Models ER-8/ ER-9 & ER-8H	Digital Resettable Totalizers and Digital Rate of Flow Indicators plus Pulse Output (ER-9 only)	Installation & Operation Manual

ER-8 / ER-9

ER-8H
(For Portable Large Meter Tester Only)

This Product Contains Lithium Batteries.

Read This Manual Before Attempting Any Installation, Wiring Or Operation.

Scope of this manual

This manual contains information concerning the installation, operation and maintenance of the Badger ER-8, ER-9, and ER-8H indicators. To ensure proper performance, the instructions given in this manual should be thoroughly understood. Retain the manual in a readily accessible location for future reference.

Installation, wiring and programming of either unit is fairly simple and straight forward. This manual is designed so as 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 attempts to illustrate the most common problems that can be encountered, their most likely cause and the recommended solution. If a problem persists, please contact our technical support group at:

Badger Meter, Inc.
Customer Service
1-800-876-3837

General Information

The ER-8, ER-9, and ER-8H are external or battery powered indicators that displays rate of flow and total flow. The ER-9 also has a scalable pulse output. They have 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 (10-28 VDC) power supply. A single unit can accept NPN or dry contact inputs for low or high speed applications.

The ER-8 and ER-8H models are powered by either one or two replaceable 3V Lithium batteries. This

design allows for a new battery to be installed before removing the old one, thereby retaining count total and program data. A low battery indicator appears on the screen to provide a warning a couple of weeks before the end of the battery life. If two batteries are used simultaneously, the individual expected life doubles to 10 years. The ER-9 is powered by two replaceable 3V Lithium batteries.

The unit will operate in battery mode for at least six months. To extend battery life to five years, we recommend the unit be connected to an external DC power source.

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

Specifications

Count Input (Terminal 2):
Type: NPN Signal, or Contact Closure
Count Speed: NPN-280Hz max., Contact-95Hz max.
Logic: Low < 1.0 VDC, High > 2.0 VDC,
Minimum Pulse Width: NPN-1.78 micro seconds,
    Contact-5 ms
Maximum Input: 28VDC
Impedance: 1 Mý to battery

Front Panel Enable Input (Terminal 5)
Type: NPN Signal, or Contact Closure; level sensitive
Maximum Input: 28 VDC

Remote Reset Input (Terminal 4)
Type: NPN Signal, or Contact Closure; edge sensitive
Frequency Response: 30 Hz (50% duty cycle)
Maximum input: 28 VDC

Pulse Output (Terminals 6 & 7) (ER-9 only)
Type: Isolated photo MOS relay
Load rating: 0.1 amp @ 30VAC/VDC
Transition time: <5ms

Operating Temperature:
Indicator: 32° F (0° C) to 140° F (60° C)

Power Source:
Type: 3V Lithium batteries-Dual (ER-9), Single (ER-8)
    with dual optional (Battery P/N 62576-001)
Expected Life: ER-9; 5 years (with external DC source)
    ER-8; 1 battery - 5 years, 2 batteries - 10 years
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 dead zero)
    for rate value
Height: 12mm (.472")
Backlighting: Green Illumination over viewable area
   with a 10 to 28 VDC supply (Terminal 8)

Physical:
Dimensions: 36mm x 72mm, 38mm deep
    1.417in x 2.835in, 1.496 in. deep
Mounting: Panel Mount (mounting bracket supplied)
    33mm x 68mm (+ 0.3mm) panel cutout
    1.299in x 2.677in, (+ 0.012in) panel cutout
Connections: Screw terminals
Weight: Approximately 13 ounces

Installation

Gasket

Mounting Bracket
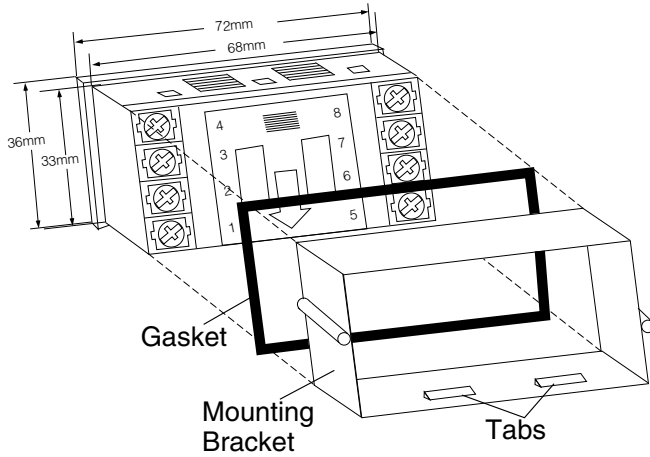
Tabs

Panel Installation

Place the unit in the panel through a 33mm x 68mm 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.
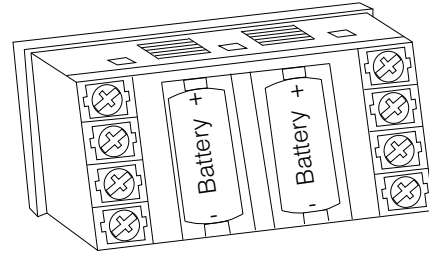

Battery Installation/Replacement

The ER-8 and ER-8H are shipped with one battery and the ER-9 with two batteries. Remove the battery cover by pushing inward and down. For the ER-8 and ER-8H, install the battery in either of the slot positions. For the ER-9, install the batteries in the two slots. Once the batteries are in place the unit will go into a self test mode, and all the segments on the LCD display will be illuminated. The self test mode is exited by depressing the **R▶** key, which will then display the model number (5) for the ER-8 and ER-8H or (9) for the ER-9. Depress **R▶** again to ready the unit for operation.

Wiring Instructions

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 (+). (ER-9 only)
7. Solid State Relay- Pulse output (-). (ER-9 only)
8. DC Supply Input - 10 to 28 VDC for backlighting and/or powering the output.

ER-9 Only
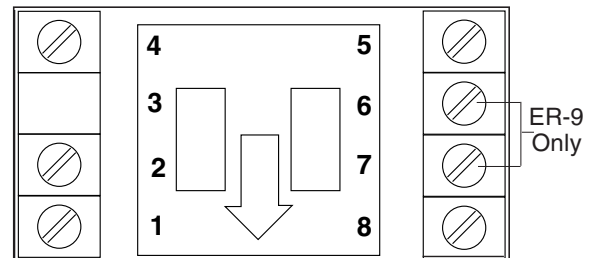
TRANSMITTER CONNECTIONS

For connecting to Badger Meter transmitters, refer to the Technical Brief (ITB) for your specific transmitter, and the chart to the right. "Connections" refers to the wires on the transmitter. The numbers in parenthesis refer to the terminal numbers on the ER-8 or ER-9. Connect the wire coming from the transmitter to the corresponding terminal number for the ER Remote models.

To connect a generic reed switch to the ER-8 or ER-9, connect one of the wires to terminal 1. Connect the remaining wire to terminal 2.

To connect a generic NPN transmitter to the ER-8 or ER-9, connect the emitter to terminal 1. Connect the collector to terminal 2.

Transmitter	Connections	
FT1 (1/2" OP)	Black (1)	Black (2)
FT1	White (1)	White (2)
FT1E	Black (1)	Green (2)
FT2	White (1)	White (2)
FT420	Black (1)	White (2)
MSE1	Black (1)	Red (2)
MSE5	Black (1)	Red (2)
PFT1E	Term #6 (1)	Term #5 (2)
PFT2	White (1)	White (2)
PFT2E	Black (1)	Green (2)
PFT3E	Black (1)	Green (2)
PFT3	White (1)	White (2)
PFT420	Black (1)	White (2)
PFT420/2	Black (1)	White (2)
PFT4E	Term #6 (1)	Term #5 (2)
PM5	Black (1)	Red (2)

Operation

By pressing the DOWN ▼ key during normal operation, the ER-9 will alternatively display the Flow Total or the Flow Rate. The Letter R on the left indicates that the Flow Rate is being displayed.

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: 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.)

```
34675890
  ▼        R ▶
```

```
R    2345
  ▼        R ▶
```

Reset Key: R ▶

If the total value is being displayed, depressing this key will cause the value to be reset to 0 as long as program mode #7 is preset accordingly.

or

When the program input is active (see wiring) this key is used to select a menu item for editing.

▼ **Down Key:** Toggles the unit between the total and rate display. When the program input is active this key is used to scroll through the menu items. After a menu item has been chosen for editing, the down key is used to set the value for the currently selected (flashing) digit.
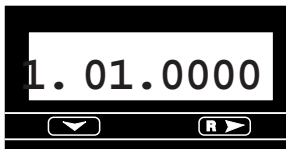
Programming

Note: Programming can be done only if terminals 1 and 5 are connected (together)

• **Step 1**- Toggle the ▼ key until the desired program mode appears on the screen (1 through 7).

• **Step 2**- Once the desired program is selected, pressing the R ▶ key will either cause the left most digit of that value to flash (scale factors modes 1, 4 & 6), or it will change the parameters for the other programming modes (decimal point position and totalizer reset)

• **Step 3**-On program modes 1, 4 & 6 use the R ▶ and ▼ keys in combination to choose individual digits and change their value.

Note that on program modes #1, #4 & #6 you can advance to the next program mode only if a digit is not flashing. Use the R ▶ key until the display is not flashing.

After all programming is complete, remove the connection between terminals 1 and 5 in order to insure that the unit is not reprogrammed by mistake.

```
1. 01.0000
  ▼        R ▶
```

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.

```
2. oFF
  ▼        R ▶
```

Mode #2: Totalizer Decimal Point: Sets the decimal point on the totalizer display from no decimal (off) to 0.00000.

```
3. 1.000
  ▼        R ▶
```

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

```
4. 9999
  ▼        R ▶
```

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.
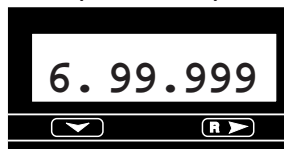
```
5. oFF
  ▼        R ▶
```

(ER-9 ONLY)

Mode #5: Rate Decimal Point: Sets the decimal point on the Rate of Flow display from no decimal (off) to 0.000. You can also program the display to have a dead zero (----0), for a 5 digit display with the least significant digit always being "0".

```
6. 99.999
  ▼        R ▶
```

Mode #6: Pulse output scale factor: Multiplies the input pulses by a number - from 0.0001 to 99.9999 - and sends them to output terminals 6 & 7.
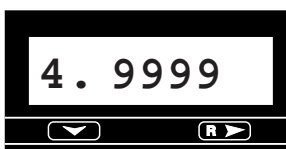
```
7.        on
  ▼        R ▶
```

The "7" value shown will be a "6" on the ER-8 unit.

(ER-9 ONLY)

```
8.        on
  ▼        R ▶
```

Mode #6/ER-8; Mode #7/ER-9: Front Panel Reset Enable: When programmed "on" the R ▶ key will reset the totalizer to zero when depressed. When programmed "off" the totalizer can only be reset through the remote reset input (see wiring)

Mode #8/ER-9: Pulse Output Enable: When active (on) the solid stay relay output will pulse to retransmit input pulses. If set to off, it will not activate (use the "off" setting to conserve battery life if not using the output.)

ER-8/ER-9/ER-8H Programming Calculations

TOTALIZER PROGRAMMING

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

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 Tech Brief (ITB) 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 PFT2 transmitter that has a pulse output of 126.7 pulses per gallon. You wish to read the totalizer to the nearest tenth gallon.

> $1/(126.7 \times 0.1) = \textbf{0.0789}$ **(scale factor)**

Step #1: Set the Totalizer Scale Factor to 0.0789. (Program Mode #1)

Step #2: Set the totalizer Decimal Point Factor to "0.0" (one decimal place) (Program Mode #2).

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, etc.

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 Tech Brief (ITB) 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 PFT2 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
> $= 60/126.7 = \textbf{0.473}$**(rate scale factor)**

Step #1: Set the rate scale factor decimal point to X.XXX (Program mode # 3)

Step #2: Set the rate scale factor to 0.473 (Program mode # 4)

Step #3: Since we are reading in whole gallons, set program mode # 5 (Rate Decimal Point) to "off".

PULSE OUTPUT PROGRAMMING (ER-9 Only)

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

Transmitter Pulses per Unit chart			
FT1 PFT2 PFT2E FT420	FT2 PFT3 FT1E PFT420		
Size (Inches)	Meter Model	Gallons	Liters
1/2	OP	223.0	58.9
1/2	OP(FT1 only)	111.5	29.4
1	OP	76.6	20.2
2	OP	20.6	5.4
2	IND'L TURBO	* 17.36	* 4.6
3	IND'L TURBO	* 12.4	* 3.2
4	IND'L TURBO	* 2.56	* 0.6
6	IND'L TURBO	* 1.08	* 0.2
5/8	25 IND RCDL	198.4	52.4
3/4	35 IND RCDL	126.7	33.5
1	40 IND RCDL	89.8	23.7
1	70 IND RCDL	46.8	12.4
1 1/2	120 IND RCDL	23.8	6.3
2	170 IND RCDL	14.6	3.9
3	TSM METER	1.598	0.422

*If using a PFT3E transmitter, multiply number by 2.

Troubleshooting

PROBLEM	POSSIBLE CAUSES	REMEDIES
Screen is blank	1. Battery is dead.	1. 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	1. Program enable jumper is not installed or installed improperly.	1. Install jumper.
Cannot reset from front panel	1. Reset enable is not programmed.	1. Reprogram mode to ON. #6, ER-8/#7, ER-9
Erroneous readings	1. Improperly programmed. 2. Defective transmitter.	1. Check programming. 2. Repair or replace transmitter.
No Pulse Output (ER-9 Only)	1. Defective output Transistor 2. Improper wiring	1. Replace ER-9 2. Check connections

For further assistance, call our Technical Support Staff at 1-877-243-1010.

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 on page 4.

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 "zero".

4. Run fluid into a weigh tank or calibrated vessel.

5. Determine number of pulses per gallon by dividing indicator reading by 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 was 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 5.

METER MOUNT SURFACING
(ER-8/ER-9)

OP
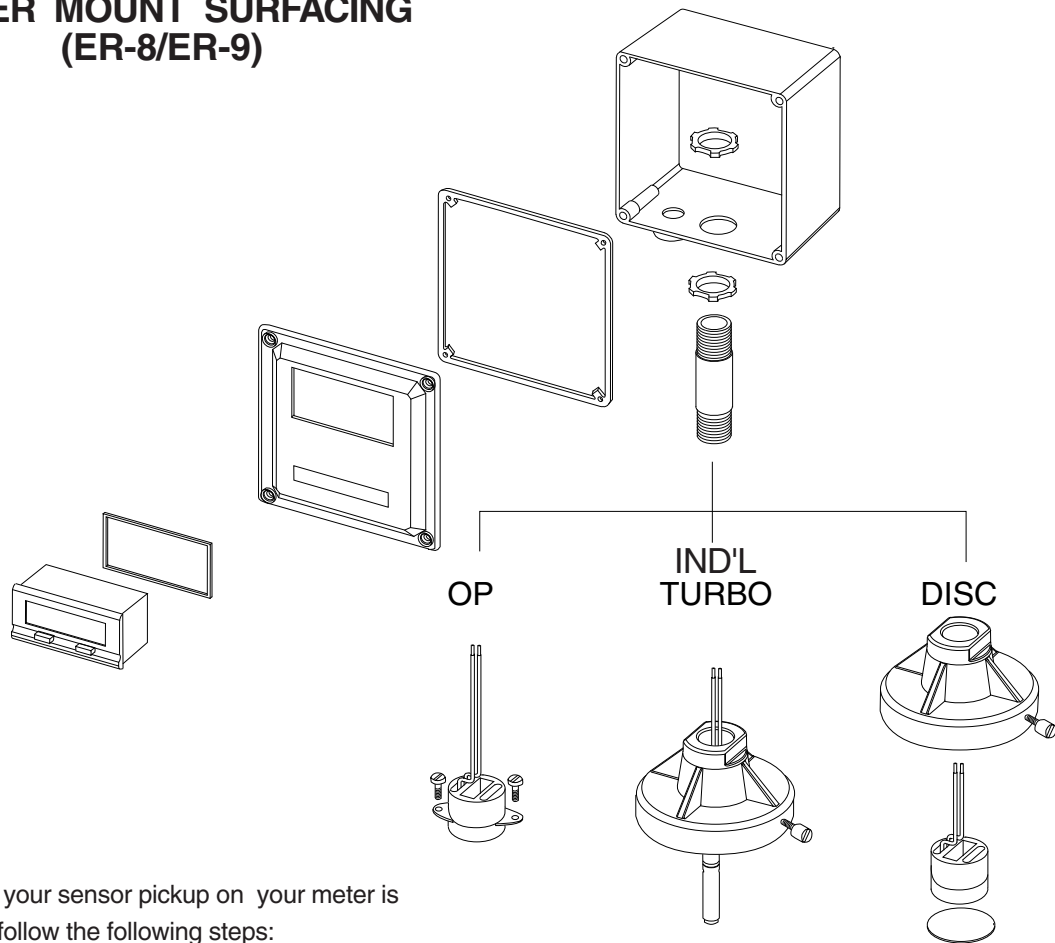
IND'L
TURBO

DISC

If replacement of your sensor pickup on your meter is required, please follow the following steps:

IND'L TURBO METER

1. Remove the front cover on the ER-8 or ER-9 unit and disconnect all wiring.
2. Remove meter head bolts and lift meter head assembly from housing.
3. Remove retaining ring which retains the accessory unit to the head.
4. Loosen the side seal screw on the accessory adapter, twist 90½ and pull entire assembly unit from the meter head.
5. Twist drop pipe in counterclockwise direction to remove it and the ER-8/9 unit from the adapter assembly.
6. Obtain new adapter assembly and reassemble to drop pipe and ER-8/9 unit.
7. Reverse the balance of the above steps.

DISC METER

1. Remove the front cover on the ER-8 or ER-9 unit and disconnect sensor wiring.
2. Loosen the side seal screw on the assembly adapter, twist 90½ and lift entire accessory unit off bare meter.

3. Pull the reed switch pickup assembly and pad from adapter.
4. Replace pickup and pad in adapter, feeding wires up through the drop pipe.
5. Reposition entire assembly on meter.
6. Rewire sensor to ER-8/9 unit.

OP METER

1. Remove the front cover on the ER-8 or ER-9 unit and disconnect sensor wiring.
2. Remove the back plate on the meter to expose the pickup assembly.
3. Remove the reed switch pickup assembly and replace.
4. Feed wires up through the drop pipe.
5. Reassembly the back plate in position.
6. Rewire sensor wires to ER-8/9 unit.

Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists.

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