ProST
IEEE802.11b/g WiFi Board

Preliminary Reference Guide
Rev: 1.00
Date: August 31, 2005

Total Manufacturing Test Process Overview:

In general the following steps are considered part of a manufacturing (test) flow:

1. PCBA assembly
2. Inspection(visual, automated visual, X-ray,)
3. Structural test of the digital circuitry(Boundary Scan Test (BST), or other methods)
4. Functional test of the analog circuitry (radio test).
5. Calibration of the radio (for optimal performance within legal bounds); storing the results to non-volatile memory.
6. Customization/ serialization (adding identity such as Part number to the DUT).
7. Plastics assembly.
8. Pack & ship.

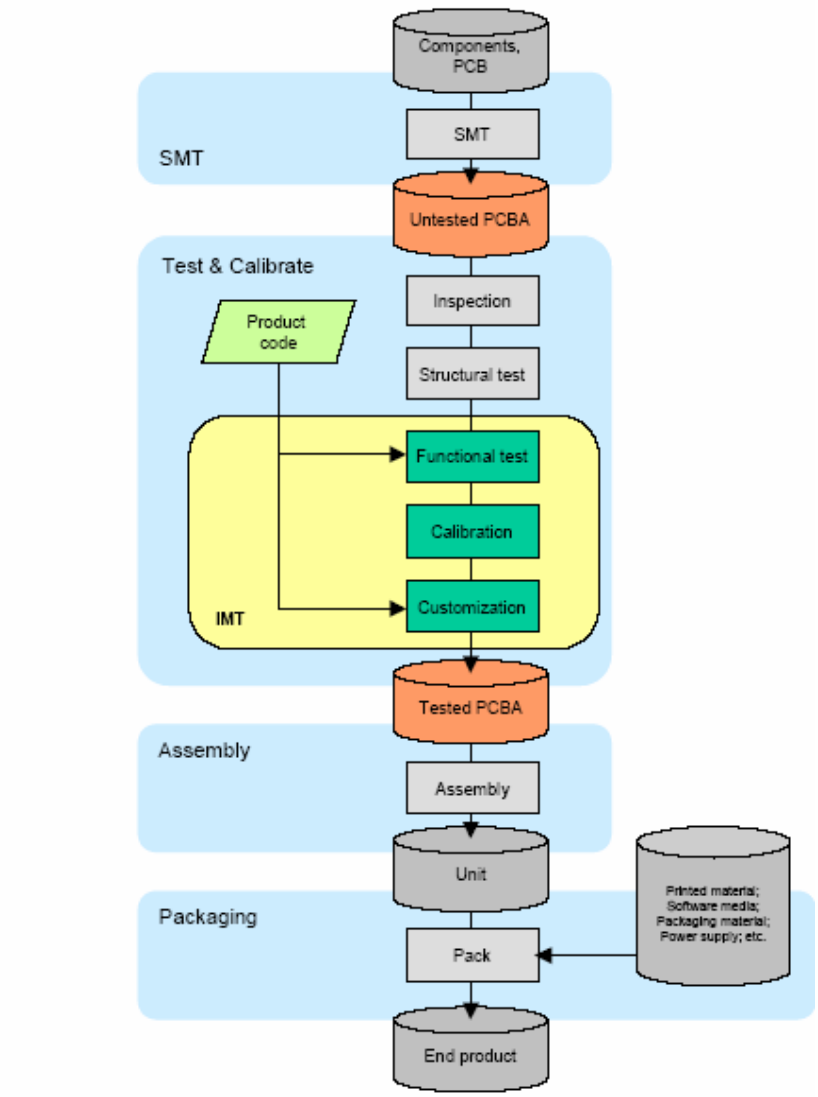


Figure 1. Manufacturing Test Process

Manufacturing Test Plan Overview for IMT tool

1. Test initialization and Product identification

   PCB serial number, product part number, and MAC address are established.
   A bar code scanner or the keyboard can be used to enter this information
   By default the information is divided between two codes. The first (bar) code contains the PCB serial number. The second bar code contains the product part number and half the Mac address.

2. DUT insertion

   Depending on the type of DUT, the software waits for the DUT to be attached to the set-up. If the DUT is not responding, the user is offered an escape by pressing the ABORT button.
   Alternatively the user is asked to insert the DUT and press the NEXT button. The software then switches the DUT on, and continues with the testing.

3. System test

   Properties of the operating system, including the version number, are determined and tested for compatibility. The versions of a number of DLLs and other system files are checked for compatibility as well.

4. Firmware and Driver Compatibility test

   The MTFW version number is tested for compatibility.

5. Transmitter verification

   A quick test is performed to verify the transmit function of the DUT. If the DUT passes this test, the following is true: the test system can communicate with the DUT firmware. The DUT can transmit RF signals with approximately the right frequency and amplitude.

6. Frequency accuracy

   The carrier frequency accuracy of the DUT is determined at the center channel. The sum of the measured deviation plus the maximum instrument error must be less than the limit set by the 802.11 standard

7. Receiver verification

   The capability of the receiver circuitry to receive and demodulate 802.11 packets is verified. If the DUT passes, the following is true: the receiver functions correctly and the receiver sensitivity(PER) is within limits.
   As part of this test the GRT output power is measured, the RF isolation between GRT and DUT is verified, and interference from other 802.11 sources is detected.

8. RSSI calibration (linear approximation)

Linear curve fitting is performed on the result, and PDR 0x1902, 0x1905, or 0x1908 is calculated, depending on the platform type.

9. PA control loop calibration

The PA control loop behavior is measured as a function of modulation type (bit rate) and channel (frequency). Depending on the platform, PDR 0x1901 or 0Xpdr1903 and 0x1904 are calculated.

There are two implementations for this step:

1. PA Calibration
2. PA Curves and PA limits

Besides, we have max/min output power pass/fail criteria for different modulation as Figure2 in ***9301A_param*** configured file.

```
;G48 PALimits
[PALimits/LimitCalculationPassFail#1]
Frequency=2412,2417,2422,2427,2432,2437,2442,2447,2452,2457,2462,2467,2472,2484
MinPower=12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5,12.5
MaxPower=15,15,15,15,15,15,15,15,15,15,15,15,15,15

;G24 PALimits
[PALimits/LimitCalculationPassFail#2]
Frequency=2412,2417,2422,2427,2432,2437,2442,2447,2452,2457,2462,2467,2472,2484
MinPower=15,15,15,15,15,15,15,15,15,15,15,15,15,15
MaxPower=16.5,16.5,16.5,16.5,16.5,16.5,16.5,16.5,16.5,16.5,16.5,16.5,16.5,16.5

;G12 PALimits
[PALimits/LimitCalculationPassFail#3]
Frequency=2412,2417,2422,2427,2432,2437,2442,2447,2452,2457,2462,2467,2472,2484
MinPower=16.5,16.5,16.5,16.5,16.5,16.5,16.5,16.5,16.5,16.5,16.5,16.5,16.5,16.5
MaxPower=17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5

;G6 PALimits
[PALimits/LimitCalculationPassFail#4]
Frequency=2412,2417,2422,2427,2432,2437,2442,2447,2452,2457,2462,2467,2472,2484
MinPower=17,17,17,17,17,17,17,17,17,17,17,17,17,17
MaxPower=18.5,18.5,18.5,18.5,18.5,18.5,18.5,18.5,18.5,18.5,18.5,18.5,18.5,18.5

;B11 PALimits
[PALimits/LimitCalculationPassFail#5]
Frequency=2412,2417,2422,2427,2432,2437,2442,2447,2452,2457,2462,2467,2472,2484
MinPower=15.5,15.5,15.5,15.5,15.5,15.5,15.5,15.5,15.5,15.5,15.5,15.5,15.5,15.5
MaxPower=17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5
```

Figure2. Power Limit

10. TX IQ Calibration

    For the platforms that require it, ZIF TX IQ Calibration is performed.

11. NV initialize

    By default this test will (re-)initialize and therefore erase the non-volatile memory.

12. Upload files to flash

    Files can be uploaded to AP based products. These files can contain firmware images, boot loaders or custom made images.

13. Write PDA

    The PDRs that were generated by the other test modules are written to the PDA that resides in the non-volatile memory of the DUT.

Features

The features supported by the ProST 802.11g WLAN Access Point are outlined below:

Interfaces directly to 10/100Mbps IEEE 802.3 Ethernet networks
Supports IEEE 802.11 WLAN functions
Supported WLAN Bridge function (WDS: Wireless Distribution System)
Firmware is stored in a flash memory and can be upgraded remotely.
Configurable through Web based management.
Power, Ethernet and wireless activity LED indicators.
One external and one internal inverted F antennas supporting diversity.

Wireless Network Configuration

Ad-hoc Mode (Peer-to-Peer Workgroup)

The Institute of Electrical and Electronics Engineers (IEEE) standard for wireless LANs (WLANs), 802.11, offers two methods for configuring a wireless network — ad hoc and infrastructure. In an ad hoc network, computers are brought together as needed; thus, there is no structure or fixed points to the network — each node can generally communicate with any other node. There is no access point involved in this configuration. It enables you to quickly set up a small wireless workgroup and allows workgroup members to exchange data or share printers as supported by Microsoft Networking in the various Windows operating systems. Some vendors also refer to ad hoc networking as Peer-to-Peer group networking.

In this configuration, network packets are directly sent and received by the intended transmitting and receiving stations. As long as the stations are within range of one another, this is the easiest and least expansive way to set up a wireless network.

To set up an ad hoc workgroup operating with standard protocols, do the following:

- Set all stations to connect in Ad-hoc mode (or Peer-to-Peer workgroup mode)
- Set all stations to use the same network name (or SSID).
- Set all stations to use no WEP encryption key or an identical WEP encryption key
- Set all stations to use the same wireless channel for communication

Infrastructure Mode

To set up an infrastructure network operating with standard protocols, do the following:

- Set all wireless stations to connect in infrastructure mode
- Set all stations to use the same network name (or SSID)
- Set all stations to use no WEP encryption key or an identical WEP encryption key
- Set up wireless channels used by individual access point. (It is not necessary to set channels on the stations as the stations will automatically scan through all channels for the nearest access point.)

Service Set Identification (SSID)

The Service Set Identification (SSID) is a thirty-two alphanumeric character (maximum) string identifying the wireless local area network (WLAN). Some vendors refer to the SSID as network name. For stations to communicate with each other, all stations must be configured with the same SSID.

Authentication and WEP Encryption

The absence of a physical connection between nodes makes the wireless links vulnerable to information theft. To provide certain level of security, IEEE 802.11 standard has defined two types of authentication methods, Open System and Shared Key. Open System authentication is a null algorithm. Shared Key authentication is an algorithm where both the transmitting node and the receiving node share an authentication key to perform a checksum on the original message. By default, IEEE 802.11 wireless devices operate in an open system network.

Wired Equivalent Privacy (WEP) data encryption is utilized when the wireless nodes or access points are configured to operate in Shared Key authentication mode. There are two shared key methods implemented in most commercially available products, 40-bit WEP data encryption and 104-bit WEP data encryption.

The 40-bit WEP data encryption method allows for a five-character (forty-bit) input. Additionally, 24 factory-set bits are added to the forty-bit input to generate a 64-bit encryption key. (The 24 factory-set bits are not user configurable.) This encryption key will be used to encrypt/decrypt all data transmitted via the wireless interface. Some vendors may refer to the 40-bit WEP data encryption as 64-bit WEP data encryption since the actual encryption key used in the encryption process is 64 bits wide.

The 128-bit WEP data encryption method consists of 104 configurable bits. Similar to the 40-bit WEP data encryption method, the remaining 24 bits are factory set and not user configurable. Some vendors allow pass phrases to be entered instead of the cryptic hexadecimal characters to ease encryption key entry.

Wireless Channel Selection

IEEE 802.11g wireless nodes communicate with each other using radio frequency signals in the ISM (Industrial, Scientific, and Medical) band between 2.4Ghz and 2.5Ghz. Neighboring channels are 5Mhz apart. However, due to spread spectrum effect of the signals, a node sending signals using a particular channel will utilize frequency spectrum12.5Mhz above and below the center channel frequency. As a result, two separate wireless networks using neighboring channels (for example, channel 1 and channel 2) in the same general vicinity will interfere with each other. Applying two channels that allow the maximum channel separation will decrease the amount of channel cross talk, and provide a noticeable performance increase over networks with minimal channel separation.

Channel	Center Frequency	Frequency Spread
1	2412Mhz	2399.5Mhz – 2424.5Mhz
2	2417Mhz	2404.5Mhz – 2429.5Mhz
3	2422Mhz	2409.5Mhz –2434.5Mhz
4	2427Mhz	2414.5Mhz –2439.5Mhz
5	2432Mhz	2419.5Mhz – 2444.5Mhz
6	2437Mhz	2424.5Mhz –2449.5Mhz
7	2442Mhz	2429.5Mhz –2454.5Mhz
8	2447Mhz	2434.5Mhz – 2459.5Mhz
9	2452Mhz	2439.5Mhz –2464.5Mhz
10	2457Mhz	2444.5Mhz –2469.5Mhz
11	2462Mhz	2449.5Mhz – 2474.5Mhz
12	2467Mhz	2454.5Mhz – 2479.5Mhz
13	2472Mhz	2459.5Mhz – 2484.5Mhz

Note: The available channels supported by the wireless products in various countries are different by firmware.

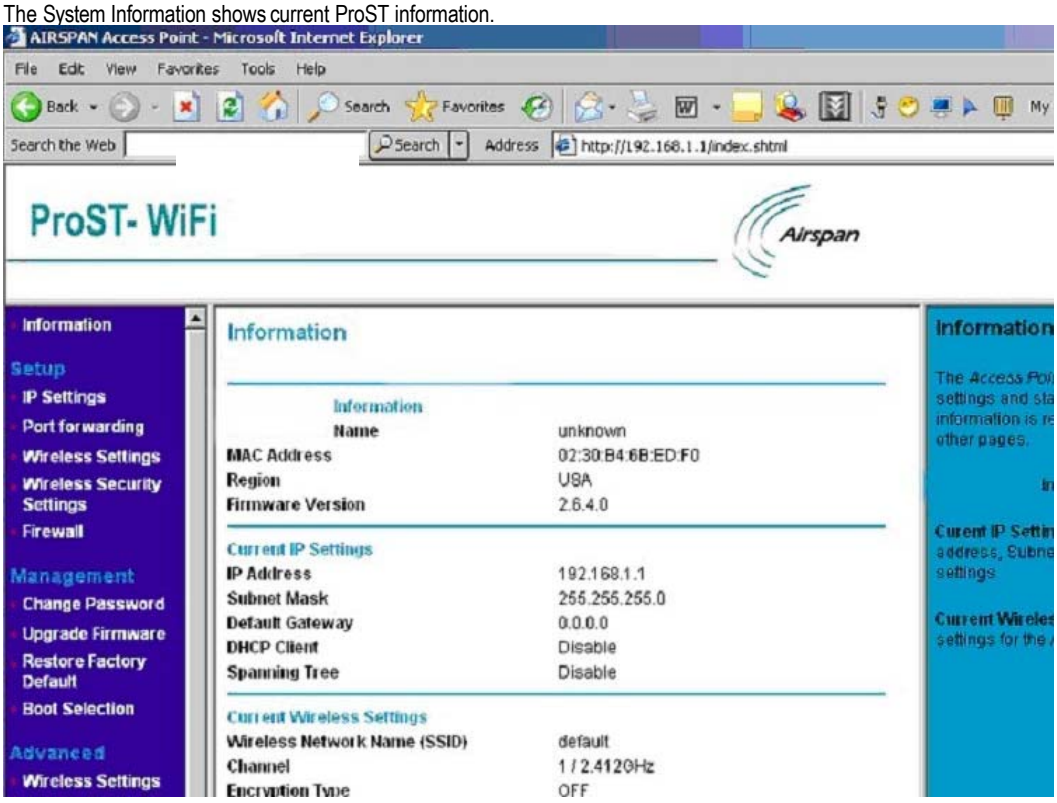
The preferred channel separation between the channels in neighboring wireless networks is 25 MHz (5 channels). This means that you can apply up to three different channels within your wireless network. There are only 11 usable wireless channels in the United States. It is recommended that you start using channel 1 and grow to use channel 6, and 11 when necessary.

Changing Wireless Parameters

The following table explains each of the configurable parameters of the ProST WLAN Device.

- **System Information**

The System Information shows current ProST information.



System Information	Model ProST WLAN Access Point
Name	Default DUT name
MAC Address	Displays the six-byte MAC address of the access point. This parameter is not changeable by the user.

Region	Define the regulatory domain of the operation area (default: US)
Firmware Version	2.6.4.0
IP Address	Assign Internet Protocol (IP) address to the access point.
Subnet Mask	Assign IP Subnet Mask to the access point.
Default Gateway	Assign default Gateway to the access point if needed
DHCP Client	Dynamic Host Configuration Protocol, it allows to request the IP from DHCP server for all wireless clie nts.
Wireless Network Name (SSID)	Enter a 32-character (maximum) extended service set ID in this field. The characters are case sensitive. With an access point, the wireless network always functions in infrastructure mode. The SSID assigned to the wireless nodes in the same network is required to match the access point SSID. The default SSID is "default.
Channel	In infrastructure mode, the wireless node automatically searches through all available wireless channels for an access point to be associated with. It is not necessary to select the wireless channel when operating in infrastructure mode. The default wireless channel is 1.
Encryption Type Access Control	Show encryption type OFF, WEP, 802.1X, or WPA. Show Access Control Enable, Disable or Block

- **Setup**

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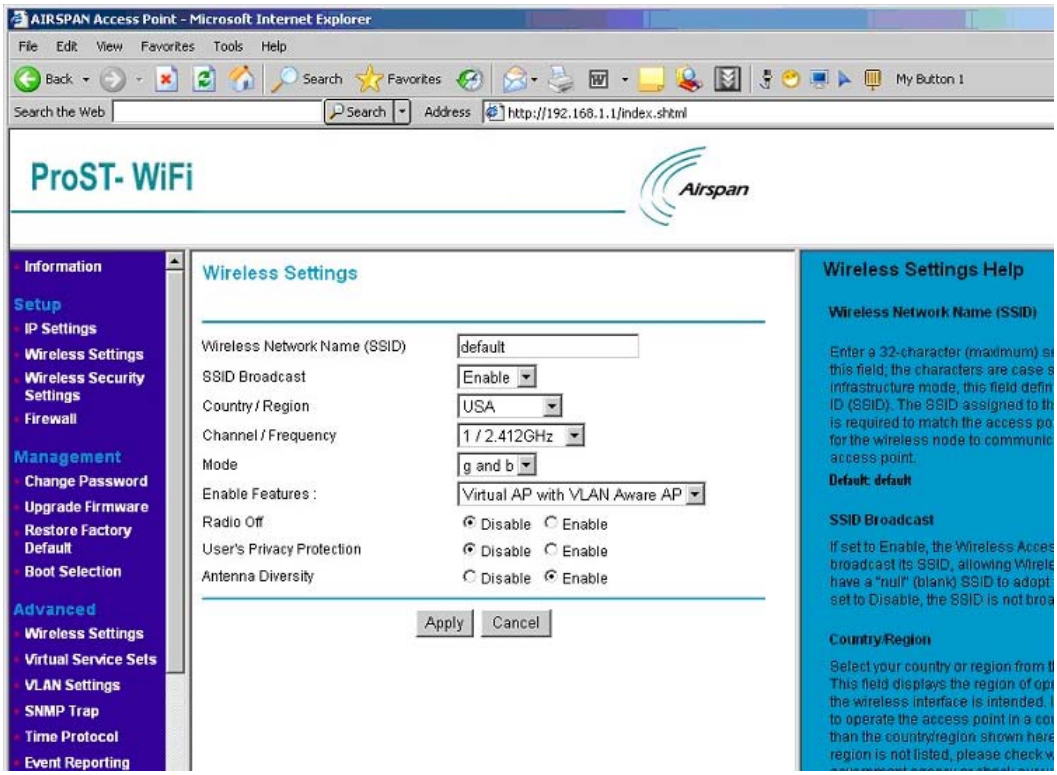
- **IP Setting**

IP Settings	MODEL ProST WLAN ACCESS POINT
Name	The default Access Point Name is located on the bottom label of the product. You may modify the default name with a unique name up to 15 characters long.
DHCP client	When there is DHCP Server on the network, if you will manually configure this device, check the "Disable" check box. Otherwise, check the "Enable" check box, and you need enter the next three items below correctly.
IP Address	Assign Internet Protocol (IP) address to the access point.
IP subnet mask	Assign IP Subnet Mask to the access point.
Default Gateway	Assign default Gateway to the access point if needed
Spanning Tree Protocol	Spanning-Tree Protocol is a link management protocol that provides path redundancy while preventing undesirable loops in the network. You can enable it to gain the function.

Apply	Means once you change the parameters and save the values
Cancel	Means you leave it un-changed

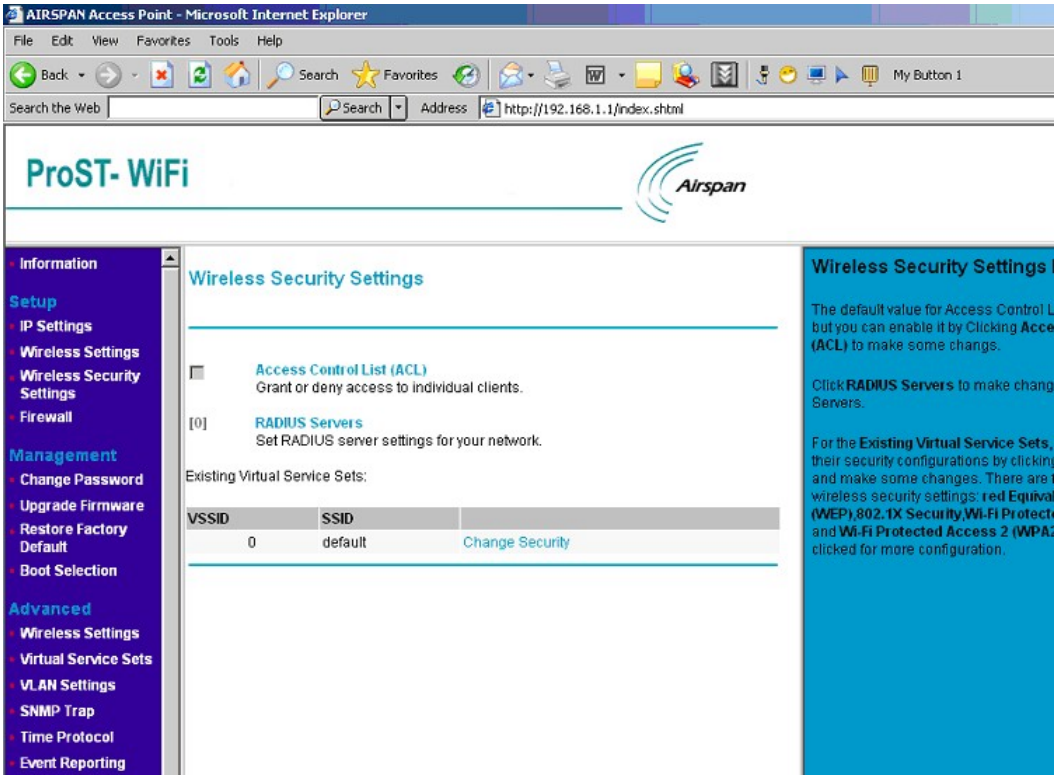
- **Wireless Settings**



Wireless Settings	MODEL ProST WLAN Device
Wireless Network Name (SSID)	Enter a 32-character (maximum) extended service set ID in this field. The characters are case sensitive. With an access point, the wireless network always functions in infrastructure mode. The SSID assigned to the wireless nodes in the same network is required to match the access point SSID. The default SSID is "default".
SSID Broadcast	Every Client can detect the AP if we check "Enable", otherwise, it can't be detected automatically.
Country/Region	Define the regulatory domain of the operation area (default: None). User may need to choose one of the areas from pop up menu.
Channel/Frequency	In infrastructure mode, the wireless node automatically searches through all available wireless channels for an access point to be associated with. It is not necessary to select the wireless channel when operating in infrastructure mode. The default

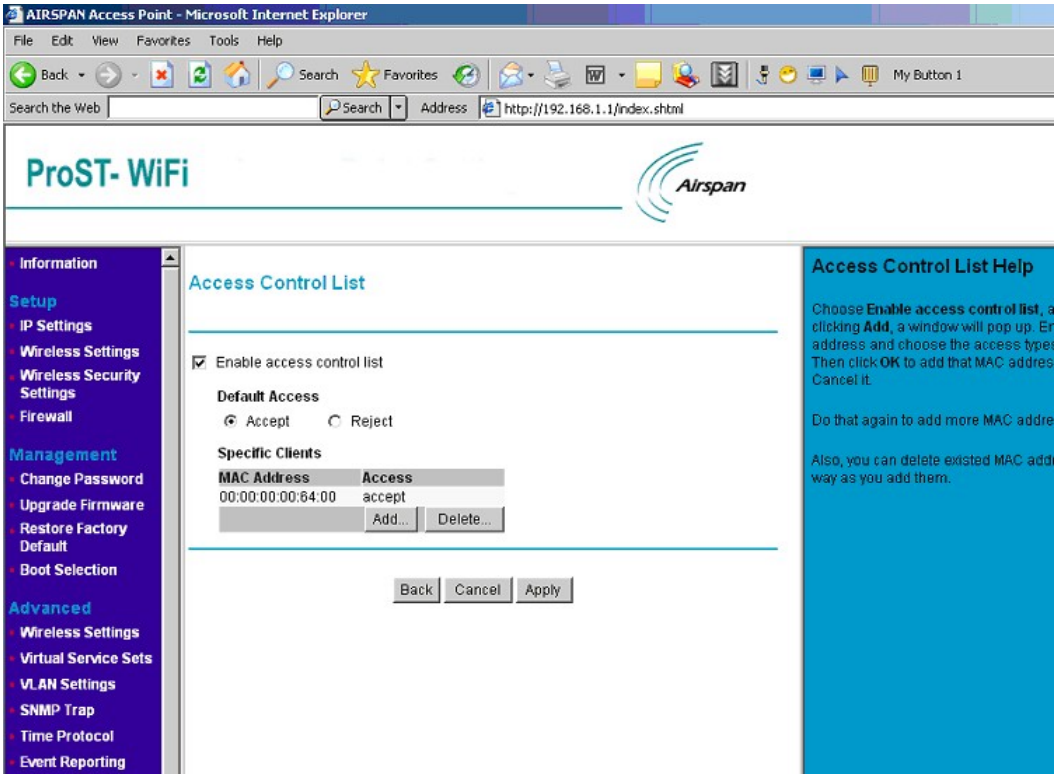
	wireless channel is 1.
Mode	B or/and G mode can be selected. With " B only" , the speed is under 11Mbps; with " G mode" or " B and G mode" , the speed is up to 54Mbps.
Enable Features Radio Off	When choose " WMM with VLAN PassThru" , you can have this function, but you can' t gain the function of " Virtual AP with VLAN Aware AP" . Vice versa. When enable it, means the radio is off and the AP won' t be scanned. Otherwise, you can find it.
User's Privacy Protection	When enabled, the signal from different users won' t be interfered.
Antenna Diversity	When enabled, the AP can automatically choose the more appropriate antenna for signal sending.

- **Security Setting**



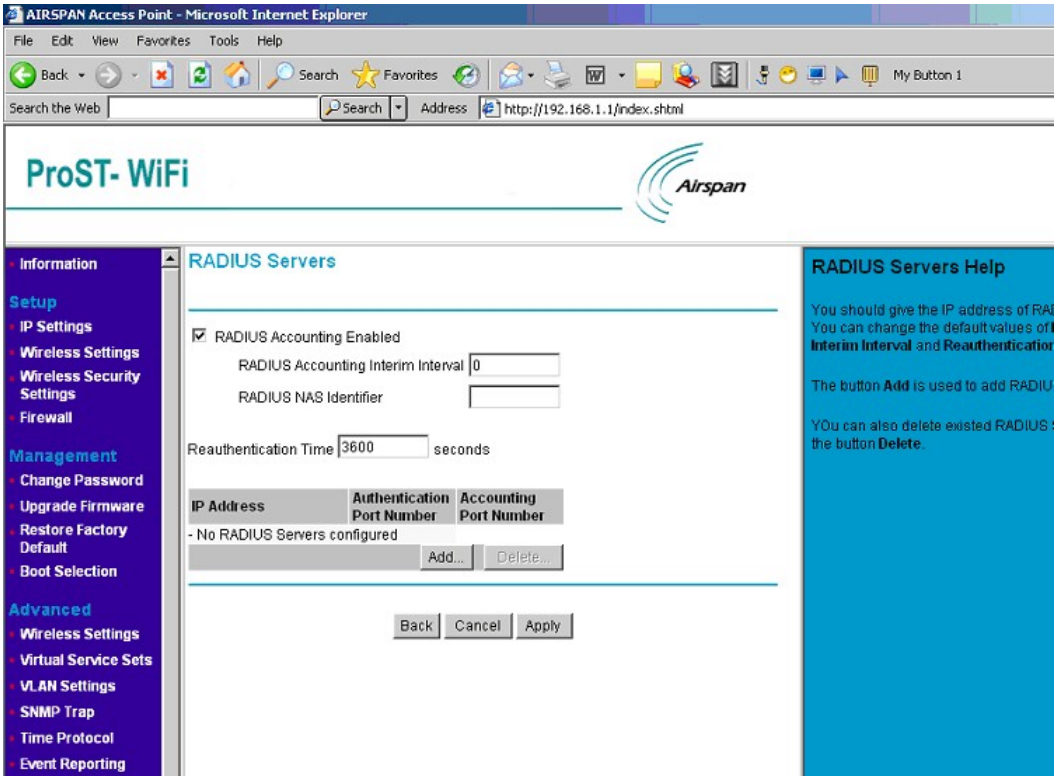
Security Settings	
Access Control List (ACL)	Grant or deny access to individual clients. Click it to make some changes.
RADIUS Servers	Set RADIUS server settings for your network. Click it to make changes.
Existing Virtual Service Sets	Change Security. Click " Change Security" to make changes to the corresponding SSID.

- **Access Control List (ACL)**



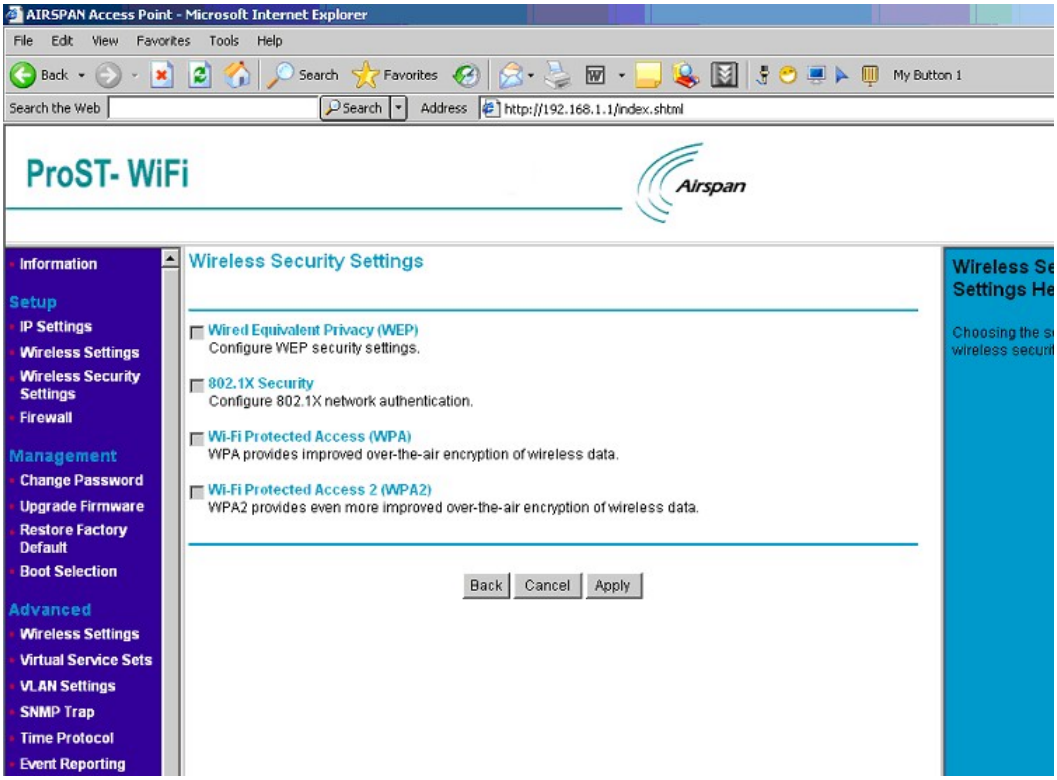
Security Settings	
Enable access control list	Default is disabled. Choose it to enable items below.
Default Access	Choose the default access policy is " Accept" or " Reject"
Specific Clients	Configure specific clients. You can add or delete these clients. Click " Add" and a window will pop up. Enter the MAC address and choose the access types (accept or reject). Then click OK to add that MAC Address to the system, or Cancel it. Also, you can delete existed MAC addresses the same way as you add them.
Back	Back to the " Wireless Security Settings" .

- **RADIUS Servers**



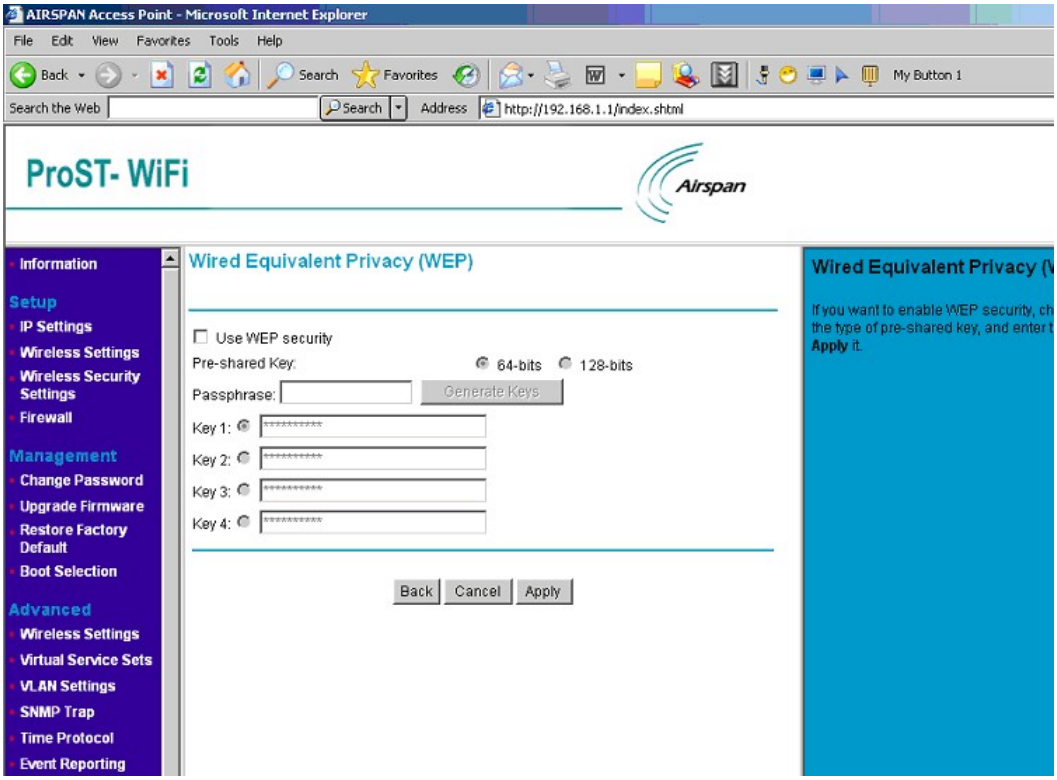
Security Settings	
RADIUS	RADIUS can enables remote access servers to communicate with a central server to authenticate dial-in users and authorize their access to the requested system or service.
RADIUS Accounting Interim Interval	How often should the RADIUS Account function take place
RADIUS NAS Identifier	Enter the IP Address of NAS, which is used for accounting.
Reauthentication	How often should the AP authentication again
Add	Used to add RADIUS Server(s). When clicked, a window will pop up. Provide the correct IP Address for RADIUS Server and " Secret" , then " OK" .
Delete	Delete existed RADIUS Server(s).
Back	Back to the " Wireless Security Settings" .

- **Change Security**



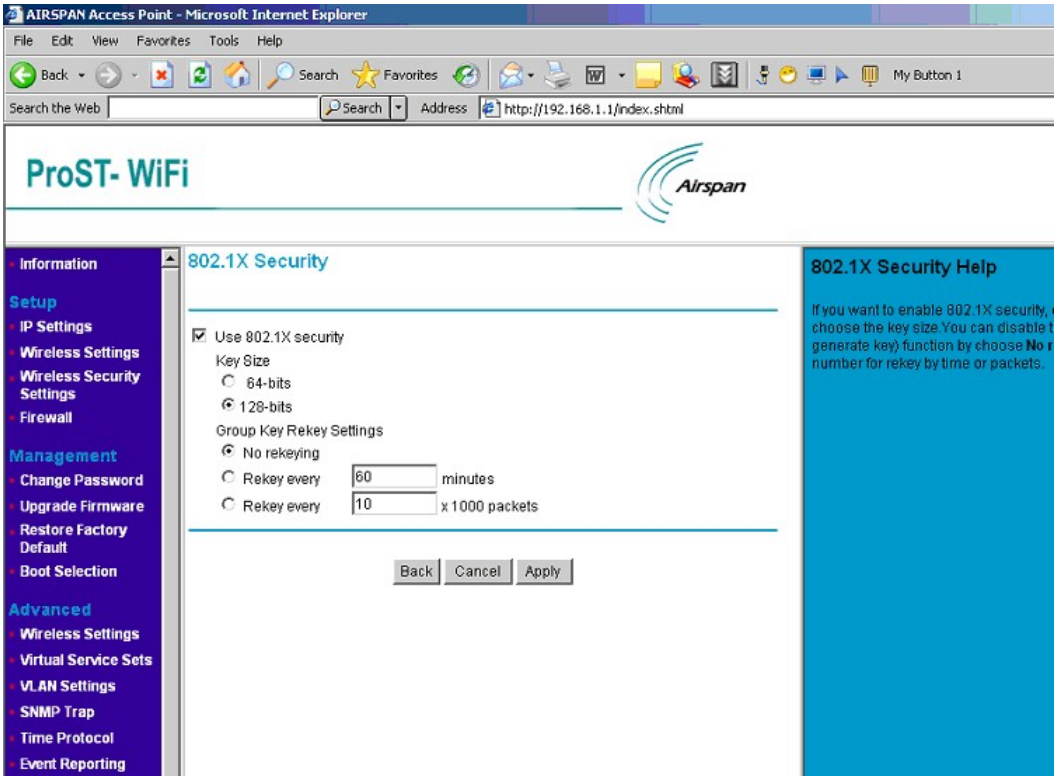
Security Settings	
Wired Equivalent Privacy (WEP)	Configure WEP security settings. Wired Equivalent Privacy (WEP) is a security protocol, which designed to provide a wireless local area network (WLAN) with a level of security and privacy comparable to what is usually expected of a wired LAN. WEP seeks to establish similar protection to that offered by the wired network's physical security measures by encrypting data transmitted over the WLAN.
802.1X Security	Configure 802.1X network authentication. 802.1X provides an authentication framework for wireless LANs, allowing a user to be authenticated by a central authority.
Wi-Fi Protected Access (WPA)	WPA provides improved over-the-air encryption of wireless data. It was designed to improve upon the security features of WEP.
Wi-Fi Protected Access 2 (WPA2)	WPA2 provides even more improved over-the-air encryption of wireless data.

WEP



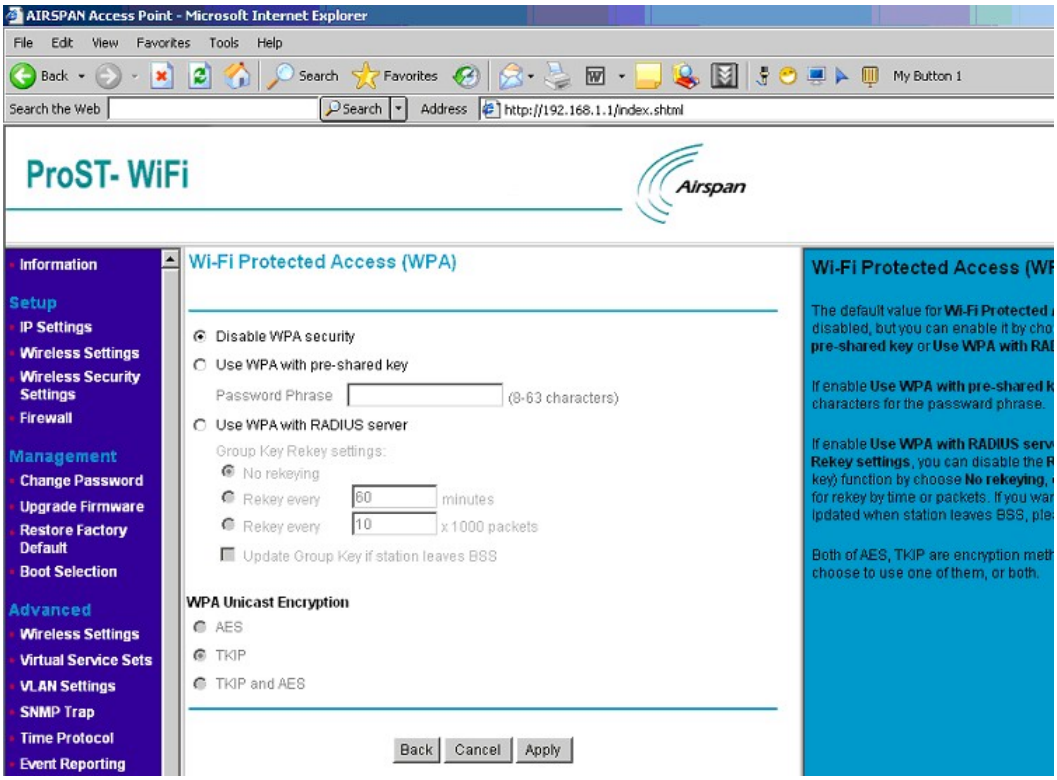
Security Setting	
Use WEP security	Choose it to enable the WEP function.
Pre-shared Key	To define the encryption strength
Passphrase	Used to generate the keys. Enter a passphrase and click the "Generate Keys" button. You can also enter the keys directly. These keys must match the other wireless stations.
Key 1/2/3/4	It is produced after clicking " Generate Keys" . The stations need these keys to connect this AP.
Back	Back to the " Wireless Security Settings" .

802.1X Security



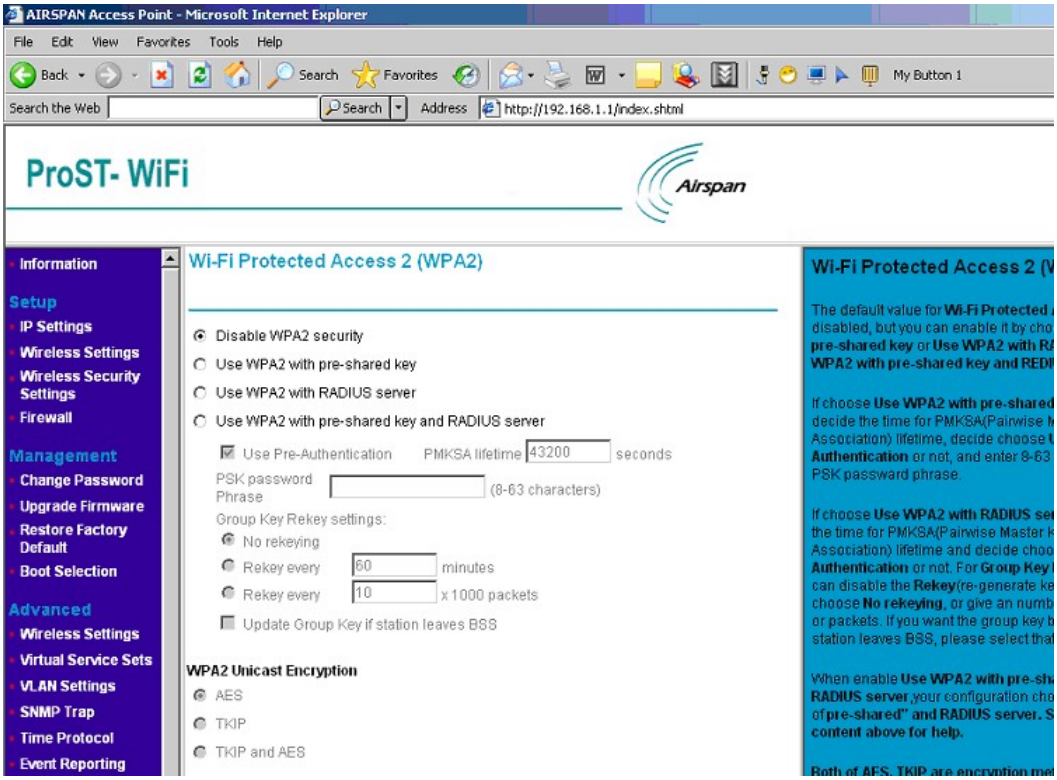
Security Setting	
Use 802.1X security	Choose it to enable the 802.1X function.
Key Size	How many bits will be provided to 802.1X.
Group Key Rekey Settings	Rekey means “ re-generate key” ; You can choose “ No rekeying” , or give an number for rekey by time or by packets.
Back	Back to the “ Wireless Security Settings” .

Wi-Fi Protected Access (WPA)



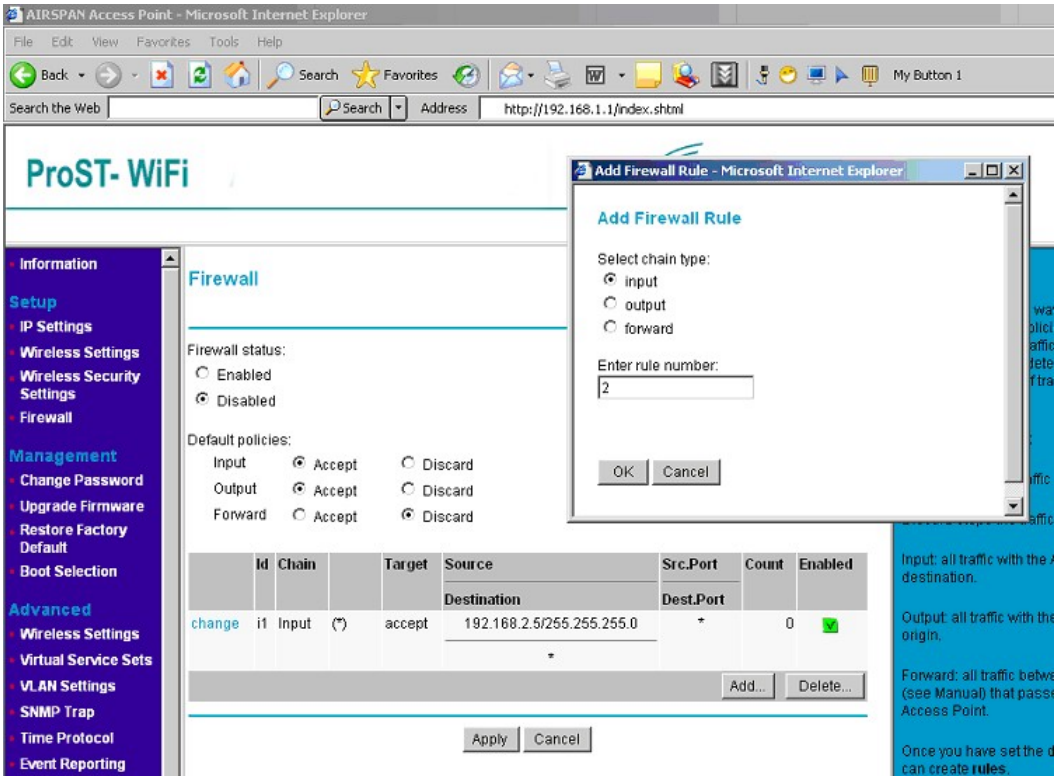
Security Setting	
Wi-Fi Protected Access (WPA)	You can choose " Disable WPA security" or " Use WPA with pre-shared key" or " Use WPA with RADIUS server" .
Use WPA with pre-shared key	If AP shares a key earlier with stations, enter it below. The key should between 8 and 63 characters.
Use WPA with RADIUS server	Rekey means " re-generate key" ; You can choose " No rekeying" , or give a number for rekey by time or by packets. If you want to update group key when station(s) leaves BSS, please choose it.
WPA Unicast Encryption	Both of AES, TKIP are encryption methods. You can choose to use one of them, or both.
Back	Back to the " Wireless Security Settings" .

Wi-Fi Protected Access 2 (WPA2)



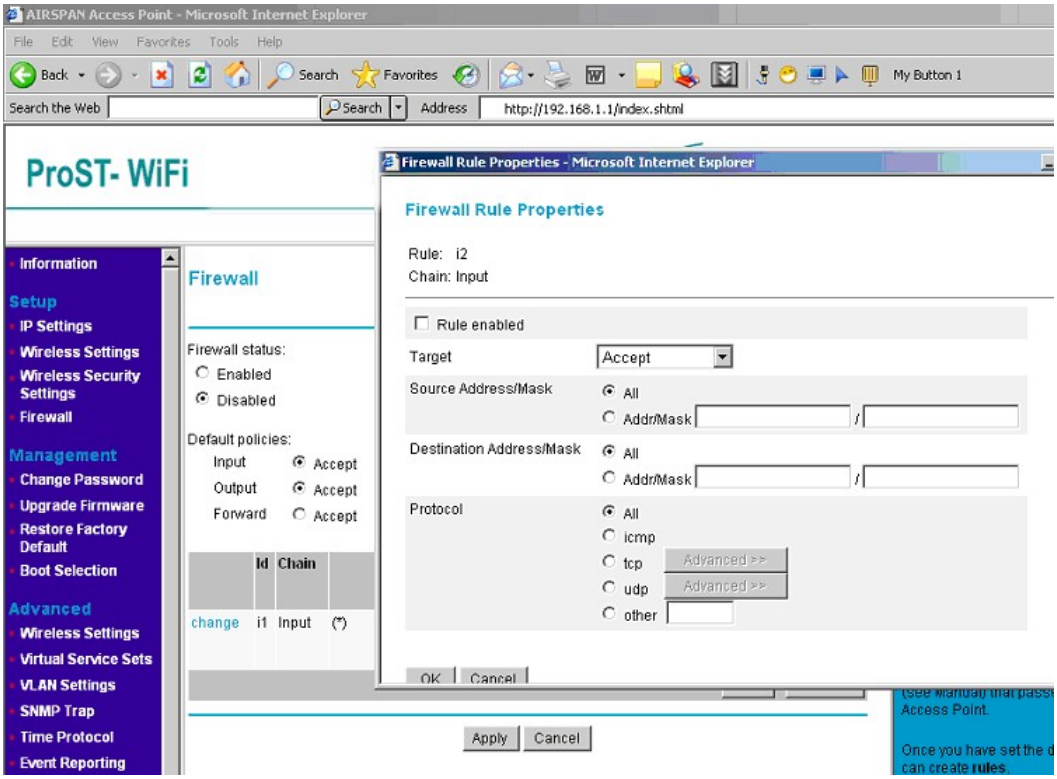
Security Setting	
Wi-Fi Protected Access 2 (WPA2)	You can choose "Disable WPA2 security", "Use WPA2 with pre-shared key", "Use WPA2 with RADIUS server" or "Use WPA2 with pre-shared key and RADIUS server".
Use WPA2 with pre-shared key	If AP shares a key earlier with stations, enter it below. The key should between 8 and 63 characters.
Use WPA2 with RADIUS server	Rekey means "re-generate key"; You can choose "No rekeying", or give a number for rekey by time or by packets. If you want to update group key when station(s) leaves BSS, please choose it.
Use WPA2 with pre-shared key and RADIUS server	If choose it, give configurations for both of "pre-shared key" and "RADIUS Server", which is the same as above.
WPA2 Unicast Encryption	Both of AES, TKIP are encryption methods. You can choose to use one of them, or both.
Back	Back to the "Wireless Security Settings".

- **Firewall**



Firewall	
Firewall	Default is " Disable" . You should choose " Enable" to make it works.
Default policies	Accept sends the traffic through; Discard stops the traffic. Input: all traffic with the Access Point as destination; Output: all traffic with the Access Point as origin; Forward: all traffic between LAN and WAN (see Manual) that passes through the Access Point. Once you have set the default policies, you can create rules.
Change	Change the properties of existed rules
Add	"Chain type" is the direction of traffic. "Rule Number" will be used to identify the rule and the order in which rules are applied.
Delete	Delete existed rules

After clicked " OK" , a pop window appears like below:



Firewall Rule	
Rule	Used to identify the rule and the order in which rules are applied.
Chain	The direction of traffic.
Rule enabled	Choose it to enable this firewall rule.
Target	This tells the firewall what to do with the traffic that meets the conditions in this rule. Accept: traffic will be allowed. Drop: traffic will be stopped, with no response to the sender. Reject: traffic will be stopped, and a response will be returned to the sender. Continue: the traffic packet will be counted, and testing will continue with the next rule. Use this if you only want to count packets.
Source Address/Mask	Enter the IP address for the source. You can enter an address range by giving the network (lowest) address and the net mask. Select the All radio button to choose 'all IP Addresses'.
Destination Address/Mask	Enter the IP address for the destination. You can enter an address range by giving the network (lowest) address and the net mask. Select the All radio button to choose 'all IP Addresses'.
Protocol	Select the type of traffic you want to be affected by the rule. If you select TCP or UDP, you can click Advanced to select a specific port number or port number range. To set a