LD-RTD / LD-TC

Temperature Controller

Available in either an RTD model or a thermocouple model, these units accept all common temperature probe types, and offer a technically advanced, but cost effective solution for a wide variety of temperature applications.

They have been designed for ease of use, with intuitive, scrolling text prompts that guide you step-by-step through the setup process.

The front panel includes 5 buttons, for simple operator interface, and the large 4 digit display ensures that the figures can be easily read from a distance.

Order Codes

LD-RTD	RTD input
LD-TC	Thermocouple input
-HV	85-265V AC / 95-370V DC
-LV	15-48V AC / 10-72V DC

Options

-R2	2 x relay outputs
-R4	4 x relay outputs
-A	1 x mA/V analog output
-S2R	1 x RS232 (RJ11 terminal)
-S4S	1 x RS485 (screw terminal)

Contents

1 SPECIFICATIONS

Sensor input

LD-RTD: RTD 385, 392, 120 or Cn10 (2, 3 or 4 wire)

LD-TC: Thermocouple J, K, R, S, T, B or N type.

Power supply HV (85-265V AC/95-370V DC) **or** LV (15-48V AC/10-72V DC)

Relay output 2 or 4 x 5A Form A relays *OPTIONAL*

Analog output 1 x isolated 16 bit analog output, 4-20mA or 0-10V. Can be wired for either current or voltage. Fully scalable. Window programmable over any range within the controller's full-scale range. *OPTIONAL*

Serial port Isolated RS232 (RJ11) or RS485 (screw terminal) *OPTIONAL*
Output mode: Custom ASCII, Modbus RTU slave or Ranger A. Data rate: 300-38400 baud. Parity: Odd, even or none.

Sampling rate 2.5Hz

Resolution 16 bit

Accuracy 0.05% of reading

Temperature drift Typically 50ppm/°C

Factory defaults

LD-RTD: Factory calibrated for 385 RTD

LD-TC: Factory calibrated for K type thermocouple

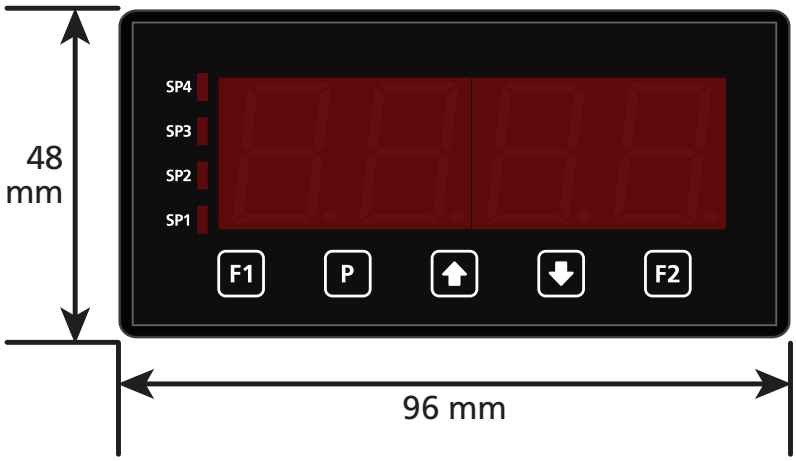
Security Calibration and setpoint functions have independent security code access

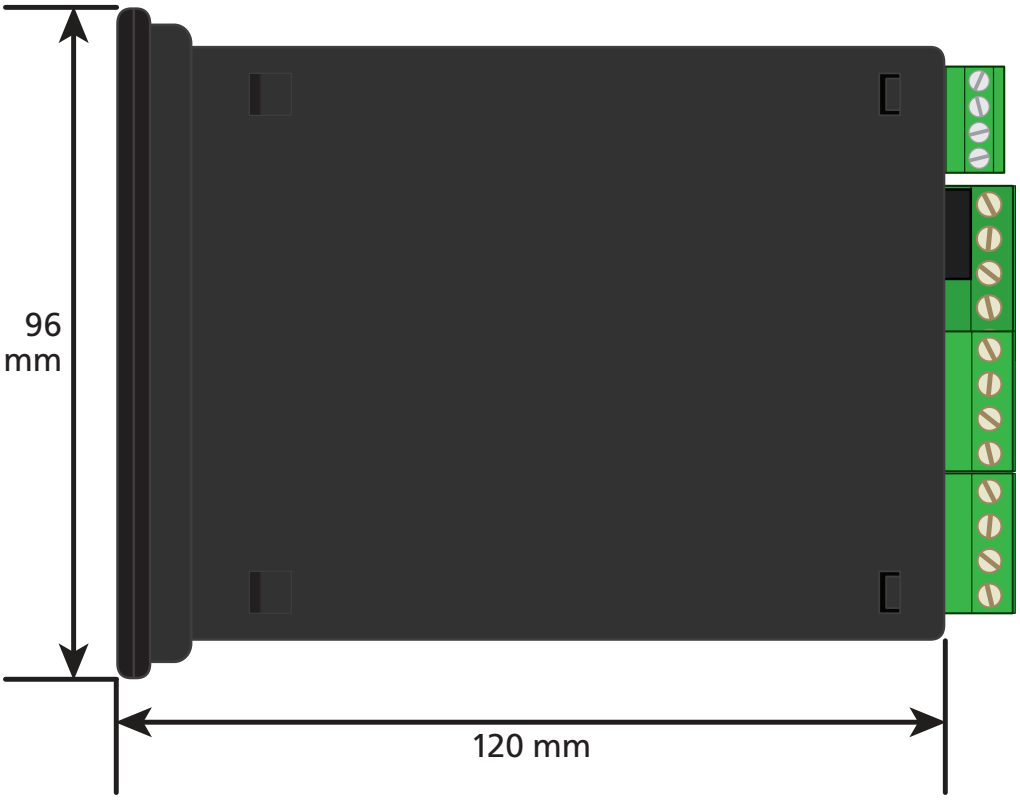
2 CASING & DISPLAY

2.1 - Case dimensions

Dimensions 48H x 96W x 120D (mm). *When calculating space requirements, please allow 30-50mm clearance behind the unit for connectors and wiring.*

Panel cutout 45H x 92W (mm)





2.2 - Front panel

SPX The SP LED's are used to indicate active setpoints.

F1 This button is used to access the **Input Setup & Calibration** menu (Section 4).

P This button is used to save your settings and advance to the next step.

This button is typically used to scroll through options or increase values in the setup menu. It can also be used to view/reset the peak value (see 2.3).

This button is typically used to scroll through options or decrease values in the setup menu. It can also be used to view/reset the valley value (see 2.3).

F2 This button is used to access the **Setpoint Setup** menu (Section 5) and the **Setpoint Direct Access** menu (Section 6).

2.3 - Up and down button shortcuts

Press the button from the main display. **PEAK** appears and toggles with the maximum measured input value since the instrument was turned on or reset.

Press the button from the main display. **VALY** (valley) appears and toggles with the minimum measured input value since the instrument was turned on or reset.

To reset **PEAK** or **VALY** (valley) press the and buttons together while the required parameter is being displayed. Peak and valley can also be reset using an external switch connected to the function pins (see 3.6). Press P at any time to return to the main display.

2.4 - Display brightness

To adjust the display brightness, press the P and buttons together from the main display. **BRI** appears and toggles with the current setting. Use the and buttons to adjust the LED backlight, and then press P to return to the normal operating mode.

2.5 - 7 Segment display characters

The 4 digit, 7 segment display is designed for large size and great visibility of numeric characters in normal operating mode. When navigating the setup menus, this table is a useful reference for the mixed-case alphabetic characters.

A	B	C	D	E	F	G
						

H	I	J	K	L	M	
						

N	O	P	Q	R	S	T
						

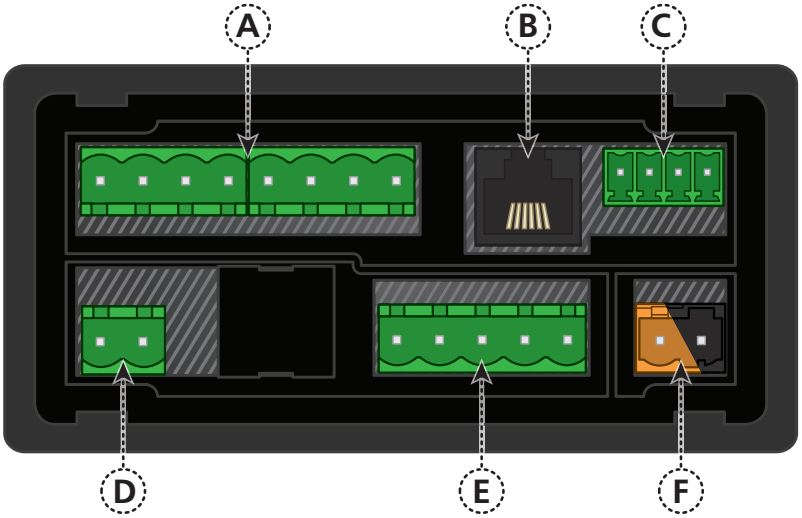
U	V	W		X	Y	Z
						

!	?	/
		

3 WIRING

BEFORE YOU BEGIN WIRING, ensure that the unit is switched off and the power supply is disconnected.

3.1 - Pinouts



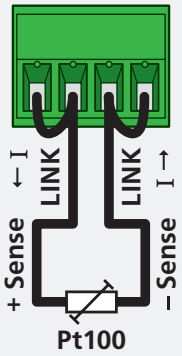
Key

A	Relay output (3.3)
B	Serial port (3.5)
C	Analog output (3.4)
D	Analog input (3.2)
E	Function pins (3.6)
F	Power supply HV/LV (3.7)

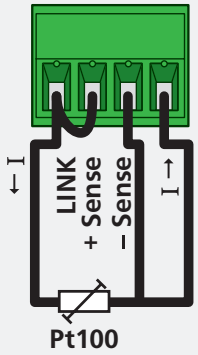
3.2 - Wire the analog input module

Wire your input as shown for RTD or thermocouple, depending on your controller model and sensor type. Note that the *LD-RTD* has a 4 pin terminal and *LD-TC* has a 2 pin terminal.

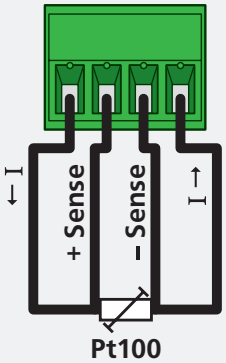
RTD 2-wire



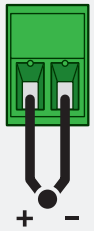
RTD 3-wire



RTD 4-wire



TC



J, K, R, S, T, B, N types

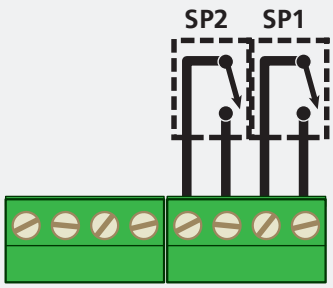
See 3.1D

3.3 - Wire the relay outputs (if installed)

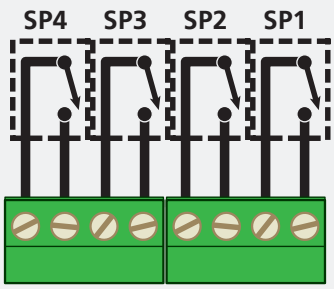
If your controller has relay outputs fitted, wire them as per the appropriate diagram below, depending on how many relay outputs you have installed. Relays can be programmed to operate within the total span range of the controller.

See 3.1A

-R2



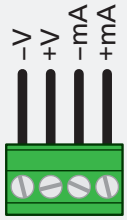
-R4



3.4 - Wire the analog output (if installed)

If your controller has analog output fitted, wire it as shown for either voltage (0-10V) or current (4-20mA).

See 3.1C

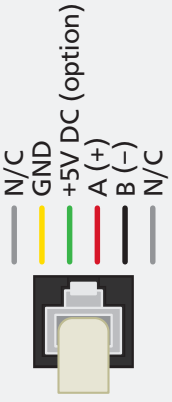


3.5 - Wire the serial port (if installed)

If your controller has serial port fitted, wire it as shown in the applicable diagram. (S2R: RS232, RJ11 terminal, S4S: RS485, screw terminal).

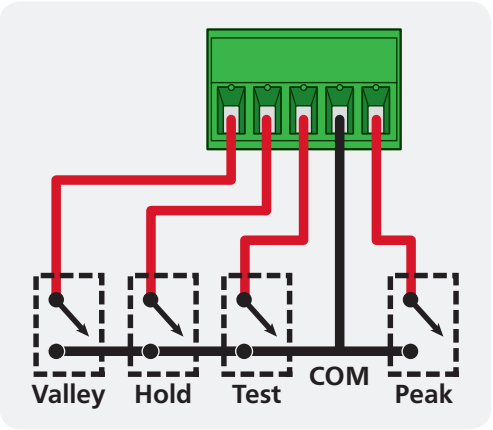
See 3.1B

-S2R



-S4S

3.6 - Wire the function pins



Connect external switches (if required) to enable a function to be executed when its switch is activated.

- **Valley:** Clears the valley reading
- **Hold**: Holds the current display value
- **Test:** Resets the unit
- **Peak**: Clears the peak reading

See 3.1E

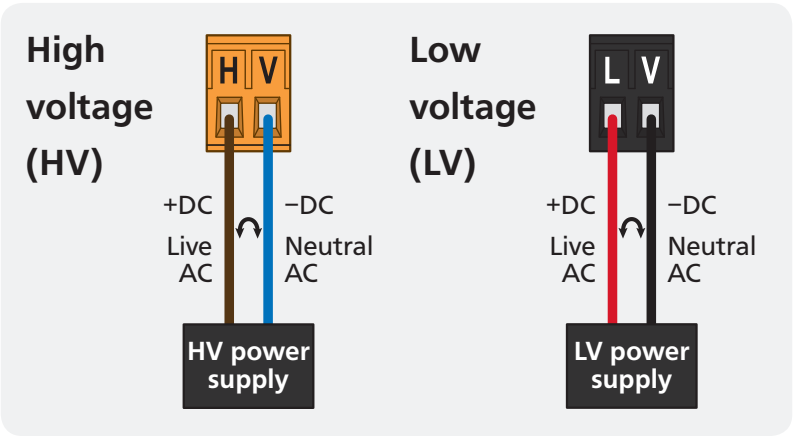
3.7 - Wire the power supply

DO NOT attempt to wire your controller while the power is on. NEVER connect your low voltage controller to mains power.

Wire your controller for low or high voltage power supply, as show in the diagrams below. Check the label on the unit against the colour of the connector:

- **Orange =**
  High voltage (85-265V AC, 95-370V DC)
- **Black =**
  Low voltage (15-48V AC, 10-72V DC)

See 3.1F



Once you have completed the wiring process it is safe to switch on your power supply. Ensure that your display is functioning before you proceed.

4 INPUT SETUP & CALIBRATION

4.1 - Enter F1 PIN number

A Enter the calibration mode by pressing the [F1] button.

_ _ _ ENTER F1 PIN NUMBER scrolls across the display and toggles with **0**. Use the [↑] and [↓] buttons to enter your security code (factory default 1). Then press [P]. If the correct PIN is entered, setup is started at 4.2.

If an incorrect PIN number is entered, **_ _ _ INCORRECT PIN NUMBER – ACCESS DENIED** scrolls across the display and it returns to normal operating mode.

You will have the opportunity to change your PIN number at the end of this section (4.7). If you have forgotten your PIN number, see Section 7.

4.2 - Input setup

A **_ _ _ INPUT SETUP** scrolls across the display and toggles with **SKIP**. Press [P] to skip to 4.3, or the [↑] button and then [P] to **ENTR** (enter) input setup.

B **_ _ _ MAINS FREQUENCY** scrolls across the display and toggles with the current selection. Use the [↑] and [↓] buttons to select **60HZ** or **50HZ**, and then press [P] to accept.

C **_ _ _ SENSOR TYPE** scrolls across the display and toggles with the currently selected sensor type. Use the [↑] and [↓] buttons to select your sensor type.

LD-RTD users, select from: **385**, **392**, **120** or **CN10**.
LD-TC users, select from: **TC J**, **TC K**, **TC R**, **TC S**, **TC T**, **TC B** or **TC N**.

When you have selected your sensor type, press [P] to accept and continue.

D *LD-RTD users, continue to 4.2E now.*
LD-TC users, please skip step 4.2E and proceed to 4.2F now.

E **_ _ _ ENTER NUMBER OF SENSOR WIRES** scrolls across the display and toggles with the currently selected number of RTD sensor wires. Use the ⬆ and ⬇ buttons to select: **2**, **3** or **4**, and then press P.

If you are setting up an LD-TC, please skip this step and proceed to 4.2F.

F **_ _ _ SELECT TEMPERATURE SCALE** scrolls across the display and toggles with the currently selected temperature scale. Use the ⬆ and ⬇ buttons to select either **DEGC** (°C) or **DEGF** (°F), and then press P.

G **_ _ _ DISPLAY UNITS** scrolls across the display and toggles with the currently selected option. Use the ⬆ and ⬇ buttons to select either **YES**, (to display either C or F in the least significant display digit) or **NO** (to hide the temperature scale units). Then press P.

When the units are displayed, the display range is reduced by a factor of 10.

H **_ _ _ DISPLAY RESOLUTION** scrolls across the display and toggles with the current resolution. Use the ⬆ and ⬇ buttons to select either **1DEG** or **0.1**, and then press P.

I **_ _ _ DISPLAY ROUNDING** scrolls across the display and toggles with the currently selected display rounding. Using the ⬆ and ⬇ buttons, select: **NONE**, **2**, **5** or **10**, and then press P.

*Rounding is quoted in display counts, not degrees, and is not influenced by decimal point position. For example, if your input signal is 5.3, the display will show: 5.3 (for rounding=**NONE**), 5.4 (for rounding=**2**), 5.5 (for rounding=**5**) or 5.0 (for rounding=**10**).*

4.3 - Calibration

When calibration is complete, you will be directed back to the operational display. To proceed to 4.4, you must select skip at 4.3A. LD-RTD units are factory calibrated for a 385 RTD, and LD-TC units are factory calibrated for a K type thermocouple.

A **_ _ _ CALIBRATE** scrolls across the display and toggles with **SKIP**. Press P to skip to 4.4, or the ⬆ button and then P to **ENTR** (enter) calibration mode.

This two point calibration procedure uses zero and span values to calculate the scale and offset. It requires known low and high input signals (or the use of a calibrator).

B **_ _ _ APPLY LOW TEMPERATURE – – – – ENTER LOW DISPLAY VALUE** scrolls across the display. The currently selected low display value appears. Apply the required low level temperature to the sensor, and wait a moment for the signal to stabilise. Then use the ⬆ and ⬇ buttons to set the low level display value, and press P to accept.

C **_ _ _ APPLY HIGH TEMPERATURE – – – – ENTER HIGH DISPLAY VALUE** scrolls across the display. The currently selected high display value appears. Apply the required high level temperature to the sensor, and wait a moment for the signal to stabilise. Then use the ⬆ and ⬇ buttons to set the high level display value, and press P to accept.

D If calibration was successful, you will be redirected to the operational display. (Note that to enter step 4.4, you must select **SKIP** at 4.3A.)

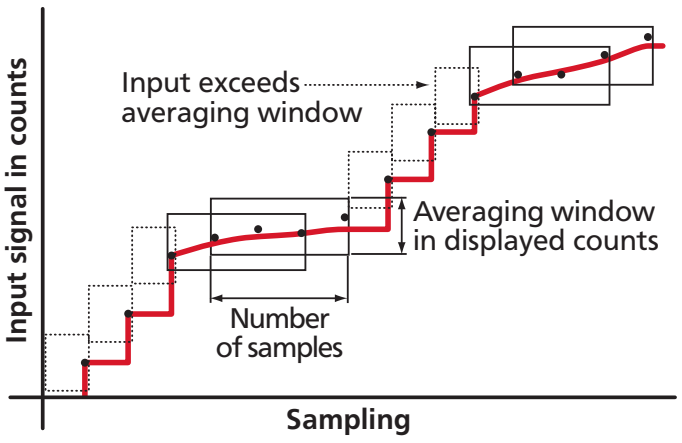
If calibration fails, **_ _ _ CALIBRATION FAILED** will scroll across the display, and then you will be directed back to normal operating mode.

The most likely cause of this error is that the controller has not detected any change in input signal during calibration. Check your signal and connections, and then repeat the calibration procedure.

4.4 - Averaging

Your controller has input signal averaging, optimising stable measurement.

If the change in input exceeds the averaging window value it will not average, ensuring fast response when there are large differences between readings.



A **_ _ _ AVERAGING PARAMETERS** scrolls across the display and toggles with **SKIP**. Press P to skip to 4.5, or the ⬆ button and then P to **ENTR** (enter) averaging setup.

B **_ _ _ AVE SAMPLES** scrolls across the display and toggles with the currently selected averaging. Using the ⬆ and ⬇ buttons, alter the number of input

samples that the controller will average, and then press [P].

Increasing the number of samples will stabilise measurement, but it will also slow down response rates.

C **_ _ _ AVE WINDOW** scrolls across the display and toggles with the currently selected averaging window value. Using the [⬆] and [⬇] buttons, alter the signal averaging window. Then press [P].

*If your input signal contains large noise spikes, you can increase the size of the averaging window to ensure that these are still averaged. However, increasing the window size too far will reduce the ability of the controller to respond quickly to real changes in input signal. Setting **AVE WINDOW** to **0** will give continuous averaging as per the selected averaging samples.*

4.5 - Analog output setup

A **_ _ _ ANALOG OUTPUT SETUP** scrolls across the display and toggles with **SKIP**. If your controller does not have analog output installed, (or you do not wish to configure your analog output now), please press [P] to skip to 4.6.

Otherwise, press the [⬆] button and then [P] to **ENTR** (enter) analog output setup.

B **_ _ _ LOW SCALE VALUE FOR ANALOG OUTPUT** scrolls across the display and toggles with the currently selected low scale value. Use the [⬆] and [⬇] buttons to enter your cal low position, and then press [P].

*This sets the display value for **CAL LOW** (as in 4.5E, below).*

C **_ _ _ HIGH SCALE VALUE FOR ANALOG OUTPUT** scrolls across the display and toggles with the currently selected high scale value. Use the [⬆] and [⬇] buttons to enter your cal high position, and then press [P].

*This sets the display value for **CAL HIGH** (as in 4.5F, below).*

D **_ _ _ CALIBRATE ANALOG OUTPUT?** scrolls across the display and toggles with **SKIP**. If you do not wish to calibrate your analog output then press [P] now to skip to 4.6.

To calibrate your analog output now, connect a mA or volt meter across the analog output connector (see 3.4). Then press the [⬆] button, followed by [P], to **ENTR** (enter) analog output calibration mode.

E **_ _ _ CAL LOW ANALOG OUTPUT** scrolls across the display and toggles with a calibration number displayed in internal units (mA or V). Using the ⬆ and ⬇ buttons, calibrate your low analog output as required, and then press P.

F **_ _ _ CAL HIGH ANALOG OUTPUT** scrolls across the display and toggles with a calibration number displayed in internal units (mA or V). Using the ⬆ and ⬇ buttons, calibrate your high analog output as required, and then press P.

4.6 - Serial setup

A **_ _ _ SERIAL SETUP** scrolls across the display and toggles with **SKIP**. If your controller does not have a serial port installed, (or you do not wish to configure your serial options now), please press P to skip to 4.7.

Otherwise, press the ⬆ button and then P to **ENTR** (enter) serial setup.

B **_ _ _ SERIAL MODE** scrolls across the display and toggles with the currently selected serial mode. Using the ⬆ and ⬇ buttons, choose either: **ASC** (custom ASCII), **MDB** (Modbus/RTU) or **RNGA** (Ranger A). Then press P.

See Appendix A for more information about the available serial modes.

C **_ _ _ BAUD RATE** scrolls across the display and toggles with the current selection. Use the ⬆ and ⬇ buttons to select one of: **300**, **600**, **1200**, **2400**, **4800**, **9600**, **19.2K** or **38.4K**. Then press P.

D **_ _ _ PARITY** scrolls across the display and toggles with the currently selected parity. Using the ⬆ and ⬇ buttons, select: **NONE**, **ODD** or **EVEN**, and then press P.

E **_ _ _ SERIAL ADDRESS** scrolls across the display and toggles with the currently selected serial address. Use the ⬆ and ⬇ buttons to alter the serial address, and then press P.

The serial address parameter is used to identify a particular device when it is used with other devices in a system. (It applies particularly to Modbus mode when used on an RS485 serial network.) The serial address of the controller must be set to match the serial address defined in the master device.

Refer to Appendix A for more information on serial modes and registers.

4.7 - Edit F1 PIN number

A **_ _ _ EDIT F1 PIN NUMBER** scrolls across the display and toggles with **SKIP**. Press [P] to skip and return to the operational display, or the [▲] button and then [P] to **ENTR** (enter) and change your PIN number.

B **_ _ _ ENTER NEW F1 PIN NUMBER** scrolls across the display and toggles with the current PIN (default 1). Using the [▲] and [▼] buttons, enter your new F1 PIN number. Then press [P] to exit to the operational display.

5 SETPOINT SETUP

The software in your controller will allow you to configure up to 4 setpoints, however full functionality is only supported by setpoints with relay output hardware installed.

(Setpoints with no corresponding relay output hardware may be used as simple LED indicators, if desired. In this case, features requiring relay output functionality will continue to appear in the setup menu, but will be ignored by the controller.)

5.1 - Enter F2 PIN number

A Enter setpoint setup mode by pressing and holding the F2 button for 3 seconds.

_ _ _ ENTER F2 PIN NUMBER scrolls across the display and toggles with **0**. Use the ⬆ and ⬇ buttons to enter your security code (factory default 1). Then press P. If the correct PIN is entered, setup is started at 5.2.

If an incorrect PIN number is entered, **_ _ _ INCORRECT PIN NUMBER – ACCESS DENIED** scrolls across the display and it returns to normal operating mode.

You will have the opportunity to change your PIN number at the end of this section (5.3). If you have forgotten your PIN number, see Section 7.

5.2 - Setpoint setup

A **_ _ _ EDIT SETPOINT** scrolls across the display and toggles with **SKIP**. The software in your controller will allow you to configure up to 4 setpoints, however full functionality is only supported by setpoints with relay output hardware installed.

Press P now to skip to 5.3, or use the ⬆ and ⬇ buttons to select a setpoint to edit, and then press P to enter setpoint setup.

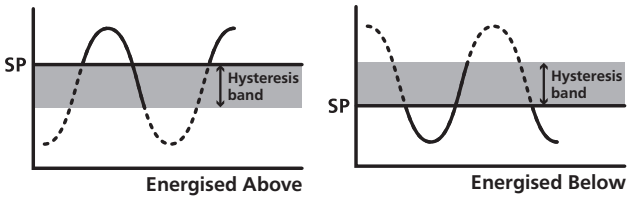
B **_ _ _ SP VALUE** scrolls across the display and toggles with the current value for the selected setpoint. Using the ⬆ and ⬇ buttons, adjust the display value at which the selected setpoint will activate, and then press P.

C **_ _ _ SP ACTIVATION** scrolls across the display and toggles with the current activation for the selected setpoint. Using the ⬆ and ⬇ buttons, select the relay activation to operate **ABVE** (above) or **BLW** (below) the setpoint value, and then press P.

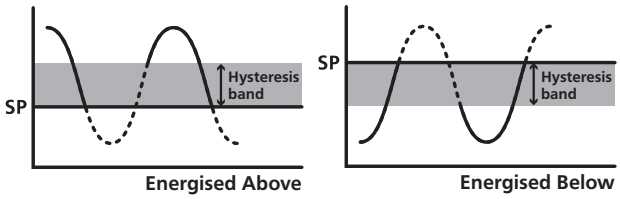
__ABVE__: Relay turns on above the setpoint value and off below it. __BLW__: Relay turns on below the setpoint value and off above it.

D **_ _ _ HYSTERESIS TYPE** scrolls across the display and toggles with the currently selected hysteresis type. Using the ⬆ and ⬇ buttons, select either **ALM** (alarm) or **CTRL** (control), and then press P.

__ALM__ - __SP VALUE__ controls setpoint activation point. __HYSTERESIS VALUE__ controls setpoint deactivation point.



__CTRL__ - __SP VALUE__ controls setpoint deactivation point. __HYSTERESIS VALUE__ controls setpoint reactivation point.



E **_ _ _ HYSTERESIS VALUE** scrolls across the display and toggles with the hysteresis value for the selected setpoint. Use the ⬆ and ⬇ buttons to adjust this value if required, and then press P.

The __HYSTERESIS VALUE__ defines the separation band between setpoint activation and deactivation, and will operate as per the __HYSTERESIS TYPE__ setting selected in 5.2D.

F **_ _ _ MAKE DELAY** scrolls across the display and toggles with the current delay value for the selected setpoint. Use the ⬆ and ⬇ buttons to adjust the delay value (in tenths of a second) as required, and then press P.

This value defines the time delay between setpoint activation, and when the relay turns on. The time is 1/10'th second resolution.

G **_ _ _ OPEN ACCESS TO SP VALUE** scrolls across the display and toggles with the current direct access permission setting for the selected setpoint. Use the ⬆ and ⬇ to select either **YES** or **NO**, and then press P.

When enabled, this option allows the selected setpoint's value to be edited directly after

pressing the F2 button, without needing to enter a PIN number or go through all of the other options. Each setpoint can individually have this option enabled or disabled. See Section 6.

H If you are currently editing **SP 1**, please skip step 5.2I and proceed to 5.2J now. If you are currently editing **SP 2-4**, continue to 5.2I now.

I **_ _ _ TRAIL SP 1** scrolls across the display and toggles with the current trailing setting for the selected setpoint. Use the ⬆ and ⬇ buttons to select **OFF** or **ON**, and press P.

*If you choose **ON**, the selected setpoint will track the setpoint value of **SP 1**, with the setpoint value of the tracking setpoint becoming an offset value.*

J **_ _ _ EDIT SETPOINT** scrolls across the display and toggles with **SKIP**. You are now back at 5.2A. To edit another setpoint, follow the instructions from 5.2A-J again. If you do not wish to edit another setpoint, press P now to skip to 5.3.

5.3 - Edit F2 PIN number

A **_ _ _ EDIT F2 PIN NUMBER** scrolls across the display and toggles with **SKIP**. Press P to skip and return to the operational display, or the ⬆ button and then P to **ENTR** (enter) and change your PIN number.

B **_ _ _ ENTER NEW F2 PIN NUMBER** scrolls across the display and toggles with the current PIN (default 1). Using the ⬆ and ⬇ buttons, enter your new F2 PIN number. Then press P to exit to the operational display.

6 SETPOINT DIRECT ACCESS

If none of the setpoints have their direct access option enabled then this feature will be disabled and the F2 button will not respond to a short button press. (See 5.2G.)

A Begin by pressing the F2 button for less than 3 seconds.

B The name of the first access-enabled setpoint will appear on the display and toggle with the current value for that setpoint. Using the ↑ and ↓ buttons, adjust the selected value. Then press P to accept and continue.

C The name of the next access-enabled setpoint will appear on the display and toggle with its setpoint value. Repeat step 6B. The direct access menu will proceed through all access-enabled setpoints in this fashion. Pressing P for the last enabled setpoint will exit and return to the operational display.

7 RESET PIN NUMBERS

If you have forgotten your PIN number(s), follow the procedure below to reset both the F1 and F2 PINs to their factory default of 1.

A Press ↑, ↓ and P at the same time. (This key combination can be difficult to execute and you may need several tries to get it right.)

B When successful, a factory identification text will scroll across the display, followed by **_ _ _ ALL PIN NUMBERS RESET TO 1**

C Reset the default PIN numbers if required by following the instructions in 4.7 (for the F1 menu) and 5.3 (for the F2 menu), entering '1' whenever you are prompted for your current PIN.

A APPENDIX A - SERIAL MODES

A.1 - Custom ASCII mode

Custom ASCII is a simple, custom protocol that allows connection to various PC configuration tools. ('Custom ASCII' differs from the 'Modbus (ASCII)' protocol used by some devices.) Custom ASCII command strings must be constructed in this order:

<Start> <Controller Address> <Read/Write Command> <Register Address> <Separator Character> <Data Value> <Message Terminator>

Start - Use '**S**' for the start character of a command string (not case sensitive). This must be the first character in the string.

Controller Address - Use an ASCII number from '**1**' to '**255**' for the controller address. If the character following the start character is not an ASCII number, then address '**0**' is assumed. All controllers respond to address '**0**'.

Read/Write Command - Use ASCII '**R**' for read, '**U**' for unformatted read, or '**W**' for write (not case sensitive). Any other character aborts the operation.

*In Custom ASCII mode, data is normally read as formatted data (which includes decimals and any text characters that may be selected to show units). However it is also possible to read unformatted data by using a '**U**' in the read command. There is no unformatted write command, as when writing to fixed point registers, any decimal point and text characters are ignored.*

Register Address - The register address for the read/write operation will be an ASCII number from '**1**' to '**65535**'. This character must be specified for a write command, but may be omitted for a read command, (in which case the controller will respond with the data value currently on the display).

Separator Character - The separator character can be either a space or a comma, and is used to separate the register address from the data value.

Data Value - Must be an ASCII number. The absolute limits for this number are **-1000000** to **1000000**, but please note that not all registers will accept this range.

Message Terminator - This is the last character, and must be either a '**$**' (dollar) or an '*****' (asterisk). Neither of these characters should be used elsewhere in the

message string. If '$' is used, a 50ms minimum delay is inserted before a reply is sent. If '*' is used, a 2ms minimum delay is inserted before a reply is sent.

Custom ASCII Read/Write Examples

Example	Description
SR$	Read display value from all controllers, 50ms delay.
S15R$	Read display value from controller address 15, 50ms delay.
S3U40*	Read unformatted data in channel 4 from controller address 3, 2ms delay.
S2W2 -10000$	Write -10000 to the display register of controller address 2, 50ms delay.
SWT CHAN_1$	Write ASCII text string Chan_1 to channel 1 text register, 50ms delay.

Controller Response - After the controller has completed a read or write instruction, it responds by sending a carriage return/line feed (CR/LF) back to the host. If the instruction was a read command, the CR/LF follows the last character in the ASCII string. If it was a write command, CR/LF is the only response sent back. The host must wait for this before sending further commands to the controller. If the controller encounters an error, it will respond with a null (0x00) CR/LF.

Custom ASCII Registers - *Active for models with relay output installed*

16 Bit Unsigned

Address	Function
1	Alarm status (Bit 0=SP1, Bit 1= SP2, Bit 2 =SP3, Bit 3=SP4 etc.)
65	Hysteresis SP1
66	Hysteresis SP2
67	Hysteresis SP3
68	Hysteresis SP4
71	Make delay SP1
72	Make delay SP2
73	Make delay SP3
74	Make delay SP4

32 Bit Signed

Address	Function
2	Temperature display
12	Peak
13	Valley
6	Setpoint 1
7	Setpoint 2
8	Setpoint 3
9	Setpoint 4
34	D/A scale low value
36	D/A scale high value

A.2 - Modbus (RTU) mode

Modbus (RTU) is an industry standard RTU slave mode that allows connection to a wide range of devices. Modbus registers are all holding registers, and should be accessed via function codes 3 and 6.

Register addresses are displayed in the Modicon™ 5-digit addressing format. I.e. Register 65=40065 (subtract 1 for direct addressing).

Modbus (RTU) Registers - *Active for models with relay output installed*

16 Bit Unsigned

Address	Function
40001	Alarm status (Bit 0=SP1, Bit 1= SP2, Bit 2 =SP3, Bit 3=SP4 etc.)
40065	Hysteresis SP1
40066	Hysteresis SP2
40067	Hysteresis SP3
40068	Hysteresis SP4
40071	Make delay SP1
40072	Make delay SP2
40073	Make delay SP3
40074	Make delay SP4

32 Bit Signed (2 x 16 Bit)

LSW	MSW	Function
40513	(40514)	Temperature display
40525	(40526)	Peak
40527	(40528)	Valley
40535	(40536)	Setpoint 1
40537	(40538)	Setpoint 2
40539	(40540)	Setpoint 3
40541	(40542)	Setpoint 4
40587	(40588)	D/A scale low value
40591	(40592)	D/A scale high value

A.3 - Ranger A mode

Ranger A is a continuous output, used to drive remote displays and other instruments in the Rinstrum™ range. (Ranger is a trade name belonging to Rinstrum Pty Ltd.) Ranger A output strings are constructed as shown:

<Start> <Sign> <Output Value> <Status> <End>

Start - STX character (ASCII 02)

Sign - Output value sign (space for + and dash for -)

Output Value - Seven character ASCII string containing the current output value and decimal point. (If there is no decimal point, then the first character is a space. Leading zero blanking applies.)

Status - Single character output value status. '**U**'=Under, '**O**'=Over, '**E**'=Error.

End - ETX character (ASCII 03)

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