

Spectrum24

Wireless LAN Adapter Models LA-3021 PC Card & LA-3026 ISA Adapter

Product Reference Guide

INF-WLAN-01
Revision A
September 2000

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Patents

This product is covered by one or more of the following U.S. and foreign Patents:

U.S. Patent No.

4,360,798;	4,369,361;	4,387,297;	4,460,120;	4,496,831;	4,593,186;	4,603,262;	4,607,156;
4,652,750;	4,673,805;	4,736,095;	4,758,717;	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;	5,142,550;	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;	5,280,164;	5,280,498;	5,304,786;	5,304,788;	5,306,900;	5,321,246;	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;	5,668,803;	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;	5,850,078;	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;	D305,885;	D341,584;	D344,501;	D359,483;	D362,453;
D363,700;	D363,918;	D370,478;	D383,124;	D391,250;	D405,077;	D406,581;	D414,171;
D414,172;	D419,548;						

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

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About This Document

Reference Documents

This Reference Guide refers to the following documents:

Part Number	Document Title
INF-SS-01	Spectrum24 Site Survey System Administrators Guide
INF-UAP-01	Spectrum24 AP-3021 Access Point Product Reference Guide
INF-FHPP-01	Spectrum24 FH Plus Pack User Guide

Conventions

Keystrokes are indicated as follows:

ENTER	identifies a key.
FUNC, CTRL, C	identifies a key sequence. Press and release each key in turn.
Press A+B	press the indicated keys simultaneously.
Hold A+B	press and hold the indicated keys while performing or waiting for another function. Used in combination with another keystroke.

Typeface conventions used include:

<angles>	indicates mandatory parameters in a given syntax.
[brackets]	for command line, indicates available parameters; in configuration files brackets act as separators for options.
GUI Screen text	indicates the control name in a GUI-based application.
<i>Italics</i>	indicates the first use of a term, book title, or menu.
'single quotes'	indicates the exact setting for a parameter.

Screen

indicates monitor screen dialog. Also indicates user input.

A screen is the hardware device on which data appears.

A display is data arranged on a screen.

Terminal

indicates text shown on a terminal screen.

URL

indicates Uniform Resource Locator. Click the URL to launch browser.

This document uses the following icons for certain conditions or types of information:



Indicates tips or special requirements.



Indicates conditions that can cause equipment damage or data loss.



Indicates a potentially dangerous condition or procedure that only Symbol-trained personnel should attempt to correct or perform.

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Spectrum24 is a frequency-hopping, spread spectrum network that operates between 2.4 and 2.5 GHz. Spectrum24 operates similarly to Ethernet networks without a wired network infrastructure. Spread spectrum communication provides a high-capacity network within large or small environments. Interference reduction makes it ideal for mobile communications and real-time data access applications.

- Spectrum24 bridging architecture allows communication between wired network devices and mobile devices.
- Spectrum24 switchable data rates enable 1 Mbps and 2 Mbps devices to communicate in the same network environment.
- Spectrum24 supports the IEEE 802.11 specification. This architecture allows Spectrum24 devices to communicate with wireless devices from other manufacturers.
- Spectrum24 enables mobile devices to roam throughout large facilities while remaining connected to the LAN.
- Spectrum24 enables firmware upgrades while devices remain operational.
- Spectrum24 antenna diversity feature alternates between antennas with the best reception, increasing overall performance.

About the Spectrum24 Wireless LAN Adapter

The Spectrum24 *Wireless LAN (WLAN)* adapter allows PC Card or ISA adapter slot-equipped host systems to configure, connect to and establish a Spectrum24 network. The ISA version of the WLAN adapter implements the Plug and Play standard.

Features Include:

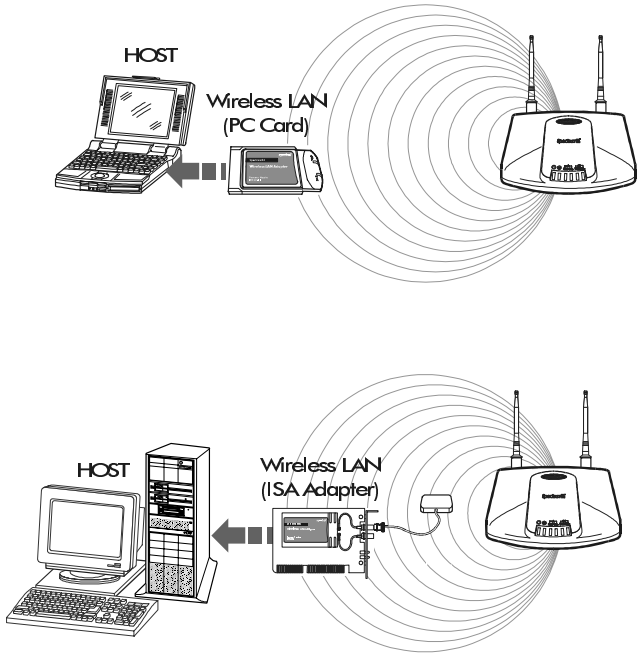
- Low-power operation for battery-powered devices with PC Card slots.
- Standard *NDIS (Network Driver Interface Specification)* and *ODI (Open Data-link Interface)* drivers.
- Windows 95, 98, NT, 2000 and DOS driver support.
- Card and Socket Services support.
- Plug and Play support.
- Power management [*Continuously Aware Mode (CAM)* and *Power Save Polling (PSP)*].



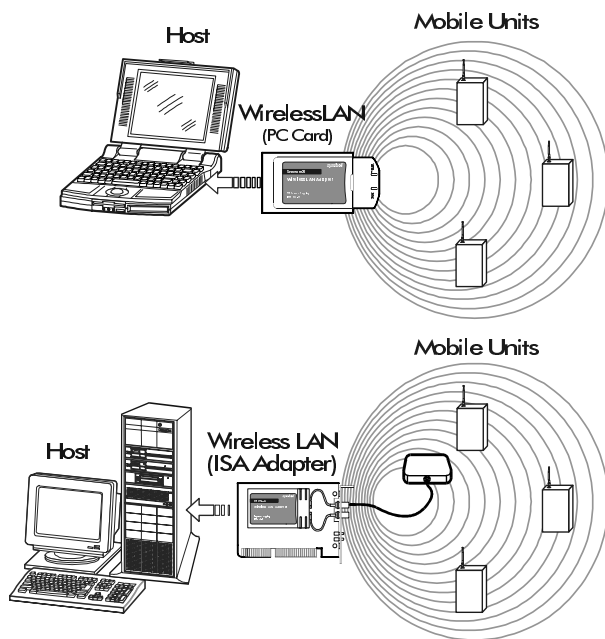
The NDIS4 and NDIS5 driver files are bundled with the WinAll.bat and Win98_2K.bat files. Use these files to create a driver installation diskette if downloading the driver from the Symbol Web site. Use Win98_2K.bat to create an NDIS5 installation diskette for Windows 98 and 2000. Use WinAll.bat to create an NDIS4 installation diskette for Windows 95/98 and NT 4.0 or an NDIS5 diskette for Windows 98 and 2000. If using NDIS5 for Windows 98, use x:\ndis5 as the path to the driver files, where x is the location of the floppy drive.

2.1 MU Mode

In *Mobile Unit (MU)* mode, the WLAN adapter connects to an access point (AP) or another WLAN installed system. MU mode enables a device to roam freely between access point cells in the network. MUs appear as network nodes to other devices.



2.2 MicroAP Mode



In the MicroAP mode, the WLAN adapter operates as an access point. The adapter, when installed in a computer without another network connection, establishes a single-cell wireless network coverage area for devices in MU mode. Each MicroAP requires a unique ESSID. Cells can coexist as separate, individual networks at the same site without interference. The MicroAP does not roam, but it does support MUs that roam. MicroAPs operate in CAM to support both CAM and PSP MUs. MUs operate only within the cell established by the MicroAP. A single MicroAP can support up to 16 MUs. An *Access Control List (ACL)* containing the MU MAC addresses within the established cell allows only the

specified MUs (within the ACL) to associate with a MicroAP. Set the MicroAP and the MU to the appropriate data rates to communicate. Refer to the MicroAP Rate Control Table for the rates. The table below shows compatible data rates. The adapter is configured to operate in the MicroAP mode through the Spectrum24 Network configuration dialog screen or the Spectrum24 Installation window in Windows NT (refer to the installation section).

Table 2-1: MicroAP Rate Control Table

Mobile Unit	Micro AP (Rate Control)			
	Supported Transmit Rates	Base Rate 1	Base Rate 1, Tx Rate 2 (Default)	Base Rate 1, Base Rate 2
1	1	1	N/A	N/A
1 & 2 (Default)	1	1 & 2	1 & 2	2
2	N/A	N/A	N/A	2

2.3 1 and 2 Mbps Operation

The Spectrum24 3021 PC Card and 3026 ISA adapter support 1 or 2 Mbps data rates when properly configured. The MU and the access point need to be operating at the same data rate to maintain network connectivity. The table below identifies the supported data rates of a properly configured MU and access point. The following factors dynamically alter the data rate.

- signal strength between the access point and the MU
- the ratio of good transmitted packets to attempted
- transmitted packets fall below a threshold
- the MU finds a higher transmit rate with another access point or encounters an unspecified data rate.

Table 2-2: AP Rate Control Table

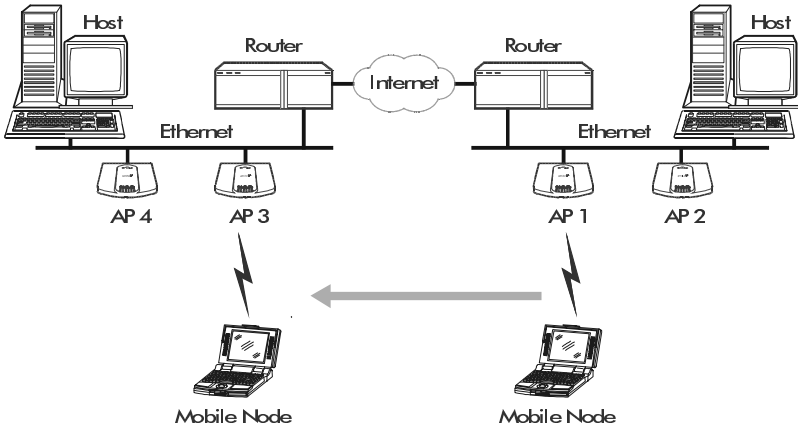
Mobile Unit	Access Point (Rate Set)			
	1 only	1 Required, 2 Optional (Default)	1 and 2 Required	2 Only
Supported Transmit Rates				
1	1	1	N/A	N/A
1 & 2 Default	1	Dynamic Rate Control	Dynamic Rate Control	2
2	N/A	N/A	N/A	2

2.4 Mobile IP

The Spectrum24 WLAN adapter supports Mobile IP (roaming across routers) when properly configured to support Mobile IP in NCPA. The Mobile IP feature allows Spectrum24 Wireless LAN devices to roam across routers.

The MU retains its IP address when configured for Mobile IP and can:

- move from one IP subnet to another
- move from an Ethernet segment to a wireless LAN
- move from one Ethernet segment to another.



Refer to Appendix A for instructions on using the NCPA utility to configure the WLAN adapter for Mobile IP support.

2.5 Power Management

The WLAN adapter supports the Continuously Aware (CAM) and Power Save Polling (PSP) power management modes. CAM requires the radio to remain on. Symbol does not recommend CAM for battery powered devices.



The ISA version of the Spectrum24 WLAN adapter functions in CAM only.

PSP mode allows the MU to conserve power by suspending communication while still associated with an access point. The access point saves data for transmission to the MU when it wakes at given intervals. When the adapter wakes to check for data, it switches back into CAM until it is ready suspend communications again.

An adjustable PSP level enables users to specify how often the MU wakes up to check for data. PSP level 1 provides the quickest response time (shortest sleep interval), while PSP level 10 provides efficient power consumption (longest sleep interval).



Use the Symbol Network Control Panel Applet (NCPA), the Symbol Network Interface Card Task Tray (NICTT) or the Network Interface Card Information (NICInfo) utility to set the PSP level.

2.6 Card and Socket Services

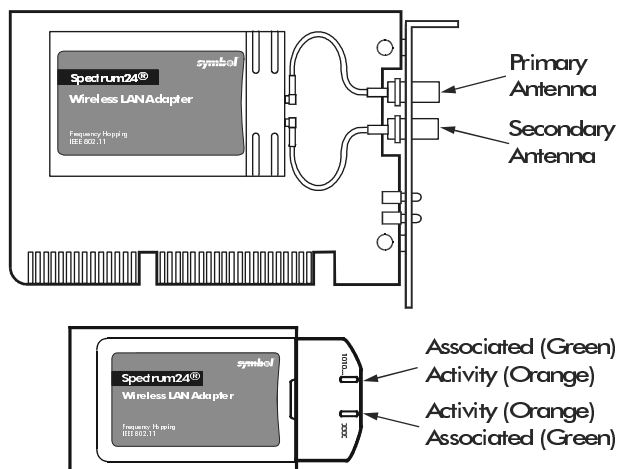
The Spectrum24 WLAN adapter supports Card and Socket services. Card and Socket Service software packages work with the host computer operating system enabling the Wireless LAN adapter to interface with host computer configuration and power management functions. Card and Socket Service software packages include SystemSoft and Phoenix.

2.7 Plug and Play

The ISA version of the Spectrum24 WLAN adapter supports Plug and Play systems. Plug and play allows a computer to recognize the ISA adapter, and configure the hardware interrupt, memory and device recognition addresses. This feature requires less user interaction and minimizes hardware conflicts.

2.8 Spectrum24 Adapter LED Descriptions

The WLAN adapter LEDs illuminate during connection or data transfer to indicate the functional status of the WLAN adapter.



LEDs	Mode	LED Function
Associated	As MicroAP	The LED flashes to indicate a powered MicroAP accepting MUs.
	As MU	A solid LED indicates association with an AP.
Activity	As MicroAP	A solid LED indicates data traffic between the MicroAP and MU.
	As MU	A solid LED indicates communication with the AP.



PC Cards without end-cap antennas lack LEDs.

Chapter 3 **Hardware Installation**

Physical installations differ for each system. Refer to the system manufacturer documentation for specific information.

3.1 Preparation

Before beginning the installation, verify the hardware package contains the correct PC Card or ISA adapter.



Verify the model indicated on the card and packaging before use. Contact the Symbol Support Center if an item is missing or not functioning.

3.2 Installing the PC Card

The Spectrum24 WLAN adapter requires:

- a computer with a Type II PC Card slot
- an available interrupt (IRQ)
- an available I/O port address



Installation and removal methods vary for different host devices. Refer to system documentation for information.



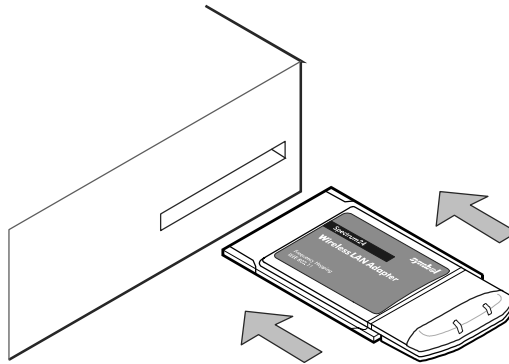
Avoid WLAN adapter contact with liquids or abrasive materials.

To install the PC Card:

1. Insert the PC Card into the PC slot. Arrows on the front of the PC Card indicate the insertion point to the slot.
2. Slide in the PC Card until it firmly seats.



Align the card properly when inserting. Insert the card firmly without forcing. Forcing the card into the slot can damage the device or the card.



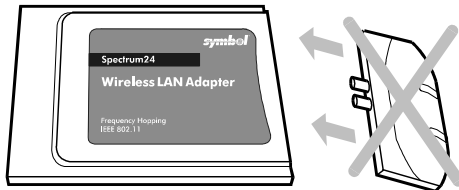
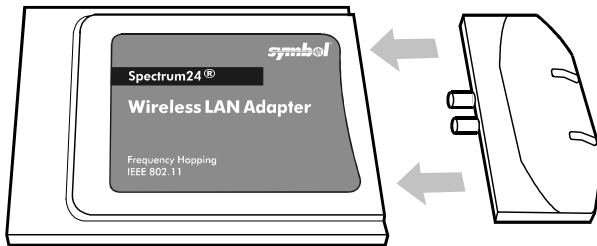
To conform with FCC RF exposure requirements, this portable device is only approved for use near a user's hand when there is 20 cm or more between the antenna and any persons body during normal operating conditions.

3.2.1 End-Cap Antenna Installation

To attach an end-cap antenna to a Spectrum24 PC Card:

1. Grasp the PC Card at its end nearest the antenna connector.
2. Line up the antenna connectors with the PC Card connectors.

Keep antenna aligned with the PC Card.



Tilting the antenna while trying to install or remove it can cause the antenna connectors to bend and break.

3. Firmly press the antenna to the PC Card.
A soft click indicates the antenna is connected.
Verify the PC Card and antenna ends are flush.

3.2.2 End-Cap Antenna Removal

To remove an end-cap antenna:

1. Grasp the antenna at the end nearest the PC Card in the center above the connectors.



Do not press the buttons at the edges.
They automatically open.

2. Firmly pull the antenna from the PC Card.
Keep the end-cap in line with the PC Card.



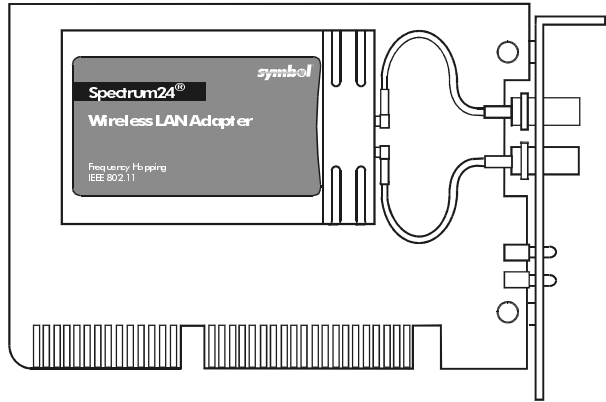
Tilting the antenna while trying to install or remove it can cause the connectors to bend and break.

To ensure a reliable connection, attach the antenna and adapter connectors securely. The antenna connection to the card is stronger than the PC Card connection in the host computer. Pulling the antenna removes the PC Card from the computer without disconnecting the antenna from the PC Card.



Flexing or tilting the antenna after attaching it to the PC Card can break the antenna and/or the PC Card connectors.

3.3 Installing the ISA Adapter



Use proper grounding for the environment when handling computer components.



Using PC 98 compliant system hardware increases the performance of the ISA adapter.

1. Power off the computer before installing the adapter.
If the system has a PCMCIA adapter installed, the ISA adapter can function as a second controller.
2. Remove the computer cover.
3. Locate an available ISA slot in the computer.
4. Remove the retaining screw and bracket for the slot.
5. Align the adapter with the slot and insert firmly.
Verify the adapter seats in the slot evenly.

6. Verify that the antenna connectors in the back of the computer are exposed.
7. Secure the adapter to the chassis with a retaining screw.
8. Replace the computer cover.

3.3.1 External Antenna Connection

The ISA adapter can use a plane antenna (not included) suitable for most environments.

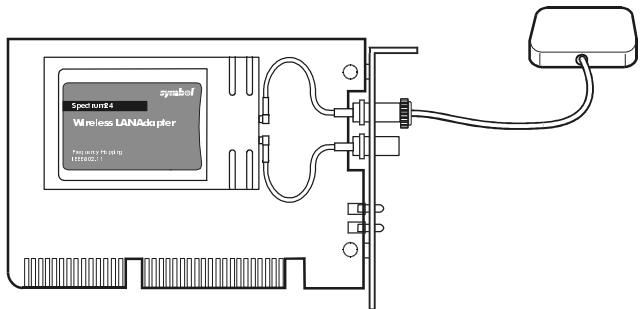


To conform with FCC RF exposure requirements, this antenna shall be installed in such a manner that it may be located near hands but must be more than 20 cm from any persons body during normal operation.



Install the plane antenna parallel to the ground for optimal performance.

1. Attach antenna to the BNC antenna connector as shown.





Note

If using only a single antenna, attach it to the PRIMARY antenna connector. Ensure the antenna is parallel to the ground.

2. Modify the DIVERSITY parameter in the appropriate configuration file as follows

Table 3-1: DOS Configuration/Parameters For Antennae

	NDIS	ODI
Single	Diversity=N	Diversity N
Dual	Diversity=Y	Diversity Y



Note

Obtain additional or higher performance antennas from Symbol. Contact a Symbol sales representative to order the following models:

additional plane antenna	ML-2499-PSA1-00
single high-performance antenna	ML-2499-HPA1-00
single rubber antenna	ML-2499-APA1-00



Note

Configure **Diversity** (for dual antennae) by selecting **Diversity Antenna** from the **NCPA WLAN Adapter** property page.

Chapter 4 **Installing and Configuring the Windows 95/98 Driver**

4.1 **Installing the Spectrum24 Driver in Windows 95**

If an installation CDROM was not included with the adapter, create a driver installation diskette. Go to (http://www.symbol.com/services/downloads/download_spec24.html) and download the driver files to a computer local drive. Insert a formatted diskette into the computer floppy drive and run WinAll.bat to create an NDIS4 driver diskette for Windows 95.

The Spectrum24 Windows driver ships with the Symbol Network Control Panel Applet (NCPA) utility. Use NCPA to view and edit Spectrum24 WLAN adapter settings.



Symbol recommends updating the Spectrum24 WLAN adapter to the latest firmware. After the driver and Plus Pack have been installed, use the NICUpdate utility to update the firmware in Windows 95. Refer to the documentation shipped with the Spectrum24 Plus Pack utility suite for instructions on using NICUpdate. To download the latest firmware, go to (http://www.symbol.com/services/downloads/download_spec24.html).

To install the driver for the first time in Windows 95:



Windows 95 requires the ndis4 driver.

1. Install the Symbol Spectrum24 WLAN adapter as described in Chapter 3.
2. Power up the system.
3. Insert the Spectrum24 Windows driver installation diskette or CD.
4. When Windows 95 recognizes the adapter, an **Update Device Driver Wizard** dialog box appears requesting a driver to install. Click **Next**.
5. Click **Finish** when Windows displays the following message:

Windows found the following updated driver for this device: Symbol LA-302x Spectrum24 Wireless LAN PC Card.



At this point in the installation the user is prompted by Windows 95 to insert the **Symbol LA-302x WLAN Card Installation Disk**. The disk was already installed in step 3. Click **Next**.

6. Specify the location of the driver files. Click **OK**.
7. Enter the network ESSID in the **Symbol Easy Setup** window. Click **OK**.
8. Click **Finish**.
9. When prompted, restart the computer.
10. Proceed to *4.3 Spectrum24 Adapter Configuration for Windows 95/98* on page 25.

4.2 Installing the Spectrum24 Driver in Windows 98

If an installation CDROM was not included with the adapter, create a driver installation diskette. Go to (http://www.symbol.com/services/downloads/download_spec24.html) and download the driver files to a computer local drive. Insert a formatted diskette into the computer floppy drive and run Win98_2K.bat to create an NDIS5 driver diskette for Windows 98.

The Spectrum24 Windows driver ships with the Symbol Network Control Panel Applet (NCPA) utility. Use NCPA to view and edit Spectrum24 WLAN adapter settings.



Symbol recommends updating the Spectrum24 WLAN adapter to the latest firmware. After the driver and Plus Pack have been installed, use the NICUpdate utility to update the firmware in Windows 98. Refer to the documentation shipped with the Spectrum24 Plus Pack utility suite for instructions on using NICUpdate.

To download the latest firmware, go to (http://www.symbol.com/services/downloads/download_spec24.html).

To install the Spectrum24 driver for the first time in Windows 98:



Windows 98 supports both the ndis4 and ndis5 drivers.

1. Install the Spectrum24 WLAN adapter as described in Chapter 3.
2. Power up the system.
3. Insert the Spectrum24 Windows driver installation diskette or CD.
4. When Windows 98 recognizes the adapter, the **Add New Hardware Wizard** dialog box appears. Click **Next**.
5. Select **Search for best driver for your device**. Click **Next**.
6. Select the **Specify the location** checkbox, and browse for the location of the ndis5 driver. Click **Next**.



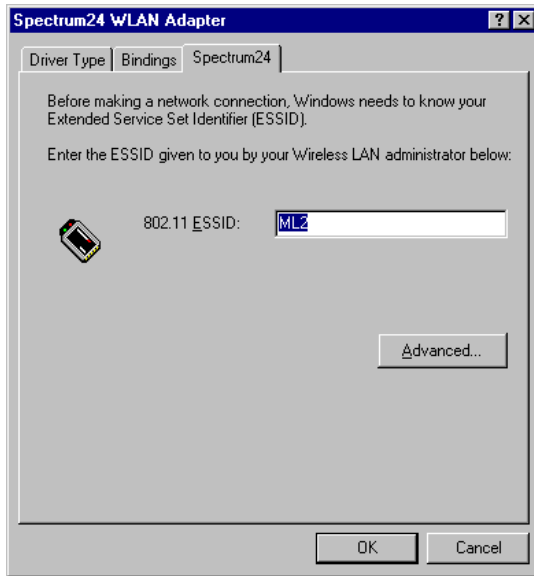
7. Click **Next** when Windows locates and displays the adapter.
The **Symbol Easy Setup** dialog box displays.
8. Enter the network ESSID in the **Easy Setup** window.
Click **OK**.
The **Add New Hardware Wizard** dialog box displays stating the required software has been installed.
9. Click **Finish**.
10. When prompted, restart the computer.
11. Proceed to *4.3 Spectrum24 Adapter Configuration for Windows 95/98* on page 25.

4.3 Spectrum24 Adapter Configuration for Windows 95/98

To configure the Spectrum24 WLAN adapter in Windows 95/98:

1. Click **Start**, select **Settings and Control Panel**.
2. Select the **Network** icon and click on the **Symbol PC Card/ISA Adapter**.
3. Select the **Properties** button.
The **Symbol Spectrum24 Easy Setup** dialog box displays.

4. Click the **Advanced** button to view the default adapter configuration.



Use the **Mobile Unit**, **Mobile IP**, **MicroAP**, **Encryption** and **WLAN Adapter** tabs to view or adjust the adapter configuration settings.



Note

For information on using the Spectrum24 NCPA utility to configure Spectrum24 adapter properties, refer to Appendix A.

5. Exit and save the configuration settings by clicking **OK** or **Finish**. Select **Cancel** to use the default values.
6. Restart the system for the changes to take effect.

Installing and Configuring the Windows NT Driver

If an installation CDROM was not included with the adapter, create a driver installation diskette. Go to (http://www.symbol.com/services/downloads/download_spec24.html) and download the driver files to a computer local drive. Insert a formatted diskette into the computer floppy drive and run WinAll.bat to create an NDIS4 driver diskette for Windows NT.

The Spectrum24 Windows driver ships with the Symbol Network Control Panel Applet (NCPA) utility. Use NCPA to view and edit Spectrum24 WLAN adapter settings.



Symbol recommends updating the Spectrum24 WLAN adapter to the latest firmware. After the driver and Plus Pack have been installed, use the NICUpdate utility to update the firmware in Windows NT. Refer to the documentation shipped with the Spectrum24 Plus Pack utility suite for instructions on using NICUpdate. To download the latest firmware, go to (http://www.symbol.com/services/downloads/download_spec24.html).

5.1 New Spectrum24 Adapter Installation

To install the Spectrum24 driver for the first time in Windows NT:



Windows NT requires the ndis4 driver.

1. Install the Spectrum24 WLAN adapter as described in Chapter 3.
2. Power up the system.
3. Insert the Spectrum24 Windows driver installation diskette or CD.

4. Click **Start**, select **Settings** and **Control Panel**.
5. Click on the **Network** icon and select the **Adapters** tab. Click **Add**.
6. Click **Have Disk**.

A window appears prompting for the location of the driver files.

7. Enter the driver letter assigned to the location of the driver files. Click **OK**.

The **Select OEM Option** dialog box displays.

8. Select the **Symbol Spectrum24 WLAN PC Card** or **Symbol Spectrum24 WLAN Plug and Play ISA Adapter (V2)**. Click **OK**.

The **Symbol Easy Setup** dialog box displays.

9. Enter the network **ESSID** in the **Symbol Easy Setup** dialog box. Click **OK**.

The **Network** dialog box appears. Click **Close**, and complete the installation instructions displayed by the Windows operating system.

10. Reboot the computer when prompted by Windows NT.
11. Proceed to *5.3 Spectrum24 Adapter Configuration for Windows NT* on page 30.

5.2 Existing Adapter Installation

To update the driver in an existing Windows NT Spectrum24 WLAN adapter installation:

1. Power up the system.
2. Insert the Spectrum24 Windows NT driver installation diskette or CD.
3. Open the **Network** applet from the **Control Panel**.
4. Click the **Adapters** tab.
5. Select the **Symbol Spectrum24 Wireless PC Card**, or **Symbol Spectrum24 Wireless ISA Adapter** and click **Update**.
6. Enter the path assigned to the driver files.
Click **Continue**.

When prompted, remove the installation diskette or CD. Click **OK** to continue.
7. Click **Close** to exit the Network applet.
8. Click **Yes** to restart the system.

5.3 Spectrum24 Adapter Configuration for Windows NT

To configure the Spectrum24 WLAN adapter for Windows NT:

1. Click **Start**, select **Settings** and **Control Panel**.
2. Click on the **Network** icon.
3. Select the **Adapters** tab and click on the **Symbol PC Card/ISA Adapter**.
4. Click the **Properties** button.

The **Symbol Easy Setup** dialog box displays.

5. Click the **Advanced** button.

The **NCPA Easy Setup** property page displays with the default **ESSID**.

Use the **Mobile Unit**, **Mobile IP**, **MicroAP**, **Encryption** and **WLAN Adapter** tabs to view or adjust the adapter configuration settings.



For information on using the Spectrum24 NCPA utility to configure Spectrum24 adapter properties, refer to Appendix A.

6. Click **OK** or **Close** to save the changes to the adapter configuration and exit the **Symbol NCPA** utility. Select **Cancel** to use the default values.
7. Remove the **Spectrum24 Windows** driver installation diskette or CD and follow the remaining instructions.
8. Restart the computer when prompted by **Windows NT**.

Installing and Configuring the Driver in Windows 2000

If an installation CDROM was not included with the adapter, create a driver installation diskette. Go to (http://www.symbol.com/services/downloads/download_spec24.html) and download the driver files to a computer local drive. Insert a formatted diskette into the computer floppy drive and run Win98_2K.bat to create an NDIS5 driver diskette for Windows 2000.



Do not install the adapter before launching the DelW2KINF.EXE file from the location where the Spectrum24 Windows 2000 driver files reside.

The Spectrum24 Windows driver ships with the Symbol Network Control Panel Applet (NCPA) utility. Use NCPA to view and edit Spectrum24 WLAN adapter settings.



Symbol recommends updating the Spectrum24 WLAN adapter to the latest firmware. After the driver and Plus Pack have been installed, use the NICUpdate utility to update the firmware in Windows 2000. Refer to the documentation shipped with the Spectrum24 Plus Pack utility suite for instructions on using NICUpdate. To download the latest firmware, go to (http://www.symbol.com/services/downloads/download_spec24.html).

6.1 Installing the Spectrum24 Driver in Windows 2000

To install the Spectrum24 driver in Windows 2000:

1. Insert the Spectrum24 Windows driver installation diskette or CD.



Do not insert the adapter before launching the DelW2KINF.EXE file. The DelW2KINF.EXE file removes the existing Spectrum24 driver residing in the Windows 2000 program files. If the DelW2KINF.EXE file is not launched, Windows 2000 loads a driver with reduced functionality.

2. Launch the DelW2KINF.EXE file from the location where the Spectrum24 driver files reside.
3. Power down the system.
4. Install the Spectrum24 WLAN adapter as described in Chapter 3.
5. Power up the system.
6. When the **Found New Hardware Wizard** dialog box displays, click **Next**.
7. When Windows 2000 recognizes the adapter, the **Found New Hardware Wizard** dialog box displays again.
8. Select the **Search for a suitable driver for my device** button. Click **Next**.
9. Specify the location of the Symbol driver files. Click **Next**.
10. Click **Next** when a message displays stating Windows has found the required device driver.



The Microsoft **Digital Signature Not Found** dialog box could appear at this point in the installation. A Microsoft digital signature is not required for the driver installation. Click **Yes** to continue with the driver installation

A progress bar displays showing the progress of the driver file download.

When the driver download is complete, the **Symbol Easy Setup** dialog box displays.

11. Enter the network ESSID in the **Easy Setup** window. Click **OK**.

The **Found New Hardware Wizard** dialog box displays again stating Windows has finished installing the software required for this device.

12. Click **Finish**.
13. Proceed to 6.3 *Configuring the Spectrum24 WLAN Adapter for Windows 2000* on page 36.

6.2 Updating the Spectrum24 Driver in Windows 2000

To update the existing Windows 2000 driver files with the Spectrum24 driver files:

1. Install the driver as described in Chapter 3.
2. Power up the system.
3. Insert the Spectrum24 driver installation diskette or CD.
4. Double-click on **My Network Places**.

5. Click on the **Network and Dial-up Connections** link.
6. Double-click **Local Area Connection**.
If the **Local Area Connection Status** is enabled, the **Local Area Connection Status** dialog box displays. If the status is **Network cable unplugged**, proceed to step 8.
7. From the **Local Area Connection Status** dialog box, click **Properties**.
The **Local Area Connection Properties** dialog box displays.
8. Click **Configure**.
The **Symbol Spectrum24 WLAN Adapter Properties** dialog box displays.
9. Click **Driver**.
10. Click **Update Driver**.
The **Upgrade Device Driver Wizard** dialog box displays.
11. Click **Next**.
The **Upgrade Device Driver Wizard** dialog box displays again.
12. Select **Search for a suitable driver for my device**. Click **Next**.
13. Specify the location of the driver files. Click **Next**.
The **Upgrade Device Driver Wizard** dialog box displays stating Windows has found a driver for the device.



Do not use the driver found by the Windows 2000 operating system.

14. Select **Install one of the other drivers**. Click **Next**.
15. Select the **Symbol LA-302x Spectrum24 Wireless LAN PC Card**. Click **Next**.



The Microsoft **Digital Signature Not Found** dialog box could appear at this point in the installation. A Microsoft digital signature is not required for the driver installation. Click **Yes** to continue with the driver installation

A progress bar displays showing the progress of the driver file download.

When the driver download is complete, the **Symbol Easy Setup** dialog box displays.

16. Enter the network ESSID in the **Easy Setup** window. Click **OK**.

The **Found New Hardware Wizard** dialog box displays again stating Windows has finished installing the software required for this device.

17. Click **Finish**.
18. Restart the computer for the changes to take effect.
19. Proceed to *6.3 Configuring the Spectrum24 WLAN Adapter for Windows 2000* on page 36.

6.3 Configuring the Spectrum24 WLAN Adapter for Windows 2000

To configure the Spectrum24 WLAN adapter for 2000:

1. Click **Start**, select **Settings** and **Control Panel**.
2. Click on the **System** icon and select the **Hardware** tab.
3. Click on the **Device Manager** button.
4. Double-click on **Network Adapters**.
5. Right-click on the Spectrum24 WLAN adapter.
6. Select **Properties**.

The **Symbol PC Card Properties** dialog box displays.

7. Select the **Spectrum24** tab.

The **Symbol NCPA Easy Setup** dialog box displays.

8. Select the **Advanced** button to view the default adapter configuration.

Use the **Mobile Unit**, **Mobile IP**, **MicroAP**, **Encryption** and **WLAN Adapter** tabs to view or adjust the adapter configuration settings.



For information on using the Spectrum24 NCPA utility to configure Spectrum24 adapter properties, refer to Appendix A.

9. Click **OK** or **Close** to save the changes to the adapter configuration and exit the Symbol NCPA utility. Select **Cancel** to use the default values.
10. Restart the computer when prompted by the Windows operating system.

Chapter 7

Installing and Configuring the Driver in DOS



Note

Symbol recommends updating the Spectrum24 WLAN adapter to the latest firmware. To download the latest firmware, go to (http://www.symbol.com/services/downloads/download_spec24.html).

7.1 Preventing Memory Range Conflicts



Note

The ISA adapter requires SLAINIT.EXE be loaded prior to installing the driver or updating the firmware.

1. To prevent conflicts with other devices, use an extended memory manager (EMM386). Exclude the upper memory block where the adapter resides. Modify the memory manager device line in CONFIG.SYS, if the adapter has a memory location starting at 0xD000 operating in memory mode and EMM386 is being used.

- For memory mode operation:

```
[DEVICE]=[path]EMM386.EXE X=D000-D7FF
```

- For I/O mode operation:

```
[DEVICE]=[path]EMM386.EXE X=D000-D0FF
```

2. Modify the network configuration to include the memory range used by the WLAN adapter.

- Exclude a 4 KB memory range for I/O Mode operation.
- Exclude a 32 KB memory range for memory mode operation.



Refer to the Network Configuration for further details. Memory manager parameter settings vary. The WLAN ISA adapter supports memory mode. WLAN ISA Plug and Play adapter does not support memory mode. Refer to the memory manager software documentation

3. Reboot the system.



Refer to Vendor documentation for setup and installation of third-party network software and drivers.

7.2 Spectrum24 Automated Driver Installation

The installation program copies the ODI driver and configuration files for the Novell Client to the hard drive. The installation program can modify AUTOEXC.BAT. The automatic installation program assumes default settings. To control value selection, use the manual installation option. The installation program also includes diagnostics functions for testing the adapter. For additional information,

refer to the README.TXT file provided on the DOS (16 bit) Drivers and Utilities diskette.

- For ODI, select **ODI Installation** from the **main** menu. This allows an automatic or manual driver installation and configuration.
- For NDIS, select **Driver Installation Instructions** from the **main** menu. For installation program overview, select **Help** from the **main** menu and select **Installation Overview**. To control value selection, use the manual installation.



Note

A default installation is assumed for all driver installations. All references made are to default directories for all installations.

1. Power up the system to a DOS prompt.
2. Insert the Drivers and Utilities Installation Diskette into the floppy drive.
3. Change the drive and path to the location of the Drivers and Utilities diskette.
4. Press the **Enter** key.
5. Type `Install`.
6. Follow the instructions from the installation program. Reboot the system when prompted.



Note

If the automatic installation program was not used, copy the files as needed (LSL.COM, SLAINIT.EXE, SL8ODIPC.COM) from the Drivers and Utilities Installation diskette to the appropriate directory on the hard disk.

7.3 NDIS Manual Installation

For NDIS, MUs require the radio device driver *SL8NDIS.EXE*. A protocol manager (*PROTMAN*) binds NDIS drivers to the protocol stack. A network bind (*NETBIND*) program binds all the network stack components. NDIS loads as a system block device driver. NDIS drivers install in the *CONFIG.SYS*.

The NDIS driver supports network configurations compatible with the NDIS v2.01 specification. NDIS configured systems require the following:

- *SL8NDIS.EXE* - The Spectrum24 radio device driver.
- *PROTMAN* - A protocol manager to bind NDIS drivers to the protocol stack.
- *NETBIND* - a network bind program for all network stack components.
- Other protocol drivers as required



Locate NDIS network parameters in *Protocol.ini*. Edit *Protocol.ini* using an ASCII text editor. The following example assumes a default installation of the third party network software. Refer to individual vendor documentation for setup of specific network software being used. [PATH] refers to the location of files on the hard drive. If the automatic installation program was not used, copy the files as needed (*PROTMAN.DOS*, *SL8NDIS.EXE*, *NETBIND.COM*) from the Drivers and Utilities Installation diskette to the appropriate directory on the hard disk.

7.4 Modifying CONFIG.SYS

Verify the following lines in CONFIG.SYS are present:

```
DEVICE=[PATH]\PROTMAN.DOS /C:\
```

```
DEVICE=[PATH]\SL8NDIS.exe
```

- other protocol drivers as required

7.5 Modifying AUTOEXEC.BAT

In AUTOEXEC.BAT verify the following:

```
[PATH]\NETBIND.COM
```

7.6 Modifying PROTOCOL.INI

Modify PROTOCOL.INI to include:

```
[sample PROTOCOL.INI entry for SYMBOL NDIS driver]
```

```
[protman]
```

```
DriverName=SYMBOL$
```

```
[SYMBOLNET]
```

```
DRIVERNAME=SYMBOL$
```

```
IOADDRESS=0x300
```

```
INT=5
```

```
MEM=0xD000
```

```
ESS_ID=101
```

```
DIVERSITY=NO
```

- other Keywords as required from appendix D.

```
[Other protocol driver sections as required]
```

7.7 ODI Manual Installation

For ODI, MUs require a *Multiple Link Interface Driver (MLID)* called SL8ODIPC.COM. SL8ODIPC.COM is the radio device driver. The multiple stacks the MU uses (TCP/IP) are known as the *Multiple Protocol Interfaces (MPI)*. A *link support layer (LSL)* program provides the link between MLID and MPI. ODI loads as a *Terminate and Stay Resident (TSR)* program. ODI program files run from the command line or as part of a batch file.



Edit ODI binding and configuration information stored in NET.CFG with an ASCII text editor using the appropriate keywords found in Appendix D. The following examples assume a default installation of third party network programs. [PATH] refers to the location of files on the hard drive. If the automatic installation program was not used, copy the files as needed (LSL.COM, SL8ODIPC.COM) from the Drivers and Utilities Installation diskette to the appropriate directory on the hard disk.

7.8 Modifying AUTOEXEC.BAT

Modify AUTOEXEC.BAT to include the following:

```
[PATH]\LSL
```

```
[PATH]\SLAINIT (If using an ISA card)
```

```
[PATH]\SL8ODIPC
```

- other protocol drivers as required.

7.9 Modifying NET.CFG

With an ASCII text editor, create NET.CFG in the network directory. Include the following statements:

```
LINK DRIVER SLAODI
FRAME ETHERNET_II
MODE IO
IOADDRESS 300
INTERRUPT 5
ESS_ID 101
```



Note

Verify the values do not conflict with other system interrupts, I/O and memory ranges. Refer to Appendix D for a detailed description of DOS keyword definitions.

7.10 Keyword usage

Certain keywords enable or disable features, modes and usage of the Spectrum24 adapter in different environments. Refer to Appendix D for a detailed definition of all DOS keywords.

7.11 Enabling Plug and Play



Note

In both cases set the driver keyword `PNP` to `YES`. Verify that the keywords `Cardservices` and `Socketservices` are not present or are set to `NO`.

For ODI, in NET.CFG enter:

```
PNP YES  
CARDSERVICES NO  
SOCKETSERVICES NO
```

For NDIS, in PROTOCOL.INI enter:

```
PNP=YES  
  
CARDSERVICES=NO  
  
SOCKETSERVICES=NO
```



The ISA Plug and Play WLAN card requires users to load SLAINIT.EXE prior to loading the driver or updating the firmware. For ODI, from the command line or in a batch file load the following:

```
LSL.COM  
  
SLAINIT.EXE  
  
SL80DIPC.COM
```

- other protocol drivers as required.

For NDIS, in the CONFIG.SYS file include:

```
[DEVICE]=[PATH]\PROTMAN.DOS
```

```
[DEVICE]=[PATH]\SLAINIT.EXE
```

```
[DEVICE]=[PATH]\SL8NDIS.EXE
```

- other protocol drivers as required.

7.12 Enabling Card Services

Load SLAINIT.EXE prior to loading the driver in order to use Card and Socket Services with the PCMCIA Adapter card. Using Card and Socket Services allows Hot Swapping the PCMCIA Adapter card. It also provides protection against resource conflicts.

For ODI, from the command line or in a batch file enter:

```
LSL.COM
```

```
SLAINIT.EXE
```

```
SL8ODIPC.COM
```

- other protocol drivers as required.

For NDIS, in config.sys enter:

```
[DEVICE]=[PATH]\PROTMAN.DOS
```

```
[DEVICE]=[PATH]\SLAINIT.EXE SECTIONNAME  
=(the Symbol Spectrum24 drivers in  
PROTOCOL.INI.)
```

```
[DEVICE]=[PATH]\SL8NDIS.EXE
```

- other protocol drivers as required.



Ensure that the driver keywords `Cardservices` and `Socketsservices` have been set to **Yes**. Verify that `PNP` is not present or has been set to **No**.

For ODI, in `NET.CFG` enter:

```
PNP NO
```

```
CARDSERVICES YES
```

```
SOCKETSERVICES YES
```

For NDIS, in `PROTOCOL.INI` enter:

```
PNP=NO
```

```
CARDSERVICES=YES
```

```
SOCKETSERVICES=YES
```



Modify the driver keywords `Memory` and `IOAddress` if desired. `SL8INIT.EXE` uses the values to request resources from Card Services. Card Services provides values if they are unavailable. If the `SL8INIT.EXE` keyword `DynamicResources` is set to **Yes**, `SL8INIT.EXE` accepts these values and passes them to the driver.

7.13 Windows for Workgroups (v3.11)

Preparation Before installing the driver for Windows for Workgroups, verify or obtain the following:

- Spectrum24 network adapter installed
- WFW v3.11 installation media
- the Spectrum24 driver disk.



If a previous Spectrum24 driver was installed, remove it before installing the new Spectrum24 driver.

7.14 Installing the Driver

1. After Windows starts, from **Program Manager** open the group **MAIN**.
2. Double click on the **Windows setup** applet.
3. Open the **Options** menu. Click **Change Network Settings**.
4. Select **WFW network** or **windows support for another network**.
5. Select **Drivers**.
6. Select **Symbol Spectrum24 LAN Adapter** and click **Remove**.
7. Click **Close**, click **OK**.
8. Select **Unlisted** or **Updated Network Adapter**.
9. Enter the new **OEMSETUP.INF** file location.
10. Select the new **Spectrum24 802.11** adapter from the list. Click **OK**.
11. From the **Network Drivers** dialog box, select **Setup**.

12. Set the parameters in this box.
13. Select **Advanced**.
14. Enter the **ESS_ID** number (Use double-quotes when entering the number). Click **OK**.
15. Click **OK** in the adapter settings dialog box.
16. At the **Network Drivers** dialog box, continue following the WFW instructions.
17. When the prompt `Files for Symbol Spectrum24 802.11 LAN Adapter are currently installed, do you want to replace them?` appears, click **YES**.
18. Enter the path where the new **OEMSETUP.INF** file is located
19. Complete the WFW installation instructions on the screen.
20. Remove the installation disk.
21. Restart System for changes to take effect.



After restarting the system, the Spectrum24 802.11 adapter driver parameters remain active and present under setup in WFW network settings. The Spring parameters remain present under network settings in WFW. This does not indicate any abnormalities with the new Spectrum24 802.11 driver.

Chapter 8 **Verifying the Firmware Version**

Verify the Spectrum24 Wireless LAN adapter firmware is the most recent version to ensure optimal functionality. In Windows 95/98, NT 4.0 and 2000, WLAN adapters use the Network Interface Card Task Tray (NICTT) utility to view driver and firmware revision data. The NICTT General Properties page allow users to verify driver firmware version data and view wireless LAN adapter signal and transmission quality information.

The NICUpdate utility updates the firmware in a Spectrum24 PC Card or ISA adapter. Refer to the documentation shipped with the Spectrum24 Plus Pack utility suite for instructions on using NICUpdate.



The driver and Plus Pack installation is required to run the NICUpdate utility.

Appendix A

Spectrum24 Network Control Panel Applet (NCPA)

A.1 Installing NCPA

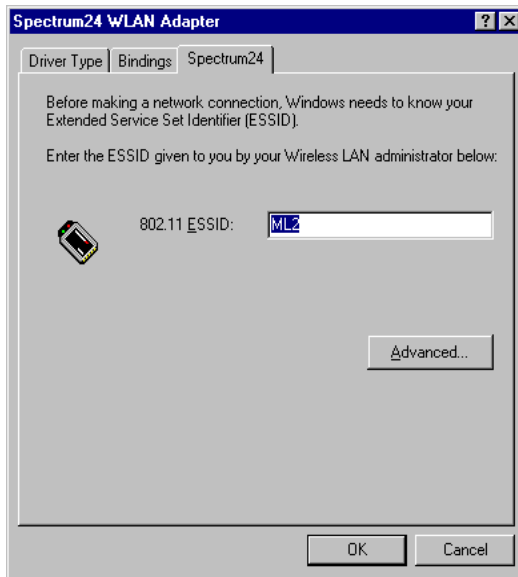


NCPA supports Windows 95/98, NT 4.0 and 2000.

The Symbol *Network Control Panel Applet* (NCPA) utility comes bundled with the Spectrum24 Windows device driver. Use NCPA to configure the Spectrum24 adapter. Complete the driver installation instructions described in Chapters 4, 5 and 6 for the Windows 95/98, NT and 2000 operating systems to install NCPA.

A.2 Using NCPA

NCPA allows users to view and edit Spectrum24 NIC settings. Access the Spectrum24 NCPA through the Windows Network Control Panel. When NCPA is installed, the applet displays an **Easy Setup** window allowing users to set the 802.11 ESSID.



Clicking the **Advanced** button allows users to view or edit WLAN adapter settings using the **Mobile Unit**, **Mobile IP**, **MicroAP**, **Encryption** and **WLAN Adapter** property pages.



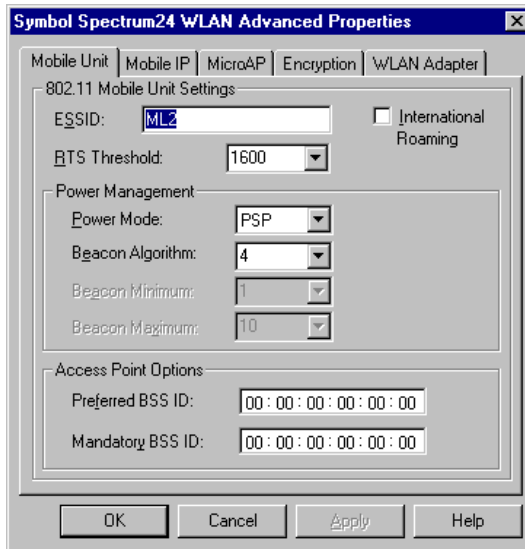
Note

The **Easy Setup** window and the five **Advanced** property pages can appear different between the Windows 95, 98, NT and 2000 operating systems.

Use the **WLAN Adapter** property page to create a NCPA Advanced property pages password dialog box. The password dialog box displays when the user clicks the **Advanced** button on the Easy Setup window. When enabled, users cannot access the Advanced property pages without entering the correct password.

A.2.1 Mobile Unit Property Page

Use the **Mobile Unit** property page to configure the NIC ESSID, power management, RTS threshold, International Roaming capability and access point options.



Use the ESS ID field to set the 802.11 Extended Service Set Identifier. the ESS ID is a 32-character string (maximum) address identifying the wireless local area network. The ESS ID assigned to the NIC is required to match the access point ESS ID for the two device to associate.

Use the RTS Threshold pull-down menu to select the data transmission size at which the NIC alerts the access point with a Request To Send (RTS) signal prior to transmission. Once the NIC receives a Clear To Send (CTS) signal from the access point, the NIC transmits the data packet. Establishing a RTS threshold in advance of sending large volumes of data helps ensure data transmission with little interference.

A Spectrum24 NIC has two main power consumption modes, Continuous Aware Mode (CAM) and Power Save Poll (PSP) mode. Use the **Power Mode** pull-down menu to specify the power mode to be used by the adapter. CAM provides the best performance but uses the most power. CAM is the preferred mode for devices running on AC power. PSP saves significant amounts of power over CAM and is the preferred mode for devices running on battery power.



Disable Power Management capabilities in NICTT to use Network Control Panel Applet (NCPA).

Use the Preferred BSS ID field to enter the IEEE MAC address of the access point where the NIC prefers to associate. The NIC assigns a higher priority to this access point when transmitting over the network.

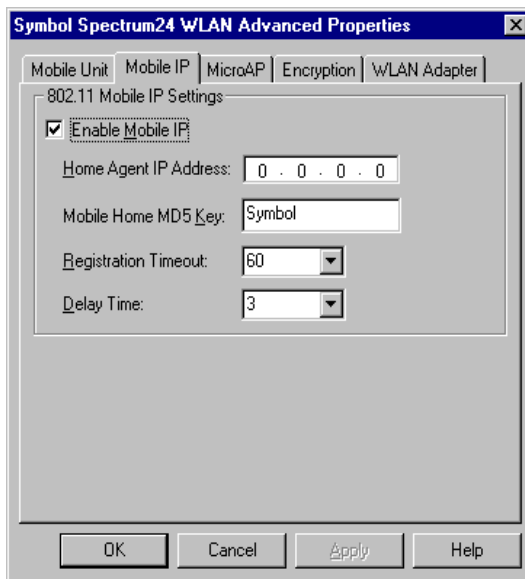
Use the Mandatory BSS ID field to enter the IEEE MAC address of the access point where the NIC is required to associate. The NIC associates to only this access point when communicating on the network. Enter an access point MAC address to associate to an access point that has a compatible ESSID.

Check the **International Roaming** checkbox to enable the NIC to associate with access points with different country codes.

A.2.2 Mobile IP Property Page

Use the **Mobile IP** property page to configure the NIC to support the roaming across routers function. Mobile IP enables an MU to communicate with other hosts using only its home IP address after changing its point-of-attachment to the internet/intranet.

Select the **Enable Mobile IP** checkbox to enable Mobile IP support. Restart the system for the changes to take effect.



Enter the **Home Agent AP Address** of an AP on the home subnet. This enables the MU to register with a foreign subnet access point and tell the access point where the MU home access point is located.

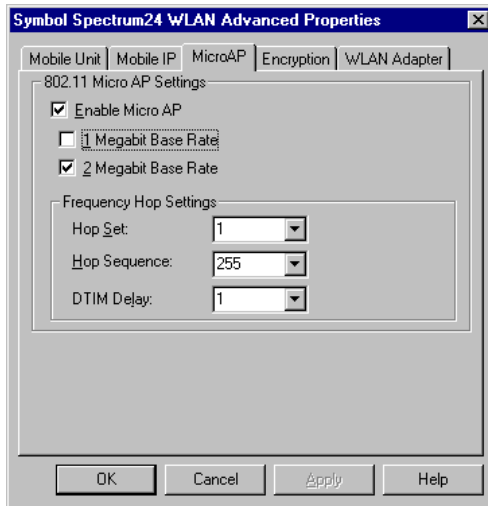
Enter a **Mobile Home MD5 Key** matching the MD5 key on the access point of the home subnet. Use this password to protect the registration packets from being tampered when forwarded to the home agent access point.

Use the **Registration Timeout** pull-down menu to select a timeout value. When the MU registers with a foreign subnet access point the registration is required to take place within the time specified. The default registration time is 60 seconds. If the MU does not register with the foreign subnet access point within the specified time, the foreign subnet AP removes the MU from its list of registered MUs.

Use the **Delay Time** pull-down menu to select the time an MU waits for a response from a foreign subnet access point when trying to register with that access point. An MU attempts to register with an access point three times before stopping.

A.2.3 MicroAP Property Page

Use the **MicroAP** property page to configure the NIC to operate as an access point. The MicroAP establishes a single-cell wireless network for devices in MU mode.



Each MicroAP requires a unique ESS ID. MicroAP cells can coexist as separate individual networks within the same site without interference. The MicroAP does not roam, but it does support roaming.

The NIC in MicroAP mode operates in CAM, and supports devices MUs operating in both PSP and CAM. The MicroAP supports up to 16 MUs.

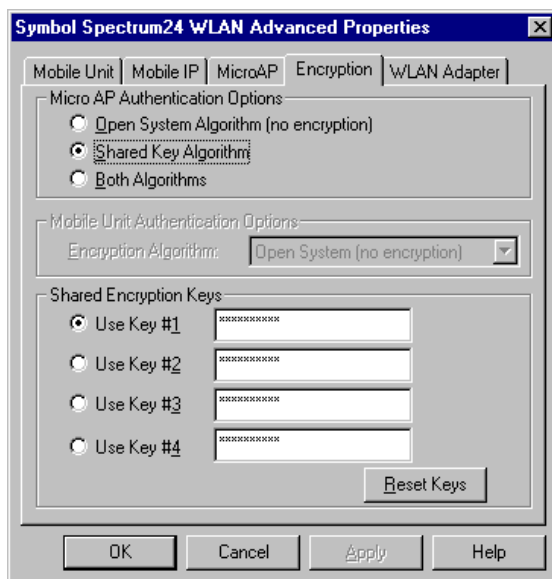
Select the **Enable MicroAP** checkbox to support MicroAP operations for the target NIC.

Use the **1** and **2 Megabit Base Rate** checkboxes to specify the data rate within the MicroAP cell. A MicroAP and MU are required to use the same data rate.

Use the **Frequency Hop Settings** pull-down menu to establish the Hop Set, Hop Sequence and DTIM Delay to be used within the MicroAP cell.

A.2.4 Encryption Property Page

Use the **Encryption** property page for configuring WLAN adapter Encryption settings. The absence of a physical connection makes wireless links vulnerable to information theft. Encryption is an efficient method of preventing data theft and improving data security. The firmware supports **Open System** and **Shared Key (40-bit)** Encryption algorithms.



Use the **Encryption Algorithm** pull-down menu to select the Encryption algorithm to be used for the adapter. The **Open System** algorithm (default setting) does not encrypt packets over the network. Select **Open System** to disable Encryption for the WLAN adapter and allow for the transmission and receipt of data with no security.

Use the **Shared Key** option to enable 40-bit Encryption for the adapter. Select the Encryption key to be used for the NIC and enter 10-hex digits for each key used. Click **OK** to save and implement the Encryption key data.

Click **Reset Keys** to clear the entries in the Shared Encryption Key fields.

MicroAP Encryption Options

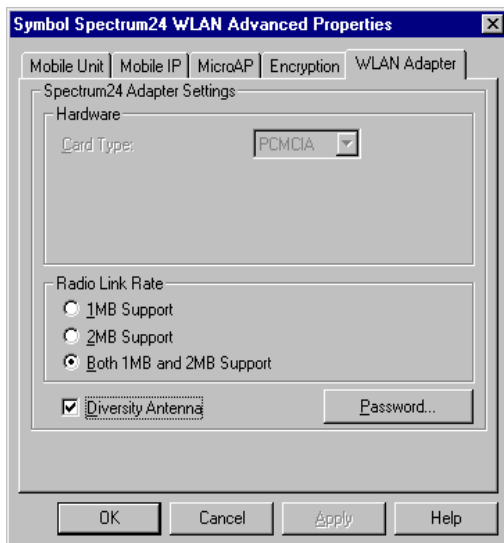
A MicroAP can use Open System, Shared Key or both. If Shared Key is enabled and Open system is not, the MicroAP grants access to adapters that have Shared Key enabled and are using the correct Encryption Key algorithm.

Adapters using Open system cannot associate to the MicroAP when the MicroAP has Shared Key enabled. Only when the MicroAP is using Open System can Open System NICs associate to it.

A.2.5 WLAN Adapter Property Page

Use the **WLAN Adapter** property page to configure hardware and radio settings.

Use the **Card Type** pull-down menu to specify the type of adapter (PC Card or ISA adapter) in the system.



Use the **Radio Data Link** field to specify the data rate to be used by the NIC. The NIC can use 1MB, 2MB or both. If **Both 1MB and 2MB Support** is selected, the NIC defaults to a 1 Mbps data rate if a 2 Mbps data cannot be established.

Select **Diversity** if dual antenna support is required. Diversity improves communication in highly reflective environments. Do not select diversity if a secondary antenna is not being used. Using diversity in a single antenna application can cause poor wireless network performance.

Password Protecting NCPA

NCPA has a password protection feature that can be turned on and off from the WLAN Adapter property page. When the NCPA program is initially launched, the password is off (default).

To create a password for the NCPA Advanced property pages:

1. Click the **Password** button from the WLAN Adapter property page.

The **Change Setup Password** dialog box displays.



2. Enter the case-sensitive password (10 characters maximum) in the **Current Password** field and Click **OK**.

The NCPA Advanced property pages dialog box is enabled and now appears

when the **Advanced** button is clicked from **Easy Setup** window.

To disable the password dialog box, enter the current password and leave the **New Password** and **Confirm New Password** fields blank. Click **OK**.

To change the password, enter the current password and enter a new password in the **New Password** and **Confirm New Password** fields. Click **OK**.

Appendix B

WLAN Adapter Specifications

PC Card Physical

<i>Dimensions</i> (less antenna)	3.3 inches x 2.1 in. x 0.2 inches (85 mm x 54 mm x 5 mm)
<i>Weight</i> (with antenna)	1.6 oz (45.36 g)
<i>Operating temperature</i>	32 to 130 °F (20 to 70 °C)
<i>Humidity 95%</i>	95% maximum non condensing
<i>Cargo/Packaged</i>	6ft(1.8m) drop 5hz vibration Mil-Std 810E
<i>Altitude</i>	15,000 ft. (4.6 km) - Storage 8,000 ft. (2.4 km) - Operating
<i>Vibration</i>	2 G peak, sine; 0.02 G peak random (5Hz - 2000Hz)
<i>Shock</i>	40 G, 11mS, half sine
<i>ESD</i>	meets CE-Mark
<i>PCMCIA Compliance</i>	Type II, Version x.xx, Card and Socket services x.xx

ISA Adapter Physical

<i>Dimensions</i>	6.2 in. x 4.2 in. (16 cm x 11 cm)
<i>Weight</i>	4.3 oz. (122 g)
<i>Operating Temperature</i>	32 to 100 °F (0 to 40 °C)
<i>Storage Temperature</i>	-15 to 140 °F (-40 to 60 °C)
<i>Humidity</i>	95% max. non-condensing
<i>Cargo/Packaged</i>	6 ft. drop; 5 Hz vibration Mil-Std 810E
<i>Altitude</i>	15,000 ft. - Storage, 8,000 ft. - Operating
<i>Vibration</i>	2 G peak, sine; 0.02 G peak random (5Hz - 2000Hz)
<i>Shock</i>	40 G, 11 mS, half sine
<i>ESD</i>	meets CE-Mark

Radio

<i>Frequency Range</i>	country dependent. Typically 2412 MHz to 2462 MHz
<i>Frequency Hopping</i>	<i>Hops</i> 79 in US, Canada and Europe 35 in France and Israel 27 in Spain 23 in Japan and Korea 20 in Belgium 27 in Mexico
<i>Hop Rate</i>	10 hops/sec
<i>Hop Sequences</i>	66
<i>Radio Data Rate</i>	2 Mbps per channel
<i>Radio Power Output</i>	500 or 100 mW versions
<i>Power Management</i>	Receive @ 5V 500mW = 300mA 100mW = 300mA Transmit @ 5V 500mW = 650mA 100mW = 400mA
<i>Range</i>	open environment over 1000 ft. (300 m). Typical office or retail environment over 180 ft. and within 250 ft. (56 to 76 m).
<i>TX Max. Radiated EIRP</i>	US: FCC part 15.247 Europe: ETS 300 320 Japan: RCR STD-33
<i>Modulation</i>	Binary GFSK

Radio

TX Out-of-Band Emissions US: FCC part 15.247, 15.205, 15.209
 Europe: ETS 300 320
 Japan: RCR STD-33

Appendix C

Troubleshooting

C.1 Windows 95 and 98 Troubleshooting Tips

Use the tools provided by Windows 95/98 and LAN analyzers (FTP Software NETXRAY, Novell LAN analyzer) to diagnose problems. Some common problems exhibited when the Spectrum24 WLAN adapter has not been properly installed include:

- Windows 95 or 98 does not recognize the Spectrum24 WLAN adapter when installed.
 - Verify Windows 95 or 98 PCMCIA support is installed.
 - Verify the computer has a Plug and Play BIOS or a Spectrum24 ISA adapter in use.
- The driver fails to load.
 - A resource conflict could exist. Use the **Device Manager** to resolve resource conflicts. Select the System applet from the Control Panel. Select the **Device Manager** tab.
- The workstation cannot associate to the Spectrum24 access point.
 - Verify the adapter ESSID matches the ESSID of the AP. Refer to the *Configuration* section of this document for details.

- Degraded performance from the Spectrum24 WLAN adapter.
 - Verify a secure antenna connection on the PC Card or ISA adapter.
 - Verify that two antennas remain attached to the PC Card or ISA adapter if **Diversity** is selected.
- Network drive mappings disappear when the laptop suspends or the adapter is removed then reinserted. Windows 95 or 98 does not restore Netware network drive mappings under these conditions.
 - Log out and log in again, or restart the machine to restore the connections.
- Nonfunctioning ISA adapter LEDs.
 - Verify the *Card Type* parameter is set to **ISA**.
 - Verify that the adapter ESSID matches the ESSID of the access point.

C.2 Windows NT 4.0 Troubleshooting

Use the tools provided by Windows NT and LAN analyzers (FTP Software NETXRAY, Novell LAN analyzer) to diagnose problems.

- A resource conflict (usually IRQ or I/O base address) caused the driver not to load.
 - Check 41ND4 entries in the System Log to look for the conflicts.
- Check Service Monitor entries in the System Log to look for the conflicts.
 - Use the Windows NT Diagnostics program to locate a free resource.



Resource conflicts could exist without an entry in the event log when another adapter failed to register its resources. When event log entries do not appear and the ESSID is set appropriately, try different settings with the **Memory Base Address**, **Interrupt Number** and **IO Port Address** parameters.

- No resource conflicts were detected, but the system does not attach to the network.
 - Verify the ESSID of the Spectrum24 WLAN Adapter matches the ESSID of the access point. Use NCPA to modify ESSID.
 - Verify the Mandatory BSSID setting of the Spectrum24 WLAN adapter is set to 0 or matches the BSSID of the access point. Use NCPA to modify the Mandatory BSSID.

- A degraded performance exists from the Spectrum24 WLAN adapter.
 - Verify a secure antenna connection on the PC Card or ISA adapter.
 - Verify two antennas remain attached to the PC Card or the ISA adapter when Diversity is selected.
- Nonfunctioning ISA adapter LEDs.
 - Verify the ISA adapter is selected in the Card Type field.
 - Verify the adapter ESSID matches the ESSID of the access point.

C.2.1 Useful Tool for Windows NT Troubleshooting

Windows NT Provides an additional tool for analyzing the network installation and performance.

PCMCIA Applet A Control Panel utility included with Windows NT displays information about the Spectrum24 WLAN adapter. If the card is installed, but does not appear in the display it is probably defective.

If it appears with an X, it is not configured properly.

C.2.2 Windows NT Errors



When errors occur during driver installation, they appear in the System Log. Use the Event Viewer program from the Administrative Tools group to view the System Log. Locate the SLA41ND4 or Service Monitor entries. If the driver fails to load, one of the following messages display in the System Log.

SLA41ND4: Could not allocate the resources necessary for operation.

- The driver could not allocate enough memory for internal data.

SLA41ND4: Has determined that the adapter is not functioning properly.

- The driver could not initialize the Spectrum24 PC Card or ISA adapter. Possible problems include:
 - The Spectrum24 PC Card or ISA adapter Firmware could be corrupted. Use NICUpdate to verify the Firmware status. In DOS, use the DOS-based Firmware update utilities to reinstall the Firmware.
 - The Spectrum24 PC Card or ISA adapter could have a hardware problem.
 - The PCMCIA controller or host bus adapter is not operating properly. Use an alternate PCMCIA socket or ISA slot.

SLA41ND4: Could not find an adapter.

- The driver could not locate a Spectrum24 PC Card in any PCMCIA socket or a Spectrum24 ISA adapter in any ISA slot.

- Verify that the Spectrum24 PC Card or ISA adapter is firmly seated in a PCMCIA socket or ISA slot.

SLA4IND4: Could not connect to the interrupt number supplied.

- The driver could not claim the configured interrupt.
 - The configured interrupt number could be in use by another adapter. Choose a different interrupt number.

SLA4IND4: Does not support the configuration supplied.

- An invalid driver configuration parameter was specified.
 - Use NCPA to view the driver configuration. Make sure values appear in each data entry field. If a value is missing, key in or use the associated list box to select an appropriate value.

SLA4IND4: A required parameter is missing from the Registry.

- A required configuration parameter was not found in the system registry.
 - Use NCPA to view the driver configuration. Ensure values appear in each data entry field. If a value is missing, key in or use the associated list box to select an appropriate value.

C.3 Windows 2000 Troubleshooting Tips

Use the tools provided by Windows 2000 to diagnose problems.

- The workstation cannot associate to the Spectrum24 access point.
 - Verify the adapter ESSID matches the ESSID of the AP. Refer to the *Configuration* section of this document for details.
- Degraded performance from the Spectrum24 WLAN adapter.
 - Verify a secure antenna connection on the PC Card or ISA adapter.
 - Verify the antennas remain attached to the PC Card or ISA adapter if **Diversity** is selected.
- Nonfunctioning ISA adapter LEDs.
 - Verify the *Card Type* parameter is set to **ISA**.
 - Verify that the adapter ESSID matches the ESSID of the access point.

Appendix D

Spectrum24 DOS Keywords

Keywords for Power Saving Mode

<i>Beacon_Alg</i>	The PSP performance index, which varies from 1 to 5, enables users to specify how often the MU wakes up to check for data (the beacon algorithm). PSP performance index 1 provides the quickest response time (shortest sleep interval), while PSP performance index 5 provides efficient power consumption (longest sleep interval).
<i>Beacon_Minimum</i>	programs the minimum beacon interval for the dynamic algorithms.
<i>Beacon_Maximum</i>	programs the maximum beacon interval for the dynamic algorithms.
<i>Powermgmt</i>	sets power management option. The default is 'No' for CAM. 'Yes' sets the card to PSP mode.

Keywords for MicroAP Mode Only

<i>MicroAP</i>	enables Micro AP operation when set to 'Yes'. If enabled, the PowerMgmt keyword is ignored and the meaning of the Tx_Rate and ESSID keywords change.
<i>MicroAP_Hop_Set</i>	specifies the Hop Set used by the Micro AP.
<i>MicroAP_Hop_Seq</i>	specifies the Hop Sequence used by the MicroAP.
<i>MicroAP_BDelay</i>	specifies the delay for broadcast packets being transmitted from the MAP.

Keywords for MicroAP Mode Only **Description**

Base_Rate (MAP Only) set to 1 or 2 to require associating MUs to operate at 1 Mbps or 2 Mbps. This keyword can be used multiple time to require multiple data rates. If the MU is not capable of the required data rate(s), it cannot associate with this MAP.

Keywords for CSS and Plug and Play Clients **Description**

Cardservices enables card services installation if no parameter is present or if the parameter is Yes. Requires I/O mode 'No' disables. Plug and Play keyword cannot be present or set to 'No'.

Socketservices enables socket services installation if no parameter or if the parameter is 'Yes'. (Requires I/O mode). 'No' disables. PNP keyword cannot be present or set to 'No'.

PNP sets the driver to require the presence of slainit.exe. Default is 'No' if slainit.exe is not loaded, preventing the driver from loading. This keyword forces Mode to IO and ignores the Interrupt, IOAddress and Memory keywords.

Keywords in MicroAP or MU Mode **Description**

Interrupt designates the port hardware interrupt (3 to 15). Default is 5. In protocol.ini the keyword Int is supported.

IOAddress I/O address (0x240 to 0x380) for the adapter. Default is 0x300. Also recognizes IOADDRESS for backward compatibility. This is a hex number.

Keywords in MicroAP or MU Mode	Description
<i>Memory</i>	resource memory location (0xC000 to 0xE800). Default is 0xD000. Memory mode uses the 32Kb block; I/O Mode uses the 4Kb block. Verify the designated memory block is reserved using an extended memory manager (EMM386.EXE with the 'x=' option for DOS). In protocol.ini, the keyword <i>Mem</i> is also supported. This is a hex number.
<i>Tx_Rate</i>	set to 1 or 2 to enable operation at 1 Mbps or 2 Mbps. Use this keyword multiple times to enable multiple data rates. If the adapter is not capable of the requested data rate, the entry is ignored. If this keyword is not entered, the adapter operates at every data rates it can. If the adapter is setup to be a MAP, this entry means that the associating MUs can optionally use this data rate.
<i>Mode</i>	Add <i>Mode</i> to the file to set I/O mode. If <i>Mode</i> is not in file, the PCMCIA interface is set to memory mode (default). I/O mode requires 16 bytes of I/O space, 4Kb of attribute memory. Memory mode requires 16 bytes of I/O space, 32Kb of memory (4Kb attribute or 32Kb common memory). In memory mode the attribute and common memory start at the same segment address. Only 8-bit I/O is supported.

Keywords in MicroAP or MU Mode	Description
<i>ESSID</i>	<p>sets the ESSID. Default is "101". The ESSID is a 32-character, case sensitive string. In net.cfg, quotes are not required unless spaces are needed in the ESSID. In protocol.ini quotes are required. Symbol recommends using quotes.</p> <p>The ESSID string "BRDCST" is reserved and places the adapter into the broadcast ESSID mode. In this mode the adapter adopts the ESSID of the first access point it finds, and continues to roam with that ESSID until rebooted.</p> <p>If in the MAP mode, this value is used as the ESSID of the MAP. Symbol supports the following alternate keywords for backward compatibility: <i>DOMAIN</i>, <i>RF_NETWORK_ID</i>, <i>NET_ID</i>.</p>
<i>PCMCIA_IO</i>	<p>sets alternate PCMCIA controller I/O address. The default is 3E0. Other possibilities are 3000 and FCFC. This is a hex number.</p>
<i>Unittype</i>	<p>for the ISA adapter, set to 2000. Not applicable for PC Card or the ISA Plug and Play adapter.</p>

Keyword Format in PROTOCOL.INI	Description
<i>KEYWORD=YES</i>	in protocol.ini all arguments to a keyword require an '=' between the keyword and the argument.
<i>KEYWORD=0x3E0</i>	in protocol.ini prefix all hex numbers with an '0x'.
Keyword Format in NET.CF	Description
<i>KEYWORD YES</i>	in net.cfg only a space is required.
<i>KEYWORD 3E0</i>	in net.cfg this is not required, but a hex number has to be used where expected and a decimal point used elsewhere.



Neither file is case sensitive. Use of case is by preference. The only exception is the ESSID argument, which is case sensitive.

Appendix E

Spectrum24 DOS Utilities

The flash utility programs included on the CDROM are compatible with computers using an Intel/Cirrus (PCIC) compatible PCMCIA interface. S_WFA, S_INFO and do not require a specific PCMCIA interface.

E.1 S_WFA

This utility functions in MU mode only. In some situations, the S_WFA utility provides a short waiting period after running the driver and before attaching to the network. The utility waits for the MU to associate with an access point before continuing.

At the DOS prompt, enter:

```
s_wfa
```

The system displays:

```
S_WFA Version 4.xx  
SLAAPI found at 096E  
Waiting for MU Association  
Type any key to abort..  
Firmware: V4.xx Date: xxxxxx  
Country: Standard  
ESS_ID: S24NET  
MAC Adrs: 00 A0 F8 21 56 3D  
Searching. Adapter is associated:  
Mode: CAM  
Scans: 0  
AP IEEE: 00 A0 F8 3D 21 56
```

E.2 S_UTIL

S_UTIL is a DOS-utility program that can configure the adapter and obtain statistics. S_UTIL runs only after the driver has been installed.

The program provides a list of available commands in the absence of a command line parameter. Each command requires a one-letter code to display current configuration parameters or statistics. Some commands allow optional parameters to change driver/Firmware settings only for the current session.

At the DOS prompt, enter:

```
s_util <func> [parms]:
```

where *func* and *parms*:

- | | |
|-----------------------|--|
| A | displays LAN adapter configuration including interrupt, I/O address, memory address, ESSID, Firmware version, IEEE table number (country code) and IEEE MAC address. |
| B | displays the BSSID of the associated access point, preferred AP and mandatory AP. |
| B [hh hh hh hh hh hh] | sets the preferred access point BSSID for the adapter to associate. The BSSID represents the access point MAC address. |
| C | |
| E <ESSID String> | sets the 32-character ESSID for the adapter. |

<i>I</i> < <i>all</i> >	displays association status, power mode, beacon algorithm and transmit status. This also displays the ESSID, station ID and radio type. The last line shows the access points in the AP table and the number of scans. The all option displays additional transmit and receive statistics. S_INFO also provides this information.
<i>J</i> [<i>hh hh hh hh hh hh</i>]	sets the mandatory access point BSSID for the adapter to associate. The BSSID represents the access point MAC address.
<i>L</i> < <i>value</i> >	get/set options that apply only to Symbol radio terminals. The value 40 selects no power down in Symbol terminals, and the value 20 automatically powers down the terminals in a cradle.
<i>O</i> < <i>option</i> >	sets the Firmware option for the adapter.
<i>P</i>	sets the unit to PSP mode. The C parameter sets it to CAM. (MU mode only)
<i>T</i> < <i>u</i> > [<i>v</i>] [<i>w</i>]	get/set beacon parameters. The u parameter indicates the algorithm. The v parameter indicates the minimum beacon interval. The w parameter indicates the maximum beacon interval. (MU mode only)

Used in MicroAP Only

- W displays the MicroAP ACL.
- X<hh hh hh hh hh hh> adds a MAC address to the ACL. The ACL allows a maximum of 16 entries. Duplicate ACL entries are not detected.
- Y<hh hh hh hh hh hh> removes a MAC address from the ACL.
- Z clears the ACL of all entries.

E.3 Examples

With no parameters, S_UTIL displays:

```
Spectrum24 API Utility V1.06a
Usage: S_UTIL <function code> [<optional parameters>,...]
Function codes and [optional] parameters:
A - Display Adapter Configuration info
B - Display ESS_ID/BSS_ID info
B <BSS_ID> - Set Preferred BSS_ID. B X to clear
C - Set Continuous Power Mode (CAM)
E <ESS_ID String> - Set ESS_ID
I - Display Adapter Info/Statistics
J <BSS_ID> - Set Mandatory BSS_ID. J X to clear
L - Get/Set SYMBOL_OPTIONS (L <value> to set)
O <option> - Set Firmware Option
P - Set Power Save Mode (PSP)
T - Display Beacon/PSP Parameters
T [<Algorithm> [<min> [<max>]] - Set Beacon parameters
The following apply to the MicroAP -
W - Display Access Control List (ACL)
X <IEEE address> - Add ACL Entry
Y <IEEE address> - Delete ACL Entry
Z - Clear ACL
```

For example, to view current adapter parameters from the DOS prompt, enter:

```
s_util A
```

To set the ESSID to Department 1, from the DOS prompt, enter:

```
s_util E Department 1
```

To set the beacon algorithm to 3 with a minimum of 1 and a maximum of 5, from the DOS prompt, enter:

```
s_util T 3 1 5
```

To change the power mode to *PSP*, from the DOS prompt, enter:

```
s_util P
```

E.4 S_INFO

S_INFO provides a dynamic, full screen display of selected Firmware statistics and configuration variables. It obtains the data through the driver extension `get_adapterinfo` and `get_statistics` functions, and it periodically refreshes the display with updated information. This utility can identify if the MU communicates properly.

At the DOS prompt, enter:

```
s_info
```

In MicroAP mode, the system displays:

```
*****SPECTRUM24 ADAPTER STATISTICS - MAP ***** V4.25 09/16/98 ***
Address 00A0F8-161CA8 | Fw Ver   V4.28 | Tx Rate 1 Mb/Sec | Freq      2461
Country   STD | Selftest  PASS | Max Rate 1 Mb/Sec | Ass'd MJs    1
SSID      s24net | Diversity OFF | Hop Pattern  0 | Bcn Interval 100
RunTime  00:00:00:00 |          | Hop Dwell   100 | DTIM Interval 5
***** TX Statistics ***** RX Statistics *****
Tx Host    1 B/Sec    0 | Rx Host    2 B/Sec    0
Tx NDir    3 Tx Bcn   960 | Rx NDir    0
Tx Dir     0          | Rx Dir     2
***** Associated MJs *****
# Mode Adrs ID Rat Fifo TxDir          RxDir
1 CAM 10461C 1 1 0 0          3
2 CAM 105623 2 2 0 0          2
3
4
5
6
7
8
9
10
11
12
F10|q = exit program
```

In MU Mode, the system displays:

```

***** SPECTRUM24 ADAPTER STATISTICS - MU ***** V4.25 09/16/98 ***
Address 00A0F8-161CA8 | Fw Ver   V4.28 | Tx Rate 1 Mb/Sec | Freq      2421
Country   STD | Sel ftest  PASS | Max Rate 1 Mb/Sec | Status   ASSOC'D
SSID      s24net | Diversity OFF | Hop Pattern 27 | Station ID 1
RunTime  00:00:00:54 | | Hop Dwell 100 | Power Mode  CAM
***** TX Statistics ***** RX Statistics***** Tx
Host      163 B/Sec      0 | Rx Host   168 B/Sec      0
Tx NDir   2             | Rx NDir   12 Rx Bcn     517
Tx Dir    161          | Rx Dir    162
***** AP Table *****
# St AG BSSID  RS #MU Hp      | # St AG BSSID  RS #MU Hp
1*CE OF 73DA7F 65  1 27      | 11
2                                     | 12
3                                     | 13
4                                     | 14
5                                     | 15
6                                     | 16
7                                     | 17
8                                     | 18
9                                     | 19
10                                    | 20
F10|q = exit program

```

To return to DOS, press ESC or ENTER.

The display includes configuration and status information, transmit statistics, receive statistics, roaming statistics, optional additional statistics and the Known AP table.

E.4.1 Configuration/Status

S_INFO displays the standard information about the MicroAP or MU. A brief description of the display content follows.

<i>Address</i>	device MAC address.																				
<i>Country</i>	the adapter country code. <i>STD</i> indicates the standard hop set for the adapter. In certain countries, this field displays Japan, Korea, France, Spain, Mexico, Belgium or Israel, as appropriate.																				
<i>SS ID</i>	the ESSID.																				
<i>Runtime</i>	the elapsed time since the adapter initialized.																				
<i>Fw Ver</i>	the adapter Firmware version and date.																				
<i>Selftest</i>	indicates adapter self-tests. A resulting <i>PASS</i> indicates no problems were found. The positional bits below indicate each failed test. <table><thead><tr><th>Bit (hex)</th><th>Corresponding test.</th></tr></thead><tbody><tr><td>001</td><td>code checksum</td></tr><tr><td>002</td><td>received first-in-first-out (<i>Rx FIFO</i>)</td></tr><tr><td>004</td><td>transmitted first-in-first-out (<i>Tx FIFO</i>)</td></tr><tr><td>008</td><td>received direct memory access (<i>Rx DMA</i>)</td></tr><tr><td>010</td><td>transmitted direct memory access (<i>Tx DMA</i>)</td></tr><tr><td>020</td><td>radio configuration</td></tr><tr><td>040</td><td>radio loopback</td></tr><tr><td>080</td><td>real-time clock</td></tr><tr><td>100</td><td>CPU clock</td></tr></tbody></table>	Bit (hex)	Corresponding test.	001	code checksum	002	received first-in-first-out (<i>Rx FIFO</i>)	004	transmitted first-in-first-out (<i>Tx FIFO</i>)	008	received direct memory access (<i>Rx DMA</i>)	010	transmitted direct memory access (<i>Tx DMA</i>)	020	radio configuration	040	radio loopback	080	real-time clock	100	CPU clock
Bit (hex)	Corresponding test.																				
001	code checksum																				
002	received first-in-first-out (<i>Rx FIFO</i>)																				
004	transmitted first-in-first-out (<i>Tx FIFO</i>)																				
008	received direct memory access (<i>Rx DMA</i>)																				
010	transmitted direct memory access (<i>Tx DMA</i>)																				
020	radio configuration																				
040	radio loopback																				
080	real-time clock																				
100	CPU clock																				

	200	host interface
	400	radio interface
	800	random access memory (RAM)
<i>Diversity</i>		indicates YES for diversity enabled or NO for single antenna selected.
<i>Tx Rate</i>		displays the transmission data rate used by the adapter in Mbps.
<i>Max Rate</i>		displays the maximum transmit rate available for use by the adapter in Mbps.
<i>Hop Pattern</i>		each hop set has a selection of hop patterns available. The field displays the hop pattern used by the access point that associates with the MU.
<i>Hop Dwell</i>		displays the time between hops in K- μ s units.
<i>Freq</i>		displays the current communication frequency for the adapter.
<i>Status</i> (MU mode only)		displays the status for the MU.
<i>Station ID</i> (MU mode only)		indicates the station ID number assigned to the MU during its last association.
<i>Power Mode</i> (MU mode only)		displays CAM or PSP
<i>Ass'd MUs</i> (MicroAP mode only)		displays the total associated MUs.

<i>Bcn Interval</i> (<i>MicroAP mode only</i>)	displays the time between beacon packets in 100 K- μ s units.
<i>DTIM Interval</i> (<i>MicroAP mode only</i>)	displays the frequency of DTIM packets as a multiple of beacon packets. This indicates how many beacons equal one DTIM cycle.

E.4.2 Transmit Statistics

Transmit statistics indicates activity over the last second. This display is useful if background operations such as pings occur. Locate counters on the left side of the display.

<i>Tx Host</i>	the packets passed to the driver. An interrupt conflict in the driver installation can occur when these fields equal 0 (zero).
<i>Tx NDir</i>	the Nondirected packets transmitted.
<i>Tx Dir</i>	the Directed packets transmitted.
<i>B/Sec</i>	approximates the bytes per second sent.
<i>Tx Bcn</i> (<i>MicroAP mode only</i>)	the total beacons transmitted.

E.4.3 Receive Statistics

Receive statistics indicates activity over the last second. This display is useful if background operations such as Pings occur. Locate counters on the right side of the display.

<i>Rx Host</i>	the packets passed from the driver. If these fields equal 0 (zero), an interrupt conflict in the driver installation can occur.
<i>Rx NDir</i>	the Nondirected packets received.
<i>Rx Dir</i>	the Directed packets received.
<i>B/Sec</i>	approximates the bytes per second received.
<i>Rx Bcn</i> (<i>MU mode only</i>)	the total beacons received.

E.4.4 AP Table (MU Mode Only)

The lower section is the AP table. The AP table contains access point status, BSSID, hop sequence, RSSI and MU load information for all known access points.

<i>St</i>	the status byte. Sign bit indicates MU association with the access point.
<i>AG</i>	the access point table entry age-out counter. An age-out counter of 0 through 8 maintains each access point table entry. Value 8 indicates an acknowledgment of an MU scan. A decreased value indicates non-acknowledgment. The MU removes an access point entry from the table when the age-out counter value decrements to 0.
<i>BSSID</i>	the last 3 hexadecimal fields of the access point MAC address.

<i>RS</i>	the access point RSSI value as measured by the MU.
<i>#MU</i>	the MUs associated with the access point. The load information helps the MU determine when to roam. The number is always 0 (zero) if the MU associates with a MicroAP.
<i>Hp</i>	the hop sequence used by the access point.

Press PgUp and PgDn to display the second block of access points.

E.4.5 Associated MU Table (MicroAP Mode Only)

The lower section is the associated MU table. The table contains the MU status, the ID assigned by the MicroAP, and transmit and receive statistics.

<i>Mode</i>	displays the MU power-operating mode.
<i>Adrs</i>	the MU MAC address.
<i>ID</i>	the station ID assigned by the AP at association.
<i>Rat</i>	displays the current transmit rate available for the MU in Mbps.
<i>FIFO</i>	the transmits buffers pending for this MU.
<i>TxDIr</i>	the fragments transmitted to this MU.
<i>RxDIr</i>	the fragments received to this MU.

Press PgUp and PgDn to display the second block of MUs.

E.4.6 Transmit and Receive Statistics Table

The transmit and receive statistics and graphs indicate activity over the last second. Use this display if background operations such as Pings occur.

Counters locate on the left side of the display.
The horizontal bar graph shows activity over the last second.

Tx_Host and *Rx_Host* the packets passed to and from the driver. If these fields register 0 (zero), an interrupt conflict in the driver installation can exist.

NDir_U and *Dir_U* the Nondirected and Directed packets.

Byte/sec approximates the bytes per second sent and received.

E.5 S_VER

S_VER displays the version/date of the installed Firmware. It also displays the *Diversity* mode status.

At the DOS prompt, enter:

```
s_ver
```

The system displays:

```
Spectrum24 LAN Adapter Version Display Utility, V4.xx  
(C) Copyright 1996 Symbol Technologies, All Rights Reserved.  
Card in slot 1
```

```
FIRMWARE: IEEE Addr: hh hh hh hh hh hh  
Ver: V4.xx  
Date: xxxxxx  
Country: United States (1)  
Diversity: 0N
```

If using s_ver to display the CIS parameters, at the DOS prompt, enter:

```
s_ver -x
```

The system displays:

Spectrum24 LAN Adapter Version Display Utility, V4.xx
(C) Copyright 1996 Symbol Technologies, All Rights Reserved.
Card in slot 1

FIRMWARE: IEEE Addr: hh hh hh hh hh hh
Ver: V4.xx
Date: xxxxxx
Country: United States (1)
Diversity: ON

CIS: Ver: Vx.xx
Serial: 00032123
Mfg Date: 00080896
Dest Code: FW: USA
Mfg Info: TSW: none
Power: 500
CkSum: CAE3

E.6 S_UPDATE

S_UPDATE updates the flash image with a new Firmware file. The standard Firmware file is SLA_FW.BIN. This program does not change the IEEE address or the country code. Locate S_UPDATE and the latest Firmware file in the FIRMWARE directory on the Installation and Utilities CDROM.



Do not run S_UPDATE after driver installation. Uninstall and reinstall the driver. The ISA Plug and Play WLAN adapter requires users to load SLAINIT.EXE prior to loading the driver or updating the Firmware.

S_UPDATE requires an Intel compatible PCMCIA controller (Intel, Vadem, Cirrus or Ricoh), or card and socket services and SLAINIT. If using EMM386, reserve the memory location at D000-D0FF (X=D000-D0FF).

To update the adapter Firmware:

At the DOS prompt, enter:

```
s_update
```

The system displays:

```
Spectrum24 LAN Adapter FLASH Update Utility, Vx.xx
```

```
Reading the Firmware binary file (SLA_FW.BIN)...
```

```
Press any key to continue, CTRL-C to abort
```

```
Press any key. The system displays:
```

```
FIRMWARE: IEEE Addr: 00 A0 F8 00 04 D2
```

```
Ver: 'V2.00'
```

```
Date: '960320'
```

```
(AMD) Erasing flash... Operation successful
```

```
Programming Flash... ..
```

When the program completes, it displays:

```
Programming operation successful
```

```
Update Operation completed
```

To display other program options for S_UPDATE, enter:

```
s_update -?
```


Appendix F

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 email, telephone or fax within the time limits set forth in individual contractual agreements.

When contacting Symbol Customer Support, please provide the following information:

- serial number of unit
- model number or product name
- software type and version number.

North American Contacts

Inside North America, contact Symbol by:

- Symbol Technologies, Inc.
One Symbol Plaza
Holtsville, New York 11742-1300
Telephone: 1-516-738-2400/1-800-SCAN 234
Fax: 1-516-738-5990
- Symbol Support Center:
 - telephone: 1-800-653-5350
 - fax: (516) 563-5410
 - Email: support@symbol.com

International Contacts

Outside North America, contact Symbol by:

- Symbol Technologies Technical Support
12 Oaklands Park
Berkshire, RG41 2FD, United Kingdom
Tel: 011-44-118-945-7000 or
1-516-738-2400 ext. 6213

Symbol Developer Program Web Site

<http://sdp.symbol.com>

Additional Information

Obtain additional information by contacting Symbol at:

- 1-800-722-6234, inside North America
- +1-516-738-5200, in/outside North America
- <http://www.symbol.com>

Appendix G

Regulatory Compliance

To comply with U.S. and international regulatory requirements, the following information has been included. The document applies to the complete line of Symbol products. Some of the labels shown, and statements applicable to other devices might not apply to all products.

Radio Frequency Interference Requirements

This device has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the Federal Communications Commissions Rules and Regulation. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

However, there is no guarantee that interference will not occur in a particular installation. If the 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:

- Re-orient 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 which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Radio Frequency Interference Requirements - Canada

This Class A digital apparatus meets the requirements of the Canadian Interference-Causing Equipment Regulations.

CE Marking & European Union Compliance



Products intended for sale within the European Union are marked with the CEMark which indicates compliance to applicable Directives and European Normes (EN), as follows. Amendments to these Directives or ENs are included: Normes (EN), as follows.

Applicable Directives:

- Electromagnetic Compatibility Directive 89/336/EEC
- Low Voltage Directive 73/23/EEC

Applicable Standards:

- EN 55 022 - Limits and Methods of Measurement of Radio Interference Characteristics of Information technology Equipment
- EN 50 082-1 - Electromagnetic Compatibility - Generic Immunity Standard, Part 1: Residential, commercial, Light Industry
- IEC 801.2 - Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment Part 2: Electrostatic Discharge Requirements
- IEC 801.3 - Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment Part 3: Radiated Electromagnetic Field Requirements
- IEC 801.4 - Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment Part 4: Electrical Fast Transients Requirements
- EN 60 950 + Amd 1 + Amd 2 - Safety of Information Technology Equipment Including Electrical Business Equipment
- EN 60 825-1 (EN 60 825) - Safety of Devices Containing Lasers

RF Devices

Symbol's RF products are designed to be compliant with the rules and regulations in the locations into which they are sold and will be labeled as required. The majority of Symbol's RF devices are type approved and do not require the user to obtain license or authorization

before using the equipment. Any changes or modifications to Symbol Technologies equipment not expressly approved by Symbol Technologies could void the user's authority to operate the equipment.

Telephone Devices (Modems)

United States

If this product contains an internal modem it is compliant with Part 68 of the Federal Communications Commission Rules and Regulations and there will be a label on the product showing the FCC ID Number and the REN, Ringer Equivalence Number. The REN is used to determine the quantity of devices which maybe connected to the telephone line. Excessive RENs on the telephone line may result in the device not ringing in response to an incoming call. In most but not all areas, the sum of the RENs should not exceed 5.0. To be certain of the number of devices that may be connected to the line, as determined by the total number of RENs, contact the telephone company to determine the maximum REN for the calling area.

If the modem causes harm to the telephone network, the telephone company will notify you in advance; however, if advance notice is not practical, you will be notified as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of the modem. If this happens the telephone company will provide advance notice so you may make any necessary modifications to maintain uninterrupted service.

Canada

If this product contains an internal modem it is compliant with CS-03 of Industry Canada and there will be a Canadian certification number (CANADA: _____) on a label on the outside of the product. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single-line, individual service maybe extended by means of a certified convector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

User should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.



User should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to the telephone loop which is used by the device, to prevent overloading. The termination of a loop may consist of any combination of devices, subject only to the requirement that the total of the Load Numbers of all devices not exceed 100.

The Load Number is located on a label on the product.

Contact your local Symbol Technologies, Inc., representative for service and support;

Symbol Technologies, Inc.,
Canadian Sales and Service
2540 Matheson Boulevard East
Mississauga, Ontario
Canada L4W 4Z2
Phone - 905 629 7226

Laser Devices

Symbol products using lasers comply with US 21CFR1040.10, Subchapter J and IEC825/EN 60 825 or (IEC825-1/EN 60 825-1, depending on the date of manufacture). The laser classification is marked one of the labels on the product.

Class 1 Laser devices are not considered to be hazardous when used for their intended purpose. The following statement is required to comply with US and international regulations:



Use of controls, adjustments or performance of procedures other than those specified herein may result in hazardous visible or invisible laser light exposure.

Class 2 laser scanners use a low power, visible light diode. As with any very bright light source, such as the sun, the user should avoid staring directly into the light beam. Momentary exposure to a Class 2 laser is not known to be harmful.

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