



Badger Meter

ORION® SE

Network Gateway Transceiver



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OVERVIEW

This manual contains installation and programming instructions for the ORION® SE network gateway transceiver.

Proper performance and reliability of the network gateway transceiver depends upon installation in accordance with these instructions.

Product Description

The ORION SE network gateway transceiver is an easy-to-install, easy-to-deploy unit that collects metering data from the ORION SE meter endpoints in the area. The network gateway transceiver uses a cellular, LAN or Wi-Fi network backhaul to send the requested metering data back to the utility where the data can be used to better manage the utility's operation and provide important data for improved customer service and utility operations. The ReadCenter® reading data management software manages this data transfer process and includes myriad tools and standard reports, as well as the ability to create any user-defined reports.

License Requirements

This device complies with Part 15 of FCC rules. Operation of this device 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 RF radiation exposure. However, to avoid public exposure in excess of limits for general population (uncontrolled exposure), a 40-centimeter distance between the transmitter and the body of the user must be maintained during testing.

No FCC license is required by a utility to operate an ORION SE 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 transmitters and receivers on all commercial aircraft. The ORION SE network gateway transceiver is considered an operating transmitter and cannot be shipped by air.

Changes: Changes or modifications to the equipment that are not expressly approved by Badger Meter could void the user's authority to operate the equipment. Only properly trained and authorized personnel should install and/or maintain this equipment.

Product Unpacking and Inspection

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

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

MOUNTING THE ORION SE NETWORK GATEWAY TRANSCEIVER

IMPORTANT

TRANSCEIVER INSTALLATION, MOUNTING AND DISPOSAL SHALL BE IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS. WHEN INSTALLING THE TRANSCEIVER, THE CUSTOMER IS RESPONSIBLE FOR COMPLYING WITH LOCAL, STATE AND FEDERAL CODES AND GUIDELINES AS WELL AS APPLICABLE INDUSTRY STANDARDS, SUCH AS ANSI/TIA/EIA 222 (STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES) AND THE NATIONAL ELECTRICAL CODE (NEC). PROPER GROUNDING IS NECESSARY, AND IN THE CASE OF A WOODEN POLE, A DEDICATED COPPER GROUND WIRE SHOULD BE USED FOR LIGHTNING PROTECTION.

Network Gateway Transceiver Standard Components

- Two removable whip antennas with O-rings. One GPRS and Wi-Fi backhaul antenna is included with GPRS and Wi-Fi gateway units.
- One ORION SE network gateway transceiver with attached mounting backplate.
- V-block clamps or banding and locking equipment for attaching an ORION SE network gateway transceiver to a pole.
- 100-foot or 300-foot power cable, M12 connector, AC-to-DC power supply and power cord.

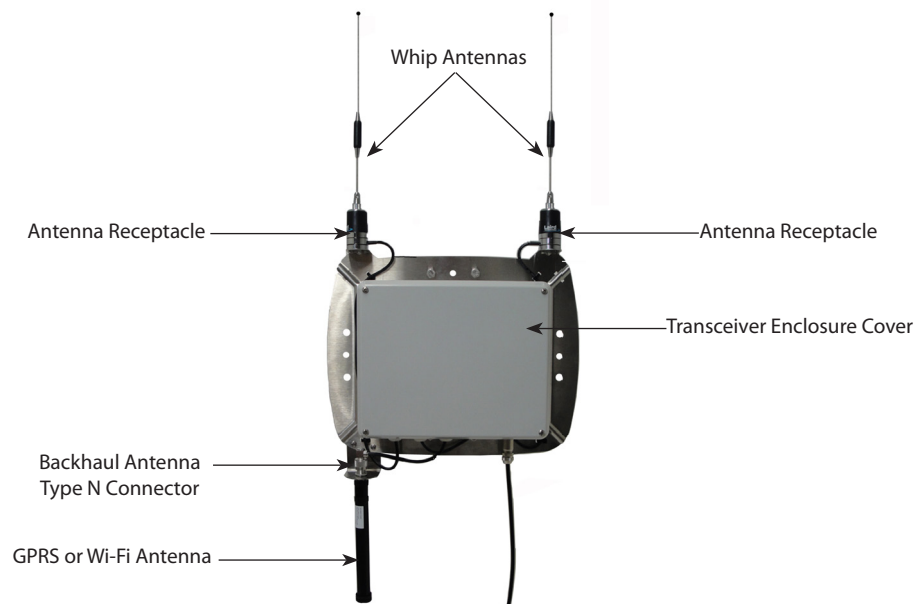


Figure 1: Transceiver Components (GPRS unit shown)

Tools and Materials (customer-supplied)

- Phillips #2 screwdriver
- Precision slotted screwdriver with a 2.0 millimeter (0.079 inch) blade size
- Two 9/16-inch or adjustable wrenches for mounting V-block clamps (standard mounting)
- BAND-IT™ tool (refer to [page 9](#)) and instructions, a 1/2-inch wrench and a hammer for large diameter pole mounting
- Wrench (for 1 1/16-inch gland nut and 1 1/16-inch dome nut)
- Pliers or strap wrench (for tightening the 15/16-inch OD backhaul antenna)

Installation Procedure

NOTE: The utility is responsible for properly positioning the ORION SE network gateway transceiver. For optimal reception and transmission, locate the network gateway transceiver and antennas in line-of-site view of the desired endpoints. The ORION SE network gateway transceiver should be positioned no closer than 25 feet from the nearest endpoint.

Connecting the Battery Backup

The ORION SE network gateway transceiver contains an onboard battery backup. The battery must be connected before the network gateway transceiver is installed and powered. Follow these steps to connect the battery backup.

NOTE: Refer to "Battery Backup Replacement" on [page 20](#) for details on replacing the battery.

1. Using a #2 slotted or Phillips screwdriver, remove the enclosure cover by unscrewing four corner-cover screws.

NOTE: The battery is held in place by the enclosure cover only. No other adhesive or locking mechanism is used.
2. Carefully install the battery connector onto the circuit board. Insert the connector only far enough so that the connector latch engages. Verify that proper connector polarity is observed.
3. Replace the enclosure cover. Tighten each of the four cover screws to 16 inch-pounds, maximum. Be careful not to overtighten any of the screws.

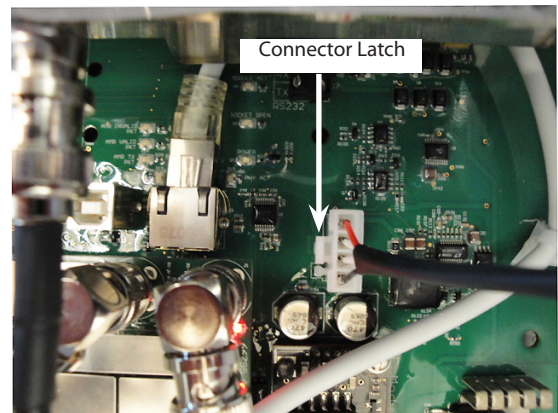


Figure 2: Battery connector latch

Attaching the Whip Antennas

1. Unpack the network gateway transceiver and locate the whip antennas.
2. Verify that a rubber O-ring is in place in the O-ring gland at the bottom of both whip antennas.
3. By hand, place a whip antenna onto an antenna receptacle and then thread the antenna clockwise to tighten to the full compression of the O-ring.
4. Repeat Step 3 for the other whip antenna.

Attaching the GPRS or Wi-Fi Antenna

1. Remove plastic cover from the Type N female connector on backhaul bracket.
2. Remove backhaul antenna from the carton.
3. Thread the Type N male connector (antenna) onto the Type N female connector on the backhaul bracket.
4. Hand tighten until finger-tight, then use pliers or a strap wrench to tighten an additional 1/16 of a turn (maximum). Do not over-tighten or the connector may be damaged.

Using the V-block Clamps

This mounting equipment is sized to mount the network gateway transceiver on a vertical or horizontal pole with outer diameters ranging from 1-1/4 inches to 2-1/2 inches. For mounting on poles larger than 2-1/2 inches, refer to "Banding Mounting" on [page 9](#).

1. Open the bag of mounting equipment.
2. Place two bolts (3/8-16 x 5 inches) through the holes in the top of the network gateway transceiver mounting backplate (Figure 3). Use the side holes for horizontal installation.
3. Place a clamp onto the bolts, as shown below.
4. Place a lock washer and nut onto each bolt, as shown below.

NOTE: The lock washer and nut nearest the enclosure mounting bracket may be omitted when mounting on smaller diameter poles to provide additional clamping distance.

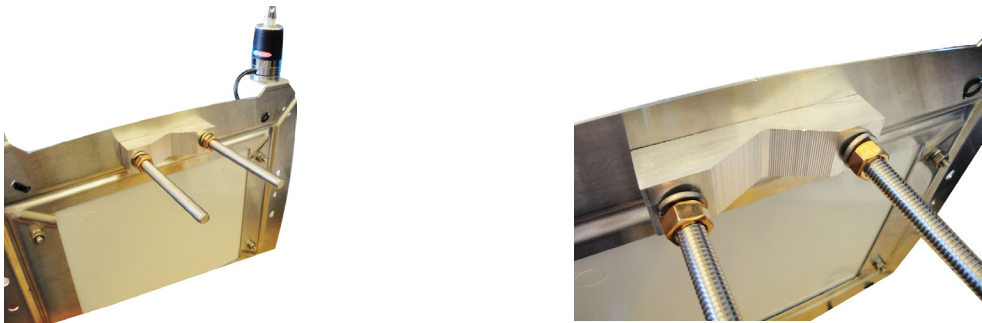


Figure 3: Attach Hardware

5. Tighten the two nuts with a 9/16-inch or adjustable wrench so that each lock washer is fully compressed and flat.
6. Repeat Steps 2 through 5, attaching a clamp to the bottom of the network gateway transceiver mounting backplate. Position the network gateway transceiver on the pole and place a clamp on the top bolts.

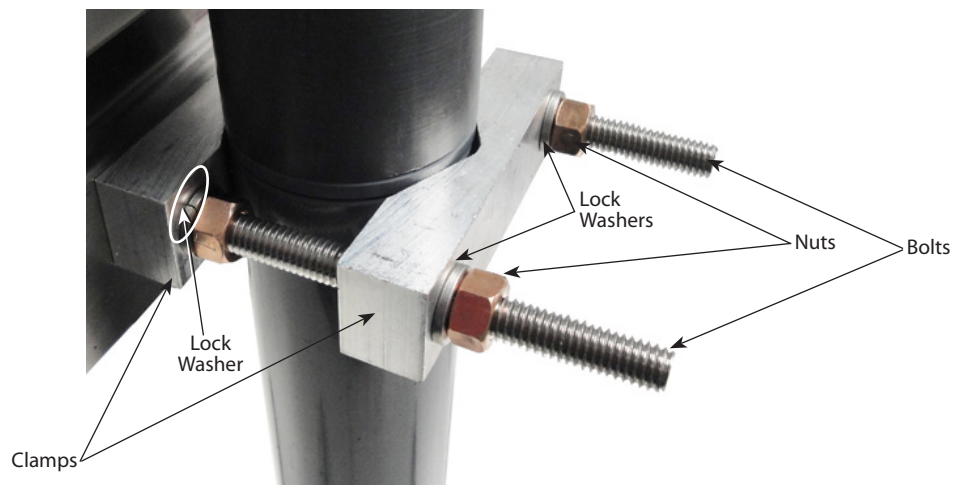


Figure 4: Transceiver Positioning and Clamps

7. Place a lock washer and nut on each bolt and tighten the nuts 100...150 inch-pounds to ensure the network gateway transceiver is sufficiently secured to the pole.
8. Repeat Steps 7 and 8 for attaching the V-block clamp mounting bracket hardware to the bottom bolts of the network gateway transceiver mounting backplate.



Figure 5: Completed Network Gateway Transceiver Mounting (GPRS unit shown)

Banding Mounting

This mounting equipment is sized to mount the network gateway transceiver on a 2-1/2...24-inch outer diameter pole.

IMPORTANT

When using the banding mounting kit for the network gateway transceiver, use BAND-IT IDEX installation practices. Refer to www.band-it-idex.com/en/Literature/Tool_Instructions/P05886.pdf for more information. This is especially applicable when mounting on a non-tapered vertical pole, as the banding could loosen over time resulting in the unit sliding down the pole.

To mount the ORION SE network gateway transceiver on a pole, gather the banding and locking equipment.

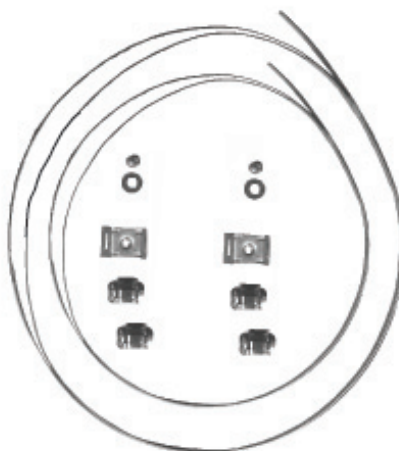


Figure 6: Banding and Locking Equipment

NOTE: Installation of banding mounting kit requires use of the BAND-IT tool shown below (66042-006) or equivalent BAND-IT tool as recommended by BAND-IT.

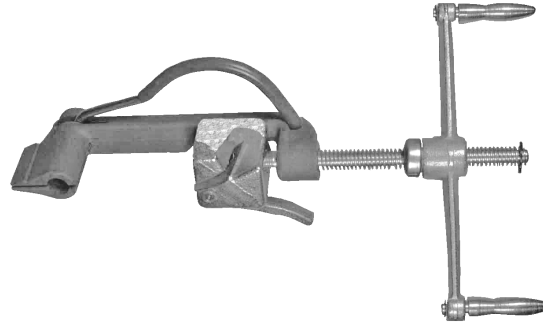


Figure 7: BAND-IT Tool

1. Locate the BAND-IT tool and supplied installation instructions.
2. Follow the BAND-IT-supplied installation instructions enclosed with the BAND-IT tool for attaching the network gateway transceiver to a pole.
3. Using a 1/2-inch wrench, apply the recommended torque for the 5/16-24 screw that attaches the network gateway transceiver bracket to the BAND-IT banding. The recommended torque is 144... 168 inch-pounds (12... 14 foot-pounds).



Figure 8: Network Gateway Transceiver Shown with BAND-IT Mounting Hardware

ELECTRICAL INSTALLATION

AC Power

Badger Meter provides an AC-to-DC power supply that plugs into a standard three-prong 120V AC outlet. If powering the network gateway transceiver directly via DC power, please refer to the DC power information on [page 17](#).



Figure 9: 120V AC Power Supply with Power Cord

M12 Connector Assembly

NOTE: Use only approved Badger Meter power cable, 100 foot (66233-015) or 300 foot (66233-017), for this assembly.

Tools and Materials

- M12 plug, 8-conductor connector (66525-002)
- Badger Meter power cable, 100 feet or 300 feet with 308 in-line connector end
- 308 in-line connector anti-tamper collar
- Coax stripper (customer supplied)
- Wire stripper for 22 AWG wires (customer supplied)
- Precision slotted screwdriver with blade size of 2.0 millimeter (0.079 inch) (customer supplied)

M12 Plug Connector Part Names

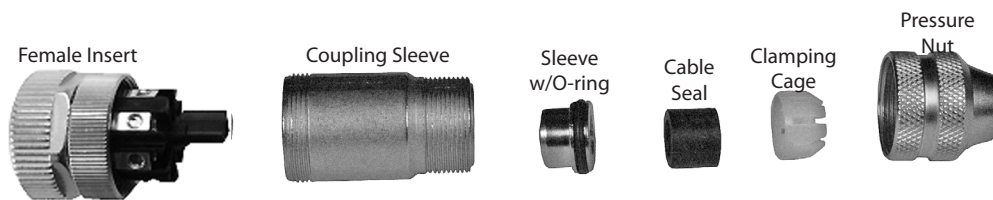


Figure 10: M12 Plug Connector Parts

1. Push the connector parts onto the power cable in the following order: pressure nut, clamping cage, cable seal, sleeve with O-ring and finally, the coupling sleeve.

- Strip the cable outer jacket to a maximum length of 1.1 inches.

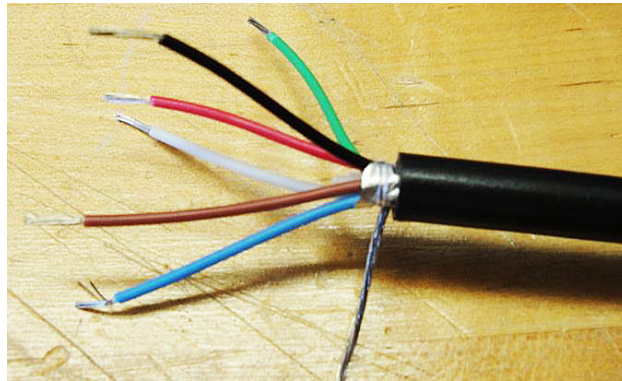


Figure 11: Stripped Cable Wires

- Shorten the foil shield flush with the outer jacket.
- Strip the ends of the six (6) colored wires to a length of 1/8 inch. Twist the conductors on each wire.
- Shorten the drain/bare wire (no insulation) to 11/16 inch.
- Loosen the screws on the female insert and attach the wires to the female insert using the chart below. Retighten the screws after each wire has been connected.

Wire	Female insert connector
White	4
Drain	8 (Center)
Black	3
Blue	7
Red	1
Green	5
Brown	2

M12 Connector Wire Contact View

8 (center) is for the shield-drain

- Assemble the female insert to the coupling sleeve by aligning the female insert tab slot with the notch in the coupling sleeve.

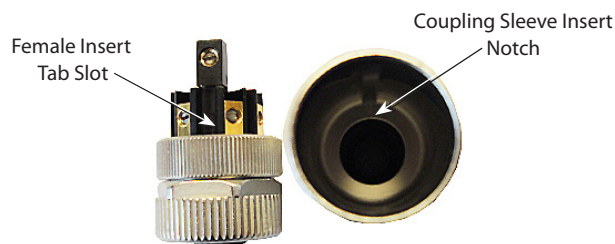


Figure 12: Slot Alignment



Figure 13: Bottom of Network Gateway Transceiver (GPRS unit shown)

8. Remove the M12 cap from the M12 receptacle on the bottom of the network gateway transceiver and discard the cap.
9. Connect the M12 plug connector assembly to the M12 receptacle and tighten the locking ring in a clockwise direction until finger tight.
10. Connect the 308 connector on the other end of the power cable to the 308 connector of the AC-to-DC power supply and snap the anti-tamper collar over the connection.
11. Connect the power cord to the power supply and then plug the three-prong male end of the power cord into a 120V AC power source.

ELECTRICAL / NETWORK INSTALLATIONS

Access to Power and Use of a NEMA 4 Enclosure

- The ORION SE network gateway transceiver requires access to power and can use either a 120V AC grounded outlet for use with the AC-to-DC power supply and power cord (66528-002) or a DC power source to be used with the DC power source cable with 308 in-line connector (Figure 14).
- Use of NEMA 4 enclosure, or equivalent.
 - AC-to-DC power supply used outdoors or in a non-environmentally controlled indoor location requires a customer-supplied NEMA 4 enclosure, or equivalent, installed in accordance with appropriate electrical codes, building codes, industry codes, regulations and standards.
 - Consult the appropriate electrical, building and industry codes, regulations and standards for accepted installation practices for use of the AC-to-DC power supply and outlet in environmentally controlled indoor locations.
- Outlet and enclosure (if required) should be mounted for easy accessibility by authorized utility personnel at the installation site.

GPRS and Wi-Fi Recommended Installation

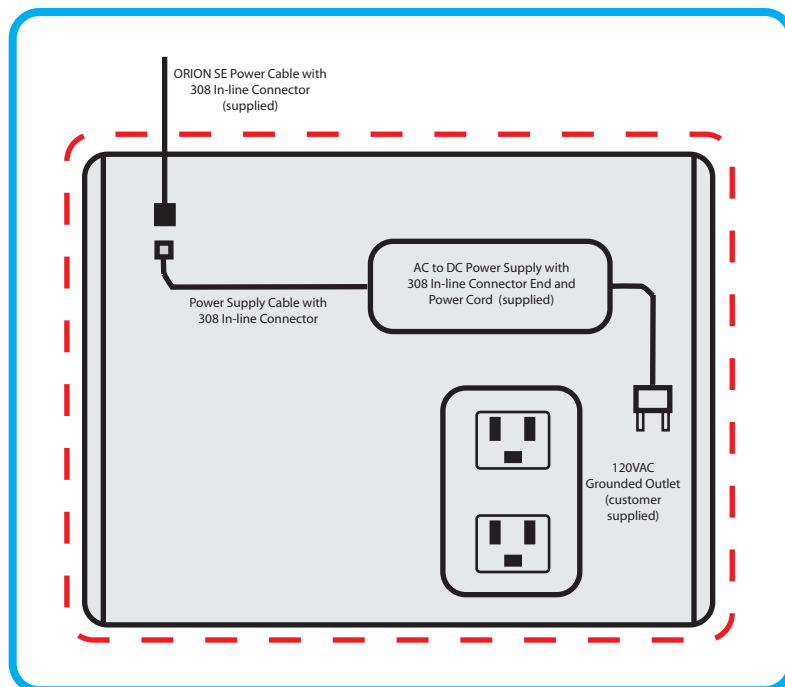


Figure 14: GPRS / Wi-Fi Connections (*Shown with NEMA 4 enclosure.)

*An enclosure may be recommended but is not included.

If NEMA 4 enclosure or equivalent is required, the minimum enclosure size is 12 inch x 10 inch x 6 inch (H x W x D).

ORION SE LAN Recommended Installation

NOTE: Consult the manufacturer's installation and usage recommendations as well as appropriate codes, regulations and standards for the LAN RJ45 Ethernet connection.

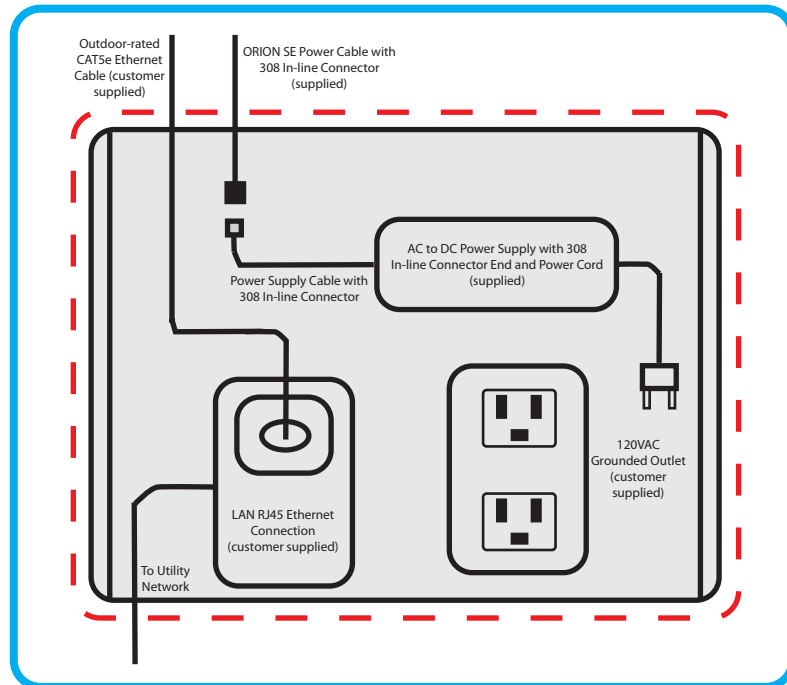


Figure 15: LAN Connections with Separate AC Power (* Shown with NEMA 4 enclosure.)

*An enclosure may be recommended but is not included.

ORION SE LAN Power Over Ethernet (PoE) Recommended Installation

NOTE: Consult the manufacturer's installation and usage recommendations as well as appropriate codes, regulations and/or standards for the LAN RJ45 Ethernet connection.

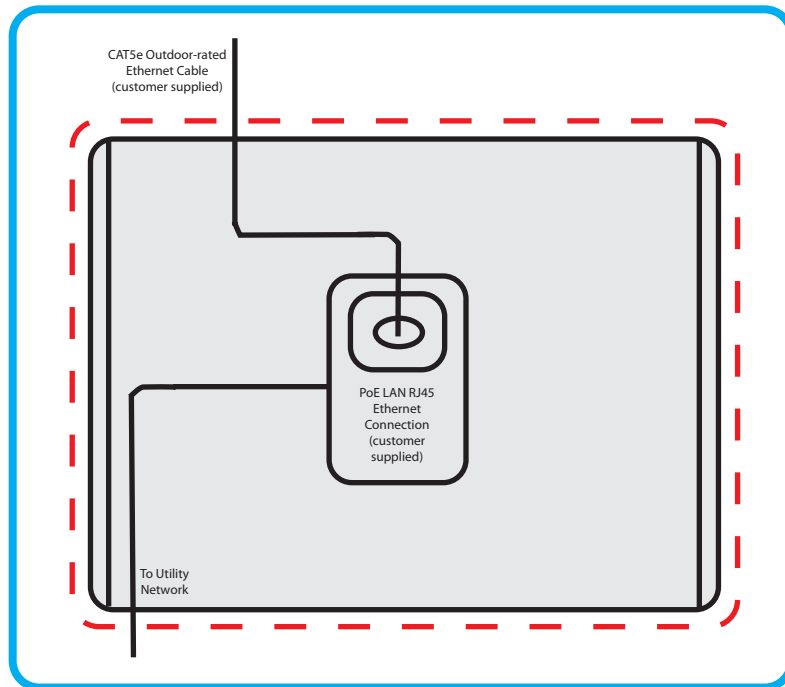


Figure 16: PoE LAN Connections (* Shown with NEMA 4 enclosure.)

*An enclosure may be recommended but is not included.

DC Power Source Installation

The ORION SE network gateway transceiver may be ordered with a 10-foot DC power source cable for direct connection with a customer-supplied DC power source (24V DC @ 1A minimum). When connecting an AC-to-DC power supply, the electrical requirement for the network gateway transceiver is 1 amp (minimum) at 24V DC. When connecting directly to batteries, as in a solar assembly (not supplied), the minimum electrical requirement is 0.4 amp at 24V DC.



Figure 17: 10' DC Power Cable

NOTE: Consult the appropriate electrical, building and industry codes, regulations and standards for accepted installation practices when attaching the cable to a DC power source.

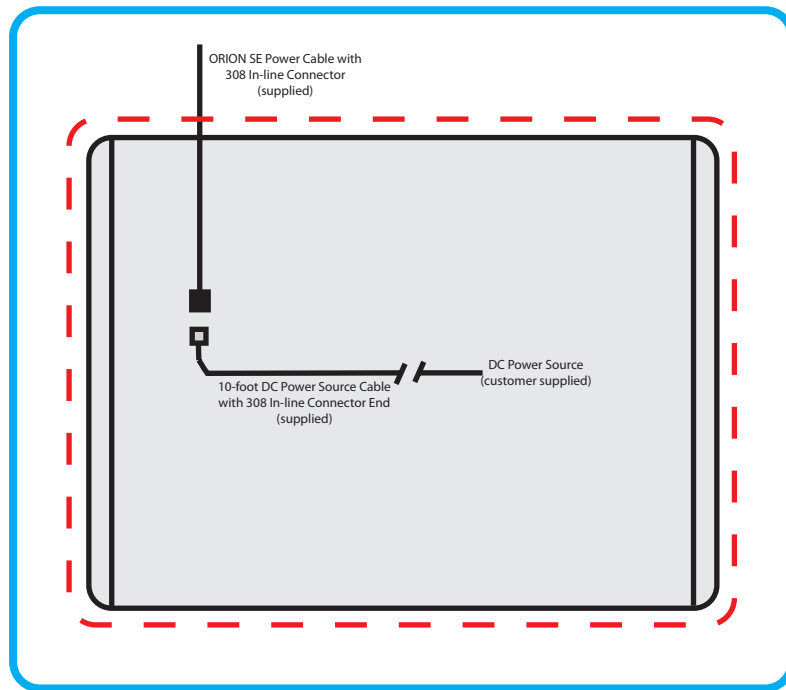


Figure 18: DC Power Source Installation (* Shown with NEMA 4 enclosure.)

*The enclosure may be recommended but is not included.

External DC power source connections:

Wire Color for 66233-020	External DC Power Source
Drain (no insulation)	Negative (-)
Black	Negative (-)
Brown	Negative (-)
Red	Positive (+)
Light Blue	Positive (+)

RJ45 Plug Assembly (for LAN connectivity only)

Required Supplies:

- RJ45 Plug Assembly (66527-001)
- Ethernet cable cordset using outdoor-rated Cat.5e cable and RJ45 jack (customer supplied)
- Wrenches – 1-1/16 inch (customer supplied)

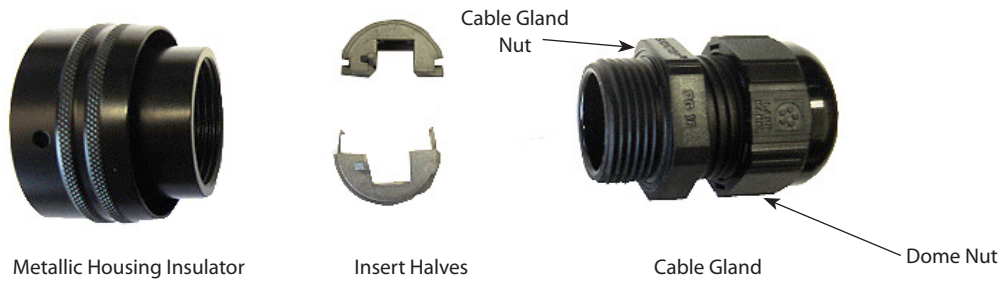


Figure 19: RJ45 Plug Components

1. Feed the cordset cable through the dome nut end of the cable gland.
2. Push down the RJ45 plug latch and place it inside one half of the insulator insert. Refer to Figure 20.

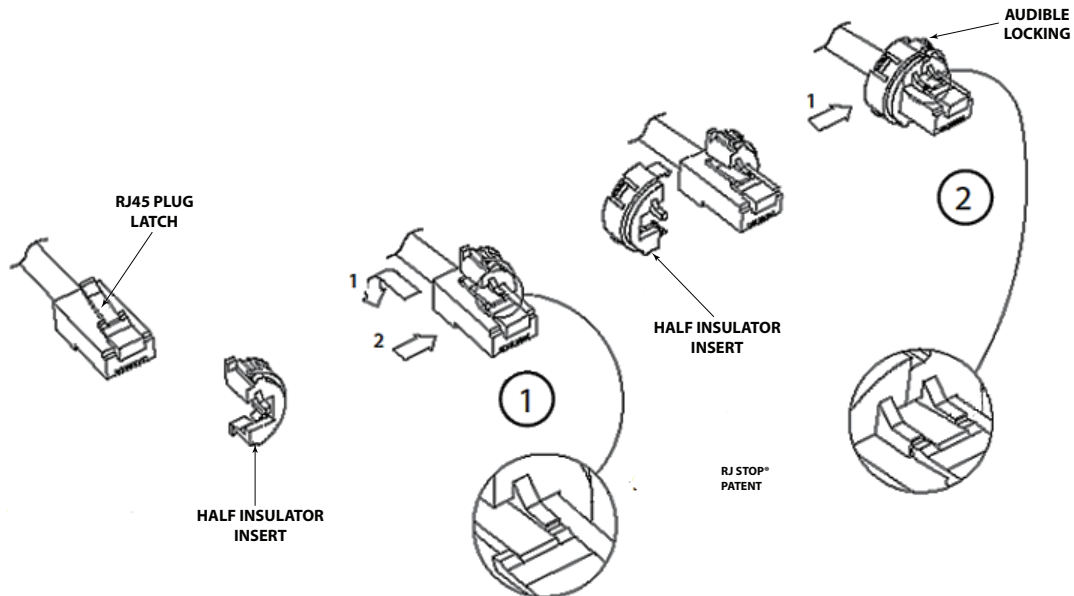


Figure 20: Insulator Assembly

3. Attach the other half of the insulator insert as shown. An audible click will sound when the connection has been made.

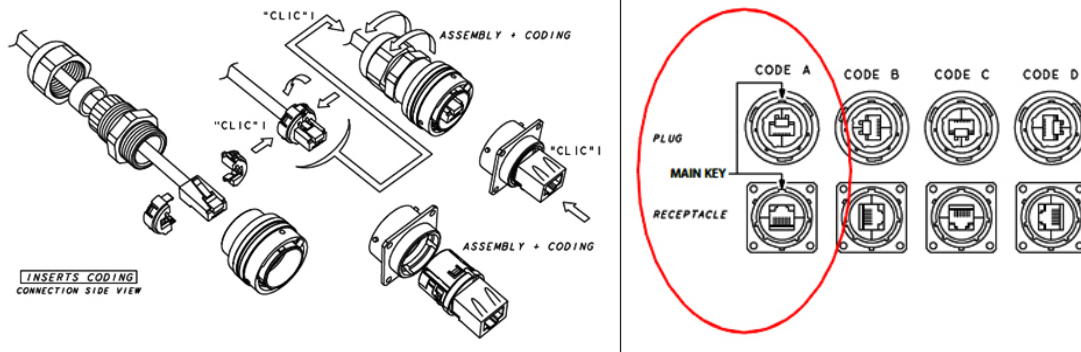


Figure 21: RJ45 Plug Assembly with Code A Orientation

4. Insert the insulator assembly into the metallic housing using the Code A orientation as shown in Figure 21. An audible click will confirm complete connection.

NOTE: Code A orientation must be used or the plug will not fit into the receptacle. Assembled RJ45 plugs cannot be disassembled without a special tool (67163-001) and must be replaced.

5. Screw the cable gland into the metallic housing and tighten the cable gland nut to 30...45 inch-pounds using wrenches.
6. Tighten the dome nut to 20 inch-pounds using a wrench. The dome nut seal must be in firm contact with the outdoor-rated Cat.5e Ethernet cable.
7. Remove the bayonet lock (Figure 22) cap from the RJ45 receptacle on the ORION SE network gateway transceiver enclosure by turning the cap 1/4 turn, counter-clockwise.



Figure 22: RJ45 Receptacle Bayonet Lock Cap (LAN with power shown)

8. Connect the RJ45 plug assembly to the RJ45 receptacle and secure by turning the metal housing 1/4 turn, clockwise. For additional information, refer to http://www.rjfield.com/ethernet_connectors_rjf_en.htm.

BATTERY BACKUP REPLACEMENT

In the event a battery replacement is required, please complete the installation steps as detailed below in the order presented.

IMPORTANT

Working with electronics requires the use of proper electrostatic discharge (ESD) protection. Grounded wrist straps are recommended when working inside the enclosure.

NOTE: It is not necessary to remove AC power from the network gateway transceiver before removing the cover and replacing the battery.

Tools and Materials

- Rechargeable battery pack kit with enclosure cover (67018-001)
 - #2 slotted or Phillips screwdriver
1. Using a #2 slotted or Phillips screwdriver, remove the enclosure cover by unscrewing four corner-cover screws (Figure 23). The cover will not be used again and may be discarded.

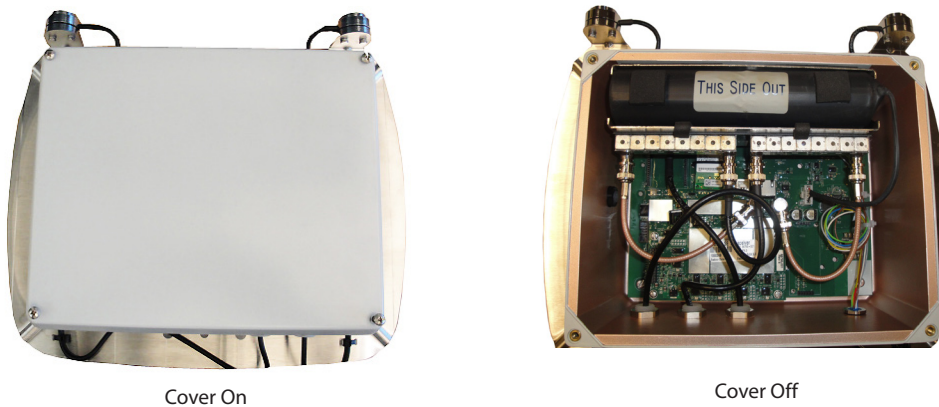


Figure 23: Enclosure Cover Removal (GPRS unit shown)

2. Squeeze the connector latch (Figure 24) on the battery connector on the circuit board and carefully pull on the connector to remove it from the circuit board pin contacts. Do NOT pull on the connector wires. If the connector is stuck, it may need to be gently rocked back and forth while pulling.

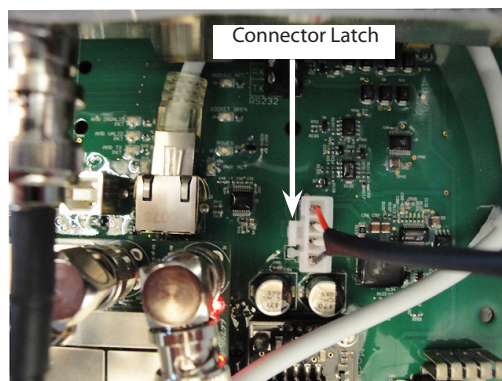


Figure 24: Battery Connector

NOTE: The battery is held in place by the enclosure cover only. No other adhesive or locking mechanism is used.

3. Remove the battery from the unit (Figure 25) and safely discard the battery (see "Battery Disposal" on [page 21](#)).

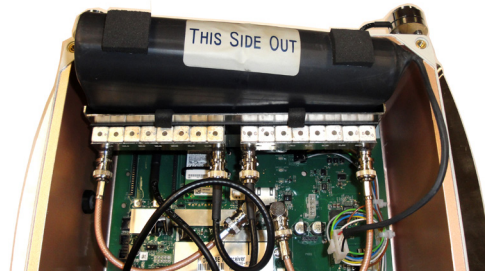


Figure 25: Battery Removal

4. Place the new battery into the enclosure with the battery label "This Side Out" visible and upright, as shown above.
5. Carefully install the battery connector onto the circuit board. Insert the connector only far enough so that the connector latch engages. Verify that proper connector polarity is observed (see "Figure 24: Battery Connector" on [page 20](#)).
6. Install the new enclosure cover provided with the battery kit. Tighten each of the four cover screws to 16 inch-pounds, maximum, being careful to not overtighten any of the screws.

BATTERY DISPOSAL

The battery contains lead and should be handled and disposed of in accordance with local, state and federal regulations. Refer to Badger Meter Battery Handling Safety Guide MRT-SG-02 for more information.

CAUTION

FAILURE TO PROPERLY DISPOSE OF A LEAD ACID BATTERY MAY RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE FROM ACID BURNS.

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