High Resolution LCD Registers

HR-LCD 4-20 scaled/unscaled, HR-LCD Pulse

REG-UM-02466-EN-03 (March 2022)

User Manual

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INTRODUCTION

This is the user manual for the High Resolution (HR) LCD registers.

Audience and Purpose

This manual is intended to be used by customers for installing and using the HR-LCD 4-20 scaled/unscaled and pulse registers.

Product Unpacking and Inspection

Upon opening the shipping container, visually inspect the product and applicable accessories for any physical damage such as scratches, loose or broken parts, or any other sign of damage that may have occurred during shipment.

NOTE: If damage is found, request an inspection by the carrier's agent within 48 hours of delivery and file a claim with the carrier. A claim for equipment damage in transit is the sole responsibility of the purchaser.

License Requirements

This device complies with Part 15 of the FCC Rules. Operation of this device is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Any changes made by the user not approved by Badger Meter can void the user's authority to operate the equipment.

Additional Resources

Refer to the document, *High Resolution LCD Register Programmer Manual*, available at *badgermeter.com*, to see programming instructions for the HR LCD registers.

DESCRIPTION

High resolution registers are fully electronic, solid-state devices with no moving parts. The devices come standard as factory programmed, with the option for programming in the field. Programming is performed through the device IR port via a computer. The programming kit with software CD (**PN: 67660-001**) or programming kit with USB (**PN: 68468-001**) can be ordered through Customer Service.

HR-LCD 4-20 scaled/unscaled

The HR-LCD 4-20 scaled/unscaled is a permanently sealed, electronic LCD register that produces a scaled/unscaled output as well as an analog 4-20 mA DC output signal with a dual output wire design. HR-LCD 4-20 scaled/unscaled registers are designed for use with all current Badger Meter Recordall® Disc, Turbo Series, Compound Series, and Combo Series meters and assemblies.

HR-LCD Pulse

The HR-LCD pulse register is a permanently sealed, electronic LCD register that produces a scaled output with a single output wire design. HR-LCD pulse registers are designed for use with all current Badger Meter Recordall® Disc, Turbo Series, Compound Series, and Combo Series meters and assemblies.

PRODUCT OVERVIEW

LCD Display

HR-LCD registers have a nine-digit Liquid Crystal Display (LCD) to show consumption, flow and alarm information.

There is no need to activate the display. The display automatically toggles between consumption (segmented leak detector in this mode), rate of flow and meter model.

NOTE: Devices are shipped in storage mode so that a meter status alarm is not triggered. In storage mode, the meter model screen is displayed.

Multiplier Value

Depending on the meter model, size and unit of measure, a multiplier value may also be shown. Multiply the displayed value by the multiplier value to calculate the reading to the nearest gallon, cubic foot, or cubic meter.
Example: 123456 (displayed value) x 10 (multiplier value) = 1234560

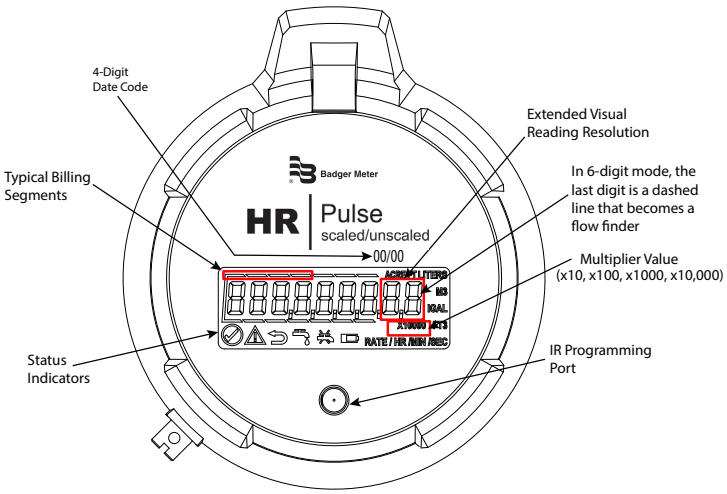

Figure 1: HR LCD register face

Visual Display

Units of Measure

The units of measure are factory-programmed and user-programmable. Options include U.S. gallons, Imperial gallons, cubic feet, cubic meters and liters.

9-Digit Totalization

The consumption display includes all nine digits and a decimal point (based on meter model, size and unit of measure). The displayed value is the sum of the forward flow minus any reverse flow. This screen displays for 45 seconds.

Model 25 Disc Series Meter Calibrated in Gallons

Rate of Flow

The rate of flow is factory programmed to gallons per minute. The device displays both the unit of measure and rate of flow. The rate of flow display is shown without leading zeros. A reverse flow is indicated by a minus sign before the flow rate. The displayed rate will be based on the average flow rate for the prior minute (since the last time the flow rate was displayed). This screen displays for 5 seconds.

Model 25 Disc Series Meter Calibrated in Gallons

Meter Model Information

The meter model information screen identifies the meter for which the register was programmed and displays for 5 seconds. The display shows the meter type (turbo, disc, compound), the meter model, digit resolution from the device, and the unit of measure (gal, ft^3, m^3, imp, liter). Disc meters are indicated by a **d**, Turbo meters are indicated by a stylized **T** (only the right half of the horizontal line appears) and Compound meters are indicated by a **C**. See examples below:

Model 25 Disc Series Meter Calibrated in Gallons

Model 450 Turbo Series Meter Calibrated in Gallons

2 in. Low Side Compound Series Meter Calibrated in Cubic Feet

The meter model information screen also displays the digit resolution sent from the register.

INSTALLING THE REGISTER

Bayonet Mount

The fully potted assembly has a bayonet mount compatible with all Recordall Disc, Turbo Series, Compound Series, and Combo Series meters and assemblies.

The bayonet mount allows you to position the register in any of four orientations for visual reading convenience. The device can be removed from the meter without disrupting water service.

The device is permanently sealed to eliminate the intrusion of moisture, dirt or other contaminants, and is suitable for installation in all environments, including meter pits subject to continuous submergence.

Install the device on the water meter and secure it using the tamper-proof screw provided.

NOTE: The registers are not compatible with the ORION® family of endpoints.

HR-LCD 4-20 SCALED/UNSCALED

The HR-LCD 4-20 scaled/unscaled is a permanently sealed, electronic LCD register that produces a scaled/unscaled output as well as an analog 4-20 mA DC output signal with a dual output wire design. Refer to *Figure 2*.

Wire Connections

- **Scaled/unscaled side cable (**Flying lead for field splice connection)
  - ◊ For a scaled output, connect the **red** wire (positive) and the **black** wire (negative).
  - ◊ For an unscaled output, connect the **green** wire (positive) and the **black** wire (negative).

  NOTE: The unscaled output will be active only when the device is powered by the 4-20 output.
- **4-20 mA side cable (**Flying lead for field splice connection)

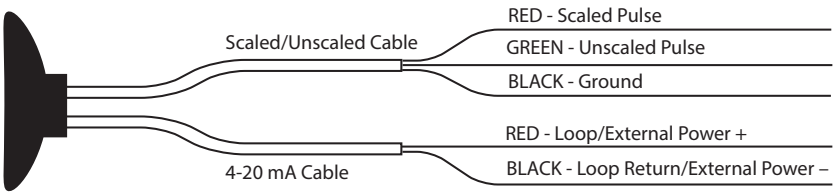

Figure 2: HR-LCD 4-20 scaled/unscaled wiring

Measurement Resolution

Recordall Disc Series	Size (in.)	Scaled (pulse/unit)			Unscaled (pulse/unit)			Analog Output
		gal	ft³	m³	gal	ft³	m³	20 mA Set point (gpm)
LP	5/8	1	10	100	228.415	1708.661	60337.105	20
M25	5/8	1	10	100	198.334	1483.641	52391.084	25
M35	3/4	1	10	100	126.678	947.621	33462.863	35
M40	1	1	10	100	89.783	671.621	23716.632	40
M55	1	1	10	100	58.065	434.358	15338.279	55
M70	1	1	10	100	46.773	349.884	12355.278	70
M120	1-1/2	0.10	1	10	23.866	178.533	6304.435	120
M170	2	0.10	1	10	14.565	108.950	3847.303	170

Recordall Turbo Series	Size (in.)	Scaled (pulse/unit)			Unscaled (pulse/unit)			Analog Output
		gal	ft³	m³	gal	ft³	m³	20 mA Set point (gpm)
T160	1-1/2	0.10	1	10	1.537	11.494	405.894	200
T200	2	0.10	1	10	1.537	11.494	405.894	310
T450	3	0.10	1	10	1.598	11.954	422.109	550
T1000	4	0.10	1	10	1.665	12.455	439.820	1250
T2000	6	0.01	0.10	1	0.150	1.123	39.639	2500
T3500	8	0.01	0.10	1	0.151	1.131	39.939	4500
T5500	10	0.01	0.10	1	0.198	1.481	52.308	7000
T6200	12	0.001	0.01	0.10	0.129	0.963	34.006	8800
T6600	16	0.001	0.01	0.10	0.016	0.116	4.107	13200
T1000	20	0.001	0.01	0.10	0.009	0.067	2.382	19800

Recordall Compound Series	Size (in.)	Scaled (pulse/unit)			Unscaled (pulse/unit)			Analog Output
		gal	ft³	m³	gal	ft³	m³	20 mA Set point (gpm)
High Side T200	2	0.10	1	10	1.537	11.494	405.894	200
Low Side M25	2	1	10	100	198.334	1483.641	52391.084	25
High Side T450	3	0.10	1	10	1.598	11.954	422.109	450
Low Side M25	3	1	10	100	198.334	1483.641	52391.084	25
High Side T1000	4	0.10	1	10	1.665	12.455	439.820	1000
Low side M35	4	1	10	100	126.678	947.621	33462.863	35
High Side T2000	6	0.01	0.10	1	0.150	1.123	39.639	2000
Low Side M35	6	1	10	100	126.678	947.621	33462.863	35
High Side T3500	8	0.01	0.10	1	0.151	1.131	39.939	—
Low side M120	8	0.10	1	10	23.866	178.533	6304.435	—

Specifications HR-LCD 4-20 scaled/unscaled

Register Type	Permanently sealed, electronic LCD register with scaled/unscaled and analog output, as well as a field-programmable option
Register Display	Status indicators, unit of measure, billing units, automatic toggle between 9-digit consumption, rate of flow, meter model
Unit of Measure	U.S. gallons, Imperial gallons, cubic feet, cubic meters, and liters
Flow Rate	Seconds, minutes, and hours
Numerals	7 mm (0.28 in.) high
Weight	11 ounces
Humidity	0…100% condensing
Temperature	Storage: – 40…140° F (– 40…60° C) Max. ambient for 1 hr: 150° F (66° C) Electronics & Display: 14…140° F (–10…60° C)
Status Indicators	Visual icons for: meter functioning correctly, meter alarm (indicates temperature limits exceeded, magnetic tamper or register removal), reverse flow, suspected leak, 30-day no usage, end of battery life
Scaled/Unscaled Output	Solid-state relay
Max. Voltage	30V DC
Current	100 mA
Pulse Width	50 ms (programmable 30…100 ms)
Analog Output	Two-wire/passive
Input Voltage Range	9…50V DC supply
Current	4…20 mA
Max. Load Resistance (Ohms)	50 Ohms + 50 Ohms (supply voltage - 9V)
Battery	Lithium thionyl chloride AA cell, fully encapsulated within register housing
Battery Life	10 years based on default settings and typical operating range

Scaled Output

- Scaled output is a switch closure output defined as: **red** wire = positive, **black** wire = negative.
- Scaled digital output from the register has a default resolution of 1/10th of the register test circle (resolution may vary in some cases).
- The movement of the meter magnet is converted to a square wave signal that is available as a scaled output through a solid-state relay.
- Scaled output is a solid-state relay to provide isolation from the 4-20 mA output.
- The nominal pulse output width is programmable from 30…100 msec.
- The resolution of the output is defined in the registration section.
- This digital pulse output is compatible with most totalizers and batch controllers.

Unscaled Output

- Unscaled output is a switch closure output defined as: **green** wire = positive, **black** wire = negative
- The movement of the meter magnet is converted to a square wave signal that is available as an unscaled output through a solid-state relay.
- Unscaled output is a solid state relay to provide isolation from the 4-20 mA output.
- The resolution of the output is defined in the registration section.
- The unscaled output will only be active when the device is powered by the 4-20 mA output.
- This digital pulse output is compatible with most totalizers and batch controllers.

Analog Output

- The input pulses generated within the transmitter assembly are converted to a standard 4-20 mA control signal.
- This signal is proportional to the flow of fluid passing through the flow meter.
- Power for the device can be obtained from a 9…50V DC control loop.
- The default 20mA setting of the signal is defined in the registration section.

HR-LCD PULSE

The HR-LCD pulse is a permanently sealed, electronic LCD register that produces a scaled output. The HR-LCD scaled pulse register is available with a single output wire connection. Refer to *Figure 3*.

Wire Connections

Scaled output cable (Flying lead for field splice connection)

- For power, connect the **red** wire (positive) and the **black** wire (negative).
- For signal, connect the **green** wire (positive) and the **black** wire (negative).

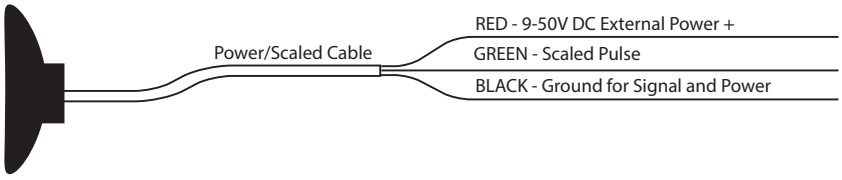

Figure 3: HR-LCD pulse wiring

Measurement Resolution

Recordall Disc Series	Size (in.)	Scaled (pulse/unit)		
		gal	ft³	m³
LP	5/8	1	10	100
M25	5/8	1	10	100
M35	3/4	1	10	100
M40	1	1	10	100
M55	1	1	10	100
M70	1	1	10	100
M120	1-1/2	0.10	1	10
M170	2	0.10	1	10

Recordall Turbo Series	Size (in.)	Scaled (pulse/unit)		
		gal	ft³	m³
T160	1-1/2	0.10	1	10
T200	2	0.10	1	10
T450	3	0.10	1	10
T1000	4	0.10	1	10
T2000	6	0.01	0.10	1
T3500	8	0.01	0.10	1
T5500	10	0.01	0.10	1
T6200	12	0.001	0.01	0.10
T6600	16	0.001	0.01	0.10
T1000	20	0.001	0.01	0.10

Recordall Compound Series	Size (in.)	Scaled (pulse/unit)		
		gal	ft³	m³
High Side T200	2	0.10	1	10
Low Side M25	2	1	10	100
High Side T450	3	0.10	1	10
Low Side M25	3	1	10	100
High Side T1000	4	0.10	1	10
Low side M35	4	1	10	100
High Side T2000	6	0.01	0.10	1
Low Side M35	6	1	10	100
High Side T3500	8	0.01	0.10	1
Low side M120	8	0.10	1	10

Specifications HR LCD Pulse

Register Type	Permanently sealed, electronic LCD register with scaled output, as well as a field-programmable option
Register Display	Status indicators, unit of measure, billing units, automatic toggle between 9-digit consumption, rate of flow, meter model
Unit of Measure	U.S. gallons, Imperial gallons, cubic feet, cubic meters, and liters
Flow Rate	Seconds, minutes, and hours
Numerals	7 mm (0.28 in.) high
Weight	11 ounces
Humidity	0…100% condensing
Temperature	Storage: – 40…140° F (– 40…60° C) Max. ambient for 1 hr: 150° F (66° C) Electronics & Display: 14…140° F (–10…60° C)
Status Indicators	Visual icons for: meter functioning correctly, meter alarm (indicates temperature limits exceeded, magnetic tamper or register removal), reverse flow, suspected leak, 30-day no usage, end of battery life
Scaled Output	Solid-state relay
Max. Voltage	30V DC
Current	100 mA
Pulse Width	50 ms (programmable 30…100 ms)
Power	
Input Voltage Range	9…50V DC supply
Max. Load Resistance (Ohms)	50 Ohms + 50 Ohms (supply voltage - 9V)
Battery	Lithium thionyl chloride AA cell, fully encapsulated within register housing
Battery Life	10 years based on default settings and typical operating range

Scaled Output

- Scaled output is a switch closure output defined as: **green** wire = positive, **black** wire = negative.
- Scaled digital output from the register has a default resolution of 1/10th of the register test circle (resolution may vary in some cases).
- The movement of the meter magnet is converted to a square wave signal that is available as a scaled output through a solid-state relay.
- Scaled output is a solid-state relay.
- The nominal pulse output width is programmable from 30…100 msec.
- The resolution of the output is defined in the registration section.
- This digital pulse output is compatible with most totalizers and batch controllers.

Power

- Power for the device can be obtained from a 9…50V DC control loop.

STATUS INDICATORS

Status indicators for the HR-LCD 4-20 scaled/unscaled and pulse registers are described in the table.

Status Indicator	Icon	Status Description	HR LCD Display
Meter functioning correctly		Register operating correctly.	Continuous display on register as long as no other status indicators are triggered.
Register alarm		Several potential conditions may exist, including: Register removal Temperature limit exceeded (34…140° F) Magnetic tamper	Register alarm remains active for 35 days. The alarm automatically clears after 35 days if any of the 3 conditions has not recurred.
Reverse flow		Register detects reverse flow.	Reverse flow alarm remains active for 35 days. The alarm automatically clears after 35 days if reverse flow condition has not recurred.
Suspected leak		Register detects 24 hours without one 15-minute interval of no flow.	The alarm clears automatically when a 15-minute no-flow interval occurs.
30 day no usage		No measured flow in past 30 days.	The alarm is automatically cleared once flow occurs.
End of life battery indicator		Indicated battery life based on pre-calculated consumption.	Alarm activated at 9.5 years and does not clear.

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