

WFD-31 NCE Cab Bus Wi-Fi Interface

Operating Manual

This document is online at <http://www.wifitrax.com/manuals/WFD-31/WFD-31-Manual.pdf>.

IMPORTANT NOTICE

This manual describes the WFD-31 with Firmware Version 1.2.10 or earlier. If you have Version 2.0.0 or later firmware, please refer to the link below:

<http://www.wifitrax.com/manuals/WFD-30-31/WFD-30-31-Manual.pdf>.

Please see our website for information on our limited warranty.

WifiTrax Model Science



www.wifitrax.com

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This product is not a toy. Keep away from children. It is not suitable for use by persons under 14 years of age.
Warning: This product contains chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.

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Version History

| Version | Changes |
|---------|---------------------------------------|
| 1.0 | Initial Release |
| 1.1 | Added link to later version for 2.x.x |
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WFD-31 NCE Cab Bus Wi-Fi Interface Operating Manual

What does WFD-31 NCE Cab Bus Wi-Fi Interface do?

The WFD-31 allows you to drive your DCC trains from a hand-held untethered controller by providing a Wi-Fi connection to NCE command stations and boosters. In PCP mode, it replaces the circuit board in an NCE Power Cab Panel (PCP) or in UTP mode a Universal Throttle Panel (UTP) and provides Wi-Fi control of your DCC locos as well as the original functions of the PCB or UTP.

- You can drive trains and control DCC accessories using a smart phone or tablet as a hand-held controller provided it has Wi-Fi capability and you have installed one of our recommended apps in Table 2 such as Engine Driver on Android and WiThrottle on Apple.
- You can use a hand-held throttle designed to control trains using the WiThrottle protocol such as the TCS UWT-100 Universal Wi-Fi Throttle.
- You can use a Windows or Apple computer, such as a laptop or desktop, with a recommended app from Table 2 installed.
- You can connect four throttles at a time but you can increase this limit using a “Home Net” to six as described in the manual.
- you may have used a computer running JMRI, you can now bypass JMRI and connect your phone directly to the WFD-31.

You don't need to install JMRI to use the WFD-31

If you have been using an app on your phone to drive trains, via a computer running JMRI, you can now bypass JMRI and connect your phone directly to the WFD-31. You can still use JMRI if you want to – it just means that the WFD-31 and the JMRI installation will both appear as WiThrottle servers in your app. Similarly, if you use [more than one WFD-31](#), they will each appear as WiThrottle servers available to your app.

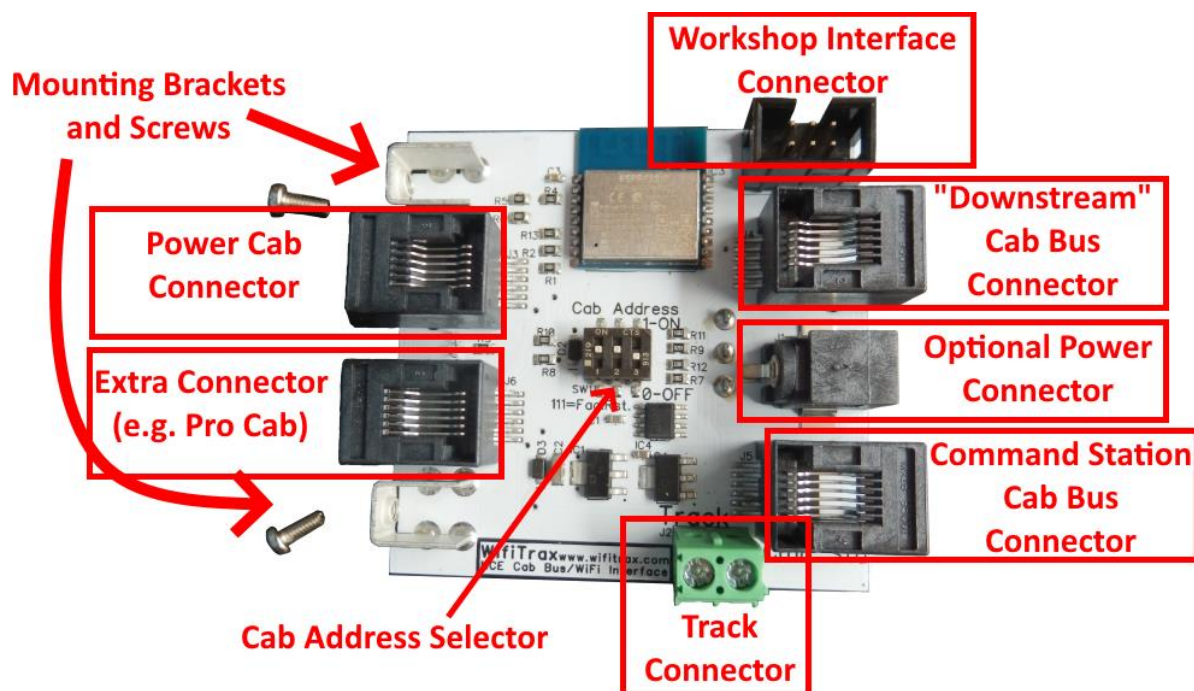


Figure 1 Connections and switches on the WFD-31

Figure 1 shows the WFD-31 module with its connectors labelled. The module can be connected in two modes: Power Cab Panel Mode (PCP Mode) and Universal Throttle Panel Mode (UTP Mode).

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Power Cab Panel (PCB) Mode Connections.

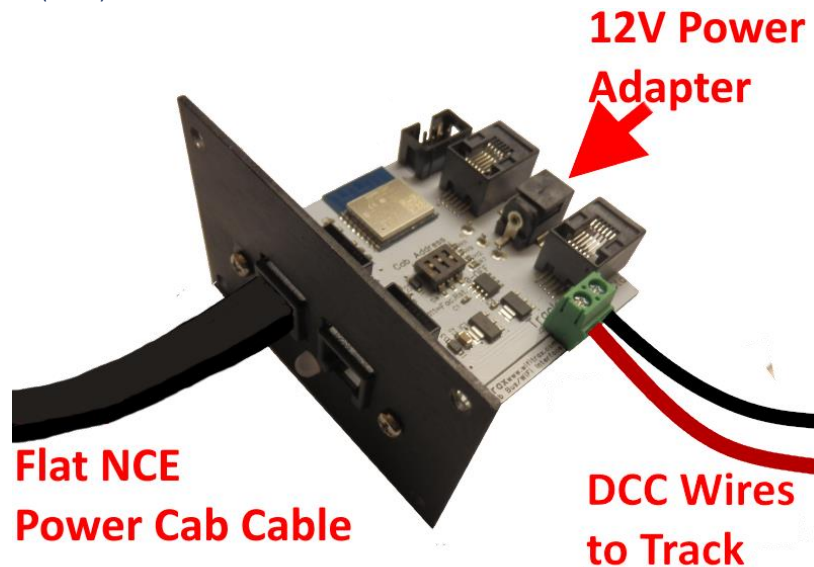


Figure 2 Basic Connections used in PCP Mode

Consider first connection in PCP mode. There are two modular connectors on the front of the module (left in the figure). The one labelled “Power Cab Connector” (on the left when viewing the fascia) is intended to be connected to an NCE Power Cab using the flat cable supplied with the Power Cab. When connected, it carries power to the Power Cab, and provides the Cab Bus for which the Power Cab is master. It also carries the DCC output from the Power Cab to the track.

The other connector on the front may be used to connect to another Cab-Bus throttle such as a Pro Cab.

On the rear of the module (right in the Figure 1) there are two more modular connectors which in PCP mode can be used to connect more modules to the Power Cab’s Cab Bus.

In the center of the rear of the module is the “Optional Power” connector. In PCP mode this is not optional and must receive 12-volt DC power which supplies both the connected Power Cab and the WFD-31 module as well as any other units connected on the other modular connectors. This connector requires a power adapter with a power jack or barrel connector with 2.5mm dia. pin, 5.5mm outer diameter, center positive.

The “Track Connector” is used to supply the DCC signal output from the Power Cab to your track.

Finally, the “Workshop Interface Connector” is used with a WifiTrax FWA-20 module to upgrade your firmware using the WifiTrax Workshop software.

On the underside of the module is the Power Source Selector switch. **In PCP mode, this must always be in the EXT POWER position.** This selects power from the 12 Volt Adapter, rather than from a command station.

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Universal Throttle Panel (UTP) Mode Connections.

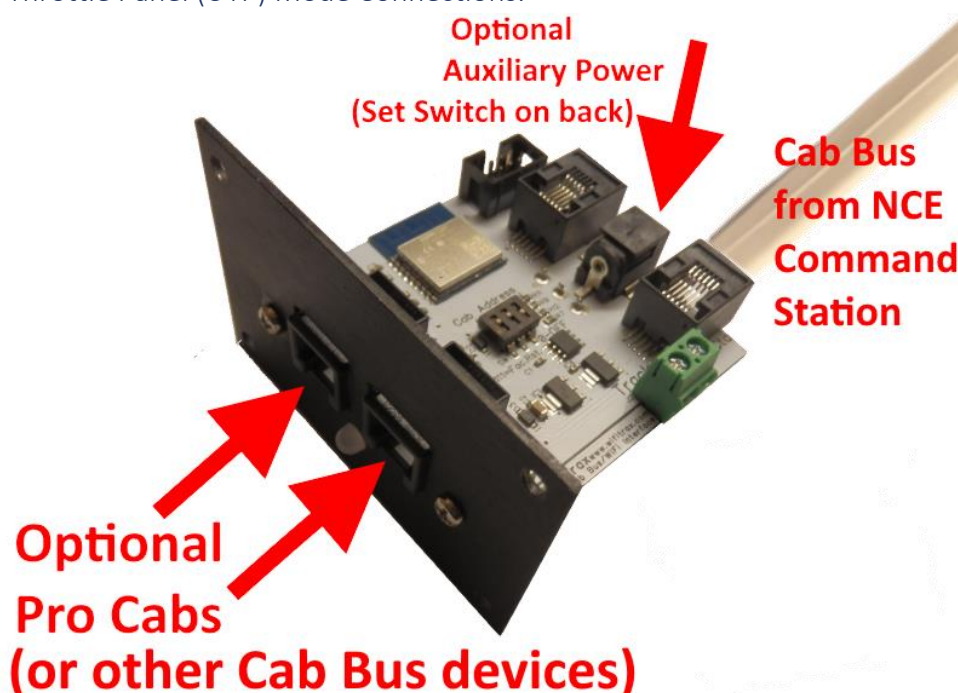


Figure 3 Basic Connections used in UTP Mode

Now consider UTP mode. Both of the two modular connectors on the front of the module (left in Figure 1) now operate as Cab Bus connectors to connect Pro Cabs or other Cab Bus devices.

On the rear of the module (right in the Figure 1) there are two more modular connectors which in UTP mode have distinct functions. The one labelled "Command Station Cab Bus Connector" in Figure 1 must be connected by a regular Cab Bus cable to one of the Cab Bus connectors on your NCE Command Station. This carries power from the Command Station and can supply both the WFD-31 and any Cab Bus devices connected to it. To make use of this, the

The connector labelled "Downstream Cab Bus Connector" may be used to connect to another Cab Bus device or to a "downstream" UTP.

In the center of the rear of the module is the "Optional Power" connector. In UTP mode use of this is optional and is an alternative power source for the WFD-31 and any Cab Bus devices connected to it.

To make use of it, position the Power Source Selector switch in the EXT POWER position. This selects power from the 12 Volt Adapter, rather than from a command station. When the Power Source Selector switch in the NORM POWER position, the WFD-31 and all connected devices, including downstream devices get their power via the Cab Bus from the NCE Command Station.

This Optional Power connector requires a 12-volt power adapter with a barrel connector with 2.5mm dia. pin, 5.5mm outer diameter, center positive.

The "Track Connector" is unused in UTP Mode.

Finally, the "Workshop Interface Connector" is used with a WifiTrax FWA-20 module to upgrade your firmware using the WifiTrax Workshop software.

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A Note on Cab Bus Cables

For Cab Bus cables you should always use NON-REVERSED cables with RJ-12 6P4C Modular Plugs on each end – the coiled cable from NCE is, of course ideal. **Warning: Some phone cables are reversed. The WDM-30 will not work with these but it will not be damaged.** See the section “More about Cables” if making your own.

Cab Bus Address Selection

The switches in the middle of the module are used to set the address that the module will respond to on the NCE Cab bus, the factory default being address 10. Please refer to Table 1 if you need to change the Cab Bus address to avoid conflict with other NCE Cabs that you might be using on your layout, or if you are using NCE equipment that has a limited range of Cab Bus addresses.

What is WiThrottle protocol?

WiThrottle protocol is a set of commands and data formats, authored by B. Hoffman and used by JMRI, that allows devices such as iPhone, Android phones and tablets to control trains and turnouts through a WiThrottle server. It has become something of a standard and is used by other products. You can find technical information here:

<https://www.jmri.org/help/en/package/jmri/jmrit/withrottle/Protocol.shtml>

What is JMRI?

JMRI (Java Model Railroad Interface) is a system of computer programs and support software that can be installed on a computer to do many things with your model railroad including running trains, controlling turnouts and programming DCC decoders. JMRI provides a wiThrottle server to allow you to run trains from phones etc. You can learn about JMRI here:

<https://www.jmri.org/>

Let's get Started!

Connecting your new WFD-31 Cab Bus Wi-Fi Interface

- (1) **Connection:** Decide if you are going to use the WFD-31 in PCP or UTP mode. If you have an NCE Power Cab, you will choose PCP mode. With an NCE Command Station such as Power Pro or SB5, you will choose UTP mode.
- (2) **CAB Bus Address:** All Cabs connected on the NCE Cab Bus must have a unique address. Use Table 1 to set the Address Switches to select an unused CAB address. The factory default is CAB Address 10. NCE Power Cab and some early NCE command stations do not scan beyond 3, so in that case, you must use address 3.
The last entry in Table 1 causes factory reset. If you wish to completely reset the unit, power down, set the switches to this position, power up and wait 5 seconds, power down and return them to select the Cab address you want. Do not leave the switches in the factory reset position.

Important note for Power Cab users: If you are using a Power Cab in “Master” mode so that it acts as the DCC command station, **you must make sure it is version 1.65B**. WFD-31 will not work with earlier versions of Power Cab such as 1.65. Version 1.65B supports Cab Addresses 3, 4 and 5, so you must set your WFD-31 to one of these using the DIP switches as in Table 1. Address 3 is a good choice, but (all the switches in the Off position) but if something else uses Cab Address 3 such as a Pro Cab, you could use Cab Address 4 or 5. If you are using Power Cab as a cab on another NCE system, this does not apply, but you must make sure the WFD-31 is given a different address to the Power Cab.

- (3) **Mounting:** Remove all the connections to your PCP or UTP and remove it from your layout's fascia. Remove the two screws securing the circuit board in your PCP or UTP to the front panel. Drill out the small hole so the LED on the WFD-31 will fit using a 5mm (#10) drill. Replace the original board with the WFD-31 using the screws provided. Re-attach to your

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layout's fascia as before. **Do not let the unit touch powered track or it may be damaged beyond repair!**

(4) Connect:

- a. **Either** PCP Mode Connections: Figure 2 left. Place the switch on the back in the "EXT POWER" position. Use the flat Power Cab cable from NCE to connect your Power Cab to the modular connector labelled "Power Cab Connector". Connect a 12 Volt Power supply (Power Jack. 2.5mm dia. pin, 5.5mm outer diameter, center positive) to the "Optional Power Connector at the back of the module. Connect your track to the two screw terminals labelled "Track Connector".
- b. **Or** UTP Mode Connections: Figure 2 right. Place the switch on the back in the "NORM POWER" position. Use an NCE Cab Bus cable to connect the "Command Station Cab Bus Connector" on the back to a cab bus output of your NCE Command Station. Power will come from the Command Station.

Setting the NCE CAB Bus Address of your WFD-31

| SW1 | SW2 | SW3 | NCE CAB Bus Address |
|-----|-----|-----|-----------------------------|
| 0 | 0 | 0 | 3 |
| 1 | 0 | 0 | 4 |
| 0 | 1 | 0 | 5 |
| 1 | 1 | 0 | 10 (default) |
| 0 | 0 | 1 | 20 |
| 1 | 0 | 1 | CAB Address 1* (Default 30) |
| 0 | 1 | 1 | CAB Address 2* (Default 40) |
| 1 | 1 | 1 | 10 (Causes Factory Reset!) |

Table 1 CAB Bus Address Selection Options (0 = Off, 1 = On)

* Address 30 & 40 may be set to any CAB address using Web Pages)

LEDs on the WFD-31

The WFD-31 has a single Red/Green/Blue LED which requires a 5mm (#10) hole through the fascia panel.

| Color | Condition |
|-------------------------|--|
| Red | WFD-31 is powered but no other function is operational. |
| Magenta | Cab bus recognizes module. |
| Magenta, flashing white | Cab bus recognizes module and module is receiving Wi-Fi traffic. |
| White | WFD-31 is on home net. |
| White flashing magenta | WFD-31 is on home net and receiving Wi-Fi traffic. |

Driving your First Trains

You can drive trains using any of the Apps in Table 2. WiThrottle and Engine Driver are apps that use the [WiThrottle protocol](#) and provide driving of trains, and control of accessories. The WFD-31 does not support routes, layout power or JMIRI panels. WifiTrax Loco Operator 3 provides train driving and configuration capability as well as being compatible with our other products such as switch machine controllers, Wi-Fi DC for DC locos etc. You can also configure the WFD-31 using its [Web Pages](#) which are accessible using WiThrottle (Full Version) or Engine Driver or indeed any web browser via the device's default URL <http://192.168.7.1>

| App Name | Author | Get From: | Windows 10 | Android | Apple IOS | Notes | Advanced Features |
|----------|--------|-----------|------------|---------|-----------|-------|-------------------|
|----------|--------|-----------|------------|---------|-----------|-------|-------------------|

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| | | | | | | | |
|-----------------|--------------|------------------------------------|-----|-----|-----|-----------------------------|----------------------------|
| Loco Operator 3 | WifiTrax | Windows Store or Google Play Store | YES | YES | NO | | YES* |
| WiThrottle | Beth Hoffman | Apple App Store | NO | NO | YES | | Via Web Pages |
| WiThrottle Lite | Beth Hoffman | Apple App Store | NO | NO | YES | No Accessories, No web page | Via Web Pages using Safari |
| Engine Driver | Steve Todd | Google Play Store | NO | YES | NO | | Via Web Pages |

Table 2 Recommended Apps that work with the WFD-31

* WifiTrax Loco Operator 3 provides setup for the more advanced features such as Home Net operation, Rosters and Automatic Function Labels. However, once you have set up these using Loco Operator, they will be available in WiThrottle and Engine Driver. You can also use the WFD-31 web pages as mentioned above.

Getting Started with WiThrottle on Apple IOS

- (1) On your iPhone, iPad or iPod device, make sure you are connected to the internet then go to the home screen and run the App Store app:



- (2) Tap Search at the bottom right, type “WiThrottle” in the Search box at the top, tap the Search key, and tap either the Lite or full version, tap “Get” to download and install. This is a great app and the full version is well worth the small fee so we definitely recommend buying it! Don’t open the app yet.

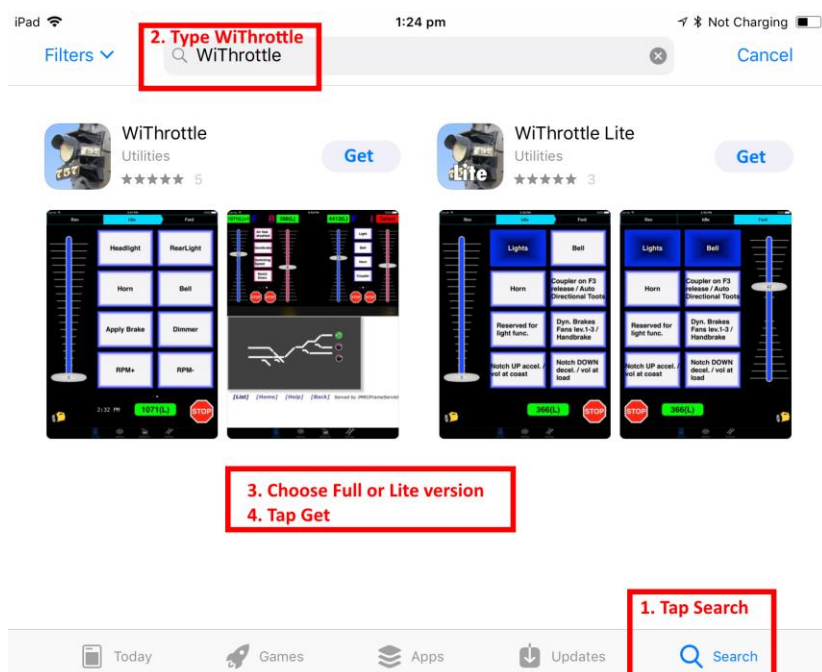


Figure 4 The Apple App Store page for WiThrottle

- (3) Before opening the app, make sure your WFD-31 is connected, your NCE Command Station is powered up and there is a locomotive on the track with a known DCC address. Both the red power LED should and the blue Cab Bus indicator LED should be alight.
- (4) Now run the Settings app on your iPhone (or iPad etc.):

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- (5) Tap Wi-Fi on the left-hand menu. You should see a collection of available Wi-Fi Access Points on your right. Look for one that is of the form wftrx_WFD31_1_XXXXXXX_7, where XXXXXXX is the serial number of your unit that appears on its bag and the unit itself. Tap that Wi-Fi Access Point as Figure 5.

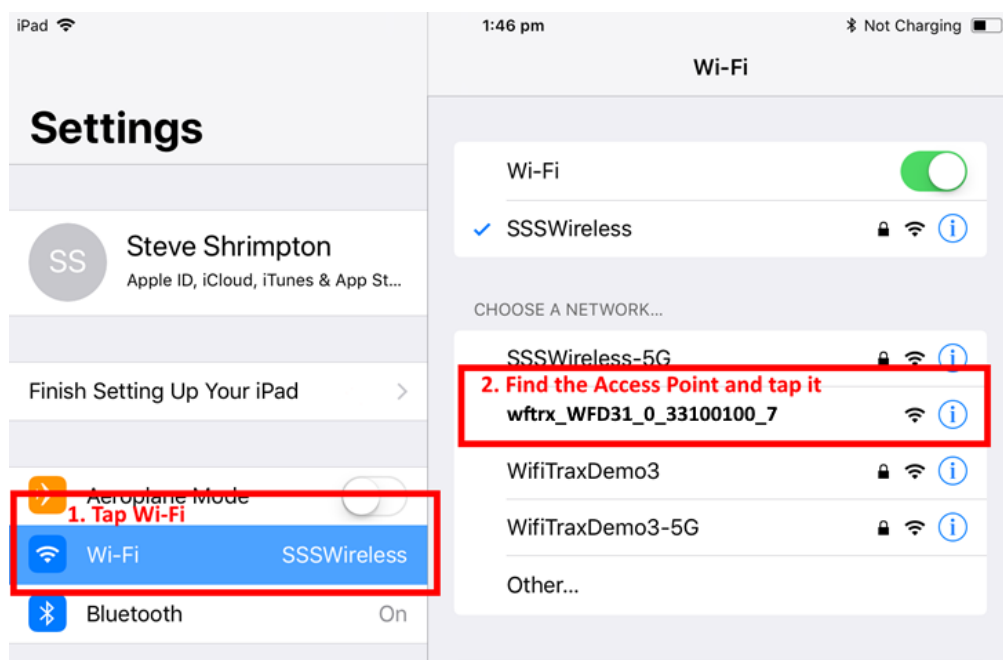


Figure 5 Connecting to the WFD-31 Wi-Fi Access Point

- (6) No password is required and after a few moments you should see that it has connected as in Figure 6. The left-hand menu shows Wi-Fi wftrx_WFD31_1_XXXXXXX_7. You will not be able to access the internet while you are connected to the Wi-Fi access point of the WFD-31, but consult the manual to find out how to put everything on your home network.

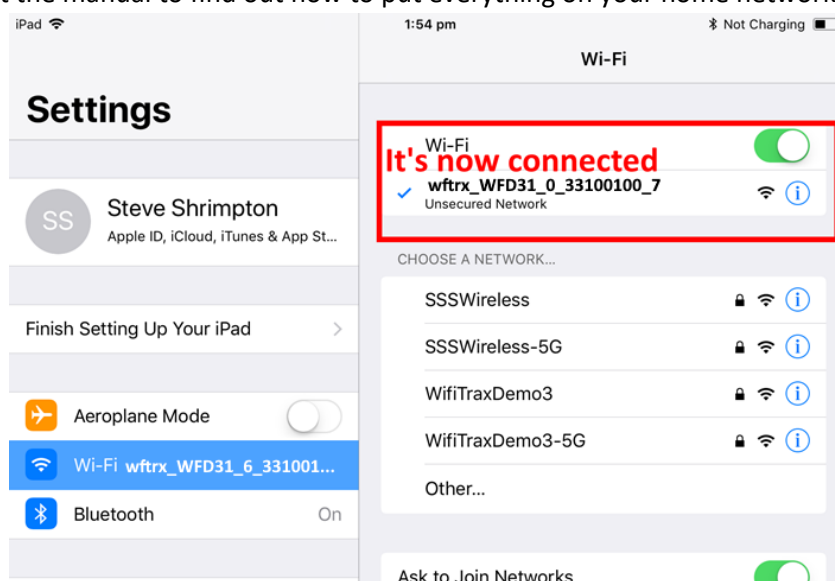


Figure 6 The iPad has connected to the WFD-31 Wi-Fi Access Point

- (7) Go to the Home Screen and find and open the WiThrottle app by tapping its icon:

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- (8) You should see the connection screen headed by “wftrx_WFD31_1_XXXXXXX_7”. The WFD-31 is a WiThrottle Server and it should appear in the “Available WiThrottle Servers” section, identified by its serial number. If it is visible, tap it as Figure 7. You may need to wait a few moments.



Figure 7 The WiThrottle app Server screen

- (9) If for some reason there is nothing in the “Available WiThrottle Servers” list, tap “Configure” or “Search for Wi-Fi Modules” and follow a. or b. below.
- Configure: The WFD-31 always has the IP Address 192.168.7.1 on its own access point, so type this IP Address. Then type 12090 into the Port textbox and tap the Connect button as Figure 8. The green network LED on your WFD-31 should now flash regularly to show that the UWT-100 is communicating with it.
 - Search for Wi-Fi Modules. The same as a. but IP Address and port are pre-entered, so just tap “Connect”.

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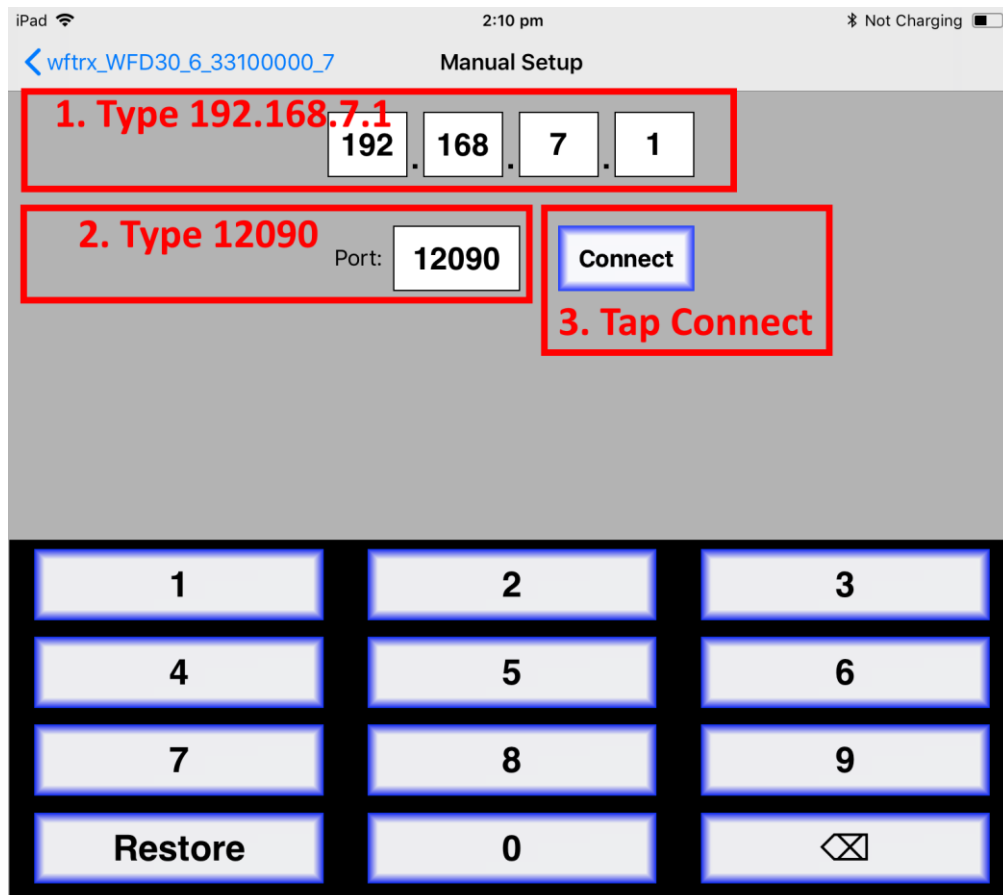


Figure 8 Connect manually if needed

(10) Now tap the "Address" tab at the bottom (it might go there automatically), tap Keypad and key in the DCC address of the locomotive that you wish to drive then tap the Set button as Figure 9.

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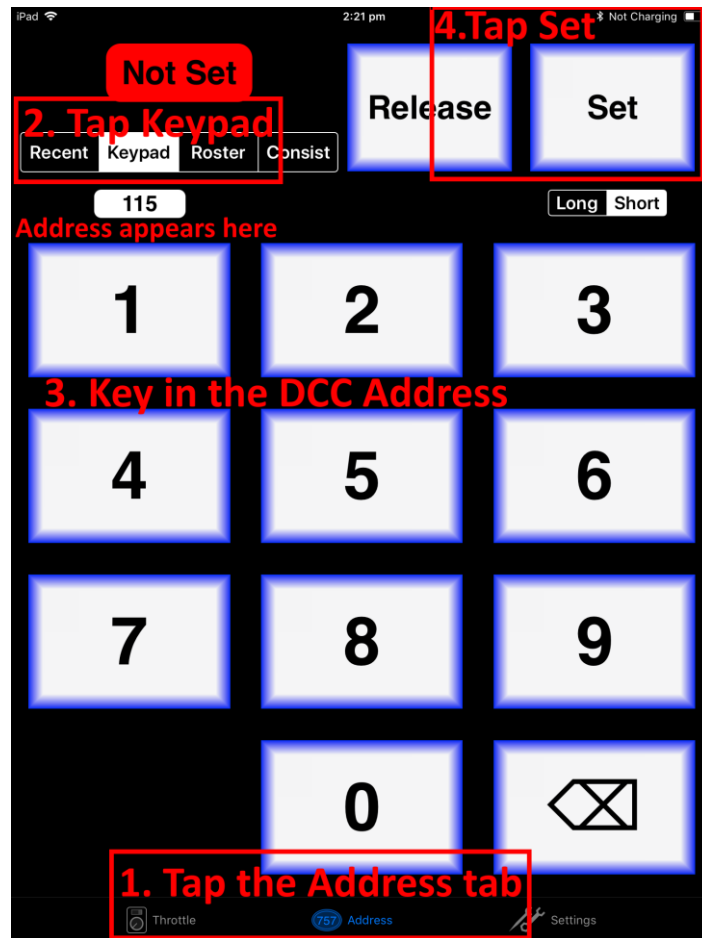


Figure 9 The Address tab of WiThrottle. Select a loco to drive

(11) The red button at the top left should turn green to show the loco is selected as Figure 10.



Figure 10 The loco is successfully selected

(12) Tap the Throttle tab at the bottom-left of the screen and you can begin driving as Figure 11. Each time you make a change to the locomotive's state, both the green network LED and the blue Cab Bus LED will flash.

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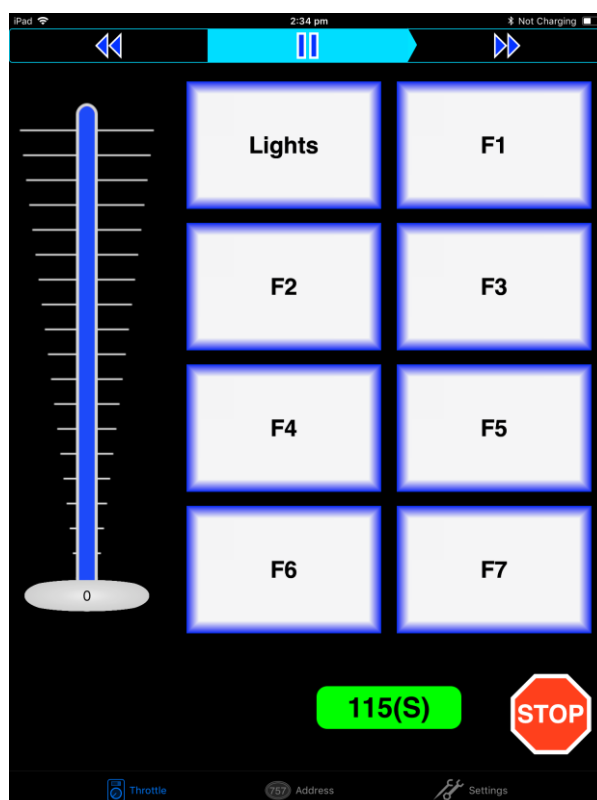


Figure 11 The WiThrottle "Throttle" screen

(13) Please consult the WiThrottle manual for more information:

<https://www.withrottle.com/html/manual.html>

Please note that WiThrottle, has many features that may vary according to the version that you install. WifiTrax has no control over the features of WiThrottle, but has tested carefully its operation with our product. If you have trouble working with WiThrottle and our module, please email us your problem rather than using the WiThrottle support. WiThrottle support persons do not know details of WifiTrax products, so please do not expect it. Support email: wifitrax@steveshrimpton.com or check our website.

Making it Easier Next Time

You can make connecting to the WFD-31 easier by setting your iPhone to automatically connect to the wftrx_WFD31_1_XXXXXXX_7 access point whenever your system is powered up. Do this by going to the Settings page on your iPhone, connecting to the wftrx_WFD31_XXXXXXX access point, then tapping it. You will see a list of options. Make sure the Auto-Join option is enabled – the Slide Switch will be green. Then, when you turn on your railroad power, after a few seconds your iPhone will join. To make this reliable, you must disable Auto-Join on any other Wi-Fi Access points such as your home router. You can always enable it again when you have finished your model railroad session.

The WiThrottle app has an option "Use Automatic Network Configuration". Set that to "on" and WiThrottle should connect automatically if your WFD-31 is powered up.

Use the recent option when selecting locos to save typing the DCC address each time, but please read the section "Locomotive Roster Web Page" to find out about defining rosters that you can pick from.

It is a good idea to always release locomotives before powering down your WFD-31. If for some reason you can't select a locomotive, just restart the WiThrottle app by tapping its icon on the home screen.

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Getting Started with Engine Driver on Android

- (1) On your Android phone or tablet, make sure you are connected to the internet and run the Google Play Store app from the home screen:



- (2) Search for Engine Driver by M. Steve Todd, download and install it. To do this:
 - a. Tap in the “Search” Text Box at the top,
 - b. Type “Engine Driver” into the text box and click the Search button, make sure the correct app “Engine Driver Throttle” displays as in Figure 12,
 - c. Tap on the “Engine Driver Throttle app” (Figure 12). The app detail page displays.
 - d. Tap the Install button (Figure 13). The app downloads and install on your device. Do not open the app until after the next steps.

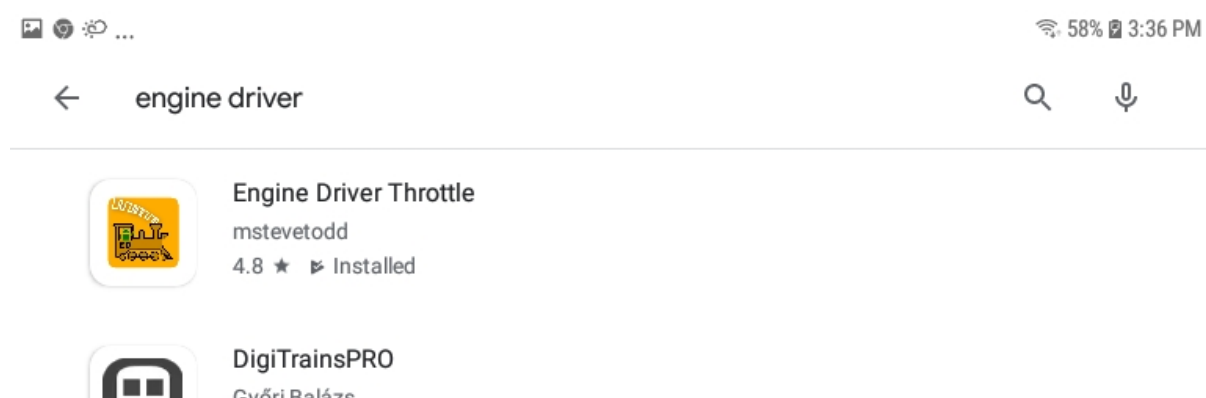


Figure 12 Searching for the Engine Driver app in Google Play Store

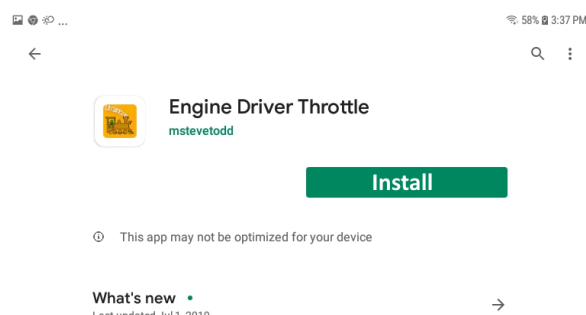


Figure 13 The Engine Driver Throttle detail page in the play store

- (3) Make sure power to your NCE Command Station and booster is on, the WFD-31 is connected to the command station and there is a locomotive on the track with a DCC address that you know. Both the red power LED should and the blue Cab Bus indicator LED should be alight.
- (4) Tap the Home button, and run the settings app on your Android phone.



- (5) Tap Connections on the left, then Wi-Fi on the right as Figure 14 (This may vary with different versions of Android).

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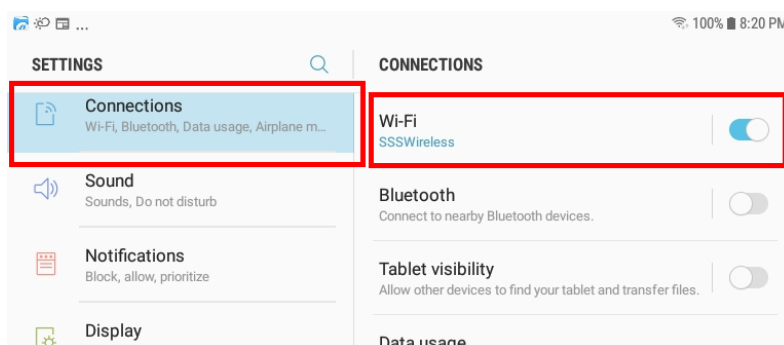


Figure 14 The Wi-Fi Connection page in the Android Settings app

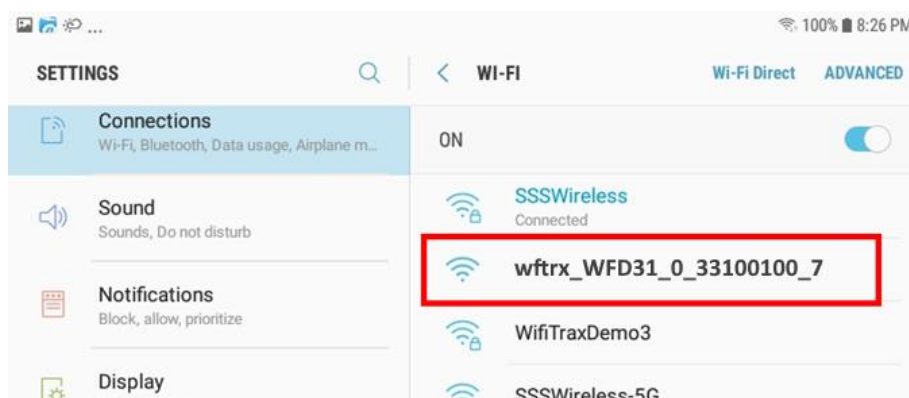


Figure 15 WFD-31 Wi-Fi Access Point is visible

- (6) You now see a collection of available Wi-Fi Access Points. Look for one that is of the form wfrtx_WFD31_1_XXXXXXX_7, where XXXXXXXX is the serial number of your unit that appears on its bag and the unit itself, like Figure 15. Tap that Wi-Fi Access Point – no password is required – and wait for it to connect. You will not be able to access the internet while you are connected to the Wi-Fi access point of the WFD-31 but consult the manual later to see how you can put everything on your home network. After a few moments the Access point should show “Connected, no internet” as Figure 16

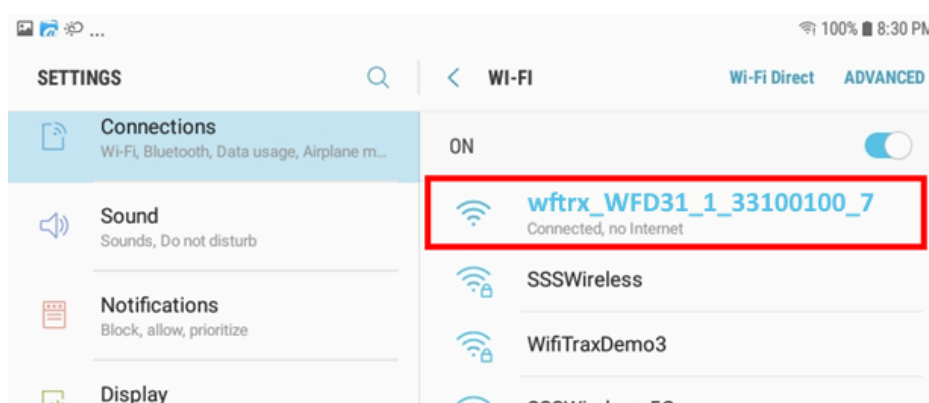


Figure 16 Connected to the WFD-31 Wi-Fi Access Point

- (7) Now you can open the Engine Driver app that you installed. Do that by going to the Home Screen and clicking the Apps icon:



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- (8) On the Apps find the Engine Driver app icon – you may have to swipe right - (for convenience you could add a shortcut to your Home Screen), then tap it:



- (9) Go through the setup sequence, accepting all the defaults and allowing the required privileges.
- (10) After setup, you should see the “Connect to Server” page with your WFD-31 listed as a “Discovered Server” as Figure 17. Tap on it to connect. The green network LED on your WFD-31 should now flash regularly to show that the UWT-100 is communicating with it.



Figure 17 The WFD-31 WiThrottle Server is discovered by the Engine Driver app on Android

- (11) **Only if the WFD-31 is not discovered** for some reason, after waiting a few moments, you must type the IP Address of the WFD-31 unit always 192.168.7.1 in the “Server Address” box at the top-left and the port value of 12090 in the port textbox as Figure 18, then tap the “Connect” button.

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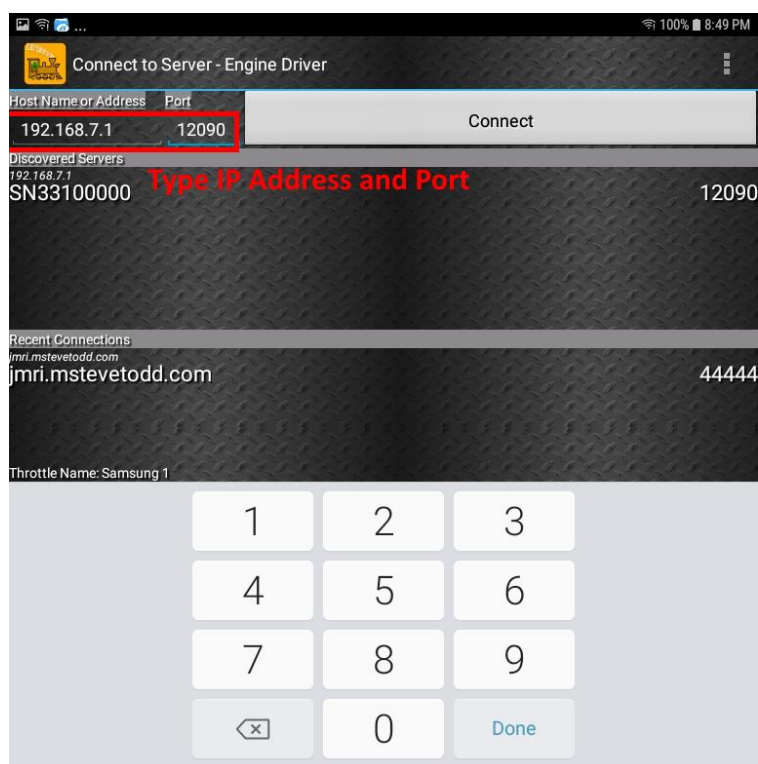


Figure 18 Connecting manually to the WFD-31 WiThrottle Server

- (12) The Throttle screen should then appear, ready to select a loco and drive. Tap the Select button, check the “DCC Address” option and type the address of your locomotive either short or long as in Figure 19. Tap Acquire.

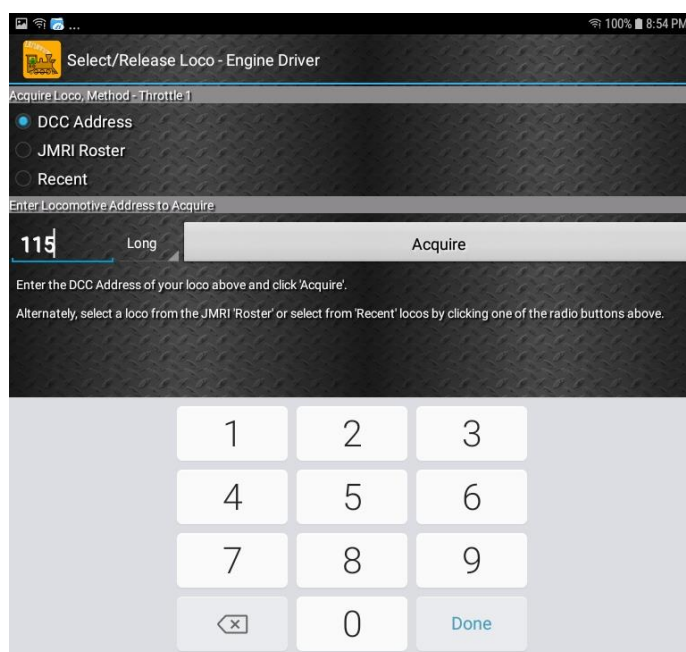


Figure 19 Selecting a locomotive by typing its DCC Address

- (13) Now the Throttle screen appears with your DCC address as the selected loco as Figure 20. Try the function buttons and throttle slider to make sure your loco responds. Each time you make a change to the locomotive’s state, both the green network LED and the blue Cab Bus LED will flash.

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Figure 20 The Throttle screen of Engine Driver with a locomotive selected to drive

(14) Please consult the Engine Driver “About” menu for more information about the app. It is possible to control more than one locomotive at a time and select different display appearances and preferences. Consult the website for more information:

<https://enginedriver.mstevetodd.com/>

Please note that Engine Driver, has many features that may vary according to the version that you install. WifiTrax has no control over the features of Engine Driver, but has tested carefully its operation with our product. If you have trouble working with Engine Driver and our module, please email us your problem rather than using the Engine Driver support. The author of Engine Driver will not know details of WifiTrax products, so please do not expect it. Support email: wifitrax@steveshrimpton.com or check our website.

Making it Easier Next Time

You can make connecting to the WFD-31 easier by setting your Android phone to automatically connect to the wfrx_WFD31_1_XXXXXXX_7 access point whenever your system is powered up. This varies according to the Android version. Once this is done, when you turn on your railroad power, after a few seconds your iPhone will join the WFD-31’s access point.

To make this reliable, you must disable Auto-reconnect on any other Wi-Fi Access points such as your home router. You can always enable it again when you have finished your model railroad session.

The WiThrottle app has an option “Auto-Connect to First WiThrottle Server” on the Preferences menu. If you enable that, Engine Driver should connect as soon as you power up your WFD-31.

Use the recent option when selecting locos to save typing the DCC address each time, but please read the section “Locomotive Roster Web Page” to find out about defining rosters that you can pick from.

It is a good idea to always release locomotives before powering down your WFD-31. If for some reason you can’t select a locomotive, just restart the Engine Driver app.

There are other options to make things easier described in the section “Advanced Features”. You can install the WFD-31 onto your Home Net, so you can operate and access the internet, control turnouts etc. at the same time as driving trains.

Getting Started with TCS UWT-100

- (1) Make sure power to your NCE Command Station and booster is on, the WFD-31 is connected to the command station and there is a locomotive on the track with a DCC address that you know. Both the red power LED should and the blue Cab Bus indicator LED should be alight.

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Figure 21 Selecting the Network Options menu on the UWT-100

- (2) Press the Menu button on your UWT, then use the up/down chevron buttons to choose Network Options, then press the Selct button [...] to open the Network menu as in Figure 21.

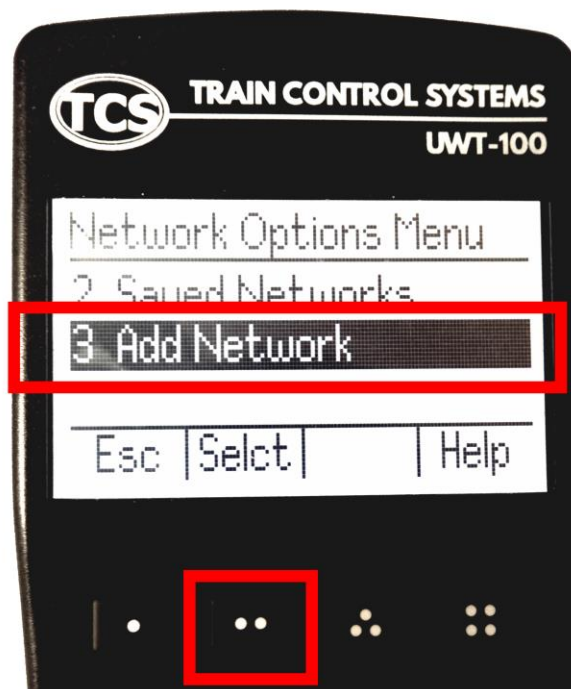


Figure 22 Select the Add Network option

- (3) Select option 3, Add Network as Figure 22

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Figure 23 Select Scan for Wi-Fi

(4) Select option 1, Scan for Wi-Fi as Figure 23.



Figure 24 Select the Wi-Fi Network of the WFD-31

(5) In the Found Networks list, identify the one which has the form wftrx_WFD31_1_XXXXXXX_7, where XXXXXXXX is the serial number of your unit as Figure 24. Select that Network, using the Selct [..] key.

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Figure 25 The WFD-31 WiThrottle server has been found. Now save it!

- (6) There will be a number of messages appear but eventually you should see the message "Found WiThrottle Server" as Figure 25. Press the Save [.] key.
- (7) Briefly, the message "Connected to wftrx_WFD31_1_XXXXXXX_7" should appear. The green network LED on your WFD-31 should now flash regularly to show that the UWT-100 is communicating with it.



Figure 26 Select a locomotive with a known DCC address

- (8) Press the Locomotive button on the keypad. Type the DCC address of a locomotive on your layout, followed by the Enter key as Figure 26
- (9) The DCC Address should show in the top left of your screen.

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- (10) Test the lights, horn and bell using the HLght, F2 and F1 buttons (if your loco has sound). Verify that the loco moves forward and backwards using the Up/Down chevron buttons and the thumb wheel. Test the Emergency Stop too! Each time you make a change to the locomotive's state, both the green network LED and the blue Cab Bus LED will flash.

Advanced Features

The WFD-31 Setup Web Pages

The WFD-31 unit provides setup of advanced features via a set of web pages that may be accessed via any browser or from within apps using WiThrottle protocol, Engine Driver and WiThrottle. Note that WiThrottle Lite does NOT provide this feature, but you can use Safari instead on an Apple device. Please understand that this is NOTHING TO DO WITH THE INTERNET OR THE WORLD WIDE WEB! The web pages are served **from the WFD-31 itself** so you do not need to be connected to the internet. The WFD-31 just uses the same protocol as the internet: HTTP and HTML.

Setup Advanced Features using Engine Driver

- (1) Connect to the Wi-Fi Access Point that your WFD-31 is using.
 - a. If you are working in direct mode, that is you have not set up a home net yet, connect to the wftrx_WFD31_1_XXXXXXX_7 Wi-Fi access point using the Settings App on your Android device.
 - b. If you are working in Home-Net mode, you need to connect to your home Wi-Fi network.
- (2) Run Engine Driver and on the Connect to Server page select the SNXXXXXXXX entry in the Discovered Servers list. If you have changed the module name, your new module name will appear in this list instead.
- (1) Tap the "three dots" icon at the top right of the screen and select Web in the menu. You should now see the Web Setup Main Menu as in Figure 27. You can click or tap on any of the headings in the menu to access the setup for that feature. The section "Setup Advanced Features using a Browser" provides information about all of the menu options.

Setup Advanced Features using WiThrottle

- (1) Connect to the Wi-Fi Access Point that your WFD-31 is using.
 - a. If you are working in direct mode, that is you have not set up a home net yet, connect to the wftrx_WFD31_1_XXXXXXX_7 Wi-Fi access point using the Settings App on your Android device.
 - b. If you are working in Home-Net mode, you need to connect to your home Wi-Fi network.
- (2) Run WiThrottle and the Connect to Server will display. Select the SNXXXXXXXX entry in the Available WiThrottle Servers list. If you have changed the module name, your new module name will appear in this list instead.
- (2) You now should see the WiThrottle Address page. At the bottom there should be four tabs Throttle, Address (highlighted in blue), WebServer and Settings. Tap on the WebServer tab and you should now see the Web Setup Main Menu as in Figure 27. You can click or tap on any of the headings in the menu to access the setup for that feature. The section "Setup Advanced Features using a Browser" provides information about all of the menu options. Note that WiThrottle Lite does not have this WebServer tab so if you are using the Lite version you will have to use Safari as described in the section "Setup Advanced Features using a Browser"

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Setup Advanced Features using a Browser

(1) On your hand-held device or computer open a browser such as in Table 3.

| Device | Operating System | Browser Options |
|-------------------------|----------------------|--------------------------------------|
| iPhone, iPad | IOS | Safari |
| Android Tablet or Phone | Android | Chrome |
| Windows Computer | Windows XP, 7, 8, 10 | Internet Explorer, Edge, Chrome etc. |

Table 3 Web Browsers available on different platforms

- (2) If you are working in Direct Mode, connect your device to the Wi-Fi Access Point of your WFD-31, that is wftrx_WFD31_1_XXXXXXX_7, where XXXXXXXX is the 8-digit serial number. If you are working in Home Net mode you do not need to do this.
- (3) Type the URL of the WFD-31 into the Address Bar of the browser.
- In Direct Mode type 192.168.7.1 and hit the enter key or “Go” button (the http:// may appear automatically. Do NOT use “https” (the WFD-31 does not support secure sockets).
 - In Home Net mode, type the IP Address that was assigned by your router and hit the enter key. Please see the section “Tips to Manage your Home Network” to see how to find this out.

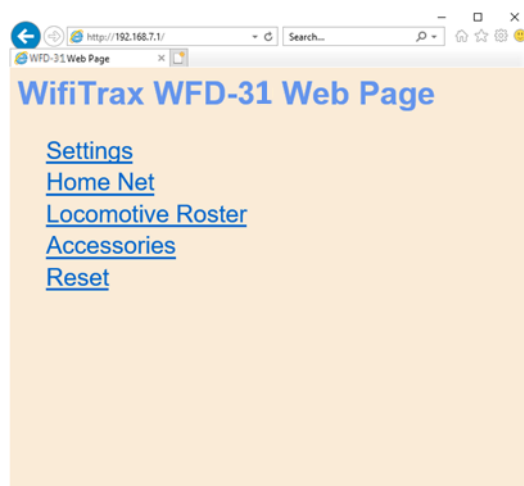


Figure 27 The WFD-31 Web Setup Main Menu

- (4) You should now see the Web Setup Main Menu as in Figure 27. You can click or tap on any of the headings in the menu to access the setup for that feature.

General Settings Web Page

To modify General Settings, tap the Settings heading in Figure 27.

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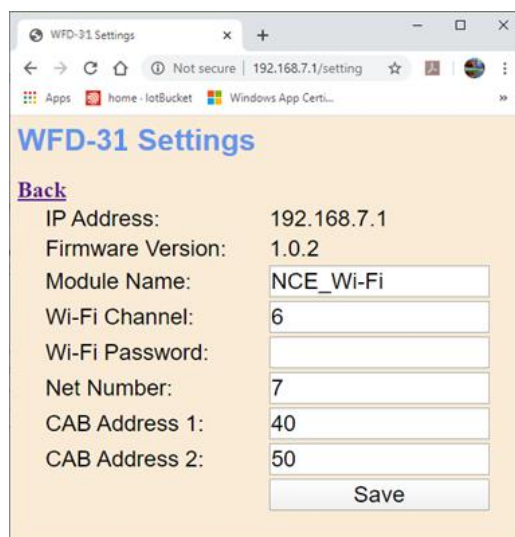


Figure 28 The WFD-31 General Settings Web Page

IP Address

If you are working in direct mode this will display 192.168.7.1. If you are in Home-Net mode it will display the IP Address assigned by your router. You cannot change this from the Settings page.

Firmware Version

This is the version of the WFD-31 firmware installed at the factory. You cannot change this but if you ask for WifiTrax support, you may be asked for it.

Module Name

This defaults to the value SNXXXXXXXX where the X's are the 8-digit serial number. You can change this to a name up to 31 characters long which cannot include spaces. Type the name you want in the text box (such as "NCE_Wi-Fi") and tap Save. After cycling power, this name will appear to all apps using WiThrottle protocol such as Engine Driver and WiThrottle as the name of the discovered WiThrottle Server.

Wi-Fi Channel

This is the Wi-Fi channel in the 2.4GHz Wi-Fi band that the WFD-31 will use when operating in Direct Mode. It will have no effect in Home Net mode as the channel will be determined by your router. You can set the channel to a value from 1 to 14 and the default value is 6 after a factory reset. You do not normally need to change this but it may be helpful if other interfering devices are being used nearby. You need to cycle power before the channel change will have an effect. Once you have cycled power, the WFD-31 Wi-Fi access point will be of the form wftrx_WFD31_N_XXXXXXXX_7 where N is your selected channel.

Note: Only channels 1 to 11 may be used in North and South America and Taiwan, 1 to 13 may be used in Europe and Asia/Pacific, and 1-14 may be used in Japan. It is your responsibility to avoid breaking the law by adhering to these conditions.

Wi-Fi Password

This allows you to set a password on the Direct Mode Wi-Fi Access Point. If you set a password, you will need to provide this when any hand-held phone or tablet, or computer, connects to the access point. You would use the Settings app on Android or Apple IOS to connect using a password NOT Engine Driver or WiThrottle. The password will have no effect in Home Net mode since your home router takes care of security. In direct mode, the password stops another user from connecting to

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and controlling your locos using Engine Driver or WiThrottle, perhaps accidentally from a neighbor or in a club environment.

To set a password type up to 32 case sensitive characters into the Wi-Fi Password text box and tap Save. The password will not be effective until you cycle power.

To remove an unwanted password, delete all characters from the Wi-Fi Password textbox and tap Save.

If you have set a password and forgotten it you can do a factory reset using the following sequence:

1. Power down,
2. Set all the switches on your WFD-31 to the on position (See Table 1),
3. Power up and cycling power, wait 5 seconds and power down,
4. Reset the switches to their required position and power up again.

Unfortunately, factory reset removes all settings that you may have made, such as rosters and function labels, and returns everything to their default values, so it's best to avoid this!

DO NOT LEAVE THE SWITCHES IN THE FACTORY RESET POSITION OR THE MODULE WILL RESET EACH TIME YOU TURN IT ON.

Net Number

This defines the subnet that the WFD-31 will use to set its own IP Address and to allocate IP Addresses to hand-held devices that connect in Direct Mode.

It has no effect in Home Net mode.

If you change this value, by typing an integer from 1 to 14 and tapping Save, the WFD-31 will use this after cycling power. The subnet will be 192.168.N.0 where N is the net number. The unit's IP Address will then be 192.168.N.1 and it will assign IP Addresses: 192.168.N.2 to 192.168.N.5

The WFD-31 Wi-Fi access point will be of the form wftrx_WFD31_1_XXXXXXX_N where N is your selected net number.

CAB Address 1

This sets the NCE Cab Address that the WFD-31 module will respond to when the switches on the module are set to the CAB Address 1 position (SW1 = On, SW2 = Off, SW3 = On) (See Table 1), The factory default is Cab Address 40 for this switch position. You can set it to any value from 2 to 63 by typing an integer in the textbox and tapping Save. Changing this setting will only have effect if you select the CAB Address 1 switch position and cycle power.

CAB Address 2

This sets the NCE Cab Address that the WFD-31 module will respond to when the switches on the module are set to the CAB Address 2 position (SW1 = Off, SW2 = On, SW3 = On) (See Table 1), The factory default is Cab Address 50 for this switch position. You can set it to any value from 2 to 63 by typing an integer in the textbox and tapping Save. Changing this setting will only have effect if you select the CAB Address 2 switch position and cycle power.

Home Net Web Page

This page allows you to change your WFD-31 from Direct Mode to Home Net Mode and back again. Once you have changed to Home-Net mode, you will not be able to work in Direct Mode, but if for some reason the WFD-31 cannot join your Home Net (maybe you typed it wrong, put in the wrong

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password or the router was turned off), the WFD-31 will attempt to connect for about 30 seconds then revert to Direct mode. You will then see the wftrx_WFD31_1_XXXXXXX_7 access point which you can connect to and correct the problem. It's always worth restarting your home router if you've checked everything and connection does not succeed, as these so often seem to get locked up somehow! If all goes wrong for some reason, you can always do a factory reset using the switches on the module.

To change to Home Net mode, tap the Home Net heading in Figure 27.

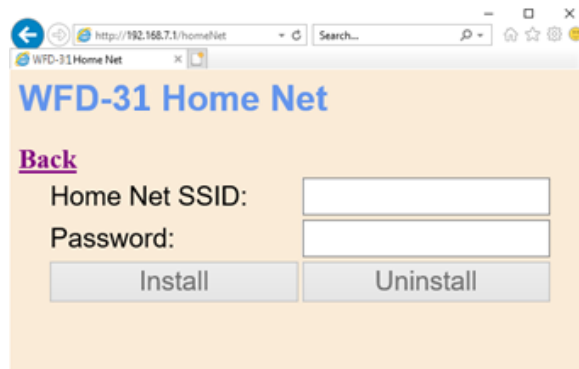


Figure 29 The Home Net Web Page

Figure 29 shows the Home Net web page. Type the SSID of your home Wi-Fi router in the Home Net SSID textbox. Type the password (shared key) for your home Wi-Fi Access Point into the Password textbox. Be careful as passwords and SSIDs are case sensitive. Check the section “Tips to Manage your Home Network” to find some tips on finding out your SSID and password. This will often be provided by your internet service provider on a card, but you may have changed it.

When you are satisfied these are correct, tap “Install”. The unit will restart and connect to the Home Wi-Fi Network you have specified. To continue, you must reconnect your phone, tablet or computer to your home network and use the WFD-31's IP Address on that network.

To obtain the roster and drive trains when operating in Home Net mode, make sure your device is connected to your home net, then run Engine Driver or WiThrottle. Select the WFD-31 WiThrottle server from the Discovered Servers list, or manually configure using the IP Address assigned to the WFD-31 module. Please see the section “Tips to Manage your Home Network” to find out the IP Address and to set your router so it always assigns the same address. Once you have connected to the server, the operation of Engine Driver and WiThrottle is the same as in Direct mode.

To access the web pages, you need to use the IP address that has been allocated to the WFD-31 by your router instead of the fixed 192.168.7.1 address in direct mode. Engine driver provides a menu item to access the web page and WiThrottle – Full Version shows a tab at the bottom.

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Locomotive Roster Web Page

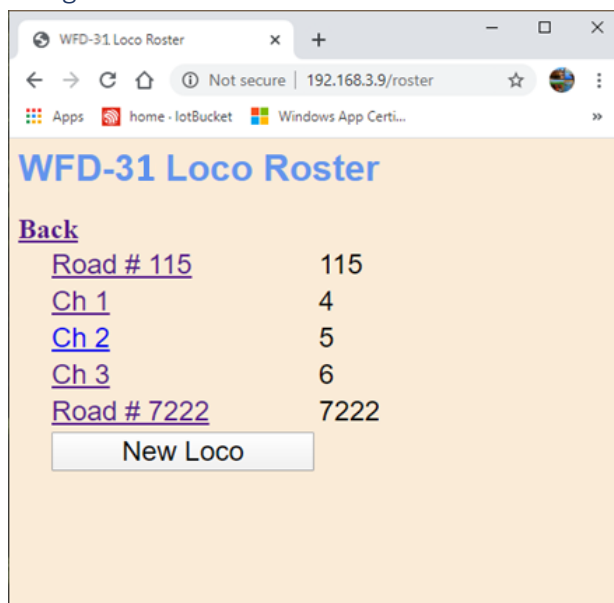


Figure 30 The Locomotive Roster Page

This page allows you to change the entries in the locomotive roster of your WFD-31. You can give each entry a Name and a DCC Address. You can then select from the roster when using Engine Driver or WiThrottle instead of needing to type the DCC Address. You can also name the function keys to match the usage by your DCC decoder and loco.

View the Locomotive Roster by tapping that heading in the Web Setup Main Menu. By default, as shipped and after factory reset only four entries are displayed and given the names “Ch 0” through “Ch 3” with DCC Addresses 3 through 6. To edit one of the entries, tap the name, to show the edit page as Figure 31, and enter what you require in the Name and DCC Address text boxes and tap Save. Names can be up to 15 characters and may contain spaces. DCC addresses must be in the range 1 – 9999.

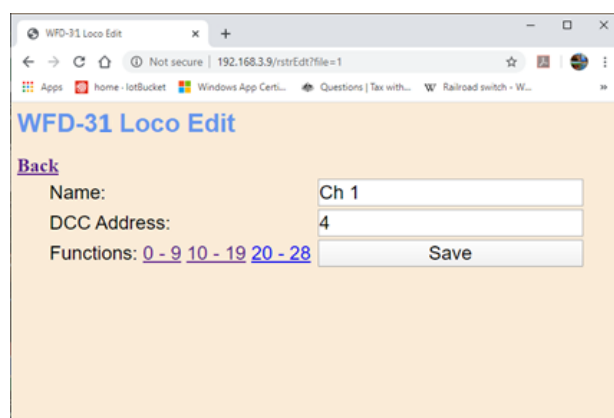
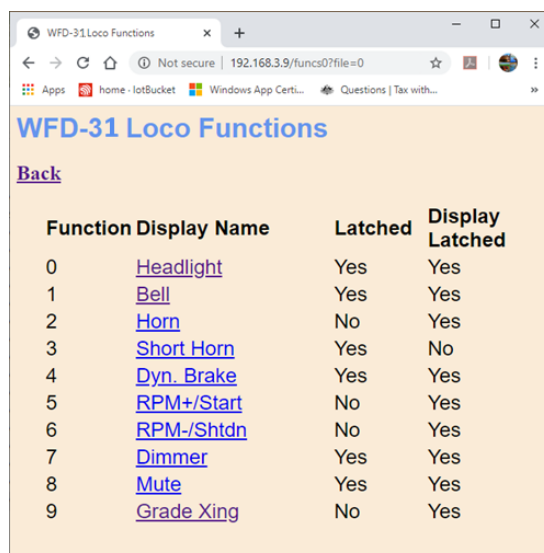


Figure 31 The Locomotive Roster Entry Edit Page. You can also access the Function labels from here.

Function Labelling Web Page

If you want to add function labels, go back into the edit page for the required loco and tap the Functions hyperlink, either “0 – 9”, “10 – 19” or “20 – 28”. The selected range of functions is displayed for that locomotive as in Figure 32.

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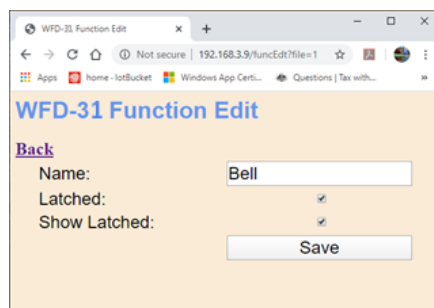


The screenshot shows a web browser window titled "WFD-31 Loco Functions". The address bar shows "192.168.3.9/functions?file=0". The page has a "Back" link and a table of functions. The table has four columns: an index (0-9), a "Function Display Name" (with links), a "Latched" status, and a "Display Latched" status.

| | Function Display Name | Latched | Display Latched |
|---|----------------------------|---------|-----------------|
| 0 | Headlight | Yes | Yes |
| 1 | Bell | Yes | Yes |
| 2 | Horn | No | Yes |
| 3 | Short Horn | Yes | No |
| 4 | Dyn. Brake | Yes | Yes |
| 5 | RPM+/Start | No | Yes |
| 6 | RPM-/Shtdn | No | Yes |
| 7 | Dimmer | Yes | Yes |
| 8 | Mute | Yes | Yes |
| 9 | Grade Xing | No | Yes |

Figure 32 The function labels displayed for a given locomotive

To edit any function, tap the name of the function and change its name in the textbox. The name can be up to 10 characters long. You can also change whether the function is latched or not using the “Latched” checkbox. When a function is latched, the WFD-31 will send a 1 value when the key is first tapped, then a 0 value when it is tapped a second time. For unlatched functions a 1 is sent when the button is pressed and a zero when released. There is also a “Show Latched” checkbox that is occasionally useful. We have found some DCC decoders seem to perform the function once on each transition, so sometimes it is useful to mark a function as latched but to display is as though it were not latched.



The screenshot shows a web browser window titled "WFD-31 Function Edit". The address bar shows "192.168.3.9/functionEdit?file=1". The page has a "Back" link and a form with three fields: "Name:" with a text input containing "Bell", "Latched:" with a checked checkbox, and "Show Latched:" with a checked checkbox. There is a "Save" button at the bottom.

Figure 33 Editing a function key for a given locomotive

You can add more locomotives to your roster up to a maximum of 16. Add a loco by tapping the “New Loco” button on the Loco Roster page. A new loco will be added with a default name, DCC address and set of functions. Once you reach 16, tapping the New Loco button will have no effect.

Currently it is not possible to remove locomotives from the roster, other than by doing a factory reset.

Accessories

The Accessories page, accessed from the main menu by tapping the heading of that name, is shown in Figure 34.

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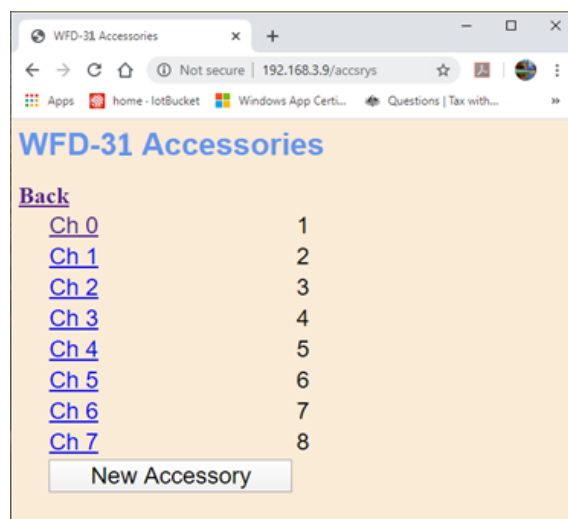


Figure 34 The Accessories List

By default, after factory reset, 8 accessories are included, but this may be extended up to 32 by tapping the New Accessory button. Accessories cannot be deleted other than by doing a factory reset.

You may name any accessory by tapping on its name in the list to display the Accessory Edit page in Figure 35.

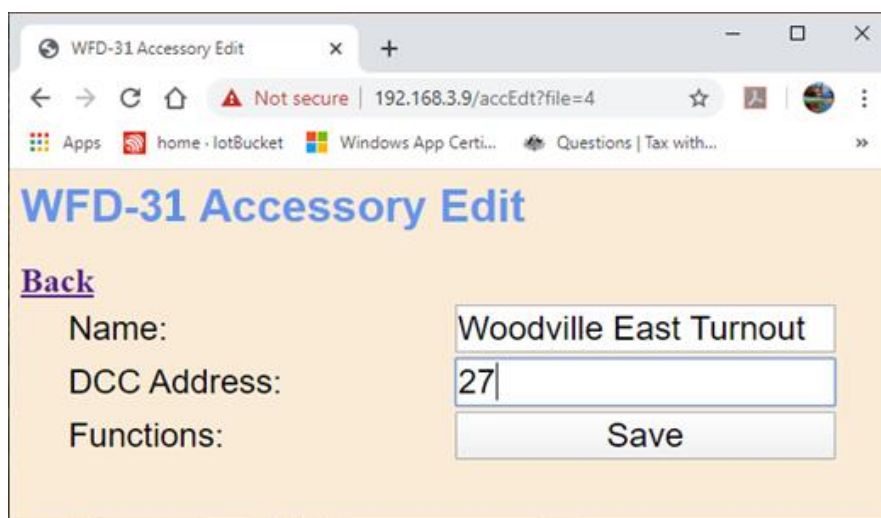


Figure 35 The Accessory Edit page

Here you may change the name and the DCC Accessory Address. Tap Save to commit the results. Accessory names may be up to 10 characters long and may include spaces. Accessory addresses must be 1 to 9999.

Factory Reset

You may factory reset your WFD-31 by selecting the Reset option on the main menu page. You will be asked to confirm the reset and then the unit will immediately revert to its factory configuration. All the settings will take their default values and Home Net settings will be removed. The locomotive roster and Accessory List will return to their default values.

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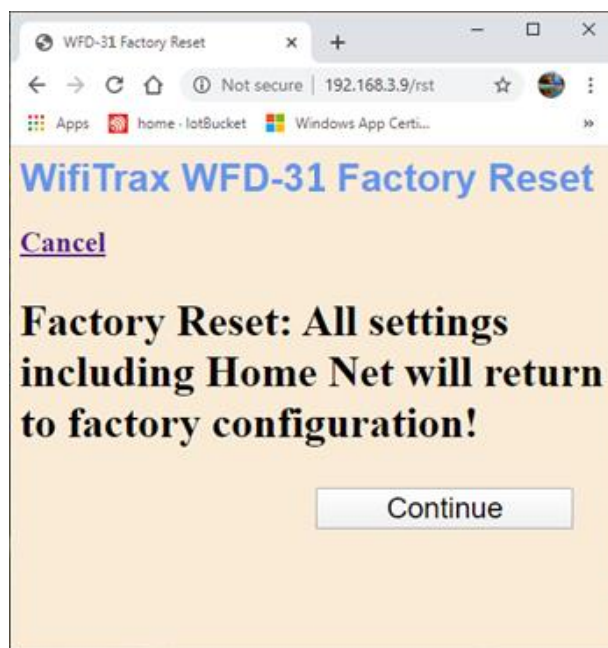


Figure 36 Factory reset confirmation page

You can also do the same factory reset by setting all the DCC Address switches to their 1 or “On” positions. This procedure is useful if for some reason you have set a password and forgotten it. To do this

- (1) Remove power to the WFD-31 module
- (2) Setting all the DCC Address switches to their “1” or “On” positions
- (3) Power up the modules, wait 5 seconds, then power down.
- (4) Return the switches to their positions to select the NCE Cab Bus Address that you require.
DO NOT LEAVE THE SWITCHES IN THE FACTORY RESET POSITION OR THE MODULE WILL RESET EACH TIME YOU TURN IT ON.

Your WFD-31 will now be returned to the factory default condition. After factory reset you can only access the unit in Direct Mode by joining its Wi-Fi Access point and using its default IP address.

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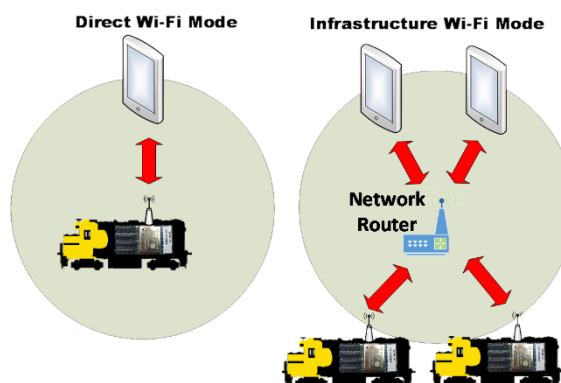
Using WifiTrax Loco Operator 3

Wi-Fi - Direct and Infrastructure Modes

**There are two ways of driving your loco over Wi-Fi:
Direct Mode and Home Net Mode.**

In direct mode, your computer, tablet or phone must be connected to the Wi-Fi Access Point within the loco (or trackside module such as WFD-31). In this mode, you can only operate one locomotive controller (which may control more than one loco) with each installation of a recommended app on a computer, tablet or phone.

In Home Net or Infrastructure Mode, the locomotive controller and your computer, tablet or phone all connect as *Wi-Fi Stations* to your network router. You can then build a full model railroad network with many locos, computers, tablets and phones. You can access all locomotive controllers with each instance of an installed app and you can also access the internet while driving trains and leave your phone, tablet or computer in its normal configuration for your home.



Why Use Loco Operator 3

The Loco Operator 3 app is an upgrade from the original Loco Operator app and each installation allows you to drive one or two locomotives fitted with a WifiTrax Loco Controller such as WMH-20 or WMR-10. It also allows driving of DCC locomotives equipped with a Wi-Fi/DCC module such as WDMI-35 or under control of a Wi-Fi/DCC Trackside module such as WFD-25 or WFD-31 and NCE System. In addition, it allows you to drive DC locomotives using a product such as WUFP-40 which appears like two locomotives which can be assigned to layout power blocks. When using a Home Net, Loco Operator 3 also provides easier install of new modules via its Install Wizard ("install" here means setting your home SSID and password in the loco controller so it will connect to your Home Net on power on).

You can find the complete Help page for Loco Operator 3 at:

<http://www.wifitrax.com/help/locoOperator/help.html>

Loco Operator 3 does not work with the Hoffman WiThrottle protocol, like Engine Drive and WiThrottle, but works directly with WifiTrax Modules using a WifiTrax proprietary protocol. Therefore, it provides more features related to WifiTrax modules including setup and configuration capability as well as home net capabilities and the operation of WifiTrax accessory controllers for turnout, power and lights (Wi-Fi Layout products) and DCC accessories. Loco Operator 3 is entirely roster based, where the available locomotives are found by scanning the network and stored in a file on your hand-held device. Currently Loco Operator 3 does not allow selection of non-rostered locos by DCC address only. A later version may add this feature.

You can use Loco Operator 3 either in Direct Mode or Home Net Mode and in both modes, it will detect all WifiTrax products on your layout. When working in Direct Mode, it will automatically connect your hand-held to the device's Wi-Fi access point, saving the need to use the Settings app on your device.

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Getting Started with Loco Operator 3

To work with the WFD-31, you need version 3.5 or later of the app from the Microsoft Store for Windows 10 or the Google Play Store for Android. Go to our website to find the current version:


<http://www.wifitrax.com/products/product-loco-operator-app-detail.html>

Android Only: When the app starts for the first time you may be asked to accept that the app will access files and the device location. You must accept these, then the screen goes black for a few seconds. Wait for the Install Wizard to appear. This is standard Android behavior. Be advised that Loco Operator absolutely does not access your pictures, any personal files or any files, other than those it generates, and no data is uploaded to the internet. Also, the need to access your location is required to work with Wi-Fi. Loco operator does automatically connect your computer to the Wi-Fi access points of WifiTrax modules that you have installed and to your Home Network transparently, without prompting. When you have finished driving trains, you may have to reconnect to your home network to access the internet or other devices such as your printer. WifiTrax privacy policy is available at <http://www.wifitrax.com/privacy.html>

Install Wizard

The figure shows the steps that the Install Wizard will take you through for Direct Mode Set-up and Infrastructure Mode Set-up. It's much easier to set up in Direct Mode first.

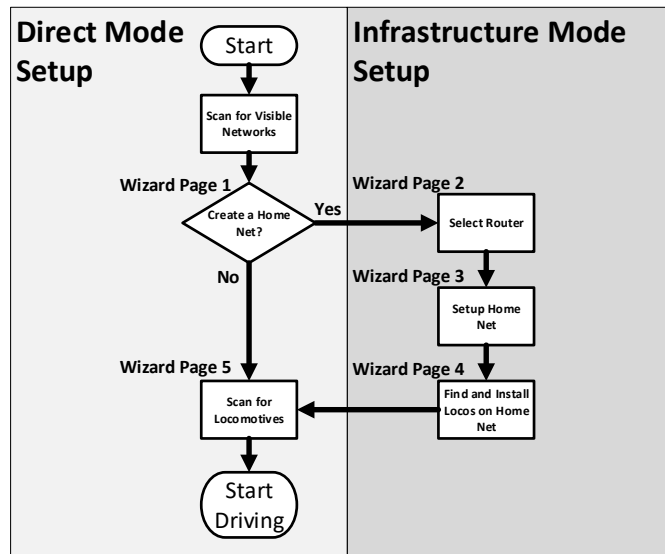
You can re-enter the install wizard at any time

by clicking the wizard symbol  at the top right of the main screen. You can use the wizard to set up your Home Net or change it. You can install new locomotives on your Home Net and scan for new locomotives that have been installed.

Driving in Direct Wi-Fi Mode

The easiest way to get your locomotive running and give it a test drive is in direct mode.

- (1) Power up your WFD-31 module and NCE system with a locomotive on the track with a known DCC address.
- (2) Start the Loco Operator App on your computer, tablet or phone. If you are starting the app for the first time the Install Wizard will automatically run and you will see a screen called Install Wizard 1 as in Figure 37. This screen asks whether you want to define a Home Network. Click No to this option for now. You can come back to this screen later.



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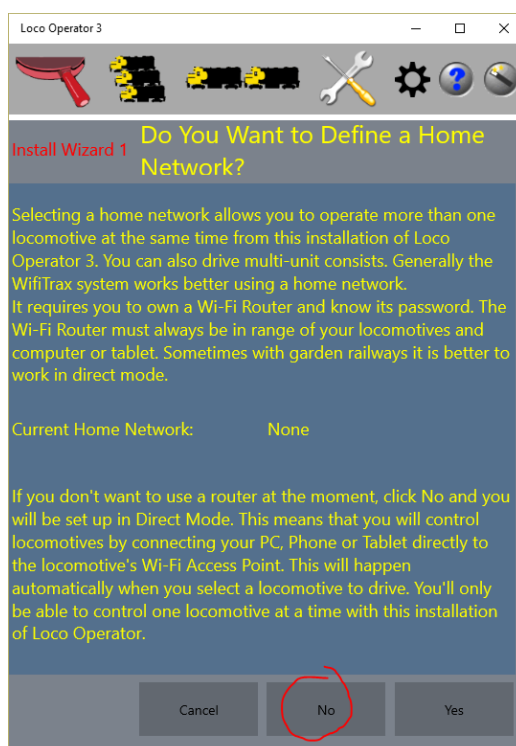


Figure 37 Install Wizard Page 1

- (3) You now see the Install Wizard 5 screen as Figure 38. This screen allows you to scan for locomotives or other WifiTrax controllers. Click the Scan for New Locos button and click Continue on the pop-up. Your new locomotives should now appear as entries in a list as Figure 39. For WFD-31, you will see the default roster (4 locos out of 16 maximum), there is a pop-up allowing you to select the DCC Decoder that you have installed. The default is Generic-Sound. When you have made your selections click Done. If your decoder is not in the drop-down list, select a generic option and see the section “Customizing Decoder Model Information”.

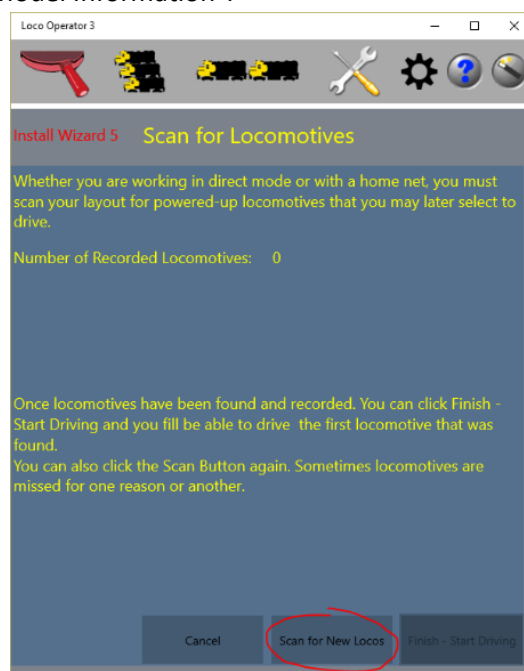


Figure 38 Install Wizard Page 5

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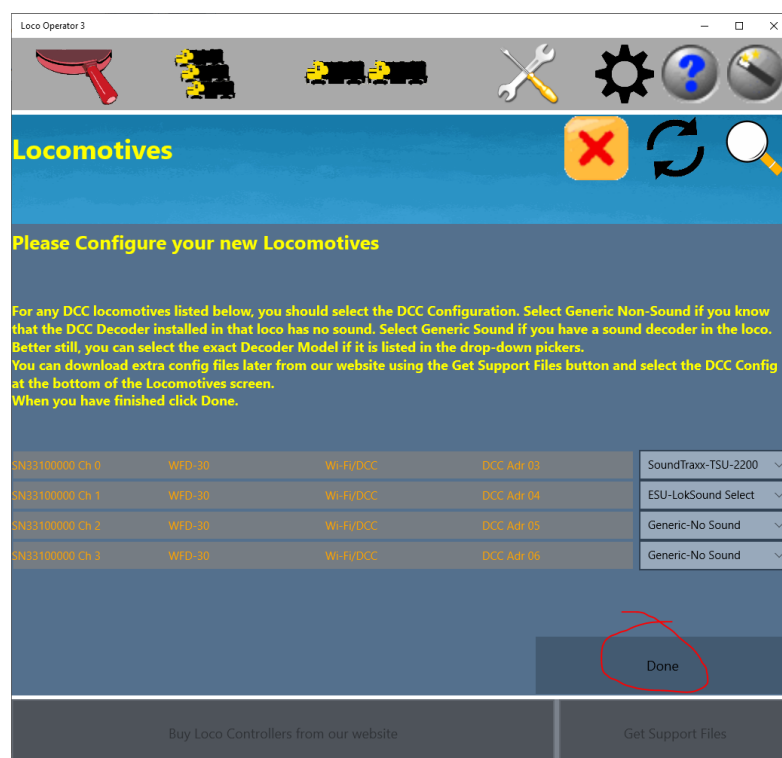


Figure 39 Install Wizard - New Locomotives Found

- (4) Install Wizard Page 5 Screen now shows some locomotives recorded. You can now click Finish-Start Driving and you will be taken straight to the Drive Screen with the first locomotive selected.



Figure 40 The Driving Screen with a DCC Loco Selected

- (5) Loco Operator 3's default roster assumes by default that there are 4 locos with DCC addresses 3, 4, 5 and 6. You can change these for each loco in the roster according to the locos that you have, and also add more than 4 locos to a maximum of 16.

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Figure 41 Tunings Screen - changing the DCC Address

- (6) To do this, select a loco in the Drive screen and click on the Tunings button at the top – the one with the screwdriver and wrench. The screen is shown here Figure 41.
- (7) In the DCC Address textbox, to the right of the default 3, 4, 5 or 6, type the DCC address of your locomotive. Then click the button to its right. This downloads the new DCC address to that slot in the roster. You may also want to change the name to something more helpful, such as the locomotive's road number.
- (8) Go back to the Drive screen (click on the Notch Lever symbol), top left.
- (9) Set Direction as required and test that the Throttle slider makes the locomotive move. You can also test the labelled function buttons, such as Lights, Horn etc.
- (10) When you are done, click the Release button – the red broken link at the top – to release the locomotive.

You can repeat this for the four locomotives in the default roster. You can increase the size of the roster up to 16 as described in the section "Increasing the Size of the Roster".

- (11) If you want to roster more than 16 locos, you can add a second WFD-31 and connect it to your NCE system with a different Cab Address - see the section "Using Multiple WFD-31 Modules on a Layout". Alternatively, you can use Engine Driver or WiThrottle and enter the DCC Address to select a non-rostered loco.

Moving to Home Net Mode (Infrastructure Mode)

This section describes how to set up Home Net mode using Loco Operator. You do not have to use Loco Operator for this. To set up a Home Net using the WFD-31 Web Pages, see section "Home Net Web Page".

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You can stay in Direct mode and operate all the locos in the WDM-30 roster from each tablet with Loco Operator 3, but for more versatility you can set up Home Net Mode as long as you have a Wi-Fi router in your household.

- (1) To do this, make sure you have released any locomotive you are driving, then click the Wizard button at the top right.
- (2) The Install Wizard 1 page is displayed. This time click Yes to define a Home Network.

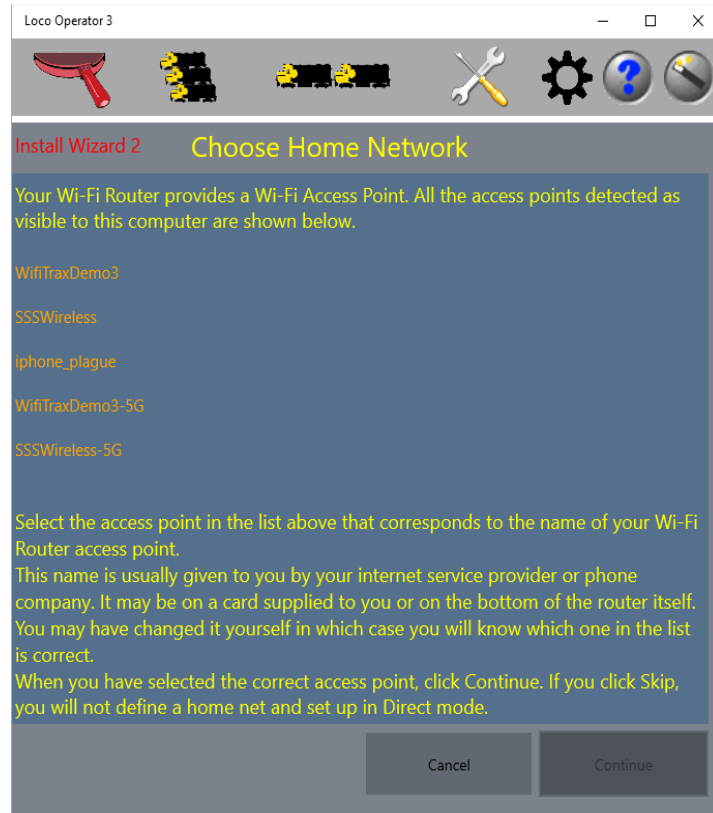


Figure 42 Selecting a Wi-Fi Access Point for your Home Net

- (3) Install Wizard 2 is now displayed as in Figure 42. Select the network in the list that corresponds to the name of your home Wi-Fi access point. This is called the SSID. You will be using the same SSID when you connect your phone or tablet to your home Wi-Fi network. Select the correct network and click Continue.

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Loco Operator 3

Install Wizard 3 Provide Home Network Details

You have selected the access point shown below to be your home network. You now need to provide the password (often called the pre-shared key) for your router Wi-Fi access point. If your Wi-Fi network is open, leave the password blank. This will be saved in the database on this computer and will be sent to locomotives that you install on this home network. The locomotives need this so that they can connect to your router on power-up. YOUR PASSWORD IS USED ONLY FOR THIS PURPOSE. Please see our privacy statement on the WifiTrax website.

Home Network: WifiTraxDemo3

Password: sd345fGC@3

You may also need to set the subnet shown below. You may have changed it in your router, or your service provider may have set the default differently. It is the same as the first three digits of the IP address of your computer. You can check this by using the ipconfig command on Windows or by looking at the network connection details.

Subnet: 192 . 168 . 0 . 0

Loco Operator looks for locomotives within the following range. You should set the first and last to include a small range that includes all IPAddresses likely to be assigned by your router to your locomotive controllers.

IP Address Range:

First: 1 Last: 20

Cancel Save and Continue

Figure 43 Provide the Details of your Home Net

- (4) Install Wizard 3 in Figure 43 requires you to provide some details for your Home Network.
- You must provide the Password (called the Shared Key). This password will be stored on your computer and sent to all locomotives that you want to install onto your Home Network. If you do type this incorrectly, the WFD-31 will not be able to connect and will stop trying. You will need to go back into the wizard and correct it.
 - Next you need to make sure that the correct subnet is shown. Most home subnets begin with 192.168 but sometimes it is different. The third digit defaults to zero but again it may be different for your network. The best way to find out the subnet is to check the IP address on your computer. The subnet is the first three digits of the IP address, with the fourth being zero. If you type this incorrectly, you will not detect any locomotive controllers when you scan the net. You will need to go back into the wizard and correct it.
 - Lastly make sure the IP Address Range is set to cover addresses likely to be assigned by your router to locomotives. Usually the default, 2 - 20 is OK. If the range is too large, it will just waste time, but you can hit the "Stop" button when all locos have been found. If the range is too small, you may miss your locos since your router may have assigned them IP Addresses outside of this range. Please see the section
 - Finally click Save which completes the setup of your Home Net.

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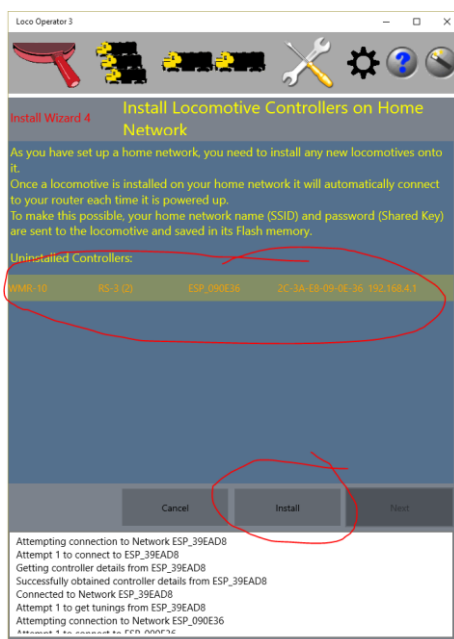


Figure 44 Installing Loco Controllers onto your Home Net

- (5) You now see the Install Wizard 4 screen as Figure 44. When the screen enters, any powered-up, uninstalled WDM-30 modules are discovered. Uninstalled locomotives are those that have not been given the SSID and Password to enable them to connect to your Home Network. Select them one by one and click the Install button. Then click Next.

Sometimes, particularly with Android, your hand-held may be slow in connecting to the Wi-Fi Access Point of each controller. You may need to tap Rescan if your new device is not detected.

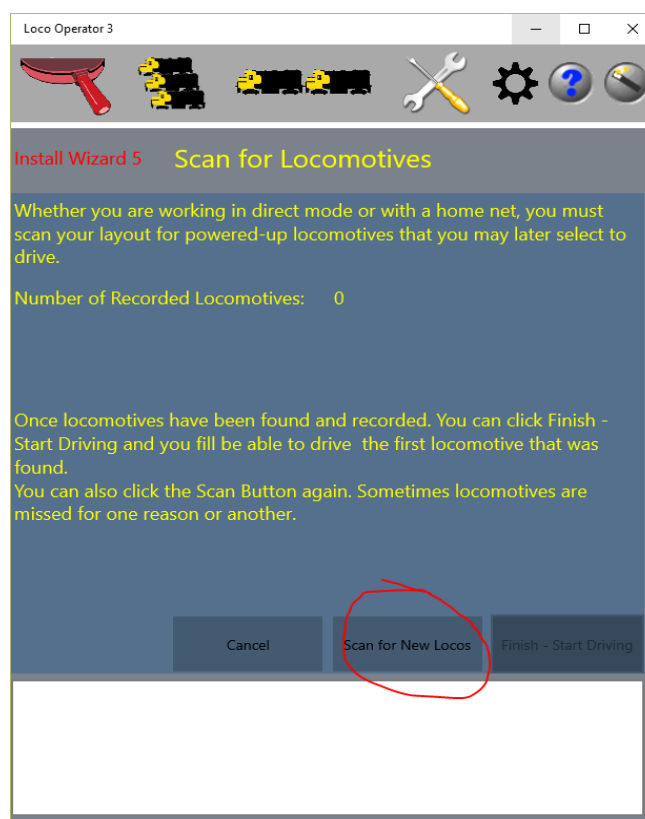


Figure 45 Install Wizard Page 5, Scan for Locomotives

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- (6) Now you see Install Wizard 5 as Figure 45. By this time, your Wi-Fi Router should have allocated IP addresses to your locomotives. Click the Scan for New Locos button. And Continue on the pop-up. Your computer will connect to your Home Net and test each IP Address in your specified range to find modules.
- (7) Once one or more module has been found, set the decoder models again, click Done and click the Finish-Start Driving button and you can perform the same tests as you did in Direct Mode. The roster is already stored in your WFD-31 and does not need to be re-entered.

Now that you are working in home-net mode you can use WiThrottle and Engine Driver without a need to connect to the Wi-Fi Access Point of the WFD-31. You can just have all your tablets and phones connected to your home Wi-Fi network. Then, the first time you start WiThrottle on your iPhone, it will show your WFD-31 module as a WiThrottle server – just like JMRI – and once you have selected it the first time, it will automatically reconnect each time you start the WiThrottle or Engine Driver app.

Furthermore, if you select a rostered loco using WiThrottle or Engine Driver, the function keys will display the names defined by the decoder model that you selected with Loco Operator – provided you have connected to that rostered loco at least once with Loco Operator. These names – and the latching information – is stored in the WFD-31's FLASH memory unless you should do a factory reset.

More about Cables

Some modellers like to build their own Cab Bus cables. If you choose to do this, you should refer to the information published by NCE:

<https://ncedcc.zendesk.com/hc/en-us/articles/201799499-NCE-DCC-Cables-Explained>

The cable between the WFD-31 and the NCE Command Station does NOT carry track power so ordinary RJ12 phone type cables will do as long as they DO NOT HAVE ANY CONDUCTORS REVERSED – in other words they are “Pass-Through”. If you choose to make them yourself you will need to buy RJ12 6P6C connectors, the flat 4 wire cable and a tool to put the connectors on. When done, if you hold the connectors in front of you pointing away from you, each with the plastic tang downwards, the black wire should be on the same side. If this is not correct, the WDM-30 will not work! It contains protection diodes to avoid damage if the Cab bus power is reversed. But the cable must be correct for it to work.

Mounting Suggestions

The WFD-31 is supplied as a bare module and no part of it must be permitted to touch any metal. If any part is allowed to touch live rails for example, it is likely that the unit will be damaged beyond repair. For this reason, it should be mounted properly before use by screwing it to the fascia panel of your existing Power Cab Panel (PCP) or Universal Throttle Panel (UTP).

Operating Accessories

The WFD-31 provides the ability to configure DCC Accessories as described in the section “Accessories”, by default there are 8 configured with default names and DCC accessory addresses.

Once configured, accessories, will be provided to WiThrottle or Engine Driver when either of those apps connect to the WFD-31 as a WiThrottle server. Both of these apps provide a display of named accessories in list form. Only two-state accessories, displayed as turnouts, are supported and you can change the state of a turnout by tapping it in the list. Alternatively, these apps provide capability to type an address and Throw, Close or Toggle the turnout.

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On Engine Driver, the Turnouts are displayed by swiping left or right. On WiThrottle, the turnouts are displayed by swiping right on the Throttle page.

You can also control turnouts from Loco Operator 3. To display the list of turnouts, tap the large red right-pointing arrow button on the Drive screen to the left of the simulated windscreen. Tap any turnout to change its state.

Customizing Decoder Model Information

Each time you connect one of the 3rd-party apps, that use the WiThrottle protocol, to the WFD-31, the WFD-31 sends its locomotive roster and accessory list. When you select a locomotive from the roster on the app, the WFD-31 sends some more information to the hand-held including a list of function labels. You then see the function buttons with meaningful names, Lights, Bell, Horn etc. rather than just Function Numbers, F0, F1, F2 etc. That's how it works between the hand-held device app and the WFD-31 module.

How do we get the function key information into the WFD-31 module? Well, there are two ways.

Setting Function Information using the WFD-31 Web Pages

You can connect to the WFD-31 web pages from a hand-held device app like WiThrottle Full Version or Engine Driver, then select the WebServer tab at the bottom of the WiThrottle screen or the Web menu item from the Engine Driver "3-dots" menu at the top right. You can also use any browser such as Internet Explorer, Edge, Google Chrome or Safari to connect directly to the IP Address of the WFD-31. Please see the section "Setup Advanced Features using a Browser" for more information on this.

Once you are displaying the Main Menu page, refer to the section "Function Labelling Web Page" which describes setting function labels. You will need to release and reconnect to the loco from your hand-held device app, using the JMRI Roster option, before the new function labels will display.

Using Loco Operator 3 to Provide Function Key Information

The WifiTrax free Loco Operator 3 app, available for Windows and Android uses files, in a format called XML, to define the function key information applicable to a decoder model. This is called the decoder configuration. There is a small set of in-built decoder configurations that can be selected as mentioned in the section "Install Wizard". However, Loco Operator will also load decoder configuration files from its "Local State" folder on Windows that have the file extension ".dcg". A generic file "Generic.dcg" is available from WifiTrax website at:

<http://www.wifitrax.com/supportFiles/supportFiles.html#dccConfig>

You can download this to a convenient location on your Windows PC, rename it, and edit it to provide the function labelling that you require. When you have finished, place the file in the Loco Operator 3 app's "Local State" folder on your Windows 10 PC. This is at the location:

C:\Users\<Your User Name>\AppData\Local\Packages\

STEVE SHRIMP TON SCIENCE SPTY.LocoOperator3_69daas6km4m3j\LocalState

Which you can access using Windows Explorer.

On Android, you should copy the file to the "Internal storage > Download" folder.

The format of the "dcg" files are described in the section "Format of "dcg" Files and Editing Guidance".

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As described in the section “Install Wizard”, you can assign a decoder configuration when the locomotives are first discovered, but you can also change them any time you like on the Locomotives screen of Loco Operator 3, by clicking on the locomotive in the list and changing the decoder configuration in the “DCC Configuration” drop-down selector as in Figure 46.

Each decoder configuration has a special unique identifier called a GUID (Globally Unique Identifier) which appears in the “dcg” file. When you select a locomotive for driving on the Drive screen, Loco Operator 3 will check that the WFD-31 module has the correct DCC Configuration according to this identifier and, if not, it will download all of the function key information to the module which will save it in its FLASH memory. This operation may cause a slight delay when you connect to a locomotive, if you have selected a new DCC Configuration.

Once you have done this, you can connect to the WFD-31 using a WiThrottle protocol app, such as Engine Driver or WiThrottle, and you will see the function naming and behavior as you specified in the “dcg” file. Please note that if you choose to modify the function labels using the WFD-31 Web Pages, that information will NOT be available to Loco Operator 3. Also, if you change to a different DCC configuration on Loco Operator 3 for that locomotive, your manual changes made using the web pages will be lost when you connect using Loco Operator 3. For this reason, if you plan on using both Loco Operator 3 AND a WiThrottle app, you should probably make a custom “dcg” configuration on Windows as described rather than using the web pages. Also, if you use multiple installations of Loco Operator 3, you should make sure that they all are set to the same DCC Configuration.

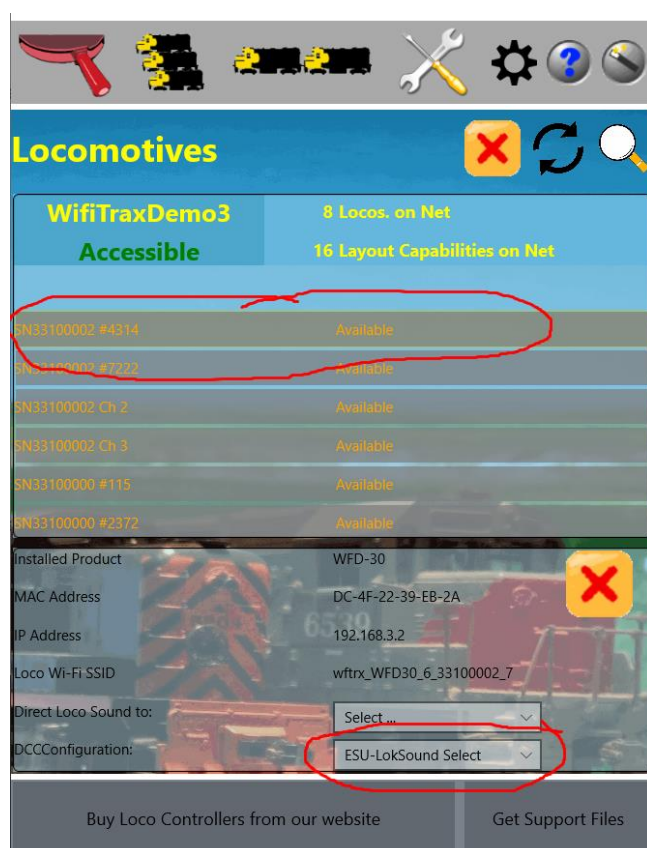


Figure 46 Changing a Locomotive's decoder configuration

Format of “dcg” Files and Editing Guidance

You can either go to the URL

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<http://www.wifitrax.com/supportFiles/supportFiles.html#dccConfig>

or use the "Get Support Files" button to download the available DCC configuration files which you can modify as needed.

To make your own DCC Configuration File, you must be connected to the internet, then:

- (1) Click the "Download Support Files" button at the bottom-right of the Locomotives screen. This will open a browser window that lists types of support files,
- (2) Click the "DCC Configuration Files" hyperlink,
- (3) Click the "Generic.dcg" file and save it to a suitable location on your computer,
- (4) Open it in a suitable editor such as Notepad (on Windows) and modify it as needed. Give the file a unique name with file extension ".dcg" such as "MyDecoder.dcg". Then save it to the LocalState folder of the Loco Operator 3 App. This is:

C:\Users\<Your User Name>\AppData\Local\Packages\

STEVE SHRIMPTON SCIENCE PTY.LocoOperator3_69daas6km4m3j\LocalState.

on Windows or the Downloads folder on Android.

Note: If your file is invalid, Loco Operator may crash on start-up. If this happens, simply remove your .dcg file to some other location until you have fixed it. The file is in the XML format and looks like Figure 47.

```
<?xml version="1.0" encoding="us-ascii"?>
<DccConfigM xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <DccConfigUid>6BFFAA6702544F0392542D63104A8417</DccConfigUid>
  <ProductName>Steam Config</ProductName>
  <VendorName>My</VendorName>
  <Functions>
    <DccFunctionM>
      <DccFunction>0</DccFunction>    <!--The DCC Function Number. Must be unique.-->
      <DisplayName>Lght</DisplayName><!--The name to be displayed on the Named
        Function Button.-->
      <Description>Directional lights</Description>
      <Latching>1</Latching>          <!-- (0 or 1) 1 means it is latching.-->
      <DisplayLatched>1</DisplayLatched> <!--(0 or 1) 1 means, if it is latching,
        it is displayed as latching - in red when
        latched on.-->
      <IsSpecial>1</IsSpecial>        <!--(0 or 1) 1 means it will be displayed
        on the Name DCC Functions panel. 0 means
        only accessible via DCC keypad.-->
    </DccFunctionM>
    <DccFunctionM>
      <DccFunction>1</DccFunction>
      <DisplayName>Whistle</DisplayName>
      <Description>Whistle</Description>
      <Latching>1</Latching>
      <DisplayLatched>1</DisplayLatched>
      <IsSpecial>1</IsSpecial>
    </DccFunctionM>
    <DccFunctionM>
      <DccFunction>2</DccFunction>
      <DisplayName>Horn</DisplayName>
      <Description>Horn</Description>
      <Latching>0</Latching>
      <DisplayLatched>1</DisplayLatched>
      <IsSpecial>1</IsSpecial>
    </DccFunctionM>
  </Functions>
</DccConfigM>
```

Figure 47 The Generic.dcg file

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When you edit this file, you can duplicate the `DccFunctionM` elements (only three are included) by copy and paste, making sure that you include both the start and end tag `<DccFunctionM> ... </DccFunctionM>` and everything in between.

Each one must have a different integer value for its `DccFunction` element this is the function number 0, 1, 2 etc.

The `DisplayName` element contains the function name text that you want to appear on the function button.

The `Description` element contains a longer text description which is not currently used but may be used as a tooltip in future.

The `Latching` element must contain either 1 or 0 with nothing else. It will cause the function to be latched in Loco Operator 3 and on the WFD-31 module.

The `DisplayLatched` element is only applicable if the `Latching` element contains 1. If the `DisplayLatched` element is set to zero, the function will be latched but not appear so. This is sometimes useful when decoders respond to both a positive and negative transition of a function state. By default, command stations with buttons usually latch everything except Function 2 (Horn) and don't display as latched, so it can look odd if single action buttons like "Short Horn" display as latched.

An `IsSpecial` element value of 1 means that a function button will be displayed on the Named DCC Functions panel in Loco Operator 3. It has no effect on WFD-31.

If you copy the file to make more than one customised DCC Configuration, say `Steam1.dcg` and `Steam2.dcg`, you MUST change the value of the `DccConfigUuid` element. This must contain exactly 32 upper-case hexadecimal characters. You can probably get away with just changing one or two to make it unique. If you want to be correct, use an on-line `Guid` generator, remove the dashes '-', opening and closing brace characters '{', '}', and then change everything to upper case, so it looks similar to the text in the `DccConfigUuid` element in Figure 47.

Set the text in the `ProductName` and `VendorName` elements as you wish. These strings will be concatenated to form the name shown in the DCC Configuration drop-down selector on the Locomotives page in Loco Operator 3.

Increasing the Size of the Roster

You can increase the size of the WFD-31 Locomotive Roster in two ways:

- (1) Use the WFD-31 Web Setup Pages,
- (2) Use WifiTrax Loco Operator 3 app.

Management of the Locomotive Roster using the Web Setup Pages is described in section "Locomotive Roster Web Page".

To use Loco Operator 3, you must have at least version 3.5 installed.

- (1) Connect to your WFD-31 device, either via your home net or directly. Make sure the current rostered locomotives are available on the Drive screen.

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- (2) Select any of the locomotives in the current roster for driving, in the Drive: drop-down selector at the top. The tuning value you will change is at the module level, not the loco, so any loco will do.
- (3) View the Tunings screen by clicking the wrench/screwdriver icon at the top.
- (4) Look for the “Enabled Channels” and “Available Channels” values in the middle column.
- (5) If the Enabled Channels is less than the Available channels, you can type a new value for the Enabled Channels in the textbox in the right column.
- (6) Type a new value and tap the Apply button at the right of that textbox. The screen should update with the new Available Channels set to whatever you typed.
- (7) Go back to the Drive Screen and deselect the loco. You still only see the original number of locos in the roster.
- (8) Display the Locomotives screen and perform a new scan. You now should see the new roster with the extra entries and you can set up the names, DCC Addresses etc.

Using Multiple WFD-31 Modules on a Layout

You can connect more than one WFD-31 to an NCE Command Station, but each must have a unique Cab Address. Set the Cab addresses of each unit according to Table 1 and connect them in any configuration to the Cab Bus of your NCE Command Station. For example, you can connect one Cab Bus Socket of your first unit directly to a spare Cab Bus socket on your command station, then connect the second unit to the downstream Cab Bus socket of the first unit. You can continue in “daisy chain” mode like that. It’s a good idea not to have branches but to keep the Cab bus linear. Please see the [NCE website](#) for advice on general use of the Cab bus.

With multiple WFD-31 modules, you can operate any or all of them in Direct mode or Home-net mode. If you leave them all in direct mode, any hand-held device will need to be connected to the Wi-Fi Access point of one of the modules and then it will only see the WiThrottle Server provided by that module. If you operate all the modules in Home-net mode, you can leave all hand-held devices connected to your home Wi-Fi network and each device will see the WiThrottle servers of all the modules. You can connect to one, then select from its roster, then connect to another and select from the other one’s roster. You can only connect to one WiThrottle Server at a time.

With Loco Operator, when you do a scan, you will get all of the locomotives in all modules so you can select any of them to drive. This applies in Direct or Home-net mode, since Loco Operator does the connection to the Wi-Fi Access Point automatically when you select a loco.

Tips to Manage your Home Network

Connection to your Home Router

When you set a WFD-31 module to Home-net mode, it will immediately restart and try to connect to the Wi-Fi Access point that you specified in the SSID, using the password that you supplied. From then on, it will try to connect each time you power on. If the connection is unsuccessful, it will give up after about 30 seconds and revert back to Direct mode to allow you to connect and either correct the problem or return it to Direct mode. Usually failure to connect occurs because the password or SSID is incorrect, so you would need to double check that, but it might be because your home router is too far away or is turned off.

Sometimes routers refuse connections because of some internal hang-up problem and need to be restarted from time to time. Also, occasionally there are so many people operating Wi-Fi devices in an area that there is just too much radio traffic. In this case changing the router to a different

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channel may work. Remember that in Home-net mode, the WFD-31 always uses the Wi-Fi channel of the router that it is connected to.

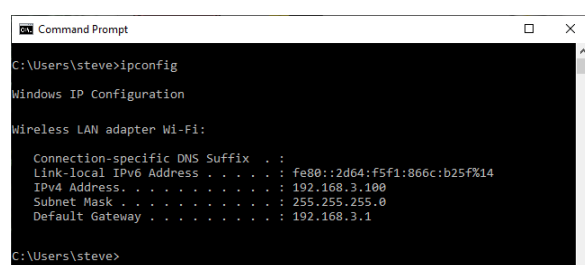
Home Net IP Address Assignment

Every device connected to a network needs an IP Address and when your WFD-31 successfully connects to your home router, the router will allocate it an IP Address from a list of unused addresses. This process is called DHCP (dynamic host control protocol) and you can Google the term to find all the information you would like. IP Addresses are leased to connected devices and it is possible that the next time you turn on your WFD-31, the lease will have expired and the router will give it a different IP Address.

This changing IP Address does not matter if you are using 3rd-party apps using the Hoffman WiThrottle protocol (like Engine Driver and WiThrottle) because they discover one or more WFD-31 modules using a protocol called Multicast DNS. The WFD-31 broadcasts its presence, with its information, to all devices connected to the network, and the Engine Driver and WiThrottle apps display WiThrottle servers found in this way in their list of discovered servers. You then connect to your choice of WiThrottle server when you start the app.

If you want to access your WFD-31 from a browser such as Internet Explorer, Edge, Chrome or Safari, you need to know its IP Address. There are several good ways of finding the IP Address assigned by your router.

- (1) Once you have connected using an app such as WiThrottle or Engine Driver, you can use the “Web Page” menu item or tab to view the Settings page as in section “General Settings Web Page”. Once you see the IP Address, you can make a note of it and type it into a browser as in section “Setup Advanced Features using a Browser”.
- (2) You can install and run the free WifiTrax Loco Operator app. This provides a scan capability to identify and log all WifiTrax modules that are on your home network. See section “Getting Started with Loco Operator 3” and look at the IP Addresses displayed in the Locomotives screen.
- (3) Probably the best way is to visit the Admin page of your router. To do this, type the address of your gateway into a browser. You can find this by opening a Windows command console and typing the ipconfig command:



```
Command Prompt
C:\Users\steve>ipconfig

Windows IP Configuration

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix  . : 
    Link-local IPv6 Address . . . . . : fe80::2d64:f5f1:866c:b25f%14
    IPv4 Address. . . . . : 192.168.3.100
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.3.1

C:\Users\steve>
```

Figure 48 Using ipconfig to find your computer's ip address and default gateway

- (4) Figure 48 shows the result. Now take the default gateway IP Address, 192.168.3.1 in this example. and type it into the address bar of your favorite browser, then hit the Enter key.

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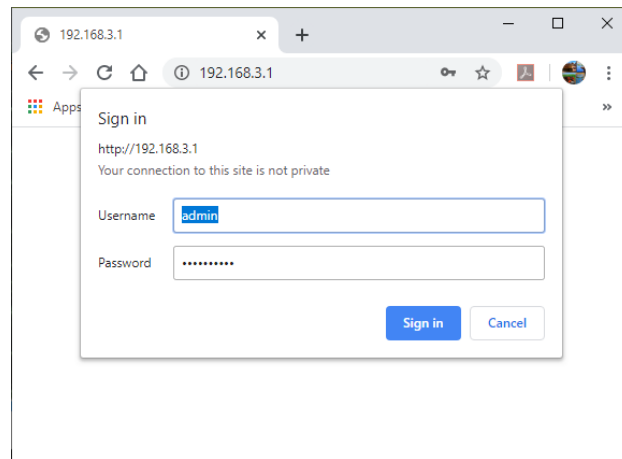


Figure 49 Access your router by using the IP Address of your default gateway in a browser

- (5) The browser will ask for your user name and password to access your router's admin page. You can find this in one of these places, unless you have changed it:
- A sticker on your router, at the back or underneath. Look for the Admin user name and password (this is not always the same as your Wi-Fi password),
 - On a card supplied by your internet service provider or telco,
 - In the leaflet that came with your router.

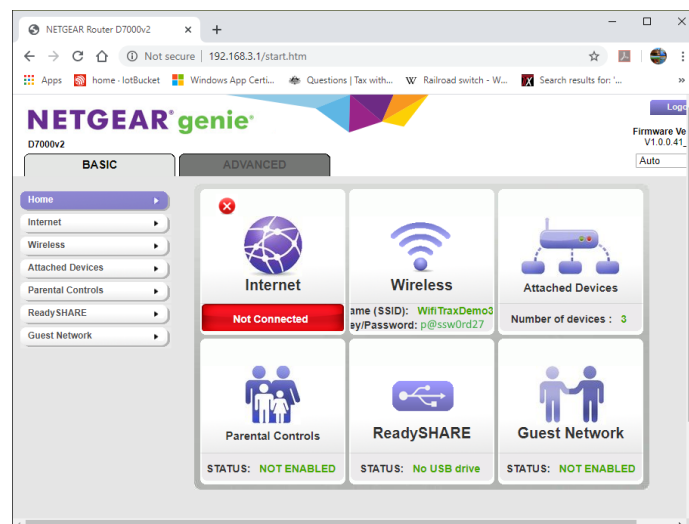


Figure 50 A typical router admin page

- (6) Once you have given the credentials, you will see the admin page. A typical one is shown in Figure 50. Find the “Attached Devices” option and click on it.

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Attached Devices

Go to [Access Control](#) to allow or block devices.

Access Control: Turned Off [Refresh](#)

Wired Devices

| # | IP Address | MAC Address | Device Name |
|---|------------|-------------|-------------|
|---|------------|-------------|-------------|

2.4G Wireless Devices (Wireless intruders also show up here)

| SSID | IP Address | MAC Address | Device Name |
|---------------|---------------|-------------------|--------------|
| WifiTraxDemo3 | 192.168.3.100 | 54:27:1E:FA:CE:DB | SSS105 |
| | 192.168.3.101 | 34:8A:7B:04:03:8C | Galaxy-Tab-A |
| | 192.168.3.103 | C0:B6:58:B6:A9:C9 | iPad-3 |
| -- | 192.168.3.9 | DC:4F:22:39:EA:C0 | ESP_39EAC0 |
| -- | 192.168.3.10 | DC:4F:22:39:EB:2A | ESP_39EB2A |

5G Wireless Devices (Wireless intruders also show up here)

| SSID | IP Address | MAC Address | Device Name |
|------|------------|-------------|-------------|
|------|------------|-------------|-------------|

VPN Client Devices

| Device Name | Remote IP Address | Local IP Address | Connection Time |
|-------------|-------------------|------------------|-----------------|
|-------------|-------------------|------------------|-----------------|

Figure 51 Typical "Attached Devices" page of a router

- (7) You will see a screen something like Figure 51. Find the row where the MAC address matches that printed on the bag label of your WFD-31 device. Here the MAC Address DC:4F:22:39:EA:C0 matches the STA MAC Address on the bag label, so the IP Address is 192.168.3.9
- (8) Now open another tab in your browser and type the IP Address, 192.168.3.9 in this case, into the address bar to get the main menu web page.

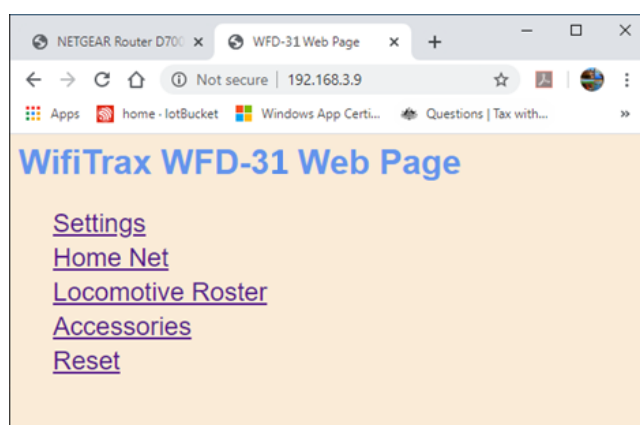


Figure 52 Use the IP Address to open the main menu web page

Reserving a Fixed IP Address

That's all well and good but earlier it was said that routers do not always assign the same IP Address!

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| # | IP Address | Device Name | MAC Address |
|---|---------------|--------------------|-------------------|
| 1 | 192.168.3.101 | Galaxy-Tab-A | 34:8A:7B:04:03:8C |
| 2 | 192.168.3.102 | Lenovo Tablet | 90:61:AE:85:2C:CB |
| 3 | 192.168.3.103 | iPad-3 | C0:B6:58:B6:A9:C9 |
| 4 | 192.168.3.104 | Lenovo Android Tab | 40:A1:08:C0:07:08 |
| 5 | 192.168.3.100 | SSS105 | 54:27:1E:FA:CE:DB |

Figure 53 An IP Address reservation table in a router

Well, while you're in the router admin page you can *reserve a fixed IP Address* for your WFD-31 module. In the Netgear D7000v2 that is used here as an example, you need to click the Advanced tab, then the Setup menu and the LAN Setup sub-menu. The table at the bottom of Figure 1 shows the Address Reservation Table. In this router, you can see that there are already 5 reservations and to add a new one, we hit the Add button.

Then type in the information from Figure 51, give the reservation a name "WFD-31" and hit Add as Figure 54.

| # | IP Address | Device Name | MAC Address |
|---|-------------|-------------|-------------------|
| | 192.168.3.9 | WFD-30 | DC:4F:22:39:EA:C0 |

Figure 54 Adding an address reservation

Usually you have to click the Apply button to restart the router, then check the reservation page to make sure the new one is there. Now your module will always have the same IP Address.

More Information

Detailed Help Pages:

<http://www.wifitrax.com/help/locoOperator/help.html>

<http://www.wifitrax.com/help/towerOperator/help.html>

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Article about Wi-Fi/DCC:

<http://www.wifitrax.com/appNotes/WiFi-DCC.pdf>

Access all the articles:

<http://www.wifitrax.com/appNotes/howToArticles.html>

FCC Information

Radio or TV Interference (this information is MANDATED by the FCC)

This equipment incorporates Espressif Wi-Fi Transceiver Module ESP-WROOM-02D.

FCC Identifier: 2AC7Z-ESPWROOM02D.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help. **Note that any modifications to the equipment not expressly approved by WifiTrax voids the user's authority to operate under and be in compliance with CFR 47 rules**, as administered by the Federal Communication Commission. WifiTrax believes any conscientiously installed equipment following guidelines in this manual would be unlikely to experience RFI problems.

For Canadian Users: "This digital apparatus does not exceed the Class B limits for Radio noise emission from digital apparatus set out in the Radio Interference Regulation or the Canadian Department of Communications." Le présent appareil numérique n'émet pas de bruits radio-électriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

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EU Declaration of Conformity

1. Radio equipment: WifiTrax Model WFD-31 NCE Cab Bus/Wi-Fi Interface Module

2. Name and address of the manufacturer or his authorised representative:

WifiTrax Model Science (A business owned by Steve Shrimpton Sciences Pty. Ltd. a company registered with the Australian Securities and Investments Commission ACN: 076 070 258)

116 The Gully Road, Berowra NSW 2081 Australia

3. This declaration of conformity is issued under the sole responsibility of the manufacturer.

4. Object of the declaration:

WifiTrax Model WFD-31 NCE Cab Bus/Wi-Fi Interface Module as pictured in Figure 55 and identified by a label on underside of module bearing the model number WFD-31.

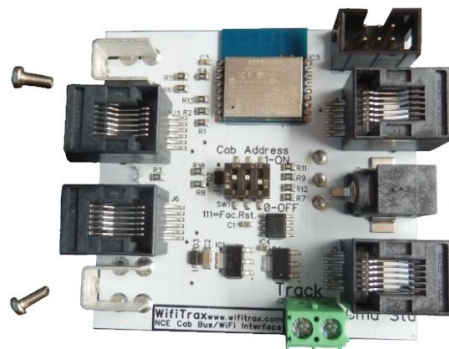


Figure 55 Identifying Illustration for WifiTrax Model WFD-31 EU Declaration of Conformity

5. The object of the declaration described above is in conformity with the relevant Union harmonisation legislation: Directive 2014/53/EU

6. Description of accessories and components, including software, which allow the radio equipment to operate as intended and covered by the EU declaration of conformity:

ESP-WROOM-02D Wi-Fi Internet of Things Module, Espressif Systems (Shanghai) Co., Ltd.

EU-type Examination (Module B) Certificate No. 192140277/AA/00

Issued by Telefication BV The Netherlands, Chamber of Commerce 51565536, www.telefication.com

7. Additional information:

Manufacturer has undertaken engineering analysis and appropriate testing to determine the subject of this declaration performs in its electromagnetic characteristics in the manner specified for the radio module identified in item 6 above.

Module is configured for EU market to allow Wi-Fi Channels 1 through 13 in the 2.4GHz Wi-Fi band.

Signed for and on behalf of: WifiTrax Model Science May 20, 2020, Berowra NSW Australia

Stephen J Shrimpton, Chief Engineer, Director