WIRELESS

J20H018

Foxconn

WLAN Client Module

IEEE 802.11g/b

802.11b/g WLAN Module

Doc. No. MV-S800245-00, Rev. C
May 26, 2005

Document Conventions

Note

Provides related information or information of special importance.

Caution

Indicates potential damage to hardware or software, or loss of data.

Warning

Indicates a risk of personal injury.

Document Status

Doc Status: 2.00	Technical Publication: 0.x

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Section 1. Introduction

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Section 1. Introduction

This document describes the functions of the Foxconn WLAN Module Configuration Utility for the following:

- Foxconn J20H018 802.11b/g WLAN Module

Notes

- In this document, the Foxconn WLAN Module Configuration Utility may also be referred to as the Configuration Utility or just the Utility.
- See the *J20H018 Installation Guide* for information on installing the Configuration Utility, the Client Card Module, and the Foxconn Windows® driver.
- See Appendix A. "Acronyms and Abbreviations" on page 51 for a list of acronyms used throughout this document.

1.1 Wireless Networks

Foxconn WLAN Module operate similar to Ethernet cards except that a radio replaces the wires between communication devices. All existing applications that operate over Ethernet operates over a Foxconn wireless network without any modification or need for special wireless networking software. The adapter supports the following network technologies:

- Ad-Hoc (peer-to-peer group) mode
- Access Point (AP) Infrastructure mode

1.1.1 Ad-Hoc Mode

In Ad-Hoc mode (also referred to as peer-to-peer mode), wireless clients send and receive information to other wireless clients without using an AP. In comparison to infrastructure mode, this type of WLAN connection only contains wireless clients. Ad-Hoc mode is useful for establishing a network where wireless infrastructure does not exist or where services are not required. Two or more computers can establish an Ad-Hoc network when within range of one another. Each computer dynamically connects to one another without additional configuration. Ad-Hoc mode is used to network computers at home or in small offices. It is also used to set up a temporary wireless network for meetings.

1.1.2 Infrastructure Mode

In infrastructure mode, wireless devices communicate with other wireless devices or devices on the LAN side wired network through Access Points. When communicating through wired networks, client cards send and receive information through APs. The AP receives the information and redirects it for clients to receive the information.

Access Points are typically strategically located within an area to provide optimal coverage for wireless clients. A large WLAN uses multiple APs to provide coverage over a wide area. APs connect to a LAN through a wired Ethernet connection. APs send and receive information from the LAN through this wired connection. Most corporate WLANs operate in infrastructure mode because they require access to the wired LAN in order to use services such as file servers or printers.

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Section 2. Configuration Utility Overview

2.1 Overview

The Foxconn Wireless Module Configuration Utility is a Microsoft® Windows® application that allows configuration and management of Foxconn J20H018 client cards. The Configuration Utility sets up profiles and performs wireless network management tasks.

See the *J20H018 Installation Guide* for information on installing the Configuration Utility.

2.2 Windows XP Users

For Windows XP, use either the Zero Configuration Utility or the Foxconn Configuration Utility to configure the cards. Both utilities cannot be used at the same time. Selection is made during installation of the card or can be switched during normal operation.

Notes

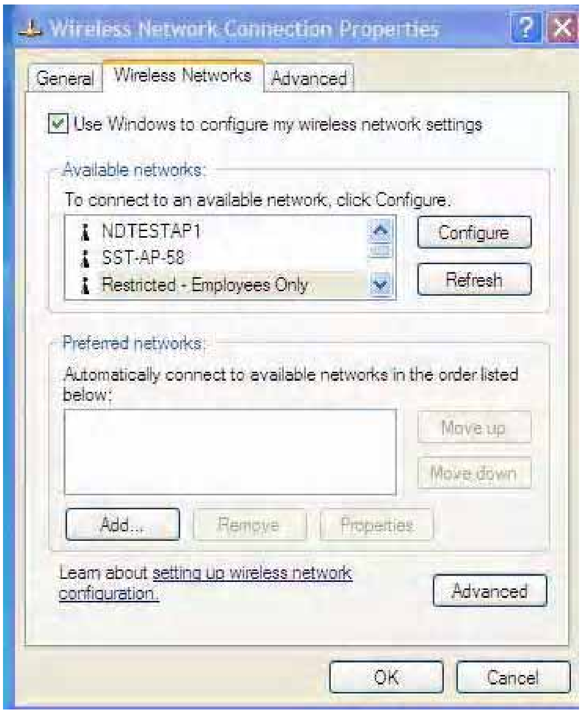
- Zero Configuration can be disabled when running the setup program for the Foxconn Client Configuration Utility. See the *Installation Guide* for more information on selections made during installation of the Utility.
- When using the Marvell Configuration Utility on Windows XP, Foxconn recommends turning off the Windows wireless configuration feature. For information on how to disable this feature, refer to Windows documentation.

2.2.1 Zero Configuration Utility

To use the Zero Configuration Utility:

1. Open the Control Panel and click on **Network Connections.**
2. Right click on the icon for the Foxconn client card and select **Properties.**
3. Click on the **Wireless Networks** tab.
4. Check the **Use Windows to configure my wireless settings** checkbox to enable Zero Configuration.

Figure 1: Zero Configuration Utility Window



☑ Use Windows to configure my wireless network settings

To connect to an available network, click Configure.

NDTESTAP1
SST-AP-58
Restricted - Employees Only

Automatically connect to available networks in the order listed below:

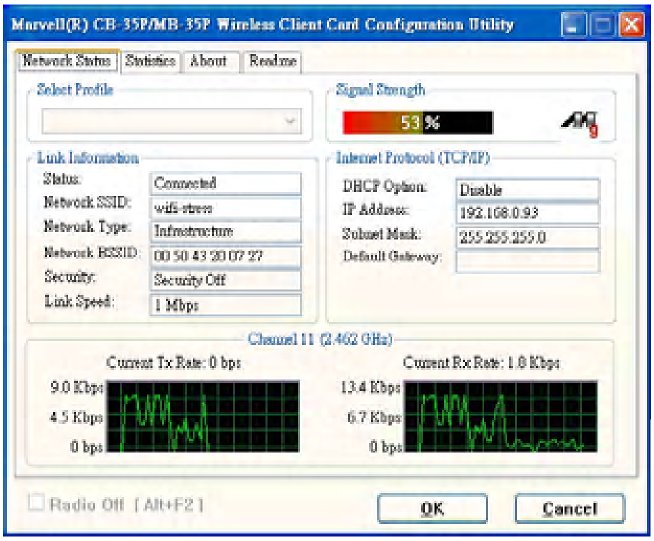
Learn about setting up wireless network configuration.

2.2.1.1 Configuration Utility Tabs

When Zero Configuration is enabled, the Foxconn Configuration Utility enters Monitor mode. When in Monitor mode, the Foxconn Configuration Utility has the following properties:

- Limited tab display (**Network Status**, **Statistics**, **About,** and **Readme** tabs)
- Information reporting only (the Utility cannot be used to configure the card)

Figure 2: Foxconn Configuration Utility in Active Mode



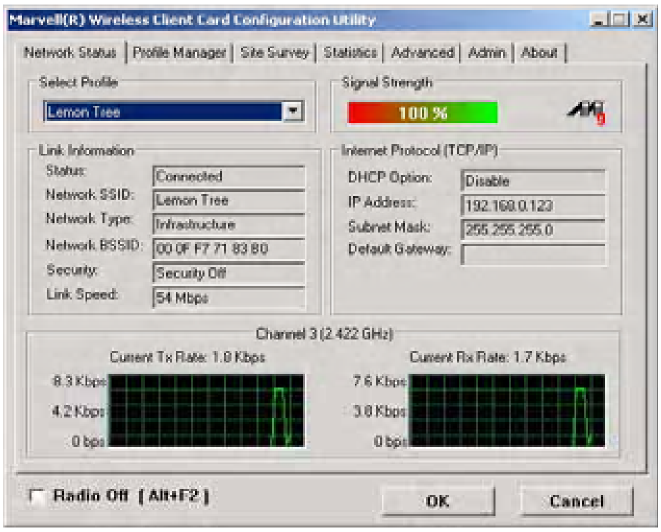
Status: Connected
Network SSID: wifi-stress
Network Type: Infrastructure
Network BSSID: 00 50 43 20 07 27
Security: Security Off
Link Speed: 1 Mbps

DHCP Option: Disable
IP Address: 192.168.0.93
Subnet Mask: 255.255.255.0
Default Gateway:

Current Tx Rate: 0 bps
Current Rx Rate: 1.0 Kbps

When Zero Configuration is disabled, all tabs available through the Foxconn Configuration Utility are active, as shown in Figure 2.

Figure 3: Zero Configuration Disabled Window



Select Profile: Lemon Tree

Status: Connected
Network SSID: Lemon Tree
Network Type: Infrastructure
Network BSSID: 00 0F F7 71 83 80
Security: Security Off
Link Speed: 54 Mbps

DHCP Option: Disable
IP Address: 192.168.0.123
Subnet Mask: 255.255.255.0
Default Gateway:

Current Tx Rate: 1.0 Kbps
Current Rx Rate: 1.7 Kbps

2.2.2 Foxconn Configuration Utility

Once installed, the Foxconn Configuration Utility is accessed from the **Start** menu or the **Desktop**:

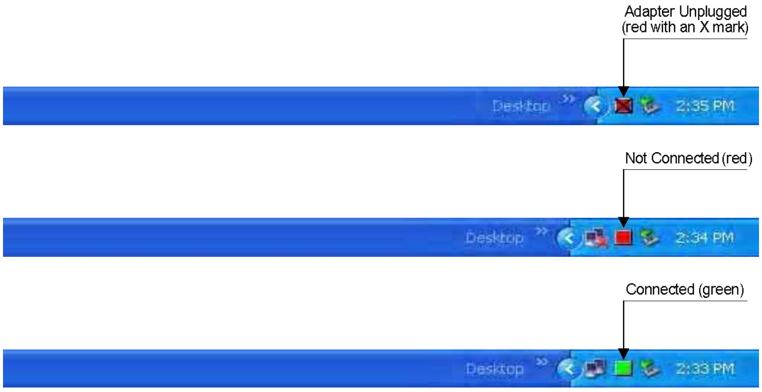
- **Start** > **Foxconn Libertas Client Configuration Manager**
- **Start** > **Programs** > **Foxconn Libertas® 802.11g Client > Foxconn Libertas Client Configuration Manager**
- **Desktop—**Double click on the Configuration Utility icon

Figure 4: Icon Window

2.2.2.1 Tray Status Icons

Different icons in the system tray indicate the status of the wireless connection:

Figure 5: Tray Status Icons Window



2.3 Security

Implementing a security infrastructure to monitor physical access to WLAN networks is more difficult than monitoring access on wired networks. Unlike wired networks where a physical connection is required, anyone within range of a wireless Access Point can send and receive frames, as well as listen for frames being sent.

IEEE 802.11 defines a set of standards and protocols for use in minimizing the security risks on wireless networks. Two of these security standards are as follows:

- **802.1x**—802.1x authentication provides authenticated access to 802.11 wireless networks and to wired Ethernet networks. 802.1x minimizes wireless network security risks by providing user and computer identification, centralized authentication, and encryption services based on the WEP algorithm. 802.1x supports Extensible Authentication Protocol (EAP). EAP allows the use of different authentication methods, such as smart cards and certificates.
- **Wi-Fi Protected Access (WPA)**—WPA is an implementation based on a subset of the 802.11i standard. WPA provides enhanced security for wireless networks when used with the TKIP and the Message Integrity Check (MIC) algorithms.
- **Wi-Fi Protected Access (WPA2)**—The next generation of Wi-Fi security, based on the final 802.11i standard. WPA2 offers the strongest available security in the form of AES-level encryption (Advanced Encryption Standard), plus faster roaming between access points.

2.3.1 Security Configurations

The configuration utility supports the following security protocols:

- Authentication Modes
  - Open System
  - Shared Key
  - Auto Switch
  - 802.1x
  - WPA-PSK
  - WPA2-PSK
  - WPA
  - WPA2
  - CCX
- Encryption Methods
  - Security Off
  - WEP
  - TKIP
  - AES
- 802.1x Authentication Protocol
  - EAP/TLS
  - EAP/PEAP
  - EAP/LEAP
- WEP Key Size
  - 64 bits WEP (40-bit key (5 bytes))
  - 128 bits WEP (104-bit key (13 bytes))

2.4 AutoLink

AutoLink is a feature integrated in Foxconn wireless client cards that offers users a simple way to configure a new Foxconn AP in conjunction with the Configuration Utility. The AutoLink dialog box pops up automatically when a non-configured Foxconn AP or an AutoLink configured Foxconn AP appears in the area of a client card that is not connected to an AP or Ad-Hoc network.

AutoLink operations include:

- Configure an AutoLink AP—first time use, AutoLink AP, or renew an AP Configuration
- Create connection with AutoLink AP—new Foxconn client card connecting to an AutoLink AP

2.4.1 Configure an AutoLink AP

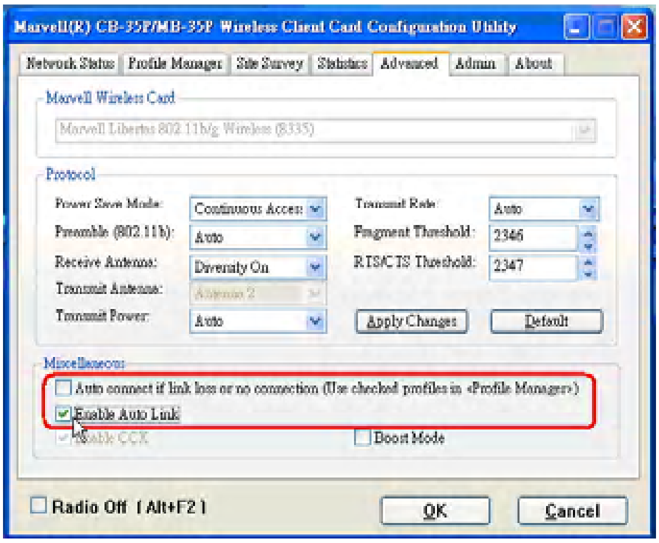
Equipment needed to configure an AutoLink AP:

- Foxconn AutoLink AP (i.e., AP-32)
- Foxconn Wireless Client Card (J20H018) and software package (in CD or storage device)
- Laptop PC or Desktop PC with a Microsoft Windows XP, 2000, ME or 98SE operating system

To start or renew an AutoLink AP, configure an AP and create a connection profile for the client card in a secure wireless network:

1. Install Foxconn Wireless Client Card (J20H018) on PC.
2. Launch Configuration Utility.
3. Click "Advanced" tab.
4. Uncheck "Auto connect …"
5. Check "Enable Auto Link". Click OK button.

Figure 6: AutoLink AP Configuration



Marvell Wireless Card: Marvell Libertas 802.11b/g Wireless (8335)

Protocol

Power Save Mode: Continuous Access
Preamble (802.11b): Auto
Receive Antenna: Diversity On
Transmit Antenna: Antenna 2
Transmit Power: Auto
Transmit Rate: Auto
Fragment Threshold: 2346
RTS/CTS Threshold: 2347

Miscellaneous

☐ Auto connect if link loss or no connection (Use checked profiles in <Profile Manager>)
☑ Enable Auto Link
☑ Enable CCX
☐ Boost Mode

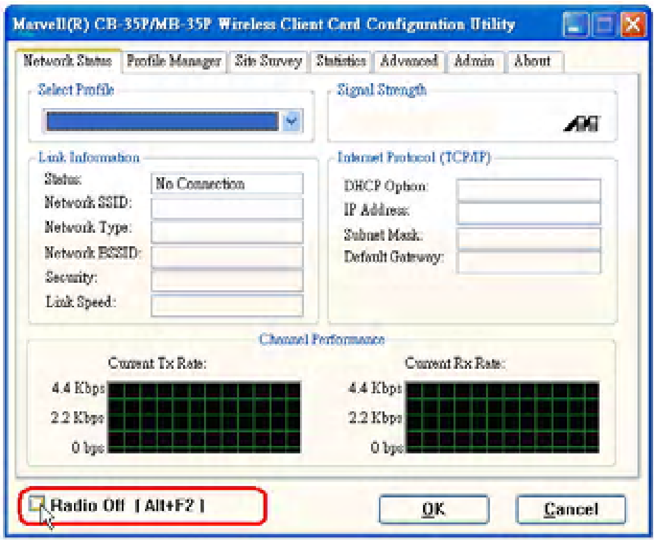
☐ Radio Off (Alt+F2)

Note

Refer to the AP User Guide for the instructions to reset AP configuration to default.

6. Relaunch Configuration Utility.
7. Click “Advanced” tab.
8. Check "Radio Off" below the Miscellaneous box in the utility.

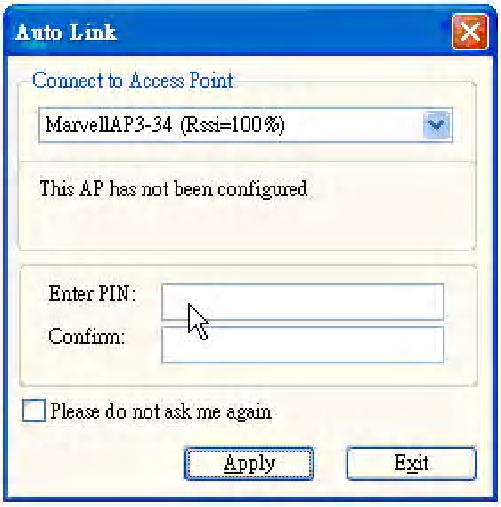
Figure 7: AutoLink AP Configuration—Radio Off



Status: No Connection
Network SSID:
Network Type:
Network BSSID:
Security:
Link Speed:
DHCP Option:
IP Address:
Subnet Mask:
Default Gateway:
□ Radio Off [Alt+F2]

9. Move the Foxconn AP close to the PC and turn the AP power on.
10. An AutoLink dialog box opens immediatetly. If not, click the AP power off and on again.

Figure 8: AutoLink AP Configuration—Security Pin



MarvellAP3-34 (Rssi=100%)

This AP has not been configured

Enter PIN:
Confirm:

□ Please do not ask me again

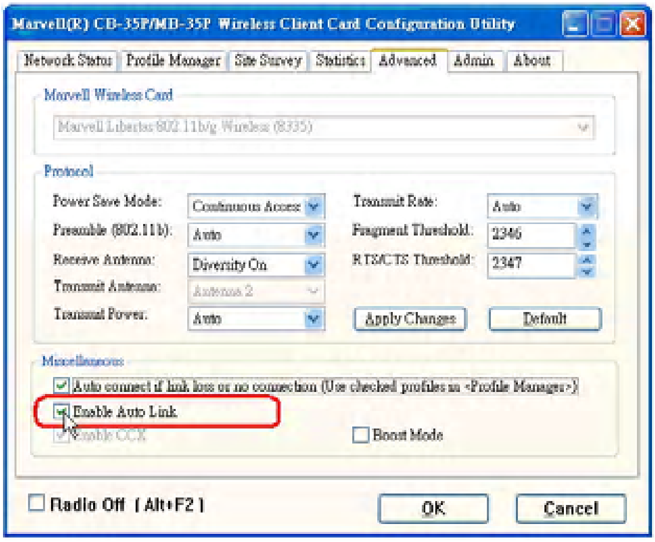
11. Enter the security PIN number. Click Apply. It takes a few seconds for the AutoLink AP configuration. After configuration completed, the AutoLink AP restarts automatically.

2.4.2 Create Connection with AutoLink AP

To set up a Foxconn wireless client card connection to an existing Foxconn AutoLink AP:

1. Install Foxconn Wireless Adapter (j20H018) on PC. Open device driver and Configuration Utility installation.
2. Launch Configuration Utility.
3. Click "Advanced" tab.
4. Check "Enable Auto Link" and click OK button.

Figure 9: AutoLink AP Connection



Marvell Wireless Card: Marvell Libertas 802.11b/g Wireless (8335)

Protocol

Power Save Mode: Continuous Access
Preamble (802.11b): Auto
Receive Antenna: Diversity On
Transmit Antenna: Antenna 2
Transmit Power: Auto
Transmit Rate: Auto
Fragment Threshold: 2346
RTS/CTS Threshold: 2347

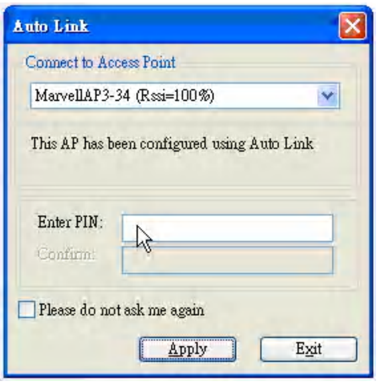
Miscellaneous

☑ Auto connect if link loss or no connection (Use checked profiles in <Profile Manager>)
☑ Enable Auto Link
☑ Enable CCX
□ Boost Mode

□ Radio Off [Alt+F2]

5. An AutoLink dialog box opens immediatetly. If not, make sure the "Radio Off" button below the Miscellaneous box in the utility is unchecked.
6. Select the AP in which to connect, and enter the PIN number used in this AutoLink AP. Click Apply.

Figure 10: AutoLink AP Connection—Security Pin



Connect to Access Point: MarvellAP3-34 (Rssi=100%)

This AP has been configured using Auto Link

Enter PIN:

Confirm:

□ Please do not ask me again

Section 3. Configuration Utility User Interface

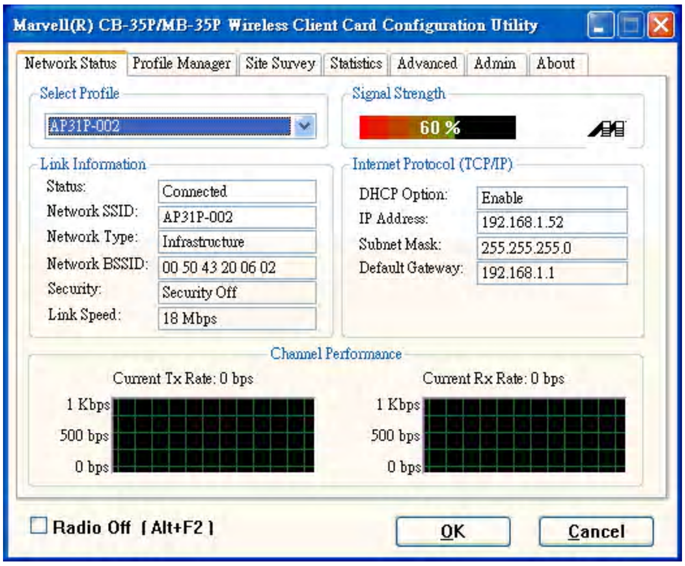
The **Configuration Utility** allows configuration of Foxconn client cards through the following tabs:

- Network Status Tab—displays the status of the network to which the user is connected. The Configuration Utility initializes on this page
- Profile Manager Tab—displays the current profiles and allows the user to set attributes for network type, security options, and protocols, as well as create/modify/delete profiles
- Site Survey Tab—displays site survey information
- Statistics Tab—displays the statistics of the current session
- Advanced Tab—used to set protocol parameters
- Admin Tab—used to import and export profiles
- About Tab—provides the information for the driver version number, firmware version number, Config Utility version number, and MAC address of the client card etc.

3.1 Network Status Tab

The **Network Status** tab displays the status of the network. When the **Wireless Client Card Configuration Utility** initializes, it displays the **Network Status** tab:

Figure 11: Network Status Window



Marvell(R) CB-35P/MB-35P Wireless Client Card Configuration Utility

Select Profile: AP31P-002

Signal Strength: 60 %

Link Information

Status: Connected
Network SSID: AP31P-002
Network Type: Infrastructure
Network BSSID: 00 50 43 20 06 02
Security: Security Off
Link Speed: 18 Mbps

Internet Protocol (TCP/IP)

DHCP Option: Enable
IP Address: 192.168.1.52
Subnet Mask: 255.255.255.0
Default Gateway: 192.168.1.1

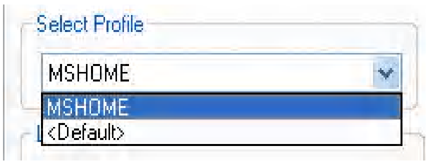
☐ Radio Off [Alt+F2]

3.1.1 Select Profile

The Select Profile window displays the name of the profile in use. Additional information about the profile is provided in the **Profile Manager**.

Select one of the profiles previously defined by clicking the **down arrow** and highlighting a profile from the pulldown list.

Figure 12: Select Profile Window



Select Profile: MSHOME

Profiles are created, modified, and deleted through the **Profile Manager**.

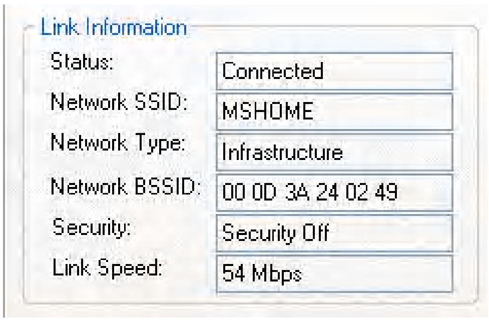
Note

This feature is disabled when Zero Configuration is enabled.

3.1.2 Link Information

The **Link Information** section contains the current information about the wireless connection:

Figure 13: Link Information Section



Link Information

Status: Connected

Network SSID: MSHOME

Network Type: Infrastructure

Network BSSID: 00 0D 3A 24 02 49

Security: Security Off

Link Speed: 54 Mbps

Table 1: Link Information Window Description

Fields	Description
Status	Status of the wireless network connection: • **Card Unplugged**—adapter is not plugged in, or adapter is plugged in but not recognized. • **Connected**—card plugged in and connected to a wireless network • **Not connected**—card plugged in, but no wireless connection. • **No Radio—**card plugged in, but the radio is turned off. Uncheck the **Radio Off** box to turn the radio on.
Network SSID	Network SSID label (i.e., Network Name). The Network Name is a text string of up to 32 characters.
Network Type	Type of environment connected to: • **Infrastructure Mode**—wireless clients send and receive information through the APs. When a wireless client communicates with another, it transmits to the AP. First the AP receives the information and rebroadcasts it, then other devices receive the information. The APs are strategically located within an area to provide optimal coverage for wireless clients. A large WLAN uses multiple APs to provide coverage over a wide area. APs can connect to a LAN through a wired Ethernet connection. APs send and receive information from the LAN through the wired connection. • **Ad-Hoc Mode**—wireless clients send and receive information to other wireless clients without using an AP. This type of WLAN only contains wireless clients. Use Ad-Hoc mode to network computers at home or in small office, or to set up a temporary wireless network for a meeting.
Network BSSID	Network Basic Service Set Identifier. The BSSID is a 48-bit identity used to identify a particular BSS within an area. In Infrastructure BSS networks, the BSSID is the MAC address of the AP. In independent BSS or Ad-Hoc networks, the BSSID is generated randomly.

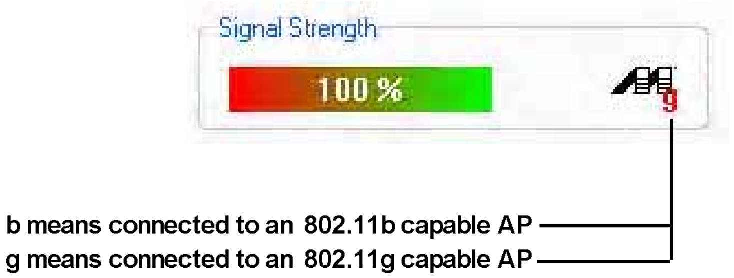
Table 1: Link Information Window Description

Fields	Description
Security	Reports the type and level of security set. The security level is set through the **Profile Setting** of the **Profile Manager** tab. Configure security settings also through the **Site Survey** tab when connecting to a network.
Link Speed	Connection speed, (i.e., 54 Mbps, 48 Mbps, etc.)

3.1.3 Signal Strength/Wireless Mode Indicator

The color-coded **Signal Strength** bar displays the signal strength of the last packet received by the adapter:

Figure 14: Signal Strength Bar Window


Signal Strength
100 %
g
b means connected to an 802.11b capable AP
g means connected to an 802.11g capable AP

Signal strength is reported as a percentage. A signal in the red indicates a bad connection. A signal in the green indicates a good connection.

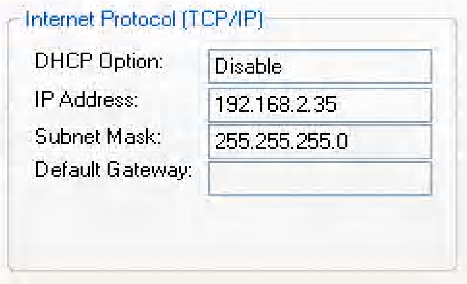
The Wireless Mode indicator shows the data rates the client card operates. There are two modes:

- 802.11b
- 802.11g (backward compatible to 802.11b)

3.1.4 Internet Protocol (TCP/IP)

The Internet Protocol specifies the format of packets, also called datagrams, and the addressing scheme. Most networks combine IP with a higher-level protocol called TCP, which establishes a virtual connection between a destination and a source.

Figure 15: TCP/IP Window



Internet Protocol (TCP/IP)

DHCP Option: Disable

IP Address: 192.168.2.35

Subnet Mask: 255.255.255.0

Default Gateway:

The parameters of the Internet Protocol are:

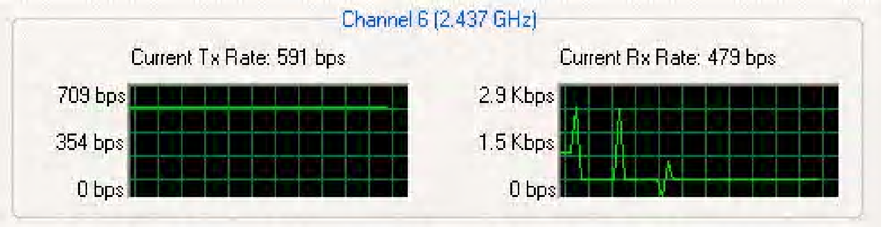
Table 2: TCP/IP Window Description

Field	Description
DHCP Option	Dynamic Host Configuration Protocol. Either enabled or disabled
IP Address	An identifier for a computer or device on a TCP/IP network. The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. Each number can be 0 to 255.
Subnet Mask	A mask used to determine what subnet an IP address belongs to. An IP address has two components, the network address and the host address. The first two numbers represent the Class B network address, and the second two numbers identify a particular host on this network.
Default Gateway	The default node on a network that serves as an entrance to another network. In enterprises, the gateway is the computer that routes the traffic from a workstation to the outside network that is serving the Web pages. In homes, the gateway is the ISP that connects the user to the internet.

3.1.5 Actual Throughput Performance

This section of the **Network Status** tab displays the Current Tx Rate and the Current Rx Rate of the channel being monitored.

Figure 16: Actual Throughput Performance Window



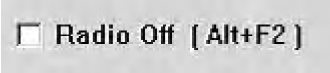
Note

These are actual throughput diagrams (without the WLAN overhead delivered by the client card).

3.1.6 Radio On/Off Box

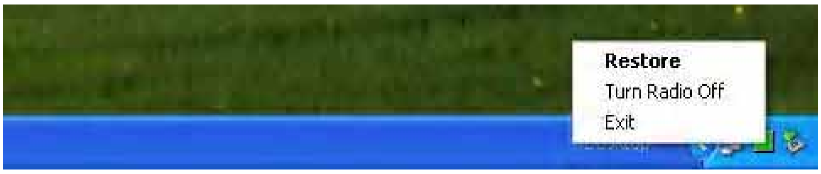
Clicking the **Radio Off** check box turns off the radio. Unchecking the box turns on the radio.

Figure 17: Radio On/Off Window



Another way to turn the radio on or off is to right-click the **Configuration Utility** icon in the **System Tray** and click **Turn Radio Off** to turn the radio off. When the radio is off, click **Turn Radio On** to turn the radio back on.

Figure 18: Radio Off Window



The system hot key (Alt+F2) is also used to turn the radio on/off.

When the radio is off, there is no radio activity, and the following property pages are disabled:

- Site Survey
- Statistics
- Advanced

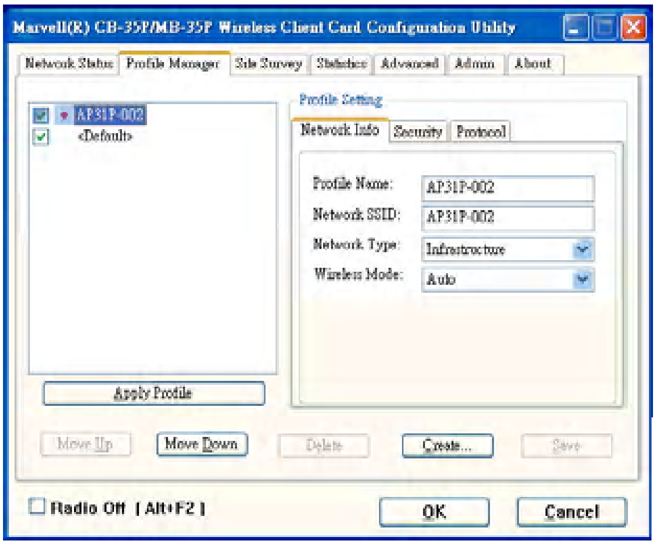
Note

This feature is disabled when Zero Configuration is enabled.

3.2 Profile Manager Tab

Clicking on the **Profile Manager** tab displays the **Profile Manager** dialog box. The Profile Manager displays the profiles available and allows you to create, modify, and delete profiles:

Figure 19: Profile Manager Window



Profile Name: AP31P-002
Network SSID: AP31P-002
Network Type: Infrastructure
Wireless Mode: Auto

□ Radio Off [Alt+F2]

Note

The Profile Manager window is not accessible when Zero Configuration is enabled.

PROFILE MANAGER—PROFILE LIST WINDOW

The window on the left side of this tab lists all of the profiles available. Highlighting a profile selects it. If the Default box next to the profile is checked, that profile is used in auto-configuration mode when the link is lost. If it is unchecked, that profile is excluded in auto-configuration. The controls associated with this window are:

Table 3: Profile List Window Description

Fields	Description
Apply Profile	Applies the profile selected or user call Apply the profile by double-clicking on the desired profile.
Move Up / Move Down	Moves the profile up and down in the window All profiles with the Network Type set to Infrastructure are displayed before the profiles with the Network Type set to Ad-Hoc. In auto-configuration mode, the checked priorities at the top of the list have higher priority than checked profiles at the bottom of the list.
Delete	Deletes a profile
Create	Creates a profile
Save	Saves changes made to a selected profile

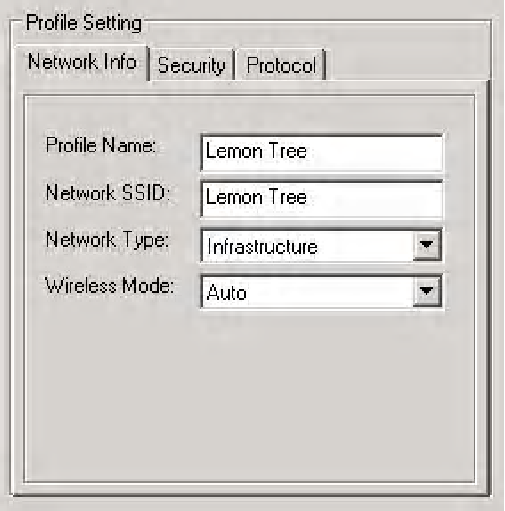
PROFILE MANAGER—PROFILE SETTING

The Profile Settings are used to display information about the profile selected in the **Profile List** window. The information is divided into three tabs: **Network Info**, **Security**, and **Protocol**.

3.2.1 Profile Setting—Network Info Tab

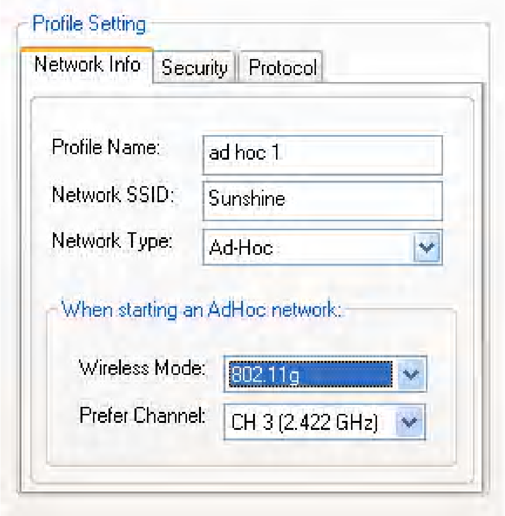
The **Profile Manager** initially displays the **Network Info** tab. The **Network Info** tab displays the following fields:

Figure 20: Network Info Tab—Infrastructure Network



Profile Name: Lemon Tree
Network SSID: Lemon Tree
Network Type: Infrastructure
Wireless Mode: Auto

Figure 21: Network Info Tab—Ad-Hoc Network



Profile Name: ad hoc 1
Network SSID: Sunshine
Network Type: Ad-Hoc

When starting an AdHoc network:

Wireless Mode: 802.11g
Prefer Channel: CH 3 (2.422 GHz)

Table 4: Network Info Description

Fields	Description
Profile Name	Profile name
Network SSID	Network SSID label
Network Type	**Infrastructure:** When an Infrastructure network is selected, the Profile Setting displays the Wireless Mode field. **Ad-Hoc**: When an Ad-Hoc network is selected, the Profile Setting displays an additional **Prefer Channel** field.
Wireless Mode	**Auto**: Connects to either 802.11g network or 802.11b network (Infrastructure network only). **802.11g**: Connects to either 802.11g or 802.11b network (Ad-Hoc network only). **802.11b**: Connects to 802.11b network only (Available in both Infrastructure and Ad-Hoc networks).
Prefer Channel	Channel being used (Ad-Hoc network only)

Note

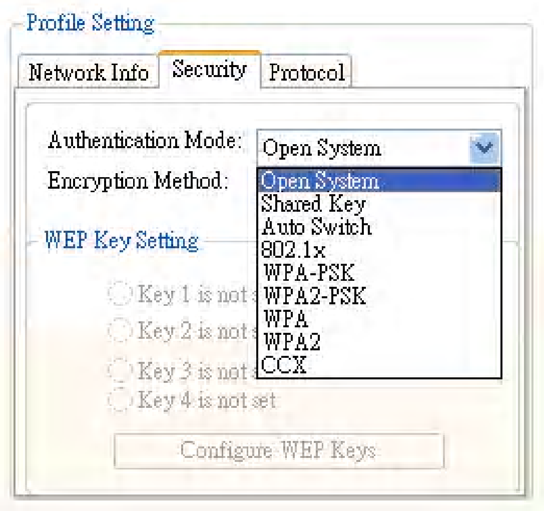
Prefer Channel and Wireless Mode are used only when an Ad-Hoc network is started by the client card. These two attributes are ignored if the client card is connected to an existing Ad-Hoc network with the same desired SSID.

3.2.2 Profile Setting—Security Tab

Clicking on the Security tab displays the following security options:

- Authentication Mode
- Encryption Method (Security off, WEP, TKIP, and AES)
- WEP Key Setting (Passphrase Key or Authentication Protocol)

Figure 22: Authentication Modes



Authentication Mode: Open System

3.2.2.1 Non-WPA Authentication Modes

The Foxconn Configuration Utility currently supports the following non-WPA authentication modes:

- **Open System**—Open Authentication (no key or a pre-shared wired equivalent privacy (WEP) key is required)
- **Shared Key**—Shared Authentication (a pre-shared wired equivalent privacy (WEP) key is required)
- **Auto Switch**—Auto Select Authentication modes (Open System or Shared Key, WEP key required)

3.2.2.2 WPA Authentication Modes

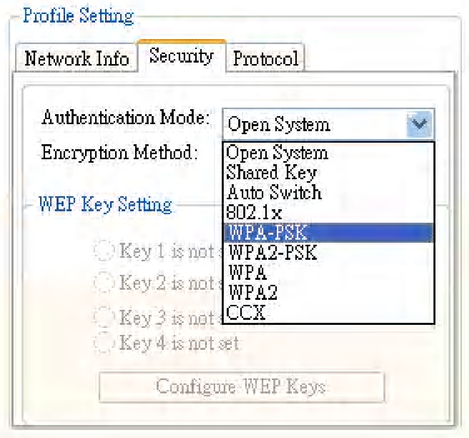
The Foxconn Configuration Utility currently supports the following WPA Authentication Modes:

- 802.1x (TLS/PEAP)
- WPA-PSK
- WPA2-PSK
- WPA (TLS/PEAP/LEAP)
- WPA2 (TLS/PEAP/LEAP)
- CCX (LEAP)

3.2.2.2.1 WPA-PSK/WPA2-PSK Support

In Infrastructure Mode, if WPA-PSK/WPA2-PSK is selected as the Authentication Mode, either TKIP or AES is selected as the Encryption Method.

Figure 23: WPA-PSK/WPA2-PSK Authentication



Profile Setting

Network Info | Security | Protocol

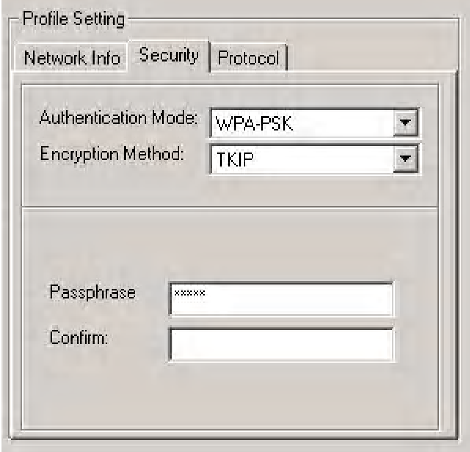
Authentication Mode: Open System

Encryption Method:

- Open System
- Shared Key
- Auto Switch
- 802.1x
- WPA-PSK
- WPA2-PSK
- WPA
- WPA2
- CCX

WEP Key Setting

Figure 24: WPA-PSK/WPA2-PSK with TKIP



Profile Setting

Network Info | Security | Protocol

Authentication Mode: WPA-PSK

Encryption Method: TKIP

Passphrase: xxxxx

Confirm:

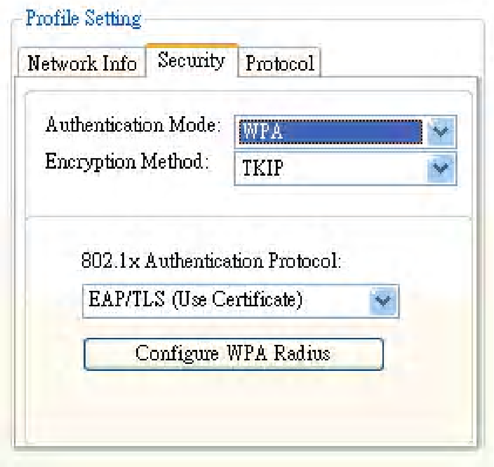
- Enter the network passphrase in the “Passphrase” and “Confirm” fields.
- WPA-PSK/WPA2-PSK is not supported in Ad-Hoc network mode.

3.2.2.2.2 802.1x/WPA/WPA2 EAP-TLS Support

If 802.1x/WPA/WPA2 is selected, AES or TKIP encryption is available, and a certificate is required for the authentication.

1. To connect to an AP through the Radius Server, select 802.1x/WPA/WPA2 as the Authentication Mode.
2. Select WEP, TKIP, or AES as the Encryption Method.
3. Select EAP/TLS (Use Certificate) as the 802.1x Authentication Protocol.

Figure 25: 802.1x/WPA/WPA2 EAP-TLS Authentication



Profile Setting

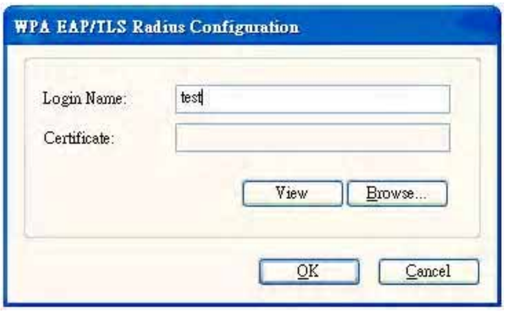
Authentication Mode: WPA

Encryption Method: TKIP

802.1x Authentication Protocol: EAP/TLS (Use Certificate)

4. Click the **Configure WPA Radius** button to configure security settings.

Figure 26: 802.1x/WPA/WPA2 EAP-TLS Radius Configuration



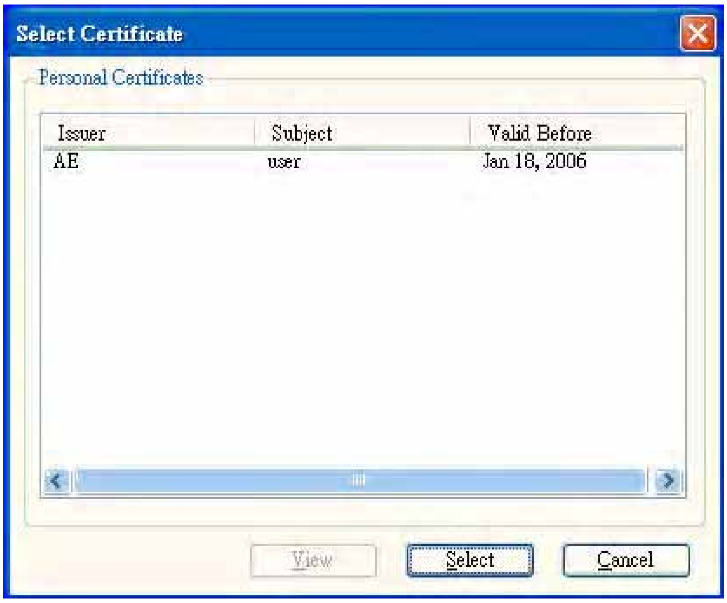
WPA EAP/TLS Radius Configuration

Login Name: test

Certificate:

5. Click the **Browse** button to activate the dialog for selecting a certificate.
6. Before clicking the **OK** button to exit the dialog, make sure that the Login Name is entered.

Figure 27: Select Certificate Window

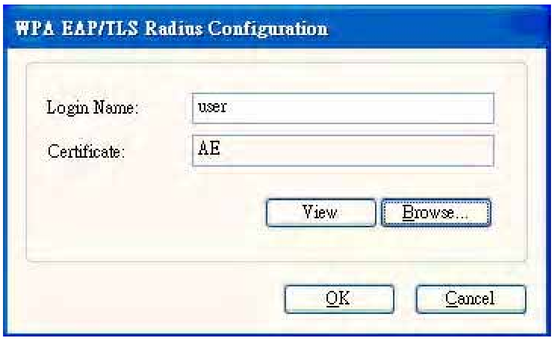


Select Certificate

Personal Certificates

Issuer	Subject	Valid Before
AE	user	Jan 18, 2006

Figure 28: WPA Radius Configuration with Certificate



WPA EAP/TLS Radius Configuration

Login Name: user

Certificate: AE

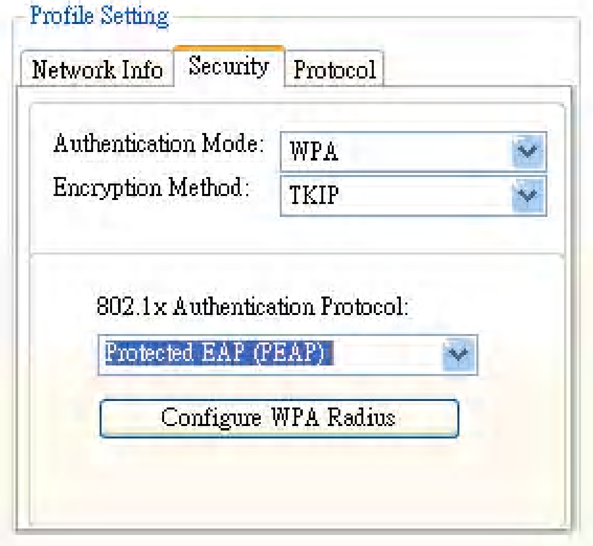
Table 5: 802.1x/WPA/WPA2 EAP-TLS Radius Configuration

Fields	Description
Login Name	Login name to the RADIUS server
Certificate	Certificate selected for authentication
View	View button to view the selected certificate
Browse	Browse button to select the certificate

3.2.2.2.3 802.1x/WPA/WPA2 PEAP Support in Infrastructure Mode

To connect to an AP through the Radius Server, select 802.1x/WPA/WPA2 as the Authentication Mode, Protected EAP (PEAP) as the Authentication Protocol, and AES or TKIP as the Encryption Method.

Figure 29: 802.1x/WPA/WPA2 PEAP Authentication



Profile Setting

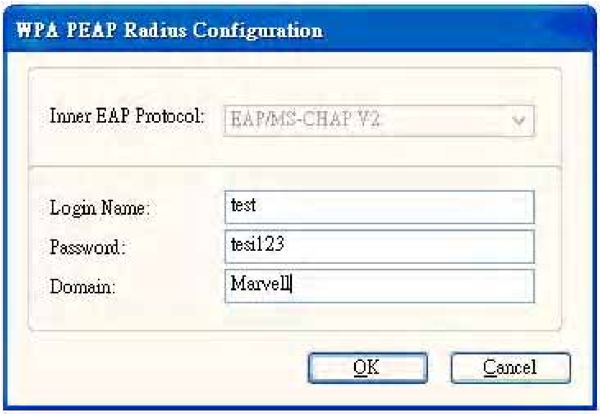
Authentication Mode: WPA

Encryption Method: TKIP

802.1x Authentication Protocol: Protected EAP (PEAP)

Clicking on the **Configure WPA Radius** button displays the WPA PEAP Radius Configuration window. Enter all of the required information. Click **OK** button to set the configuration.

Figure 30: 802.1x/WPA/WPA2 PEAP Radius Configuration



WPA PEAP Radius Configuration

Inner EAP Protocol: EAP/MS-CHAP V2

Login Name: test

Password: tesi123

Domain: Marvell

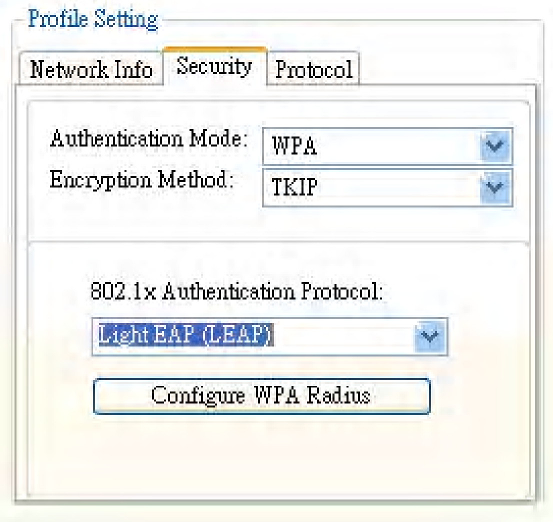
Table 6: WPA PEAP Radius Configuration

Fields	Description
Inner EAP Protocol	Currently supports EAP/MS-CHAP V2 only
Login Name	Login name to the RADIUS server
Password	Password to login to the RADIUS server
Domain	Domain name for login to the RADIUS server (optional)

3.2.2.2.4 WPA/WPA2 EAP/LEAP

To connect to an AP through the Radius Server, select WPA/WPA2 as the Authentication Mode, Light EAP (LEAP) as the 802.1x Authentication Protocol, and TKIP as the Encryption Method for WPA LEAP or AES as the Encryption Method for WPA2 LEAP.

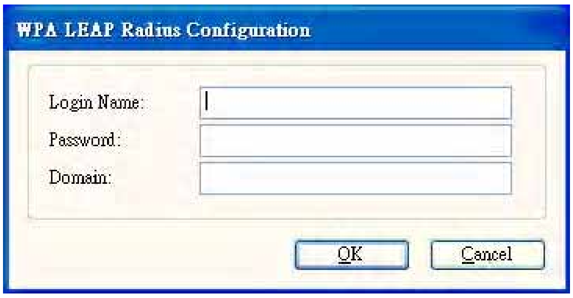
Figure 31: WPA/WPA2 EAP/LEAP Authentication



Authentication Mode: WPA
Encryption Method: TKIP
802.1x Authentication Protocol: Light EAP (LEAP)

Clicking on the **Configure WPA Radius** button configures the security settings displays the **WPA LEAP Radius Configuration** Window. Enter all the required information. Click **OK** button to set the configuration.

Figure 32: WPA/WPA2 EAP/LEAP Radius Configuration



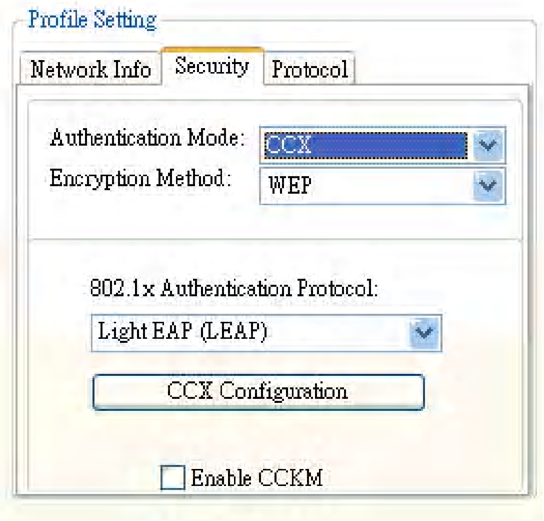
WPA LEAP Radius Configuration

Login Name:
Password:
Domain:

3.2.2.2.5 CCX EAP/LEAP

To connect to a Cisco® AP through the Radius Server, select CCX EAP/LEAP. WEP is the encryption method and the key is generated automatically.

Figure 33: CCX EAP/LEAP Authentication

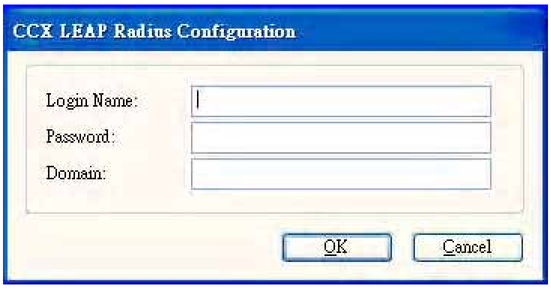


Authentication Mode: CCX
Encryption Method: WEP
802.1x Authentication Protocol: Light EAP (LEAP)
□ Enable CCKM

If **Enable CCKM** is checked, the Cisco Centrailized Key Management (CCKM) is enabled.

Clicking on the **CCX Configuration** button displays the **CCX LEAP Radius Configuration** window. Enter all the required information in CCX configuration box. Click **OK** button to set CCX EAP/LEAP configuration.

Figure 34: CCX EAP/LEAP Radius Configuration



Login Name:
Password:
Domain:

Table 7: CCX EAP/LEAP Radius Configuration

Fields	Description
Login Name	Login name to the RADIUS server.
Password	Password to login to the RADIUS server.
Domain	Domain name to login to the RADIUS server (optional).

3.2.2.3 Encryption Methods

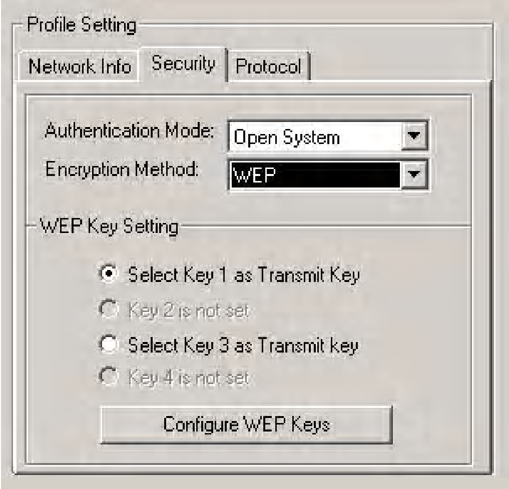
The following encryption methods are available, depending on the Authentication Mode:

- Security Off
- WEP
- TKIP
- AES

3.2.2.4 WEP Key Settings

If the WEP Encryption method is selected, the security tab displays the WEP Key Setting. To configure the WEP keys, select any WEP Key Setting and press the **Configure WEP Keys** button.

Figure 35: WEP Key Settings



Profile Setting

Network Info | Security | Protocol

Authentication Mode: Open System

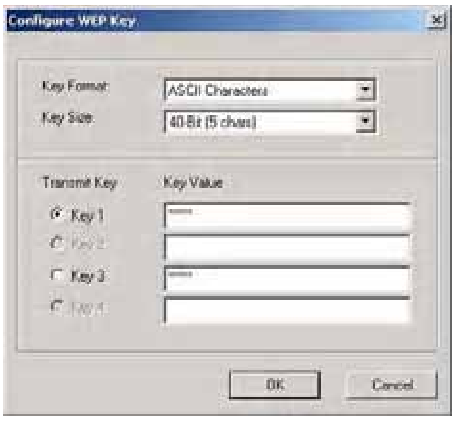
Encryption Method: WEP

WEP Key Setting

● Select Key 1 as Transmit Key
○ Key 2 is not set
○ Select Key 3 as Transmit key
○ Key 4 is not set

Clicking the **Configure WEP Keys** button displays the **Configure WEP Key** dialog box:

Figure 36: WEP Key Configuration



Configure WEP Key

Key Format: ASCII Characters

Key Size: 40-Bit (5 chars)

Transmit Key | Key Value

● Key 1 *****
○ Key 2
○ Key 3 *****
○ Key 4

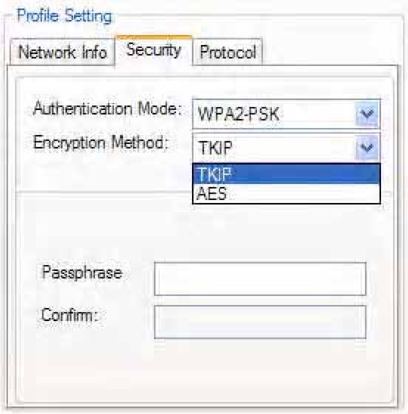
Table 8: WEP Key Configuration

Fields	Description
Key Format	Either ASCII characters or hexadecimal digits
Key Size	40-bit, 5 character ASCII key size (40-bit, 10 character hexadecimal) 104-bit, 13 character ASCII key size (104-bit, 26 character hexadecimal)
Transmit Keys	There are four transmit keys. The key value is in ASCII or hexadecimal, depending on the format selected. The WEP key size shown depends on the key size selected.

3.2.2.5 TKIP/AES Settings

If TKIP/AES is selected and the authentication mode is WPA-PSK or WPA2-PSK, the security tab displays the TKIP/AES passphrase settings. Enter the passphrase into the **Passphrase** and **Confirm** boxes. Click **OK**.

Figure 37: TKIP/AES Settings



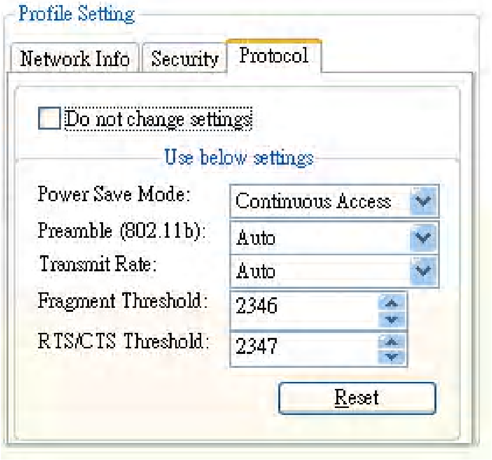
Authentication Mode: WPA2-PSK

Encryption Method: TKIP

3.2.3 Profile Setting—Protocol

The protocol tab allows you to set or change the protocol information.

Figure 38: Profile Setting—Protocol Window



□ Do not change settings

Use below settings

Power Save Mode: Continuous Access

Preamble (802.11b): Auto

Transmit Rate: Auto

Fragment Threshold: 2346

RTS/CTS Threshold: 2347

Do not change settings

If this box is checked, the protocol setting is not changed when the profile is applied.

Use below settings

When the **Do not change setting** box is unchecked, the protocol settings include:

Table 9: Protocol Window Description

Fields	Description
Power Save Mode	Sets the power mode. Available options are Continuous Access or Max Power Save. The default is Continuous Access.
Preamble (802.11b)	Sets the Radio Preamble to Auto, short, or Long. This option takes effect only when attaching to an 802.11b network.
Transmit Rate	The range of the data rate depends on the type of AP that the client card is connected to. The default setting is Auto Select.
Fragment Threshold	Sets the fragmentation threshold (the size that packets are fragmented into for transmission). The default setting is 2346.
RTS/CTS Threshold	Sets the packet size at which the AP issues a Request-To-Send (RTS) or Clear-to-Send (CTS) frame before sending the packet. The default setting is 2347.
Reset button	Resets the protocol settings to their default values.

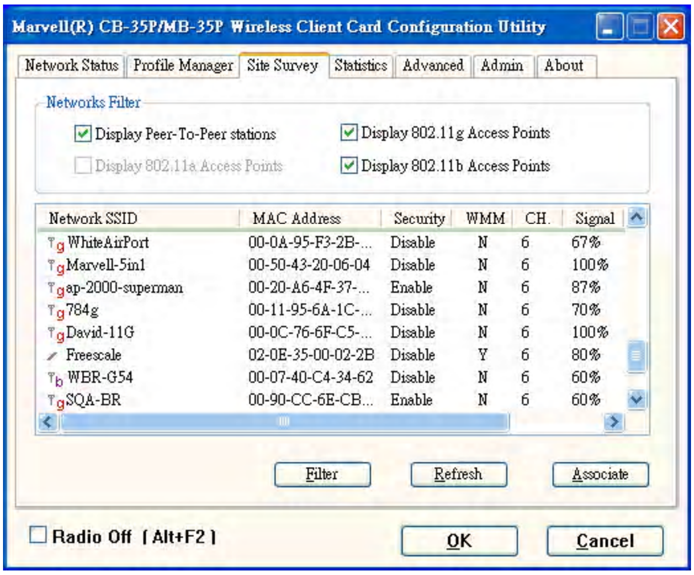
3.3 Site Survey Tab

Clicking on the **Site Survey** tab displays the **Site Survey** dialog box.

There are two ways to connect to a network through the **Site Survey** Window:

- Double click on the network
- Select network and click the **Associate** button

Figure 39: Site Survey Tab



Networks Filter

☑ Display Peer-To-Peer stations
☑ Display 802.11g Access Points
□ Display 802.11a Access Points
☑ Display 802.11b Access Points

Network SSID	MAC Address	Security	WMM	CH.	Signal
g WhiteAirPort	00-0A-95-F3-2B-...	Disable	N	6	67%
g Marvell-5in1	00-50-43-20-06-04	Disable	N	6	100%
g ap-2000-superman	00-20-A6-4F-37-...	Enable	N	6	87%
g 784g	00-11-95-6A-1C-...	Disable	N	6	70%
g David-11G	00-0C-76-6F-C5-...	Disable	N	6	100%
Freescale	02-0E-35-00-02-2B	Disable	Y	6	80%
b WBR-G54	00-07-40-C4-34-62	Disable	N	6	60%
g SQA-BR	00-90-CC-6E-CB...	Enable	N	6	60%

□ Radio Off (Alt+F2)

This tab shows a list of all of the peer-to-peer and AP stations within range of the adapter.

3.3.1 Site Survey—Access Point Filter

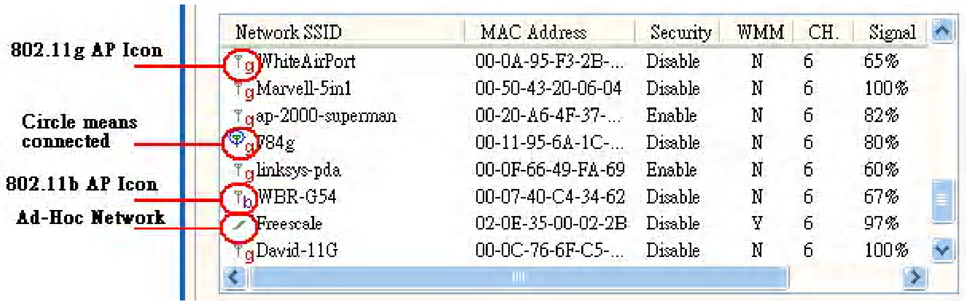
This section is used to customize which sites are displayed in the Site Survey list window:

- **Display Peer-To-Peer stations**—checking this box displays all of the peer-to-peer stations within range.
- **Display 802.11a Access Points**—disabled (not supported in CB-35P/MB-35P).
- **Display 802.11g Access Points**—checking this box displays all of the 802.11g APs within range.
- **Display 802.11b Access Points**—checking this box displays all of the 802.11b APs within range.

3.3.2 Site Survey—List Window

This window reports information on the Ad-Hoc or AP stations detected:

Figure 40: Site Survey List Window



Network SSID	MAC Address	Security	WMM	CH.	Signal
WhiteAirPort	00-0A-95-F3-2B-...	Disable	N	6	65%
Marvell-5in1	00-50-43-20-06-04	Disable	N	6	100%
ap-2000-superman	00-20-A6-4F-37-...	Enable	N	6	82%
784g	00-11-95-6A-1C-...	Disable	N	6	80%
linksys-pda	00-0F-66-49-FA-69	Enable	N	6	60%
WBR-G54	00-07-40-C4-34-62	Disable	N	6	67%
Freescale	02-0E-35-00-02-2B	Disable	Y	6	97%
David-11G	00-0C-76-6F-C5-...	Disable	N	6	100%

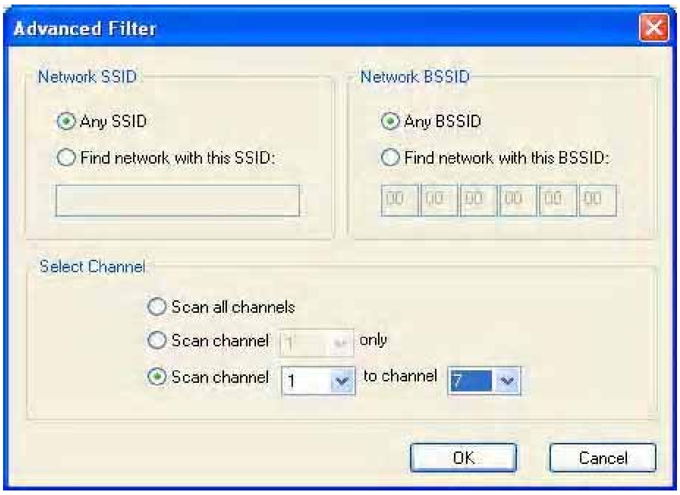
Table 10: Site Survey List Window Description

Fields	Description
Network SSID	Network SSID label; i.e., the Network Name. The Network Name is a text string.
MAC Address	MAC address, a hardware address that uniquely identifies each node of a network.
Security	Security enabled or disabled
CH	Channel used by the detected device
WMM	Wireless Multimedia Enhancements (WMM) supported by the detected device.
Signal	Signal strength of the detected device as a percentage
Icons	The following icons may be displayed on the left side of the Network SSID column: • An antenna icon with a superscript b indicates an 802.11b AP. • An antenna icon with a superscript g indicates an 802.11g AP. • A circle around the icon means the adapter is connected to this network. • A slash icon indicate an Ad-Hoc network.

3.3.3 Site Survey—Filter Button

Clicking the **Filter** button displays the **Advanced Filter** dialog box:

Figure 41: Site Survey Filter Button Window



Advanced Filter

Network SSID

● Any SSID

○ Find network with this SSID:

Network BSSID

● Any BSSID

○ Find network with this BSSID: 00 00 00 00 00 00

Select Channel

○ Scan all channels

○ Scan channel 1 only

● Scan channel 1 to channel 7

3.3.3.1 Network SSID

- **Any SSID**—if selected, no specific SSID is used when scanning for available network in the area.
- **Find network with this SSID**—if selected, the utility searches for the specified SSID.

3.3.3.2 Network BSSID

- **Any BSSID**—if selected, no specific BSSID is used when scanning for available network in the area.
- **Find network with this BSSID**—if selected, the utility searches for the specified BSSID.

3.3.3.3 Select Channel

- **Scan all channels—**all channels are scanned when searching for the available networks in the area.
- **Scan channel Only—**only specified channel is scanned when searching for the available networks in the area.
- **Scan Channel to Channel—**a range of channels are scanned when searching for the available networks in the area.

3.3.4 Site Survey—Refresh Button

Clicking the **Refresh** button requests a survey of the wireless networks in the area.

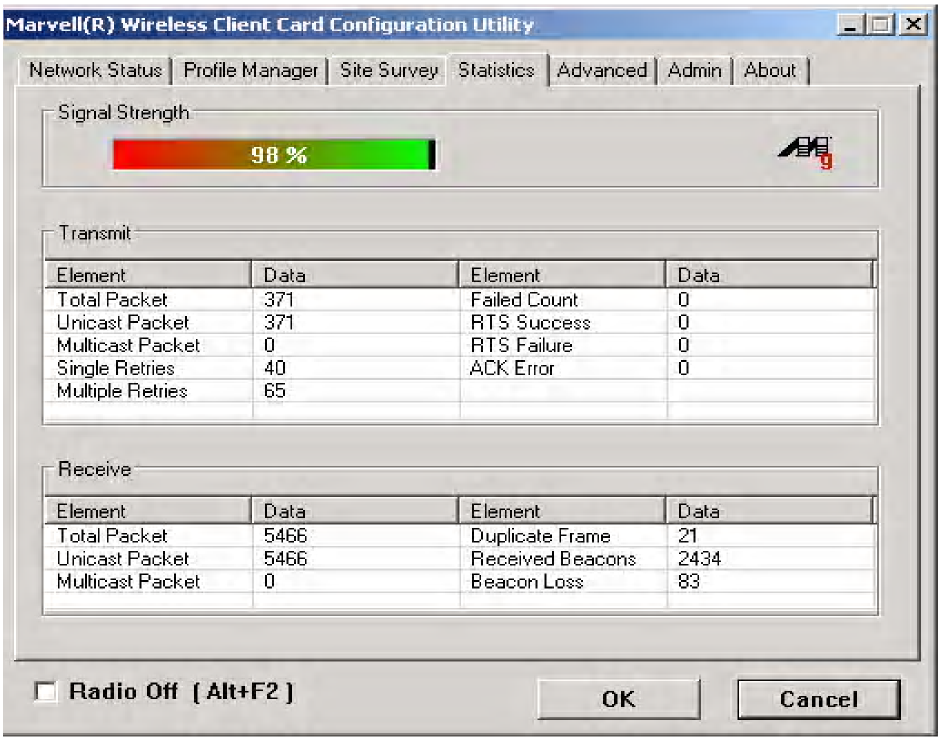
3.3.5 Site Survey—Associate Button

Select an available network, and then click the **Associate** button requests to establish a connection.

3.4 Statistics Tab

Clicking on the **Statistics** tab displays the statistics of the current connect session:

Figure 42: Statistics Window



Transmit

Element	Data	Element	Data
Total Packet	371	Failed Count	0
Unicast Packet	371	RTS Success	0
Multicast Packet	0	RTS Failure	0
Single Retries	40	ACK Error	0
Multiple Retries	65		

Receive

Element	Data	Element	Data
Total Packet	5466	Duplicate Frame	21
Unicast Packet	5466	Received Beacons	2434
Multicast Packet	0	Beacon Loss	83

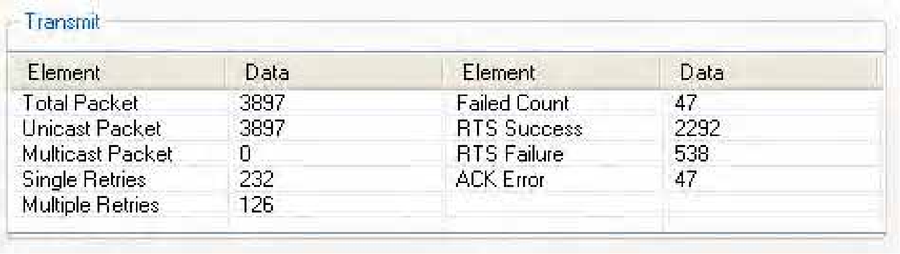
3.4.1 Signal Strength

The color-coded Signal Strength bar displays the signal strength of the last packet received by the adapter. Signal strength is reported as a percentage. A signal in the red indicates a bad connection. A signal in the green indicates a good connection.

3.4.2 Transmit Window

The **Transmit** window displays the information on the packets sent:

Figure 43: Transmit Window



Transmit

Element	Data	Element	Data
Total Packet	3897	Failed Count	47
Unicast Packet	3897	RTS Success	2292
Multicast Packet	0	RTS Failure	538
Single Retries	232	ACK Error	47
Multiple Retries	126		

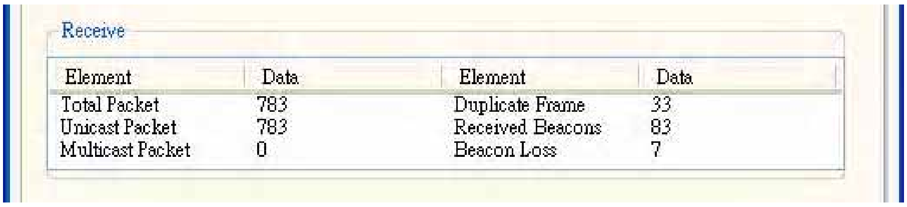
Table 11: Transmit Window Description

Fields	Description
Total Packet	Reports the total number of packets transmitted.
Unicast Packet	Reports the number of packets transmitted by the adapter that were destine for a single network node.
Multicast Packet	Reports the number of packets transmitted by the adapter that were destine for more than one network node.
Single Retries	Reports the number of packets that require one retry before the adapter received an acknowledgement. **NOTE:** After the adapter sends a packet, it waits for an acknowledge from the receiving radio to confirm that the packet was successfully received. If the acknowledge is not received within a specified period of time, the adapter retransmits the packet.
Multiple Retries	Reports the number of packets that require more than one retry before the adapter received an acknowledgement.
Failed Count	Reports the number of packets that were not successfully transmitted because the adapter did not receive an acknowledgement within the specified period of time.
RTS Success	Reports the number of RTS attempts that were successful.
RTS Failure	Reports the number of RTS attempts that were not successful.
ACK Error	Reports the number of unicast transmit attempts for which no acknowledgement was received.

3.4.3 Receive Window

The **Receive** window displays the information on the packets received:

Figure 44: Receive Window



Receive

Element	Data	Element	Data
Total Packet	783	Duplicate Frame	33
Unicast Packet	783	Received Beacons	83
Multicast Packet	0	Beacon Loss	7

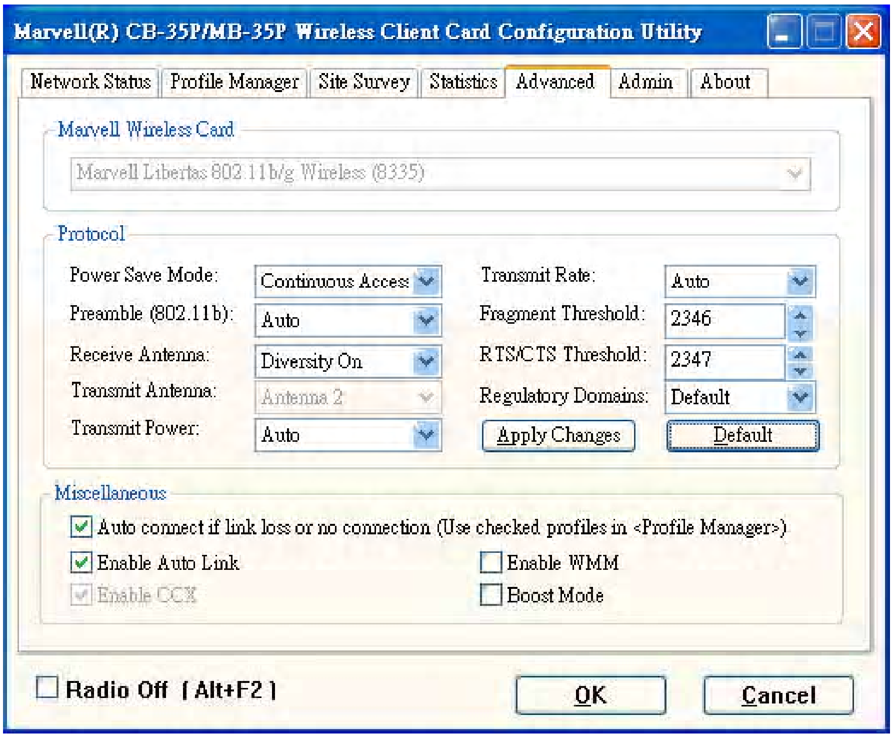
Table 12: Receive Window Description

Fields	Description
Total Packet	Reports the total number of packets received.
Unicast Packet	Reports the number of packets received by the adapter that were destined for a single network node.
Multicast Packet	Reports the number of packets received by the adapter that were destined for more than one network node.
Duplicate Frame	Reports the number of duplicate frames received.
Received Beacons	Reports the number of beacons received after association is established.
Beacon Loss	Reports the number of missing beacons after association is established.

3.5 Advanced Tab

Clicking on the **Advanced** tab displays the **Advanced** dialog box.

Figure 45: Advanced Tab



Marvell Wireless Card: Marvell Libertas 802.11b/g Wireless (8335)

Protocol

Power Save Mode:	Continuous Acces	Transmit Rate:	Auto
Preamble (802.11b):	Auto	Fragment Threshold:	2346
Receive Antenna:	Diversity On	RTS/CTS Threshold:	2347
Transmit Antenna:	Antenna 2	Regulatory Domains:	Default
Transmit Power:	Auto		

Miscellaneous

☑ Auto connect if link loss or no connection (Use checked profiles in <Profile Manager>)

☑ Enable Auto Link ☐ Enable WMM

☑ Enable CCX ☐ Boost Mode

☐ Radio Off [Alt+F2]

Note

The Advanced Tab page is not accessible when Zero Configuration is enabled.

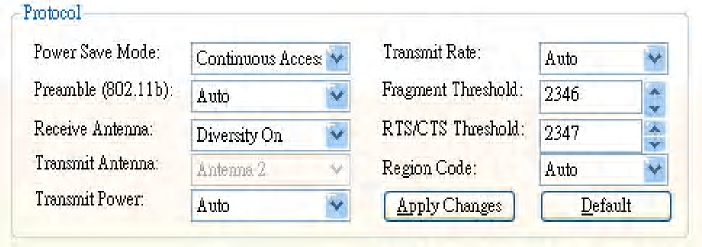
3.5.1 Advanced Tab—Foxconn Wireless Card

This window reports the type of Foxconn WLAN adapter installed.

3.5.2 Advanced Tab—Protocol

This section of the Advanced tab sets the **Protocol** options:

Figure 46: Protocol Window



Protocol

Power Save Mode: Continuous Acces

Preamble (802.11b): Auto

Receive Antenna: Diversity On

Transmit Antenna: Antenna 2

Transmit Power: Auto

Transmit Rate: Auto

Fragment Threshold: 2346

RTS/CTS Threshold: 2347

Region Code: Auto

Table 13: Advanced Tab Protocol Window Description

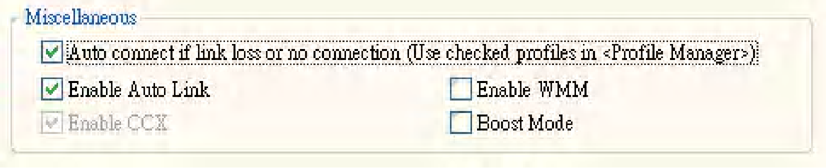
Fields	Description
Power Save Mode	Sets the power mode: • Continuous Access • Max Power Save
Preamble (802.11b)	Sets the radio preamble (takes effect only when attaching to 802.11b networks): • Auto • Short • Long
Receive Antenna	Sets the Receive Antenna mode, either: • Diversity On • Diversity Off •
Transmit Antenna	Fixed at Antenna 2
Transmit Power	Sets the power mode: • Auto • High • Medium • Low
Transmit Rate	Data transmit rate The range of the data rate depends on the type of AP that the client card is connected to. The default setting is Auto.
Fragment Threshold	Sets the fragmentation threshold (i.e., the size that packets are fragmented into for transmission). The default setting is 2346.
RTS/CTS Threshold	Sets the packet size at which the AP issues a RTS (or CTS) frame before sending the packet. The default setting is 2347.

Table 13: Advanced Tab Protocol Window Description

Fields	Description
Region Code	Sets the regulatory domains: • Default • FCC/IC • Spain • France • MKK • MKK1 • Israel • Other **NOTE:** Set Default to select region as manufacture default. Set “Other” to customize frequency channels.
Apply Changes or Default buttons	Configures the options according to the changes entered or applies the default values.

3.5.3 Advanced Tab—Miscellaneous

Figure 47: Miscellaneous Window



Miscellaneous

☑ Auto connect if link loss or no connection (Use checked profiles in <Profile Manager>)

☑ Enable Auto Link

□ Enable WMM

☑ Enable CCX

□ Boost Mode

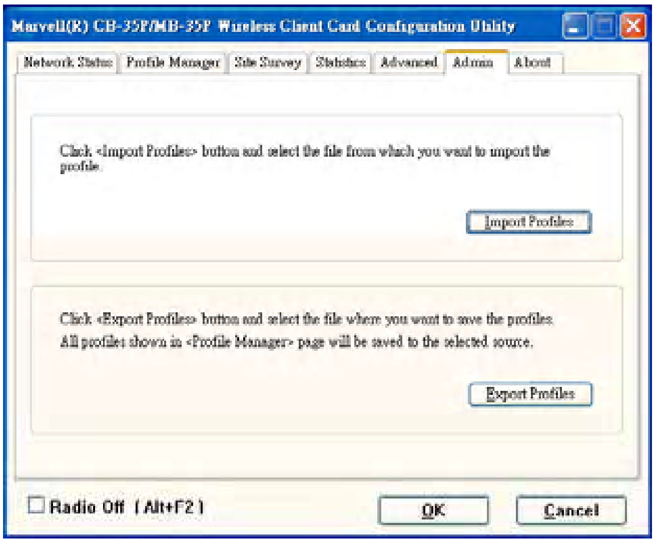
Table 14: Advanced Tab Miscellaneous Window

Field	Description
Auto Correct if link or no connection (Use checked profiles in <Profile Manager>	Uncheck this box to disable the auto-configuration feature. Whenever there is a link loss, auto-configuration tries to establish a connection using the checked profiles in the **Profile Manager** window.
Enable AutoLink	Check this box to enable/disable the AutoLink feature (see Section 2.4 "AutoLink" on page 16).
Enable CCX	Fixed CCX enabled.
Enable WMM	Check this box to enable/disable the Wireless Multimedia Enhancements (WMM) feature.
Boost Mode	Check this box for performance enhancement.

3.6 Admin Tab

Clicking the **Admin** tab displays the **Admin** dialog box. This tab allows you to import and export profiles.

Figure 48: Configuration Utility Window with Admin Tab



Click <Import Profiles> button and select the file from which you want to import the profile.

Click <Export Profiles> button and select the file where you want to save the profiles.
All profiles shown in <Profile Manager> page will be saved to the selected source.

3.6.1 Admin Tab—Import Profiles

To import a profile:

1. Click the **Import Profiles** button.
2. Select the path and filename of the profile.
3. Click **Open.**

3.6.2 Admin Tab—Export Profiles

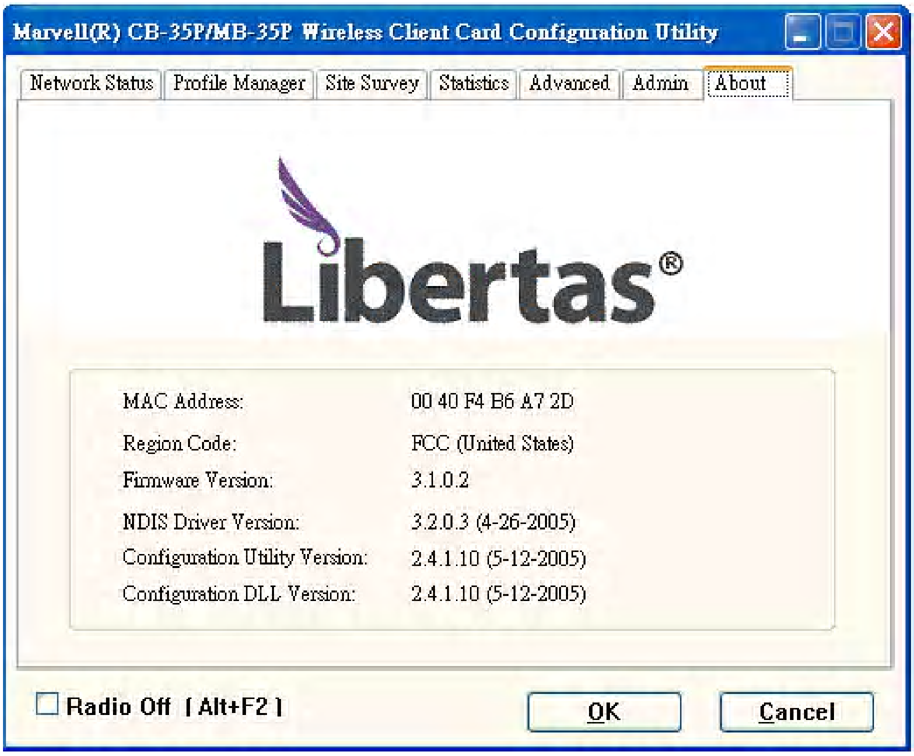
To export a profile:

1. Click the **Export Profiles** button.
2. Select or enter the path and filename of the profile.
3. Click **Save.**

3.7 About Tab

Clicking on the **About** tab displays the **About** dialog box, as shown in the following example.

Figure 49: About Tab Window



MAC Address: 00 40 F4 B6 A7 2D

Region Code: FCC (United States)

Firmware Version: 3.1.0.2

NDIS Driver Version: 3.2.0.3 (4-26-2005)

Configuration Utility Version: 2.4.1.10 (5-12-2005)

Configuration DLL Version: 2.4.1.10 (5-12-2005)

Appendix A. Acronyms and Abbreviations

Table 15: Acronyms and Terms

Term	Definition
802.11	A family of specifications developed by the IEEE for WLAN technology.
802.11a	An extension to 802.11 WLAN standard that provides up to 54 Mbps transmission in the 5 GHz UNII radio band.
802.11b	An extension to 802.11 WLAN standard that provides up to 11 Mbps transmission in the 2.4 GHz ISM radio band. 802.11b uses DSSS modulation.
802.11g	An extension to 802.11 WLAN standard that provides up to 54 Mbps transmission in the 2.4 GHz ISM radio band. 802.11g uses OFDM modulation and is backwards compatible with 802.11b.
AC	Admission Control
Ad-Hoc	A group of computers each with wireless adapters, connected as an independent WLAN.
AES	Advanced Encryption Standard
AP	Access Point
ATIM	Announced Traffic Indication Message
BBP	Baseband Processor
BSS	Basic Service Set
BSSID	Basic Service Set ID
CardBus	The 32-bit version of the PCMCIA PC Card standard. In addition to supporting a wider bus (32 bits instead of 16 bits), CardBus also support bus mastering and operation speeds up to 33 MHz.
CCMP	Counter mode with Cipher Block Chaining Message protocol
CCX	Cisco Compatible Extensions
CE	European health and safety label
CF	CompactFlash
CTS	Clear to Send
DGT	Directorate General of Telecommunications Taiwan
DHCP	Dynamic Host Configuration Protocol
DMA	Direct Memory Access
DRV	Driver
DSL	Digital Subscriber Line
DSR	Delayed Service Routine

Table 15: Acronyms and Terms

Term	Definition
DSSS	Direct Sequence Spread Spectrum. DSSS is one of two types of spread spectrum radio. The other is frequency-hopping spread spectrum (FHSS).
DTIM	Delivery Traffic Indication Message
EAP	Extensible Authentication Protocol
EAPOL	EAP Over LAN
EAP-TLS	EAP Transport Layer Security (RFC2716)
ESSID	Extended Service Set Identifier
G Protection	Secures the 802.11g client’s traffic in an environment where both 80211g and 802.11b clients are transmitting.
GUI	Graphical User Interface
IAPP	International Association of Privacy Professionals
IBSS	Independent Basic Service Set (“Ad-Hoc”)
ICV	Integrity Check Vector
IEEE	Institute of Electrical and Electronics Engineers
LAN	Local Area Network
MAC	Medium Access Controller
MIC	Message integrity check
MSDU	MAC Service Data Unit
NAS	Network Access Server
NDIS	Network Driver Interface Specification
NIC	Network Interface Card
OCB	Offset Codebook Block mode
OFDM	Orthogonal Frequency Division Multiplexing
OID	Object Identifier
OS	Operating System
PCI	Peripheral Component Interconnect
PCMCIA	Personal Computer Memory Card International Association
PEAP	Protected EAP
PHY	Physical Layers
PMK	Pairwise Master Key
PSK	Pre-Shared Keys
PWK	Pair Wise Key
QoS	Quality of Service
RADIUS	Remote Authentication Dial In User Service

Table 15: Acronyms and Terms

Term	Definition
RF	Radio Frequency
RSN	Robust Secure Network
RSSI	Received Signal Strength Indication
RTS	Request to Send
SoC	System-on-Chip
SPI	Serial Peripheral Interface
SSID	Service Set Identifier. A 32-character unique identifier attached to the header of packets sent over a WL/AN that acts as a password when a mobile device tries to connect to the BSS.
TCP/IP	Transmission Control Protocol/Internet Protocol
TIM	Traffic Information Map
TKIP	Temporal Key Integrity Protocol
TLS	Transport Layer Security
TSC	Transmit Sequence Counter
UART	Universal Asynchronous Receiver / Transmitter
USB	Universal Serial Bus
WAN	Wide Area Network
WDS	Wireless Distribution System
WEP	Wired Equivalent Privacy. A security protocol for WLANs defined in the IEEE 802.11 standard.
Wi-Fi	Wireless Fidelity (IEEE 802.11)
WLAN	Wireless Local Area Network
WMM	Wi-Fi Multimedia Enhancements
WOW	Wake on Wireless
WPA	Wi-Fi Protected Access
WPA2	Wi-Fi Protected Access 2. The next generation of Wi-FI security, based on the final 802.11i standard.
WPA2-PSK	Wi-Fi Protected Access 2-Pre-shared Keys
WPA-PSK	Wi-Fi Protect Access-Pre-shared Keys
WZC	Wireless Zero Configuration System

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 is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

Labeling Rule for the End Product Which Integrate this Module

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users The final end product must be labeled in a visible area with the following statement: "Contains TX FCC ID: **MCLJ20H018**".

Information Needed to be Included in the Users Manual of the End Product

The users manual for OEM integrators must include the following information in a prominent location " IMPORTANT NOTE: To comply with FCC RF exposure compliance requirements, the antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.”

IC statement

"This device has been designed to operate with an antenna having a maximum gain of [2] dB. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is [50] ohms."

"To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication".