

Connecting to HamWAN – WestCoast Amateur Radio Association

Introduction:

HamWAN is a multi-megabit IP-based amateur radio network. The system uses 5.8GHz frequencies in the amateur radio band to link repeater sites, EOCs and end users together over a network that operates completely independently from the commercial Internet. While HamWAN is designed to operate independently of the Internet, it does offer Internet connectivity as one of the services; however, many aspects of the commercial Internet are incompatible with amateur radio. Please see our acceptable use policy at: <http://www.ve7vic.ca/amateur-radio-data-network/> to learn what is, and is not acceptable on the network.

Hardware Requirements:

Radio: The network has been built using Mikrotik Routerboard systems and consequently requires the use of a Mikrotik radio to connect. The officially supported radio is the **Mikrotik Metal 5SHPn** (<http://routerboard.com/RBMetal5SHPn>). Other radios may work, however, they are not officially supported and this guide may not be accurate for those devices.

Antenna: You can use any 5.8GHz antenna so long as it has a female N-type connector. We recommend the use of a dish or grid antenna such as the **L-Com HG5827EG grid antenna** (<http://www.ispsupplies.com/L-Com-HG5827EG>) which will deliver maximum gain.

Feedline: No feedline should be required as the recommended **Metal 5SHPn** radio is rated for outdoor use (Temperature rated from -40 to +70C) and is designed to connect directly to your antenna. We recommend that you mount the radio on your mast and connect directly to the antenna to minimize signal losses. If you do mount the radio a distance from the antenna then low loss coax (eg. LMR400) is essential.

First Boot and Initial connection to your Radio:

Your **Metal 5SHPn** radio will come with a few key pieces of equipment:

- 1) **Metal 5SHPn radio** – this is the main component of the system. It has 2 connectors: one N-type connector to the antenna and a second, Ethernet connector, for connection to a PC/router and for power
- 2) **PoE injector** – this device will supply power to your radio. You connect one side to your network (or computer) and the other side to the radio. You will also need to connect a transformer (included) to supply the radio power.
- 3) **24V Transformer** – The **Metal 5SHPn** will operate off any DC voltage in the range of 6-30V. The radio does include a 24V transformer for power for plugging directly into the wall.

Once you have identified the equipment it's time to start connecting it. Start by connecting your antenna directly to the radio's N connector. **Never boot the radio up without an antenna or dummy load connected – you WILL damage it.** Next, connect a piece of **straight through** Ethernet cable to the Ethernet port on the radio. Connect the other end of the cable to the "PoE & Ethernet" port on the power injector. Connect the Ethernet pigtail on the PoE injector directly to your computer, or if you need a longer cable use an Ethernet coupler. Finally, you can connect your transformer to the barrel jack on the PoE injector and plug the other end to wall power.



Figure 1 – Connections to/from radio

Once the radio is connected to power you should hear a single *beep* which indicates it has begun the boot process. Once the boot is complete (it usually takes around 45-75 seconds) you should hear two *beeps* in rapid succession. At this point you can connect to the radio using your computer.

Download the WinBox software from Mikrotik’s website at: <http://www.mikrotik.com/download> and run the downloaded *winbox.exe*. When the program opens, click on the tab that says ‘Neighbours.’ The software will then automatically locate your connected radio. Note that you may receive a Windows firewall prompt when you open the program, please allow the application through your firewall.

Now click on the MAC address of your radio, enter ‘admin’ as the username, leave the password field blank and hit ‘connect.’ After a few seconds you should be logged into your radio.

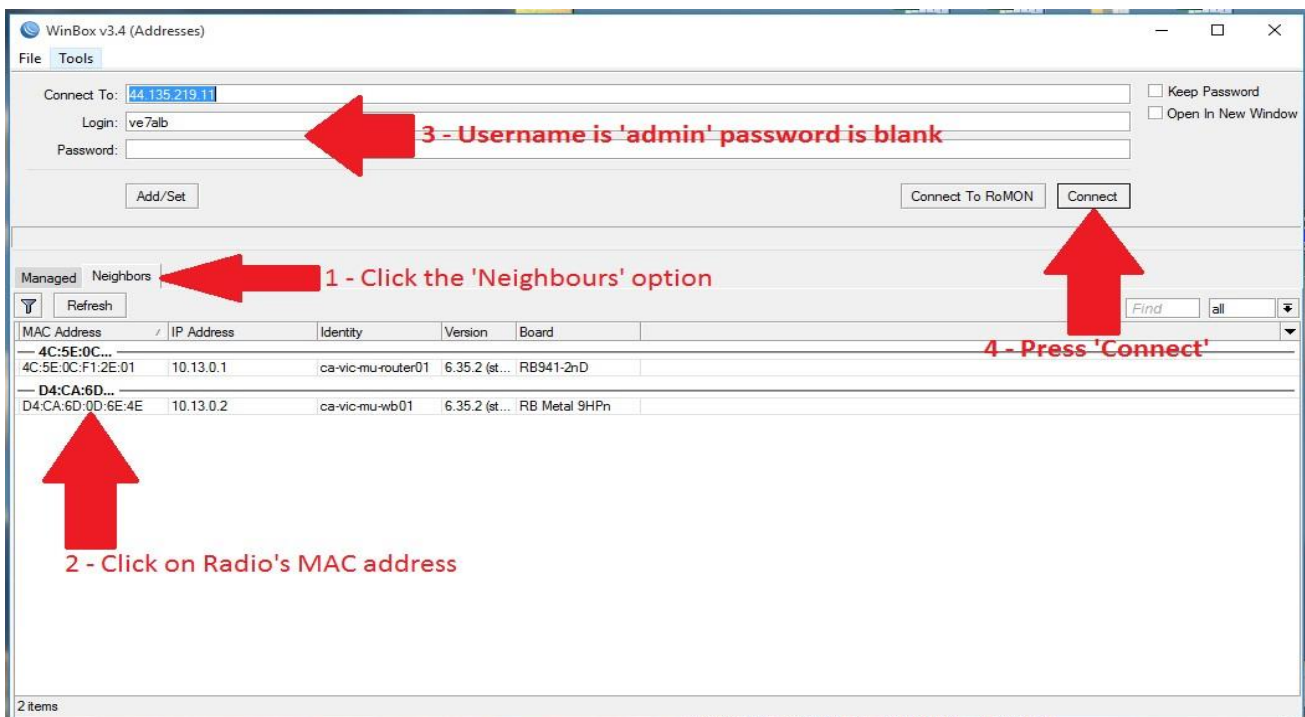


Figure 2 – Initial login to radio

Radio Configuration:

Once you have successfully logged in to your radio you will need to enter a series of commands into the terminal to configure the device. The commands will be provided below as plain text. Ensure you enter the commands exactly as they appear. It is best to type the commands manually as **copy/paste from this document may not work**. Press <Enter> after each line break to execute the command.

Start off by launching a terminal by pressing the 'New Terminal' button in the sidebar:

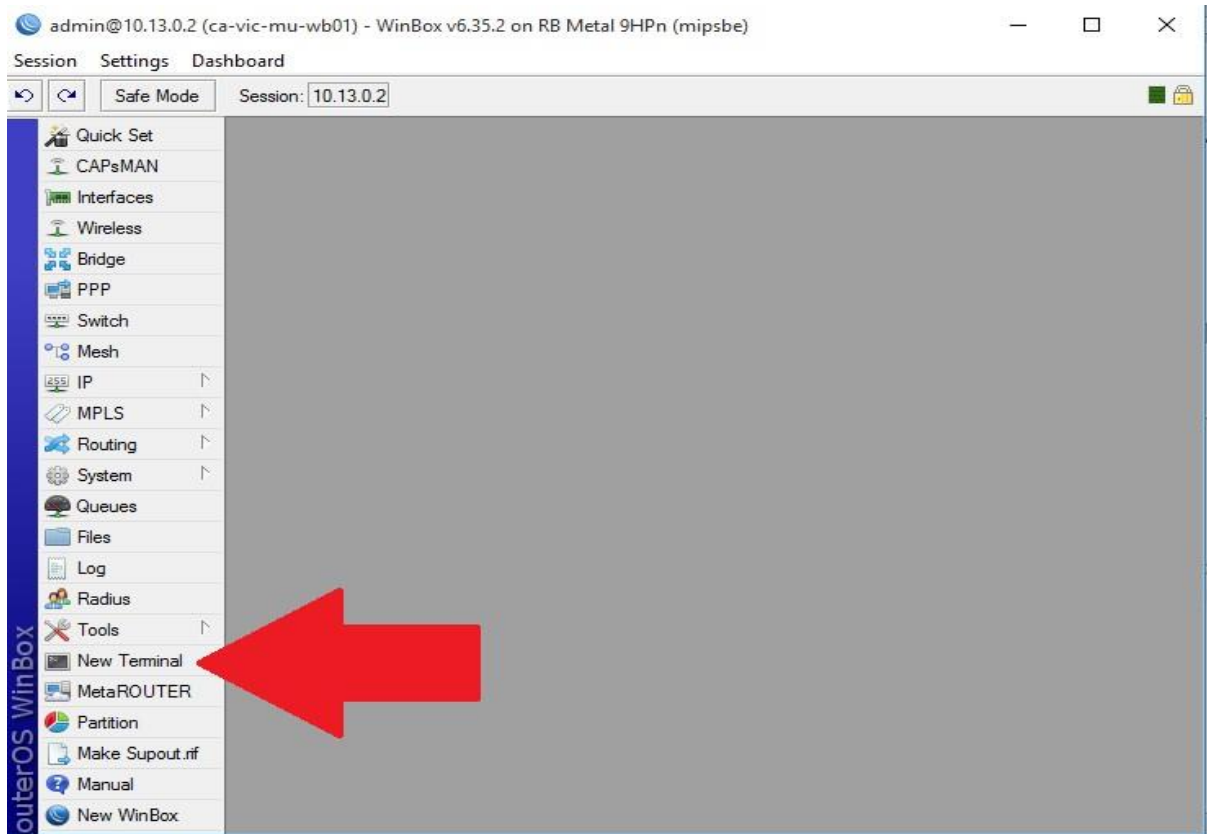


Figure 3 - Launch a new terminal

First off, create a password to secure the administrator account:

```
/user set admin password=<your password>
```

Set the radio name; recommended best practice is to use your callsign and location.

```
/system identity set name=VE7ALB-Saanich
```

Enable Ethernet booting in case recovery is required

```
/system routerboard settings set boot-device=try-ethernet-once-then-nand
```

Enable remote logging for easier debugging

```
system logging action set 3 bsd-syslog=no name=remote remote=44.24.244.8 remoteport=514
src-address=0.0.0.0 syslog-facility=daemon syslog-severity=auto target=remote
/system logging add action=remote disabled=no prefix="" topics=info
/system logging add action=remote disabled=no prefix="" topics=warning
/system logging add action=remote disabled=no prefix="" topics=error
```

Enable SNMP Monitoring

```
/snmp set enabled=yes contact="#HamWAN on irc.freenode.org"
/snmp community set name=hamwan addresses=44.24.240.0/20 read-access=yes writeaccess=no
numbers=0
```

Use the official HamWAN NTP servers to ensure your system time is kept in sync:

```
/system ntp client set enabled=yes primary-ntp=44.24.244.4 secondary-ntp=44.24.245.4
```

Clear default firewall rules:

```
/ip firewall filter remove [find dynamic=no]
```

Set the Maximum Transmission Unit Policy:

```
/ip firewall mangle
add action=change-mss chain=output new-mss=1378 protocol=tcp tcp-flags=syn tcp-mss=!0-1378
add action=change-mss chain=forward new-mss=1378 protocol=tcp tcp-flags=syn tcp-mss=!01378
```

Remove local DHCP server (as it is enabled by default):

```
/ip dhcp-server remove [find]
/ip dhcp-server network remove [find]
```

Disable DNS server:

```
/ip dns set allow-remote-requests=no
```

Add the sector channels:

```
/interface wireless channels
add band=5ghz-onlyn comment="0 degrees" frequency=5920 list=HamWAN name=Sector1-5 width=5
add band=5ghz-onlyn comment="0 degrees" frequency=5920 list=HamWAN name=Sector1-10 width=10
add band=5ghz-onlyn comment="120 degrees" frequency=5900 list=HamWAN name=Sector2-5 width=5
add band=5ghz-onlyn comment="120 degrees" frequency=5900 list=HamWAN name=Sector2-10 width=10
add band=5ghz-onlyn comment="240 degrees" frequency=5880 list=HamWAN name=Sector3-5 width=5
add band=5ghz-onlyn comment="240 degrees" frequency=5880 list=HamWAN name=Sector3-10 width=10
```

Configure the radio to announce your callsign and location **Note: the importance of this step as it will ensure your radio identifies itself on air in compliance with Industry Canada regulations**

```
/interface wireless set 0 radio-name="CALLSIGN/YourLocation"
```

Configure the wireless card to use HamWAN:

```
/interface wireless set 0 disabled=no frequency-mode=superchannel scan-list=HamWAN ssid=HamWAN wireless-protocol=nv2
```

Tell your radio to pull DHCP, including default gateway, from HamWAN:

```
/ip dhcp-client add add-default-route=yes dhcp-options=hostname,clientid disabled=no interface=wlan1
```

Connecting to the Network

Now that you've finished the initial configuration of the radio it's time to mount it to your mast and connect to the network. Orient your antenna so it is pointing in the approximate direction of the closest cell site & secure it. Now connect your radio to the antenna and Ethernet. Once everything is locked down, go ahead and connect your computer to the system and apply power. Wait for the radio to boot up and connect once again using Winbox.

Once you're logged in launch a terminal and use the following command to search for signal:

```
/interface wireless scan 0
```

This command will tell your radio to continually search for signal. Once you receive a signal you should see an output similar to below:

```

MMM      MMM      KKK      TTTTTTTTTT      KKK
MMMM     MMMM     KKK      TTTTTTTTTT      KKK
MMM MMMM MMM III KKK KKK RRRRRR  OOOOOO      TTT  III KKK KKK
MMM MM  MMM III KKKKK  RRR RRR  OOO OOO      TTT  III KKKKK
MMM      MMM III KKK KKK RRRRRR  OOO OOO      TTT  III KKK KKK
MMM      MMM III KKK KKK RRR RRR  OOOOOO      TTT  III KKK KKK

MikroTik RouterOS 6.35.2 (c) 1999-2016      http://www.mikrotik.com/

[?]          Gives the list of available commands
command [?]  Gives help on the command and list of arguments

[Tab]        Completes the command/word. If the input is ambiguous,
              a second [Tab] gives possible options

/            Move up to base level
..          Move up one level
/command    Use command at the base level
[admin@MikroTik] > /interface wireless scan 0
Flags: A - active, P - privacy, R - routeros-network, N - nstreme, T - tdma,
W - wds, B - bridge
      ADDRESS          SSID          CHANNEL  SIG  NF SNR RADIO-NAME ROUTERO...
A RT B E4:8D:8C:F1:6D:28 HamWAN      5900/5/an -83 -124 41 S1.Tria...
-- [Q quit|D dump|C-z pause]
```

Figure 4 – Scanning for signals

Once you see the signal, slowly adjust your dish left & right, up & down until the signal is optimized.

Note that the signal strength is presented as a negative number, so the closer the number is to zero the better the signal is.

Once you have optimized the signal, verify you have Internet connectivity. Enter the command:

```
/ping 8.8.8.8
```

in your Winbox terminal. You should see the following output:

```

[admin@ca-vic-mu-wb01] > ping 8.8.8.8
  SEQ HOST                SIZE TTL TIME  STATUS
    0 8.8.8.8                56  56 16ms
    1 8.8.8.8                56  56 15ms
    2 8.8.8.8                56  56 19ms
sent=3 received=3 packet-loss=0% min-rtt=15ms avg-rtt=16ms max-rtt=19ms
```

Figure 5 – Ping to the Internet

Final Configuration Steps

Once you have optimized the signal and confirmed Internet connectivity there are a few more configuration steps you need to follow. The following steps are to be run directly from the Winbox terminal just like the previous commands:

Update firmware:

```
/system package update check-for-updates  
/system package update upgrade
```

If an update to your radio is available it will be downloaded and installed. You need to reboot the radio once the update completed by issuing the command:

```
/system reboot
```

Finally, add the usernames and private keys of the network administration team. This will ensure we can remotely update the configuration of your radio as required. **Note that we will always connect using private keys (more secure than passwords) so when creating the user accounts use a randomly generated password**

```
/user  
add group=read name=monitoring password=<randomly generated password>  
add group=full name=ve7alb password=<randomly generated password>  
  
/tool fetch url="https://www.hamwan.org/t/tiki-download_wiki_attachment.php\?attId=148"  
dst-path=key-dsa-monitoring.txt  
  
/tool fetch url="http://files.ve7alb.ca/ve7alb-hamwan.txt" dst-path=key-dsa-ve7alb.txt  
  
/user ssh-keys  
import public-key-file=key-dsa-monitoring.txt user=monitoring  
import public-key-file=key-dsa-ve7alb.txt user=ve7alb
```

You're done! You can now look at integrating HamWAN into your EOC's LAN if desired or start connecting to services on the network. For more information on services:

<http://www.ve7vic.ca>

<http://www.hamwan.org>