

smartBridges model SB3001
IEEE 802.11a,b,g MiniPCI WLAN Card
Installation Manual
Version 0.21

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1. Introduction

The smartBridges SB3001 is a complete wirelessLAN high speed Network Interface Card (NIC) used for Point to Point and Point to Multi Point Links with external antennas. Developed by modifying GlobespanVirata ISL39200M WLAN NIC, it conforms to the IEEE 802.11a,b,g protocol, works in point to point and point to multi point mode and operates in the 2412-2483.5,5250-5350 MHz frequency band. The device shall not be used in any application other than Point to Point and Point to multi Point modes.

1. The module has Radio PCB and Booster PCB glued together inseparably with epoxy based potting compound. Any attempt to separate the PCB's will destroy both the PCB's irreparably. Booster is an amplifier which keeps intact spectral mask and offers higher receiver sensitivity for the radio. This platform is used to enhance Nexus features.
 2. Antennas qualified with the device are 31dBi Parabolic Dish 5.3 GHz, 31.5 dBi Parabolic Dish 5.25~5.7GHz, 29dBi Parabolic grid, 29 dBi Panel for 5.25 ~ 5.35 GHz band and 5.25 ~ 5.75 GHz bands. For 2.412 ~ 2.485 GHz band following antennas are qualified: 24 dBi Parabolic Grid, 17 dBi Vertically Polarised Sector antenna, 16.5 dBi Horizontally Polarised sector antenna, 12 dBi Omni antenna. Other antennas in the same family but with lower gain are allowed for use with the device.
- Fully compliant with the IEEE 802.11a, b, g WLAN standards for Point to point and Point to Multi Point links
 - FCC Certified Under Part 15 (pending) to Operate in the 5250~5350, 2412 ~ 2483.5 MHz Bands
 - Support for 54, 48, 36, 24, 18, 12, 9, and 6 Mbps OFDM
 - Driver Supports Microsoft Windows® 98/SE, ME, XP and 2000 (SR1)

2. Installation Procedure

SB 3001 has to be installed inside smartBridges NEXUS 3010 out door specified back haul device or NEXUS 3020 Access Points or NEXUS 3040 Client Devices.

2.1 NEXUS 3010, BackHaul, 3020, Access Point, 3040, Client device for outdoor application

NEXUS 3010 is a Back Haul Point to Point link for carrying high data traffic. It uses Intel IXP 425 BCT a powerful processor to run the application and provide high security. It provides two Ethernet ports for connection to network devices or PC. Antenna is connected to the NEXUS unit.

NEXUS 3020 is a wireless Access Point for high data traffic. It uses the same hardware as NEXUS 3010 and provides point to multi Point Access.

NEXUS 3040 is a wireless Client device for high speed internet access. It works with NEXUS 3020 as Access Point. Many clients can be connected to an Access Point.

NEXUS 3010, 3020, 3040 are meant for out door applications. The device has to be mounted on Tower or roof top along with the antenna. It has all mounting hardware for this purpose.

2.2 Installing SB 3001 into NEXUS 3010/ 3020/ 3040

The module SB 3001 is normally installed into NEXUS 3010/ 3020/ 3040 in the factory at the time of manufacturing. NEXUS 3010/ 3210/ 3410 has mini PCI connector (socket). The Radio module SB 3001 can directly fit into the NEXUS unit and is fixed by screws to the mounting pillars shown.



IXP 425 communicates with the Radio module and routes the data signals with necessary mini PCI format and controlling software. The units are run by software resident in the memory IC's. SB 3010 can communicate to another SB 3010 only. The second device can be connected only when its MAC number is written into the first device. Channel blocking is provided by the software control which does not allow the user to select un authorized channels.

SB 3210 is an Access Point which can connect to many SB 3410 client devices.

2.3 NEXUS 3010 Software

NEXUS 3010 runs on its own software and does not require external PC software. PC provides Graphic User Interface and displays all controls and allows the user to configure the units. One unit is configured as Root device and another is configured as Remote Client. Root is master device and Client is slave in configuration. This configuration is required for networking purposes.

Channel setting and output power control and client authentication are main functions of master. Slave gets wireless signals, decodes them and outputs them through Ethernet connector. The access points and other network devices are connected through the Ethernet link. Master normally connects to the internet back bone.

2.4 User Manual NEXUS 3010

SB 3001 module which is the main Transmitting and Receiving module inside NEXUS 3010 does not have independent user interface functionality. User controls the Radio module through NEXUS 3010 operating Instructions. The Instructions run as below.

Activating the Link

It is recommended that you activate and configure the NEXUS 3010 link on your desktop prior to mounting the units in the field. Associating the units in advance will facilitate antenna alignment and simplify the overall installation procedure. Below are instructions on how to perform a basic association to allow antenna alignment.

By default, one unit will operate in Root Bridge Mode and the other will operate in Remote Client Bridge Mode. Follow these steps to configure the first unit for Root Bridge Mode:

First Unit Setup

Note The default IP Address of NEXUS 3010 units is 192.168.0.205 and the default IP Mask is 255.255.255.0. The PC must be on the same subnet as the unit to access it (e.g. 192.168.0.10).

Step 1 Log into the NEXUS unit by typing 'http://192.168.0.205' in your web browser window (Figure 4-1). Enter **User Name:** Administrator and **Password:** smartBridges. You will be directed to the 'License Agreement' page (Figure 4-2). Click on 'Accept' to proceed to the 'Summary Information' page (Figure 4-3).

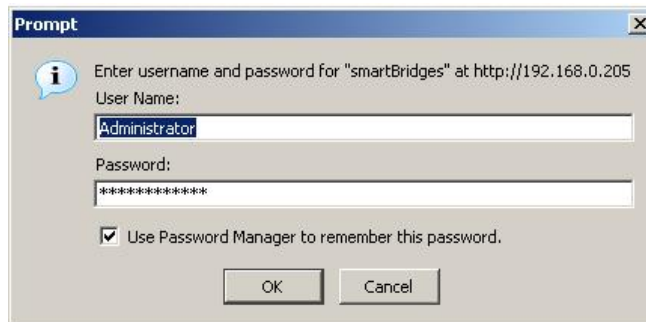


Figure2- 4-1 Step 1: Log into airHaul unit



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3. Please refer to the URL below for latest updates to the Software Warranty Statement http://www.smartbridges.com/web/support/ah_nexus.asp

Figure2-4-2 Step 1: License Agreement Page

[Home](#)
 [Networking](#)
 [Radio](#)
 [Tools](#)
 [Help](#)
 [Logout](#)

Summary Information : airHaul (sB3010) - [Root Bridge mode](#)

Wireless Configuration		Ethernet Configuration	
SSID	NEXUS_MASTER	IP Address	192.168.0.205
Channel	140 - (5700 MHz)	IP Mask	255.255.255.0
RSSI (dBm)	No Association	Gateway	0.0.0.0
Maximum Wireless Throughput (Kbps)	15360	DHCP	Disabled

Port Information	
ETH A MAC Address	00:30:1A:1C:3D:9F
ETH B MAC Address	00:30:1A:1C:3D:A0
Radio MAC Address	00:30:1A:1F:49:73

Figure 2-4-3 Step 1: Root Bridge Summary Information Page

Step 2 From the 'Radio' drop-down menu, select 'Main – Root Mode' and the Radio Configuration page will be displayed as shown in Figure 4-4. Enter the SSID of

the unit. Select the operating Domain and Channel. Enter the MAC address of the second unit's radio card and designate it as a Bridge. Click 'Apply Changes'.



Figure 2-4-4 Step 2: Root Bridge Wireless Configurations

Follow these instructions to configure the second unit for Remote Client Bridge Mode:

Second Unit Setup

Step 1 After login to the second unit, click on 'Ethernet Configuration' and give the unit a unique IP Address on the same IP subnet (e.g. 192.168.0.2) as the first unit and then click 'Apply Changes'.



Figure 2-4-5 Step 1: Second Unit Ethernet Configuration

Step 2 From the Summary Information page, click on "Operational Mode" (in the top right hand corner) to redirect to System Configuration page as shown in Figure 4-6. Select the Bridge radio button under Remote Client Device and Click

‘Apply Changes’ to change the operational mode to Remote Client Bridge mode. A ‘Confirm Ethernet Configuration’ window pop-up will be displayed.

System Configuration :

[Operational mode : Root Bridge mode](#)

System Configuration	
SNMP Security	SNMP Security
Reset To Factory Defaults	Reset To Defaults
Reset	Reset
Delayed Reset	Delayed Reset
NTP Server	NTP Server Settings Time Server Not available
Firmware Version	v0.01.36 Release Notes
Radio Firmware Version	2.13.2.0
Edit Configuration	IP Configuration Radio : Performance Data Encryption
System Name	<input type="text" value="Nexus"/>
System Description	<input type="text" value="Nexus"/>
Syslog server IP Address	<input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/> Log level : <input type="text" value="1"/>
SNMP Trap server IP Address	<input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/>
LED Control	<input checked="" type="radio"/> On <input type="radio"/> Off Apply Changes

Current Operational Mode	
<input checked="" type="radio"/> Root Device	<input type="radio"/> Remote Client Device
<input type="radio"/> Bridge	<input checked="" type="radio"/> Bridge
	<input type="radio"/> Router
Apply Changes	

Figure 2-4-6 Step 2: Change Operational Mode to Remote Client Bridge mode
Step 3 Click Apply Changes in the ‘Confirm Ethernet Configuration’ pop-up window

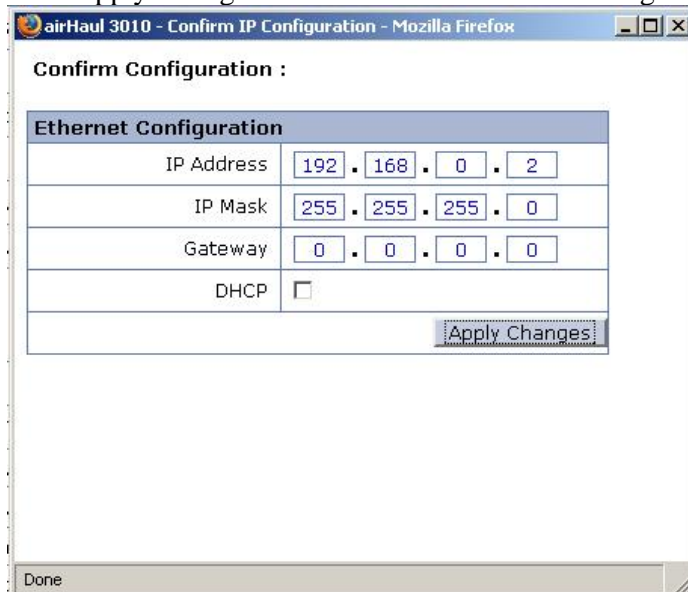


Figure 2-4-7 Step 3: Confirm Ethernet Configuration pop-up window

Step 4 From the 'Radio' drop-down menu, click on 'Main – Remote Client Bridge Mode' and the Radio Configuration page will be displayed as shown in Figure 4-8. Enter the SSID, MAC address and Channel of the first unit. Click 'Apply Changes'. The units will attempt to associate.

Note Clicking on 'Status' will display further details on the association.

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Home Networking Radio Tools Help Logout

Radio Configuration : Remote Bridge - Main airHaul (sB3010) - [Remote Bridge mode](#)

Wireless Settings		
SSID	<input type="text" value="NEXUS_MASTER"/>	
MAC Address	<input type="text" value="00:30:1A:1F:4A:00"/>	
Domain	<input type="text" value="FCC"/>	
Channel	<input type="text" value="140 - (5700 MHz)"/>	
Dial a Power	<input type="text" value="18 dBm"/>	Antenna Gain (dBm): <input type="text" value="23"/>
		RF Cable Loss(dBm) : <input type="text" value="3"/>
Status	<input type="button" value="Apply Changes"/>	

Figure 2-4-8 Step 4: Configuring Remote Client Bridge Wireless Settings

2.5 User Manual NEXUS 3210

Note The default IP Address of NEXUS 3210 unit is 192.168.0.206 and the default IP Mask is 255.255.255.0. The PC must be on the same subnet as the unit to access it (e.g. 192.168.0.10).

Follow step 1 of Nexus 3010 User Manual in logging into the unit. The web browser will appear as shown below:



Summary Information :

airPoint (sB3210) - [Bridge mode](#)

Wireless Configuration		Ethernet Configuration	
SSID	NEXUS_MASTER	IP Address	192.168.0.206
Channel	140 - (5700 MHz)	IP Mask	255.255.255.0
Association Table	View	Gateway	0.0.0.0
Maximum Wireless Throughput (Kbps)	15360	DHCP	Disabled

Port Information		Security	
ETH A MAC Address	00:30:1A:13:17:55	None	
ETH B MAC Address	00:30:1A:13:17:56		
Radio MAC Address	00:30:1A:1F:51:C0		

To choose the desired channel to operate, go to Radio and the browser will appear as shown below:

 This is a screenshot of the 'Radio Configuration' page in the web interface. The navigation menu at the top shows 'Radio' is selected. The page title is 'Radio Configuration : airPoint Bridge - Main'. The main content area is titled 'Wireless Settings' and contains several configuration fields:

- SSID: NEXUS_MASTER
- Domain: FCC (dropdown)
- Radio Operating Mode: Mixed (802.11 a/b/g) (dropdown)
- Channel: 140 - (5700 MHz) (dropdown)
- Rates: Radio buttons for 1 Mbps, 2 Mbps, 5.5 Mbps, 11 Mbps, 6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps, 48 Mbps, and 54 Mbps (54 Mbps is selected).
- Auto rate fallback:
- Dial a Power: 18 dBm (dropdown)
- Antenna Gain (dBm): 23 (dropdown)
- RF Cable Loss(dBm) : 3 (input field)
- Client Communication:

 At the bottom, there is a 'View Association Table' link and an 'Apply Changes' button.

To ensure association with a Nexus 3410, check whether the units have identical SSIDs.


Wait for the unit to show an Associated status.

2.6 User Manual NEXUS 3410

Note The default IP Address of NEXUS 3410 unit is 192.168.0.207 and the default IP Mask is 255.255.255.0. The PC must be on the same subnet as the unit to access it (e.g. 192.168.0.10).

Follow step 1 of Nexus 3010 User Manual in logging into the unit. The web browser will appear as shown

below:



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Summary Information : airClient (sB3410) - NAT mode

Wireless Configuration	
IP Address	192.168.2.207
IP Mask	255.255.255.0
Gateway	0.0.0.0
DHCP	Disabled
SSID	NEXUS_MASTER
Channel	0 - (2407 MHz)
Association Status	Not Associated
RSSI	-100 dBm

Ethernet Configuration	
IP Address	192.168.0.207
IP Mask	255.255.255.0

Port Information	
ETH A MAC Address	00:30:1A:14:9E:83
ETH B MAC Address	00:30:1A:14:9E:84
Radio MAC Address	00:30:1A:1F:50:61

To ensure association with a Nexus 3210, check whether the units have identical SSIDs. Nexus 3410 will automatically follow the channel of the access point it is associated to.

Wait for the unit to show an Associated status.

2.7 Mounting the Unit

This section describes how to mount the NEXUS and position the antenna. It contains the following sections:

- Choosing a Mounting Location and Site Survey
- Assembling the Mounting Hardware
- Mounting the NEXUS

Choosing a Mounting Location and Site Survey

Every RF application is a unique installation. Before installing, you should perform a site survey to determine the optimum use of wireless networking components and to maximize range, coverage, and network performance.

Choosing a good mounting location for the NEXUS is important because it affects the reliability of the wireless link and maximum data rates it can support. The most important considerations are link length and clearance from obstacles.

The following operating and environmental conditions should be taken into account when performing a site survey:

- Data rates—Sensitivity and range are inversely proportional to data bit rates. The maximum radio range is achieved at the lowest workable data rate. A decrease in receiver sensitivity occurs as the radio data increases.

- **Antenna type and placement**—Proper antenna configuration is a critical factor in maximizing radio range. As a general rule, antenna height helps to reach longer distances to avoid obstruction. However, do not place the antenna higher than necessary, because the extra height also increases potential interference from other unlicensed radio systems. Do not install the airHaul Nexus on a TV or Radio receiving mast or within proximity of the same.
- **Physical environment**—Clear or open areas provide better radio range than closed or filled areas.
- **Obstructions**—Physical obstructions such as buildings, trees, or hills can hinder performance of wireless devices. Avoid locating the devices in a location where there is an obstruction between the sending and receiving antennas.

Link Distance

In an environment without obstacles in the signal path, the maximum link distance depends primarily on the type of antennas and the free space path loss. Make sure your proposed mounting site is within range of the remote antenna. The NEXUS units have a built-in Link Analysis Calculator to help you estimate the range for your specific installation.

Antenna Polarization

The antennas radiate and receive polarized radio signals. Polarization helps reduce interference because the antenna tends to reject cross-polarized signals from other sources. Therefore, you can solve some interference problems by changing the antenna polarization. For the link to operate correctly, two antennas at each end of the link must always be set for the same polarization, either vertical or horizontal. The NEXUS mounting hardware accommodates either vertical or horizontal antenna polarization.

Signal Path Clearance (Fresnel Zone)

A radio beam travels from one antenna to another in a straight line. Therefore, the path between the antennas must be free of major obstacles. The effects of obstacles and terrain, both along and near the path, have a significant bearing on the propagation of radio signals and can cause both interference and signal cancellation.

When choosing a site, consider the effects of the following common obstacles:

- **Trees and large plants** - A tree directly in the path can totally block the signal. With clearance above the trees there are usually no secondary effects, but you should allow for future tree growth.
- **Man-made obstacles** - A large round container such as a gas storage reservoir or water tower that is partially in the path causes some blocking. These obstacles may also reflect some energy, which can interfere with other receivers. Square or rectangular objects in or near the path have rectangular surfaces that can block and diffract signals over and around them.
- **Earth surface** - The earth surface also interferes with signals if the antenna is mounted too low. Mount the antenna just high enough to allow adequate clearance from the ground. Placing the antennas too high makes it susceptible to interference from other systems.

For tower installations, you may need to climb the tower to verify a clear path to the other site. If trees are in the line of signal propagation, leave extra clearance above them for future growth into the signal path.

Table 5-1 (below) can be used as a guide to determine the clearance to leave around the signal path. Install the bridge or external antenna where obstacles along the propagation path, including the ground, are no closer than these values.

Total Path Length Km (Miles)	Clearance Radius Around Signal Path Meters (Feet) 2.4 GHz	Clearance Radius Around Signal Path Meters (Feet) 4.9 GHz to 5.8 GHz
6 (4)	8.4 (27.6)	5.4 (17.9)
10 (6)	10.3 (33.8)	6.7 (22.0)
13 (8)	11.9 (39.1)	7.7 (25.4)
16 (10)	13.3 (43.7)	8.6 (28.4)
20 (12)	14.5 (47.9)	9.4 (31.1)

Table 5-1 Fresnel Zone Clearance Guidelines for Frequencies

How to Mount the NEXUS

This section describes the mounting procedures for rooftop, mast, and tower installations. Personnel installing the NEXUS must understand wireless techniques, antenna alignment and adjustment, and grounding methods. The unit is shipped with mounting hardware that accommodates tower, mast, or rooftop installations.

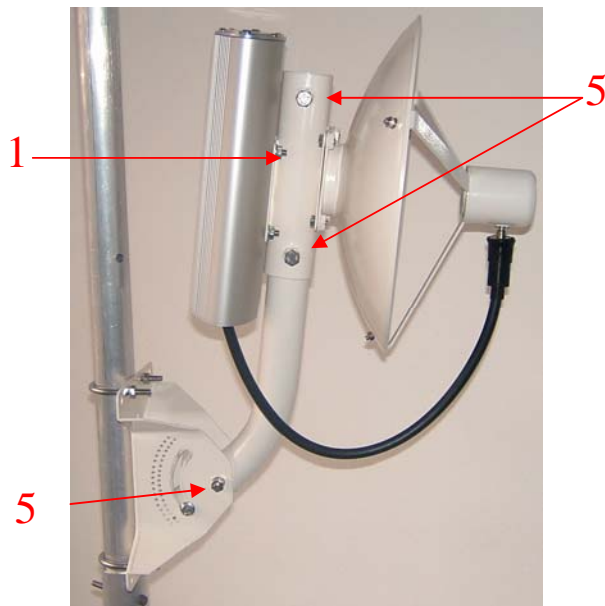


Figure2-4-9 Tower and Wall Mounting

The unit is shipped with a mounting bracket that is suitable to be attached to towers. To mount the NEXUS on a pole, follow these steps:

-
- Step 1** Attach the NEXUS unit to the square plate on the mounting bracket with the supplied bolts.
- Step 2** Find a suitable mounting location on the tower or wall. (If required, drill holes on the wall corresponding to the mounting bracket holes.)
- Step 3** Hoist the entire assembly to the mounting location.
- Step 4** Attach the mounting arm assembly to the wall or to the tower pole using the supplied U bolts, which fit 1.25 to 1.75 inch poles.
- Step 5** Loosen the screws and adjust the vertical and horizontal alignment one at a time to point towards the remote NEXUS unit.
- Note** Factory assembled smartBridges antennas are vertically polarized. Be sure to mount the unit so that the antenna polarization matches the remote antenna polarization. If it does not, remove the four bolts, rotate the parabolic dish 90 degrees and reattach.
-

2.8 Wireless LAN installation guide lines and Authorization for use

Installation and use of this Wireless LAN device must be in strict accordance with the instructions included in the user documentation provided with the product. Any changes or modifications made to this device that are not expressly approved by smartBridges may void the user's authority to operate the equipment. smartBridges is not responsible for any radio or television interference caused by unauthorized modification of this device, or the substitution or attachment of connecting cables and equipment other than specified. It is the responsibility of the user to correct any interference caused by such unauthorized modification, substitution or attachment. smartBridges and its authorized resellers or distributors will assume no liability for any damage or violation of government regulations arising from failing to comply with these guidelines.

The use of Wireless LAN devices may be restricted in some situations or environments for example:

- * On board of airplanes, or
- * In an explosive environment, or
- * In case the interference risk to other devices or services is perceived or identified as harmful.

In case the policy regarding the use of Wireless LAN devices in specific organizations or environments (e.g. airports, hospitals, chemical/oil/gas industrial plants, private buildings etc.) is not clear, please first verify authorization to use these devices prior to operating the equipment.

2.9 Label fixing

The installer who is installing the SB 3001 module inside Nexus 3010 should

paste FCC label “ Contains FCC ID PWG NEXUS2” at the backside of the unit as in picture below.



3-Regulatory information

3.1 FCC Information to User

This product does not contain any user serviceable components and is to be used with approved antennas only. Any product changes or modifications will invalidate all applicable regulatory certifications and approvals

3.2 FCC Guidelines for Human Exposure

In order to comply with RF exposure limits, the user is advised to maintain a distance of at least 70 cm from the antenna of this device while it is in use. The antenna is external to the device . Antennas qualified are 31.5 dBi Parabolic Dish 5.4GHz , 31 dBi Parabolic Dish 5.25 GHz , 29 dBi Parabolic Grid 5GHz band , 29 dBi Panel type 5Ghz Band . For 2.4 GHz band the qualified antennas are 24 dBi Parabolic Grid , 17.5 dBi V Pol Sector Antenna and 16.5 dBi H Pol Sector antenna , 12 dBi Omni .

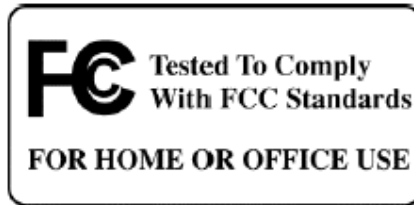
3.3 FCC Electronic Emission Notices

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
2. This device must accept any interference received, including interference that may cause undesired operation.

3.4 FCC Radio Frequency 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 when the equipment is operated in a commercial environment. 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. Operation of this equipment in a residential area may cause harmful interference, in which case the user will be required to correct the interference at his own expense.

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

3.5 Export restrictions

This product or software contains encryption code which may not be exported or transferred from the US or Canada without an approved US Department of Commerce export license

4. Technical Specification

Radio Technology	IEEE 802.11a ,b, g (OFDM, DSSS)
Operating Frequency	5260-5320 , 2412 - 2462 MHz bands
Modulation Schemes	BPSK, QPSK, 16 QAM, 64 QAM
RF Channel Availability	5GHz band , 2.4 GHz band 11 channels for 2.412GHz ~ 2.462GHz , 4 Channels for 5.26GHz~5.32 GHz,
Data Rate	Support for 54, 48, 36, 24, 18, 12, 9, and 6 Mbps OFDM
Media Access Protocol	CSMA/CA with ACK
Transmitter RF Output Power at the UFL connector	+5.9 dBm to -4 dBm @ 6Mbps, + 5.9 dBm to -4 dBm @ 54 Mbps (5.x GHz) +23.8 dBm to -4 dBm @ 6MBPs , +21dBm to -4 dBm @54 MBPs (2.4 GHz 11g band) +19.8 dBm to -4 dBm @ 6MBPs , +21dBm to -4 dBm @54 MBPs (2.4 GHz 11b band)
Receive sensitivity at the UFL connector	-91 dBm @ 6 Mbps, -69 dBm @ 54 Mbps (5.x GHz) - 96 dBm @ 6 MBPs , - 73 dBm @ 54 MBPs
Operating Voltage Interface	5 VDC and 3.3 VDC via host miniPCI slot and a wiring should be done to connect power to booster board JP701 miniPCI
Device driver Support	Microsoft® Windows® NT, 2000, ME, and XP
Data Security	64/128 bit WEP
Power Consumption	500mA at +5V and 150mA at +3.3V
Antenna Type	External Antennas 31.5 dBi Parabolic Dish5.4GHz ,31 dBi Parabolic dish 29dBi Parabolic Grid, 29 dBi panel for 5 GHz band and 24 dBi Parabolic Grid , 16.5 dBi V Pol sector , 16 dBi H Pol sector , 12 dBi Omni for 2.4 GHz band .