

LUXUL
WIRELESS

USER GUIDE

SHOCK-WAV™ INDOOR WI-FI SIGNAL BOOSTER



FOR USE WITH THE MOTOROLA AP-5131
MODEL NUMBER: SWM-1000-I



SHOCK-WAV WI-FI SIGNAL BOOSTER

MODEL NUMBER: SWM-1000-I

INSTALLATION GUIDE

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Antenna for broadband wireless communications

This product is covered by one or more U.S. and foreign patents.

Patents: 7,379,717 6,606,075, 6,373,448, other patents pending

SHOCK-WAV WI-FI SIGNAL BOOSTER

MODEL NUMBER: SWM-1000-I

FCC ID: W59SWM1000I

IC: 8584A-SWM1000I

MOTOROLA (SYMBOL TECHNOLOGIES INC)

MODEL NUMBER: AP-5131

FCC ID: H9PAP5131D

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SHOCK-WAV SIGNAL BOOSTER USER GUIDE

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1 - INTRODUCTION

The Luxul Wireless Shock-WAV Wi-Fi Signal Booster is designed to complement and enhance the performance of the Motorola AP-5131 Wireless Access Point (WAP). When combined with the AP-5131 and approved antenna, it delivers up to the maximum allowed transmit power (EIRP of 36dBm), resulting in a farther reaching and higher performing network.

Luxul Wireless Shock-WAV Wi-Fi Signal Boosters feature patented RF technology that dynamically optimizes output strength and provides the cleanest, most consistent signal amplification available for Wi-Fi networks. Designed for bidirectional signal amplification, Shock-WAV Wi-Fi Signal Boosters utilize patented Digital Automatic Gain Control (D-AGC) technology that actively monitors the incoming signal from each packet and makes adjustments so that the output signal maintains constant power levels, ensuring the cleanest and most consistent RF signal possible.

1.1 DOCUMENT CONVENTIONS

The following graphical alerts are used in this document to indicate notable situations:



NOTE: Tips, hints, or special requirements that you should take note of.



CAUTION: Care is required. Disregarding a caution can result in data loss or equipment malfunction.



WARNING!: Indicates a condition or procedure that could result in personal injury or equipment damage.

1.2 WARNINGS

- Read all installation instructions and site survey reports, and verify correct equipment installation before connecting the Shock-WAV Wi-Fi Signal Booster or AP-5131 to its power source.
- Remove jewelry and watches before installing this equipment.
- Verify that the unit is grounded before connecting it to the power source.
- Verify that any device connected to this unit is properly wired and grounded.
- Connect all power cords to a properly wired and grounded electrical circuit.
- Verify that the electrical circuits have appropriate overload protection.
- Attach only approved power cords to the device.
- Verify that the power connector and socket are accessible at all times during the operation of the equipment.

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- Do not work with power circuits in dimly lit spaces.
- Do not install this equipment or work with its power circuits during thunderstorms or other weather conditions that could cause a power surge.
- Verify there is adequate ventilation around the device, and that ambient temperatures meet equipment operation specifications.
- Products outside the approved configurations may be in violation of Part 15 of the FCC Rules.

1.3 SITE PREPARATION

- Consult your site survey and network analysis reports to determine specific equipment placement, power drops, and so on.
- Assign installation responsibility to the appropriate personnel.
- Identify and document where all installed components are located.
- Provide a sufficient number of power drops for your equipment.
- Ensure adequate, dust-free ventilation to all installed equipment.
- Identify and prepare Ethernet and console port connections.
- Verify that cable lengths are within the maximum allowable distances for optimal and certified signal transmission.

1.4 PROFESSIONAL INSTALLATION CONSIDERATIONS



CAUTION: Operation of the signal booster without regulatory approval is illegal

The Luxul Shock-WAV Wi-Fi Signal Booster system is required to be professionally installed. The following components are approved for use in the system.

- Luxul SWM-1000-I
- Motorola AP-5131
- Motorola 3dBi omni antenna (included with the AP-5131) and supplied adapter
- Motorola AP-PSBIAS-1P2-AFR Power over Ethernet (POE) Injector
- For additional approved antennas, see section 3.5

The AP-5131 can be used with default RF power settings, although some additional throughput performance may be gained by backing the output power down by 3dB. (reference section 4.3) The signal booster only amplifies the RF provided to it by the AP-5131. Channel selection, data rates, encryption, etc. are all controlled by the AP-5131.



The output power of the amplifier is set and tested during manufacturing. There are no user modifiable parameters in the amplifier. The Luxul Shock-Wav Wi-Fi Signal Booster incorporates a Digital AGC (D-AGC) that ensures a consistent and approved output power.

Please reference section 4 for installation instructions.

2 - SHOCK-WAV WI-FI SIGNAL BOOSTER SPECIFICATIONS

Operating Range	2400 - 2483 MHz
Transmit Power	1W (30dBm)
Transmit Gain	20dB Typical (under D-AGC Control)
Receive Gain	15dB Typical
TX Input Power	+8dBm to +24dBm
Noise Figure	3.5dB Typical
LED Indicators TX\RX	Red for Transmit, Green for Receive
Power Consumption	400mW (RX) 5W (TX) Max
Power Options	Power Over Ethernet (POE) or AC-DC adapter
Operating Voltage	12 to 48VDC
Operating Temp	-4 F to +122F (-20c - +50c)
Dimensions	W: 4" (101.6mm) L: 5.16" (131mm) H: 1.13" (28.7mm)
Enclosure	Indoor, Aluminum
RF Connectors	Two (2) Type N Female
Weight	0.7lbs.

3 - GETTING STARTED

3.1 PRECAUTIONS

Before installing the Shock-WAV Wi-Fi Signal Booster and AP-5131 verify the following:

- Do not install in wet or dusty areas without additional protection. Contact a Luxul Wireless representative for more information.
- Verify the environment has a continuous temperature range between -4 F to +122F (-20c - +50c).

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3.2 PACKAGE CONTENTS

The Luxul Shock-WAV Wi-Fi Signal Booster consists of the following:



One Shock-WAV Wi-Fi Signal Booster



One 36" (914.4mm) N-Male to RP-SMA-Male cable



One N-Male to RP-SMA-Female adapter



One 36" (914.4mm) Ethernet cable

3.3 ADDITIONAL ITEMS REQUIRED

Before installing your Shock-WAV Wi-Fi Signal Booster, be sure to have the following items available:

- Motorola AP-5131 Wireless Access Point (WAP)
- One of the following power options
 - Motorola AP-PSBIAS-1P2-AFR Power Over Ethernet (POE) injector
 - 48V AC-DC power supply
- Ethernet cable for connection to your network source

3.4 OPTIONAL PRODUCTS AND ACCESSORIES

X-WAV™ Antennas: Luxul Wireless offers a wide range of antenna products to complement your Shock-WAV Wi-Fi Signal Booster purchase. X-WAV antennas deliver superior range and signal penetration over other antenna products. A list of antennas approved for use with the AP-5131 and Shock-WAV Wi-Fi Signal Booster combination can be found in section 3.5 Antenna Options.

Power Over Ethernet (POE) Injectors: POE eliminates the need to run direct power to your wireless gear, allowing for more flexibility in mounting and placement. POE allows for a device to be powered via standard Ethernet cables over a distance of up to 328 feet (100 meters). Your Shock-WAV Wi-Fi Signal Booster is approved to work with the Motorola AP-PSBIAS-1P2-AFR POE injector.

Direct Power Adapters: While the Shock-WAV Wi-Fi Signal Booster is designed to be powered using POE injectors, if desired it can also be powered using a 48VDC Universal Input Power Supply. The appropriate 48V AC-DC power supply can be ordered directly from Luxul Wireless (Part No. PS-48VDC).

Cables: This Shock-WAV Wi-Fi Signal Booster is FCC certified for use with various antenna options (see section 3.5). In order to comply with FCC certification, cables connecting the device to the antenna must be no less than 1 foot in length. Luxul Wireless offers a variety of cable lengths that can be purchased separately and used in conjunction with the Shock-WAV device.

Splitters and Surge Protectors: Signal splitters, lightning surge protectors, and other useful accessories are available for making the most of your Luxul Wireless purchase.

Mounting brackets: Luxul Wireless offers several mounting brackets and stands for mounting the Shock-WAV Wi-Fi Signal Booster and associated antennas.

3.5 ANTENNA OPTIONS

The following antennas have been certified for use with the Shock-WAV Wi-Fi Signal Booster and AP-5131 WAP.

- **Motorola** - 3dBi omni antenna (included with the AP-5131)
- **Luxul XW-24-FP7** - 7 dBi circularly polarized patch antenna
- **Motorola ML-2499-HPA3-01R** - 5 dBi omnidirectional antenna

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4 - INSTALLATION PROCEDURES



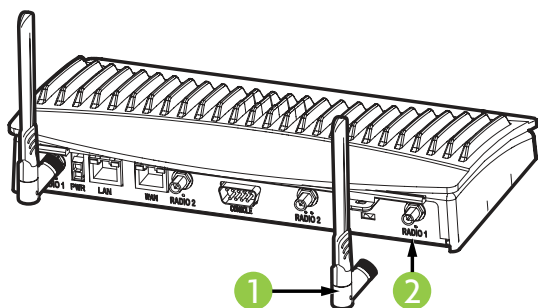
NOTE: The combination of the Motorola AP-5131 and the Shock-WAV Wi-Fi Signal Booster requires professional installation. Please contact Luxul Wireless for more information.

4.1 ATTACHING SHOCK-WAV WI-FI SIGNAL BOOSTER TO THE MOTOROLA AP-5131

Shock-WAV Wi-Fi Signal Boosters are typically connected between the AP-5131 and the stock antenna. For better coverage, use Luxul Wireless X-WAV antennas. A list of certified antennas can be found in section 3.5.



NOTE: The primary and secondary radio ports are identified by dots over the "RADIO" label. One dot for the primary port, and two dots for the secondary.



Remove the stock antenna (Figure 1) **1** from your AP-5131's primary "RADIO 1" port (Figure 1) **2**.

(Consult your AP-5131's documentation for more details on the radio ports).

Figure 1

Using the included N-Male to RP-SMA-Female adapter (Figure 2) **4**, connect the AP-5131 stock antenna (Figure 2) **5** to the Shock-WAV Wi-Fi Signal Booster. Be sure to connect the adapter to the side of the Signal Booster labeled Antenna (Figure 2) **6**.

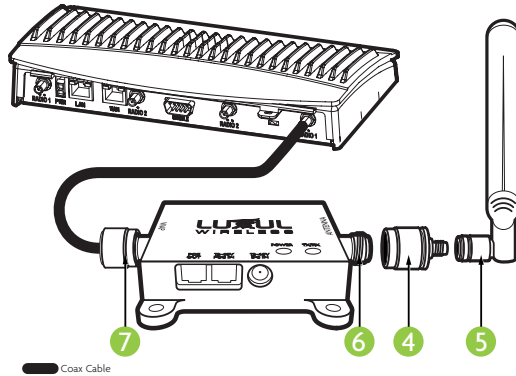


Figure 2

Using the supplied N-Male to RP-SMA-Male coax cable, connect the Shock-WAV Wi-Fi Signal Booster to your AP-5131's radio 1, primary port . (Figure 1) **2**. Be sure to connect the cable to the side of the Signal Booster labeled WAP (Figure 2) **7**.

(Consult your AP-5131's documentation for more details on the radio ports).

4.2 CONNECTING POWER

For maximum flexibility and to optimally meet your specific requirements and environment, the Shock-WAV Wi-Fi Signal Booster can receive power via an Ethernet cable connected to POE (Power Over Ethernet) injector AP-PSBIAS-IP2-AFR or alternatively directly from a 48V AC-DC power supply that can be ordered separately from Luxul Wireless (Part No. PS-48VDC).

The optional Motorola Power Injector (Part No. AP-PSBIAS-IP2-AFR), in certain AP-5131 kits, is an integrated AC-DC converter and 802.3af power injector which requires 110-220V AC power to combine DC voltage with Ethernet data in a single Ethernet cable, reducing the burden of installation and allowing optimal WAP and Signal Booster placement in respect to the intended radio coverage area.



CAUTION: Using the wrong power solution (including a POE system used with a legacy Motorola access point) could severely damage the Shock-WAV Wi-Fi Signal Booster and void the product warranty.



WARNING!: Do not attempt to connect or disconnect any components while the Motorola AP-5131 WAP or Shock-WAV signal booster are plugged into power. Doing so may cause equipment damage and/or physical injury and will void your warranty

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4.2.1 POWER OVER ETHERNET OPTION

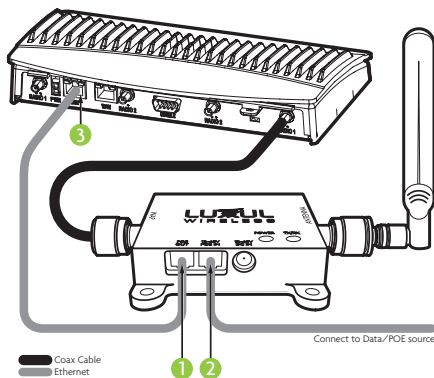


Figure 4

Connect the included 36" (914.4mm) Ethernet cable to the Signal Booster "POE OUT" port (Figure 4) ①. Connect the other end to the LAN port on the back of your Motorola AP-5131, (Figure 4) ③. Connect your Data/POE source Ethernet cable to the "12-48V POE IN" port of the Signal Booster, (Figure 4) ②. Connect the power cable to the Motorola AP-PSBIAS-1P2-AFR POE injector. Plug the POE injector power supply into your 100-240V compatible power source.



NOTE: Your Data/POE Ethernet cable should not exceed a maximum length of 328' (100 meters).

(Consult your Motorola Documentation for more information on the AP-5131 WAP and the AP-PSBIAS-1P2-AFR POE).

4.2.2 DIRECT POWER OPTION (48VDC)

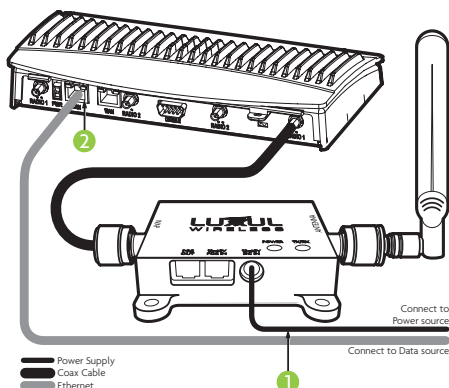


Figure 5

Connect your Data source Ethernet cable to the LAN port on the back of your Motorola AP-5131, (Figure 5) ②. Connect the 48V AC-DC power supply to the Signal Booster (Figure 5) ①. Plug the Signal Booster power supply into your 100-240V compatible power source.

(Consult your Motorola Documentation for more information on the AP-5131 WAP and the AP-PSBIAS-IP2-AFR POE).

4.3 SETTING THE AP-5131 TO THE PRIMARY ANTENNA PORT ONLY

Consult your AP-5131 documentation to access the Radio Configuration Software to configure Radio 1 to use only the Primary Antenna Port. Using the Left side navigation tree, navigate to the Radio 1 (802.11 b/g). The file path is: Network Configuration\Wireless\Radio Configuration\Radio 1 (802.11 b/g) (Figure 3) ①. In the Radio Settings dialog box set Antenna Diversity drop down to Primary Only (Figure 3) ②. Then apply your change.

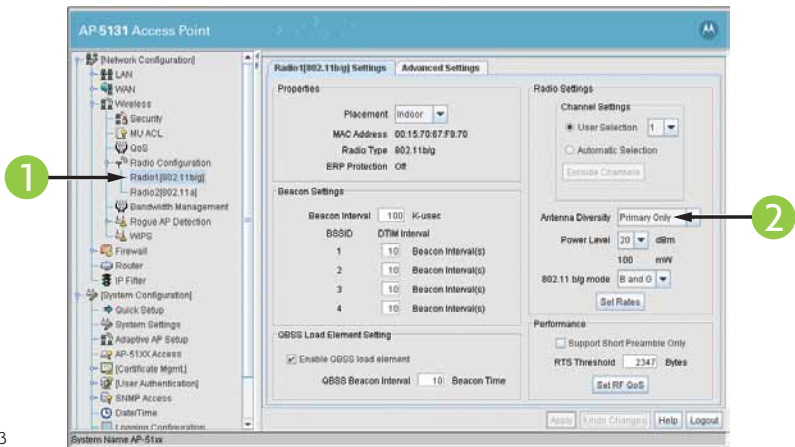


Figure 3

(Consult your AP-5131's documentation for more details on Radio Configuration and Antenna Diversity).

5 - ANTENNA PLACEMENT

For best results, the Antenna should be deployed where the maximum amount of signal can be sent throughout the desired coverage area.

Luxul Wireless products, particularly those implementing our patented signal booster technology, are often capable of emitting enough signal strength to cover the desired area regardless of orientation.

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5.1 ANTENNA DEPLOYMENT

Be sure you place the antenna so there is a minimum of 2 feet (.6 meters) of open space around it. Refer to Figure 6 for examples of antenna deployment.

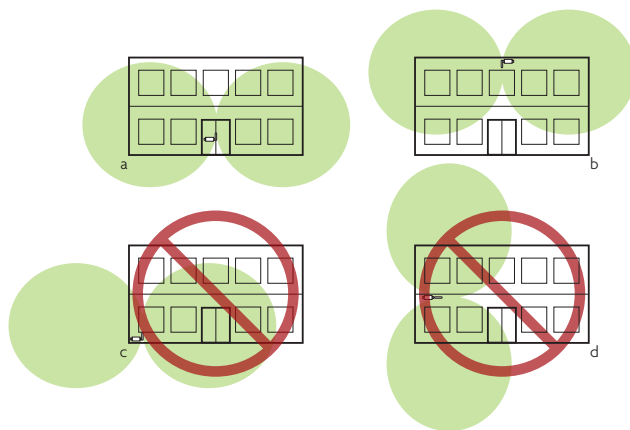


Figure 6

Pattern shape and size is not to scale, for reference only

Figure 6c and d show the loss of the signal coverage due to bad antenna placement. This problem can be addressed by installing an approved Luxul Wireless X-WAV directional antenna. See section 3.5 for a list of approved antennas.

5.2 ANTENNA DIRECTION

For maximum coverage it is important to have your antenna pattern radiating in the correct direction. The pattern radiates out in a donut shaped pattern perpendicular to the antenna. If the antenna is tipped at an angle, the pattern will radiate out at that angle. See Figure 7 for an example of pattern radiation.

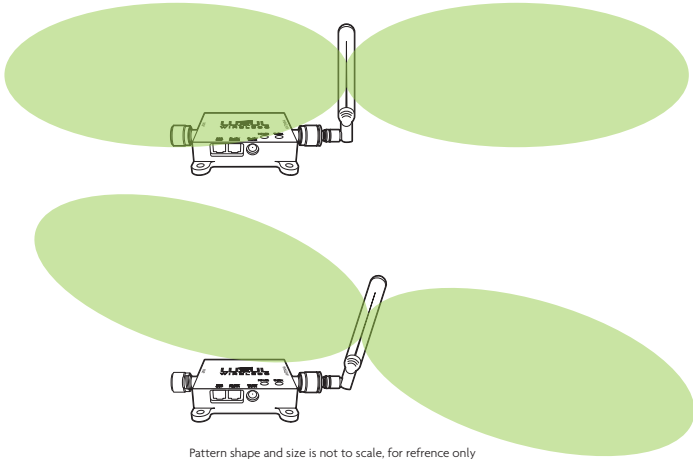


Figure 7

Pattern shape and size is not to scale, for reference only

6 - REGULATORY COMPLIANCE

This device is approved under the Luxul Wireless brand and designed to comply for use specifically with the Motorola AP-5131. This device is designed to be compliant with rules and regulations in locations where they are sold and will be labeled as required. Any changes or modifications to Luxul equipment, not expressly approved by Luxul, could void the user's authority to operate the equipment. This Luxul device when used in conjunction with the Motorola AP-5131 should be professionally installed and the Radio Frequency Output Power will not exceed the maximum allowable limit for those countries that have regulatory approval. Antennas: Use only the supplied or an approved replacement antennas. Unauthorized antennas, modifications, or attachments could cause damage and may violate regulatory approvals.

6.1 HEALTH AND SAFETY RECOMMENDATIONS

Warnings for the use of Wireless Devices: Please observe all warning notices with regard to the usage of wireless devices

Potentially Hazardous Atmospheres: You are reminded of the need to observe restrictions on the use of radio devices in fuel depots, chemical plants etc. and areas where the air contains chemicals or particles (such as grain, dust, or metal powders).

Safety in Hospitals: Wireless devices transmit radio frequency energy and may affect medical electrical equipment. When installed adjacent to other equipment, it is advised to verify that the adjacent equipment is not adversely affected.

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Power Supply: Use only a Luxul approved power supply output rated at 48VDC and minimum 0.25A. The power supply shall be Listed to UL/CSA 60950-1; and certified to IEC60950-1 and EN60950-1 with SELV outputs. The device can also be powered from a compliant POE source. Use of alternative power supply will invalidate any approval given to this device and may be dangerous.

6.2 RF EXPOSURE GUIDELINES

Safety Information: The device complies with internationally recognized standards covering human exposure to electromagnetic fields from radio devices.

Warning: Exposure To Radio Frequency (RF) Radiation:

- The radiated output of this device is below the FCC radio frequency exposure limits. Nevertheless, the device should be used in such a manner that the potential for human contact during normal operation is minimized.
- The end user must avoid any extended human RF exposure directly in front of the Model SWM-1000-I, up to a distance of 20cm, when unit is switched on.
- When servicing the equipment and selecting a location for the antennas, it is important to note that a minimum distance of 20cm is required between personnel and the Model SWM-1000-I antennas to comply with the radio frequency exposure limit.
- The antenna used for this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.
- The following safety precautions should be observed:
 - Do not touch or move the antenna while the unit is transmitting or receiving.
 - Do not hold any component containing the radio such that the antenna is very close or touching any exposed parts of the body, especially the face or eyes, while transmitting.
 - Do not operate the radio or attempt to transmit data unless the antenna is connected; this behavior may cause damage to the radio.

Remote and Standalone Antenna Configurations: To comply with FCC RF exposure requirements, antennas that are mounted externally at remote locations or operating near users at stand-alone desktop of similar configurations must operate with a minimum separation distance of 20 cm from all persons.

6.3 RADIO FREQUENCY INTERFERENCE REQUIREMENTS—FCC

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 pro-

tection 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.

6.4 RADIO TRANSMITTERS (PART 15)

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.

7 - SALES AND SUPPORT CONTACTS

For Sales Assistance:

Luxul Wireless
357 South 670 West, Suite 160
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sales@luxulwireless.com

For Technical Assistance:

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Results may vary depending on building layout, type of construction and other environmental factors including Wi-Fi traffic, Microwaves Ovens, Cordless Phones, etc.

FCC NOTICE: The use of all radio equipment is subject to regulations in each country. To comply with FCC part 15 rules in the United States, radio equipment must only be used in systems that have been FCC certified. It is the responsibility of the user/professional installer/operator to ensure that only approved equipment/systems are deployed. To ensure FCC part 15 compliance, Luxul amplifier products should only be installed in certified systems by licensed professionals.

FCC Certification Support for OEMs: Luxul Wireless offers FCC certification assistance and engineering support for qualified OEMs interested in certifying complete amplified WLAN systems. Please contact us for details.



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