

Application guide W-BACnet

This guide provides users with instructions for operating a BACnet MS/TP network wirelessly, even in cases involving significant network size and load, such as ReadPropertyMultiple, file transfers, and trend log handling.

Always remember that an unstable or non-functioning network can have three possible root causes—or a combination of them:

1. **Issues with individual nodes**, such as a malfunctioning RS-485 interface or the presence of too many EOL resistors. LumenRadio devices have built-in EOL resistors that cannot be disabled.
2. **Non-ideal BACnet MS/TP network settings**.
3. **An unstable wireless network**.

For troubleshooting steps, refer to LumenRadio's LED Behavior [Quick Start Guide](#).

Quick Guide – Best Practice MS/TP & Wireless Settings

- **Max BACnet MS/TP Devices (Wireless Network):** 25
- **PDR (Packet Delivery Ratio):** Above **95%** on all nodes (*check in Network Map via Mobile App*)
- **APDU Timeout:** 15 seconds (*15,000 ms*)
- **APDU Segment Timeout:** 10 seconds (*10,000 ms*)
- **APDU Segment Retries:** 3
- **Max APDU Segment Size:** 480 bytes
- **Backup Failure Timeout (if performing backups):** 30 seconds or more *In-depth guide for MS/TP settings*

In-depth guide for MS/TP settings

Network Size

- **≤ 25** Wireless W-BACnet devices if fast response/rapid control is required (especially without COV support).
- Additional repeater-only nodes (no BACnet connection) **may exceed 25** to improve mesh strength and coverage.

Firmware 4.0.0 Highlights

- Optimized for *ReadPropertyMultiple*, file transfers, and trend log handling.
- Reduced wireless bandwidth usage for large/complex transactions.

- Significant performance gains in many scenarios.

Wireless Performance Requirements

- $\geq 95\%$ **PDR** for every node in the Network Map for stability.
- Parameter tuning does **not** fix poor signal — improve placement and mesh coverage first.

Recommended MS/TP Settings

APDU Segment Size

- Max: **480 bytes**
- Reduce from higher values (e.g., 1080 bytes) if necessary.

APDU Timeout & Retries

- APDU Timeout: ≥ 15 **sec**
- APDU Segment Timeout: ≥ 10 **sec**
- Retries: ≥ 3

Backup Timeout

- For backups over MS/TP: ≥ 30 **sec**, depending on file size.

Tip: Refer to the *LumenRadio LED Behavior Quick Start Guide* for diagnostic codes and troubleshooting steps.

Wireless Network Planning & External Antennas

A consistent, high-quality wireless network is essential for maintaining a stable BACnet MS/TP system. Follow the guidelines below to optimize performance.

Metal Enclosures

- Metal structures, such as electrical cabinets, **significantly reduce wireless range**.
 - Always mount devices and any external antennas **outside** of metal enclosures before making other adjustments.
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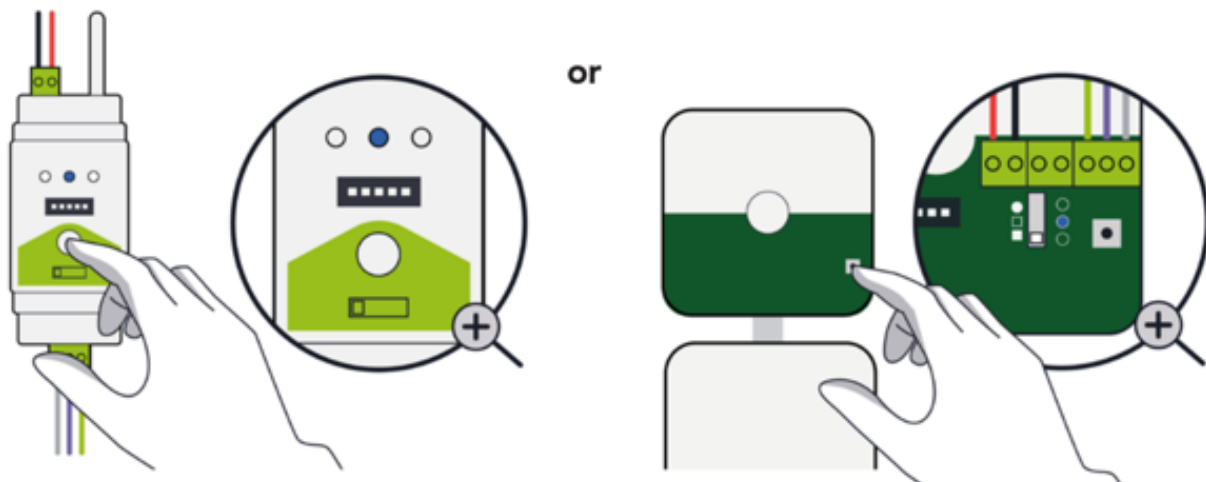
Installation Validation

1. Install the W-BACnet Mobile App

- [Google Play: W-BACnet](#)
- [Apple App Store: W-BACnet](#)

2. Activate Bluetooth on the Gateway

- Press the gateway's button **three times**.
- The middle LED will flash **blue twice**, indicating Bluetooth mode is active.
- The gateway remains connectable for **3 minutes**.



Validating the Network Map

The **Network Map** in the W-BACnet Mobile App displays the full mesh topology. Each node shows a large hexagon in the top-left corner indicating its **Packet Delivery Ratio (PDR)** — measured *end-to-end across all mesh hops* starting with firmware version **4.0.0**.

In previous firmware versions, PDR displayed only single-hop performance.

How PDR Updates

- The PDR value is refreshed **every 3 minutes** — it may not reflect the live current state.
 - On a newly established network, expect **yellow or red PDR values** initially.
 - Allow at least **15 minutes** for the network to stabilize before making adjustments.
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PDR Performance Guidelines

- **Good (Green):** $\geq 95\%$ – Required for optimal BACnet performance.
 - **Fair (Yellow):** Acceptable for *monitoring-only* BACnet devices.
 - **Poor (Red):** Requires correction for reliable operation.
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Improving PDR

If any node shows **less than 95% PDR**:

1. **Adjust device placement** for better signal coverage.
 2. **Add repeater units** to strengthen mesh connectivity.
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PDR Improvements in Firmware 4.0.0

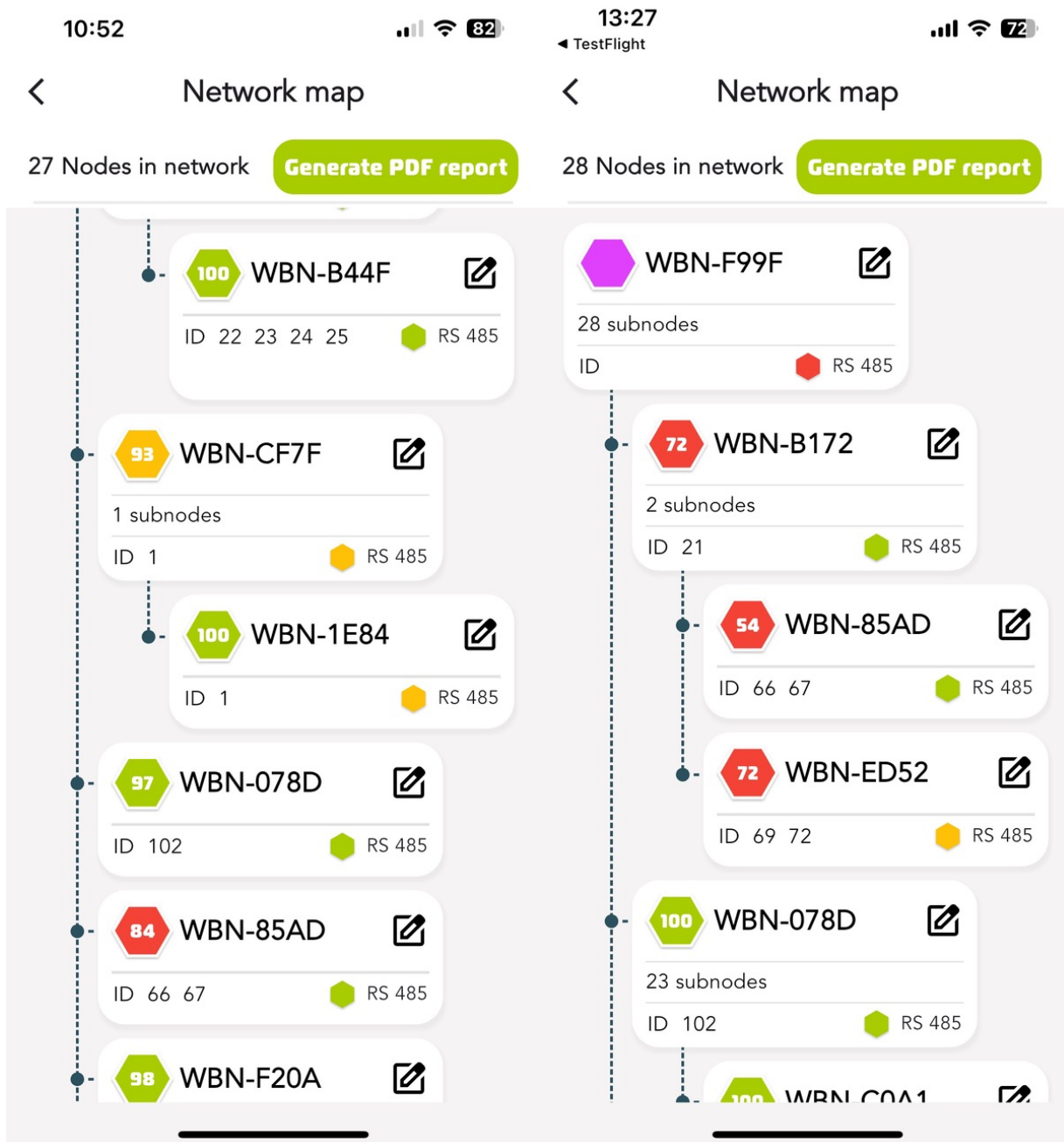
- **Before v4.0.0:** The Network Map showed *single-hop* PDR only, which could be misleading.
- **From v4.0.0 onward:** Displays **true end-to-end PDR**, ensuring a more accurate view of network health.

Example in 3.3.2 (left image):

- Node **WBN-1E84** may appear “good” in single-hop PDR that shows **100% (Good)** but the end-to-end PDR is **93% (Fair)** – Parent node needs adjustment.
- Node **WBN-CF7F**: Single-hop PDR = **93% (Fair)** – needs adjustment.
- Node **WBN-85AD**: End-to-end PDR = **84% (Poor)** – needs adjustment.

Example in 4.0.0 (right image):

- Node **WBN-ED52** have a “good” in single-hop PDR (100 %) but shows **72% (bad)** end-to-end PDR since it now inherits the bad signal from it’s parent in the visual.
 - Node **WBN-B172** have a “bad” in single-hop PDR (72 %) and has no parent node before the gateway and have therefor **72% (bad)** end-to-end PDR. This node needs to be adjusted
 - Node **WBN-85AD** have a “bad” in single-hop mode but also an end-to-end bad signal since it’s parent have bad signal. Both nodes needs to be adjusted.
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Different PDR behavior in 3.3.2 (left side) and 4.0.0 (right side)

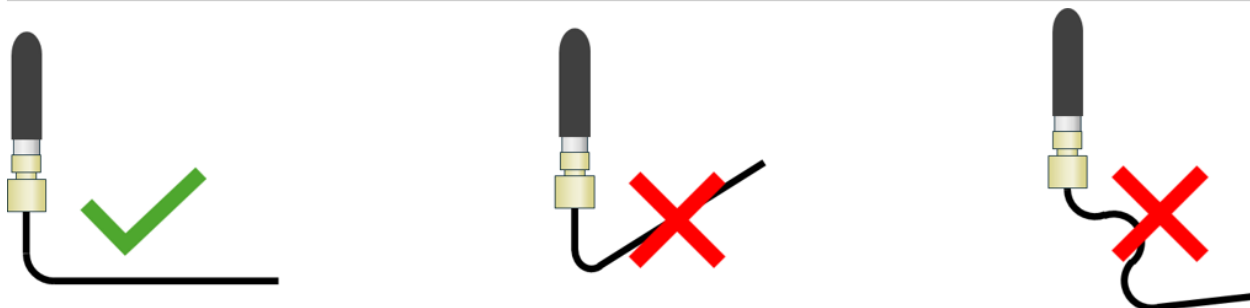
External Antennas

Note (U.S. Market):

For W-BACnet DIN rail products, FCC certification allows up to **27 dBm** output power. This enables the use of higher-gain replacement antennas for improved performance.

Generic Antenna Placement Guidelines

- **Clearance:** Maintain at least **3/4 of an inch** of unobstructed space around the antenna — avoid contact with cables or other objects that could disrupt the radiation pattern and reduce range.
- **Orientation:** Mount the antenna **perpendicular to the floor** for optimal radiation coverage.
- **Height:** Install devices or external antennas at least **1.5 m (5 ft)** above floor level.
- **Cable Handling:** Antenna cables are sensitive; avoid excessive bending or tight loops both during installation and in final placement.
- **Metal Interference:** Do **not** install inside a metal enclosure or where the device is surrounded by metal objects.
- **Moisture & Snow:** Water significantly attenuates wireless signals. For outdoor installations, use antennas that cannot be covered by snow buildup — see *Outdoor Antenna Guidelines* for details.



Outdoor Enclosure

- The W-BACnet product **must be installed in a properly rated enclosure** for outdoor use to ensure weather protection and durability.
- LumenRadio offers an **Outdoor Kit** for the DIN rail form factor, rated **IP67** (equivalent to NEMA 4), specifically designed for reliable outdoor installations.

Outdoor Kit Contents (SKU 800-2324):

- 1x IP67-rated plastic enclosure
- 1x 24 VDC power supply
- 1x N-Type antenna connector
- 1x 2 dBi outdoor antenna
- 1x Sheet metal vandal cover

Using this kit is the **recommended method** for outdoor W-BACnet DIN rail installations.

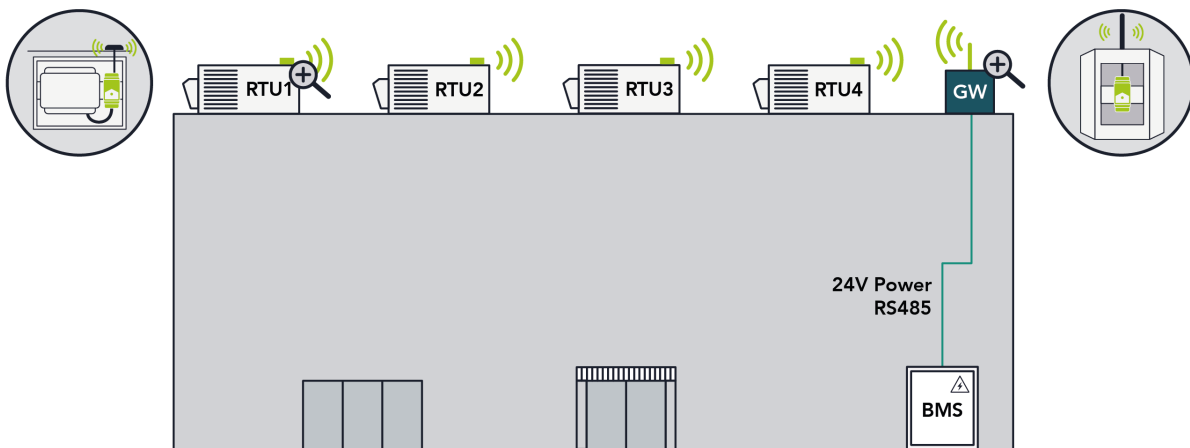
Alternative Outdoor Setup:

- If you prefer to source **24 VAC power from your electrical cabinet** and do not require a vandal cover, you can purchase the enclosure and antenna separately:
 - **SKU 800-2322:** IP67 DIN rail enclosure with N-Type female connector
 - **SKU 104-1002:** 2 dBi outdoor antenna with N-Type male connector
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External Puck Antenna Option

- An **external puck antenna** (SKU 104-1033) offers a simpler outdoor installation alternative.
- Note: This option carries a higher risk of **incorrect antenna placement**.
- The antenna cable is very sensitive — avoid excessive bending or looping to maintain optimal wireless range.

Recommended Installation for Rooftop Unit Projects



Long-Range Directional Antenna

- LumenRadio offers a **long-range outdoor directional antenna** with a gain of **6 dBi**, ideal for extended coverage requirements.

- This antenna is **highly directional** in the horizontal plane — precise alignment is critical for optimal performance.

Tip: Refer to the [alignment video](#) for proper installation guidance.

Required Components for Installation:

Component	SKU	Description
RP-SMA to N-Type Female Connector	102-2011	Adapter for antenna connection
Antenna Cable (N-Male to N-Male), various lengths:		
1 meter	800-9101	Cable length options
3 meters	800-9102	
5 meters	800-9103	
Outdoor Antenna with N-Type Female Connector	104-1004	6 dBi directional antenna

Ensure all connectors and cables are properly secured and avoid excessive bending or twisting of the cable to maintain signal integrity.

Support ticket

You are welcome to reach out to our partners or create a support ticket if you still have issues after following this guide.

You create a support ticket [here](#). Try to be as detailed as you can including appending a screenshot of the network map or the pdf report from the mobile app. This helps us speed up the resolution of your issue.