- **Interface Type**: Select the CPE from the **Interface Type** drop-down list. When finished, click **Apply**. This will tell the configurator that you are in CPE 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.

Base Station Information

To see if a CPE is connected to the base station, choose **Base Station Info** from the **Network** menu. The following page will appear. Note: If there is no connection to the base station, a message will appear confirming that the CPE is not connected to the base station.

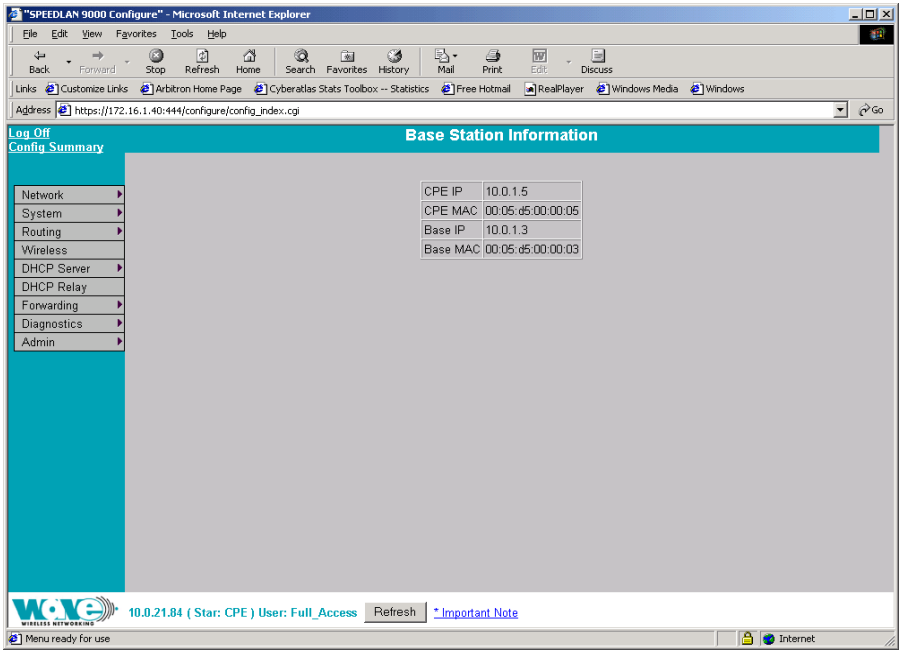


Figure 5-2: Base Station Information (for CPE mode)

Authentication

Normally, the CPE routers must prove their authenticity with a base station before participating in the star network. One way to do this is to set a common pass on both the CPE router and on the base station. Use this page (Authentication Settings) to set a pass phrase for a CPE router. You are only required to do this once, unless the pass phrase on the base station changes. Just make sure that the password is kept in a safe place so it is not lost or stolen.

All interfaces connected to the 9000 router are restricted to systems based on the authentic pass phrase (or password). Any interface that does not have the correct pass phrase will not be able to establish a data connection.

To authenticate a CPE, choose **Authentication** from the **Network** menu. The following page will appear.

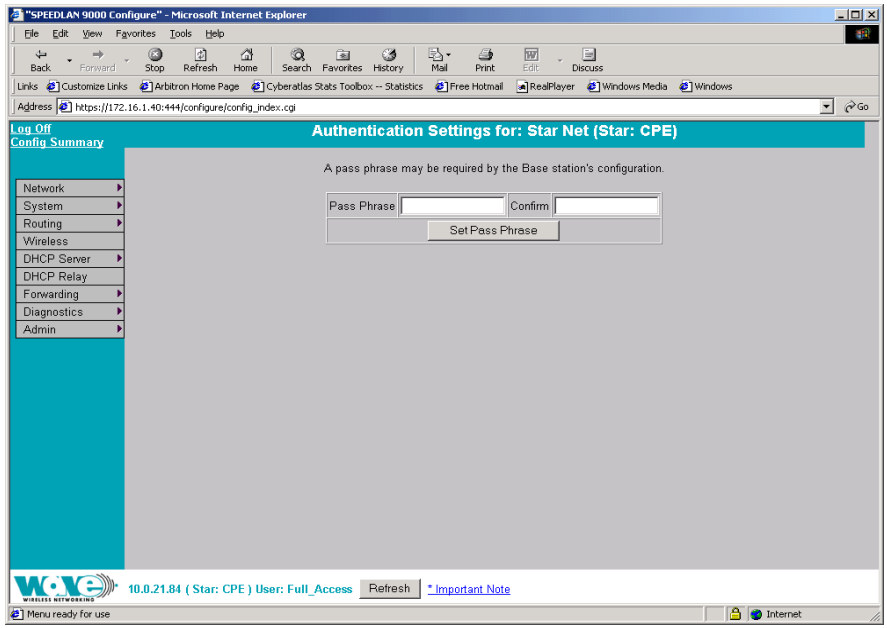


Figure 5-3: Authentication Settings for CPE page

- **Pass Phrase:** Enter a pass phrase and confirm it like setting up a regular password. As shipped there would be a blank pass phrase and a base station authenticates CPE routers using the MAC address. If you want to use the Pass Phrase authentication, then you have to set matching pass phrases on a base

station and on a CPE. (Pass Phrases have a minimum of 8 characters and a maximum of 32 characters.)

- **Confirm**: Enter the pass phrase again to ensure it is correct. Make sure you keep the pass phrase in a safe place.

Wireless menu

Choose **Configuration** from the **Wireless** menu and you will be able to choose one of the following:

- If you click the **Channel and Rates** button, you will be able to select the channel and signaling rate of the interface. For more information, see *Channel and Rates, page 5-6*.
- If you click the **Tx Retries** button, 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 5-8*.
- If you click the **Max Throughput** button, you will be able to set the Max Transmit Data Rate in Kb/s. For more information, see *Max Throughput (Regulating Bandwidth), page 5-10*.

Channel and Rates

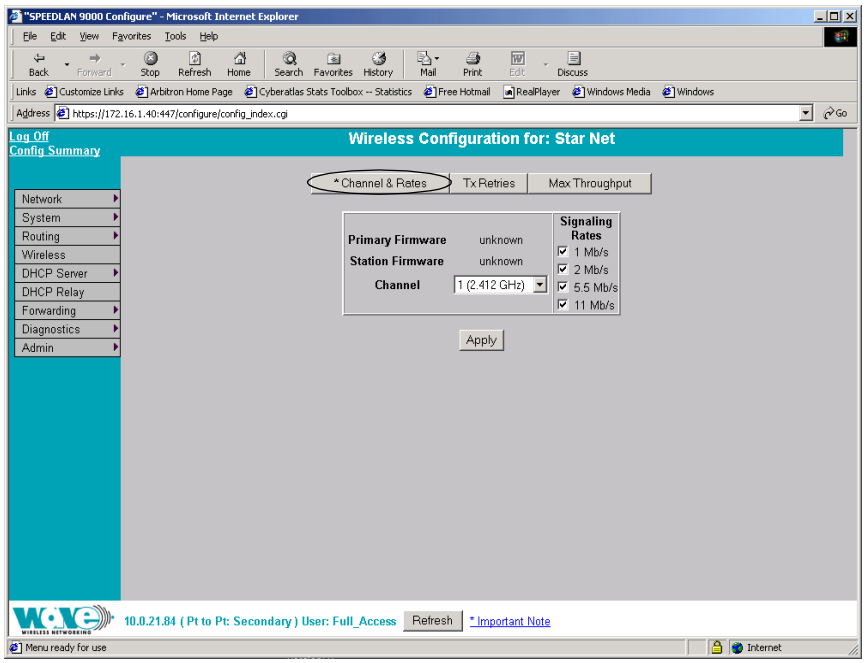


Figure 5-4: Channel and Rates page

- **Primary Firmware:** This is the current primary firmware version in use by the wireless card.
- **Station Firmware:** This is the current station firmware version in use by the wireless card.
- **Channel:** This is the specific band of frequencies (from 1 to 11) to determine the data path between routers. All SPEEDLAN 9000 routers expected to communicate in a network must have the same channel (frequency). Select one of the following channels (all are represented in GHz) from the **Channel** drop-down list:

  1 2.412

  2 2.417

  3 2.422

  4 2.427

  5 2.432

  6 2.437

  7 2.442

8 2.447

9 2.452

10 2.457

11 2.462

- **Signaling Rate**: This setting refers to the wireless signaling rate. The SPEEDLAN 9000 routers have four signaling rates that can be used. Select one of the following check boxes:
  - **1 Mb/s**: This setting limits the card by providing 1 Mb/s of bandwidth. The minimum receiver sensitivity of the radio with this setting is -92 dBm.
  - **2 Mb/s**: This setting limits the card by providing 2 Mb/s of bandwidth. The minimum receiver sensitivity of the radio with this setting is -89 dBm.
  - **5.5 Mb/s**: This setting limits the card to providing 5.5 Mb/s of bandwidth. The minimum receiver sensitivity of the radio with this setting is -88 dBm.
  - **11 Mb/s**: This is the full 11 Mb/s signaling rate. This value is recommended for most installations. The minimum receiver sensitivity of the radio with this setting is -85 dBm.

Note: The network can automatically downgrade the bandwidth if needed (that is, if lower Mb/s settings are selected). Click **Apply** when finished.

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. The following page appears when the **Tx Retries** button is clicked:

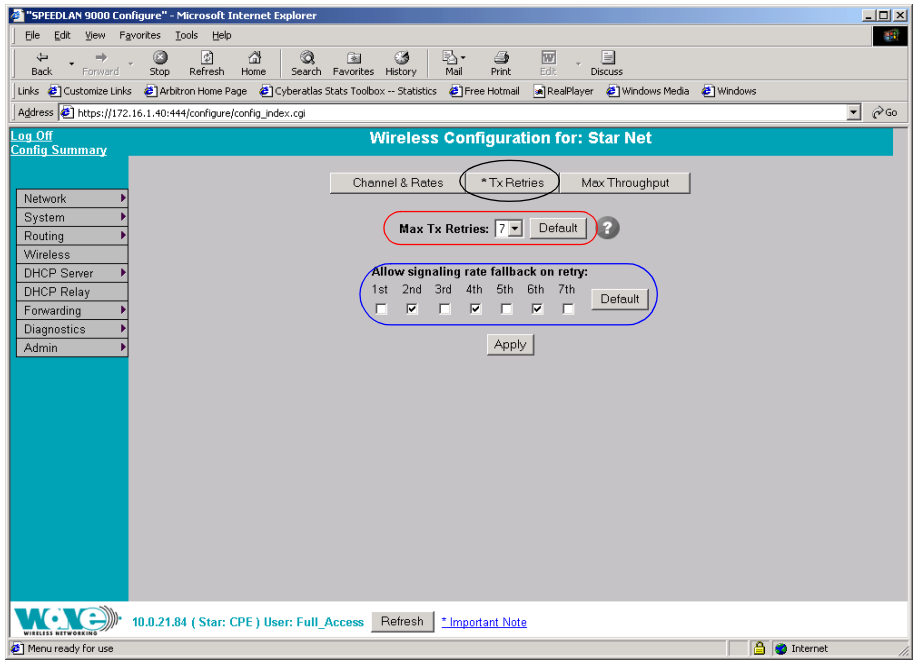


Figure 5-5: Tx Retries and Signaling Rate Fallback page

Note: Click **Apply** to activate settings.

Max Tx Retries

Wave Wireless 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.

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.

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 Throughput (Regulating Bandwidth)

Max Throughput is useful to ISPs that want to regulate the maximum bandwidth provided to each customer. The following page appears when the **Max Throughput** button is clicked:

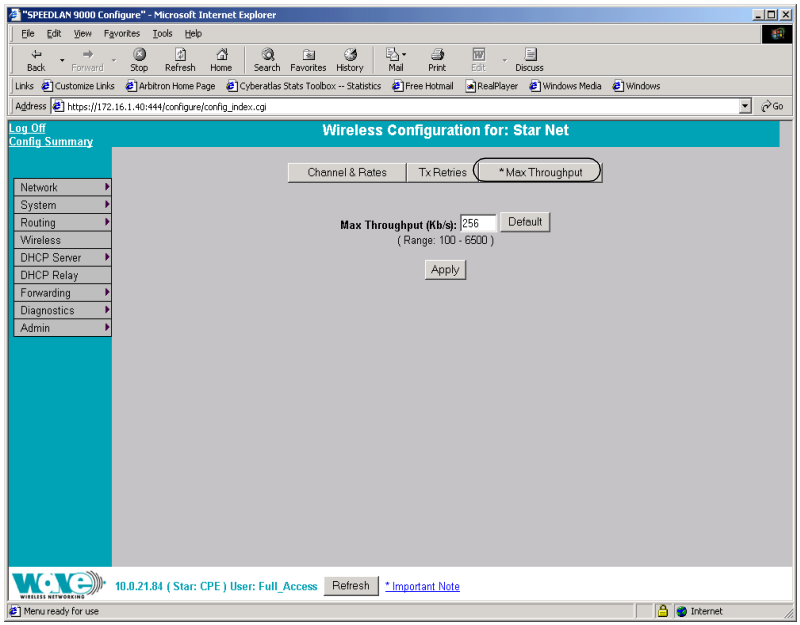


Figure 5-6: Max Throughput page

The Max Transmit Data Rate (in Kb/s) default is set to 6500. Click **Default** to get the default value. The range is from 100 to 6500 Kb/s. Then, click **Apply**.

Admin Menu

Software Update

Note: The Software Update zip file (found on the Wave Wireless 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. The zip file will also include the update (.wwn) file to perform the update. After you have unzipped the file, make sure you extract the update file (.wwn) file to your desktop. Then, follow the directions below.

To update the software on a CPE, choose **Software Update** from the **Admin** menu. The following page will appear.

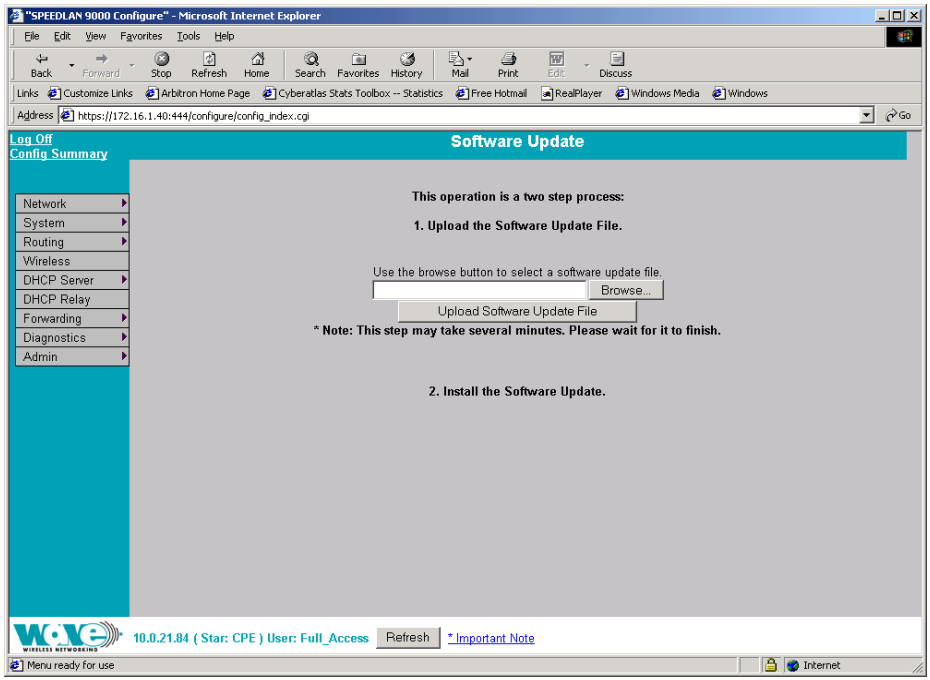


Figure 5-7: Updating the software on the CPE

If you obtain a software update file from Wave Wireless Networking, you can use this page to update software on one or more SPEEDLAN 9000 routers.

This operation is a two-step process:

1. Upload the Software Update file. Locate the latest software file (by clicking **Browse**) and click **Upload Software Update File**.
2. Install the Software Update.

Note: When you updated your network in the past, the remotes would not have been rebooted until the final step. This step happened after you clicked the **Reboot Updated Nodes** button. Now the remotes are automatically rebooted after a successful upgrade. The local or connected router is not rebooted until you click the **Reboot Updated Nodes** button at the end of the upgrade.

Chapter 6
Using the Configurator to Set Up Special Parameters for Point-to-Point Routers

This chapter covers only those special parameters needed to set up the point-to-point primary and secondary routers, such as:

- Network menu: *Interfaces for Point-to-Point Mode, page 6-2*; *Point-to-Point Settings, page 6-3*; *Primary Station Information, page 6-6*; and *Authenticating a Point-to-Point Secondary Router Only, page 6-6*
- Wireless: *Channel and Rates, page 6-8*, *Max Tx Retries and Signaling Rate Fallback, page 6-10* and *Max Throughput (Regulating Bandwidth), page 6-12*
- Admin: *Remote Control for Point-to-Point Primary Routers, page 6-13*; *Software Update for Point-to-Point Primary or Secondary Routers, page 6-13*; and *Updating the Software on a Local Router and Remote Router: Primary Mode Only, page 6-15*

All other common configuration information can be found in *General Functions of the Configurator, page 3-1*.

Network Menu

Interfaces for Point-to-Point Mode

The Network Interfaces page will appear when you choose **Interfaces** under the **Network** menu. This is where you enter the interface type (or router) and network name of the interface (or the point-to-point primary or secondary router).

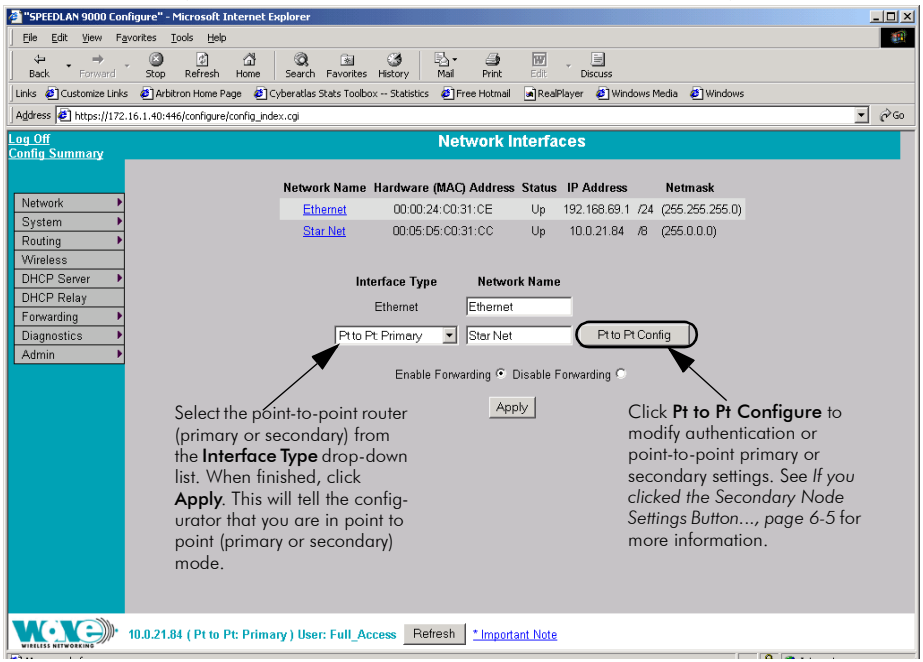


Figure 6-1: Selecting point-to-point primary or secondary mode

Important Note: The "Pt to Pt Configure" button is only accessible in point-to-point primary mode.

- **Network Name:** This is the fixed or wireless interface (e.g., pt to pt: primary or pt to pt: secondary).
- **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 the point to point router (primary or secondary) from the **Interface Type** drop-down list. When finished, click **Apply**. This will tell the configurator that you are in point to point (primary or secondary) 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.

Point-to-Point Settings

To set up your point-to-point primary or secondary routers (that is, if you are in primary mode), choose **Pt to Pt Config** from the **Network** menu. The following default page will appear. An alternative is to also click **Pt to Pt Config** on the **Network Interfaces** page.

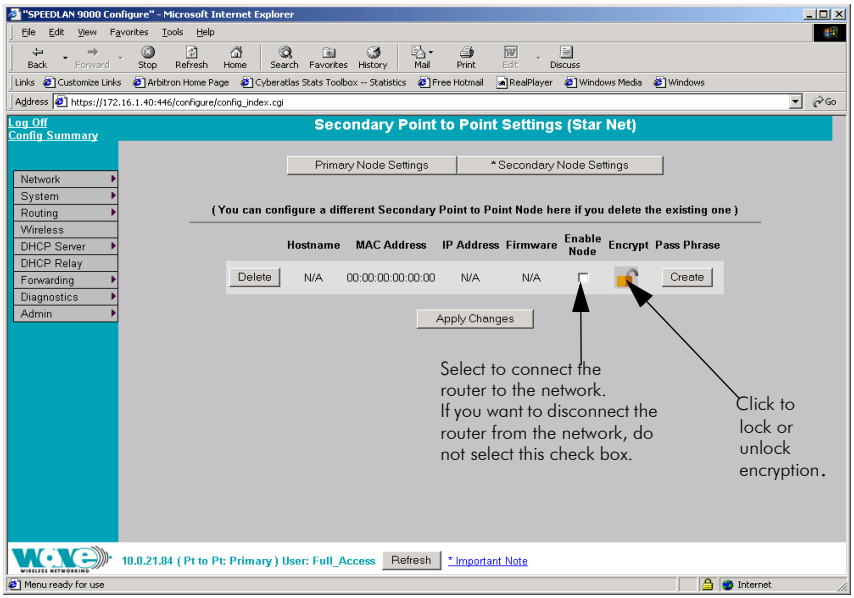


Figure 6-2: Configuring Secondary Point-to-Point Settings (if in Primary mode)

For directions on this page (Secondary Point-to-Point Settings), see *If you clicked the Secondary Node Settings Button..., page 6-5*.

This page contains two buttons on the top called Primary Node Settings and Secondary Node Settings:

- Click **Primary Node Settings** to configure your primary point-to-point router. For more information, see *If you clicked the Primary Node Settings Button..., page 6-4*.
- Click **Secondary Node Settings** to configure your secondary point-to-point router. For more information, see *If you clicked the Secondary Node Settings Button..., page 6-5*.

If you clicked the Primary Node Settings Button...

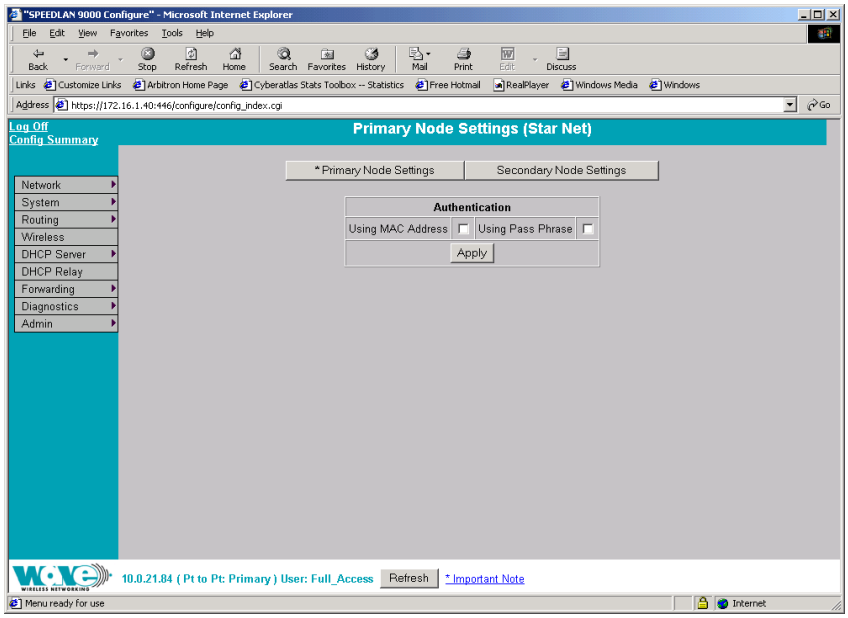


Figure 6-3: Configuring Primary Node Settings (in Primary mode)

Note: The SPEEDLAN 9000 implements an advanced point-to-point mode. The previous performance tuning parameter (latency vs throughput) was removed from the Configurator. This means if you used firmware version 2.20 (or an older version), the tuning parameter appeared for the primary point-to-point node. If you are using firmware version 2.21 or higher, the tuning parameter will not be displayed. If the

primary node is running firmware version 2.21 or higher, it will automatically optimize the point-to-point link.

Authentication section

- **Using MAC Address:** Select this check box if you want to use the factory default address (MAC layer self learning router mode) for the point-to-point router. Click **Apply** to activate selection.
- **Using Pass Phrase:** Select this check box if you want to use the pass phrase. The pass phrase for the point-to-point router must match the pass phrase for the router it is communicating with. Click **Apply** to activate selection.

If you clicked the Secondary Node Settings Button...

You will also be able to enable encryption for your point-to-point secondary router.

- If you want the router to be connected to the network, click the **Enable Node** check box. If you want to disable the router from the network, make sure this check box is not selected. Encryption is locked if the lock image is displayed, and encryption is unlocked if the unlocked image is displayed under the "Encrypt" column.
- Click **Modify** to change an existing pass phrase. Click **Create** if the pass phrase has not been set.

Note: You can configure a point-to-point (primary or secondary) router on this page if you delete the existing one by clicking **Delete**.

- Click **Apply Changes** after making changes.

Primary Station Information

To see if a secondary point-to-point router is connected to the primary point-to-point router, choose **Primary Station Info** from the **Network** menu. The following page will appear.

Note: If there is no connection to the primary point-to-point router, a message will appear confirming that the secondary point-to-point router is not connected to the primary point-to-point router.

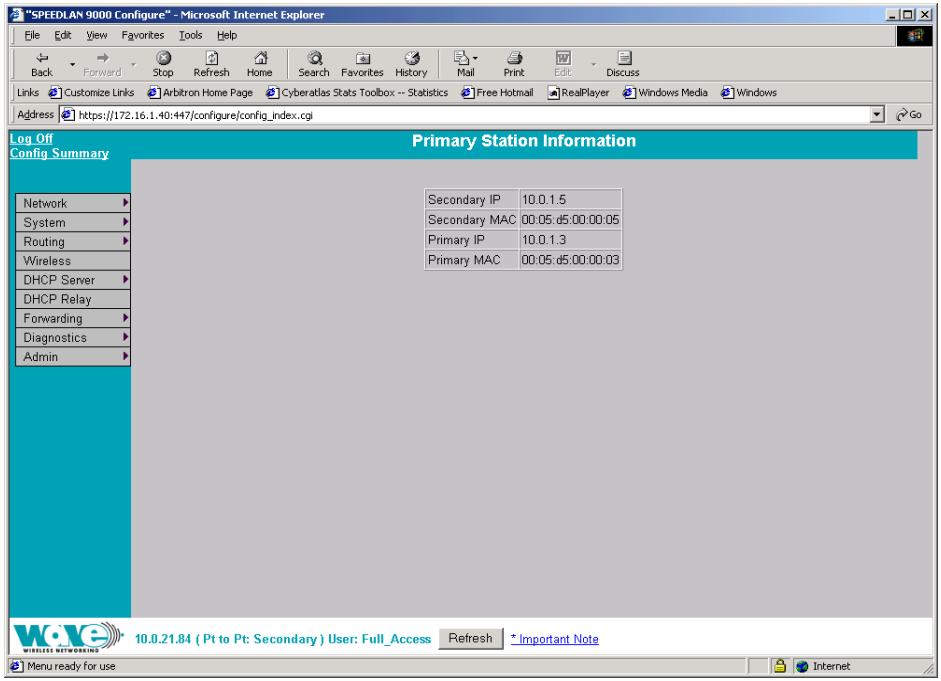


Figure 6-4: Primary Station Information page

Authenticating a Point-to-Point Secondary Router Only

If you are only in point-to-point secondary mode only, you can authenticate the router on this page.

Note: All interfaces connected to the 9000 router are restricted to systems based on the authentic pass phrase (or password). Any interface that does not have the correct pass phrase will not be able to establish a data connection.

To authenticate a point-to-point secondary router only, choose **Authentication** from the **Network** menu. The following page will appear.

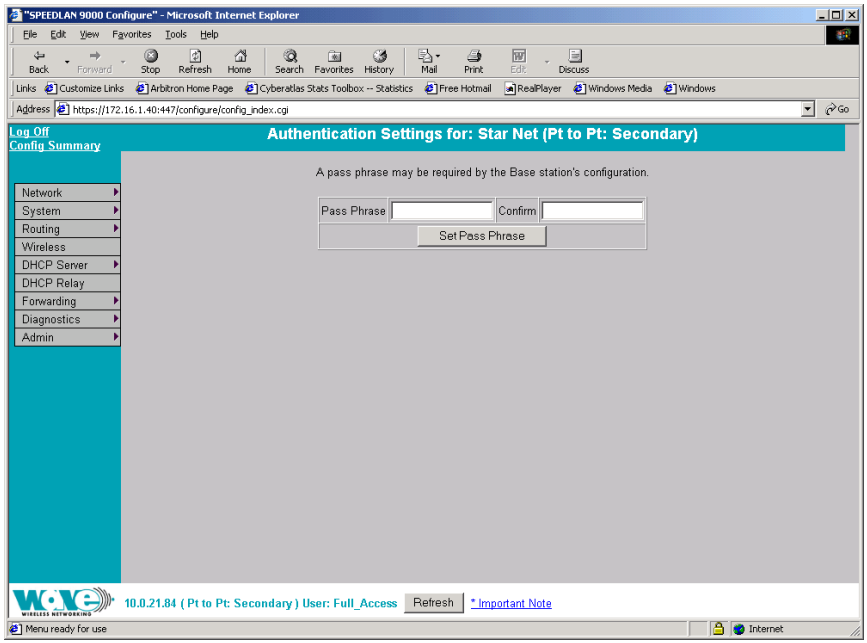


Figure 6-5: Authentication Settings for Point-to-Point Secondary Router page (while in Secondary mode)

- **Pass Phrase:** Enter a pass phrase and confirm it like setting up a regular password. (Pass Phrases have a minimum of 8 characters and a maximum of 32 characters.)
- **Confirm:** Enter the pass phrase again to ensure it is correct. Make sure you keep the pass phrase in a safe place.

Wireless menu

Configuration for Point-to-Point

Choose **Configuration** from the **Wireless** menu, and click one of the following buttons:

- If you click the **Channel and Rates** button, you will be able to select the channel and signaling rate of the interface. For more information, see *Channel and Rates, page 6-8*.

- If you click the **Tx Retries** button, 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 6-10*.
- If you click the **Max Throughput** button, you will be able to set the Max Transmit Data Rate in Kb/s. For more information, see *Max Throughput (Regulating Bandwidth), page 6-12*.

Channel and Rates

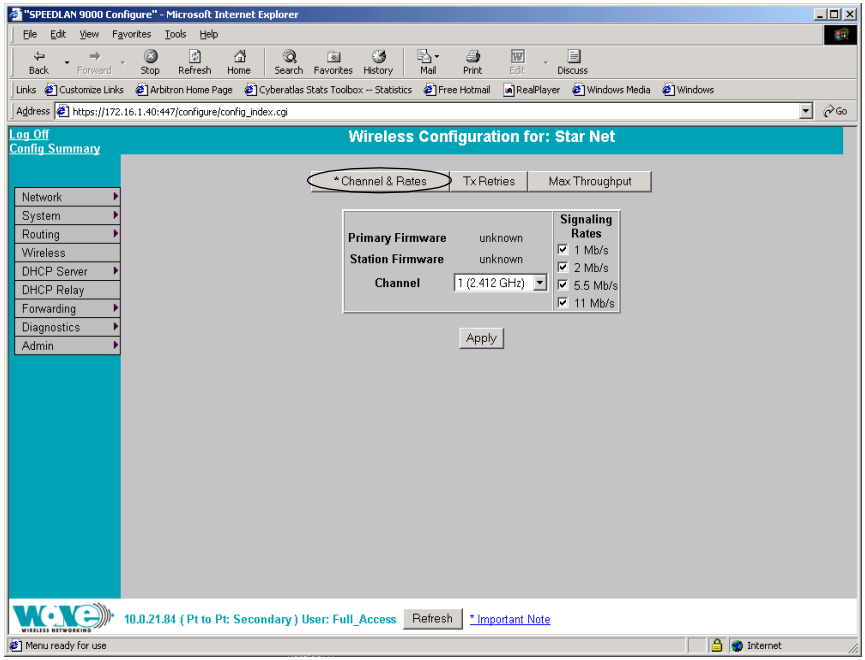


Figure 6-6: Channel and Rates (Point primary and secondary)

- **Primary Firmware:** This is the current primary firmware version in use by the wireless card.
- **Station Firmware:** This is the current station firmware version in use by the wireless card.
- **Channel:** This is the specific band of frequencies (from 1 to 11) to determine the data path between routers. All SPEEDLAN 9000 routers expected to communicate in a network must have the same channel (frequency). Select one of the following channels (all are represented in GHz) from the **Channel** drop-down list:

1 2.412

2 2.417

3 2.422

4 2.427

5 2.432

6 2.437

7 2.442

8 2.447

9 2.452

10 2.457

11 2.462

- **Signaling Rate**: This setting refers to the wireless signaling rate. The SPEEDLAN 9000 routers have four signaling rates that can be used. Select one of the following check boxes:
  - **1 Mb/s**: This setting limits the card by providing 1 Mb/s of bandwidth. The minimum receiver sensitivity of the radio with this setting is -92 dBm.
  - **2 Mb/s**: This setting limits the card by providing 2 Mb/s of bandwidth. The minimum receiver sensitivity of the radio with this setting is -89 dBm.
  - **5.5 Mb/s**: This setting limits the card to providing 5.5 Mb/s of bandwidth. The minimum receiver sensitivity of the radio with this setting is -88 dBm.
  - **11 Mb/s**: This is the full 11 Mb/s signaling rate. This value is recommended for most installations. The minimum receiver sensitivity of the radio with this setting is -85 dBm.

Note: The network can automatically downgrade the bandwidth if needed (that is, if lower Mb/s settings are selected). Click **Apply** when finished.

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. The following page appears when the **Tx Retries** button is selected:

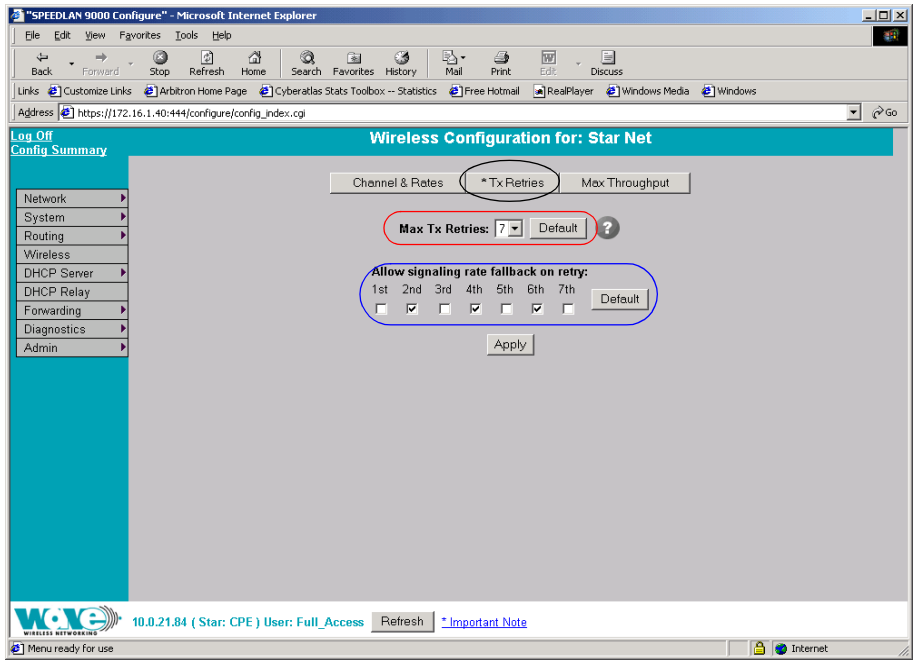


Figure 6-7: Tx Retries and Signaling Rate Fallback (Point primary and secondary)

Max Tx Retries

Wave Wireless 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.

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.

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 Throughput (Regulating Bandwidth)

Max Throughput is useful to ISPs that want to regulate the maximum bandwidth provided to each customer. The following page appears when the **Max Throughput** button is selected:

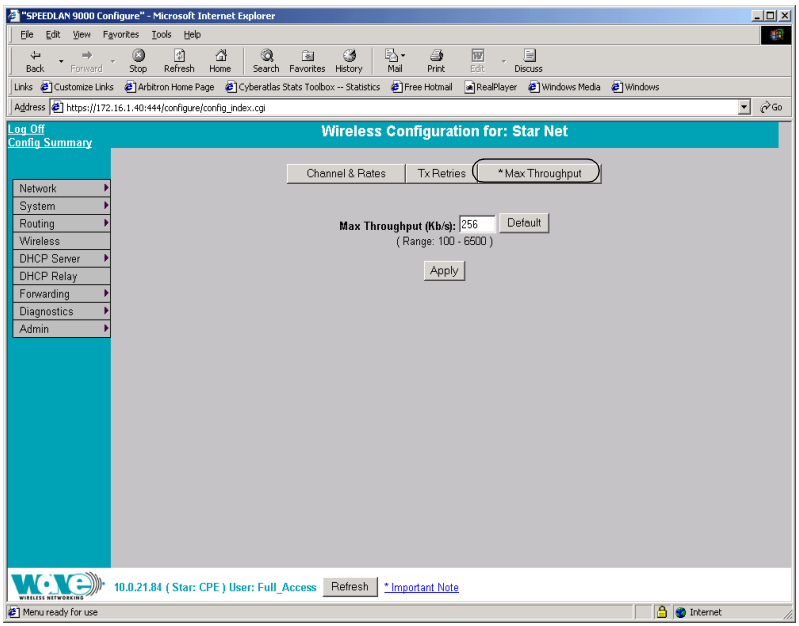


Figure 6-8: Max Throughput (Point Primary and secondary)

The Max Transmit Data Rate (in Kb/s) default is set to 6500. Click **Default** to get the default value. The range is from 100 to 6500 Kb/s.

Admin Menu

Remote Control for Point-to-Point Primary Routers

To remotely reboot or turn off the SPEEDLAN 9000 point-to-point primary routers, choose **Remote Control** from the **Admin** menu. The following page will appear.

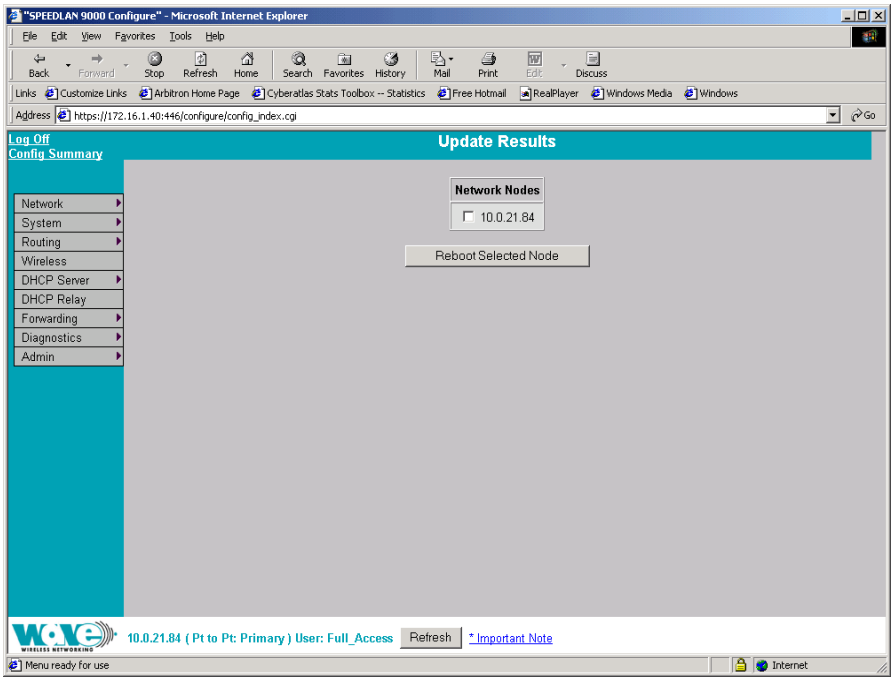


Figure 6-9: Remote Control for point-to-point primary mode (in Primary mode)

Select the primary point-to-point routers you want to reboot and click **Reboot Selected Nodes**.

All other common configuration information can be found in *General Functions of the Configurator, page 3-1*.

Software Update for Point-to-Point Primary or Secondary Routers

Note: The Software Update zip file (found on the Wave Wireless 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. The zip file will also include the update (.wwn) file to perform the update.

After you have unzipped the file, make sure you extract the update file (.wwn) file to your desktop. Then, follow the directions below.

To update the software on the local router or on the remote point-to-point routers, choose **Software Update** from the **Admin** menu. The Software Update page will appear.

Updating the Local Router

If you only need to update the software on a local point-to-point primary or secondary router, choose **Local** (under the **Software Update** submenu).

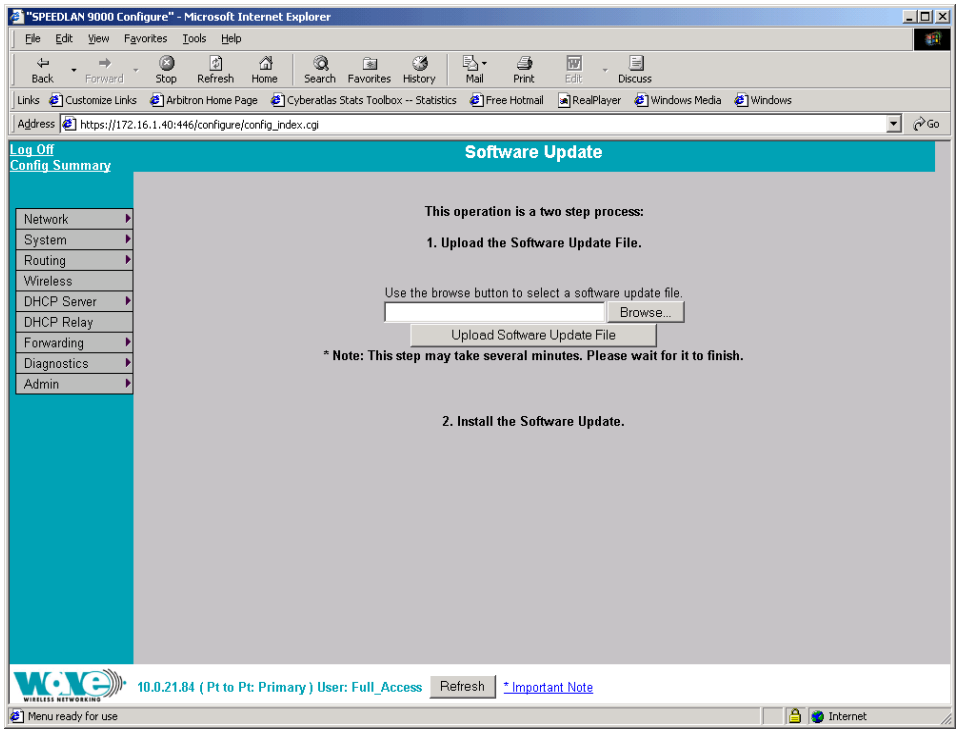


Figure 6-10: Updating the software for point-to-point primary or secondary local router (in Primary or Secondary mode)

This operation is a two-step process:

1. Upload the Software Update file. Locate the latest software file (by clicking **Browse**) and click **Upload Software Update File**.
2. Install the Software Update. **Note:** When you updated your network in the past, the remotes would not have been rebooted until the final step. This step happened after you clicked the **Reboot Updated Nodes** button.

Now the remotes are automatically rebooted after a successful upgrade. The local or connected router is not rebooted until you click the **Reboot Updated Nodes** button at the end of the upgrade.

Updating the Software on a Local Router and Remote Router: Primary Mode Only

To update the software on a location router and on a remote point-to-point primary router, choose it under the **Software Update** submenu.

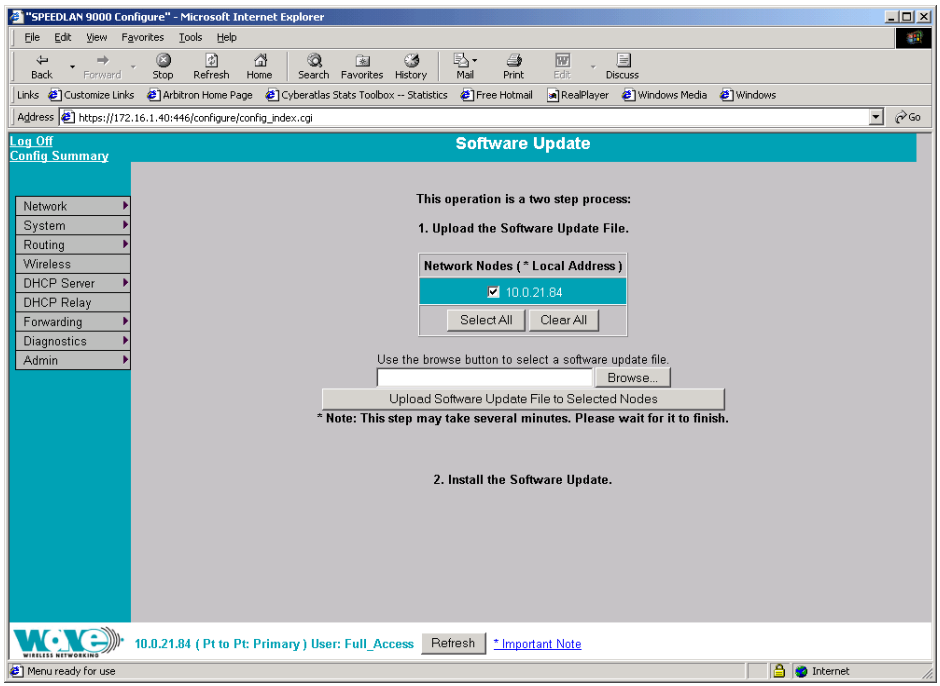


Figure 6-11: Updating the software for a point-to-point primary router (in Primary mode only)

This operation is a two-step process:

1. Select the point-to-point routers where you want to update the software. (The IP addresses that are selectable are active. If only a MAC address is listed, or a bunch of zeros, then these represent inactive devices.
2. Upload the Software Update file. Locate the latest software file (by clicking **Browse**) and click **Upload Software Update File to Selected Nodes**.
3. Install the Software Update. **All other common configuration information can be found in** *General Functions of the Configurator, page 3-1*.

Notes:

Chapter 7
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 7-2*; *Mesh Nodes, page 7-3* and *Security, page 7-3*
- Wireless menu: *Configuration, page 7-5*
  - See also *Max Tx Retries and Signaling Rate Fallback, page 7-8*; *Max Throughput (Regulating Bandwidth), page 7-10*; *Receive (Rx) Threshold Parameter, page 7-11* and *Blocked Links, page 7-12*
- Admin menu: *Remote Control, page 7-13*; *Software Update, page 7-14*; and *Updating the Software on a Local Router and Remote Router, page 7-15*

All other configuration information can be found in *General Functions of the Configurator, page 3-1*.

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.

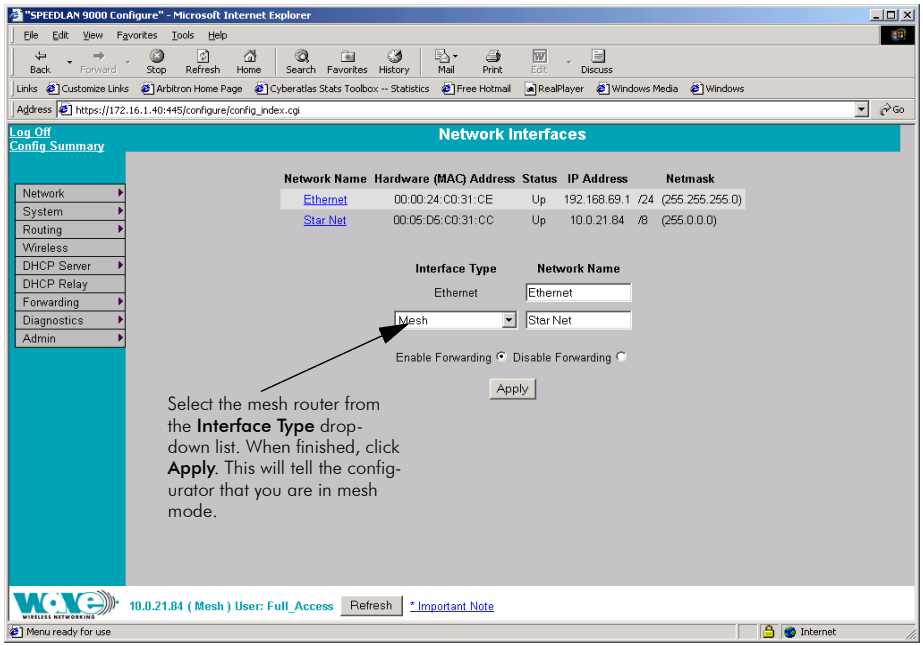


Figure 7-1: Selecting mesh mode

- **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.

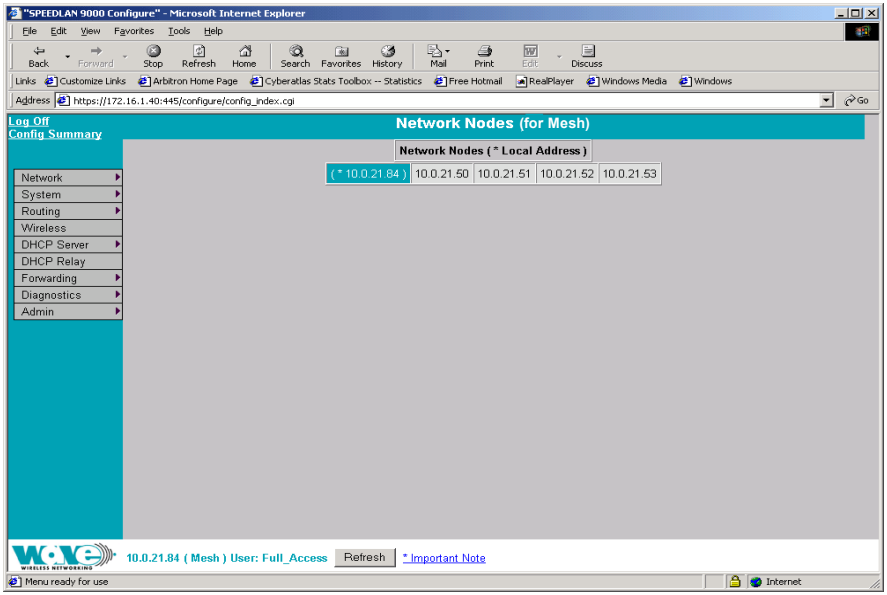


Figure 7-2: Network Nodes page

Security

Use this page to set a pass phrase for a mesh router. Just make sure that the password is kept in a safe place so it is not lost or stolen.

All interfaces connected to the 9000 router are restricted to systems based on the authentic pass phrase (or password). Any interface that does not have the correct pass phrase will not be able to establish a data connection.

To authenticate a mesh router, choose **Security** from the **Network** menu. The following page will appear.

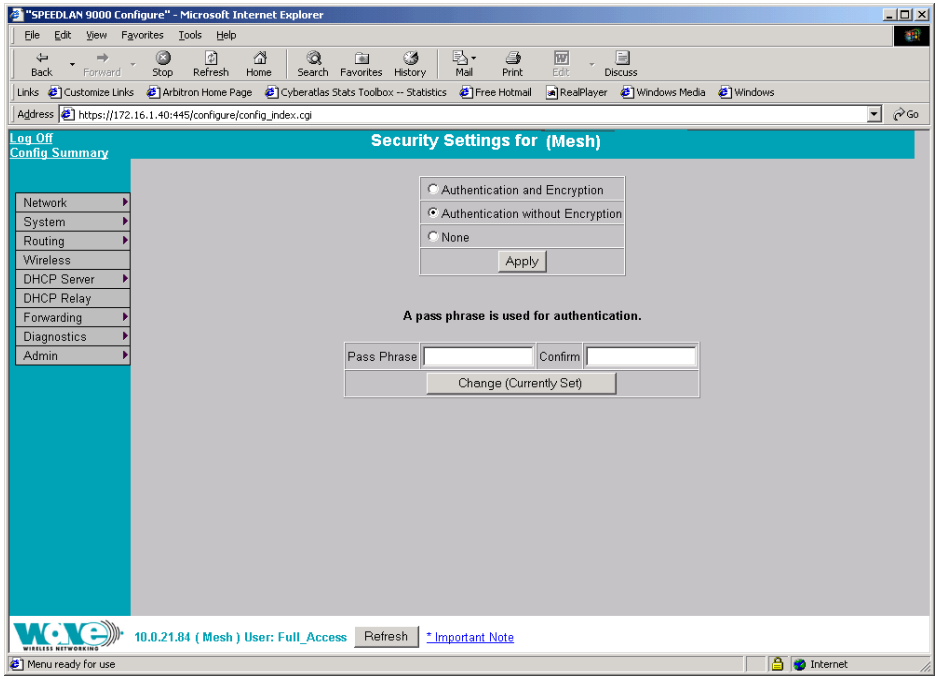


Figure 7-3: Security Settings page

Use this page to change the security settings for a mesh router. The first section controls network access for a mesh router. At the lowest level, the mesh routers will only communicate with each other if they are on the same channel and IP network. There are two levels of security that can be used to restrict this communication further with authentication and encryption.

Select one of these options below:

- **Authentication and Encryption**: the mesh router will only communicate with other Mesh routers that have the same pass phrase and are encrypting their traffic.

- **Authentication without Encryption**: the mesh router will only communicate with other mesh routers that have the same pass phrase but the traffic will not be encrypted.
- **None**: the mesh router will communicate with any other mesh router on the same channel and IP network without encryption.

A pass phrase is used for authentication in both security modes. Make sure that the pass phrase is kept in a safe place so it is not lost or stolen.

- **Pass Phrase**: Enter a pass phrase and confirm it like you would to set a regular password. (Pass Phrases have a minimum of 8 characters and a maximum of 32 characters.)
- **Confirm**: Enter the pass phrase again to ensure it is correct.

If there is no pass phrase set for the system the button will read "Change (Currently Not Set)". If a pass phrase has been set, the button will read "Change (Currently Set)".

Wireless menu

Configuration

Choose **Configuration** from the **Wireless** menu, and click one of the following buttons:

- If you click the **Channel and Rates** button, you will see the page shown in the figure above. For more information, see *Channel and Rates, page 7-6* for more details.
- If you click the **Tx Retries** button, 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 7-8* for more details.
- If you click the **Max Throughput** button, you will be able to set the Max Transmit Data Rate in Kb/s. For more information, see *Max Throughput (Regulating Bandwidth), page 7-10*.
- If you click the **Rx Threshold** button, you will be able to set the threshold for each mesh router on the network. For more information, see *Receive (Rx) Threshold Parameter, page 7-11* for details.

- If you click the **Blocked Links** button, you will be able to block or unblock mesh routers. For more information, see *Blocked Links, page 7-12* for more details.

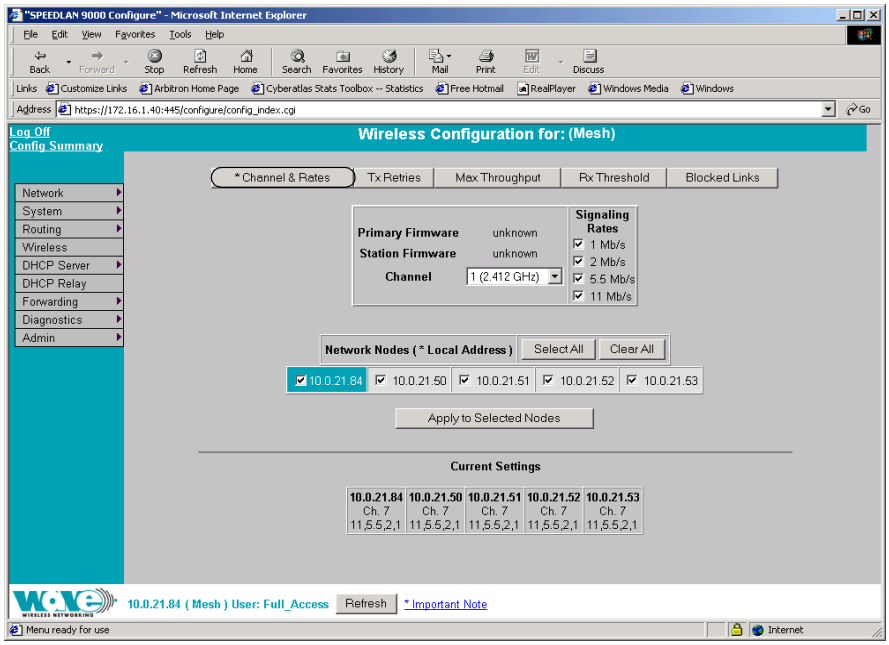


Figure 7-4: Channel and Rates page

Channel and Rates

- **Primary Firmware:** This is the current primary firmware version in use by the wireless card.
- **Station Firmware:** This is the current station firmware version in use by the wireless card.
- **Channel:** This is the specific band of frequencies (from 1 to 11) to determine the data path between routers. All routers expected to communicate in each pico cell must have the same channel (frequency).
  Select one of the following channels (all are represented in GHz) from the **Channel** drop-down list:

1 2.412

2 2.417

3 2.422

4 2.427

5 2.432

6 2.437

7 2.442

8 2.447

9 2.452

10 2.457

11 2.462

- **Signaling Rate**: This setting refers to the wireless signaling rate. The routers have four signaling rates that can be used. Select one of the following check boxes:
  - **1 Mb/s**: This setting limits the card by providing 1 Mb/s of bandwidth. The minimum receiver sensitivity of the radio with this setting is -92 dBm.
  - **2 Mb/s**: This setting limits the card by providing 2 Mb/s of bandwidth. The minimum receiver sensitivity of the radio with this setting is -89 dBm.
  - **5.5 Mb/s**: This setting limits the card to providing 5.5 Mb/s of bandwidth. The minimum receiver sensitivity of the radio with this setting is -88 dBm.
  - **11 Mb/s**: This is the full 11 Mb/s signaling rate. This value is recommended for most installations. The minimum receiver sensitivity of the radio with this setting is -85 dBm.

Note: The network can automatically downgrade the bandwidth if needed (that is, if lower Mb/s settings are selected).

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

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. The following page appears when the **Tx Retries** button is selected:

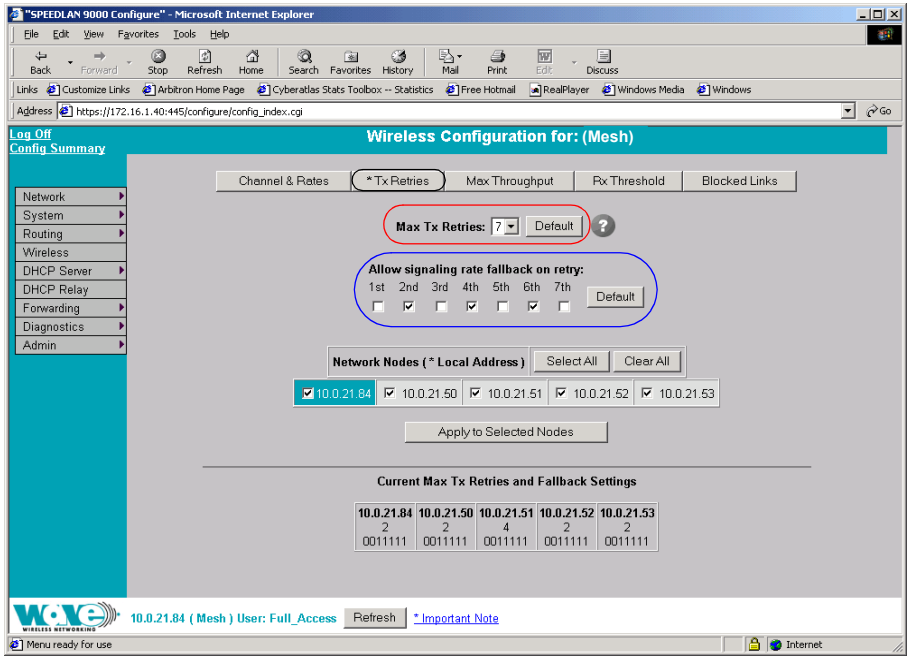


Figure 7-5: Tx Retries and Signaling Rate Fallback page

Note: Click **Apply** to activate settings.

Max Tx Retries

Wave Wireless 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.

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.

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 Throughput (Regulating Bandwidth)

Max Tx Rate is useful to ISPs that want to regulate the maximum bandwidth provided to each customer. The following page appears when the **Max Throughput** button is clicked:

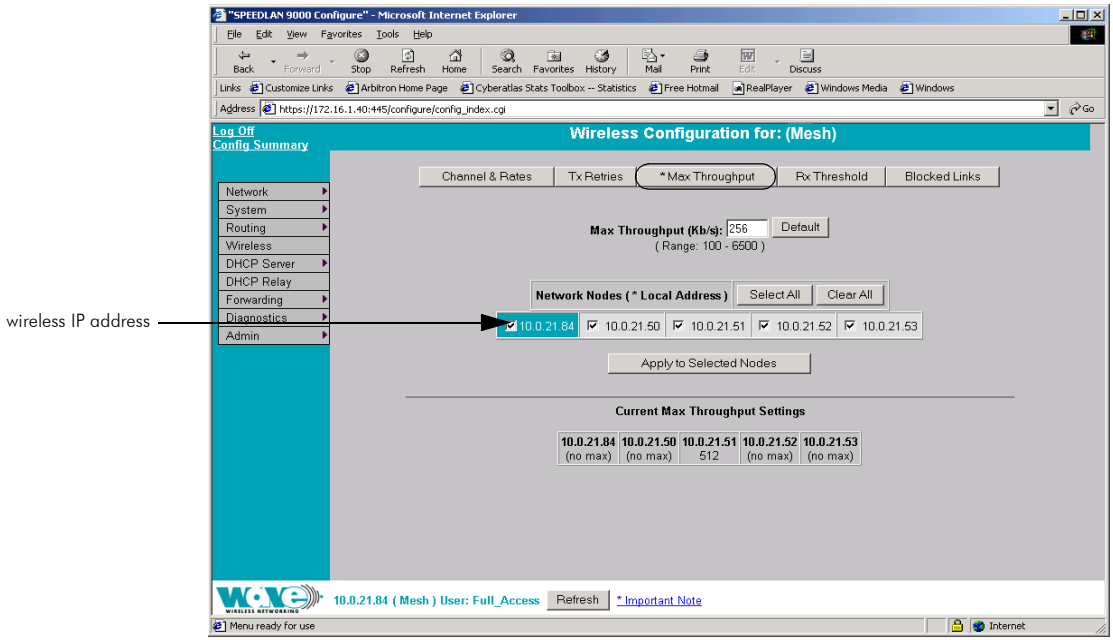


Figure 7-6: Max Throughput page

The Max Transmit Data Rate (in Kb/s) default is set to 6500. The range is from 100 to 6500 Kb/s. If you click **Default**, it will load the current default setting for the Configurator. Click **Apply** when finished.

Receive (Rx) Threshold Parameter

From a single mesh unit connected to a mesh network, you can set the receive threshold (given in dBm), for every mesh router in the network. The receive threshold specifies the minimum acceptable receive level for a datagram (defined for signaling rates of 11, 5.5, 2, and 1 Mb/s). Any datagrams received below these levels will be discarded. This will provide better network stability for networks containing marginal links, since link state changes (and the corresponding routing changes) will be avoided for marginal links which are not capable of consistent communication.

By clicking the **Defaults** button, the values will go to their default values. If you enter a value of **0** (zero), you are turning the receive threshold parameter off.

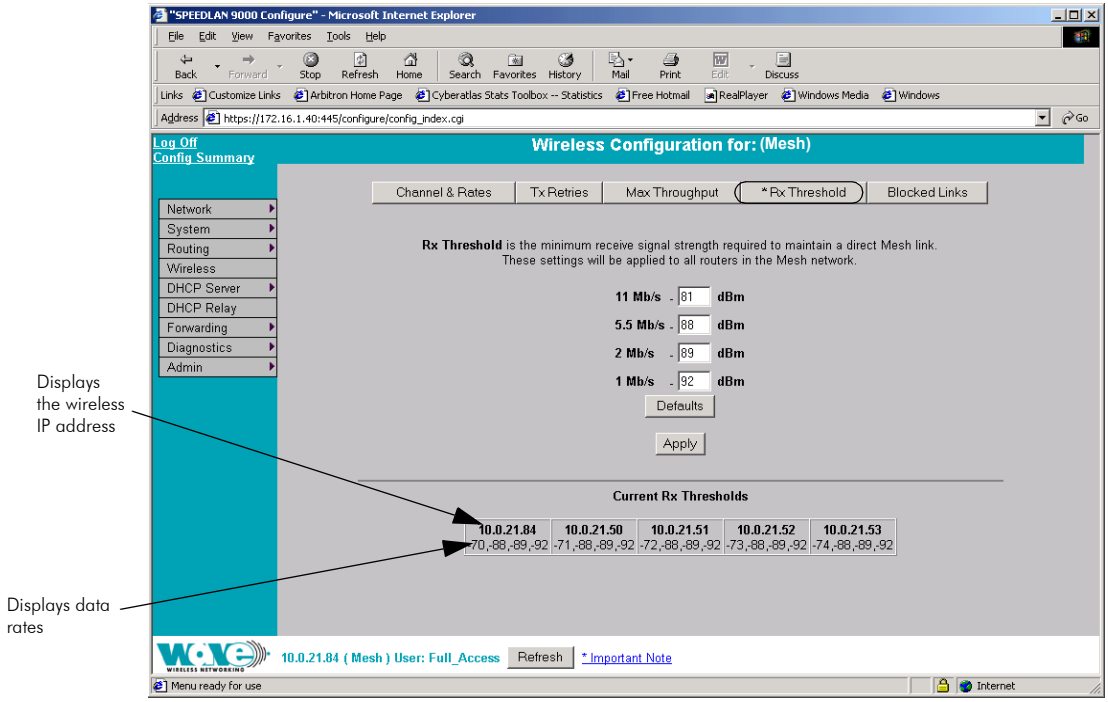


Figure 7-7: Rx Threshold page

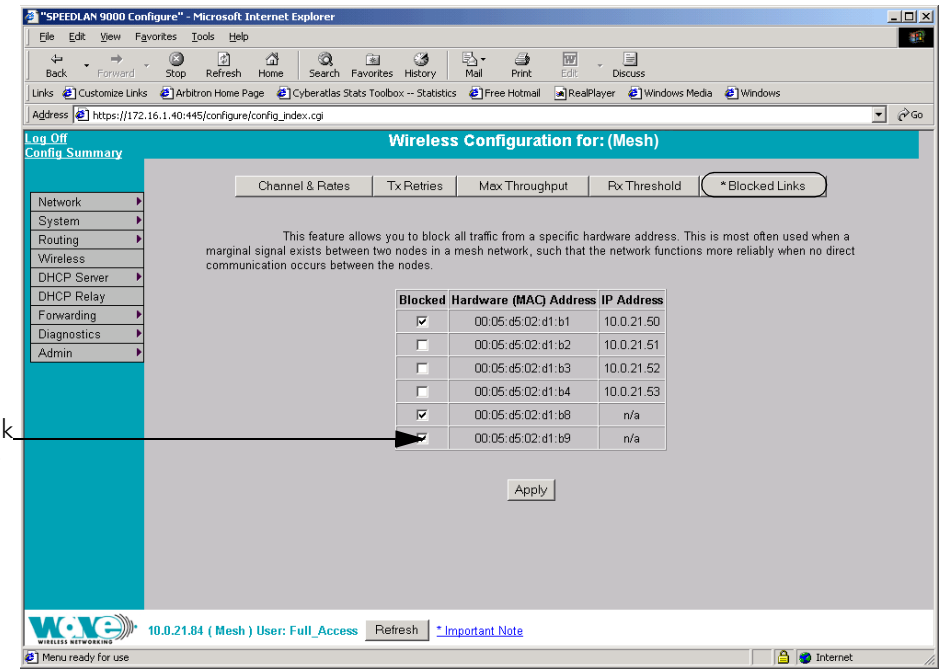
Note: The default value for the receive signal strength are as follows:

- 11 Mb/s: 81
- 5.5 Mb/s: 88
- 2 Mb/s: 89, and
- 1 Mb/s: 92

The current Rx thresholds for your wireless mesh router(s) are listed in the Current Rx Thresholds section. Their signaling rates are also listed, as described above.

If you click **Default**, it will load the current default setting for the Configurator. Click **Apply** when finished.

Blocked Links



Select the checkbox under **Blocked** to block a mesh router. Leave it unselected when you want leave the mesh router unblocked.

Figure 7-8: Blocking Mesh Routers

This feature allows you to block all traffic from a specific hardware address. This is most often used when a marginal signal exists between two nodes in a mesh network, such that the network functions more reliably when no direct communication occurs between the nodes. To completely block a link you must perform the same action on the remote node.

Note: If you blocked a mesh router, the next time it is rebooted it will remain blocked. If you want to unblock the router, make sure that the **Blocked** check box is not selected.

Note: Click **Apply** when finished.

Admin Menu

Remote Control

To remotely reboot or turn off the SPEEDLAN 9000 mesh routers, choose **Remote Control** from the **Admin** menu. The following page will appear.

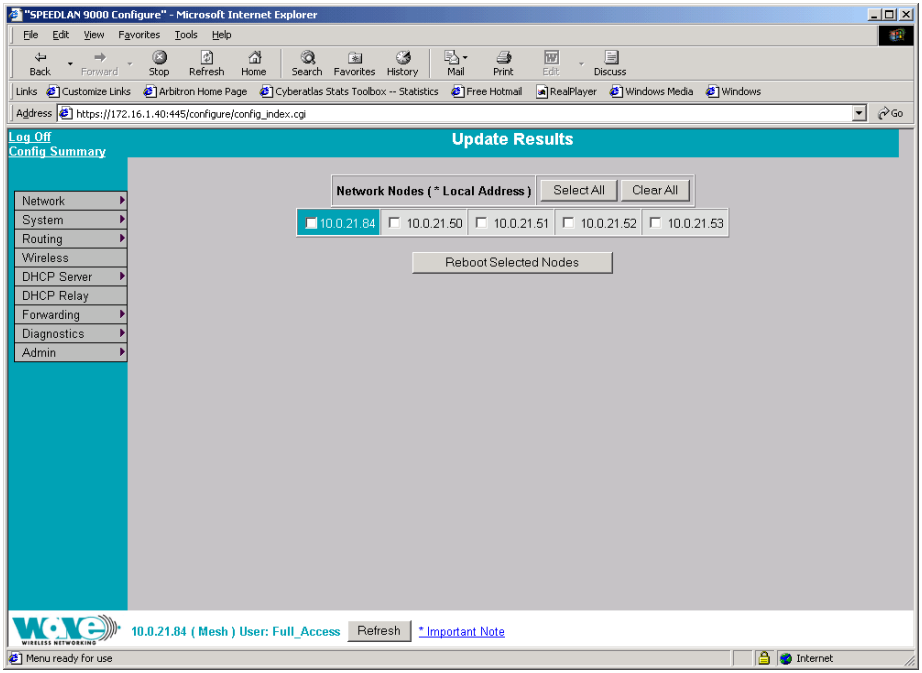


Figure 7-9: Remote Control for mesh mode

Select the mesh routers you want to reboot and click **Reboot Selected Nodes**.

Software Update

Note: The Software Update zip file (found on the Wave Wireless 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. The zip file will also include the update (.wwn) file to perform the update. After you have unzipped the file, make sure you extract the update file (.wwn) file to your desktop. Then, follow the directions below.

To update the software on the local router or on the remote mesh routers, choose **Software Update** from the **Admin** menu. The Software Update page will appear.

Updating the Local Router

If you only need to update the software on a local router, choose **Local** (under the **Software Update** submenu).

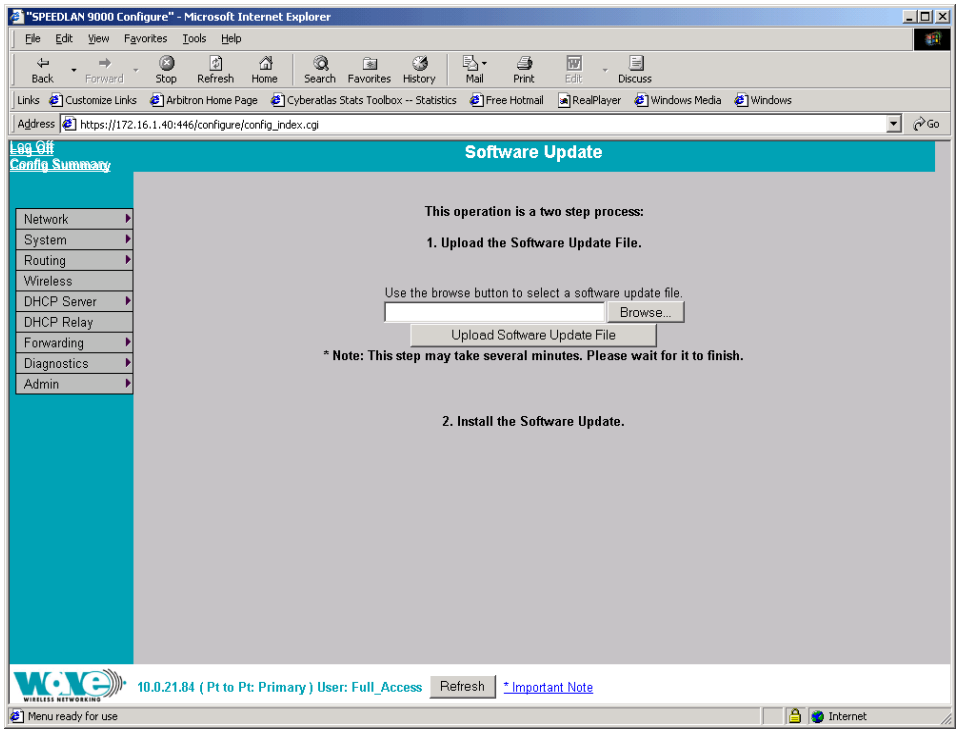


Figure 7-10: Updating the software for mesh local router

This operation is a two-step process:

1. Upload the Software Update file. Locate the latest software file (by clicking **Browse**) and click **Upload Software Update File**.
2. Install the Software Update.
   Note: When you updated your network in the past, the remotes would not be rebooted until the final step. This step happened after you clicked the **Reboot Updated Nodes** button. Now the remotes are automatically rebooted after a successful upgrade. The local or connected router is not rebooted until you click the **Reboot Updated Nodes** button at the end of the upgrade.

Updating the Software on a Local Router and Remote Router

To update the software on a location router and on a remote router, choose it under the **Software Update** submenu (e.g., MeshNet).

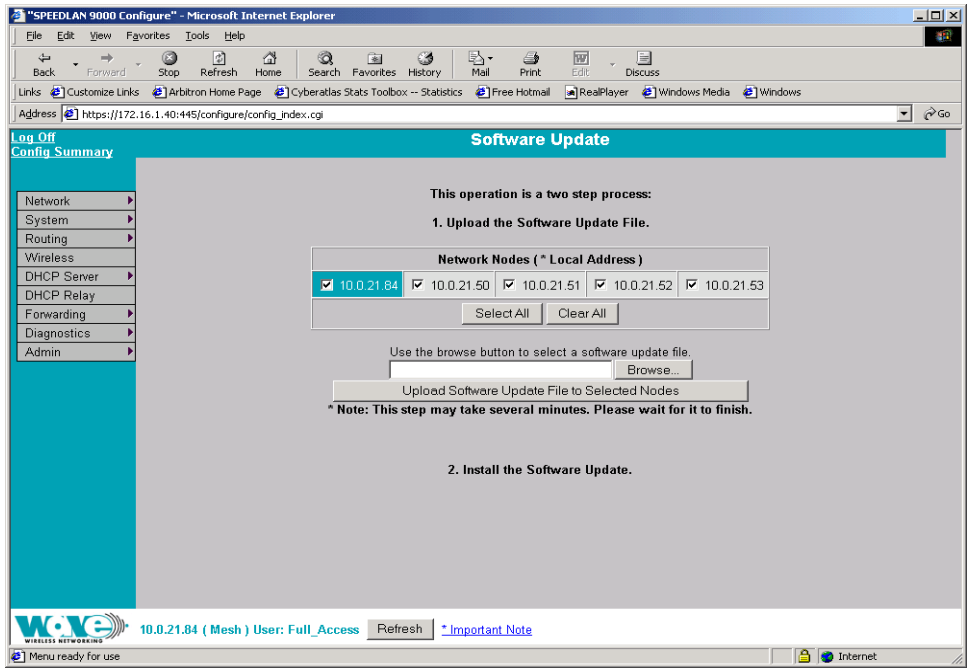


Figure 7-11: Updating the software for a local mesh and remote router

This operation is a two-step process:

1. Select the remotes where you want to update the software. (The IP addresses that are selectable are active. If only a MAC address is listed, or a bunch of zeros, then these represent inactive devices.
2. Upload the Software Update file. Locate the latest software file (by clicking **Browse**) and click **Upload Software Update File to Selected Nodes**.
3. Install the Software Update.

Chapter 8
Using SPEEDView

Note: You can configure any 9000 router by either opening the SPEEDLAN 9000 Configurator or by double-clicking the router (or node) in the SPEEDView network diagram.

What is SPEEDView?

SPEEDView® provides an "at-a-glance" view of all the nodes currently on the network. Network managers can monitor and control management functions for local and remote SPEEDLAN® 9000 nodes from a central location, or from anywhere on the network. SPEEDView operates on a Windows platform.

Check your operations quickly with a dynamic graphical user interface, and view the performance of network links through an easy-to-read graphical format. SPEEDView uses display lines to indicate direct line-of-sight connections, obstructed connections (due to network bugs or improper mounting of the antenna) and non-existent physical connections. These indicators, along with included diagnostic testing features, will help network managers troubleshoot antenna alignment and locate blocked nodes, so that paths can be re-routed for successful connectivity. In addition, you can double-click any node to monitor and update its configuration through the SPEEDLAN 9000 Configurator.

System Requirements

- Runs on the following Windows platforms: 98, ME, NT (Service Pack 4.0), 2000 or XP.
- 10 Megabytes of Hard Drive Disk Space
- CD-ROM Drive (for installation)
- Monitor (monochrome is sufficient but VGA or better is highly recommended)
- SPEEDView is compatible with the SPEEDLAN 9000 series

Installation Instructions

Note: You will need to make sure that you have enabled the TCP/IP protocol for your Ethernet device before using this program.

If you install SPEEDView from the SPEEDLAN 9000 Series CD, follow these directions:

1. Insert the **SPEEDLAN 9000 Series** CD into your CD-ROM drive.

2 Locate the zip file under the \SPEEDLAN 9000_Files\9000 Management Software\SPEEDView_& IP Recovery & SPEEDSignal Install_Files directory. Follow steps 1 through 5 below:

If you are installing an executable from a zip file (e.g., from our website):

Note: SPEEDView can also be downloaded from the Wave Wireless web site "Support" directory. Locate the link and save the zip file to your desktop.

1 Locate the **".zip"** file and double-click it. The WinZip® dialog box will appear on your desktop allowing you to extract the SPEEDView install files. Select the files and click the **Extract** button. Next, extract the files to a location on your computer.

2 Click **Start** on the Windows taskbar. The Start menu appears.

3 Choose **Run** from the **Start** menu. The Run dialog box appears.

4 Locate the executable called setup.exe.

5 Follow the installation prompts.

Starting SPEEDView

1 When the installation is finished, start the **SPEEDView** application by doing one of the following:

- Click the **SPEEDView** shortcut icon on the desktop, as shown in Figure 8-1 on page 8-3.

Figure 8-1: SPEEDView shortcut icon

- From the Windows **Start** menu, choose **Programs+ Wave Wireless+SPEEDView**. (If SPEEDView was installed in another folder, select the appropriate directory.)

2 The SPEEDView Login dialog box appears.

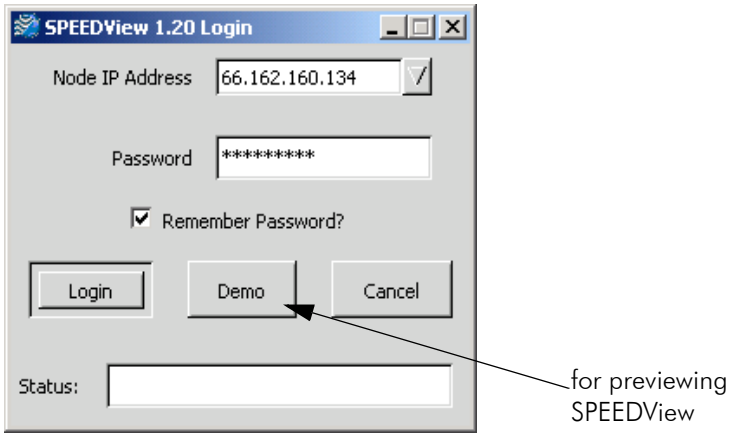


Figure 8-2: SPEEDView Login dialog box

3 Enter the IP address (or hostname if you are using a Domain Name Server) of the 9000 node you want to connect to in the **Node IP Address** text box. The last 10 previous IP addresses can be selected in this drop-down box.

4 The passwords are defined, based on user class level, in the SPEEDLAN 9000 Configurator. Before you enter the password, decide which account level you should enter:

- Administrator: allows access to all of SPEEDView's features (for administrative use only). The default full access password is "wave_full".
- Read Only: limits the following features: TCP dump functions, bandwidth tests, bandwidth toolbar and block and unblock features (items under the Link menu). The default read-only passwords are "wave_wired" for wired nodes or "wave_wireless" for wireless nodes.

Note: You can change the password(s) in the SPEEDLAN 9000 Configurator. The minimum password length is 8 characters. (You can enter 8 characters.) The maximum password length is 16 characters (including the underscore character or spacebar).

Note: If you want SPEEDView to recall the password for future logins, click **Remember Password**. Also, make sure you change the default password for security purposes.

5 Click **Login**.

Note: The Status box (blank text box) at the bottom of the screen displays the status of the connection.

Note: You can change the default text for the SPEEDView application by clicking **Start**+**Settings**+**Control Panel**+**Display**+**Appearance** tab. Then, select the appropriate item in the **Item** list.

6 Next, the Interface Selection box appears which displays all the wireless interfaces that are connected to the SPEEDLAN 9000 system.

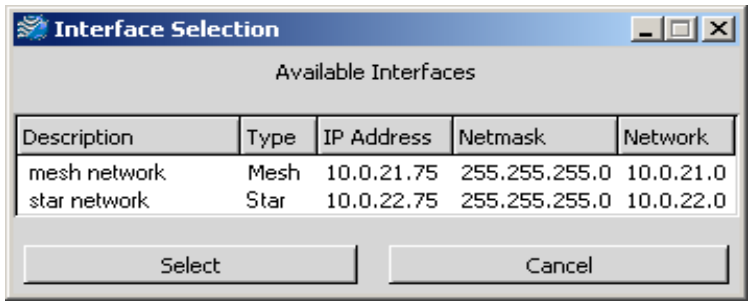


Figure 8-3: (Available) Interfaces Selection box

7 Highlight the interface and click **Select**.

8 The following elements are displayed on this box:

- **Description:** A name for the interface (e.g., where it is located). This can be changed in the SPEEDLAN 9000 Configurator.
- **Type:** Star (for base to CPE functionality) or mesh (nodes in a mesh cloud). The star or mesh network will display on the Main tab, as shown in Figure 8-4 on page 8-6.
- **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 that only the host computer part of the IP address remains.
- **Network:** The address of the network.

Star Network

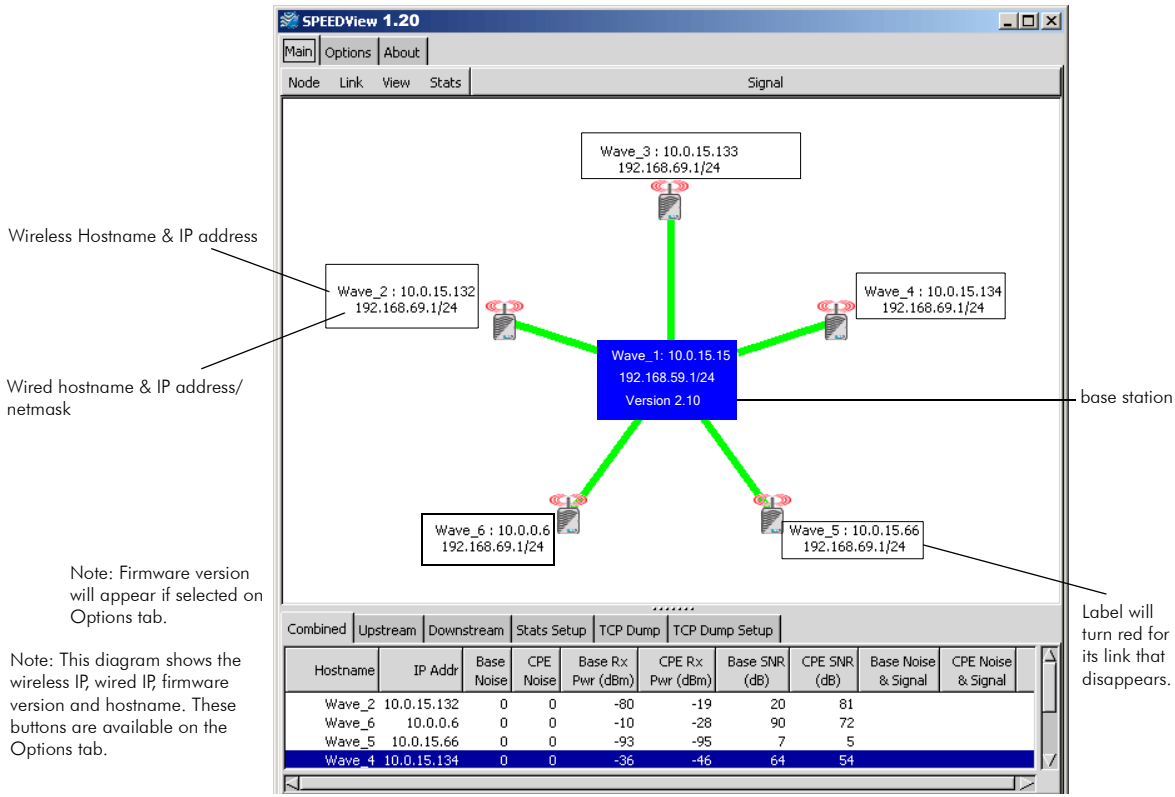


Figure 8-4: Star network diagram

Note: A star network consists of a group of remote nodes, called Customer Premise Equipment (CPE), and a base station. A star network is based on a star topology with the base station in the center of the star network. Each CPE must have clear line-of-sight to a base station. (The star node icons are aligned symmetrically.)

You can also use SPEEDView for a point-to-point network. An example can be seen in the section called *SPEEDLAN 9000 Mesh Protocol -- How It Works in Mesh Clouds, page 1-8*.

Mesh Network

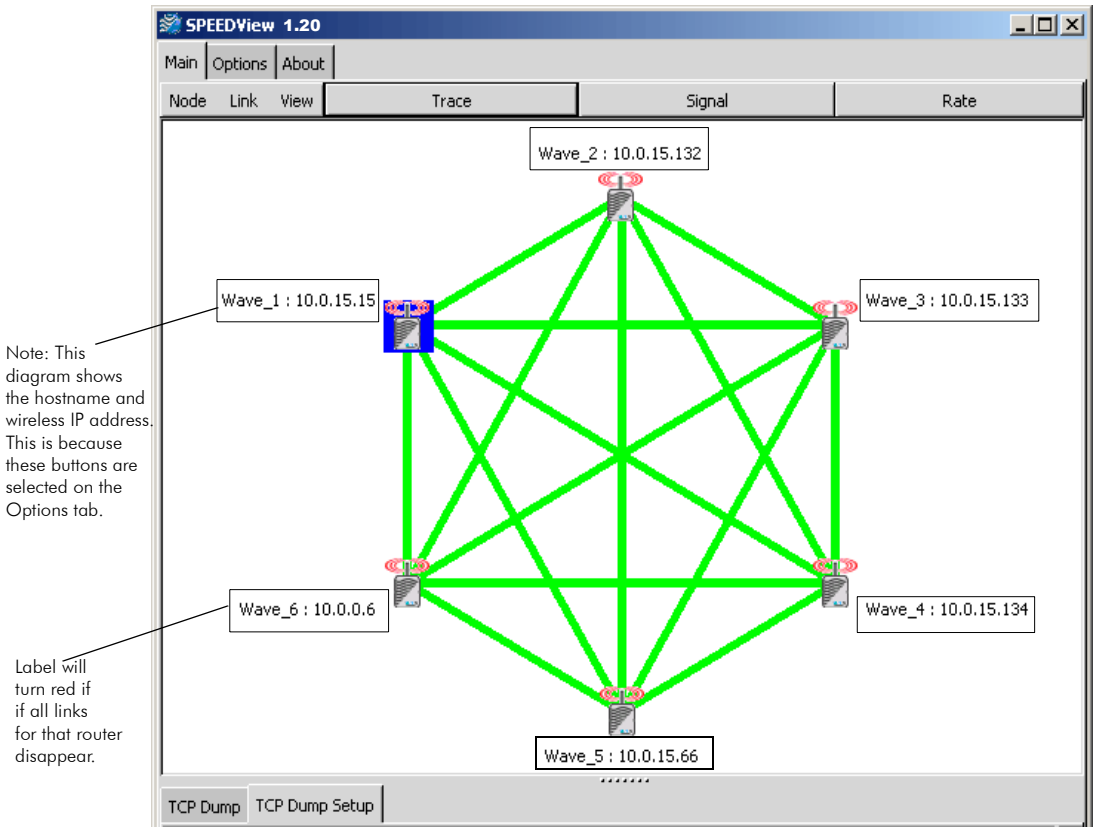


Figure 8-5: Mesh network diagram

Note: A mesh cloud consists of nodes that have non-line-of-sight functionality, meaning they are able to route around obstructions by finding the next closest node within line-of-sight. Mesh nodes reside in a mesh cloud. Each node can communicate up to a 1/2 mile with its neighboring node. Nodes in the same mesh cloud do not use a central base station to communicate with each other. Instead, nodes use other nodes in the mesh cloud to communicate. Mesh clouds can also be linked to other mesh clouds via gateways and base stations in other LOS networks to improve scalability.

Note: For more information about star and mesh functionality, see *SPEEDLAN Polling Protocol -- How it Works, page 1-6* and *SPEEDLAN 9000 Mesh Protocol -- How It Works in Mesh Clouds, page 1-8*.

The Program Instructions

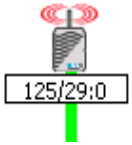
Note: The Options tab is used for altering the way data is displayed on the Main tab (e.g., font size, number of octets shown, etc.). The About tab contains version information about the SPEEDView application. The Options and About tabs are described in greater detail at the end of this document. For more information, see *Options Tab, page 8-22*.

The Main Tab

The elements on the Main tab are discussed in the following order:

- *The Main Tab Icons, page 8-9*
- *The Node, Link, View and Stats Menus (on the Main tab), page 8-11*
- *Buttons (on the Main tab), page 8-12*
- *Performing a Bandwidth Test, page 8-14*
- *Performing a Ping Test, page 8-15*
- *Accessing the Statistics Tabs on Bottom of Main Tab, page 8-16*

The Main Tab Icons

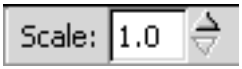


Represents each SPEEDLAN 9000 node. The numerical digit (e.g., "51") next to the node represents the last octet(s) of the node's IP address. This is also referred to as the IP address or IP label. For more information, see *Options Tab, page 8-22*. To view more than one octet or change the font size of the octet(s), click the **Options** tab. If you want to display the hostname to the left of the IP address, click **Show Hostname** on the **Options** tab.

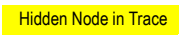
The signal, noise and bit rate for each node pair are indicated inside square boxes, as shown in the graphic to the left. The higher the signal, the better. The lower the noise, the better. These values are dynamic and change constantly to reflect the current state of the network. To include the signal and noise level, click **Signal** (on the Main tab). To include the bit rate, click **Rate** (on the Main tab). To include the noise level, click **Show Noise** on the **Options** tab. To view signal and noise in dBm, click **Show dBm** on the **Options** tab. For more information, see *Options Tab, page 8-22*.

Note: The Rate button is only used in mesh mode. The Signal button is used in both mesh and star modes.

A test message (i.e., Hello, Goodybe, Testing, Marco!, Polo!) can be sent to any node in the network. The message is automatically echoed by the receiving node and displayed on your screen to verify end-to-end connectivity between the nodes. In addition, if another user is currently logged into the destination node via SPEEDView, he will see your message flash on his the upper left-hand corner of his network diagram.



The zoom in/zoom out icon is displayed to the right of the test message. Click the **up** arrow to zoom in, and click the **down** arrow to zoom out. If you click on the network diagram, you can also move it around the desktop.



Black text on yellow indicates that one or more nodes are hidden, and this message box will be displayed in the lower left-hand corner of the Main tab. For directions on how to hide a node, see, "Hide" under the *The Node, Link, View and Stats Menus (on the Main tab), page 8-11*.

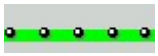


Fig. A

Top picture on left (noted as Fig. A) represents a Trace Route test. Trace Routes are used for mesh networks only. For directions on how to create a trace route, see *Buttons (on the Main tab), page 8-12*.

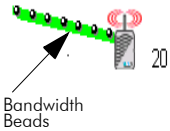


Fig. B

In a star topology, bandwidth on any given link is shown as a series of black beads, as shown to the left. When the bandwidth beads are closer (as shown in the bottom picture to the left as Fig. B), this indicates that more bandwidth is being used. When these beads are further apart, less bandwidth is being used.

Blue, box outlines indicate that the node is selected. Solid green boxes indicate that the node is the target of a trace route.

Solid, blue squares indicate which 9000 node SPEEDView is connected to. The IP address of the node will be displayed on top of each node. You can display the full IP address or part of it by selecting how many octets you want displayed. For more information, see *Options Tab, page 8-22*.

Can the nodes hear each other?

Green lines indicate direct line-of-sight connections between SPEEDLAN 9000 nodes.

Solid, red lines indicate that there is not enough signal strength to reliably exchange data between the node pair, but some signal was detected on at least one end of the connection.

Dashed, red lines indicate no signal between the node pair.

Red lines are used for debugging and adjusting antennas (e.g., who can hear and why) in a star network. If a solid, red line appears, the system in a mesh network could still use an indirect route or hop in order for the two nodes to exchange data.

A redline without any signal level means that there is no direct communication between the node pair in a mesh network. Data will automatically be routed through the 9000 network in order for the node pair to communicate. It is a user configurable option as to whether a dashed red line, or no line at all, appears between the node pair without direct communication.

The Node, Link, View and Stats Menus (on the Main tab)

There are several commands located under the Node, Link, Stats and View menus on the Main tab.

Figure 8-6: The SPEEDView menu bar

Node menu

- Configure: Choose **Configure** to launch the SPEEDLAN 9000 Configurator, which is a web browser used to view/configure many parameters and services for that node. This is the same as double-clicking any node.
- Hide: If there are too many nodes to comprehensively view on the 9000 network, select the nodes you want to hide and choose **Hide**.
- Show: Choose **Show** to display any nodes that were previously hidden using the "Hide" feature.
- Select All: If you want to select all of the nodes on the 9000 network (including hidden), choose **Select All**. This is useful for hiding a large number of nodes.

Link menu

- Bandwidth Test: Choose **Bandwidth Test** and a node pair or link to verify that your equipment is communicating properly at the RF level. This process will help you during your performance evaluation. See *Performing a Bandwidth Test, page 8-14* for further instructions.
- Ping Test: Choose **Ping Test** to verify node connectivity. See *Performing a Ping Test, page 8-15* for further instructions.
- Block: (This command is used with mesh networks only.) Select the node pair or link. (Press the **Ctrl** key on your keyboard to select more than one node or link at a time.) Next, choose **Block**. When you "block" a connection, the node pair will not be able to communicate.
- Unblock: (This command is used with mesh networks only.) Select the nodes or links you want to unblock. Next, choose **Unblock** to clear the "blocked" path.

View menu

- Message Toolbar: Choose **Message Toolbar** to display the test message box just under the Node menu.

- Bandwidth Toolbar: Choose **Bandwidth Toolbar** to display a shortcut version of the bandwidth test (displays results of traffic moving in both directions of the selected link). Next, you will see the bandwidth toolbar appear on the top of the Main tab, as circled in Figure 8-7 on page 8-12.

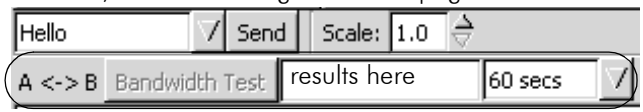


Figure 8-7: Bandwidth Toolbar

Choose the duration: 15, 30 or 60 seconds. Then, click **Bandwidth Test**. The results will be displayed in the box to the right of the Bandwidth Test button.

- Zoom: Choose **Zoom** to zoom in or out.
- Refresh: Choose **Refresh** to request new hostnames and Ethernet wired IP addresses.

Stats menu - These are only available for star and point-to-point networks.

- Show All Link Stats: Choose **Show All Link Stats** to display all the statistics of all of the links in the statistics window (bottom half of Main tab). For more information, see *Accessing the Statistics Tabs on Bottom of Main Tab, page 8-16*.
- Clear Stats: Choose **Clear Stats** to remove the statistics of the links in the statistics window (bottom half of Main tab).

Buttons (on the Main tab)

- Send: Click this button to send a UDP-based test message to any node on the 9000 network. Select the test message from the drop-down list such as: Hello, Goodbye, Testing, Marco or Polo (located just under the Main tab).

Figure 8-8: Send button

Then, select the node where you want to send the test message and click **Send**. The remote node automatically echoes the message back to the originating node.

If successful, you will see your message flash (in blue) on the network diagram. This indicates a successful round trip of the data.

Note: If someone is monitoring the remote node with another instance of SPEEDView, he will also see your message appear (in a mesh network).

- Trace: (This button appears for mesh networks only.) Click this button to trace the data flow between the node pair or link. To set up a trace route, select the destination node. (The node you are connected to is the source.) Then, choose **Trace**. You will see the links chosen by the routing algorithm in order to send data from the source node to the destination node. The screen shot on the Main tab with a mesh network (*Mesh Network, page 8-7*) displays a trace route --> .
- Signal: Click this button to display the signal strength. Higher values show stronger received signal strength. The values range from 1-255.
- Rate: Click this button to view the signaling rate (in Mb/s).

Note: Multi-sel: (This button is used for iPAQs only.) All Windows operating systems will use the standard Ctrl key command to select more than one node.) This button allows iPAQ users to select more than one node. To deselect nodes, simply click anywhere on the white screen of the Main tab. Alternatively (and for Windows operating systems), you can deselect any individual node by clicking on that node. This button is useful when setting up "blocked" paths (under the Link menu), or "hiding" nodes (under the Node menu).

Note: If you right-click on the white area in the network diagram, a pop-up submenu will appear displaying short-cut features depending on the type of network selected.

Figure 8-9: Shortcut pop-up menu

These shortcuts are described in the section called *The Node, Link, View and Stats Menus (on the Main tab), page 8-11*.

Note: Block and Unblock are used for mesh networks only.

Performing a Bandwidth Test

1. Click the node pair or link that you want to test.
2. Choose **Bandwidth Test** under the **Link** menu. The Bandwidth Test dialog box will appear, as shown in Figure 8-10 on page 8-14.

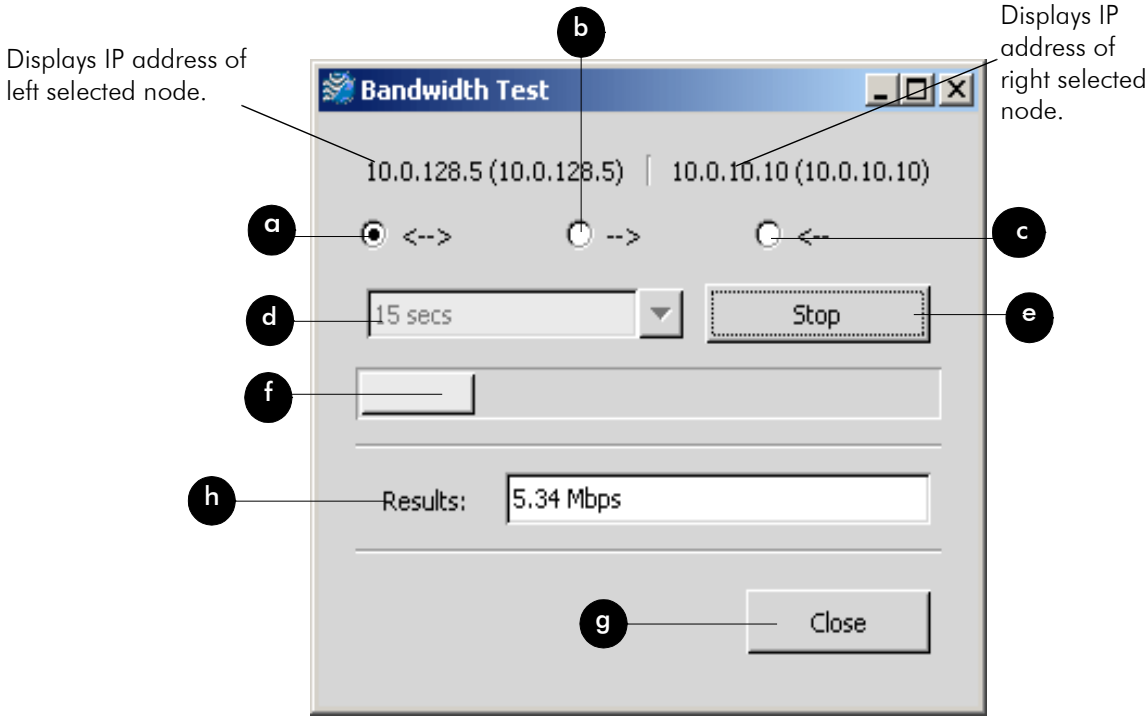


Figure 8-10: Bandwidth Test dialog box

The elements on the Bandwidth Test dialog box are described below:

- **a:** Tests the full duplex path (e.g., from Node A to B and then from Node B to A).
- **b:** Tests the path going to the right (e.g., from Node A to Node B).
- **c:** Tests the path going to the left (e.g., from Node B to Node A).
- **d:** The length of time (in seconds) for the bandwidth test.

- **e**: Executes the bandwidth test.
- **f**: Displays results of the bandwidth test (in Mb/s).
- **g**: Closes the Bandwidth Test dialog box.
- **h**: Displays the results of the bandwidth test.

Performing a Ping Test

1. Click the node(s) you want to ping.
2. Choose **Ping Test** from the **Link** menu. The Ping Test dialog box will appear, as shown in Figure 8-11 on page 8-15.

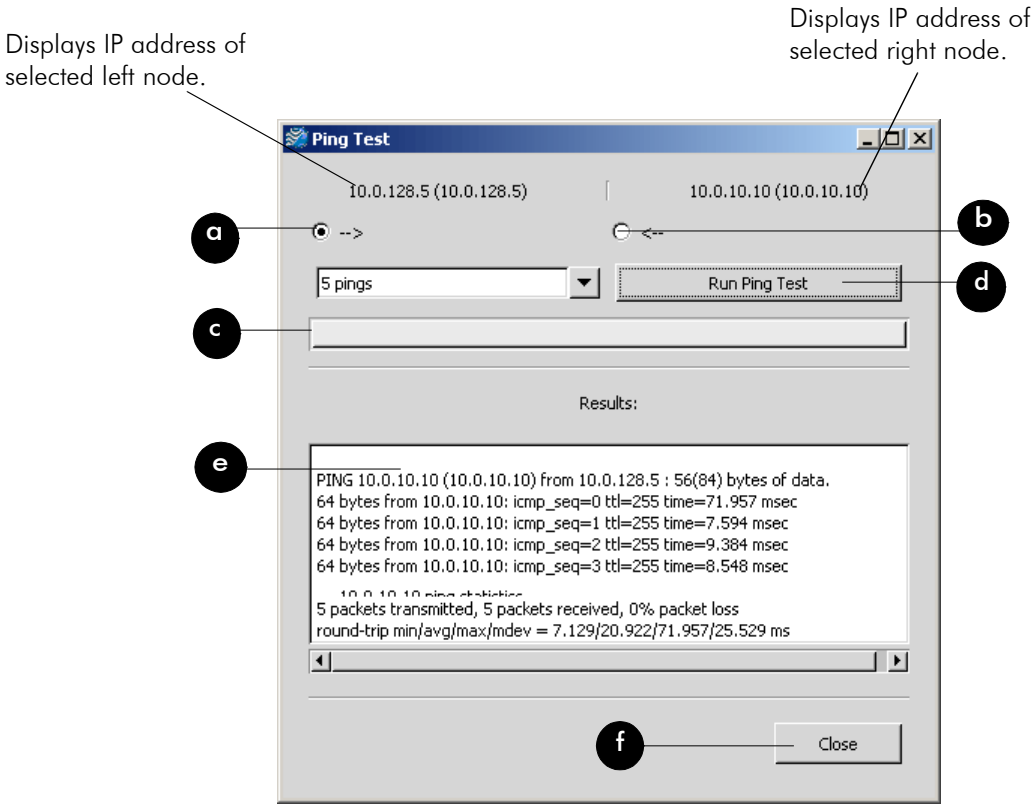


Figure 8-11: Ping Test dialog box

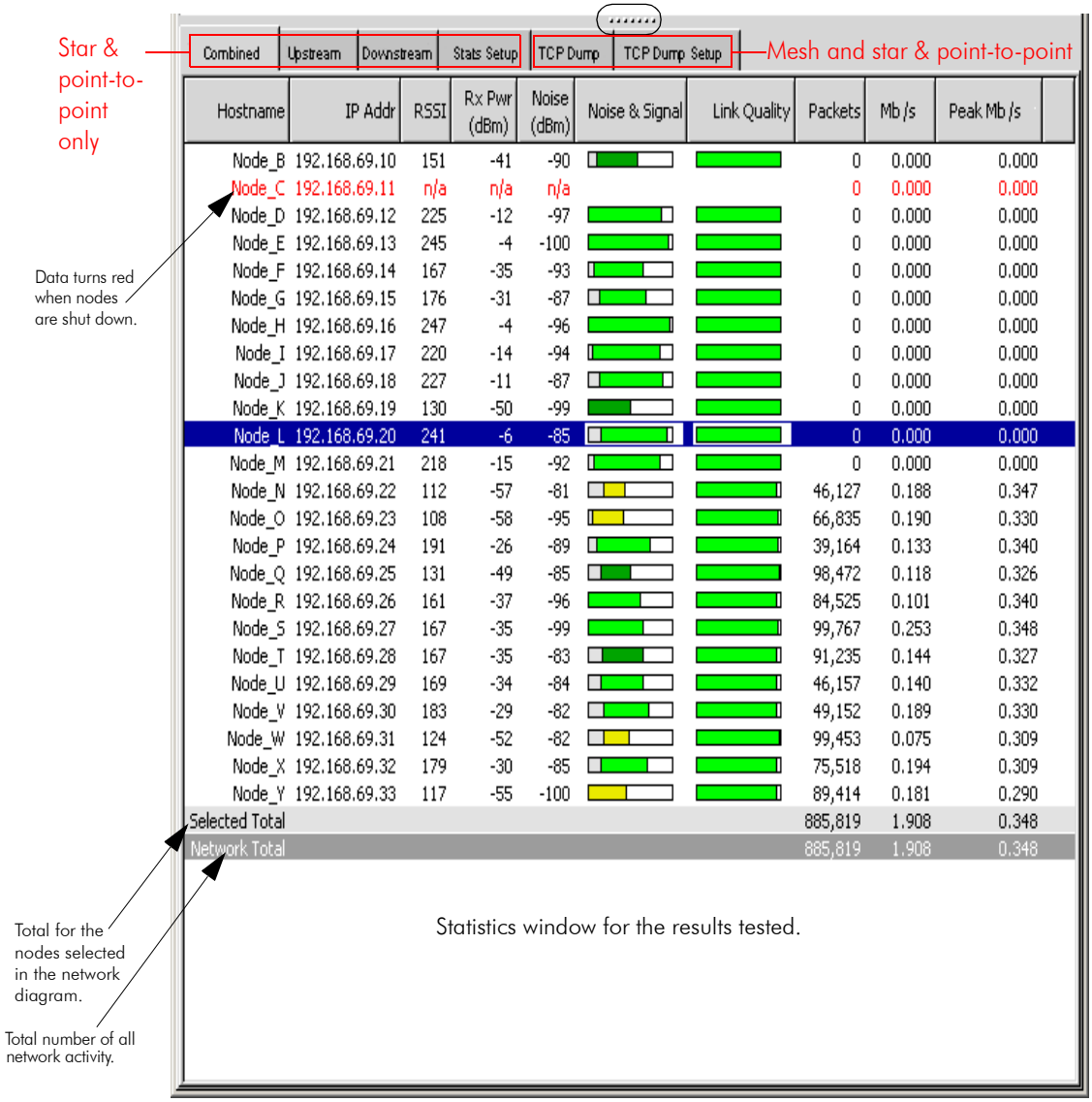
The elements on the Ping Test dialog box are described below:

- **a**: Pings the path to the right (e.g., from Node A to Node B).
- **b**: Pings the path to the left (e.g., from Node B to Node A).
- **c**: The status bar.

- **d**: Executes the ping test.
- **e**: Displays the results of the ping test.
- **f**: Closes the Ping Test dialog box.

Accessing the Statistics Tabs on Bottom of Main Tab

If you want to enlarge the statistics window, place your mouse on the splitter bar ".....", as circled (in black) in Figure 8-12 on page 8-16.



Hostname	IP Addr	RSSI	Rx Pwr (dBm)	Noise (dBm)	Noise & Signal	Link Quality	Packets	Mb/s	Peak Mb/s
Node_B	192.168.69.10	151	-41	-90			0	0.000	0.000
Node_C	192.168.69.11	n/a	n/a	n/a			0	0.000	0.000
Node_D	192.168.69.12	225	-12	-97			0	0.000	0.000
Node_E	192.168.69.13	245	-4	-100			0	0.000	0.000
Node_F	192.168.69.14	167	-35	-93			0	0.000	0.000
Node_G	192.168.69.15	176	-31	-87			0	0.000	0.000
Node_H	192.168.69.16	247	-4	-96			0	0.000	0.000
Node_I	192.168.69.17	220	-14	-94			0	0.000	0.000
Node_J	192.168.69.18	227	-11	-87			0	0.000	0.000
Node_K	192.168.69.19	130	-50	-99			0	0.000	0.000
Node_L	192.168.69.20	241	-6	-85			0	0.000	0.000
Node_M	192.168.69.21	218	-15	-92			0	0.000	0.000
Node_N	192.168.69.22	112	-57	-81			46,127	0.188	0.347
Node_O	192.168.69.23	108	-58	-95			66,835	0.190	0.330
Node_P	192.168.69.24	191	-26	-89			39,164	0.133	0.340
Node_Q	192.168.69.25	131	-49	-85			98,472	0.118	0.326
Node_R	192.168.69.26	161	-37	-96			84,525	0.101	0.340
Node_S	192.168.69.27	167	-35	-99			99,767	0.253	0.348
Node_T	192.168.69.28	167	-35	-83			91,235	0.144	0.327
Node_U	192.168.69.29	169	-34	-84			46,157	0.140	0.332
Node_V	192.168.69.30	183	-29	-82			49,152	0.189	0.330
Node_W	192.168.69.31	124	-52	-82			99,453	0.075	0.309
Node_X	192.168.69.32	179	-30	-85			75,518	0.194	0.309
Node_Y	192.168.69.33	117	-55	-100			89,414	0.181	0.290
Selected Total							885,819	1.908	0.348
Network Total							885,819	1.908	0.348

Figure 8-12: Statistics window

Next, you will see a double arrow pointing up and down, as shown in Figure 8-13 on page 8-17:

Figure 8-13: Double arrow

Click and push up (to enlarge the window) or down to (decrease the size of the window). The statistic tabs look similar to the Statistics window shown in Figure 8-12 on page 8-16.

Note: If you want to remove a link from the Statistics window, right click your mouse in the window, choose the link row and choose **Remove Link** (as shown in Figure 8-14 on page 8-17).

Figure 8-14: Remove link shortcut

Downstream Tab

This tab displays information regarding the number of packets moving downstream in the network. This tab is used only with star and point-to-point networks.

Upstream Tab

This tab displays information regarding the number of packets moving upstream in the network. This tab is used only with star and point-to-point networks.

Combined Tab

This tab displays information regarding the total number of packets moving downstream and upstream in the network. This tab is used only with star and point-to-point networks.

Note: In star networks upstream is from CPE to base station and downstream is from base station to CPE.

Stats Setup Tab

This tab allows you to set up the statistics that display on the Downstream, Upstream and Combined tabs. This tab is used only with star and point-to-point networks. Select the boxes next to the statistics that you would like to be displayed.

- You can also click **Select All** (to display all statistics) or **None** (to select no statistics).
- Click **Zero Counters** to temporarily set all packet, byte, polls and missed counters to zero (0).
- Click **Reset Counters** to put the counters back to their original values.

The following are statistics you can select to display on the Downstream, Upstream and Combined sub tabs:

Note: All statistics on this tab are updated every 3 seconds.

- **Hostname:** The name of the host. Hostnames are set using the SPEEDLAN 9000 Configurator.
- **IP Address:** This is the IP address of the node.
- **Uptime:** The amount of time the node has been running.
- **RSSI:** The Receive Signal Strength Indicator, not measured in dBm.
- **Noise:** The amount of interference before the packets were received (not measured in dBm), the lower the better.
- **Rx Pwr (dBm):** This is the signal strength expressed in dBm.
- **Noise (dBm):** The noise before the packets were received in dBm.
- **SNR (dB):** The Signal-to-Noise Ratio, the higher the better.
- **Noise & Signal:** A combined graphical depiction of signal and noise percentage.

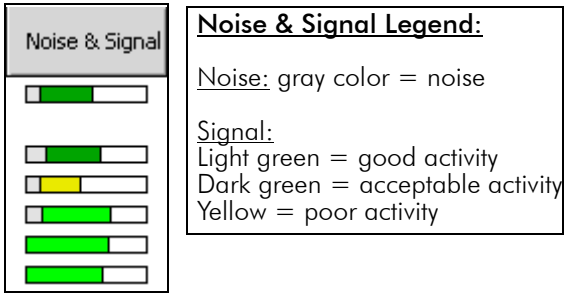


Figure 8-15: Noise & Signal graphic

- **Link Quality:** The percentage of polls a CPE responds to. The higher the number, the better. This displays the quality of the link. Light green = good activity (50% or higher). Dark green = acceptable activity.
  Yellow = Poor activity).
- **Polls:** The number of times the station has been polled.
- **Missed (Polls):** The number of polls that a base station sent that a CPE did not respond to. This statistic is also updated every 3 seconds.
- **Packets:** The number of packets that were received (downstream, upstream or combined).
- **Bytes:** The number of bytes that were sent to the interface.
- **Kb/s:** The current bandwidth (downstream, upstream or combined).
- **Peak Kb/s:** The highest rate of data transfer reached (downstream, upstream or combined).
- **Mb/s:** The current bandwidth (downstream, upstream or combined).
- **Peak Mb/s:** The highest rate of data transfer reached (downstream, upstream or combined).
- **Protocols:** (UDP, TCP, ICMP, HTTP, POP3, SMTP, TELNET, FTP, FTP_DATA and SSH).

Notes:

- Statistics related to mesh networks on this tab are the following: hostname, Mb/s, IP address, Peak Mb/s, RSSI, Rx Pwr (dBm), Kb/s and
  Peak Kb/s.
- Statistics related to star networks on this tab are the following: Hostname, Noise (dBm), Packets, Protocol-related information, IP address, Bytes, Uptime, Noise and signal, Kb/s, RSSI, Link quality, Peak Kb/s, Noise, Polls, Mb/s, Rx Power (dBm), Missed polls and Peak Mb/s.

TCP Dump Tab

This tab allows you to look at packet headers on a given network interface as they occur. This is useful for determining what traffic a node is receiving when debugging a network connection. This tab is used with star, point-to-point, and mesh networks.

- **Start:** Click the node that you want to "TCP dump" and click this button.
- **Stop:** Stops the TCP dump.
- **Clear:** Click to clear all information in the output window.
- **Show Routes:** Click to query the current routing table for the selected node.

- Show Stats: Click if you want to view the following transmitted and received wireless statistics for the selected node:

  Transmitted Wireless Statistics

  - **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.

  Received Wireless Statistics

  - **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.
- Save to File: Click to save all text in the output window for diagnostic purposes.

TCP Dump Setup

This tab allows you to set up TCP Dump. This tab is used with star, point-to-point and mesh networks.

- **Use:** Select this box to activate the item you want to include.
- **Item:** The item to filter.
- **Src:** The filter item only applies to the source of the packet.

- **Dest:** The filter items only applies to the destination of the packet.

Filter items

- **IP Address:** Use this to include (exclude) the display of packets destined for or coming from (or both) to a given network host.
- **Port:** Use this to include (exclude) the display of packets destined for or coming from (or both) a given network port. Select port by protocol: HTTP (80), POP3 (110), SMTP (25), TELNET (23), FTP (21), FTP_Data (20), SSH (22) or Custom (the port you enter).
- **Protocol:** Select either **ARP** (Address Resolution Protocol), **IP** (Internet Protocol), **TCP** (Transmission Control Protocol), and **UDP** (User Datagram Protocol)
- **Interface:** The wired (i.e., eth1) or wireless (i.e., wlan1) interface where the device is connected.
- **Include Selected From Above:** Click to enter the selected criteria into the “Include” filter list.
- **Exclude Selected From Above:** Click to exclude the selected criteria into the "Exclude" filter list.
- **Remove Selected:** Highlight the filter criteria you want to remove and click this button.
- **Clear:** Click to remove all filter criteria items from this box.

Select the boxes next to the filter item(s) that you would like to define.

Options Tab

To customize how the network diagram will appear on the Main tab, click the **Options** tab. The following tab will appear.

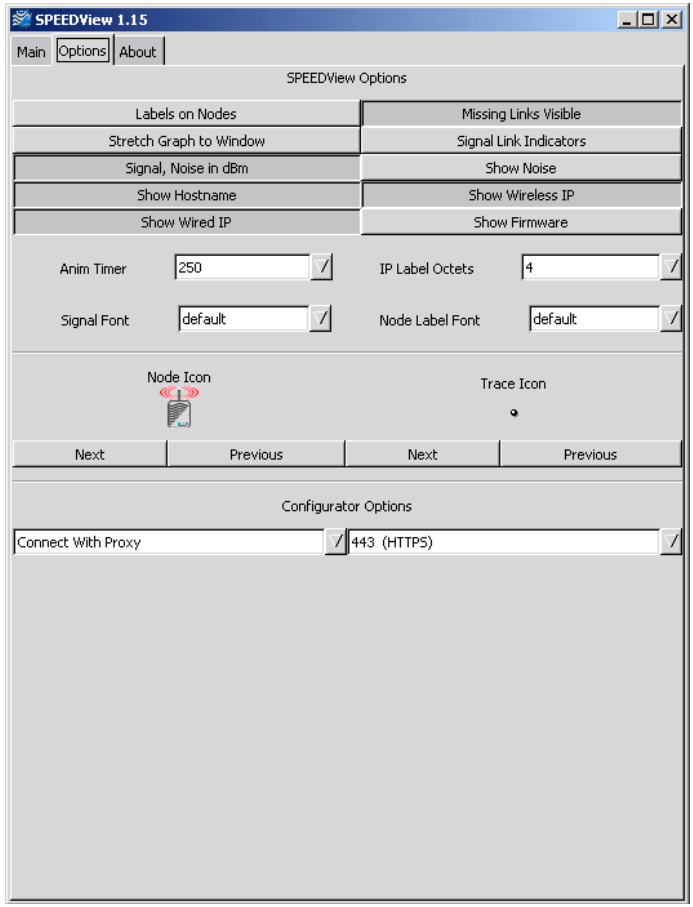


Figure 8-16: Options tab

Elements on Options Tab:

- **Labels on Nodes**: Click to display the IP address (IP label) on the node. If this item is not selected, the IP label will be displayed next to the node.
- **Stretch Graph to Window**: Click if you want the network diagram to use all of the available window space.
- **Show dBm**: Click to show the dBm (decibels per milliwatt). 0 dBm is defined as 1mw at 1 kHz of frequency at 600 ohms of impedance (displays near node on Main tab). **Note:** Signal (on the Main tab) must be selected to show dBm.

- **Show Hostname:** Click to show the hostname of the wireless node (displays on node on Main tab).
- **Show Wired IP:** Click to show the wired IP address and netmask. (The Star diagram network, as shown in "Star Network" on page 6, shows an example of this button being enabled. The Mesh diagram, as shown in "Mesh Network" on page 7, shows an example of this button NOT being enabled.)
- **Missing Links Visible:** Click to display broken links. The broken (or disconnected) link will appear as a red, dashed line. This link appears when there is no signal strength between nodes. If this item is not selected, the link will be absent between the broken links.
- **Signal Link Indicators:** Selecting this item will produce graphical link indications to show which link a Signal label is attached to. This is useful for a large number of nodes. In order to display the signal, you must have clicked **Signal** (on the Main tab).
- **Show Noise:** Click to display the noise for the wireless node (displays to the right of the Signal on the Main tab). In order to display the noise, you must have clicked **Signal** (on the Main tab).
- **Show IP Address:** Click to display the wired IP address (displays near node on Main tab).
- **Show Wireless IP:** Click to display the wireless IP address (displays near node on Main tab).
- **Show Firmware:** Click to display firmware version (displays near node on Main tab).
- **Anim Timer (Animation Timer):** Select this drop-down list to change the animation speed during a trace route test. The speed is measured in milliseconds.
- **Signal Font:** To change the font size of the signal, click this drop-down list and select one of the following: **default**, **tiny**, **small**, **medium** or **large**.
- **IP Label Octets:** To change how many octets appear for the label (IP address or IP label) on the **Main** tab, click this drop-down list. You can select up to 4 octets. (Note that selecting "**4**" will display the full IP address.)
- **Node Label Font:** This is the font used to display the IP Label. To change the size, click this drop-down list and select one of the following: **default**, **tiny**, **small**, **medium** or **large**.
- **Node Icon:** This displays how the SPEEDLAN 9000 node will appear on the Main tab. You can select one of the following: **Smiley Face**, **Node**, **SPEEDView** icon (small and large) or a **Computer** icon.

- **Trace Icon**: This displays which Trace Route icon (yellow star or black dot) will appear on the network diagram (on the Main tab). The default is shown in Figure 8-17 on page 8-24).

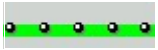


Figure 8-17: Trace icon

- **Next button**: Select this button to move forward.
- **Previous button**: Select this button to move backward.

- **Configurator Options**:
  - The drop-down list to the left lets you connect directly to SPEEDView or via proxy. Using **Connect with Proxy** is the default because you will likely not have a TCP route to all nodes in the SPEEDView network diagram. In this mode the connection is proxied through the 9000 node where it is connected. Selecting **Connect Directly** is faster, but it assumes you do have a direct route to the 9000 node you are trying to configure (and it must have a route back to your computer).
  - The drop-down list to the right allows 4 available ports to configure each 9000 node.
- If you do not want to reboot any nodes, click **Select None**.

Note: To view version and license information, click the **About** tab.

Chapter 9
Basics of IP Addressing

Main sections in this chapter:

- *What is an IP address?, page 9-2*
- *Internet Address Classes, page 9-2*
- *How does a network administrator assign an IP address?, page 9-7*
- *What is DHCP?, page 9-8*
- *What is NAT?, page 9-9*
- *NAPT, page 9-10*
- *Diagram of Outgoing NAT, page 9-11*
- *Diagram of Incoming NAT, page 9-12*
- *Basics of Routing, page 9-13*

Basics of IP Addressing

IP Addressing is important because it tells the network how to locate the computers or network equipment connected to it. IP addresses are given so each computer or equipment on the network contains a unique address. In addition, network addresses and node addresses, depending on the Class (A, B, C, etc.), contain their own unique address as well. IP addressing provides the following information:

- Provides communication between different platforms and diverse systems
- Provides universal data transfer over large geographic distances
- Has been "adopted" as a standard in the computer industry

What is an IP address?

An IP address contains:

- Two sections: the network address and the node address (also known as the host address)
- An IP address contains four octets.

The following examples show the conversion of the same IP address into several different formats:

- Decimal (192.0.2.56)
- Hexadecimal (82.39.1E.38)
- Binary (10000010.00111001.00011110.00111000).

Internet Address Classes

Understanding this methodology is difficult, even for customers. Therefore, let's explain this in easier terms. The first octet defines the "class" of the address, which is the only method to tell the size of the network (how big) and where the internet address belongs.

There are three main classes:

- Class A: 35.**0.0.0**
- Class B: 128.5.**0.0**
- Class C: 192.0.2.**0**

-non-bolded text = Part of network address

-bolded text = Part of local address (node section)

This definition is not random; it is based on the fact that routers by reading just the first three octets of the address field designate which network class it belongs to. This selection simplifies the way routers handle the messages (packets) and speed up the forwarding process.

In fact, IP defines five classes:

- **Class A** addresses uses 1 octet for the network portion and 3 octets for the node (or host) section of the address. This provides up to 128 networks with 16.7 million nodes for each network.
  - First octet is assigned as network address
  - Remaining octets used for node addresses
  - Format: network, node, node, node
  - In IP address 49.22.102.70, "49" is network address and "22.102.70" is the node address—all machines on this network have the "49" network address assigned to them
  - Maximum of 224 or 16,777,216 nodes

- **Class B** addresses uses 2 octets for the network portion and 2 octets for the node (or host) section of the address. This provides up to 16,384 networks with 64,534 nodes for each network.
  - First 2 octets are assigned as network address
  - Remaining octets used for node addresses
  - Format: network, network, node, node
  - In IP address 130.57.30.56, "130.57" is the network address, and "30.56" is the node address
  - Maximum of 216 or a total of 65,534 nodes

- **Class C** addresses use 3 octets for the network portion and 1 octet for the node (or host) section of the address. This provides 16.7 million networks with 256 nodes for each network.
  - First three octets are assigned as network address
  - Remaining octet used for node address
  - Format: network, network, network, node
  - In IP address 192.0.2.102, "192.0.2" is the network address, and "102" is the node address

  - Maximum of 28 or 254 node addresses

- **Class D**
  - Range is 224.0.0.0 to 239.255.255.255
  - Used for multicast packets (i.e., host sends out router discovery packets to learn all of the routers on the network)

- **Class E**
  - Range is 240.0.0.0 to 255.255.255.255
  - Reserved for future use

Note: Class D & E **should NOT** be assigned to net assignment of IP addresses. In addition, the first octet, 127, is reserved. In each network definition, the first node number (i.e., "0") is used to define the network, as well as the last number (i.e., "255"). The last number is known as the broadcast address.

Note: Non-public addresses can include a network address assigned from the network administrator or from the IP provider. Also, there is one network in each class that is defined for private use, allowing the creation of internal networks. These addresses are Class A: 10.0.0.0, Class B:172.10.0.0, and Class C: 192.0.2.0.

Subnetting a Network

The increasing number of hosts and networks make impractical address blocks that are not smaller than 255. In order keep the IP address small, so routers can manage them without changing the whole protocol, a smaller network definition is created. This is called a subnet. Subnets are intended to:

- Reduce network traffic
- Optimize performance
- Simplify management
- Create more effective and efficient addresses for large geographic distances

Default Subnet masks

- Class A: **255**.0.0.0
- Class B: **255.255**.0.0
- Class C: **255.255.255**.0

Note: Subnet mask is bolded.

What is a Subnet?

Subnetting allows you to create multiple networks within one Class A, B, or C network. Each data link (octet) contains its own unique identifier also known as the subnet. Also, each node on the same data link must belong on the same subnet as well.

What is a Subnet Mask?

A subnet mask allows you to mask section(s) (depending on the class specified) of the octets in the network address. Each octet used in the subnet mask is assigned to a data link. The leftover octet(s) are assigned to the remaining nodes.

For more information on subnetting, see the example below and *Diagram of Subnetting a Network, page 9-6*.

Example of Subnetting:

For example, a Class C network (255.255.255.0) contains three masked octets (255.255.255). The last octet (0) is leftover for remaining nodes (i.e., computers).

If Router D is reading IP Addresses 192.0.2.1 (let's call this IP Address 1) and 192.0.2.64 (let's call this IP Address 2) on this Class C network, it would send IP Address 1 to Subnet A and IP Address 2 to Subnet B. The remaining nodes in each subnet (A through D) on this network can contain up to 254 pieces of network equipment (computers, printers, fax machines, bridges or routers, etc.).

Diagram of Subnetting a Network

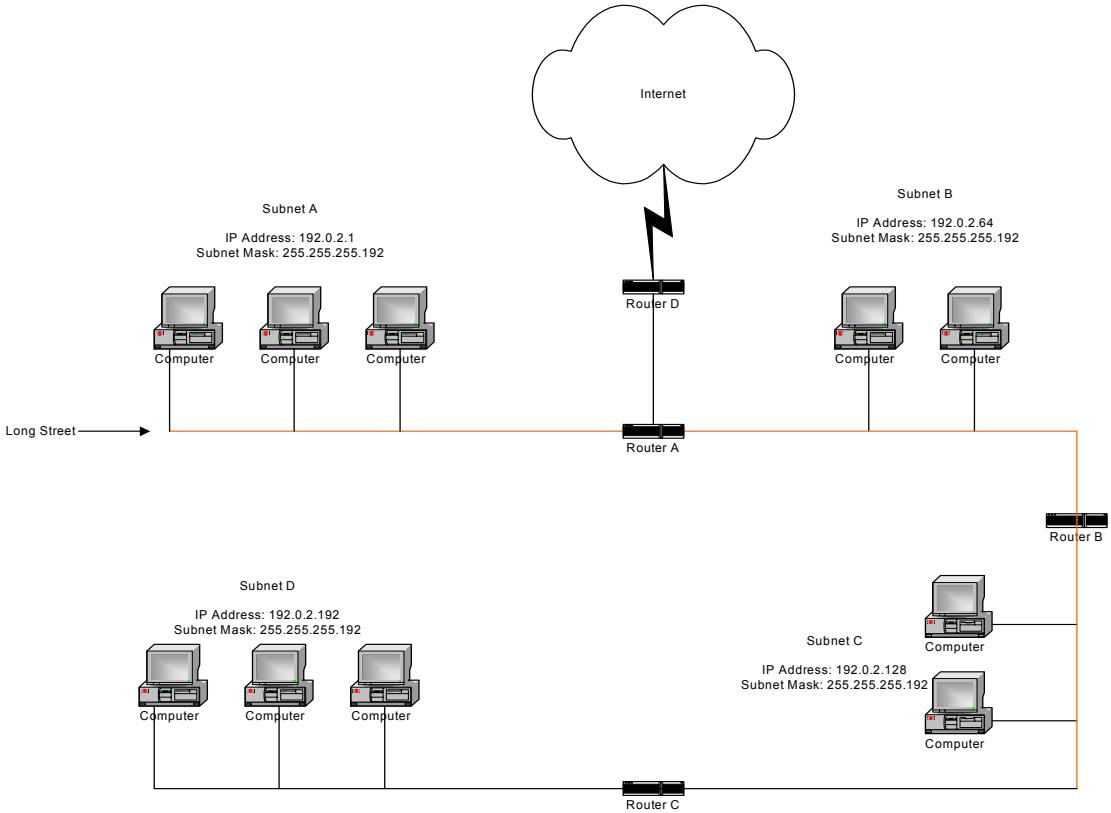


Figure 9-1: Subnetting diagram

Still confused?

An easier method to explain this concept is to use the classic "mailing" analogy used in IP addressing. Consider that this network, called Long Street, is four blocks long. There are 254 houses on Long Street, and each block contains 64 houses. Houses 1 to 63 reside on Block A. Houses 64 to 127 reside on Block B. Houses 128 to 191 reside on Block C. Houses 192 to 254 reside on Block D. Think of each block as a subnet. This

means that Blocks A, B, C, and D are all part of Long Street, which is also known as the network in this example. The mailman would organize the letters (or IP addresses for network equipment) by creating four piles (one for each block, or subnet). As soon as the mailman picks up pile A in his hand, he knows which block to turn on. This same reasoning applies to piles B, C, and D as well. Router D knows exactly which subnet to transfer (or turn) the packets to by reading its IP and subnet mask address. Note that each subnet on this network is 255.255.255.192. Why is 192 the last octet in the subnet mask and not 64? The last octet, 192, is the mask that allows 64 "houses" to know that the mailman (or router) is coming in advance. The "houses" will know it's mailman "Jim" by looking at the IP number.

Note: If the network is managed by a Simple Network Management Protocol for local or Internet access, each interface must contain a unique IP Address. This is a benefit of static or dynamic addressing.

How does a network administrator assign an IP address?

IP addresses are supplied by the network administrator, the ISP, or hosting company.

The two types of IP addressing—manual (static) and automatic (dynamic) addressing—are described below.

- **Manual (static) Addressing - Is 'Manually Configure' option on Interfaces Parameters page of 9000 Configuator**
  Each device connected to the Internet must have its own unique IP address. Also, if a computer is being used as a server, you will assign it a permanent IP address. 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. This will enable users to easily access the IP address.
- **Automatic (dynamic) Addressing - Is 'Use DHCP' option on Interface Parameters page of 9000 Configurator.**
  A 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 (i.e., great for temporary employees or mobile users), it must be assigned a new IP address for that network. DHCP can be used to manage these assignments automatically. DHCP is described in further detail below.

What is DHCP?

Dynamic Host Configuration Protocol (DHCP) allows network administrators to assign dynamic IP addresses for the period of time needed to connect to the Internet. Think of DHCP as leasing an apartment. A prospective tenant may not need to live in an apartment for two years, maybe just a year. Therefore, the tenant will only sign a one-year lease agreement. For example, each time a computer is set up to connect to the Internet, the network administrator uses DHCP to automatically assign the computer a unique IP address. That computer will give up its IP address when it is no longer needed (when the lease has ended) allowing new a computer (or a new tenant) on the same network to use it. This benefits educational and corporate settings where users often log on to different computers. In this case more IP addresses outnumber computers because you can quickly reconfigure the network if needed from a centralized location.

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

Note: The figure on the next page may help you understand how DHCP assigns and IP address.

Figure of DHCP Addressing

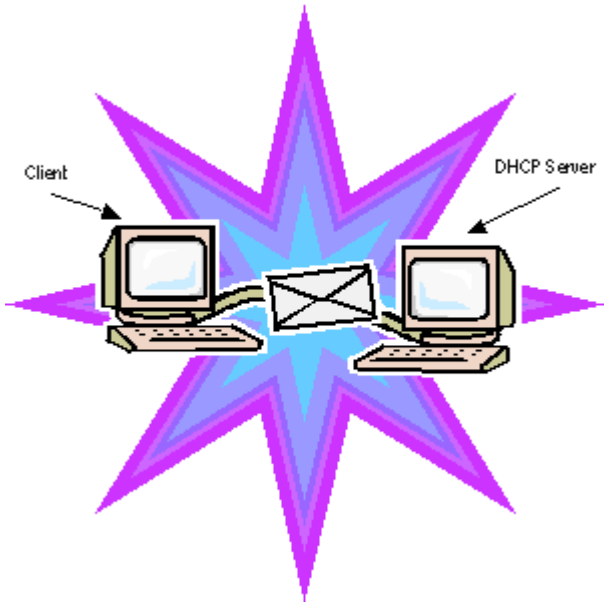


Figure 9-2: DHCP client and server

1. The client asks DHCP server for IP address and configuration if needed.
2. The DHCP server assigns an available IP address to client.
3. The client takes IP address from DHCP server and requests any additional configuration needed.
4. DHCP server confirms IP address and configuration.

What is NAT?

Network Address Translation (NAT) is the conversion of an Internet Protocol address (IP address) used within one network to a different IP address within another network. One network is designated the inside network and the other is the outside network.

Network Address Translation (NAT) occurs when there is a translation among an Internet Protocol (IP address) used within one network (designated as inside network) to a different IP addresses within another network (designated as outside network). Network Address Translators (NATs) allow companies to decrease the number of global

IP addresses. This enables companies to communicate with other devices on the Internet with a single global IP address (or more than one IP address).

For example, a company can provide its clients with one IP address, allowing access to the company's firewall only. This IP address is not a "real" address on the company's internal network, but it is successfully translated to the correct IP location through NAT (i.e., NAT router). Therefore, the company controls access through firewalls and provides multiple IP addresses to outside customers without excessive limited resources, or "global" Internet IP protocols.

NAPT

What differentiates NAPT from NAT? NAPT (or Network Address Port Translation) not only translates the IP address but also the transport layer port. Thus, if an inbound packet addressed to port 80 on the NAPT device would be translated and passed to the private network's web server. Without port translation, the NAT device has no means of knowing which host in the private network can pass packets to other devices. For an example see, *Diagram of Incoming NAT, page 9-12*.

Diagram of Outgoing NAT

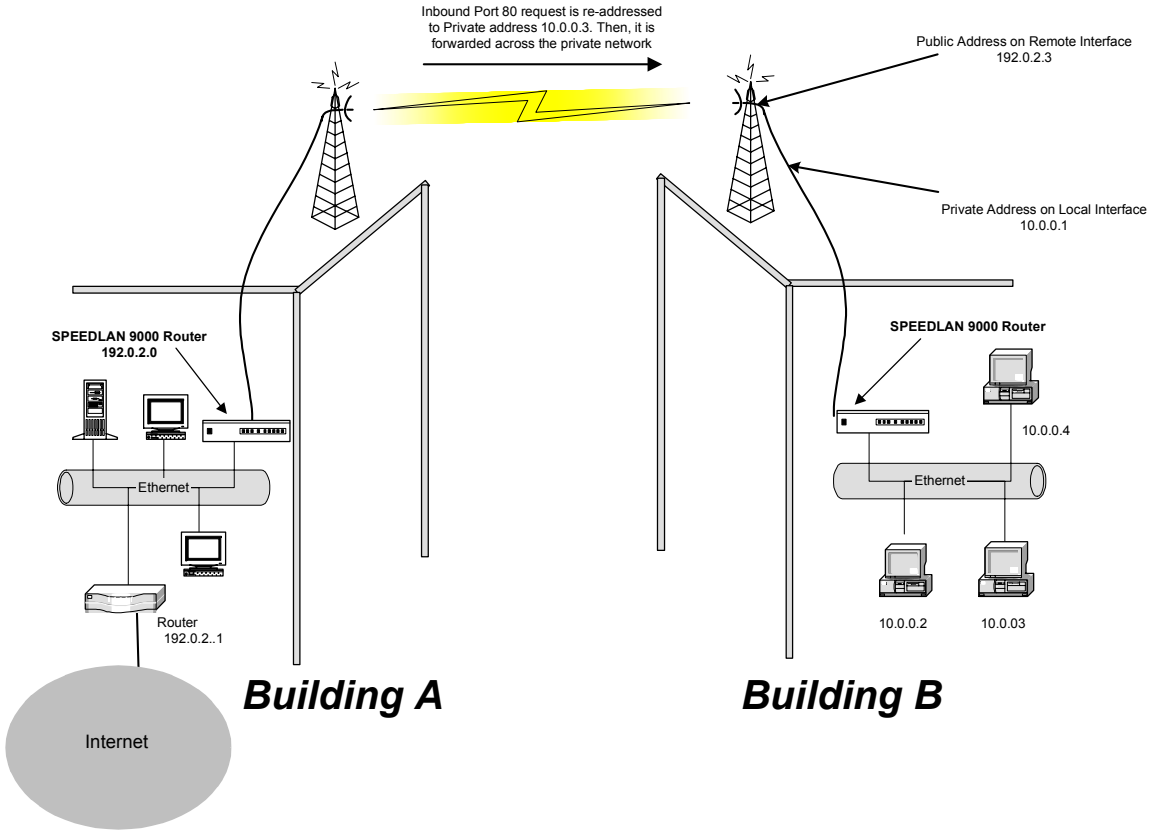


Figure 9-3: Outgoing NAT

As the packet is transmitted from the private network (in Building B) across the public network (public address in Building A and the Internet), the packet will be re-addressed as 192.0.2.3 (public address). When the packet returns to Building B, the packet will be re-addressed to the IP address of the private network by using the MAC address contained in the header to identify the destination.

Diagram of Incoming NAT

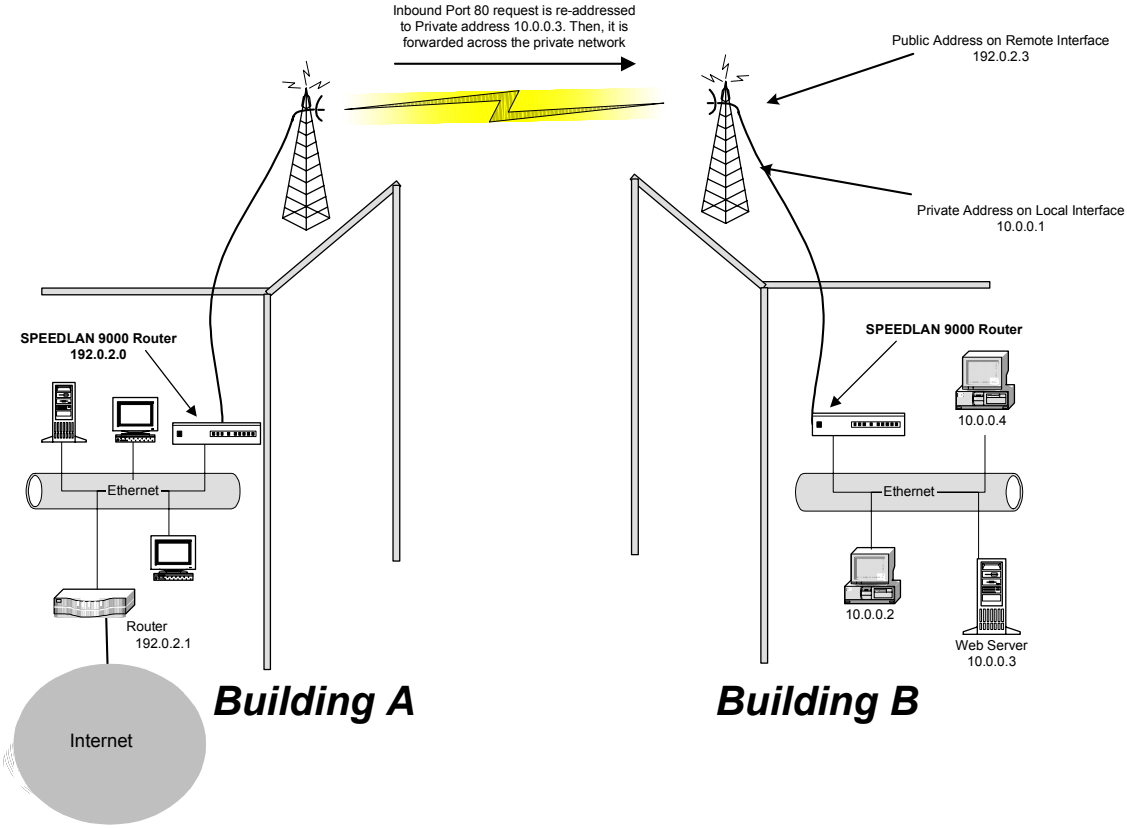


Figure 9-4: Incoming NAT

Incoming NAT allows you to specify ports on the private network (Building B) that you would like to be available on the public network (Building A and the Internet). For example, if a web server (IP Address 10.0.0.3) is being hosted on a private network in Building B, you can create a pair that will specify that all requests on the public IP address, Port 80, be forwarded to IP Address 10.0.0.3 on the private IP address, Port 80.

Basics of Routing

A router connects two or more networks together and decides which direction it should send each packet. The router is located at each gateway (where one network meets another). A router operates at the Network Layer of the OSI model. This means a router sends information based on the packet's IP address instead of the Ethernet address (as in bridging).

Routing protocols use special metric algorithms when determining the best path for a packet to travel. All of this information is stored in a routing table. Some of this information includes hop count and destination information. The routing table also stores when the receiver gets the packet and lets the sender know that is was received.

Note: For more information about routing, see www.whatis.com, http://www.techweb.com/encyclopedia/, http://www.computeruser.com/resources/dictionary/dictionary.html, or search for "basics of routing" on the World Wide Web.

Notes:

Glossary for Standard Data Communications

Glossary for Standard Data Communications

Alignment
In order to create a successful link, all related equipment should be associated to its respective attachments or equipment.

Amplitude
The magnitude of a waveform when measured from the mid-point to the peak of the wave.

Analog
A signal in the form of a continuously varying quantity such as voltage, frequency or phase.

Antenna
Device used to concentrate and direct the energy of a signal into a tight beam. Parabolic or dish, grid, and Yagi are different varieties of antennas.

Antenna Gain
The ratio of the power radiated by an antenna in a specific direction versus the power required to produce this same strength if an isotropic antenna were used.

Attenuation
The measure of the loss of power in a microwave signal as it travels between two points. It is measured in decibels (dB).

Attenuator
Attenuators simulate antennas during bench tests.

Azimuth
This is the direction of antenna pointing relative to true north.

Band
A portion of the electromagnetic frequency spectrum.

Bandwidth
The range of frequencies over which a device will transmit information.

Bit
An abbreviation for binary digits.

Bit Error Rate

A measure of the number of errors in a digital transmission. Typically given as an exponential number that represents the ratio of errors to total bits. Example: 1E-03 = 0.001 = 1.0 x 10-3 and 1.0E-6 = 0.000001 = 1.0 x 10-3. A single element in a binary code. A measure of the number of errors in a digital transmission. Typically given as an exponential number that represents the ratio of errors to total bits. Example: 1E-03 = 0.001 = 1.0 x 10-3 and 1.0E-6 = 0.000001 = 1.0 x 10-3.

Bridge

The function of a bridge is to connect separate networks together. This device operates at the DataLink Layer of the OSI model. Bridges connect different network types (such as Fast Ethernet and Ethernet) or networks of the same type. Bridges allow only necessary traffic to pass through the designated segments. When the bridge receives a packet, the bridge determines the destination and source segments. If the segments are the same, the packet is dropped, or filtered. If the segments are different, then the packet is “forwarded” to the correct segment. Additionally, bridges do not forward bad or misaligned packets. Bridges are also called “store-and-forward” devices because they look at the whole Ethernet packet before making filtering or forwarding decisions. Filtering packets, and regenerating forwarded packets enables bridging technology to split a network into separate collision domains.

Byte

A data unit consisting of eight bits.

Cable

A transmission medium of copper wire or optical fiber wrapped in a protective cover.

Channel

A specific band of frequencies designated for a specific purpose; the data path between two nodes.

Channel Service Unit/Data Service Unit (CSU/DSU)

Manages digital transmission and monitors signals for problems. Performs many functions similar to a modem with the exception of converting digital signals to/from analog since the end device and transmission facility are both digital.

Channel Spacing

The amount of space signals can flow through.

Class

Understanding this methodology is difficult, even for customers. Therefore, let's explain this in easier terms. The first octet (or octets) defines the "class" (indicated by the word "net" in this example) of the address, which is the only method to tell the size of the network (how big) and where the internet address belongs. The remaining octets indicate availability for network equipment (i.e., computer or other network equipment). The three main classes are: Class A, Class B, and Class C.

- Class A: Net, Node, Node, Node 255.**0.0.0** (last three octets are available for equipment)
- Class B: Net, Net, Node, Node 255.255.**0.0** (last two octets are available for equipment)
- Class C: Net, Net, Net, Node 255.255.255.**0** (last octet is available for equipment)

Coaxial Cable

A type of transmission line consisting of a center conductor wire surrounded by insulation that is in turn surrounded by a conductive shield made of metal foil or wire braid. Often used to connect the RF unit and modem unit of a wireless system.

Code Division Multiple Access (CDMA)

A system in which all users occupy the same bandwidth. Uncorrelated codes are used to allow for higher bandwidth occupancy. This is also known as the spread spectrum system.

Common Management Information Protocol (CMIP)

A network management protocol that is consistent with an Open Systems Interconnection (OSI) network communication model.

Company name

This is the name of the company that owns or maintains the radio given to the terminal.

Console

This device allows you to communicate through the Telnet client to access the configuration software.

Crimp

Crimp the connector to secure the conductors.

Customer Premise Equipment (CPE)

Any equipment located at the customer site. Usually in reference to those that are connected to a network.

Data Communication Equipment (DCE)
A definition of an interface standard that determines how it is connected to another device. For most modems, it resolves issues of interface between Data Terminal Equipment (DTE) and the network.

Data Terminal Equipment (DTE)
Hardware that provides for data communications. See also DCE above.

dBm
Decibels (dB) relative to 1 milliwatt.

dBw
Decibels (dB) relative to 1 watt.

Decibel (dB)
The standard unit of measurement for expressing relative signal power. It is dimensionless and is instead referenced to a certain level.

DHCP
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. By providing a DHCP server within the CPE and the base station, the SPEEDLAN 9000 series allows the DHCP transactions to be handled locally at the remote building. This reduces the load on the entire wireless network.

Diffraction
The distortion of a wave as it is partially obstructed by an object in its path.

Digital Signal Processor (DSP)
A specialized computer chip designed to perform speedy and complex operations on digitized waveforms.

Direct Sequence (DS)
A type of spreading technique that multiplies a higher rate PN code to the signal in order to spread the energy of the narrow band signal over a much wider bandwidth for transmission.

Direct Sequence Speed Spectrum (DSSS)
DSSS may be seen as the result of two processes. Data is multiplied with a higher rate digital sequence (spreading code). The sequence has many “chips” for every data bit. The resultant signal modulates the RF carrier.

E1

European Standard also used in South American nations, among others. Speed is 2.048 Mega bits per second (Mb/s). Uses the G.703 data interface.

Elevation

1. Height above sea level. 2. The vertical angle in degrees between the ground and the direction the antenna is pointed.

Encryption

The method of converting data into a form that cannot be understood by unauthorized people. Encryption is very important when using wireless communication because wireless circuits are easier to tap into than wireless circuits. There is also strong encryption, which means ciphers are used to make uncoding the signal almost impossible, unless you have the decryption keys.

ESD

Electro-Static Discharge happens when there is a transfer between objects at diverse voltages.

Ethernet

This is the most popular physical layer LAN technology in use today. Other LAN types include Token Ring, Fast Ethernet, Fiber Distributed Data Interface (FDDI), Asynchronous Transfer Mode (ATM) and Local Talk. Ethernet is popular because it strikes a good balance between speed, cost and ease of installation. These benefits, combined with wide acceptance in the computer marketplace, create the ability to support virtually all-popular networks and make Ethernet an ideal networking technology for most computer users today. The Institute for Electrical and Electronic Engineers (IEEE) defines the Ethernet as IEEE Standard 802.3. This standard defines rules for configuring an Ethernet, as well as specifying how elements in an Ethernet network interact with one another. By adhering to the IEEE standard, network equipment and network protocols will communicate efficiently.

Ethernet Switch

This device helps expand the Ethernet network. LAN switches can link four, six, ten or more networks together, and have two basic architectures. This switch “cuts through” and “stores and forwards” as well. This technique takes more time to examine the entire packet, but it allows the switch to catch certain packet errors and keep them from propagating through the network. A switch also operates between the DataLink and Network Layer of the OSI model. It reads the MAC address and will either bridge it to the Physical Layer or route to the Network Layer.

Fade Margin
The difference between the receiver signal input level and the receiver sensitivity. Fade margin is usually considered the safety factor allowing the system to remain operating under additional forms of attenuation.

Fading
The loss of signal strength due to changes in the atmosphere.

Fault
This section of the browser gives the user a detailed list of alarm activity. Along with the alarm activity, the Event Log also time stamps an alarm, so the user is able to determine when an event occurred, and at what time the event cleared. The date and time fields are derived from the time read by the radio on the network time server.

Federal Communications Commission (FCC)
Government organization appointed by the U.S. President that regulates interstate communications (by use of licenses, standards, rates, etc.).

Firewall
A firewall protects resources in a private network from the users on outside networks. It can also restrict unwanted traffic from the private network to the outside. The firewall determines based on a set of rules whether packets should be forwarded to their destination.

Firmware
Alterable programs in semitransparent storage (e.g., some type of read-only or flash reprogrammable memory).

Forward Error Correction (FEC)
The ability of a receiving station to correct a transmission error. The transmitter sends redundant information along with the original bits and the receiver uses this information to find and correct errors. This can increase the throughput of a data link operation.

Framing
Dividing data for transmission into groups of bits, and adding a header and a check sequence to form a frame.

Frequency
The number of complete cycles per second existing in a waveform. Note that frequency is measured in Hertz (Hz).

Frequency Hopping (FH)

A type of spreading technique using a PN code to change the signal's frequency between several pre-assigned values (hopping). Although the signal itself looks like a narrow band signal at any given point in time, it acts like a spread signal because of the frequency hopping.

Fresnel Zone

An imaginary ellipse surrounding the direct transmission path formed by all the points from which a reflected wave would have an increased path length of multiple of the transmitted signal's wavelength. At least 60% of the Fresnel zone must be unobstructed.

Full Duplex

Independent, simultaneous two-way transmission going in both directions.

Gain

The increase in signal power caused by a device such as a transmitter or antenna.

GHz

GigaHertz. Billions of Hertz.

Ground elevation

This is the approximate mean sea level (AMSL) of the terminal.

Half Duplex

A one-way directional communication line going in both directions. Only one signal can be transmitted or received at a time

Hertz (Hz)

A unit of measurement equal to one cycle per second.

Hexadecimal (Hex, or H)

A Base-16 numbering system. This means 16 sequential numbers are used as a base unit (i.e., "0-9" and "A-F").

Hop

A term used to describe a single radio path between two points.

Host
This term is interchangeable with the definition "node," which means this is a point on the network. The host is also any device on the network that has two-way communication to any point on the network, as well as the Internet.

Hot-standby
A condition whereby when the primary method of communication goes down, the secondary method instantly takes over.

Hub
This device on a network collects, receives, and repeats data to its forwarded destination on the network. A hub is also known as a switch.

HyperTerminal
This provides you details of the internal configuration of the ODU. In the HyperTerminal, you can also change the port settings for the modem connection and adjust the settings to make a call.

IDU
Indoor Unit (i.e., Modem Unit).

IF Cable
In an SPEEDCOM system, this is the coaxial cables that connects the modem unit to the RF unit. These cables are terminated with male TNC-type connectors at both ends.

Interface
The standard signal for connecting a microwave system to the connecting equipment.

Interference
Unwanted signals that cause performance degradation or loss of information.

Intermediate Frequency (IF)
The frequency to which a microwave signal is converted to permit signal processing. This range is typically around 70 to 200 MHz.

Internet

This is a system of linked networks that are worldwide in scope and facilitates data communicate service such as remote login, file transfer, electronic mail, the World Wide Web and newsgroups. With the meteoric rise of demand for connectivity, the Internet has become the communications highway for millions of users. The Internet was initially restricted to military and academic institutions in its infancy, but now it is a full-fledged information channel for any and all forms of information and commerce. Internet web sites now provide personal, educational, political and economic resources to every cornet of the planet.

IP Address

This address tells the network how to locate the computers or network equipment connected to it. IP addresses are given so each computer or equipment on the network contains a unique address. There are two methods used when assigning an IP address:

- **Automatic (dynamic) Addressing**
  A 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 (i.e., great for temporary employees or mobile users), it must be assigned a new IP address for that network. DHCP can be used to manage these assignments automatically.
- **Manual (static) Addressing**
  Each device connected to the Internet must have its own unique IP address. Also, if a computer is being used as a server, you will assign it a permanent IP address. 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. This will enable users to easily access the IP address.

ISM (Industrial, Scientific, and Medical Bands)

Ranges are 900 to 928 MHz; 2.4 to 2.4835 GHz; and 5.725 to 5.85 GHz. The FCC for unlicensed use allocated these bands with a restriction on the output power.

Isotropic

Uniform in all directions.

K^2

This is a polling protocol used in star networks (line of sight). A base station polls the remote stations (Customer Premise Equipment) and tells when and where CPEs can transmit.

Kb/s

Thousands of bits per second.

KHz (KiloHertz)
Thousands of Hertz. Each wireless phone call occupies only a few KiloHertz.

LAN
This is a local area network that enables computers, network equipment, or other peripherals to communicate on a small network.

Last mile
Any type of telecommunications technology where data (voice, video, etc.) is traveled within relatively short distances to maintain to highest quality of bandwidth and throughput.

Latitude
This is the geographic latitude of the location of the terminal.

LED
This is a light-emitting diode, which is a semiconductor, that sends out visible light when an electrical current moves through it.

Light Emitting Diode (LED)
An electronic device that emits light with little generation of heat.

Line Interface Unit (LIU)
The first unit inside the modem units encountered by signals from the user.

Line of Sight (radio) (LOS)
A condition whereby the antennas of a given link have a sufficient path for communication. It requires that at least 60% of the Fresnel zone between them be unobstructed. (Do not confuse with Loss of Signal.)

Local Area Network (LAN)
A short distance data communications network used to link together computers and peripheral devices (such as printers) under some form of standard control.

Loopback
This is the process of sending out a test signal to the device on the network so that you know if your signal was successful or unsuccessful.

Loss of Signal (LOS)

The signal from the user's device does not appear in the DSX or E1 interface. (This is not to be confused with Line of Sight.)

MAC address

In a LAN environment each computer contains its own Medium Access Control (MAC) address which is the embedded and unique hardware number. For computers on Ethernet LANs, this is the same number as its Ethernet address. This address is controlled at the DataLink Layer of the OSI model, and is in a hexadecimal format separated by four octets (i.e., 82.39.1E.38).

MAN

This is a metropolitan network that enables computers, network equipment, other peripherals, and more than one LAN to communicate within the city or nearby limits.

Management Information Base (MIB)

A database of network parameters used by SNMP and CMIP to monitor and change network device settings. It provides a logical naming of all information resources on the network pertinent to the network's management.

Mean Time Between Failure (MTBF)

A measure of the theoretical times a component or device will operate without failing.

MHz (MegaHertz)

Millions of Hertz.

Modulation

The process of varying characteristics of a carrier signal to represent changes in the transmitted information.

MOdulator-DEModulator (MODEM)

A device that converts a digital signal to analog, or vice versa, and is used to transfer data between computers over communications lines.

Mb/s

Million of samples per second.

Multi-path fading

The condition in which the "true" signal from an antenna reflects off an object (usually the ground) and, as a result, the reflected signal causes destructive interference at the receiving antenna. Multi-path fading affects linearly polarized signals more than circularly polarized signals.

NAT

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.

Network

A set of connections that allow them to exchange data with each other, which enables multiple users to share to communicate data through the accepted path(s). Two or more locations tied together with equipment and communications channels.

Node

This is a point on the network such as a computer, server, peripheral (printer, scanner, etc).

Noise

Any unwanted signal or disturbance that degrades the quality of a transmitted signal.

Obstruction

Any man-made or natural object that blocks, diffracts, or reflects a transmitted signal.

Octet

There are four octets in an IP address. Each octet contains 8 bits, which are equivalent to 1 byte. Each octet is separated by a period (.).

OD

Outside diameter of pipe for mounting an antenna.

Outdoor Unit

The Outdoor Unit (ODU) provides the baseband and RF signal processing required to convert the 100Base-T signal from the CPI to an RF frequency at 23, 26, 29, or 38 GHz. The ODU mounts to an antenna through an integral "Quick-Fit" connection that does not require any external waveguide. The ODU housing is ruggedized to protect the RF and modem electronics contained inside. It is capable of simultaneously transmitting and receiving 100 Mb/s of data traffic over the air.

Packet
A unit of data transmitted between a receiver and a sender. Each packet contains embedded information, as well as place to go on the network (known from the IP address).

Part 15 (of FCC rules)
The section of the FCC Code of Federal Regulations defines the restrictions regarding the use of Spread Spectrum systems.

Passive Repeater
A re-radiation device associated with a transmitting/receiving antenna system that re-directs intercepted radio frequency energy without boosting or processing the signal.

Path Length
The distance between two ends of a wireless system.

Path Loss
The decrease in signal power experienced when a signal is transmitted between two points.

Path Profile
A drawing of the terrain (including buildings, trees, hills, lakes, etc.) along a transmission path to determine if a given path is viable for the communication link. This is usually done with a computer.

Personal Communication Services (PCS)
A lower powered, higher frequency competitive technology to cellular.

Polarization
The direction of the amplitude of a radio wave. Polarization is usually horizontal or vertical.

Pole Height
This is the height of the antenna supporting structure.

Power Output
The power produced by a transmitter. This is measured in decibels per meter (dBm).

Processing Gain
The ability of the spread spectrum decoder to recover the received signal out of noise. It is essentially the increase in ability to recover the signal in the presence of an interfering carrier of the same or greater level.

Propagation
The transmission of a wave along a given path through a medium.

Protocol
A network protocol is the standard that allows computers to communicate with each other. A protocol defines how computers identify one another on the network, the form that the data should take in transit, and how this information is processed once it reaches its final destination. Protocols also define procedures for handling lost or damaged transmissions or "packets." IPX (for Novell Netware), TCP/IP (for UNIX, Windows NT, Windows 95 and 98 and other platforms), DECnet (for networking Digital Equipment Corp. computers), AppleTalk (for main Macintosh computers), and NetBIOS/NetBEUI (for LAN and Windows NT networks) are some of today's most popular networks. Although each network protocol is different, they all share the same physical cabling. This common method of accessing the physical network allows multiple protocols to peacefully coexist over the network media, and allows the builder of the network to use common hardware for a variety of protocols. This concept is known as "protocol independence," which means that devices that are compatible at the physical and data link layers allowing the user to run many different protocols over the same medium.

Pseudo-random Noise code (PN code)
A high rate digital code that mimics random noise-like properties. It is multiplied with a lower rate data signal in order to achieve spread spectrum transmission signals. The receiver then multiplies the same code back into the transmission to recover the data signal.

Public Switched Telephone Network (PSTN)
This refers to a worldwide voice telephone network accessible to all those with telephones and access privileges.

Quadrature Amplitude Modulation (QAM)
A method for modulating a signal by which more than one bit can be sent simultaneously.

Quadrature Phase Shift Keying (QPSK)
Phase-shift keying in which there are four phase states or positions in the time or frequency domains within a single period.

Radiation
The flow of electromagnetic energy from a transmitter.

Radiation Pattern
An illustration of the energy level radiated by an antenna in every direction.

Radio address
This is the physical location (street name) of the terminal. This is also displayed at the bottom of the web page.

Radio Frequency (RF)
The frequency at which microwave systems transmit.

Received Signal Strength Indicator (RSSI)
The RSSI Voltage provided at the output of the RF Unit that is used to indicate the RF Input Level.

Reflection
The sharp change in direction of a wave after hitting an obstruction in its path.

Refraction
The bending of a wave as it moves from one medium to another.

Reliability
A measure of the percentage of time the system is operating. Reliability is usually a measure of both the availability of the signal and the MTBF of the equipment.

Responsible personnel
This is the person(s) responsible for maintaining the radio system.

RF Signal Level
The strength of the power received by the RF Unit from the antenna.

Router
This device filters out network traffic by specific protocol rather than by packet address. This device operates at the Network layer of the OSI model. Routers also divide networks logically instead of physically. An IP router can divide a network into various subnets so that only traffic designated for particular IP addresses can pass between segments. Network speed often decreases due to this type of intelligent forwarding. Such filtering takes more time than exercised in a switch or bridge, which only looks at the Ethernet address. In more complex networks, overall efficiency is improved by using routers.

Rx (Receiver)
This is where the packet is going.

Server
A computer that is responsible for tracking, as well as receiving and sending requests from other computers connected to it (on the same network).

Sidelobe
These are 20 dB lower than the main lobe, and it is critical from a performance standpoint that antennas are aligned with respect to the main lobe. Failure to do so may cause the radio to be interfered with or the radio may interfere with other systems.

Signal level
This is the value of the signal level at the receiving end of the transmission path.

Simple Network Management Protocol (SNMP)
The standard protocol for TCP/IP network management that has the most common worldwide use.

Site ID (Unique)
This is the alphanumeric site address given to the terminal by you (the user).

Spread Spectrum Technology (SST)
A method of encoding (with a PN code) a digital signal in a transmitter so as to spread it over a wide range of frequencies so that the average signal power is close to the noise floor. The same code is known to the receiver and is used to decode the signal. Keeping the code secret provides communications security.

Star
A topology (in the K2 polling protocol category) that includes point-to-point or point-to-multipoint activity, as long as those routers are within line-of-sight of each other.

Submask
This term allows you to mask section(s) (depending on the class specified) of the octets in the network address. Each octet used in the subnet mask is assigned to a data link. The leftover octet(s) are assigned to the remaining nodes.

Subnet
This term allows you to create multiple networks within one Class A, B, or C network. Each data link (octet) contains its own unique identifier also known as the subnet. Also, each node on the same data link must belong on the same subnet as well.

Symbol Threshold

After a signal has been acquired, the acquisition algorithm in the spread-spectrum chip continues to run a cross-correlation between the expected PN sequence and the received signal, but now uses the Symbol Threshold for comparison. If the result of the cross-correlation drops below the Symbol Threshold, the signal is considered to have been lost, and the algorithm begins trying to acquire the signal again.

System Gain

The sum of the transmitter power output and the receiver sensitivity. System gain is an important measure of a system's ability to overcome attenuation and perform to a satisfactory level. These are measured in decibels per meter (dBm).

Tx (Transceiver)

This is where the packet is coming from.

WAN

A wide-area metropolitan network is a connection between LANs, which may be privately owned or rented.

Wired

A network interface connected by wire to other nodes in the network.

Wireless

A network interface that uses radio to communicate to other nodes in the network.

Appendices

The Appendices include:

- Appendix A - Changing the Router's Topology Mode
- Appendix B - IP Recovery
- Appendix C - Passwords for the SPEEDLAN 9000 Configurator, SPEEDView & IP Recovery
- Appendix D - Declarations of Conformity and Regulatory Information
- Appendix E - 9000 Technical Specifications & Product Model Information
- Appendix F - SPEEDSignal

Appendix A - Changing the Router's Topology Mode

Changing the Router's Topology Mode

This tutorial tells you how 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).

1. Enter the correct URL or IP address for the router in your web browser.
2. Enter the correct password and click **Login**. If you do not want to reset all configuration to the Factory Default, skip to step 6.
3. Reset all configuration to the factory defaults. Do this by choosing **Factory Reset** from the **Admin** menu. Then, click **Reset All Configuration to the Factory Default**.
4. The system will reboot the router.
5. When the router is back up, log in again to the default IP address of 192.168.69.1.

Note: You can also use the IP Recovery application to assign a temporary IP address that is compatible to your existing network. For information on how to set up a temporary IP address, see *What is IP Recovery?, IP Recovery, Appendix A-2*.

6. Choose **Interfaces** under the **Network** menu. The Network Interfaces page will appear. Select the new mode (e.g., Mesh) from the **Interface Type** drop-down menu. Then, click **Apply**.
7. The system will reboot the router.
8. Now you can configure any other router parameters as needed.

Appendix B - IP Recovery

What is IP Recovery?

Primary Use: If you changed the IP address on the router and forgot it, you can find the configured IP address of the Ethernet interface using IP Recovery.

Secondary Use: If after learning the IP address of the Ethernet interface, you cannot log on to the router using the HTML Configurator (SPEEDLAN 9000 Configurator), then you will be able set a temporary Ethernet IP address so that a connection can made. This will allow you to troubleshoot the problem. It does not change the existing IP address on the Ethernet. After you have fixed/checked the settings on the router, reboot the router and the temporary IP address will be removed. The real IP address will be functioning again.

Note: You can also perform a power transmit test. For more information, see page 6 of this chapter.

Installing the IP Recovery Program

System Requirements

- Runs on the following Windows platforms: 98, ME, NT (Service Pack 4.0), 2000 or XP.
- 10 Megabytes of Hard Drive Disk Space
- CD-ROM Drive (for installation)
- Monitor (monochrome is sufficient but VGA or better is highly recommended)
- This IP Recovery program is only compatible with the SPEEDLAN 9000 series

Installation Instructions

Note: You will need to make sure that you have enabled the TCP/IP protocol for your Ethernet device before using this program.

If you install IP Recovery from the SPEEDLAN 9000 Series CD, follow these directions:

1. Insert the **SPEEDLAN 9000 Series CD** into your CD-ROM drive.
2. Locate the zip file under the \SPEEDLAN 9000_Files\9000 Management Software\SPEEDView_& IP Recovery & SPEEDSignal Install_Files directory.

Follow steps 1 through 5 below.

If you are installing an executable from a zip file (from our website):

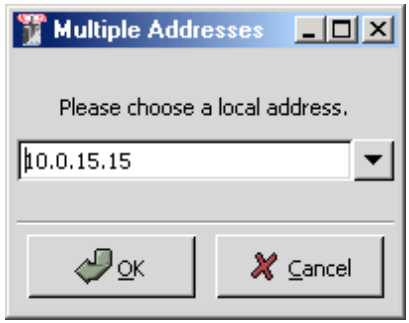
Note: IP Recovery can also be downloaded from the Wave Wireless web site "Support" directory. Locate the link and save the zip file to your desktop.

1. Locate the **".zip"** file and double-click it. The WinZip® dialog box will appear on your desktop allowing you to extract the SPEEDView install files. Select the files and click the **Extract** button. Next, extract the files to a location on your computer.
2. Click **Start** on the Windows taskbar. The Start menu appears.
3. Choose **Run** from the **Start** menu. The Run dialog box appears.
4. Locate the executable called **setup.exe**.
5. Follow the installation prompts.

Starting IP Recovery

1. When the installation is finished, start the **IP Recovery** program choosing by the **Start** menu, **Programs+Wave Wireless+IP Recovery**. (If the IP Recovery program was installed in another folder, select the appropriate directory.)

Note: If you have more than one IP address on your PC, this dialog box will appear when you first launch the program.



It will ask you which local address you want to select. Select it and click **OK**.

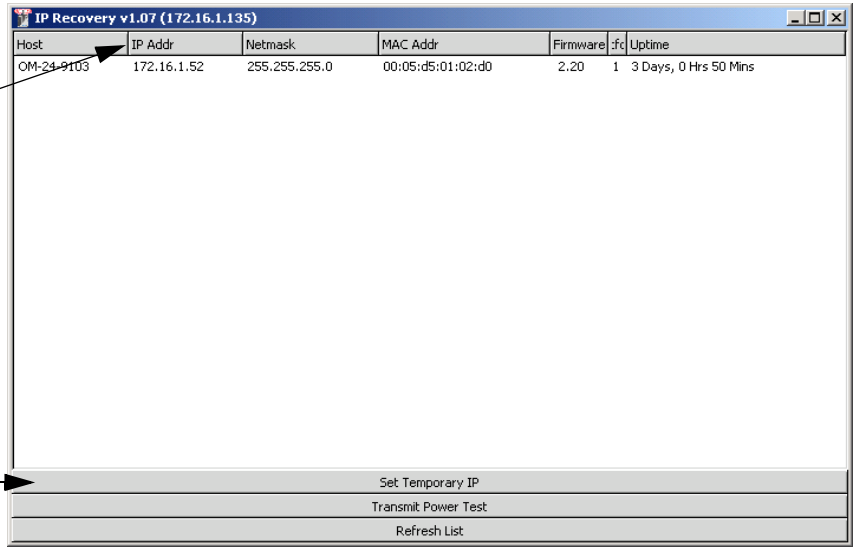
Multiple Addresses dialog box

2 The IP Recovery dialog box appears.

Use the sliders to view or hide IP Recovery fields on the dialog box.

You can also use the scroll bar to view more fields.

Click to reload the list of units for the wired network.



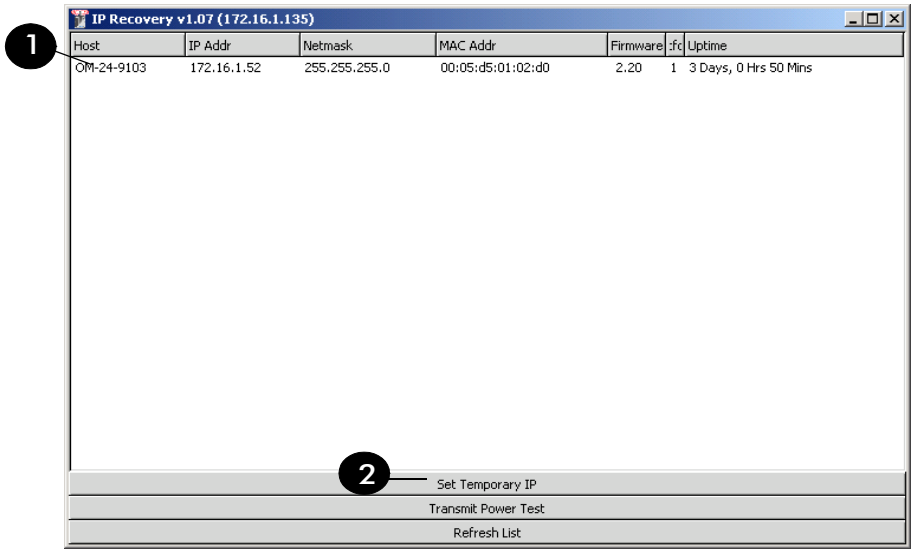
IP Recovery dialog box

The following IP Recovery fields are displayed:

- **Host**: The name of the host (or RF interface) IP address if host name has not been set in the SPEEDLAN 9000 HTML Configurator).
- **IP Address**: Contains the IP address of the selected router.
- **Netmask**: Contains the netmask of the selected router.
- **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 assigned to the unit.
- **Firmware**: This lists the firmware's version.
- **Platform**: The internal hardware code to determine the type of underlying hardware.
- **Uptime**: The time that the unit has been running.

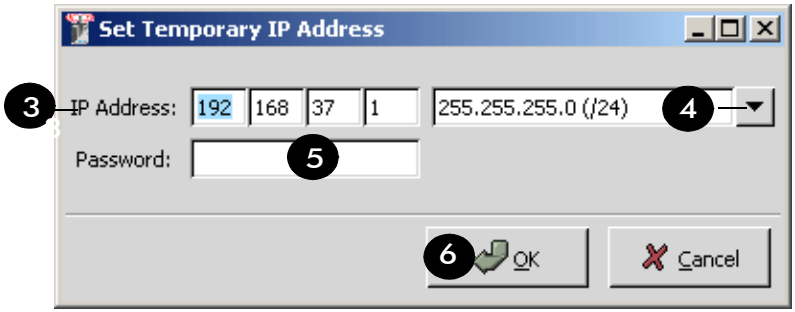
Setting a Temporary IP Address

1 Select the host for the router that you want to set a temporary address by selecting it (as shown in the example below).



Setting a Temporary IP address

2 Click the **Set Temporary IP** button on the IP Recovery dialog box to set a temporary Ethernet IP address for the router. You will be allowed to enter a temporary IP address to connect to the router. The **Set Temporary IP Address** dialog box will appear as shown below.



Setting the temporary address and netmask

3 Enter the temporary address in the **IP Address** textbox.

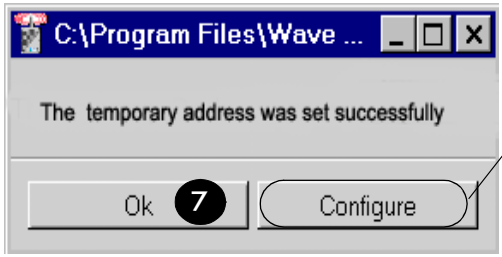
4 Next, select the netmask for the router.

5 The password entry is for full access rights only. The default password is "wave_full". Again, this can be altered in the SPEEDLAN 9000 Configurator.

Note: The minimum password length is 8 characters. The maximum password length is 16 characters (including the underscore character or spacebar).

6 Click **OK** on the **Set Temporary IP Address** dialog box.

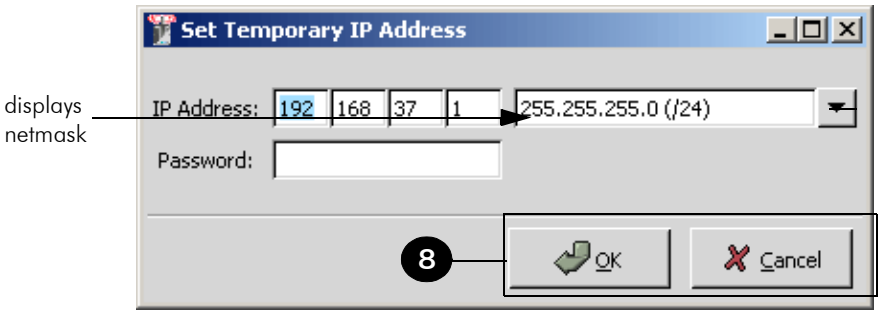
7 Next, you will receive a message confirming that the temporary IP address has been set, as shown below. Click **OK** to close this message box.



Note: Clicking the Configure button will start the SPEEDLAN 9000 Configurator using the new temporary IP address. The Config. will automatically enter the default password (e.g., "wave_full").

Message confirmation

8 Finally, click **OK** or click **Cancel** to re-enter your settings.



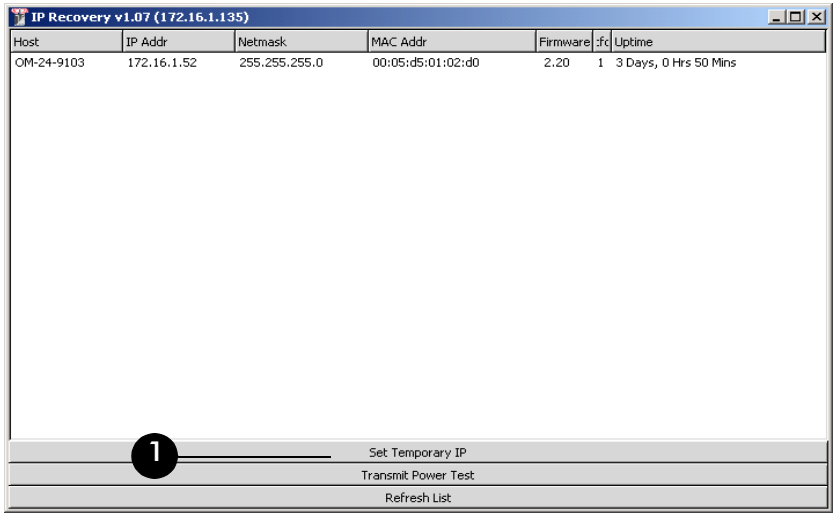
Temporary IP address complete

9 Now you can connect to the router via the SPEEDLAN 9000 HTML Configurator to make any changes/configurations to the router.

Transmit Power Test

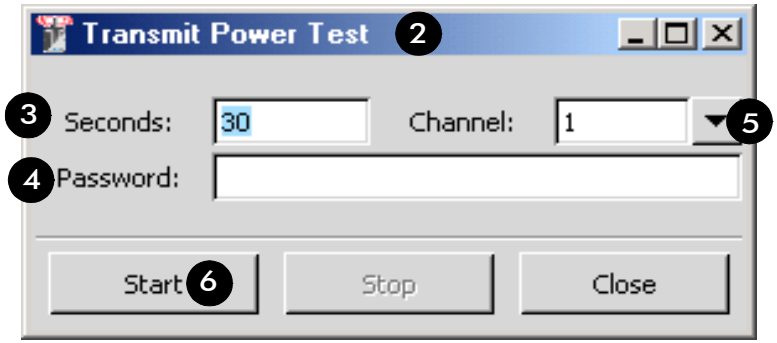
You are encouraged to use the transmit power test during installation if you have a spectrum analyzer or power meter to measure the output for the antenna alignment. It should not be used on a running network because it will disrupt the network for the duration of the test. To perform a power transmit test, follow these steps:

1 Click the **Transmit Power Test** button.



Begin Transmit Test

2 The following dialog box will appear.



Transmit Power Test dialog box elements

3 Enter the length of time for the power transmit test in the **Seconds** text box. (The default length is 30 seconds).

4 Next, enter the password in the **Password** textbox, depending on the type of user access, as follows:

- **Full Access** (also known as a superuser): wave_full.
  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).

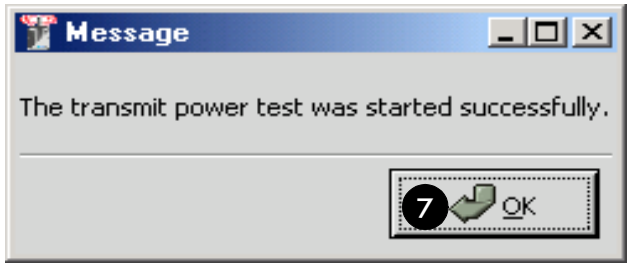
- **Wired Read**: wave_wired (account for the private Ethernet network).
- **Wireless Admin**: wave_wireless_ad (account for the wireless SPEEDLAN 9000 network).
- **Wireless Read**: wave_wireless (account for the wireless SPEEDLAN 9000 network).

5 Select the channel rate (from 1 to 11) from the **Channel** drop-down list.

- 2.412 - Channel 1
- 2.417 - Channel 2
- 2.422 - Channel 3
- 2.427 - Channel 4
- 2.432 - Channel 5
- 2.437 - Channel 6
- 2.442 - Channel 7
- 2.447 - Channel 8
- 2.452 - Channel 9
- 2.457 - Channel 10
- 2.462 - Channel 11

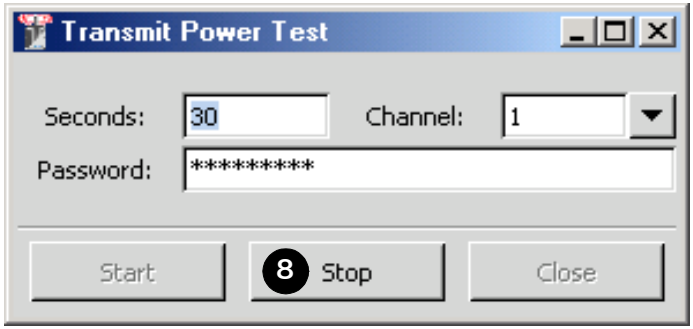
6 Click **Start** to begin the test.

7 A message box will appear telling you the "test was started successfully."



Successful message

8 Click **Stop** when you want to stop the test.



Transmit Power Test complete

Notes:

Appendix C - Passwords for the SPEEDLAN 9000 Configurator, SPEEDView & IP Recovery

This appendix provides the passwords needed for the SPEEDLAN 9000 Configurator, SPEEDView, IP Recovery and SPEEDSignal.

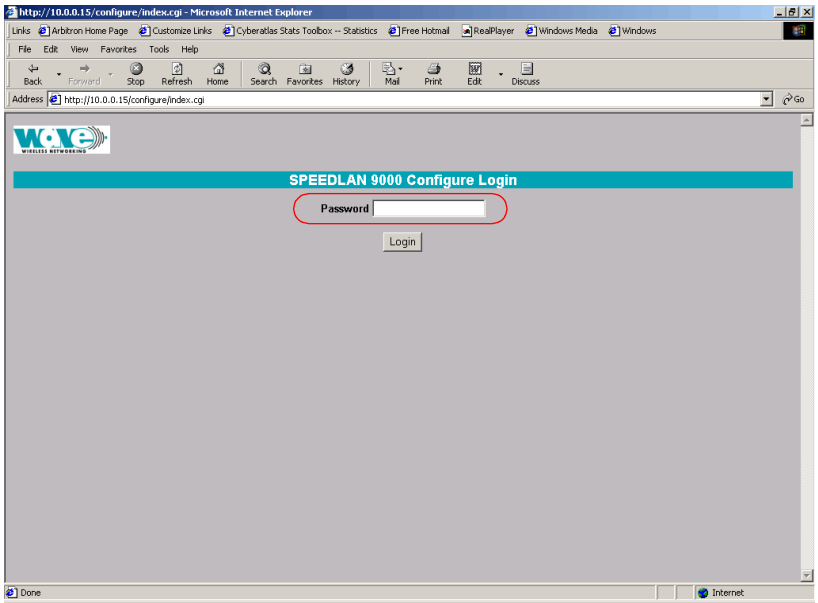
SPEEDLAN 9000 Configurator and SPEEDSignal Passwords

There are five classes of users. The classes are as follows with their default passwords:

- Full Access (also known as a superuser): "wave_full"
  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 9000 network)
- Wireless Read: "wave_wireless" (account for the wireless SPEEDLAN 9000 network)

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

Note: 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 3-73*.



SPEEDView Passwords

The passwords are defined, based on user class level, in the SPEEDLAN 9000 Configurator. Before you enter the password, decide which account level you should enter:

- Administrator: allows access to all of SPEEDView's features. You would enter "wave_full" in the **Password** text box.
- Read Only: limits the following features: TCP dump functions, bandwidth tests, bandwidth toolbar and block and unblock features (items under the Link menu). You would enter "wave_wired" for wired nodes or "wave_wireless" for wireless nodes in the **Password** text box.

IP Recovery Password

This application uses the full access password only which is defined in the SPEEDLAN 9000 Configurator. The default full access password is "wave_full".

Appendix D - Declarations of Conformity and Regulatory Information

This appendix provides declarations of conformity and regulatory information for the Wave Wireless SPEEDLAN 9000 series.

This appendix contains the following sections:

- Safety Instructions
- Manufacturers Federal Communication Commission Declaration of Conformity Statement
- Declaration of Conformity for RF Exposure
- Manufacturers Canadian Declaration of Conformity Statement
- European Telecommunications Standards Institute Statement of Compliance Information to User
- Radio Approval Table

Safety Instructions

Rooftop and Tower Installations Warning

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

General Safety Requirements for Installation of SPEEDLAN 9000 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 9000 on the tower or on the 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.

Manufacturer Information

Manufacturer/Importer Name: Wave Wireless Networking
A Division of SPEEDCOM Wireless Corporation
7020 Professional Parkway East
Sarasota, FL 34240
Phone: 941-907-2300
Fax: 941-355-0219

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 on page 6 of this section.

Manufacturers Federal Communication Commission Declaration of Conformity Statement

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. 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 harmful interference. However, there is no guarantee that interference will not occur. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to 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 part 15 radio device operates on a non-interference basis with other devices operating at this frequency when using the antennas: 24 dBi grid antenna and 8 dBi omni 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. For the 24-dBi antenna, the equipment should be positioned more than 2 m from your body or nearby persons. For the 8-dBi antenna, the equipment should be installed more than 20 cm from your body or nearby persons.

Manufacturers Canadian (IC) Declaration of Conformity Statement

This Class B Digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numerique de la classe B respecte les exigences du Reglement sur le material broilleur du Canada. This device complies with Class B Limits of Industry Canada. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and

2. This device must accept any interference received, including interference that may cause undesired operation.

The device is certified to the requirements of RSS-139-1 and RSS-210 for 2.4-GHz spread spectrum devices. The use of this device in a system operating either partially or completely outdoors may require the user to obtain a license for the system according to the Canadian regulations. For further information, contact your local Industry Canada office.

European Telecommunications Standards Institute (CE) Statement of Compliance

Information to User

This equipment has been tested and found to comply with the requirements of ETSI standards. The product is in conformity with COUNCIL DIRECTIVE 89/336/EEC (EMC Directive) and applicable safety Standards.
The Standards to which conformity is declared:

EN 55022 1998 Class B	EN 61000-4-4
EN 50082 – 1 1998	EN 61000-4-5
ETSI EN 300-328/-2	EN 61000-4-6
EN 6100-4-2	EN 61000-4-8
EN 61000-4-3	EN 61000-4-11
EN 60950-2000	EN 61000-3-2
EN 60215-1996	

These Standards cover Wideband Data Transmission Systems referred to in the CEPT recommendation T/R 10.01. This type of accepted equipment is designed to provide reasonable protections against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructional manual, may cause harmful interference to radio communications.

DECLARATION OF CONFORMITY is herby issued to the named Manufacturer/ Importer and is VALID ONLY for the equipment identified below:

Date of Approval:
May 25, 2002

Declares That This Product (Product Description):
2.4 GHz BAND DSSS WIRELESS LAN

Manufacturer/Importer Signature: Name: Janusz Dyndul

Date: 25 May 2002

Radio Approvals

To determine the correct device you are allowed to use in your country, refer to the tables below:

Radio Approval Table for Models SL910x

Country	Commission	Model SL910x & Certification Number
United States	FCC	NCBSL9101, NCBSL9102
Canada	IC	4309A-SL9101, 4309A-SL9102
Europe (ETSI)	CE	NCBSL9104

Appendix E - 9000 Technical Specifications & Product Model Information

This appendix provides specifications and product model information for the Wave Wireless SPEEDLAN 9000 series.

9000 Series Technical Specifications

Radio

Type: Direct Sequence Spread Spectrum (DSSS)

Frequency: 2.4 GHz (2.4000 to 2.4835)

Channels: 11 user selectable channels

Modulation: CCK at 11 Mb/s & 5.5 Mb/s, DQPSK at 2 Mb/s, DBPSK at 1 Mb/s

Processing Gain: 11dB (Nominal)

Communication Method: Half-duplex

Transmit Power: 15 dBm (typical)

Receiver Sensitivity: Max -92dBm (-82 dBm at 11 Mb/s)

Bandwidth Signal: 22 MHz

Power Supply Input: 100-250 VAC, 47-62 Hz

External Antenna Connector: Reverse TNC (models 9101/9103)

Wired LAN Interface

Compliance: IEEE 802.3 Ethernet

Physical Interface: 10/100 Base T (RJ-45)

Network Protocols Supported: IP, TCP, UDP, ICMP, RIPv1, RIPv2, TFTP, IGMP, ARP, DHCP relay, DHCP server, DHCP client, NAT, NAPT

Wireless LAN Interface

Standard Wireless Interface: Single 11 Mb/s interface

RF Physical Interface: RTNC bulkhead RF connector

Bit Error Rate: Better than 10 -5

Configuration & Management

Upgradeability: Firmware is upgradeable via in-band management

Configuration & Monitoring: Web-based

SPEEDView operates under Windows 95, 98, NT, 2000, XP, ME, Linux (available but unsupported)

Mechanical

Enclosure: NEMA 4 Metal chassis; tower or pole-mount

Dimensions: (H x W x D)

9101: 31.5″ x 7″ x 3.5″ (80.0 cm x 17.8 cm x 8.9 cm)

9102/9103: 9″ x 7″ x 3.5″ (22.9 cm x 17.8 cm x 8.9 cm)

9104: 25.0″ x 7″ x 3.5″ (63.5 cm x 17.8 cm x 8.9 cm)

(Mechanical continued)

Weight

9101: 5.5 lbs

9102/9103: 4.55 lbs

9104: 5.1 lbs

Environmental

Temperature Range:

-40 ° C to +60 ° C (Storage)

-25 ° C to +60 ° C (Operation start-up)

-40 ° C to +60 ° C (Operation)

Humidity: 0 to 100% (Non-immersion Rain)(4″/hr)

General

Power Supply: 100-250 VAC, 47-62 Hz, 70 VA

Max Signal Range:

	Signaling Rate @ 11 Mb	Signaling Rate @ 1 Mb
9101	1/2 mile	2 miles
9102/9103	16 miles	25 miles
9104	1/4 mile	1.25 miles

Regulatory (Pending): FCC Part 15, ETSI/CE, DOC

Warranty: 1 year depot warranty, extended warranty available

Security

Wireless Encryption: AES 128-bit

Other

Mesh Network Scalability: Up to 100 per channel per cloud

Recommended Applications: mesh networks, long haul broadband backbone, leased line replacement, enterprise metropolitan area networks

Mesh Distance Capability:
11Mb/s: 5 dBi antenna - .25 mile / 0.4 km
11 Mb/s: 8 dBi antenna - .50 mile / 0.8 km
5.5 Mb/s: 5 dBi antenna - .50 mile / 0.8 km
5.5 Mb/s: 8 dBi antenna - 1 mile / 1.6 km
2 Mb/s: 5 dBi antenna - 1 mile / 1.6 km
2 Mb/s: 8 dBi antenna - 2 miles / 3.2 km
1 Mb/s: 5 dBi antenna - 1.5 miles / 2.4 km
1 Mb/s: 8 dBi antenna - 2.5 miles / 4.5 km

Maximum Point-to-Point Link: 25 miles

9000 Series Product Model Information

- Outdoor, remote-mount (present in 9101, 9102, 9103, 9104)
- NAT (present in 9101, 9102, 9103, 9104)
- DHCP server/client (present in 9101, 9102, 9103, 9104)
- Firmware upgradeable via web-based browser (present in 9101, 9102, 9103, 9104)
- Web-based monitoring and configuration (present in 9101, 9102, 9103, 9104)
- RIP 2 Routing (present in 9101, 9102, 9103)
- Star - Base Station Operation Mode (present in 9103)
- Star - CPE Operation Mode (present in 9102)
- Mesh topology Operation Mode (present in 9101, 9102, 9103, 9104)
- Integrated 8 dBi Omni-directional antenna (present in 9101)
- Integrated 5 dBi Omni-directional antenna (present in 9104)
- Residental solution (present in 9104)
- MDU/Business (present in 9101, 9102, 9103)

Appendix F - SPEEDSignal

What is SPEEDSignal?

SPEEDSignal is a tool designed to help installers align or position antennas on SPEEDLAN 9000 units. SPEEDSignal allows you to view how well the unit (being installed) is communicating with the rest of the network. SPEEDSignal is available in two versions: one that is designed to operate over a wired connection and another that communicates with 9000s via their wireless interface. Since the wireless version of SPEEDSignal runs on a Pocket PC® Personal Digital Assistant, installers can easily access it when troubleshooting antenna alignment problems in the field.

The wired version is called SPEEDSignal for Desktop PC. (This version can run on a laptop or a desktop PC using an Ethernet connection.) The wireless version is called SPEEDSignal for Pocket PC Personal Digital Assistant, herein abbreviated in this document as SPEEDSignal for Pocket PC PDA.

How This Document is Structured

- See "How to Install SPEEDSignal on a Desktop PC" on page 2. This version is designed to operate over a wired connection (via Ethernet).
- See "How to Install SPEEDSignal on a Pocket PC PDA" on page 4. This version is designed to be installed on a Pocket PC (i.e., Compaq iPAQ).
- See "Enabling/Disabling SPEEDSignal (for Pocket PC PDAs)" on page 7.
- See "Opening SPEEDSignal on the Desktop PC" on page 8.
- See "Opening SPEEDSignal on the Pocket PC PDA" on page 9.
- See "SPEEDSignal's Scanned Results" on page 10.
- See "How To Exit SPEEDSignal on the Pocket PC PDA" on page 13.
- See "Troubleshooting" on page 14.

How to Install SPEEDSignal on a Desktop PC

System Requirements

To connect to a wired interface using a desktop PC, you will need:

- Desktop PC (i.e., a desktop PC or laptop) with an Ethernet connection running one of the following Windows platforms: 98, ME, NT (Service Pack 4.0), 2000 or XP
- CD-ROM Drive or internet access to www.wavewireless.com
- Monitor

Installation Instructions

Note: You will need to make sure that you have enabled the TCP/IP protocol for your Ethernet device before using this program.

If you install SPEEDSignal from the SPEEDLAN 9000 Series CD, follow these directions:

1. Insert the **SPEEDLAN 9000 Series CD** into your CD-ROM drive.
2. Locate the zip file on the CD ROM drive (i.e., Drive D:). It will be in the following directory on the CD: \SPEEDLAN 9000_Files\9000 Management Software\SPEEDView_& IP Recovery & SPEEDSignal Install_Files directory. Then, follow steps 1 through 6 below:

If you are installing an executable from a zip file (from our website):

Note: SPEEDSignal can also be downloaded as part of the SPEEDLAN 9000 series tools in SPEEDView, which is located under the Support directory of the Wave Wireless web site. Locate the link and save the zip file to your desktop.

1. Locate the **".zip"** file and double-click it. The WinZip® dialog box will appear on your desktop PC allowing you to extract the SPEEDView install files. Select the files and click the **Extract** button. Next, extract the files to a location on your computer.
2. Click **Start** on the Windows taskbar. The Start menu appears.
3. Choose **Run** from the **Start** menu. The Run dialog box appears.
4. Locate the executable called **setup.exe** in the directory where you extracted the files.
5. Follow the installation prompts.
6. SPEEDSignal will now be located in the Wave Wireless Program Group, unless you installed it in another group.

How to Install SPEEDSignal on a Pocket PC PDA

System Requirements

Hardware

- Personal Digital Assistant (PDA): iPAQ H3600 or H3100 Series (Pocket PC Models H3630, H3640, H3650, H3130, or H3150)
- A cradle connected to a desktop PC using a serial/USB port.
  The USB is recommended for better performance.
- Recommended: 802.11b Wireless LAN PC Card using the Prism chipset
  Examples are:
  - D-Link DWL-650
  - Linksys WPC11

Software

- SPEEDSignal application
- Microsoft® ActiveSync
- You need a driver that will operate in psuedo adhoc mode (e.g., Compaq WL100 Wireless LAN PC Card Drivers for Microsoft Pocket PC PDA is a type of psuedo adhoc driver used in these directions). Make sure your driver and Wireless LAN PC Card match.
- Platform: Pocket PC Version 2002

Installation Instructions

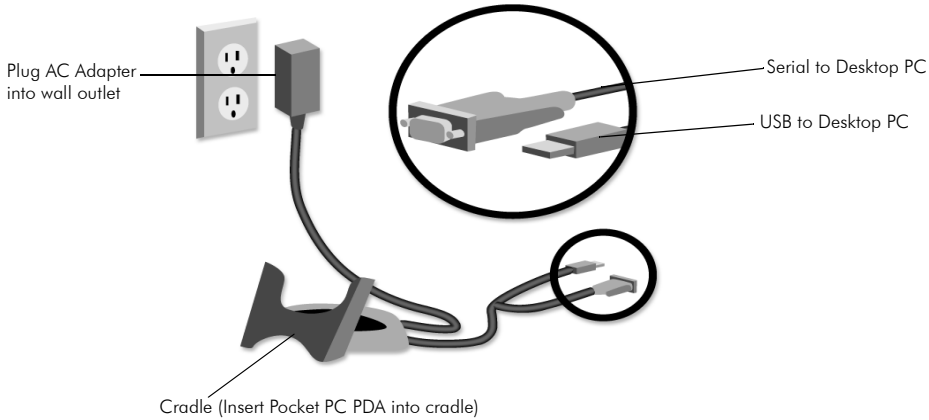
Installation Notes

- The purpose of ActiveSync is to copy files from the desktop PC to the Pocket PC PDA. **(It is not necessary to establish a partnership between ActiveSync and your desktop PC. When prompted to select a partnership, click the No button.)**
- SPEEDSignal uses broadcast technology, so it is not necessary to set up an IP address on the Pocket PC.
- Ensure that the TCP/IP protocol is enabled on the desktop PC before installing ActiveSync.
- Remove your Compaq WL100 Wireless LAN (WLAN) PC Card from the Pocket PC PDA prior to installation.

Installing the Compaq WL100 Wireless LAN PC Driver and ActiveSync

To install the wireless driver and ActiveSync, follow the directions below:

1 Plug the AC Adapter into an outlet. Next, connect the AC adapter to the Pocket PC PDA's cradle. The serial or USB connector (not both) on the cradle should be connected to the appropriate port on the front or back of your desktop PC. On the desktop PC, start Active Sync. **Insert the Pocket PC PDA into the cradle.** Refer to the installation diagram below to see how the components should be connected.



Note: If you have not previously installed a USB device, you will be prompted to install the USB device driver.

2 Using ActiveSync, establish a connection between the Pocket PC PDA and the desktop PC. (The Pocket PC PDA should now be in the cradle.)

Note: If you do not have ActiveSync, download it from this website: "http://www.microsoft.com/mobile/pocketpc/downloads/". Under **Microsoft Downloads**, locate ActiveSync and download it. **Note:** It may take a few minutes to download ActiveSync.

Follow the ActiveSync install prompts and instructions. ActiveSync will detect the connection for the Pocket PC PDA. Continue to follow the onscreen installation prompts to establish a connection between the Pocket PC PDA and desktop PC. When you are prompted do establish a partnership, click **No** or click **Guest**. For more information, refer to the Pocket PC PDA's manual.

3 If you WLAN driver does not support pseudo adhoc mode, you will need to uninstall these drivers.

a Tap **Start+Settings+System** tab+**Remove Programs**. Then, tap the WLAN driver (i.e., Compaq WL100 Wireless LAN for...) and tap **Remove**. Follow the onscreen instructions to remove the previous drivers.
(If prompted to remove the 802.11b Wireless LAN PC Card, remove it now.)

4 You will need a WLAN driver that will operate in psuedo adhoc mode.
In this example, we are downloading the WL100 PC radio card driver.
Download it to the desktop PC by following these steps:

a Open your web browser. Go to: http://h18007.www1.hp.com/support/files/handheldiPAQ/us/locate/48_1231.html.

b Locate the driver for the WL100 Wireless LAN PC Card, which is located under the **Network** link. Download the driver and save it to a location on your desktop PC. (Download this driver for Pocket PC PDA version 2002.)

5 Install the driver on the Pocket PC PDA.

a Ensure that the Compaq WL100 PC Card is not inserted into the card slot on the Pocket PC PDA.

b Locate the driver file on your desktop PC and double-click it.

c The Microsoft Pocket PC PDA installation will begin automatically.

d Follow the installation instructions to install the drivers onto the Pocket PC PDA. When the installation is complete, click **Finish**.

6 Insert the WLAN PC Card into the Pocket PC PDA.

7 If prompted for the device driver for the Pocket PC, type "**WL100NDS.dll**". Tap **OK**.
Tap the green "radio control" icon on the Windows taskbar of the Pocket PC. (Make sure the 802.11b Wireless LAN PC Card is inserted in the Pocket PC PDA.) The WLAN settings configuration utility will appear. Modify the Pocket PC PDA's WLAN settings to connect to the wireless network:

a Select **Psuedo AdHoc** for the Mode.

b Select the appropriate AdHoc channel. (This will be the channel that you are going to use to communicate with the wireless router.)

c Type "**Any**" for the SSID. Then, tap **Apply** to activate the modified WLAN settings. Tap **OK**. You can verify that the above settings have been saved by tapping the radio control icon on the Windows taskbar.

d Your WLAN PC Card is now ready to be used with SPEEDSignal. Your next step is to install SPEEDSignal on the Pocket PC PDA. See the section below.

Installing SPEEDSignal on the Pocket PC PDA

To install the SPEEDSignal application on the Pocket PC PDA, follow the directions below:

1. The Pocket PC PDA should now be in the cradle with the WLAN PC Card still in it. A connection should now be established with ActiveSync.
2. Locate the executable called SPEEDSignalPDA.exe. It will be in the following directory on the CD: \SPEEDLAN 9000_Files\9000 Management Software\ SPEEDSignal PDA directory. (If the file is zipped, double-click the zip file, which should be called SPEEDSignalPDA.zip. The WinZip®dialog box will appear on your desktop PC, allowing you to extract it. Select it and click the **Extract** button. Next, extract the executable to a location on your computer, e.g., on your desktop PC).
3. Click the **Explore** button on the ActiveSync dialog box (on the desktop PC).
4. Copy the SPEEDSignalPDA.exe file to the "**Mobile Device\My PocketPC\ Windows\Start Menu**" directory.
5. Check the Wave Wireless website for software updates. The SPEEDSignal for PocketPC version will always be called "SPEEDSignalPDA.exe" to avoid ambiguity between this version and SPEEDSignal for Desktop PC.

Enabling/Disabling SPEEDSignal (for Pocket PC PDAs)

Access for Wireless SPEEDSignal (choose the **Support** page under **Admin** menu of SPEEDLAN 9000 Configurator)

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 **Disabled** to disable communication with SPEEDSignal. Click **Apply** when finished.

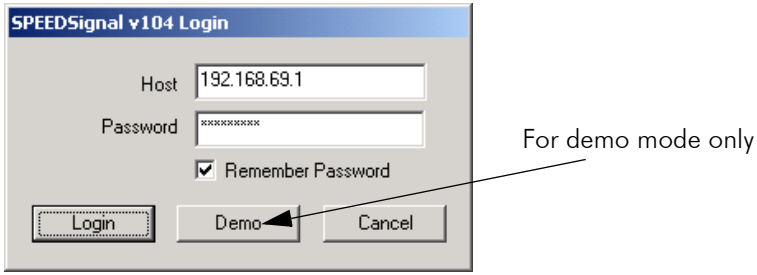
Opening SPEEDSignal on the Desktop PC

To open SPEEDSignal on the desktop PC, follow these steps:

1 To open SPEEDSignal on the desktop PC, double-click the **SPEEDSignal** shortcut icon. Or, you can open SPEEDSignal from the Start menu by choosing **Programs+Wave Wireless+SPEEDSignal**. If SPEEDSignal was installed in another folder, select the appropriate directory.

SPEEDSignal shortcut icon

2 When you open SPEEDSignal on the desktop PC, the SPEEDSignal Login dialog box appears, as shown in the example below.



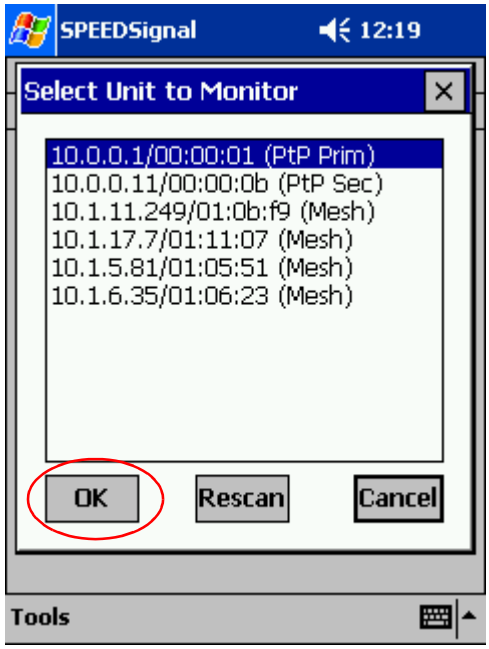
Login dialog box (desktop PC)

Enter the Node IP address (or hostname if you are using a Domain Server) of the node you want to connect to in the **Node IP Address** text box.
The passwords are defined, based on user class level, in the SPEEDLAN 9000 Configurator. You need to enter the "Full Access" password as configured in the SPEEDLAN Configurator. For more information, see *Classes of Users (and Passwords), page 3-10*. **Note:** Also, if you want SPEEDSignal to recall the password for future logins, click **Remember Password**. Click **Login**.

Opening SPEEDSignal on the Pocket PC PDA

To open SPEEDSignal on the Pocket PC PDA, follow these steps:

1. Tap the **Start** button on the Windows taskbar. Then, tap **Start+SPEEDSignal**.
2. The SPEEDSignal "Select Unit to Monitor" dialog box will appear (as shown in the figure below). SPEEDSignal will scan for any SPEEDLAN 9000 routers within range of the radio. Any units discovered will be listed. Then, select the unit you want to monitor (as shown in the figure below).



Selecting a unit

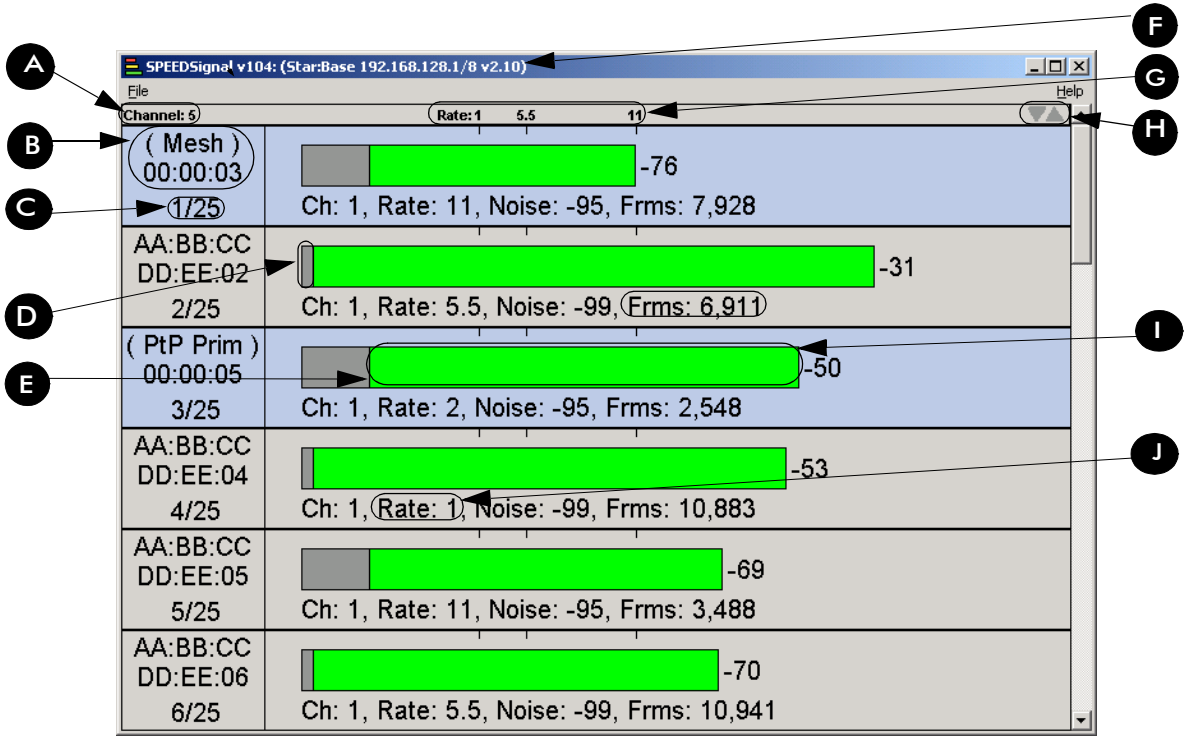
3. Next, click **OK**. **Note:** Click **Rescan** to monitor another 9000 router.

.

SPEEDSignal's Scanned Results

Note: The scanned results are very similar for both the Pocket PC PDA and desktop PC versions of SPEEDSignal.

SPEEDSignal will report the following information for the router that is being monitored: channel, MAC address, noise, signal and number of frames for each unit that the monitored unit hears on the network. This information is recorded in separate rows, as shown below.



Scanned results

Descriptions of scanned results:

A: Channel - Reports the channel of 802.11b incoming and outgoing traffic. (This is abbreviated as "C" on the Pocket PC PDA).

B: MAC address and type of unit - Two items are included here: the MAC address of the 802.11b unit SPEEDSignal hears on the network. It also lists the type of 9000 unit (e.g., mesh, point-to-point, base station, CPE).

C: Row - Numeral value to represent each row of data (e.g., 2/25 means this is row 2 of the possible 25 rows. The maximum amount of rows is 25).

D: Noise - The noise represents the noise before the packets were received. This is indicated in the gray area of the horizontal bar and it is expressed in dBm (e.g., -95). (This is abbreviated as "Ns" on the Pocket PC PDA.)

E: Signal - This is the quality of the signal, which is displayed as red, yellow or green. Red indicates a lack of signal strength, which means you cannot get a reliable link at that rate. Yellow indicates a link at that rate is possible but not recommended. Green indicates a link at a given rate should be attainable. (The signal is expressed in dBm.)

F: Title bar: The horizontal blue bar at the top of the window that shows the name of the 9000 unit (e.g., star: base station) and name of the program (SPEEDSignal).

G: Signaling Rate - 1, 5.5 or 11 Mb/s.

H: Up and down arrow - You can rearrange the order of the rows by highlighting a row and clicking on the **up** or **down** arrow.

I: Frame - The total number of frames transmitted. (This is abbreviated as "Frm" on the Pocket PC PDA.)

J - Rate (Signaling Rate) - Displayed as either 1, 2, 5.5 or 11 Mb/s. See also description G (in the previous figure). (This is abbreviated as "Rx" on the Pocket PC PDA.)

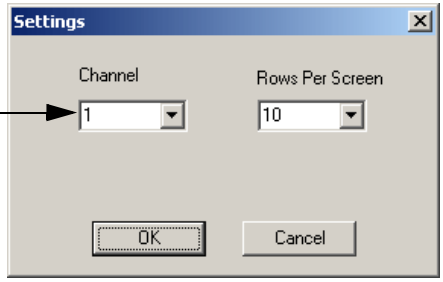
Adjusting SPEEDSignal Settings

Settings

If you want to change the settings, such as the channel and rows shown per screen, choose **Settings** from the **File** menu. (For Pocket PC PDA, tap **Tools** and then tap **Settings**. However, only the Channel setting will be available for the Pocket PC PDA.) A dialog box similar to the following will appear:

This setting changes the channel on the SPEEDLAN 9000, not the channel on the SPEEDSignal unit being monitored.

Make sure that the channel on the SPEEDLAN 9000 router and unit being monitored match. If you want to change the channel for your Pocket PC PDA's, go into the WLAN settings configuration utility.



Settings dialog box

- **Channel** - This is the specific band of frequencies (from 1 to 11) to determine the data path between routers. The following channels are available:

  1 2.412
  2 2.417
  3 2.422
  4 2.427
  5 2.432
  6 2.437
  7 2.442
  8 2.447
  9 2.452
  10 2.457
  11 2.462

- **Rows Per Screen** - You can select a value between 5 and 10. For example, choosing 5 will magnify the rows (and display less rows) and choosing 10 will do exactly the opposite (display more rows). (*This feature does not appear for the Pocket PC PDA version, only for the desktop PC version*.)

Note about changing the channel:

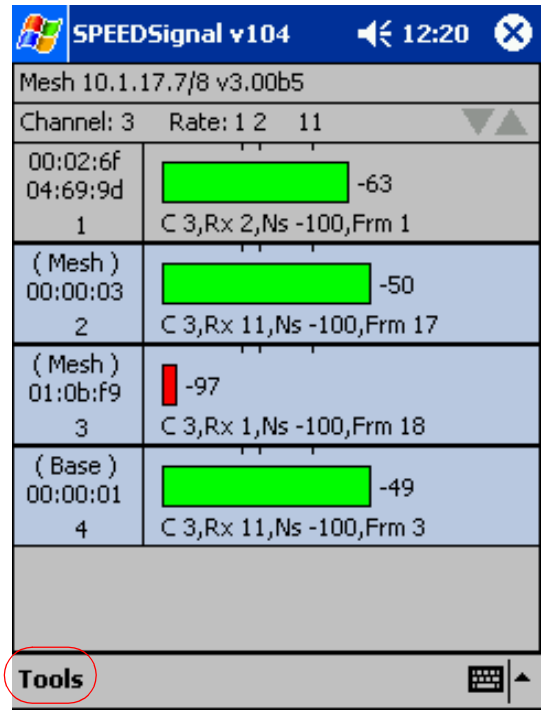
- <u>If you are using a wired network to connect to the remote SPEEDLAN 9000 unit:</u> If you change the channel of the node you are connected to with SPEEDSignal, the node will lose its connection to the network. For this reason, you should only use SPEEDSignal while directly connected to a SPEEDLAN 9000 series router. If you are routed across the wireless network when you change the channel of the router, you will lose your connection. You can do this by establishing a direct connection to the remote node by:
  - changing the channel in the (Channel drop-down list), or
  - power cycle the remote node (shut down node and turn it back on again).
- <u>For wireless connections:</u> If you change the channel of the 9000, you must change the Pocket PC PDA to the corresponding channel to resume wireless communications.

Clear List

For the desktop PC version, if you choose **Clear List** from the **File** menu, all of the rows will be removed from the frame list. For the Pocket PC PDA version, tap **Tools** and then **Clear List**. When you switch channels the frames seen on the previous channel remain unless you choose **Clear List**.

How To Exit SPEEDSignal on the Pocket PC PDA

Make sure the application is open that you want to exit. Tap the **Tools** menu located on the bottom left hand corner of the screen (as circled below). Then, tap **Exit**.



Troubleshooting

Read this section to troubleshoot any problems when using SPEEDSignal for Pocket PC PDA.

- Unit is not displayed in Scan dialog box of Pocket PC PDA - If the unit you want to monitor is not listed among the scanned results, try tapping **Rescan** again, or move closer to the radio if needed (see next bullet).
- Radio is out of range - Depending on the antennas involved, you may need to minimize your distance from the 9000 router that is being monitored. When using directional antennas, make sure there is line of sight between the units to establish communication.
- SPEEDSignal is disabled on the Pocket PC PDA - As shipped, SPEEDSignal can communicate with a wired (via desktop PC) or wireless interface (via Pocket PC PDA). Your network administrator may have disabled SPEEDSignal for the Pocket PC PDA for security reasons.
- How do I modify the radio card settings (Mode and Channel)? Make sure your 802.11b Wireless LAN PC Card is inserted. You will see a green radio control icon on the lower right hand corner of your screen. Tap this and you will be able to modify your Mode and Channel settings.

If you want to enable SPEEDSignal for the Pocket PC PDA, ask your network administrator to re-enable it through the SPEEDLAN 9000 Configurator. This will re-establish communication between the 9000 wireless router and embedded unit.

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