WideBand Professional Series

Gigabit Ethernet Switches

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QUICK INSTALLATION GUIDE
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MANAGEMENT GUIDE
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CORPORATION

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WideBand Professional Series Gigabit Ethernet Switches

QUICK INSTALLATION GUIDE

Introduction

The WideBand Professional Series Gigabit Ethernet Switches are high performance switches available in the following models:

- 8-port Un/Managed 10/100/1000 Switch
- 16-port Un/Managed 10/100/1000 Switch
- 28-port Un/Managed 10/100/1000 Switch
- 8+8-port Un/Managed 10/100/1000 Copper/Fiber Switch
- 24+4-port Un/Managed 10/100 Copper, plus 10/100/1000 Copper Switch
- 24+2+2-port Un/Managed 10/100 Copper, plus 10/100/1000 Copper/Fiber Switch

8- 16- and 28-port Un/Managed 10/100/1000 Switches

Available managed or unmanaged, these switches are ideal as network core, backbone or server farm switches for today's networks. Each port supports 10/100/1000BASE-T copper to provide flexibility for an easy migration path to higher bandwidths as gigabit moves to the desktop.

8+8 10/100/1000 Un/Managed Copper/Fiber Switch

This switch is a scalable 1000BASE-T / 1000BASE-X managed or unmanaged switch with 8 copper auto-negotiation ports and 8 Small Form Pluggable (SFP) mini-GBIC slots for 1000BASE-SX or 1000BASE-LX modules. The fiber modules can be added as needed. Whether the application is aggregating eight fiber lines to a Gigabit core or just linking a copper workgroup to a fiber backbone, the 8+8 Switch is a cost-effective way to achieve maximum performance.

24+4-port Un/Managed 10/100 Copper, plus 10/100/1000 Copper Switch

This model makes a great, cost effective way to connect a large number of workstations to a network backbone or high performance server. With 24 10/100BASE-T ports and 4 10/100/1000BASE-T ports, this switch is excellent for the client edges of your network.

24+2+2-port Un/Managed 10/100 Copper, plus 10/100/1000 Copper/Fiber Switch

This switch is the solution for those distant locations where a number of clients need a high performance connection to the LAN. This model includes 24 10/100/BASE-T ports, plus 2 copper 10/100/1000BASE-T ports and 2 Small Form Pluggable (SFP) mini-GBIC slots. A combination that makes this switch perfect for the outer reaches of a LAN.

Layer 2 Switching: The WideBand Professional Series Gigabit Ethernet Switches support Layer 2 switching at wire speed, along with extensive support for VLANs, traffic prioritization, and packet filtering based on Layer 2, 3, and 4 information.

Store-and-Forward Blocks Error Packets: Store-and-Forward switching technology blocks all error packets within the Professional Series Gigabit Switch, preventing the generation of unwanted (useless) network traffic.

Flow Control Enables High Throughput: The Professional Series Gigabit Ethernet Switches support flow control (IEEE 802.3x for Full Duplex, Back Pressure for Half Duplex), which prevents packet losses that result from mismatches between the sending and the receiving speeds. The Switch achieves highly reliable and superior throughput while providing a truly efficient network environment.

All Copper Ports Support Auto MDI/MDI-X: All copper ports support the Auto MDI/MDI-X feature that automatically detects straight-through/crossover cable types. Since these ports recognize both cable types, communication problems resulting from cable type mismatches are eliminated. This new feature also eases cascading with other hubs and/or switches.

WGNA Certified: All copper ports of the Professional Series Gigabit Ethernet Switches meet the WideBand Gigabit Networking Alliance's stringent certification, assuring users that they can be used to transmit data up to a full 100 meters with a bit error rate of less than 1 per million on all grades of Category 5 cables.

Among other advanced features supported by the Professional Series Switches are the following:

- VLANs – Supports 4094 VLANs (IEEE 802.1Q) based on MAC, Port, Subnet, and Protocol
- Port Statistics – including counters defined by Ethernet SNMP MIB and RMON MIB
- Port Mirroring – Incoming and outgoing traffic of any port can be mirrored.
- Spanning Tree – IEEE 802.1D network loop resolution protocol
- Trunking – IEEE 802.3ad link aggregation control protocol
- SNMPv1 – Support for rfc1157, rfc1213, rfc1493 and rfc1643
- L3 Routing – Up to 64 virtual router ports (only on L3 switches)

The WideBand Professional Series Gigabit Ethernet Switches provide optional management software that allows you to configure or monitor the switch. To manage the switch, you can access the Management Software via a local PC over the network or over the Serial Port on the front panel of the switch.

Installing the Switch

Before installing the switch, verify that you have all the items listed under "Package Contents." If any of the items are missing or damaged, contact your local distributor. Also be sure you have all the necessary tools and cabling before installing the switch. Note that this switch can be installed on any suitably large, flat surface or in a standard EIA 19-inch rack. After installing the switch, refer to the Management Guide portion of this Manual to set up its more advanced features, such as VLANs and Spanning Tree.

Package Contents

The WideBand Professional Series Switch package includes the following items:

- Professional Series Switch
- Management software CD (only managed switches)
- AC power cord

Description of Hardware

The Professional Series Switches come in six port configurations:

- 8-port Un/Managed 10/100/1000 Switch
- 16-port Un/Managed 10/100/1000 Switch
- 28-port Un/Managed 10/100/1000 Switch
- 8+8-port Un/Managed 10/100/1000 Copper/Fiber Switch
- 24+4-port Un/Managed 10/100 Copper, plus 10/100/1000 Copper Switch
- 24+2+2-port Un/Managed 10/100 Copper, plus 10/100/1000 Copper/Fiber Switch

All RJ-45 ports on these units operate at 10, or 100 Mbps and support auto-negotiation of speed, duplex mode (i.e., half or full duplex), and flow control, while gigabit ports also support 1000 Mbps. Note that when using the auto-negotiation feature, speed, transmission mode, or flow control can be automatically set as long as this feature is also supported by the attached device. Otherwise, these items can be manually configured for any connection.

All fiber ports are Small Form Pluggable (SFP) mini-GBIC slots for 1000BASE-SX or 1000BASE-LX modules, providing as much as 10km transmission distance, depending on which module you choose.

The base unit also includes LED indicators for start-up, loading, and port indications that simplify installation and network troubleshooting.

8-port Gigabit Switch
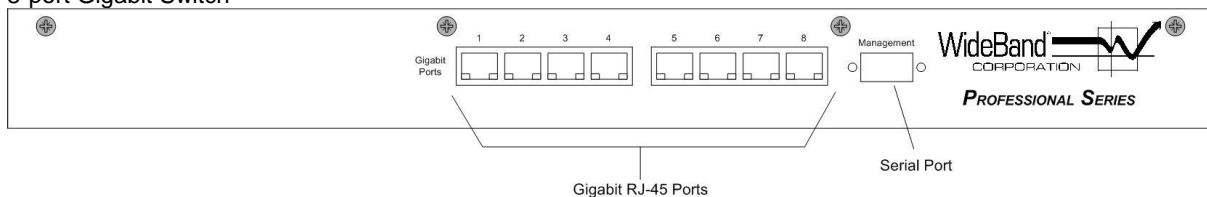
16-port Gigabit Switch
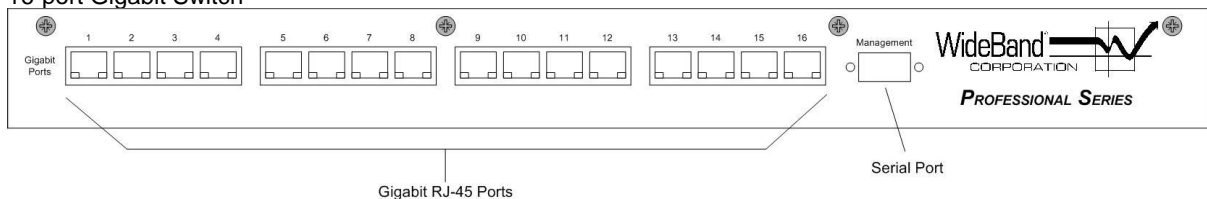
28-port Gigabit Switch
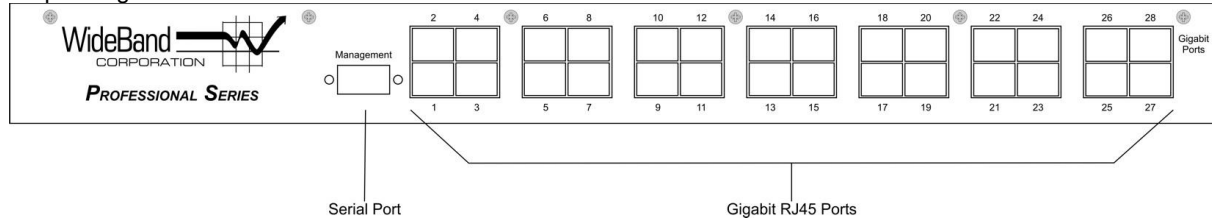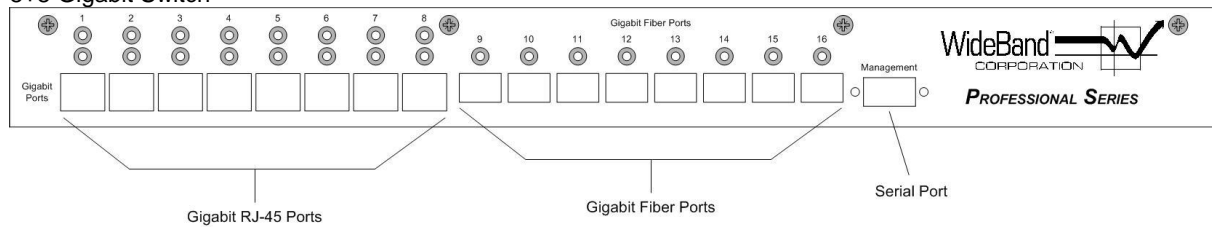
Serial Port

Gigabit RJ45 Ports

8+8 Gigabit Switch

Gigabit RJ-45 Ports

Gigabit Fiber Ports

Serial Port

24+4 10/100 Switch with Gigabit Connections

Serial Port

Gigabit RJ-45 Ports

10/100 RJ-45 Ports

24+2+2 10/100 Switch with Gigabit Connections

10/100 RJ-45 Ports

Gigabit RJ-45 Ports

Gigabit Fiber Ports

Serial Port

7
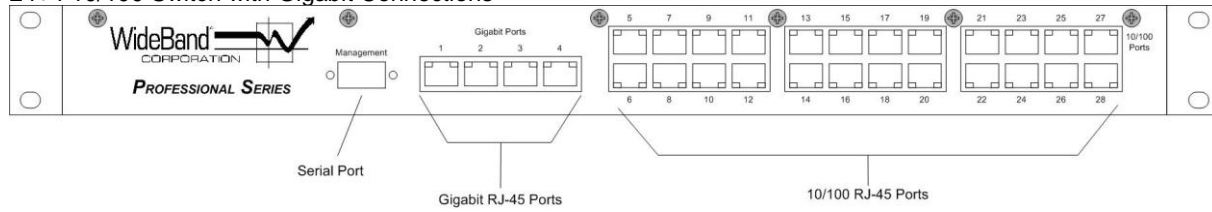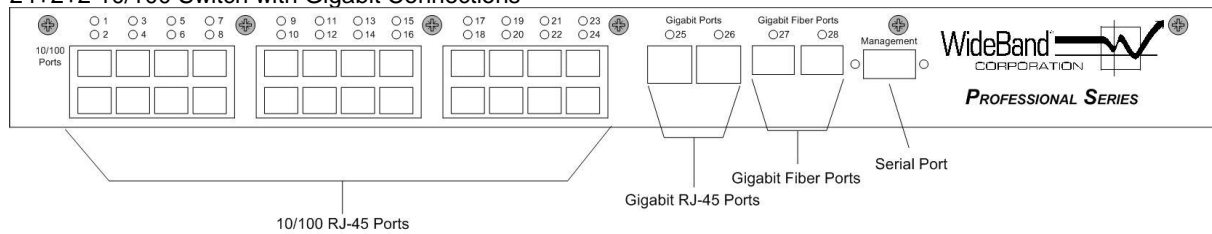
Mounting the Switch

This switch can be placed directly on your desktop, or mounted in a rack.

Before you start installing the switch, make sure you can provide the right operating environment, including power requirements, sufficient physical space, and proximity to other network devices that are to be connected. Verify the following installation requirements:

- Power requirements: 100 to 220 VAC (plus or minus 10%) at 50 to 60 Hz (plus or minus 3 Hz). If there is a voltage control switch located on the rear panel next to the power cord connector, this switch must be set to the correct voltage setting.
- The switch should be located in a cool, dry place, with at least 10 cm (4 in.) of space on the sides for ventilation.
- Place the switch out of direct sunlight and away from heat sources or areas with a high amount of electromagnetic interference.
- If you intend to mount the switch in a rack, make sure you have all the necessary mounting screws, bolts and nuts, and the right tools.
- Make sure that network cables and connectors needed for installation are available.

Stacking Switches on a Flat Surface

The Professional Series Switch can be placed anywhere there is enough flat space, such as on a table or desktop. The first switch should be placed on a firm, flat surface where you want to install the stack, and subsequent switches may be stacked carefully, one on top of another.

Mounting Switches in a Rack

Please comply with the following instructions to ensure that your switch is securely mounted in the rack:

1. Use a standard EIA 19-inch rack.
2. Use the brackets that are already attached to the switch.
3. Position the switch in the rack by lining up the holes in the brackets with the appropriate holes on the rack, and then use appropriate rack-mount screws to mount the switch in the rack.

Connecting the Switch System

The Professional Series Switches provide a number of different port configurations. Each RJ-45 port supports connection to 10 Mbps Ethernet and 100 Mbps Fast Ethernet, and has the ability to run in full or half-duplex operation. While gigabit ports also support 1 Gbps Gigabit Ethernet (GbE). The switch automatically sets the transmission speed for each port to use the highest speed supported.

The transmission mode can be set for each port using auto-negotiation (if also supported by the attached device). However, if the device attached to any port on the switch does not support auto-negotiation, you can manually configure the transmission mode via the optional management software, accessible from a local PC.

Making a Connection to an RJ-45 Port

You can use straight-through or crossed twisted-pair cable to connect any RJ-45 port on the switch to any device that uses a standard network interface such as a workstation or server, or to a network interconnection device such as a bridge or router (depending on the port type implemented).

1. Prepare the network devices you wish to network. Make sure you have installed 10BASE-T, 100BASE-TX, or 1000BASE-T network interface cards for connecting to the switch's RJ-45 station ports.
2. Prepare straight-through or crossed unshielded twisted-pair cables with RJ-45 plugs at both ends. Use 100-ohm Category 3 or greater cable for standard 10 Mbps Ethernet connections, or 100-ohm Category 5 cable for 100 Mbps Fast Ethernet or 1000 Mbps GbE connections.
3. Connect one end of the cable to the RJ-45 port on the network interface card, and the other end to any available RJ-45 port on the switch. When inserting an RJ-45 plug, be sure the tab on the plug clicks into position to ensure that it is properly seated.

Caution: Do not plug a phone jack connector into any RJ-45 port. This may damage the switch. Instead, use only twisted-pair cables with RJ-45 connectors that conform to FCC standards.

Notes:

1. The transmission mode for each of the copper ports on each Professional Series Switch is automatically set as Auto-MDI/MDI-X support. So, the Switch is designed to connect with other devices through any of its copper ports. When connecting to another compatible adapter, whether or not straight-through cable is utilized, the Switch will automatically, electronically ensure that a straight-through connection is made. Similarly, when connecting to another compatible switch or hub, the Switch will automatically, electronically ensure that a crossover connection is made.
2. All copper ports on WideBand's Professional Series Switches are WGNA Certified to transmit data up to a full 100 meters (328 ft.) with a bit error rate of less than 1 per million on all grades of Category 5 cables.
3. We advise using Category 5 cable for all network connections to avoid any confusion or inconvenience in the future when you upgrade attached devices to Fast Ethernet or GbE.

Restrictions on Cascade Length -- The IEEE 802.3 standard recommends restricting the number of hubs (i.e. repeaters) cascaded via twisted-pair cable to four, while IEEE 802.3u provides even stricter recommendations for Fast Ethernet. Therefore, when cascading devices other than this switch, please refer to the equipment's accompanying documentation for cascade restrictions. However, please note that because switches break up the path for connected devices into separate collision domains, you need not include the WideBand Professional Series switch or connected cabling in your calculations for cascade length involving other devices.

Installing a Fiber Module

To Install a Fiber Module, simply push the Module into the port until you feel it lock into place. It is immediately ready to accept a fiber cable terminated with a mini-GBIC connector.   To remove the Module, lift up on the small bar that protrudes from the top of the Module, and pull it out.

Connecting Fiber Cable

Similarly, the mini-GBIC connector on the fiber cable snaps into place in the Fiber Module. Release its tab to remove the cable.

Powering On the Switch

1. If there is a voltage control switch located on the rear panel next to the power cord connector, this switch must be set to the correct voltage setting.
2. Plug the power cord into the power socket on the rear of the switch, and the other end into a power outlet.
3. As the switch powers up, the LEDs near the copper ports will come on in blue. This indicates that the switch is running start-up tests. Once these tests have successfully completed, the lights will change to green, indicating that the switch is loading programs. When the loading is completed, the lights will go off, and then, when a cable is plugged into one of the copper ports, the light above it will come on -- green lights indicating 10/100 Mbps and blue lights indicating 1 Gbps.

Verifying System and Port Status

The LEDs located on the front panel are described in this section.

Check each connection by viewing the port indicators shown in the following table:

LED Over Each Port	On Green	Port has a valid 10/100 Mbps connection, port enabled.
	On Blue	Port has a valid 1 Gbps connection, port enabled.
	On Red	Port has detected a physical error on the connected wire.
	Off	Port either has no valid connection or has been disabled.

Verifying System Operation

Copper Ports -- Verify that all attached devices have a valid connection. The switch monitors the link status for each port. When any device is properly connected to the switch via a copper port and is transmitting a link signal, the Link Indicator (the LED above the port) will light up for the corresponding port. If the port has a valid link but is detecting errors, a red light will come on above the port. If the Link Indicator fails to light, or a red light appears when you connect a device to a copper port, check the following items:
- Be sure network cables and connectors are properly attached to the connected device and the switch.
- Be sure your cable is functioning properly by using it for another port and attached device that displays valid indications when connected to the network.

- Be sure no twisted-pair cable exceeds 100 meters (328 feet). Access Switch Management to make sure the port is enabled.

Fiber Ports – Verify that all attached devices have a valid connection. Check the Link Indicator above the port. On a managed switch, access the Port Information screen of the WideBand Network Management System to verify the link status of fiber ports. On unmanaged switches, verify valid connections by running a "ping" test (in DOS type "ping TCP/IP ADDRESS" where TCP/IP ADDRESS is the TCP/IP address of another computer that is also connected to the switch. Hit "Enter" and wait a few moments. You should receive four lines of "Reply from TCP/IP ADDRESS").

- The maximum length for Gigabit connections should be within the limits listed in the following table:

Module	Cable	Maximum Length
WB1MGBICPRO-LX	9/125 µm single-mode	Up to 10Km
WB1MGBICPRO-SX	62.5/125 µm multimode	300m / 984 ft
	50/125µm multimode	860m / 2821 ft
WBMFPLCSCPRO	LC-to-SC Multi-Mode Fiber Patch Cable	2m
WBMFPLCSTPRO	LC-to-ST Multi-Mode Fiber Patch Cable	2m
WBSFPLCSCPRO	LC-to-SC Single-Mode Fiber Patch Cable	2m
WBSFPLCSTPRO	LC-to-ST Single-Mode Fiber Patch Cable	2m

MANAGEMENT GUIDE

Switch Management

The WideBand Network Management Software is available for advanced management capability. This software permits the user to manage WideBand Professional Series Switches from a PC on which the management software is installed either via the network connection or through the serial port located on the front panel of the switch. The software supports management functions such as the following:

- Find and list all WideBand Switches on the network
- Update Switch Firmware
- Upgrade an Unmanaged Switch to a Managed Switch
- Assign names and descriptions to switches
- Configure port information
- Display port statistics
- Setup port mirroring
- Set up and manage VLANs
- View MAC address forwarding databases
- Configure multicast tables
- Manage SNMP settings
- Configure loop resolution settings
- Manage link aggregation (port trunking)
- Manage L3 routing settings on layer 3 switches
- Save, load, or delete management templates

Only one copy of the Management Software is required to manage all of the WideBand Professional Series Managed Switches on your L2 network.

Required Connections

The WideBand Network Management Software can be run from any PC where the Program is installed, either via a normal Local Area Network connection or via the Serial port on the front panel of the switch.

Using the network connection, the PC need not be connected directly to the switch you wish to manage. The management software will find all of the WideBand Professional Series Switches on the VLAN it is connected to, and from it you will be able to manage any of these Switches that has Management capability.

Using the Serial Port connection, only the Switch to which the PC is connected can be managed.

Obtaining and Installing the Management Program

The WideBand Network Management Software is available for download any time, free of charge. Switches that are purchased "unmanaged" may be upgraded using a unique Management Token that must be installed, using the Management software, on each Switch. Both Management Software and Token(s) may be obtained via the web at http://www.wband.com/proswitch, or through your WideBand Reseller. To locate the WideBand Authorized Resellers nearest you, contact the WideBand Sales Office at (888) 663-3050.

The Token(s) will be emailed to you within approximately 24 hours after being ordered.

To install the Management Software, download it from the WideBand Web Page and save the software installation file on the PC where you want to install the Management System. When you are ready to install it, find the file in Windows Explorer or My Computer and double-click on the name of the file. The installation process will begin. Follow the instructions you receive on screen. When the program installation has completed, you can open the program by clicking its icon on your desktop or in the Program Menu.

Accessing the Switch Via the Network Management System

When you open the Management Program, the startup screen will appear and you will need to select which type of management interface you would like to use in this session. Because the WideBand Professional Series Switches use the WideBand Management Protocol there is no need to set up any configuration or addresses over the serial port before connecting. Therefore, you may continue with network management by selecting the *Network* button.
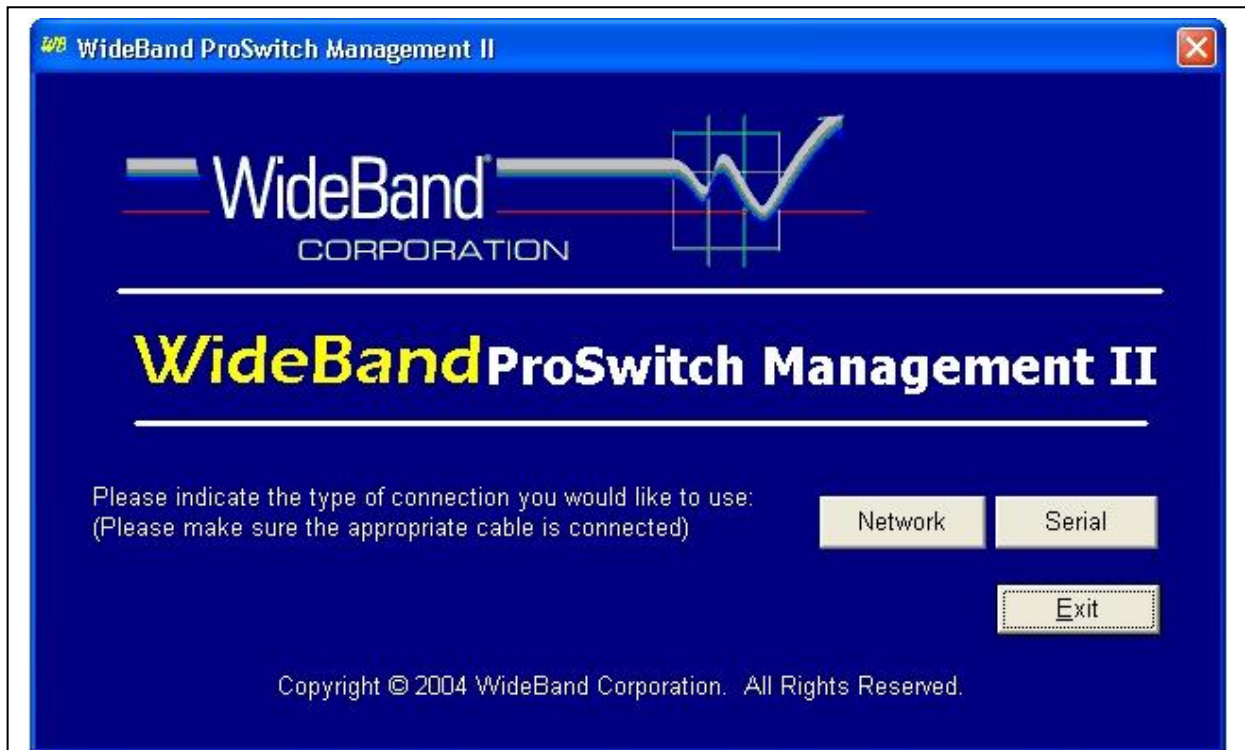
Figure 1 – Select what management interface you plan to use on the WideBand Management Software Startup screen.
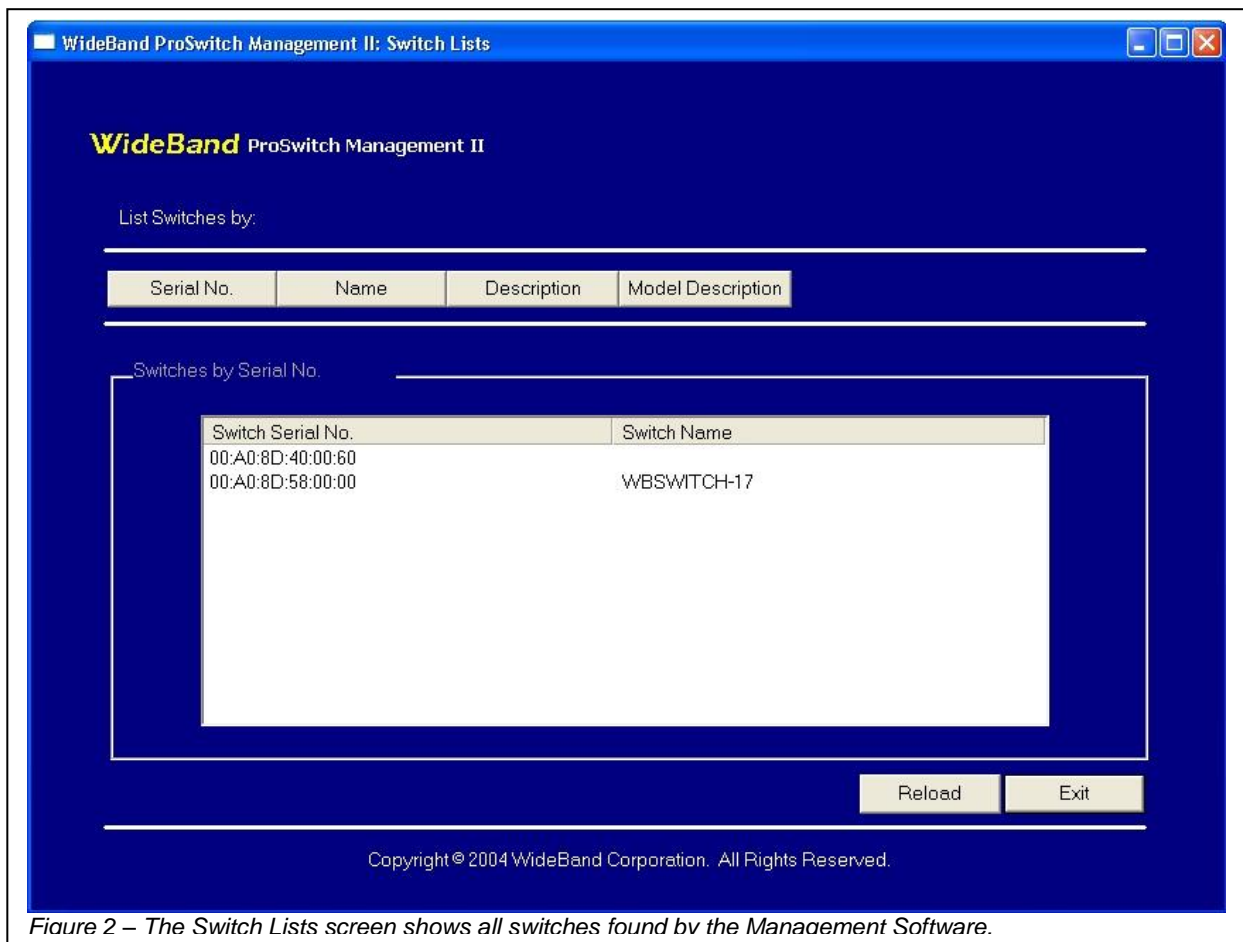
Figure 2 – The Switch Lists screen shows all switches found by the Management Software.

The next screen you will see is the **Switch Lists** screen, shown in Figure 2 (above). As the screen loads, the program will search the network to find all of the WideBand Professional Series Switches on the connected VLAN. Until you have configured the switch identification information, the switches can only be found using their Serial Numbers and Model Descriptions. Once the switch information is configured, switches can be found and sorted in the following categories:

- Switch Name
- Switch Description
- Switch Serial Number
- Switch Model Description

The switch list can be refreshed at any time by clicking on the *Reload* button.
You can manage any switch that appears in the list by simply clicking on it.

Network Management Security

If the switch you select is not password protected you will be prompted to enter a password at this time. If you do not wish to enter a password press the *Continue* button. WideBand Corporation strongly recommends that you password protect all of the switches on your network for security reasons. Even unmanaged switches can have a password since they can be upgraded to manageable switches.

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If you selected a switch that is already password protected, you will be required to enter the correct password before continuing to the **Switch Summary & Menu** screen.

The password can be cleared at any time on the **Switch ID** screen. A password is not required for management over a serial port.

Accessing the Switch via the Serial Port

First, make sure that the switch is connected to your PC via a null modem RS-232 cable. Then start the management program and click on the "Serial" button shown in Figure 1.

The software will automatically search the COM ports on the PC. If a valid connection to a Professional Series switch is found it will be displayed in the switch list. Simply select the switch to begin management.

Switch Summary & Menu

Once you have successfully selected a switch and entered a correct password the **Switch Summary & Menu** screen (displayed in Figure 3) will open.

Most of the information on this screen can be set on the **Switch Identification** screen, accessible using the *Switch ID* button at the bottom of this screen. Information is displayed on this screen for both Managed and Unmanaged Switches, and is useful for "at-a-glance," detailed surveys of switch parameters. The information displayed on this screen is outlined in the following table:

Menu	Description
Switch Name	The Name assigned to the Switch
Switch Description	Greater detail for identifying the Switch
Switch Department	The Department in which the Switch resides
Management Enabled	Indicates whether the Switch's management features are enabled
Management Template	Lists the Management Template currently in use by the Switch
Switch Serial Number	The Switch's Serial Number (same as the Switch's MAC ID)
Model Number	The Switch's Model Number
Firmware Version	Lists the Hardware/Firmware version the Switch is currently using
Model Description	A full description of the Switch's Model Number
Switch Location	The physical location of the switch

This screen also provides a "gateway" to managing the switch, allowing access to the management functions, as described in the following table:

Link	Description
Port Information	View and configure the current speed, duplex, and flow control settings of each port
Port Statistics	Monitor the current statistic counter values for each port
VLANs	Set up and configure VLANs for every port
Switch ID	Assign identification information to the switch
Firmware Update	Update the switch firmware or management status
Templates	Create and use Management Templates for ease of changing or duplicating some management settings.
Find Switch	Go back to the "Switch Lists" screen to manage another switch

Address Tables	View the MAC address forwarding tables for this switch
Multicast Tables	View and manage IGMPv2 multicast tables (only on Media Streaming Switches)
Management Control	Configure a switch IP address and SNMP management settings
Loop Resolution	Configure and monitor IEEE 802.1D Spanning Tree Protocol
Link Aggregation	Configure and monitor IEEE 802.3ad Link Aggregation Protocol
Layer 3 Routing	Configure layer 3 router settings (only on layer 3 switches)

Note: The items in the table above that are marked with blue are available on unmanaged switches as well and as on managed switches.
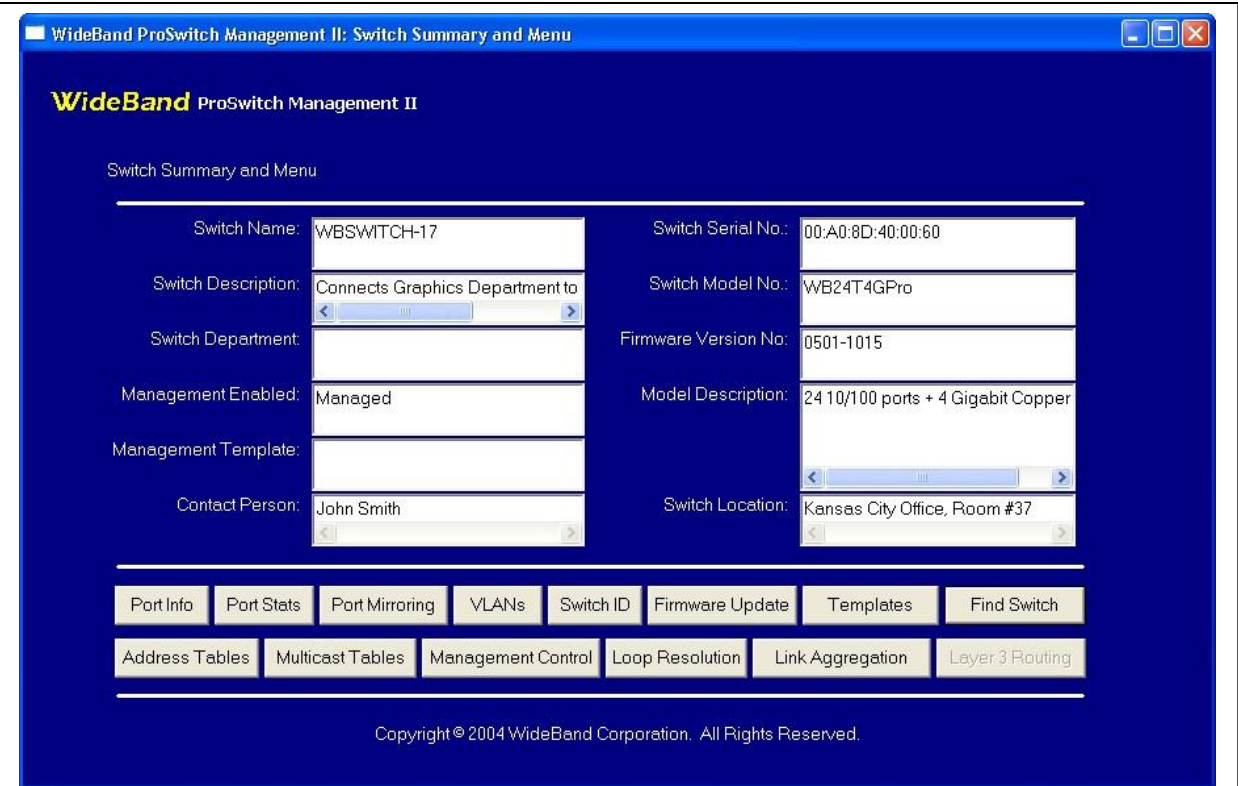
Figure 3 – The Switch Summary and Menu screen shows basic information about the selected switch. It also provides links to other management screens.

Switch Identification

From the **Switch Summary & Menu** screen select the *Switch ID* button to advance to the **Switch ID** screen (Shown in Figure 4). The information on this screen is similar to that found on the **Switch Summary & Menu** screen. Some of this information is also used for the SNMP *system* group found in MIB-II (rfc1213). Make sure that you save all changes by clicking the *Save* button before closing the screen.

Menu	Description
Switch Name	The Name assigned to the Switch, same as SNMP *sysName*

Company Name	Used when multiple corporations share one LAN
Switch Description	Greater detail for identifying the Switch, same as SNMP *sysDescr*
Switch Department	The Department in which the Switch resides
Management Enabled	Indicates whether the Switch's management features are enabled
Contact Person	Contact person for this managed node, same as SNMP *sysContact*
Switch Serial Number	The Switch's Serial Number (same as the Switch's MAC ID)
Model Number	The Switch's Model Number
Firmware version	Lists the Hardware/Firmware version the Switch is currently using. In the example *0501-0014* the *0501* is the hardware, and *0014* is the firmware.
Model Description	A full description of the Switch's Model
Switch Location	The physical location of the switch, same as SNMP *sysLocation*

Note: All items in the table that are marked with green can be edited on this screen.
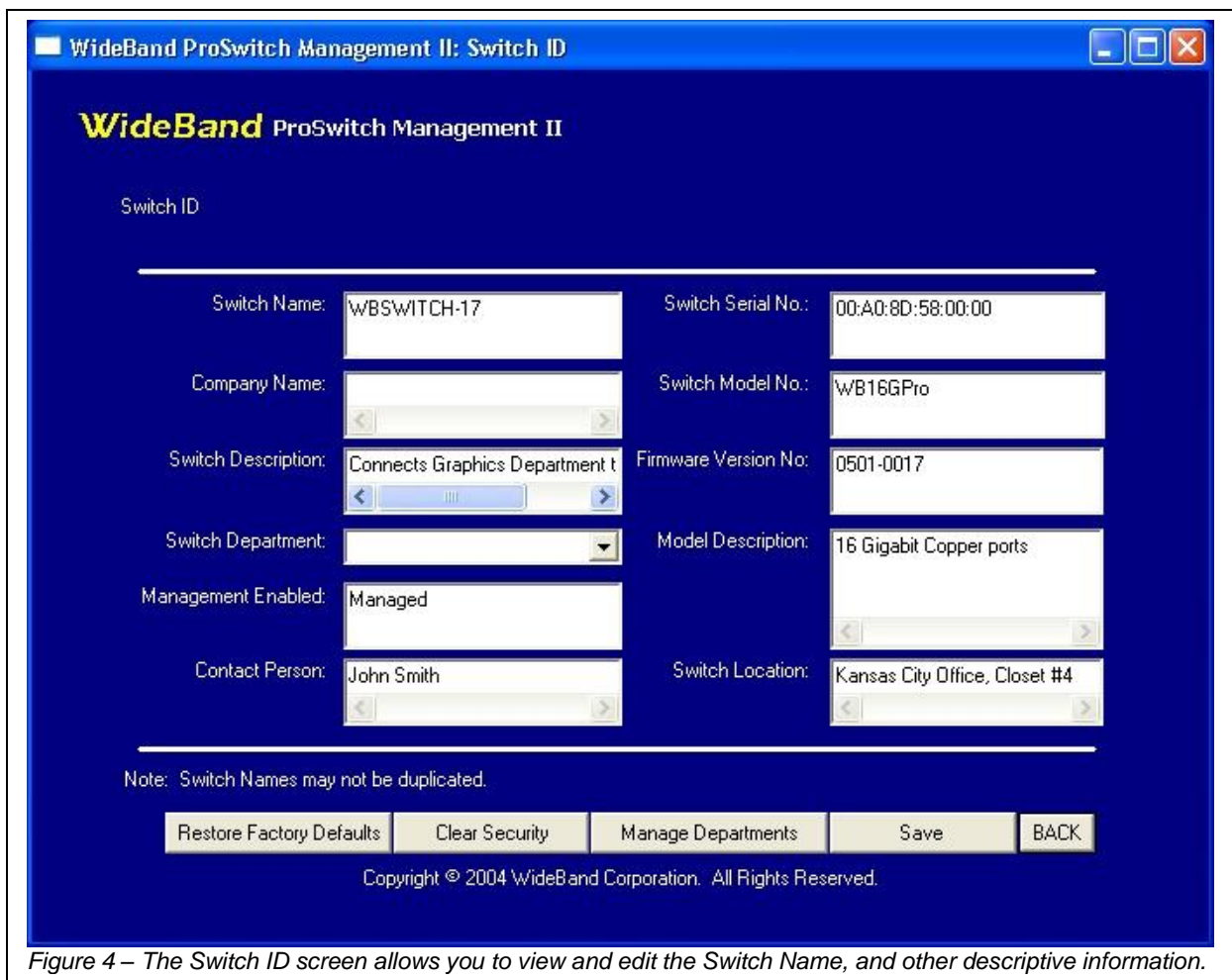
Figure 4 – The Switch ID screen allows you to view and edit the Switch Name, and other descriptive information.

Restoring Factory Defaults

In some cases it is useful to clear out any management settings, and start over with the factory defaults. This can be accomplished by clicking the *Restore Factory Defaults* button.

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Warning: Restoring factory defaults will cause all configuration data to be lost. If the current configurations are required for proper communication with the switch, like specific VLAN settings, the switch may become inaccessible over the network.

Clearing Security

If you wish to remove the current password protection on the switch you should click on the *Clear Security* button located at the bottom of this screen. The password will be cleared and the switch will no longer be secure. You will be prompted to enter a new password the next time you try to manage this switch.

Updating Switch

From the **Switch Summary & Menu** screen select the *Firmware Update* button to open the **Switch Update** screen (shown in Figure 5). On this screen you will be able to access the following management features:

- Update a switch's firmware version
- Upgrade an Unmanaged switch to Managed
- Reboot the switch
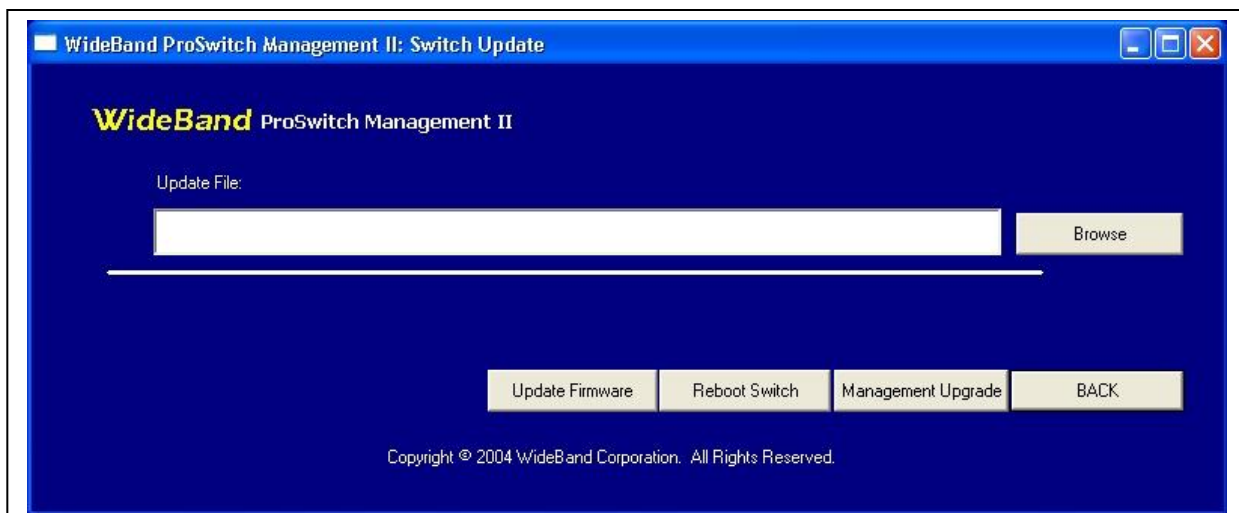
Figure 5 – The Switch update screen is used to perform updates and upgrades on the selected switch.

Update Firmware

WideBand Corporation frequently releases new switch firmware for the Professional Series Switches. These upgrades are included with the latest version of ProSwitch Management Software which can be downloaded free of charge from the WideBand website http://www.wband.com/proswitch. In most cases, the management software will automatically detect when a selected switch is running older firmware, and attempt to perform the upgrade before you start your management session.

If for any reason you would like to do a manual upgrade use the *Browse* button on this screen to locate a valid firmware file. Then click the *Update Firmware* button to start the upgrade.
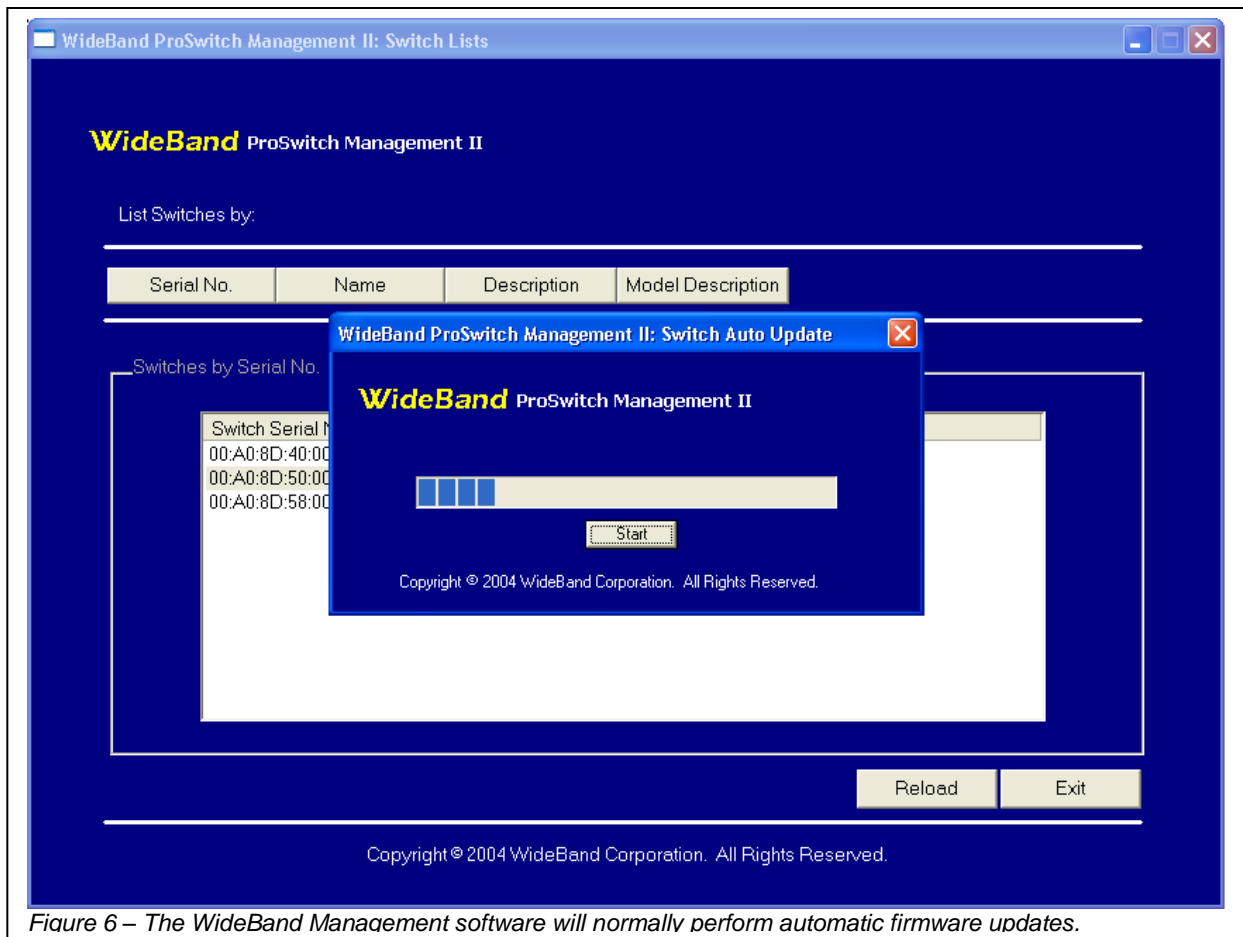
Figure 6 – The WideBand Management software will normally perform automatic firmware updates.

Management Upgrade

Switches that are purchased "unmanaged" may be upgraded using a unique Management Token that must be installed, using the Professional Switch Management Software, on each Switch.   Both Management Software and Token(s) may be obtained via the web at http://www.wband.com/proswitch, or through your WideBand Reseller. To locate the WideBand Authorized Resellers nearest you, contact the WideBand Sales Office at (888) 663-3050.

Once you have the Token ready to enter, select the *Management Upgrade* button on the **Switch Update** screen to open the **Management Upgrade** screen (shown in Figure 7). Here you will be able to enter a valid Token and press the *Upgrade to Managed* button. If the switch accepts the Token, it will now become managed.

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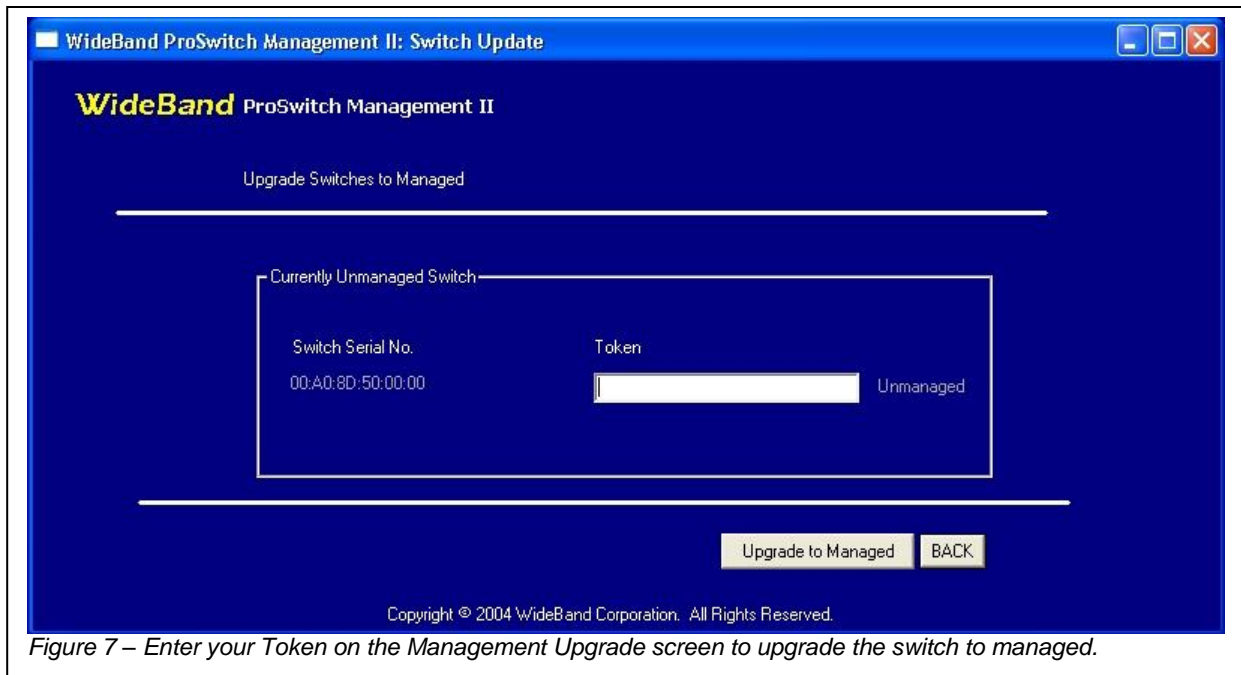
Figure 7 – Enter your Token on the Management Upgrade screen to upgrade the switch to managed.

Rebooting Switch

It is possible to reboot a WideBand Professional Series Switch at any time by selecting the *Reboot Switch* button on the **Switch Update** screen. However, the Professional Series Switches have been found to be quite stable in most environments, so this feature is rarely needed.

ADVANCED SUBJECTS

The subjects listed in this section can only be utilized with WideBand's Professional Series Managed Switches. If you would like to upgrade your WideBand Professional Series Unmanaged Switch to Managed, visit the WideBand web site at http://www.wband.com/proswitch, or contact your WideBand authorized Reseller. If there is no WideBand Reseller in your area, contact WideBand Marketing toll-free at (888) 660-3050.

Port Information

By selecting the *Port Info* button on the **Switch Summary & Menu** screen you may access the **Port Information** screen (Figure 8). On this screen you will be able to do the following:

- Get a quick look at the status of every port
- View link status details for every port
- Configure link status details for every port
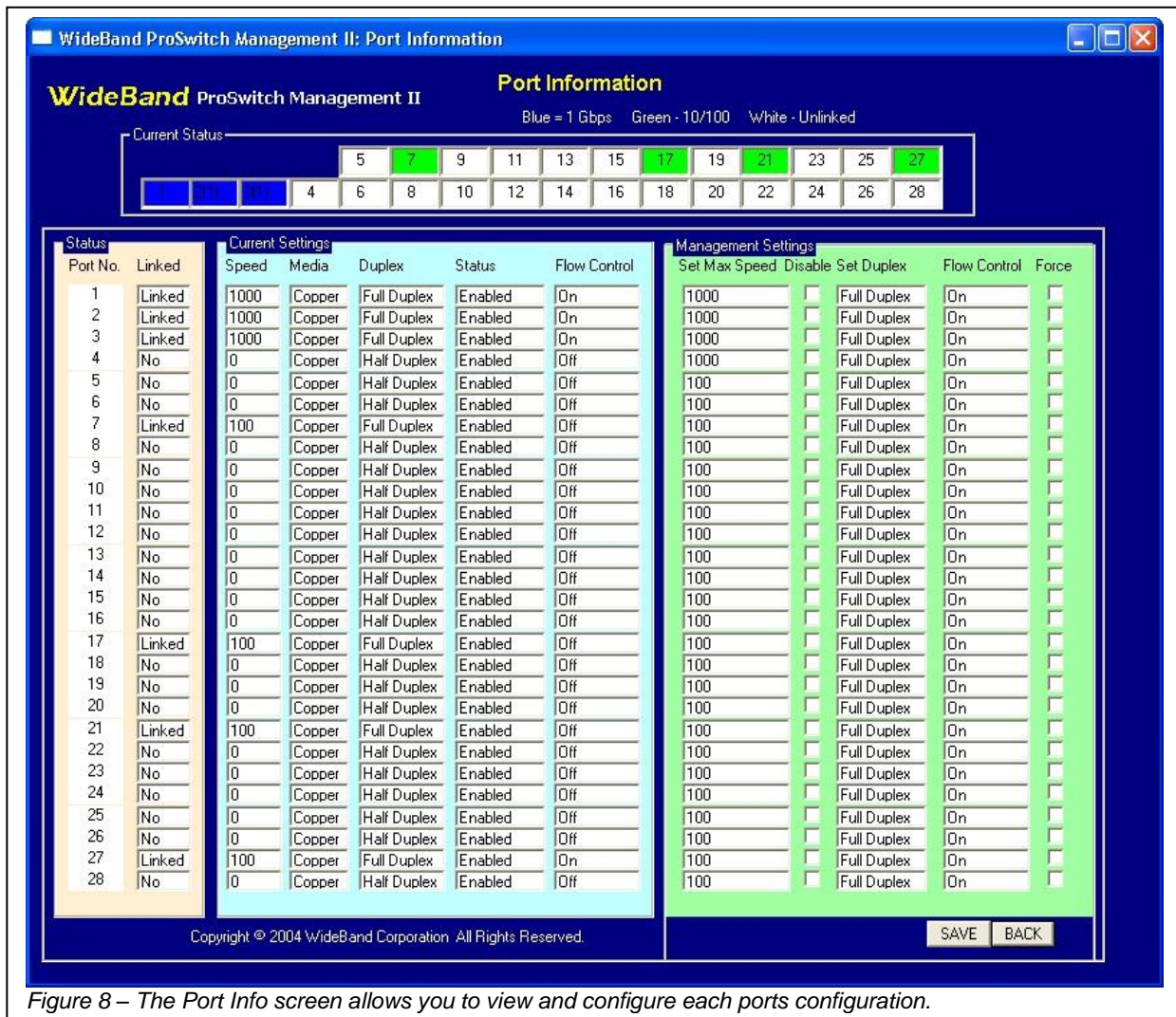
Figure 8 – The Port Info screen allows you to view and configure each ports configuration.

Current Status Bar

You will find the Current Status bar at the top of several management screens. It is used to display the basic status of every port. Since it updates every several seconds, the Current Status bar is a good way to see what ports are linked at any given moment. The color of each port relates to the link indicators on the switch as expressed in the following table:

Color	Meaning
White	Port is not linked
Green	Port is linked and is running at 10/100 Mbps
Blue	Port is linked and is running at 1 Gbps

The Current Status bar also displays the current Link Aggregation status. For example, in Figure 8, ports 2 and 3 are both aggregated with port 1. This is shown by the "(1)" following the port numbers.

There is one other use for the Current Status bar. On some screens you can click on any port in the status bar to view that ports management information.

Link Status Details

Next is more detailed information about each port. The *Status* portion of the table indicates whether each port is linked. The *Current Settings* portion indicates the details of the current link. Remember that the current link details will be determined by the link information of both the port and the link partner at the other end of the wire. These details are listed and explained in the following table:

Name	Description
Speed	Link speed of the port in Megabits per second
Media	The type of media this port is using (Copper or Fiber)
Duplex	Link Duplex status of this port:
	Full Duplex: Send and receive data simultaneously *(Best Performance)*
	Half Duplex: Data moves only one direction at a time
Status	The current management status of the port:
	Enabled: Port is ready for a link
	Disabled: Port is disabled and will not link
Flow Control	Flow Control status on link:
	On: Flow Control is enabled on both sides of the link *(Best Performance)*
	Off: Flow Control is disabled on one or both sides of the link

Finally, the *New Settings* portion allows the user to set new link information for each of the ports, as described in the following table:

Setting	Options	Description
Set Max	10	Advertise a max speed of 10Mbps
Speed	100	Advertise a max speed of 100Mbps
	1000	Advertise a max speed of 1000Mbps (only on gigabit ports)
Disable	Checked	Port is turned off as it were, and will never link
	Unchecked	Port is on, and ready to link
Set	Full Duplex	Send and receive data simultaneously *(Best Performance)*
Duplex	Half Duplex	Data moves only one direction at a time
Flow	On	Support Flow Control on this side of the link *(Best Performance)*
Control	Off	Don't support Flow Control
Force	Checked	Force link settings, autonegation is disabled so all settings must be entered manually
	Unchecked	Port will automatically negotiate with link partner for best link settings

Make sure that any changes you make are saved to the switch by clicking the *Save* button before closing the screen. If any of the new settings are invalid (if for example, you disabled the port your PC is connected on) the WideBand Management Protocol will detect the error, and revert back to the former settings. This is a feature built into the WideBand Management Protocol to protect the user from any kind of accidental management lockout.

Port Statistics

The **Port Statistics** screen displays the "quick view" Current Status bar (described above), and provides 39 RMON statistics for each port. To access the statistics for a given port, click on the port number on the Current Status bar. The port's statistics will appear in the fields below the bar, as shown in Figure 9.
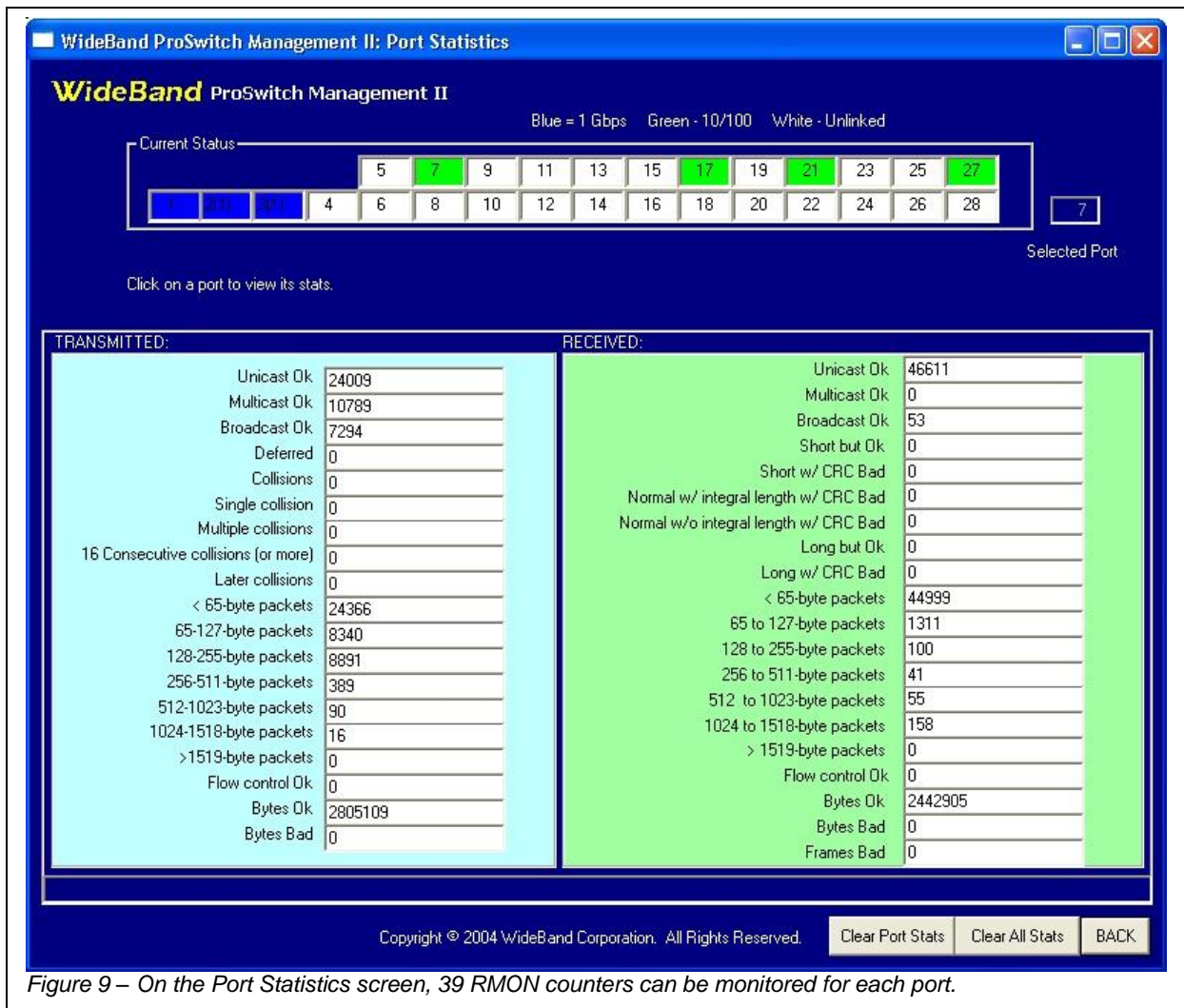
Figure 9 – On the Port Statistics screen, 39 RMON counters can be monitored for each port.

The statistics displayed in the **Port Statistics** screen reflect how efficiently data is being transferred through each port, and provide information to help determine what is causing any delays that might be observed. Any counter value that might be considered an error shows up in red. Move the mouse over the name of any counter to get a more detailed description at the bottom of the screen. A few words of explanation might also be helpful:

- *Unicast Packets* are packets that are addressed to go to a single, specified destination.
- *Multicast Packets* are packets addressed in such a way that anyone who "tunes in" may receive them, much like an AM Radio signal is broadcast to that group of people who have AM Radio receivers.
- *Broadcast Packets* are packets addressed to go to every device connected to the network.
- *CRC Errors* refer to errors in the checksum that is done to ensure that an error-free packet has been received.
- According to the Ethernet Standard, when a collision occurs, the Ethernet network will retry as many as 16 times to resend the packet. If the system cannot get the data through in 16 attempts, it will stop trying.

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Clearing Statistics

At the bottom of the screen there are two buttons for clearing the Statistics: *Clear Port Stats* and *Clear All Stats*. Clicking on *Clear Port Stats* will "zero out" all the statistics for the currently selected port and start them over. Clicking on *Clear All Stats* will zero out all the statistics for all of the ports.

Port Mirroring

Port Mirroring is a powerful tool used for monitoring and debugging the network. It works by duplicating all network traffic moving in or out of one port, called the *Monitored Port*, to another port, called the *Mirror Port*. This allows the network administrator to monitor any port's traffic during normal operation.
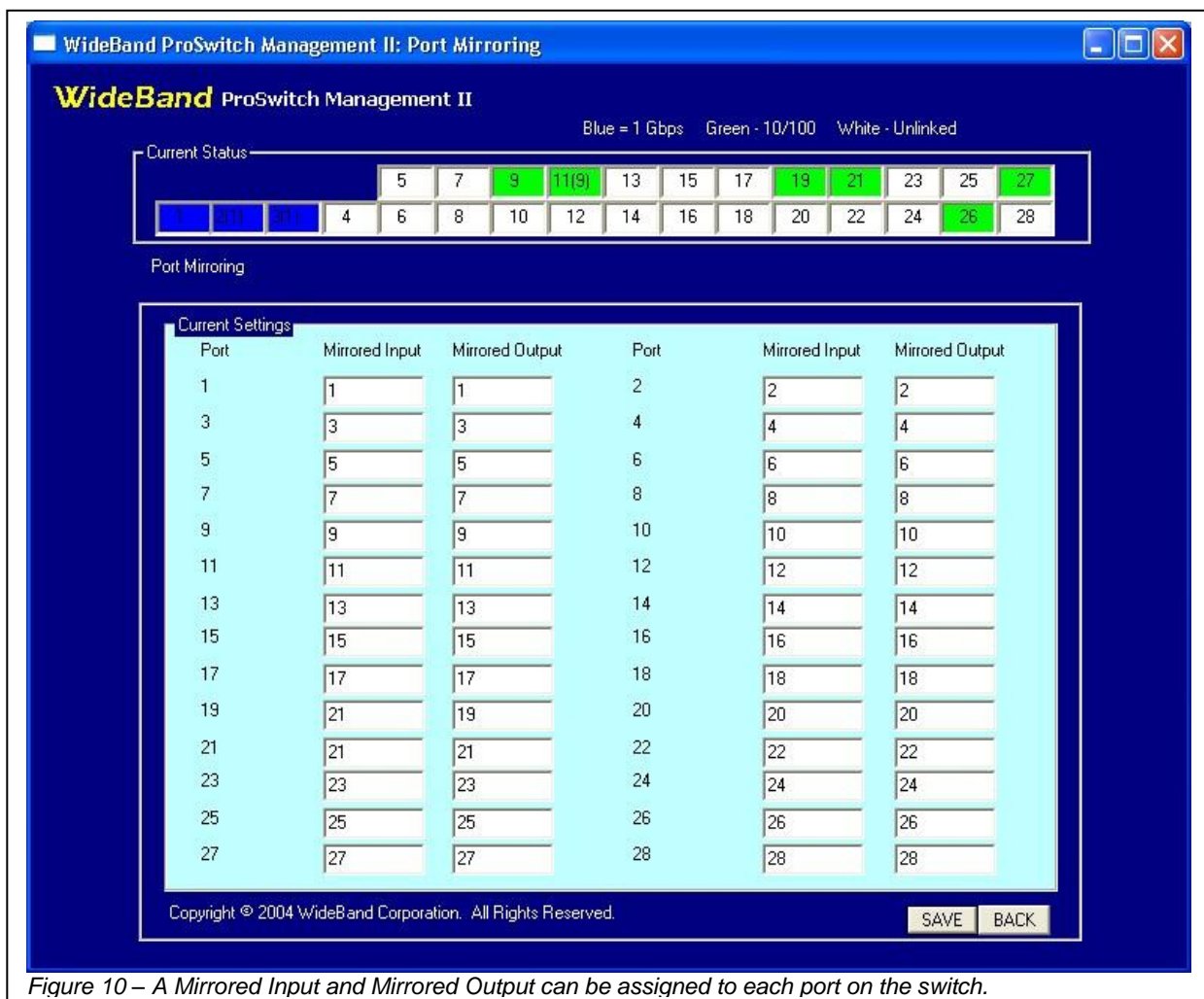
Figure 10 – A Mirrored Input and Mirrored Output can be assigned to each port on the switch.

As shown in Figure 10, each port has a *Mirrored Input* and a *Mirrored Output* field. So each Monitored Port can have two Mirror Ports. When the Mirrored Port is the same as the Monitored Port the Mirroring function is disabled. In Figure 10, the only Monitored Port is port 19, and its input traffic is mirrored to port 21. Be sure to save all changes before closing the screen.

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VLANs

Switches do not inherently support broadcast domains, which can lead to broadcast storms in large networks that handle a lot of traffic, such as NetBuei or IPX. In conventional networks with routers, broadcast traffic is split up into separate domains to confine this traffic to the originating group and provide a much cleaner network environment. Instead of using physically separate subnets that are linked by traditionally slow routers, the WideBand Professional Series Switch can create segregated broadcast domains based on easily configurable VLANs, and then link these VLANs as required with wire-speed routing.

An IEEE 802.1Q VLAN is a group of ports that can be located anywhere in the network, but communicate as though they belong to the same physical segment. VLANs help to improve network management by allowing you to move devices to a new VLAN without having to change any physical connections. VLANs can be easily organized to reflect departmental groups (such as Marketing or R&D), usage groups (such as e-mail), or multicast groups (used for multimedia applications such as videoconferencing). VLANs also can provide a higher level of network security because traffic must pass through a configured Switch to reach a different VLAN.

The WideBand Professional Series Switches support the following VLAN features:

- Configuration of up to 4094 VLANs
- Distributed VLAN learning across multiple switches using Explicit or Implicit tagging
- Port overlapping, allowing a port to participate in multiple VLANs
- The ability of letting a VLAN aware end station be a member of multiple VLANs
- The ability to pass traffic between VLAN-aware and VLAN-unaware devices
- The ability to assign VLAN Priorities

VLAN Classification

When the switch receives a frame, it classifies the frame as ether *Implicit* or *Explicit*. If the frame is untagged, it is considered *Implicit*, and the switch assigns the frame to an associated VLAN based on the defined VLAN Rules and VLAN Indices of the receiving port. But if the frame is tagged, it is considered *Explicit*, and the switch uses the tagged VLAN ID. The switch then establishes which ports the frame will be forwarded to, based on the VLAN Membership Table.

There are several steps involved in organizing and assigning VLANs. These steps are described in the following sections.

VLAN Rules and Indices

The VLAN Rules and Indices only need to be configured if you wish to assign untagged packets on one port to multiple VLANs based on the packet protocol and type. The **VLAN Rules Indices** screen is shown in Figure 11. The VLAN Rules can be configured to match different packet protocols and types. Up to eight rules may be set, and each of these rules may be assigned to any one of four indices. Rule 8, has already been set as a default Rule. To make the Rule assignment parameters more clear, they are indicated graphically on the VLAN Rules Indices screen in the following ways: On each Index, there are numbered spaces provided for eight rules. Rules that are available to be set are shown in light yellow. Rule 8, the default Rule, is highlighted in green on the Index where it is set (set by default to Index 1), and Rule 8 on the other Indices is grayed out and disabled to indicate that Rule 8 has been used and is unavailable for use in the other indices.

Similarly, when a Rule is set in any index, the space for that Rule on the other three Indices is grayed out and disabled, indicating, again, that this Rule is unavailable for use in the other indices.
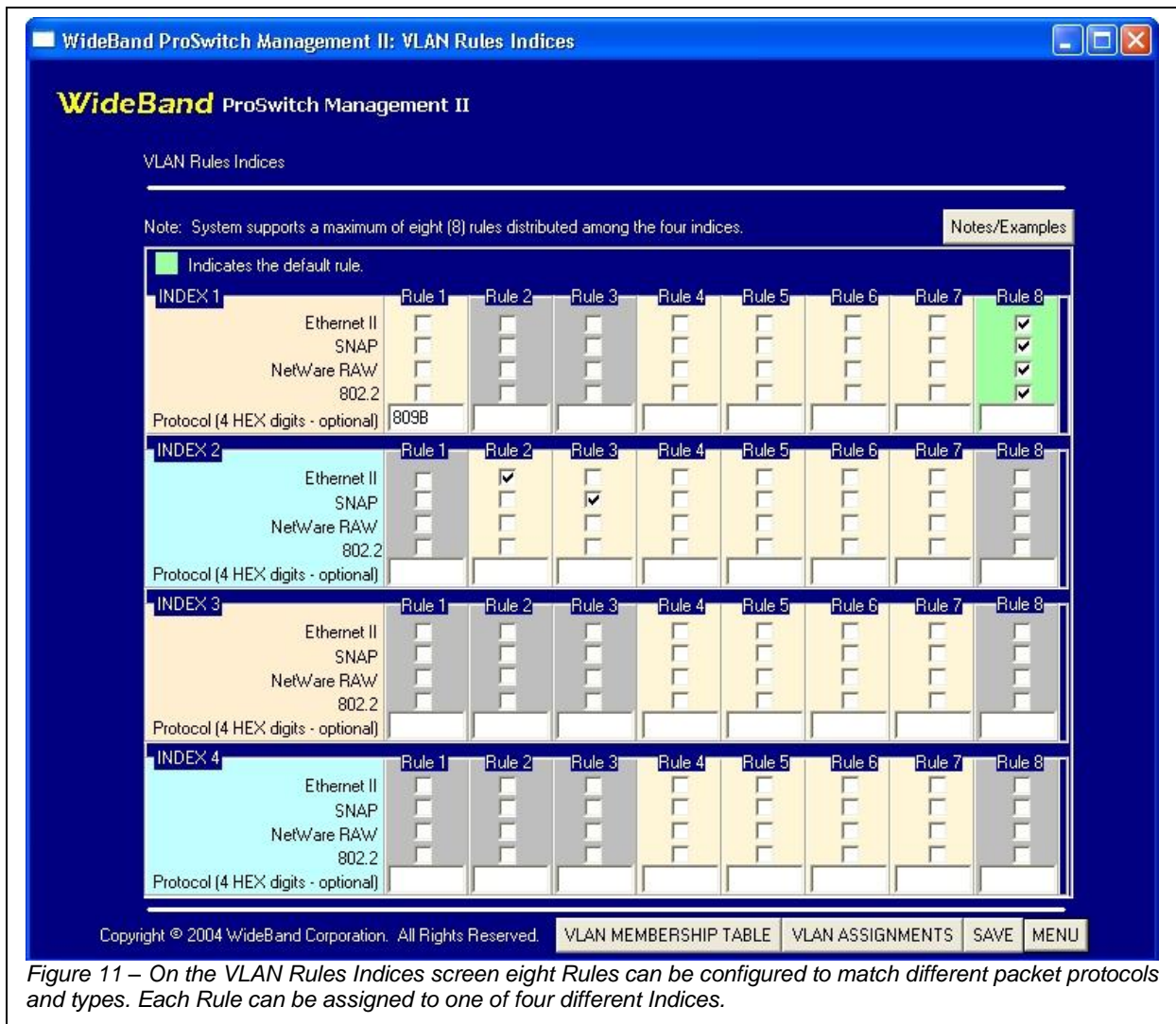

Figure 11 – On the VLAN Rules Indices screen eight Rules can be configured to match different packet protocols and types. Each Rule can be assigned to one of four different Indices.

Each of the Rules can be set to receive any combination of the following protocols:

- Ethernet II Packets
- SNAP Packets
- 802.2 Packets
- NetWare RAW Packets
- Protocol

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0800	IP datagram
0806	ARP
0835	RARP
8137	IPX datagram
86DD	Ipv6
809B	Appletalk
88A0	WideBand Management Packets

The last item, "Protocol" represents a field into which you may enter the 4-digit hexadecimal standard code for various protocols. By way of example, in the table (left) is a list of common protocols and their corresponding four-digit Hexadecimal codes (These examples and notes are available on-screen via the "*Notes/Examples*" button):

NOTES:
1. *Netware "RAW" packets do not have a protocol and thus the protocol is treated as a "don't care" by the WideBand Professional Series Switch (any value given is ignored).*
2. *The protocol for 802.2 packets is the value taken from the LLC Field of the packet.*

When a protocol is set on a given Rule, the Switch allows that protocol to be used on the Index it is a part of, and in turn, on the VLANs which are assigned to use that Index. If one protocol matches on multiple rules, only the first matching rule will be used.

As always, any changes must be saved by clicking the *Save* button.

Making VLAN Assignments

Every untagged packet that is received on a WideBand Professional Series Switch will be assigned a VLAN based on the VLAN Assignments table.

On the **VLAN Assignment Screen** (Figure 12) each Port is listed along the left side of the screen, and the four indices are listed across the top of the screen. Under each Index heading is a space for each port where the VLANs and VLAN Priorities can be assigned. So each index on each port can have its own VLAN. Any VLAN ID within the range of 1-4094 can be used.

Any index that is devoid of Rules will be grayed out on the VLAN Assignment screen, indicating that it is not available for use.

When the Switch receives a packet that is not tagged, the Switch determines the packet's protocol, and then checks the *VLAN Rules Indices* to determine which one will match this protocol. By default, all protocols match on index 1. The switch then checks the *VLAN Assignments* table to determine which VLAN the packet should be placed in, based on the Index and the receiving port number.

Once the VLAN Assignments are set as you desire them, you must click the *Save* button in order for the new settings to take effect on the switch.

From the VLAN Assignments table, one can access the **VLAN Rules Indices** and the **VLAN Membership Table**, as well as return to the **Switch Summary and Menu**.
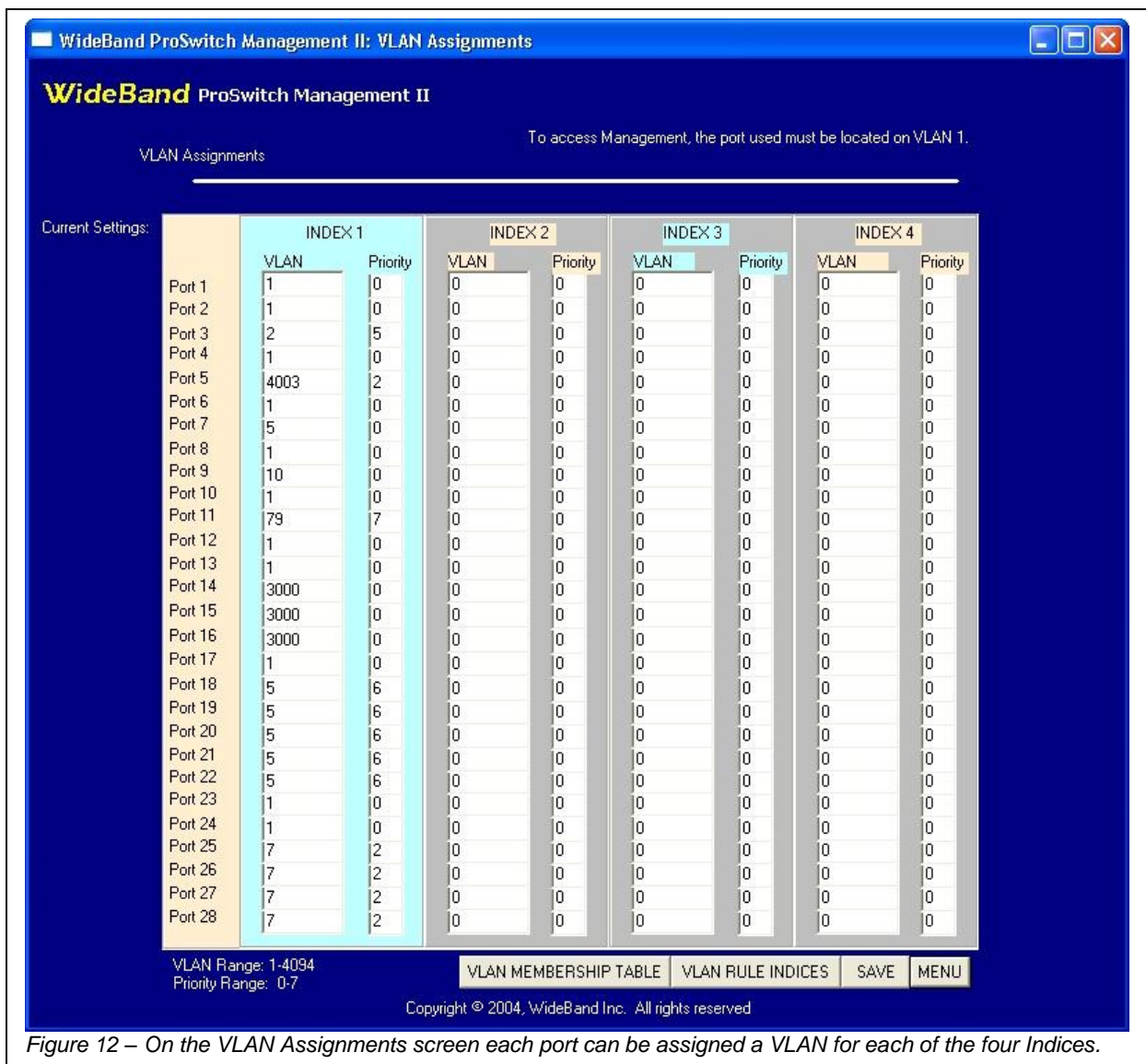
Figure 12 – On the VLAN Assignments screen each port can be assigned a VLAN for each of the four Indices.

WideBand ProSwitch Management II: VLAN Assignments

WideBand ProSwitch Management II

VLAN Assignments

To access Management, the port used must be located on VLAN 1.

Current Settings:

	INDEX 1		INDEX 2		INDEX 3		INDEX 4	
	VLAN	Priority	VLAN	Priority	VLAN	Priority	VLAN	Priority
Port 1	1	0	0	0	0	0	0	0
Port 2	1	0	0	0	0	0	0	0
Port 3	2	5	0	0	0	0	0	0
Port 4	1	0	0	0	0	0	0	0
Port 5	4003	2	0	0	0	0	0	0
Port 6	1	0	0	0	0	0	0	0
Port 7	5	0	0	0	0	0	0	0
Port 8	1	0	0	0	0	0	0	0
Port 9	10	0	0	0	0	0	0	0
Port 10	1	0	0	0	0	0	0	0
Port 11	79	7	0	0	0	0	0	0
Port 12	1	0	0	0	0	0	0	0
Port 13	1	0	0	0	0	0	0	0
Port 14	3000	0	0	0	0	0	0	0
Port 15	3000	0	0	0	0	0	0	0
Port 16	3000	0	0	0	0	0	0	0
Port 17	1	0	0	0	0	0	0	0
Port 18	5	6	0	0	0	0	0	0
Port 19	5	6	0	0	0	0	0	0
Port 20	5	6	0	0	0	0	0	0
Port 21	5	6	0	0	0	0	0	0
Port 22	5	6	0	0	0	0	0	0
Port 23	1	0	0	0	0	0	0	0
Port 24	1	0	0	0	0	0	0	0
Port 25	7	2	0	0	0	0	0	0
Port 26	7	2	0	0	0	0	0	0
Port 27	7	2	0	0	0	0	0	0
Port 28	7	2	0	0	0	0	0	0

VLAN Range: 1-4094
Priority Range: 0-7

VLAN MEMBERSHIP TABLE | VLAN RULE INDICES | SAVE | MENU

VLAN Membership Table

The VLAN Membership Table is used to configure the outgoing traffic of every VLAN. Traffic, such as a broadcast packet, that is to be flooded on the network will only find its way to ports that are members of the traffic's VLAN. Each port can be a member of up to 4094 VLANs.

Along with the VLAN Membership, each VLAN on each port can be set to send 802.1Q compatible VLAN tagged packets. Tagged packets make it possible for multiple VLANs to coexist on one physical link. Keep in mind that VLAN-unaware devices cannot read tagged packets, so you must make sure that ports which link to these devices are set as untagged. On the other hand, if the WideBand Professional Series Switch has already learned the destination MAC address of a packet, the switch will use the tag status from the MAC address table entry (See **MAC Address Tables** section). This means that, in some cases, the WideBand Professional Series Switch will automatically detect the correct tag status.
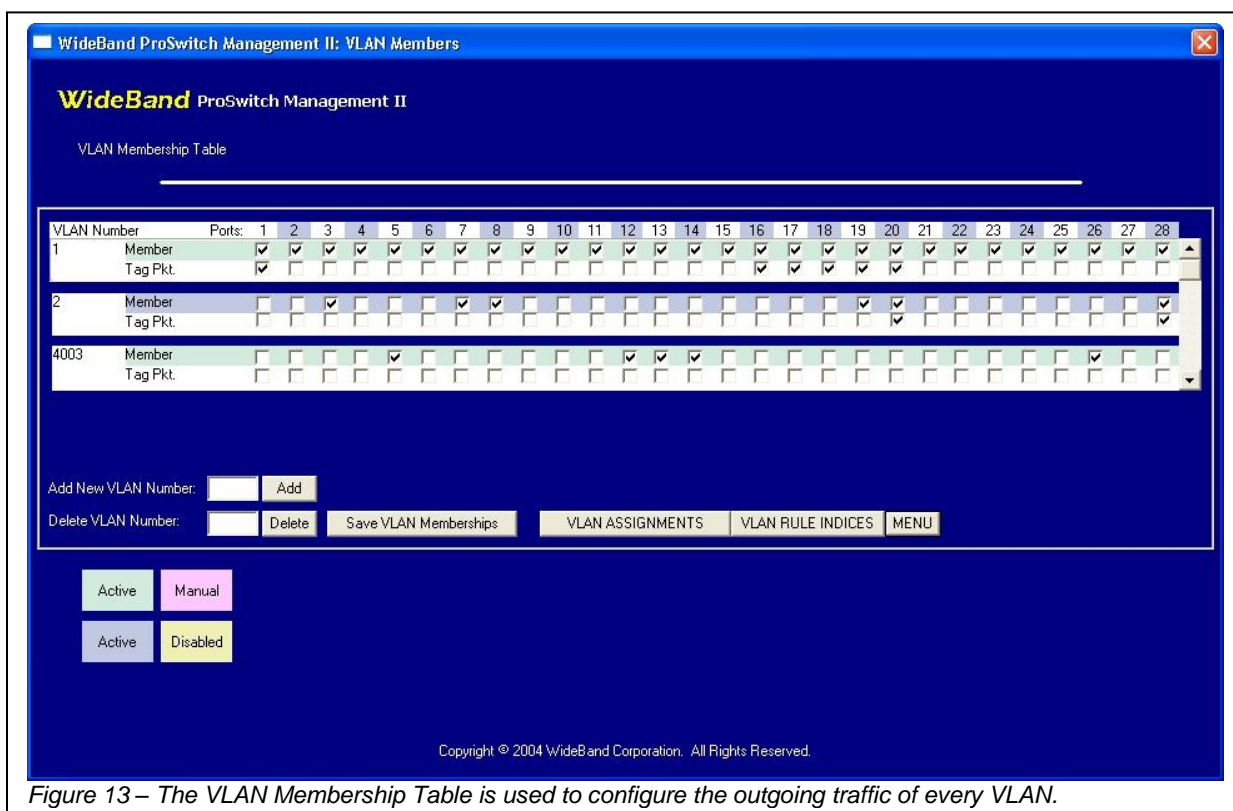
Figure 13 – The VLAN Membership Table is used to configure the outgoing traffic of every VLAN.

As illustrated in Figure 13, each Port can be a member of as many of the VLANs as desired. The VLAN names are color coded to indicate their status, as follows:

Color	Meaning
Blue/Green	VLAN was created by the VLAN Assignments Table, and is active
Pink	VLAN is defined only in VLAN Membership Table (Can only be used by tagged packets)
Yellow	A VLAN that was created in the VLAN Assignments Table, but is no longer active (No Rule is used for that Index)

In the lower left corner of the **VLAN Membership Table** screen are the *Add New VLAN Number* and *Delete VLAN Number* fields. Using the first, the user may define additional VLANs up to a total of 4094 to be recognized with explicit tags. To indicate that a VLAN has been defined in this way, the background of its title field is colored pink. VLANs that have been assigned on the VLAN Assignment screen are given a blue or green title field, and VLANs that are disabled are given a yellow title field.

Once the VLAN Memberships have been assigned, the *Save VLAN Memberships* button must be clicked before the new settings will take effect on the Switch.

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MAC Address Tables

Every Ethernet switch must build and maintain a MAC address-forwarding table. This table is used to determine what port the incoming traffic should be forwarded to. An entry in the table is created every time a packet with a new source MAC address is received in the switch. Each table entry keeps track of the following information about that packet:

- The source MAC address of the packet (a unique six byte value assigned to the Ethernet MAC which generated the packet)
- What port number the packet was received on
- The VLAN ID that was assigned to the packet
- Whether or not the received packet had a VLAN tag

The switch determines where to send each packet by finding the packet's destination MAC address in the table, and using that entry to know what port leads to the destination MAC. If there is no entry with the same MAC address and VLAN as the packet, then the switch must flood the packet to every port that might lead to the destination MAC (every port which is a member of the packet's VLAN).

The WideBand Professional Series Switches can maintain up to 8k MAC address entries in all layer 2 models, and up to 32k in layer 3 models. Entries that are not used for a few minutes age out and are deleted to make room for new entries.

MAC Address Tables in the WideBand Professional Series Switches can be viewed on the **Address Tables** screen shown in Figure 14.

The Address Table can be sorted in any of the following ways by pressing the corresponding button:

- By MAC address
- By assigned VLAN
- By the received port

Viewing this table can be useful for debugging and network monitoring. It also provides the ability to see where any Ethernet MAC on the network is in relation to the managed switch.
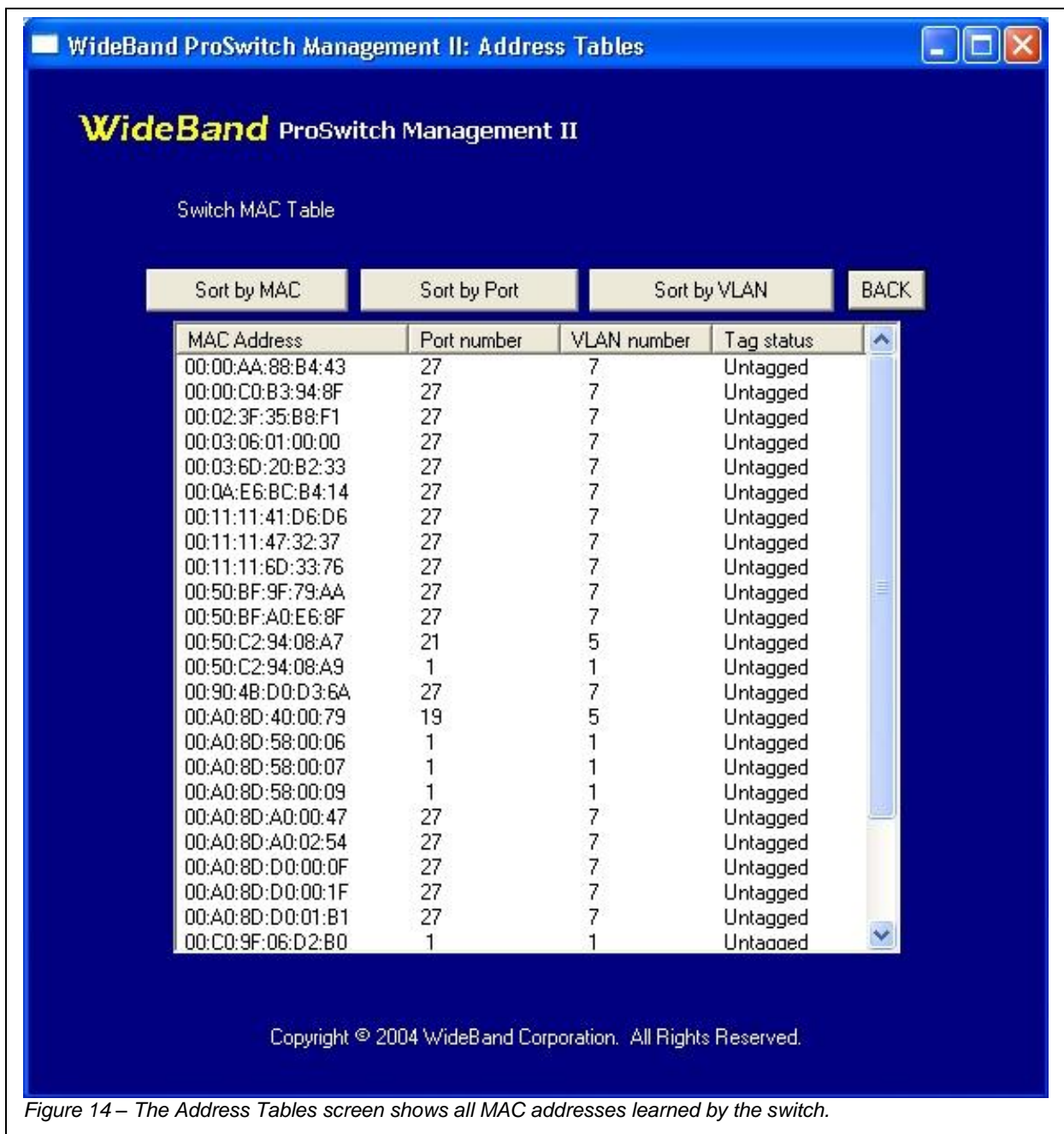
Figure 14 – The Address Tables screen shows all MAC addresses learned by the switch.

Multicast Tables

The Multicast Tables are currently only available on the Media Streaming Models of WideBand Professional Series Switches. The tables are maintained using IGMPv2 Snooping. Ethernet multicast traffic can be received by multiple hosts. So without the Multicast Tables, multicast traffic must be flooded to every port on the VLAN. Networks with a great deal of multicast traffic, such as media streaming, may see a considerable performance improvement with the Media Streaming Models of WideBand Professional Series Switches because of this feature.
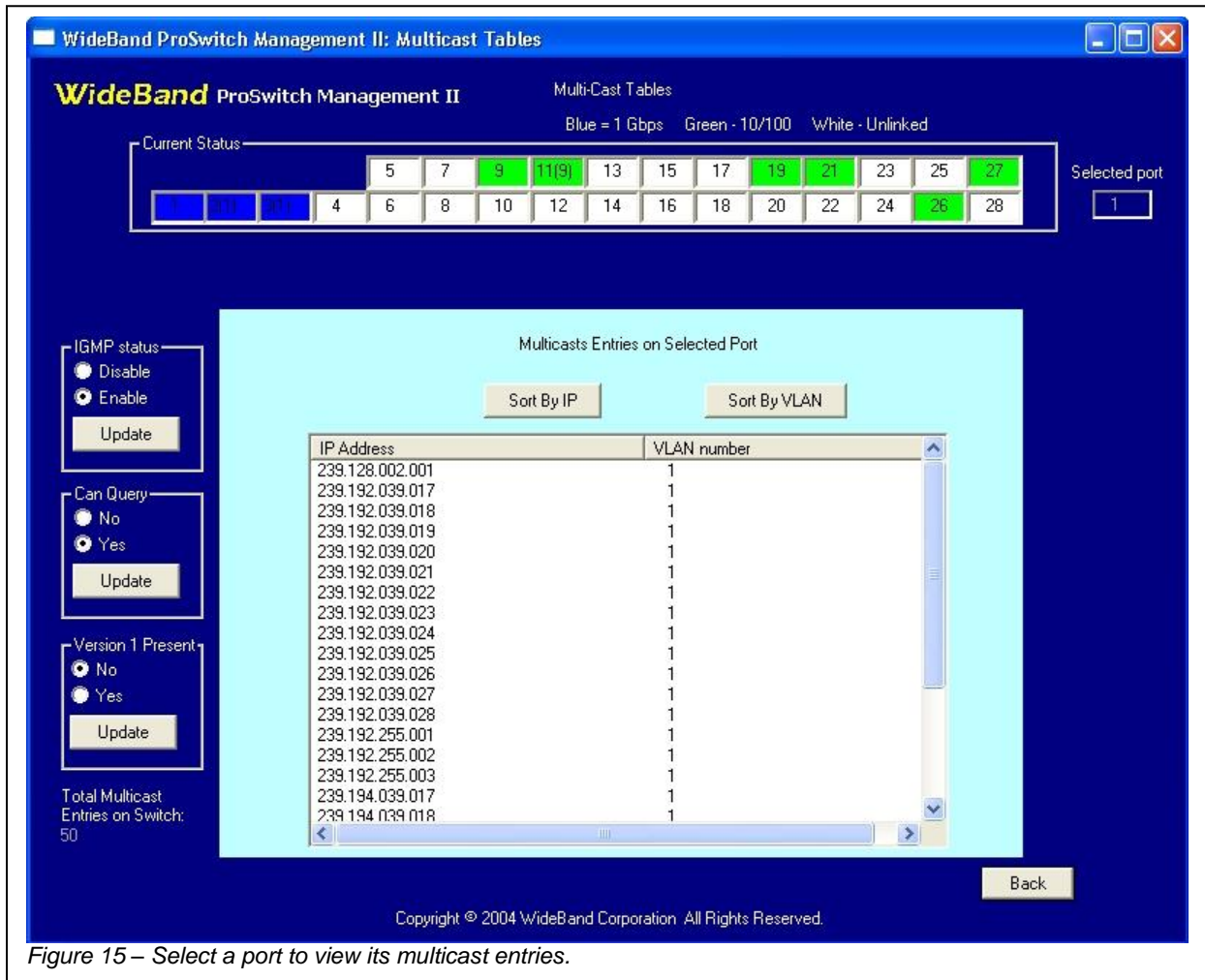
Figure 15 – Select a port to view its multicast entries.

On the **Multicast Screen** (Figure 15) the multicast entries for a port can be seen by selecting the port in the *Current Status* bar at the top of the screen. There are three configurable options on the left which are described in the following table:

Setting	Options	Description
IGMP	Disable	IGMP Snooping and filtering is disabled
status	Enable	IGMP Snooping is enabled, and switch is filtering multicast traffic
Can Query	No	Switch will just listen IGMP traffic

	Yes	Switch can become the Querier, and send IGMP query traffic
Version 1	No	There are no IGMPv1 Routers on the network
Present	Yes	There is at least one IGMPv1 Router on the network

If the switch is set to be capable of becoming the Querier it should have a valid IP address assigned to it (Refer to **Assigning an IP Address** section).

SNMP Management Control

Simple Networking Management Protocol, or SNMP, is a standard management interface designed to help simplify management of multiple brands of equipment on the same network. The WideBand Professional Series Switches support SNMPv1. This management protocol is used to read and write standard MIBs (Management Information Bases) each of which comprises of a set of managed objects. The following MIBs are supported on the WideBand Professional Series Switches:

- system(1) – rfc1213
- interfaces(2) – rfc1213
- icmp(5) – rfc1213
- transmission(10) – rfc1643
- snmp(11) - rfc1213
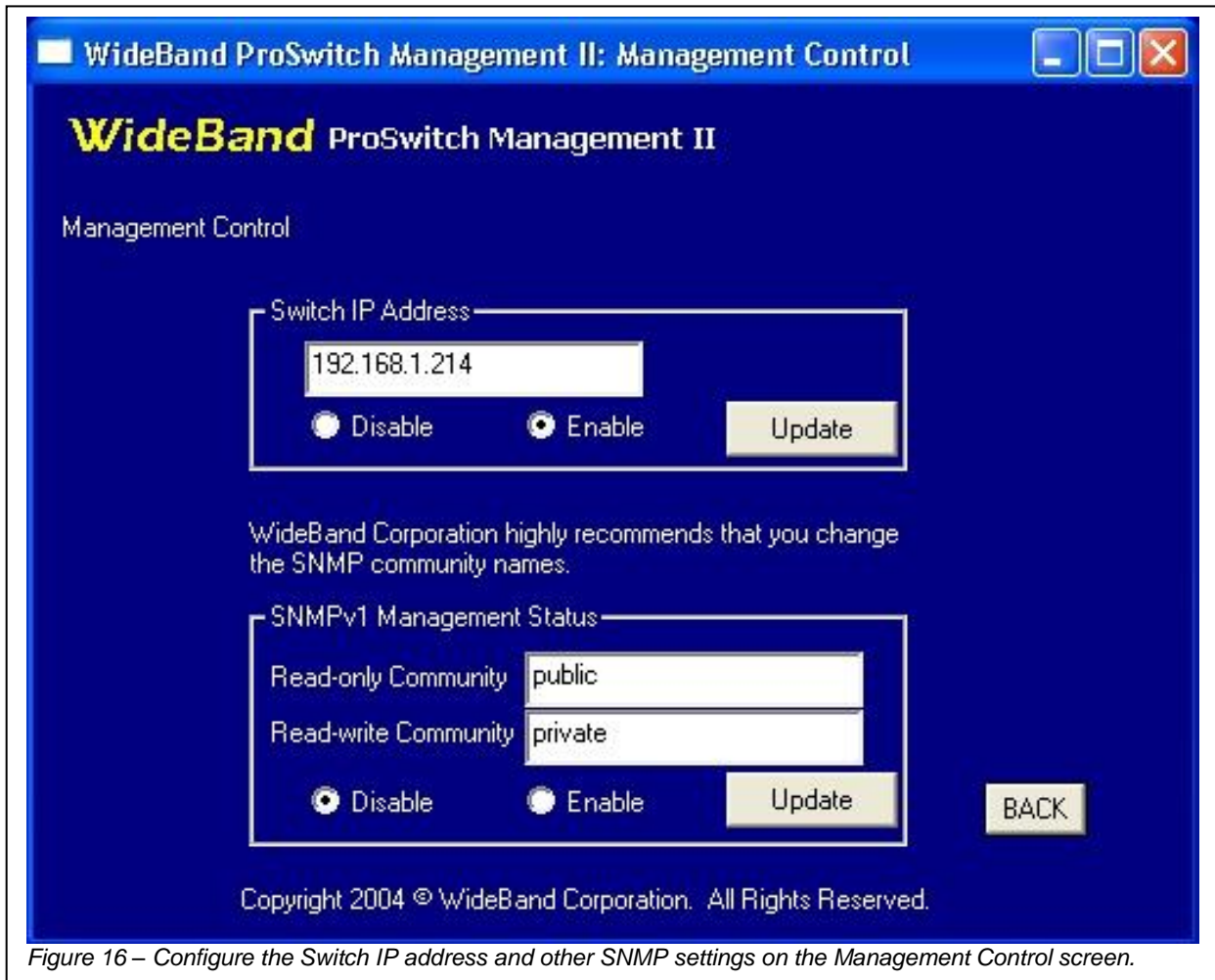- dot1dBridge(17) – rcf1493

Figure 16 – Configure the Switch IP address and other SNMP settings on the Management Control screen.

Assigning an IP Address

SNMP will only work if the switch has a valid IP address assigned to it. Make sure the address you use is on the same IP subnet as the SNMP management entity, and that it is not already in use. Open the **Management Control** screen shown in Figure 16. You may find that there is already a default IP address that is based on the switch MAC address. This value is set at the factory for low-level functionality, but is not a valid IP address. Enter the new IP address and select the *Enable* Radio button under the edit box. Save the changes by pressing the *Update* button.

This IP address is also needed for other Switch features such as IGMP Snooping and L3 Routing.

Configuring SNMP Communities

SNMP communities are like passwords to authenticate any management entity. The management entity must know the community name in order to have access to any of the SNMP management features. The WideBand Professional Series Switches support the two following communities:

- Read-only Community

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- Read-write Community

This separation can be useful to allow public read access to the switch, but limit write access to authorized users only. It is strongly recommended that you change the *Read-write* community immediately. Otherwise, any unauthorized user will be capable of reconfiguring the switch. Always be sure to follow any changes by pressing the *Update* button.

NOTE: *The WideBand Professional Series Switches are not as secure with SNMP enabled regardless of what value is set to the community names. If you are not planning to use SNMP in the near future, we recommend that you keep it disabled by selecting the Disable Radio button under the Community edit boxes.*

Loop Resolution

Ethernet networks are normally susceptible to traffic loops. Such loops occur when a user accidentally connects ports in such a way that data gets stuck in an endless path. The loop will continue to collect traffic until it crashes the entire network with a packet storm. To resolve the potentially serious problem IEEE developed the Spanning Tree Protocol (IEEE 802.1D). This protocol monitors each link, and disables any that create loops. This feature comes at the small cost of a 30 second delay from when the port links to when it starts passing data. This delay is needed for Spanning Tree to check for loops on the link before enabling it. On the WideBand Professional Series Switches, Spanning Tree is disabled by default.

Spanning Tree is also occasionally used for redundancy since multiple paths can be connected between two points. If one path is lost, the other will start working.

Figure 17 – The WideBand Professional Series Switches use the Spanning Tree protocol for Loop Resolution.

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There is a long list of configurable fields on the **Loop Resolution** screen (Figure 17), but most of the time you should only need to use the *Enable All Ports* and *Disable All Ports* buttons to enable or disable Spanning Tree on every port. Remember that when Spanning Tree is enabled, the switch will stop passing data for 30 seconds while the network stabilizes. The other settings are for advanced users only.

Let's start with the *Port* box. Items in this box are for a specific port on the switch. You can select which port by clicking on one of the ports in the *Current Status* bar at the top of the screen. All of the settings in the Port box are described in the following table:

Setting	Description
Enabled	Spanning Tree status for this port
Priority	The Priority assigned to this port
State	This port's Spanning Tree State:
	Blocking: Port is not passing data to stop a loop
	Listening: Preparing to participate in frame relay
	Learning: Learning MAC addresses, but data is forwarding
	Forwarding: Participating in frame relay *(Normal Operation)*
	Disabled: Spanning Tree is disabled on this port, or port is not linked
Path Cost	The Cost that will be added to traffic on this link
Designated Root	The unique Bridge Identifier of the Bridge assumed to be the Root by this port
Designated Cost	The path cost this port offers to the Root
Designated Bridge	The unique Bridge Identifier of the Bridge that this port uses to reach the Root
Designated Port	The port on the Designated Bridge which is this ports path to the Root
Transitions to Forwarding	A counter of how many times this port has advanced to the Forwarding State.

Note: All items in the table that are marked with green can be edited.

Next is the *Topology* box, which contains information about the network topology configuration. A description of the *Topology* box settings can be found in the following table:

Setting	Description
Hello Time	Time interval between the generation of Configuration BPDUs if this switch is the Root (In seconds)
Maximum Age	A timeout value to be used by all Bridges in the Bridged LAN if this switch is the Root (in seconds)
Forward Delay	A timeout value to be used by all Bridges in the Bridged LAN if this switch is the Root (in seconds)
Link Speed Cost 1000	The Cost to be given to ports with a link speed of 1000Mbps
Link Speed Cost 100	The Cost to be given to ports with a link speed of 100Mbps
Link Speed Cost 10	The Cost to be given to ports with a link speed of 10Mbps
Bridge Priority	The Priority given to this switch (helps determine the Root)

Time since last change	How much time has passed since the last major topology change
Topology changes	The number of topology changes since the switch was powered on

Note: All items in the table that are marked with green can be edited.

The one other box on this screen is the *Root* box. None of the fields in this box can be changed. It merely gives information about the current Root. The Root device is what all other Spanning Tree entities calculate their path cost relative to. It also sends out periodic messages to all of the other bridges on the network to maintain the Spanning Tree. All fields in the *Root* box are listed in the following table:

Setting	Description
Identifier	The unique Bridge Identifier of the current Root
Path Cost	This switch's Path Cost to the current Root
Root Port	The port on this switch that goes towards the Root
Hello Time	Hello Time used by the Root (in seconds)
Maximum Age	Maximum Age used by the Root (in seconds)
Forward Delay	Forward Delay used by the Root (in seconds)

Link Aggregation (Port Trunking)

Link Aggregation, also known as Port Trunking, is when multiple network ports on a device are setup to work together as one higher-bandwidth link. The WideBand Professional Series Switches use the IEEE 802.3ad Link Aggregation Control Protocol (LACP) to automatically configure the ports in this manner. This feature is enabled by default on the Professional Series Switches, and up to 16 ports can be connected in one aggregate.

Here are some important requirements that you must keep in mind while connecting multiple links for any aggregate:

- Every link must be running at the same speed
- Full Duplex is required on every link in the aggregate
- Link Aggregation must be enabled on both ends of the aggregate

If any of these requirements are not met, the links will not aggregate together, which could create a network loop. You may want Spanning Tree enabled just in case that ever happens.
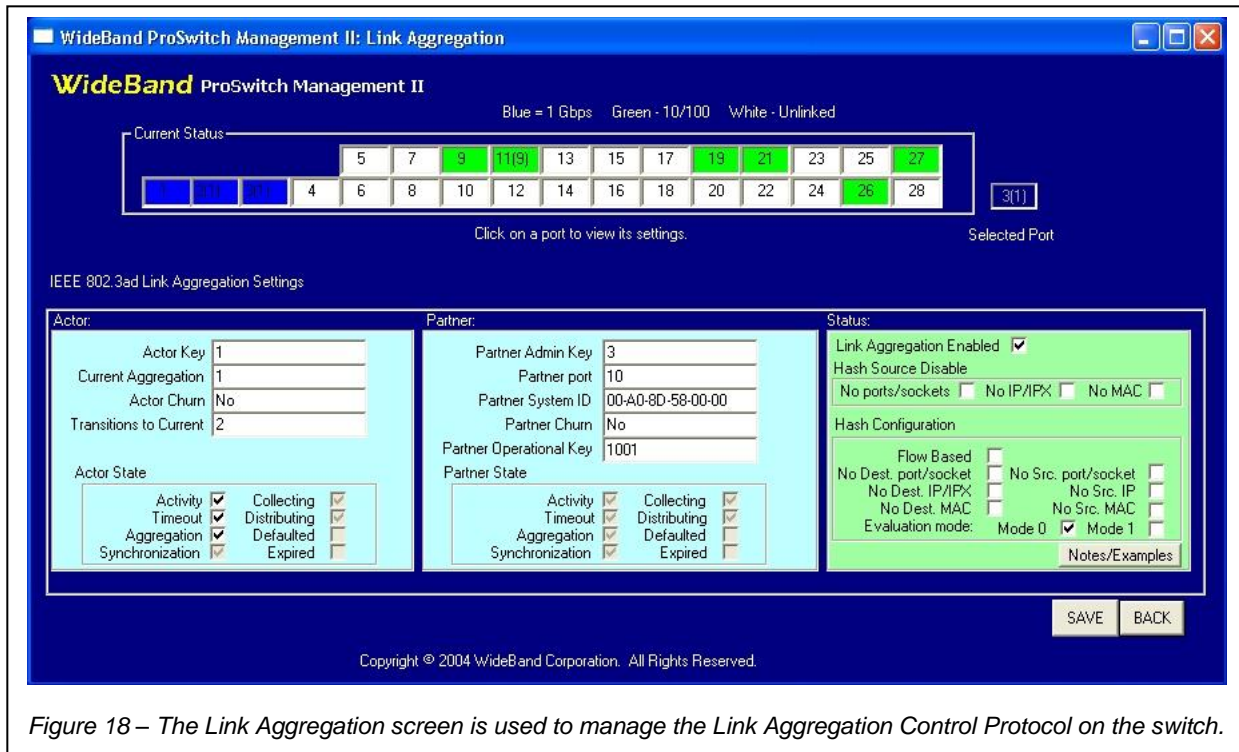
Figure 18 – The Link Aggregation screen is used to manage the Link Aggregation Control Protocol on the switch.

When managing LACP keep in mind that the switch we are currently managing is referred to as the *Actor*, while the device at the other end of the aggregate is referred to as the *Partner*. This means that if we were to go manage the device on the other end, these names would reverse. The **Link Aggregation** screen, shown in Figure 18, has three boxes with different settings. The first two are the *Actor* and *Partner* boxes. These both relate to a single port on the switch, which can be selected by clicking on the port in the *Current Status* bar at the top of the screen. These boxes are described with more detail in the following tables:

Actor Box Data	
Field Name	**Description**
Actor Key	All ports in an aggregate must have the same Actor Key
Current Aggregation	The aggregate ID of which this port is currently a member of (The aggregate ID is the same as the lowest-numbered port in the aggregate)
Actor Churn	An Actor Churn occurs when the port's aggregation status fails to stabilize
Transitions to Current	The number of valid aggregations this port has had since power up
Actor State	This port's current Aggregation State (the Aggregation State is described with more detail in the *Aggregation State Bits* table)

Partner Box Data	
Field Name	**Description**
Partner Admin Key	The Key assigned to the Partner by management
Partner port	Port number on the Partner to which we are connected to
Partner System ID	Aggregation ID of the Partner (Based on the Partner's MAC address)
Partner Churn	A Partner Churn occurs when the Partner aggregation status fails to stabilize

Partner Operational Key	The Key which the Partner is currently using
Partner State	Partner's current Aggregation State (the Aggregation State is described with more detail in the *Aggregation State Bits* table)

Aggregation State Bits		
Bit Name	**Status**	**Description**
Activity (Actor)	True	Running in Active LACP mode (always sends LACPDUs)
	False	Running in Passive LACP mode (only sends LACPDUs when a Partner is detected)
Timeout (Actor)	True	Using Short Timeout (3 seconds)
	False	Using Long Timeout (90 seconds)
Aggregation (Actor)	True	This link is considered *Aggregatable* (ready to trunk)
	False	This link is considered *Individual* (will never join a trunk)
Synchronization	True	Link is in sync, and is a member of a valid aggregate
	False	Link is out of sync (reconfiguring aggregation)
Collecting	True	Traffic received on this link will be accepted
	False	Traffic from this link will be discarded
Distributing	True	This link is ready to send data
	False	This link is not yet ready to send data
Defaulted	True	No Partner is detected, so default values are in use
	False	A valid Partner is running on the other end of the link
Expired	True	Partner has not responded for *Timeout* time, and this link is getting ready to go to the default Partner values.
	False	A recent response from the Partner has been received

Note: All items in the tables above that are marked with green can be edited.

Aggregation Status at a Glance

A quick observation of the current Aggregation status can be made by looking at the *Current Status* bar at the top of the screen. Remember that every port is always a member of some aggregate. The aggregate ID is the same as the lowest port in the aggregate. By default, every aggregate only has one port, which is the same as the aggregate ID. If a port's aggregate ID is not the same as the port number, then the port is joined with at least one other port. When this is the case, the aggregate ID is shown in the *Current Status* bar within parentheses next to the port number. For example, in Figure 18, ports 2 and 3 are both aggregated with port 1. This is shown by the "(1)" following the port numbers.

Link Aggregation's Effect on Other Management Features

When multiple ports aggregate together, they act as one link. This means that, for some features, they must only use the configuration values of one port. The configuration data for the lowest port in the aggregate is always used. One example of this is with Loop Resolution. When Spanning Tree is enabled on a multiple link aggregate, all but the lowest link will always stay in the Disabled state. This is simply because these ports share the port status of the lowest port in the aggregate. This applies to the following management features:

- VLAN Management

- Port Mirroring
- Address Tables
- Multicast Tables
- Loop Resolution

Features such as Port Information and Port Statistics are independent of the aggregation configuration.

Configuring Aggregates Manually

Some networking equipment does not support LACP. If you wish to connect such a device with an aggregated link to a WideBand Professional Series Switch, the aggregate must be set up manually. First, make sure Link Aggregation is enabled. Then change the *Partner Admin Key* of each port you would like in the aggregate to the port number of the lowest port in the aggregate. Don't forget to save all of the changes. Make sure the other device is configured correctly, and you should be ready to connect the wires.

Hash Configurations

For multiple port aggregates, a hash is used to determine the port on which each packet is to be sent. Normally, the default hash configuration will work fine, but the WideBand Professional Series Switches allow extensive hash management control. In some cases, changes to the hash can evenly distribute the traffic load on the aggregated links, greatly improving performance. All of the hash configuration fields can be found in the *Status* box to the right of the screen, and are shown in the table below (also refer to *Notes/Examples* screen):

Hash Configuration Settings	
Field Name	**Description**
No ports/sockets	Disables the use of MAC addresses
No IP/IPX	Disables the use of IP/IPX addresses
No MAC	Disables the use of IP-TCP/UDP ports of IPX-Sockets
Flow Based	Makes the flow always pass on the same link in both directions
No Dest. port/socket	Disables IP-TCP/UDP destination Port/Socket in hashing function
No Dest. IP/IPX	Disables destination IP/IPX address in hashing function
No Dest. MAC	Disables destination MAC address in hashing function
No Src. Port/socket	Disables IP-TCP/UDP source Port/Socket in hashing function
No Src. IP	Disables source IP address in hashing function
No Src. MAC	Disables source MAC address in hashing function
Evaluation Mode	*Mode 0:* Uses the lower 9 bits of the different addresses and data
	Mode 1: Polynomial mode. All bits are used for hashing

Layer 3 Routing

The Internet Protocol (IP) has become the dominant data carrier protocol on most Ethernet networks. In order for IP to run on Ethernet some supporting L2 protocols are needed. One example is the Address Resolution Protocol (ARP). ARP is used to learn what Ethernet MAC address should be used with a given IP address. On large networks such L2 traffic can use up a substantial percentage of the total bandwidth. This being the case, large Ethernet networks can

see considerable improvement from being broken into multiple segments. This can be done using multiple VLANs and a Layer 3 Wideband Professional Series Switch.

Each VLAN can be connected to a virtual router port via a VLAN IP address, which can be used as a gateway to any other VLAN on the network. Up to 64 virtual router ports can be created per a switch. The Layer 3 WideBand Professional Series Switches also support static routes, which can be added to support communication across multiple router hops.

It is important to remember that even though VLANs must be used to separate the IP subnets, the VLAN settings are not always required anywhere outside of the L3 switch. By using untagged packets and port-based VLANs, each physical port on the L3 switch can act as a physical router port, while, on the other hand, a more advanced VLAN configuration could be set up, along with tagged packets, to have multiple IP subnets connected on the same physical port of the L3 switch. Refer to the VLANs section of this manual for more information on configuring VLANs.
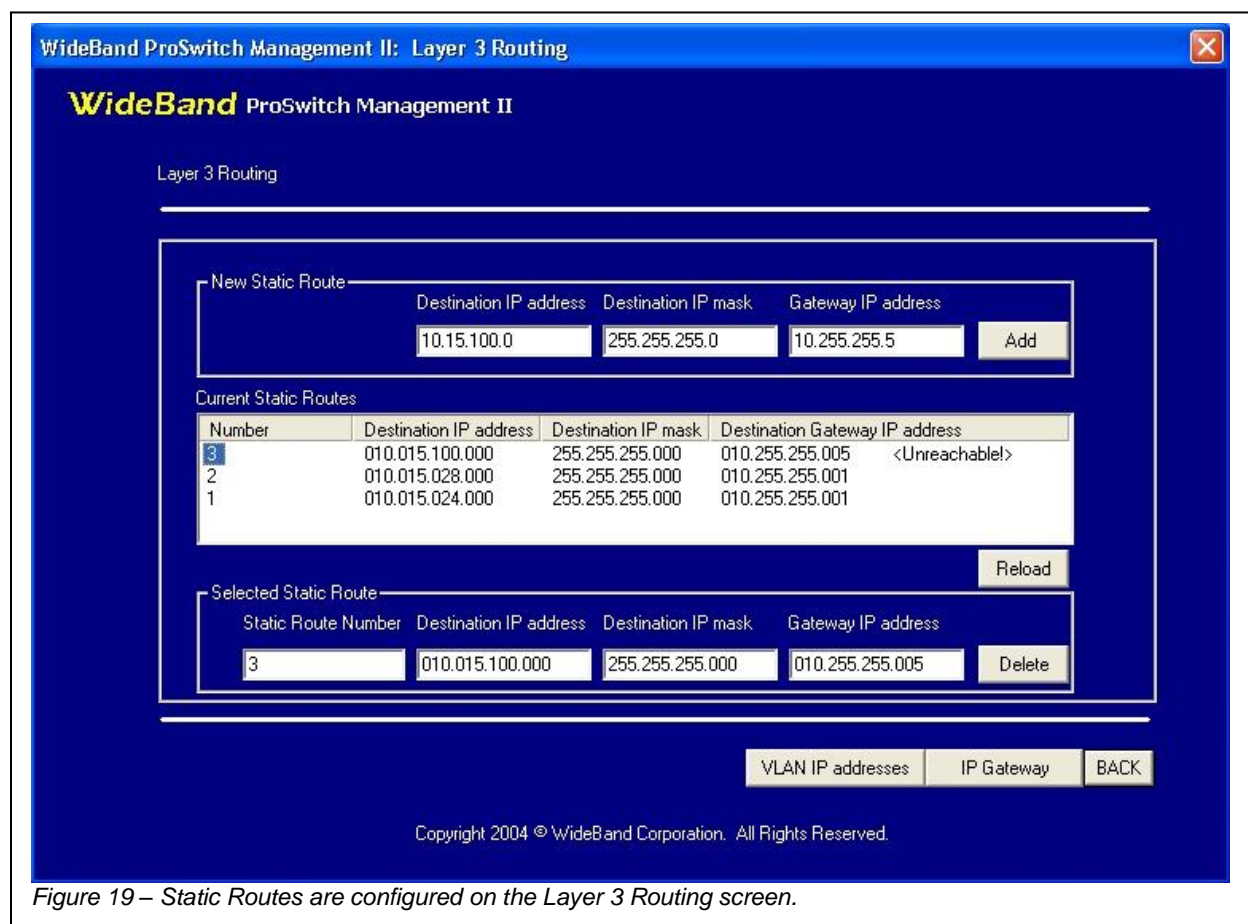
Figure 19 – Static Routes are configured on the Layer 3 Routing screen.

Assigning VLAN IP Addresses

Up to 64 VLANs can be assigned a VLAN IP address. The assigned VLAN IP address will be used as the selected VLAN's gateway to other VLANs. To access the **VLAN IP addresses** screen, click on the *VLAN IP addresses* button located on the **Layer 3 Routing** screen. Here, all of the VLANs that are currently configured on the switch can be found in the *VLAN number* drop down list. After selecting a VLAN, you will be able to modify its IP address and mask. Make

sure the IP address you enter is within the IP subnet you are assigning to the VLAN. Pressing the *Save VLAN IP* button will make the modifications take effect.

VLAN IP addresses can be removed by pressing either the *Clear VLAN IP* button to clear the currently selected VLAN IP address, or the *Clear All IP addresses* button to clear all VLAN IP addresses on the switch.

Note: Some VLAN IP address functionality requires that the Switch IP Address be enabled. This can be done on the **Management Control Screen** (See **Assigning An IP Address** section).

Setting a Gateway For The Switch

A gateway for the switch can be entered on the **IP Gateway** screen. This gateway is where the switch will send all traffic that is addressed to an unrecognized IP subnet. This would normally be the address of an Internet gateway on the network. If this is the case, it is important to remember that since the traffic is hopping from one router to another, a static route must be set up in the router that is acting as the Internet gateway. This is needed so the router will know what IP networks to forward to the L3 switch.

Managing Static Routes

Before adding any static routes, make sure you have every VLAN IP address entered correctly. The VLAN IP addresses are used to locate the Destination Gateway for each route.

Adding a static route to the switch can be done by simply entering the *Destination IP address*, *Destination IP mask*, and *Gateway IP address* of the route in the edit boxes above the static route list. Hit the *Add* button to activate the route.

The current status of the static route table can be loaded by pressing the *Reload* button located right under the route list. When the switch is currently unable to find a Destination Gateway, the route it is for will be marked as *<Unreachable!>*.
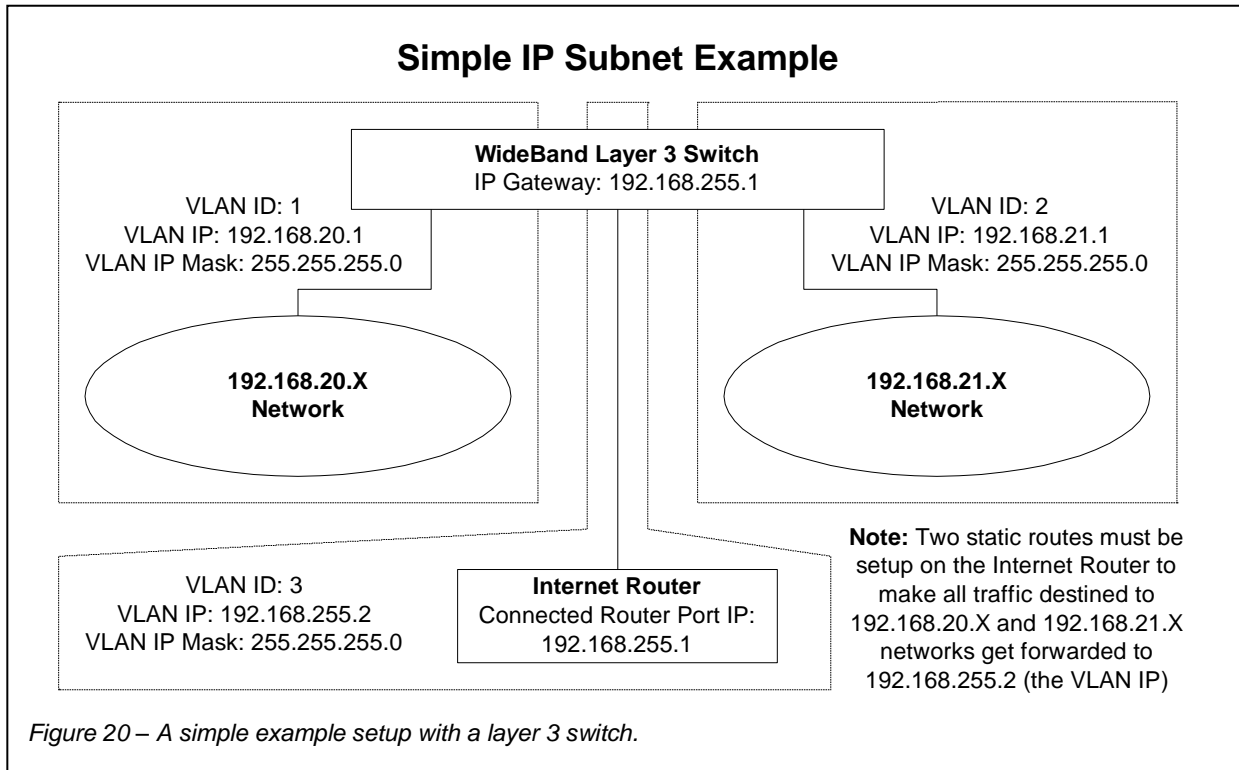
To delete a route click on the route number of the route you wish to remove. This should make the route appear in the text boxes under the route list. Complete the removal by hitting the *Delete* button.

Routing Example

There are two common IP address ranges that are set apart for use in private networks. First is 10.0.0.0 with a mask of 255.0.0.0, and second is 192.168.0.0 with a mask of 255.255.0.0. These ranges can be divided in any way on a private network, but should never appear out on the Internet.

In our example we have two class C IP networks, 192.168.20.X, and 192.168.21.X. Since they are class C, the mask for both IP networks will be 255.255.255.0.

We have assigned a VLAN for both IP networks, and given those VLANs each a VLAN IP address. The workstations on the 20.X network will use 192.168.20.1 as their gateway. While the workstations on the 21.X network will use 192.168.21.1 for their gateway. With that done the two IP networks should be able to ping each other through the L3 switch.

Simple IP Subnet Example

WideBand Layer 3 Switch
IP Gateway: 192.168.255.1

VLAN ID: 1
VLAN IP: 192.168.20.1
VLAN IP Mask: 255.255.255.0

VLAN ID: 2
VLAN IP: 192.168.21.1
VLAN IP Mask: 255.255.255.0

192.168.20.X
Network

192.168.21.X
Network

VLAN ID: 3
VLAN IP: 192.168.255.2
VLAN IP Mask: 255.255.255.0

Internet Router
Connected Router Port IP:
192.168.255.1

Note: Two static routes must be setup on the Internet Router to make all traffic destined to 192.168.20.X and 192.168.21.X networks get forwarded to 192.168.255.2 (the VLAN IP)

Figure 20 – A simple example setup with a layer 3 switch.

We have also added a third class C network for an Internet Router (192.168.255.X). The IP Gateway of the WideBand Professional Series Switch can be set to this router (192.168.255.1) for all Internet communication. It is also very important that static routes for the 20.X and 21.X networks be configured on the Internet router with the WideBand Switch as their Gateway (192.168.255.2 in this case). That way the Internet Router will be able to pass data through the WideBand L3 Switch to the appropriate IP network.

VLAN ID 3 could also connect to other WideBand Layer 3 Switches (not drawn) controlling different sub-networks. It is the job of the static routes in the Internet Router to tell which L3 Switch the incoming Internet traffic should go to. This means that other static routes may be needed to forward the Internet traffic to multiple WideBand L3 Switches. Furthermore, if sub-networks on different L3 Switches are to communicate with each other, routes must be added to each L3 Switch to forward the traffic correctly from a sub-network on one L3 Switch to a sub-network on another. Often, a WideBand NMU will control the route tables on the Wideband Professional Series Switches automatically.

In this example we are assuming that the Internet Router will be performing IP masquerading to prevent our private IP addresses from going out on the Internet. Also, a firewall is recommended for security reasons.

Management Configuration Templates

The WideBand Network Management System allows for a wide variety of settings. The **Management Configuration Templates** screen (See Figure 21) allows a "setting scheme" to be captured as a "Template" for ease of duplication, for backup, or for changing between setting schemes rapidly.

The settings saved in a Template include the settings from the **Port Information** screen and from the three VLAN screens: **VLAN Rules Indices**, **VLAN Assignments** and **VLAN Members**.
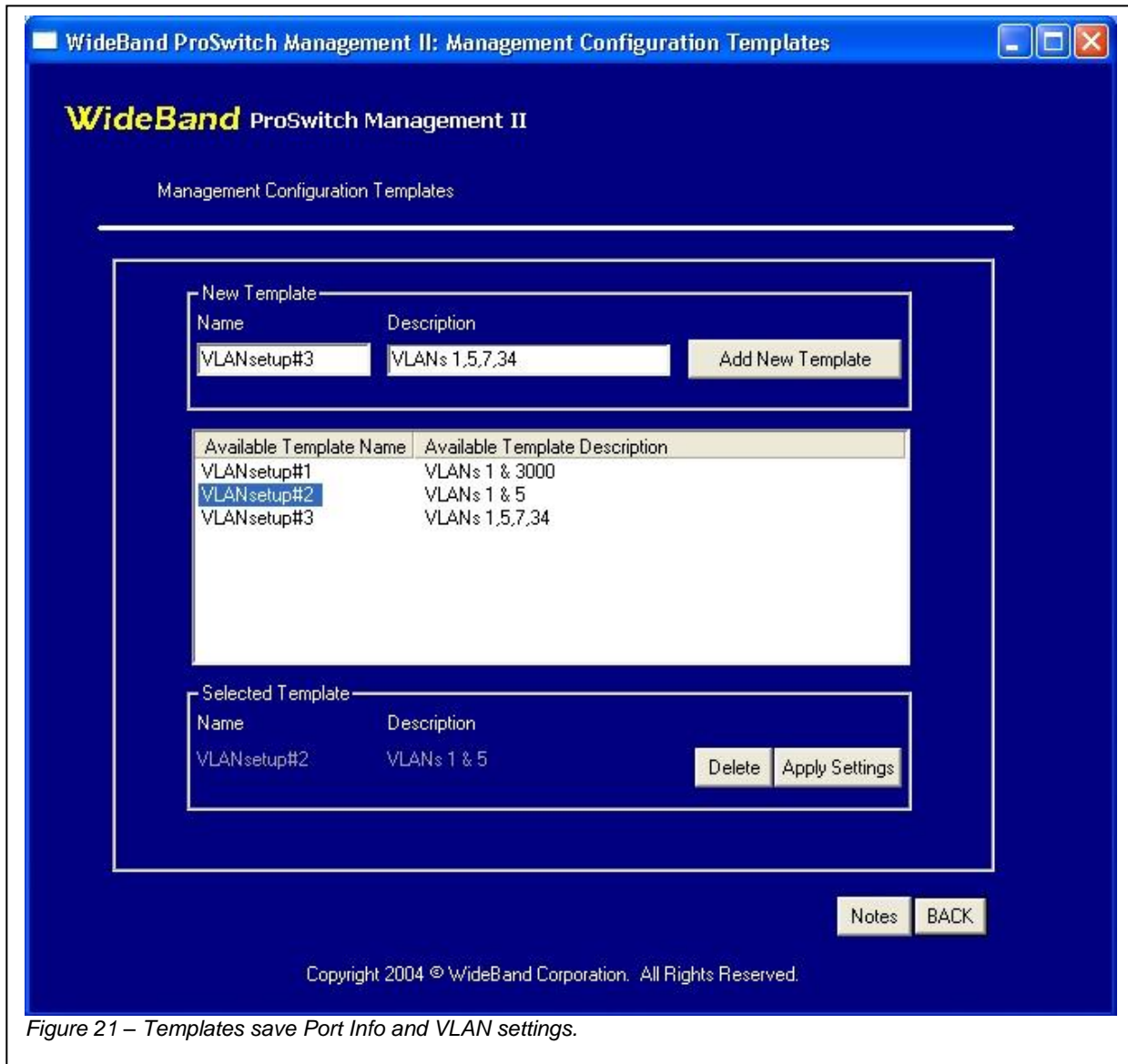

Figure 21 – Templates save Port Info and VLAN settings.

If a Template has been applied to the switch, the Template name will appear on the **Switch Summary and Menu** screen under "*Management Template.*"

The following table lists the buttons on the **Templates** screen and describes their functions:

Buttons Found on Templates Screen	
Button	**Function**
Add New Template	Select this button after a valid Name and Description have been entered for a new Template. The Template will be created with the current settings of the selected switch.
Delete	Clicking on this button will delete the currently selected Template

	from the Template database.
Apply Settings	This will apply the selected Template to the switch being managed.

So, to create a new Template, make sure the settings on the **Port Information** and/or **VLAN** screens are what you want in the new Template. Then go to the **Templates** page, enter a name for your new Template in the *Add New Template Name* field and a description in the *Add New Template Description* field, and click on *Add New Template* button. The name of the new Template will appear in the list of *Available Templates*, and this Template will contain the current settings of the selected switch.

If you wish to make a switch use this Template, go to the **Find Switches** screen and select the switch, then return to the Templates Screen, click on the Template name to select it, then click on *Apply Settings* button. This will load the settings defined in this Template onto the switch.

FIBER INFORMATION

The WideBand Professional Series 8+8 Gigabit and 24+2+2 Switches provide high-performance, long-distance fiber networking options combined with WideBand's high-performance 10/100/1000BASE-T copper solution for a cost effective way to achieve maximum performance. This is achieved with slots for Small Form-factor (SFP) mini-GBIC's, 1000BASE-SX or 10000BASE-LX modules.

Optional Fiber Modules

1000BASE-SX Mini-GBIC

The WB1MGBICPRO-SX transceiver is a cost effective, gigabit serial optical transceiver that is compliant with the Gigabit Ethernet 1000BASE-SX standards. This transceiver features a highly reliable, 850 nm, high-speed, oxide VCSEL Laser, coupled to an LC optical connector. This transceiver meets Class 1 laser eye safety requirements. It provides GBIC functionality in half the width. The transceiver complies with the new Small Form Factor Pluggable Multisource Agreement (SFP-MSA).

Figure 22 – WB1MGBICPRO-SX

1000BASE-LS Mini-GBIC

The WB1MGBICPRO-LS long wavelength transceiver also complies with SFP-MSA, and satisfies eye safety requirements of CDRG and IEC. The module design allows for excellent latching performance in high-density port configurations.

Both of WideBand's Mini-GBIC Fiber Modules are compliant with industry-wide physical and optical specifications, provide high reliability, enable higher port densities, and provide in-house precision alignment.

Figure 23 – WB1MGBICPRO-LX

Applications include:
- Extended reach
- High-speed storage area networks
- Switch and hub interconnect
- Mass storage systems interconnect
- Host adapter interconnect
- Computer cluster cross-connect
- Custom high-speed data pipes

These modules provide state-of-the-art features:

- Compliant with SFP-MSA specifications
- Hot pluggable
- Less than 700 mW power consumption

- 0ºC to 70ºC operating range
- Single +3.3 V power supply
- Bit error rate of less than $1x10^{-12}$
- OC transmit disable, loss of signal, and transmitter fault functions
- Serial ID functionality
- CDRG and IEC 60825-1 Class 1 laser eye safe
- FCC Class B compliant
- FSD Class 2 per MIL-STD 883 Method 3045
- UL-94 V-0 certified
- Internal AC coupling on both transmit and receive data signals
- Full die cast housing for superior EMI performance
- SX utilizes a high reliability, high-speed, 850 nm, oxide VCSEL
- SX is 802.3z 1000BASE-SX compliant
- LX utilizes a 1310 nm, high-reliability, high-speed, uncooled Fabry-Perot laser
- LX is compliant with single mode 802.3z 1000BASE-LSE (extended reach)

Cable Types

SX   Up to 860 m enhanced bandwidth 50/125 µm multimode fiber at 1.062 and 1.25 Gbps
       Up to 300 m on enhanced bandwidth 62.5/125 µm multimode fiber at 1.0625 Gbps
LX   Up to 10km on 9µM single mode fiber

Installing a Fiber Module

To Install a Fiber Module, simply push the Module into the port until you feel it lock into place. It is immediately ready to accept a fiber cable terminated with a mini-GBIC connector. To remove the Module, lift up on the small bar that protrudes from the top of the Module, and pull it out.

Connecting the Mini-GBIC

Similarly, the mini-GBIC connector on the fiber cable snaps into place in the Fiber Module. Release its tab to remove the cable.

Model Number	Power Specification
WideBand Switches (except WB28GMPRO)	115V/230V~, 50Hz-60Hz
WB28GMPRO	115V/230V~, 47Hz-63Hz, 8A/4A

Installation

WideBand switches have no serviceable parts inside.

This equipment must be connected to a controlled power circuit offering short-circuit and Overcurrent protection.

Electromagnetic Compatibility

WideBand switches are certified with the following standards:
- FCC/ CISPR Class A
  - o Note: This equipment has been tested and found to comply with the limits for a Class A 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 commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at this own expense.
  - o Any changes or modifications made by the user, which are not expressly approved by WideBand Corporation for compliance could void the user's authority to operate the equipment.
- CE Mark
  - o EN55022: 1998
  - o EN55024: 1998
- IEC 60950-1

Contact Customer Service

If you have questions or problems with your WideBand Professional Series Switch, you have the following options:

Web Page Support
The WideBand Web Page offers on-line support 24/7. Go to http://www.wband.com and click on "*Support.*" Installation information, known issues, support pages, helpful downloads, and more are available at any time.

e-mail Support
E-mail our Customer Service department at techsupport@wband.com. E-mail assistance is available during our regular Customer Service hours.

Telephone Support
Call our toll-free Customer Service line at (888) 220-4020. The Customer Service Department is open during these hours:

Monday – Thursday   7:00 am – 7:00 pm

Friday   7:00 am – 5:00 pm

All times listed are in the Central Time Zone.

WideBand Corporation   401 West Grand, Gallatin, MO 64640 (660) 663-3000 http://www.wband.com