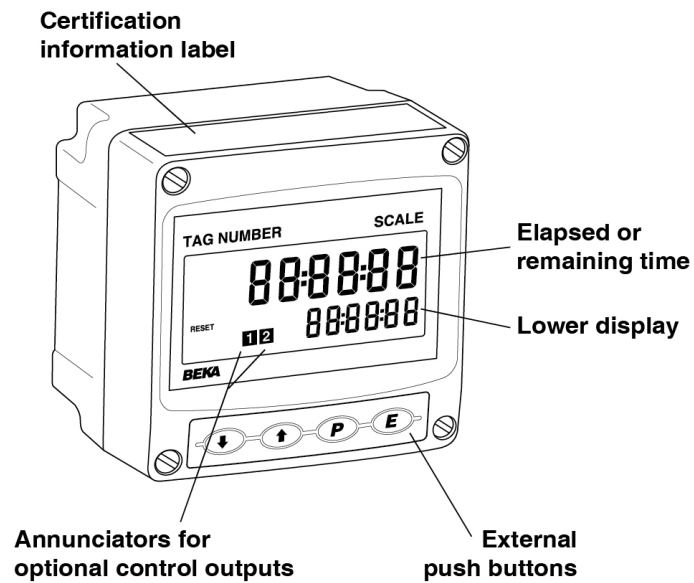


BA374NG
Ex nA and Ex tc
Two input
Timer or Clock
Issue 3



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Appendix 1

ATEX dust certification

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IECEx certification

Appendix 3

ETL and cETL certification

1. DESCRIPTION

The BA374NG is an Ex nA and Ex tc certified, field mounting instrument with two inputs that can be configured on-site as a Timer or as a Clock.

As a Timer the BA374NG can measure and display the elapsed time between external events, or control external events via the status output or the optional control outputs.

When configured as a Clock, the BA374NG can display time in a variety of formats and the optional control outputs may be configured to turn *on* and *off* at pre-set times.

This instruction manual is divided into three sections.

Common features

2. Certification
3. System design for hazardous areas
4. Installations
5. Accessories

Timer

6. Operation as a timer
7. Timer application example
8. Maintenance

Clock

9. Operation as a clock
10. Clock configuration example
11. Maintenance

The BA374NG has been ATEX certified Ex nA and Ex tc by Notified Body Intertek Testing and Certification Ltd and complies with the European ATEX Directive 2014/34/EU.

The main sections of this manual describe ATEX Ex nA gas certification. See Appendix 1 for details of the BA374NG ATEX Ex tc dust certification.

For international applications the BA374NG also has IECEx certification which is described in Appendix 2.

For applications in the USA and Canada the BA374NG has ETL and cETL certification which is described in Appendix 3.

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

2. CERTIFICATION

The BA374NG has ATEX and IECEx Ex nA gas and Ex tc dust certification. The main sections of this instruction manual describes ATEX gas certification. ATEX dust certification is described in Appendix 1 and IECEx gas and dust certification in Appendix 2. For applications in the USA and Canada the BA374NG also has ETL and cETL which are described Appendix 3.

The certification of the BA374NG is unaffected by whether it is configured as a Timer or as a Clock.

2.1 ATEX Ex nA certification

Notified Body Intertek Testing and Certification Ltd have issued the BA374NG with a Type Examination Certificate number ITS16ATEX48409X. This has been used to confirm compliance with the European ATEX Directive for Group II, Category 3G equipment. The instrument carries the Community Mark and, subject to local codes of practice, may be installed in any of the European Economic Area (EEA) member countries and in the EEA EFTA states, Iceland, Liechtenstein and Norway. ATEX certificates are also acceptable in Switzerland and Turkey. The European Commission's Blue Guide lists the member states, overseas countries and territories that have adopted harmonisation legislation.

This section of the instruction manual describes ATEX Ex nA installations in explosive gas atmospheres conforming with EN 60079-14 *Electrical installations design, selection and erection*. When designing systems for installation outside the UK the local Code of Practice should be consulted.

2.2 Zones, gas groups and T rating

The Timer or Clock has been certified as Group II Category 3G Ex ic nA IIC T5 Gc, Ta = -40 to +60°C apparatus. This is non-sparking apparatus complying with EN 60079-15 *Equipment protection by type of protection 'n'* that minimises the risk of arcs or sparks capable of creating an ignition hazard occurring during conditions of normal operation.

The Timer or Clock's front panel push button contacts are non incandive and have been certified intrinsically safe Ex ic as shown on the Type Examination Certificate. This allows the Timer or Clock to be adjusted and configured live when installed in Zone 2.

When connected to a suitable system the BA374NG Timer or Clock may be installed in:

Zone 2 explosive gas air mixture not likely to occur, and if it does will only exist for a short time.

Be used with gases in groups:

Group A propane
Group B ethylene
Group C hydrogen

In gases that may safely be used with equipment having a temperature classification of:

T1	450°C
T2	300°C
T3	200°C
T4	135°C
T5	100°C

At ambient temperatures between -40 and +60°C.

This allows use with all commonly used industrial gases except carbon disulphide CS₂.

2.3 Safety parameters

The certificate specifies input safety parameters in normal operation i.e. without faults for all the instrument terminals. Where only a voltage or only a current is specified, the unspecified parameter will be defined by components within the BA374NG.

2.4 Special conditions for safe use

The Ex nA certificate has an 'X' suffix indicating that the certificate defines special conditions for safe use. These state that the BA374NG Timer or Clock should be:

- a. Supplied from a *limited energy* circuit with output parameters in normal operation equal to, or less than the instrument's input parameters. The certificate states that It is **not** necessary to power the instrument from an intrinsically safe interface, such as a certified shunt diode safety barrier or a galvanic isolator to comply with this requirement.
- b. Fitted with cable entry glands or conduit fittings which maintain the impact and ingress protection of the enclosure. Certified Ex e or Ex n components satisfy these requirements.

The BA374NG is supplied fitted with one certified M20 stopping plug and one temporary hole plug which should be replaced with the required gland or conduit fitting.

2.5 Power supply

The input safety parameters for the power supply terminals 1 and 2 are:

$$\begin{aligned} U_i &= 30V \text{ dc} \\ I_i &= 100mA \end{aligned}$$

This allows the BA374NG to be powered from any dc supply which in normal operation has an output of less 30V and 100mA. See section 4.1 for power supply recommendations.

2.6 Input terminals

When configured as a Timer the BA374NG is controlled via input A and input b which may be individually configured for use with different type of sensors. Each input is a separate Ex nA circuit, although the negative side of each input is internally connected to the negative side of the power supply and reset terminal RS2. See Fig 10. The two inputs should not be connected in parallel.

Some types of sensor that may be connected to the BA374NG inputs, such as a switch contact, open collector or a 2-wire proximity detector, require energising to determine their state. For sensors requiring energising fitting an external link between terminals 3 and 4 of the BA374NG for input A and between terminals 7 and 8 for input b, connects an internal 7V, 6mA supply to the respective input. Energising is not required when a BA374NG input is connected to a voltage pulse source.

Fitting an energising link changes the safety parameters of each BA374NG input as shown in the following table which also shows the types of sensor requiring energising (link fitting).

Type of input	Link *	Safety parameters		
		Input	Output	
		Ui	Uo	Io
Switch contact	Yes	15V	10.5V	9.2mA
Proximity detector	Yes	15V	10.5V	9.2mA
Open collector	Yes	15V	10.5V	9.2mA
Magnetic pick-off	No	30V	1.1V	0.5mA
Voltage input (low)	No	30V	1.1V	0.5mA
Voltage input (high)	No	30V	1.1V	0.5mA

*For input A link terminals 3 and 4

*For input b link terminals 7 and 8

2.7 Remote reset terminals

The BA374NG total display may be reset by connecting the external reset terminals RS1 and RS2 together for more than one second. The two reset terminals have the following safety parameters in normal operation:

$$\begin{aligned} U_i &= 30V \\ U_o &= 3.8V \\ I_o &= 1mA \end{aligned}$$

2.8 Status output

The BA374NG Timer or Clock has an opto-isolated open collector output which can be configured to indicate the status of the instrument, or to perform simple control functions.

The status output is a separate Ex nA circuit with the following input safety parameters:

$$\begin{aligned} U_i &= 30V \text{ dc} \\ I_i &= 100mA \end{aligned}$$

This allows the status output to be connected to any dc circuit providing that in normal operation the maximum supply voltage is not greater than 30V dc and the current is not greater than 100mA.

2.9 Certification label information

The Timer or Clock certification information label is fitted in a recess on the top outer surface of the instrument enclosure. It shows the ATEX and IECEx certification information plus BEKA associates name, location, year of manufacture and the instrument serial number.



BA374NG Certification information label

3. SYSTEM DESIGN FOR HAZARDOUS AREAS.

When correctly installed in Zone 2 the BA374NG Timer or Clock may be connected to almost any apparatus in the safe area and to Ex n, Ex e, Ex p and Ex d protected apparatus located in Zone 2. Because the BA374NG is not certified intrinsically safe it should not be connected to an intrinsically safe system.

BEKA Application Guide AG310, *Guide for Installation of [extra low voltage d.c.] Ex nA instrumentation*, which can be downloaded from www.beka.co.uk, contains explanations and recommendations for the installation of Ex nA equipment.

In addition to being able to be connected to other equipment in the safe area and in Zone 2, the BA374NG may also be connected to suitably protected and certified equipment located in Zone 1. This is illustrated in Fig 6 and explained in Application Guide AG310.

There are four design requirements:

1. The BA374NG should be powered from a circuit that has output safety parameters in normal operation equal to, or less than, the input safety parameters for terminals 1 and 2 specified by the BA374NG ATEX Type Examination Certificate.
2. BA374NG input and reset terminals should only be connected to circuits having safety parameters in normal operation compliant with the BA374NG safety parameters which are specified by the ATEX Type Examination Certificate.
3. Hazardous area apparatus to which the BA374NG is connected should be protected by a technique suitable for the Zone in which the equipment is located, such as Ex n or Ex e if located in Zone 2. Equipment protected by intrinsic safety should not be connected to a BA374NG.
4. Wiring should comply with Clause 9 of EN 60079-14.

When designing a system it is important to remember that terminals 2, 6, 10 and RS2 are interconnected within the BA374NG. See Fig 10.

3.1 Power supply

The BA374NG Timer or Clock requires a minimum of 10V between terminal 1 & 2 and consumes:

	10mA	without optional backlight
plus	6mA	when terminals 3 & 4 are linked
plus	6mA	when terminals 7 & 8 are linked
plus	16mA	with optional backlight

A 24V dc regulated, current limited supply located in a safe area is suitable.

The power supply should meet the requirements for personnel safety so that 'live maintenance' can safely be performed. The implicit requirement for galvanic isolation from the mains supply ensures that the possible difficulties from circulating earth currents caused by mains faults is minimised. In European terms if the power supply is CE marked it is almost certainly acceptable.

To comply with the requirements of EN 60079:14 *Electrical installations design, selection and erection*, each of the wires entering the hazardous area should be individually fused and contain a means of isolation. These two requirements may be satisfied by using DIN rail mounted terminals incorporating easily removable fuses which can be extracted to achieve isolation as shown in Fig 1.

If an input current safety parameter I_i is specified, a suitably rated fuse will ensure that it is not continuously exceeded in normal operation.

Clear identification of, and easy access to the means of isolation is essential for their effective use. It is also necessary to ensure that the maintenance procedure makes sure that unauthorised re-closure of the switches does not occur.

It is not considered necessary to have a means of isolation or electrical protection for the screen.

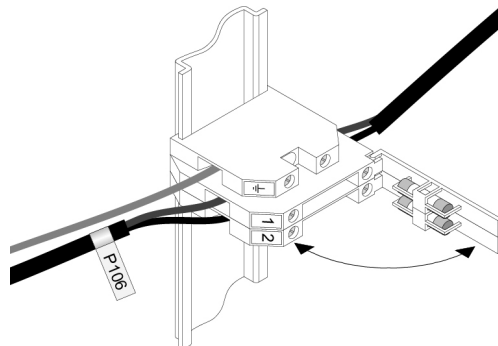


Fig 1 DIN rail mounting terminals incorporating a fuse.

For some applications Ex nA instrumentation energised by a current limited power supply or instrument that can be switched off, is considered adequate and to comply with the requirements of the standard.

3.2 Sensor inputs

When configured as a Timer both inputs may be connected to a wide variety of Zone 2 sensors as shown in Fig 2, or to safe area sensors as shown in Fig 3. The two BA374NG inputs are not used when the instrument is configured as a Clock.

When designing a system it is important to remember that Terminals 2, 6, 10 and RS2 of the BA374NG Timer or Clock are internally connected together.

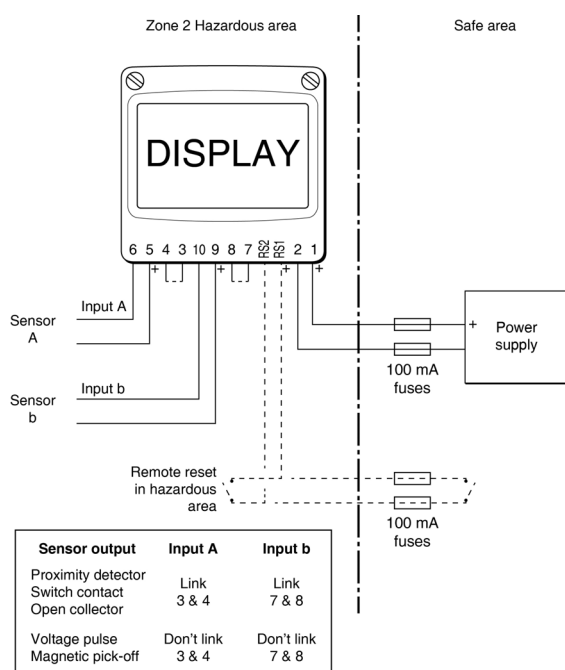


Fig 2 BA374NG connected to Zone 2 sensors

3.2.1 Input switching thresholds

For reliable operation the BA374NG Timer or Clock sensor input must fall below the lower threshold and rise above the upper thresholds shown in the following table.

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

Switch contact, proximity detector and open collector sensors require energising which is achieved by linking Timer or Clock terminals 3 and 4 for input A and terminals 7 and 8 for input b.

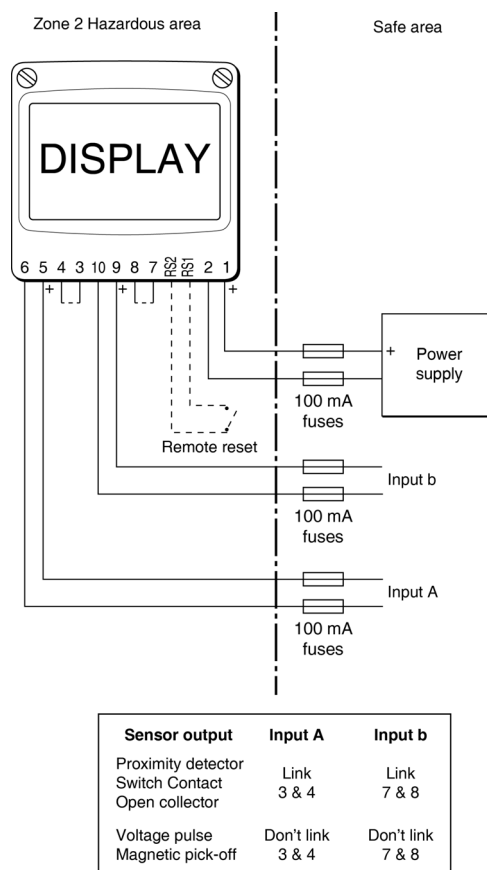


Fig 3 BA374NG connected to safe area sensors

3.2.2 Switch contact input

Any mechanically or magnetically activated switch contact located in Zone 2 or in the safe area may be directly connected to pulse input terminals 5 and 6 and to terminals 7 and 8. Both Timer or Clock pulse inputs are non incensive, allowing connection to unprotected switch contacts located in Zone 2. The switch sensor and associated wiring should be able to withstand a 500V rms insulation test to earth. Most magnetically activated reed relays comply with these requirements. The BA374NG contains a configurable debounce circuit to prevent contact bounce being counted. See section 6.5.6.

3.2.3 Open collector input

Sensors with an open collector output located in Zone 2 or in the safe area may be directly connected to input terminals 5 and 6 or to 7 and 8 providing the Sensor and associated wiring can withstand a 500V rms insulation test to earth.

The BA374NG contains a configurable debounce circuit to prevent false triggering. See section 6.5.6.

3.2.4 2-wire proximity detector input

Most Zone 2 certified NAMUR 2-wire proximity detectors may be directly connected to a BA374NG input terminals 5 and 6 or to 7 and 8 providing the minimum operating voltage of the proximator is greater than 7.5V. The proximity detector and the associated wiring should be able to withstand a 500V rms insulation test to earth.

The BA374NG contains a configurable debounce circuit to prevent false triggering. See section 6.5.6.

3.2.5 Magnetic pick-off input

Sensors incorporating a magnetic pick-off will usually have a low level ac voltage output which a BA374NG Timer or Clock can sense when configured for a \overline{L} input. The Timer or Clocks input terminals may be connected to any Zone 2 certified magnetic pick-off sensor, providing the output in normal operation is equal to or less than 30V the Timer or Clock's U_i . The sensor and associated wiring should be able to withstand a 500V rms insulation test to earth.

The BA374NG contains a configurable debounce circuit to prevent false triggering. See section 6.5.6.

3.2.6 Voltage pulse input

Two voltage pulse input ranges are selectable in the BA374NG Timer or Clocks configuration menu, $U_{\text{H}}L\overline{L}5L$ and $U_{\text{H}}L\overline{L}5H$. The Timer or Clocks input terminals may be connected to any Zone 2 certified voltage pulse output sensor, providing the output in normal operation is equal to or less than 30V the Timer or Clock's U_i . The sensor and associated wiring should be able to withstand a 500V rms insulation test to earth.



The BA374NG contains a configurable debounce circuit to prevent false triggering. See section 6.5.6.

3.2.7 Remote reset

Connecting the external reset terminals RS1 and RS2 together will reset the BA374NG when configured as a Timer and synchronise the displayed time to a preset time when configured as a Clock.

Remote resetting may be accomplished by any mechanically operated switch located in the same Zone 2 hazardous area as the instrument providing the switch and the associated wiring can withstand a 500V rms insulation test to earth.

Fig 2 illustrates how a BA374NG may be reset from both the safe and the hazardous area.

Note: When used as a Timer the BA374NG may also be reset from the display mode by operating the  and  push buttons simultaneously for more than three seconds. See 6.5.20

3.2.8 Status output

The BA374NG Timer or Clock has an opto-isolated Ex nA certified open collector output which can be configured to indicate the status of the instrument, or to perform simple control functions. The output has the following electrical parameters:

V_{max}	=	30V dc
I_{max}	=	10mA
R_{on}	=	$60\Omega + 3V$
R_{off}	=	1M Ω

The status output may be connected to any dc circuit providing that in normal operation the maximum supply voltage is not greater than 30V dc and the maximum current is not greater than 10mA.

Providing the BA374NG Timer or Clock is correctly installed in Zone 2, the status output may be directly connected to any suitably protected equipment located in Zone 2 or to equipment located in a safe area.

Fig 4 shows a BA334NE Timer or Clock installed in Zone 2 with the status output connected to a safe area load. The status output flows through R1 resulting in a voltage output of about 20V in the safe area when the status output is activated..

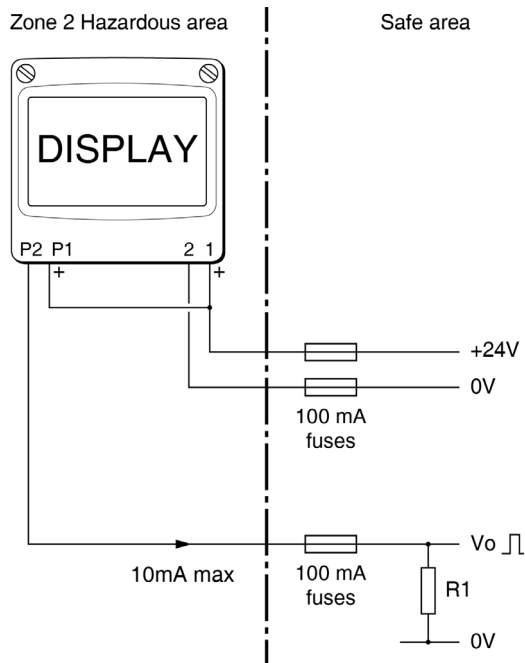


Fig 4 Transferring status output to safe area.

3.2.9 Control outputs (optional)

Each of the two factory fitted optional control outputs is a galvanically isolated single pole solid state switch as shown in Fig 5. 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.

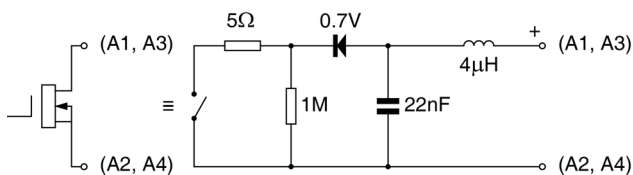


Fig 5 Equivalent circuit of each control output

Each control output is a separate galvanically isolated Ex nA circuit with the following input parameters:

$$\begin{aligned} U_i &= 30V \text{ dc} \\ I_i &= 200mA \end{aligned}$$

This allows each control output to switch any dc circuit providing that in normal operation the maximum supply voltage is not greater than 30V dc and the switched current is not greater than 200mA.

Providing that the BA374NG Timer or Clock is correctly installed in Zone 2 the two control outputs may be used to switch suitably protected equipment located in a Zone 1 or 2 hazardous area, or equipment located in a safe area.

Fig 5 shows a typical application in which a Zone 2 mounted BA374NG configured as a Timer is measuring the time that a Zone 2 contact is closed. Control output 1 is switching an Ex e sounder in Zone 1 and control output 2 is switching a safe area sounder.

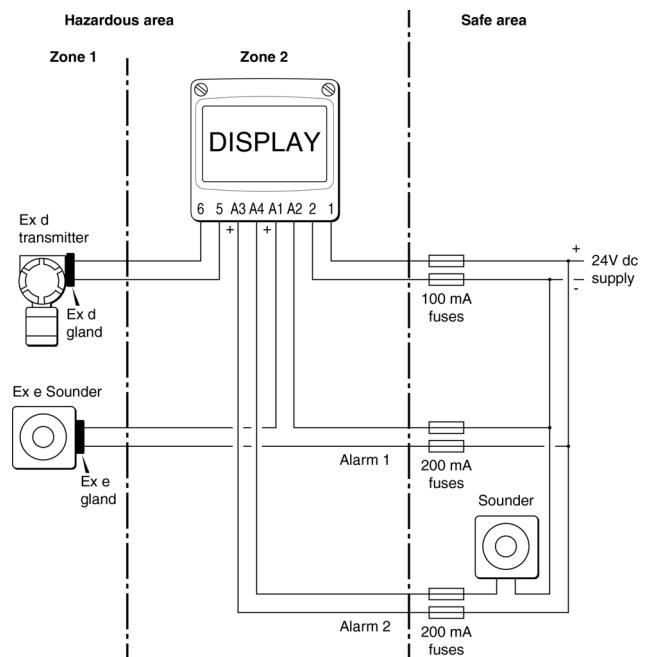


Fig 6 Typical control output application (Shown without recommended screened cables)

4. INSTALLATION

4.1 Location

The BA374NG Timer or Clock is housed in robust IP66 glass reinforced polyester (GRP) enclosure incorporating an armoured glass window and stainless steel fittings making it suitable for exterior mounting in most industrial on-shore and off-shore installations. The Timer or Clock should be positioned where the display is not in continuous direct sunlight.

Field wiring terminals are located on the rear of the Timer or Clock assembly as shown in Fig 8.

To ensure electrical continuity between the two conduit or cable entries, the enclosure back-box is fitted with a bonding plate which includes an M4 earth stud. The bonding plate may be mounted on the inside or outside of the enclosure. If the carbon loaded GRP enclosure is not bolted to an earthed post or structure, this earth stud should be connected to a local earth or the plant potential equalising conductor.

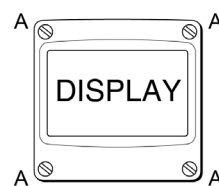
An insulated M4 stud is provided in the bottom right hand corner of the back-box for interconnecting cable screens.

The BA374NG Timer or Clock may be pipe mounted using a BA393G pipe mounting kit..

4.2 Installation Procedure

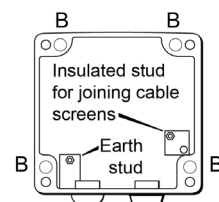
Fig 7 illustrates the instrument installation procedure.

- Remove the Timer or Clock assembly by unscrewing the four captive 'A' screws.
- Mount the enclosure back-box on a flat surface and secure with screws or bolts through the four 'B' holes. Alternatively use the pipe mounting kit which is available as an accessory.
- Remove the temporary hole plug and install an appropriate IP and temperature rated M20 x 1.5mm certified cable gland or conduit fitting. If two entries are required, the supplied IP66 stopping plug should be replaced with an appropriate IP and temperature rated M20 x 1.5mm certified cable gland or conduit fitting.
- Connect the field wiring to the terminals as shown in Fig 8. Replace the instrument assembly on the back-box and evenly tighten the four 'A' screws.



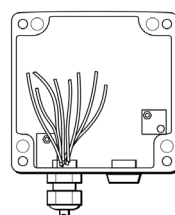
Step A

Unscrew the four captive 'A' screws and separate the indicator assembly and the back-box.



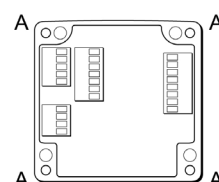
Step B

Secure the enclosure back-box to a flat surface with M6 screws through the four 'B' holes. Alternatively use a pipe mounting kit.



Step C

Remove the temporary hole plug and install an appropriate IP rated cable gland or conduit fitting. Feed the field wiring through the cable entry.



Step D

Terminate field wiring on the indicator assembly. Replace the indicator assembly on the enclosure back-box and tighten the four 'A' screws.

Fig 7 BA374NG installation procedure

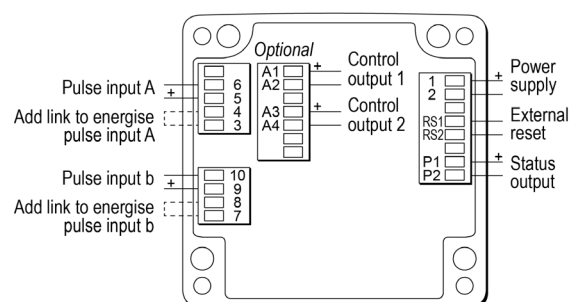
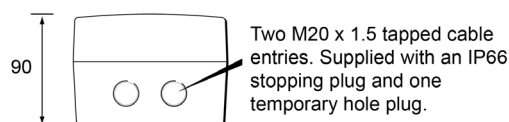
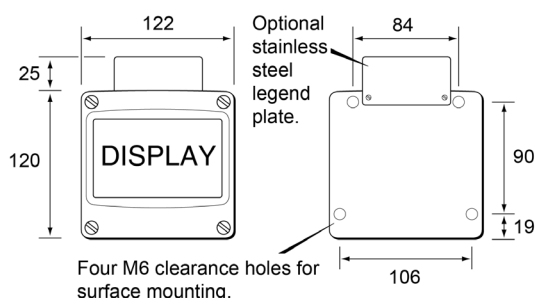


Fig 8 Dimensions and terminal connections

4.3 EMC

The BA374NG 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 in the safe area.

4.4 Units of measurement and tag marking on scale card.

The Timer or Clock's units of measurement and tag information are shown on a scale card which slides into the instrument.

New Timer or Clocks are supplied with a printed scale card showing the requested units of measurement and tag information. If this information is not supplied when the instrument is ordered, a blank scale card will be fitted which can easily be marked on-site with a dry transfer or a permanent marker. Custom printed scale cards are available from BEKA associates as an accessory.

To remove the scale card from a Timer or Clock carefully pull the transparent tab at the rear of the instrument assembly away from the assembly as shown in Fig 9a.

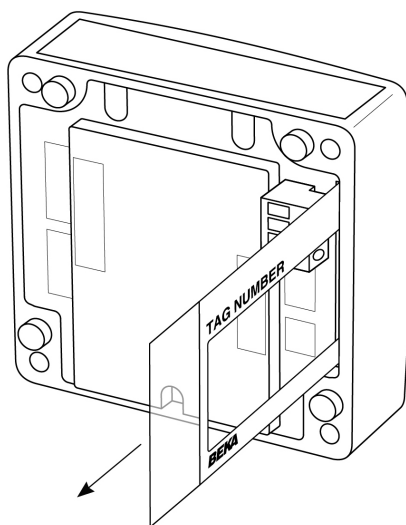


Fig 9a Removing scale card

To replace the scale card carefully insert it into the slot on the right hand side of the input terminals as shown in Fig 9b. Force should be applied evenly to both sides of the scale card to prevent it twisting. The card should be inserted until about 2mm of the transparent tab remains protruding.

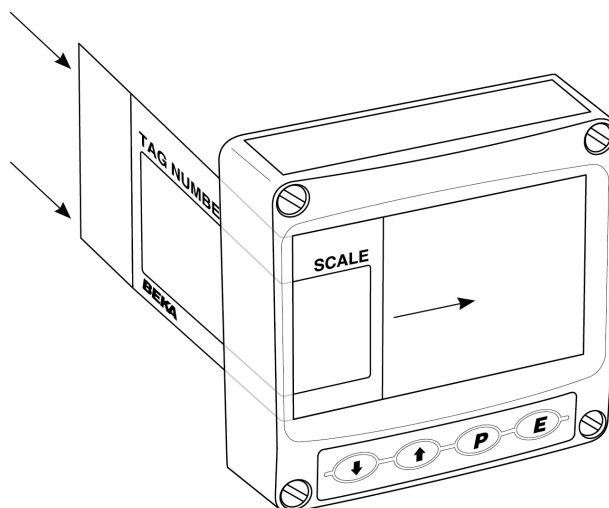


Fig 9b Inserting scale card into the instrument assembly.

5. ACCESSORIES

5.1 Display backlight

The BA374NG Timer or Clock can be supplied with a factory fitted backlight that produces 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 no additional wiring is required, but the supply current increases as shown below.

BA374NG configured as Timer current consumption

BA374NG Timer or Clock	10mA
Additional for backlight	16mA
Addition with terminals 3 & 4 linked	6mA
Addition with terminals 7 & 8 linked	6mA

Total current	38mA max

BA374NG configured as Clock current consumption

BA374NG Timer or Clock	10mA
Additional for backlight	16mA

Total current	26mA max

5.2 Control outputs

Although the dual isolated control outputs are factory fitted options, they are described in the main body of this instruction manual as they will be used for the majority of applications. If control outputs are required they should be specified when the instrument is ordered.

5.3 Units of measurement & instrument identification.

New BA374NG Timer or Clocks are supplied with a printed scale card showing the units of measurement and tag information specified when the instrument was ordered. If this information was not supplied a blank scale card will be fitted which can easily be marked with a dry transfer or a permanent marker on-site.

Custom printed scale cards are available as accessories and may be easily fitted as shown in section 4.4 of this manual.

5.4 Legend plate

The BA374NG can also be supplied with a blank or custom laser engraved stainless steel legend plate - see Fig 8. The plate, which after installation is visible from the front of the instrument, is supplied loose with two fixing screws for securing it to the rear of the instrument's back-box. This plate can typically accommodate:

1 row of 5 alphanumeric characters 10mm high

or 1 row of 6 alphanumeric characters 7mm high

or 2 rows of 10 alphanumeric characters 5mm high

5.5 BA393G pipe mounting kit

316 stainless steel pipe mounting kit, attaches a BA374NG to any vertical or horizontal pipe with an outside diameter between 40 and 73mm.

5.6 BA394G panel mounting kit

The BA374NG may be panel mounted using a BA394G stainless steel panel mounting kit. This secures the BA374NG into a panel aperture and maintains the ingress protection of the instrument, but it does not provides an IP66 seal between the front and rear of the panel in which the BA374NG Timer or clock is mounted.

6. OPERATION AS A TIMER

When configured as a Timer the BA374NG can measure and display the elapsed time between external events. The Timer can be started and stopped by remote sensors, or from the front panel push buttons.

The addition of optional factory fitted isolated control outputs allows the Timer to control external events such as opening a valve for a predetermined time. Again the Timer can be started and stopped by remote sensors, or from the front panel push buttons. Timed events can be repeated using the **REPEAT** function which enables the BA374NG Timer to repeat the timing period up to 99 times, or continuously, with a configurable delay between timed periods of up to 100 hours.

The BA374NG may be configured to time-up from zero to the set time **SET T**, or to time-down from the set time to zero. Times may be entered and displayed in hours, minutes or in seconds, or in a combination of units. Elapsed or remaining time is continuously displayed and a separate display may be activated to show the target set time **SET T**. Throughout the timing cycle the instrument can be paused and restarted without changing the cycle time. Resetting is accomplished via the front panel push buttons or a remote contact.

A grand total time is maintained by the instrument which can be viewed by operating the front panel push buttons and reset from the display mode or from within the configuration menu.

Fig 10 shows a simplified block diagram of the BA374NG when configured as a Timer. The two separate inputs A and b can be individually configured to accept inputs from a wide variety of sensors. When the sensor requires energising to detect its state, such as a switch contact, open collector or a two wire proximity detector, a link connected between external terminals of the BA374NG supplies power to the sensor input terminals.

The optically isolated status control output is a current sink intended for monitoring the Timer's status, but may also be used for simple control applications.

The instrument can be supplied with the following factory fitted accessories:

Internally powered Backlight

Dual isolated Control Outputs

The optional, factory fitted, dual isolated solid state control outputs may be independently configured to be activated in any of the timer's state allowing the BA374NG Timer to perform a wide variety of tasks.

6.1 Initialisation

Each time power is applied to a BA374NG initialisation is performed. After a short delay the following display sequence occurs:

All segments of the display are activated

BA374NG is ready to start functioning using the configuration information stored in the instrument's permanent memory.

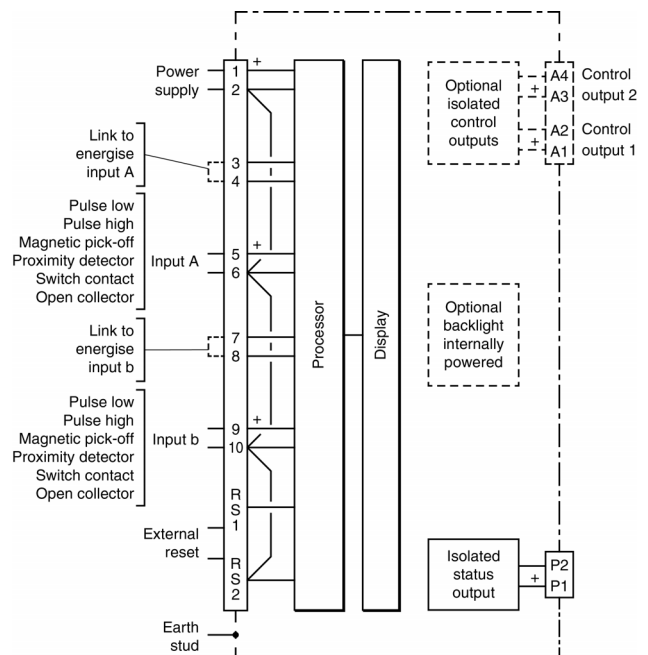


Fig 10 BA374NG block diagram with Timer configuration.

6.2 Controls when configured as a Timer

The BA374NG is controlled and configured via four front panel push buttons. In the display mode i.e. when the instrument is timing the push button functions are:

Push Button Functions

- ▼ When local control is enabled starts the Timer. See 6.5.9
- ▲ When local control is enabled stops the Timer. See 6.5.9
- Ⓔ + ▲ Shows the grand total (run time) in hours and tenths of an hour irrespective of Timer configuration. If buttons are held for longer than ten seconds the grand total may be reset to zero if the grand total reset sub-function *GLR GLt0t* is enabled in the *L0C r5Et* configuration function. See 6.5.21
- The grand total can be reset to zero from the display mode by pressing the Ⓔ and ▲ buttons simultaneously for ten seconds until *GLR n0* is displayed. Changing the display to *GLR 4E5* using the ▼ or ▲ button and then pressing Ⓔ will reset the grand total to zero.
- ▼ + ▲ Resets the Timer to zero or to the set time *5Et t* depending on whether the Timer is configured to *time-up* or *time-down* when the two buttons are operated simultaneously for more than two seconds. This is a configurable function. See 6.5.20
- ⒫ + ▲ When enabled in the configuration menu, operating these two buttons simultaneously provides direct access from the display mode to the set time *5Et t* and, if the repeat timing cycle is enabled, to the restart delay *r5t dELR*. See 6.5.16
- ⒫ + ▼ Shows in succession, firmware version number, instrument function *ELRP5E* and any output accessories that are fitted:
 - A Dual control outputs
 - P Status output
 - (Always fitted)
- ⒫ + Ⓔ Accesses the configuration menu

6.3 Displays when configured as a Timer

The BA374NG has two digital displays and associated annunciators as shown on front cover of this manual.

Elapsed time The upper display shows the elapsed time since the Timer was started when *timing-up from zero* and the remaining time when *timing-down* from the set time. Display may be formatted as hh:mm:ss; hh:mm; mm:ss or ss.

Lower display The display options available on the lower display depend on whether the Timer repeat cycle function *GLLE5*, which can repeat the timing period up to 99 times with a configurable delay between periods, is enabled.

GLLE5 disabled

The lower display shows the set time *5Et t* or the lower display may be disabled if not required. See 6.5.8

GLLE5 enabled

The lower display shows the total number of repeat cycles requested together with the number of the current cycle. Each operation may be briefly named at it's start or periodically throughout the cycle. Alternatively the lower display may be disabled if not required. See 6.5.8

Reset annunciator

Activated while elapsed time is being reset to zero or to the set time *5Et t*.

Status output annunciator

RTX shown while status output is activated.

Grand total annunciator



Activated when the grand total time is being shown on the upper display.

Control output annunciators 1 and 2.

Shows status of each optional control outputs.

6.4 Timer structure

Fig 11 illustrates the Timer structure and function. It applies when the instrument is measuring the time between events or is controlling external events.

The circles in Fig 11 represent the five Timer states, *Reset*, *Running*, *Restart-delay*, *Paused* and *Complete*. The lines between the circles represent the event required to move the Timer between states. e.g. to initiate timing the Timer is moved from the *Reset* state to the *Running* state by a start event. This could be an input signal at input A or operation of the  button. Similarly, to pause the Timer while it is timing, the Timer must be moved from the *Running* state to the *Paused* state by a stop event which could be an input on input b or operation of the  button.

Reset

In this state the Timer is readied for operation. The Timer is stopped and loaded with zero for timing-up or 5Et t for timing-down.

Running

Entered by a start event from the *Reset* or *Paused* states. The Timer times-up to 5Et t or times-down to zero depending upon its configuration.

Pause

Entered by a stop event from *Running* or *Restart-delay*. Timer is stopped, a start event returns the timer to its previous state.

Restart-delay

Entered automatically from *Running*. At the end of the delay time automatically returns to *Running*.

Complete

Entered automatically from *Running* when there are no more timing cycles to perform.

6.5 Configuration as a Timer

The BA374NG is configured via the four front panel push buttons. All the configuration functions are contained in an easy to use intuitive menu that is shown diagrammatically in Fig 12.

Each menu function is summarised in section 6.5.2 of this manual and each summary includes a reference to more detailed information.

All new BA374NG instruments are supplied configured as requested at the time of ordering. If configuration is not requested, the BA374NG will be supplied with default Timer configuration as shown below, but the instrument can easily be re-configured on-site.

Function	Display	Default
Access code	[odE	0000
Function	Funct on	ELAPSE
Input A	input-A	oP.CoL
Input b	input-b	oP.CoL
Debounce (each input)	dEbounCE	dEFRAULt
Display 2	diSP-2	5td
Start stop	StArStoP	LoCAL
Units	unitS	12:00:00
Set time	5Et t	00:00:00
Enable repeat cycle	CYCLE5	oFF
Access set time from display mode.	RC5Et t	oFF
Direction of count	uP or dn	dn
Recovery from power supply failure.	P-FR, L	idLE
Local total reset	t-rESEt	on
Local grand total reset	Gr-tESEt	oFF
External reset	E-rSEt	5td
Enable status output	EnbL	oFF
Enable control output 1*	EnbL	oFF
Enable control output 2*	EnbL	oFF

* Optional output

When the CYCLE5 function is enabled the timing cycle can be specified to repeat up to 99 times, or can be configured to repeat continuously.

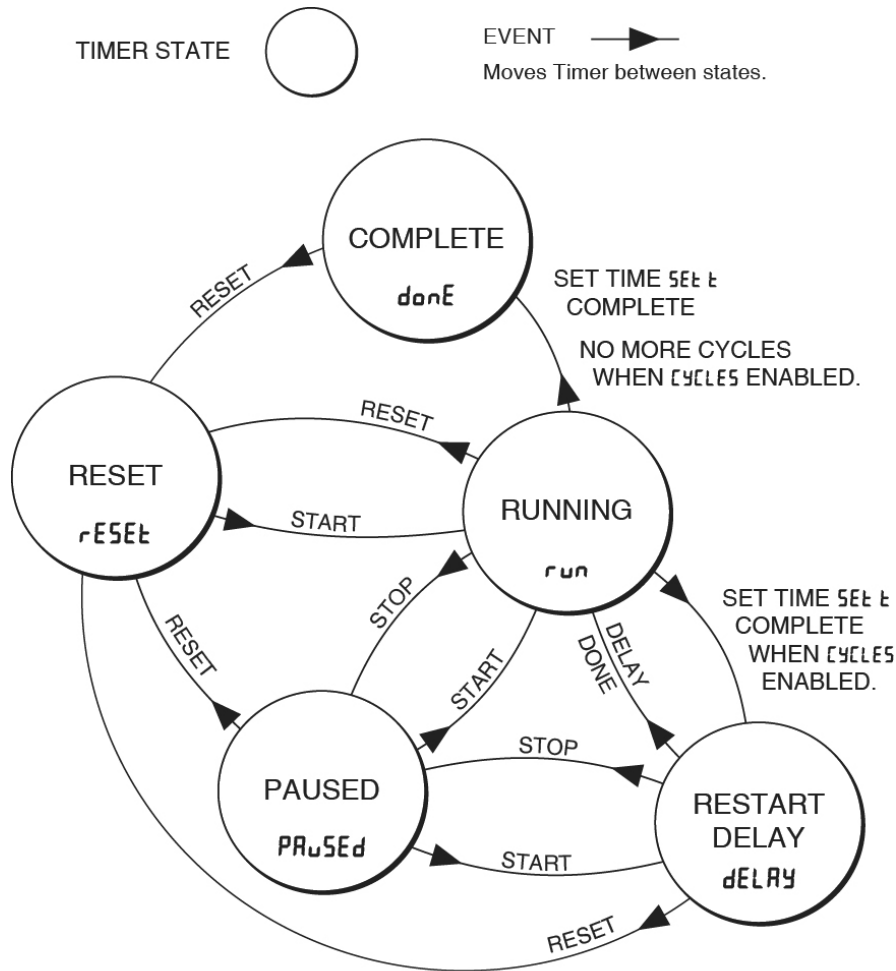













Fig 11 Timer structure showing states and events



6.5.1 Accessing configuration functions

Throughout this manual front panel push buttons are shown as , ,  and . Legends displayed by the instrument are shown in a seven segment font just as they appear on the instrument e.g. *RESET-R* and *CLR Gt000*.

Access to the configuration menu is obtained by operating the  and  push buttons simultaneously. If the instrument is not protected by an access security code the first parameter *Function on* 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 *Function on* 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 main configuration menu the required parameter can be selected by scrolling through the menu using the  or  push buttons. The Timer configuration menu is shown diagrammatically in Fig 12.

When returning to the display mode following reconfiguration, the Timer will display *ARR* followed by *SAVE* while the new information is stored in permanent memory.

When configuring the Timer or clock if a push button is not operated for a minute, the instrument will automatically return to the display mode without saving any configuration changes. Therefore it is advisable to save configuration changes frequently to avoid losing any configuration changes.





6.5.2 Summary of Timer configuration functions

This section summarises all the Timer configuration functions. When read in conjunction with Fig 16 it provides a quick aid for configuring the Timer. If more detail is required, each section of this summary contains a reference to a full description of the function.

Display	Summary of function
Funct on	Instrument function Defines the function of the instrument. May be set to: ELAPSE Timer configuration CLoc Clock configuration All the entries in this Timer summary assume that the BA374NG is configured as a Timer by selecting ELAPSE. See section 6.5.3
Input-A	Configuration of Input A Contains a sub-menu with two sub-functions: InputYPE Selects input sensor type debounce Defines input debounce See section 6.5.4 InputYPE Configures the Timer sensor Input A to accept one of six types of input: Voltage L Voltage pulse <1 >3V Voltage H Voltage pulse <3 >10V Mag L Magnetic pick-off Prox.dEt Proximity detector * Switch REL Switch contact * Open.col Open collector * * Energise input by linking terminals 3 & 4 for Input A. See section 6.5.5 debounce Defines the level of input debounce applied to the input A to prevent false counting: DEFAULT HEAVY LIGHT See section 6.5.6

Display	Summary of function																		
Input b	Configuration of input-b As configuration of Input A * Energise input by linking terminals 7 & 8 for Input b. See section 6.5.7																		
SP-2	Lower display Configures the lower display to show set time SEt or, when the CYCLE5 repeat function is activated, the restart delay count-down plus the cycle count number. With CYCLE5 not enabled: <table><tr><td>Select</td><td>Lower display shows</td></tr><tr><td>SEt</td><td>Set time SEt</td></tr><tr><td>oFF</td><td>Disables lower display. See section 6.5.8</td></tr></table> With CYCLE5 enabled: <table><tr><td>Select</td><td>Lower display shows</td></tr><tr><td>SEt</td><td>Cycle counts requested and counts performed with time-down shown during requested delay period. Brief notification of timer status i.e. CYCLE or dELAY at start of each period.</td></tr><tr><td>LRbEL</td><td>Exactly as SEt but with periodic notification of timer status i.e. CYCLE or dELAY.</td></tr><tr><td>oFF</td><td>Disables lower display. See section 6.5.8</td></tr></table>	Select	Lower display shows	SEt	Set time SEt	oFF	Disables lower display. See section 6.5.8	Select	Lower display shows	SEt	Cycle counts requested and counts performed with time-down shown during requested delay period. Brief notification of timer status i.e. CYCLE or dELAY at start of each period.	LRbEL	Exactly as SEt but with periodic notification of timer status i.e. CYCLE or dELAY.	oFF	Disables lower display. See section 6.5.8				
Select	Lower display shows																		
SEt	Set time SEt																		
oFF	Disables lower display. See section 6.5.8																		
Select	Lower display shows																		
SEt	Cycle counts requested and counts performed with time-down shown during requested delay period. Brief notification of timer status i.e. CYCLE or dELAY at start of each period.																		
LRbEL	Exactly as SEt but with periodic notification of timer status i.e. CYCLE or dELAY.																		
oFF	Disables lower display. See section 6.5.8																		
Start-Stop	Starting and stopping the timer Defines how the Timer is started and stopped. <table><tr><td></td><td>Start</td><td>Stop</td></tr><tr><td>Control 1</td><td>A input high</td><td>b input high</td></tr><tr><td>Control 2</td><td>A input low</td><td>b input low</td></tr><tr><td>Control 3</td><td>A input high</td><td>A input low</td></tr><tr><td>Control 4</td><td>A input low</td><td>A input high</td></tr><tr><td>LoCRL</td><td>▼ button</td><td>▲ button</td></tr></table> High and low inputs are specified for a voltage input. For other types of sensor input, see section 6.5.9		Start	Stop	Control 1	A input high	b input high	Control 2	A input low	b input low	Control 3	A input high	A input low	Control 4	A input low	A input high	LoCRL	▼ button	▲ button
	Start	Stop																	
Control 1	A input high	b input high																	
Control 2	A input low	b input low																	
Control 3	A input high	A input low																	
Control 4	A input low	A input high																	
LoCRL	▼ button	▲ button																	

Display	Summary of function
units t5	<p>Units of display Enables the format of the displayed time to be selected.</p> <p>12:00:00 Hours, minutes & seconds 12:00 Hours & minutes 30:00 Minutes & seconds 30 Seconds</p> <p>Excludes delay of optional control outputs which is always shown in seconds and the grand total which is always shown in hours. See section 6.5.10</p>
5Et t	<p>Set time This is the BA374NG Timer's setpoint. When controlling an external event via the optional control outputs the BA374NG will time-down from the set time to zero or time-up from zero to the set time. Note: Timer will only start if a non zero value is entered for set time 5Et t. See section 6.5.11</p>
CYCLE5	<p>Repeat timing cycle Contains a sub-menu with three sub-functions, EnbL, CYCL Cnt and r5t dELR. See section 6.5.12</p> <p>Cycle function enable EnbL Enables or disables the cycles function without changing the parameters. See section 6.5.13</p> <p>Cycle count CYCL Cnt Defines the number of times that the timer cycle is repeated. See section 6.5.14</p> <p>Restart delay r5t dELR Defines the time delay between timer cycles. See section 6.5.15</p>
RC5Et t	<p>Access 5Et t from display mode Contains two sub-functions, EnbL which when activated allows the set time 5Et t and restart delay r5t dELR to be adjusted from the display mode. The second sub-function RCLd defines a separate access code to protect access to 5Et t from the display mode. See section 6.5.16</p>

Display	Summary of function
uP or dn	<p>Direction of count Defines whether the Timer times-up from zero to the set time 5Et t, or times-down from 5Et t to zero. See section 6.5.17</p>
P-FR, L	<p>Power Failure Defines how the Timer functions when power is restored after a power failure. Contains three alternative options, dLE, PRu5E and Cont, nuE.</p> <p>Idle dLE Timer returns in stopped state as if having completed single timing cycle displaying Timer value when power was lost. Timing resumes when reset followed by start instructions are received.</p> <p>Pause PRu5E Timer returns in paused state displaying Timer value when power was lost. Timing resumes when start instruction is received.</p> <p>Continue Cont, nuE Timer will continue without any manual intervention. See section 6.5.18</p>
LdC r5Et	<p>Local reset Contains two sub-functions which when enabled allow the Timer and the grand total, which represents total Timer run-time, to be reset to zero via the front panel push buttons while the Timer is in the display mode. See section 6.5.19</p> <p>Local total reset r5Et.EnbL When on is selected, Timer is reset to zero, or 5Et t if timing-down, when the  and  buttons are operated simultaneously for more than 2 seconds in the display mode. See section 6.5.20</p> <p>Local grand total reset CLr Gtnt When on is selected the grand total, which represents total run-time, may be reset to zero by operating the  and  buttons simultaneously for more than 10 seconds in the display mode. See section 6.5.21</p>

Display	Summary of function	Display	Summary of function
E-rSEt	External reset Defines the time taken for closure of external contacts connected to terminals RS1 & RS2 to reset the Timer. <div> Set 1s FRSE 2ms </div> See section 6.5.22		Control output 1 on aP1 on Control output 1 turns <i>on</i> when the Timer enters the state selected in this function. Output phase can be reversed. See section 6.5.30
SEtE aP	Status output Contains sub-menu with four sub-functions, <i>EnbL</i> , <i>SEtE on</i> , <i>SEtE oFF</i> and <i>SEtEdELR</i> Note: Output is a passive open collector. See section 6.5.23 Status output enable EnbL Enables or disables the status output without changing any of the parameters. See section 6.5.24 Status output on SEtE on Status output turns <i>on</i> when the Timer enters the state selected in this function. Output phase can be reversed. See section 6.5.25 Status output off SEtE oFF Status output turns <i>off</i> when the Timer enters the state selected in this function. Output phase can be reversed. See section 6.5.26 Status on delay SEtEdELR Introduces a specified delay between the <i>on</i> condition occurring and the status output being activated. See section 6.5.27	aP2	Control output 1 off aP1 oFF Control output 1 turns <i>off</i> when the Timer enters the state selected in this function. Output phase can be reversed. See section 6.5.31 Control output on delay aP1 dELR Introduces a specified delay between the <i>on</i> condition occurring and control output 1 closing. See section 6.5.32 Control output 2 (Optional) aP2 Functions as control output 1. See section 6.5.28 to 6.5.33
aP1	Control output 1 (Optional) Contains sub-menu with four sub-functions, <i>EnbL</i> , <i>aP1 on</i> , <i>aP1 oFF</i> and <i>aP1 dELR</i> . See section 6.5.28 Control output enable EnbL Enables or disables control output 1 without changing the parameters. See section 6.5.29	CLr GtOt	Resets grand total to zero This function resets the grand total, which represents the total Timer run-time, from within the configuration menu when <i>CLr yE5</i> is selected and <i>SurE</i> is entered to confirm the instruction. Note: Once reset, the grand total can not be recovered. See section 6.5.34
		CoDE	Security code Defines a four digit alphanumeric code that must be entered to gain access to the instrument's configuration menu. Default code 0000 disables the security function and allows unrestricted access to all configuration functions when the P and E buttons are operated simultaneously in the display mode. See section 6.5.35
		rSEt dEF	Reset to factory defaults Resets the BA374NG to the Timer factory default configuration shown in section 6.4. Instruction confirmed by entering <i>SurE</i> . See section 6.5.36

6.5.3 Instrument function: $F_{unc}E, on$

The BA374NG may be configured as a Timer or as a Clock. This section of the instruction manual describes the Timer, for details of Clock configuration see section 9.

To reveal the existing function of the instrument select $F_{unc}E, on$ from the configuration menu and press $\langle P \rangle$. If $ELAPSE$ is displayed, the instrument is already configured as a Timer therefore press $\langle E \rangle$ to return to the $F_{unc}E, on$ prompt in the configuration menu. If $ELoE$ is displayed, press the \blacktriangle or \blacktriangledown button to change the setting to $ELAPSE$ followed by the $\langle P \rangle$ button which will result in a 0000 prompt being displayed with the first digit flashing. This is a request for the instruction to be confirmed by entering $5urE$ using the \blacktriangledown or \blacktriangle button to adjust the flashing digit and the $\langle P \rangle$ button to move control to the next digit. When $5urE$ has been entered, pressing $\langle E \rangle$ will change the instrument to a Timer and return the instrument to the display mode. To configure the Timer enter the configuration menu by pressing the $\langle P \rangle$ and $\langle E \rangle$ buttons simultaneously until $F_{unc}E, on$ is displayed.

6.5.4 Input A: i_{npul-R}

The i_{npul-R} function contains two sub-functions $i_{np.etype}$ which defines the type of sensor that may be connected to the input and $debounce$ which adjust the amount of input noise rejection.

6.5.5 Input type: $i_{np.etype}$

$i_{np.etype}$ is a sub-menu in the i_{npul-R} function which defines the type of input sensor that may be connected to input A. To check or change the type of input, select i_{npul-R} in the configuration menu and press $\langle P \rangle$ which will reveal the $i_{np.etype}$ prompt, pressing $\langle P \rangle$ again will show the existing input. If set as required press $\langle E \rangle$ twice to return to the configuration menu, or repeatedly press the \blacktriangle or \blacktriangledown button until the required type of input is displayed, then press $\langle E \rangle$ twice to return to the configuration menu.

One of following six types of input may be selected:

Display	Input type	Switching thresholds	
		Low	High
oP_{col}	Open collector ²	2	10k Ω
$UoLE5L$	Voltage pulse low ¹	1	3V
$UoLE5H$	Voltage pulse high ¹	3	10V
LoL	Magnetic pick-off	0	40mV
$Pr.dEt$	Proximity detector ²	1.2	2.1mA
$ConEREt$	Switch contact ²	100	1000 Ω

Notes:

1. Maximum voltage input +28V.
2. For sensors connected to input A that require energising i.e. a proximity detector, a switch contact or an open collector, terminals 3 & 4 of the BA374NG Timer should be linked together.
3. To function correctly, the input signal must fall below the lower switching threshold and rise above the higher switching threshold.

6.5.6 De-bounce: $debounce$

$debounce$ is an adjustable sub-menu in the i_{npul-R} function which prevents the Timer mis-functioning when the input has noisy edges, such as those resulting from a mechanical contact closing and bouncing. Three levels of protection may be selected and the amount of debounce applied depends upon the type of Timer input that has been selected in the $i_{np.etype}$ function.

The following table shows the minimum time that the input signal must be continuously above the upper input switching threshold and continuously below the lower switching threshold to ensure that the Timer processes the input signal. Input switching thresholds are shown in section 6.5.5.

De-bounce level	Min input pulse width	
	Contact	All others
$default$	1600 μ s	40 μ s
$heavy$	3200 μ s	350 μ s
$LGHE$	400 μ s	5 μ s

6.5.7 Input b: i_{npul-b}

The i_{npul-b} function and sub-functions are identical to the i_{npul-R} function & sub-functions described in sections 6.5.4, 6.5.5 and 6.5.6.

Notes:

1. Maximum voltage input +28V.
2. For sensors connected to input b that require energising i.e. a proximity detector, a switch contact or an open collector, terminals 7 & 8 of the BA374NG Timer should be linked together.
3. To function correctly, the input signal must fall below the lower switching threshold and rise above the higher switching threshold.

6.5.8 Lower display: $d, 5P-2$

The configuration options for the lower display vary depending upon whether the repeat timer function CYCLE5 is enabled.

CYCLE5 disabled

When the lower display is enabled it shows the set time $5Et\ t$

CYCLE5 enabled

When the lower display is enabled it shows the total number of repeat cycles requested together with the number of cycles performed. During the delay time between cycles the display shows the time until the next cycle starts.

Menu options allow each part of the cycle to be briefly identified at the start of each part, or periodically throughout the cycle.

To check or change the configuration of the lower display select $d, 5P-2$ from the configuration menu and press P which will reveal the existing setting which can be changed by pressing the \blacktriangle or \blacktriangledown button followed by the E button to enter the selection and return to the configuration menu.

If the CYCLE5 function is not enabled the following two options are available:

5Ed Lower display shows the Timer's set time $5Et\ t$, to which the BA374NG will time-up to, or time-down from, depending upon the direction of count selected in the uP or dn function.

oFF Lower display disabled – see 6.5.17.

If the CYCLE5 function is enabled the following three options are available:

5Ed Lower display shows the number of cycles requested together with the current cycle number. During the configurable delay period between cycles the display times-down from the requested delay to zero. A brief notification of timer status i.e. CYCLE or $dELAY$ is shown at the start of each period.

02 - 11

Current cycle number. Number of cycles requested, not shown when cycle is continuously repeated.

LABEL Exactly the same as $5Ed$, but timer status i.e. CYCLE or $dELAY$ is shown periodically.

oFF Lower display disabled.

6.5.9 Starting & stopping the Timer: $5tRr5tOP$

The Timer may be started and stopped by signals on Input A and Input b, or by operation of the front panel \blacktriangle or \blacktriangledown push buttons.

To check or change the control of the Timer, select $5tRr5tOP$ from the configuration menu and press P which will reveal the existing setting which can be changed by pressing the \blacktriangle or \blacktriangledown button followed by the E button to enter the selection and return to the configuration menu. The options available are shown in the following tables.

Voltage inputs and control from front panel

Display	Start	Stop
$\text{Control } 1$	A input high	b input high
$\text{Control } 2$	A input low	b input low
$\text{Control } 3$	A input high	A input low
$\text{Control } 4$	A input low	A input high
LoCAL	\blacktriangledown button	\blacktriangle button

Contact and open collector inputs






Display	Start	Stop
$\text{Control } 1$	A open	b open
$\text{Control } 2$	A closed	b closed
$\text{Control } 3$	A open	A closed
$\text{Control } 4$	A closed	A open

Proximity detector input

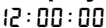



Display	Start	Stop
$\text{Control } 1$	A low current	b low current
$\text{Control } 2$	A high current	b high current
$\text{Control } 3$	A low current	A high current
$\text{Control } 4$	A high current	A low current



6.5.10 Units of display: 5

Defines the format of all displayed times, except the delay time of the status output and optional control outputs which are always shown in seconds and the grand total which is always shown in hours and tenths of an hour.

To check or change the units of display, select  5 from the configuration menu and press  which will reveal the existing setting which can be changed by pressing the  or  button followed by the  button to enter the selection and return to the configuration menu. The options available are shown in the following tables:

Display

	Hours, minutes & seconds
	Hours & minutes*
	Minutes & seconds
	Seconds

* Only available when time specified in seconds for  and  are zero or exactly divisible by 60.

The Timer's maximum elapsed time in any format is 100 hours.

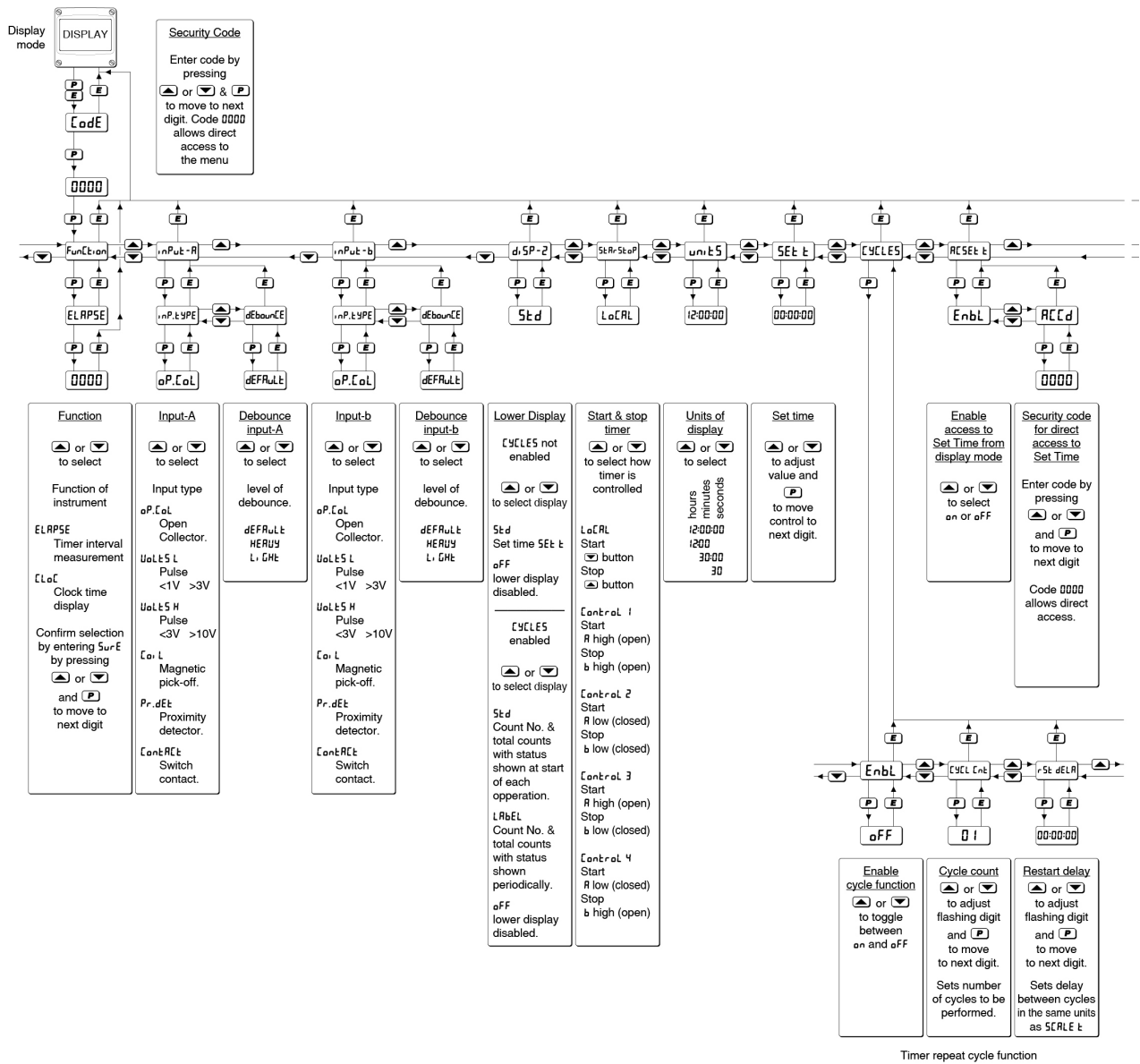
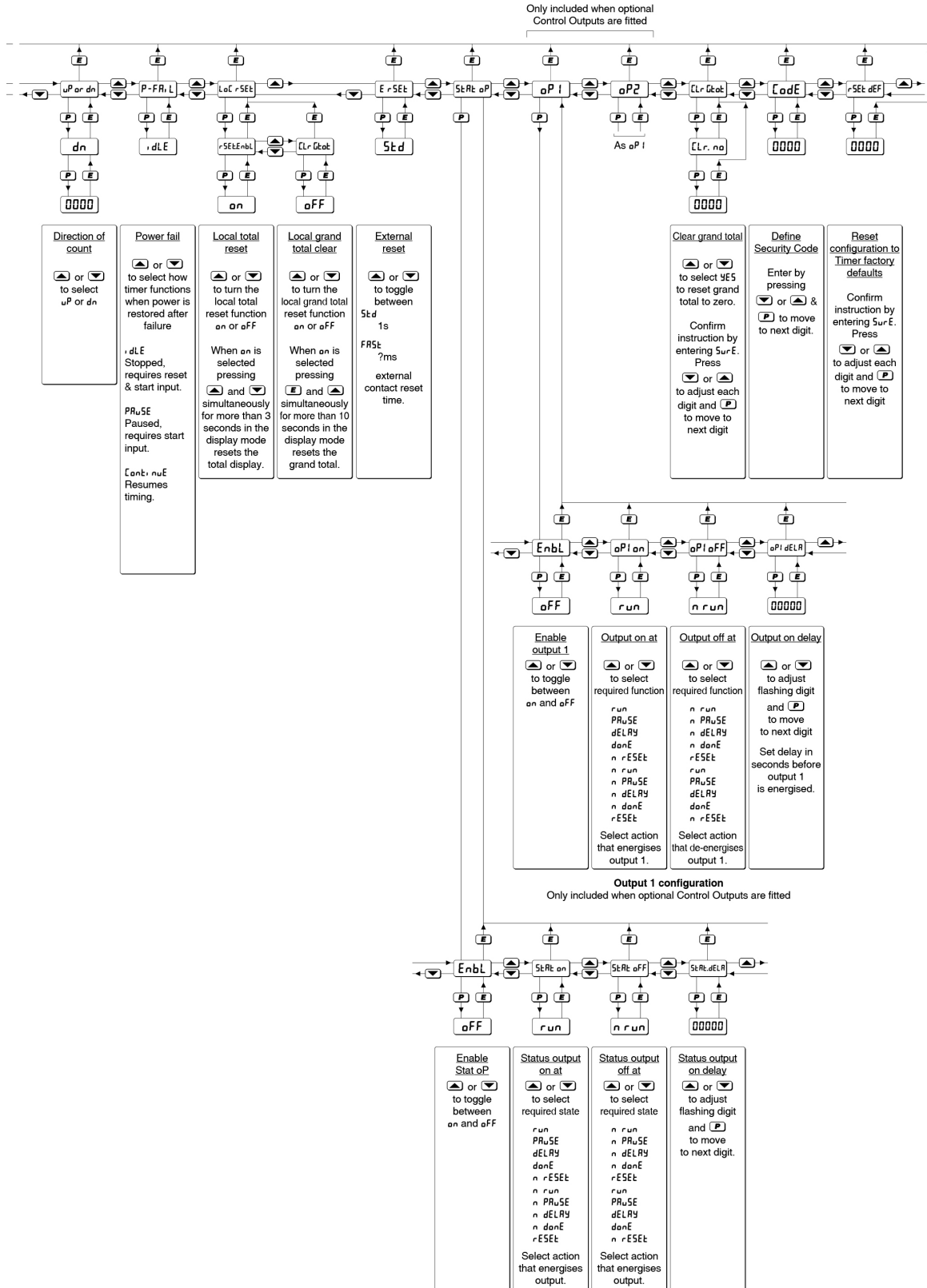


Fig 12 Timer Configuration menu



6.5.11 Set time: 5E t

Set time is the Timer's setpoint. When controlling an external event via the optional control outputs the BA374NG will time-down from the set time to zero or time-up from zero to the set time.

To check or change the set time, select 5E t from the configuration menu and press **[P]** which will reveal the existing setting displayed in the units defined by the u n t S function with the most significant digit flashing. The flashing digit may be adjusted by pressing the **[▲]** or **[▼]** button followed by the **[P]** button to transfer control to the next digit. When set as required, enter the selection and return to the 5E t prompt in the configuration menu by operating the **[E]** button.

Can also be adjusted from Timer display mode, see 6.5.16.

Note: If 5E t is zero the Timer will not function when an external start input is received or the **[▼]** button is operated.

6.5.12 Repeat timing cycle: Y L E S

This a powerful function which allows the BA374NG timing cycle to be repeated up to 99 times or continuously with a configurable delay between cycles of up to 99hours, 59 minutes & 59 seconds.

To check or adjust the repeat timing cycle, select Y L E S from the configuration menu and press **[P]** which will enter a sub-menu containing three sub-functions, E n b L, Y L E L n t and r S t d E L A which are described in the following sections.

6.5.13 Cycle function enable: E n b L

This sub-function allows the repeat timing cycle to be enabled or disabled without altering any of the repeat timing cycle parameters. To check or change the function select E n b L from the repeat timing cycle sub-menu Y L E S and press **[P]** which will reveal if the repeat cycle function is o n or o f f. The setting can be changed by pressing the **[▼]** or **[▲]** button followed by the **[E]** button to return to the repeat timing cycle sub-menu.

6.5.14 Cycle count: Y L E L n t

This sub-function defines the number of times the timer cycle is repeated. It may be set to any number between 1 and 99, or to 00 for continuous repetition. To check or change the function select Y L E L n t from the repeat timing cycle sub-menu Y L E S and press **[P]** which will reveal the number of times the timer cycle is to be repeated with the most significant flashing. The flashing digit may be adjusted by pressing the **[▲]** or **[▼]** button followed by the **[P]** button to transfer control to the next digit.

When set as required, enter the selection and return to the Y L E L n t prompt in the sub-menu by operating the **[E]** button.

6.5.15 Restart delay: r S t d E L A

This sub-function defines the time delay between repeat timing periods. It is shown in the format selected in the units function and may be set to any time between zero and the maximum time allowed in the selected format.

Time format selected in u n t S	Maximum delay
12:00:00	99:59:59
12:00	99:59
30:00	5999:59
30	359999

To check or change the restart delay time select r S t d E L A from the repeat timing cycle sub-menu Y L E S and press **[P]** which will reveal the delay time in the selected format with the most significant digit flashing. The flashing digit may be adjusted by pressing the **[▲]** or **[▼]** button followed by the **[P]** button to transfer control to the next digit. When set as required, enter the selection and return to the r S t d E L A prompt in the sub-menu by operating the **[E]** button.

Can also be adjusted from Timer display mode, see 6.5.16.

Note: When the repeat timing cycle Y L E S is used, there is no restart delay after the final cycle.

6.5.16 Adjusting the set time 5E t and restart delay r S t d E L A from the display mode: R C 5 E t

When this function is enabled the Timer's set time 5E t and restart delay r S t d E L A can be adjusted from the display mode by simultaneously operating the **[P]** and **[▲]** push buttons. Thus allowing an operator to adjust these parameters without having access to the instrument's configuration menu. The function contains two sub-functions, E n b L which activates the function and R C d which defines a separate code for access to 5E t with the Timer in the display mode.

To check or change the function, select R C 5 E t in the configuration menu and press **[P]** which will reveal the E n b L prompt, pressing **[P]** again will show if the function is o n or o f f. If adjustment of the set time from the display mode is not required press the **[▲]** or **[▼]** button to select n o and then press **[E]** twice to return to the configuration menu. If the function is required, select Y E S and press **[E]** to return to the E n b L prompt from which R C d, which allows a separate access code to be entered, can be selected by pressing the **[▲]** or **[▼]** button.

Access to SEt t from the display mode may be protected by a four digit alphanumeric security code which must be entered to gain access. Default security code 0000 allows unrestricted access. With RCLd displayed, press **[P]** to enter a new access code. The Timer will display 0000 with one digit flashing. The flashing digit may be adjusted using the **[▲]** or **[▼]** push button, when set as required operating the **[P]** button will transfer control to the next digit. When all the digits have been entered press **[E]** twice to return to the RCLSEt t prompt in the configuration menu. The revised access code will be activated when the BA374NG is returned to the display mode.

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

6.5.17 Direction of count: uP or dN

The Timer may be configured to time-up from zero to the set time SEt t while displaying elapsed time, or to time-down from the set time SEt t to zero while displaying the remaining time.

When the repeat timing cycle function CYCLE5 is enabled, it is recommended that a down count is selected so that the progress of the timer can be observed with a known completion time i.e. zero. If set as an up Timer or Clock, elapsed time will be displayed, but the set time SEt t at which the timer will stop is not shown.

To check the direction of count, select uP or dN from the configuration menu and press **[P]** which will reveal the existing setting. This can be changed by pressing the **[▲]** or **[▼]** button followed by the **[E]** button to enter the selection and return to the configuration menu.

6.5.18 Power Fail: P-FRL

Defines how the Timer powers-up and functions when power is restored after a power supply interruption. Three options are available, r dLE, PRuSE and CLnE, nUE.

r dLE The Timer is stopped in the state it achieves when it has timed-up to SEt t or timed-down to zero, with the elapsed or remaining time when power was lost shown on the upper display. The Timer must be reset before it can be restarted. If the repeat timing cycle is in use the number of cycles completed will be lost when the Timer is reset.

PRuSE The Timer is stopped in the state it achieves following receipt of a stop input to pause timing – see Fig 11. The elapsed or remaining time when power was lost is shown on the upper display. Timing resumes when a start instruction is received. If a start input exists when power is restored timing will start immediately.

CLnE, nUE When power is restored the Timer will continue from where it stopped without any manual intervention.

To check or change the function, select P-FRL from the configuration menu and press **[P]** which will reveal the existing setting which can be changed by pressing the **[▲]** or **[▼]** button followed by the **[E]** button to enter the selection and return to the configuration menu.

6.5.19 Local reset: Ld rSEt

The Local reset function contains two separate sub-functions rSEt.EnbL and CLr CLtE which when enabled allow the Timer and the grand total to be reset via the instrument's front panel push buttons while the Timer is in the display mode.

6.5.20 Local total reset: rSEt.EnbL

rSEt.EnbL is a sub-function in the Ld rSEt function which when activated allows an operator to reset the Timer from the display mode by operating the **[▲]** and **[▼]** push buttons simultaneously for more than three seconds.

To check or change the local total reset select Ld rSEt in the configuration menu and press **[P]** which will reveal the rSEt.EnbL prompt, press **[P]** again to 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 **[▲]** or **[▼]** button to change the setting followed by the **[E]** button twice to enter the change and return to the Ld rSEt prompt in the configuration menu.

Note:

The Timer may also be reset remotely by connecting terminals RS1 and RS2 together. See section 3.2.7

6.5.21 Local grand total reset: CLr CLtE

The grand total is the total run-time of the Timer that may be viewed by operating the **[E]** and **[▲]** push buttons simultaneously in the display mode. When activated CLr CLtE allows an operator to reset the grand total display to zero from the display mode by operating the **[E]** and **[▲]** push buttons simultaneously for more than ten seconds.

CLr CLtE is a sub-function in the Ld rSEt menu. To check or change the setting select Ld rSEt in the configuration menu and press **[P]** which will reveal rSEt.EnbL. Using the **[▼]** or **[▲]** button select CLr CLtE and press **[P]** to 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 **[▼]** or **[▲]** button to change the setting followed by the **[E]** button twice to enter the change and return to the Ld rSEt prompt in the configuration menu.

6.5.22 External reset

The Timer may be reset by connecting terminals RS1 and RS2 together. This function defines how long the connection must exist before resetting occurs. When resetting is performed by a manually operated external push button switch, *5Ed* should be chosen. This requires the contact to be closed for one second before resetting occurs which prevents false resetting.

If the Timer is being reset by the a control output or similar apparatus *FR5t* should be selected.

Select	Resetting time
<i>5Ed</i>	1s
<i>FR5t</i>	2ms

6.5.23 Status output: *5tRt oP*

The status output of the Timer is an opto isolated open collector that can be used for transmitting the status of the Timer to other instruments. It may also be used for simple control applications. When the Status output is *on* the RTX annunciator on the Timer display is activated.

The status output function contains four sub-functions, *EnbL*, *5tRt on*, *5tRt oFF* and *5tRtdELR*. To gain access to the sub-menu select *5tRt oP* in the configuration menu and press **P** which will show the *EnbL* prompt from which the other sub-functions can be accessed using the **▼** or **▲** button.

The status output may be configured to turn *on* when the Timer enters a selected Timer state and to turn *off* when the Timer enters another specified Timer state. e.g. if *run* is selected in the *5tRt on* sub-function and *done* is selected the *5tRt oFF* function. The status output will turn *on* when the Timer enters the *run* state and will stay *on* until the Timer enters the *done* state. Alternatively, the status output phase may be reversed by selecting the *n* states such as *n rESEt*.

If the status output is required to be *on* in only one Timer state, this can be achieved with the following configuration.

<i>5tRt on</i>	state required	e.g. <i>run</i>
<i>5tRt oFF</i>	<i>n</i> state required	e.g. <i>n run</i>

In this example when the Timer enters the *run* state the status output turns *on*. When the Timer moves from the *run* to any other state, the status output turns *off*.

6.5.24 Status output enable: *EnbL*

This function allows the status output to be enabled or disabled without altering any other status output parameters. To check or change the function select *EnbL* from the status output sub-menu and press **P** to reveal if the status output is *on* or *oFF*. The setting can be changed by pressing the **▼** or **▲** button followed by the **E** button to return to the status output sub-menu.

6.5.25 Status output *on* at : *5tRt on*

The status output may be configured to turn *on* when the Timer enters any one of the five Timer states. Alternatively, the status output phase may be reversed by selecting an *n* state. This will cause the status output to turn *on* when the Timer enters any other than the specified Timer state. Timer states are shown in Fig 11.

To define when the status output turns *on* select *5tRt on* from the sub-menu and press **P** to show the existing setting. Pressing the **▼** or **▲** button will scroll through the options:

Display	Status output turns <i>on</i> when Timer enters selected state
<i>rESEt</i>	Reset state
<i>run</i>	Running state
<i>PRuSEd</i>	Paused state
<i>dELAY</i>	Restart delay state
<i>done</i>	Complete state
Status output turns <i>on</i> when Timer enters any other than the selected state	
<i>n rESEt</i>	Reset state
<i>n run</i>	Running state
<i>n PRuSEd</i>	Paused state
<i>n dELAY</i>	Restart delay state
<i>n done</i>	Complete state

When the required setting has been selected press **E** to enter the selection and return to the status output sub-menu.

6.5.26 Status output off at : 5tRt oFF

The status output may be configured to turn *off* when the Timer enters any one of the five Timer states. Alternatively, the status output phase may be reversed by selecting an *n* state. This will cause the status output to turn *off* when the Timer enters any other than the specified Timer state. Timer states are shown in Fig 11.

To define when the status output is *off* select 5tRt oFF from the sub-menu and press **[P]** to show the existing setting. Pressing the **[▼]** or **[▲]** button will scroll through the options:

Display	Status output turns off when Timer enters selected state
rESEt	Reset state
rUn	Running state
PRuSEd	Paused state
dELAY	Restart delay state
dOnE	Complete state
	Status output turns off when Timer enters any other than the selected state
n rESEt	Reset state
n rUn	Running state
n PRuSEd	Paused state
n dELAY	Restart delay state
n dOnE	Complete state

When the required setting has been selected press **[E]** to enter the selection and return to the status output sub-menu.

6.5.27 Status output on delay time: 5tRtdELR

The status output may be delayed from turning *on* for a fixed time following the selected condition occurring. e.g. when the timer enters the *Run* state. This delay is useful for many control applications, for example when the status output is connected to the reset terminals RS1 and RS2 to automatically reset the BA374NG Timer.

This delay can be adjusted in 1 second increments up to 32,400 seconds, which is 9 hours. If a delay is not required zero should be entered. To adjust the delay select 5tRtdELR from the status output sub-menu and press **[P]** which will reveal the existing delay time with one digit flashing. The flashing digit can be adjusted using the **[▼]** or **[▲]** button and the **[P]** button to move to the next digit. When the required delay has been entered, press **[E]** to return to the status output sub-menu.

6.5.28 Control output 1 (optional): oP l

Control output 1 is an optional factory fitted, galvanically isolated solid state switch contact which can be configured to turn *on* and *off* when the Timer enters a specified states. When control output 1 is *on* the '1' annunciator on the Timer display is activated.

The function contains four sub-functions, E_nbL, oP l o_n, oP l oFF and oP l dELR. To gain access to the sub-menu select oP l in the configuration menu and press **[P]** which will show the E_nbL prompt from which the other sub-functions can be accessed using the **[▼]** or **[▲]** button.

Control output 1 may be configured to turn *on* when the Timer enters a selected Timer state and to turn *off* when the Timer enters another specified Timer state. e.g. if *rUn* is selected in the oP l o_n sub-function and *dOnE* is selected the oP l oFF function. Control output 1 will turn *on* when the Timer enters the *rUn* state and will stay *on* until the Timer enters the *dOnE* state. Alternatively, the control output phase may be reversed by selecting the *n* states such as *n rESEt*.

If control output 1 is required to be *on* in only one Timer state, this can be achieved with the following configuration.

oP l o _n	state required	e.g. <i>rUn</i>
oP l oFF	n state required	e.g. <i>n rUn</i>

In this example when the Timer enters the *rUn* state control output 1 turns *on*. When the Timer moves from the *rUn* to any other state, control output 1 turns *off*.

Timer configuration examples in section 7.2. and 7.3 of this manual illustrate the use of the control outputs. Further examples can be found in Application Guide AG374 which is available on the BEKA website.

6.5.29 Control output 1 enable: E_nbL

This function allows control output 1 to be enabled or disabled without altering any other control output parameters. To check or change the function select E_nbL from the control output 1 sub-menu and press **[P]** to reveal if control output 1 is *on* or *oFF*. The setting can be changed by pressing the **[▼]** or **[▲]** button followed by the **[E]** button to return to the control output 1 output sub-menu.

6.5.30 Control output 1 on at: $\alpha P I \alpha n$

Control output 1 may be configured to turn *on* when the Timer enters in any one of the five Timer states. Alternatively, the control output 1 phase may be reversed, by selecting an *n* state which will cause the control output to turn *on* when the Timer enters any other than the specified Timer state. Timer states are shown in Fig 11.

To define when control output 1 turns *on* select $\alpha P I \alpha n$ from the sub-menu and press \boxed{P} to show the existing setting. Pressing the \blacktriangledown or \blacktriangle button will scroll through the options:

Display	Control output 1 turns on when Timer enters selected state
$rESEt$	Reset state
rUn	Running state
$PRuSEd$	Paused state
$dELAY$	Restart delay state
$dOnE$	Complete state

	Control output 1 turns on when Timer enters any other than the selected state
$n rESEt$	Reset state
$n rUn$	Running state
$n PRuSEd$	Paused state
$n dELAY$	Restart delay state
$n dOnE$	Complete state

When the required setting has been selected press \boxed{E} to enter the selection and return to the status output sub-menu.

6.5.31 Control output 1 off at: $\alpha P I \alpha FF$

Control output 1 may be configured to turn *off* when the Timer enters any one of the five Timer states. Alternatively, the phase of control output 1 may be reversed, by selecting an *n* state which will cause the control output to turn *off* when the Timer enters any other than the specified Timer state. Timer states are shown in Fig 11.

To define when control output 1 turns *off* select $\alpha P I \alpha FF$ from the sub-menu and press \boxed{P} to show the existing setting. Pressing the \blacktriangledown or \blacktriangle button will scroll through the options:

Display	Control output 1 turns off when Timer enters selected state
$rESEt$	Reset state
rUn	Running state
$PRuSEd$	Paused state
$dELAY$	Restart delay state
$dOnE$	Complete state

	Control output 1 turns off when Timer enters any other than the selected state
$n rESEt$	Reset state
$n rUn$	Running state
$n PRuSEd$	Paused state
$n dELAY$	Restart delay state
$n dOnE$	Complete state

When the required setting has been selected press \boxed{E} to enter the selection and return to the control output 1 sub-menu.

6.5.32 Control output 1 on delay time: $\alpha P I dELR$

Control output 1 may be delayed from turning *on* (output closed) for a fixed time following the selected condition occurring. e.g. when the Timer enters the *rUn* state. This delay is useful for many control applications, for example when the control output is connected to the reset terminals RS1 and RS2 to automatically reset the BA374NG Timer.

The delay can be adjusted in 1 second increments up to 32,400 seconds, which is 9 hours. If a delay is not required zero should be entered. To adjust the delay select $\alpha P I dELR$ from the control output 1 sub-menu and press \boxed{P} which will reveal the existing delay time with one digit flashing. The flashing digit can be adjusted using the \blacktriangledown or \blacktriangle button and the \boxed{P} button to move to the next digit. When the required delay has been entered, press \boxed{E} to return to the control output 1 output sub-menu.

6.5.33 Control output 2 (optional): $\alpha P2$

Control output 2 is an optional, galvanically isolated solid state switch contact which can be independently configured to turn *on* and *off* when the Timer enters any of its five states. Its functions and configuration are identical to control output 1 described in sections 6.5.28 to 6.5.32. When control output 2 is *on* the '2' display annunciator is activated.

6.5.34 Reset grand total from within the configuration menu: CLR GtOt

The grand total is the total run-time of the Timer that may be viewed by operating the E and \blacktriangle push buttons simultaneously in the display mode.

The grand total can be reset to zero from within the configuration menu using this CLR GtOt function, or from the display mode if CLR GtOt is activated in the local grand total clear function - see 6.5.21

To zero the Timer grand total from within the configuration menu select CLR GtOt and press P which will cause the instrument to display CLR. nO with nO flashing. Operate the \blacktriangledown or \blacktriangle push button until CLR. 5E5 is displayed and then press P which will result in a 0000 prompt being displayed with the first digit flashing. This is a request for the instruction to be confirmed by entering 5urE using the \blacktriangledown or \blacktriangle button to adjust the flashing digit and the P button to move control to the next digit. Pressing E will then reset the grand total to zero and return the Timer to the configuration menu.

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

6.5.35 Security code: CodE

Access to the instrument configuration menu may be protected by a four digit alphanumeric 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 CodE from the configuration menu and press P which will cause the Timer to display 0000 with one digit flashing. The flashing digit may be adjusted using the \blacktriangle or \blacktriangledown push button, when set as required operating the P button will transfer control to the next digit. When the new security code has been entered press E to return to the CodE prompt. The revised security code will be activated when the Timer is returned to the display mode.

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

6.5.36 Reset configuration to factory defaults r5Et dEF

When the BA374NG is configured as a Timer this function resets the instrument to the Timer factory defaults shown in sections 6.5.

To reset the configuration select r5Et dEF from the configuration menu and press P . The BA374NG will display 0000 with the first digit flashing which is a request to confirm the instruction by entering 5urE . Using the \blacktriangle or \blacktriangledown 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 and return the instrument to the display mode.

Note: r5Et dEF does not reset the grand total to zero.

7. TIMER APPLICATION EXAMPLES

This section illustrates three applications for the BA374NG when configured as a Timer.

7.1 Measuring the time that a contact is closed.



In this example a BA374NG is required to display the time that a Zone 2 hazardous area contact is closed. The display is required in hours and minutes within the hazardous area and is to be reset to zero by a push button located in the same hazardous area, not by the instrument front panel push buttons. The operator is required to zero the grand total by operating the  and  buttons simultaneously. No security codes are required to protect access to the configuration menu or to the grand total reset.

Figure 13 shows the wiring for the BA374NG when powered by a single channel Zener barrier. This example illustrates how the Timer may be started and stopped by one input, the second input is not used in this application.

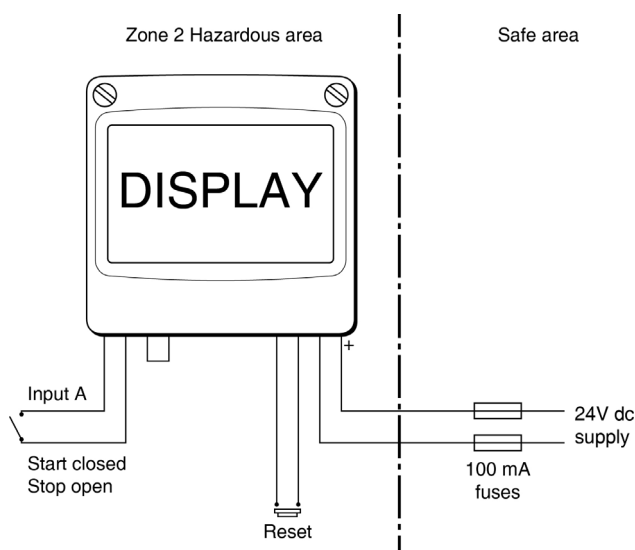


Fig 13 Starting & stopping timer with one input

The required instrument configurations for this example are shown below.

Function	Display	Setting
Access code	[odE	0000
Function	Fun[E, on	ELAPSE
Input A	Input A	ContAR[E
De-bounce	deBoun[E	default
Display 2	diSP-2	oFF
Start stop	StAr-StoP	Control 4
Units	unitS	12:00
Set time	SEt t	99:59
Direction of count	uP or dN	uP
Local total reset	rESE EnbL	oFF
Local grand total reset	[Lr GtAt	on

7.2 Controlling an Ex nA solenoid valve

This example illustrates how a BA374NG Timer can open an Ex nA solenoid valve for 5 minutes each time the start button is operated. The operator needs to pause the process without affecting the total time that the valve is open. At the end of the process the Timer is required to automatically reset within 10 seconds ready for the next timing cycle to be started.

For this application the BA374NG Timer requires dual control outputs which are a factory fitted option and should be specified when the instrument is ordered.



Control output 1 is used to switch the Ex nA solenoid valve, and control output 2 is wired to the Timer's reset terminals to perform the automatic resetting at the end of the timing cycle, see Fig 10.

The control outputs are configured so that control output 1 is closed when the timer is in the *run* state and control output 2 is closed when the Timer is in the *done* state with a 5 second *on* delay. The sequence of events is shown in Fig 14, and the Timer's configuration is listed at the end of this section.

This valve opening process is to be linked to other processes on the plant, therefore the status output is required to indicate when the 5 minute valve open period has been completed and the Timer has entered the *reset* state ready for the next cycle to be started.

When the start button is operated the Timer enters the *run* state and control output 1 closes for 5 minutes which opens the solenoid valve. At the end of the 5 minute period, the Timer automatically moves from the *run* to the *done* states and control output 1 opens which closes the solenoid valve. Control output 2 is externally wired to the Timers reset terminals. It is configured to close when the Timer enters the *done* state and has been configured with a 5 second *on* delay. Therefore 5 seconds after the Timer enters the *done* state, control output 2 closes and resets the Timer ready to start another cycle when the start button is operated.

If at any time during the cycle the stop button is operated, the Timer will enter the paused state which will stop the process until the start button is operated when it will resume from the place at which it was paused.

In this example Local total reset *rESE.EnbL* is *on*. This enables the Timer to be reset when power is first connected by operating the  and  push buttons simultaneously for more than three seconds.

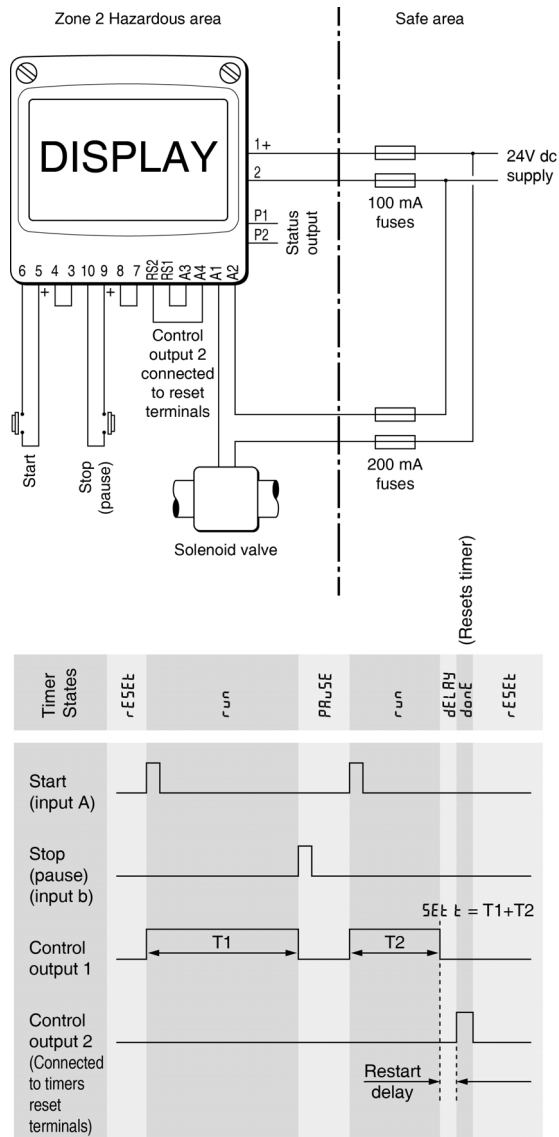


Fig 14 Control of valve in a Zone 2 hazardous area

The required instrument configurations for this example are shown below.

Function	Display	Setting
Access code	Code	0000
Function	Function	ELAPSE
Input A	Input-A	Control
Input b	Input-b	Control
De-bounce (both inputs)	debounce	default

Display 2	di SP-2	Set
Start stop	Start stop	Control 2
Units	units	12:00:00
Set time	Set time	00:05:00

Timer repeat cycle	CYCLES	
Enable repeat cycle	Enbl	off

Power failure	P-FAIL	idle
Local total reset	reset.Enbl	on
Local grand total reset	Ctrl Gate	off
External reset	reset	Fast

Enable status output	Enbl	on
Status output on at	Start on	reset
Status output off at	Start off	on reset
Status output delay	Start delay	00000

Enable control output 1	Enbl	on
Control output 1 on at	op1 on	run
Control output 1 off at	op1 off	on run
Control output 1 delay	op1 delay	00000

Enable control output 2	Enbl	on
Control output 2 on at	op2 on	done
Control output 2 off at	op2 off	on done
Control output 2 delay	op2 delay	00005

7.3 Cycling an Ex nA solenoid valve

In this example a BA374NG is required to cycle a Zone 2 Ex nA solenoid valve such that it opens 4 times for 10 minutes at 15 minutes intervals. Once all 4 solenoid valve cycles have been completed a remote “sequence complete” lamp is illuminated in the safe area until the reset push button is operated.

If, during the sequence, power is lost the control outputs are to remain de-energised when power is restored. The timer is to recommence operating from the last known point when the start push button is pressed.

When the start button is operated control output 1 closes which opens the solenoid valve and the Timer *times-down* for 10 minutes. When the elapsed time equals zero, control output 1 opens thus closing the solenoid valve. The timer then counts down the 15 minute delay which is shown on the lower display (display 2). When the delay equals zero, control output 1 closes again for a second 10 minutes, the whole cycle being repeated such that the solenoid valve opens and closes 4 times. After the solenoid valve has closed for a fourth time control output 2 closes which illuminates a “Sequence Complete” lamp indicating that the whole operation is finished.

The lamp remains illuminated until the reset push button is operated (Reset is shown in the display) at which point control output 2 is de-energised which turns the lamp off.

Operating the stop button at any time during the timing cycle will pause the cycle. The cycle can be resumed by operating the start button or abandoned by operating the reset button.

Note:

Both the timer (display 1) and delay (display 2) will count down – but the cycle display counts *up* towards its target.

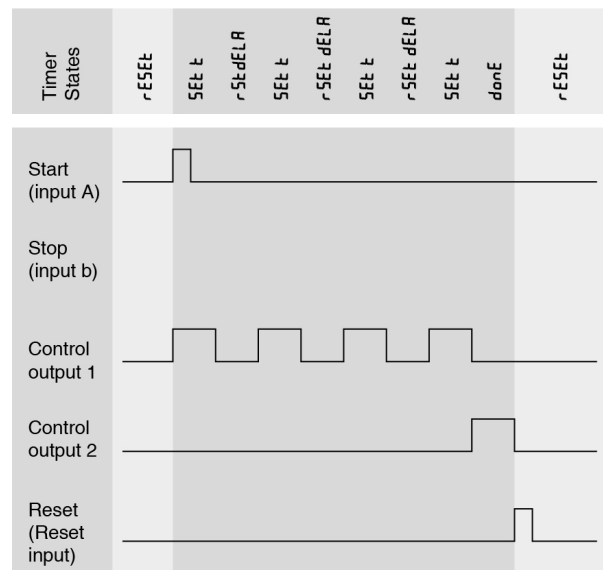
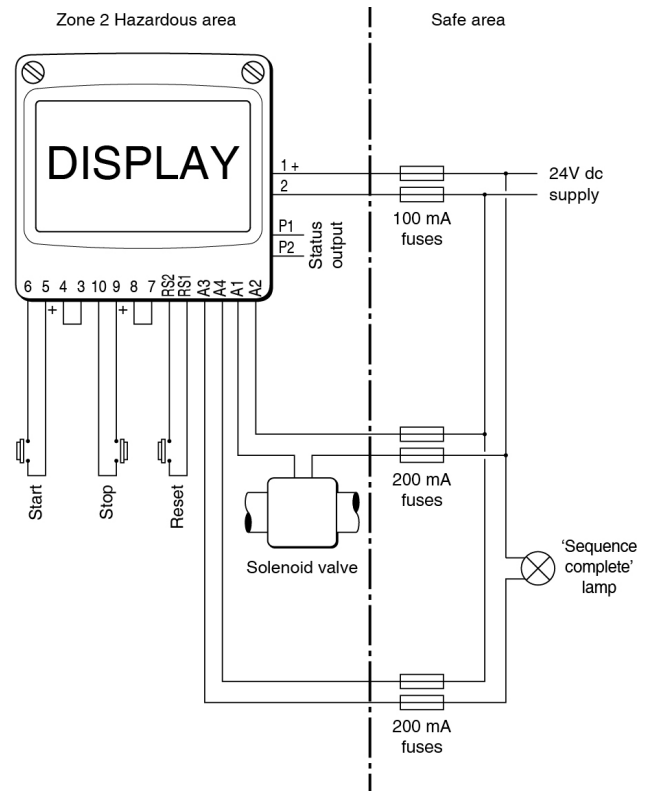


Fig 15 Cycling an Ex nA solenoid valve

The required instrument configurations for this example are shown below:



Function	Display	Setting
Function	<i>Functi on</i>	ELAPSE
Input A	<i>Input-A</i>	ContAct
Debounce	dEBOUNCE	DEFAULT
Input b	<i>Input-b</i>	ContAct
Debounce	dEBOUNCE	DEFAULT
Display 2	<i>di SP-2</i>	Std
Start stop	<i>Start-Stop</i>	Control 2
Units	<i>units</i>	120000
Set time	<i>SEt t</i>	00:1000
Timer repeat cycle	<i>CYCLES</i>	
Enable Repeat Cycle	EnbL	on
Cycle Count	CYCCL Cnt	04
Restart delay	rSt dELR	00:1500
Access set time from display mode	<i>ACSEt-t</i>	oFF
Direction of count	<i>uP or dn</i>	dn
Control output after power restoration	<i>P-FA, L</i>	PRuSE
Local total reset	<i>LoC rSEt</i>	oFF
External Reset Contact Closure Time	<i>ErSEt</i>	Std
Status Output	<i>Stat op</i>	DEFAULT
Output 1	<i>oP 1</i>	
Enable control output 1	EnbL	on
Control output 1 on at	oP 1 on	run
Control output 1 off at	oP 1 oFF	n run
Control output 1 delay	oP 1 dELR	000000
Output 2	<i>oP2</i>	
Enable control output 2	EnbL	on
Control output 2 on at	oP2 on	donE
Control output 2 off at	oP2 oFF	n donE
Control output 2 delay	oP2 dELR	000000
Local grand total reset	<i>GLr Gtob</i>	oFF
Access code	<i>Code</i>	0000

Note: Functions in bold are first level menu items.

8. MAINTENANCE when configured as a Timer

8.1 Fault finding during commissioning

If a BA374NG fails to function as a Timer during commissioning the following procedure should be followed:



Symptom	Cause	Check:
No display	No power supply, or incorrect wiring. Note: Terminals 2, 6, 10 & RS2 are interconnected within the instrument.	That there is between 10 and 30V on terminals 1 & 2 with terminal 1 positive.
Instrument configuration menu does not correspond with Timer section of this manual.	BA374NG may be configured as a clock.	That <code>FUNCTION</code> in configuration menu is set to <code>ELAPSE</code> not to <code>CLOCK</code> .
Timer will not start.	Timer not reset	Reset timer via external contact or by operating  and  buttons simultaneously if the local total reset <code>RESET.Enbl</code> function has been activated.
	Set time <code>SEt t</code> has not been entered.	Enter time other than zero for <code>SEt t</code> .
Timer will not respond to sensor inputs.	Input A and/or Input b incorrectly configured, or sensor incorrectly connected.	<code>INPUT A</code> and <code>INPUT b</code> configuration and that input energising link is correctly fitted for selected sensor.
Control output(s) do not function.	Control outputs have not been enabled.	Enable Control Output(s) in the configuration menu.
Unable to enter configuration menu.	Incorrect security code	That the correct security code is being used. Contact BEKA if the code is lost.

8.2 Fault finding after commissioning

EN 60079-17 *Electrical installations inspection and maintenance* permits live maintenance in Zone 2 if a risk analysis demonstrates that this does not introduce an unacceptable risk. The removal of covers [opening of Ex n instrument enclosure] is permitted if this can be done without contaminating the interior of the instrument with dust or moisture. Some end-users may prefer not to permit live maintenance to minimise risk.

ENSURE PLANT SAFETY BEFORE STARTING MAINTENANCE

Live maintenance within the hazardous area should only be performed when it is permitted by risk analysis, or when there is no risk of a flammable atmosphere being present.

Symptom	Cause	Check:
No display	No power supply	That there is between 10 and 30V on terminals 1 & 2 with terminal 1 positive.
Timer will not start.	Timer not reset	Reset timer via external contact or by operating  and  buttons simultaneously if local total reset <code>RESET.Enbl</code> has been activated.
Control output(s) do not function.	Control Outputs have not been enabled.	Enable Control Output(s) in the configuration menu.
Unable to enter configuration menu.	Incorrect security code	That the correct security code is being used. Contact BEKA if code is lost.

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

Note:

If configuration changes are made to any of the following functions the Timer will be forced into a fail safe idle condition. This stops the Timer in the state it achieves when it has timed-up to `SEt t` or timed-down to `0000`. The Timer must be reset before it can be restarted.

`INPUT A`, `INPUT b`, `STARTSTOP`, `CYCLES`, `UP or dn`, `OP 1` and `OP2`.

8.3 Servicing

We recommend that faulty BA374NG Timers are returned to BEKA associates or to your local BEKA agent for repair. It is helpful if a brief description of the fault symptoms is provided.

8.4 Routine maintenance

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

8.5 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.

8.6 Customer comments

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

9. OPERATION AS A CLOCK

When configured as a clock the BA374NG can display local time in a variety of twelve or twenty four hour formats. The displayed time can be adjusted via the front panel push buttons which may be protected by a user definable four digit security code to prevent unauthorised or accidental adjustment.

The clock may be synchronised to an external time standard via the instrument's reset terminals. When these two terminals are connected together by an external switch contact, the clock display will be reset to a preconfigured time and will resume running from this time when the contacts are opened.

The optically isolated status open collector output can be used to monitor the clock or to perform simple control functions.

When fitted with the optional galvanically isolated control outputs the clock can be configured to turn each solid state output *on* and *off* twice during each twenty four hour period.

Fig 16 shows a simplified block diagram of the BA374NG configured as a clock.

The instrument can be supplied with the following factory fitted accessories:

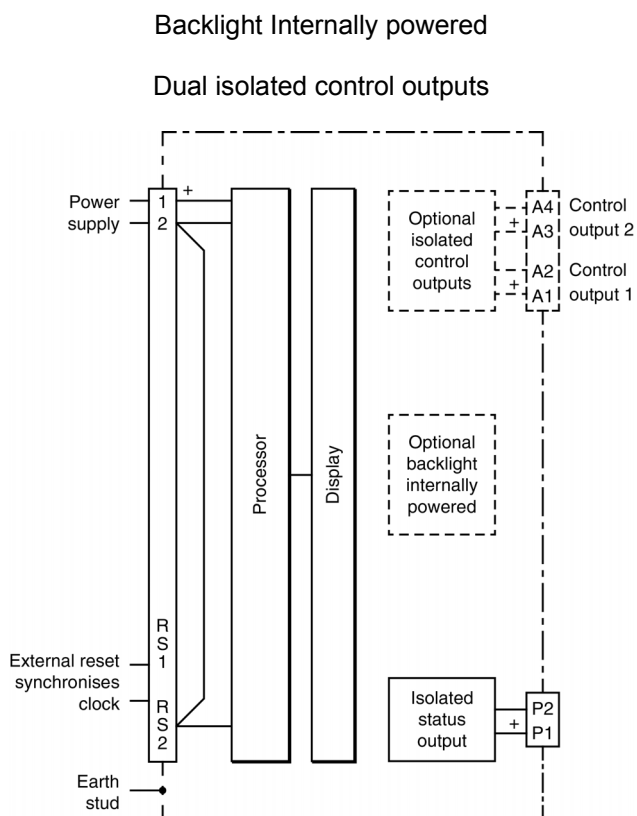


Fig 16 BA374NG block diagram with clock configuration.

9.1 Initialisation and loss of power

Each time power is applied to a BA374NG initialisation is performed. After a short delay the following display sequence occurs:

All segments of the display are activated

Instrument starts functioning, using the configuration information stored in the instrument's permanent memory.

Following initialisation, the instrument will display a flashing display which is a request for the local time to be entered. The clock will not start to function until a display time has been entered, or the remote reset contacts are closed and opened to synchronise the clock to a preconfigured time.

If during normal operation the power supply is interrupted for more than 30ms, the display will return to the flashing condition and the display time will have to be re-entered. This time may be increased by powering the Clock from an instrument supply with a large output capacitance.

9.2 Controls when configured as a clock

The BA374NG clock is configured and adjusted via four front panel push buttons. In the display mode i.e. when the instrument is displaying time, the push button functions are:

Push Button Functions

P + **▼** Shows in succession, firmware version number, instrument function [Ld] and any output accessories that are fitted:

- A Dual control outputs
- P Status output (always fitted)

P + **E** Access to configuration menu

Note: When optional control outputs are fitted, the BA374NG clock may be configured to provide direct access to the control outputs from the display mode when the **P** + **▲** push buttons are operated. - see section 9.4.16

9.3 Displays when configured as a clock

The BA374NG clock has a single digital display plus annunciators.

Time display	Shows time in selected 12 or 24 hour format.
Reset annunciator	Activated while clock is being synchronised and external reset contacts are closed.
Status output annunciator	RTx shown while status output is activated.
Control output annunciators	Show status of both optional control outputs.

9.4 Configuration as a Clock

The BA374NG 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 17.

Each menu function is summarised in section 9.4.2 of this manual and each includes a reference to more detailed information.





All new BA374NG instruments are supplied configured as requested at the time of ordering. If configuration is not requested, the BA374NG will be supplied with default Timer configuration as shown in section 6.5.








If a BA374NG Clock is requested without detailed configuration information, the instrument will be supplied with default Clock configuration as shown below, but can easily be re-configured on-site.

Function	Display	Default
Access code	Code	0000
Function	Function	CLoC
Display	diSPLAY	12:00
Set display time	SEt	A 12:00:00
Synchronise time	SYnC t	A 12:00:00
Enable status output	EnbL	oFF
Enable control output 1*	EnbL	oFF
Enable control output 2*	EnbL	oFF
Enable access alarm	ALSP	oFF
times from display mode.		
Access code for alarm	ALCd	0000
times from display mode.		



Note: * Control outputs are a factory fitted option.

9.4.1 Accessing configuration functions

Throughout this manual push buttons are shown as , ,  and  and legends displayed by the Clock are shown in a seven segment font just as they appear on the instrument e.g. diSPLAY and Code.

Access to the configuration menu is obtained by operating the  and  push buttons simultaneously. If the instrument is not protected by an access security code the first parameter Function 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 Function 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 main configuration menu the required parameter can be selected by scrolling through the menu using the  or  push button. The Clock configuration menu is shown diagrammatically in Fig 17.

When returning to the display mode following reconfiguration, the Clock will display dRtR followed by SAvE while the new information is stored in permanent memory.

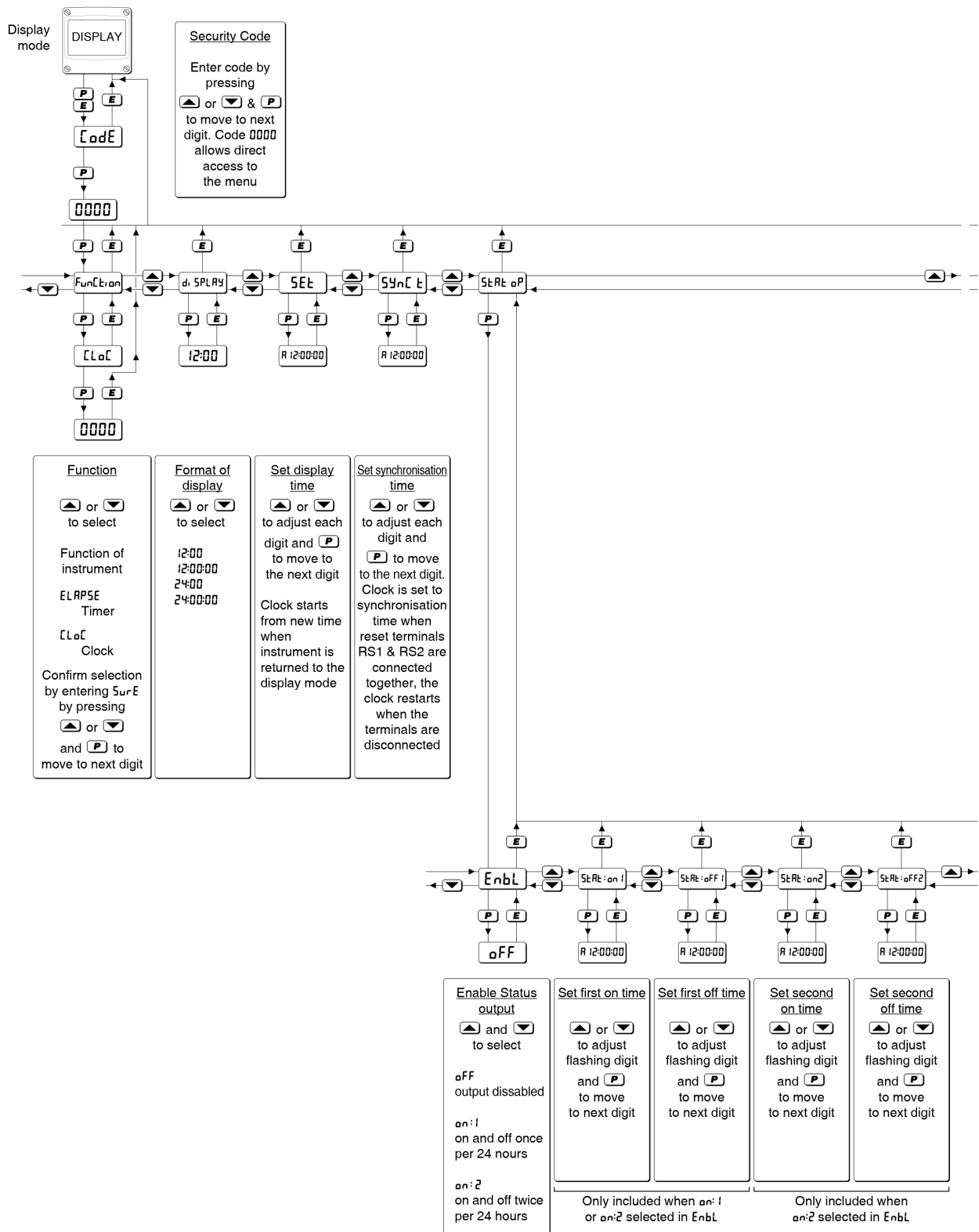
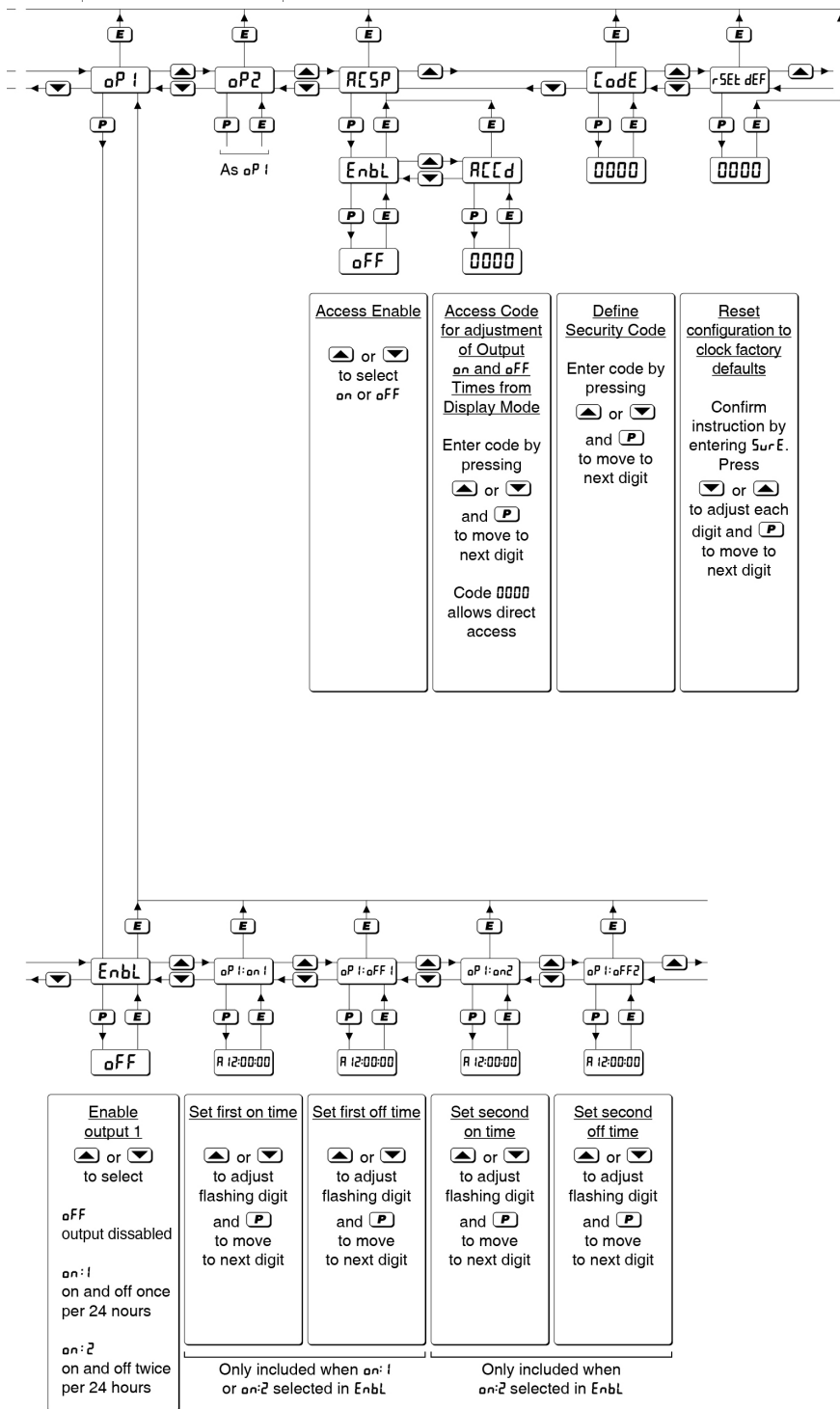


Fig 17 Clock Configuration menu

Only included when optional
Control Outputs are fitted



9.4.2 Summary of Clock configuration functions.

This section summarises all the Clock configuration functions. When read in conjunction with Fig 17 it provides a quick aid for configuring the Clock. If more detail is required, each section of this summary contains a reference to a full description of the function.

Display	Summary of function								
FunCt, on	Instrument function Defines the function of the instrument. May be set to: <table> <tr> <td>ELAPSE</td><td>Timer</td></tr> <tr> <td>CLoc</td><td>Clock</td></tr> </table> <p>All the entries in this Clock configuration summary assume that the BA374NG is configured as a Clock by selecting CLoc.</p> <p>See section 9.4.3</p>	ELAPSE	Timer	CLoc	Clock				
ELAPSE	Timer								
CLoc	Clock								
d, SPLAY	Display format Defines the clock display format, four alternatives are available. Select: <table> <tr> <td>12:00</td><td>Twelve hours without seconds</td></tr> <tr> <td>12:00:00</td><td>Twelve hours with seconds</td></tr> <tr> <td>24:00</td><td>Twenty four hours without seconds</td></tr> <tr> <td>24:00:00</td><td>Twenty four hours with seconds</td></tr> </table> <p>See section 9.4.4</p>	12:00	Twelve hours without seconds	12:00:00	Twelve hours with seconds	24:00	Twenty four hours without seconds	24:00:00	Twenty four hours with seconds
12:00	Twelve hours without seconds								
12:00:00	Twelve hours with seconds								
24:00	Twenty four hours without seconds								
24:00:00	Twenty four hours with seconds								
SEt	Set clock display time Enables the clock displayed time to be adjusted, the clock resumes operation when the instrument is returned to the display mode. <p>See section 9.4.5</p>								
SynC t	Synchronising time Defines the time to which the clock display is set when the reset terminals RS1 and RS2 are connected together. The Clock restarts from the synchronising time when terminals RS1 and RS2 are disconnected. <p>See section 9.4.6</p>								

Display	Summary of function										
StAt oP	Status output Status output can turn <i>on</i> (open collector on) and <i>off</i> (open collector off) once or twice in each twenty-four hour period. This function contains five sub-function: <table> <tr> <td>EnbL</td><td>Enables Status output and defines if it turns <i>on</i> and <i>off</i> once or twice in each 24 hours.</td></tr> <tr> <td>StAt: on 1</td><td>Time when oP 1 turns <i>on</i> 1st time</td></tr> <tr> <td>StAt: off 1</td><td>Time when oP 1 turns <i>off</i> 1st time</td></tr> <tr> <td>StAt: on 2</td><td>Time when oP 1 turns <i>on</i> 2nd time</td></tr> <tr> <td>StAt: off 2</td><td>Time when oP 1 turns <i>off</i> 2nd time</td></tr> </table> <p>Note: Output is a current sink. See sections 9.4.7 to 9.4.9</p>	EnbL	Enables Status output and defines if it turns <i>on</i> and <i>off</i> once or twice in each 24 hours.	StAt: on 1	Time when oP 1 turns <i>on</i> 1 st time	StAt: off 1	Time when oP 1 turns <i>off</i> 1 st time	StAt: on 2	Time when oP 1 turns <i>on</i> 2 nd time	StAt: off 2	Time when oP 1 turns <i>off</i> 2 nd time
EnbL	Enables Status output and defines if it turns <i>on</i> and <i>off</i> once or twice in each 24 hours.										
StAt: on 1	Time when oP 1 turns <i>on</i> 1 st time										
StAt: off 1	Time when oP 1 turns <i>off</i> 1 st time										
StAt: on 2	Time when oP 1 turns <i>on</i> 2 nd time										
StAt: off 2	Time when oP 1 turns <i>off</i> 2 nd time										
oP 1	Control output 1 (Optional) Control output 1 can turn <i>on</i> (output closed) and <i>off</i> (output open) once or twice in each twenty-four hour period. This function contains five sub-function: <table> <tr> <td>EnbL</td><td>Enables output 1 and defines if it turns on and off once or twice in each 24 hours.</td></tr> <tr> <td>oP 1: on 1</td><td>Time when oP 1 turns <i>on</i> 1st time</td></tr> <tr> <td>oP 1: off 1</td><td>Time when oP 1 turns <i>off</i> 1st time</td></tr> <tr> <td>oP 1: on 2</td><td>Time when oP 1 turns <i>on</i> 2nd time</td></tr> <tr> <td>oP 1: off 2</td><td>Time when oP 1 turns <i>off</i> 2nd time</td></tr> </table> <p>See sections 9.4.10 to 9.4.12</p>	EnbL	Enables output 1 and defines if it turns on and off once or twice in each 24 hours.	oP 1: on 1	Time when oP 1 turns <i>on</i> 1 st time	oP 1: off 1	Time when oP 1 turns <i>off</i> 1 st time	oP 1: on 2	Time when oP 1 turns <i>on</i> 2 nd time	oP 1: off 2	Time when oP 1 turns <i>off</i> 2 nd time
EnbL	Enables output 1 and defines if it turns on and off once or twice in each 24 hours.										
oP 1: on 1	Time when oP 1 turns <i>on</i> 1 st time										
oP 1: off 1	Time when oP 1 turns <i>off</i> 1 st time										
oP 1: on 2	Time when oP 1 turns <i>on</i> 2 nd time										
oP 1: off 2	Time when oP 1 turns <i>off</i> 2 nd time										
oP2	Control output 2 (Optional) As control output 1 described above. <p>See section 9.4.13 to 9.4.15</p>										
ACSP	Access control output alarm-times from display mode. Contains two sub-functions, EnbL which when activated allows the control output times to be adjusted from the display mode (displaying time). The second sub-function REEd defines a four digit alphanumeric access code which may be used to protect access to the control output times from the display mode. Default code 0000 disables this security feature and allows unrestricted access. <p>See section 9.4.16</p>										

Display	Summary of function
Code	<p>Security code</p> <p>Defines a four digit alphanumeric code that may be used to protect access to the Clock configuration menu. Default code 0000 disables this security function and allows unrestricted access to all configuration functions when the P and E buttons are operated simultaneously in the display mode.</p> <p>See section 9.4.17</p>
rSEt dEF	<p>Reset to factory defaults</p> <p>Resets the BA374NG to the Clock factory default configuration shown in section 9.4 Instruction confirmed by entering SurE.</p> <p>See section 9.4.18</p>

9.4.3 Instrument function: Functi on

The BA374NG may be configured as a Timer or as a Clock. This section of the instruction manual describes the Clock, for details of Timer configuration see section 6.4.

To reveal the existing function of the instrument select **Functi on** from the configuration menu and press **P**. If **CLoC** is displayed, the instrument is already configured as a Clock therefore press **E** to return to the **Functi on** prompt in the configuration menu. If **ELAPSE** is displayed, press the **▲** or **▼** button to change the setting to **CLoC** followed by the **P** button which will result in a 0000 prompt being displayed with the first digit flashing. This is a request for the instruction to be confirmed by entering **SurE** using the **▲** or **▼** button to adjust the flashing digit and the **P** button to move control to the next digit. When **SurE** has been entered, pressing **E** will change the instrument to a Clock and return the instrument to the display mode. To configure the Clock enter the configuration menu by pressing the **P** and **E** buttons simultaneously until **Functi on** is displayed.

9.4.4 Display format: d, SPLRY

The BA374NG Clock may be configured to display time in a 12 or 24 hour format with or without seconds. When a 12 hour format is selected, AM is denoted by an **A** prefix at the left hand side of the display, similarly a **P** is displayed to denote PM.

To check or change the display format of the Clock, select **d, SPLRY** from the configuration menu and press **P** which will reveal the existing setting which can be changed by pressing the **▲** or **▼** button followed by the **E** button to enter the selection and return to the configuration menu. The options available are shown below:

12:00	Twelve hour format without seconds
12:00:00	Twelve hour format with seconds
24:00	Twenty four hour format without seconds
24:00:00	Twenty four hour format with seconds

9.4.5 Set clock display time: SEt

This function sets the time displayed by the Clock which must be entered each time the BA374NG Clock is powered. Until a set time is entered the Clock will display a flashing 00:00:00 or 00:00 depending upon how it has been configured.

To adjust the clock set time, select **SEt** from the configuration menu and press **P** that will show 00:00:00 or the existing set time with the hours flashing. When setting the clock display time seconds are always shown. Using the **▲** or **▼** button adjust the flashing hours and then press **P** to transfer control to the minutes display, pressing **P** again will transfer control to the seconds display. When adjustment is complete press **E** to start the Clock and return to the **SEt** prompt.

9.4.6 Enter synchronising time: 54nŁ Ł

When the external reset terminals RS1 and RS2 are connected together the clock is stopped and the displayed time is set to the synchronising time. When the connection between the reset terminals is removed, the clock restarts from the synchronising time.

To enter the synchronising time, select 54nŁ Ł from the configuration menu and press **[P]** which will reveal the existing synchronising time with the hours flashing. Using the **[▲]** or **[▼]** button adjust the hours and then press **[P]** to transfer control to the minutes display, pressing **[P]** again will transfer control to the seconds display. When the synchronising time has been set as required, press **[E]** to return to the configuration menu.

9.4.7 Status output: 5ŁRŁ oP

The status output is an optically isolated open collector that can be used for transmitting the status of the Clock to other instruments. It may also be used for simple control applications. Status *on* is indicated by the RTX display annunciator.

The function contains five sub-functions allowing the Status output open collector to be turned *on* and *off* once or twice in each twenty-four hour period.

EnbŁ	Number of times status output turns <i>on</i> & <i>off</i> in 24 hours.
5ŁRŁ: oŁ 1	First time Status oP turns <i>on</i>
5ŁRŁ: oFF 1	First time Status oP turns <i>off</i>
5ŁRŁ: oŁ 2	Second time Status oP turns <i>on</i>
5ŁRŁ: oFF 2	Second time Status oP turns <i>off</i>

To check or change the function of the status output select 5ŁRŁ oP from the configuration menu and press **[P]** which will reveal the first sub-function EnbŁ.

9.4.8 Enable Status output: EnbŁ

This is a sub-function in the Status output function 5ŁRŁ which allows the status output open collector to be enabled or disabled without changing any of the *on* or *off* times and also determines whether the status output turns *on* and *off* once or twice in each twenty four hour period.

Select 5ŁRŁ in the configuration menu and press **[P]** which will result in the EnbŁ prompt being displayed. Pressing **[P]** again will enter the sub-function from which one of the three options may be selected using the **[▲]** or **[▼]** button:

Display	Status output
oFF	Status output disabled
oŁ: 1	Turns <i>on</i> & <i>off</i> once per 24 hours
oŁ: 2	Turns <i>on</i> & <i>off</i> twice per 24 hours

When the required option is displayed operating **[E]** will enter the selection and return to the EnbŁ prompt from which another sub-function may be selected.

9.4.9 Status output

**On and off times: 5ŁRŁ: oŁ 1; 5ŁRŁ: oFF 1
5ŁRŁ: oŁ 2; 5ŁRŁ: oFF 2**

The status output will have one or two *on* and *off* times depending upon whether it has been configured to turn *on* and *off* once or twice in each 24 hour period. - see 9.4.8.

All of the times are adjusted in the same way. To adjust any of them select 5ŁRŁ from the configuration menu and press **[P]** which will result in the EnbŁ prompt being displayed. The **[▲]** or **[▼]** button will scroll through the sub-functions. Only 5ŁRŁ: oŁ 1 and 5ŁRŁ: oFF 1 will be present if the status output has been configured to switch *on* and *off* once in a 24 hour period in the EnbŁ sub-function.

Select the required sub-function

5ŁRŁ: oŁ 1	Time status output turns <i>on</i> first time
5ŁRŁ: oFF 1	Time status output turns <i>off</i> first time
5ŁRŁ: oŁ 2	Time status output turns <i>on</i> second time
5ŁRŁ: oFF 2	Time status output turns <i>off</i> second time

When selected, pressing **[P]** will show the existing time with the hours flashing. Using the **[▲]** or **[▼]** button adjust the hours and then press **[P]** to transfer control to the minutes display, pressing **[P]** again will transfer control to the seconds display. When the time has been set as required press **[E]** to return to the sub-menu from which another *on* / *off* time may be selected for adjustment. When all the *on* / *off* times have been entered, return to the configuration menu by pressing the **[E]** button twice.

9.4.10 Control output 1: oP1

Control output 1 is an optional factory fitted galvanically isolated solid state switch contact output which can be configured to turn *on* (output closed) and *off* (output open) twice in each twenty-four hour period. The control output status is shown by the 1 control output display annunciator.

Function oP 1 contains a sub-menu with five sub-functions:

EnbŁ	Number of times output 1 turns <i>on</i> & <i>off</i> in 24 hours.
oP 1: oŁ 1	First time oP 1 turns <i>on</i> (closes)
oP 1: oFF 1	First time oP 1 turns <i>off</i> (opens)
oP 1: oŁ 2	Second time oP 1 turns <i>on</i> (closes)
oP 1: oFF 2	Second time oP 1 turns <i>off</i> (opens)

To check or change the function of Control output 1 select oP 1 from the configuration menu and press **[P]** which will reveal the first sub-function EnbŁ.

9.4.11 Enable Control output 1: *EnbL*

This is a sub-function in the Control output 1 function *oP 1* which allows output 1 to be enabled or disabled without changing any of the *on* or *off* times and also determines whether output 1 turns *on* and *off* once or twice in each twenty four hour period.

Select *oP 1* in the configuration menu and press **[P]** which will result in the *EnbL* prompt being displayed. Pressing **[P]** again will enter the sub-function from which one of the three options may be selected using the **[▲]** or **[▼]** button:

Display	Control output 1
<i>oFF</i>	Control output 1 disabled
<i>on: 1</i>	Turns <i>on</i> & <i>off</i> once per 24 hours
<i>on: 2</i>	Turns <i>on</i> & <i>off</i> twice per 24 hours

When the required option is displayed operating **[E]** will enter the selection and return to the *EnbL* prompt from which another sub-function may be selected if control output 1 has not been disabled.

9.4.12 Control output 1

On and off times: *oP 1: on 1*; *oP 1: oFF 1*
oP 1: on 2; *oP 1: oFF 2*

The control output will have one or two *on* and *off* times depending upon whether control output 1 has been configured to turn *on* and *off* once or twice in each 24 hour period. - see 9.4.11.

All of the times are adjusted in the same way. To adjust any of them select *oP 1* from the configuration menu and press **[P]** which will result in the *EnbL* prompt being displayed. The **[▲]** or **[▼]** button will scroll through the sub-functions. Only *oP 1: on 1* and *oP 1: oFF 1* will be present if control output 1 has been configured to switch *on* and *off* once in a 24 hour period in the *EnbL* sub-function.

Select the required sub-function

<i>oP 1: on 1</i>	Time oP1 turns <i>on</i> first time
<i>oP 1: oFF 1</i>	Time oP1 turns <i>off</i> first time
<i>oP 1: on 2</i>	Time oP1 turns <i>on</i> second time
<i>oP 1: oFF 2</i>	Time oP1 turns <i>off</i> second time

When selected, pressing **[P]** will show the existing time with the hours flashing. Using the **[▲]** or **[▼]** button adjust the hours and then press **[P]** to transfer control to the minutes display, pressing **[P]** again will transfer control to the seconds display. When the time has been set as required press **[E]** to return to the sub-menu from which another *on* / *off* time may be selected for adjustment. When all the *on* / *off* times have been entered, return to the configuration menu by pressing the **[E]** button twice.

9.4.13 Control output 2: *oP2*

Control output 2 is an optional factory fitted output which can be configured to turn *on* (output closed) and *off* (output open) twice in each twenty-four hour period. The control output status is shown by the 2 control output display annunciator.

Function *oP2* contains a sub-menu with five sub-functions:

<i>EnbL</i>	Number of times output 2 turns <i>on</i> & <i>off</i> in 24 hours.
<i>oP 2: on 1</i>	First time when oP 2 turns <i>on</i> (closes)
<i>oP 2: oFF 1</i>	First time when oP 2 turns <i>off</i> (opens)
<i>oP 2: on 2</i>	Second time when oP 2 turns <i>on</i> (closes)
<i>oP 2: oFF 2</i>	Second time when oP 2 turns <i>off</i> (opens)

To check or change the function of Control output 2 select *oP2* from the configuration menu and press **[P]** which will reveal the first sub-function *EnbL*.

9.4.14 Enable control output 2: *EnbL*

This is a sub-function in the Control output 2 function *oP2* which allows output 2 to be enabled or disabled without changing any of the *on* or *off* times and also determines whether output 2 turns *on* and *off* once or twice in each twenty four hour period. Select *oP2* in the configuration menu and press **[P]** which will result in the *EnbL* prompt being displayed. Pressing **[P]** again will enter the sub-function from which one of the three options may be selected using the **[▲]** or **[▼]** button:

Display	Control output 2
<i>oFF</i>	Control output 2 disabled
<i>on: 1</i>	Turns <i>on</i> & <i>off</i> once per 24 hours
<i>on: 2</i>	Turns <i>on</i> & <i>off</i> twice per 24 hours

When the required option is displayed operating **[E]** will enter the selection and return to the *EnbL* prompt from which another sub-function may be selected if control output 2 has not been disabled.

9.4.15 Control output 2

On and off times: *oP2: on 1*; *oP2: oFF 1*
oP2: on 2; *oP2: oFF 2*

The control output will have one or two *on* and *off* times depending upon whether control output 2 has been configured to turn *on* and *off* once or twice in each 24 hour period. - see 9.4.14.

All of the times are adjusted in the same way. To adjust any of them select *oP2* from the configuration menu and press **[P]** which will result in the *EnbL* prompt being displayed. The **[▲]** or **[▼]** button will scroll through the sub-functions. Only *oP2: on 1* and *oP2: oFF 1* will be present if control output 2 has been configured to switch *on* and *off* once in a 24 hour period in the *EnbL* sub-function.

Select the required sub-function

oP2:on 1	Time oP2 turns on first time
oP2:off 1	Time oP2 turns off first time
oP2:on 2	Time oP2 turns on second time
oP2:off 2	Time oP2 turns off second time

When selected pressing **[P]** will show the existing time with the hours flashing. Using the **[▲]** or **[▼]** button adjust the hours and then press **[P]** to transfer control to the minutes display, pressing **[P]** again will transfer control to the seconds display. When the time has been set as required press **[E]** to return to the sub-menu from which another on / off time may be selected for adjustment. When all the on / off times have been entered, return to the configuration menu by pressing the **[E]** button twice.

9.4.16 Access control output on and off times from display mode: RCLSP

This function activates a separate menu that provides direct access to the control output's on and off times when the Clock is in the display mode (displaying time). An operator may therefore adjust the on and off times without having access to the instrument configuration menu. Further protection is provided by a separate security code. When this function is enabled the on and off times of the two control outputs may be adjusted from the display mode by simultaneously operating the **[P]** and **[▲]** push buttons. The function contains two sub-functions, EnbL which activates the function and RCLd which defines a separate access code that may be used to prevent the on and off times being accidentally adjusted from the display mode.

To check or change the function, select RCLSP in the configuration menu and press **[P]** which will reveal the EnbL prompt, pressing **[P]** again will show if the function is on or off. If adjustment of the control output times from the display mode is not required press the **[▲]** or **[▼]** button to select off and then press **[E]** twice to return to the configuration menu. If the function is required, select on and press **[E]** to return to the EnbL prompt from which RCLd, which allows a separate access code to be entered, can be selected by pressing the **[▲]** or **[▼]** button.

Access to the control output times from the display mode may be protected by a four digit alphanumeric security code which must be entered to gain access. Default security code 0000 allows unrestricted access. With RCLd displayed, press **[P]** to enter a new access code. The BA374NG Clock will display 0000 with one digit flashing. The flashing digit may be adjusted using the **[▲]** or **[▼]** push button, when set as required operating the **[P]** button will transfer control to the next digit. When all the digits have been adjusted press **[E]** twice to return to the RCLSP prompt in the configuration menu. The revised security code will be activated when the BA374NG is returned to the display mode.

9.4.17 Security code: Lode

Access to the instrument's configuration menu may be protected by a four digit alphanumeric 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 Lode from the configuration menu and press **[P]** which will cause the Clock to display 0000 with one digit flashing. The flashing digit may be adjusted using the **[▲]** or **[▼]** push button, 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 Lode prompt. The revised security code will be activated when the Clock is returned to the display mode.

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

9.4.18 Reset configuration to factory defaults: rSEt dEF

When the BA374NG is configured as a Clock, this function resets the configuration to the Clock factory defaults shown in sections 9.4 of this manual.

To reset the instrument configuration select rSEt dEF from the configuration menu and press **[P]**. The Clock will display 0000 with the first digit flashing which is a request to confirm the instruction by entering 5urE. 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 defaults and return the instrument to the display mode as a Clock with default configuration.

10. CLOCK CONFIGURATION EXAMPLE

In this example a BA374NG is required to function as a Clock displaying time in a 24 hour format including seconds. For external synchronisation the displayed time is required to change to 12:00:00 when the external reset terminals are connected together.

Both control outputs are required to close and open once in each 24 hour period. Control output 1 (OP1) is to turn *on* (close) at 07:30:00 and *off* (open) at 09:30:00, control output 2 (OP2) is to turn *on* (close) at 18:00:00 and *off* (open) at 22:30:00.

For this application the operator needs to adjust the control output *on* and *off* times from the display mode via an access code of 1111. To prevent tampering the instrument configuration menu is to be protected by security code of 1209

10.1 Configuration procedure

The BA374NG may be configured as a Clock on-site without disconnection from external wiring.

Step 1 Enter the configuration menu

Enter the configuration menu by simultaneously pressing **[P]** and **[E]**. Assuming a security code has not already been entered the instrument will respond by displaying *FuncE, on* which is the first item in the configuration menu. See Fig 20.

Step 2 Configure instrument as a Clock

With *FuncE, on* displayed press **[P]** to reveal the existing function of the instrument. If *ELoC* is displayed no change is required, therefore return to the *FuncE, on* prompt by pressing the **[E]** button.

If *ELAPSE* is displayed, press the **[▲]** or **[▼]** button to change the setting to *ELoC* followed by the **[P]** button which will result in a *0000* prompt being displayed with the first digit flashing. This is a request for the instruction to be confirmed by entering *SurE* using the **[▼]** or **[▲]** button to adjust the flashing digit and the **[P]** button to move control to the next digit. Pressing **[E]** will then change the instrument to a Clock and return the display to *FuncE, on* in the configuration menu.

See 9.4.3

Step 3 Select display format

Using the **[▲]** or **[▼]** button select *d, SPlAY* in the configuration menu and press **[P]** which will reveal the current display format. Using the **[▲]** or **[▼]** button select *24:00:00* which is the required 24 hour format with seconds and press **[E]** to enter the selection and return to the configuration menu.

See 9.4.4

Step 4 Enter the synchronisation time

Using the **[▲]** or **[▼]** button select *SynC t* in the configuration menu and press **[P]** to reveal the current synchronisation time with the hours flashing. Using the **[▲]** or **[▼]** push button adjust the hours to 12 and press **[P]** to transfer control to the minutes. Using the **[▲]** or **[▼]** push button adjust the minutes to 00 and press **[P]** to transfer control to the seconds which should be adjusted to 00, in the same way. When the seconds are set enter the selection and return to the *rSEt* prompt in the configuration menu by pressing the **[E]** button.

See 9.4.6

Step 5 Enable control output 1 and enter the *on* and *off* times.




Using the **[▲]** or **[▼]** button select *OP1* in the configuration menu and press **[P]** to reveal the *EnbL* prompt in the control output 1 sub-menu.

In this application control output 1 is required to turn *on* and *off* once every 24 hours. With *EnbL* displayed press **[P]** and using the **[▲]** or **[▼]** button select *on t* followed by the **[E]** button to return to the *EnbL* prompt.















The control outputs *on* time should now be entered by selecting *OP1: on t* in the control output 1 sub-menu using the **[▲]** or **[▼]** button. Pressing **[P]** will reveal the existing *on* time which should be adjusted to 07:30:00 using the **[▲]** or **[▼]** button and the **[P]** button to transfer control to the following digits. When entered return to the *OP1: on t* prompt by pressing the **[E]** button.

The *off* time should now be entered by selecting *OP1: off t* from the sub-menu and adjusting the time to 09:30:00. Finally press **[E]** to return to the *OP1: off t* prompt in the sub-menu and press **[E]** again to return to *OP1* in the configuration menu.








Step 6 Enable control output 2 and enter the on and off times.

Using the  or  button select **oP2** in the configuration menu and press  to reveal the **EnbL** prompt in the control output 2 sub-menu. Follow the procedure described in step 5 above, but set control output 2 to turn on at 18:00:00 and off at 22:30:00.


Step 7 Allow control outputs times to be adjusted from the display mode & enter separate security code.

Using the  or  button select **RESP** in the configuration menu and press  to reveal the **EnbL** prompt, pressing  again will show if this function is **on** or **off**. Using the  or  button select **on** followed by  to return to the **EnbL** prompt. A separate security code which must be entered to gain access to the alarm times in the display mode, is entered in the **REEd** function which may be selected by operating the  or  button once. Pressing  will reveal the existing access code with one digit flashing. This should be changed to the required code of 1111 by adjusting the flashing digit using the  or  button and the  button to transfer control to the next digit. When 1111 has been entered press  twice to return to the configuration menu. See 9.4.16















Step 8 Define the configuration menu security code.

Defining a security code prevents unauthorised access to the configuration menu. Using the  and  buttons select **REdE** from the configuration menu and press  which will reveal 0000 with the first digit flashing. This example requires the security code to be 1209, using the  and  buttons set the flashing digit to 1 and press  to transfer control to the second digit. When all have been entered press  to return to the main configuration menu. See 9.4.17.

Step 9 Return to the display mode

The BA374NG is now configured as required for this example. Pressing the  button will save the configuration and return the BA374NG to the display mode with all the digits flashing indicating that the set time has to be entered.

Step 10 Enter the set time

Finally the current time to be displayed by the Clock should be entered. Re-enter the configuration menu by pressing the  and  buttons simultaneously which will result in **REdE** being displayed. Pressing  will allow the access code 1209 to be entered using the  or  button to adjust the flashing digit and the  button to transfer control to the next digit. When all four digits have been adjusted, press  to enter the configuration menu and using the  or  button select **SEt** and press  which will reveal 00:00:00 with the hours flashing. Using the  or  button adjust the flashing hours digit and press  to transfer control to the minutes and then to the seconds. When all have been set as required, press  to start the clock from the entered time and return to the display mode.

11. MAINTENANCE when configured as a clock

11.1 Fault finding during commissioning

If a BA374NG fails to function as a Clock during commissioning the following procedure should be followed:

Symptom	Cause	Check:
No display	No power supply, or incorrect wiring. Note: Terminals 2 & RS2 are interconnected within the instrument.	That there is between 10 and 30V on terminals 1 & 2 with terminal 1 positive. That there are no connections to terminals 3, 4, 5, 6, 7, 8, 9 & 10.
Configuration menu does not correspond with the Clock section of this manual.	BA374NG is configured as a Timer.	That <code>Function</code> in configuration menu is set to <code>Clock</code> not to <code>ELAPSE</code> .
Clock display flashes 00:00:00	Local time has not been entered.	Enter the local time in the <code>Set</code> function of the instrument configuration menu.
Control output(s) do not function.	Control outputs have not been enabled.	Enable Control Output(s) in the configuration menu.
Clock will not start	Reset terminals RS1 and RS2 are connected together and the Clock is continuously synchronising.	If reset annunciator on display is activated, disconnect connection between RS1 and RS2.
Unable to enter configuration menu.	Incorrect security code	That the correct security code is being used. Contact BEKA if the code is lost.

11.2 Fault finding after commissioning

EN 60079-17 *Electrical installations inspection and maintenance* permits live maintenance in Zone 2 if a risk analysis demonstrates that this does not introduce an unacceptable risk. The removal of covers [opening of Ex n instrument enclosure] is permitted if this can be done without contaminating the interior of the instrument with dust or moisture. Some end-users may prefer not to permit live maintenance to minimise risk.

ENSURE PLANT SAFETY BEFORE STARTING MAINTENANCE

Live maintenance within the hazardous area should only be performed when it is permitted by risk analysis, or when there is no risk of a flammable atmosphere being present.

If a BA374NG fails after it has been functioning correctly as a Clock, 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.
Clock display flashes 00:00:00	Instrument power supply has been interrupted and local time has been lost.	Enter the local time in the <code>Set</code> function of the instrument configuration menu.
Control output(s) do not function.	Control outputs have not been enabled.	Enable Control Output(s) in the configuration menu.
Clock will not start	Reset terminals RS1 and RS2 are connected together and the Clock is continuously synchronising.	If reset annunciator on display is activated, if it is disconnect connection between RS1 and RS2.
Unable to enter configuration menu.	Incorrect security code	That the correct security code is being used. Contact BEKA if the code is lost.

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

11.3 Servicing

We recommend that faulty BA374NG Clocks are returned to BEKA associates or to your local BEKA agent for repair. It is helpful if a brief description of the fault symptoms is provided.

11.4 Routine maintenance

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

11.5 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.

11.6 Customer comments

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

APPENDIX 1

ATEX dust certification

A1.0 ATEX dust certification

In addition to ATEX Ex nA certification permitting installation in Zone 2 explosive gas atmospheres, which is described in the main section of this instruction manual, the BA374NG Timer or Clock has ATEX Ex tc dust ignition protection by enclosure certification permitting installation in Zone 22 combustible dust atmospheres. The front panel push button switches are non incensive and have been certified intrinsically safe Ex ic without the need for Zener barriers or galvanic isolators.

This appendix describes ATEX installations in explosive dust atmospheres conforming with EN 60079-14 *Electrical installations design, selection and erection*. When designing systems for installation outside the UK the local Code of Practice should be consulted.

The Timer or Clock's Ex tc dust input and output safety parameters are identical to the Ex nA gas parameters, therefore all the electrical circuits shown in the main section of this manual may also be used for Ex tc dust applications.

A1.1 Zones, and Maximum Surface Temperature

The BA374NG has been ATEX dust certified

Group II, Category 3D
Ex ic tc IIIC T80°C Dc $-40 \leq T_a \leq 60^\circ\text{C}$

When connected to a suitable system the Timer or Clock may be installed in:

Zone 22 explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation, but if it does occur, will only persist for a short period.

Be used with dust in subdivisions:

IIIA	combustible flyings
IIIB	non-conductive dust
IIIC	conductive dust

Having a Minimum Ignition Temperature of:

Dust cloud	120°C
Dust layer on indicator up to 5mm thick	155°C
Dust layer on indicator over 5mm thick.	Refer to EN 60079-14

At an ambient temperature between -40 and +60°C

A1.2 Special conditions for safe use in dust atmospheres.

Special conditions for safe use are specified by the Ex ic tc certificate indicated by the certificate number's 'X' suffix. These state that the BA374NG Timer or Clock should be:

- Supplied from a *limited energy* circuit with output parameters in normal operation equal to, or less than the instrument's input parameters. The certificate states that it is **not** necessary to power the instrument from an intrinsically safe interface, such as a certified shunt diode safety barrier or a galvanic isolator to comply with this requirement.
- Fitted with cable entry glands or conduit fittings which maintain the impact and ingress protection of the enclosure. Certified Ex e or Ex n components satisfy these requirements.

The BA374NG is supplied fitted with one certified M20 stopping plug and one temporary hole plug which should be replaced with the required gland or conduit fitting.

A1.3 Maintenance

The IEC guidance on maintenance procedures EN 60079-17 permits live maintenance in Zone 22 if a risk analysis demonstrates that this does not introduce an unacceptable risk. The removal of covers [opening of Ex tc enclosure] is permitted if this can be done without contaminating the interior of the enclosure and instrument with dust or moisture. Some end-users may prefer not to permit live maintenance to minimise risk.

ENSURE PLANT SAFETY BEFORE STARTING MAINTENANCE

Live maintenance within the hazardous area should only be performed when it is permitted by risk analysis or when there is no risk of a flammable atmosphere being present.

The instrument assembly should only be removed from the enclosure back-box when dust can not enter the instrument enclosure. Before replacing the instrument assembly the sealing gasket should be inspected to ensure that it is undamaged and free from foreign bodies.

Inspection of the Timer or Clocks mechanical condition and removal of accumulated dust from the front of the instrument and the outside of the enclosure should be regularly performed. The interval between inspections depends upon environmental conditions. Removal of flammable dust should be performed with care to avoid creating a dust cloud.

APPENDIX 2

IECEX certification

A2.0 The IECEx Certification Scheme

IECEX is a global certification scheme for explosion protected products which aims to harmonise international certification standards. For additional information about the IECEx certification scheme and to view the BEKA associate certificates, please visit www.iecex.com

A2.1 IECEx Certificate of Conformity

The BA374NG Timer or Clock and the optional accessories have been issued with an IECEx Certificate of Conformity number IECEx ITS 16.0005X which specifies the following certification codes:

Ex nA ic IIC T5 Gc
Ex ic tc IIIC T80°C Dc IP66
Ta = -40°C to 60°C

The specified IECEx gas and dust parameters are identical to the ATEX safety parameters described in the main section and Appendix 1 of this manual.

The IECEx certificate may be downloaded from the BEKA associates or the IECEx website, or may be requested from the BEKA sales office.

A2.2 Installation

The IECEx and ATEX certificates specify identical safety parameters and installation requirements for both gas and dust approvals as defined by IEC 60079-14. The ATEX installation requirements specified in the main section and Appendix 1 of this manual may therefore be used for IECEx installations, but the local code of practice should also be consulted.

A2.3 Special conditions for safe use

The IECEx certificate number has an 'X' suffix indicating that special conditions apply for safe use. These conditions are identical to the ATEX special conditions for safe use specified in the main sections and in Appendix 1 of this manual.

APPENDIX 3

ETL & cETL certification for installations in USA and Canada.

A3.0 cETL Mark

For installations in the USA and Canada, the BA374NG Timer or Clock has ETL and cETL Ex nA and Ex tc approval, Control Number 4008610. Copies of the Authorisation to Mark may be downloaded from the BEKA associates website www.beka.co.uk or requested from the BEKA associates sales office.

A3.1 ETL and cETL certification

The US and Canadian standards used for assessment and certification of the BA374NG are listed on the cETL Authorisation to Mark.

ETL codes for USA

Class I Zone 2 AEx nA ic IIC T5 Gc
Zone 22 AEx ic tc IIIC T80°C Dc
Ta = -40°C to 60°C

cETL codes for Canada

Ex nA ic IIC T5 Gc
Ex n IIC T5 Gc
Ex ic tc IIIC T80°C Dc
Class III Div 2 Class II Div 2 Gp F G
Ta = -40°C to 60°C

The ETL and cETL safety parameters are the same as ATEX and IECEx parameters, therefore the systems shown in the main section of this manual and in Appendix 1 may be used for US and Canadian installations subject to complying with the local codes of practice.

The Timer or Clock's front panel push button contacts are non incandive and have been certified intrinsically safe Ex ic, without the need for an external Zener barrier or galvanic isolator, as shown on the ETL Authorisation to Mark. This allows the Timer or Clock to be adjusted and configured live when installed in Zone 2 or 22 hazardous areas.