

Wireless Probes Connectivity

Firmware and Application

Make sure you have the latest firmware on your iManifold. Some iManifolds will not have the most current firmware as it has been updated frequently and some inventory sits on distributors shelves for a few months prior to sale. All updates are over-the-air. If available, an Android device will make this process faster by about a factor of 10 times due to the classic Bluetooth connection which has a faster throughput rate.

Deleting the application:

The application should only be removed from your device if you want to completely stop using the application and do not plan to reinstall it or update it later. Deleting and reinstalling an application rarely if ever “fix” a problem. You are simply deleting and reinstalling the same software.

Updating the application:

The application should be updated, as new releases are available. Updates contain bug fixes as well as most times extending the feature set. Updating allows changes to be made without losing the user database. This means things like emails, user configurations, and custom profiles will not be lost.

Restarting the application:

Your smart device is a mini computer and it can hang up or stop working if resources are low. If the application is restarted, for the most part data will be saved, as each submission (pressing the submit key) stores the session data with the report. When the report is reopened you will be able to pick up where you left off. This should not be a frequent occurrence.

Close unused applications:

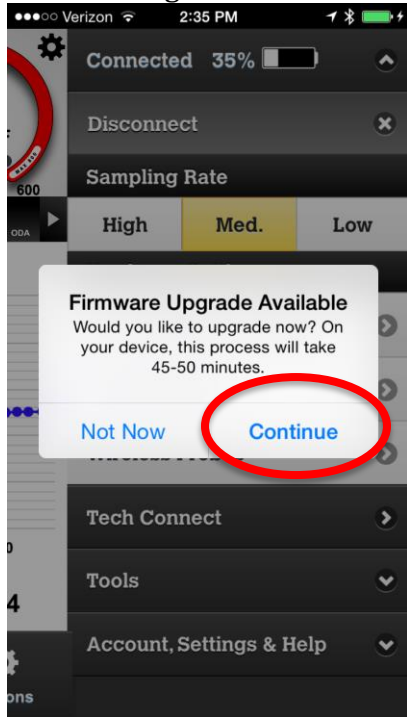
Running multiple applications at the same time can tie up system resources (memory) and shorten smart device battery life. It is recommended that you close all unneeded applications when running the iManifold application for best performance.

Firmware Update Process

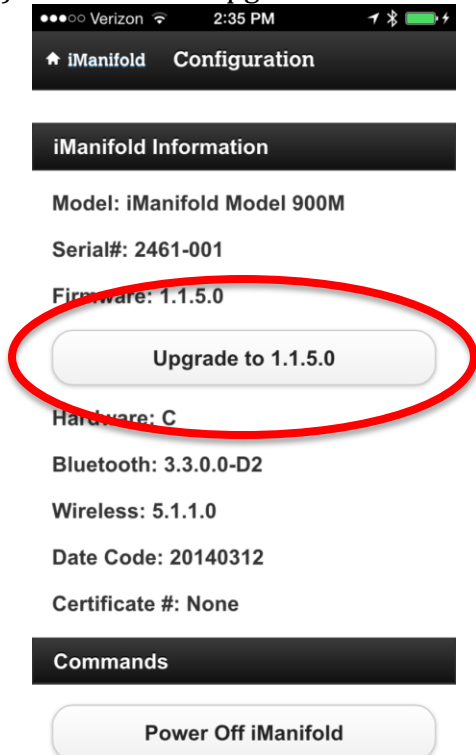
The process of updating firmware on an iManifold is simple and straight-forward. Updated firmware is shipped with the iManifold app for iOS and Android. The main purpose of updating firmware is to add and enhance functionality of the iManifold, iConnect and Wireless Probes.

Follow these steps to update firmware on your device:

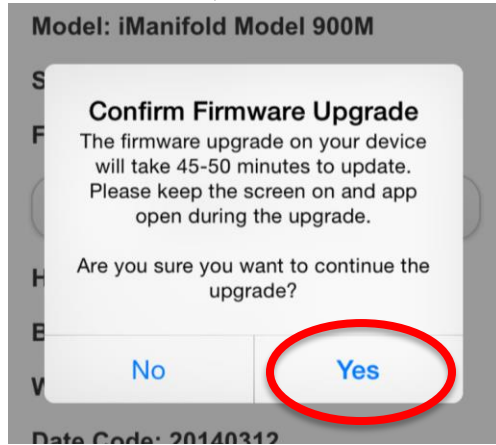
- 1) Connect to an iManifold or iConnect
- 2) If new firmware is available, a notification will popup. Click 'Continue' to go to the Configuration Screen



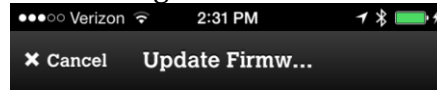
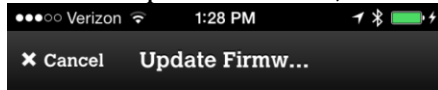
- 3) Click on the 'Upgrade to 1.x.x.x' button



- 4) Click *Yes* to accept that you want to continue.
 - a. On iOS, this process will take 45-50 minutes (Bluetooth Low Energy)
 - b. On Android, this will take 4-5 minutes (Bluetooth Classic)



- 5) When the process starts, the screen will change to a status bar.



The firmware update is currently transferring to the iManifold. Do NOT leave this screen during this process.



0.4%
Approx. 54 minutes & 37 seconds remaining.



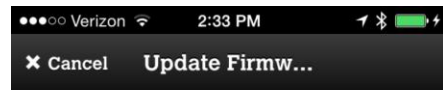
The firmware update is currently transferring to the iManifold. Do NOT leave this screen during this process.



98.0%
Approx. 1 minutes & 11 seconds remaining.



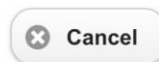
- 6) Leave your app open on this screen for the entirety of the firmware update process. This will ensure the entire firmware file is transferred without issue.
- 7) When the process reaches 100%, the app sends a command to reboot the iManifold. During the reboot, the updated firmware is being saved on the iManifold. This process takes 15-30 seconds to complete. DO NOT attempt to turn the iManifold off at this stage.



The firmware update is currently transferring to the iManifold. Do NOT leave this screen during this process.



100%
The iManifold will now reboot. This process will take 15-30 seconds.



- 8) Upon the iManifold turning back on, the auto-reconnect feature of the iManifold app may auto-reconnect, at which time a “firmware success” message will appear, completing the process. If the iManifold does not auto-reconnect, the Reconnect button can be tapped, just hit the Cancel button and reconnect to the iManifold as you would normally do.
- 9) Firmware update is now complete and the notification that a firmware update is available will no longer appear.

Wireless Probes Order

Probes will be displayed in the order that they are paired to the network. We recommend that they be paired in the following order only for the sake of consistency.

- 1) RADB/RAWB probe
- 2) SADB/SAWB probe
- 3) LP probe
- 4) HP probe
- 5) LP probe (circuit 2 if used)
- 6) HP probe (circuit 2 f used)
- 7) Repeater

If any problems are suspected with the probes, removing them from a network and reinstalling them will not fix problems. You can verify probes are connected to the network using the wink command (located in the wireless probe menu under the gear for each probe). When wink is pressed it will quickly flash the light on the probe.

Getting the most from Bluetooth and Zigbee

There are two radios in the iManifold, Bluetooth and Zigbee. Bluetooth is a short-range non-repeatable radio signal. The power of the transmitter cannot be increased. We use a very high output class 1 Bluetooth radio. The range is about 400 feet within line of sight; however it is easily diminished through building material. It is also important to note that the smart device and the iManifold work as a system. The quality of the smart device receiver is also important. Some devices have higher gain (sensitivity) than others and work better at further distances. If you lose connection there are some workarounds. For instance, if you are working on a residential air conditioner and you lose Bluetooth signal when you take your phone or tablet into the house, try reconnecting when you are where you want to work (by the furnace, in the basement, attic etc.). You may have lost the signal walking around the house to the door, but may be closer to the manifold at the interior work area and may be able to reconnect there. It is not intended for long-range use as it simply will not work for that. We intended the technician to be standing close to the manifold and the wireless probes to send the data to the iManifold. That is the job of the Zigbee radio in the wireless probes.

Bluetooth Operation

To maximize the range of Bluetooth you should follow these rules:

- Do not hang the iManifold against a solid metal panel. Hang it in free air - typically off the electrical disconnect is a good place.
- Hang the iManifold on the side of the unit that you want to transmit to. If you hang it on the opposite side that you are transmitting to it has to transmit through the unit. This cuts down range.
- Do not set the unit on the ground. You will be transmitting a lot of the signal into the earth, cutting the transmission distance in half.
- Handle the tablet/smart device with care. Position of the Smart Device (tablet) and setting it down on a metal panel or on the floor will compromise the tablet's ability to receive. The Smart Device and the iManifold work as a system; handling and placement of one is just as important as the other when you desire to transmit longer distances.

If you do disconnect, the iManifold will reconnect once you are back in range. After three tries (default) you will get a disconnected message. All you have to do is reconnect once you are back in proximity. Also, you do not have to be connected to the iManifold in order to continue to add data to the application. For example, you went inside to get blower amps and lost connection. You can still put the information into the application and it will be there when you reconnect once you are back in range. You may want to set the Auto Off to a higher timeout in the configuration menu if you are going to be disconnected for more than 10 minutes.

ZigBee Operation (Wireless Probes)

Now to the Probes ZigBee network. ZigBee also has a 400' plus range, but has much better penetration through typical building materials than Bluetooth. Because of the way that Zigbee works, the range can be easily be extended— even up to miles away— by adding probes to the network. It is the most common type of radio used in building automation networks and wireless thermostats in the HVAC industry. Zigbee is very robust, as it forms a mesh network. This means that probes can talk to probes or directly to the iManifold. The more probes that you are using in a network the more reliable the network will be as it can establish multiple and alternate paths. When you first set up the probes, it may take them a minute or so to establish the route back to the iManifold, as the current path might not be optimal, and a new path is being established. The network is called “self-healing.” This is a very cool feature of Zigbee as all you have to do if you need to transmit a long distance is to add a repeater probe to the network and the path will establish and restore the network.

To get the most range out of wireless probes the following is recommended:

- Initially, add probes to the network in the vicinity of the iManifold. The iManifold is the network coordinator and needs to establish what probes are on the network.

- Remove any probes that are not going to be used in the network by removing them in the probe management screen if desired. This will make the application easier to navigate as only the probes you are using will be shown on the slider screens.
- Allow the network a few minutes to establish a path when it is first set up. The probes need to configure a path back to the iManifold. Interrupting the process or trying to do it manually by removing and adding probes will take longer than waiting a minute or so for it to reconfigure. Once it configures it will be solid.
- If you are transmitting long distances or in areas of high interference, adding a repeater might be required or helpful.
- If you are using the probe in a freezer or placing it in the return duct, (in a metal enclosure) the range will be cut back significantly. To get the signal back to the iManifold, either have another probe in the vicinity that is not totally enclosed in a metal enclosure, or place a repeater outside the enclosure to extend the signal back to the iManifold. This is probe-to-probe communication.
- If you can see one probe on the iManifold, and the other is in close vicinity but cutting in and out, it simply needs a minute or so to reestablish the network. Give it a minute or so. Removing it from and reinstalling into a network will only add time to the process and will not fix connection problems.

Remember that when you start probes next to the iManifold, they are likely talking directly to the iManifold. When you move them to the measurement location, they may need to establish a new route back to the iManifold, so they could be hit/miss for a minute or so until the path is reestablished.

Deploying the Zigbee Network

Experience has shown that the best way to deploy the network when using an iManifold is to carry the iManifold with you during deployment. It can easily be slung over your shoulder during this process. If this process is followed, you will always establish a path back to the iManifold without having to walk back and fourth trying to establish a connection.

- 1) Turn on the iManifold and probes. (It is assumed that they are already paired). Go to the wireless probe screen for the remainder of the deployment process
- 2) Make sure all probes are communicating with the iManifold.
 - a. Green means actively transmitting a data packet
 - b. Yellow means connected and waiting for next data packet
 - c. Red (or blank) means installed in the network, but out of range or off. Data will not be transmitted.
- 3) Starting from the furthest point away from where the iManifold will be located deploy the first probe.

- 4) Go to the location of the second furthest probe and make sure that all probes are still communicating. (flashing yellow and green)
 - a. If the distance is too far, (first probe goes to red) place a repeater between the two probes.
- 5) Go to the next location of measurement and deploy a third probe (if needed). Again verify that all probes are still communicating.
 - a. If the distance is too far, (one of the probes goes and stays red) place a repeater between the two probes.
- 6) Repeat this process until all probes are in their desired measurement locations and finally connect the iManifold to the system following the Bluetooth best practices at the beginning of this document.

Remember that all software is very process oriented, if you follow the process the outcome will work as expected. Deviating from the process can yield unexpected results. If the process needs changed for some reason, and the application does not work as anticipated please notify us so we can make changes as required and perform testing so the process will work as you need it to.