▶ **RT-10 Battery Powered Local Flow Transmitter**

Installation, Operating & Maintenance Manual

Table of Contents

Unpacking

Separate the RT-10 Flow Monitor from packaging materials and check for any visual signs of damage. If you determine there are damages caused by shipping, file a claim with the shipping company. If the flow monitor appears to have been improperly assembled or does not operate properly, return it for replacement or repair (see Limited Warranty information at the end of this manual).

CAUTION: Before connecting, programming, or operating the RT-10 Flow Monitor, read this manual.

Quick Start Guide

CAUTION: As with any precision-engineered device, always use the RT-10 in accordance with the manufacturer's instructions.

Installation

Secure appropriate sensor onto RT-10 Flow Monitor. Place flow monitor with sensor into fitting in flow meter.

NOTICE: Before attaching the RT-10 Flow Monitor to the flow meter, note any potential clearance issues.

Power

A lithium battery provides the power to the RT-10. To replace the battery, refer to Changing the Battery on page 21.

Program K-Factor

You must program the K-factor for the RT-10 to operate. Refer to page 15.

Product Description

The battery-powered RT-10 has a large, six-digit LCD display that continuously shows either the flow rate or total in any engineering units. Program rate, total, reset, sleep mode, or time using buttons when the protective blue cover is open, or with a magnet wand when the cover is closed.

The unit's battery lasts as long as four years and is replaceable on-site. A variety of sensor options make the RT-10 flow monitor compatible with most meters available from AW Gear Meters, including the JV and HPM series positive displacement flow meters, and the TW, TRG and THM turbine meters. (Not compatible with the JVHS, JV-01, JV10 or JV-12 flow meters.)

Options include a loop-powered 4-20 mA rate output, fiber-optic input, and a scaled fiber-optic frequency output. (See page 8.)

Features

- Gate time function
- Real-time clock display
- Reverts to sleep mode to conserve battery
- "Sleep" and "Lo Battery" indicators
- 4-20 mA loop power output
- Displays Total and Rate values in engineering units such as cc's, ounces or gallons
- Easy programming using Up, Down and Enter functions
- Automatically updates and stores totals in memory every 24 hours

RT-10 Models

Refer to this chart for ordering different versions of the RT-10 Flow Monitor.

Part#	Standard 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

The illustration below shows standard, TR series, HUB, and fiber optic variations of the RT-10 Flow Monitor.

JV, HPM & TRG

TR Series

SWIVEL FITTING

MAG SENSOR FOR TR SERIES TURBINES

5/64" HEX KEY

HUB

FOP Fiber-optic Input/Output

HUB ADAPTOR

SPRING LOADED SENSOR NOSE

FIBER-OPTIC INPUT FROM FOP-20 OR FOP-30

FIBER-OPTIC OUTPUT TO OPTV-20

Dimensions

5 in.

4.5 in.

RT-EX10

23.6247

SR# RI001500

Ø.3 in.

MAGNET
WAND FOR
PROGRAMMING/
DISPLAY
SELECTION

5 in.

5 in.

2.3 in.
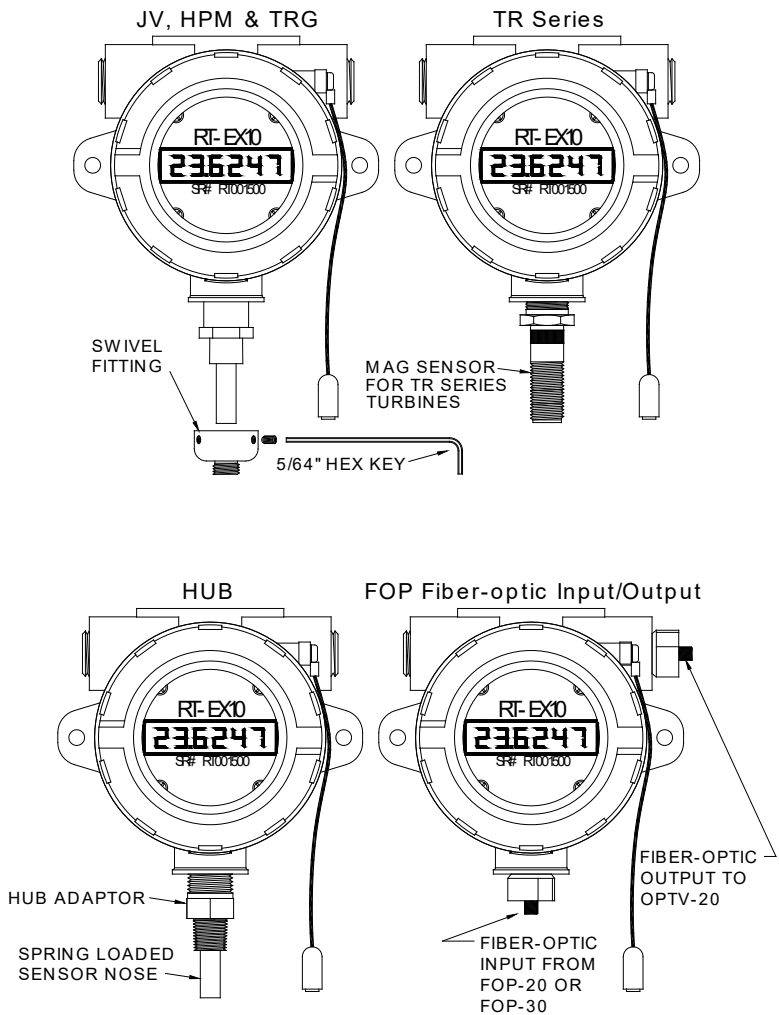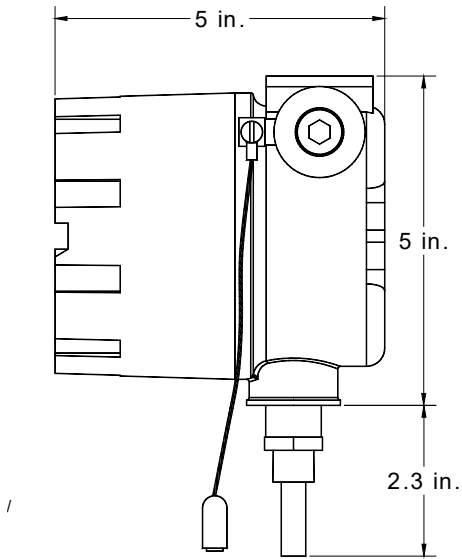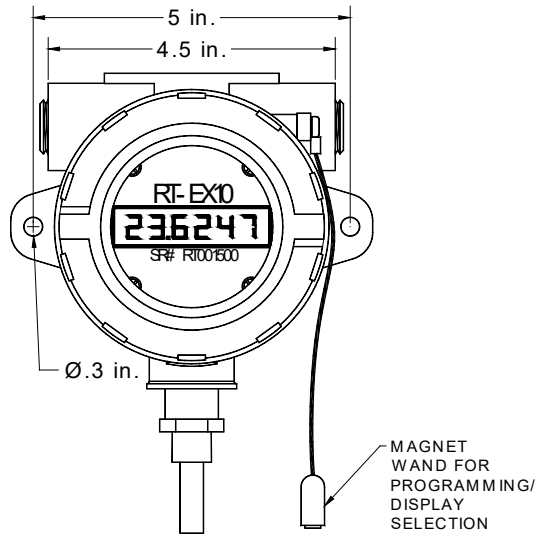
Specifications

- **Flow Meter Compatibility:** positive displacement: JV and HPM series (except JV-01, JV-10, and JV-12); turbine: TR, TRG, and TA Series (linear flow range may vary)
- **Power:** internal 3.6V "C" cell battery, field replaceable; four year battery power estimated average life, depending on RT-10 model
- **Sensor/Monitor Frequency Range:** 0-3,000 Hz
- **Fiber-Optic Frequency Output (Option):** 0-100 Hz programmable scaling
- **Temperature Rating:** -20° to 70°C (-4° to 158°F) ambient; 80°C (175°F) maximum fluid temperature
- **2-Wire Loop Powered 4-20 mA Output (Option):** loop power = 12-24 Vdc ±10%; max. load = 250 Ohm @ 12V, 500 Ohm @ 24V
- **Enclosure Certification:** NEMA 4X

Customer Connections

Two types of connections are available, depending on your need and the model you choose.

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

A two-wire loop powered 4-20 mA output option with an analog Rate output has 16-bit resolution. Supply voltage is between 12 and 24VDC, with maximum loads from 250Ω at 12VDC to 500Ω at 24VDC.

The RT-10 utilizes the AD421 output device manufactured by Analog Devices. The minimum output is trimmed to 4.00mA by the device manufacturer. Consult the manufacturer's data sheet for complete specifications regarding offset tolerance.

Program the scaling value for the mA output from the Rate display screen. (See ANALOG Scaling on page 18 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. See illustration next page.

NOTICE: Connection to conduit is required to maintain the enclosure's hazardous location rating. Make all connections in accordance with local and national electrical codes.

CAUTION: Make certain circuits are not live while wiring the RT-10 in a hazardous area. Keep cover tightly closed while circuits are alive.

Figure 1: Loop-Powered Analog Output
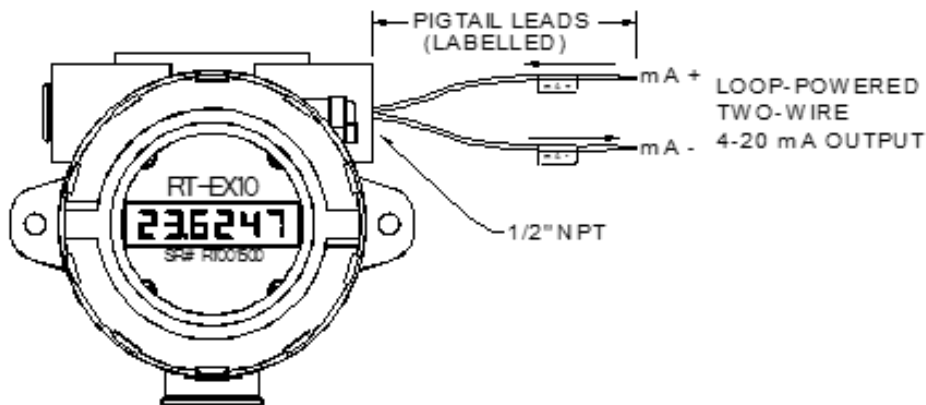
## Fiber-Optic Systems (fiber-optic input/output models only)

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

Figure 2: Fiber-Optic Systems
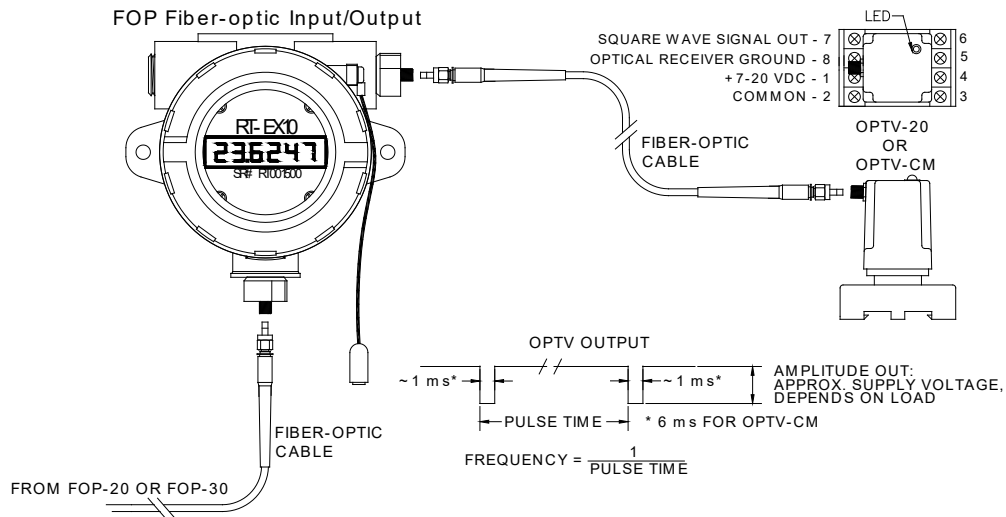
Operation

Use the buttons on the face plate when the cover is off, or the magnet wand when the cover is on, to affect mode and program changes and to reset total.

The magnetic switches are located at the 3, 6, 9 and 12 o'clock positions on the side of the housing. Markers on the faceplate of the device indicate the function of each position. Touch the side of the magnet wand to the appropriate location to activate a magnetic switch.
Display Modes

Figure 2: Button and Magnetic Switch Locations

BUTTON LOCATIONS   MAGNETIC SWITCH LOCATIONS
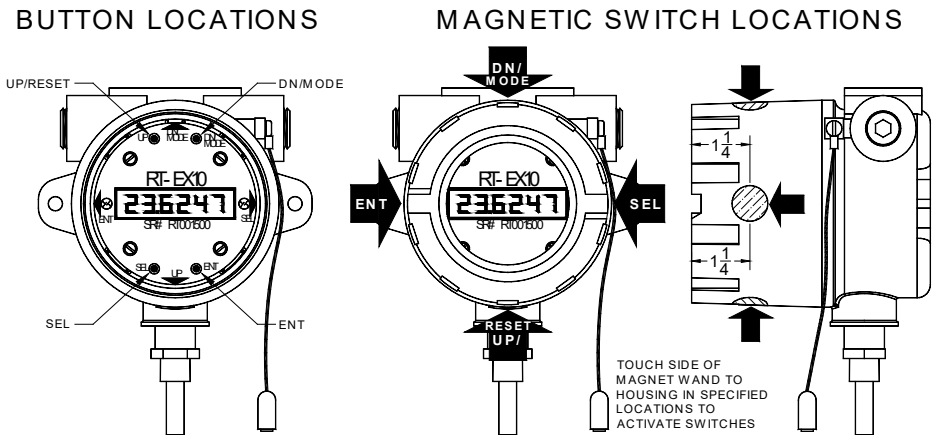
The RT-10 has three main display modes:
- RATE
- TOTAL
- CLOCK

Change the Display Mode by using the DN/MODE button when the cover is open or by using the external magnetic switch.

The RT-10 automatically generates two additional displays: SLEEP and LO BATTERY. See below.

Sleep Mode

In order to conserve the battery, the RT-10 reverts to "sleep" mode after a specific period of inactivity where the device receives no pulses and activates no switches. See page 20 for information on programming the "sleep time" period.

```
┌─────────────┐  ┌──────┐  ┌──────────────┐
│   SLEEP     │◁─┤SLEEP ├─▷│   23.6247    │
└─────────────┘  │TIMER │  └──────────────┘
                 └──────┘
SLEEP WHEN INACTIVE        RATE, TOTAL, OR CLOCK DISPLAY
```

Low Battery

The RT-10 has an ON-time battery timer with a factory-specified limit of 700 to 1400 days, depending on options. After the time limit expires, "Lo Bat" appears briefly on the display whenever you change modes. This means you should change the battery. The device continues to display "Lo Bat" until you change the battery and reset the timer. See page 21 for instructions.

```
┌─────────────┐
│   Lo bAt    │
└─────────────┘
```
DISPLAYS BRIEFLY ON MODE CHANGES
AFTER BATTERY TIMER IS EXCEED

Rate Display Mode

View the Rate using the DN/MODE button when the cover is open, or by using the magnet switch when the cover is closed. As the MODE is changed, "rate" displays briefly. The rate displays initially with five decimal places. The decimal point "floats" to the right as the rate increases. The rate displays based on the number of pulses the RT-10 counts during a "gate time" period.

"Gate time" is programmable. Increasing the gate time interval produces a filtering or averaging effect useful for stable display of uneven or intermittent flows. The Rate display reverts to "sleep" mode after a programmed period of inactivity where the device receives no pulses and activates no switches.

FROM CLOCK OR TOTAL DISPLAY

MODE

rAtE — DISPLAYS BRIEFLY

SLEEP WHEN INACTIVE

1 SEC

SLEEP ⬅ TIMER ⬅ 23.6247

MODE
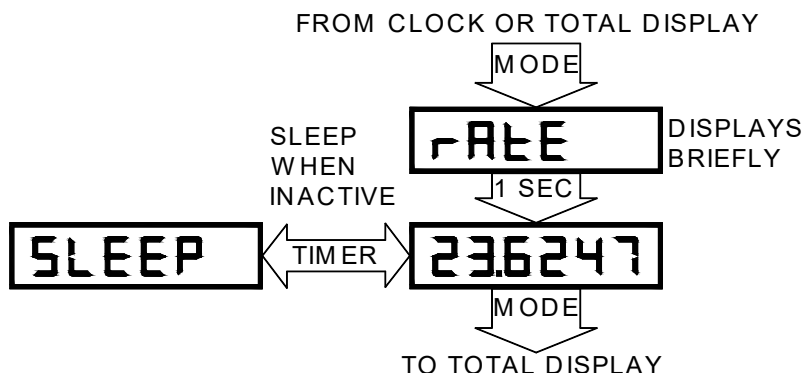
TO TOTAL DISPLAY

Total Display

View the Job Total using the DN/MODE button when cover is open, or externally using the magnet switch. As the MODE changes, "total" displays briefly. The total initially displays with five decimal places. The decimal point "floats" to the right as the total increases. The Job Total rolls over to zero when the value reaches 999999. The RT‑10 reverts to "sleep" mode after a specific period of inactivity where the device receives no pulses and activates no switches.

FROM RATE DISPLAY

MODE

totAL — DISPLAYS BRIEFLY

SLEEP WHEN INACTIVE

1 SEC

SLEEP ⬅ TIMER ⬅ 586.372

MODE

PRESS UP TO RESET TOTAL ⬅ UP

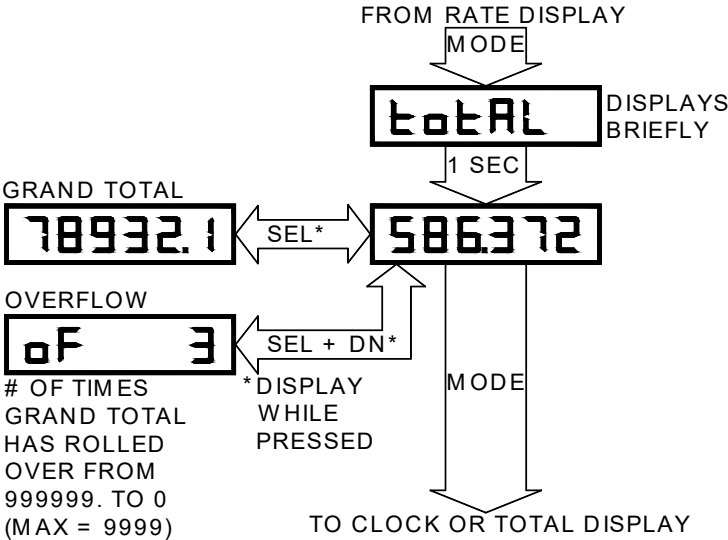TO CLOCK OR TOTAL DISPLAY
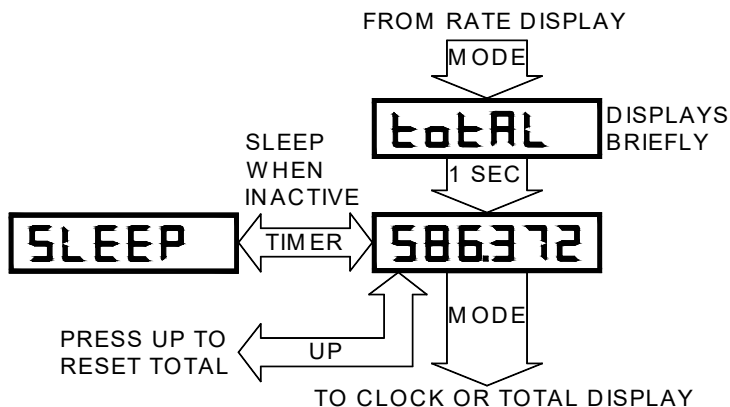
Total Reset

Reset the Job Total while it is displayed by using the UP/RESET button when cover is open, or the magnet wand when cover is closed.

NOTICE: Total values are maintained and backed-up in non-volatile memory every 24 hours. Backup occurs when the clock reaches 12:00 A.M. A total value accumulated since midnight is lost if you remove or change the battery.
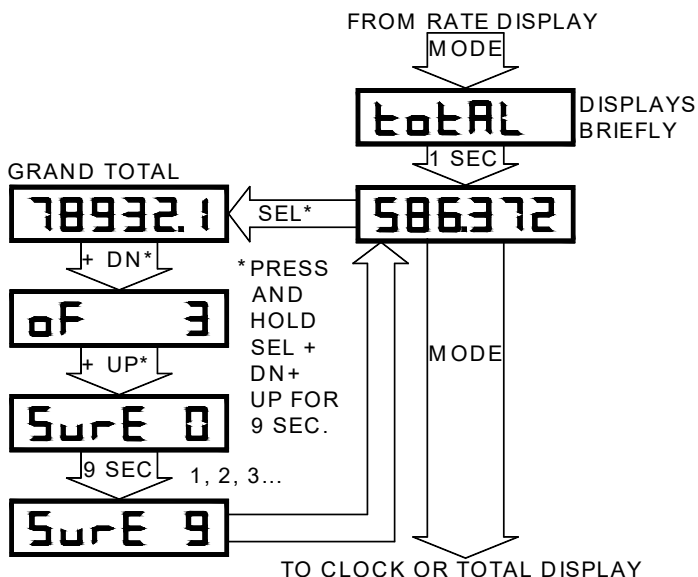
Grand Total Display

The Grand Total is a second totalizer. It has protection from accidental reset and an overflow counter for a larger capacity. Press and hold the SEL button when the cover is open to view the Grand Total while the Job Total is displayed; externally, use the magnetic switch. The Grand Total only displays as long as you hold the button or activate the magnetic switch. The Grand Total rolls over to zero when the value reaches 999999. An overflow counter keeps track of the number of times the Grand Total has rolled over. You can only view the overflow counter with the cover off by pressing and holding the SEL and DN buttons. See flow chart next page.

FROM RATE DISPLAY

MODE

totAL DISPLAYS BRIEFLY

1 SEC

GRAND TOTAL

78932.1 ⟵ SEL* ⟷ **586.372**

OVERFLOW

oF   3 SEL + DN*

OF TIMES GRAND TOTAL HAS ROLLED OVER FROM 999999. TO 0 (MAX = 9999)

*DISPLAY WHILE PRESSED
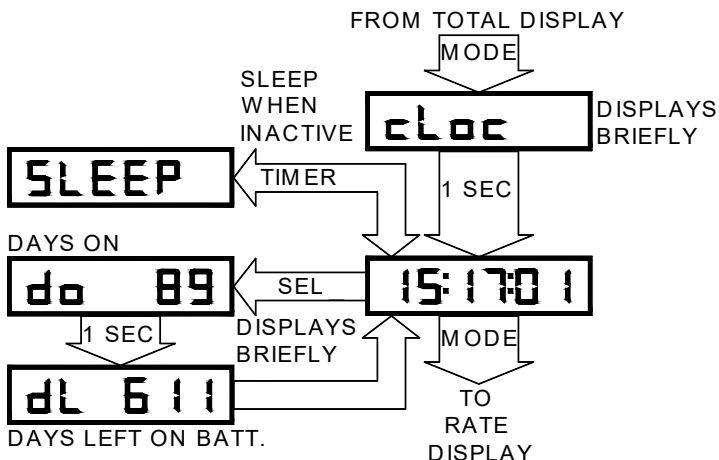
MODE

TO CLOCK OR TOTAL DISPLAY

Grand Total Reset

As security against losing the Grand Total and overflow values, you must hold three keys simultaneously for nine seconds to reset. You can only do this with the cover off. While viewing the Total display, press and hold the SEL and DN and UP buttons for the full nine seconds. The display asks you if you are "SURE" and counts down to reset.

FROM RATE DISPLAY

MODE

totAL DISPLAYS BRIEFLY

1 SEC

GRAND TOTAL

78932.1 ← SEL* ← **586372**

+ DN*

oF   3

+ UP*

SurE 0

9 SEC   1, 2, 3...

SurE 9

*PRESS AND HOLD SEL + DN+ UP FOR 9 SEC.

MODE

TO CLOCK OR TOTAL DISPLAY

Clock Display Mode

The real-time clock has a 24-hour format. View it using the DN/MODE button when cover is open or by externally using the magnetic switch. As the MODE changes, "cloc" displays briefly. The RT-10 uses the real-time clock for the Sleep Timer (to conserve energy) and the Battery Timer (for indicating battery life). Use the SEL button or magnetic switch to view the number of days of battery use and the remaining days on the timer. The Clock display reverts to "sleep" mode after a programmed period of inactivity where the device receives no pulses and activates no switches.

FROM TOTAL DISPLAY

MODE

SLEEP WHEN INACTIVE   **cloc** DISPLAYS BRIEFLY

SLEEP ← TIMER

1 SEC

DAYS ON

do   89 ← SEL ← **15:17:01**

1 SEC   DISPLAYS BRIEFLY

dL 611

DAYS LEFT ON BATT.

MODE

TO RATE DISPLAY

Programming the RT-10

You can program the RT-10 in the hazardous area with the cover on using the magnetic switches, or outside the hazardous area with the cover removed using the programming buttons.

WARNING: If you remove the cover for programming, you must do this outside the hazardous area.

To scale the rate and total displays and the optional analog output, the RT-10 requires programming of the K-factor, Rate time-base, Gate Time, and Analog Output or Fiber-optic Output Scaling (if applicable). Use the RT-10's three main display modes to access programming. With their respective variables, these are:

RATE Display	TOTAL Display	CLOCK Display
Time-base for Rate	K-factor (pulses/engineering unit)	Set Time
Gate Time		Sleep Timer
Analog Scaling (loop power option only)		
Frequency Scaling (fiber optic option only)		

Since the Rate Scaling and optional Analog Scaling variables are based on the K-factor, it is best to start by programming the K-factor.

Total Mode Programming

K-Factor in Pulses per Engineering Unit
You will use the Total Display Mode to enter this scaling factor, which is used to display both Rate and Total in an 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 flow meter 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). You can enter the K-factor with either leading or trailing zeroes.

Use the DN/MODE button or magnetic switch to view the Total Display Mode.
Press and hold the ENT button or activate and maintain the ENT magnetic switch
for three seconds until the display indicates the RT-10x model number.

| r̄Ł- !0�>A | DISPLAYS BRIEFLY |

The display then briefly indicates "PPen U" (pulses per engineering unit) followed
by the K-factor.

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. Edit the decimal point last. Use DN to move the decimal
point to the right, UP to move it to the left. When the desired value displays, use
ENT to store it and exit K-factor programming. See the flowchart below.
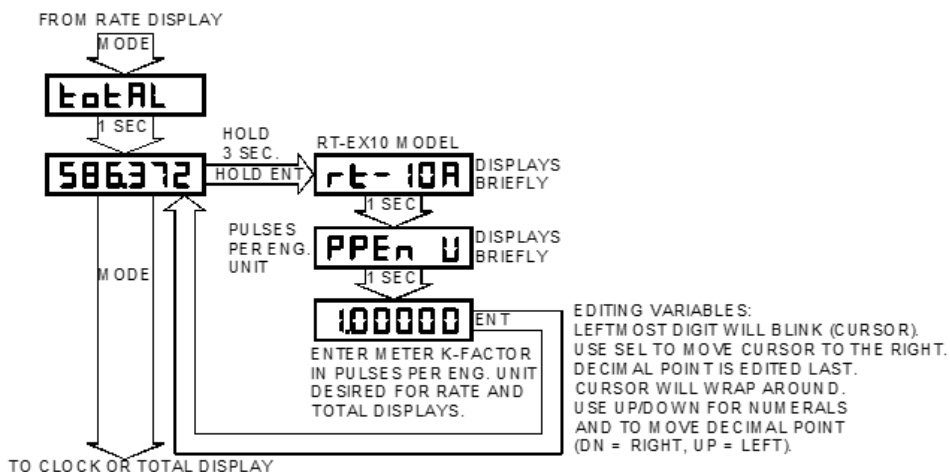
Rate Mode Programming

Program the Rate parameters 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
three seconds until the display indicates T-base (briefly) followed by the currently
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 appears, use ENT to record selection. The display (briefly) shows G-TIME followed by the currently programmed Gate Time value.
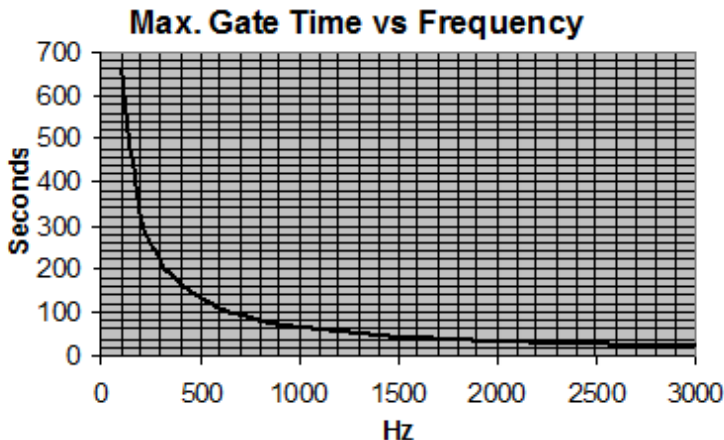
Gate Time

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 updates 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 depends on the expected maximum input frequency and is determined by the formula:

Maximum gate time (seconds) = 65,535 counts/maximum frequency in Hz

To calculate the maximum frequency, use the formula:

Maximum flow rate (engineering unit/sec) X K-factor (pulses/engineering unit) = frequency in Hz

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

Max. Gate Time vs Frequency

When editing the Gate Time variable, the leftmost digit will blink (cursor). Use SEL to move the cursor to the right; the cursor wraps around. Use UP or DN to increment or decrement numerals. Edit the decimal point last. Use DN to move the decimal point to the right, UP to move it to the left. When the desired value displays, use ENT to store the value and exit or advance to the next variable.
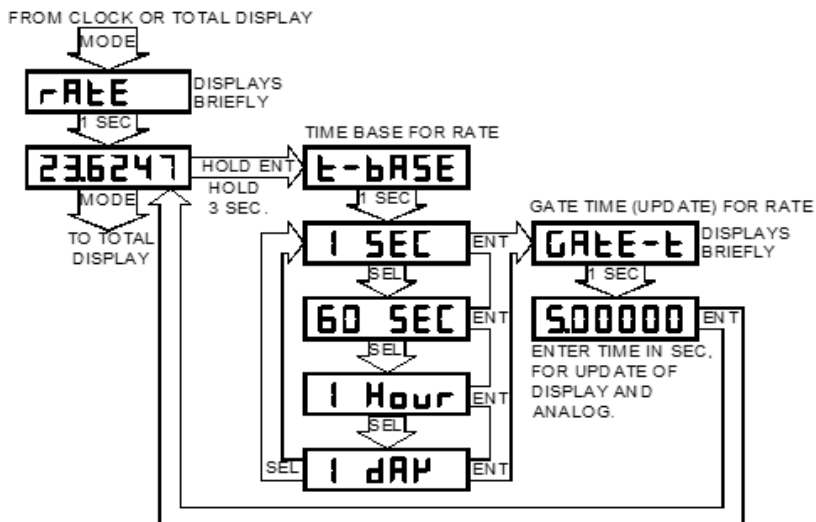
Analog Scaling (option)

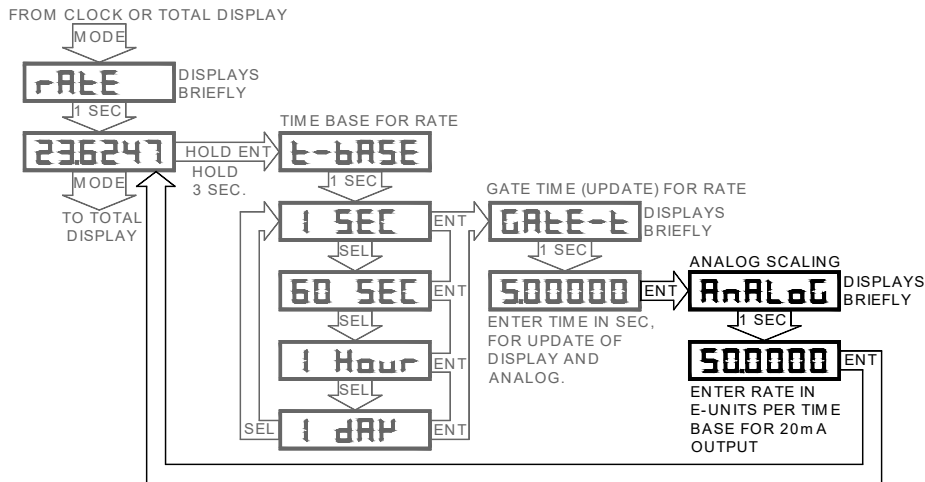*NOTICE: Will not display if model does not include analog output.*

The display (briefly) shows ANALOG followed by the currently programmed Analog Scaling value. This scaling variable is used to set the maximum output of 20 mA to a corresponding rate value, which 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). Enter the variable 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 wraps around. Use UP/DN to increment or decrement numerals. Edit the decimal point last. Use DN to move

the decimal point to the right, UP to move it to the left. When the value displays, use ENT to store the value, exit programming, and return to the RATE display.

FROM CLOCK OR TOTAL DISPLAY

| MODE |

rAtE DISPLAYS BRIEFLY

| 1 SEC |

23.6247 — HOLD ENT → **t-bASE** TIME BASE FOR RATE

MODE HOLD 3 SEC.

TO TOTAL DISPLAY

| 1 SEC |

1 SEC ENT → **GAtE-t** GATE TIME (UPDATE) FOR RATE DISPLAYS BRIEFLY

|SEL| | 1 SEC |

60 SEC ENT → **5.00000** ENT → **AnALoG** ANALOG SCALING DISPLAYS BRIEFLY

ENTER TIME IN SEC, FOR UPDATE OF DISPLAY AND ANALOG.

|SEL| | 1 SEC |

1 Hour ENT **5.00000** ENT

ENTER RATE IN E-UNITS PER TIME BASE FOR 20mA OUTPUT

|SEL|

SEL **1 dAY** ENT

Clock Mode Programming

Use the Clock Display Mode 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 pulse or switch activity) before the RT-10 "sleeps" to conserve energy
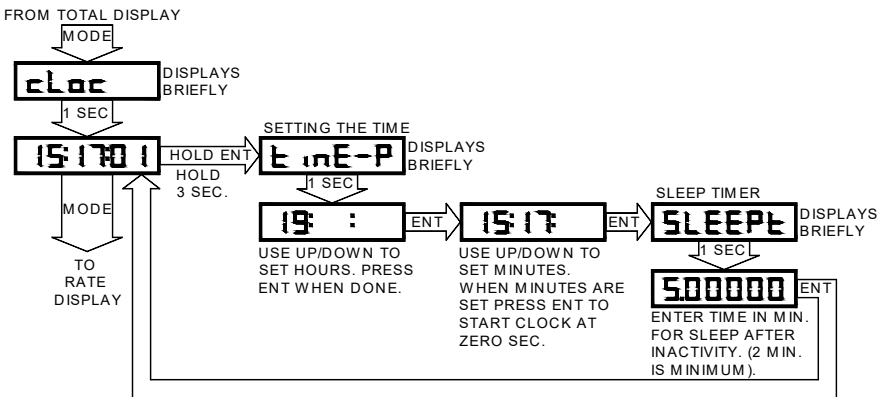.

Setting the Time

To view the Clock Display Mode, use the DN/MODE button or magnetic switch. Press and hold the 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 blinks. Use UP/DN to set the hours and then ENT to continue.

The current minutes (HH:MM:) become visible and blink. Use UP/DN to set the minutes and then ENT to continue.

NOTICE: Seconds begin at zero the instant you press ENT.

Sleep Timer

The display (briefly) indicates "SLEEPt" (Sleep Time) followed by the current Sleep Time value. Program the Sleep Time in minutes; default value is 5 minutes. The minimum value allowed is 2 minutes and the maximum 254 minutes. If you enter a value less than 2 or greater than 254, the display reverts to the minimum or maximum value. When you edit Sleep Time, the leftmost digit blinks (cursor). Use SEL to move the cursor to the right. The cursor wraps around. Use UP or DN to increment or decrement numerals. Edit the decimal point last. Use DN to move the decimal point to the right, UP to move it to the left. When the desired value appears, use ENT to store the value and exit Clock programming.
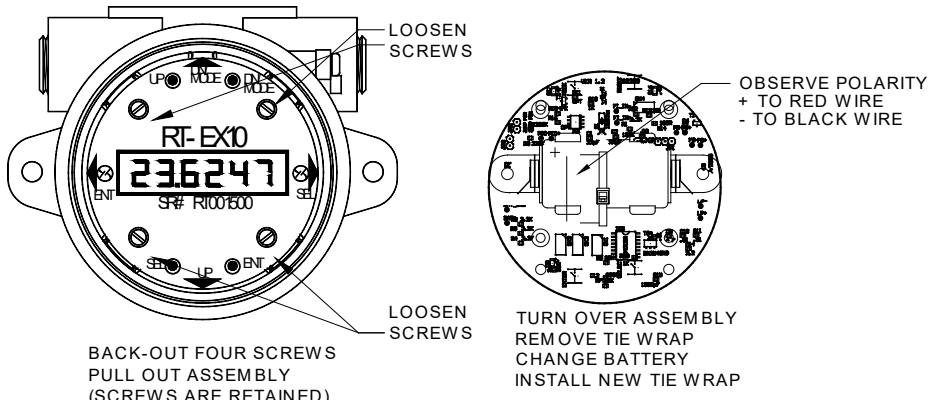
FROM TOTAL DISPLAY
MODE
cLoc — DISPLAYS BRIEFLY
1 SEC
15:17:01
HOLD ENT / HOLD 3 SEC.
MODE
TO RATE DISPLAY

SETTING THE TIME
tinE-P — DISPLAYS BRIEFLY
1 SEC
19:   : — ENT
USE UP/DOWN TO SET HOURS. PRESS ENT WHEN DONE.

15:17 — ENT
USE UP/DOWN TO SET MINUTES. WHEN MINUTES ARE SET PRESS ENT TO START CLOCK AT ZERO SEC.

SLEEP TIMER
SLEEPt — DISPLAYS BRIEFLY
1 SEC
5.00000 — ENT
ENTER TIME IN MIN. FOR SLEEP AFTER INACTIVITY. (2 MIN. IS MINIMUM).

Changing the Battery

Remove the enclosure cover.

WARNING: You must remove the cover outside the hazardous area if dangerous conditions are present.

When the battery timer has expired, LO BAT displays briefly every time you change the display mode to indicate that the expected battery life has been reached. The battery is a 3.6 volt Lithium "C" cell available from AW Gear Meters (part number MI50004).

LOOSEN SCREWS

RT-EX10

23.6247

SR# RT00600

OBSERVE POLARITY
+ TO RED WIRE
- TO BLACK WIRE

LOOSEN SCREWS

BACK-OUT FOUR SCREWS
PULL OUT ASSEMBLY
(SCREWS ARE RETAINED)

TURN OVER ASSEMBLY
REMOVE TIE WRAP
CHANGE BATTERY
INSTALL NEW TIE WRAP

Battery Replacement

To change the battery, follow these steps:

1. Locate the four screws recessed behind the faceplate.
2. Back these screws out (screws are retained and do not come completely out).
3. Carefully remove the faceplate/circuit board assembly and turn it over.
4. A tie-wrap secures the battery in the battery holder. Cut the tie-wrap.
5. Install new battery making certain to install it in the proper orientation (positive [+] end to the contact with the red wire, the negative [-] end to the contact with the black wire).
6. Immediately turn over the assembly over and follow the procedure for resetting the battery timer (below).
7. When finished with reset procedure, install new tie-wrap around battery.
8. Reinstall faceplate assembly into housing.

Resetting the Battery Timer

As soon as you place a battery in the holder, the RT-10 alternately displays "bA old" (battery old) and "bA neu" (battery new) several times for approximately one second each. If you have replaced the battery with a new battery, press ENT when "bA neu" appears to reset the battery timer to zero days.

If you re-installed the same battery, press ENT while "bA old" appears; the battery timer will not reset.

NOTICE: If you do not press ENT before this procedure exits, the timer will not reset.

To return to the reset procedure, briefly remove battery again.

NOTICE: If you do not peform a battery timer reset, the RT-10 continues to display LO BAT briefly whenever the mode changes.

ON BATTERY CHANGE

bA oLd [ENT] > SAME BATTERY

1 SEC   1 SEC

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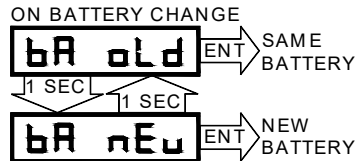
IF BATT. IS REMOVED/REPLACED DISPLAY WILL BLINK OLD/NEW.
PRESS ENT WHILE NEW IS VISIBLE TO RESET BATT. TIMER FOR NEW BATTERY.
PRESS ENT WHILE OLD IS VISIBLE IF BATTERY WAS NOT CHANGED.

NOTICE: The device maintains total values 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 is lost if you change or remove the battery.

414.574.4300 | www.aw-lake.com

2440 W. Corporate Preserve Dr. #600 Oak Creek, WI 53154