Branch Office Wireless Networking

Symbol Wireless Switch

WS 2000 Solution (802.11 b)

Quick Installation Guide
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Symbol Technologies, Inc.
One Symbol Plaza
Holtsville, N.Y. 11742-1300
http://www.symbol.com

Patents

This product is covered by one or more of the following U.S. and foreign Patents: U.S. Patent No.

4,593,186 4,603,262 4,607,156 4,652,750 4,673,805 4,736,095 4,758,717 4,760,248 4,806,742 4,816,660 4,845,350

4,896,026 4,897,532 4,923,281 4,933,538 4,992,717 5,015,833 5,017,765 5,021,641 5,029,183 5,047,617 5,103,461

5,113,445 5,130,520 5,140,144 5,149,950 5,157,687 5,168,148 5,168,149 5,180,904 5,216,232 5,229,591

5,230,088 5,235,167 5,243,655 5,247,162 5,250,791 5,250,792 5,260,553 5,262,627 5,262,628 5,266,787 5,278,398

5,280,162 5,280,163 5,280,498 5,304,786 5,304,788 5,306,900 5,324,924 5,337,361 5,367,151 5,373,148

5,378,882 5,396,053 5,396,055 5,399,846 5,408,081 5,410,139 5,410,140 5,412,198 5,418,812 5,420,411 5,436,440

5,444,231 5,449,891 5,449,893 5,468,949 5,471,042 5,478,998 5,479,000 5,479,002 5,479,441 5,504,322 5,519,577

5,528,621 5,532,469 5,543,610 5,545,889 5,552,592 5,557,093 5,578,810 5,581,070 5,589,679 5,589,680 5,608,202

5,612,531 5,619,028 5,627,359 5,637,852 5,664,229 5,688,803 5,675,139 5,693,929 5,698,835 5,705,800 5,714,746

5,723,851 5,734,152 5,734,153 5,742,043 5,745,794 5,754,587 5,762,516 5,763,863 5,767,500 5,789,728 5,789,731

5,808,287 5,811,785 5,811,787 5,815,811 5,821,519 5,821,520 5,823,812 5,828,050 5,848,064 5,850,078 5,861,615

5,874,720 5,875,415 5,900,617 5,902,989 5,907,146 5,912,450 5,914,478 5,917,173 5,920,059 5,923,025 5,929,420

5,945,658 5,945,659 5,946,194 5,959,285 6,002,918 6,021,947 6,029,894 6,031,830 6,036,098 6,047,892 6,050,491

6,053,413 6,056,200 6,065,678 6,067,297 6,082,621 6,084,528 6,098,482 6,092,725 6,101,483 6,102,293 6,104,620

6,114,712 6,115,678 6,119,944 6,123,265 6,131,814 6,138,180 6,142,379 6,147,416 6,176,428 6,178,426 6,186,400

6,188,681 6,209,788 6,209,789 6,216,951 6,220,514 6,243,447 6,244,513 6,247,647 6,250,551 6,259,031 6,295,371

6,308,061 6,308,892 6,321,990 6,328,213 6,330,244 6,336,587 6,340,114 6,340,115 6,340,119 6,348,773 6,305,885


D414,171 D414,172 D418,500 D419,548 D423,468 D424,035 D430,158 D430,159 D431,562 D436,104

Invention No. 55,358; 62,539; 69,060; 69,187 (Taiwan); No. 1,601,796; 1,907,875; 1,955,269 (Japan);

European Patent 367,299; 414,281; 367,300; 367,298; UK 2,072,832; France 81/03938; Italy 1,138,713 rev. 07/04
**Document Conventions**

The following icon conventions are used throughout this document.

- **Note**: Indicates tips, hints, and special requirements.

- **Caution**: Care is required. Disregarding cautions can cause data loss or equipment damage.

- **Warning**: Indicates a potentially dangerous condition or procedure that only Symbol-trained personnel should attempt to correct or perform.
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This guide is intended to assist the technician responsible for installing the WS 2000 Wireless Switch and the AP 100 802.11b Access Port and get the system to a known working configuration. It assumes that the technician is familiar with basic Ethernet LAN-based networking concepts. This guide provides specifications, procedures, and guidelines to use during the installation process. It does not give site-specific installation instructions.

Before operating any equipment, review this document for any hazards associated with installation and use of the device. Also, review standard practices for preventing accidents.
1.1 Verifying Package Contents

Inspect the package contents and report any missing or damaged items to a sales representative. This system ships in a large box containing two smaller boxes, one for the WS 2000 Wireless Switch and one for the AP 100 Access Port. These packages should contain the following:

<table>
<thead>
<tr>
<th><strong>WS 2000 Wireless Switch Parts</strong></th>
<th><strong>AP 100 Access Port Parts</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• WS 2000 Wireless Switch</td>
<td>• AP 100 Access Port assembly</td>
</tr>
<tr>
<td>• Clear snap-on face plate</td>
<td>• Surface-mount assembly</td>
</tr>
<tr>
<td>• Power supply</td>
<td>• Mounting anchors</td>
</tr>
<tr>
<td>• Line cord</td>
<td>• Mounting screws</td>
</tr>
<tr>
<td>• Ethernet CAT-5 patch cable (1)</td>
<td>• Surface-mount badge</td>
</tr>
<tr>
<td>• Rubber feet for desk-mount option</td>
<td>• Surface-mount cover</td>
</tr>
<tr>
<td>• Rubber plugs for bottom of housing (4) (already assembled)</td>
<td>• Surface-mount light pipe screw</td>
</tr>
<tr>
<td>• Rubber plug for CompactFlash® slot (already installed in port)</td>
<td>• Ceiling-mount grommet</td>
</tr>
<tr>
<td>• Product Documentation CD</td>
<td>• Ceiling-mount badge</td>
</tr>
<tr>
<td></td>
<td>• Ceiling-mount light pipe screw</td>
</tr>
</tbody>
</table>

**Other Parts**

- WS 2000/AP 100 System Installation Guide (this document)
2.1 Introduction

The Branch Office Wireless Switch Solution provides both a complete wireless for the enterprise branch office and small-medium businesses. The WS 2000 Wireless Switch can connect directly to a cable or DSL modem, and can also connect to other wide-area networks through a Layer 2 or 3 device (such as a switch or router). The AP 100 802.11b Access Port provides area RF coverage to 802.11b wireless network devices. The AP 100 Access Port includes different installation options, allowing best placement for optimum range.
2.2 WS 2000 Wireless Switch Description

The WS 2000 Wireless Switch has the following features:

- One WAN port for connection to a DSL modem, cable modem, or any other Layer 2/3 network device.
- Six LAN ports—four provide 802.3af Power over Ethernet (PoE) support, and the other two do not provide power. Each port has two LEDs, one indicating the speed of the transmission (10 Mbit/sec. or 100 Mbit/sec.), the other indicating whether there is activity on the port.
- A serial port for direct access to the command-line interface from a PC. Use a DB-9 female to female null modem cable to connect to this port.
- A CompactFlash® slot provides storage and delivery of mobile applications.

The WS 2000 offers the power and cost-efficiencies of second-generation wireless networking. Intelligence previously distributed and duplicated throughout first-generation access point-based wireless LANs is centralized and aggregated in the WS 2000 Wireless Switch, delivering unprecedented power and control, and reduced deployment and management costs.

WS 2000 offers enterprise class security (802.11i, site-to-site IPSec VPN), integrated Gateway (NAT, DHCP, Firewall), public/private network segmentation, and 802.11a/b/g standards support.
2.2.1 Technical Specifications

<table>
<thead>
<tr>
<th>Physical Specifications</th>
<th>Power Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>286 mm (11.26 in.)</td>
</tr>
<tr>
<td>Height</td>
<td>45 mm (1.75 in.)</td>
</tr>
<tr>
<td>Depth</td>
<td>203 mm (7.99 in.)</td>
</tr>
<tr>
<td>Weight</td>
<td>0.64 kg</td>
</tr>
<tr>
<td>Max Power Consumption</td>
<td>90-256VAC, 47-63 Hz, 3A</td>
</tr>
<tr>
<td>Operating Voltage</td>
<td>48VDC</td>
</tr>
<tr>
<td>Operating Current</td>
<td>1A Peak Current 1.6A</td>
</tr>
</tbody>
</table>

Environmental Specifications

- Operating Temperature: 0°C to 40°C (32°F to 104°F)
- Storage Temperature: -40°C to 70°C (-40°F to 158°F)
- Operating Humidity: 5% to 95% Non-condensing
- Storage Humidity: 5% to 95% Non-condensing
- Operating Altitude: 2.4 km (1.49 mi.)
- Storage Altitude: 4.6 km (2.86 mi.)
2.3 AP 100 Access Port Description

The AP 100 Access Port provides the power of IEEE 802.11b Wi-Fi® compatibility to the wireless LAN. The integrated (internal) 3.5 dBi omni-directional cross-polarized diversity antenna provides strong wireless coverage, regardless of how the Access Port is mounted. The AP 100 Access Port receives its firmware from the WS 2000 Wireless Switch, so the time-consuming process of loading traditional access point firmware is eliminated.

The compact design allows installation on desktops, walls, above ceilings, or beneath ceilings. The standard mounting base allows securing of the unit to most surfaces with two screws. The above-ceiling mounting option secures the unit to the ceiling using the ceiling-mount light pipe screw.

Regardless of where the AP 100 Access Port is installed, LED lights are easily visible, providing visual feedback on the state of the Access Port.

The AP 100 Access Port receives power and transfers data through the Ethernet cable using 802.3af-compliant power from the wireless switch. No power supply or additional power source is necessary.
2.3.1 Technical Specifications

**Physical Specifications**

<table>
<thead>
<tr>
<th></th>
<th>Without Mounting Hardware</th>
<th>With Mounting Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Height</strong></td>
<td>78.7 mm (3.10 in.)</td>
<td>152.4 mm (2.04 in.)</td>
</tr>
<tr>
<td><strong>Diameter</strong></td>
<td>51.8 mm (2.0 in.)</td>
<td>155.4 mm (6.12 in.)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>0.36 kg (13 oz.)</td>
<td></td>
</tr>
</tbody>
</table>

**Power Specifications**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating Voltage</strong></td>
<td></td>
</tr>
<tr>
<td>Typical</td>
<td>48VDC</td>
</tr>
<tr>
<td>Range</td>
<td>36VDC to 57VDC</td>
</tr>
<tr>
<td><strong>Operating Current</strong></td>
<td>10mA to 150mA</td>
</tr>
<tr>
<td><strong>Peak Current</strong></td>
<td>250mA</td>
</tr>
</tbody>
</table>

**Environmental Specifications**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>-20°C to 50°C (-4°F to 122°F)</td>
</tr>
<tr>
<td><strong>Operating Humidity</strong></td>
<td>5% to 95%</td>
</tr>
<tr>
<td><strong>Storage Temperature</strong></td>
<td>-40°C to 70°C (-40°F to 158°F)</td>
</tr>
<tr>
<td><strong>Altitude</strong></td>
<td>2.4 km (operating max)</td>
</tr>
<tr>
<td></td>
<td>4.6 km (storage max)</td>
</tr>
<tr>
<td><strong>Drop</strong></td>
<td>0.8 meters (31.50 in.) to concrete</td>
</tr>
<tr>
<td><strong>Electrostatic Discharge</strong></td>
<td>+/-15kV (air discharge)</td>
</tr>
<tr>
<td></td>
<td>+/-8kV (contact discharge)</td>
</tr>
</tbody>
</table>
3.1 The Installation Process

The WS 2000 Wireless Switch can operate in various locations, allowing placement in most environments. The basic installation steps are:

1. Select a site (desk, wall, or rack) for installation of the wireless switch.
2. Install the switch in the selected location using the instructions specifically for that location type, found in Section 3.3, Installing the WS 2000 Wireless Switch.

Connect the wireless switch to the power supply early in the installation process for easy access to the connector; however, do not plug the power supply into a power source before installation is complete.
3. Lock the device to desk, wall, or rack using the lock port on the switch.
4. Install the Access Port in the selected location using the instructions specifically for that location type, found in Section 3.4, Installing the AP 100 Access Port.
5. Plug the WAN and LAN (Access Port) connections into the switch.
6. Plug the wireless switch into the wall power socket.
7. See Chapter 4, Configuring the WS 2000 Wireless Switch for information on how to configure the switch for your network and devices.

3.2 Warnings

Before installing and operating any equipment, review this document for any hazards associated with installation and use of the device. Also, review standard practices for preventing accidents.

- Only trained and qualified personnel should install this equipment.
- Read all installation instructions and site survey reports and verify correct equipment installation before connecting the system to its power source.
- Remove any jewelry (rings, watches, necklaces, etc.) while installing this equipment.
- Install this equipment in racks with appropriate dimensions and weight allowances.
- Verify that racks are anchored and do not install in a way that can cause the equipment to tip over and break away from its mountings. Damage to the devices or bodily injury can occur from equipment that was not appropriately mounted and secured.
- Verify the unit is grounded before connecting to the power source. Connect all power cords to a properly wired and grounded electrical circuit.
- Verify that any devices connected to this unit are properly wired and grounded.
- Verify that connecting power circuits have appropriate overload protection.
- Attach only approved power cords and cables to the devices.
- Verify that the power connector is accessible at all times during the operation of the equipment.
- Verify that the power circuit for the unit is grounded, can provide the required power, and is not overloaded.
- Do not work with equipment power circuits in dimly lit spaces.
**3.3 Installing the WS 2000 Wireless Switch**

### 3.3.1 Selecting a Site for Installation

The WS 2000 Wireless Switch can be installed on a flat surface, on a wall, or in a rack. In selecting a site, the installer should verify that the location has access to:

- A grounded outlet—preferably one that has surge protection or is protected by a uninterruptible power supply (UPS)
- The WAN connection for the switch (whether a modem, router, switch, or hub) (The wireless switch comes with a 6 ft. (1.829 m) patch cable for this purpose, but the installer is not required to use either that cable or stay within that distance.)
- The LAN connections for this switch (whether Access Port, switch, hub, or computer)

Ensure that this location meets optimal temperature and environmental requirements for the operation of this device (see Section 2.2.1, Technical Specifications).

### 3.3.2 Desk Mounting

The desk-mount option uses rubber feet that allow the unit to sit on most flat surfaces. The four round rubber feet can be found in the WS 2000 Wireless Switch (main) box.

1. Turn the switch upside down so that the side with the power connector is facing up.
2. Snap the clear face plate (in the WS 2000 main box) onto the front-right side of the switch.
3. Connect the power supply to the switch as shown in the diagram.

---

Do not attach the power supply to the wall outlet until the installation of the switch is complete.

---

4. Remove the backings from the four rubber feet and stick them to the switch on the four circles, as shown. The feet are right next to the four plugs.

5. Return the switch to the upright position in the place where you wish it to sit, ensuring that it is sitting evenly on all four rubber feet.

6. Connect the power supply to the wall outlet.

3.3.3 Wall Mounting

The wall-mount bracket option secures the unit to most walls using the four screws included in the mounting accessories box. The wall-mounting accessories are sold separately from the wireless switch (Part No. KT-MTG-WS-2000-WW).

1. Remove the protective rubber plugs from the switch as shown.
To snap into the wall-mount bracket, the protective rubber plugs must be removed.

2. Using the screws and wall anchors supplied in the mounting accessories box, attach the wall-mount bracket to the wall as shown.

Align the RJ-45 ports on the switch with the embossed port symbols on the front of the wall-mount bracket.

3. Connect the power supply to the switch, but not to the wall outlet.

Do not attach the power supply to the wall outlet until installation of the switch is complete.

4. Align the holes on the bottom of the switch (where the plugs used to be) with the plastic guides on the mounting bracket (circled in diagram below).
5. Push the switch into place on the bracket. A snap indicates that the switch is securely attached to the bracket.

6. Connect the power supply to the wall outlet.

The wall-mount bracket is designed to allow threading of cables underneath the bracket. There is space underneath the wall-mount bracket to hold cables. Cables can be placed above, between, or below the attachment points.

3.3.4 Rack Mounting

The rack-mounting option provides a 1U bracket to the switch allowing it to be mounted in a standard rack. Rack-mounting accessories are sold separately from the wireless switch (Part No. KT-MTG-WS-2000-WW).

1. Connect the power supply to the connector on the bottom-rear of the switch.

---

**Do not attach the power supply to the wall outlet until installation of the switch is complete.**

---

2. Attach the 1U bracket to the rack using four of the six screws provided in the mounting accessories box.
3. With the front of the switch tilted slightly upward, slide the back of the switch between the guides at the rear of the bracket, until the two retaining clips slide into slots in the back of the switch, as shown.

4. Set the front side of the switch down on to the bracket making sure that the locator tabs in the front of the bracket slide into the two slots on the bottom front of the switch.

5. Attach the rack bezel to the bracket. To do this, tilt the bezel forward and place the T-shaped tabs on the lower edge of the bezel just behind the lip on the front of the rack bracket. (There are two holes in the lip where they attach.) Pull the bezel forward slightly and the T-tabs should lock into place.

6. Using the remaining two screws provided in the mounting accessories box and attach the bezel to the rack bracket.
7. Connect the power supply to the wall outlet and turn on the switch when appropriate.

3.3.5 Securing the Network Switch

The WS 2000 Wireless Switch comes with a lock port that is compatible with most locking systems. The lock port is on the rear of the switch, opposite the power connector. In order to have clear access, lock the wireless switch in place before plugging in the WAN and LAN cables.
3.3.6 Using the CompactFlash® Slot

The WS 2000 Wireless Switch has a CompactFlash® slot which provides for storage and delivery of application to mobile units with AirBEAM Smart Client. When not being used for this purpose, the rubber plug provided with the switch should remain in the slot.

3.3.7 Connecting Switch to WAN and LAN (RJ-45) Ports

The WS 2000 Wireless Switch provides six LAN ports and one WAN port. LAN Ports 1-4 provide 802.3af PoE support. Connect the Ethernet cable that will go into the Access Port into one of these four LAN ports.

The WAN port is capable of hooking up to a DSL or cable modem, or to any Layer 2/3 network device.

Plug devices into RJ-45 ports using standard CAT-5 patch cables.

Note

The power LED flashes during startup and remains lit during normal operation.
Each Ethernet port has two LEDs. The LED on the left side of the port indicates whether the port is transmitting at 10 Mbit/sec. or 100 Mbit/sec. The light is off when transmitting at 10 Mbit/sec. The light is on when transmitting at 100 Mbit/sec.

The LED on the right side indicates an Ethernet link or activity on that port. This light is on solidly when a link to a device is made. The light flashes when traffic is being transferred over the line.

The four ports that have PoE capabilities also have a PoE LED. A green light indicates that 48 volts are being delivered to the power device connected to that port. A red light indicates that the power device on the port is faulty. Once set to red, the light remains red until a non-faulty device is installed. If a non-power device is connected to the port, the PoE light remains off.
3.4 Installing the AP 100 Access Port

The AP 100 Access Port can be placed in a large variety of locations. Review installation plans to determine device placement and cable routing. Use the instructions in the section “Surface Mounting” on page 23 for information on how to mount the Access Port on a flat surface, a wall, or a solid ceiling. Use the instructions in the section “Suspended Ceiling Tile (Plenum) Mounting” on page 25 to install the Access Port for a suspended ceiling.

The following diagram shows the position of the cables and mounting holes for the AP 100 Access Port.

![Diagram of AP 100 Access Port with labels for Ethernet Cord, Mounting Holes, Cable Retainer, and Ethernet Port]

3.4.1 Surface Mounting

The AP 100 Access Port mounts to most surfaces using the mounting screws and surface-mount assembly as shown in the picture below.
3.4.2 Desk Mounting

No mounting screws are necessary for mounting on a desk or other flat surface. However, Symbol does not recommend installation on such a surface because wall or ceiling mounting ensures better signal reception.

3.4.3 Wall or Solid Ceiling Mounting

To mount the AP 100 Access Port on a wall or solid ceiling, follow these steps:

1. Determine the appropriate placement on the wall. Placement near the ceiling typically provides better reception.
2. Orient the case on the wall so that the Ethernet cable can be easily plugged in to the RJ-45 port.
3. Mark the screw holes on the mounting surface.
4. Put in the mounting anchors (if necessary).
5. Put the mounting screws through the main access port body, then through the surface-mount assembly, and screw them into the anchors.
6. If required, install and attach a security cable to the unit’s surface-mount assembly.
7. Place the surface-mount light pipe screw through the center of the surface-mount cover and branding badge, and screw into the access port.
8. Attach the Ethernet cable that comes from the WS 2000 Wireless Switch.

3.4.4 Suspended Ceiling Tile (Plenum) Mounting

Some installations require mounting the AP 100 Access Port above the ceiling tile. This type of installation places the unit and cable out of sight. Use this installation in plenum-rated ceiling configurations. Verify that the attaching Ethernet cable is also plenum rated.

To mount the AP 100 Access Port on a suspended ceiling tile (plenum), follow these steps:

1. Find a location that provides good signal access.
2. If possible, remove the ceiling tile from its frame and place it, finished side down, on a work surface.
3. If required, install a safety wire in the ceiling space.
4. Mark a point on the upper or unfinished side of the tile.
5. Push the light pipe screw through the tile at the marked point and pull it out again.
6. Screw the light pipe screw into the flat surface of the Access Port.
7. Place the light pipe screw back in the hole in the tile, and then from the other side, place the ceiling-mount grommet through the branding badge and into the tile until it snaps into place on the screw.
8. Bring the tile into the ceiling space.
9. Plug the Ethernet cable into the unit.
10. Attach the safety cables.
11. Replace the tile into the ceiling.

The Ethernet cable should be tie wrapped to a nearby building structure to relieve strain on the cable. Do not tie wrap the cable to electrical wiring.

**Note**

To prevent damage to the device, use care when pulling cables attached to a mounted unit.

**Caution**

### 3.4.5 Power/Data (RJ-45) Connection

The AP 100 Access Port receives power from the Ethernet cable. It supports the following Symbol-branded Power over Ethernet (PoE) devices:

- Symbol Power Injector 1 Port
- Symbol Power Injector 12 Port
Configuring the WS 2000 Wireless Switch

Getting Started with the WS 2000 Wireless Switch

This section provides just enough instruction to set up the WS 2000 Wireless Switch, connect an Access Port, and test communications with a single mobile unit and the wide area network (WAN). The configuration suggestions made here are just the minimum needed to test the hardware. It is assumed that the switch and the Access Port are already installed using the instructions found earlier in this guide. Once finished with the Getting Started section, additional configuration settings are required. This section covers the following topics:

- Setting up administrative communication with the switch
- Setting the basic switch settings
- Enabling Subnet1
- Configuring Subnet1

- Configuring the WAN interface
- Enabling wireless LANs (WLANs)
- Configuring WLAN security
- Testing connectivity
Step 1: Setting up Administrative Communication to the Switch

Before the configuration process can begin, establish a link with the wireless switch.

1. Connect a “wired” computer to the switch (in any one of the available LAN ports) using a standard CAT-5 cable.
2. Set up the computer for TCP/IP DHCP network addressing and make sure that the DNS settings are not hardcoded.
3. Start up Internet Explorer (with Sun Micro systems’ Java Runtime Environment (JRE) 1.4 or higher installed) and type in the following IP address in the address field: 192.168.0.1

For optimum compatibility use Sun Microsystems’ JRE 1.4 or higher (available from Sun’s website), and be sure to disable Microsoft’s Java Virtual Machine if it is installed.

The following screen is displayed.

4. Log in using “admin” as the User ID and “symbol” as the Password.
5. If the login is successful, the following dialog window is displayed.

![Change Admin Password](image)

For security purposes please change the administrator password. You are not allowed to keep the default password.

Enter New Password (up to 11 chars):

Re-Type New Password (up to 11 chars):

Update Password Now  Cancel

Enter a new admin password in both fields, and click the **Update Password Now** button. Once the admin password has been updated, the System Settings screen is displayed.

![System Settings](image)
Step 2: Setting the Basic Switch Settings

1. Enter a **System Name** for the wireless switch. The specified name appears in the lower-left corner of the configuration screens, beneath the navigation tree. This name can be a useful reminder if multiple Symbol wireless switches are being administered.

2. Enter a text description of the location of the switch in the **System Location** field. This text is used as a reminder to the network administrator and is also used to set the location variable if the switch is administered using SNMP.

3. Enter an email address for the administrator in the **Admin Email Address** field. The switch uses this address for sending SNMP-related and other administration-related messages to the administrator.

4. Select the **Country** for the switch from the drop-down menu. Selecting the correct country is extremely important. Each country has its own regulatory restrictions concerning electromagnetic emissions and the maximum RF signal strength that can be transmitted by Access Ports. To ensure compliance with national and local laws, be sure to set this field accurately.

5. Click **Apply** to save changes. Unapplied changes are lost if the administrator navigates to a different screen.

---

The WS 2000 switch is shipped with an open default SNMP configuration:

- community: public  OID: 1.3.6.1 Access: Read-only
- community: private OID: 1.3.6.1 Access: Read-write

If your switch has these settings, it is important to change them immediately; otherwise, users on the same network will have read-write access to the switch through the SNMP interface. Select **System Configuration --> SNMP Access** from the left menu to examine the settings and change them if necessary.

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Step 3: Configuring the LAN Interface

The first step of network configuration process is to figure out the topology of the LAN. The WS 2000 Wireless Switch allows the administrator to enable and configure four different subnets. The administrator can assign an IP address, port associations, DHCP settings, and security settings to each subnet.
Enable Subnet1

Select **LAN** under the Network Configuration group from the left menu. Use the LAN configuration screen to view a summary of physical-port addresses and wireless LANs (WLANs) associated with the four supported subnets, and to enable or disable each configured subnet.

1. In the **LAN** screen, the administrator can enable up to four subnets. Make sure that the checkbox to the left of the Subnet1 line is enabled.

   Each enabled subnet shows up in the directory tree in the left column of the configuration screens. Consider disabling a previously configured subnet if its assigned ports are no longer in use, or to consolidate the LAN’s communications on fewer subnets.

The rest of the information on this screen is summary information—it is collected from other screens (such as the subnet configuration screens) where the administrator can set the data.

<table>
<thead>
<tr>
<th>Network</th>
<th>Network (subnet) name is a descriptive string that should describe the subnet’s function. The WS 2000 Network Management System uses subnet names throughout the configurations screens.</th>
</tr>
</thead>
</table>
Step 4: Configuring Subnet1

The WS 2000 Network Management System allows the administrator to define and refine the configuration of the enabled subnets. Each of four subnets (short for "subnetworks") can be configured as an identifiably separate part of the switch-managed local area network (LAN). Each subnet can include some combination of assigned ports and associated wireless LANs (WLANs).

1. Select **Network Configuration --> LAN --> Subnet1** from the list on the left. The following screen appears for the selected subnet.
2. Check to make sure that all the ports and WLAN1 are selected for this subnet. WLAN1 should automatically be included if the switch and the access port are communicating properly. If WLAN1 is not present in the list, check:
   - The power to the Access Port
   - The connections between the switch and the access port
   - The LEDs to make sure that lights are on and flashing

3. For this initial configuration, ensure that **This interface is a DHCP Server** is enabled. If so, the switch sets the IP addresses automatically for the mobile devices. This value can be changed at any time in the future. All other default settings are fine for the system test. DHCP is a protocol that includes mechanisms for IP address allocation and delivery of host-specific configuration parameters from a DHCP server to a host. Some of these parameters are IP address, network mask, and gateway. The switch includes internal DHCP server and client features, and the subnet’s interface can use either capability.

4. Click the **Apply** button if any changes were made.
Step 5: Configuring the WAN Interface

A wide area network (WAN) is a widely dispersed telecommunications network. In a corporate environment, the WAN port might connect to a larger corporate network. For a small business, the WAN port might connect to a DSL or cable modem to access the Internet.

The WS 2000 Wireless Switch includes one WAN port. In order to set up communications with the outside world, select Network Configuration --> WAN from the left menu. The following WAN configuration page appears.

### Communicating with the Outside World

1. Click the Enable WAN Interface checkbox to enable a connection between the switch and a larger network or the outside world through the WAN port.

2. If this switch should be a DHCP client (get its IP address automatically from another server or switch), check This interface is a DHCP Client checkbox. If This interface is DHCP

![WAN Configuration Page](image-url)
Client is checked, the switch is limited to one WAN IP address. This choice is required when:

- The host router or switch on the WAN is communicating with the WS 2000 Wireless Switch using DHCP.
- The switch is interfacing with an Internet Service Provider (ISP) that uses DHCP addressing.

This setting is independent from the DHCP settings for the switch’s internal subnets.

3. If This interface is DHCP Client is not checked, fill in the information in this area. To find out the information to enter into these fields, contact the network administrator or the ISP that provided the cable modem or DSL router. All the fields below take standard IP addresses of the form xxx.xxx.xxx.xxx.

- The IP Address refers to the IP address that the outside world uses to address the WS 2000 Wireless Switch.
- Click the More IP Addresses button to specify additional static IP addresses for the switch. Additional IP addresses are required when users within the LAN need dedicated IP addresses, or when servers in the LAN need to be accessed (addressed) by the outside world. The pop-up window allows the administrator to enter up to eight WAN IP addresses for the switch.
- The Subnet Mask is the mask used for the WAN.
- The Default Gateway is the address of the device that provides the connection to the WAN (often a cable modem or DSL router).
- The two DNS Server fields specify DNS addresses of servers that can translate domain names, such as www.symbol.com, into IP addresses that the network uses when passing information. The Secondary DNS Server acts as a backup to the Primary DNS Server when the primary server is not responding.

Setting Up Point-to-Point over Ethernet (PPPoE) Communication

PPPoE provides the ability to connect a network of hosts through a simple device to a remote access concentrator. Many DSL providers require that their clients communicate using this protocol. The facility allows the ISP to control access, billing, and type of service provided to clients on a per-user or per-site basis. Check with the network administrator or ISP to determine whether to enable this feature, and, if so, find out the username and password required for authentication.
1. Check Enable in the PPP over Ethernet area to enable the PPoE protocol for high-speed connections.

2. Enter the Username and Password required for authentication. The username and password are for the switch’s router to use when connecting to the ISP. When the Internet session starts, the ISP authenticates the username.

3. Set the Idle Time to an appropriate number. This number is the amount of time the PPoE connection will be idle before it disconnects. The 10000 second (default idle time is appropriate for most situations).

4. Check Keep Alive to instruct the switch to continue occasional communications over the WAN even when client communications to the WAN are idle. Some ISPs terminate inactive connections, while others do not. In either case, enabling Keep-Alive mode keeps the switch’s WAN connection alive, even when there is no traffic. If the ISP drops the connection after so much idle time, the switch automatically reestablishes the connection to the ISP.

5. Select the appropriate WAN authentication method from the drop-down menu. Collect this information from the network administrator. Select between None, PAP, CHAP, or PAP or CHAP.

6. Click the Apply button to save changes.

### Step 6: Enabling Wireless LANs (WLANs)

The WS 2000 Wireless Switch works either in a wired or wireless environment; however, the power of the switch is associated with its support of wireless networks. In order to use the wireless features of the switch, the administrator needs to enable up to four wireless LANs (WLANs).
To start the WLAN configuration process, select the **Network Configuration --> Wireless** item from the left menu. The following Wireless summary screen appears.

### Wireless Summary Area

The top portion of the window displays a summary of the WLANs that are currently defined. This is the screen in which the administrator can enable or disable a WLAN. At first, four WLANs are listed WLAN1, WLAN2, WLAN3, and WLAN4; however, only WLAN1 is enabled.

1. Verify that WLAN1 is enabled (checked) and associated with Subnet1.
2. Verify that Access Port 1 is shown in the **Access Ports Adopted** field to the right. If it is not, verify the connection between the switch and the Access Port.

The current settings for the associated Subnet and adopted Access Ports are displayed on this screen; however, the screen associated with each WLAN (under **Network Configuration --> Wireless**) is where the settings and rules for adopting Access Ports can be modified.
Use the Access Port Adoption area to assign Access Ports to a particular WLAN. The switch can adopt up to six Access Ports at a time, but the list of allowed Access-Port addresses (displayed in this area) can exceed six in number. A dual-radio 802.11a/b Access Port counts as one Access Port with respect to the maximum allowed; however, each radio is listed as a separate Access Port.

This adoption list identifies each Access Port by its Media Access Control (MAC) address. This address is the Access Port’s hard-coded hardware number that is printed on the bottom of the device. An example of a MAC address is 00:09:5B:45:9B:07.

The default setting associates all adopted Access Ports with WLAN1.

**Step 7: Configuring WLAN Security**

In the previous step, the administrator set parameters for each WLAN that fine tune the performance of the WLAN. In addition, the administrator can set the type and level of security for each WLAN. These security measures do not control communications from the WAN; instead, they control communication from the clients within the WLAN.

In the **Network Configuration** --> **Wireless** --> `<WLAN name>` --> `<WLAN Name>` --> **Security** screen, the administrator can set the user authentication method and the encryption method, as well as define a set of rules that control which MUs can communicate through the WLAN.
Setting the Authentication Method

The authentication method sets a challenge-response procedure for validating user credentials such as username, password, and sometimes secret-key information. The WS 2000 Wireless Switch provides two methods for authenticating users: 802.1x EAP and Kerberos. The administrator can select between these two methods. For testing connectivity, WLAN security is not an issue, so there is not reason to enable authentication—the default setting (No Authentication) is sufficient.

Setting the Encryption Method

Encryption applies a specific algorithm to data to alter its appearance and prevent unauthorized reading. Decryption applies the algorithm in reverse to restore the data to its original form. Sender and receiver employ the same encryption/decryption method.

Wired Equivalent Privacy (WEP) is a security protocol specified in the IEEE Wireless Fidelity (Wi-Fi) standard, 802.11b. WEP is designed to provide a WLAN with a level of security and privacy comparable to that of a wired LAN. WEP might be all that a small-business user needs for the simple...
encryption of wireless data. However, networks that require more security are at risk from a WEP flaw. An unauthorized person with a sniffing tool can monitor a network for less than a day and decode its encrypted messages.

For the connectivity test, set WEP 128 encryption. This ensures that communications with the switch are secure enough for this stage. Later on, increasing the security level might be necessary.

1. Select the **WEP 128 (104-bit key)** option.
2. To use WEP encryption with the **No Authentication** selection, click the **WEP Key Settings** button to display a sub-screen for entering keys.

3. Add a key to **Key #1**, and use that key with the mobile unit. The keys consist of 26 hexadecimal (0-9, A-E) characters. When finished, click the **Ok** button to close this screen and return to the WLAN Security screen.
4. Click the **Apply** button in the WLAN Security screen to save changes.

**Mobile Unit Access Control List (ACL)**

This list is used to specify which mobile units can or cannot gain access to the WLAN. The list employs an adoption rule for allowing or denying specific mobile units by way of exception. By default, all mobile units can gain access.

**Step 8: Testing Connectivity**

At this point, the switch is set up to allow mobile units.
1. Go to the mobile unit and ensure that it is set up as a DHCP client.
2. Set the mobile unit for WEP 128 encryption and set the same key as the one that was entered in the WEP Key Settings dialog. It may be necessary to reboot the mobile unit after changing the settings.
3. Open a Web browser and type the IP address: 192.168.0.1.
   The WS 2000 Switch Management screen should appear. If not, go back to the wired system used to configure the switch and see if the mobile device appears in the MU Stats screen (Status & Statistics --> MU Stats). If it does not appear on the MU Stats screen, recheck the network and WEP settings on the mobile device.
4. In the Web browser, enter a URL for a site (such as www.symbol.com) on the WAN. If the site does not appear, go to the WAN Stats screen (Status & Statistics --> WAN Stats) to review the status of the WAN connection.

Where to Go from Here?

Once full connectivity has been verified, the switch can be fully configured to meet the needs of the organization. The Online System Reference has detailed information about how to configure the WS 2000 Wireless Switch. In addition, two case studies are provided on the CD for specific installation examples. These case studies describe the environment, the desired features, and the configuration selections that were made in two different scenarios.

- Case 1: Small Retail Store
  (with handheld terminals, wireless printers, wired POS, secured access to in-store server, and public access to WAN)
- Case 2: Small Branch Office
  (with 3 WAN IP addresses, VPN passthrough, RADIUS server, and full-access between subnets)
Regulatory Information

All Symbol devices are designed to be compliant with rules and regulations in locations they are sold and will be labeled as required. Any changes or modifications to Symbol Technologies equipment, not expressly approved by Symbol Technologies, could void the user's authority to operate the equipment.

Country Approvals

A regulatory label is applied to signify the AP 100 Access Port is approved for use in the following countries: United States, Canada, Australia, Japan, and Europe.

Europe includes: Austria, Belgium, Croatia, Czech Republic, Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom.

In addition to the list above, other countries may require a regulatory stamp to be affixed to the product. Please refer to http://www.symbol.com/wireless/ for the list of countries where mandatory stamps are required.

For countries that require a regulatory label, a sheet of stamps may be enclosed within the package. If the appropriate stamp is not provided, please contact your supplier.

To apply the country stamp:

1. Peel the stamp appropriate to the country where this device is to be used.
2. Apply the country stamp in the space provided on the regulatory label.

Operation of the device without a regulatory label or the correct country stamp is illegal.

Power Supply

Use only a Symbol-approved power supply output rated 48VDC. The power supply is certified to EN60950 with SELV outputs.
Hinweis:
Benutzen Sie nur eine Symbol Technologies genehmigte Stromversorgung in den Ausgabe: 48VDC. Die Stromversorgung ist bescheinigt nach EN60950 mit SELV Ausgaben.

FCC RF Exposure Guidelines

To comply with FCC RF exposure requirements, antennas that are mounted externally at remote locations or operating near users at stand-alone desktop of similar configurations must operate with a minimum separation distance of 20 cm from all persons.

Radio Frequency Interference Requirements

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help.
Radio Transmitters (Part 15)

The AP 300 Access Port complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Radio Frequency Interference Requirements—Canada

This device is a Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Radio Transmitters

The AP 300 Access Port complies with RSS 210 of Industry & Science Canada. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

Label Marking: The Term “IC:” before the radio certification only signifies that Industry Canada technical specifications were met.

CE Marking and European Economic Area (EEA)

RLANs (2.4 GHz) for use through the EEA have the following restrictions:

- Maximum radiated transmit power of 100 mW EIRP in the frequency range 2.400 – 2.4835 GHz
- France, outside usage is restricted to 2.4 – 2.454 GHz
- Belgium, outside usage is restricted to 2.460 – 2.4835 GHz
- Italy requires a user license for outside usage.

Statement of Compliance

Symbol Technologies, Inc., hereby, declares that this device is in compliance with the essential requirements and other relevant provisions of Directives 1999/5/EC, 89/336/EEC and 73/23/EEC. Declaration of Conformities may be obtained from http://www2.symbol.com/doc/

Other Countries

- Mexico – Restrict Frequency Range to: 2.450 – 2.4835 GHz.
- Sri Lanka – Restrict Frequency Range to: 2.400 – 2.430 GHz.

For the latest version of this guide go to: http://www.symbol.com/manuals/.
Service and Support

Service Information

Before using the unit, it must be configured to operate in the facility’s network and run your applications. If you have a problem running your unit or using your equipment, contact your facility’s Technical or Systems Support. If there is a problem with the equipment, they will contact the Symbol Support Center:

For the latest version of this guide go to: http://www.symbol.com/manuals/.

Customer Support

Symbol Technologies provides its customers with prompt and accurate customer support. Use the Symbol Support Center as the primary contact for any technical problem, question or support issue involving Symbol products. If the Symbol Customer Support specialists cannot solve a problem, access to all technical disciplines within Symbol becomes available for further assistance and support. Symbol Customer Support responds to calls by e-mail, telephone or fax within the time limits set forth individual contractual agreements.
When contacting Symbol Customer Support, please provide the following information:

- Device serial number
- Product name or model number
- Software type and version number

**North American Contacts**

Inside North America, contact Symbol at:

**For sales and product information:**

Symbol Technologies, Inc.
One Symbol Plaza
Holtsville, New York 11742-1300
Telephone: 1-631-738-2400/1-800-SCAN 234
Fax: 1-631-738-5990

**For product support and service:**

Symbol Global Support Center:
Telephone: 1-800-653-5350, +1-631-738-6213 (Outside North America)
Fax: 1-631-738-5410
Email: support@symbol.com
International Contacts

Outside North America, contact Symbol at:
Symbol Technologies, Inc.
Symbol Place
Winnersh Triangle, Berkshire, RG41 5TP
United Kingdom
Telephone: 0800-328-2424 (Inside UK), +44 118 945 7529 (Outside UK)
http://www.symbol.com/services/howto/howto_contact_us.html

Web Support Sites and Additional Information

Comprehensive On-line support is available at the MySymbolCare Web-site. Registration is free and a variety of services can be linked through this web-portal.

<table>
<thead>
<tr>
<th>Service</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>MySymbolCare</td>
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<td><a href="http://kb.symbol.com/register.asp">http://kb.symbol.com/register.asp</a></td>
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For warranty and service information, contact the Symbol Support Center: telephone 1-631-738-6213 or 1-800-653-5350; fax: (631) 563-5410; or E-mail: support@symbol.com.

Obtain additional information by contacting Symbol at:

- 1-800-722-6234, inside North America
- +1-631-738-5200, in/outside North America
- http://www.symbol.com/