CDM
WIRELESS

Statement of Conditions

In the course of improving design, function, operation or reliability, CDM reserves the right to make changes to the products in this manual without notice. If any questions arise during installation or product validation please contact our customer service or technical support.

Contacts

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Disclaimer: Limitations of Liability

1. CDM assumes no risk and shall be subject to no liability for damages or loss resulting from the specific use or application of the product. CDMs liability for any claim, whether based on breach of contract, negligence or product liability, relating to the products shall not exceed the price paid by the Customer. In no event will CDM be liable for any special, incidental or consequential damages (including loss of use, loss of profit, loss of data, loss of revenue, loss of business or claims of third parties) however caused, whether by imputed negligence or otherwise.

2. Users of CDM products shall abide to policies, regulations or laws of the respective nation or local territories in which the product is being used. Any consequences arising from, or relating to, violations of local laws or regulations shall be solely imputed to the user and not CDM.

   General Safety Warnings

   CDM products should be installed by trained professional technicians. The warnings below should be read prior to any installation of CDM products

   Antenna Safety Warning

   ⚠️You can be injured or killed if performing installations near electrical power lines. Please read all instructions in this guide prior to performing installation tasks. Do not install antennas near overhead power lines or where the antenna can come in contact with such obstacles.

   Lightning Warning

   ⚠️Take proper precautions during periods of lightning. Do not connect or disconnect cables during this time. Surge protective devices should be installed, when applicable, to prevent possible damage from strong surges such as lightning strikes.

Grounding of the Device

⚠️Proper grounding of the device and the PoE injectors must be performed in order to prevent possible electrical damage due to lightning or other power surges. The ground connection must be complete before powering up the device. Make sure the resistance is less than 5 ohms between the ground termination point and earth ground.

Overhead Work Warning

⚠️When working on roofs, bucket trucks, towers or ledges, individuals should comply with governing safety procedures regarding safety belts, tool lanyards, hard hats and other safety measures to insure a safe work environment.

RF Device Protection

⚠️Prolonged overpowering of the devices can cause permanent damage. If powering up the devices prior to installation make sure there is adequate distance between devices or orient the antennas away from each other to prevent possible damage to the radios.

FCC

CDM products comply with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, included interference that may cause undesired operation.

CAN RSS-Gen/CNR-Gen:

En: This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Fr: Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Contents

Introduction

The purpose of this manual is to guide you through the installation process for your CDM Wireless products. Installation involves several items that must be considered relative to the system site(s) before beginning the actual installation.

If you need additional information during the installation process contact CDM using the information provided in the last section of this manual.

Component Inspection

Check the Part Number on the back of each device against the Part Number specified on your original Purchase Order. Also, record the associated Serial Number for each device. This information will be helpful if you need to contact Customer Service about a device.

- Verify that you have received the correct antennas, cables and associated mounting hardware.

- Verify that you have received the correct mounting hardware for the CDM Wireless Devices.

- Check that PoE Injectors and Power Supplies are correct.

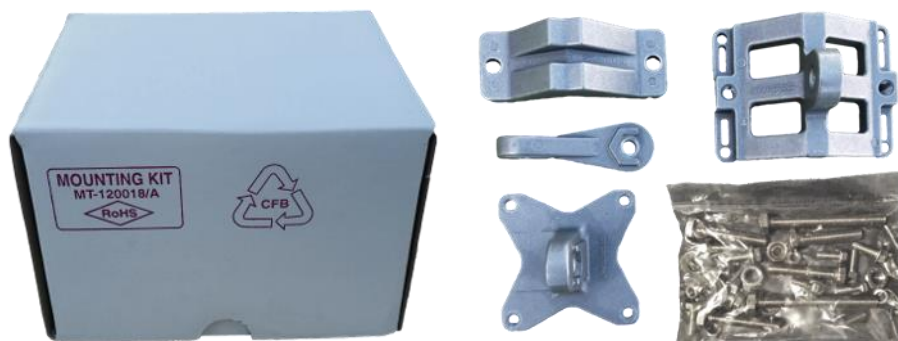## Universal Mounting

Pole or mast mounting

Figure 1. Universal Mounting Kit up to 3" pole or wall

(Can adapt to larger poles using stainless steel straps)

The supplied mounting kits will be used to mount the CDM Wireless equipment to poles, masts or flat surfaces. Refer to installation instructions for mounting the product that is included in the shipment.

AC Power Connections

The CDM Wireless products are provided with PoE injector kits that supply all the power requirements needed to power the CDM Wireless product. Ideally they should be located inside the building close to the DVR, NVR or computer. If they are to be installed outside they will need to be in a weatherproof enclosure. They use 110/220 Vac input power and supply 48Vdc output power for the CDM Wireless product (and IP devices on

certain models). The total length of Cat 5 Ethernet cable that powers the CDM Wireless Device and external IP device can be up to 328' from the power source.

Camera Connections

All CDM Wireless devices are 802.3af compliant. Certain CDM models are 802.3at compliant and will provide intelligent PoE connectivity as a Power Sourcing Equipment (PSE) device. Simply plug a Cat 5 cable into the Ethernet port and then plug this cable into the IP device. In addition certain CDM Wireless Models are 802.3af/at Powered Device (PD) compliant and can be powered by an intelligent PoE Switch.   Refer to the documentation that came with your device to ensure 802.3at PD support is enabled for your CDM Wireless Device.

Fixed and Pan Tilt Zoom Connections

If your Fixed and/or PTZ camera is a PoE+ (802.3at) capable device, you may use the PoE+ Ethernet output ports of the CDM Wireless radio to power the camera(s). CDM Wireless products do not supply AC power for PTZ cameras.

Ethernet and Antenna Connections

The location of the Ethernet Ports & Type-N antenna connectors are shown in the illustrations below.

CDM models supporting 802.3af only:

The Ethernet and antenna(s) ports of these models are each provided as external plug-in ports. An example of the external connections of select models is shown below:

Figure 2. External port connections

CDM models supporting 802.3af and 802.3at:

Antenna(s) ports of these models are each provided as external plug-in ports. The Ethernet ports of these models are accessible from inside the radio. An example of the connections of select models is shown below:

Figure 3a. Internal & External port connections

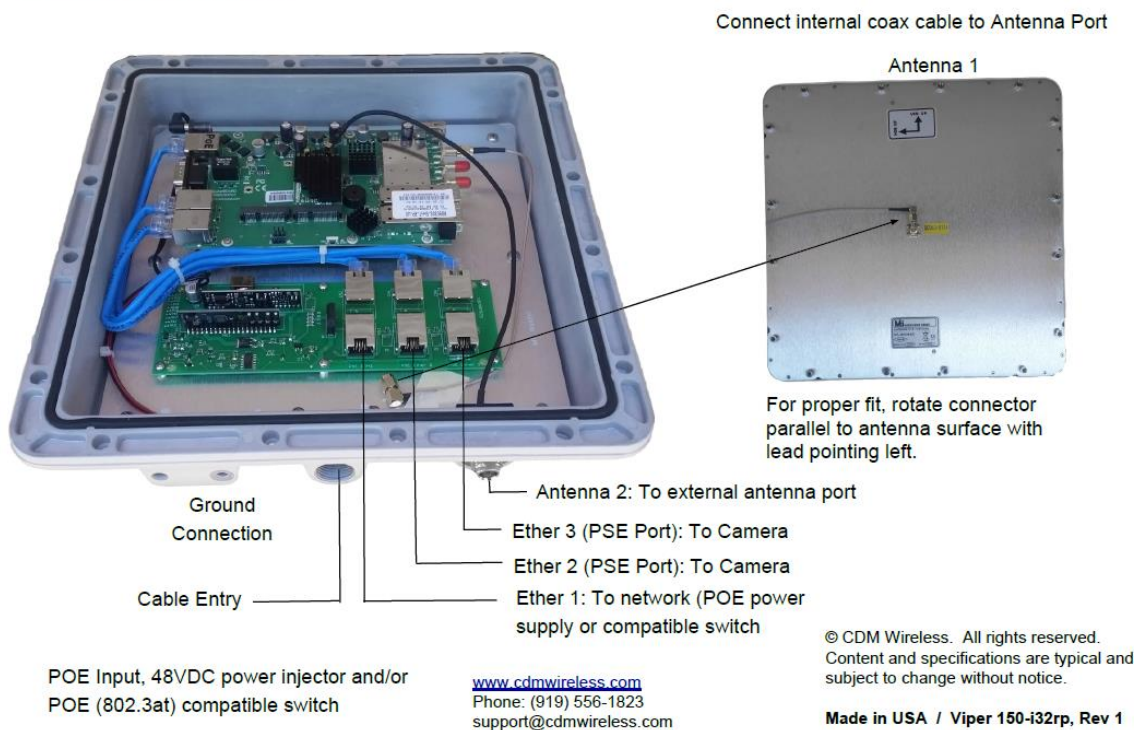**Illustration of Viper 150-132rp connections:**

Figure 3b. Internal & External port connections

Proper Grounding Procedures for CDM Wireless Radio Equipment

The CDM Wireless Radio Systems are all wired to a common ground plane within the enclosure. It is **IMPERATIVE** that the installation technician connect the grounding lug located on the bottom right side of the CDM Wireless Unit next to the tool holes for the mounting bracket. This ground connection must be tied to a true earth ground to minimize risk of damaging the device.

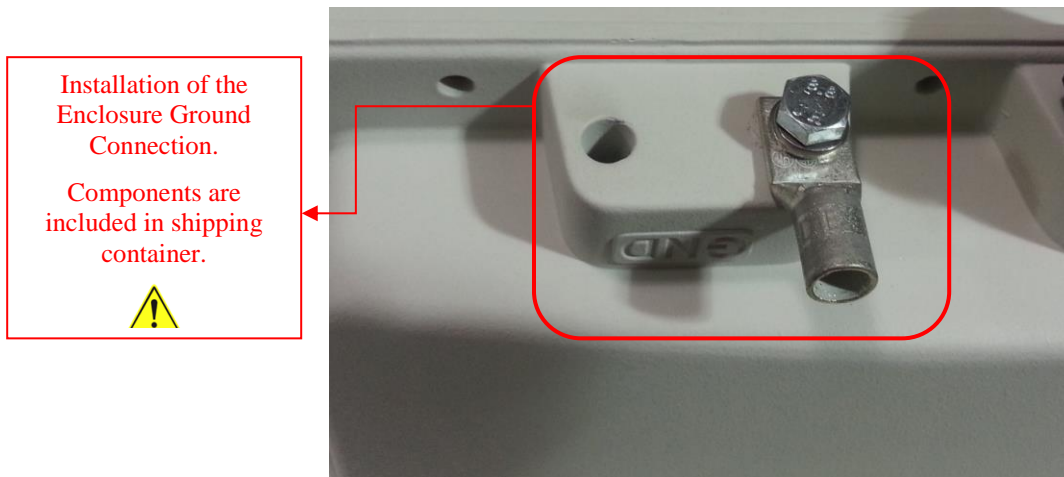The grounding lug is called out in Figure 2 below for further illustration.

Installation of the Enclosure Ground Connection.

Components are included in shipping container.

⚠️

Figure 4. Device Enclosure Grounding Lug

PoE Power Injectors

CDM provides two different PoE Power Injectors, depending on the model of CDM Wireless radio. All radios supporting PoE output ports are supplied with a 64 Watt power injector. For radios that do not support PoE output ports, a 32 Watt power injector is supplied.

Installing PoE Power Injectors and Cables

Terminate the cat 5 Ethernet cable from the computer or other network device into the **DATA** connector on the PoE Injector. Terminate the Ethernet cable from the CDM Wireless Device (**Ethernet 1**) into the **DATA & PWR** connector on the PoE Injector.

If you have a CDM radio model supporting PoE Output Ports, connect the cameras or accessory to the CDM Wireless PoE Output Ports (**Ethernet 2 & 3**).

Insert the AC cable from the PoE Power Supply into suitable 120/240 VAC outlet.

64 Watt PoE Power Injector

32 Watt PoE Power Injector

Figures 5. PoE Power Injectors

If you need information about which pin numbers to use on the IP cables, see the circuit diagram on the side of the PoE Injector as shown.

Cable Information

Weatherproofing Exterior Connections

After the installation is completed, waterproof all of the exterior cable connections. This is a very critical step, not only for the longevity of the system but the integrity of the wireless signal and other communications. Use the weather proofing hardware supplied with the CDM Wireless product to weather proof all Ethernet connections.

We recommend that you use the procedure described below that covers the antenna connectors and cable other than the Ethernet connections.

Note: 3M makes a good quality Mastic tape (Scotch #2228) and black plastic tape (Scotch700).

Use good quality black plastic electrical tape for the first wrap. Start with a complete wrap around the connectors with the tape touching the connector mounting nut. When you reach the starting point, angle the tape and continue wrapping so that when you return to the starting side the tape overlaps the previous layer by about ¼". Continue wrapping until there is about ¼" to ½' of tape around the cable. Carefully cut the tape and smooth the ends firmly against the cable.

This first wrap is illustrated in the cut-away view in Figure 6 below. The thickness of the tape has been exaggerated in the drawing for clarity.
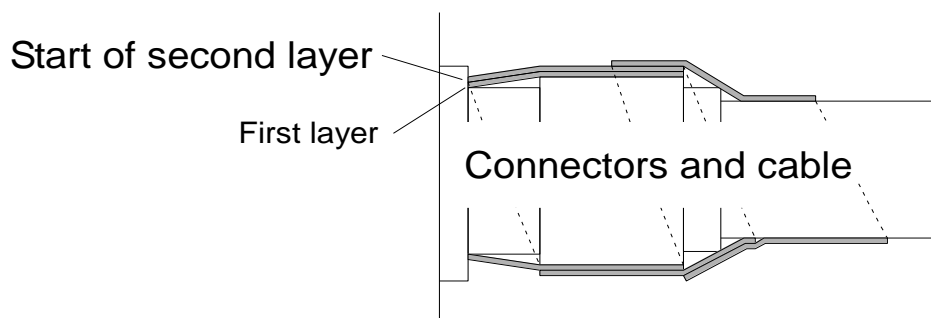

Figure 6. First Layer of Waterproof Tape

Use the same basic procedure and apply a second wrap of good quality mastic tape. Continue this wrap about ¼" to ½" beyond the end of the first wrap. Be sure that the end of the tape is cut cleanly and smoothed firmly against the cable. Follow this wrap with a final wrap of the black plastic electrical tape. The three wraps are illustrated in the cut-away view in Figure 7 below.
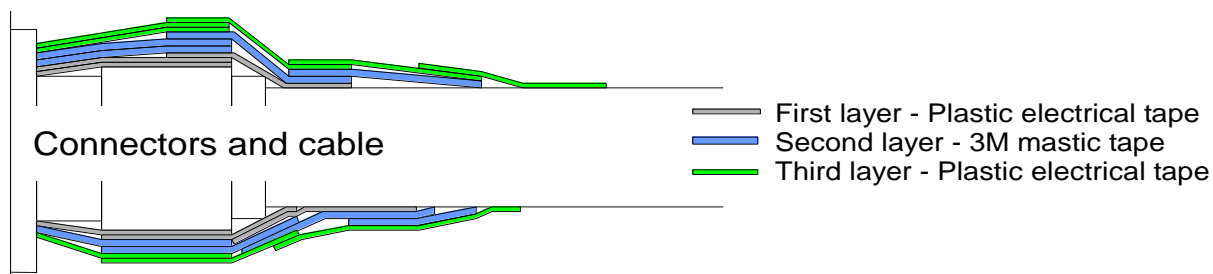

Figure 7. Three Layers of Waterproof Tape

Power up System

Verify that all of the necessary connections have been made in the system. Turn on the circuit breakers that were turned off during the installation process if applicable.
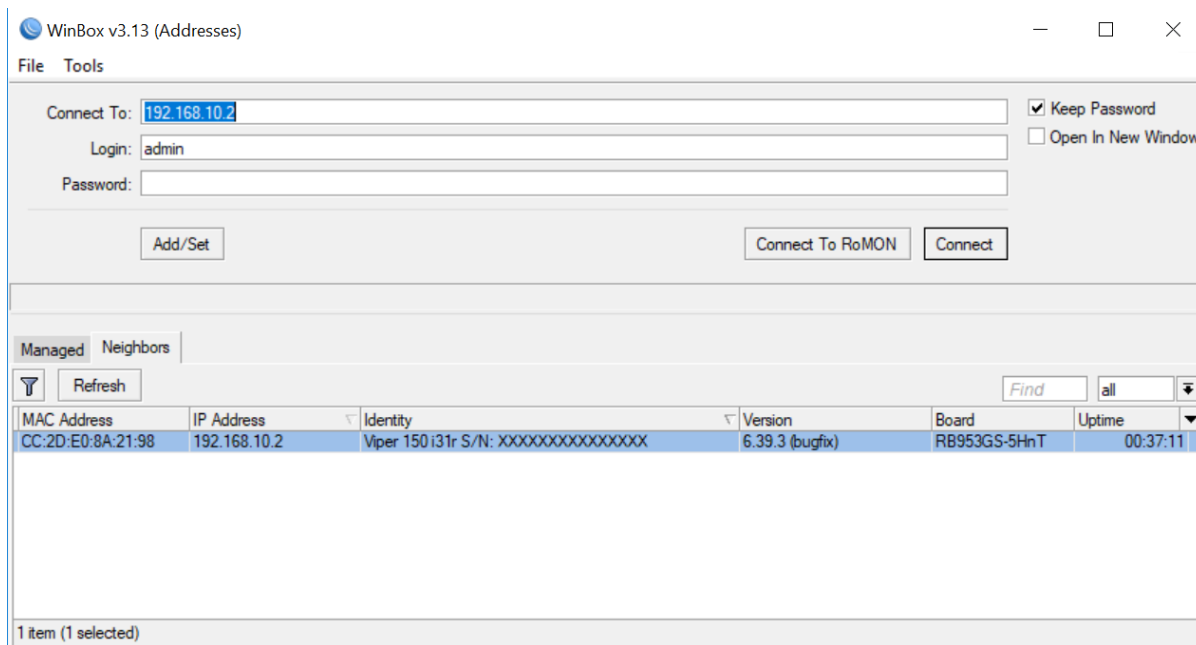
First Time Accessing A CDM Wireless Device

Based on the information provided to CDM when your equipment was ordered, the system was designed and configured/programmed using the network layout provided or with factory default information. A copy of this diagram is provided to you with the equipment. This diagram details the specific IP addresses used for each of the CDM Wireless Devices and any associated equipment used in your system.

Obtaining the CDM Wireless Configuration Tool (Winbox)

You can locate a copy of the CDM Wireless Configuration Tool (Winbox powered by Mikrotik™) on the CD-ROM that accompanied the shipment of your CDM Wireless Networking Equipment.

The Winbox.exe software package is a standalone executable and does not require any special permissions to run or save settings.

System Configuration and Test

The wireless links between the various devices should be tested to determine the optimum frequency and bandwidth.

The appropriate IP addresses and configuration of the system is done at the factory during the manufacturing of your devices. The wireless link and data throughput tests are performed after the equipment is installed at your site. Changes in the configuration or IP addresses can be done after installation if necessary by the end user.

Final System Programming

After the basic CDM Wireless Device programming has been accomplished, the final programming can be done. This consists of adding the CDM Wireless Devices to the Access Point "Access" and "Connect" lists.

Some of the initial steps in this procedure are similar to those used for Access Point and programming. Refer to this information, if needed.

Equipment Needed For Final Programming

The following items are needed for the final programming the system:

- Ethernet cable (This cable is used only if needed to connect directly to the AP device Ether port.)

- Computer that is connected to the CDM Wireless Device.

Final System Programming Procedure

1. Power up the CDM Wireless Device and associated CDM Wireless Devices.

2. Open the **Winbox** program and use the assigned IP Address; the username **admin** and leave the password **blank** connect to the CDM Wireless Device.

Assign a system password to secure your CDM Wireless Device

- o Locate the main menu to the left hand side of the **Winbox** application window.

- o Navigate down to the **System** menu option

- o Select **Password**

- o **Enter The Old Password**: <blank> by default

- o **Enter New Password**   *Record Password Here:* _____

- o **Re-Enter New Password**

- o Cick **Ok**

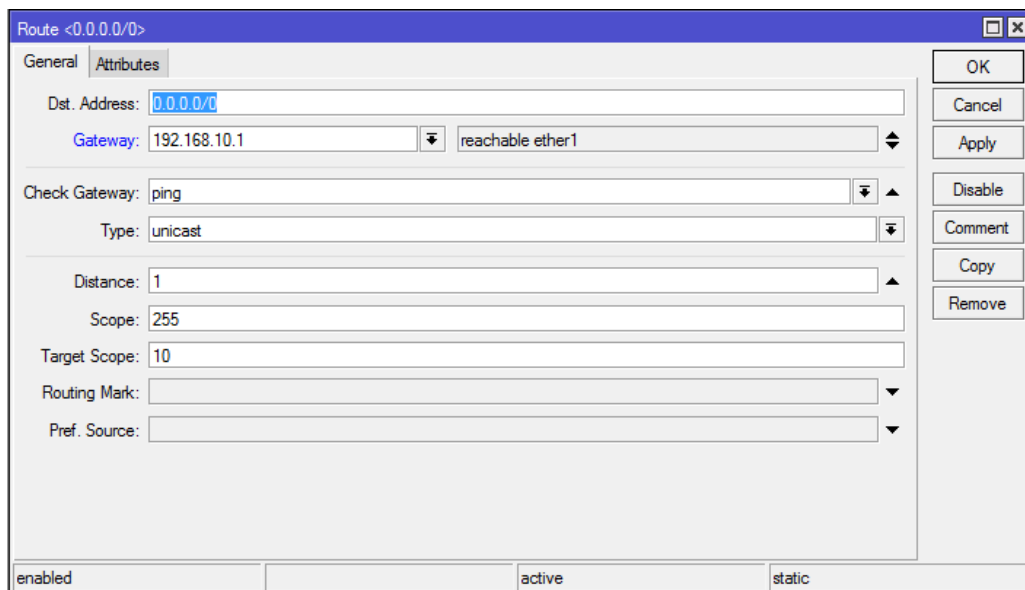### Assign a new IP Address to Your CDM Wireless Device

- o Locate the main menu to the left hand side of the **Winbox** application window.

- o Navigate down to the **IP** menu option

- o Select **Addresses**

- o **Click Red Plus Sign** ➕

- o Fill In the IP Address Information **New Address** dialog box.
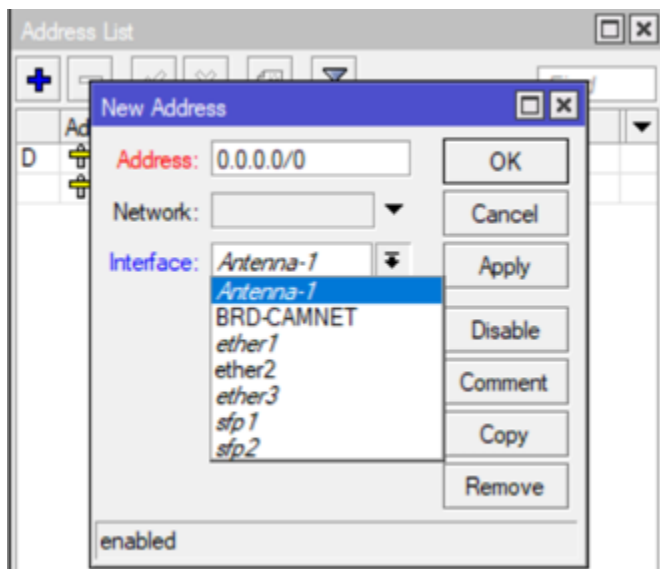
o   Enter Your IP Address in the **Address:** field using the following format
    <***ip.add.re.ss/sub.net.ma.sk***> ie. *192.168.100.100/255.255.255.0*

o   Leave the Network Line Empty

o   Select the **BRD-CAMNET** interface from the **Interface:** Dropdown Selector

o   Cick **Apply**

o   Click **Ok**

Assign a new Default Gateway to Your CDM Wireless Device

o   Locate the main menu to the left hand side of the **Winbox** application window.

o   Navigate down to the **IP** menu option

o   Select **Routes**

o   Locate the current **Default Gateway Route** It will begin with **0.0.0.0/0**

o   **Double Click** the **Default Gateway Route** (*All Zeroes Route*)

o   Enter the **Default Gateway** address in the **Gateway:** i.e. 192.168.10.1

o   Select the **Ping** option from the **Check Gateway:** dropdown selector.

o   Cick **Apply**

o   Click **Ok**

Restoring Your CDM Wireless Device to Factory Settings

Only use this feature if directed to do so by a CDM Wireless Technician as it will eradicate any modifications made to the system either positive or negative.

Due to complexity of the CDM Wireless Configuration we have included the Factory Configuration in an easy to restore binary file with your system. This will restore the device to the settings with which it was shipped from the factory. In order to utilize this functionality you will need access to the Winbox utility and have the device in question connected to your computer via an Ethernet cable as explained earlier in this document.

Equipment Needed For Factory Restore Procedure

The following items are needed for the Factory Restore Procedure:

•   Ethernet cable (This cable is used only if needed to connect directly to the Access Point device Ethernet port.)

•   Computer that is connected to the CDM Wireless Device.

Factory Setting Recovery Procedure

1. Power up the CDM Wireless device.

2. Open the **Winbox** program and use the assigned **IP Address** and your password to the CDM Wireless Device.
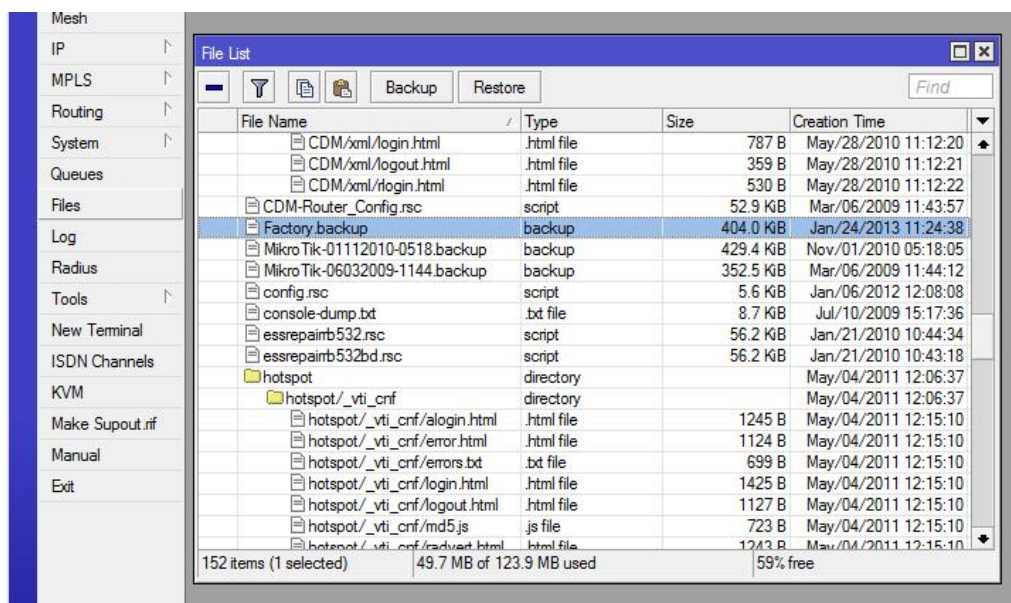

Figure 8. File Storage Interface

3. Select the '**Files**' from the left hand menu. The Files Dialog will open up.

4. Select the '**Factory.backup**' file from the files list. (Although it is dependent upon the configuration of your CDM Wireless Unit you may see significantly fewer files in the File List.)

5. Select the '**Restore**' button from the top menu of the '**Files**' dialog box.

6. When prompted if you are sure you wish to restore the backup select '**Yes**' from the dialog box.

7. Once you make your selection the router will reboot and restore the original configuration.

8. Repeat these steps for all of the radios you wish to restore to factory settings.

Final System Programming

After the basic Viper device programming has been accomplished, final programming can be done. This consists of adding the Viper devices to the Access Point "Access" and "Connect" lists.

Some of the initial steps in this procedure are similar to those used for Access Point and programming. Refer to this information, if needed.

Equipment Needed for Final Programming

The following items are needed for the final programming the system:

- Ethernet cable (This cable is used only if needed to connect directly to the AP device Ether port.)

- Computer that is connected to the Viper Device.

Final System Programming Procedure

1. Power up the Viper device and associated Viper devices.

2. Open the **Winbox** program and use the assigned (or changed) IP address and your new password (if applicable to connect to the Access Point device. Select **Wireless** in the **Winbox** menu to display the **Wireless Tables** dialog box as shown in Figure 9 below.
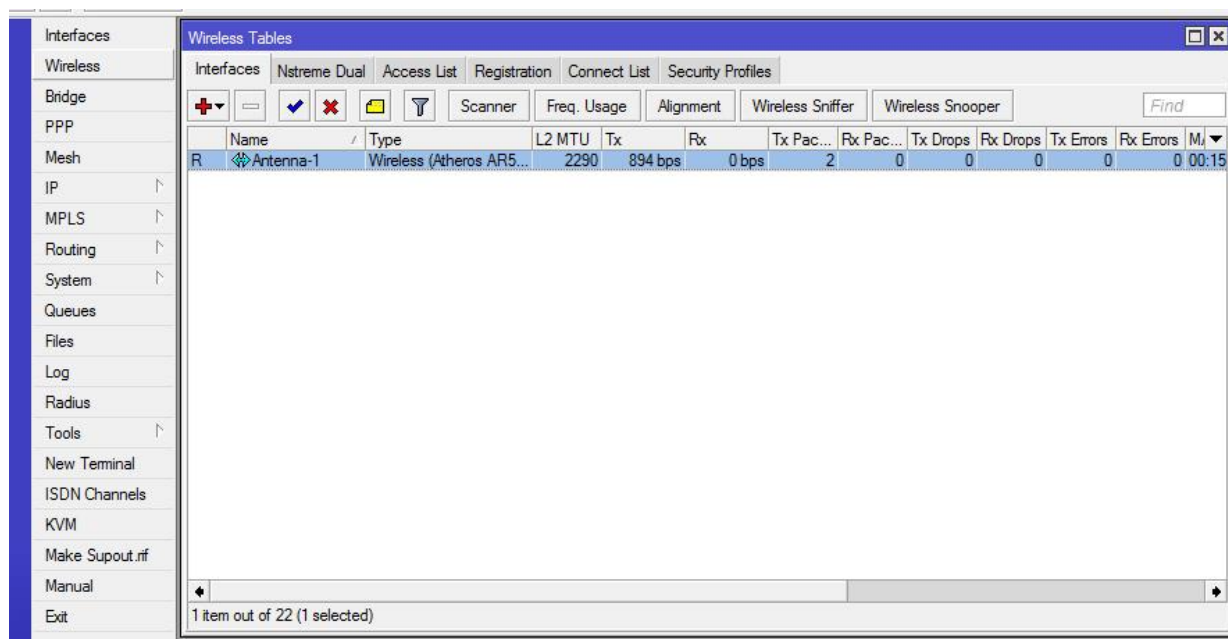

Figure 9. Wireless Tables Dialog Box

3. Select the **Registration** tab, right click on one of the radios and select 'copy to access list; right click the same radio and select 'copy to connect list button.
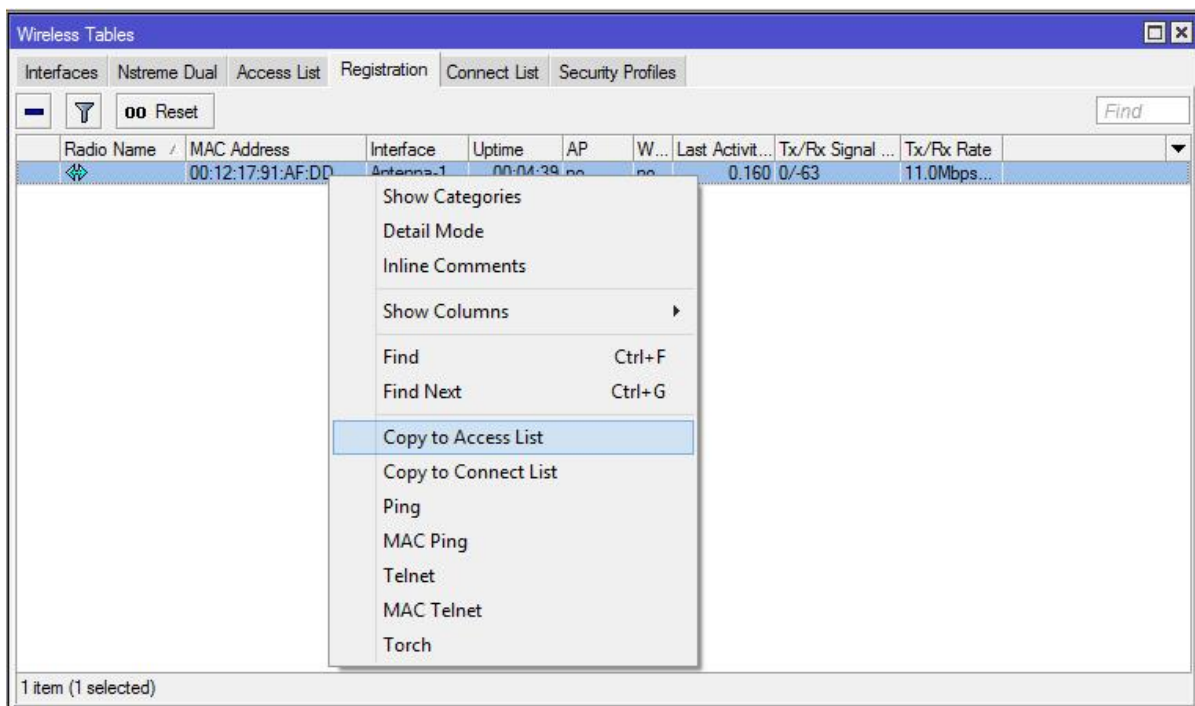

Figure 10. Wireless Tables Dialog Box – Registration List

4. Repeat these steps for all of the radios in the list.

5. Return to the **Interfaces** Tab of the Wireless Tables Dialog Box

6. Double Click on a wireless interface. (**Antenna-1** or **Antenna-2**)

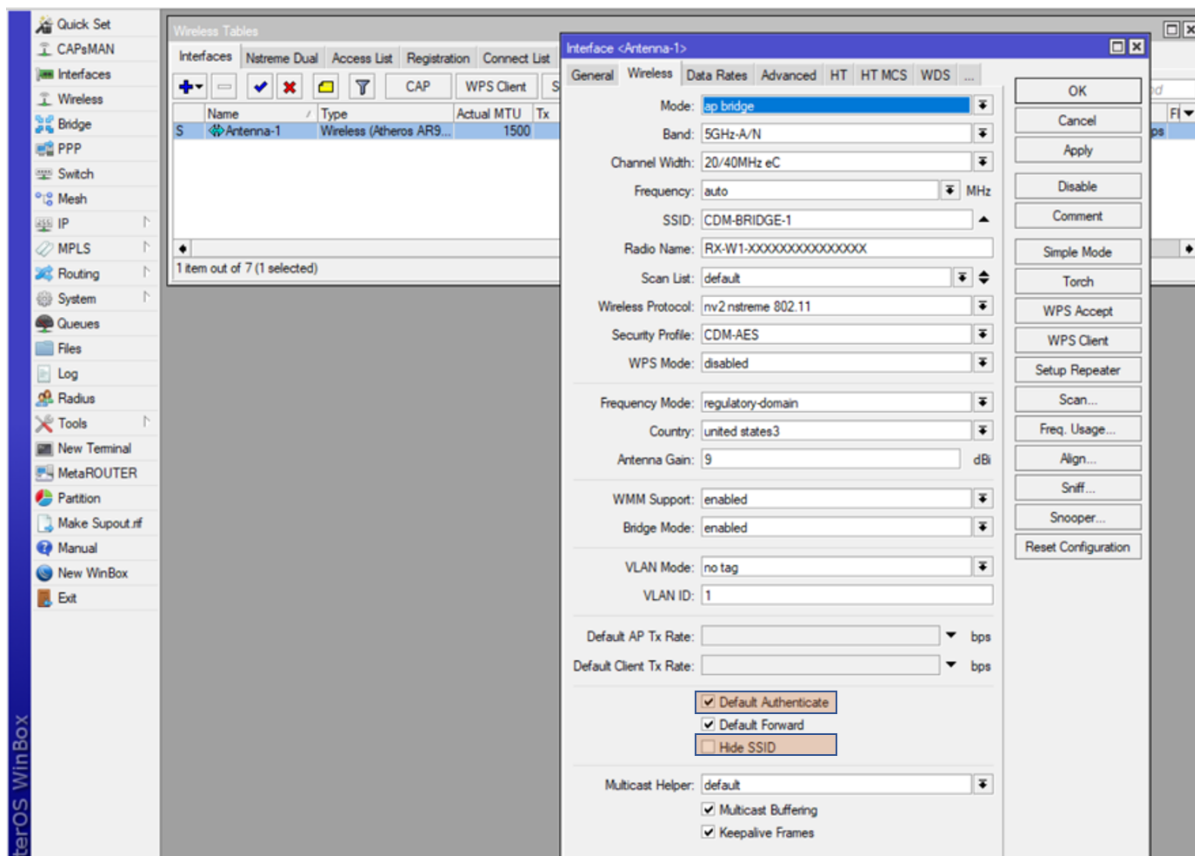7. Select **Wireless** tab as pictured in *Figure 11* below.

Figure 11. Wireless Interface Properties Dialog Box – Wireless Tab

8.   Uncheck **Default Authenticate**: This will prevent any radios that are not authorized in the Connect List or Access List from connecting to your Wireless Network.

9.   Optionally: To hide your Network Name or SSID you may check **Hide SSID** only do this if you are certain you have all of your remote stations configured correctly and you are familiar with the behavior of a hidden Access Point.

Wireless Link Test

A detailed Wireless link test may be performed between each CDM Wireless Device and its corresponding CDM Wireless Device.

The link test involves using different frequencies and to determine the optimum operating parameters (maximum bandwidth) for communication between two devices.

Data for the wireless link test is recorded on the data sheet shown on the next page.

If the link test is being performed between a CDM Wireless transmitter device and a CDM Wireless Access Point device, verify that the CDM Wireless Ethernet output is connected to the Ethernet port on your computer.

If your system contains a Repeater device between the transmitter and the Viper, you must perform a separate test between each link. First connect the Ethernet output of the Repeater to your computer and perform the Wireless Link Test between the transmitter and the repeater. Examine the results of the test and select the optimum frequency and bandwidth for that link following the guidelines presented in the procedure below.

Next connect the Ethernet output of the CDM Wireless Device to your computer and conduct the Wireless Link Test between the repeater and the Access Point. Examine the results of the test and select the optimum frequency and bandwidth for that link following the guidelines presented in the procedure below.

Details of the test procedure are provided in the next section. You will need the list of IP addresses assigned by the System Integrator.

CDM Wireless Radio Link Test

Survey # _____   Page _____ of _____

Site Name _____   Date _____

Address _____   Xmit Radio _____

City/State/Zip _____   Rcvr Radio _____

_____

X-Ant Type _____   Gain (dBm) _____   Sys Loss (dBm) _____

R-Ant Type _____   Gain (dBm) _____   Sys Loss (dBm) _____

Site Description _____

_____

_____

				Measurement Data					
Ref #	Polar (H/V)	Freq (gHz)	Band (gHz)	Nstrm Mode	X-Ant Height (ft)	R-Ant Height (ft)	Xmit Signal (dBm)	Send Data (Mbps)	Rec Data (Mbps)

Notes: _____

_____

Drawing of Test Setup Showing Reference # Location

Wireless Link Test Procedure

1. Power up the system and the computer that is connected to the CDM Wireless Device.

2. At this point, check the network settings on your computer. Select **Control Panel**, then **Network and Internet Connections** and then **Network Connections**. The LAN icon should be displayed as shown in Figure 10 below with associated link information.

Figure 12. LAN Connection Icon

Right click the icon and select **Properties** in the drop-down menu. On the **General** tab highlight **Internet Protocol (TC/IP), a**nd then select **Properties.** Enter an IP address that is in the same subnet as the Viper Equipment. Close the **Network Connections** window.

4. If you have not already done so please download the Winbox utility from the CDM website. Alternatively, you may download Winbox directly from your radio by using a web browser. Simply right click on Winbox and select "Download."

5. When the download is complete, select **Run** to open the **Winbox Loader** dialog box. For subsequent **Winbox** sessions, activate **Winbox** from the **winbox.exe** icon on your computer desktop.

6. The **Winbox Loader** dialog box is displayed as shown in figure 11 below. Select the "Neighbors" tab and Click on the "Refresh" button to display available wireless radios. Select the MAC or IP address and Click on the "Connect" button for the device you want to log into. Use either the MAC or IP address and Fill in the **Login** and **Password** fields with information provided by your system integrator. The factory default value for **Login** is "admin" and by default there is no password defined. Click **Connect**.
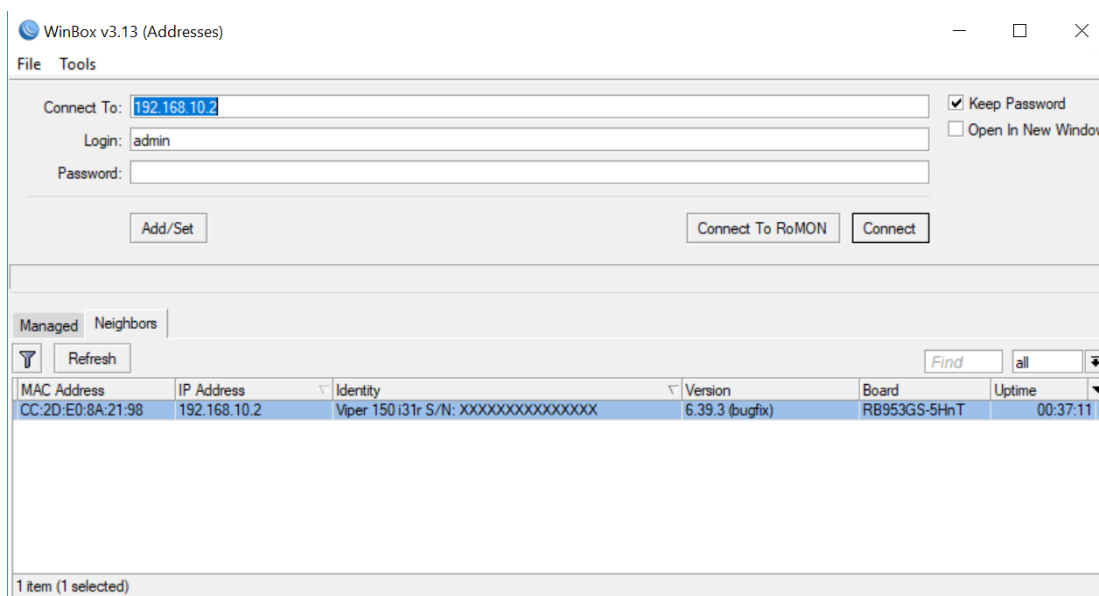

Figure 13. Winbox Loader Dialog Box

7. The main **Winbox** window opens with login information in the window title bar. Select **Wireless**. The **Wireless Tables** dialog box is displayed as shown in Figure 12 below. The list of information on the **Interfaces** tab may be specific to your particular system.
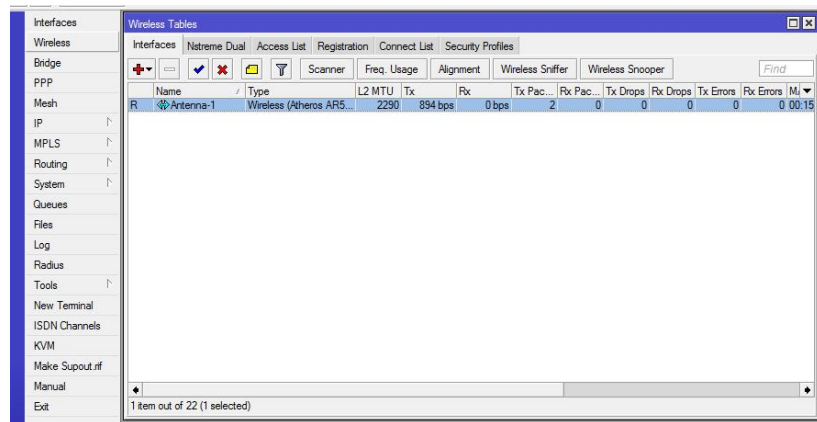

Figure 14. Wireless Table Dialog Box

8. Select the **Interfaces** tab and double-click the **Antenna-1** line. The **Interface <Antenna-1>** dialog box is displayed. Select the **Wireless** tab. The upper portion of the dialog box is shown in Figure 15 below.

Figure 15. Interface <Antenna-1> Wireless Tab Dialog Box (Upper portion only)

9. Click the arrow at the right side of the **Frequency:** field to display the list of available frequencies as shown in Figure 16 below. Select the desired frequency. You will eventually be testing with all of the frequencies, so it is best to start at the top of the list and work your way down.
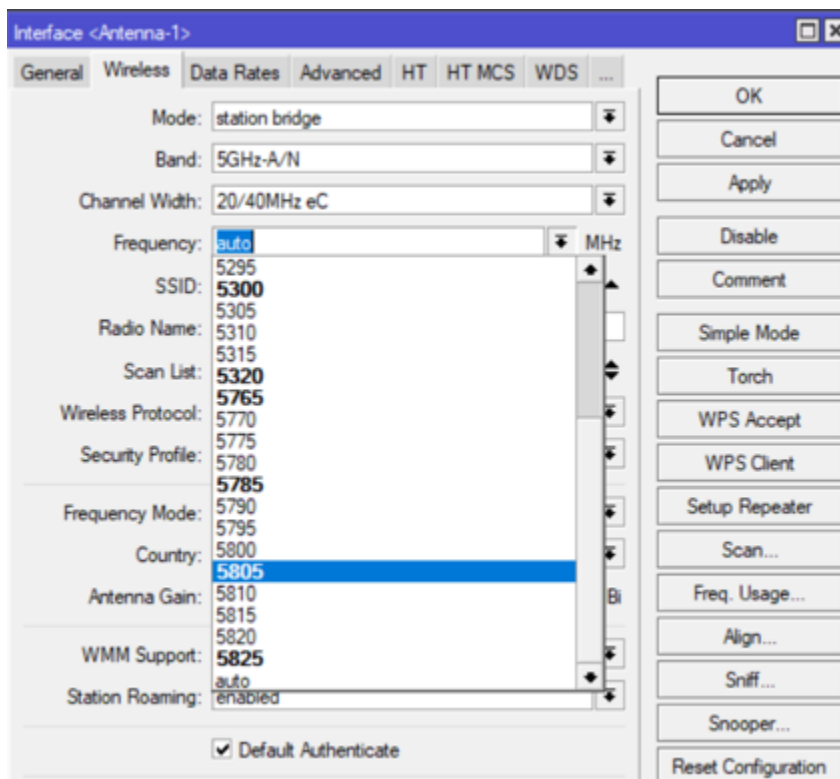
Figure 16. Frequency List

10. Click the arrow at the right side of the **Band:** field to display a list of available wireless bands as shown in Figure 17 below.
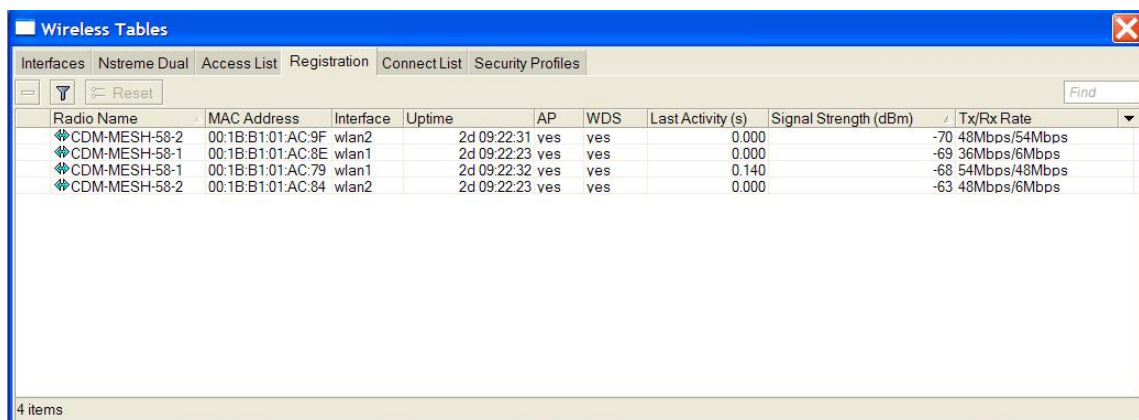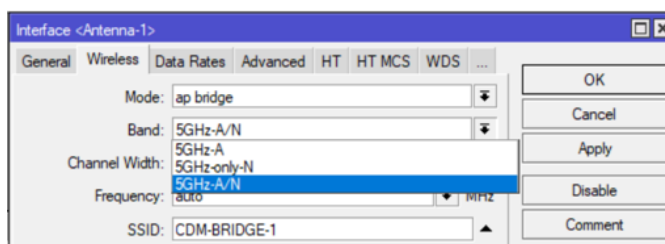

Figure 17. Frequency Band List

Note: The **5GHzA/N** band setting is typically used for Point-to-Multipoint links where the Access Point device is communicating with more than one CDM Wireless Device using the same radio.

11. Select the desired band and click the **Apply** button to accept the selection. (Select **Apply** rather than **OK** to keep the dialog box open for subsequent changes.)

12. Return to the Wireless Tables window and select the **Registration** tab as shown in Figure 16 below. Record the **Signal Strength (dBm)** in the **Xmit Signal (dBm)** column on the first line of the Wireless Link Test data sheet.
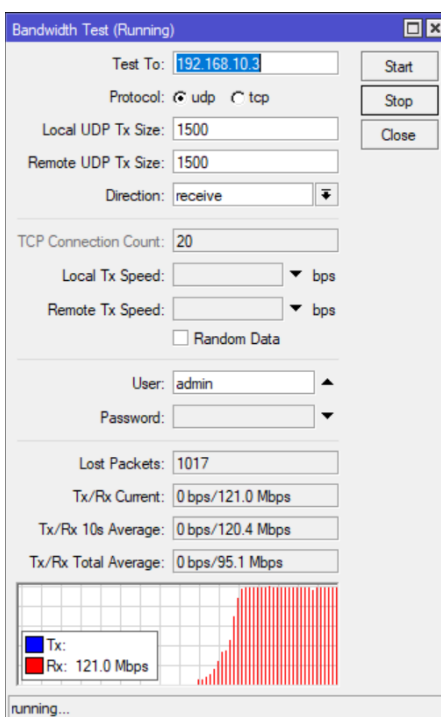
Figure 18. Registration Tab Dialog Box

13. Return to the main **Winbox** window and select **Tools/Bandwidth Test** from the menu at the left side of the window. The **Bandwidth Test** dialog box is displayed as shown in Figure 19 below.

    Position the **Wireless Tables**, **Interface**, and **Bandwidth Test** dialog boxes so they are all visible and easily accessible during the test procedure.

14. Fill in the **User:** and **Password:** fields with the User: admin & Password: <The password you selected on back on page 1>. Select tcp and enter the CDM Wireless Device IP address in the **Test to:** field. Select **receive** in the **Direction**: field and click the **Start** button.

Figure 19. Bandwidth Test Dialog Box (General Tab)

15. Allow the test to run for one minute. After one minute click the **Stop** button. Record the **Tx/Rx 10s Average** figure in the **Rec Data** column of the **Wireless Link Test** data sheet.

16. In the **Bandwidth Test** dialog box change the **Direction:** field to **send** and click the **Start** button. After one minute click the **Stop** button. Record the **Tx/Rx 10s Average** figure in the **Send Data** column of the **Wireless Link Test** data sheet.

17. At this time, the first row of the Wireless Link Test data sheet should look as illustrated below.

Measurement Data									
Ref #	Polar (H/V)	Freq (gHz)	Band (gHz)	Nstrm Mode	X-Ant Height (ft)	R-Ant Height (ft)	Xmit Signal (dBm)	Send Data (Mbps)	Rec Data (Mbps)
001	V	5180	5	None	15	30	-46	24.3	18.6

18. Return to step 11 above and repeat the test steps for the next frequency. When the next test run is completed, record the appropriate data in the next row of the Wireless Link Test data sheet.

19. When all of the frequencies and all of the desired bandwidth settings have been tested, review the data sheet to determine the optimum frequency and bandwidth for communication between the two devices.

   If the link is to be used for two-way transfer of data, a compromise may have to be selected for good communication in each direction. If the link is to be used for one-way transfer of data, from a camera to the Access Point device, for example, then the parameters that provide the optimum **Rec data** should be used.

Customer Service Information

For Technical help, call 919-556-7480 or send a detailed email message to: support@cdmwireless.com.

Appendix I – IP Scan & Device Discovery

The CDM Wireless series equipment has a very useful tool for discovering devices on your network.   While there are many scenarios in which the IP Scan tool can be used, one of the most useful is the detection of IP address conflicts on the network.

When using Winbox, and after you have connected to your CDM Wireless Device, you can mouse over Tools Menu on the main menu near the bottom. It is a slide out menu with additional test and troubleshooting features. Click on IP Scan and wait for the IP Scan dialog to pop up.
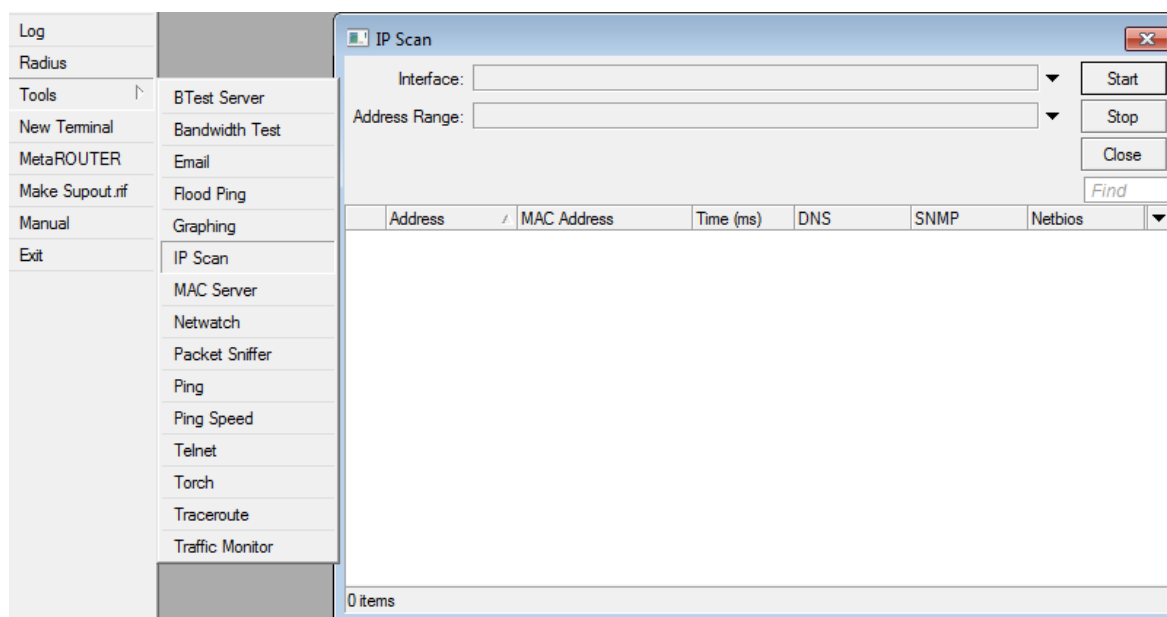

Figure: IP Scan Dialog with Menu Pop-out

Once the dialog box has been activated you can choose which interface you would like to perform the scan on. In most cases with a Viper system you will choose '**bridge1**' from the drop down selection menu. You can activate the menu by clicking in the grey text area just to the right of the word interface.

When choosing an address range to scan you can use the following notations:

1. IP Address Range Example: 192.168.1.1-192.168.1.254
2. CIDR Subnet Notation Example: 192.168.1.0/24

Both of these notations represent the same contiguous address space. Take a look at the image below for an example of a running IP Scan.
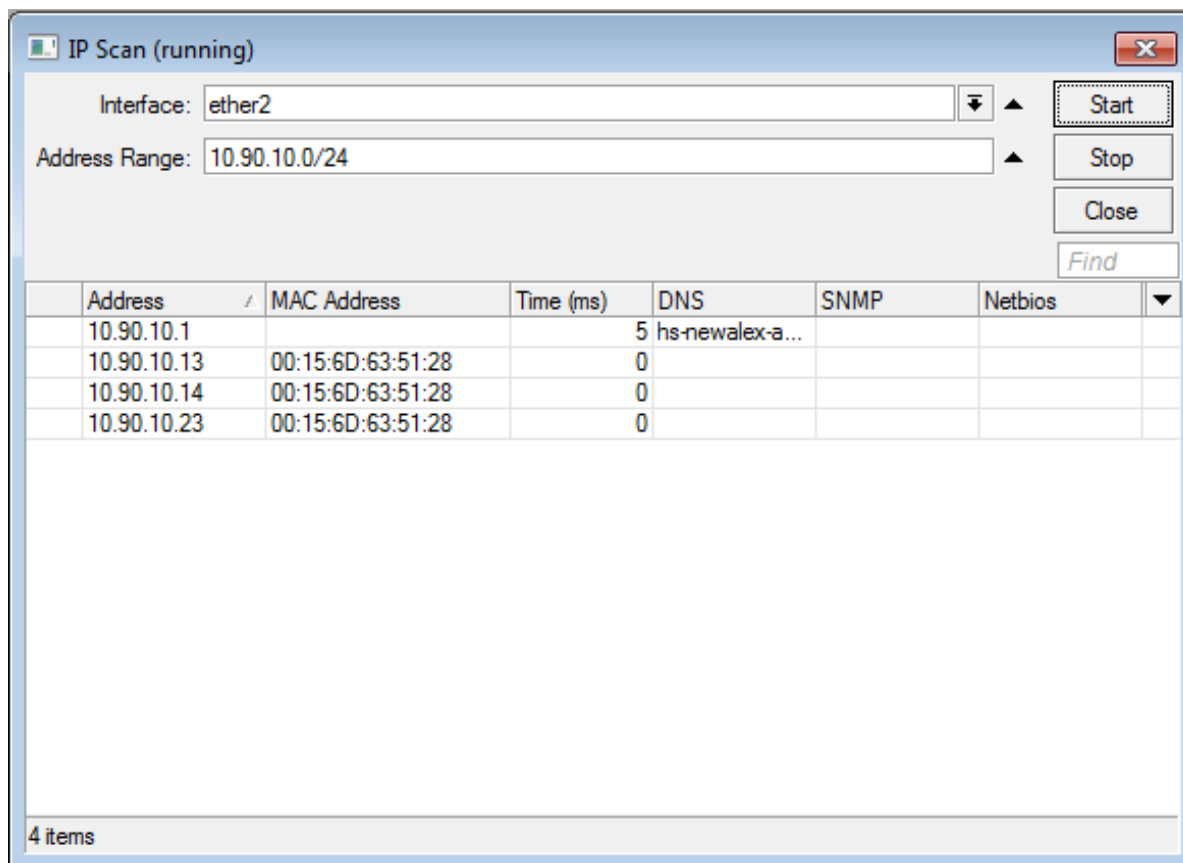
Figure: IP Scan Dialog with Menu Pop-out

You can see in the example of the running scan that we chose to scan interface '**ether2**' and a CIDR Notation address range of '**10.90.10.0/24**'. In the results pane you can see a table with labeled columns and results.

Each entry in this results table is a unique device on the network segment you chose to scan.   The first column is the devices IP Address, the second is the MAC Address belonging to that devices network facing interface, the third is the total time it took for the device to respond (Think Ping) as for the remaining columns they may or may not contain any information but can be helpful in diagnosing more uncommon networking issues.

If you see two entries with different MAC addresses but identical IP addresses you have detected an IP address conflict and you can use the MAC addresses to help track down the offending devices and correct the issue.

The IP Scan tool is very powerful yet very simple to use and with time and practice you will be able to understand and resolve several network related issues with the information you find or even sometimes don't find in this dialog box.

For Technical help, call 919-556-7480 or send a detailed email message to: support@cdmwireless.com.

Appendix II - Wireless Frequency Usage

When working with a CDM Wireless wireless device you may need to adjust the frequency on which your wireless network is communicating. When selecting an operating channel, or frequency, you should always perform a Wireless Frequency Usage scan.   This should be done from the CDM Wireless AP while you are connected to the device via the POE interface or via a direct wired switch.

You can find the Frequency Usage feature in the wireless interface settings for your access points' radio.   For most CDM Wireless Devices you can follow these steps to locate the tool
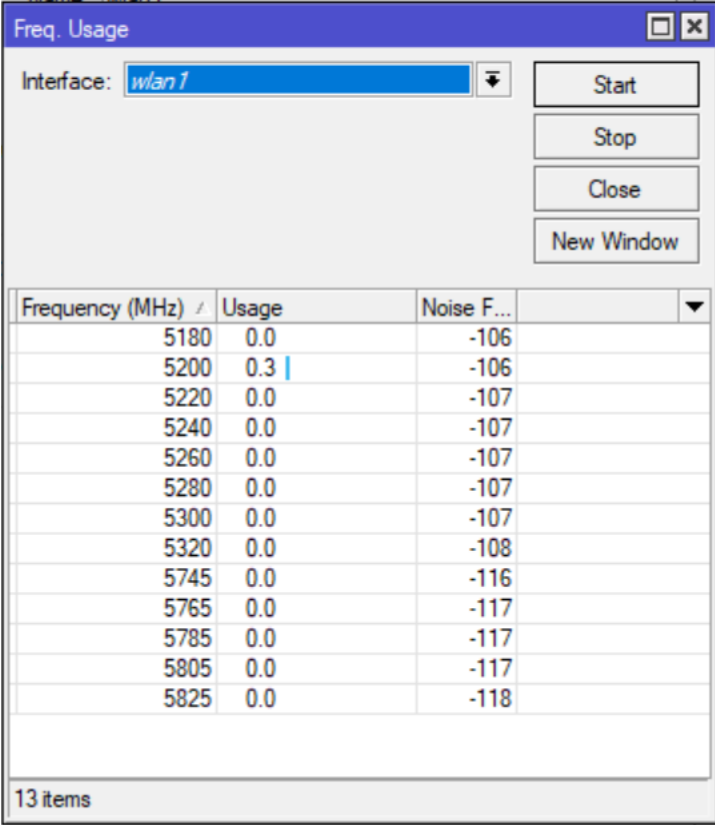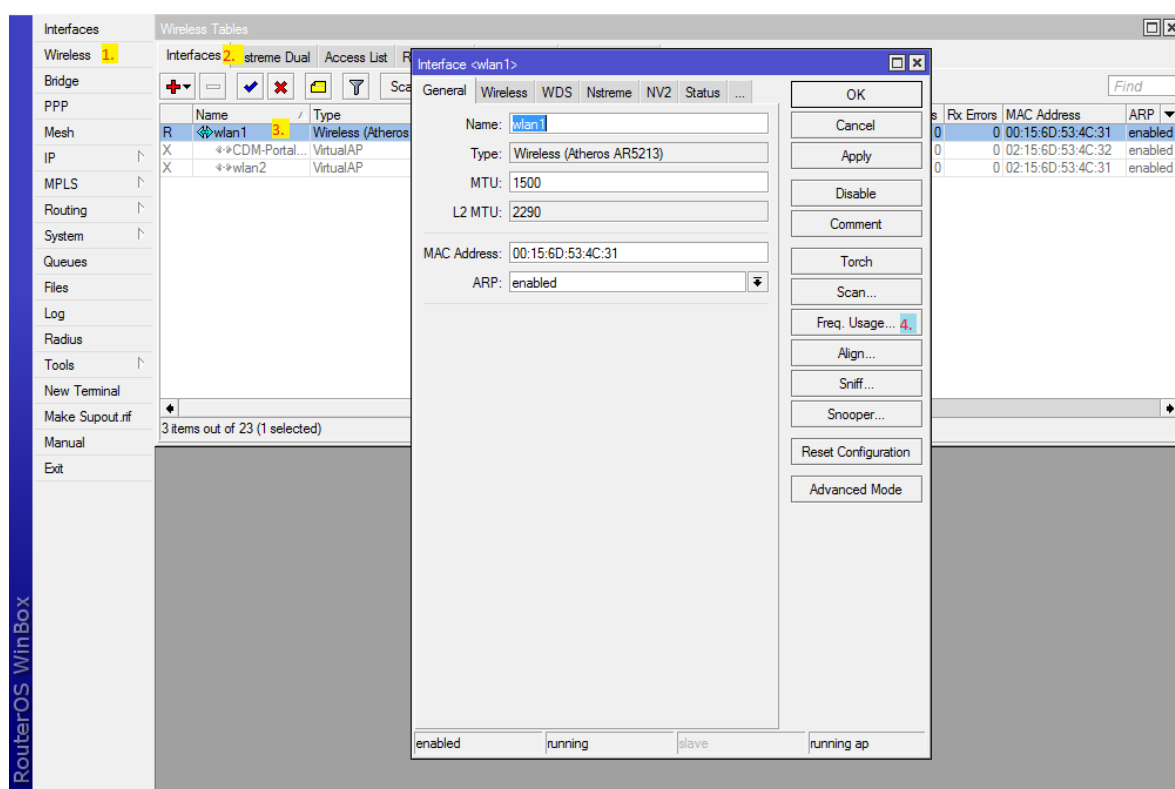

Where to find the Frequency Usage tool in the Winbox interface

WARNING: Following These Steps will temporarily disconnect all of your Wireless Clients/Transmitters

1. Click on Wireless Main Menu
2. Click on the Interfaces Tab on the Wireless Tables dialog.
3. Double Click on the Interface You Wish to use for the Scan
4. Click the Frequency Usage menu button on the Interface <*xxxxx*> Dialog box.

Following these steps will activate the **Freq. Usage** dialog box and a scan will begin automatically. All of the connected wireless equipment will be disconnected from the network during the duration of the scan. Once the scan has completed your wireless transmitters and client stations will reconnect.

A running Frequency Usage Scan.

The results panel contains three (3) columns which are for the most part self-explanatory. The frequency column displays the available channels for the regulatory domain, country, in which the radio is configured to operate. The Usage column displays as a percentage the approximate amount of 802.11x traffic that is being sent on that frequency as a representation of the total amount of traffic that can be sent before that section of the spectrum is rendered unusable. We recommend that you try to stay below 40% on any given channel as best practice and spectrum conservation. The Noise Floor column displays the average strength of background noise as a dBm rating. The noise floor needs to be less than the carrier signal strength of your radio by a margin of at least 25 to 30 points for ideal operating environments. A high noise floor rating can be evidence of near field interference or a congested spectrum. Avoid any frequency with a noise floor above -91 for best practice.

 If you are unable to do so consider calling CDM Support to help you develop a better procedure for your installation.

The Frequency Usage tool can be a valuable asset when you are troubleshooting a wireless installation so feel free to use it regularly if you are noticing any strange behavior in your wireless network. Do keep in mind that when performing a Frequency Usage scan that you will be disconnecting every wireless device until **you stop** the scan.

Appendix III - Signal Quality vs. Signal Strength

When evaluating the performance of your wireless network there are couple of key indicators as to the health of the wireless environment. The first is the one most people are familiar with and that is Signal Strength. The common thought is that the stronger the signal strength the better your network will operate. To an extent this is correct but it is possible to have a **very strong** carrier signal (RSSI) and have poor wireless signal quality (CCQ). The quality of the signal directly correlates to the bandwidth that the link is capable of providing to host devices. You can find the information for both of these two metrics under the Wireless Registration Tables.

1. Click on Wireless Main Menu
2. Click on Registration Tab
3. Select Radio Link in Question by Double Clicking on its entry.
4. AP Client Dialog Box: Click on Signal Tab

Registered Client's Signal/Status Dialog

The symptoms of an overpowered radio link can be both observed and measured by examining a few data points within the Winbox interface.

One of the most common symptoms of an overpowered or underpowered link is called '**flapping**'; flapping occurs when the radio is unable to maintain the negotiated data rate due to some destabilizing force. The most common destabilizing force is the receiver side of the radio is being over driven by the signal strength of the transmitter side of the client radio.

Flapping can be seen when you look at Wireless Registration table and notice the Data Rates column constantly cycling between different speeds for a single connection. If all of the data rates are holding steady or are only occasionally re-modulating then your network is mostly likely healthy. You can follow the rest of these methods to be certain.

The second way to take stock of the health of your wireless system is to look at the TX/RX CCQ rating, commonly called Client Connection Quality. It is a measurement of how well the bandwidth is being utilized as a quotient of the theoretically maximum amount of bandwidth. Without going into details of how the calculations are made a simple explanation of this rating would be the following.

If a radio card requires a –74dBm carrier wave in order to deliver 150Mbps/150Mbps of steady bandwidth and it is receiving a -63dBm carrier the maximum theoretical bandwidth is 150Mbps/150Mbps. The client station in this scenario is only negotiating at 45Mbps/150Mpbs; this indicates that something is hindering the quality of the negotiated signal resulting in an approximate 36%/99% CCQ Rating. This is calculated for every frame sent across the network and is then averaged over a period of time to arrive at the TX/RX CCQ result.

The result is a user friendly number indicated as a percentage of how efficient your wireless environment really is.

TX/RX CCQ ratings above 90% but below 97% may indicate minor random interference but it is little to worry about.

Percentages between 90% and 80% can indicate a more steady interference level or a high level of background noise on your chosen frequency. Try performing a frequency usage scan and selecting a different operating frequency.

When the CCQ rating drops below 80% you need to check on the transmitter power of the client side radio as well as the run a Frequency Usage Scan to try evaluate any adjustments are required to stabilize the CCQ settings.

If, in the course of investigating and troubleshooting the wireless network, it is discovered that the culprit is the power output of a client radio you can adjust the power output to help mitigate the problems caused by either inadequate or extraneous transmitter power.

Appendix IV - Adjusting CDM Wireless Power Levels

CDM Wireless products often include integrated antennas and are designed for medium to long range installations, but even in these situations and depending on the wireless environment the signal strength of the radio's default configuration may be too high or too low. This can cause issues with signal CCQ and wireless bandwidth. In most circumstances we can adjust the output power of the offending card by using software controls built into the CDM Wireless Device. On occasion there are circumstances where this may not be the case and CDM Wireless can provide RF signal attenuators for your device to electrically reduce the gain from the antenna before it enters the wireless cards receiver. This allows us to make more finite adjustments in software to balance RSSI with CCQ ratings.

Although you may adjust these settings yourself it is highly recommended that you contact CDM Wireless Support before adjusting any of these values.

Power adjustments to the radio card interface can be made by doing the following:

1. Click on Wireless Main Menu to activate Wireless Table Dialog
2. Click on Interfaces Tab on Wireless Tables Dialog
3. Select the interface that needs adjusted by double click on its interface entry.
4. Click on Advanced Mode
5. Click on the ellipses tab […] and select TX Power
6. Click on the '**TX Power Mode**' drop down selection box and pick '**Card Rates**'
7. Click on '**TX Power**' and enter a new value between 2 and 26 dBm. Lower numbers indicate lower power output.
8. Click on Apply
9. Click Ok

Tx Power Interface Window

Once you have completed the steps above you need to check the RSSI and CCQ ratings again and repeat the process as necessary to achieve a proper CCQ rating.

Physically adjusting the output power of the transmitter on a CDM Wireless radio requires the selection of a lower gain antenna or the use of ceramic attenuators.   CDM Wireless offers the customer a selection of attenuators to make electrical adjustments to the antennas effective gain.

Attaching an attenuator to a CDM Wireless device requires that the field service technician or integrator physically open the enclosure and install the attenuation device.   This should only be attempted with the supervision of CDM Wireless support staff agent.   While the process is fairly straight forward it can expose the internal circuitry to the elements causing other problems.
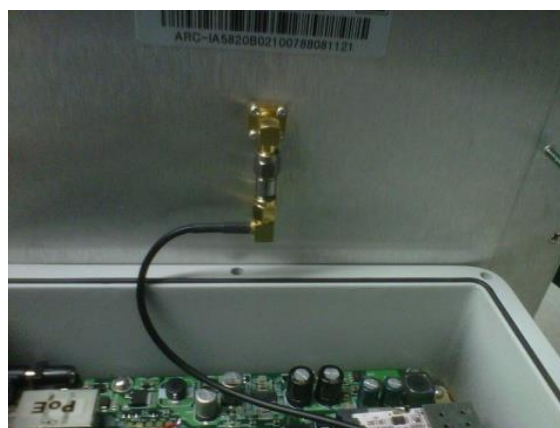
Inside view without Attenuator inside view with Attenuator Installed

Appendix V - Orientation of Integrated and External Antennas

Integrated: When installing any CDM Wireless Equipment with an integrated panel antenna the installer should make sure the connection ports are always oriented in the down position. This will not only to help to prevent moisture from pooling near the connectors but also helps keep the antennas in their proper alignment.

Properly oriented CDM Wireless Unit with integrated panel

CDM installs the panels at the factory in the correct orientation based on the connections of the CDM Wireless enclosure being oriented downwards.

External Antennas: As with the integrated antennas the CDM Wireless units should always be mounted with the connections oriented downwards or to the side. However, the external antenna modules themselves will have an independent orientation from the CDM Wireless radio and it is important to verify the antenna orientation for your order. CDM Antenna modules are marked calling out the orientation of the antenna with an Arrow marked vertical and horizontal and the arrow should be pointing up towards the sky. This will place the antenna into its proper (vertical) orientation and will ease the process of installation significantly. As for the polarization of the antenna, vertical vs. horizontal there will be special notations added to the label of a

antenna port. The absence of this label, as with the majority of CDM Wireless installations, indicates that the antenna should be installed in the vertical polar orientation. If the label is present it should be installed in the horizontal polar orientation.

Antenna Orientation Labels On CDM Wireless Equipment

Installing the antennas in the wrong orientation may or may not prevent your network from linking up; however if a link is established there will be a significant degradation in the wireless network performance as you will lose approximately 30dBi of gain by not correctly mounting your antenna panels. Always be certain that you check the orientation labels on any CDM Wireless Antenna Kits.