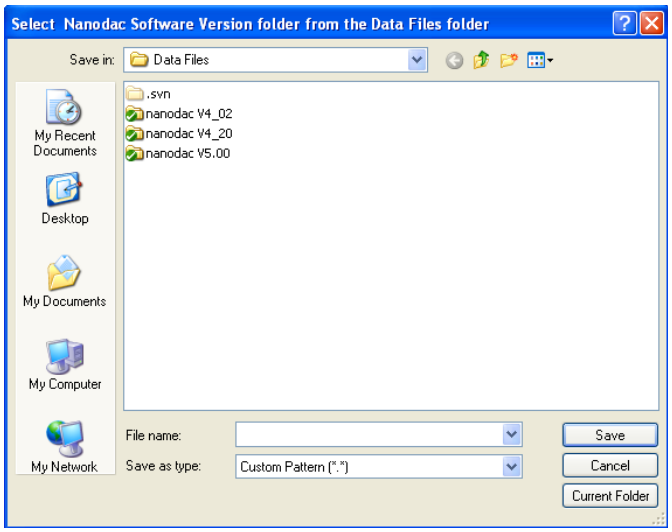


Figure F1b Data Files Folder

The application view then becomes live

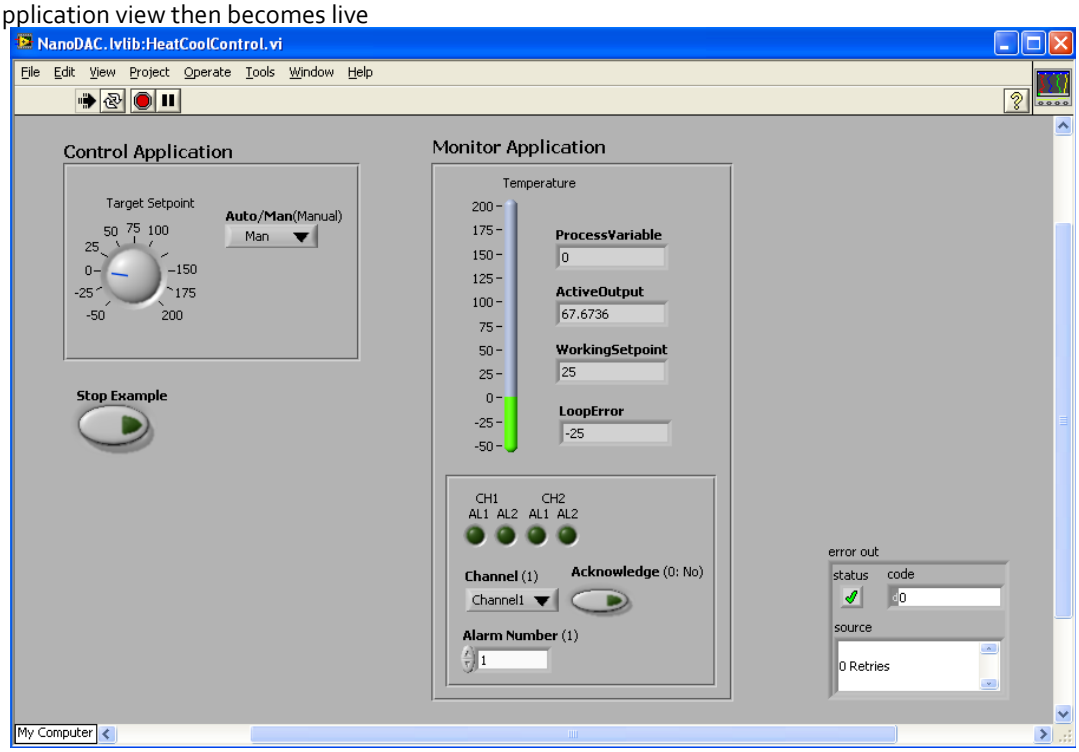


Figure F1c Heat Cool Live Application

The following parameters may be monitored/adjusted:

- Target setpoint
- Select Auto/Manual and adjust the output power manually if in Manual.
- Monitor the current Process Variable, Active Output demand, Working Setpoint and Error.
- Monitor alarms. The alarm beacon turns red when an alarm occurs.
- Acknowledge alarms. Pressing the Acknowledge button acknowledges the selected alarm in the nanodac instrument. If the alarm is still active the alarm beacon remains red. If the alarm is no longer active the beacon reverts to its dark colour.

13.2 Application Example 2 - Program Load by Program Number

The "Program_LoadControl.vi" is an Application example which allows the user to load a program stored in the instrument using numbers, and to Run/Hold or Reset a preloaded Program.

This feature has been added in the nanodac instrument from firmware versions 5.00 and above.

To open and load this file, repeat the steps listed in Example 1.

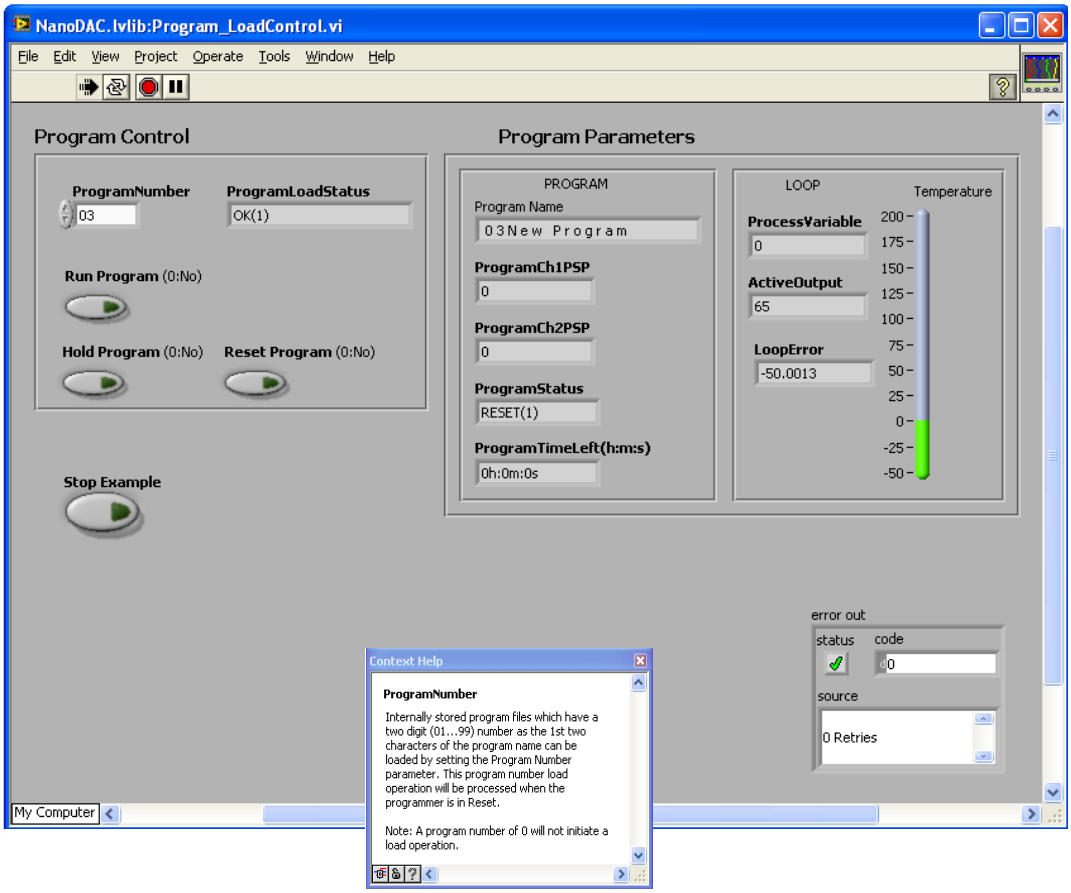


Figure F2 Program Load by Program Number (showing Context Help)

The following parameters may be monitored/adjusted:

- Select the Program Number. If the number entered is not available in the instrument it will not be recognised and an error message shown in the Program Load Status box
- Run/Hold/Reset the program
- Monitor the running program

13.3 Full driver capabilities list

As a general summary, with the nanodac Ethernet Labview Driver the user can:

Configure SensorBreakType and Fault Response
Configure Instrument Alarm Types
Configure Alarm Parameters e.g. (Threshold, Hysteresis, Latching Mode, Blocking)
Configure Channel Filter Time
Configure Humidity parameters
Configure Cool Type
Configure FeedForward Parameters
Configure Control Action
Configure Control Loop Type
Configure ServoToPV and Tracking
Configure Range Low and High Limits
Change Instrument Modes e.g. Operator, Configuration, Auto, Manual
Configure Setpoints (Setpoint1, Setpoint2, Remote Setpoint, Target Setpoint)
Configure Dead Band
Configure hysteresis
Configure Safe Output, Manual Output and ManStartUp
Configure Control Output Limits.
Configure Valve Operation
Configure Proportional Band Integral Time and Derivate Time
Configure Cutback Low and High Limits
Configure Setpoint Low and High Limits
Configure Setpoint Ramp Rate Value
Configure Tuning parameters
Configure PID Loop Break Time
Configure Virtual Channel Timer Parameters
Configure Virtual Channel Totaliser Parameters
Configure Virtual Channel Counter Parameters
Configure Steriliser parameters
Read Working Setpoint and Working Output
Read Alarm Output status
Read Manual Output Value
Read Process Variable and Measured Values
Read Timer Status
Read PID parameters
Enable/Disable the Alternative Setpoint
Start an Autotune
Global Acknowledge Alarms
Set Active Setpoint (Setpoint1, Setpoint2)
Set Controller Mode (Auto, Manual, OFF)
Start Program (Reset, Run, Hold)
Read Steriliser Parameters
Read Program parameters

For preventive maintenance, repair and calibration of all Furnace and Oven products, please contact:

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Fax: +44 (0)1433 624243
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