



OVERVIEW

To help maximize the performance of your ORION Fixed Network (SE) system, the following installation guidelines and recommendations are being provided.

Taking a few minutes to review this information prior to installing your ORION Fixed Network system will guide you toward a safe and optimal system deployment.

PROPAGATION STUDY AND RECOMMENDED INSTALLATION ORDER

Badger Meter provides each customer with an RF propagation study that outlines the expected performance of the system when the endpoints and gateway devices are installed according to Badger Meter installation and operation manuals. The propagation study is a guideline to help place gateway infrastructure in locations that will maximize performance.

The Badger Meter RF propagation study is contingent upon the following installation protocol:

- Pit endpoints are installed through a non-metal lid and are confirmed by the handheld test equipment to support two-way communications to and from the gateway at the time of endpoint installation.
- Remote/indoor endpoints are installed in a location confirmed by the handheld test equipment to support two-way communications to and from the gateway at the time of endpoint installation.
- Gateways are installed in a location that provides the antennas with a 360 degree view of the service area. Gateways are required to be mounted as far as possible from other RF antennas that may interfere with the performance of the system and out of the direct path of a directional antenna. Please refer to Badger Meter installation and user manuals, available at www.badgermeter.com, for more information on proper gateway installation.



- When deploying an ORION Fixed Network system in fixed network mode, Badger Meter recommends that the gateways be installed *before* installation of the endpoints. When gateways are installed first, full system testing can be completed when the endpoints are deployed to confirm two-way communication to and from the gateway. This testing allows utilities to confirm that the endpoint will successfully transition to a fixed network mode of operation when requested by the system.

BEFORE STARTING INSTALLATION

Prior to installation, confirm that the installer is qualified, properly trained, certified and insured.

Installation, mounting and disposal must be done in accordance with all local, state and federal regulations, including zoning and permit requirements, and compliance with 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.

Make sure the proper tools, mounting hardware and proper length of power cable are available for the deployment.

GATEWAY LOCATION AND INSTALLATION CONSIDERATIONS

When selecting a location for a gateway deployment, the following considerations must be addressed *before* installation.

- **How will the gateway be powered?**

The gateway requires a power source. Consider the power source when selecting the location.

- **How will the data collected by the gateway be sent back to the ReadCenter® Analytics software at the utility?**

Cellular networks, LAN (local area network) and proprietary networks are the different backhaul options available.

- **Are there other sources of RF in the proposed gateway location? If so, what frequency do they use? What are they used for? Is there a location far enough away from the other RF devices to avoid potential interference?**

Avoid installing the gateway or remotely mounted antennas near RF transmitters or other sources of RF radiation including high-power in band and near-power sources such as pagers, other 900 MHz transmitters and other communications transmitters. Other potential sources of RF radiation include power line transformers, neon or fluorescent signs, RADAR transmitters and SCADA systems. If the gateway is to be located near other RF radiators, a minimum distance of 100 feet horizontal separation and 10 feet vertical separation must be maintained between the gateway and the source of RF radiation.

Refer to Badger Meter installation manuals for more information regarding gateway installations.

- **How high will the gateway be installed?**

Typically, the higher the gateway installation the better for system performance. Mount the gateway as high as possible above average terrain, within the limits of the 300-foot power cable, and maintain a 360 degree view of the horizon. Based on previous deployments, there comes a point of diminishing return on performance that can be expected with additional height, which is somewhere between 100 and 150 feet. Regulatory limitations and requirements may also apply.

- **Will a remote antenna be deployed?**

With the ORION Fixed Network II gateway, the TX/RX antennas and/or backhaul antenna can be installed separately from the gateway transceiver. However, once the antennas have been installed but prior to attaching the antenna assembly to the gateway enclosure, the professional installer is required to take VSWR readings on the remotely mounted antenna system and record them.

Other Gateway Installation Considerations

- For optimal reception and transmission, locate the gateway transceiver and antennas in line-of-sight view of the desired endpoints.
- The gateway transceiver or remotely mounted antennas should be positioned no closer than 25 feet from the nearest endpoint.
- Avoid installing the gateway or remotely mounted antennas next to or between objects such as tall buildings, towers, bridges, highway overpasses or signs that obstruct line of sight with the endpoints.
- Avoid installing the gateway transceiver antennas inside metal enclosures or inside a building as the antennas cannot communicate if surrounded by metal.
- Minimum standoff distance of two (2) feet from any structure is required.
- Locations and heights of gateways should match those used in the propagation study.

ENDPOINT INSTALLATION REQUIREMENTS

Endpoints should be installed *after* gateways are installed to allow for full system testing at the time of endpoint deployment.

- Each installation crew should have access to the handheld test equipment to confirm deployment at each service location.
- Endpoints should be verified to be transmitting before the installer leaves the meter. Activation can be accomplished by either running water through the meter or by starting it with the handheld.
- All endpoints should be installed in a location confirmed by the handheld test equipment to support two-way communications to and from the gateway at the time of endpoint installation.

Pit Installations

- All endpoints installed in a pit application must be installed through a non-metal lid.
- All pit endpoints should be mounted at or above grade and not covered by grass, dirt, landscaping, etc., for optimal RF propagation and to minimize the chance for flooding to cover the endpoint antenna assembly.

Indoor/Remote Installations

- The endpoint normally should be installed as high as possible (in the floor joist) and as close to the outside wall as possible. Several locations might need to be tested to determine the optimum location for RF propagation. In some situations, the endpoint may need to be mounted on an outside wall.

Vault Installations

- Solid metal vault lids may require the endpoint be brought out of the vault and installed in a small box next to the vault.

NOTE: Utilities installing endpoints in a mobile application prior to transitioning to a fixed network should take into consideration where they install the endpoints. Badger Meter can prepare an RF propagation study to map out future gateway locations. This allows the installer to make endpoint installation decisions based on the location of future gateway deployments.

RELATED BADGER METER DOCUMENTS

To access all Badger Meter ORION Fixed Network installation documents, go to www.badgermeter.com.

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