Badger Meter

Industrial Registers

Model ER-9 Digital Resettable Totalizer and Rate of Flow Indicator, Plus Pulse Output

ER-9 Indicator

ER-9 Register
For Portable Large Meter Tester

REG-UM-00836-EN-12 (August 2018)

User Manual

CONTENTS

ABOUT THIS MANUAL

This manual contains information concerning the installation, operation and maintenance of the Badger Meter® ER-9 Digital Resettable Totalizer and Rate of Flow Indicator (ER-9). To ensure proper performance, the instructions given in this manual should be thoroughly understood. Keep this manual for future reference.

Installation, wiring and programming of the unit is fairly simple and straightforward. This manual is designed to provide you with a step-by-step guide for this purpose.

Examples are provided only to facilitate programming. Your specific application will most likely require a different set of numbers for proper programming.

The troubleshooting section lists the most common problems that can be encountered, their most likely cause and the recommended solution. See *"Troubleshooting" on page 12*.

PRODUCT DESCRIPTION

The ER-9 is an external or battery powered indicator that displays rate of flow and total flow. The ER-9 also has a scalable pulse output. It has independent programmable scale factors for rate and totalization, allowing you to program these displayed values in different but meaningful engineering units, such as gallons per minute and total gallons.

The supertwist LCD display with 8 digits for total, and 4 digits plus legend for rate, provides easy viewing at a glance. For conditions where ambient light is poor, the display can be backlit by connecting an external DC (10…28V DC) power supply. A single unit can accept NPN or dry contact inputs for low or high speed applications.

The ER-9 is powered by two replaceable 3V lithium batteries. You can install a new battery before removing the old one, thereby retaining count total and program data. A low battery indicator appears on the screen about two weeks before the end of the battery life. See *"Battery Installation/Replacement" on page 6*. The unit operates in battery mode for at least six months. To extend battery life to five years, connect the unit to an external DC power source.

Setup is quick and easy as the two front panel keys are used to scroll through and preset values in all program mode choices.

INSTALLATION

Panel Installation

Place the unit in the panel through a 33 mm x 68 mm cutout. Slide the included gasket over the rear of the unit, then slide the panel mount bracket into place so that the 4 tabs catch in the grooves on the top and the bottom of the unit (the bracket should be oriented so that the tabs are on the side nearest the panel). Use the provided panel mount screws to tighten the bracket until there is a secure seal against the gasket. Do not over tighten.

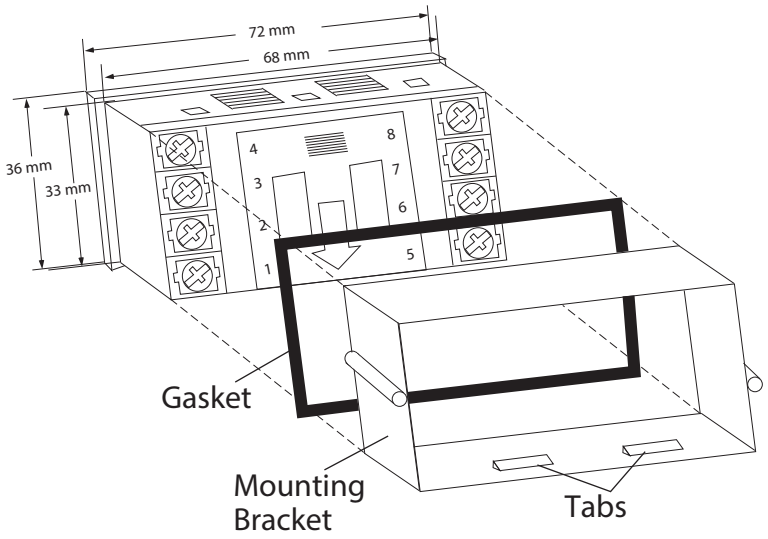

Figure 1: Panel installation

Battery Installation/Replacement

NOTE: If the low battery indicator is flashing, replace batteries *before* they are completely exhausted to retain programming and indicated volume. If two batteries are present, remove and replace one battery at a time. If only one battery is present, install a new battery in the open slot before removing/replacing the old battery.

The ER-9 is shipped with two batteries. Remove the battery cover by pushing inward and down. Install batteries in the two slots. Once the batteries are in place, the unit goes into a self-test mode, and all the segments on the LCD display illuminate. To exit the self-test mode, press the **Reset/Select** key. The unit then displays the model number **9** for the ER-9. Press the **Reset/Select** key again to ready the unit for operation.

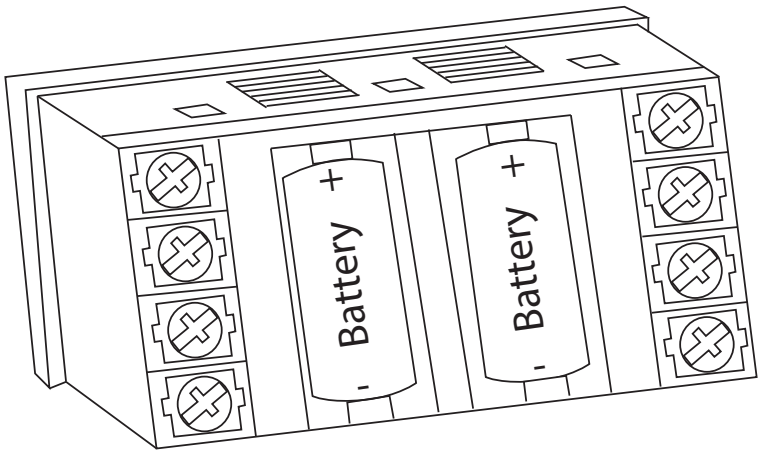

Figure 2: Battery installation

WIRING INSTRUCTIONS

Wiring Terminals

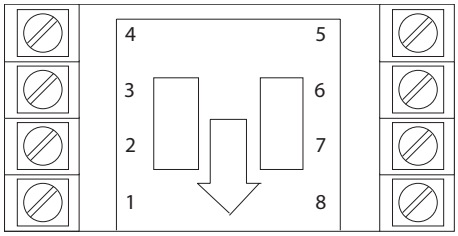

Figure 3: Wiring terminals

Terminal	Function	Operation
1	DC common	—
2	Count input	NPN signal, 280 Hz max or Dry contact, 95 Hz max
3	—	Not used
4	Remote reset	Resets count value when switched to common.
5	Front panel program enable	Allows access to program mode when connected to common.
6	Solid-state relay	Pulse output (+)
7	Solid-state relay	Pulse output (–)
8	DC supply input	10…28V DC for backlighting and/or powering the output.

Table 1: Wiring terminals

Transmitter Connections

For connecting to Badger Meter transmitters, refer to the literature for your specific transmitter and to *Table 2* below. The *Connections* column refers to the wires on the transmitter. The numbers in parentheses refer to the terminal numbers on the ER-9. Connect the wire coming from the transmitter to the corresponding terminal number for the ER Remote models.

Connecting to a Generic Reed Switch

To connect a generic reed switch to the ER-9, connect one of the wires to terminal 1 and the remaining wire to terminal 2.

Connecting to a Generic NPN Transmitter

To connect a generic NPN transmitter to the ER-9, connect the emitter to terminal 1. Connect the collector to terminal 2.

Transmitter	Connections		Transmitter	Connections	
FT-1 (1/2 in. OP)	Black (1)	Black (2)	PFT-2	White (1)	White (2)
FT-1	White (1)	White (2)	PFT-2E	Black (1)	Green (2)
FT-1E	Black (1)	Green (2)	PFT-3E	Black (1)	Green (2)
FT-2	White (1)	White (2)	PFT-3	White (1)	White (2)
FT-420	Black (1)	White (2)	PFT-420	Black (1)	White (2)
MS-E1	Black (1)	Red (2)	PFT-420/2	Black (1)	White (2)
MS-E5	Black (1)	Red (2)	PFT-4E	Term 6 (1)	Term 5 (2)
PFT-1E	Term 6 (1)	Term 5 (2)	PM-5	Black (1)	Red (2)

Table 2: Transmitter connections

OPERATION

Display Types

Figure 4: Total display

Figure 5: Rate display

Total Display

Total Display indicates the present count value, which is equal to the number of pulses received (since the last reset) multiplied by the *Totalizer Scaler Value* in program mode 1.

Rate Display

Rate Display indicates the rate value, which is equal to the input frequency multiplied by the *Rate Prescale Value* in program mode 4. (If no pulses are received for 2 seconds, the rate value goes to zero.)

Control Keys

Down arrow key

Normal operating mode
When you press the **Down Arrow** key during normal operation, the ER-9 toggles the display of the *Flow Total* and the *Flow Rate*. The letter *R* on the left of the screen indicates that the *Flow Rate* is being displayed.

Programming mode
The **Down Arrow** key toggles the unit between the *Total Display* and the *Rate Display*. When the program input is active, press the **Down Arrow** key to scroll through the menu items. After choosing a menu item for editing, press the **Down Arrow** key again to set the value for the currently selected (flashing) digit.

Reset key

While the *Total Value* displays, press the **Reset key** to reset the value to zero. The front panel Reset function works only when *Program Mode 7* is preset to enable.

When the program input is active (see *"Wiring Instructions" on page 7*), press the **Reset** key to select a menu item for editing.

PROGRAMMING

IMPORTANT

You must connect terminals 1 and 5 together to enable the programming mode. After all programming is complete, remove the connection between terminals 1 and 5 to prevent the unit from being reprogrammed by mistake.

To access the programming screens, press ▼ repeatedly until the *Program Mode* (1 through 7) you want displays on the screen.

1. Once you select a program, press R► to either cause the left digit of that value to flash (scale factors modes 1, 4 & 6), or to change the parameters for the other programming modes (*Decimal Point Position* and *Totalizer Reset*).
2. On program modes 1, 4 & 6, use R► and ▼ in combination to choose individual digits and change their value.

NOTE: On program modes 1, 4 & 6, you can advance to the next program mode only if a digit is not flashing. Press R► until the display stops flashing.

Mode 1: Totalizer Scaler multiplies the input pulses by this number (programmable from 0.0001 to 99.9999) and displays the results as the totalizer value.

Mode 2: Totalizer Decimal Point sets the decimal point on the totalizer display from no decimal (**OFF**) to 0.00000.

Mode 3: Rate Scale Factor Decimal Point sets the decimal in *Rate Scale Factor* number, from no decimal to 0.000.

Mode 4: Rate Scale Factor multiplies the input pulses by this number, which can be programmed in conjunction with the *Rate Decimal Point* for a number from 0.001 to 9999.

Mode 5: Rate Decimal Point sets the decimal point on the *Rate of Flow* display from no decimal (off) to 0.0000. You can program the display to have a dead zero (----0), for a 5-digit display with the least significant digit always being **0**.

Mode 6: Pulse Output Scale Factor multiplies the input pulses by a number from 0.0001 to 0.9999 and sends them to output terminals 6 & 7.

Mode 7: Front Panel Reset Enable When set to **ON**, press R► to reset the totalizer to zero. When set to **OFF**, the totalizer can only be reset through the remote reset input
(see *"Wiring Instructions" on page 7*).

Mode 8: Pulse Output Enable When set to **ON**, the solid-state relay output will pulse to re-transmit input pulses. If set to **OFF**, it will not activate. Use the **OFF** setting to conserve battery life if not using the output.

Totalizer Programming

Totalizer values can be expressed in any engineering unit of measure such as gallons, quarts, or liters. For each unit, a unique scale factor must be programmed.

Totalizer scale factor

To determine the *Totalizer Scale Factor* (Program Mode 1), use the following formula:

Totalizer Scale Factor = 1/(Transmitter pulses per unit X Decimal Factor)

where:

Transmitter Pulses per Unit is the number from the chart at the right, or the literature for your particular transmitter/meter combination. The chart is expressed in gallons and liters. If you wish to read in other units, use the appropriate conversion factor.

Decimal Factor (from 1.0 to .001) determines the resolution of the reading. If you wish to read to the nearest 1/10 unit, the Decimal Factor would be 0.1.

Example: You have a model 35 RCDL meter with a PFT-2 transmitter that has a pulse output of 126.7 pulses per gallon. You wish to read the totalizer to the nearest tenth gallon.

1/(126.7 X 0.1) = 0.0789 (scale factor)

1. Set the *Totalizer Scale Factor* (*Program Mode 1*) to **0.0789**.
2. Set the *Totalizer Decimal Point Factor* (*Program Mode 2*) to **0.0** (one decimal place).

Rate of Flow Programming

Rate of flow can be expressed in any engineering unit of measure for any time base such as gallons/minute, liters/second, barrels/hour.

Rate scale factor

To determine the *Rate Scale Factor* (*Program Mode 4*), use the following formula:

Rate Scale Factor = (Seconds / Transmitter Pulses per Unit)

where:

Seconds is the number of seconds in the rate time unit. If you wish to read flow in units per minute, seconds would equal 60. If you wish to read flow in units per hour, seconds would equal 3600.

Transmitter Pulses per Unit is the number from the chart to the right or the literature for your particular transmitter/meter combination. The chart is expressed in gallons and liters. If you wish to read in other units, use the appropriate conversion factor.

Before you program the *Rate Scale Factor*, you must set the *Rate Decimal Point* position (*Program Mode 3*). This decimal point will correspond to the decimal in the *Rate Scale Factor* number.

Example: You have a model 35 RCDL meter with a PFT-2 transmitter that has a pulse output of 126.7 pulses per gallon. You wish to read rate of flow in gallons per minute.

60 seconds /126.7 pulses per gallon = 60/126.7 = 0.473(rate scale factor)

1. Set the *Rate Scale Factor Decimal Point* (*Program Mode 3*) to **X.XXX**.
2. Set the *Rate Scale Factor* (*Program Mode 4*) to **0.473**.
3. Since we are reading in whole gallons, set *Rate Decimal Point* (*Program Mode 5*) to **off**.

Pulse Output Programming

The *Pulse Output* can be programmed for any engineering unit of measure. A *Pulse Output Scale Factor* must be calculated and programmed (*Program Mode 6*) using the same formula and procedure as described under the *Totalizer Scale Factor* (*Program Mode 1*).

The transmitter pulses per unit in Table 3 apply to the following transmitters:

- FT-1
- FT-1E
- FT-2
- PFT-2
- PFT-2E
- PFT-3
- FT-420
- PFT-420

Size (in.)	Meter Model	US Gallons	Liters	Ft^3
1/2	OP	222.960	58.899	1687.857
1/2	OP (FT1 only)	111.500	29.455	834.078
1	OP	76.640	20.246	573.307
2	OP	20.600	5.442	154.099
2	Industrial Turbo	17.360	4.586	129.862
3	Industrial Turbo	12.400	3.276	92.758
4	Industrial Turbo	2.560	0.676	19.150
6	Industrial Turbo	1.080	0.285	8.079
5/8	LP RCDL	229.554	60.641	1717.186
5/8	25 RCDL	198.340	52.396	1484.689
3/4	35 RCDL	126.671	33.463	947.566
1	40 RCDL	89.781	23.717	671.610
1	55 RCDL	58.064	15.339	434.351
1	70 RCDL	46.752	12.350	349.726
1-1/2	120 RCDL	23.867	6.305	178.539
2	170 RCDL	14.565	3.848	108.955
1-1/2	160 Turbo Series	1.537	0.406	11.495
2	200 Turbo Series	1.537	0.406	11.495
3	450 Turbo Series	1.598	0.422	11.955
4	1000 Turbo Series	1.665	0.440	12.455
6	2000 Turbo Series	0.150	0.040	1.122
8	3500 Turbo Series	0.151	0.040	1.133
10	5500 Turbo Series	0.198	0.052	1.481
12	6200 Turbo Series	0.129	0.034	0.963
16	6600 Turbo Series	0.016	0.004	0.116
20	10000 Turbo Series	0.009	0.002	0.067
1/2	Industrial OG	378.5 *	100 *	2831 *
3/4	Industrial OG	249.8 *	66 *	1868 *
1	Industrial OG	249.8 *	66 *	1868 *
1HF	Industrial OG	162.8 *	43 *	1217 *
1-1/2	Industrial OG	64.4 *	17 *	481 *
2	Industrial OG	34.1 *	9 *	255 *
3	Industrial OG	11.4 *	3 *	85 *

* If using a PFT-3E transmitter, multiply number by 2.

Table 3: Transmitter pulses per unit

TROUBLESHOOTING

Problem	Possible Causes	Remedies
Screen is blank	Battery is dead.	Replace battery.
Will not count in totalizer mode	1. Improperly programmed. 2. Broken or defective wiring. 3. Improperly connected. 4. Transmitter defective.	1. Check programming. 2. Check wiring. 3. Check connections. 4. Repair or replace transmitter.
Will not indicate rate of flow	1. Improperly programmed. 2. Improperly connected. 3. Transmitter defective.	1. Check programming. 2. Check connections. 3. Repair or replace transmitter.
Cannot program	Program-enable jumper is not installed or is installed improperly.	Install jumper.
Cannot reset from front panel	Reset enable is not programmed.	Reprogram mode to **ON** (*Program Mode 7*).
Erroneous readings	1. Improperly programmed. 2. Defective transmitter.	1. Check programming. 2. Repair or replace transmitter.
No Pulse Output	1. Defective output transistor. 2. Improper wiring.	1. Replace ER-9. 2. Check connections

Table 4: Troubleshooting

If a problem persists, call 800-876-3837 to contact our Technical Support Staff.

FIELD CALIBRATION

Field calibration consists of determining the exact transmitter pulse output per unit of measure for your particular meter/transmitter combination and then using this value as the transmitter pulse output value when calculating the counter and time base values. The procedure is as follows:

1. Set the *Totalizer Scale Factor* to **1**.
2. Set the *Totalizer Decimal Point* to **OFF**.
3. Reset the counter to **0**.
4. Run fluid into a weigh tank or into a calibrated vessel.
5. Determine the number of pulses per gallon by dividing the indicator reading by the number of gallons of fluid in the vessel. Use this value for your calculations.

Example: You programmed the indicator for calibration and connected the outlet of a 1" OP meter to a calibrated vessel. You opened the valve and allowed fluid to flow into the vessel. You determined that there were 22.35 gallons of fluid in the vessel. The reading on the indicator is 1720.

1720 / 22.35 = 76.95

The transmitter output is 76.95 pulses per gallon. Use 76.95 when calculating the *"Totalizer scale factor" on page 10*.

Replacing the Meter's Sensor Pickup

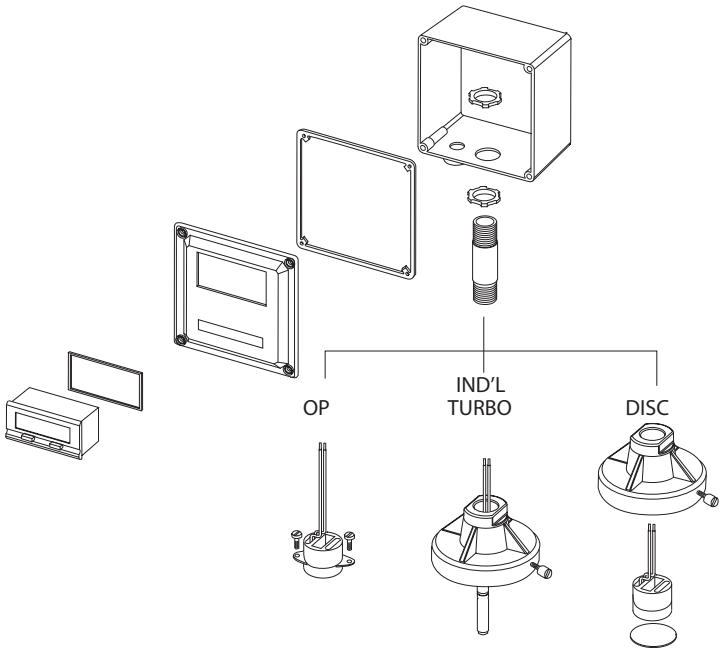

Figure 6: Meter mount components

To replace the sensor pickup on your meter, follow these steps:

Industrial turbo meter

1. Remove the front cover from the ER-9 unit and disconnect all wiring.
2. Remove meter head bolts and the lift meter head assembly from the housing.
3. Remove the retaining ring that holds the accessory unit to the head.
4. Loosen the side seal screw on the accessory adapter, twist 90° and pull entire assembly unit from the meter head.
5. Twist the drop pipe in counterclockwise direction to remove it and the ER-9 unit from the adapter assembly.
6. Attach the new adapter assembly to the drop pipe and ER-9 unit.
7. Reverse the balance of the above steps to re-assemble the unit.

Disc meter

1. Remove the front cover on the ER-9 unit and disconnect the sensor wiring.
2. Loosen the side seal screw on the assembly adapter, twist the adapter 90° and lift the entire accessory unit off the bare meter.
3. Pull the reed switch pickup assembly and pad from the adapter.
4. Replace the reed switch pickup and pad in the adapter, feeding the wires up through the drop pipe.
5. Reposition the entire assembly on meter.
6. Rewire the sensor to the ER-9 unit.

Oscillating piston meter

1. Remove the front cover on the ER-9 unit and disconnect the sensor wiring.
2. Remove the back plate on the meter to expose the pickup assembly.
3. Remove the reed switch pickup assembly and replace it.
4. Feed the wires up through the drop pipe.
5. Reassemble the back plate to the meter.
6. Rewire the sensor wires to the ER-9 unit.

SPECIFICATIONS

Count Input (Terminal 2)	
Type	NPN signal, contact closure
Count speed	NPN, 280 Hz maximum, Contact, 95 Hz maximum
Logic	Low < 1.0V DC, High > 2.0V DC
Minimum pulse width	NPN=1.78 µs, Contact,=5 ms
Maximum input	28V DC
Impedance	1 Meg to V BATT
Front Panel Program Enable (Terminal 5)	
Type	NPN signal, contact closure; level sensitive
Maximum input	28V DC
Remote Reset Input (Terminal 4)	
Type	NPN signal, contact closure; edge sensitive
Frequency response	30 Hz (50% duty cycle)
Maximum input	28V DC
Output (Terminals 6 & 7)	
Type	Isolated Photomos relay
Load rating	0.1 Amp @ 30V AC/V DC
Transition time	< 5 ms
Operating Temperature	
Indicator	32…140° F (0…60° C)

Power Source	
Type	Dual 3V Lithium battery
Replacement part	62576-001
Battery life expectancy	5 years typical if using external DC supply 6 months if used alone with 50% duty cycle output
Low power indicator	"Low Bat" flashes on display approx. 2 weeks prior to end of battery life
Display	
Type	Supertwist LCD for use with or without backlighting
Number	8 digits count value, 4 digits (plus dummy zero) for rate value
Height	12 mm (0.472 in.)
Backlighting	Green Illumination over whole viewable area with a 10…28V DC supply (Terminal 8)
Physical	
Dimensions	36 mm x 72 mm, 38 mm deep 1.417 x 2.835 in., 1.496 in. deep
Mounting	Panel mount (mounting bracket supplied) 33 mm x 68 mm (+ 0.3 mm) panel cutout 1.299 x 2.677 in., (+ 0.012 in.) panel cutout
Connections	Up to 8 screw terminals
Weight	Approximately 13 ounces

Control. Manage. Optimize.

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