Division 23 09 - Building Automation System (BAS) Wireless Solution Specification

Part 1. General

1.1 Summary

1. A wireless solution for replacing BACnet MS/TP cabling in the Building Automation System (BAS) for the control, monitoring, and management of building systems and devices, including HVAC, lighting, and energy management.

1.2 References

1. ANSI/ASHRAE Standard 135-2020, BACnet® - A Data Communication Protocol for Building Automation and Control Networks
2. IEEE 802.15.4 - Standard for Low-Rate Wireless Personal Area Networks (LR-WPANs)

1.3 Submittals

1. Product Data: Manufacturer's data sheets on each product to be used, including:
    1.1.   W-BACnet wireless devices
    1.2.   Diagrams of network control layout, communication, and power wiring architecture.
    1.3.   Power sources and backup systems
2. Shop Drawings:
    2.1.   Detailed floor plan drawing showing the location of W-BACnet devices and all BACnet-related (IP and MSTP) network devices.
3. Operation and Maintenance Data:
    3.1.   Instructions on the operation, maintenance, and troubleshooting of the W-BACnet wireless solution.

1.4 Quality Assurance

1. Manufacturer Qualifications: Firms regularly engaged in the manufacture of wireless building automation components with at least five years of experience.
2. Installer Qualifications:

    2.1.   Experienced installers who have successfully completed BAS installations similar in material, design, and extent to that indicated for this Project.

    2.2.   Installers are not required to be licensed electricians

    2.3.   Prior wireless networking or installation experience is not required

3. Network Testing:

    3.1.   Perform distance testing when the distance between devices falls outside the operating range or there significant environmental restricting conditions

        3.1.1.   Reference 1.6 Project Conditions

1.5 Delivery, Storage, and Handling

1. Deliver materials in manufacturer's original, unopened, and undamaged containers with identification labels intact.
2. Store materials in a dry, protected, and well-ventilated area.

1.6 Project Conditions

1. Environmental Requirements:

    1.1.   Install W-BACnet wireless devices within the suggested operating range temperatures and humidity conditions as specified by the manufacturer.

    1.2.   Verify that there are no significant water or metal obstructions between expected installation location

2. Existing Conditions:

    2.1.   Verify that existing site conditions are suitable for W-BACnet wireless installation.

1.7 Standards Compliance

1. All equipment and material to be from the manufacturer's regular production.
2. All equipment includes following certifications:

    a. UL

    b. FCC

    c. CSA (Canadian Standard Association)

Part 2. Products

2. W-BACnet; Wireless BACnet MS/TP Cable Replacement

1. Features
    1.1. RS-485 Cable Replacement; Self-forming wireless mesh network connecting any BACnet MS/TP device via the RS-485 port without running control conduit. Ability to manually adjust local serial configuration baud-rate, parity, and stop-bit settings. LEDs indicate the Device Mode, BACnet MS/TP transmissions sent or received, and whether the device has an RS-485 BACnet MS/TP serial connection.
    1.2. Device Mode; Set the device in the Gateway or Node mode.
        1.2.1. Nodes can act as network repeaters to extend range. Nodes acting as repeaters do not need to be connected to a BACnet MS/TP device, but do need to be powered and join the network
    1.3. Android and iOS BLE Mobile App
        1.3.1. Visualize network topology, indicate device signal strength, ability to troubleshoot the RS-485 connection, and export the installation details for project sign off. Ability to locally update the Firmware of the W-BACnet device(s); When the W-BACnet gateway is updated with the latest FW, it will automatically propagate the latest FW to all networked devices.
    1.4. W-BACnet PRO Devices enable connecting upwards of 4 unique BACnet MS/TP Devices.
2. Additional Accessories:
    2.1. An additional 5dBi external antenna should be added to every electrical cabinet or metal enclosures providing 5 dBi gain in all directions
    2.2. For outdoor installation, provide water-proof IP65 housing to protect the W-BACnet device
3. Agency Approvals
    3.1. FCC ID:
        3.1.1. XRSTIMOMWAN201 (Wall mount)
        3.1.2. XRSTIMOMWAN301 (DIN Rail)
    3.2. IC ID:
        3.2.1. 8879A-TIMOMWAN201 (Wall mount)
        3.2.2. 8879A-TIMOMWAN301 (DIN Rail)
    3.3. MET: E115504
    3.4. UL 62368-1

3.5. CSA C22.2 No. 62368-1

Housing Type	Wall Mount	DIN Rail
Power supply AC:	24 VAC ±10%	24 VAC ±10%
Power supply DC:	24 VDC ± 15%	12–24 VDC ± 15%
Max. power consumption:	2.5 W	2.5 W
24 V output max. power:	10 W	N/A
Auto resettable fuse:	Yes	Yes
Solid cable rating, connector:	0.14 - 0.5 mm2	0.2 - 1.5 mm2
Stranded cable rating, connector: 0.2 - 0.5 mm2	0.2 - 0.5 mm2	0.2 - 1.5 mm2
Conductor sizes (AWG):	24 - 20	24 - 16
Range per hop (Line-of-sight):	500 m	700 m
Range per hop (Indoor with walls):	20 - 70 m	20 - 70 m
IP class:	40	X0
Dimensions (W x H x D):	86.0 x 86.0 x 25.5	36.5 x 93.0 x 58.7
Weight:	95 g	87 g
Power source restriction:	Only powered by a UL listed LPS power supply of max 15 W	
Ambient operating temperature:	-20 to +55°C	
Ambient storage temperature:	-30 to +80°C	
Relative humidity:	10 - 95% non-condensing	
Material:	ABS UL94-V0	
Color:	White	
Frequency band:	2.45 GHz, ISM band (2400-2483 MHz)	
Supported Baud rates:	9600, 19200, 38400, 76800 bps	
Number of Nodes:	100 Nodes in one wireless network	
Max. number of hops:	8 hops in the meshing network	

2.1 Compatible 3rd party Manufacturers & Devices

1. The W-BACnet solution is compatible with all manufacturers whose devices utilize an RS-485 serial port for BACnet MS/TP communication. W-BACnet can communicate with the following, but not limited to following BACnet MS/TP devices:
    1.1. Controllers
    1.2. Actuators
    1.3. Sensors & Monitors
    1.4. Relays
    1.5. Routers

1. W-BACnet devices communicate via MiraMesh Wireless Mesh protocol:
    1.1.   MiraMesh is a proprietary mesh protocol developed by LumenRadio AB with unique interference mitigation patented technology.
        1.1.1.   Self-healing and self-configuring capabilities
        1.1.2.   Adaptive Frequency hopping and time-synchronized channel hopping ensure interference free transmissions and do not disrupt current and future 2.4 GHz devices and networks within the spectrum
    1.2.   MiraMesh is compatible with the RF requirements of RED (Radio Equipment Directive) according to EN 300 328 v2.1.1 as well as FCC part 15, subpart C.
2. Network Size
    2.1.   Recommended single network size is 30-40 devices.
    2.2.   Multiple W-BACnet networks can coexist within the same space
3. Security: W-BACnet network traffic is encrypted (AES-128) and is not accessible remotely. Each W-BACnet network has a unique ID disallowing from 3rd party wireless devices of joining the network.
4. BACnet Device Addressing
    4.1.   W-BACnet is compatible with BACnet MS/TP Master devices: addresses # 0-127
    4.2.   W-BACnet is not compatible with BACnet Slave Devices: addresses #127-255

Part 3. Execution

3.1 Installation

1. Install W-BACnet wireless devices as per the manufacturer's instructions and project drawings.
2. Ensure proper placement of devices to maximize communication range and network reliability.
3. Ensure antenna shouldn't be touching any obstructions or cables, as it can affect the radiation pattern and effectively reduce the radio range. (No obstructions at least 2cm around the antenna)
    3.1.   The antenna should be mounted perpendicular to the floor plane to have optimal radiation pattern.
4. Perform wireless signal strength tests to confirm proper network coverage.

      4.1.   Implement a robust wireless mesh network to ensure reliable communication between W-BACnet devices.

5. Install W-BACnet devices at minimum 1.5m above the floor level.
6. Ensure all 3rd party controllers and devices are pre-configured or configured before commissioning of the W-BACnet wireless mesh network.
7. Do not install inside a metal enclosure or with the W-BACnet device surrounded by metal objects.

3.2 System Integration

1. Integrate W-BACnet wireless solution with existing building systems, including HVAC, lighting, and energy management systems.
2. Configure the system to provide seamless operation and monitoring through the central BAS interface.

3.3 Testing and Commissioning

1. Test the W-BACnet wireless solution to ensure proper functionality of all devices, gateways, and controllers.
2. Conduct network performance tests to verify communication reliability and signal strength.
3. Provide commissioning documentation, including test results and configuration settings.

      3.1.   W-BACnet Mobile APP can export a PDF report of a success installation

4. Maintenance

4.1 Preventive Maintenance

1. Develop a preventive maintenance schedule for the W-BACnet components, including firmware updates.
2. Provide guidelines for periodic network health checks and performance evaluations.

4.2 Troubleshooting

1. Include detailed troubleshooting procedures for common issues related to wireless communication, sensor failures, and controller malfunctions.
2. Provide contact information for technical support and warranty services.