

FLOW  
TRANSMITTERS

  
AW COMPANY

ELECTRONICS FOR  
INSTRUMENTATION

# RT-Ex10 FLOW MONITOR

Users Manual



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## Introduction / Features / Options

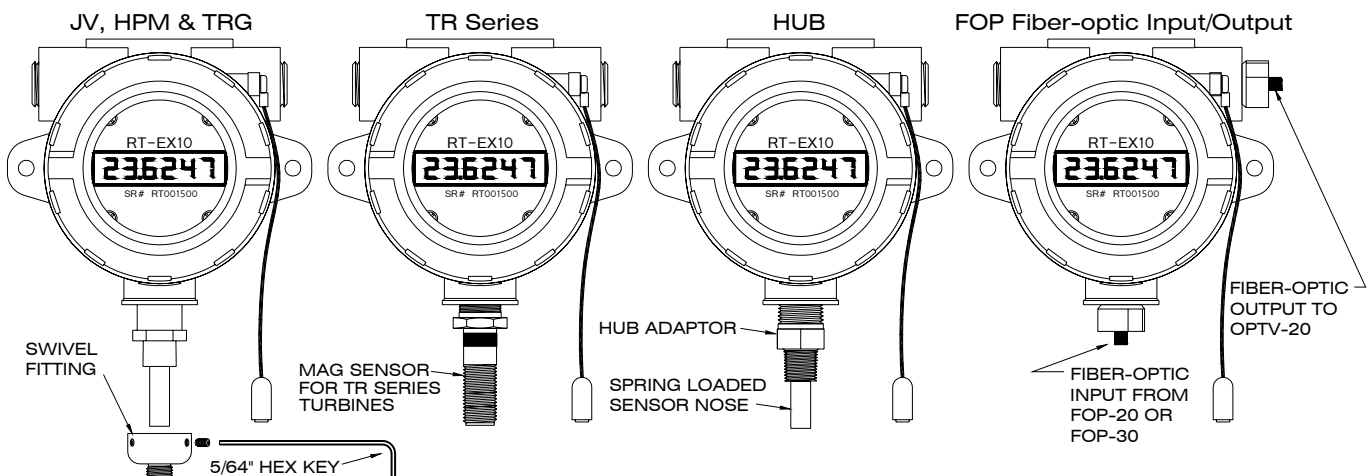
The RT-Ex10 is a meter-mounted battery powered digital flow monitor. A large, six segment LCD display provides easy to read indication of flow rate and totals in any engineering unit. Programming, display mode selection, or totalizer reset is accomplished using an attached magnet without opening the enclosure or using the pushbuttons on the faceplate with cover off.

Options include a loop-powered 4-20 mA rate output, fiber-optic input, and a scaled fiber-optic frequency output. A variety of sensor options are available to make the RT-Ex10 compatible with most AW Company flowmeters.

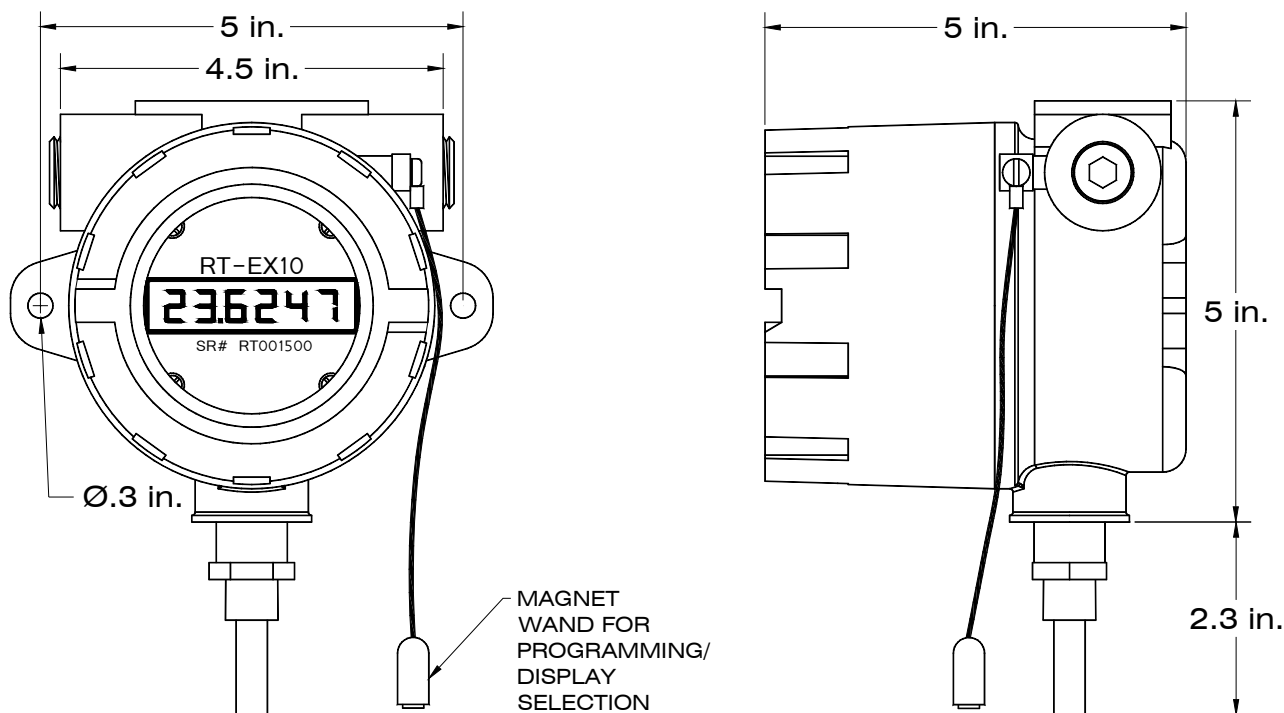
### Ordering Information:

Part #	Std Sensor	Fiber Optic Input	Hub Sensor	TR Sensor	Battery Power	4-20mA Loop Powered Output	Fiber Optic Output
RT-EX10A	X				X		
RT-EX10C	X				X	X	
RT-EX10H	X				X		X
RT-EX10D		X			X		
RT-EX10F		X			X	X	
RT-EX10L		X			X		X
RT-EX10J			X		X		
RT-EX10N			X		X	X	
RT-EX10P			X		X		X
RT-EX10R				X	X		
RT-EX10T				X	X	X	
RT-EX10U				X	X		X

### Standard Configurations:



## RT-Ex10 Dimensions



## Specifications

### **Flowmeter Compatibility:**

Positive Displacement: JV & HPM Series\*  
 \*(except JV-01, JV-10, & JV-12)  
 Turbine: TR, TRG & TA Series  
 (Linear flow range may vary)

### **Power:**

Internal 3.6V "C" Cell Battery – field replaceable  
 Four Year Battery – estimated average life  
 depending on RT-Ex10 model.

### **Sensor/Monitor Frequency Range:**

0-3,000 Hz

### **Fiber-Optic Frequency Output (Option):**

0-100 Hz Programmable Scaling

### **Temperature Ratings:**

-20 to 70°C (-4 to 158°F) Ambient  
 80°C (175°F) Max. Fluid Temp.

### **2-Wire Loop Powered 4-20 mA Output (Option):**

Loop power: 12-24 Vdc  $\pm$ 10%,  
 Max. load: 250 Ohm @ 12V, 500 Ohm @ 24V

### **Enclosure Certifications:**

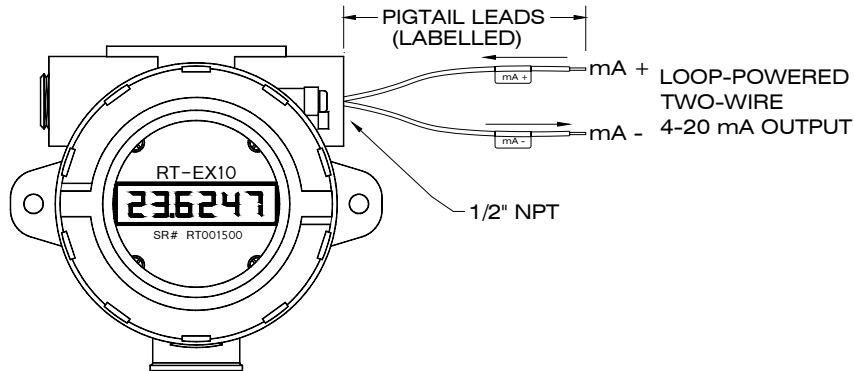
Class I, Groups B, C, D  
 Class II, Groups E, F, G  
 Class III  
 Atex: EExd IIC, IP68  
 NEMA 4X,  
 FM Class No. 3615  
 CSA Class 1, Div. 1 Certification Pending

## Customer Connections

### Loop-Powered Analog Output (loop-powered analog output models only)

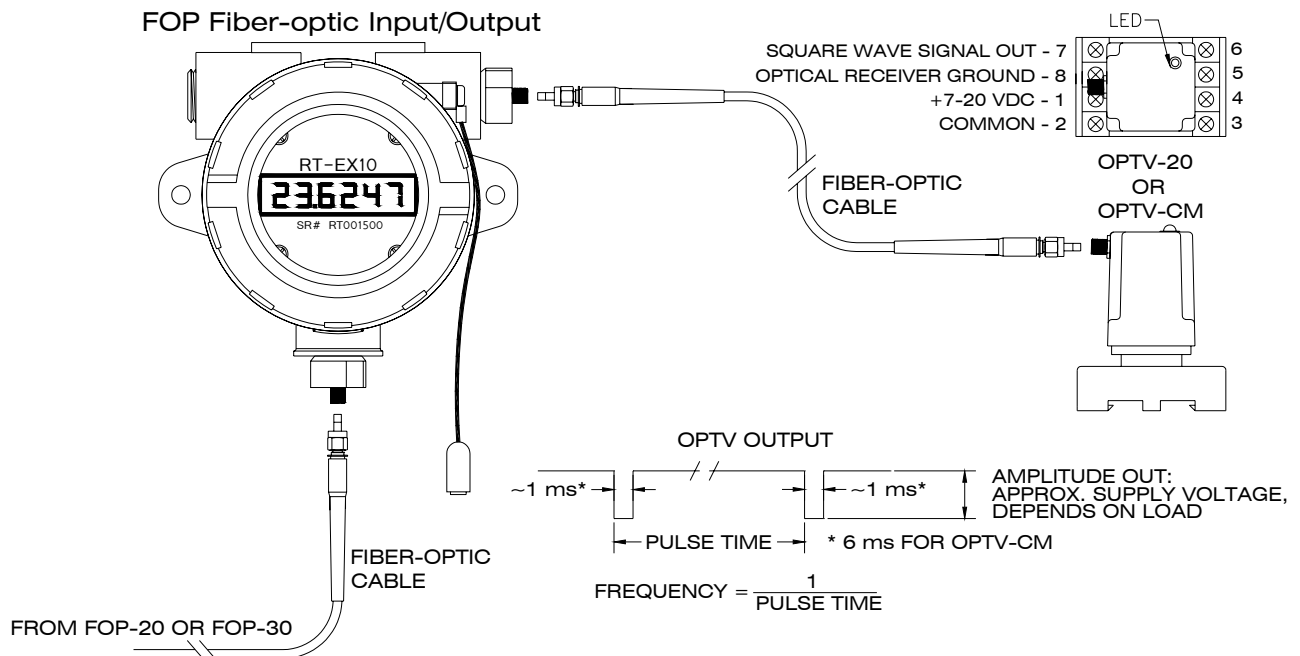
A two-wire loop powered 4-20 mA output option is offered for the RT-Ex10. The analog Rate output has 16-bit resolution. Supply voltage can be between 12 and 24Vdc with maximum loads from 250Ω at 12Vdc to 500Ω at 24Vdc. The RT-Ex10 utilizes the output device AD421 manufactured by Analog Devices. The minimum output is trimmed to 4.00mA by the device manufacturer. Consult the manufacturer's data sheet for AD421 for complete specifications regarding offset tolerance. The scaling value for the mA output is programmed from the Rate display screen. See ANALOG Scaling on page 11 for instructions on scaling of the analog output.

Wiring for the loop powered output option is via pig-tail leads with a 3/4" NPT wire exit for conduit connection. Connection to conduit is required to maintain the enclosures explosion-proof rating and must be made in accordance with all local and national electrical codes. **MAKE CERTAIN CIRCUITS ARE NOT LIVE WHILE WIRING RT-Ex10 IN HAZARDOUS AREA.** Keep cover tightly closed while circuits are alive.



### Fiber-Optic Systems (Fiber-optic input/output models only)

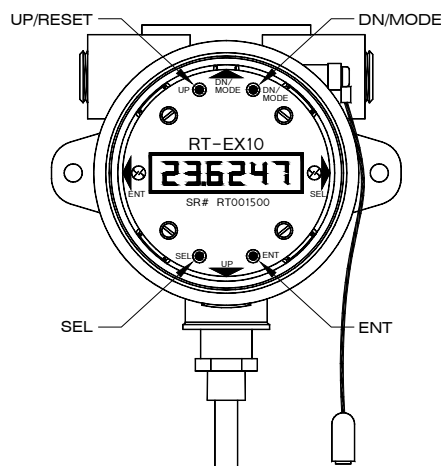
Fiber optic input models accept optical signals from AW Company FOP-20 or FOP-30 fiber optic transmitters using AW Company fiber optic cable. Fiber-optic output models will transmit a scaleable 0-100 Hz signal via fiber-optic cable to the AW Company OPTV-20 or OPTV-CM fiber optic receiver.



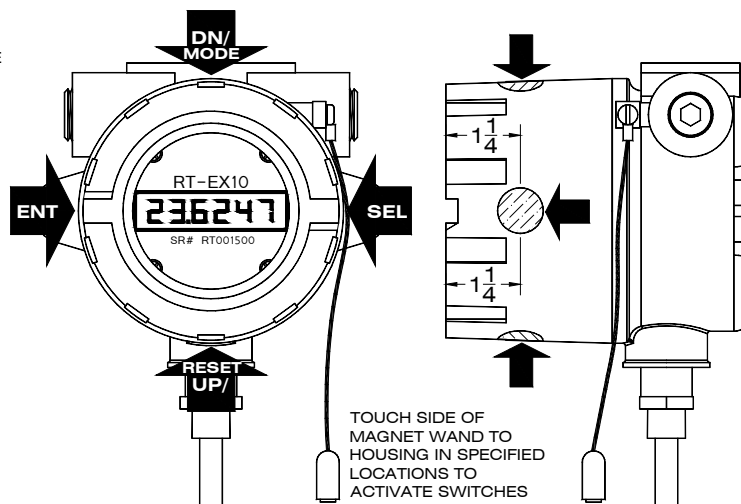
## RT-Ex10 Operation

Display mode changes, reset of total and programming functions are accomplished using the buttons located on the face plate when the cover is off or external to the cover using the magnetic switches. The magnetic switches are located at the 3, 6, 9 and 12 o'clock positions on the side of the housing. The function of each position is indicated on the faceplate of the RT-Ex10. Touching the side of the magnet wand to the appropriate location will activate the magnetic switches.

### BUTTON LOCATIONS



### MAGNETIC SWITCH LOCATIONS



## RT-EX10 Display Modes

The RT-Ex10 has three main display modes:

RATE

TOTAL

CLOCK

The Display Mode is changed by using the DN/MODE button when cover is open or externally by use of the magnetic switch. Two additional displays, SLEEP and LO BATTERY are automatically generated by the RT-Ex10 as described below.

### **SLEEP MODE**

In order to conserve the battery, the RT-Ex10 will revert to "Sleep" mode after a specific period of inactivity where no pulses are received or switches activated. This "sleep time" period is programmed by the user. See page 13 for information on programming the sleep timer.



### **LOW BATTERY**

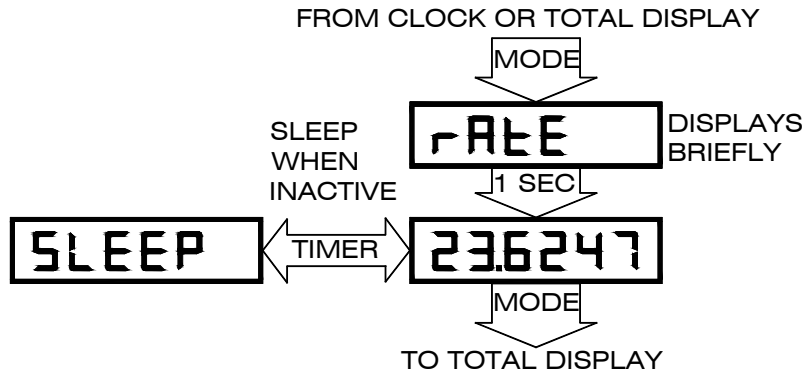
The RT-Ex10 has an ON-time battery timer with a factory specified limit of 700 to 1400 days depending on options. After the battery time limit is exceeded "Lo Bat" will appear briefly whenever the display mode is changed to indicate that the battery should be changed. This indication will continue until the battery is changed and the battery timer is reset. See page 14 for information on changing the battery and resetting the battery timer.

**Lo bat**

DISPLAYS BRIEFLY ON MODE CHANGES  
AFTER BATTERY TIMER IS EXCEED

## RATE Display Mode

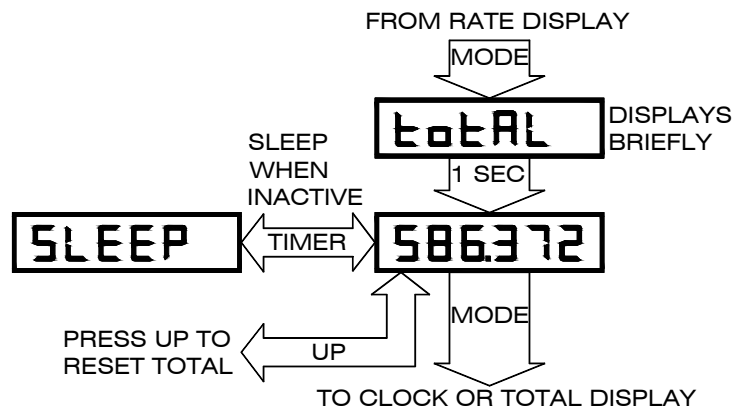
The Rate can be viewed using the DN/MODE button when cover is open or externally by use of the magnetic switch. As the MODE is changed, “rate” will display briefly. The rate will initially be displayed with 5 decimal places. The decimal point will “float” to the right as required as the rate increases. Rate is displayed based on the number of pulses counted during a prescribed “gate time” period. The “gate time” is user programmable. Increasing the gate time interval produces a filtering or averaging effect useful for stable display of uneven or intermittent flows. The Rate display will revert to “Sleep” mode after the programmed period of inactivity where no pulses are received or switches activated.



## TOTAL Display Modes

### TOTAL DISPLAY

The Job Total can be viewed using the DN/MODE button when cover is open or externally by use of the magnetic switch. As the MODE is changed, “total” will display briefly. The total will initially be displayed with 5 decimal places. The decimal point will “float” to the right as required as the total increases. The Job Total rolls over to zero when the value reaches 999999. The Total display will revert to “Sleep” mode after the programmed period of inactivity where no pulses are received or switches activated.

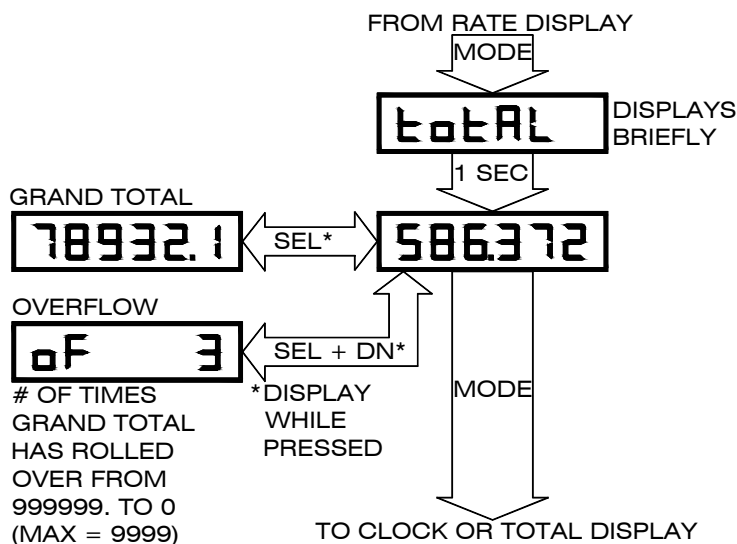


**TOTAL RESET** – The Job Total can be reset while it is displayed by using the UP/RESET button when cover is open or externally by use of the magnetic switch.

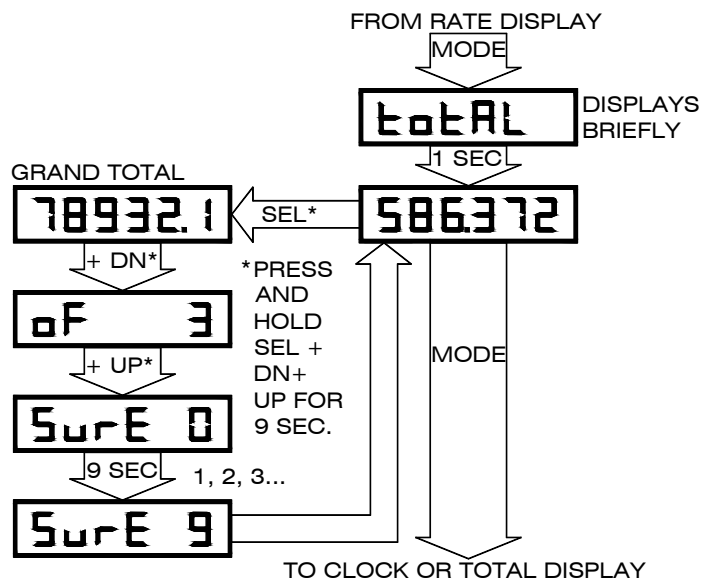
**NOTE:** Total values are maintained in memory by battery power. These total values are backed-up in non-volatile memory every 24 hours when the clock reaches 12:00 A.M. The total value accumulated since midnight will be lost if the battery is removed or changed.

## GRAND TOTAL DISPLAY

The Grand Total is a second totalizer with protection from accidental reset and an overflow counter for a larger capacity. The Grand Total can be viewed while the Job Total is displayed by pressing and holding the SEL button when cover is open or externally by use of the magnetic switch. The Grand Total will only display as long as the button is held or the magnetic switch is activated. The Grand Total rolls over to zero when the value reaches 999999. An overflow counter keeps track of the number of times that the Grand Total has rolled over. The overflow counter can only be viewed with the cover off by pressing and holding the SEL and DN buttons.



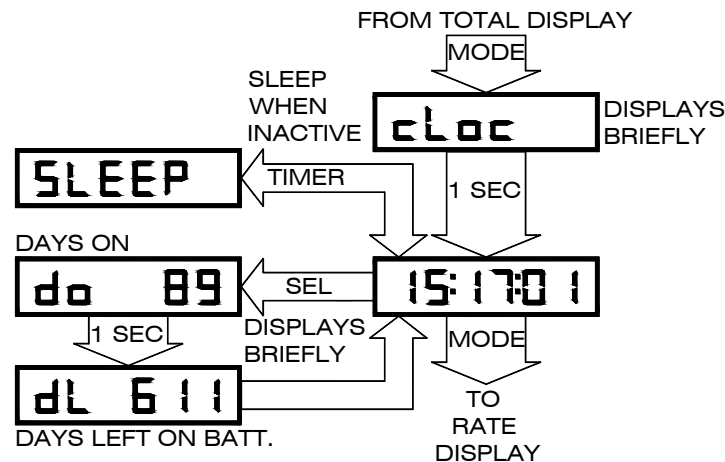
**GRAND TOTAL RESET** – To secure against unintentional loss of the Grand Total value, three keys must be held simultaneously for 9 seconds in order to reset the Grand Total and overflow value. This can only be accomplished with the cover off. While viewing the Total display, press and hold the SEL and DN and UP buttons for a full 9 seconds. The display will prompt to make certain the user is SURE and indicate the count-down to reset.





## Clock Display Mode

A real-time clock with a 24-hour display format can be viewed using the DN/MODE button when cover is open or externally by use of the magnetic switch. As the MODE is changed, “cloc” will display briefly. The real-time clock is used by the RT-Ex10 for the Sleep Timer to conserve battery energy and the Battery Timer for battery life indication. The number of days of battery use and the remaining days on the battery timer are viewed using the SEL button or magnetic switch. The Clock display will revert to “Sleep” mode after the programmed period of inactivity where no pulses are received or switches activated.



## Programming the RT-Ex10

**The RT-Ex10 can be programmed in the hazardous area with the cover on using magnetic switches or outside the hazardous area with the cover removed using programming buttons. IF THE COVER IS REMOVED FOR PROGRAMMING THIS MUST BE DONE OUTSIDE THE HAZARDOUS AREA!!!**

To scale the rate and total displays and the optional analog output, the RT-Ex10 will require programming of the K-factor, Rate time-base, Gate Time, and Analog Output or Fiber-optic Output Scaling (if applicable). The RT-Ex10's three main display modes are also used to access programming as follows:

### RATE display

Time-base for Rate  
Gate Time  
Analog Scaling\*  
Frequency Scaling\*\*

### TOTAL display

K-factor (pulses/E-unit)

### CLOCK display

Set Time  
Sleep Timer

\*Loop power option only.    \*\*Fiber-optic output option only.

Since the Rate Scaling and optional Analog Scaling variables are based on the K-factor it is recommended to start by programming the K-factor in the Total Display Mode.

## Total Mode Programming

### **K-Factor in Pulses per Engineering Unit**

The Total Display Mode is used to enter the scaling factor to display both the Rate and Total in a desired engineering unit such as gallons, ounces, liters or cc's. The K-factor is the number of impulses per engineering unit established by the transducer manufacturer or by a calibration test. An average K-factor is provided for several basic engineering units with each meter on the flowmeter calibration sheets.

Initial default K-factor is 1.00000 (Default displays are total in pulses and rate in Hz.)

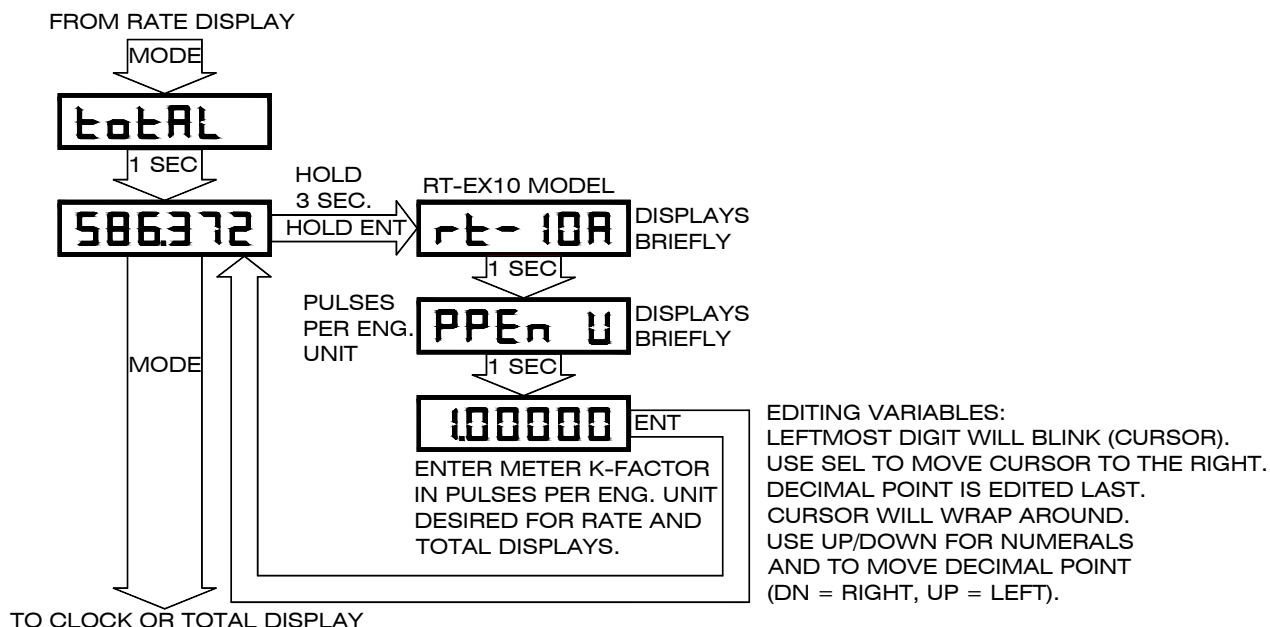
Enter the average K-factor in pulses per desired unit of display directly as it is given on the calibration sheet up to six digits with a decimal point. The K-factor can be entered with either leading or trailing zeroes.

To view the Total Display Mode, use the DN/MODE button or magnetic switch. Press and hold ENT button or activate and maintain the ENT magnetic switch for 3 seconds until the display briefly indicates the RT-Ex10<sub>x</sub> model number.

**rt-10A** DISPLAYS BRIEFLY

The display will then briefly indicate "PPEn U" (pulses per eng. unit) followed by current K-factor program value.

When editing the K-factor, the leftmost digit will blink (cursor). Use SEL to move the cursor to the right. The cursor will wrap around. Use UP/DN to increment or decrement numerals. The decimal point is edited last. Use DN to move the decimal point to the right, UP to move it to the left. When the desired value is displayed, use ENT to store the value and exit K-factor programming.



## RATE Mode Programming

The Rate parameters are programmed from the RATE display screen. To view the RATE Display Mode use the DN/MODE button or magnetic switch.

### TIME BASE for rate

Press and hold ENT button or activate and maintain the ENT magnetic switch for 3 seconds until the display indicates **T-base** briefly followed by the current programmed time-base. The default is 1 SEC.

Use SEL to select whether the rate is displayed in Engineering units per:

1 SEC          60 SEC          1 HOUR          1 DAY

When desired Time Base is displayed use ENT to record selection. The display will briefly show G-TIME followed by the current programmed Gate Time value.

### GATE TIME

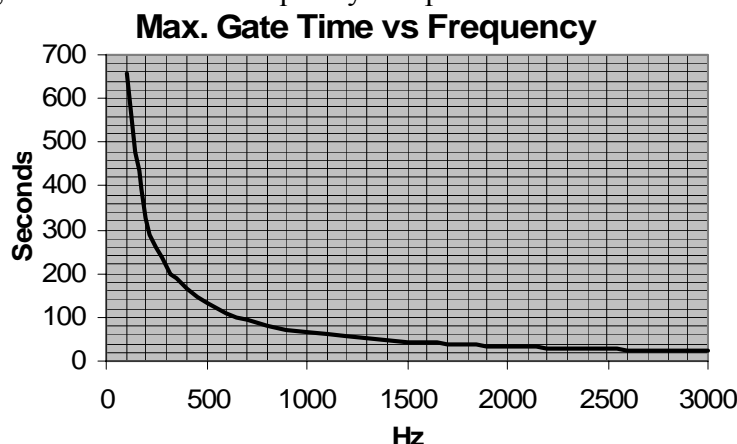
This variable sets the sample time on the incoming frequency for the RATE display and analog output. The Rate display and analog output is based on the number of pulses counted during a prescribed “gate time” period and is updated at the programmed “gate time” interval. Increasing the gate time interval produces a filtering or averaging effect useful for stable display and output of uneven or intermittent flows. Gate Time is always programmed in seconds and the minimum Gate Time is 1 second. The default value is 3 seconds. The maximum allowable Gate time is dependant upon the expected maximum input frequency and is determined by the formula:

$$\text{Maximum gate time (seconds)} = 65,535 \text{ counts/Maximum frequency in Hz}$$

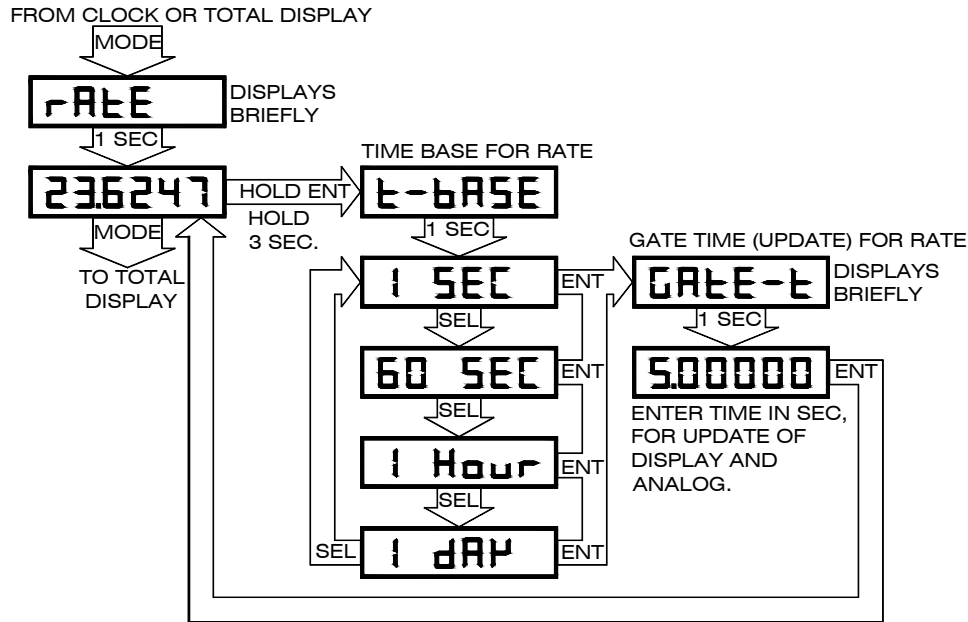
To calculate the maximum frequency, use the formula:

$$\text{Maximum flowrate (Eng. Unit/sec)} \times \text{K-factor (pulses/Eng. Unit)} = \text{Frequency in Hz}$$

The maximum gate time value vs. frequency is represented in the following graph.



When editing the Gate Time variable the leftmost digit will blink (cursor). Use SEL to move the cursor to the right. The cursor will wrap around. Use UP or DN to increment or decrement numerals. The decimal point is edited last. Use DN to move the decimal point to the right, UP to move it to the left. When the desired value is displayed, use ENT to store the value and exit or advance to the next variable.



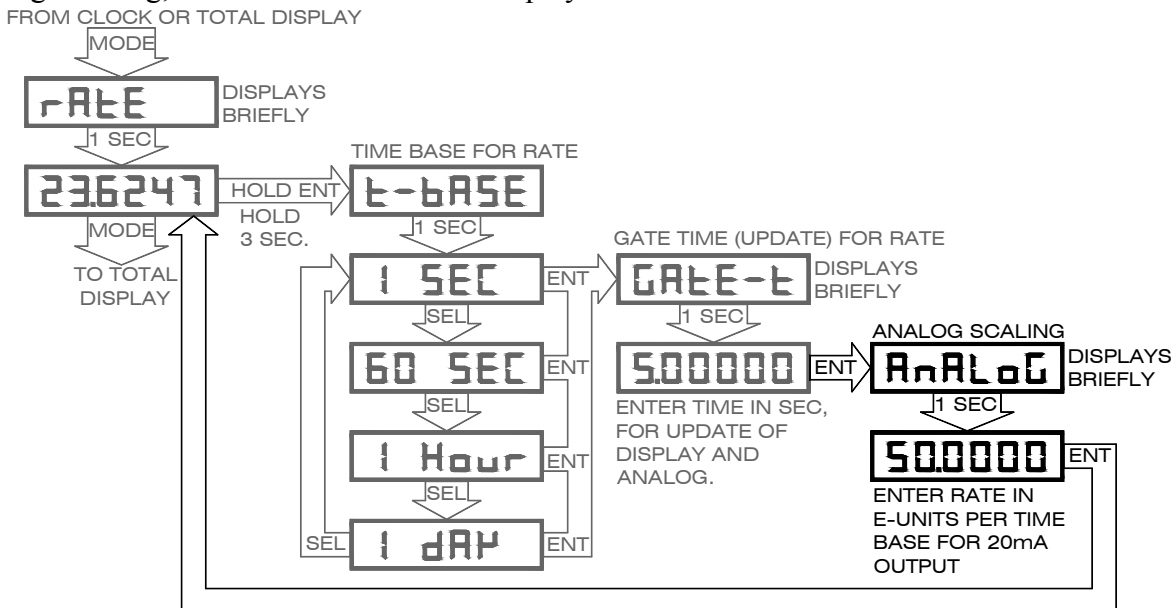
**ANALOG SCALING (Option – will not display if model does not include analog output)**

The display will briefly show ANALOG followed by the current programmed Analog Scaling value. This scaling variable is used to set the maximum output of 20 mA to a corresponding rate value. This produces an output ranging from 4 mA for a zero value to 20 mA for the programmed flow rate. The default initial value is 50.000 (Hz by default K-factor). The variable is entered directly in the engineering units dictated by the K-factor and Rate Time Base.

Example:

- K-factor entered in pulses per gallon
- Time base programmed for 60 Sec
- Enter 20.000 for 20mA = 20 GPM

When editing the Analog Scaling variable the leftmost digit will blink (cursor). Use SEL to move the cursor to the right. The cursor will wrap around. Use UP/DN to increment or decrement numerals. The decimal point is edited last. Use DN to move the decimal point to the right, UP to move it to the left. When the desired value is displayed, use ENT to store the value, exit programming, and return to the RATE display.



## FREQUENCY SCALING (Option – will not display if model does not include fiber-optic frequency output)

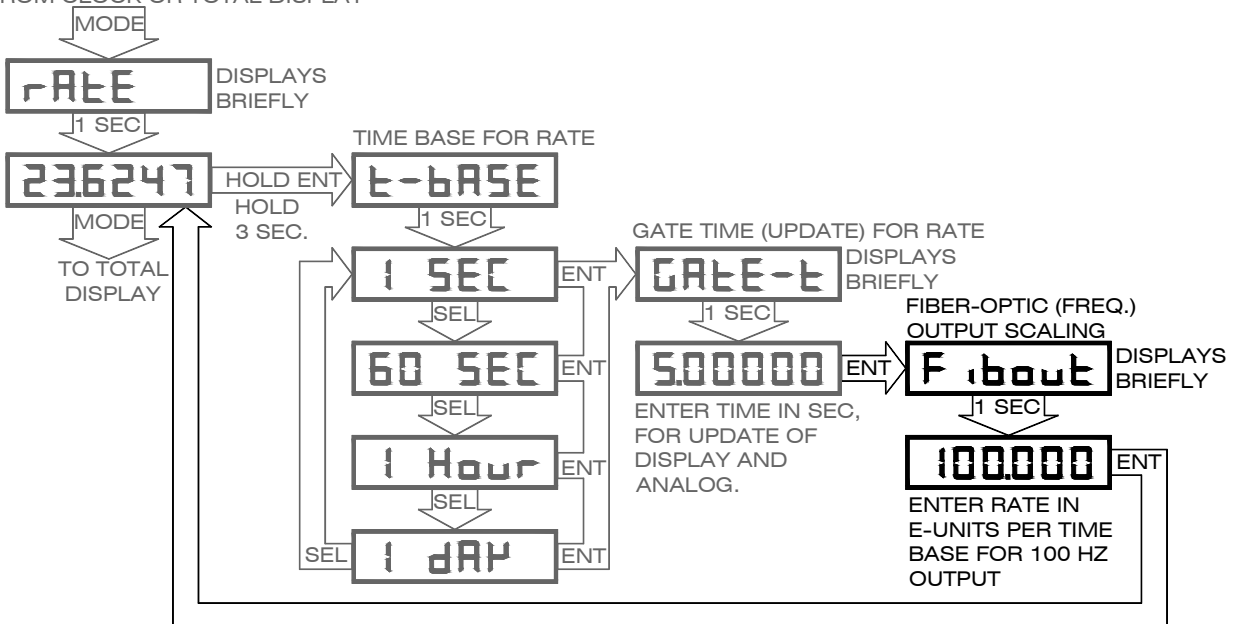
The display will briefly show “Fibout” followed by the current programmed Frequency Scaling value. This scaling variable is used to set the maximum output of 100 Hz to a corresponding rate value. This produces an output ranging from 0 Hz for a zero value to 100 Hz for the programmed flow rate. The default initial value is 100.000 (Hz by default K-factor). The variable is entered directly in the engineering units dictated by the K-factor and Rate Time Base.

Example:

K-factor entered in pulses per gallon  
 Time base programmed for 60 Sec  
 Enter 20.000 for 100Hz = 20 GPM

When editing the Frequency Scaling variable the leftmost digit will blink (cursor). Use SEL to move the cursor to the right. The cursor will wrap around. Use UP or DN to increment or decrement numerals. The decimal point is edited last. Use DN to move the decimal point to the right, UP to move it to the left. When the desired value is displayed, use ENT to store the value, exit programming, and return to the RATE display.

FROM CLOCK OR TOTAL DISPLAY



## Clock Mode Programming

The Clock Display Mode is used to set the time on the real-time clock (if necessary), and to program the “Sleep Time”. The Sleep Time determines the length of the period of inactivity (no pulses received or switches activated) before the RT-Ex10 “sleeps” to conserve energy.

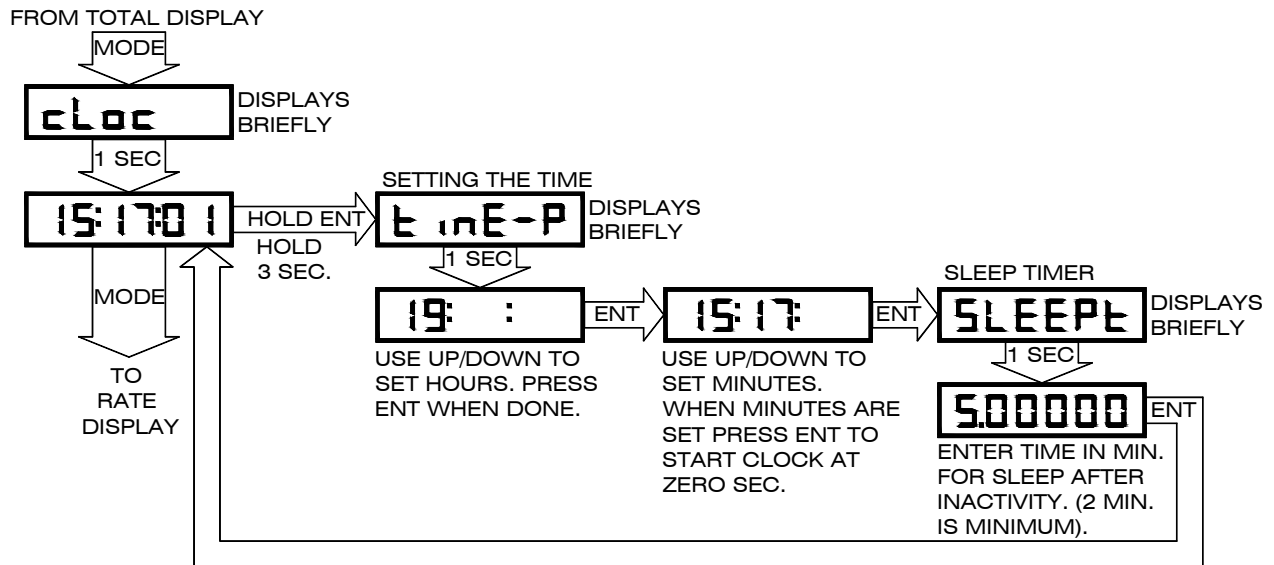
### SETTING THE TIME

To view the Clock Display Mode use the DN/MODE button or magnetic switch. Press and hold ENT button or activate and maintain the ENT magnetic switch for 3 seconds until the display briefly indicates “tinE-P” (time programming) followed by the current hour (HH: : ) which will blink. Use UP/DN to set the hours and then ENT to continue.

The current minutes (HH:MM: ) will become visible and blink. Use UP/DN to set the minutes and then ENT to continue. NOTE: The seconds will begin at zero at the instant ENT is pressed/activated.

### SLEEP TIMER

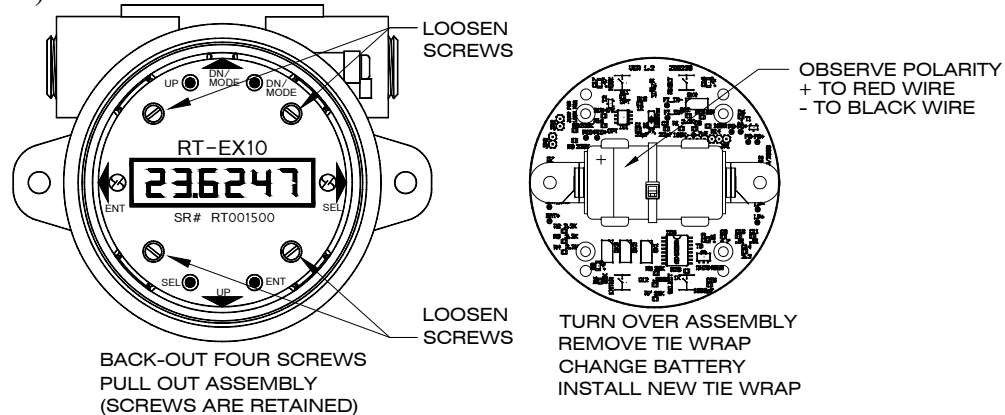
The display will briefly indicate “SLEEpt” (Sleep Time) followed by the currently programmed Sleep Time value. The Sleep Time is programmed in minutes and the default value is 5 minutes. The minimum value allowed is 2 minutes and the maximum 254 minutes. An entered value less than 2 or greater than 254 will revert to the min. or max. value. When editing Sleep Time the leftmost digit will blink (cursor). Use SEL to move the cursor to the right. The cursor will wrap around. Use UP or DN to increment or decrement numerals. The decimal point is edited last. Use DN to move the decimal point to the right, UP to move it to the left. When the desired value is displayed, use ENT to store the value and exit Clock programming.



## Changing the Battery

Changing the battery requires removing the cover of the enclosure. REMOVING THE COVER TO CHANGE THE BATTERY MUST BE DONE OUTSIDE THE HAZARDOUS AREA OR HAZARDOUS CONDITIONS MUST NOT BE PRESENT AT THE TIME.

When the battery timer has expired, LO BAT will display briefly every time the display mode is changed to indicate that the expected battery life has been reached. The battery is user replaceable. The battery is a 3.6 volt Lithium "C" cell available from AW Company (AW part number MI50000).

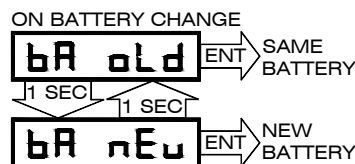


### Battery Replacement

To change the battery, locate the four screws recessed behind the faceplate. Back these screws out (screws are retained and will not come completely out). When these screws are loosened carefully remove the faceplate/circuit board assembly and turn it over. The battery is retained by spring clips in a typical battery holder and secured with a tie-wrap. Cut the tie-wrap and replace the battery making certain to install the new battery in the proper orientation with the positive (+) end to the contact with the red wire and the negative (-) end to the contact with the black wire. Immediately turn the assembly over and follow the procedure for resetting the battery timer. When finished with reset procedure, install new tie-wrap around battery and reinstall assembly into housing.

### Resetting the Battery Timer

As soon as a battery is placed in the holder the RT-Ex10 will alternately display "bA old" (battery old) and "bA neu" (battery new) several times for approximately 1 second each. If the battery has been replaced with a new battery then press ENT while "bA neu" appears to reset the battery timer to zero days. If the same battery was reinstalled then press ENT while "bA old" appears and the battery timer will not be reset. If ENT is not pressed before this procedure exits, the timer will not be reset. To return to reset procedure, briefly remove battery again. NOTE: If the battery timer reset is not performed the RT-Ex10 will continue to display LO BAT briefly whenever the mode is changed.



IF BATT. IS REMOVED/REPLACED DISPLAY WILL BLINK OLD/NEW.  
 PRESS ENT WHILE NEW IS VISIBLE TO RESET BATT. TIMER FOR NEW BATTERY.  
 PRESS ENT WHILE OLD IS VISIBLE IF BATTERY WAS NOT CHANGED.

NOTE: Total values are maintained in memory by battery power. These total values are backed-up in non-volatile memory every 24 hours when the clock reaches 12:00 A.M. The total value accumulated since midnight will be lost if the battery is removed or changed.