Instruction sheet

CUB5
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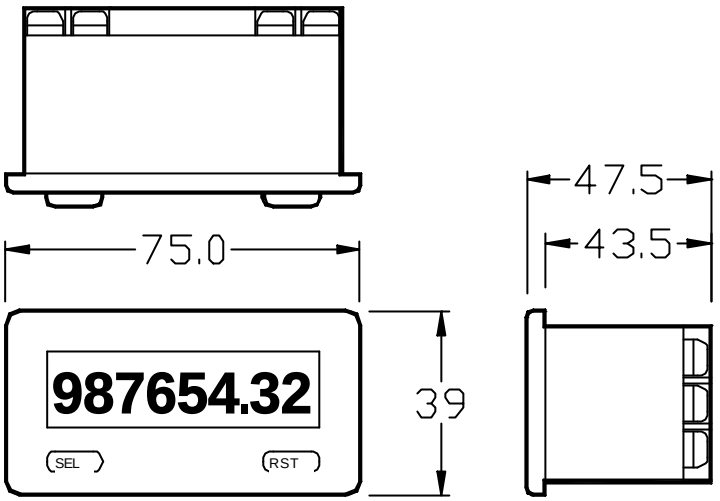
When power is applied to the unit it will perform a self diagnostic and LCD check and then display its revision level. If all "P"s appear in the display press SEL and check all of the data set ups. The CUB5 can be set up to function a single counter, rate meter, dual counter or a combination of single or dual counter and rate meter, an optional relay card is also available. For the counter the unit receives the incoming pulses and multiplies them by the count scale factor. The count can be reset to zero by a manual or remote reset operation and if power is lost during counting the last total is saved to the internal memory. This feature permits consecutive counting even between shifts or accidental power failure. If the maximum display of 99,999,999 is exceeded the display will flash "**tot OvER**" indicating an overflow condition. The rate display uses a time interval method. The unit counts the number of negative edges until the next pulse is received after the selected minimum update time. The number of pulses during this elapsed period is multiplied by the rate scaling factor , this number is used to calculate the rate display. For low frequency inputs the rate minimum update time can be programmed for the appropriate response. The relay may be allocated to either the rate or total A.

Contents

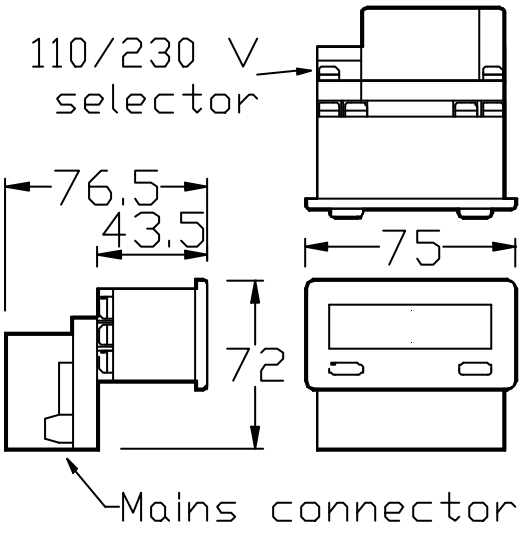
In the normal operating mode the display indicates (to the left of the display) either :-

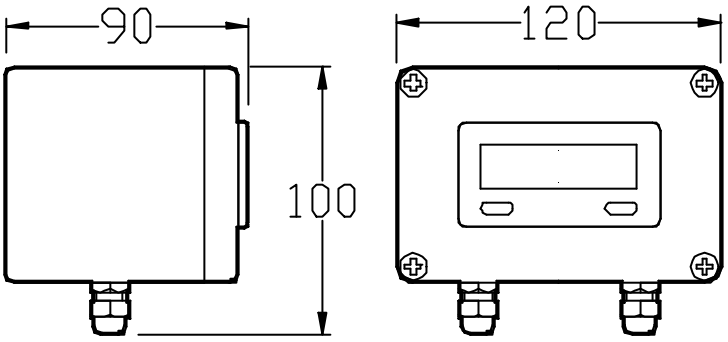
"R" This indicates that the display is showing rate.
"b" This indicates the "B" count is being displayed.
"t" This indicates the set point (relay) status.

No enunciator indicates that the "A" count is being displayed.
If the select button is enabled this will toggle between rate and total. If display scroll in enabled the unit will cycle between all displays automatically approximately every 4 seconds. If both are enabled the select button will hold the display on its current function until the button is released.



The drawings below show the CUB5 with its attached mains power supply and the wall mounted enclosure. The panel cut out is 68.5 X 33.5 mm, the minimum vertical and horizontal pitches are 55 & 75mm the panel thickness must be between 1.3 & 5mm.





Wall mounting centres 108 X 50 mm X M4 screw

Specification

Display	LCD 8 digit total 6 digits for rate with “R” enunciator 5 programmable decimal points for both totaliser and rate indicator
Signal Inputs	Universal pulse frequency input compatible with reed switch, Hall effect detector, Voltage pulse. Maximum input frequency 50 to 20Khz depending on sensor type minimum 0.01Hz,
Power	9 - 24 V dc @10mA to 125mA depending on backlight and relay set up.
Enclosure	IP66 (NEMA 4X) High impact glass polymer, front when fitted to panel.
Temp	-35°C to +35, 50, 60,70,75 or 80°C. depending on backlight & its brightness setting.
K Factor range	0.0001 - 99.9999

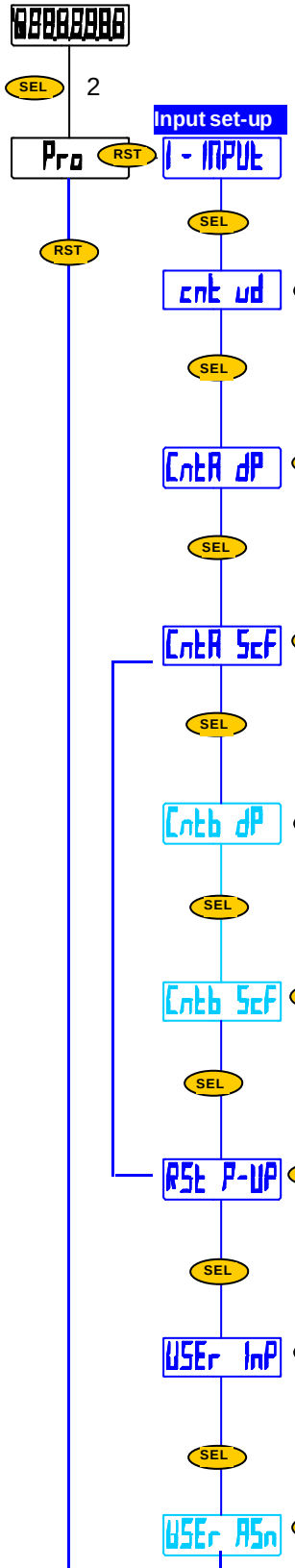
Programming is via the key pad and may be security code protected.

Programming

There are four stages to programming the CUB5. **Input set up**, **Rate set up, Front panel set up** and if the relay card is fitted **Set point set up.**

For numeric entries the RST button (RST) **increments display.**

SEL (SEL) **advances to next digit or function.**



On power up the display will display all of the LCD segments and the software revision. To enter the programming mode press SEL button for 2 seconds. The display will then show **pro** - **no**. RST exits the programme mode SEL enters the 4 set up menus.

This is the most common mode for totalising, Under normal operating conditions the counter will increase the display with every pulse received on input "A" . If input "B" has a low logic level the counter will reduce the display. 7 other modes are available but as these are rarely used they have been detailed on another sheet.

Total decimal point select 0 0.0 0.00 0.000 0.0000 0.00000 or none (This is independent of the rate decimal point). A second number of decimal points may be required for input "B" if alternative count modes are selected. When the desired number has been entered press the SEL key to advance to the next level.

This is the totaliser scale factor the incoming pulse is multiplied by this number to increment the counter (the reciprocal of the 'K' factor). If alternative count modes are selected a second scale factor will be required for counter "B" RST increments the number SEL advances to the next digit. Hold the SEL key for 2 seconds to advance to the next level.

Total decimal point select 0 0.0 0.00 0.000 0.0000 0.00000 or none (This is independent of the rate decimal point). A second number of decimal points may be required for input "B" if alternative count modes are selected.

DUAL COUNT MODE ONLY

This is the totaliser scale factor the incoming pulse is multiplied by this number to increment the counter (the reciprocal of the 'K' factor). If alternative count modes are selected a second scale factor will be required for counter "B"

Resets counters at power up. **No**, count "B". **Yes**, count "A", and both "A & B".

User input. This permits the user input connection to be connected to common with an external switch for remote control purposes.
"**NO**" User input disabled.
"**Pro Loc**" Program mode access.
"**d-SELECt**" Display select.
"**RESET**" Resets the selected counts to zero .
"STORE" Freezes display but the internal counts continue.
"**STOR RST**" Resets the selected counter(s) after storing the count.
"INHIBIT" Freezes the display and the input signal is ignored.

Security code	User input function	User input state	Programming access
No	Not "Pro Loc"		Immediate access
Yes	Not "Pro Loc"		Enter security code
Yes	"Pro Loc"	Active	Enter security code
Yes	"Pro Loc"	Not active	Immediate access
No	"Pro Loc"	Active	No access
No	"Pro Loc"	Not active	Immediate access

If "**INP A_B"** is "**DUAL CNT" and "**USER INP" **not "**DSP SEL" is set the program enters an extra step
"**USEr ASn"** the user input may be assigned as follows.
"Count A" A input count. **"Count b"** B input count. **"BOTH A-B"** A & B counters.

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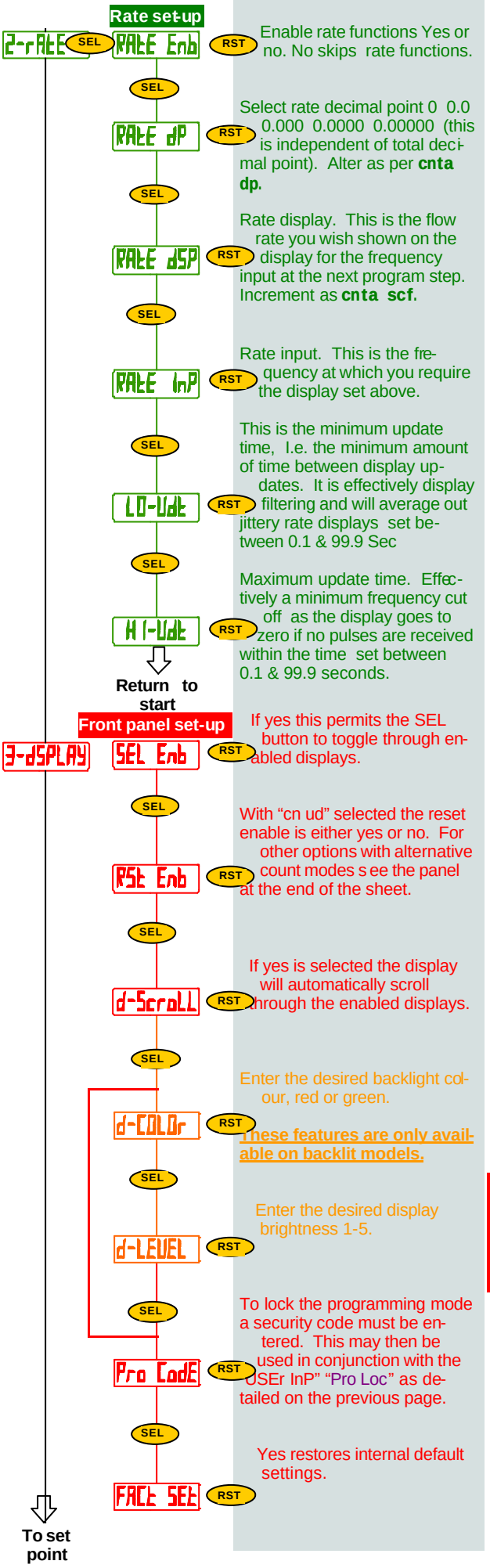
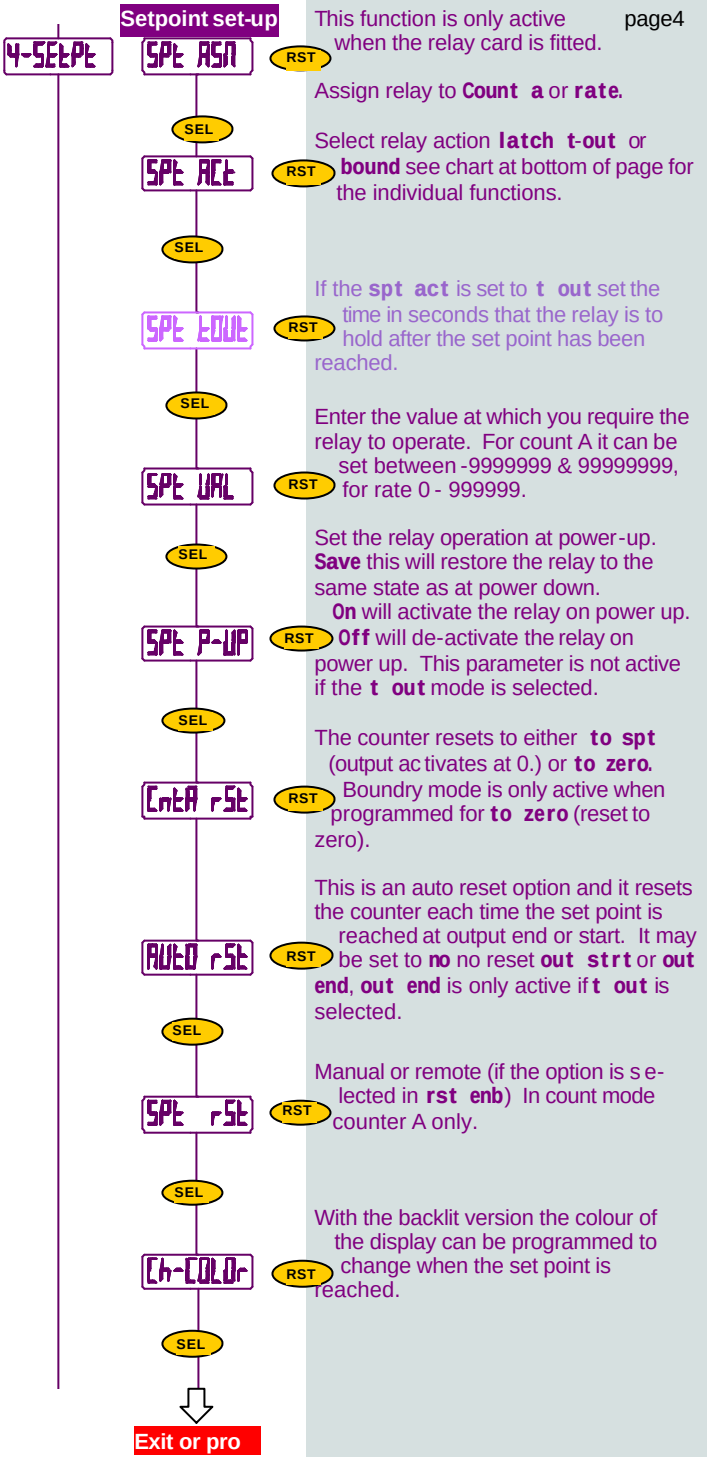




If "**rst enb**" is set "**dual cnt**" the front panel button can be enabled to reset

counta	counter A	**both a b**	counters A & B
countb	counter B	**dsplay**	displayed count
no	neither counter may be reset from the front panel.		

Set point action functions

Setting	Description	Activates when	De-activates
latch	Relay latches	Count = set point	On reset if **spt rst = yes**
T-out	Times out	Count = set point	After time out time
bound	Boundary mode	Count ≥ set point	Count < set point

Count modes

There are 8 count modes, the selection determines the functions of input “A” and input “B” and assigns the function to either counter A, counter B, rate indicator or a combination of all three. The “user input” programming for the inhibit functions can be used with any of the count modes. Input “A” is always the rate indicator.

Cnt ud	Counter “A” will increment or decrement the counter on every negative edge of input “A” depending on the logic state of input “B”. A high level will cause the display to increment a low level to decrement.
Rte cnt	Counter “A” increments the display for every negative edge received on the input “B”. The direction is always plus and the input “A” is used exclusively for rate input.
Dual cnt	Both counters “A” and “B” increment the count on every received negative edge. This is the only mode in which dual counting is a available.
Q.uad1	Quadrature counting modes are used primarily in positioning and anti-jitter applications. This requires two identical square wave signals one of them shifted 90° relative to the other. The operating function is as follows. Input “A” serves as the count input and input “B” as the quadrature input. A negative edge at input “A” will increment the counter when the quadrature input “B” is at a low level. If input “A” has a positive edge when input “B” is at a low level the counter decrements. When input “B” is at a high level all level changes at input “A” are ignored. These logic states should eliminate any false counts due to jitter or backlash.
Q.uad2	When double edge input counting is used the quadrature input works the same as single quadrature input when the put “B” is low. When input “B” is a high level counts at input “A” are no longer ignored. Instead the logic rules for input “A” are complimented allowing both rising and falling edges on input “A” to be counted. This effectively doubles the resolution of input “A”.
Q.uad4	This is one step further where both inputs count on both edges effectively quadrupling the input resolution.
add/add	This effectively sums both inputs even if the pulses occur simultaneously.
Add/sub	In this mode input “A” increments the counter and input “B” decrements it giving the net difference between the two signals.

Scaling the counter

The CUB5 multiplies the incoming pulse by the scale factor and has the range of 0.0001 to 99.9999. The scale is factor can be expressed as :-

$$\text{Scale factor} = \frac{1}{\text{Pulses per measured unit.}}$$

The indicator does not automatically calculate the position that has been set for the decimal place (DP) so the equation must be modified to account for this :-

$$\text{Scale factor} = \frac{1}{\text{Pulses per unit} \times \text{DP position.}}$$

Where the least significant digit for the DP position = 1

E.g. for no decimal places DP = 1
1 decimal place DP = 0.1
2 decimal places DP = 0.01
3 decimal places DP = 0.001
4 decimal places DP = 0.0001
5 decimal places DP = 0.00001

Increasing the scale factor to greater than 1 does not improve the resolution of the system.

Counter scaling example

If a flowmeter ‘K’ factor is 2024 pulses per litre and you wish the counter to display litres to two decimal places the equation is as follows :-

$$\text{Scale factor} = \frac{1}{2024 \times 0.01.} = 0.049407$$

Scaling the rate indicator

To scale the rate meter the operator need only set the rate display value for the relevant frequency. This should be set towards the maximum range of the measurement. If the display shows “r OLOLOL” it is over-ranged and the unit must be re-calibrated for a lower full scale or a lower resolution.

Scaling rate example

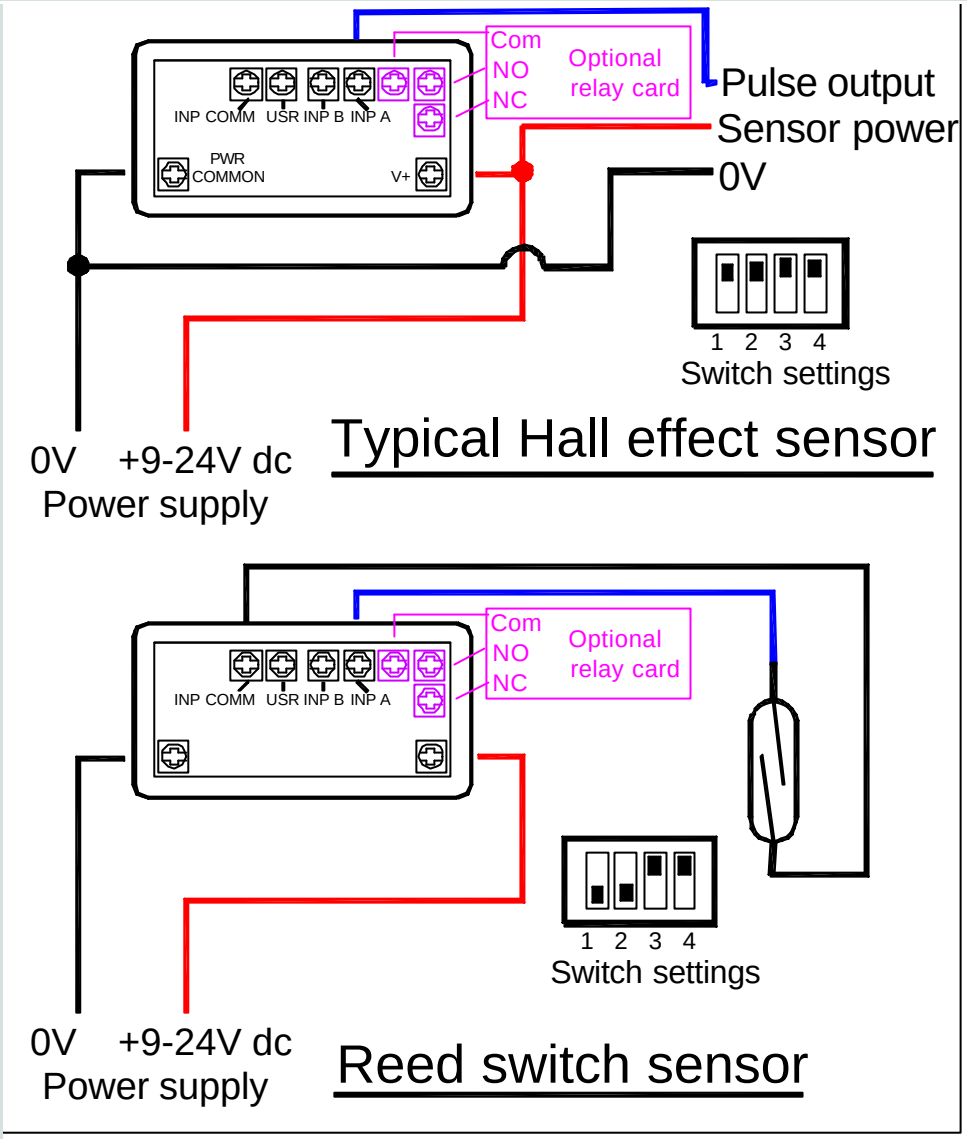
For the flowmeter shown above, if the display is to measure in litres per minute to two decimal places and full scale is 2 L/min. The “*RATE DISPLAY*” would be set to 2.00 and the “*RATE INPUT*” set to 67.5. This number is derived from the number of litres per unit time base multiplied by the number of pulses per litre and reduced to a frequency.

$$\textit{RATE INPUT} = \textit{RATE DISPLAY} \times \frac{\text{Pulses per unit}}{\text{time base adjustment}}$$

RATE INPUT = 2.00 X 2024÷60 = 67.4646

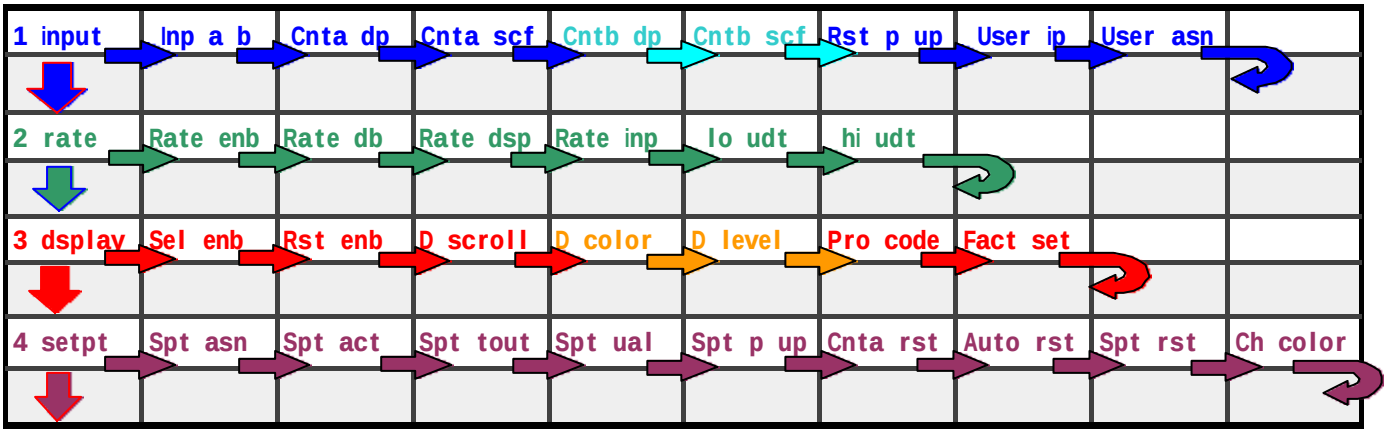
Installation guidelines

Always use good wiring practice, never run signal and power cables in the same conduit. Where possible use screened signal cables and follow good instrument practice when earthing the screen. Within an instrument case or panel run the signal cables as far as possible away from contactors, relays or any other electrically "noisy" apparatus including transformers and motor controllers. Use short cable runs wherever possible. It is recommended that the power supplied to the unit is protected by an appropriate fuse or circuit breaker.



Note :- The input circuit for the CUB5 can be configured for almost any type of sensor. Please contact your sales office if your sensor type differs from the examples shown above.

Enter your program setting in the flow chart below.



Indicator type	.....	**Indicator serial number**	.....
For use with flowmeter	.....	**Flowmeter serial number**	.....
Rate units & time base	.....	**Job number**	.....
Calibrated by	.....	**Date**	.....