Certification Exhibit

FCC ID: R4N-AW5802MR
IC: 5303A-AW5802MR

FCC Rule Part: 15.247
IC Radio Standards Specification: RSS-210

ACS Project: 12-2135

Manufacturer: AvaLAN Wireless Systems Inc
Model: AW5802MR

User Manual

AW5802mTR-EVAL

USER'S MANUAL

5.8 GHz Wireless Ethernet Module Evaluation Kit

Industrial-grade, long-range wireless Ethernet systems

AvaLAN
WIRELESS

Thank you for your purchase of the AW5802mTR-EVAL Wireless Ethernet Module Evaluation Kit. The AW5802mTR Module consists of the AW5802MR Radio Module soldered to a second PC board that provides power and an Ethernet data interface. This Evaluation Kit provides a pair of these Ethernet-interfaced modules along with the necessary accessories to allow your testing and determination of the suitability of these modules for inclusion in your own systems.

If you have any questions when configuring your AvaLAN product, 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.

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.

125A Castle Drive
Madison, AL 35758

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

Operational summary

The AW5802mTR Radio Module allows the user to create a long-range, wireless Ethernet network with up to 16 subscriber units per access point.

Configuring a wireless link with the AW5802mTR 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.

AW5802mTR radios may be configured by two different methods. They may be connected to a computer that will run a web browser, setting parameters via their built-in browser interfaces. They may also be programmed via the "easy key" method using the DIP switches and LEDs on the module.

The access point (AP) automatically scans for the best of the 59 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 or 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 AW5802mTR 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 continuous Ethernet cable.

Evaluation Kit Contents
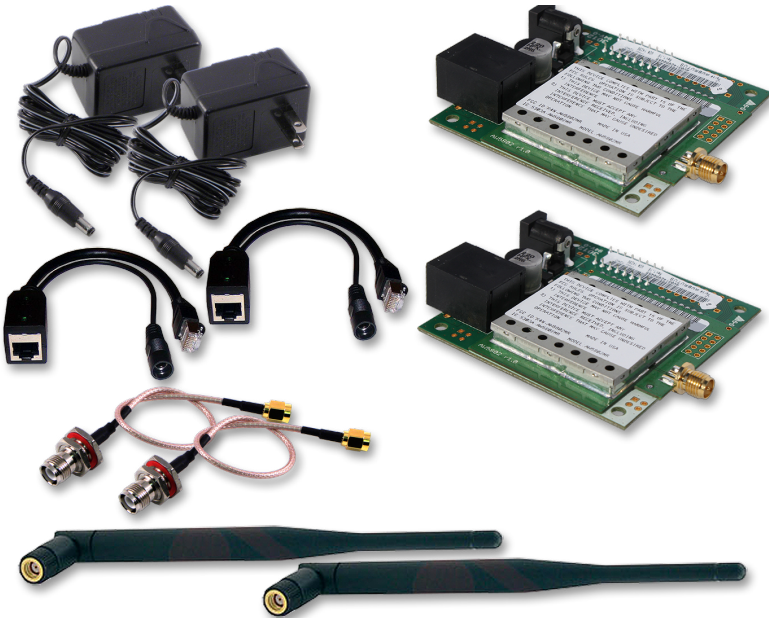
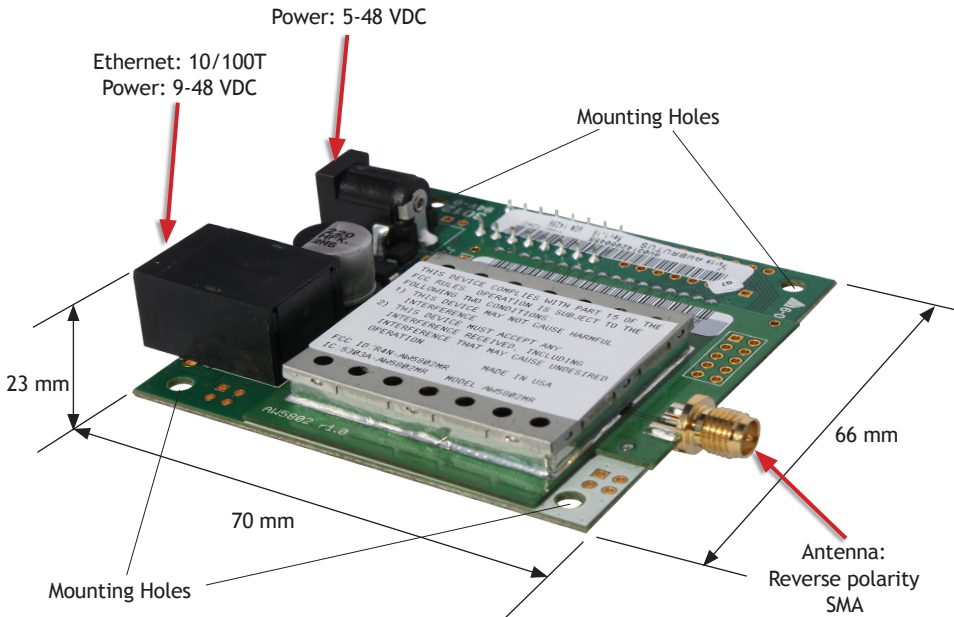The AW5802mTR-EVAL 5.8 GHz Wireless Ethernet Module Evaluation Kit contains two each of the following items:

- AW5802mTR Wireless Ethernet Modules
- AW5-5800 Omnidirectional Antennas
- AW-P8 Antenna to Radio Connectors
- AW-POE Power Over Ethernet Injectors
- AW-12VPS 12 Volt Power Supplies

Additional quantities of any of these components may be purchased from AvaLAN Wireless or our distributors.

To power up a radio module, connect the antenna via the pigtail cable provided. Connect an Ethernet cable to the RJ-45 jack on the module. Power may be supplied to the module using the 12 VDC wall hanger power supply either through the Ethernet cable using the POE or directly into the P5 jack on the module.

Provide some physical separation between two radio modules — at least five feet. If their antennas are in close proximity, the module radio receivers will be overloaded, causing degradation in the bit error rate and slower link performance.

Physical Dimensions

Power: 5-48 VDC

Ethernet: 10/100T
Power: 9-48 VDC

Mounting Holes

23 mm

70 mm

66 mm

Mounting Holes

Antenna:
Reverse polarity
SMA

5.8 GHz Channels

| Channel	Center Frequency	Channel	Center Frequency	Channel	Center Frequency	Channel	Center Frequency
0	Auto Mode						
1	5728.125 MHz	16	5758.845 MHz	31	5789.565 MHz	46	5820.285 MHz
2	5730.173 MHz	17	5760.893 MHz	32	5791.613 MHz	47	5822.333 MHz
3	5732.221 MHz	18	5762.941 MHz	33	5793.661 MHz	48	5824.381 MHz
4	5734.269 MHz	19	5764.989 MHz	34	5795.709 MHz	49	5826.429 MHz
5	5736.317 MHz	20	5767.037 MHz	35	5797.757 MHz	50	5828.477 MHz
6	5738.365 MHz	21	5769.085 MHz	36	5799.805 MHz	51	5830.525 MHz
7	5740.413 MHz	22	5771.133 MHz	37	5801.853 MHz	52	5832.573 MHz
8	5742.461 MHz	23	5773.181 MHz	38	5803.901 MHz	53	5834.621 MHz
9	5744.509 MHz	24	5775.229 MHz	39	5805.949 MHz	54	5836.669 MHz
10	5746.557 MHz	25	5777.277 MHz	40	5807.997 MHz	55	5838.717 MHz
11	5748.605 MHz	26	5779.325 MHz	41	5810.045 MHz	56	5840.765 MHz
12	5750.653 MHz	27	5781.373 MHz	42	5812.093 MHz	57	5842.813 MHz
13	5752.701 MHz	28	5783.421 MHz	43	5814.141 MHz	58	5844.861 MHz
14	5754.749 MHz	29	5785.469 MHz	44	5816.189 MHz	59	5846.909 MHz
15	5756.797 MHz	30	5787.517 MHz	45	5818.237 MHz		

Browser Interface Configuration ──────

1. Digital configuration is done by means of the AW5802mTR'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://www.avalanwireless.com/ipfinder/ipfinder.zip

Note that this utility only runs on MS 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, continuing the setup procedure with step 6.

3. Run the IP Discovery Utility, ipfinder.exe and you should see a window similar to this:
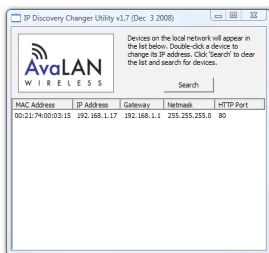
The AW5802mTR should appear in the list at the default IP address of 192.168.17.17. If it does not, click "Search" to regenerate the list. If it still does not appear, you have a connection issue and need to re-examine the cabling or you may have a firewall issue on your computer.

4. Double click the list item that refers to the AW5802mTR being configured. You should see a second window that is similar to this:
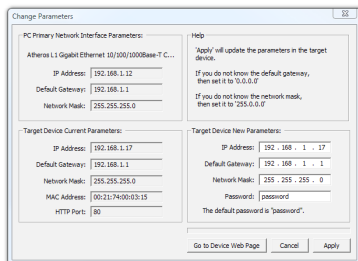
The information on the left is the current status of the radio, while the boxes on the right allow you to change it. It is important that the IP address of the AW5802mTR is in the same subnet as your computer. For example, if the subnet mask is 255.255.255.0 (a class C network), the first three number groups of the IP address must match. Choose your 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].

6. The browser page that loads first shows the current device information and QoS statistics and provides a login at 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:

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. References to DIPs on this and the next web page refer to the DIP switches on the module that are used in the "easy key" method of configuration and may be ignored when using the browser method.

If you scroll down in the Admin browser page, you will come to three more sections:
- A graphical spectrum analyzer display that may help you to select radio channels that avoid interference
- A section to be used if an update to the AW5802mTR's firmware is required
- An Advanced Links section with a dire warning about advanced users only.

Despite the warning, you will need to click the "Advanced Admin" button in order to set the device type, ID and encryption key. You should then see a page similar to this:

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 63.
- For an Access Point, enter the number of Subscriber Units that will be communicating with it.
- Click the box labeled "Enable User Specified Keys."
- 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 module.

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

LED and Switch Behavior

Reset Switch:

Press momentarily for soft reset of processor. Hold for 10 seconds to reset module to factory defaults.

LEDs
PWR
RX
TX
ETH
CH1
CH2
CH4
CH8
CH16
CH32

LINK
QUALITY

DIP Switches
1
2
3
4
5
6
7
8
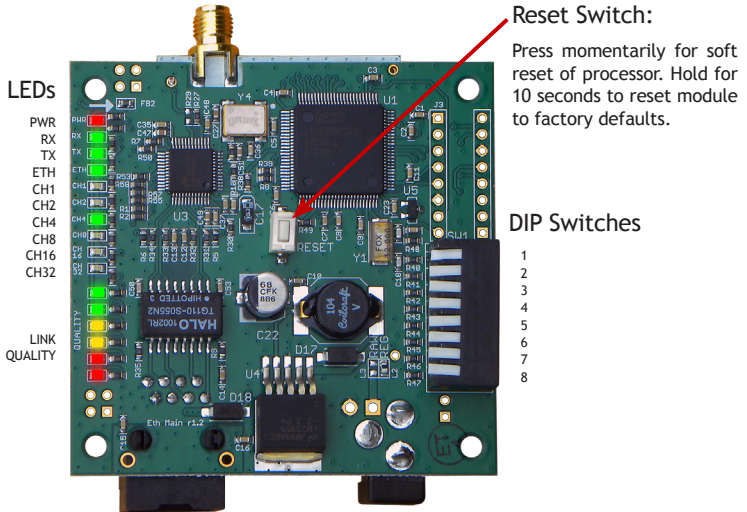
LED	Function	Color
PWR	Unit has power and has successfully booted	Red
RX	Radio reception is occuring	Green
TX	Radio transmission is occuring	Green
ETH	Ethernet port is connected	Green
CH1	By adding the numbers that are lit, you can determine the current radio channel. Valid channels are 1 to 59. For the frequency of each channel, see the table on page 5.	Green
CH2		
CH4		
CH8		
CH16		
CH32		
Shows link quality (more lit the better) or indicates "key exchange mode" if blinking sequentially	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: frequent retransmissions	Red
	No link quality: no link available	Red
DIP Switch	**Function (up is off, down is on)**	
1	Set on for Access Point, off for Subscriber Unit	
2	Test switch for tech support use. Leave off	
3-8	All off: automatic frequency selection. To manually set the channel, set switches on in same pattern as the channel LEDs: Switch 3 is bit 1, switch 4 is bit 2, switch 5 is bit 4, etc.	

"Easy Key" Configuration ────────────

In most cases, the browser interface is a better choice for configuring the modules. But they also can be configured as a point-to-point bridge or a point-to-multipoint group using the DIP switches. When this method is used, the module that will operate as the access point provides a unique network ID calculated from its MAC address and a unique random encryption key programmed into it during manufacture.

If you do configure a set of modules this way, be aware that they will all have the factory default IP address of 192.168.1.17. If you later need access to a module via the browser interface, use the IP Finder utility, select the individual unit and give it a unique IP address.

Initial Setup:

1. Select the module that will operate as the access point (AP) and set its DIP switch 1 on (down). Set DIP switch 1 off (up) on the module(s) that will operate as subscriber units (SUs).

2. Select matching frequency channels on all modules or select automatic channel selection by leaving DIP switches 3-8 off.

3. Power up the AP module. Its link quality LEDs will begin blinking sequentially, showing that the module is hunting for an SU to exchange keys with.

4. Power up an SU module (its DIP switch 1 is off). This module's link quality LEDs will also begin blinking sequentially showing that it is hunting for an AP to supply a network key.

5. Connect an Ethernet cable from the AP module to the SU module and the two modules will automatically exchange keys. (Do not connect through a switch or hub, but cable directly with a regular patch or crossover cable.)

   - On the AP module, the link quality LEDs will still blink sequentially in key exchange mode and the TX LED will light showing successful key exchange

   - On the SU module, the link quality LEDs will no longer blink sequentially, but one of the green link quality LEDs will slowly blink to indicate successful key exchange.

6. Repeat steps 4 and 5 for any other SU modules to be configured to the same AP.

7. disconnect the Ethernet cable and cycle power on all modules for the new keys to take effect. LED behavior should reflect normal RF operation once the units are deployed.

To add a new SU to the AP, disconnect the AP from the network and power off. Connect an Ethernet cable between the SU and AP. Power up the <u>SU</u> <u>FIRST</u> and then the AP. The SU will receive the key. Disconnect the Ethernet cable and cycle power on the SU to cause the new keys to take effect.

To re-key SUs to a new AP, proceed as in the inital setup, making sure to power up the <u>AP</u> <u>FIRST</u>.

Technical specifications

Characteristic	Specification/Description
RF transmission rate	1.536 Mbps
Ethernet data rate	935 Kbps
Receiver Sensitivity	-97 dBm at 10^{-4} Bit Error Rate
Range	Up to 30 miles line-of-sight with 22 dBi antennas
RF channels/bandwidth	59 non-overlapping with 2.048 MHz spacing and 1.75 MHz bandwidth, automatic or manually selectable via web browser interface
Connector types	RF: RPSMA Female / 10/100 base T Ethernet: RJ-45
Data Encryption	128-bit AES, FIPS197, keys set through password-protected browser interface
Error correction technique	Sub-block error detection and retransmission
Power regulation	Built-in switching regulator
Browser management tools	QoS Statistics, Network Settings, Spectrum Analyzer, Firmware Upgrade
Power consumption	Transmit: 2.2 Watts Receive: 1.2 Watts
Voltage	9 to 48 VDC via unused pins in RJ-45 jack - pins 4,5 positive, 7,8 ground
Power regulation	Switching regulator
Transmit current draw	180 ma at 12 VDC
Operating Temperature Range	-40 °C to +80 °C
Size	70 x 66 x 23 mm, 40 grams

Agency Certifications

Warning: Changes or modifications to this device not expressly approved by AvaLAN Wireless could void the user's authority to operate the equipment.

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.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

This radio transmitter AW5802mR has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio AW5802MR a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Antenna Type	Maximum Gain	Impedance
Dipole	5 dBi	50 Ohm
Panel	22 dBi	50 Ohm

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.

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.

Additional Labeling Requirements For Products Including This Module:

When the AW5800MR Radio Module is used in an end product where the label of the module is not visible, the host device must have an exterior label that includes the information shown below:

Contains FCC ID: R4N-AW5802MR

Contains IC: 5303A-AW5802MR