

BAT D/T

Installation and Operating Instructions
Software Version 631C

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KEP

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SPECIFICATIONS

Description

Featuring 5 digits of resettable total and 8 digits of grand total, the BAT D/T is a battery powered indicator capable of accepting magnetic pickup, DC pulse and switch closure inputs. Linearization and Analog Output are optional.

Specifications

POWER:

BATTERY POWERED

Supplied with 2 C size Lithium battery pack.

EXTERNAL POWER INPUT

Voltage: 8.5 to 30 VDC

Current: Less than 5 mA

Supplied with 1 C size lithium battery

Protection: Reverse Polarity Protection on DC Power Input

LOOP POWERED

Voltage: 8.5 to 30 VDC

Supplied with 1 C size lithium battery

(battery must be installed to power display)

Protection: Reverse Polarity Protection on Current Loop

Battery Life Expectan

RUN TIME

PART NUMBER	RUN TIME			
	Idle	2hrs/day	8hrs/day	24hrs/day
BATDT A	5 yrs	4.5 yrs	3.5 yrs	2.1 yrs
BATDT A 4	5 yrs	3.7 yrs	2.7 yrs	1.5 yrs
BATDT B Standby Operator	2.5 yrs	2.25 yrs	1.75 yrs	1 yr
BATDT B/C External or Loop Power	10 years			

All of the above values are calculated with the pulse output ON
Turn the pulse output OFF to prolong battery life up to 30%.

Loop Burden: 8.5V maximum

DISPLAY:

Resettable Total Display

5 Digits (99999), 0.35" High, Display updates once every two seconds

Grand Totalizer Display: (selectable decimal)

8 Digits (99999999), 0.2" High

Totalizer Descriptors: GAL, LIT, FT3, M3, "blank"

Warning Displays: Low battery warning

PULSE OUTPUT:

The pulse output advances with the least significant digit of the totalizer.

Type: Opto-isolated open collector transistor.

Max. voltage (off state): 30 VDC

Current (on state): 5 mA @ .9 V drop, .1mA @ .7 drop

Pulse Rate / Duration: 65 mSec

Pulse output divider: User selectable, +1, +10, +100 or OFF

NOTE: Select OFF for max. battery life.

ACCURACY:

±1 count

MOUNTING STYLES:

- 0- Circuit Board- OEM option (consult factory)
- 1- Panel Mount - NEMA 4X Front
- 2- Wall Mount - NEMA 4X Enclosure
(unit mounted behind clear cover)
- 3- Explosion Proof - Class I, Division I, Groups B, C & D
Class II, Division I, Groups E, F & G
- 5- Wall Mount - NEMA 4X Enclosure
(unit mounted on cover)

ENVIRONMENTAL:

OPERATING TEMPERATURE

-4°F (-20°C) to + 158°F (70°C)

Extended Temp: -22°F (-30°C) to + 158°F (70°C)

HUMIDITY

0 - 90% Noncondensing

INPUTS:

MAGNETIC PICKUP INPUT

Frequency Range: 0 to 3500 Hz

Trigger Sensitivity: 30 mV p-p

Over Voltage Protected: ± 30 VDC

OPTO-ISOLATED DC PULSE INPUT

High (logic 1): 4-30 VDC

Low (logic 0): Less Than 1 VDC

Minimum Current: .5 mA

Hysteresis: 0.4 VDC

Frequency Range: 0 to 5 kHz

Min. Pulse Width: 0.1 msec

CONTACT CLOSURE INPUT (contact closure to common)

Internal Pullup Resistor: 100 KΩ to +3.6 VDC

High (logic 1): Open or 4-30 VDC

Low (logic 0): Less Than .5 VDC

Internal Switch Debounce Filter: 0 to 40 Hz

RESET INPUT (contact closure to common)

Internal Pullup Resistor: 100 KΩ to +3.6 VDC

High (logic 1): Open or 4-30 VDC

Low (logic 0): Less Than .5 VDC

Minimum On : 25 msec

Remote reset causes top line to reset to zero.

K-FACTOR

Range: 0.001 to 59999

Decimal Point Locations: XX.XXX to XXXXX

10 Point Linearization Option

This feature allows the user to enter 10 different frequencies with 10 different corresponding K-Factors to linearize non linear signals.

ANALOG OUTPUT OPTION:

Type: 4-20 mA follows rate display, Two wire hookup

Scaling: scaled per second, minute or hour.

0.000 to 59999 (selectable decimal)

Accuracy: 0.15% Full Scale at 20° C

Temperature Drift:

50 ppm/°C Typical

200 ppm/°C Worst Case

Reverse Polarity Protected

NOTE: The BAT D/T uses the 4-20 mA loop power as its power source when this option is used. The battery is still required to power the display.

INSTALLATION

Battery Installation and BATDT Initialization:

All BATDT models are shipped without the battery installed. This preserves battery life when the unit is not in service but requires that the BATDT hardware be initialized when the battery is installed. When using external BATPACK, mount within 12" and plug connector into 3 position square posts (see Fig 1). Polarity is not a concern because center is common.

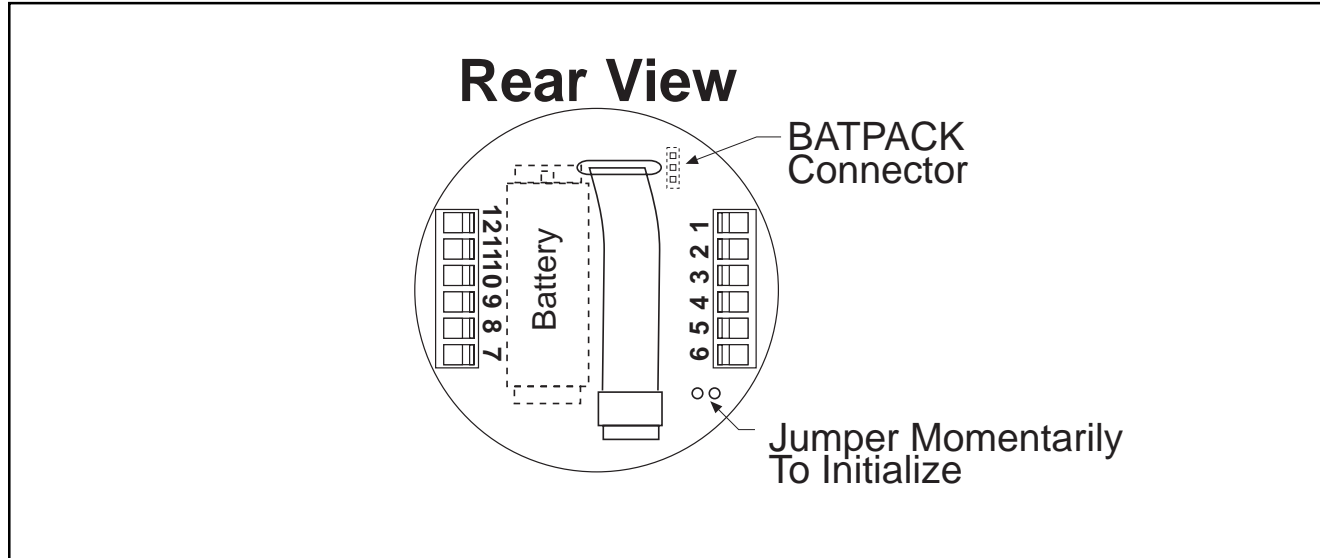
To install the battery, begin by locating the battery holder. The BATDT-2, 3 and 5 require opening the enclosure cover and removing the BATDT to expose the battery holder.

The plus terminal of the battery is marked with a (+) symbol stamped into the battery holder. Be sure to install the battery(ies) correctly.

Locate the "initialize" terminals on the BATDT PCB (see Fig1). Using a small length of wire, temporarily jumper across the initialize terminals. The unit will respond by showing its software version number and then illuminating the LCD display. See Programming Flowchart to setup desired operating parameters.

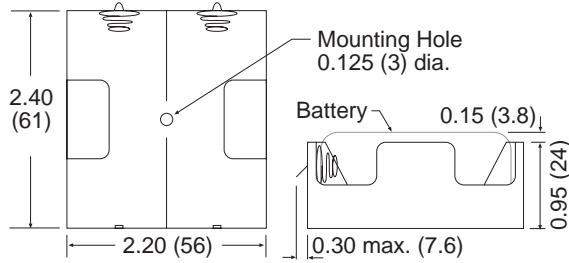
CAUTION : All BATDT models are provided with two or more sources of power. The power should not be interrupted when changing batteries. For models with two batteries, change one battery at a time. If all power sources are interrupted, information will be lost and the unit will have to be re-initialized as described above.

Fig 1

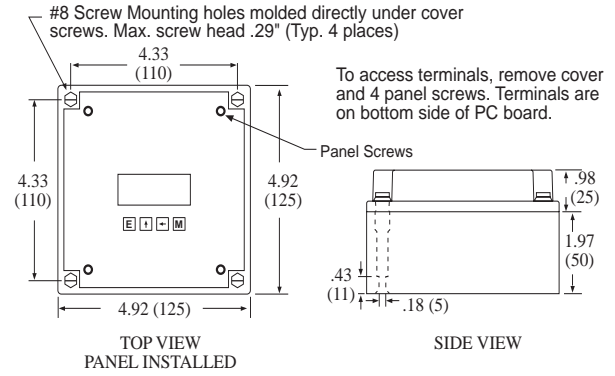


DIMENSIONS

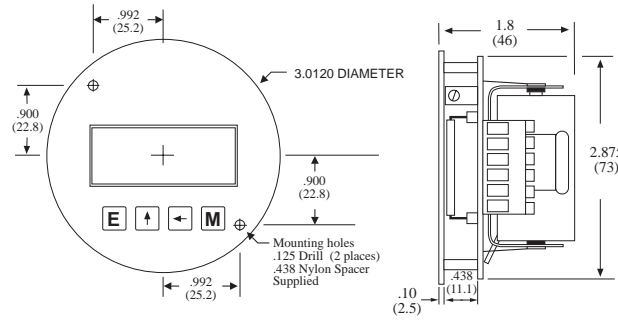
BATPACK



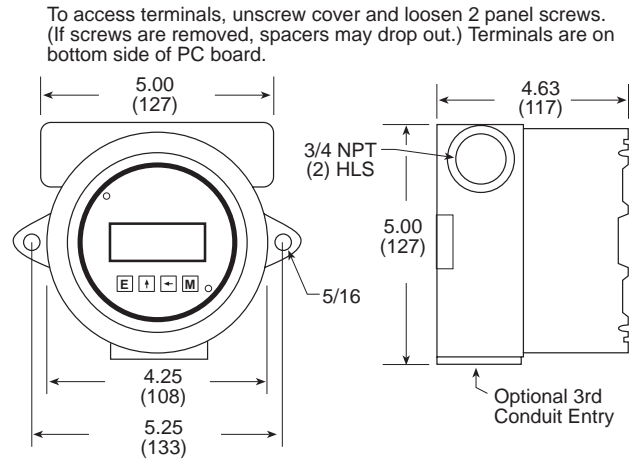
BATDT-2



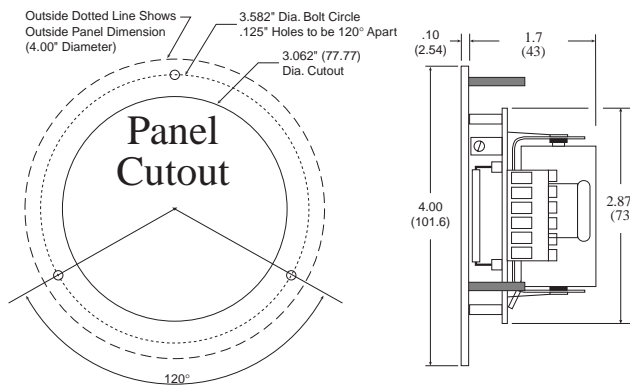
BATDT-0



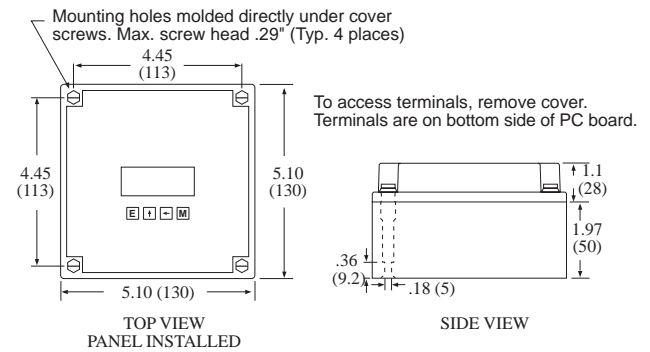
BATDT-3



BATDT-1



BATDT-5



THEORY OF OPERATION

Flow total equation:

$$\text{Flow Total} = \frac{\text{Sum of Input Pulses}}{\text{FAC}}$$

10 Point Linearization Option:

A 10 point linearization table is used to construct a curve describing the relationship of K-Factor and input frequency. The measured input frequency is used to access the table. A linear interpolation of adjacent point pairs is used to arrive at the K-Factor at that input frequency. The total and grand total are then computed based upon the K-Factor for that measurement sample.

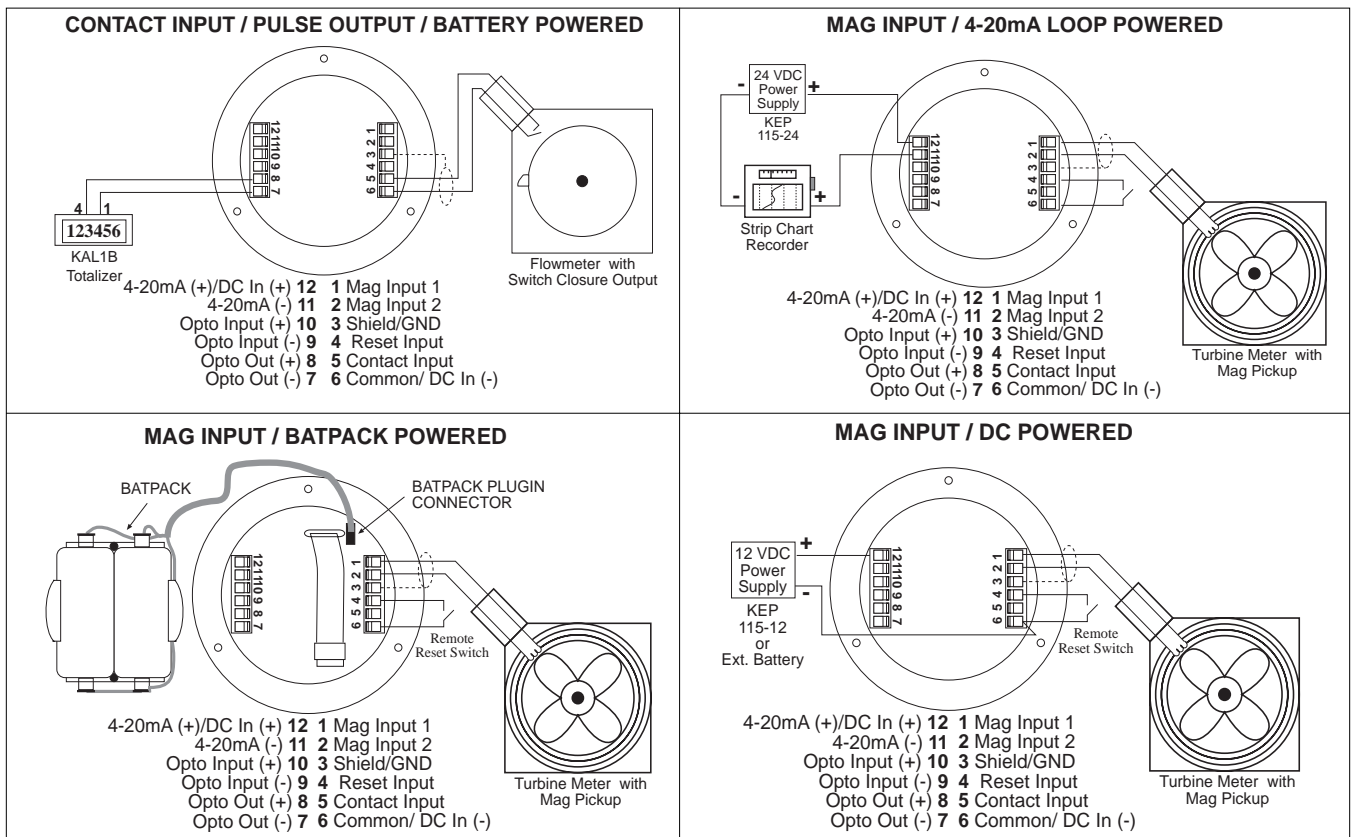
NOTE: For best performance and resolution choose as many decimal places as possible in the K-Factor.

Example: Enter a K-Factor of 1 as 1.000. Points must be entered in ascending order by frequency.

WIRING

Several typical applications of the BAT D/T are shown below. Please observe that the various pulse inputs and power options may be intermixed in many ways to solve common applications. The isolated pulse output may be freely used so long as proper polarity is observed.

TYPICAL APPLICATIONS



DEFINITIONS

Ent CodE: (enter code) This prompt will only appear if the panel lock is ON. Press the \uparrow key to increment each digit. Press the \leftarrow key to step to the next digit to the left. Press the **E** key to enter the 4 digit code. If the entered code is correct, the display will advance to the next menu prompt (CLr tot). If incorrect, the display will return to the run mode.

CLr tot: (clear total) Clears (resets) the Grand totalizer. Press the **E** key to clear the total and return to the run mode. Press the **M** key to skip and advance to the next menu selection.

FdEC: (factor decimal) Sets the decimal location for the factor. This location is restricted to 3 places (59.999). The use of this decimal automatically limits the number of decimal locations allowable in the total to acceptable ranges. Press the \leftarrow key to move the decimal. Press the **E** key to select the displayed decimal location.

NOTE: For best performance and resolution choose as many decimal places as possible in the K-Factor.
Example: Enter a K-Factor of 1 as 1.000.

FAC LinER/ 10Point: (factor type) This prompt will only appear if the unit is ordered with the 10 point linearization option. The **10 Point** linearization selection is recommended for flow meters whose K-factors change with different flow rates. This selection allows users to enter up to 10 different frequencies with 10 corresponding K-factors for different flow rates. The **LinER** setting is used for flow meters whose output is linear over its' entire operating flow range. Press the \uparrow key to step to the desired choice. Press the **E** key to enter the displayed factor type.

FAC : (factor) This prompt appears on all units with linear inputs. The Factor is the number of pulses per unit volume for the flow sensor. The pulses/unit volume is implied by the totalizer descriptor when a descriptor is used. The implied units for the Factor are then as follows:

GAL pulses/gallon

LIT pulses/liter

FT3 pulses/ft³

M3 pulses/M³

Factors from 0.001 to 59999 may be used. A 0 value for the factor is not allowed and a warning message will be given. The factor is displayed on the subsidiary (lower) display. Press the \uparrow key to increment each digit. Press the \leftarrow key to step to the next digit to the left. Press the **E** key to enter the displayed factor.

Fr#: (frequency for point #) This prompt will only appear when 10 point selected. It sets the frequency for each of the 10 points (#). Press the \uparrow key to increment each digit. Press the \leftarrow key to step to the next digit to the left. Press the **E** key to enter the desired frequency for point #.

DEFINITIONS

(continued)

FR# : (factor for point #) This prompt will only appear when 10 point selected. It sets the factor for each of the 10 points (#). Press the ↑ key to increment each digit. Press the ← key to step to the next digit to the left. Press the **E** key to enter the desired factor for point #.

NOTE: The display will advance to the next point (Fr#) after each entry of the Fr & Fac until all 10 points are complete. Entering a 0 in the Fr or fac setting will advance the display to the next menu prompt (tdec).

tdec : (totalizer decimal) Sets the decimal location for the totalizer. The totalizer decimal is not a dummy decimal and will scale the totalizer display accordingly. (i.e. if the tdec is set in the tenths position (1234567.8), 100 will be displayed as 100.0). The location of the decimal point allows for greater resolution of both the totalizer display and the pulse output. The pulse output advances at a rate dependent on the least significant digit of the totalizer. The totalizer decimal location is restricted to a maximum of 4 places (1234.5678). However, the number of totalizer decimal locations allowable is reduced with each decimal place added to the factor decimal. Press the ← key to move the decimal. Press the **E** key to enter the displayed decimal location.

Note:

The selection of the factor decimal point limits the available selections for the number of decimal points available for the totalizer. This is automatic.

Enter your selection of the Factor's decimal point before entering the totalizer decimal point to assure the proper selection of the totalizer decimal point has been made.

tdESC : (totalizer descriptor) This allows you to illuminate one of the available descriptors on the display (GAL, LIT, FT3, M3 or "blank"). Press the ↑ key to select the descriptor. Press the **E** key to enter the selected descriptor.

SCALE : (ratemeter scaling) Sets the rate scaling which is used for the analog output. Choose rate per hour (HR), minutes (MIN) or seconds (SEC). The scale setting is shown on the main (upper) display. Press the ↑ key to step to the desired choice. Press the **E** key to enter the displayed scale setting.

r decloc : (ratemeter decimal location) Sets the decimal location for the ratemeter which is used for the analog output. The ratemeter decimal is not a dummy decimal and will scale the rate reading accordingly. (i.e. if the r decloc is set in the tenths position (123.4), 100 will be calculated as 100.0). The ratemeter decimal location is restricted to a maximum of 4 places (.1234). However, the number of ratemeter decimal locations allowable is reduced with each decimal place added to the factor decimal. Press the ← key to move the decimal. Press the **E** key to enter the displayed decimal location.

DEFINITIONS

(continued)

DELAY: (delay) Sets the amount of time (0.1 to 8.0 seconds) that the unit will "look" for valid input data. If pulses are not detected within this "window", the rate will be computed as 0 and the analog out will read 4mA. The output will update once every two seconds as long as the unit receives valid data within two seconds. Some internal mathematics may delay this update. Press the \uparrow key to increment each digit. Press the \leftarrow key to step to the next digit to the left. Press the **E** key to enter the displayed delay value.

OUT LO: (out low) Sets the low setting for the 4-20 mA analog output. Key in the low rate value at which the unit will output 4mA. Press the \uparrow key to increment each digit. Press the \leftarrow key to step to the next digit to the left. Press the **E** key to enter the displayed out lo value.

OUT HI: (out high) Sets the high setting for the 4-20 mA analog output. Key in the high rate value at which the unit will output 20 mA. Press the \uparrow key to increment each digit. Press the \leftarrow key to step to the next digit to the left. Press the **E** key to enter the displayed out hi value.

PULSEOUT: (pulse out divider) This allows the unit to output a pulse for each least significant total count divided by the selected divider. The pulse out can be divided by 1 (d 1), 10 (d 10), 100 (d 100), or turned off (OFF). With the divider set at 1, the unit will give a pulse out for every increment of the LSD displayed.

Note: For maximum battery life, turn the pulse output off when pulse output is not used.

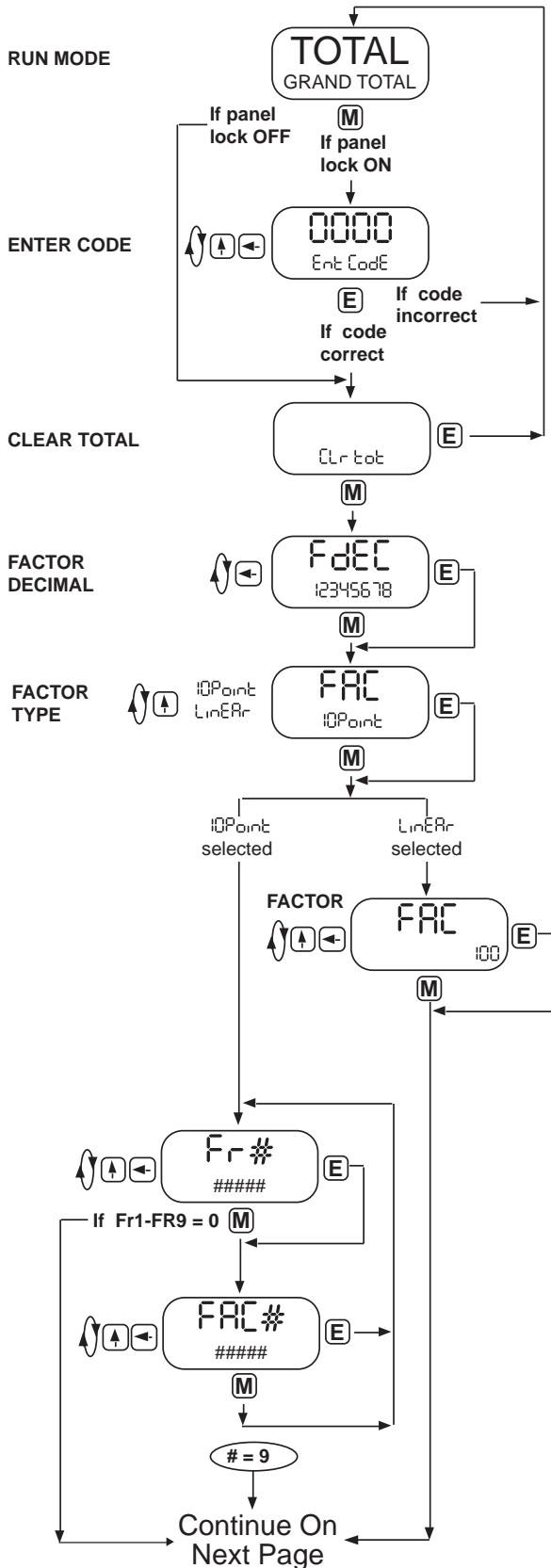
Selecting the proper pulse output divider may be needed so that the pulse output does not exceed the maximum rate of the pulse output (10 Hz). If the pulse output pulses too quickly a flashing display will result. Pressing the "M" key will result in a display of an error message "E PULSE". Press the "E" key to return to the run mode.

LOCK CODE: (lock code) Sets the 4 digit lock code to be entered when the unit prompts Enter Code. This allows the user to gain access to the menu when the unit is locked. Press the \uparrow key to increment each digit. Press the \leftarrow key to step to the next digit to the left. Press the **E** key to enter the displayed code.

Record this number for later use!

LOCK UNIT: (lock unit) Sets the panel lock ON or OFF. Press the \uparrow key to select On or OFF. Press the **E** key to enter the displayed selection.

PROGRAMMING FLOWCHART



Press the **M** key to enter the programming menu.

If the panel lock is on, you must enter the 4 digit lock code to gain access to the menu.

Press the **↑** key to increment each individual digit of the code.

Press the **←** key to advance to the next digit.

Press the **E** key to enter the displayed code.

If the code is correct, display advances to "Clr tot", if not, display returns to run mode

Press the **E** key to clear the grand totalizer and return to the programming menu.

Press the **M** key to skip and go to next menu item.

Press the **←** key to step the factor decimal to the desired location.

Press the **E** key to enter the displayed decimal location.

Press the **M** key to skip and keep the existing location

NOTE: For best performance and resolution choose as many decimal places as possible in the K-Factor. Example: Enter a K-Factor of 1 as 1.000.

Press the **↑** key to choose factor type (**10Point** or **Linear**).

Press the **E** key to enter the displayed factor type.

Press the **M** key to skip and keep the existing factor type.

The **FAC** prompt will only appear if **Linear** is selected or if the unit was ordered without the 10 point linearization option.

Press the **↑** key to increment each individual digit of the factor.

Press the **←** key to advance to the next digit.

Press the **E** key to enter the displayed factor.

Press the **M** key to skip and keep the existing factor.

Press the **↑** key to increment each individual digit of the frequency for point #.

Press the **←** key to advance to the next digit.

Press the **E** key to enter the displayed frequency.

Press the **M** key to skip and keep the existing frequency.

If 0 is entered, the display will advance to the next prompt (tdec).

Press the **↑** key to increment each individual digit of the factor for point #.

Press the **←** key to advance to the next digit.

Press the **E** key to enter the displayed factor.

Press the **M** key to skip and keep the existing factor.

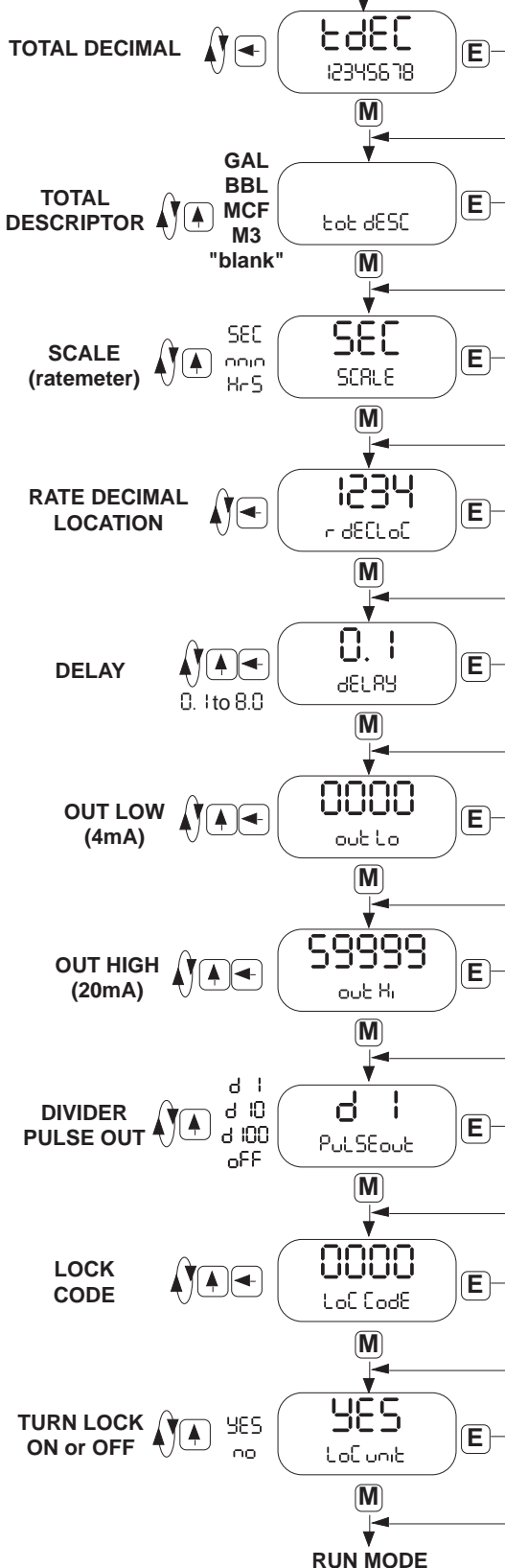
If 0 is entered, the display will advance to the next prompt (tdec).

Enter points in ascending order of input frequency.

PROGRAMMING FLOWCHART

(continued)

Continued From
Previous Page



Press the ← key to step the totalizer decimal to the desired location.
Press the E key to enter the displayed decimal location.
Press the M key to skip and keep the existing location

Press the ↑ key to step to the desired totalizer descriptor.
Press the E key to enter the displayed descriptor.
Press the M key to skip and keep the existing descriptor.

Press the ↑ key to step to the desired scale setting.
Press the E key to enter the displayed scale setting.
Press the M key to skip and keep the existing setting.
This prompt will only appear on units with analog output option.

Press the ← key to step the ratemeter decimal to the desired location.
Press the E key to enter the displayed decimal location.
Press the M key to skip and keep the existing location
This prompt will only appear on units with analog output option.

Press the ↑ key to increment each individual digit of the delay.
Press the ← key to advance to the next digit.
Press the E key to enter the displayed value.
Press the M key to skip and keep the existing value.
This prompt will only appear on units with analog output option.

Press the ↑ key to increment each individual digit of the out low setting (4mA value). **This will only display on units with Analog Output.**
Press the ← key to advance to the next digit.
Press the E key to enter the displayed value.
Press the M key to skip and keep the existing value.

Press the ↑ key to increment each individual digit of the out high setting (20mA value). **This will only display on units with Analog Output.**
Press the ← key to advance to the next digit.
Press the E key to enter the displayed value.
Press the M key to skip and keep the existing value.

Press the ↑ key to step to the desired divider for the pulse output.
Press the E key to enter the displayed divider.
Press the M key to skip and keep the existing divider.

Press the ↑ key to increment each individual digit of the lock code.
Press the ← key to advance to the next digit.
Press the E key to enter the displayed value.
Press the M key to skip and keep the existing value.

Press the ↑ key to step to the desired lock setting.
Press the E key to enter the displayed lock setting.
Press the M key to skip and keep the existing setting.

OPERATION

A suitable pulse producing device or flow meter is wired to one of the three pulse inputs provided on the BAT D/T. Only one of these inputs is used in a given application. There are no connections to the two unused pulse inputs.

Isolated magnetic pickups may be connected to terminals 1 and 2. Isolated contact closures may be connected to terminals 5 and 6. Any pulse type may be connected to terminals 9(-) and 10(+).

Power to the unit may be provided by internal batteries, external DC or 4-20mA loop. In all cases, the internal battery will provide for continued operation in the event primary power is lost.

Once properly wired, the operation of the BAT D/T is automatic.

The flow totalizer is updated every 2 seconds* with the latest total. If no input counts are received the unit remains in a low power state to conserve power.

The analog output will be scaled based on the user selected zero and full scale and the measured flow rate. The analog output is updated every 2 seconds*.

The pulse output will generate a burst of pulses every 2 seconds* in accordance with the instrument setup of pulse scaling.

* A large delay setting and internal math operations may delay the update rate.

RESETTING THE TOTALIZERS:

The grand total may be cleared only by using the following key sequence:

Press **M** "CLr tot" will be displayed (if the panel lock is on, the display will prompt "Ent Code".
Enter the proper code to advance to the CLr tot prompt)
Press **E** To clear the total. Unit will return to operation

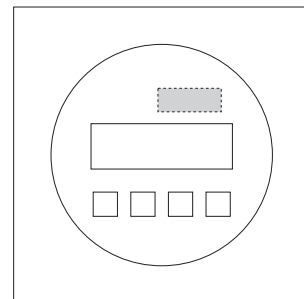
The 5 digit total can only be reset by a contact closure on the remote reset terminal to circuit common.

MAGNETIC RESET:

When the magnetic reset option is ordered (order option "RN"), the 5 digit total can be reset as follows:

Place the magnet over the area shown by the dotted line and grey fill in the drawing to the right.

Slide the magnet across the top of the housing. This may take more than one attempt. The 5 digit total will reset when the switch is activated by the magnet.



MAINTENANCE:

The only scheduled maintenance for the BAT D/T is periodic replacement of the battery.

Battery Replacement:

The BAT D/T has a battery monitor feature which illuminates when the lithium battery voltage approaches its end of life. A descriptor, "BAT", illuminates when the battery voltage falls below this predetermined value. The low battery detector operates correctly with all power options.

The battery, or batteries, should be replaced within several weeks of the first occurrence of low battery warning, "BAT". Left unattended, the unit may become inaccurate, cease to operate or lose setup information or malfunction.

Batteries should be replaced one at a time to avoid interrupting the power.

See INSTALLATION section for battery installation instructions.

ERROR MESSAGES

The BATDT is provided with extensive self checking which assists the user in the location of setup entry errors and in reporting malfunctions or unusual operating conditions. When an error occurs, the display will flash. Press any key to see the error message corresponding to the error that has occurred. Press any key again to acknowledge the error. (If the error can be eliminated by a change of setup values, the unit will automatically advance to the MENU so that the appropriate setup changes can be made).

Table - 2 illustrates the warning message, problem, and recommended corrective actions.

Diagnostic Error Messages Table-2

WARNING MESSAGE	CAUSE	CORRECTIVE ACTION
FAC Err	Factor = 0	Set in correct Factor
“BAT” Descriptor	Low Battery	Replace battery(ies)
E total	Total rollover	None required
E PULSE	Pulse out Overflow	Use different pulse scaler or totalizer decimal point



WARRANTY

This product (excluding batteries) is warranted against defects in materials and workmanship for a period of two (2) years from the date of shipment to Buyer.

The Warranty is limited to repair or replacement of the defective unit at the option of the manufacturer. This warranty is void if the product has been altered, misused, dismantled, or otherwise abused.

ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, ARE EXCLUDED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

How To Order

Example: BATDT 3 A 4

Series _____

Mounting _____

- *0 = None
- *1 = Panel Mount
- 2 = NEMA 4X Box with unit mounted behind clear cover
- 3 = Explosion Proof Housing
- 5 = NEMA 4X Box with unit mounted on opaque cover

Power Supply _____

- *A = Battery
- B = External Power Supply (8.5 to 30 VDC)
- C = Loop Powered with 4-20 mA Output
- A/C = Loop Powered with 4-20mA output and dual battery backup

Options _____

- 4 = 10 Point Linearization
- ET = Extended Temperature: -22°F to + 158°F (-30°C to +70°C)
- RN = Magnetic Reset

Accessories

- BATPACK= External Battery Pack with Two C Size Batteries & 12" leads
- BATC = Single Tadiran P/N TL2200/S 3.6V 5500mAh or equal
- 115-24 = 115 VAC to 24 VDC power supply

* External battery pack supplied with models BATDT0A & BATDT1A