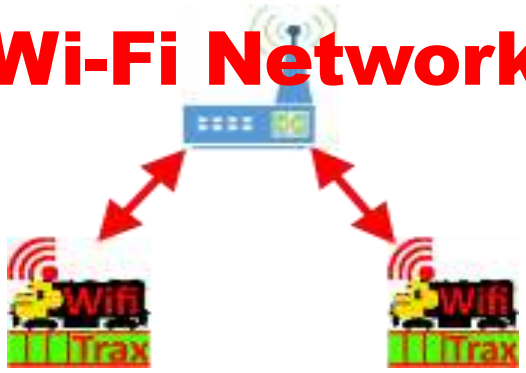
Managing your Model Railroad Wi-Fi Network



How to Build and Manage a Model Railroad Wi-Fi Network using the WifiTrax Products

Practical notes by Steve Shrimpton

Updated August 5, 2017 to include Direct Wi-Fi Mode

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The WifiTrax series of products enable you to use a Wi-Fi Network to connect Hand-Held devices such as smart phones and tablets to your locomotives and other items on your layout equipped with WifiTrax Wi-Fi Controllers.

In this document, I will show you first how to set up your WifiTrax network with your first locomotive and then how to manage your network and add more locomotives as you equip more of your locomotives with Wi-Fi Controllers.

First, we will need to run over some basics concerning networks and Wi-Fi networks in particular.

Related Documents

You can obtain these from our website www.wifitrax.com

(1) The WifiTrax Model Railroad Network Vision – this will tell you about our concept for an entire model railroad infrastructure based on Wi-Fi and the products that will be released to support it.

Tools and Skills Required

1. Basic Computer Literacy
2. A computer with Windows 7, 8, 8.1 or 10 installed or a Surface Pro with Windows 10
3. A smart phone or tablet with Android 4.4 or later, or alternatively the computer in 2. has Windows 10 installed.
4. A Wi-Fi Router
5. There is **NO** computer programming required.

Networking Basics – Three Important Terms

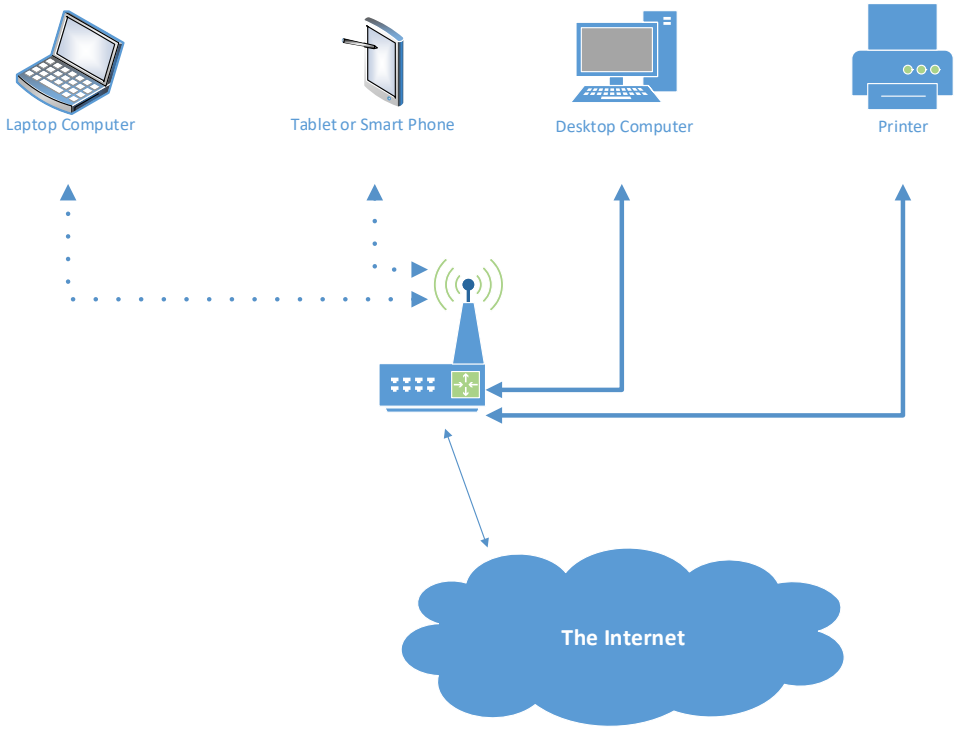


Figure 1 Typical household network

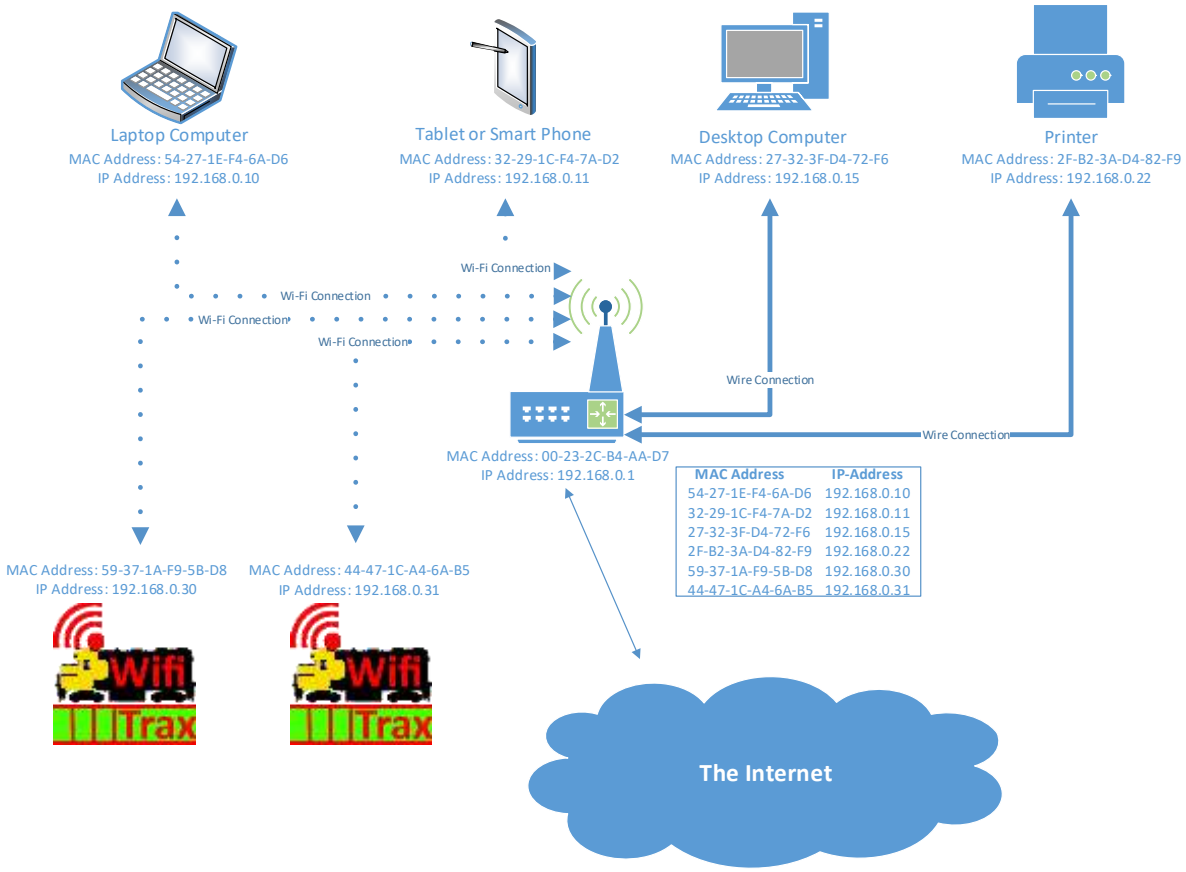
In 2014, it was reported that 73% of U.S households own a computer with a broadband connection to the internet. This means that these households have a network router and a good many will have a Wi-Fi Network Router so that smart phones and tablets can access the internet via the same broadband connection. I bet among model railroaders the percentage is even higher.

Why is it called a router? Because it routes packets of data between computers on your local network in your house and also between your local network and the internet.

Therefore, most of you already have the infrastructure in place to build your model railroad network. Moreover, that infrastructure can carry a lot of data, so we can imagine all kinds of clever things we can do with our networked model railroads in the near future. Figure 2 shows a typical household network with a desktop computer, a laptop, a network printer and a tablet or smart phone.

How does it work? Well, almost anything that connects to networks and the internet is assigned something called an IP-Address. That's nothing more than a postal address for each computer connected to your router, whether it's a smart phone, desktop, tablet or a model railway locomotive. That's the first idea to get clear. Nothing can be on your network unless it has an IP-address, because no one could talk to it! Figure 2 shows an IP address assigned to each item on the network – even the router has its own IP Address (usually 192.168.0.1).

IP Addresses are always written as four numbers each 0 to 255 separated by dots e.g. 192.168.0.1, the address of the router mentioned.



MAC Address	IP-Address
54-27-1E-F4-6A-D6	192.168.0.10
32-29-1C-F4-7A-D2	192.168.0.11
27-32-3F-D4-72-F6	192.168.0.15
2F-B2-3A-D4-82-F9	192.168.0.22
59-37-1A-F9-5B-D8	192.168.0.30
44-47-1C-A4-6A-B5	192.168.0.31

Figure 2 Typical Network within your Home, with your WifiTrax Model Railroad Locomotives Added. The IP and MAC addresses here are just typical examples.

Next question: Where do these IP-Addresses come from? The answer is that your network router assigns them. The network router is in charge of the network. When a new computer connects to your network, it first has to ask the network router for an IP-Address and the network router assigns it one. The network router keeps track of all the IP-Addresses it has assigned and which computer has them.

How can the router identify computers before it's given them an IP-Address? The answer is that every computer has a special identifier that it was born with and which never changes. This is called a MAC Address or sometimes Physical Address and every computer that connects to a network has its own MAC Address, and no two are the same – just like fingerprints. So, when a computer asks for an IP Address from the network router, it sends its MAC Address to the router. The router assigns it an IP Address and adds an entry to a table that it keeps of the IP Address assigned to every MAC Address. So, the router remembers computers on its network according to their MAC Addresses.

The three underlined terms above are the ones to remember Network Router, IP Address and MAC Address – we will use these terms a lot.

Extra Information

If you want to be a bit more technical, the protocol by which this all happens is called DHCP (Dynamic Host Control Protocol), MAC Address stands for Media Access Control and IP is Internet Protocol. Of course I'm keeping it simple. If you want more there's plenty on the internet.

What is this strange IP Address format? Every IP Address is actually a 32-bit binary number (0 to 4,294,967,295 in decimal) so there are more than 4 billion of them available. To make them easy to

read they are represented as four decimal numbers each from 0 to 255 representing each 8-bit byte in the 32-bit binary number. So, they look like this: 27.195.67.255, 192.168.1.1, 123.212.233.123 but never 456.256.500.512! None of the four numbers can be bigger than 255 and both 0 and 255 are reserved in the last of the four numbers.

Wi-Fi Network Basics – Two More Important Terms

So far, I've talked about networks. In the old days, we used cables with little RJ-45 connectors to join our computers to the network router. That's still the fastest way, but now most people use laptops and tablets that connect to the network router via Wi-Fi.

Wi-Fi is just another medium on which the data can travel – radio of course – instead of cables. The Wi-Fi network router has an antenna and acts as an Access Point (AP). It's the master of the Wi-Fi network. All the Wi-Fi computers – laptops, tablets, model locomotives, etc. connected to it are Client Stations – or Stations as they are usually called.

Remember the fact that it's a Wi-Fi network makes no difference as far as IP Addresses and MAC Addresses are concerned.

So, the two terms underlined in this section are important to remember – Access Point and Station.

More than One Network – SSID and Password

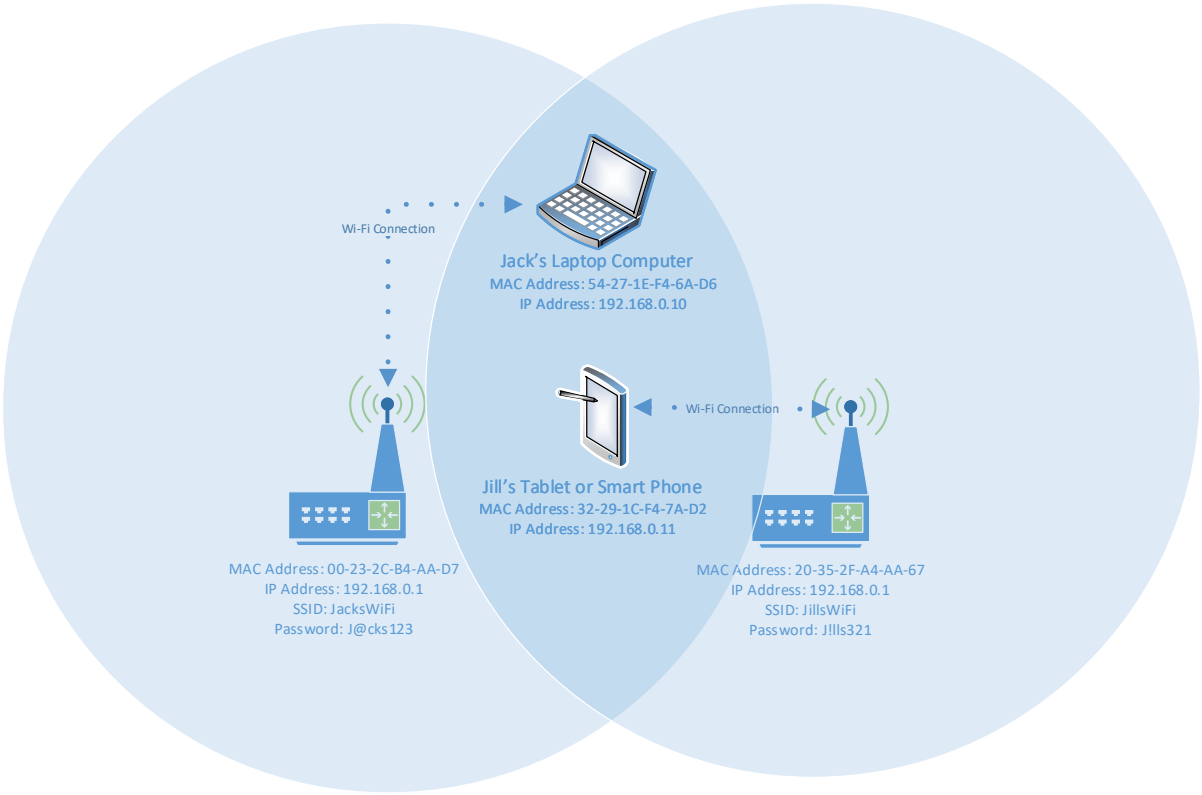


Figure 3 Two Wi-Fi Networks that overlap in their range

What happens if there's two or more Access Points (AP's) in the same house? The answer is that they get along just fine. Each one has their own network of clients and assigns them IP-Addresses and they coexist in the amazing radio world just like different radio stations in the same city.

For example, when you connect to your Wi-Fi Router's Access Point in your house, you usually can see a few neighbors' access points too. How come you don't connect to them? Well because most people secure their access points with passwords.

Now each access point has an identifier called its SSID and it has an assigned password. Figure 3 shows two Wi-Fi networks. Jack and Jill are neighbors and both have Wi-Fi routers, Jack's network and Jill's network. Both have SSID's and passwords. Jack does not know Jill's password and Jill does not know Jack's password. When Jack bought his laptop and connected to his Wi-Fi he saw Jill's network as well as his own but he only knew the password for his own network. Similarly, Jill only knew her own password. Of course, the laptop and tablet remember the network they usually connect to and the password, so when Jack comes home his laptop always connects to his Wi-Fi network – and remember, the router gives his laptop an IP Address.

So again, two important terms to understand – SSID and password.

Access Point and Station at the Same Time

Now some Wi-Fi enabled devices can be both an Access Point and a Station, even both at the same time. WifiTrax Locomotive controllers are like this!

When we manufacture, and test a new Locomotive Controller such as WMH-20 and WMR-10 at our factory, we do not know the SSID of your Wi-Fi router or your password. You might be Jack or Jill or someone else. So, we have to ship the modules in a standard configuration and when you receive your module it will not know which access point to connect to, or the password to use.

However, there are two ways of using any WifiTrax Controller, called Direct Mode and Infrastructure Mode. These are shown in Figure 4 and Figure 5.

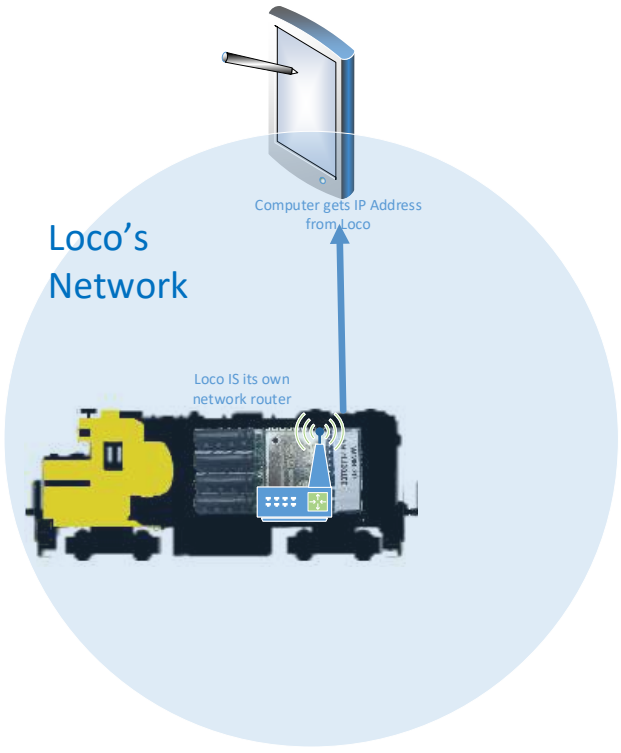


Figure 4 Direct Mode for a WifiTrax Controller

Direct Mode

In Direct Mode, in Figure 4, the WifiTrax Loco is ***its own network router*** in that it is master of a Wi-Fi network under its own access point and controls access by computers to that network. When computers connect to its private network, they are assigned IP Addresses on its private network; the loco will always have the IP Address 192.168.4.1.

You can start using your locomotive in Direct Mode immediately, but there are a few things you cannot do. You cannot access the internet from your controlling computer, smartphone or tablet when it is connected in direct mode. Also you cannot use our app to control more than one locomotive at a time from the same computer, smartphone or tablet when it is connected in direct mode. However, you can use a phone for each locomotive in direct mode and control as many as you like.

As mentioned earlier, since we know nothing about your router, **we ship our Wi-Fi controllers configured only in Direct Mode. For Infrastructure Mode you need to use our software to tell each new controller the SSID and password of the Wi-Fi Router that you want to use for your model railroad Wi-Fi.**

Each WifiTrax controller is shipped with a MAC Address, an SSID, an IP Address and a serial number, something like:

MAC Address: 5C-CF-7F-D8-50-F6

SSID: ESP_D850F6

IP Address: 192.168.4.1

Serial Number: 21100104

Infrastructure Mode

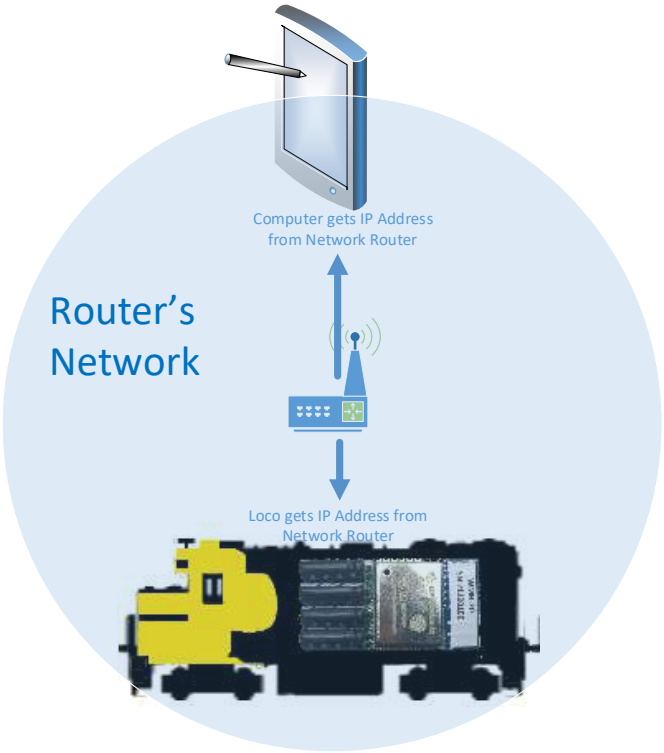


Figure 5 Infrastructure Mode for a WifiTrax Controller

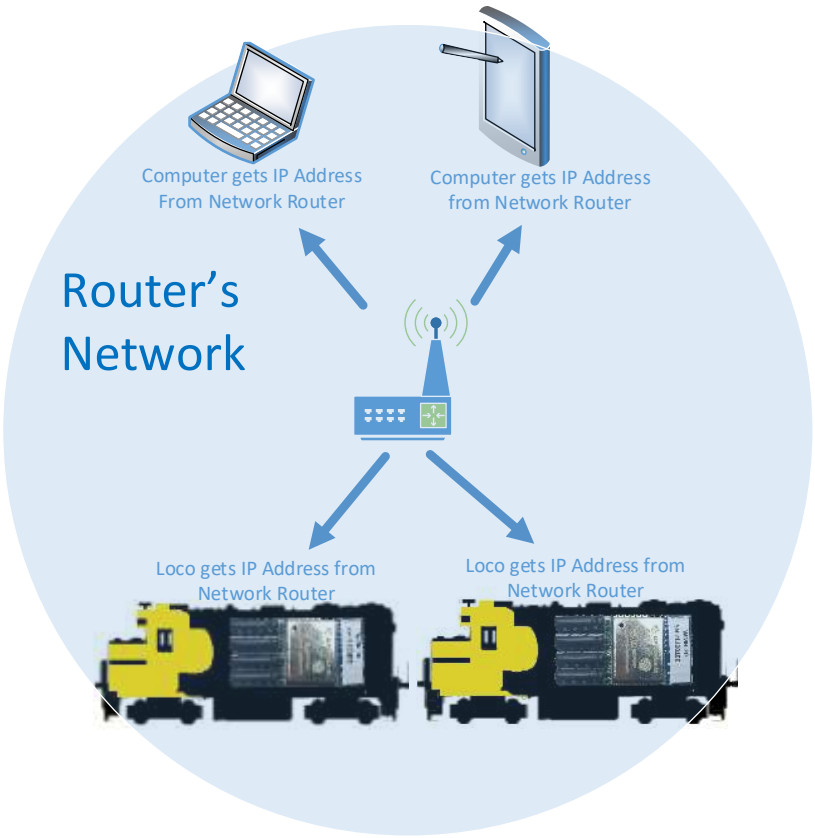


Figure 6 Two WifiTrax Locos and two computers on an Infrastructure Network

For Infrastructure Mode, Figure 5, a separate Wi-Fi Network Router is required. Usually this will be one in your home that you already use for internet access, but it could be dedicated to your model railroad. The network router in now the Access Point for its Wi-Fi network and it is the master in that it hands out IP Addresses to both your computer and your WifiTrax Locomotive.

The advantages of this configuration are that instead of the computer and loco being together on a private network, they can share the network with other devices and also access the internet if required. Figure 6 shows two computers and two locomotives connected on the same infrastructure network.

Driving Your Loco in Direct Mode

This section explains how to use the Loco Operator App to drive a WifiTrax Locomotive in Direct Mode.

The First Check of Your Locomotive

If you haven't yet installed the controller in the locomotive you can find help in documents such as

Atlas RS3 Installation

Kato GP35 Installation

OK, so you have installed one of our Wi-Fi Locomotive Controllers in one of your locomotives, checked everything visually and are ready to try it out!

The first test you can do does not require any software from us.

(1) Place the locomotive on your track and apply DC power between 12 Volts and 18 Volts (or power from a DCC booster that meets these specification). Please be careful not to apply higher voltages. We include over-voltage protection on our modules but this cannot always be relied upon. Also take care that if you are using AC, the peak voltage is 1.414 times the RMS voltage so using AC of 12V RMS would generate a DC voltage on our unit of 1.414 x 12 = 16.9V. You should therefore not use an AC voltage higher than 12.7 V RMS.

(2) When you turn on the power, you should see the front and rear lights illuminate for about a half a second, then go out. When the lights have gone out, this means the micro-computer is running. It the lights do not illuminate, or one or both of them stay on, something is wrong. Turn off the power immediately and check everything.

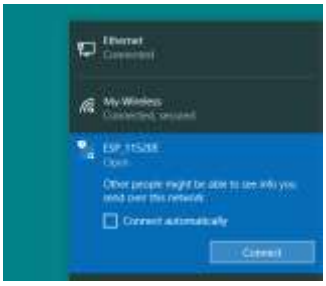
(3) On a computer that has Wi-Fi Access with Windows 10, Windows 7 or Windows 8 or Android 4.4 or greater, view the Network Settings.

a. On Windows, you can do this by clicking the Network icon in the System Tray in the bottom right hand corner of the screen:

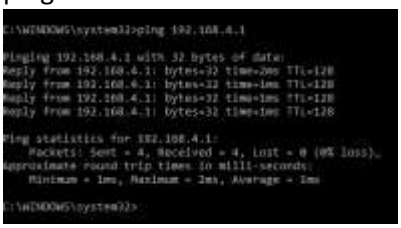
b. This will display the pop-up view as in Figure 7. On this view, you can see my ethernet connection, my Wi-Fi Connection called “My-Wireless” and you can also see a wireless access point called ESP_11520E as well as two weaker access points belonging to my neighbors. The ESP_11520E is the access point provided by my new WifiTrax Wi-Fi Controller module. Notice the exclamation point symbol which indicates that it provides no internet connection.

Figure 7 Network information view in Windows 10

c. Try connecting to the controller by clicking the ESP_11520E access point and clicking connect.

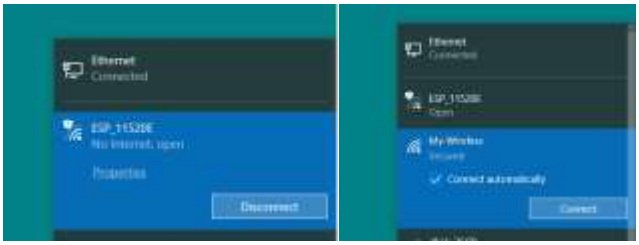


d. Once it is connected, open a command window and type:
ping 192.168.4.1



If the results are roughly as indicated above, your new module is working correctly. There are other things you can do via this interface, which I will describe elsewhere.

e. Now go back to the Network pop-up and disconnect as below and reconnect to your own network. Note that, until you do that, you will have no connection to the internet.



(4) To perform the same procedure on Android, you will need to install a Ping App from the Google Play Store. There are plenty of free ones to choose from. For my tests, I used one called “Ping” which seems to work well. You need to install this before proceeding, if you want to ping your controller.

(5) You can perform the same check using Android using the following procedure:

a. In Android, press the Home button, then choose Apps and Settings.

b. Select the Wi-Fi setting on the left of the screen. The screen should be like Figure 8.

Figure 8 The Android Settings, Wi-Fi screen showing the Wi-Fi Access point of your new WifiTrax Controller

c. Tap the access point identified with an SSID beginning with ESP_ and tap connect. Note that the last six characters are the last six characters of the MAC address, without the dashes. You will now be disconnected from your normal access point, through which you obtain internet access, and be connected to the locomotive controller's access point, as in Figure 9.

Figure 9 Connecting to your Locomotive Controller's access point. The SSID will be that for your purchased controller.

d. Once you are connected to your Locomotive Controller's Access Point, you can run the Ping App and ping it at its default IP Address 192.168.4.1

e. Press the Home button, then choose Apps and Ping.

f. Type the IP Address into the Ping App and tap Start. You should see some responses as in Figure 10.

Figure 10 The Ping Application

g. Once you are happy, you can close the Ping App and reconnect to your normal Wi-Fi access point as in Figure 11.

Figure 11 Reconnecting to your normal access point in Android.

(6) The above procedure seems very complicated when you describe every step but it's actually a very simple and quick check to make sure your installation of the WifiTrax controller is working correctly before you attach it to your Wi-Fi network.

(7) Remember that all of the above is done before you give the controller access to your Wi-Fi network. You are using *its own Wi-Fi network*, by connecting to its Access Point to do this test. (Just for interest, when you do this, the Locomotive gives your computer an IP address, usually 192.168.4.2, so it's acting as the network router. Funny to think of a model loco being a network router.)

Drive Your Locomotive

To drive your locomotive, you will need to install the Loco Operator App either on Windows 10 or Android. Once that has been done run the app either on Windows 10 or Android.

(1) Click the Settings Tab. The Settings Page has two tabs, General and Networks, shown in

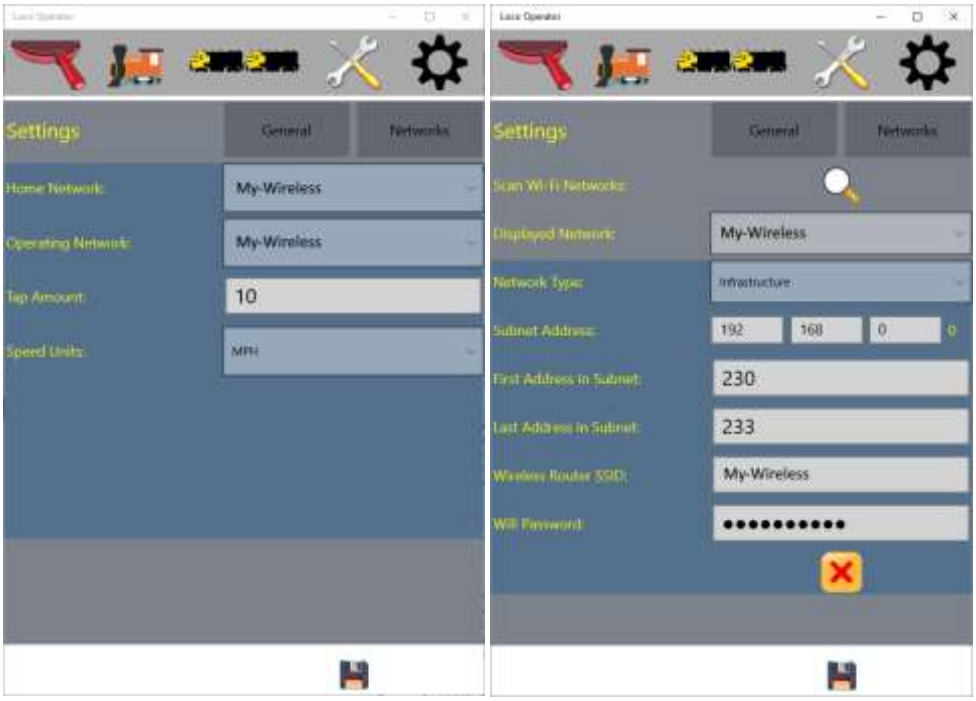


Figure 12 The Settings Screen Tabs

(2) Select the Networks Tab. Initially no networks will be available.
(3) Make sure your locomotive is on track and powered up.
(4) Click the Scan Wi-Fi Networks button. This will determine all the Wi-Fi networks visible to your computer. You can look at them individually by selecting a network in the Displayed Networks drop-down. Networks are divided into infrastructure and Controller type networks. Controller Networks are private networks belonging to WifiTrax Controllers, Infrastructure Networks are networks controlled by network routers.
(5) Find the controller network for your new locomotive, for example as in Figure 13. The SSID for your controller will be of the form ESP_XXYYZZ, where XX, YY, ZZ are the last three fields of the MAC Address printed on the bag label of your controller module.
(6) Go back to the General Tab of the Settings page and select your controller's SSID in the Operating Network drop-down as in Figure 14.
(7) Now connect your computer to the same network as you selected. This is the same as you did in the section "The First Check of Your Locomotive" Figure 7, Figure 8 and Figure 9.
(8) Now select the Locomotives Tab on the Loco Operator app. It should look like Figure 15. If instead of the green "Net Accessible", there is red "Net Not Accessible" it means that your computer has not been connected to the Wi-Fi access point of the controller as in the previous step.
(9) Click the Scan button  . You now see a pop-up indicating that the network will be scanned over a range of IP addresses. In the case, the range will include only 192.168.4.1, Click OK.
(10) When the scan completes, you should see something like Figure 16 with your new locomotive indicated as Available.
(11) Now go to the Drive Page on the app and select the locomotive in the Drive: drop-down as in Figure 17.
(12) You can now begin driving as in Figure 18. Make sure the locomotive runs smoothly and that the lights work properly, if they are fitted.

Figure 13 Controller Network for a new WifiTrax Locomotive.

Figure 14 Choosing direct mode. Select a loco private network as the operating network.

Figure 15 Locomotives Page for a selected Network.

Figure 16 Locomotives Page for a selected Network after scanning.

Figure 17 Selecting the new locomotive for driving.

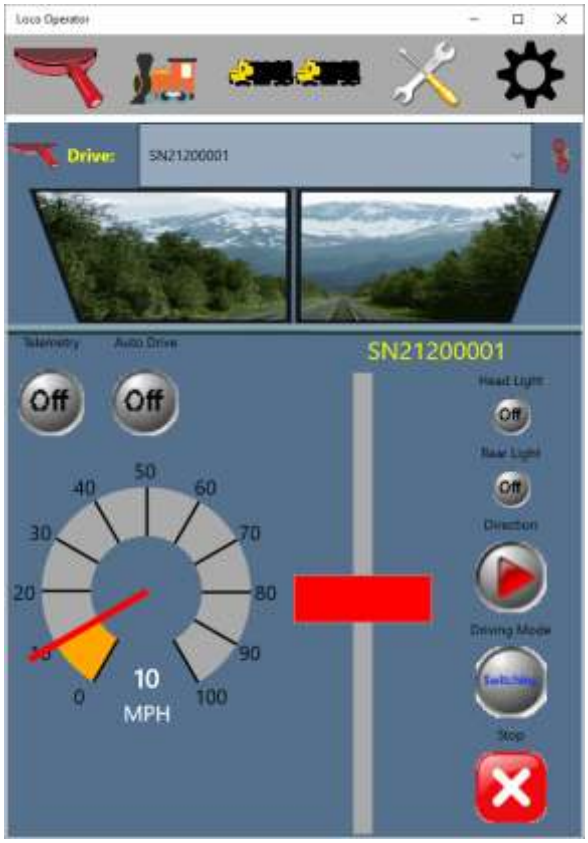


Figure 18 Driving the new locomotive.

Driving a New Locomotive in Infrastructure Mode

In this section, I'll go through the process of connecting a new locomotive to your network.

First some privacy information regarding your network information:

Privacy Information Relating to Network SSID and Password

In order for your new locomotive to be able to connect to your router, you must use our software (or an alternative means) to send it your Wi-Fi connection details including the password. The locomotive controller will store this password in its Flash memory permanently.

If you sell or otherwise dispose of your locomotive controller whether with or without the locomotive, it might be possible for someone to discover your Wi-Fi password by reading the Flash memory or by other means. Therefore, in the event of disposal you should go through the procedure to remove your locomotive from your network, as described in this document. This will remove the SSID and password from the flash memory.

WifiTrax Model Science the manufacturer of WifiTrax software and modules hereby guarantees that we will never add into our software or firmware the means of uploading your network information to the internet, or make use of any information from your models in any way whatsoever without your express permission.

Further, we hereby declare that our WifiTrax products contain no listening or visual devices such as microphones or cameras and that if, for the purposes of model railroad realism, we should add any such devices in future products, we will include full information and privacy notices as appropriate to such future products.

(1) If you have not already done so, install the WifiTrax Loco Operator App from the Windows App Store.
(2) Start the App and go to the settings page. Select the Networks Tab and scan for Wi-Fi networks. Determine which network is to be your home network and enter the Wi-Fi password for your network router as in Figure 23. If you are able to do this without problem, you can skip steps (3) – (8) below. Note that the range from first and last IP address should normally match those addresses allocated to DHCP and may be rather large. You can reduce range by using address reservations as described later in this document.
(3) If you are not sure which network to use as your home, you can look at the settings of your router. The IP Address of the router manager page is usually 192.168.0.1, so you can type this IP address into a web browser such as Google Chrome, Internet Explorer or Edge and hit Enter. You will probably see a screen as in Figure 19. If you have changed the password for your router, you will know it (I hope!), but otherwise you will need to dig out the information that came with it to find the default User Name and password. I happen to be using a Netgear DG834 in my lab and the default is "admin" and "password", both being case sensitive. You can usually find the default value in the instructions on the manufacturer's web site, if like me, you have lost the instructions that came with it.

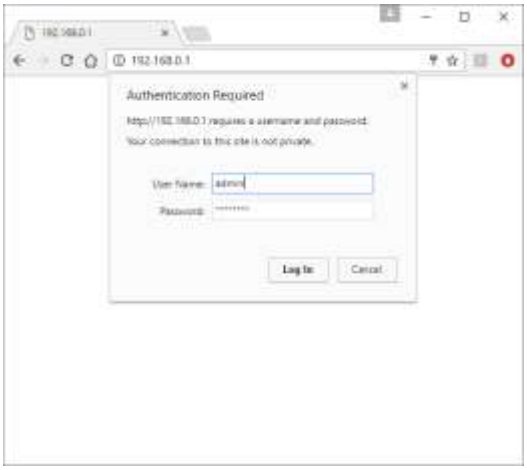


Figure 19 Opening the Maintenance Page of your Network Router

(4) You should see a page something like Figure 20. Of course, all routers are a little bit different but they all have sections that relate to:

a. The WAN or Internet Setup – that's the Wide Area Network that connects you to the internet,
b. The LAN Setup that sets up your local network,
c. The Wireless Setup that defines the way your Wi-Fi operates.

Remember, your home network includes the computers on your ethernet Local Area Network (LAN) *and* the computers connected via Wi-Fi and the DHCP setup includes the range of IP Addresses defined for both.

Figure 20 Typical Router Admin Page

(5) Routers nearly always use something called NAT which is Network Address Translation. This allows you to have a whole independent set of IP Addresses on your *internal* network that is completely independent from the world outside. We need not worry about this since the router handles all the details, except to say that by convention most routers use the subnet 192.168.0.0 or 192.168.1.0. Defining a subnet such as this gives us 254 available IP addresses which is plenty for most people.
If you have a more complicated network involving multiple subnets then you will know how to set it all up.

(6) The page of interest is the LAN Setup page and somewhere you should be able to find a section like Figure 21. It may be a bit different on your router, but these settings will be there somewhere. You don't need to change them but you do need to copy some of them.
The first is the IP Address of the router, this is usually set to 192.168.0.1 or 192.168.1.1.
The second is the IP Subnet Mask. It is nearly always 255.255.255.0.
We need to make a note of the Subnet Address which is actually the portion of the router's IP address which is not masked by the zeros in the subnet mask. To get this we take the bitwise AND of the binary value of the subnet mask with the router's IP address:

Subnet Mask:	255.255.255.0	11111111 11111111 11111111 00000000
Router IP Address:	192.168.0.1	11000000 10101000 00000000 00000001
Subnet Address:	192.168.0.0	11000000 10101000 00000000 00000000

It sounds complicated, but most domestic routers are set up like this one. In this case, it is 192.168.0.0 so make a note of that.
Now find the DHCP Settings. These define the range of IP Addresses that the router may hand out to computers requesting allocation of one via DHCP.
On this router, the range is 192.168.0.10 to 192.168.0.254. Make a note of the starting and ending IP Addresses on your router.

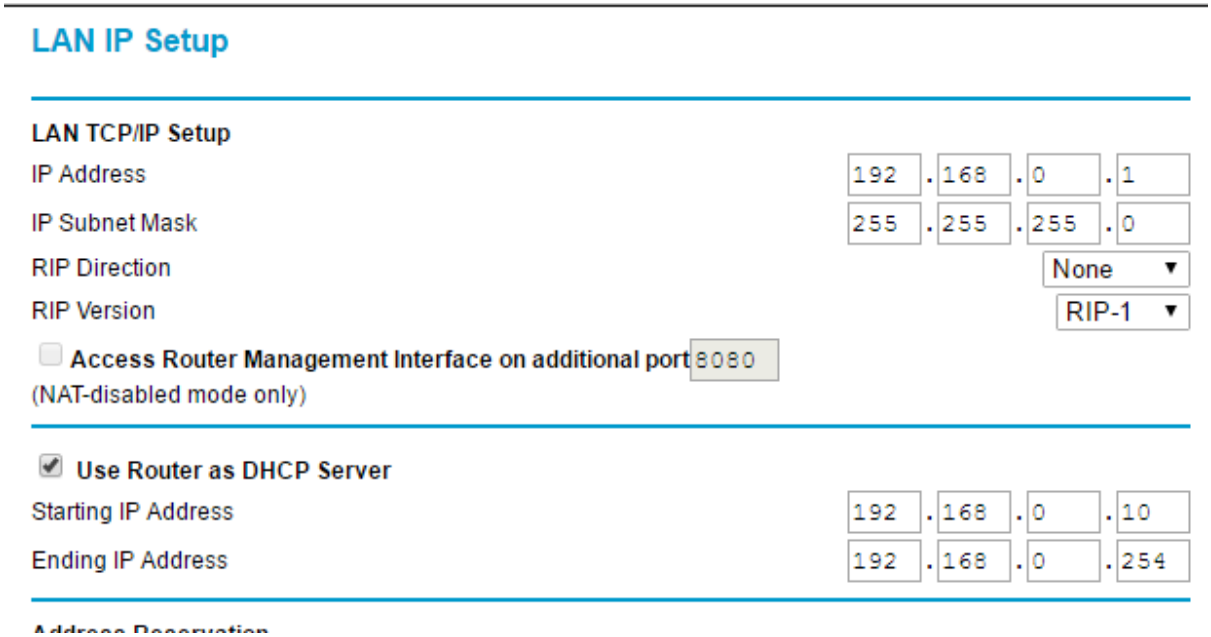


Figure 21 The important LAN Settings on your router

(7) The next thing you need to do is to find the settings for the Wireless Access Point. In fact, I'm using a separate wireless access point from my router. Anyway, the settings are shown in Figure 22. Again, we don't need to change these. The important settings are Wireless Network Name (SSID) and the Pre-Shared Key (Password). For the example in Figure 22, the SSID is My-Wireless. The Password is hidden but you will know what it is for your router because you use it each time you connect a new smart phone to your Wi-Fi network. It's exactly the same information you ask for when you want to use your smart phone in a restaurant.

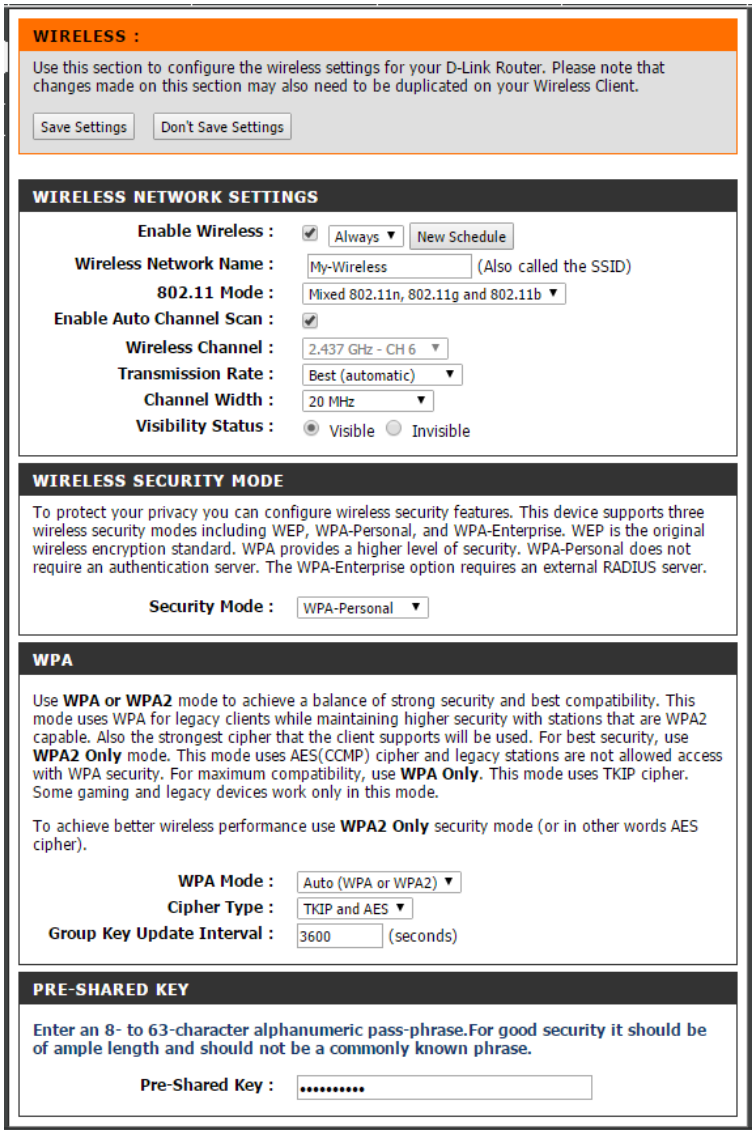


Figure 22 Typical Wireless Settings on your Network Router

(8) So now you have 5 pieces of information written down:
Subnet Address
DHCP Starting IP Address
DHCP Ending Address
SSID
Password
Now going back to the settings tab on the WifiTrax Loco Controller App, you can enter these settings in the correct boxes. Figure 23 shows the values entered for the example. Of course you must enter the values that you obtained from looking at your router.

Figure 23 The router configuration values in the Settings Tab

(9) Click the Save symbol at the bottom right of the Settings Tab.
(10) Now go to the General Tab and select your chosen Home Network and save the settings.
(11) Now you are ready to start working on your new locomotive to add it as a Station on your home network. To do this you have to send it the Home Network SSID and Password and you have to work in direct mode to do this.
(12) On the General tab of the Settings Page select your locomotive's private Controller Network as the Operating Network.
(13) Connect your machine to that Wi-Fi network.
(14) View the Locomotives tab, perform a scan if needed and make sure that the network is accessible and the locomotive is available.
(15) Go to the Drive page and select the locomotive in the Drive: drop-down.
(16) Now go to the Tuning page and select Page 2. It should look like Figure 24.

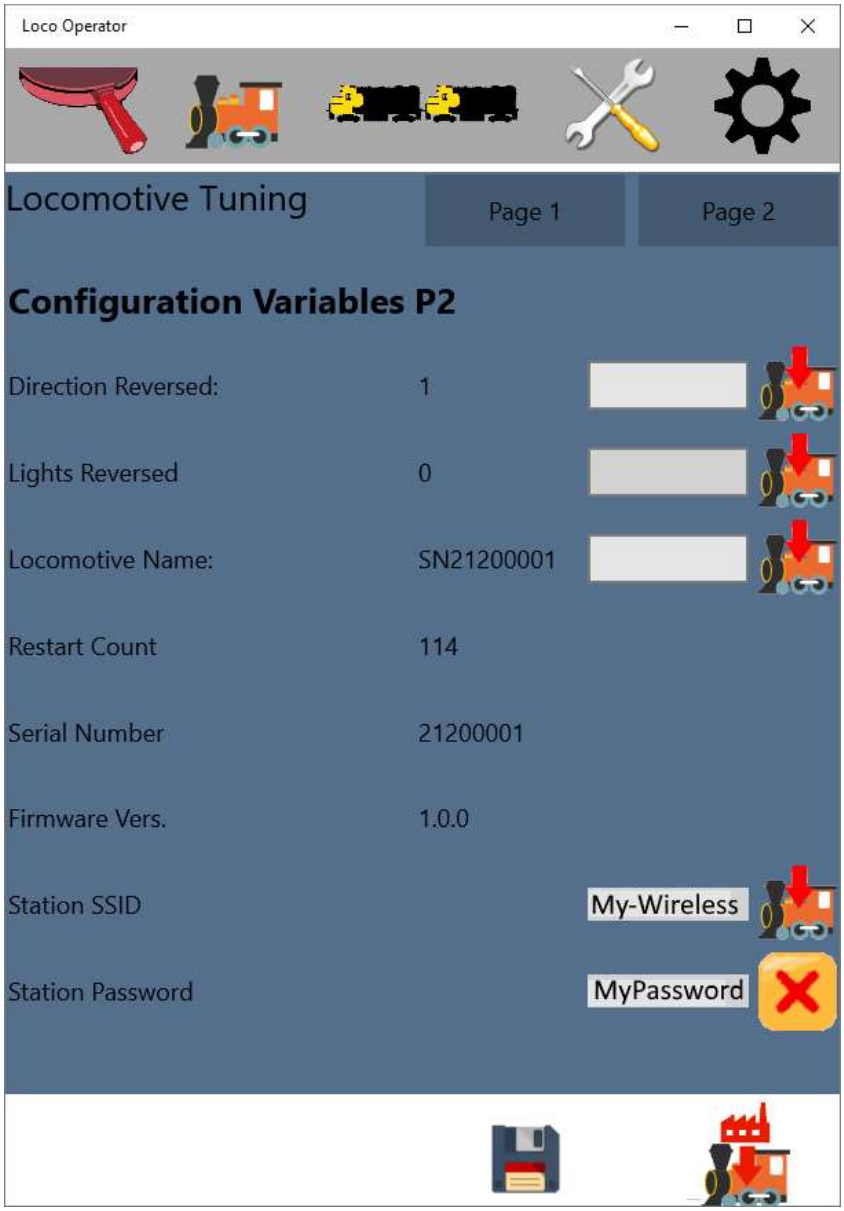


Figure 24 Tab 2 of the Tunings Page ready to download the Home Network information.

(17)Click the Apply Tuning button to the right of the Station SSID. A message will be shown describing what will happen. Click OK.

(18)A message will be displayed indicating that tunings are being downloaded, then the Tunings screen will be refreshed as in

Figure 25 Tab 2 of the Tunings Page after download of the Home Network information.

(19) Now return to the Drive page and deselect the locomotive.
(20)Return to the settings page and select the home network as the operating network.
(21)Connect your computer to the home network.
(22)Display the Locomotives tab which should show that the home network is accessible but with no locomotives on it.

Figure 26 Locomotive Management Tab before Scan

(23)Click the scan button – the one like a magnifying glass. Figure 27 shows what will happen. Your entire subnet will be scanned for computers that are WifiTrax Locomotive Controllers from 192.168.0.10 to 192.168.0.254. Since this is a large range it will take quite a long time. Later I will show you how to greatly reduce this time. There is a progress bar to show how far you have got.

Figure 27 Starting the Scan for Wi-Fi Locomotive Controllers

(24)When the scan completes, the screen looks like Figure 28.

Figure 28 Completion of Locomotive Scan for your First Locomotive after adding it to your home network.

(25)The new locomotive is already selected and its details are shown in the section at the bottom.

(26)Now go to the Drive page and select the locomotive in the Drive drop-down. You can drive it now on your home network in infrastructure mode. Each time the locomotive powers up it will join the home network as a station as well as offering its own private controller network as an access point. You may drive it either in direct or infrastructure mode.

(27)You may want to visit the tuning tab to give the new locomotive a recognizable name since the default name is just the serial number applied during manufacturing.
To change the locomotive name in the settings tab, type a new value as in **Error! Reference source not found.**, then click the Apply button just to the right. To make the name change permanent, you must also click the Save button at the bottom. Please see the software manual for more details.

(28)You have now completed the operation of adding your new locomotive to the network. There are a few extra actions to be taken as described in the next section.

Making Your Model Railroad Home Wi-Fi Network More Efficient

There are two problems with what we have described so far:

(1) When each Locomotive Controller attaches to your Network Router Access Point, the network router grants it an IP Address but the grant is based on a lease period. That is to say, the Controller is only permitted to use the IP Address for a limited period of time. When that time has elapsed, the network router grants a new one which may not be the same. Therefore, each day, the layout must be scanned to get the latest IP Addresses of the controllers so they can be selected for driving.

(2) Since the range of IP Addresses that can be allocated is typically 1 to 254 on the subnet all of these must be scanned to establish which IP Address has been allocated to a Locomotive Controller. This can take quite a long time.

Both of these issues can be easily solved by making use of another capability of all network routers, the ability to reserve an IP Address for a particular MAC Address.

Here's the procedure:

(1) First decide on a range of IP Addresses within your subnet you want to allocate to Locomotive Controllers. If you might possibly have ten locomotives, you could allocate 200 to 210 as the range of the least significant field in the IP Address, so typically that might be 192.168.0.200 to 192.168.0.210 if your subnet address is 192.168.0.0 with a mask of 255.255.255.0.

(2) Go back to your network router and find where IP Address Reservation is controlled. Usually it's on the page concerned with LAN IP Setup. In Figure 29, the page we looked at earlier, there is a table showing the current reservations. There are Add, Edit and Delete buttons.

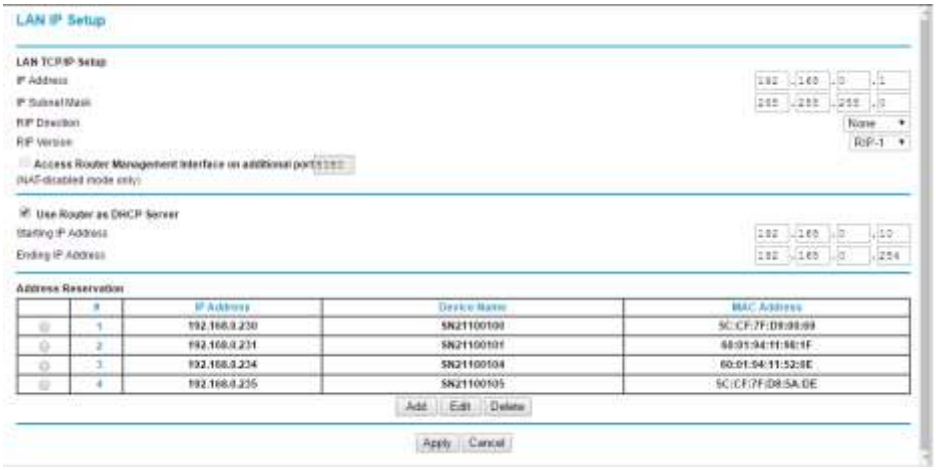


Figure 29 IP Address Reservation Settings for a Typical Router.

(3) Click the Add button to make a new IP Address reservation for your new locomotive. Typically a screen with a section something like Figure 30 will be displayed.

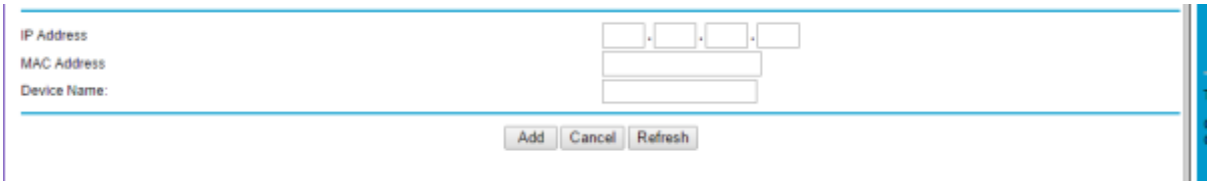


Figure 30 New Address Reservation Fields

(4) Fill out the form with the first IP Address in the range you decided in step (1), add the MAC Address from the label supplied with the module or from the Locomotives Screen displayed in the Loco Operator App (in the example 60-01-94-11-52-0E). Use the Serial Number for the Device Name. The screen appears as below.

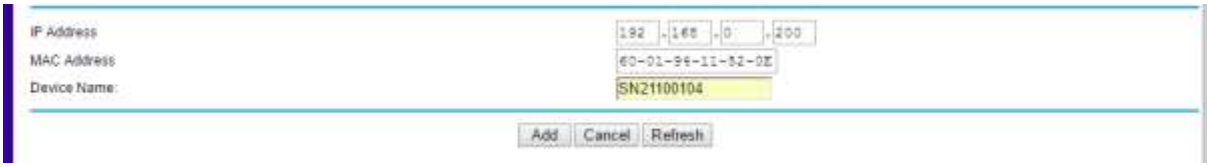


Figure 31 Completing the values for a new address reservation.

(5) Click the Add button to create the new reservation.
(6) Cycle power on the locomotive. Be sure to keep it powered down for at least 15 seconds to ensure the keep-alive period expires and the micro-computer resets.
(7) Go to the settings page and change the First and Last Addresses in the Subnet to be those that you decided on in step (1).
(8) Now you must do a new scan and you will see that the locomotive has been given the new IP Address by the router. The locomotive controller will always have that IP Address and the network router will not allocate it to any other computer. Moreover, the time taken to scan will be much shorter, since the Loco Operator App only needs to scan 10 IP Addresses..

Making use of the Address Reservation Capabilities of a network router is very useful when you don't want an IP Address to change.

Conclusion

If you've managed to get through this and you've never worked with networks before, congratulations! It's really not that difficult and it's worth understanding these ideas about networks as it will help you fix all kinds of computer problems.