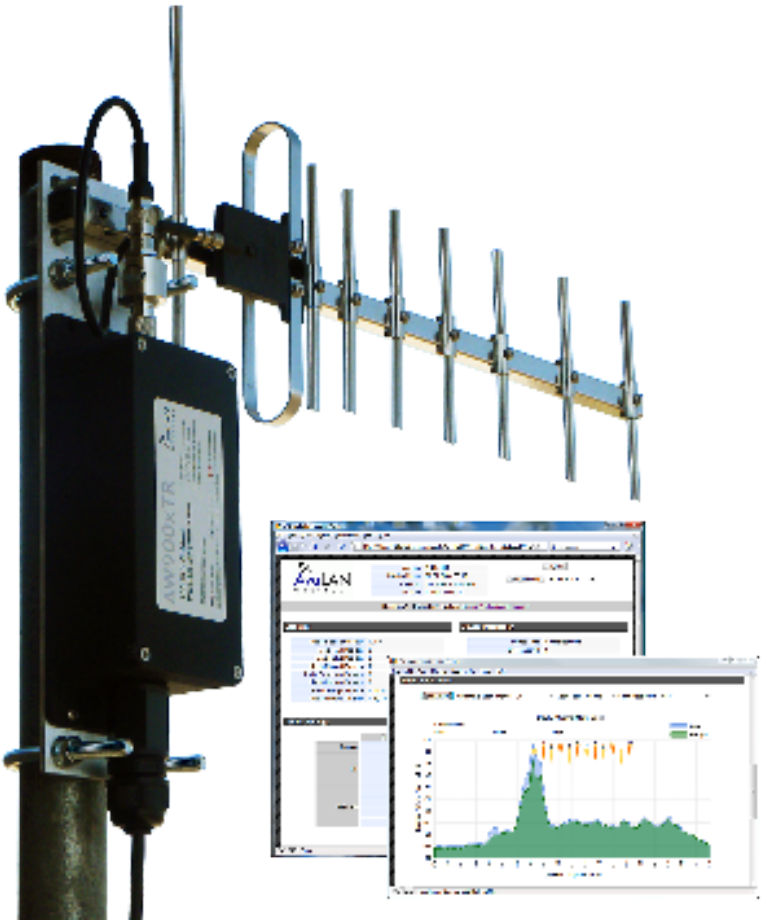


AW900xTR

USER'S MANUAL

900 MHz Outdoor Wireless Ethernet Radio

Industrial-grade, long-range wireless Ethernet systems

AvaLAN WIRELESS

Thank you for your purchase of the AW900xTR Outdoor Wireless Ethernet

The AW900xTR includes:
(1) AW900xTR radio in extruded aluminum box
(1) AW2-900 2.5dBi omnidirectional antenna
(1) AW-POE Power Over Ethernet injector
(1) 110 VAC to 12 VDC power adapter

The AW900xTR-PAIR includes:
(2) AW900xTR preconfigured radios in extruded aluminum box
(2) AW11-900 11 dBi directional yagi antennas
(2) AW2-900 2.5dBi omnidirectional antenna
(2) AW-POE Power Over Ethernet injector
(2) 110 VAC to 12 VDC power adapters

TABLE OF CONTENTS

If you have any questions when configuring your AvaLAN system, the best place to get answers is to visit www.avalanwireless.com. You will also find the latest updates there. If more assistance is needed, send email to support@avalanwireless.com.

To speak to a live technician, please call technical support at the number below during normal business hours.

Revision 09.11.2013

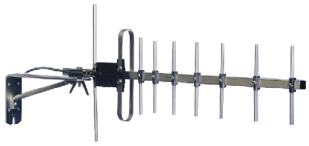
125A Castle Drive
Madison, AL 35758

Sales: (866) 533-6216
Technical Support: (650) 384-0000
Customer Service: (650) 641-3011
Fax: (650) 249-3591

Compatible Accessories

Antennas

AW11-900

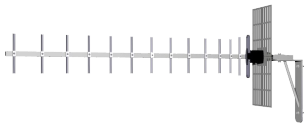


900 MHz Directional 11 dBI YAGI Antenna

AW10-900

900 MHz Directional 10 dBI Panel Antenna

AW15-900



900 MHz Directional 15 dBI YAGI Antenna

AW3X-900

900 MHz Omnidirectional 3 dBI Armored Antenna

AW5M-900

900 MHz Omnidirectional 5 dBI Magnetic Antenna

AW5P-900

900 MHz Omnidirectional 5 dBI Pole Antenna

Accessories

AW-12VA

Auto Adapter

AW-LA

Lightning Arrestor

AW-RFx900

x = 4ft, 10ft, 25ft or 50ft

900 MHz Antenna Extension Cable

Warranty

AW-Warranty-900

These items can be found on our website, www.avalanwireless.com

Quick Start Guide

PROGRAMMING:

Step 1. Gather the AvaLAN radios, power supplies, 2x CAT5 cables and a computer with an RJ45 Ethernet interface.

Step 2. Connect the radios one at a time directly to the PC via the male end of the POE injector (the female end goes to the radio). Set your computer to an IP address of 192.168.17.1 (refer to page 6 for detailed instructions). Enter the radio's default IP address* of 192.168.17.17 into a web browser.

Step 3. Enter the password and click login. The default password is "password".

Step 4. Click "advanced admin" at the bottom of the web page.

Step 5. Toggle to select the device type - Access Point or Subscriber Unit. An access point (AP) can communicate with up to 16 Subscriber Units (SU).

- For the AP, enter the maximum number of SUs communicating with the AP.
- For each SU, set the subscriber ID incrementing from one. (Ex. 1, 2, 3, etc.)

Step 6. Enter the "Network Name" and "Encryption Key" using numbers "0-9" and characters "A-F". All radios in a single network must have the same "Network Name" and "Encryption Key".

TESTING:

We recommend connecting and powering up the units on the bench before deploying in the field. During bench testing, keep the radios at least 10 feet apart to prevent overload of radio receivers.

Step 1. Power on all the radios with the computer wired directly to the AP.

Step 2. Use the AvaLAN IP finder utility to assign a unique IP address to each radio. (See page 7)

Step 3. Open a web browser to view the operation of all the radios. (See page 9)

Step 4. Perform PING flood testing to simulate network data and observe overall performance.

INSTALL:

Every installations is different, however radio performance is typically best at shorter distances using directional antennae with unobstructed paths in low noise environments. It can be challenging to determine the best approach for a unique installation. The radio's browser interface has a link performance statistics and a spectrum analyzer display that is helpful for troubleshooting radio interference noise levels. (See page 9).

Please call AvaLAN Technical Support for assistance as needed.

Operational Summary

The AW900xTR Radio allows the user to create a long-range, wireless Ethernet network with up to 16 subscriber units per access point. The configuration may include any combination of AW900xTR, AW900xTR and AW900xTP radios. (Please note that older AvaLAN 900 MHz radios can exist on the same LAN but cannot be used to form wireless links with the AW900xTR units because link encryption protocols have changed.)

Configuring a wireless link with the AW900xTR requires the establishment of six elements:

- Each radio must know whether it is to be an access point (AP) or subscriber unit (SU).
- Each radio must have an IP address that is unique among all others on the same network.
- The AP must know how many SUs are expecting communication with it.
- The AP and any given SU must agree on which radio frequency channel they are using. This can be manually set or allowed to change automatically.
- The SU must be assigned a unique subscriber ID to specify which time division slot it will use when communicating with the AP.
- The AP and any given SU must share a common 128-bit encryption key and 32-bit network name.

The access point (AP) automatically scans for the best of the 12 available radio frequency channels, encrypts Ethernet data received from the network, and transmits it wirelessly to the correct subscriber unit (SU). The AP is constantly monitoring the radio link and can automatically change the channel if performance is degraded due to interference. If two AP units are very close to one another, they may interfere if operating on adjacent frequency channels. Place them at least 10 feet apart and manually select non-adjacent channels for their operation. Also, the SU should be placed at least 10 feet from the AP to avoid overloading the radio's receiver.

Any 10/100 BaseT Ethernet client device (ECD) can be connected to an AW900xTR subscriber unit. Each SU encrypts Ethernet traffic received from the attached ECD and transmits the data wirelessly to its AP. Each SU can be plugged directly into an ECD without adding drivers or loading software. Essentially, once the AP/SU pair is configured and running, it behaves like a transparent Ethernet cable that encrypts and then passes all traffic including VLANs.

Physical Setup

1. Before placing the radio in its final location, it may be best to perform the digital setup procedure described in the next section.

2. Connect the AW900xTR's RP-TNC RF connector to a suitable antenna. A 2 dBI omni-directional dipole antenna (AW2-900) is included and is suitable for testing and general applications. Application specific antennas are available if greater range and/or directionality is required. Choose one of our other antenna models that can be found on our website at www.avalanwireless.com.

3. Power is provided to the unit by means of the Ethernet cable, allowing the power supply to be located at a convenient location. The included power-over-Ethernet injector (POE) provides the means for adding DC power to unused wires in the cable. Decide where to place the POE based on proximity to AC power at some point along the desired path of the Ethernet cable. Plug the included power supply into an appropriate electrical outlet and into the POE. Connect an Ethernet cable between your network and the "DATA IN" port on the POE. Connect a second cable from the "P + DATA OUT" port on the POE and the AW900xTR. The AW900xTR is provided with a cable clamping device that allows an RJ45 plug on the cable to pass through it and can be tightened down around the cable to provide a weatherproof seal.

Digital Setup

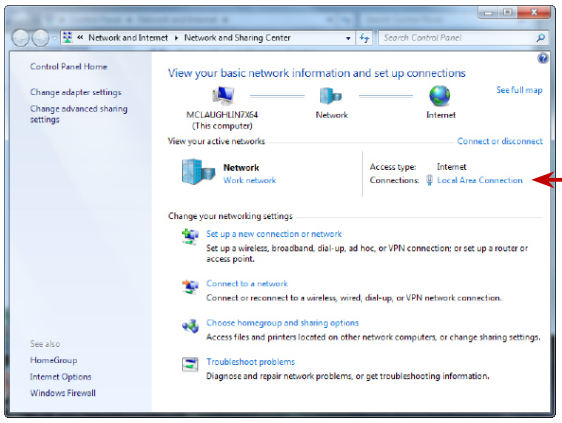
1. Digital configuration is done by means of the AW900xTR's built in browser interface. It should be powered on and connected at least temporarily to a network containing a computer that can run a conventional web browser.

2. Download the AvaLAN IP Discovery Utility from our website and extract ipfinder.exe from the zip archive, placing it on your desktop or in a convenient folder.

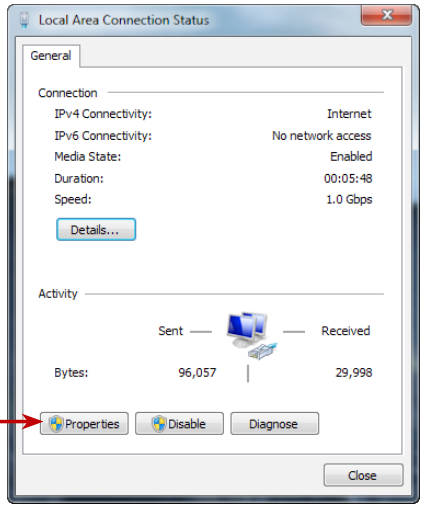
http://avalanwireless.com/marketing_resources/downloads/finder.exe

Note: This utility only runs on Microsoft Windows, not linux or MAC. If you must use a non-Windows computer for configuration, make sure your subnet mask allows your computer to see 192.168.17.17. Connect to that default IP address with your web browser and continue the setup procedure with step 6.

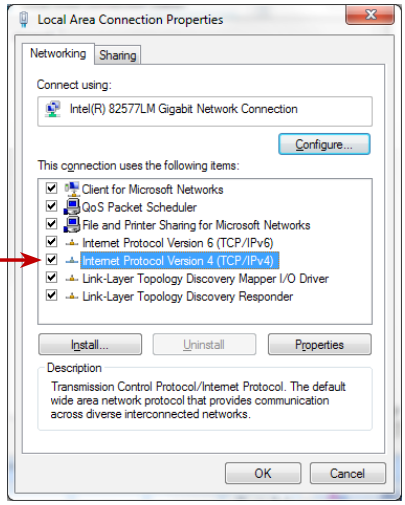
How to configure static IP address for Windows 7.



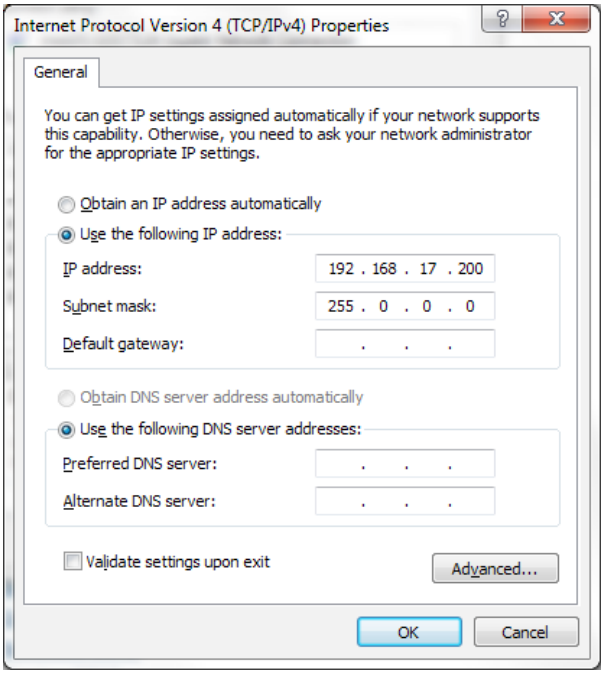
Click local area connection



Click Properties



Double Click Internet Protocol Version 4 (TCP/IPv4)



Click "Use the following IP address"

Populate the following information:

IP address: 192.168.17.17

Subnet mask: 255.0.0.0

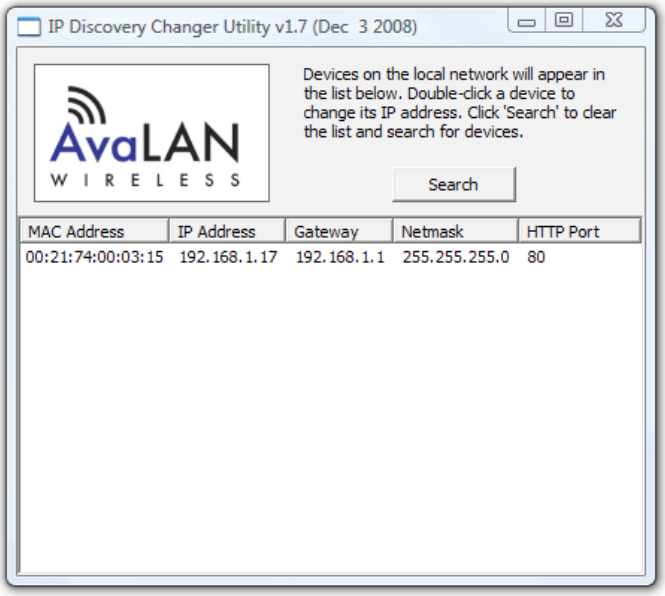
Default gateway: leave blank

Click OK

Click OK

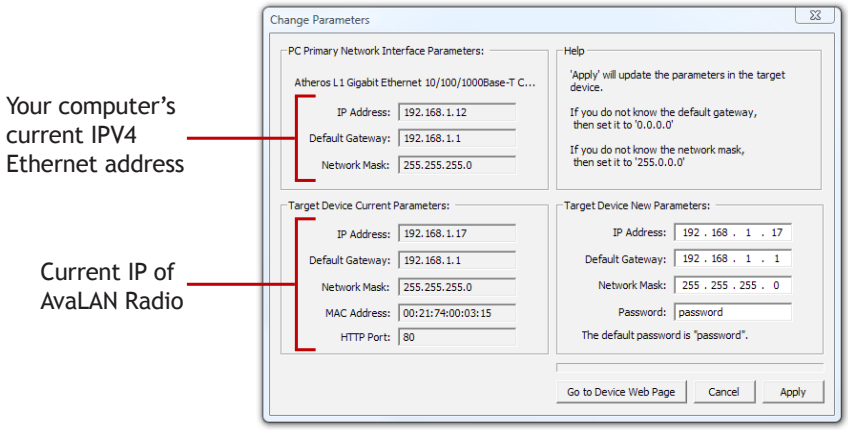
Click Close

3. Run the IP Discovery Utility, ipfinder.exe and you should see a window similar to the view on the next page.



The AW900xTR should appear in the list at the default IP address of 192.168.17.17. If it does not, click "Search" to regenerate the list. If it still does not appear, it may be a connection issue and need to re-examine the cabling or you may have a subnet or firewall issue on your computer.

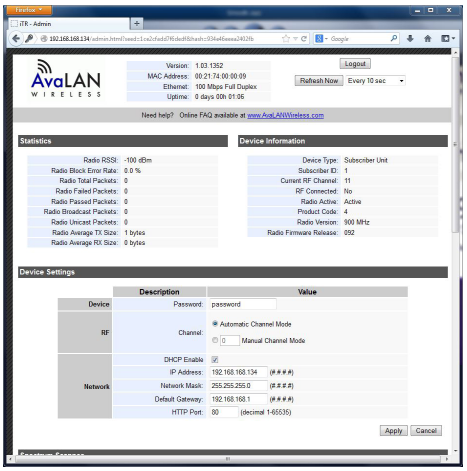
4. Double click the list item that refers to the AW900xTR being configured. You should see a second window that is similar to this:



The information on the left is the current status of the radio, while the boxes on the right allow you to change it. It is important that the IP address of the AW900xTR is in the same subnet as your computer. For example, if the subnet mask is 255.255.255.0, the first three number groups of the IP address must match. Choose the desired parameters and click "Apply."

5. Make note of the chosen IP address and password, then click "Go to Device Web Page." This will cause your default web browser to launch with the device IP address in the browser address bar. Or you may launch the browser on your own and enter the web page address manually: http://[the IP address you just set]. Note: You are not assigning a password, you're matching the password that the unit has built into it.

6. The browser page that loads first shows the current device information and provides a login in the upper right. Log in using the password you just specified (or "password" if you kept the default). If the login succeeds, you will see an admin page similar to this:



The Device Settings section is where the password, channel, DHCP (enable or disable), network parameters are defined and/or reconfigured.

Radio Status Information

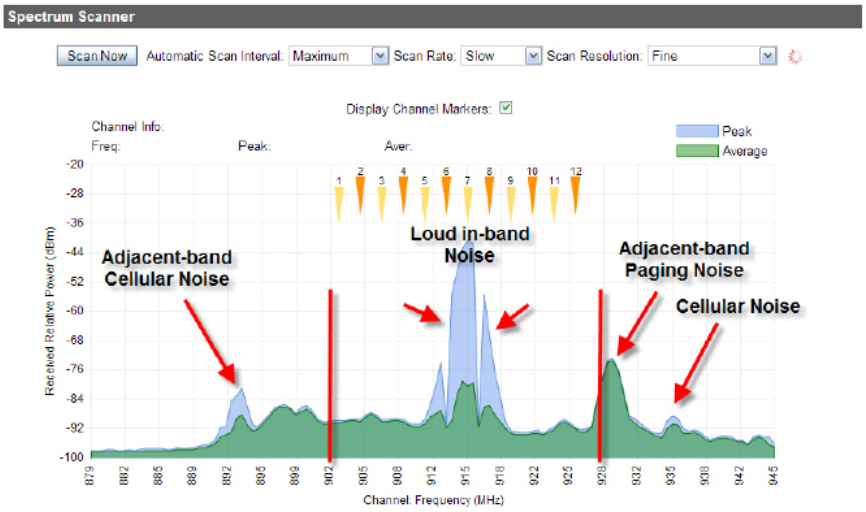
The Login or Admin pages of the radio's built-in web browser interface provide many useful pieces of information that let you know how well the wireless link is working:

Top of Web Page	
Version	Current version of the radio's Ethernet interface.
MAC Address	Radio's hardware MAC Address.
Ethernet	Status of Ethernet connection: 10 Mbps or 100 Mbps, full or half duplex, connected or disconnected.
Uptime	Total time radio has been active since last power cycle or hardware reset.
Device Information	
Device Type	Access Point (master) or Subscriber Unit (client)
# of Subscriber IDs Issued	For Access Point only, up to 16 permitted.
Subscriber ID	For Subscriber Unit only, the ID selected for this radio.
Current RF Channel	The RF Channel in use. See table in this manual for center frequency.
Connected Subscribers	Access Point only, how many SUs are currently connected (16 maximum).
RF Connected	Yes or No
Radio Active	Active or Standby
Product Code	4 for multi-point radio
Radio Version	Specific radio module in use
Radio Firmware Release	Current version of radio module firmware.
Statistics	
Radio RSSI	Received Signal Strength Indicator. The radios operate best with this value between -30 and -80 dBm
Radio Block Error Rate	Should be less than 10% (check RSSI or spectrum scan if greater.) Higher values indicate degraded data rate, not necessarily lost data.
Radio Total Packets	# of Ethernet packets received since last reset.
Radio Failed Packets	# of packets unsuccessfully transmitted.
Radio Passed Packets	# of packets successfully transmitted.
Radio Broadcast Packets	Traffic simultaneously addressed to all devices on the network.
Radio Unicast Packets	Traffic sent to a single destination.
Radio Average TX Size	Average bytes per packet transmitted.
Radio Average RX Size	Average bytes per packet received.

7. The admin page has sections similar to the login page showing radio statistics and device information plus it adds several new sections. The Device Settings section allows setting the network information and choosing an RF frequency channel. The default is to allow the radio to choose its own frequency based on minimizing interference. If you set a fixed channel, make sure the AP and all SUs use the same one.

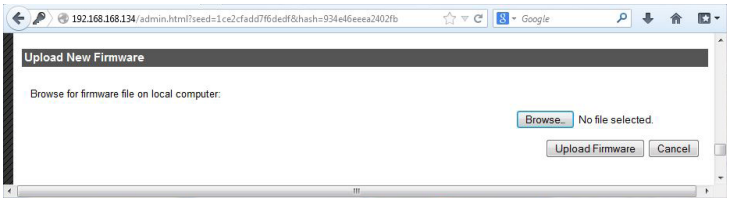
Scroll down in the Admin browser page to see these three additional sections:

1. A graphical spectrum analyzer display that may help you to manually select a radio channel

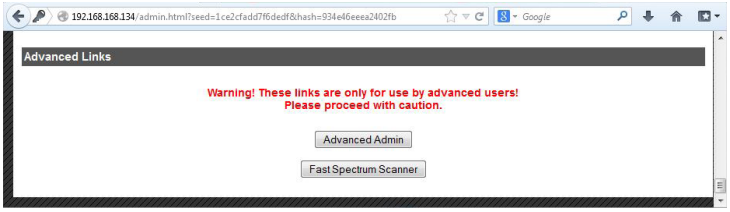


If you need more information about the interpretation of this diagram please refer to our Spectrum Analyzer application guide.

2. A section to be used if an update to the AW900xTR's firmware is required



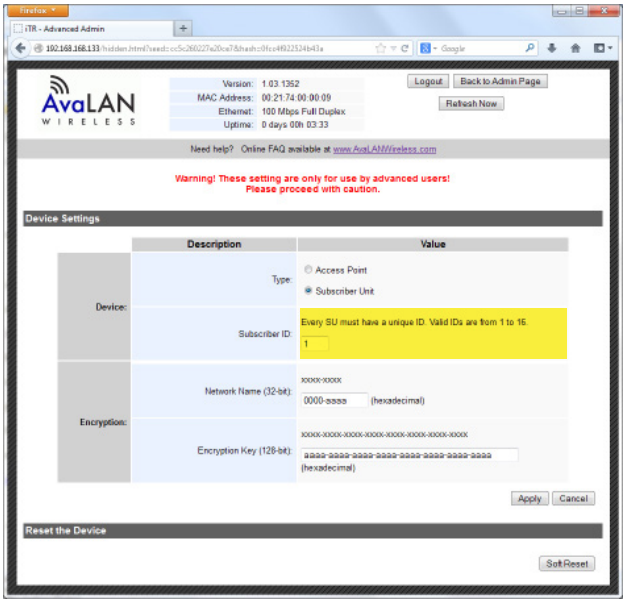
3. An advanced links section



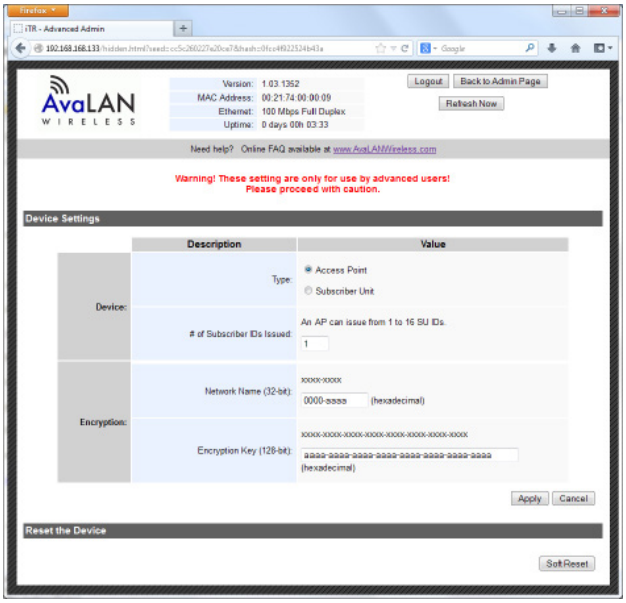
8. On the Advanced Admin page, set the parameters as follows:
   - Choose Device Type: Access Point or Subscriber Unit.
   - For Subscriber Units, assign unique ID numbers in numeric order from 1 to 16.
   - For an Access Point, enter the number of Subscriber Units that will be communicating with it.
   - Choose an 8-digit hex (0-9 and A-F) Network Name that will be common among the AP and its SUs and enter it. The hyphen is required.
   - Choose a 32-digit hex encryption key and enter it. Again, the hyphens are required. This key must match between the AP and the SU so make a note of it as well.

After entering the parameters, click the "Apply" button to save them to the radio.

9. When all of the radios are keyed and operating, connect them to your network and Ethernet devices as desired and cycle the radio's power to begin normal operation. Now, browser mamagement of the SUs can be performed over the wireless network. Note: Avoid plugging actively linked radios into the same switch because this will corrupt the switch's routing table and may cause network problems just as if you had plugged a CAT5 cable directly between two ports of a switch (commonly called a loop back).



Subscriber Screen Shot



Access Point Screen Shot

900 MHz Channels

Channel	Center Frequency
0	Auto Mode
1	903.12500 MHz
2	905.20833 MHz
3	907.29167 MHz
4	909.37500 MHz
5	911.45833 MHz
6	913.54167 MHz
7	915.62500 MHz
8	917.70833 MHz
9	919.79167 MHz
10	921.87500 MHz
11	923.95833 MHz
12	926.04167 MHz

Limited Warranty

This product is warranted to the original purchaser for normal use for a period of 360 days from the date of purchase. If a defect covered under this warranty occurs, AvaLAN will repair or replace the defective part, at its option, at no cost. This warranty does not cover defects resulting from misuse or modification of the product.

Compliance Statement (Part 15.19)
This device complies 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, including interference that may cause undesired operation.

Warning (Part 15.21)
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RF Exposure (OET Bulletin 65)
To comply with FCC RF exposure requirements for mobile transmitting devices, this transmitter should only be used or installed at locations where there is at least 20cm separation distance between the antenna and all persons.

Information to the User - Part 15.105 (b)
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 installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, 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 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.

Technical Specifications

PARAMETER	SPECIFICATIONW
RF transmission rate	1.536 Mbps
Ethernet throughput	935 Kbps
Output power	+21 dBm (4 Watts EIRP when used with 15 dBi antenna)
Receiver Sensitivity	-97 dBm at 10^{-4} BER
Range	40 miles line-of-sight with 15 dBi antenna
RF channels	12 non-overlapping channels with 2.0833 MHz spacing
Frequency selection	Automatic or manually selectable via web browser interface
RF Connector	RPTNC Female
Ethernet	RJ-45
Power Connector	P5 2.1 mm
Adjacent band rejection	SAW receiver filter attenuates cellular and pager interference
Mounting	DIN rail clip
Power regulation	Built-in switching regulator
Browser management tools	Statistics, Network Settings, Spectrum Analyzer, Firmware Upgrade
Power consumption	Transmit: 1.7 Watts Receive: 0.8 Watts
Voltage	9 to 48 VDC
Transmit current draw	140 mA at 12 VDC
Temperature range	-40° C to +70° C
Size	110 x 110 x 35 mm
Compatibility	Compatible with AW900xTR and AW900xTP radios

Antenna Alignment Guide

Please be sure to consider the following when installing antennae from AvaLAN:

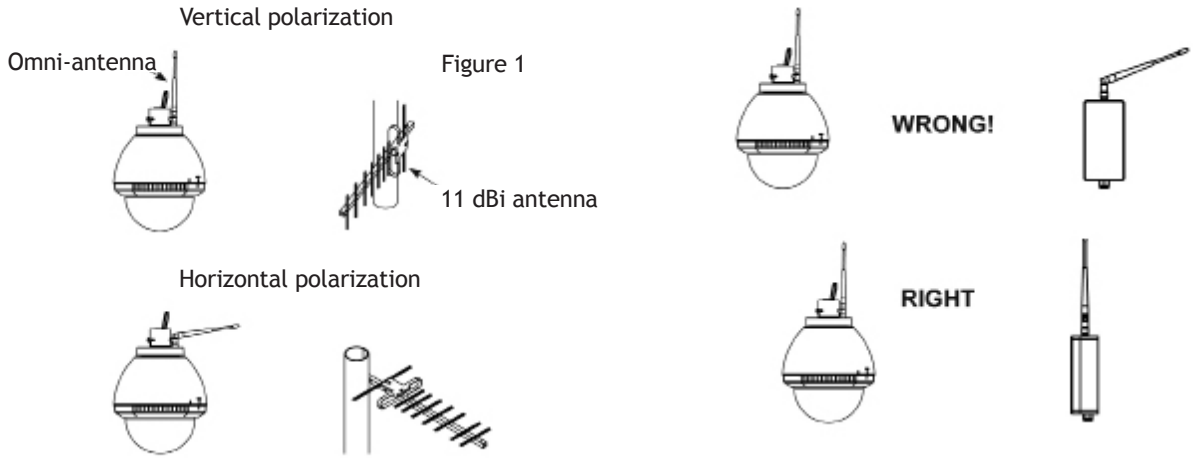
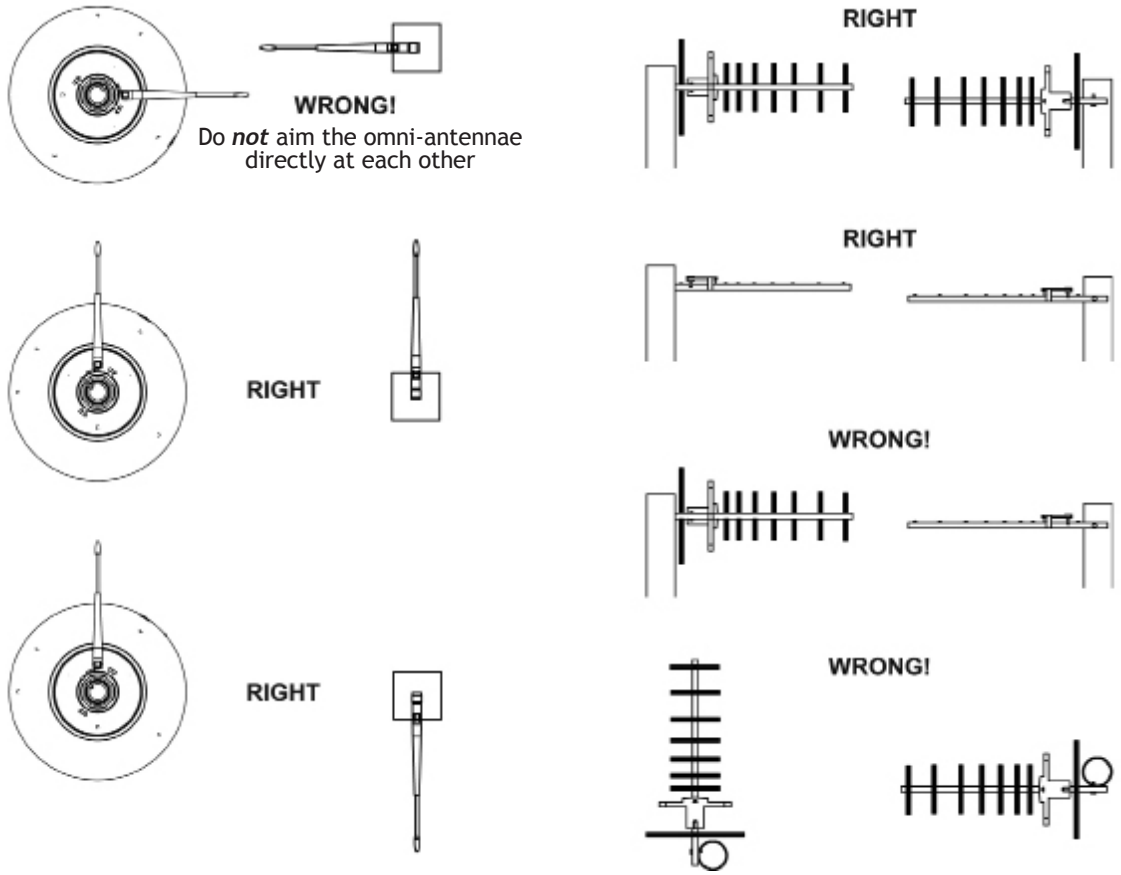
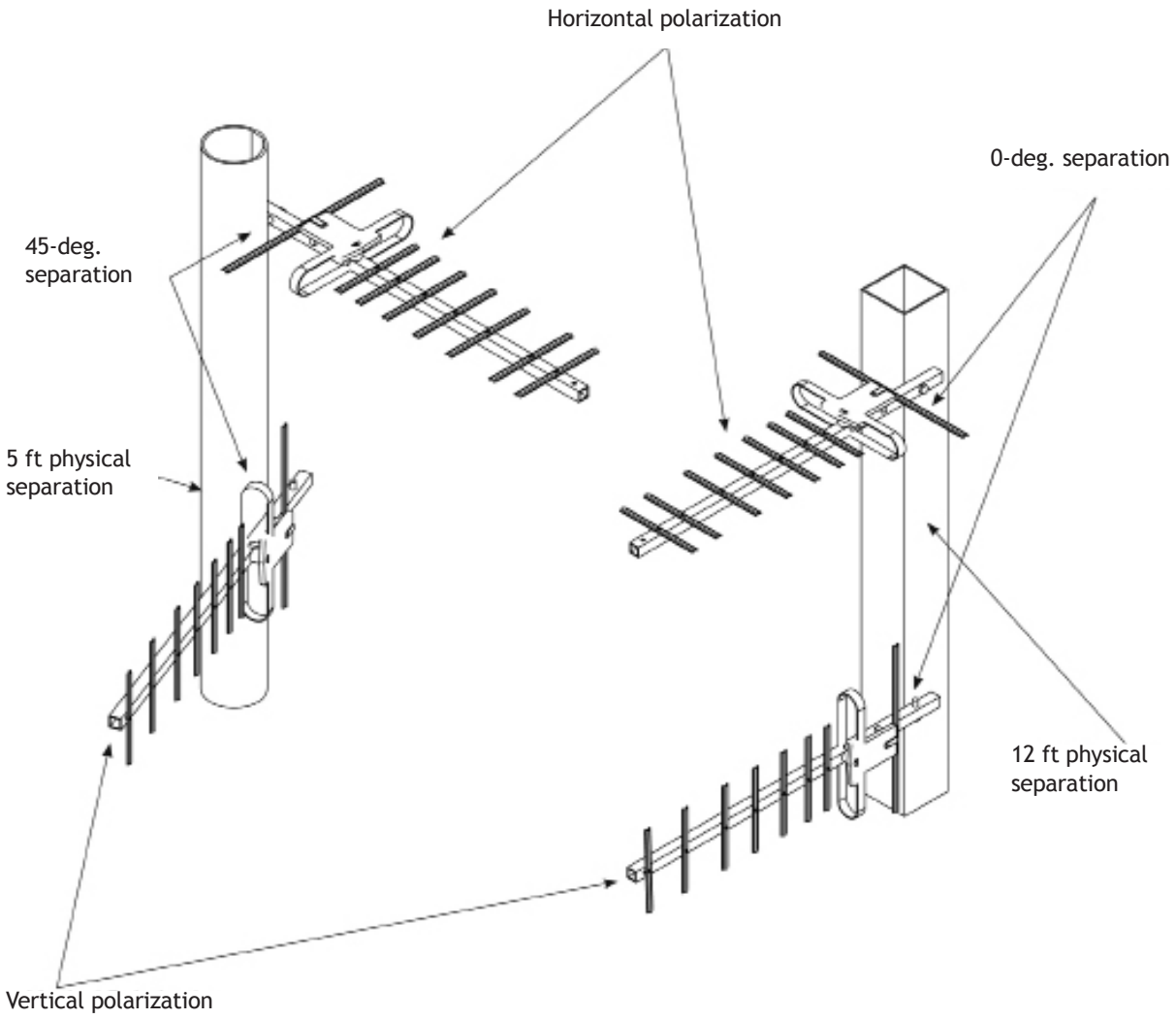


Figure 2



ATTENTION: When multiple 900 MHz antennas are installed in one area and face the same direction, antennas should be spaced a minimum of 12 feet apart. When multiple antennas are installed in one area and face different directions, antennas should be spaced a minimum of 5 feet apart.



Transmitter to Reciever Placement

If radios are installed either indoors or outdoors at distances closer than recommended, antennas can overpower each other and cause undesired effects. If testing radios within one or two feet, remove both antennas. The radios will still be able to signal each other at close distances. This applies to both indoor and outdoor units.

ANTENNA	RANGE Maximum line-of-sight *	Maximum non-line-of-sight
AW2-900	1 mile	5 walls / 450 ft
AW3x-900	1 mile	5 walls / 450 ft
AW5-900	2 miles	6 walls / 500 ft
AW10-900	15 miles	1,000 feet w/ trees
AW11-900	20 miles	1,200 feet w/ trees
AW15-900	40 miles	1,500 feet w/ trees

Abbreviation Guide

AP: Access Point
SU: Subscriber Unit
RF: Radio Frequency
RX: Recieve
TX: Transmit
LCD: Liquid-Crystal Display
ECD: Ethernet Client Device
RP: Reversed Polarity
TNC: Need name of plug
IP: Internet Protocol
CH: Channel
DHCP: Dynamic Host Configuration Potocol