

**smartBridges model SB3000**  
**IEEE 802.11a MiniPCI WLAN Card**  
**Installation Manual**  
**Version 0.8**

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### 1. Introduction

The smartBridges SB3000 is a complete wireless high speed Network Interface Card (NIC) used for Point to Point Links with external antennas. Developed by modifying GlobespanVirata ISL39200M WLAN NIC, it conforms to the IEEE 802.11a protocol, works in point to point mode and operates in the 5725-5850 MHz frequency band. The device shall not be used in any application other than Point to Point mode.

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 32dBi Parabolic Dish, 29dBi Parabolic grid, 14 dBi Panel. No other antenna is allowed for use with the device.
- Fully compliant with the IEEE 802.11a WLAN standards for Point to point links
  - FCC Certified Under Part 15 (pending) to Operate in the 5725-5850 MHz Band
  - Support for 54, 48, 36, 24, 18, 12, 9, and 6 Mbps OFDM
  - Driver Supports Microsoft Windows @ 98/SE, ME, XP and 2000 (SR1)

### 3. Installation Procedure

SB 3000 has to be installed inside smartBridges NEXUS 3010 etc out door specified back haul devices.

#### 3.1 NEXUS 3010 BackHaul 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 3010 is meant for out door application. It has to be mounted on Tower or roof top along with the antenna. It has all mounting hardware for this purpose.

#### 3.2 Installing SB 3000 into NEXUS 3010

The module SB 3000 is normally installed into NEXUS 3010 in the factory at the time of manufacturing. NEXUS 3010 has mini PCI connector (socket). The Radio module SB 3000 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.

### ***3.3 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.

### ***3.4 User Manual NEXUS 3010***

SB 3000 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.

#### ***2.4.1 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.

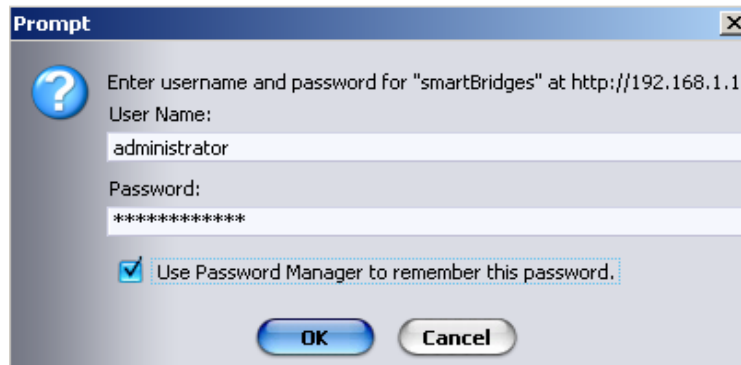
By default, one unit will operate in Root Bridge Mode and the other will operate in Remote Client Bridge Mode. Follow these steps to configure the first unit for Root

Bridge Mode:

**First Unit Setup**

**Note** The default IP Address of NEXUS 3010 units is 192.168.1.1 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. 192.168.1.10).

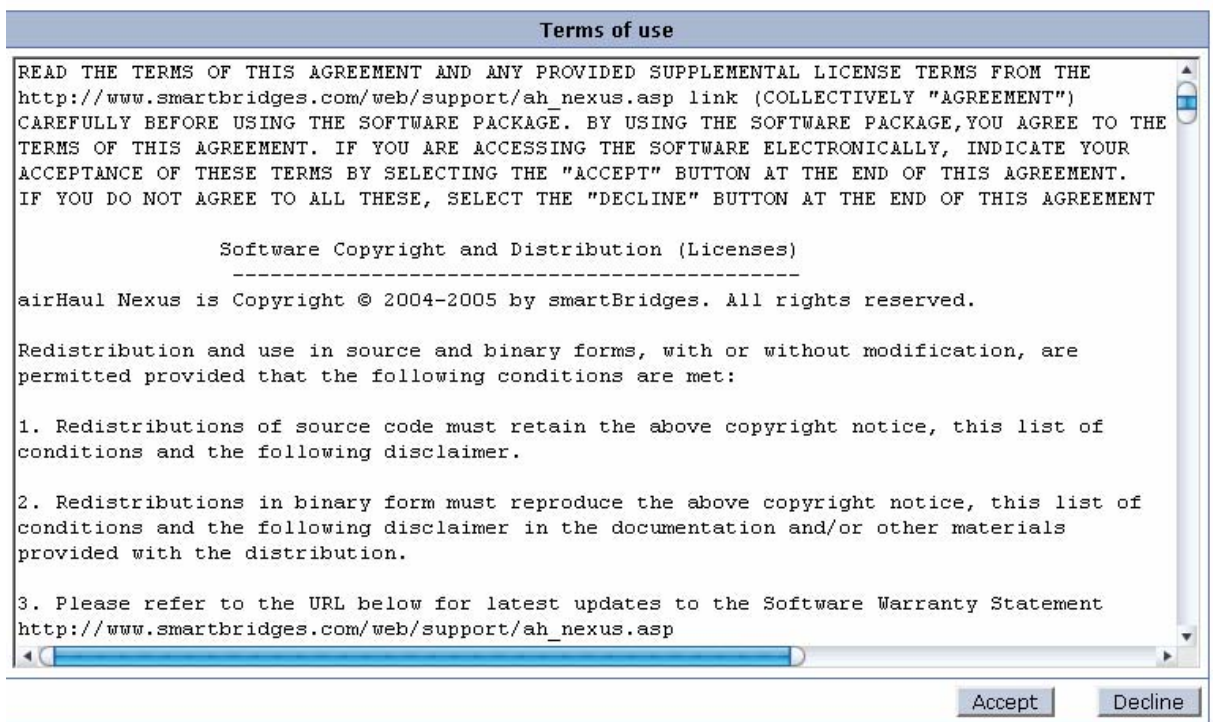
**Step 1** Log into the NEXUS unit by typing 'http://192.168.1.1' in your web browser window (Figure 4-1). Enter **User Name:** Administrator and **Password:** smartBridges. You will be directed to the 'License Agreement' page (Figure 4-2). Click on 'Accept' to proceed to the 'Summary Information' page (Figure 4-3).



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



**Terms of use :**



**Figure2-4-2 Step 1: License Agreement Page**



**Summary Information :**

[Operational mode : Root Bridge](#)

Wireless Configuration	
SSID	NEXUS_MASTER
Channel	161 - (5805 MHz)
RSSI (dBm)	No Association
Maximum Wireless Throughput (Kbps)	12288

Ethernet Configuration	
IP Address	192.168.0.205
IP Mask	255.255.255.0
Gateway	0.0.0.0
DHCP	Disabled

Port Information	
ETH A MAC Address	00:30:1A:1C:43:3F
ETH B MAC Address	00:30:1A:1C:43:40
Radio MAC Address	00:30:1A:1F:4A:45



**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'.



**Radio Configuration : Root Bridge - Main**

[Operational mode : Root Bridge](#)

Wireless Settings			
SSID	<input type="text" value="NEXUS_MASTER"/>	Domain	<input type="text" value="FCC"/>
Channel	<input type="text" value="161 - (5805 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="3.0"/>
Client Authorization MAC	<input type="text" value="00:30:1A:1F:4A:47"/>	<input type="radio"/> Router	<input checked="" type="radio"/> Bridge
<a href="#">View Association Table</a>			<input type="button" value="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. 192.168.1.2) as the first unit and then click ‘Apply Changes’.

The screenshot shows the smartBridges web interface. At the top is a navigation menu with links for Home, Networking, Radio, Tools, Help, and Logout. Below the menu is a 'Summary Information' section with a link for 'Operational mode : Root Bridge'. There are three tables: 'Wireless Configuration', 'Ethernet Configuration', and 'Port Information'. The 'Ethernet Configuration' table shows IP Address (192.168.0.2), IP Mask (255.255.255.0), Gateway (0.0.0.0), and a DHCP checkbox. An 'Apply Changes' button is located below the tables.

Wireless Configuration	
SSID	NEXUS_MASTER
Channel	161 - (5805 MHz)
RSSI (dBm)	No Association
Maximum Wireless Throughput (Kbps)	12288

Ethernet Configuration	
IP Address	192 . 168 . 0 . 2
IP Mask	255 . 255 . 255 . 0
Gateway	0 . 0 . 0 . 0
DHCP	<input type="checkbox"/>

Port Information	
ETH A MAC Address	00:30:1A:1C:43:41
ETH B MAC Address	00:30:1A:1C:43:42
Radio MAC Address	00:30:1A:1F:4A:47



**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	<a href="#">SNMP Security</a>
Reset To Factory Defaults	<a href="#">Reset To Defaults</a>
Reset	<a href="#">Reset</a>
Delayed Reset	<a href="#">Delayed Reset</a>
NTP Server	<a href="#">NTP Server Settings</a> <a href="#">Time Server Not available</a>
Firmware Version	v0.01.36 <a href="#">Release Notes</a>
Radio Firmware Version	2.13.2.0
Edit Configuration	<a href="#">IP Configuration</a> <a href="#">Radio</a> : <a href="#">Performance</a> <a href="#">Data Encryption</a>
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 <input type="button" value="Apply Changes"/>

Current Operational Mode	
<input checked="" type="radio"/> <b>Root Device</b>	<input type="radio"/> Remote Client Device
<input type="radio"/> Bridge	<input checked="" type="radio"/> Bridge
	<input type="radio"/> Router
<input type="button" value="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.

**Confirm Ethernet Configuration :**

Ethernet Configuration	
IP Address	<input type="text" value="192"/> . <input type="text" value="168"/> . <input type="text" value="1"/> . <input type="text" value="2"/>
IP Mask	<input type="text" value="255"/> . <input type="text" value="255"/> . <input type="text" value="255"/> . <input type="text" value="0"/>
Gateway	<input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/> . <input type="text" value="0"/>
DHCP	<input type="checkbox"/>
<input type="button" value="Apply Changes"/>	

**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 [Operational mode : Remote Bridge](#)

**Wireless Settings**

SSID	<input type="text" value="NEXUS_MASTER"/>		
MAC Address	<input type="text" value="00:30:1A:1F:4A:45"/>		
Domain	<input type="text" value="FCC"/>		
Channel	<input type="text" value="161 - (5805 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="3.0"/>
<a href="#">Status</a>	<input type="button" value="Apply Changes"/>		

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

## 2.4.2 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.

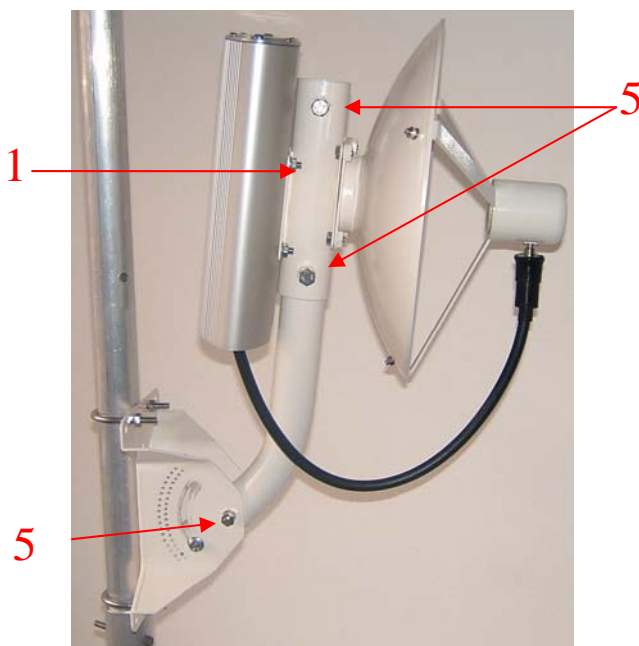
Table 5-1 (below) can be used as a guide to determine the clearance to leave around the signal path. Install the bridge or external antenna where obstacles along the propagation path, including the ground, are no closer than these values.

<b>Total Path Length Km (Miles)</b>	<b>Clearance Radius Around Signal Path Meters (Feet) 2.4 GHz</b>	<b>Clearance Radius Around Signal Path Meters (Feet) 4.9 GHz to 5.8 GHz</b>
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.

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**2.4.3 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.

**2.4.4 Label fixing**

The installer who is installing the SB 3000 module inside Nexus 3010 should

paste FCC label “ Contains FCC ID PWG NEXUS1” 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***

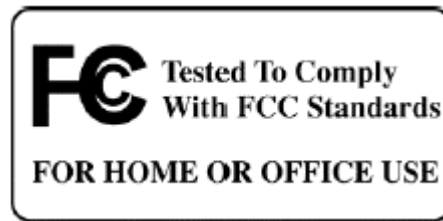
In order to comply with RF exposure limits, the user is advised to maintain a distance of at least 150 cm from the antenna of this device while it is in use. The antenna is external to the device . Antennas qualified are 32 dBi Parabolic Dish , 29 dBi Parabolic Grid , 14 dBi Panel type .

#### ***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**

<b>Radio Technology</b>	IEEE 802.11a (OFDM)
<b>Operating Frequency</b>	5725-5850 MHz band
<b>Modulation Schemes</b>	BPSK, QPSK, 16 QAM, 64 QAM
<b>RF Channel Availability</b>	5GHz band 5 channels for US (5725MHz to 5850MHz)
<b>Data Rate</b>	Support for 54, 48, 36, 24, 18, 12, 9, and 6 Mbps OFDM
<b>Media Access Protocol</b>	CSMA/CA with ACK
<b>Transmitter RF Output Power at the UFL connector</b>	+23 dBm to -4 dBm @ 6Mbps, + 18 dBm to -4 dBm @ 54 Mbps (5.x GHz)
<b>Receive sensitivity at the UFL connector</b>	-91 dBm @ 6 Mbps, -69 dBm @ 54 Mbps (5.x GHz)
<b>Operating Voltage</b>	5 VDC and 3.3 VDC via host miniPCI slot and a wiring should be done to connect power to booster board JP701
<b>Interface</b>	miniPCI
<b>Device driver Support</b>	Microsoft® Windows® NT, 2000, ME, and XP
<b>Data Security</b>	64/128 bit WEP
<b>Power Consumption</b>	500mA at +5V and 150mA at +3.3V
<b>Antenna Type</b>	External Antennas 32 dBi Parabolic Dish, 29dBi Parabolic Grid, 14 dBi panel