



ZWP-TBX

Z-Wave ToolBox

Learn more about Z-Wave* and ZWaveProducts by visiting us on the web: www.zwaveproducts.com

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About This User's Manual

This manual starts with the Quick Start Guide. The QSG gets your feet wet and tries not to over-explain the tasks. If you find the depth of knowledge inadequate, please follow the page numbers we've included to more detailed information further on.

The second part of this manual is the User's Manual. The UM is filled with instructions about what each button does and why, and gives a little more insight into Z-Wave. This guide does not attempt to explain Z-Wave in depth; only what a ToolBox user would need to know. If you are interested in more Z-Wave training, please contact us and we can advise you about options.

We thank you for your purchase of the Z-Wave ToolBox, and truly hope that the times you'll need it are kept to a minimum. All the best!

Look for the following icons in the margins to help guide you through information that is the most important for you.



Key Item! While we think EVERYTHING is important, this is a step or piece of information that you must know in order to use the ToolBox effectively.



Easy task that even a beginner should be able to perform. If you're new, start with these tasks!



Caution! Technical Information! We load you up with a lot of info. Don't get so caught up with it that you become overwhelmed.



We've found some who have trouble before. Think you found an error? Read this to find out how to fix it.



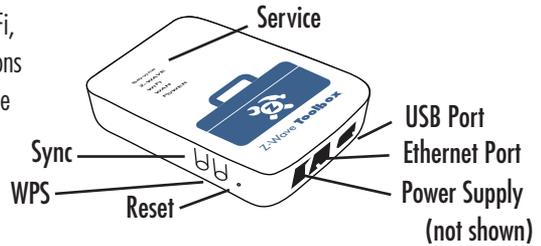
Caution! These steps or tasks might not blow up your computer, but it may cause damage to your ToolBox or a Z-Wave network.

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The Z-Wave ToolBox

- **Indicator Lights:** Shows Z-Wave, WiFi, WAN (not used), and Power connections
- **Service** (not used - may be used in the future to expand capabilities)
- **Sync** (not used - may be used in the future to expand capabilities)
- **WPS** (not used)
- **Reset** (DO NOT USE - contact us if you feel the ToolBox needs to be reset)
- **Power Supply - Plug in power adapter** (included)
- **Ethernet Port - CAT5 cable connection to network**
- **USB Port** (not used - may be used in the future to expand capabilities)



Other Devices

Here are devices that you will find on site, and definitions of what we call them in this Quick Start Guide:

Monitoring Device

This could be any device (smart phone, tablet, laptop, etc) that you use to connect to the ToolBox. The ToolBox is web-based so it will work with any internet browser. Your connection is via WiFi or a CAT5 Ethernet cable; more about that on the opposite page.



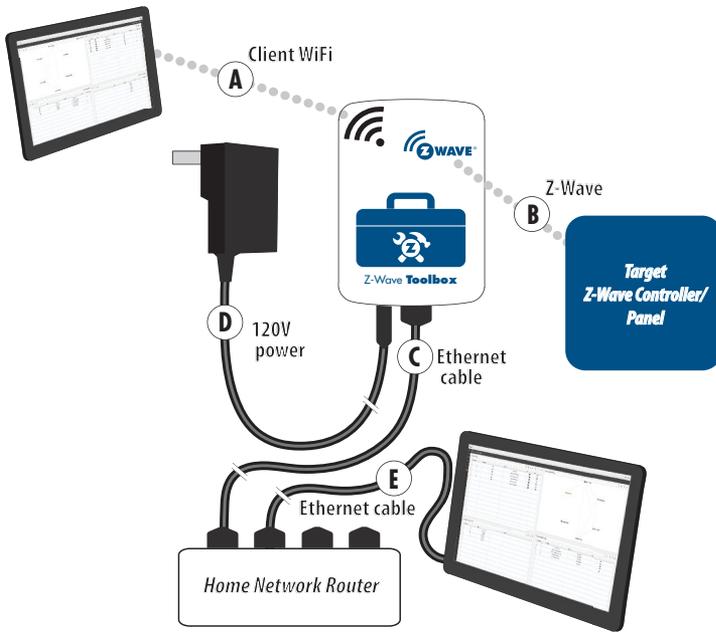
Target Z-Wave Controller/Panel

This is the Z-Wave Controller or Panel on site that you are troubleshooting. There may be multiple Z-Wave networks in the vicinity, but you will only be able to troubleshoot the ones you can access, and only one network at a time.



Home Network Router

This is any access point to the internet. It can be a router, a multi-port switch, or even a cellular modem. There are reasons for you to connect to the internet for troubleshooting, but this is mostly for updating firmware, which we recommend you do before going out on site.



- A. ToolBox to Monitoring Device (tablet, smart phone, computer) via Client WiFi**
The ToolBox has internal WiFi that is the standard connection during troubleshooting (pg 24)
This allows you to view the ToolBox interface on any web browser.
- B. ToolBox to Target Z-Wave Controller/Panel via Z-Wave connection**
Once the ToolBox is connected to your Monitoring device using methods A or C, you can pair the ToolBox with the Z-Wave Controller you are troubleshooting to run tests (pg 37, 47)
- C. ToolBox to Home Network Router via Ethernet (CAT5) Cable**
This connection is primarily for updating firmware, but there are some advanced troubleshooting techniques that can utilize a wired connection. Firmware updates require access to the internet.
- D. ToolBox to 120VAC Power**
The ToolBox must be powered.
- E. Monitoring Device to Home Network Router via Ethernet (CAT5) Cable**
This connection allows you to access your ToolBox interface when it is connected via method C, above.

There are 2 ways to connect the ToolBox to your Monitoring Device



1. Via ToolBox WiFi (Please see page 24 for more detailed instructions)

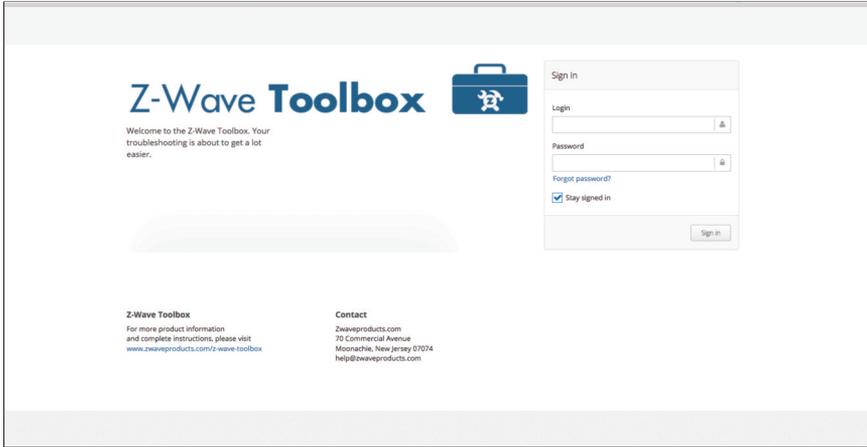
- a. **Power Up the ToolBox**
Plug in your ToolBox and wait up to 90 seconds for loading. See page 5 to see a diagram; Connection D.
- b. **Find the Z-Wave ToolBox SSID on your Monitoring Device's WiFi network list.**
- c. **Log onto WiFi on your Monitoring Device.** Default password is **password**
- d. **Open a browser window on your Monitoring Device and enter**

192.168.100.1

2. Via CAT5 Connection to a Home Network Router (Please see page 26 for more detailed instructions)

- a. **Connect the ToolBox to the Home Network Router using the CAT5 cable**
See page 5 for the diagram; Connection C
- b. **Power Up the ToolBox**
Plug in your ToolBox and wait up to 90 seconds for loading. See page 5 to see a diagram; Connection D.
- c. **Access a Computer on the same network you connected to in Step a.**
See page 5 for the diagram; Connection E
- d. **Find the ToolBox on your network**
Find the Z-Wave ToolBox IP address and enter it in your internet browser.

After connecting your Monitoring Device, you should see this screen on your browser:



1. Enter User Name
Default Login is **user**
2. Enter Password
Default Password is **password**

The complete instructions are on page 27

Workflow • Updating the ToolBox Firmware

Updating the Firmware should be done when the ToolBox is first purchased, and then periodically as features are added and bugs fixed.

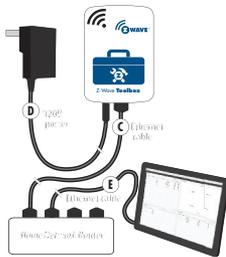
Difficulty Level: EASY

Time to Complete Task: 20 min.

Items Needed:

ToolBox
CAT5 Ethernet Cable
Computer on the Home Network
Access to Home Router (internet)

Connection Type:



Where to find more information:
“Updating the Firmware” pg 33

Steps:

1. Connect the ToolBox to the Home Network Router using the CAT5 cable.
2. Power Up the ToolBox. Plug in the ToolBox and wait up to 90 seconds for loading.
3. Access a Computer on the same network you connected to in Step 1
4. Find the ToolBox on your network
Find the Z-Wave ToolBox IP address and enter it in your internet browser.

The process for updating the firmware, as well as the interface graphics, may differ slightly depending on the initial version.

1. Open The Update Firmware panel.
To start, click the Blue ToolBox to access the Personalization Menu;



A slider will open with the Personalization Icons. Click the Update Firmware icon to open the Firmware Update page.



2. Click the Check for updates button.
The process will start, then give you additional instructions.



Did you Get a 404 Error?
Please see the Changing The Target URL for Firmware Updates on page 35

3. If there is an update available, click update to begin the downloading/ installation process.
4. Once complete, or if there are no current updates available, click Exit Firmware Update.
5. Refresh browser window. Version number will update (pg 32). **-ZWP**

Workflow • Evaluating a Site Before Installing

The *Site Survey Widget* is a quick, non-intrusive way to evaluate a location for a new gateway. Use *Site Survey* to show the number of networks on a site, how close those networks are to your proposed location, and estimated potential for congestion and latency. You do not have to pair the *ToolBox* with any *Target Z-Wave Controller*s; only the *Monitoring Device*. This test will show if the desired location for your *Target Z-Wave Controller* is good, or if it should be relocated. It is best used at apartment complexes or townhomes where there may be multiple Z-Wave networks in adjacent homes.

Difficulty Level: EASY

Time to Complete Task: 15 min.

Items Needed:

ToolBox
Smart phone/Tablet (*Monitoring Device*) to see the *ToolBox* interface
Extension Cord to be able to move around the work area comfortably

Where to find more information:

"Site Survey" - pg 51

Connection Type:



Steps:

1. Connect the Z-Wave *ToolBox* to the extension cord, then plug the extension cord to power.
2. From the *Monitoring Device*, navigate to access WiFi networks.
3. Find the SSID for the *ToolBox* and connect. Password = password. Having Trouble? See page 6.
4. Still on the *Monitoring Device*, open up a web browser and type 192.168.100.1 and enter.
5. Sign into the home page. Login = user
Password = password (see pg 7 for more)
6. Using the navigation on the left, select Z-Wave Analyzers / Site Survey.



7. Click the Start button to start the test. You can move the *ToolBox* around as needed.



RSSI = Received signal strength indication; a scale of how strong Z-Wave communication is.

8. This test is FROM the *ToolBox*, so placement and location of the *ToolBox* is key.

9. The test is interpreted by viewing the RSSI values of nearby networks. With the *ToolBox* at the proposed *Target Z-Wave Controller or Panel* location, view the data. The lower the RSSI number of each device, the better the proposed gateway will hear. Under 40 is ideal. 40 to 50 shows some traffic that may cause latency and missed transmissions, and at over 50, the new gateway location should be changed. Reposition the *ToolBox* for a new test.

10. At this time, there is no way to save the *Site Survey* data. We recommend screen captures and specific names of the capture files for documentation and later evaluation.
IE: BldA_Apt35_Stat.png. -ZWP

ID	Date	Network	Device	Status	RSSI
1	2018-01-23 10:00:00	Network 1	Device 1	OK	40 dBm
2	2018-01-23 10:00:00	Network 1	Device 2	OK	40 dBm
3	2018-01-23 10:00:00	Network 1	Device 3	OK	40 dBm
4	2018-01-23 10:00:00	Network 1	Device 4	OK	40 dBm
5	2018-01-23 10:00:00	Network 1	Device 5	OK	40 dBm
6	2018-01-23 10:00:00	Network 2	Device 1	OK	40 dBm
7	2018-01-23 10:00:00	Network 2	Device 2	OK	40 dBm
8	2018-01-23 10:00:00	Network 2	Device 3	OK	40 dBm
9	2018-01-23 10:00:00	Network 2	Device 4	OK	40 dBm
10	2018-01-23 10:00:00	Network 2	Device 5	OK	40 dBm
11	2018-01-23 10:00:00	Network 3	Device 1	OK	40 dBm
12	2018-01-23 10:00:00	Network 3	Device 2	OK	40 dBm
13	2018-01-23 10:00:00	Network 3	Device 3	OK	40 dBm

Workflow • Finding the Best Repeater Location

Use the *Repeater Finder Widget*. Finding THE place for a repeater saves time and devices; eliminating the “shotgun” approach. In this hypothetical test, we will address a Z-Wave door lock that won’t reliably communicate with the *Target Z-Wave Controller*, assuming due to a range issue.

Difficulty Level: EASY

Time to Complete Task: 20-30 min.

Items Needed:

ToolBox
Computer/App to access *Target Z-Wave Controller’s* interface
Smart phone/Tablet (*Monitoring Device*) to see the ToolBox interface
Extension Cord to be able to move around the work area comfortably

Connection Type:



Where to find more information:
Page 44 in this manual

Before the ToolBox . . .

Before we get started, are you sure you have a range issue? Have you considered weak batteries in the target Z-Wave device? Operator error (user unplugging a module to use an outlet?) Some things can be ruled out before the ToolBox is taken out of its box. Or you can check interference with a faster test (pg 53)

If you’ve done your homework and are still ready to install a repeater, let’s continue!

Steps:

1. Connect the Z-Wave Toolbox to the extension cord, then plug the extension cord to power.
2. While waiting for the ToolBox to power up, log into your *Computer* and access the interface for the *Target Z-Wave Controller’s* area where you would add a Z-Wave device to the network.
3. From the *Monitoring Device*, navigate to access WiFi networks.
4. Find the SSID for the ToolBox and connect. Password = password. Having Trouble? See page 6.
5. Still on the *Monitoring Device*, open up a web browser and type 192.168.100.1 and enter.
6. Sign into the home page.
Login = user
Password = password
(see pg 7 for more)
7. Using the navigation on the left, select Network Health / Utils.

8. On your *Target Z-Wave Controller’s* interface, start to include a generic Z-Wave device (a bulb or switch would work too).

9. On the Network Health Tool page, toward the upper right, select CONNECT TO NETWORK.

10. Wait for the devices to connect. If the status is blue and you still don’t see a list of devices, try clicking REFRESH NETWORK.



11. On the Repeater Finder Widget, find the pull-downs. Leave Dev 1 (*Z-Wave Controller*) alone, but pull down the other to read the problematic Z-Wave device Node ID (7 in the above example).



The Z-Wave Node ID is a unique identifier of each Z-Wave device on your network. See your hub’s instructions on how to find this info.

12. Click the Start button.

13. With the ToolBox in one hand and the *Monitoring Device* in the other, move around the room to available repeater locations. Available wall switches are your best candidates.

. . . Maybe here?



... Or maybe here?



14. Watch the two pointers, which will move in real time based on the ranges. The Dev 1 dial is measuring the range from the *Z-Wave Controller* to the ToolBox. Dev 7 is measuring the range from the problematic *Z-Wave* device to the ToolBox. Since our test is for a door lock, we have to wake up the battery operated device every once in a while.

15. Once you've settled on a location, install the repeater. For in-wall *Z-Wave* devices, consider swapping out an old metal box with a new plastic one for better reception.

16. Operate the new repeater from the *Target Z-Wave Controller*. After a successful test, do a Network Rediscovery to find neighbors and heal the mesh.



Network Rediscovery (aka 'a heal') is the process from your *Z-Wave Controller* that asks each device to find its neighbors. Some of this is done when a new device is added, but a heal is a good idea after the network is installed.

17. After you have completed this test, be sure to remove the ToolBox from the network. On the *Target Z-Wave Controller's* interface, start the process to EXCLUDE a generic *Z-Wave* Device (or the process to delete the ToolBox if it showed up on your GUI). On the ToolBox select CONNECT TO NETWORK and the ToolBox will be removed. **-ZWP**

Workflow • EXERCISE - Using the Control Panel

This workflow is not a test, per se, but its a great skill to be used with just about any other widget on the Network Health Tester. In this exercise, we will join the ToolBox with the Monitoring Device, a Target Z-Wave Controller, and then control and rename a few Z-Wave devices on the ToolBox

Difficulty Level: EASY

Time to Complete Task: 15 min.

Items Needed:

ToolBox
Computer/App to access *Target Z-Wave Controller's* interface
Smart phone/Tablet (*Monitoring Device*) to see the ToolBox interface

Connection Type:



Where to find more information:

Page 39 in this manual

Steps:

1. Connect the Z-Wave Toolbox to power.

2. While waiting for the Toolbox to power up, log into your *Computer* and access the interface for the *Target Z-Wave Controller's* area where you would add a Z-Wave device to the network.

3. From the *Monitoring Device*, navigate to access WiFi networks.

4. Find the SSID for the Toolbox and connect. Password = password. Having Trouble? See page 6.

5. Still on the *Monitoring Device*, open up a web browser and type 192.168.100.1 and enter.

6. Sign into the home page. Login = user
Password = password
(see pg 7 for more)

7. Using the navigation on the left, select Network Health / Testers.

8. On your *Target Z-Wave Controller's* interface, start to include a generic Z-Wave device (a bulb or switch would work too).

9. On the Network Health Tester page, toward the upper right, select CONNECT TO NETWORK.

10. Wait for the devices to connect. If the status is blue and you still don't see a list of devices, try clicking REFRESH NETWORK.

11. In the Control Panel, you will get a list of items on the *Target Z-Wave Controller's* network. The Dev 1, Dev 2, etc is the Z-Wave Node ID



The Z-Wave Node ID is a unique identifier of each Z-Wave device on your network. See your hub's instructions on how to find this info.

12. You can use the ON/OFF dialog buttons to cycle any powered Z-Wave device to determine what it is.

13. Once you determine a node's function, you can temporarily name it on the Control Panel. For example, you found Dev 4 is the Living Room switch. Select Dev 4 and double-click directly on the name, it will highlight and you can enter up to a 30-character name; IE: Living Room Switch.

This will NOT alter or change anything on the Target Z-Wave Controller. The Toolbox does not have this permission.

14. Battery operated devices will not be woke by the Toolbox ON/OFF dialog. You will need to determine the Z-Wave Node ID from the Target Z-Wave Controller. Also, you will need to wake these up locally, following the manufacturer's instructions.

For security reasons, you cannot control Door Locks from the Toolbox's ON/OFF dialogs on the Control Panel.

15. After you have completed this exercise, be sure to remove the Toolbox from the network. On the *Target Z-Wave Controller's* interface, start the process to EXCLUDE a generic Z-Wave Device (or the process to delete the Toolbox if it showed up on your GUI). On the Toolbox select CONNECT TO NETWORK and the Toolbox will be removed. **-ZWP**

Workflow • Checking for Noise/Interference

The Spectrum Analyzer is a non-intrusive way to see the levels of noise in the 900 MHz range. You do not have to pair the ToolBox with your Target Z-Wave Controller, just your Monitoring Device.

Difficulty Level: EASY

Time to Complete Task: 15 min.

Items Needed:

ToolBox
Smart phone/Tablet (*Monitoring Device*) to see the ToolBox interface
Extension Cord to be able to move around the work area comfortably
Access to rooms/apartments/basements/crawl spaces

Connection Type:



Where to find more information:

Page 53 in this manual

Steps:

1. Connect the Z-Wave Toolbox to the extension cord, then plug the extension cord to power.

2. From the *Monitoring Device*, navigate to access WiFi networks.

3. Find the SSID for the Toolbox and connect. Password = password. Having Trouble? See page 6.

4. Still on the *Monitoring Device*, open up a web browser and type 192.168.100.1 and enter.

5. Sign into the home page.
Login = user
Password = password
(see pg 7 for more)

6. Using the navigation on the left, select Spectrum Analyzer.

7. Click the Start button to start the test. You can move the ToolBox around as needed.

8. As you walk around, check the RSSI levels, which will reply in real time.

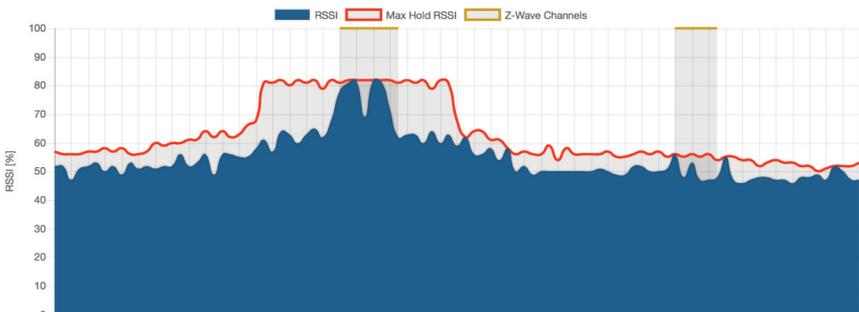


RSSI = Received signal strength indication; a scale of how strong Z-Wave communication is.

9. The ToolBox has an Omnidirectional antenna, which is not ideal for pinpointing noise direction, but it will respond quickly as you move towards/away from the source of the interference.

10. You are looking for something like a plateau (see sample below) which would block the signal in either of the two grey shaded areas (The Z-Wave channel for classic and Plus).

11. The red line will keep the Max Hold, or 'high water mark' of the signal strength, in case you miss it or want to put it down and go to lunch or leave it overnight. **-ZWP**



Workflow • Viewing the Z-Wave Routing Table

This workflow can be a test or just an exercise to be combined with other tools on the Network Health Tester. In this example, we will join the ToolBox with the Monitoring Device, a Target Z-Wave Controller, and then explain the Static Network Map and why it's important.

Difficulty Level: MEDIUM

Time to Complete Task: 30 min.

Items Needed:

ToolBox
Computer/App to access *Target Z-Wave Controller's* interface
Smart phone/Tablet (*Monitoring Device*) to see the ToolBox interface

Connection Type:



Where to find more information:

Page 37, 42 in this manual

Steps:

1. Connect the Z-Wave ToolBox to power.
2. While waiting for the ToolBox to power up, log into your *Computer* and access the interface for the *Target Z-Wave Controller's* area where you would add a Z-Wave device to the network.

3. From the *Monitoring Device*, navigate to access WiFi networks.

4. Find the SSID for the ToolBox and connect. Password = password.
Having Trouble? See page 6.

5. Still on the *Monitoring Device*, open up a web browser and type 192.168.100.1 and enter.

6. Sign into the home page.
Login = user
Password = password
(see pg 7 for more)

7. Using the navigation on the left, select Network Health / Maps.

8. On your *Target Z-Wave Controller's* interface, start to include a generic Z-Wave device (a bulb or switch would work too).

9. On the Network Health Tester page, toward the upper right, select CONNECT TO NETWORK.

10. Wait for the devices to connect. If the status is blue and you still don't see a list of devices, try clicking REFRESH NETWORK.

11. In the Static Network Map, you should get a circle made of small circles; in shades of green, yellow and red.

12. The small circle indicates a Z-Wave Node. The color represents the health, the Dev X is the Z-Wave Node ID, and the (X N) is the number of neighbors, or devices a node 'sees.'

13. You can use the arrows to expand this window, and direct select each Node ID to move it around to see it's relationship with other nodes.

This is not a live representation of your Z-Wave network. The Static Network Map is what the Z-Wave chip "thinks" the network is, based on its last Network Rediscovery.



Network Rediscovery (aka 'a heal') is the process from your Z-Wave Controller that asks each device to find its neighbors. Some of this is done when a new device is added, but a heal is a good idea after the network is installed.

15. Unplug or unpower a Z-Wave device that is otherwise healthy on this Static Map. You will see no change until you do a rediscovery.

This tool is a great way to identify issues with the Target Z-Wave Controller; especially marginal connections. Use this in conjunction with live tests (like the Simple Connection Tester) to isolate and pinpoint neighbor issues.

16. After you have completed this exercise, be sure to remove the ToolBox from the network. On the *Target Z-Wave Controller's* interface, start the process to EXCLUDE a generic Z-Wave Device (or the process to delete the ToolBox if it showed up on your GUI). On the ToolBox select CONNECT TO NETWORK and the ToolBox will be removed. **-ZWP**

This workflow can be a stand-alone test or combined with other tools on the Network Health Tester. In this example, we will join the ToolBox with the Monitoring Device, a Target Z-Wave Controller, and then ping some devices and explain the possible results.

Difficulty Level: EASY

Time to Complete Task: 20 min.

Items Needed:

ToolBox

Computer/App to access *Target Z-Wave Controller's* interface

Smart phone/Tablet (*Monitoring Device*) to see the ToolBox interface

Connection Type:



Where to find more information:

Page 37, 41 in this manual

Steps:

1. Connect the Z-Wave ToolBox to power.

2. While waiting for the ToolBox to power up, log into your *Computer* and access the interface for the *Target Z-Wave Controller's* area where you would add a Z-Wave device to the network.

3. From the *Monitoring Device*, navigate to access WiFi networks.

4. Find the SSID for the ToolBox and connect. Password = password.
Having Trouble? See page 6.

5. Still on the *Monitoring Device*, open up a web browser and type 192.168.100.1 and enter.

6. Sign into the home page.
Login = user
Password = password
(see pg 7 for more)

7. Using the navigation on the left, select Network Health / Testers.

8. On your *Target Z-Wave Controller's* interface, start to include a generic Z-Wave device (a bulb or switch would work too).

9. On the Network Health Tester page, toward the upper right, select CONNECT TO NETWORK.

10. Wait for the devices to connect. If the status is blue and you still don't see a list of devices, try clicking REFRESH NETWORK.

11. Keep the ToolBox very close to the *Target Z-Wave Controller*. On the Simple Connection Tester, click Test All.

12. As the test starts, you will see the ToolBox test each node. This is a simple pass/fail test, with a few things you should know.

• This is a live test from the ToolBox and has nothing to do with the *Target Z-Wave Controller's* Routing Table. Keep the ToolBox close to the *Target Z-Wave Controller* for best results.

• Battery operated devices need to be woken manually/locally if included in this test. The ToolBox will not see Bat-Op sensors, locks, etc. with this test.

13. The Simple Test will also show you the route the ToolBox used to reach the target Z-Wave device for each line.

Example: (99) - 3 - (7)

99 is the ToolBox. 3 is the repeater. 7 is the Z-Wave device being tested.

14. After you have completed this test, be sure to remove the ToolBox from the network. On the *Target Z-Wave Controller's* interface, start the process to EXCLUDE a generic Z-Wave Device (or the process to delete the ToolBox if it showed up on your GUI). On the ToolBox select CONNECT TO NETWORK and the ToolBox will be removed. -ZWP

Workflow • Is a Z-Wave Device still in the Network?

A frustrating part of Z-Wave networks is a flaky node.

Sometimes it works. Sometimes it doesn't. This test is meant to give insight on what is happening, but probably isn't the quickest way of fixing an issue.

This test requires a bit of back-ground. Nod and grit your teeth if you recognize any of this.

This is a run-down of the down & dirty fixes and how this test fits in.

1. Complaint: Z-Wave device that worked has now stopped, or is working intermittently.

2. Installer removes bad device from the Z-Wave network, then includes it back in.

3. 1 & 2 repeat, then Installer adds a repeater (or more) to try and fix the problem.

Responses to above:

Item 2; if the device is removed from the network, there is no way to know if the bad Z-Wave node left the network, or if this is a range issue. This test can answer this question. WHY it does either is the hard part.

Item 3; The need for a repeater can be explored by using the Repeater Finder (QSG pg 10)

Difficulty Level: MEDIUM/HARD

Time to Complete Task: 45 min.

Items Needed:

ToolBox
Computer/App to access Target Z-Wave Controller's interface
Smart phone/Tablet (*Monitoring Device*) to see the ToolBox interface

Connection Type:



Where to find more information:

Page 38, 48, 49 in this manual

Steps:

1. Connect the Z-Wave Toolbox to power.
2. While waiting for the ToolBox to power up, log into your *Computer* and access the interface for the *Target Z-Wave Controller's* area where you would add a Z-Wave device to the network.

3. From the *Monitoring Device*, navigate to access WiFi networks.

4. Find the SSID for the ToolBox and connect. Password = password. Having Trouble? See page 6.

5. Still on the *Monitoring Device*, open up a web browser and type 192.168.100.1 and enter.

6. Sign into the home page.
Login = user
Password = password
(see pg 7 for more)

7. Using the navigation on the left, select Network Health / Testers.

8. On your *Target Z-Wave Controller's* interface, start to include a generic Z-Wave device (a bulb or switch would work too).**

9. On the Network Health Tester page, toward the upper right, select CONNECT TO NETWORK.

10. Wait for the devices to connect. If the status is blue and you still don't see a list of devices, try clicking REFRESH NETWORK.

11. Using the navigation on the left, switch to Packet Analyzer.

12. Click Start.

13. Manually operate the bad Z-Wave device until you are sure you can see it show up on the Packet Analyzer. IE: 35 talking to 1 Turn On. 35 talking to 1 Turn Off. Do you see a Node ID (like the 35?) Then the device is still in the network and you can pursue range issues.

Do you see 000? Then the device has left the network.

15. After you have completed this exercise, be sure to remove the ToolBox from the network. On the *Target Z-Wave Controller's* interface, start the process to EXCLUDE a generic Z-Wave Device (or the process to delete the ToolBox if it showed up on your GUI). On the ToolBox select CONNECT TO NETWORK and the ToolBox will be removed. **-ZWP**

** There is a join button on the Packet Analyzer, but using the Network Health Inclusion will give you more flexibility for future testing.

Workflow • Testing Communication Link Strength

This workflow can be a stand-alone test or combined with other tools on the Network Health Tester. In this example, we will join the ToolBox with the Monitoring Device, a Target Z-Wave Controller, and then ping some devices with the Network Health Tester and explain the possible results.

Difficulty Level: MEDIUM

Time to Complete Task

60 min. depending on network size

Items Needed:

ToolBox

Computer/App to access *Target Z-Wave Controller's* interface

Smart phone/Tablet (*Monitoring Device*) to see the ToolBox interface

Connection Type:



Where to find more information:

Page 37, 40 in this manual

Steps:

1. Connect the Z-Wave Toolbox to power.

2. While waiting for the Toolbox to power up, log into your *Computer* and access the interface for the *Target Z-Wave Controller's* area where you would add a Z-Wave device to the network.

3. From the *Monitoring Device*, navigate to access WiFi networks.

4. Find the SSID for the Toolbox and connect. Password = password. Having Trouble? See page 6.

5. Still on the *Monitoring Device*, open up a web browser and type 192.168.100.1 and enter.

6. Sign into the home page.
Login = user
Password = password
(see pg 7 for more)

7. Using the navigation on the left, select Network Health / Testers.

8. On your *Target Z-Wave Controller's* interface, start to include a generic Z-Wave device (a bulb or switch would work too).

9. On the Network Health Tester page, toward the upper right, select CONNECT TO NETWORK.

10. Wait for the devices to connect. If the status is blue and you still don't see a list of devices, try clicking REFRESH NETWORK.

11. Keep the Toolbox very close to the *Target Z-Wave Controller*. On the Network Health Tester, click Test All.

12. As the test starts, you will see the Toolbox test each node. This is a complex test with a few things you should know.

- This is a live test from the Toolbox and has nothing to do with the *Target Z-Wave Controller's* Routing Table.

Keep the Toolbox close to the *Target Z-Wave Controller* for best results.

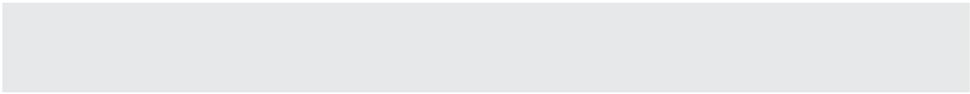
- Battery operated devices need to be woken manually/locally if included in this test. The Toolbox will not wake up Bat-Op sensors, locks, etc.

13. The Network Health Tester will grade the connection on 60 successful pings of each device, but also how many routes were used to accomplish this task. Varying routes could be a sign of a weak mesh network. The NHS symbol takes this into account. Network Health Symbol color legend: Good (dk. green), OK (lt. green), Caution (orange), Fail (red)



Routes and the Mesh Network. Z-Wave depends on neighbor nodes to communicate past the designed distance of a particular device. All mains-powered devices act as repeaters, and this communication is called a mesh (like a net or grid). The routes are stored in the Z-Wave chip during the inclusion of a device to a network. A strong primary route will yield the best communication. Two routes of equal strength may allow the Target Z-Wave Controller to flip between the two with unexpected results.

14. After you have completed this test, be sure to remove the Toolbox from the network. On the *Target Z-Wave Controller's* interface, start the process to EXCLUDE a generic Z-Wave Device (or the process to delete the Toolbox if it showed up on your GUI). On the Toolbox select CONNECT TO NETWORK and the Toolbox will be removed. -ZWP





ZWP-TBX

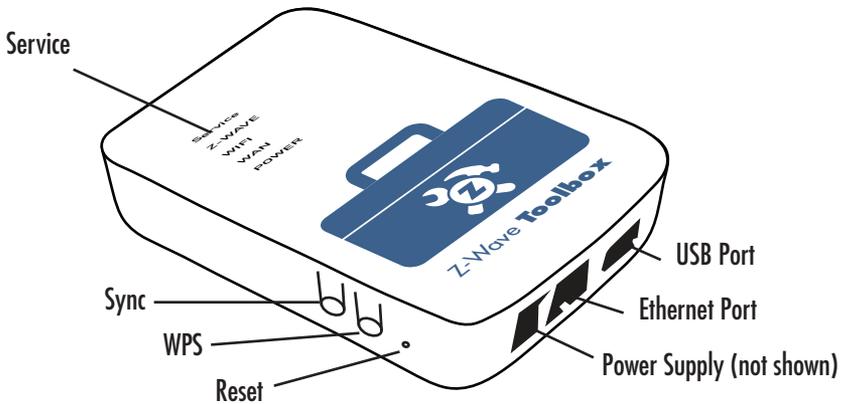
Z-Wave ToolBox

User's Manual

Learn more about Z-Wave* and ZWaveProducts by visiting us on the web: www.zwaveproducts.com

*Z-Wave and Z-Wave Plus are registered trademarks of Sigma Designs and its subsidiaries in the United States and other countries.

Z-Wave ToolBox Parts Identifier



- **Indicator Lights:**
Shows Z-Wave, WiFi, WAN (not used), and Power connections
- **Service** (not used - may be used in the future to expand capabilities)
- **Sync** (not used - may be used in the future to expand capabilities)
- **WPS** (not used)
- **Reset** (DO NOT USE - contact us if you feel the ToolBox needs to be reset)
- **Power Supply** - Plug in power adapter (included)
- **Ethernet Port** - CAT5 cable connection to network
- **USB Port** (not used - may be used in the future to expand capabilities)

Here are devices that you will find on site, and definitions of what we call them in this User Manual:



Monitoring Device

This could be any device (smart phone, tablet, laptop, etc) that you use to connect to the ToolBox. The ToolBox is web-based so it will work with any internet browser. Your connection can be via WiFi or a CAT5 Ethernet cable; we'll talk more about that on the next page.



Target Z-Wave Controller/Panel

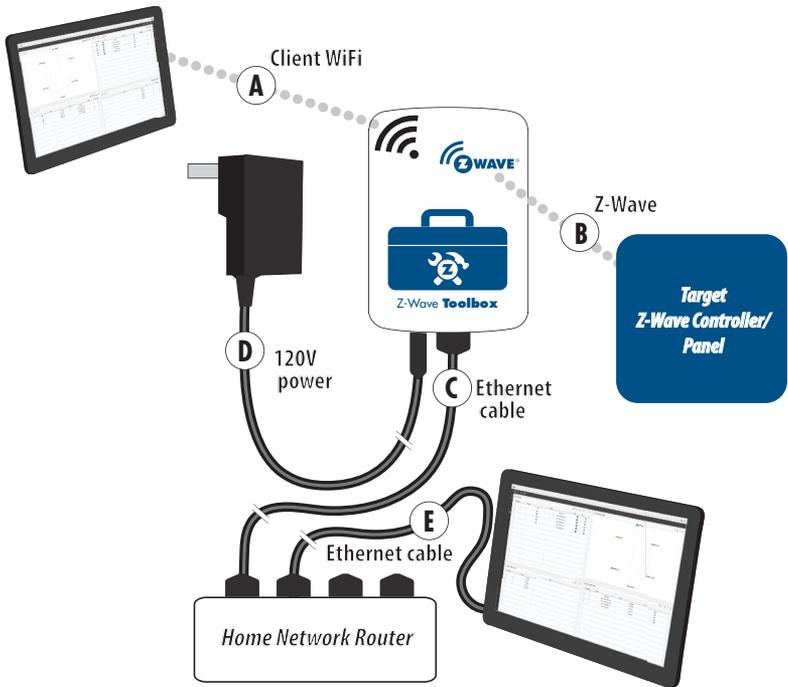
This is the Z-Wave Controller or Panel on site that you are troubleshooting. There may be multiple Z-Wave networks in the vicinity, but you will only be able to troubleshoot the ones you can access, and only one network at a time.



Home Network Router

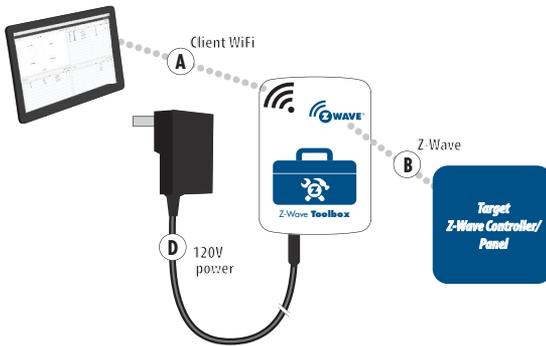
This is any access point to the internet. It can be a router, a multi-port switch, or even a cellular modem. There are reasons for you to connect to the internet for troubleshooting, but this is mostly for updating firmware, which we recommend you do before going out on site.

Z-Wave ToolBox Connection Types

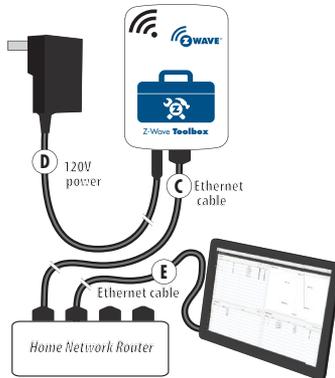


- A. ToolBox to Monitoring Device (tablet, smart phone, computer) via Client WiFi**
The ToolBox has internal WiFi that is the standard connection during troubleshooting. This allows you to view the ToolBox interface on any web browser.
- B. ToolBox to Target Z-Wave Controller/Panel via Z-Wave connection**
Once the ToolBox is connected to your Monitoring device using methods A or C, you can pair the ToolBox with the Z-Wave Controller you are troubleshooting to run tests.
- C. ToolBox to Home Network Router via Ethernet (CAT5) Cable**
This connection is primarily for updating firmware, but there are some advanced troubleshooting techniques that can utilize a wired connection. Firmware updates require access to the internet.
- D. ToolBox to 120VAC Power**
The ToolBox must be powered.
- E. Monitoring Device to Home Network Router via Ethernet (CAT5) Cable**
This connection allows you to access your ToolBox interface when it is connected via method C, above.

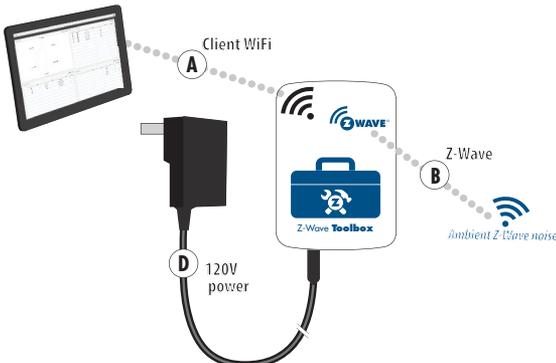
Z-Wave ToolBox Connection Types



Connections with the **Network Health Tool** (pg 37) and **Packet Analyzer** (pg 47)



Connections for **Updating ToolBox Firmware** (pg 33)



Connections with the **Site Survey** (pg 51) and **Spectrum Analyzer** (pg 53)

Connecting the ToolBox to the Monitoring Device via WiFi

We set up the ToolBox to use it's own WiFi network to connect to your device

1. Power Up the ToolBox

Plug in your ToolBox using the power adapter (or battery pack). Wait up to 90 seconds for loading. See page 22 for the diagram; Connection D.

2. Find the Z-Wave ToolBox SSID on your smart device's WiFi network list.



Sample smart phone WiFi panel showing ToolBox SSID

3. Log onto the WiFi client on your smart device. Default password is **password**



4. Open a browser window in your tablet, computer, or smart phone and enter

192.168.100.1

If you are having difficulty finding or connecting to the ToolBox via WiFi:

- **Your WiFi SSID is Z-WaveToolBoxXXXX**
(the XXXX is the last 5 or 6 digits of your TB Serial Number)
- **Once connected to the ToolBox via WiFi, you will not have internet access.**
Your monitoring device could be a tablet, computer, or smart phone. Ideally it should be separate from the device you use to operate your Target Z-Wave Controller's interface, since you will not have access to the internet while troubleshooting
- **If you cannot find the WiFi SSID, be sure your device shows all networks.**
Try another device
- **In a congested WiFi location, the signal may have interference. Try a wired connection or another spot**

When you're all done with troubleshooting for the day:

- **Be sure to disconnect from the ToolBox WiFi when complete**
You will be wondering why your emails are not coming through and webpages cannot load

Connecting the ToolBox to the Home Network Router

The primary reasons to connect the ToolBox to a Home Network Router are to perform firmware updates or receive remote ToolBox troubleshooting from our support team

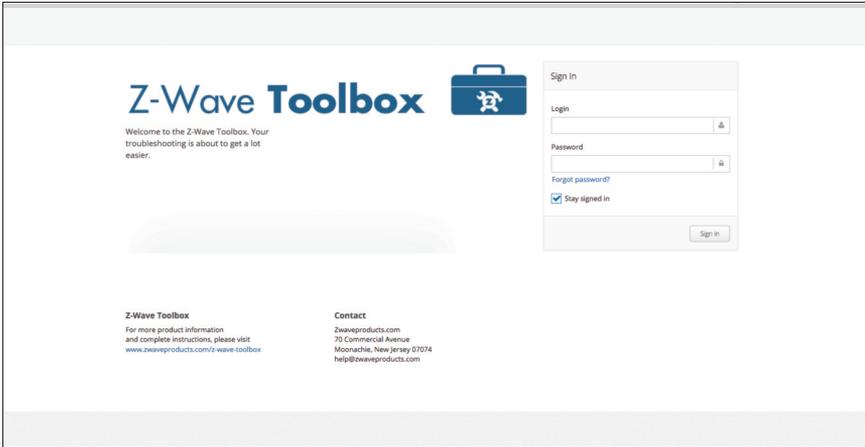
1. **Connect the ToolBox to the Home Network Router using the CAT5 cable**
See page 22 for the diagram; Connection C
2. **Power Up the ToolBox**
Plug in your ToolBox using the power adapter (or battery pack). Wait up to 90 seconds for loading. See page 22 for the diagram; Connection D
3. **Access a Computer on the same network you connected to in Step 1**
See page 22 for the diagram; Connection E
4. **Find the ToolBox on your network**
Find the Z-Wave ToolBox IP address and enter it in your internet browser and press return

MAC User shortcut: Enter `z-wavetoolboxXXXX.local` into your internet browser (the XXXX is the last 5 or 6 digits of the ToolBox serial number), and press return

PC Users: Find the ToolBox IP address by looking at your client list (connected devices) in your router's interface. Use the MAC address to confirm the device. Type the IP address in your internet browser and press return. Alternately use third-party software to locate the IP of the ToolBox on the network

- **Does your Router use 192.168.100.XX? Then you may not be able to connected via a CAT5 cable due to subnet mask conflicts. (Our WiFi uses 192.168.100.1). Contact us.**

After connecting your Monitoring Device, you should see this screen on your browser:



Z-Wave Toolbox

Welcome to the Z-Wave Toolbox. Your troubleshooting is about to get a lot easier.

Sign In

Login

Password

[Forgot password?](#)

Stay signed in

Z-Wave Toolbox
For more product information and complete instructions, please visit www.zwaveproducts.com/z-wave-toolbox

Contact
Zwaveproducts.com
75 Commercial Avenue
Moonachie, New Jersey 07074
help@zwaveproducts.com

1. Enter User Name
Default Login is **user**

2. Enter Password
Default Password is **password**

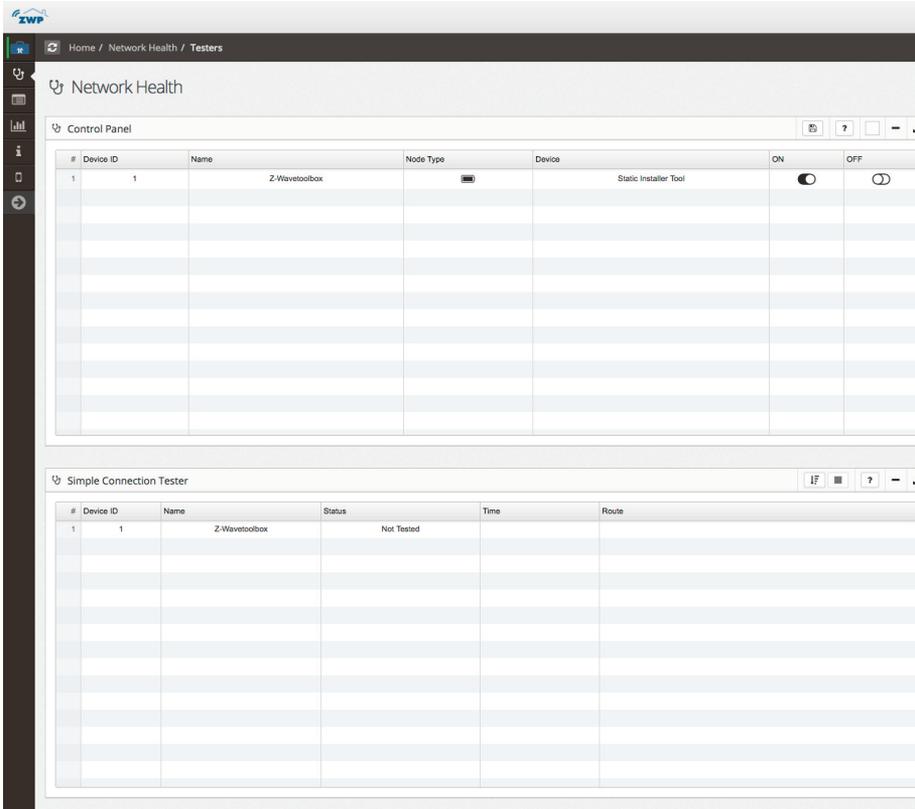


Please keep these notes in mind regarding Sign In:

- Every ToolBox starts with the same Login and Password. It can be changed (see page 30)
- ZWP does not have access to changed passwords, so please change it carefully
- For privacy, the Z-Wave Toolbox runs only on its own local web server. There is no cloud server at this time



Navigating the ToolBox Interface



From The Sign In page

The ToolBox interface initially loads to the Network Health Pane/Testers.

Navigating the ToolBox Interface

The interface consists of a navigation bar on the left, and various information windows on the right. Each icon on the navigation bar represents a specific panel on the ToolBox.

- On larger devices, you can hide/show the left navigation using the arrow 
- On smaller devices, use the "triple horizontal line" icon in the upper right to navigate
- Many boxes have expand/contract "arrows". Use this to make the ToolBox user-friendly 

The Personalization Menu

Access The Personalization Menu

The Personalization Menu is accessed by clicking the blue ToolBox Icon with the green stripe, in the upper left corner of the Navigation Screen.



After clicking the **Blue Toolbox** a slider will open with the Personalization Icons:



The selections here allow some personalization and customization of the tool.

User Profile

Selecting the User Profile Icon brings up the User Settings dialog box.

Please update your contact information here, which is stored locally on the Toolbox.

We use this information if you ever have us log into your tool, or if you send us Packet Analyzer traces.



ZWP does not have access to changed passwords, so please change it carefully

User Settings

Serial number: 000020

Login: User

Password: *****

Name:

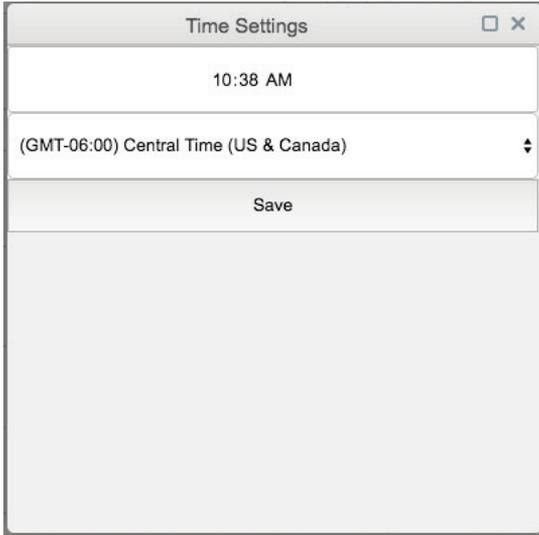
Last Name:

Email:

Phone Number:

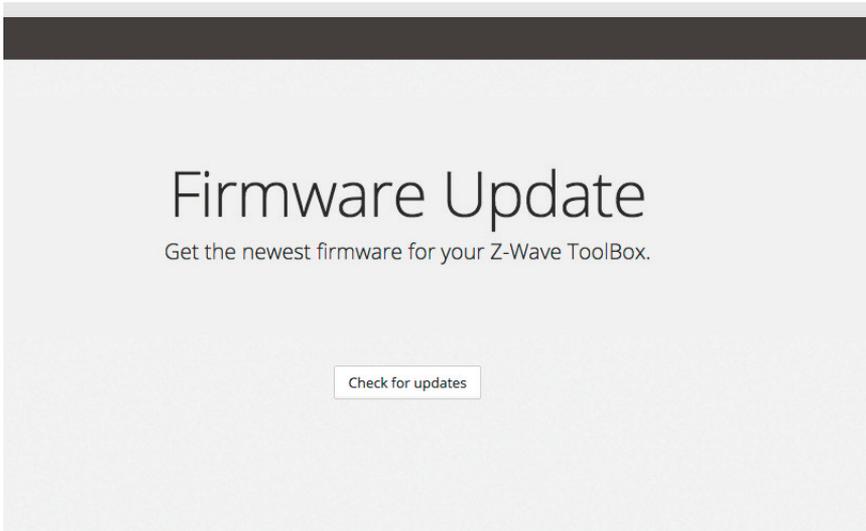
Time Options

Clicking Time Options brings up the Time Settings dialog box, which allows the user to set his/her time zone.



Update Firmware

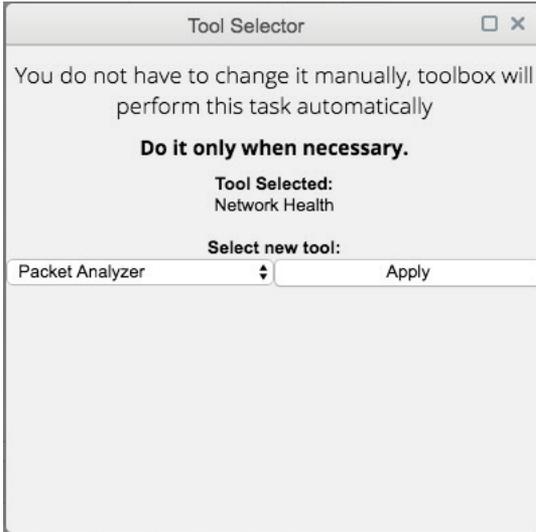
Clicking the Update firmware Icon brings up the Firmware Update page. Details on page 33.



The Personalization Menu

Tool Selector

Under normal operation, the tool selection changes will be performed automatically. Click Tool Selector only if instructed by the ZWP help desk.



Finding your ToolBox Firmware Version

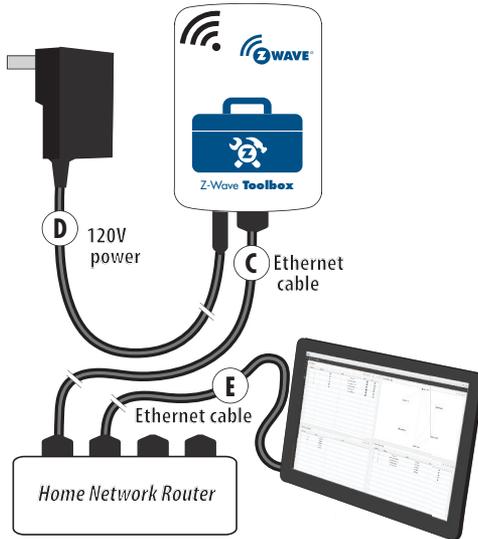
Firmware Version

The current firmware version number of your ToolBox is located in the lower-left corner of the navigation window.

Please share this information if contacting ZWaveProducts for assistance.



Updating the ToolBox Firmware



CONNECTIONS: Updating the ToolBox firmware Both your monitoring device and the ToolBox will be connected to the Home Network Router via a CAT5 Ethernet cable. The ToolBox should be powered up following the steps on page 26.

Firmware Update

You will need to have the ToolBox connected to the Home Router with a valid internet connection to update the ToolBox Firmware. The process for updating the firmware, as well as the interface graphics, may differ slightly depending on the initial version.

1. Open The Update Firmware panel

To start, click the Blue ToolBox to access the Personalization Menu; click the Update Firmware icon (pg 30) to open the Firmware Update page.

2. Check for updates

Click the Check for updates button. The process will start, then give you additional instructions.

Firmware Update

Get the newest firmware for your Z-Wave ToolBox.

Check for updates

Updating the ToolBox Firmware continues on page 34

Updating the ToolBox Firmware



Did you Get a 404 Error?

Please see the ***Changing The Target URL for Firmware Updates*** on page 35



3. Update ToolBox Firmware

You will be shown your version, and a new version (if available). Click Update.
Do not close the internet browser window or unplug the ToolBox.



4. Exit Firmware Update

You will get a dialog box that says, "Your Version Is Up To Date." Click Exit.

5. Refresh the Browser Window

Make sure all functions have stopped, then refresh your browser window (not the ToolBox).

Changing the Target URL for Firmware Updates

A few months into deployment of the Z-Wave ToolBox, we changed the server where the firmware updates reside. If you are having trouble updating your ToolBox firmware (404 errors, time-outs, etc.) please check the Current Server in the Server Selector dialog box.

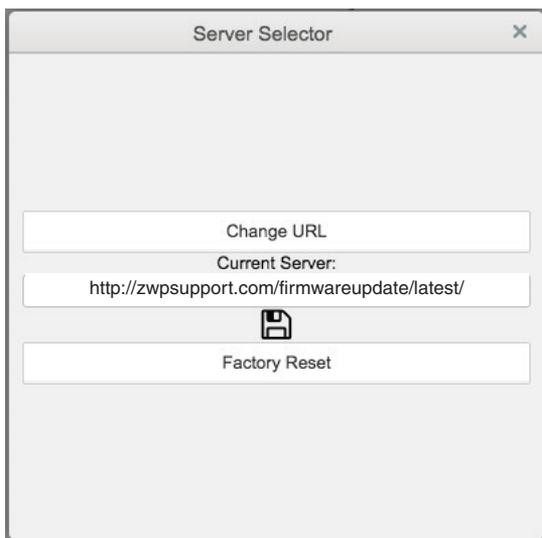
1. Open the Server Selector

Click on the Wrench (or Gear) Icon in the upper left corner of Firmware Update panel.



2. Change URL

Click on the Change URL button.



3. New target URL

Enter the new target URL in the Current Server space

`http://zwpsupport.com/firmwareupdate/latest/`

4. Save and Retry Update

Click the Save icon, then follow Upgrading the ToolBox Firmware Update on page 33.

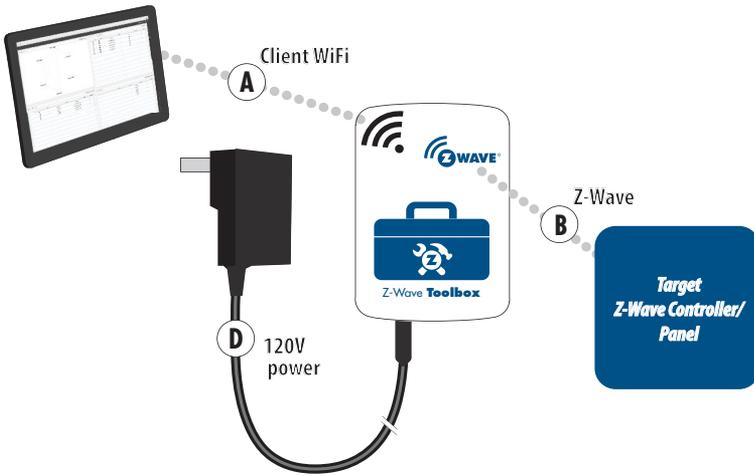


A Word About Battery-Operated Z-Wave Devices

(This is a very simplified version of relationship between battery operated devices and a Z-Wave network) In the upcoming series of tests, The ToolBox may ping a battery operated device, and it will fail. This is because Z-Wave uses a complicated protocol to wake up battery operated devices. Most times Z-Wave sensors will be in a dormant state and will only wake up when triggered (motion, open/close, water detected, etc). Other devices have a process to remain almost asleep; waking only when there is information to transmit. Either one of these processes allow extended battery life.

Most of the testing the average ToolBox user will perform is due to a range issue, or a network health (mesh) issue. Range is fairly easy to perform with a Battery Operated device. Once you performed other tests and suspect a particular Z-Wave battery operated node (like a door lock), wake the node up before performing any tests. For network health testing, battery operated devices don't participate in the Z-Wave network, so testing wouldn't help in this case.

Don't get anxious because a Z-Wave device fails a test. There is a root cause behind it, and the failure brings you one step closer to a perfect network. If the Z-Wave node is battery operated, consider ignoring that particular device for now, until you are troubleshooting it directly.

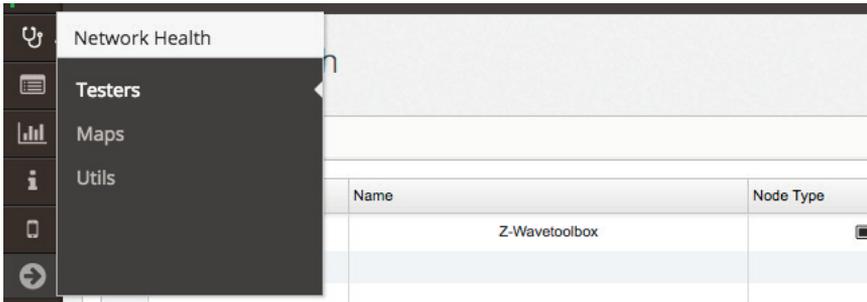


Connections: The above diagram shows General Troubleshooting for MOST Network Health Tool Tasks

Network Health Tool

The Network Health Tool is one of the three main tools of the ToolBox. Each of these tools is broken out into sections to make the ToolBox easier to use.

The Network Health Tool itself consists of 3 tabs: Testers, Maps, and Utils. These are accessed from the left navigation bar via a flyout menu.



Testers Contains the Control Panel, Network Health, and Simple Connection Tester widgets.

Maps Contains the Static Network Map and Static Connection Grid widgets.

Utils Contains the Repeater Finder and Background RSSI widgets.

Pairing The ToolBox with Target Z-Wave Controller

Connection toolbar



Status	Indicates activity; Working (green), Idle (blue), Error (red)
Connect To Network	Connects/disconnects the ToolBox and the Target Z-Wave Controller
Refresh Network	Refreshes the information in the widgets but keeps the ToolBox connection
Reset	Forces a Reset of the ToolBox connection



Connecting the ToolBox and the Target Z-Wave Controller

You should have the ToolBox within 30 feet (9.1 m) of the Target Z-Wave Controller

1. **Go to the Z-Wave Controller and add a Z-Wave device.**
It could be a light bulb, switch, or generic Z-Wave device; the simpler the better.
2. **While the Z-Wave Controller is adding, click Connect to Network on the toolbar.**
The ToolBox will process, then the Control Panel will list the connected Z-Wave devices.
 - If the device list does not populate, refresh the network and/or your internet browser
3. **Name the Z-Wave ToolBox on the Target Controller for easy removal later**
Most Z-Wave Controllers add the ToolBox as some type of scene controller.

Removing the ToolBox from the Target Z-Wave Controller's Network

Again, have the ToolBox within 30 feet (9.1 m) of the Z-Wave Controller.

1. **Go to the Z-Wave Controller and remove the device named in step 3 above.**
2. **While the Z-Wave Controller is removing, click Connect to Network on the toolbar.**
The ToolBox will process, then the connected Z-Wave devices will disappear from the ToolBox.

NOTE: Firmware versions before 1.1.32 have TWO ways to Connect to Network. Please update.

Control Panel

Control Panel

#	Device ID	Name	Node Type	Device	ON	OFF
1	1	Z-WaveToolbox		Static Installer Tool	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Control Panel Navigation Bar Icons



Save Names Allows user to create 'nicknames' for devices in the list



Help Brings up interactive help menu



Colors Allows user to change the color of the Network Health Tool widget boxes



Collapse Minimizes the widget box



Fullscreen Expands the widget box

Control Panel Navigation Bar Column Headers

Device ID Z-Wave Node ID of the Z-Wave device
Check with Z-Wave Controller manufacturer how to obtain Z-Wave Node IDs

Name Generic name of Z-Wave device. Once you determine a node's function, you can temporarily name it on the Control Panel. For example, you found Dev 4 is the Living Room switch. Select Dev 4 and double-click directly on the name, it will highlight and you can enter up to a 30-character name; IE: Living Room Switch.

Node Type Indicates secure (wave icon) battery (battery icon) or mains-powered devices (plug icon)

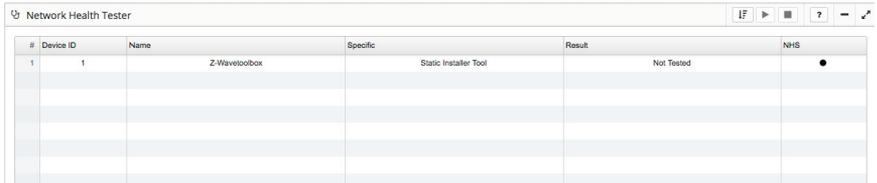
Device Generic description of device type

On & Off Allows user to trigger on/off commands for Z-Wave device identification



The Network Health Tester

Network Health Tester



#	Device ID	Name	Specific	Result	NHS
1	1	Z-Wavetoolbox	Static Installer Tool	Not Tested	●

Network Health Tester Navigation Bar Icons

-  **Test All** Tests all devices in the list
-  **Test** Click on a device in the list, then select Test to check one or more devices.
-  **Stop** Stops test
-  **Help** Brings up interactive help menu
-  **Collapse** Minimizes the widget box
-  **Fullscreen** Expands the widget box

Network Health Tester Navigation Bar Column Headers

Device ID Z-Wave Node ID of the Z-Wave device

Name Generic name of Z-Wave device

Specific Generic description of device type

Result Shows test in process

NHS Network Health Symbol Good (dk. green), OK (lt. green), Caution (orange), Fail (red)



- The Network Health Tester runs FROM the ToolBox, so the ToolBox must be very close to the Target Z-Wave Controller for an accurate test
- The Network Health Tester takes into account 60 pings AND routes of each ping
- Battery-operated devices will NOT be woken up by the ToolBox, and must be woken manually to be included in this test, otherwise they will fail

Simple Connection Tester

Simple Connection Tester

#	Device ID	Name	Status	Time	Route
1	1	Z-Wave toolbox	Not Tested		

Simple Connection Tester Navigation Bar Icons



Test All Tests all devices in the list



Stop Stops test



Help Brings up interactive help menu



Collapse Minimizes the widget box



Fullscreen Expands the widget box

Network Health Tester Navigation Bar Column Headers

Device ID Z-Wave Node ID of the Z-Wave device

Name Generic name of Z-Wave device

Status Result of test

Time Time elapsed for 1 ping

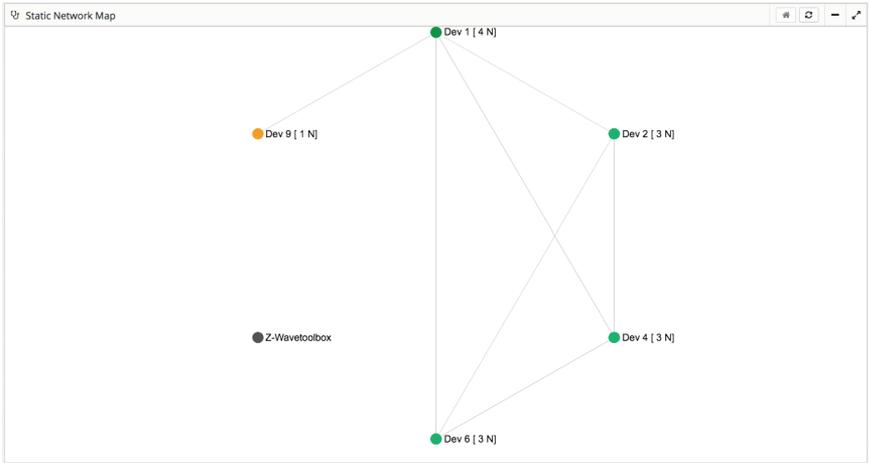
Route Shows route of communication through Z-Wave network (Node IDs)

- The Simple Connection Tester runs FROM the ToolBox, so the ToolBox must be very close to the Target Z-Wave Controller for an accurate test
- The Simple Connection Tester is a simple pass/fail test to see if the ToolBox can hear each node
- Battery-operated devices will NOT be woken up by the ToolBox, and must be woken manually to be included in this test, otherwise they will fail



The Static Network Map

Static Network Map



Static Network Map Navigation Bar Icons



Update Neighbors May be used in the future to expand capabilities



Help Brings up interactive help menu



Collapse Minimizes the widget box



Fullscreen Expands the widget box

Static Network Map Graphic Icons

Device # Z-Wave Node ID of the Z-Wave device

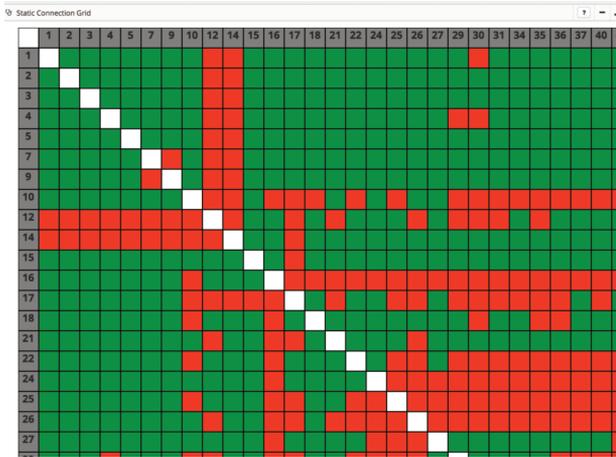
[2N] The number in brackets is the number of neighbors for each Z-Wave device

NHS Good (dk. green) = 4+ neighbors, OK (lt. green) = 2 or 3 neighbors,
Caution (orange) = 1 neighbor, Fail (red) = 0 neighbors



- The Static Network Map runs FROM the Routing Table in the Target Z-Wave Controller, does not depend on the ToolBox distance from the Z-Wave Controller. The test does not respond in real time. (See your Z-Wave Controller's guide for more on Z-Wave Network Rediscovery)

Static Connection Grid



Static Network Grid Navigation Bar Icons

	Help	Brings up interactive help menu
	Collapse	Minimizes the widget box
	Fullscreen	Expands the widget box

- The Static Connection Grid shows the relationship between two devices on the X & Y axis of the table. Failure (red) does not necessarily mean a bad network; two devices may simply be too far away from one another
- The Static Connection Grid runs FROM the Routing Table in the Target Z-Wave Controller, does not depend on the ToolBox distance from the Z-Wave Controller. The test does not respond in real time. (See your Z-Wave Controller's guide for more on Z-Wave Network Rediscovery)
- You can hover over the device numbers and will see the nicknames you gave to any devices on the Control Panel (page 39)

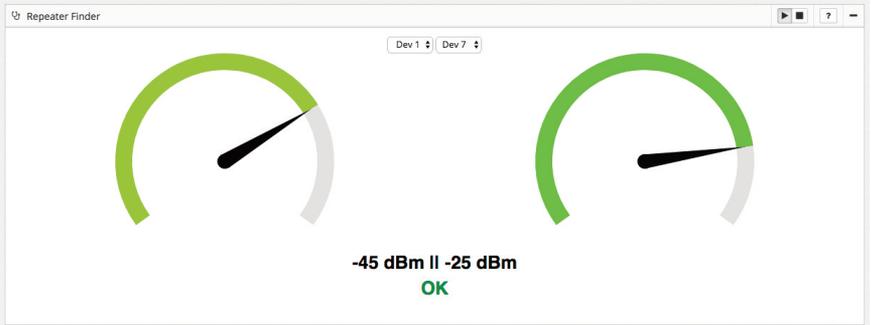


The Repeater Finder

easy!



Repeater Finder



Repeater Finder Navigation Bar Icons



Start

Starts Repeater Finder test



Stop

Stops Repeater Finder test



Help

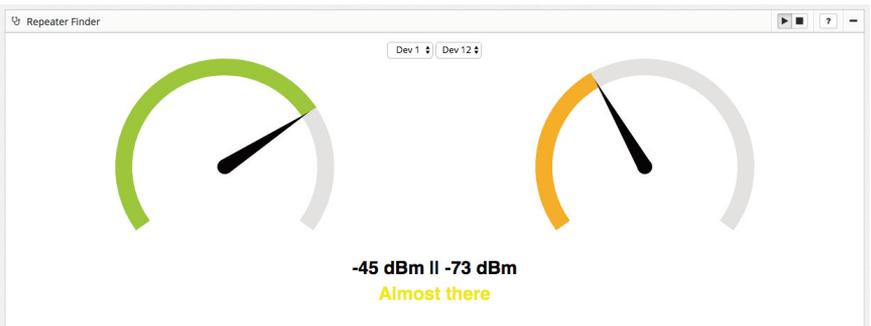
Brings up interactive help menu



Collapse

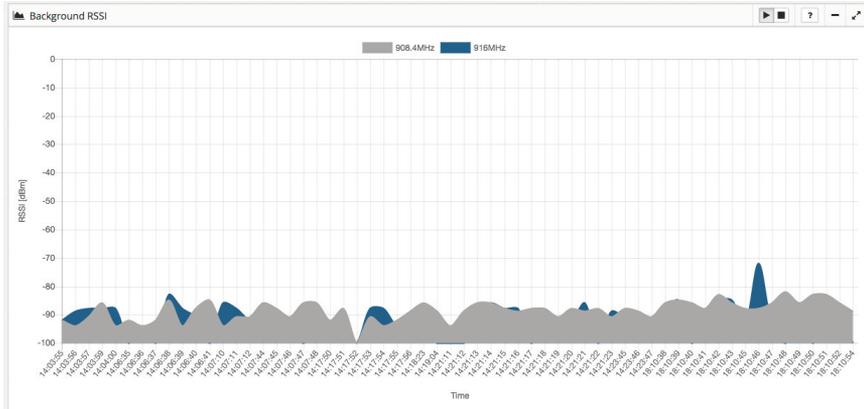
Minimizes the widget box

- The Repeater Finder shows the communication strength of the ToolBox talking to any 2 Z-Wave devices in the Target Z-Wave Controller's network
- The ToolBox can be moved around (extension cord works great for this) to possible repeater locations to gauge the signal strength in real-time
- The Z-Wave Devices are chosen from the pull-down menu, and usually include the Z-Wave Controller (always Dev 1) and another Z-Wave Device you are trying to reach



- Results are shown as colors (green, amber, red) and numbers, with some text encouragement

Background RSSI



Background RSSI Navigation Bar Icons

-  **Start** Starts Background RSSI test
-  **Stop** Stops Background RSSI test
-  **Help** Brings up interactive help menu
-  **Collapse** Minimizes the widget box
-  **Fullscreen** Expands the widget box

- RSSI means Received Signal Strength Indication; a scale of Z-Wave communication health
- The Background RSSI widget is great for examining environmental noise (baby monitors, speakers, etc) without leaving the Network Health Tool
- The Background RSSI widget measures ambient noise on Z-Wave channels as a timeline, in real time
- If you are interested in examining the ambient noise **WITHOUT** connecting the ToolBox to the Target Z-Wave Controller, the stand-alone Spectrum Analyzer is much simpler and less invasive to use. See page 53 for more details

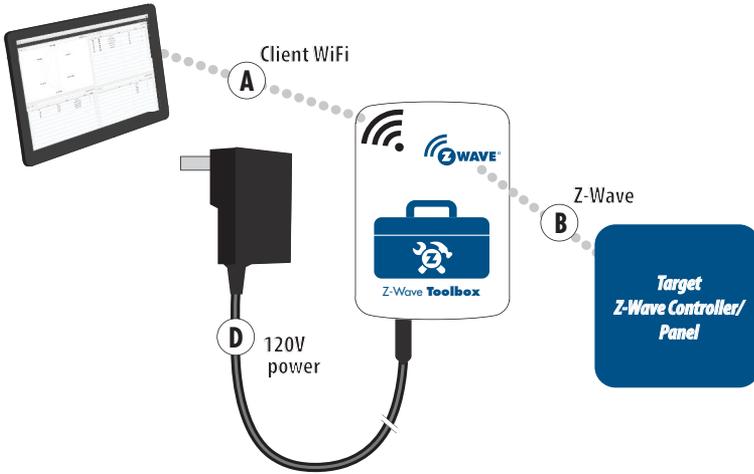


A Word About the Z-Wave Analyzers

The Z-Wave Packet Analyzer is our version of the “Sniffer.” You may have heard “Sniffer Trace” or “Trace” among developers and engineers. The Packet Analyzer is probably one of the more difficult tools to decipher, as there is an overabundance of information. It is also very powerful. Don’t be intimidated by the P.A. Get familiar with other tools, and only use the P.A. when other avenues have been exhausted. Even then, look for one specific communication. Know your node IDs, and what you are expecting (or not expecting) to see.

The Packet Analyzer is rather intrusive, but very comprehensive. The Site Survey, a simpler analyzer, is not intrusive, but also not as comprehensive and may be prone to skipped info. Both of these tools, in addition to many others contained in this ToolBox, run the gamut from easy to difficult. Wherever possible use the easiest and most familiar tool to test your network.

The Z-Wave Analyzers

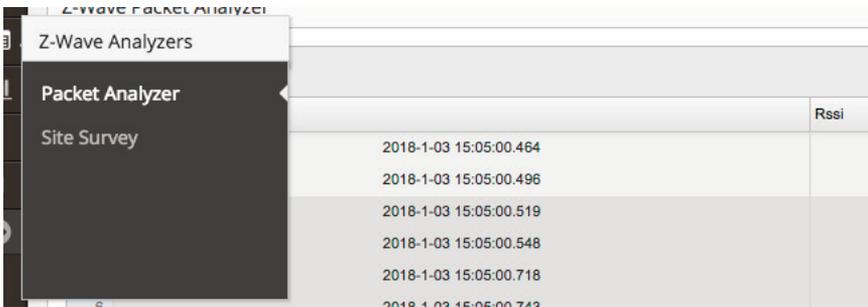


Connections: The above diagram shows General Troubleshooting for MOST Z-Wave Analyzer Tasks

Z-Wave Analyzers

Z-Wave Analyzers is one of the three main tools of the ToolBox. Each of these tools is broken out into sections to make the ToolBox easier to use.

These tools are accessed from the left navigation bar via a flyout menu.



Packet Analyzer Shows Z-Wave traffic from the Target Z-Wave Controller in real-time

Site Survey Shows all Z-Wave networks for a location and gives strength indications (RSSI)

The Packet Analyzer

Packet Analyzer

Z-Wave Packet Analyzer

#	Date	Resi	Source	Route
1	2018-1-03 12:04:21.863	70	25	
2	2018-1-03 12:04:21.893	66	1	
3	2018-1-03 12:04:21.915	70	25	
4	2018-1-03 12:04:21.943	74	1	
5	2018-1-03 12:04:21.966	73	25	
6	2018-1-03 12:04:22.007	73	25	
7	2018-1-03 12:04:22.032	77	2	
8	2018-1-03 12:04:22.055	73	25	
9	2018-1-03 12:04:22.108	73	25	
10	2018-1-03 12:04:22.133	73	25	
11	2018-1-03 12:04:22.159	73	25	
12	2018-1-03 12:04:22.436	73	25	
13	2018-1-03 12:04:22.564	73	25	
14	2018-1-03 12:04:22.85	68	25	
15	2018-1-03 12:04:22.909	74	25	
16	2018-1-03 12:04:22.979	58	25	
17	2018-1-03 12:04:23.009	58	25	
18	2018-1-03 12:04:23.038	60	25	
19	2018-1-03 12:04:23.067	72	25	
20	2018-1-03 12:04:23.096	61	25	
21	2018-1-03 12:04:23.126	78	25	

Packet Analyzer Navigation Bar Icons

-  **Status** Indicates activity; Working (green), Idle (blue), Error (red)
-  **Capture** Starts the Trace. Traffic autoscrolls with the most recent at the bottom
-  **Pause** Trace continues, but autoscroll stops. Allows closer examination of traffic
-  **Stop** Stops the Trace (trace will clear when new Capture is started)
-  **Join** Advanced Users Only!!**
-  **Save** Save Traces to the ToolBox's memory
-  **Traces** View Traces saved to the ToolBox's memory
-  **Refresh** Refreshes the Packet Analyzer without clearing the Trace
- My Network** When checked, shows only the network that you joined with
-  **Fullscreen** Expands the widget box



** Join is used in combination with your gateway to 'join' the ToolBox to a Z-Wave controller. Firmware versions AFTER 1.1.31 join a network via the Network Health Tool. Joining from the Packet Analyzer is NOT recommended for most users. See page 38 for the best practice.

	Destination	Command
(25)>(1)	1	CRC16 Command
(1)>(25)	25	ACK
(25)>(1)	1	CRC16 Command
(1)>(25)	25	ACK
(25)>(Many)	NaN	Multicast
(25)>(2)	2	Turn ON Device
(2)>(25)	25	ACK
(25)>(3)	3	Turn ON Device
(25)>(3)	3	Turn ON Device
(25)>(3)	3	Turn ON Device
(25)>(3)	3	Turn ON Device
(25)>(3)	3	Turn ON Device
(25)>(3)	3	Turn ON Device
(25)>(3)	3	Turn ON Device
(25)>(3)	3	Turn ON Device
(25)>(3)	3	Turn ON Device
(25)>(3)	3	Turn ON Device
(25)>(3)	3	Turn ON Device
(25)>(3)	3	Turn ON Device
(25)>(3)	3	Turn ON Device
(25)>(3)	3	Turn ON Device
(25)>(3)	3	Turn ON Device
(25)>(3)	3	Turn ON Device
(25)>(3)	3	Turn ON Device

Packet Analyzer Navigation Bar Icons

-  **Reload** Refreshes the browser
-  **Columns** Show or hide columns of data
-  **Search** Searches the Trace

Packet Analyzer Navigation Bar Column Headers

- Date** Timestamp of entry
- RSSI** Received Signal Strength Indication; a scale of Z-Wave communication health
- Source** Where the transmission originated
- Route** Which Z-Wave devices were used to complete the transmission
- Destination** Where the transmission terminated
- Command** Translated description of the communication (only the most common commands show)

The Packet Analyzer

Decoding the Packet Analyzer

1	2018-1-03 12:04:21.863	70	25
2	2018-1-03 12:04:21.893	66	1
3	2018-1-03 12:04:21.915	70	25
4	2018-1-03 12:04:21.943	74	1
5	2018-1-03 12:04:21.966	73	25
6	2018-1-03 12:04:22.007	73	25
7	2018-1-03 12:04:22.032	77	2
8	2018-1-03 12:04:22.065	73	25
9	2018-1-03 12:04:22.108	73	25
10	2018-1-03 12:04:22.133	73	25

Tips for Using the Packet Analyzer

- For the most accurate results, keep the ToolBox close to the gateway (or the device you are troubleshooting)
- In the ROUTES column on the Packet Analyzer, the source and destination are in parenthesis ()
- The numbers are the Z-Wave Node ID's of the devices on the primary network
- The shades group commands within the same routing attempt. (There is no legend)
- Device 1 is always the Target Z-Wave Controller
- Routes: The < > signs show the route progression from Source to Destination
- In the example above, a command is being sent from Device 25. Device 25 talks to Device 1. The > in each line indicates the progression of the communication.
- Example: If a Z-Wave Repeater was added to the network (Device 50), you would still see the command sent from Device 25. Device 25 talks to Device 50. Then Device 50 talks to Device 1. The communication would look something like:

```
25 > 50* 1
25* 50 > 1
```

- The Z-Wave device or Controller will try the command 3 times. If you see 3 lines together with no return communication, then you know this is where the transmission is breaking.

For a practical sample, check out the Quick Start guide on page 17

Site Survey

ID	Date	Network	Device	Power
1	2018-01-24 22:28:15 (UTC)	Network 1	Device 1	45 dBm
2	2018-01-24 22:28:16 (UTC)	Network 1	Device 2	45 dBm
3	2018-01-24 22:28:17 (UTC)	Network 1	Device 3	45 dBm
4	2018-01-24 22:28:18 (UTC)	Network 1	Device 4	45 dBm
5	2018-01-24 22:28:19 (UTC)	Network 1	Device 1	45 dBm
6	2018-01-24 22:28:20 (UTC)	Network 1	Device 2	45 dBm
7	2018-01-24 22:28:21 (UTC)	Network 1	Device 3	45 dBm
8	2018-01-24 22:28:22 (UTC)	Network 1	Device 4	45 dBm
9	2018-01-24 22:28:23 (UTC)	Network 1	Device 1	45 dBm
10	2018-01-24 22:28:24 (UTC)	Network 1	Device 2	45 dBm
11	2018-01-24 22:28:25 (UTC)	Network 1	Device 3	45 dBm
12	2018-01-24 22:28:26 (UTC)	Network 1	Device 4	45 dBm
13	2018-01-24 22:28:27 (UTC)	Network 2	Device 1	47 dBm
14	2018-01-24 22:28:28 (UTC)	Network 2	Device 2	48 dBm
15	2018-01-24 22:28:29 (UTC)	Network 2	Device 3	48 dBm



Site Survey Navigation Bar Icons

-  **Status** Indicates activity; Working (green), Idle (blue), Error (red)
-  **Capture** Starts the Trace. Traffic autoscrolls with the most recent at the bottom
-  **Pause** Trace continues, but autoscroll stops. Allows closer examination of traffic
-  **Stop** Stops the Trace (trace will clear when new Capture is started)
-  **Fullscreen** Expands the widget box

Packet Analyzer Navigation Bar Column Headers

Date Timestamp of entry

Network Generic Z-Wave network identifier

Device Generic Z-Wave device identifier

RSSI Received Signal Strength Indication; a scale of Z-Wave communication strength

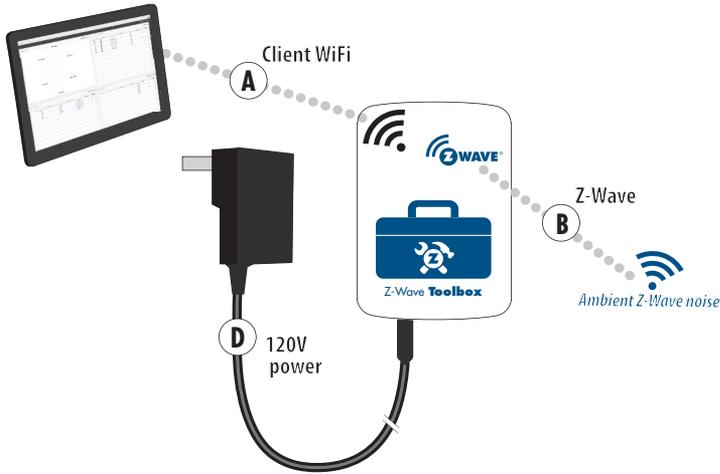
- Use the Site Survey at an apartment building or similar installation to show the number of networks, how close other networks are to a proposed location, and estimated potential for congestion and latency.
- This test will only show generic names of existing Z-Wave networks; Network 1, Network 2, etc. and the relative communication in a proposed location for your new *Target Z-Wave Controller*.
- The test is interpreted by viewing the RSSI values of nearby networks. The lower the RSSI number of other networks, the better the new gateway will hear. Under 40 is ideal. 40 to 50 shows some traffic that may cause latency and missed transmissions, and at over 50, the new gateway location should be changed. Reposition the ToolBox for a new test.

Site Survey continues on page 52



The Site Survey

- Really weak or incomplete signals will show up as CRC errors. CRC means “Cyclic Redundancy Check” and is the Z-Wave protocol’s way of knowing that a complete command was received. A few CRC errors are not necessarily cause for alarm.
- This test is FROM the ToolBox, so placement and location of the ToolBox is key. Put it where you want your new *Target Z-Wave Controller* to go.
- A yellow field on The Site Survey reveals a change in that device’s RSSI levels.
- At this time, there is no way to save the Site Survey data. We recommend screen captures and specific names of the capture files for documentation and later evaluation. IE: BldA_Apt35_Stat.png
- The Site Survey should be used to test an environment conducive for installing a new network. For mesh network questions or more comprehensive tests of a Z-Wave network that you control, check out the Network Health Tool (pg 37). For suspected environmental interference, check out the Spectrum Analyzer (pg 53).

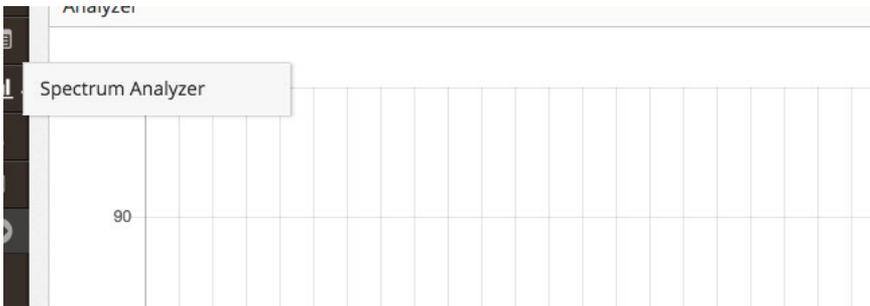


Connections: The above diagram shows General Troubleshooting for MOST Spectrum Analyzer Tasks

Spectrum Analyzer

The Spectrum Analyzer is one of the three main tools of the ToolBox. Each of these tools is broken out into sections to make the ToolBox easier to use.

This tool is accessed from the left navigation bar via a flyout menu.



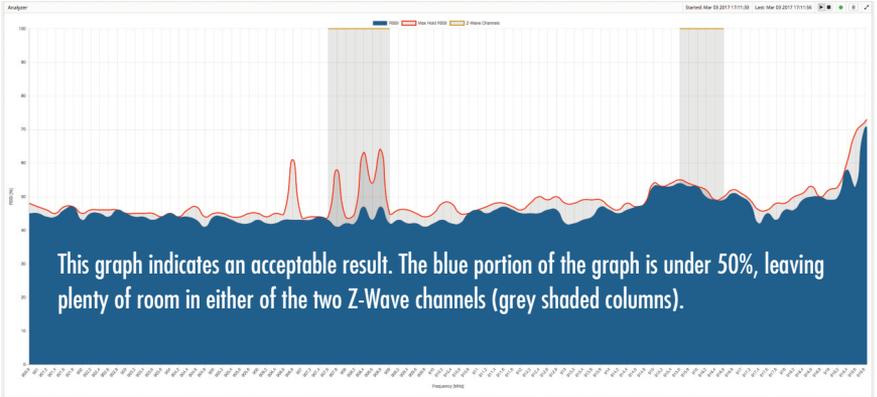
Spectrum Analyzer Shows ambient noise near the Z-Wave frequency ranges in real time

The Spectrum Analyzer

easy!



Spectrum Analyzer



Spectrum Analyzer Control Icons



Capture Starts the test



Stop Stops the test



Status Indicates activity; Working (green), Stopped (red)



Clear Resets the test information



RSSI Clicking directly on the icon will show/hide the blue RSSI level



Max Hold RSSI Clicking directly on the icon will show/hide the red RSSI Max



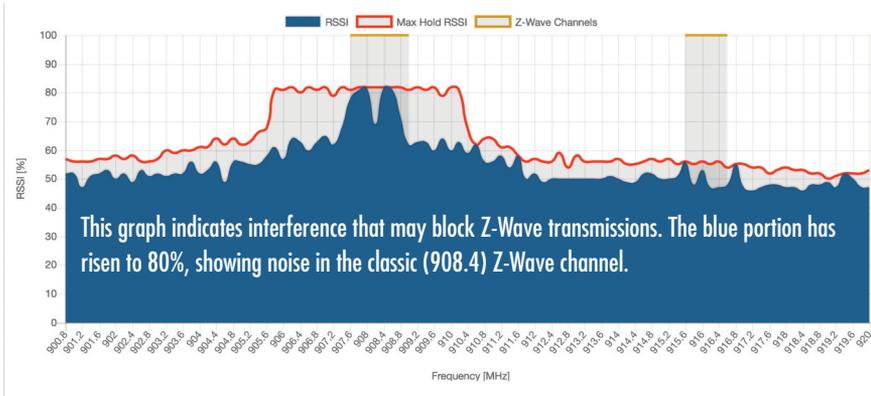
Channels Clicking directly on the icon will show/hide the channel columns

The Spectrum Analyzer does not have to be added to the network; it simply displays nearby frequency power levels

The RSSI, Max Hold, and Z-Wave Channels can be hidden by clicking directly on the icon's text

The Spectrum Analyzer has channels for both the North American Z-Wave and Z-Wave Plus frequencies. These shaded areas allow technicians to check for interference quickly.

Spectrum Analyzer Bad Sample



Above is a screenshot of a case of interference which will block normal Z-Wave traffic.

Increased 'pyramid or buttress' shows possible interference in one of the two Z-Wave channels

The ToolBox has been moved closer to the potential cause of the interference, which could be a third-party device or even a malfunctioning Z-Wave device in the network

If the ToolBox is left to monitor after hours, the Max Hold feature will keep track of an interfering event, even if it happens after the installer crew has left the building

- An immediate analyzer result with higher RSSI numbers is worse than one that builds up over time (ie: a week). These results should be considered together
- Once a potential source of interference has been established, the ToolBox should be moved to try and isolate the source

Lifespan of the Embedded Z-Wave Chip:

Each time the Toolbox is changed from the Network Health Tool or Packet Analyzer to Spectrum Analyzer and/or back, the Z-Wave chip is reconfigured. The chip has a life of approximately 10,000 changes, so please think ahead for planning, to avoid reconfiguring the chip back and forth needlessly. We recommend starting from the Network Health Tester.



Using The Z-Wave ToolBox - Symptoms and Remedies

What Tool at What Time?

Here are some very general symptoms and what tool can be used to diagnose the issue

Z-Wave Device suddenly is not responsive to the Target Z-Wave Controller

- Simple Connection Test will determine if you can communicate with the device. (pg 41)
- Operating the bad Z-Wave device manually while watching the Packet Analyzer (pg 48) can show you if the Z-Wave device left the network. If you get 000, then contact your Target Z-Wave Controller manufacturer for more help. If you get the Z-Wave Node ID, consider range or interference issues.

Z-Wave Device responds intermittently to the Target Z-Wave Controller

- Use the Spectrum Analyzer (pg 53) to rule out interference issues.
- Use the Network Static Map (pg 42) to view the Z-Wave device health (neighbors).
- Use the Network Health Tester (pg 40) to view the Z-Wave device health (range and routes).
- Use the Packet Analyzer (pg) and operate the Z-Wave Device from the Target Z-Wave Controller. Follow the route of the device from the Target Z-Wave Controller (Device 1) to the bad Z-Wave Device. If you see 3 commands repeat ($1 > 15 * 20$) and/or a "Routed Error" message (COMMAND Column) than that is where the communication breaks.

If You Suspect Interference Issues

- Use the Spectrum Analyzer (pg 53) and consider leaving it overnight.

If You Suspect Range Issues

- Use the Network Health Tester (pg 40) to view the Z-Wave device health (range and routes).
- Use the Network Static Map (pg 42) to view the Z-Wave device health (neighbors).

Thinking Z-Wave

We have gone through an extraordinary effort to make this a tool for installers. Still, there is a big unknown to many when it comes to Z-Wave. This ToolBox is awesome, but it requires some understanding.

Much of the feedback we have received was not directed at the ToolBox, but the knowledge base that's required to use it!! We will do our best to make sure this tool works for everyone, and teach you the skills required to excel in your installations.

- Sometimes it's hard for installers to think Z-Wave. One common error is the user who uses the Network Health Tool to create a Static Network Map which shows all green devices. Then he/she unplugs a device, and the Network Map doesn't change! Network rediscovery and a re-inclusion of the ToolBox is necessary to update this change. If you cannot do a heal, excluding and re-including the offending device can be a substitute (the 'new' node will look for neighbors upon configuration).
- Better yet, see if you can communicate with the device from the gateway while watching the traffic on the Packet Analyzer. (This also works for battery operated devices waiting for wakeup commands).
- The correct order of troubleshooting steps might not follow the tool order in the navigation

If you feel that the ToolBox is not performing as it should, here are some things to try:

- Remember if you're working from the client WiFi, you may have interference or range issues. (There's a reason we use Z-Wave, after all!)
- If you restart the ToolBox, you will need to check the WiFi connection on your smart device
- If the ToolBox refresh commands don't work, refresh your browser window/empty browser cache.
- If you cannot connect to the Packet Analyzer or Network Health Tool (or it seems to be acting up), remove the device several times and recycle the power. Delete any scene controllers or other devices that may have been added to your Z-Wave Controller. When the ToolBox reboots, go to the Network Health Tool and click RESET. Sometimes certain Z-Wave Controllers like to try to re-add the ToolBox and things get confused.
- Does your Router use 192.168.100.XX? Then you may not be able to connect via a CAT5 cable due to subnet mask conflicts. (Our WiFi uses 192.168.100.1). Contact us.

Technical Specs:

- Z-Wave Frequency 908.4 (US Standard) and 916 (Z-Wave Plus)
- Self-contained hardware - access through IP address
- Connectivity - Ethernet, WiFi (AP and Client mode)
- Low power; it can run on batteries (battery pack sold separately)
- Power Adapter (12V/1A, 100-240VAC)
- FCC and CE compliant

Support:

- Free Firmware updates available for first year after purchase
- Visit www.zwaveproducts.com/toolbox for technical support
- User Group: www.facebook.com/groups/ZwaveToolBox/

Options:

- Battery Pack will be available for true mobile troubleshooting
- Packet Analyzer trace reading service available from Zwaveproducts.com

Advanced:

Association Command Class Description:

The Z-Wave ToolBox Supports Association Command Class. It has 1 Association group, and one Destination. The only message sent is Device Reset Locally COMMAND CLASS

Interoperability:

This device can be used in a Z-Wave network with any other certified Z-wave device regardless of manufacturer and all non-battery devices will act as signal repeaters

Lifespan of the Embedded Z-Wave Chip:

Each time the Toolbox is changed from the Network Health Tool and/or Packet Analyzer to Spectrum Analyzer and/or back, the Z-Wave chip is reconfigured. The chip has a life of approximately 10,000 changes, so please think ahead for planning, to avoid reconfiguring the chip back and forth needlessly. We recommend starting from the Network Health Tester.

Questions? See an issue that you'd like corrected?

- Please visit www.zwaveproducts.com/toolbox
- Join our User Group: www.facebook.com/groups/ZwaveToolBox/