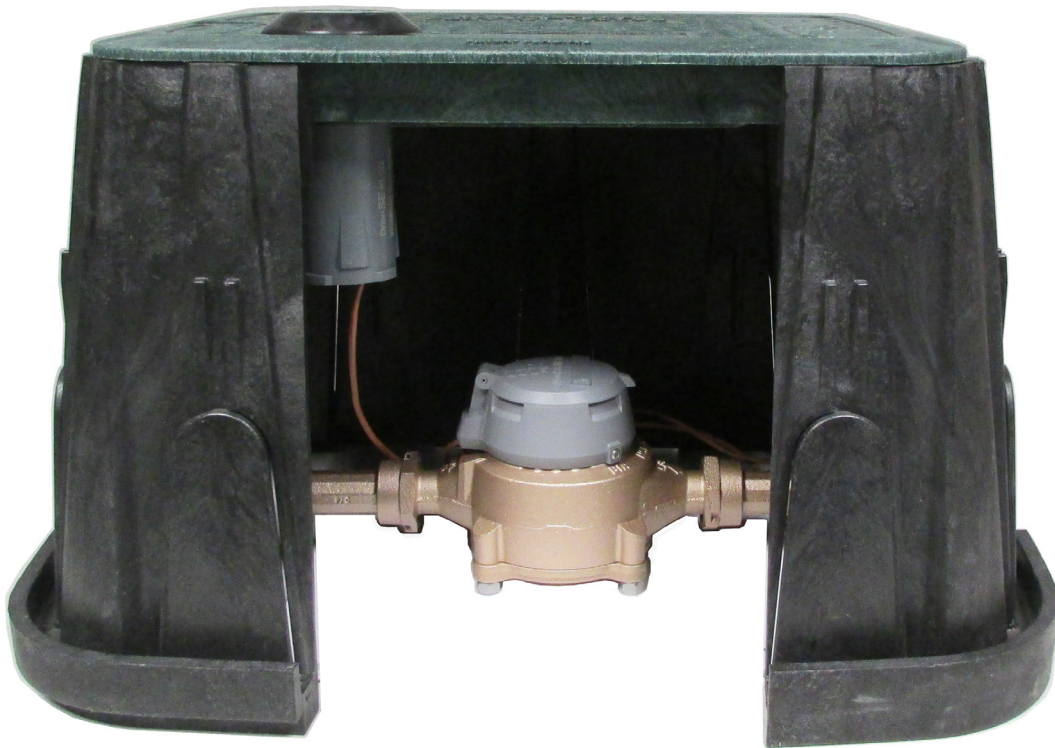




Badger Meter

ORION® Water Endpoints



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OVERVIEW

This manual contains installation instructions for ORION® water endpoints.

- Installation of ORION endpoints must comply with all applicable federal, state and local rules, regulations and codes.
- Failure to read and follow these instructions can lead to misapplication or misuse of this product, resulting in personal injury and damage to equipment.
- Proper performance and reliability of ORION endpoints depend upon installation in accordance with these instructions.

PRODUCT UNPACKING AND INSPECTION

Upon receipt of the product, perform the following unpacking and inspection procedures.

NOTE: If damage to the shipping container is evident upon receipt, request the carrier to be present when the product is unpacked.

Carefully open the shipping package, follow any instructions that may be marked on the exterior. Remove all cushioning material surrounding the product and carefully lift the product from the package.

Retain the package and all packing material for possible use in reshipment or storage.

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.

Carefully remove the pre-wired ORION endpoint and encoder assembly or ORION endpoint from the shipping carton and inspect for damage. Retain the contents of the installation kit for use in mounting the endpoint in the field.

LICENSE REQUIREMENTS

ORION Fixed Network, Migratable and Classic endpoints comply with Part 15 of FCC Rules. ORION Cellular endpoints comply with Part 15, Part 22 and Part 24 of FCC Rules. Operation is subject to the following 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 of the device.

In accordance with FCC Regulations, "Code of Federal Regulations" Title 47, Part 2, Subpart J, Section 1091, transmitters pass the requirements pertaining to radiation exposure. However, to avoid public exposure in excess of limits for general population (uncontrolled exposure), a 20 centimeter distance between the transmitter and the body of the user must be maintained during operation.

No FCC license is required by a utility to operate an ORION meter reading system.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IMPORTANT

Transportation: The Federal Aviation Administration prohibits operating endpoints and receivers on all commercial aircraft. The ORION endpoint is considered an operating transmitter and cannot be shipped by air.

IDENTIFICATION

The ORION endpoint is a three-wire metering endpoint device that requires connection to an encoder to complete the assembly. Each ORION endpoint has a unique numeric serial number on the tag attached to the cable harness and etched on the top or side of the endpoint housing. Each Badger Meter encoder is identified on the face of the register with an assembly number, unit of measure and meter model.



Cellular Endpoint
(medium gray with yellow label)



Fixed Network (SE) or
Migratable (ME) Endpoint
(medium gray)



Classic (CE) ADE® Endpoint
(light gray)



Classic (CE) RTR® Endpoint
(black)



High Resolution LCD Encoder (HR-E® LCD)



E-Series® Ultrasonic Meter with
High Resolution LCD Encoder



High Resolution 8-Dial Encoder (HR-E®)



Absolute Digital Encoder (ADE®)
Figure 1: Endpoints and encoders



Recordall® Transmitter Register (RTR®)

ENDPOINT INSTALLATION GUIDELINES

ORION endpoints can be installed indoors or outdoors, observing these guidelines:

Meter Indoor Installation

- The wired radio endpoint should be mounted outside the building, or in the floor joist near an outside wall, and away from large metal objects for maximum propagation of the radio signal.

Meter Pit Installation

- Cellular endpoints:** Mounting through a nonmetal pit lid is **required**. Deploying Cellular endpoints in applications that are not recommended, such as *through* or *below* metal lids, obstructs radio frequency (RF) performance, increases call-in attempts, and extends RF communication time for the endpoint. Endpoints that are not properly installed may not be covered under warranty.
- Fixed Network endpoints:** Mounting through a nonmetal pit lid is **required** for maximum propagation of the radio signal.
- Migratable and Classic endpoints:** Mounting through a nonmetal pit lid is **recommended** for maximum propagation of the radio signal.

Endpoint/Encoder Connections

ORION endpoints are three-wire metering devices that require connection to an encoder to complete the assembly. Available configurations and the encoder connection methods are listed here, based on the endpoint type.

ORION Cellular Endpoint Configurations

ORION Cellular endpoints are available in the following configurations that can be deployed in indoor, outdoor and pit applications.

Endpoint Configurations	Encoder Connection
<ul style="list-style-type: none"> Prewired endpoint/encoder assembly with or without connector 	Factory prewired ORION endpoints are shipped connected to a Badger Meter encoder, ready for installation and require no splicing. See "Endpoint Installation Kits" on page 17 .
<ul style="list-style-type: none"> Endpoint only with in-line connector (308 or Nicor®) 	Connect the endpoint to an encoder using the in-line connector. See "In-line Connectors" on page 8 , "Outdoor Installation for Endpoint with Nicor Connector" on page 9 , and "Endpoint Installation Kits" on page 17 .
<ul style="list-style-type: none"> Endpoint only with flying lead for field splice 	See "ORION Cellular Endpoints" on page 10 for field wiring information.

ORION Fixed Network, Migratable and Classic Endpoint Configurations

ORION Fixed Network, Migratable and Classic endpoints are available in the following configurations that can be deployed in indoor, outdoor and pit applications.

Endpoint Configurations	Encoder Connection
<ul style="list-style-type: none"> Prewired endpoint/encoder assembly with or without connector 	Factory prewired ORION endpoints are shipped connected to a Badger Meter encoder, ready for installation and require no splicing. See "Endpoint Installation Kits" on page 17 .
<ul style="list-style-type: none"> Prewired integral endpoint/encoder assembly 	Mount the assembly on the bayonet of the meter. See "Integral Endpoint Installation" on page 29 for details.
<ul style="list-style-type: none"> Endpoint only with in-line connector (308 or Nicor®) 	Connect the endpoint to an encoder using the in-line connector. See "In-line Connectors" on page 8 and "Endpoint Installation Kits" on page 17 .
<ul style="list-style-type: none"> Endpoint only with flying lead for field splice 	See "ORION Fixed Network and Migratable Endpoints" on page 11 and "ORION Classic Endpoints" on page 11 for field wiring information.

In-line Connectors

An in-line connector is a feature that allows AMR/AMI device connectivity without the need for a field splice kit. The available connector types, 308 connector and Nicor connector, are shown in [Figure 2](#) and [Figure 3](#).

When ordered as an assembly, the in-line connectors of the endpoint and encoder (or electronic meter) are joined at the factory prior to shipping. When ordered separately, the connectors ends can be connected in the field by the customer. With the proper orientation, the connector ends go together easily. No tools are necessary.

Joining the Connectors

The 308 and Nicor connectors come with a removable cap. Remove the caps and join the connector ends as described below.

NOTE: The connector caps are available for order. Part numbers are shown in [Figure 2](#) and [Figure 3](#).

308 connector:

1. Squeeze the notched area and pull to remove the cap(s).
2. Align the notch on the endpoint-side connector with the corresponding projection on the encoder-side connector and push the ends together for the correct fit. You will hear a “click” when the connector ends are firmly seated and the connection is secure. Additional information can be found in the Product Data Sheet titled, *308 In-line Connector Assembly*, available at www.badgermeter.com.



Protective cap endpoint side:
PN: 66233-005



Protective cap encoder side:
PN: 66233-006

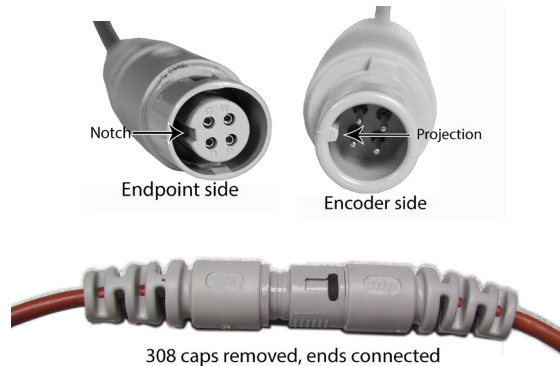


Figure 2: 308 in-line connector

Nicor connector:

1. Pull the cap(s) straight off to remove.
2. Locate the arrow on each connector. With the arrows pointed toward each other, push the ends together until the encoder side connector is fully seated into the endpoint side connector. There should be no visible gap. See [Figure 3](#).



Dust cap endpoint side
PN: 66488-014



Dust cap encoder side
PN: 66488-004



Figure 3: Nicor in-line connector

Outdoor Installation for Endpoint with Nicor Connector

For an outdoor installation of an endpoint with a Nicor connector harness, follow the recommended installation steps below and refer to the image in [Figure 4](#).

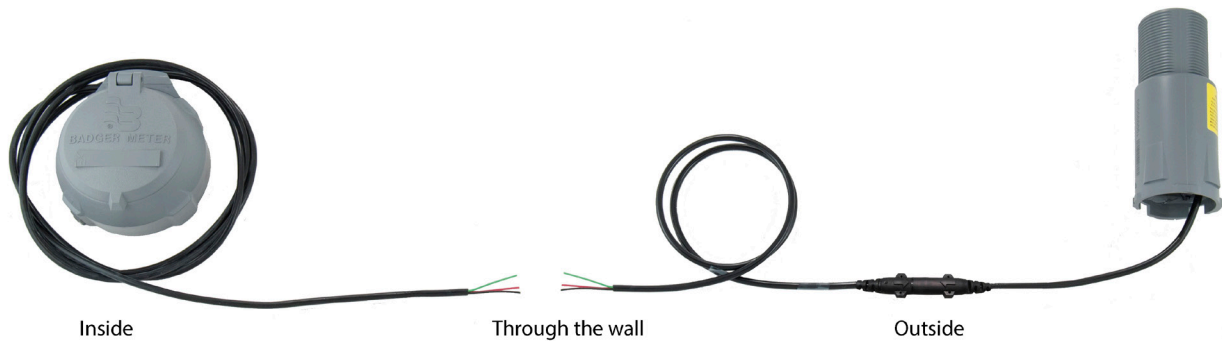


Figure 4: Outdoor endpoint installation

1. Mount the endpoint in an appropriate outdoor location, within the limits of the Nicor connector harness.

NOTE: If using a remote enclosure box ([Figure 5](#)), see ["Remote Installation" on page 21](#) for additional information on mounting.



Figure 5: Endpoint with Nicor connection in remote enclosure box

2. Join the Nicor connector of the endpoint with the Nicor connector mate of the encoder. See ["Joining the Connectors" on page 8](#) for details.
3. Drill a small hole in the wall of the structure to accommodate the endpoint cable.
4. Pass the cable end with the flying leads through the wall of the structure.
5. Connect the cable to the encoder inside the structure. Depending on the encoder connection, either field splice the wires or connect the wires directly to the encoder terminal screws.

NOTE: Refer to the Field Splice Kit Application Data Sheet, available at www.badgermeter.com, for field splice instructions.

Nicor Harness

For available lead lengths and part numbers of the Nicor harness, refer to the document, *Recommended Installation Ordering Guide*, available at www.badgermeter.com.

ORION CELLULAR ENDPOINTS

This section contains information regarding identification and encoder compatibility for field wiring and activation of ORION Cellular endpoints. ORION Cellular endpoints have a 9-digit serial number range of 100000000 to 199999999.

Field Wiring, Encoder Connectivity and Read Resolution

ORION Cellular endpoints with flying leads are available for connectivity to Badger Meter high resolution encoders and E-Series Ultrasonic meters as well as a number of competitive encoders as shown in chart below.

Endpoints are shipped from the factory pre-programmed and are available in an indoor/outdoor, three-wire configuration for connection to the encoders listed. *See also "Endpoint Installation Kits" on page 17.*

All three wires must be connected to complete an installation. The ORION endpoint connection can be made to either existing wires from the encoder or directly to the terminal screws of the encoder, depending on the application and manufacturer. Follow the manufacturer's installation kit instructions provided with the gel splice or field splice kit you are using.

NOTE: For instructions on field wiring using gel connectors, see *"Using Gel Caps to Connect an Encoder" on page 15.*

ORION endpoint wires: **Red** = Power/Clock; **Black** = Ground; **Green** = Data

Endpoint Label	Encoder Connectivity		Endpoint Wire Colors			Reading Resolution
			Red	Black	Green	
ORION Cellular CDMA	Badger Meter HR-E LCD or HR-E encoders or E-Series Ultrasonic Meter with High Resolution output	Encoder Wire/Termination Colors	Red	Black	Green	Up to nine (9) most significant digits
	Elster/AMCo ScanCoder or Invision* Elster evoQ4 meter (encoder output)*		Green	Black	Red	Up to nine (9) most significant digits
	Metron Hawkeye*		Red	Black	Green	Up to nine (9) most significant digits
	Mueller Systems 420 Solid State Register (SSR) LCD*		Red	Black	Green	Up to nine (9) most significant digits
	Neptune ProRead, E-coder or ARB-V*		Black	Green	Red	Up to nine (9) most significant digits
	Sensus Electronic Register encoder (ECR) or ICE*		Red	Black	Green	Up to nine (9) most significant digits
	Master Meter® Octave® Ultrasonic meter (encoder output)*		Red	Black	Green	Up to eight (8) most significant digits
	Hersey Translator*		Due to the customized, factory wire configurations of the Hersey Translator, the terminal posts may not match the ORION endpoint wire colors. Please contact Hersey for the terminal post wiring schematic of your encoders to determine how the posts correspond to ORION endpoint wires.			

NOTE: Competitive encoder output is determined by the encoder configuration.

*ORION Cellular endpoints are compatible with the encoders/meters noted above with a manufacture date of 2000 or newer as long as the encoder has three wires connected to it and is programmed into the three-wire output mode for AMR/AMI. Encoder registers that are currently in two-wire mode of operation require programming by the Utility, including registers that support auto two- or three-wire detection systems that do not automatically switch to three-wire mode of operation once a compatible endpoint is connected for ORION connectivity.

Activating the Endpoint

ORION Cellular endpoints are shipped in an inactive, non-transmitting state. The endpoint must be activated by magnet swipe and use of the ORION Cellular endpoint installation smartphone application, BEACONTool.

Confirming an Installation

Before leaving the installation site, the installer can use an ORION handheld to confirm via IR that the endpoint wiring has been done correctly and is broadcasting RF data for cellular data collection. Refer to the appropriate handheld user manual for more information.

ORION FIXED NETWORK AND MIGRATABLE ENDPOINTS

This section contains information regarding identification and encoder compatibility for field wiring and activation of ORION Fixed Network and Migratable endpoints. ORION Fixed Network and Migratable endpoints have a serial number range of 30000000 to 599999999.

Field Wiring, Encoder Connectivity and Read Resolution

ORION Fixed Network and Migratable endpoints with flying leads are available for connectivity to Badger Meter encoders and E-Series Ultrasonic meters as well as a number of competitive encoders as shown in chart below.

Endpoints are shipped from the factory pre-programmed and are available in an indoor/outdoor, three-wire configuration for connection to the encoders listed. *See also "Endpoint Installation Kits" on page 17.*

All three wires must be connected to complete an installation. The ORION endpoint connection can be made to either existing wires from the encoder or directly to the terminal screws of the encoder, depending on the application and manufacturer. Follow the manufacturer's installation kit instructions provided with the gel splice or field splice kit you are using.

NOTE: For instructions on field wiring using gel connectors, see *"Using Gel Caps to Connect an Encoder" on page 15.*

ORION endpoint wires: **Red** = Power/Clock; **Black** = Ground; **Green** = Data

Endpoint Label	Encoder Connectivity	Endpoint Wire Colors			Reading Resolution
		Red	Black	Green	
ELCD or ENC	Badger Meter HR-E LCD or HR-E encoders, or E-Series Ultrasonic Meter with High Res output	Red	Black	Green	Up to eight (8) most significant digits
ADE or ENC	Badger Meter ADE or E-Series Ultrasonic Meter with ADE output	Red	Black	Green	Up to six (6) most significant digits
RTR	Badger Meter RTR or E-Series Ultrasonic Meter with RTR output	Red	Black	Green	Up to seven (7) most significant digits
ADE or ENC	Elster/AMCo ScanCoder or Invision* Elster evoQ4 meter (encoder output)*	Green	Black	Red	Up to eight (8) most significant digits
C700D	Elster/AMCo C700 Digital*	Red	Black	Not used – cut green wire flush with outer sheath	Up to seven (7) most significant digits
ADE or ENC	Master Meter Octave Ultrasonic meter (encoder output)*	Red	Black	Green	Up to eight (8) most significant digits
ADE or ENC	Metron Hawkeye*	Red	Black	Green	Up to eight (8) most significant digits
ADE or ENC	Mueller Systems 420 Solid State Register (SSR) LCD*	Red	Black	Green	Up to eight (8) most significant digits
ADE or ENC	Neptune ProRead, E-coder or ARB-V*	Black	Green	Red	Up to eight (8) most significant digits
ADE or ENC	Sensus Electronic Register encoder (ECR) or ICE*	Red	Black	Green	Up to eight (8) most significant digits
ADE or ENC	Hersey Translator*	Due to the customized, factory wire configurations of the Hersey Translator, the terminal posts may not match the ORION endpoint wire colors. Please contact Hersey for the terminal post wiring schematic of your encoders to determine how the posts correspond to ORION endpoint wires.			

NOTE: Competitive encoder output is determined by the encoder configuration.

*ORION Fixed Network and Migratable ADE or ENC endpoints are compatible with the encoders/meters noted above with a manufacture date of 2000 or newer as long as the encoder is programmed into the three-wire output mode for AMR/AMI and has three wires connected to it. Encoder registers that are currently in two-wire mode of operation require programming by the Utility, including registers that support auto two- or three-wire detection systems that do not automatically switch to three-wire mode of operation once a compatible endpoint is connected for ORION connectivity.

Activating the Endpoint

ORION Fixed Network and Migratable endpoints are shipped in “Pause” mode, an inactive, non-transmitting state. The endpoint offers a Smart Activation feature. After installation, the endpoint begins broadcasting data when the encoder to which it is connected first senses water usage. No field programming or special tools are required to activate the endpoint.

NOTE: Endpoints shipped via air are shipped in “Stop” (hard sleep) mode and must be activated via infrared (IR) communication using an ORION handheld or mobile reading system and the ORION Endpoint Utility software.

RTR

When an RTR is mounted on the water meter, and the ORION endpoint connected to the RTR is securely installed, the ORION system is ready for operation. The endpoint will turn on with water usage. Run water through the meter to increment the RTR 1/10th of the test circle. Upon receiving the first digital signal from the RTR, the endpoint counts the signal and begins its RF transmissions. No specific wire testing or endpoint programming is required.

HR-E or ADE

When an HR-E or ADE encoder is mounted on the water meter, and the ORION endpoint connected to the encoder is securely installed, the ORION system is ready for operation. The endpoint will begin RF transmission when it detects enough water usage from the register within one fifteen minute interval. The amount of water depends on the endpoint and meter size. For example, with an ORION ME endpoint connected to an 8-dial HR-E on an M25 meter, the encoder must detect 1 gallon of water usage before the endpoint turns on and begins its RF data broadcast. Once it begins broadcasting, the endpoint updates hourly based on the encoder odometer reading. No specific wire testing or endpoint programming is required.

High Resolution ELCD Encoder or E-Series Ultrasonic Meter

When an HR-ELCD encoder is mounted on the water meter or an E-Series Ultrasonic meter is installed, and the ORION endpoint connected to the encoder or E-Series Ultrasonic meter is securely installed, the ORION system is ready for operation. The endpoint will begin RF transmission when it detects enough water usage from the register within one fifteen minute interval. The amount of water depends on the endpoint and meter size. For example, with an ORION ME endpoint connected to a 9-dial HR-E LCD on an M120 meter, the encoder must detect 1 gallon of water usage before the endpoint begins its RF data broadcast. Once the endpoint has begun broadcasting, it will update hourly based on the HR-E LCD encoder or High Resolution E-Series Ultrasonic meter odometer reading. No specific wire testing or endpoint programming is required.

Changing the Registration for an Existing Endpoint Assembly – Best Practice

To connect an ORION Fixed Network or Migratable endpoint with previously logged historical profile data to different registration, best practice recommends following this process:

1. Extract and save the historical profile data from the endpoint. See the *ORION Endpoint Utility User Manual* for mobile or handheld, available at www.badgermeter.com, if you need help.
2. Clear the profile data from the endpoint.
3. Connect the new registration. Follow applicable installation instructions in this manual.

Confirming an Installation

Reading an ORION endpoint immediately after installation verifies proper operation and reading performance. Before leaving the installation site, the installer can use an ORION handheld or mobile reading system to confirm the endpoint wiring was done correctly and that the endpoint is broadcasting RF data for reading. See the appropriate handheld or mobile reading system user manuals for more information.

ORION CLASSIC ENDPOINTS

This section contains information regarding identification and encoder compatibility for field wiring and activation of ORION Classic endpoints. ORION Classic endpoints have a serial number range of 70000000 to 199999999.

Field Wiring, Encoder Connectivity and Read Resolution

ORION Classic endpoints with flying leads are available for connectivity to Badger Meter encoders and E-Series Ultrasonic meters as well as a number of competitive encoders as shown in chart below.

Endpoints are shipped from the factory pre-programmed and are available in an indoor/outdoor, three-wire configuration for connection to the encoders listed. *See also "Endpoint Installation Kits" on page 17.*

All three wires must be connected to complete an installation. The ORION endpoint connection can be made to either existing wires from the encoder or directly to the terminal screws of the encoder, depending on the application and manufacturer. Follow the manufacturer's installation kit instructions provided with the gel splice or field splice kit you are using.

NOTE: For instructions on field wiring using gel connectors, see *"Using Gel Caps to Connect an Encoder" on page 15.*

ORION endpoint wires: **Red** = Power/Clock; **Black** = Ground; **Green** = Data

Endpoint Label	Encoder Connectivity	Endpoint Wire Colors			Reading Resolution
		Red	Black	Green	
ADE	Badger Meter ADE, HR-E LCD or HR-E encoders, or E-Series Ultrasonic Meter with High Res or ADE output	Red	Black	Green	Up to seven (7) most significant digits
RTR	Badger Meter RTR or E-Series Ultrasonic Meter with RTR output	Red	Black	Green	Up to seven (7) most significant digits
UNIV*	Elster/AMCo ScanCoder or Invision	Green	Black	Red	Up to seven (7) most significant digits
UNIV*	Master Meter Octave Ultrasonic meter (encoder output)	Red	Black	Green	Up to seven (7) most significant digits
UNIV*	Metron Hawkeye	Red	Black	Green	Up to seven (7) most significant digits
UNIV*	Mueller Systems 420 Solid State Register (SSR) LCD	Red	Black	Green	Up to seven (7) most significant digits
ARB-V*/**	Neptune ARB-V for connectivity to ORION endpoint > serial number 80000000	Black	Green	Red	Up to seven (7) most significant digits
ARB-V*/**	Neptune ARB-V for connectivity to ORION endpoint < serial number 79999999	Red	Black	Green	Up to seven (7) most significant digits
UNIV*	Neptune ProRead or E-coder	Black	Green	Red	Up to seven (7) most significant digits
UNIV*	Sensus Electronic Register Encoder (ECR) or ICE	Red	Black	Green	Up to seven (7) most significant digits
UNIV*	Hersey Translator	Due to the customized, factory wire configurations of the Hersey Translator, the terminal posts may not match the ORION endpoint wire colors. Please contact Hersey for the terminal post wiring schematic of your encoders to determine how the posts correspond to ORION endpoint wires.			

NOTE: Competitive encoder output is determined by the encoder configuration.

*ORION Classic UNIV and ARB-V endpoints are compatible with the encoders/meters noted above with a manufacture date of 2000 or newer as long as the encoder is programmed into the three-wire output mode for AMR/AMI and has three wires connected to it. Encoder registers that are currently in two-wire mode of operation require programming by the Utility, including registers that support auto two- or three-wire detection systems that do not automatically switch to three-wire mode of operation once a compatible endpoint is connected for ORION connectivity.

**A separate ORION CE Universal endpoint is available for connectivity to the Neptune ARB-V encoder. Make sure the ORION Classic endpoint has "ARB-V" on the harness label when wiring to an ARB-V encoder. Wiring differs depending on the serial number of the ORION endpoint you are connecting to the ARB-V encoder, so make sure to verify wiring is correct per the above chart.

Activating the Endpoint

ORION Classic water endpoints are shipped in an inactive, non-transmitting state known as “Pause” mode. The endpoint offers a Smart Activation feature. After the endpoint is installed, it begins broadcasting data when the encoder senses the first usage of water. No field programming or special tools are required to activate the endpoint.

NOTE: Endpoints shipped via air are shipped in “Stop” (hard sleep) mode and must be activated via IR communication using an ORION handheld or mobile reading system and the ORION Endpoint Utility software.

RTR

When an RTR is mounted on the water meter, and the ORION endpoint connected to the RTR is securely installed, the ORION system is ready for operation. The endpoint will turn on with water usage. Run water through the meter to increment the RTR 1/10th of the test circle. Upon receiving the first digital signal from the RTR, the endpoint counts the signal and begins its radio frequency (RF) transmissions. No specific wire testing or endpoint programming is required.

ADE, UNIV or ARB-V Endpoint

After the ORION endpoint is securely installed and the encoder is mounted on the water meter, the ORION system is ready for operation. The endpoint will turn on with water usage. An ADE/UNIV/ARB-V endpoint requires up to one hourly reading interval where consumption changes the electronic reading. The amount of water depends on meter size. For example, with an ORION endpoint connected to a 6-dial ADE on an M35 meter, the encoder must detect 10 gallons of water usage before the endpoint will begin its RF data broadcast. Once it begins broadcasting, the endpoint will update hourly based on the encoder odometer reading. No specific wire testing or endpoint programming is required.

Confirming an Installation

Reading an ORION endpoint immediately after installation verifies proper operation and reading performance. Before leaving the installation site, the installer can use an ORION handheld or mobile reading system to confirm the endpoint wiring has been done correctly and that the endpoint is broadcasting RF data for reading. See the appropriate handheld or mobile reading system user manuals for more information.

USING GEL CAPS TO CONNECT AN ENCODER

For those connections that are not factory wired or equipped with in-line connectors, follow these guidelines for using gel caps when splicing is required, either for installation or to fix a repair after a tamper.

Refer to the wiring charts starting on [page 10](#).

NOTE:

- For pit environments, splice connections require a field splice kit (PN: 62084-001), which can be ordered separately. Refer to the instructions found in the document, *Field Splice Kit for Badger Meter AMR/AMI Products*, which is available at www.badgermeter.com.
- For all installations, excess wire should be coiled and cable tied to avoid any damage.
- Required splicing tools are shown here.

Splice Tools (Customer Supplied)

Badger Meter Part Number

- Parallel Pliers

59983-001



- Coax Wire Stripper

59989-001



- Diagonal Cutting Pliers

n/a

Using Gel Caps to Connect an Encoder

Follow these steps when using Badger Meter supplied gel caps.

- To connect an encoder with existing wires to an ORION endpoint, strip approximately 1-1/2 inches of outer insulation sheath from the encoder and endpoint cables using a coax wire stripping tool. We recommend using the Badger Meter Coax Wire Stripper (59989-001).

⚠ CAUTION

USE CAUTION WHEN REMOVING THE OUTER SHEATH SO THAT THE INNER SIGNAL WIRE INSULATION IS NOT NICKED OR DAMAGED.

- Unwind the outer foil shield from the endpoint cable and cut it off even with the outer sheath using diagonal cutting pliers.
- Connect the ORION endpoint to an approved encoder. Verify the endpoint serial number prior to completing the wiring setup.
 - Connect the encoder cable wires to the ORION endpoint wires using the insulation gel caps provided in the installation kit. Refer to the charts starting on [page 10](#) for the endpoint type and determine which wires need to be connected to complete an installation.

NOTE: The terminal posts and wire colors may not match.

⚠ CAUTION

DO NOT STRIP ANY INSULATION FROM THE ENDS OF THE WIRES BEFORE YOU PUSH THEM INTO THE GEL CAP.

- Insert the wires from each cable end as far as possible into the gel cap. See [Figure 6: Wires in gel cap](#).

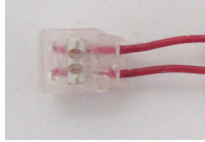


Figure 6: Wires in gel cap

- Using a crimping tool such as the Badger Meter Parallel Pliers (59983-001), place the gel cap with the wires into the jaws of the crimping tool.

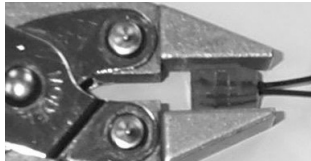


Figure 7: Gel cap in crimping tool

- Crimp the gel cap by squeezing the crimping tool handles until the gel cap is completely compressed. The Badger Meter Parallel Pliers is designed to apply just enough pressure to crimp the gel cap. Apply pressure for three seconds.



Figure 8: Compress the gel cap

- Repeat the crimping procedure for the remaining gel caps and wires.
4. Attach the two plastic cable ties and tighten securely for strain relief. Snip off the excess cable tie with the wire cutter.
 5. For remote installations, the connection is complete.

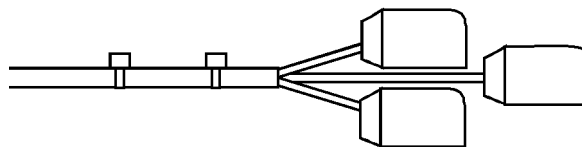


Figure 9: Wire tie attachment locations

NOTE: For pit installations, an appropriate field splice kit should be used. If using the Badger Meter Field Splice Kit, refer to the *Field Splice Kit Application Data Sheet* provided with the kit.

Testing Wire Connections

It is recommended that you test all wiring connections to confirm connectivity and to verify the ORION endpoint reading and the encoder reading are the same. The connections can be tested using the Quick Read function with either an ORION handheld or mobile data collector. See the appropriate software manual, available at www.badgermeter.com, for more information.

ENDPOINT INSTALLATION KITS

The following kits are available for pit, vault and remote endpoint installations. Instructions for using the kits are included in this section.

TYPE	DESCRIPTION	KIT PART NUMBER
PIT	<i>ADA-compliant Through-the-Lid Installation Kit</i>	64394-030
	<i>Below-the-Lid with Knuckles Installation Kit</i>	64394-003
	<i>Integrated Pit Lid Hanger Installation Kit</i>	64394-009
VAULT	<i>Vault Installation</i>	64394-008
REMOTE	<i>Remote Wall Mount Box Enclosure</i>	66009-004
	<i>IR Programming Bracket (Optional)</i>	67625-001
	<i>Remote Installation Bracket Kit</i>	64394-029
	<i>Mounting Bracket for Remote Endpoints</i>	64394-023

NOTE: Refer to the *ORION Water Endpoint Parts List*, available at www.badgermeter.com for individual endpoint kit components.

PIT INSTALLATION

Through-the-Lid Installation Kit

The ADA-compliant **Through the Lid Installation Kit (PN: 64394-030)** is designed for use with a pit lid of one inch maximum thickness and a standard hole diameter of 1-7/8 inches.

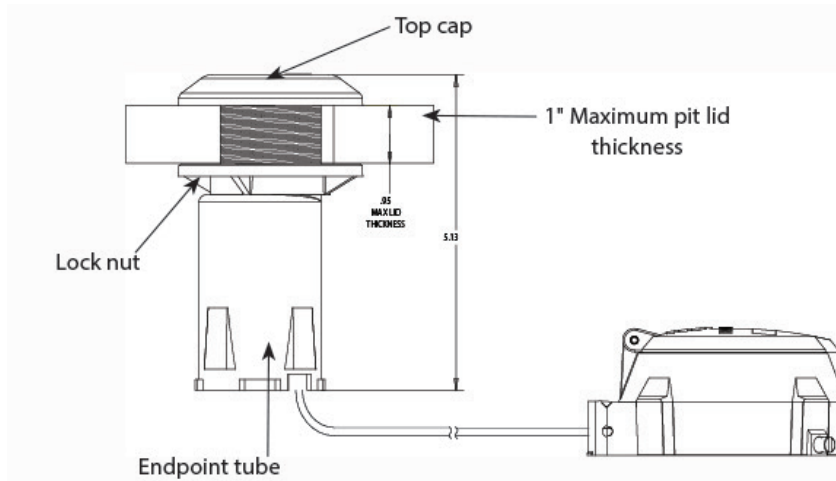


Figure 10: ORION pit endpoint

To install the endpoint through the lid, follow these steps and see [Figure 10](#).

1. Screw the lock nut onto the tube threads as shown.
2. Insert the endpoint tube through the bottom of the lid.
3. Screw the top cap onto the endpoint tube threads as shown and tighten.
4. Tighten the lock nut against the bottom of the lid until secure.

NOTE: When installing an ORION endpoint through a thick lid, you can use a **Pit Tube Extender (PN: 67025-001)** which requires a two-inch diameter hole. Radio frequency (RF) performance may be reduced when using the Pit Tube Extender.



Figure 11: Endpoint pit tube extender

Below-the-Lid with Knuckles Installation Kit

For below the lid installations, a special **Below-the-Lid with Knuckles Installation Kit (PN: 64394-003)** with mounting bracket ([Figure 12](#)) is available. This mounting support bracket is designed for use with a 3/8, 5/8 and 1/2 inch rebar or 1/2 inch schedule 40 PVC pipe.

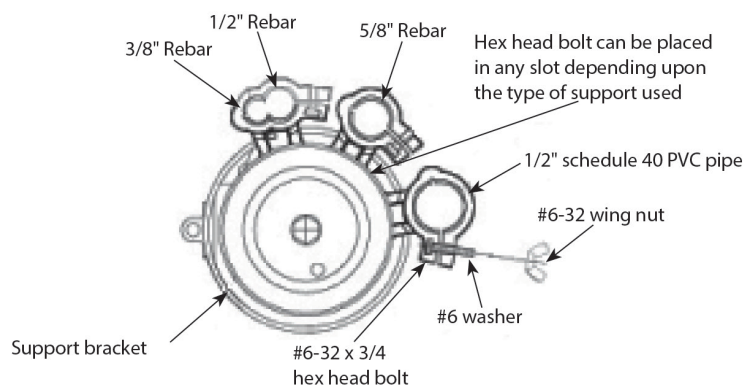


Figure 12: Pit support bracket (knuckles) - top view

To install an ORION endpoint below a meter pit lid, follow these steps and see [Figure 13](#).

1. Drive rebar or stake into the ground.

CAUTION

DRIVE REBAR OR STAKE INTO THE GROUND PRIOR TO ATTACHING THE ENDPOINT TO AVOID DAMAGE.

2. Once in the ground, secure the mounting bracket on the appropriate rebar or pipe using the enclosed washer, wing nut and hex head bolt provided with the bracket.
3. Insert the endpoint through the bottom of the bracket and thread the lock nut onto the top of the endpoint. For best results, mount the endpoint a maximum of one to two inches below the underside of the lid.

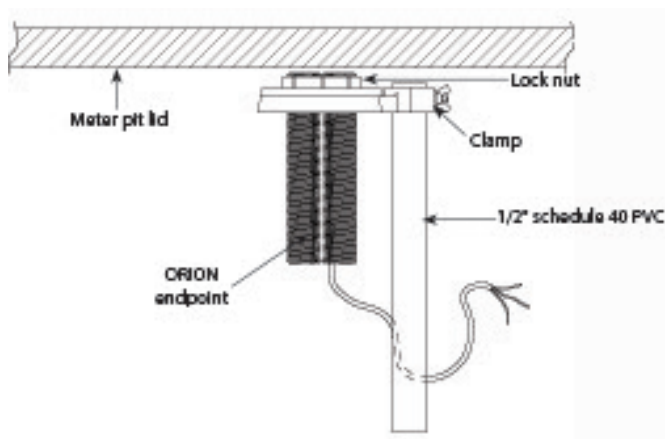


Figure 13: Pit ORION beneath lid installation

Integrated Pit Lid Hanger Installation Kit

ORION endpoints can be installed below composite and plastic lids that have an integrated hanger for AMR/AMI endpoints using the **Integrated Pit Lid Hanger Installation Kit (PN: 64394-009)**.

To install an ORION endpoint to a composite or plastic lid with an integrated hanger, follow these steps and see [Figure 14](#).

1. Thread the lock nut onto the top of the ORION endpoint as shown.
2. Slide the endpoint into the lid bracket.
3. Tighten the lock nut so that the endpoint is held firmly in place.

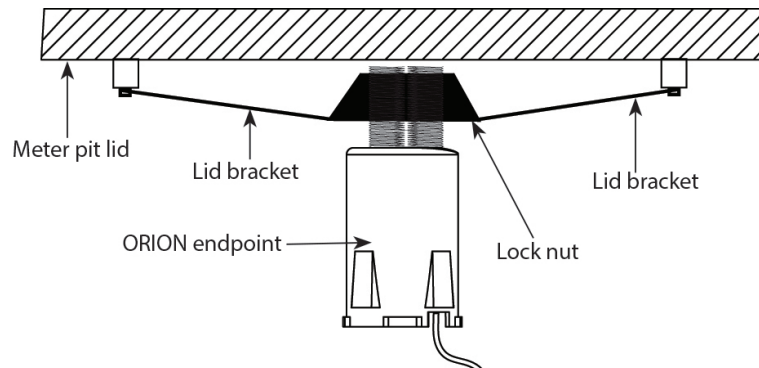


Figure 14: Integrated pit lid hanger installation

VAULT INSTALLATION

For a deep vault installation, Badger Meter offers a **Vault Installation Kit (PN: 64394-008)** that can be used to mount the endpoint to the side of the vault.

To install an ORION endpoint in a deep vault, follow these steps and see [Figure 15](#).

1. Mount the C-clamp on the side of the vault. Select a location inside the vault, close to the top, that will not be damaged when access to the meter is required.
2. Place the neoprene spacer supplied in the installation kit around the endpoint, approximately 1/2 inch from the top of the endpoint.
3. Thread the lock nut on the endpoint until it makes contact with the neoprene spacer as shown in [Figure 15](#).
4. Insert the endpoint into the C-clamp as shown.
5. Close the C-clamp and lock it in place so that it closes over the neoprene spacer and securely holds the endpoint.

NOTE: ORION radio endpoints perform best with a clear line of sight. Performance varies by installation and lid construction.

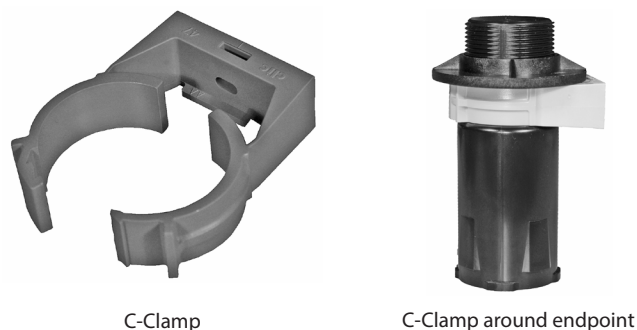


Figure 15: C-Clamp and placement

REMOTE INSTALLATION

Remote Wall Mount Box Enclosure

The ORION **Remote Wall Mount Box Enclosure Kit (PN: 66009-004)** can be used for endpoint remote mounting applications. The wall mounted enclosure is designed for mounting ORION endpoints in indoor or outdoor environments, and also provides an environmentally protected area for gel splice connections (if needed).

The ORION Remote Wall Mount Box Enclosure Kit is recommended for proper mounting of the ORION endpoint in remote applications.

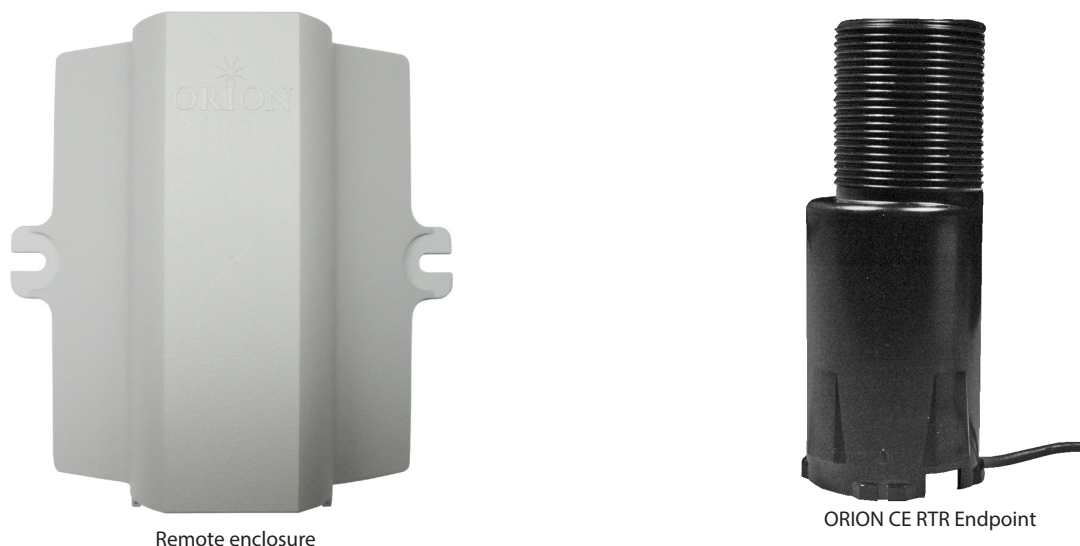


Figure 16: Enclosure and endpoint

To install an ORION endpoint using the enclosure, follow these steps.

1. Flip over the enclosure and look inside to verify the proper orientation. The bottom is identified by the IR head holder rails and an opening that allows access to the endpoint IR communication port without having to disassemble the unit ([Figure 17](#)).

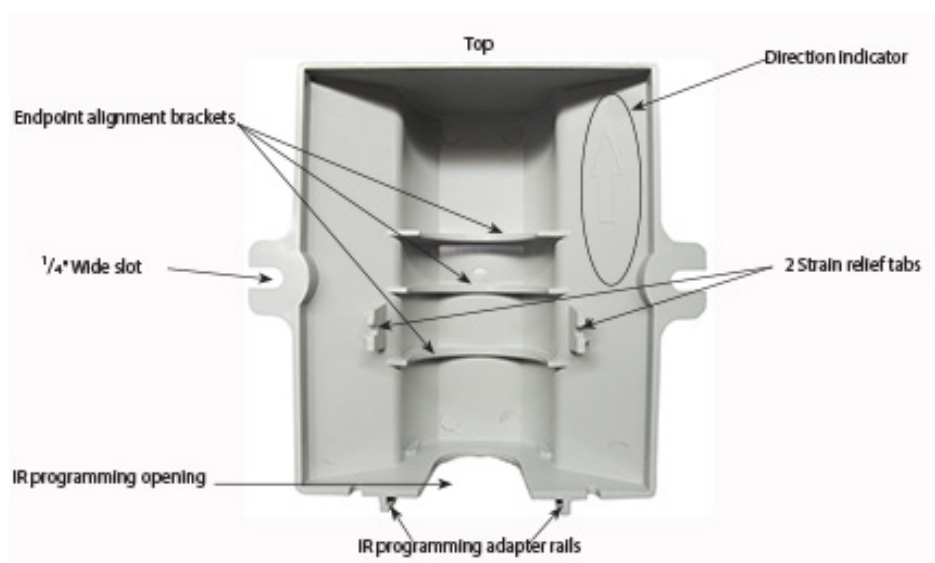


Figure 17: Enclosure orientation

2. Place the endpoint into the enclosure as shown in [Figure 18](#). Make sure the flat side of the endpoint is facing out (toward the installer). Mount the endpoint antenna toward the top of the enclosure, using the endpoint alignment brackets.

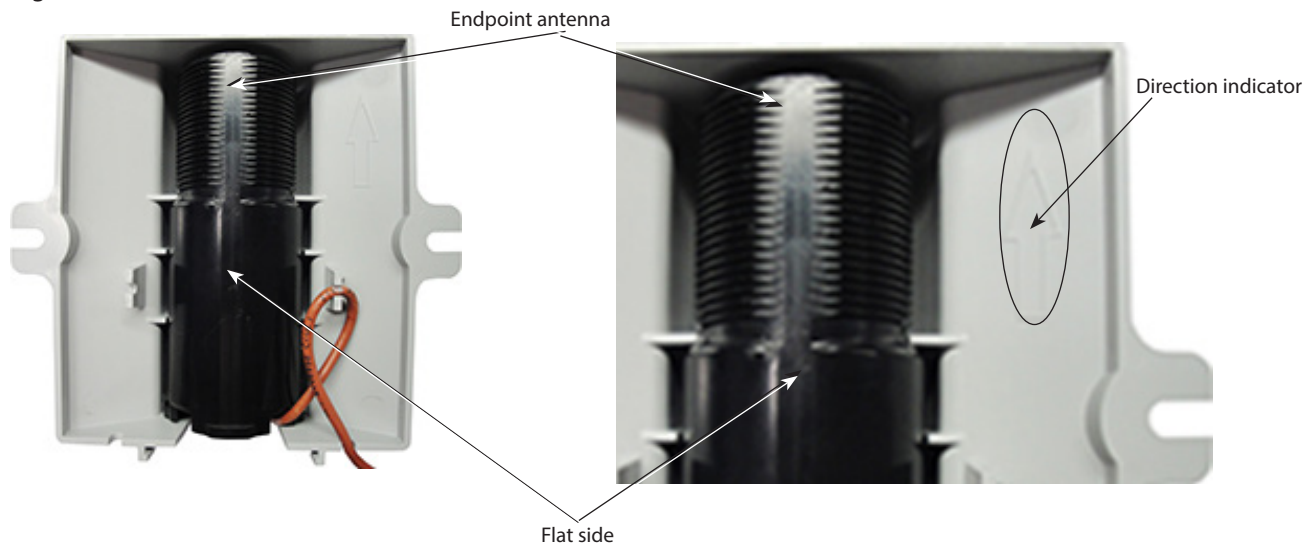


Figure 18: Endpoint orientation

NOTE: The arrow points up, indicating the endpoint position. See the close-up image in [Figure 18](#).

3. When mounting the enclosure on a wall, mount it with the arrow pointed up (toward the sky).
4. After the endpoint is placed in the enclosure, position the endpoint cable.
 - Loop the endpoint cable through the strain relief tab and through the cutout on the bottom ([Figure 19](#)).
 - If the endpoint has a Nicor connector, place the Nicor connector inside the enclosure with the endpoint ([Figure 20](#)) and route the connector cable through the cutout on the bottom. If the endpoint cable is fed through the wall behind the enclosure, it does not need to route through the cutout at the bottom.

NOTE: If needed, gel splice connections can be made and kept inside the enclosure prior to mounting.

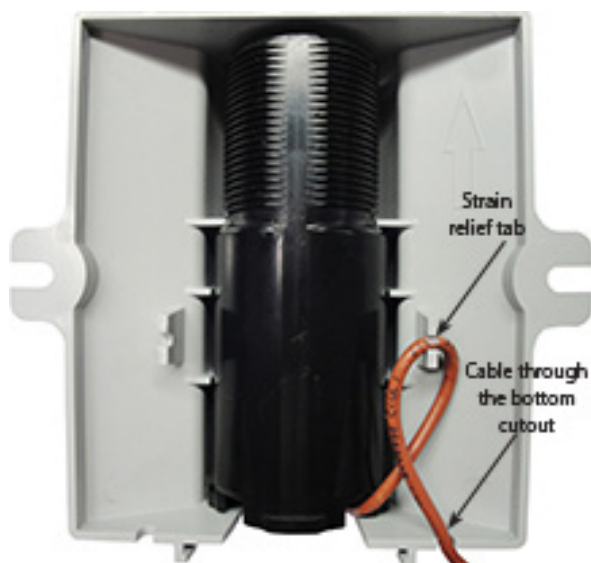


Figure 19: Cable positioning



Figure 20: Cable position with Nicor connector

5. Verify that the enclosure is properly positioned with the endpoint antenna up and the endpoint IR port facing down. Secure the enclosure to the wall using customer-supplied screws.



Figure 21: Enclosure positioning

IR Programming Bracket (Optional)

To hold the IR programming head in place while performing IR functions on ORION endpoints, an optional **IR Programming Bracket (PN: 67625-001)** is available for use with the remote enclosure box. The programming bracket slides into the adapter rails on the bottom of the remote enclosure box to correctly align the optical head of the IR programming cable with the endpoint LED port.

1. Slip the optical head of the IR programming cable into the top of the bracket with the nubs on the head fitted into the cutouts on the bracket.



Optical head of the IR programming cable



Bracket (PN: 67625-001) for the optical head



Optical head inserted into bracket

Figure 22: Optical head and bracket

2. Slide the bracket into the adapter rails at the bottom of the enclosure.



Figure 23: IR programming bracket inserted into the adapter rails

3. Connect the IR programming cable to a Badger Meter ORION handheld or mobile reading device and refer to the IR Programming software instructions in the user manuals for those devices.

Remote Installation Bracket Kit

The **Remote Installation Bracket Kit (PN: 64394-029)** can be used to properly install an ORION endpoint in any indoor, outdoor or pit application. Prior to beginning the installation procedure, ensure that the following items are available.

- Remote Installation Bracket kit
- Two customer-supplied screws
- Screwdriver and drill

The remote installation bracket securely mounts an ORION endpoint. For non-submerged indoor and outdoor applications, the installation bracket can also be used to enclose gel-cap, wire-splice connections, to protect them from the environment and to prevent tampering in any indoor or outdoor nonmetallic joist, wall or pit application.

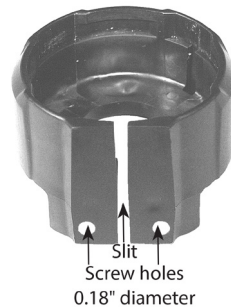


Figure 24: Remote installation bracket

To install the bracket to the endpoint housing, follow these steps.

1. Place the encoder cable harness through the slit in the bracket with the screw holes at the bottom.

NOTE: Carefully slide the cable harness through the slit in the bracket.

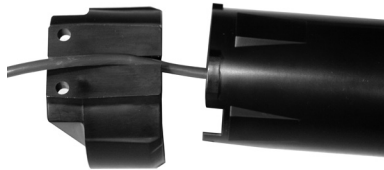


Figure 25: Cable harness threading

2. Locate the small triangle aligned with the small hole on the bottom of the installation bracket. This triangle is used to properly align the endpoint to the installation bracket.

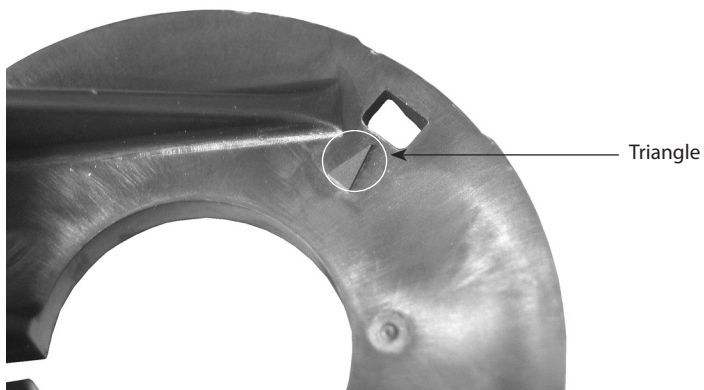


Figure 26: Aligning triangle

On the ORION endpoint, there is a small raised triangle on the lower side of the housing.



Figure 27: Housing triangle

3. Align the two triangles and push the bracket and endpoint together.

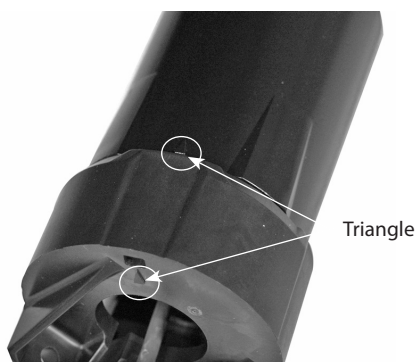


Figure 28: Align both triangles

4. With the installation bracket in one hand and the housing in the other hand, hold the bracket still and twist the housing approximately 1/4 turn clockwise until it clicks and locks into place.

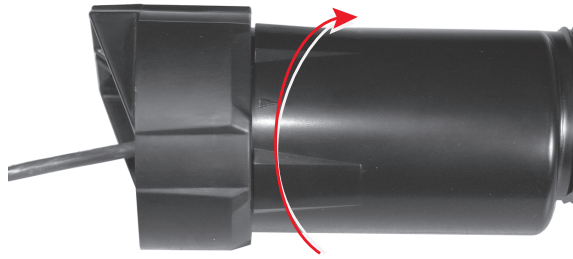


Figure 29: Bracket and housing connection

To install the endpoint assembly, follow these steps.

1. Align the ORION endpoint and the installation bracket with the antenna facing upwards ([Figure 30](#)).
2. Using two customer-supplied screws, secure the endpoint and installation bracket assembly to a nonmetallic joist or wall.



Figure 30: Endpoint positioning

Mounting Bracket for Remote Endpoints

The **Commercial Meter Mounting Bracket Kit (PN: 64394-023)** is designed for use with most Badger Meter Turbo, Compound Series and Fire Service Disc bypass meter lines. The mounting bracket kit allows you to securely mount an ORION remote endpoint to a meter.

Before you begin the installation, you will need a torque wrench set and the mounting bracket kit. The kit components are:

Stainless steel mounting bracket PN: 66360-001

Lock nut PN: 62825-001

To install the bracket, follow these steps:

1. Verify that the water is turned off.
2. Slip the mounting bracket over the top of the ORION endpoint, as shown below.



Figure 31: Stainless steel mounting bracket



Figure 32: Mounting bracket over endpoint

3. Remove the lock nut from the kit packaging and screw it on the top of the endpoint.

Hand tighten the lock nut. Verify that the bracket is secure.



Figure 33: Tighten lock nut

4. At the meter, unscrew the head assembly bolt at the location where you plan to mount the endpoint.
5. Position the bracket, reinsert the casing bolt and hand tighten it.

NOTE: For visual clarity, the photo in [Figure 34](#) shows the bracket without the endpoint attached.

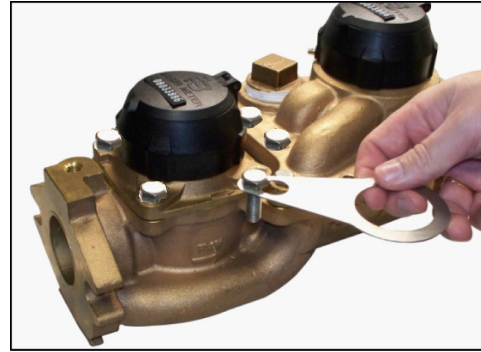


Figure 34: Unscrew head assembly bolt

6. Position the bracket with the endpoint as far from the meter as possible to provide adequate space for the ORION endpoint signal to propagate.



Figure 35: Endpoint connected with bracket to meter

7. With the torque wrench, tighten the casing bolt as indicated in the chart below:

Meter	Ft-lb
2-inch Turbo Series Meter	10.9
3-inch Turbo Series Meter	37.5
4-inch Turbo Series Meter	37.5
6-inch Turbo Series Meter	37.5
2-inch Compound Series Meter	16.7
3-inch Compound Series Meter	33.3
4-inch Compound Series Meter	33.3
6-inch Compound Series Meter	33.3
Heavy Duty Bypass M70	21.0
Heavy Duty Bypass M170	50.0

8. Installation is complete. Turn water back on.

NOTE: If two ORION endpoints are required for a fire series assembly or a compound meter application, the endpoints must be mounted on opposite sides of the meter head assembly.

INTEGRAL ENDPOINT INSTALLATION

ORION Fixed Network, Migratable and Classic endpoints are available in an integral configuration, in which the endpoint and encoder are connected in one assembly.

Mounting an Integral Endpoint on the Meter

An integral endpoint can be installed on any Badger Meter disc, turbo or compound meter by mounting the assembly onto the bayonet of the meter and rotating it into its locking position. See [Figure 36](#).

1. Loosen the security screw on the endpoint encoder assembly prior to mounting the assembly on the meter.
2. Mount the assembly housing on the meter bayonet.
3. Turn the assembly clockwise 1/4 turn to lock the assembly into place on the meter.
4. After the assembly is mounted on the meter, tighten the security screw to secure the assembly to the register.

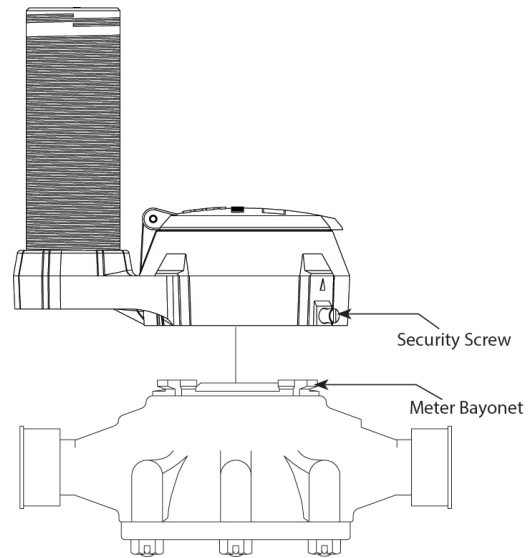


Figure 36: Integral assembly on meter

Integral Endpoint with Three Feet of Wire

An integral endpoint can be ordered with three feet of wire inside the assembly housing. Units with additional wire are marked "3 Ft Wire" on the the serial number label on the side of the integral bracket. With this option, the endpoint can be removed from the housing and mounted remote from the encoder. See ["Removing an Integral Endpoint from the Assembly Housing" on page 30](#).



Figure 37: Additional wire noted on label

Removing an Integral Endpoint from the Assembly Housing

IMPORTANT

Removing the endpoint from the assembly housing can only be done once. Once removed, the endpoint cannot be reassembled into an integral configuration with the encoder.

⚠ CAUTION

PRIOR TO DISASSEMBLING AN INTEGRAL ENDPOINT, VERIFY THAT THE ENDPOINT HAS THREE FEET OF WIRE PACKAGED WITH THE ASSEMBLY. CHECK THE SERIAL NUMBER LABEL ON THE SIDE OF THE INTEGRAL BRACKET TO MAKE SURE IT INDICATES "3 FT WIRE." DO NOT CONTINUE WITH THE STEPS LISTED BELOW IF YOUR INTEGRAL ENDPOINT DOES NOT HAVE THIS DESCRIPTION ON THE SERIAL NUMBER LABEL, AS ENDPOINT DAMAGE WILL OCCUR.

1. Remove the assembly from the meter.
 - Remove the security screw at the base of the assembly.
NOTE: Make sure to retain the security screw for remounting the encoder assembly in Step 5.
 - Turn the endpoint encoder assembly (as one piece) 1/4 turn, counter-clockwise.
 - Lift the assembly off the meter.



Figure 38: Remove assembly from meter

2. Remove the endpoint wire under the breakaway plate.
 - Turn the endpoint/encoder assembly over.
 - Grasp the pull tab located to the right of the encoder seal screw with pliers (Figure 39). Then pull and remove the bottom breakaway plate from the housing to expose the wire. The plate is scored to facilitate removal.
 - With your fingers, remove the three feet of endpoint wire from the housing.

NOTE: The wire is attached to the endpoint.

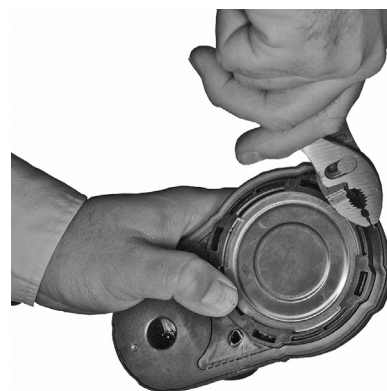


Figure 39: Pull tab to remove the breakaway plate

3. Rotate the endpoint counter-clockwise 1/4 turn and pull the endpoint and endpoint wire out from the assembly base.



Figure 40: Rotate endpoint clockwise



Figure 41: Pull endpoint away from base

4. Mount the endpoint according to recommended installation guidelines using the three feet of wire. See "[Endpoint Installation Guidelines](#)" on page 7.

NOTE: The encoder cannot be removed from the assembly housing.

5. Remount the encoder in the assembly housing onto the meter bayonet.
 - Turn the assembly clockwise 1/4 turn so it locks in place.
 - Replace and tighten the security screw.

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