

User Manual



Series 460 Digital Profiler

Series 460 User Manual
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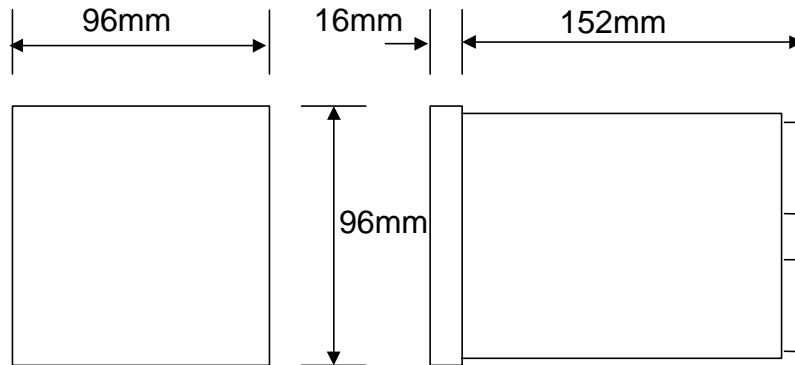
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1 Installation.

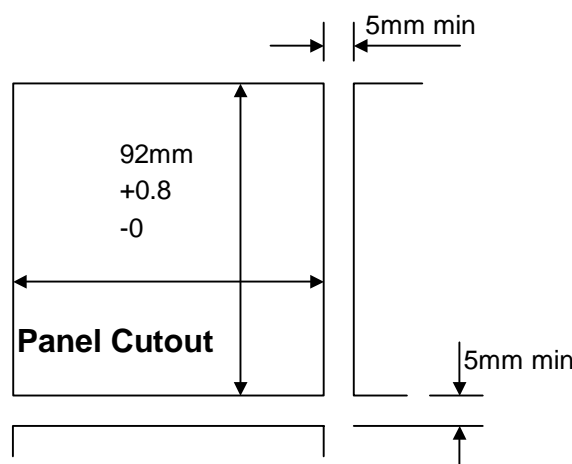
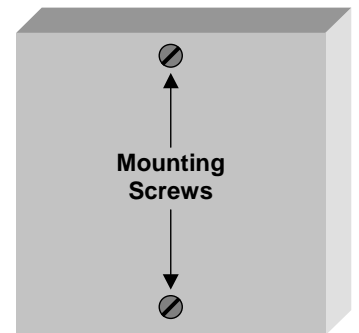
1.1 Panel Mounting.

The instrument will fit into a DIN standard 92mm x 92mm +0.8mm -0 square cut-out and will accommodate a panel thickness up to 7mm.



The instrument projects behind the panel by less than 152mm including terminal connections. If IP65 sealing is required then ensure that the panel sealing gasket is fitted into position behind the bezel. The gasket may be omitted if IP65 sealing is not required.

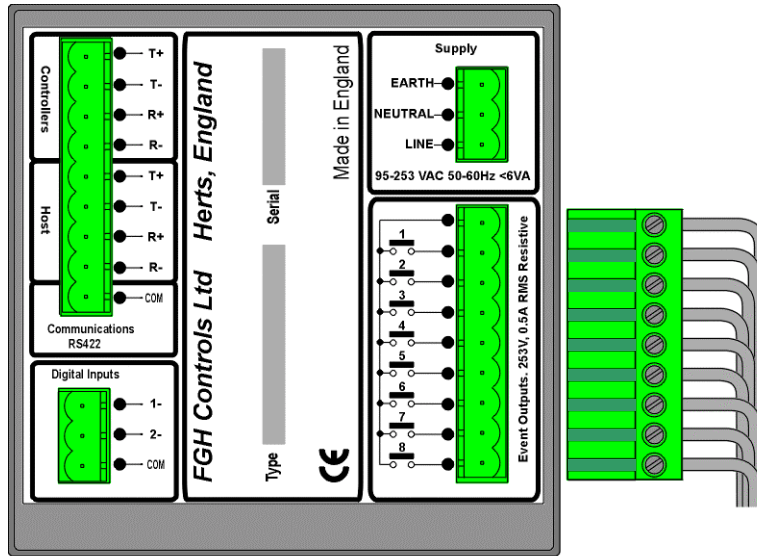
Unscrew the two instrument mounting screws on the bezel until the two retaining ears are near their rearmost positions. Whilst holding the retaining ears retracted within the recesses, fit the instrument into the panel cut-out. Hold the instrument in place and gently tighten the two mounting screws on the front of the instrument until the gasket is compressed and the instrument is firmly retained in the panel. **DO NOT OVER TIGHTEN THE SCREWS.**



Additional measures will be required to seal multiple instruments if they are mounted in a common slot. These measures may consist of sealing compound or other devices at the discretion of the installer.

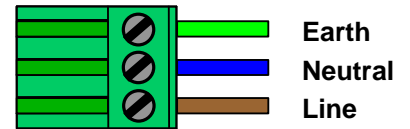
1.2 Electrical Connections

All electrical connections are made to the rear of the instrument via screw terminal blocks. Each terminal block plugs into a receptacle in the rear of the instrument and may be unplugged to allow easy wiring and to withdraw the instrument from the panel.



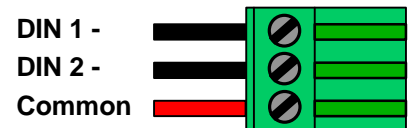
1.2.1 Supply

Mains power should be connected to the three way mains terminal block. The instrument will accept 95 to 253 V RMS at 50 to 60Hz and consumes approx. 6VA. A good earth connection is essential for safety and screening purposes and this is internally connected to the metal case of the instrument.



1.2.2 Digital Inputs

Up to two digital inputs may be connected to the P460 for the purposes of remote start/stop or hold etc. Each input should be driven from a voltage free relay contact or push button. The actual function of each input is programmable within the instrument.



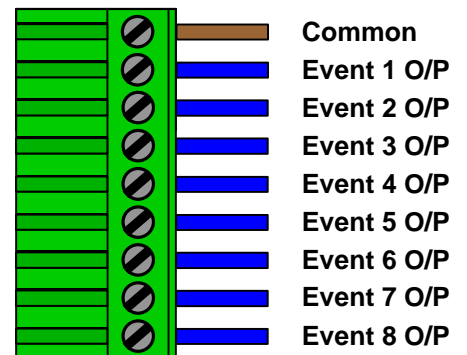
1.2.3 Event Outputs

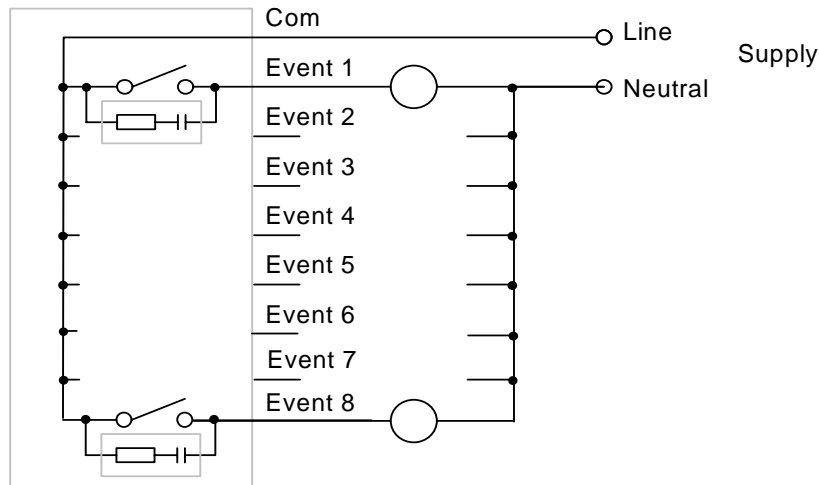
The 8 profile event outputs should be wired to the 9 way connector. Each output consists of a normally open relay contact rated at 0.5A RMS at 253V maximum into a resistive load.

Warning.

Each relay is internally fitted with a CR arc suppression device which will result in a small residual current flow (approx. 4mA at 250V) when the contact is open. This small current may result in very light loads failing to switch off.

If this is the case **DO NOT** remove the internal arc suppression devices. A 10K, 10W resistor should be connected across the load, this will usually solve any problem. The resistor will get hot so take care to mount it so that this does not cause a hazard.



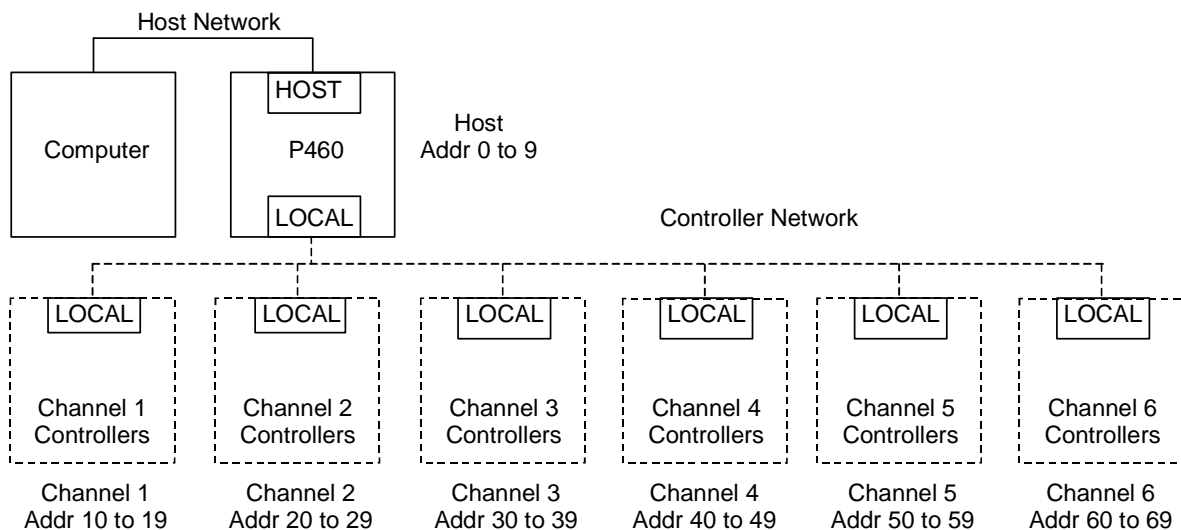
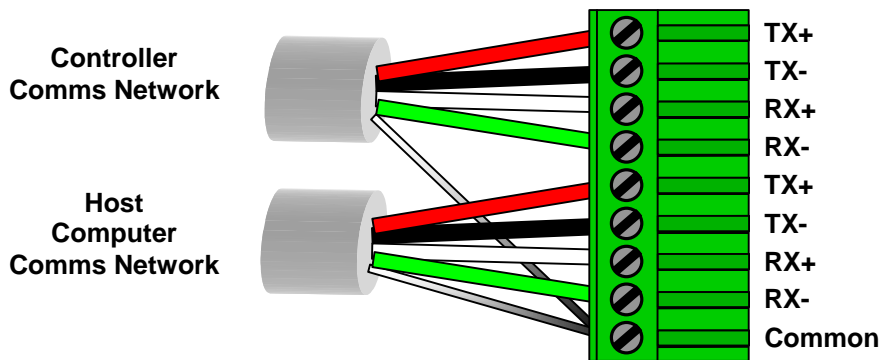


Note

Output 8 may be used as a watchdog output relay. This relay will change its state every 30 seconds indicating that the unit is passing messages between the host computer and controller network ports. If these messages stop for more than 60 seconds, the watchdog output will stop. The watchdog feature is enabled by DIL switch 3 being turned on.

1.2.4 Serial Communications

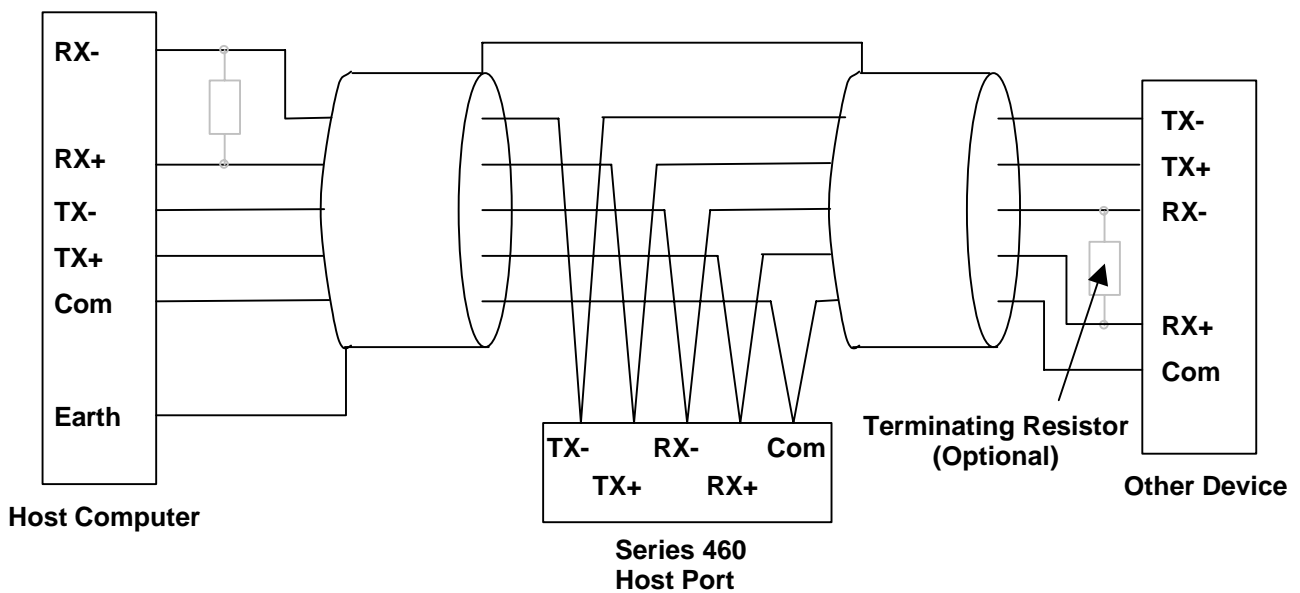
All series 460 instruments are equipped with two RS422 standard serial communications ports. This allows the units to communicate with each other and any other suitable equipment over distances up to 1200m. The HOST port is used for communications with a host computer system for monitoring or recording purposes. The CONTROLLER port is intended purely for communications between the P460 and its control instruments only and is used for the transfer of setpoints and control information.



The serial communications should be connected using the four wire system. The instrument uses a balanced voltage communications system which will perform well under most situations provided some simple guidelines are observed.

1. The communications wiring should be implemented using a suitable, screened twisted pair cable. The cable screen should be earthed at one point only.
2. The cable should be routed well away from sources of electrical noise such as motors, contactors and any other high voltage wiring.
3. The network should be wired as a daisy chain, taking the wires into one instrument and hence on to the next. Wiring spurs should be avoided. Take care to continue the cable screen on to the next instrument.
4. For long cable runs or noisy environments it may be necessary to fit a terminating resistor to the network. The terminator (a 200Ω resistor) should be fitted between RX+ and RX- on both the computer and the furthest instrument. For two wire networks this resistor should be fitted at the computer end only. Only one such terminator should be fitted on each wire pair.

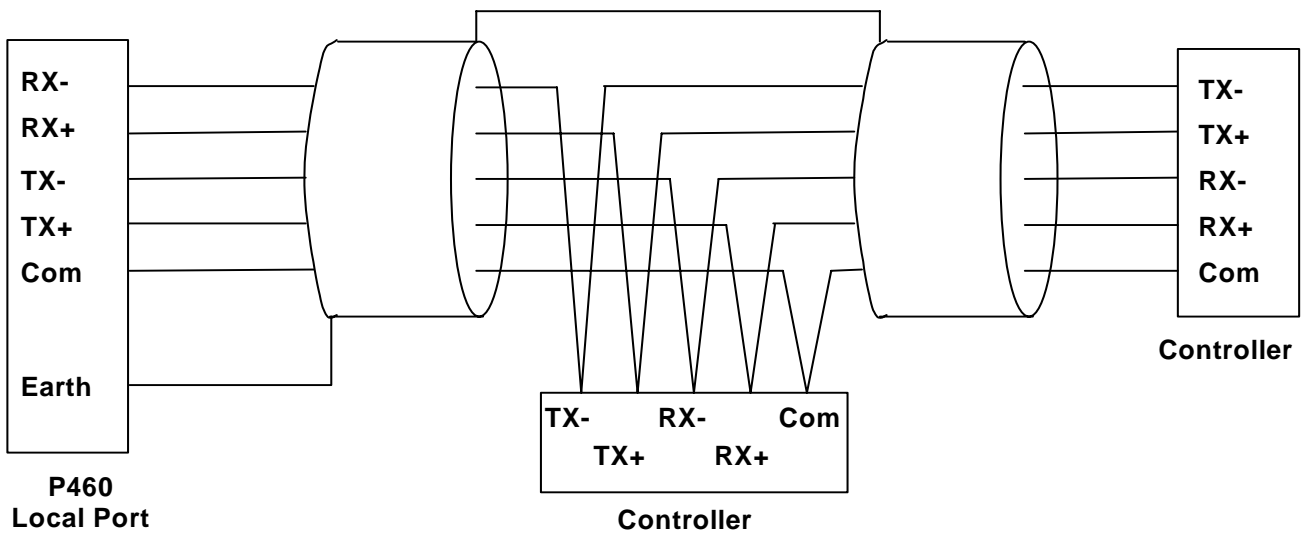
4 Wire Connection to host computer.



The above diagram shows the connections for 4 wire RS422 operation. This method of connection uses a separate pair of wires for transmission and reception and is the preferred connection method. Although called the '4 wire' connection, a fifth common wire is shown on the diagram. This wire should be fitted if at all possible

Controller network connection.

The P460 profiler communicates with its control instruments digitally. These instruments are connected to the profiler via the local communications port.

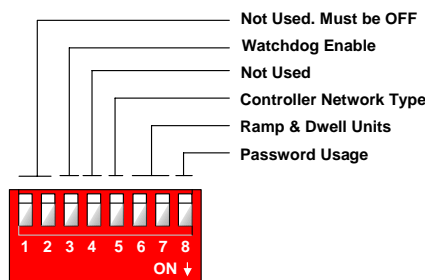


Function	1000 Series	2000 Series	3000 Series
TX+	31	14	31
TX-	30	13	30
RX+	33	15	33
RX-	32	16	32
Com	34	N/A	34

Table of controller communications connections.

1.3 Configuration DIL Switch Setting

Several aspects of the instruments operation are set by the user on the options DIL switch. This switch is accessible through a cut-out in the case at the bottom of the instrument. Use a narrow pointed device such as a ball point pen to set the switches to the required positions.



Switches 1 and 2 are not used and should be left off.

Switch 3 is used to enable the watchdog output on event 8. (Version V1.07 onwards)

SW 3	Watchdog Enable
OFF	Relay output 8 is used as event 8
ON	Relay output 8 is used as a watchdog output

Switch 4 is not used.

Switch 5 is used to select the type of controller network required.

SW 5	Controller Network Type
OFF	Series 1000 or 2000 controller network
ON	Series 3000 controller network

Switches 6 and 7 are used to select the programming units for ramps and dwells.

SW 6	Rate units
OFF	Rates in digits per hour.
ON	Rates in digits per minute

SW 7	Dwell units
OFF	Dwells in hours.
ON	Dwells in minutes

Switch 8 is used to select whether or not the security password is used. If this is disabled then the profiler configuration data is able to be changed by any user.

SW 8	Security System
OFF	Security system is ENABLED
ON	Security system is DISABLED

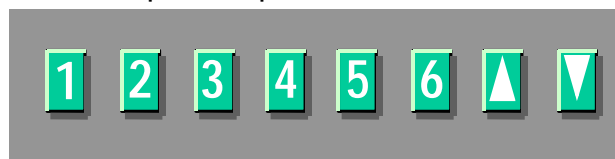
2 Operation

2.1 General

The FGH P460 series is a range of multi channel, digital profilers (setpoint generators) for use with FGH series 1000, 2000 and 3000 controllers. The P460 may have up to four setpoint channels. This manual shows illustrations of the 4 channel version and some displays may differ slightly from the users actual instrument.

2.1.1 Using the display and buttons

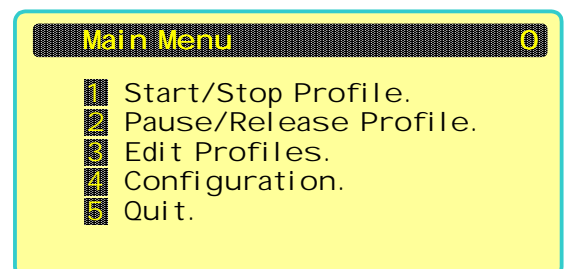
The instrument keypad consists of six numbered buttons and two up/down buttons. All buttons will emit a short beep when pressed.



The numbered buttons are soft function keys whose meanings change depending on the current display mode. The function of each button is indicated on the display.

For example.

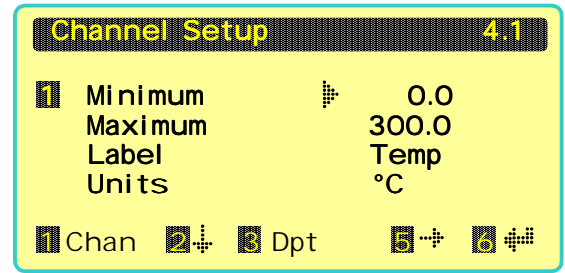
When a menu is displayed
 The function of each button is shown next to a number in a black square. For the menu opposite.
 Press **1** to start or stop a profile.
 Press **2** to pause or release the profile.
 Press **3** to edit a profile.
 Press **4** to configure the instrument.



Press **5** to return to the previous screen.

For data entry screens the function of each numbered button is usually shown on the bottom line of the display.

- Press 1 to change the channel viewed.
- Press 2 to move the pointer to the next parameter.
- Press 3 to change the decimal point position.
- Press 5 to move the cursor to the right.
- Press 6 to return to the previous screen.



Up/Down keys

These keys are used to change the value of the parameter currently selected on the display.

The currently selected parameter is indicated by means of the symbol. Use key 2 to cycle through the available parameters.

Press the Up button to increase the value (or select the next option in a list) and the down button to decrease the value (or select the previous option in a list). If the button is held down the value of the parameter will change continuously. Slowly at first and then with increasing speed until the button is released.

2.2 Software version and serial number

When power is first applied to the instrument. The power up display appears showing the instrument serial number and software version. After a few seconds, the display will disappear and is replaced with the Status Overview.

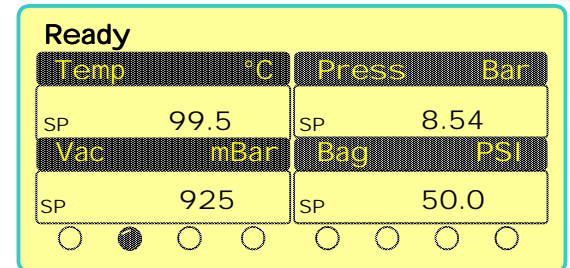


2.3 Status overview display

This is the default display for the instrument and shows an overview of the current profile status along with the current setpoint values for each channel and the status of the event outputs. The display is divided into three main areas.

The top line of the display shows the current profile condition.

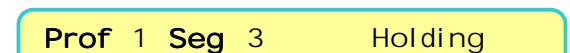
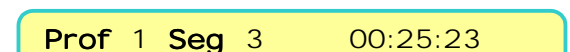
If the profiler is not running the word **Ready** is displayed.



If the profiler is running the running profile number and the current segment are shown along with the current total elapsed time in hours, minutes and seconds.



If the running profile is in hold the word Holding will be displayed flashing alternatively with the elapsed



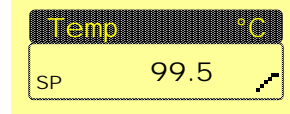
time.

If the running profile has a name this will be displayed flashing alternatively with the profile status.

The central area of the display shows the current values of each of the setpoint channels. The symbol next to the setpoint shows whether the setpoint is ramping or is in a dwell.

The bottom line of the display shows the current status of the eight event outputs. The events are labelled 1 to 8 from left to right. An event which is on is indicated by a filled circle.

High Temperature Soak



- ↘ Up Ramp
- ↙ Down Ramp
- ▬ Dwell
- Dwell Ended



- 1 Off
- 2 On
- 3 Off
- 4 Off
- 5 Off
- 6 Off
- 7 Off
- 8 Off

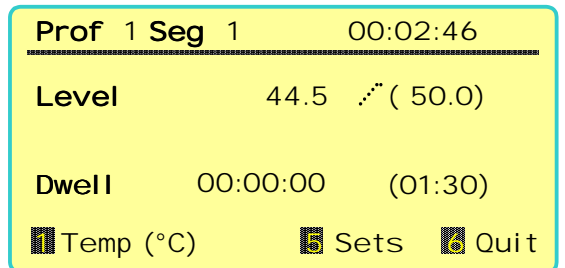
From this display press either the up or down buttons to advance to the **Detailed status display**.

Alternatively press any numbered button to advance to the **Main Menu**.

2.4 Detailed status display

This display shows detailed profile status for the selected channel. The top line of the display shows the profile status as for the Status Overview.

The middle two lines show the current setpoint and dwell elapsed time with the target values in brackets shown afterwards.



To view the status for a different channel, press the **1** button until the required channel is displayed.

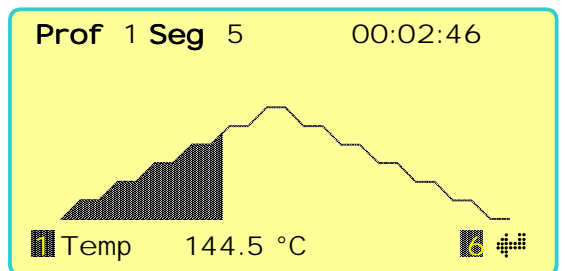
To view the profile status graph press either the up or down buttons.

2.5 Profile status graph display

This display shows a stylised graph of the profile for the selected channel. The top line of the display shows the profile status as for the Status Overview.

As the profile is running the graph is shaded from left to right to indicate the profile progress.

The bottom line of the display indicates the channel number shown and the current value of the channel setpoint.



To view the status graph for a different channel, press the button for the channel number required.

2.6 Starting and stopping a profile

Profiles may be started and stopped from the instrument front panel or by remote control. In some cases starting and stopping of profiles from the instrument front panel may be disabled or may be password protected. If this is the case please refer to section 4 Security

To start a profile from the front panel invoke the main menu by pressing any numbered key from the **Status Overview** display.

Press the **1** key to select Start/Stop profile.

Select the profile number that you wish to start using the up/down buttons. If the profiles have been given names, then the profile name will be shown on the line below the profile number. Finally press the **2** button to start the profile. The display will immediately jump back to the **Status Overview** display.

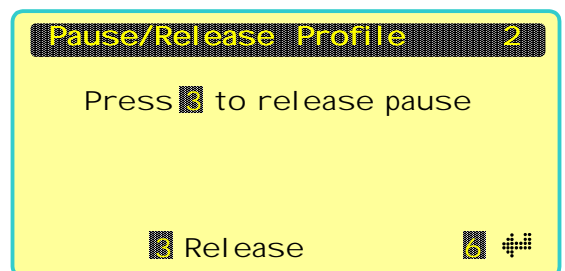
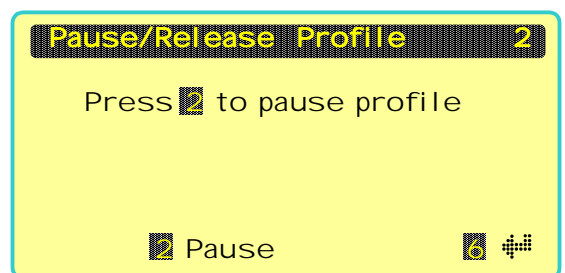
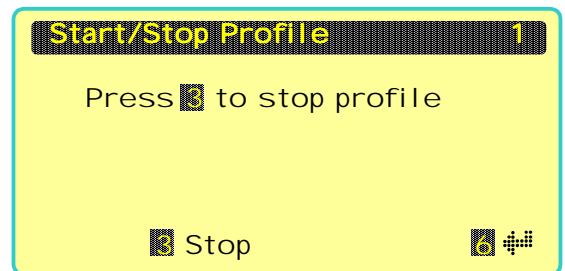
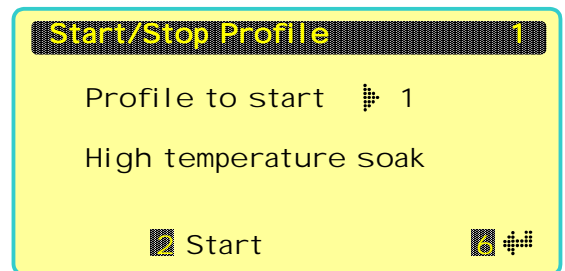
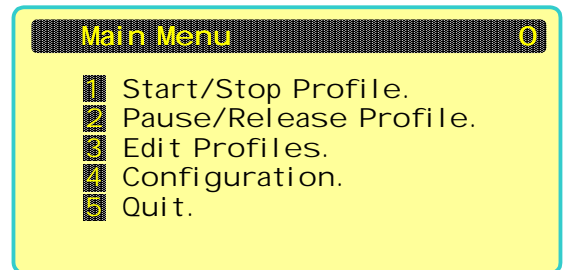
To stop a profile which is currently running. Invoke the **Start/Stop** display as before and press the **3** button to stop the profile. The display will immediately jump back to the **Status Overview** display.

2.7 Pausing a profile

A running profile may be paused from the instrument front panel or by remote control. To pause a profile from the front panel invoke **Pause /Release** from the main menu. Press the **2** key to actually pause the profile. The display will immediately jump back to the **Status Overview** display. The pause will remain in effect until manually released by the operator.

To release the pause on the profile, invoke the **Pause/Release** display as before and press **3**

The display will immediately jump back to the **Status Overview** display.



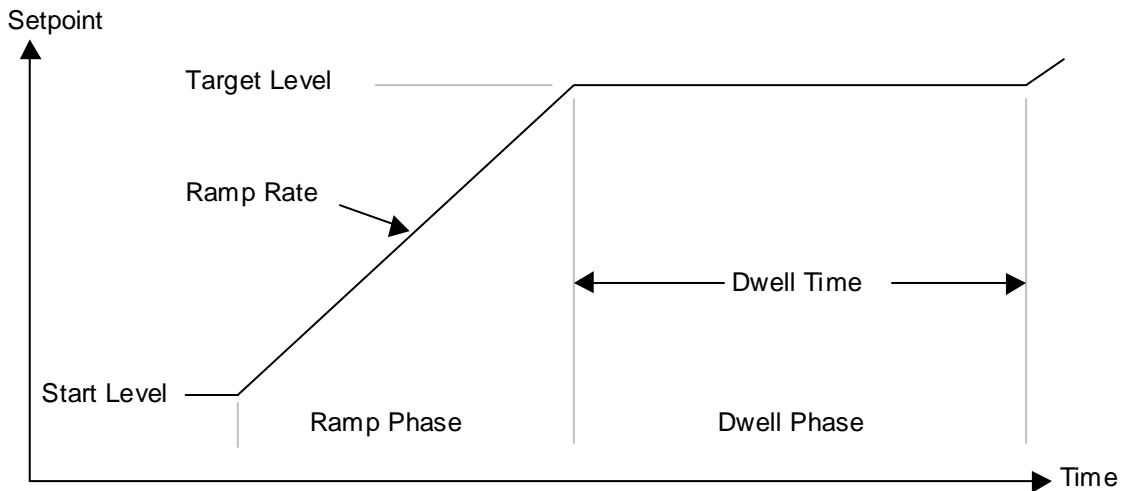
3 Profiles

3.1 General

The standard P460 can hold 10 profiles of up to 12 segments each. Other combinations are available to special order.

A profile segment consists of a ramp to a level followed by a dwell at that level for each of the setpoint channels. The user may also specify the required states for any of the 8 event outputs and the control terms to be used by the channel controllers.

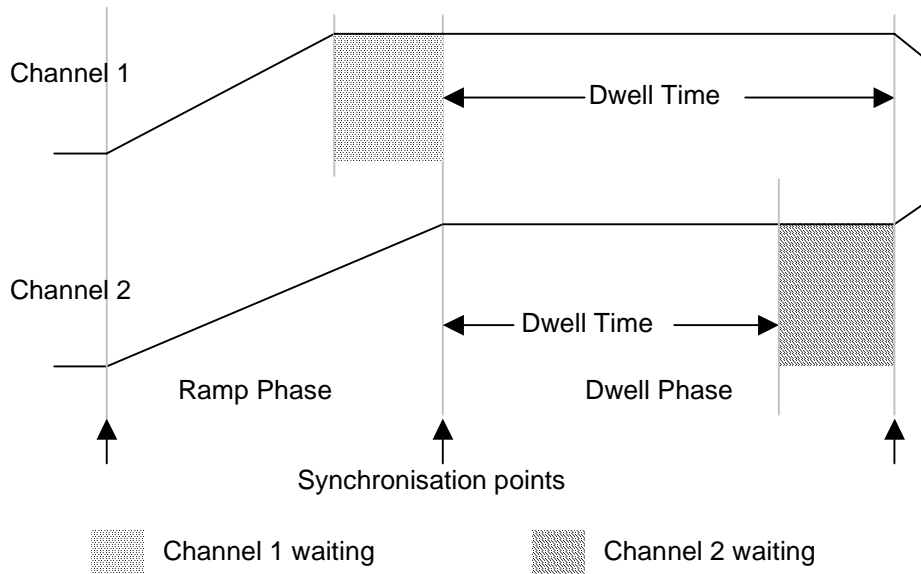
When a profile is run the profiler starts at segment 1 and executes each segment in turn until an END segment is reached or until there are no more segments left.



3.1.1 A profile segment

During a segment the channel setpoint will ramp from the previous level to its target level at the rate specified by the user. This rate may be in digits per minute or digits per hour depending on how the configuration DIL switch is set for the instrument. When the target level is reached the segment will enter the dwell phase and the dwell timer is started. The setpoint will remain at the segment target until the dwell timer reaches its programmed value at which point the next segment will commence. The dwell time may be entered in hours and minutes, or minutes and seconds depending on how the configuration DIL switch is set for the instrument.

On a multi channel instrument, each channel will generate its setpoint obeying its individual ramp rates, targets and dwell time. Channels are synchronised with each other at the end of both the ramp and the dwell phases. This means that those channels with faster rates or shorter dwell times will wait for slower channels to complete before advancing



In the above two channel example, channel 1 completes its ramp before channel 2 and so has to wait until channel 2 completes before the dwell phase is started. Channel 2 dwell time completes before channel 1 and so has to wait before the next segment is started.

3.1.2 Segment events

Each segment contains the desired states for each of the available eight event outputs. The programmed events will be applied to the outputs for the whole duration of the segment (both the ramp and the dwell phases) and are not related to any particular channel.

3.1.3 Terms sets

The P460 can maintain a table of 20 different sets of control parameters called terms sets. Ten of these sets are applicable to ramps and ten to dwells. Each terms set contains three control parameters:-

Proportional Band Expressed as a percentage of the controller span, this parameter specifies the gain of the controller.

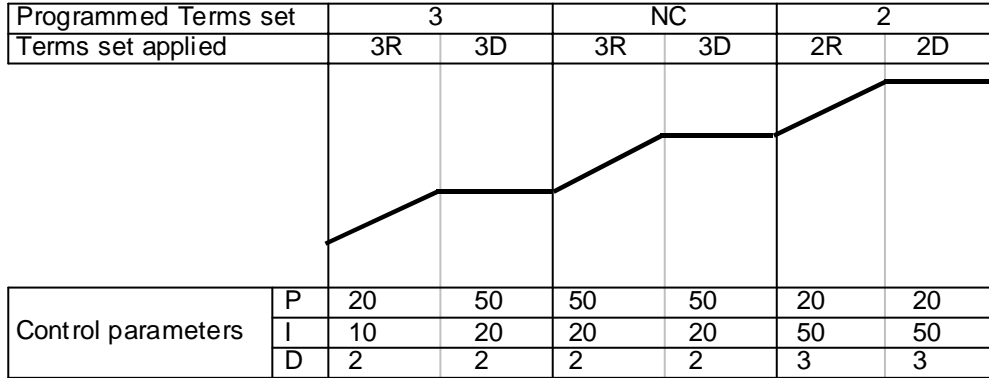
Integral Time Expressed in seconds.

Derivative Time Expressed in seconds.

A terms set can be selected for use in the ramp or dwell phase of any segment of any channel. When a setpoint channel starts a ramp or dwell phase the selected terms set values are transferred to all the control instruments on that channel.

The terms sets are numbered **1R** to **10R** (for ramp phase terms sets) and **1D** to **10D** (for dwell phase terms sets). Thus if a segment is programmed to use terms set 6 for example, then it will use set **6R** during its ramp phase and **6D** during its dwell phase.

Within a terms set, any parameter may be set either to a value, or to **NC** (No Change). A value that is set to **NC** is not transferred to the control instruments. Thus it is possible just to change one parameter at a time.



Set	P	I	D
2R	20	30	3
2D	NC	NC	NC
3R	20	10	2
3D	50	20	NC

In the above profile section, terms sets 2 and 3 are used to change the control parameters. Note that in the second segment the programmed terms set is set to **NC**. Thus the control terms do not change at all during the second segment and remain as programmed for the first.

Also terms set **2D** is all set to **NC**. This means that the terms for the dwell phase will remain unchanged from the ramp phase.

Remember

Terms sets may be applied to any segment on any channel in any order. Terms set 3 does not necessarily correspond to segment 3

3.1.4 Alarm sets

The P460 also maintains a table of 20 different sets of alarm parameters called alarm sets. Alarm sets are similar to terms sets but they specify the required alarm conditions for controllers on each channel.

Each alarm set contains two parameters:-

Alarm Level Specifies the alarm 1 level for the channel controller. This value is stored in digits corresponding to the display resolution of the intended target controller. For example if the target controller is displaying in tenths, then an alarm set value of 1000 will correspond to an alarm level of 100.0 in the target controller.

Alarm Type Specifies the alarm 1 type for the channel controller.

As for terms sets, an alarm set can be selected for use in the ramp or dwell phase of any segment of any channel. When a setpoint channel starts a ramp or dwell phase the selected alarm set values are transferred to all the control instruments on that channel.

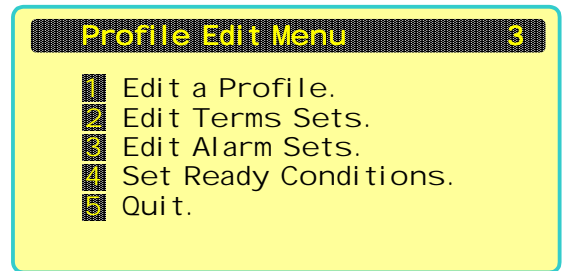
The alarm sets are numbered **1R** to **10R** (for ramp phase alarm sets) and **1D** to **10D** (for dwell phase alarm sets). Thus if a segment is programmed to use alarm set 3 for example, then it will use set **3R** during its ramp phase and **3D** during its dwell phase.

Within an alarm set, any parameter may be set either to a value, or to **NC** (No Change). A value that is set to **NC** is not transferred to the control instruments. Thus it is possible just to change one parameter at a time.

The operation of the alarm sets is exactly the same as for terms sets explained above.

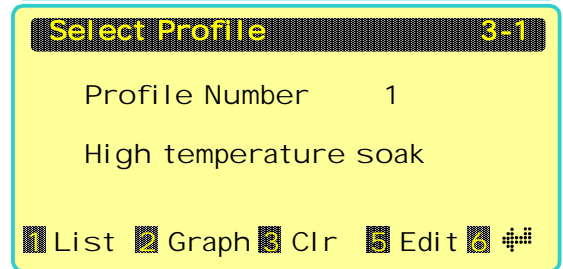
3.2 Editing a profile

To edit a profile invoke **Edit profiles** from the main menu and the **Profile edit menu** will be displayed. Select option 1 **Edit a profile**.



Select the profile number that you require by using the up/down buttons. If the profile has a name, then it will appear on the line below the profile number.

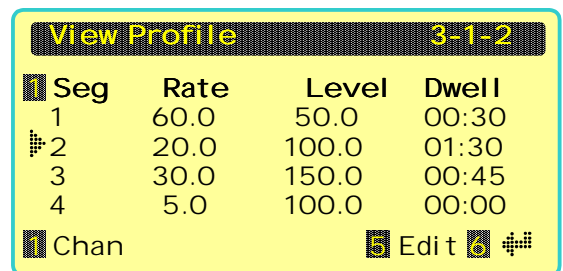
To view a list of the named profiles press the 1 button.



To view a stylised graph of the selected profile press the 2 button.

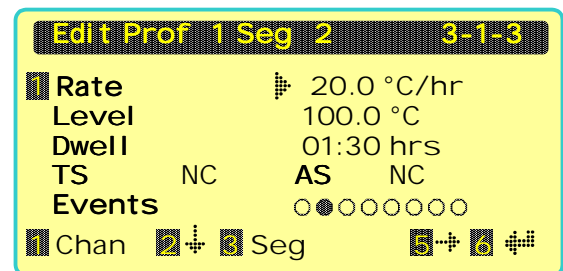
To edit the selected profile press the 5 button and the View Profile display will appear.

This display shows a summary of the profile for a channel. Use the up/down buttons to scroll through the profile as required. To view a different channel press the 1 button to cycle through the channels in sequence. To edit a particular segment, use the up/down buttons to move the pointer to the segment required and then press the 5 button to edit the segment.



The segment editing display shows the data for one channel of the segment. The top line of the display shows the profile and segment number currently being edited. The number in the black square next to the word **Rate** shows the current channel number. To display alternative channels, press the 1 button to cycle through the channels available.

Use the 2 button to move the edit pointer from one parameter value to the next. To modify the value, use the up/down buttons.



Rate

Enter the ramp rate required. This is the rate at which the setpoint moves from its previous value to the segment target level. If the rate is driven down to zero then the word **Step** will be displayed, this implies a step change in setpoint. If the rate is driven down still further then the word **End** will be displayed. This will cause profile execution to end at this segment.

Level

Enter the dwell level required. This is the target value for the ramp and the channel setpoint will remain at this level for the dwell time.

Dwell

Enter the time required for the dwell phase. The channel setpoint will remain at this level until the specified time has elapsed. Enter zero if no dwell is required.

TS

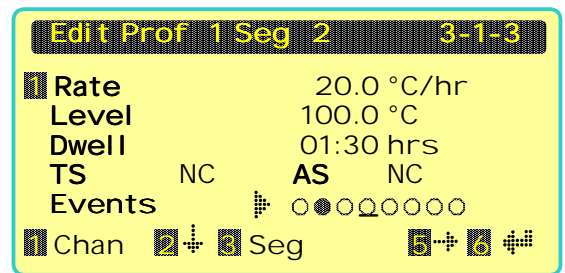
Enter the number of the terms set required for this segment. If no terms set is to be used, drive the number downwards past one to set **NC** (No Change).

AS

Enter the number of the alarm set required for this segment. If no alarm set is to be used, drive the number downwards past one to set **NC** (No Change).

Events

When the edit pointer is opposite the segment events, an underline cursor will appear under the first event. Use button 5 to move this cursor to select the required event and then use the up/down button to turn it on or off. The events are numbered 1 to 8 from the left. An event that is shown as a dark circle is programmed to be ON.

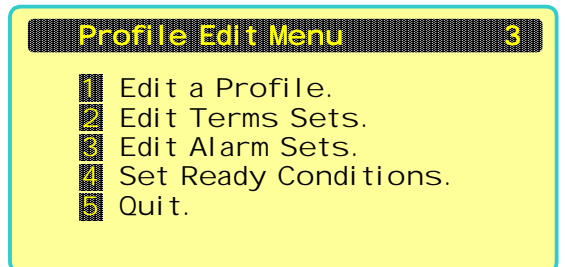


Press **1** to display the segment information for the next channel or press **3** to display the next segment.

When profile entry is complete, press **6** to return to the previous display.

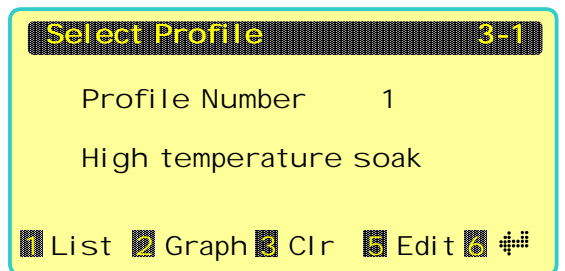
3.3 Viewing a graph of a profile

Invoke **Edit profiles** from the main menu and the **Profile edit menu** will be displayed. Select option **1 Edit a profile**.

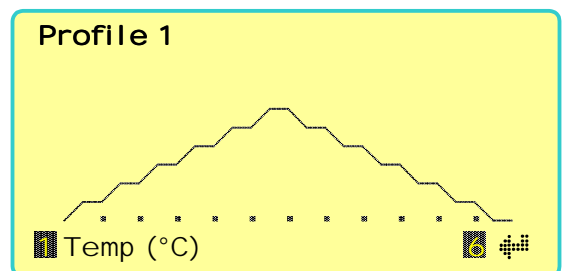


Select the profile number that you require by using the up/down buttons. If the profile has a name, then it will appear on the line below the profile number.

To view a stylised graph of the selected profile press the **2** button.



The profile is shown in a stylised form. All segments are shown with the same width and no distinction is made between short and long segments. A dot is shown at the bottom of the display to indicate the segment boundaries. The display initially shows the graph for channel 1. To view other channels press button **1** until the desired channel is shown.



3.4 Deleting a profile

Invoke **Edit profiles** from the main menu and the **Profile edit menu** will be displayed.
Select option 1 **Edit a profile**.

Select the profile number that you wish to delete by using the up/down buttons. If the profile has a name, then it will appear on the line below the profile number.

To delete the selected profile press the **3** button.

Press **1** to confirm that you really wish to delete the profile. If you are not sure press the **3** button or the **6** button to return to the previous display.

3.5 Editing the terms sets

To edit a terms set invoke **Edit profiles** from the main menu and the **Profile edit menu** will be displayed.
Select option **2 Edit Terms Sets**.

A summary of the terms sets are shown. Use the up/down buttons to move the edit pointer until it points to the terms set that you wish to edit.

To edit the selected terms set press the **5** button and the **Edit Terms Set** display will appear.

The top line of the display shows the current terms set being edited. For example **1D** means terms set 1 for the dwell phase.

A parameter may be modified by first moving the edit pointer using button **2**. Then use the up/down buttons to modify the value as required.

To set the selected parameter to **NC** (No change) press button **4**.

Use button **3** to advance to the next terms set.

Profile Edit Menu 3

- 1 Edit a Profile.
- 2 Edit Terms Sets.
- 3 Edit Alarm Sets.
- 4 Set Ready Conditions.
- 5 Quit.

Select Profile 3-1

Profile Number 1

High temperature soak

1 List 2 Graph 3 Clr 5 Edit 6 ↵

Confirm

Clear profile 1

Are you sure ?

1 Yes 3 No 6 ↵

Profile Edit Menu 3

- 1 Edit a Profile.
- 2 Edit Terms Sets.
- 3 Edit Alarm Sets.
- 4 Set Ready Conditions.
- 5 Quit.

View Terms Sets 3-2

Set	Prop	Int	Der
1R	50.0	150	40
1D	40.0	NC	25
2R	20.0	120	30
2D	5.0	60	NC

5 Edit 6 ↵

Edit Terms Set 1D 3-2-1

Prop Band 40.0

Integral NC

Derivative 25

2 ↓ 3 Set 4 NC 6 ↵

3.6 Editing the alarm sets

To edit an alarm set invoke **Edit profiles** from the main menu and the **Profile edit menu** will be displayed.

Select option **3 Edit Alarm Sets**.

A summary of the alarm sets are shown. Use the up/down buttons to move the edit pointer until it points to the alarm set that you wish to edit.

To edit the selected alarm set press the **5** button and the **Edit Alarm Set** display will appear.

The top line of the display shows the current alarm set being edited. For example **1D** means terms set 1 for the dwell phase.

A parameter may be modified by first moving the edit pointer using button **2**. Then use the up/down buttons to modify the value as required.

To set the selected parameter to **NC** (No change) press button **4**.

Use button **3** to advance to the next terms set.

3.7 Profile ready conditions

The profile ready conditions determine the values of the channel setpoints and the event outputs when a profile is **NOT** running.

To edit the ready conditions, invoke **Edit profiles** from the main menu and the **Profile edit menu** will be displayed.

Select option **4 Set Ready Conditions**.

The **Ready Conditions** display appears showing the current Ready state values.

Use button **2** to move the edit pointer to the parameter of interest and then use the up/down button to change the value as required.

When the edit pointer is opposite the segment events, an underline cursor will appear under the first event. Use button **5** to move this cursor to select the required event and then use the up/down button to turn it on or off. The events are numbered 1 to 8 from the left. An event that is shown as a dark circle is programmed to be ON.

Profile Edit Menu 3

- 1 Edit a Profile.
- 2 Edit Terms Sets.
- 3 Edit Alarm Sets.
- 4 Set Ready Conditions.
- 5 Quit.

View Alarm Sets 3-3

Set	Level	Type
1R	1000	High
1D	950	NC
2R	NC	Low
2D	NC	NC

5 Edit 6

Edit Alarm Set 1D 3-3-1

Alarm Level 950

Alarm Type NC

2 3 Set 4 NC 6

Profile Edit Menu 3

- 1 Edit a Profile.
- 2 Edit Terms Sets.
- 3 Edit Alarm Sets.
- 4 Set Ready Conditions.
- 5 Quit.

Ready Conditions 3-1-4

Ready Setpoints

1	0.00	2	0.0
3	900	4	1000

Events ○●○○○○○○○

2 5 6

3.8 The affect of Holds.

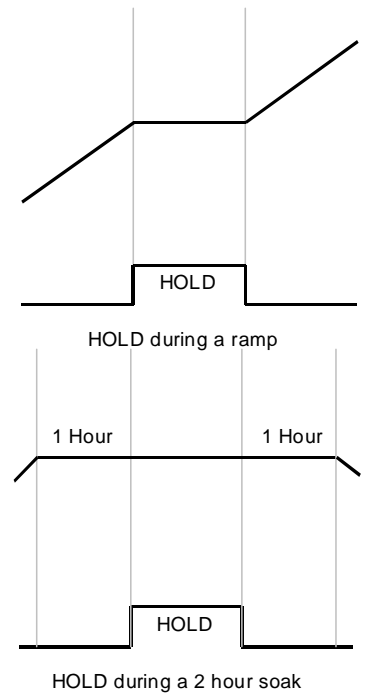
The operation of the profiler may be modified by the use of **Holds**.

A **Hold** is usually generated by an external controller in response to an out of limits condition. Holds are received by the P460 via a digital input.

When the profiler is in **Hold** both the profile setpoint and profile time-base are frozen for the duration of the **Hold**. This effectively pauses the profile until the hold is removed.

If a Hold occurs during a ramp stage, the ramp is suspended for the duration of the hold. This has the affect of extending the expected ramp time.

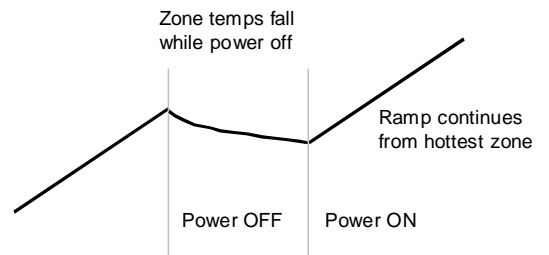
If a hold occurs during a dwell stage, the dwell timer is stopped for the duration of the hold. Obviously the apparent dwell time may be extended if a hold does occur.



3.9 Supply failures during a profile.

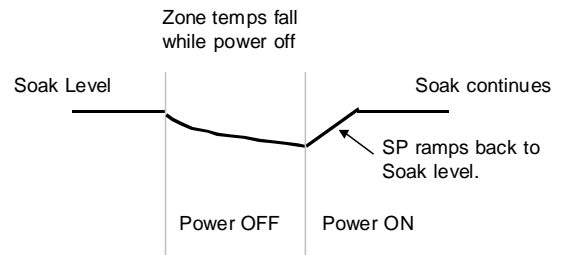
Supply interruption during a ramp.

If the profiler is executing a ramp and a supply interruption occurs. It is very likely that during the power outage the channel measured values will drop. Upon supply restoration the instrument forces each of its profile setpoints to be equal to the mv of the master controller on each channel and continues the ramp from there.



Supply interruption during a dwell.

If the profiler is executing a dwell and a supply interruption occurs. It is very likely that during the power outage the channel measured values will drop. Upon supply restoration the instrument forces each of its profile setpoints to be equal to the mv of the master controller on each channel and ramps the setpoints back to the dwell level at the segment ramp rate. When the setpoint reaches the dwell level the dwell timer continues from where it left off.



4 Security

The P460 is equipped with a password security system that will discourage tampering by an unauthorised user. See section 5 for information on how to configure the security system.

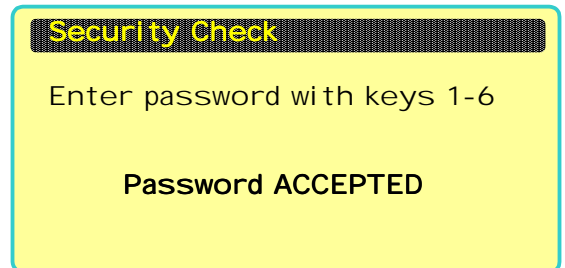
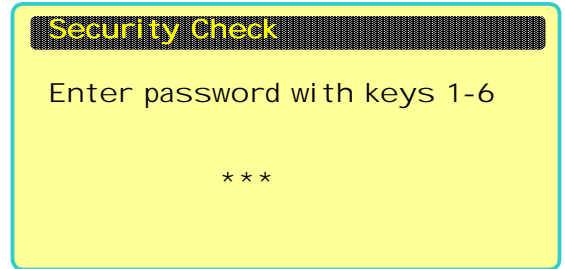
4.1 Password entry

If security is activated on your instrument, then you may be asked to enter a password if you are about to perform a sensitive operation.

Enter the 4 digit password using the numbered buttons. An asterisk is shown on the display as each button is pressed.

After the fourth button is pressed the display will indicate if the password has been recognised. If the password has been accepted the user will be allowed to proceed with the operation. The successful password will be in operation until the instrument display times out and reverts back to the **Status Overview** display.

If the password is rejected then the user will either be returned to the previous menu, or will be allowed to proceed but will not be permitted to change any instrument settings.



5 Configuration

5.1 General

To perform any configuration function the user must invoke **Configuration** from the **Main Menu** by pressing button 4.

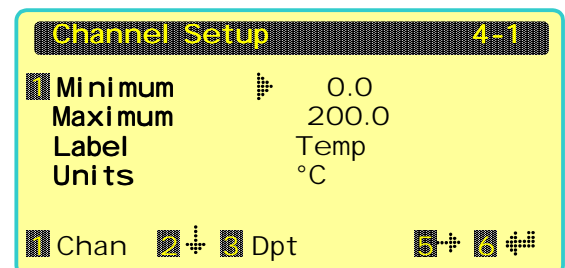
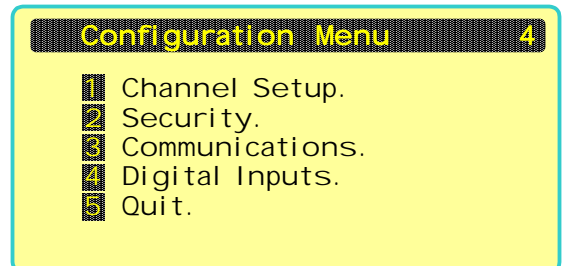
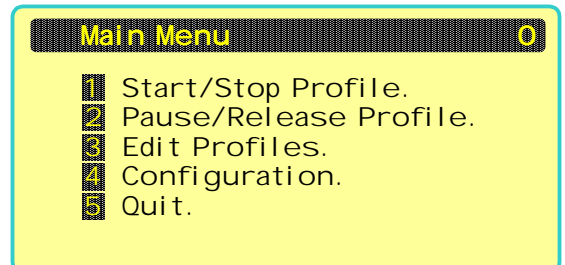
If security is active you will be asked to enter the password in the **Security Check** display. If this is successful the **Configuration Menu** will be shown.

All configuration functions are performed from this menu display.

5.2 Channel configuration

Invoke **Channel Setup** from the **Configuration Menu** and the **Channel Setup** display will be shown.

This display is used to set the setpoint limits, channel title and units for each of the setpoint channels available.



The display initially appears with channel 1 displayed, use button **1** to select the channel required.

Use button **2** to move the edit pointer to the parameter of interest and then use the up/down button to change the value as required.

Minimum

Enter the minimum value of setpoint allowed for the channel. The user can introduce and move the decimal point position at any time by pressing the **3** button.

Maximum

Enter the maximum value of setpoint allowed for the channel.

Label

This is the title of the channel.

When the edit pointer is opposite the label, an underline cursor will appear under the first character position. Use button **5** to move this cursor to select the required position and then use the up/down button to change the character displayed at that position. The maximum length of the channel label is 5 characters

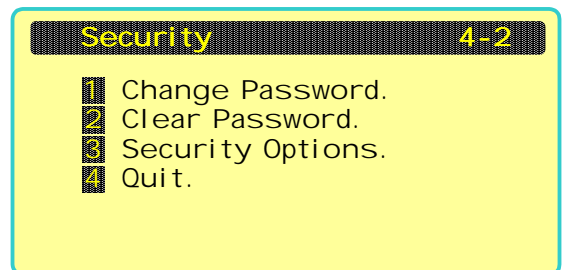
Units

This is the units of measure of the channel.

When the edit pointer is opposite the units, an underline cursor will appear under the first character position. Use button **5** to move this cursor to select the required position and then use the up/down button to change the character displayed at that position. The maximum length of the units is 5 characters

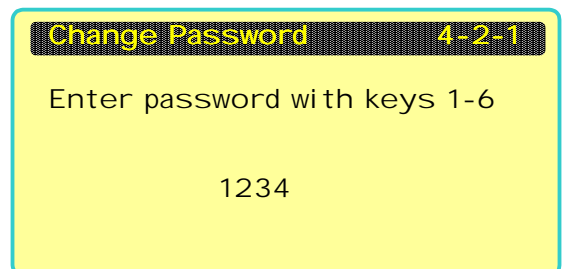
5.3 Security

To change any of the security settings for the instrument the user should invoke the **Security Menu** from the **Configuration Menu**.

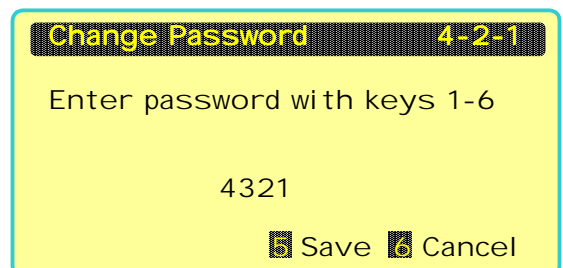


5.3.1 Changing the password

Invoke **Change Password** form the **Security Menu** and the **Change Password** display will appear. Initially this display shows the current password in use. If this is shown as zero then no password is currently in use
Use buttons 1 to 6 to enter the new password. Each number will appear as the button is pressed.

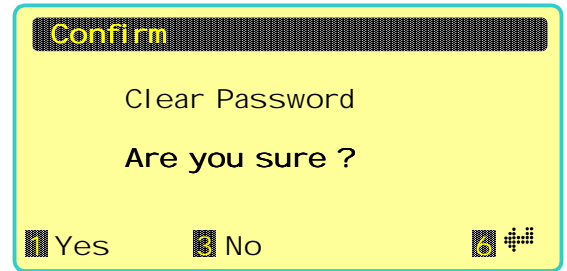


When the fourth number has been pressed, two options will appear on the bottom line of the display. Use button **5** to save the new password or button **6** to cancel.



5.3.2 Clearing the password

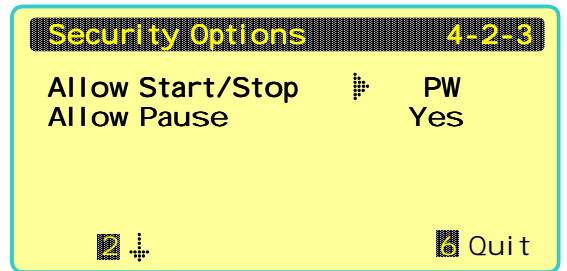
To clear the password and hence disable password security. Invoke **Clear Password** from the **Security Menu**. The display will then ask you to confirm that you wish to proceed. Press button **1** to clear the password or button **6** to return to the **Security Menu**.



5.3.3 Security options

The user may specify if the operator can start, stop or pause a profile from the instrument front panel.

Invoke **Security Options** from the **Security Menu**. Position the edit pointer as required with button **2** and use the up/down button to select the option required.



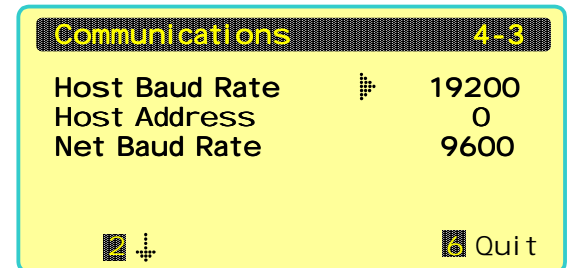
Options

- No** The user may not perform the operation from the instrument front panel.
- Yes** The user can always perform the operation from the instrument front panel.
- PW** The user may perform the operation if the password is correctly entered.

5.4 Serial communications setup

To set up the serial communications parameters for the instrument, invoke **Communications** from the **Configuration Menu**.

Position the edit pointer as required with button **2** and use the up/down button to select the values required.



Host Baud Rate

This is the speed at which the instrument is to communicate with a host computer. Normally set to 9600 or 19200 Baud.

Host Address

This is the unique address that will identify this instrument on the host communications network. The address can be set between 0 and 9.

Net Baud Rate.

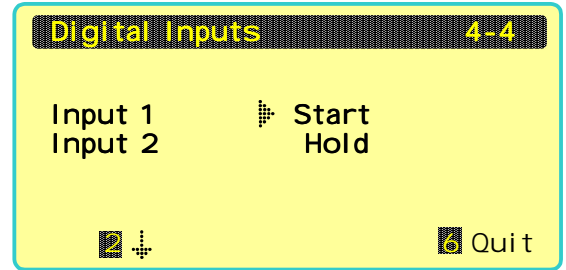
This is the speed at which the instrument is to communicate with the remote controllers connected to the controller network port. Normally set to 4800 or 9600 Baud.

5.5 Digital inputs

To set up the function of the digital inputs for the instrument, invoke **Digital Inputs** from the **Configuration Menu**.

Position the edit pointer as required with button 2 and use the up/down button to select the values required.

The function of each digital input is individually programmable from the following options.



- Off** The digital input is not used.
- Start** When made, this digital input will start the profile.
- Stop** When made, this digital input will stop the profile.
- Hold** When made, this digital input will hold the profile.
- Run/Rdy** When made, this digital input will start the profile, when not made the profile will be reset.
- Ramp Hold** When made, this digital input will hold the profile if it is currently in the ramp phase.
- Dwell Hold** When made, this digital input will hold the profile if it is currently in the dwell phase.

6 Assigning controller network addresses

The P460 instrument is a profiler only unit which uses external instruments to perform its control function.

The P460 communicates with these external instruments via the controller network port. Setpoints and control parameters are regularly transferred from the P460 to the external controllers and vice versa. It is vitally important to plan and configure the external instruments such that they receive the correct information.

The host computer may also communicate with these external instruments even though the are not connected to the same network. Any message transaction received by the P460 host port with a destination address of 10 or higher will be passed through to the controller network. Similarly any transaction reply from the controller network will be passed back to the host computer. Message transactions received by the host port with a destination address less than 10 will NOT be passed on

The following table gives the available address ranges for the external instruments.

P460 (A)	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Chan 6	Vacant
0	10	20	30	40	50	60	70
to	to	to	to	to	to	to	to
9	19	29	39	49	59	69	99
Master	10+A	20+A	30+A	40+A	50+A	60+A	

Control instruments for channel 1 must have addresses in the range 10 to 19 inclusive. All external devices in this range will receive setpoint and control terms information from

channel 1. One instrument in this address range is designated the channel master controller and it is this controller's measured value which is used to servo start the channel 1 profiler.

Control instruments for channel 2 must have addresses in the range 20 to 29 inclusive. All external devices in this range will receive setpoint and control terms information from channel 2. One instrument in this address range is designated the channel master controller and it is this controller's measured value which is used to servo start the channel 2 profiler.

Control instruments for channel 3 must have addresses in the range 30 to 39 inclusive. All external devices in this range will receive setpoint and control terms information from channel 3. One instrument in this address range is designated the channel master controller and it is this controller's measured value which is used to servo start the channel 3 profiler.

Control instruments for channel 4 must have addresses in the range 40 to 49 inclusive. All external devices in this range will receive setpoint and control terms information from channel 4. One instrument in this address range is designated the channel master controller and it is this controller's measured value which is used to servo start the channel 4 profiler.

Control instruments for channel 5 must have addresses in the range 50 to 59 inclusive. All external devices in this range will receive setpoint and control terms information from channel 5. One instrument in this address range is designated the channel master controller and it is this controller's measured value which is used to servo start the channel 5 profiler.

Control instruments for channel 6 must have addresses in the range 60 to 69 inclusive. All external devices in this range will receive setpoint and control terms information from channel 6. One instrument in this address range is designated the channel master controller and it is this controller's measured value which is used to servo start the channel 6 profiler.

Control instruments with addresses of 70 or higher may be connected to the controller network but will receive no information from the P460.

The address of the master controller on each channel is the P460 address PLUS the channel base address. Thus if the P460 has a host address of 5 then the channel master addresses will be 15, 25, 35 and 45.

7 Host Serial Communications

The P460 unit has 2 serial communications channels. The controller network port is used solely for communications between the P460 and its external controllers and is not available for use by the user. The host port however is available to the user and this section provides the details required to implement successful data communications between instrument and PC.

7.1 Data format

Communications may be performed in either 2 wire RS485 or 4 wire RS422 standards. Both modes are half duplex only.

The data format and Baud rate are fixed as follows.

Baud Rate	up to 19200
Start bits	1

Word length	7 bits
Parity	Odd
Stop bits	1

7.2 Message structure

All series 460 instruments act as slave devices. This means that an instrument will not itself initiate a transaction, it merely responds to transaction requests initiated by a host computer or other similar device. Messages consist entirely of printable ASCII characters so transaction data may be conveniently tested or monitored using any terminal device.

There are two types of transaction which are supported by the P460 instrument. Read transactions (requests for data from the P460) or write transactions (data sent to the P460).

7.2.1 Read transactions

Read transactions are used to acquire data from the P460 and consist of messages of the following general form.

RAAPSS<CR>

Where **R** = Read message header ASCII code 52h
AA = Instrument address
P = Parameter code
SS = Secondary parameter code
<CR> = Message terminator ASCII code 0Dh

Messages to the instrument may include spaces or linefeeds if required. These will be ignored. Messages from the instrument will not contain either linefeeds or spaces.

7.2.2 Write transactions

Write transactions are used to write data into the P460 and consist of messages of the following general form.

WAAPSSD...D<CR>

Where **W** = Read message header ASCII code 57h
AA = Instrument address
P = Parameter code
SS = Secondary parameter code
D...D = Data to write
<CR> = Message terminator ASCII code 0Dh

Messages to the instrument may include spaces or linefeeds if required. These will be ignored. Messages from the instrument will not contain either linefeeds or spaces.

7.2.3 Instrument address

Each instrument must be given a unique address between 00 and 09. This address is set as part of the instrument configuration (see section 5.4 Serial communications setup). The address field of the message consists of two ASCII numerals and determines to which instrument the message is directed. An instrument will ignore a message that does not contain its own address.

7.2.4 Parameter code and SS field

The parameter code field of the message is a single ASCII character, this identifies the parameter group within the instrument which is the target of the read or write message. Used in conjunction with the two digit SS field the instrument is able to identify the specific parameter required.

Code	SS	R/W	Parameter	SS notes	Value notes
@		R/W	Profile pointer		
A	Seg	R/W	Segment Events	Seg 0 = ready	Coded type 1
B	Seg	R/W	Profile Chan 1 Seg ramp rate		0=Step, -1= End
C	Seg	R/W	Profile Chan 1 Seg target level	Seg 0 = ready	
D	Seg	R/W	Profile Chan 1 Seg dwell time		
E	Seg	R/W	Profile Chan 1 Seg terms set		0=NC
F	Seg	R/W	Profile Chan 1 Seg alarm set		0=NC
G	Seg	R/W	Profile Chan 2 Seg ramp rate		0=Step, -1= End
H	Seg	R/W	Profile Chan 2 Seg target level	Seg 0 = ready	
I	Seg	R/W	Profile Chan 2 Seg dwell time		
J	Seg	R/W	Profile Chan 2 Seg terms set		0=NC
K	Seg	R/W	Profile Chan 2 Seg alarm set		0=NC
L	Seg	R/W	Profile Chan 3 Seg ramp rate		0=Step, -1= End
M	Seg	R/W	Profile Chan 3 Seg target level	Seg 0 = ready	
N	Seg	R/W	Profile Chan 3 Seg dwell time		
O	Seg	R/W	Profile Chan 3 Seg terms set		0=NC
P	Seg	R/W	Profile Chan 3 Seg alarm set		0=NC
Q	Seg	R/W	Profile Chan 4 Seg ramp rate		0=Step, -1= End
R	Seg	R/W	Profile Chan 4 Seg target level	Seg 0 = ready	
S	Seg	R/W	Profile Chan 4 Seg dwell time		
T	Seg	R/W	Profile Chan 4 Seg terms set		0=NC
U	Seg	R/W	Profile Chan 4 Seg alarm set		0=NC
0	Seg	R/W	Profile Chan 5 Seg ramp rate		0=Step, -1= End
1	Seg	R/W	Profile Chan 5 Seg target level	Seg 0 = ready	
2	Seg	R/W	Profile Chan 5 Seg dwell time		
3	Seg	R/W	Profile Chan 5 Seg terms set		0=NC
4	Seg	R/W	Profile Chan 5 Seg alarm set		0=NC
5	Seg	R/W	Profile Chan 6 Seg ramp rate		0=Step, -1= End
6	Seg	R/W	Profile Chan 6 Seg target level	Seg 0 = ready	
7	Seg	R/W	Profile Chan 6 Seg dwell time		
8	Seg	R/W	Profile Chan 6 Seg terms set		0=NC
9	Seg	R/W	Profile Chan 6 Seg alarm set		0=NC
V	Set	R/W	Terms Set Prop band		9999=NC
W	Set	R/W	Terms Set Integral Time		9999=NC
X	Set	R/W	Terms Set Derivative time		9999=NC
Y	Set	R/W	Alarm Set Level		9999=NC
Z	Set	R/W	Alarm Set Type		9999=NC
a	Chan	R	Current Channel Setpoint		
b		R	Current Segment number		
c		R	Current Segment Dwell Elapsed time		
d		R	Current Event Outputs		Coded type 1
e		R	Current Profile Number		9999=Ready
f	Chan	R	Profiler Status	Chan0 = Master	Coded type 2
g	Chan	R	Current Channel master measured value		
h		R	Total Profile Elapsed Time		8 digit Hex
i	Chan	R/W	Channel Minimum Setpoint Limit		
j	Chan	R/W	Channel Maximum Setpoint Limit		
k	Chan	R/W	Channel Decimal Point Position		Coded type 3
l	Chan	R/W	Channel Title Text	Max 5 chars	Use _ for spaces
m	Chan	R/W	Channel UOM Text	Max 5 chars	Use _ for spaces
n		R	Segment phase (ramp or dwell) elapsed time		

o		R/W	Start allow function code		Coded type 4
p		R/W	Pause allow function code		Coded type 4
q		R/W	Digital Input 1 function code		Coded type 5
r		R/W	Digital Input 2 function code		Coded type 5
s		R	Instrument serial number		4 digit Hex
t	Prof	R/W	Profile Title	Max 30 chars	Use _ for spaces
u					
v					
w					
x		W	Profiler Start/Stop/Hold/Step		Coded type 6
y					
z					
]	What	R	Instrument information		Coded type 7

7.3 Numeric Data fields

The data field part of the message consists of 4 ASCII numeric characters preceded by an optional minus sign. The data field should be left padded with zeros such that there are always 4 numeric characters.

For example

- 0000 represents zero
- 0100 represents the number 100d
- 0100 represents the number -100d

7.4 Coded data fields

Certain parameters use data fields whose meanings are coded.

7.4.1 Type 1, Event data

Event information is encoded as a 8 bit binary number, transmitted as a four character ASCII decimal number.

Bit Weightings

- Bit 0 Event 1
- Bit 1 Event 2
- Bit 2 Event 3
- Bit 3 Event 4
- Bit 4 Event 5
- Bit 5 Event 6
- Bit 6 Event 7
- Bit 7 Event 8

For example

- 0000 represents all events off
- 0001 represents event 1 on, all others off
- 0024 represents events 4 and 5 on, all others off
- 0255 represents all events on.

7.4.2 Type 2, Profiler status

Status information is encoded as a 8 bit binary number, transmitted as a four character ASCII decimal number.

When the SS field is zero the overall profiler status is returned.

Bit Weightings

- Bit 0 Running

Bit 1	Dwell phase
Bit 2	Hold
Bit 3	Pause
Bits 4to 8	Not used

For example

0000	represents profile not running
0001	represents profile running, not in dwell and not in hold
0005	represents running and in hold

When the SS field is non zero the status of an individual channel is returned.

Bit Weightings

Bit 0	Ramping upwards
Bit 1	Ramping downwards
Bit 2	In dwell
Bit 3	Dwell time expired
Bits 4to 8	Not used

For example

0001	represents channel is ramping upwards
0004	represents channel has reached dwell target level

7.4.3 Type 3, Decimal point data

Decimal point information is transmitted as the usual 4 digit ASCII decimal number.

0000	represents no decimal point
0001	represents one place of decimal ie XXX.X
0002	represents two places of decimal ie XX.XX
0003	represents three places of decimal ie X.XXX

7.4.4 Type 4, Start allow data

Start and Pause allow information is transmitted as the usual 4 digit ASCII decimal number.

0000	Not allowed
0001	Always allowed
0002	Allowed when password given

7.4.5 Type 5, Digital inputs

Digital input type information is transmitted as the usual 4 digit ASCII decimal number.

0000	Off
0001	Start
0002	Stop
0003	Hold
0004	Run/Ready
0005	Ramp Hold
0006	Dwell Hold

7.4.6 Type 6, Start/Stop/Hold

Parameter code x provides a convenient way of controlling the profiler. It is a write only parameter. Data sent to this parameter has the following meanings

0000	Stop the profile
01XX	Start profile XX
0200	Pause profile
0300	Release profile pause
0400	Step profile

7.4.7 Type 7, Instrument information

Parameter code] provides a means of reading the instrument information. The piece of information read is dictated by the SS field of the message as follows

00	Read the instrument firmware version number
01	Read the maximum number of profiles
02	Read the maximum number of segments per profile
03	Read the number of channels
04	Read the maximum number of terms sets
05	Read the maximum number of alarm sets
06	Read the DIL switch setting

7.5 Normal message responses

A successful message received by the instrument will usually initiate a message response. This will consist of a message of the following general form.

***AAPSSD...D<CR>**

Where * = Response message header ASCII code 2Ah
AA = Instrument address
P = Parameter code
SS = Secondary parameter code
D...D = Data
<CR> = Message terminator ASCII code 0Dh

The returned data field contains either the data requested (read transaction) or confirmation of the data just written (write transaction). All data returned is numeric and is of the type defined in section 7.3 Numeric Data fields.

7.6 Error message responses

Commands to the P460, that contain an error or cannot be understood result in an error reply of the general form:

?AAEF<CR>

Where ? = Message header ASCII code 3Fh
AA = Address of the replying instrument.
E = Character fault error code.
F = Message fault error code.

<CR> = Message terminator ASCII code 0Dh

Character error codes.

Field **E** is a single ASCII hexadecimal number whose binary weighting indicates the type of character corruption that may have given rise to the error:

BIT	MEANING
0	receiver over-run error
1	framing error
2	parity error
3	break in transmission

Message error codes.

Field **F** is a single ASCII hexadecimal number whose binary weighting indicates the type of message fault that may have given rise to the error:

BIT	MEANING
0	Illegal number of characters in command.
1	Illegal data
2	Illegal parameter code or number
3	Illegal header

In general only one possible error will be identified thus either fields **E** or **F** will be zero. Where a command character is found to be corrupted then the receiving instrument(s) will treat the corrupted character as the final character of the message and will attempt to interpret it. Where the corruption has occurred in the header or address fields of the message then no reply is given and message is ignored. If, as is likely, the message continues after the corrupted character then the instruments will treat that part of the message after the corruption as a new message. This will generate a reply if the supposed address in the remainder of the message is recognised by an instrument: this is bound to result in an error message but fields **E** and **F** will refer, not to the original corruption, but to the meaningless nature of the remainder of the message. For this reason no great reliance should be placed on the validity of either **E** or **F**.

