

CITY OF ANN ARBOR
INVITATION TO BID



Residential and Special Use Water Meters

ITB No. 4708

Due Date: February 2, 2022 at 2:00 PM (Local Time)

Public Services Area
Public Works Unit

Issued By:

City of Ann Arbor
Procurement Unit
301 E. Huron Street
Ann Arbor, MI 48104

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ATTACHMENTS

- City of Ann Arbor Standard Purchase Order Terms and Conditions*
- City of Ann Arbor Vendor Conflict of Interest Disclosure Form*
- City of Ann Arbor Non-Discrimination Ordinance Declaration Form and Notice*
- Badger Meter HR-RED High Resolution Remote Electronic Display Data Sheet*
- Badger Meter HR-RED High Resolution Remote Electronic Display Install Data*

INSTRUCTIONS TO BIDDERS

General

Work to be done under this Contract is generally described through the detailed specifications and must be completed fully in accordance with the contract documents. All work to be done under this Contract is located in or near the City of Ann Arbor.

Any Bid which does not conform fully to these instructions may be rejected.

Preparation of Bids

Bids should be prepared providing a straight-forward, concise description of the Bidder's ability to meet the requirements of the ITB. Bids shall be written in ink or typewritten. No erasures are permitted. Mistakes may be crossed out and corrected and must be initialed and dated in ink by the person signing the Bid.

Bids must be submitted on the "Bid Forms" provided with each blank properly filled in. If forms are not fully completed it may disqualify the bid. No alternative bid will be considered unless alternative bids are specifically requested. If alternatives are requested, any deviation from the specification must be fully described, in detail on a clearly marked "Alternate" section of Bid form.

Each person signing the Bid certifies that he/she is the person in the Bidder's firm/organization responsible for the decision as to the fees being offered in the Bid and has not and will not participated in any action contrary to the terms of this provision.

Questions or Clarifications / Designated City Contacts

All questions regarding this ITB shall be submitted via email. Emailed questions and inquires will be accepted from any and all prospective Bidders in accordance with the terms and conditions of the ITB.

All questions shall be due on or before **January 21, 2022 @ 10:00 a.m.** and should be addressed as follows:

Specification/Scope of Work questions emailed to Alison Heatley, Aheatley@a2gov.org
Bid Process and Compliance questions emailed to Colin Spencer, CSpencer@a2gov.org

Any error, omissions or discrepancies in the specification discovered by a prospective contractor and/or service provider shall be brought to the attention of Colin Spencer at cspencer@a2gov.org after discovery as possible. Further, the contractor and/or service provider shall not be allowed to take advantage of errors, omissions or discrepancies in the specifications.

Addenda

If it becomes necessary to revise any part of the ITB, notice of the Addendum will be posted to Michigan Inter-governmental Trade Network (MITN) www.mitn.info and/or City of Ann Arbor web site www.A2gov.org for all parties to download.

Each Bidder must in its Bid, to avoid any miscommunications, acknowledge all addenda which it has received, but the failure of a Bidder to receive, or acknowledge receipt of; any addenda shall not relieve the Bidder of the responsibility for complying with the terms thereof.

The City will not be bound by oral responses to inquiries or written responses other than written addenda.

Bid Submission

All Bids are due and must be delivered to the City of Ann Arbor Procurement Unit **on or before February 2, 2022 at 2:00 p.m. (local time)**. Bids submitted late or via oral, telephonic, telegraphic, electronic mail or facsimile **will not** be considered or accepted.

Each Bidder must submit one (1) original Bid and one (1) Bid copy in a sealed envelope clearly marked: ITB No. 4708 – Residential and Special Use Water Meters.

Bids must be addressed and delivered to:

City of Ann Arbor
Procurement Unit,
c/o Customer Services, 1st Floor
301 East Huron Street
Ann Arbor, MI 48104

All Bids received on or before the Due Date will be publicly opened and recorded immediately. No immediate decisions are rendered.

The following forms provided within this ITB Document should be included in submitted bids.

- **Vendor Conflict of Interest Disclosure Form**
- **City of Ann Arbor Non-Discrimination Ordinance Declaration of Compliance**

Bids that fail to provide these forms listed above upon bid opening may be rejected as non-responsive and may not be considered for award.

Hand delivered bids may be dropped off in the Purchasing drop box located in the Ann Street (north) vestibule/entrance of City Hall which is accessible to the public at all hours. The City will not be liable to any Bidder for any unforeseen circumstances, delivery or postal delays. Postmarking to the Due Date will not substitute for receipt of the Bid. Each Bidder is responsible for submission of their Bid.

Additional time for submission of bids past the stated due date and time will not be granted to a single Bidder; however, additional time may be granted to all Bidders when the City determines in its sole discretion that circumstances warrant it.

Award

The City intends to award a Contract/Purchase Order to the lowest responsible Bidder(s) providing the best value to the City. The City may, at its sole discretion, award line-by-line in the best interest of value to the City.

Responsible bidder means a bid submitted, which conforms in all aspects of the requirements set forth in the invitation to bid. All aspects could include references, past experience, past performance, and qualifications.

Official Documents

The City of Ann Arbor officially distributes bid documents from the Procurement Unit or through the Michigan Intergovernmental Trade Network (MITN). Copies of the bid documents obtained from any other source are not Official copies. Addenda and other bid information will only be posted to these official distribution sites. If you obtained City of Ann Arbor Bid documents from other sources, it is recommended that you register on www.MITN.info and obtain an official Bid.

Taxes

Municipalities are exempt from Michigan State Sales and Federal Excise taxes. Do not include such taxes in the bid figure(s). The City will furnish the successful bidder with tax exemption certificates when requested.

Withdrawal of Bids

After the time of opening, no Bid may be withdrawn for the period of one-hundred and twenty (120) days.

Non-Discrimination Requirements

All contractors proposing to do business with the City shall satisfy the non-discrimination administrative policy adopted by the City Administrator in accordance with the Section 9:158 of the Ann Arbor City Code. Breach of the obligation not to discriminate shall be a material breach of the contract. Contractors are required to post a copy of Ann Arbor's Non-Discrimination Ordinance attached at all work locations where its employees provide services under a contract with the City.

Conflict Of Interest Disclosure

The City of Ann Arbor Purchasing Policy requires that prospective Vendors complete a Conflict of Interest Disclosure form. A contract may not be awarded to the selected Vendor unless and until the Procurement Unit and the City Administrator have reviewed the Disclosure form and determined that no conflict exists under applicable federal, state, or local law or administrative regulation. Not every relationship or situation disclosed on the Disclosure Form may be a disqualifying conflict. Depending on applicable law and regulations, some contracts may awarded on the recommendation of the City Administrator after full disclosure, where such action is allowed by law, if demonstrated competitive pricing exists and/or it is determined the award is in the best interest of the City. A copy of the Vendor Conflict of Interest Disclosure Form is attached.

Debarment

Submission of a Bid in response to this ITB is certification that the Bidder is not currently debarred, suspended, proposed for debarment, and declared ineligible or voluntarily excluded from participation in this transaction by any State or Federal departments or agency. Submission is also agreement that the City will be notified of any changes in this status.

Disclosures

After bids are opened, all information in a submitter's bid is subjected to disclosure under the provisions of Michigan Public Act No. 442 of 1976, as amended (MCL 15.231 et seq.) known as the "Freedom of Information Act." The Freedom of Information Act also provides for the complete disclosure of contracts and attachments thereto except where specifically exempted.

Bid Protest

All Bid protests must be in writing and filed with the Purchasing Agent within five (5) business days of the award action. The bidder must clearly state the reasons for the protest. If a bidder contacts a City Service Area/Unit and indicates a desire to protest an award, the Service Area/Unit shall refer the bidder to the Purchasing Agent. The Purchasing Agent will provide the bidder with the appropriate instructions for filing the protest. The protest shall be reviewed by the City Administrator or designee whose decision shall be final.

Any inquiries or requests regarding this procurement should be only submitted in writing to the Designated City Contacts provided herein. Attempts by the Offeror to initiate contact with anyone other than the Designated City Contacts provided herein that the prospective Offeror believes can influence the procurement decision, e.g., Elected Officials, City Administrator, Selection

Committee Members, Appointed Committee Members, etc., may lead to immediate elimination from further consideration.

Cost Liability

The City of Ann Arbor assumes no responsibility or liability for costs incurred by the Bidder prior to the execution of a contract with the City. By submitting a bid, a bidder agrees to bear all costs incurred or related to the preparation, submission and selection process for the bid.

Reservation of Rights

The City of Ann Arbor reserves the right to accept any bid or alternative bid proposed in whole or in part, to reject any or all bids or alternatives bids in whole or in part and to waive irregularity and/or informalities in any bid and to make the award in any manner deemed in the best interest of the City.

Environmental Commitment

The City of Ann Arbor recognizes its responsibility to minimize negative impacts on human health and the environment while supporting a vibrant community and economy. The City further recognizes that the products and services the City buys have inherent environmental and economic impacts and that the City should make procurement decisions that embody, promote, and encourage the City's commitment to the environment.

The City encourages potential vendors to bring forward emerging and progressive products and services that are best suited to the City's environmental principles.

INVITATION TO BID

City of Ann Arbor
Guy C. Larcom Municipal Building
Ann Arbor, Michigan 48107

Ladies and Gentlemen:

The undersigned, as Bidder, declares that this Bid is made in good faith, without fraud or collusion with any person or persons bidding on the same Contract; that this Bidder has carefully read and examined the bid documents, including City Nondiscrimination requirements, Vendor Conflict of Interest Form, Instructions to Bidders, Bid Forms, Purchase Order Terms and Conditions, General Conditions, Detailed Specifications, and all Addenda, and understands them. The Bidder declares that it conducted a full investigation of the work proposed and is fully informed as to the nature of the work and the conditions relating to the work's performance.

The Bidder acknowledges that it has not received or relied upon any representations or warrants of any nature whatsoever from the City of Ann Arbor, its agents or employees, and that this Bid is based solely upon the Bidder's own independent business judgment.

In accordance with these bid documents, and Addenda numbered _____, the undersigned, as Bidder, proposes to deliver to the City all product/services herein described for the amounts set forth in the Bid Forms.

The Bidder declares that it has become fully familiar with the liquidated damage clauses for completion times and for compliance with City Code Chapter 112, understands and agrees that the liquidated damages are for the non-quantifiable aspects of non-compliance and do not cover actual damages that may be shown and agrees that if awarded the Contract, all liquidated damage clauses form part of the Contract.

Bidder further agrees that the cited provisions of Chapter 14 form a part of this Contract.

The Bidder declares that it has become familiar with the City Conflict of Interest Disclosure Form and certifies that the statement contained therein is true and correct.

In submitting this Bid, it is understood that the right is reserved by the City to accept any Bid, to reject any or all Bids, to waive irregularities and/or informalities in any Bid, and to make the award in any manner the City believes to be in its best interest.

SIGNED THIS _____ DAY OF _____, 202__.

Bidder's Name

Authorized Signature of Bidder

Official Address

(Print Name of Signer Above)

Telephone Number

Email Address for Award Notice

LEGAL STATUS OF BIDDER

(The Bidder shall fill out the appropriate form and strike out the other three.)

Bidder declares that it is:

* A corporation organized and doing business under the laws of the State of _____, for whom _____, bearing the office title of _____, whose signature is affixed to this Bid, is authorized to execute contracts.

NOTE: If not incorporated in Michigan, please attach the corporation's Certificate of Authority

• A limited liability company doing business under the laws of the State of _____, whom _____ bearing the title of _____ whose signature is affixed to this proposal, is authorized to execute contract on behalf of the LLC.

* A partnership, organized under the laws of the state of _____ and filed in the county of _____, whose members are (list all members and the street and mailing address of each) (attach separate sheet if necessary):

* An individual, whose signature with address, is affixed to this Bid: _____
(initial here)

Authorized Official

_____ **Date** _____, 201_

(Print) Name _____ Title _____

Company: _____

Address: _____

Contact Phone () _____ Fax () _____

Email _____

BID FORM

VENDOR NAME: _____

BASE BID – Badger E Series Ultrasonic Cold Water Meter, Residential Application, Engineered Polymer					
Item #	Description	Est. Quantity	Unit	Unit Price	Total Price
1	5/8" Water Meter	200	Each	\$	\$
2	5/8" x 3/4" Water Meter	200	Each	\$	\$
3	3/4" Water Meter	200	Each	\$	\$
4	3/4" Short Water Meter	200	Each	\$	\$
5	1" Water Meter	200	Each	\$	\$
6	Badger HR-RED High Res. Remote Electronic Display	100	Each	\$	\$
TOTAL BASE BID					\$

Alternate BID – Badger E Series Ultrasonic Cold Water Meter, Residential Application, Stainless Steel					
Item #	Description	Est. Quantity	Unit	Unit Price	Total Price
1	5/8" Water Meter	200	Each	\$	\$
2	5/8" x 3/4" Water Meter	200	Each	\$	\$
3	3/4" Water Meter	200	Each	\$	\$
4	3/4" Short Water Meter	200	Each	\$	\$
5	1" Water Meter	200	Each	\$	\$
6	1-1/2" Water Meter	200	Each	\$	\$
7	2" Water Meter	200	Each	\$	\$
TOTAL BASE BID					\$

BASE BID – Badger E Series Ultrasonic Meter, Fire Service Application					
Item #	Description	Est. Quantity	Unit	Unit Price	Total Price
1	3/4" Water Meter	25	Each	\$	\$
2	1" Water Meter	25	Each	\$	\$
TOTAL BASE BID					\$

BASE BID – Badger M Series, M5000 Electromagnetic Meter, PTFE Liner					
Item #	Description	Est. Quantity	Unit	Unit Price	Total Price
1	1" Water Meter	25	Each	\$	\$
2	1 1/2" Water Meter	25	Each	\$	\$
3	2" Water Meter	25	Each	\$	\$
1	2 1/2" Water Meter	25	Each	\$	\$
4	3" Water Meter	25	Each	\$	\$
5	4" Water Meter	25	Each	\$	\$
TOTAL BASE BID					\$

REFERENCES: Please list at least three (3) entities for which you have provided similar materials:

- | | <u>Organization</u> | <u>Address</u> | <u>Contact Person</u> | <u>Telephone</u> |
|----|---------------------|----------------|-----------------------|------------------|
| 1. | _____ | | | |
| 2. | _____ | | | |
| 3. | _____ | | | |

DETAILED SPECIFICATIONS

Badger E Series Ultrasonic Cold Water Meters

SECTION 1 – SCOPE

This specification covers E-Series® Ultrasonic Cold Water Meters in sizes 5/8", 5/8 x 3/4", 3/4", 1", 1-1/2" and 2", and the materials and workmanship employed in their fabrication. The meter must utilize ultrasonic measurement technology and have no moving parts within the meter.

SECTION 2 – METER DESCRIPTION

The basis for measurement is the use of ultrasonic signals sent consecutively in forward and reverse directions of flow. Velocity is determined by measuring the time difference between the measurement in the forward and reverse direction. Flow totalization can then be calculated from the measured flow velocity using water temperature and pipe diameter. The meter is all electronic with totally potted circuitry, display and battery. There are no moving parts to wear or replace and meter and registration are sealed, non-removable and protected from tampering.

SECTION 3 – AFFIDAVIT OF COMPLIANCE

The purchaser may require, in their supplemental specifications, an affidavit from the manufacturer or vendor that the meters furnished under the purchaser's order comply with all applicable requirements of this specification. Failure to meet any part of the specification shall be sufficient cause for rejection.

SECTION 4 – SIZE, CAPACITY, AND LENGTH

Along with the operating and physical characteristics, the nominal size, capacity ratings, related pressure loss limits, and length of the meters are those shown in Table 1 and 2. Meters supplied under this specification shall operate without leakage or damage at a working pressure of 175 psi.

SECTION 5 – METERING TUBE

The housing shall be lead-free and shall be designed so that at a working pressure of 175 psi, any distortion will not affect the accuracy of the meter. Metering tube shall not be repaired in any manner. The flow direction and meter size shall also be cast in the meter tube and the inlet and outlet shall have a common axis.

SECTION 6 – METERING INSERT

The ultrasonic metering insert shall be self-contained within the meter flow tube, seated, and not removable. The insert shall be secured to the main case, providing a method of minimizing turbulence and cleaning the reflectors, so that the accuracy of the meter will not be affected by any distortions of the case when operating at a pressure of 175 psi. The metering insert shall be made of thermoplastic polymer and stainless steel and the ultrasonic transducers shall be wetted components that extend through the meter tube and shall have a surface of stainless steel.

SECTION 7 – ELECTRONIC METER AND REGISTRATION

The electronic circuit shall be micro-processor based and include a non-replaceable battery, and non-volatile memory capable of storing all programmable data and accumulated data. The circuit shall control the ultrasonic transducers. No field programming or calibration shall be necessary.

The entire meter circuit and related components shall be fully potted and sealed from water intrusion. No components shall require service or replacement over the life of the meter. For reliability, the use of inductive coil technology shall not be permitted with an electronic residential meter.

SECTION 8– REGISTRATION/DISPLAY

- 8.1 The registration lid shall have the name or logo of the manufacturer permanently molded and the serial number shall be imprinted for identification. The lid shall overlap to protect the lens and be made of engineered polymer.
- 8.2 The registration shall be encased in an integral non-corrosive polymer housing, with the electronics, display, and battery completely potted within. It must be permanently epoxy sealed to provide moisture resistance to flooded pit or submerged conditions. The permanent seal between the lens and non-corrosive polymer housing shall utilize an adhesive seal.
- 8.3 The Register shall be an integral part of the meter assembly and must be available factory wired to an inline connector that can be used to connect to an endpoint.
- 8.4 The registration shall consist of an electronic display combined with electronic circuitry to provide a high resolution absolute encoder output. This electronic registration assembly shall transmit a signal through properly shielded (grounded) transmission wire for AMR/AMI connectivity.
 - 8.4.1 The High Resolution industry standard ASCII encoder protocol shall be capable of sending a 9-digit encoder output to the endpoint as well as extended status messages. Resolution being sent to the reading software is based on the output of the endpoint.
- 8.5 The display shall be a straight reading, permanently sealed electronic LCD with digits 0.28 inches high. The display will contain 9 digits plus a decimal point and display consumption, unit of measure, rate of flow and alarm information. The digital display shall provide a totalized consumption resolution to 0.01 gallons, 0.001 cubic feet, or 0.0001 cubic meters for 5/8” through 1” meters and 0.1 gallons, 0.01 cubic feet, or 0.001 cubic meters for 1-1/2” and 2” meters. The maximum indication on the dial and the minimum allowable capacity of the register shall comply with Table 3.
- 8.6 The size, model, and direction of flow through the meters shall be permanently visible on the topside of all meter displays. The units of registration, U.S. gallons, cubic feet, or meters cubed, shall also be designated on the LCD display. The enhanced resolution of the totalized flow display can be utilized as a flow indicator for leak detection.

SECTION 9 – REGISTRATION ACCURACY

Specified in Table 1, at any flow rate within normal test flow limits, the meter shall register not less than 98.5% and not more than 101.5% of the water actually passed through the meter. At the minimum test flow rate, the meter shall register not less than 97.0% and not more than 103.0% of

the water actually passed through the meter.

SECTION 10– REJECTED METERS

The manufacturer shall repair or replace, at its option, without charge, all meters rejected for failure to comply with this specification.

Meter Size	Required Safe Maximum Operating Capacity	Maximum Pressure Loss At AWWA Safe Maximum Operating Capacity	Recommended Maximum Rate For Continuous Operations	Extended Low Flow	Normal Test Flow Limits
5/8"	25 gpm	4.3 psi @ 15 gpm	25 gpm	0.05 gpm	0.1...25 gpm
5/8" x 3/4"	25 gpm	2.3 psi @ 15 gpm	25 gpm	0.05 gpm	0.1...25 gpm
3/4"	32 gpm	2.0 psi @ 15 gpm	32 gpm	0.05 gpm	0.1...32 gpm
1"	55 gpm	1.8 psi @ 25 gpm	55 gpm	0.25 gpm	0.4...55 gpm

Table 1: 5/8" through 1" Meter Performance Characteristics

Meter Size	Required Safe Maximum Operating Capacity	Maximum Pressure Loss At AWWA Safe Maximum Operating Capacity	Recommended Maximum Rate For Continuous Operations	Extended Low Flow	Normal Test Flow Limits
1-1/2" Elliptical	100 gpm	3.8 psi @ 100 gpm	100 gpm	0.40 gpm	1.25...100 gpm
2" Elliptical	160 gpm	5.2 psi @ 160 gpm	160 gpm	0.50 gpm	1.5...160 gpm
1-1/2" Hex NPT	100 gpm	3.8 psi @ 100 gpm	100 gpm	0.40 gpm	1.25...100 gpm
2" Hex NPT	160 gpm	5.2 psi @ 160 gpm	160 gpm	0.50 gpm	1.5...160 gpm

Table 1: 1-1/2" and 2" Meter Performance Characteristics

Meter Size	Meter Length Threaded Spud Ends	Meter Spuds Nominal Thread Size	Meter Housing Spuds Pitch Diameter	
			Minimum	Maximum
5/8"	7-1/2"	3/4"	0.978"	0.988"
5/8" x 3/4"	7-1/2"	1"	1.227"	1.237"
3/4"	7-1/2", 9"	1"	1.227"	1.237"
1"	10-3/4"	1-1/4"	1.563"	1.573"

Table 2: 5/8" through 1" Dimensional Design Limits for Meters

Meter Size	Lay Length	Minimum Thickness at Bolt Hole	Diameter of Bolt Circle	Number of Bolt Holes	Diameter of Bolt Holes	Nominal Thread Size
1-1/2" Elliptical	13"	9/16"	4"	2	11/16"	-----
2" Elliptical	17"	5/8"	4-1/2"	2	13/16"	-----
1-1/2" Hex NPT	12-5/8"	-----	-----	-----	-----	1-1/2"
2" Hex NPT	15-1/4"	-----	-----	-----	-----	2"

Table 2: 1-1/2" and 2" Dimensional Design Limits for Meters

Meter Size	Maximum Allowable Indication of Initial Dial			Minimum Allowable Capacity of Register (Millions)			
	Local Register or Electronic Encoder Register	Cu. Ft	Gallons	M ³	Cu. Ft	Gallons	M ³
5/8"		0.001	0.01	0.0001	1,000,000	10,000,000	100,000
5/8" x 3/4"		0.001	0.01	0.0001	1,000,000	10,000,000	100,000
3/4"		0.001	0.01	0.0001	1,000,000	10,000,000	100,000
1"		0.001	0.01	0.0001	1,000,000	10,000,000	100,000

Table 3: 5/8" through 1" Maximum Indication on Initial Dial and Minimum Register Capacity

Meter Size	Maximum Allowable Indication of Initial Dial			Minimum Allowable Capacity of Register		
	Cu. Ft	Gallons	M ³	Cu. Ft	Gallons	M ³
1-1/2"	0.01	0.1	0.001	10,000,000	100,000,000	1,000,000
2"	0.01	0.1	0.001	10,000,000	100,000,000	1,000,000

Table 3: 1-1/2" and 2" Maximum Indication on Initial Dial and Minimum Register Capacity

DETAILED SPECIFICATIONS
Badger M Series Electromagnetic Flow Meter

MODEL M-5000
Electromagnetic Flow Meter, Liquid, Single-Channel

PART 1 - GENERAL

1.1 SCOPE

- A. This section describes the requirements for a flow sensor.
- B. Under this item, the contractor shall furnish and install the flow measurement equipment and accessories as indicated on the plans and as herein specified.

1.2 QUALITY ASSURANCE

- A. Referenced Standards and Guidelines - Complies with applicable portions of ANSI/AWWA Standards and NSF/ANSI Standard 61, Annex G. There are currently no AWWA standards that specifically address electromagnetic metering.
 - 1. Flow measurement function complies with Industry Standards
 - a. ANSI B16.5 Class 150 RF
 - b. AWWA Class B
 - c. NEMA 4X/6P (IP66/IP67)

1.3 SUBMITTALS

- A. The following information shall be included in the submittal for this section:
 - 1. Outline dimensions, conduit entry locations and weight
 - 2. Customer connection and power wiring diagrams
 - 3. Data sheets and catalog literature for microprocessor-based transmitter and transducer
 - 4. Interconnection drawings
 - 5. Installation and operations manual
 - 6. List of spare parts
 - 7. Complete technical product description including a complete list of options provided

8. Any portions of this specification not met must be clearly indicated or the supplier and contractor shall be liable to provide all additional components required to meet this specification

1.4 SYSTEM DESCRIPTION

- A. Electromagnetic flow meter is intended for fluid metering in industries including water, wastewater, food and beverage, pharmaceutical and chemical. Measures fluid flow of water or fluids which are highly corrosive, very viscous, contain a moderate amount of solids, or require special handling. No moving parts are in the flow stream. Amplifier can be integrally mounted to the detector or can be remote-mounted. Unit is ideally suited for measuring dynamic, non-continuous flow. In applications where a minimum and/or maximum flow rate must be tracked and monitored, the unit provides pulse signals that can be fed to dedicated batch controllers, PLCs and other more specialized instrumentation.

1.5 DEFINITIONS

- A. Amplifier – Device used for increasing the power of a signal. It does this by taking energy from a power supply and controlling the output to match the input signal shape but with larger amplitude.
- B. ANSI – (American National Standards Institute) A private non-profit organization that oversees the development of voluntary consensus standards for products, services, processes, systems, and personnel in the United States. The organization also coordinates U.S. standards with international standards so that American products can be used worldwide.
- C. AWWA – (American Water Works Association) An international non-profit professional organization founded to improve water quality and supply.
- D. Detector Coils – Also called an “induction loop”, an electromagnetic communication or detection system which uses a moving magnet to induce an electrical current in a nearby wire.
- E. Electrode – An electrical conductor used to make contact with a nonmetallic part of a circuit (e.g. a semiconductor, an electrolyte or a vacuum).
- F. Modbus RTU – a serial communications protocol published by Modicon (now Schneider Electric) in 1979 for use with its programmable logic controllers (PLCs). This is used in serial communication & makes use of a compact, binary representation of the data for protocol communication.
- G. NEMA – (National Electrical Manufacturers Association) Is the 'Association of Electrical Equipment and Medical Imaging Manufacturers' in the United States. Its

approximately 450 member companies manufacture products used in the generation, transmission, distribution, control, and end use of electricity. These products are used in utility, industrial, commercial, institutional, and residential applications.

- H. NSF International – An independent, accredited organization that develops standards, and tests and certifies products and systems. They provide auditing, education and risk management solutions for public health and the environment.
- I. PLCs – (Programmable Logic Controller) A digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures. PLCs are used in many industries and machines.
- J. PTFE – (Polytetrafluoroethylene) A synthetic fluoropolymer of tetrafluoroethylene that finds numerous applications. The best known brand name of PTFE is Teflon by DuPont Co.
- K. Serial Communications – In telecommunication and computer science, serial communication is the process of sending data one bit at a time, sequentially, over a communication channel or computer bus. This is in contrast to parallel communication, where several bits are sent as a whole, on a link with several parallel channels.

PART 2 – PRODUCTS

1.1 APPROVED MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with specifications, provide flow measurement equipment by one of the following:

- 1. Badger Meter

1.2 OPERATING CONDITIONS

- A. System Components

- 1. Metering Tube (Detector)
 - a. Consists of stainless steel tube lined with a non-conductive material. Energized detector coils around tube create a magnetic field across the diameter of the pipe. As a conductive fluid flows through the magnetic field, a voltage is induced across two electrodes; this voltage is proportional to the average flow velocity of the fluid.

2. Signal Amplifier

- a. Consists of unit which receives, amplifies, and processes the detector's analog signal. Signal is converted to both analog and digital signals that are used to display rate of flow and totalization. Processor controls zero-flow stability, analog and frequency outputs, serial communications and a variety of other parameters. Integrated LCD display indicates rate of flow, forward and reverse totalizers and diagnostic messages. Display guides user through programmable routines.

B. Operational Requirements

1. Electromagnetic Flow Meter

- a. The flow meter system shall operate with a pulsed DC excitation frequency, and shall produce a signal output that is directly proportional and linear with the volumetric flow rate of the liquid flowing through the metering tube. The metering system shall include a metering sensor tube (detector), a signal amplifier, and the necessary connecting wiring. The metering system shall have the ability to incorporate a meter mounted or remote mounted amplifier.
- b. Engineering Units:
 - 1) The signal amplifier shall be program selectable to display the following units of measure: U.S. gallons, imperial gallons, million gallons (U.S.), cubic feet, cubic meters, liters, hector-liters, oil barrels, ounces or acre feet.
- c. Operating Principle: Electromagnetic Induction
- d. Metering Tube (Detector)
 - 1) The metering tube (detector) shall be constructed of 316 stainless steel, and rated for a maximum allowable non-shock pressure and temperature for steel pipe flanges, according to ANSI B16.5.
 - 2) The metering tube (detector) shall be available in line size from 1/2" to 24" [12.7 to 600 mm]
 - 3) The metering tube (detector) end connections shall be carbon steel or 316 stainless steel flanged, according to ANSI B16, Class 150 and AWWA Class B standards.
 - 4) The insulating liner material of the metering tube (detector) shall be made of a hard rubber elastomer and NSF-listed for meter sizes 4"

and above, in conformance with manufacturer's recommendation for the intended service or an NSF-listed meter option with PTFE liner.

- 5) The metering tube (detector) shall include two self-cleaning measuring electrodes. The electrode material shall be corrosion resistant and available in Alloy C or 316 stainless steel.
- 6) The metering tube (detector) shall include a third "empty pipe detection" electrode located in the upper portion of the inside diameter of the flow tube in order to detect an empty pipe condition when the flow tube is running partially empty. Empty pipe detection that is not activated until the pipe is 50% empty is not acceptable.
- 7) The metering tube (detector) housing shall be constructed of carbon steel, welded at all joints, and rated to meet NEMA 4X/6P (IP66/IP67) ratings.
- 8) For remote amplifier applications, the metering tube (detector) junction box enclosure shall be constructed of cast aluminum (powder-coated paint) and shall meet NEMA 4X/6P (IP66/IP67) ratings.
- 9) When installed in non-metallic or internally lined piping, the metering tube (detector) shall be provided with a pair of corrosion resistant grounding rings. The grounding ring material shall be 316 stainless steel.
- 10) Fluid Temperature Range
 - i. For remote amplifier applications, the fluid temperature range shall be -4°F to 302°F [-20°C to 150°C] at a maximum ambient temperature of 122°F [50°C] for the PTFE liner material.
 - ii. For meter-mounted amplifier applications, the fluid temperature range shall be -4°F to 212°F [-20°C to 100°C] at a maximum ambient temperature of 122°F [50°C] for the PTFE liner material.

e. Signal Amplifier

- 1) The signal amplifier shall be microprocessor based, and shall energize the detector coils with a digitally controlled pulsed DC. The sampling rate shall be programmable from ¼, 1 to 99 seconds.
- 2) Power shall be supplied by internal battery with life of 10 years.

- 3) The signal amplifier shall have an ambient temperature rating of -4°F to 140°F [-20°C to 60°C].
 - 4) The signal amplifier shall include non-volatile memory capable of storing all programmable data and accumulated totalizer values in the event of a power interruption.
 - 5) Automatic zero stability, low flow cut-off, empty pipe detection and bi-directional flow measurement shall be inherent capabilities of the signal amplifier.
 - 6) All signal amplifier outputs shall be galvanically isolated to 50 volts.
 - 7) The signal amplifier and remote junction enclosures shall be constructed of cast aluminum (powder-coated paint) and shall meet NEMA 4X/6P (IP66/IP67) ratings.
 - 8) Inputs/Outputs:
 - 9) The signal amplifier shall provide a total of four digital outputs and one digital input.
 - i. Up to four open collector digital outputs, program selectable from the following: Forward pulse, reverse pulse, AMR pulse, high/low flow alarm, empty pipe alarm, flow direction, and error alarm.
 - ii. One digital input: ADE
 - iii. Advanced protocol support using Modbus/RTU.
- f. Control and Programming
- 1) The signal amplifier shall be programmed via three function buttons. The programming functions shall be available in a user-friendly, menu driven software through the two-line LCD interface. The signal amplifier shall accommodate the following languages: English, German, Czech, French, Italian or Spanish.
 - 2) Programmable parameters of the amplifier include, but are not limited to: calibration factors, totalizer resets, unit of measure, pulse output scaling and ADE, flow-alarm functions, language selection, low-flow cutoff, noise dampening factor and sampling frequency selection.

- 3) The signal amplifier shall have a programming option allowing entry of a selected numeric password value for tamper protection.

g. System Performance

- 1) The metering system shall operate over a flow range of 0.10 to 32.8 ft/s [0.03 to 10 m/s].
- 2) The metering system shall perform to an accuracy ± 0.4 percent of rate ± 0.0065 ft/s [± 2 mm/s].
The accuracy for zero straight run with a single elbow up and/or a single elbow down stream shall be 1% or better in the flow range 1.2 ft/s (0.35 m/s) and up.
- 3) The metering system shall be capable of measuring the volumetric flow rate of liquids having an electrical conductivity as low as 20 micromhos per centimeter.
- 4) The system measuring repeatability shall be $<0.10\%$ of full scale.

h. Indication

- 1) The signal amplifier shall include a two-line, 15-character, LCD interface to display the following values:
 - i. Flow rate in selectable rate units
 - ii. Forward totalizer in selectable volume units
 - iii. Reverse totalizer in selectable volume units
 - iv. Net totalizer in selectable volume units
 - v. Error or alarm messages
 - vi. Software revision level
 - vii. Flow velocity
 - viii. % of full scale flow

PART 3 - EXECUTION

1.1 INSTALLATION

- A. Follow manufacturer's recommendation for installation. Installation will conform to the guidelines provided by the Installation & Operation Manual.
- B. Straight pipe requirement shall be an equivalent of three diameters on the inlet (upstream) side, and two diameters on the outlet (downstream) side.

- 1.2 For best performance, place meter vertically, with liquid flowing upward and meter electrodes in a closed, full pipe.

1.3 CALIBRATION

- A. Each meter shall be hydraulically calibrated in an ISO 9000-certified testing facility, which utilizes a computerized gravimetric testing method with a measuring uncertainty of 0.1%.
- B. Each meter shall be provided with a calibration certificate indicating the measured error (percent deviation) at three different flows, respectively equivalent to 25%, 50% and 75% of the nominal flow rate for each size.

1.4 MANUFACTURER'S WARRANTY

- A. Terms
 - 1. The manufacturer of the above specified equipment warrants the Product to be free from defects in materials and workmanship appearing within the earlier of either: One (1) year after installation; or one (1) year and six (6) months after shipment from manufacturer.

END OF SECTION

GENERAL CONDITIONS

ESTIMATED QUANTITIES

Quantities stated are estimated and not guaranteed. The quantities stated will be used for award purposes only and are based up an average of actual annual usage.

DOWN PAYMENTS

Any bid proposal submitted which requires a down payment or prepayment of any kind prior to delivery and acceptance of the item, as being in conformance with the specifications will not be considered for award.

PURCHASE ORDER

The successful bidder will be issued a purchase order from the City of Ann Arbor, which will create a bilateral contract between the City and the successful bidder. The purchase order shall commit the bidder to perform the contract in accordance with the specifications and the terms and conditions of the purchase order.

The terms and conditions of the Purchase Order are provided herein.

CONTRACT TERM

The pricing provided for this ITB shall be firm for two (2) years. Upon mutual agreement between the City and the vendor the pricing provided in this ITB may be extended for two (2) additional one (1) year periods not to exceed four (4) years in total with a maximum 3% unit price increase per year the contract is extended.

City of Ann Arbor: General Terms and Conditions

The following General Terms and Conditions shall apply.

Tax Exemption: The City of Ann Arbor is tax exempt, ID# 38-6004534.

Acceptance of Contract: This order is the City's contract to purchase the goods and services described on the reverse front side of this document from the Vendor. The City's placement of this order is expressly conditioned upon the Vendor's acceptance of all the terms and conditions of purchase contained on or attached to this purchase order. All specifications, drawings, and data submitted to the Vendor with this order are hereby incorporated and made part hereof.

Amendments: No agreement or understanding to modify this contract shall be binding upon the City unless in writing and signed by the City's authorized agent.

Delivery: All prices must be F.O.B. delivery point. Time is of the essence on this contract. If delivery dates cannot be met, the Vendor agrees to advise the City, in writing of the earliest possible shipping date. The City reserves the right to cancel or purchase elsewhere and hold the Vendor accountable.

Risk of Loss: Regardless of F.O.B. point, the Vendor agrees to bear all risk of loss, injury, or destruction of goods and materials ordered herein which may for any reason occur prior to delivery or acceptance by the City, whichever is later. No such loss, injury, or destruction shall release the Vendor from any obligations hereunder.

Inspection: Goods and materials must be properly packaged. Damaged goods and materials will not be accepted. The City reserves the right to inspect the goods at a reasonable time subsequent to delivery where circumstances or conditions prevent effective inspection of the goods at the time of delivery. All rejected goods shall be returned to the Vendor at no cost to the City, whether the damage is readily apparent at the time of delivery or later. The City's acceptance is conditioned on such inspection.

Patents and Copyrights: If an article sold and delivered to the City hereunder shall be protected by any applicable patent or copyright, the Vendor agrees to indemnify and save harmless the City, from and against any and all suits, claims, judgments, and costs instituted or recovered against it by any person whomsoever on account of the use or sale of such articles by the City in violation or right under such patent or copyright.

Uniform Commercial Code: All applicable portions of the Michigan Uniform Commercial Code shall govern contracts for goods with the City of Ann Arbor; except as modified by contract documents.

Non-waiver of Rights: No failure of either party to exercise any power given to it hereunder or to insist upon strict compliance by the other party with its obligations hereunder, and no custom or practice of the parties at variance with the terms hereof, nor any payment under this agreement shall constitute a waiver of either party's right to demand exact compliance with the terms hereof.

Material Safety Data Sheets: Applicable Material Safety Data Sheets, in compliance with OSHA/MIOSHA hazard communication regulations/standards, must be provided by the Vendor to the City at the time of purchase.

Assignments: The Vendor agrees not to assign or transfer this contract or any part thereof without the written consent of the City of Ann Arbor, acting through its authorized representative. Any unauthorized assignment may subject the contractor to immediate termination.

Laws Governing, Severability: This contract shall be governed by and construed according to the laws of the State of Michigan. Vendor agrees to submit to the jurisdiction and venue of the Circuit Court of Washtenaw County, MI, or if original jurisdiction is established, the U.S. District Ct. for Eastern District of MI, Southern Division. The Vendor stipulates venues referenced are convenient and waives any claim of non-convenience. If any term herein is found to be ineffective, unenforceable or illegal under any present or future laws, such term shall be fully severable, and the remaining terms shall not be affected and shall remain full force and effect.

Prevailing Wage: It shall be the responsibility of the Vendor to comply, when applicable, with the prevailing wage requirements and/or the Davis-Bacon Act as amended.

Living Wage: It shall be the responsibility of the Vendor to comply, when applicable, with the City of Ann Arbor's Living Wage Ordinance as defined in Chapter 23, Section 1:811-1:821.

Non-Discrimination: It shall be the responsibility of the Vendor to comply, when applicable, with, all State, Federal and Local non-discrimination laws, including MCL 37.2209 and Section 9:158 of the City Code.

Indemnification: To the fullest extent permitted by law the Vendor shall indemnify, defend and hold the City, its officers, employees and agents harmless from all suits, claims, judgments and expenses including attorney's fees resulting or alleged to result from any act or omission, associated with the performance of this contract by the Vendor or anyone acting on the Vendor's behalf under this contract. The Vendor shall not be responsible to indemnify the City for losses or damages caused by or resulting from the City's sole negligence. This indemnity survives delivery and acceptance of the Vendor's goods and services.

Warranty: The Vendor warrants to the City that all goods and services furnished hereunder will conform in all respects to the terms of this contract, including any drawings, specifications and standards incorporated herein. In addition, the Vendor warrants the goods and services are suitable for and will perform in accordance with the purposes for which they were intended.

Payment Terms: The City of Ann Arbor's payment terms are net 30. The payment date will be calculated based on the invoice receipt date or delivery date, whichever is later.

Payments: All invoices for goods and services shall be emailed to accountspayable@a2gov.org. Mailed invoices shall be addressed to the City of Ann Arbor, Accounts Payable, P.O. Box 8647, Ann Arbor, MI 48107, as indicated on the front of this purchase order. Invoices must include the Vendor's name, phone number, and clearly listed item descriptions, quantities and units of measure. The Vendor acknowledges and understands that invoices not addressed as stated above shall have the net 30 begin once the invoice is received by Accounts Payable.

Compliance with Laws: The Vendor certifies that in performing this contract it will comply with all applicable provisions of Federal, State and Local laws, regulations, rules and orders.

Termination for Cause: In the event the Vendor fails, at any time, to comply with, fully perform or strictly adhere to any covenant, condition or representation contained within the contract, the City shall have the right to give written notice to Vendor of such failure. If such failure is not cured to the City's satisfaction within ten (10) business days from the time of delivery to Vendor of such notice, the City shall have the right to terminate immediately without the requirement of a further notice.



Vendor Conflict of Interest Disclosure Form

All vendors interested in conducting business with the City of Ann Arbor must complete and return the Vendor Conflict of Interest Disclosure Form in order to be eligible to be awarded a contract. Please note that all vendors are subject to comply with the City of Ann Arbor's conflict of interest policies as stated within the certification section below.

If a vendor has a relationship with a City of Ann Arbor official or employee, an immediate family member of a City of Ann Arbor official or employee, the vendor shall disclose the information required below.

1. No City official or employee or City employee's immediate family member has an ownership interest in vendor's company or is deriving personal financial gain from this contract.
2. No retired or separated City official or employee who has been retired or separated from the City for less than one (1) year has an ownership interest in vendor's Company.
3. No City employee is contemporaneously employed or prospectively to be employed with the vendor.
4. Vendor hereby declares it has not and will not provide gifts or hospitality of any dollar value or any other gratuities to any City employee or elected official to obtain or maintain a contract.
5. Please note any exceptions below:

Conflict of Interest Disclosure*	
Name of City of Ann Arbor employees, elected officials or immediate family members with whom there may be a potential conflict of interest.	<input type="checkbox"/> Relationship to employee <hr/> <input type="checkbox"/> Interest in vendor's company <input type="checkbox"/> Other (please describe in box below)

*Disclosing a potential conflict of interest does not disqualify vendors. In the event vendors do not disclose potential conflicts of interest and they are detected by the City, vendor will be exempt from doing business with the City.

I certify that this Conflict of Interest Disclosure has been examined by me and that its contents are true and correct to my knowledge and belief and I have the authority to so certify on behalf of the Vendor by my signature below:		
Vendor Name	Vendor Phone Number	
Signature of Vendor Authorized Representative	Date	Printed Name of Vendor Authorized Representative

CITY OF ANN ARBOR NON-DISCRIMINATION ORDINANCE

Relevant provisions of Chapter 112, Nondiscrimination, of the Ann Arbor City Code are included below.
You can review the entire ordinance at www.a2gov.org/humanrights.

Intent: It is the intent of the city that no individual be denied equal protection of the laws; nor shall any individual be denied the enjoyment of his or her civil or political rights or be discriminated against because of actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight.

Discriminatory Employment Practices: No person shall discriminate in the hire, employment, compensation, work classifications, conditions or terms, promotion or demotion, or termination of employment of any individual. No person shall discriminate in limiting membership, conditions of membership or termination of membership in any labor union or apprenticeship program.

Discriminatory Effects: No person shall adopt, enforce or employ any policy or requirement which has the effect of creating unequal opportunities according to actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight for an individual to obtain housing, employment or public accommodation, except for a bona fide business necessity. Such a necessity does not arise due to a mere inconvenience or because of suspected objection to such a person by neighbors, customers or other persons.

Nondiscrimination by City Contractors: All contractors proposing to do business with the City of Ann Arbor shall satisfy the contract compliance administrative policy adopted by the City Administrator in accordance with the guidelines of this section. All city contractors shall ensure that applicants are employed and that employees are treated during employment in a manner which provides equal employment opportunity and tends to eliminate inequality based upon any classification protected by this chapter. All contractors shall agree not to discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of any applicable protected classification. All contractors shall be required to post a copy of Ann Arbor's Non-Discrimination Ordinance at all work locations where its employees provide services under a contract with the city.

Complaint Procedure: If any individual believes there has been a violation of this chapter, he/she may file a complaint with the City's Human Rights Commission. The complaint must be filed within 180 calendar days from the date of the individual's knowledge of the allegedly discriminatory action or 180 calendar days from the date when the individual should have known of the allegedly discriminatory action. A complaint that is not filed within this timeframe cannot be considered by the Human Rights Commission. To file a complaint, first complete the complaint form, which is available at www.a2gov.org/humanrights. Then submit it to the Human Rights Commission by e-mail (hrc@a2gov.org), by mail (Ann Arbor Human Rights Commission, PO Box 8647, Ann Arbor, MI 48107), or in person (City Clerk's Office). For further information, please call the commission at 734-794-6141 or e-mail the commission at hrc@a2gov.org.

Private Actions For Damages or Injunctive Relief: To the extent allowed by law, an individual who is the victim of discriminatory action in violation of this chapter may bring a civil action for appropriate injunctive relief or damages or both against the person(s) who acted in violation of this chapter.



Badger Meter

HR-RED

High Resolution Remote Electronic Display

APPLICATION

The High Resolution Remote Electronic Display (HR-RED) is designed to provide remote visual readings when connected directly to Badger Meter high resolution products: HR-E®, HR-E LCD, HR-E LCD 4-20 encoders, or E-Series® Ultrasonic meters. The HR-RED is used to read compatible encoder products that are not easily accessible or are in difficult to read locations. Installations such as those inside houses or buildings, meter vaults, or dangerous industrial locations are ideal for the HR-RED.

OPERATION

The HR-RED is a battery operated device. When attached to Badger Meter high resolution encoders or high resolution E-Series Ultrasonic meters, the unit is designed to provide the same output resolution as the encoder, up to 9 digits for Badger Meter products. It also displays the encoder serial number. To conserve battery life the HR-RED is awakened only when the internal acoustic switch is activated. This is easily accomplished by tapping the target circle on the register display.

How the meter reading displays depends on the output resolution. The letters "RD" display to the left of the digits. Decimal points do not display.

6 digit output or less: "RD" and all digits appear at the same time, right-justified, and display for 10 seconds.

EXAMPLE of 6 digit meter reading

<displays for 10 sec> **RD 123456**

7 or 8 digit output: "RD" appears by itself for 2 seconds. Then the complete meter reading (up to 8 digits) displays for 10 seconds.

EXAMPLE of 8 digit meter reading

<displays for 2 sec> **RD**
<displays for 10 sec> **12345678**

9 digit output: "RD" appears, followed by the first of the 9 digits, and displays for 5 seconds. Then the remaining 8 digits display for 10 seconds.

EXAMPLE of 9 digit meter reading

<displays for 5 sec> **RD 1**
<displays for 10 sec> **23456789**

After the meter reading displays, the serial number of the encoder or meter displays. Then the HR-RED returns to sleep mode.



TAMPER-PROOF FEATURES

The HR-RED is supplied with an anti-tamper indicator. Any time the connection is interrupted, a visual alarm appears on the display.

There is no maintenance since the electronics and battery are fully encapsulated in the housing and not accessible. The unit is also supplied with a tamper resistant Torx® seal screw to prevent access to the unit.

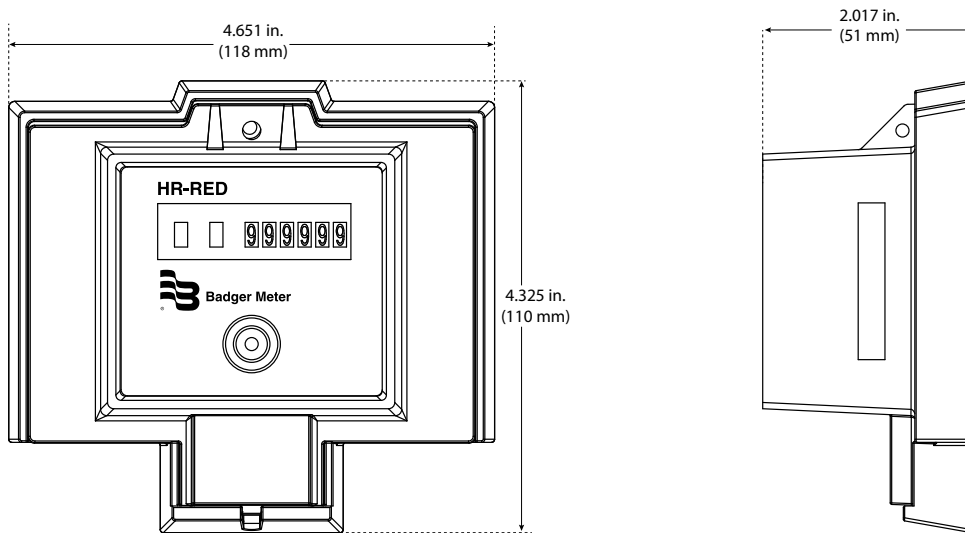
FEATURES

- Environmentally sealed
- Tamper indicators
- Designed for use with any Badger Meter high resolution encoder or E-Series Ultrasonic meter
- Torx seal screw security
- Acoustic "TAP" switch for viewing
- 10 year calculated battery life

SPECIFICATIONS

Operating Temperature	-4...140° F (-20...60° C)
Encoder Compatibility	HR-E, HR-E LCD, HR-E LCD 4-20, E-Series Ultrasonic meter
Dimensions	L 4.651 in. (118 mm) × H 4.325 in. (110 mm) × W 2.017 in. (51 mm)
Weight	9 oz (255 g)
Display	LCD, 8 characters, 0.25 inches high
Battery Life	10 years, 3.6V lithium battery
Construction	High impact thermoplastic, weather and UV resistant

DIMENSIONS



NOTE: Refer to the *HR-RED Installation Data Sheet* available in the Resource Library at www.badgermeter.com for installation instructions.

Making Water Visible®

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www.badgermeter.com

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Badger Meter

HR-RED

High Resolution Remote Electronic Display

SCOPE OF MANUAL

This manual provides instructions for installing and using the HR-RED (High Resolution Remote Electronic Display).

Product Description

The HR-RED is an electronic display designed to provide remote visual readings when connected directly to Badger Meter® Recordall® Disc, Turbo, Compound, and Fire Series meters equipped with high resolution (HR) encoders—HR-E®, HR-E LCD, HR-E LCD 4-20—or E-Series® Ultrasonic meters that are not easily accessible or are in difficult to read locations. Installations such as those inside houses or buildings, meter vaults, or dangerous industrial locations are ideal for the HR-RED.

For additional information and product specifications, refer to the HR-RED product data sheet, available in the Resource Library at www.badgermeter.com.



STANDARD COMPONENTS

HR-RED Kit 64466-002

- Strain relief ring
- Three (3) connectors for wires
- Torx® seal screw
- Unit of measure adhesive label

Installation Tools

The following customer-supplied tools are recommended for installing the HR-RED. Items with a part number are available from Badger Meter.

- Electric drill
- 3/16 in. carbide tip masonry drill bits
- Screw driver
- 59983-001 Crimping tool
- 59989-001 Cable stripper
- 59991-001 Wire cutting pliers

Wire Options (if cable supplied with the meter/encoder is not sufficient)

- 64153-003 One (1) ft Belden® cable
- 68307-001 Nine (9) in. Twist Tight® connector cable
- 66488-007 Ten (10) in. Nicor® connector cable

LOCATION

The HR-RED can be installed indoors or outdoors.

IMPORTANT

While the HR-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.

INSTALLATION GUIDELINES

- Always use enough cable wire. It is better to have a little excess than to go back and rewire.
- If the HR-RED is replacing an existing RED or Read-o-Matic® display, do not use the existing interface wiring. Replace it with new wire.
- When installing the unit on buildings with a stone or masonry exterior, the use of masonry cleats and fasteners is required. After determining the location, use a 3/16 in. carbide-tip masonry bit, and drill two mounting holes. Insert masonry cleats and attach the HR-RED with round head screws.
- After wiring, if the unit does not operate, check for bare wires touching each other.
- If you secure the cable with staples, be careful not to pierce the outer sheath since this could short out the unit.

INSTALLING THE HR-RED

NOTE: For best results the HR-RED should be mounted at eye level in an easily accessible location. Choose a location within the limits of the meter cable. Maximum cable length between the meter and the HR-RED is 2000 feet.

1. Using the HR-RED base as a template, mark the mounting hole locations on the wall where the unit will be mounted.
2. Drill the mounting holes at the marked locations and secure the base to the wall. (Mounting hardware is customer supplied.)

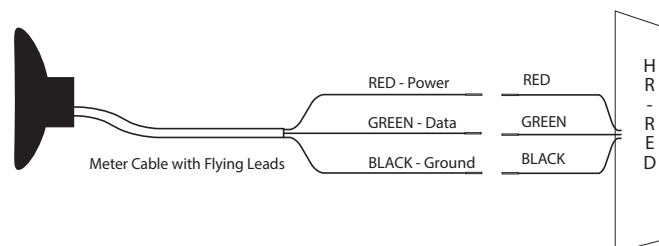
NOTE: Avoid mounting the HR-RED on any type of loose siding since this may lead to wire breakage or other potential problems.

3. Drill a 3/16 in. (5 mm) entry hole in the wall of the structure to accommodate the meter cable.
4. Pass the meter cable with the flying leads through the entry hole to the HR-RED.
5. Cut the meter cable to the proper length at the HR-RED, allowing sufficient cable for the connection.

NOTE: Allow sufficient length so the cable hangs loosely, not taut, where it enters the building to eliminate the possibility of rainwater running along the wire into the building.

6. Place the strain relief ring from the installation kit around the meter cable and secure it about 1-1/2 in. (38 mm) from the end.
7. Use a cable stripper to remove the outer sheath of the meter cable, up to the strain relief ring, to expose the three lead wires and the non-insulated shield wire.
8. Strip about 1/2 in. (13 mm) of insulation from the ends of the meter lead wires. Make sure you do not cut/damage the wires or the wire insulation. At this point, you can cut off the exposed shield wire, even with the meter cable outer sheath, to keep it out of the way.
9. Join the meter wires and the HR-RED wires using the connectors from the installation kit, one for each pair of wires.

NOTE: Polarity must be observed when connecting the meter and the HR-RED wires: **red** (power/clock) to **red**, **green** (data) to **green**, **black** (ground) to **black**.



10. Make sure the wire ends are completely inserted into the connector, then crimp the connector using a crimping tool, such as the Badger Meter crimping tool (PN: 59983-001). Do this for each pair of wires.
11. After the three wire pairs are connected, place the connected wires into the rectangular recess of the HR-RED base and guide the meter cable through the slot at the bottom of the HR-RED.
12. Attach the HR-RED cover to the base with the seal screw from the installation kit.

NOTE: The Torx seal screw is designed to discourage and identify tampering.

13. Secure the entire length of cable from the meter to the HR-RED to complete a neat installation.
14. Check the system (meter, HR-RED wires) by running an adequate amount of water through the meter. Observe that the HR-RED records correctly to confirm successful installation.

NOTE: If the meter is installed backwards, the encoder will not send a signal to the HR-RED. Check to make sure the flow arrow on the meter is pointing in the direction of water flow.

READING THE METER

The HR-RED is a battery operated device. When attached to Badger Meter high resolution encoders or high resolution E-Series Ultrasonic meters, the unit is designed to provide the same output resolution as the encoder, up to 9 digits for Badger Meter products. It also displays the encoder serial number. To conserve battery life the HR-RED is awakened only when the internal acoustic switch is activated. **Tap the target circle on the front of the HR-RED display to activate the unit.**

How the meter reading displays depends on the output resolution. The letters "RD" display to the left of the digits. Decimal points are not displayed.

- **6 digit output or less:** "RD" and all digits appear at the same time, right-justified, and display for 10 seconds.

EXAMPLE of 6 digit meter reading:

<displays for 10 sec> RD 123456
--

- **7 or 8 digit output:** "RD" appears by itself for 2 seconds. Then the complete meter reading (up to 8 digits) displays for 10 seconds.

EXAMPLE of 8 digit meter reading

<displays for 2 sec> RD
<displays for 10 sec> 12345678

- **9 digit output:** "RD" appears, followed by the first of the 9 digits, and displays for 5 seconds. Then the remaining 8 digits display for 10 seconds.

EXAMPLE of 9 digit meter reading

<displays for 5 sec> RD 1
<displays for 10 sec> 23456789

After the meter reading displays, the serial number of the encoder or meter displays. Then the HR-RED returns to sleep mode.

ERROR MESSAGES

If an error is encountered, the display shows one of the following messages.

Message	Description	How to Correct
Check Wiring	No meter/encoder appears to be connected.	Check the wiring connections between the HR-RED and the encoder/meter.
Unknown Register	A response was obtained but not from a supported register type.	Verify that the connected meter is a supported type.
Framing Error	The data is corrupted. A stop bit did not occur where it should have.	Check the integrity of the cable connections.
Parity Error	An incorrect parity error check bit was received.	Check the integrity of the cable connections.

SPECIFICATIONS

Operating Temperature	-4...140° F (-20...60° C)
Encoder Compatibility	HR-E, HR-E LCD, HR-E LCD 4-20, E-Series Ultrasonic meter
Dimensions	L 4.651 in. (118 mm) × H 4.325 in. (110 mm) × W 2.017 in. (51 mm)
Weight	9 oz (255 g)
Display	LCD, 8 characters, 0.25 inches high
Battery Life	10 years, 3.6V lithium battery
Construction	High impact thermoplastic, weather and UV resistant

Making Water Visible®

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