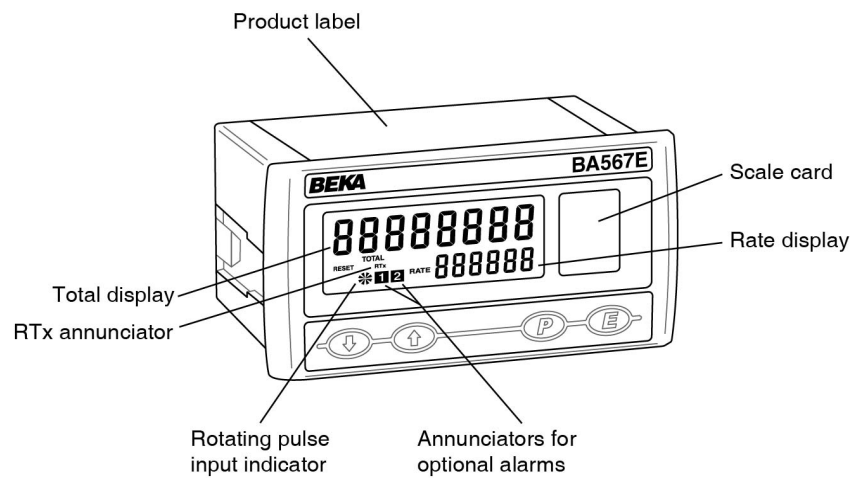


BA567E

One input General Purpose Counter

Issue 4



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1. DESCRIPTION

This general purpose, single channel pulse 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.

This instruction manual supplements the abbreviated instruction sheet supplied with each instrument.

2. OPERATION

Fig 1 shows a simplified block diagram of the BA567E 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

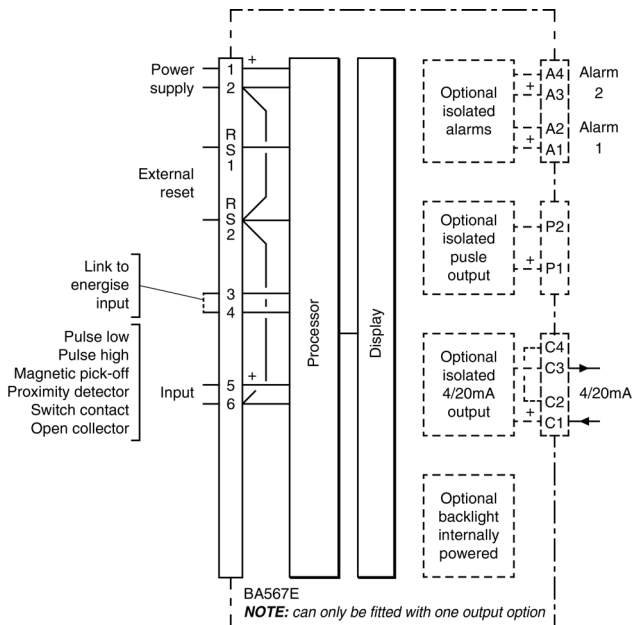


Fig 1 BA567E block diagram

2.1 Initialisation

Each time power is applied to a BA567E 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 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:

Push Button Functions

- [P] + [E]** Access to configuration menu
- [▼] + [▲]** If Local Total Reset [Lr Tot] 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
- [E] + [▼]** Grand total - shows Lo followed by least significant 8 digits of the 16 digit grand total.
- [E] + [▲]** Grand total - shows Hi followed by the most significant 8 digits of the 16 digit grand total.
If Local Grand Total Reset [Lr Gt Tot] in the instrument configuration menu has been activated, operating the [E] and [▲] buttons simultaneously for ten seconds will result in [Lr.no] being displayed with the no flashing. Operating the [▲] or [▼] button will change the display to [Lr.YES], the [E] button will then reset the grand total to zero which will be confirmed by a brief display of [Lr.d]. See 5.20
- [P] + [▼]** Shows in succession, firmware version number, instrument function [Counter] and output accessories that are fitted:
 - R Dual alarm outputs
 - P Pulse output
 - C 4/20mA output

Note: When optional alarms are fitted, the BA567E Counter may be configured to provide direct access to the alarm setpoints from the display mode when the [P] + [▲] buttons are operated simultaneously. See 8.3.12 and 8.3.13

2.3 Displays

The BA567E Counter has two digital displays and associated annunciators, plus a pulse input indicator as shown on the front cover of this instruction 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 `5OUTEE` in the pulse output configuration menu.

SCALE#

Annunciator activated each time pulse output open collector is *on*, i.e. R_{on} is less than $60\Omega + 3V$.

drEE#

Annunciator continuously activated.

3. SYSTEM DESIGN

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

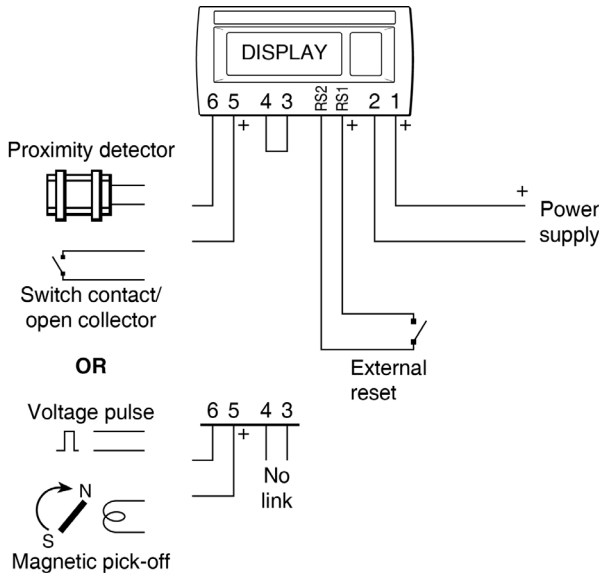


Fig 2 Basic BA567E system

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

3.1 Power supply

The BA567E Counter requires 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 can count pulses from a wide variety of sensors in the hazardous area.

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 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 pulse input, providing the minimum operating voltage of the proximity detector is less than 7.5V. The BA367E contains 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 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. In the BA567E input configuration menu, $U_{0L15} L$ 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 Counter configuration menu, $U_{0L15} L$ and $U_{0L15} H R$ 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 Counter has a robust glass reinforced Noryl enclosure with a toughened glass window. The front of the instrument has IP66 ingress protection and a gasket seals the joint between the instrument enclosure and the panel. The rear of the instrument has IP20 ingress protection.

The BA567E may be installed in any panel providing that the operating temperature is between -40°C and +70°C. At temperatures below -20°C the instrument will continue to count but the display digits will change more slowly and the contrast will be reduced.

Figs 3 shows the overall dimensions together with the recommended panel cut-out dimensions. To achieve an IP66 seal between the instrument enclosure and the instrument panel, the smaller cut-out dimensions should be used.

4.2 EMC

The BA567E Counter 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.

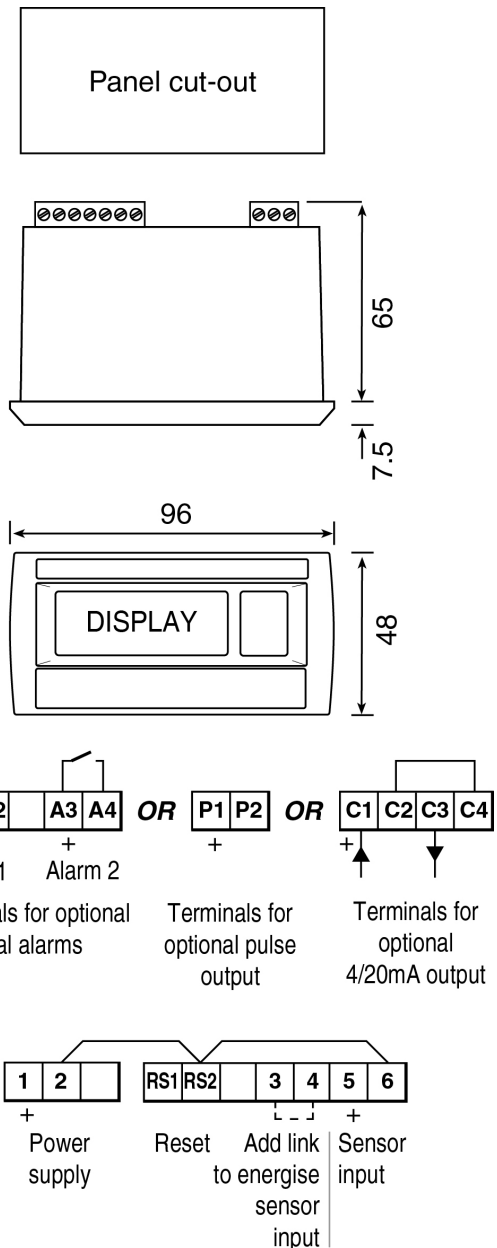
Recommended panel cut-out dimensions for all installations

Mandatory to achieve an IP66 seal between instrument and panel

$90 +0.5/-0.0 \times 43.5 +0.5/-0.0$

DIN 43700

$92.0 +0.8/-0.0 \times 45 +0.6 -0.0$



Support panel wiring to prevent vibration damage

Note: Optional backlight is internally powered

Fig 3 BA567E dimensions & terminals

4.3 Installation Procedure

- Cut the specified aperture in the panel. To achieve an IP66 seal between the instrument enclosure and the instrument panel the aperture must have the tighter tolerances specified in Fig 3.
- Slide the gasket over the body of the BA567E Counter before inserting the instrument into the panel aperture.
- Firstly ensure that both the panel mounting clamps are closed by turning the knurled screws fully anti clockwise until the two pins in the clamp foot align with holes in the clamp body.
- Place a clamp in the recess on each side of the Counter, pulling gently to slide it onto the dovetail as shown in Fig 4. Push the knurled screw slightly forward to engage the thread and tighten by turning clockwise until it is just finger tight. When both clamps are fitted ensure that the gasket behind the front panel bezel is correctly positioned before fully tightening the clamps to secure the instrument. The maximum recommended clamp tightening torque is 22cNm (1.95 lbf in) which is approximately equivalent to finger-tight plus one half turn. **Do not over tighten.**
- Connect the panel wiring to the rear terminal block(s) as shown in Figs 3. To simplify installation, the terminals are removable so that the panel wiring can be completed before the instrument is installed. To prevent vibration damage **ensure panel wiring is supported.**

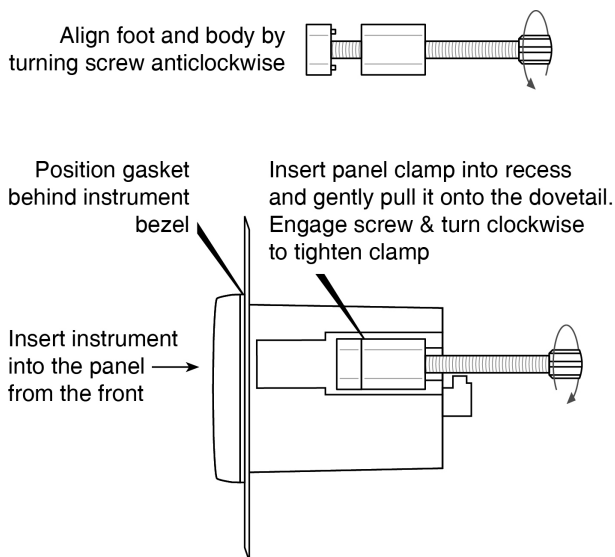


Fig 4 Fitting panel mounting clamps

4.4 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 5. Thus the scale card can easily be changed without removing the Counter from the panel or opening the instrument enclosure.

New BA567E 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 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.

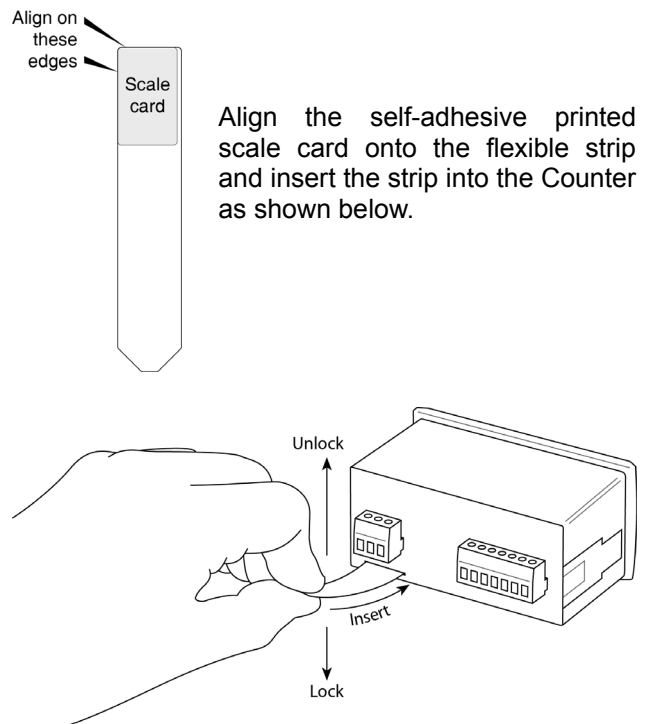


Fig 5 Inserting the flexible strip carrying the scale card into slot at the rear of the BA567E Counter.

5.0 CONFIGURATION & CALIBRATION

The BA567E 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 7.

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 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 | INP.TYPE | oP.CoL |
| Debounce | dEBOunCE | dEFRAULt |
| Counting edge | Cnt EdGE | EdGE 1 |
| Update | uPdRtE | 05 |
| Upper display | d, SP-1 | totRL |
| Lower display | d, SP-2 | on |
| Decimal point | dP | Rate 00000.0 Total 00000000 |
| Total scale factor | SCALE.t | 00 1.00 |
| Rate scale factor | SCALE.r | 00 1.00 |
| Timebase | t-bRSE | t6-0 1 |
| Filter | F, LTER | 24 |
| Counter direction | uP or dN | uP |
| Clear value | CLr VAL | 00000000 |
| Local clear | | |
| Local total reset | CLr tot | oFF |
| Local grand total reset | CLr Gtot | 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 6 shows the calibration structure of the BA567E Counter. The pulse input is passed to the SCALE.r and SCALE.t functions allowing the independent rate and total displays to have different engineering units.

SCALE.t 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, SCALE.t should be set to 2000.

SCALE.r 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, SCALE.r should be set to 2.0.

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

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

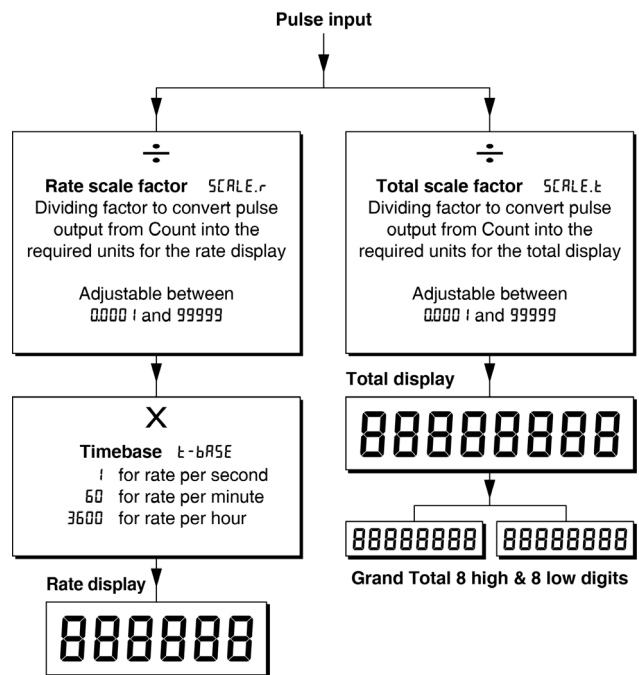















Fig 6 Calibration structure

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. `F1 LkE` and `5RLER`.

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 `1 nPUL` 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 `1 nPUL` 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 7.

When returning to the display mode following reconfiguration, the BA567E Counter will display `dRER` followed by `5RUE` 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 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 10 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 |
|-------------------------|--|
| <code>1 nPUL</code> | Contains sub-menu with two functions: <code>1 nP.ETYPE</code> Select Input type <code>dEbounCE</code> Set debounce See section 5.4 |
| <code>1 nP.ETYPE</code> | Configures input to accept one of six types of input: <code>oP.LaL</code> Open collector * <code>UoLk5 L</code> Voltage pulse <1 >3V <code>UoLk5 H</code> Voltage pulse <3 >10V <code>Lo, L</code> Magnetic pick-off <code>Pr.dEt</code> Proximity detector * <code>LoRkRE</code> Switch contact * * Link terminals 3 & 4 See section 5.5 |
| <code>dEbounCE</code> | Defines level of input debounce applied to the pulse input to prevent false counting: <code>dEFAuLE</code> <code>HEAUU</code> <code>L, GHk</code> See section 5.6 |
| <code>LoRk EdGE</code> | 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 |
| <code>uPdRE</code> | Display update interval Defines the interval between display updates between 0.5 and 5 seconds. See section 5.8 |

| Display | Summary of function |
|----------------|--|
| d, 5P-1 | Upper display Defines whether <i>rATE</i> or <i>tOTAL</i> are shown on the upper display. The other variable will be shown on the lower display, providing the lower display is on in function <i>d, 5P-2</i> . See section 5.9 |
| d, 5P-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: t-b-01 for rate / second t-b-60 for rate / minute t-b-3600 for rate / hour See section 5.14 |
| F, LEEr | 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 UAL | Reset value Defines a preset number to which the total display will be set when the BA567E Counter is locally or remotely reset. Enables the instrument to count down from a preset number. See section 5.17 |
| 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 6.18 |

| 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 **tot** 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 **tot** is selected the grand total may be reset when  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

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 Gtot** 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 Counter to the factory defaults shown in section 5.0 To prevent accidental use the request must be confirmed by entering **5urE** before the reset will be executed.

See section 5.23

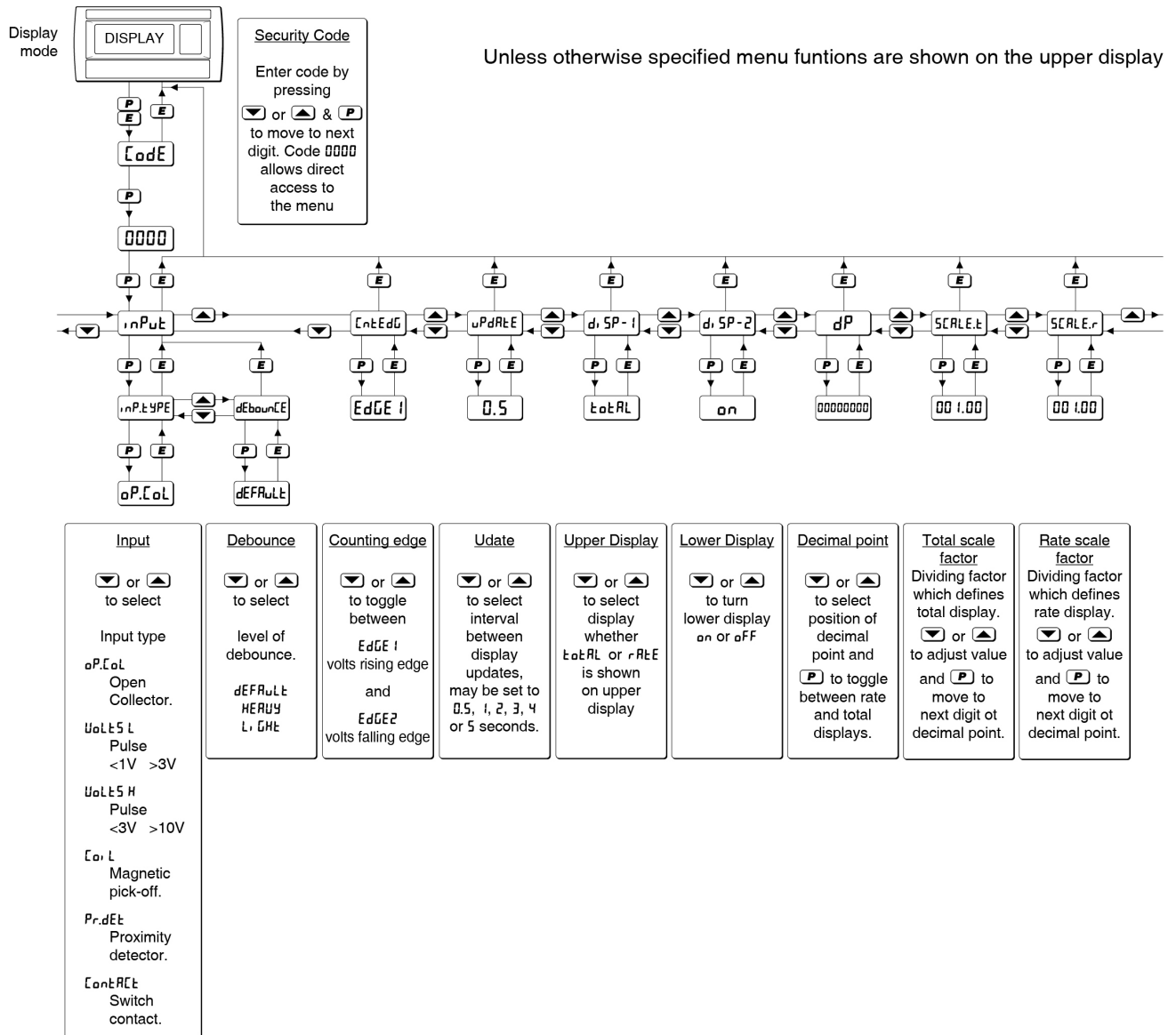
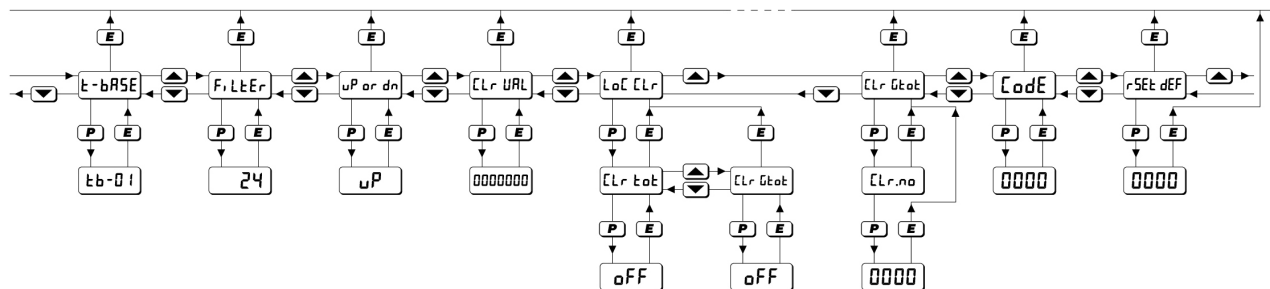


Fig 7 Configuration menu

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



| | | | | | | | | |
|---|---|--|--|--|---|---|---|--|
| <p>Timebase</p> <p>▼ or ▲ to select rate display timebase.</p> <p>t-b-01 for pulses/sec</p> <p>t-b-60 for pulses/min</p> <p>t-b-3600 for pulses/hour</p> | <p>Filter input</p> <p>▼ or ▲ to adjust value of each digit and (P) to transfer control to the next digit.</p> <p>First digit: filter magnitude</p> <p>Second digit: step response</p> <p>Note: While making adjustments the filtered rate display is shown on lower display so stability can be assessed</p> | <p>Direction of count</p> <p>▼ or ▲ to toggle between uP and dn</p> | <p>Reset value</p> <p>▼ or ▲ to adjust value of each digit and (P) to transfer control to the next digit.</p> | <p>Local total reset</p> <p>▼ 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.</p> | <p>Local grand total reset</p> <p>▼ 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.</p> | <p>Grand total reset</p> <p>Press ▼ or ▲ to select CLr.GE5 to reset grand total to zero</p> <p>Confirm instruction by entering 5urE. Press ▼ or ▲ to adjust each digit and (P) to move to next digit</p> | <p>Define Security Code</p> <p>Enter by pressing ▼ or ▲ and (P) to move to next digit.</p> <p>Default code 0000 allows direct access to configuration menu</p> | <p>Reset configuration to factory defaults</p> <p>Confirm instruction by entering 5urE. Press ▼ or ▲ to adjust each digit and (P) to move to next digit</p> |
|---|---|--|--|--|---|---|---|--|

5.4 Input: , nPUL

The Input function contains two sub-functions , nP.ETYPE and dEBOUNC which define the type of input and the amount of input noise rejection.

5.5 Input type: , nP.ETYPE

, nP.ETYPE is a sub-menu in the , nPUL 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 , nPUL in the configuration menu and press **[P]** which will reveal the , nP.ETYPE prompt, pressing **[P]** again will show the existing Input setting. If set as required press **[E]** twice to return to the configuration menu, or repeatedly press the **[V]** or **[A]** button until the required type of input is displayed and then press **[E]** twice to return to the configuration menu.

One of following six types of input may be selected:

| | | Switching thresholds | |
|--------|---------------------------------|----------------------|-------|
| | | Low | High |
| oP.EL | Open collector ² | 2 | 10kΩ |
| UoLESL | Voltage pulse low ¹ | 1 | 3V |
| UoLESH | Voltage pulse high ¹ | 3 | 10V |
| LoL | Magnetic pick-off | 0 | 40mV |
| Pr.dEt | Proximity detector ² | 1.2 | 2.1mA |
| ConEL | 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 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: dEBOUNC

dEBOUNC is an adjustable sub-menu in the , nPUL 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 , nP.ETYPE function.

Select , nPUL in the configuration menu and press **[P]** which will reveal the , nP.ETYPE prompt, press the **[V]** or **[A]** button to select dEBOUNC followed by **[P]** to reveal the existing setting. Pressing the **[V]** or **[A]** button will scroll through the three levels. When the required level has been selected, pressing **[E]** 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 4.1.2.

| 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 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 |

5.7 Input pulse counting edge: **Cnt EdGE**

This function defines whether the BA567E 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 **[P]** which will reveal **EdGE 1** or **EdGE 2**. If required press the **[▼]** or **[▲]** button to change the setting, followed by the **[E]** 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: **uPdRtE**

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

5.9 Upper display: **d, 5P- 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 **d, 5P- 1** from the configuration menu and press **[P]** which will reveal if the display is showing **rRtE** or **tAtRL**. The setting can be changed by pressing the **[▼]** or **[▲]** button followed by the **[E]** button to enter the selection and return to the configuration menu.

5.10 Lower display: **d, 5P- 2**

This function turns the lower display **on** or **off**. When turned **off**, the BA567E will only have one eight digit display which may be configured in the **d, 5P- 1** function to show the total count or rate.

To check the setting for the lower display, select **d, 5P- 2** from the configuration menu and press **[P]** that will reveal if the lower display is **on** or **off**. The setting may be changed by pressing the **[▼]** or **[▲]** button followed by the **[E]** 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 | 0000.0000 | 1 of 5 positions or absent |
| Rate | 00.0000 | 1 of 4 positions or absent |

Lower display

| | | |
|--------------|---------|----------------------------|
| Total | 0.0000 | 1 of 5 positions or absent |
| Rate | 00.0000 | 1 of 4 positions or absent |

To adjust the position of the decimal points select **dP** from the configuration menu and press **[P]**. The upper display defined as the rate or total display by function **d, 5P- 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 **[P]** 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 **[E]** 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 \blacktriangledown or \blacktriangle 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 \blacktriangledown or \blacktriangle 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 Counter is required to display rate per second, per minute or per hour. See Fig 6.

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

$t-b-1$ for pulses / second
 $t-b-60$ for pulses / minute
 $t-b-3600$ 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: $F, LLEr$

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 recommended 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 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 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 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 Counter is in the display mode i.e. counting.

5.19 Local total reset: $\llcorner \text{t}$

$\llcorner \text{t}$ is a sub-menu in the $\llcorner \text{f}$ function. When activated it allows an operator to reset the total display to the reset value [see section 6.17] while the BA567E Counter is in the display mode by operating the \blacktriangledown and \blacktriangle push buttons simultaneously for more than two seconds.

To check or change the setting select $\llcorner \text{f}$ in the configuration menu and press P which will reveal the $\llcorner \text{t}$ prompt, operating P again will show if the local total reset is on or off . If set as required operate the E button twice to return to the configuration menu, or the \blacktriangledown or \blacktriangle button to change the setting followed by the E button twice to enter the change and return to the $\llcorner \text{f}$ 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.

5.20 Local grand total reset: $\llcorner \text{gt}$

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.

$\llcorner \text{gt}$ is a sub-menu in the $\llcorner \text{f}$ function which when activated allows the operator to reset the grand total display to zero from the display mode by operating the E and \blacktriangle push buttons simultaneously for more than ten seconds.

To check or change setting select $\llcorner \text{f}$ in the configuration menu and press P which will reveal $\llcorner \text{gt}$. Using the \blacktriangledown or \blacktriangle button select $\llcorner \text{gt}$ and press P which will show if local grand total reset is on or off . If set as required operate the E button twice to return to the configuration menu, or the \blacktriangledown or \blacktriangle button to change the setting followed by the E button twice to enter the change and return to the $\llcorner \text{f}$ prompt in the configuration menu.

Note:

Once reset, the grand total can not be recovered.

5.21 Reset grand total from configuration menu: $\llcorner \text{gt}$

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 $\llcorner \text{gt}$ and press P which will cause the instrument to display $\llcorner \text{gt}$ with no flashing. Using the \blacktriangledown or \blacktriangle push button change $\llcorner \text{gt}$ to YES pressing P 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 \blacktriangledown or \blacktriangle button set the first flashing digit to 5 and press P to transfer control to the second digit which should be set to u . When SURE has been entered pressing the E button will reset the grand total which will be confirmed by a brief display of $\llcorner \text{gt}$, the instrument will automatically return to the $\llcorner \text{gt}$ prompt in the configuration menu.

Note:

Once reset, the grand total can not be recovered.

5.22 Security code: $\llcorner \text{sd}$

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 $\llcorner \text{sd}$ from the configuration menu and press P which will cause the BA567E Counter to display 0000 with one digit flashing. The flashing digit may be adjusted using the \blacktriangledown and \blacktriangle push buttons, when set as required operating the P button will transfer control to the next digit. When all the digits have been adjusted press E to return to the $\llcorner \text{sd}$ prompt. The revised security code will be activated when the BA567E 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:

RESET DEF

This function returns the BA567E Counter to the factory defaults shown in section 5.0. To prevent accidental use the request must be confirmed by entering `5urE` before the configuration change will be executed.

Select `RESET DEF` from the configuration menu and press **[P]** the instrument will display `0000` with the first digit flashing. To confirm the instruction to reset all the configuration functions to factory defaults `5urE` must be entered. Using the **[▼]** or **[▲]** button set the first flashing digit to 5 and press **[P]** to transfer control to the second digit which should be set to `u`. When `5urE` has been entered pressing the **[E]** 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 Counter will display `- - - - -` before automatically returning to the display mode when the operation is complete.

5.24 Display overflow

The BA567E 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`

Overrange `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 2.2.

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

6. CONFIGURATION EXAMPLE

A BA567E 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 Counter front panel. Similarly the grand total is not to be resettable from the BA567E Counter front panel. To simplify reading the BA567E 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 may be configured on-site without disconnection from the power supply or from the proximity detector. This example assumes that the BA567E 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 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 Counter in the configuration mode by simultaneously pressing the **[P]** and **[E]** push buttons. Assuming a security code has not already been entered the instrument will respond by displaying `input` which is the first parameter in the configuration menu. See Fig 7

Step 2 Select the type of inputs

With `input` displayed; press **[P]** to reveal the `input.TYPE` submenu and press **[P]** again to enter the function. Using the **[▼]** or **[▲]** button select `PrdEt`, the input for a 2-wire proximity detector and then return to the `input` prompt in the configuration menu by pressing **[E]** twice. A proximity detector requires energising therefore terminals 3 and 4 of the BA567E should be linked together.

Step 3 Select display update

To aid reading the display the BA567E is only to be updated every 3 seconds. Select `uPdRtE` from the configuration menu and press `[P]`. Using the `[▼]` or `[▲]` button select `3` and press `[E]` to return to the `uPdRtE` 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 `d,SP-1` from the configuration menu and press `[P]` which will reveal if the upper display is showing `rRtE` or `tStRL`. Using the `[▼]` or `[▲]` button select `tStRL` followed by the `[E]` 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 `d,SPLR42` from the main menu and press `[P]` to show the existing setting. Using the `[▼]` or `[▲]` button select `on` followed by `[E]` to enter the selection and return to the configuration menu.

Step 6 Position of decimal point

In this example the BA567E is required to display total and rate with no decimal points.

Select `dP.` from the configuration menu and press `[P]`. The BA567E 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 `[P]` 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 `[E]` 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 is required to display thousands of pump strokes therefore the total scale factor `5CRLEt` should be set to $(4 \times 1000) = 4000$.

Select `5CRLEt` from the configuration menu and press `[P]` to view the current value with one digit flashing. Use the `[▼]` or `[▲]` button to adjust the flashing digit and the `[P]` button to transfer control to the next digit and to the decimal point. Enter `40000` and return to the `5CRLEt` prompt in the configuration menu by pressing `[E]`.

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 `5CRLEr` should be set to 4.0.

Select `5CRLEr` from the configuration menu and press `[P]` to view the current value with one digit flashing. Use the `[▼]` or `[▲]` button to adjust the flashing digit and the `[P]` button to transfer control to the next digit and to the decimal point. Enter `40` and return to the `5CRLEr` prompt in the configuration menu by pressing `[E]`.

Step 9 Set the display timebase

In this example the rate display is required in pump strokes per hour.

Select `t-bR5E` from the configuration menu and press `[P]` to reveal the current setting. Using the `[▼]` or `[▲]` button scroll through the three options and select `t-b-3600`. Return to the `t-bR5E` prompt in the configuration menu by pressing `[E]`.

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 recommended 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 `FILTER` from the main menu and press `[P]` to reveal the current setting. The first digit will be flashing and may be adjusted using the `[▼]` or `[▲]` button. The `[P]` button will transfer control to the second digit. When both are set as required, return to the `FILTER` prompt in the configuration menu by pressing `[E]`.

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 `[P]` 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 `[P]` button to transfer control to the next digit. When the new code has been entered, press `[E]` to return to the configuration menu.

Step 12 Return to the display mode

Following completion of configuration, return the BA567E to the display mode by pressing `[E]`. The instrument will display `AREA` followed by `SRUE` while the configuration changes are stored in permanent memory.

The BA567E 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 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 | SCALE E - bRSE |
| Pulse indicator rotating but incorrect total display. | Incorrect total display calibration. Remote reset switch contacts closed. | SCALE 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 does 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

If a BA567E 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 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.

7.3 Servicing

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

7.4 Routine maintenance

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

7.5 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.

7.6 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

8.1 Scale card

The BA567E Counter has a window on the right hand side of the display through which a scale card showing the units of measurement such as metres is visible. 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 4.4 of this instruction manual.

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

8.2 Tag information

New Counters can be supplied with a tag number or application information 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, or an isolated pulse output or an isolated 4/20mA output.

The BA567E Counter can be supplied with factory fitted isolated, 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.

WARNING

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

When the BA567E 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 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 8. 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.

$$\begin{aligned} R_{on} &= \text{less than } 5\Omega + 0.7V \\ R_{off} &= \text{greater than } 1M\Omega \end{aligned}$$

Note: Because of the series protection diode some test meters may not detect a closed alarm output

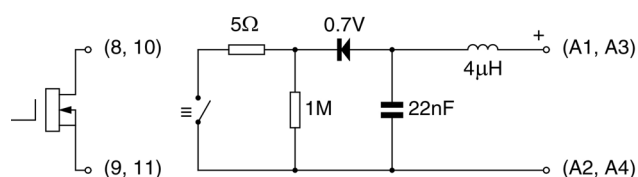


Fig 8 Equivalent circuit of each alarm output

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

$$\begin{aligned} V &= 30V \\ I &= 200mA \end{aligned}$$

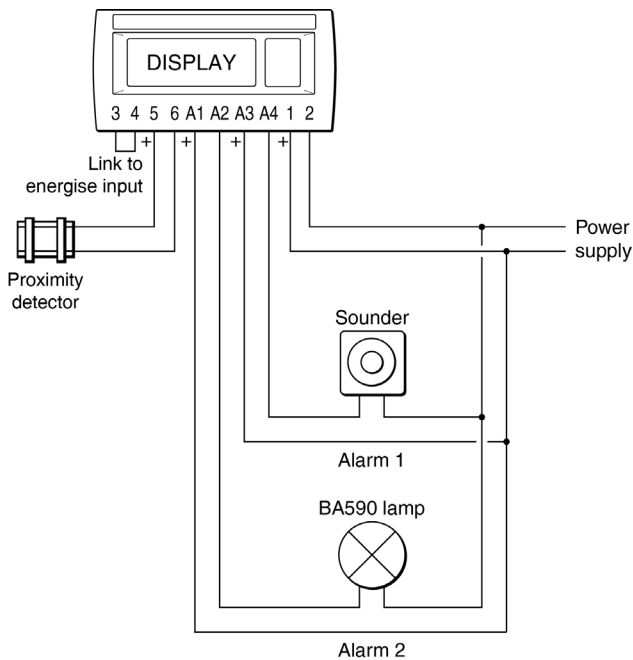


Fig 9 Typical alarm application

8.3.2 Configuration summary

When a BA567E Counter is supplied with alarms the configuration menu is extended as shown in Fig 10. Each alarm may be configured to operate on the rate or total display.

For simplicity Fig 10 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 |
| SP 1r or SP 1t | Alarm setpoint 1 Adjusts the alarm setpoint. The alarm is activated when the rate or total display equals the setpoint. Note: SP 1r is displayed for a rate alarm and SP 1t 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 9.3.7 |
| H5tr | Hysteresis Adjusts the alarm hysteresis. Only available on a rate alarm. See section 8.3.8 |
| dELtA | Alarm delay time Adjusts the delay between the display equalling the alarm setpoint and the alarm output being activated. See section 8.3.9 |
| S.L | 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 RL1 or RL2 when an alarm output is activated. See section 8.3.11 |
| RCSP | Access setpoint Sub-menu that enables direct access to the alarm setpoints from the display mode and defines a separate security code. See section 9.3.12 |

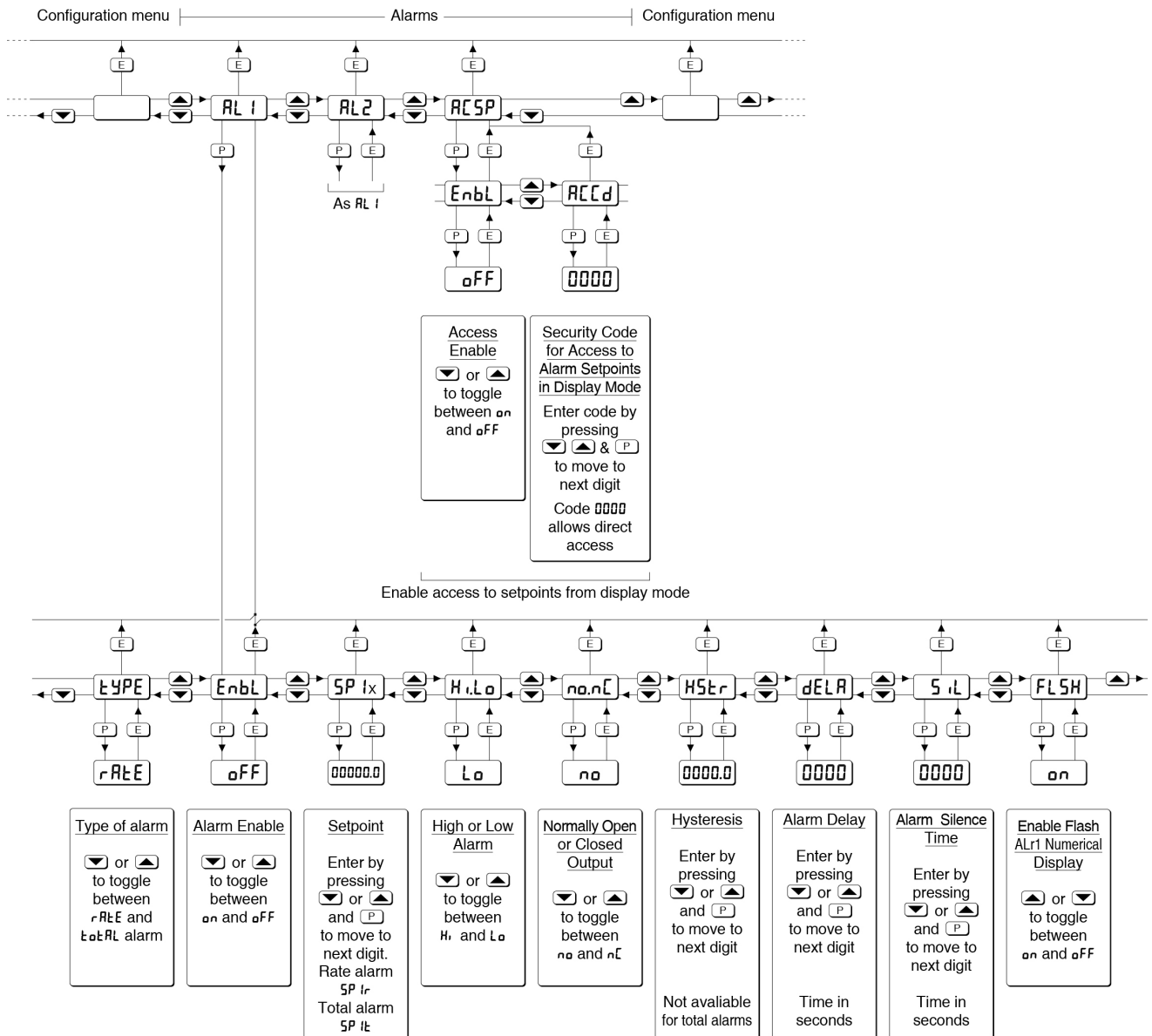


Fig 10 Alarm Configuration Functions in Configuration Menu

9.3.4 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.

9.3.5 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 rALtE and tALtAL, 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.

9.3.6 Setpoint adjustment: $SP\ Lr$ & $SP2x$

The rate alarm setpoints $SP\ Lr$ and $SP2x$ may be positioned anywhere between -99999 and 999999, and the total alarm setpoint $SP\ Lt$ 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 \blacktriangledown or \blacktriangle push button select $SP\ Lr$ in the $RL\ I$ sub-menu and press P which will reveal the existing setpoint with one digit flashing. The required setpoint can be entered using the \blacktriangledown or \blacktriangle push button to adjust the flashing digit and the P button to transfer control to the next digit. When set as required press E to enter the value and return to the $SP\ Lr$ prompt in the alarm 1 sub-menu.

9.3.7 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 \blacktriangledown or \blacktriangle push button select $Hi.Lo$ from the selected alarm sub-menu and press P to check or change the function. The \blacktriangledown or \blacktriangle push button will toggle the alarm function between Hi and Lo , when set as required, press the E button to return to the $Hi.Lo$ prompt in the alarm sub-menu.

9.3.8 Alarm output status: $no.nf$

Each single pole alarm output may be open or closed in the non-alarm condition. When the BA567E 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 nf should be selected so that the output opens when an alarm occurs or if the power supply fails.

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

9.3.9 Hysteresis: $H5Lr$

Hysteresis is only available on rate alarms so the $H5Lr$ 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 \blacktriangledown or \blacktriangle push button select $H5Lr$ in the selected alarm sub-menu and press P which will reveal the existing hysteresis with one digit flashing.

The required hysteresis can be entered using the \blacktriangledown or \blacktriangle push button to adjust the flashing digit and the P button to transfer control to the next digit. When set as required press E to enter the value and return to the $H5Lr$ prompt in the alarm sub-menu.

e.g. A BA567E 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.

9.3.10 Alarm delay: $dELR$

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 $dELR$ using the \blacktriangledown or \blacktriangle push button in the selected alarm sub-menu and press P which will reveal the existing delay time in seconds with one digit flashing. The required delay time can be entered using the \blacktriangledown or \blacktriangle push button to adjust the flashing digit and the P button to transfer control to the next digit. When set as required press E to enter the value and return to the $dELR$ 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.

9.3.11 Alarm silence time: S_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 P push-button becomes an alarm accept button.

After an alarm has occurred, operating the P 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 S_L using the \blacktriangledown or \blacktriangle push button in the selected alarm sub-menu and press P which will reveal the existing alarm silence time in seconds with one digit flashing. The required silence time can be entered using the \blacktriangledown or \blacktriangle push button to adjust the flashing digit and the P button to transfer control to the next digit. When set as required press E to enter the value and return to the S_L prompt in the alarm sub-menu.

8.3.11 Flash display when alarm occurs: FLASH

In addition to the two alarm annunciators on the left hand side of the BA567E 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 *RL1* or *RL2* when an alarm occurs.

Using the or push button select *FLASH* 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 button to return to the *FLASH* prompt in the alarm sub-menu.

8.3.12 Access Setpoint: *RESP*

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 *RESP* 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 button to return to the *ENBL* prompt from which a separate security access code can be entered using the *RECD* function which can be selected using the or push button.

To enter a new security code select *RECD* from the sub-menu and press which will cause the BA567E 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 *RECD* prompt. The revised security code will be activated when the BA567E 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 Counter's display mode is obtained by operating the and push buttons simultaneously as shown in Fig 11. 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 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*.

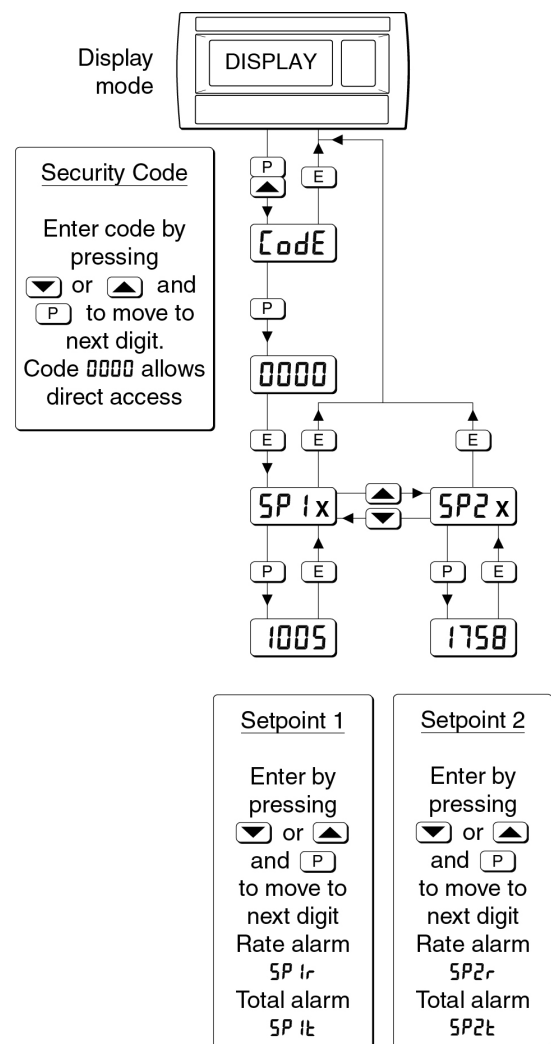


Fig 11 Setpoint adjustment from the display mode

To adjust an alarm setpoint select $5P\ 1x$ or $5P\ 2x$ and press \boxed{P} which will reveal the current setting. The flashing digit of the setpoint may be adjusted using the \blacktriangledown and \blacktriangle push buttons and the \boxed{P} button to move control to the next digit. When the required setpoint has been entered, pressing \boxed{E} 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 \boxed{E} again.

Note: Direct access to the alarm setpoints from the display mode is only available when the $RL5P$ menu is enabled - see section 8.3.12

8.4 Pulse output

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

The BA567E 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:

| | | |
|-----------|---|-----------------|
| R_{on} | = | $60\Omega + 3V$ |
| R_{off} | = | 1M |
| I_{max} | = | 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 $5OUTEE$ in the pulse output configuration menu.

SCALE#

Annunciator activated each time pulse output open collector is *on*, i.e. R_{on} is less than $60\Omega + 3V$.

default

Annunciator continuously activated

8.4.1 System design

The BA567E Counter pulse output is a passive circuit i.e. not powered, but it is totally isolated from all other Counter circuits. Providing polarities are observed, terminals P1 and P2 may be directly connected to another instrument with an open collector input.

Fig 12 shows how a resistor may be used to produce a voltage pulse. The positive terminal of the pulse output circuit P1 is connected to the BA567E Counter's positive supply terminal 1 at the instrument. When an output pulse occurs and the open collector 'closes', P2 is connected to P1 and a pulse output current flows through the resistor R1. The current flowing in the circuit is determined by resistor R1 which should be chosen to limit the output current to less than 10mA. For a 24V supply R1 should therefore be greater than 2,200 Ω

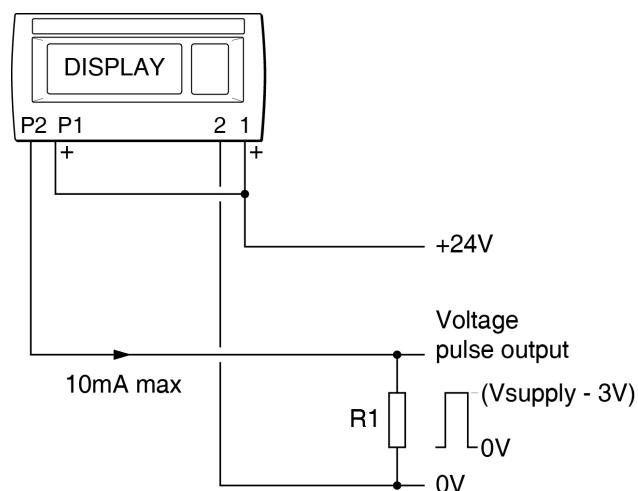


Fig 12 Generating a voltage pulse output

8.4.2 Configuration

When a BA567E Counter is supplied with an optional pulse output the configuration menu is extended as shown in Fig 13.

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

Selecting **Scaled** derives the output pulse from the total display and introduces two additional functions, **divide** and **duration** into 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 **divide** function, pulses of width defined by the **duration** function are asynchronously output from this counter as quickly as possible.

If the **divide** and **duration** 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 Counter is disconnected any stored pulses not yet transmitted will not be retained

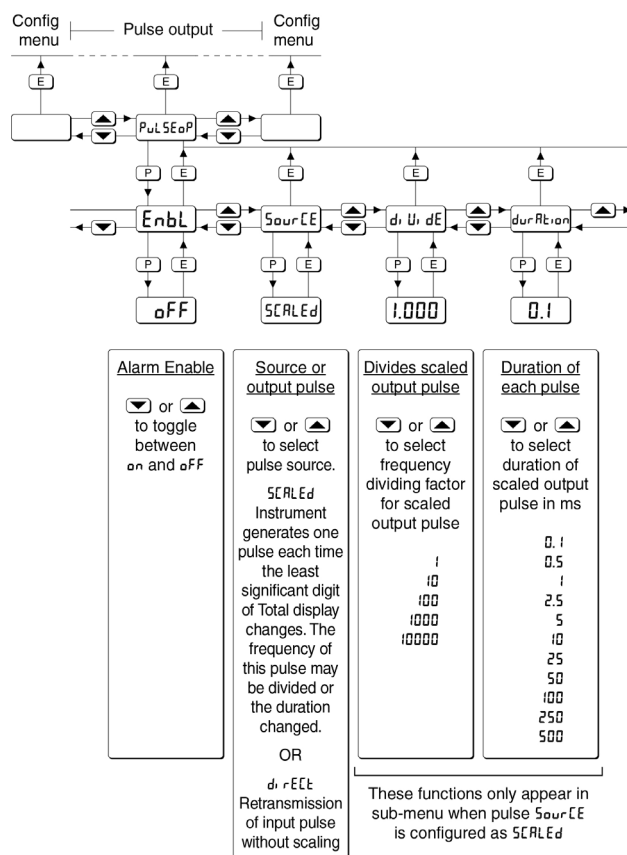


Fig 13 Pulse output configuration sub-menu

8.4.3 Access Pulse output sub-menu: **Pulse on**

Access the BA567E Counter configuration menu as described in section 5.2. Using the ▼ and ▲ push buttons scroll through the menu until **Pulse on** is displayed, pressing **P** will then access the pulse output sub-menu which is shown in Fig 13.

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 **P** to reveal the existing setting **on** or **off**. The function can be changed by pressing the ▼ or ▲ push button followed by the **E** button to return to **Enbl** prompt.

8.4.5 Source of pulse output: **Source**

The output pulse may be derived from:

direct Output is a duplicate of the input pulse.

Scaled Output is derived from the total display. When **Scaled** is selected two additional functions, **divide** and **duration**, appear in the pulse output sub-menu.

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

8.4.6 Divide output pulse frequency: d_i , U , 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 \blacktriangle push button select d_i , U , dE in the pulse output sub-menu and press P to reveal the existing divisor. The value can be changed by pressing the ∇ or \blacktriangle push button to select the required value followed by the E button to return to d_i , U , dE prompt.

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

8.4.7 Output pulse width: $durPkt$, 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 \blacktriangle push button select $durPkt$, on in the pulse output sub-menu and press P to reveal the existing pulse duration. The value can be changed by pressing the ∇ or \blacktriangle push button to select the required value followed by the E button to return to $durPkt$, on prompt.

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

8.4.8 Stored pulses

If the d_i , U , dE and $durPkt$, on 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 or the power supply to the Counter is disconnected, any stored pulses will not be retained.

8.5 4/20mA output

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

The BA567E 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 rate or total display. Terminals C1 and C3 may be directly connected to another instrument which will accept a 4/20mA loop powered transmitter input.

Fig 14 shows a typical 4/20mA application.

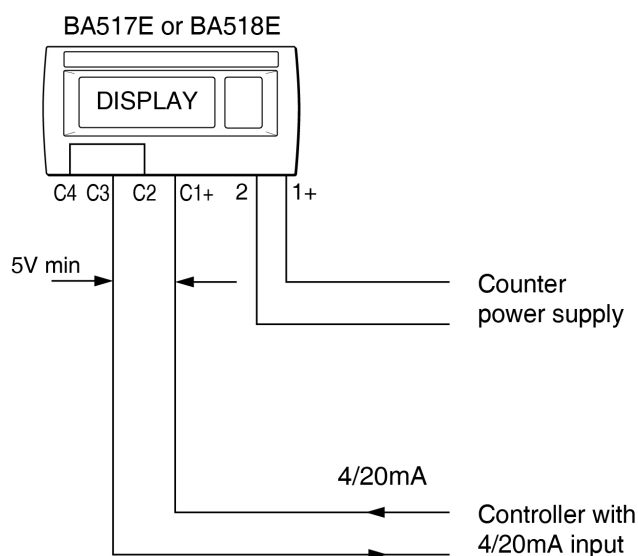


Fig 14 Application of 4/20mA output

8.5.2 Configuration

When a BA567E Counter is supplied with an optional 4/20mA output the configuration menu is extended as shown in Fig 15. The 4/20mA output sub-menu which is accessed via the $4-20\text{mA}$ oP function 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 Counter configuration menu as described in section 5.2. Using the ▼ and ▲ push buttons scroll through the menu until 4-20 oP is displayed, pressing P will then access the 4/20mA output sub-menu which is shown in Fig 15.

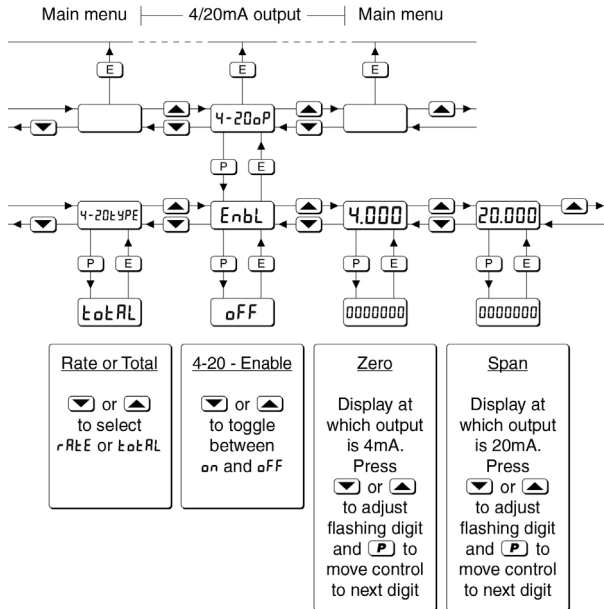


Fig 15 4/20mA output configuration sub-menu

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 P to reveal the existing setting on or oFF. The function can be changed by pressing the ▼ or ▲ push button followed by the E button to return to EnbL prompt.

Note: 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 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 P to reveal the existing setting tOtRL or rRtE. The function can be changed by pressing the ▼ or ▲ push button followed by the E 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.

9.5.6 Display which corresponds to 4mA output: 4.000

The BA567E Counter display which corresponds to a 4.000mA output current is defined by this function. Using the ▼ or ▲ push button select 4.000 in the 4/20mA output sub-menu and press P 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 P button to transfer control to the next digit. When set as required press E to enter the value and return to the 4.000 prompt in the 4/20mA output sub-menu.

9.5.7 Display which corresponds to 20mA output: 20.000

The BA567E 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 P 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 P button to transfer control to the next digit. When set as required press E to enter the value and return to the 20.000 prompt in the 4/20mA output sub-menu.

Note 1: If the BA567E 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 Counter supply fails or is turned off. Powering both from a common supply eliminates this effect.

8.6 Display backlight

The BA567E 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 power supply so that no additional wiring is required, but the BA567E supply current increases as shown below.

| | BA567E Maximum current consumption |
|--------------------------------------|---|
| Without backlight | 10.0mA |
| With backlight | 32.5mA |
| Addition with terminals 3 & 4 linked | 6.0mA |
| | ----- |
| Total current | 38.5mA max |