BA567E-SS
Rugged one input
General purpose
Counter
Issue 6

Product label

Scale card

Total display

BA567E-SS

Rate display

RTx annunciator

Rotating pulse input indicator

Push buttons

Annunciators for optional alarms

CONTENTS

1. DESCRIPTION

This rugged general purpose, one input Counter may be configured to count input pulses from a wide variety of sensors and to display the total number in engineering units. A smaller six digit display may be activated to show the input pulse rate in engineering units per second, minute or per hour.

2. OPERATION

Fig 1 shows a simplified block diagram of the BA567E-SS Counter. The instrument can be supplied with a factory fitted internally powered display backlight, plus one of the following three factory fitted accessories:

Dual isolated alarms

or Isolated pulse output

or Isolated 4/20mA output
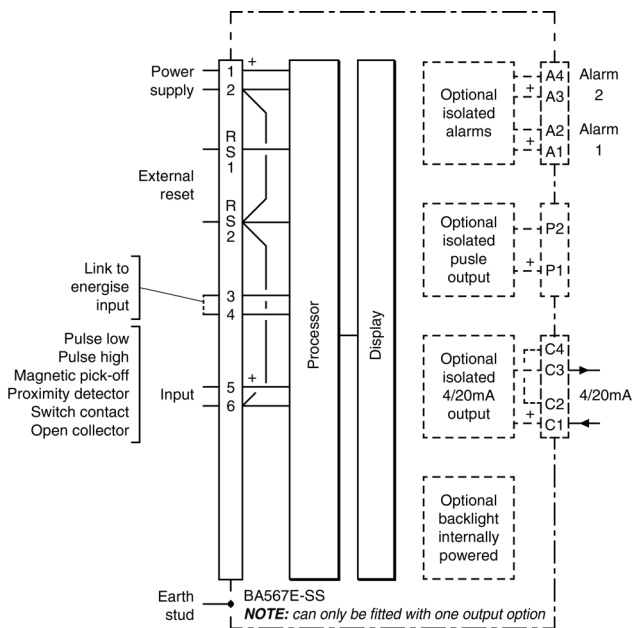
Fig 1 BA567E-SS block diagram

2.1 Initialisation

Each time power is applied to a BA567E-SS Counter initialisation is performed. After a short delay the following display sequence occurs:

All segments of the display are activated

Counter starts functioning, using the configuration information stored in the instrument's permanent memory. Unless total and grand total displays have been reset to zero, new pulses will be added to the existing totals.

2.2 Controls

The BA567E-SS Counter is controlled and configured via four front panel push buttons. In the display mode i.e. when the instrument is counting, the push button functions are:

<u>**Push Button Functions**</u>

ⓟ + ⓔ   Access to configuration menu

▼ + ▲   If Local Total Reset ɛʟr ŧoŧ in the instrument configuration menu has been activated, operating the ▼ and ▲ buttons simultaneously for three seconds will reset the total display to zero and clear any pulses stored in the optional pulse output. See 5.19

ⓔ + ▼   Grand total - shows ʟo followed by least significant 8 digits of the 16 digit grand total.

ⓔ + ▲   Grand total - shows Hɪ followed by the most significant 8 digits of the 16 digit grand total.
If Local Grand Total Reset ɛʟr ɛŧoŧ in the instrument configuration menu has been activated, operating the ⓔ and ▲ buttons simultaneously for ten seconds will result in ɛʟr.no being displayed with the no flashing. Operating the ▲ or ▼ button will change the display to ɛʟr.ЧЕ5, the ⓔ button will then reset the grand total to zero which will be confirmed by a brief display of Ɠŧ ɛʟrd. See 5.20

ⓟ + ▼   Shows firmware version

Note: When optional alarms are fitted, the BA567E-SS Counter may be configured to provide direct access to the alarm setpoints from the display mode when the ⓟ and ▲ buttons are operated simultaneously. See 8.3.13

2.3 Displays

The BA567E-SS Counter has two digital displays and associated annunciators, plus a pulse input indicator as shown on the front page of this manual.

Total display	Shows the total pulse count on the upper eight digit display. May be reset to zero via front panel push buttons or by a remote reset switch.
Rate Display	Shows the pulse rate on the lower six digit display. Total and rate displays may be reversed.
Pulse input indicator	This disc in the lower left hand corner of the display 'rotates' for two seconds each time an input pulse is received on either input. Appears to rotate continuously when combined input frequency on both inputs exceeds 0.5Hz.
Reset annunciator	Activated while the total display is being reset via the front panel push buttons, or the external reset terminals.
Rate annunciator	Identifies rate display
Total annunciator	Identifies total display
RTx annunciator	Retransmitted pulse annunciator. Depends upon the setting of 5our[E in the pulse output configuration menu.

> **5[ALE𝗱**
> Annunciator activated each time pulse output open collector is *on*, i.e. Ron is less than 60Ω + 3V.

> **dɪrE[E**
> Annunciator continuously activated.

3. SYSTEM DESIGN

Fig 2 illustrates the basic circuit that is used for all BA567E-SS Counter installations. For simplicity, connections for the optional alarms, pulse output and 4/20mA output are shown separately in section 8 this manual.
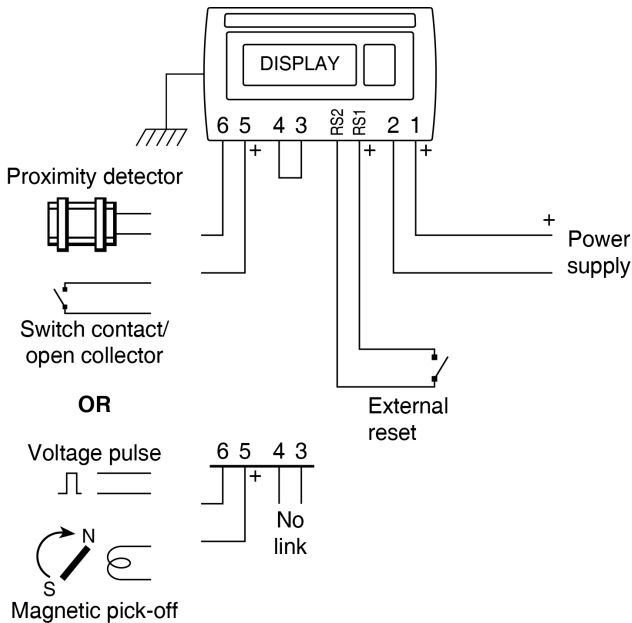

Fig 2 BA567E-SS connections

When designing a system it is important to remember that terminals 2, 6 and RS2 are interconnected within the BA567E-SS see Fig 1.

3.1 Power supply

The BA567E-SS Counter requires a 10 to 30V dc supply between terminal 1 & 2 and consumes:

	10mA	without optional backlight
plus	6mA	when terminals 3 & 4 are linked
plus	22mA	for optional backlight

3.2 Pulse input

As shown in Fig 2 the BA567E-SS can count pulses from a wide variety of sensors.

The following table shows the switching thresholds for the various types of sensor. For reliable counting the pulse input must fall below the lower threshold and rise above the upper threshold.

Input sensor	Switching thresholds	
	Lower	Upper
Switch	100Ω	1000Ω
Proximity detector	1.2mA	2.1mA
Open collector	2kΩ	10kΩ
Magnetic pick-off	0mV	40mV peak
Voltage pulse low	1.0V	3.0V
Voltage pulse high	3.0V	10.0V

3.2.1 Switch contact input

Any switch contact may be directly connected to pulse input terminals 5 and 6, The BA567E-SS contains a configurable debounce circuit to prevent contact bounce being counted. See section 5.6 including details of the maximum counting frequency.

3.2.2 2-wire proximity detector input

Most NAMUR 2-wire proximity detector may be directly connected to the BA567E-SS pulse input, providing the minimum operating voltage of the proximity detector is less than 7.5V. The BA367E-SS contain a configurable debounce circuit to prevent false triggering. Three levels of debounce protection are independently available. See section 5.6.

3.2.3 Open collector input

Sensors with an open collector output may be directly connected to Counter input terminals 5 & 6. Polarity of the sensor output should be observed. The BA567E-SS contains a configurable debounce circuit to prevent false triggering. Three levels of debounce protection are independently available. See section 5.6.

3.2.4 Magnetic pick-off input

Sensors incorporating a magnetic pick-off will have a low level voltage output unless the sensor incorporates an amplifier. Coil in the BA567E-SS input configuration menu is a low level voltage pulse input intended for use with a magnetic pick-off. The Counter contains a configurable debounce circuit to prevent false triggering of the instrument. See section 5.6.

3.2.5 Voltage pulse input

Two voltage pulse input ranges are selectable in the BA567E-SS Counter configuration menu, Volts L and Volts H A shown in section 3.2. The Counter contains a configurable debounce circuit to prevent false triggering of the instrument. Three levels of debounce protection are independently available. See section 5.6.

3.3 Remote reset

The Counter's total display may be remotely reset to zero by connecting terminals RS1 and RS2 together for more than one second. Permanent interconnection inhibits counting.

Note: The BA367E may also be configured to reset the total display to zero by operating the ▼ and ▲ push buttons simultaneously for more than two seconds in the totalising mode i.e. when the instrument is displaying flow. See 5.19
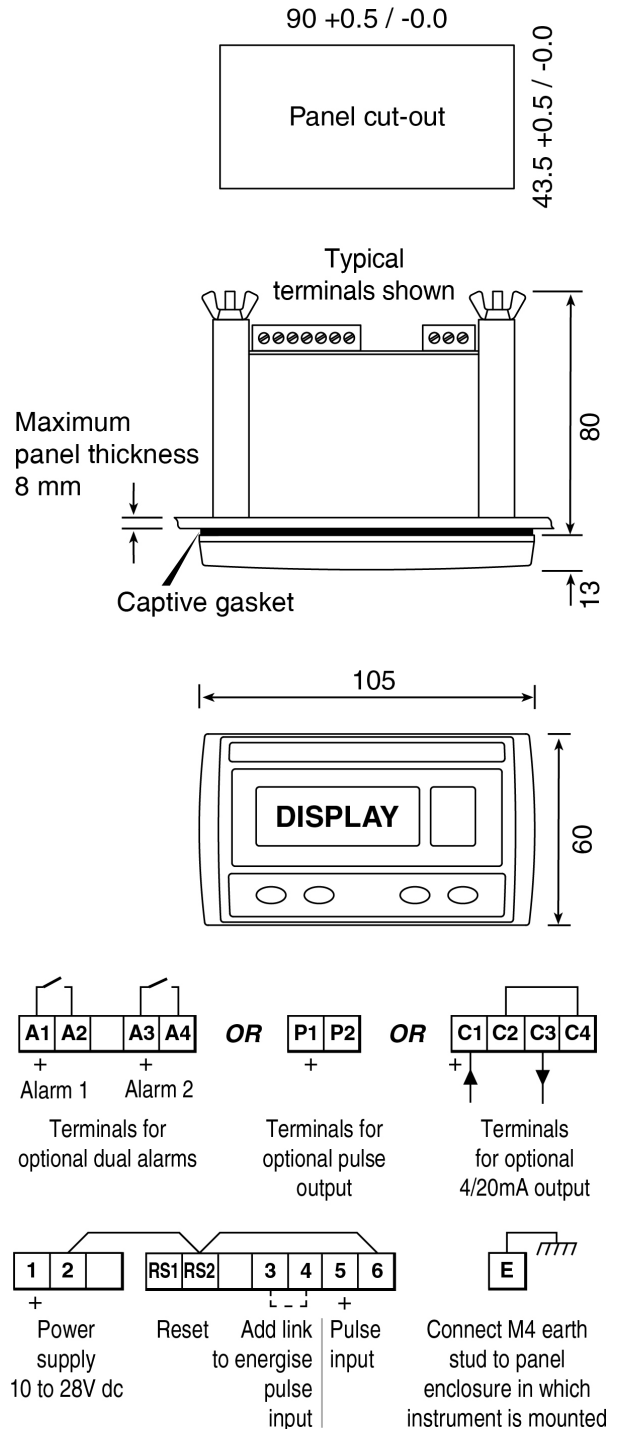
4. INSTALLATION

4.1 Location
The BA567E-SS has a stainless steel case with a 10mm thick toughened glass window. The case provides 7J and the window 4J front of panel impact protection. The captive silicone gasket, which seals the joint between the instrument and the panel enclosure, ensures IP66 front of panel ingress protection. The rear of the Counter has IP20 protection.

Fig 3 shows the overall dimensions of the BA567E-SS together with the recommended panel enclosure cut-out dimensions and terminal locations.

4.2 Installation Procedure

a. Cut the aperture specified in Fig 3 in the panel enclosure. Ensure that the edges of aperture are de-burred.

b. Inspect the Counter's captive gasket and ensure that it is not damaged before inserting the Counter into the panel enclosure aperture.

c. If the enclosure panel is less than 1.0mm thick, or is non-metallic, an optional BEKA stainless steel support plate should be slid over the rear of the Counter before the panel clamps are fitted to evenly distribute the clamping force and prevent the enclosure panel being distorted or creeping.

d. Slide a panel clamp into the two grooves at each corner of the indicator housing with the M3 stud protruding through the hole at the rear of the clamp. Fit the stainless steel spring washer over the stud and secure with the stainless steel wing nut.

e. Evenly tighten the four clamps to secure the instrument. The recommended minimum tightening torque for each wing nut is 22cNm (1.95 lbf in).

f. Connect the panel enclosure wiring to the rear terminal blocks. To simplify installation, the terminals are removable so that wiring can be completed before the instrument is installed. Cables should be mechanically secured to ensure terminals are not damaged by vibration.

g. Finally fit a silicone rubber push-on cap to the end of each M3 threaded rod.

90 +0.5 / -0.0

Panel cut-out

43.5 +0.5 / -0.0

Typical
terminals shown

Maximum
panel thickness
8 mm

80

13

Captive gasket

105

DISPLAY

60

| A1 | A2 | | A3 | A4 | *OR* | P1 | P2 | *OR* | C1 | C2 | C3 | C4 |

+ + + +
Alarm 1 Alarm 2

Terminals for
optional dual alarms

Terminals for
optional pulse
output

Terminals
for optional
4/20mA output

| 1 | 2 | | RS1 | RS2 | | 3 | 4 | 5 | 6 |

+
Power
supply
10 to 28V dc

Reset

Add link
to energise
pulse
input

+
Pulse
input

E

Connect M4 earth
stud to panel
enclosure in which
instrument is mounted

Support panel wiring to prevent vibration damage

Note: Optional backlight is internally powered

Fig 3 Dimensions and terminals

Captive gasket

Panel enclosure

Optional stainless steel support plate

Slide a panel clamp into the two grooves at each corner of the instrument

Silicone rubber push-on cap

Secure each clamp with a stainless steel washer and wing nut, tighten 22cNm (1.95lbf in) min.
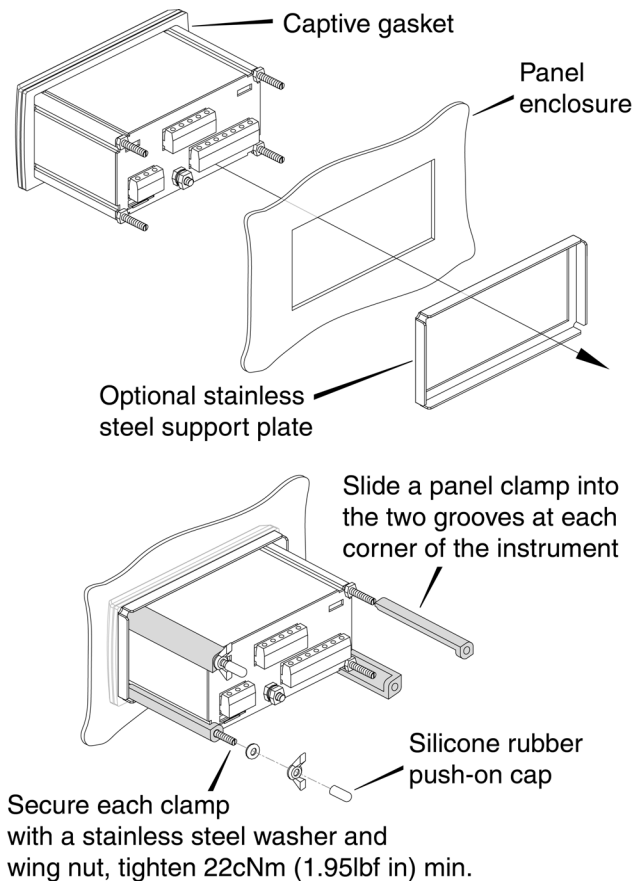
Fig 4 Installation procedure

4.3 EMC
The BA567E-SS complies with the requirements of the European EMC Directive 2014/30/EU. For specified immunity all wiring should be in screened twisted pairs, with the screens earthed at one point.
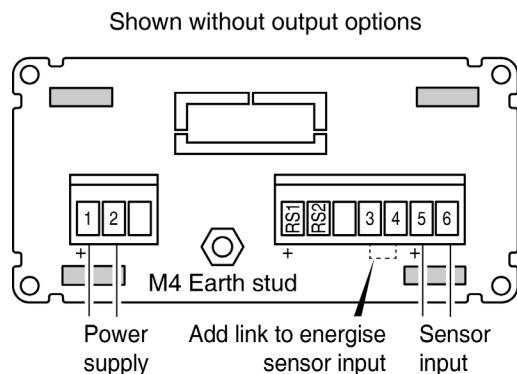
Shown without output options

Power supply

M4 Earth stud

Add link to energise sensor input

Sensor input

Fig 5 Terminals for field wiring

4.4 Counter earthing
The BA567E-SS has an M4 earth stud on the rear panel which should be electrically connected to the panel enclosure in which the instrument is mounted, or to the plant equipotential conductor.

4.5 Scale card
The Counter's units of measurement are shown on a printed scale card in a window at the right hand side of the display. The scale card is mounted on a flexible strip that is inserted into a slot at the rear of the instrument as shown in Fig 6. Thus the scale card can easily be changed without removing the Counter from the panel or opening the instrument enclosure.

New Counters are supplied with a printed scale card showing the requested units of measurement, if this information is not supplied when the instrument is ordered a blank card will be fitted.

A pack of self-adhesive scale cards printed with common units of flow measurement is available as an accessory from BEKA associates. Custom printed scale cards can also be supplied.

To change a scale card, unclip the tapered end of the flexible strip at the rear of the instrument by gently pushing it upwards and pulling it out of the enclosure. Peel the existing scale card from the flexible strip and replace it with a new printed card, which should be aligned as shown below. Do not fit a new scale card on top of an existing card.

Install the new scale card by gently pushing the flexible strip into the slot at the rear of the Counter, when it reaches the internal end-stop secure it by pushing the end of the flexible strip downwards so that the tapered section is held by the rear panel.

Align on these edges

Scale card

Align the self-adhesive printed scale card onto the flexible strip and insert the strip into the indicator as shown below.
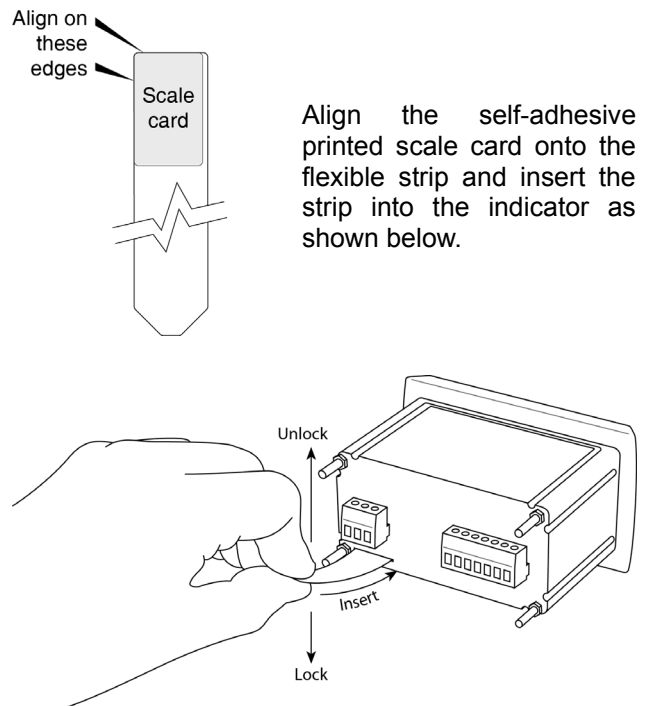

Unlock

Insert

Lock

Fig 6 Inserting flexible strip carrying scale card into slot at the rear of the Tachometer.

5.0 CONFIGURATION & CALIBRATION

The BA567E-SS Counter is configured and calibrated via four front panel push buttons. All the configuration functions are contained in an easy to use intuitive menu that is shown diagrammatically in Fig 8.

Each menu function is summarised in section 5.3 of this manual and each summary includes a reference to more detailed information.

When factory fitted optional dual alarms, pulse output or a 4/20mA output are included, additional functions appear in the configuration menu which are described separately in section 8.

All new BA567E-SS Counters are supplied calibrated as requested at the time of ordering. If calibration is not requested, Counters will have default configuration as shown in the following table, but can easily be re-configured on-site.

Function	Display	Default
Input		
Input type	ınP.ŁYPE	oP.CoL
Debounce	dEbounCE	dEFAuLŁ
Counting edge	CnŁ EdGE	EdGE ı
Update	uPdAŁE	0.5
Upper display	dıSP-ı	ŁoŁAL
Lower display	dıSP-2	on
Decimal point	dP	Rate 00000.0
		Total 00000000
Total scale factor	SCALE.Ł	001.00
Rate scale factor	SCALE.r	001.00
Timebase	Ł-bASE	Łb-0ı
Filter	FıLŁEr	24
Counter direction	uP or dn	uP
Clear value	CLr VAL	00000000
Local clear		
Local total reset	CLr ŁoŁ	oFF
Local grand total reset	CLr GŁoŁ	oFF
Security code	CodE	0000

Note: While the instrument is being configured counting continues so that any input pulses occurring during this time are recorded.

5.1 Configuration structure

Fig 7 shows the configuration structure of the BA567E-SS Counter. The pulse input is passed to the SCALEr and SCALEŁ functions allowing the independent rate and total displays to have different engineering units.

SCALEŁ is a dividing factor that converts the input pulses into the required total display in engineering units. e.g. if the input is two pulses per pump stroke and it is required to display the total number of pump strokes in thousands of strokes, SCALEŁ should be set to 2000.

SCALEr is a dividing factor that converts the input pulses into a rate display with the required engineering units. e.g. if the input is two pulses per pump stroke and it is required to display the pump stroke rate, SCALEr should be set to 2.0.

The timebase Ł-bASE is a multiplying factor that determines if the instrument displays pulse rate per second, per minute or per hour.

The BA567E-SS uses 'real' decimal points. Moving the position of a decimal point in a scale factor will affect the instrument calibration.
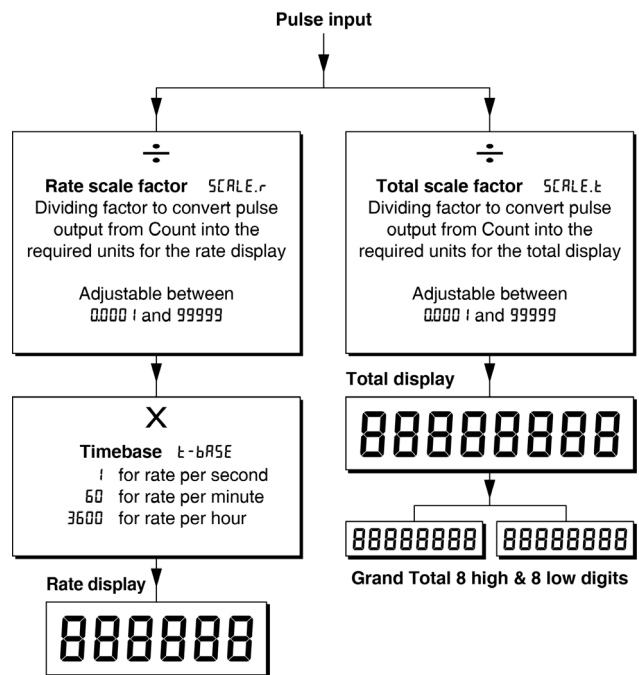

Fig 7 Calibration structure

5.2 Accessing configuration functions

Throughout this manual the instrument front panel push buttons are shown as ⯆, ⯅, Ⓟ and Ⓔ and legends displayed by the instrument are shown in a seven segment font as displayed by the Counter e.g. FiLtEr and SCALE.r.

Access to the configuration menu is obtained by operating the Ⓟ and Ⓔ push buttons simultaneously. If the instrument is not protected by a security code the first parameter inPut will be displayed. If a security code other than the default code 0000 has already been entered, the instrument will display CodE. Press Ⓟ to clear this prompt and enter the security code for the instrument using the ⯆ or ⯅ push button to adjust the flashing digit, and the Ⓟ push button to transfer control to the next digit. If the correct code has been entered pressing Ⓔ will cause the first parameter inPut to be displayed. If an incorrect code is entered, or a push button is not operated within ten seconds, the instrument will automatically return to the display mode.

All configuration functions and prompts are shown on the upper eight digit display.

Once within the configuration menu the required function can be selected by scrolling through the menu using the ⯆ and ⯅ push buttons. The configuration menu is shown diagrammatically in Fig 8.

When returning to the display mode following reconfiguration, the BA567E-SS Counter will display dAtA followed by SAVE while the new information is stored in permanent memory.

If after accessing the configuration menu the interval between operating any front panel push button exceeds one minute, the BA567E-SS will automatically return to the display mode and any configuration changes will not be stored in permanent memory. When making changes to multiple configuration functions, it is therefore sensible to occasionally return to the display mode to save the changes that have already been made.

5.3 Summary of configuration functions

This section summarises all the configuration functions. When read in conjunction with Fig 8 it provides a quick aid for configuring the Counter. If more detail is required, each section contains a reference to a full description of the function.

Display	Summary of function
inPut	Contains sub-menu with two functions:

        inP.tYPE   Select Input type
        dEbounCE   Set debounce
See section 5.4

inP.tYPE
Configures input to accept one of six types of input:

oP.CoL	Open collector *
VoLtS L	Voltage pulse <1 >3V
VoLtS H	Voltage pulse <3 >10V
CoiL	Magnetic pick-off
Pr.dEt	Proximity detector *
ContACt	Switch contact *

* Link terminals 3 & 4
See section 5.5

dEbounCE
Defines level of input debounce applied to the pulse input to prevent false counting:
        dEFAuLt
        HEAVY
        LiGHt
See section 5.6

Cnt EdGE   **Input pulse counting edge**
Defines whether the Counter is incremented/decremented on the leading or trailing edge of an input pulse.
See section 5.7

uPdAtE   **Display update interval**
Defines the interval between display updates between 0.5 and 5 seconds.
See section 5.8

Display	Summary of function
di SP- I	**Upper display** Defines whether rAtE or totAL are shown on the upper display. The other variable will be shown on the lower display, providing the lower display is on in function di SP-2. **See section 5.9**
di SP-2	**Lower display** Turns the lower display, which normally shows rate, on or oFF. **See section 5.10**
dP	**Position of decimal points** Defines the position of the decimal point in both the total and rate displays. **See section 5.11**
SCALE.t	**Total Scale Factor** SCALE . t is a dividing factor that converts the number of input pulses into the required total display in engineering units. SCALE.t may be adjusted between 0.0001 & 99999. e.g. if one input pulse represents 1 centimetre of dispensed cable and the total display is required in metres, SCALE.t should be set to 100.0 which is the number of centimetres in a metre. The total display is independent of the rate display. **See section 5.12**
SCALE.r	**Rate scale factor** SCALE . r is a dividing factor that converts the input pulse rate into the required rate display in engineering units. SCALE . r may be adjusted between 0.0001 and 99999. e.g. if one pulse represents 2 pump strokes and the rate display is required in pump strokes, SCALE . r should be set to 2.0. The rate display is independent of the total display. **See section 5.13**

Display	Summary of function

t-bASE	**Timebase**
	Selectable multiplier allowing rate to be displayed in units per second, per minute or per hour.
	Select:
	    tb-0 I for rate / second
	    tb-60 for rate / minute
	  tb-3600 for rate / hour
	See section 5.14

Fi LtEr	**Display filter** Is an adjustable digital filter to reduce the noise on the rate display. The filter has two parameters each represented by a digit adjustable between 0 and 9. The first digit defines the amount of filtering applied to the display, the second digit the deviation from the displayed rate at which the filter will be overridden and the rate display will move rapidly to the new value. **See section 5.15**
uP or dn	**Direction of count** Determines whether input pulses increment or decrement the total display. **See section 5.16**
CLr VAL	**Reset value** Defines a preset number to which the total display will be set when the BA567E-SS Counter is locally or remotely reset. Enables the instrument to count down from a preset number. **See section 5.17**

| Display	Summary of function
LoC CLr	**Local clear** Contains sub-menu with two functions enabling the total and the grand total to be reset via the front panel push buttons while the Counter is in the display mode. **See section 5.18**

CLr tot
When on is selected total display is reset when ▼ and ▲ buttons are operated simultaneously for more than three seconds in the display mode.
See section 5.19

CLr Gtot
When on is selected the grand total may be reset when E and ▲ buttons are operated simultaneously for more than 10 seconds in the display mode - see section 2.2 for details.
Note: Once reset, the grand total can not be restored.
See section 5.20

Display	Summary of function
CLr Gtot	**Resets grand total to zero from within configuration menu.** This function resets the grand total to zero from within the configuration menu when CLr YES is selected. **Note**: Once reset, the grand total can not be recovered. **See section 5.21**

Display	Summary of function
CodE	**Access code** Defines a four digit alphanumeric code that must be entered to gain access to the configuration menu. Default code 0000 disables the security function and allows unrestricted access to all configuration functions. **See section 5.22**
rSEt dEF	**Reset to factory defaults** Returns the BA567E-SS Counter to the factory defaults shown in section 6.0 To prevent accidental use the request must be confirmed by entering SurE before the reset will be executed. **See section 5.23**

Display mode
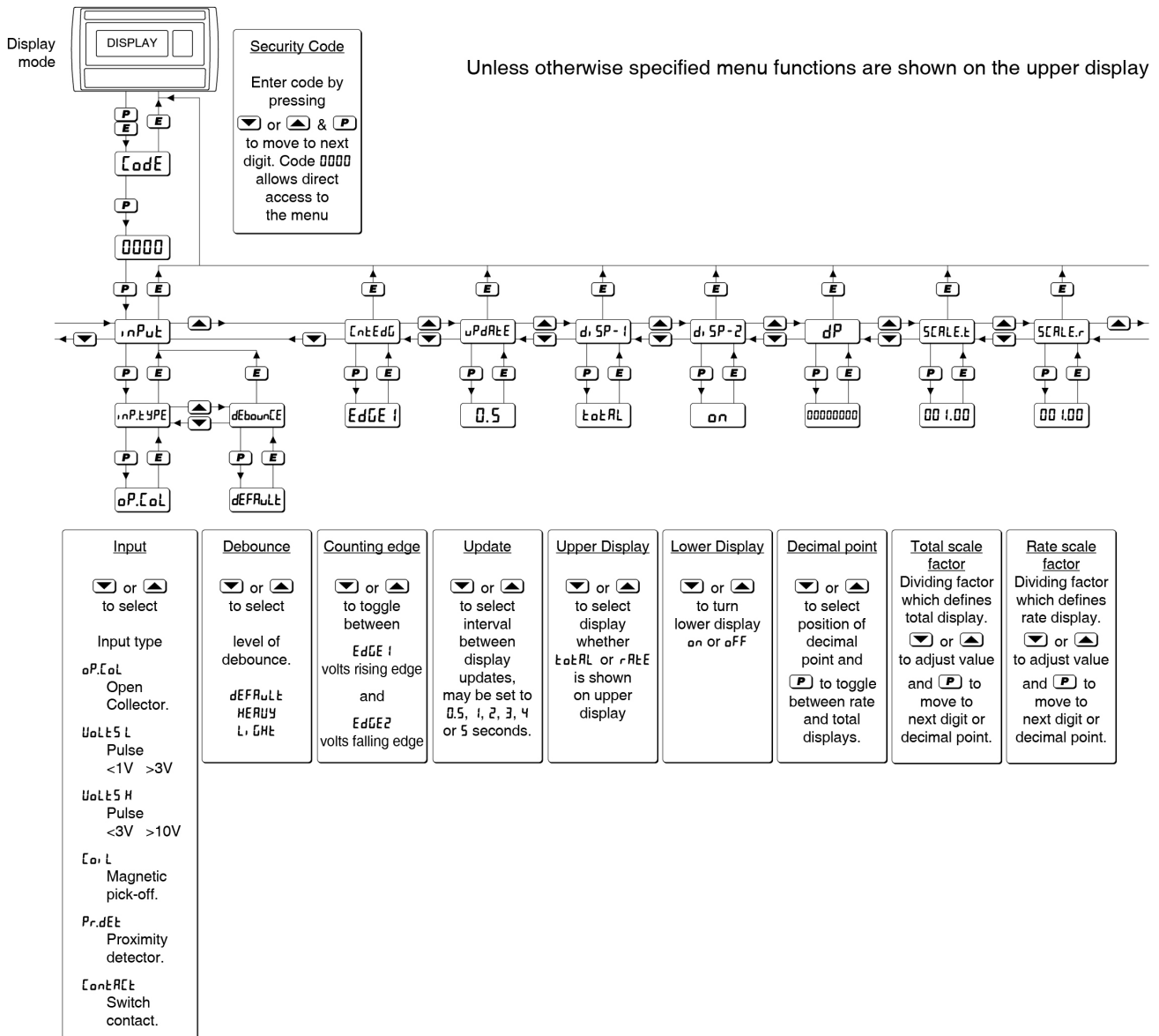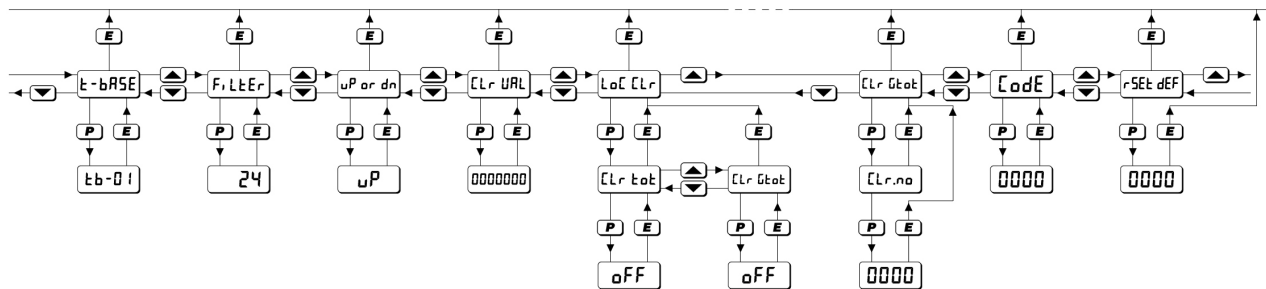
DISPLAY

Security Code

Enter code by pressing
▼ or ▲ & P to move to next digit. Code 0000 allows direct access to the menu

Unless otherwise specified menu functions are shown on the upper display

CodE

0000

inPut   CntEdG   uPdAtE   diSP-1   diSP-2   dP   SCALE.t   SCALE.r

inP.tYPE   dEbounCE   EdGE1   0.5   totAL   on   00000000   001.00   001.00

oP.CoL   dEFAuLt

Input	Debounce	Counting edge	Update	Upper Display	Lower Display	Decimal point	Total scale factor	Rate scale factor
▼ or ▲ to select	▼ or ▲ to select	▼ or ▲ to toggle between	▼ or ▲ to select interval between display updates, may be set to 0.5, 1, 2, 3, 4 or 5 seconds.	▼ or ▲ to select display whether totAL or rAtE is shown on upper display	▼ or ▲ to turn lower display on or oFF	▼ or ▲ to select position of decimal point and P to toggle between rate and total displays.	Dividing factor which defines total display. ▼ or ▲ to adjust value and P to move to next digit or decimal point.	Dividing factor which defines rate display. ▼ or ▲ to adjust value and P to move to next digit or decimal point.
Input type	level of debounce.	EdGE1 volts rising edge and EdGE2 volts falling edge						
oP.CoL Open Collector.	dEFAuLt HEAVY LiGHt							
VoLtS L Pulse <1V >3V								
VoLtS H Pulse <3V >10V								
CoiL Magnetic pick-off.								
Pr.dEt Proximity detector.								
ContACt Switch contact.								

Fig 8 Configuration menu

Optional pulse output, alarms
or 4/20mA output appear here

E   E   E   E   E   E   E   E

| t-bASE | FiLtEr | uP or dn | CLr UAL | LoC CLr | | Clr Gtot | CodE | rSEt dEF |

P E   P E   P E   P E   P E   E   P E   P E   P E

| tb-01 | 24 | uP | 0000000 | CLr tot | CLr Gtot | CLr.no | 0000 | 0000 |

P E   P E   P E

| oFF | oFF | 0000 |

Timebase	Filter input	Direction of count	Reset value	Local total reset	Local grand total reset	Grand total reset	Define Security Code	Reset configuration to factory defaults
▼ or ▲ to select rate display timebase. tb-01 for pulses/sec tb-60 for pulses/min tb-3600 for pulses/hour	▼ or ▲ to adjust value of each digit and P to transfer control to the next digit. First digit: filter magnitude Second digit: step response **Note:** While making adjustments the filtered rate display is shown on lower display so stability can be assessed	▼ or ▲ to toggle between uP and dn	▼ or ▲ to adjust value of each digit and P to transfer control to the next digit.	▼ or ▲ to turn the local total reset function on or oFF. When on is selected, Total may be reset when ▼ and ▲ are pressed simultaneously for more than 3 seconds in the display mode.	▼ or ▲ to turn the local grand total reset function on or oFF. When on, grand total display may be reset when E and ▲ are pressed simultaneously for more than 10 seconds in the display mode.	Press ▼ or ▲ to select CLr.YES to reset grand total to zero Confirm instruction by entering SurE. Press ▼ or ▲ to adjust each digit and P to move to next digit	Enter by pressing ▼ or ▲ and P to move to next digit. Default code 0000 allows direct access to configuration menu	Confirm instruction by entering SurE. Press ▼ or ▲ to adjust each digit and P to move to next digit

5.4 Input: ɪnPuʈ

The Input function contains two sub-functions ɪnP.ʈYPE and dEbounCE that define the type of input and the amount of input noise rejection.

5.5 Input type: ɪnP.ʈYPE

ɪnP.ʈYPE is a sub-menu in the ɪnPuʈ function which defines the type of input sensor or input pulse that the instrument will count. To check or change the type of input, select ɪnPuʈ in the configuration menu and press Ⓟ which will reveal the ɪnP.ʈYPE prompt, pressing Ⓟ again will show the existing Input setting. If set as required press Ⓔ twice to return to the configuration menu, or repeatedly press the ▼ or ▲ button until the required type of input is displayed and then press Ⓔ twice to return to the configuration menu.

One of following six types of input may be selected:

		Switching thresholds	
		Low	High
oP.CoL	Open collector [2]	2	10kΩ
UoLʈ5 L	Voltage pulse low [1]	1	3V
UoLʈ5 H	Voltage pulse high[1]	3	10V
CoɪL	Magnetic pick-off	0	40mV
Pr.dEʈ	Proximity detector [2]	1.2	2.1mA
ConʈRCʈ	Switch contact [2]	100	1000Ω

Notes:

1. Maximum voltage input +30V.

2. For sensors connected to the input that require energising i.e. proximity detectors, switch contacts or open collector sensors, terminals 3 & 4 of the BA567E-SS should be linked together.

3. To count correctly, the input pulse must fall below the lower switching threshold and rise above the higher switching threshold.

4. See section 5.6 for maximum counting frequency.

5.6 Input debounce: dEbounCE

dEbounCE is an adjustable sub-menu in the ɪnPuʈ function which prevents the input miscounting when the input pulse has noisy edges, such as those resulting from a mechanical contact closing and bouncing.

Three levels of protection may be selected. The amount of debounce applied depends upon the type of Counter input that has been selected in the ɪnP.ʈYPE function.

Select ɪnPuʈ in the configuration menu and press Ⓟ which will reveal the ɪnP.ʈYPE prompt, press the ▼ or ▲ button to select dEbounCE followed by Ⓟ to reveal the existing setting. Pressing the ▼ or ▲ button will scroll through the three levels. When the required level has been selected, pressing Ⓔ twice will enter the selection and return the display to the configuration menu.

The following table shows the minimum time that the input pulse must be continuously above the upper input switching threshold and continuously below the lower switching threshold to ensure that the Counter processes the input pulse. Input switching thresholds are shown in section 5.5.

debounce level	Min input pulse width	
	Type of Input	
	Contact	All others
Default	1600μs	40μs
Heavy	3200μs	350μs
Light	400μs	5μs

The maximum counting frequency of the BA567E-SS depends upon the debounce level selected, the shape of the input pulse and its amplitude. The following table assumes a square wave input and is included for guidance. The maximum counting frequency will be lower if the input pulses have sloping edges and the pulse amplitude only slightly exceeds the input switching thresholds.

ONLY FOR GUIDANCE		
debounce level	Max counting frequency	
	Type of input	
	Contact	All others
Default	250Hz	12kHz
Heavy	120Hz	2kHz
Light	1000Hz	100kHz

The minimum counting frequency is 0.01Hz. Below this frequency the rate display is forced to zero.

5.7 Input pulse counting edge: *Cnt EdGE*
This function defines whether the BA567E-SS Counter is incremented/decremented on the leading or trailing edge of an input pulse.

To check or change the input pulse edge on which the count occurs select *Cnt EdGE* from the configuration menu and press Ⓟ which will reveal *EdGE 1* or *EdGE 2*. If required press the ▼ or ▲ button to change the setting, followed by the Ⓔ button to return to the configuration menu.

EdGE 1

Type of input	Counting edge
Voltage	Low to high
Switch contact	Closed to open
Open collector	Closed to open
Proximity detector	High to low current

EdGE 2

Type of input	Counting edge
Voltage	High to low
Switch contact	Open to closed
Open collector	Open to closed
Proximity detector	Low to high current

5.8 Display update interval: *uPdAtE*
If either the rate or the total display is likely to change rapidly, a longer interval between display updates may simplify reading. This function allows one of six different display intervals between 0.5 and 5 seconds to be selected. The selected display update interval does not affect the update time of any other instrument function.

To adjust the update interval select *uPdAtE* from the configuration menu and press Ⓟ to reveal the current update interval. Pressing the ▼ or ▲ button will scroll through the six times. When the required interval has been selected press Ⓔ to enter the selection and return to the configuration menu.

5.9 Upper display: *diSP-1*
Usually the total count is shown on the larger upper eight digit display, but this function reverses the display locations allowing rate to be shown on the larger upper display and total on the smaller lower display.

To check the setting for the display, select *diSP-1* from the configuration menu and press Ⓟ which will reveal if the display is showing *rAtE* or *totAL*. The setting can be changed by pressing the ▼ or ▲ button followed by the Ⓔ button to enter the selection and return to the configuration menu.

5.10 Lower display: *diSP-2*
This function turns the lower display *on* or *oFF*. When turned *oFF*, the BA367E-SS will only have one eight digit display which may be configured in the *diSP-1* function to show the total count or rate.

To check the setting for the lower display, select *diSP-2* from the configuration menu and press Ⓟ that will reveal if the lower display is *on* or *oFF*. The setting may be changed by pressing the ▼ or ▲ button followed by the Ⓔ button to enter the selection and return to the configuration menu.

5.11 Position of the decimal points: *dP*
The upper and lower displays have eight and six digits respectively. This function enables the position of the decimal point in both displays to be independently positioned as shown below.

Upper display		
Total	0 0 0.0.0.0.0.0	1 of 5 positions or absent
Rate	0 0.0.0.0.0	1 of 4 positions or absent
Lower display		
Total	0.0.0.0.0.0	1 of 5 positions or absent
Rate	0 0.0.0.0.0	1 of 4 positions or absent

To adjust the position of the decimal points select *dP* from the configuration menu and press Ⓟ. The upper display defined as the rate or total display by function *diSP-1* (section 5.9) will be activated and identified by the display annunciator as Rate or Total. The decimal point, which may be positioned as shown in the table above, is moved by operating the ▼ or ▲ push button. The ▼ button moves the position of the decimal point to the left and the ▲ button moves the decimal point position to the right.

When the decimal point in the upper display has been positioned pressing the Ⓟ button will transfer control to the lower display variable, but it will be shown and annunciated on the larger upper display. The position of the decimal point may be positioned in the same way by operating the ▼ and ▲ push buttons. When both decimal points are positioned as required, enter the settings and return to the configuration menu by operating the Ⓔ button.

Note:
Adjustment of a decimal point position will disable the following outputs which must be re-enabled after the adjustment is complete:

Optional Pulse output

Optional Alarm outputs

Optional 4/20mA output

5.12 Total scale factor: SCALE.t

SCALE . t is a dividing factor adjustable between 0.0001 and 99999 that enables the total to be displayed in engineering units.   e.g. if one input pulse represents 1 centimetre of dispensed cable and the total display is required in metres, SCALE.t should be set to 100.0 which is the number of centimetres in a metre.   If a display of the total number of input pulses is required, SCALE.t should be set to 1.0. The total display is independent of the rate display.

To check or change the total scale factor select SCALE.t from the configuration menu and press P which will reveal the existing value with one digit flashing.   The value of the flashing digit may be changed by pressing the ▼ or ▲ button.   When this digit has been adjusted as required, pressing P will transfer control to the next digit.   When all the digits have been adjusted pressing P will transfer control to the decimal point that may be positioned between any of the digits, or may be omitted by moving it to the right of the least significant digit.   When the total scale factor has been entered, press P to return to the SCALE.t prompt in the configuration menu.

Note:
Adjustment of SCALE.t will disable the following outputs which must be re-enabled after the adjustment is complete:

Optional Pulse output

Optional Alarm outputs

Optional 4/20mA output

5.13 Rate scale factor: SCALE.r

SCALE . r is a dividing factor adjustable between 0.0001 and 99999 that enables the rate display to be in engineering units.   e.g. if one input pulse represents 2 pump strokes and the rate display is required in pump strokes, SCALE.r should be set to 2.0.   If just the rate of input pulses is required, SCALE.r should be set to 1.0. The rate display is independent of the total display.

The units of the rate display are counts per unit of time.   The unit of time is the timebase of the instrument which is determined by t-bASE described in section 5.14.

To check or change the rate scale factor select SCALE.r from the configuration menu and press P which will reveal the existing value with one digit flashing.   The value of the flashing digit may be adjusted by pressing the ▼ or ▲ button.

When this digit has been adjusted as required, pressing P will transfer control to the next digit. When all the digits have been adjusted pressing P will transfer control to the decimal point that may be positioned between any of the digits, or may be omitted by moving it to the right of the least significant digit. When the required rate scale factor has been entered, press E to return to the SCALE.r prompt in the configuration menu.

Note:
Adjustment of SCALE.r will disable the following outputs which must be re-enabled after the adjustment is complete:

Optional Pulse output

Optional Alarm outputs

Optional 4/20mA output

5.14 Timebase: t-bASE

The timebase multiplies the rate display by 1, 60 or 3,600 depending upon whether the BA567E-SS Counter is required to display rate per second, per minute or per hour.   See Fig 7.

To check or change the timebase, select t-bASE from the configuration menu and press P which will reveal the current setting.   Pressing the ▼ or ▲ button will scroll through the three options:

tb-1	for pulses / second
tb-60	for pulses / minute
tb-3600	for pulses / hour

When the required multiplier is displayed press E to return to the t-bASE prompt in the configuration menu.

5.15 Display filter: FiLtEr

The digital display filter has two independent adjustable parameters enabling the rate display response to be tailored for optimum performance. The filter parameters are controlled by a two digit number. The first digit defines the amount of filtering applied to the display as shown below.

First digit	Filter time constant Seconds
0X	0
1X	1.3
2X	4.3
3X	6.5
4X	8.7
5X	11.3
6X	15.7
7X	20.9
8X	25.2
9X	31.5

The second digit defines the deviation from the displayed rate at which the filter will be overridden and the rate display will move rapidly to the new value.

Second digit	Magnitude of step change which will produce a rapid response
X0	Off
X1	1%
X2	2%
X3	4%
X4	8%
X5	12%
X6	16%
X7	24%
X8	32%
X9	64%

By careful adjustment of the two parameters a stable display with an acceptable input step response can be obtained for most applications.

During commissioning it is recommend that initially the second digit is set to 0 (off) and the first digit is adjusted to provide acceptable rate display stability. The second digit should then be increased until the selected step size is greater than the noise on the display signal, at which setting the rate display will become stable. These will be the optimum filter parameters for acceptable rate display stability and a fast response to a large rate signal change.

To check or change the filter select FiLtEr in the configuration menu and press P which will reveal the current settings with the first digit flashing. Pressing the ▼ or ▲ button will adjust the flashing digit and P will transfer control to the second digit. While making adjustments the filtered rate display is shown on the lower display so that stability can be assessed while adjustments are being made. When set as required, press the E button to enter the revised parameters and return to the FiLtEr prompt in the configuration menu.

5.16 Direction of count: uP or dn
This function defines whether input pulses increment or decrement the total display.   i.e. whether the BA567E-SS is an up-counter or a down-counter.

When configured as a down-counter with a non-zero number entered for the reset value CLr URL, the BA567E-SS will count down from the reset value to zero.

To check or change the count direction select uP or dn from the configuration menu and press P which will reveal the present setting.   uP indicates that the instrument is an up-counter and dn that it is a down counter. Pressing the ▼ or ▲ buttons will toggle the instrument between the two settings. When set as required, press the E button to enter the setting and return to the configuration menu.

5.17 Reset value: CLr URL
This function defines the value to which the total display is reset when the local or remote reset are operated. This allows the BA567E-SS to be used as a preset down-counter.

When the instrument is used as an up-counter, CLr URL is normally set to zero.

To check or change the reset value select CLr URL from the configuration menu and press P which will reveal the current setting with one digit flashing. The flashing digit may be adjusted by pressing the ▼ or ▲ button.   When this digit is correct, pressing P will transfer control to the next digit.

When all the digits have been adjusted press the E button to enter the revised number and return to the configuration menu.

5.18 Local reset: LoC CLr
The Local reset function contains two sub-functions CLr tot and CLr Gtot which when enabled allow the total display and grand total to be reset via the instrument front panel push buttons while the BA567E-SS Counter is in the display mode.

5.19 Local total reset: ɔLr ʈoʈ

ɔLr ʈoʈ is a sub-menu in the Loɔ ɔLr function. When activated it allows an operator to reset the total display to the reset value [see section 5.17] while the BA567E-SS Counter is in the display mode by operating the ▼ and ▲ push buttons simultaneously for more than three seconds.

To check or change the setting select Loɔ ɔLr in the configuration menu and press Ⓟ which will reveal the ɔLr ʈoʈ prompt, operating Ⓟ again will show if the local total reset is on or oFF. If set as required operate the Ⓔ button twice to return to the configuration menu, or the ▼ or ▲ button to change the setting followed by the Ⓔ button twice to enter the change and return to the Loɔ ɔLr prompt in the configuration menu.

Note:
> The total display may also be remotely reset to the reset value by connecting terminals RS1 and RS2 together for more than one second. See sections 3.3 of this manual.

6.20 Local grand total reset: ɔLr Gʈoʈ

The grand total is a separate sixteen digit counter which is incremented or decremented in parallel with the total display, but is not reset when the total display is reset. The grand total may be viewed in the display mode in two eight digit sections as described in section 2.2 of this manual.

ɔLr Gʈoʈ is a sub-menu in the Loɔ ɔLr function which when activated allows the operator to reset the grand total display to zero from the display mode by operating the Ⓔ and ▲ push buttons simultaneously for more than ten seconds.

To check or change setting select Loɔ ɔLr in the configuration menu and press Ⓟ which will reveal ɔLr ʈoʈ. Using the ▼ or ▲ button select ɔLr Gʈoʈ and press Ⓟ which will show if local grand total reset is on or oFF. If set as required operate the Ⓔ button twice to return to the configuration menu, or the ▼ or ▲ button to change the setting followed by the Ⓔ button twice to enter the change and return to the Loɔ ɔLr prompt in the configuration menu.

Note:
> Once reset, the grand total can not be recovered.

5.21 Reset grand total from configuration menu: ɔLr Gʈoʈ

The grand total is a separate sixteen digit counter which is incremented or decremented in parallel with the total display, but is not reset when the total display is reset. The grand total may be viewed in the display mode in two eight digit sections as described in section 2.2 of this manual.

To zero the grand total from within the configuration menu select ɔLr Gʈoʈ and press Ⓟ which will cause the instrument to display ɔLr.no with no flashing. Using the ▼ or ▲ push button change ɔLr no to ɔLr YES pressing Ⓟ will result in the instrument displaying 0000 with the first digit flashing. This is a request to confirm the reset instruction by entering SurE. Using the ▼ or ▲ button set the first flashing digit to S and press Ⓟ to transfer control to the second digit which should be set to u. When SurE has been entered pressing the Ⓔ button will reset the grand total which will be confirmed by a brief display of Gʈ ɔLrd, the instrument will automatically return to the ɔLr Gʈ prompt in the configuration menu.

Note:
> Once reset, the grand total can not be recovered.

5.22 Security code: ɔodE

Access to the instrument configuration menu may be protected by a four digit security code which must be entered to gain access. New instruments are configured with the default security code 0000 which allows unrestricted access to all configuration functions.

To enter a new security code select ɔodE from the configuration menu and press Ⓟ which will cause the BA567E-SS Counter to display 0000 with one digit flashing. The flashing digit may be adjusted using the ▼ and ▲ push buttons, when set as required operating the Ⓟ button will transfer control to the next digit. When all the digits have been adjusted press Ⓔ to return to the ɔodE prompt. The revised security code will be activated when the BA567E-SS Counter is returned to the display mode.

Please contact BEKA associates sales department if the security code is lost.

5.23 Reset configuration to factory defaults: rSEt dEF

This function returns the BA567E-SS Counter to the factory defaults shown in section 5.0. To prevent accidental use the request must be confirmed by entering SurE before the configuration change will be executed.

Select rSEt dEF from the configuration menu and press Ⓟ the instrument will display 0000 with the first digit flashing. To confirm the instruction to reset all the configuration functions to factory defaults SurE must be entered. Using the ▼ or ▲ button set the first flashing digit to S and press Ⓟ to transfer control to the second digit which should be set to u. When SurE has been entered pressing the Ⓔ button will reset all the configuration functions to the factory default settings and zero both the total display and the grand total. While resetting the BA567E-SS Counter will display - - - - - - - - before automatically returning to the display mode when the operation is complete.

5.24 Display overflow

The BA567E-SS Counter total has a maximum display range of -9999999 to 99999999 when shown on the eight digit upper display. If this range is exceeded the display will be as shown below with all of the decimal points flashing:

Underrange   -9.9.9.9.9.9.9

Overrange   9.9.9.9.9.9.9.9

When the total is shown on the lower six digit display the maximum display range is -99999 to 999999.

When a total overflow occurs the actual total may be obtained from the instrument's grand total display which has sixteen digit - see 2.3.

To prevent future total display overflows occurring the total scale factor SCALE.t and the position of the decimal point in the total display dP should be reviewed.

6. CONFIGURATION EXAMPLE

A BA567E-SS Counter is required to display the total number of strokes that a reciprocating pump makes in thousands of strokes on the larger upper display and to show the speed of pumping in strokes per hour on the lower display. The stroke sensor is a proximity detector which produces four pulses per stroke. The total display is only to be resettable by an external contact, not from the BA567E-SS Counter front panel. Similarly the grand total is not to be resettable from the BA567E-SS Counter front panel. To simplify reading the BA567E-SS display is to be updated every 3 seconds and to prevent tampering the instrument configuration menu is to be protected by security code 1209.

The BA567E-SS may be configured on-site without disconnection from the power supply or from the proximity detector. This example assumes that the BA567E-SS initially has default factory configuration.

If after accessing the configuration menu the interval between operating any front panel push button exceeds one minute the BA567E-SS will automatically return to the display mode and any configuration changes will not be stored in permanent memory. When making multiple changes it is therefore sensible to occasionally return to the display mode to save the changes that have already been made.

Step 1   Enter the configuration menu
Put the BA567E-SS Counter in the configuration mode by simultaneously pressing the ⓟ and ⒠ push buttons. Assuming a security code has not already been entered the instrument will respond by displaying ɩnPuɫ which is the first parameter in the configuration menu. See Fig 8.

Step 2   Select the type of inputs
With ɩnPuɫ displayed; press ⓟ to reveal the ɩnPuɫ.ɫУPE submenu and press ⓟ again to enter the function. Using the ⓥ or ⓐ button select PrdEɫ, the input for a 2-wire proximity detector and then return to the ɩnPuɫ prompt in the configuration menu by pressing ⒠ twice. A proximity detector requires energising therefore terminals 3 and 4 of the BA567E-SS should be linked together.

Step 3   Select display update
To aid reading the display the BA567E-SS is only to be updated every 3 seconds.
Select uPdRɫE from the configuration menu and press ⓟ. Using the ⓥ or ⓐ button select Ʒ and press ⒠ to return to the uPdRɫE prompt in the configuration menu.

Step 4   Define function of upper display
In the example the total number of strokes is required on the larger eight digit upper display.
Select dɩ5P-ɩ from the configuration menu and press ⓟ which will reveal if the upper display is showing rRɫE or ɫoɫRL. Using the ⓥ or ⓐ button select ɫoɫRL followed by the ⒠ button to enter the selection and return to the configuration menu.

Step 5   Activate lower rate display
A rate display is required so the lower display must be activated.
Select dɩ5PLRУ.2 from the main menu and press ⓟ to show the existing setting. Using the ⓥ or ⓐ button select on followed by ⒠ to enter the selection and return to the configuration menu.

Step 6   Position of decimal point
In this example the BA567E-SS is required to display total and rate with no decimal points.

Select dP. from the configuration menu and press ⓟ. The BA567E-SS will show and identify the total display with all the digits activated. Using the ⓥ or ⓐ button position the decimal point to the right of the least significant digit i.e. not visible.
Operating the ⓟ button will show and identify the rate display with all the digits activated, Again using the ⓥ or ⓐ button position the decimal point to the right of the least significant digit i.e. not visible.
Finally press ⒠ to return to the configuration menu.

Step 7 **Enter the total scale factor**
In this example the proximity detector produce four pulses per pump stroke. The BA567E-SS is required to display thousands of pump strokes therefore the total scale factor 5CRLEE should be set to (4 x 1000) = 4000.

Select 5CRLEE from the configuration menu and press ⒫ to view the current value with one digit flashing. Use the ⒧ or ⒩ button to adjust the flashing digit and the ⒫ button to transfer control to the next digit and to the decimal point. Enter 40000 and return to the 5CRLEE prompt in the configuration menu by pressing ⒠.

Step 8 **Enter the rate scale factor**
The proximity detector produces four pulses per pump stroke and the rate display is required in strokes per hour, therefore the rate scale factor 5CRLE should be set to 4.0.

Select 5CRLE from the configuration menu and press ⒫ to view the current value with one digit flashing. Use the ⒧ or ⒩ button to adjust the flashing digit and the ⒫ button to transfer control to the next digit and to the decimal point. Enter 40 and return to the 5CRLE prompt in the configuration menu by pressing ⒠.

Step 9 **Set the display timebase**
In this example the rate display is required in pump strokes per hour.
Select E-bR5E from the configuration menu and press ⒫ to reveal the current setting. Using the ⒧ or ⒩ button scroll through the three options and select Eb-3600. Return to the E-bR5E prompt in the configuration menu by pressing ⒠.

Step 10 **Adjust the rate display filter**
The rate display filter parameters should be adjusted experimentally after installation to provide a stable rate display with an acceptable step response.

During commissioning it is recommend that initially the second digit of the rate parameters is set to 0 (step response off) and the first digit (amount of filtering) is adjusted to provide acceptable rate display stability.

The second digit should then be increased until acceptable rate display stability is once again achieved.
To adjust the filter parameters select FiLEEr from the main menu and press ⒫ to reveal the current setting. The first digit will be flashing and may be adjusted using the ⒧ or ⒩ button. The ⒫ button will transfer control to the second digit. When both are set as required, return to the FiLEEr prompt in the configuration menu by pressing ⒠.

Note: While adjusting the filter, the rate is shown on the lower display so that stability can be assessed.

Step 11 **Define the security code**
Defining an access security code prevents unauthorised access to the configuration menu. Select CodE in the configuration menu and press ⒫ which will reveal the existing security code with the first digit flashing. Enter the new code 1209 using the ⒧ or ⒩ button to adjust the flashing digit and the ⒫ button to transfer control to the next digit. When the new code has been entered, press ⒠ to return to the configuration menu.

Step 12 **Return to the display mode**
Following completion of configuration, return the BA567E-SS to the display mode by pressing ⒠. The instrument will display dRER followed by 5RUE while the configuration changes are stored in permanent memory.

The BA567E-SS was assumed to initially have factory default configuration, therefore the counting edge, counting direction, local total and local grand total resets were not reconfigured as they already complied with the requirements for this example.

During commissioning the debounce and filter functions may need adjustment to obtain a stable display.

7. MAINTENANCE

7.1 Fault finding during commissioning

If a BA567E-SS Counter fails to function during commissioning the following procedure should be followed:

Symptom	Cause	Check:
No display	No power supply, or incorrect wiring. Note: Terminals 2, 6 & RS2 are interconnected within the instrument.	That there is between 10 and 30V on terminals 1 & 2 with terminal 1 positive.
Counter is receiving power but pulse input indicator not rotating.	No input pulses, incorrect input configuration, incorrect linking of terminals 3 & 4.	Input configuration. Linking of terminals 3 & 4. That input signal polarity is correct.
Pulse input indicator rotating but incorrect rate display.	Incorrect rate display calibration	SCALEr t-bASE
Pulse indicator indicator rotating but incorrect total display.	Incorrect total display calibration. Remote reset switch contacts closed.	SCALEt That rESEt annunciator is not activated. If it is, check reset wiring and switch.
Unstable rate display	Noisy pulse input signal	Eliminate source of electrical noise. Increase debounce and/or display filter.
Unable to enter configuration menu.	Incorrect security code	That the correct security code is being used. Contact BEKA if code is lost.
Optional 4/20mA or pulse output do not function	Output has been disabled following configuration change	Re-enable output
Optional alarms do not function	Alarms have been disabled following configuration change.	Re-enable both alarms.

7.2 Fault finding after commissioning

ENSURE PLANT SAFETY BEFORE STARTING MAINTENANCE

Live maintenance is permitted on intrinsically safe equipment installed in a hazardous area, but only certified test equipment should be used unless a gas clearance certificate is available.

If a BA567E-SS Counter fails after it has been functioning correctly, the following table may help to identify the cause of the failure.

Symptom	Cause	Check:
No display	No power supply.	That there is between 10 and 30V on terminals 1 & 2 with terminal 1 positive
Pulse input indicator not rotating.	No input pulses	Output from sensor. Wiring between sensor and BA567E-SS Counter.
Unstable rate display	Noisy pulse input signal	Locate source of electrical noise, or increase debounce and rate display filter.

If this procedure does not reveal the cause of the fault, it is recommended that the instrument is replaced.

5.3 Servicing

We recommend that faulty BA567E-SS Counters are returned to BEKA associates or to our local agent for repair.

5.4 Routine maintenance

The mechanical and electrical condition of the instrument should be regularly checked. Inspection frequency should be adjusted to suit the environmental conditions.

5.5 Guarantee

Instruments which fail within the guarantee period should be returned to BEKA associates or our local agent. It is helpful if a brief description of the fault symptoms is provided.

5.6 Customer comments

BEKA associates is always pleased to receive comments from customers about our products and services. All communications are acknowledged and whenever possible, suggestions are implemented.

8. ACCESSORIES

Accessories for the BA567E-SS Counter are shown below, all except the scale card are factory fitted and should be specified when the instrument is ordered:

Scale card

Tag number

Backlight [1]

Isolated pulse output [2]
or
Isolated 4/20mA output [2]
or
Isolated dual alarms [2]

Notes:

1. Internally powered

2. Only one of the three output options can be fitted to a BA567E-SS.

8.1 Scale card

The BA567E-SS has a window on the right hand side of the display through which to view a scale card showing the units of measurement such as Strokes or Metres.   New Counters are fitted with a scale card showing the units of measurement specified when the instrument was ordered, if the units are not specified a blank scale card will be fitted.   A pack of scale cards pre-printed with common units of measurement is available as an accessory. These can easily be fitted on-site to the Counter without opening the instrument enclosure or removing it from the panel, See section 4.5 of this instruction manual.

Custom scale cards for applications requiring less common units of measurement are also available.

8.2 Tag information

A tag number or application information can be printed onto the rear panel adjacent to the terminals. This information is not visible from the front of the instrument after installation.

8.3 Alarms

Only one of the following accessories may be fitted: dual alarms, pulse output or 4/20mA output.

The BA567E-SS Counter can be supplied with factory fitted dual solid state single pole alarm outputs that may be independently configured as high or low, rate or total alarms with normally open or normally closed outputs.

Configurable functions for each alarm include adjustable setpoint, alarm delay time and alarm silence time.   Hysteresis may be applied to rate alarms.

CAUTION
Alarm outputs should not be used for critical safety applications such as a shut down system.

When the BA567E-SS power supply is turned off or disconnected, alarm outputs will open irrespective of whether normally open or normally closed outputs have been selected. When designing a system an open output should therefore be chosen for the alarm condition.

Alarm annunciators on the instrument display indicate the status of each alarm. If an alarm delay or silence time has been selected the annunciator will flash during the delay or silence period.

The BA567E-SS internal counters are up-dated and compared with the alarm setpoint twice per second, irrespective of the display update time selected. This may result in an alarm being delayed for up to half a second after the rate or total has exceeded the setpoint.

8.3.1 Solid state output

Each alarm has a galvanically isolated single pole solid state switch output as shown in Fig 14. The outputs are polarised and current will only flow in one direction.   Terminals A1 and A3 should be connected to the positive side of the supply.

$$Ron \quad = \quad less\ than\ 5\Omega + 0.7V$$
$$Roff \quad = \quad greater\ than\ 1M\Omega$$

Note: Because of the series protection diode some test meters may not detect a closed alarm output
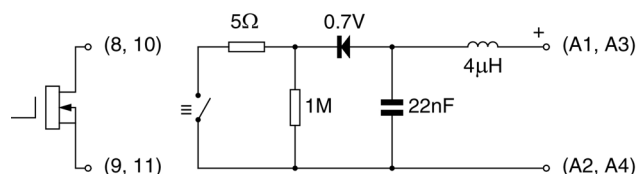
Fig 9 Equivalent circuit of each alarm output

The solid state output of each alarm may be used to switch any circuit with parameters equal or less than:

$$V \quad = \quad 30V$$
$$I \quad = \quad 200mA$$
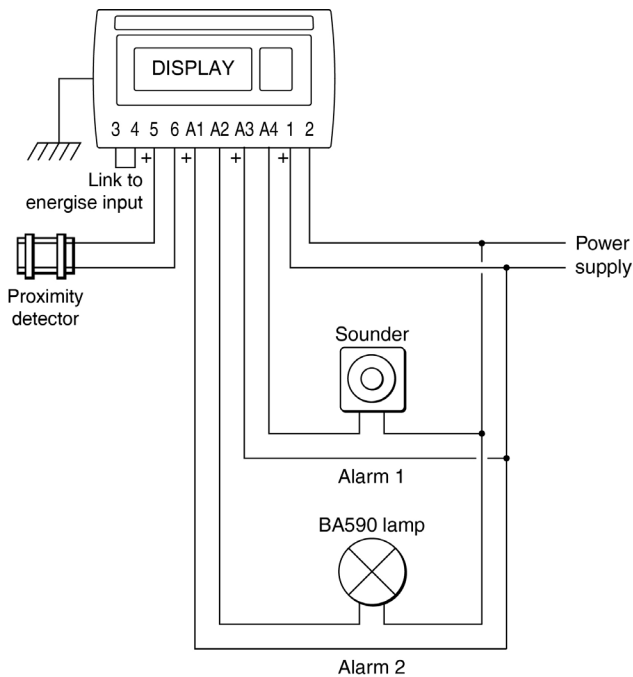
Fig 10 Typical alarm application

8.3.2 Configuration summary
When a BA567E-SS Counter is supplied with alarms the configuration menu is extended as shown in Fig 11.   Each alarm may be configured to operate on the rate or total display.

For simplicity Fig 11 only shows the configurable functions on the rate option of alarm AL1, the total options is identical except that the total alarms can not have hysteresis.   Configuration of alarm AL2 is identical to alarm AL1.

The following table summarises each of the alarm configuration functions and includes a cross reference to more detailed information.   Again only the functions on alarm AL1 are listed.

Display	Summary of function
EnbL	**Alarm enable** Enables or disables the alarm without changing the alarm parameters. See section 8.3.3
tYPE	**Type of alarm** Defines whether the alarm operates on the rate or total display. See section 8.3.4
SP1r or SP1t	**Alarm setpoint 1** Adjusts the alarm setpoint. The alarm is activated when the rate or total display equals the setpoint. **Note:** SP1r is displayed for a rate alarm and SP1t for a total alarm. See section 8.3.5
Hi.Lo	**Alarm function** Defines whether the alarm has a high or low function. See section 8.3.6
no.nC	**Normally open or normally closed output.** Determines whether the single pole alarm output is open or closed in the non-alarm condition. See section 8.3.7
HStr	**Hysteresis** Adjusts the alarm hysteresis. Only available on a rate alarm. See section 8.3.8
dELA	**Alarm delay time** Adjusts the delay between the display equalling the alarm setpoint and the alarm output being activated. See section 8.3.9
SiL	**Alarm silence time** Defines the time that the alarm output remains in the non-alarm condition following acceptance of an alarm. See section 8.3.10
FLSH	**Flash display when alarm occurs** When enabled, alternates the rate or total display between process value and alarm reference AL1 or AL2 when an alarm output is activated. See section 8.3.11
ACSP	**Access setpoint** Sub-menu that enables direct access to the alarm setpoints from the display mode and defines a separate security code. See section 8.3.12
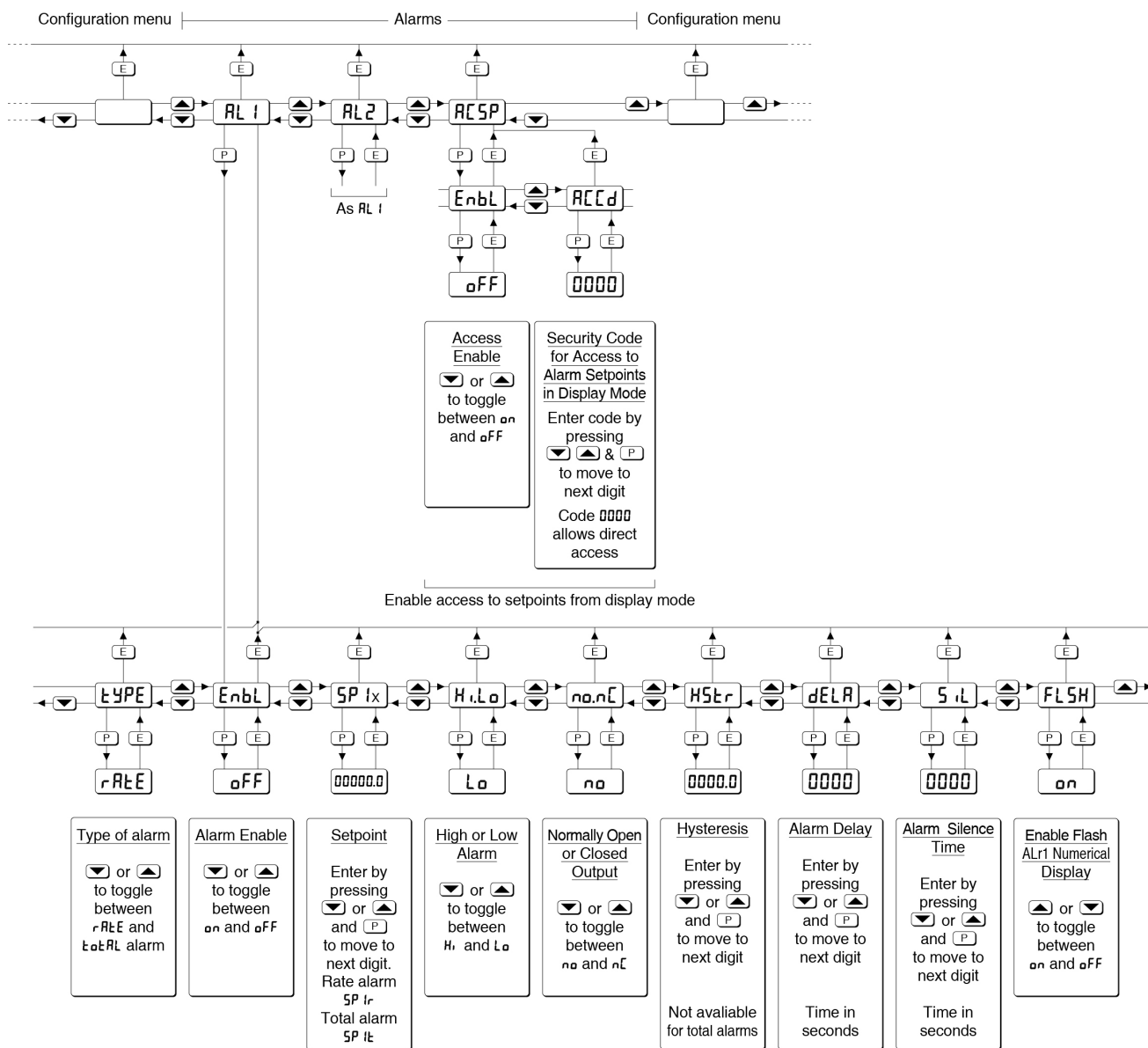
Fig 11 Alarm Configuration Functions in Configuration Menu

8.3.3 Alarm enable: EnbL

This function allows the alarm to be enabled or disabled without altering any of the alarm parameters. Using the ▼ or ▲ push button select AL1 or AL2 from the configuration menu and press P to reach EnbL in the alarm sub-menu. Pressing P will then reveal the existing setting. The function can be changed by pressing the ▼ or ▲ push button followed by the E button to return to the alarm sub-menu.

8.3.4 Type of alarm: tYPE

Alarm 1 and Alarm 2 are totally independent, both may be rate or total alarms, or one may be conditioned for rate and the other for total.

Using the ▼ or ▲ push button select tYPE from the selected alarm sub-menu and press P to check or change the function. The ▼ or ▲ push button will toggle the selection between rAtE and totAL, when set as required press the E button to return to the alarm sub-menu.

Note: When tYPE is changed, the alarm configuration is automatically reset to the default values and the alarm is disabled. It must therefore be reconfigured before use.

8.3.5 Setpoint adjustment: SP1x & SP2x

The rate alarm setpoints SP1r and SP2r may be positioned anywhere between -99999 and 999999, and the total alarm setpoint SP1t and SP2t anywhere between -9999999 and 99999999.

All the setpoints are adjusted in the same way, for example, to adjust the setpoint of Alarm 1 which has been configured to operate on the rate display. Using the ▼ or ▲ push button select SP1r in the AL1 sub-menu and press Ⓟ which will reveal the existing setpoint with one digit flashing. The required setpoint can be entered using the ▼ or ▲ push button to adjust the flashing digit and the Ⓟ button to transfer control to the next digit. When set as required press Ⓔ to enter the value and return to the SP1r prompt in the alarm 1 sub-menu.

8.3.6 Alarm function: Hi.Lo

Alarm 1 and Alarm 2 are totally independent, both may be Hi or Lo, or one may be conditioned as a Hi alarm and the other as a Lo alarm.
Using the ▼ or ▲ push button select Hi.Lo from the selected alarm sub-menu and press Ⓟ to check or change the function. The ▼ or ▲ push button will toggle the alarm function between Hi and Lo, when set as required, press the Ⓔ button to return to the Hi.Lo prompt in the alarm sub-menu.

8.3.7 Alarm output status: no.nC

Each single pole alarm output may be open or closed in the non-alarm condition. When the BA567E-SS power supply is turned off or disconnected, the alarm output(s) will open irrespective of whether normally open or normally closed outputs have been selected. Therefore, when designing an alarm system normally closed nC should be selected so that the output opens when an alarm occurs or if the power supply fails.

Using the ▼ or ▲ push button select no.nC from the selected alarm sub-menu and press Ⓟ to check or change the function. The ▼ or ▲ push button will toggle the contact status between no and nC, when set as required, press the Ⓔ button to return to the no.nC prompt in the alarm sub-menu

8.3.8 Hysteresis: HStr

Hysteresis is only available on rate alarms so the HStr function only appears in the configuration sub-menu when alarm tYPE has been set to rAtE. During configuration hysteresis is shown in the units of rate previously configured for the rate display.

Using the ▼ or ▲ push button select HStr in the selected alarm sub-menu and press Ⓟ which will reveal the existing hysteresis with one digit flashing.

The required hysteresis can be entered using the ▼ or ▲ push button to adjust the flashing digit and the Ⓟ button to transfer control to the next digit. When set as required press Ⓔ to enter the value and return to the HStr prompt in the alarm sub-menu.

e.g. A BA567E-SS Counter configured to display a rate of 0 to 5000, with a high alarm set at 4000 and hysteresis of 100 will perform as follows:

High alarm will be activated when rate equals or exceeds 4000, but will not reset until the rate falls below 3900.

8.3.9 Alarm delay: dELA

This function enables activation of the alarm output to be delayed for a fixed time following the alarm condition occurring. The delay can be set in 1 second increments up to 3600 seconds. If a delay is not required zero should be entered.

To adjust the delay select dELA using the ▼ or ▲ push button in the selected alarm sub-menu and press Ⓟ which will reveal the existing delay time in seconds with one digit flashing. The required delay time can be entered using the ▼ or ▲ push button to adjust the flashing digit and the Ⓟ button to transfer control to the next digit. When set as required press Ⓔ to enter the value and return to the dELA prompt in the alarm sub-menu.

The alarm annunciator will start flashing immediately an alarm occurs and will continue for the delay time, after which the alarm output will be activated and the alarm annunciator will be permanently activated.

8.3.10 Alarm silence time: Si L

The alarm silence function is primarily intended for use in small installations where the alarm output directly operates an annunciator such as a sounder. When the alarm silence time is set to any figure other than zero, the Ⓟ push-button becomes an alarm accept button.

After an alarm has occurred, operating the Ⓟ button will cause the alarm output to revert to the non-alarm condition for the alarm silence time. When an alarm is silenced the alarm annunciator will flash until the silence time expires.

To adjust the alarm silence time select Si L using the ▼ or ▲ push button in the selected alarm sub-menu and press Ⓟ which will reveal the existing alarm silence time in seconds with one digit flashing. The required silence time can be entered using the ▼ or ▲ push button to adjust the flashing digit and the Ⓟ button to transfer control to the next digit. When set as required press Ⓔ to enter the value and return to the Si L prompt in the alarm sub-menu.

8.3.11 Flash display when alarm occurs: FLSH

In addition to the two alarm annunciators on the left hand side of the BA567E-SS Counter display which show the status of both alarms, this function provides an even more conspicuous indication that an alarm condition has occurred.

When enabled, this function alternates the rate or total display between the numerical value and the alarm identification AL1 or AL2 when an alarm occurs.

Using the ▼ or ▲ push button select FLSH from the selected alarm sub-menu and press ℗ to check or change the function. The ▼ or ▲ push button will toggle the function between oFF and on, when set as required, press the ℰ button to return to the FLSH prompt in the alarm sub-menu.

8.3.12 Access Setpoint: ACSP

This function activates a separate menu that provides direct access to the alarm setpoints from the display mode by simultaneously operating the ℗ and ▲ buttons. An operator can therefore adjust the alarm setpoints without having access to the configuration and alarm sub-menus. Protection against unauthorised or accidental adjustment is provided by a separate security access code.

Using the ▼ or ▲ push button select ACSP from the configuration menu and press ℗ to reach the enable function EnbL. Pressing ℗ will reveal the existing setting which can be toggled between on and oFF by pressing the ▼ or ▲ push button. When set as required, press the ℰ button to return to the EnbL prompt from which a separate security access code can be entered using the ACCd function which can be selected using the ▼ or ▲ push button.

To enter a new security code select ACCd from the sub-menu and press ℗ which will cause the BA567E-SS Counter to display 0000 with one digit flashing. The flashing digit may be adjusted using the ▼ and ▲ push buttons, when set as required operating the ℗ button will transfer control to the next digit. When all the digits have been adjusted press ℰ to return to the ACCd prompt. The revised security code will be activated when the BA567E-SS Counter is returned to the display mode. Default security access code 0000 will disable the security code allowing direct access to the setpoints in the display mode by pressing the ℗ and ▲ buttons simultaneously.

Please contact BEKA associates sales department if the security code is lost.

8.3.13 Adjusting alarm setpoints from the display mode

Access to the two alarm setpoints from the BA567E-SS Counter's display mode is obtained by operating the ℗ and ▲ push buttons simultaneously as shown in Fig 12. If the setpoints are not protected by a security code the alarm setpoint prompt SP1r or SP1t will be displayed depending upon whether a rate or total alarm has been configured. If the setpoints are protected by a security code, CodE will be displayed first. Pressing ℗ again will allow the alarm setpoint security code to be entered digit by digit using the ▼ or ▲ button to adjust the flashing digit and the ℗ push button to move control to the next digit. If the correct code is entered pressing ℰ will then cause alarm setpoint prompt SP1x to be displayed. If an incorrect security code is entered, or a button is not pressed within ten seconds, the instrument will automatically return to the display mode.

Once within the menu pressing the ▼ or ▲ buttons will toggle the display between the two alarm setpoint prompts SP1x and SP2x.
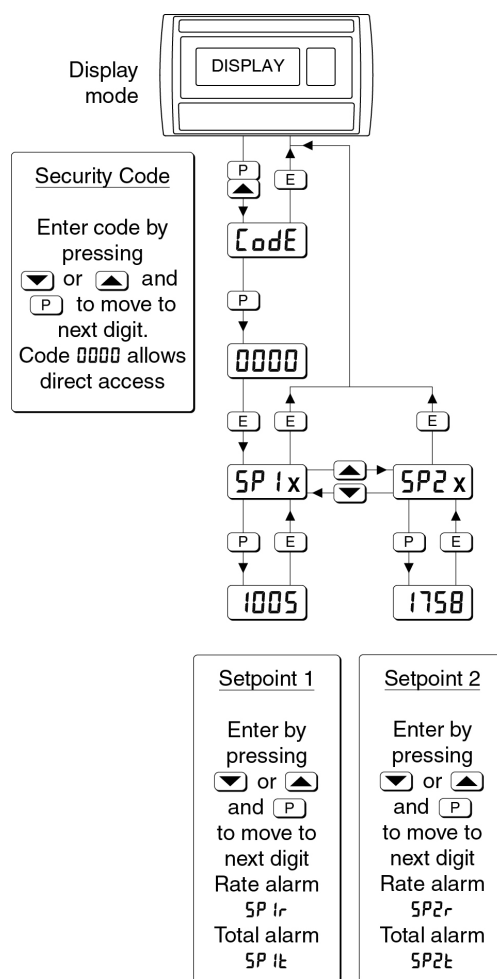
Fig 12 Setpoint adjustment from the display mode

To adjust an alarm setpoint select 5P 1x or 5P 2x and press Ⓟ which will reveal the current setting. The flashing digit of the setpoint may be adjusted using the ▼ and ▲ push buttons and the Ⓟ button to move control to the next digit. When the required setpoint has been entered, pressing Ⓔ will return the display to the 5P 1x or 5P 2x prompt from which the other setpoint may be selected, or the instrument may be returned to the display mode by pressing Ⓔ again.

Note: Direct access to the alarm setpoints from the display mode is only available when the RCSP menu is enabled - see section 8.3.12

8.4 Pulse output

Only one of the following accessories may be fitted: dual alarms, pulse output or 4/20mA output.

The BA567E-SS Counter can be supplied with a factory fitted opto-isolated solid state pulse output. The output is an open collector having the following electrical parameters:

Ron   =   60Ω + 3V
Roff   =   1M
Imax   =   10mA

The output pulse may be a duplicate of the input pulse for re-transmission applications, or it may be derived from the total display. When derived from the total display the output pulse frequency may be divided and the output pulse width defined.

The retransmitted RTx annunciator on the instrument display shows the status of the retransmitted pulse output. Annunciator activation depends upon the setting of 5ourCE in the pulse output configuration menu.

SCALEd
Annunciator activated each time pulse output open collector is *on*,   i.e. Ron is less than 60Ω + 3V.

di rECt
Annunciator continuously activated

8.4.1 System design

The BA567E-SS Counter's optional pulse output is a passive circuit i.e. not powered, but it is totally isolated from all other Counter circuits. Terminals P1 and P2 may be connected to any other instrument with an open collector input.

Fig 13 shows how a voltage pulse may be generated that could be used to drive a remote counter. The positive terminal of the pulse output circuit P1 is connected to the BA567E-SS Counter's positive supply terminal 1 at the instrument. When an output pulse occurs and the open collector output 'closes', P2 is connected to P1 and a pulse current flows through resistor R1. The current flowing in the circuit is determined by resistor R1 which should be chosen to limit the pulse output current to less than 10mA. For a 24V supply R1 should be greater than 2,200Ω.
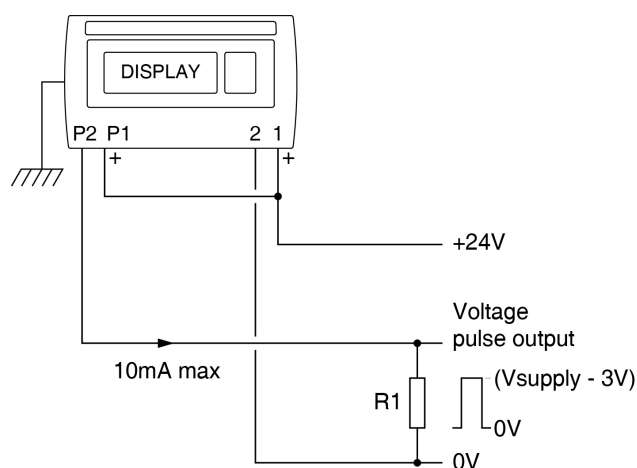
Fig 13 Generating a voltage pulse output

8.4.2 Configuration
When a BA567E-SS Counter is supplied with an optional pulse output the configuration menu is extended as shown in Fig 14.

The pulse output sub-menu allows the source of the output pulse to be selected in the 5ourCE sub-function. For re-transmission applications the output pulse may be a synchronous duplicate of the input pulse by selecting dɪrECt in the 5ourCE sub-function.

Selecting SCALEd derives the output pulse from the total display and introduces two additional functions, dɪUɪdE and durAtɪon to the sub-menu allowing the output pulse frequency to be divided and the output pulse width (duration) to be defined. The total display is read every half second and any increase since the last reading copied into the pulse output counter. After dividing by the dɪUɪdE function, pulses of width defined by the durAtɪon function are asynchronously output from this counter as quickly as possible.

If the dɪUɪdE and durAtɪon functions are configured such that the output pulse frequency with the specified pulse width can not be output in real time, the number of pulses will be stored and transmitted at the maximum possible speed.

When the total display is reset to zero or the power supply to the BA567E-SS Counter is disconnected or turned off, any stored pulses will not be retained

8.4.3 Access Pulse output sub-menu: PuLSE oP
Access to the BA567E-SS Counter configuration menu as described in section 5.2. Using the ▼ and ▲ push buttons scroll though the menu until PuLSE.oP is displayed, pressing ℗ will then access the pulse output sub-menu which is shown in Fig 14.
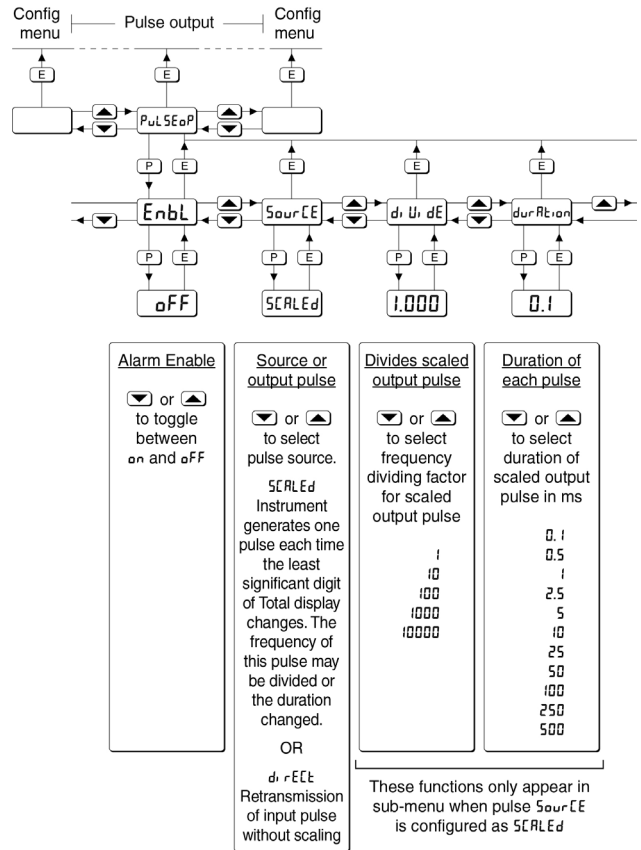
Fig 14 Pulse output configuration sub-menu

8.4.4 Enable pulse output: EnbL
This function allows the pulse output to be disabled or enabled without altering any of the pulse output parameters. Using the ▼ or ▲ push button select EnbL in the pulse output sub-menu and press ℗ to reveal the existing setting on or oFF. The function can be changed by pressing the ▼ or ▲ push button followed by the Ⓔ button to return to EnbL prompt.

8.4.5 Source of pulse output: 5our[E

The output pulse may be derived from:

di r E[E Output is a duplicate of the input pulse.

5[RLEd Output is derived from the total display. When 5[RLEd is selected two additional functions, di Ui dE and durRri on, appear in the pulse output sub-menu.

Using the ▼ or ▲ push button select 5our[E in the pulse output sub-menu and press ℗. to reveal the existing pulse source. The function can be changed by pressing the ▼ or ▲ push button followed by the Ⓔ button to return to 5our[E prompt.

8.4.6 Divide output pulse frequency: di Ui dE

When the output pulse is derived from the total display the output pulse frequency may be divided by:

    1
    10
    100
    1000
    10000

Using the ▼ or ▲ push button select di Ui dE in the pulse output sub-menu and press ℗ to reveal the existing divisor. The value can be changed by pressing the ▼ or ▲ push button to select the required value followed by the Ⓔ button to return to di Ui dE prompt.

Note: This function only appears in the sub-menu when the output pulse is derived from the the total display.

8.4.7 Output pulse width: durRri on

When the output pulse is derived from the total display, the pulse width is defined by this function. One of 11 pulse widths may be selected in milliseconds:

    0.1
    0.5
    1
    2.5
    5
    10
    25
    50
    100
    250
    500

Using the ▼ or ▲ push button select durRri on in the pulse output sub-menu and press ℗ to reveal the existing pulse duration. The value can be changed by pressing the ▼ or ▲ push button to select the required value followed by the Ⓔ button to return to durRri on prompt.

Note: This function only appears in the pulse output sub-menu when the output pulse is derived from the total display.

8.5 4/20mA output

Only one of the following accessories may be fitted: dual alarms, pulse output or 4/20mA output.

The BA567E-SS Counter can be supplied with a factory fitted galvanically isolated 4/20mA current sink which may be configured to represent the rate or total display.

8.5.1 System design

The optional 4/20mA output is a passive current sink i.e. not powered, but it is totally isolated from all other Counter circuits. It is effectively a 2-wire 4/20mA transmitter requiring a minimum supply of 5V with the current being controlled by the BA567E-SS rate or total display. Terminals C1 and C3 may be directly connected to any other instrument which will accept a 4/20mA loop powered transmitter input.
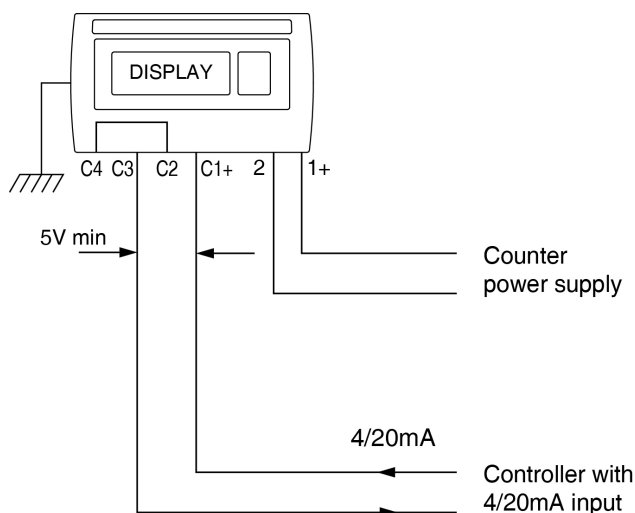
Fig 15 Application of 4/20mA output

8.5.2 Configuration

When a BA567E-SS Counter is supplied with an optional 4/20mA output the configuration menu is extended as shown in Fig 16.   The 4/20mA output sub-menu is accessed via the 4-20 oP function.

The 4/20mA output sub-menu allows the 4/20mA output to be controlled by the rate or the total display.

8.5.3 Access 4/20mA output sub-menu: 4-20 oP

Access the BA567E-SS Counter configuration menu as described in section 5.2. Using the ▼ and ▲ push buttons scroll though the menu until 4-20 oP is displayed, pressing ℗ will then access the 4/20mA output sub-menu which is shown in Fig 21.
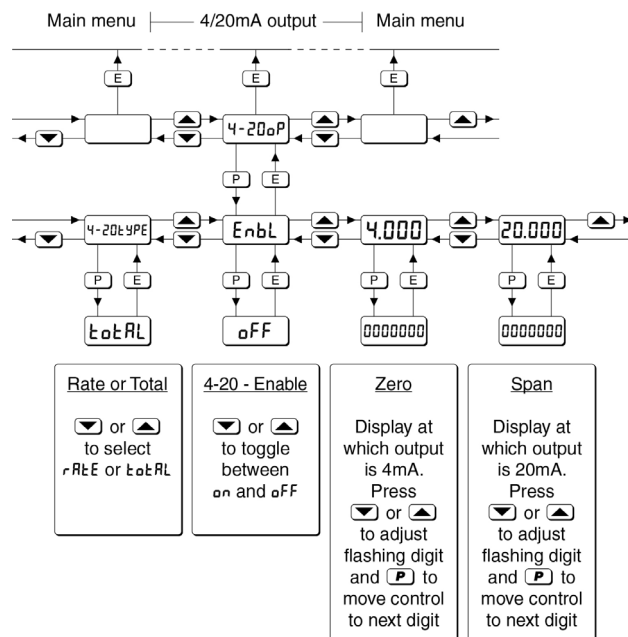
Fig 16   4/20mA output configuration sub-menu

8.5.4 Enable 4/20mA output: EnbL

This function allows the 4/20mA output to be disabled or enabled without altering any of the 4/20mA output parameters. Using the ▼ or ▲ push button select EnbL in the 4-20 oP sub-menu and press ℗ to reveal the existing setting on or oFF. The function can be changed by pressing the ▼ or ▲ push button followed by the ℇ button to return to EnbL prompt.

Note 1: When the 4/20mA output is disabled by selecting oFF, the output is a constant 3.5mA irrespective of the instrument display.

8.5.5 Select rate or total source: 4-20tYPE

The 4/20mA output current can represent the BA567E-SS Counter's rate or total display and this should be defined before any other 4/20mA current output functions are configured.

Using the ▼ or ▲ push button select 4-20tYPE in the 4/20mA output sub-menu and press ℗ to reveal the existing setting totAL or rAtE. The function can be changed by pressing the ▼ or ▲ push button followed by the ℇ button to return to 4-20tYPE prompt.

Note : If the controlling source of the 4/20mA output is changed i.e. from rate to total, the 4/20mA output will be disabled and the output will be a constant 3.5mA irrespective of the instrument display. The 4/20mA output must always be re-enabled and reconfigured following the controlling source being changed.

8.5.6 Display which corresponds to 4mA output: ꓩ.000

The BA567E-SS Counter display which corresponds to a 4.000mA output current is defined by this function. Using the ▼ or ▲ push button select ꓩ.000 in the 4/20mA output sub-menu and press ℗ to reveal the existing rate or total display with one digit flashing. The required display can be entered using the ▼ or ▲ push button to adjust the flashing digit and the ℗ button to transfer control to the next digit. When set as required press Ⓔ to enter the value and return to the ꓩ.000 prompt in the 4/20mA output sub-menu.

8.5.7 Display which corresponds to 20mA output: 20.000

The BA567E-SS Counter display which corresponds to a 20.000mA output current is defined by this function. Using the ▼ or ▲ push button select 20.000 in the 4/20mA output sub-menu and press ℗. to reveal the existing rate or total display with one digit flashing. The required display can be entered using the ▼ or ▲ push button to adjust the flashing digit and the ℗ button to transfer control to the next digit. When set as required press Ⓔ to enter the value and return to the 20.000 prompt in the 4/20mA output sub-menu.

Note : If the BA567E-SS Counter and the 4/20mA current sink output are powered from separate supplies, the 4/20mA output current will continue to flow when the BA567E-SS Counter supply fails or is turned off. Powering both from a common supply eliminates this effect.

8.6 Display backlight

The BA567E-SS Counter can be supplied with a factory fitted backlight that produce green illumination enhancing display contrast and enabling it to be read at night or in poor lighting conditions. The backlight is internally powered from the instrument therefore no additional wiring is required, but the BA567E-SS supply current increases as shown below.

	BA567E-SS Maximum current consumption
Without backlight	10.0mA
Addition for backlight	22.5mA
Addition with terminals 3 & 4 linked	6.0mA

Total current	38.5mA max