Access Point

AT-WL2411

Installation and User's Guide

VERSION 1.80

PN 613-50229-00 Rev C

Allied Telesyn

Simply connecting the IP world

Electrical Safety and Emission Statement

Standards: This product meets the following standards.

U.S. Federal Communications Commission	
Declaration Of Conformity	
Manufacture Name:	Allied Telesyn, Inc.
Manufacture Address:	960 Stewart Drive, Suite B Sunnyvale, CA 94085 USA
Manufacture Telephone:	408-730-0950
Declares that the product:	Access Point
Model Numbers:	AT-WL2411
This product complies with FCC Part 15B, Class B Limits:	
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device must not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.	
Radiated Energy	
Note: This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of 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 instructions, may 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 the 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.	
Changes and modifications not expressly approved by the manufacturer or registrant of this equipment can void your authority to operate this equipment under Federal Communications Commission rules.	

Canadian Department of Communications
This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.
Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

RFI Emission	EN55022 Class B ☞ **1**
Immunity	EN55024 ☞ **2**
Electrical Safety	EN60950 (TUV), UL1950 (UL/cUL) ☞ **3**

Important: Appendix C contains translated safety statements for installing this equipment. When you see the ☞, go to Appendix C for the translated safety statement in your language.

Wichtig: Anhang C enthält übersetzte Sicherheitshinweise für die Installation dieses Geräts. Wenn Sie ☞ sehen, schlagen Sie in Anhang C den übersetzten Sicherheitshinweis in Ihrer Sprache nach.

Vigtigt: Tillæg C indeholder oversatte sikkerhedsadvarsler, der vedrører installation af dette udstyr. Når De ser symbolet ☞, skal De slå op i tillæg C og finde de oversatte sikkerhedsadvarsler i Deres eget sprog.

Belangrijk: Appendix Cbevat vertaalde veiligheidsopmerkingen voor het installeren van deze apparatuur. Wanneer u de ☞ ziet, raadpleeg Appendix C voor vertaalde veiligheidsinstructies in uw taal.

Important: L'annexe C contient les instructions de sécurité relatives à l'installation de cet équipement. Lorsque vous voyez le symbole ☞, reportez-vous à l'annexe C pour consulter la traduction de ces instructions dans votre langue.

Tärkeää: Liite Csisältää tämän laitteen asentamiseen liittyvät käännetyt turvaohjeet. Kun näet ⏚-symbolin, katso käännettyä turvaohjetta liitteestä C.

Importante: l'Appendice C contiene avvisi di sicurezza tradotti per l'installazione di questa apparecchiatura. Il simbolo ⏚, indica di consultare l'Appendice Cper l'avviso di sicurezza nella propria lingua.

Viktig: Tillegg C inneholder oversatt sikkerhetsinformasjon for installering av dette utstyret. Når du ser ⏚, åpner du til Tillegg C for å finne den oversatte sikkerhetsinformasjonen på ønsket språk.

Importante: O Anexo C contém advertências de segurança traduzidas para instalar este equipamento. Quando vir o símbolo ⏚, leia a advertência de segurança traduzida no seu idioma no Anexo C.

Importante: El Apéndice C contiene mensajes de seguridad traducidos para la instalación de este equipo. Cuando vea el símbolo ⏚, vaya al Apéndice C para ver el mensaje de seguridad traducido a su idioma.

Obs! Bilaga C innehåller översatta säkerhetsmeddelanden avseende installationen av denna utrustning. När du ser ⏚, skall du gå till Bilaga C för att läsa det översatta säkerhetsmeddelandet på ditt språk.

Table of Contents

Electrical Safety and Emission Statement 3

Preface 11
How This Guide is Organized 11
Document Conventions 13
Where to Find Web-based Guides 14
Contacting Allied Telesyn Technical Support 15
- Online Support 15
- E-mail and Telephone Support 15
- Returning Products 15
- For Sales or Corporate Information 15
- Management Software Updates 15
- Tell Us What You Think 15

Chapter 1

Product Description 17
Summary of Features 17
Hardware Features 18
- Status LEDs 18
- Ports 19
- 10 Mbps Twisted Pair Ethernet Port 19
- Serial Port 20
- Serial Cable 20
- Power Supply Input Port 20
- External AC/DC Power Adapter 20

Firmware Features 21
Network Configurations 22
- A Simple Wireless Network 22
- Using Multiple APs and Roaming End Devices 23
- Using APs to Create a Point-to Point Bridge 24

Chapter 2

Installation 25
Installation Safety Precautions 26
Selecting a Site for the Access Point 27
Verifying Package Contents 29
- Cables Not Included 29

Installing the Access Point 30
Wall-mounting the AT-WL2411 30
Attaching an External Antenna (Optional) 33
Warranty Registration 35

Chapter 3

Configuration Overview 37
Using a Serial Connection 38
Assigning an IP Address 41
Using a Web Browser 43
Saving Your Configuration Changes 46
Using a Telnet Session 47
Using SNMP 48
Configuring the SNMP Community 48

Chapter 4

Configuring the Ethernet Network 51
Configuring the TCP/IP Settings 52
Configuring the Access Point as a DHCP Client 54
Configuring the Access Point as a DHCP Server 55
About Network Address Translation (NAT) 59
Configuring the Access Point to Send ARP Requests 61
Configuring the Ethernet Settings 63
Configuring Ethernet Filters 64
Configuring the Ethernet Address Table 64
Using Ethernet Frame Type Filters 66
Using Predefined Subtype Filters 69
Customizing Subtype Filters 70
Configuring Advanced Filters 73
Setting Filter Values 73
Setting Filter Expressions 74

Chapter 5

Configuring the Spanning Tree 77
Configuring the Spanning Tree Parameters 78
About the Root Access Point 81
About Bridging 81
Bridging Layer Functions 83
About Secondary LANs and Designated Bridges 85
Configuring Global Parameters 86
Configuring Global Flooding 86
Configuring Global RF Parameters 89
About IP Tunnels 91
Internet Group Management Protocol (IGMP) 93
Originating IP Tunnels 94
Establishing and Maintaining IP Tunnels 95
IP Addressing for End Devices 95
Using Non-IP Protocols 95
Frame Forwarding 96
Configuring IP Tunnels 98
Configuring IP Address List 101
Configuring IP Tunnel Filters 102
Using IP Tunnel Frame Type Filters 103
Using Predefined Subtype Filters 106
Customizing Subtype Filters 107

Chapter 6

Configuring the IEEE 802.11b Radio 111
Using One AT-WL2411 in a Simple Wireless Network 112
Configuring an 802.11b Access Point Parameters 113
Using Multiple Access Points and Roaming Wireless End Devices 114
Configuring Point-to-Point Bridges 116
Configuring 802.11b Point-to-Point Bridges Parameters 126
To Configure the 802.11b Radio 127
Configuring 802.11b Radio Advanced Parameters 130
About the Radios 133

Chapter 7

Configuring Security 135
Understanding Security 136
Enabling Access Methods 139
Enabling Secure IAPP and Secure Wireless Hops 141
Setting Up Logins 143
Configuring the Access Point to Use a Password Server 144
Changing the Default Login 146
Configuring WEP 64/128 Security 148
Using an Access Control List (ACL) 151
Configuring 802.1x Security 154
About Secure IAPP and Secure Wireless Hops 155
Configuring the Access Point as an Authenticator 156

Chapter 8

Access Point Maintenance 159
Monitoring the Access Point 160
Viewing Access Point Connections 160
Viewing Port Statistics 161
Viewing the Configuration Summary 162
Viewing Information About the Access Point 163
Restoring the Default Settings 164
Upgrading the Firmware 166
Using a Serial Connection 166
Using TFTP via Telnet 169
Using a Web Browser Interface 170

Chapter 9

Troubleshooting 173
LEDs 174
Radio 175
LEDs 175
Communications Program or Telnet 175
Radio MAC Ping 176
Internet Control Message Protocol (ICMP) Echo 176
Security 177
Viewing the Security Events Log 177
General Security Troubleshooting 178
Problems During Web Browser Firmware Upgrade 179
Commonly Asked Technical Support Questions 180
Getting Help with Your Installation 183

Chapter 10

Advanced Configuration Commands 185
Using the Access Point Monitor 186
Understanding Access Point Segments 186
Entering the Access Point Monitor 187
Using Access Point Monitor Commands 188
B 189
FX 189
FD 189
FR 189
MR 189
SR 190
Using Service Mode Commands 191
SRVC 191
FFR 192
PN 192
PQ 192
Using Test Mode Commands 193
TEST 193
Using Console Command Mode 195
Using Console Commands 196
fb 196
fd 197
fdel 197
fe 198
script 198
Using Sdvars Commands 199
sdvars set serveripaddress 199
sdvars set scriptfilename 199
sdvars set starttime 200
sdvars set checkpoint 200
sdvars set terminate 201
sdvars set setactivepointers 202
sdvars set nextpoweruptime 202
Using TFTP Commands 204
tftp get 204
tftp put 206
tftp server log 207
tftp server start 207
tftp server stop 207

Appendix A

Default Configuration Settings 209
TCP/IP Menu Default Settings 209
Spanning Tree Settings Menu Defaults 210
Global Flooding Menu Defaults 210
Global RF Parameters Menu Defaults 211
Ethernet Configuration Menu Defaults 212
Ethernet Advanced Filters Menu Defaults 213
IP Tunnels Menu Defaults 214
Tunnel Filters Menu Defaults 214
Network Management Menu Defaults 215
Security Menu Defaults 216
Passwords Menu Defaults 216
ACL Menu Defaults 216

802.1x Menu Defaults 217
IEEE 802.11 (b or a) WEP Menu Defaults 217
Internal RADIUS Server Menu Defaults 217
IEEE 802.11b Radio Menu Defaults 218

Appendix B

Technical Specifications 219
Physical Specifications 219
Environmental Specifications 219
Power Specifications 219
Safety and Electromagnetic Emissions Certifications 219
Standards 219
Other Specifications 220
IEEE 802.11b Radio Specifications 220

Appendix C

Translated Electrical Safety and Emission Information 221

Glossary 229

Preface

This guide contains instructions on how to install and configure the AT-WL2411 Access Point.

How This Guide is Organized

This manual contains the following chapters and appendices:

Chapter 1, Product Description, describes the features and components of the access point.

Chapter 2, Installation, contains installation and mounting instructions.

Chapter 3, Configuration Overview, explains how to access the configuration firmware.

Chapter 4, Configuring the Ethernet Network, explains how to configure the Ethernet settings on the access point.

Chapter 5, Configuring the Spanning Tree, explains how to configure the Spanning Tree settings on the access point.

Chapter 6, Configuring the IEEE 802.11b Radio, explains how to configure the radio settings on the access point.

Chapter 7, Configuring Security, explains how to configure the security settings for the access point.

Chapter 8, Access Point Maintenance, provides information on how to monitor the performance of the access point and upgrade the firmware.

Chapter 9, Troubleshooting, explains how to identify and resolve common problems that occur with the access point.

Chapter 10, Advanced Configuration Commands, contains commands for advanced access point users.

Appendix A, Default Configuration Settings lists the default firmware settings.

Appendix B, Technical Specifications, lists the technical specifications for the access point.

Appendix C, Translated Electrical Safety and Emission Information, contains multi-language translations of the warnings and cautions in the manual.

Glossary, contains definitions for technical terms that you may not be familiar with.

Document Conventions

This document uses the following conventions:

Note
Notes provide additional information.

Warning
Warnings inform you that performing or omitting a specific action may result in bodily injury.

Caution
Cautions inform you that performing or omitting a specific action may result in equipment damage or loss of data.

Where to Find Web-based Guides

The Allied Telesyn web site at www.alliedtelesyn.com provides you with an easy way to access the most recent documentation and technical information for all of our products. All Allied Telesyn products can be downloaded from the web site in PDF format.

Contacting Allied Telesyn Technical Support

This section provides Allied Telesyn contact information for technical support as well as sales or corporate information.

Online Support

You can request technical support online by accessing the Allied Telesyn Knowledge Base from the following web site at kb.alliedtelesyn.com. You can use the Knowledge Base to submit questions to our technical support staff and review answers to previously asked questions.

E-mail and Telephone Support

For Technical Support via e-mail or telephone, refer to the "Support & Services" section of the Allied Telesyn web site at www.alliedtelesyn.com.

Returning Products

Products for return or repair must first be assigned a Return Materials Authorization (RMA) number. A product sent to Allied Telesyn without a RMA number will be returned to the sender at the sender's expense.

To obtain a RMA number, contact Allied Telesyn's Technical Support at our web site at www.alliedtelesyn.com

For Sales or Corporate Information

You can contact Allied Telesyn for sales or corporate information at our web site at www.alliedtelesyn.com. To find the contact information for your country, select "Contact Us" then "Worldwide Contacts".

Management Software Updates

New releases of management software for our managed products can be downloaded from one of the following web sites:

- the Allied Telesyn web site: www.alliedtelesyn.com
- the Allied Telesyn FTP server: ftp.alliedtelesyn.com.

To use the FTP server, enter 'anonymous' for the user name and your e-mail address for the password.

Tell Us What You Think

If you have any comments or suggestions on how we might improve this or other Allied Telesyn documents, please fill out the General Enquiry Form online. This form can be accessed by selecting "Contact Us" from www.alliedtelesyn.com.

Chapter 1
Product Description

The AT-WL2411 Access Point forwards data from wireless end devices to the wired Ethernet network. The AT-WL2411 can be used as an access point or as a point-to-point bridge. An access point is connected to a wired network and provides network access for wireless end devices. A point-to-point bridge connects two wired LANs and is often used to provide wireless communications in locations where running cable is difficult, such as across roads or between buildings. The AT-WL2411 accommodates one 802.11b radio. The AT-WL2411 is ideal for use in networks that do not need mixed radios or when configured as a station at the remote end of a wireless hop to a secondary LAN.

Summary of Features

- ❑ Supports IEEE 802.11b radios
- ❑ Installed 802.11b radio is Wi-Fi certified
- ❑ 10 Mbps Ethernet port with an RJ-45 connector
- ❑ Status LEDs
- ❑ Serial port for initial configuration and management
- ❑ Version 1.80 configuration firmware
- ❑ 5 V DC external power supply input port
- ❑ Configuration via serial connection, Web browser, and Telnet
- ❑ Can be used a DHCP server or client
- ❑ Can support 256 wireless end devices

Hardware Features

The following sections describe these hardware features of the AT-WL2411 Access Point:

- ❑ Status LEDs
- ❑ 10 Mbps twisted pair Ethernet port
- ❑ Serial connection management port
- ❑ Serial connection management cable
- ❑ 5V DC power supply input port
- ❑ External AC/DC power adapter

Status LEDs

The AT-WL2411 features the following status LEDs:

- ❑ Power
- ❑ Radio
- ❑ Wired LAN: Ethernet link and activity
- ❑ Root/error

Figure 1 illustrates the four LEDs on the AT-WL2411.

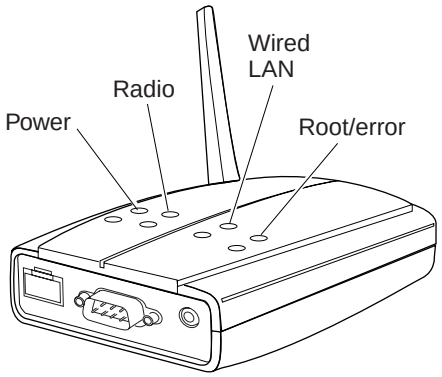


Figure 1 System LEDs

Table 1 defines the LEDs for the AT-WL2411 Access Point.

Table 1 Status LEDs

LED	Color	Description
PWR	Green	Power is applied to the unit.
Radio	Green	Flashes when a frame is transmitted or received on the radio port.
Wired LAN	Green	Flashes when a frame is transmitted or received on the Ethernet port.
Root/error	Green	Flashes if access point has been configured as root; remains on if an error is detected.

Ports

The AT-WL2411 features the following ports:

- ❑ Ethernet
- ❑ Serial connection/management
- ❑ Power

Figure 2 illustrates the ports on the AT-WL2411.

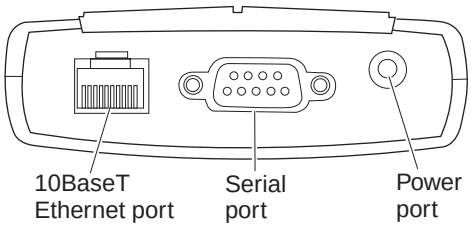


Figure 2 System Ports

10 Mbps Twisted Pair Ethernet Port

The AT-WL2411 Access Point has one twisted pair Ethernet port. The twisted pair port features an RJ-45 connector with a maximum operating distance of 100 meters (328 feet). The Ethernet port is used to connect the access point to your Ethernet network.

Type of Cabling

The 10Base-T twisted pair port on the AT-WL2411 Access Point is designed to operate with a Category 3 or better 100 ohm unshielded twisted pair cable.

RJ-45 Port Pinouts

Figure 3 illustrates the pin assignments of an RJ-45 connector and port.

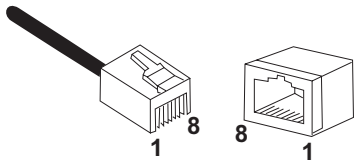


Figure 3 RJ-45 Connector and Port Pin Assignments

Serial Port

The serial connection/management port features a DB-9 connector for connecting the access point to your laptop or PC-compatible computer for configuration using the provided management cable.

Serial Cable

The RS-232 null-modem cable included with the AT-WL2411 Access Point features a 9-pin RS-232 connector to attach to the serial port on your computer and an 9-pin RS-232 connector to attach to the serial port on the access point.

Power Supply Input Port

The access point has a single power supply port. The unit does not have a power switch. To turn the access point ON or OFF, you connect or disconnect the power cord.

External AC/DC Power Adapter

An external AC/DC power adapter is included with the access point. The power adapter supplies 5V DC to the access point. The power required for the access point is 5V DC, 2.0 A.

Firmware Features

The Version 1.80 firmware used to configure the AT-WL2411 Access Point has the following features:

- ❑ Remote access via Web browser, and Telnet
- ❑ Configuration as a DHCP server or client
- ❑ Upgrades via serial port, Web browser, or Telnet
- ❑ Advanced filtering of wired data traffic
- ❑ Enhanced roaming reliability
- ❑ Embedded authentication server
- ❑ MAC address access control list
- ❑ Secure IAPP
- ❑ Secure wireless hops
- ❑ Secure web browser

Note
The features listed here are further described in the Configuration Overview on page 37.

Network Configurations

The AT-WL2411 Access Point supports a variety of network configurations that are explained in this section.

A Simple Wireless Network

You can use the access point to extend your existing Ethernet network to include wireless end devices. The access point connects directly to your wired network and the end devices form a network that functions as a wireless extension of the wired LAN.

In a simple wireless network, a single access point on the wired network serves as a transparent bridge between the wired network and end devices. The end devices communicate exclusively with devices on the wired network; they do not communicate with other end devices. This kind of simple wireless network is illustrated in Figure 4.

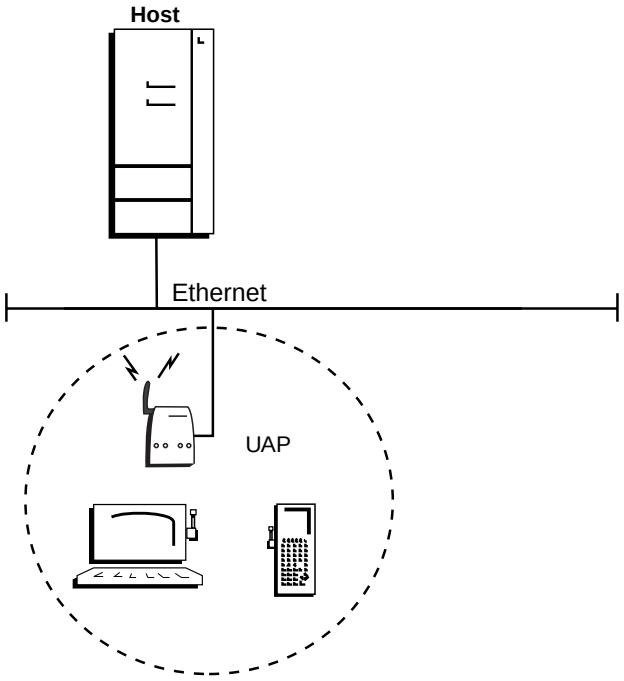


Figure 4 Simple Wireless Network

Using Multiple APs and Roaming End Devices

For larger or more complex environments, you can install multiple access points so end devices can roam from one access point to another. Multiple access points establish coverage areas or cells similar to those of a cellular telephone network. End devices can connect with any access point that is within range and belongs to the same network.

With the access point multichannel architecture, you can have more than one access point within the same cell area to increase throughput. In addition, overlapping radio coverage cells offer redundancy for critical applications so that coverage is not lost if a single access point or radio fails. This kind of network is illustrated in Figure 5.

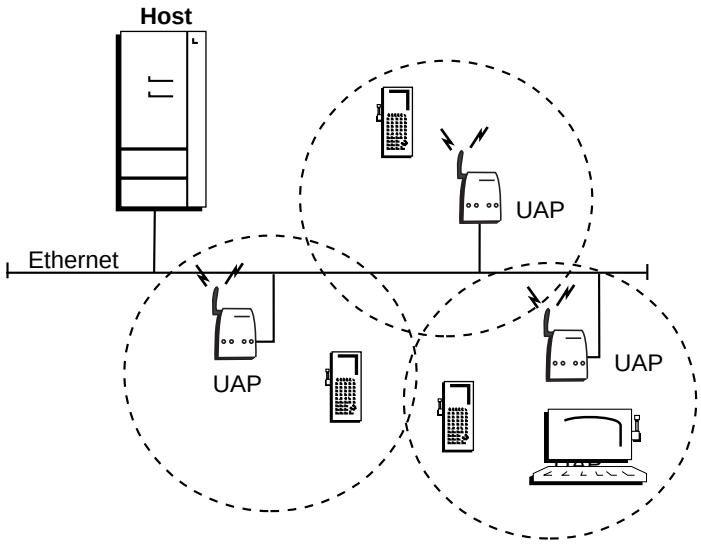


Figure 5 Multiple APs and Roaming End Devices

Using APs to Create a Point-to Point Bridge

You can use access points to create a wireless or point-to-point bridge between two LANs. You can have a access point wired to a network in one building and have a second access point wired to a network in another building. Wired clients in both buildings can then communicate with each other over the wireless bridge created by the access points. This configuration is useful in a campus environment where pavement or other objects prevent installation of a wired link. For information about configuring access points for point-to-point bridging, see Configuring Wireless Hops. Figure 6 illustrates a network with a point-to-point bridge.

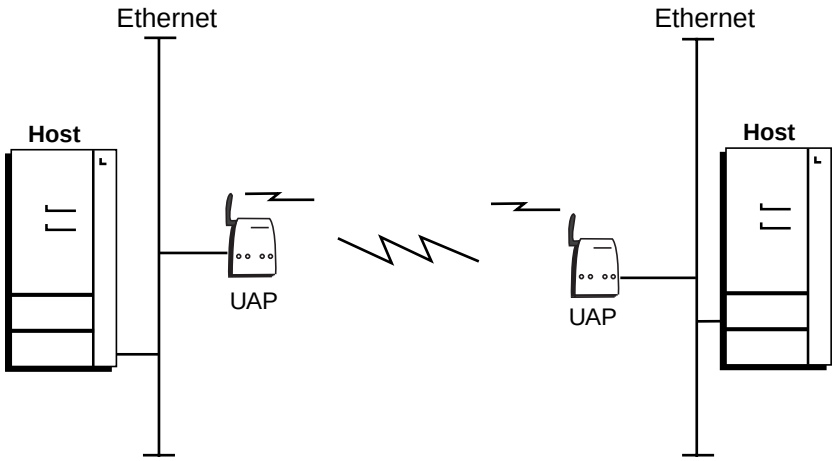


Figure 6 APs as a Bridge Between Wired LANs

Chapter 2
Installation

This chapter contains the following sections:

- ❑ Installation Safety Precautions on page 26
- ❑ Selecting a Site for the Access Point on page 27
- ❑ Verifying Package Contents on page 29
- ❑ Installing the Access Point on page 30
- ❑ Attaching an External Antenna (Optional) on page 33
- ❑ Warranty Registration on page 35

Installation Safety Precautions

Please review the following safety precautions before you begin to install the access point. Refer to Translated Electrical Safety and Emission Information on page 221 for statements in your language.

Warning
Power to the access point must be sourced only from the adapter:
Europe—EC
Use TÜV licensed AC adapter of 5 V DC, min 2.0 A.
Other Countries
Use a Safety Agency Approved AC adapter of 5 V DC, min 2.0 A. 4

Warning
Power cord is used as a disconnection device: To de-energize equipment, disconnect the power cord. 5

Warning
Lightning Danger: Do not work on this equipment or cables during periods of lightning activity. 6

Caution
Air vents: The air vents must not be blocked on the unit and must have free access to the room's ambient air for cooling. 7

Caution
Operating Temperature: This product is designed for a maximum ambient temperature of 65°C. 8

Caution
All Countries: Install this product in accordance with local and national electric codes. 9

Selecting a Site for the Access Point

Allied Telesyn recommends that you have Allied Telesyn or other certified providers conduct a site survey to determine the ideal locations for all of your network components. A proper site survey requires special equipment and training.

Observe the following requirements when choosing a site for your access point:

- ❑ If you are installing the access point on a table, be sure that the table is level and secure.
- ❑ The power outlet for the access point should be located near the unit and should be easily accessible.
- ❑ The site should provide for easy access to the ports on the access point. This will make it easy for you to connect and disconnect cables.
- ❑ Try to position the access point so that its LEDs are visible. The LEDs are useful for troubleshooting.
- ❑ To allow proper cooling of the access point, air flow around the unit and through its vents on the side and rear should not be restricted.
- ❑ Do not place objects on top of the access point.
- ❑ Do not expose the access point to moisture or water.
- ❑ Make sure that the site is a dust-free environment.
- ❑ You should use dedicated power circuits or power conditioners to supply reliable electrical power to the access point.
- ❑ Locate access points centrally within areas requiring coverage.
- ❑ Overlap access point coverage areas to avoid coverage holes.
- ❑ Access points configured for the frequency in the same coverage area may interfere with each other and decrease throughput. You can reduce the chance of interference by configuring your access points so they are configured 5 channels apart, such as Channels 1, 6, and 11.
- ❑ Install wired LAN cabling within device limit and cable length limitations.

- Microwave ovens operate in the same frequency band as the 802.11b HR radio; therefore, if you use a microwave within range of your Allied Telesyn RF network, you may notice network performance degradation. Both your microwave and your RF network will continue to function, but you may want to consider relocating your microwave out of range of your access point.

  The access point features an advanced configuration parameter for the 802.11b HR radio called microwave oven robustness. You can enable this parameter to minimize potential interference between your microwave oven and your RF network.

Verifying Package Contents

Make sure the following items are included in your package. If any item is missing or damaged, contact your Allied Telesyn sales representative for assistance.

- ❑ One AT-WL2411 Access Point
- ❑ Mounting bracket
- ❑ Power supply and AC power cord
- ❑ Documentation CD

Cables Not Included

The AT-WL2411 Access Point requires the cables described in Table 2. These cables are not included with the access points.

Table 2 Cables

Port	Cable	Connector
Ethernet	Category 3 or better 100-ohm unshielded straight-through or crossover twisted pair cable	RJ-45
Serial	RS-232 null-modem	RS-232

Installing the Access Point

You can install the AT-WL2411 horizontally on a desk or counter, or you can install it vertically to a wall using the wall bracket that ships with it. An optional cubicle bracket is also available for mounting the AT-WL2411 on a cubicle wall.

Wall-mounting the AT-WL2411

To install the mounting bracket and AT-WL2411 on a sturdy surface in accordance with local building codes, you need the following tools and materials:

- ❑ Two #5 or M3 screws.
- ❑ Drill and drill bit appropriate for the mounting screws
- ❑ Screwdriver

To wall-mount the AT-WL2411, perform the following procedure:

1. Using the mounting bracket as a template, mark the location of the mounting holes on the wall.
2. Drill the mounting holes.
3. Position the wall-mounting bracket on the wall and using the M3 screws (not provided), secure the bracket to the wall, as shown in Figure 7.

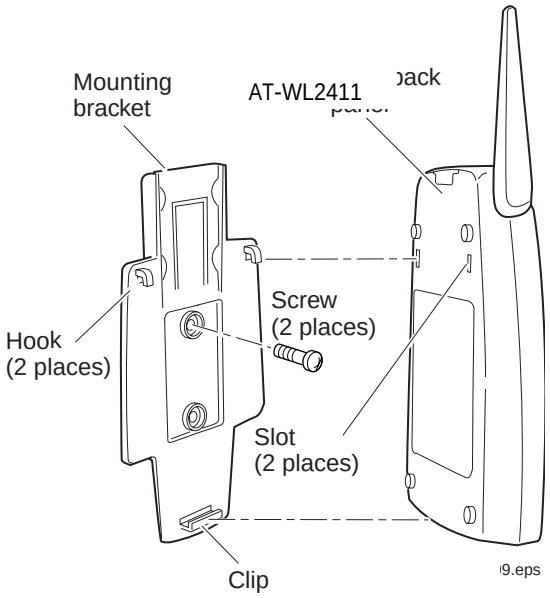


Figure 7 Wall-mounting the Access Point

4. Fit the slots on the back of the AT-WL2411 over the hooks on the mounting bracket.
5. Slide the AT-WL2411 up slightly and then press the base of the AT-WL2411 until it clicks into the clip at the bottom of the wall-mounting bracket.
6. Using the guidelines below, position the antenna accordingly. See to Figure 8.
   - ❑ Place the antenna at 90° when using the AT-WL2411 horizontally; for instance, on a desk or counter.
   - ❑ Place the antenna at 180° when using the AT-WL2411 vertically; for instance, mounted on a wall or cubicle.

Note
Keep the antenna at 0° when in storage.

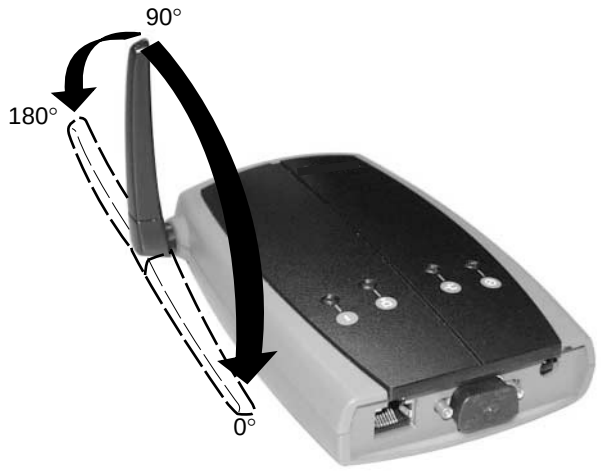


Figure 8 Positioning the Antenna

Note
Do not force the antenna past the 0° or 180° or you may break the antenna connector.

7. Attach the data cable to the unit by, first connecting the Ethernet cable to the Ethernet port on the access point and then attach the other end of the cable to your Ethernet network.

8. To configure the access point or assign it an IP address for remote configuration, attach one end of the RS-232 null-modem management cable to the serial port on the unit and then attach the other end of the cable to the serial port on your computer. For instructions on how to further configure the access point, see Configuration Overview on page 37.

9. Power ON the unit by plugging one end of the power cord into the power port on the access point and plug the other end into an AC power outlet. The AT-WL2411 does not have an ON/OFF switch, so it turned ON as soon as you apply power.

Caution
You must use the appropriate Allied Telesyn power supply with this device or equipment damage may occur.

Your AT-WL2411 is now ready to begin transmitting data packets between your end devices and your wired network.

Attaching an External Antenna (Optional)

To attach an external antenna, you must disconnect the built-in antenna and attach an antenna cable directly to the radio card in the access point. For more information about antenna options, contact your local Allied Telesyn representative.

To attach an antenna cable to the AT-WL2411, perform the following procedure:

1. Remove the Radio Card Door. Refer to Figure 9.
2. Using pliers, gently pull the antenna wire to disconnect it from the radio card, as shown in Figure 9.

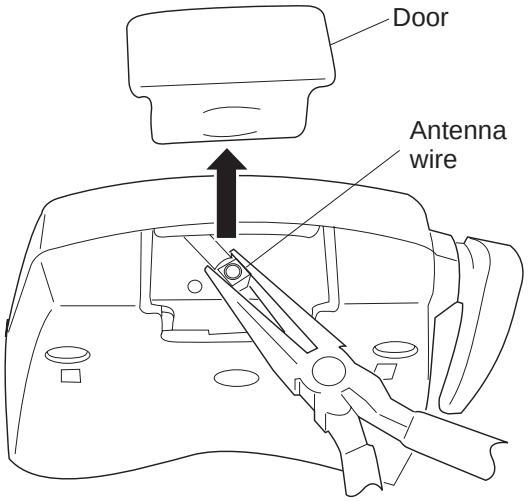


Figure 9 Antenna Wire

3. Tuck the antenna wire inside the access point housing.
4. Remove the punch-out tab from the door, as shown in Figure 10.

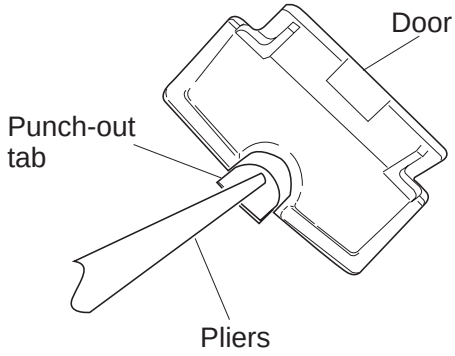


Figure 10 Punch-out Tab

5. Attach the antenna cable to the radio by inserting the cable connector into the radio card.
6. Replace the door.

The AT-WL2411 is now ready for use.

Warranty Registration

When you have finished installing the access point, register your product by completing the enclosed warranty card and mailing it to Allied Telesyn.

Chapter 3
Configuration Overview

The AT-WL2411 Access Point features three different management interfaces:

- Using a Serial Connection on page 38
- Using a Web Browser on page 43
- Using a Telnet Session on page 47

Note
You must first access the management firmware using a communications program via serial connection to assign the AT-WL2411 an IP address before you can use the other management interface options. To assign an IP Address, refer to Assigning an IP Address on page 41.

Using a Serial Connection

Although the AT-WL2411 Access Point will work directly out of the box, you must assign it an IP Address and define other basic parameters before you can manage it remotely. To perform these initial configurations, you must use a serial connection and a terminal or a communications program (such as HyperTerminal). This manual assumes that you are using a communications program for your initial configuration and performing all other configurations remotely using the Web interface.

To perform a basic configuration of the AT-WL2411 using the default settings, you need the following:

- ❑ An RS-232 null-modem cable
- ❑ A terminal or PC with an open serial port

To configure the AT-WL2411, perform the following procedure:

1. Use the RS-232 null-modem cable to connect the serial port on the access point to a serial port on your PC.
2. Open your communications program and configure the serial communications parameters on your PC to:

Baud	9600
Data bits	8
Parity	no
Stop bit	1
Flow control	none

3. Connect the power cable to the access point and to a power source. The access point does not have an ON/OFF switch, so the unit is ON as soon as power is applied.

4. Press **Enter** when the message Starting system appears on your PC screen. The Login screen shown in Figure 11 is displayed..

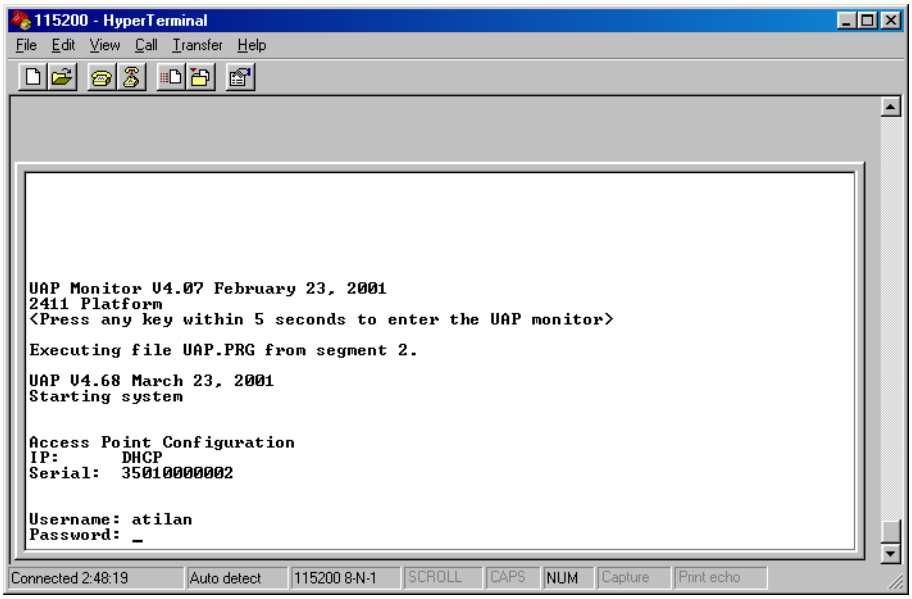


Figure 11 Login Screen

5. Type **atilan** as the user name (default) and press **<Enter>**.

6. Then type **atilan** as the password (default) and press **<Enter>**. The Configuration Menu as shown in Figure 12 is displayed.

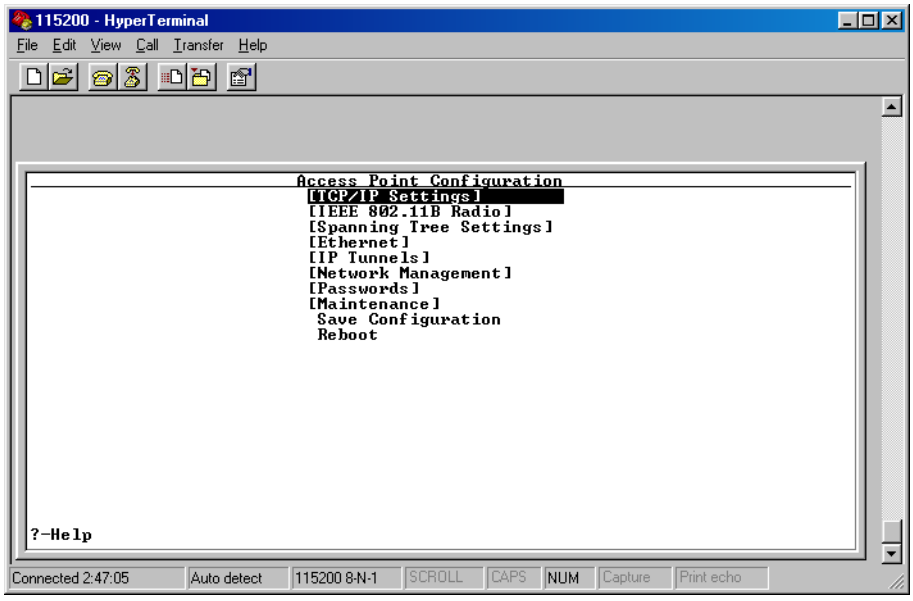


Figure 12 Configuration Menu

7. To assign the access point an IP address so that you can continue configuration remotely, proceed to the next section Assigning an IP Address on page 41.
8. To continue configuration using the serial connection, use the menu shown in Figure 12.
9. When you have finished your configurations, save you changes by using the **Save Configuration** option and then reboot the access point to activate your changes.

Assigning an IP Address

The AT-WL2411 will work directly out of the box if you are using a DHCP server to assign it an IP Address. By default, the access point is configured to be a DHCP client. However, if you are not using a DHCP server to assign IP Address, you must assign the access point an IP Address before you can manage it remotely.

1. To use DHCP to automatically assign an IP Address, configure the following parameters in the TCP/IP Settings Menu. These parameters are describe below.

   DHCP Mode
   Set to <Use DHCP if IP Address is zero>.

   DHCP Server Name
   The name of the DHCP server that the AT-WL2411 is to access for automatic address assignment. If no server name is specified, the AT-WL2411 responds to offers from any server.

   To assign an IP Address manually, configure these parameters in the TCP/IP Settings Menu:

   IP Address
   A unique IP Address.

   IP Subnet Mask
   The subnet mask that matches the other devices in your network.

   IP Router (Gateway)
   The address of the router that will forward frames if the AT-WL2411 will communicate with devices on a subnetwork.

2. If you are configuring a AT-WL2411, you must configure Node Type in the Wireless Bridging submenu of the 802.11b Radio Menu. Configure Node Type as Master if this access point will communicate with end devices; configure it as Station if you are configuring a access point to communicate with an Master access point on the wired network.

3. In the Spanning Tree Settings Menu, configure LAN ID (Domain). All access points must have the same LAN ID to participate in the same spanning tree.

4. In the 802.11b Radio Menu, configure the parameters. These parameters are described below.

   (SSID) Network Name
   The network name. All 802.11b radios must have the same network name to communicate.

   Frequency
   The frequency appropriate for your installation. Frequencies range from 2.4 to 2.5 GHz and depend on the specific country.

5. Save the configurations by using the **Save Configuration** option and reboot the access point to activate your changes.

Now that the access point has an IP Address, you can configure it remotely using the procedures in the next sections.

Using a Web Browser

After you have configured the IP address and other basic network parameters as described in Assigning an IP Address on page 41, you can manage your access point using a Web browser.

You must know the IP Address of the access point to manage it remotely. If a DHCP server assigned the IP Address, you must determine the IP Address from the DHCP server.

Only one session can be active on the access point at a time. If your session terminates abruptly or a new sign-on screen appears, someone else may be using the access point.

When using the Web to establish remote management of your access point, follow these guidelines:

- ❑ Your session will terminate if it is not used for 15 minutes
- ❑ Console Command mode is not available

To establish a Web browser session with the AT-WL2411, perform the following procedure:

1. Type the DHCP server-assigned IP Address or the IP Address you assigned to the AT-WL2411 in the address field of your Web browser.

   Note
   If you access the Internet using a proxy server, you must add the IP Address to your exceptions list. The exceptions list contains the addresses that you do not want to use with a proxy server.

2. Press **<Enter>**. The Access Point Login screen as shown in Figure 13 is displayed.

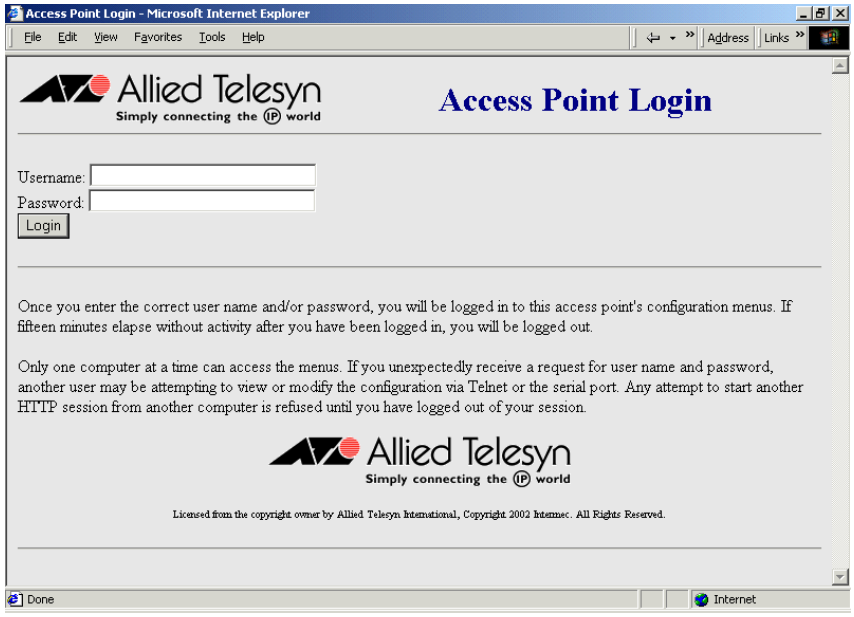


Figure 13 Access Point Login Screen

3. Type **atilan** as both the user name and password (defaults).

> **Note**
> You can change the user name and password from the Security Menu.

4. Select **Login**. The TCP/IP Settings screen as shown in Figure 14 is displayed.

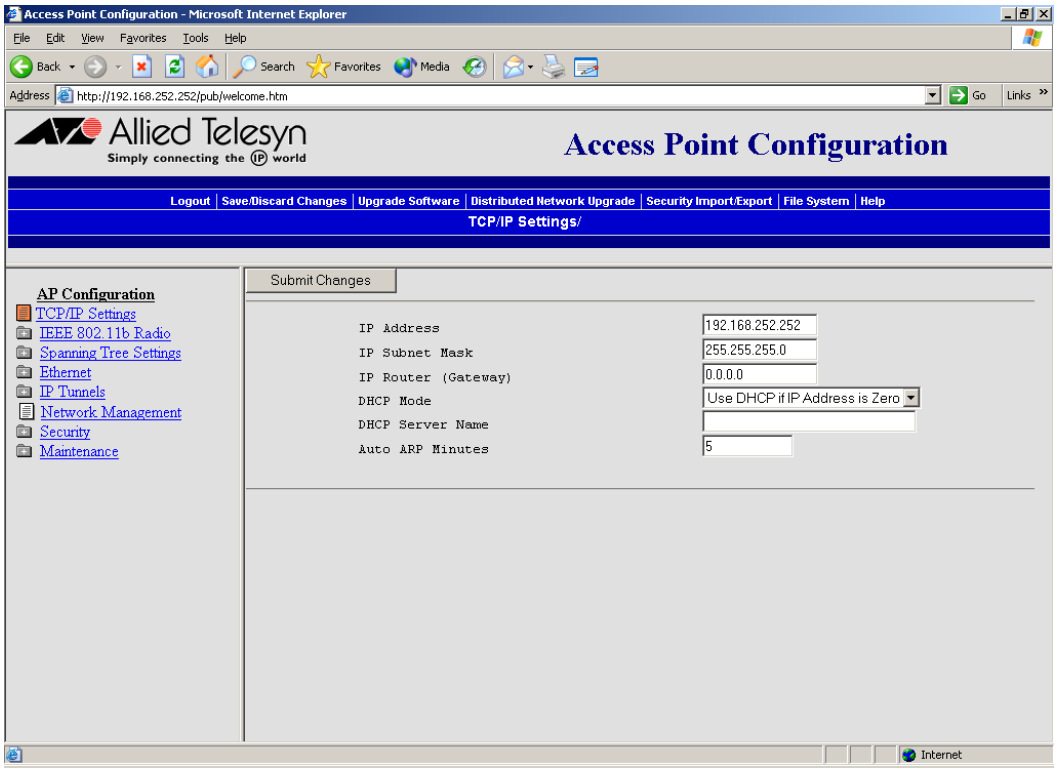


Figure 14 TCP/IP Settings Screen

You can now configure the AT-WL2411 using the Web browser menus.

Saving Your Configuration Changes

There are two ways to save your configuration settings in a Web browser session:

- **Submit Changes**
  When you select Submit Changes, the access point updates the current configuration file. The access point does not change the active configuration file. You can see a list of pending changes when you click Save/Discard Changes. Having separate files for the current and active configurations lets you make changes while the access point is running without interrupting communication.

- **Save Discard/Changes**
  When you select Save/Discard Changes and then you select Save Changes and Reboot, the access point copies the current configuration file to the active configuration file. The active configuration file is the file that the access point uses.

Note
You must save your configuration changes and reboot the access point in order for the new configurations to become active.

Using a Telnet Session

To establish a Telnet configuration session, perform the following procedure:

1. Go to an MS-DOS prompt and type **Telnet IP address**, where IPaddress has the form x.x.x.x and x is a number from 0 to 255. Use the IP address assigned to the AT-WL2411 you want to configure.

   or

   Open a Telnet program and type **open**. Press **<Enter>**. At the **<open>** prompt, type the IP address of the AT-WL2411 and press **<Enter>**.

2. Follow the configuration instructions in Using a Serial Connection on page 38, since the Telnet interface is similar to this communication program interface.

Using SNMP

The access point supports SNMP management. Contact your Allied Telesyn representative for information about obtaining a copy of the MIB. The passwords for accessing the SNMP community table are shown below.

Type of Access	MIB Password
read only	public
read/write	CR52401

Configuring the SNMP Community

Simple Network Management Protocol (SNMP) community strings are passwords used by SNMP. When you use an SNMP client, you must enter the correct community string to gain access to the access point SNMP interface.

To configure the SNMP community, perform the following procedure:

1. Establish a Web browser session if you have not already done so. For more information, see Using a Web Browser on page 43.
2. From the Main Menu, select **Network Management**. The Community Strings screen as shown in Figure 15 is displayed.

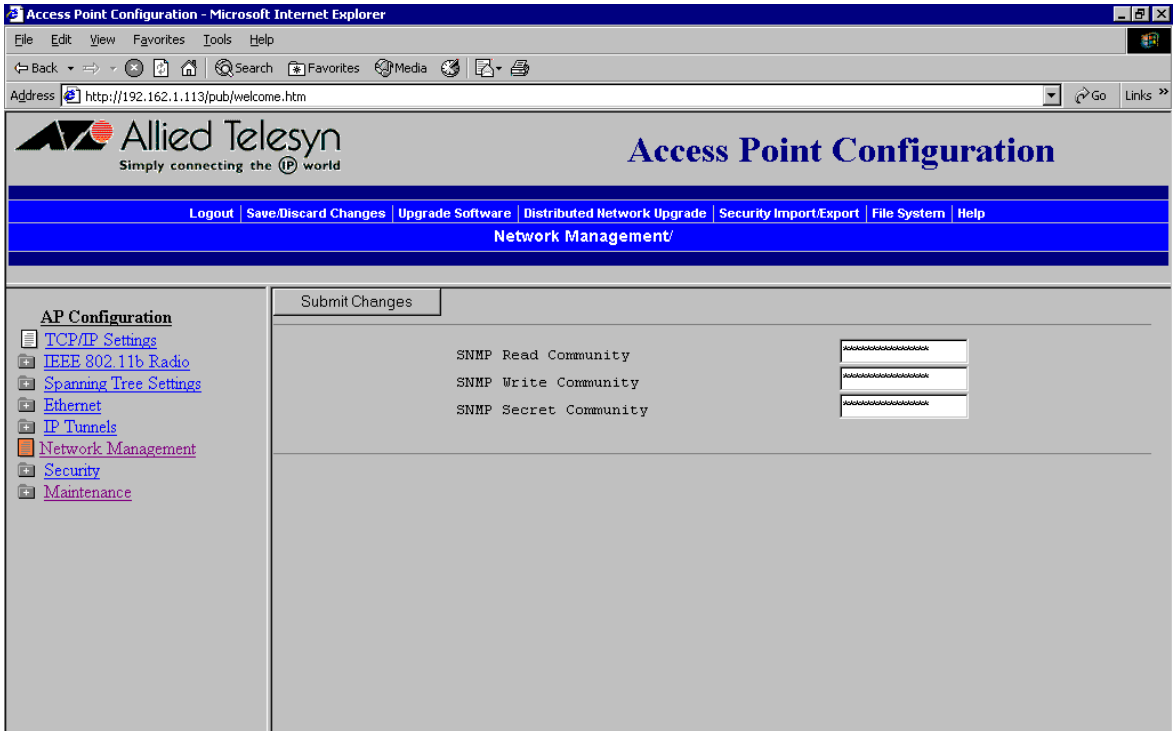


Figure 15 Community Strings Screen

3. Configure the SNMP community parameters. The SNMP community parameters are explained below.

   SNMP Read Community
   Allows read-only access. Defaults to public.

   SNMP Write Community
   Allows read/write access. Defaults to CR52401.

   SNMP Secret Community
   Allows read/write access to change the community strings. Defaults to Secret.

4. When you are finished, select **Submit Changes** to save your changes.

Chapter 4

Configuring the Ethernet Network

This chapter contains the following sections:

- Configuring the TCP/IP Settings on page 52
- Configuring the Ethernet Settings on page 63
- Configuring Ethernet Filters on page 64

Configuring the TCP/IP Settings

If you are using a DHCP server to automatically assign an IP address to the access point, go to Configuring the Access Point as a DHCP Client in the next section. If you are not using a DHCP server, you need to manually assign some TCP/IP parameters.

You should have already configured an IP address for the access point, as described in Assigning an IP Address on page 41.

To configure the TCP/IP settings, perform the following procedure:

1. From the Main Menu, select **TCP/IP Settings**. The TCP/IP Settings screen as shown in Figure 16 is displayed..

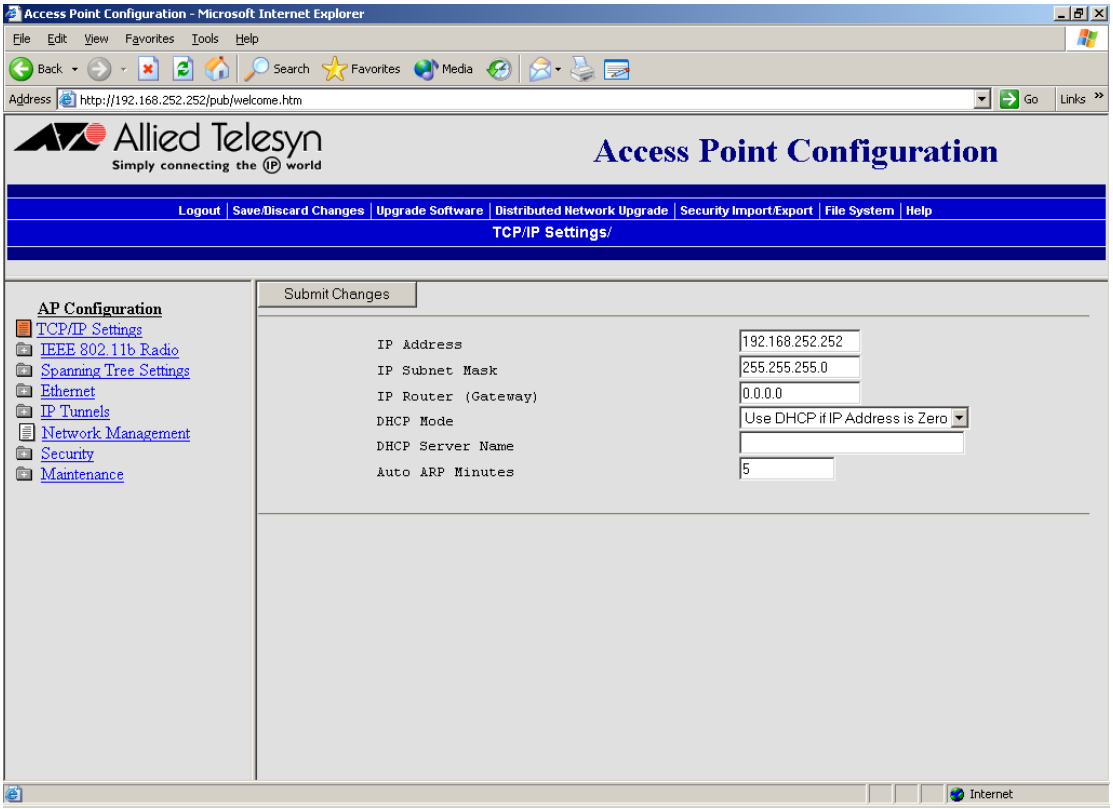


Figure 16 TCP/IP Settings Screen

2. Configure the TCP/IP settings using the following parameters:

   IP Address
   Enter the IP Address of the AT-WL2411. The IP Address has the form **x.x.x.x** where **x** is a number from 0 to 225.

IP Subnet Mask
Enter the subnet mask that matches the other devices in your network. The subnet mask has the form **x.x.x.x**, where **x** is a number from 0 to 225.

IP Router
Enter the IP Address of the router that will forward packets if the access point will communicate with devices on another subnet. The IP Address has the form **x.x.x.x**, where **x** is a number from 0 to 225.

IP Frame Type
This parameter controls the encapsulation of IP frames sent by this access point. You select either DIX (Ethernet 2.0) or SNAP encapsulation.

DIX
Encapsulate using DIX (Ethernet 2.0) frames.

SNAP
Encapsulate using SNAP frames. You need to use SNAP if other network computers use SNAP encapsulation for IP frames.

3. Do one of the following:

   - ❑ If you want to configure the access point as a NAT server, refer to About Network Address Translation (NAT) on page 59.
   - ❑ If you want to configure the access point to send ARP requests, see Configuring the Access Point to Send ARP Requests on page 61.
   - ❑ If you want to configure the access point as a DHCP server, see Configuring the Access Point as a DHCP Server on page 55.

4. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar and then select **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Configuring the Access Point as a DHCP Client

You can use a DHCP server to automatically assign an IP Address to your access point; that is, the access point can act as a DHCP client.

> **Note**
> You cannot configure the access point as both a DHCP server and a DHCP client.

To configure the access point as a DHCP client, perform the following procedure:

1. From the Main Menu, select **TCP/IP Settings**. The TCP/IP Settings screen as shown in Figure 17 is displayed.

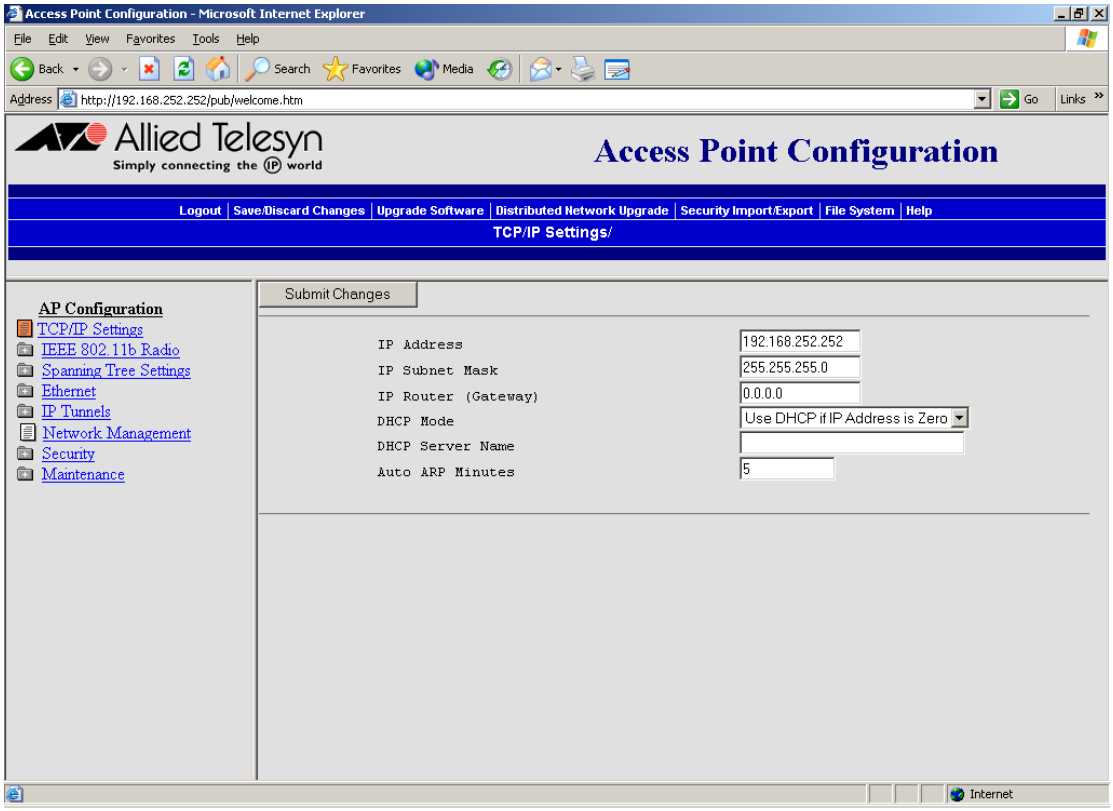


Figure 17 TCP/IP Settings Screen

2. Select the down arrow on the right side of the DHCP Mode field and choose either **Always Use DHCP** or **Enabled, if IP Address is Zero**. If you choose **Enabled, if IP Address is Zero**, make sure that the IP Address field is 0.0.0.0.

3. In the DHCP Server Name field, enter the name of the DHCP server that the access point is to access for automatic address assignment. If no server name is specified, the access point responds to offers from any server.

4. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar and then select **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Configuring the Access Point as a DHCP Server

You can configure the AT-WL2411 as a simple DHCP server that can provide DHCP server functions for small installations where no other DHCP server is available. The DHCP server will offer IP Addresses to any DHCP client it hears as long as a pool of unallocated IP Addresses is available. These clients may include other access points, wireless end devices, wired hosts on the distribution LAN, or wired hosts on secondary LANs.

Note
If you configure the access point as a DHCP server, it is not intended to replace a general purpose, configurable DHCP server, and it makes no provisions for synchronizing DHCP policy between itself and other DHCP servers. Customers with complex DHCP policy requirements should use other DHCP server software.

Note
You cannot configure the access point as both a DHCP server and a DHCP client.

To avoid a single point of failure, you can configure more than one access point to be a DHCP server; however, the access points do not share DHCP client databases. You should configure each DHCP server with a different DHCP address pool from which to allocate client addresses.

To configure the access point as a DHCP server, perform the following procedure:

1. From the Main Menu, select **TCP/IP Settings**. The TCP/IP Settings screen as shown in Figure 18 is displayed.

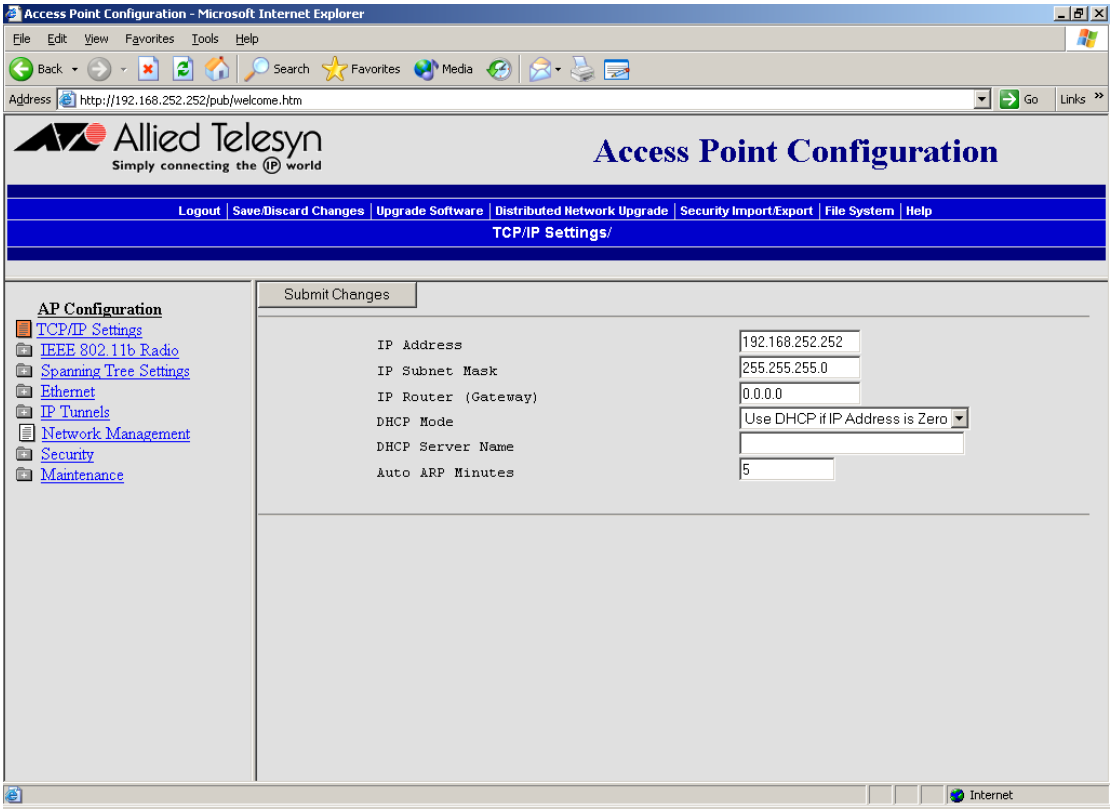


Figure 18 TCP/IP Settings Screen

2. Verify that the IP Subnet Mask field and IP Router field are configured. For help, see Configuring the TCP/IP Settings on page 52.

3. Select the down arrow on the right side of the DHCP Mode field and choose **This AP is a DHCP Server**.

4. Select **Submit Changes** to save your changes.

5. Select **DHCP Server Setup**. The DHCP Server Setup screen as shown in Figure 19 is displayed.

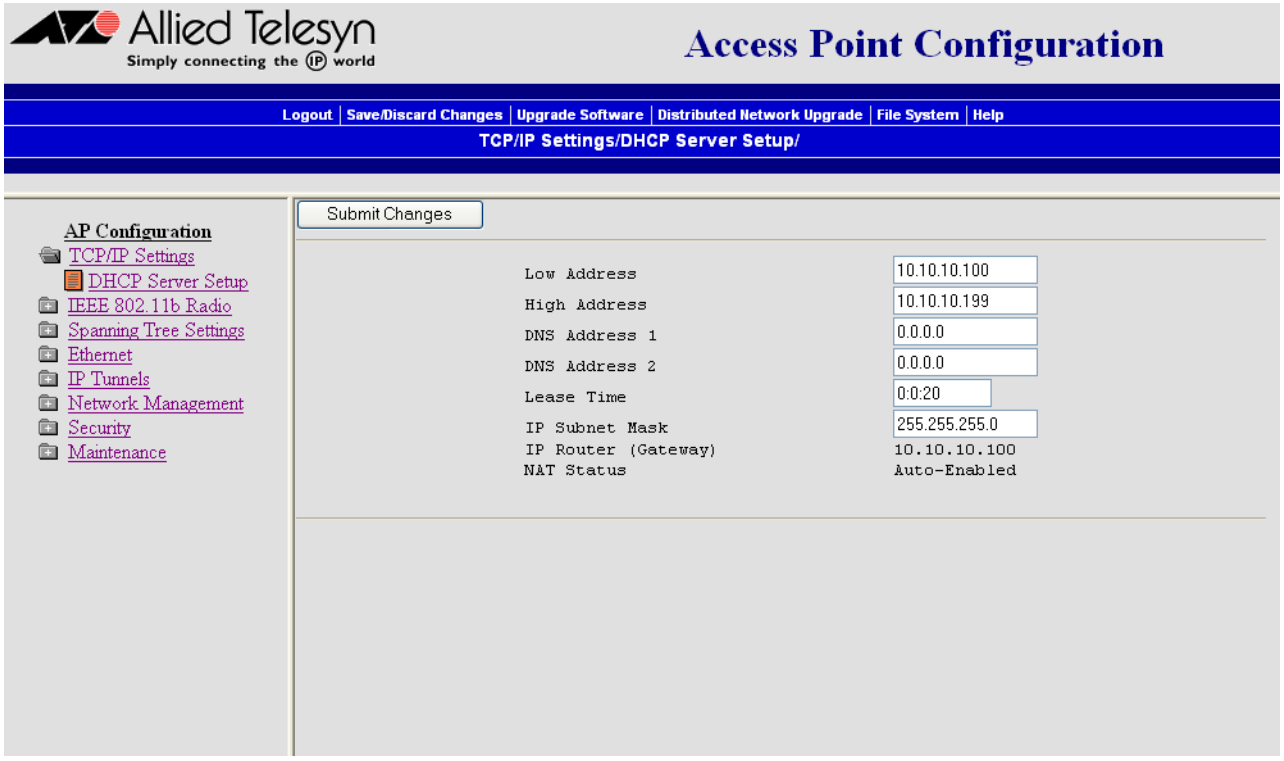


Figure 19 DHCP Server Setup

6. Configure the DHCP server using the following parameters:

Low Address
The low IP Address in the range of IP Addresses available to the DHCP server for distribution to DHCP clients. If these addresses are not on the same subnet as the access point, the access point will perform Network Address Translation (NAT) for the devices to which it grants IP Addresses.

High Address
the high IP address in the range of IP Addresses available to the DHCP server for distribution to DHCP clients. If these addresses are not on the same subnet as the access point, the access point will perform Network NAT for the devices to which it grants IP Addresses.

DNS Address 1
The IP Address of a Domain Name Server that will be distributed to DHCP clients. You can enter up to two DNS addresses to be delivered to DHCP clients.

DNS Address 2
The IP address of a Domain Name Server that will be distributed to DHCP clients. You can enter up to two DNS addresses to be delivered to DHCP clients.

Lease Time
Specifies the duration of the leases that are granted by the DHCP server. Enter the lease time in the format days:hours:minutes. If you set the lease time to 0, infinite leases are granted

7. Select **Submit Changes** to save your changes and then select **here**. To activate your changes, select **Save/Discard Changes** from the menu bar and then select **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Supported DHCP Server Options

The DHCP server issues IP address leases to configure this field:

IP broadcast address
The IP broadcast address, along with the subnet mask and IP router, will contain the same values as those configured for the access point.

Unsupported DHCP Server Options

The DHCP server does not support any DHCP options other than those listed. The DHCP server disregards any DHCP options that are not explicitly required by the DHCP specification. The DHCP server ignores all packets with a non-zero giaddr (gateway IP address). The DHCP server only responds to requests from its own subnet.

About Network Address Translation (NAT)

NAT allows IP addresses to be used by more than one device. The access point can act as a NAT server, which instantaneously rewrites IP addresses and port numbers in IP headers so that packets all appear to be coming from (or going to) the single IP address of the access point instead of the actual source or destination.

When a device uses the access point as an IP router, the access point replaces the IP header, which includes the device's MAC address, IP source address, and TCP/UDP port, with its own. You can configure the DHCP server to indicate that the access point is the IP router when the server allocates an IP address. Special consideration is given to changing the FTP data connection TCP port number, which is in the body of the TCP packet. After the packet source is modified, it is forwarded to the proper subnet.

If the destination subnet is not the same subnet as the access point's Ethernet network, the destination MAC address is changed to the IP router that has been configured for the access point. If destination subnet is the same subnet as the access point's Ethernet network, the access point converts the MAC address to the MAC address that belongs to the destination IP address. This may involve using ARP for MAC address discovery.

When the access point receives a packet with its IP address, it identifies the need for address translation by inspecting the destination port number. If the port number is within the pool reserved for NAT operation, it looks up the original MAC address, IP address, and port number. The packet is then modified and forwarded to the end device.

NAT operation is disabled or enabled automatically depending on the continuous range of addresses you enter into the DHCP server. NAT is disabled if the range of addresses to be given to DHCP clients is on the same subnet as the access point. NAT is enabled if the range of addresses to be given to DHCP clients is not on the same subnet as the access point; thus, you are creating a virtual network and the DHCP server will also perform NAT translation.

When NAT operation is enabled, the access point uses the low address in the range of addresses as its own. The DHCP/NAT clients also use this address as their router IP address. These clients can configure the access point using this internal IP address or the normal external IP address.

To configure the access point as a NAT server, perform the following procedure:

1. From the Main Menu, select **TCP/IP Settings**. The TCP/IP Settings screen as shown in Figure 16 is displayed.

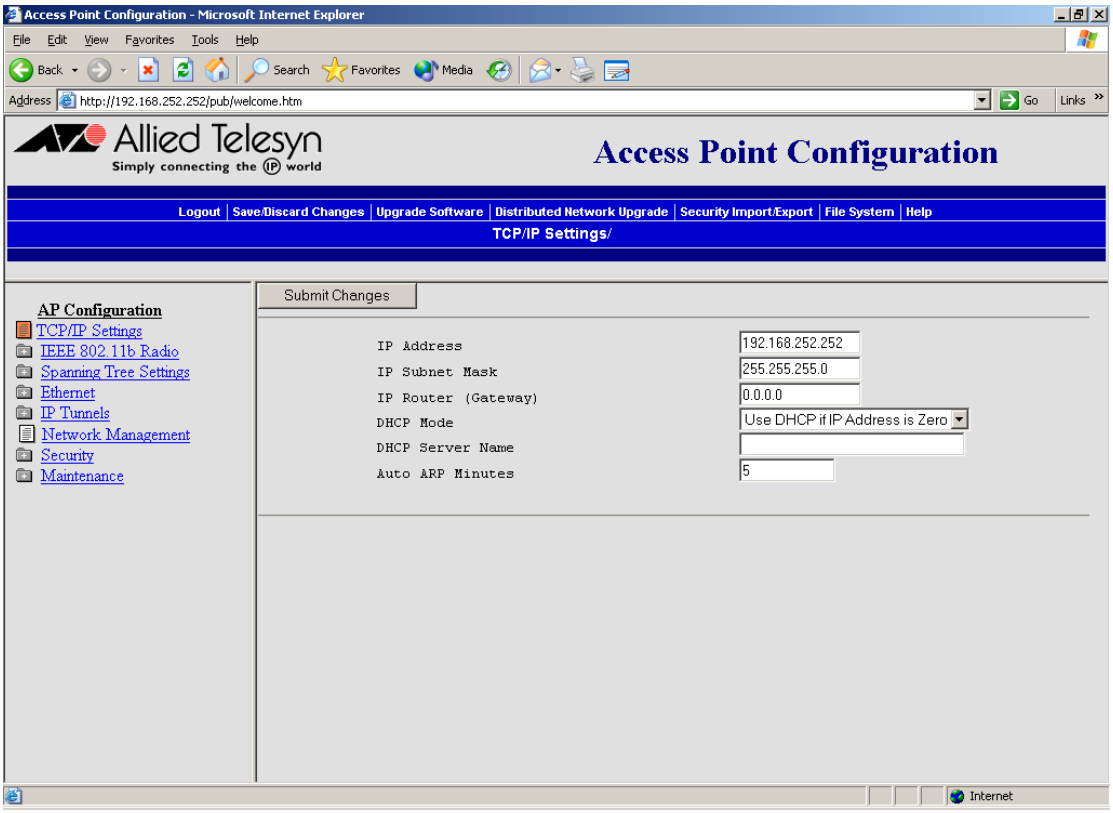


Figure 20 TCP/IP Settings Screen

2. Verify that the IP Address field and IP Subnet Mask field are configured. For help, see Configuring the TCP/IP Settings on page 52.

3. Select the down arrow on the right side of the DHCP Mode field and choose **This AP is a DHCP Server**.

4. Select **Submit Changes** to save your changes.

5. Select **DHCP Server Setup** and enter a range of IP addresses that are *NOT* on the same subnet as the access point.

6. Select **Submit Changes** to save your changes. To activate your changes, Select **Save/Discard Changes** from the menu bar and then Select **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Configuring the Access Point to Send ARP Requests

ARP requests are multicast packets, which means they are sent to all devices on the network. The access point periodically sends an unsolicited ARP request to the default IP router so that all routers can update their routing tables. This ARP request enables a network management program to learn about the access point on the network by querying routers. The auto ARP period controls the time interval between ARP broadcasts.

If the address of the default IP router is 0.0.0.0, the access point sends an ARP request to its own IP address. Without this option, an access point might not use its IP address for extended periods of time and the IP address would expire from the router ARP table. If the IP address expires, the network management program must ping all potential addresses on a subnet to locate active IP addresses or require the user to enter a list. You should not let the IP address for the access point expire.

To set the auto ARP period, perform the following procedure:

1. From the Main Menu, select **TCP/IP Settings**. The TCP/IP Settings screen as shown in Figure 21 is displayed.

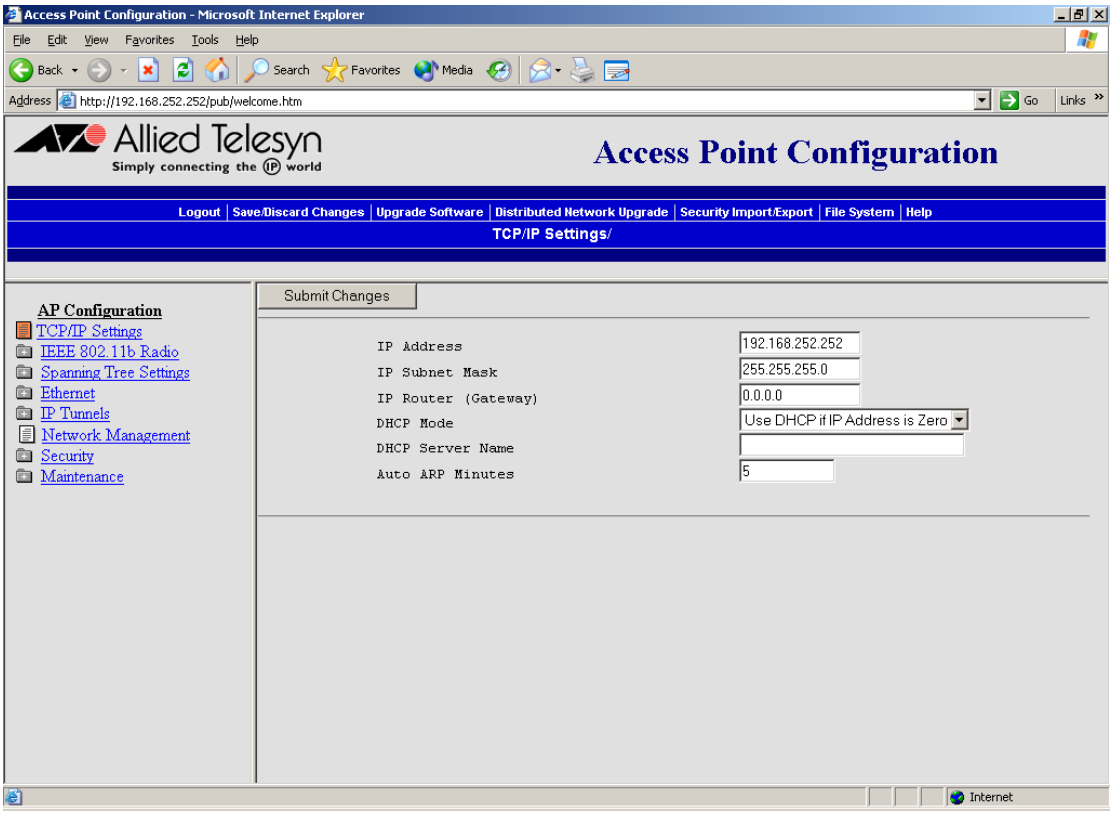


Figure 21 TCP/IP Settings Screen

2. In the Auto ARP Minutes field enter a time period from 1 to 120 minutes. To disable this parameter, set the time period to 0.
3. Select **Submit Changes** to save your changes. To activate your changes, **Select Save/Discard Changes** from the menu bar and then select **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Configuring the Ethernet Settings

Many of the standard Ethernet settings are configured in the TCP/IP Settings screen. For help, see Configuring the TCP/IP Settings on page 52. In the Ethernet Settings screen, you can

- Enable or disable the link status check. Enable this parameter if you want the access point to periodically check its Ethernet connection. If it loses the connection, this access point can no longer be the root access point and any end devices that are connected to this access point (whether or not it is the root) will roam to a different access point. The access point will attempt to reconnect to the spanning tree through one of its radio ports. Disable this parameter if this access point must be the root access point.
- Set the hello period, which defines how often the access point sends out multicast hello packets so it can dynamically discover and test connections to other routers on the network. Once this information is learned, the access point and routers can exchange routing information.

Configuring Ethernet Filters

You can set both Ethernet and IP tunnel filters, and you can create protocol filters for both predefined and user-defined protocol types. In addition, you can define arbitrary frame filters based on frame content.

For help with configuring IP filters, see Configuring IP Tunnel Filters on page 102.

Configuring the Ethernet Address Table

You can use the Ethernet address table to list the permanent unicast 802 MAC addresses that are using the access point that is the designated bridge on the secondary LAN to communicate to the primary LAN. These addresses become permanent entries in the route table of the designated bridge on the secondary LAN.

You must enter the MAC addresses of the devices on the secondary LAN that do not always initiate communication.

You should fill in this table when configuring designated bridges for secondary LANs so that this access point will not need to flood frames to all the wired stations on the secondary LAN. If you choose not to use this table, the access point may need to flood frames to all ports (Ethernet and radio) to learn the path to the MAC address.

To configure the Ethernet address table, perform the following procedure:

1. From the Main Menu, select **Ethernet**.
2. Select **Address Table**. The Address Table screen as shown in Figure 22 is displayed.

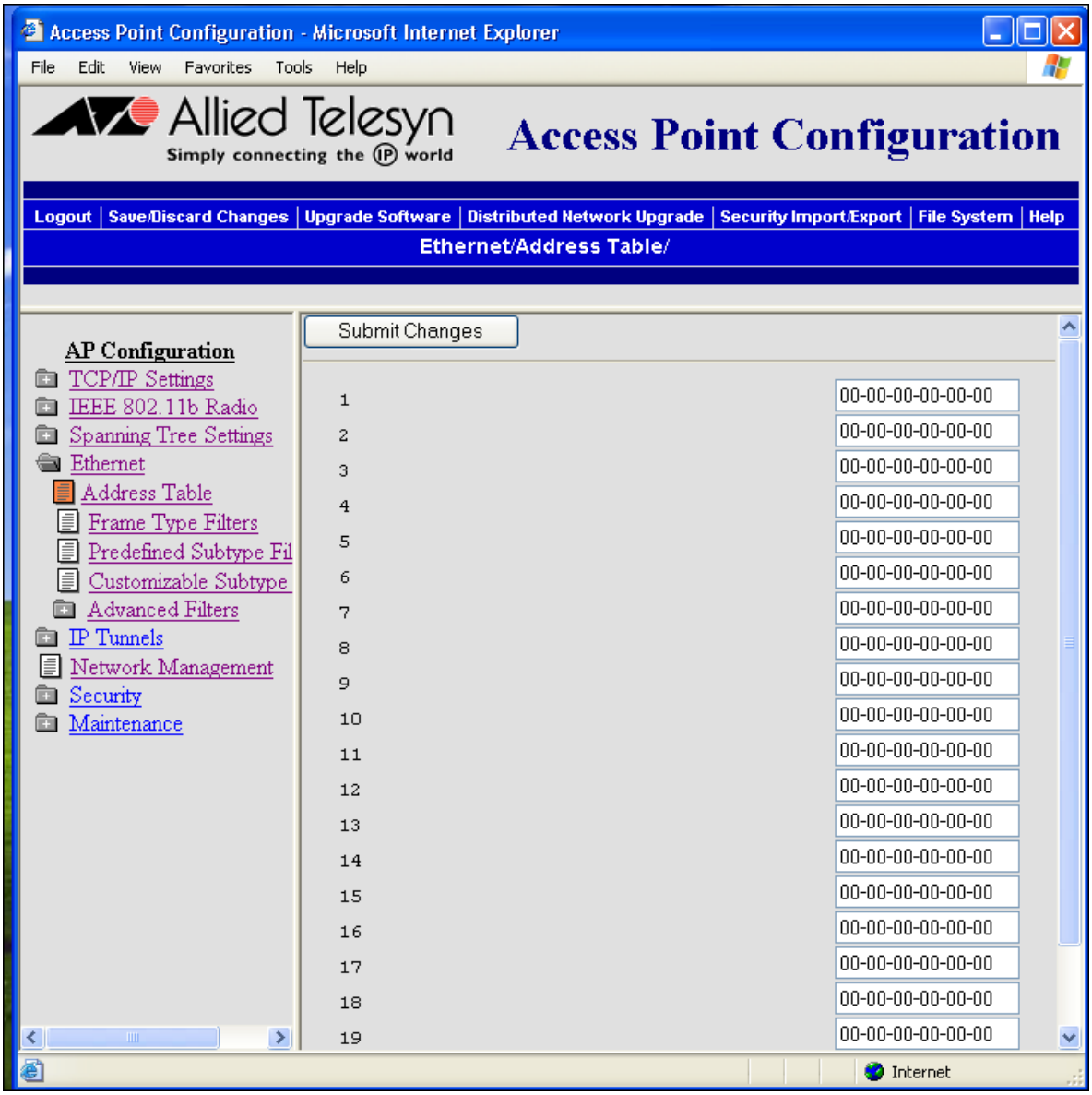


Figure 22 Address Table Screen

3. You can enter up to 20 MAC addresses. MAC addresses consist of six hex pairs that are separated by spaces, colons, or hyphens.

4. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar and then select **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Using Ethernet Frame Type Filters

You can define filters for common networking protocols such as IP, Novell IPX, and 802.2 LLC. You can also set filters that will pass only those Ethernet frame types found on your network.

You can set the default action for general and specific frame types. For example, you can set the DIX-Other EtherTypes frame parameter to drop, and then use the subtype menus to pass only those specific DIX types that are used in your radio network.

You can also set the scope for general and specific frame types. For example, you can set the action to Drop and the scope to All for DIX-IP-TCP Ports, and then all IP packets with the TCP type will be dropped even if specific TCP parts are set to pass in the subtype menus.

Action
Set the action to Pass or Drop. If you select Pass, then all frames of that type are passed. If you select Drop, then all frames of that type are dropped.

Scope
Set scope to Unlisted or All. If you select All, then all frames of that type are unconditionally passed or dropped, depending on the action you specified. If you select Unlisted, then frames are passed or dropped only if the frame type is not listed in the predefined or customizable tables.

To set frame type filters, perform the following procedure:

1. From the Main Menu, select **Ethernet** then **Frame Type Filters**. The Frame Type Filters screen as shown in Figure 23 is displayed.

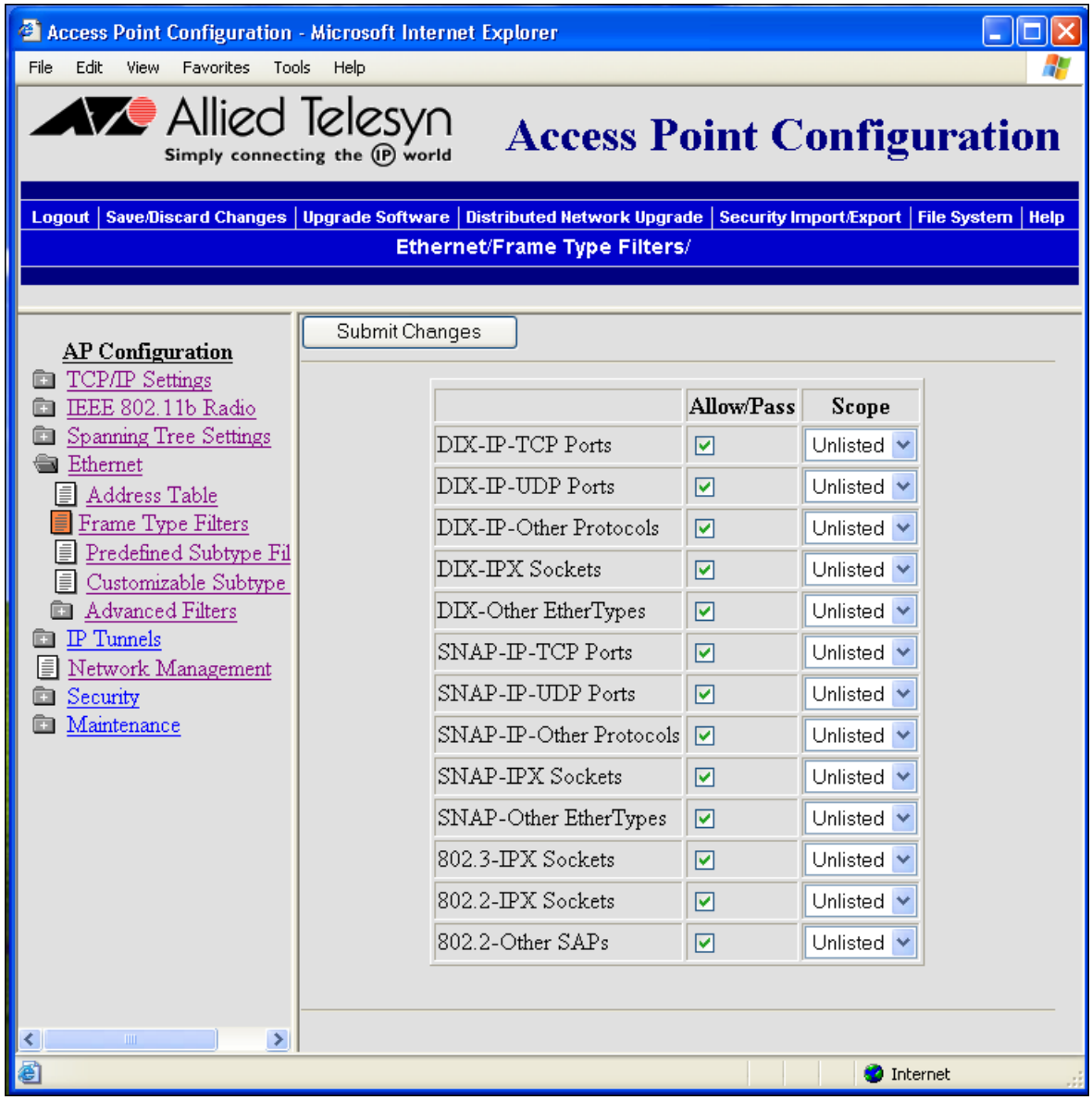


Figure 23 Frame Type Filters Screen

2. In each frame type field, select the down arrow on the right side of the Action field and set the action to **Pass** or **Drop**.

3. In each frame type field, select the down arrow on the right side of the Scope field and set the scope to **Unlisted** or **All**.

Note
If you set the Scope field to **Unlisted** for any of the frame types, you must also configure predefined subtype filters or customizable subtype filters. For help, see Using Predefined Subtype Filters on page 69 or Customizing Subtype Filters on page 70.

The various frame types are explained below:

DIX IP TCP Ports
DIX IP UDP Ports
SNAP IP TCP Ports
SNAP IP UDP Ports
Primary Internet Protocol Suite (IP) transport protocols.

DIX IP Other Protocols
SNAP IP Other Protocols
IP protocols other than TCP or User Datagram Protocol (UDP).

DIX IPX Sockets
Novell NetWare protocol over Ethernet II frames.

SNAP IPX Sockets
Novell NetWare protocol over 802.2 SNAP frames.

802.3 IPX Sockets
Novell NetWare protocol over 802.3 RAW frames.

DIX Other Ethernet Types
SNAP Other Ethernet Types
DIX or SNAP registered protocols other than IP or IPX.

802.2 IPX Sockets
Novell running over 802.2 Logical Link Control (LLC).

802.2 Other SAPs
802.2 SAPs other than IPX or SNAP.

Note
You cannot filter HTTP, Telnet, SNMP, and ICMP frames because they are used for configuration and management of the access point. Additionally, you cannot filter broadcast ARP request packets if the target IP address belongs to the local access point or to an access point in the subtree rooted at the local access point.

4. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar and then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Using Predefined Subtype Filters

You can configure the access point to pass or drop certain predefined frame subtypes.

To configure predefined subtype filters, perform the following procedure:

1. From the Main Menu, select **Ethernet** and then **Predefined Subtype Filters**. The Predefined Subtype Filters screen as shown in Figure 24 is displayed.

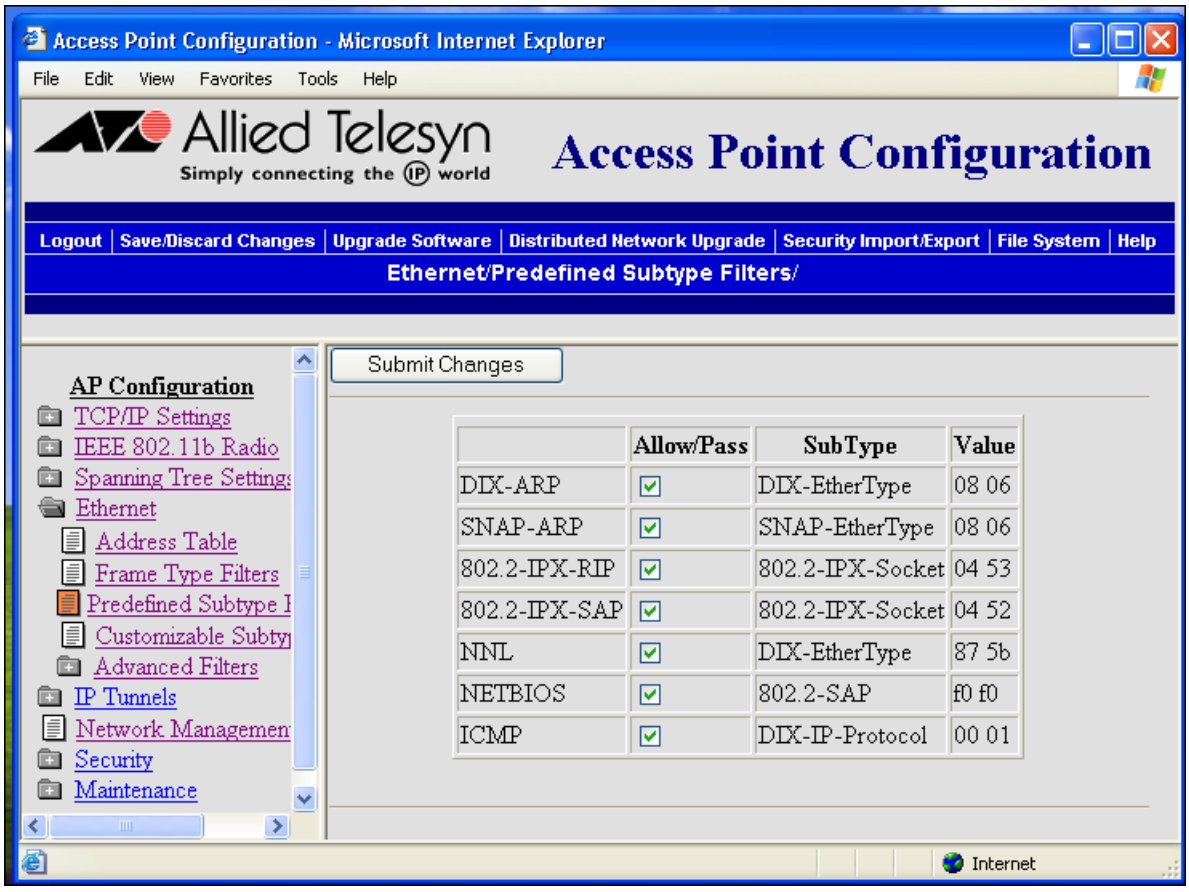


Figure 24 Predefined Subtype Filters Screen

2. In each Allow/Pass field, check or uncheck the boxes to choose **Allow** or **Pass**.

3. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar and then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Customizing Subtype Filters

You can configure the AT-WL2411 to pass or drop certain customized frame subtypes. You define the action, subtype, and value parameters.

Action

Set the action to Pass or Drop. If you select Pass, then all frames of that subtype and value are passed. If you select Drop, then all frames of that subtype and value are dropped.

Subtype

Selects the frame subtype you wish to configure.

Value

The following table describes frame subtypes and their values. The value must be two hex pairs. You must enter port values as decimals; for example, enter **23.** for port 23. The access point displays the hexadecimal equivalent in the Value field on the menu. When a match is found between frame subtype and value, the specified action is taken.

To customize subtype filters, perform the following procedure:

1. From the Main Menu, select **Ethernet** and then **Customizable Subtype Filters**. The Customizable Subtype Filters screen as shown in Figure 25 is displayed.

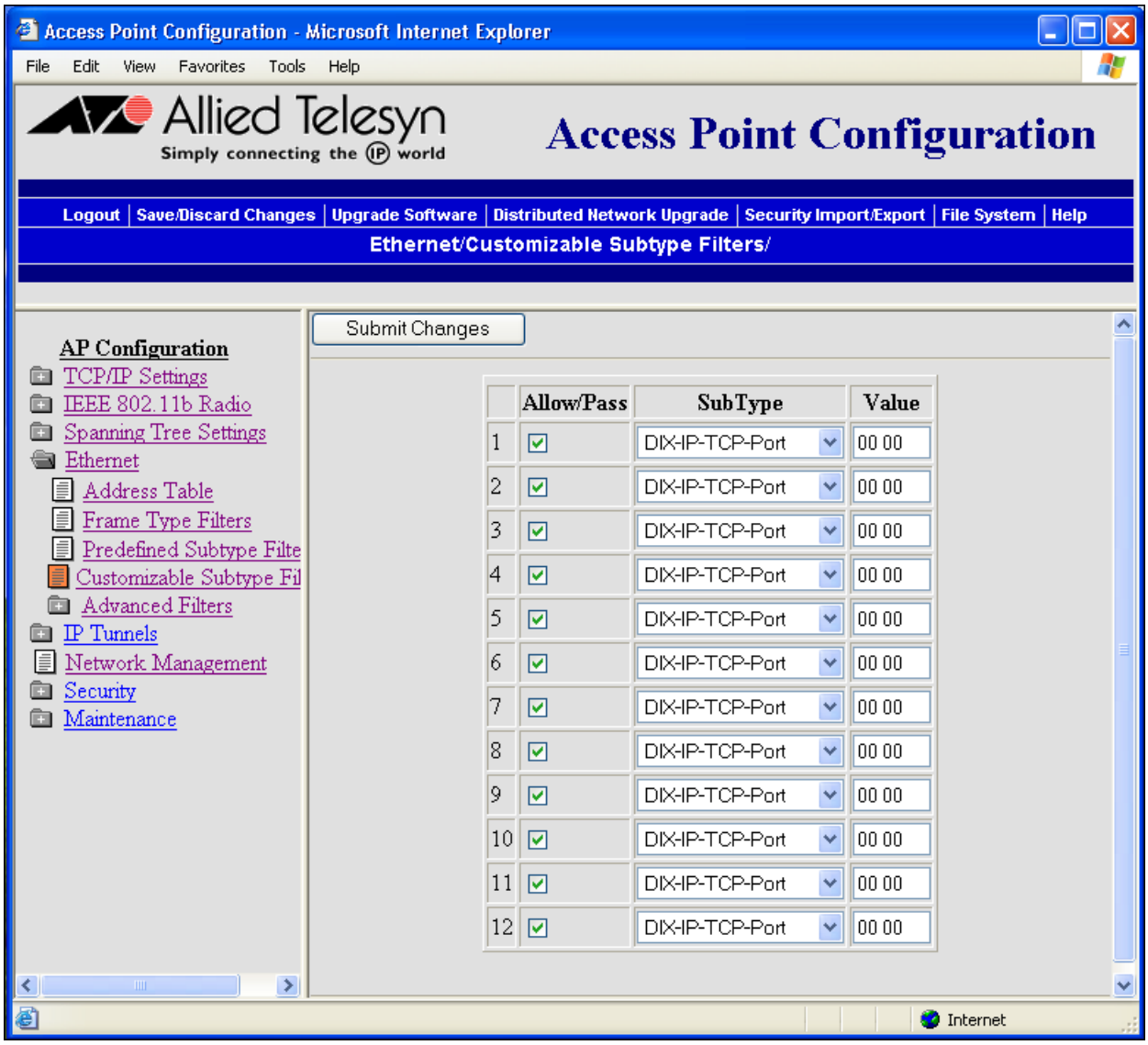


Figure 25 Customizable Subtype Filters Screen

2. Check or uncheck the boxes under the Allow/Pass field to choose **Allow** or **Pass**.

3. Selet the down arrow on the right side of the SubType field and choose the customizable frame subtype. The frame subtype filters and their values are defined below.

   DIX-IP-TCP-Port
   Port value in hexadecimal.

DIX-IP-UDP-Port
Port value in hexadecimal.

DIX-IP-Protocol
Protocol number in hexadecimal.

DIX-IPX-Socket
Socket value in hexadecimal.

DIX-EtherType
Specify the registered DIX type in hexadecimal.

SNAP-IP-TCP-Port
Port value in hexadecimal.

SNAP-IP-UDP-Port
Port value in hexadecimal.

SNAP-IP-Protocol
Port value in hexadecimal.

SNAP-IPX-Socket
Socket value in hexadecimal.

SNAP-EtherType
SNAP type in hexadecimal. To filter on both SNAP type and OUI, use advanced filters.

802.3-IPX-Socket
Socket value in hexadecimal.

802.2-IPX-Socket
Socket value in hexadecimal.

802.2-SAP
802.2 SAP in hexadecimal.

4. In the Value field enter the two hex pairs.
5. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Configuring Advanced Filters

You can configure advanced filters if you need more flexibility in your filtering. Settings for advanced filters execute after those for other filters; that is, advanced filters are only applied if the frame has passed the other filters.

You can use filter values and filter expressions to minimize network traffic over the wireless links; however, it is recommended that you use advanced Ethernet filters only if you have an extensive understanding of network frames and their contents. Use other existing filters whenever possible.

Setting Filter Values

You can associate an ID with a pattern value by selecting a filter and then entering an ID and a value. All values with the same value ID belong to the same list.

To set the value ID and value, perform the following procedure:

1. From the Main Menu, select **Ethernet** then **Advanced Filters**.
2. Select **Filter Values**. The Filter Values screen as shown in Figure 26 is displayed.

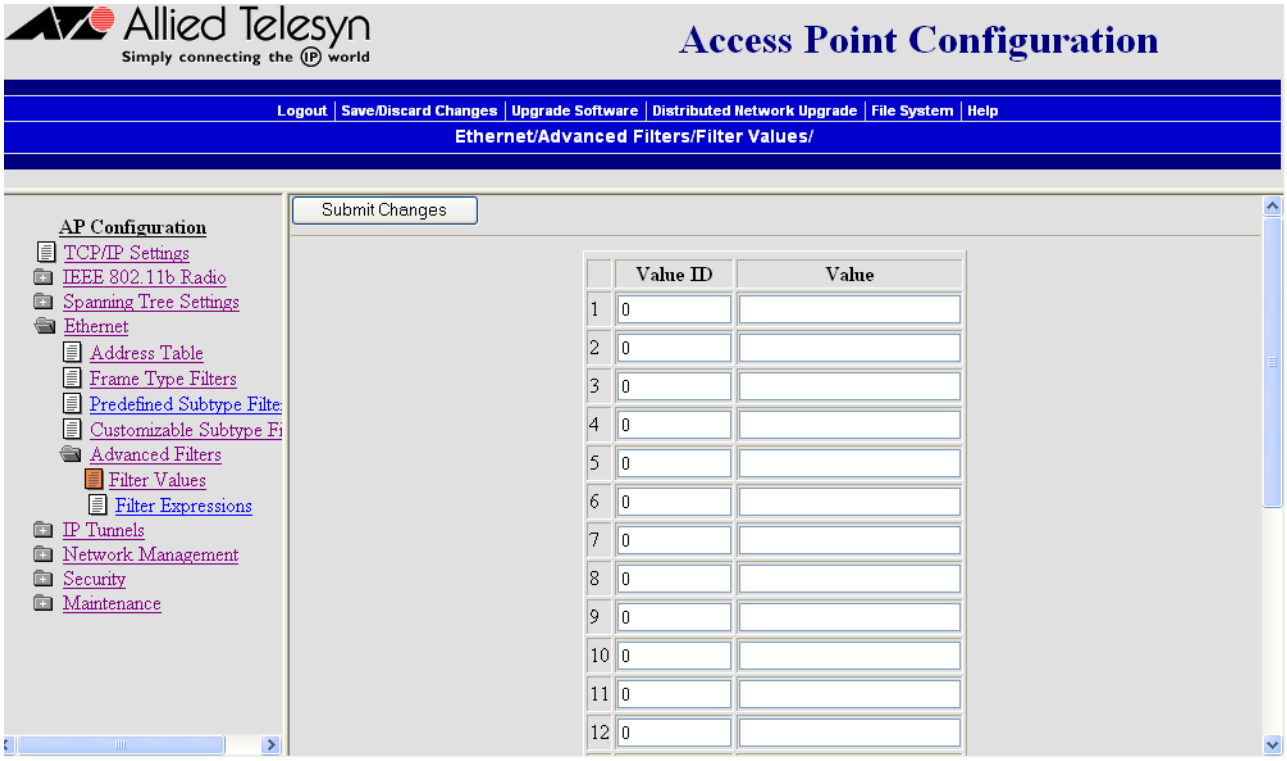


Figure 26 Filter Values Screen

3. You can enter up to 22 Value IDs and Values.

4. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar then select **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Setting Filter Expressions

You can set filter expressions by specifying parameters for packet filters. You can also create a filter expression, which is executed in ascending order based on the ExprSeq values until the access point determines whether to pass or drop the frame.

To set filter expressions, perform the following procedure:

1. From the Main Menu, select **Ethernet** then **Advanced Filters**.
2. Select **Filter Expressions**. The Filter Expressions screen as shown in Figure 27 is displayed.

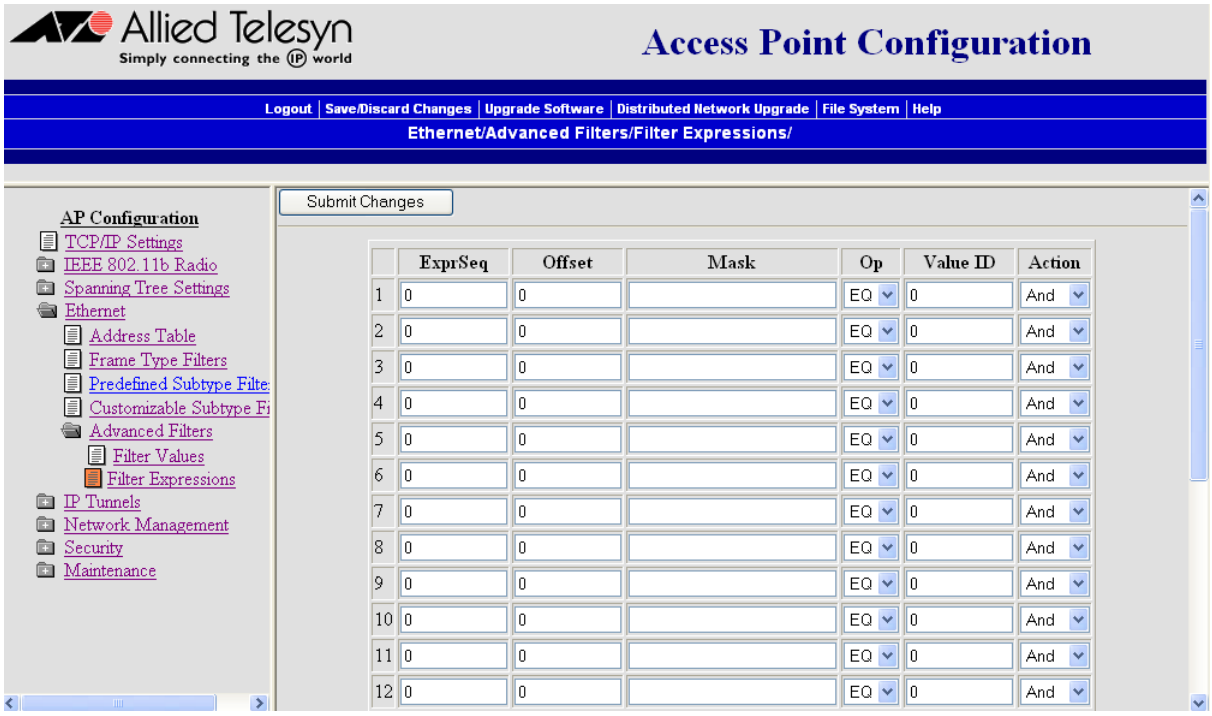


Figure 27 Filter Expressions Screen

3. Configure the filter expressions parameters. The filter expressions parameters are defined below.

   ExprSeq (Expression Sequence)
   Chains expressions together for filtering. After you change the parameter, the statements are reordered and renumbered so the Expression Sequence order is maintained. The range is from **0** to **255**.

This parameter works with the Action parameter; for example, if the action is set to **And**, then the next sequence in another expression is processed.

Offset
Identifies a point inside a bracket where testing for the expression is to start. The range is from **0** to **65535**.

Mask
Applies a data pattern to the packet. If the data pattern in the mask matches the packet, then the specific action is performed. The mask indicates the bits that are significant at the specified offset. A bit is significant if a bit in the mask is set to **one**. If this field is empty, the length of the field is determined by the longest value in the Filter Values Menu for the specified value ID. The mask values are entered in hexadecimal pairs. You can enter 0 to 8 pairs.

Op (Operation)
Performs a logical operation when a data pattern matches a value in the Filter Values menu to determine if the specified action should be taken. Valid operations include:

- ❑ EQ (equal)
- ❑ NE (not equal)
- ❑ GT (greater than)
- ❑ LT (less than or equal)

Value ID
Represents a value in the Filter Values Menu. The bytes after the packet offset are compared to the data pattern indicated by the value. Value ID can be from **0** to **255** and must match one or more value IDs in the Filter Values Menu.

Action
Sets the action to **Pass**, **Drop**, or **And**. If you set the action to **And**, the filter expression with the next highest sequence is applied.

4. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Chapter 5
Configuring the Spanning Tree

This chapter contains the following sections:

- Configuring the Spanning Tree Parameters on page 78
- Configuring Global Parameters on page 86
- About IP Tunnels on page 91
- Configuring IP Tunnel Filters on page 102

Configuring the Spanning Tree Parameters

Access points automatically configure themselves into a self-organized network using a spanning tree topology. As devices are added to or removed from the network, the access points automatically reconfigure to maintain reliable operation. The spanning tree provides efficient, loop-free forwarding of frames through the network and allows rapid roaming of wireless end devices.

To configure the spanning tree parameters, perform the following procedure:

1. From the Main Menu, select **Spanning Tree Settings**. The Spanning Tree Settings screen as shown in Figure 28 is displayed.

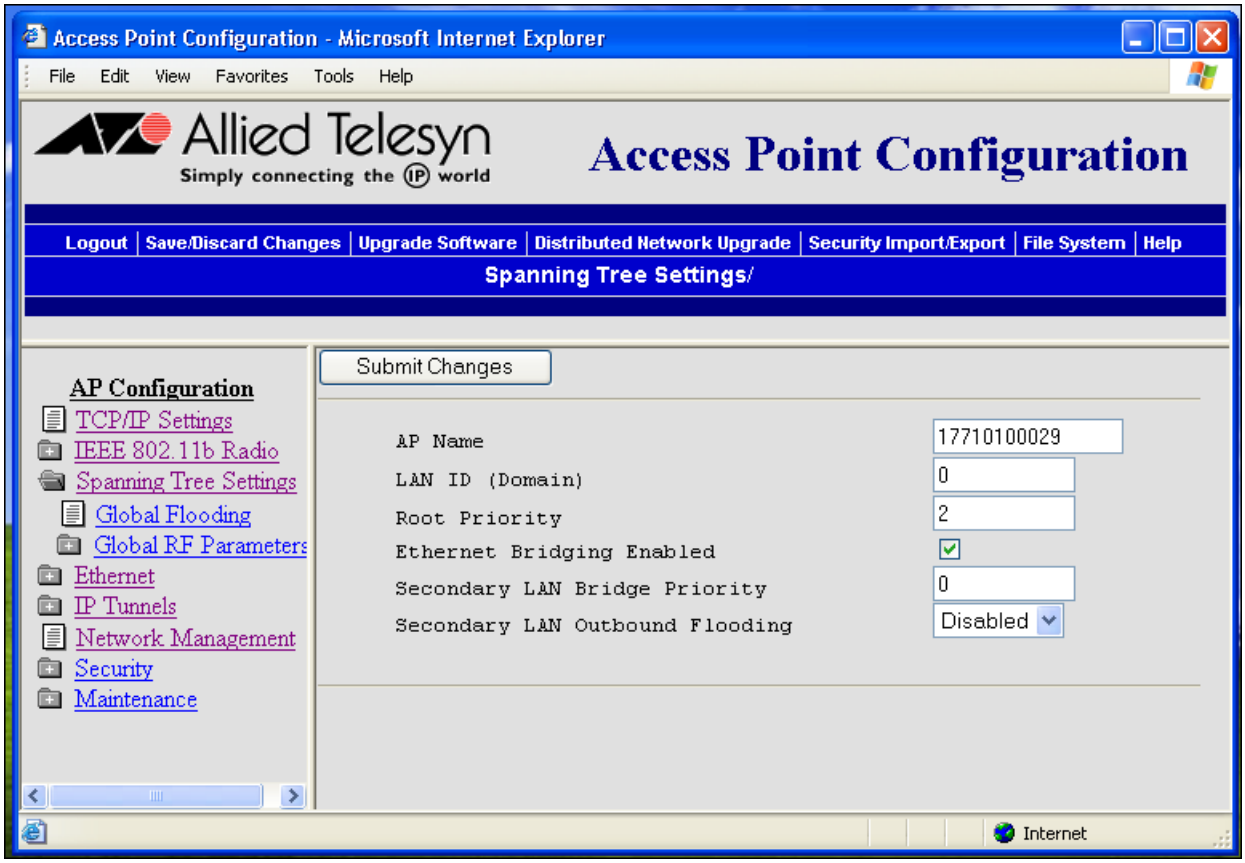


Figure 28 Spanning Tree Settings Screen

2. Configure the spanning tree parameters. The spanning tree parameters are defined below.

AP Name
Enter a unique name for this access point. The name can be from 1 to 16 characters. The default is the access point serial number.

LAN ID (Domain)
Enter the LAN ID. All access points must have the same LAN ID to participate in the same spanning tree. The LAN ID can be from **0** to **254**.

Also, if you assign a LAN ID greater than 15, the AT-WL2411 uses a LAN ID that is the remainder after dividing the LAN ID by 16. For example, if you set the LAN ID to 21 or 37, the access point uses 5.

Root Priority
Determines if this access point is a candidate to become the root of the spanning tree. The access point with the highest root priority becomes the root whenever it is powered on and active.

The root priority can be a value from **0** to **7**. If you set the root priority to **0**, the AT-WL2411 can never become the root access point.

For more information, see About the Root Access Point on page 81.

IAPP Frame Type
Controls the encapsulation of Inner Access Point Protocol (IAPP) frames sent by this access point. You can select either **DIX** (Ethernet 2.0) or **SNAP encapsulation**. Choose **SNAP** if other network computers use **SNAP encapsulation** for IP frames.

Ethernet Bridging
Determines how wireless frames are converted to Ethernet frames and vice versa.

Enabled
Choose **Enabled** if you want frames to be forwarded directly to the Ethernet network. On the root access point, this parameter is always enabled.

Disabled
Choose **Disabled** to use data link tunneling. The AT-WL2411 forwards data from the wireless network encapsulated in OWL data frames to the root access point. The root access point unencapsulates these frames and dumps them raw on the Ethernet network. Also, the root access point encapsulates all Ethernet traffic that is sent to the wireless network. When access points receive this traffic, they forward it to the wireless network. This process makes it seem like all wireless traffic is originating on the root access point's switch port. You may need to use data link tunnels to make roaming transparent to network protocols that are not designed to accommodate roaming.

Secondary LAN Bridge Priority
Determines when and if the access point can become the designated bridge in a secondary LAN. To become a designated bridge, the AT-WL2411 must have at least one radio configured as a Station node or be the endpoint of an IP tunnel. The access point that meets either one of these requirements and has the highest secondary LAN bridge priority will be the designated bridge.

The secondary LAN bridge priority can be a value from **0** to **7**. If you set the priority to **0**, wireless traffic is encapsulated and will use data link tunneling to the secondary LAN bridge. The secondary LAN bridge will then forward the data to the primary LAN.

For more information, see About Secondary LANs and Designated Bridges on page 85.

Secondary LAN Flooding
When an AT-WL2411 is the designated bridge in a secondary LAN, this parameter specifies the types of frames it passes from the primary LAN to the secondary LAN.

Disabled
No flooding occurs unless the root access point (in the Global Flooding screen) enables the Multicast or Unicast Outbound to Secondary LANs parameter.

Enabled
Multicast and unicast flooding occurs unless the root access point (in the Global Flooding screen) disables multicast or unicast flooding.

Multicast
Multicast flooding occurs unless the root access point (in the Global Flooding screen) disables multicast flooding.

Unicast
Unicast flooding occurs unless the root access point (in the Global Flooding screen) disables unicast flooding.

3. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

About the Root Access Point

The root access point is always on the primary LAN and initiates the spanning tree. The root coordinates the network and distributes global system parameters to other access points. The root is elected from a group of access points that are designated as root candidates (access points that are powered on, active, and do not have a root priority of 0). The access point with the highest root priority is the root.

The election process also occurs in the event of a root access point failure. Besides the root, you should have two or three access points with a non-zero root priority. If two access points have the same root priority, the access point with the highest Ethernet address becomes the root. You should configure your network with overlapping coverage so that the network can automatically recover from any single point of failure.

After the root access point is elected, it transmits hello messages on all enabled ports. The spanning tree forms as other access points receive hello messages and attach to the network on the optimal path to the root. A non-root access point also transmits hello messages after it is attached to the network. Each hello message contains the LAN ID of the access point that originated the message. The protocol does not allow wireless links to exist between access points that do not have matching LAN IDs.

About Bridging

Wireless end devices operate similarly to other Ethernet products; therefore, all of your existing Ethernet applications will work with the wireless network without any special networking software. Figure 29 shows the general architecture of the access point.

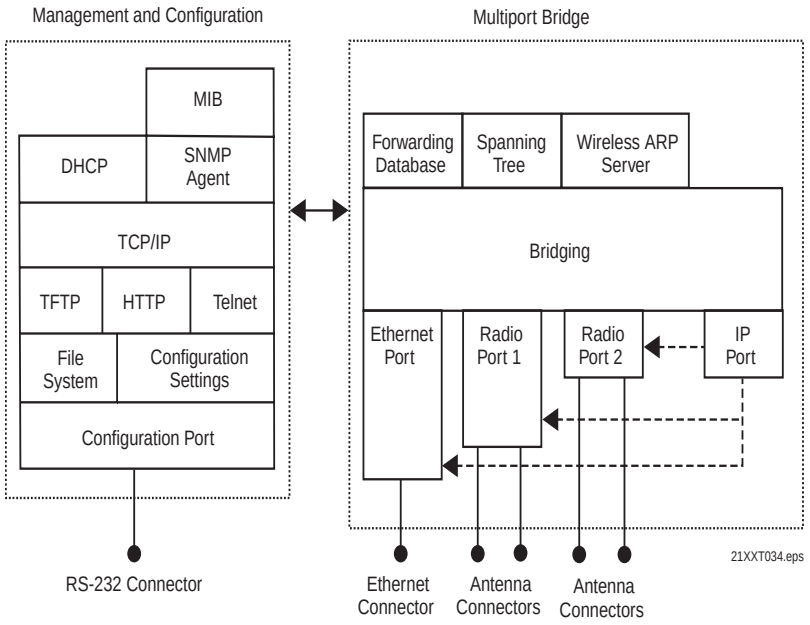


Figure 29 General Architecture of the Access Point

By default, wireless traffic is not bridged to a remote IP subnet. Any access point on a remote subnet that can receive IP hello messages can establish an IP tunnel; therefore, multiple IP tunnels can exist between the root access point and a single remote IP subnet.

If bridging is disabled, all traffic for end devices is forwarded between access points using data link encapsulation, which means that the MAC source/destination addresses correspond to the access points originating/receiving the traffic for the end devices. By using data link encapsulation, you prevent network monitoring tools and other network components from detecting end device MAC/IP addresses that belong to the remote subnet. It is strongly recommended that you use the default setting when you are using IP tunnels to provide mobility of other routable protocols, such as IPX. In some network installations, detecting these addresses may generate alarms or cause switches to behave erroneously. There is no additional forwarding overhead for disabling bridging in this situation.

If you enable bridging on a remote subnet, a single access point functions as the designated bridge for the secondary LAN. In this case, only the designated bridge can establish an IP tunnel. Any other access point on the remote subnet must attach to the network through the designated bridge. End device MAC/IP addresses are fully visible on the remote subnet. If you are using IP tunnels to provide mobility for IP and other non-routable protocols, you can enable bridging on remote IP subnets, because IP has built-in safeguards and filters for protecting the operation of IP routers and other network components.

Also, you should enable bridging if the root access point and the gateway that supports the NNL devices are on different IP subnets. You may also need to enable bridging if your wireless end devices use terminal emulation running the NNL protocol or if you use wireless end devices that are running both IP and NNL.

Bridging Layer Functions

Some of the significant functions supported at the bridging layer are explained below.

Network Organization

Access points automatically configure into a self-organized network using a spanning tree topology. As devices are added to or removed from the network, the access points automatically reconfigure to maintain reliable operation. The spanning tree provides efficient, loop-free forwarding of frames through the network and allows rapid roaming of end devices.

The root access point initiates the spanning tree. The root coordinates the network and distributes common system parameters to other access points and wireless end devices. The root is elected from a group of access points that are designated as root candidates at the time of installation. The election process also occurs in the event of a root failure. You can configure your network with overlapping coverage so that the network automatically recovers from any single point of failure.

End devices can optionally participate in the spanning tree protocol by explicitly attaching to the network. As a result, operational parameters are easily distributed, unicast flooding is reduced or eliminated, and roaming hands-off logic is more robust.

Forwarding

The access point maintains a forwarding database of all physical station addresses, and it knows the correct port for each address. The access point updates this database by monitoring source addresses on each port (backward learning), by receiving explicit attachment messages, and by examining messages exchanged between access points when wireless end devices roam. The database also includes the power management status of each end device, which allows the access point to support the pending message feature of the network. The forwarding database allows the bridging software to make efficient forwarding decisions.

Switch Support

Ethernet switches that do not comply with the 802.1D standard have difficulty handling wireless end devices that roam between different switched segments. The access point provides data link tunneling for switches that do not handle roaming. Using data link tunneling, frames for a given end device always appear on the root access point's switched segment, regardless of roaming, and the switch's routing tables remain stable.

Flooding Configurations

When the destination address is unknown, standard LAN bridges flood frames on all ports. Most wireless end devices supported by the access point operate at lower speeds than Ethernet; therefore, indiscriminate flooding from a busy Ethernet backbone to an end device can consume a substantial portion of the available wireless bandwidth and reduce system performance. The access point allows you to set flooding control options for both unicast and multicast frames to free up bandwidth and improve system performance.

Pending Messages

Wireless end devices may use power management to maintain battery life. These end devices wake up periodically to receive frames that arrived while their radio was powered down. The bridging software in the access point provides a pending message delivery service that allows frames to be held until the end device is ready to receive them.

Filtering Options

The access point incorporates extensive filtering capabilities. Basic filters allow you to filter on DIX type, protocol port, socket, or SAP. Advanced filters let you create and group filters based on data patterns that you define.

About Secondary LANs and Designated Bridges

The access point that is responsible for bridging data between the secondary LAN and the primary LAN is called the designated bridge. In both types of secondary LANs, the designated bridge acts the same. The designated bridge must be an access point that has at least one radio set to Station mode or is the endpoint of an IP tunnel. If more than one access point meets at least one of these requirements, the access point with the highest secondary LAN bridge priority is the designated bridge.

If an access point has the highest bridge priority on the secondary LAN, but it is not in the radio coverage area of an access point on the primary LAN, it cannot become the designated bridge. In this case, an access point with a lower bridge priority that is in the radio coverage area or an access point on the primary LAN becomes the designated bridge. If two access points have the same secondary LAN bridge priority, the access point with the highest Ethernet address becomes the designated bridge. If the designated bridge goes offline, the remaining access points negotiate to determine which access point becomes the new designated bridge.

Designated bridges determine if the secondary LAN is bridging or non-bridging. By enabling the Ethernet bridging parameter on the designated bridge, all wireless traffic gets dumped raw on the secondary LAN. You should enable bridging if you have wired hosts on the secondary LAN that must communicate with a wireless device on the secondary LAN.

You should enable bridging unless the inbound path through a bridge or switch does not support roaming. Bridges and switches that adhere to the IEEE 802.1D standard support roaming. Some proprietary VLAN switches and ATM LANE bridges do not support roaming. If you disable the Ethernet bridging parameter on the designated bridge, the wireless traffic is encapsulated on the secondary LAN, which eliminates communication from secondary LAN end devices.

If you set the secondary LAN bridge priority to 0 on the designated bridge, you have a non-bridging secondary LAN; that is, bridging to the secondary LAN is automatically disabled.

Configuring Global Parameters

Global parameters are configured on the root access point and on any other access point that is a root candidate (does not have a root priority of 0). The root access point sends these settings to all other access points on the network. You should set the same global parameters for the root access point and its backup candidates.

Any global parameters you set on the root access point will override parameters those you set in other access points.

Configuring Global Flooding

Use global flooding to configure how the access points handle a frame with an unknown address. Access points try to forward frames to the port with the shortest path to the destination address. When the access point has not learned the direction of the shortest path, you can configure it to flood the frames in certain directions to try to locate the destination address.

To configure global flooding, perform the following procedure:

1. From the Main Menu, select **Spanning Tree Settings** then **Global Flooding**. The Global Flooding screen as shown in Figure 30 is displayed.

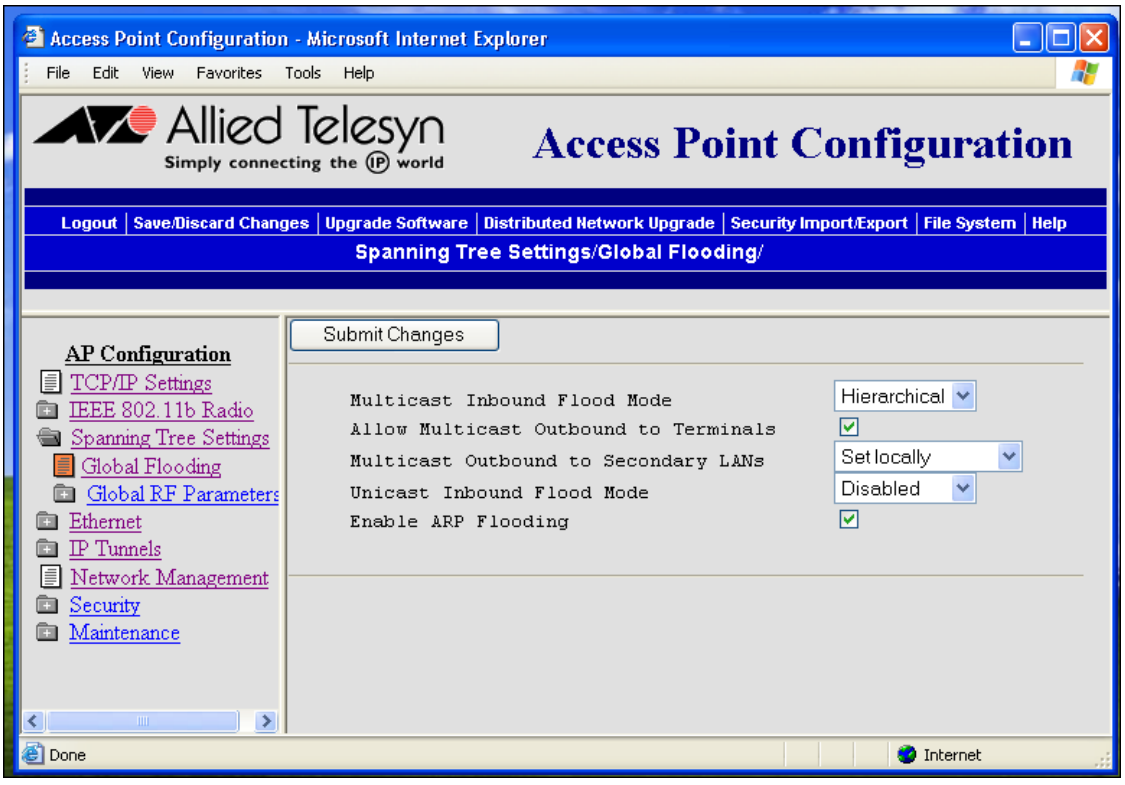


Figure 30 Global Flooding Screen

2. Configure the Global Flooding parameters. The Global Flooding Parameters are explained below.

Multicast Flood Mode
Determines the flooding structure for inbound multicast frames with unknown destination addresses.

Universal
Allows any wireless end device to communicate with any other wireless end device.

Hierarchical
Allows wireless end devices to communicate with nodes on the primary LAN but not with other wireless end devices.

Disabled
Prevents flooding.

Multicast Outbound to Terminals
This parameter only applies to 802.11b radios. If multicast flood mode is not disabled, this parameter specifies if outbound multicast frames with unknown destination addresses are flooded toward wireless end devices

Multicast Outbound to Secondary LANs
If multicast flood mode is not disabled, this parameter specifies if outbound multicast frames with unknown destination addresses are flooded toward secondary LANs.

Enabled
The root access point controls flooding for all access points serving as designated bridges for the secondary LANs.

Set locally
Designated bridges for the secondary LANs control flooding on their LANs.

Unicast Flood Mode
Determines the flooding structure for inbound unicast frames with unknown destination addresses.

Universal
Allows any wireless end device to communicate with any other wireless end device.

Hierarchical
Allows wireless end devices to communicate with nodes on the primary LAN but not with other wireless end devices.

Disabled
Prevents flooding.

Unicast Outbound to Terminals
If the unicast flood mode is not disabled, this parameter specifies if outbound unicast frames with unknown destination addresses are flooded toward wireless end devices. This parameter only applies to 802.11b radios.

Unicast Outbound to Secondary LANs
If the unicast flood mode is not disabled, this parameter specifies if outbound unicast frames with unknown destination addresses are flooded toward secondary LAN segments.

Enabled
The root access point controls flooding for all access points serving as designated bridges for the secondary LANs.

Set locally
Designated bridges for the secondary LANs control flooding on their LANs.

3. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Configuring Global RF Parameters

Use global RF parameters to set various parameters on the access points. If you are configuring the root access point and you set the Set Globally parameter to Enabled, the value for that parameter is set globally for all access points and wireless end devices in the network. If you are configuring the root access point and you set the Set Globally parameter to Disabled or if you are not configuring the root access point, each device uses its local setting.

To configure global RF parameters, perform the following procedure:

1. From the Main Menu, select **Spanning Tree Settings** then **Global RF Parameters**. The Global RF Parameters screen as shown in Figure 31 is displayed.

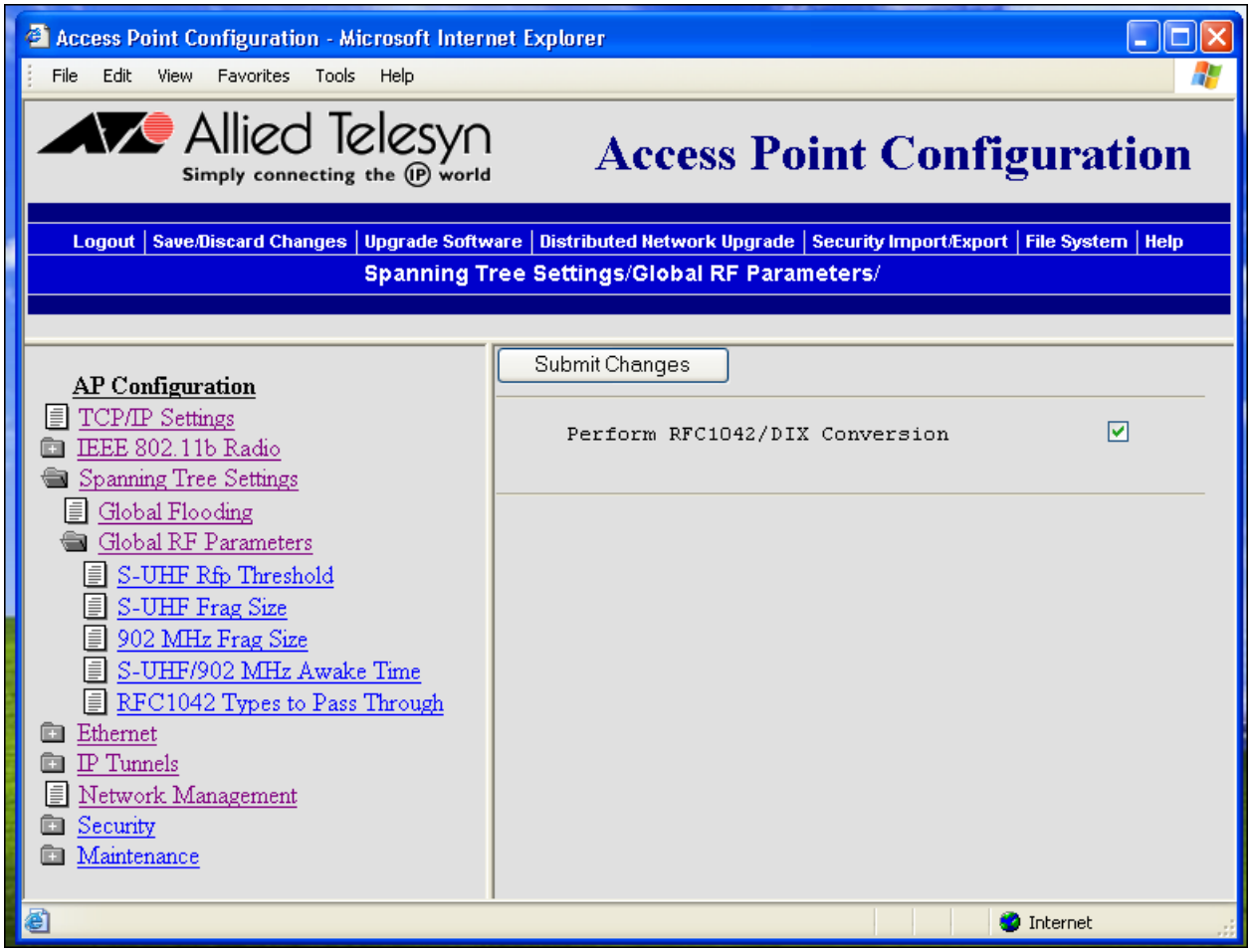


Figure 31 Global RF Parameters Screen

2. Configure the GLOBAL RF Parameters. Select the links in the Global RF Parameters Menu to set more parameters. The parameters are explained below.

RFC1042/DIX Conversion
Determines how the access point will handle the conversion of RFC1042/DIX frames that are received on its 802.11b ports.

Enabled
Causes frames received on an 802.11b port with a protocol type equal to a value in the "RFC1042 types to pass through" list to be forwarded without conversion. If the frame has a protocol types that is not found in the list, it will be converted to DIX format before it is forwarded.

Disabled
Causes frames received on an 802.11b port to be forwarded without conversion; that is, when a SNAP frame is received from an 802.11b radio with an OUI (Organizationally Unique Identifier) equal to 000000, it will be forwarded without conversion.

RFC1042 Types to Pass Through
If the RFC1042/DIX Conversion field is Enabled, this parameter specifies values for protocol types that are to be passed without conversion. The list includes the Apple Talk protocol type, value 80F3.

Values entered in this parameter represent the protocol types of frames that will be passed without conversion to DIX format.

3. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

About IP Tunnels

The physical boundary of a wireless network is usually defined by the presence of an IP router. Multiple independent wireless networks may exist, each with its own LAN ID, root access point, and set of wireless end devices. In this environment, an end device can only operate within the limited coverage area of its own network and cannot roam across IP subnet boundaries. However, using IP tunnel technology, end devices now can roam across subnet boundaries. This technology is designed to safely and transparently coexist with routed IP installations while supporting mobility for end devices. IP tunnels do the following:

- Enables access points on different subnets to belong to the same wireless network.
- Supports transparent roaming of end devices between access points that are on different subnets without losing network connections.
- Supports end devices using both IP and other routable or nonroutable protocols.

The AT-WL2411 consists of a group of multiport Ethernet-to-wireless bridges. The IP tunnel port uses a standard IP protocol called Generic Routing Encapsulation (GRE) to encapsulate a frame. These encapsulated frames can use normal IP routing to pass through IP routers. Unlike the physical Ethernet and radio ports, the IP tunnel port does not have its own output connector. It is a logical port that provides IP encapsulation services for frames that must be routed to reach their destinations. Once frames are encapsulated, they are transmitted or received through a physical port.

In other words, IP tunnels use encapsulation to establish a virtual LAN segment through IP routers. The virtual LAN segment includes the home IP subnet and logically extends to include end devices attached to access points on remote IP subnets. An IP tunnel becomes a branch in the spanning tree. Access points on remote subnets can be directly connected to an IP tunnel or indirectly connected through another access point on a remote subnet.

An IP Tunnels configuration is shown in Figure 32.

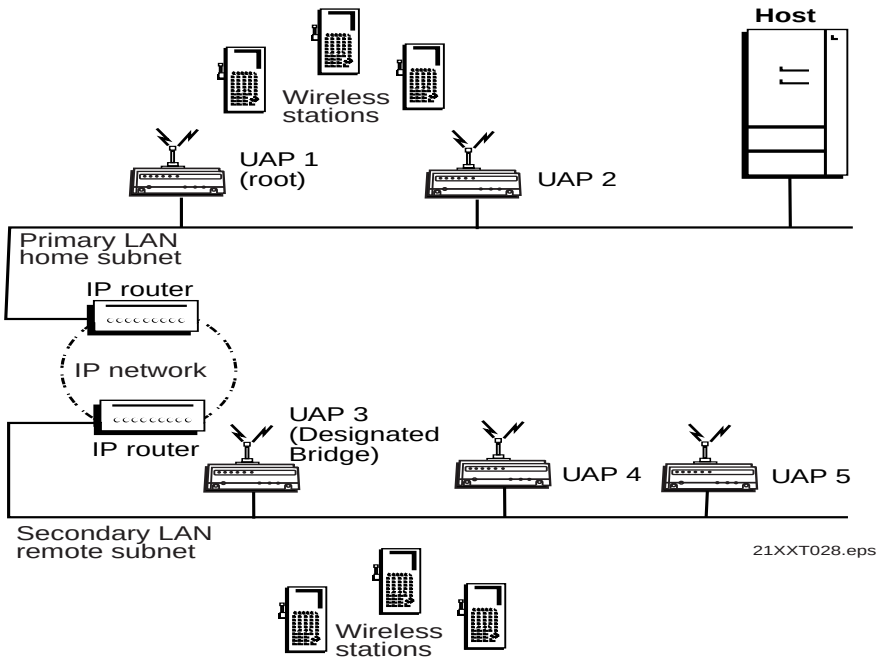


Figure 32 IP Tunnels Configuration

A non-root access point can concurrently receive hello messages on its Ethernet port, its radio port, and its IP tunnel port. However, an access point can use only one port to attach to the network. Port priorities are structured so that an Ethernet connection is always selected first and an IP tunnel connection is always selected before a radio connection.

Setting the secondary LAN bridge priority to zero disables the bridging of wireless traffic to remote IP subnets. It allows end devices that are connected to access points on a remote IP subnet to communicate with hosts on the home subnet without bridging wireless traffic to the remote IP subnet. This is always done for IP communication since the wireless traffic is always from the home subnet and not from the remote subnet. The secondary LAN bridge priority will allow you to select the bridging mode for non-IP traffic such as NNL.

Internet Group Management Protocol (IGMP)

IGMP lets you originate multiple IP tunnels using a single IP multicast address. Note that IGMP is independent of IP; it can be used to facilitate multicast for IP or any other application.

IP routers only forward multicast packets to those subnets that have IP hosts that participate in the respective IP multicast group. An IP host uses IGMP to notify IP routers that it wants to participate in an IP multicast group. Access points can act as IP hosts and participate in an IP multicast group by enabling IGMP and by defining a Class D IP multicast address. The Internet Assigned Numbers Authority has allocated 224.0.1.65 as an inter-access-point protocol (IAPP). You must enter this address in the IP address list in the root access point. (Note that the address list may contain other IP addresses.) and in the Multicast Address field in the other access points.

If you enable IGMP on the root access point, the root access point uses a Class D IP multicast address to send IP hello packets through IP routers to access points on other subnets. If you enable IGMP on remote IP subnets, intermediate IP routers will forward the IP hello packets to those subnets. Enabling IGMP also has these advantages:

- Causes IP hello packets to be forwarded only to those subnets that participate in the IP multicast group.
- Increases redundancy because multiple access points on a remote subnet can receive IP hello packets.

IP multicast provides an ideal way to distribute IP hello messages. Normally, you should enable IGMP and configure an IP multicast address in at least one access point on each remote IP subnet. (Some routers can provide proxy IGMP services for IP hosts.) IP multicast has the following advantages:

- The user does not have to know unicast or directed broadcast IP addresses in advance.
- IP multicast provides better built-in redundancy than IP unicast, because any access point can establish an IP tunnel.

IP hello messages are only forwarded to those IP subnets and IP hosts (such as access points) that participate in the multicast group. Directed broadcast packets are forwarded to all IP hosts on the target subnet.

Originating IP Tunnels

The creation of tunnels between the root access point on the home IP subnet and access points on remote IP subnets is controlled by three operational parameters:

- ❑ Enabled/disabled IP ports. A tunnel can never be established on a disabled IP port.
- ❑ IP address list
- ❑ Secondary LAN bridge priority settings

An IP tunnel is established when an access point on a remote IP subnet attaches to the root access point through its IP tunnel port. The number of IP tunnels the root access point can originate is practically unlimited. However, the IP address list can presently contain eight entries. The size of the address list effectively limits the number of tunnels that can be created if unicast and directed broadcast IP addresses are used; however, you can use a single IP multicast address to originate a practically unlimited number of tunnels.

The IP address list can contain any combination of IP unicast, IP broadcast, or IP multicast addresses. Only one IP tunnel can be created for each IP unicast address in the list. A single IP multicast address can be used to create a practically unlimited number of tunnels to multiple remote IP subnets. A single IP directed broadcast address can be used to create a practically unlimited number of tunnels to a single remote IP subnet. (An IP directed broadcast address is typically used to specify all hosts on a single remote subnet.)

A remote IP subnet functions much like a wireless secondary LAN with these exceptions:

- ❑ Any access point can provide a wireless link to another access point. Only the root access point can originate an IP tunnel.
- ❑ A wireless link can provide a transparent bridge for both wired and wireless devices on a wireless secondary LAN. An IP tunnel only provides a transparent bridge for end devices (unless explicitly configured to provide connectivity for an NNL gateway on a remote IP subnet).

Establishing and Maintaining IP Tunnels

If the IP tunnel port control is enabled, the root access point sends hello messages to each IP address in its IP address list. An access point on a remote IP subnet automatically establishes an IP tunnel if it receives an IP hello message from the root access point. An access point attached through an IP tunnel transmits hello messages on the remote subnet so that other access points on the remote subnet that do not receive IP hello messages can also attach to the network.

If IP hello messages are sent to IP unicast addresses, then some access points on a remote subnet will not receive hello messages; therefore, those access points cannot establish an IP tunnel. If bridging is disabled on the subnet, wireless traffic is forwarded to and from these access points through data link tunnels. A data link tunnel is logically concatenated with an IP tunnel so that wireless traffic can be completely isolated from the remote IP subnet.

If you need to bridge to a remote subnet, see Configuring the Spanning Tree Parameters on page 78.

IP Addressing for End Devices

IP end devices must be assigned IP addresses that are on the home IP subnet. There are no address restrictions for non-IP end devices.

Using Non-IP Protocols

Servers that use a routable network protocol such as IP or IPX may be located on any subnet; however, triangular routing can be minimized if servers are located on the home IP subnet. (Note that this is also true for standard mobile IP.) You should be able to use default flooding and bridging settings if you are using routable protocols, even if servers are located on remote IP subnets.

The NNL protocol is a simple Non-routable Network Layer protocol that is used to carry high-layer data in a local area network environment. An NNL gateway forwards NNL traffic to non-NNL hosts such as TCP/IP hosts. You can use the default flooding and bridging settings, and minimize triangular routing, if NNL gateways are located on the home subnet. If NNL gateways are located or remote subnets, you must enable outbound multicast flooding and secondary bridging.

Frame Forwarding

Any data packet sent through an IP tunnel is addressed to the unicast IP address of the access point at the other end of the tunnel. An access point at the remote end of the tunnel learns the unicast IP address of the root access point by listening to IP hello packets. The root access point learns the unicast IP address of a remote access point when the access point attaches to the network.

Usually, ARP requests (which are multicast packets) that originate on the home IP subnet are forwarded outbound to all devices on the network, including through IP tunnels to remote IP subnets. If you configure the access point as an ARP server, ARP packets are only sent through the IP tunnel to the destination end device.

Unicast frames are only forwarded outbound through an IP tunnel if the destination address identifies an end device that has roamed to a remote IP subnet. Usually, wireless traffic is not bridged to remote IP subnets and traffic from a remote IP subnet is never forwarded inbound through an IP tunnel.

MAC frames originating on the home IP subnet are encapsulated in the root access point, forwarded through the IP network, unencapsulated by the access point at the remote end of the IP tunnel, and forwarded to the appropriate access point (if necessary) for delivery to the destination end device. For inbound frames, the same process is used in reverse between the access point at the remote end of an IP tunnel and the root access point.

Certain frame types are never forwarded through tunnels. Frame types that are never forwarded include IP frames used for coordinating routers and MAC frames used for coordinating bridges. Frame types that are never forwarded include:

- 802.1D bridge frames
- Proprietary VLAN switch frames
- IP frames with a broadcast or multicast Ethernet address
- IP frames with the following router protocol types and decimal values:
  - DGP (86) (Dissimilar Gateway Protocol)
  - EGP (8) (Exterior Gateway Protocol)
  - IDPR (35) (Inter-Domain Policy Routing Protocol)
  - IDRP (45) (Inter-Domain Routing Protocol)
  - IGP (9) (Interior Gateway Protocol)

- IGRP (88)
- MHRP (48) (Mobile Host Routing Protocol)
- OSPFIGP (89) (Open Shortest Path First Interior Gateway Protocol)

❑ IP ICMP (Internet Control Message Protocol) types:

- IPv6
- Mobile IP
- Router Advertisement
- Router Selection

❑ IP/UDP (User Datagram Protocol) frames with the following destination protocol port numbers:

- BGP (179) (Border Gateway Protocol)
- RAP (38) (Route Access Protocol)
- RIP (520) (Routing Information Protocol)

❑ IP/TCP frames with the following destination or source protocol port numbers:

- BGP (179) (Border Gateway Protocol)
- RAP (38) (Route Access Protocol)

Outbound Frames

Data frames are forwarded outbound through an IP tunnel if

❑ an end device is known to be attached to an access point on a remote IP subnet.

❑ the frame type is enabled in the Tunnel Filters menu.

Unicast frames are not flooded. End devices attach to the root access point, which maintains entries for these devices in its forwarding database. The database entries indicate the correct subnet for outbound forwarding.

For TCP/IP applications, IP and ARP frames must be forwarded through IP tunnels. An IP or ARP frame is only forwarded outbound if the destination address identifies an end device on the home IP subnet. If you enable the ARP server in the root access point, you can reduce the number of ARPs forwarded outbound.

Inbound Frames

Only frame types that are enabled in the Tunnel Filters menu are forwarded, and the frames are only forwarded inbound if the source IP address belongs to the home IP subnet. Frames transmitted by servers or devices that are wired to a remote IP subnet are not forwarded through IP tunnels if the IP address does not belong to the home subnet. Only frames from wireless end devices with IP addresses belonging to the home subnet are forwarded inbound.

Configuring IP Tunnels

In general, here are some guidelines you can use to configure IP tunnels:

- ❑ When choosing the home IP subnet, ideally you should choose the subnet that contains gateways or servers for end devices; however, these servers may be on other subnet. Note that you can create a home subnet for end devices. Fixed or variable length subnet masks can be used; subnet addressing is not required. IP addresses for end devices must belong to the home subnet.
- ❑ Identify the root candidates on the home subnet. The root access point should be an access point that does not otherwise handle a large volume of traffic.
- ❑ Configure all access points on the home subnet and remote IP subnets with the same LAN ID. If IP tunnels are not used to attach a remote subnet, then access points on that subnet should be configured with a different LAN ID.
- ❑ In the IP Tunnels screen, enable the Port Control parameter in all access points that are root candidates and designated bridge candidates.
- ❑ In the IP Tunnels screen, configure the Mode parameter in root candidates to Originate if Root. Configure the Ethernet Address table to include access points on each remote subnet. All root candidates should be configured identically.
- ❑ In the IP Tunnels screen, configure the Mode parameter in designated bridge candidates to Listen.

- In the Tunnel Filters screen, configure the filters in root candidates and in other access points that can be attached through an IP tunnel. IP tunnel filters are consistent with Ethernet filters.
- For networks using IP networking on end devices, it is recommended that you enable the ARP server capability in the access points.
- Determine if you need to enable bridging on remote subnets. For example, bridging must be enabled if an NNL gateway is attached to the remote subnet. For help, see Configuring the Spanning Tree Parameters on page 78. The designated bridge candidates must have permanent IP addresses and must be able to receive IP hello messages from the root access point. An access point will receive IP hello messages if the messages are sent to the unicast IP address of the access point, or to an IP-directed broadcast or IP multicast address. Note you may need to enable IGMP for IP multicast.

To configure the IP Tunnels screen, perform the following procedure:

1. From the Main Menu, select **IP Tunnels**. The IP Tunnels screen as shown in Figure 33 is displayed.

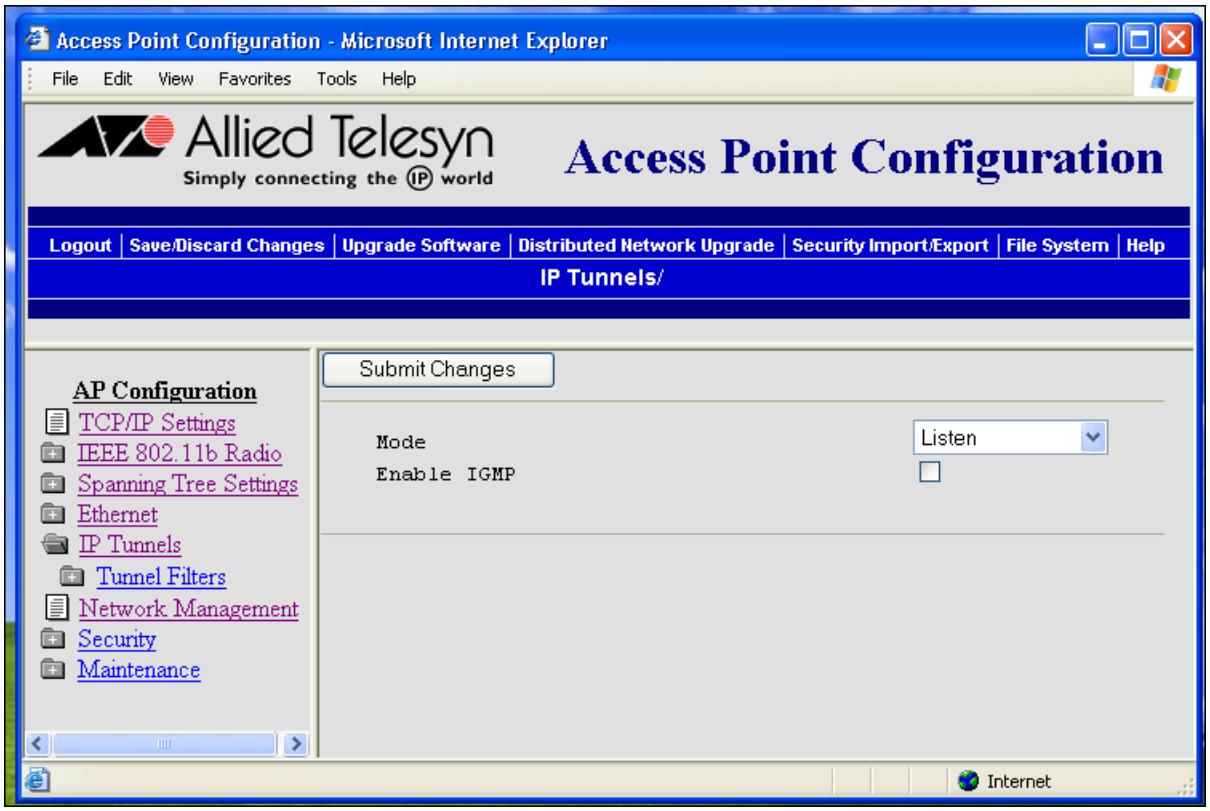


Figure 33 IP Tunnels Screen

2. Select the down arrow on the right side of the Mode field and choose **Originate if Root** to let the access point originate the tunnel if it is functioning as the root access point for the network.

   a. Choose **Disabled** if you do not want this access point to participate in IP tunnels.

   b. Chose **Listen** to configure access points that are designated bridges or designated bridge candidates for their remote IP subnet to serve as the endpoint of an IP tunnel.

3. Check or uncheck the box on the right side of the Enable IGMP to **Enabled** or **Disabled** this feature.

   Note
   If you enable IGMP on the root access point, you need to enter the Class D IP multicast address in the IP address list. For help, refer to Configuring IP Address List on page 101.

4. Select **Submit Changes**.

5. In the **Multicast Address** field, enter the multicast address. Unless you have your own IP multicast address, the Internet Assigned Numbers Authority has allocated 224.0.1.65 for the inter-access-point protocol (IAPP). You should use this default multicast address.

6. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Configuring IP Address List

If you enabled IGMP on the root access point, you will need to enter the Class D IP multicast address in the IP address list.

To configure the IP address list, perform the following procedure:

1. From the Main Menu, select **IP Tunnels** then **IP Addresses**. The IP Addresses screen as shown in Figure 34 is displayed.

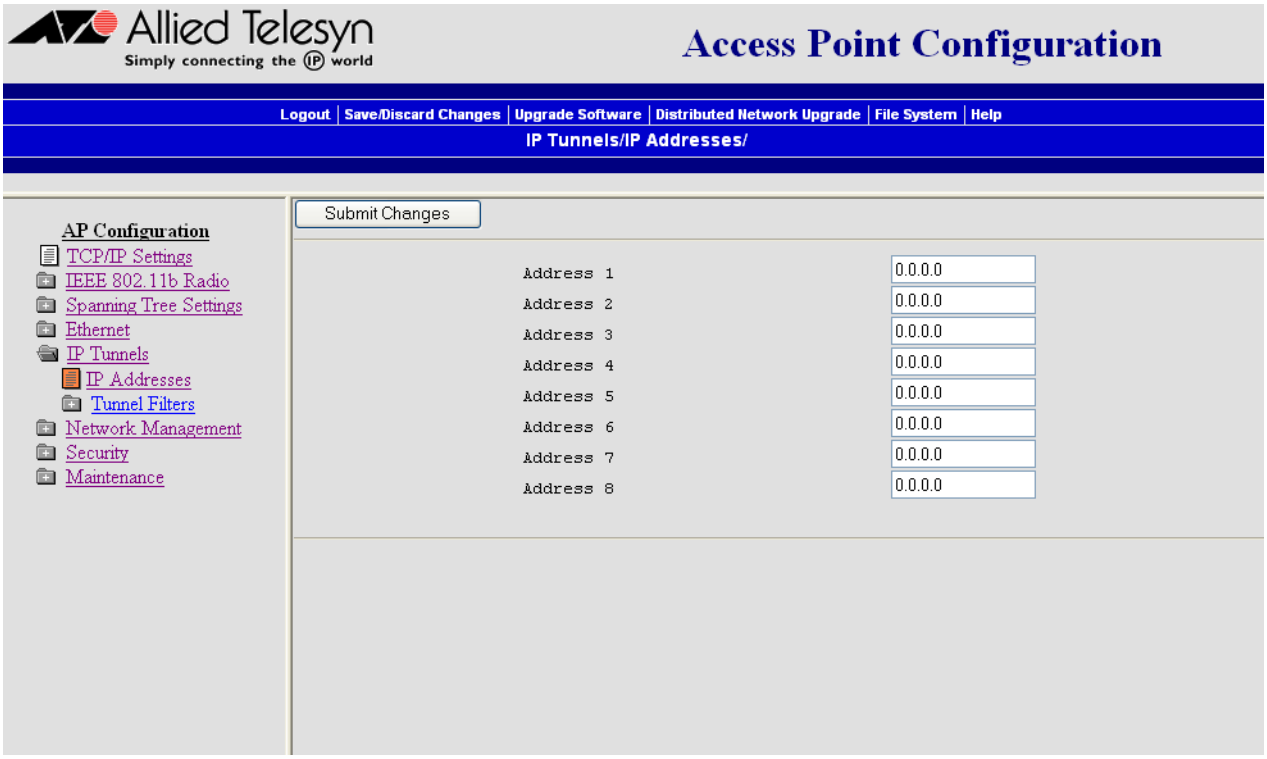


Figure 34 IP Addresses Screen

2. If you enabled IGMP, enter the Class D IP multicast address. The default is **224.0.1.65**.
3. Enter the IP unicast addresses of the access points that can be the endpoints of IP tunnels.
4. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Configuring IP Tunnel Filters

You can set both Ethernet and IP tunnel filters, and you can create protocol filters for predefined protocol types. In addition, you can define arbitrary frame filters based on frame content. For help configuring Ethernet filters, see Configuring Ethernet Filters on page 64.

To configure IP tunnel filters, perform the following procedure:

1. From the Main Menu, select **IP Tunnels** then **Tunnel Filters**. The Tunnel Filters screen as shown in Figure 35 is displayed.

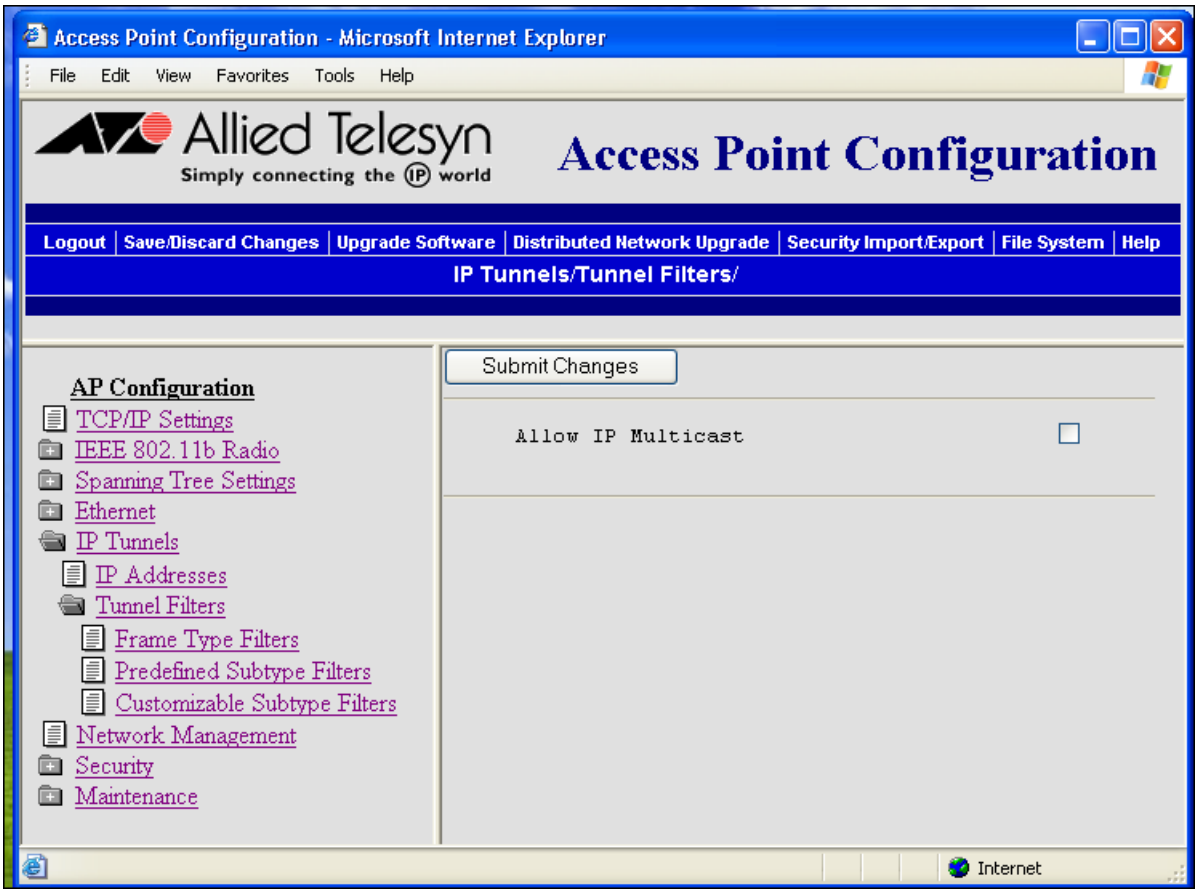


Figure 35 Tunnel Filters Screen

2. Check or uncheck the box on the right side of Allow IP Multicast to **Allow** or **Pass**. This parameter specifies if the access point can receive IP multicast packets through the IP tunnel port.

3. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Using IP Tunnel Frame Type Filters

The IP port automatically provides some filtering for end devices. You can define permanent IP port filters to prevent unwanted frame forwarding through an IP tunnel. IP ICMP packets with the following types are forwarded:

- ❑ Echo Request
- ❑ Echo Reply
- ❑ Destination Unreachable
- ❑ Source Quench
- ❑ Redirect
- ❑ Alternate Host Address
- ❑ Time Exceeded
- ❑ Parameter Problem
- ❑ Time Stamp
- ❑ Time Stamp Reply
- ❑ Address Mask Request
- ❑ Address Mask Reply
- ❑ Trace Route

IP and ARP frames are never forwarded inbound through an IP tunnel to the home subnet unless the source IP address belongs to the home subnet. (Frames are only forwarded inbound if the source IP address in the IP or ARP packet identifies an end device that has roamed away from its home subnet.) IP and ARP frames are never forwarded outbound through an IP tunnel by the root access point unless the destination IP address belongs to the home subnet. (Frames are only forwarded outbound to end devices that have roamed away from the home subnet.) For detailed information about other frame types that are never forwarded, see the list of frame types that are never forwarded in Frame Forwarding on page 96.

You can set the default action and scope for general and specific frame types.

Allow/Pass
Set the action to **Allow** or **Pass**. If you select **Allow** (checked), then all frames of that type are passed. If you select **Pass** (unchecked), then all frames of that type are dropped.

Scope
Set the scope to **Unlisted** or **All**. If you select **All**, then all frames of that type are unconditionally passed or dropped, depending on the action you specified. If you select **Unlisted**, then frames are passed or dropped only if the frame type is not listed in the predefined or customizable tables.

To use IP tunnel frame type filters, perform the following procedure:

1. From the Main Menu, select **IP Tunnels** then **Tunnel Filters**.
2. Select **Frame Type Filters**. The Frame Type Filters screen as shown in Figure 36 is displayed.

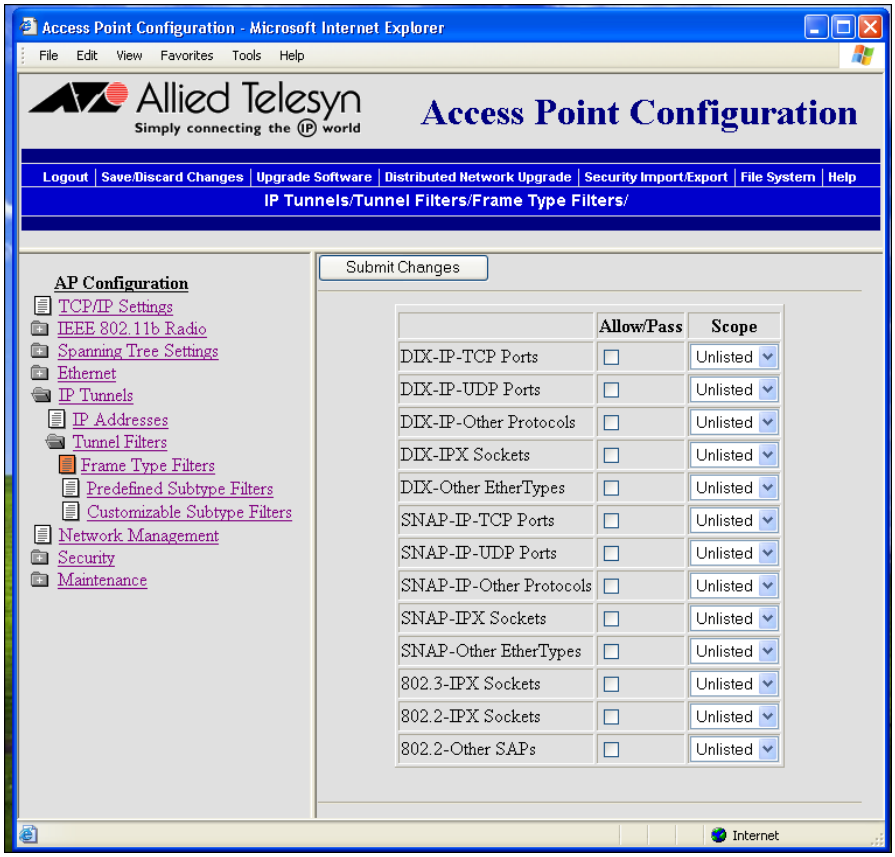


Figure 36 Frame Type Filters Screen

The various frame type filters are explained below:

DIX IP TCP Ports
DIX IP UDP Ports
SNAP IP TCP Ports
SNAP IP UDP Ports
Primary Internet Protocol Suite (IP) transport protocols.

DIX IP Other Protocols
SNAP IP Other Protocols
IP protocols other than TCP or User Datagram Protocol (UDP).

DIX IPX Sockets
Novell NetWare protocol over Ethernet II frames.

SNAP IPX Sockets
Novell NetWare protocol over 802.2 SNAP frames.

802.3 IPX Sockets
Novell NetWare protocol over 802.3 RAW frames.

DIX Other Ethernet Types
SNAP Other Ethernet Types
DIX or SNAP registered protocols other than IP or IPX.

802.2 IPX Sockets
Novell running over 802.2 Logical Link Control (LLC).

802.2 Other SAPs
802.2 SAPs other than IPX or SNAP.

Note
You cannot filter HTTP, Telnet, SNMP, and ICMP frames, because they are used for configuration and management of the access point. Additionally, you cannot filter broadcast ARP request packets if the target IP address belongs to the local access point or to an access point in the subtree rooted at the local access point.

3. In each Allow/Pass field, check or uncheck the boxes to **Allow** or **Pass**.
4. In each field, select the down arrow on the right side of the Scope field and set the scope to **Unlisted** or **All**.

Note
If you set the Scope field to **Unlisted** for any of the frame types, you must also configure predefined subtype filters or customizable subtype filters. For help, see Using Predefined Subtype Filters on page 106 or Customizing Subtype Filters on page 107.

5. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Using Predefined Subtype Filters

You can configure the access point to pass or drop certain predefined frame subtypes.

To configure predefined subtype filters. perform the following procedure:

1. From the Main Menu, select **IP Tunnels** then **Tunnel Filters**.
2. Select **Predefined Subtype Filters**. The Predefined Subtype Filters screen as shown in Figure 37 is displayed.

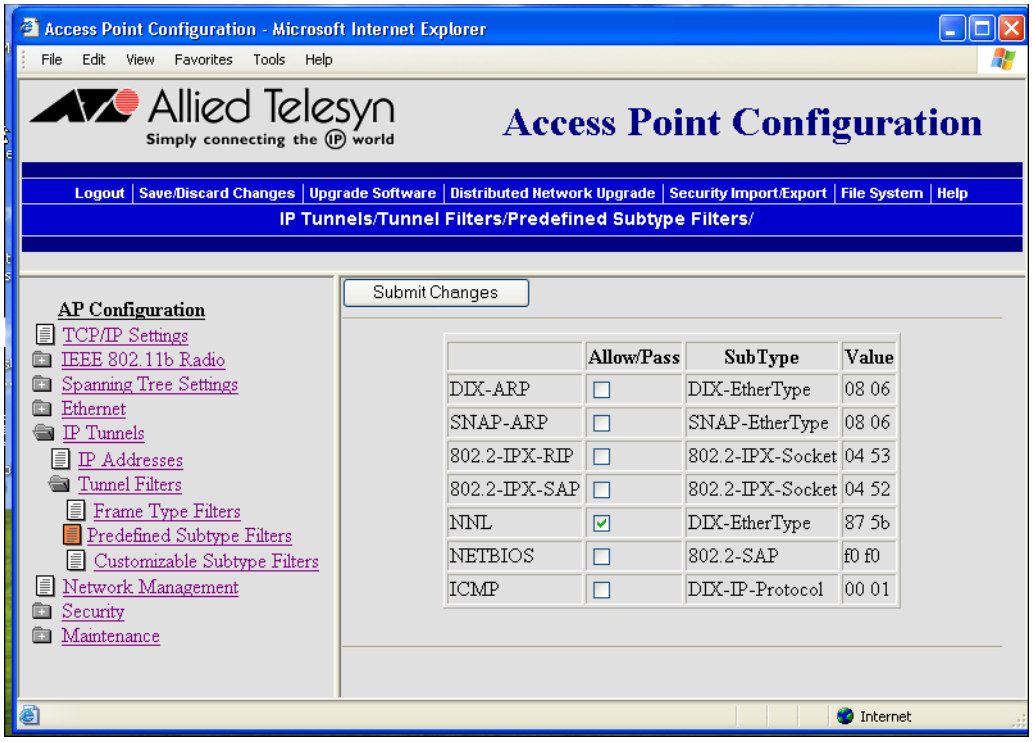


Figure 37 Predefined Subtype Filters Screen

3. In each Allow/Pass field, check or uncheck the boxes to **Allow** or **Pass**.

4. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Customizing Subtype Filters

You can define output filters that restrict customized frame subtypes that can pass through an IP tunnel. Frames can be filtered by the DIX, 802.2, or 802.3 SNAP type, the IP protocol type, or the TCP or UDP port number. By default, the filters drop all protocol types except the NNL DIX Ethernet type (hexadecimal 875B). Filters must be configured in all root candidates and in any access point that can attach to the remote end of an IP tunnel. You define the action, subtype, and value parameters in customized filters.

Allow/Pass
Set the action to **Allow** or **Pass**. If you select **Allow** (checked), then all frames of that type are passed. If you select **Pass** (unchecked), then all frames of that type are dropped.

SubType
Selects the frame subtype you wish to filter.

Value
Specifies the value of the subtype. Refer to the following table for the value for a specific subtype. The value must be two hex pairs. You must enter port values as decimals; for example enter **23.** for Port 23. The access point displays the hexadecimal equivalent in the Value field. When a match is found between frame subtype and value, the specified action is taken.

To customize subtype filters, perform the following procedure:

1. From the Main Menu, select **IP Tunnels** then **Tunnel Filters**.

2. Select **Customizable Subtype Filters**. The Customizable Subtype Filters screen as shown in Figure 38 is displayed.

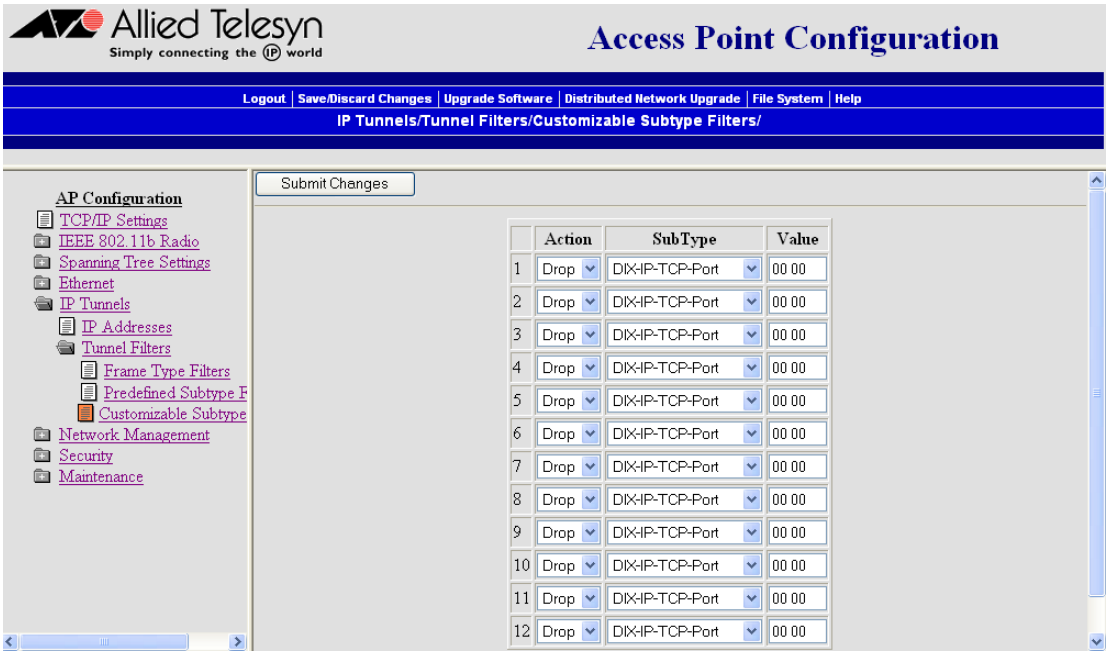


Figure 38 Customizable Subtype Filters Screen

3. Select the down arrow on the right side of the Action field and choose **Pass** or **Drop**.

4. Select the down arrow on the right side of the SubType field and choose the customizable frame subtype. The frame subtypes and their values are described below.

   DIX-IP-TCP-Port
   Port value in hexadecimal.

   DIX-IP-UDP-Port
   Port value in hexadecimal.

   DIX-IP-Protocol
   Protocol number in hexadecimal.

   DIX-IPX-Socket
   Socket value in hexadecimal.

   DIX-EtherType
   Specify the registered DIX type in hexadecimal.

   SNAP-IP-TCP-Port
   Port value in hexadecimal.

SNAP-IP-UDP-Port
Port value in hexadecimal.

SNAP-IP-Protocol
Port value in hexadecimal.

SNAP-IPX-Socket
Socket value in hexadecimal.

SNAP-EtherType
SNAP type in hexadecimal. To filter on both SNAP type and OUI, use advanced filters.

802.3-IPX-Socket
Socket value in hexadecimal.

802.2-IPX-Socket
Socket value in hexadecimal.

802.2-SAP
802.2 SAP in hexadecimal.

5. In the Value field enter the two hex pair.
6. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Chapter 6

Configuring the IEEE 802.11b Radio

This chapter contains the following sections:

- Using One AT-WL2411 in a Simple Wireless Network on page 112
- Using Multiple Access Points and Roaming Wireless End Devices on page 114
- Configuring Point-to-Point Bridges on page 116
- To Configure the 802.11b Radio on page 127
- Configuring 802.11b Radio Advanced Parameters on page 130
- About the Radios on page 133

Using One AT-WL2411 in a Simple Wireless Network

You can use the AT-WL2411 to extend your existing Ethernet network to include wireless end devices. The access point connects directly to your wireless network and the end devices a wireless extension of the wired LAN.

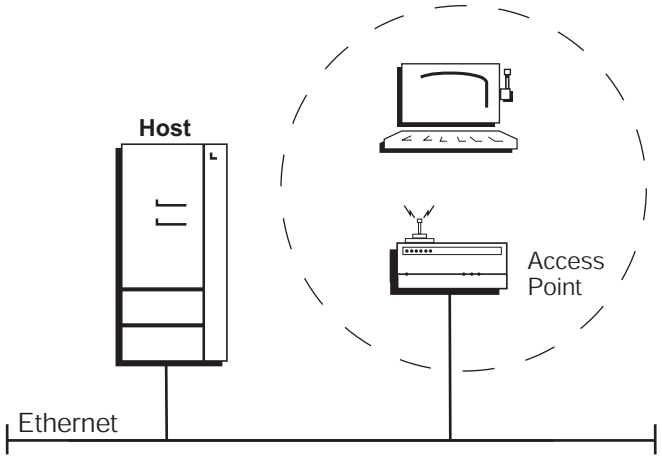


Figure 39 A Simple Wireless Network

In a simple wireless network, the access point that is connected to he wired network serves as a transparent bridge between the wired network and wireless end devices.

To install a simple wireless network, perform the following procedure:

1. Configure the initial IP address. For help, refer to Configuring the TCP/IP Settings on page 52.
2. Install the access point. For help, refer to Installation on page 25.
3. Configure the Ethernet network. For help, refer to Configuring the Ethernet Network on page 51.
4. Configure the radios. For help, refer to To Configure the 802.11b Radio on page 127.

5. Decide what level of security you want to implement in your network. For help, refer to Configuring Security on page 135.

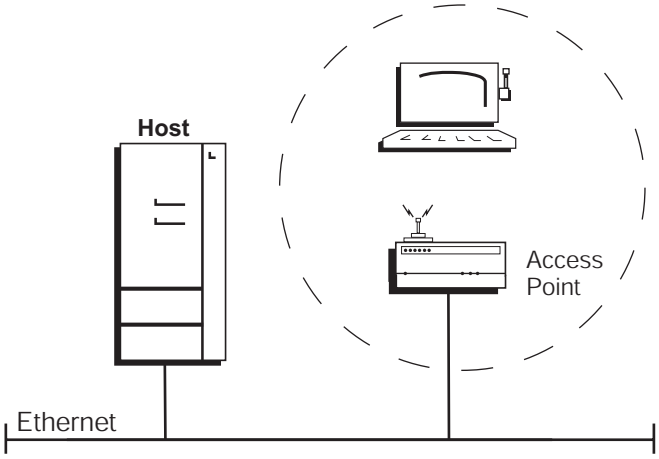


Figure 40 Access Point Network Example

Figure 40 illustrates wireless end devices use the access point to communicate with the host and other end devices.

Configuring an 802.11b Access Point Parameters

The 802.11b parameters are described in Table 3.

Table 3 802.11b AT-WL2411 Parameters

Screen	Parameter	Access Point
IEEE 802.11b Radio	Node Type SSID	Master Manufacturing
Spanning Tree Settings	Root Priority Ethernet Bridging Enable	5 Checked

Allied Telesyn recommends that you always implement some type of security.

Using Multiple Access Points and Roaming Wireless End Devices

For larger or more complex environments, you can install multiple access points so wireless end devices can roam from one access points to another. Multiple access points establish coverage areas or cells similar to those of a cellular telephone network. End devices can connect with and access point that is within range and belongs to the same wireless network.

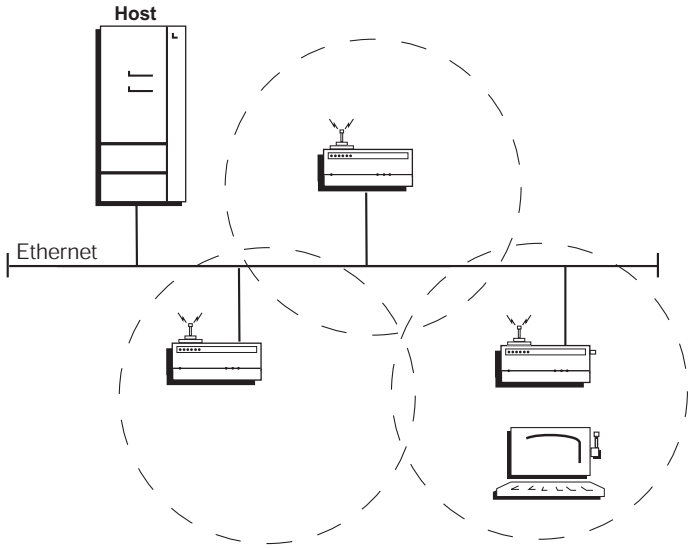


Figure 41 Wireless Network with Multiple Access Points

Figure 41 illustrates wireless end devices roaming between the access points to communicate with the host and other end devices.

An end device initiates a roam when it attaches to a new access point. The access point sends an attached message to the root access point, which in turn forwards a detach message to the previous access point, allowing each access point to update it's forwarding database. Intermediate access points monitor these exchanges and updates their forwarding databases.

With the access point's multichannel architecture, you can have more than one access point within the same cell area to increase throughput and provide redundancy.

To install multiple access points with roaming end devices, perform the following procedure:

1. Follow the instructions for installing a simple wireless network on page 112.
2. Configure the LAN ID. For help, refer to Configuring the Spanning Tree Parameters on page 78.
3. Configure one of the access points to be a root access point.
4. If your network has a switch that is not IEEE 802.1d compliant and is located between access points, configure data link tunneling.

Configuring Point-to-Point Bridges

In your environment, you may have point-to-point bridges, which send data from wireless end devices on a secondary LAN to a primary LAN. This data is sent via a wireless hop. Wireless hops are formed when data from wireless end devices move from one access point to another access point through the radio ports.

Figure 42 illustrates a point-to-point bridge configuration.

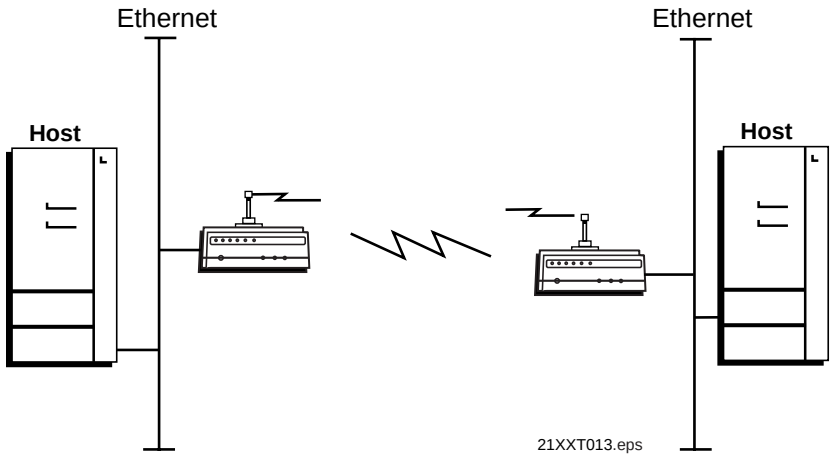


Figure 42 Point-to-Point Bridging

Note
Before you can create wireless hops, the radios in the access points must be communicating with each other.

To create wireless hops, one radio in the point-to-point bridge on the primary LAN must be configured as a master and one radio in the bridge on the secondary LAN must be configured as a station. The master on the primary LAN must have the Wireless Hops parameter enabled so that it honors connections from stations. The master transmits hello packets, which allow the bridge on the secondary LAN to attach to the spanning tree in the same way that wired access points do.

You need to set the root priority of the master to a number that is greater than the root priority of the station. The devices will not form a point-to-point bridge if the master has a lower root priority than the station. On the master, you should also set the Secondary LAN Bridge Priority parameter to 0 and the Secondary LAN Flooding parameter to disabled. On the station, you should set bridge priority parameter to a number other than 0 and the flooding parameter to enabled.

You may also need to adjust the flooding parameters. Follow these recommendations when configuring the flooding parameters for a point-to-point bridge:

- ❑ If there are no wireless end devices on the secondary LAN, the access point on the secondary LAN can use the default flooding settings.

To configure the master (in the point-to-point bridge on the primary LAN), perform the following procedure:

1. From the Main Menu, select the link corresponding to the radio that you are configuring.
2. Select **Wireless Bridging**. The Wireless Bridging screen as shown in Figure 43 is displayed.

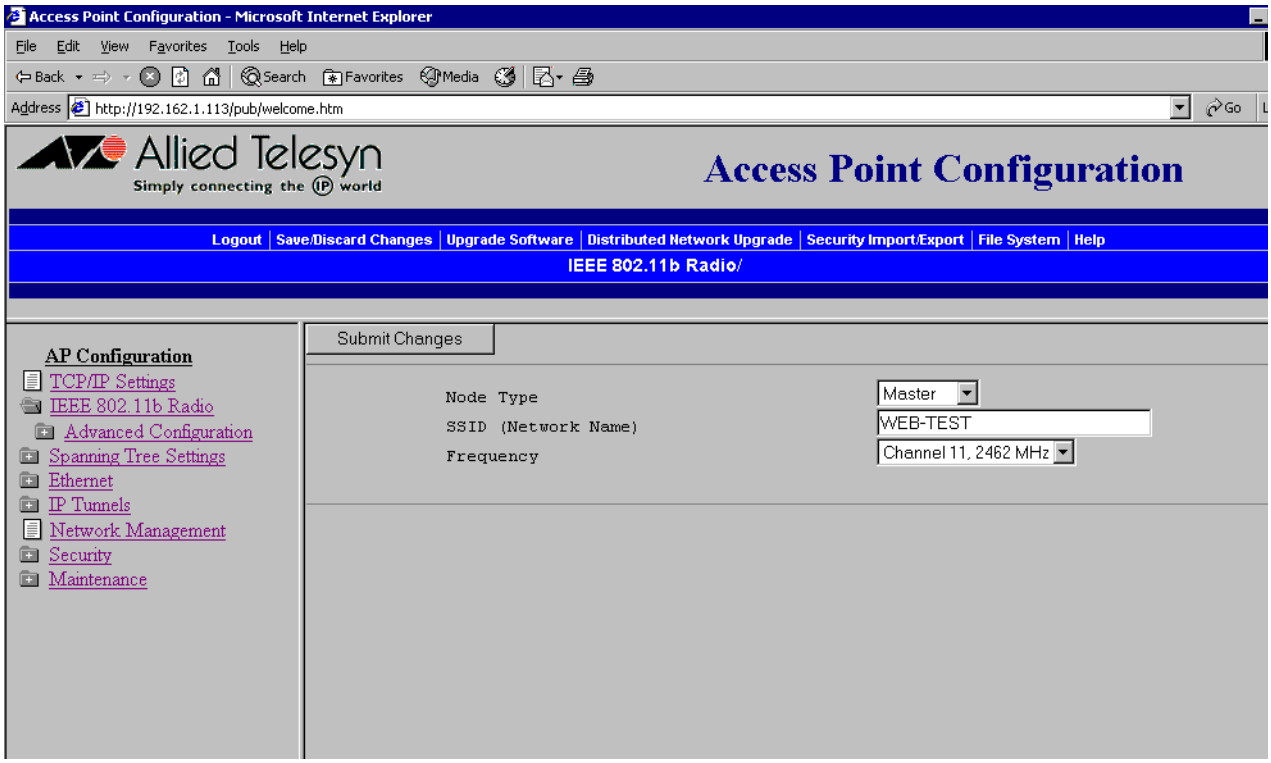


Figure 43 Wireless Bridging Screen

3. Select the down arrow on the right side of the Node Type field and choose **Master** then **Submit Changes**. Your changes are saved and the Wireless Hops parameter appears.
4. Select the down arrow on the right side of the Wireless Hops field and choose **Enabled** then **Submit Changes**. Your changes are saved and the Hello Period parameter appears.

5. Select the down arrow on the right side of the Hello Period field and choose a hello period of **1**, **2**, or **3** seconds then **Submit Changes**. Your changes are saved.

6. From the Main Menu, select **Spanning Tree Settings**. The Spanning Tree Settings screen as shown in Figure 44 is displayed.

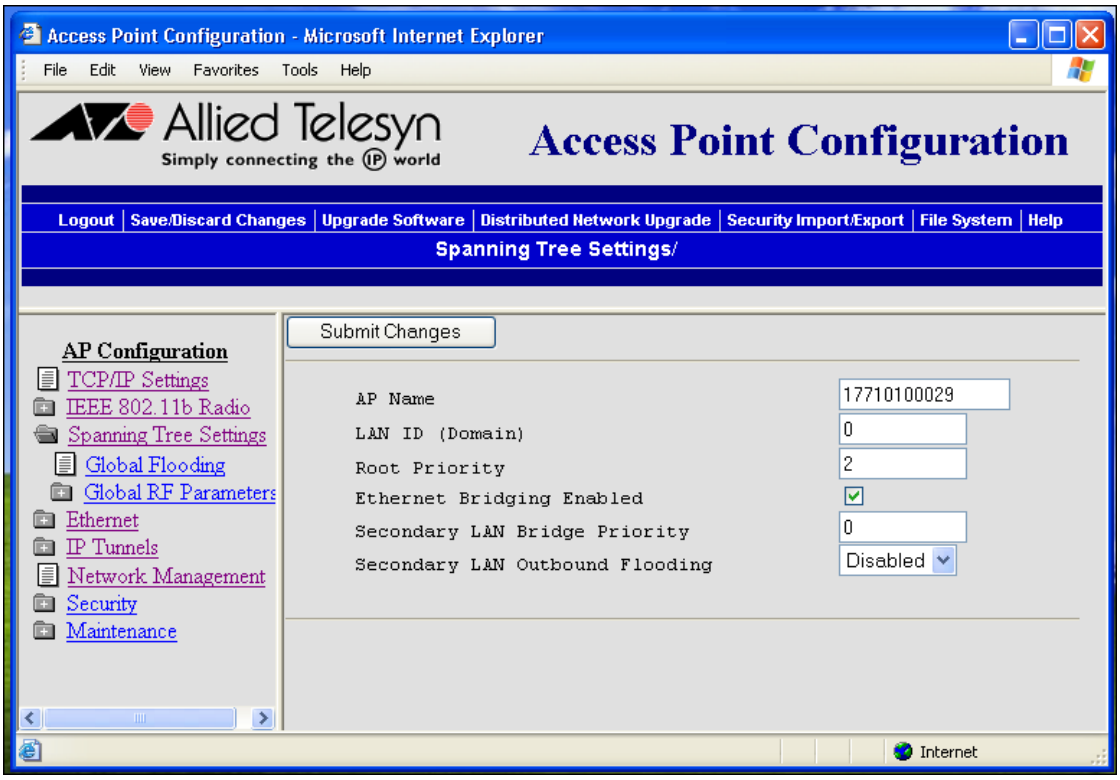


Figure 44 Spanning Tree Settings Screen

7. In the Root Priority field, enter a number other than 0.

8. In the Secondary LAN Bridge Priority field, enter **0**.

9. Select the down arrow on the right side of the Secondary LAN Flooding field and choose **Disabled**.

10. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar and then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

To configure the station (in the point-to-point bridge on the secondary LAN), perform the following procedure:

1. From the Main Menu, select the link corresponding to the radio that you are configuring.

2. Select **IEEE 802.11b Radio**. The IEEE 802.11b Radio screen as shown in Figure 45 is displayed.

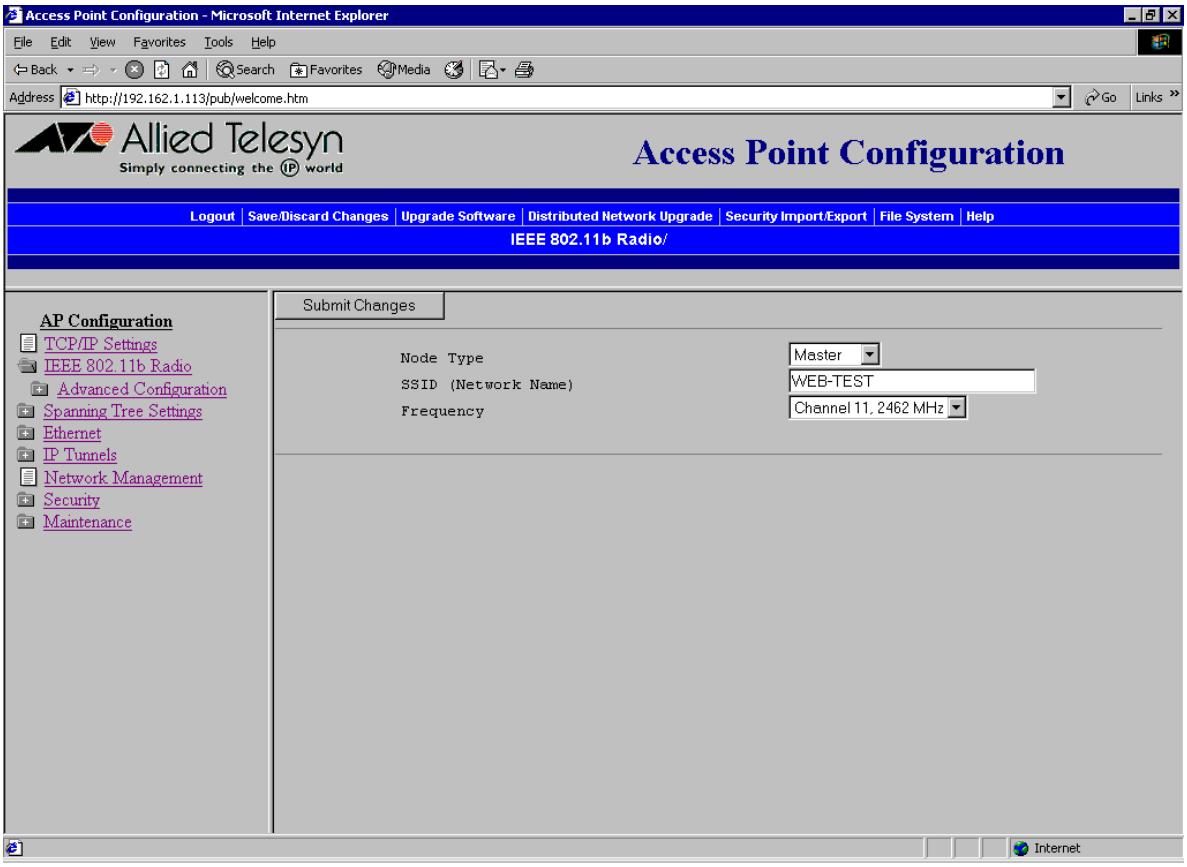


Figure 45 Wireless Bridging Screen

3. Select the down arrow on the right side of the Node Type field and choose **Station**. Wireless hops are automatically disabled.

4. Select **Submit changes** to save your changes.

5. From the Main Menu, select **Spanning Tree Settings**. The Spanning Tree Settings screen as shown in Figure 46 is displayed.

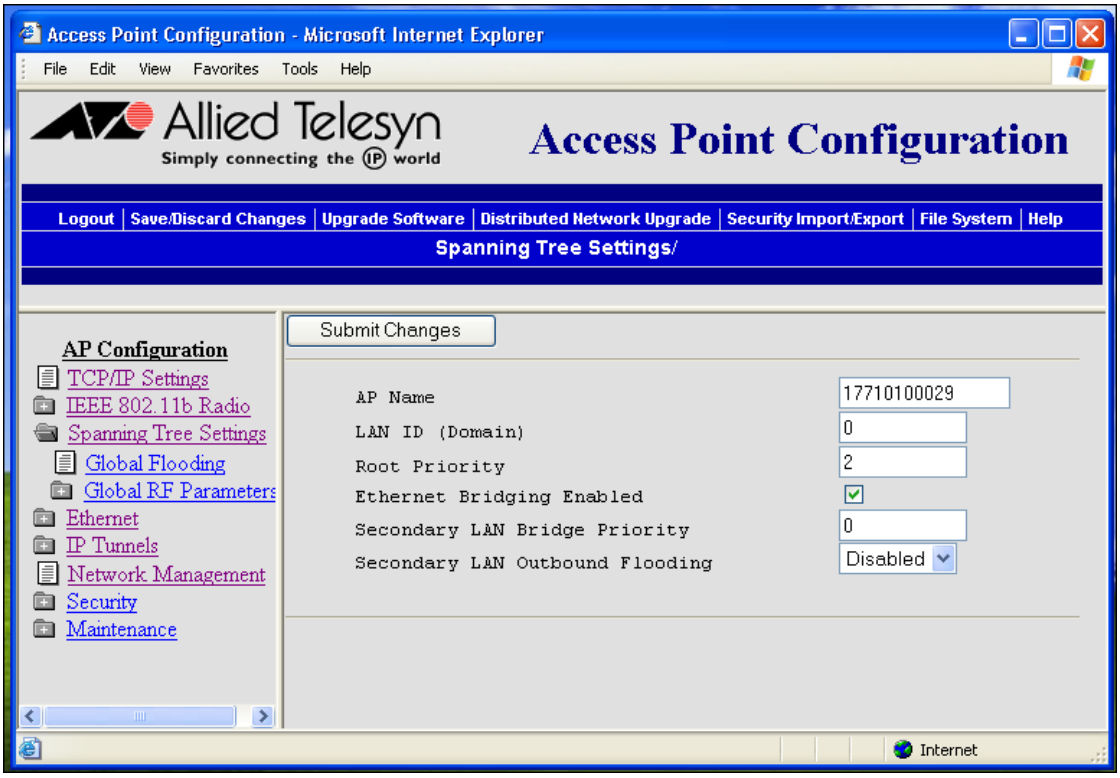


Figure 46 Spanning Tree Settings Screen

6. In the Root Priority field, enter 0 or another number lower than the root priority that is set in the master in the access point on the primary LAN.

7. In the Secondary LAN Bridge Priority field, enter a number higher that the bridge priority that is set in the master in the access point on the primary LAN.

8. Select the down arrow on the right side of the Secondary LAN Flooding field and choose **Enabled**.

9. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar and then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

To install a point-to-point or a point-to-multipoint bridge, perform the following procedure:

1. Follow the instructions for installing a simple wireless network on page 112.

2. Configure the LAN ID. For help, refer to Configuring the Spanning Tree Parameters on page 78.

3. Configure the station in the point-to-point bridge on the secondary LAN by performing the procedure below:

   a. From the Main Menu, select the link corresponding to the station radio. The radio screen as shown in Figure 47 is displayed.

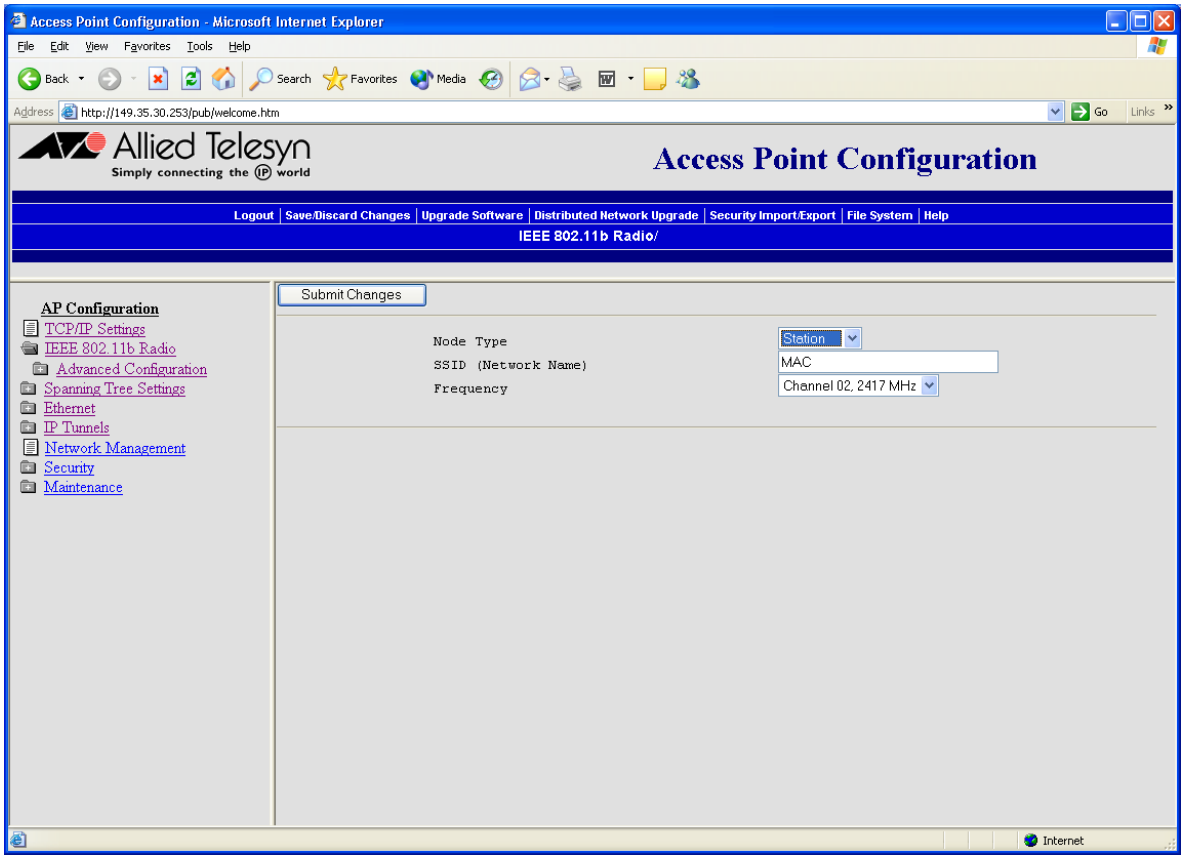


Figure 47 Radio Screen

   b. Select the down arrow on the right side of the Node Type field and choose **Station** then **Submit Changes**.

4. Configure the spanning tree settings for the point-to-point bridge on the secondary LAN by performing the procedure below:

a. From the Main Menu, select **Spanning Tree Settings**. The Spanning Tree Setting screen as displayed.

b. In the Root Priority field enter **0**.

c. In the Secondary LAN Bridge Priority field, enter a number other than zero.

d. Select the down arrow on the right side of the Secondary LAN Flooding field and choose **Enabled**.

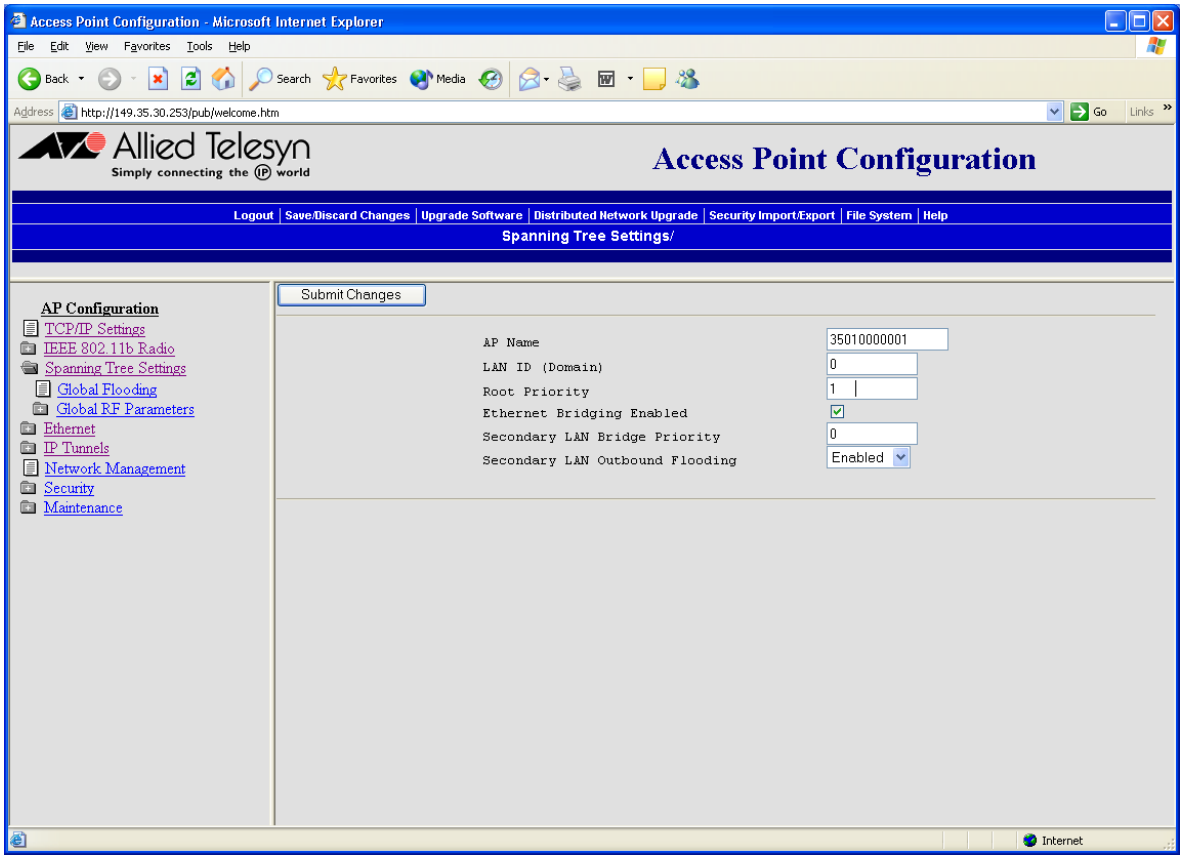


Figure 48 Spanning Tree Settings Screen

5. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar and then select **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

6. Configure the master in the point-to-point bridge on the primary LAN by performing the procedure below:

a. From the Main Menu, select the link corresponding to the master radio. The radio screen as shown in Figure 49 is displayed.

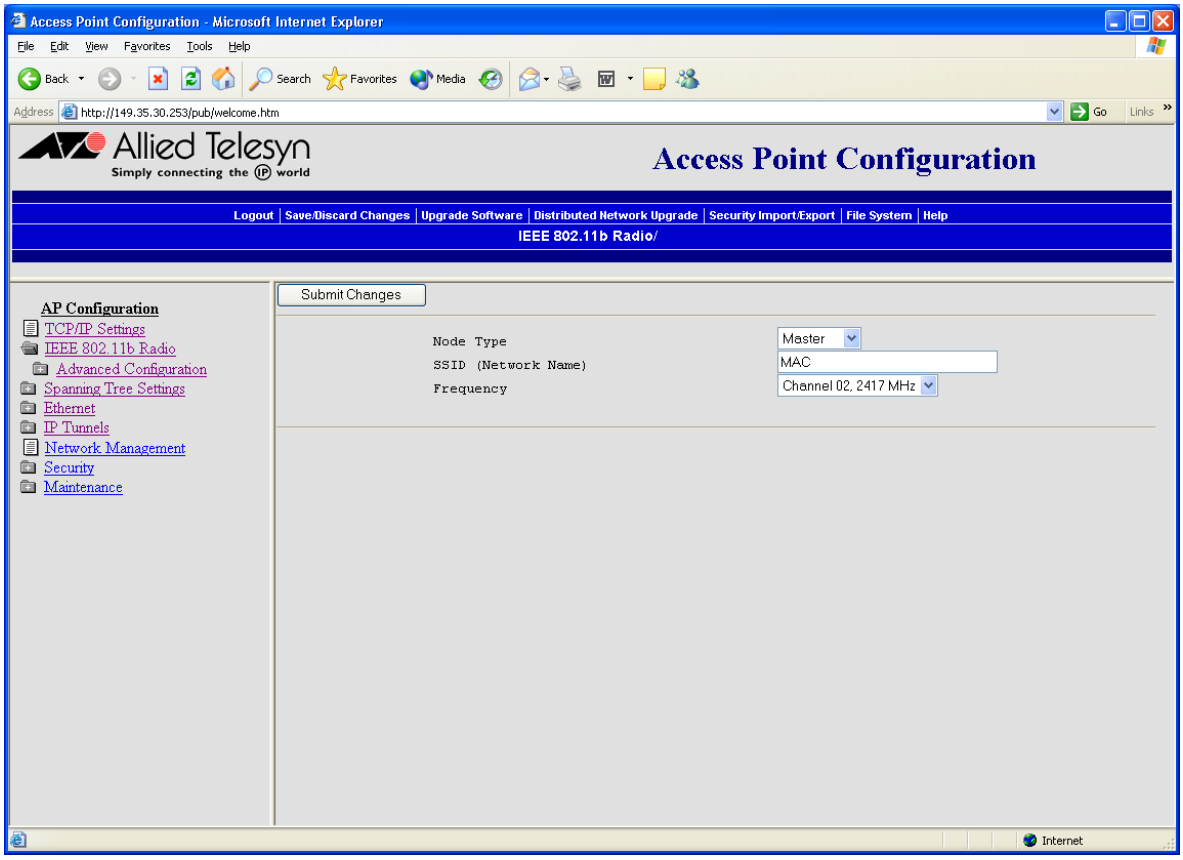


Figure 49 Radio Screen

b. Select the down arrow on the right side of the Node Type field and choose **Master** then **Submit Changes**.

7. Configure the spanning tree settings for the point-to-point bridge on the primary LAN by performing the procedure below:

a. From the Main Menu select **Spanning Tree Settings**. The Spanning Tree Settings screen as shown in Figure 50 is displayed.

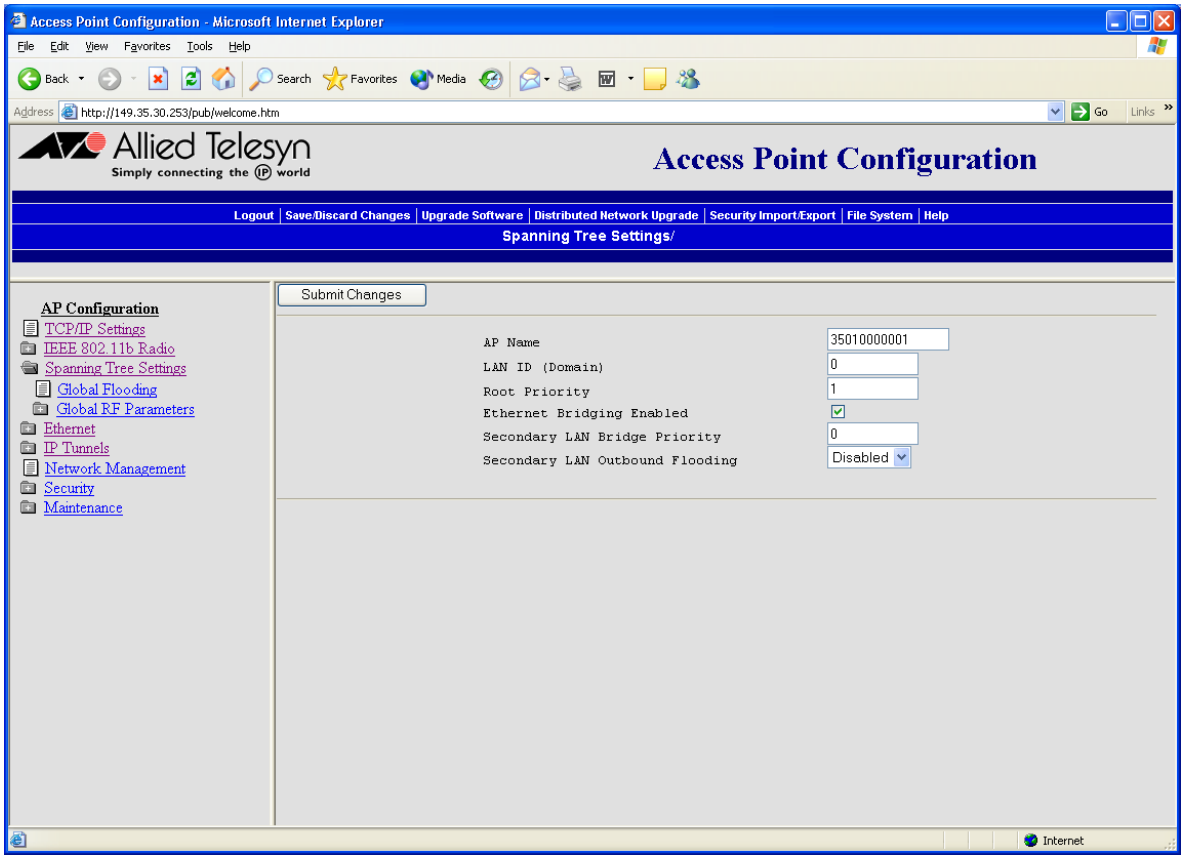


Figure 50 Spanning Tree Setting Screen

b. In the Root Priority field enter a number other than 0.

c. In the Secondary LAN Bridge Priority field enter **0**.

d. Select the down arrow on the right side of the Secondary LAN Flooding field and choose **Disabled**.

8. If the roaming end device will be roaming across an IP router, you must configure IP tunnels. For help, refer to Configuring IP Tunnels on page 98.

9. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar and then select **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

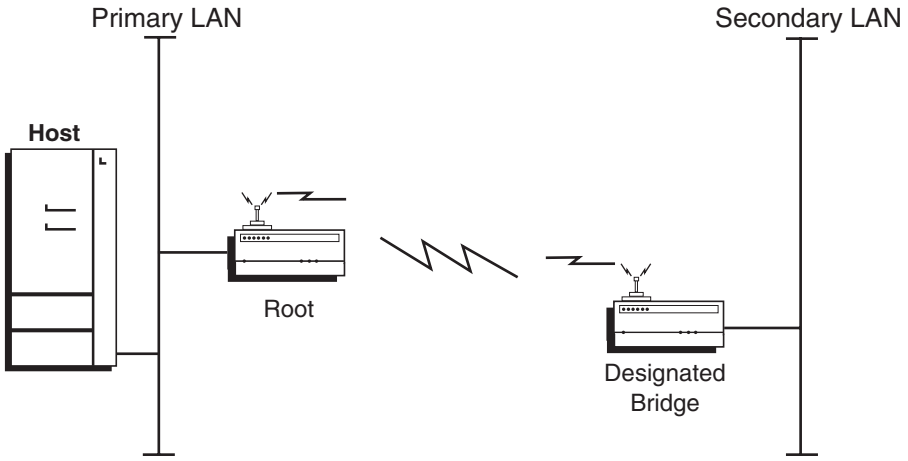


Figure 51 802.11b Bridge

In Figure 51 each access point only has one 802.11b radio. Since the designated bridge only has a station radio, wireless end devices can only communicate with the root access point. However, on the secondary LAN can communicate with the primary LAN.

Configuring 802.11b Point-to-Point Bridges Parameters

The 802.11b Point-to-Point Bridge parameters are described in Table 4.

Table 4 Point-to-Point Parameters

Screen	Parameter	Bridge - Primary LAN (Root)	Bridge - Secondary LAN (Designated Bridge)
IEEE 802.11b Radio	Node Type	Master	Station
	SSID	Manufacturing	Manufacturing
Spanning Tree Settings	LAN ID	0	0
	Root Priority	5	0
	Ethernet Bridging Enabled	Checked	Checked
	Secondary LAN Bridge Priority	0	1
	Secondary LAN Outbound Flooding	Disabled	Enabled

Even though WEP encryption is not required for this configuration, Allied Telesyn recommends that you always implement some type of security.

To Configure the 802.11b Radio

The IEEE 802.11b radio will communicate with other 802.11b radios that have the same SSID (Network Name) and security. For help, refer to Configuring Security on page 135.

To configure the 802.11b radio, perform the following procedure:

1. From the Main Menu, select **IEEE 802.11b Radio**. The IEEE 802.11b Radio screen as shown in Figure 52 is displayed.

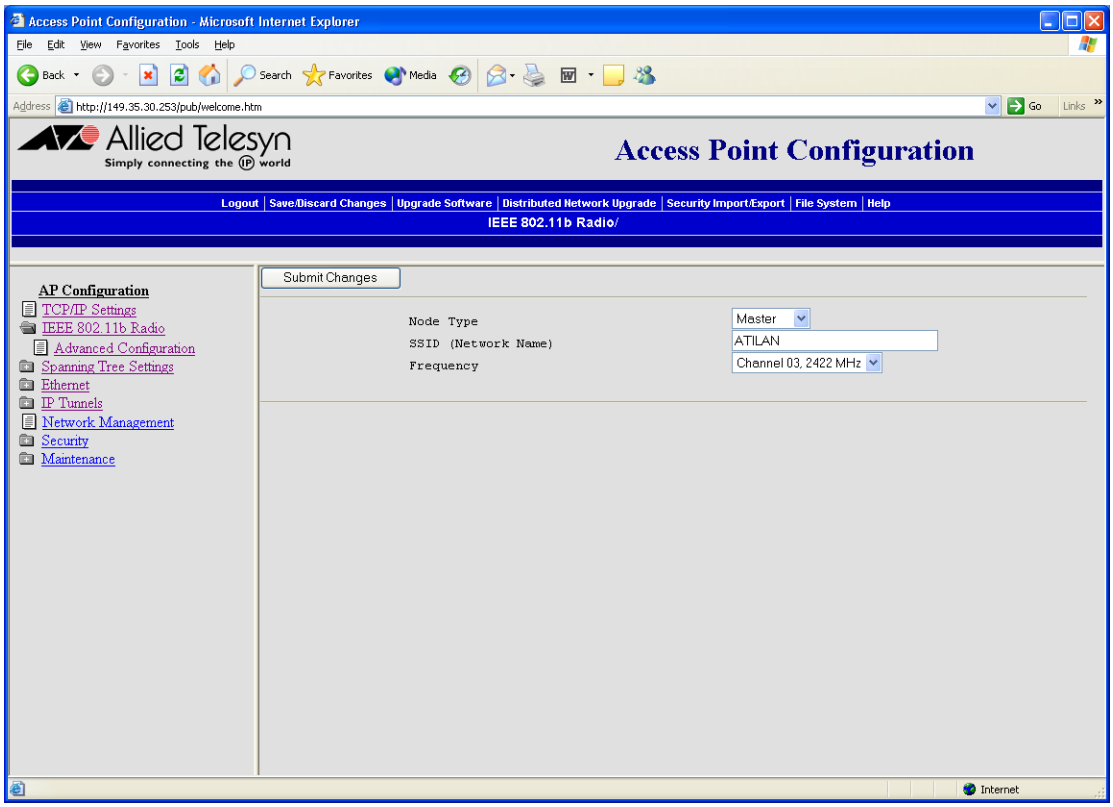


Figure 52 IEEE 802.11b Radio Screen

2. Configure the parameters for the radio. The radio parameters are described below:

   Node Type
   Configure the 802.11b radio as a master or station. You can also disable the radio.

SSID (Network Name)
Enter the network name for this access point. 802.11b radios communicate with other 802.11b radios with the same network name. You need to assign the same network name to the wireless end devices that will connect to the access point.

The network name is case sensitive and can be no more than 32 alphanumeric characters.

Frequency (Master radio only)
Choose the frequency within the 2.4 to 2.5 GHz range that this access point uses to transmit and receive frames. The available frequencies are country-dependent and are determined by the radio. See the Worldwide Frequencies for the 802.11b Radio table.

Configure all access points to a common frequency, or select up to three frequencies that are at least three channels (or 25 MHz) apart. For example, you could select 2412 MHz, 2437 MHz, and 2462 MHz. You may want to use a single frequency to isolate the installation to part of the band; for example, use a single frequency if other wireless networks or microwave ovens are in the area.

For optimal performance of master radios in access points that are in range of each other, configure the frequencies to be at least five channels apart. For example, configure the frequency to use channels 1, 6, and 11.

3. Configure the advanced parameters for the radio. For help, refer to Configuring 802.11b Radio Advanced Parameters on page 130.

4. Select **Submit Changes**. To activate your changes, from the menu bar select **Save/Discard Changes** then **Save Changes and Reboot**. For help, refer to Saving Your Configuration Changes on page 46.

Table 5 lists the worldwide frequencies for the 802.11b Radio

Table 5 Worldwide Frequencies for the 802.11b Radio

Channel	FCC	ETSI
1	2412	2412
2	2417	2417
3	2422 (default)	2422 (default)
4	2427	2427
5	2432	2432
6	2437	2437
7	2442	2442
8	2447	2447
9	2452	2452
10	2457	2457
11	2462	2462
12	-	2467
13	-	2472
14	-	-

The 802.11b channels that are allowed in a given country may change without notice. Be sure you use only those frequencies that are permissible in the given country. Note the following:

- FCC countries include the United States, Canada, China, Taiwan, India, Thailand, Indonesia, Malaysia, Hong Kong, and most South American countries.
- ETSI countries include all European Union countries except France. It also includes Switzerland, Iceland, Norway, Czech Republic, Slovenia, Slovakia, Turkey, Russia, and the United Arab Emirates.
- France, Mexico, and Singapore use the same channels.

Configuring 802.11b Radio Advanced Parameters

To configure the 802.11b advanced parameters, perform the following procedure:

1. From the Main Menu, select **IEEE 802.11b Radio**. The IEEE 802.11b Radio screen is displayed.

2. Select **Advanced Configuration**. The Advanced Configuration screen as shown in Figure 53 is displayed.

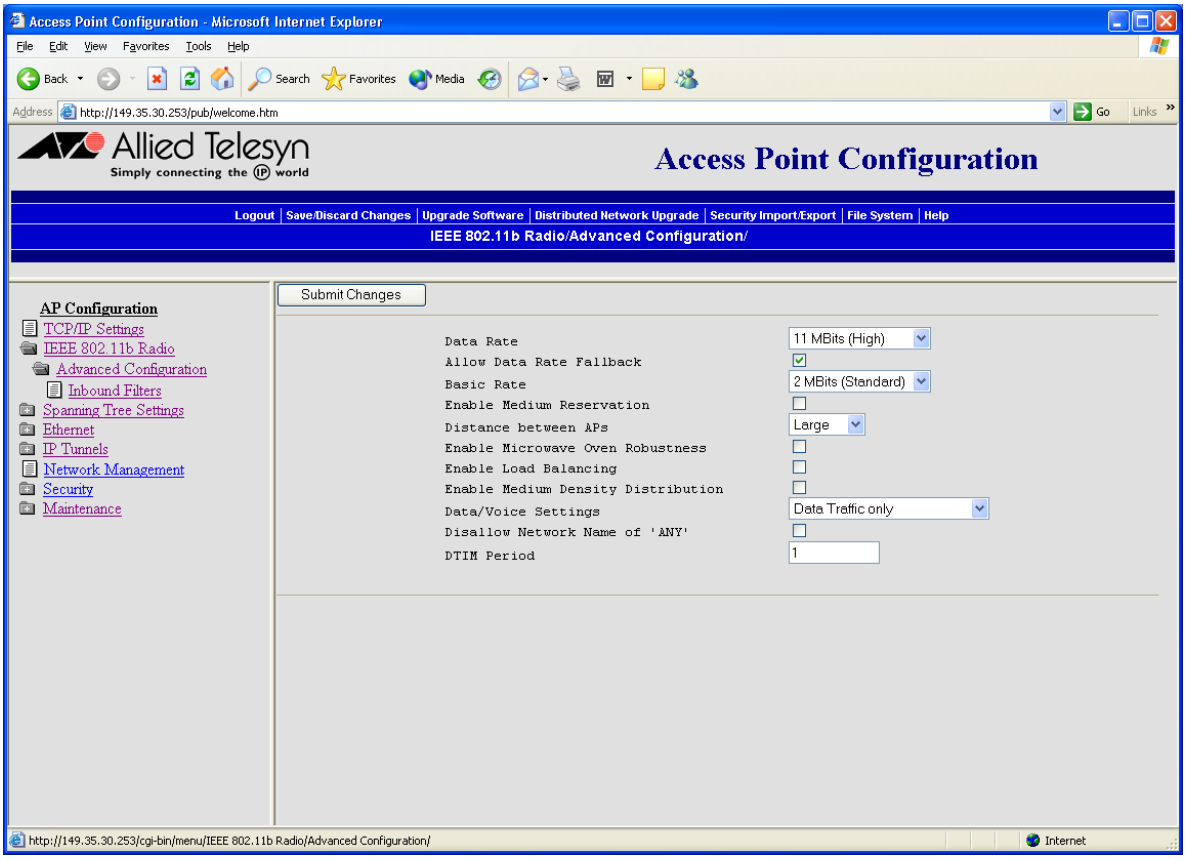


Figure 53 Advanced Configuration Screen

3. Configure the advanced parameters. The advanced parameters are described below:

   Data Rate
   Choose the rate at which the access point transmits data. In general, higher speeds mean shorter range and lower speeds mean longer range. You can set this rate to 11, 5.5, 2, or 1 Mbps.

Allow Data Rate Fallback
Determines if you want the radio to drop to a slower data rate when it has trouble communicating with another radio.

Basic Rate
Choose the rate at which the access point transmits multicast and beacon frames. In general, higher speeds mean shorter range and lower speeds mean longer range. Do not set this rate higher than the maximum rate at which your end devices can receive multicast frames. You can set this rate to 11, 5.5, 2, or 1 Mbps. This parameter should usually be left at the default 2 Mbps.

Enable Medium Reservation
Determines if you want to specify a reservation threshold. Check this check box to set a threshold value. If you clear this check box, you may improve network response time in installations that usually send very small frames or that have no hidden stations.

Reservation Threshold
If you enable medium reservation, you need to set a threshold value, which is the largest data frame that can be transmitted without reserving air time. Air time is normally reserved to help prevent collisions with other transmitters.

Distance Between APs
Controls the roaming sensitivity of your end devices. This setting should match the setting on your end devices.

You can use this parameter to virtually reduce the range of your access point. If you choose Small or Medium, you do not reduce the absolute range of your radio, but you modify the collision detection mechanism to allow significant overlap of the wireless cells. Thus, you create a higher performance radio network, but you need more access points to cover an area.

Enable Microwave Oven Robustness
Determines if the access point activates a modified algorithm for automatic rate fallback, which prevents the access point from falling back to 1 Mbps when trying to retransmit radio frames when 2.4 GHz interference is present.

Enable Load Balancing
Determines if end devices can distribute their connections across multiple access points.

Enable Medium Density Distribution
Determines if these access point parameters Enable Medium Reservation, Distance Between APs, Enable Microwave Oven Robustness are distributed to end devices that support this feature.

Data/Voice Settings (Master radio only)
Choose the setting that optimizes the wireless network.

Set to Data Traffic Only if the access point will transmit only data traffic.

Set to SpectraLink Traffic Only if the access point will transmit only voice traffic. MobileLAN voice 2 telephone frames will be sent with a priority setting. All other multicast/broadcast frames will be dropped.

Set to Data and SpectraLink Traffic if the access point will transmit both data and voice traffic. MobileLAN voice 2 telephone frames will be sent in the high priority queue. Frames in the high priority queue are sent ahead of frames in the normal priority queue. No special filtering.

Disallow Network Name of ANY (Master radio only)

Determines if end devices that have their SSID (Network Name) set to ANY or are left blank can associate with this access point. Check this check box to allow these end devices to associate with this access point. This setting is 802.11b compliant, but not very secure.

Clear this check box to prevent end devices with an SSID of ANY or are left blank from associating with this access point.

DTIM Period (Master radio only)
Specifies the number of beacon frames to skip before including a DTIM (delivery traffic indication message) in a beacon frame. Setting a higher DTIM period may conserve battery life in an end device, but it may increase response time.

4. Select **Submit Changes**. To activate your changes, from the menu bar select **Save/Discard Changes** then **Save Changes and Reboot**. For help, refer to Saving Your Configuration Changes on page 46.

About the Radios

The AT-WL2411 Access Point consists of a group of multiport Ethernet bridges. The 802.11b radio on the access point is:

- ❑ Wi-Fi Compliant
- ❑ Wireless Hops

Chapter 7
Configuring Security

This chapter explains how to use different security solutions to ensure that you have a secure wireless network. This chapter covers these topics:

- Understanding Security on page 136
- Enabling Access Methods on page 139
- Enabling Secure IAPP and Secure Wireless Hops on page 141
- Setting Up Logins on page 143
- Configuring WEP 64/128 Security on page 148
- Using an Access Control List (ACL) on page 151
- Configuring 802.1x Security on page 154

Understanding Security

The AT-WL2411 provide many different security features and solutions that you can use to create a secure wireless network. To create a secure wireless network, you need:

- ❑ Secure your backbone. Only authorized users should be able to communicate with your network.
- ❑ Keep your data private. Make it difficult for an eavesdropper, such as a rogue access point, to monitor your data.
- ❑ Authenticate wireless end devices. End devices must prove who they are before they are allowed to communicate with your network.

You can implement one or more of the security solutions in Table 6.

Table 6 Security Soluctions

Security Type	Secure Backbone	Data Privacy	Client Authentication
Change default parameters	X		
Disable access methods	X		
Enable secure IAPP	X		
Enable secure wireless hops	X		X
Use WEP 64/128 security/ Configure security ID		X	
Use a password server to control access point logins	X		
Use an access control list (ACL)			X
Use an 802.1x security solution	X	X	X

These security features and solutions are listed below in the order of amount of security and ease of use (most basic/least secure to most secure). Allied Telesyn recommends you at least change the default parameters, use basic security (WEP 64/128 security or security ID), and enable secure IAPP and secure wireless hops (Steps 1 through 4).

To change the security features, perform the following procedure:

1. Change the default parameters on the access points and on the wireless end devices.

   Change the SSID from its default value of **atilan**. For help, see Configuring the IEEE 802.11b Radio on page 111.

2. Enable/disable access methods. For example, if you are not using Telnet sessions to configure or manage your access point, you can disable this access method. For help, see Enabling Access Methods on page 139.

3. Enable secure IAPP and secure wireless hops. Even if you are not configuring an 802.1x-enabled network, you can enable secure IAPP, which prevents unauthorized users from joining the spanning tree. For help, see Enabling Secure IAPP and Secure Wireless Hops on page 141.

4. For 802.11b, configure basic WEP 64/128 security. You can configure up to four different WEP keys on the access point and most wireless end devices, and then you specify which key is being used to encrypt data. You should periodically change which WEP key these devices use. For help, see Configuring WEP 64/128 Security on page 148.

5. Use a password server to maintain a list of authorized users who can configure and manage the access points.

   Or, change the default login for users who need to be able to configure or manage the access point. For help, see Setting Up Logins on page 143.

6. Use a RADIUS server to maintain an Access Control List (ACL), which is a list of MAC addresses of end devices that can connect to the network through access point.

7. Use an 802.1x security solution. 802.1x security provides a framework to authenticate user traffic to a protected 802.11b network. Using 802.1x security provides secure data transmission by enabling secure IAPP, enabling secure wireless hops, and dynamically rotating the WEP keys. You configure the access point as an authenticator. For the authentication server use an external RADIUS server. For help, see Configuring 802.1x Security on page 154.

For help troubleshooting security, see Troubleshooting on page 173.

Allied Telesyn is constantly evaluating new and more robust security solutions. For more information, contact your local Allied Telesyn representative.

Enabling Access Methods

There are four access methods that you can enable or disable depending on how you want users to be able to configure or manage the access points:

- ❑ Web browser interface (HTTP or HTTPS)
- ❑ Telnet session
- ❑ SNMP management station
- ❑ Program that uses ICMP echo

All access methods are enabled by default. You may want to disable any of these methods that you will not use to prevent access by an unauthorized method.

To enable or disable access methods, perform the following procedure:

1. From the Main Menu, click **Security**. The Security screen as shown in Figure 54 is displayed.

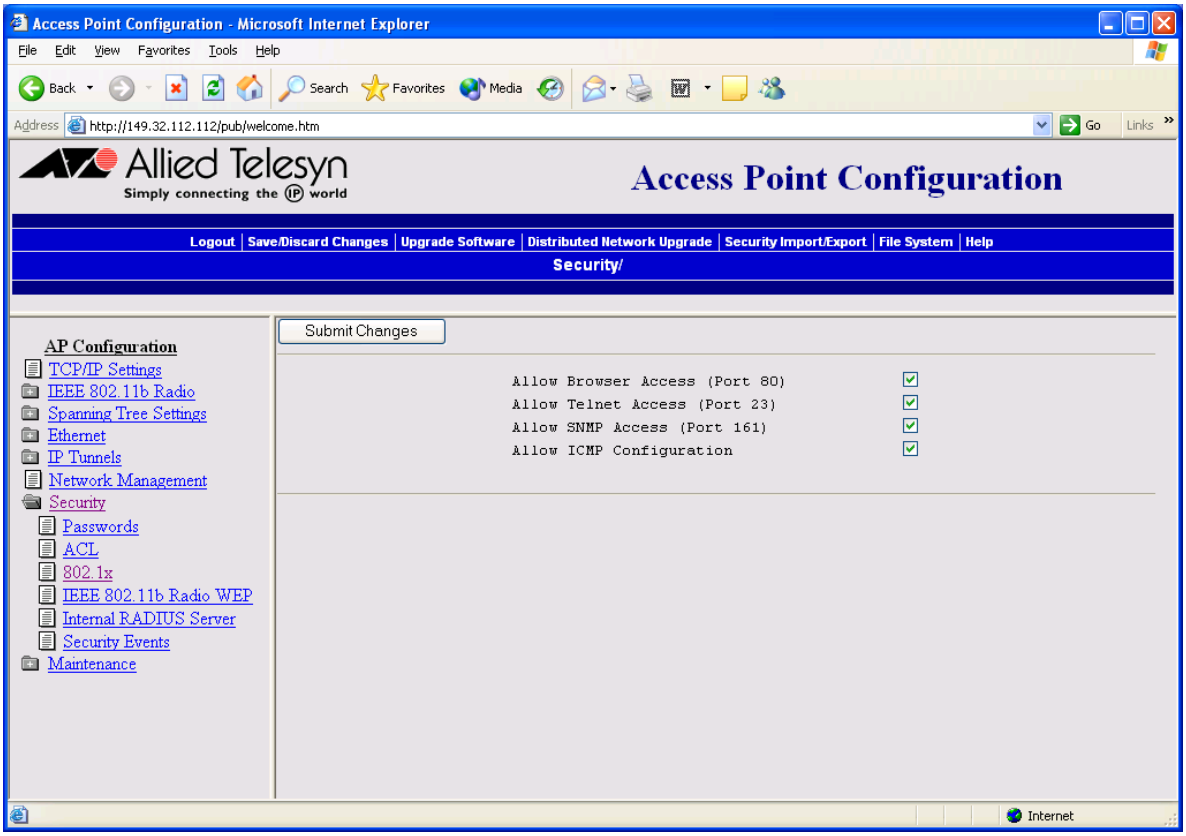


Figure 54 Security Screen

3. Enable or disable the access methods that users can use to connect to the access point. These methods are described below.

   Browser Access
   Determines if users can use a web browser to configure or manage this access point. Browser access is through either port 80 or port 443.

   Choose Secure-Only if you want to force users to log in using the secure web browser (HTTPS) interface. Secure-only access is through port 443. This feature is only available on the newer access points AT-WL2411.

   Allow Telnet Access
   Determines if users can use a telnet session (or a communications program) to configure or manage this access point. Telnet access is through port 23.

   Allow SNMP Access
   Determines if users can use SNMP management station to configure or manage this access point. SNMP access is through port 161.

   Allow ICMP Configuration
   Determines if users can use the a program that uses ICMP echo (PING) to set the IP address or restore factory defaults on this access point.

4. Click **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Enabling Secure IAPP and Secure Wireless Hops

Secure IAPP prevents unauthorized AT-WL2411 access points from joining the spanning tree and it encrypts IAPP frames. If you enable secure IAPP, when access points communicate with each other through the radios, they will create secure wireless hops using the Secure Wireless Authentication Protocol (SWAP). SWAP forces access points to authenticate each other using an EAP-MD5 challenge.

By default, secure IAPP is disabled. All AT-WL2411 access points have the same IAPP secret key so they can communicate with each other. You can enable secure IAPP and secure wireless hops in any type of radio network.

Note these potential problems:

- If you enable secure IAPP on a root access point that is running software release 1.80 or later and other access points in your network are running an earlier software release than 1.80, the access points with the earlier software release will not attach to the root. The access points with the earlier software release do not support secure IAPP. If you want to use secure IAPP, upgrade all access points to software release 1.80.
- If you enable secure IAPP on a non-root access point and the root access point has secure IAPP disabled, the access points will form separate spanning trees with the same LAN ID. If you want to use secure IAPP, enable secure IAPP on all access points.

To enable secure IAPP and secure wireless hops, perform the following procedure:

Note
You do not need to perform this procedure if you are enabling 802.1x authentication in your network. Enabling 802.1x authentication automatically enables secure IAPP and secure wireless hops. See Configuring 802.1x Security on page 154.

1. From the Main Menu, click **Security** then **802.1x**. The 802.1x screen as shown in Figure 55 is displayed.

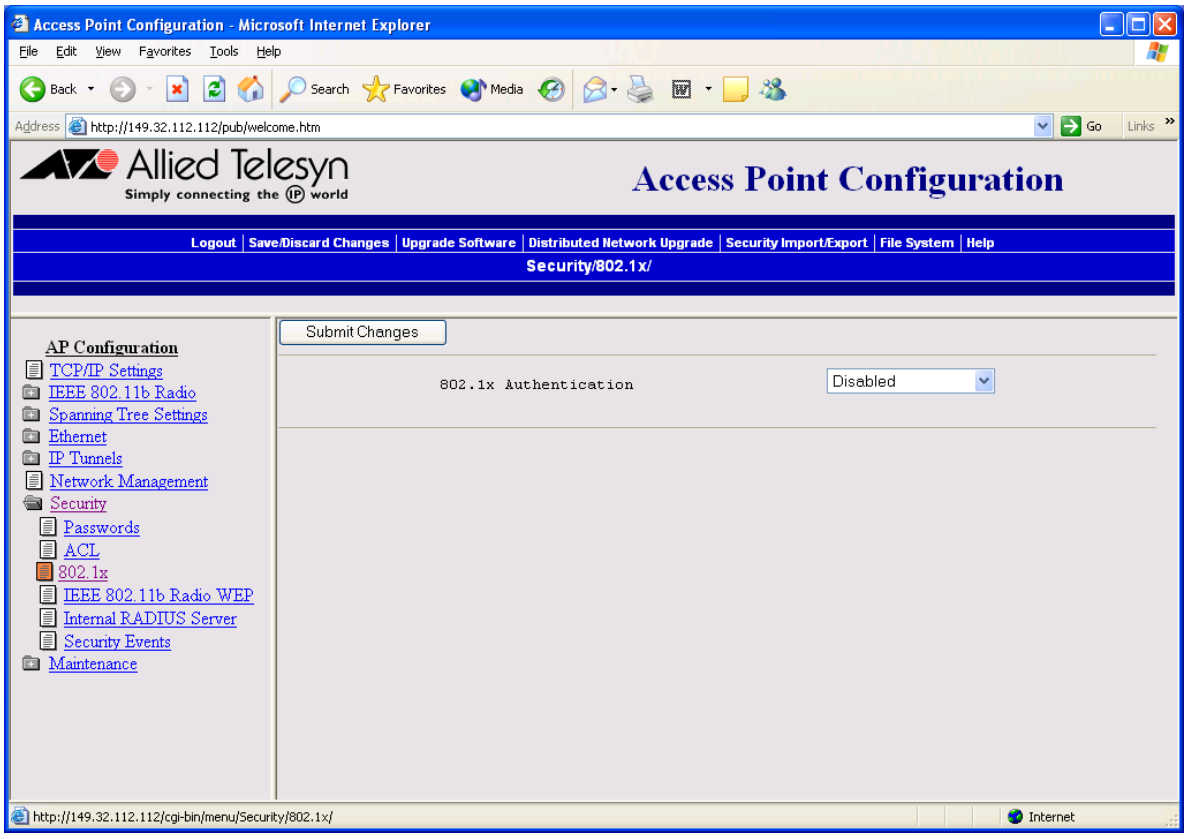


Figure 55 802.1x Screen

3. Select the down arrow on the right side of the Authentication field and choose **IAPP Only**.

4. In the IAPP Secret Key field, enter a secret key. This secret key must be between 16 and 32 bytes.

5. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

6. Repeat Steps 1 through 4 for each access point in your spanning tree. All access points must have the same IAPP secret key to communicate with each other.

In the access point that contains the master radio, select **Maintenance** then **AP Connections**. The AP Connections screen lists the station radios (including ones in other access points) that are communicating with the master radio. For help, see Viewing Access Point Connections on page 160.

Setting Up Logins

To ensure login security for configuring or maintaining the access points, you should either use a password server or immediately change the default user name and password.

To use the password server, you must have:

- A password server on the network that contains the user name/password database. For help, see Configuring the Access Point to Use a Password Server on page 144.
- Access points, which are the RADIUS clients.

If you enable RADIUS authorization, when a user uses a web browser or telnet to access the access point configuration screens, the user will need to enter a user name and password. This login is sent through the RADIUS client to the RADIUS server. The server compares the user name and password to its list of authorized user names and passwords. If a match is found, the server returns an access-accept frame and the user is logged into the access point with read/write privileges.

If neither RADIUS server #1 nor RADIUS server #2 is available when the user attempts a login and the Allow Service Password check box is checked, the service password is checked. If the login does not match the service password, the login fails.

Note
Each time the service password login attempt fails, the process may take up to eight seconds.

If you do not want to use RADIUS authorization, you should change the default login user name and password. You may also want to change the read-only password. For help, see Changing the Default Login on page 146.

Configuring the Access Point to Use a Password Server

If you use a password server to manage users who can log in to the AT-WL2411, you need to tell this access point how to communicate with the password server and then you need to configure the password server.

To configure the access point to use a password server, perform the following procedure:

1. From the Main Menu, select **Security** then **Passwords**. The Passwords screen as shown in Figure 56 is displayed.

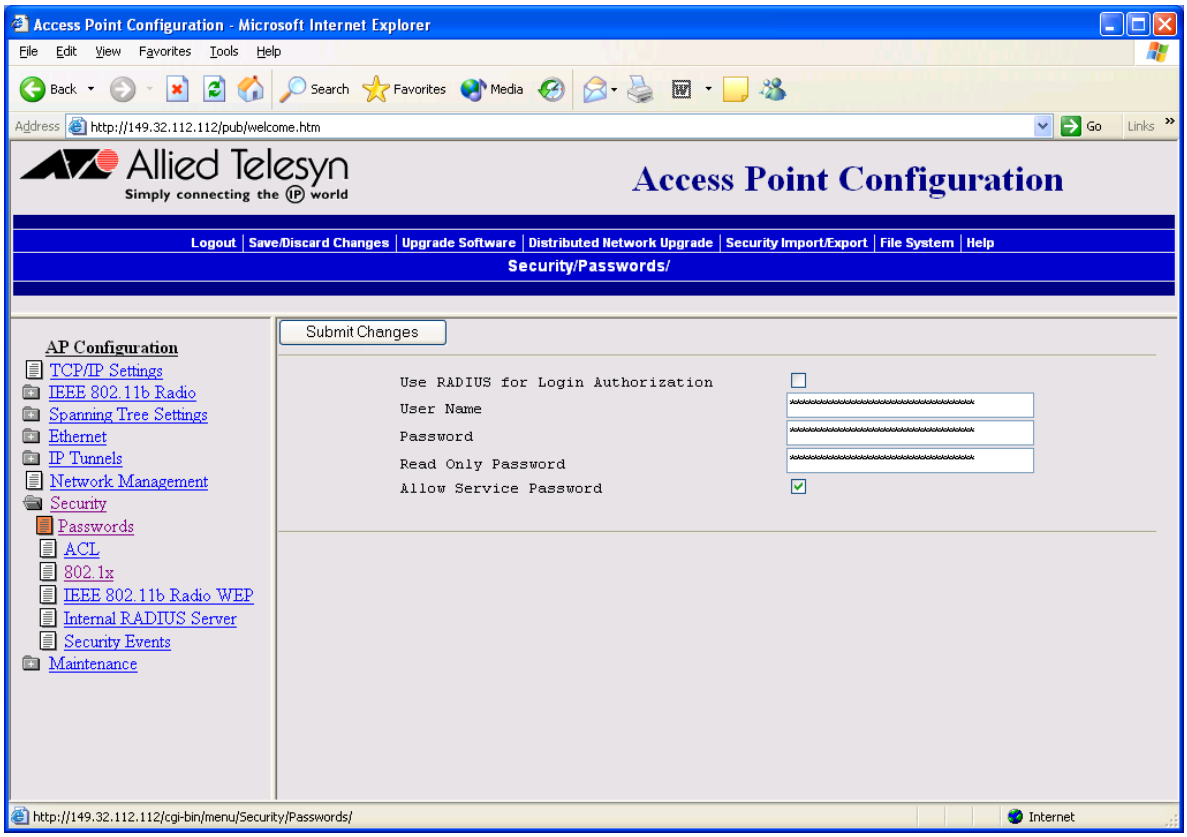


Figure 56 Password Screen

2. Check the **Use RADIUS for Login Authorization** box then select **Submit Changes**.

3. Configure the password parameters. The password parameters are described below.

   Use RADIUS for Login Authorization
   Determines if you are using a password server to authenticate end devices that communicate with this access point. Check this check box to use a password server.

RADIUS Server #1 IP Address
Enter the IP address of the password server that you want to use to authenticate user logins.

RADIUS Server #1 Secret Key
Enter the shared secret key for the password server. You can enter the key from 1 to 32 characters in ASCII or in hexadecimal. To enter a hexadecimal key, it must start with 0x. For example, enter the ASCII key as ABCDE; enter the same hexadecimal key as 0x4142434445.

RADIUS Server #2 IP Address
Enter the IP address of the backup password server that you want to use to authenticate user logins if RADIUS server #1 is unavailable.

RADIUS Server #2 Secret Key
Enter the shared secret key for the backup password server. You can enter the key from 1 to 32 characters in ASCII or in hexadecimal. To enter a hexadecimal key, it must start with 0x. For example, enter the ASCII key as ABCDE; enter the same hexadecimal key as 0x4142434445.

Allow Service Password
If RADIUS servers #1 and #2 are unavailable, check this check box to allow the login to be checked against the service password. Allied Telesyn Technical Support may use this service password if they need to troubleshoot this access point.

4. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar click then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

5. Configure the password server by:

   a. (Optional) If you change the default shared secret key, enter each access point as a RADIUS client and enter the shared secret key.

   b. Enter the user name and password for each user that is allowed to log in to this access point.

For help configuring an external RADIUS server, see the documentation that shipped with your server.

Changing the Default Login

If you are not using a password server to authorize user logins, you should change the default user name and password.

To set up logins, perform the following procedure:

1. From the Main Menu, select **Security**, then **Passwords**.The Password screen as shown in Figure 56 is displayed.
2. Uncheck the **Use RADIUS for Login Authorization** box then **Submit Changes**.
3. Configure the password parameters. The password parameters are described below.

   Use RADIUS for Login Authorization
   Determines if you are using a password server to authenticate end devices that can communicate with this access point. Clear this check box.

   User Name
   Enter the user name you need to use to log in to this access point. This parameter can be from 0 to 16 characters long.

   If you leave the user name and password fields blank, a user will not need to log in to the access point.

   Password
   Enter the password you need to use to log in to this access point. This password gives you read and write access to the access point configuration. This parameter can be from 0 to 16 characters long.

   If you leave the user name and password fields blank, a user will not need to log in to the access point.

   Read Only Password
   Enter the password you need to use to log in to this access point. This password gives the user read-only access to the access point. This user is able to view the configuration and execute diagnostics but cannot perform any tasks that affect the operation of the access point, such as changing configuration options, rebooting, or downloading software.

   To disable this password, delete it.

Allow Service Password
If the user enters a login that does not match either the user name and password or the read only password, check this check box to allow the login to be checked against the service password. Allied Telesyn Technical Support may use this service password if they need to troubleshoot this access point.

4. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Once the changes are activated, you must enter these new values when you use a web browser or telnet to connect to this access point.

Configuring WEP 64/128 Security

Note
If you configure WEP 64/128 security for a radio, you cannot also enable 802.1x authentication for that radio. 802.1x security uses rotating WEP keys that are automatically generated.

In your 802.11b network, you can configure static WEP keys (for WEP 64 or for WEP 128 security) to provide security between the access points and the wireless end devices. To use static WEP keys, your radios must support WEP encryption. All access points and wireless end devices on a particular network must use the same WEP encryption type and the same WEP transmit key. You should periodically change this WEP transmit key to prevent an unauthorized person with a sniffing tool from monitoring your network and discovering the WEP key.

Since, static WEP keys can be difficult to update, the AT-WL2411 and other Allied Telesyn products let you enter up to four WEP keys, and then pick a WEP transmit key (1-4). It is easier to rotate the WEP transmit key than to individually change all the WEP keys. For improved security, use 802.1x security.

WEP 64 has four 40-bit encryption keys and one 24-bit initialization vector (IV) key. To use WEP 64, you enter five ASCII characters or five hex pairs for the WEP keys. WEP 128 provides a higher degree of encryption protection. It has four 104-bit encryption keys and one 24-bit IV key. For WEP 128, you enter 13 ASCII characters or hex pairs.

To configure WEP 64/128 security, perform the following procedure:

1. From the Main Menu, click **Security** then **IEEE 802.11b Radio**. The appropriate radio screen like the one in Figure 57 is displayed.

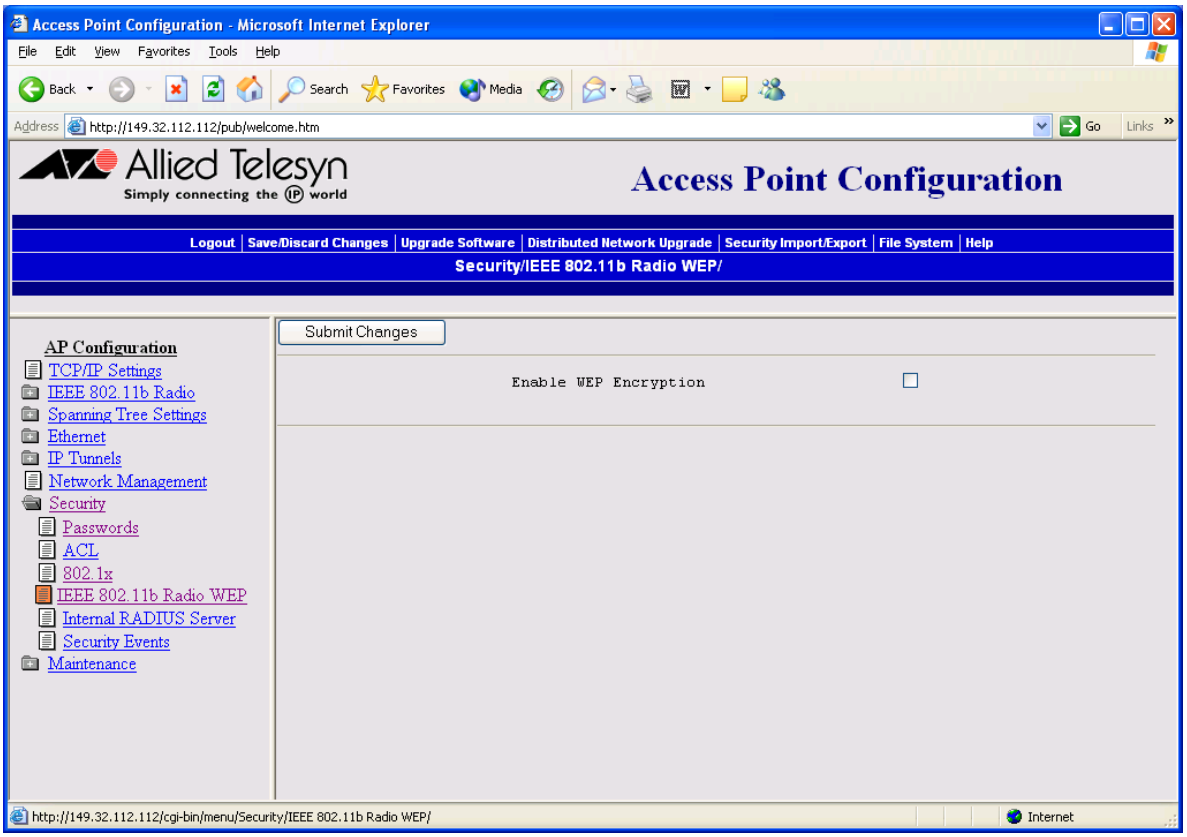


Figure 57 An example of a Radio Screen

2. Check the **Enable WEP Encryption** box then **Submit Changes**.

3. Configure the parameters for WEP configuration. To ensure maximum security, configure each WEP key with a different WEP code. The WEP parameters are described below.

   Enable WEP Encryption
   Determines if you are using WEP 64/128 security. Check this check box.

   Allow Unencrypted Clients
   Determines if the access point will receive transmissions from wireless end devices that are not using WEP encryption. Check this check box to accept transmissions from devices that are not using WEP encryption. Clear this check box to block transmissions from end devices that are not using WEP encryption.

WEP Transmit Key
Determines which of the four WEP keys this access point uses to transmit data.

WEP Key 1 through WEP Key 4
For WEP 64, you enter five ASCII characters or five hex pairs. For WEP 128, you enter 13 ASCII characters or hex pairs. To enter a hexadecimal key, prefix it with 0x. For example, the ASCII key ABCDE is equivalent to 0x4142434445.

4. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar click then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

Using an Access Control List (ACL)

You can use an Access Control List (ACL) to list the MAC addresses that are authorized to communicate with the network through the access point. The end devices do not need any special client software.

To use the ACL, you must have

- ❑ a RADIUS server on the network that contains the ACL.
- ❑ access points, which are the RADIUS clients.

To configure an Access Control List (ACL), perform the following procedure:

1. From the Main Menu, select **Security** then **ACL**. The ACL screen as shown in Figure 58 is displayed.

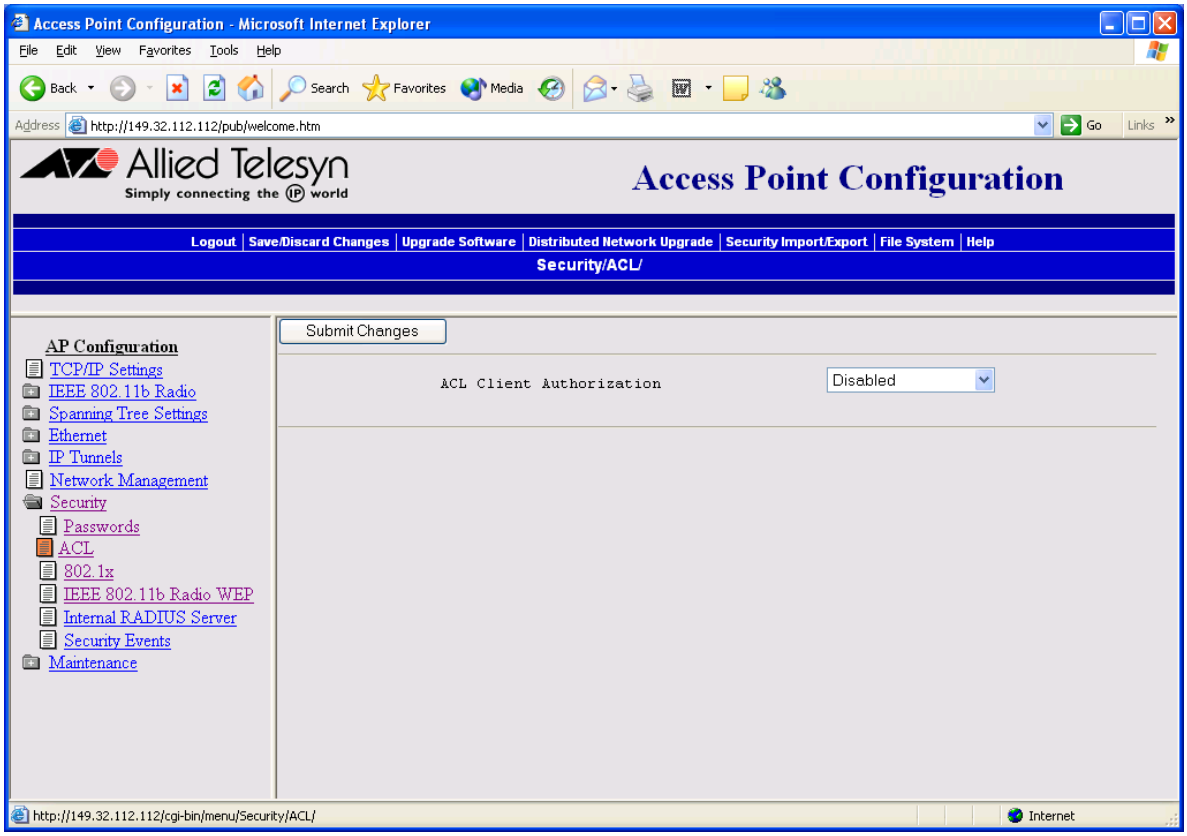


Figure 58 ACL Screen

3. In the **ACL Client Authorization** field, select the down arrow on the right side of the field. Choose which radio network that will use the ACL or choose All Radios.

4. Configure the RADIUS server parameters. The RADIUS parameters are described below:

   ACL Client Authorization
   Determines if this access point uses an ACL. Click the down arrow on the right side of the field and choose which radio uses an ACL to authenticate end devices.

   RADIUS Server #1 IP Address
   Enter the IP address of the RADIUS server that contains the ACL.

   If you are configuring an access point as a RADIUS server, enter the IP address of the access point.

   RADIUS Server #1 Secret Key
   Enter the shared secret key for the RADIUS server. You can enter the key from 1 to 32 characters in ASCII or in hexadecimal. To enter a hexadecimal key, it must start with 0x. For example, enter the ASCII key as ABCDE; enter the same hexadecimal key as 0x4142434445.

   RADIUS Server #2 IP Address
   Enter the IP address of the backup RADIUS server that contains the ACL if RADIUS server #1 is unavailable.

   You cannot use this server to provide more ACL entries.

   RADIUS Server #2 Secret Key
   Enter the shared secret key for the backup RADIUS server. You can enter the key from 1 to 32 characters in ASCII or in hexadecimal. To enter a hexadecimal key, it must start with 0x. For example, enter the ASCII key as ABCDE; enter the same hexadecimal key as 0x4142434445.

5. Select **Submit Changes** to save your changes. To activate your changes, select **Save/Discard Changes** from the menu bar then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

6. Configure the RADIUS server.

    a. (Optional) If you change the default shared secret key, enter each access point as a RADIUS client and enter the shared secret key.

    b. Enter the MAC address for each end device radio that is allowed to communicate to the network.

    For help configuring an external RADIUS server, see the documentation that shipped with your server.

Configuring 802.1x Security

The AT-WL2411 can help implement 802.1x security in an 802.11b network. The IEEE 802.1x standard provides an authentication protocol for 802.11 LANs. 802.1x provides strong authentication, access control, and key management, and lets wireless networks scale by allowing centralized authentication of wireless end devices. Allied Telesyn can provide a complete 802.1x security solution.

The 802.1x authentication process uses a RADIUS server, which is the authentication server, and access points, which are the authenticators, to manage the wireless end device authentication and wireless connection attributes. Extensible Authentication protocol (EAP) authentication types provide devices with secure connections to the network. They protect credentials and data privacy. Examples of EAP authentication types include Transport Layer Security (EAP-TLS) and Tunneled Transport Layer Security (EAP-TTLS).

To implement 802.1x security, you must have the following:

- A trusted certificate authority (CA), which issues digital authentication certificates. The authentication server must have a certificate installed on it. Also, if the end devices are using EAP-TLS, each one needs a client certificate.
- An authentication server (RADIUS server), which is software that is installed on a PC or server on your network. The authentication server accepts or rejects requests from end devices that want to communicate with the 802.1x-enabled network.
- An authenticator, which is an access point on your network. The authenticator receives requests from end devices that want to communicate with the network and forwards these requests to the authentication server. The authenticator also distributes the WEP keys to end devices that are communicating with it.
- End devices that are 802.1x-enabled. These end devices have an 802.11b radio and a supplicant (EAP-TLS or EAP-TTLS) loaded on them. Supplicants allow your end devices to request communication with the authenticator using a specific EAP authentication type. For more information on the availability of 802.1x-enabled end devices, contact your local Allied Telesyn representative.

About Secure IAPP and Secure Wireless Hops

Secure IAPP prevents unauthorized AT-WL2411 Access Points from joining the spanning tree and it encrypts IAPP frames. If you enable secure IAPP, when access points communicate with each other through the radios, they will create secure wireless hops using the Secure Wireless Authentication protocol (SWAP). SWAP forces access points to authenticate each other using an EAP-MD5 challenge. For more information, see Enabling Secure IAPP and Secure Wireless Hops on page 141.

By default, secure IAPP is disabled. All AT-WL2411 Access Points have the same IAPP secret key so they can communicate with each other. When you configure the access point as an authenticator, you enable secure IAPP and secure wireless hops.

Configuring the Access Point as an Authenticator

The access point, when acting as an authenticator, receives requests from end devices that want to communicate with the network and forwards these requests to the authentication server. It also distributes the WEP keys to end devices that are communicating with it. Before you configure the access point as an authenticator, the access point should be installed and configured to communicate with the wireless end devices.

To configure the access point as an authenticator, perform the following procedure:

1. From the Main Menu, select **Security** then **802.1x**. The 802.1x screen as shown in Figure 59 is displayed.

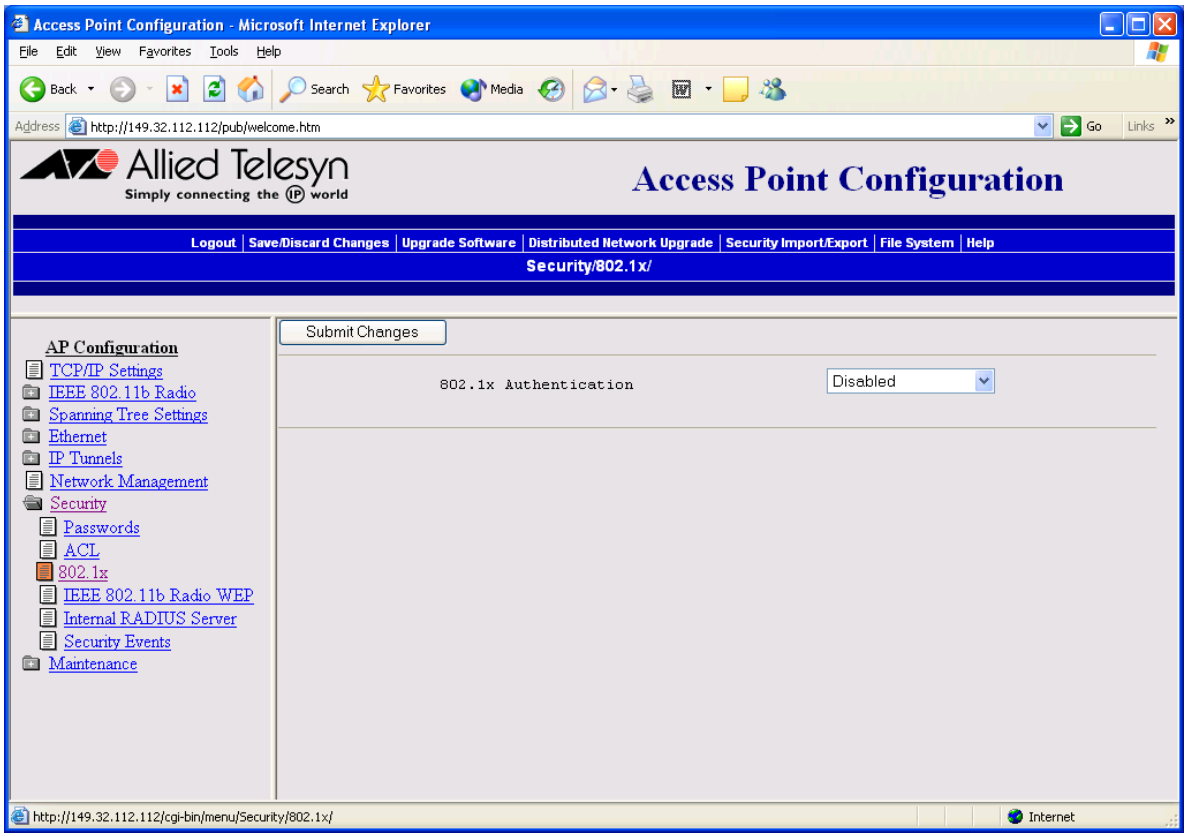


Figure 59 802.1x Screen

2. Select the down arrow on the right side of the 802.1x Authentication field then choose the radio networks that you want to implement 802.1x security then select **Submit Changes**.

3. Configure the parameters for 802.1x security. The parameters are described below.

802.1x Authentication
Determines if this access point uses 802.1x security. Click the down arrow on the right side of the field and choose which radio uses 802.1x security to authenticate end devices.

IAPP Secret Key
Choose IAPP only if you only want to enable secure IAPP and secure wireless hops.

Enter a key that the access points use to encrypt and sign security context exchanges. This key must be the same in all access points and can contain from 16 to 32 characters. You can enter the key in ASCII or in hexadecimal. To enter a hexadecimal key, it must start with 0x. For example, enter the ASCII key as ABCDE; enter the same hexadecimal key as 0x4142434445.

Enable IAPP Security Context Hand Off
Check this check box if you want to use IAPP for security context handoffs. This feature uses the advantages of the spanning tree for faster roaming. Devices do not have to perform a full reauthentication each time they roam between access points.

Clear this check box if you want to use the 802.1x standard for reauthentication or if the supplicant functionality that is implemented on the end device does not support it.

Key Rotation Period
Enter how often (in minutes) the access point generates a new WEP key.

RADIUS Server #1 IP Address
Enter the IP address of the RADIUS server that you want to use to perform the 802.1x authentication.

RADIUS Server #1 Secret Key
Enter the shared secret key for the RADIUS server. You can enter the key from 1 to 32 characters in ASCII or in hexadecimal. To enter a hexadecimal key, it must start with 0x. For example, enter the ASCII key as ABCDE; enter the same hexadecimal key as 0x4142434445.

RADIUS Server #2 IP Address
Enter the IP address of the backup RADIUS server that you want to perform the 802.1x authentication if RADIUS server #1 is unavailable. You cannot use this server to provide more entries.

RADIUS Server #2 Secret Key
Enter the shared secret key for the backup RADIUS server. You can enter the key from 1 to 32 characters in ASCII or in hexadecimal. To enter a hexadecimal key, it must start with 0x. For example, enter the ASCII key as ABCDE; enter the same hexadecimal key as 0x4142434445.

4. Select **Submit Changes** to save your changes. To activate your changes select **Save/Discard Changes** from the menu bar click then **Save Changes and Reboot**. For help, see Saving Your Configuration Changes on page 46.

5. To configure the authentication server, do the following:

   ❑ In the external RADIUS server, enter each authenticator's IP address and the shared secret key. For help configuring an external RADIUS server, see the documentation that shipped with your server.

Chapter 8
Access Point Maintenance

This chapter contains the following sections:

- Monitoring the Access Point on page 160
- Restoring the Default Settings on page 164
- Upgrading the Firmware on page 166

Monitoring the Access Point

Using a Web browser session, you can view different parameters configured for the AT-WL2411 access point, including port statistics, connections, and a configuration summary. The information on these screens may be needed when you call Allied Telesyn Technical Support.

Viewing Access Point Connections

The AP Connections screen shows information about the devices in the spanning subtree. To view the AP Connections screen, perform the following procedure:

1. From the Main Menu, select **Maintenance**. The read-only AP Connections screen as shown in Figure 60 is displayed.

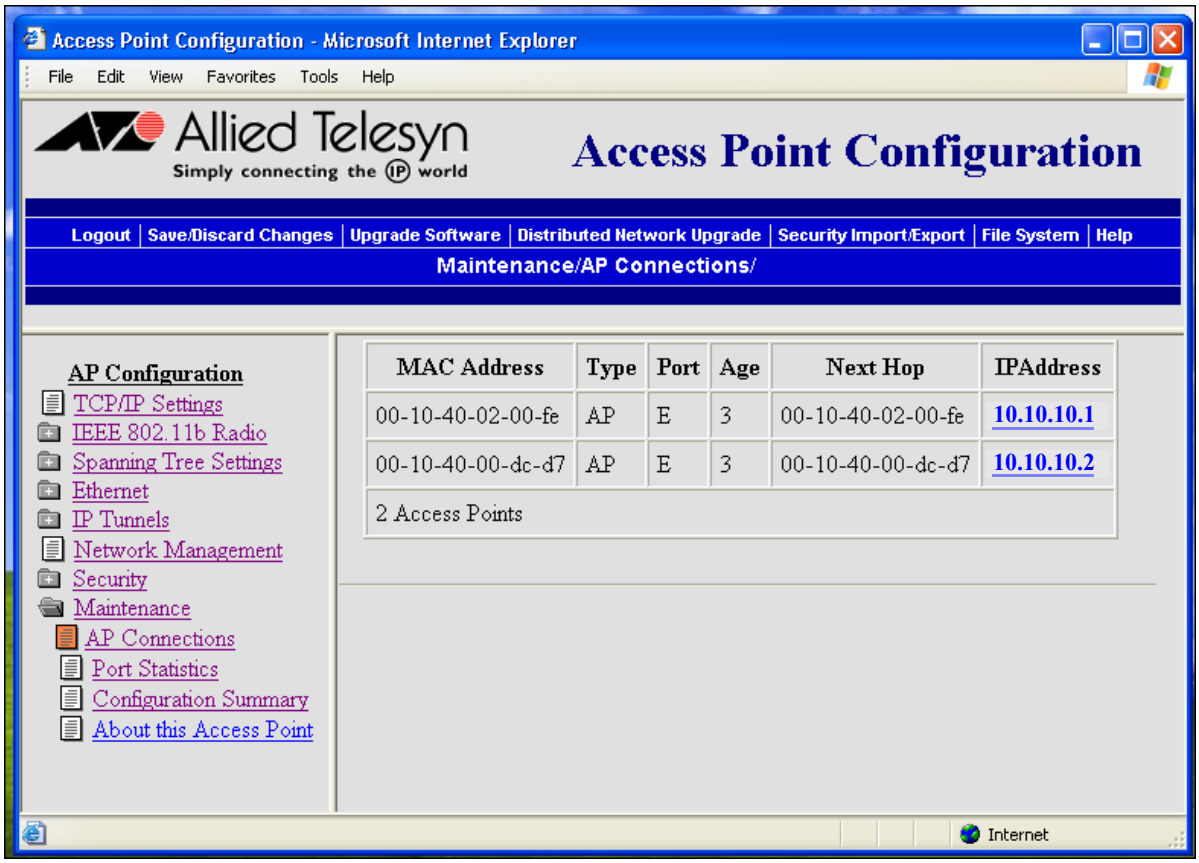


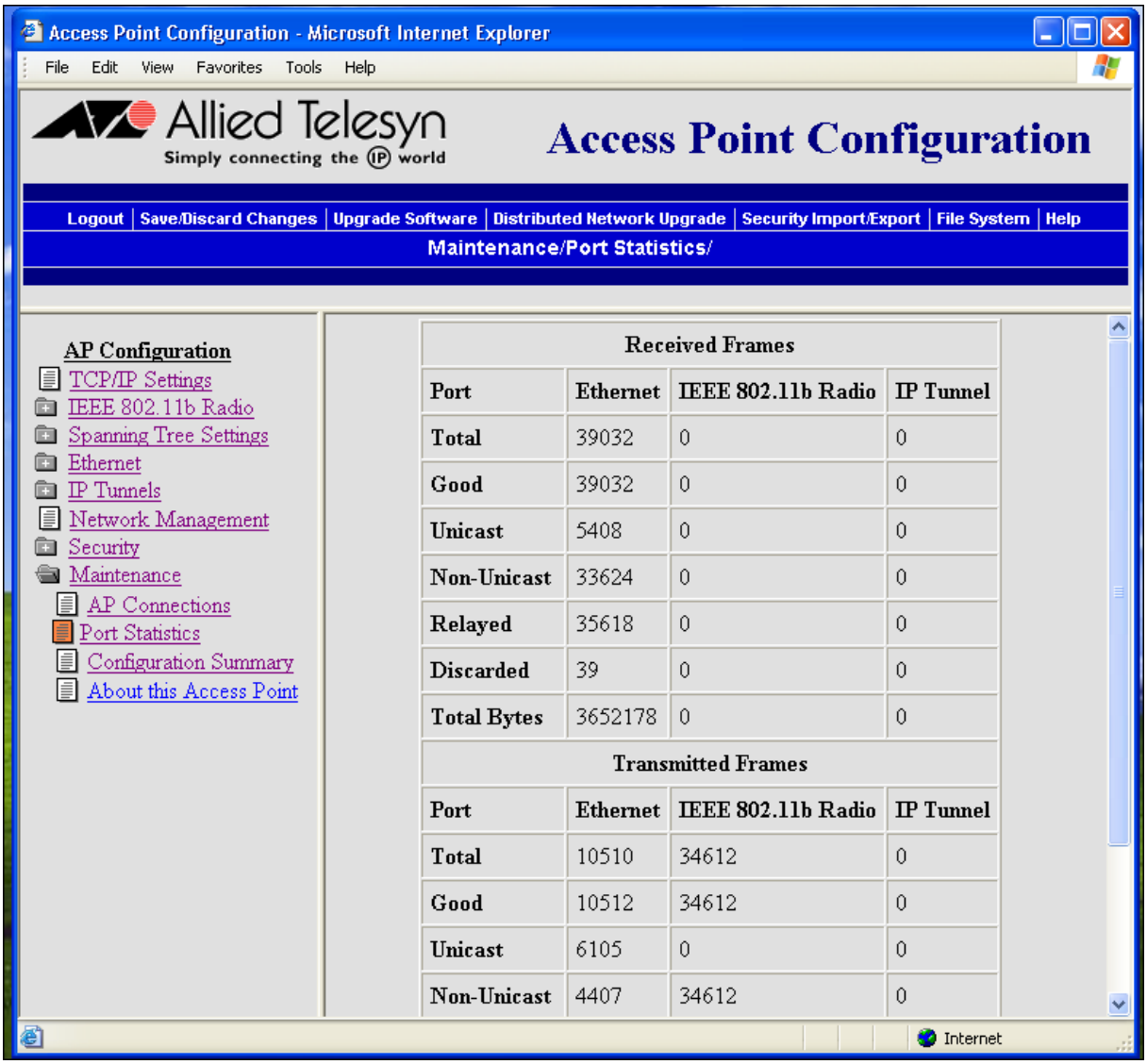
Figure 60 AP Connections Screen

Viewing Port Statistics

The Port Statistics screen shows the total number of frames and bytes that the access point has transmitted and received since it was last booted.

To view port statistics, perform the following procedure:

1. From the Main Menu, select **Maintenance** then **Port Statistics**. The read-only Port Statistics screen as shown in Figure 61 is displayed.



Received Frames			
Port	**Ethernet**	**IEEE 802.11b Radio**	**IP Tunnel**
Total	39032	0	0
Good	39032	0	0
Unicast	5408	0	0
Non-Unicast	33624	0	0
Relayed	35618	0	0
Discarded	39	0	0
Total Bytes	3652178	0	0

Transmitted Frames			
Port	**Ethernet**	**IEEE 802.11b Radio**	**IP Tunnel**
Total	10510	34612	0
Good	10512	34612	0
Unicast	6105	0	0
Non-Unicast	4407	34612	0

Figure 61 Port Statistics Screen

Viewing the Configuration Summary

The Configuration Summary summarizes the major configuration settings and installed hardware for the AT-WL2411.

To view the configuration summary, perform the following procedure:

1. From the Main Menu, select **Maintenance**, then **Configuration Summary**. The read-only Configuration Summary screen as shown in Figure 62 is displayed. This screen lists each parameter in the AT-WL2411 and its current configuration.

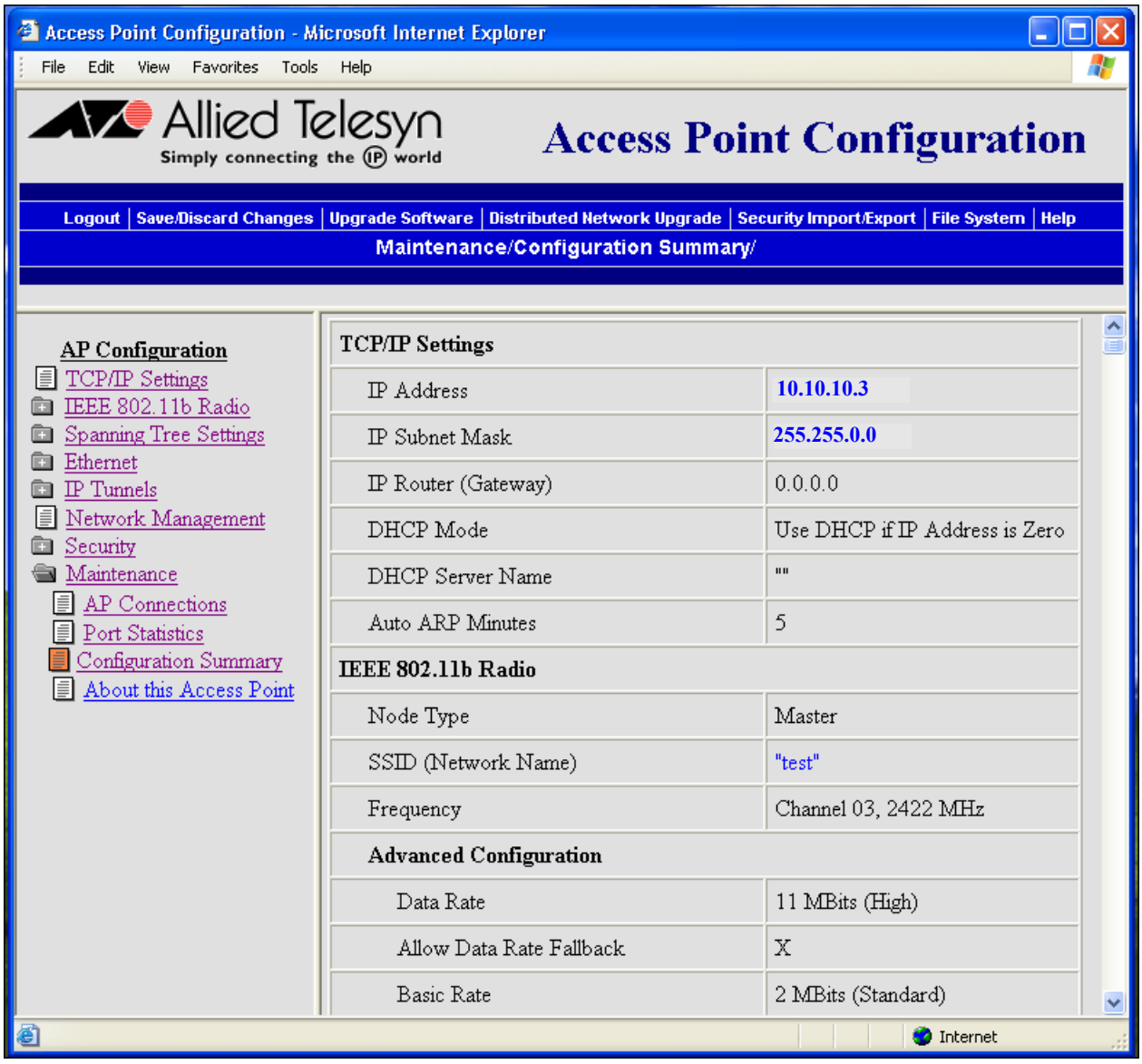


Figure 62 Configuration Summary Screen

Viewing Information About the Access Point

About this Access Point shows the firmware version, radio versions, and MAC addresses.

To view About this Access Point, perform the following procedure:

1. From the Main Menu, select **Maintenance** then **Access Point**. The read-only About this Access Point screen as shown in Figure 63 is displayed.

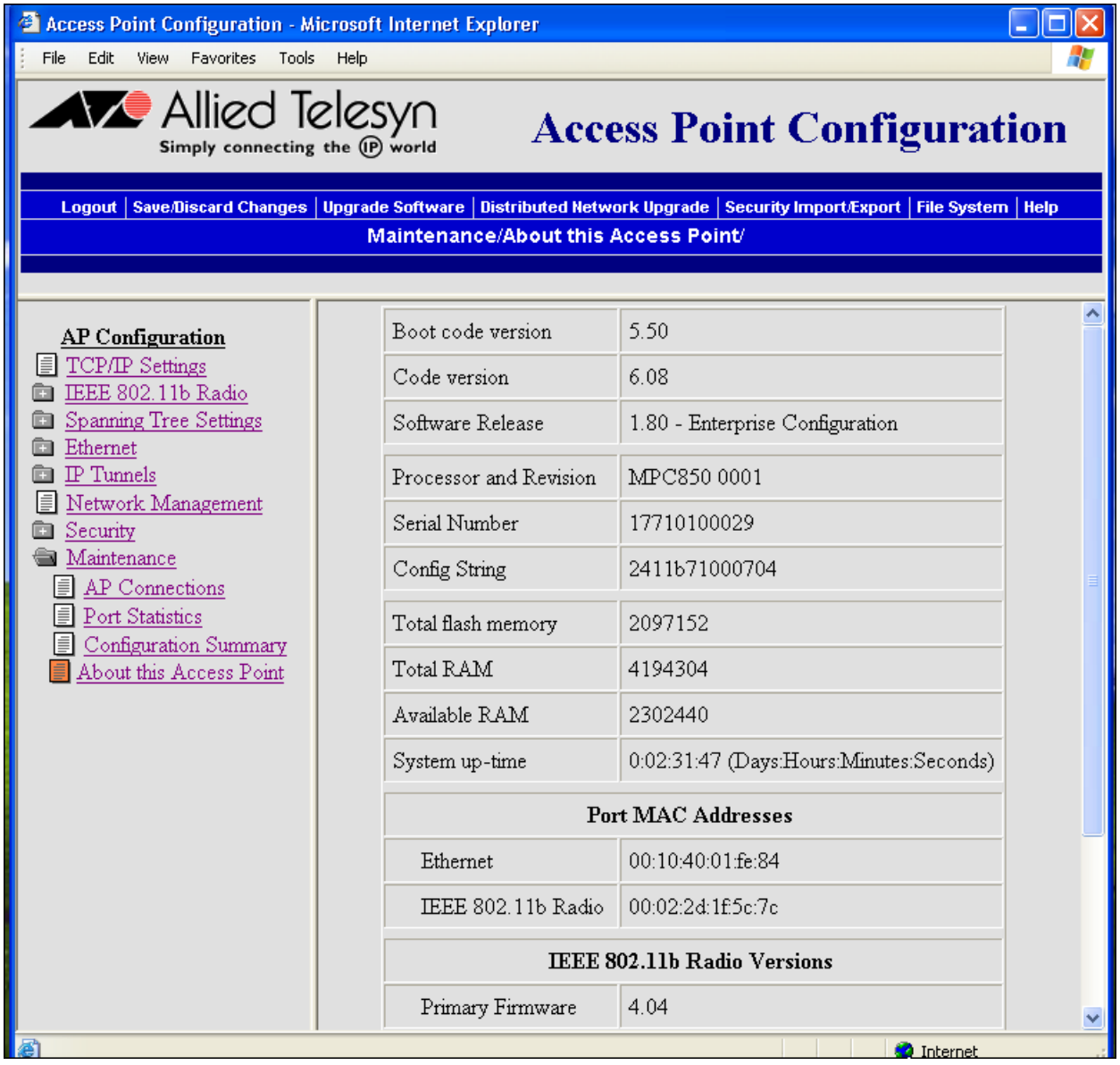


Figure 63 About this Access Point Screen

Restoring the Default Settings

If you need to restore the access point to the factory default settings. This can be done using the Web browser interface. For a list of the default settings, see Default Configuration Settings on page 209. To restore the default configuration, perform the following procedure:

1. In the menu bar, select **Save/Discard Changes**. The Changes screen as shown in Figure 63 is displayed.

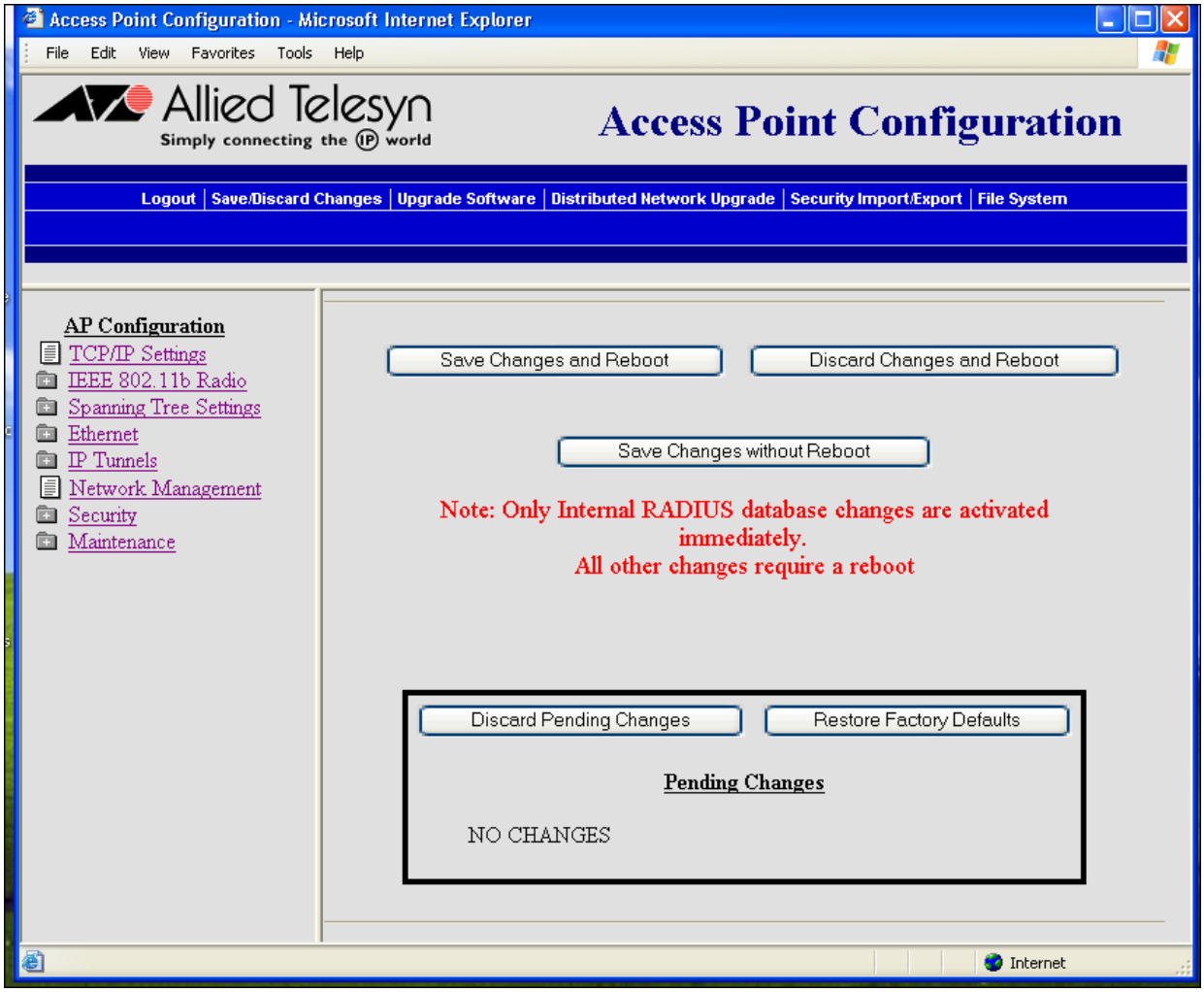


Figure 64 Changes Screen

2. Select **Restore Factory Defaults**. Under Pending Changes, you will see a list of what parameters need to be changed.

3. Select **Save Changes and Reboot**. When the access point is done rebooting, it will use the factory default settings as its active configuration. You may need to reset the IP address and other network parameters.

Upgrading the Firmware

The procedures in this section explain how to upgrade the firmware on the AT-WL2411 to Version 1.80.

The current access point configuration information, such as IP address, should be retained when the new firmware is installed. However, keeping backup records of configuration settings is recommended.

You can install the firmware release using the following methods:

- ❑ Serial connection
- ❑ TFTP transfer via a Telnet session
- ❑ Web browser session (only available on Version 1.72 and later releases)

To upgrade the firmware, you must first download the firmware release onto your local computer. The latest version of the AT-WL2411 firmware is available from the Allied Telesyn Web site at www.alliedtelesyn.com.

Using a Serial Connection

To upgrade the firmware using a serial connection, you must have an RS-232 null-modem cable connecting the wireless access point to your computer and a communications program such as HyperTerminal installed on your computer.

To upload the firmware, perform the following procedure:

1. Configure the following parameters on your communications software:

Baud rate	9600
Data bits	8
Parity	none
Stop bit	1
Flow control	none

2. Reboot the wireless access point and enter the wireless access point monitor by pressing any key within 5 seconds when prompted. The **ap>** prompt appears.
3. Type **srvc** at the prompt and press **C** and press **<Enter>**.
4. Type the service password. The default password is **EV98203S** (case-sensitive). The **service>** prompt appears.
5. Type **fd** at the prompt and press **<Enter>**. The file directory appears.

6. Scroll up on the communications software window until you see a section similar to the following:

   Startup Segment: This startup = 1, Next startup = 1
   Data Segment: This startup = 3, Next startup = 3

7. These are the current startup and data segments. In this example, the active startup segment is 1 and the active data segment is 3.

   You will first erase the inactive segments and then you will load the new firmware into the inactive segments and make those segments active. In this example, the inactive segments are 2 and 4.

8. Erase the inactive startup segment. Type **fe 2** at the **service>** prompt and press **<Enter>**. A **P** appears in the command line when the segment is erased.

9. Erase the inactive data segment. Type **fe 4** at the **service>** prompt and press **<Enter>**. A **P** appears in the command line when the segment is erased.

10. Transfer the startup files to the inactive startup segment.

    a. At the **service>** prompt, type **fx s** (where **s** is the inactive startup segment) and press **<Enter>**. A series of **C**s appears in the command line.

    b. Select the **Transfer Menu** tab in your communications program then select **Send File**. The Send File dialog box as shown in Figure 65 is displayed.

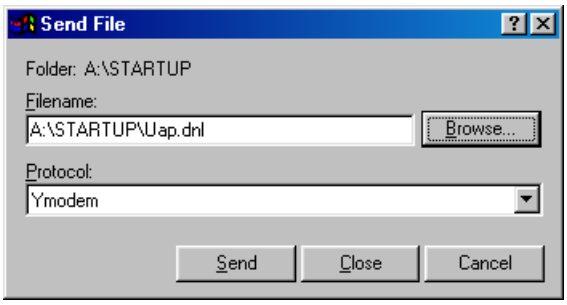


Figure 65 Send File

    c. Select the Protocol down arrow and choose **Ymodem**.

    d. Browse to the location where the UAP.DNL is saved. Double-click this file so that it appears in the Filename field.

    e. Select **Send** to start the file transfer. A **P** appears in the command line when the transfer is complete.

11. Transfer the data files to the inactive data segment.

    a. At the **service>** prompt, type **fx s** (where **s** is the inactive data segment) and press **<Enter>**. A series of **C**s appears in the command line.

    b. Select the **Transfer Menu** tab in your communications program and then **Send File**. The Send File dialog box appears.

    c. Browse to the location where the data files are saved. Double-click any data file. This file name appears in the Filename field.

    d. To transfer all the data files at once, replace the specific file name with an asterisk (*). For example, if the file name is c:\2411uap\data\applets.dnl, change it to c:\2411uap\data*.dnl.

    e. Select **Send** to start the file transfer. A **P** appears in the command line when the transfer is complete.

12. Activate the inactive startup segment by typing **fb s** (where **s** is the inactive startup segment) at the **service>** prompt and pressing **<Enter>**. A **P** appears in the command line when the operation is complete.

13. Activate the inactive data segment by typing **fb s** (where **s** is the inactive data segment) at the **service>** prompt and pressing **<Enter>**. A **P** appears in the command line when the operation is complete.

14. Repeat Step 10 through Step 13 for the second startup file, **uapboot.dnl**.

15. Type **x** at the **service>** prompt and press **<Enter>** to return to the **ap>** prompt.

16. To reboot the wireless access point, type **b** and press **<Enter>**.

17. Reconfigure the wireless access point, if necessary, and save the configuration. To activate the configuration, reboot the wireless access point.

Using TFTP via Telnet

To upgrade the firmware using a TFTP transfer, you must have a TFTP server installed on your network. When you execute the UPGRADE.DNL script file that is included with the firmware release, a TFTP transfer copies all the startup and data files to the wireless access point.

To upgrade the firmware using a TFTP transfer, perform the following procedure:

1. Start your TFTP server.
2. Establish a Telnet session with the AT-WL2411.
3. Choose **Maintenance** then **Command Console**.
4. Use the sdvars set serveripaddress command to specify the IP address of the TFTP server. For example, if the server IP address is 151.60.110.241, type: **sdvars set serveripaddress 151.60.110.241**.
5. Use the sdvars set scriptfilename command to identify the script file. Type: **sdvars set scriptfilename c:\2411uap\upgrade.dnl**.
6. Use the sdvars set starttime command to set the start time for the upgrade in dd:hh:mm:ss format. Start time is a countdown time; when the timer expires, the download begins. You can enter days, hours, minutes, and seconds in the Start Time field. For example, to start the upgrade in two hours and ten minutes, type: **sdvars set starttime 00:02:10:00**.

   When the starttime computer reaches zero, the upgrade begins. The wireless access point reboots after the upgrade is complete.

Using a Web Browser Interface

You can use a Web browser interface to upgrade the access point one at a time. In other words, for each access point you want to upgrade, you will need to establish a Web browser session with it, upgrade the firmware, save the new configuration, and reboot it.

To upgrade the access point software, perform the following procedure:

1. Establish a Web browser session with the access point you want to upgrade.
2. From the menu bar, select **Upgrade Software**. The Upgrade Software screen, as shown in Figure 66 is displayed.

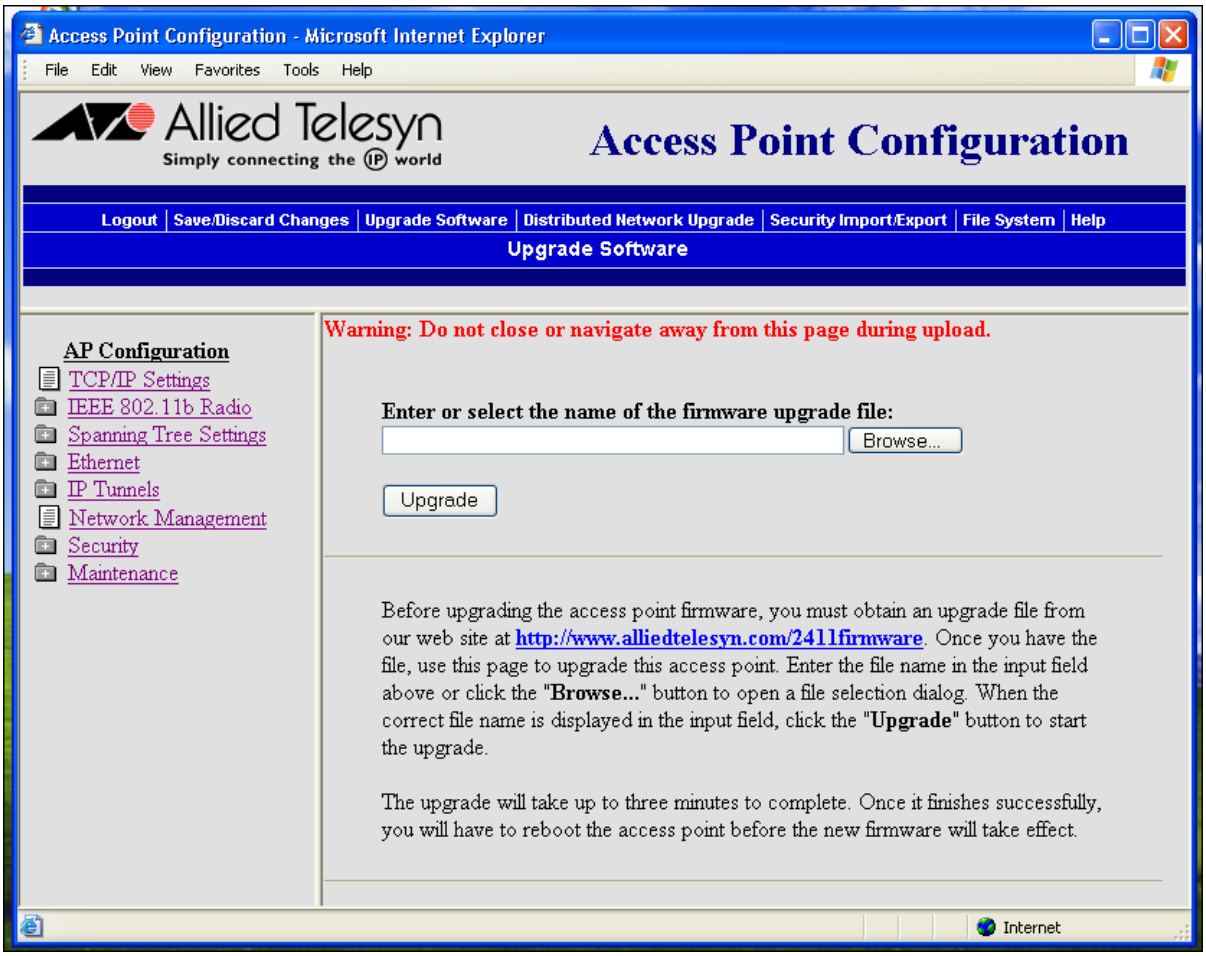


Figure 66 Upgrade Software Screen

3. Enter the path and firmware of the upgrade file (AP*WEB.BIN) or click the Browse button to find the file on your PC.
4. Click **Upgrade** to start the upgrade. The upgrade may take up to three minutes to complete.

5. When the upgrade is complete, select **Save Changes and Reboot**.

When the access point is done rebooting, it is upgraded to the new software. Repeat this procedure for each access point you want to upgrade.

Chapter 9
Troubleshooting

This chapter contains troubleshooting information for the following:

- LEDs on page 174
- Radio on page 175
- Security on page 177

This chapter also contains the following troubleshooting sections:

- Problems During Web Browser Firmware Upgrade on page 179
- Commonly Asked Technical Support Questions on page 180
- Getting Help with Your Installation on page 183

LEDs

When the access point is powered ON, the LEDs flash as the access point boots and performs internal diagnostics. Table 7 describes the LED activity during the boot process.

Table 7 Boot-up LED Activity

Power	Radio	Wired LAN	Root/Error	Description
ON	OFF	OFF	ON	Flash checksum being calculated.
ON	ON	OFF	ON	Flash checksum failure.
ON	OFF	ON	OFF	RAM test in progress.
ON	ON	ON	OFF	RAM test failure.
ON	OFF	OFF	OFF	Monitor loading in progress.
ON	OFF	OFF	ON	Ethernet test in progress.
ON	ON	OFF	ON	Ethernet test failure

Table 8 displayes the LEDs of the access point after a successfully boot-up.

Table 8 After Boot-up LED Activity

Power	Wireless #1	Wired LAN	Root/Error
ON	Flashes	Flashes	Flashes if the access point is configured as the root.

Radio

LEDs

If the radio is faulty or the configuration matrix string is incorrect, the LEDs on the access point display the following pattern, as shown in Table 9, after the access point boots.

Table 9 Radio LEDs

Power	Radio	Wired LAN	Root/Error
ON	OFF	ON	ON

Communications Program or Telnet

If you are connected to the access point through a serial connection, an error message also appears on your terminal or PC. The error messages are described in Table 10.

Table 10 Serial/Telnet Error Messages

Error Message	Explanation
Couldn't read country code from radio	The radio may be faulty. Contact your Allied Telesyn representative.
Radio A has unknown country code	The radio may have been configured incorrectly at the factory. Contact your Allied Telesyn representative.
Invalid country code in string for radio	The country code in the configuration matrix string does not match the country code in the radio in the access point. Contact your Allied Telesyn representative.
Radio string doesn't match radio installed	When this error message appears, additional information also appears on the screen. The radio may be faulty. Contact your Allied Telesyn representative.

Radio MAC Ping

Radio MAC Ping runs at the MAC sublayer of the Data Link layer, thus allowing you to ping any 802.11b device that is connected to the access point. Radio MAC Ping can help you determine the connectivity and signal strength of an 802.11b radio.
To use radio MAC ping, perform the following procedure:

1. From the Main Menu, select **Maintenance** then **AP Connections**. The AP Connections screen appears. All devices that support a radio MAC ping will have their MAC address listed with a hyperlink.
2. Select a MAC address hyperlink. The access point pings the device and then the Ping Utility screen appears showing the results.
3. Select **Return** to connections to return to the AP Connections screen.

Internet Control Message Protocol (ICMP) Echo

Internet Control Message Protocol (ICMP) echo lets you ping devices using their IP address. ICMP echo can only be used if the access point has determined the IP address of the end device or another access point. If the access point is acting as an ARP server, it will determine the IP addresses of the end devices that are attached to it and allow you to use ICMP echo on the wireless network. The access point always knows the IP address of all access points in the spanning tree.
To use ICMP echo, perform the following procedure:

1. From the Main Menu, select **Maintenance** then **AP Connections**. The AP Connections screen appears.
2. Select an IP address link. The access point pings the device and then the Ping Utility screen appears showing the results.
3. Select **Return to connections** to return to the AP Connections screen.

Security

This section helps you troubleshoot problems you may have while installing and configuring security in your network. For more help troubleshooting 802.1x security, refer to the documentation for the MobileLAN secure 802.1x security solution, the Odyssey server, and the end devices.

Viewing the Security Events Log

The access point logs a variety of 802.1x events in its Security Events log. Only the access point that generates the security event displays it in its Security Events log.
To see all the 802.1x events in your network, you need to use MobileLAN manager or another SNMP management station or network management tool.
To view the Security Events log, perform the following procedure:

1. From the Main Menu, select **Security** then **Security Events**. The Security Events Log descriptions are described below.

   MAC Address
   Ethernet MAC address of the device that caused the event.

   IP Address
   IP address of the device that caused the event.

   Priority
   Priority of the event (critical, high, low, informative).

   Trap
   Specifies if the event generated an SNMP-reliable trap. Any event with a priority of critical or high will generate an SNMP reliable trap.

   Count
   Number of times the event occurred.

   Type
   Details of the event that occurred.

   Age
   Amount of time that has passed since the event occurred.

   Note
   If you use an SNMP management station or another network management tool, the age represents how much time has passed since the access point was booted that this event occurred.

General Security Troubleshooting

This section provides you with information on getting help with your secure network and some problems and solutions.

You enabled secure IAPP in your network, but the access points do not communicate with the root access point.

- ❑ The root access point is running software release 1.80 or later. All access points must also be running software release 1.80 or later. Upgrade all access points to the same software release as the root access point.
- ❑ Verify that you enabled secure IAPP on all access points.
- ❑ In the root access point, click Maintenance, and then click AP Connections. If any access point station radios are blocked, re-enter the IAPP secret key in all access points.

You are implementing 802.1x security and you cannot get an end device to authenticate with a RADIUS server.

- ❑ Verify that the RADIUS server IP address is correct. Re-enter the RADIUS server secret key in both the access point and the RADIUS server.
- ❑ Verify that the IAPP secret key is the same in all access points.
- ❑ Verify that the access point that the end device is communicating with has the 802.1x Authentication field set to authenticate the radio that is in the end device.
- ❑ Verify that the root access point is running software release 1.80 or later.
- ❑ Verify that your end device is configured properly for 802.1x security. For help, see the end device user's manual.

Problems During Web Browser Firmware Upgrade

Each access point on a wired LAN requires approximately three minutes to upgrade (it takes slightly longer for wireless access points). The Web browser screen updates every 30 seconds as the upgrade progresses and shows the final status when all upgrades are complete. If you checked the **Reboot selected Access Points after successful upgrade** box, the Web browser disconnects. Select the **Refresh** button to log in again. Errors may occur during the upgrade process or during the final reboot. If an error occurs, an explanation appears on the Web browser screen. If an error occurs during the upgrade, none of the access points reboot, perform the following procedure:

1. Recheck the access points where the error occurred.
2. Select **Start Upgrade** to attempt the upgrade again. If the upgrade is successful and you checked the **Reboot selected Access Points after successful upgrade** box, the access points will reboot.

If an error occurs during the final reboot, perform the following procedure:

1. Wait five minutes for the access points that did not reboot to refresh.
2. Refresh your Web browser screen and select the access points that are not running the new version.
3. Select **Start Upgrade** to attempt the upgrade again. If the upgrade is successful and you checked the **Reboot selected Access Points after successful upgrade** box, the access points will reboot according to your Reboot selection.

Note
Only access points with Version 1.80 or higher firmware can upgrade using a Web browser.

Commonly Asked Technical Support Questions

Refer to the following table for solutions and answers to common problems and questions concerning the AT-WL2411 unit.

Is the access point fully booted?

When the access point is fully booted, the Power LED remains steady green and the Wired LAN LED flashes.

The Power LED is not ON.

The access point may have a hardware problem. Do the following:

- ❑ Make sure the power cable is firmly plugged into the access point and the power source.
- ❑ Unplug the access point, and then plug it back into the power source. Verify that the Power LED remains ON.
- ❑ Call Allied Telesyn Technical Support.

You cannot configure the access point locally using the serial port.

- ❑ Verify that you are using a null-modem cable to connect the access point to your terminal or PC.
- ❑ Verify that your terminal or PC is set to **9600**, **N**, **8**, **1**, no flow control.
- ❑ Your system may be in autobaud mode. Reboot and press a key once per second until the signon screen appears.

You cannot ping or Telnet to a new access point.

You must set an IP address and subnet mask using the serial port before you can remotely connect to the access point.

The Ping Utility screen does not appear when you click a MAC address or an IP address in the AP Connections screen.

The Web browser you are using does not have Java support. Use Internet Explorer v3.0 or later or Netscape Communicator v4.0 or later.

You cannot connect to the access point using a Web browser.

If you access the Internet through a proxy server, be sure you have added the IP address of the access point to the Exceptions list.

You cannot connect to the access point using an SNMP management station.

Verify that you did not disable the SNMP Access field in the Security screen.

The end device cannot connect to the network.

- ❑ Choose AP Connections from the Maintenance menu and verify that the MAC address of your end device appears on your PC screen. If it does not appear, your device is not communicating with the access point. Check your radio configuration settings.
- ❑ Verify that the access point is not filtering out the type of traffic you are trying to pass through it.

The end device cannot synch to the access point.

If you are using 802.11b HR radios, verify that the end device and the access point have the same frequency and network name.

The end devices are unable to roam to another AT-WL2411.

Roaming through switches requires backward learning, which is part of the IEEE 802.1D standard. If switches in your network do not support backward learning, you can create a data link tunnel to force all radio traffic through a fixed point so that roaming is transparent to the bridges or switches.
To create a data link tunnel, perform the following procedure:

1. Set Ethernet Bridging to **Enable** on the root access point.
2. Set Ethernet Bridging to **Disabled** on all access points that are separated from the root by a bridge or switch that does not support backward learning.

You need to verify the static WEP keys.

You cannot verify the WEP keys. The keys are encrypted after you enter them and are never displayed again. You may need to reconfigure your access points and end devices to reset the WEP keys.

The filters are not filtering properly.

Check all of your filter settings. Conflicts may exist between the various filters.

You need to verify the WEP keys.

You cannot verify the WEP keys. The keys are encrypted after you enter them and are never displayed again. You may need to reconfigure your access points and end devices to reset the WEP keys.

You cannot establish an IP tunnel to a access point on a remote subnet.

1. Select **TCP/IP Settings** and verify that the IP Router (Gateway) address is correct.
2. Select **Spanning Tree Settings** and verify that the access points on both ends of the tunnel have the same LAN ID.
3. Select **IP Addresses** from the IP Tunnels menu to verify that the IP address of the remote access point appears in the IP Addresses list.

The throughput seems slow.

- ❑ Verify that your antennas are well placed and that they are not blocked by metal or other obstacles.
- ❑ You may want to add a second access point and implement roaming if you move the antenna closer to the device and throughput increases.

You may be able to set filters to eliminate Ethernet traffic on the wireless side of the network.

Getting Help with Your Installation

The AT-WL2411 Access Point is designed to be easy to install and configure; however, you may need to call Allied Telesyn Technical Support if you have problems. Refer to Contacting Allied Telesyn Technical Support on page 15 for information.
Before calling, be sure you can answer the following questions:

- ❑ What kind of network are you using?
- ❑ What were you doing when the error occurred?
- ❑ What error message did you see?
- ❑ Can you reproduce the problem?
- ❑ What version of the firmware are you using?

To confirm the firmware version on your access point, perform the following procedure:

1. Establish a Web browser session.
2. Select **Maintenance** then **About this Access Point**. The About this Access Point screen as shown in Figure 67 is displayed.

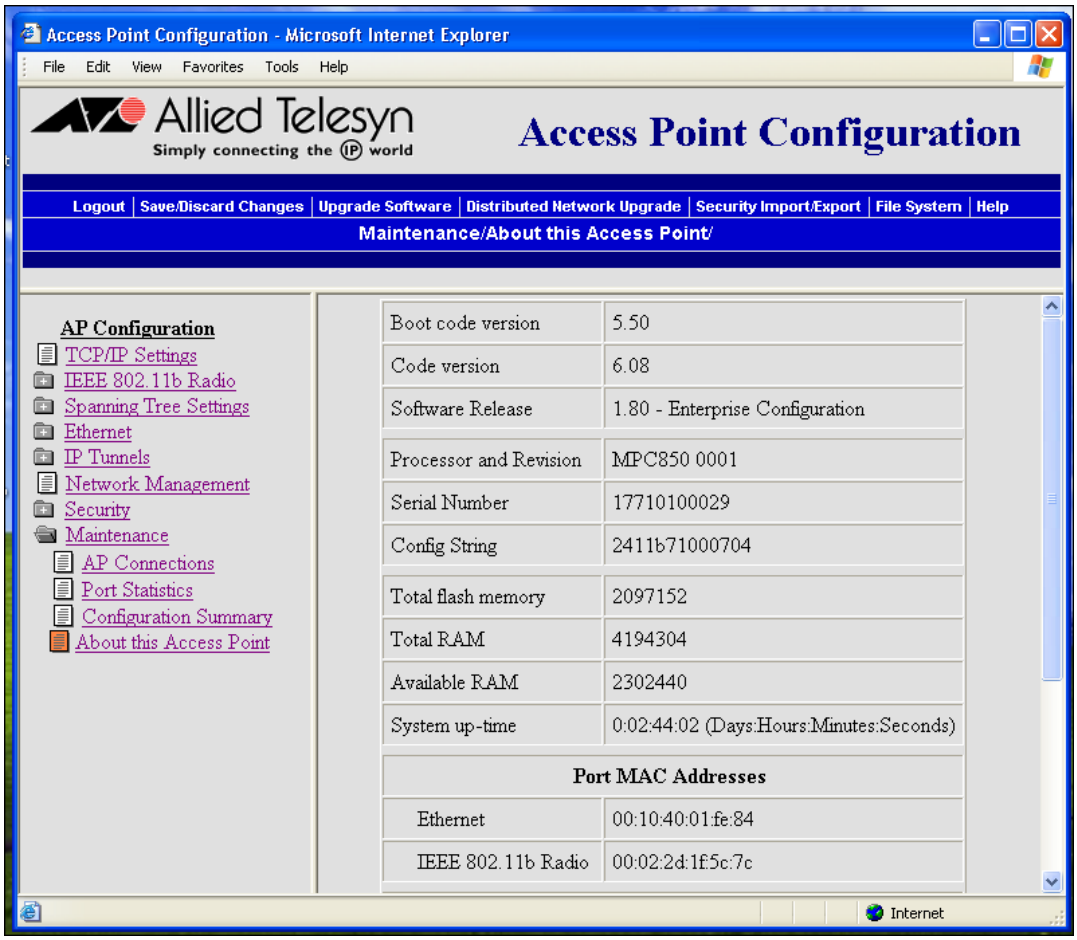


Figure 67 About this Access Point Screen

You should have the information on this screen available when you call Allied Telesyn Technical Support.

Chapter 10
Advanced Configuration Commands

This chapter contains the following sections:

- Using the Access Point Monitor on page 186
- Using Access Point Monitor Commands on page 188
- Using Service Mode Commands on page 191
- Using Test Mode Commands on page 193
- Using Console Command Mode on page 195
- Using Console Commands on page 196
- Using Sdvars Commands on page 199
- Using TFTP Commands on page 204

Using the Access Point Monitor

The access point monitor is the system software that controls the access point. You can use access point monitor commands to manipulate the access point file segments.

Understanding Access Point Segments

The access point has the following five segments in its file system:

- ❑ The current active boot or startup segment (can be segment 1 or 2)
- ❑ The current inactive boot or startup segment (can be segment 1 or 2)
- ❑ The current active data segment (can be segment 3 or 4)
- ❑ The current inactive data segment (can be segment 3 or 4)
- ❑ The RAM memory segment

You can enter commands to manipulate the boot and data segments. For instance, you typically download a new firmware version into an inactive segment and then make that segment active the next time the access point boots. For more information on upgrading the access point firmware, see Upgrading the Firmware on page 166.

Entering the Access Point Monitor

You can enter the access point monitor only through a connection on the serial port and only during the boot process.

To enter the access point monitor, do the following:

- Press any key on the keyboard when you see this message displayed during the boot process:

  ```
  <Press any key within 5 seconds to enter the
  access point monitor>
  ```

Note

Certain functions available through the access point monitor can erase your configuration information. Allied Telesyn strongly recommends that you only use the access point monitor when absolutely necessary. For example, you might use the access point monitor to upgrade your firmware or when instructed to do so by qualified Allied Telesyn personnel.

Using Access Point Monitor Commands

When you are in the access point monitor, the access point prompt **uap>** appears. You can display a list of access point monitor commands anytime you see the access point prompt.

To display access point monitor commands, press a letter or number key on the keyboard, and then press Enter. A list of access point monitor commands appears.

> **Note**
> If you type the letter B (upper or lower case) and press **<Enter>**, the access point will reboot. Type any letter or number *other* than B to display access point commands.

The following example shows the list of available access point commands. The commands are not case sensitive; you can type the commands using either upper or lower case.

```
UAP Monitor V4.03 July 17,2000
<Press any key within 5 seconds to enter the UAP monitor>
uap>d
-------------------------------------------------------------------
----"uap>" commands...
-------------------------------------------------------------------
----
B       -Reboot                       |             -Device IDs
menu
FX s    -Ymodem File Download         | MR          -Display
Mfg Record
FD      -File System Directory        | TEST        -Test Menu
FR      -Run Flash Startup File  | SRVC       -Service Menu
        -Manufacturing Menu      | SR z       -Serial Baud Rate
-------------------------------------------------------------------
----
uap>
```

B Purpose

Deletes the most recent data record and remains in Accumulate mode. If no data exists, a null string is entered.

Syntax

```
B
```

FX Purpose

Performs a Ymodem batch protocol download of a file into the flash segment that is specified by s.

Syntax

```
FX s
```

where *s* is segment 1, 2, 3, or 4.

FD Purpose

Displays the flash file system directory, including information about the boot file.

Syntax

```
FD
```

FR Purpose

Finds the first executable file in the access point boot segment and tries to run it; therefore, the first executable file in the access point boot segment must be the boot file.

Syntax

```
FR
```

MR Purpose

Displays the manufacturing record for the access point. Use the MR command to display the MAC address, configuration string, and serial number for your access point.

Syntax

```
MR
```

SR Purpose

The SR command sets the baud rate of the access point.

Syntax

```
SR z
```

where *z* is the baud rate.

You must enter the baud rate as a whole number with no commas. For example, to enter a baud rate of 19,200, you must enter 19200.

Setting Autobaud Using the SR Command

You can use autobaud to let the access point set its baud rate to match the baud rate of your terminal, up to a baud rate of 115,200.

To set Autobaud using SR, perform the following procedure:

1. Set the baud rate to **0** using SR.
2. Press **<Enter>** twice. The autobaud feature automatically detects the baud rate of your terminal and sets the baud rate of the access point to match.

Using Service Mode Commands

Use service mode to perform certain file functions. Because service mode commands can cause undesirable results if not properly executed, you should contact Allied Telesyn Technical Support for assistance if you are unsure about the proper procedure to use. Refer to Contacting Allied Telesyn Technical Support on page 15 for information.

SRVC

Use the SRVC command to enter service mode. In service mode, you can perform file functions such as deleting a file and performing a Ymodem download through the serial port.

To enter service mode, perform the following procedure:

1. Type **SRVC** and press **<Enter>**.
2. Enter a password. The default password is **EV98203S** (case sensitive).

When you are in service mode, the service prompt (**service>**) appears. Service mode has a set of defined commands that you can use.

To display service mode commands, type any letter or number (other than B) and press **<Enter>**. The service commands appear on the screen.

```
UAP Monitor V4.03 July 17,2000
Press any key within 5 seconds to enter the UAP monitor>
uap>srvc
Enter password : ********
service>d
-------------------------------------------------------------------
--"service>" commands...
-------------------------------------------------------------------
--FD        - File System Directory | SU b     - Set Upgrade Byte
FDEL f (s)- File Delete              | RU       - Reset Upgrade
Bytes
FE <s|all>- Erase Segment(s)       | DU       - Display Upgrade
Bytes
FI        - File System Reset      | PN       - Normal power up
FFR f (s) - Run File          | PQ       - Quiet power up
FX s      - Ymodem File Download  | B        - Reboot
FB bs (ds)- Set Boot/Data Segments| X        - Exit
-------------------------------------------------------------------
--
```

Most of the commands that you use in service mode are also used in the access point monitor or console command mode and are described in those sections in this chapter. Some additional service commands you may need are listed next.

FFR Purpose

Runs a program that is specified by f, from a location specified by s.

Syntax

```
FFR f (s)
```

where:

f is the program name.

s is the optional segment location of the program.

Example: To run program access pointBOOT.PRG from segment 1, enter:

```
FFR access pointBOOT.PRG 1
```

PN Purpose

Returns the access point to normal mode from quiet mode.

Syntax

```
PN
```

To return the access point to normal mode, perform the following:

1. Reboot the access point.
2. The LEDs flash ON and OFF during the reboot. When the LEDs flash OFF and only the Power LED remains ON, type **!!!** (three exclamation points). The access point prompt (**access point>**) appears.
3. Type **SRVC** and press **<Enter>**.
4. Type the service password (the default is **EV98203S**) and press **<Enter>**. The service prompt (service>) appears.
5. Type **PN** and press **<Enter>**.
6. Type **B** to reboot the access point in normal mode.

PQ Purpose

Puts the access point in quiet mode. When the access point is in quiet mode, you cannot access the access point monitor. You may want to use quiet mode for security reasons.

Syntax

```
PQ
```

Using Test Mode Commands

Within the access point monitor, test mode allows you to perform certain test functions. Because the commands can cause undesirable results if not properly executed, you should contact Allied Telesyn Technical Support for assistance if you are unsure about the proper procedure to use. Refer to Contacting Allied Telesyn Technical Support on page 15 for information.

TEST Purpose

Allows you to enter test mode where you can perform a variety of test functions.

Syntax

```
TEST
```

To enter test mode, perform the following procedure:

1. Type **Test** and press **<Enter>**.
2. Enter a password. The default password is **EV98203T** (case sensitive).

When you are in test mode, the test prompt (**test>**) appears. Test mode has a set of defined commands that you can use.

To display test mode commands, type any letter or number other than B and press **<Enter>**. The test commands appear on the screen.

```
UAP Monitor V4.03 July 17, 2000
<Press any key within 5 seconds to enter the UAP monitor>
uap>test
Enter password : ********
test>d
-----------------------------------------------------------------
-----"test>" commands...
-----------------------------------------------------------------
-----
LT          - LED Test          | MWW s d .. d  - Memory word
Write
MACE        - MACE Test Menu    | MRB s l       - Memory byte
Read
MF s l      - Memory Fill       | MWB s d .. d  - Memory byte
Write
MV s l      - Memory Verify     | SD            - Get DRAM Size
(K)
MR s 1      - Memory dword Read | SF            - Get Flash Size
(K)
MW s d .. d - Memory dword Write| X             - Exit
MRW s l     - Memory word Read
-----------------------------------------------------------------
-----
test>
```

Using Console Command Mode

Another way you can access the access point file system is through Console Command mode. Use Console Command mode to upgrade access points using TFTP and Script files.

To enter Console Command mode, perform the following procedure:

1. Select **Command Console** from the **Maintenance** menu.

   When you first enter Console Command mode, a list of valid console commands appears. You can display the console commands any time you are in Console Command mode.

2. To display console commands, type **F** and press **<Enter>**. The following screen appears.

```
Command                    Description
=======                    ===========
Fb                         fb <boot segment> <data segment>
Fd                         fd (<segment> | all) - directory list
Fdel                       fdel <filename> - delete file
Fe                         fe (<segment> | all) - erase
segment(s)
Tftp                       File transfer
Script                     Execute script files
SDVars                     Software Download variables
Exit                       Return to main menu
?                          Display this help
```

3. To exit Console Command mode, type **exit** and press **<Enter>**.

   Several file menu commands require that you enter file names. To indicate the segment where the file is located, precede the file name with either a segment number or name followed by a colon. For example:

   ```
   1:access point.prg
   ```

   refers to the file named access point.PRG that is located in segment 1. If you do not specify a segment name or number, the access point searches the segments in the following order until it finds a file that matches the file name:

   RAM, 1, 2, 3, 4

Using Console Commands

This section describes the console commands.

fb Purpose

Use the fb command to make an inactive segment the active segment.

Syntax

```
fb boot segment data segment
```

where:

boot segment is the name or number of the boot segment to be activated.

data segment is the name or number of the data segment to be activated.

Example

To make segment 2 the active boot segment and segment 4 the active data segment, enter:

```
fb 2 4
```

You can use an asterisk instead of a segment name if you want to leave that segment unchanged. For example, to leave the active boot segment unchanged and make segment 4 the active data segment, you could enter:

```
fb * 4
```

After loading software into the access point a common task is to activate the new software. To activate the new software, enter:

```
Fb ib: id:
```

This command activates the inactive boot and data segments. You do not need to know which of the boot and data segment numbers the flash is loaded into.

fd Purpose

Use the fd command to display the flash file system directory, which includes information about the boot file.

Syntax

```
fd
```

Use the fd command to ensure that the correct version of the file is in the active boot segment.

Typing **fd ab:** shows only the files loaded in the active boot segment.

> **Note**
> If the active segment contains no files when you reboot the access point, the unit enters the access point monitor and you lose the ability to Telnet to it during this session. If this occurs, you must access the access point through its serial port to correct the problem.

fdel Purpose

Use the fdel command to delete a particular file name from a segment.

Syntax

```
fdel filename
```

where filename is the name of the file to be deleted.

Example

To delete the file access point.PRG from the inactive boot segment, enter:

```
fdel ib:access point.prg
```

> **Note**
> When you use the fdel command, the file is marked as invalid and remains in the file system. To reclaim the file space, you must erase the entire segment. Use the fe command to erase a segment.

fe Purpose

Erases the files in a particular segment. To recover the files after they have been erased, you must reload them from another source.

Syntax

```
fe segment
```

where segment is the name or number of the segment to be erased.

Example

To erase the contents of segment 1, enter:

```
fe 1
```

You can enter ALL instead of a segment name or number if you want to erase segments 1 through 4.

Fe ib: erases the contents of the inactive boot segment.

> **Note**
> You must execute the fe command before you execute a TFTP transfer.

script Purpose

Executes a specified file as a list of console commands. You can create a script file to automate a software download.

Syntax

```
script filename
```

where *filename* is the name of the script file to be executed.

Using Sdvars Commands

Use sdvars commands in Console Command mode to manipulate certain software download variables. Sdvars commands support both GET and SET arguments. You can enter sdvars commands to GET a software download object, and then issue the sdvars command using the SET argument to assign the object a specified value.

The sdvars commands are described in this section using the SET argument. To execute an sdvars command using the GET argument, omit the variable from the end of the command.

sdvars set serveripaddress

Purpose

Sets the internal variable called serveripaddress to a specified address.

Format

```
sdvars set serveripaddress ip address
```

where *ip address* is the address of the server.

Example

To set the IP address of the server to 192.168.49.29, enter:

```
sdvars set serveripaddress 192.168.49.29
```

sdvars set scriptfilename

Purpose

Sets the internal variable scriptfilename to a specified string. The specified string should be the filename of the script to be retrieved from the TFTP server.

Syntax

```
sdvars set scriptfilename foreign filename
```

where *foreign filename* is a script filename on the TFTP server.

Example

To set the scriptfilename to SCRIPT.DAT, enter:

```
sdvars set scriptfilename script.dat
```

sdvars set starttime

Purpose

Sets the internal variable starttime. Starttime is a countdown time such that when zero is reached, the software download process begins. You set this variable to reflect how long into the future the access point is to begin downloading and executing the script file from the TFTP server. When the timer reaches 0, the access point uses the values in serveripaddress and scriptfilename to get the script file that is to be executed. If either serveripaddress or scriptfilename contains no value, an error is noted in the status variable and the software download process is terminated.

Syntax

```
sdvars set starttime dd:hh:mm:ss
```

where *dd:hh:mm:ss* is how far in the future the download is to begin.

Example

To begin the script file download in 5 minutes, enter:

```
sdvars set starttime 00:00:05:00
```

> **Note**
> If you need to stop the download, you can do so by setting starttime to 0 if it has not already been reached by the countdown. Resetting starttime to 0 stops the timer and the download process.

sdvars set checkpoint

Purpose

Sets the internal variable called checkpoint to a specified value. The checkpoint variable is useful for monitoring the progress of a script file as it is executed. You can set the checkpoint variable to a different value after each script command and then query the checkpoint value using SNMP to determine the progress of the download.

Syntax

```
sdvars set checkpoint value
```

where *value* is a whole number.

Example

Consider the following script file commands:

```
sdvars set checkpoint 1
fe ab
sdvars set checkpoint 2
TFTP get * access point.prg ab
sdvars set checkpoint 3
reboot
```

When the software download is started, you can use SNMP to query its progress by reading the checkpoint variable. If the variable has a value of 2, you know that the access point is trying to execute the TFTP get statement. If the value is 3, you know the script has completed and the reboot was executed. The value of the checkpoint variable may also be helpful in determining where an error occurred if the script fails.

sdvars set terminate

Purpose

Sets the internal variable terminate to a specified value. Use terminate to stop a countdown process in the access point. If either starttime or nextpoweruptime is counting down, setting this variable stops the timer and halts the countdown process.

Syntax

```
sdvars set terminate
```

Note
You should use caution when using this command. If the script file is being downloaded or executed, setting this variable interrupts the processing and can leave the access point in an undetermined state that may require user intervention.

sdvars set setactivepointers

Purpose

Sets the setactivepointers command to change inactive segments to active segments the next time the access point is rebooted. This command is usually used with the nextpoweruptime command.

Syntax

sdvars set setactivepointers *none/boot/data/both*

where:

none	does not change the active segments. The default is none. Also, when the reboot is completed, the access point resets this value to none.
boot	changes the inactive boot segment to the active boot segment.
data	changes the inactive data segment to the active data segment.
both	changes both the boot and data inactive segments to the active segments.

Example

To change the inactive boot and data segments to active at the next reboot, enter:

```
sdvars set setactivepointers both
```

sdvars set nextpoweruptime

Purpose

Sets the nextpoweruptime command to set the internal variable nextpoweruptime to a countdown time so that when 0 is reached, the access point will reboot. When the nextpoweruptime counter reaches 0, the access point checks the value of the setactivepointers variable, takes the appropriate action, and then reboots.

Syntax

```
sdvars set nextpoweruptime dd:hh:mm:ss
```

where dd:hh:mm:ss is how far in the future the reboot is to begin.

Example

To reboot the access point 2 hours from now, enter:

```
sdvars set nextpoweruptime 00:02:00:00
```

Note
If you need to terminate the reboot, you can do so by setting nextpoweruptime to 0 if it has not already been reached by the countdown. By resetting nextpoweruptime to 0, the timer is stopped so the unit does not reboot.

Using TFTP Commands

TFTP commands are file transfer commands that you execute when you are in Console Command mode. A access point can act as either a client or server in the TFTP environment. As a server, the access point can service read and write requests from a access point client. As a client, the access point can read files from and write files to any TFTP server on the network. Both the client and server must operate in octet, or 8-bit, mode.

When executing a script file, the access point retries TFTP client commands get and put until the command is successfully completed. If the first attempt fails, the access point retries after a one-minute delay. With each successive failure, the retry time doubles until it reaches eight minutes. Once this limit is reached, it remains at eight minutes until the command is completed.

In general, TFTP client sessions should fail only if the server is not responding either because it is busy serving other clients or because it has not been started. In either case, the access point backoff algorithm should prevent excessive network traffic when many access points are trying to contact a TFTP server.

tftp get Purpose

Supports standard get and put commands. You can use the TFTP get command to start a client session that gets a file from the TFTP server.

Syntax

tftp get *IP address foreign filename local filename*

where:

IP address	is the IP address of the server. You can use an asterisk (*) here if you want to use the value in serveripaddress.
foreign filename	is the name of the file on the server. The filename can contain directory path information and must be in the format required by the server operating system. The file must already have the appropriate file header before the transfer to the access point.

local filename	is the name you wish to call the file on the access point. The name must include a segment number or name followed by a colon. An actual filename is optional. If only the segment name is supplied, the filename is set equal to the filename that is embedded in the file header on the server.

Example

The following command gets file access point.DNL from a directory on a PC server with IP address 1.2.3.4 and stores it in the inactive boot segment on the access point.

```
tftp get 1.2.3.4 c:\startup\access point.dnl ib:
```

Note
You must use the fe command to erase the segment before you execute a TFTP get command. If you do not erase the segment, you may get a "can't write file" error.

The following error messages may be generated by the access point when the access point issues a TFTP get command. Other error messages may be returned from the server and displayed by the access point. See your server documentation for additional information.

Error Message	Explanation
Can't write file	The file may be too big. The file may not have a access point file header (filehdr.exe). The file name may be incorrectly formed. The file may already exist in the segment and cannot be overwritten. You must erase the file first.
Invalid opcode during read	This error should not occur under normal operating conditions. This error indicates a TFTP protocol error that will not occur when you use TFTP servers that conform to the protocol.

tftp put Purpose

Copies a file from a client to the server or to another access point.

Syntax

tftp put *IP address foreign filename local filename*

where:

IP address	is the IP address of the server. You can use an asterisk (*) here if you want to use the value in the serveripaddress.
foreign filename	is the name of the file as it will appear on the server. The file name can contain directory path information and must be in the format required by the server operating system.
local filename	is the name of the file to be sent from the access point.

Example

The following command takes file access point.PRG that is saved in the active boot drive on the access point client and stores it in the inactive boot segment on the access point server that has IP address 1.2.3.4.

```
tftp put 1.2.3.4 ib:access point.prg ab:access
point.prg
```

The following error messages may be generated by the access point when the access point issues a TFTP put command. Other error messages may be returned from the server and displayed by the access point. See your server documentation.

Error Message	Explanation
Can’t read file	The requested file may not exist.
Invalid opcode during put	This error should not occur under normal operating conditions. This error indicates a TFTP protocol error that will not occur when you use TFTP servers that conform to the protocol.

tftp server log

Purpose

Your access point can function as a TFTP server. You can use the TFTP server log command to save a history of TFTP client requests.

Syntax

```
tftp server log
```

The TFTP server log contains useful TFTP server status information. The log begins when you set up the server. You must reboot the access point to clear the log.

tftp server start

Purpose

A access point can obtain files from a TFTP server. You can enable one access point to act as a TFTP server and download files to additional access points. Use the TFTP server start command to enable your access point to act as a server.

Syntax

```
tftp server start
```

After you issue this command, the access point responds to TFTP client requests that are directed to its IP address. When acting as a server, the access point supports up to four concurrent TFTP sessions.

tftp server stop

Purpose

When you are done transferring files, you can stop the access point from being a TFTP server by using the TFTP server stop command.

Syntax

```
tftp server stop
```

After you issue this command, the access point no longer responds to TFTP client requests; however, current TFTP sessions with the server are allowed to complete.

The following table lists error messages that can be issued from the TFTP server. These messages are sent to the client and are meant to be read from the client perspective.

Error Message	Explanation
TFTP server only supports octet mode	The client is attempting to transfer a file in ASCII mode. The access point TFTP server only supports octet mode, which includes binary and image.
Unable to open remote file	The TFTP server cannot open the file that is named in the read or write request. If you are trying to read a file, the file may not exist. If you are trying to write a file, the file may be too big, the file may not have a access point file header, or the file name may be incorrectly formed.
Can't read remote file	The server returns this message if the access point file system returns an error while the server is attempting to read the file. This message is unlikely to occur.
Can't write remote file	The server returns this message if the access point file system returns an error while the server is attempting to write the file. This message is unlikely to occur.
TFTP opcode not read or write request	This error should not occur under normal operating conditions. This error indicates that the TFTP client does not conform to the protocol.
Invalid opcode during read	This error should not occur under normal operating conditions. This error indicates that the TFTP client does not conform to the protocol.
Invalid opcode during write	This error should not occur under normal operating conditions. This error indicates that the TFTP client does not conform to the protocol.

Appendix A
Default Configuration Settings

TCP/IP Menu Default Settings

Parameter Name	Range	Default
IP Address	4 nodes, 0 to 255	0.0.0.0
IP Subnet Mask	4 nodes, 0 to 255	255.255.255.0
IP Router (Gateway)	4 nodes, 0 to 255	0.0.0.0
DHCP Mode	Always use DHCP, Use DHCP if IP address is Zero, Disable DHCP, This AP is a DHCP Server	Use DHCP if IP address is Zero
DHCP Server Name	0 to 31 characters	(blank)
Auto ARP Minutes	0 to 120	5

Spanning Tree Settings Menu Defaults

Parameter Name	Range	Default
IP Address	4 nodes, 0 to 255	0.0.0.0
IP Subnet Mask	4 nodes, 0 to 255	255.255.255.0
IP Router (Gateway)	4 nodes, 0 to 255	0.0.0.0
DHCP Mode	Always use DHCP, Use DHCP if IP address is Zero, Disable DHCP, This AP is a DHCP Server	Use DHCP if IP address is Zero
DHCP Server Name	0 to 31 characters	(blank)
Auto ARP Minutes	0 to 120	5

Global Flooding Menu Defaults

Parameter Name	Range	Default
Multicast Flood Mode	Universal, Hierarchical, Disabled	Hierarchical
Allow Multicast Outbound to Terminals	Check/Clear	Check
Multicast Outbound to Secondary LANs	Enabled globally/Set locally	Set locally
Unicast Inbound Flood Mode	Universal, Hierarchical, Disabled	Disabled
Enable ARP Flooding	Check/Clear	Check

Global RF Parameters Menu Defaults

Parameter Name	Range	Default
Perform RFC1042/DIX Conversion	Check/Clear	Check
S-UHF Rfp Thershold		
Set Globally	Enable/Disabled	Disabled
Value	0 to 250 bytes	70 bytes
S-UHF Frag Size		
Set Globally	Enable/Disabled	Disabled
Value	50 to 250 bytes	250 bytes
902 MHz Frag Size		
Set Globally	Enable/Disabled	Disabled
Value	50 to 250 bytes	250 bytes
S-UHF/902 MHz Awake Time		
Set Globally	Enable/Disabled	Disabled
Value	0 to 250 tenths of a second	10 (902 MHz) 20 (S-UHF)
RFC1042 Types to Pass Through		
1	Two sets of hexadecimalpairs 00 through FF.	80 F3
2	Two sets of hexadecimal pairs 00 through FF	81 37
3 through 20	Two sets of hexadecimal pairs 00 through FF	00 00

Ethernet Configuration Menu Defaults

Parameter Name	Range	Default
Port Type	10/100 Mbps twisted pair 100 Mbps fiber optic	10/100 Mb twisted pair
Link Speed	Auto select, 100 Mbps full-duplex, 100 Mbps half-duplex, 10 Mbps full-duplex, 10 Mbps half-duplex	Auto select
Enable Link Status Check	Check/Clear	Clear
Address Table		
1 through 20	Six sets of hexadecimal	00 00 00 00 00 00
Frame Type Filters		
Allow/Pass	Check/Clear	Check
Scope	Unlisted/All	Unlisted
Predefined Subtype Filters		
Allow/Pass	Check/Clear	Check
Customizable Subtypes Filters		
Allow/Pass	Check/Clear	Check

Parameter Name	Range	Default
SubType	DIX-IP-TCP-Port, DIX-IP-UDP-Port, DIX-IP-Protocol, DIX-IPX-Socket DIX-EtherType, SNAP-IP-TCP-Port, SNAP-IP-UDP-Port, SNAP-IP-Protocol, SNAP-IPX-Socket, SNAP-EtherType, 802.3-IPX-Socket, 802.2-IPX-Socket, 802.2-SAP	DIX-IP-TCP-Port
Value	Two sets of hexadecimal pairs 00 through FF	00 00

Ethernet Advanced Filters Menu Defaults

Parameter Name	Range	Default
Filter Vaules		
Vaule ID		0
Value		(blank)
Filter Expressions		
ExprSeq		0
Offset		0
Mask		(blank)
Op	EQ, NE, GT, LE	EQ
Value ID		0
Action	And, Pass, Drop	And

IP Tunnels Menu Defaults

Parameter Name	Range	Default
Mode	Listen, Originate If Root, Disable	Listen
Enable IGMP	Check/Clear	Check

Tunnel Filters Menu Defaults

Frame Type Filters

Frame Type Filters		
Allow/Pass	Check/Clear	Clear
Scope	Unlisted/All	Unlisted
Predefined Subtype Filters		
Allow/Pass	Check/clear	Clear (except Check for NNL)
Customizable Subtype Filters		
Allow/Pass	Check/Clear	Clear
Subtype	DIX-IP-TCP-Port, DIX-IP-UDP-Port, DIX-IP-Protocol, DIX-IPX-Socket, DIX-EtherType, SNAP-IP-TCP-Port, SNAP-IP-UDP-Port, SNAP-IP-Protocol, SNAP-IPX-Socket, SNAP-EtherType, 802.3-IPX-Socket, 802.2-IPX-Socket, or 802.2-SAP	DIX-IP-TCP-Port
Value	Two sets of hexadecimal pairs 00 through FF	00 00

Network Management Menu Defaults

Parameter Name	Range	Default
SNMP Read Community	1 to 15 characters	public
SNMP Write Community	1 to 15 characters	CR52401
SNMP Secret Community	1 to 15 characters	Secret

Security Menu Defaults

Parameter Name	Range	Default
Browser Access	Secure-Only (Port 443), Enabled (Port 80/443), Disabled	Enabled (Port 80/443)
Allow Telnet Access (Port 23)	Check/Clear	Check
Allow SNMP Access (Port 161)	Check/Clear	Check
Allow ICMP Configurations	Check/Clear	Check

Passwords Menu Defaults

Parameter Name	Range	Default
Use RADIUS for Login Authorization	Check/Clear	Clear
User Name	1 to 32 characters	atilan
Password	1 to 32 characters	atilan
Read Only Password	1 to 32 characters	(blank)
Allow Service Password	Check/Clear	Check

ACL Menu Defaults

Parameter Name	Range	Default
ACL Client Authorization	Radio, IEEE 802.11b	Disabled

802.1x Menu Defaults

Parameter Name	Range	Default
802.1x Authentication	Radio, IEEE 802.11b	Disabled

IEEE 802.11 (b or a) WEP Menu Defaults

Parameter Name	Range	Default
Enable WEP Encryption	Check/Clear	Clear

Internal RADIUS Server Menu Defaults

Parameter Name	Range	Default
Enable Server	Check/Clear	Clear

IEEE 802.11b Radio Menu Defaults

Parameter Name	Range	Default
Node Type	Master, Station, Disable	Master
SSID (Network Name)	0 to 32 characters	atilan
Frequency	Channel 1 to 14, 400 to 2500 MHz	Channel 03, 2422 MHz
Advance Configuration		
Data Rate	11, 5.5, 2, or 1 Mbps	11 MBits (High)
Allow Data Rate Fallback	Check/Clear	Check
Basic Rate	11, 5.5, 2, or 1 Mbps	2 MBits (Standard)
Enabled Medium Reservation	Check/Clear	Clear
Distance Between APs	Large, Medium, or Small	Large
Enable Microwave Oven Robustness	Check/Clear	Clear
Enable Load Balancing	Check/Clear	Clear
Enable Medium Density Distribution	Check/Clear	Clear
Data/Voice Setting	Data Traffic Only, Data and SpectraLink Traffic, SpectraLink Traffic Only	Data Traffic Only
Disallow Network Name of ‘ANY’	Check/Clear	Clear
DTIM Period	1 to 65535	1

Appendix B
Technical Specifications

Physical Specifications

Dimensions (HxDxW)	9.32 cm x 14.66 cm x 3.53 cm (3.67 in x 5.77 in x 1.39 in)
Weight	232 g (0.51 lbs)
Recommended Minimum Ventilation on All Sides	5.08 cm (2.0 in)

Environmental Specifications

Operating Temperature	-20° C to 65° C (-4° F to 149° F)
Storage Temperature	-40° C to 70° C (-40° F to 158° F)
Humidity	10% to 90% non-condensing

Power Specifications

AC Input Voltage	2 A
Input Supply Voltage	5 V DC

Safety and Electromagnetic Emissions Certifications

Safety	EN60950 (TUV), UL1950 (UL/cUL)
EMI	FCC Class B, EN55022 Class B
Immunity	EN55024

Standards

IEEE 802.3 10Base-T Ethernet and CSMA/CD

Other Specifications

Architecture	transparent bridge
Data Rate	10 Mbps (Ethernet)
Filtering Rate	14,880 frames per second
Filters (Protocol)	Appletalk, NetBEUI, IPX, IP, DECNET
Filters (Other)	IP ARP, Novell RIP, SAP, LSP
Serial Port Max Data Rate	115, 200 bps
Management Interfaces	SNMP, Web, Telnet, Serial Connection
SNMP Agent	Version 1 RFC1213,1493, Enterprise MIB
Software Upgrades	Web, TFTP via Telnet, Serial Connection

IEEE 802.11b Radio Specifications

Frequency Band	2.4 to 2.5 GHz worldwide
Type	direct sequence, spread spectrum
Modulation	direct sequence, spread spectrum (CCK, DQPSK, DBPSK)
Power Output	32 mW (15 dBm)
Data Rate	11 Mbps (High), 5.5 Mbps (Medium), 2 Mbps (Standard), 1 Mbps (Low) with automatic fallback for increased range
Channels	11 (North America), 13 (Europe), 4 (France), 14 (Japan), 1 (Israel)
Range (11 Mbps)	160 m (525 ft) open environment, 50 m (165 ft) semi-open environment, 24 m (80 ft) closed environment
Receiver Sensitivity (11 Mbps)	-82 dBm
Security	IEEE 802.11 Wired Equivalent Privacy (WEP) standard, WEP 64, WEP 128

Appendix C
Translated Electrical Safety and Emission Information

Important: This appendix contains multiple-language translations for the safety statements in this guide.

Wichtig: Dieser Anhang enthält Übersetzungen der in diesem Handbuch enthaltenen Sicherheitshinweise in mehreren Sprachen.

Vigtigt: Dette tillæg indeholder oversættelser i flere sprog af sikkerhedsadvarslerne i denne håndbog.

Belangrijk: Deze appendix bevat vertalingen in meerdere talen van de veiligheidsopmerkingen in deze gids.

Important: Cette annexe contient la traduction en plusieurs langues des instructions de sécurité figurant dans ce guide.

Tärkeää: Tämä liite sisältää tässä oppaassa esiintyvät turvaohjeet usealla kielellä.

Importante: questa appendice contiene traduzioni in più lingue degli avvisi di sicurezza di questa guida.

Viktig: Dette tillegget inneholder oversettelser til flere språk av sikkerhetsinformasjonen i denne veiledningen.

Importante: Este anexo contém traduções em vários idiomas das advertências de segurança neste guia.

Importante: Este apéndice contiene traducciones en múltiples idiomas de los mensajes de seguridad incluidos en esta guía.

Obs! Denna bilaga innehåller flerspråkiga översättningar av säkerhetsmeddelandena i denna handledning.

Standards: This product meets the following safety standards.

U.S. Federal Communications Commission	
Declaration Of Conformity	
Manufacture Name:	Allied Telesyn, Inc.
Manufacture Address:	960 Stewart Drive, Suite B Sunnyvale, CA 94085 USA
Manufacture Telephone:	408-730-0950
Declares that the product:	Access Point
Model Numbers:	AT-WL2411

This product complies with FCC Part 15B, Class B Limits:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device must not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Radiated Energy

Note: This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of 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 instructions, may 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 the 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.

Changes and modifications not expressly approved by the manufacturer or registrant of this equipment can void your authority to operate this equipment under Federal Communications Commission rules.

Canadian Department of Communications
This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.
Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Standards: This product meets the following safety standards.

$ 1	RFI Emission	EN55022 Class B
$ 2	Immunity	EN55024
$ 3	Electrical Safety	EN60950 (TUV), UL1950 (UL/cUL)

Safety

$ 4 ⚠ Power to the access point must be sourced only from the adapter.

Europe—EC
Use TÜV licensed AC adapter of 5 V DC, min 2.0 A.

Other Countries
Use a Safety Agency Approved AC adapter of 5 V DC, min 2.0 A.

$ 5 **Caution**: Power cord is used as a disconnection device. To de-energise equipment disconnect the power cord.

$ 6 **Lightning Danger**
Danger: Do not work on equipment or cables during periods of lightning activity.

$ 7 Do not block air vents.

$ 8 **Operating Temperature**: This product is designed for a maximum ambient temperature of 65 degrees C.

$ 9 **All Countries**: Install product in accordance with local and National Electrical Codes.

Normen: Dieses Produkt erfüllt die Anforderungen der nachfolgenden Normen.

1	Hochfrequenzstörung	EN55022 Klasse B
2	Störsicherheit	EN55024
3	Elektrische Sicherheit	EN60950 (TUV), UL1950 (UL/cUL)

Sicherheit

4 Der Buchse darf nur aus dem Adpater Strom zugeführt werden.

Europe—EC
Gebrauchen Sie einen von TÜV zugelassenen Wechselstromadapter für Gleichstrom 5 Vdc, 2.0 A.

5 **Vorsicht**: Das netzkabel dient zum trennen der stromversorgung. Zur trennung vom netz, kabel aus der steckdose ziehen.

6 **Gefahr Durch Blitzschlag**
Gefahr: Keine Arbeiten am Gerät oder an den Kabeln während eines Gewitters ausführen.

7 Entlüftungsöffnungen nicht versperren.

8 **Betriebstemperatur:** Dieses Produkt wurde für den Betrieb in einer Umgebungstemperatur von nicht mehr als 65° C entworfen.

9 **Alle Länder**: Installation muß örtlichen und nationalen elektrischen Vorschriften entsprechen.

Standarder: Dette produkt tilfredsstiller de følgende standarder.

1	Radiofrekvens forstyrrelsesemission	EN55022 Klasse B
2	Immunitet	EN55024
3	Elektrisk sikkerhed	EN60950 (TUV), UL1950 (UL/cUL)

Sikkerhed

4 Strømforsyningen til apparatet må udelukkende tages fra tilpasningstransformatoren.

Europe - EC
Brug kun TÜV godkendt vekselstrømstransformator på 5 Vdc, 2.0 A.

5 **Advarsel**: Den strømførende ledning bruges til at afbryde strømmen. Skal strømmen til apparatet afbrydes, tages ledningen ud af stikket.

6 **Fare Under Uvejr**
Fare: UNDLAD at arbejde på udstyr eller KABLER i perioder med LYNAKTIVITET.

7 Ventilationsåbningerne må ikke blokeres.

8 **Betjeningstemperatur**: Dette apparat er konstrueret til en omgivende temperatur på maksimum 65 grader C.

9 **Alle Lande**: Installation af produktet skal ske i overensstemmelse med lokal og national lovgivning for elektriske installationer.

Eisen: Dit product voldoet aan de volgende eisen.

1	RFI Emissie	EN55022 Klasse B
2	Immuniteit	EN55024
3	Electrische Veiligheid	EN60950 (TUV), UL1950 (UL/cUL)

Veiligheid

4 Stroom mag alleen via de adapter naar het apparaat toegevoerd worden.

Europe - EC
Gebruik een door TÜV gekeurde wisselstroomadapter van 5 Vdc, 2.0 A.

5 **Waarschuwing**: Het toestel wordt uitgeschakeld door de stroomkabel te ontkoppelen. Om het toestel stroomloos te maken: de stroomkabel ontkoppelen.

6 **Gevaar Voor Blikseminslag**
Gevaar: NIET aan toestellen of KABELS WERKEN bij BLIKSEM.

7 Ventilatiegaten niet blokkeren.

8 **Bedrijfstemperatuur:** De omgevingstemperatuur voor dit produkt mag niet meer bedragen dan 65 graden Celsius.

9 **Alle Landen**: het toestel installeren overeenkomstig de lokale en nationale elektrische voorschriften.

Normes: ce produit est conforme aux normes de suivantes.

1	Eemission d'interférences radioélectriques	EN55022 Classe B
2	Immunité	EN55024
3	Sécurité électrique	EN60950 (TUV), UL1950 (UL/cUL)

Sécurité

4 L'alimentation du concentrateur doit être uniquement fournie par l'adaptateur.

Europe - EC
Utiliser un adaptateur secteur conforme TÜV de 5 V dc, 2.0 A en courant continu.

5 **Attention**: Le cordon d'alimentation sert de mise hors circuit. Pour couper l'alimentation du matériel, débrancher le cordon.

6 **Danger De Foudre**
Danger: NE PAS MANIER le matériel ou les CÂBLES lors d'activité orageuse.

7 Ne pas bloquer les fentes d'aération.

8 **Température De Fonctionnement:** Ce matériel est capable de tolérer une température ambiante maximum de 65 degrés Celsius.

9 **Pour Tous Pays**: Installer le matériel conformément aux normes électriques nationales et locales.

Standardit: Tämä tuote on seuraavien standardien mukainen.

1	Radioaaltojen häirintä	EN55022 Luokka B
2	Kestävyys	EN55024
3	Sähköturvallisuus	EN60950 (TUV), UL1950 (UL/cUL)

Turvallisuus

4 Tähtipisteeseen (hub) syötettävän virran pitää tulla ainoastaan sovittimesta.

Europe - EC
Käytä TÜV-lisenssillä valmistettua verkkosovitinta, jonka tasajännitteen nimellisarvot ovat 5 Vdc, 2.0 A (milliampeeria).

5 **Huomautus**: Virtajohtoa käytetään virrankatkaisulaitteena. Virta katkaistaan irrottamalla virtajohto.

6 **Salamaniskuvaara**
Hengenvaara: ÄLÄ TYÖSKENTELE laitteiden tai KAAPELEIDEN KANSSA SALAMOINNIN AIKANA.

7 Älä tuki ilmareikiä

8 **Käyttölämpötila:** Tämä tuote on suunniteltu ympäröivän ilman maksimilämpötilalle 65° C.

9 **Kaikki Maat**: Asenna tuote paikallisten ja kansallisten sähköturvallisuusmääräysten mukaisesti.

Standard: Questo prodotto è conforme ai seguenti standard.

1	Emissione RFI (interferenza di radiofrequenza)	EN55022 Classe B
2	Immunità	EN55024
3	Sicurezza elettrica	EN60950 (TUV), UL1950 (UL/cUL)

Norme Di Sicurezza

4 Questo dispositivo deve essere alimentato solo mediante l'adattatore.

Europe - EC
Utilizzare l'adattatore per c.a. da 5 Vdc, 2.0 A conforme alla normativa TÜV.

5 **Attenzione**: Il cavo di alimentazione è usato come dispositivo di disattivazione. Per togliere la corrente al dispositivo staccare il cavo di alimentazione.

6 **Pericolo Di Fulmini**
Pericolo: NON LAVORARE sul dispositivo o sui CAVI durante PRECIPITAZIONI TEMPORALESCHE.

7 Non ostruire le prese d'aria.

8 **Temperatura Di Funzionamento**: Questo prodotto è concepito per una temperatura ambientale massima di 65 gradi centigradi.

9 **Tutti I Paesi**: installare il prodotto in conformità delle vigenti normative elettriche nazionali.

Sikkerhetsnormer: Dette produktet tilfredsstiller følgende sikkerhetsnormer.

1	RFI stråling	EN55022 Klasse B
2	Immunittet	EN55024
3	Elektrisk sikkerhet	EN60950 (TUV), UL1950 (UL/cUL)

Sikkerhet

4 All strømtilførsel må komme fra adapteren.

Europe - EC
Benytt TÜV-godkjent AC-adapter på 5 Vdc, 2.0 A (milliampere).

5 **Forsiktig**: Strømledningen brukes til å frakoble utstyret. For å deaktivisere utstyret, må strømforsyningen kobles fra.

6 **Fare For Lynnedslag**
Fare: ARBEID IKKE på utstyr eller KABLER i TORDENVÆR.

7 Blokker ikke luftventilene.

8 **Driftstemperatur**: Dette produktet er konstruert for bruk i maksimum romtemperatur på 65 grader celsius.

9 **Alle Land**: Produktet må installeres i samsvar med de lokale og nasjonale elektriske koder.

Padrões: Este produto atende aos seguintes padrões.

1	Emissão de interferência de radiofrequência	EN55022 Classe B
2	Imunidade	EN55024
3	Segurança eléctrica	EN60950 (TUV), UL1950 (UL/cUL)

Segurança

4 Use somente o adaptador fornecido para alimentação elétrica do hub.

Europe - EC
Use um adaptador de corrente alternada com saída DC de 5 Vdc, 2.0 A em conformidade com as especificações da TÜV.

5 **Cuidado**: O cabo de alimentação é utilizado como um dispositivo de desconexão. Para deseletrificar o equipamento, desconecte o cabo de ALIMENTAÇÃO.

6 **Perigo De Choque Causado Por Raio**
Perigo: NÃO TRABALHE no equipamento ou nos CABOS durante períodos suscetíveis a QUEDAS DE RAIO.

7 Não bloqueie as aberturas de ventilação.

8 **Temperatura De Funcionamento**: Este produto foi projetado para uma temperatura ambiente máxima de 65 graus centígrados.

9 **Todos Os Países**: Instale o produto de acordo com as normas nacionais e locais para instalações elétricas.

Estándares: Este producto cumple con los siguientes estándares.

1	Emisión RFI	EN55022 Clase B
2	Inmunidad	EN55024
3	Seguridad eléctrica	EN60950 (TUV), UL1950 (UL/cUL)

Seguridad

4 La energía para el dispositivo central o "hub" debe provenir únicamente del adaptador.

Europe - EC
Utilizar un adaptador de corriente alterna autorizado TÜV de 5 Vdc, 2.0 A.

5 **Atencion**: El cable de alimentacion se usa como un dispositivo de desconexion. Para desactivar el equipo, desconecte el cable de alimentación.

6 **Peligro De Rayos**
Peligro: NO REALICE NINGUN TIPO DE TRABAJO O CONEXION en los equipos o en LOS CABLES durante TORMENTAS ELECTRICAS.

7 No bloquee las aberturas para ventilacion.

8 **Temperatura Requerida Para La Operación:** Este producto está diseñado para una temperatura ambiental máxima de 65 grados C.

9 **Para Todos Los Países**: Monte el producto de acuerdo con los Códigos Eléctricos locales y nacionales.

Standarder: Denna produkt uppfyller följande standarder.

1	Radiostörning	EN55022 Klass B
2	Immunitet	EN55024
3	Elsäkerhet	EN60950 (TUV), UL1950 (UL/cUL)

Säkerhet

4 Endast anslutningsenheten får vara kraftkälla till centralen.

Europe - EC
Använd en växelströmsanslutningsenhet licensierad av TÜV. Likström 5 Vdc, 2.0 A.

5 **Varning**: Nätkabeln används som strömbrytare för att koppla från strömmen, dra ur nätkabeln.

6 **Fara För Blixtnedslag**
Fara: ARBETA EJ på utrustningen eller kablarna vid ÅSKVÄDER.

7 Blockera inte luftventilerna.

8 **Driftstemperatur**: Denna produkt är konstruerad för rumstemperatur ej överstigande 65 grader Celsius.

$ 9 **Alla Länder**: Installera produkten i enlighet med lokala och statliga bestammelser for elektrisk utrustning.

Glossary

ARP (Address Resolution Protocol)

The protocol used by TCP/IP networks to relate IP addresses with the physical network addresses of network interfaces.

BFSK (Binary Frequency Shift Key)

A broadcasting method that lengthens the range but halves the throughput as compared to the QFSK method.

bridge

A device that expands a local area network by forwarding frames between data link layers associated with two separate physical media types, usually carrying a common protocol. A bridge connects wireless devices to a wired network and allows connection of networks or subnetworks with similar architectures.

broadcast

A type of transmission in which a message sent from the host is received by many devices on the system.

channel

The path for transmitting data from a device to the host computer. A port may contain one or more logical channels. In 2.4 GHz RF networks, the channel refers to the frequency hopping sequence the radio follows.

data link tunneling

An access point encapsulates an Ethernet frame in a data frame and forwards the frame to the next access point on the path to the final destination. Data link tunneling is used to make mobility transparent to the underlying network or to isolate the radio traffic from terminals on an Ethernet segment. Data link tunneling occurs automatically when Ethernet bridging is disabled on the root access point. Ethernet bridging is automatically disabled on a secondary LAN if there is no designated bridge for the secondary LAN. An access point that has Ethernet bridging disabled forwards a frame inbound on its Ethernet port using data link tunneling. The root access point or a designated bridge for a secondary LAN uses data link tunneling to forward frames outbound to access points on the same Ethernet segment.

designated bridge

An access point that is assigned the role of bridging frames destined for or received from a secondary LAN. A designated bridge, or secondary LAN bridge, connects a secondary LAN with the primary LAN. In the access point, the secondary LAN bridge priority parameter determines if the access point is a candidate to become the designated bridge.

DHCP (Dynamic Host Configuration Protocol)

An Internet standard stack protocol that allows dynamic distribution of IP address and other configuration information to IP hosts on a network. Implementation of the DHCP client in Allied Telesyn network devices simplifies installation because the devices automatically receive IP addresses from a DHCP server on the network.

distribution LAN

Any Ethernet LAN attached to access points that are bridging between the Ethernet LAN and the radio network. At any given time, only one access point in a distribution LAN provides access to the Ethernet LAN for a given node in the domain.

DIX

A standardized Ethernet frame format developed by Digital Equipment Corporation, Intel Corporation, and Xerox. Another frame format is 802.3.

flooding

A frame is flooded when the destination location is unknown. The destination location of a multicast frame is never known. Unicast and multicast flooding parameters determine how a flooded frame is forwarded.

home IP subnet

The IP subnet that contains the wired primary LAN and any wireless extensions of the subnet.

IGMP (Internet Group Management Protocol)

IGMP is a protocol that allows the access point to have more than eight IP tunnels. IGMP allows an access point to participate in an IP multicast group without any special router configuration.

inbound frames

Frames moving toward the primary LAN.

IP subnet

A single member of the collection of hardware networks that composes an IP network. Host addresses on a given subnet share an IP network number with hosts on all other subnets of the IP network. The local address is divided into subnet-number and host-number fields to indicate which subnet a host is on.

MAC address

There are 2 types of MAC addresses: unicast and broadcast. Unicast specifies a single Ethernet interface, while multicast specifies a group of Ethernet addresses. Broadcast is a variation of multicast in which a multicast is received by all interfaces.

MIB (Management Information Base)

This repository stores network traffic information that SNMP management programs collect. Your network administrator can use management software interacting with the MIB to obtain information about network activity. Contact your local Allied Telesyn representative to learn how to obtain a copy of the MIB for the access point.

multicast address

A form of broadcast address through which copies of the frame are delivered to a subset of all possible destinations that have a common multicast address.

non-bridging secondary LAN

A secondary LAN that does not have a designated bridge. A non-bridging secondary LAN is used to connect access points without using wireless hops.

outbound frames

Frames moving away from the primary LAN.

peer-to-peer network

A type of LAN whose workstations are capable of being both clients and servers.

point-to-point bridge

A wireless link that connects two wired Ethernet segments. Two access points can be used to provide a point-to-point bridge between two buildings so that wired and wireless devices in each building can communicate with devices in the other building.

primary bridging

Ethernet bridging on a root port. An access point uses primary bridging to bridge frames to and from the Ethernet network on its root port. Note that primary bridging is not the same as bridging to the primary LAN.

primary LAN

The Ethernet LAN attached to the access point that is acting as the root. The primary LAN is typically the LAN on which the servers are located. Primary and secondary LANs are both distribution LANs.

QFSK (Quad Frequency Shift Key)

A broadcasting method that shortens the range but doubles the throughput as compared to the BFSK method.

remote subnet

An Ethernet segment other than the primary LAN. A remote subnet is a secondary LAN.

remote IP subnet

A secondary LAN attached to the network through an IP tunnel.

root

The access point with the highest root priority becomes the root of the network spanning tree. If the root becomes inactive, the remaining root candidates negotiate to determine which access point becomes the new root. The root can be used to set system-wide flooding and RF parameters. The root is also the only node in the network that can originate IP tunnels.

root port

The access point port that provides the inbound connection to the spanning tree. The root port provides a link to a parent access point. Note that a root access point does not have a root port.

root subnet

The Ethernet segment to which the root access point connects, also known as the primary LAN.

router

A software and hardware connection between two or more subnetworks that permits traffic to be routed from one network to another on the basis of the intended destinations.

secondary bridging

Ethernet bridging on a non-root port. An access point that is the designated bridge for a secondary LAN uses secondary bridging to bridge frames to and from the secondary LAN on a non-root Ethernet port.

secondary LAN

Any Ethernet LAN that is not the primary LAN. A single access point functions as the designated bridge for a secondary LAN. The designated bridge attaches the secondary LAN to the network through a radio link or an IP link. Primary and secondary LANs are both distribution LANs.

SNAP

A protocol extension typically used by Appletalk networks.

SNMP (Simple Network Management Protocol)

SNMP is a popular network management protocol in the TCP/IP and SPX/IPX protocol suite. SNMP allows TCP/IP and SPX/IPX sites to exchange configuration and status information. It uses management programs called "agents" to monitor network traffic. SNMP stores the information it collects in the Management Information Base (MIB). Your network administrator can use management software interacting with the MIB to obtain information about network activity.

spanning tree

A form of network organization in which each device on the network has only one path to the root. The access points automatically configure into a self-organized network that provides efficient, loop-free forwarding of frames through the network.

subnet

A single member of the collection of hardware networks that compose an IP network. Host addresses on a given subnet share an IP network number with hosts on all other subnets of that IP network.

triangular routing

The routing logic used for a mobile IP end device that has roamed to a foreign network. Frames destined for a mobile end device are always sent to the home subnet of the end device. If the end device has roamed to another subnet, the frame must be forwarded to the remote subnet where the end device currently resides.

access point

The access point bridges frames between a wired Ethernet network and a wireless RF network. The access point can also serve as a bridge between two RF networks. The AT-WL2411 features Radio Independent and Network Independent architecture.

unicast address

A unique Ethernet address assigned to a single device on the network.

WEP

Wired Equivalent Privacy, a feature that can be enabled in the IEEE 802.11b HR radio that allows data encryption for wireless communications.

wireless bridging

A wireless link that connects two wired Ethernet segments. Two access points can be used to provide a point-to-point or wireless bridge between two buildings, so that wired and wireless devices in each building can communicate with devices in the other building.