

A Guide to Getting Started with HSMM-Mesh

Getting Started

Getting started with HSMM-Mesh™ (High Speed Multimedia-Mesh), also known as Broadband Hamnet™, can be daunting to hams that have the interest, but lack the expertise of network engineers. Indeed, perusing comments and documents on the Web can be confusing to newcomers who want to participate in setting up Amateur Radio broadband mesh networks under FCC Rules in Part 97.

This document will help you get started and up-and-running so you can see how a basic 2.4 GHz ham radio mesh network works. The notes that follow assume you're using a PC running the Microsoft Windows operating system.

Select a Router

For starters, you'll need a commercial off-the-shelf Cisco Linksys WiFi router (it operates under FCC Part 15 unlicensed rules).

Read [WRT54Shop.pdf](#) for a list of suitable routers. Some hams print out this list and search for surplus Linksys routers at Goodwill and Salvation Army stores and garage sales. Look in the "Files to Download" section on NB7O/K7MGO Mesh web page (the page that you accessed this document from.)

At the time of this writing the desirable Cisco Linksys WRT54G, WRT54-GL, and WRT54-GS models can be found for less than \$50, including shipping. My suggestion is to obtain at least two identical routers so you can communicate between them and verify the results of your work.

Converting The Box

If you have appropriate routers in hand, what's next? Well, you need to install the Broadband Hamnet firmware. This code is stored in nonvolatile RAM, called flash memory. This memory is built-in and resides on the router's circuit board. It stores the original code that makes these WiFi boxes work as Part 15 consumer devices.

When you load your new ham radio software into the router, the process is referred to as “flashing the router.” You will be storing the new code in the nonvolatile flash memory array.

Here’s how to do it.

You must first communicate with your WiFi router. That means your Windows PC must have the appropriate Ethernet drivers installed. Most PCs have these installed, but if you can’t communicate initially with your router you’ll need to install a driver.

Typically, you can locate the right driver by going on the Internet and navigating to your PC vendor’s Web site. A search there for Ethernet drivers should result in locating the small executable file that you’ll need to activate your PC’s Ethernet port.

Begin by testing your PC to see if it will talk to your new router. Connect an RJ-45-equipped cable (packed with new routers) to one of the four Ethernet ports on the back of the WRT54-GL router. These are referred to as WAN (wide area network) ports. Plug the other end into the Ethernet port on your PC.

Next, open a Web browser of choice, such as Internet Explorer or Mozilla Firefox, and type in the Internet Protocol address for your router. The WRT54-GL uses an address of 192.168.1.1, so poke the following into your browser’s command line: <http://192.168.1.1>

Your browser is now accessing the mini-server within the WiFi router. This server is stored in the router’s solid-state flash. It is not a Web page on the Internet.

Once the router is moved into the ham band at 2.4 GHz, and broadband Hamnet code is installed, you’ll never see this screen again.

The top of the image that comes up on your WiFi browser should look like this:



Note the black “Administration” tab. That’s where you start to begin modifying the router’s code that’s stored in flash memory. Click on “Administration” to bring up the next screen. The uppermost portion of your screen should now look like this:



Click on the blue “Firmware Upgrade” tab.

In the following procedure you’ll be modifying the original WiFi code, installing the new flash firmware that converts your router into an Amateur Radio node. This ham radio code will overwrite the WiFi code.

The available Broadband Hamnet firmware at the time of this document is Version 3.1.0. The file for this version, specifically for the WRT54G and the WRT54-GL router, is called <bbhn-3.1.0-wrt54g-2.4-squashfs.bin>.

Files for other models of Linksys routers will have different filenames.. Download the file and save it in a convenient subdirectory (folder) on your PC. You’ll be calling it up shortly. Look in the “Files to Download” section on NB7O/K7MGO Mesh web page (the page that you accessed this document from.)

Important Note

In the next step you’ll find that the upgrade takes a few minutes to load into flash memory from the stored file on your PC. During this time it is imperative that the DC power to the router not be interrupted. Do not stop the upgrade or otherwise tinker with your PC during this critical period of time.

Now click on “Firmware Upgrade.” Be patient and watch the LEDs on the front panel of your router. The power LED will blink and eventually stop blinking. The DMZ LED will be off for a few seconds and then also illuminate (believe it or not, this indicator is called the “De-Militarized Zone” LED).



Be patient; the DMZ indicator will eventually go out. When it does, your router has been converted! The router will take about two full minutes to re-boot from flash, so bide your time during this process.

Initial Settings

You're now ready to access the HSMM-Mesh ham radio node that you've created, and make some initial settings, including installation of your Amateur Radio callsign. Open your favorite browser again, and type <http://localnode.local.mesh:8080/>.

You should see a "Redirecting to Status Page" message on your screen. If not, then you may have to go to the Windows START box and select "RUN." This will bring you to the Windows RUN window. If you type in the command "cmd" (no quotation marks) and click on OK your PC will go to the DOS command prompt. At that point enter "ipconfig/release" followed by Enter. Then type "ipconfig/renew" and hit your PC's Enter key. This procedure will let your PC provide a working IP address. When finished, type "exit" at the cmd prompt to return to the Windows graphical user interface.

Open your browser and type <http://localnode.local.mesh:8080/>. You should now see a "Redirecting to Status Page" message on your screen. After a short time you'll see the HSMM-Mesh opening screen. Click "Setup" and insert a "User Name" as "root" and a default "Password" as "hsmm."

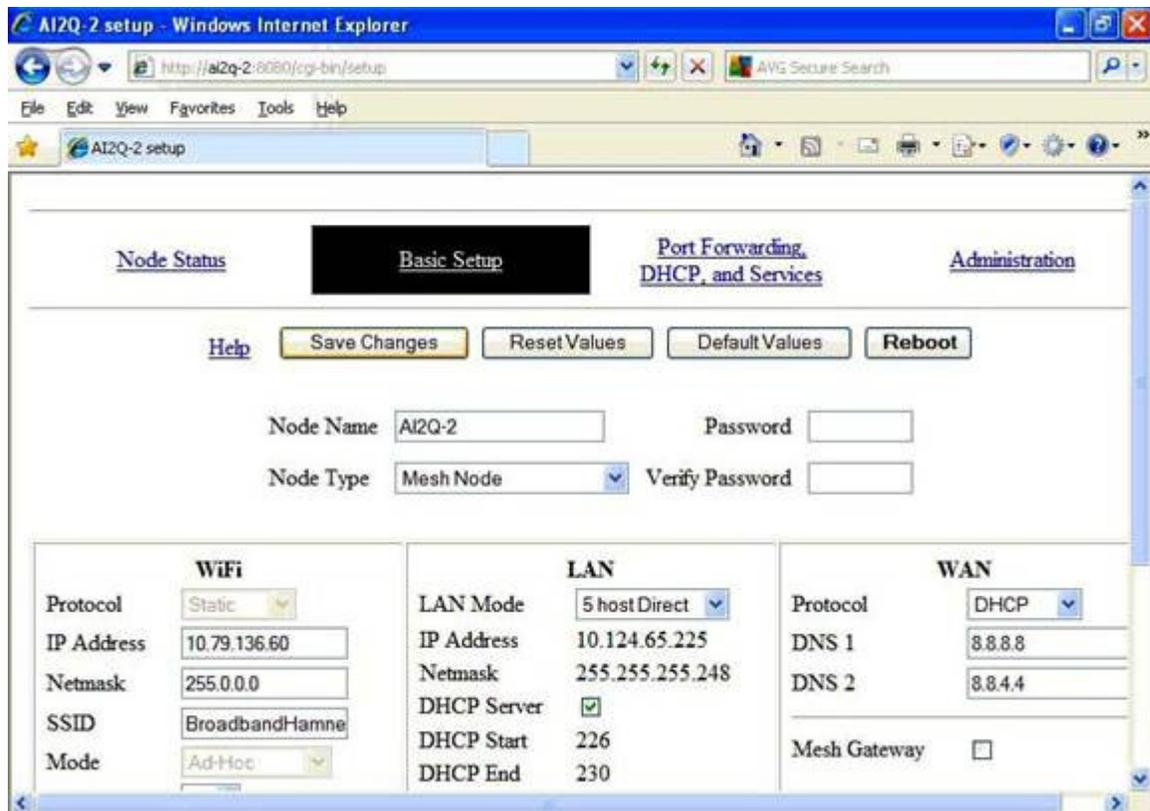
You can change the password later, perhaps to your callsign. If you enter your own personal password, click "Save Changes," and wait patiently for the node to re-boot. For later reference, paste a label on the bottom of the router with the stored username and password.

You will see "NOCALL" on your screen. Go ahead and enter a node name on the "Setup" screen. The name will be your callsign. Later you may wish to add an additional identifier, such as your callsign plus the word Server or maybe Hospital or perhaps HQ. These words can help identify your node's capabilities once it's part of a mesh network.

You can follow your callsign or name by a dash or hyphen. That's useful for naming multiple routers under one callsign (i.e. AI2Q-1, AI2Q-2). You can choose any letters, numbers and dashes.

You may be familiar with AX.25 packet radio addressing, where Secondary Station Identifiers (SSIDs) can be used. Unlike packet, you are not limited to SSID numerals 1 through 15 on an HSMM-Mesh node. You can name your node KB1GTT-100, or N1HL-88, for example.

The "Setup" screen will look like the following image. Type in your call, and SSID if desired. You can also choose a password if you wish. When you're done, click on "Save Changes." Then click on "Reboot" and wait approximately 60 seconds for a re-boot. Do not interrupt 12V DC power during the re-boot.



You are now on the air and ready to make some basic tests to test the function of your newly flashed router. Your callsign that you typed in the previous step will be prominently displayed.

A word of advice: Resist the temptation to alter or modify any of your node's other settings. Go with the defaults at this point!

If you have two or more routers now on the air under your callsign or a colleague's call, and they're within range of each other, select the "Mesh Status" button. You'll be treated to information about the other nodes in your network. If other hams have routers on the air, and you're receiving their signals either directly or through the network, you'll see their callsigns and names, as well as other details.

Only The Beginning

There's far more that can be done on an Amateur Radio HSM-Mesh network, but that's beyond the scope of this beginner's guide. You'll eventually find that servers on the Broadband Hamnet may announce their available services, and you'll likely be able to use these without necessarily knowing what's set up at the remote node. You might, for example, tunnel into the Internet if a station in the mesh offers this capability.

Don't fret. The tradition of hams helping other hams will eventually expand your knowledge. There are also many technical documents on the Broadband Hamnet Web site, as well as user Q&A forums.

You will run into a lot of jargon, acronyms, and technical detail that can be confusing to a beginner not intimately network-savvy. Take heart. This gateway document will get you started, and hopefully whet your appetite for more---much more!