ALERTON

Installation and Operations Guide

AZW-5000

Important safety information and installation precautions

Read all instructions
Failure to follow all instructions may result in equipment damage or a hazardous condition. Read all instructions carefully before installing equipment.

Local codes and practices
Always install equipment in accordance with the National Electric Code and in a manner acceptable to the local authority having jurisdiction.
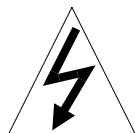
Electrostatic sensitivity
This product and its components may be susceptible to electrostatic discharge (ESD). Use appropriate ESD grounding techniques while handling the product. When possible, always handle the product by its non-electrical components.

High voltage safety test
Experienced electricians, at first contact, always assume that hazardous voltages may exist in any wiring system. A safety check using a known, reliable voltage measurement or detection device should be made immediately before starting work and when work resumes.

Lightning and high-voltage danger
Most electrical injuries involving low-voltage wiring result from sudden, unexpected high voltages on normally low-voltage wiring. Low-voltage wiring can carry hazardous high voltages under unsafe conditions. Never install or connect wiring or equipment during electrical storms. Improperly protected wiring can carry a fatal lightning surge for many miles. All outdoor wiring must be equipped with properly grounded and listed signal circuit protectors, which must be installed in compliance with local, applicable codes. Never install wiring or equipment while standing in water.

Wiring and equipment separations
All wiring and controllers must be installed to minimize the possibility of accidental contact with other potentially hazardous and disruptive power and lighting wiring. Never place 24VAC or communications wiring near other bare power wires, lightning rods, antennas, transformers, or steam or hot water pipes. Never place wire in any conduit, box, channel, duct or other enclosure containing power or lighting circuits of any type. Always provide adequate separation of communications wiring and other electrical wiring according to code. Keep wiring and controllers at least six feet from large inductive loads (power distribution panels, lighting ballasts, motors, etc.). Failure to follow these guidelines can introduce electrical interference and cause the system to operate erratically.

Warning
This equipment (FCC ID: HS9AZWDGL) has been tested and found to comply with the limits for a class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two 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.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

Contents

About AZW-5000

Alerton's AZW-5000 is a wireless communications device designed to replace MS/TP and wall sensor cabling in instances where cabling is cost-prohibitive. It allows you to add a small (up to 15 controllers or devices) wireless subnetwork to a wired network.

A scenario where the AZW-5000 would be effective is a school that adds portable class rooms that need to be tied into the existing school Building Automation System (BAS). The cost of running cable underground to each portable is significant. AZW-5000 is an ideal solution to this problem allowing a wireless network to make the connection for a lower price than the labor and materials needed to bury a cable.

It will also be useful when retrofitting wireless controllers into places where wiring or rewiring is prohibitively expensive - buildings with concrete walls, for example.

The AZW-5000 operates in one of three modes:.

- **Coordinator** - connects to the committed MS/TP network. Sends and receives system data to/from transceivers.

- **Transceiver** - connects to a unitary controller by an MS/TP cable. Also supports a wireless sensor by communicating data between the unitary controller and the wireless sensor. Sends and receives system data to/from the coordinator.

- **Repeater** - Connects only to power. Repeats transmissions in areas of weak reception. Note that the use of repeaters reduces the overall bandwidth of the network.

Dimensions
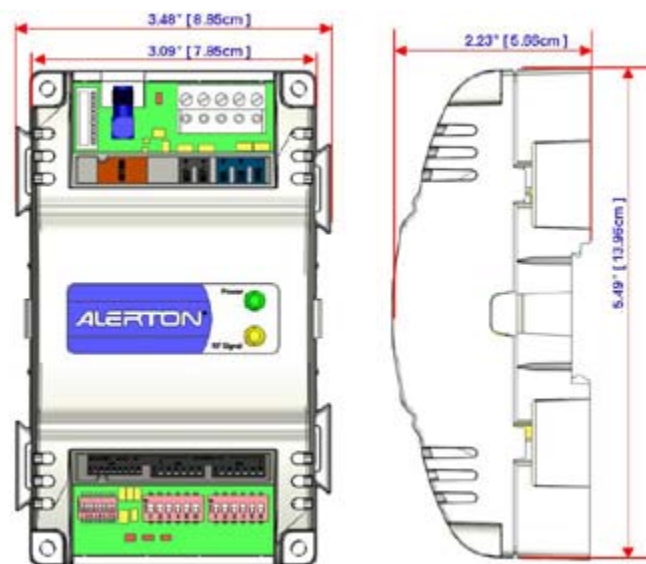
Figure 1   AZW-5000 dimensions

Power rating

The AZW-5000 consumes <5VA power at 24VAC 50/60Hz typical.

AZW-5000 network topology

Figure 2 shows a typical, stand-alone, AZW-5000 implementation. For examples of other topologies, see the System Design Guide (LTBT-TM-SYSDSGN).
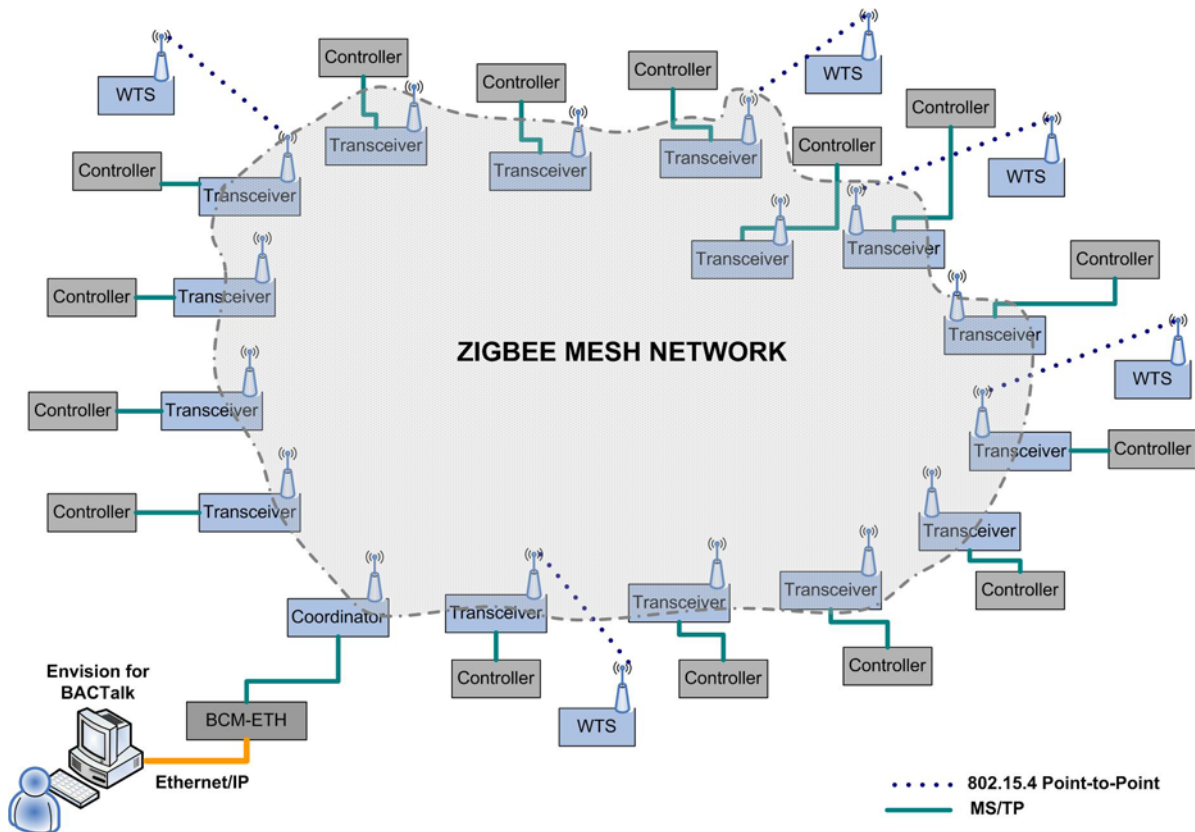
Figure 2   Typical AZW-5000 implementation

Items to note in relation to Figure 2:

- The maximum number of AZW-5000 devices on a network is 16 (1 coordinator and 15 transceivers/repeaters).

- The AZW-5000 connected to the BCM-ETH must be configured as a coordinator. This device manages the wireless network.

- The coordinator must have a dedicated BCM-ETH or BCM-MSTP. Do not connect multiple MS/TP devices to the coordinator's BCM.

- An Alerton Wireless Temperature Sensor cannot be associated with a coordinator or a repeater.

- An AZW-5000 transceiver or repeater may be associated with only one WTS. Both must share the same ZigBee MAC address.

- Locating a transceiver more than 100 feet from the coordinator may degrade data transfer rates.

About this document and related publications

This document provides information about installing and wiring a AZW-5000 to equipment, power, and communication channels. It also shows how to operate the device.

IMPORTANT Always install equipment in accordance with the National Electric Code and in a manner acceptable to the local authority having jurisdiction (AHJ). No guidelines, instructions, installation practices, or other information presented in this guide may be interpreted to supersede or modify the local codes and practices of the AHJ.

Table 1 Other documentation related to AZW-5000s

Document (ID)	Contains
AZW-5000 Installation Instructions (LTBT-AZW-INST)	Instructions for mounting and wiring the AZW-5000. Also lists field configuration settings. A printed copy ships with each unit.
Data Sheet	Single-sheet summary of applications, capabilities, and configuration.
System Design Guide	Guidelines for BAS systems. Includes a section on wireless networks and Alerton wireless hardware. includes max trendlogs, schedules, and alarms supported.
Alerton Wireless Temperature Sensor Installation Instructions (LTBT-TM-WTS-INST-USA)	Instructions for installing and operating the Alerton Wireless Temperature Sensor.

General installation guidelines

This section provides guidance for wiring and powering Alerton controllers. For installation instructions specific to AZW-5000, see "Installation" on page 14.

Using terminal blocks

The AZW-5000 uses header-style termination blocks to simplify field wiring of power, communications, and I/Os. Terminal blocks accept wire gage from 12–24 AWG.

▶ **To terminate wire to a AZW-5000**

1. Strip approximately 1/8" of the wire jacket from the end of the wire.

2. Use a small screwdriver (1/8" max) to turn the adjustment screw fully counter-clockwise. The clamps in the wire slot separate as you turn the screw.

3. Insert the stripped end of the wire into it (try to get the jacket flush with the terminal block). If using stranded wire, be sure to insert all strands into the wire slot. If terminating multiple wires, trim wires to same length and tightly twist exposed wire together.

4. Hold the wire in place and turn the adjustment screw clockwise to tighten it until the clamps in the wire slot secure the wire.

5. Tug gently on the wire to ensure it is secure.

Power supply guidelines and requirements

AZW-5000 uses 24 VAC power from a UL Listed Class 2 24 VAC transformer (not provided). The AZW-5000 uses a half-wave rectifier to convert the AC power supply to onboard power. This enables multiple devices with half-wave power supplies to be powered from a single, grounded transformer. When sharing a transformer make sure the sum of the MAX loads for all connected devices does not exceed the Load rating for the transformer. AZW-5000 maximum power consumption is <5VA.

CAUTION Half-wave devices and full-wave devices must not use the same AC transformer. If a AZW-5000 will share its power supply with another device, ensure that the other device uses a half-wave rectifier and that polarity of wiring is maintained. Failure to do so can result in equipment damage.

Note All Alerton unitary controllers are half-wave devices.

Selecting a transformer

The safest way to size a transformer is to ensure that the maximum VA load rating of the AZW-5000 is less than 85% of the Nameplate VA rating of the transformer. Even if all outputs are not presently used, this ensures that each AZW-5000 has sufficient power for future equipment additions.

CAUTION If an AZW-5000 will share its power supply with another device, ensure the transformer is rated to handle the combined maximum load. Using and undersized transformer may damage equipment.

IMPORTANT Transformer sizing should never exceed the maximum UL Class 2 rating.

Power supply grounding and wiring

When connecting power to the AZW-5000, ensure that one leg of the VAC secondary circuit connects to a known earth ground. Also ensure that the GND terminal on the AZW-5000 connects to the same known earth ground.

Supplying a high-quality ground connection to a AZW-5000 and then properly connecting the AZW-5000 to the ground is one of the most important things you can do to ensure a trouble-free installation.

The 24VAC secondary leads are not interchangeable. Once a lead connects to the GND terminal on the AZW-5000, it is the grounded lead. Observe and maintain polarity for subsequent connections. The GND terminal provides a reference ground for the circuit board and communications wiring. Use 18 AWG cable for best results.

WARNING Ensure that all AZW-5000 power, communications, and I/O cabling are grounded according to these instructions. Failure to follow these instructions may result in AZW-5000 operational and communication failures or equipment damage.

Power supply wire selection

If you are considering long power supply wiring runs, using the right wire size is critical. If the wire diameter is too small, the resistance may be too high, resulting in a low voltage supply to the AZW-5000. This is known as *line loss.* The wire size is based on the length of the wire run and the current draw of the AZW-5000. Obtain additional information from the transformer manufacturer.

MS/TP LAN wiring

The AZW-5000 coordinator device communicates with the BACnet system over the MS/TP LAN, which uses the EIA–485 signaling standard. Transceivers communicate with their associated unitary controllers over

Note This section applies only to the coordinator device.

Table 2 MS/TP LAN facts

Transmission speed	9.6, 19.2, 38.4, 76.8 Kbps (figured at global controller). At startup, AZW-5000 devices operate at 76.8 Kbps.
Layout	Bus.
Cabling	BACnet specifies the following. Shielded, twisted-pair cabling with characteristic impedance between 100 and 130 Ohms. Distributed capacitance between conductors must be less than 30 pF/foot (100 pF/m). Distributed capacitance between conductor and shield must be less than 60 pF/foot (200 pF/m). Foil or braided shield acceptable.
Segment length	Segments between transceivers and controllers/devices should be kept as short as practical to reduce cable costs. Longer segments are acceptable to improve radio signal strength. The segment between a coordinator and its associated BCM can be up to 4000 ft. (1071 m.), but will typically be much shorter.
Maximum devices overall	One coordinator and 15 transceivers/Repeaters.
Maximum devices per segment	One transceiver and one controller per subnet.
MS/TP repeaters	Do not use.
Terminating resistors	not applicable
Shield grounding	Ground transceiver shield drain wires at single point earth (panel) ground, *not* AZW-5000 *ground*. Tape off the shield drain wire at the other end. Grounding coordinator shield wires is not necessary unless the coordinator is located more than ten feet from its associated BCM.

Terminating MS/TP LAN cabling

MS/TP terminations are located at the top of the AZW-5000. See Fig. 4 on p. 15.

Maintain polarity of the MS/TP wire run throughout the MS/TP LAN.

Note Basic information about MS/TP terminations at the AZW-5000 are provided here. See the *BACtalk System Design Guide* (LTBT-TM-SYSDSGN) for more detailed information and limitations with respect to MS/TP LANs — distance requirements, unit loads, repeater architectures, and so on.

Grounding the MS/TP LAN shield

Proper shield grounding of the MS/TP cabling can help minimize the risk of communications problems and damage to equipment because of transient voltage spikes (for example, lightning strikes).

Follow these guidelines for grounding MS/TP cable shields:

- Each transceiver MS/TP segment should have a single point of shield ground, preferably as close to the middle of the cabling run as possible.

- Do not ground the MS/TP shield to an AZW-5000 GND terminal.

- Do not ground both ends of a shield. Differences in potential between the grounds may induce current on the shield, causing interference.

- At ungrounded, exposed shield points, tape back the shield to the wire jacket or, for optimum transient shunting, use 100 V gas discharge tubes or 120 V MOVs between the shield and ground.

LTBT-TM-AZWIOG   Rev. 0001BETA

Configuration

This section lists the configuration steps that must be performed on the device. Commissioning steps performed using Envision for BACtalk are explained in "Commissioning" on page 12.

IMPORTANT Write down the values you assign during this process. This information will be useful in troubleshooting problems should they arise. See "Appendix B: AZW-5000 Commissioning Record" on page 30.

1. Use the MS/TP MAC address DIP switches 1-7 to set the MS/TP MAC address (ON is toward the body of the device). Valid addresses are 1-127.

2. Use the two 6-position DIP switches to set the ZigBee network address (ON is toward the body of the device). Set the coordinator device ZigBee network address to 0.

   Note If the device is associated with an Alerton Wireless Temperature Sensor, both units must have the same ZigBee MAC address DIP switch settings.
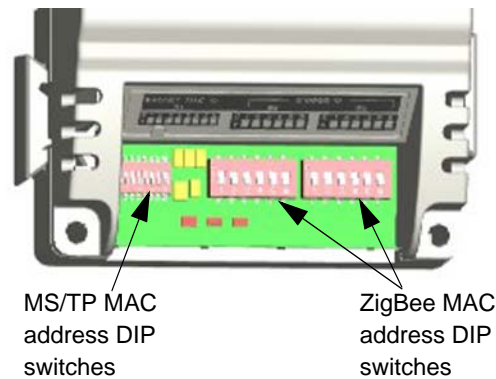

MS/TP MAC address DIP switches

ZigBee MAC address DIP switches

Figure 3 DIP switch locations

Commissioning

Commissioning requires temporarily wiring the device to the MS/TP network, opening it in a device template, and then editing the device's settings. Commission the coordinator first.

IMPORTANT Write down the values you assign during this process. This information will be useful in troubleshooting problems should they arise. See "Appendix B: AZW-5000 Commissioning Record" on page 30.

▶ **To open the commissioning template**

1. Download device template 99100017.dvt from the Alerton Support Network and copy it to the Alerton\Standard\Displays folder.

2. Start Envision for BACtalk.

3. Open a data display in Edit mode and then add a Pushbutton Selector.

4. Double-click the pushbutton and select **Device template (different device)** as the button type.

   The Pushbutton Item dialog box appears.

5. Enter the text for the button label ("AZW-5000 commissioning", for example).

6. Enter 9999 for the Device instance.

7. Select **Use display from** and then select the **Alerton/Standard** rep/job.

8. Select template number 99100017 and then click **Close**.

9. Exit Edit mode.

▶ **To commission AZW-5000 devices**

1. Temporarily wire the device to the MS/TP network and apply power. See "Wiring" on page 15.

2. Start Envision for BACtalk.

3. Open Device Manager and then perform a device scan.

   The unit will appear in the list of devices with device instance 9999 (Model AZW-5000).

4. Save it to the table and then close Device Manager.

5. Click the commissioning button you created.

   The device template opens.

6. Set the Extended PAN ID to a value other than the default (optional, but recommended). Remember to record the values.

7. If the unit will function as a coordinator, set the Device Type to 0. If it will function as a transceiver or repeater, leave the default value (1).

   Note You can have only one coordinator per network.

   CAUTION Connecting more than one coordinator to a ZigBee network will cause routing loops and degrade performance.

8. Set the Device Instance.

9. Set the ZigBee Network Number. You can use the default setting as long as it is unique across the BAS. All AZW-5000 devices on a given network must have the same ZigBee Network Number.

   Note You can set up overlapping ZigBee networks as long as you keep the ZigBee Network Numbers distinct.

10. Set the MS/TP Network Number. This network number must be unique within the ZigBee network.

    Note Because each transceiver/controller pair form their own MS/TP network, the MS/TP Network Number for the coordinator must be different from the MS/TP Network Numbers of the transceivers.

11. If you are commissioning a coordinator, leave the default Baud rate setting (0=Auto-baud). If you want to specify a Baud rate for a transceiver, type a rate.

12. Click **Commit Configuration Changes** and then cycle power to the device.

    Note The display button will no longer open this unit because the device instance has changed. See "Viewing commissioning data" on page 21 for instructions on accessing this data.

13. Check radio communication. See "Checking radio communication" on page 16.

    If it is not functioning properly, see "Troubleshooting weak reception" on page 22

14. Repeat steps 1 through 13 for each device. You can reuse the commissioning button because the units ship from the factory with the device instance set to 9999.

Installation

This section explains how to mount and wire individual devices once they are configured.

After all AZW-5000 devices are installed, ensure that only the coordinator is wired to the primary BAS MS/TP network. Wiring multiple AZW-5000s to the primary MS/TP network will cause routing loops.

WARNING Thoroughly read all instructions before mounting and wiring. Install equipment in accordance with the National Electric Code, these instructions, and in a manner acceptable to the local authority having jurisdiction. Failure to do so can result in bodily injury or equipment damage.

Mounting

Choose a mounting location that minimizes the amount of interference for radio communication with the nearest node. Do not mount in a metal box or in a fiberglass box impregnated with ferro magnetic` materials. Leave at least six inches above the device for connecting wires and an external antenna (optional).

Some points to consider when selecting a location:

- The effective communication range is 50 feet (through two non-metal walls).

- Any metal (ducting, equipment, metal studs, and so on) near the device or between two devices will impede radio waves.

- If a wall has metal components (studs, ductwork, and so on) radio waves will tend to travel along the plane of the wall. Mounting the device on the same wall as other device(s) will increase signal strength.

- When mounting near ductwork or other metal, use double-sided tape to temporarily mount the device while testing radio reception.

- Mount the AZW-5000 indoors only.

DIN rail mounting

▶ **To mount the AZW-5000 on a DIN rail**

1. Hold the device with its top tilted toward the DIN rail and then hook the two top tabs on the back of the device onto the top of the DIN rail.

2. Push down and in to snap the bottom flex connector onto the DIN rail.

To remove the AZW-5000 from a DIN rail, push straight up from the bottom to release the top tabs and then pull the top of the device outward.

Wall mounting

To mount the AZW-5000 on a wall, position the device in any orientation and secure it to the wall with size 6 or 8 screws appropriate for the mounting surface.

Attaching an external antenna (optional)

The AZW-5000 has two internal antennas that will meet the requirements of most applications. If you need additional range or if the device is mounted in an

area not accessible to radio waves, you can connect an external antenna. Before connecting an external antenna to improve radio signal strength, try moving the AZW-5000.

A compatible antenna is available from www.antennafactor.com, part number ANT-2.4-CW-RCT-SS.

The cable must have a male SMA on one end and a female SMA on the other.

▶ **To mount an external antenna**

1. Set the MS/TP MAC address DIP switch 8 to ON (up). Note that this sets AV-31 present value to 2 (external).

2. Screw the antenna onto the terminal at the top of the device.

3. If necessary, use an RF cable to relocate the antenna. Use a cable with a maximum signal loss of 1 dB.

Wiring

Once the AZW-5000 is mounted, connect the MS/TP and power.
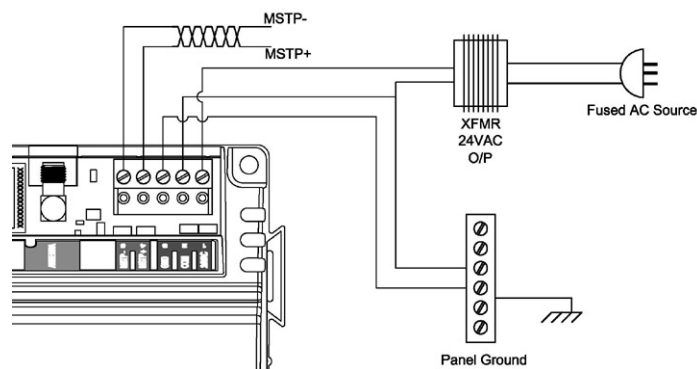
Figure 4   Wiring diagram

Connecting MS/TP

If the unit will function as a repeater, skip this section.

Connect the device to its parent controller using cabling that meets the EIA–485 signaling standard. Use shielded, twisted-pair cabling with characteristic impedance between 100 and 130Ω. Distributed capacitance between conductors must be less than 30 pF/foot (100 pF/m). Distributed capacitance between conductor and shield must be less than 60 pF/foot (200 pF/m). Foil or braided shield is acceptable. Maintain wiring polarity.

Connecting power

Connect the AZW-5000 to 24VAC power from a UL Listed Class 2 24VAC transformer (not included).

CAUTION   The AZW-5000 is a half-wave device. Do not connect half-wave devices and full-wave devices to the same AC transformer. If the AZW-5000 will share its power supply with another device, make sure that the other device uses a half-wave rectifier. Maintain wiring polarity.

Checking proper operation

This section gives instructions for checking individual devices after installation. For information about verifying that multiple devices have formed a network, see "Checking network operation" on page 18.

Checking power supply

The power status indicator (see Fig. 5 on p. 17) will light when the device is powered up.

Checking MS/TP communication

If the device will function as a repeater, skip this section.

Before checking MS/TP communication, make sure the device is in normal operation mode (not booting up or downloading a ROC file).

The MS/TP status indicator (see Fig. 5 on p. 17) flashes to indicate whether the AZW-5000 is communicating with other devices.

Flash Pattern	Status
one 100-mS flash every 2.5 seconds	No other MS/TP devices present or invalid MS/TP MAC address
two flashes every 2.5 seconds	Received MS/TP header (token passing activity)
three flashes every 2.5 seconds	Received a message requiring a response
one flash per second (continuous)	ZigBee firmware is being programmed
five flashes per second (continuous)	BACnet firmware is being programmed

Checking radio communication

The RF signal indicator (see Fig. 5 on p. 17) flashes red when the device communicates with another AZW-5000. It flashes yellow to indicate the device is communicating with an Alerton Wireless Temperature Sensor.

Checking radio signal strength

The radio signal strength indicator (RSSI) LEDs (see Fig. 5 on p. 17) show the strength of the radio communication with the nearest device. It is made up of three LEDs. Signal strength is indicated by the color and number of lighted LEDs.

Solid RSSI LEDs	Signal Strength
One solid red	Poor
One yellow	Weak
One yellow with one green	Good
One yellow with two greens	Excellent

Note The RSSI LEDs also flash to indicate error conditions. See See "Troubleshooting RSSI flash sequences" on page 22 for more information.
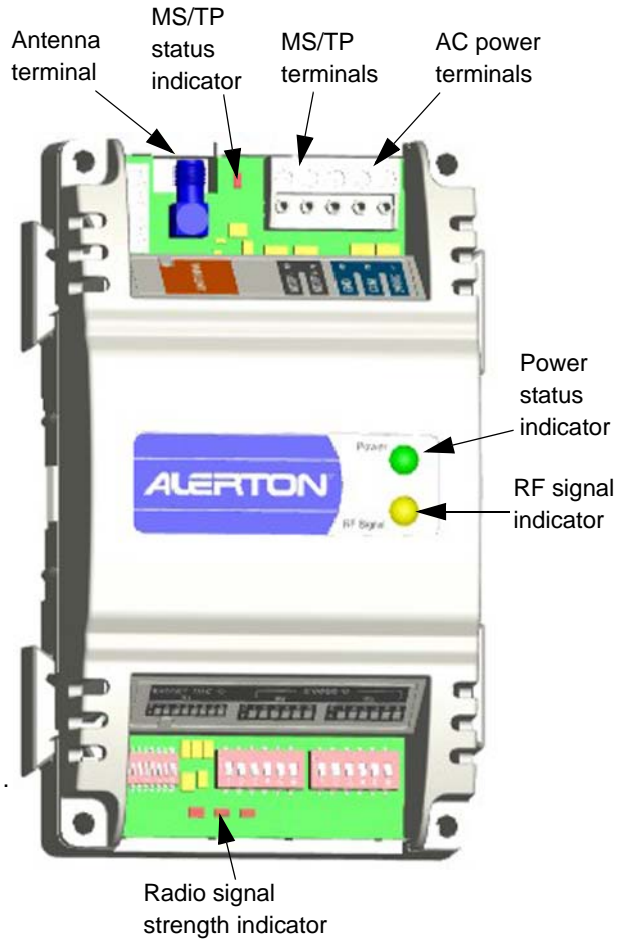
Figure 5   Locations of AZW-5000 components

Checking network operation

▶ **To check that an AZW-5000 network is commissioned correctly**

1. Open Envision for BACtalk.

2. Use Device Manager to perform a device scan.

3. Select the new units and then click **Save to table**.

   If a device does not appear on the device scan, see "Troubleshooting" on page 22.

4. Check the ASN (http://asn.alerton.com) and verify that the AZW-5000 devices and unitary controllers have the latest ROC file. If they do not, update the ROC files (see "Updating the real-time operating code (ROC) file" on page 20).

Adding Alerton Wireless Temperature Sensors

The Alerton Wireless Temperature Sensor (WTS) integrates with the AZW-5000 to add programmable space temperature control without the expense of cutting walls and running wires. The WTS is available in two models: one with a temperature adjustment knob and manual override, and one without.

A WTS differs from other devices you might add to an AZW-5000 network because it does not need to be wired to a transceiver. It has an internal radio that acts as its transceiver.

You can pair a WTS with an AZW-5000 transceiver or repeater, but not with a coordinator.

▶ **To pair a WTS with an AZW-5000**

1. Set up the WTS using the WTS Installation Instructions (LTBT-TM-WTS-INST-USA).

2. Set the WTS DIP switches labeled S2 and S3 to match the ZigBee MAC address DIP switches on the associated AZW-5000.

WTS AVs and BVs

When a WTS device is connected to the network, the associated AZW-5000 reads its AVs and returns the values shown.

Function	WTS Point	Default AZW-5000 Point
Temperature sensor reading	AV-80	AV-50
Temperature setpoint	AV-81	AV-51
Occupancy override status	AV-82	BV-52
Battery status	AV-83	BV-53

Note Setpoint Adjust Range is set using AV-25 in the AZW-5000.

You can change the AZW-5000 points to which the values are written by setting these AZW-5000 AVs:

- AV-84 specifies where the temperature sensor reading is written

- AV-85 specifies where the temperature setpoint is written

- AV-86 specifies where the occupancy override status is written

- AV-87 specifies where the battery status is written

Maintaining an AZW-5000

This section explains how to update the ROC file, replace an AZW-5000 device, and view commissioning data for a device.

Updating the real-time operating code (ROC) file

AZW-5000 has downloadable software called real-time operating code (ROC file). The ROC file is the brains of the device and handles the more complex functions of the AZW-5000 (object support, behaviors, and so on). The ROC file can be downloaded whenever a software upgrade is necessary.

To upgrade the ROC file, copy the latest ROC file from the ASN and then use BACtalk operator workstation software to send the ROC file to the device.

ROC file version

When servicing an AZW-5000, communicating with Alerton customer support, or reading documentation, you may need to know the version of an AZW-5000 ROC file. AZW-5000 ROC file information is available in Envision for BACtalk software as the application-software-version property of the AZW-5000 Device object.

To view the ROC version, use BACtalk operator workstation software to open a display template showing its device properties.
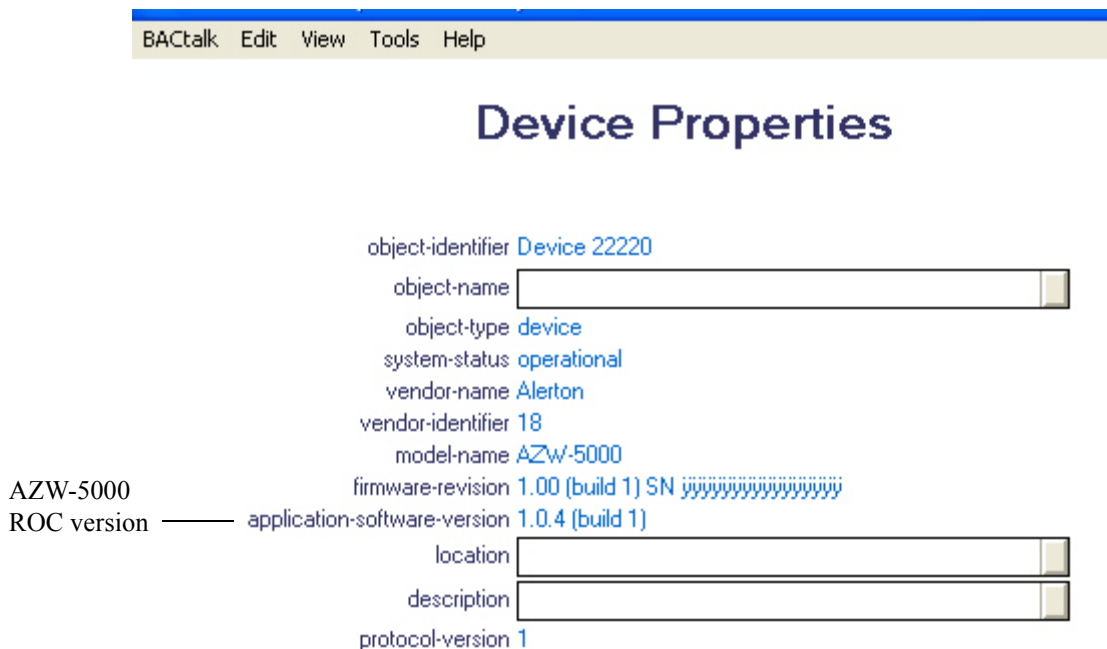
Replacing an AZW-5000

The process for replacing a failed device is the same as setting up a new device - with one exception: you must set the DIP switches on the replacement device to match those on the one being replaced. See "Configuration" on page 11 to start the process.

Viewing commissioning data

You may need to view commissioning data after initial commissioning.

▶ **To view settings for a commissioned AZW-5000**

1. If the device is not listed in the Device Manager table, perform a device scan and add the device to the table.

2. Open your commissioning data display in Edit mode.

3. Select the commissioning button.

4. Right-click the commissioning pushbutton and select **Repeat item**.

5. Accept the defaults and click **Do it**.

6. Double-click the new button.

7. Change the text for the button label to a unique name (device instance, for example).

8. Type the Device instance of the device you want to view.

9. Click **Close** and then exit Edit mode.

10. Click the new button.

Troubleshooting

Troubleshooting weak reception

If you are having trouble getting a good signal:

1. Switch the orientation of the internal antenna by changing AV-31 (0=vertical, 1=horizontal).

2. Move the device to reduce interference.

3. Add an external antenna. See "Attaching an external antenna (optional)" on page 14.

4. Add another AZW-5000 device to act as a repeater. Note that the use of repeaters reduces the overall bandwidth of the network.

Troubleshooting RSSI flash sequences

The RSSI LEDs show radio signal strength, but will flash if an error occurs.

RSSI flash sequence	Error Condition	Recommended Actions
One red	No communication or the device has not joined the ZigBee network	Ensure the device has the same Extended PAN ID and security key as the coordinator. The device may not be in range of another AZW-5000. See "Troubleshooting weak reception".
One yellow and two green	ZigBee MAC address does not match device type	For the coordinator, make sure the ZigBee MAC address is zero. For transceivers and repeaters, make sure the ZigBee MAC address is not zero.
Two green	Multiple devices have identical ZigBee MAC addresses	1. Remove power from all devices showing this sequence. 2. Use Envision for BACtalk to configure unique ZigBee MAC addresses for each of the devices. 3. Wait one minute and then apply power.
One red and one green	Coordinator - no other devices on the ZigBee network. Transceiver or repeater - lost communication with the coordinator. Note: This sequence will flash momentarily and then revert to a single red flashing LED.	The device may not be in range of another AZW-5000. See "Troubleshooting weak reception". Check the radio signal strength of the coordinator. See "Checking radio signal strength" on page 16.
One flashing red and two solid green	The device has joined the ZigBee network, but has not yet joined the BACnet network.	Be patient. It can take up to three minutes for a device to join the BACnet network.

Troubleshooting devices not found by device scan

If a device does not appear in the results of a device scan:

1. Check LEDs for power, radio signal, and MS/TP activity.

2. Check RSSI LEDs for error flash sequences (see "Troubleshooting RSSI flash sequences" on page 22).

3. Check wiring, especially polarity of 24 VAC.

4. Pull up the coordinator in device template 99100017 and verify that the Device Type is 0.

5. If the device is a transceiver, swap it with the coordinator and scan again.

6. Pull up the problem device in device template 99100017 and check the parameters:

Parameter	Value
Extended PAN ID	Same as all other AZW-5000 devices
ZigBee Network Number	Same as all other AZW-5000 devices, but unique across BAS
MS/TP Network Number	Different from all other AZW-5000 devices and unique across BAS

7. (Advanced Users) Pull up the device in template 99100014 and check these parameters:

Parameter	Value
Master Key	Same for all AZW-5000 devices
ZigBee Group ID	Same for all AZW-5000 devices

Troubleshooting erroneous WTS temperature readings

If you encounter a faulty reading from a wireless temperature sensor (WTS), it may be caused by two WTS devices with the same ZigBee MAC address. Check that each WTS in the system has a unique ZigBee MAC address. Also check for WTS devices that are not part of the system but may be transmitting temperature readings (test devices, other systems, and so on). Remove the batteries from unused units to prevent conflicts.

Appendix A: AZW-5000 AVs and BVs

AZW-5000 points sorted by point number					
Point	**Function**	**Description**	**Default Value**	**R/W**	**Comments**
AV–0 through AV-7	Commissioning	ZigBee PAN ID		r/w	
AV–8 through AV-23	Commissioning	ZigBee Security Key		r/w	
AV–24	Commissioning	ZigBee Group ID		r/w	
AV–25	Commissioning	WTS Set Point Adjustment Limit.		r/w	Defines the relative set point range for WTS set point. Value X represents set point range of –X to +X). User can set it between 0 and 100.
AV–26	Commissioning	ZigBee Device Type (0 =coordinator, 1 = transceiver)		r/w	
AV–27	Commissioning	BACnet Device instance		r/w	
AV–28	Commissioning	BACnet MS/TP Network Number		r/w	
AV–29	Commissioning	BACnet ZigBee Network Number		r/w	
AV–30	Commissioning	MS/TP Baud Rate		r/w	Valid values are 0 (auto), 9600, 19200, 38400, 76800.
AV–31	Commissioning	Internal Antenna Selection (0=vertical, 1=horizontal)		r/w	
AV–32	AZW-5000 diagnostics	ZigBee Channel Number		r	
AV–33 through AV-40	AZW-5000 diagnostics	ZigBee Extended PAN ID (128 bit)		r	
AV–41 through AV-56	AZW-5000 diagnostics	ZigBee Master Key		r	

AZW-5000 points sorted by point number					
Point	Function	Description	Default Value	R/W	Comments
AV–57	AZW-5000 diagnostics	ZigBee Device Type		r	
AV–58	AZW-5000 diagnostics	ZigBee BZLL Type		r	
AV–59	AZW-5000 diagnostics	ZigBee Group ID		r	
AV–60	AZW-5000 diagnostics	WTS RSSI		r	
AV–61	AZW-5000 diagnostics	AZW-5000 RSSI		r	
AV–62	AZW-5000 diagnostics	ZigBee Short Address		r	
AV–63	AZW-5000 diagnostics	ZigBee Short PAN ID (16 bit)		r	
AV–64	AZW-5000 diagnostics	ZigBee Firmware Major Version Number		r	
AV–65	AZW-5000 diagnostics	ZigBee Firmware Minor Version Number		r	
AV–66	AZW-5000 diagnostics	ZigBee Firmware Bug Fix Version Number		r	
AV–68 through AV-75	AZW-5000 diagnostics	ZigBee IEEE 64bit Address		r	
AV–76	AZW-5000 diagnostics	Internal Antenna Selection		r	
AV–77	AZW-5000 diagnostics	MS/TP MAC Address		r	

AZW-5000 points sorted by point number

Point	Function	Description	Default Value	R/W	Comments
AV−80	WTS diagnostics	WTS Temperature Reading		r	
AV−81	WTS diagnostics	WTS Setpoint Adjust		r	
AV−82	WTS diagnostics	WTS Occupancy Override Status		r	
AV−83	WTS diagnostics	WTS Battery Status		r	
AV−84	WTS diagnostics	VAV's AV point for WTS Temperature Reading		r	
AV−85	WTS diagnostics	VAV's AV point for WTS Setpoint Adjust		r	
AV−86	WTS diagnostics	VAV's BV point for WTS Occupancy Override Status		r	
AV−87	WTS diagnostics	VAV's BV point for WTS Battery Status		r	
AV-89	ROC download diagnostics	Error codes for failed BSL attempt			
AV−90	Inter-processor communication	SPI Rx Count		r	
AV−91	Inter-processor communication	SPI Tx Count		r	
AV−10000	AZW-5000 diagnostics	Startup count		r	
AV−10001	AZW-5000 diagnostics	Free heap (blocks >= 256)		r	

AZW-5000 points sorted by point number

Point	Function	Description	Default Value	R/W	Comments
AV–10002	AZW-5000 diagnostics	Free obj mem		r	
AV–10003	AZW-5000 diagnostics	Router Queued Message count		r	
AV–10004	AZW-5000 diagnostics	MS/TP RX frames		r	
AV–10005	AZW-5000 diagnostics	MS/TP TX frames		r	
AV–10006	AZW-5000 diagnostics	MS/TP RX bytes		r	
AV–10007	AZW-5000 diagnostics	MS/TP TX bytes		r	
AV–10008	AZW-5000 diagnostics	MS/TP dropped frames		r	
AV–10009	AZW-5000 diagnostics	MS/TP invalid frames		r	
AV–10010	AZW-5000 diagnostics	MS/TP baud rate in use		r	
AV–10011	AZW-5000 diagnostics	MS/TP RX errors		r	
AV–10020	Network tuning	Max packets before ack	3	r/w	Maximum number of packets BACnet packets that can sent by the device over ZigBee network before getting an acknowledgement for previously sent packet.
AV–10021	Network tuning	Longest transmit time	500 ms	r/w	Worst case time required for packet to be transmitted and acknowledgment/response reception.
AV–10022	Network tuning	Packets sent		r	Number of packets currently sent over ZigBee network.

AZW-5000 points sorted by point number					
Point	**Function**	**Description**	**Default Value**	**R/W**	**Comments**
AV–10029	AZW-5000 diagnostics	MSP Heartbeat Failures		r	
AV-10100 through AV-10149	Network diagnostics, neighbor table	Neighbor table entries	n/a	r	Lists the nodes in the device's communication range, up to 50 nodes. Each node is assigned an AV with these properties: Property 530 - neighbor address (ZigBee MAC + Hex(0x1000) Property 531 - neighbor device instance Property 532 - RSSI (dBm) Property 533 - transmit cost
AV-10150 through AV-10199	Network diagnostics, routing table	Routing table entries		r	Shows how links are formed between nodes. Each node on the network has an AV assigned with the following properties: Property 530: Address of final destination Property 531: Device instance of final destination Property 532: Address of next hop in the route Property 533: Device instance of next hop in the route Property 534: Cost for the given route Property 535: Route status
AV-10200 through AV-10249	Network diagnostics, reliability table	Reliability table entries		r	The percentage of requests for which responses are received. Each node visible to the device has an entry with the following properties: Property 530: Node Address Property 531: Device instance of Node Property 532: Reliability (In Percent)
AV-10250	WTS status	WTS status and reliability	n/a	r	Shows if a WTS is communicating with the device and, if so, the RSSI and reliability of the connection. This AV has these properties: Property 530: RSSI (dBm) Property 531: Status (TRUE = connected, FALSE = not connected) Property 532: Reliability (In Percents)

AZW-5000 points sorted by point number

Point	Function	Description	Default Value	R/W	Comments
AV-20000 + ZigBee DIP switch value	RSSI trending	RSSI for a particular AZW-5000		r	Can be used to trend RSSI for a particular device. For example, suppose you have a transceiver with a ZigBee DIP switch setting of 4 (device 1004), and want to setup a trendlog to monitor the RSSI value to that transceiver from the coordinator (device 1000). Set up a trendlog in the BCM monitoring AV-20004 in the coordinator. The value returned by AV-20004 is the RSSI value between device 1000 and device 1004.
AV-25000 + ZigBee DIP switch value	Reliability	Reliability data for a particular AZW-5000		r	Can be used to trend reliability for a particular device. For example, suppose in a multi-hop network you have a transceiver with a ZigBee DIP switch setting of 6 (device 1006). It is acting as a router to a remote transceiver that has a DIP switch setting of 11 (device 1011). Set up a trendlog in the BCM monitoring AV-25011 in device 1006. The value returned by AV-25011 is the reliability value between device 1006 and device 1011.
BV-0	AZW-5000 Commissioning	Commissioning changes		r/w	Indicates that commissioning data has been changed in Envision for BACtalk and that power needs to be cycled to write the changes to the AZW-5000. Must be manually set to active by the user to initiate a save of the commissioning data when power is cycled.
BV-1	ZigBee Status	MAC Layer Status		r	
BV-2	ZigBee Status	Network Layer Status		r	
BV-4	ZigBee Status	Application Layer Status		r	

Appendix B: AZW-5000 Commissioning Record

Use this worksheet to record the configuration and commissioning information for each AZW-5000 device.

Date: _____   Commissioned by: _____

MS/TP MAC Address	ZigBee MAC Address	Extended PAN ID	Device Type	Device Instance	ZigBee Network Number	MS/TP Network Number	Baud Rate