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M103 Rate Meter/Totalizer: Additional Instructions

Most of the basic Setup and Installation Instructions are covered within the M103 Technical Manual #181423. This document is intended as an aid to configure the Rate Meter/Totalizer to operate with our RotorFlow and FT -110 Turbine Flow products.

Electrical Connections

Both the RotorFlow and TurboFow should be connected as follows:

Terminal 1 Black wire (Common) (and connect to (negative) on external power supply)
Terminal 2 White wire (Signal)

Red (+Vdc) connect to external voltage source. Or, Terminal 8 when using MA10312 power module or when back lighting feature is desired using an external power supply.

For the FT -110 (and OEM configuration RFO's without the PC board), a 10K ohm pull up resistor (customer supplied) is required between terminals 2 and 8 (between the Signal and +VDC).

Programming

In the normal operation mode, pressing the down arrow **V** key will cycle between Total (Flow) and (Flow) Rate, where the Rate indication is noted by the R in the left hand side of the Display. In order to program the M103 for displaying Total and Rate, a jumper wire (customer supplied) is connected between Terminals 1 and 5.

Once this wire is in place:

1. Press the down key **V** (on the front left underneath the readout) until a **1.** appears on the left hand side of the display indicating Step 1 of programming. There will be a series of either zeroes or numbers displayed on the right. This value is the Count Input Calibrator used for setting up the Totalized Flow function.

The **Count Calibration Factor** is determined by dividing the desired units to be displayed by the pulses per gallon, liters, etc. Example: FT -110 pn 173934 with pulses per gallon = 2200; Display to hundredths of a gallon = 100/PPG or a Count Input Calibrator of 0.045. Use the accompanying chart to determine the Count Input Calibration Factor for the specific RotorFlow or FT -110 used.

Calibration Factor = Z/PPG Where Z is selected from the table below and PPG is Pulses per Gallon (if you want to display in liters then enter PPL)

<u>Z</u>	<u>Desired Decimal point for total display</u>	
1	x	no decimal point
10	x.x	1 decimal place
100	x.xx	2 decimal places
1000	x.xxx	3 decimal places



Press the **R >** key once and the left hand digit will start blinking. Use the down key to change the number and then the **R >** key to move to the next digit. Once the appropriate Count Calibrator has been entered press the **R >** key until the display stops blinking. Press the down key **V** to move to the next program step.

2. A **2.** will appear on the left side of the display. This step is used to set the **decimal place** for the displayed Total value: i.e. Total number of Gallons. This is based on the "Z" value entered in step 1. Press the **R >** key to change the number of digits past the decimal point or you can set it to off. Once the desired number of digits is set press the down key **V** to move to the next program step. For the previous example x.xx would be chosen.
3. Step **3.** is for the **Rate Calibrator Decimal Point**: Press the **R >** key until the decimal point is to the right of the first digit: i.e. "x.xxx". Press the **V** key when done. The Rate Calibration Factor is determined per the equation below. It is normally a very small number so enter the maximum number of decimal places allowed "x.xxx".

Rate Calibration Factor = $60/\text{PPG}$ where PPG equals pulses per gallon. If you want to scale in liters then use PPL.

4. Step **4.** is for entering the **Rate Input Calibrator (or Rate Scale Factor)**. The Rate Input Calibrator is the calibration constant (multiplier) that converts the frequency output of the RotorFlow or FT-110 into the desired flow rate. The Rate Input Calibrator number is determined by dividing the time scale (using 60 for minutes) by the pulses per gallon: Example: for RFO-2500P 0.25" p/n 155421 -low flow range 0.1-1.0 GPM, the $\text{PPG} = 10800$; $60/10800 = 0.006$. Use the attached chart to determine the proper PPG for the specific RotorFlow or FT - 110 used.

Press the **R >** key and the first digit should start blinking. Enter the Rate Input Calibrator from the chart for the appropriate sensor. Once the correct calibration factor has been entered. press the **V** key to advance to the next program step.

5. Step **5.** sets the **decimal point position of the rate value**. Generally this would be set to 0.00 to display the Flow rate in hundredths of a gallon or 0.0 in tenths of a gallon. Press the **V** key for the next program step. This meter uses a smart decimal point for the rate display. You do not need to alter the rate input calibration decimal point (step3) if you wish to change the rate display decimal point.
6. Step **6.** is for the front panel Reset enable. When set to on, the Total can be reset to 0 by pressing the **R>** key. If set to off, the Total can only be Reset to 0 by connecting Terminal 4 to Terminal 1 either by a jumper wire or momentary switch.

At this point, the programming is complete and the jumper wire from Terminal 5 to Terminal 1 can be removed. To double check that all values are indeed correct, press the down **V** key twice (past the Total and then Rate display) to Step 1. You can then cycle through Steps 1 to 6 to make sure all parameters are set properly.



Once the jumper wire is removed, pressing the down key **V** will alternate between the normal operation modes of Total display or Rate display.

Fine Tuning the Total and Rate Calibration Constants

The attached chart includes the Count (Totalizer) and Rate Calibration constants for the FT -110 and RotorFlow sensors. Please note that these values are averages based on a sample of units under "normal operating" conditions: water flow at midpoint of flow range, temp. 70° F, 50 PSI line pressure, sensors mounted in recommended orientation, 8" straight flow path into the inlet port, etc. Under most circumstances, these calibration factors are sufficient for accurate readings.

Customers can optimize the performance of their specific Sensor/Meter combination under their application conditions. One way to achieve this for Total Flow is to set up the sensor in an open ended flow stream and dispensing a specific amount of flow into a calibrated container:

1. Using the steps outlined above, change the Count Input calibrator to 1.00. During the test, this will allow the Rate Meter/Totalizer to count the total number of pulses equal to the volume dispensed into a calibrated container.
2. For the example of the RFO p/n 155421, low flow range 0.1 -1.0 GPM, the nominal pulses per gallon is 10,800. Under test, a pulse count of 5,300 is recorded for a volume of 0.5 gallons. The specific PPG for this sensor therefore = 10,600.

For fine tuning the Rate Calibration factor, the test would be basically the same as above. The primary difference would be to run the test at the normal system flow rate to get an optimized calibration factor for the customer's specific application: The nominal Rate Calibration factors are based on the midpoint of the sensor flow range. The pulses per gallon can vary at the low end vs. the high end of the range.

An alternate method would be to adjust the calibration factors up or down by a few numbers based on whether the meter is reading high or low.

For example using the FT-110, 173935 where the PPG = 1,000: If the displayed total on the meter is reading low for total flow: Rather than 1 gallon = 1,000 pulses it is actually 1,050 pulses to = 1 gallon. You would then reduce the calibration factor slightly from the nominal 0.100 to 0.095. If the total flow displayed is higher than it should be, increase the calibration factor slightly: i.e. If 950 pulses = 1 Gallon, change the calibration factor to 0.105.

Rule of Thumb: If the display reads less than the "known" actual flow rate: Decrease the calibration factor. If the actual flow is higher -Increase the calibration factor .

Instructions for the complete specifications and other mounting and installation instructions are included in the Standard Installation document # 181423. If you still need additional help or information, please contact someone in Gems Flow Products group.



FT-110 p/n	GPM PPG	GPM Count (x.xx)	GPM Rate	LPM PPG	LPM Count (x.xx)	LPM Rate
173931	26,100	.0038	.002	6,900	.0145	.009
173932	12,500	.0080	.005	3,300	.0303	.018
173933	17,400	.0058	.003	4,600	.0217	.013
173934	8,300	.0120	.007	2,200	.0455	.027
173935	3,800	.0263	.016	1,000	.1000	.060

RFO p/n		Low Flow Range	Standard Flow Range
155421	P	.1 to 1 GPM	.5 to 5 GPM
156261	B	10,800 PPG	2,200 PPG
165071	S	Count: .0092 Rate: .006	Count: .0454 Rate: .0273
155481	P	1.5 to 12 GPM	4 to 20 GPM
156262	B	940 PPG	610 PPG
165075	S	Count: .1064 Rate: .064	Count: .1639 Rate: .098
194761	B		6 to 30 GPM
194763	S		395 PPG Count: .2532 Rate: .152
194762	B		8 to 60 GPM
194764	S		168 PPG Count: .5952 Rate: .357

Remember if you want the total to be displayed to something other than 2 decimal places the Count Calibration Factor above needs to be altered.