Simark Controls Ltd.
Rate Totalizer
Model SRT-IS-101A

Installation and Operating Instructions

1-800-565-7431
www.simark.com

SIMARK CONTROLS

10509 - 46 St. S.E.
Calgary, AB. T2C 5C2
Phone : (403) 236-0580
Fax : (403) 279-6553
Toll Free: 1-800-565-7431

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SPECIFICATIONS

DESCRIPTION
Featuring 5 digits of rate and 8 digits of total, the SRT-IS-101A is a battery or loop powered indicator capable of accepting magnetic pickup, DC pulse and switch closure inputs from pulse producing flowmeters.

SPECIFICATIONS
POWER:
BATTERY POWERED
  Supplied with 1 C size Lithium battery
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

BATTERY LIFE EXPECTANCY:
Expected Years of Operation for SRT-IS-101A of various powering options at equipment duty cycles

MODEL	RUN TIME			
	Idle	2hrs/day	8hrs/day	24hrs/day
Battery	10 yrs	10 yrs	10 yrs	8.4 yrs
Loop	Indefinite operation when externally powered			

NOTE: Battery shelf life is rated at 10 years by manufacturer
Life expectancy based on rated battery capacity at 20°C
The above table is shown with pulse output inactive. Use of pulse output shortens battery life.
Example: A pulse output of 0.06 sec. duration, once per second, would derate the battery life by 20%.

DISPLAY:
Rate Display: (selectable decimal)
  5 Digits (99999), 0.35" High, Display updates once per second with battery power, 8X per second with DC power
  Rate Descriptors: /MIN, /HR, /DAY
  Min. Input Frequency: 0.01 Hz to 10 Hz (selectable delay of 0.1 to 99.9 seconds)*
  Selectable Rate Display Damping
Totalizer Display: (selectable decimal)
  8 Digits (99999999), 0.2" High
  Totalizer Descriptors: GAL, BBL, MCF, M3, "blank"
Display is viewable from -22°F (-30°C) to + 158°F (70°C)
Warning Displays: Low battery warning

PULSE OUTPUT:
  The pulse output advances with the least significant digit of the totalizer or decimal multiples there of (see Pulse scale divider).
  Type: Isolated photomos relay in series with 680Ω resistor
  Max. voltage (off state): 30 VDC
  Current (on state): Limited by 680Ω resistor
  Pulse Duration: Selectable 0.5, 0.25, 0.125, 0.0625 seconds
  Pulse Scale divider (Pulscale): User selectable, ÷1, ÷10, ÷100 or OFF
  NOTE: Select OFF for max. battery life.

ACCURACY:
  0.01% Reading, ±1 count
  Temperature Drift: 50 ppm/°C Worst Case

ENVIRONMENTAL:
TEMPERATURE
  Maximum Temperature: + 158°F (70°C)
HUMIDITY
  0 - 90% Noncondensing

MOUNTING STYLE:
  NEMA4X keypad mounted outside opaque cover, with 1" union connection for turbine.

INPUTS:
MAGNETIC PICKUP INPUT
  Frequency Range: 0 to 3500 Hz
  Trigger Sensitivity: 10 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
(momentary 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
  NOTE: Sustained contact closure will shorten battery life.
RESET INPUT (momentary 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
  K-FACTOR
  Range: 0.001 to 99999999
  Decimal Point Locations: XXXX.XXXX to XXXXXXXX

20 POINT LINEARIZATION
  This feature allows the user to enter 20 different frequencies with 20 different corresponding K-Factors to linearize non linear signals.

DATA STORAGE:
  Setup Information: Stored in flash memory
  Totalizer: Stored in battery backed RAM but can be saved to flash memory by operator for recall after battery change out.

SAFETY LISTINGS:
  UL/C-UL File E225832
  CLASS 1, DIV 1, GROUPS B, C, D
  When installed in accordance with Installation Drawing 17075-1 (see Appendix A)

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

BATTERY INSTALLATION and REPLACEMENT

Battery Installation:

All SRT-IS-101A models are shipped without the battery installed. This preserves battery life when the unit is not in service but requires that the SRT-IS-101A hardware be initialized when the battery is installed.

To install the battery, begin by locating the battery holder. This requires opening the enclosure cover of the SRT-IS-101A 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 correctly.

Locate the "initialize" terminals on the SRT-IS-101A 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.
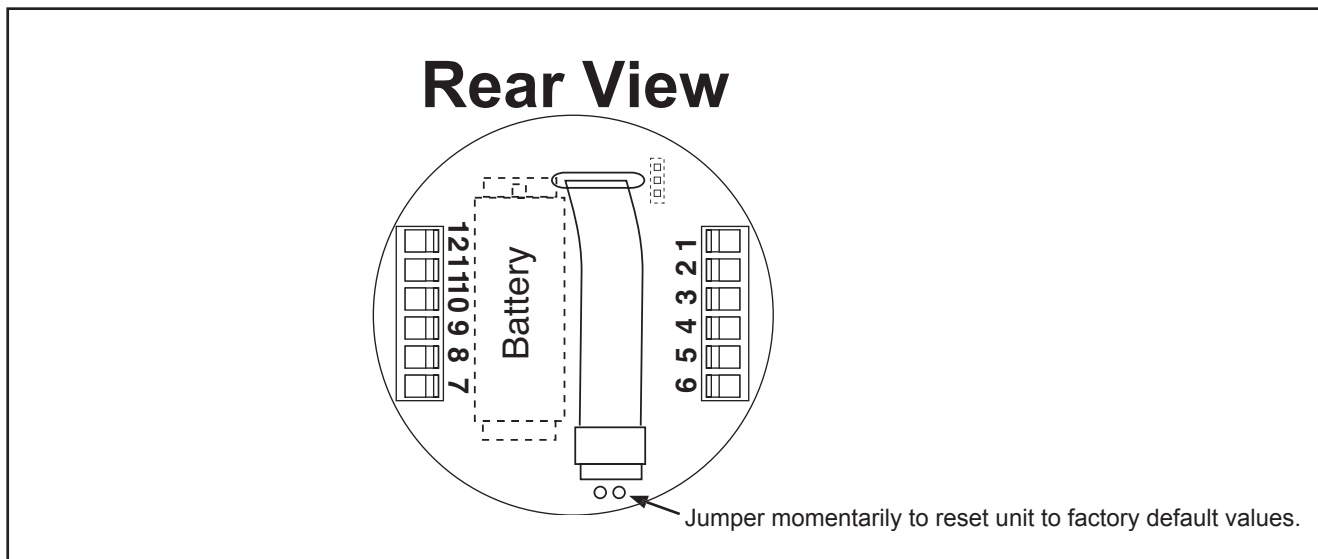
Battery Replacement:

The SRT-IS-101A 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 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 malfunction.

Before replacing the battery, Press the ← (left arrow) key to save the totalizer. The display will show "SAuE totAL". This will save the current total value and the total will resume from this value when the new battery is installed. **NOTE:** If the display starts to flash after the "SAuE totAL" message times out, press the "E" (enter) key. If the message "E FLASH" is displayed, then there was not enough power left to save the setup and totalizer to flash memory. At this point you must record the totalizer and setup information and verify the setup data after the new battery is installed.

Install new battery as described above.

Fig 1

Jumper momentarily to reset unit to factory default values.

DIMENSIONS

#8 Screw Mounting holes molded directly under cover screws. Max. screw head .29" (Typ. 4 places)

5.10(130)

4.45 (113)

4.45
(113)

5.10
(130)

E ↑ ← M

Hub Fitting
3/4" F-NPT
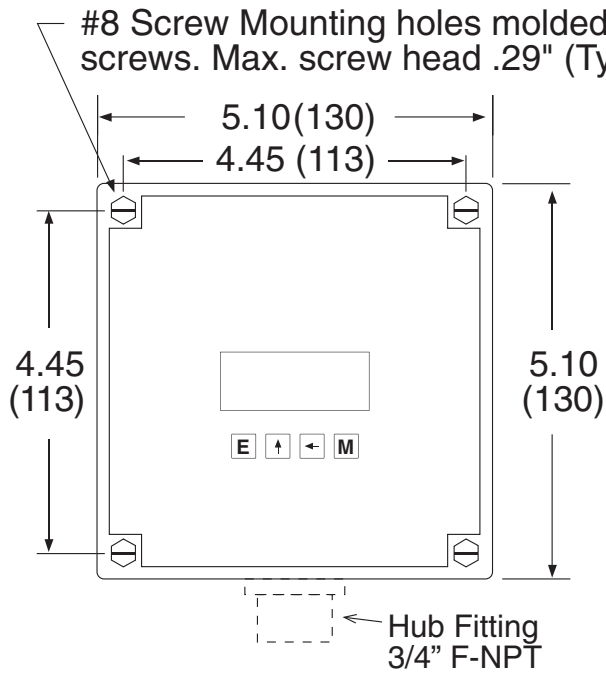
TOP VIEW (PANEL INSTALLED)

To access terminals, remove cover.
Terminals are on bottom side of PC board.

1.1
(28)

1.97
(50)

.36
(9.2)

Hub Fitting

.18 (5)
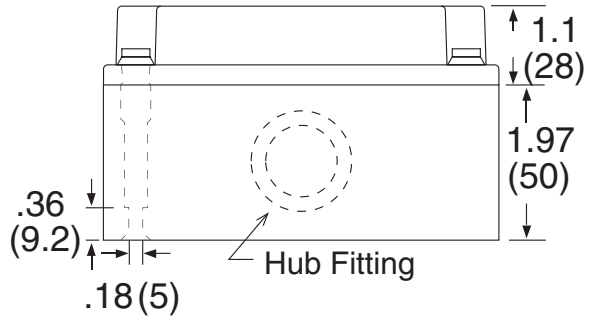
BOTTOM VIEW

THEORY OF OPERATION

Flow rate equation:

$$\text{Flow Rate Indication} = \frac{\text{Input Frequency}}{\text{FAC}} \times \text{Time Scaler}$$

Where Time Scaler is equal to: 60 for rate per minute read out
3600 for rate per hour read out
86400 for rate per day read out

Flow total equation:

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

20 Point Linearization:

A 20 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 flow rate and 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.

WIRING

Some typical applications of the SRT-IS-101A are shown at right. 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

MAG INPUT / DC POWERED / PULSE OUTPUT

DC In (+) **12**	**1** Mag Input 1
Not Used (-) **11**	**2** Mag Input 2
Opto Input (+) **10**	**3** Shield/Common
Opto Input (-) **9**	**4** Reset Input
Opto Out (+) **8**	**5** Contact Input
Opto Out (-) **7**	**6** Common/ DC In (-)
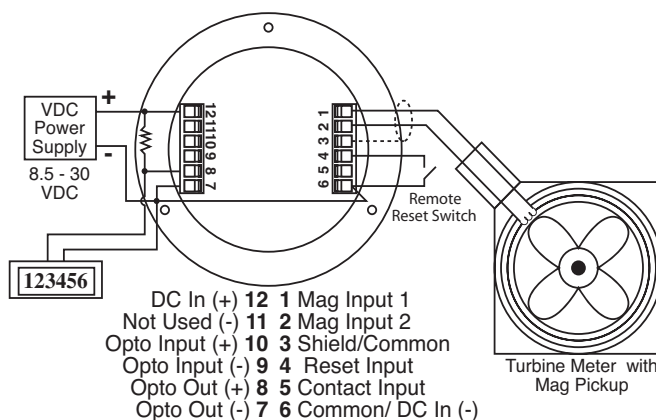
MAG INPUT / BATTERY POWERED

DC In (+) **12**	**1** Mag Input 1
Not Used **11**	**2** Mag Input 2
Opto Input (+) **10**	**3** Shield/Common
Opto Input (-) **9**	**4** Reset Input
Opto Out (+) **8**	**5** Contact Input
Opto Out (-) **7**	**6** Common/ DC In (-)

NOTE: For intrinsically safe installation, see Appendix A

DEFINITIONS

 SAᴜE totAL: (Save Total) Press the **E** key while the unit is running to save the total value. The display will show "SAᴜE totAL" for a few seconds. This is a very useful "scratch pad" to save and restore total when replacing the battery.

Ent CodE: (enter code) This prompt will only appear if the panel lock is ON. 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 5 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.

FdEC: (factor decimal) Sets the decimal location for the factor. This location is restricted to 3 places (99.999). The use of this decimal automatically limits the number of decimal locations allowable in the rate and total to acceptable ranges. Press the ← 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.
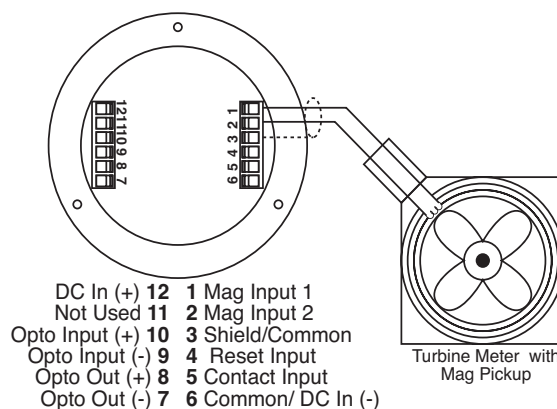   Example: Enter a K-Factor of 1 as 1.000.

FAC LinEAr/20Point: (factor type) The 20 Point linearization selection is recommended for flow meters whose K-factors change with different flow rates. This selection allows users to enter up to 20 different frequencies with 20 corresponding K-factors for different flow rates. The LinEAr setting is used for flow meters whose output is linear over its' entire operating flow range. Press the ↑ key to step to the desired choice. Press the **E** key to enter the displayed factor type.

no/YES SEt PntS: (set 20 point?) This prompt allows the user to skip the 20 point setup routine. Select YES for initial setup or to change the present 20 point values. Select no to skip and keep the existing values.

FAC : (factor) This prompt appears if "FAC LinEAr" is selected for the factor type. 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
   BBL   pulses/BBL
   MCF   pulses/MCF
   M3   pulses/M3

   Factors from 0.0001 to 99999999 may be used. A "0" value for the factor is not allowed and the unit will default to "1" in LSD if a "0" entry is attempted . The factor is displayed on the subsidiary (lower) display. 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 factor.

Fr# : (frequency for point #) This prompt will only appear when 20Point is selected as the factor type. It sets the frequency for each of the 20 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 frequency for point #.

FAC# : (factor for point #) This prompt will only appear when 20Point is selected as the factor type. It sets the factor for each of the 20 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 20 points are complete. Entering a 0 in the Fr or fac setting will advance the display to the next menu prompt (tdec).

ʈdEC: (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.

ʈoʈ dESC: (totalizer descriptor) This allows you to illuminate one of the available descriptors on the display (GAL, BBL, MCF, M3, "blank"). Press the ↑ key to select the descriptor. Press the **E** key to enter the selected descriptor.

r SCALE: (ratemeter scaling) Sets the time base for the rate readout. Choose rate per hour (Hr5), minutes (nnin) or day (dAY). 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.

> **Note:** A rate descriptor corresponding to the above choice will be illuminated on the display.

r dECLoC: (ratemeter decimal location) Sets the decimal location for the ratemeter. The ratemeter decimal is not a dummy decimal and will scale the rate display accordingly. (i.e. if the r decloc is set in the tenths position (123.4), 100 will be displayed 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.

> **Note:** The flow rate indicator will flash "99999" if the computed flow rate exceeds the 99999 display capability of the indicator. Choose a new decimal point location to avoid this.

nor # NORMALIZING FACTOR - Normalizes (averages) the data being received. Enter a value from 0 to 9. Higher settings provide more normalizing (averaging) for a more stable display. Derived from the equation:

$$\frac{(\text{Old Data x "NOR" + New Data})}{(\text{"NOR" + 1})}$$

dELAY: (delay) Sets the amount of time (0.1 to 99.9 seconds) that the unit will "look" for valid input data. If pulses are not detected within this "window", the rate will display 0. The display will update once every second as long as the unit receives valid data within a second. Some internal mathematics may delay this update. 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 delay value.

PuLSCALE: (pulse out scaling) 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. 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.

P width: (pulse width) Sets the pulse width of the pulse output. Selections are: 0.5 (1Hz), 0.25 (2Hz),0.125 (4Hz) or 0.0625 (8Hz). This menu item is skipped if PuLSCALE is turned off.

LoC CodE: (lock code) Sets the 5 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.
Record this number for later use!   **LOCK CODE: _____**

LoC unit: (lock unit) Sets the panel lock ON or OFF. Press the ↑ key to select On or OFF. Press the **E** key to enter the displayed selection.

PROGRAMMING FLOWCHART

RUN MODE

RATE
TOTAL

M

If panel lock OFF   **If panel lock ON**

ENTER CODE

0000
Ent CodE

E   **If code incorrect**

If code correct

CLEAR TOTAL

CLr tot   **E**

M

FACTOR DECIMAL

FdEC
12345678   **E**

M

FACTOR TYPE

20Point
LinEAr   FAC
20Point   **E**

M

20Point selected   LinEAr selected

FACTOR

FAC
100   **E**

M

SET 20PT

YES
no   YES
SEt PntS   **E**

M

no selected   YES selected

FREQUENCY for POINT # (Fr0-Fr19)

Fr#
E

If Fr1-FR19 = 0 M

FACTOR for POINT # (FAC0-FAC19)

FAC#
E

M

= 19

Continue On Next Page

Press the **M** key to enter the programming menu.
Press the ← key to save total. See Battery Installation and Replacement for details.

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 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 (20Point 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
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.

The SEt PntS prompt will only appear if 20Point is selected. This allows users to bypass the 20 point set up and keep the existing values.
Press the ↑ key to choose YES or NO.
Press the **E** key to enter the displayedselection.
Press the **M** key to skip (same as selecting NO).

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).
NOTE: Frequency/factor point pairs must be entered in ascending order of frequency

Press the ↑ key to increment each individual digit of the factor for point #.
Press the ← key to advance to the next digit.
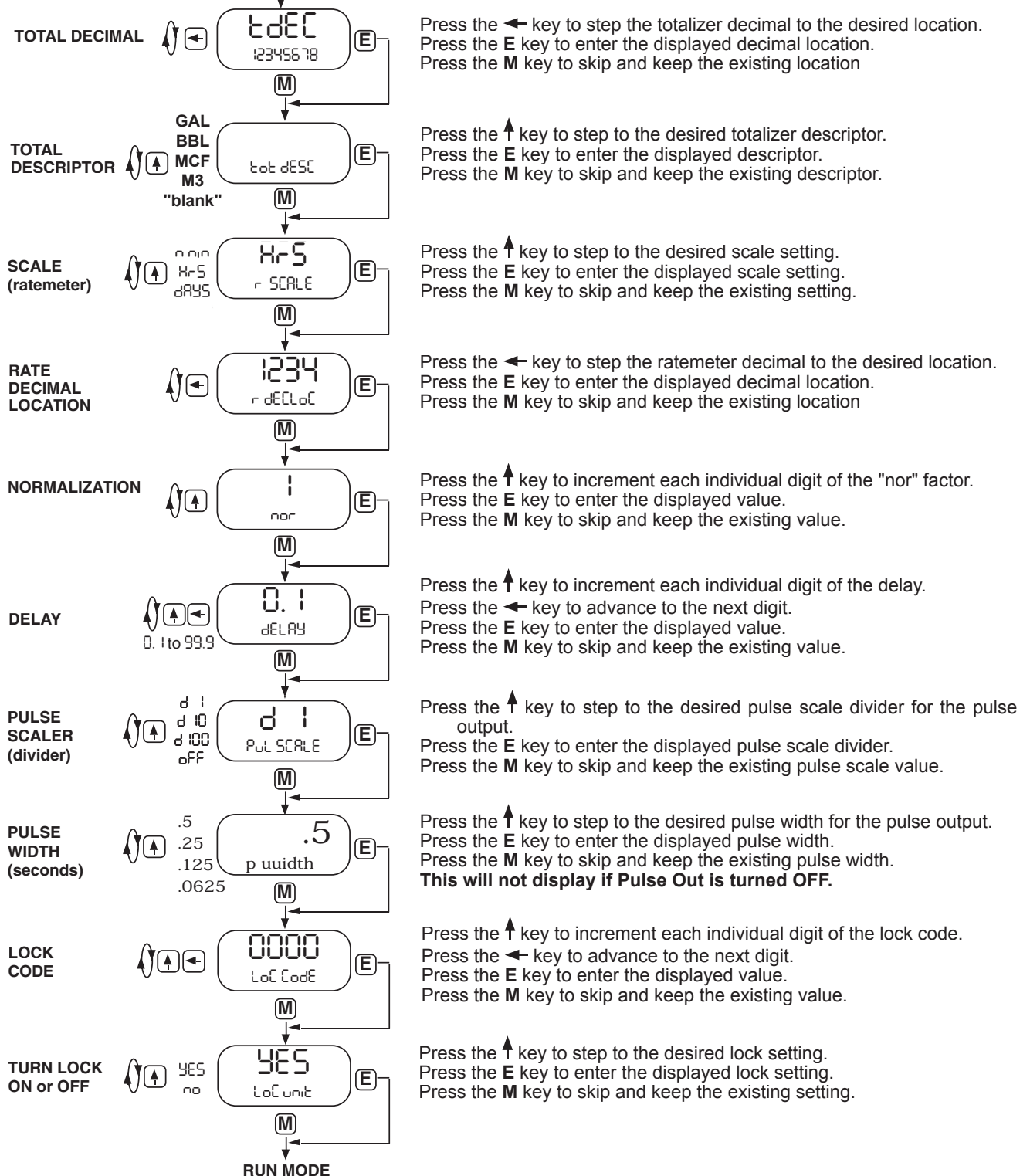Press the **E** key to enter the displayed factor.
Press the **M** key to skip and keep the existing factor.
If 0 is entered, the display will advance to the next prompt (tdec).

PROGRAMMING FLOWCHART
(continued)

Continued From Previous Page

TOTAL DECIMAL

`tdEC`
`12345678`

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

TOTAL DESCRIPTOR

GAL
BBL
MCF
M3
"blank"

`tot dESC`

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.

SCALE (ratemeter)

n.nin
Hr-S
dAYS

`Hr-S`
`r SCALE`

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.

RATE DECIMAL LOCATION

`1234`
`r dECLoC`

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

NORMALIZATION

`1`
`nor`

Press the ↑ key to increment each individual digit of the "nor" factor.
Press the **E** key to enter the displayed value.
Press the **M** key to skip and keep the existing value.

DELAY

0.1 to 99.9

`0.1`
`dELAY`

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.

PULSE SCALER (divider)

d 1
d 10
d 100
oFF

`d 1`
`PuL SCALE`

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

PULSE WIDTH (seconds)

.5
.25
.125
.0625

`.5`
`p uuidth`

Press the ↑ key to step to the desired pulse width for the pulse output.
Press the **E** key to enter the displayed pulse width.
Press the **M** key to skip and keep the existing pulse width.
This will not display if Pulse Out is turned OFF.

LOCK CODE

`0000`
`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 value.
Press the **M** key to skip and keep the existing value.

TURN LOCK ON or OFF

YES
no

`YES`
`LoC unit`

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.

RUN MODE

9

OPERATION

A suitable pulse producing device or flow meter is wired to one of the three pulse inputs provided on the SRT-IS-101A. 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 high level, DC pulse type may be connected to terminals 9(-) and 10(+).

Power to the unit may be provided by the internal battery or external DC. 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 SRT-IS-101A is automatic.

The flow totalizer is updated once per second* with battery power, instantaneously with DC.   If no input counts are received the unit remains in a low power state to conserve power.

The flow total may be cleared by the front panel switch sequence or by a contact closure on the remote reset terminal to circuit common.

To reset the unit from the front panel, the following key sequence is required:

> 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 flow rate indicator will measure the flow rate once every second* with battery power, 8 times per second with DC power and display the flow rate.

If the input pulses are not detected within the delay setting (0.1 to 99.9 seconds), a flow rate of 0 will be indicated.

The pulse output updates at the same rate as the total display in accordance with the instrument setup of pulse scaling.

* A large delay setting and internal math operations may delay the update rate. A faster update rate occurs when the unit is loop powered or externally powered.

MAINTENANCE:

The only scheduled maintenance for the SRT-IS-101A is periodic replacement of the battery. See Battery Installation and Replacement for details.

ERROR MESSAGES

The SRT-IS-101A 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
rAtE Er	Rate Low set higher than Rate Hi	Set Rate Hi greater than Rate Lo
FAC Err	Factor = 0	Set in correct Factor
"BAT" Descriptor	Low Battery	Replace battery(ies)
E totAL	Total rollover	None required
E rAtE	Rate exceeds 99999	Use lower rate dec point
E PuLSE	Pulse out Overflow	Use different pulse scaler or totalizer decimal point
E FLASH	Save to flash memory failed	Write down displayed total and setup values if you are changing the battery. If total wasn't saved, it will display an arbitrary total when new battery is installed. In this case, reset the total to 0 and check the setup information.

K-Factor or Divisor Calculations

The signal from the flowmeter used with the SRT-IS-101A is amplified and conditioned by the electronic circuitry. The K-Factor (the number of pulses per unit volume from the flowmeter) is programmed into the SRT-IS-101A. A divisor can also be used which is the K-Factor.   By making continuous calculations based on number of stored pulses and the divisor, the SRT-IS-101A generates rate and total volume readings in the desired unit of measure.

K-Factor

The K-Factor is the meter manufacturers stated pulses/unit volume for the flowmeter determined at the factory for each particular flowmeter. This information is supplied by the meter manufacturer. The units of volume are stated.

Divisor

The divisor is the pulses per user unit of volume that is required in the setup of the instrument to provide indication in the desired user units of volume. The divisor is equal to (K-Factor x Volume Conversion Factor) and is entered by the user during the setup of the instrument.

The following liquid flowmeter examples will help you calculate divisors for the SRT-IS-101A. To enter the data into the SRT-IS-101A, follow the programming flowcharts on pages 8 and 9.

Liquid Flowmeter Calculations

The divisor for a liquid flowmeter is determined based on the flowmeter calibration factor (K-Factor) and the appropriate conversion factor for the required units of measure. The following examples provide liquid flowmeter calculations for barrels, gallons and cubic meters.

Barrels

To set the totalizer to display total barrels, multiply the pulses/gal (K-Factor) by 42 (gal/bbl).

Examples:

1 inch Turbine Meter calibration Factor (K-Factor) of 900 pulses/gal.
To display in Total Barrels enter 37800. as the factor in the SRT-IS-101A (900 x 42 = 37800. pulses/bbl)

1.5 inch Turbine Meter calibration factor (K-Factor) of 325 pulses/gal.
To display in Total Barrels enter 13650. as the factor in the SRT-IS-101A (325 x 42 = 13650. pulses/bbl)

NOTE:
If the required totalizer display is in tenths of barrels, enter one decimal point at the ⱦdEⱦ display when programming the SRT-IS-101A. The SRT-IS-101A scales the display accordingly.

Gallons

To set the totalizer to display total gallons, simply enter the decimal in the desired location when the FdEⱦ is displayed and enter the K-Factor at the FAⱦ display that follows FdEⱦ. Gallons will totalled in the totalizer display.

Examples:

1 inch Turbine Meter calibration Factor (K-Factor) of 900 pulses/gal.
To display in Total Gallons enter 900.0 as the factor in the SRT-IS-101A

1.5 inch Turbine Meter calibration factor (K-Factor) of 325 pulses/gal.
To display in Total Gallons enter 325.00 as the factor in the SRT-IS-101A

NOTE: If the required totalizer display is in tenths of gallons, enter one decimal point at the ⱦdEⱦ display when programming the SRT-IS-101A. The SRT-IS-101A scales the display accordingly.

Cubic Meters

To set the totalizer to display total cubic meters, multiply the calibration factor (K-Factor) by 264.17.

Examples:

1 inch Turbine Meter calibration Factor (K-Factor) of 900 pulses/gal.
To display in Total Cubic Meters enter 237753 as the factor in the SRT-IS-101A (900 x 264.17= 237753)

1.5 inch Turbine Meter calibration factor (K-Factor) of 325 pulses/gal.
To display in Total Cubic Meters enter 85855.25 as the factor in the SRT-IS-101A (300 x 264.17= 85855.25)

NOTE:
If the required totalizer display is in tenths of cubic meters, enter one decimal point at the ᵗdᴱᴸ display when programming the SRT-IS-101A. The SRT-IS-101A scales the display accordingly.

Descriptors
GAL, BBL, MCF, M3
Descriptors that can be selected on the SRT-IS-101A are for display purposes only. Make sure the descriptor matches the desired volume units of display when you are programming the unit. To display other volume units, us the "blank" option.

Rate
/MIN, /HR, /DAY
When a particular rate of display is selected, the display automatically calculates the rate depending on the selection. Volume per minute (/MIN), volume per hour (/HR) or volume per day (/DAY).

WARRANTY

This product (excluding batteries) is warranted against defects in materials and workmanship for a period of one (1) year 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.

Ordering Information

Part Number	Description
SRT-IS-101A	Rate and Total indicator with 20 point linearization, NEMA4X enclosure with hub fitting, intrinically safe

VERSION A & B

THE CAPACITANCE AND INDUCTANCE OF THE CABLES MUST BE RESTRICTED TO THE FOLLOWING VALUES

GROUP	C (MICRO F)	L (MICRO H)
A, B	0.03	0.47
C, D	0.33	7.41
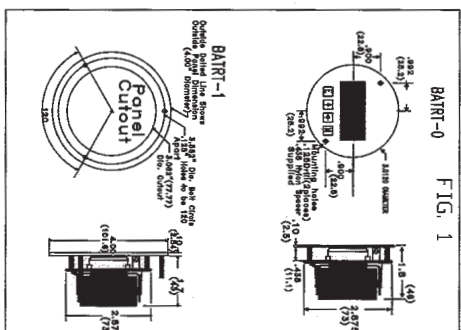
FOR OTHER CABLING AND BARRIER SELECTION USE THE FOLLOWING INFORMATION

TERMINALS 6 & 12, 7 & 8
Vmax = 28.5
Imax = 150mA
Ci = 0.3µF
Li = 0.0mH

TERMINALS 5 & 6, 4 & 6
Voc = 28.5
Isc = 0.5mA
Li = 0.0mH
Ci = 0.0µF

TERMINALS 1 & 2
Voc = 28.5
Isc = 1.8mA
Ca = 78nF
La = 5H

TERMINALS 1 & 2 ARE NOT INTENDED TO BE USED SIMULTANEOUSLY WITH TERMINALS 5 & 6

OLYMPIC CABLE PART No. 28861T (OR EQUAL.)

OLYMPIC CABLE PART No. 28861T (OR EQUAL.)

HAZARDOUS LOCATION (CLASSIFIED) CLASS I, DIV 1 GROUP A, B, C, & D

NON-HAZARDOUS LOCATION

SAFETY BARRIER MTL MODEL 787S+

SAFETY BARRIER FOR EXAMPLE MTL MODEL 787S+

CONDITIONS		MAX. LOOP RESISTANCE 250 OHM
GROUP	A, B	
	C, D	
BOTH OUTPUTS CAN BE USED SIMULTANEOUSLY	3900 FEET	
ONLY ONE OUTPUT CAN BE USED	600 FEET	

12 TO 24 VDC MAX. LOOP RESISTANCE 250 OHM

CONTROL EQUIPMENT RTU /PLC

0.1 A @ 0.7 VOLT DROP PULSE WIDTH IS SOFTWARE ADJUSTABLE 68.5 TO 800 mSEC

OPTO-ISOLATED PULSE INPUT

+28.5 VDC MAX

GND

RESET SWITCH

0.5 FEET TO MAX. 100 FEET

CABLE IS INTRINSICALLY SAFE CONNECTOR, REMOTE CABLE WITH 90 DEG STRAIGHT AMPHENOL. REMOTE CABLE CONNECTOR

MAGNETIC PICKUP

OPTIONAL AMPHENOL CONNECTOR STRAIGHT 90 DEG OR STRAIGHT TO FLOWMETER PICKUP

TYPICAL FLOWMETER (NOT PART OF THE U.L.) LISTED SYSTEM)

NOTES ON BARRIERS

1. MAY BE IN DIVISION 2 LOCATION IF SO APPROVED
2. THE OUTPUT CURRENT MUST BE LIMITED BY A RESISTOR SUCH THAT THE OPEN-CIRCUIT VOLTAGE-CURRENT PLOT IS A STRAIGHT LINE DRAWN BETWEEN THE OPEN CIRCUIT VOLTAGE AND SHORT CIRCUIT CURRENT.
3. CABLE CAPACITANCE PLUS INTRINSICALLY SAFE EQUIPMENT CAPACITANCE MUST BE LESS THAN THE MARKED CAPACITANCE (Co) SHOWN ON ANY BARRIER USED. THE SAME APPLIES FOR INDUCTANCE.
4. CAPACITANCE AND INDUCTANCE OF FIELD WIRING FROM THE INTRINSICALLY SAFE EQUIPMENT TO THE BARRIER SHOULD BE CALCULATED AS Cc = 83pF/ft AND Lc = 0.2 MICRO H/ft AND SHALL BE INCLUDED IN THE SYSTEM CALCULATIONS.
5. SELECTED BARRIERS MUST BE THIRD PARTY APPROVED AS INTRINSICALLY SAFE FOR THE APPLICATION AND HAVE Voc OR Vt NOT EXCEEDING Vmax AND Isc OR It NOT EQUAL TO THE Pmax OF THE BARRIER MUST BE LESS THAN OR EQUAL TO THE Pmax OF THE INTRINSICALLY SAFE EQUIPMENT. IF Pmax IS NOT KNOWN, IT MAY BE CALCULATED USING THE FORMULA (Voc x Isc)/4 = Pmax BARRIERS MUST BE INSTALLED IN ACCORDANCE WITH BARRIER MANUFACTURER'S CONTROL DRAWING AND ARTICLE 504 OF THE NATIONAL ELECTRIC CODE ANSI/NFPA 70 OR SECTION 18 OF THE CANADIAN ELECTRICAL CODE

NOTES ON CONTROL EQUIPMENT

1. CONTROL EQUIPMENT MUST NOT USE OR GENERATE MORE THAN 250V WITH RESPECT TO EARTH.

TABLE 1:

BARRIER		IS EQUIPMENT
Voc	<	Vmax
Isc	<	Imax
Pmax	<	Pmax
Co	>	Ci + Cc
Lo	>	Li + Lc

1. THE BATRI-0 AND BATRI-1 ARE OPEN DEVICES INTENDED TO BE MOUNTED IN AN ENCLOSURE. SEE FIG 1 FOR DIMENSIONS
2. THE ENVIRONMENTAL RATING OF THE ENCLOSURE MUST BE SUITABLE FOR THE APPLICATION.
3. THE ENCLOSURE MUST BE SEPARABLE OF ALL CIRCUITS MUST COMPLY WITH ARTICLE 504.
4. WHEN APPLICABLE THE ENCLOSURE MUST BE GROUNDED IN ACCORDANCE WITH ARTICLE 504.50 OF THE NEC.
5. WHEN APPLICABLE THE SECTION 18, AND APPENDICES B AND F OF THE CEC, CANADIAN ELECTRICAL CODE C22.1-02, MUST BE FOLLOWED. PARTICULAR ATTENTION SHOULD BE GIVEN TO WIRE SEPARATION AND GROUNDING REQUIREMENTS.

BATRI-0   FIG. 1

BATRI-1

Panel Cutout