BMS-WiNG Quick Start Guide

Raptor

v05.21

RLE Technologies

Thank you for purchasing a BMS-WiNG wireless sensor network manager designed to integrate directly into a building management system (BMS). This guide outlines basic BMS-WiNG installation and configuration. Before you install a BMS-WiNG, check RLE's website to ensure you are using the most recent version of our documentation.

If you need further assistance, please contact RLE Technologies at support@rletech.com.

Installation Supplies

Included with the BMS-WiNG
BMS-WiNG device
Two antennas

Available from RLE, sold separately
24VDC power adapter
WiNG sensors as necessary for your application

Additional Supplies
18AWG shielded twisted pair stranded copper wire - no more than 2000ft (610m)
(Modbus RTU or BACnet MS/TP communication via RS-485 port)

Mount the Device

The BMS-WiNG is designed to be installed in a panel, on a DIN rail, or mounted on a wall.
- If you're installing it on a DIN rail, use the DIN rail clip and secure the unit appropriately for your application.
- If you're mounting the unit on a wall, use a screwdriver to loosen the three screws and remove the DIN rail clip from the back of the unit. Then use the keyhole slots and secure the unit to the wall.

Mount the Antennas

The BMS-WiNG ships with two antennas. After you connect each antenna firmly to its labelled terminal connection on the BMS-WiNG, you'll need to ensure proper antenna position. The antennas should be in direct line of sight to the sensors; Configure placement to avoid walls or metal enclosures between sensors and the manager/antennas. Extend the leader cables on the antennas to their fullest lengths and secure the antennas as far away from the BMS-WiNG - and as high off the ground - as possible.

Power the Unit

The BMS-WiNG is designed to accept hardwired 24VDC power through the power terminal block (TB2). If hardwired power is not available, purchase and install RLE's PSWA-DC-24 power supply.

Set the DIP Switches

The BMS-WiNG has two sets of DIP switches. Push the numbered switch to the right to turn it on; push the switch to the left to turn it off. DIP switch 1 is used for system and communications configuration. DIP switch 2 is used to set the unit's device address.

DIP Switch 1, switches 1 through 8		
SW1 and SW2 - Set the baud rate for the EIA-485 Port - 8 bit, no parity, 1 stop bit.		
1 = Off	2 = Off	9600 baud
1 = On	2 = Off	19200 baud
1 = Off	2 = On	38400 baud
1 = On	2 = On	76800 baud
SW3 - Modbus RTU or BACnet MS/TP Selection		
3 = Off		Communication via BACnet MS/TP
3 = On		Communication via Modbus RTU
SW4 - Modifiable BACnet Instance (For advanced users only)		
4 = Off		BACnet instance set via DIP switch SW2 (default)
4 = On		BACnet instance set from the command line. Refer to the BMS BACnet Instance Modification Technical Guide for complete instructions.
SW5 - Unused		
5 = Off		Unused, leave in the off position.
SW6 - Offline Sensor Alarm Delay - The amount of time that elapses without communication before the sensor is considered offline.		
6 = Off		120 seconds (Default)
6 = On		600 seconds
SW7 - Unit Type - Designate whether information is presented in metric or imperial units.		
7 = Off		Metric (Default)
7 = On		Imperial
SW8 - Radio Channel Pair - Select whether this unit communicates via radio channel pair 1 or channel pair 2.		
8 = Off		Channel pair 1 (Default)
8 = On		Channel pair 2

Use DIP switch 2 to set the address of the device. This should be a number between 1 and 254. Adjust the individual switches until their sum equals the device address. Switch values are as follows:

DIP Switch 2, switches 1 through 8
SW1 through SW8 - Set the device address for the BMS-WiNG

Switch number	Switch value
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128

Off   On

Example:
Device address 34
SW2 and SW6 are ON

Example:
Device address 226
SW2, SW6, SW7, and SW8 are ON

Connect the BMS-WiNG to the Network

The BMS-WiNG needs network connectivity to communicate with a Modbus RTU or BACnet MS/TP system, such as a BMS. Use a 2-wire RS-485 cable to connect the BMS-WiNG to the network through the wiring connection at TB1. RLE recommends an 18AWG shielded twisted pair stranded copper wire for the connection, using no more than 2000 feet (609.6m) of wire at this specification. If longer runs are needed, please contact RLE.

CLI

After the BMS-WiNG is connected to the terminal (115200 bps, 8 bit, no parity 1 stop bit) you'll see a menu that can be used to help understand which sensors the BMS-WiNG has seen and in what order they are displayed. Commands available from this menu are:

Command	Action
slist	List all sensors
sinfo [#]	Show info and modbus register numbers for sensor #
sdel [#]	Remove sensor #
settings	Show current settings (set by dip switches)
bid	Show BACnet device ID in use
sbid	Configure custom BACnet device ID
reboot	Reboot unit
?	Print main menu
??	Print advanced menu

Modbus Communications

The BMS-WiNG uses its RS-485 port to communicate via Modbus. The BMS-WiNG is configured to act as a Modbus Server device on a common network and is a Server only device – it will never initiate a communications sequence.

Read Output Registers

To read the BMS-WiNG's parameter values, the Client must send a Read Output Registers request packet (function code 03). The full range of registers is 40001 - 41000. Each sensor occupies 20 registers. The register settings illustrated here are representative of sensor #1. Sensor #2 would start at 40021, sensor #3 starts at 40041, #4 at 40061, etc.

command: sinfo 1 Sensor 1 Information				command: sinfo 3 Sensor 3 Information	
Register	Sample Data	Name	Units	Register	Sample Data
40001	1 (WiNG-T)	Sensor model type	uint16	40041	2 (WiNG-TH)
40002	0X1234	Sensor serial number	int32 - high16	40042	0XC7A0
40003	0X5678	Sensor serial number	int32 - low16	40043	0X62DA
40004	Sensor #1	Sensor name	int16*9 ASCII	40044	Sensor #3
40013	702 Temperature	Data value 1	int16*10 (deg * 10)	40053	714 Temperature
40014		Data value 2	int16	40054	13 Humidity
40015		Data value 3a	int32 - high16 (deg)	40055	19 Dewpoint
40016		Data value 3b	int32 - low16	40056	
40017	368	Sensor battery voltage	uint16*100 (Centivolts)	40057	368
40018	0	Out of service status	uint16	40058	0
40019	2	Sensor reading age	uint16 (Seconds)	40059	8

BACnet Communications

BACnet auto-discovery can be used to find all BACnet data points available for the WiNG sensors.

Directions for modifying the BACnet instance, intended for advanced users, can be found in the BACnet Instance Modification Technical Guide.

Add Sensors To The BMS-WiNG

RLE recommends adding sensors to the BMS-WiNG one at a time. This way you'll know the order in which they will appear in the sensor register list. To add sensors:

1. Perform a factory reset to remove any sensors already associated with the BMS-WiNG: press and hold the push button on the front of the unit for 20 seconds. The red LED will turn off and the unit will reset. When the LED is flashing again the unit is ready to use.
2. Move the unit to an area away from any other WiNG sensors and put it into discovery mode: hold down the push button on the front of the unit until the LED turns solid blue or green (yellow or purple for 868MHz systems), depending on which channel pair you're using.
3. Remove the battery pull tab to activate one WiNG sensor. This sensor will be the first one in the sensor list.
4. Remove the battery pull tab on the next sensor to activate it. This sensor will be the second one in the sensor list.
5. Repeat until all sensors have been activated.
6. Use the terminal and the "slist" command to verify the sensor's type and the serial number associated with each slot. Use the "sinfo" command to retrieve the Modbus register numbers associated with a particular sensor.

Delete Sensors From The BMS-WiNG

If the BMS-WiNG is receiving signals from sensors that should not be associated with it, you can remove those sensors from the system.

NOTE: When you remove sensors from the system, the other sensors in the list will not change places. This prevents a sensor's Modbus register numbers from changing. Any new sensors that are added will enter into the first empty slot in your sensor list. For example, you have 5 sensors in your system. You remove sensor number 3 and then add another sensor to the system. The new sensor will show up in the vacant slot number 3.

1. For sensors to be removed automatically, the system must recognize them as "old" sensors. Old sensors are any sensors that have not communicated with the BMS-WiNG in the past 10 minutes. If the sensors you'd like to remove are currently functional, either remove the batteries from the sensors, or physically remove the sensors from the transmission radius of the BMS-WiNG.
2. Once 10 minutes has passed, use your BMS system to ensure the system has not received a reading from the sensors in more than 10 minutes.
3. Access the push button on the bottom right of the unit and press and hold it for 10 seconds. Once the LED glows red, release the button. The old sensors will be removed from the system and the unit will reset.
4. You can remove sensors manually from the terminal by using the "sdel" command.
5. Once you have removed all the sensors you need from the system, use the terminal and the "slist" command to verify the sensors that remain associated with the BMS-WiNG system are as expected.

System Reference
Front Panel LED
The lower right corner of the BMS-WiNG houses an LED that uses different colors and blink patterns to convey device status and information.

Blink Pattern		Status Description
	Blue / Off - Every 2 seconds	900MHz system; Operating on channel pair 1 (default)
	Blue Solid	900MHz system, channel pair 1 System is in sensor discovery mode
	Green / Off - Every 2 seconds	900MHz system; Operating on channel pair 2
	Green Solid	900MHz system, channel pair 2 System is in sensor discovery mode
	Purple / Off - Every 2 seconds	868MHz system; Operating on channel pair 1 (default)
	Purple Solid	868MHz system, channel pair 1 System is in sensor discovery mode
	Yellow / Off - Every 2 seconds	868MHz system; Operating on channel pair 2

Blink Pattern		Status Description
	Yellow Solid	868MHz system, channel pair 2 System is in sensor discovery mode
	Cyan / Off - Up to once every 10 seconds	The BMS-WiNG is being polled by the Modbus RTU or BACnet MS/TP system
	Red / Off	The BMS-WiNG is not monitoring any WiNG sensors

Front Panel Push Button
A white button in the lower right corner of the unit initiates system functions:

Operation	Function
Press and hold for two seconds	Enable or disable (toggle) sensor discovery mode
Press and hold for ten seconds (LED will glow red)	Erase old sensors - An "old" sensor is considered to be any sensor that hasn't communicated with the BMS-WiNG in the past ten minutes.
Press and hold for 20 seconds (Red LED will turn off)	Perform a full factory reset of the unit. All sensors are deleted from the system.

Troubleshooting
Sensors Are Not Associating With the BMS-WiNG
If an installed sensor is not detected by the BMS-WiNG, it is either too far away from the BMS-WiNG or there is an obstruction in its path. To determine the source of the problem, remove the sensor from its installed location and place it near the BMS-WiNG. If it's then discovered by the BMS-WiNG:

- Its desired location may be too far away. Move the sensor away from the BMS-WiNG in small increments. This will help you determine the distance threshold of the sensor.
- An obstruction is blocking the signal. Move the sensor.
- The sensor has a wire whip antenna that can be extended out of the sensor case in an effort to resolve either a distance limitation or obstruction issue. To expose the whip antenna:
  1. Access the sensor's circuit board. Hold the sensor upside down in your hand (label toward your palm) and squeeze the short side of the sensor

enclosure's lid. Pull the base away to open the sensor enclosure. The sensor board should remain in the lid. Gently grasp the edges of the sensor lid and pull it to free it from the sensor enclosure.
2. Locate the whip antenna connection on the circuit board. Gently rotate the connection 180° so the antenna routes toward the U3 marking on the board, instead of routing past the Y1 marking on the board.
3. Now put the board back into the enclosure. The whip antenna will route out the vent hole in the enclosure near the tip of the orange wing icon on the enclosure label, and the sensor board will slip into the board slots in the enclosure. The whip antenna should extend directly out of the enclosure and not pass back over the length of the board. Reapply the sensor base.
4. You should end up with about three inches of antenna outside of the enclosure, and this can dramatically increase the signal distance the sensor can achieve.

If the sensor is still not discovered by the BMS-WiNG:
- Verify the sensor's serial number. Make sure you're looking for the correct sensor at that position.
- Remove the sensor's cover and make sure the battery pull tab has been completely removed.
- Check to see that the heartbeat LED is blinking, once every 10 to 20 seconds.
- If the LED is not blinking, ensure there is not a gap between the battery clips and the side of the battery. Remove the battery, gently squeeze the clips in, and replace the battery.
- Check the battery's voltage. If the battery is reading a low voltage (lower than 2.7V), replace the battery with a 3.6V lithium AA battery.

Sensor Battery Issues
When you replace the battery, replace it with a 3.6V lithium battery. WiNG sensors will NOT operate with a standard alkaline AA cell.

Make sure you replace the battery with the terminals facing the correct direction. The sensor will not function if the battery is inserted backwards.

BMS-WiNG Physical Diagram

DIP Switch 1
DIP Switch 2
24VDC Power Input
Antenna A Terminal Connection
Antenna B Terminal Connection
RS-485 Wiring Connection
Push Button
Front Panel LED