WATERS NETWORK SYSTEMS™

INSTALLATION GUIDE AND
OPERATING MANUAL

ProSwitch®-SecureAir+

Wireless Access and Hard Wired Combined

Dual Band Wireless Access and 10/100Mbps Ethernet Switching

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1.0   Specifications

OPERATIONAL CHARACTERISTICS:

MAC Address Table: 4K
Switching Mode: Store-and-forward
Memory Buffer Size: 256KB

MANAGEMENT OPTIONS:

- ❏   Web-based Telnet and Console access to software
- ❏   Air+ Security SchedulerTM
- ❏   SNMP
- ❏   MIB-II (RFC 1213)
- ❏   Bridge MIB (RFC 1493)
- ❏   Port setting control
- ❏   QoS
- ❏   Password security
- ❏   Spanning tree protocol
- ❏   Port-based VLANs
- ❏   BootP/DHCP

LED INDICATORS:

Power
- ❏   On: Power to the switch
- ❏   On: Link to AP
Per Port LEDs:
- ❏   On: 100Mbps
- ❏   Off: 10Mbps with LINK on
- ❏   Link/Act: Steady ON for LINK with no traffic, blinking for Activity
Full/Half Duplex
- ❏   On: Full duplex mode
- ❏   Off: Half-duplex mode or no device attached
LED INDICATORS: WIRELESS AP
Power
- ❏   On: Power to the AP
- ❏   On: Local network at 10Mbps
- ❏   On: Local network at 100Mbps
- ❏   On/blinking: Wireless at 802.11a
- ❏   On/blinking: Wireless at 802.11b

NETWORK STANDARDS:

- ❏   IEEE 802.3 10BASE-T Ethernet
- ❏   IEEE 802.3u 100BASE-TX/FX Fast   Ethernet
- ❏   IEEE 802.3 Flow Control
- ❏   IEEE 802.1p QoS
- ❏   IEEE 802.1d Spanning Tree

WIRELESS SPECIFICATIONS
IEEE 802.11a
- ❏   Data Rates: 6, 9, 12, 18, 24, 36, 48, 54 and 72Mbps
- ❏   Frequency Range: 5.150 - 5.350GHz
- ❏   Data Security: 64, 128, 152-bit WEP
- ❏   Operating Range: Indoor only 150 feet (46 meters)

<u>IEEE 802.11b</u>
- ❑ Data Rates: 1, 2, 5.5, 11, and 22Mbps
- ❑ Frequency Range: 2.4 - 2.462GHz
- ❑ Data Security: 64, 128, 256-bit WEP
- ❑ Operating Range: Indoor up to 328 feet (100 meters)

EMI/SAFETY COMPLIANCE:
FCC Class A, UL 1950, CSA C22.2 No. 950, EN60950, CE: EN55022 Class A, EN55024

FIBER PORT CHARACTERISTICS:
- ❑ Multimode with SC or ST Connectors
- ❑ Singlemode with SC Connectors
- ❑ Speed: 100BASE-FX
- ❑ Wavelength: 1300nm
- ❑ Maximum distance for multimode: 2km
- ❑ Fiber size: 62.5/125, 50/125
- ❑ Maximum distance for singlemode: 20km
- ❑ Fiber size: 9/1.25

NETWORK CABLE CONNECTORS:
RJ45 shielded female ports
- ❑ 100Mbps: CAT5 UTP or better

MANAGEMENT CONSOLE CABLE CONNECTOR:
- ❑ DB9 male, accepts industry standard null-modem cable

POWER SUPPLY:
Input Voltage
- ❑ 110 to 240 VAC,   50 to 60Hz
Power Consumption
- ❑ 17 Watts maximum

OPERATING ENVIRONMENT:
Ambient Temperature:
- ❑ 23° to 131°F (-5° to 55°C)
Storage:
- ❑ -13° to 158°F (-25°to 70°C)
Ambient relative humidity:
- ❑ 10% to 90% (non-condensing)

MECHANICAL:
Enclosure:
- ❑ Rugged high-strength sheet metal suitable for stand-alone, wall or tabletop mounting
- ❑ Cooling Method: Fan cooled

PHYSICAL CHARACTERISTICS:
Dimensions:
- ❑ 16.0 x 11.0 x 2.0 in (40.6 x 27.9 x 5.1 cm)
Weight:
- ❑ 4.6 lbs

WARRANTY:
- ❑ Limited Lifetime Made in U.S.A.

2.0   Package Contents - ProSwitch®- Secure Air⁺

❑   ProSwitch®- Secure Air+

❑   Power Cord

2.1   Product Description

Waters' ProSwitch®-Secure Air+ switches provide the ultimate in flexibility by combining wireless access with six wired switch ports. The Air+ has six 10/100Mbps switch ports, an uplink in either fiber or copper for wiring closet connectivity and dual band wireless access. The Air+ is fully compatible with both 802.11a and 802.11b, so wireless connection can be made at speeds of 11 and 54Mbps.

Designed for use in workgroups, classrooms, remote offices and network traffic centers, the Secure Air+ switches are easy to install and use. Setup of the wireless access point on your Air+ will be explained in this manual.

Models

MWS1007-RJ45   7-port managed switch with 6 switched 10/100Base-TX RJ45 ports plus 1-port 10/100Base-TX and internal 2.4GHz and 5GHz dual band wireless access points

MWS1007-MSC   7-port managed switch with 6 switched 10/100Base-TX RJ45 ports, plus 1-port 100Base-FX multimode fiber with SC connector internal 2.4GHz and 5GHz dual band wireless access points

MWS1007-MST   7-port managed switch with 6 switched 10/100Base-TX RJ45 ports, plus 1-port 100Base-FX multimode fiber with ST connector and internal 2.4GHz and 5GHz dual band wireless access points

MWS1007-SSC   7-port managed switch with 6 switched 10/100Base-TX RJ45 ports, plus 1-port 100Base-FX singlemode fiber with SC connector and internal 2.4GHz and 5GHz dual band wireless access points

2.2   Uplink Port

The uplink port of your Air+ will be either fiber (multimode or singlemode) or copper. The 100Mbps fiber uplink port is factory set to operate in full-duplex mode for best fiber distance and performance. The copper uplink port is auto-negotiating (as a default setting), for operation at 10 or 100Mbps in full- or half-duplex mode. It will move to half-duplex mode at 10 Mbps or at 100Mbps speed if the device at the other end of the twisted pair cable is half-duplex or is not an auto-negotiating device.

2.3   Management Features

The Air+ comes with licensed management software which allows you to configure the switch to meet your requirements. Management functions can be accessed either by console connection or Telnet. These functions will be discussed later in the manual.

3.0   Installation of the Air+

This section provides instructions for installing the Air⁺.

3.1   Location of the Air+

The location of the Air+ is dependent on the physical layout of the network. The switch can be placed in a central wiring location or a workgroup area where groups of network devices require network connection.   The rugged housing of the Air+ protects the electronics from environmental conditions and limits tampering. For power, locate an AC receptacle that is within six feet (2 meters) of the location of the switch. Maintain an open view of the front to visually monitor the status LEDs. Keep an open area

around the unit so that cooling can occur while the unit is in operation.

3.2   Connecting the Air+

The uplink port of the Air+ can be connected to the following: 100Base-FX fiber cable (singlemode or multimode), 10Base-T or 100Base-TX copper cables. CAT5 or higher should be used when making 100Base-TX connections. When ports are used as 10Base-T ports, CAT3 may be used. For fiber ports at multimode 100Base-FX, 50/125 or 62.5/125 micron cabling may be used. The following media types are supported along with the corresponding IEEE 802.3 and 802.3u standards:

Fiber:

IEEE Standard	Media Type	Max. Distance	Connector Type
100Base-FX	multimode fiber	2km (6,562 ft)	SC, ST or MTRJ
100Base-FX	singlemode fiber	20km (65,620 ft)	SC

Copper:

10Base-T	CAT3, 4 or 5	100m (328 ft)	RJ45
100Base-TX	CAT5 or 5E	100m (328 ft)	RJ45

3.3   Mounting the Air+

The enclosed compact housing makes it ideal to mount the Air+ on the wall or on a desktop in an office, classroom or lab area. Locate an AC receptacle that is within six feet of the intended switch location. Maintain an open view of the top of the switch so the LEDs will be visible. Allow enough ventilation space between the switch and surrounding objects.

3.4   Connection to NICs Which Support Auto-Negotiation

The copper ports of the Air+ will function properly with NICs which support auto-negotiation and the Fast Link Pulse (FLP) coding for the 100Base-TX signaling system. When connecting a NIC to the Air+, it may be necessary to reload the NIC drivers on the user device if the NIC has been communicating with a protocol other than 100Base-TX (such as 10Base-T). When 100Mbps speed is agreed and in use, the 10/100 LED is steady ON. It is OFF if there is no traffic or if 10Mbps traffic is present.

4.0   Operation of the Air+

4.1   Dual –Speed Functionality and Switching

Depending on the model of Air+ that you have purchased, the Air+ provides either seven 10/100 RJ45 switched ports or six 10/100 RJ45 switched ports with one fiber 100Mbps switched port. Both models have an internal connection to a wireless transmitter. We will discuss use of the wireless transmitter in this manual in another section.

Since the RJ45 ports are equipped with auto-negotiation capability, the architecture of the switch supports a dual speed switching environment. The switched RJ45 ports are full and half duplex and auto-sensing for speed. When the connected device is 10Mbps, the Air+ will obey all rules of 10Mbps Ethernet configurations. The 10Mbps users share a 10Mbps traffic domain, but can also communicate with 100Mbps users as well as 100Mbps domain.

The Air+ switches are plug-and-play devices. There is no software configuration to be done at installation or for maintenance. However, there are software features available for customization of your switch. Software settings will be discussed in another section. The half and full duplex mode for the RJ45 switch ports are user dependent and changes to full or half duplex are made as the unit attaches to these ports. You can use the management software to hard set speed or duplex mode.

4.2   Switching, Filtering and Forwarding

Each time a packet arrives on one of the switched ports, the decision is made to either filter or to forward the packet. Packets whose source and destination addresses are on the same port segment will be filters, constraining them to one port and relieving the rest of the network from processing them. A packet whose destination address is on another port segment will be forwarded to the appropriate port and will not be sent to the other ports where it is not required. Packets required for maintaining the operation of the network (such as occasional multi-cast packets) are forwarded to all ports.

The Air+ operates in the store-and-forward switching mode which eliminates bad packets and enables peak performance to be achieved when there is heavy traffic on the network.

4.3   Switching and Address Learning

The Air+ units have an address table of 4K node addresses and are suitable for use in large networks. They are self-learning, so that as nodes are added or removed or moved from one segment to another, the Air+ automatically keeps up with node locations. An address-aging algorithm causes least-used addresses to fall out in favor of new frequently-used addresses. To reset the address buffer, cycle power down and up, or wait 3.5 minutes.

4.4   Auto-negotiation and Speed-sensing

All six RJ45 ports independently support auto-negotiation for speed in 10Base-T and 100Base-TX modes. Operation is according to IEEE 802.3u standards. When an RJ45 cable connection is made, and each time a LINK is enabled, auto-negotiation takes place. The Air+ advertises its capability for 10 or 100Mbps speed, and the device at the other end of the cable should similarly advertise / respond, then both sides will agree to the speed that will be used. Depending upon the device connected, this will result in agreement to operate at either 10Mbps or 100Mbps.

When the **LK/ACT** LED is ON, steady ON indicates LINK with no traffic, and blinking ON indicates the port is receiving. The port has auto-negotiated for operation. If a port is connected to a non-negotiating device, it will default to 10Mbps and half-duplex mode, per the IEEE 802.3u standard.

4.5   Status of Switch LEDs

LED	STATUS	CONDITION
Power	Green	Steady when power applied.
Self Test	All Flashing	Indicates the self-test at power up was successful.
Link / Act	ON	Port has established a valid link.
	Blinking	Port is transmitting and receiving.
	ON	The connection speed is 100Mbps.
	Off	The connection speed is 10Mbps.
FDX / Col	ON	The connection is Full Duplex.
	OFF	Half duplex and / or no Link.

4.6 Status of Wireless LEDs

LED	STATUS	CONDITION
Power	ON	Power to AP.
Self Test	All Flashing	Indicates the self-test at power up was successful.
Link / Act	OFF	Local to 10Mbps. (Disabled since internal connection is made at 100Mbps)
	ON	Local network hard set at 100Mbps.
	On/blinking	Wireless at 802.11a
	On/blinking	Wireless at 802.11b.

5.0 Using the Software

This section provides an overview for configuring the software for your Air+. By default, the switch does not have an assigned IP address, so all management access through the network is disabled. You must use the Console Management Interface (CMI) to set the IP address. Once the IP address has been set, you may then access the software functions via your network or Telnet.

Instructions for downloading future updates to this software will be provided in this section. Check the Waters' web site: http://www.watersnet.com/ for future software updates.

The management interface is accessible through a terminal attached to the serial port or through the Telnet protocol over the network. In either case, the user interface and the features are the same. Standards based Simple Network Management Protocol (SNMP) is available over the network. Appropriate client software is required to use this feature.

5.1 Using the Console Management Interface (CMI)

Equipment Required

- ❑ Null modem cable, 9 position D-Sub, female to female
- ❑ Computer with function RS-232C port (COMx)
- ❑ Terminal emulation program (HyperTerminal in Windows, Minicom in Linux or any other emulation software).

To use the Hyper Terminal Program with Windows, follow these instructions.

Hardware setup

1. Connect the console port on the switch to the COM port on the PC using a standard 9-pin console cable.

Software setup

1. Boot PC with MS Windows.

2. Load the **HyperTerminal** program from the Start menu. Select **Programs – Accessories – Communications – HyperTerminal**. (If you don't have the Terminal program, install it from your MS Windows installation disk.)

3. If the connection file has not been created, follow the instructions on the screen to create a new connection named "Air+" (or something similar).

4. Select the COM1 port in the **connect using** field.

5. Set COM port parameters:

6. "Bits per second: *38400*

7. Data Bits: *8*

8. Parity Check: *None*

9. Stop Bit: *1*

10. Flow Control: *None*.

11. Select OK.

12. Power on the switch and a login screen will be displayed on your screen.

Logging Into the Management Functions

Once a CMI session has begun, the login screen should be displayed. You will be required to enter a valid username and password combination to gain access to the menu functions through the CMI. The following are the two predefined user names and passwords created by default:

User name:	manager (allows all access to configuration options)	operator (allows read access only)
Password:	Manager	operator

You may change the user name and password to customize your system through the management software. Directions will be provided in another section to make these changes. User names and passwords are case sensitive. The default user names and passwords are in lower case letters.

Note: If you change the factory default password and lose that password, a utility must be executed in order to return the switch to a factory default password. The utility requires the MAC address of the switch. The MAC address can be obtained from the System Configuration menu on the switch or from the product information label on the switch. Document the MAC address of the switch for future use. Contact Waters' customer service if you require the factory default password. Contact information is Section 12 of this manual.

5.2 Using the Menus

To use the menus, simply enter the number of the menu. Make the appropriate changes. If you see the menu option, **Save Values and Reset Switch**, remember to select that option so the changes will be saved.

5.3   IP Address Configuration for Network Access

If you don't intend to use the management features of the Air+ over the network, no special configuration steps are necessary.   After login, you can navigate through the menu structure and access all management features available through the CMI. However, if you plan to use the management features through the network, you must first configure the IP Address and associated parameters in order to use the management functions.   The **Main Menu** has a variety of configurations that will be discussed in this section. To make a selection from the **Main Menu**, press the number of the menu option of your choice. Once you are in the submenu, follow the instructions on the screen to configure your switch. Once you have logged into the switch, the Main Menu will be displayed.
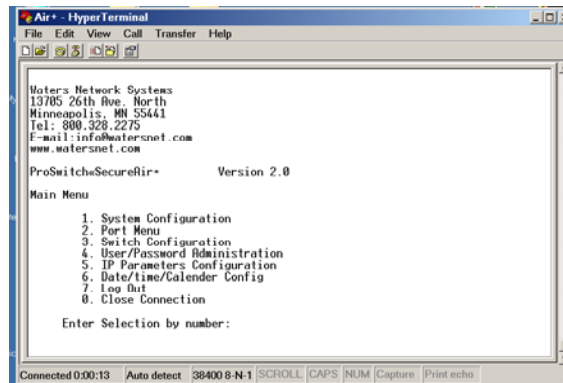
To enable the DHCP/Bootp function:

1.   Select **5 – IP Parameters Configuration** from the **Main Menu**.

2.   Select **1 – Enable/Disable DHCP/Bootp**. The DHCP function is disabled by default, so this change will enable the DHCP.

3.   Select **5 – Save Value and Reset Switch**.

4.   The switch will go through a reset sequence, (all LEDs flash during reset) and you will be returned to the login prompt.

5.   Login again and return to the **IP Configuration Menu**. Make a note of the IP Address in use. This will be required to access the switch from the network.

Note: If Spanning Tree Protocol is enabled, the DHCP system will wait until the initial configuration of the Spanning Tree is complete before attempting to get an IP Address from the DHCP Service. The Login screen will alert on this status. Wait until the alert goes away to look for the IP address (approximately 30 to 60 seconds). If the DHCP Server lease to the IP Address could not be renewed after the expiration time, the system will disable the DHCP protocol and disable network access. No attempt will be made to look for DHCP servers after the expiration time. You will have to reset the switch in order to restart the DHCP discovery.

5.4   IP Address Configuration

The **IP Address Configuration Menu** allows the user to configure the network address of the switch. This is required to enable network access to the device. The values are entered in normal IP dotted quad notation. Null IP Address (0.0.0.0) cannot be entered as a value. The entered values do not take effect until the values are saved and the switch reset by menu selection **5**. You can discard the values by choosing **0**.

Note: If you are accessing the CMI through the network, and if the IP Address is changed, your connection will be terminated and you will have to initiate another telnet session to the new IP Address.

5.5 IP Address and Subnet Mask

By default, the switch is set to manual IP addressing. To input the manual IP address, use the CMI to configure the initial IP values. If you want to automatically configure the IP, enable the DHCP/Bootp server and ensure that the correct information to support the switch has been set. The IP will configure automatically.

5.6 Default Gateway Operation

The default gateway is required for tasks such as reaching off-subnet destinations or forwarding traffic across multiple VLANs. The gateway value is the IP address of the next-hop gateway node for the switch, which is used if the requested destination address is not on a local subnet/VLAN. If the switch does not have a manually-configured default gateway and DHCP/Bootp is configured, then the default gateway value provided by the DHCP or Bootp server will be used. If the switch has a manually configured default gateway, then the switch uses this gateway.

5.7 Configuring IP Address, Gateway, DHCP

One of the following tasks should be completed to configure these settings:

❑ To manually enter an IP address and subnet mask, set the IP Configuration parameter to Manual and manually enter the IP address and subnet mask values you want for the switch.

❑ To use DHCP or Bootp, Enable it by choosing option 1, then **restart** the switch. The Air+ will secure an IP address from the DHCP server.

If you are not using DHCP, you will have to configure the IP Address manually. Use the following procedure to configure the IP Address Parameters manually.

1. Select **5 – IP Parameters Configuration** from the **Main Menu**.

2. Select **2 – IP Address**. Enter the IP Address in the dotted quad format (ex. 192.168.1.1). The displayed IP Address will immediately change to the new value. However, the network stack will not use the new IP Address until the changes are saved and the switch is reset.

3. Select **3 – Netmask**. Enter the Netmask.

4. Select **4 – Default Gateway**. Enter a default gateway if you will be accessing the switch from another network through a gateway.

5. Select **5 – Save Values and Reset Switch**. This must be done to save changes.

Note: It is a good idea to return to the IP Configuration screen to confirm that the parameters are correct and the IP Address in use is the same as the IP Address you have configured. *Please make a note of the IP Address for future use*.

If DHCP is Enabled, the switch will first try to obtain an IP Address through DHCP. If the attempt is unsuccessful, the manually configured IP Address will be used. Disable DHCP if you only want to use the manually configured IP Address.

The Air+ is ready for use.

6.0 System Configuration Menu

The System Configuration Menu allows you to configure the system name, location and contact information. This information is used by the SNMP protocol to identify the managed device. It also allows the user to configure the community names to be used to access the SNMP agent. SNMP Traps can be configured by the Trap Configuration submenu. The resident software in the Air+ can be upgraded from this menu.

1. Select **1 – System Configuration Menu** from the Main Menu.

2. Select **1 – System Name**. Enter the system name.

3. Select **2 – System Location**. Enter the system location.

4. Select **3 – System Contact**. Enter the system contact.

5. Select **0 – Exit This Menu**. Changes will be saved.

This information will be reported in the management information base of SNMP. If required, community names (like passwords) to be used for accessing management through SNMP can also be modified at this time.

6.1   SNMP

You can manage the switch via SNMP from a network management station. For this purpose, Waters recommends SNMPc, (from Castle Rock Computing, www.castlerock.com) which is an easy-to-use network management platform that runs on Windows based PCs. It uses the SNMP agent statistical sampling software that is included in the switch to provide powerful, but easy-to-use traffic monitoring and network activity analysis tools.

The BitView and HubView of the Air+ can be seen through a third party SNMP management package program. BitView displays a bitmap image that matches the faceplate of the device, whereas HubView is a more generic view that shows the layout of the device, but always uses the same picture elements. BitView is functionally similar to HubView, but displays a more realistic image of supported devices.

Generally, all the LEDs and other graphical elements available on the device front panel can be displayed with BitView. As with HubView, you can select a device slot or port, and then a menu to operate on the selected item.

7.0   Upgrading the Air+ Software

As updates are developed, the Air+ software can be upgraded in the field. The software will be available in the form of a binary file. It must be downloaded into the switch through the network connection through the CMI. Remember, in order to use the network connection, you must have the network parameters set up properly and telnet access enabled as described in another section. Check the Waters' web site: www.watersnet.com for future updates.

Upgrading the software will not affect the device configuration. The following are instructions for upgrading the software from the CMI.

1. Load the terminal emulation program.

2. Login into the switch.

3. Select **1 – System Configuration** from the **Main Menu**.

4. Select **8 – Upgrade Software (Serial/TFTP)**.

5. Press **Y** to confirm upgrade.

6. Select **Transfer – Send File (from the Terminal Emulation Menu Options listed at the top)**.

7. When the popup window is displayed, use the **Browse** button to locate the path to the MNS software upgrade file

8. Select the **XMODEM** protocol.

9. Click **Send**.

The download will begin. Once the download is complete, the switch will check the integrity and signature of the binary file. If it is found to be a certified Air+ binary file with no errors, it will be copied to flash memory. The system will reboot after a successful upgrade and will return to the Login prompt.

Note: Do not interrupt the switch or the PC during the download process. You can safely terminate the download process at any time, and the existing version of the software will continue to be used.

The following are instructions for upgrading the software through the network.

1. Use a Telnet client to connect to the switch. The IP Address of the switch is required to perform this function. The telnet session resembles the CMI session in all respects.

2. Login into the switch.

3. Select **1 – System Configuration** from the **Main Menu**.

4. Select **8 – Upgrade Software (Serial/TFTP)**.

5. Press **Y** to confirm upgrade.

6. The switch will promptly send the binary file through TFTP protocol. You will have to use the PUT method of TFTP protocol (on TFTP Client) to send the file to the switch.
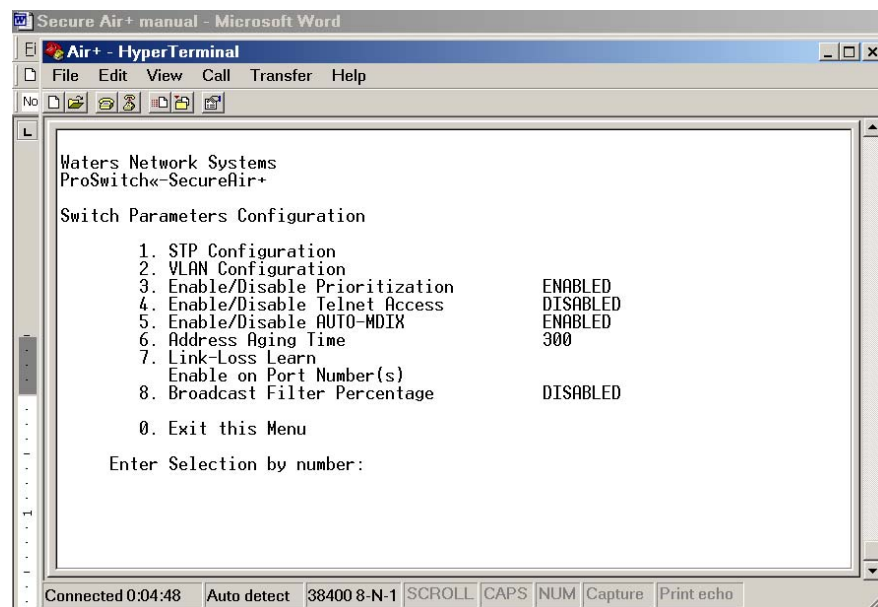
The download will begin. Once the download is complete, the switch will check the integrity and signature of the binary file. If it is found to be a certified Air+ binary file with no errors, it will be copied to flash memory. The system will reboot after a successful upgrade and will return to the Login prompt.

Note: Do not interrupt the switch or the PC during the download process. You can safely terminate the download process at any time, and the existing version of the software will continue to be used.

8.0   Switch Configuration Menu

The Switch Configuration Menu allows you to set various parameters associated with the switch engine. The Spanning Tree Protocol (STP) configuration and VLAN configuration are available through submenus in the **Switch Configuration Menu**.

The following displays the menu options available in the **Switch Configuration Menu**.

```
Waters Network Systems
ProSwitch«-SecureAir+

Switch Parameters Configuration

        1. STP Configuration
        2. VLAN Configuration
        3. Enable/Disable Prioritization        ENABLED
        4. Enable/Disable Telnet Access         DISABLED
        5. Enable/Disable AUTO-MDIX             ENABLED
        6. Address Aging Time                   300
        7. Link-Loss Learn
           Enable on Port Number(s)
        8. Broadcast Filter Percentage          DISABLED

        0. Exit this Menu

    Enter Selection by number:
```

The Air+ implements the Spanning Tree Protocol (STP) as defined in the IEEE 802.1d standard. STP ensures that only one network path is active between any two nodes. If more than one physical path exist between any two nodes, STP will ensure a single active path by blocking all redundant paths. More than one active path between nodes will result in loops. If a packet gets into the loop, it will pass around the loop infinitely, resulting in a "broadcast storm" which will bring the network down. STP is necessary in such situations to avoid loops.

When the switch is powered ON, all ports are set to a *disabled* state. The STP arrives at an active configuration by passing messages around the network. The configuration is continuously monitored and updated by passing messages. By default, STP (if enabled) will take 30 seconds to finish the initial configuration. The switch will not pass traffic during this time period.

8.1   VLAN Configuration

A VLAN is a group of ports designated by the switch as belonging to the same broadcast domain. That is,

all ports carrying traffic for a particular subnet address would normally belong to the same VLAN. The **VLAN Configuration Submenu** allows configuration of up to four port based Virtual LANs. When VLAN is enabled, a port can communicate with another port only if both are members of the same VLAN. The VLAN membership is entered as a string containing the port numbers that should be part of the VLAN. The system will scan the string and create a port map using the numbers found in the string. The map can be deleted by entering an empty string.

For example, if the string **13567** is used, ports 2, 4 and 8 have been deleted. All ports will return to normal mode of operation when the VLAN operation is disabled. The VLAN port maps are, however, remembered and can be activated when the VLAN operation is enabled later. A VLAN can be discontinued by selecting the VLAN number and entering nothing. The string will be deleted.

Another example could be making ports 1 and 8 into a VLAN and ports 2, 3, 4, 5, 6, 7 and 8 into another VLAN. This would make the wireless port's traffic secure from the nodes on the copper ports, forcing all wireless traffic to go through the uplink port (port #8) to the switch upstream where it can be analyzed.

The following screen shows that VLANs are enabled, but there are no current ports as members of a VLAN.
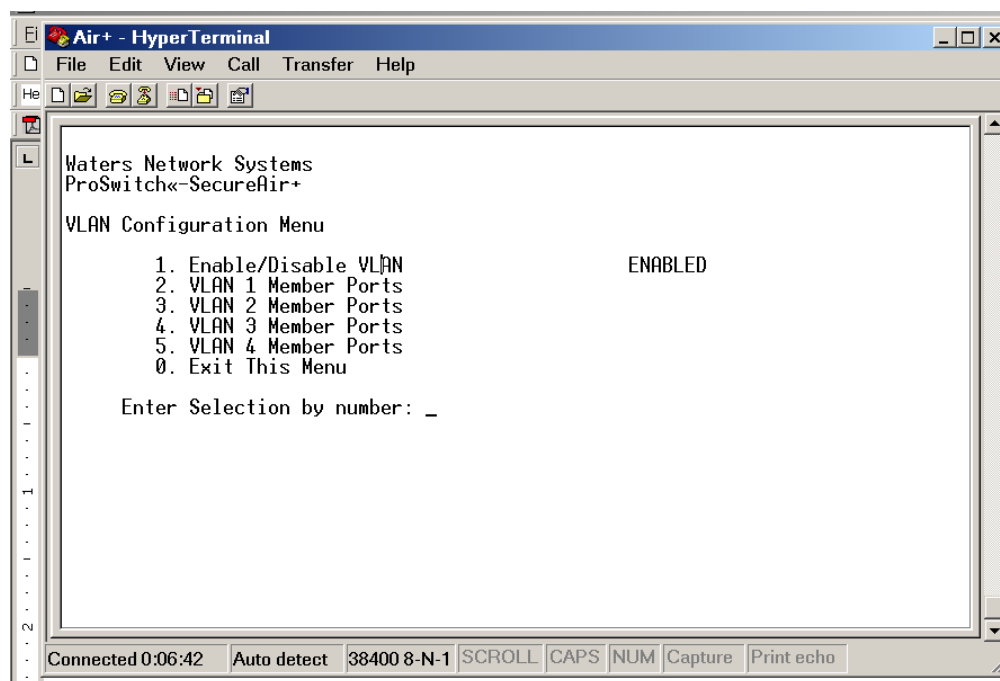
8.2   Telnet

The Telnet protocol is often thought of simply as a vehicle for remote logins to a computer via the Internet. This was its original purpose although it can be used for many other purposes. It is best understood in the context of a user with a local computer accessing the local telnet program (known as the client program) to run a login session on a remote computer. Communication needs are handled by a telnet server program running on the remote computer. It should be emphasized that the telnet server can pass on the data it has received from the client to many other types of processes including a remote login server.

Telnet access can be enabled though the **Switch Configuration Menu**. Telnet is enabled by default.

8.3   Auto-MDIX Support

The Air+ supports Auto-MDIX (medium dependent interface) for all the RJ45 Ports globally. MDI/MDIX refers to the physical connections between the electrical or optical connection to a cable medium. An

MDIX (for *MDI crossover*) is a version of MDI that enables a connection between like devices. MDI ports connect to MDIX ports via straight-through twisted pair cabling; both MDI-to-MDI and MDIX-to-MDIX connections use crossover twisted pair cabling. The Auto-MDIX connection can be disabled or enabled though the **Switch Configuration Menu** for all RJ45 Ports.

As long as Auto-MDIX is enabled, you don't have to worry about cross-over cables.

8.4 Aging Time

The default value for aging time is 300. You can set the Address Table Aging Time between 10-1000000 seconds

The value of the aging time is the period that active addresses are saved in the Switch's internal address buffer after their last activity is experienced. The default number of 300 seconds is five minutes (5 minutes x 60 seconds/min = 300 seconds). Longer times provide more efficient switching and less address relearning during normal operation. Shorter times better accommodate network moves and changes for flexibility.

8.5 Broadcast Protection

One of the best features of the Air+ is its ability to keep broadcast storms from spreading throughout a network. Network storms are characterized by an excessive number of broadcast packets being sent over the network. These storms can occur if network equipment is configured incorrectly, network software is not properly functioning, or poorly designed programs (including some network games) are used. Storms can reduce network performance and cause bridges, routers, workstations, servers and PC's to slow down or even crash.

The default value of the Broadcast Filter Percentage is 50 percent, however, it can be set from 0-100, 0 or Disabled.

9.0 Port Menu

The **Port Menu** displays the status of the ports.
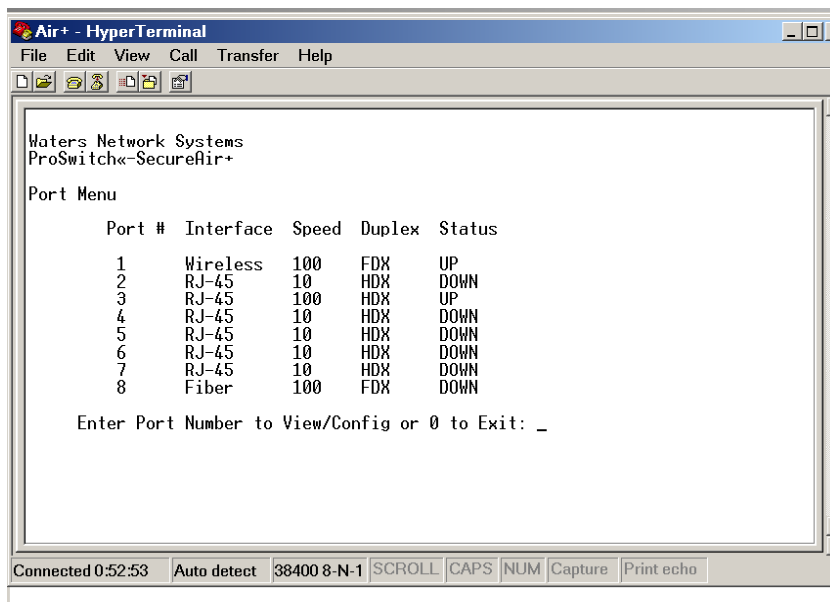
Port parameters are configured from the **Port Configuration** screen. You must select a port number to access the **Port Configuration** screen. Changes for speed and duplex are made from this screen. All configurations are stored in non-volatile memory, so that the switch boots up with the configurations enabled. This can sometimes lead to confusion when ports are accidentally disabled. Always check the configuration of the ports and the VLAN configuration if a port isn't communicating.

Note: In order to hard set a port for speed or duplex, first you must turn OFF **Auto Negotiation. Auto Negotiation** is turned off by port through the **Port Configuration** screen.

STP priority and path cost can be set for each port. Use the **Port Menu** to configure the STP priority and path costs. Once you are in the **Port Menu**, select a port. The following system parameters are available for the Air+.

Parameter	Default	Range	Description
Priority	32768	0 - 65535	Specifies the priority value used along with the switch MAC address to determine which device is root. The lower a priority value, the higher the priority.
Maximum-age	20 seconds	6 – 40 seconds	Maximum received message age the switch allows for STP information before discarding the message,
Hello-time	2 seconds	1 - 10	Time between messages transmitted when the switch is the root.
Forward-delay	15 seconds	4 – 30 seconds	Time the switch waits before transitioning from the listening to the learning state, and between the learning state to the forwarding state.

Port Parameters affect individual ports. The following are the port parameters available for the Air+ switch.

Parameter	Default	Range	Description
Path-cost	100	0 – 255	Assigns an individual port cost that the switch uses to determine which ports are the forwarding ports.
Priority	128	0 - 255	Used by STP to determine the port(s) to use for forwarding. The port with the lowest number has the highest priority.

9.1   Quality of Service (QoS)

The Air+ offers Quality of Service (QoS) as specified in IEEE 802.1p standard. Each port of the Air+ has a packet buffer into which the packets destined for that port are placed. The packets in the buffer are then transmitted in a first-in first-out basis. This can create problems by 'delaying critical' traffic like voice and video streaming. When QoS functionality is enabled, the packet buffer for the ports is divided into two buffers.   One is treated as high priority and the other as low priority. Packets placed in the high priority buffer will be given preference over those in the low priority buffer for transmission.

The Air+ switch engine will identify the priority and place the packet in the appropriate buffer. The default priority is set to low. To change priority to high, go to the **Port Menu**. Select the **port number** for the change. This will take you to a submenu for that port. High priority can be set in this submenu.

10.0   Security Features

The Air+ has security features that aren't set up by default. This section will explain how to protect access to your switch with customized passwords and also how to configure the time and calendar

configuration

10.1　Manager and Operator User Levels

Access to your Air+ menu interfaces can either be through the console port or through the network by using Telnet. There are two levels of console access:　Manager and Operator.　For security, you can set a password on both of these levels.　The default password for Manager is *Manager* and the default password for Operator is *Operator*.　The *Manager* user level has access to all console interface areas and may make changes to the configuration of the switch.　The *Operator* user level has access to the status of the configurations but may not make changes to the configuration capabilities.

It is highly recommended that you set a manager and operator password for the CMI.　Passwords are case sensitive.

To set a manager password:

1. Load the terminal emulation program.

2. Login into the switch.

3. From the **Main Menu**, select **4 – User/Password Administration**.

4. Select **1 – Administrator Password**.　(This changes the password of the **Manager user**.)

5. Follow the directions to change the password so your system is protected.

6. Logoff and try the new password.

Note:　If you have logged in as "operator" you cannot change the password for the "manager".　Operator user only has read access.

If you change the factory default password and lose that password, a utility must be executed in order to return the switch to a factory default password.　The utility requires the MAC address of the switch.　The MAC address can be obtained from the System Configuration menu on the switch or from　the product information label on the switch.　Document the MAC address of the switch for future use.　Contact Waters' customer service if you require the factory default password.　Contact information is Section 12 of this manual.

10.2　Time and Calendar Configurations

The Air+ has a real time clock and capability to synchronize the clock to an external time server using the SNTP protocol.　The switch has no battery backup, therefore, time information will be lost if the power supply to the switch is interrupted.　Once the correct time is set either manually or by configuring the switch to synchronize itself with an external service, the built-in crystal controlled clock keeps accurate time.

The clock system in the Air+ automatically takes care of adjustments for time zone, daylight savings time and leap years.　The Air+ also supports a "weekly security scheduler" feature which can turn the wireless port **OFF** during certain times of the days or days of the week.　This feature will assist in preventing unauthorized access to your network using wireless access.　By default, wireless access is turned **ON** for all hours during all days of the week.　In order to take advantage of this feature, you must configure the switch to enable wireless access only during specified time periods.

Note:　Time is set in military time.

10.3　Setting Current　Time

1. Select **6 - Date/time/Calendar Config** from the **Main Menu**.　This takes you to the **Time Parameters Configuration Menu**.

2. Enter the **current time** in the format **hh:mm:ss** (military time) and press **Enter**.　The time will be updated.

10.4   Setting Date

1. Select **2 – Set Date** from the **Time Parameters Configuration Menu**.

2. Enter the **current date** in the format **mm:dd:yy** and press **Enter**. Dates between 01/01/2003 and 12/31/2036 are valid.

Note: The date cannot be set unless SNTP is **DISABLED**. Check Menu option **#7 – Enable/Disable SNTP** on the **Time Parameters Configuration Menu** to make sure it is disabled before setting the date.

10.5   Setting Time Zone

In order for the time zone setting to work properly, set up the time zone depending on the number of time zones you are from GMT (Greenwich Mean Time). For example, if you are in the Central Time Zone, you are minus 6 hours from GMT. So, your setting would be –6.00.

10.6   SNTP Server

Before you can use the SNTP to synchronize the clock of the switch with an external server, a server must be made available. The server can either be local to the network, or if it is feasible to connect the switch to the Internet, an available server can be used. Many networks offer public service. Ntp-cup.external.hp.com (192.6.38.127) is one such server.

For correct operation of SNTP, the following parameters must be set:

❑   Make sure the Air+ is connected to the Internet and can ping the SNTP server

❑   Use Menu option **#7 – Enable/Disable SNTP** from the **Date/Time/Calender Config** menu to enable the SNTP Server.

❑   IP Address of the SNTP server must be set using Menu option **#6 - Date/Time/Calendar Config** from the Main Menu. Next use Menu option **#5 – SNTP Server** to set the IP Address.

❑   Enter appropriate time zone information with Menu option **#3 – Set Time Zone** from the **Date/Time/Config** menu.

❑   Enable daylight savings time with Menu option **#4 – Set Daylight Saving** from the **Date/Time/Config** menu.

As soon as the SNTP server is enabled and everything is set properly, the current time displayed on the screen will be updated to represent the actual time.

Note: In order to update the time continually, it is recommended to synchronize the Air+ with an SNTP server**.**

10.7   SNTP Interval

1. Select **6 – SNTP Interval**.

2. Enter the appropriate time (recommended **1 hour**) and press **Enter**. (You can set it for less time when you are testing the SNTP.)

10.8   Weekly Scheduler Startup

The weekly scheduler allows you to configure the days and times wireless access is available to your LAN. By default, wireless access is turned **ON**. By using this powerful feature, you can limit wireless access to your LAN by enabling access only during the days and times you desire.

1. Select **8 - Setup Access Schedule** from the **Time Parameters Configuration Menu**.

2. The calendar function must be **enabled** in order to perform the following functions. If the calendar isn't enabled, use **1 - Enable/Disable Calendar** to make that change.

3. Use menu selections **2 – 8** to enter start and end times for each day of the week. The format is **hh:mm-hh:mm**. No space or any other character is allowed. The entered value will be updated

immediately on the screen.

4. A set value of **00:00-00:00** will turn the wireless port **OFF**. A value of **00:00-24:00** turns the port on for the entire day. As mentioned earlier, the wireless port is **ON** by default.

Note: When the wireless port is disabled or OFF, there is no connection to the LAN. This control condition allows maximum security for the internal network by blocking access from the wireless port to the other ports of the Air+. When the wireless is disabled or OFF, wireless connection between wireless users is still active.

10.9   Return to Factory Default Settings

The menu option for returning to the factory default settings is hidden by design. Before returning to the default settings, think through your configuration (IP Addresses, etc) to make sure you want to do this.

1. Use Hyper Terminal or Telnet to login to the switch.

2. Select **1 – System Configuration**.

3. Select **9 – (Menu option 9 is hidden by design.)**

4. Press **Y to load default config and reset switch.**

5. You will return to the login screen.

11.0   Wireless Setup

Wireless access is turned on by default on your Air+ switch, so there is no configuration required to connect to the Air+. If you haven't already configured access to the wireless port for day and time settings, see section 10 - Security Features. This section also explains the procedure to turn off access to your network via the wireless port for the times and days of the week that you require.

Use the **Help** button for additional information as you make changes to the wireless port. Section 11 will explain the procedures to configure the wireless port to:

❑   Change channels

❑   Disable/enable WEP

❑   Enter MAC addresses for wireless access

The default IP setting for the wireless port is **192.168.0.50**. In order to access the **Configuration Menu** for the wireless port, you **must** set a static IP address to the computer that you are using to configure the wireless port.

1. Make sure the Air+ is disconnected from your LAN.

2. Change the IP address of the workstation you are using to configure the wireless port so that it is in the same range of the default IP address of the wireless port (**192.168.0.50**). For example, you could use **192.168.0.1**.

3. You may be required to reboot the workstation.

4. Once you have logged in, access your web browser and enter the following**: http:// 192.168.0.50**.

5. Type: **admin** in the user name field.

6. Leave the **password** field blank. (You may enter a password through the configuration menu later if you want.)

7. Click **OK**.

11.1   Default Settings

Once you login, the opening screen displays an option to run a wizard for setup. This should not be necessary. Click on the **Wireless** button on the left side of the screen. Displayed are the defaults settings for wireless access.

Defaults are shown for 802.11a. You can change the Wireless band from 802.11a to 802.11b by using the drop-down arrow next to 802.11a and changing it to 802.11b. As you use these menus, notice that there are different settings for 802.11a and 802.11b. As you configure the wireless port, make sure you using the correct band.

The SSID (Service Set Identifier) is a unique name that identified a network. All devices on a network must share the same SSID name In order to communicate on the network. You can change the SSID to another name up to 32 characters in length.

Channel 36 is the default channel for 802.11a and channel 6 is the default channel for 802.11b. Devices on the network must be set to the same channel to communicate with the network. Current wireless network adapters will automatically scan for the channel to establish connection with the access point. You will see how to change the channel in another section

11.2   IP Address Setting

The default IP address is 192.168.0.50 and set to static. You can set the IP address for your LAN.

1.   Click on the **Home** tab at the top of the screen.

2.   Click on the **LAN** button on the left side of the screen.

3.   You may enter an IP address for your LAN at this screen or select **Dynamic IP Address**.

   Note: If you select Dynamic IP Address, an IP address will be obtained from your network. You must know the IP address to be able to get back to the wireless menu.

11.3   The Advanced Menu

The first field in the Advanced Settings menu lists the wireless band settings (802.11a or 802.11b). The settings will change depending on the wireless band that is displayed. The advanced setting menu allows you to set the following:

- ❑ **Turbo Setting** – The turbo setting is available for 802.11a and by default is set to **Disable**. You may lose distance by running in the turbo setting mode.

- ❑ **Frequency** - The frequency range is displayed for the wireless band selected.

- ❑ **Channel** – The default channels are displayed. You may change the channel with this option.

- ❑ **Data Rate** - Auto is the default for the data rate. You may change the data rate with this option, however, it is recommended to use auto.

- ❑ **Beacon Interval** – Beacons are packets sent by the access point to synchronize a wireless network. The beacon interval has a range of 20-1000. The default of 100 is recommended.

- ❑ **DTIM** – Delivery Traffic Indication Message is a countdown which informs clients of the next window for listening to broadcast and multicast messages. The range can be set from 1 and 255.

- ❑ **Fragment Length** – It is recommended to keep this value at its default setting of 2346. If you experience a high packet error rate, you may increase the valued slightly. If you set the fragment length too low, you may experience poor performance.

- ❑ **RTS Length** – It is recommended to keep this value at the default of 2346. If you encounter inconsistent data flow, only minor modifications to the value range of 256 – 2346 are recommended.

11.4   Changing Channels

1. Click on the **Advanced** tab at the top of the screen.

2. Before changing the channel, make sure the wireless band is displayed of the channel you want to change. (Look at the first field, and change the wireless band if necessary.)

3. Click on the **arrow** in the channel field.

4.   Select the appropriate channel number.

5.   Click on **Apply** at the bottom of the screen.

6.   Click **Continue** once the message is displayed "Settings saved. System is restarting."

Note: Once the system restarts, you will have to login again if you want to return to the setup screens.

11.5   Setting MAC Addresses

By using this setting, you can create another level of security for the Air+. Up to 16 MAC addresses can be either accepted or rejected by the wireless port on the Air+. The MAC address is a unique hardware address that identifies a device on a network. It is assigned at the factory and cannot be changed. Usually, you can find this address on a sticker on the device or on the packaging. Please use the following format: xx:xx:xx:xx:xx:xx to set the MAC address.

1.   Identify the MAC addresses you want to set before accessing this menu.

2.   Access the **Advanced** tab to set the MAC addresses.

3.   Click on the **Filters** button on the left side of the screen.

4.   Click on the arrow in the **Access Control** field.

5.   You have a choice of **Accept** or **Reject**. Make the appropriate selection.

6.   Type in the appropriate MAC addresses.

7.   Once the addresses are entered, click on **Apply** at the bottom of the screen.

8.   Click **Continue** once the message is displayed "Settings saved. System is restarting."

Note: Once the system restarts, you will have to login again if you want to return to the setup screens.

11.6   Advanced Security Settings

The following lists the settings for authentication on the wireless port:

❑   **Open System** – The wireless port is visible to all devices on the network. Open System is the default.

❑   **Shared Key** – In order to access the wireless port, the device must be listed in the **Access Control List.**

❑   **Both** – Both can be selected.

WEP (Wired Equivalent Privacy) access is controlled in the advanced security settings. WEP provides security by encrypting data over the radio waves to that it is protected as it travels from destination to destination. The default setting for WEP is disabled. The three levels of WEP Encryption provided for 802.11a are 64, 128 and 152Bit, and the three levels provided for 802.11b are 64, 128 and 256Bit. To make changes to the security settings:

1.   Click on the **Advanced** tab at the top of the screen.

2.   Click on the **Encryption** button on the left side of the screen.

3.   Before making changes, make sure the appropriate wireless band is displayed.

4.   You must **Enable WEP** before making any changes.

5.   Enter the information for the:

   a.   WEP Key Type

   b.   WEP Key Size

   c.   Valid Key

   d.   Key Table

6. Once the information is entered, click on **Apply** at the bottom of the screen.

7. Click **Continue** once the message is displayed "Settings saved. System is restarting."

Note: Once the system restarts, you will have to login again if you want to return to the setup screens.

11.7   The Tools Menu

The **Tools** Menu contains the following options:

- ❑   Assign password and change password
- ❑   Restore factory setting
- ❑   Apply software updates

Changing the Password

There is no password assigned by default, so it is up to you to set up a password if you want this additional layer of security.

1. Click on the **Tools** tab at the top of the screen.

2. If you are assigning a password for the first time, leave the **Password** field blank.

3. Enter the new password in the **New Password** field. (Highlight the stars in the field and type over them.)

4. Enter the new password in the **Confirm Password** field. (Highlight the stars in the field and type over them.)

5. Click on **Apply** at the bottom of the screen.

6. You will have to login again if you want to return to the setup screens.

Note: Notice the **Admin** button on the left side of the screen. If you are in another section of the **Tools Menu**, click on the **Admin** button to return to the change password screen.

Restore Factory Settings

1. Click on the **System** button on the left side of the screen.

2. Click on **Restore to Factory Default Settings**.

3. Click on **OK** at the message **Device will reboot and web will be disconnected! Continue?**

4. You will have to login again if you want to return to the setup screens.

5. You will return to the **Tools – System** screen.

6. Logout if you have completed the tasks for this session.

Apply Software Updates

1. Access the **Tools Menu**.

2. Click on the **Firmware** button on the left side of the screen.

3. You may be required to login again depending on the menu you are in.

4. Enter the appropriate information.

5. Click on **Update & Restart**.

Note: Check the Waters' web site: www.watersnet.com for future updates.

11.8   Status Menu

This status menu will display information about your wireless access setup. There are two pages of information listed under the buttons **Device info** and **Stats**.

12.0   Troubleshooting

All Waters' switching products are designed to provide reliability and consistently high performance in all network environments. The installation of Waters' ProSwitch®- Air+ switch is a straightforward procedure (See Section 3)**;** the operation is also straightforward and is discussed in Section 4.

Should problems develop during installation or operation, this section is intended to help locate, identify and correct these types of problems. Please follow the suggestions listed below prior to contacting your supplier. However, if you are unsure of the procedures described in this section or if the ProSwitch®- Air+ switch is not performing as expected, do not attempt to repair the unit; instead contact your supplier for assistance or contact Waters Network Systems' Customer Support Center at **800.328.2275** or email netinfo@wtrs.com.

12.1   Before Calling for Assistance

1. If difficulty is encountered when installing or operating the unit, refer back to the Installation Section of the chapter of this manual. Also check to make sure that the various components of the network are inter-operable.

2. Check the cables and connectors to ensure that they have been properly connected and the cables/wires have not been crimped or in some way impaired during installation. (About 90% of network downtime can be attributed to wiring and connector problems.)

3. Make sure that an AC power cord is properly attached to the Air+.

4. Be certain that each AC power cord is plugged into a functioning electrical outlet. Use the PWR LEDs to verify each unit is receiving power.

5. If the problem is isolated to a network device other than the Waters' ProSwitch®- Air+ switch, it is recommended that the problem device be replaced with a known good device. Verify whether or not the problem is corrected. If not, go to next step. If the problem is corrected, the Waters' ProSwitch®- Air+ switch and its associated cables are functioning properly.

6. If the problem continues, contact Waters Network Systems' Customer Service at 800.328.2275 or email netinfo@wtrs.com for assistance.

When Calling for Assistance

1. Please be prepared to provide the following information.

2. A complete description of the problem, including the following points:

3. The nature and duration of the problem

4. Situations when the problem occurs

5. The components involved in the problem

6. Any particular application that, when used, appears to create the problem

7. An accurate list of Waters Network Systems product model(s) involved. Include the date(s) that you purchased the products from your supplier.

8. It is useful to include other network equipment models and related hardware, including personal computers, workstations, terminals and printers; plus, the various network media types being used.

9. A record of changes that have been made to your network configuration prior to the occurrence of the problem. Any changes to system administration procedures should all be noted in this record.

12.2   Return Material Authorization (RMA) Procedure

All returns for repair must be accompanied by a Return Material Authorization (RMA) number. To obtain an RMA number, call Waters Network Systems Customer Service at 800.328.2275 during business hours from 8:00 am to 5:00 pm (CT) email netinfo@wtrs.com.   When calling, please have the following information readily available:

- ❑ Name and phone number of your contact person

- ❑ Name of your company/institution

- ❑ Your shipping address

- ❑ Product name

- ❑ Packing List Number (or Sales Order Number)

- ❑ Failure symptoms, including a full description of the problem

- ❑ Waters Network Systems will carefully test and evaluate all returned products, will repair products that are under warranty at no charge, and will return the warranty-repaired units to the sender with shipping charges prepaid (see Warranty Information, Appendix A, for complete details). However, if Waters cannot duplicate the problem or condition causing the return, the unit will be returned as: **No Problem Found**.

- ❑ Waters Network Systems reserves the right to charge for the testing of non-defective units under warranty. Testing and repair of product that is not under warranty will result in a customer (user) charge.

12.3   Shipping and Packaging Information

Should you need to ship the unit back to Waters Network Systems, please follow these instructions: Package the unit carefully. It is recommended that you use the original container if available. Units should be wrapped in a "bubble-wrap" plastic sheet or bag for shipping protection. (You may retain all connectors and this Installation Guide.) CAUTION: Do not pack the unit in Styrofoam "popcorn" type packing material. This material may cause electro-static shock damage to the unit.

Clearly mark the Return Material Authorization (RMA) number on the outside of the shipping container. Waters Network Systems is not responsible for your return shipping charges.

Ship the package to:

> Waters Network Systems
>
> Attention: Customer Service
>
> RMA Number:
>
> 2411 Seventh Street NW
>
> Rochester, MN 55901

12.4   Warranty

Waters Network Systems makes no express or implied warranties including, but not limited to, any implied warranty of merchantability or fitness for a particular purpose, except as expressly set forth in this warranty. In no event shall Waters Network Systems be liable for incidental or consequential damages, costs, or expenses arising out of or in connection with the performance of the product delivered hereunder. Waters Network Systems will in no case cover damages arising out of the product being used in a negligent fashion or manner.

For additional Waters' warranty information, please contact Customer Service at 800.328.2275 during business hours from 8:00 am to 5:00 pm (CT) or email netinfo@wtrs.com.