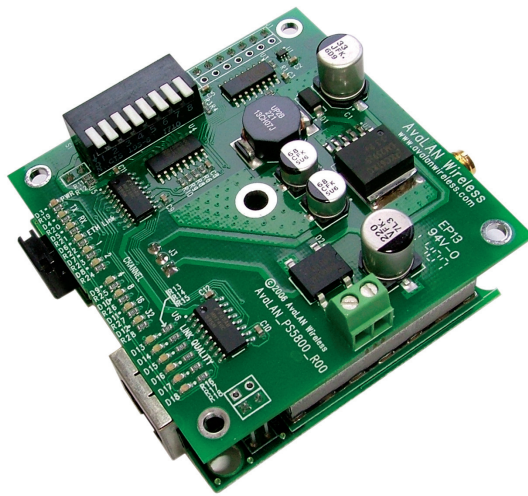




AW900mT

USER'S MANUAL

Point-to-multipoint

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

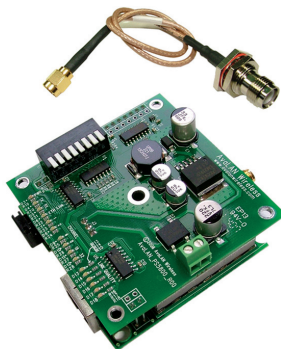
Non-line-of-sight :: 900 MHz

Thank you for your purchase of the AW900mT multipoint wireless Ethernet module.

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.



AW900mT OEM Module

900 MHz non-line-of-sight, point-to-multipoint radio transceiver module. Includes:

- (1) AW900mT RF module – RPSMA female
- (1) AWP8 8-inch pigtail – RPSMA male to RPTNC bulkhead female

Requires antenna: Use with AW2, AW5H-900, AW5P-900, AW6, AW10, AW11, or AW15 – all FCC approved

Operational summary

The AvaLAN AW900mT module allows 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 AW900mT 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 module'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 modules use electronic network keys that allow the user to group modules together to form a network. Network keys are shared between modules by connecting an Ethernet cable between the RJ45 ports while the modules are in "key exchange mode" (modules 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 module will be the access point (AP) by setting DIP switch 1 ON (see Page 5 for DIP details). The other modules 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 AW900mT the key exchange will occur through 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."

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 modules cannot be damaged by incorrect programming. If DIP 1 is accidentally toggled then DIP 1 can be turned back and the module still retains all the network associations it had in its previous mode (assuming that the module 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.

Please see the next page

Continued from Page 2

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.”

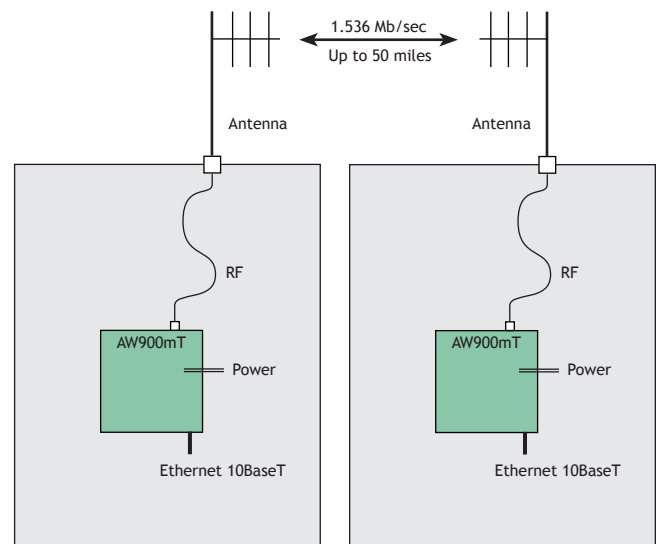
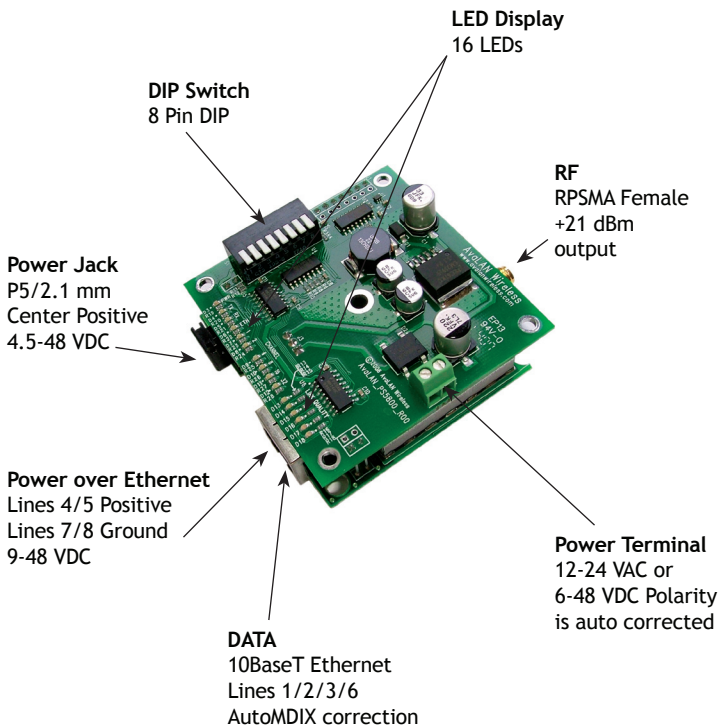
Advanced operation

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
Power	Unit has power and has successfully booted.	Red
RF TX	Radio transmission is occurring.	Green
RF RX	Radio reception is occurring.	Green
Eth Link	The Ethernet Port has a valid Ethernet connection	Green
1	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
2		
4		
8		
16		
32		
Link Quality Meter - <i>The more LEDs that are lit the higher the link quality.</i> OR <i>“Key exchange mode” when blinking sequentially</i>	Excellent link quality - No retransmissions	Green
	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 module 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 module 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 module 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 module 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 module 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) Power cycle all modules for the new keys to take effect.
- 7) Deploy the modules.

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 modules for the new keys to take effect.
- 6) Reconnect the AP to the network and deploy the new SU modules.

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

- 1) Select the module 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 modules for the new keys to take effect.
- 7) Deploy the modules.

DIP settings

DIP 1

Access point or subscriber unit

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

DIP 3-8

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

The AW900mT is 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 AW900mT 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 antenna AW5-5800
Range	50 miles LOS with 15 dBi antenna
Radio channels/bandwidth	12 non-overlapping with 2.0833 MHz spacing and 1.75 MHz occupied bandwidth
Automatic frequency select	Yes, radio channel automatically selected and adaptively optimized
Connector types	RF RPSMA 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
Regulator type	Switching regulator
Power consumption	Transmit: 1.4 W Receive: 0.8 W
Voltage	4.5-48 VDC at screw terminal 9-48 VDC over Ethernet 12-26 VAC at screw terminal
Temperature range	-40° C to 70° C
Transmit current draw	250 mA at 5 VDC 110 mA at 12 VDC 32 mA at 48 VDC
Size	65 x 65 x 33 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.

Appendix A — Agency certifications

FCC Certification

The AW900mT OEM RF Module complies with Part 15 of the FCC rules and regulations. Compliance with labeling requirements, FCC notices and antenna regulations is required.

Labeling Requirements

In order to inherit AvaLAN's FCC Certification, compliance requires the following be stated on the device:

Contains FCC ID: R4N-AW900M
 The enclosed 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.

Figure 1. Required FCC label for OEM products containing the AvaLAN AW900mT OEM RF module

The Original Equipment Manufacturer (OEM) must ensure that FCC labeling requirements are met. This includes a clearly visible label on the outside of the final product enclosure that displays the contents shown in the Figure 1.

User's Manual Requirements

In order to inherit AvaLAN's FCC Certification, compliance requires the following be stated in the user's manual:

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.

FCC Notices

Adherence to the following is required:

IMPORTANT: The AW900mT OEM RF Modules have been certified by the FCC for use with other products without any further certification (as per FCC section 2.1091). Changes or modifications not expressly approved by AvaLAN could void the user's authority to operate the equipment.

IMPORTANT: OEMs must test their final product to comply with unintentional radiators (FCC section 15.107 and 15.109) before declaring compliance of their final product to Part 15 of the FCC Rules.

IMPORTANT: The AW900mT OEM RF Modules have been certified for fixed base station and mobile applications. If modules will be used for portable applications, the device must undergo SAR testing.

FCC-Approved Antennas (900 MHz)

Fixed base station and mobile applications

AvaLAN Modules are pre-FCC approved for use in fixed base station and mobile applications. When the antenna is mounted at least 20 cm (8") from nearby persons, the application is considered a mobile application.

Portable applications and SAR testing

When the antenna is mounted closer than 20 cm to nearby persons, then the application is considered "portable" and requires an additional test be performed on the final product. This test is called the Specific Absorption Rate (SAR) testing and measures the emissions from the module and how they affect the person.

RF exposure (This statement must be included as a CAUTION statement in OEM product manuals.)

WARNING: This equipment is approved only for mobile and base station transmitting devices. Antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

To fulfill FCC certification requirements:

1. Integrator must ensure required text [Figure 1] is clearly placed on the outside of the final product.
2. AW900mT Module may be used only with Approved Antennas types that have been tested with this module.

Antenna Type	Type	Maximum Gain
Omni directional	Monopole	$\leq 8\text{dBi}$
Directional	Yagi	$\leq 15\text{dBi}$

Table 1. Type certified antennae

Antenna warning

WARNING: This device has been tested with Reverse Polarity SMA connectors with the antennas listed in Table 1 Appendix A. When integrated into OEM products, fixed antennas require installation preventing end-users from replacing them with non-approved antennas. Antennas not listed in the tables must be tested to comply with FCC Section 15.203 (unique antenna connectors) and Section 15.247 (emissions).

IC (Industry Canada) Certification

Labeling requirements for Industry Canada are similar to those of the FCC. A clearly visible label on the outside of the final product enclosure must display the following text:

Contains Model AW900 Radio, IC: 5303A-AW900M

Integrator is responsible for its product to comply with IC ICES-003 & FCC Part 15, Sub. B - Unintentional Radiators. ICES-003 is the same as FCC Part 15 Sub. B and Industry Canada accepts FCC test report or CISPR 22 test report for compliance with ICES-003.

support@avalanwireless.com

Technical support :: (650) 384.0000

For advanced installation information visit
www.avalanwireless.com

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