

# **SQUIRT**

*LOOP POWERED INDICATOR*  
INSTRUCTION MANUAL



**KESSLER-ELLIS PRODUCTS**

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## SPECIFICATIONS

### Description:

Featuring up to 4 1/2 digits of rate and 8 digits of total, the Squirt is a loop powered indicator capable of accepting either linear or square root 4-20 mA inputs. An isolated scaled pulse output is available for hook up to a remote totalizer. Numeric password protection prevents unauthorized access to menu. The easy to read menu prompts make the Squirt so easy to program that you will feel comfortable programming it without the use of a manual.

### Specifications:

#### POWER:

Loop powered 4-20 mA

Internal Battery (Memory only):

3 V 250 mA-H Lithium (2 yr. Standby life)

#### DISPLAY:

Rate Display: (selectable decimal)

3.5 or 4.5 Digits (selectable), 0.35" High, Display up-dates once every two seconds.

Rate Descriptors: /SEC, /MIN, /HR or "blank"

Totalizer Display: (selectable decimal)

8 Digits (99999999), 0.2" High

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

Low Battery Error Detection: "BAT" descriptor & flashing display

Under/Over range Indication: Display flashes when out of range

#### 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

#### ACCURACY: (Rate @ 20°C)

0.1% Full Scale Resolution,  $\pm 1$  count

Temperature Drift:

50 ppm/°C Typical 200 ppm/°C Worst Case

#### LOCKOUT:

Password: Unauthorized menu changes can be prevented by entering a user selectable password (5 digit number).

Jumper: An internal jumper shunt is provided for applications requiring a "sealed" menu and totalizer lockout. Install the jumper to enable the lock. (see Typical Wiring, Pg. 2)

### INPUTS:

Signal Input:

Full Scale Range: 4 to 20 mA DC

Loop Voltage Drop: 6 Volts Maximum

Reverse Polarity Protected

Over Current Protection to 60 mA 16 Bit resolution; 1 sample every 2 seconds Low Cutoff supplied to inhibit indications at low flow rates.

Reset Input: (contact closure)

Internal Pullup Resistor: 100 k $\Omega$  to +3 VDC High (logic 1):

Open or 3-30 VDC

Low (logic 0): Less Than .5 VDC

Minimum On : 25 msec

**NOTE:** The reset input is not protected by the password or jumper lockout.

**CAUTION:** Sustained contact closures will shorten battery life.

### 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

Duration: 15 msec

Pulse Output Rate: 25 CPS max.

Pulse output divider: User selectable:  $\div 1$ ,  $\div 10$ ,  $\div 100$  or off

### CALIBRATION & OPERATION:

Input Scaling: Via front keypad

Calibration: Via front keypad

Decimal Point: Via front keypad

Reset Input: Via front keypad or remote dry contact closure

Keypad: 4 tactile feedback keys

### Mounting:

0- Circuit Board- OEM option (consult factory)

1- Panel Mount - NEMA 4X Front

2- Wall Mount - NEMA 4X Enclosure  
(keypad mounted behind clear cover)

3NE- Explosion Proof -White, Includes Third Conduit Entry  
Class I, Division I, Groups B, C & D  
Class II, Division I, Groups E, F & G

3SS- Explosion Proof -Stainless Steel  
Class I, Division I, Groups B, C & D  
Class II, Division I, Groups E, F & G

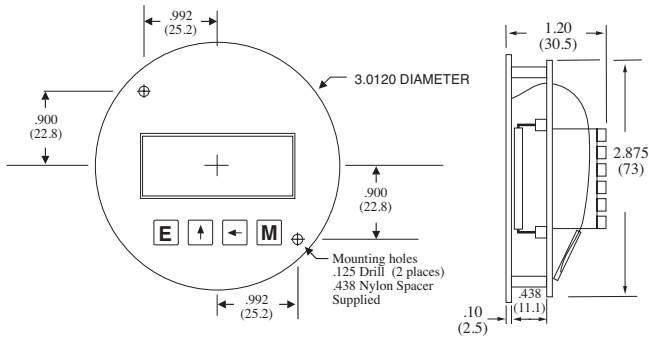
5- Wall Mount - NEMA 4X Enclosure  
(keypad mounted on cover)

6- Double Ended Explosion Proof -  
Class I, Division I, Groups B, C & D  
Class II, Division I, Groups E, F & G  
(contact factory for details)

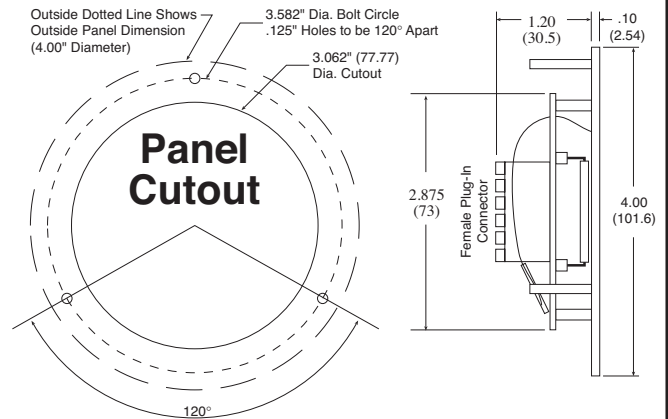
**NOTE:** Meter mounting kits available for styles 2, 3, 5 and 6  
Consult Factory

## DIMENSIONS

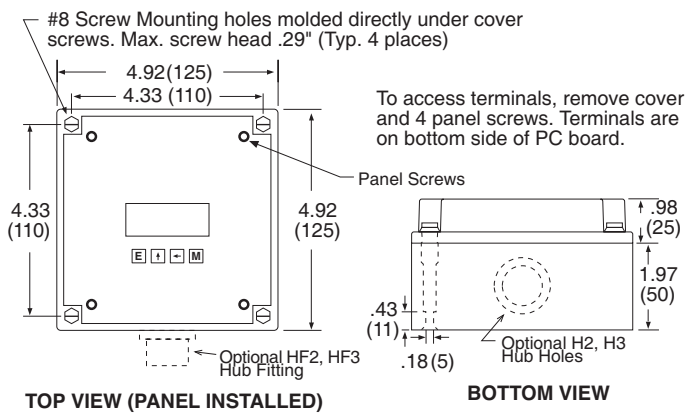
## SQUIRT-0



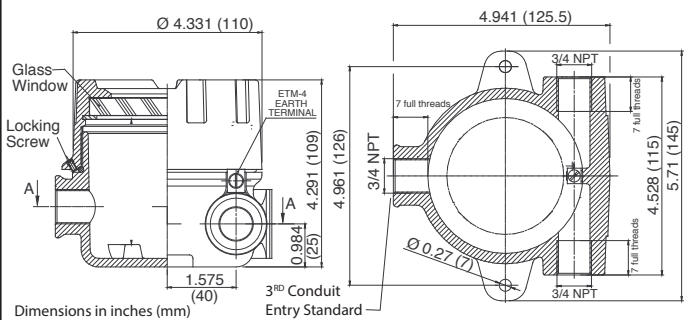
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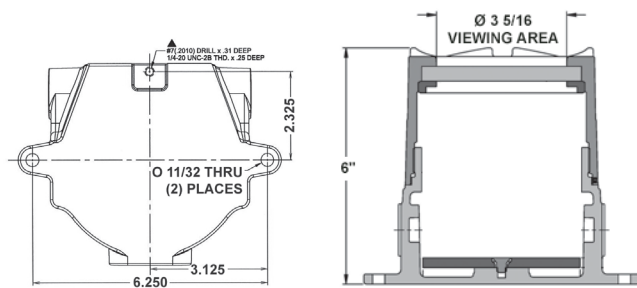
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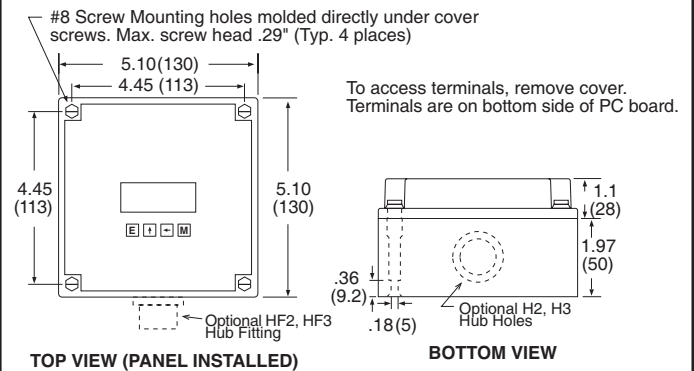
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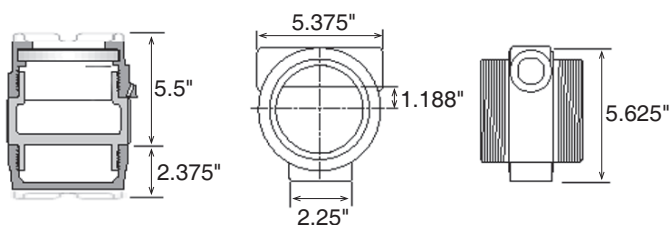
## SQUIRT-3SS



## SQUIRT-5

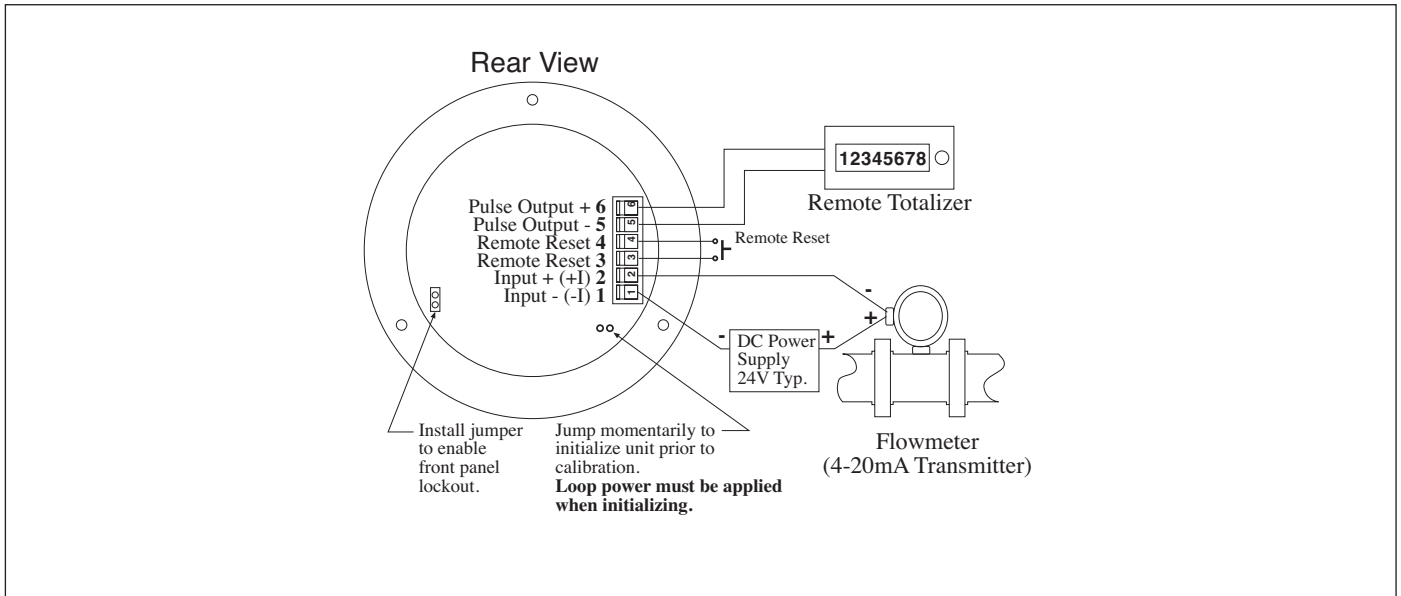


## SQUIRT-6

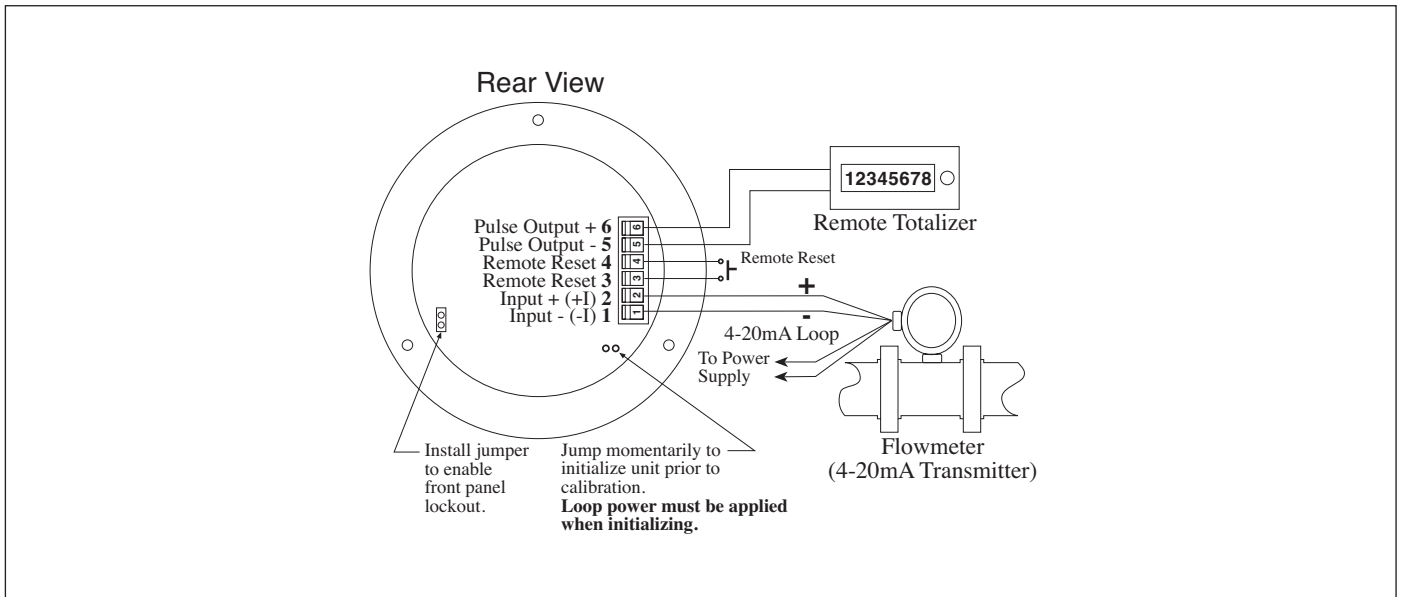


## Typical Wiring:

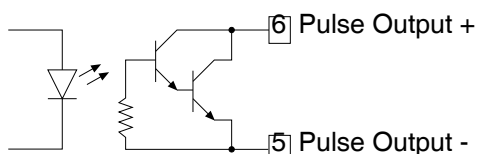
### 2-Wire Transmitter



### 4-Wire Transmitter



### Pulse Output Schematic



### CAUTION

Observe proper polarity when connecting the pulse output. The pulse output circuitry may be damaged by reverse polarity or voltages exceeding 30V.

## DEFINITIONS

**Ent CodE** : (enter code) This prompt will only appear if the panel lock is ON. Enter the password code to enter the program menu. 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 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.

**3 or 4** : (3.5 or 4.5 digits) Choose between 3.5 or 4.5 digit rate display. Press the  $\uparrow$  key to step to the desired choice. Press the **E** key to enter the displayed choice.

**dEC Loc** : (Decimal Location for ratemeter) Sets the decimal location for the ratemeter and the rate lo & rate hi settings. Press the  $\leftarrow$  key to move the decimal. Press the **E** key to enter the displayed decimal location.

**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).

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

**rate dESC** : (ratemeter descriptor/scaling) Sets the rate readout. Choose rate per hour, minutes, seconds or "blank" (when no descriptor is selected the unit assumes that the rate lo and rate hi are entered in units per second). Press the  $\uparrow$  key to step to the desired choice. Press the **E** key to enter the illuminated descriptor.

**inPut** : (input type) Choose between linear (LIN) or Square Root Extraction (SQ.√) . Press the  $\uparrow$  to step to the desired input type. Press the **E** key to enter the displayed choice.

**rate Lo** : (rate low) Sets the low setting for the 4-20 mA analog input. Key in the low rate value which corresponds to the 4mA input. 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 rate lo value.

**rate Hi** : (rate high) Sets the high setting for the 4-20 mA analog input. Key in the high rate value which corresponds to the 20mA input. 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 rate hi value.

## DEFINITIONS

(continued)

**LoCut:** (low cutoff) Percent of input span (0.1 to 9.9) below which all inputs will assume the rate lo value. (With LoCut set at 9.9, and rRtELo set to 0, all inputs below 5.6mA will read 0)

**CALCULATION EXAMPLE:** Given: Cutoff desired at 9.9% span Compute: mA corresponding to 9.9% =  $((9.9\% \times 16\text{mA}) / 100\%) + 4\text{mA} = 5.6\text{mA}$

**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.

**CRl:** (calibrate; yes or no) Select YES to calibrate the unit, select no to skip the calibration procedure. Press the ↑ key to select YES or NO. Press the E key to enter the displayed selection.

**CRl Lo:** (calibrate low) Apply an accurate 4 mA signal to the input and press the E key. If the calibration is successful the unit will display "done CRl Lo". If the calibration is not successful the display will read "done CRl Err" see error codes page 7. Press the M key to continue.

**CRl Hi:** (calibrate high) Apply an accurate 20 mA signal to the input and press the E key. If the calibration is successful the unit will display "done CRl Hi". If the calibration is not successful the display will read "done CRl Err" see error codes page 7. Press the M key to continue.

**LoC Code:** (lock code) Sets the 4 digit lock code to be entered when the unit prompts Ent Code. This allows the user to gain access to the menu when the unit is locked. 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 displayed code. (Factory Default Code = 1000)

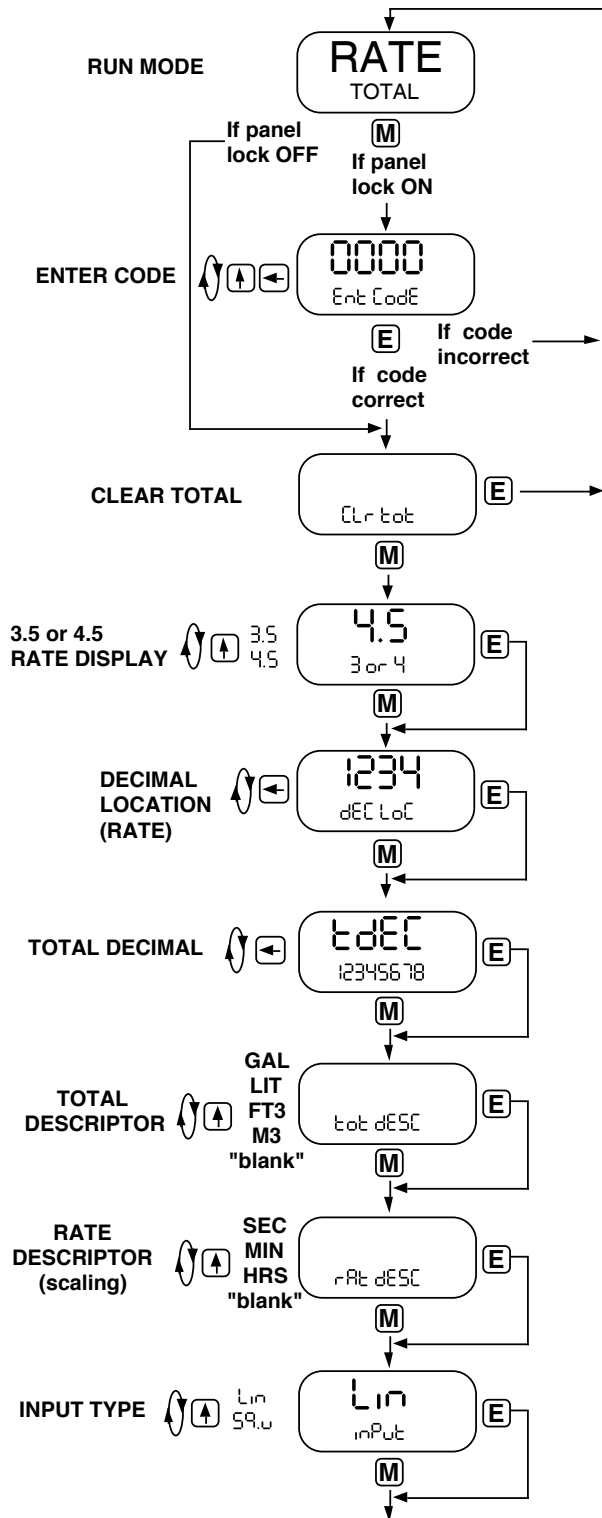
**Record this number for later use!**

**LoC unit:** (lock unit) Sets the panel lock ON or OFF. Press the ↑ key to select YES (ON) or no (OFF). Press the E key to enter the displayed selection.

**NOTE:** A hardware jumper menu lockout is also available. (see Typical Wiring Pg. 2)

## PROGRAMMING FLOWCHART

**NOTE:** All menu selections are saved upon exiting the program menu and returning to the run mode. When making menu changes, do not remove loop power until returning to the run mode.



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. (Factory Default Code = 1000)

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 totalizer and return to the Run Mode  
Press the **M** key to skip and go to next menu item.

Press the **↑** key to step to the desired number of digits for the rate display.

Press the **E** key to enter the displayed choice.  
Press the **M** key to skip and keep the existing choice.

Press the **←** key to step the decimal to the next digit.  
Press the **E** key to enter the displayed decimal location.  
Press the **M** key to skip and keep the existing decimal location.

Press the **←** key to step the decimal to the next digit.  
Press the **E** key to enter the displayed decimal location.  
Press the **M** key to skip and keep the existing decimal location.

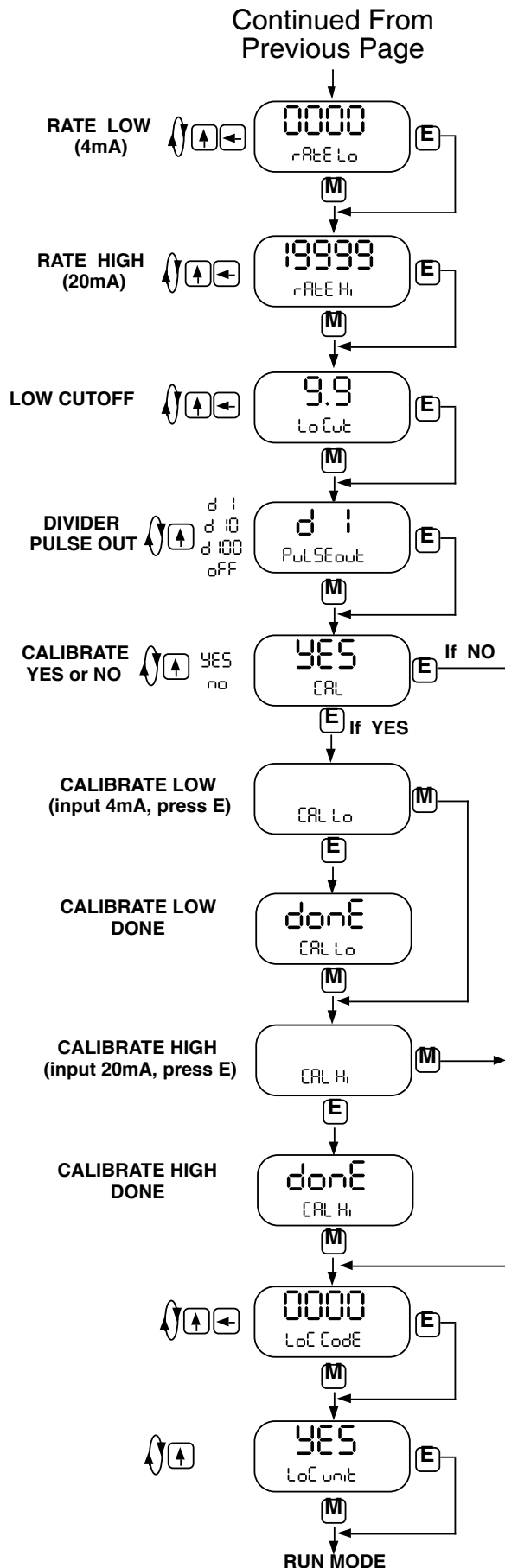
Press the **↑** key to step to the desired totalizer descriptor.  
Press the **E** key to enter the displayed descriptor.  
Press the **M** key to skip and keep the existing descriptor.

Press the **↑** key to step to the desired rate descriptor.  
Press the **E** key to enter the displayed descriptor.  
Press the **M** key to skip and keep the existing descriptor.  
(Choose the descriptor which reflects the time base used for rate high)

Press the **↑** key to step to the desired input type.  
Press the **E** key to enter the displayed choice.  
Press the **M** key to skip and keep the existing input type.



# PROGRAMMING FLOWCHART (continued)



Press the ↑ key to increment each individual digit of the rate low setting.  
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 rate high setting.  
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 low cutoff setting.  
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 step to cal YES or cal NO.  
Press the E key to enter the displayed choice.  
Press the M key to skip and proceed to loc code.

Press the E key when 4mA is supplied to the input.  
Press the M key to skip and proceed to cal hi.

Done will appear to signal that the cal lo was successful.  
Press the M key to advance to cal hi.

Press the E key when 20mA is supplied to the input.  
Press the M key to skip and proceed to loc code.

Done will appear to signal that the cal hi was successful.  
Press the M key to advance to loc code.

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 code.  
Press the M key to skip and keep the existing code.

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.

## ERROR CODES

0000  
RATE Err

This error message is displayed when the "RATE LO" value is set equal to or higher than the "RATE HI" value. Press (M) to re-enter the "RATE LO" and "RATE HI" values.

done  
CAL Err

This error message is displayed when the "CAL LO" or "CAL HI" input is set at a value which is out of range (see "CAL LO" and "CAL HI" in programming section for calibrating input ranges). Press (M) to re-enter the "CAL LO" and/or "CAL HI" procedure.

E BATTERY

If a low battery / invalid memory condition is detected, the display will flash and the "BAT" descriptor will come on. Press (M) to acknowledge the condition, E BATTERY will be displayed. Replace the battery, reinitialize and recalibrate the unit. (see "Battery Replacement" below).

E PULSE

This error message is displayed when the total is advancing at a speed greater than the pulse output capability. Choose a greater pulse divider or select "OFF".

### Battery Replacement

Suggested Battery:  
Panasonic BR2330

The polarity of the battery must be correct. Plus (+) must be on top as signified on the conductor arm.

**Note:** The unit **must** be powered by the loop and reinitialized immediately after battery replacement to prevent early battery discharge.

All menu items must be re-entered and the unit must be re-calibrated.

### DECODING PART NUMBER

**Example:**      **SQUIRT**      **3**      **ET**

---

SQUIRT \_\_\_\_\_  
     Loop powered; Rate & Total  
 Mounting: \_\_\_\_\_  
     0 = OEM  
     1 = Panel Mount  
     2 = NEMA 4X Box (Squirt behind clear cover)  
     3NE = Explosion Proof Housing, White  
           Includes Third Conduit Entry  
     3SS = Stainless Steel Ex-Proof Housing  
     5 = NEMA 4X Box (Squirt outside opaque cover)  
     6 = Double Ended Explosion Proof Housing

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Options: \_\_\_\_\_  
 ET = Extended Temp.: -22°F to 158°F (-30°C to 70°C)  
 ATEXCASE\*\* = European Flame Proof  
                 ATEX Case (consult factory)  
 R = External Magnetic Reset  
     for NEMA4X & Explosion Proof Enclosures  
 RX = NEMA7 Explosion Proof Reset Switch  
     for Explosion Proof Enclosure with  
     3/4" straight thread side entry  
 H2 = 0.875" Hole for mounting styles 2 and 5  
 CG - Cable Grip with Locking Nut  
     used for H2 option  
 HF2 = 1/2" Female NPT Hub fitting (mount styles 2 & 5)  
 H3 = 1.125" Hole for mounting styles 2 and 5  
 HF3 = 3/4" Female NPT Hub fitting (mount styles 2 & 5)

\*\* Contact factory for latest information

### WARRANTY

This product 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.