



# AW900T

## USER'S MANUAL

### Point-to-multipoint

Industrial-grade, ultra-long-range 900 MHz  
**non-line-of-sight** wireless Ethernet systems

# Non-line-of-sight :: 900 MHz

Thank you for your purchase of the AW900T multipoint wireless Ethernet radio.

If you have any questions when configuring your AvaLAN system, please send an e-mail to support@avalanwireless.com.

For a live technician, please call technical support at (650) 384-0000.

For advanced installation information, please visit [www.avalanwireless.com](http://www.avalanwireless.com).



## AW900xT Outdoor Radio

Long-range 900 MHz wireless outdoor Ethernet radio transceiver. Contents:

- (1) AW900xT outdoor radio
- (1) AW2 2.5 dBi omni-directional antenna
- (1) 110 VAC to 12 VDC power adapter
- (1) Power over Ethernet injector

Includes AW2 2.5 dBi omni-directional antenna. Recommended upgrades: AW5H-900, AW5P-900, AW10, AW11 (shown), and AW15 – all FCC approved

## AW900iT Indoor Radio

Long-range 900 MHz wireless indoor Ethernet radio transceiver. Contents:

- (1) AW900iT indoor radio
- (1) AW2 2.5 dBi omni-directional antenna
- (1) 110 VAC to 6 VDC power adapter

Includes AW2 2.5 dBi omni-directional antenna. Recommended upgrades: AW5H-900, AW5P-900, AW10, AW11, and AW15 – all FCC approved

## Operational summary

The AvaLAN AW900iT and AW900xT radios allow a user to create an ultra-long-range, wireless Ethernet network for up to 16 subscriber units per access point.

The access point (AP) automatically scans for the best of the 12 available radio channels, encrypts Ethernet data received from the network, and transmits it wirelessly to the correct subscriber unit (SU). The AP is constantly monitoring the network performance and automatically changes channels if the performance is degraded due to interference. The user may manually select any of the 12 radio channels by toggling DIP switch settings (see Page 5). It is possible to operate up to 12 APs in the same area with each AP on a different channel. To avoid interference, the APs should be spaced at least 10 feet apart. Typically the AP is attached to the wired network via an Ethernet cable. The AP does not have a MAC/IP address.

Any 10BaseT Ethernet client device (ECD) can be connected to an AW900iT or AW900xT 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. Crossover cables are never needed. Only one ECD can be attached to each SU, and fixed IP addresses are recommended for the attached ECDs. The DIP switches on the SU should be in the default OFF setting. To avoid overloading the radio's receiver, the SU should be placed at least 10 feet from the AP, and 100 feet spacing is recommended if using the higher gain AW11 or AW15 antennae.

The SU does not have its own MAC/IP address. AvaLAN radios use electronic network keys that allow the user to group radios together to form a network. Network keys are shared between radios by connecting an Ethernet cable between the RJ45 ports while the radios are in "key exchange mode" (radios that are in "key exchange mode" display the 6 LINK QUALITY LEDs blinking sequentially back and forth).

To share the keys and to create the network, the user first selects which radio will be the access point (AP) by setting DIP switch 1 ON (see Page 5 for DIP details). The other radios will function as subscriber units (SUs) and do not require any DIP settings. The user then connects an Ethernet cable from the AP to each SU to transfer the network keys. For the AW900xT the key exchange will occur though an Ethernet cable attached to the supplied POE injector. Key exchange will not work through a switch or hub. Once the key sharing is complete the AP and SU change their LED displays in confirmation of the successful programming:

- The SU blinks one of the GREEN LINK QUALITY LEDs.
- The AP illuminates the LED labeled RF RX and the AP remains in "key exchange mode."

Please see the next page

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If the user's needs change, additional SUs can be added to the network and/or a SU can be reprogrammed to join a different network and/or a SU can be changed into an AP and/or an AP into a SU. The radios cannot be damaged by incorrect programming. If DIP 1 is accidentally toggled then DIP 1 can be turned back and the radio still retains all the network associations it had in its previous mode (assuming that the radio had not yet successfully key exchanged with a new network). An AP can be reset by programming it as a SU to a new AP and then turning it back into an AP again.

SUs that have not yet received a network key boot up in "key exchange mode" and wait to receive a key. SUs that have received a network key will boot up for 5 seconds in "key exchange mode" and will look to see if a new AP is present. If a new AP is present, then the SU exchanges keys with the AP, otherwise the SU begins normal operation after the 5 seconds.

APs that have not yet issued network keys boot up in "key exchange mode" until they have issued network keys to at least 1 SU. Once the AP has issued keys it will only boot up for 5 seconds in "key exchange mode." If a SU is present during the 5 seconds, then the AP will issue new keys to the SU and will then remain in "key exchange mode," waiting for more SUs to be attached. Once all new SUs have been attached, the AP must be power cycled. The AP will boot up and will enter normal operation after 5 seconds of "key exchange mode."

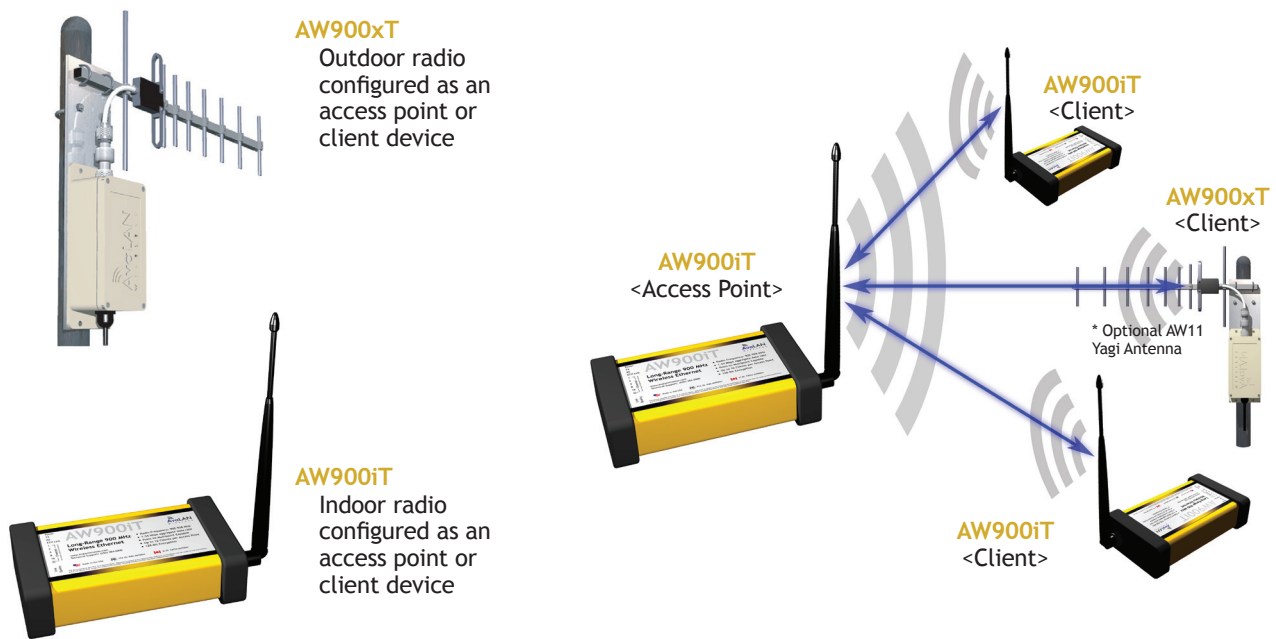
## Advanced operation

Please call AvalAN technical support at (650) 384-0000 if the system topology requires:

- More than 16 subscriber units per access point for roaming/mobility applications
- Multiple access points that use the same network key for roaming/mobility
- Low packet loss rates when using broadcast or multicast Ethernet packets

**NOTE:** Broadcast and multicast packets (example: DHCP, UDP) are sent once and may experience losses at extended range. Unicast packets (example: HTTP, TCP) are sent using advanced error correction and retransmission techniques to ensure delivery.

## System diagram



## LED display

Name	Function	Color
<b>Power</b>	Unit has power and has successfully booted.	Red
<b>RF TX</b>	Radio transmission is occurring.	Green
<b>RF RX</b>	Radio reception is occurring.	Green
<b>Eth Link</b>	The Ethernet Port has a valid Ethernet connection	Green
<b>1</b>	By adding the numbers that are lit the user can determine the current radio channel. 1 903.12500 MHz    7 915.62500 MHz 2 905.20833 MHz    8 917.70833 MHz 3 907.29167 MHz    9 919.79167 MHz 4 909.37500 MHz    10 921.87500 MHz 5 911.45833 MHz    11 923.95833 MHz 6 913.54167 MHz    12 926.04167 MHz	Green
<b>2</b>		
<b>4</b>		
<b>8</b>		
<b>16</b>		
<b>32</b>		
<b>Link Quality Meter - The more LEDs that are lit the higher the link quality.</b>  <b>OR</b>  <b>“Key exchange mode” when blinking sequentially</b>		
	Very good link quality - Few retransmissions	Green
	Good link quality - Occasional retransmissions	Amber
	Fair link quality - Some retransmissions	Amber
	Poor link quality - Many retransmissions	Red
	No link quality No link available	Red

## Initial setup

- 1) Select the radio that will operate as the access point (AP) and set DIP switch 1 ON to enable AP operation.
- 2) Plug in the access point.
  - The LINK QUALITY LEDs will blink sequentially showing that the radio is hunting for a subscriber unit (SU) to share keys with.
- 3) Plug in a subscriber unit.
  - The LINK QUALITY LEDs will blink sequentially showing the radio is hunting for an AP to supply a network key.
- 4) Connect an Ethernet cable from the AP to the SU and the units will automatically exchange keys over the Ethernet cable (key exchange will not work through a switch or hub – crossover cables are required).
  - On the AP, the LINK QUALITY LEDs will still show that the radio is still in “key exchange mode” and the RF TX LED will be lit showing that the keys exchanged successfully – ignore the other LEDs.
  - On the SU, the LINK QUALITY LEDs no longer blink sequentially and will show that the radio has stopped hunting and now has a slowly blinking pulse on one of the GREEN LINK QUALITY LEDs – ignore the other LEDs.
- 5) Repeat steps 3 and 4 until all SUs are successfully programmed.
- 6) Disconnect the Ethernet cable.
- 7) Power cycle all radios for the new keys to take effect.
- 8) Deploy the radios.

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## To add NEW subscriber units to the access point

- 1) Disconnect the AP from the network and disconnect power from the AP.
- 2) Connect an Ethernet cable from the AP to the SU (key exchange will not work through a switch or hub – crossover cables are not required).
- 3) Plug in the NEW SU, then plug in the AP. The units will automatically exchange keys over the Ethernet cable.
- 4) Repeat steps 2 and 3 until all SUs are successfully programmed.
- 5) Power cycle all radios for the new keys to take effect.
- 6) Reconnect the AP to the network and deploy the new SU radios.

## To re-key a subscriber unit to a NEW access point

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- 1) Select the radio that will operate as the access point (AP) and set DIP switch 1 ON to enable access point operation.
- 2) Plug in the NEW AP.
- 3) Connect an Ethernet cable from the AP to the SU (key exchange will not work through a switch or hub – crossover cables are not required).
- 4) Plug in the SU.
- 5) Repeat steps 3 and 4 until all SUs are successfully programmed.
- 6) Power cycle all radios for the new keys to take effect.
- 7) Deploy the radios.

## DIP settings

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### DIP 1

#### Access point or subscriber unit

- By selecting DIP 1 ON the radio will operate as an access point
- By selecting DIP 1 OFF the radio will operate as a subscriber unit

### DIP 3-8

#### Automatic frequency selection mode (DIP switches – DIP 3-8 OFF for automatic mode)

The AW900iT and AW900xT are designed to automatically select and continuously optimize the performance of its radio channel. The radio channel is monitored to ensure it is providing low error rates necessary for successful data transmission. In the event that the error rate rises, the access point will autonomously change to a new channel. There are 12 non-overlapping channels.

#### Manual frequency selection mode

The operation of the AW900iT and AW900xT can be restricted to a specific channel within the 900 MHz band by setting DIP switches 3-8 on the access point as shown in the table on Page 6. The subscriber unit responds to the access point's choice of channel and its DIP switches have no effect and do not need to be selected.

Please see the next page

## 900 channel table

Channel	DIP Setting	Center Frequency
1	3 On / 4 Off / 5 Off / 6 Off	903.12500 MHz
2	3 Off / 4 On / 5 Off / 6 Off	905.20833 MHz
3	3 On / 4 On / 5 Off / 6 Off	907.29167 MHz
4	3 Off / 4 Off / 5 On / 6 Off	909.37500 MHz
5	3 On / 4 Off / 5 On / 6 Off	911.45833 MHz
6	3 Off / 4 On / 5 On / 6 Off	913.54167 MHz
7	3 On / 4 On / 5 On / 6 Off	915.62500 MHz
8	3 Off / 4 Off / 5 Off / 6 On	917.70833 MHz
9	3 On / 4 Off / 5 Off / 6 On	919.79167 MHz
10	3 Off / 4 On / 5 Off / 6 On	921.87500 MHz
11	3 On / 4 On / 5 Off / 6 On	923.95833 MHz
12	3 Off / 4 Off / 5 On / 6 On	926.04167 MHz

## Technical specifications

CHARACTERISTIC	SPECIFICATION / DESCRIPTION
RF transmission rate	1.536 Mb/s
Ethernet throughput	935 Kb/s
Output power	+21 dBm (4 Watts EIRP used with 15 dBi antennae)
Receive sensitivity	-97 dBm at 10e-4 BER (-112 dBm with 15 dBi antennae)
Radio link budget	148 dB with 15 dBi antennae
Range	40 miles LOS with 15 dBi antennae
Radio channels/bandwidth	12 non-overlapping with 2.0833 MHz spacing and 1.75 MHz occupied bandwidth
Manual frequency select	Channel selected with DIP switch
Connector types	RF RPTNC Female / Ethernet RJ45 10BaseT / Power Jack P5-2.1 mm ID
Status LEDs	Power, Ethernet Link, RF RX, RF TX, 4/Channel, and 6/Link Quality
Error correction technique	Sub-block error detection and retransmission
Adjacent-band rejection	SAW receiver filter attenuates cellular and pager interference
Regulator type	Indoor uses linear regulator and outdoor uses switching regulator
Power consumption	Transmit: Indoor – 1.9 W Outdoor – 1.25 W      Receive: Indoor – 1.2 W Outdoor – 0.6 W
Voltage	Indoor: 5 VDC-7 VDC Outdoor: Power over Ethernet 9-48 VDC over Ethernet -4/5 positive and 7/8 ground
Temperature range	-40° C to 70° C
Transmit current draw	Indoor: 375 mA      Outdoor: 150 mA at 9 VDC 110 mA at 12 VDC 32 mA at 48 VDC
Size	Indoor: 140 x 85 x 30 mm      Outdoor: 200 x 80 x 55 mm

## 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)**

Note: 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.

## Example installations



**EXAMPLE 1**  
Indoor point-to-multipoint wireless Ethernet system



**EXAMPLE 2**  
Ultra-long-range, point-to-multipoint wireless system transmitting Ethernet data across golf course

support@avalanwireless.com

**Technical support :: (650) 384.0000**

For advanced installation information visit  
**[www.avalanwireless.com](http://www.avalanwireless.com)**

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