ΩΞ OMEGA®

User's Guide

ZW-REC
ZW Series Wireless Receiver

ΩE OMEGA®

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NOTES, CAUTIONS & WARNINGS

Information that is especially important is identified by the following labels:

Symbol	Description
Note	**NOTE:** Information that is important to successfully setup and use the ZW Series Wireless System.
⚡	**CAUTION:** Risk of electrical shock.
⚠	**WARNING:** May effect the functionality of the device.

1 INTRODUCTION

1.1 Safety and EMC Considerations

ESD Warning

⚠ **Warning:** The following parts of the unit are ESD sensitive:
- The Antenna
- Metal connectors for the Antenna, USB Port, and Power

EMC Considerations:

- Whenever EMC is an issue, always use shielded cables.
- Never run signal and power wires in the same conduit.
- Use twisted-pair wires for differential signal connections.
- Install Ferrite Bead(s) on signal wires close to the instrument if EMC problems persist.
- Failure to follow all instructions and warnings may result in injury.

1.2 Environmental and Operating Conditions

The ZW-REC is designed to be fixed mounted and operated in a clean and dry environment. Care should be taken to prevent the components of the device from being exposed to moisture, toxic chemicals, extreme cold or hot temperature that are outside the specification listed in this manual. Refer to **Section 7** for more information on allowable Environmental and Operating Conditions.

The following is a list of basic good practices when operating this Wireless System.

- Do not operate the wireless device in flammable or explosive environments.
- Do not use the wireless device in medical, nuclear or any other critical application

where failure can cause damage or harm.
- Always operate the device within the recommended environmental limits specified in this manual.
- Do not operate the device with a battery or AC adapter other than what's supplied or specified in this manual or on the battery compartment label.
- Keep each wireless device at least 8 inches (20 cm) from other radio transmitters, antennas, and people.
- The wireless approvals for this device specifies the specific antenna supplied with this device.

1.3 Before Begining

Inspecting the Shipment

Remove the packing slip and verify that you have received everything listed. Inspect the container and equipment for signs of damage as soon as you receive the shipment. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent. The carrier will not honor damage claims unless all shipping material is saved for inspection. After examining and removing the contents, save the packing material and carton in the event reshipment is necessary.

If you need assistance, please contact the Customer Service Department nearest you.

Obtaining User Manuals and Software

A quick start guide is included with the ZW-REC. The latest user manual, firmware upgrades and free software, such as OMEGA Dashboard, are available at the website listed on the cover page of this manual.
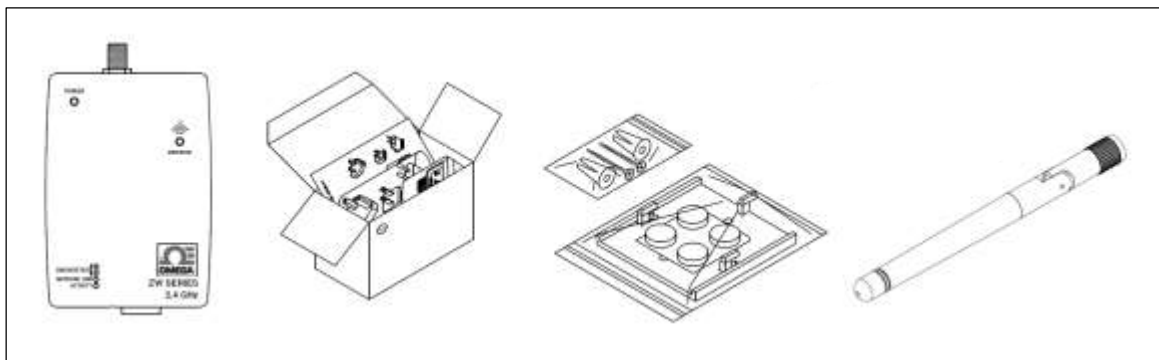
1.4 Included with the ZW-REC

Figure 1.   Included Items

- ZW-REC Wireless Receiver
- Universal AC Adaptor with US, EU and GB prongs
- Mounting Kit including screws, anchors, mounting bracket and feet.
- 2.4GHz Antenna
- Quick Start Guide

1.5 Description

The new, high-performance, long range, OMEGA® ZW-REC wireless receiver provides Web-based monitoring of OMEGA's IEEE 802.15.4 compliant wireless End Devices including the zSeries, UW Series[1] and ZW Series.

The ZW-REC is IEEE 802.15.4 compliant and operates at 2.4 GHz. It is designed to communicate up to 1000m[2] (3280') to various wireless sensors including the all new ZW-ED. The ZW-REC connects directly to an Ethernet network to serve active web pages and display the data. It enables monitoring and recording of Temperature, Humidity, and Barometric Pressure over an Ethernet network or the Internet without any special software—just a Web Browser. OMEGA offers a wide variety of different wireless sensors and transmitters to suit every application.

The ZW-REC offers expanded functionality over previous wireless receivers. The ZW-REC can connect to up to 128[3] wireless End Devices at once. The built in web server supports encryption to protect your sensitive data. The all new web pages run HTML5 and are ready to use on mobile devices. The ZW-REC can also wirelessly update firmware for compatible End Devices and Sensors.

The ZW-REC is designed to setup and run without any required software. A standard web browser can be used to monitor and chart all sensor readings. The browser can also be used to configure the device's IP address, passwords for access and overall configuration parameters. Firmware updates for the ZW-REC itself, compatible End Devices and sensors are loaded directly from the web browser. The web server supports HTTP over TLS (HTTPS) which provides a secure, encrypted, connection between web browser and ZW-REC receiver.

Each ZW-REC receiver can support up to 128 End Devices and up to 8 receivers can be setup in one area allowing for networks of up to 1024 total End Devices. The OMEGA Dashboard web server software can monitor and log data from one or more receivers from a single webpage. The OMEGA OPC Server is available for customers with existing SCADA systems, to connect the ZW-REC directly to their PLC or Historian. A free trial of the OPC Server is available for evaluation purposes. Please contact Customer Service for more information.

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[1] *Refer to the OMEGA Website for a list of compatible UW Series devices.*
[2] *Without obstructions or interferences*
[3] *Requires end devices that support IDs 32-127.*

2 HARDWARE

2.1 ZW-REC Diagram
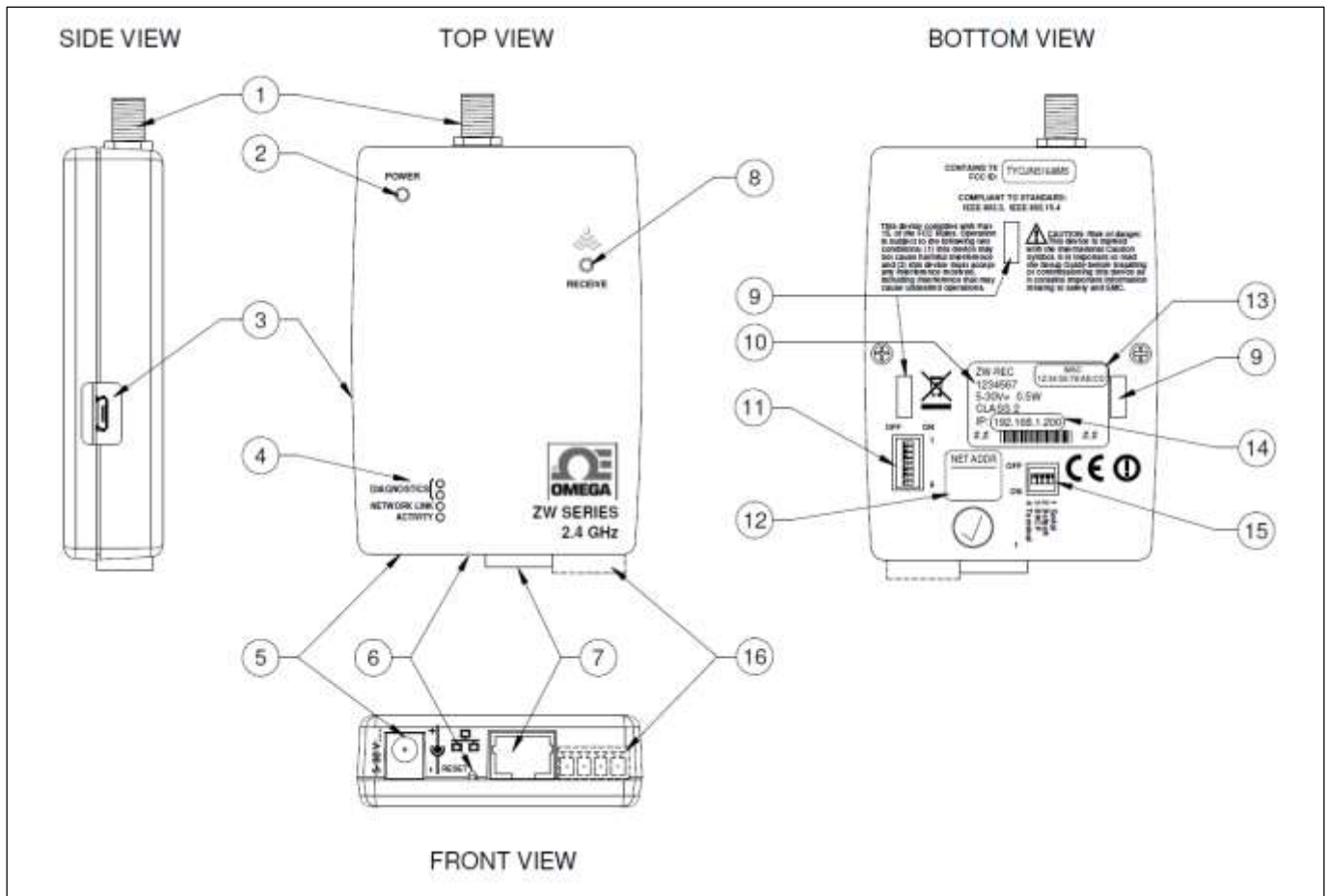
Figure 2.   ZW-REC Parts Diagram

Item	Description		Item	Description
1	Antenna Connector		9	Mounting Bracket Holes
2	Power LED		10	Serial Number
3	USB Connector[1]		11	Network ID DIP Switches
4	Network / Diagnostic LEDs		12	Network ID Label
5	Power Connector		13	MAC Address Label
6	Reset Button		14	IP Address Label
7	Ethernet Connector		15	Configuration DIP Switches
8	Wireless Link LED		16	Analog / Alarm Output (Optional)

[1] *Factory Use Only*

2.2 DIP Switches

The ZW-REC has two banks of DIP switched located on the back of the unit for easy configuration. **Figure 3** shows a close up view of the switches. To change the DIP switches, use a tweezer or small screwdriver to gently push the switch. Do not apply excessive force.
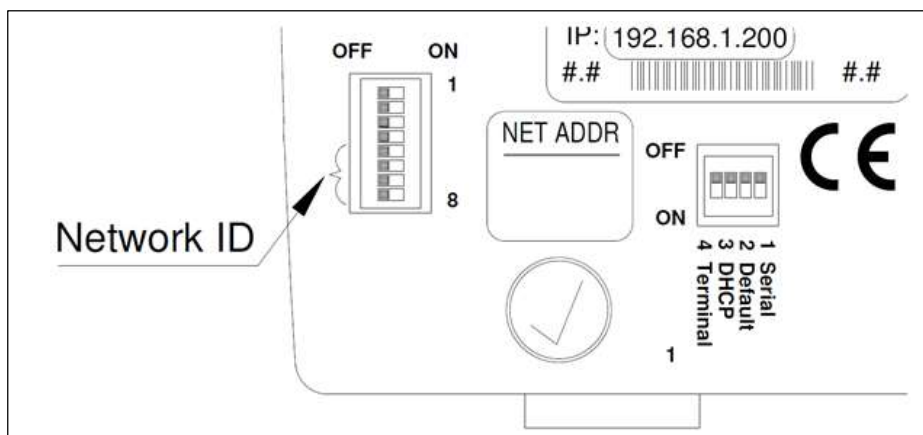
Figure 3.   DIP Switch Detail

Setting the Network ID

The set of 8 switches on the left selects the Network ID. The Network ID (NID) identifies which End Devices the ZW-REC communicates with. If there are multiple Receivers deployed in the same area each one must be assigned a unique NID. Make sure the same NID is selected on the ZW-REC and the End Devices. Only switches 5 to 8 are used. Do not use switches 1 to 4.

zSeries End devices only support NIDs 0 to 7. UW Series End Devices require a 5 digit NID referred to as a PAN ID for configuration. The PAN ID corresponding to each NID is listed in **Table 1**. Consult the user manual of each specific End Device for more information.

Table 1.   Network ID DIP Switches

Switch				NID	PAN ID		Switch				NID	PAN ID
8	7	6	5				8	7	6	5		
OFF	OFF	OFF	OFF	0	13106		ON	OFF	OFF	OFF	8	13114
OFF	OFF	OFF	ON	1	13107		ON	OFF	OFF	ON	9	13115
OFF	OFF	ON	OFF	2	13108		ON	OFF	ON	OFF	10	13116
OFF	OFF	ON	ON	3	13109		ON	OFF	ON	ON	11	13117
OFF	ON	OFF	OFF	4	13110		ON	ON	OFF	OFF	12	13118
OFF	ON	OFF	ON	5	13111		ON	ON	OFF	ON	13	13119
OFF	ON	ON	OFF	6	13112		ON	ON	ON	OFF	14	13120
OFF	ON	ON	ON	7	13113		ON	ON	ON	ON	15	13121

⚠️ **Warning:** The NID may be set with a different set of switches depending on the type of End Device. Please refer to the user manual for the End Device to determine which switches correspond to the NID.

DHCP and Defaults

The set of 4 switches near the Ethernet port are for basic configuration. Switches 1 and 4 are reserved and should not be used.

Switch 2 is used to reset the ZW-REC to factory defaults. This is useful if the IP address or password to the ZW-REC is lost. To set the Receiver to factory default settings perform the following steps:

- Remove power from the ZW-REC.
- Slide DIP switch #2 to ON position.
- Power the ZW-REC on and wait about 10 seconds until the Receiver fully boots up.
- Set the DIP switch #2 back to OFF position

Note: Make sure that the DIP switch is set to OFF before resuming normal operation. When the switch is on, every time the unit is power-cycled the factory settings are loaded. The switch may be changed while the unit is running but this has no effect until the ZW-REC is reset or power cycled.

Switch 3 is used to force DHCP on. Changing Switch 3 to ON enables DHCP the next time the ZW-REC is powered or reset. Turning on DHCP in the manner overwrites the webpage setting. This is useful for situations where it is not possible to connect to the default IP address. Please see **Section 3.3**for more information on requirement to use DHCP.

To disable forced DHCP change Switch 3 to OFF and reset the device. DHCP remains on until it is changed from the webpage or the device is reset to defaults.

2.3 Reset Button

Pushing the Reset Button while the ZW-REC is powered reboots the device. Holding the Reset Button for 9 seconds resets the ZW-REC to its factory default settings. To access the Reset Button carefully use a small screw driver or paperclip to depress the switch through the pinhole shown in **Figure 4**. Do not apply excessive force as this may damage the device.
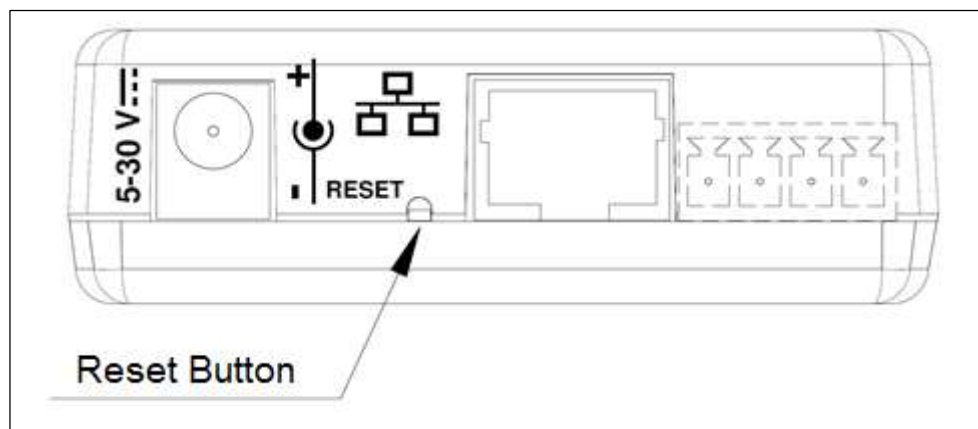
Figure 4. Reset Button

2.4 Dimensions and Mounting

The ZW-REC includes all required hardware for mounting. To mount the ZW-REC position unit where required. Mark the location of the top center of the unit. Refer to **Figure 5** to mark and drill the two screw holes as indicated. Use the included drywall anchors if needed and mount the bracket so that the bracket clips are facing up. Align the back of the unit over the three clips. When engaged slide downward and snap the unit in place.
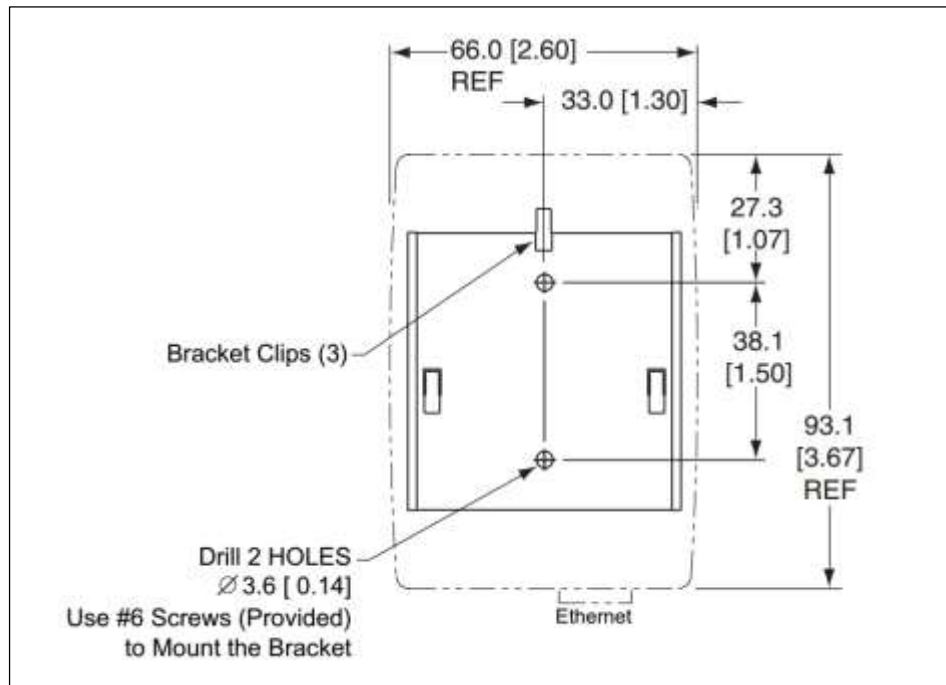
Figure 5.   Mounting Dimensions

Note ☞
- When mounting the unit be sure to leave room on the top for the Antenna and on the bottom and side for the cables.
- Mount the unit away from any large metal obstructions such as posts, catwalks or large machinery.
- For best wireless range, do not co-locate the ZW-REC with other 2.4GHz wireless equipment such as wireless routers or access points.
- For best wireless range, elevate the ZW-REC and keep a direct line of sight to End Devices.

3 INITIAL SETUP

This section guides you through how to setup the ZW-REC. Please do not power on any End Devices until Initial Setup is complete. If the ZW-REC is being integrated into a deployment with existing End Devices those End Devices may need to be reset once the ZW-REC is configured.

3.1 Antenna Warning

Before powering up the ZW-REC ensure the supplied antenna is properly installed. Running the ZW-REC without an antenna, or with an unapproved antenna, may cause damage to the device and/or cause operation outside of regulatory compliance. OMEGA Engineering accepts no liability and issues no warranty for devices operated improperly.

3.2 Choosing a Network ID

The Network ID (NID) selects which End Devices the ZW-REC communicates with. The NID is selected using the DIP switches found on the back of the device. If this ZW-REC is replacing an existing receiver in a wireless sensor installation, determine which NID is currently used and use the same one. Refer to **Section 2.2** to determine the correct DIP switch settings for each NID.

In a new installation with only one Receiver, keeping the default NID of 0 is recommended. All End Devices ship with a default NID of 0. If this installation requires multiple Receivers, ensure that each Receiver has a unique NID.

Record the NID on the Net. Addr. label on the back of the ZW-REC for easy reference in the future.

3.3 Connecting to the ZW-REC

Power on the ZW-REC by plugging in the supplied AC adaptor. The Green Power LED lights up and the Blue Receive LED flashes. The ZW-REC performs an energy scan to determine what the best RF frequency to transmit on is. Once the energy scan has completed the Blue LED will remain lit. See **Section 5.4** for more information on the energy scan.

Connect the ZW-REC to your network or computer using an Ethernet Cable. When connecting the ZW-REC directly to a computer a crossover cable is needed if the network adapter is an older 10Base-T or 100Base-TX type. A normal cable can be used for modern 1000Base-T network adaptors. The green Network Link and Activity LEDs light up once a connection has been established.

Static IP Address

The ZW-REC comes configured from the factory with a default IP address of 192.168.1.200. This address appears on a label on the back of the device. Bring up the ZW-REC web page by navigating to http://192.168.1.200 in your web browser.

DHCP/DNS

In installations where a static IP address is undesirable, an IP address can be automatically assigned using a DHCP server. See **Section 5.2** for more information.

3.4 Default Passwords

A password is required to view the ZW-REC web page. Enter the Client information in the dialog box when prompted. The default usernames and passwords are shown in **Table 2**.

Table 2.   Default Passwords

User Account	Login Name	Password
Client	login	12345678
Administrator	admin	00000000

The Client account is used to view reading and setup sensors. The Administrator account can change network options, update firmware and enable or disable security features. The default passwords can be changed from the Security page. It is recommended that you change these passwords. See **Section 6.1** for more details.

3.5 Navigating the Webpage

The End Device Reading Page (**Figure 6**) is shown by default when logging into the ZW-REC. The page will initially have no entries. End Devices are automatically added to the page as they are connected to the ZW-REC.
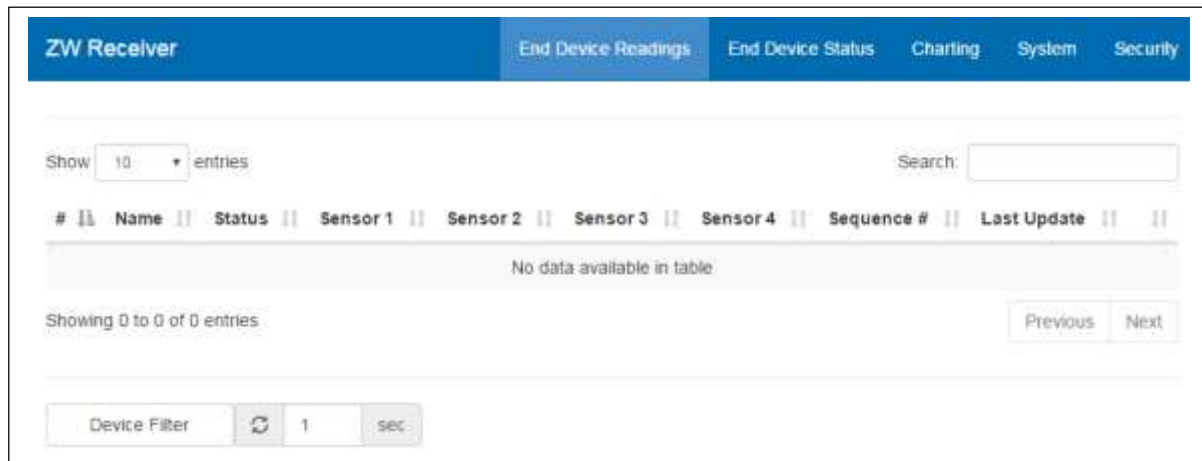
Figure 6.   End Device Readings (Blank)

The End Device Readings Tab is highlighted in the Navigation Bar at the top of the page indicating the current page. To navigate to a different page, click the corresponding tab in the navigation bar. The End Device Status and Charting tabs bring up additional information about connected End Devices. These three pages require the Client Account credentials and are described in more detail in **Section 4**.

The System tab and Security tab deal with ZW-REC wireless and Ethernet network configuration, encryption, logins and other system details. These pages require Administrator credentials and are described in more detail in **Section 5** and **Section 6**.

4 END DEVICE READINGS AND CONFIGURATION

This section details how to view, log and chart data received from End Devices. Turn on and configure any End Devices now. Confirm that all End Devices are set to the same Network ID as the desired ZW-REC. Also ensure each End Device has a different Device ID selected. If an End Device is running, it needs to be reset after changes to the Device ID or Network ID. Power on all End Devices now. If existing End Devices are running they may need to be reset now.

Please refer to the End Device user manual for detailed instructions on setting Network IDs and Device IDs.

Note ☞

The ZW-REC can display a NID chart to help configure zSeries and ZW Series End Devices. Refer to **Section 5.1** for more information.
zSeries and ZW Series devices are configured using DIP Switches and will automatically connect to the ZW-REC. UW Series devices must be configured using the OMEGA TC Central Software. Please follow the instructions found in Application Note AP-11

4.1 End Device Readings Page

When logging into the ZW-REC the End Device Readings page is displayed. The readings page shows the current sensor data from all connected End Devices. When an End Device turns on it enters active scan mode and search for a receiver. When the ZW-REC is found the Blue Wireless Link Indicator on the End Device flashes once and turns off. The Link Indicator flashes again each time a reading is transmitted. Once an End Device finishes connecting to the ZW-REC it is automatically added to the reading page.

#	Name	Status	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sequence #	Last Update		
0	Supply Closet	Good	23.00 ℃	49.60 %RH	1010.20 mbar	579.00 lx	49	17:08:21		⚙
7	Lab TH Sensor	Good	23.10 ℃	52.30 %RH	--	--	192	17:08:15		⚙
15	Storage Room 1	Good	23.50 ℃	48.00 %RH	1011.20 mbar	475.00 lx	6	17:08:21		⚙

Figure 7.   End Device Readings (Populated)

The readings page shows the End Device ID, Name and Status followed by readings from any

connected sensors. End Device Status will change from Good to Lost if an End Device misses three transmissions in a row.

The Sequence Number is transmitted by the End Device and incremented with each transmission. An increasing sequence number shows that the web page is getting fresh data from the End Device. The Sequence Number resets to 0 after it reaches 255.

The Last Update field shows the last time a new measurement was updated on the webpage. The webpage update rate is set at the bottom of the page. This changes how often the webpage checks for readings but does not change how often End Devices transmit new readings. The Last Update field uses the time retrieved from the local system.

By default, End Devices are displayed (sorted by Device ID) and up to 10 End Devices are shown. Use the **Previous** and **Next** buttons to show additional End Devices. The maximum number of entries can be changed using the drop down menu in the upper left. Up to 100 End Devices can be displayed at once.

When dealing with a large number of End Devices it may be useful to filter which ones to view. Use the search bar in the upper right to search for specific end devices by name. Use the **Device Filter** button to show or hide specific End Devices by Device ID.

4.2 Changing End Device Settings

Connected End Devices and Sensors can be configured by clicking the settings icon ⚙ on the right side of the page, on either the Readings or Status Page. A list of user adjustable parameters including the Sensor Name, Update Interval, and Sensor Offsets are shown. Other parameters may be shown based on the connected sensor. Please refer to the Sensor User Manual for sensor specific instructions.

General Settings

The End Device Name can be up to 16 characters long. Names are displayed on the web pages with the Device ID to help differentiate between End Devices.

The name cannot contain any of the following characters: ; = ( ) < > " &

The Update Interval is the frequency End Devices transmit readings. By default, most End Devices send one reading every 10 seconds. The update interval greatly effects the battery life of End Devices. The shorter the update interval the shorter the battery life will be. Shorter update intervals also increase the chance of RF Interference when there are multiple End Devices. It is recommended that the update interval be set only as short as required for optimal battery life. Please refer to the End Device user manual for more information on battery life.

Each End Device can have multiple sensors. The Sensor Offset is used to make adjustments to each measurement as needed. The offset can be positive or negative and contain up to 4 decimal places. The End Device will round each reading to the local sensor accuracy so extra decimal places may not be reflected in the final reading. If the

Figure 8. End Device Settings

End Device has a display, the offset will also be reflected on the display.

To change a value in the General section, type the desired value into the dialog box and press the **Update** button. Changes are sent to the End Device after its next transmission. The **Reset Fields** button clears any changes made but not yet updated.

Special Functions

In a large deployment it may be difficult to know which End Device is currently being configured. Checking the **Identify Mode**[1] setting turns on the Blue Wireless Link LED on the End Device being configured. Once the End Device has been located uncheck **Identify Mode** setting to turn off the LED. Leaving the LED on will quickly drain the battery on battery powered units and new readings may not be taken by certain devices in identify mode.

The **Clear End Device** button removes the End Device from the ZW-REC data base. This will remove any Lost devices from the webpage and clear any errors. If the **Clear End Device** button is pressed when there are no error conditions, the End Device will be removed but immediately rejoin the network when it next transmits.

The **Reset End Device**[2] button resets the End Device if it is currently connected to the network. The End Device will reset itself the next time it sends a reading to the ZW-REC and re-join the network automatically.

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[1] Identify Mode not available for UW Series End Devices
[2] Reset End Device not available for UW Series End Devices

4.3 End Device Status

The End Device Status page provides a quick overview of all current connected End Devices and their status. The page functions similarly to the End Device Readings page. Use the **Previous** and **Next** buttons to navigate between pages of End Devices. End Devices can be selected and filtered in the same way as the reading page.

Figure 9.   End Device Status Page

Name	Description
Type	Model of End Device
Sensors	Number of Sensors Connected
Power	Current Power Source (Battery or Line Power)
Success	Percent of Successful Transmissions
Strength	Wireless Signal Strength (See **7APPENDIX C**)
Update Interval	Time Between Readings
Battery	Current Battery Voltage of End Device

4.4 Chart Page

The Chart page gives a graphical view of the sensor data. **Figure 10** shows the chart interface. The Chart is highly customizable based on your needs. Any combination of End Devices can be charted and two measurement types can be displayed at once.
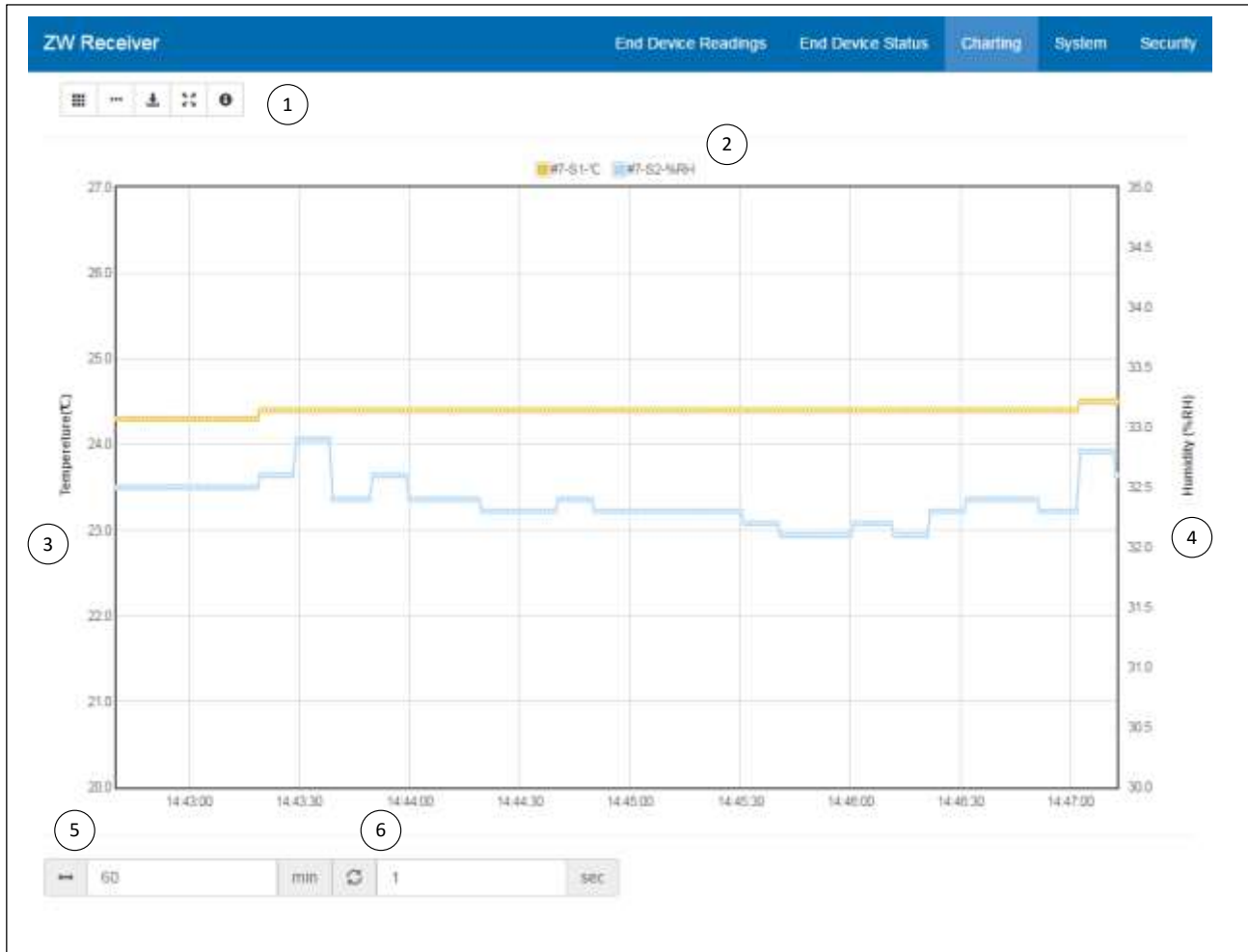
Figure 10.   Chart Page

Item	Name	Description
1	Toolbar	Chart Utilities
2	Key	Displayed Sensors
3	Axis 1	Axis for Measurement Type 1
4	Axis 2	Axis for Measurement Type 2
5	Time Span	Length of Time Charted
6	Update Time	Time Between Updates

Setting up the Chart

The first time the chart is loaded it is blank. To start graphing, first use the toolbar in the upper left of the chart to select which end devices to view. Next select which sensor type to view. The chart will now start to display the data. Up to two different sensor types can be selected. The first is plotted on the left axis and the second is plotted on the right axis.
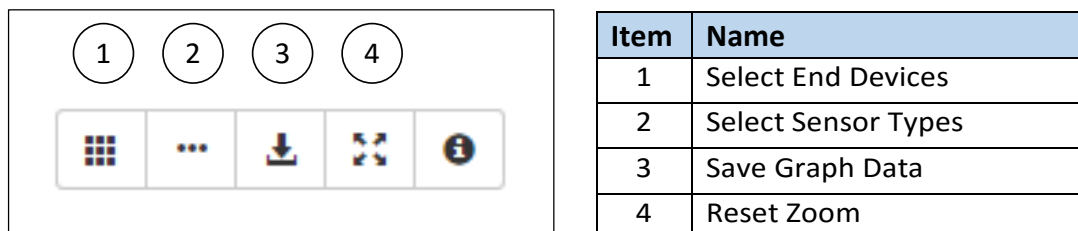

Item	Name
1	Select End Devices
2	Select Sensor Types
3	Save Graph Data
4	Reset Zoom

Figure 11.   Chart Toolbar

As End Devices are added to the chart they also appear in the key above the chart. Each measurement in the chart is displayed in a different color. The key displays the color followed by the End Device ID, the sensor number and the units of measure for each measurement. The sensor number is used to distinguish between sensors for units equipped with more than one sensor of the same type such as dual thermocouple inputs.

Manipulating The Chart

All chart axes are fully user customizable. By default, the cart will show one hour of data and scale each axis to fit the sensor readings received. The scale on each axis can be fixed to user defined extents and the amount of time shown can also be customized.

To change the scale of a vertical axis, click on the axis title, enter the desired Maximum and Minimum for the axis and press the **Set** button to change the scale. Use the **Auto Scale** button to have the chart scale to fit the data.

Figure 12.   Chart Axis Dialog

To change the horizontal axis, enter the desired chart time, in minutes, into the time span box at the bottom of the chart. This indicated how much time the chart will cover. The chart always displays the most recent data. The frequency the chart is updated can also be changed. Enter the desired frequency in the update time box.

> **Note** ☞ **Note:** The update time for the chart is unrelated to the update time for End Devices. If the chart updates more often than the End Device, it will display the same data point multiple times.

Viewing Chart Data

The Chart has several helpful features to make viewing data easier. Move the mouse over any data point to show the sensor reading for that data point. Click and drag on the chart to zoom into a specific section. Click the **Reset Zoom** button to zoom out to the full extents. The **Save Graph Data** button will save all of the points displayed on the graph to a comma separated value (csv) file which is readable by most programs.

Note ☞   **Note:** Data is lost after closing the chart page. Data older than the time span is lost and will not be displayed on the chart. For long term data logging please use the OMEGA Dashboard Software.

5   System Page

The ZW-REC System page is used to setup the Radio and Network parameters for the device and to upgrade firmware. The administrator login is required for this pages. Changes to these settings could cause loss of connectivity to the webpages or the connected End Devices. Care is advised when making any changes. Some settings on this page require a reboot to take effect. The ZW-REC can be rebooted using the **Reboot ZW Receiver** button at the bottom on the page.

Note ☞   **Note:** For detailed instructions on upgrading firmware see **7APPENDIX B**.

5.1 System Information

System information is displayed at the top of the page. The current version on Baseboard and radio firmware is listed as well as the PAN ID. The PAN ID is similar to the Network ID and is used for setting up UW Series End Devices.

Clicking on the information icon next to the PAN ID brings up a DIP Switch configuration chart for zSeries and ZW Series End Devices. This chart shows which DIP switches need to be used to connect the End Devices to the ZW-REC. Refer to the End Device User Manual for more information on End Device setup.

Figure 13.   System Information

5.2 Network Setup

The Network options configure the webserver in the ZW-REC. A reboot of the ZW-REC is required after changing any network settings. The ZW-REC can be rebooted by using the **Reboot ZW Receiver** button at the bottom of the page.

Figure 14.   Network Configuration

IP Address

To change the default static IP settings, enter the new information into the dialog boxes. Press the **Save** button to confirm any changes. Changes will take effect the next time the ZW-REC is rebooted.

> **Note** ☞
> - When changing the ZW-REC to an IP address on a different subnet you will be unable to access the webpage until you connect your computer to that that subnet.
> - If you change the IP address it is highly advised that the label be updated. Remove the IP Address sticker and write in your new IP address in the area provided.

Host Name, DHPS and DNS Server

The default host name for the ZW-REC is zwrec**** where **** are the last 4 digits of the MAC Address. See **Figure 2** for the location of the MAC address.

The ZW-REC can be accessed using its host name instead of its IP address. To use this feature DHCP must be with a Domain Name Server (DNS).

Enabling DHCP on the ZW-REC allows a DHCP Server to automatically assign an IP address. Checking the DHCP box overwrites the static IP settings. Be sure to also enter the address of the associated Domain Name System (DNS) server when DHCP is enabled. A DNS Server links the device's host name to its IP address. If DHCP is turned on but a DNS server is not available, it may be difficult to locate the correct IP address to connect to the ZW-REC.

After changes are made, press the **Save** button to save the new settings. The changes will take effect the next time the ZW-REC is rebooted. Please note that it may take a few moments for the DNS server to recognize the receiver after a reboot.

Note ☞
- It is important to communicate with the network administrator, in order to understand DHCP and its existing configurations on the host server, before enabling DHCP on the Receiver.
- On Windows servers DHCP and DNS are separate functions. It is important to configure the DHCP server to communicate with the DNS server in order for the Host Name to be correctly identified.
- If the ZW-REC cannot be reached using its Host Name, please contact your network administrator to make sure the DHCP server and DNS are properly configured.

5.3 Client Connection

The Client Connection options configure how TCP connections are handled. Client connections allow external software to read data from the ZW-REC using the ZW-REC Serial Protocol detailed in the ZW-REC Serial Programming Guide. The default options work with the OMEGA Dashboard. If different software is used these setting may need to be changed. Press **Save** to save any changes. The changes will take effect the next time the ZW-REC is rebooted.

Figure 15.   Client Connection Configuration

Name	Description
Maximum Client Connections	The number of open connections allowed. Additional connections over the limit are refused.
	The ZW-REC supports up to 5 client connections but the number of connections is limited to 2 when encryption is enabled.
Client Connection Port	The port number for external software to connect to.
Disconnect After Data Sent	The ZW-REC will close the port after each command. This is useful if multiple programs require access simultaneously.
Require Authentication	Prompts for Client Password before establishing a connection.

5.4 Radio

When the ZW-REC starts up it performs an energy scan to find a clear RF channel. This RF channel is displayed in the Radio Section. Due to network planning this channel may need to be changed. Select the desired channel here. If the RF Channel is changed all connected End Devices need to be reset. To prevent the ZW-REC from re-scanning when it is rebooted uncheck the Enable Energy Scan box. Press the **Save** button to save any changes. Changes in this section take place immediately.

Note: It is highly recommended to uncheck the Enable Energy Scan Box after the first boot up. This allows End Devices to automatically re-connect to the ZW-REC if it is rebooted. If left checked, End Devices may need to be reset when the ZW-REC is rebooted.

Figure 16.   Radio Configuration

5.5 Measurement Units

This section selects between SI and Imperial units for temperature and pressure. Changes in this section take place immediately. End Devices with LCDs will reflect the new setting after they next transmit.

Figure 17.   Measurement Units

6 Security Page

The Security Page controls logins and encryption for the ZW-REC. The ZW-REC ships with encryption off and easy to remember passwords by default. For secure applications Encryption and Strong Password enforcement are available. After making changes on the Security page reboot the ZW-REC using the **Reboot ZW Receiver** button at the bottom of the page.

Figure 18.   Authentication

6.1 Usernames and Passwords

To change the default user name for the Client or Admin account, type the desired name in the dialog box. Click on the **Save** button to confirm any changes.

The change a password, click the 🔒 button next to the username. In the dialog box, enter the old password followed by the new password. Retype the new password for confirmation. Click the **Submit** button to submit changes.

Figure 19.   Change Password Dialog

By default, any password up to 16 characters long is allowed by the ZW-REC. If additional security is required check the require Strong Password box to enable the Strong Password Policy.

Strong Password Requirements

- Length of at least 8 characters but no more than 16 characters
- At least 1 uppercase letter (A-Z)
- At least 1 lowercase letter (a-z)
- At least 1 numerical digit (0-9)
- At least 1 special character (any other character not including ;=()[]<>"&)

The password requirements can be viewed by clicking the information icon. If the current passwords do not meet the password policy, they are automatically reset to the defaults shown in **Table 3**. Usernames remain the same.

Table 3.   Default Strong Passwords

User Level	Password
Client	Omeg15c!
Administrator	Omeg15a!

Reboot the ZW-REC after completing changes to the usernames or passwords. The new credentials are enforced following the reboot.

6.2 Encryption

Check the Use Encryption box on the Security page to turn on encryption for the webpage and client connections. A reboot is required after enabling encryption. After encryption is enabled, login to the ZW-REC using https:// followed by the ZW-REC IP address or hostname.

When encryption is enabled the ZW-REC is configured with a default SSL certificate that is not issued by a Certificate Authority (CA). Most web browsers provide a warning page when connecting to the ZW-REC indicating the SSL certificate is not issues by a trusted certificate authority. This is normal and it is safe to procced. Click '**Continue to this website**' to bring up the ZW-REC Home Page. A sample warning displayed by Internet Explorer is shown below in **Figure 20**.
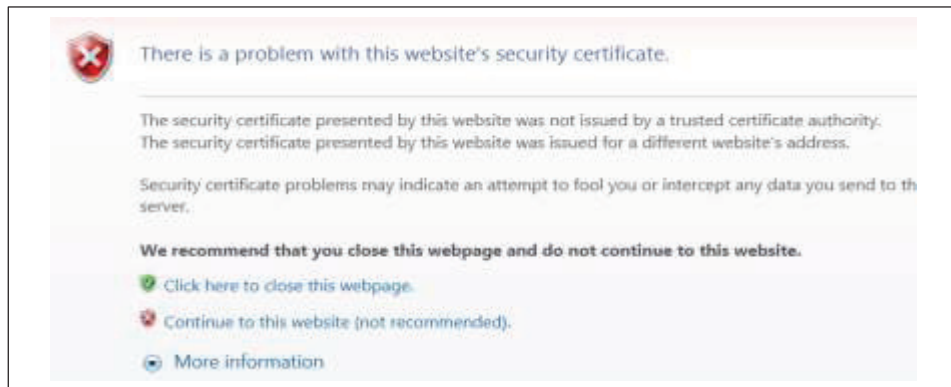
Figure 20.   Certificate Warning

This warning can be eliminated by obtaining a trusted SSL certificate. For details on how to use a trusted SSL certificate please refer to **APPENDIX A**.

7 SPECIFICATIONS

Wireless Communications	
Standard	IEEE 802.15.4, DSSS
Frequency	2.4GHz
Transmit Power	9.5dBm
Receiver Sensitivity	-96dBm
Range	Up to 1000m (3280')

Compatible Transmitters	
ZW Series	Up to 128 Devices
zSeries	Up to 32 Devices
UWTC, UWRTD, UWRH, UWIR	Up to 127 Devices

Operating Conditions	
Input Voltage	5 Vdc to 30 Vdc
Input Power	0.8W Maximum
Operating Temperature	0 to 70°C (32 to 158°F)
Humidity	90% RH non-condensing

Physical Properties	
Case Dimensions (W x H x D)	66 x 93.1 x 27.4 mm (2.6 x 3.7 x 1.1") (Excluding Antenna)
Antenna Length	108 mm (4.3")
Weight	90g (3.2 oz) (Including Antenna)

Networking and Security	
Ethernet	10/100Base-T
IP Address	Static or DHCP Assigned
Encryption	TLS 1.2 with AES_256_CBC
User Accounts	Client and Administrator

Safety Qualified AC Adaptor	
Input Voltage	100 Vac to 240 Vac, 50/60 Hz
Nominal Output	9 Vdc, @ 0.5A
Operating Temperature	0 to 40°C (32 to 104°F)

Export Control Classification Number	
ECCN	5A992

Approval Information	
The product herewith complies with the essential requirements and other relevant provisions of the directives listed below and carries the CE-marking accordingly. The following CE Mark CE ① is affixed to this equipment. The CE declaration is available at the website listed on the cover page of this manual.	
EMC Directive	2014/30/EU
Low Voltage Directive	2014/35/EU
Radio Equipment Directive	2014/53/EU
RoHS Directive	2011/65/EU

APPENDIX A Certificate Configuration

The ZW-REC is configured with a default SSL certificate not issued by a Certificate Authority (CA). The non-verified certificate causes most web browsers to display warning messages. A CA-issued SSL certificate can be used instead and will not trigger warnings. This may make for a better user experience.

OMEGA cannot provide a CA signed certificate because a private encryption key is required to be stored on the device. Distributing a private encryption key compromises its security. Always protect your encryption key. A stolen encryption key can be used to spoof your presence on the internet. OMEGA is not responsible for and does not have any obligation towards the process of obtaining a certificate or protecting your encryption key.

Figure 21.   Certificate Configuration

Create Certificate Validation Page

Some Certificate Authorities require a verification page to ensure that the website is authentic. The ZW-REC can automatically generate the required verification page. The certificate issuer is allowed to remotely access to this page to verify the website.

To create a validation page, enter the name of the validation page to be created in the Page Name box and enter the information provided by the CA in the page content box. Click the **Create** button to finalize the process. Please contact your CA if you have any questions about this process.

Upload a Certificate

Once you have obtained a certificate, you can upload it to ZW-REC. The certificate contains two parts; the Certificate and the Private Key. Click on the **Choose File** button next to the Certificate and Private Key fields shown in **Figure 21**. Use the file browser to find the corresponding file. Make sure the correct files are selected before uploading the certificate. Click the **Upload** button to upload the certificate and finish the process.

Reset the Certificate

To remove the CA issued certificate and use default certificate click the **Reset Certificate** button.

APPENDIX B Firmware Updates

The ZW-REC firmware and ZW Series End Device Firmware can be updated through the network connection. A firmware update may add additional features or allow the ZW-REC to communicate with additional End Device models. To update the firmware first visit the ZW-REC page at www.omega.com. Download the latest firmware version and unzip the file to a location a local drive.

Before starting a firmware upgrade, close all unused programs, unused web browser tabs and disable anti-virus software if possible. It is recommended that any firmware upgrade is initiated on the same local area network as the ZW-REC using a wired Ethernet connection. This will reduce the risk of dropped packets or network traffic interfering with the upgrade.

B.1 Upgrading from Version 1.X

ZW-REC units running version 1.X firmware require a multi-part update to run version 2.0 or above. Download the Version 1.X upgrade files from the OMEGA website and unzip the files to a local directory. Confirm that the following files are included:

- ZW_COORD_BL.b64
- coordinator.b64
- zw-rec-app.b64

Step 1: Before proceeding, record the IP Address for the ZW-REC:

- IP Address: http://__ __ __ . __ __ __ . __ __ __ . __ __ __

Step 2: Connect to the ZW-REC and log into the Access Control page using the administrator log on.

At the bottom of the page press the **Firmware Upgrade** button.

The Firmware Upgrade page appears as shown in **Figure 22**. Click the **Upgrade** button. A dialog box will appear reminding you to have your firmware ready. Click **Okay**.

Figure 22. Old Firmware Upgrade Page

Step 3: The ZW-REC will restart in firmware update mode as shown in **Figure 23**.

If the page does not come up automatically after 10 seconds, navigate to the IP address of the ZW-REC. In firmware update mode encryption is disabled so the IP address needs to start with http://.
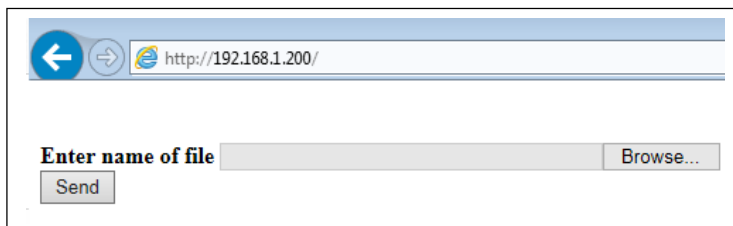

Figure 23.   Old Firmware Upload Page

Step 4: Press the **Browse** button and Locate the **ZW_COORD_BL.b64** file using the dialog box. Press **Open**. After selecting the file press the **Send** button to begin the firmware update. The firmware update process may take several minutes. Do not close the web page or remove power from the device until the update is complete. When the update has finished the Update Success screen in **Figure 24** is shown.
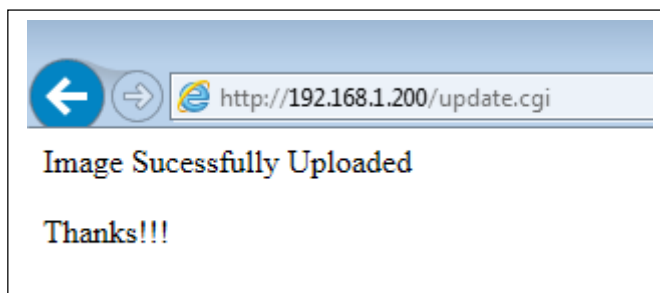

Figure 24.   Old Upload Success Page

Step 5: Connect to the ZW-REC again using the IP Address recorded in Step 1. Follow the instruction in Section B.2 Step 3 to upload **coordinator.b64**.

Step 6: Connect to the ZW-REC again using the IP Address recorded in Step 1. Follow the instruction in Section B.2 Step 3 to upload **zw-rec-app.b64**.

The ZW-REC is now ready to use. User settings including, IP Address, Encryption, User Name and Password are preserved during the update so no additional setup is required.

B.2 Upgrading Version 2.0 and above

Step 1: Before proceeding, record the IP Address for the ZW-REC:

- IP Address: http://__ __ __ . __ __ __ . __ __ __ . __ __ __

Step 2: Connect to the ZW-REC and log into the System page using the administrator log on. At the bottom of the page press the **Update Firmware** button located near the bottom of the page.

A dialog box will pop up. Click **OK** and the firmware update page will load. If the page does not come up automatically after 10 seconds, navigate to the IP address of the ZW-REC. In firmware update mode encryption is disabled so the IP address needs to start with http://.
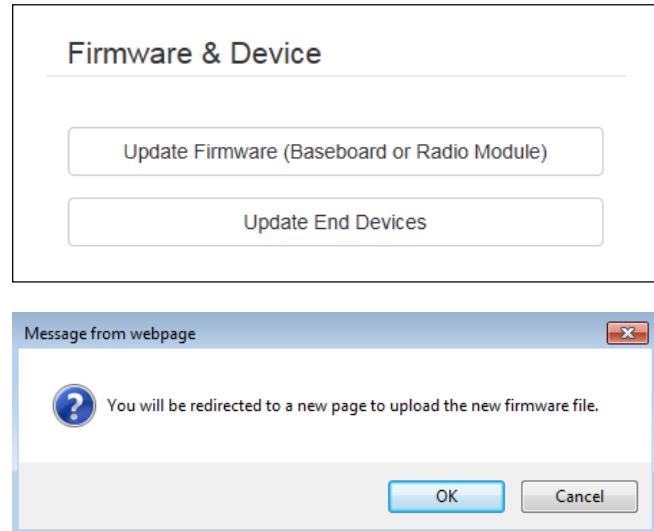
Figure 25.   Firmware Upgrade Dialog

Step 3: Press the **Browse** button and select the firmware (b64 file) for the update. Press the **Upgrade** button to update the firmware.

Figure 26.   Firmware Upload Page

Wait for the update success screen shown in **Figure 27.**

Figure 27.   Upload Success Page

Once the firmware is loaded the ZW-REC restarts and is ready to use. User settings including, IP Address, Encryption, User Name and Password are preserved during the update so no additional setup is required.

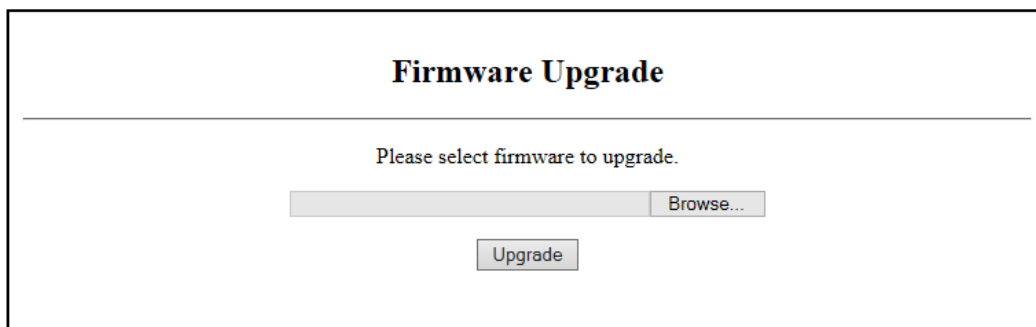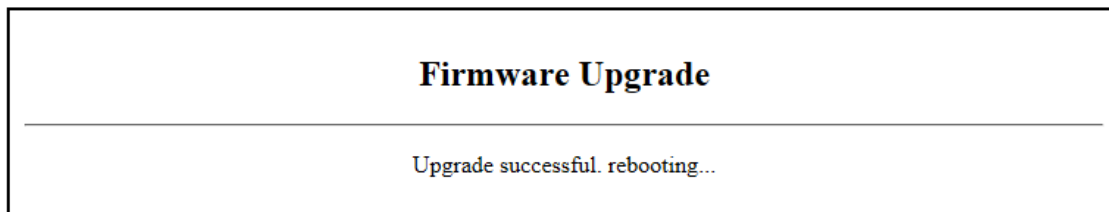# APPENDIX C RF Topics

This section discusses some topics to ensure the best RF coverage range.

C.1 RF Channel Selection

The 802.15.4 wireless standard uses 16 RF channels numbered 11 through 26. Each channel has a bandwidth of 2MHz and channels are separated by 5MHz. When the ZW-REC is powered on it automatically searches for the quietest channel to use for communications. You may also choose to manually select your RF Channel. (See **Section 5.4**)

Manually selecting an RF channel may be necessary if there are running multiple receivers in one area. While multiple Receivers can coexist on the same RF channel, selecting different channels is recommended. Using separate RF channels will reduce potential interference between systems. This is particularly true for large deployments.

Wi-Fi networks may also create interference with the ZW-REC. Wi-Fi networks operate on fixed frequencies with channels occupying 20MHz or 40MHz of bandwidth. While there are many Wi-Fi Channels there are only a few non-overlapping channels that are generally used. **Figure 29** shows the 802.15.4 channels mapped against the occupied bandwidth of the most commonly used Wi-Fi Channels in North America and Europe. If the Wi-Fi channels currently in use are known, select an 802.15.4 channel that does not overlap with it to reduce interference.
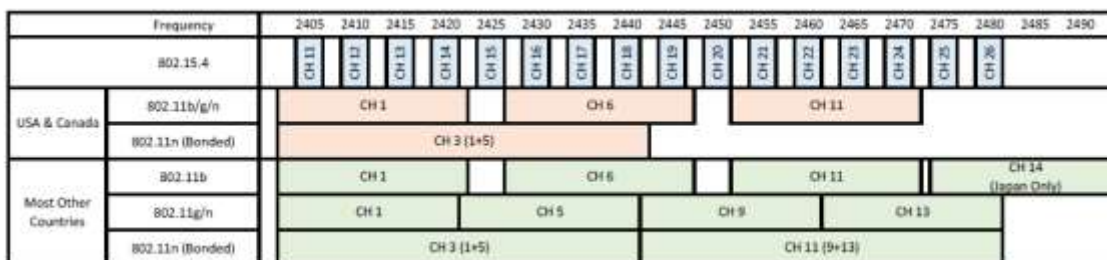
Figure 29.   2.4GHz Spectrum Map

C.2 Signal Strength Indicator

Signal Strength is displayed as a percentage, for each end device, in the End Device Status Page. This indicates how well each End Device can hear the ZW-REC. The ZW-REC and most end devices have a receive sensitivity of -96dBm or better. In most cases this means that a Signal Strength reading of 15% to 20% is reasonable for maintaining reliable communication.

The ZW-REC transmits at a power of +9.5dBm. Certain End Devices are lower power than the ZW-REC so the received signal strength is higher at the End Device than it is at the ZW-REC. For these End Devices the Signal Strength indicator needs to be higher for reliable communications. For these low power devices, a signal strength of at least 25% to 30% is recommended.

Figure 30 shows the rough mapping from Received Power to Signal Strength. Receive power is measured in dBm which is a logarithmic term. For every 10dBm increase in receive power the actual power is increased by 10 times. For Low Power End Devices, the received power at the ZW-REC may be 10dBm, or more, lower than indicated by the Signal Strength field. Take this into account when evaluating link quality for low powered devices.
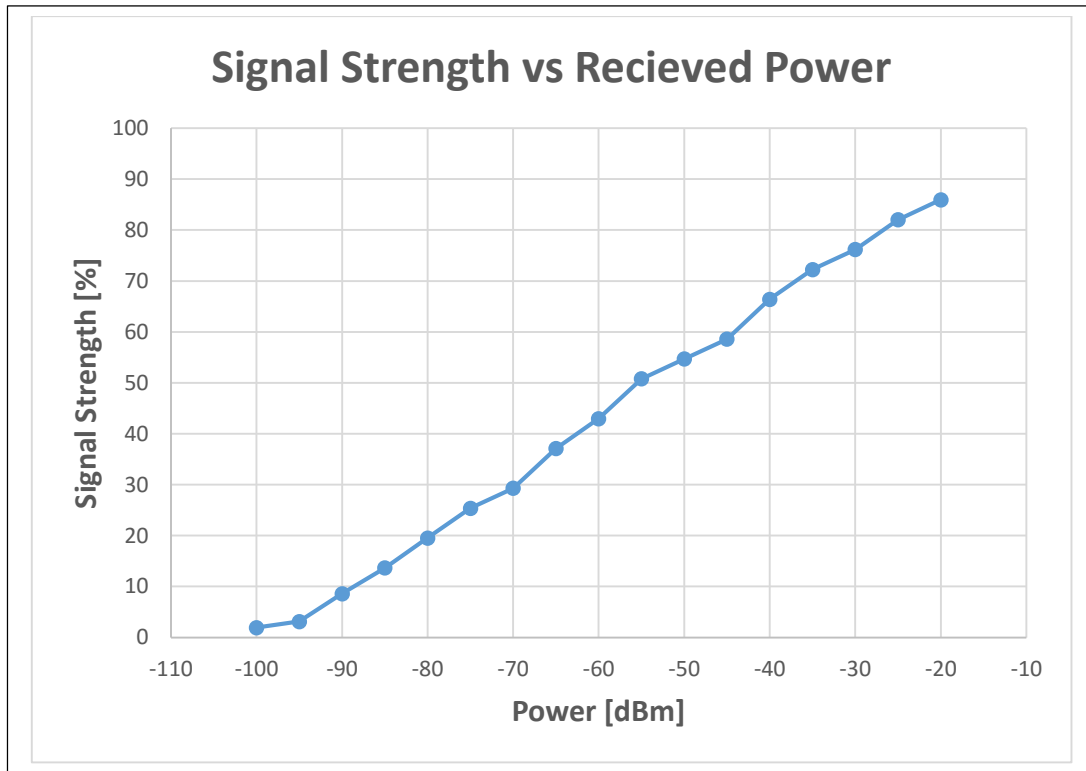
Figure 30.   Received Power Chart

C.3 Maximizing Range

Under favorable conditions the ZW-REC can achieve a line of sight wireless link distance of up to 1000m. Generally, most indoor applications will not be able to achieve these distances although steps can be taken to maximize range. Ensure the Receiver and End Device are located away from large obstacles and other RF sources such as Wireless Access points and microwave. Keep objects clear of the zone between the End Device and Receiver. Metal objects, walls, and cubical partitions in particular will all significantly reduce the signal strength.

The antenna provided with the ZW-REC is a dipole. Care must be taken in the positioning of the antenna to achieve the best possible range. The gain of the antenna is lower along the axis of the antenna. Do not point the ZW-REC Antenna in the direction of an End Device. When possible, The ZW-REC antenna should be parallel to the End Device antenna. If the End Device does not have an external antenna the longest dimension of the End Device itself should be parallel to the antenna of the ZW-REC.

Keep the antenna away from dense or metallic structures. Metallic structures should be kept away by at least 0.8" (2 cm), although 2.4" (6 cm) is recommended. Objects too close to the antenna may screen the ZW-REC from End Devices. Reflections off of nearby objects can also cause destructive interference reducing received signal strength.

For long distance connections the Receiver and the End Device should be elevated to keep the signal from being attenuated by the ground. Elevate each device by at least 0.6 meters above the ground for each 100 meters or separation. It is best to keep this same clearance distance to walls, ceilings and other obstructions as well.

APPENDIX D Wireless Certifications

D.1 Federal Communication Commission Interference Statement

Part 15C, Class DTS Intentional radiator

Contains TX FCC ID: TYOJN5168M5

⚠ **Caution:** In order to comply with FCC radio frequencies (RF) exposure limits, dipole antennas should be located at a minimum 7.9" (200mm) or more from the body of all persons.

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.

This equipment has been tested and found to comply with the limits of a Class B 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 residential environment. This equipment generates, uses, and radiates radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference. However, there is no guarantee that interference will not occur. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from which the receiver is connected.
- Consult dealer or an experienced radio/TV technician.

FCC Radiation Exposure Statement:

This portable equipment with its antenna complies with FCC's RF radiation exposure limits set forth for an uncontrolled environment. To maintain compliance, follow the instructions below;

1. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

2. Avoid direct contact to the antenna, or keep it to a minimum while using this equipment.

D.1 Industry Canada Statement

Contains Industry Canada ID IC: 7438A-CYO5168M5

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.	Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

This device has been designed to operate with antennas having a maximum gain of 2.2 dBi. Antennas having a gain greater than 2.2 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

D.2 CE Statement

The following alert sign indicates that there are restrictions on usage of the equipment in regards to power limitations on Equivalent Isotropic Radiated Power (EIRP) levels in the European Community.

The Following Are User Restrictions:

- Combinations of power levels and antennas resulting in a radiated power level above 10 mW - EIRP for Direct Sequence Spectrum (DSSS) devices are considered as not compliant, and are not allowed for use within the European Community and other countries that have adopted the European R&TTE directive 2014/53/EU or the CEPT recommendation ERC/REC 70-03 or both.
- This device has been designed to operate with antennas having a maximum gain of 2.2 dBi. Antennas having a gain greater than 2.2 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **25 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **two (2) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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