



### SUGGESTED TOOLS

- Electric Drill
- 3/16" Carbide Tip Masonry Drills
- Screw Driver
- Wire Stripper
- T-10 Stapler with Cable Attachment
- 59983-001 Crimping Tool
- 59989-001 Cable Stripper
- 59991-001 Wire Cutting Pliers

### MISCELLANEOUS PARTS PROVIDED

- Two Wire Connectors
- Seal Screw
- Strain Relief Ring
- Units of Measure Label

### REQUIRED MATERIAL

- Non-Corrosive Staples
- Caulking Compound
- Masonry Fasteners
- Non-Corrosive Screws
- 62440-001 Belden 8451 Wire if proper length not supplied with RTR®

### IDENTIFICATION

The Model RED (Remote Electronic Display) remote reading registers are designed for use with all Badger® Recordall® Disc, Turbo, Compound and Fire Series meters equipped with RTR® registers, plus the Badger Magnetoflow® meter.

### REGISTER INSTALLATION

While the RED electronics and battery are environmentally sealed and suitable for outdoor installation, the wire terminals are not sealed from moisture. The unit, therefore, should not be installed in locations below grade level or in a submersible environment.

1. Remove register cover.



2. Using the register base as a template, locate and mark mounting holes on outside wall of building. For best results the RED should be located at eye level in an easily accessible location.

3. Secure register base to wall using the mounting dimensions in the drawing below to drill the locating holes.

NOTE: Avoid mounting register on loose siding of any type since this will only lead to wire breakage or other potential problems. (Register mounting hardware is supplied by the customer).

4. Drill a 3/16" wire entry hole at a suitable location in the building wall.

5. Run the wire from the meter-mounted RTR through the hole in the wall to the Remote Electronic Display register.

6. Cut the wire to proper length at the register, allowing sufficient wire for connection to the register. Maximum wire length between the RTR and the RED register is 3000 feet using Belden 8451 wire.

NOTE: Wire access to the Remote Electronic Display register is through a bottom access port. Allow sufficient wire to form a small U-shaped loop where the wire enters the building. The loop eliminates the possibility of rainwater running down the wire into the building.

7. Place the strain relief ring around the RTR lead wire and secure.
8. Carefully remove about 1-1/2" of the outer sheath of the RTR lead wire, up to the strain relief ring; avoid cutting the lead wires or the insulation of the wires. Strip about 1/2" of the insulation from both RTR lead wires.
9. Remove any temporary protective material from the register base using the two register terminal screws. Do not tighten down the screws yet.
10. Connect the RTR cable conductors to the RED wires using the wire connectors provided in the installation kit. Crimp the cables completely using a parallel jaw crimper such as the Badger Meter P/N 59983-001. Polarity must be observed when connecting the RTR to the RED wires: red (+) to red, black (-) to black. Make sure to place the wire connector and strain relief in the rectangular recess of the base.
11. Attach register cover to register base with the Seal screw. The Seal screw is designed to discourage and identify tampering.
12. Secure the entire length of wire run from the RTR to the RED to complete a neat installation.
13. The complete system (meter, RTR, RED, and wire) should be performance tested to insure proper installation. Refer to performance check section of this bulletin for procedures.

## PROGRAMMING INSTRUCTIONS

Since the Badger RTR is an incremental encoder, RED must be programmed to match the meter reading upon installation. From that point forward the incremental pulses from the meter should keep the RED in sync with it. Programming the RED clears any existing "tamper" error flag.

1. After connecting the RED to the RTR, tap the circular gold disk on the front of the RED display.
2. If the message "PROGRAMNG REQUIRED" appears, the RED has never been programmed since power was applied, or has gone through reset. The current meter reading must be programmed.
3. To enter PROGRAMMING MODE, tap the display to turn it on, then when it is displaying either a meter reading or the "PROGRAMNG REQUIRED" message, tap the following password into the display:

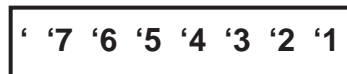
- 8 taps
- 3 taps
- 7 taps
- 2 taps

Wait after each tap until one of the small comma symbols (dots) near the top left corner of each display digit lights up acknowledging your tap, then tap again. Keep tapping until the number of dots above the digits corresponds to the number of taps in the current password digit. For example, if 3 password taps have been received, then 3 digits will have a small dot lit above them. The following shows 3 dots above the digits, so 3 of 8 password taps have been acknowledged so far:

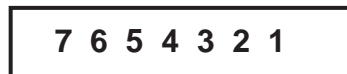


4. After all the taps have been acknowledged for the first password digit, wait a few seconds for the dots to disappear, then start tapping in the next digit. Repeat until all 4 of the password digits stated above have been tapped in. The following shows correct entry of all 4 password digits:

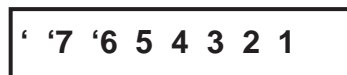
8 acknowledged taps:



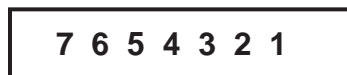
Wait for dots to disappear:



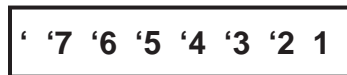
3 acknowledged taps:



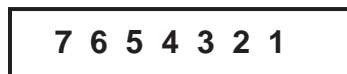
Wait for dots to disappear:



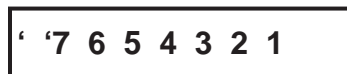
7 acknowledged taps:



Wait for dots to disappear:



2 acknowledged taps:



5. After all of the password digits have been tapped in successfully, the display will show the message "PROGRAM MODE". If the meter is not connected properly a diagnostic message is issued at this point, otherwise proceed as follows with programming of the digits.

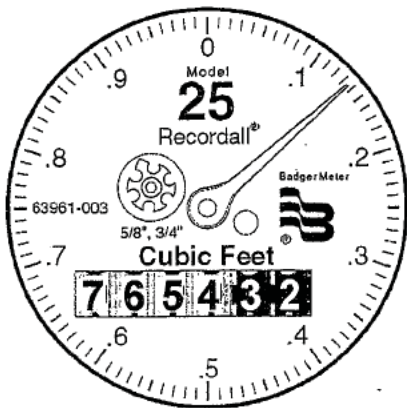
6. A digit will appear near the left side. This is the first (left-most) digit of the meter to be programmed in (this will be 2nd digit from left on display, since far left digit is reserved for "E" tamper error character). Tap to increment the digit until it equals the left-most odometer digit of the meter (if the left-most meter digit is already correct no taps need to be entered). To correct a mistake keep tapping until the digit rolls over from 9 back to 0 and then counts upward again to the desired digit.



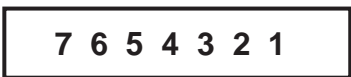
7. After 4 seconds of no tapping, the next digit to the right will illuminate. Tap until this digit matches the corresponding meter digit (second from left). Wait at least 4 seconds to move to the next digit.



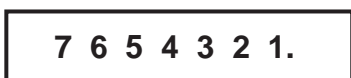
8. Continue tapping in digits to match the meter's movable odometer digits. When reaching the 7th digit from the left (the right-most digit) on the RED display, tap to make its value match the sweep hand of the meter. The value of the far right digit should be the next lower major division of the sweep hand (not rounded up, but truncated down). The major divisions of the round sweep dial are numbered 0 through 9, possibly multiplied or divided by a power of 10. In the example below the sweep hand is read as "1:"



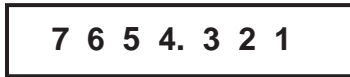
Digits programmed into RED display corresponding to above meter reading:



9. Next, a decimal point will show up at the far right of the display to the right of the right most digit. Tap the display to move the decimal point 1 digit to the left for each tap (wait until the decimal point moves before tapping again).



10. Tap until the decimal point is to the right of the least significant billing digit. For example, for the meter displayed above, if the utility wishes to bill in units of hundreds of cubic feet of water (the first 4 digits only, which happen to be white), the decimal point should be moved to the right of the 4th digit from the left, which is between the numbers "4" and "3" in the example above. After tapping the decimal point into position the RED display looks like:



The billing digits clearly read "7654" since they are to the left of the decimal point.

11. Wait until the display blanks.

12. Run enough water through the meter to advance the sweep hand to just past the next labelled digit. Tap the circular disk to display the meter reading. Check to make certain that the reading is correct. The display will dynamically update the reading until the display turns off (after 20 sec).

NOTE: The RED software version displays briefly before the display turns off.

## READING THE METER

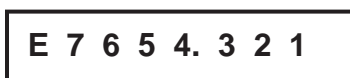
1. Tap the circular disk on the front of the display.

2. Write down the digits shown which are to the left of the decimal point. This is the meter reading for billing purposes.

The display will be immediately updated if the meter reading changes while the display is active, so it is possible to watch the digits change as water is used.

After the reading has been displayed for 20 seconds, the software version is displayed for 2 seconds, then the display turns off. The reading is re-displayed if the housing is tapped either during the RED version display or after the display turns off. Don't tap during the meter reading display unless you wish to enter the programming password and reprogram the value.

If the cable between RED and the meter has been disconnected or shorted since last programmed, an "E" will appear at the far left side of the reading, indicating that the reading may be erroneous. This tamper error flag can only be cleared by reprogramming the RED as described in "Installing the RED" above. The following example shows the TAMPER error indicator turned on:



## RED USER ERROR MESSAGES

The display will indicate one of the following messages if an error is encountered during programming of a meter reading:

MESSAGE	DESCRIPTIONS
CHECK WIRING, OPEN CIRCUIT	One or both wires are disconnected. Check wiring connections between RED and the register
CHECK WIRING, REVERSE POLARITY	The red and black wires appear to have been reversed. Check for proper polarity of connection.
CHECK WIRING, SHORT CIRCUIT	The red and black wires appear to be shorted together somewhere.
INTERNAL (SOMETHING)	An internal error has occurred. Contact the manufacturer.

An "E" (for "Error") will display to the left of the meter reading if tampering has occurred by either disconnecting or short-circuiting the two wires between the RED and the meter register. This "E" is displayed until the RED is reprogrammed.

## ADDITIONAL INSTALLATION TIPS

- Never short yourself on wire. It is better to have a little excess than to have to go back and rewire.
- If the RED is replacing an existing Read-o-Matic® display, do not use the existing interface wiring. You will need to replace it with new RTR wire (Belden 8451).
- If after wiring, unit does not operate, check for bare wires touching each other.
- When stapling wire, be careful not to pierce covering. This could short out unit.
- When installing the unit on buildings having a stone or masonry exterior, the use of masonry cleats and fasteners is required. After determining register location, use a 3/16" carbide-tip masonry bit and drill two register mounting holes. Insert masonry cleats and attach register with round head screws.

## PERFORMANCE CHECK

The RED installation should be checked for proper operation by using one of the following methods:

NOTE: If meter is installed backwards, the RTR transmitter will not send a signal to the RED remote register. To insure meter is installed correctly, flow arrow on meter should point in direction of water flow.

- Meter Test — Run an adequate amount of water through the meter and observe that the RED register records correctly.
- Ohm Meter Test — Once the complete system is wired, it is important to check for continuity using an ohm meter. Connect the ohm meter across the RED terminals. An "open" should be indicated. When operating the RTR the ohm meter should show a momentary voltage deflection toward zero when the RTR sends a signal.

THIS DEVICE COMPLIES WITH PART 15 OF FCC RULES. OPERATION OF THIS DEVICE IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE. (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRE OPERATION.

## RED MULTIPLIERS FOR VARIOUS UNITS OF MEASURE AND METER SIZES

NOTE: Always verify the Test Circle (the value of the full 360-degree sweep of the register hand) for your particular RTR before using these tables.

### Gallons

### Cubic Feet

#### RECORDALL Disc Meters

Meter Size		Unit of Measure	RTR Test Circle (gal)	RTR Resolution (gal)
M25	5/8", 3/4"	Gallons	10	1
M35	3/4"	Gallons	10	1
M40	1"	Gallons	10	1
M70	1"	Gallons	10	1
M70	1-1/2"	Gallons	100	10
M120	1-1/2"	Gallons	100	10
M170	2"	Gallons	100	10
M180	2"	Gallons	100	10

Meter Size		Unit of Measure	RTR Test Circle	RTR Resolution
M25	5/8", 3/4"	Cubic Feet	0.1	1
M35	3/4"	Cubic Feet	0.1	1
M40	1"	Cubic Feet	0.1	1
M70	1"	Cubic Feet	0.1	1
M70	1-1/2"	Cubic Feet	1	10
M120	1-1/2"	Cubic Feet	1	10
M170	2"	Cubic Feet	1	10
M180	2"	Cubic Feet	1	10

#### RECORDALL Turbo Series Meters

Meter Size		Unit of Measure	RTR Test Circle (gal)	RTR Resolution (gal)
T160	1-1/2"	Gallons	1000	100
T200	2"	Gallons	1000	100
T450	3"	Gallons	1000	100
T1000	4"	Gallons	1000	100
T2000	6"	Gallons	1000	100
T3500	8"	Gallons	1000	100
T5500	10"	Gallons	1000	100
T6200	12"	Gallons	10000	1000
T6600	16"	Gallons	10000	1000
T10000	20"	Gallons	10000	1000

Meter Size		Unit of Measure	RTR Test Circle	RTR Resolution
T160	1-1/2"	Cubic Feet	100	10
T200	2"	Cubic Feet	100	10
T450	3"	Cubic Feet	100	10
T1000	4"	Cubic Feet	100	10
T2000	6"	Cubic Feet	100	10
T3500	8"	Cubic Feet	100	10
T5500	10"	Cubic Feet	100	10
T6200	12"	Cubic Feet	1000	100
T6600	16"	Cubic Feet	10000	100
T10000	20"	Cubic Feet	1000	1000

#### RECORDALL Turbo II Meters

Meter Size		Unit of Measure	RTR Test Circle (gal)	RTR Resolution (gal)
T200	2"	Gallons	1000	100
T450	3"	Gallons	1000	100
T1000	4"	Gallons	1000	100
T2000	6"	Gallons	1000	100
T3500	8"	Gallons	1000	100
T5500	10"	Gallons	1000	100
T6200	12"	Gallons	10000	1000
T6600	16"	Gallons	10000	1000
T10000	20"	Gallons	10000	1000

Meter Size		Unit of Measure	RTR Test Circle (gal)	RTR Resolution (gal)
T200	2"	Cubic Feet	100	10
T450	3"	Cubic Feet	100	10
T1000	4"	Cubic Feet	100	10
T2000	6"	Cubic Feet	100	10
T3500	8"	Cubic Feet	100	10
T5500	10"	Cubic Feet	100	10
T6200	12"	Cubic Feet	1000	100
T6600	16"	Cubic Feet	1000	100
T10000	20"	Cubic Feet	1000	100

## Cubic Meters

### RECORDALL Disc Meters

Meter Size		Unit of Measure	RTR Test Circle (gal)	RTR Resolution
M25	5/8", 3/4"	Cubic Meter	0.1	0.01
M35	3/4"	Cubic Meter	0.1	0.01
M40	1"	Cubic Meter	0.1	0.01
M70	1"	Cubic Meter	0.1	0.01
M70	1-1/2"	Cubic Meter	1	0.1
M120	1-1/2"	Cubic Meter	1	0.1
M170	2"	Cubic Meter	1	0.0
M180	2"	Cubic Meter	1	0.1

### RECORDALL Turbo Series Meters

Meter Size		Unit of Measure	RTR Test Circle	RTR Resolution
T160	1-1/2"	Cubic Feet	1	0.1
T200	2"	Cubic Feet	1	0.1
T450	3"	Cubic Feet	1	0.1
T1000	4"	Cubic Feet	1	0.1
T2000	6"	Cubic Feet	10	1
T3500	8"	Cubic Feet	10	1
T5500	10"	Cubic Feet	10	1
T6200	12"	Cubic Feet	10	1
T6600	16"	Cubic Feet	10	10
T10000	20"	Cubic Feet	100	10

### RECORDALL Turbo II Meters

Meter Size		Unit of Measure	RTR Test Circle (gal)	RTR Resolution
T200	2"	Cubic Feet	1	0.1
T450	3"	Cubic Feet	1	0.1
T1000	4"	Cubic Feet	1	0.1
T2000	6"	Cubic Feet	10	1
T3500	8"	Cubic Feet	10	1
T5500	10"	Cubic Feet	100	10
T6200	12"	Cubic Feet	100	10
T6600	16"	Cubic Feet	10	1
T10000	20"	Cubic Feet	10	1

Intentional Blank Page

Recordall® and RTR® are registered trademarks of Badger Meter, Inc.  
Copyright 2010, Badger Meter, Inc. All rights reserved.



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.

---

**Badger Meter | P.O. Box 245036, Milwaukee, Wisconsin 53224-9536**  
**800-876-3837 | [infocentral@badgermeter.com](mailto:infocentral@badgermeter.com) | [www.badgermeter.com](http://www.badgermeter.com)**