AirMagnet AM-5020-11AG

User Guide

Part Number: UG-AM-5020

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Definitions and Terminology

802.3	
802.11 a	
802.11 b	
802.11 g	
802.11 e	
802.1x	
ACK	Acknowledgement frame
AGC	Automatic Gain Control
AID	Association Identifier
BCC	Binary Convolutional Code
BPSK	Binary Phase Shift Keying
CF-End	Contention-Free End
CFP	Contention-Free Period
CF-Poll	Contention-Free Poll
CTS	Clear to Send
DA	Destination Address
dB	Decibels
DBPSK	Differential Binary Phase Shift Keying
DCF	Distributed Coordination Function
DIFS	Distributed Interframe Space
DPSK	Differential Phase Shift Keying
DQPSK	Differential Quadrature Phase Shift Keying
DS	Distribution System
DSSS	Direct Sequence Spread Spectrum
EIFS	Extended Interframe Space
ESS	Extended Service Set
ETSI	European Telecommunications Standards Institute
FCC	Federal Communications Commission
FCS	Frame Check Sequence
FFT	Fast Fourier Transform
GFSK	Gaussian Frequency Shift Key
GPS	Global Positioning System
HR/DSSS	High Rate Direct Sequence Spread Spectrum
I/Q	Interphase/Quadrature
IAPP	Inter-Access Point Protocol
ICI	Interchip Interference
ICV	Integrity Check Value
IEEE	Institute of Electrical and Electronics Engineers
IPSEC VPN	
IR	Infrared ISI Intersymbol interference
ISM	Industrial, Scientific, and Medical
LBT	Listen Before Talk
L2TP VPN	Layer 2 Tunneling Protocol VPN

LEAP	
LLC	Logical Link Control
MIB	Management Information Base
MIC	Message Integrity Check
MKK	Ministry of Telecommunications
MMACS	Multimedia Mobile Access Communication System
MPDU	MAC Protocol Data Unit
MSDU	MAC Service Data Unit
NAV	Network Allocation Vector
OFDM	Orthogonal Frequency Domain Multiplexing
PBCC	Packet Binary Convolutional Coding PC Point Coordinator
PCF	Point Coordination Function
PEAP	
PHY	Physical Layer
PIFS	Priority Interframe Space
PLCP	Physical Layer Convergence Procedure
PMD	Physical Medium Dependent
POE	Power over Ethernet
PPDU	PLCP Protocol Data Unit PFSF PLCP Signaling Field
PPTP VPN	Point to Multiple Point Virtual Private Network
PS	Poll Power Save Poll
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RA	Receiver Address
RF	Radio Frequency
RFID	Radio Frequency ID
RSADSI	RSA Data Security, Inc.
RTS	Request to Send
SA	Source Address
SFD	Start of Frame Delimiter
SIFS	Short Interframe Space
SNR	Signal to Noise Ratio
SSH	VPN
SSID	Service Set Identity
STA	Station
TA	Transmitter Address
TBT	Target Beacon Transmission Time
TIM	Traffic Indication Map
TKIP	
TLS	
TSF	Timer Synchronization Factor
TTLS	
TU	Time Units
WEP	
WLAN	Wireless LAN
WPA	

References

Visit http://www.airmagnet.com for the following referenced documents:

Reference 1	AirMagnet Enterprise Datasheet
Reference 2	AirMagnet Enterprise FAQ
Reference 3	AirMagnet Guided Tour
Reference 4	AirMagnet Impact Study

Introduction

The AirMagnet AM-5020-11AG Sensor provides 24x7 remote monitoring and troubleshooting of 802.11 wireless networks. Sensors are deployed near clusters of access points, and provide security assessment, performance monitoring, network fault detection and remote troubleshooting functions. Management staff can easily monitor the security measures in use on every station and access point device to insure compliance with established policies, and also automatically scan for dozens of wireless network attacks.

These analysis functions can be monitored and controlled from both centralized and distributed operations centers. These centers can be located in the building, on the campus, or anywhere in the world without requiring high travel costs or excessive delay of sending IT expert staff to remote locations.

Figure 1 shows a complete network including the AM-5020-11AG AirMagnet Sensor. Companion software functions available for the complete AirMagnet Enterprise system include the following:

AirMagnet Enterprise Server – provides the dynamic operations control function to the entire network of bound sensors including sensor activation/deactivation, upgrade of sensor software, and collection of alerts, data, and statistics for all stations and access points within wireless segments monitored by the sensors.

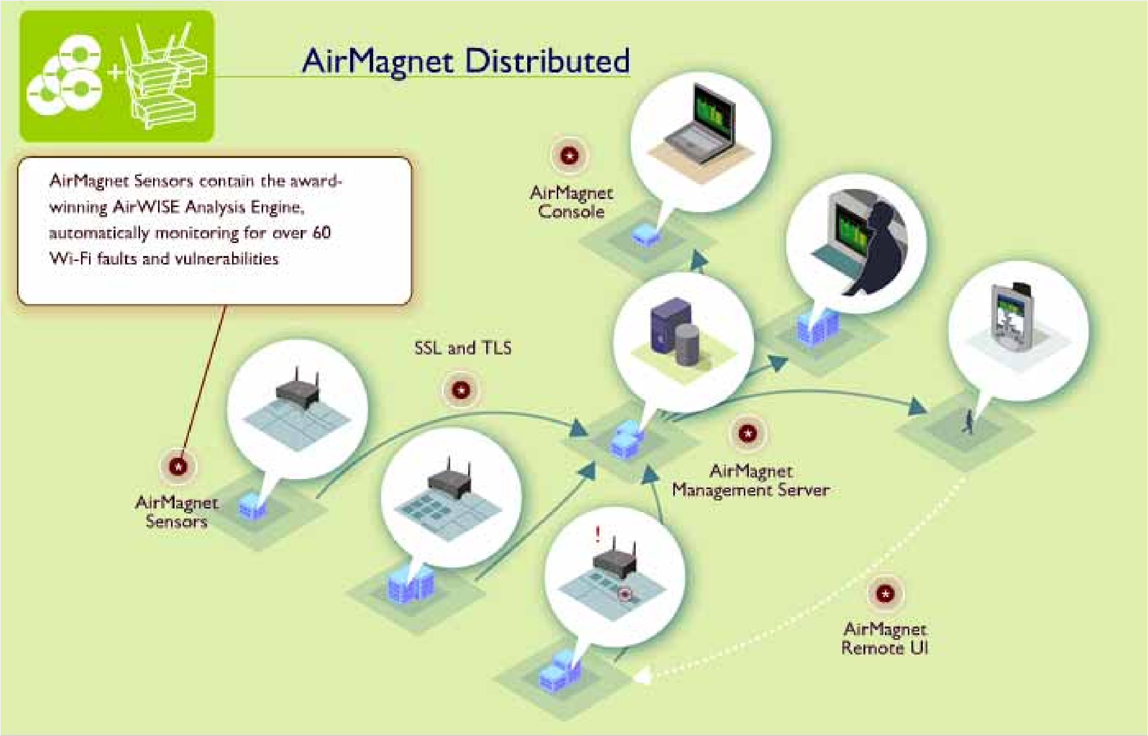

AirMagnet Distributed
AirMagnet Sensors contain the award-winning AirWISE Analysis Engine, automatically monitoring for over 60 Wi-Fi faults and vulnerabilities
AirMagnet Console
SSL and TLS
AirMagnet Sensors
AirMagnet Management Server
AirMagnet Remote UI

Figure 1: WLAN Network with AM-5020-11AG AirMagnet SmartEdge Sensors Installed

AirMagnet Enterprise Console – provides the graphical user interface into the server from any location in the enterprise wide network.

AirMagnet Enterprise Remote User Interface – provides the graphical user interface into any individual sensor from any location in the enterprise wide network.

Enterprise Reporter – manages and administers a SQL database of all collected alarms, monitored traffic, and RF signal/noise information. Also provides a broad set of detailed reports and trend summaries of key data. Using Reporter the administrator is able to conduct both short-term and long-term trend analysis and also conduct forward looking capacity planning and topology reconfiguration planning for the entire wireless network.

Expert Analysis Functions Enabled by Sensor

The intelligent sensor provides around-the-clock coverage of the entire wireless environment including all 802.11a, 802.11b, and 802.11g channels and infrastructure. Each individual sensor is armed with the patent-pending AirWISE Analytical Engine that, in real time, monitors and analyzes the security, performance, and reliability of the wireless network.   The sensor enables the following categories of expert analysis functions. See ANNEX B for a detailed and full listing of expert analysis functions.

Enforce Security Policy

New security protocols are continually appearing that close the security gap between WLANs and their wired counterparts. Nevertheless ensuring that all users and stations comply with these security measures continues to grow as the major issue for wireless networks. AirMagnet Sensors address this gap by auditing and validating the security of every Wi-Fi device in the network, providing managers with an easy process to insure all users employ the appropriate level of security. Supported protocols include:

- wep
- leap
- peap
- tkip
- mic
- 802.1x
- ttls
- tls
- wpa
- pptp vpn
- l2tp vpn
- ssh vpn
- ipsec vpn

Detect Wireless Intruders and Attacks

As Wi-Fi has grown, so have the number and sophistication of wireless attacks. AirMagnet Sensors are engineered specifically to counter these threats - scanning the environment for Rogue APs and War-Drivers, Spoofed MAC Addresses, and a host of Denial of Service Attacks unique to Wi-Fi. Sensors send encrypted alarms in real time in response to an attack, allowing the staff to respond before network operations are negatively impacted.

Lock In Network Performance

Radio Frequency transmissions are inherently susceptible to environmental factors such as physical obstructions and radio interference from a variety of sources. If not identified and managed, these factors can lead to unacceptable performance for the end-user. To address this challenge, AirMagnet Sensors constantly monitor and generate alarms on over 20 key indicators of network health, allowing IT administrators to take a proactive approach toward the maintenance of the network.

Ensure Network Reliability

WLANs must both have predictable performance and be highly reliable before being considered industrial grade. The AirMagnet Enterprise System addresses this need with a suite of alarms and diagnostics that detect network faults and configuration errors that can lead to outages in the network. These diagnostics are complemented by active utilities to pin down the sources of connectivity problems in the network.

Centralizing System Management

The AirMagnet Management Server receives information from every AirMagnet Sensor and provides a centralized SQL database of all network data and alarms. SNMP traps allow for seamless integration with leading management consoles such as HP Open View and CA UniCenter. All sensor-to-server traffic is secured via SSL and TLS insuring management information remains secure while transiting corporate firewalls and VPNs.

Enable Flexible Configuration and User Access

The Management Server maintains configurations for every Sensor in the System, allowing IT Personnel to tune sensor thresholds appropriately for each location. Additionally, AirMagnet Enterprise supports three unique administrative user levels, insuring that the users access only the level of information appropriate for their role and level of responsibility.

Enable Graphics User Interface from Anywhere in the Network

The AirMagnet Management Console provides the User Interface to the AirMagnet Enterprise System. From the Management Console, Users can view alarms and WLAN health by Campus, Building, Floor, or by individual Sensor. Consoles can be run securely whether in a NOC, or remotely on a laptop – keeping administrators connected to the information they need, regardless of their location.

Enable Remote Troubleshooting and Active Tools

Using the Remote UI built into the AirMagnet Management Console, Users can leverage a growing collection of active troubleshooting tools to pinpoint problems in the network. These tools allow the User to remotely test throughput on a particular AP, diagnose connection problems, and perform Layer 3dDebugging and end-to-end provisioning. Administrators can view low level data on every channel and device in the area, alarms, real-time local statistics, and even packet decodes. Such remote capability greatly reduces the need to dispatch resources when troubleshooting the WLAN.

Low Overhead On Operational Network

Most remote monitoring systems simply capture wireless packets and resend them to a remote site for processing, needlessly consuming valuable bandwidth. AirMagnet Sensors, conversely process locally, sending real-time alarms only when thresholds are reached. Trending data is saved on the sensor, and securely sent at regular intervals to the Management Server, minimizing operational load on the network and servers.

AirMagnet Sensor Operation Modes

The Sensor has three operational modes, configuration mode, analysis mode, and active control mode.

Configuration Mode

The Airmagnet Sensor can be configured both with a serial command line interface (CLI) and secure HTTPS communications with a remote browser. Key parameters that need to be configured prior to placing the sensor online include provisioning of the unit's network addressing, the server's network addressing, and the secret key needed for connection to the server and for administrator logon-override functions. Once the unit is configured it is placed on the live network and powered up. The sensor can be powered either by an AC-to-DC power brick or Power-over-Ethernet using an AirMagnet in-line power injector.

After configuration the unit boots up, connects to the server, and receives any additional configuration parameters. If the administrator has upgraded the sensor software on the server to a new release, the sensor automatically downloads the software into memory and then writes it to flash.

Analysis Mode

The majority of the time the sensor is in the analysis mode. The unit scans all configured channels, measures signal and noise, gathers statistics on management and data traffic, analyzes security mis-configurations and performance problems, and searches for issues such as rogue access points and denial of service attacks.

All of the analyzed data is recorded in memory and is reported back to the management server periodically. The reporting period for accumulated data is configurable. Whenever an event occurs that generates an alert, such as a security mis-configuration, the alert is sent immediately to the server.

The administrator can view the consolidated status of the entire network, a subset of the network, or the specific set monitored and analyzed by an individual sensor. The AirMagnet Enterprise Console tool is used to view this information collected on the server.

The Analysis mode can be administered from anywhere within the global enterprise network.

Active Control Mode

In active mode the sensor can drill down to an individual access point or station, and diagnose connection and provisioning problems.   Using the Remote User Interface function within the Console program, the administrator can see a real time display of all scanning and analysis functions performed by the sensor. He can zero in on channels, individual access points, or individual stations. He can plot real time displays of all monitored information such as signal, noise, traffic, and errors. He can also do packet decodes and statistical charting.

The Active Control mode can be administered from anywhere within the global enterprise network.

Hardware Specifications

The AirMagnet AM-5020-11AG sensor is a robust hardware monitoring analysis device that can be installed on a shelf, on the wall, or in a ceiling. It can be powered by AC power, or by -48V Power over Ethernet. The detailed technical specifications are as follows.

Mechanical

Enclosure
    Metallic chassis
    Dimensions 6.693 in. (17.0 cm) wide; 8.267 in. (21.0 cm) deep
Mounting options
    Flat on shelf
    Plastic stand for shelf vertical configuration
    Wall hanging via dual screw holder at back of housing, or
    Using AirMagnet mounting kit for wall and ceiling
Weight
    32 oz (909g)
LEDs
    Power status
    WLAN (5 GHz/2.4 GHz) status
    10/100 Base T status
    Link status
Switches
    Reset switch
RF connectors
    Reverse polarity TNC – female

Environmental

Temperature
    32º to 131ºF (0º to 55ºC)
Humidity
    5 to 95% humidity (non-condensing)

Power

Power supply options
    External power adapter w/ 12VDC/1A
    Power over Ethernet (POE)
        Power injector
        48VDC +/- 10% and 400mA
        Max distance between power injector and sensor is 100 meters
Power injector

Coaxial Barrel connector female port
RJ45 DATA IN port (unpowered)
RJ45 DATA OUT port (-48VDC)

Power consumption
9.2 watts RMS

Radio Frequency

Bands
2.4 GHz Band: 802.11b/g
5.25-5.35 GHz Band: 802.11a
5.75 GHz: 802.11a

Country Frequency plans
All worldwide frequency plans (See ANNEX A for detail)

Antenna
Omni-directional

Dual antenna

Receive Sensitivity (Typical @ the antenna ports)
802.11a:
-84dBm @ 6Mbps   -77dBm @ 18Mbps   -70dBm @ 48Mbps
-82dBm @ 9Mbps   -75dBm @ 24Mbps   -68dBm @ 54Mbps
-79dBm @ 12Mbps -73dBm @ 36Mbps
802.11b/g:
-91dBm @ 1Mbps   -84dBm @ 6Mbps   -75dBm @ 24Mbp
-90dBm @ 2Mbps   -82dBm @ 9Mbps   -73dBm @ 36Mbps
-89dBm @ 5.5Mbps -79dBm @ 12Mbps -70dBm @ 48Mbps
-87dBm @ 11Mbps   -77dBm @ 18Mbps -68dBm @ 54Mbps

Transmit Output Power (Typical @ the antenna ports)
802.11a:
18dBm+/-2 @6-24Mbps   15dBm+/-2 @54Mbps
17dBm+/-2 @36Mbps
16dBm+/-2 @48Mbps
802.11g:
20dBm +/-2dBm @ 6~24Mbps   17dBm +/-2dBm @ 48 Mbps
19dBm +/-2dBm @ 36 Mbps   15dBm +/-2dBm @ 54 Mbps
802.11b:
20dBm +/-2dBm for all rates

Effective Data Rates

802.11a

6, 9, 12, 18, 24, 36, 48, 54

802.11g

6, 9, 12, 18, 24, 36, 48 & 54Mbps

802.11b

1, 2, 5.5, 11Mbps

Physical Interfaces

Network port

RJ45 Ethernet with POE powering option

10/100 Base T

Serial Port

RS232 DB9

115,200 bps; 8 data bits; no parity; 1 stop bit; no flow control

Internal

Processor

IDT RC32438 200Mhz

Memory

64 Mbytes RAM
8 Mbytes FLASH

Radio

Dual radio – 802.11 a & b/g
Atheros MAC and PHY

Compliance

FCC Part 15C
CE 0560
EN60950 (equivalent UL ETSI 300/328)
IC (Canadian Radio Regulations)
Japan Equipment Radio Regulations

Sensor Powering Options

AC Power

The unit can be powered with AC power. An AC-to-DC power supply converts from AC to 12V DC.

Power-over-Ethernet (POE) Injector

The unit can also be powered with Power over Ethernet (POE). In this configuration no AC power is required near the Sensor. This is ideal for applications that are not near normal sources of power, such as above a false ceiling or high on a wall.

AirMagnet POE uses existing CAT 5 cable to carry –48V DC power to the sensor.

Note: AirMagnet’s power over Ethernet solution is compatible with AirMagnet power injectors. A future version will be compatible with the emerging IEEE 802.3af POE standard. No plans exist for compatibility with Cisco’s proprietary pre-802.3af solution.

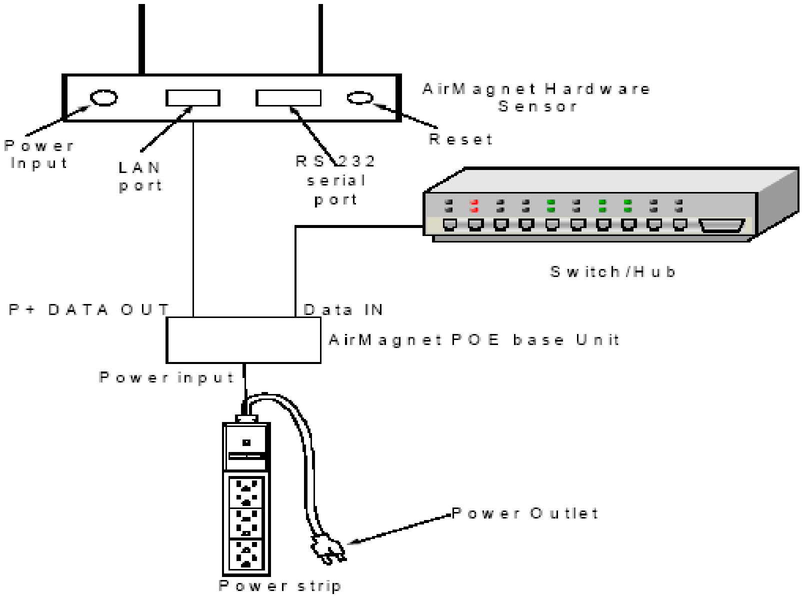


Figure 2: AirMagnet POE Injector

The POE injector has three ports and a single LED. One port accepts a coaxial barrel connector that distributes 48V DC power. One port is RJ45 and attaches to the incoming Ethernet cable which has no power. One port is RF45 and attaches to the outgoing Ethernet cable which has –48V power.

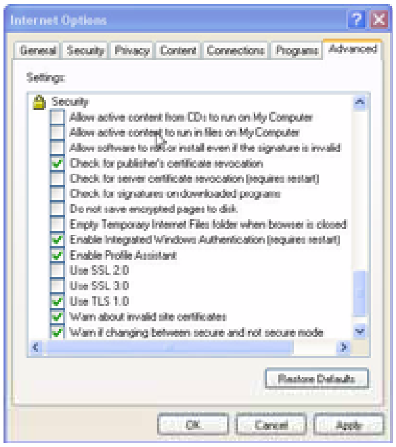
Appendix A: FIPS-Required Features

The features described here are required by the Federal Information Processing Standards (FIPS).

Use of TLS Protocol for Secure Communication

FIPS requires the use of TLS protocol for secure communication. Otherwise, there would be no communication among the AirMagnet SmartEdge Sensor, the AirMagnet Enterprise Console, and the AirMagnet Enterprise Server.

To comply with the FIPS requirement, you must configure your Internet Explorer by using these commands: **Start>Internet Explorer>Tools>Internet Options...>Advanced>Security>Use TLS 1.0.** See Figure 6.



Security
- ☐ Allow active content from CDs to run on My Computer
- ☐ Allow active content to run in files on My Computer
- ☐ Allow software to run or install even if the signature is invalid
- ☑ Check for publisher's certificate revocation
- ☐ Check for server certificate revocation (requires restart)
- ☐ Check for signatures on downloaded programs
- ☐ Do not save encrypted pages to disk
- ☐ Empty Temporary Internet Files folder when browser is closed
- ☑ Enable Integrated Windows Authentication (requires restart)
- ☑ Enable Profile Assistant
- ☐ Use SSL 2.0
- ☐ Use SSL 3.0
- ☑ Use TLS 1.0
- ☑ Warn about invalid site certificates
- ☑ Warn if changing between secure and not secure mode

Figure 6: Configuring Security Settings

As shown in Figure 6, the user must check Use TLS 1.0 in order for the Sensor to communicate with the AirMagnet Enterprise Server using the FIPS-mode.

Limited Logon Attempts

The user is allowed a maximum of 3 logon attempts per minute.

Length of Password Word

The password used to access the AirMagnet Enterprise system must be between 6 and 36 characters in length. All passwords must include upper- and lower-case letters, and at least one (1) numeric character and one (1) punctuation character.

Automatic Self Checking and Module Integrity Checking

AirMagnet SmartEdge Sensor will automatically perform self checking and module integrity checking upon the start or reboot of the AirMagnet Enterprise system to ensure the system security and integrity.

If your Command Line Interface is open, the following commands will be displayed on the screen:

```
Start FIPS Self Test for Encrypted Algorithm...
Passed.
AmWebserver Module Integrity Checking...
Passed.
AmConfig Module Integrity Checking...
Passed.
AmMonitor Module Integrity Checking...
Passed.
Checking Done.
```

If an error occurs during the self checking, then the AirMagnet SmartEdge Sensor will enter an error state, in which all communication among the Sensor, Server, and Console will be disabled since NO secure communication is allowed in an error state. The Sensor will keep generating the same error message. If this occurs, contact AirMagnet Technical Support for assistance.

Change of Shared Secret Key via Secure Communication

FIPS does NOT allow the change of the shared secret key through Telnet due to the lack of encryption in the Telnet communication protocol. If, for some reason, the user needs to change the shared secret key, it can be done either through the serial port or a browser interface.

Password Encrypted in FIPS-Approved Algorithms

All passwords used to access the Sensor will be encrypted using a FIPS-approved algorithm and saved in a file. Passwords entered using a Web browser and the TLS protocol and those entered using the serial port meet the requirement.

Securing the Sensor with the Tampering-Proof Tape

To prevent your AirMagnet SmartEdge Sensor from tampering that may jeopardize the security and integrity of your corporate network, use the supplied tamper-proof tape to cover the screws at the bottom of each Sensor. At least two tapes should be applied, diagonally.

Periodical Inspection of the Module for Evidence of Tampering

Tamper evidence includes unexpected scratches on the cover and damage to the tamper-proof tape surrounding the module. If tampering is suspected, zeroize the cryptographic keys and shared key using the zeroize command. Then remove the module from service and contact AirMagnet Technical Support for assistance.

When operating the Sensor in FIPS-approved mode, administrators must take precaution to avoid disclosure of sensitive authentication data, including the shared secret key and passwords. Follow all of the guidance in this section to ensure that the module is installed and operated in a *secure manner.*

Federal Communication Commission Interference Statement

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 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 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.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

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 & your body.

If this device is going to be operated in 5.15 ~ 5.25GHz frequency range, then it is restricted in indoor environment only.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

AirMagnet declares that A5020 (FCC ID: RD7-A5020) is limited in CH1~CH11 for 2.4 GHz by specified firmware controlled in U.S.A.

IC statement

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.

To prevent radio interference to the licensed service (i.e. co-channel Mobile Satellite systems) this device is intended to be operated indoors and away from windows to provide maximum shielding. Equipment (or its transmit antenna) that is installed outdoors is subject to licensing.

Because high power radars are allocated as primary users (meaning they have priority) in 5250-5350 MHz, these radars could cause interference and/or damage to license exempt LAN devices.

This device has been designed to operate with an antenna having a maximum gain of 8 dBi. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.