PRO-CTR100/200

Counter/Rate Controller

E2180

This advanced controller is ideal for a wide variety of rate monitoring and batching applications.

It is available with either a single or dual display, and has a variety of advanced features, including: batching, batch count modification, user programmable input functions, setpoint tracking, set-point latching and startup inhibit.

Order Codes

PRO-CTR100 Single display

PRO-CTR200 Dual display

–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

Input

Sensor type Quadrature (x1, x2, x4), NPN, PNP or TTL
3 x counter inputs available

Input 0–24V DC, 0–30V AC

Power supply HV= 85–265V AC / 95–370V DC, or LV= 15–48V AC / 10–72V DC

Excitation Default: 24V DC (50mA max). Optional: 5V DC (200mA max)

Count modes Quad x1/x2/x4, A+B, A–B, A/B Independent, Up/Down, C Count, Reset to offset A B, Reset to offset and start A B

Counter input frequency

10kHz: Quad x4, A+B, A–B, A/B Ind, Up/Down, RSOFAB, RSOFST
20kHz: Quad x1, Quad x2
38kHz: C Count

Rate input frequency 20kHz max

Minimum pulse width Must be > 5µs

Sampling rate Counter: 10msec
Rate: 100msec

Rate resolution 0.01Hz

Rate accuracy 0.005%

Rate temp. drift Typically 2ppm/°C

Relay Output *OPTIONAL*

Number of relay outputs None, 2 or 4

Relay output type 5A form A (3A 240V AC max or 3A 30V DC max)

Analog Output *OPTIONAL*

Number of analog outputs None or 1

Analog output type Isolated 16 bit 4–20mA/0–10V

Comm Port *OPTIONAL*

Number of comm ports None or 1

Comm port options
S2R= Isolated RS232, RJ terminal, or
S4S= Isolated RS485, screw terminal

Serial output Custom ASCII, Modbus RTU slave or Ranger A

Data rate 1200–115k2 baud

Parity Odd, even or none

Programming

Front panel buttons Up, Down, P (Prog/Enter), plus 2 Menu buttons (F)

Security Input and setpoint setups are independently accessible and PIN protected

Display

Display type 14 segment alphanumeric LED display, 5 buttons

LED indicators 6 setpoint LED's

PRO-CTR100 1 x 6 digits 13mm (0.5")

PRO-CTR200 2 x 6 digits 10mm (0.4")

Display range 0.1 to 99999.9

Construction

Casing Panel mount case

Ingress protection rating IP65 dust/ splash proof (face only)

Dimensions (H x W x D)
48 x 96 x 120mm (1.89 x 3.78 x 4.72")

Panel cutout 45 x 92mm (1.77 x 3.62")

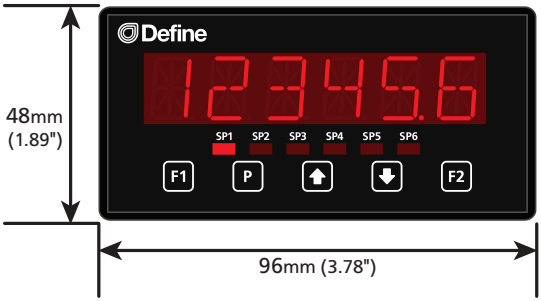
2 DISPLAY & FRONT PANEL

2.1 - Display

Two display types are available for the PRO–CTR controller. Both feature 14 segment alphanumeric display characters, 6 indicator LEDs and 5 buttons:

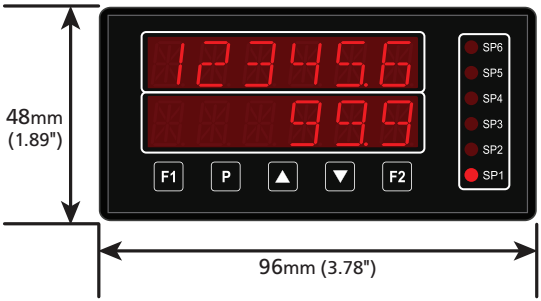
PRO-CTR100

- 1 x 6 digits 13mm (0.5")
- Customisable display source (see 8.4B)
- During setup, the text prompt toggles with selectable options/values



PRO-CTR200

- 2 x 6 digits 10mm (0.4")
- Customisable display source for both rows (see 8.4B–D)
- During setup, the top row displays selectable options/ values, and the bottom row displays the text prompt



2.2 - Front panel

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

F1 This button is used to access the **Input Setup & Calibration** menu (Section 8).

P This button is typically used to save your settings and advance to the next step in the setup process. A custom function can also be programmed (see 8.5B).

⬆ This button is typically used to scroll through options or increase values in the setup menu. Pressing this button from the main display will allow you to view/reset the *Peak* value, and view the Rate and Primary Counter values (see 2.3).

⬇ This button is typically used to scroll through options or decrease values in the setup menu. Pressing this button from the main display will allow you to view/reset the *Valley* value, and view the B and C Counter values (see 2.3).

F2 This button is used to access the **Setpoint Setup** menu (Section 9) and the **Setpoint Direct Access** menu (Section 10).

2.3 - Up and down button shortcuts

Pressing the ⬆ and ⬇ buttons from the main operational display allows instant access to a number of values held in the controller's memory. These variables will appear in the order shown in the table below, and will cycle continuously at each press of the ⬆ or ⬇ button. Press P at any time to return to normal operating mode.

Up and down button shortcuts

⬆	**PEAK**	Maximum measured *rate value* since the instrument was turned on/reset
	PRMCNT	Current value of primary counter
	RATE	Current rate value
⬇	**VALLEY**	Minimum measured *rate value* since the instrument was turned on/reset
	B CNT	Current value of B counter
	C CNT	Current value of C counter

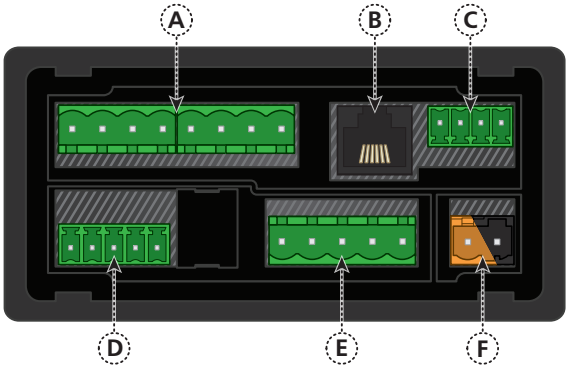
PEAK and **VALLEY** may be reset to zero by pressing the ⬆ and ⬇ buttons **at the same time** while the variable is being displayed.

2.4 - Display brightness

To adjust the display brightness, press the [P] and [⬆] buttons together from the main display. **BRI** appears on the display with the current brightness setting. Use the [⬆] and [⬇] buttons to adjust the LED backlight, and then press [P] to finish.

3 WIRING

3.1 - Pinouts



Key

3.1A	**Relay Output** (See 3.3)
3.1B	**Serial Port** (See 3.5)
3.1C	**Analog Output** (See 3.4)
3.1D	**Analog Input** (See 3.2)
3.1E	**Function Pins** (See 3.6)
3.1F	**Power Supply HV/LV** (See 3.7)

3.2 - Wire the analog input module

See 3.1D

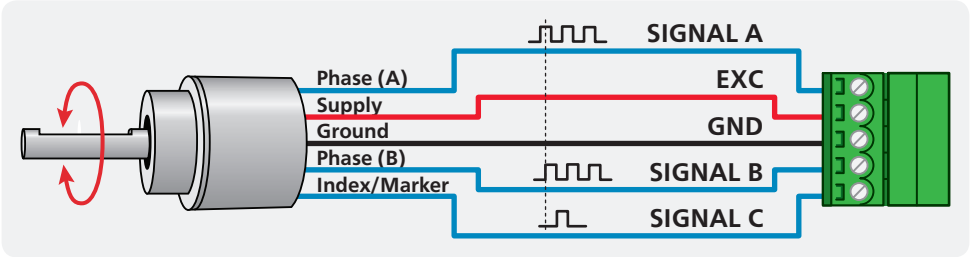
⚠ IMPORTANT:

The analog input board for the PRO–CTR has adjustable headers for *Sensor Type*, *Noise Filtering*, and *Excitation Voltage*. Unless you specified otherwise when you ordered your PRO–CTR, the headers will be set to:

- Sensor Type = NPN (for all counters)
- Noise Filtering = Off (20kHz)
- Excitation Voltage = 24V

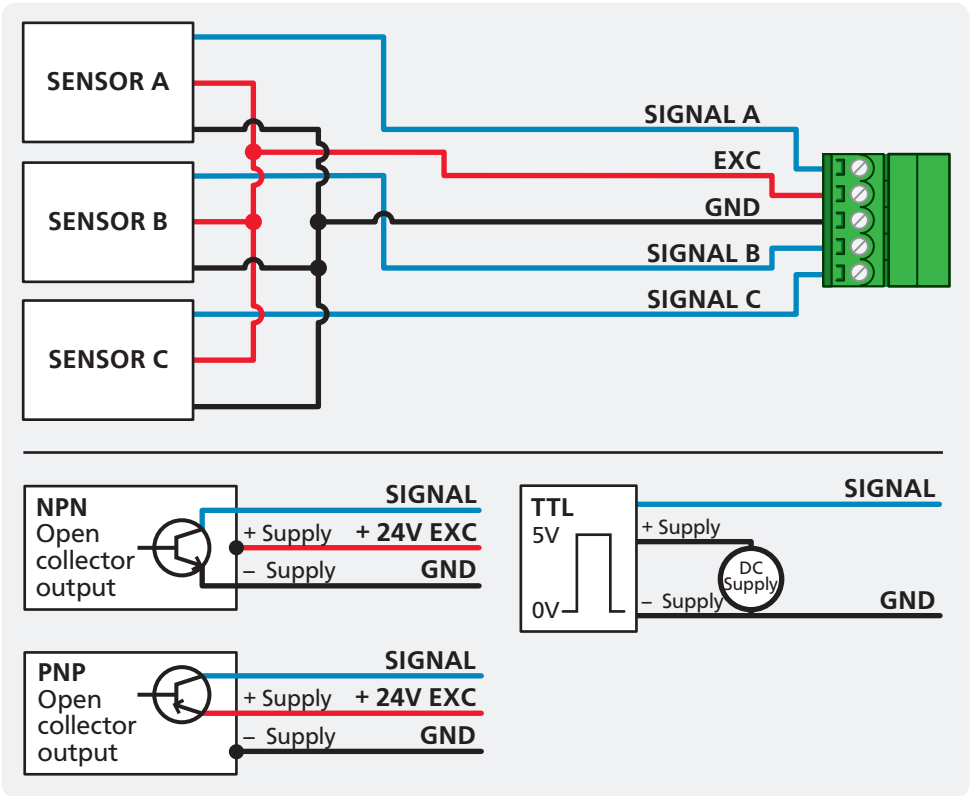
If you need to change these settings, please follow the instructions in Section 4 BEFORE proceeding to wiring your sensor(s).

Quadrature encoder (speed & direction)



Non-quadrature sensor connections

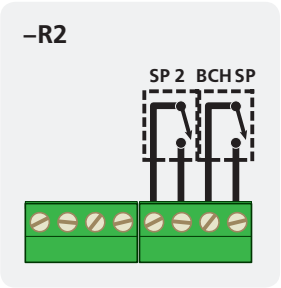
The following diagram shows how multiple sensors can be connected to your input module. Any combination of NPN, TTL and PNP may be used for sensors A, B and C.

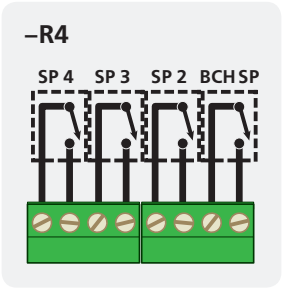


3.3 - Wire the relay outputs (if installed)

See 3.1A

If your controller has relay outputs fitted, wire them as shown below. Relays can be programmed to operate within the total span range of the controller. See Section 9 to configure your setpoints.

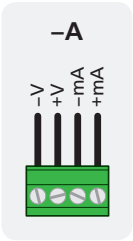




3.4 - Wire the analog output (if installed)

See 3.1C

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

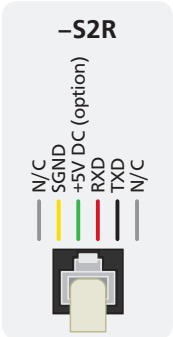


3.5 - Wire the serial port (if installed)

See 3.1B

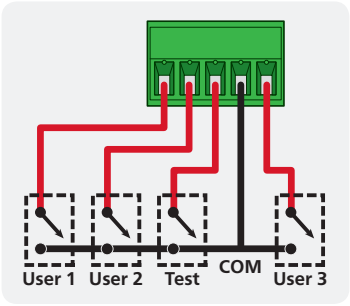
If your controller has serial port fitted, wire it as shown in the applicable diagram.

- S2R= RS232, RJ11 terminal
- S4S= RS485, screw terminal



3.6 - Wire the function pins

See 3.1E



Connect external switches to enable a function to be executed when its switch is activated.

- **User 1–3:** Activating one of these function pins will execute its user-defined function (as specified in 8.5C–E)
- **Test:** Activating this pin resets the unit

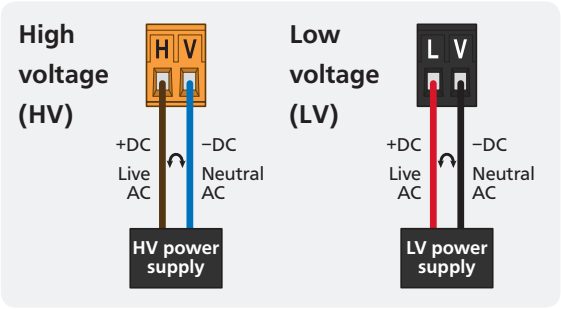
3.7 - Wire the power supply

See 3.1F

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 shown 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)



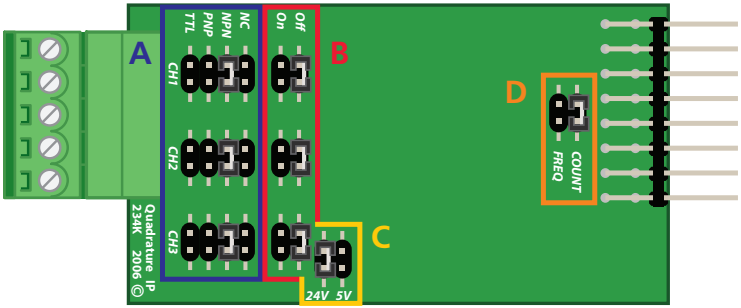
Once you have completed the wiring process it is safe to switch on your power supply. Ensure that your display is functioning before you proceed.

4 INPUT HEADER ADJUSTMENT

Define Instruments recommends that you specify your sensor type(s) when you place your order, to avoid unnecessary removal of the input module.

4.1 - Input header settings

The analog input board for the PRO–CTR has adjustable headers for Sensor Type (A), Noise Filtering (B) and Excitation Voltage (C). Refer to the tables below to determine whether the default header positions (shown in black) are suitable for your application. If required, follow the instructions in 4.2 to adjust the header positions.



Sensor Type (A)

CH1= Primary Ctr, CH2= B Ctr, CH3= C Ctr

NC	Not Connected
NPN	NPN Sensor (Sink)
PNP	PNP Sensor (Source)
TTL	TTL Sensor

Excitation Voltage (C)

24V	Standard setting
5V	May apply to some encoders

Noise Filtering (B)

CH1= Primary Ctr, CH2= B Ctr, CH3= C Ctr

Off	20kHz, for high-speed counting
On	1kHz low pass filter, for a noisy signal or mechanical contact

Mode Header (D) - **Do not adjust!**

COUNT	Always use this setting
FREQ	Not used for PRO–CTR

4.2 - How to remove the input module

A If the meter is already installed, remove it from the panel, and unplug all plugs from the back of the unit.

B Using a small screwdriver or similar implement, press downward into one of the slots at the rear of the case. This will disengage one of the tabs which holds the back plate on, allowing it to be gently levered away at one corner.

C Holding the loosened corner open with one hand, disengage the lever on the opposite slot (Fig 1).

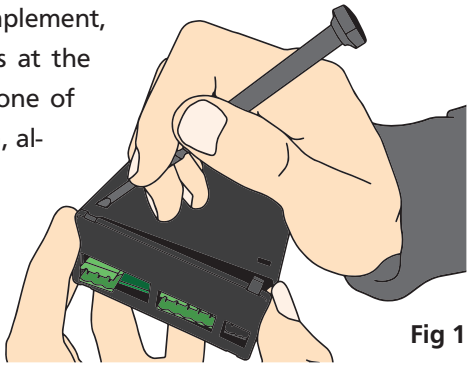


Fig 1

D You should now be able to remove the back plate. If it does not unclip easily, you may need to disengage the two remaining tabs by repeating steps 4.2B–C on the other side of the meter.

E Slide the analog input module out of the meter case (Fig 2). (See 3.1D to identify the input module.)

F Position the headers on the input module as required for your sensor type, referring to 4.1.

G Slide the input module back into the meter case.

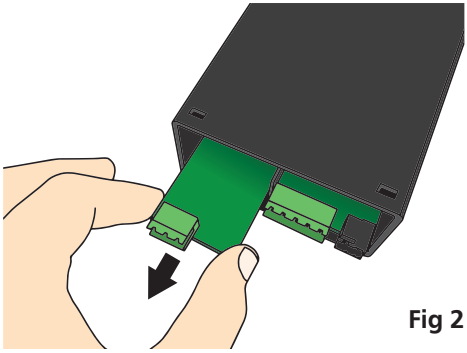


Fig 2

Make sure that it is sitting in the tracks on the left and right. Press firmly until the input module is fully inserted and sits flush with the other boards that are visible from the back of the meter.

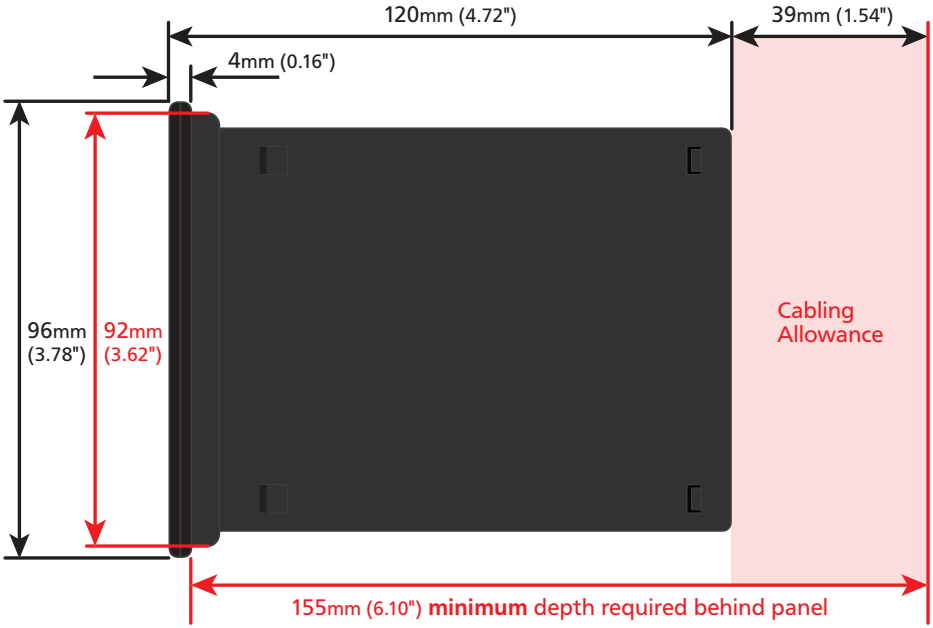
H Replace the back plate.

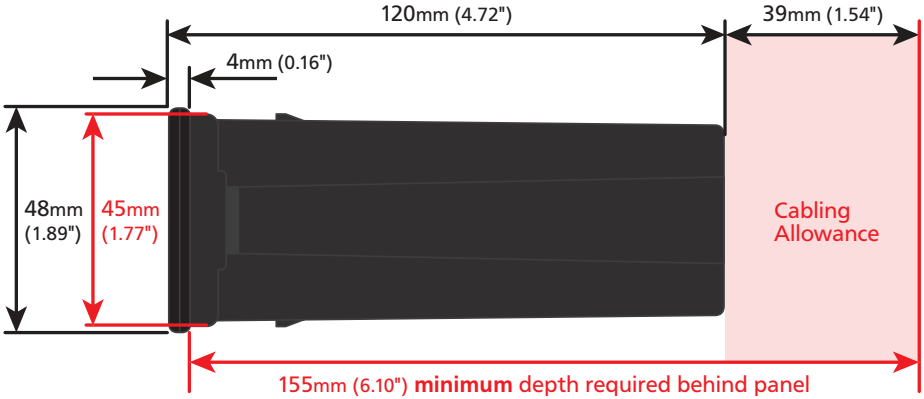
Begin by inserting the two lower tabs into the slots, and then position the upper tabs so that they will not catch on the top lip of the meter case. Apply firm pressure until the back plate clicks into place.

I Reconnect the plugs and return the meter to the panel installation.

5 DIMENSIONS & INSTALLATION

5.1 - Case dimensions

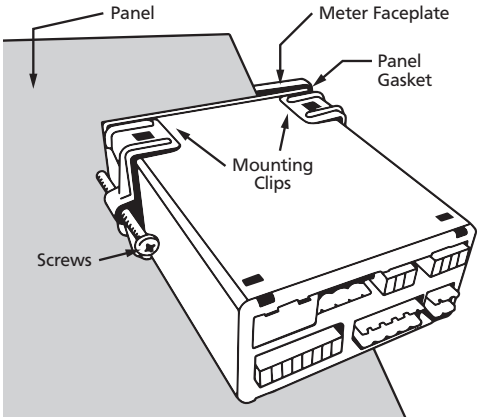




5.2 - Installation instructions

A Prepare the **Panel Cutout** to 92 x 45mm ±.5 (3.62 x 1.77" ±.02), as shown below.
Allow at least 155mm (6.10") depth behind the panel to accommodate the meter body, protruding connectors and cabling.

B Remove the **Mounting Clips** from the meter back.

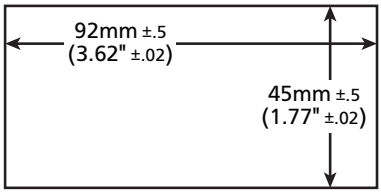


C Slide the **Panel Gasket** over the rear of the unit to the back of the **Meter Faceplate**.

D From the front of the panel, insert the meter into the P**anel Cutout**. Holding the unit in place, engage the **Mounting Clips** so that the tabs snap into place over the notches on the case.

E To achieve a proper seal, tighten the **Screws** evenly until the unit sits firmly against the panel. Do not over-tighten the screws.

Panel Cutout

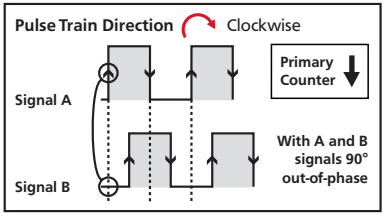


6 COUNT MODES

6.1 - Quad x1

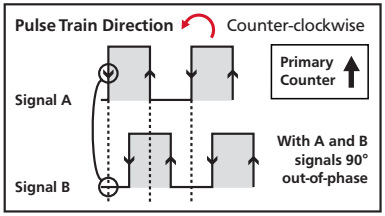
Example: Shaft Encoder

This is the most commonly used counter function. Depending on the direction of rotation, the A signal either leads or lags the B signal.



Primary counter **decrements**:

- On a **rising** edge A signal when B is **low**



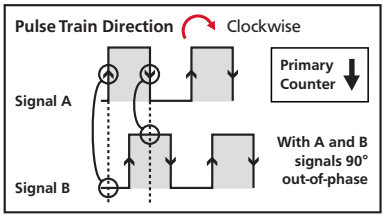
Primary counter **increments**:

- On a **falling** edge A signal when B is **low**.

6.2 - Quad x2

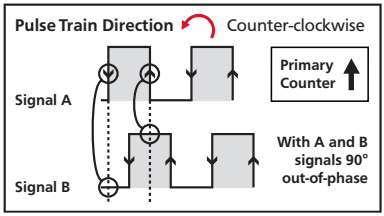
Example: Shaft Encoder

In this mode, the angular/linear resolution of the x1 mode is increased by 2. Depending on the direction of rotation, the A signal leads or lags the B signal.



Primary counter **decrements**:

- On a **rising** edge A signal when B is **low**
- On a **falling** edge A signal when B is **high**



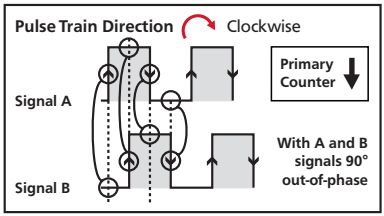
Primary counter **increments**:

- On a **rising** edge A signal when B is **high**
- On a **falling** edge A signal when B is **low**

6.3 - Quad x4

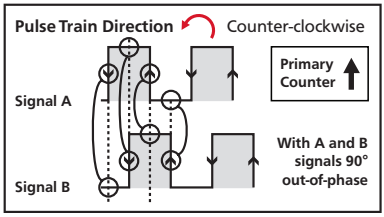
Example: Shaft Encoder

In this mode, the angular/linear resolution of the x1 mode is increased by 4. Depending on the direction of rotation, the A signal leads or lags the B signal.



Primary counter **decrements**:

- On a **rising** edge A signal when B is **low**
- On a **rising** edge B signal when A is **high**
- On a **falling** edge A signal when B is **high**
- On a **falling** edge B signal when A is **low**

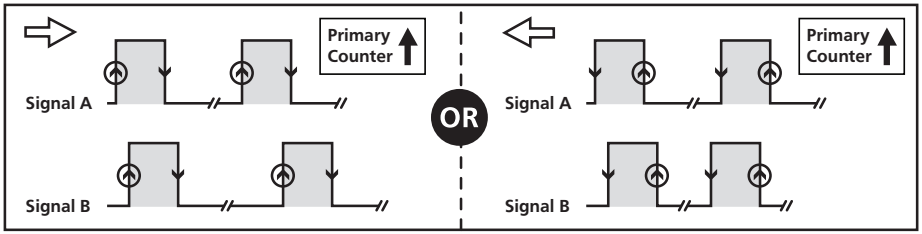


Primary counter **increments**:

- On a **rising** edge A signal when B is **high**
- On a **rising** edge B signal when A is **low**
- On a **falling** edge A signal when B is **low**
- On a **falling** edge B signal when A is **high**

6.4 - A+B

In this mode there is no fixed relationship between signals A and B.

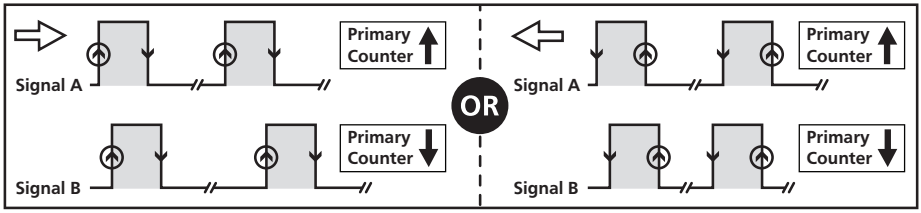


Primary counter **increments**:

- On a **rising** edge A signal
- On a **rising** edge B signal

6.5 - A–B

In this mode the A and B signals are linked in a phase relationship. Signal A increments the primary counter on every rising edge, while signal B decrements the primary counter on every rising edge.



Primary counter **increments**:

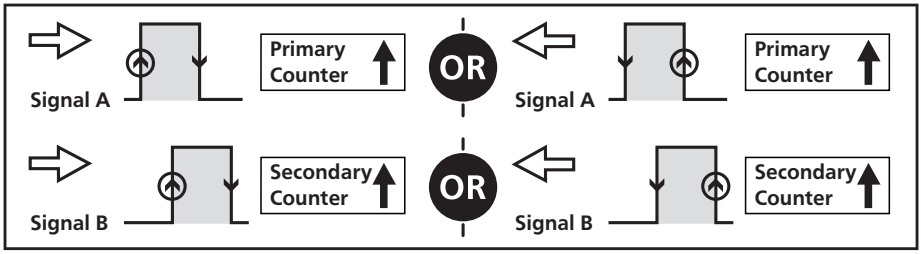
- On a **rising** edge A signal

Primary counter **decrements**:

- On a **rising** edge B signal

6.6 - A&B Independent

In this mode there is no fixed relationship between signals A and B. Signal A increments the primary counter on every rising edge, and signal B increments the secondary counter on every rising edge.



Primary counter **increments**:

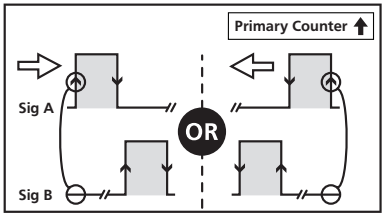
- On a **rising** edge A signal

Secondary counter **increments**:

- On a **rising** edge B signal

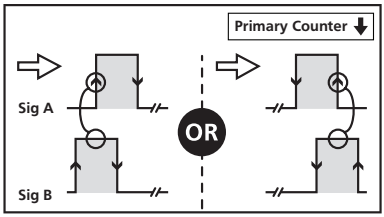
6.7 - Up/Down

In this mode the A and B signals are linked in a phase relationship. Signal A increments the primary counter on every rising edge when signal B is low. Signal A also decrements the primary counter on every rising edge when signal B is high.



Primary counter **increments**:

- On a **rising** edge A signal when B is **low**

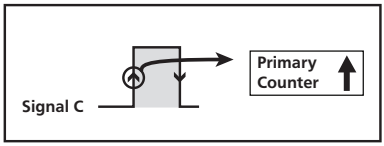


Primary counter **decrements**:

- On a **rising** edge A signal when B is **high**

6.8 - Count

This mode is particularly useful for multi-input systems.

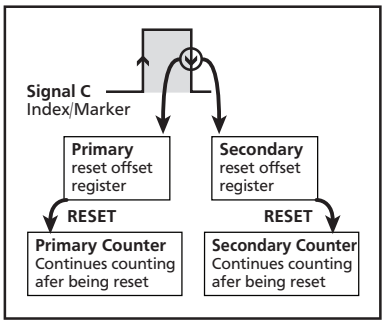


Primary counter **increments**:

- On a **rising** edge C signal only

6.9 - RSOFAB - Reset to offset A, B mode

In this mode the **primary** and **secondary** counters are reset to the values stored in the meter's reset offset registers, and they continue counting after being reset. This is useful for setting a position to a known reference position.

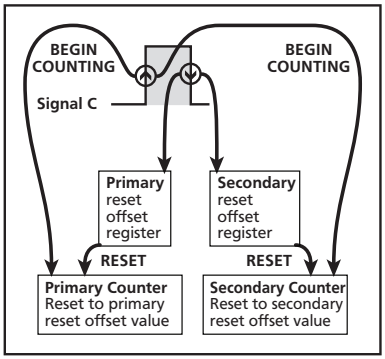


On a **falling** edge C signal:

- **Primary** counter is reset to the value stored in **primary reset offset register**
- **Secondary** counter is reset to the value stored in **secondary reset offset register**
- **Both counters** continue to count after being reset

6.10 - RSOFST - Reset to offset and start A, B mode

In this mode the **primary** and **secondary** counters are reset to the values stored in the meter's reset offset registers, and they continue counting after being reset.



On a **rising** edge C signal:

- **Both counters** begin counting

On a **falling** edge C signal:

- **Primary** counter is reset to the value stored in **primary reset offset register**
- **Secondary** counter is reset to the value stored in **secondary reset offset register**
- **Both counters** continue to count after being reset

7 FEATURES

7.1 - Batching feature

The PRO–CTR has a *Batching* function, which is used to maintain the total count, as well as the current *Batch Value*. The *Batch Value* is calculated using the following formula:

Batch Value = Primary Count – Batch Tare

The *Batch Tare* value is reset to the *Primary Count* value via the setpoint reset function **RST BT**, which can be executed by setpoint logic (see 9.2M) or manually by activating an appropriately configured user input pin (see 3.6 & 8.5). (*Batch Tare* is a hidden register used only for this calculation.)

The controller also includes a *Batch Counter* function associated with **SP 1**. The 'Batch Count Modifier' value (see 9.2P) is added to the *Batch Count* register each time **SP 1** activates, allowing the user to count how many completed batches have been processed.

8 INPUT SETUP & CALIBRATION

Setup menu display note:

If you are using a single display (PRO-CTR100), the menu title or text prompt will scroll across the display, and toggle with the currently selected option. If you are using a dual display (PRO-CTR200), the menu title or text prompt will scroll across the bottom row, and the currently selected option will appear in the top row.

8.1 - Enter CAL PIN number

A Enter the calibration mode by pressing the F1 button.

_ _ _ ENTER CAL PIN NUMBER scrolls across the display, and **0** appears. 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 8.2.

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 (8.8). If you have forgotten your PIN number, see Section 11.

8.2 - Counter setup

There are 3 counter inputs available on the input module:

- Count A input (drives the primary counter)
- Count B input
- Count C input

When the primary counter mode is set to **AB IND** (A & B independent) the A input drives the primary counter and the B input drives the secondary counter. In other count modes, the A and B inputs are both used to drive the primary counter, so the B counter options are not available. **IT IS THEREFORE ADVISABLE TO SET UP THE PRIMARY COUNT MODE FIRST.**

A **_ _ _ COUNTER SETUP** scrolls across the display, and **SKIP** appears. Press [P] to skip to 8.3, or use the [▲] and [▼] buttons to select: **PRM CT** (primary counter), **B INPT** (B input) or **C INPT** (C input), and then press [P] to enter setup for the selected counter.

- ➡ If you selected **PRM CT** or **C INPT**, continue to 8.2B now.
- ➡ If you selected **B INPT**, skip to 8.2C now.

*Note that the **B INPT** counter cannot be independently configured unless the count mode for **PRM CT** is set to **AB IND** (see 8.2B). If you attempt to enter the **B INPT** counter setup when the above condition has not been met, an error message will scroll across the display, and you will not be allowed to continue.*

B **_ _ _ COUNT MODE** scrolls across the display, and the current count mode appears. Use the [▲] and [▼] buttons to select an option from the list. (Options will vary depending on which counter you are editing.) When you have made a selection, press [P] to accept and continue.

- ➡ If you are currently editing **PRM CT**, the menu options will be: **QUADX1**, **QUADX2**, **QUADX4**, **A+B**, **A–B**, **AB IND** (AB independent) or **UP/DN** (up/down).
- ➡ If you are currently editing **C INPT**, the menu options will be: **COUNT**, **RSOFAB** (reset to offset A, B mode) or **RSOFST** (reset to offset and start A, B mode).

For more information on count modes, please see Section 6.

C **_ _ _ DECIMAL POINT POSITION** scrolls across the display, and the current decimal point position appears. Use the [▲] and [▼] buttons to select **NO DP**, **0.1**, **0.12**, **0.123**, **0.1234** or **0.12345**, and then press [P] to accept and continue.

D **_ _ _ PULSES PER UNIT OF MEASUREMENT** scrolls across the display, and the current number of pulses appears. Adjust this value using the [▲] and [▼] buttons, and then press [P].

For example, if an encoder outputs 1,500 pulses/metre, set this value to 1500.

E **_ _ _ ENTER DISPLAY VALUE FOR X PULSES** scrolls across, and the current display value appears. ('X' is the number of pulses selected in 8.2D.) Adjust this value using the [▲] and [▼] buttons, and then press [P].

For example, if you selected 1,500 pulses in 8.2D, and 1,500 pulses = 1 metre, then enter 1

here. (Enter this value with reference to your decimal point position - the controller will automatically calculate the correct scale factor for you.)

F **_ _ _ RESET AT POWER UP** scrolls across the display, and the current setting appears. Use the ⬆ and ⬇ buttons to select: **NO** (count value will be retained at power up), **ZERO** (count value will be set to zero at power up), or **LD VAL** (count value will be set to a user defined load value at power up - see 8.2G). Then press P to accept and continue.

G **_ _ _ LOAD VALUE** scrolls across the display, and the load value appears. (This value will loaded into the selected counter at power up when **LD VAL** is selected in 8.2F.) Use the ⬆ and ⬇ buttons to adjust your load value as desired, and then press P.

This value is also used for the C input reset functions RSOFAB (see 6.9) and RSOFST (see 6.10).

H **_ _ _ COUNTER SETUP** scrolls across the display, and **SKIP** appears. You are now back at 8.2A. To set up another input channel, follow the instructions from 8.2A–H again. If you do not wish to set up another input channel, press P now to skip to 8.3.

8.3 - Rate display setup

A **_ _ _ RATE DISPLAY SETUP** scrolls across the display, and **SKIP** appears. Press P to skip to 8.4, or the ⬆ button and then P to **ENTER**.

The rate value is taken from the primary count input (signal A).

B **_ _ _ DECIMAL POINT POSITION** scrolls across the display, and the current selection appears. Use the ⬆ and ⬇ buttons to select **NO DP**, **0.1**, **0.12**, **0.123**, **0.1234** or **0.12345**, and then press P.

C **_ _ _ ROUNDING** scrolls across the display, and the currently selected rounding setting appears. Using the ⬆ and ⬇ buttons, select either: **NONE**, **2**, **5** or **10**. Then press P.

Rounding is quoted in display counts 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).

D **_ _ _ TIME PERIOD FOR RATE DISPLAY** scrolls across the display, and the current selection appears. Use the ⬆ and ⬇ buttons to select: **SECS**, **MINS** or **HOURS**, and then press P.

This parameter allows you to view the effective rate over different time periods. For example, if the measurement units are metres, then rate can be viewed in m/sec, m/min or m/hr.

The controller will automatically calculate the required scaling factors based on the input channel setup, so you must complete 'Counter Setup' (8.2) first.

E **_ _ _ RATE MULTIPLIER** scrolls across the display, and the current multiplication factor appears. This option adds a scale factor, to display the rate in the required units. Use the ⬆ and ⬇ buttons to select: **X0.0001**, **X0.001**, **X0.01**, **X0.1**, **X1**, **X10**, **X100** or **X1000**. (To disable this feature select '**X1**'.) Then press P.

F **_ _ _ LOW CUT** scrolls across the display, and the current low cut value appears. When the rate drops below the low cut value, it displays as zero. Use the ⬆ and ⬇ buttons to adjust this value (or set the low cut value to '**0**' to disable this feature). Then press P.

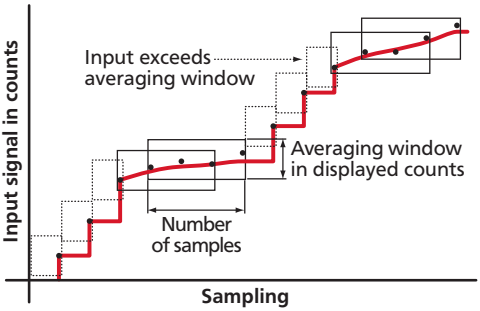
G **_ _ _ DISPLAY ZERO TIME** scrolls across the display, and the current display zero time appears. This controls how quickly the rate display changes to zero. Use the ⬆ and ⬇ buttons to select either: **100SEC** (for slow inputs), or **0.5SEC** (for faster inputs with more than 2 pulses/second). Then press P.

H **_ _ _ AVE SAMPLES** scrolls across the display, and the current averaging appears. Using the ⬆ and ⬇ buttons, alter the number of rate samples that the controller will average, and then press P.

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.

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



I **_ _ _ AVE WINDOW** scrolls across the display, and the currently selected averaging window value appears. Using the ⬆ and ⬇ buttons, alter the rate signal averaging window, and then press P.

If your input signal contains large noise spikes, then you can increase the size the of averaging window to ensure that these pulses are still averaged. However, increasing the averaging window too far will reduce the ability of the controller to respond quickly to real changes in input signal.

Setting the averaging window to zero will turn off the window mode and give continuous averaging as per the selected averaging samples.

8.4 - Display setup

A **_ _ _ DISPLAY SETUP** scrolls across the display, and **SKIP** appears. Press P to skip to 8.5, or the ⬆ button and then P to **ENTER**.

B **_ _ _ LINE 1 DISPLAY SOURCE** scrolls across the display, and the currently selected line 1 display source appears. (Line 1 is the main display for PRO-CTR100, and the top row for PRO-CTR200). Using the ⬆ and ⬇ buttons, select: **NONE**, **PRMCTR**, **B CNTR**, **C CNTR**, **RATE**, **BATCH** or **BCHCNT**. Then press P.

See 7.1 for more information on the batching feature.

C The step that you proceed to now will depend on whether you have a single or dual display PRO–CTR model:

- ➡ If your PRO–CTR has a single display (PRO-CTR100), skip the rest of this section and proceed to 8.5 now.
- ➡ If your PRO–CTR has a dual display (PRO-CTR200), continue to 8.4D now.

D **_ _ _ LINE 2 DISPLAY SOURCE** scrolls across the bottom row and the currently selected line 2 display source appears in the top row. (Line 2 is the bottom row display for PRO-CTR200). Using the ⬆ and ⬇ buttons, select: **NONE**, **PRMCTR**, **B CNTR**, **C CNTR**, **RATE**, **BATCH** or **BCHCNT**. Then press P.

See 7.1 for more information on the batching feature.

8.5 - User programmable input functions

This section allows you to assign a custom function to the front panel [P] button, or the rear user input pins (see 3.6). The following functions are available:

User programmable input functions

NONE	No action
RS PRM	Reset primary counter to load value (8.2G)
RST B	Reset B counter to load value (8.2G)
RST C	Reset C counter to load value (8.2G)
RST BT	Reset batch value to zero
RSTBTC	Reset batch counter value to zero
UNLTCH	Unlatch all setpoints*
UNLT 1	Unlatch **SP 1***
UNLT 2	Unlatch **SP 2***
UNLT 3	Unlatch **SP 3***
UNLT 4	Unlatch **SP 4***

** When a setpoint is configured for latching mode it will activate as normal and remain activated until it is unlatched, either by setpoint logic or manually (as specified in this section). Refer to section 9.2F to configure setpoint latching.*

A **_ _ _ USER PROGRAMMABLE INPUT FUNCTIONS** scrolls across the display, and **SKIP** appears. Press [P] to skip to 8.6, or the [⬆] button and then [P] to **ENTER** input functions setup.

B **_ _ _ PROGRAM BUTTON** scrolls across the display, and the current function appears. This specifies the operation to be executed when the [P] button is pressed (for more than 2 seconds) from the main display. Referring to the table above, use the [⬆] and [⬇] buttons to select a function, and then press [P].

C **_ _ _ USER INPUT 1** scrolls across the display, and the current function appears. This specifies the operation to be executed when the User 1 pin is activated from the rear of the unit (see 3.6). Referring to the table above, use the [⬆] and [⬇] buttons to select a function, and then press [P].

D **_ _ _ USER INPUT 2** scrolls across the display, and the current function appears. This specifies the operation to be executed when the User 2 pin is activated from the rear of the unit (see 3.6). Referring to the table above, use the [⬆] and [⬇] buttons to select a function, and then press [P].

E **_ _ _ USER INPUT 3** scrolls across the display, and the current function appears. This specifies the operation to be executed when the User 3 pin is activated from the rear of the unit (see 3.6). Referring to the table above, use the ⬆ and ⬇ buttons to select a function, and then press P.

8.6 - Analog output setup

N.B. All new units are calibrated before shipping. Recalibration is **only** *necessary if settings are wiped or the unit's accuracy requires verification after a long period of use. e.g. 1 year.*

A **_ _ _ ANALOG OUTPUT SETUP** scrolls across the display, and **SKIP** appears. If your controller does not have analog output installed, (or you do not wish to configure your analog output now), press P to skip to 8.7.

Otherwise, press the ⬆ button and then P to **ENTER** analog output setup.

B **_ _ _ DATA SOURCE FOR ANALOG OUTPUT** scrolls across the display, and the current analog output data source appears. Use the ⬆ and ⬇ buttons to select an option from: **NONE**, **PRMCTR**, **B CNTR**, **C CNTR**, **RATE**, **BATCH** or **BCHCNT**, and then press P.

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

This sets the display value for ***CAL LOW*** *(as in 8.6F, below).*

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

This sets the display value for ***CAL HIGH*** *(as in 8.6G, below).*

E **_ _ _ CALIBRATE ANALOG OUTPUT?** scrolls across the display, and **SKIP** appears. To skip analog output calibration, press P now and go to 8.7.

Factory analog output calibration is precisely set before shipping this instrument, and should not be adjusted unless advised by the manufacturer.

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 **ENTER** analog output calibration mode.

F **_ _ _ CAL LOW ANALOG OUTPUT** scrolls across the display and toggles with a calibration number shown in internal units (around -16000). Press the ⬆ or ⬇ buttons until the multimeter displays your target low output, then press P.

G **_ _ _ CAL HIGH ANALOG OUTPUT** scrolls across the display and toggles with a calibration number shown in internal units (around 30000). Press the ⬆ or ⬇ buttons until the multimeter displays your target high output, then press P.

8.7 - Serial setup

A **_ _ _ SERIAL SETUP** scrolls across the display, and **SKIP** appears. 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 8.8.

Otherwise, press the ⬆ button and then P to **ENTER** serial setup.

B **_ _ _ SERIAL MODE** scrolls across the display, and the currently selected serial mode appears. Using the ⬆ and ⬇ buttons, choose either: **ASCII** (custom), **MODBUS** (RTU) or **RNGR A** (Ranger A), and then press P.

See Appendix A [p32] for more information about the available serial modes.

- ➡ If you selected **ASCII** or **MODBUS**, skip to 8.7D now.
- ➡ If you selected **RANGER A**, continue to 8.7C now.

C **_ _ _ SERIAL DATA SOURCE** scrolls across the display, and the current Ranger A serial data source appears. Use the ⬆ and ⬇ buttons to select an option from: **PRMCTR**, **B CNTR**, **C CNTR**, **RATE**, **BATCH** or **BCHCNT**, and then press P.

D **_ _ _ BAUD RATE** scrolls across the display, and the current selection appears. Use the ⬆ and ⬇ buttons to select one of: **1200**, **2400**, **4800**, **9600**, **19200**, **38400**, **57600** or **115200** Then press P.

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

F **_ _ _ SERIAL ADDRESS** scrolls across the display, and the serial address appears. Use the ⬆ and ⬇ buttons to alter the serial address, and then press P.

*Serial address is used to identify a particular device when used with other devices in a system. (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 [p32] for more information on serial modes and registers.

8.8 - Edit CAL PIN number

A **_ _ _ EDIT CAL PIN NUMBER** scrolls across the display, and **SKIP** appears. Press [P] to skip and return to the operational display, or the [⬆] button and then [P] to **ENTER** and change your PIN number.

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

9 SETPOINT SETUP

The software in your controller will allow you to configure 1 batch setpoint (SP 1) and 3 standard setpoints (SP 2–4). SP 5 may be used as an LED indicator, if desired. SP 6 is reserved.

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.

9.1 - Enter SP PIN number

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

_ _ _ ENTER SP PIN NUMBER scrolls across the display, and **0** appears. 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 9.2.

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 (9.3). If you have forgotten your PIN number, see Section 11.

9.2 - Setpoint setup

A **_ _ _ EDIT SETPOINT** scrolls across the display, and **SKIP** appears. Press [P] now to skip to 9.3, or use the [▲] and [▼] buttons to select a setpoint to edit from **1–5**, and then press [P]. Remember that:

- **SP 1** is a special use batch setpoint
- **SP 2–4** require relay output hardware to be installed for full functionality
- **SP 5** may be configured as an LED indicator, if desired (relay functions will be ignored)
- **SP 6** is reserved

B **_ _ _ SP VALUE** scrolls across the display, and the current value for the selected setpoint appears. 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 the current activation for the selected setpoint appears. Using the [▲] and [▼] buttons, select the relay activation to operate **ABOVE** or **BELOW** the setpoint value, and then press [P].

➡ If you are currently editing **SP 1**, skip to 9.2E now.
➡ If you are currently editing **SP 2–4**, continue to 9.2D now.

***ABOVE**: Relay turns on above the setpoint value and off below it.*
***BELOW**: Relay turns on below the setpoint value and off above it.*

D **_ _ _ TRACK SP 1** scrolls across the display, and the tracking setting for the selected setpoint appears. Using the [▲] and [▼] buttons, select **OFF** or **ON**, and then press [P].

➡ If you selected **OFF**, continue to 9.2E now.
➡ If you selected **ON**, skip to 9.2F now.

*A setpoint with **TRACK SP 1** enabled will track the setpoint value of **SP 1**, with the setpoint value of the tracking setpoint becoming an offset value.*

E **_ _ _ SETPOINT SOURCE** scrolls across the display, and the activation source for the selected setpoint appears. Use the [▲] and [▼] buttons to choose **PRMCTR**, **B CNTR**, **C CNTR**, **RATE**, **BATCH** or **BCHCNT**, and then press [P].

See 7.1 for more information on the batching feature.

F **_ _ _ SETPOINT TYPE** scrolls across the display, and the setpoint type for the selected setpoint appears. Using the ⬆ and ⬇ buttons, select: **NORMAL**, **TIMED** or **LATCHD** (latched), and then press P.

- ➡ If you selected **TIMED** or **LATCHD**, skip to 9.2I now.
- ➡ If you selected **NORMAL**, continue to 9.2G now.

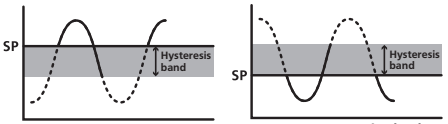
***NORMAL**: A normal setpoint will activate and deactivate using alarm or control logic regulated within a hysteresis band (9.2G–H).*

***TIMED**: A timed setpoint will activate as normal, and remain active for a user defined time period (9.2K), after which it will deactivate automatically.*

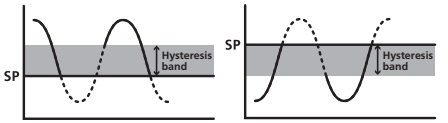
***LATCHD**: A latched setpoint will activate as normal, and remain active until it is unlatched either by setpoint logic (9.2M), or manually using a user programmable shortcut (8.5).*

G **_ _ _ HYSTERESIS TYPE** scrolls across the display, and the hysteresis type for the selected setpoint appears. Using the ⬆ and ⬇ buttons, select either **ALARM** or **CNTRL** (control), and then press P.

ALARM - SETPOINT VALUE *controls setpoint activation point.* **HYSTERESIS VALUE** *controls setpoint deactivation point.*



CNTRL - SETPOINT VALUE *controls setpoint deactivation point.* **HYSTERESIS VALUE** *controls setpoint reactivation point.*



H **_ _ _ HYSTERESIS VALUE** scrolls across the display, and the hysteresis value for the selected setpoint appears. 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 9.2G.*

I **_ _ _ MAKE DELAY** scrolls across the display, and the current make delay time for the selected setpoint appears. This is the time delay between setpoint activation, and when the relay turns on. Adjust this value in 0.1 second increments using the ⬆ and ⬇ buttons, and then press P.

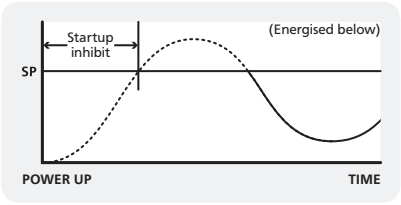
- ➡ If your Setpoint Type = **NORMAL**, proceed to 9.2J now.
- ➡ If your Setpoint Type = **TIMED**, skip to 9.2K now.
- ➡ If your Setpoint Type = **LATCHD**, skip to 9.2L now.

J **_ _ _ BREAK DELAY** scrolls across the display, and the current break delay value for the selected setpoint appears. This is the time delay between setpoint deactivation, and when the relay turns off. Adjust this value in 0.1 second increments using the ⬆ and ⬇ buttons, and then press P.

➡ Please skip to 9.2L now.

K **_ _ _ ON TIME** scrolls across the display, and the current selection appears. This defines the time that a 'Timed' relay (see 9.2F) remains energised. Adjust this value in 0.1 second increments using the ⬆ and ⬇ buttons, and then press P.

L **_ _ _ STARTUP INHIBIT** scrolls across the display, and the current selection appears. Use the ⬆ and ⬇ buttons to select **NO** or **YES**. Then press P.



*This option can be used with setpoints which may be active initially at power up. Setting **STARTUP INHIBIT** to **YES** will cause a relay to remain off (de-energised) at power up until it has first reached its inactive state. It will then function normally.*

M **_ _ _ RESET ACTION** scrolls across the display, and the current selection appears. This parameter specifies the action to be executed when the 'Reset Edge' (9.2O) occurs. Use the ⬆ and ⬇ buttons to select: **NONE**, **RS PRM** (reset primary counter), **RST B** (reset B counter), **RST C** (reset C counter), **RST BT** (reset batch), **RSTBTC** (reset batch count) or **UNLTCH** (unlatch all setpoints). Then press P to accept.

➡ If you selected **NONE**, then the step that you proceed to now will depend on which setpoint you are editing (your selection in 9.2A):
- **SP 1** = Skip to 9.2O now.
- **SP2–4** = Skip to 9.2Q now.

➡ If you selected **RS PRM**, **RST B**, **RST C** or **RSTBTC**, continue to 9.2N now.

➡ If you selected **RST BT** or **UNLTCH**, skip to 9.2O now.

See 7.1 for more information on the batching feature.

N **_ _ _ RESET VALUE** scrolls across the display, and the current reset value appears. Use the ⬆ and ⬇ buttons to adjust the value which will be loaded into the destination register selected in 'Reset Action' (9.2M) when the selected 'Reset Edge' (9.2O) occurs. Then press P to accept.

O **_ _ _ RESET EDGE** scrolls across the display, and the current selection appears. The defines the reset edge which must occur in order to trigger the 'Reset Action' selected in 9.2M. Use the ⬆ and ⬇ buttons to select: **NONE**, **MAKE** (make edge, relay energises), **BREAK** (break edge, relay de-energises) or **BOTH** (make and break edges). Then press P to accept and continue.

- ➡ If you are currently editing **SP 1**, continue to 9.2P now.
- ➡ If you are currently editing **SP 2–4**, skip to 9.2Q now.

P **_ _ _ BATCH COUNT MODIFIER** scrolls across the display, and the current value appears. Use the ⬆ and ⬇ buttons to adjust this value if desired, and then press P.

A positive number will cause the batch count register to be incremented by that amount each time the selected reset edge is triggered. Likewise, a negative number will cause the batch count register to be decremented. Setting this value to zero will disable this feature.

See 7.1 for more information on the batching feature.

Q **_ _ _ USER ACCESS?** scrolls across the display, and the direct access permission setting for the selected setpoint appears. Use the ⬆ and ⬇ to select either **OFF** or **ON**, 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 10.

R **_ _ _ EDIT SETPOINT** scrolls across the display, and **SKIP** appears. You are now back at 9.2A. To edit another setpoint, follow the instructions from 9.2A–R again. If you do not wish to edit another setpoint, press P now to skip to 9.3.

9.3 - Edit SP PIN number

A **_ _ _ EDIT SP PIN NUMBER** scrolls across the display, and **SKIP** appears. Press P to skip and return to the operational display, or the ⬆ button and then P to **ENTER** and change your PIN number.

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

10 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 9.2Q.)

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

B The name of the first access-enabled setpoint will appear in and the current value for that setpoint will appear. 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, along with its setpoint value. Repeat step 10B. 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.

11 RESET PIN NUMBERS / VIEW FIRMWARE VERSION

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

This procedure will also allow you to view the current software installed on your controller, which may be required for support purposes.

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 A message will appear on the display, with details of the unit's current software configuration (Product Name, Firmware Version, and Macro Version). At the end, you will see – **PIN NUMBERS RESET TO 1**.

C Both the CAL and SP PIN's have now been reset to '**1**'. You can change this, if required, by following the instructions in 8.8 (for *Input Setup & Calibration*) and 9.3 (for *Setpoint Setup*), using '**1**' to enter each menu initially.

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.

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

8 Bit Unsigned

8207	Baud rate
8211	Serial address
8215	Serial mode

16 Bit Unsigned

4181	Hysteresis SP 1 (Batch SP)
4182–4185	Hysteresis SP 2–5
4197	Make delay SP 1 (Batch SP)
4198–4201	Make delay SP 2–5
4213	Break delay SP 1 (Batch SP)
4214-4217	Break delay SP 2–5
5173	Batch count increment

24 Bit Signed (2 x 16 Bit)

2509	Load value (Primary)
2511	Load value (B counter)
2513	Load value (C counter)

32 Bit Signed (2 x 16 Bit)

7	Batch result
9	Rate
13	Primary counter
15	B counter
11	C counter
37	Batch tare
39	Batch count
57	Peak
59	Valley
111	Setpoint 1 (Batch setpoint)
113	Setpoint 2
115	Setpoint 3
117	Setpoint 4
119	Setpoint 5
239	Alarm status

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.

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*

8 Bit Unsigned

48207	Baud rate
48211	Serial address
48215	Serial mode

16 Bit Unsigned

44181	Hysteresis SP 1 (Batch SP)
44182–44185	Hysteresis SP 2–5
44197	Make delay SP 1 (Batch SP)
44198–44201	Make delay SP 2–5
44213	Break delay SP 1 (Batch SP)
44214–44217	Break delay SP 2–5
45173	Batch count increment

24 Bit Signed (2 x 16 Bit)

42509	Load value (Primary)
42511	Load value (B counter)
42513	Load value (C counter)

32 Bit Signed (2 x 16 Bit)

40007	Batch result
40009	Rate
40013	Primary counter
40015	B counter
40011	C counter
40037	Batch tare
40039	Batch count
40057	Peak
40059	Valley
40111	Setpoint 1 (Batch setpoint)
40113	Setpoint 2
40115	Setpoint 3
40117	Setpoint 4
40119	Setpoint 5
40239	Alarm status

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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