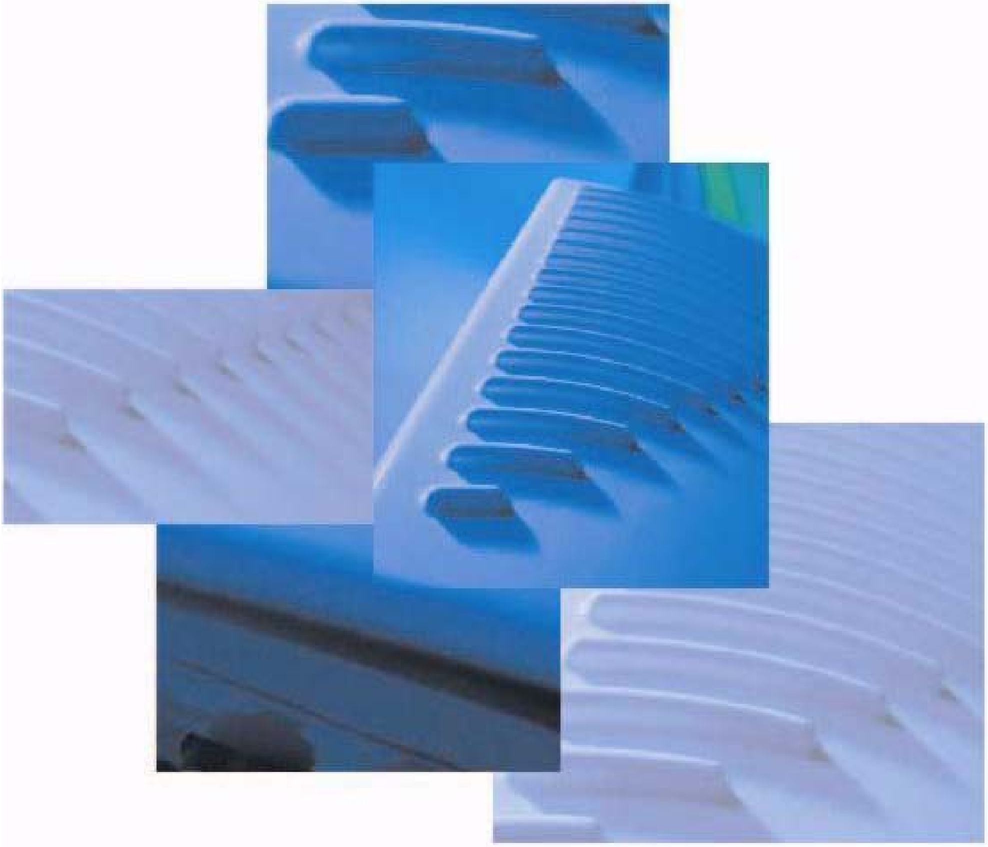
SPEEDLAN 9200 User Guide



WAVE WIRELESS

Part Number 34357-MNL Rev B (For Firmware Version 2.2.0) Last Revised Oct. 2005

This publication may contain technical inaccuracies or typographical errors. Periodic changes are made to the information contained herein. These changes, and mechanical corrections, will be incorporated in subsequent revision levels of the publication.

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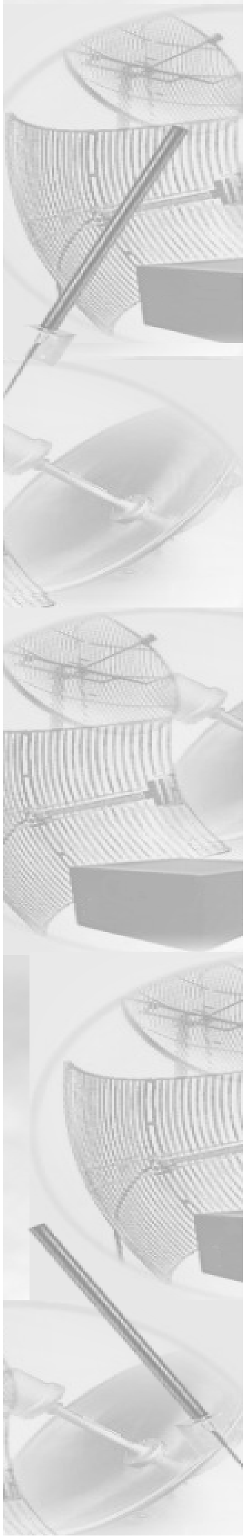
Chapter 1
Introduction



Features and Benefits

SPEEDLAN 9200 Features

The SPEEDLAN 9200 series introduces the second generation of wireless routers. The SPEEDLAN 9200 offers the following new features:

- *New Wireless Mode parameters (e.g., 5.8GHz OFDM, 2.4GHz DSSS or 2.4GHz OFDM, 4.9GHz OFDM, Preamble, Tx power and SSID). For more information, see Configuring the Radio Parameters, page 3-44.*
- *Double the transmission rate with turbo mode, up to 108Mb/s for 5.8GHz OFDM. For more information, see Configuring the Radio Parameters, page 3-44.*
- *You can allow a mesh node in a 9200 network to communicate with a SPEEDMesh-enabled client in adhoc mode. For more information, see Enabling/Disabling the SPEEDMesh-Enabled Client, page 4-6.*
- *Provide network security between SPEEDMesh-enabled clients (PDAs and laptops) and SPEEDLAN 9200 routers via WEP. In a SPEEDLAN 9200 network, you can authenticate a SPEEDMesh-enabled client with a standard security mechanism called Wired Equivalent Privacy (WEP). WEP encrypts data that is transmitted over the wireless LAN. WEP protects the wireless link between clients and access points. Network administrators can control access via standard 802.11 client using WEP. For more information, see B. Enabling WEP Security Between a SPEEDMesh-Enabled Client and SPEEDLAN 9200, page 4-5.*
- *RTS/CTS allows you to fine-tune the operation of your wireless LAN. RTS/CTS will help minimize collisions between transmissions from hidden nodes on the wireless network. For more information, see Request to Send (RTS) / Clear to Send (CTS), page 4-8.*
- *Provide DHCP relay: This release of the SPEEDLAN 9200 shall use the DHCP relay function to forward DHCP requests from non-SPEEDLAN wireless clients to one or more DHCP servers. Those DHCP servers may be suitably configured SPEEDLAN 9200 routers (in which they won't relay), or they may be dedicated servers, reachable through the Ethernet interfaces of one or more of the SPEEDLAN 9200 routers. To configure DHCP relay, see Configuring DHCP Relay, page 3-63.*
- *Support for DC input sources: Devices that lack AC power will require DC-to-DC supply.*

The SPEEDLAN 9200 offers the network manager unsurpassed flexibility in meeting the challenges of designing, building and managing today's wireless broadband networks.

In a mesh topology, the SPEEDLAN 9200 routes traffic around physical limitations, eliminating the line-of-sight (LOS) issue present in star topology-only networks. Each mesh router will communicate with other mesh routers in a radius of up to 2 miles depending upon the model and signaling rate selected. This creates a multi-hop IP routed cell: self-healing, load balancing, and scalable network. By removing LOS issues caused by large buildings, hills, and other obstructions, service providers can reduce network deployment costs while maximizing their broadband wireless investment and reach new markets that could otherwise not be served.

For more information about mesh, see SPEEDLAN 9200 Mesh Protocol -- How It Works in Mesh Cells, page 1-7.

ISP Functionality

The SPEEDLAN 9200 products are tailored to fit the needs of Internet Service Providers and Broadband Telecommunications Providers. Two features particularly useful to Internet Service providers are Network Address Translation (NAT) and Dynamic Host Configuration Protocol (DHCP). NAT helps to ensure network security and allows an entire company to share a single global IP address for communication on the Internet. This enables companies to communicate with other devices on the Internet. DHCP servers provide efficient use of IP addresses by assigning them dynamically or statically to the wireless router location. DHCP allows network administrators to dynamically assign IP addresses for the period of time needed to connect to the Internet or network.

IP Router Functionality

The SPEEDLAN 9200 is a highly configurable wireless IP router which supports mesh topologies. In addition to being configurable via a standard web browser, the SPEEDLAN 9200 also contains a firewall to control incoming and outgoing traffic, preventing unauthorized access.

Configuration Management

The SPEEDLAN 9200 Configurator is a web-based management tool that allows a network manager to configure routers. For more information, see General Functions of the Configurator, page 3-1.

SPEEDManage

The SPEEDManage suite offers network management tools to help you troubleshoot and resolve network issues to keep your network running. Packaged in SPEEDManage are SPEEDView®, SPEEDSignal® and IP Recover:

- *SPEEDView® is a flexible Windows®-based management tool that allows you to quickly isolate and resolve network problems. SPEEDView gives you an "at-a-glance" view of your network, presenting you all of the nodes on the network. Network managers can monitor local and remote SPEEDLAN 9200 nodes from a central location, or from any location on the network. SPEEDView also allows you to troubleshoot network bugs and non-existent physical connections. You can also perform bandwidth and diagnostic tests.*
- *SPEEDSignal® allows you to communicate with SPEEDLAN 9200 routers via their wireless or wired interface. This software makes it easier for installers to troubleshoot antenna alignment problems in the field.*
- *IP Recover is an application that allows you to temporarily change the IP address on the router if you forgot it. You can also locate the configured IP address of a router's Ethernet interface.*

For information about SPEEDManage, see the SPEEDManage User Guide.

Features (and Benefits)

- *2.4GHz DSSS, 2.4GHz OFDM and 5.8GHz OFDM License-free ISM band (No lengthy licensing delays).*
- *Mesh topologies (Maximum network flexibility).*
- *NAT & DHCP server/client (Secure and efficient network).*
- *SPEEDManage suite for antenna alignment (via SPEEDSignal), troubleshooting network problems and viewing nodes on a network (via SPEEDView) and creating a temporary IP address (via IP Recover).*
- *Web-based configuration.*
- *Multihop, Self-healing (Increased network stability and performance).*
- *4.9 GHz OFDM (Public Safety Band)*

- *Hardware AES 128-bit encryption for security between SPEEDLAN 9200 routers.*
- *You can recover lost IP addresses. (Use IP Recover in SPEEDManage.)*
- *Bandwidth Limiting: Users will now have the ability to control the bandwidth use of each SpeedLAN unit in a mesh or a star network. This feature allows controlling the amount of traffic from the Wireless Port to the Ethernet Port and also from the Ethernet Port to the Wireless Port with independent parameters.*
- *ToS [Type of Service]: ToS provides a comprehensive traffic classification scheme and the choice of 8 levels of priority selection for each classification. Tagged traffic is classified by its DiffServ Code Point, and untagged traffic by other set of properties like for example the protocol and IP port.*
- *License Control: Allows a Speed LAN unit to be licensed to communicate with a certain number of mobile clients that associate to it. The license if provided by uploading to a given unit a license file specific for that unit. This is a feature once believed by marketing to be a potential source of revenue. [A mobile client is a laptop or PDA with a standard radio card that and on which our mobile client application has been installed]*
- *Configuration File Upload/Download: This feature was added at the request of several customers since it helps the operations, administration and maintenance of a network because it simplifies the process of unit configuration that generally requires a good degree of expertise and can lead to errors.*
- *System Log: A configurable Sys Log capability was added to improve troubleshooting and general network management.*
- *Ethernet Port DHCP Client: The DHCP client has been enhanced. The new design propagates and uses additional fields provided by the DHCP server in the network.*
- *Wireless Port DCHP Server: Server support has been added to the Wireless Port to assign IP addresses to mobile mesh clients.*

Note: *Advanced Encryption Standard was adopted by the National Institute of Standards and Technology in October of 2000. AES presents a new level in computer networking security, especially important in wireless communications because wireless circuits are easier to tap than their hard-wired counterparts.*

AES is more difficult to crack than its predecessor Data Encryption Standard. These routers use an AES 128-bit encryption key.

Encryption Note! A Web browser must support 128 bit encryption in order to be used with the Configurator. *For more information about AES, visit http://www.nist.gov. This User*

Guide explains how encryption works with 9200 products in A. Enabling Encryption Between SPEEDLAN 9200 Routers, page 4-4 and B. Enabling WEP Security Between a SPEEDMesh-Enabled Client and SPEEDLAN 9200, page 4-5.

Priority Queuing

Despite having two physical interfaces, a SPEEDLAN 9200 router can experience congestion. That is because the interfaces' bit rates are not matched. Specifically, packets can ingress (enter) the Ethernet interface faster than they can egress (exit) the wireless interface. If this occurs briefly, it is called short-term congestion, which can cause increased packet delay and/or jitter. If congestion lasts too long, it can cause packet discard ("loss"). Long-term congestion in a SPEEDLAN 9200 will typically only occur when it receives excessive unthrottled UDP traffic at its Ethernet interface. TCP traffic will self-throttle, typically experiencing only short-term congestion, if any.

A SPEEDLAN 9200 mitigates short-term congestion by providing priority egress queuing at its wireless interfaces. With priority queuing, packets may be transmitted in a different order than they were received. This allows favoring network management, VoIP and SCADA, over SMTP, ftp, and NNTP (for example).

How does Priority Queuing work? The packets are prioritized into a hierarchy of queues, based on class of traffic. The highest priority queue packets are serviced first. When the highest queue is emptied, the next lower queue is serviced. The SPEEDLAN 9200 has four levels of priority queues.
Queue 1 (the highest queue serviced) contains "management" traffic (i.e., RIP, Mesh& SNMP). Queue 2, the next lower queue serviced, contains "real-time" traffic (i.e., VOIP, Video, SCADA). Queue 3, the next lower queue serviced, contains "non-real time interactive" traffic (i.e., HTTP, SSH and Telnet). Queue 4 (the lowest level queue serviced) contains all traffic that doesn't fit into one of the first three queues.
There are no matching or requirements for this queue; it is simply the default queue if the packet doesn't qualify for one of the first three queues.

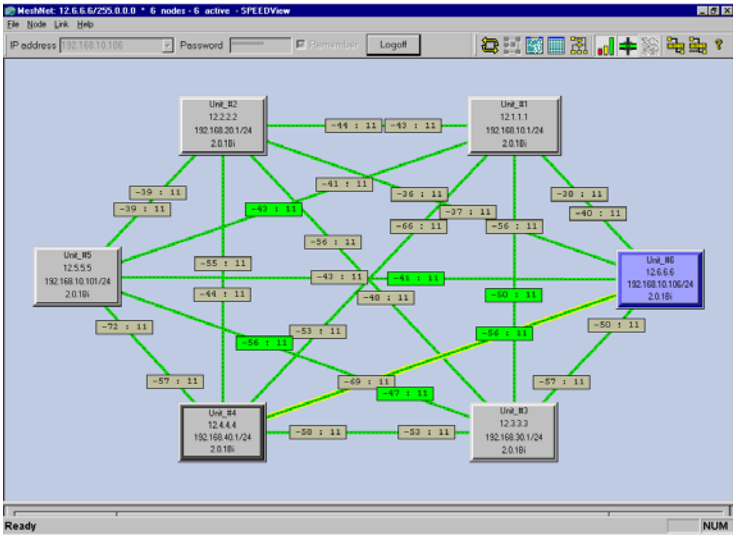
SNMP

The SPEEDLAN 9200 contains a Simple Network Management Protocol (SNMP) Agent that provides a remote Network Management System (NMS) with read-only ("get") access to certain configuration and status parameters. For more information, see SNMP, see SNMP, page 3-26.

Equipment and Hardware

For information about equipment and hardware, see SPEEDLAN 9200 Hardware, page 2-1.

SPEEDLAN 9200 Mesh Protocol -- How It Works in Mesh Cells



MeshNet: 12.6.6.6/255.0.0.0 * 6 nodes - 6 active - SPEEDView

IP address 192.168.10.106

Password ********

☑ Remember

Ready

Figure 1-1: SPEEDView illustrating a mesh network (in SPEEDManage suite)

SPEEDLAN 9200 routers provide the unique ability to "self-heal" the wireless network as the topography changes over time, thereby increasing the overall stability and performance of the network while allowing traffic to reach buildings blocked by obstructions of line-of-sight.

What is happening in Figure 1-1 on page 1-7?

- *You will notice negative numbers next to the routers, or referred to as nodes on the network diagram. These numbers represent the receive signal strength (expressed as dBm) for the links in the network diagram.*
- *The black dots in a mesh network diagram indicate a trace route, which maps out the current data flow between the selected pair of nodes. A user would select the trace feature to view the data flow between a node pair (for mesh networks only).*

This illustration also shows that every router in the mesh cell can be heard by *every other router in the cell, except for the blocked link indicating that there is no signal between those two nodes.*

SPEEDView allows you to block traffic over any link in the cell. When you block a connection, the node pair will not be able to communicate. The advantage of blocking a connection is verifying that the path can be re-routed for successful connectivity. (This is done using the "Block" feature in SPEEDView. The broken [or disconnected] link will appear as a red line. This link also appears when there is no signal between two nodes.)

- *SPEEDView can also be used to perform bandwidth, link and ping tests.*

Routing Around Obstacles

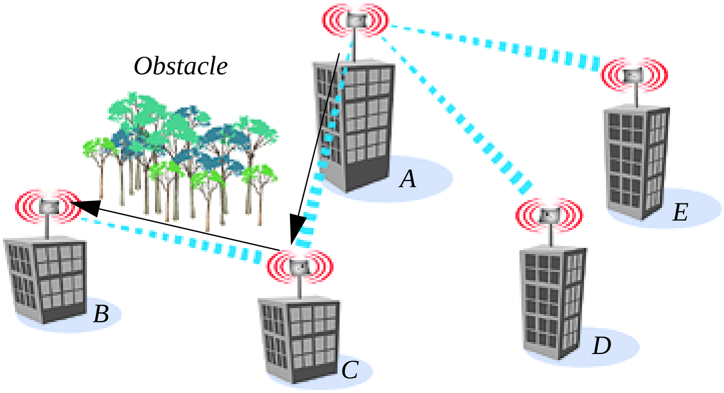


Figure 1-2: Routing around obstacles

Explaining this scenario on the simplest level (using the Mesh protocol as shown in Figure 1-2 on page 1-8). A can route a packet to B, despite the tree obstruction (block of trees) within the path. How does this procedure work?

1. *A has line-of-sight to C but not to B.*
2. *C has line-of-sight to A and to B.*

The most efficient path in this case is to hop from A to C to B.

Note: *No manual programming is required because A automatically detects its neighboring router (in this case C, and B and detect a clear path to C). Therefore, the packet is successfully routed around the obstacle between B and A.*

This process creates a more scalable, flexible, and extended wireless network (as shown in Document Changes & Corrections/Firmware Updates, page 1-11).

SPEEDLAN's Mesh Cell Architecture

Specifically designed to meet the connectivity demands for everyone from single users to large corporations, all SPEEDLAN 9200 models are equipped for mesh operation. These models will communicate with every other mesh router within an unobstructed path.

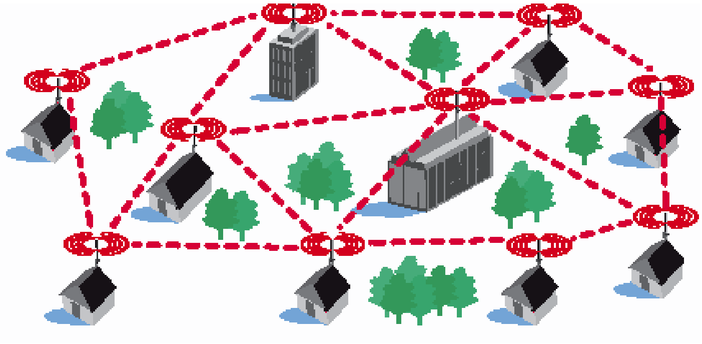


Figure 1-3: An example of a mesh network

SPEEDLAN 9200 Mesh Core Components

SPEEDLAN 9200 Mesh protocol includes three central components which are neighbor discovery, topology updates, and routing.

Neighbor Discovery

Neighbor discovery occurs when each router sends a broadcast "hello" message to detect those routers to which it has line-of-sight. The "hello" sender acknowledges those replies, whereupon the sender and the neighboring router add each other to their respective active neighbor lists. Neighbor discovery protocol messages are sent by each router on startup and periodically thereafter. The periodic messages are required to determine when a former neighbor can no longer be reached, whereupon it is removed from the active neighbor list. Neighbor discovery messages are relatively short and are sent infrequently enough that they don't constitute significant overhead.

Topology Updates

When a router adds or deletes a neighbor to or from its active neighbor list, it propagates that information to the rest of the routers in the wireless mesh LAN. Unlike classic wired routing protocols, topology update notifications are not flooded. Instead they are sent via a spanning tree, such that each router receives only one notification of a particular event. (A brief explanation of the spanning tree algorithm is explained in the note below.) This approach also conserves bandwidth for use in forwarding user traffic. Since each router *knows the topology of the entire wireless LAN, it can determine the shortest path to each peer router in the wireless LAN.*

Note: *In short, the spanning tree algorithm enables units to dynamically locate a subset of the topology that is loop-free. The spanning tree algorithm determines the best path a unit can use to send a message.*

Routing

Routing is simply the act of forwarding a received Internet Protocol (IP) datagram (a block of data) toward its destination. The router compares the destination IP address to entries in its routing table. If the destination is a wireless neighbor or a node connected to the router's wired LAN, the router sends the datagram directly to the destination. Otherwise, it sends the datagram to another router, which must be on the wired LAN or be a wireless neighbor.

In wired broadcast LANs, all routers on the LAN can hear each other. Therefore, a datagram only passes through a router when it is moving from one LAN to another LAN along the path to its destination. In a mesh wireless LAN, not all routers can hear each other. Therefore, a router within a wireless LAN may forward a datagram to a neighbor router within the same wireless LAN, in order to send the datagram toward its destination. For each datagram, the routing algorithm minimizes the number of router-to-router hops within the wireless LAN, thereby also conserving bandwidth for other user traffic.

Why SPEEDLAN Outperforms Other Routing Equipment

The SPEEDLAN 9200 outperforms other routers because the SPEEDLAN 9200 routing table broadcasts only the information that changed, such as when new routes are added or old routes are removed from the network. This information is sent to the router's immediate neighbors along the most efficient path to the end destination. This process helps conserve bandwidth. If an existing path is modified in some way, by the addition or deletion of a router, a SPEEDLAN 9200 using the Mesh protocol can monitor its routing table to decide if a secondary path should be taken. One could call this a "self-healing" network, which means it finds a secondary route through the network without manually reprogramming the routers.

Document Changes & Corrections/Firmware Updates

Documents Changes & Corrections

- *Added IC (Canada) and ETSI channels in Channel Frequency Appendix, F-2 for certified channels 1-11.*
- *Added 12 dBm (13mW) under 5GHz column in Table 3-3, "TX Power List," on page 3-46.*

Firmware Updates

The most current version of firmware is Version 2.2.0

This section informs the customer about new features and requirements for the SPEEDLAN 9200 firmware.

Bug Fixes:

None

Known Problems:

None

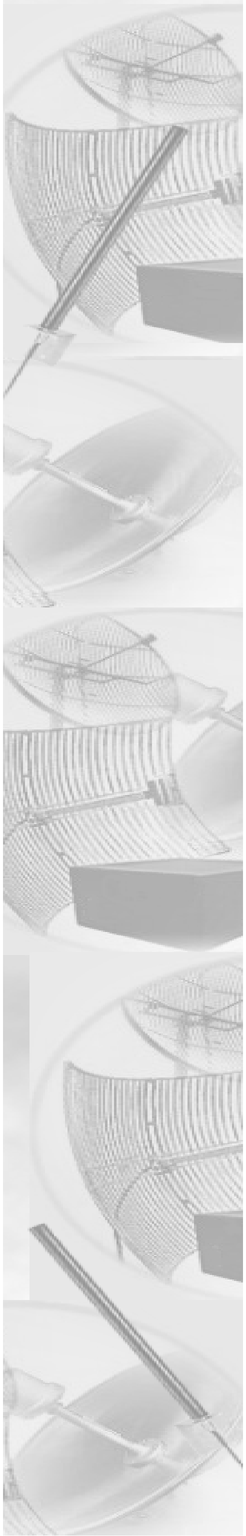
CHANGES PRIOR TO THIS RELEASE CAN BE FOUND IN Firmware History, Appendix E-1 OF THE SPEEDLAN 9200 USER GUIDE.

Contacting Technical Support

408-943-4202 (phone)
408-943-4355 (fax)

Note: *Registered customers should check our web site on a regular basis for updates, router firmware, SPEEDView, and other utility programs. If you haven't registered your products yet, you may do so by visiting www.p-com.com.*

Chapter 2
SPEEDLAN 9200 Hardware



Rooftop and Tower Installations Warning

Rooftop, tower, and other mounted location equipment installations are extremely dangerous and incorrect installation can result in property damage, injury or death.

Regulatory Information

Install this device in accordance with the instructions provided in this User Guide. To determine the type of device you should use in your country, see the Radio Approval Table Radio Approvals, Appendix C-4.

This equipment has been tested and found to comply with the limits of a Class B digital device, pursuant to Part 15 of the FCC Rules. Additionally, the equipment is certified to operate under Part 90, Subpart Y of the FCC rules to operate as a high power device in the 4.9 GHz PSB band with 5, 10, and 20 MHz channel bandwidths. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and radiates radio frequency energy, and if not installed and used in accordance with the instructions, may cause interference. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the installer should correct the interference by one of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from which the receiver is connected.*
- *Consult the professional installer or an experienced radio/TV technician.*

Note: *The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user’s authority to operate the equipment.*

Warning! *This radio device operates on a non-interference basis with other devices operating at this frequency when using the following antennas:*

- *The Part 15 device mode at*

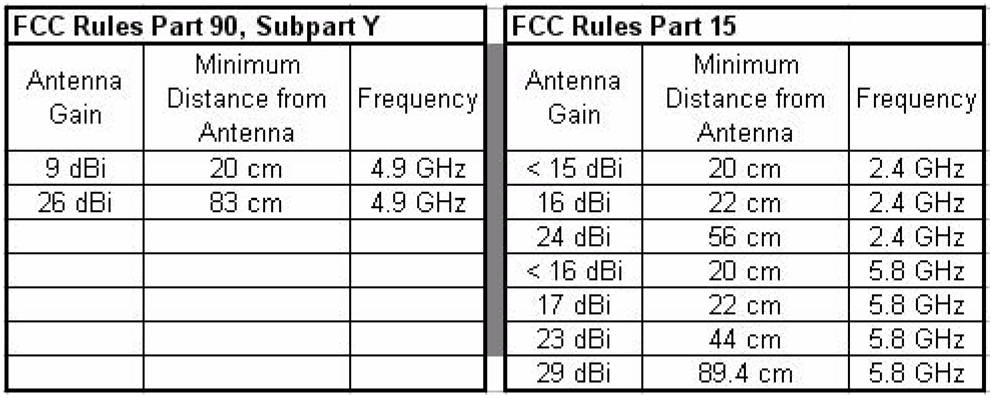
  •2.4GHz: 12dBi external omni or 24dBi directional grid antenna.

  •5.8GHz: 10dBi external omni antenna. The 29dBi directional dish antenna or 23dBi sector flat panel antenna may only be used with filter .

- *The Part 90 device mode at 4.9 GHz may be used with a 9 dBi omni or 26 dBi directional antenna.*

Declaration of Conformity for RF Exposure

The radio module has been evaluated under FCC Bulletin OET65C and found compliant to the requirements as set forth in CFR 47 Sections 2.1091, 2.1093, and 15.247 (b) (4) addressing RF Exposure from radio frequency devices. The radiated output power of this wireless LAN device is far below the FCC radio frequency exposure limits. Nevertheless, this device shall be used in such a manner that the potential for human contact during normal operation is minimized. When using this device, a certain separation distance between the antenna and nearby persons must be maintained to ensure RF exposure compliance. In order to comply with RF exposure limits established in the ANSI C95.1 standards, the distance between the antenna and your body or nearby persons should not be less than:



FCC Rules Part 90, Subpart Y		
Antenna Gain	Minimum Distance from Antenna	Frequency
9 dBi	20 cm	4.9 GHz
26 dBi	83 cm	4.9 GHz

FCC Rules Part 15		
Antenna Gain	Minimum Distance from Antenna	Frequency
< 15 dBi	20 cm	2.4 GHz
16 dBi	22 cm	2.4 GHz
24 dBi	56 cm	2.4 GHz
< 16 dBi	20 cm	5.8 GHz
17 dBi	22 cm	5.8 GHz
23 dBi	44 cm	5.8 GHz
29 dBi	89.4 cm	5.8 GHz

General Safety Requirements for Installation of SPEEDLAN 9200 Models

1. *The AC power socket outlet should be installed near the switching power supply and junction box.*
2. *It is recommended that replacement of the battery which is soldered to the PC board should be done by manufacturer or professional installer.*
   CAUTION: THERE IS RISK OF EXPLOSION IF BATTERY IS REPLACED BY INCORRECT TYPE. DISPOSE USED BATTERIES ACCORDING TO INSTRUCTIONS.
3. *During installation of SPEEDLAN 9200 on a tower, pole or wall,*
   the necessary clearance from the power and lightning conductors should be maintained and proper grounding provided. The installation should be done in accordance with National Electrical Code:
   - *NEC Article 725 – CEC Rule 16*
   - *NEC Article 800 – CEC Section 60 and*
   - *NEC Article 810 – CEC Section 54.*

Hardware Overview

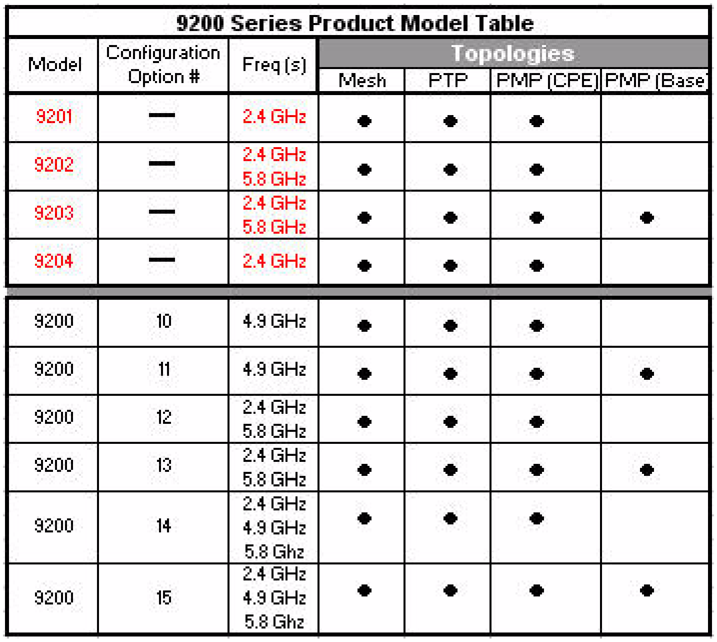
The SPEEDLAN 9200 offers all the equipment you need to meet your connectivity requirements:

- *SPEEDLAN 9201: A router used in a non-line-of-sight pico cell (using the Mesh protocol). This router contains an integrated 8 dBi, omni antenna (for 2.4 GHz only) which is directly attached on the top. You do not need an additional external antenna. The parameters are configured with the Mesh protocol in the SPEEDLAN 9200 Configurator. This type of self-healing Mesh topology process helps you reach buildings that do not have a clear line-of-sight back to a base station without the possibility of interference from hidden transmitters. For more information on this topic, see SPEEDLAN 9200 Mesh Protocol -- How It Works in Mesh Cells, page 1-6.*
- *SPEEDLAN 9202: This model can be configured as Customer Premise Equipment (CPE) at one end of the point-to-point or point-to-multipoint link. It can be used with a 2.4GHz or 5.8GHz external antenna.*
- *SPEEDLAN 9203: This model is pre-configured as a base station but can be reconfigured to function as a CPE router or as one end of a point-to-point or*

point-to-multipoint link. It can be used with a 2.4GHz or 5.8GHz external antenna.

- SPEEDLAN 9204: This model provides the same functionality as a SPEEDLAN 9201, but it uses an integrated 5 dBi omni (for 2.4GHz only). The SPEEDLAN 9204 is intended for more densely populated cells.
- SPEEDLAN 9200 (Option #10-15): This is the new model numbering format. The Option # identifies the router's topology capabilities. See the following Table 2-1.

Table 2-1: 9200 Topology Configuration Table



9200 Series Product Model Table

Model	Configuration Option #	Freq (s)	Topologies			
			Mesh	PTP	PMP (CPE)	PMP (Base)
9201	—	2.4 GHz	●	●	●	
9202	—	2.4 GHz 5.8 GHz	●	●	●	
9203	—	2.4 GHz 5.8 GHz	●	●	●	●
9204	—	2.4 GHz	●	●	●	
9200	10	4.9 GHz	●	●	●	
9200	11	4.9 GHz	●	●	●	●
9200	12	2.4 GHz 5.8 GHz	●	●	●	
9200	13	2.4 GHz 5.8 GHz	●	●	●	●
9200	14	2.4 GHz 4.9 GHz 5.8 Ghz	●	●	●	
9200	15	2.4 GHz 4.9 GHz 5.8 Ghz	●	●	●	●

As of October 2005, the model numbering format changed. The new model numbering format uses a Configuration Option # to distinguish different models.

The SPEEDLAN 9200 is housed in a waterproof, cast enclosure that mounts outside the building, on a mast, or tower. The SPEEDLAN 9200 allows up to 300' of specialized, outdoor Ethernet cable to be used between the LAN and the RF device, without loss of any radio signal. This increases the effective wireless link distance and reduces or even eliminates the need for an amplifier.

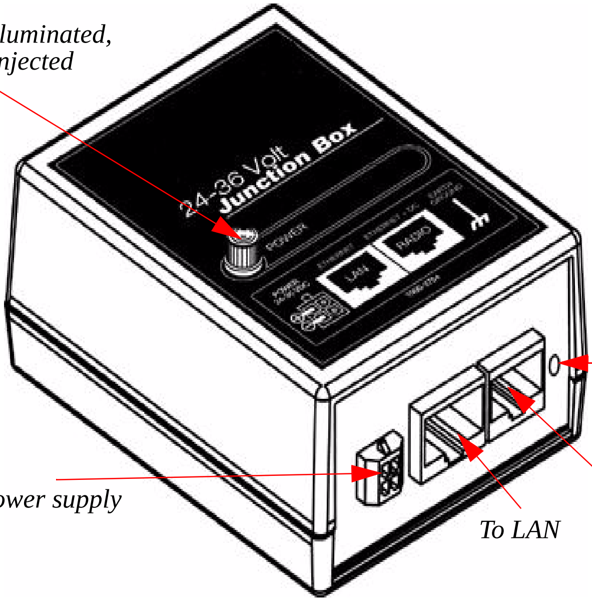
Tips for Antenna Alignment

You are encouraged to use the transmit power test during installation if you have a spectrum analyzer or power meter to measure the output for the antenna alignment. For more information, see the SPEEDManage User Guide. The SPEEDSignal application will also help installers align or position antennas on SPEEDLAN 9200 units.

Drawings of Outdoor, Remote-Mounted Components

Indoor Junction Box

When the green light is illuminated, the DC voltage is being injected



Grounding - Ground the wire to the nearest earth ground. Indoor ground plug will be installed here.

DC jack to external power supply

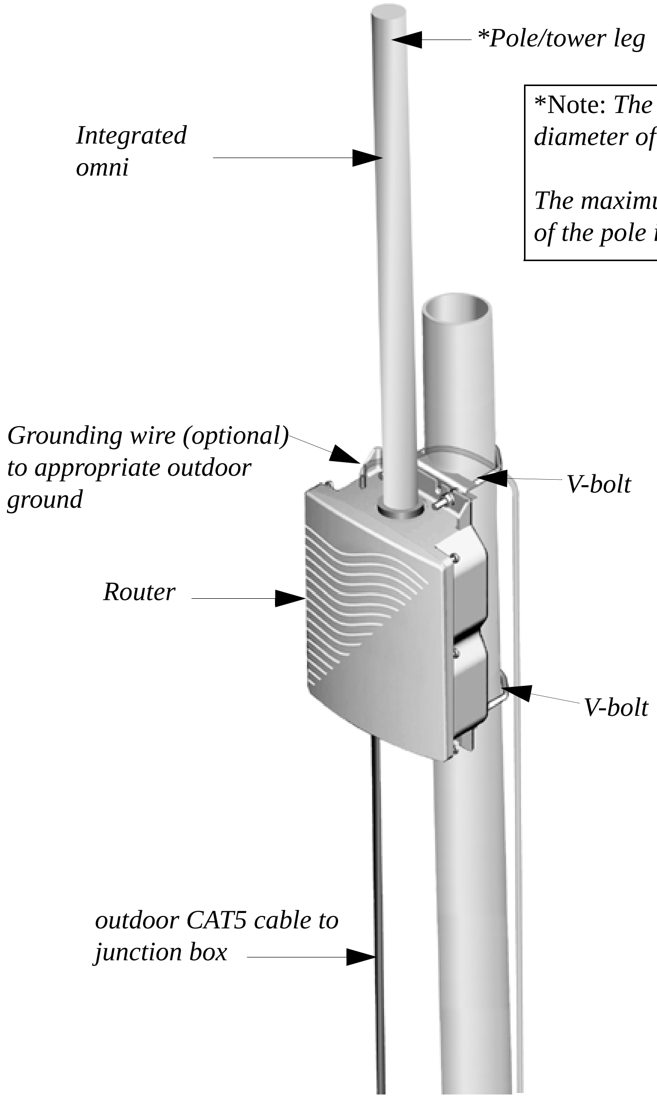
To LAN

To Radio

Figure 2-1: Indoor junction box for SPEEDLAN 9200

WARNING!: *Make sure the network is plugged into the LAN interface, and that the radio is plugged into the radio interface. If you do this procedure wrong, the voltage that is meant to go to the radio can damage a device on the network.*

SPEEDLAN 9201/9204 with an Integrated Omni-Directional Antenna-


*Pole/tower leg
Integrated omni
Grounding wire (optional) to appropriate outdoor ground
V-bolt
Router
V-bolt
outdoor CAT5 cable to junction box

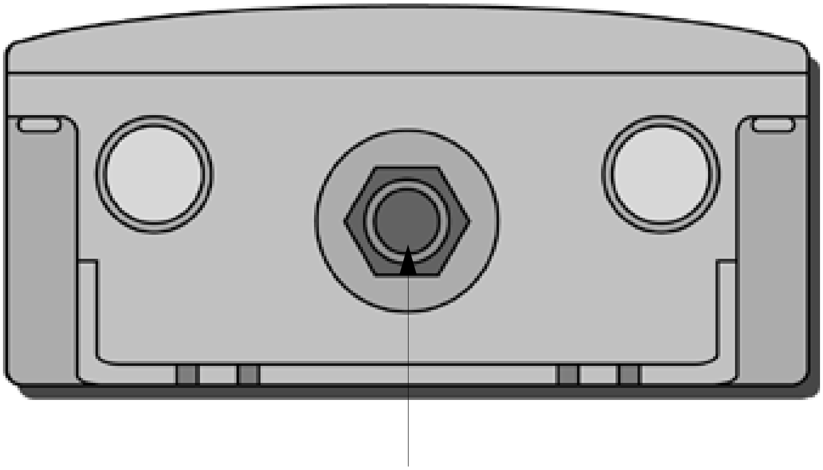
*Note: *The minimum outside diameter of the pole is 1.25 inches.*

The maximum outside diameter of the pole is 2.5 inches.

Figure 2-2: SPEEDLAN 9201/SPEEDLAN 9204 installation

The installation steps for the SPEEDLAN 9201 and SPEEDLAN 9204 are similar, but the SPEEDLAN 9201 uses a larger omni and the SPEEDLAN 9204 uses a smaller omni-directional antenna.

Bottom View of SPEEDLAN 9201/SPEEDLAN 9204



Power/Ethernet (CAT5 down to junction box)

Figure 2-3: Bottom view of case

System Description

These are high-speed, long range wireless LAN outdoor, remote-mounted units/routers that provide building-to-building connectivity in a mesh cell.

Package Contents

- *SPEEDLAN 9201 or SPEEDLAN 9204*
- *CD containing: Adobe Acrobat Reader, SPEEDManage software & User Guide, this User Guide, Installation Diagram booklet and Getting Started Guide*
- *Indoor junction box*
- *Power supply*
- *Integrated, omni-directional antenna*
- *V-bolt kit which includes the following*
  - *Bolt, V, Tower Mount, Stainless Steel (quantity 2)*
  - *Nut, 1/4"-20, Serrated Flange, Stainless Steel (quantity 4)*
  - *V-Bracket, Tower Mount, Aluminum (quantity 2)*

The following items are included with the installation kit, which can be purchased separately:

- *Hardware ties*
- *Specialized CAT5 cable*

Customer Sourced / Other

- *Combination wrench or socket wrench (7/16") to tighten the nuts on the V-bolts (customer sourced only)*
- *Other tool accessories that can be purchased separately from Wave Wireless are: cable, connectors, crimpers, spectrum analyzer, shrink wrap, putty, aluminum 2" pole, extendable mast, ballast mount, peak roof mount, extra v-bolts, nuts, grounding rod clamps, wall mounts*

Installation Steps for the SPEEDLAN 9201/SPEEDLAN 9204

To install your SPEEDLAN 9201/SPEEDLAN 9204, follow the steps below:

Step 1: Mounting the SPEEDLAN 9201/SPEEDLAN 9204

This router will have an omni directly attached. No additional steps are needed for this step. Go to Step 2.

Step 2: Mounting the SPEEDLAN 9201/SPEEDLAN 9204 on the Pole

- Pole Mount: *Attach the router to the mounting pole using the two V-bolted clamps and aluminum bracket, one on top of the router and the other on the bottom of the router. Make sure you tighten the nuts for the clamps securely to prevent shifting of the router after antenna alignment.*

Step 3: Running the Cabling

1. *Run outdoor CAT5 cable (from bottom of router) down to junction box located inside the building.*
2. *Secure grounding wire by running this wire to a suitable "earth" ground and fasten it securely in place. See the installation diagram following these directions.*
3. *Install proper indoor ground plug into the junction box. Connect the outdoor CAT5 Ethernet to the "radio" jack. Connect the LAN Ethernet cable to the "LAN" jack of the junction box. Install the power supply DC connector to the junction box. Plug the external power supply into the wall outlet.*
   (The VAC power outlet’s input voltage of this universal adapter can vary from 100 to 250 VAC.) Connect the DC output of the adapter to DC jack on the indoor junction box.

4 *Connect the wireless SPEEDLAN 9201/SPEEDLAN 9204 to the customer's Ethernet LAN or PC by connecting the RJ-45 plug on a standard Ethernet CAT5 cable to the RJ-45 port connector, marked as "LAN" on indoor junction box. Connect the other end of the Ethernet CAT5 cable to your Ethernet hub, switch or router.*

Important Note: Waterproofing the External Connectors!

Make sure you waterproof all the connectors, as follows: Apply two layers of electrical tape to the connector (covering three inches of cable past the connector), and leave approximately 3 inches of cable exposed on either side of the connector. An alternative is to begin at the lowest point, so the tape overlaps from bottom to top creating a shingled effect. (This creates an effective barrier against runoff.) Apply this "shingle effect" to each layer of the sealing process. Then, apply one layer of insulation putty over the top of the electrical tape, and leave at least one inch of the cable jacket to ensure a good seal. Do not stretch the putty, as this causes thinning and reduces the effectiveness of a good seal. Finally, apply five layers of electrical tape over the insulation putty and extend at least one (1) inch past the putty. This is the most important step in a creating a watertight seal. Make sure that there are no wrinkles in the tape, and the final wrap must be completed from bottom to top.

Installation Diagram of the SPEEDLAN 9201/SPEEDLAN 9204

The diagram below displays where the main components are located for the SPEEDLAN 9201/SPEEDLAN 9204 with an integrated omni.

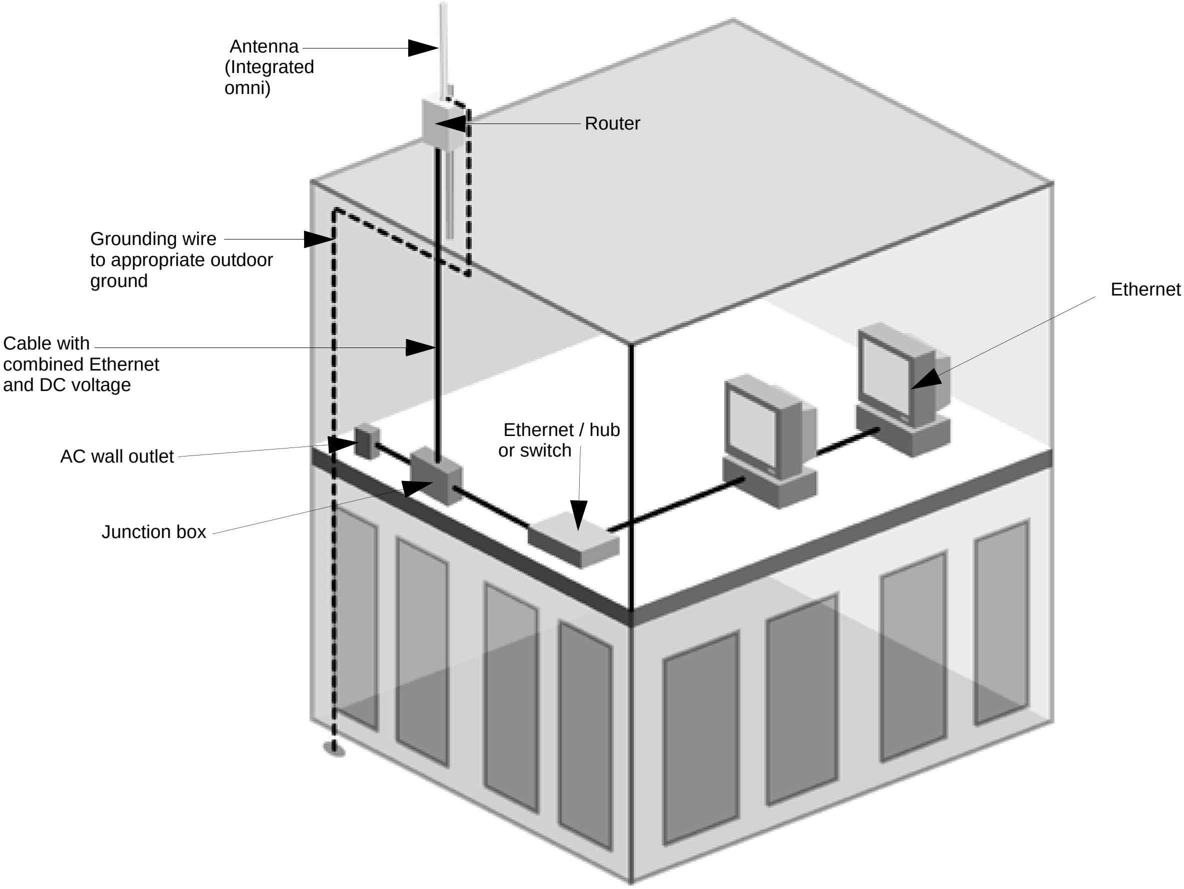

Antenna (Integrated omni)
Router
Grounding wire to appropriate outdoor ground
Ethernet
Cable with combined Ethernet and DC voltage
Ethernet / hub or switch
AC wall outlet
Junction box

Figure 2-4: SPEEDLAN 9201/SPEEDLAN 9204 installation diagram

Note: ***Routers purchased and/or labeled as SPEEDLAN 9200 with Configuration Option # 10, 11, 12, 13, 14, or 15, please follow all hardware and installation instructions for the SPEEDLAN 9202/SPEEDLAN 9203 products listed in this manual***.

SPEEDLAN 9202/SPEEDLAN 9203/SPEEDLAN 9200 (Option # 10-15) using External Antenna

*Note: *The minimum outside diameter of the pole is 1.25 inches.*

The maximum outside diameter of the pole is 2.5 inches.

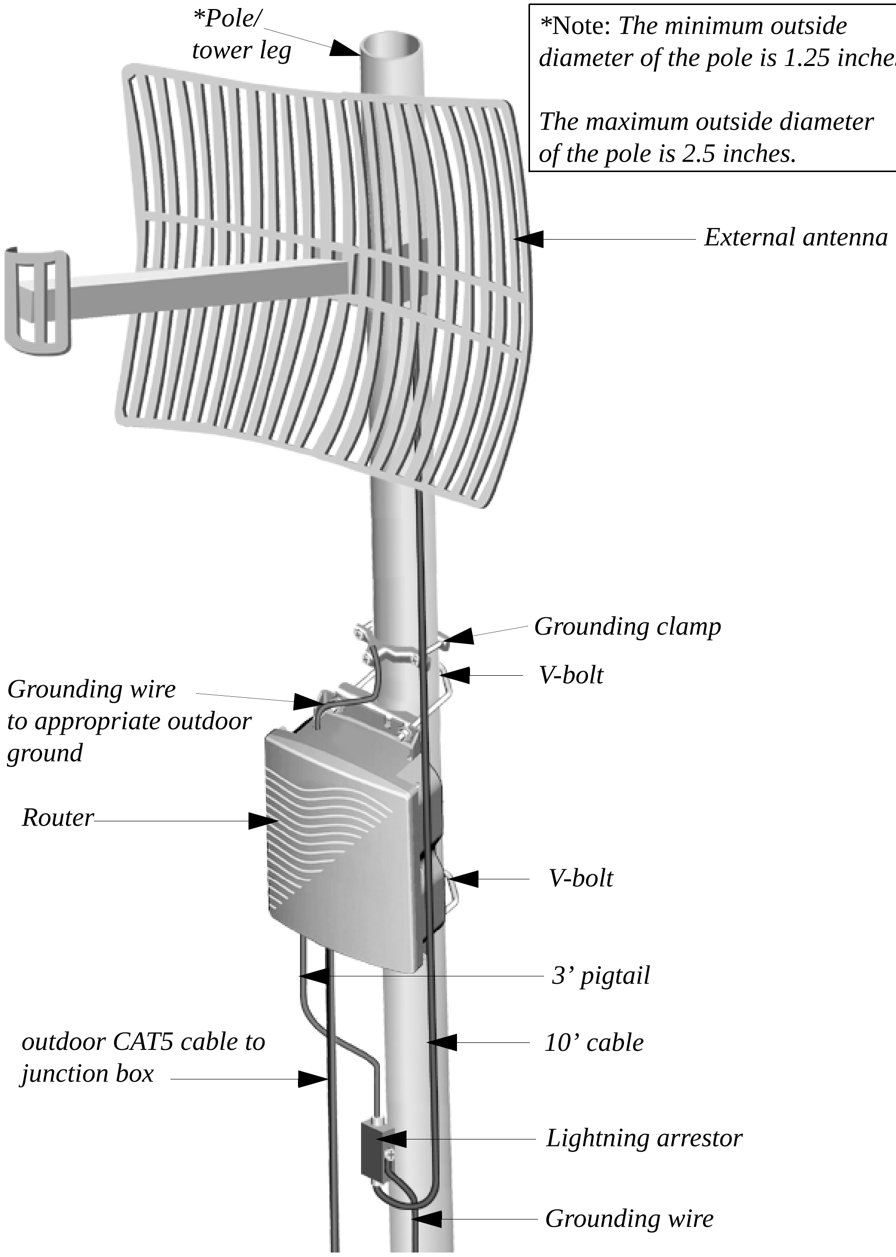


Figure 2-5: SPEEDLAN 9202/SPEEDLAN 9203/SPEEDLAN 9200 (Option # 10-15) installation

Bottom View of SPEEDLAN 9202/SPEEDLAN 9203/SPEEDLAN 9200 (Option #10-15)

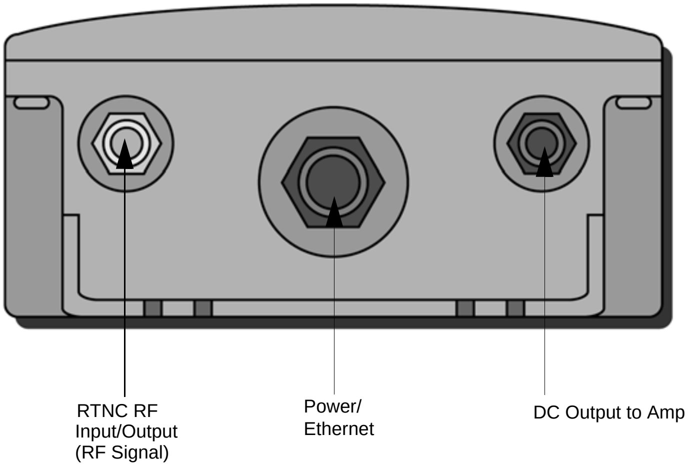


Figure 2-6: Bottom view of case

System Description

The SPEEDLAN 9202/SPEEDLAN 9203/SPEEDLAN 9200 (Option #10-15) routers are high speed, long range wireless LAN routers that provide connectivity to remote Ethernet networks.

Package Contents

The following items are included in the package contents:

- *SPEEDLAN 9202, SPEEDLAN 9203, or SPEEDLAN 9200 (Option #10-15) router*
- *CD containing: Adobe Acrobat Reader, SPEEDManage software & User Guide, this User Guide, Installation Diagram booklet and Getting Started Guide*
- *Indoor junction box*
- *3’ pigtail*
- *V-bolt kit which includes the following*
  - *Bolt, V, Tower Mount, Stainless Steel (U-bolt) (quantity 2)*
  - *Nut, 1/4"-20, Serrated Flange, Stainless Steel (quantity 4)*
  - *V-Bracket, Tower Mount, Stainless Steel (quantity 2)*
- *Power supply*

The following items are included with the installation kit, which can be purchased separately:

- *Hardware ties*
- *Lightning arrestor*
- *Electrical tape*
- *Waterproof putty tape*
- *Specialized CAT5 cable*
- *10’ RF cable*
- *Grounding rod clamps*

*Note: *Antennas for the router are purchased separately.* ***Using an antenna whose gain is greater than +17dBi at 5.8 GHz will require the use of an external RF Filter to be installed between the RF Output of the router and the RF Input to the antenna. (See the installation drawing on page 2-18)***

Customer Sourced / Other

- *Combination wrench or socket wrench (7/16") to tighten the nuts on the V-bolts (customer sourced only)*
- *Other tool accessories that can be purchased separately from Wave Wireless are: cable, connectors, crimpers, spectrum analyzer, shrink wrap, putty, aluminum 2" pole, extendable mast, ballast mount, peak roof mount, extra v-bolts, nuts, grounding rod clamps, wall mounts*

Installation Steps for the SPEEDLAN 9202/SPEEDLAN 9203/ SPEEDLAN 9200 (Option #10-15)

Generally, these routers follow the same general installation steps. Some installation instructions are specific to customers who purchased Installation Kits from Wave Wireless. To view a diagram of the installation listed below, see Figure 2-9 on page 2-21.

If you are having trouble and need a full site installation, contact Wave Wireless for services and fees.

Antenna Selection Tip: *Use a high-gain omni or sectoral antenna for a base station (SPEEDLAN 9203), and use a grid or directional antenna for a CPE or point-to-point router (SPEEDLAN 9202).*

To install your router with an external antenna, do the following:

Step 1.Verifying Line-of-Sight

Before installing the antenna and router, make sure a clear line-of-sight exists between the two points. Line-of-sight can be defined as each antenna clearly seeing the other antenna, and seeing the remote locations when viewing from the central base location. Be sure to look at the center of origin of the transmission (i.e., the middle of the antenna). Repeat this procedure from the remote location. Any disruption of the signal path due to trees, building, or any other obstructions may cause the link to function incorrectly. Make sure at least 60 percent of the RF signal is unobstructed by any path blockages.

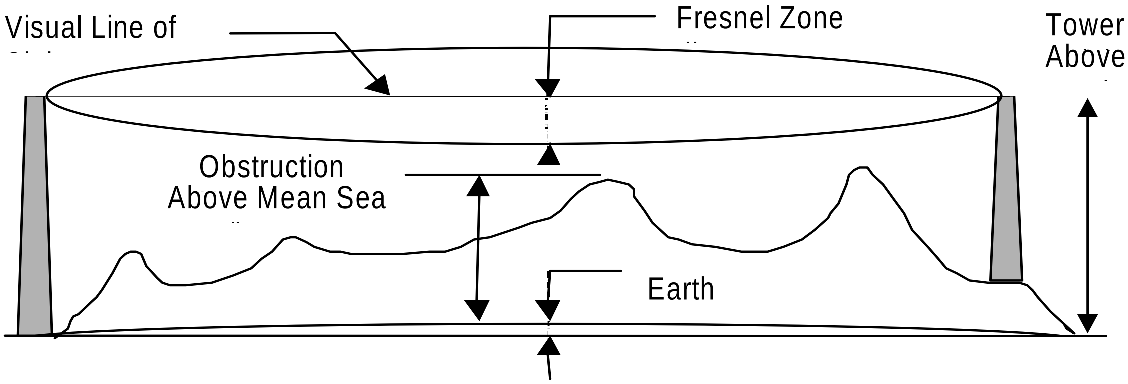


Figure 2-7: Line-of-sight (LOS) diagram

Note: *For long distances, additional antenna height is often required to overcome signal diffraction and to provide clear Radio LOS. For Radio LOS, a clear Fresnel (Freh-nel) zone is required to minimize diffraction effects. The Fresnel zone is shaped like an elongated football. The most clearance is required at the mid-point between the two sites.*

Beyond approximately 10 miles, the curvature of the earth can also become significant. At these longer distances, visually sighting the remote site can be difficult or impossible due to atmospheric haze. Terrain data (map or differential GPS) must be relied upon for determining path clearance. Elevation data determined with these methods is above Mean Sea Level; and does not account for curvature of the earth. Both the curvature of the earth and the Fresnel clearance numbers can be combined to determine the additional clearance required above any natural or man-made obstructions along the path.

Obtaining this clearance can be accomplished by raising the antenna height at one or both sites. If this is not practical, then consider relocating one or both sites to locations with higher elevations. Another option is to add a third site to go over or around the obstacle.

If you see any obstructions between two antennas, move one or both antennas to another location.

Step 2. Mounting the Antenna

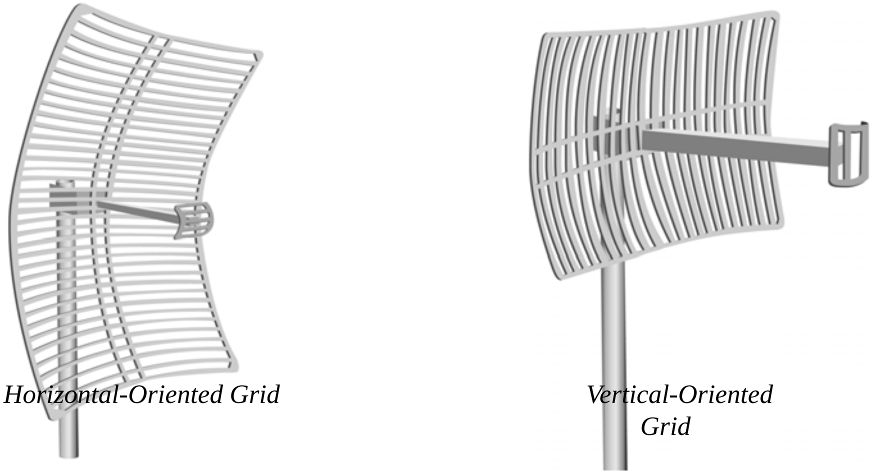
Follow the instructions below to mount the antenna.

a *On a side-building mount, position the bracket so there will be at least three feet (one meter) above the roof line where the pole is attached. This enables room for the antenna and reduces signal loss from building reflection.*

Note: *It is not recommended to mount the antenna onto any unstable object.*

b *Allow for as much space between the wall brackets as possible while maintaining the appropriate antenna height. For extended poles, additional wall brackets may be necessary.*

c *Assemble the antenna and mount it to the pole using the included V-bolt antenna mounting hardware. For a semi-parabolic grid type antenna, align the grid to run parallel with the grid on the tip of the antenna horn.*
A horizontal grid should be horizontal (or parallel to the ground). A vertical grid should be perpendicular to the ground. Make sure all bolts and screws are fastened tightly.



Horizontal-Oriented Grid

Vertical-Oriented Grid

See also Tips for Antenna Alignment, page 2-5.

Figure 2-8: Grid antennas

d *Fasten the pole to the brackets. Position the antenna, point it in the appropriate direction, and tighten the screws. Then, aim the antenna so it is pointed toward the receiving antenna on the other building. The radio signal radiates from the end of antenna like a wide-beamed flashlight. For optimal performance, you may need to test your link using both horizontal and vertical-oriented polarities. This configuration option varies with each location, as well as RF signals that may be present in the area.*

Step 3. Mounting the SPEEDLAN Router

Select one *of two options below:*

- Option A: Pole Mount
  On a pole mount, position the router 5 to 10 feet below the antenna. Then, attach the router to the mounting pole using two included V-bolt clamps, one on the top of the router and the other on the bottom. Make sure you tighten the nuts for the clamps on the back of the pole mount.

OR

- Option B: Wall or Concrete Mount
  On a side building mount, position the router 5 to 10 feet below the antenna. Then, attach the SPEEDLAN router to the wall or concrete by using the concrete or wood mounting screws. Make sure it is securely mounted on the wall.

Step 4. Running and Securing All Cable

The installation kit includes two cables with ready-made connectors to fit your particular installation needs such as:

- *3’ RF cable*
- *10' antenna cable (attaches to antenna one end and to lightning arrestor other end)*
- *Lightning arrestor (attaches to pigtail and to antenna cable)*

a *Attach the 3’ RF cable to the RF port on the router.*

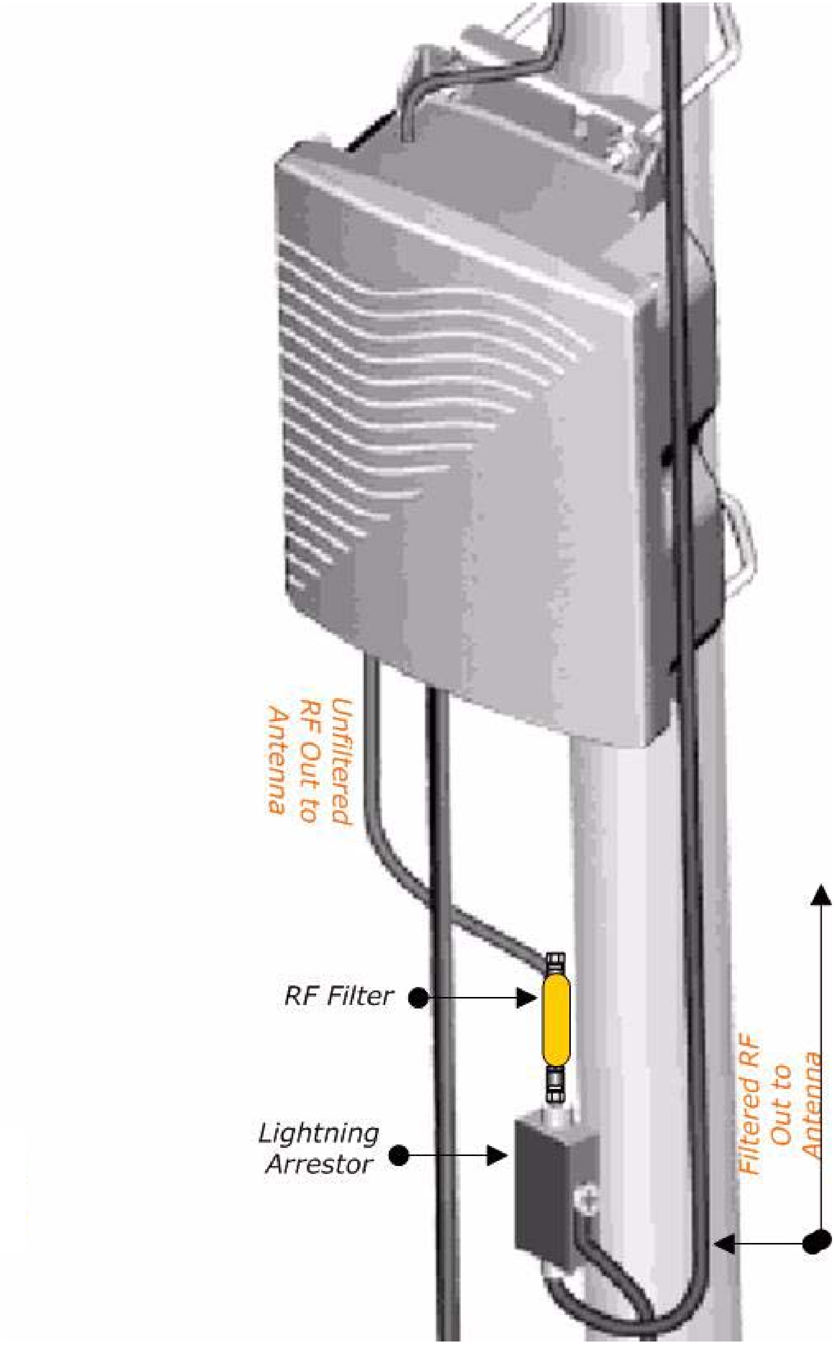
b *Attach the 10' length of cable to the antenna. Next, attach the lightning arrestor to the lower end of the antenna cable.*

c *Attach the other end of lightning arrestor to 3’ RF cable.*

d *Run the main length of the specialized outdoor Ethernet cable from the router to the indoor junction box located inside the building.*

e *Secure the cable (i.e., to the pole) with zip ties or cable clamps during this procedure.*

f *Don't forget: If your installation requires the use of an RF Filter because you plan to transmit at 5.8 GHz using an antenna whose gain is greater than +17dBi as mentioned in the note at the bottom of page 2-11, then you will install the RF filter between the RF output of the router and the RF input of the antenna.*



Note: *When running the cable through walls or obstructions, make sure that there is ample room for the connector to pass through the opening without being damaged. Also, do not create extra pressure that would cause the cable to kink or be stretched or cut (i.e., pulling cable through tight locations).*

g *Create a proper weatherproofing seal on all outdoor connections by wrapping it with electrical tape and sealing it with putty. This is the most crucial step of the installation. If this procedure is not completed, long-term and complex problems could occur. For more information on implementing this procedure, see Weatherproofing Connectors, page 2-19.*

h *Next, ground the lightning arrestor. For more information, see Grounding the Lightning Arrestor, page 2-19. You can also ground the router case to the ground, as shown in the installation diagrams in this chapter.*

Step 5. Grounding the Lightning Arrestor

a *Mount the lightning arrestor to a solid surface.*

b *Run the grounding wire from the lightning arrestor to a proper ground source such as a grounding rod or roof ground wire. The lightning arrestor is* NOT *waterproof. The next series of steps will show you how to effectively seal the lightning arrestor and its cables.*

Step 6. Weatherproofing Connectors

a *Seal the entire lightning arrestor with the black waterproof sealant insulation putty that is included in the installation kit.*

b *Apply two layers of electrical tape to the connector, and leave approximately 3 inches of cable exposed on either side of the connector. An alternative is to begin at the lowest point, so the tape overlaps from the bottom, below the bottom connector over the lightning arrestor and beyond the upper connector, to top creating a shingled effect. (This creates an effective barrier against water runoff). Apply this "shingle effect" to each layer of the sealing process.*

c *Apply one layer of insulation putty over the top of the electrical tape, and leave at least one inch of the cable jacket to ensure a good seal. Do not stretch the putty, as this causes thinning and reduces the effectiveness of a good seal.*

d *Apply five layers of electrical tape over the insulation putty and extend at least one (1) inch past the putty. This is the most important step in creating a watertight seal. Make sure that there are no wrinkles in the tape and the final wrap must be completed from bottom to top.*

Step 7. Connect the Router to Customer's Ethernet LAN

a *Connect the RJ-45 connector on a standard Ethernet CAT5 cable to the "LAN" RJ-45 port on the indoor junction box.*

b *Connect the other end of the Ethernet CAT5 cable to your Ethernet hub, switch or router.*

Step 8. Connect the Wireless Router to the Power Supply

a *Connect the DC output of the adapter (24-36 Vdc) to DC jack on the indoor junction box.*

b *Connect power cord of AC-DC 24-36 Vdc adapter to 110 or 220 VAC power outlet (the input voltage of this universal adapter can vary from 100 to 250 VAC).*

Step 9. Adding Additional Routers

Repeat the steps above for SPEEDLAN 9202/SPEEDLAN 9203/SPEEDLAN 9200 (Option #10-15) routers that will be communicating with this one.

SPEEDLAN 9202/SPEEDLAN 9203/SPEEDLAN 9200 (Option #10-15) Installation Diagram

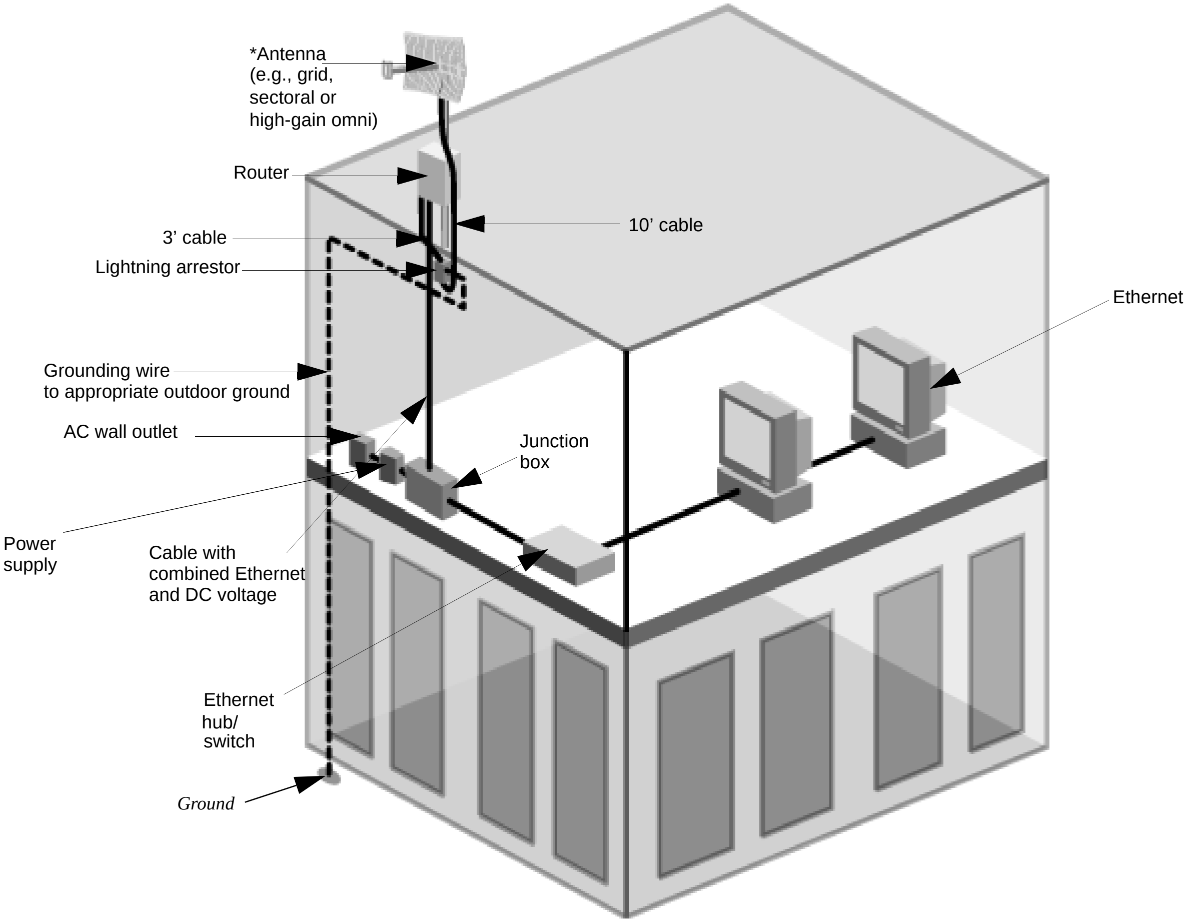
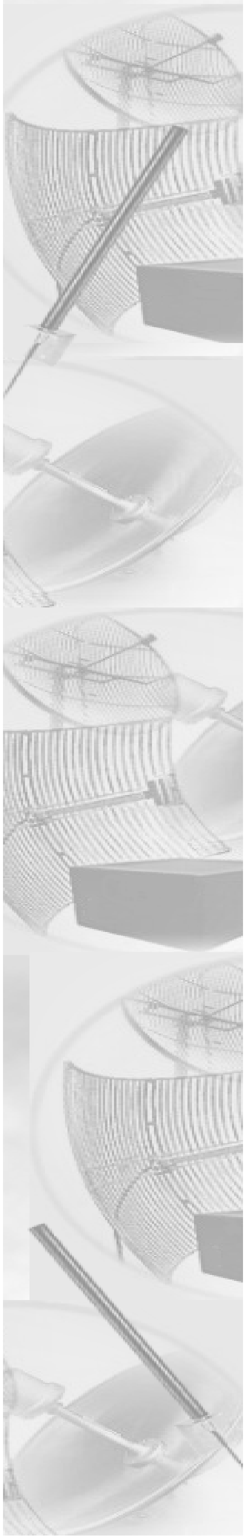


Figure 2-9: SPEEDLAN 9202/SPEEDLAN 9203/SPEEDLAN 9200 (Option #10-15) installation diagram

*Note: *The sectoral, grid (directional) and high-gain omni antennas all follow the same installation instructions.*

You can ground the router case to the ground. You can ground the lightning arrestor as well.

Chapter 3
General Functions of the Configurator



This chapter covers general functions when configuring any SPEEDLAN 9200 router, such as:

- *General Information: Manual Initial Configuration of the SPEEDLAN 9200, page 3-2, Logging on the SPEEDLAN 9200 Configurator, page 3-10 and Logging Off, page 3-12*
- *Network menu: IP Address Configuration, page 3-18, Alias IP, page 3-21 and Virtual Addresses, page 3-22*
- *System menu: Configuration Summary, page 3-24, SNMP, page 3-25, Version, page 3-28; Host Name, page 3-28; Password, page 3-29 and Reboot, page 3-30*
- *Routing menu: Def Gateway, page 3-37; RIP2 Setup, page 3-38 and RIP Settings, page 3-39; Authentication on RIP-2 MD5, page 3-39, Route Table, page 3-41 and Static Route, page 3-42*
- *Wireless menu: Configuring the Radio Parameters, page 3-43 (i.e., setting the SSID, wireless mode, channel, signaling rate, turbo mode, Tx power and preamble); Max Tx Retries and Signaling Rate Fallback, page 3-46;*

Request to Send (RTS) / Clear to Send (CTS), page 4-8; and Max Throughput (Regulating Bandwidth), page 3-48)

- *DHCP Server menu: Setting Up DHCP, page 3-57; Adding a New DHCP Subnet, page 3-59, Adding a DHCP Client, page 3-61, Configuring DHCP Relay, page 3-62, Viewing Log Messages, page 3-63 and Forwarding Menu, page 3-63*
- *Forwarding menu: Forwarding Menu, page 3-63, Priority Queuing, page 3-64, Three Features of NAT, page 3-68, Firewall, page 3-74 and IP Sessions, page 3-79*
- *Diagnostics menu: Interface Statistics, page 3-80; ARP Table, page 3-82 and ICMP Statistics, page 3-82*
- *Admin menu: User Configuration Passwords, page 3-85; Software Update, page 3-86; Software Update, page 3-86, Support, page 3-87 and Current Sessions, page 3-88*

Note: For more information on how the Configurator menu and this chapter is structured, see *Overview of the SPEEDLAN 9200 Configurator General Main Menu, page 3-6*.

Warning! Do not forget your password. Keep it in a safe place.
If you lose your full access password, there is no way to recover
it without returning the router back to the manufacturer.

Manual Initial Configuration of the SPEEDLAN 9200

Each SPEEDLAN 9200 is produced with a default configuration that renders it usable in many applications. However, if you need to manually configure your SPEEDLAN 9200 router, follow the directions below.

Prerequisites

Configuration of the SPEEDLAN 9200 is done through the SPEEDLAN 9200 Configurator. In order to access the SPEEDLAN 9200 Configurator, you must have:

- *a client workstation (e.g., PC, Mac, Sun),*
- *a compatible browser (Netscape Navigator 4+ or Internet Explorer 5+), and*

- *a TCP/IP connection to the SPEEDLAN 9200.*

A TCP/IP connection to the SPEEDLAN 9200 can be made through its wireless interface or through its wired interface. If the default configuration creates a wireless LAN that is compatible with the target inter-network, the network administrator can connect to the individual SPEEDLAN 9200 router through that wireless LAN.

The following section assumes that a SPEEDLAN 9200 router is being configured via its wired interface, possibly before it is installed at its intended physical location.

Connecting a SPEEDLAN 9200 and a Client PC

A connection between a SPEEDLAN 9200 and a client PC may be established using either:

1. *one crossover cable, or*
2. *two straight-through cables (also called patch cables) and a hub or a switch.*

- *If you select option # 1, connect one end of the crossover cable to the client PC and the other end to the junction box.*

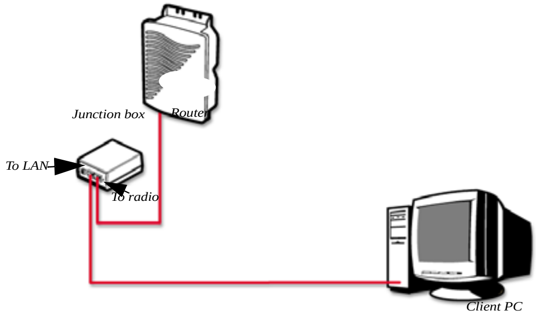
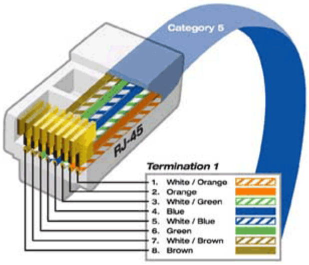


Figure 3-1: Using one crossover RJ-45 Ethernet cable

Either end of the crossover cable can connect to the client PC or junction box.



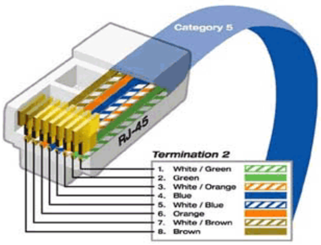


Figure 3-2: Crossover cable and pin out diagram

Note: *The crossover cable actually crosses the transmit and receive pairs of wires so that direct communications can take place between devices. Use a crossover cable anytime you need to interconnect two computers or two devices in the same location when a hub or a switch is either unavailable or not practical.*

- *If you select option # 2, connect a straight-through cable from both the client PC and the junction box to the hub or a switch.*

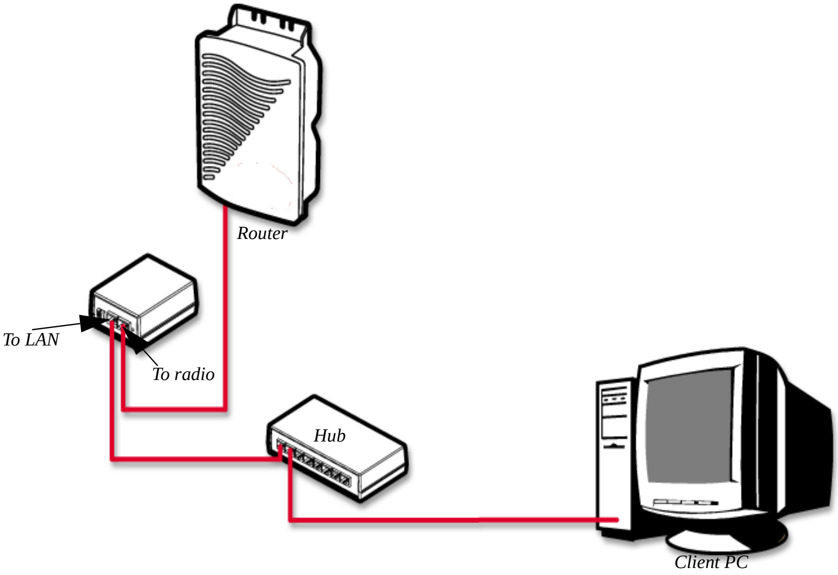


Figure 3-3: Using two straight-through RJ-45 Ethernet cables

SpeedLan 9200 comes from the factory pre-configuredwith a private IP network address 192.168.69.1 and a ?24 netmask (255.255.255.0)

Follow these general directions to configure your Speedlan connection:

- *Open the* Control Panel, *and then double-click the* Network and Dial-up Connections *icon. Go to* TCP/IP Protocol Properties *to verify that your PC is on the same network as the router 192.168.69.x (x is in the range of 2 - 254), and the subnet mask should be /24 (255.255.255.0). If you made changes, accept the changes and close this dialog box. Then, restart your computer.*

Before continuing you should verify that the client PC has TCP/IP connectivity with the SPEEDLAN 9200. The most common way to do this is to run 'ping' 192.168.69.1 *(or the DHCP assigned address) at a command-line prompt. This ping command is available in a Windows 9x DOS prompt, a Windows 2000 / NT / XP command prompt, or any Unix console.*

Configuring the SPEEDLAN 9200

Once your PC can access the SPEEDLAN 9200, you can open the client's browser and enter the IP address of the SPEEDLAN 9200 router.

Note: *SPEEDView gives you a "monitoring" view of the network. You will use the SPEEDLAN 9200 Configurator (web browser) to configure the SPEEDLAN 9200 routers. If you want to configure a router in SPEEDView, just double-click any router and it will open the SPEEDLAN 9200 Configurator. For more information about SPEEDView, see the SPEEDManage User Guide.*

Wireless Interface IP Address Assignment

If the wireless interface does not already have a statically configured IP address, it will assume the 10.x.y.z/8 address, where x, y, and z are the decimal representations of the least significant three octets of the IEEE 802 MAC address of the SPEEDLAN 9200's wireless interface. This method is used to ensure uniqueness. Because the last three octets of the IP address are variable, a /8 netmask (255.0.0.0) is used in order for the SPEEDLAN 9200s to communicate on this network.

Automating the Configuration of Multiple SPEEDLAN 9200s

Some of the configuration parameters for the SPEEDLAN 9200 are common to all SPEEDLAN 9200s in the same network, for instance the channel and signaling rate of the wireless interface.

Completing Configuration

Certain configuration parameters require a reboot after they have been changed. Therefore, to ensure all changes have been activated, each SPEEDLAN 9200 should be rebooted when its configuration is complete. Multiple SPEEDLAN 9200 routers can be rebooted at the same time from either the SPEEDView application or the SPEEDLAN

9200 Configurator. To reboot the router in the SPEEDLAN 9200 Configurator, choose Reboot *from the* System *menu (see Reboot, page 3-30).*

Adding Additional SPEEDLAN 9200s to the Wired Network

If you need to add an additional SPEEDLAN 9200 to the wired network, do the following:

- *Connect the additional SPEEDLAN 9200 routers to a hub or switch on the network and have DHCP assign IP addresses dynamically.*
- *Connect additional SPEEDLAN 9200 routers to a hub or switch on the network one at a time, changing the wired IP address of each router as it is added, to an address other than 192.168.69.1 (to avoid duplicate IP addresses).*
  If you need help, contact your system administrator.

Overview of the SPEEDLAN 9200 Configurator General Main Menu

How the Configurator Menu is Structured

Base stations, CPE routers, point-to-point routers and mesh routers all use the same main menu, as shown in Figure 3-4 on page 3-9. However, some of the submenus are limited depending on which mode you are operating, such as base station mode, CPE mode, point-to-point (primary and secondary), and mesh mode. Any configuration that is common for the base station, CPE, point-to-point, and mesh router is located in this chapter.

Network menu

Use this menu to view a list of the interfaces that exist on the router, such as wireless interfaces, fixed interfaces, or both. This is where you would assign either a static or dynamic Internet address for the router. You will also be able to define the display name for the wireless or fixed device and add an Alias IP. For more information, see IP Address Configuration, page 3-18.

- *If you need to view mesh routers currently on the network, Mesh Nodes, page 4-3. To authenticate your mesh routers and enable security for SPEEDMesh-enabled clients, see Enabling Network Security, page 4-4. To* *enable AES encryption in your network, see A. Enabling Encryption Between SPEEDLAN 9200 Routers, page 4-4. To enable WEP security on a SPEEDMesh-enabled client, see B. Enabling WEP Security Between a SPEEDMesh-Enabled Client and SPEEDLAN 9200, page 4-5. To allow a mesh node in a 9200 network to communicate with a SPEEDMesh-enabled client, see Enabling/Disabling the SPEEDMesh-Enabled Client, page 4-6.*

System menu

Use this menu to define information about the host, view information about the SPEEDLAN 9200 Configurator, set the current password and reboot the SPEEDLAN 9200 router. For more information see, System Menu, page 3-24. To view a configuration summary of the units on the network, see Configuration Summary, page 3-24. The SPEEDLAN 9200 contains a Simple Network Management Protocol (SNMP) Agent that provides a remote Network Management System (NMS) with read-only ("get") access to certain configuration and status parameters. For more information, see SNMP, page 3-25.

Routing menu

Use this menu to view and set routing configuration. For more information, see Routing Menu, page 3-36. This is also where you can set RIP-2 MD5 Authentication (see Authentication on RIP-2 MD5, page 3-39).

Wireless menu

Use this menu to configure the wireless parameters.

- *If you choose* Configuration*, you will be able to set the following radio parameters: SSID, wireless mode, channel, signaling rate, turbo mode, Tx power and preamble. For more information, see Configuration, page 3-43 for more details.*
- *If you choose* Tx Retries*, you will be able to set the Transmit Retry Limit and Signaling Rate Fallback. For more information, see Max Tx Retries and Signaling Rate Fallback, page 3-46.*
- *If you choose* Max Throughput*, you will be able to set the Max Transmit Data Rate in Kb/s. For more information, see Max Throughput (Regulating Bandwidth), page 3-48.*

Other specialized parameters not common under the Wireless menu for mesh routers:

  - *RTS/CTS has been added to this chapter. See Request to Send (RTS) / Clear to Send (CTS), page 4-8. RTS/CTS allows you to fine-tune the operation of your wireless LAN. It will help minimize collisions between transmissions from hidden nodes on the wireless network.*
  - *If you choose* Rx Threshold*, you will be able to set the threshold for each mesh router on the network. For more information, see Receive (Rx) Threshold Parameter, page 4-9 for details.*
  - *If you choose* Blocked Links*, you will be able to block or unblock mesh routers. For more information, see Blocked Links, page 4-10 for more details.*
  - *If you want to enter the number of times that a neighbor node can fail to reply to a neighbor discovery probe before it is declared unreachable, see Link Expiration, page 4-11.*
- DHCP
  Use this menu to configure a DHCP server on one or more of the wired interfaces. You can also view log messages and view the interfaces being serviced with DHCP. For more information see, DHCP Server Menu, page 3-56. You can also enable DHCP Relay and set the parameters as needed.
- Forwarding
  Use this menu to control how traffic is forwarded through this router. For more information, see Forwarding Menu, page 3-63.
- Diagnostics

  Use this menu to troubleshoot your SPEEDLAN 9200 network. For more information, see Diagnostics Menu (Troubleshooting the Network), page 3-79.
- Admin
  Use this menu to perform administrative tasks, such as setting up user password and permission information. You can also remotely control the SPEEDLAN 9200 routers on the network, update software, reset all configuration to the factory default, enable or disable SPEEDSignal, and enable manufacturer access to the router for advanced troubleshooting. For more information, see Admin Menu, page 3-85.
  - *If you need to remotely reboot or turn off the SPEEDLAN 9200 mesh routers, see Remote Control, page 4-12.*
  - *If you need to remotely reboot a mesh router, see Remote Control, page 4-12. If you need to update the software on the mesh routers, see Software Update, page 4-12.*

Diagram of SPEEDLAN 9200 Configurator Main Menu

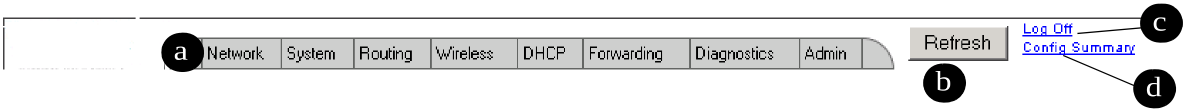


Figure 3-4: Main menu

- **a** Main menu: *Contains the following menus: Network, System, Routing, Wireless, DHCP, Forwarding, Diagnostics and Admin.*
- **b** Refresh button: *Click to Refresh data on the web page.*
- **c** Log Off link: *Click to close a user session.*
- **d** Config Summary link: *Click to view a summarized list of the configuration on the routers (units). For more information, see Configuration Summary, page 3-24*

Note: *If you want to learn more about IP addressing, see Basics of IP Addressing, page 5-2.*

Logging on the SPEEDLAN 9200 Configurator

To access the SPEEDLAN 9200 Configurator, open your web browser and enter the URL (https://) or IP address of the router you want to configure. The factory default IP address is 192.168.69.1.

Note: *The SPEEDLAN 9200 Configurator can be accessed at the standard web (HTTP, port 80) and secure web (HTTPS, port 443) locations. If you have forwarded either of those ports to internal network nodes, you can still reach the configurator at an alternate location:*

- *port 6590 - server alternate HTTPS (for example, type "https://192.168.69.1:6590/")*

Classes of Users (and Passwords)

All software including the SPEEDLAN 9200 Configurator and SPEEDManage share the same password(s). The only place where you change the password for all of these is in the

SPEEDLAN 9200 Configurator. For more information about SPEEDManage, see the SPEEDManage User Guide.

There are five classes of users on the SPEEDLAN 9200. The classes are as follows with their default passwords:

- Full Access (also known as a superuser): *"wave_full" (this is also the only access password for IP Recover in the SPEEDManage suite). Use this option when changing passwords. You cannot change the password to an existing password.* Note: *"Full Access" does not show up in "Admin/Users" because the user will not be able to change its permissions and it has write permission on everything.*
- Wired Admin: *"wave_wired_admin" (account for the private Ethernet network)*
- Wired Read: *"wave_wired" (account for the private Ethernet network)*
- Wireless Admin: *"wave_wireless_ad" (account for the wireless SPEEDLAN 9200 network)*
- Wireless Read: *"wave_wireless" (account for the wireless SPEEDLAN 9200 network)*

Notes:

The minimum password length is 8 characters. The maximum password length is 16 characters (including the underscore character or spacebar). Any characters over the maximum length (16) will be truncated. This rule applies for the Configurator and the SPEEDManage suite.

Admin accounts have administration rights to their appropriate network (wired or wireless), and Read Only accounts have only read only access.

If you are a network administrator and want to modify the default passwords and settings for any of the users, choose the Admin *menu. For more information, see Admin Menu, page 3-85.*

Logging On

Follow these steps (starting on the following page) to log on to the SPEEDLAN 9200 Configurator.

1 *Make sure you entered the correct URL or IP address of the router. For more information, see Logging on the SPEEDLAN 9200 Configurator, page 3-10.*

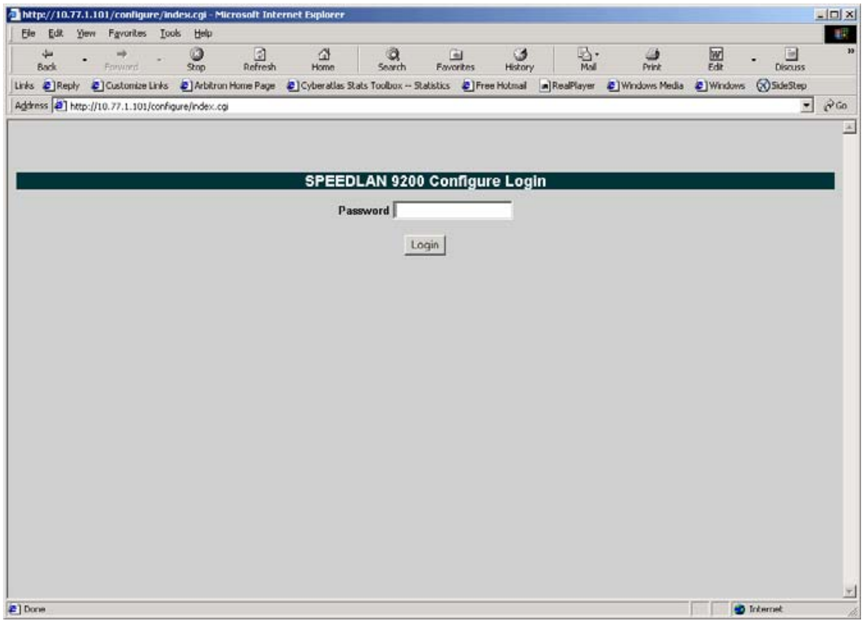

http://10.77.1.101/configure/index.cgi - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back
Forward
Stop
Refresh
Home
Search
Favorites
History
Mail
Print
Edit
Discuss
Links
Reply
Customize Links
Arbitron Home Page
Cyberatlas Stats Toolbox -- Statistics
Free Hotmail
RealPlayer
Windows Media
Windows
SideStep
Address http://10.77.1.101/configure/index.cgi
Go
SPEEDLAN 9200 Configure Login
Password
Login
Done
Internet

Figure 3-5: Login page

2 *Enter the password in the* Password *text box. To know which password (from 8 to 16 characters) you should enter, see Classes of Users (and Passwords), page 3-10.*

3 *Login by clicking* Login.

4 *When you login for the first time, the Security Alert dialog box will appear. Follow the directions under Understanding the Security Alert Screens, page 3-12.*

Logging Off

If you need to log off the Configurator, click the Log Off *link (as circled in red in the figure below).*

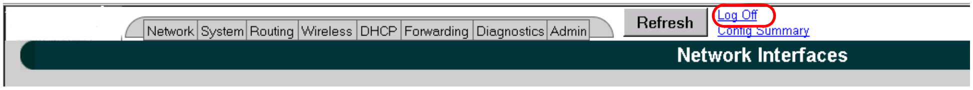


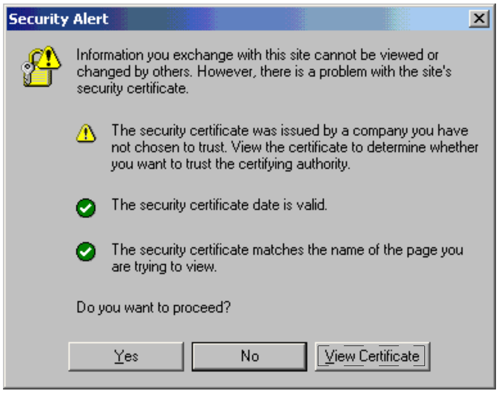
Figure 3-6: Logging Off

Understanding the Security Alert Screens

In order to avoid a security alert each time the SPEEDLAN 9200 Configurator is accessed, you must install its security certificate into Internet Explorer. If the SPEEDLAN 9200's host name changes, you will have to repeat this process.

Follow the steps beginning on the next page:

1 *When the Security Alert dialog box appears, click* View Certificate *(right most button on bottom of Security dialog box). The following dialog box will appear.*



Security Alert

Information you exchange with this site cannot be viewed or changed by others. However, there is a problem with the site's security certificate.

⚠ The security certificate was issued by a company you have not chosen to trust. View the certificate to determine whether you want to trust the certifying authority.

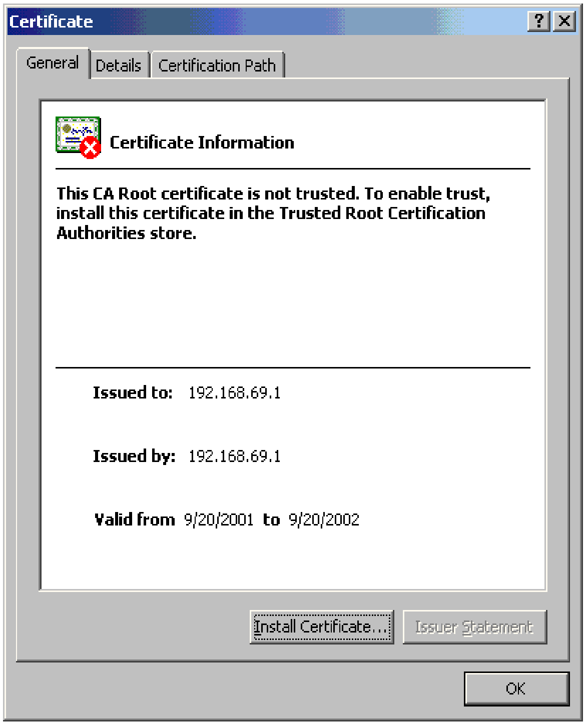
✓ The security certificate date is valid.

✓ The security certificate matches the name of the page you are trying to view.

Do you want to proceed?

Figure 3-7: Security Alert screen

2 *Click* Install Certificate.



Certificate Information

This CA Root certificate is not trusted. To enable trust, install this certificate in the Trusted Root Certification Authorities store.

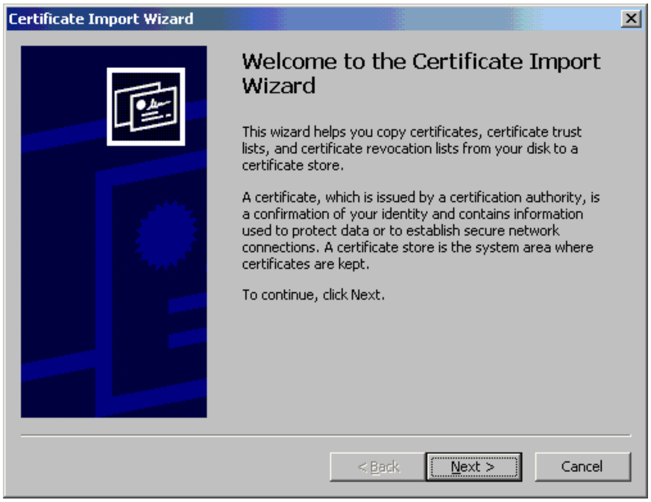
Issued to: 192.168.69.1

Issued by: 192.168.69.1

Valid from 9/20/2001 to 9/20/2002

Figure 3-8: Certificate screen

3 *The Certificate Import Wizard will appear.*



Welcome to the Certificate Import Wizard

This wizard helps you copy certificates, certificate trust lists, and certificate revocation lists from your disk to a certificate store.

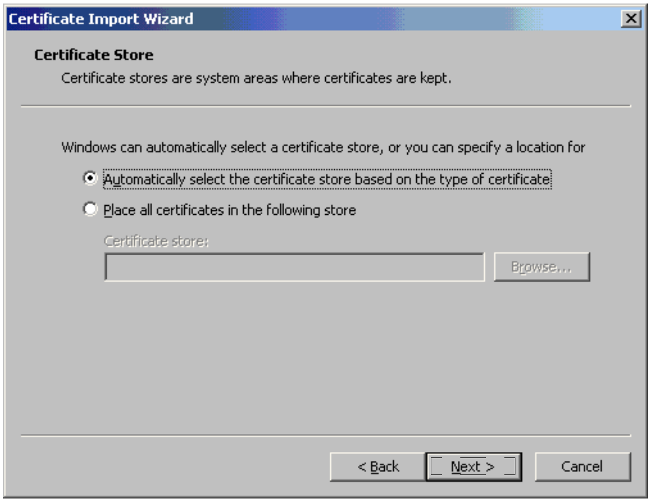
A certificate, which is issued by a certification authority, is a confirmation of your identity and contains information used to protect data or to establish secure network connections. A certificate store is the system area where certificates are kept.

To continue, click Next.

Figure 3-9: Certificate Import Wizard screen 1

4 *Click* Next.

5 *The following dialog box will appear.*



Certificate Import Wizard

Certificate Store

Certificate stores are system areas where certificates are kept.

Windows can automatically select a certificate store, or you can specify a location for

● Automatically select the certificate store based on the type of certificate

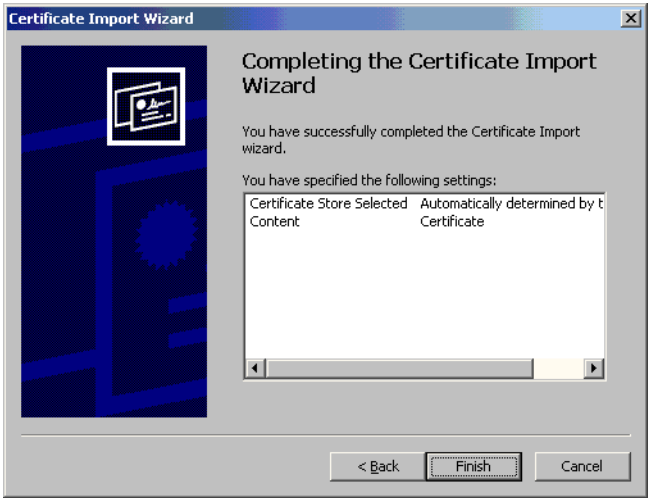
○ Place all certificates in the following store

Certificate store:

Figure 3-10: Certificate Import Wizard screen 2

6 *Click* Next *again.*

7 *The following dialog box will appear.*



Certificate Import Wizard

Completing the Certificate Import Wizard

You have successfully completed the Certificate Import wizard.

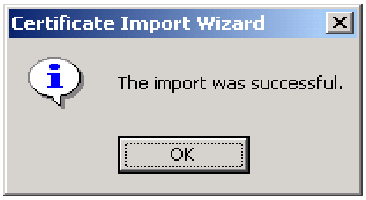
You have specified the following settings:

Certificate Store Selected	Automatically determined by t
Content	Certificate

Figure 3-11: Certificate Import Wizard screen 3

8 *Click* Finish. *A message will appear asking you "if you want to add a certificate to the Root Store." Click* Yes.

9 *You will see a confirmation stating that the import was successful. Click* OK. *Click* OK *again. If the Security Alert dialog box appears, click* Yes.



Certificate Import Wizard

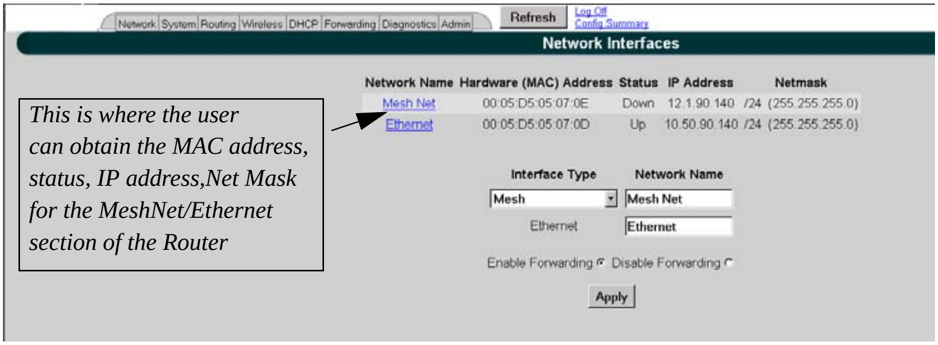
The import was successful.

Figure 3-12: Certificate Import Wizard message box

You should not get the Security Alert the next time you access this site. The SPEEDLAN 9200 Configurator web site will appear.

After Logging On

After you log on, you will see the Network Interfaces page, as displayed below.



Network Interfaces

Network Name	Hardware (MAC) Address	Status	IP Address	Netmask
Mesh Net	00:05:D5:05:07:0E	Down	12.1.90.140 /24	(255.255.255.0)
Ethernet	00:05:D5:05:07:0D	Up	10.50.90.140 /24	(255.255.255.0)

Interface Type	Network Name
Mesh	Mesh Net
Ethernet	Ethernet

Enable Forwarding ● Disable Forwarding ○

This is where the user can obtain the MAC address, status, IP address,Net Mask for the MeshNet/Ethernet section of the Router

Figure 3-13: 1st screen after logging on

Elements to know on the Network Interfaces page:

- *If you click the interface link,* Ethernet, *you will jump to the IP Addresses page.*
- *The* "Interface Type" *drop-down list is where you select the type of router. To select a different mode, select it and click* Apply. *The Configurator will log you out, reboot the unit, and the next time you log in the mode will be available.*
- *Click the* Refresh *button to refresh data.*
- *The name you enter in the* Network Name *text box (shown in Figure 3-13 on page 3-15) determines what the interfaces are called on the network. For instance, you can enter, "Star Net" in the* Network Name *text box to represent the*

"Star CPE" interface. This option just gives the user control over the name of the interface.

What are enable and disable forwarding?

- Enable Forwarding: *Select the* Enable Forwarding *option to enable the forwarding of IP packets from the wired interface to the wireless interface and vice-versa.*
- Disable Forwarding: *Select the* Disable Forwarding *option to disable the forwarding of IP packets from the wired interface to the wireless interface and vice-versa.*

Helpful Information to Know...

How do you select the router?

As shown in Figure 3-13 on page 3-15, select the type of router (e.g., mesh) from the Interface Type *drop-down list. Then, click* Apply. *The SPEEDLAN 9200 Configurator will then recognize the router you selected and allow you to make modifications as needed.* Note: *If you need to change the router's topology mode (base station, CPE, point-to-point or mesh) from or to another topology mode (base station, CPE, point-to-point or mesh), see Changing the Router's Topology Mode, Change Topology Mode, Appendix A-2. (Directions are also described in the previous figure, see Figure 3-13 on page 3-15.)*

References on Setting Up the Router

The next step is to set up your router. Follow this chapter to set up the IP address, set routing information, set DHCP, set NAT information, troubleshoot network errors (diagnostic information), and enter basic Administrative information. Make sure you see the section called, Overview of the SPEEDLAN 9200 Configurator General Main Menu, page 3-6. This section will tell you which functions are common to all routers and which functions are specialized. This will help you locate the proper section in the manual more quickly.

Caching - viewing the most recent version of a page

Important Note: *If you do not see the changes you made on a configurator page, click the* Refresh *button, as shown in Figure 3-13 on page 3-15. Then, the changes will appear.*

If the above procedure does not work, follow these steps below:

1. *Go to your Internet browser. (These directions are for Internet Explorer.)*
2. *From the* Tools *menu, choose* Internet Options. *The Internet Options dialog box appears. Click the* Delete Files *button. Then, click* OK.
3. *On the Internet Options dialog box, click the* Settings *button. The Settings dialog box appears. Select the* Every visit to the page *option. This makes sure that the new information is displayed the next time you visit the configurator web page, and the new information will also be added on the SPEEDLAN router.*

Session Activity

If you receive this message during your configuration session, "Sorry, the maximum number of sessions has been reached. Try to login later," this is because the maximum log on is 32 concurrent sessions.

If you receive this message during your configuration session, "Your session has expired due to inactivity or because another user has made configuration changes that affect your session, " this is because the configuration session's default time is 30 minutes.

SPEEDLAN 9200 Firmware Updates, SPEEDManage or Other Utility Programs

Registered customers should check our web site on a regular basis for updates to router firmware, SPEEDManage, and other utility programs. If you haven't registered your products yet, you may do so by visiting www.p-com.com + click on the Wave Wireless Logo + Support. For more information about SPEEDManage, see the SPEEDManage User Guide.

If You Need a Temporary IP Address

- *If after learning the IP address of the Ethernet interface, you cannot log on to the router using the HTML Configurator (SPEEDLAN 9200 Configurator), then you will be able set a temporary Ethernet IP address so that a connection can made.The temporary IP address will last until next reboot or interface start.*

OR

- *For additional information, see the IP Recover chapter in the SPEEDManage User Guide.*

The Configuration Menu

Network Menu

- *Choose* Interfaces *to select the router you need.*
- *Choose* IP Addresses *from the* Network *menu to assign an IP address (manually or dynamically via DHCP).*
- *Choose* Virtual Addresses *from the* IP Addresses *submenu (under the Network menu) to create a public IP address that can be mapped to a private IP address.*

Network Interfaces

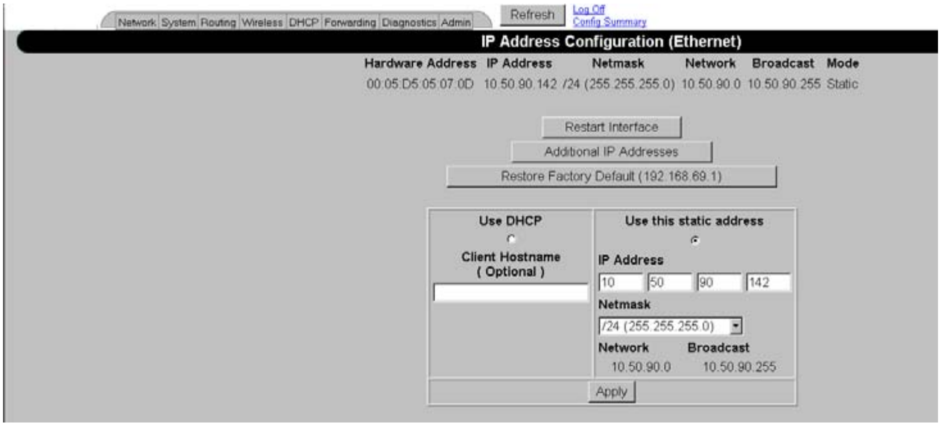
Choose the type of router as shown in Figure 3-13 on page 3-15. Then, click Apply.

IP Address Configuration

This is where you would assign IP Addresses either Manually (static) or via DHCP (dynamic). For DHCP, you may also enter the hostname of the client.

To activate this page, choose IP Addresses *and then the name of the interface (i.e., Ethernet, Star Net, Mesh Net) from the* Network *menu. The following page will appear.*

The following page similar to the following will appear. (This is showing a Mesh interface.)



IP Address Configuration (Ethernet)

Hardware Address	IP Address	Netmask	Network	Broadcast	Mode
00:05:D5:05:07:0D	10.50.90.142	/24 (255.255.255.0)	10.50.90.0	10.50.90.255	Static

Use DHCP ○

Client Hostname (Optional)

Use this static address ●

IP Address: 10 . 50 . 90 . 142

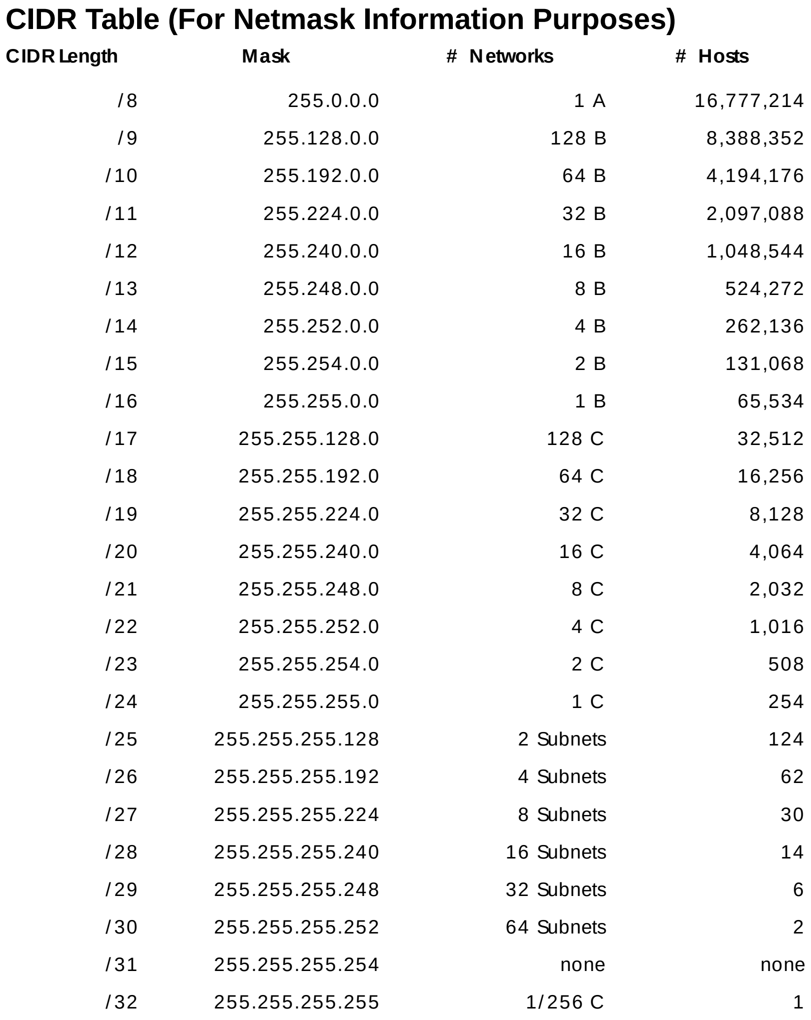
Netmask: /24 (255.255.255.0)

Network: 10.50.90.0 Broadcast: 10.50.90.255

Figure 3-14: IP Addresses page

After you choose the appropriate interface, you will be able to view the following parameters:

- Hardware (MAC) Address: *In a LAN environment each network interface contains its own Medium Access Control (MAC) address which is the embedded and unique hardware number.*
- IP Address: *This address tells the network how to locate the computers or network equipment connected to it.*
- Netmask: *The netmask is a 4-byte number that masks the network part of the Internet Protocol IP address, so only the host computer part of the address remains.*
- Mode: "*Static" or "DHCP."*



CIDR Table (For Netmask Information Purposes)

CIDR Length	Mask	# Networks	# Hosts
/8	255.0.0.0	1 A	16,777,214
/9	255.128.0.0	128 B	8,388,352
/10	255.192.0.0	64 B	4,194,176
/11	255.224.0.0	32 B	2,097,088
/12	255.240.0.0	16 B	1,048,544
/13	255.248.0.0	8 B	524,272
/14	255.252.0.0	4 B	262,136
/15	255.254.0.0	2 B	131,068
/16	255.255.0.0	1 B	65,534
/17	255.255.128.0	128 C	32,512
/18	255.255.192.0	64 C	16,256
/19	255.255.224.0	32 C	8,128
/20	255.255.240.0	16 C	4,064
/21	255.255.248.0	8 C	2,032
/22	255.255.252.0	4 C	1,016
/23	255.255.254.0	2 C	508
/24	255.255.255.0	1 C	254
/25	255.255.255.128	2 Subnets	124
/26	255.255.255.192	4 Subnets	62
/27	255.255.255.224	8 Subnets	30
/28	255.255.255.240	16 Subnets	14
/29	255.255.255.248	32 Subnets	6
/30	255.255.255.252	64 Subnets	2
/31	255.255.255.254	none	none
/32	255.255.255.255	1/256 C	1

Figure 3-15: CIDR information page

- Restart Interface: *Click to restart the interface.*
- Additional IP Addresses: Click this button to add an Alias IP. *(You can add an alias IP address to the Ethernet interface.) This allows you to assign more than one IP address to an Ethernet interface. For more information, see Alias IP, page 3-21.*
- Restore Factory Default: *Click to revert to factory default settings for this interface.*
- Use DHCP: *Select this option if you want to dynamically acquire an IP address or DHCP from a DHCP server. The DHCP (Dynamic Host Configuration*

Protocol) server assigns the IP address to each computer as the computer connects to the network. If a computer moves to a new network, it must be assigned a new IP address for that network. DHCP can be used to manage these assignments automatically. Then, click Apply.
Optional: *If you prefer, you can enter the client name of the host in the* Client Hostname *text box (under "Use DHCP"). The limit of the Client Hostname is 16 characters. (See also Important Note about DHCP, page 3-57.)*

- Use this static address: *Select this option if you want to statically assign an IP address to the interface. For example: you may want to assign a "static" (permanent) address to a computer that will always be used as a server. This enables other computers to connect to it. Static addressing is also beneficial to users that need to maintain a "constant" connection to the Internet. Then, click* Apply.

Note: *If you selected the* "Use this static address" *option, enter the Internet address that you want to assign to the interface in the* IP Address *text box. You will also enter the subnet/netmask for the IP address. Select the appropriate netmask in the* Netmask *drop-down list.*

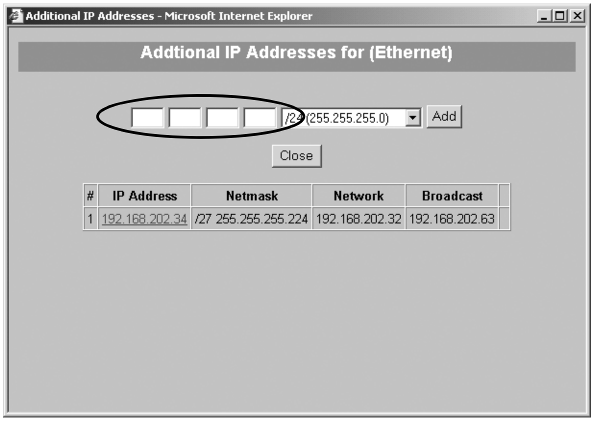
After you change the Internet address for an Ethernet or directly connected interface, you must restart the interface. Otherwise, the information will not be activated. If you follow this step correctly, the next time you open the SPEEDLAN 9200 Configurator, these changes will be updated.

Alias IP

Note: *Alias IP addresses can only be created for the Ethernet interface. They are not for the wireless interface.*

To add an Alias IP, do the following:

1 *Choose* IP Addresses + Ethernet *from the* Network *menu. Next, click the* Additional IP Addresses *button on the IP Address Configuration (Ethernet) page. The IP Addresses Configuration (for Ethernet) page will appear:*



Additional IP Addresses - Microsoft Internet Explorer

Addtional IP Addresses for (Ethernet)

/24 (255.255.255.0)

#	IP Address	Netmask	Network	Broadcast
1	192.168.202.34	/27 255.255.255.224	192.168.202.32	192.168.202.63

Figure 3-16: Adding an Additional IP Address (Alias IP)

2 *Aliased addresses cannot be dynamically assigned from the DHCP server, so you must manually type in the Alias IP in the text box, circled above. Verify the netmask and click* Add*. Repeat this step for each Alias IP you add to the Ethernet interface.*

Other elements on this window are described below:

- # - (Address Number): *The first address is the primary IP address on the Ethernet interface. Addresses numbered 2 or higher are aliases.*
- IP Address: *Lists the IP address of the primary or alias address.*
- Netmask: *Lists the netmask of the primary or aliased address.*
- Network: *Lists the network number of the primary or aliased address.*
- Broadcast: *Lists the broadcast address of the primary or aliased address.*

Virtual Addresses

Choose Virtual Addresses *from the* IP Addresses *submenu (under the Network menu) to create a public IP address that can be mapped to a private IP address. Virtual addresses are IP addresses (usually public) that the SPEEDLAN 9200 router can use in addition to the IP addresses assigned to each of its network interfaces. Virtual addresses are normally used to preserve public IP addresses when a limited number is available. Previously, virtual addresses were implicitly created when referenced in a NAT rule.*

Virtual addresses can be used to access the SPEEDLAN 9200 router for configuration, or in NAT functions like Address Sharing, Internal Servers, and 1:1 NAT. Virtual addresses are particularly useful when using 1:1 NAT, where you need more than one public IP address. The virtual addresses do not need to belong to a network assigned to one of the SPEEDLAN 9200's interfaces.

The existence of these addresses will be advertised with RIP, providing that the RIP filters allow it. The Virtual Address page will appear when you choose the Virtual Addresses feature.

The elements on this page are explained below:

- IP Address: *In this text box, enter the virtual address you want to add. Click* Add *to add the new virtual address. (In the next figure, the user entered "13.13.13.16" in the* IP Address *text box. Next, the user will click* Add.*)*

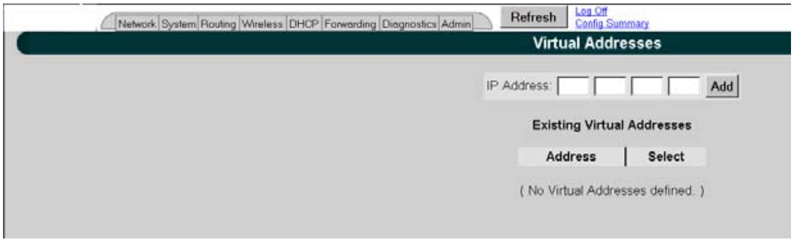
Notes: *You cannot apply an IP address from the Ethernet port's subnet.*
All virtual addresses have a netmask of /32 (255.255.255.255).

Existing Virtual Addresses

This list contains all defined virtual addresses.

- *To remove a virtual address, select it and click* Delete Selected. *(In the next figure, if the user wants to remove virtual address "13.13.13.14". Then, the user would select the check box next to it and click* Delete Selected.*)*
- *To select all addresses, click* All. *To clear all selections, click* None.

If an entry has "(In Use)" instead of a check box (as shown in the next figure to the right of virtual address "13.13.13.13"), this means the virtual address is "in use" and cannot be removed.



(No Virtual Addresses defined.)

Figure 3-17: Virtual address

Note: *If you want to distribute virtual routes, make sure the* Static Routes *check box is selected on the RIP Global Settings page under the Routing / RIP2 Setup / Global Settings menu.*

System Menu

- *Choose* Config Summary *to view a summarized configuration of the units.*
- *SNMP: The SPEEDLAN 9200 contains a Simple Network Management Protocol (SNMP) Agent that provides a remote Network Management System (NMS) with read-only ("get") access to certain configuration and status parameters. For more information, choose* SNMP.
- *Choose* Version *to view the current version information.*
- *Choose* Host Name *to enter a name of the host.*
- *Choose* Password *to modify the password entries.*
- *Choose* Reboot *to reboot the system.*

Configuration Summary

To view a summarized list of the configuration on the units, choose Config Summary *from the* System *menu. (You can also select the Config Summary link in the upper-right hand corner of each page.) This is very useful tool if you want to capture a screen shot of the summary and email it to technical support. The Configuration Summary for the Host page will appear displaying a summary which includes the following information:*

- System Version*: Displays the firmware version and uptime for the unit.*
- SNMP: *Displays the read-only SNMP configuration parameters and their current status which are described in SNMP, page 3-25.*
- Network Interfaces: *Displays the interfaces on the network.*
- Route Table: *Displays the routing information between destinations.*
- Wireless Configuration: *Displays the channel, signaling rates, Max Tx Retries, Signaling Rate Fallback, SSID, Max Throughput, Rx Threshold and Link Expiration.*
- Blocked Wireless Links: *Displays blocked links. For more information, see Receive (Rx) Threshold Parameter, page 4-9.*
- Wireless Security Settings: *See Enabling Network Security, Chapter 8.*

- RIP Configuration: *The routing table displays routing information between destinations.*
- Routing Configuration: *Indicates if RIP is on or off, lists global settings and send and receive information, authentication and distribute information.*
- DHCP Server Configuration: *Indicates if DHCP Server Configuration is on or off.*
- DHCP Relay Configuration: *Indicates if DHCP Relay Configuration is on or off.*
- Virtual Addresses: *Displays virtual addresses.*
- NAT: *Lists the implementation(s) of NAT: address sharing, internal servers and 1:1 NAT.*
- Firewall: *Displays if the firewall is enabled or disabled.*
- ARP Table: *Displays Address Resolution Protocol statistics.*
- Statistics: *Displays statistics about the wireless inbound and outbound traffic.*

Note: *Select the appropriate feature (noted via blue-underlined hyperlink) to jump to the proper feature page. For example, if you click the* Firewall *link on the Configuration Summary page, it will bring up the Firewall page where you can modify further information.*

There is a short-cut link to the Configuration Summary by clicking the Config Summary *Link as circled in the figure below.*

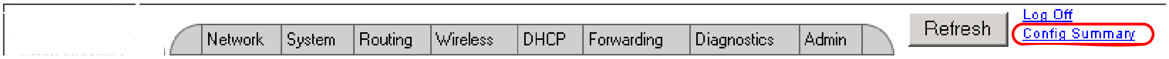


Figure 3-18: Config Summary Link

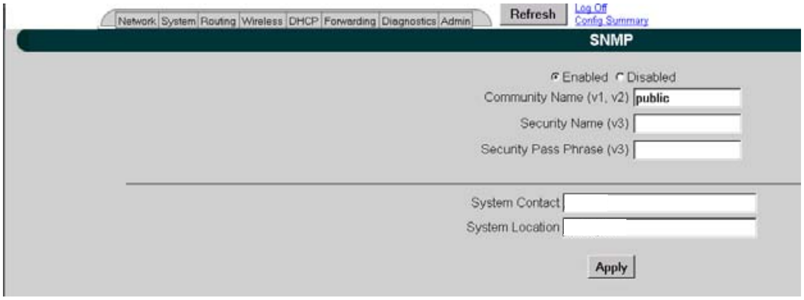
SNMP

The SPEEDLAN 9200 contains a Simple Network Management Protocol (SNMP) Agent that provides a remote Network Management System (NMS) with read-only ("get") access to certain configuration and status parameters. Those parameters are Management Information Base (MIB) objects. The currently supported MIBs are identified in table the MIBs.

The SPEEDLAN 9200 supports communications with an NMS using SNMP versions 1, 2 or 3. Secure communications between NMS and Agent requires use of SNMP version 3.

To enable the SNMP Agent, do the following:

1. *Choose* SNMP *from the* System *menu. The following page will appear:*



SNMP

● Enabled ○ Disabled

Community Name (v1, v2) public

Security Name (v3)

Security Pass Phrase (v3)

System Contact

System Location

Figure 3-19: SNMP

2. *Enter the following information, depending on the version(s) of the SNMP protocol supported by your NMS, and the level of security required:*
   - Community Name (v1, v2): *This is the read-only password. This entry is blank by default - you have to create one for the service to work. (If this entry is left blank, SNMP v1 or v2 service will be disabled.) The minimum number of characters entered is 1 and the maximum number of characters entered is 30. The default name is "public". If you want to use SNMP v1 or v2, enter the community name. Otherwise, leave this entry blank.*
   - Security Name (v3): *This is the read-only 'user name' used for SNMP v3. This entry should be set to a value that is only known by the network administrator. The minimum number of characters entered is 1 and the maximum number of characters entered is 30.*
   - Security Pass Phrase: *This is the 'password' for SNMP v3. The minimum number of characters entered is 8 and the maximum number of characters entered is 30.*

Note: *If you want to use SNMP v3, enter the Security Name and Security Pass Phrase. Otherwise, leave these entries blank.*

- System Contact: *This field should contain the identification of the contact person for this SNMP-managed node.*
- System Location: *This field should contain the administratively assigned name for this managed node. By convention, this is the node's fully qualified Internet Domain name (e.g., "noc.domain.com").*

3. *After you have entered the information described above, click* Apply.

4 *Enable SNMP by selecting the* Enabled *option. When SNMP is enabled, the SPEEDLAN 9200 router will respond to SNMP queries initiated by your NMS. (See the section below for MIBII strings and definitions.) If you want to disable it, click the* Disabled *option. (SNMP is disabled by default.)*

5 *You will receive a confirmation that your settings have been applied. SNMP is now enabled on the node you want to monitor.*

6 *To view SNMP information, you must now use a NMS. Consult your NMS software for information on polling and logging the MIB objects.*

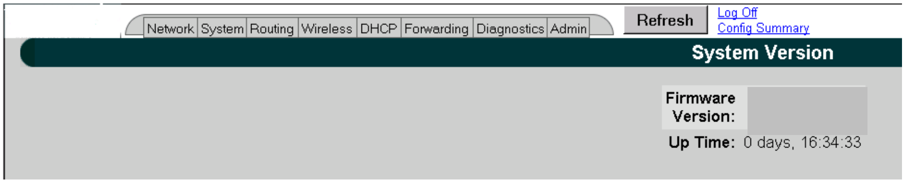
Table 3-1: List of MIBs supported by SPEEDLAN 9200

MIB Name	*RFC*[+]	*SPEEDLAN 920x Firmware*
MIB-II	*RFC1213*	*1*
SNMPv2-MIB	*RFC3418*	*1*

[+] *RFC = Internet Engineering Task Force (IETF) Request for Comments (http://www.rfc-editor.org/rfc.html)*

Version

This page displays information about the current version. When you choose Version *under* System *menu, the System Version page appears displaying the following information.*



System Version

Firmware Version:

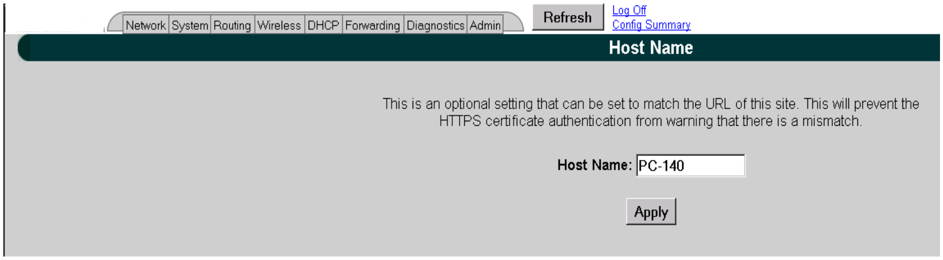
Up Time: 0 days, 16:34:33

Figure 3-20: Version page

- Firmware Version: *The version of the firmware.*
- Up Time: *The time since the last system startup was initialized.*

Host Name

To enter the host name of a SPEEDLAN 9200 router, choose Host Name *from the* System *menu. The following page will appear.*



Host Name

This is an optional setting that can be set to match the URL of this site. This will prevent the HTTPS certificate authentication from warning that there is a mismatch.

Host Name: PC-140

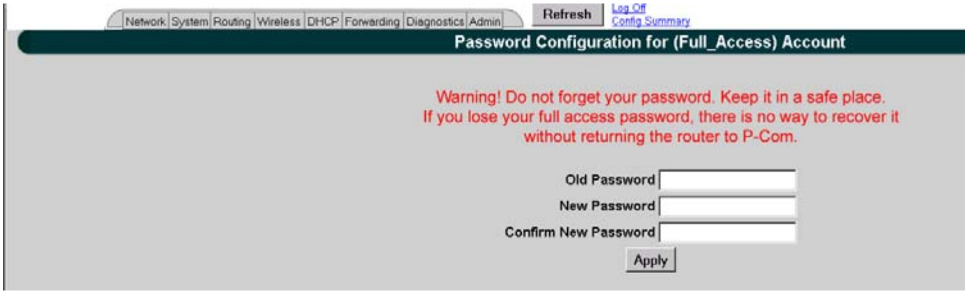
Apply

Figure 3-21: Host Name page

The hostname should contain the administratively assigned name for this managed host.

Password

This is where you modify the password for the current account on the SPEEDLAN 9200 Configurator. To modify password information, choose Password *from the* System *menu. The following page will appear.*



Password Configuration for (Full_Access) Account

Warning! Do not forget your password. Keep it in a safe place.
If you lose your full access password, there is no way to recover it without returning the router to P-Com.

Old Password

New Password

Confirm New Password

Apply

Figure 3-22: Password page

To enter a new password, do the following:

1. *Enter the old Password in the* Old Password *text box.*
2. *Next, enter the new password in* New Password *text box.*
   The minimum password length is 8 characters. The maximum password length is 16 characters (including the underscore character or spacebar).

3 *Finally, confirm the new password in the* Confirm New Password *text box and click* Apply.

Warning! Do not forget your password. Keep it in a safe place.
If you lose your full access password, there is no way to recover
it without returning the router to the manufacturer.

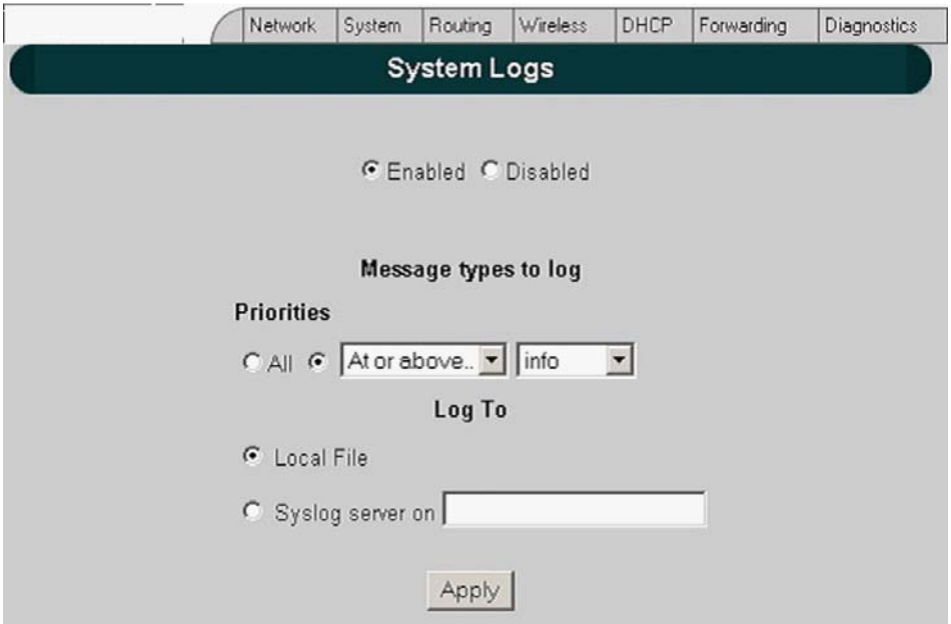
Reboot

To reboot the system, choose Reboot *from the* System *menu. Then, click the* Reboot *button. After clicking* Reboot, *it could take a minute for the SPEEDLAN 9200 to become fully operational following a reboot.*

SYSTEM MESSAGE LOGGING

Linux syslog feature is supported in SPEEDLan 9200 to log system messages. Messages are forwarded to a central daemon by library functions.

To access System Logs configuration page, choose Message Log->Configure from System main menu.



System Logs

● Enabled ○ Disabled

Message types to log

Priorities

○ All ● At or above.. info

Log To

● Local File

○ Syslog server on

Figure 3-23: System Logs

System logs page provides the following settings to allow user to configure the logs on the system:

- *Enable/Disable - Choose enable or disable radio button to enable or disable system messages logging respectively;*
- *Choose message priority level to be logged, Allow you to select all priority levels or customize by choosing desired severity. Syslog has 8 types (levels) of severity:*

0 - EMERG (old name is PANIC)

1 - ALERT

2 - CRIT

3 - ERR (old name is ERROR)

4 - WARNING (old name is WARN)

5 - NOTICE

6 - INFO

7 - DEBUG

Web configurator provides 4 types of flags.

- *At or above*
- *Exactly*

- *Below*
- *All except*

The combination of severity and flag defines the logs that user would like to have.

For example if the user has selected WARNING severity and "At or above" flag, then all logs with one of EMERG, ALERT, CRIT, ERR and WARNING severity will be written to the log.

LOG LOCATION

When logging is enabled, log messages are sent to a logging process, which logs messages to designated locations. You can specify to send log messages to local file or to remote server choosing "Local file" or "Syslog server on" respectively.

The local system log file is located in /var/log/ directory which is a symbolic link to /tmp directory. This directory is cleared out at boot or at shutdown by the local system.

LOG ROTATION

Managing of the maximum size of log file is provided by Linux standard daemon called "logrotate". The "logrotate" checks the size of the log file once in hour and if the size is exceeded the maximum allowed size (for now the limit is 100K) then the log file is cleared out and old file is kept in /var/log folder. The maximum number of copies is 5.

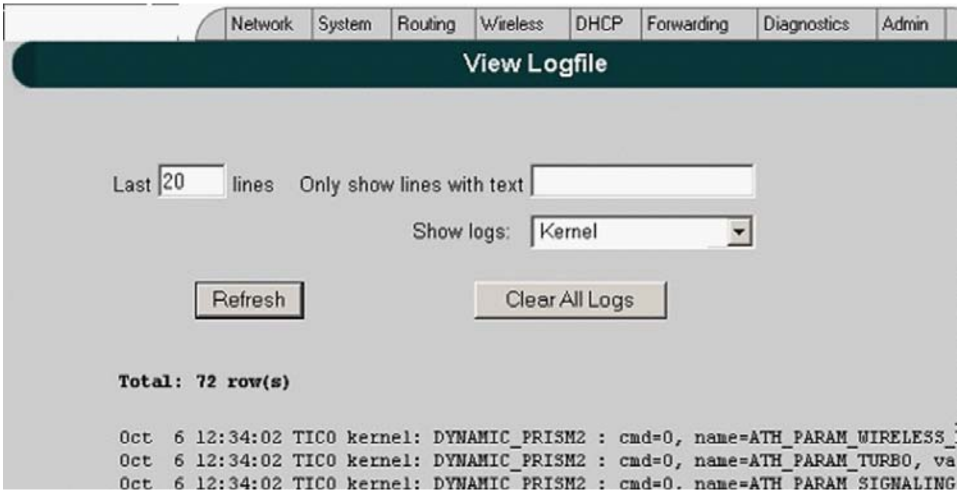
MESSAGE STRUCTURE

The message format always follows the same basic pattern. The date and timestamp come first, followed by the computer name -hostname in our example, and then the message itself. The message starts with the name of the program from which it originated, typically followed by the process number in square brackets.

```
Jan 29 09:06:51 hostname kernel: wlan[ath0]: Set ath0 operation mode: HOSTAP
Jan 29 09:06:51 hostname kernel: wlan[ath0]: Set ESSID: "SPEEDLAN9200"
Jan 29 09:06:51 hostname kernel: wlan[ath0]: Set Turbo: Disabled
Jan 29 09:06:51 hostname kernel: wlan[ath0]: Set Tx power: 17 dBm
Jan 29 09:06:51 hostname kernel: wlan[ath0]: Set Preamble: Long Only
Jan 29 09:06:51 hostname kernel: wlan[ath0]: Set ACL Policy: OPEN
Jan 29 09:07:03 hostname sshd[319]: Server listening on 0.0.0.0 port 22
Jan 29 09:07:09 hostname rc.local: Starting 'socksvr' ...
Jan 29 09:07:10 hostname rc.local: Starting 'sendfilemc' ...
Jan 29 09:07:10 hostname rc.local: Starting 'ip_recov' ...
Jan 29 09:07:10 hostname rc.local: Starting 'k2status' ...
```

VIEW LOGS

To access View System Logs page, choose Message Log->View Logs from System main menu.



Last 20 lines Only show lines with text

Show logs: Kernel

```
Total: 72 row(s)

Oct  6 12:34:02 TICO kernel: DYNAMIC_PRISM2 : cmd=0, name=ATH_PARAM_WIRELESS_
Oct  6 12:34:02 TICO kernel: DYNAMIC_PRISM2 : cmd=0, name=ATH_PARAM_TURBO, va
Oct  6 12:34:02 TICO kernel: DYNAMIC_PRISM2 : cmd=0, name=ATH_PARAM_SIGNALING
```

Figure 3-24: View Logfile

The following controls are available:

- *Specify number of last recorded messages to be displayed;*
- *Filter messages by specifying the text (case insensitive);*
- *Choose source of message recorder: kernel, wlan, dhcp, snmp, config manager*

PREDEFINED LOG MESSAGES

Kernel Logs

```
NatSemi DP8381[56] at 0xc4808000, 00:05:d5:12:67:46, IRQ 11.
00:05:d5:12:67:46, IRQ 11.
Setting full-duplex based on negotiated link capability.
Atheros 5212: mem=0xa0000000, irq=10
```

Atheros Driver Logs

INFO level logs

```
wlan: 0.8.4.4 (EXPERIMENTAL)
ath_hal: 0.9.12.14 (AR5210, AR5211, AR5212)
ath_pci: 0.9.4.11
acl: ACL module 1.0 - loaded

Atheros driver version 0.8.4.4 loaded
Atheros driver unloaded
mac acl policy registered

Set atheros device operation mode: {ADHOC,HOSTAP, … }
Set ESSID: {string upto 32 character}
Set Wireless Mode: {IEEE 802.11a, IEEE 802.11b and IEEE
802.11g}
Set Turbo: {Disabled/Enabled}
Set Tx power: {power in dBm}
Set Preamble: { Short & Long ; Long Only }
Set ACL Policy: {OPEN,ALLOW,DENY}
Set signaling rate: {rate in hexadecimal}
Set Rate:
Set RTS/CTS: {Enabled/Disabled} Threshold: {1 up to 2311}
Set Desired Base/Primary MAC: {MAC address}
Set Channel: { channel value }
Set SW/retry: {Disabled/<value>}
Set encryption stuff
Set Key ID: {1-4};  MAC: {MAC address}
Deleted unicast key for MAC: {MAC address}
Deleted shared key ID: {1-4}
Added ACL MAC: {MAC address}
Deleted ACL MAC: {MAC address}
```

Error Level Logs

```
Unable to attach hardware; HAL status {<status>}
Failed to allocate descriptors: {<error code>}
```

```
Unable to setup a beacon xmit queue!
Unable to register device
ath_pci: 32-bit DMA not available
ath_pci: cannot reserve PCI memory region
ath_pci: cannot remap PCI memory region
ath_pci: no memory for device state
```

Warning Level Logs

```
request_irq failed
```

Ethernet Driver Logs

```
natsemi dp8381x driver, version 1.07+LK1.0.17, Sep 27, 2002
originally by Donald Becker <becker@scyld.com>
http://www.scyld.com/network/natsemi.html
2.4.x kernel port by Jeff Garzik, Tjeerd Mulder
eth0: silicon revision 0x403
```

System startup logs

```
Starting 'socksvr' ...
Starting 'sendfilemc' ...
Starting 'ip_recov' ...
Starting 'k2status' ...
Starting 'frame_mon' ...
Starting 'frame_monw' ...
Starting 'reset_server' ...
Starting 'watchdog' ...
Starting 'inetd' ...
Starting 'rxthresh' ...
Starting 'mesh' ...
Starting 'phopstatus' ...
Starting 'forwarding' ...
```

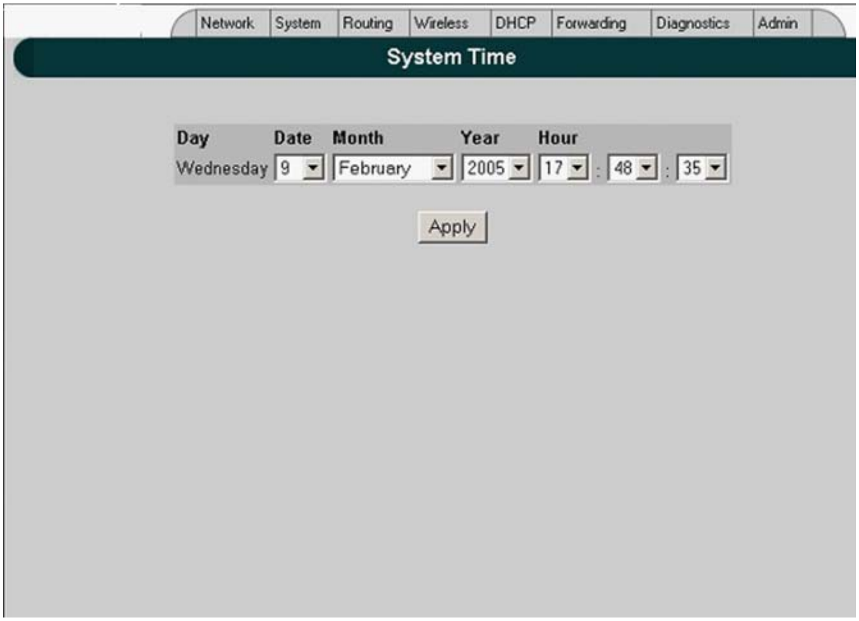
Config Manager Logs

```
INFO level logs
System Logs {Enabled/Disabled}
Mobile client { Enabled/Disabled }
Wireless Security {WEP/WPA/WPA2} { Enabled/Disabled }
SNMP { Enabled/Disabled }
DHCP Server { Enabled/Disabled }
DHCP Relay { Enabled/Disabled }
Access By Manufacturer's Tech Support { Enabled/Disabled }
```

```
Wireless access to SPEEDSignal { Enabled/Disabled }
Firewall { Enabled/Disabled }
Reset All Configuration to the Factory Default
Configuration File has been uploaded
Configuration File has been installed
Firmware image has been uploaded
Firmware image  version {version} has been installed
Reset All Passwords to the Factory Default
Wired Admin { Enabled/Disabled }
Wired Read { Enabled/Disabled }
Wireless Admin { Enabled/Disabled }
Wireless Read { Enabled/Disabled }
Wired Admin password changed
Wired Read password changed
Wireless Admin password changed
Wireless Read password changed
Host name has been changed
{ Ethernet / Wireless } IP address has been changed
```

SYSTEM TIME

SPEEDLAN 9200 web Configurator provides ability to get/set the system date/time of the unit. To access System Time, choose System->Time menu.



System Time

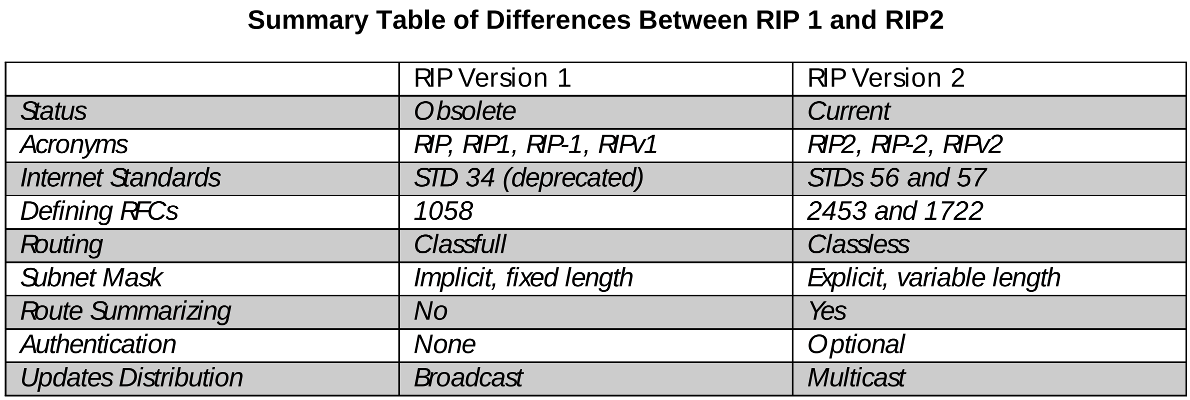
Day	Date	Month	Year	Hour
Wednesday	9	February	2005	17 : 48 : 35

Figure 3-25: System Time

The user is able to set system date/time by choosing values from corresponding combo boxes he/she wants to set and clicking Apply button. This will change both system and hardware time. So the new date/time will be there even after power cycle the unit.

Routing Menu

Note that full interoperability with RIP-1 domains requires that the RIP-2 domain be describable as a collection of classfull networks. This requirement can artificially limit the use of Variable Length Subnet Mask (VLSM) to support Classless Inter-Domain Routing (CIDR).



Summary Table of Differences Between RIP 1 and RIP2

	RIP Version 1	RIP Version 2
Status	*Obsolete*	*Current*
Acronyms	*RIP, RIP1, RIP-1, RIPv1*	*RIP2, RIP-2, RIPv2*
Internet Standards	*STD 34 (deprecated)*	*STDs 56 and 57*
Defining RFCs	*1058*	*2453 and 1722*
Routing	*Classfull*	*Classless*
Subnet Mask	*Implicit, fixed length*	*Explicit, variable length*
Route Summarizing	*No*	*Yes*
Authentication	*None*	*Optional*
Updates Distribution	*Broadcast*	*Multicast*

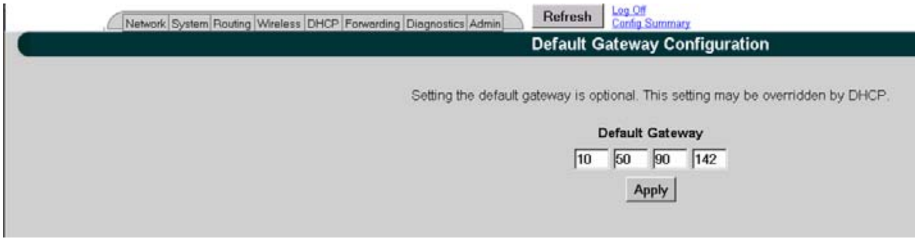
Figure 3-26: Summary Table

The submenus for general routing are specified below:

- *Choose* Default Gateway *to modify the IP address of the default gateway.*
- *Choose* RIP2 *to enter settings for RIP.*
- *Choose* Route Table *to view the information in the routing table.*
- *Choose* Static Routes *to add static routes as additional routes, default routes or routes that the SPEEDLAN 9200 routers do not contain in their routing table.*

Def Gateway

If you want to modify the IP address of the default gateway, choose Def Gateway *from the* Routing *menu. The following page will appear.*



Default Gateway Configuration

Setting the default gateway is optional. This setting may be overridden by DHCP.

Default Gateway

10 | 50 | 90 | 142

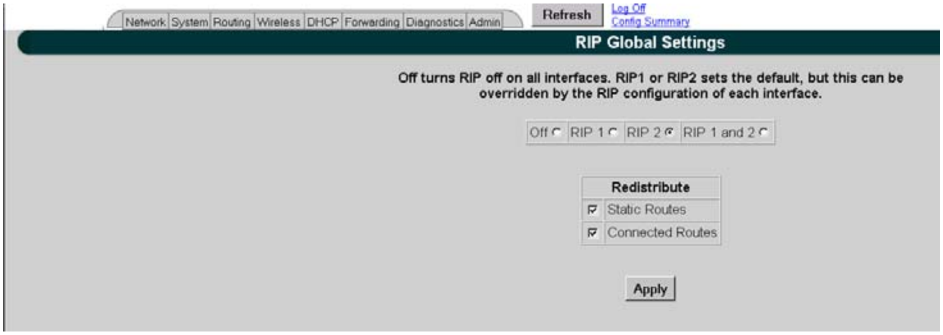
Figure 3-27: Default Gateway page

Default Gateway: *Enter the IP address of the default gateway. This is the "door" where you want the data to travel. Then, click* Apply *after modifying information.*

Note: *Setting the default gateway is optional. This setting may be overridden by DHCP.*

RIP2 Setup

To set up global settings for RIP, from the Routing *menu, choose* RIP2 Setup + Global Settings. *The following page will appear.*



RIP Global Settings

Off turns RIP off on all interfaces. RIP1 or RIP2 sets the default, but this can be overridden by the RIP configuration of each interface.

Off ○ RIP 1 ○ RIP 2 ● RIP 1 and 2 ○

Redistribute

☑ Static Routes

☑ Connected Routes

Figure 3-28: RIP Global Settings page

The following RIP Global Settings parameters are described below:

- Off: *Select to disable RIP.*
- RIP 1: *Select to enable RIP 1.*
- RIP 2: *Select to enable RIP 2.*

- RIP 1 and RIP 2: *Select to enable RIP 1 and RIP 2.*

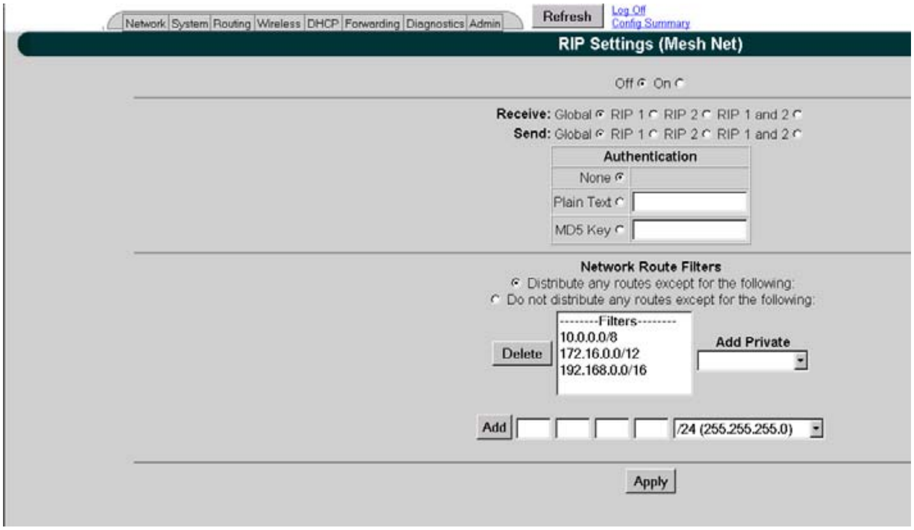
Redistribute section:

- Static routes: *Select this check box to redistribute static routes so all routers know who it has to pass through to get to the destination. Do not select this check box if you do not want other devices on the network to learn its static route. A static route is an IP path from one point on the network to another point on the network.*
- Connected routes: *Select this check box to redistribute connected routes, which tells the network what is connected to it. Do not select this check box if you do not want other devices on the network to know what network(s) the router is connected to.*

Click Apply *when you are finished making changes.*

RIP Settings

To set up RIP-2 settings, from the Routing *menu, choose* RIP2 Setup + *the interface (e.g., Ethernet or StarNet). The following page will appear.*



RIP Settings (Mesh Net)

Off ● On ○

Receive: Global ● RIP 1 ○ RIP 2 ○ RIP 1 and 2 ○
Send: Global ● RIP 1 ○ RIP 2 ○ RIP 1 and 2 ○

Authentication	
None ●	
Plain Text ○	
MD5 Key ○	

Network Route Filters

● Distribute any routes except for the following:
○ Do not distribute any routes except for the following:

--------Filters--------
10.0.0.0/8
172.16.0.0/12
192.168.0.0/16

Delete

Add Private

Add /24 (255.255.255.0)

Apply

Figure 3-29: RIP Settings page

The following RIP Settings parameters are described below:

- Off: *Select this option to disable RIP.*
- On: *Select this option to enable RIP.*

- RIP 1 and RIP 2: *Select to enable RIP 1 and RIP 2.*
- Receive: *This is from the incoming location.*
- Send: *This is from the outgoing location.*

Receive and Send options:

- Global: *Click this option to receive/send RIP 1, RIP 2 or RIP 1 & 2 throughout the entire network.*
- RIP 1: *Click this option to receive/send RIP-1 from/to the interface.*
- RIP 2: *Click this option to receive/send RIP-2 from/to the interface.*
- RIP 1 and 2: *Click this option to receive/send RIP 1 & 2 from/to the interface.*

Authentication on RIP-2 MD5

- None: *Select this option when authentication is not needed.*
- Plain Text: *Select this option to enable authentication (security) for legacy systems.*
- MD5 key: *Select this option to enable RIP-2 MD5 authentication for security. It is recommended that you select this option.*

Note: Both the RIP-2 MD5 authentication key and Plain Text entries are restricted to digits or alphabetic characters. Both are entered like a password, but the characters are visible. The minimum amount of characters entered is 4 *and the maximum is* 16.

What is RIP-2 MD5 Authentication?

Both RIP-1 and RIP-2 are vulnerable to hostile messages and attacks. This is because broadcast (RIPv1) or multicast (RIPv2) packets alone lack authentication. When RIP-2 is used with an authentication algorithm, such as MD5, network security is increased since the destination receiving the RIP packet knows that it was generated by a reliable source (i.e., the actual sender of the packet).

RIP-2 MD5 authentication transmits the output of the authentication algorithm rather than the RIP-2 authentication key. Therefore, the RIP-2 authentication key is never transmitted over the network and cannot be heard by other routers. This means a router can determine exactly who sent the message and not assume which router sent it.

Select one of the following options:

Note: *You will need to enter the same authentication type and text / key for all participating SPEEDLAN 9200 routers.*

Click Apply *when you are finished making changes.*

Network Route Filters:

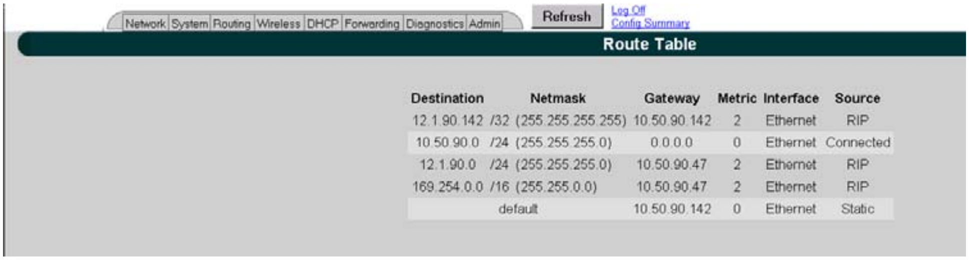
- Distribute any routes except for the following: *Select this option to distribute all the network routes, except those which are selected in the Filters box.*
- Do not distribute any routes except for the following: *Select this option to only distribute the selected network routes in the Filters box.*
- Filters box: *Select those filters needed for option 1 or 2 as explained above.*
- Add: *Click this button to add a network route to the Filters box.*
- Delete: *Click this button to remove a network filter from the Filters box.*
- Add Private: *Select the private address from this drop-down list if you want to include a private address in the Network Route Filters list.*

Note: *If you want to create your own network route filter IP address, type them in the four boxes provided below (each box represents the first, second, third and forth octet in the IP address). Then, click the* Add *button to add the new IP address to the Filters box.*

Click Apply *when you are finished making changes.*

Route Table

The routing table displays routing information between destinations. To view routing information, choose Route Table *from the* Routing *menu. The following page will appear.*



Route Table

Destination	Netmask	Gateway	Metric	Interface	Source
12.1.90.142	/32 (255.255.255.255)	10.50.90.142	2	Ethernet	RIP
10.50.90.0	/24 (255.255.255.0)	0.0.0.0	0	Ethernet	Connected
12.1.90.0	/24 (255.255.255.0)	10.50.90.47	2	Ethernet	RIP
169.254.0.0	/16 (255.255.0.0)	10.50.90.47	2	Ethernet	RIP
default		10.50.90.142	0	Ethernet	Static

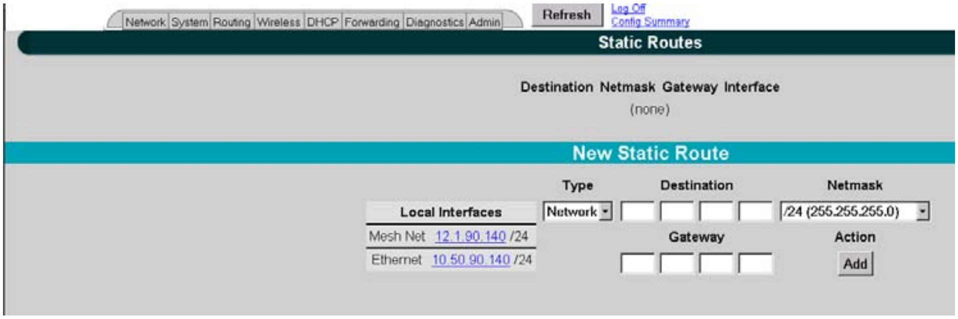
Figure 3-30: Route Table page

Each statistic is defined below:

- Destination: *This is the destination network or host.*
- Netmask: *The netmask is a 4-byte number that masks the network part of the Internet IP address, so only the host computer part of the address remains.*
- Gateway: *This is a network point that acts as the "entrance door" to another network. This is the first router that takes you to the designated host (i.e., the next hop on the network).*
- Metric: *Metric is a number indicating the preference of one route link over another. A route link with a lower number will be chosen over one with a higher number.*
- Interface: *This specifies which network interface the route will use.*
- Source: *This lists the how the information is routed to/from the router (e.g., RIP enabled, static or connected route).*

Static Route

The Static Route page allows you to add static routes that the SPEEDLAN 9200 routers do not contain in their routing table. To open the Static Route page, choose Static Routes *from the* Routing *menu.*



Static Routes

Destination	Netmask	Gateway	Interface
(none)			

New Static Route

Local Interfaces
Mesh Net 12.1.90.140 /24
Ethernet 10.50.90.140 /24

Type: Network
Destination:
Netmask: /24 (255.255.255.0)
Gateway:
Action: Add

Figure 3-31: Static Route page

Terms for this page are defined below:

- Type: *Select either* Network *or* Host *from this drop-down list.*
- Network: *Traffic will be destined either to, from or between network segments.*
- Host: *Traffic will be destined either to, from or between specific hosts.*
- Destination: *The destination network or host.*

- Netmask: *Select the appropriate value for the netmask (also in CIDR format from /8 to /30) in this drop-down list. This is an abbreviated method of entering the netmask. For more information, see CIDR Table (For Netmask Information Purposes), page 3-20.*
- Interface: *Select the appropriate interface from this drop-down list.*
- Gateway: *This is a network point that acts as the "entrance door" to another network. This is the first router that takes you to the designated host (i.e., the next hop on the network).*

  Note: *If you do not want to use a current static route, select the routes you want to remove and click* Delete Selected*. To add a new static route, click* Add.
-

Configuring the Radio Parameters

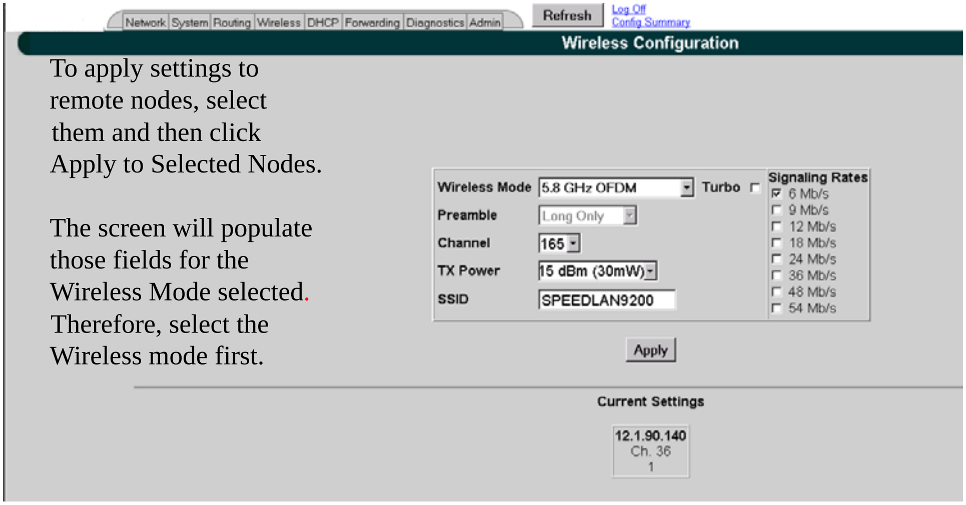
Choose one of the options from the Wireless *menu:*

- *If you choose* Configuration*, you will be able to set the following radio parameters: SSID, wireless mode, channel, signaling rate, turbo mode, Tx power and preamble. For more information, see Configuration, page 3-43 for more details.*
- *If you choose* Tx Retries*, you will be able to set the Transmit Retry Limit and Signaling Rate Fallback. For more information, see Max Tx Retries and Signaling Rate Fallback, page 3-46.*
- *If you choose* Max Throughput*, you will be able to set the Max Transmit Data Rate in Kb/s. For more information, see Max Throughput (Regulating Bandwidth), page 3-48.*

Note: *If you're looking for mesh-only functions like Blocked Links, Rx Threshold and Link Expiration, see the Wireless menu, page 4-7. If you're looking for the mesh Remote Control feature, see the Admin Menu, page 4-12. Mesh software/firmware update instructions are also located under the Admin menu section.*

Configuration

1 *To set these parameters, choose* Configuration *from the* Wireless *menu. The Configuration page will appear:*



To apply settings to remote nodes, select them and then click Apply to Selected Nodes.

The screen will populate those fields for the Wireless Mode selected. Therefore, select the Wireless mode first.

Wireless Mode: 5.8 GHz OFDM
Turbo □
Preamble: Long Only
Channel: 165
TX Power: 15 dBm (30mW)
SSID: SPEEDLAN9200

Signaling Rates
☑ 6 Mb/s
□ 9 Mb/s
□ 12 Mb/s
□ 18 Mb/s
□ 24 Mb/s
□ 36 Mb/s
□ 48 Mb/s
□ 54 Mb/s

Current Settings

12.1.90.140
Ch. 36
1

Figure 3-32: Configuration page

2 *Select one of the following from the* Wireless Mode *list:*

- *5.8 GHz OFDM*
- *2.4 GHz DSSS*
- *2.4 GHz DSSS/OFDM*
- *4.9 GHz OFDM*

Note: Extended turbo mode provides up to 108 Mb/s, which is automatically selected when you select 5.8GHz OFDM. <u>If 5.8GHz OFDM is not selected, the "Turbo mode" is disabled.</u> The Channel drop-down list will populate the appropriate values for the Wireless Mode you selected.

3 *You can select a* Long, *or* Short & Long *preamble during the transmission process between two or more systems from the* Preamble *drop-down list. <u>This parameter specifies the preamble setting in 2.4GHZ DSSS mode.</u> There are two types of preamble, short and long - referring to the length of the sync field. The default setting is Short & Long. This setting is useful when you cannot determine the field size of the data being sent. The system will sync itself for both short and long. Users should select a* Long *preamble when there is a lot of interference or noise on the network. (A short preamble is more likely to be used in stable links*

with low noise levels.) The field size of a long preamble is 128 bits and a short preamble is only 56 bits.

4 *Select the appropriate channel from the* Channel *drop-down list. This is the specific band of frequencies to determine the data path between routers. All SPEEDLAN 9200 routers expected to communicate in a network must have the same channel (frequency).*

Table 3-2: Channel list

	5.8GHz OFDM	2.4GHz DSSS/OFDM	2.4 GHz DSSS
Channels supported	149 (5.745GHz) 153 (5.765GHz) 157 (5.785GHz) 161 (5.805GHz) 165 (5.825GHz)	1 (2.412GHz) 2 (2.417GHz) 3 (2.422GHz) 4 (2.427GHz) 5 (2.432GHz) 6 (2.437GHz) 7 (2.442GHz) 8 (2.447GHz) 9 (2.452GHz) 10 (2.457GHz) 11 (2.462GHz)	1 (2.412GHz) 2 (2.417GHz) 3 (2.422GHz) 4 (2.427GHz) 5 (2.432GHz) 6 (2.437GHz) 7 (2.442GHz) 8 (2.447GHz) 9 (2.452GHz) 10 (2.457GHz) 11 (2.462GHz)

Note: *Valid operating channels for the FCC and IC (Canada) are listed in Channels for IEEE 802.11x, Appendix G-1.*

5 *The following transmit power levels are currently available for 5GHz and 2.4: Select the appropriate value from the* TX Power *drop-down list.*

Table 3-3: TX Power List

Frequency	5.8GHz	2.4GHz	
Specific Channels	All	1, 2, 10 and 11	3-9
TX Power supported	10 dBm(10mw) 12 dBm(13mW) 13 dBm(20mW) 15 dBm(30mW) 17 dBm(50mW)	10 dBm (10mw) 13 dBm (20mW)	10 dBm (10mw) 13 dBm (20mW) 15 dBm (30mW) 17 dBm (50mW)

6 *Check the appropriate* Signaling Rate *check boxes. This setting refers to the wireless signaling rate. The SPEEDLAN 9200 routers have different signaling rates that can be used, depending on the wireless mode selected.*

The signaling rate is intended to control the transmit rate, depending on the quality of the link. If the link is getting better/worse, the signaling rate is automatically increased/decreased by one increment. By default, all the supported signaling rates for the appropriate protocol are selected. An alternative is to select a subset of the supported rates.

The table below lists the supported Signaling Rates for the wireless modes offered:

Table 3-4: Signaling Rates

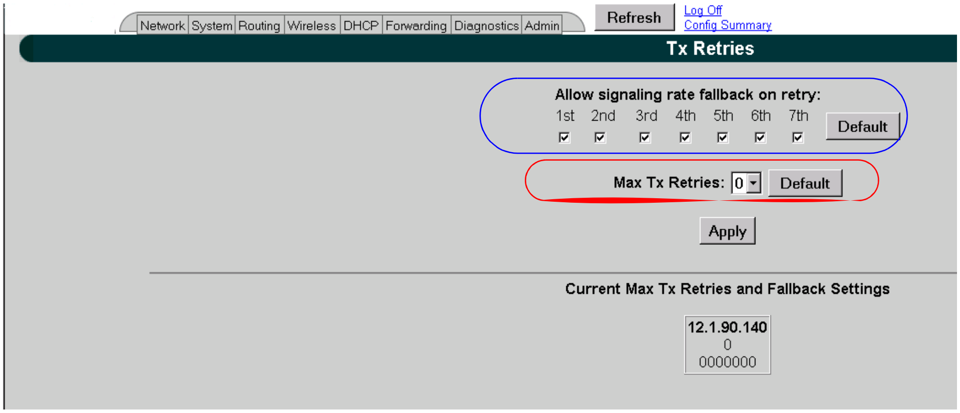
	5.8GHz OFDM	Turbo Mode OFDM	OFDM/DSSS 2.4 OFDM/DSSS	2.4 DSSS
Signaling Rates Supported (in Mb/s)	6,9,12,18, 24,36, 48, 54	12,18,24,36, 48,72,96,108	1,2,5.5,11 (DSSS) 6,9,12,18, 24,36, 48, 54 (OFDM)	1,2,5.5,11

Note: *For information about the minimum receiver sensitivity, see: “Minimum Receive Sensitivity (in dBm) for SL920x” on page 4 of Appendix D.*

7 *Enter the Service Set Identifier in the* SSID *text box. This is a sequence of characters that provides a unique name for the wireless network. This field has a maximum limit of 32 characters. The default value for SSID is "SPEEDLAN9200".*

Max Tx Retries and Signaling Rate Fallback

This page includes two features: Max Tx Retries and Signaling Rate Fallback. On the figure below, Max Tx Retries is circled in red and Signaling Rate Fallback is circled in blue.



Tx Retries

Allow signaling rate fallback on retry:

1st	2nd	3rd	4th	5th	6th	7th
☑	☑	☑	☑	☑	☑	☑

Max Tx Retries: 0

Current Max Tx Retries and Fallback Settings

12.1.90.140
0
0000000

Figure 3-33: Tx Retries and Signaling Rate Fallback page

Note: *To apply settings to other remote network nodes, select them and click* Apply to Selected Nodes. *If you want to select all of the routers, click* Select All.
The default for Max Tx Retries is 6.

Signaling Rate Fallback

During the retransmission of a unicast frame, the signaling rate can "fall back" in order to increase the chance of reception. Signaling Rate Fallback can occur multiple times for a single frame. Signaling Rate Fallback occurs from the current rate and will only include those signaling rates selected on the Channel and Rates page. After ten consecutive successful unicast frames, the current rate is restored to the highest selected rate.

The Signaling Rate Fallback parameter allows you to control when the signaling rate will drop, depending on the check box(es) you selected. That is, the check box(es) labeled, "Allow signaling rate fallback on retry" (circled in blue on previous figure).

The following parameters (check boxes) govern at which point in the re-transmission process the rate may be dropped:

- 1st retry: *Will drop signaling rate on first retry.*
- 2nd retry: *Will drop signaling rate on second retry.*

- 3rd retry: *Will drop signaling rate on third retry.*
- 4th retry: *Will drop signaling rate on forth retry.*
- 5th retry: *Will drop signaling rate on fifth retry.*
- 6th retry: *Will drop signaling rate on sixth retry.*
- 7th retry: *Will drop signaling rate on seventh retry.*

Here is one example.....

2.4GHz DSSS Example:

The network administrator has configured the allowable transmit signaling rates to be 11, 5.5, 2, and 1 Mb/s. (These values can be selected on the Channel and Rates page under the Wireless menu.) In addition, the network administrator has selected 7 from the Max Tx Retries *drop-down list and set the signaling rate to "fall back" on the second, fourth, and sixth retry attempts (as shown in blue on previous figure). When the intended recipient does not acknowledge a transmitted unicast frame, it will be retransmitted again (after a short timeout) at the current rate (e.g., 11 Mb/s). If this attempt is also unsuccessful (e.g., the receiver did not acknowledge it), the signaling rate will drop to 5.5 Mb/s and another attempt will be made. If after the third retry, the transmission is still not successful, the signaling rate will drop to 2 Mb/s for the fourth and fifth retry, and then to 1 Mb/s for the sixth and seventh retry (if needed).*

The recipient sends acknowledgements at the same signaling rate at which it receives frames. When a frame is successfully transmitted (acknowledgement received in the case of unicast), the transmitter immediately proceeds to the next frame. The last signaling rate used to transmit (other than acknowledgements) becomes the current rate. After ten consecutive unicast frames, the current rate returns to the highest rate selected, if it is not already at that signaling rate. Note that the receiver's signaling rate is not affected (other than returning the acknowledgement at a possibly different rate). Each transmitter's fallback schedule is independent of the signaling rate used by other transmitters.

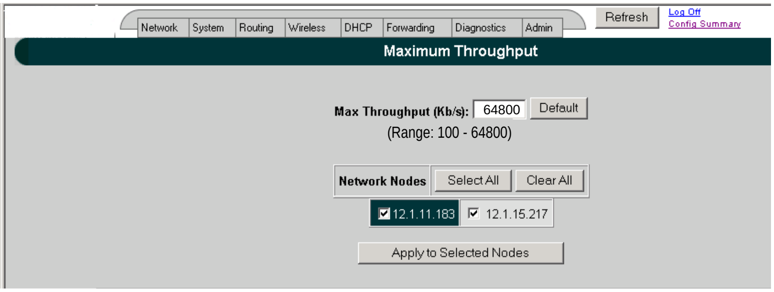
Max Tx Retries

P-Com recommends that you use this parameter to increase the throughput of your wireless network. This parameter tells a network node the maximum number of times a unicast frame can be retransmitted before it is discarded. (A unicast frame is one that is transmitted to a single node in a network.) This allows a network manager to tune a network for its particular topology and expected traffic characteristics. The network *topology, RF environment, number of nodes, throughput requirements, latency requirements, and type of applications are all factors in choosing an appropriate value for this parameter.*

This parameter can be tuned on a per unit basis in order to optimize network performance. Click Default *to get the default value of 7. You can select a value between 0 and 8 from the* Max Tx Retries *drop-down list.*

Max Throughput (Regulating Bandwidth)

Max Throughput is useful to ISPs that want to regulate the maximum wireless bandwidth provided from each customer.



Max Throughput (Kb/s): 64800

(Range: 100 - 64800)

☑ 12.1.11.183 ☑ 12.1.15.217

Figure 3-34: Max Throughput page

The Max Transmit Data Rate (in Kb/s) defaults are 29300 Kb/s for 2.4GHz & 5.8GHz OFDM modes, and 6500 Kb/s for DSSS. The range is from 100 to 64,800 Kb/s (6.5 Mb/s).

If you want to use these settings on remote routers, select them and click Apply to Selected Nodes. *If you want to select all of the routers, click* Select All.

Bandwidth Limiting

User can enable or disable the "Bandwidth Limiting" on both Ethernet and Wireless interfaces. When "Bandwidth Limiting" is 'Enabled", user can specify desired maximum bandwidth on the selected interface. If "Bandwidth Limiting" feature is disabled, the maximum bandwidth for each interface is:

Ethernet Interface: maximum bandwidth provided by processor.

Wireless Interface: the "throttle" parameter in the wireless driver.

Note: Egress "Bandwidth Limiting" is not applicable to the management traffic of SPEEDLAN 9200.

Configuration

Forwarding->ToS and Forwarding->Bandwidth Limiting menu items of the main menu in the Configurator are provided to access the ToS and Bandwidth Limiting configurations.

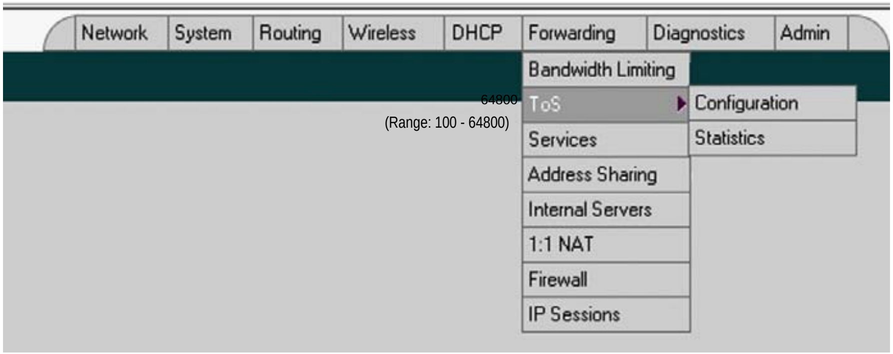
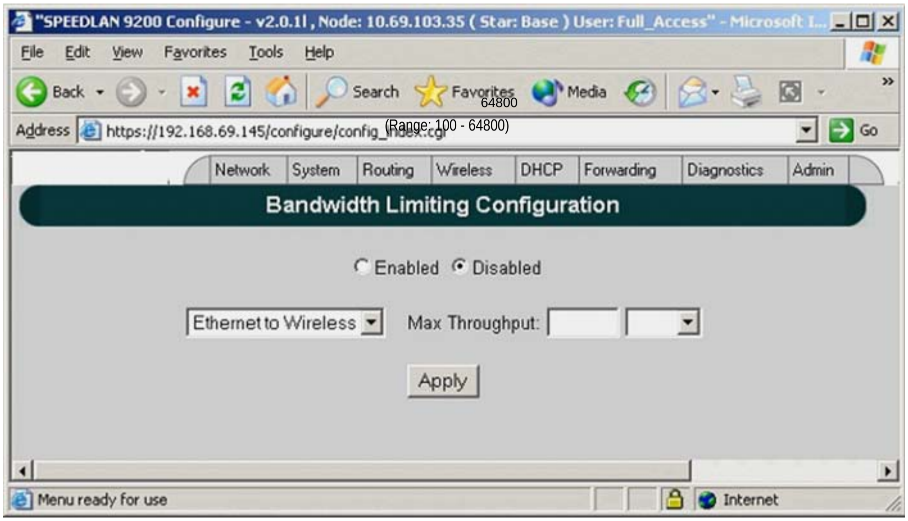


Figure 3-35: Bandwidth and ToS Menu

Bandwidth Limiting Configuration

Menu Forwarding->Bandwidth Limiting is used to access Bandwidth Limiting Configuration Page:



"SPEEDLAN 9200 Configure - v2.0.1l , Node: 10.69.103.35 (Star: Base) User: Full_Access" - Microsoft I...

Address https://192.168.69.145/configure/config_index.cgi

64800

(Range: 100 - 64800)

Bandwidth Limiting Configuration

○ Enabled ● Disabled

Ethernet to Wireless Max Throughput:

Apply

Menu ready for use

Figure 3-36: Bandwidth Limiting

User can enable or disable the "Bandwidth Limiting" on Ethernet and/or Wireless interfaces. When "Bandwidth Limiting" is "Enabled", user can specify desired maximum bandwidth threshold for the selected interface.

ToS

When ToS is enabled, SPEEDLAN9200 prioritizes the packets based on the DSCP (DiffServ Code Point) in the IP header of the packet to be transmitted to the wireless port. The source of the packet can be Ethernet port, Wireless port, and CPU. 8 priority queues are created to map the user traffic to one of the priority queues based on the configured policies.

When ToS is disabled, one queue is allocated for all the user traffic (non-management). The global maximum throughput applies to this queue. Global maximum throughput is configurable if the "Bandwidth Limiting" feature is enabled.

ToS Configuration

ToS is performed via Forwarding->ToS->Configuration submenu.

User can prioritize traffic according to DiffServ Code Points and Service types. Each line will show the current mappings of DiffServ Code Points and Services to corresponding priorities.

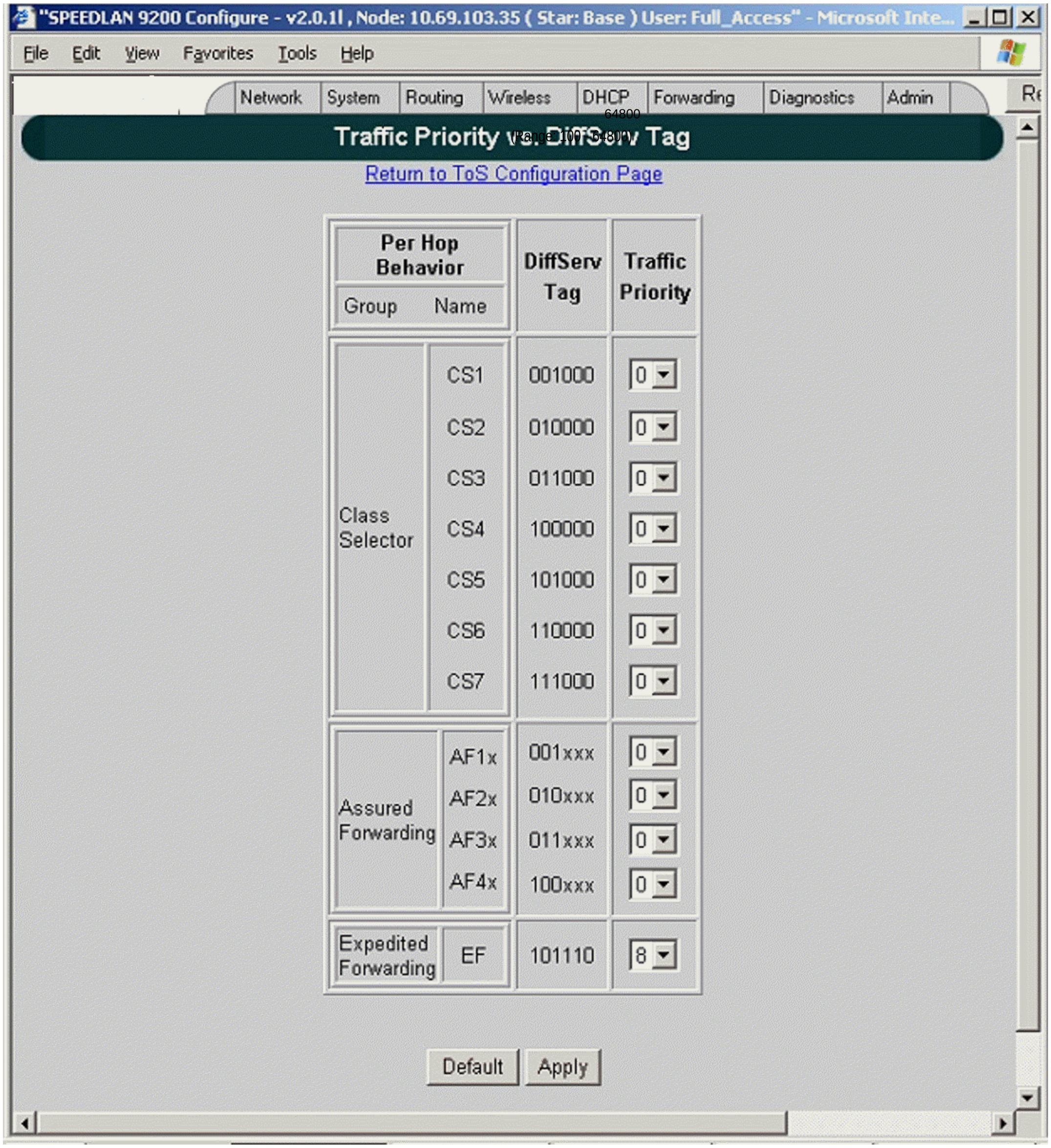
To perform the DiffServ Code Point mapping to corresponding priority, "DiffServ Tagged" link is selected. This link opens the new page for DiffServ Code Points mapping (see DiffServ Code Point mapping chapter).

To perform the Service type mapping to corresponding priority, "Untagged" link is selected. This link opens new page for Service mapping (see Service Mapping chapter).

NOTE: All DiffServ Code Points and Service Mappings are applied when ToS is enabled.

DiffServ Code Point mapping

The DiffServ Code Point mapping to priorities is performed by the page below.



Traffic Priority vs. DiffServ Tag

Return to ToS Configuration Page

Per Hop Behavior		DiffServ Tag	Traffic Priority
Group	Name		
Class Selector	CS1	001000	0
	CS2	010000	0
	CS3	011000	0
	CS4	100000	0
	CS5	101000	0
	CS6	110000	0
	CS7	111000	0
Assured Forwarding	AF1x	001xxx	0
	AF2x	010xxx	0
	AF3x	011xxx	0
	AF4x	100xxx	0
Expedited Forwarding	EF	101110	8

Figure 3-37: DiffServ Code Point Mapping

This page allows user to configure the mapping of the predefined DiffServ Code Points (DSCP) to corresponding priority from range 1 to 8 (8 is the highest priority and 1 is the lowest priority.). 0 priority has a special meaning, which is used for un-mapping given DiffServ Code Point.

The "Default" button is used to specify the default mapping for all the Codepoints. By default all DiffServ Code Points are un-mapped except the EF Code Point. The EF Code Point is mapped to priority 8(the highest).

Link ToS Configuration Page is used to return to the previous page (ToS Configuration Page).

Rules for Class Selector Codepoints group

A Class Selector Codepoint with a larger numerical value should be mapped to the higher priority than the Class Selector Codepoint with a smaller numerical value. Entire Class Selector Codepoints group can be map into a minimum of 2 priorities.

Rules for AF Codepoints group

The mapping of each of four AF classes is performed by the following rules: Within each AF class three corresponding AF subclasses are mapped implicitly. For example if user mapped class AF2x then it means that class AF21, AF22 and AF23 will be mapped for the corresponding priority.

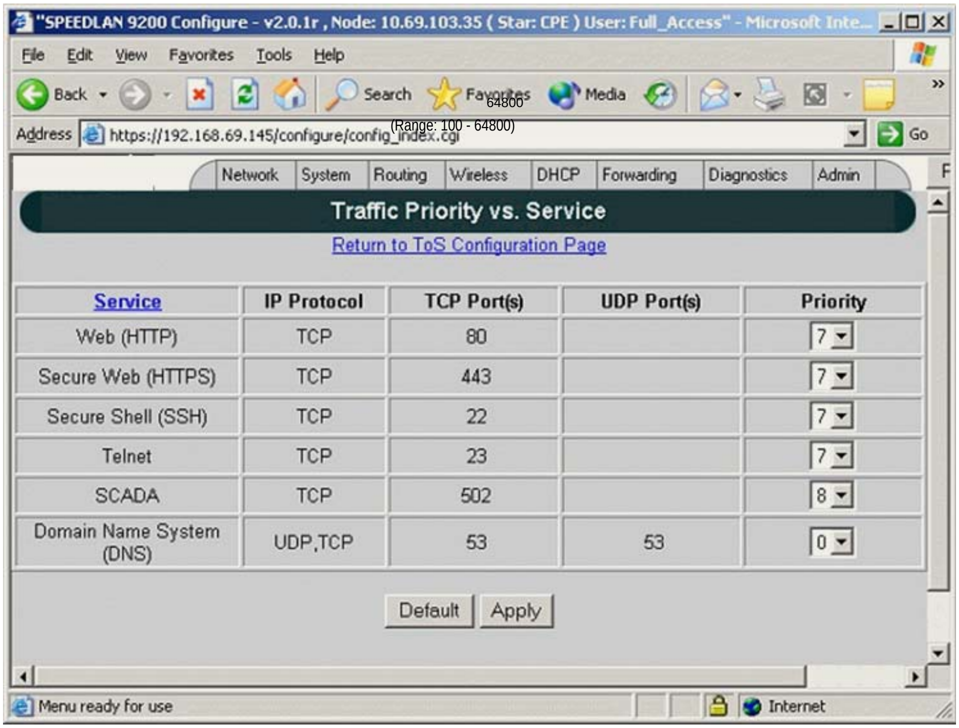
Recommendations for EF Codepoint

EF traffic belongs to fast-track and guaranteed bandwidth service. It is the golden dream of any application requiring a "First Class" service, special for those that have to deal with real-time services. Real-time service traffic requires a very fast and safe service for the moving of data from sources to destinations.

In order to offer this kind of service, it is always recommended to map the EF traffic to higher priority.

Service type mapping

This page allows the user to map the predefined services to the corresponding priority.


"SPEEDLAN 9200 Configure - v2.0.1r , Node: 10.69.103.35 (Star: CPE) User: Full_Access" - Microsoft Inte...
File Edit View Favorites Tools Help
Back Search Favorites Media
64800
(Range: 100 - 64800)
Address https://192.168.69.145/configure/config_index.cgi Go
Network System Routing Wireless DHCP Forwarding Diagnostics Admin
Menu ready for use
Internet

Traffic Priority vs. Service

Return to ToS Configuration Page

Service	IP Protocol	TCP Port(s)	UDP Port(s)	Priority
Web (HTTP)	TCP	80		7
Secure Web (HTTPS)	TCP	443		7
Secure Shell (SSH)	TCP	22		7
Telnet	TCP	23		7
SCADA	TCP	502		8
Domain Name System (DNS)	UDP,TCP	53	53	0

Default Apply

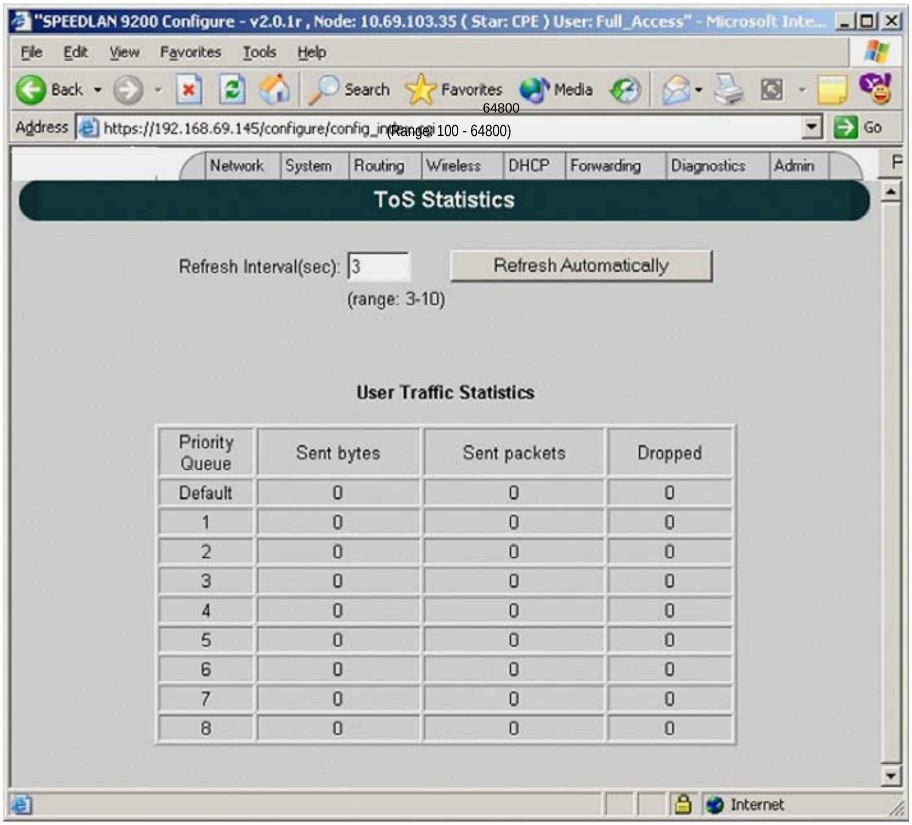
Figure 3-38: Serv Type Map

The "Service" link points to the "Services" configuration page where the user can add the desired service to the system. The table above is populating with the services as soon as the new service is added in the system. In order to un-map corresponding Service user should set the priority to "0" for the corresponding Service. The default service mapping is illustrated in the picture above. The default mapping is following:

- *SCADA to priority 8 (highest)*
- *HTTP, HTTPS, TELNET, SSH to priority 7 (second highest)*

ToS Statistic

ToS statistic is performed via Forwarding->ToS->Statistics submenu. See Figure below.



ToS Statistics

Refresh Interval(sec): 3 (range: 3-10)

Refresh Automatically

User Traffic Statistics

Priority Queue	Sent bytes	Sent packets	Dropped
Default	0	0	0
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0

Figure 3-39: ToS Statistic

When ToS is enabled, this page displays the statistic of the ToS priority table. This page also contains the automatic update mechanism. The refresh interval is user configurable.

DHCP Server Menu

The SPEEDLAN 9200 Configurator allows you to define a DHCP server on the Ethernet interface. A DHCP server is configured with a table of Ethernet addresses, ranges of IP *addresses and maps that are assigned to client network devices asking for the network settings. The DHCP server uses a "lease" to determine the length of time that a device or interface can use the assigned IP address.*

Servers that utilize DHCP resolve security issues, costly IP addressing services, and compatibility problems. DHCP is a superset to BOOTP, which reduces the agony of assigning static IP addresses, and also provides advanced configuration options.

How DHCP Assigns an IP Address

This section explains how a DHCP server assigns an address. If you are familiar with this terminology, skip to Setting Up DHCP and DHCP Relay, page 3-57.

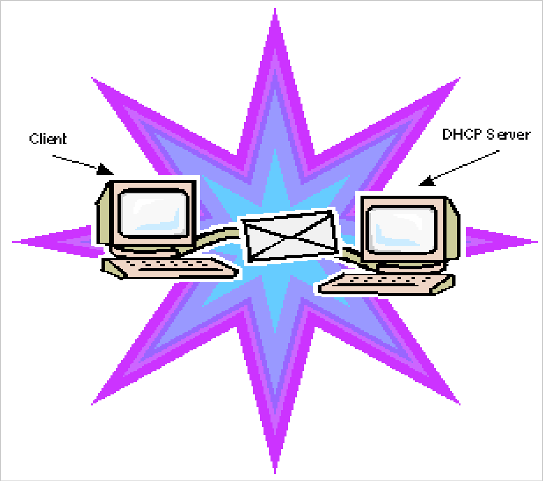


Figure 3-40: DHCP client and server

1. *The client asks DHCP server for IP address and configuration if needed.*

Note: *The DHCP server allows IP addresses be assigned dynamically at the remote building. Distributing these administrative functions to each remote building significantly reduces the "administrative overhead" traffic that must travel back to the service provider's headquarters. A DHCP server is configured with a table of IP addresses that are assigned to client network devices asking for network settings. The DHCP server uses a "lease" to determine the length of time that a device or interface can use the assigned IP address.*

2. *The DHCP server assigns an available IP address to the client.*
3. *The client takes the IP address from DHCP server and requests for additional configuration that is needed.*

4 *DHCP server confirms IP address and configuration.*

The SPEEDLAN 9200 Configurator allows you to assign IP addresses via DHCP on the interfaces.

Setting Up DHCP and DHCP Relay

These instructions will explain how to:

- *Configure and Manage the SPEEDLAN 9200 DHCP Server*
- *Configure DHCP Relay*

Important Note about DHCP

The DHCP Server serves IP addresses via the wireless interfaces in addition to the Ethernet interface. The DHCP Server does not serve other nodes on the same wireless cell.

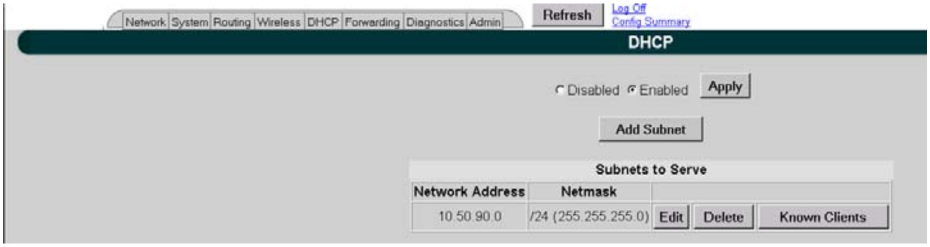
For example, for Node A's DHCP server to serve IP addresses via its wireless interface, at least one of the following must be true:

- *Another SPEEDLAN 9200 router on the same cell has DHCP Relay enabled, and configured to use Node A's DHCP server.*
- *Beyond the Ethernet of a SPEEDLAN 9200 router on the same cell, there is a router (wired or wireless) whose DHCP Relay is enabled and configured to use Node A's DHCP server.*

Setting Up DHCP

To set up DHCP, do the following:

1 *Choose* DHCP *from the main menu. Choose* Server *from the DHCP menu. This will display the DHCP page, as shown below:*



○ Disabled ● Enabled

Subnets to Serve

Network Address	Netmask
10.50.90.0	/24 (255.255.255.0)

Figure 3-41: Setting UP DHCP

2 *This is where you can:*

- *enable or disable the DHCP service*
- *configure the subnet(s) that the DHCP server will manage*

3 *Select the following information:*

- Disabled: *Select this option to disable the DHCP server.*
- Enabled: *Select this option to enable the DHCP server.*
- Apply: *Click this button to save the settings.*
- Add Subnet: *Click this button to create a new subnet for the DHCP server to manage.*

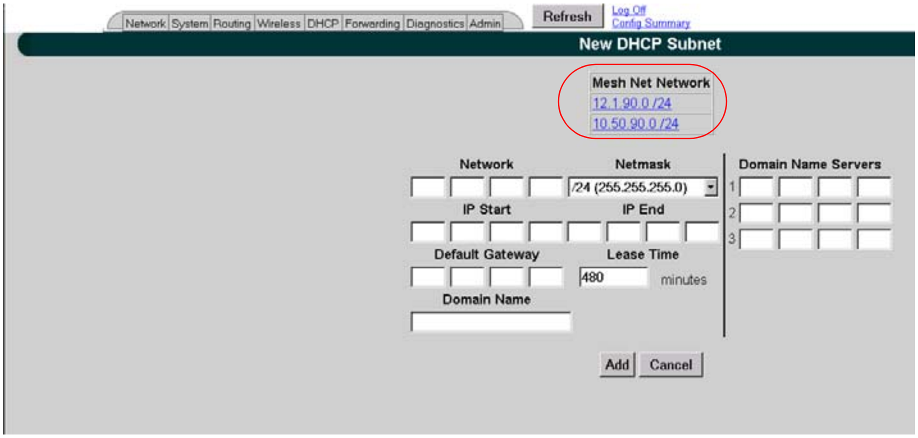
Note: *If you have any problems configuring the DHCP server, you can look for logged messages generated by the server. For more information, see Viewing Log Messages, page 3*-63.

Subnets to Serve Section

- Network Address: *This is the network address.*
- Netmask: *This is the netmask for the network.*
- Edit: *Click this button to modify the subnet on the DHCP server.*
- Delete: *Click this button to remove the subnet from the DHCP server.*
- Known Clients: *Click this button if you want to assign specific IP addresses to specific client computers on a given subnet. This feature will also enable you to allow or decline specific client requests. For more information, see Adding a Known Client.*

Adding a New DHCP Subnet

1 *To add a new DHCP subnet, click* Add Subnet *on the DHCP page. The following page will appear:*



Mesh Net Network
12.1.90.0 /24
10.50.90.0 /24

Netmask: /24 (255.255.255.0)

Lease Time: 480 minutes

Figure 3-42: Adding a New DHCP Subnet

Notes: *After you have added a subnet, you can click the IP address under the "Ethernet/ Mesh Net" Network section, as circled Figure 3-42 on page 3-59, which populates the following information:*

- *Network*
- *Netmask*
- *IP Start*
- *IP End*
- *Default Gateway*

Notes:

In most cases, if you use values that are compatible with the appropriate network, you will only need to change a few values (e.g., the last octet of "IP Start" and "IP End").

When you define the range of IP addresses to be assigned, make sure you do not include any of the static IP addresses that you have assigned on the network.

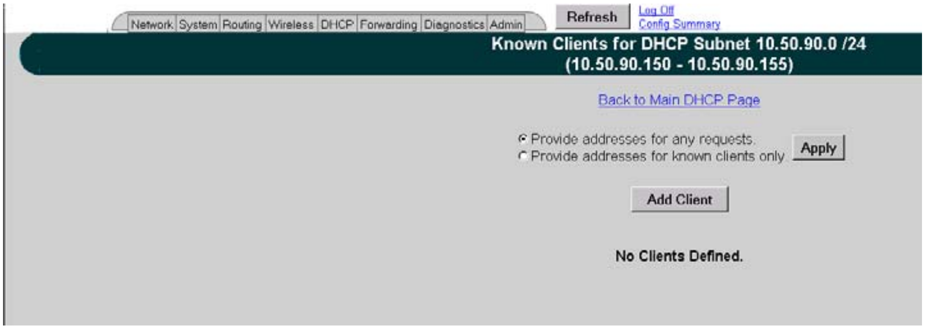
2 *Enter the following elements:*

- Network: *Enter the network address.*

- Netmask: *Select the netmask from the drop-down list. This is the 4-byte number that masks the network part of the Internet Protocol address, so only the host computer part of the address remains.*
- IP Start (Address): *This is the start of the block of served IP addresses.*
- IP End (Address): *This is the end of the block of served IP addresses.*
- Default Gateway: *This is the default gateway that will be assigned to DHCP clients.*
- Lease Time (in minutes): *This is the amount of minutes that the interface, computer or device can use the assigned IP address. When the time is up, the IP address will revert to the pool of available addresses and can be reassigned to another computer. The default is 480. (Entering "0" means the lease time never expires.)*
- Domain Name: *This is the internet domain of the organization, such as p-com.com.*
- Domain Name Servers: *Enter the IP address of your DNS server (optional). Prioritize them by listing the DNS to be used first, followed by the second and third DNS addresses.*
- *Click* Add *to implement the changes.*

Adding a Known Client

If you click the Known Client *button on the DHCP page, the following page will appear:*



Known Clients for DHCP Subnet 10.50.90.0 /24
(10.50.90.150 - 10.50.90.155)

● Provide addresses for any requests.
○ Provide addresses for known clients only

No Clients Defined.

Figure 3-43: Adding a Known Client

The elements on this page are described below:

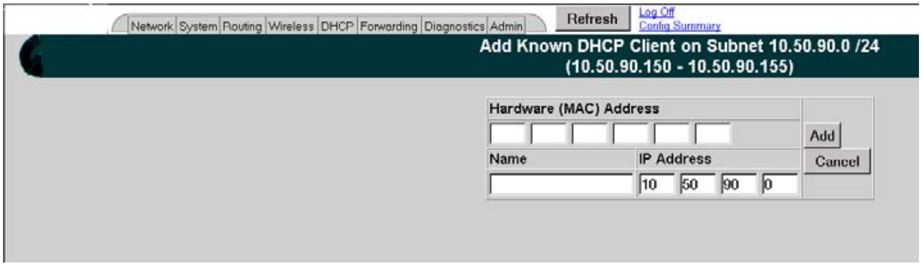
- Provide addresses for any requests: *Provides addresses to any client.*
- Provide addresses for known clients only: *Provides addresses to the clients that appear in this list only.*
- Apply: *Click to implement changes.*

- Add Client: *Click this button to add a DHCP client. For more information, see Adding a DHCP Client.*
- Edit: *Click this button to edit a DHCP client.* Note: Clicking this button displays similar information explained in the next section, but it allows you to modify the current client information. The fields will be populated, based on the client information entered.
- Delete: *Click this button to remove a DHCP client.*

Note: *To go back to the main DHCP page, click the* Back to Main DHCP Page *link, as shown on the page above.*

Adding a DHCP Client

When you click the Add Client *button on the Known Clients for DHCP Subnet page, the following page will appear:*



Add Known DHCP Client on Subnet 10.50.90.0 /24
(10.50.90.150 - 10.50.90.155)

Hardware (MAC) Address

Name

IP Address 10 50 90 0

Figure 3-44: Adding a DHCP Client

This is where you can specify the name of the computer or device, MAC address and its corresponding IP address that should be assigned to that device at all times. The elements on this page are described below:

- Hardware (MAC) Address: *In a LAN environment each computer contains its own Medium Access Control (MAC) address, which is the embedded and unique hardware number.*
- Name: *Enter the name of the host.*
- IP Address: *Enter the IP address for the client. Then, click* Add *to save changes, or click* Cancel *to return to the main Known Clients page for this subnet.*

Note: *The above fields (Hardware Address, Name and IP Address can be clicked to automatically populate the textboxes on this page.)*

If you need to modify this information later, click Edit *on the Known Clients for DHCP Subnet page.*

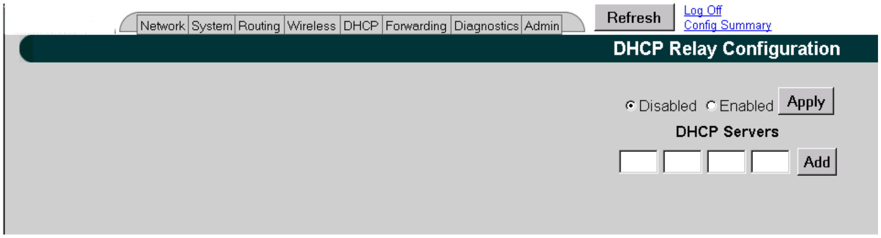
Note: *If you have only one DHCP subnet defined, the DHCP server will offer addresses from that subnet. If you have two or more subnets defined, offered addresses will be from the subnet designated as the primary subnet, unless a match is found with a "known client" defined in a non-primary subnet.*

Configuring DHCP Relay

DHCP Relay allows you to configure the SPEEDLAN 9200 to relay (forward) any DHCP requests originating on the Ethernet interface to a remote DHCP server. This allows you to use existing DHCP servers to assign IP addresses and other configuration parameters for SPEEDLAN 9200 routers via their wireless interfaces. If this service is enabled and no DHCP servers are listed, the SPEEDLAN 9200 will relay DHCP requests to the DHCP server that the SPEEDLAN 9200 used to get its interface address. If this service is enabled and the SPEEDLAN 9200 did not use DHCP to get an address for its interface, there must be at least one DHCP server address listed for this feature to work.

To add DHCP Relay information, do the following:

1 *Choose* DHCP Relay *from the* DHCP *menu. The following page will appear:*



● Disabled ○ Enabled

Figure 3-45: Configuring DHCP Relay

2 *Enter the following information:*

- Disabled: *Click to disable the DHCP Relay service.*
- Enabled: *Click to enable the DHCP Relay service.*
- DHCP Servers: *To enter a new DHCP server, enter the IP address and click* Add*. This is the IP address of the DHCP server that is offering IP addresses to its clients.*

- Delete: *Click this button to remove information related to that DHCP server address.*

3 *Once you have set up the SPEEDLAN 9200 router, configure the clients to obtain an IP address from a DHCP server;* do this on the PC and not on the router! *If the SPEEDLAN 9200 is the DHCP server, it will get the IP address directly from it. If the DHCP server is located beyond the SPEEDLAN 9200 routers, the DHCP request will be forwarded to the DHCP server and then returned to the correct client machine.*

If a SPEEDLAN 9200 router is serving as a DHCP relay and it has alias IP addresses, the IP network information that the SPEEDLAN 9200 relays to the DHCP server will always be that of the primary Ethernet IP.

Viewing Log Messages

If the DHCP server is not working properly, you can view system log messages by choosing DHCP Server. *Then, choose* Log Messages. *The page will display log messages for the DHCP server. Timestamps are also reported in client time. Timestamps track the date and time for each event in the log.*

Forwarding Menu

Use this menu to control how traffic is forwarded through this router. These features are available under the Forwarding menu:

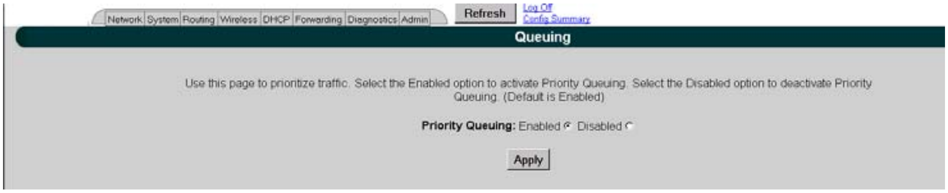
- Queuing - *Use this page to prioritize traffic out its wireless interface. Select the* Enabled *option to activate the Priority Queuing feature. This feature is enabled by default. For more information, see Priority Queuing, page 3-64.*

- Services - *Defines a network service (e.g., web server, FTP and email server) between the client and server nodes on your network. When you create a service, you will be allowed to forward public services inward to the internal (privately addressed) servers on your network. See Services, page 3-65.*
- Address Sharing - *Address Sharing uses Network Address Translation (NAT) to allow you to share public IP addresses with privately addressed network nodes in order for them to access the Internet. See Address Sharing, page 3-70.*

- Internal Servers - *Allows an administrator to make a service available from an IP address, even though the owner of the IP address may not be actually providing the service. See Internal Servers, page 3-72.*
- 1:1 NAT - *Allows an administrator to statically map a public IP address to the private IP address of one of the nodes on your network. This is useful when trying to preserve a limited number of IP addresses on the WAN network. See 1:1 NAT, page 3-73.*
- Firewall - *The SPEEDLAN 9200 (via the SPEEDLAN 9200 Configurator) allows you to control incoming and outgoing traffic. A firewall prevents unauthorized access to a network. Utilizing the SPEEDLAN 9200 Configurator, SPEEDLAN 9200 routers can increase security and provide additional support to users of the network. See Firewall, page 3-74.*
- lP Sessions - *The SPEEDLAN 9200 firewall offers stateful packet filtering. IP Sessions allows you to view sessions whose state is currently active. See IP Sessions, page 3-79.*

Priority Queuing

Use this page to prioritize traffic out its wireless interface. Select the Enabled *option to activate the Priority Queuing feature. This feature is enabled by default. Select* Disabled *to turn off this feature. To open this feature, choose* Queuing *from the* Fowarding *menu. The following page will appear:*



Use this page to prioritize traffic. Select the Enabled option to activate Priority Queuing. Select the Disabled option to deactivate Priority Queuing. (Default is Enabled)

Priority Queuing: Enabled ● Disabled ○

Apply

Figure 3-46: Setting Up Priority Queuing

1. *Select* Enabled *or* Disabled.
2. *Click* Apply.

Explanation of this feature

Despite having two physical interfaces, a SPEEDLAN 9200 router can experience congestion. That is because the interfaces' bit rates are not matched. Specifically, packets can ingress (enter) the Ethernet interface faster than they can egress (exit) the wireless interface. If this occurs briefly, it is called short-term congestion, which can cause *increased packet delay and/or jitter. If congestion lasts too long, it can cause packet discard ("loss"). Long-term congestion in a SPEEDLAN 9200 will typically only occur when it receives excessive unthrottled UDP traffic at its Ethernet interface. TCP traffic will self-throttle, typically experiencing only short-term congestion, if any.*

A SPEEDLAN 9200 mitigates short-term congestion by providing priority egress queuing at its wireless interfaces. With priority queuing, packets may be transmitted in a different order than they were received. This allows favoring network management, VoIP, and SCADA over SMTP, ftp, and NNTP (for example).

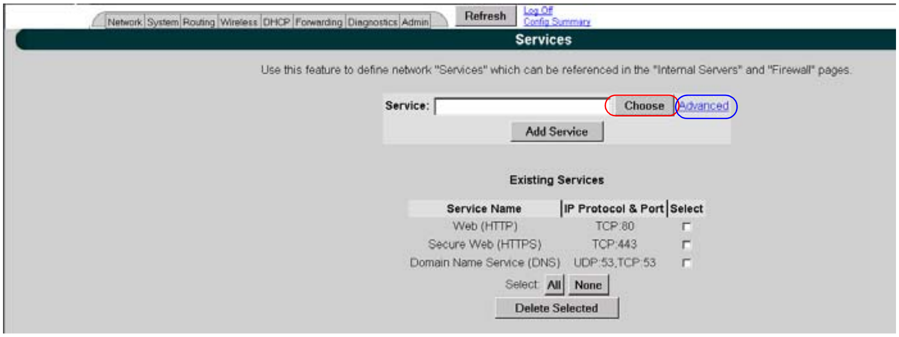
How does Priority Queuing work? The packets are prioritized into a hierarchy of queues, based on class of traffic. The highest priority queue packets are serviced first. When the highest queue is emptied, the next lower queue is serviced. The SPEEDLAN 9200 has four levels of priority queues. Queue 1 (the highest queue serviced) contains "management" traffic (i.e., RIP, Mesh, SNMP). Queue 2, the next lower queue serviced, contains "real-time" traffic (i.e., VoIP, Video, SCADA). Queue 3, the next lower queue serviced, contains "non-real time interactive" traffic (i.e., HTTP, SSH and Telnet). Queue 4 (the lowest level queue serviced) contains all traffic that doesn't fit into one of the first three queues.

Services

Network "Services" describe specific sessions between clients and servers, servers and servers, or clients and clients on your network. Examples of servers that provide services are web servers, FTP servers and email servers. Service definitions allow you to forward public services inward to the internal (privately addressed) servers on your network.

Note: *You can also choose to allow or deny such services between networks or individual nodes in the firewall section. For more information, see Firewall, page 3-74.*

To use the Services feature, choose Services *from the* Forwarding *menu. The following page will appear:*



Use this feature to define network "Services" which can be referenced in the "Internal Servers" and "Firewall" pages.

Service:

Existing Services

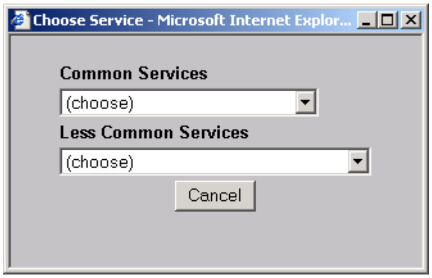
Service Name	IP Protocol & Port	Select
Web (HTTP)	TCP:80	□
Secure Web (HTTPS)	TCP:443	□
Domain Name Service (DNS)	UDP:53,TCP:53	□

Figure 3-47: Services page

To enter a service, do the following:

1 *To display a service in the Service text box, you must click the* Choose *button to select a service (circled in red in the previous figure). The service describes the specific sessions between client and server nodes on your network (e.g., web servers, FTP servers and email servers).*

2 *The following pop-up will appear, which lists the known services.*



Common Services

(choose)

Less Common Services

(choose)

Figure 3-48: Choose Service

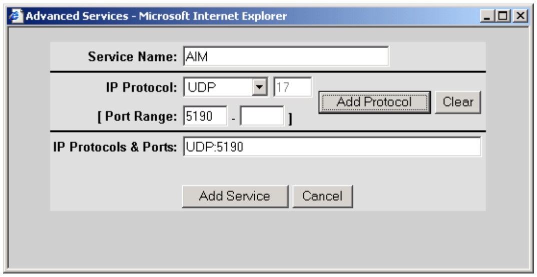
3 *Select one of the following:*

- Common Services: *This list contains the most common type of network services. (Note: SPEEDView is also listed under this list. It simply lets the user allow SPEEDView access when the firewall is enabled.) Select the appropriate service from this drop-down list. Then, click the* Add Service *button on the Services page.*
- Less Common Services: *This list contains less common types of network services. Select the appropriate service from this drop-down list.*

Your selection will be added to the Services page. Then, click the Add Service *button on the Services page.*

Creating an Advanced Service

If you cannot locate the service you want to add, you can define an advanced service by clicking the Advanced *link to the right of the "Choose" button (as circled in blue in Figure 3-47 on page 3-66). The following pop-up will appear:*



Advanced Services - Microsoft Internet Explorer

Service Name: AIM

IP Protocol: UDP 17

[Port Range: 5190 -]

IP Protocols & Ports: UDP:5190

Figure 3-49: Advanced Services (adding AIM)

Advanced services can have one or more IP protocols. Under Advanced Services, you will need to know the name of the service (or it can be unique), the protocol(s) used and the ports needed to operate the service. *For the TCP and UDP protocols, you can define specific ports, or a range of ports. Enter the following information:*

1. Service Name: *Enter a new name for the service. (In the previous figure, the user entered "AIM" because the user wanted to add AOL Instant Messenger.)*
2. IP Protocol: *Select an IP protocol for your service. If you select any protocol other than TCP or UDP, the protocol will be immediately added to the list of protocols for this service. (In previous figure, the user selected "UDP" because it is the protocol for AIM.)*
3. [Port range]: *If you select TCP or UDP, you can specify a port or a port range. Then, click* Add Protocol *to add that protocol and port to the list. Click* Clear *to remove the IP protocol list if you need to start over. (In the previous figure, the user entered port "5190".) If you are only entering a single port, enter it in the left* Port Range *text box.*
4. IP Protocols and Ports: *After clicking* Add Protocol, *this text box will be populated with the data, based on what you entered in the IP Protocol, Port number and Port range text boxes.*

5 *Click* Add Service *to add the service to the Existing Services list on the Services page.*

Existing Services

The Existing Services list shows all defined services.

- Service Name: *The name of the service.*
- IP Protocol: *The IP protocol by which data sent from one network node to another is classified (e.g., TCP, UDP, ICMP, OSPF).*
- Port: *A number used in the TCP and UDP protocols to differentiate streams. The number is included in the transmitted packets to link the incoming data to the correct service (e.g., port 80 is used for HTTP).*

Note: *To remove a service, select its check box and click* Delete Selected*. Click* All *to select all of the existing services. Click* None *to clear all selections. If an entry has (In Use) instead of a check box, this means the service is in use and cannot be removed.*

Three Features of NAT

NAT Background Info

Network Address Translation (NAT) occurs when there is a translation from one IP address to another. There are several implementations of NAT - each with their own purpose. One would choose the type of NAT that suits the task.

The SPEEDLAN 9200 offers 3 features that use NAT: Address Sharing, Internal Servers and 1:1 NAT. Each is described below.

1. Address Sharing: *This feature allows an administrator to share a public IP address with privately addressed nodes. Typically, this is used to allow outbound connections to the Internet from hosts who do not have IP addresses that can be reached from the Internet. In implementing Address Sharing, requests to the Internet would be directed to the SPEEDLAN 9200. The SPEEDLAN 9200 would then translate the source address and port to one of its own, and then forward the request on to its destination. The destination server would return the request to the SPEEDLAN 9200, which would consult its NAT table, determine which host made the request, change the destination address and port,*

and return the completed request. Similar to Internal Servers, this process also creates the Network Address and Port Translations (NAPT). Address sharing is possible when units need to act only as clients and do not need to respond to requests. This is a useful feature if you have a limited number of public IP addresses. You can use this feature to connect the whole LAN to the Internet using just one public IP address. Here are some other benefits of address sharing:

- *reduce costs by using only one Internet account.*
- *protect your information by hiding your workstations IP addresses.*
- *restrict those users you want to access Internet services and resources.*

The main Address Sharing page allows you to share the IP addresses assigned to the SPEEDLAN 9200's network interfaces with all nodes connected to a different network interface.

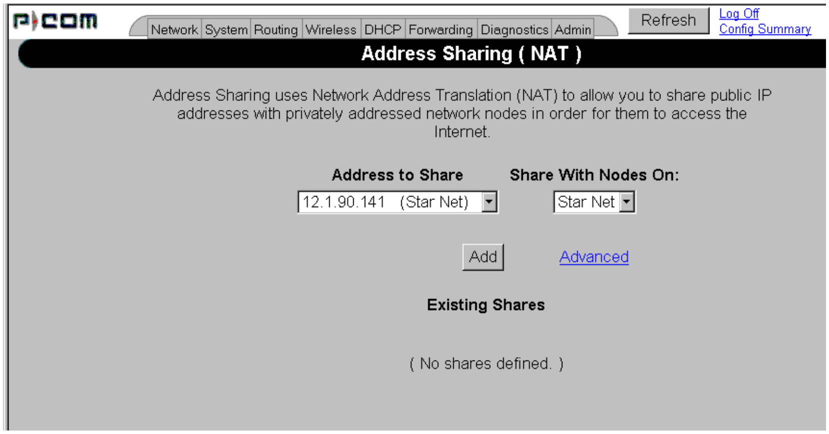
2. Internal Servers: *This feature allows an administrator to make a service available from an IP address, even though the owner of the IP address may not be actually providing the service. Typically, this is used to allow access through a firewall to a protected server. In implementing "Internal Servers," static NAT rules are established that forward requests on a given port to a port on a server. For example, a client request to port 80 on the SPEEDLAN 9200 would be forwarded to an internal web server on port 80. The web server would then handle the request and return to the client via the SPEEDLAN 9200 router. To the client, it would appear that the reply came from the external address.*

3. 1:1 NAT: *This feature allows an administrator to statically map a public IP address to the private IP address of one of the nodes on the network. This is useful when trying to preserve a limited number of public IP addresses on the WAN network. Otherwise, you may be forced to split a public network into two smaller networks and incur the penalty of network and broadcast IP address for both of the new networks. All traffic, regardless of protocol or port, is translated from the external address to the internal address.*

For example, a client request to any port on the "advertised" IP address would be forwarded to the "internal" IP address of the node. The node would then handle the request and return to the client the requested data. To the client, it would appear that the reply came from the external address. This is also referred to as Static NAT.

Address Sharing

To share a public IP address with other computers, choose Address Sharing *from the* Forwarding *menu. The following page will appear:*



Address Sharing (NAT)

Address Sharing uses Network Address Translation (NAT) to allow you to share public IP addresses with privately addressed network nodes in order for them to access the Internet.

Address to Share: 12.1.90.141 (Star Net)

Share With Nodes On: Star Net

Add

Advanced

Existing Shares

(No shares defined.)

Figure 3-50: Address Sharing page

The elements on this page are described below:

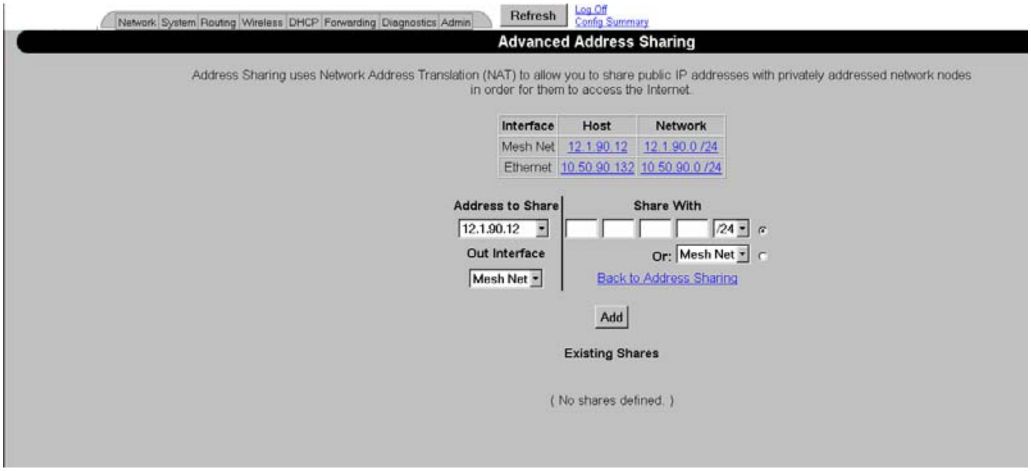
If you want to share an IP address assigned to the wireless or wired network interfaces, select the address from the Address to Share *list. (In the previous figure, the user entered "12.1.90.141"). The "Share With Nodes" will automatically be selected (for the StarNet interface in this example).*

Note 1: *Addressing Sharing works for connections originating from a host on the "address to share" interface/network. Connections to actual IP addresses can still be made from the outside network; those connections will not use the shared address. To prevent this issue, make sure the firewall is enabled.*

Note 2: *If changes are made to "address sharing," connections that originated prior to these changes may still use the previous configuration. The only way to ensure this does not happen is to reboot the SPEEDLAN 9200 router.*

If your WAN interface were the wireless network, you would share the wireless network interface's IP address with nodes on the Ethernet network. For more options, click on the Advanced *link to the right of the "Add" button.*

The Advanced Address Sharing page will appear:



Advanced Address Sharing

Address Sharing uses Network Address Translation (NAT) to allow you to share public IP addresses with privately addressed network nodes in order for them to access the Internet.

Interface	Host	Network
Mesh Net	12.1.90.12	12.1.90.0 /24
Ethernet	10.50.90.132	10.50.90.0 /24

Address to Share: 12.1.90.12

Out Interface: Mesh Net

Share With: /24 ●

Or: Mesh Net ○

Existing Shares

(No shares defined.)

Figure 3-51: Advanced Address Sharing

<u>Description of Advanced Address Sharing</u>

The Address Sharing page allows you to share an address with all nodes connected to one of the SPEEDLAN 9200's network interfaces. This page allows you to narrow down the IP addresses to a specific network.

- Interface, Host and Network: *This table lists the name of the interface, IP address of the wired and wireless host, and the IP address of the network. If you click an IP address, it will populate the* Share With *text box.*
- Address(es) to Share: *Select a virtual address from this drop-down list. You will need to select an* Out Interface *if using a virtual address from the* Address to Share *list. This tells the SPEEDLAN 9200 which interface is acting as the WAN for this operation.*
- Share With: *Do of the following:*
    - *enter the wired or wireless private IP address where you want the public IP address to be shared. Select a netmask that specifies a network or host (/32), or*
    - *select the interface that the private nodes are connected to (e.g., Ethernet).*

Click Add *to implement this setting. This will also be added to the Existing Shares list on the bottom of this page.*

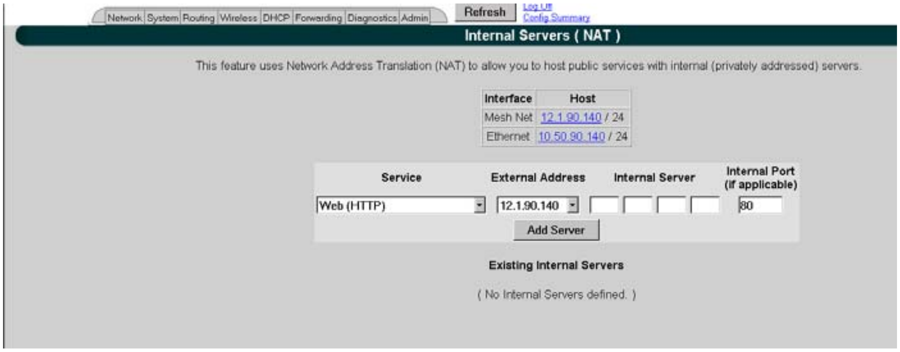
Note: *Click the* Back To Address Sharing *link to return to the previous page.*

<u>Existing Shares</u>

This list displays the public IP addresses that are being shared with the private IP nodes. To remove an existing share, select its check box and then click Delete Selected. *Click* All *to select all shares. Click* None *to clear all selections.*

Internal Servers

Use this feature to host public (Internet) services with internal (privately addressed) servers on your network. This allows you to offload services to multiple servers for a given public IP address. To activate this feature, choose Internal Servers *from the* Forwarding *menu. The following page will appear:*



Internal Servers (NAT)

This feature uses Network Address Translation (NAT) to allow you to host public services with internal (privately addressed) servers.

Interface	Host
Mesh Net	12.1.90.140 / 24
Ethernet	10.50.90.140 / 24

Service	External Address	Internal Server	Internal Port (if applicable)
Web (HTTP)	12.1.90.140		80

Existing Internal Servers

(No Internal Servers defined.)

Figure 3-52: Internal Servers (NAT) page

The elements on this page are described below:

- Interface and Host: *This table lists the name of the interface and host IP addresses assigned to the wired and wireless interfaces. If you click on an IP address, it will populate the* Internal Server *text box.*
- Service: *This is the network service (e.g., HTTP, FTP, etc.) that is provided to the client. The current services are displayed in the Existing Internal Servers list on the bottom of this page.* (Note: *If you want to add to the list of services, choose* Services *from the* Forwarding *menu. Then, follow the directions for Services, page 3-65.)*

- External Address: *Select the IP address where the service will be hosted.*
- Internal Server: *Enter the IP address of the computer on the network that will host the service.*
- Internal Port (if applicable): *If the port is different than the standard for that service, enter it here.*

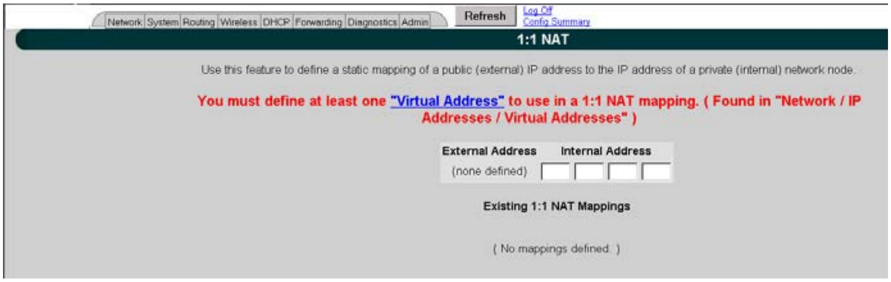
When finished making changes, click Add Server*. This will add the server to the existing internal servers list. If the service has multiple TCP or UDP ports defined, a pop up will appear allowing you to map these to ports on the internal server.*

Existing Internal Servers

To remove an internal server, select its check box and click Delete Selected*. Click* Select All *to select all of the existing internal services. Click* None *to clear all selections.*

1:1 NAT

To access 1:1 NAT settings, choose 1:1 NAT *from the* Forwarding *menu. The following page will appear:*



1:1 NAT

Use this feature to define a static mapping of a public (external) IP address to the IP address of a private (internal) network node.

You must define at least one "Virtual Address" to use in a 1:1 NAT mapping. (Found in "Network / IP Addresses / Virtual Addresses")

External Address	Internal Address
(none defined)	

Existing 1:1 NAT Mappings

(No mappings defined)

Figure 3-53: 1:1 NAT page

Make sure you define at least one virtual address prior to using 1:1 NAT. *To define a virtual address, see Virtual Addresses, page 3-22.*

The elements on this page are described below:

- Interface and Host: *This table lists the name of the interface and host IP addresses assigned to the wired and wireless interfaces.*
- External Address: *This lists the IP address on the "outside" network. (In the previous figure, the user entered "13.13.13.14" for the virtual address.)*

- Internal Address: *Enter the IP address for the inside or private network. This address "hides" behind the public IP address you selected. (In the previous figure, the user entered "192.168.69.88" for the internal IP address.)*

Existing 1:1 NAT Mappings

To remove a 1:1 NAT mapping, select its check box and click Delete Selected*. Click* All *to select all 1:1 NAT mappings. Click* None *to clear all selections.*

Firewall

The SPEEDLAN 9200 (via the SPEEDLAN 9200 Configurator) allows you to control incoming and outgoing traffic.

A firewall prevents unauthorized access to a network. Utilizing the SPEEDLAN 9200 Configurator, SPEEDLAN 9200 routers can increase security and provide additional support to the users of the network. In addition, it may help prevent dangerous packets from intruding on a network that contains sensitive data. It does this by analyzing the network traffic that is permitted or not permitted to enter the firewall based on pre-established rules.

The firewall contains a checklist, and it filters traffic that enters and exits the firewall based on the rules you set (e.g., allowing or denying certain source/destination combinations). When traffic passes through the firewall, the firewall starts at the top of its checklist and looks for the rule that matches its criteria. Traffic that meets the criteria in the checklist will be permitted, and traffic that does not meet the criteria in the checklist will be blocked. This feature allows you to restrict specific network packets from entering or leaving your network.

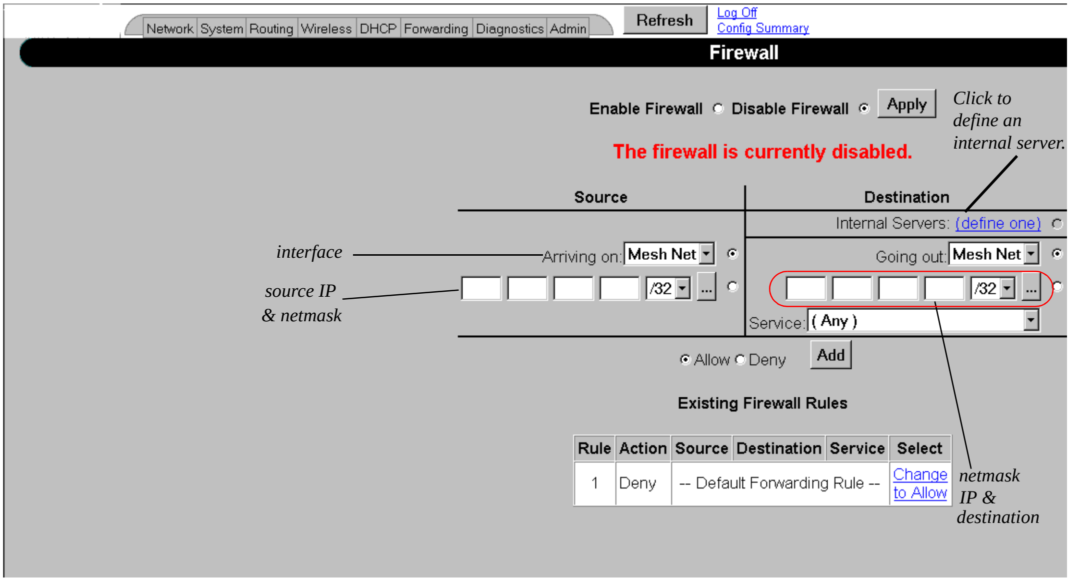
Tips on Creating Rules for Your Firewall

Before you create a rule, make sure you:

- *Understand the purpose of the rule. For example, will this rule block all IRC traffic from the LAN to the Internet? Will this rule allow a remote mail server to send data at the same time over the Internet to an internal mail server?*

- *Do you want the firewall to allow or deny certain traffic? What type of traffic? What type of IP protocol?*
- *What is the direction of the traffic: from the Internet to the LAN or from the LAN to the Internet?*
- *What IP services will this rule affect?*
- *Which nodes (or workstations) on the LAN will these rules affect? Make a mental note of the IP address (those on the private and public LANs) that these rules will affect.*
- *Consider the security of the network. For example, once you enable this rule, which areas of the network will become more vulnerable?*
- *Will this rule override any other rules you created?*

To control traffic flow through the router, choose Firewall *from the* Forwarding *menu. The following page will appear:*



Firewall

Enable Firewall ○ Disable Firewall ● Apply

The firewall is currently disabled.

Source | Destination

Internal Servers: (define one) ○

Arriving on: Mesh Net ●

Going out: Mesh Net ●

/32 ... ○

/32 ... ○

Service: (Any)

● Allow ○ Deny Add

Existing Firewall Rules

Rule	Action	Source	Destination	Service	Select
1	Deny	-- Default Forwarding Rule --			Change to Allow

Click to define an internal server.

interface

source IP & netmask

netmask IP & destination

Figure 3-54: Firewall page

Note: *When DHCP relay is enabled, it may appear as if DHCP requests get through the firewall when they are not explicitly allowed. The reason for this is that DHCP requests come in as link layer broadcasts (which are not filtered by the firewall) and then the relay server unicasts from the SPEEDLAN 9200 router to the ultimate DHCP server. These* *unicasts originate from the SPEEDLAN 9200 and thus are not considered to be "forwarded" by the firewall. Turning off DHCP relay stops this behavior.*

The elements on this page are explained below:

- Enable Firewall: *Select the* Enable Firewall *option to activate the firewall feature.*
- Disable Firewall: *Select the* Disable Firewall *option to disable the firewall feature. Click* Apply *to activate the option you selected.*

Source Section

Arriving on: Select one of the following:

- *the interface or*
- *the IP address/netmask. Then, enter the IP address for the source and select the netmask.*

Note: *If you click the "…" button, the physical addresses of the interfaces will be displayed.*

Destination Section

Select one of the following:

- Internal Servers: *If there are any internal servers defined on this SPEEDLAN 9200, you can choose one as the destination in a rule. If there are no internal servers defined, this combo box will be disabled and you can click on the* Define one *link to create an internal server.*
- Going Out: *Select one of the following: the interface for the destination or the IP address/netmask. Then, enter the IP address for the destination and select the netmask.*
- Service: *Select the name of the service if this rule applies to a single service. This is the network service (e.g., HTTP, FTP, etc.) that is provided to the client.*

Allow or Deny Action

Select one of the following:

- Allow: *Select the* Allow *option to enable that traffic through the firewall.*

- Deny: *Select the* Deny *option to block that traffic through the firewall.*
- Add: *Click this button to add this rule to the Existing Firewall Rules list.*

Existing Firewall Rules

This lists the existing firewall rules, and the firewall will run through the checklist as explained in the introduction. To remove a firewall rule from the list select its check box and click Delete Selected*. Click* All *to select all firewall rules. Click* None *to clear all selections. To change the Default Forwarding Rule, click the link that either says, "*Change to Allow*" or "*Change to Deny*".*

Note: *Once you have finished configuring your firewall, reboot the SPEEDLAN 9200 router. This will terminate any undesired connections that may have existed prior to the firewall configuration. You can verify if such undesired connections exist by opening the IP Sessions page, which is last function under the Forwarding menu. For more information, see IP Sessions, page 3-79.*

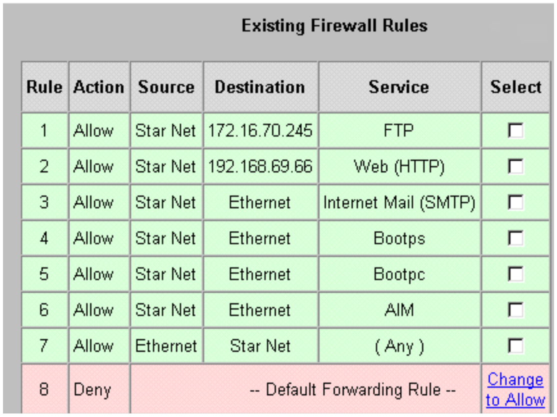
Special Rules for Virtual Addresses

When you create a firewall rule that references a 1:1 NAT mapping or an internal service using a virtual address, you must specify the internal address as the destination. This is important to know because the virtual addresses have already been translated to their defined internal addresses before the firewall examines the packet's destination.

Tutorial: What is happening in this firewall rule set?

As previously explained, a rule set tells the firewall what it can do. The rule set checklist follows the top-down concept. The first row takes priority, and then follows the second row's criteria, followed by the third, and so on.

Can you explain what is happening in the example below?



Existing Firewall Rules

Rule	Action	Source	Destination	Service	Select
1	Allow	Star Net	172.16.70.245	FTP	□
2	Allow	Star Net	192.168.69.66	Web (HTTP)	□
3	Allow	Star Net	Ethernet	Internet Mail (SMTP)	□
4	Allow	Star Net	Ethernet	Bootps	□
5	Allow	Star Net	Ethernet	Bootpc	□
6	Allow	Star Net	Ethernet	AIM	□
7	Allow	Ethernet	Star Net	(Any)	□
8	Deny	-- Default Forwarding Rule --			Change to Allow

Figure 3-55: Example of Firewall Rules

<u>The explanation:</u>

Rule 1 (FTP server): This rule will allow incoming traffic coming from the Star Net interface to enter the firewall and go to the FTP server on 172.16.70.245.

Rule 2 (Web server): This rule will allow incoming traffic coming from the Star Net interface to enter the firewall and go to the web server on 192.168.69.66.

Rule 3 (Mail server): This rule will allow incoming traffic from the Star Net interface to enter the Internet mail server on the Ethernet interface.

Note about DHCP Rules 4 and 5: *DHCP spans both rules 4 and 5. These rules allow DHCP requests to a DHCP server from the Star Net interface to enter the firewall. The Bootps service support server requests, and the Bootpc service provides client support for DHCP.*

Rule 4 (DHCP request): This rule allows DHCP requests to a server.

Rule 5 (DHCP reply): This rule allows replies to a client.

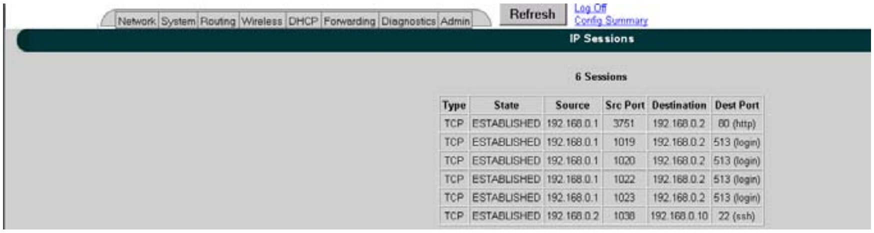
Rule 6 (AOL Instant Messenger: AIM): This rule will allow incoming traffic from the Star Net interface to enter the firewall so clients can run AOL Instant Messenger.

Rule 7 (Anywhere): This rule will allow traffic coming from the Ethernet interface to go through the firewall via the Star Net interface. The intention is to go anywhere on the internet or the network).

Rule 8 (Deny incoming traffic): This rule will tell the firewall to deny other incoming traffic. The firewall will not allow any incoming traffic to go through the firewall.

IP Sessions

The SPEEDLAN 9200 firewall offers stateful packet filtering. IP Sessions allows you to view sessions whose state is currently active. Choose IP Sessions *from the* Forwarding *menu. The following page will appear:*



IP Sessions

6 Sessions

Type	State	Source	Src Port	Destination	Dest Port
TCP	ESTABLISHED	192.168.0.1	3751	192.168.0.2	80 (http)
TCP	ESTABLISHED	192.168.0.1	1019	192.168.0.2	513 (login)
TCP	ESTABLISHED	192.168.0.1	1020	192.168.0.2	513 (login)
TCP	ESTABLISHED	192.168.0.1	1022	192.168.0.2	513 (login)
TCP	ESTABLISHED	192.168.0.1	1023	192.168.0.2	513 (login)
TCP	ESTABLISHED	192.168.0.2	1038	192.168.0.10	22 (ssh)

Figure 3-56: IP Sessions

This list includes IP sessions terminating or originating on this router, as well as any forwarded sessions. It is recommended that you open the IP Sessions page after you alter any firewall rules to verify that all sessions comply with the new rules. Existing sessions that are not allowed by the new firewall rules will be terminated. You must reboot the router to remove these types of sessions, or wait for them to finish.

Diagnostics Menu (Troubleshooting the Network)

Choose Diagnostics *to troubleshoot network problems.*

- *Choose* Statistics *under the Diagnostics menu to view information about inbound and outbound traffic for the interfaces (or routers).*
- *Choose* ARP Table *to locate systems on the LAN that are configured with incorrect IP addresses.*

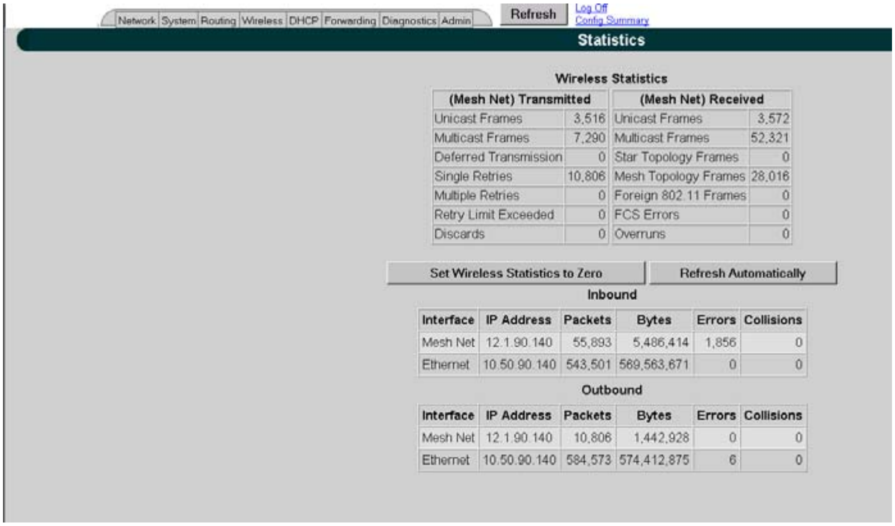
- *Choose* ICMP Stats *to view ICMP messages and errors between the host servers and gateways.*

Special Note about Link & Ping Tests:

Note: *If you need to perform a link test to verify that your equipment is communicating properly at the RF level,* SPEEDView *is an excellent tool. This process will help you with the performance evaluation. For more information on how to perform a link test, see The SPEEDManage User Guide. You can also perform a ping test if need.*

Interface Statistics

The Interface Statistics menu lists the current available network interfaces. To view the statistics of an interface, choose Statistics *from the* Diagnostics *menu. The following page will appear.*



Statistics

Wireless Statistics

(Mesh Net) Transmitted		(Mesh Net) Received	
Unicast Frames	3,516	Unicast Frames	3,572
Multicast Frames	7,290	Multicast Frames	52,321
Deferred Transmission	0	Star Topology Frames	0
Single Retries	10,806	Mesh Topology Frames	28,016
Multiple Retries	0	Foreign 802.11 Frames	0
Retry Limit Exceeded	0	FCS Errors	0
Discards	0	Overruns	0

Inbound

Interface	IP Address	Packets	Bytes	Errors	Collisions
Mesh Net	12.1.90.140	55,893	5,486,414	1,856	0
Ethernet	10.50.90.140	543,501	569,563,671	0	0

Outbound

Interface	IP Address	Packets	Bytes	Errors	Collisions
Mesh Net	12.1.90.140	10,806	1,442,928	0	0
Ethernet	10.50.90.140	584,573	574,412,875	6	0

Figure 3-57: Interface Statistics page

Wireless Statistics

Transmitted

- Unicast Frames: *Total number of unicast frames transmitted.*
- Multicast Frames: *Total number of multicast frames transmitted.*
- Deferred Transmission: *Total number of frames for which one or more transmission attempt(s) was deferred to avoid a collision.*

- Single Retries: *Total number of frames successfully transmitted after one (and only one) retransmission.*
- Multiple Retries: *Total number of frames successfully transmitted after more than one retransmission.*
- Retry Limit Exceeded: *Total number of frames not transmitted successfully because the retry limit was reached.*
- Discards: *Total number of frames discarded to free up buffer space.*

<u>*Received*</u>

- Unicast Frames: *Total number of unicast frames received.*
- Multicast Frames: *Total number of multicast frames received.*
- Star Topology Frames: *Total number of star topology frames received.*
- Mesh Topology Frames: *Total number of mesh topology frames received.*
- Foreign 802.11 Frames: *Total number of 802.11 frames received.*
- FCS Errors: *Total number of frames considered to be destined for this station, but received with an FCS error.*
- Overruns: *Total number of frames discarded to free up buffer space.*

Inbound & Outbound

Refer to the definitions below for traffic moving inbound or outbound, depending on the direction of movement. Each inbound and outbound statistic is defined below:

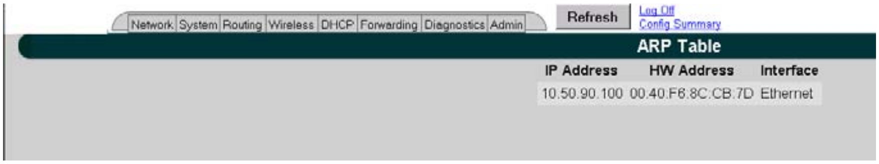
- Interface: *The interface on which this entry is effective.*
- IP address: *This address tells the network how to locate the computers or network equipment connected to it.*
- Packets: *A unit of data transmitted between a receiver and a sender. Each packet contains embedded information, as well as a place to go on the network (known as the IP address).*
- Bytes: *The length of the packet.*
- Errors: *The number of packets that did not reach their destination due to an error.*
- Collisions: *The number of packets that did not reach their destination because two network nodes tried to transmit at the same time.*

Note: *The statistics are refreshed every time you refresh the web page.*

ARP Table

ARP is the abbreviation for Address Resolution Protocol, which maps an IP address to a machine's hardware address. Network administrators use ARP to locate systems on the LAN that are configured with incorrect IP addresses. This helps diagnose MAC addresses that your router knows about.

To open the ARP table, choose ARP Table *from the* Diagnostics *menu. The following page will appear.*



ARP Table

IP Address	HW Address	Interface
10.50.90.100	00:40:F6:8C:CB:7D	Ethernet

Figure 3-58: ARP page

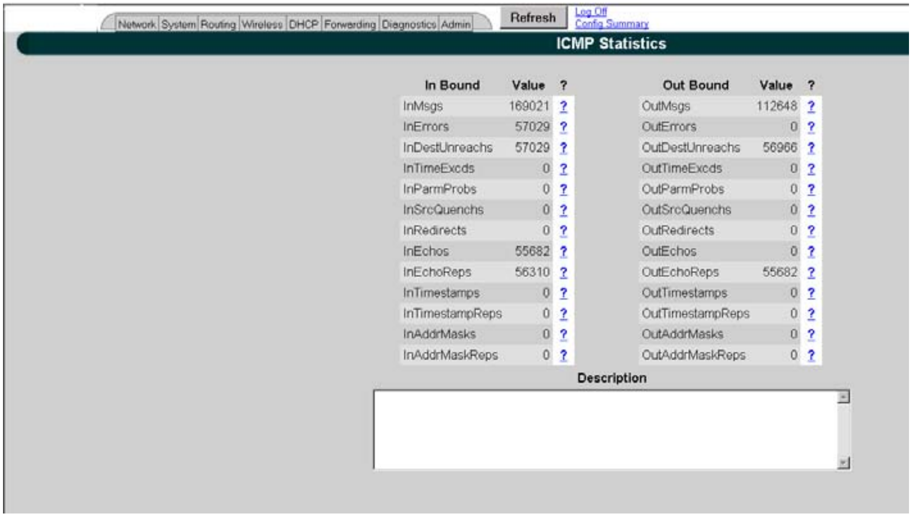
The ARP statistics are defined below:

- IP address: *The IP address corresponding to the media-dependent 'physical' MAC address.*
- HW Address: *In a LAN environment each computer contains its own Medium Access Control (MAC) address which is the embedded and unique hardware number.*
- Interface: *The interface on which this entry is effective.*

ICMP Statistics

ICMP is the abbreviation for Internet Control Message Protocol. ICMP supplies messages and error reports for packets that travel between host servers and gateways. The ICMP stats can be used to diagnose a connectivity problem. If you are trying to ping a router and you're not getting a response, you can check the "InMsgs" to see if the ping arrived at the router and just could not get back. This might indicate that the router has no route back to the originator.

To view ICMP information, choose ICMP Stats *from the* Diagnostics *menu. The following page will appear.*



ICMP Statistics

In Bound	Value	?	Out Bound	Value	?
InMsgs	169021	?	OutMsgs	112648	?
InErrors	57029	?	OutErrors	0	?
InDestUnreachs	57029	?	OutDestUnreachs	56966	?
InTimeExcds	0	?	OutTimeExcds	0	?
InParmProbs	0	?	OutParmProbs	0	?
InSrcQuenchs	0	?	OutSrcQuenchs	0	?
InRedirects	0	?	OutRedirects	0	?
InEchos	55682	?	OutEchos	0	?
InEchoReps	56310	?	OutEchoReps	55682	?
InTimestamps	0	?	OutTimestamps	0	?
InTimestampReps	0	?	OutTimestampReps	0	?
InAddrMasks	0	?	OutAddrMasks	0	?
InAddrMaskReps	0	?	OutAddrMaskReps	0	?

Figure 3-59: ICMP page

The In Bound statistics are defined below:

- Msgs: *The total number of ICMP messages which the entity received. Note that this counter includes all those counted by icmpInErrors.*
- Errors: *The number of ICMP messages which the entity received but determined as having ICMP-specific errors (bad ICMP checksums, bad length, etc.).*
- Dest Unreach: *The number of ICMP Destination Unreachable messages received.*
- Time Exceeds: *The number of ICMP Time Exceeded messages received.*
- Param Problems: *The number of ICMP Parameter Problem messages received.*
- Src Quenches: *The number of ICMP Source Quench messages received.*
- Redirects: *The number of ICMP Redirect messages received.*
- Echos: *The number of ICMP Echo (request) messages received.*
- Echo Replies: *The number of ICMP Echo Reply messages received.*
- Timestamps: *The number of ICMP Timestamp (request) messages received.*
- Timestamp Replies: *The number of ICMP Timestamp Reply messages received.*
- Addr Masks: *The number of ICMP Address Mask Request messages received.*

- Addr Mask Replies: *The number of ICMP Address Mask Reply messages received.*

The Out Bound statistics are defined below:

- Msgs: *The total number of ICMP messages which this entity attempted to send. Note that this counter includes all those counted by icmpOutErrors.*
- Errors: *The number of ICMP messages which this entity did not send due to problems discovered within ICMP such as a lack of buffers. This value should not include errors discovered outside the ICMP layer such as the inability of IP to route the resultant datagram. In some implementations there may be no types of error which contribute to this counter's value.*
- Dest Unreach: *The number of ICMP Destination Unreachable messages sent.*
- Time Exceeds: *The number of ICMP Time Exceeded messages sent.*
- Param Problems: *The number of ICMP Parameter Problem messages sent.*
- Src Quenches: *The number of ICMP Source Quench messages sent.*
- Redirects: *The number of ICMP Redirect messages sent.*
- Echos: *The number of ICMP Echo (request) messages sent.*
- Echo Replies: *The number of ICMP Echo Reply messages sent.*
- Timestamps: *The number of ICMP Timestamp (request) messages sent.*
- Timestamp Replies: *The number of ICMP Timestamp Reply messages sent.*
- Addr Masks: *The number of ICMP Address Mask Request messages sent.*
- Addr Mask Replies: *The number of ICMP Address Mask Reply messages sent.*

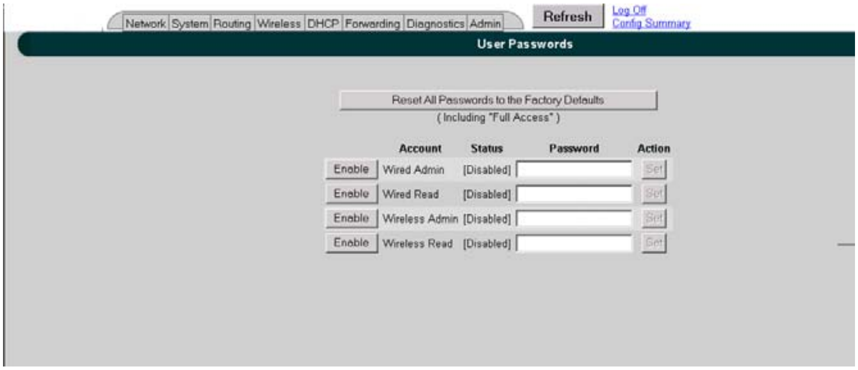
Admin Menu

If you want to limit administrative rights to certain users, choose the Admin *menu.*

- *Choose* Users *to set passwords for the type of account needed. The user now has the ability to selectively enable alternate accounts (i.e., accounts other than Full Access). All alternate accounts will be disabled by default.*
- *Choose* Permissions *if you want to restrict certain settings to users.*
- *Choose* Software Update *to update the SPEEDLAN 9200 router.*
- *Choose* Support *to reset the entire configuration of the SPEEDLAN 9200 factory default settings, enable manufacturer access to the router for advanced troubleshooting, and enable/disable communication with SPEEDSignal.*
- *Choose* Current Sessions *from the* Admin *menu to view the status of a session or to terminate it.*

User Configuration Passwords

When logged on with the full-access password, you will see the Users page. To activate this page, choose Users *from the* Admin *menu. The following page will appear.*



User Passwords

Reset All Passwords to the Factory Defaults
(Including "Full Access")

	Account	Status	Password	Action
Enable	Wired Admin	[Disabled]		Set
Enable	Wired Read	[Disabled]		Set
Enable	Wireless Admin	[Disabled]		Set
Enable	Wireless Read	[Disabled]		Set

Figure 3-60: User Configuration page

The classes of users are described in Classes of Users (and Passwords), page 3-10. The User Configuration page allows you to set a password for each user account in the SPEEDLAN 9200 Configurator.

The user now has the ability to selectively enable alternate accounts (i.e., accounts other than Full Access). All alternate accounts will be disabled by default.

1 *Do one of the following:*

- *Click* Enable *to enable the account.*
- *Click* Disable *to disable the account*

2 *Enter the password for the user account in the textbox provided. The minimum password length is 8 characters. The maximum password length is 16 characters (including the underscore character or spacebar).*

3 *Click* Set.

To revert to factory default settings, click Reset to Factory Defaults.

Software Update

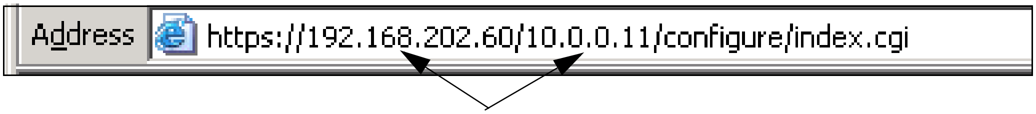
The Software Update zip file (found on the www.wavewireless.com web site under the Support + Firmware link) will contain a document describing the recent changes and any other additional information needed to perform the update.

- *For updating the software on a mesh router, see Software Update, page 4-12.*

Proxy Mode Warning

Warning! *Do not use Proxy mode when performing the update. Update from the location (host) where you are connected. If you are not directly connected, then you are proxied to another host and the update will not work. There is a limitation of proxy mode that restricts a transaction to 60 seconds. If the update takes longer than 60 seconds, which it frequently does, the update will be stopped.*

How do you tell if you are directly connected to the host? Look in the Address bar on your Internet browser. If you only see one IP address in the Address bar, you are directly connected. However, if you see two IP address in the Address bar, as shown in the following figure, then you are in "Proxy" mode.

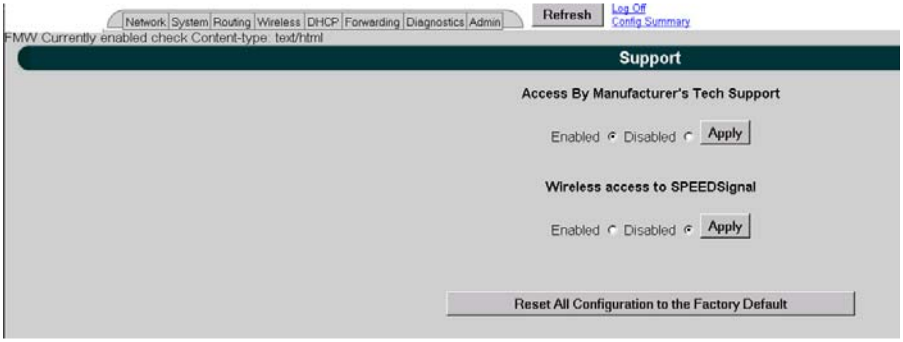


https://192.168.202.60/10.0.0.11/configure/index.cgi

displays two IP addresses (Proxy mode)

Support

This page displays some support function features for Technical Support, Access to SPEEDSignal (for Pocket PC) and Reset to Factory Default. You can access these features by choosing Support *from the* Admin *menu. The following page will appear:*



FMW Currently enabled check Content-type: text/html

Support

Access By Manufacturer's Tech Support

Enabled ● Disabled ○ Apply

Wireless access to SPEEDSignal

Enabled ○ Disabled ● Apply

Reset All Configuration to the Factory Default

Figure 3-61: Support page

The elements on this page are explained below:

<u>Access By Manufacturer's Tech Support</u>

This is where you can enable the manufacturer to access the router for advanced troubleshooting (by choosing the Enabled *option). The factory default is disabled and should remain disabled unless requested by a manufacturer's technical support representative (by choosing the* Disabled *option). Click* Apply *when finished.*

<u>Access to Wireless SPEEDSignal</u>

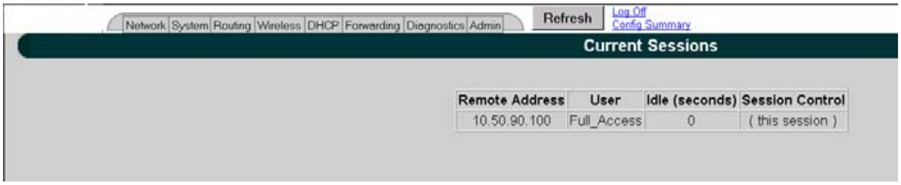
This feature is used to enable or disable Pocket PC PDAs to communicate with SPEEDSignal.

- *Click the* Enabled *option to enable communication with SPEEDSignal.*
- *Click the* Disabled *option to disable communication with SPEEDSignal. Click* Apply *when finished.*

Reset to Factory Default

If you need to reset the entire configuration of the SPEEDLAN 9200 to factory default settings, click Reset All Configuration to the Factory Default.

Current Sessions



Remote Address	User	Idle (seconds)	Session Control
10.50.90.100	Full_Access	0	(this session)

Figure 3-62: Current Sessions

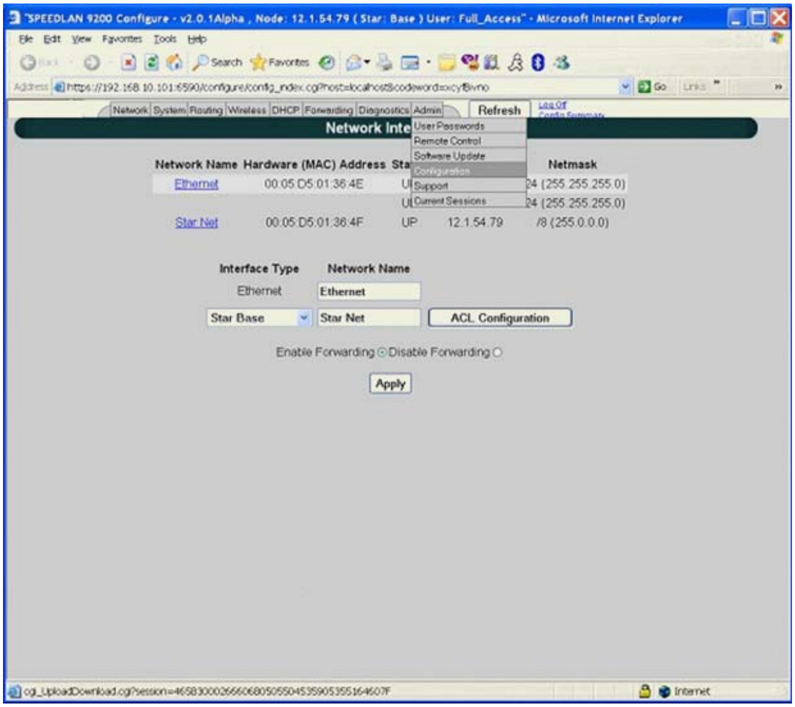
Current Sessions is activated by choosing Current Sessions *from the* Admin *menu. This page displays the active actions for the web server. It displays who is logged on and also lets you terminate the session by clicking the* Terminate *link.*

CONFIGURATION DOWNLOAD/UPLOAD

Configuration Download/Upload feature is supported in SPEEDLan 9200 to allow user to:

- *Download the all the current configuration settings to a file on the local host.*
- *Upload the configurations that are stored in the configuration to the specific SPEEDLAN 9200 unit.*

To access Configuration Download/Upload page, choose Admin->Configuration from System main menu


"SPEEDLAN 9200 Configure - v2.0.1Alpha , Node: 12.1.54.79 (Star: Base) User: Full_Access" - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address https://192.168.10.101:6590/configure/config_index.cgi?host=localhost&codeword=xcyf8vno
Go Links
Network System Routing Wireless DHCP Forwarding Diagnostics Admin
Refresh
Log Off
Config Summary
Network Inte
User Passwords
Remote Control
Software Update
Configuration
Support
Current Sessions
cgi_UploadDownload.cgi?session=4658300026660680505504535905355164607F
Internet

Network Name	Hardware (MAC) Address	Sta		Netmask
Ethernet	00:05:D5:01:36:4E	U		24 (255.255.255.0)
		U		24 (255.255.255.0)
Star Net	00:05:D5:01:36:4F	UP	12.1.54.79	/8 (255.0.0.0)

Interface Type	Network Name	
Ethernet	Ethernet	
Star Base	Star Net	ACL Configuration

Enable Forwarding ● Disable Forwarding ○

Apply

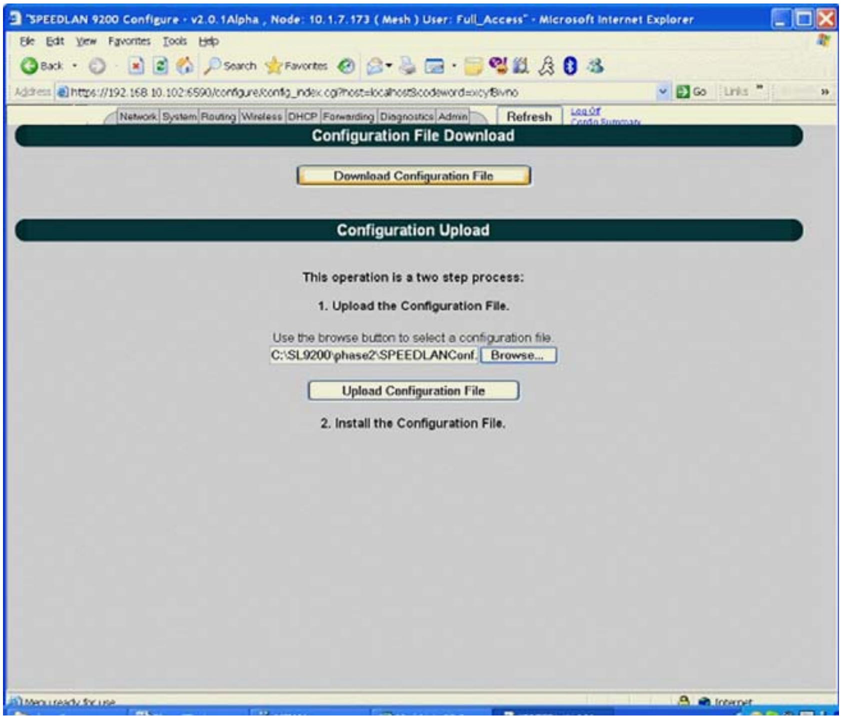
Figure 3-63: Configuration

CONFIGURATION DOWNLOAD

"Download Configuration File" button is used to activate the configuration download process. When the download process is done, the configuration is saved in c:\SL9200\phase2\SPEEDLANConf.ecf on the local host. The saved file is encrypted; user is not able to read the contents; however, user can upload the same file to a replacement unit or new unit later.

CONFIGURATION UPLOAD

"Upload Configuration File" button is used to activate the configuration upload process. There are two steps in the upload process: 1) upload the specified configuration file, and 2) install the configuration file to the unit. After the configuration file is installed into the unit, user can use the Web Configurator to configure the configurations parameters as needed.


"SPEEDLAN 9200 Configure - v2.0.1Alpha , Node: 10.1.7.173 (Mesh) User: Full_Access" - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address https://192.168.10.102:6590/configure/config_index.cgi?host=localhost&codeword=xcyf8vno
Go Links
Network System Routing Wireless DHCP Forwarding Diagnostics Admin
Refresh
Log Off
Config Summary
Download Configuration File
Browse...
Upload Configuration File
Internet

Configuration File Download

Configuration Upload

This operation is a two step process:

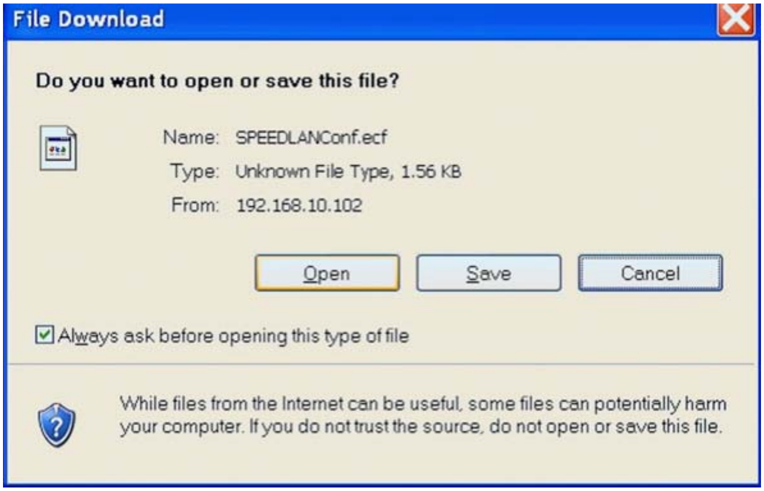
1. Upload the Configuration File.

Use the browse button to select a configuration file.

C:\SL9200\phase2\SPEEDLANConf.

2. Install the Configuration File.

Figure 3-64: Configuration Download/Upload



Do you want to open or save this file?

Name: SPEEDLANConf.ecf

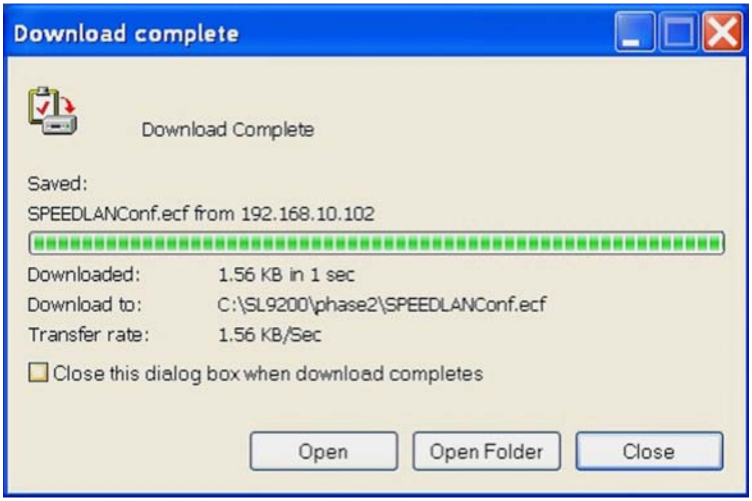
Type: Unknown File Type, 1.56 KB

From: 192.168.10.102

☑ Always ask before opening this type of file

While files from the Internet can be useful, some files can potentially harm your computer. If you do not trust the source, do not open or save this file.

Figure 3-65: Configuration Download



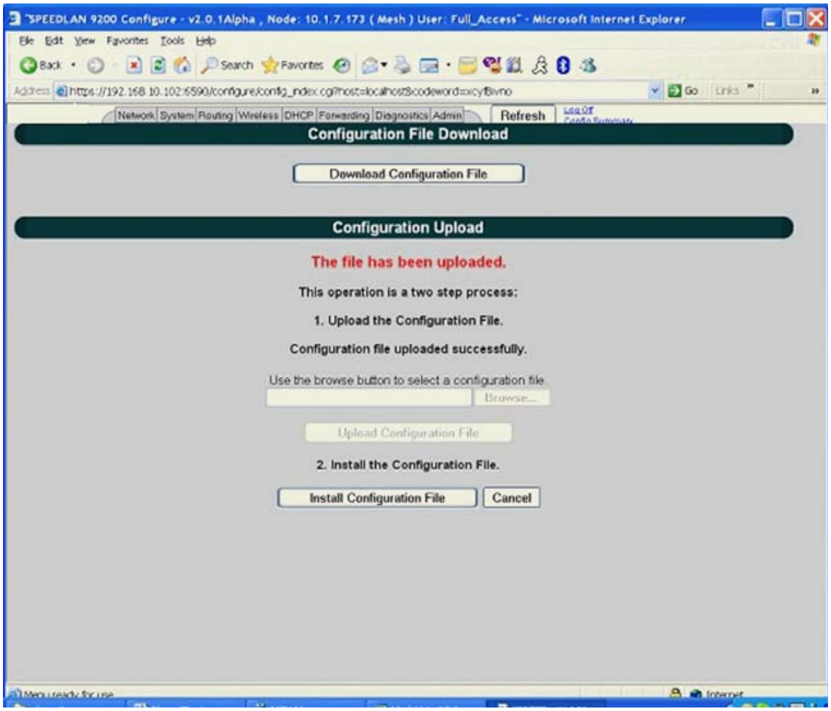
Download Complete

Saved:
SPEEDLANConf.ecf from 192.168.10.102

Downloaded: 1.56 KB in 1 sec
Download to: C:\SL9200\phase2\SPEEDLANConf.ecf
Transfer rate: 1.56 KB/Sec

□ Close this dialog box when download completes

Figure 3-66: Download Complete


"SPEEDLAN 9200 Configure - v2.0.1Alpha , Node: 10.1.7.173 (Mesh) User: Full_Access" - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back
Search
Favorites
Address
Go
Links
Network
System
Routing
Wireless
DHCP
Forwarding
Diagnostics
Admin
Refresh
Log Off
Config Summary
Download Configuration File
Browse...
Upload Configuration File
Install Configuration File
Cancel
Internet

https://192.168.10.102:6590/configure/config_index.cgi?host=localhost&codeword=xcyfBvno

Configuration File Download

Configuration Upload

The file has been uploaded.

This operation is a two step process:

1. Upload the Configuration File.

Configuration file uploaded successfully.

Use the browse button to select a configuration file.

2. Install the Configuration File.

Figure 3-67: Upload Successful

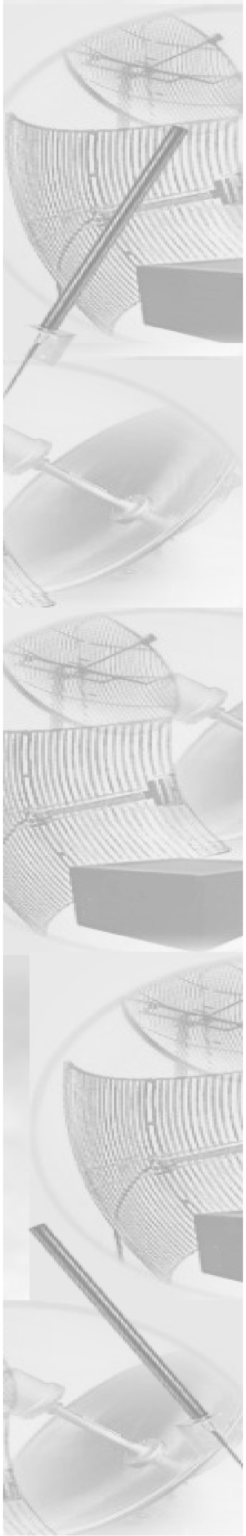
Notes:

Chapter 4 Using the Configurator to Set Up Special Parameters for Mesh Routers

This chapter covers only those special parameters needed to set up mesh routers, such as:

- *Network menu: Interfaces for Mesh Mode, page 4-2; Mesh Nodes, page 4-3; Enabling/Disabling the SPEED-Mesh-Enabled Client, page 4-3*
- *Wireless menu: Request to Send (RTS) / Clear to Send (CTS), page 4-5; Receive (Rx) Threshold Parameter, page 4-6, Blocked Links, page 4-8 and Link Expiration, page 4-9. To set up other wireless configuration parameters, see Configuration, Chapter 3*
- *Admin menu: Remote Control, page 4-10; Software Update, page 4-10; and Updating the Software on a Local Router and Remote Router(s), page 4-12*

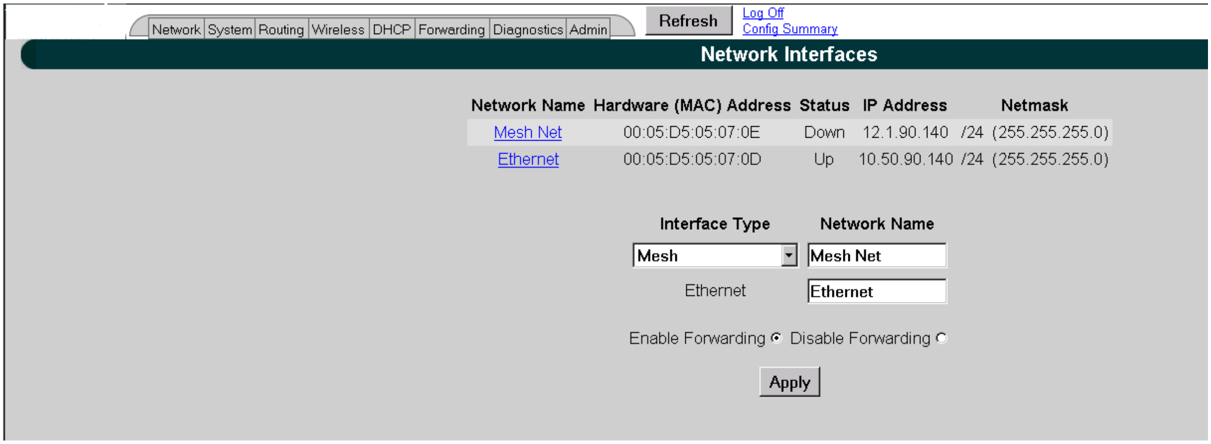
For other common configuration, see Overview of the SPEEDLAN 9200 Configurator General Main Menu, Chapter 3.



Network Menu

Interfaces for Mesh Mode

The Network Interfaces page will appear when you choose Interfaces *under the* Network *menu. This is where you enter the interface type and network name of the mesh interface.*



Network Interfaces

Network Name	Hardware (MAC) Address	Status	IP Address	Netmask
Mesh Net	00:05:D5:05:07:0E	Down	12.1.90.140	/24 (255.255.255.0)
Ethernet	00:05:D5:05:07:0D	Up	10.50.90.140	/24 (255.255.255.0)

Interface Type	Network Name
Mesh	Mesh Net
Ethernet	Ethernet

Enable Forwarding ● Disable Forwarding ○

Apply

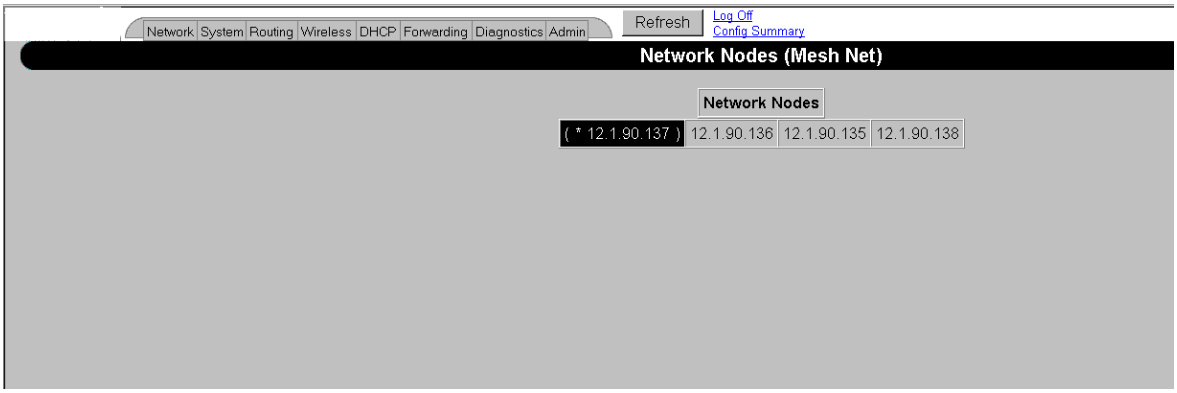
Figure 4-1: Selecting mesh mode

- Network Name: *This is the name you assign to the mesh interface.*
- Hardware Address: *In a LAN environment each network interface contains its own Medium Access Control (MAC) address which is the embedded and unique hardware number.*
- Status: *This is the state of the interface. Up - ready to pass packets; Down - cannot pass packets.*
- IP Address: *This address tells the network how to locate the computers or network equipment connected to it.*
- Netmask: *The netmask is a 4-byte number that masks the network part of the Internet Protocol IP address, so only the host computer part of the address remains.*
- Interface Type: *Select* Mesh *from the* Interface Type *drop-down list. When finished, click* Apply*. This will tell the configurator that you are in mesh mode.*
- Network Name: *The type of network for the wireless or fixed router.*
- Enable Forwarding: *Select the* Enable Forwarding *option to enable the forwarding of IP packets from the wired interface to the wireless interface and vice-versa.*

- Disable Forwarding: *Select the* Disable Forwarding *option to disable the forwarding of IP packets from the wired interface to the wireless interface and vice-versa.*
- Apply: *Click after making changes.*

Mesh Nodes

The Mesh Nodes (Network Nodes) page shows you what other routers are currently in your network. This is useful if you do not have SPEEDView on your workstation. This page will appear when you choose Mesh Nodes *under the* Network *menu.*



Network Nodes (Mesh Net)

Network Nodes

(* 12.1.90.137) 12.1.90.136 12.1.90.135 12.1.90.138

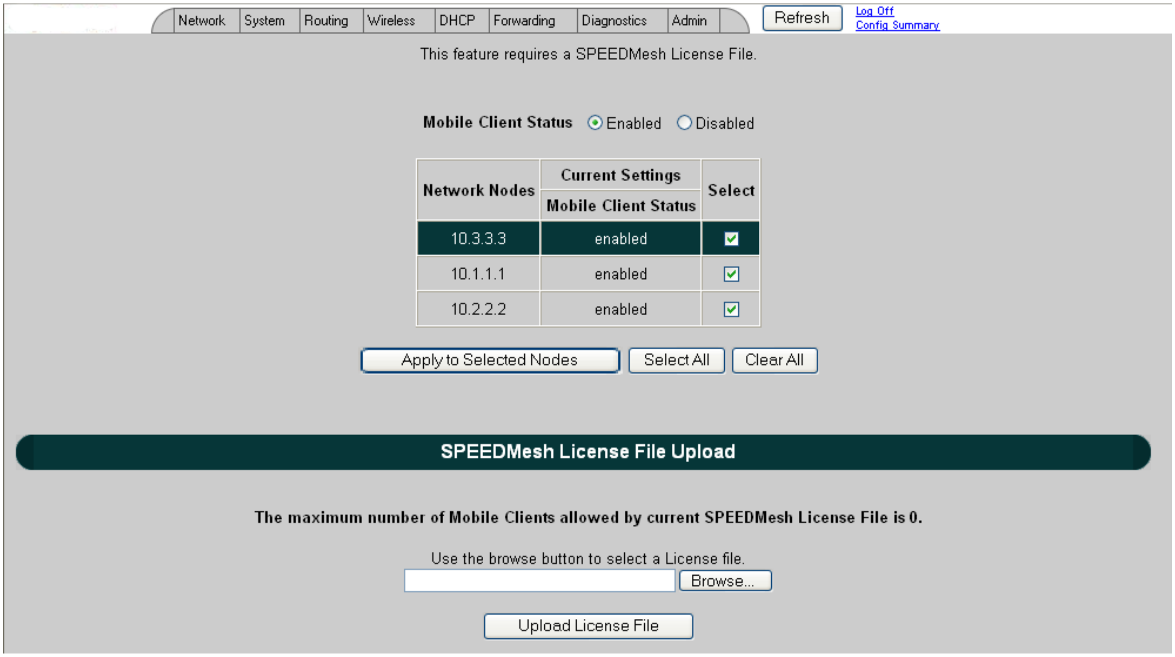
Figure 4-2: Network Nodes page

Enabling/Disabling the SPEEDMesh-Enabled Client

SPEEDLAN 9200 routers allow any 802.11 SPEEDMesh-enabled client (i.e., PC, PDA, laptop) to join the wireless network. Network administrators can control access via WEP.

To enable or disable the SPEEDMesh client, do the following:

1. *Choose* Mobile Client *from the* Network *menu. The Mobile Client page will appear:*



This feature requires a SPEEDMesh License File.

Mobile Client Status ● Enabled ○ Disabled

Network Nodes	Current Settings	Select
	Mobile Client Status	
10.3.3.3	enabled	☑
10.1.1.1	enabled	☑
10.2.2.2	enabled	☑

SPEEDMesh License File Upload

The maximum number of Mobile Clients allowed by current SPEEDMesh License File is 0.

Use the browse button to select a License file.

Figure 4-3: Enabling/disabling the SPEEDMesh client

2 *To enable the SPEEDMesh client, select the* Enable Mobile Client *check box.*

3 *Select the nodes you want to enable for SPEEDMesh-enabled client mode node via one node, all nodes (via Select All) or unselect all nodes (via Clear All).*

4 *Click* Apply to Selected Nodes *to active the SPEEDMesh client(s).*

5 *License Control: Enabling Mesh Client will not be enough if you want your mobile clients to roam on the SPEEDLan MESH network. The administrator will need to upload a SPEEDMesh License file. The SPEEDMesh License file specifies the number of clients the Mesh router will allow at all times. The client will need to enable the SPEEDMesh application to be able to roam around on the SPEEDLan network. Otherwise the client will be limited to only that particular SPEEDLan MESH router. Additional information can be obtained from the SPEEDMesh User Guide, which is provided on your SPEEDManage CD.*

Note: *If you forgot to enable WEP security, see B. Enabling WEP Security Between a SPEEDMesh-Enabled Client and SPEEDLAN 9200, page 4-5.*