

EXHIBIT 5

USER'S MANUAL

symbol

WSS 1000



Product Reference Guide



Regulatory Addendum

Radio Frequency Interference Requirements - United States

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 generate, 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.

Cet appareil numérique de la Classe A respecte toutes les exigences du Reglement sur le Matériel Brouilleur du Canada.

CE Marking and European Union Compliance



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

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. Inmost, 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 son as possible. Also, you will be advised of your right o file a complaint with the FCC is 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.

Telephone Devices (Modems) - 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.

CAUTION: 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

L'étiquette d'Industrie Canada indentifie le matériel homologué. Cette étiquette certifie que le matériel est conforme à certaines normes de protection, d'exploitation et de sécurité des réseaux de télécommunications. Toutefois, le Ministère n'assure pas que le matériel fonctionnera a la satisfaction de l'utilisateur.

Avant d'installer ce matériel, l'utilisateur doit assurer qu'il soit permis de la raccorder aux installations de l'entreprise locale de télécommunications. Le matériel doit également être installé en suivant une méthode de acceptée raccordement. Dans certains cas, les fils intérieurs de l'entreprise utilisés pour un service individuel à ligne unique peuvent être prolongés au moyen d'un dispositif de raccordement homologué (cordon rallonge téléphonique interne). L'abonné ne doit pas oublier qu'il est possible que la conformité aux conditions énoncées ci-dessus n'empechent pas la dégradation du service dans certaines situations. Actuellement, les entreprises de télécommunication ne permettent pas que l'on raccorde leur matériel à des jacks d'abonné, sauf dans les cas précis prévus pas les tarrifs particuliers de ces entreprises.

Les réparations de matériel homologué doivent être effectuées par un centre d'entretien canadien autorise désigné par le fournisseur. La compagnie de télécommunications peut demander à



l'utilisateur de débrancher un appareil à la suite de réparations ou de modifications effectuées par l'utilisateur, ou à cause de mauvais fonctionnement.

Pour sa propre protection, l'utilisateur doit assurer que tous les fils de mise à la terre de la source d'énergie électrique, des lignes téléphoniques et des canalisations d'eau métalliques, s'il y en a, soient raccordés ensemble. Cette précaution est particulièrement importante dans les régions rurales.

AVERTISSEMENT: L'utilisateur ne doit pas tenter de faire ces raccordements lui-même; il doit avoir recours aux services d'un électricien.

L'indice de charge (IC) assigné à chaque dispositif terminal indique, pour éviter toute surcharge, le pourcentage de la charge totale qui peut être raccordée à un circuit téléphonique bouclé utilisé par ce dispositif. La terminaison du circuit bouclé peut être constituée de n'importe quelle combinaison de dispositifs, pourvu que la somme des indices de charge de l'ensemble des dispositifs ne dépasse pas 100.

L'indice de charge se trouve sur le produit.

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 on 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:

CAUTION: 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.

The following laser information labels are attached to Symbol's products as shown:

WSS 1000
Product Reference Guide

70-16192-03

Revision A

March 1998



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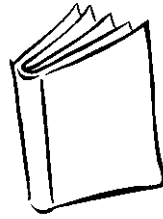
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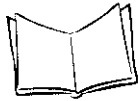
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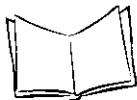
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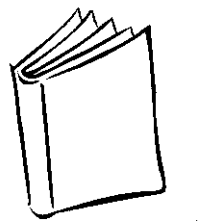
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Glossary

Tell Us What You Think...



About This Manual

The *WSS 1000 Product Reference Guide* provides general information about the WSS 1000 wearable scanning computer system components and accessories, including hardware setup, software download procedures, operating instructions, maintenance information, and troubleshooting assistance.

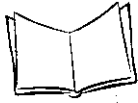
Audience

This manual is intended for system administrators or programmers responsible for setting up the WSS 1000 system.

Notational Conventions

The following conventions are used in this document:

- ◆ "Operator" and "User" refer to anyone using an application on a WSS 1000 system.
- ◆ "PC" refers to the IBM personal computer or compatible system that you are using to develop applications.
- ◆ WWC 1000 refers to wrist computer.
- ◆ RS 1 refers to the ring scanner.
- ◆ "You" refers to the system administrator or programmer who is using this manual as a reference aid.
- ◆ Keystrokes in bold type indicate non-alphanumeric keystrokes on the PC or on the terminal. For example:
Select the <F1> key on the terminal to access on-line help.
- ◆ Bold type is used to identify menu items and input or text fields on a screen



- ◆ *Italics* are used:
 - ◆ for the names of parameters in function prototypes and variable names in usage and syntax descriptions
 - ◆ to highlight specific items in the general text
 - ◆ to identify chapters and sections in this and related documents
- ◆ Square brackets [] in a command line enclose optional inline parameters.
- ◆ Bullets (•) indicate:
 - ◆ action items
 - ◆ lists of alternatives
 - ◆ lists of required steps that are not necessarily sequential
- ◆ Sequential lists (e.g., those that describe step-by-step procedures) appear as numbered lists.

Related Publications

The following is a list of documents and publications that you may find useful if you want to know more about the WSS 1000 or about the tools and utilities that are available for writing applications.

Documents Available from Symbol Technologies

- ◆ *WSS 1000 Quick Reference Guide*,
p/n 70-16191-0X
- ◆ *RS 1 Quick Reference Guide*,
p/n 70-16190-0X
- ◆ *Series 3000 System Software Manual*,
p/n 70-16310-0X
- ◆ *Series 3000 Application Programmer's Guide*,
p/n 70-16308-0X
- ◆ *Series 3000 Application Programmer's Reference Manual*,
p/n 70-16309-0X
- ◆ *Series 3000 Application Developer's Library*,
p/n 70-16311-XX
- ◆ *CS 1000 4-Slot Cradle Quick Reference Guide*,
p/n 70-17661-0X

- ◆ *Novell LAN Workplace Reference Manual*
p/n 70-20288-0X
- ◆ *Spectrum24 Ethernet Access Point User Guide,*
Spectrum24 Ethernet Access Point User Guide Addendum,
p/n 70-20183-XX
- ◆ *Spectrum24 STEP: Installation and Configuration Guide for*
Series 3000 Flash Disk Terminals
p/n 70-20343-XX

Service Information

If you have a problem with your equipment, contact the Symbol Support Center. Before calling, have the model number, serial number, and several of your bar code symbols at hand.

Call the Support Center from a phone near the equipment so that the service person can try to talk you through your problem. If the equipment is found to be working properly and the problem is symbol readability, the Support Center will request samples of your bar codes for analysis at our plant.

If your problem cannot be solved over the phone, you may need to return your equipment for servicing. If that is necessary, you will be given specific directions. Symbol Technologies is not responsible for any damages incurred during shipment if the approved shipping container is not used. Shipping the units improperly can possibly void the warranty. If the original shipping container was not kept, contact Symbol to have another sent to you.

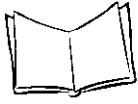
Note: Symbol Technologies is not responsible for any damages incurred during shipment if the approved shipping container is not used. Shipping the units improperly can possibly void the warranty. If the original shipping container was not kept, contact Symbol to have another sent to you.

Symbol Support Center

In the U.S.A, for service information, warranty information or technical assistance, call:

SYMBOL SUPPORT CENTER
1-800-653-5350

If you purchased your Symbol product from a Symbol Business Partner, contact that Business Partner for service.



WSS 1000 Product Reference Guide

Canada

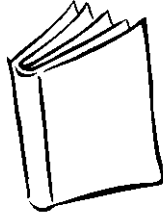
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Chapter 1

The WSS 1000 System

Introduction

The WSS 1000 is a modular wearable scanning system which allows the operator hands-free, unencumbered operation of a scanner and data collection device. The WSS 1000 consists of a ring scanner (RS 1) worn on the operator's hand, and a wearable wrist computer (WWC 1000) with display and keypad on the forearm, along with personal mounts which make the system wearable.

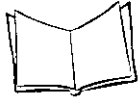
The WWC 1000 is a DOS-based computer with decode and scanner-control capability, which optionally performs RF communications with an access unit. The wrist computer contains a battery which powers both wrist computer and ring/back-of-hand scanner. The system operates in full sunlight and low ambient light; LCD and keyboard backlighting is also provided.

The WSS 1000 can be worn on either the right or left arm. The WWC 1000 and scanners are easily removed from their mounts allowing for interchangeable use by other operators.

As a batch terminal, the WSS 1000 collects and stores data for upload to a host computer. As a radio terminal, it incorporates a Spectrum One[®] or Spectrum24[®] wireless radio with an internally mounted antenna.

Unpacking the System

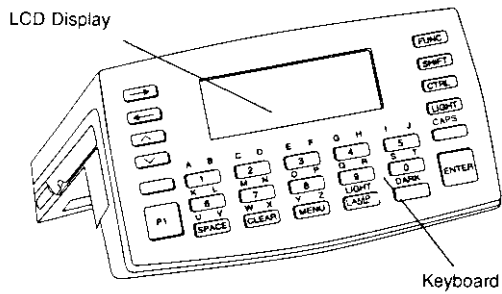
To unpack the system components, carefully remove all protective material from around the unit. Save the shipping container for later storage and shipping. Verify that you received all equipment listed on the packing slip and inspect the equipment for damage. If you find any damaged or missing items, contact the Symbol Support Center immediately (see *Symbol Support Center* on page xi for details).



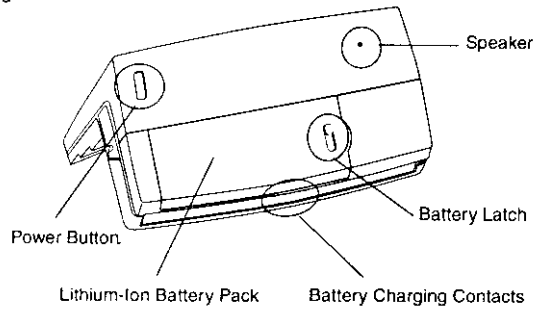
Parts of the WSS 1000 System

Wrist Computer (WWC 1000)

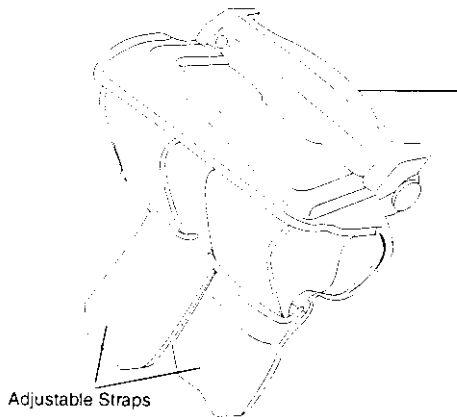
Front View



Top View

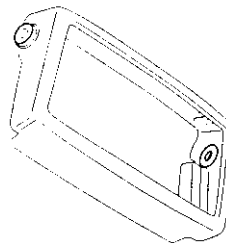


Wrist Mount

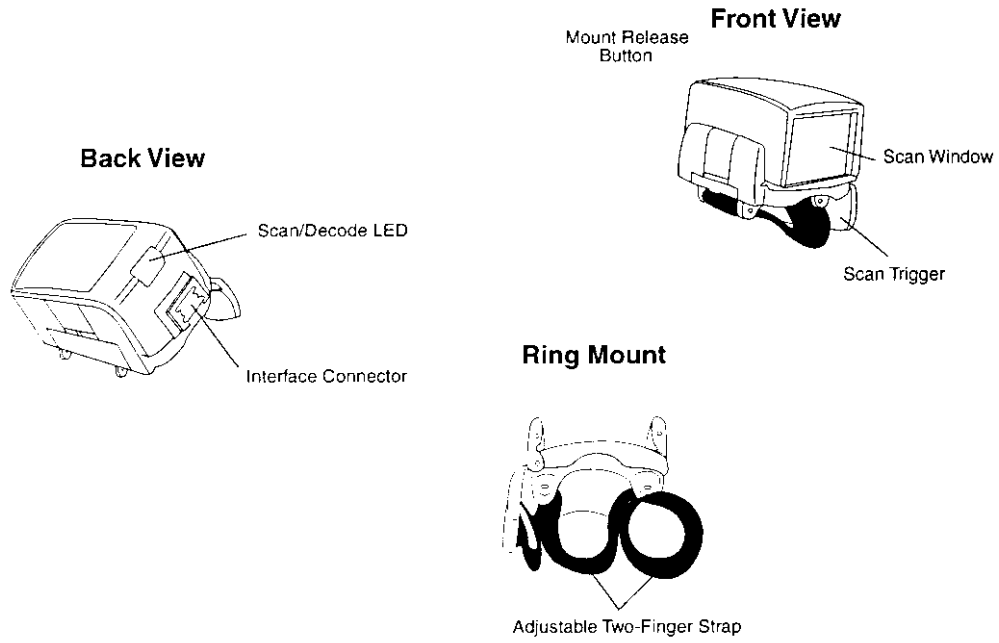


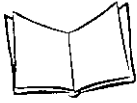
Rugged Boot

Snap-On Bar



RS-1 Scanner





WSS 1000 Product Reference Guide

Wrist Computer

Detaches from scanners and provides for minimum breakaway force as safety feature. Controls scanner (e.g., laser power on, visual feedback, scanner connectivity), receives data from scanner, and transmits data via batch or radio communications. Includes interconnect cable.

Wrist Mount

Worn on wrist or forearm of either arm. Detaches from wrist computer, which can then be used by other operators wearing their own wrist mounts.

Ring Scanner

Miniature laser bar code scanner, with trigger on thumb side of mount. Visual feedback for operator is provided through a 2-color LED on the back of the ring scanner.

Ring Mount

Worn on either hand using a strap which wraps around both the index and middle fingers, preventing the scanner from rotating on the finger during use. Detaches from ring scanner, which then can be used by other operators wearing their own ring mounts.

Keyboard

27-key keypad with alphanumeric and function keys. Left and right shift keys provide the equivalent of a 56-key keyboard.

Lithium-Ion Battery Pack

User-replaceable 1300 mA Lithium-Ion battery pack, supporting a typical 8-hour work shift at 0 - 50° C. The pack powers both wrist computer and scanner and operates through a maximum of 500 full recharge cycles. The battery can be recharged using a CS 1000 cradle or a Universal Battery Charger with adaptor.

Radio and Network Options

Spectrum One Network

The WWC 1010 includes an internal radio frequency transmitter/receiver for use in a Symbol Spectrum One network.

Spectrum24 Network

The WWC 1040 includes an internal radio frequency transmitter/receiver for use in a Symbol Spectrum24 network.

Accessories

The following accessories are available for the WSS 1000 System.

Attachments

A rugged boot (p/n 21-19670-02) provides added protection for the wearable unit, and is used in place of the snap-on bar on the wrist mount.

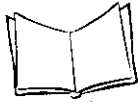
Cradles

The CS 1000 single-slot and 4-slot cradles combine a communications device with a battery charger, and are the fastest means of recharging the battery. The cradle is table-top or wall-mounted.

UBC 1000 (Universal Battery Charger) and Adaptor

This 4-battery charger is either desk-mounted or wall-mounted:

- ◆ UBC1000-400D (Desk Mount)
- ◆ UBC1000-400W (Wall Mount)
- ◆ (p/n 50-12100-234) battery adaptor for WWC 1000 using UBC 1000.



Power Supply

The following power supplies are available with the CS 1000 cradle:

p/n 50-14000-045	powers one single-slot cradle
p/n 50-14000-052	powers one 4-slot cradle
p/n 50-14000-055	powers four 4-slot cradles
p/n 25-16657-01	adapter cable (used with four-cradle power supply).

Before You Use the Terminal

Before using the WSS 1000 for the first time, perform the following procedures.

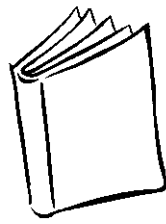
Install and Charge the Battery

Charge the Lithium-Ion battery. The battery can be charged while in the terminal or charged separately in the cradle's charging slot. Refer to Chapter 2 for instructions on installing the cradle. Refer to Chapter 6 for instructions on installing and charging the battery.

Load the Appropriate Software

Terminal initialization consists of loading the system software and applications. What software you load depends on the following factors:

- ♦ If this unit is intended for use in batch applications or in a Spectrum One network environment (1000 or 1010), refer to Chapter 3 for information on loading the software.
- ♦ If this unit is intended for use in a Spectrum24 network environment (1040), refer to Chapter 4 for information on Spectrum24 and software loading procedures.



Chapter 2

Hardware Installation

Mounting the CS 1000 Cradle

You have the option of table-top mounting or wall-mounting the Single-Slot Cradle. The CS 1000 4-Slot Cradle is wall mounted only.

Table-Top Mounting

The CS 1000 Single-Slot Cradle has a rear handle for desktop mounting.

To mount the CS 1000 4-Slot Cradle on the table top:

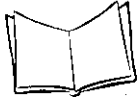
1. Place the mounting stand on a flat surface.
2. Place the cradle onto the stand so that the holes in the bottom of the cradle align with the bottom leg of the stand. The cradle should be tipped back at a slight angle.
3. Use two #6 screws (3/4" max. length) to secure the top of the cradle to the top of the stand.

Wall Mounting

To make the connection process easier, connect the power supply to the cradle before mounting.

Single-Slot

An optional metal bracket is available from Symbol as part of a kit for mounting the single-slot cradle to a wall. Contact a Symbol sales representative to order.



Four-Slot

To wall mount the CS 1000 4-Slot Cradle:

1. Place the empty cradle on the wall where it is to be mounted.
2. Insert two #8 screws through the holes in the outer spare battery compartments (Figure 2-1).
3. Insert two more screws through the holes on the lower portion of the cradle (between the first and second slot, and between the third and fourth slot).

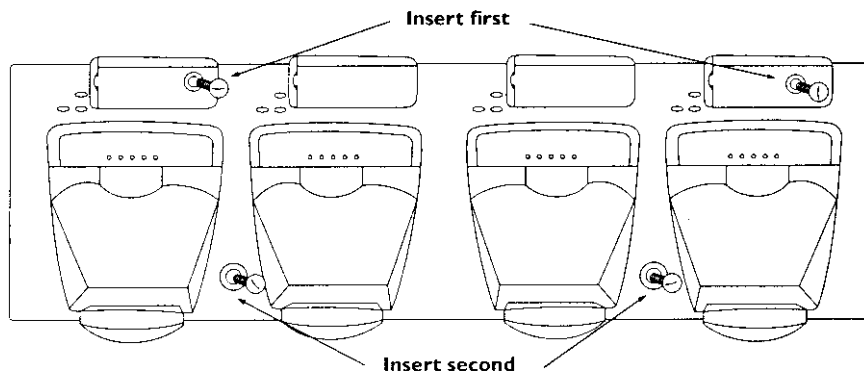


Figure 2-1. Wall Mounting the 4-Slot Cradle

Connect Host and CS 1000 4-Slot Cradle

To connect the CS 1000 4-Slot Cradle to a host computer for communications:

1. Plug the RS-232 serial cable's DB-25 connector in the cradle's communication port. The port is located on the back, right-hand side of the single-slot cradle, and on the left side of the 4-slot cradle (Figure 2-2).

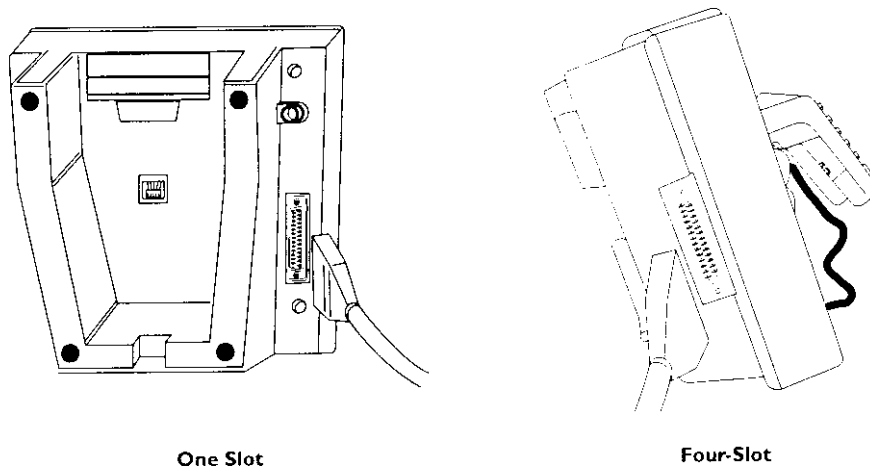


Figure 2-2. Plugging Serial Connector into Single-Slot and 4-Slot Cradles

2. Connect the cable's other DB-25 connector to the host's serial (COMM) port.
3. Connect the power supply cord's round connector to the cradle's power port (Figure 2-3).

The single-slot cradle's power port is on the back right-hand side, above the communications port; use power supply p/n 50-14000-045.



The four-slot cradle's power port is in the center back; use power supply p/n 50-14000-052.

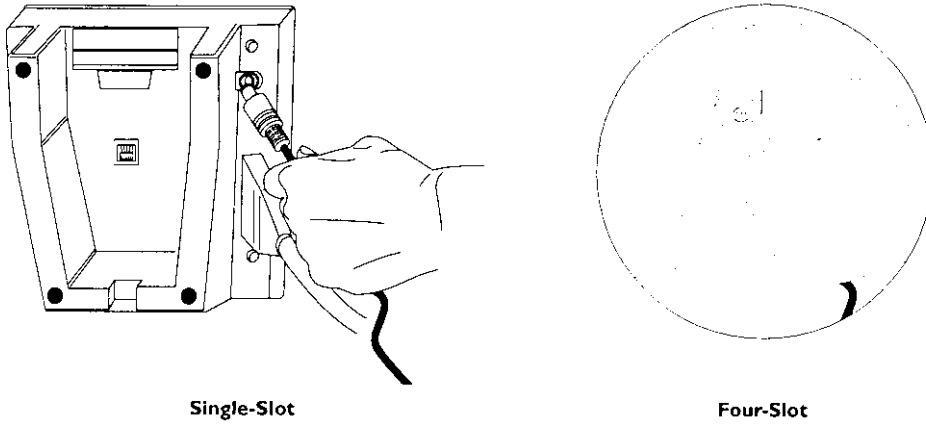


Figure 2-3. Plugging Power Supply into Single-Slot and 4-Slot Cradles

4. Connect an adapter cable to the other end of the power supply (Figure 2-4).

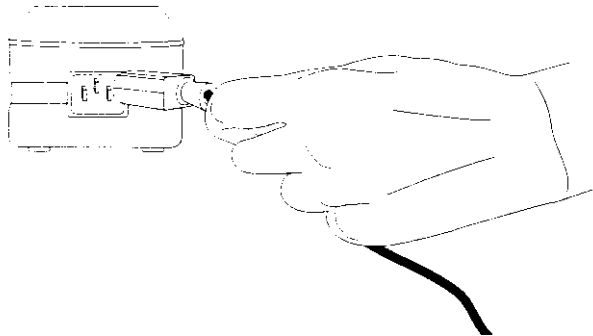


Figure 2-4. Plugging Power Supply into Adapter Cable

5. Plug the adapter cable into an electrical outlet.

Connecting to Other Cradles

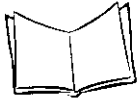
Up to 24 four-slot cradles can be daisy-chained together using the RS-232 inter-cradle cable (p/n 25-16740-01).

Note: Single-slot cradles can not be interconnected.

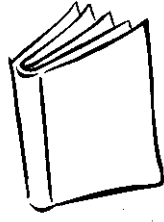
Caution

Each cradle must receive power directly from a compatible power supply; any other method of power hookup is unsafe.

1. Plug one end of the inter-cradle cable into the cradle's communication port located on the right side of the first cradle.
2. Plug the inter-cradle cable's other DB-25 connector into the second cradle's communication port, located on the left side.
3. Connect a power supply to the second cradle as described in the previous sections.
4. Repeat the above steps for any additional cradles you wish to connect.



WSS 1000 Product Reference Guide



Chapter 3

Batch and Spectrum One Initialization

Before using the WSS 1000 system, perform the following procedures:

- ◆ set up the CS 1000 cradle (refer to Chapter 2, *Hardware Installation*)
- ◆ install the battery (refer to Chapter 6, *Maintaining the WSS 1000*)
- ◆ charge the battery (refer to Chapter 6, *Maintaining the WSS 1000*)
- ◆ load the system files and application(s).

Hardware Requirements

Hardware required for performing initialization includes:

- ◆ Host PC
- ◆ RS-232 serial null modem cable
- ◆ WWC 1000 wrist computer
- ◆ Cradle with power supply

Communications

For terminals being used in a direct communications (batch) environment or a Spectrum One network environment, applications are transferred from a host computer over a communications line to the terminal. This procedure uses the SENDHEX program on the host computer and the Program Loader function (from Command Mode) on the WWC 1000. Programs are stored in the terminal's nonvolatile memory (NVM), also called the application EEPROM.



Note: For details on SENDHEX, refer to the *Series 3000 Application Programmer's Manual*.

Other software may be used in place of SENDHEX.

Set up for Initialization

1. Verify that the cradle is connected to the host PC. Refer to Chapter 2, *Hardware Installation*.
2. Place the WWC 1000 in the cradle and power it off (refer to Figure 3-1).

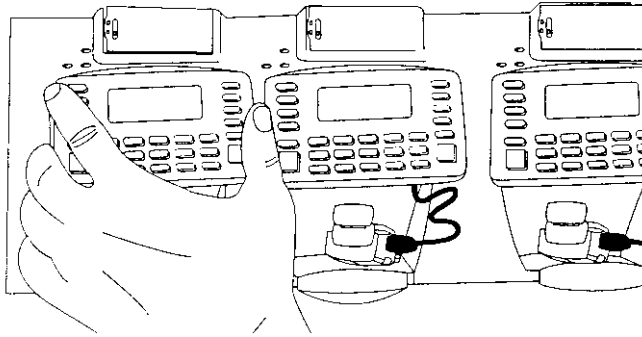


Figure 3-1. Placing the WWC 1000 in the Cradle

Loading the BIOS or an Application

Note: To cancel communications at any time during the session, press CLEAR on the WWC 1000. The session stops immediately.

To download the BIOS or an application, initiate the communications software on the host computer and WWC 1000. The WWC 1000 must be connected to the host through a cradle to program the EEPROM.

Note: Communication parameters specified on host and WWC 1000 must match. These parameters typically are:

38400 bps
7 bit data
Odd parity
None

Initiate Host Communications Software on the PC

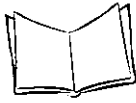
1. Power on host computer.
2. Start the communication program.
3. At a DOS prompt, enter the SENDHEX command:

```
sendhex pgmname 38400 com2
```

where:

SENDHEX	is the command.
pgmname	is the application being loaded (.hex extension is optional).
parameters	are the communications parameters following the program name. Parameters include baud rate, communications port, data bits, parity, and flow control. To accept the default parameters, do not enter a value.

In the example, baud rate is set to 38400 bps and communications port to COM2. The default values are accepted for the remaining parameters.



Note: *Versions of SENDHEX earlier than 3.0 do not support flow control. If you use an earlier version and encounter communication errors, use a lower baud rate. If you use a later version of SENDHEX and have communications errors, try setting flow control to XON/XOFF.*

4. SENDHEX displays the prompt:

Press <ENTER> to begin
communications.

5. Do NOT press <ENTER> yet. Before starting communications (refer to *Starting Communications* on page 8), set up the WWC 1000 for loading a BIOS or an application as directed in the following sections.

Initiate WWC 1000 Communications: Loading the BIOS

If you are loading a new copy of the BIOS or extended BIOS:

1. Boot the WWC 1000 to BIOS loader mode.
 - a. Press < 1 + 8 + 5 >.
 - b. Press and release the PWR button.
 - c. Release < 1 + 8 + 5 >.
2. The WWC 1000 displays:

```
BIOS loader
WARNING: ERASE?
<ENT>
```

Before loading the new BIOS, erase the old BIOS.

3. Press <ENTER> to erase the BIOS.
Wait while the BIOS is erased. When complete, the program prompts for the communications parameters.
4. **Baud Rate.** The WWC 1000 displays:

```
Comm Params

Baud
38.4K
```

Batch and Spectrum One Initialization

Scroll through the list using **UpArrow** or **DownArrow**. When the correct rate is displayed (38400 is recommended), press **<ENTER>**.

5. **Data Bits.** The WWC 1000 displays:

Comm Params

Data Bits

7

Press **<7>** (recommended) or **<8>** to specify data bits, or scroll through the list using **UpArrow** and **DownArrow**. Press **<ENTER>** when the correct value is displayed.

Note: If 8 data bits is selected, the program selects "No parity" and skips the next step.

6. **Parity.** If 7 data bits is selected, the WWC 1000 displays:

Comm Params

Parity

Odd

Press the first letter of a parity option (**E**ven, **O**dd, **N**one, **S**pace, or **M**ark), or scroll using **UpArrow** and **DownArrow** and press **<ENTER>** when the correct value is displayed.

7. **Flow Control.** The WWC 1000 displays:

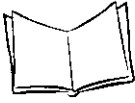
Comm Params

Flow Ctrl

None

Press the first letter of a flow control option (**N**one, **X**on/**X**off, or **R**TS/**C**TS), or scroll using **UpArrow** or **DownArrow** and press **<ENTER>** when the correct value is displayed. **None** is recommended.

8. Go to *Starting Communications* to continue.



Initiate WWC 1000 Communications: Loading an Application

If you are loading an application:

1. Boot the WWC 1000 to command mode.
 - a. Press <ENTER> and <FUNC>.
 - b. Press and release the Power button.
 - c. Release <ENTER> and <FUNC>.

The display shows the function selector screen:

```
COMMAND MODE

Select function
Self Test
```

2. Scroll through Command Mode options using UpArrow or DownArrow until "Program loader" is displayed. Press <ENTER>.
3. The WWC 1000 displays:

```
Program loader
WARNING: EEPROM
WILL BE ERASED
CONTINUE? <ENT>
```

Before loading the new application, erase NVM's original contents.

Note: To cancel this operation, press <CLEAR>.

4. Press <ENTER> to erase the EEPROM.
Wait while the EEPROM is erased. When complete, the program prompts for the communications parameters.

5. Baud Rate. The WWC 1000 displays:

```
Comm Parameters

Baud
5      38400
```

Scroll through the list using UpArrow or DownArrow. When the correct rate is displayed (38400 is recommended), press <ENTER>.

Batch and Spectrum One Initialization

6. **Data Bits.** The WWC 1000 displays:

Comm Parameters

Data Bits

7

Press <7> (recommended) or <8> to specify data bits, or scroll through the list using **UpArrow** and **DownArrow**. Press <ENTER> when the correct value is displayed.

Note: If 8 data bits is selected, the program selects "No parity" and skips the next step.

7. **Parity.** If 7 data bits is selected, the WWC 1000 displays:

Comm Parameters

Parity

Odd

Press the first letter of a parity option (**Even**, **Odd**, **None**, **Space**, or **Mark**), or scroll using **UpArrow** and **DownArrow** and press <ENTER> when the correct value is displayed.

8. **Flow Control.** The WWC 1000 displays:

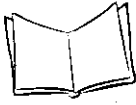
Comm Parameters

Flow Control

None

Press the first letter of a flow control option (**None**, **Xon/Xoff**, or **RTS/CTS**), or scroll using **UpArrow** or **DownArrow** and press <ENTER> when the correct value is displayed.

9. Go to *Starting Communications* to continue.



Starting Communications

The WWC 1000 is ready to receive the program from the host PC and displays:

Comm Parameters

Start? <ENT>

1. Press <ENTER> on the WWC 1000. The WWC 1000 waits a few seconds for the host PC to initiate communications. While waiting, the WWC 1000 displays:

Comm Parameters

Receiving:

If the host is not ready or the cable is not connected between the host PC and cradle, the terminal displays:

Awaiting DSR

2. Press <ENTER> on the host computer. SENDHEX begins transmitting the program image. When communications are established, the WWC 1000 displays:

Program loader

Receiving: XXXX

where XXXX is the program segment address being transferred.

3. When the transmission is complete, the WWC 1000 displays:

Program loader

Status 0000

A status of 0000 (all zeros) indicates a successful transfer. Other status values indicate an error. These values are provided in Appendix C.

Loading Applications After Loading the BIOS

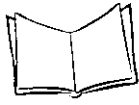
To load applications after loading the BIOS:

1. Press <CLEAR> to exit the communications program.
2. Power down the WWC 1000.
3. Go to *Initiate WWC 1000 Communications: Loading an Application* on page 6.

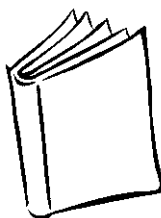
Ending Communications

To return to the Command Mode main menu:

1. Press <CLEAR> on the WWC 1000.
2. Power down the WWC 1000.
3. Remove the WWC 1000 from the cradle.
4. Reboot the WWC 1000 using the appropriate cold boot sequence described in *Booting the WWC 1000* on page 11.



WSS 1000 Product Reference Guide



Chapter 4

Spectrum24[®] RF Terminal Setup

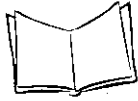
Spectrum24 Terminals

In Spectrum24 terminals, wireless connectivity is accomplished using standard communications protocols. Because they are standard, the protocols are generalized and take up considerably more space on the terminal's NVM than was required for Spectrum One[®] terminals. Because there is less space available in NVM for application files, the WWC 1040 operates with an additional megabyte of non-volatile memory or *flash disk*. This extra memory is used to reduce not only the boot times but also the time and resources required to load applications into the terminal. The flash disk also offers the possibility of running multiple applications from the same WWC 1040 (refer to the section *Multiple Applications on the Same Terminal* for more information. With version 3.03 or later of the system software (LWP.HEX), the WWC 1040 can also run diagnostic tools.

Accessing the Flash Disk

The flash disk is accessed through a driver, FLASHDSK.SYS, which makes the flash disk appear to a program as another disk drive (E:). The drive has characteristics of fast reading but slow writing (e.g., even for the smallest files, the write process takes 3-4 seconds). These characteristics make it ideal for files that are written once, accessed often, and seldom updated.

We recommend that you use the flash disk (E:) mainly for application and configuration file storage. To avoid overwriting the flash disk by mistake, the flash disk is set to read-only mode for normal operation. The software installation or application software takes care of write/read mode switching for you.



Standard Spectrum24 Software

The WWC 1040 comes with the system software installed, including:

- Spectrum24 radio drivers
- TCP/IP software
- configuration files
- various utilities.

A BIOS of version 1.09 or later is required.

The default files cover most expected installations/initializations with minor changes as detailed in this chapter.

If your requirements are more advanced, refer to the *Spectrum24 Network Development Kit* documentation for more information on the Spectrum24 RF network, SLAODI.COM, the Symbol-provided ODI driver, and the configuration file setups required for various platforms.

Boot Options & Internet Addressing

Each WWC 1040 requires a unique internet address (IP address), allowing messages it sends and receives to be correctly routed over networks conforming to the TCP/IP protocol standards. These addresses can be administered and entered manually, or administered and allocated by a server on the network.

By default, the WWC 1040 uses NOBOOT (manual entry) to define the IP address. To set the IP address, use the CFG24 utility described later in this chapter in the section *Initializing the WWC 1040*.

Two protocols are defined for the IP address allocation on the network: BOOTP and DHCP. To allocate IP addresses through BOOTP or DHCP, you must change the boot option in the configurator using the Boot Mode parameter.

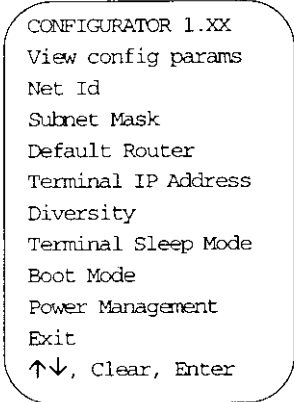
Initializing the WWC 1040

To initialize a WWC 1040 which has *LWP.HEX version 3.03* or greater loaded:

Note: *This section covers specific settings required on first booting the WWC 1040, out of the box. For a complete review of the CFG24 screens, refer to Appendix D, Spectrum24 Utilities.*

1. Insert a charged battery in the WWC 1040. Refer to Chapter 5 for instructions on charging and installing a battery.
 2. Cold boot the WWC 1040.
 - a. Press <→ + ENTER>.
 - b. Press and release the Power button.
 - c. Release <→ + ENTER>.
 3. The WWC 1040 loads software, then brings up the Spectrum24 Configurator (CFG24) menu, shown in Figure 4-1.
-

Note: *CFG24 comes up automatically after the first initialization out of the box. On subsequent initializations, type CFG24 at the DOS prompt to bring up the configurator.*



```
CONFIGURATOR 1.XX
View config params
Net Id
Subnet Mask
Default Router
Terminal IP Address
Diversity
Terminal Sleep Mode
Boot Mode
Power Management
Exit
↑↓, Clear, Enter
```

Figure 4-1. CFG24 Main Menu



On the WWC 1040 screen, the top and bottom lines of the menu are displayed, and the remaining lines are viewed by scrolling. In this menu, pressing <CLEAR> has the same effect as selecting *Exit*.

4. The WWC 1040 initially is set to NOBOOT mode. To configure the terminal for operation, set up the parameters provided in Table 4-1 (the procedures are detailed in the steps below).

Table 4-1. Spectrum24 Configuration Parameters

Net Id	The Net Id identifies the radio network and differentiates between different radio networks. All equipment on one network must use the same Net Id. Set to the same value specified for the Spectrum24 Access Points (APs).
Boot Mode	The boot mode indicates the source of the terminal's IP address. If this value is set to "Manual entry", you must enter a terminal IP address through CFG24.
Terminal IP Address	Required if you are not using a boot server to allocate IP addresses (BOOTP or DHCP). Set as advised by your LAN administrator. Note: Take care entering this value! The IP address must be unique in the network or communications will be unpredictable.
Subnet Mask	Set as advised by your LAN administrator. Note: If you change boot mode, the value set by a server overrides this value.
Default Router	The default router is the address of the node where all packets destined for remote networks will be sent. Set as advised by your LAN administrator. Note: If you change boot mode, the value set by a server overrides this value.
Diversity	Determines whether the radio firmware attempts to use one or two antenna ports for communications. It is important to match this setting with the actual number of antennas in use. If set to "Yes", the radio firmware attempts to use both antenna ports for communications. The WWC 1040 has one antenna. Set to "No".

Table 4-1. Spectrum24 Configuration Parameters (Continued)

Terminal Sleep Mode	Determines whether radio is powered off after the terminal enters sleep mode due to inactivity. Refer to Appendix D for more information. The default value is "On".
Power Management	If power management is set to PSP, the radio powers up only when there is traffic on the network. If it is set to CAM, the radio is always ready to receive. Use the PSP setting to save battery life. The default value is "PSP".

- a. To view the WWC 1040's default parameters, select VIEW CONFIG PARAMS (Figure 4-2).

This screen is for display only; it is not a data entry screen. Use it to review the terminal's IEEE (or MAC) address, IP address, and Net Id. Press <CLEAR> or <ENTER> to return to the main menu.

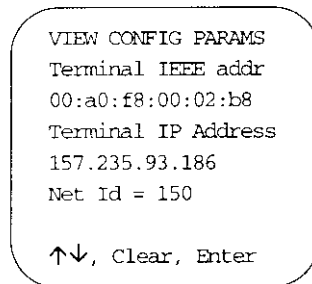
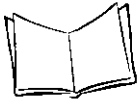


Figure 4-2. View Configuration Parameters Screen



- b. To change the Net Id, select Net Id from the CFG24 Menu. The *Net Id* screen (Figure 4-3) is displayed.

```
NET ID
Enter Net Id(hex):
150

BkSp, Clear, Enter
```

Figure 4-3. Net Id Screen

To change the current Net Id value, backspace over the current value and type a new value, in hexadecimal format, in the range 101 to 1FE. Alphabetical hex values can appear in upper or lower case.

Press <ENTER> to effect the change. Press <CLEAR> to exit without changes.

- c. Select Subnet Mask from the main configuration menu. The *Subnet Mask* screen (Figure 4-4) is displayed.

```
SUBNET MASK
Enter Subnet Mask:
255.255.255.0

Bksp, Clear, Enter
```

Figure 4-4. Subnet Mask Screen

To change the current Subnet Mask setting, backspace over the current value and type a new value, in decimal form. Each part of the four-part address must be in the range 0 to 255.

Press <ENTER> to effect the change. Press <CLEAR> to exit without changes.

- d. Select **Default Router** from the main configuration menu. The *Default Router* screen (Figure 4-5) is displayed.

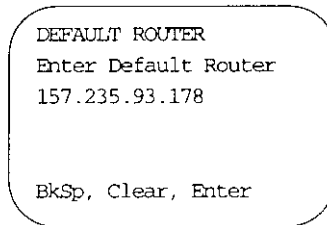


Figure 4-5. Default Router Screen

To change the current Default Router setting, backspace over the current value and type a new value, in decimal form. Each part of the four-part address must be in the range 0 to 255.

Press <ENTER> to effect the change. Press <CLEAR> to exit without changes.

- e. Select **Terminal IP Address** from the main configuration menu. The *Terminal IP Address* screen (Figure 4-6) is displayed.

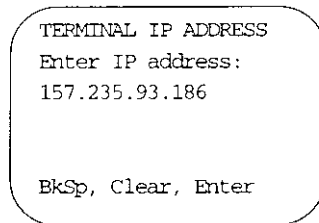
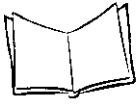


Figure 4-6. Terminal IP Address Screen

To change the current Terminal IP Address, backspace over the current value and type a new value in decimal form. Each part of the four-part address must be in the range 0 to 255.

Press <ENTER> to effect the change. Press <CLEAR> to exit without changes.



- f. Select **Diversity** from the main configuration menu. The *Diversity* screen (Figure 4-7) is displayed.

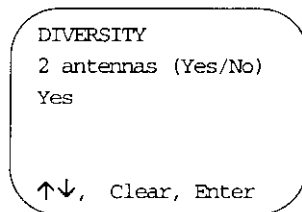


Figure 4-7. Diversity Screen

To change the current Diversity setting, use the ↑↓ cursor keys to toggle between the settings “Yes” and “No”. For the WWC 1040, set Diversity to “No”.

Press <ENTER> to effect the change. Press <CLEAR> to exit without changes.

- g. Select **Terminal Sleep Mode** from the main configuration menu. The *Terminal Sleep Mode* screen (Figure 4-8) is displayed.

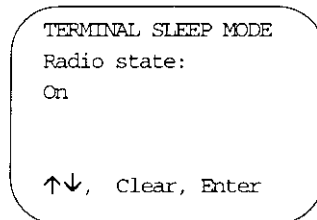


Figure 4-8. Terminal Sleep Mode Screen

To change the current Terminal Sleep Mode, use the ↑↓ cursor keys to toggle between the “On” and “Off” settings. The default setting is “On”.

Press <ENTER> to effect the change. Press <CLEAR> to exit without changes.

- h. Select **Boot Mode** from the main configuration menu. The *Boot Mode* screen (Figure 4-9) is displayed.

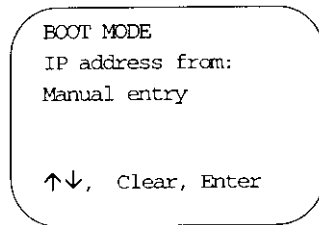


Figure 4-9. Boot Mode Screen

To change the current boot mode, use the \updownarrow keys to toggle among the three settings: “Manual entry”, “BOOTP”, and “DHCP”. Refer to Appendix D for a complete explanation of the three boot modes.

Press \langle ENTER \rangle to effect the change. Press \langle CLEAR \rangle to exit without changes.

- i. Select **Power Management** from the main configuration menu. The *Power Management* screen (Figure 4-10) is displayed.

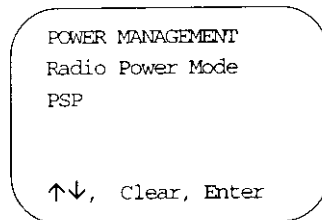
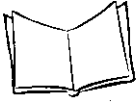


Figure 4-10. Power Management Screen

To change the current power management mode, use the \updownarrow keys to toggle between the settings “PSP” and “CAM”. The default setting is “PSP”.

Press \langle ENTER \rangle to effect the change. Press \langle CLEAR \rangle to exit without changes.

5. When all of your changes are made, press \langle CLEAR \rangle to return to the main configuration menu.
6. Select *Exit* from the main configuration menu and press \langle ENTER \rangle to exit the configurator.



The WWC 1040 displays the message:

```
...updating config data
```

and proceeds with the initialization which writes the configuration values to a R/W non-volatile section of radio flash memory.

Initiating Network Connection

As the initialization continues, the terminal attempts to associate with the Spectrum24 AP using the default or newly entered Net Id.

WWC 1040 Association with AP Not Successful

If the WWC 1040 is unable to associate with the AP (the Net Id is wrong or forgotten), it displays the message:

```
STAT24 Ver 1.XX  
NOT Associated
```

for a few seconds. A second message follows:

```
Terminal cannot associate with AP. You're  
out of range or not configured. Ctrl+C to end  
or other key to retry. Strike any key when ready.....
```

The WWC 1040 continues trying to connect until the attempt is cancelled.

1. Press <Ctrl + C> to end the attempt. The WWC 1040 displays the message:

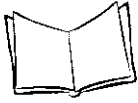
```
Halt Batch process Y/N?
```
2. Type Y to exit to the DOS prompt (D:).
3. At the DOS prompt, type CFG24 and press <ENTER> to initiate the Configurator and bring up the Configurator screen.
4. Verify the Net Id with the LAN administrator to ensure you are entering the correct value.
5. Verify other parameters and proceed as directed in the section *Initializing the WWC 1040*, beginning with step 4a.

WWC 1040 Association with AP Successful

If the association is successful, the terminal begins operating using the software files loaded on the flash disk.

On first initialization, you probably don't have applications loaded. Proceed with loading the applications as directed in *Installing Application Software on Flash Disk*.

On subsequent initializations, if only one application is loaded, that application is displayed automatically. If you loaded multiple applications, a application selection menu is displayed early in the initialization process. Select the application to load for the current session and proceed.



Installing Application Software on Flash Disk

Note: LWP.HEX version 3.03 or greater is required on the WWC 1040 for this process. If you are not sure of the terminal's hex version, boot (initialize) the WWC 1040. The hex version is displayed for approximately 5 seconds during the initialization process.

Installing application software on the WWC 1040 flash disk includes downloading a HEX file to the WWC 1040, using **SENDHEX** on the PC and **Program Loader** on the terminal, and re-initializing the terminal. On the initial boot after a software download, the WWC copies the software files on to the flash disk, and remembers that the copy occurred, ensuring that it is not repeated each time the WWC is booted.

The hardware required for performing the download includes:

- ♦ WWC 1040 wrist computer
- ♦ CS 1000 1- or 4-slot cradle with power supply
- ♦ DOS PC
- ♦ RS-232 serial null modem cable

Initiate Host Communications on the PC

To update the hex image:

1. Power on the host computer.
2. On the PC, change to the directory where the application's hex file is stored and type the following command at a DOS prompt:

```
SENDHEX <hexfile> 384 [1|2]<ENTER>
```

where:

SENDHEX is the command

<hexfile> is the hex file for the application being loaded. There may be other application hex files which load other software (e.g., STEP version 2.6.0 or greater, or TelNet Clients 3.0 or greater) to the flash disk.

Note: Be sure to use applications that are flash-disk enabled.

38400 is the baud rate.

[1|2] sets the host communications port the cradle is attached to.

The following message is displayed:

Press <ENTER> when remote is ready. ESC to abort...

3. Do NOT press <ENTER> yet. Set up the WWC 1040 as described in *Initiate WWC 1040 Communications*.

Initiate WWC 1040 Communications

1. Place the WWC 1040 in the cradle and power it off.
2. Boot the WWC 1040 to command mode.
 - a. Press <ENTER> and <FUNC>.
 - b. Press and release the Power button.
 - c. Release <ENTER> and <FUNC>.

The display shows the function selector screen:

```
COMMAND MODE
```

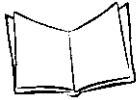
```
Select function  
Self Test
```

3. Scroll through Command Mode options using ↑ or ↓ until “Program loader” is displayed. Press <ENTER>.
4. The WWC 1040 displays:

```
Program loader  
WARNING: EEPROM  
WILL BE ERASED  
CONTINUE? <ENT>
```

Note: *To cancel this operation, press <CLEAR>.*

5. Press <ENTER> to erase the EEPROM.
Wait while the EEPROM is erased. When complete, the program prompts for the communications parameters.
6. Set the parameters to 38400 bps, 7 data bits, odd parity and no flow control. Press <ENTER>.



Start Communications

1. The WWC 1040 displays:

Comm Parameters

Start? <ENT>

2. Press <ENTER> on the WWC 1040.

3. The WWC 1040 displays:

Comm Parameters

Receiving:

If the host is not ready or if the cable is not connected properly between the host PC and the cradle, the WWC displays:

Awaiting DSR

4. Press <ENTER> on the host PC to start the download. The terminal displays:

Program loader

Receiving: XXXX

where XXXX indicates the download's progress.

5. When the transmission is complete, the WWC 1000 displays:

Program loader

Status 0000

A status of 0000 (all zeros) indicates a successful transfer. If the status is other than 0000, check the cable connections between the host PC and the cradle and repeat the process. If the problem persists, contact the Symbol Support Center for assistance.

6. After the download to each terminal is complete, re-initialize (cold boot) the WWC 1040 to finish copying the system files to the flash disk.

Note: The WWC 1040 must be re-initialized to ensure the files are copied to the flash disk.

Updating System Software on Flash Disk

Updating the LWP hex image means loading the new system files on the flash disk using the SENDHEX utility on a PC. It is possible to perform this update on multiple terminals in a cradle at one time, with each terminal running Program Loader from Command Mode.

Note: The WWC 1040 is shipped with the LWP hex file installed. Use this procedure ONLY:

- to load a new version of LWP greater than 3.03
 - if you experience serious difficulties
 - if you are so directed by Symbol's Technical Support staff.
-

1. Following the instructions for installing software on the flash disk (through step 5). Be sure, when entering the SENDHEX command on the PC, to issue the command from the directory where the hex file (LWP.HEX) is stored.

When the download is complete, the WWC 1040 displays the following query:

```
LWP.HEX Ver X.XX
Loading system files
1. Reformat flash
2. Use flash as-is
Select [1,2]:
```

Note: Reformatting the flash removes all files stored on the flash disk.

2. Select 1, Reformat flash, ONLY if you have problems with the WWC 1040's operation.

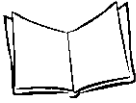
Caution

This removes the system software and all applications!

Select 2, Use flash as-is, to update the flash while retaining the existing contents.

3. If you select 1, the WWC displays the message:

```
Are You sure Y or N
```



4. Press **Y** to continue with the reformat or **N** to cancel and press **<ENTER>**.

The WWC 1040 finishes reformatting (if requested), copies the files to the flash disk, and executes them.

Multiple Applications on the Same Terminal

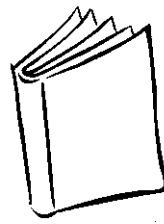
The system files (from LWP.HEX) fill over 200 KB of the flash disk's 1 MB. Current standard applications such as STEP or TN clients require between 100 KB and 150 KB of flash disk. This leaves ample space for installing more than one application on a single WWC 1040. Terminals have been configured to run as many as four applications, with a maximum of five applications allowed.

Individual applications may require special terminal configurations that can only be set at boot time, such as RAM disk size. The TN clients require configuring a minimum-size RAM disk (<100 KB) because their limiting resource is program execution space. STEP, on the other hand, uses the RAM disk to hold forms. Some STEP application implementations use forms extensively and require a larger RAM disk (>100 KB). The application loaded last defines the size of the RAM Disk for all applications on the flash disk.

Note: *The system files contained in the LWP.HEX have the RAM disk defined as 80 KB.*

Note: *It is possible with multiple applications to have applications co-existing on the terminal with conflicting memory requirements. If this occurs, work out a compromise value that both applications can work with before loading the files.*

If multiple applications are installed on the WWC 1040, a menu is presented during the initialization process where you select the application to run for this session. Switching between applications requires re-initializing the terminal and selecting an alternative application when prompted. On warm boots, the terminal re-initializes and reenters the same application that was selected before the re-initialization. On cold boots, if there are multiple applications available, an application selection menu is presented.



Chapter 5 Operating the WSS 1000

Assembling the WSS 1000 System

The WSS 1000 assembly consists of putting the WWC 1000 and mount together with a scanning components, the RS 1 ring scanner.

Assembling the WWC 1000 (Standard Unit)

1. Orient the cable on the WWC 1000 for right- or left-handed operation.
2. Ensure that the cable is fully seated in the channel (Figure 5-1).

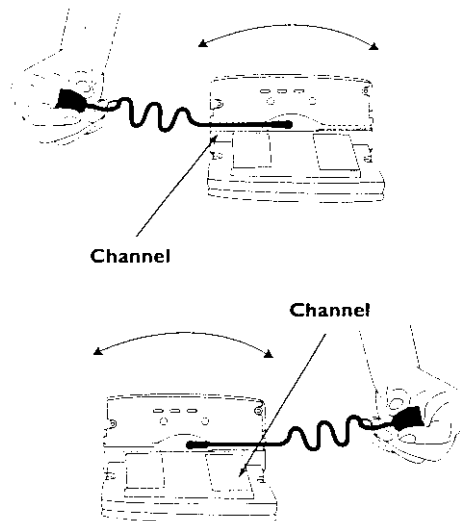
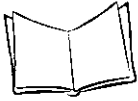


Figure 5-1. Orienting the Cable on the WWC 1000



3. Place the WWC 1000 wrist computer onto the wrist mount, facing you. Be sure the mount is oriented so that the longer strap will be further up the forearm.
4. Snap the bar over the WWC 1000 using the snaps on either side of the mount. The straight part of the bar lies across the front of the WWC 1000, with the curved part in back (Figure 5-2).

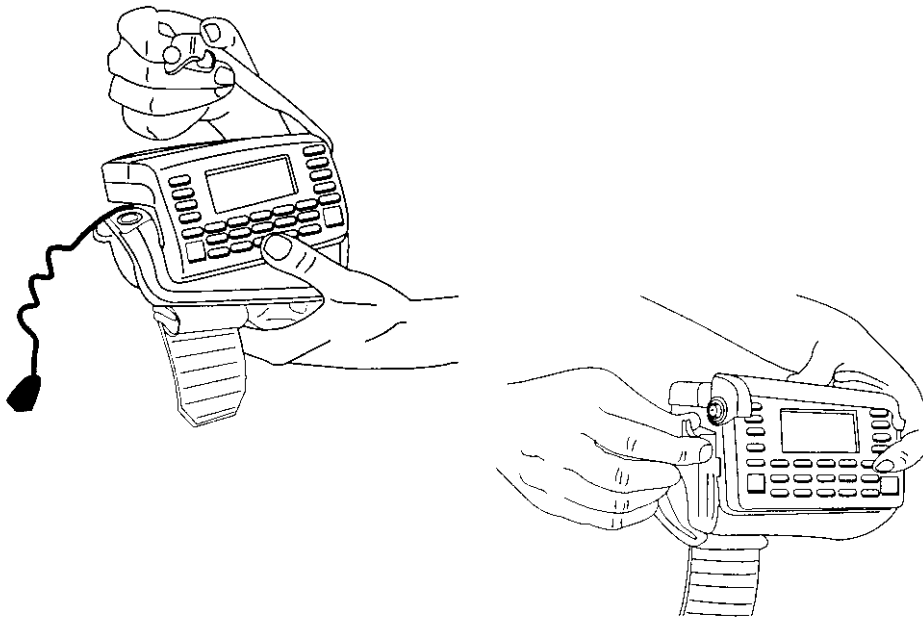


Figure 5-2. Snapping the Bar Over the WWC 1000

Note: The snaps on the wrist mount act as a tear-away device allowing the wrist computer to detach from the mount if it catches on an object.

Assembling the WWC 1000 (Rugged Boot Option)

When using the WSS 1000 in harsher conditions, a rugged boot option may be ordered. To assemble the WWC 1000 with the rugged boot:

1. Orient the cable on the WWC 1000 for right- or left-handed operation.
2. Ensure that the cable is fully seated in the channel (Figure 5-1).
3. The WWC 1000 should be oriented so that the longer strap will be further up the forearm and the keyboard is facing you. If necessary, rotate the protective sleeve attached to the mount to accomplish this (Figure 5-3).

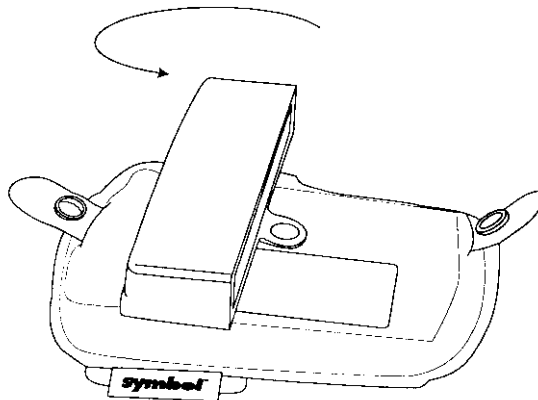
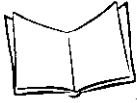


Figure 5-3. Rotating Protective Sleeve on Mount



4. Place the WWC 1000 wrist computer onto the wrist mount by sliding it into the protective sleeve (Figure 5-4).

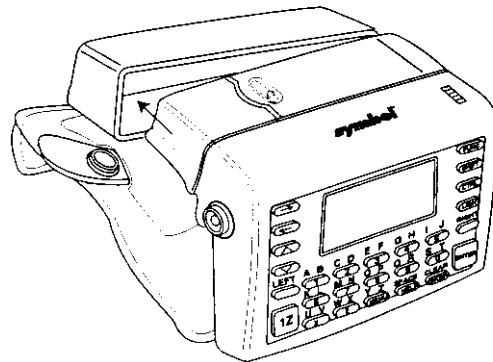


Figure 5-4. Sliding WWC 1000 into Sleeve

5. Snap the mount straps onto the WWC 1000 to secure (Figure 5-5).

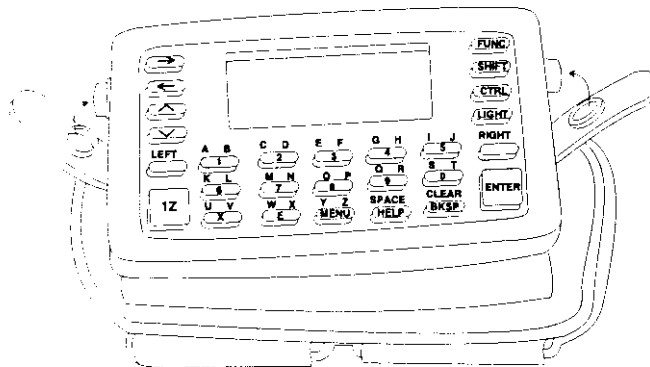


Figure 5-5. Snapping Mount Straps on the WWC 1000

Assembling the Ring Scanner

1. Adjust the strap of the ring mount to fit your right or left index and middle fingers:
 - a. Slip the mount onto your right or left index and middle fingers, oriented so the trigger is next to your thumb (Figure 5-6).



Figure 5-6. Placing the Ring Mount on Fingers

- b. If necessary, adjust the strap so that the mount fits comfortably (Figure 5-7).

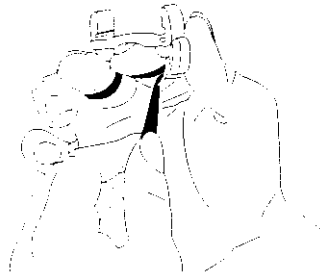
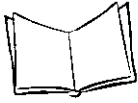


Figure 5-7. Adjusting Strap

- c. Remove the mount.
 2. Insert the ring scanner in the ring mount, depending on right- or left-handed use.
 - a. Determine whether the scanner will be used on a right or left arm.
 - b. Orient the ring scanner to the mount so that the trigger is next to the operator's thumb.



- c. Slide the ring scanner backwards into the mount (Figure 5-8).

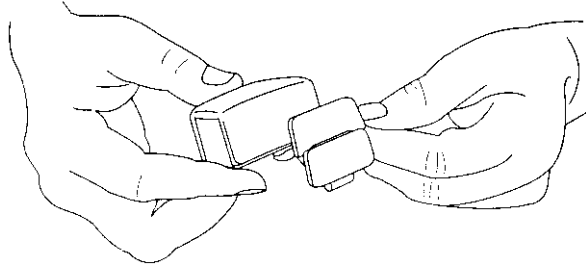


Figure 5-8. Sliding the Ring Scanner into the Mount

3. Plug the cable connector from the WWC 1000 in the interface port on the back of the ring scanner, with the arrow on the top of the cable facing up (Figure 5-9).

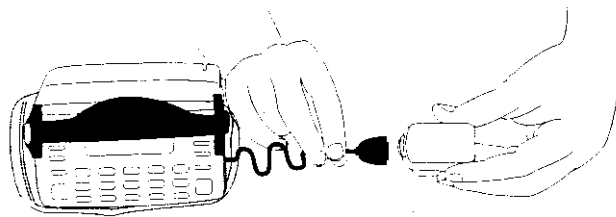


Figure 5-9. Connecting Cable from WWC 1000 to Ring Scanner

Wearing the WSS 1000 System

1. Slide the wrist mount on your arm, so that the longer strap is further up your arm (Figure 5-10).

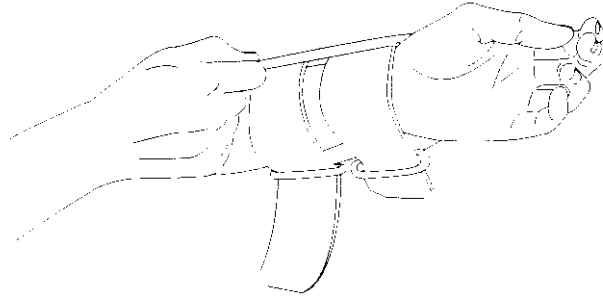


Figure 5-10. Sliding Wrist Mount Onto Arm

2. Pull the straps through the buckles so the mount is secure but not tight (Figure 5-11).

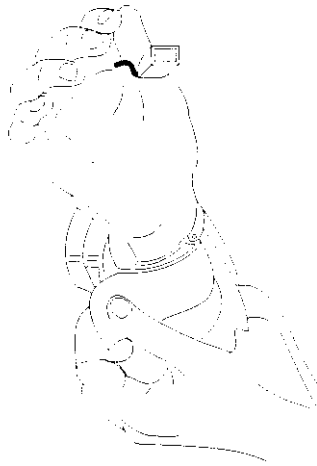
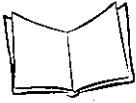


Figure 5-11. Adjusting Straps on Wrist Mount

3. Use the Velcro to secure the straps.



4. Slide the ring mount and ring scanner on your right or left index and middle fingers with the trigger next to your thumb (Figure 5-12).

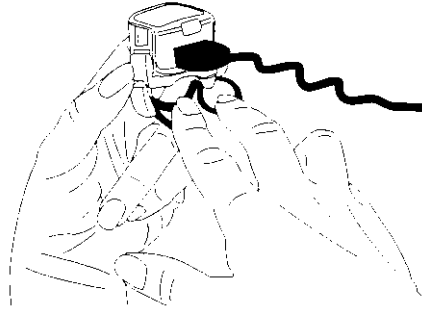


Figure 5-12. Sliding Ring Mount and Scanner Onto Finger

Removing the Ring Scanner

To remove the ring scanner for use by another operator:

1. Remove the cable from the scanner's interface port by twisting the cable counterclockwise and pulling to disconnect. Do NOT yank on the cable -- this may damage the connector!
2. Press the mount release button and gently pull/push the ring scanner out of the mount (Figure 5-13).

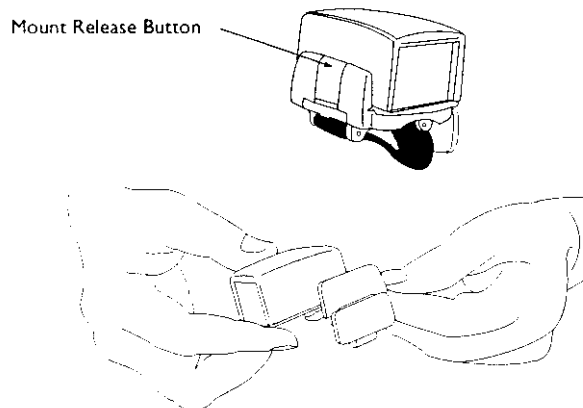


Figure 5-13. Removing the Ring Scanner from the Mount

Power On and Off

Because the WWC 1000 is battery powered, it is important to save power whenever possible. The period of time that the wrist computer can be used before recharging or replacing the battery can be increased by turning the wrist computer off when not entering data.

When powered off, the WWC 1000 saves power by not performing process or display functions. Applications or data in memory are retained. Before the wrist computer powers up, it checks the battery for enough power to ensure reliable operation and data storage. When powered on, the display is restored and processing continues at the point where it was when the wrist computer was powered down.

Powering the WWC 1000 on does not boot the system or initialize either the application or data. For more information regarding initialization, refer to Chapter 3, *Batch and Spectrum One Initialization*.

Normal Power

To power the WWC 1000 on or off, press the **Power** button on top of the WWC 1000 (refer to *Parts of the WSS 1000 System* on page 2).

Automatic Power

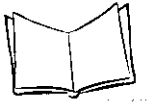
A number of other events may turn a wrist computer on or off, depending on the application. Some of these are:

Power On Via System Control

- ◆ The system powers on when a key other than the **Power** button is pressed.
- ◆ The system powers on when a scanner trigger is pressed.
- ◆ The application powers the system on at a preset time to perform unattended operations such as an overnight communications session.
- ◆ The application powers the system on when the wrist computer is placed in the cradle.

Power Off

The system powers off automatically to conserve power if it is not used for a specific period of time, as determined by the application program.



Forcing Power Off

If the WWC 1000 freezes in the middle of an operation, pressing the power switch does not power it off. You can force the system to power off, which reduces the drain on the batteries until you can download any collected data to the host system.

To force the system to power off, press and hold the **Power** button for 15 seconds.

Since the WWC 1000 is still frozen at this time, turning the power back on does not solve the problem. To recover the data held in memory, perform a Warm Boot (refer to *Booting the WWC 1000* on page 11).

Restarting After Forced Power Off

If an operator is forced to power down the WWC 1000 because of defective software, restart the system using the warm or cold boot procedures in the following section.

Note: Do not use the power key to restart if the WWC 1000 was forced off due to defective system or application program software in NVM. Pressing the Power button will only cause the program to resume where it left off, trying to perform the same unsuccessful operation.

Booting the WWC 1000

Powering the WWC 1000 on does not boot the system or initialize the program or data. To initialize the WWC 1000, perform either a warm or cold boot.

Warm Boot

A warm boot resets the operating system while preserving the program and data on the RAM disk. This process is similar to pressing the <Ctrl+Alt+Del> keys on a PC, except that it does not clear the system's memory. To perform a warm boot:

1. Press <P1+ENTER>.
2. Press and release the Power button.
3. Release <P1+ENTER>.

The WWC 1000 displays a copyright message, RAM size, expanded memory RAM size, etc., depending on the system's configuration.

Note: If the battery is removed for a period of time long enough for the supercap to discharge (15 minutes), the wrist computer automatically cold boots upon power-up.

Cold Boot

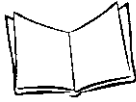
A cold boot fully resets the system and clears memory, including the RAM disk. Any programs and data stored in memory or on the RAM disk are deleted. Nonvolatile memory (NVM - the Application EEPROM) is not affected.

Caution

This procedure erases all data and programs residing in dynamic memory and RAM disk. All contents of the RAM disk are lost.

To perform a cold boot:

1. Press <RightArrow+ENTER>.
2. Press and release the Power button.
3. Release <RightArrow+ENTER>.



The wrist computer displays a copyright message, amount of RAM, and expanded memory. Other messages are displayed as well, depending on the system configuration.

Cold-Boot Failure

During a cold boot, the system briefly displays a status line for each driver as it loads in the format:

```
0: Driver    #.##
```

The line shows a status value, usually 0, followed by the name and version number of the driver. If the system halts at one of these lines and displays a status value other than 0, the displayed device driver failed to load properly.

If such a failure occurs, cold boot the wrist computer. If this does not solve the problem, call the Symbol Support Center.

More troubleshooting information is found in the publications listed at the beginning of this manual.

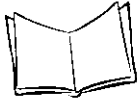
Boot to Command Mode

Command Mode provides functions for:

- ◆ Performing a Program Download to transfer an application program from the host system to the WWC 1000 (refer to *Chapter 3, Loading Applications* on page 9).
- ◆ Running the Self-Test program to verify that the hardware is operating properly (refer to *Chapter 7, Error Codes and Troubleshooting*).
- ◆ Performing a Memory Transfer to upload data from the WWC 1000 to the host system (refer to *Chapter 7, Error Codes and Troubleshooting*).

To boot to Command Mode:

1. Press <ENTER+FUNC>.
2. Press and release the Power button.
3. Release <ENTER+FUNC>.



Adjusting the Display

Backlighting

The WWC 1000's backlight illuminates the display in dimly lit areas. The backlight can be turned on in two ways:

- ◆ Press <LAMP> (LeftAlpha and HELP).
- ◆ Through the application (Interrupt 10h, Function 82h)

The backlight also turns off when the wrist computer is powered off or when an application-set timeout occurs.

Display Contrast

The LCD display contrast is adjustable, making the display more readable in different lighting conditions, at various temperatures, with different attachments, and at other viewing angles.

To increase contrast (darken) by one step, press <FUNC + SPACE>.

To decrease contrast (lighten), press <FUNC + BKSP>.

The WWC 1000 Keyboard

The keyboard is used for entering data and issuing commands to the WWC 1000. Figure 5-14 illustrates the standard 27-key keyboard.

The keys on the keyboard are distinguished as modifier keys and character keys. Because WWC 1000 keyboards have fewer keys than PC keyboards, each character key can produce more than the usual one or two characters. The modifier keys, **FUNC**, **SHIFT**, **CTRL**, and the Alpha Shift keys, used individually or in combination, determine which character or special function the character keys produce.

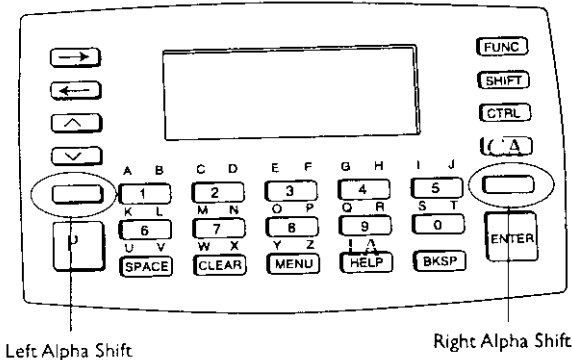


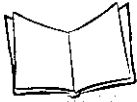
Figure 5-14. WWC 1000 27-key Keyboard

Using the Keyboard

The keyboard also has an optionally configurable auto-repeat function. If the application allows, a character is repeated as long as the key is held down. If the key is pressed immediately following a modifier key, the modifier sequence affects only the first occurrence of the character key.

Modifier Keys

The <SHIFT>, <Alpha Shift>, <FUNC>, and <CTRL> keys are modifier keys. When pressed individually or in certain combinations, these keys change the keyboard state and possibly the character produced by the character key that is subsequently pressed.



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For example:

- ♦ Pressing the right or left <Alpha Shift> causes the numeric keys to produce the letters listed above them. The left-hand Alpha Shift produces the letters in purple; the right-hand Alpha Shift produces the letters in green.
- ♦ Pressing <Right Alpha Shift> followed by <FUNC> produces Alt characters, the same as the Alt key on a PC.

The modifying effect applies only to the next key pressed.

Key Descriptions

Most of the keys are self-explanatory. Letter keys produce letters, number keys produce numbers. Keys that perform special functions are described in Table 5-1.

Table 5-1. Special Keys and Sequences

Key Name	Description
SHIFT	Changes letter and number keys to punctuation marks and symbols. Special combinations include: Following <Left Alpha Shift> produces Cap Lock.
Alpha Shift (unlabeled green and purple keys; refer to Figure 5-14)	Shifts the keyboard to produce alphabetic characters or to modify other key functions when held down. Selectable by the operator.
FUNC	Function key. Invokes special keyboard functions. Special combinations include: Following <Right Alpha Shift> produces the Alt state.
CTRL	Control key. Generates control characters. Special combinations include: Following <Right Alpha Shift> produces Num Lock. Following <Left Alpha Shift> produces Scroll Lock. <CTRL + BKSP> is equivalent to CTRL + C.
ENTER	Usually pressed after typing data or a command. Special combinations include: Following <Left Alpha Shift> produces a TAB.
LAMP	Turns the display light and/or keyboard light on or off.
CLEAR (Escape)	Depending on the application, completely or partially escapes from an application level or screen, or clears data entered in a field.

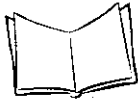
Table 5-1. Special Keys and Sequences (Continued)

Key Name	Description
BKSP	Following <Right Alpha> produces the same result as CLEAR (see above).
MENU	Defaults to F9, if not otherwise programmed by the application.
F1	is the Help key.

Refer to Appendix B for the characters and operations produced by pressing a sequence of modifier keys on the standard WWC 1000 keyboards. These key assignments can be changed by an application. Refer to your application documentation for any special key assignments.

Keyboard State

The cursor's shape indicates the current keyboard state, unless changed by the application. The standard cursor shapes are shown in Table 6-1.



Scanning

The WWC 1000 supports several scanning devices, including:

- ◆ RS 1 Ring Scanner
- ◆ HF 1200 Back-of-Hand Scanner
- ◆ Tethered Scanners

If you use a scanner other than the RS 1 or HF 1200 with the WWC 1000, follow its pertinent instructions for installation and operation after verifying that you have the proper cable.

Note: Before scanning can actually occur, the application must implement routines to support bar code scanning. For information on scanning applications, refer to the Series 3000 ADK.

Bar code types (with full autodiscrimination) supported by the WSS 1000 include:

- ◆ Code 3 of 9 (standard and full ASCII)
- ◆ Code 128
- ◆ Interleaved 2 of 5
- ◆ UPC Versions A and E (EAN 8 and 13)
- ◆ UPC-E1
- ◆ Code 11
- ◆ Codabar
- ◆ Discrete 2 of 5
- ◆ MSI/Plessey
- ◆ Code 93

Scanning Bar Codes

The RS 1 is a standard scanner; the HF 1200 a long-range scanner. The process for using each of these scanners differs slightly.

Scanning with the RS 1

To use the ring scanner, power the system and scanner on by pressing the **Power** button or the scanner trigger. To begin scanning:

1. Aim the scanning element at the bar code and press the trigger. The LED turns red to indicate the scanner is on.
2. Adjust the aim so that the thin, red laser beam covers the entire length of the bar code (Figure 5-15).

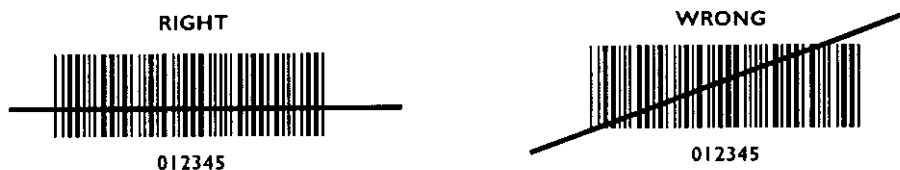


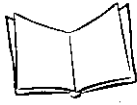
Figure 5-15. Adjusting the Scan Beam

3. If the decode is successful, the screen displays the code and the green LED flashes. The wrist computer may also beep.
The optimal scanning distance varies with bar code density and scanner optics, but most combinations work within 4 to 10 inches.

Note: Scanner use depends on the application. The procedure for your scanner may differ from the ones listed above.

**Table 5-2. LED Indications
(Subject to Application Use)**

Message	Green LED	Red LED
Successful Decode	On	Off
Scanning	Off	On
Scanner in Blink Mode	Off	Blinking
Unit Off	Off	Off



Scanning Considerations

Usually, scanning is a simple matter of aim, scan, and decode, and a few trial efforts master it. However, two important considerations can optimize any scanning technique — angle and range.

Angle

Scanning angle is important for promoting quick decodes. When laser beams reflect *directly* back into the scanner from the bar code, this specular reflection can actually “blind” the scanner.

To avoid this, scan the bar code so that the beam does not bounce directly back. But don't scan at too oblique an angle; the scanner needs to collect scattered reflections from the scan to make a successful decode. Practice shows what tolerances to work within.

Range

Any scanning device decodes well over a particular working range —minimum and maximum distances from the bar code. This range varies according to bar code density and scanner optics.

Scanning within range results in quick, constant decodes; scanning too close or too far away prevents decodes. You need to find the right working range for the bar codes you are scanning. The best way to specify appropriate working range by bar code density is through a decode zone chart. The decode zone plots the scanner's working range as a function of minimum element widths of bar code symbols.

Refer to Appendix A for the RS 1 decode zone.

Communications

Connecting Cable for Data Communications to a Host Computer

1. Plug serial cable (RS-232) into the communication port located on the right side of the back of the single-slot cradle, and on the left end of the 4-slot cradle.
2. Connect the other end of the cable to the serial (COM) port of the host computer, modem, or printer.

Note: In most cases, you must use a null-modem cable.

3. Place the WWC 1000 in the cradle. The amber indicator lights.
4. Press the appropriate key on the WWC 1000, as required by the application.
5. The cradle's COM indicator blinks when communications begin.

Note: Do not remove the wrist computer while the cradle's COM light is blinking.

6. When communications are complete, the COM light stays on steady.

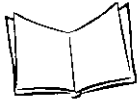
Wireless Printing

Note: Wireless printing is applicable only to the WWC 1049, and works only with applications modified to support wireless printing such as STEP and TNClient. Any application developer can create an application using wireless printing using the Series 3000 ADK.

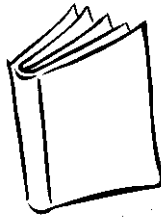
The WWC 1049 can perform wireless printing with Comtec's portable printers such as the MP5033 if:

- Print support is included with the application loaded on the terminal.
- The terminal is within range of a supported wireless printer.

Refer to the documentation for your application and to the *PS1K Addendum to the Series 3000 Application Development Kit* for more information on printing.



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Chapter 6

Maintaining the WSS 1000

Batteries

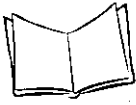
The WSS 1000's primary power is provided by a 1200 mAh Lithium-Ion battery pack.

Battery Life

The approximate life of the battery pack between charges is a typical 8-hour shift @ 500 scans per hour. This time, however, is affected by many factors, including temperature, battery age, application, and data collection method. The following uses and operating conditions place a burden on the battery and shorten the battery's life:

- ◆ scanning
- ◆ radio communications
- ◆ very high operating temperatures
- ◆ very low operating temperatures

The WSS 1000 powers down during periods of non-use, and powers on when scanning activity resumes (under application control).



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When to Replace or Recharge Batteries

The WSS 1000 provides two types of indicators to notify you when battery power is running low: warning messages and modified cursors. These indicators may be changed or disabled by an application.

- ◆ **LOW POWER** - When the battery is low, the cursor changes as shown in Table 6-1. Depending on the configuration (if ERR3000 is loaded), the message LOW BATTERY is also displayed. At this level, the wrist computer continues to operate, but there is probably less than 1 hour of usable power left.
- ◆ **VERY LOW** - When the power is very low, the DEAD BATTERY message is displayed and the system powers off. Replace or recharge the battery before attempting to use the wrist computer. If the battery is not immediately recharged or replaced, data may be lost.

Table 6-1. Cursor Indicators

Keyboard State	Cursor Character	Low Battery
Unshifted	∨	▼
Shifted	∧	▼
Control	C	<u>c</u>
Alt	a	<u>a</u>
Function	f	<u>f</u>
Right	R	▼
Left	L	▼

Supercap Power Backup

The wrist computer has a supercap power backup to prevent data loss during battery replacement. The supercap backup provides sufficient power to preserve memory contents for approximately 15 minutes while the batteries are replaced.

Note: The supercap does not provide enough power to operate the wrist computer. Replace or recharge the primary batteries immediately upon receiving a dead battery message.

Replacement Batteries

A Lithium-Ion battery pack is available from Symbol Technologies:

- Lithium-Ion battery pack p/n 20-16228-02

To replace the Lithium-Ion battery:

1. Power the wrist computer off.
2. Unlock and remove the battery compartment door.
3. Remove the spent battery pack.
4. Fit a fully-charged battery pack in the compartment.
5. Replace and lock the battery compartment cover.

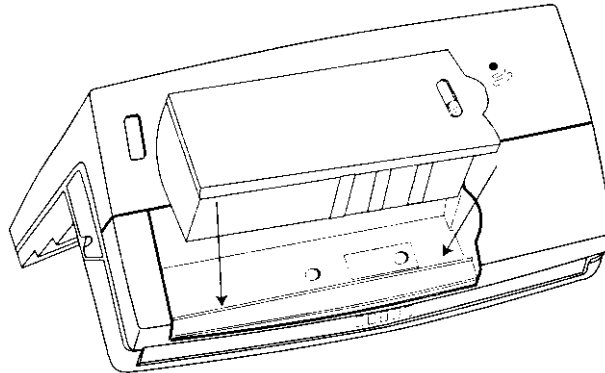
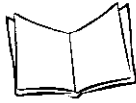


Figure 6-1. Battery Compartment



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Battery Charging

Charging the Wrist Computer's Battery

To charge a Lithium-Ion battery in the CS 1000 4-Slot Cradle:

1. Verify that the cradle has power.
2. Slide the WWC 1000 in the cradle as shown in Figure 6-2
3. The WWC 1000's battery begins charging automatically.

The battery pack fully charges in approximately 120 minutes.

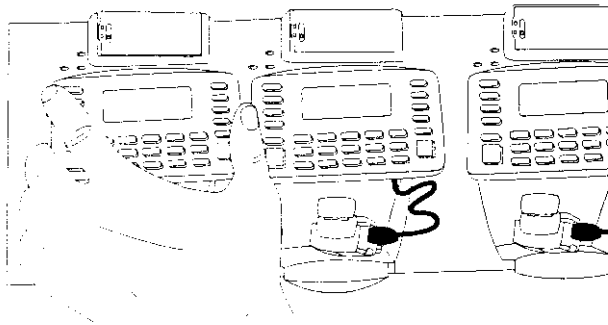


Figure 6-2. Inserting Wrist Computer into 4-Slot Cradle

Charging the Spare (Auxiliary) Battery in the 4-Slot Cradle

1. Plug the power supply cord's round DIN connector into the power port located in the center of the back of the cradle.
2. Connect an adapter cable to the other end of the power supply.
3. Plug the other end of the adapter cable into an electrical outlet.

4. Lift the latch on the spare battery, and insert the battery in the cradle's charging slot. The latch snaps into place when the battery is inserted (see Figure 6-3)

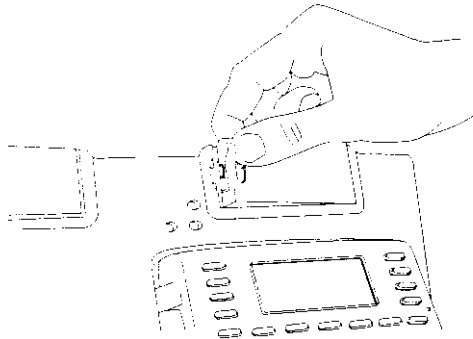


Figure 6-3. Inserting Spare Battery in 4-Slot Cradle

5. The spare battery is charged in approximately two hours, even if the WWC 1000 is charging at the same time.

Battery Charging Tips

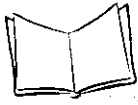
For maximum capacity and battery life:

- ◆ Charge at a temperature between 0°C and 45°C (32°F and 113°F).
- ◆ Recharge as soon as you see the “Dead Battery” message.
- ◆ Charge Lithium-Ion batteries after storage.

Cleaning

Wrist Computer

To clean the wrist computer, use a clean, soft cloth dampened with a mild cleaner such as soap and water. Do not use abrasive paper, cloth, or abrasive/corrosive cleaners. Clean the keypad and scanner triggers, and wipe the display window with lens tissue.



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Wrist Mount

Remove the bar from the wrist mount. Hand wash the fabric mount with warm water using a mild detergent and air dry (see tag on mount for washing instructions).

Ring Scanner

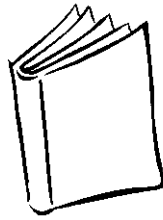
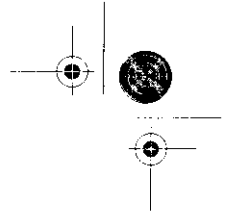
Wipe the scanner window periodically with a lens tissue or other material suitable for cleaning optical material such as eyeglasses.

Caution

Do not pour, spray, or spill any liquid onto any part of the wrist computer or ring scanner, particularly the scanner or scan element components.

Ring Mount

To clean the ring mount, use a clean soft cloth, dampened with a mild cleanser, such as soap and water. Do not use abrasive paper, cloth, or abrasive/corrosive cleaners.

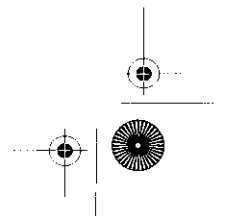


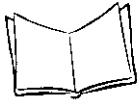
Chapter 7

Error Codes and Troubleshooting

This chapter provides information to assist in basic trouble analysis and correction, including:

- ◆ Error messages
- ◆ Troubleshooting start-up failures
- ◆ Running the self test function
- ◆ Self test summaries
- ◆ Keyboard test
- ◆ Running memory transfer
- ◆ Scanning problems.





Error Messages

If ERR3000 is loaded in the system configuration, the wrist computer displays the following messages to indicate error conditions that affect system performance. A message is usually accompanied by one or more beeps, after which the system returns to its previous status.

The application can change the actual wording of the messages or disable messages. The messages listed in Table 7-1 are representative. Refer to the application's documentation for further information.

Table 7-1. Error Messages

Message	Explanation
Low Battery	The battery pack should be recharged or replaced soon.
Dead Battery	Replace or recharge the battery pack immediately. After this message is displayed, the system shuts off. You may not be able to power it on again until the battery pack is charged.
Power Fault	The last power off was caused by a power failure. This occurs, for example, if the battery pack is removed while the wrist computer is on or the batteries fail suddenly.

Troubleshooting

Start-up Failure

Problems are most frequently start-up failures. If cold booting the wrist computer does not start the application successfully, either the application, the system software, or the system is malfunctioning. If you can boot the system to command mode, try the following:

- ◆ Use Program Loader to download a new version of the software to NVM. This procedure is described in Chapter 3, *Batch and Spectrum One Initialization*.
- ◆ Use Self Test to check system hardware operation. The Self Test procedure is described later in this chapter. After downloading new software, warm boot the wrist computer as described in Chapter 5, *Operating the WSS 1000*.

Boot Failure Messages

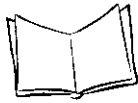
During a cold boot, the system briefly displays a status line for each driver as it loads, in the format:

```
0:Driver    #.##
```

The line shows a status value, usually 0, followed by the name and version number of the driver. If the system halts at one of these lines and displays a status value other than 0, the displayed device driver did not load properly.

If such a failure occurs, cold boot the wrist computer again. If this does not solve the problem, call the Symbol Support Center.

More troubleshooting information is found in the documentation listed in *Related Publications* on page x.



Spectrum24 Terminal

Typical initialization and operating problems and solutions for Spectrum24 terminals are provided in Table 7-2.

Table 7-2. Troubleshooting Spectrum24 Terminals

Problem	Explanation/Action
Out of range	Terminal is out of the Access Point's range. If you move the terminal during initialization, the terminal may be out of range of the AP and unable to complete the initialization process. Move back in range and repeat the initialization process.
Startup process fails	Boot server type (BOOTP or DHCP) doesn't exist. Verify that boot server is operating and able to respond to TCP/IP BOOTP or DHCP requests from the terminal.
Low Battery Message	Place the terminal in a cradle and recharge battery. OR Power terminal off and replace battery.
Battery is dead	Battery not replaced after receiving low battery message or terminal left on for more than 24 hours. Recharge or replace the battery.
Terminal disassociated from Access Point	Application does not respond to interactive operations. Applications using internal batch mode continue to function until required to transmit by radio, then fail to work. No message displayed.

Self Test Function

The WWC 1000 wrist computer includes a series of self tests which verify that terminal hardware components are operating properly. Run self test if you suspect a problem with the hardware. Except for keyboard testing, no operator input is necessary after selecting a test screen.

Running the Self Test

Access the Self Test function from the Command Mode menu:

1. Boot to command mode (refer to Chapter 5, *Operating the WSS 1000* for boot sequences).
2. On the Command Mode screen, use the **UpArrow** or **DownArrow** to scroll through the options.
3. Highlight Screen Test and press **<ENTER>**.

Self Test Summaries

The Self Test is divided into the following functions or screens:

Config Screen 1 - Reports the version, time, and date.

Config Screen 2 - Reports information on the keyboard and display. If a laser scanner is attached, the test reports if the trigger is pulled or not.

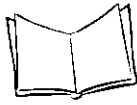
Config Screen 3 - Reports the main battery condition, current power source, and status of the serial ports when a loopback connector is used.

Memory Screen - Tests ROM, RAM, and EMS (Expanded) memory, and reports the amount of RAM and EMS.

Fill Screen - Fills the entire screen with a test pattern to verify that the entire screen displays.

Set RTC Screen - Sets the time and date settings of the real-time clock.

Serial ID Screen - Reports the unique identifier for the "flash" memory chip installed in the wrist computer.



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Keyboard Test

Keyboard testing can be performed while the wrist computer displays Config Screen 1 results.

Test any keys except <Right Alpha Shift>. When you press a key, the corresponding scan code is displayed on the top row to the right of the test name. For the codes for each key on the 27-key keyboard, refer to the scan codes for the unmodified, right unmodified, and left unmodified keyboards.

Exiting Self Test

The test loop continues updating the time and battery status and processing keystrokes.

To end the test, press <CLEAR> or <Right Alpha Shift><BKSP>. The display returns to the Command Mode menu.

Memory Transfer Program

Command Mode includes a memory transfer utility that transfers data from the wrist computer to a host PC for program troubleshooting. Programmers can analyze an application using tools provided in the Series 3000 Application Development Kit and described in the *Series 3000 Application Programmer's Reference Manual*.

Hardware Setup

1. Verify that the cradle is properly connected to the PC, as covered in Chapter 2, *Hardware Installation*.
2. Place the wrist computer in the cradle.
3. Power on the host PC.

Set Communications Parameters

Host

1. Start the Communications program on the host PC.
2. Set up the host communication parameters (these parameters must match the wrist computer's parameters). At the DOS prompt on the host, enter:

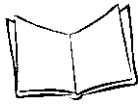
```
RCVHEX <filename.hex> <baud rate> <comport#>
```

Typical parameters are:

```
38400 bps  
7 bit data  
Odd parity  
Xon/Xoff flow control
```

Wrist Computer

1. Boot the wrist computer to Command Mode (refer to Chapter 5, *Operating the WSS 1000* for the appropriate key sequence).
2. Select the Memory Transfer function from the Command Mode menu. Use **UpArrow** or **DownArrow** to scroll through the command mode options until Memory Transfer is displayed, and press **<ENTER>**.
3. Select the range of memory to transfer by pressing the first letter of the desired range (**All**, **Range**, or **None**), or use the **UpArrow** or **DownArrow** and press **<ENTER>**.
If you select **All**, the program skips to the range verification screen (step 7).



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If you select **Range**, the screen displays:

```
RAM
Use Arrow Keys
Start      End
00000     9FFFF
```

4. Specify a range of RAM by setting the Start and End addresses.
 - Use **RightArrow** and **LeftArrow** to move the cursor to the digit to be changed
 - Use **UpArrow** and **DownArrow** to change the values.Type a range and press **<ENTER>**.
5. Specify a range of NVM to transfer. Choose All or None.
6. If the system has EMS installed, it prompts for the range to transfer (otherwise, the program skips this screen):

```
EMS

Use arrow keys
Start      End
```

The range is specified in page numbers (16 KB per page). Use **RightArrow** and **LeftArrow** to move between the Start and End values. Use **UpArrow** and **DownArrow** to change the page number value.

Set the range and press **<ENTER>**.

7. The wrist computer displays a range verification screen. For example:

```
RAM 0000 3FFF
NVM C839 DFFF
EMS None
Correct?
```

If the values are correct, press **<ENTER>**. If the values are not correct, press **<CLEAR>** to clear the fields and select new values.

8. Specify the baud rate. Use the up and down arrows to scroll through the list of baud rates until the correct rate is displayed, and press **<ENTER>**. (Flow control may be necessary at 38400 bps and higher.)
9. Specify the data bits. Press **<7>** or **<8>**, or use **UpArrow** and **DownArrow** to display 7 or 8, and press **<ENTER>**.

Note: If you select 8 data bits, the program selects No parity and skips the next screen.

10. Specify parity type. Use **UpArrow** and **DownArrow** to display a parity option, or press the first letter of a parity option (Even, Odd, None, Space, or Mark) and press **<ENTER>**.
11. Set flow control. Use **UpArrow** and **DownArrow** to display the flow control options, or press the first letter of an option (None, Xon/Xoff, or RTS/CTS) and press **<ENTER>**.

Start Communications

1. The wrist computer is ready to send the data to the host PC and displays:

```
Comm Parameters
```

```
Start? <ENT>
```

2. Verify that the host is ready to receive data.
3. Press **<ENTER>** on the wrist computer.

While data is being transferred, the wrist computer displays a report of the 1 KB range being transferred:

```
Memory Transfer
```

```
Sending: XXXX
```

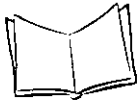
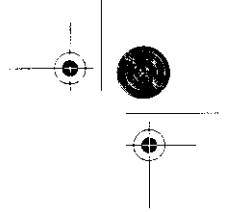
The display is updated for every 1024 bytes (1 KB) of memory.

4. When the transmission completes or aborts, the wrist computer displays the transmission status screen:

```
Memory Transfer
```

```
Status 0000
```

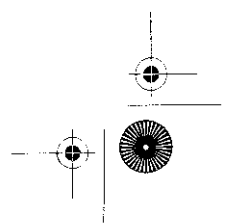
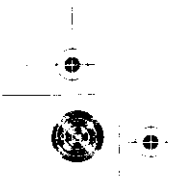
A status of 0000 (all zeros) indicates that the transfer was successful. Any other status indicates failure. Refer to Appendix C for communications status codes which indicate the source of the error.

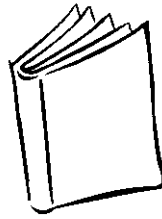


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End Communications

To return to the Command Mode main menu, press <CLEAR>. Then take whatever corrective action is necessary, and reboot the wrist computer.





Appendix A Specifications

Environmental Considerations

The WSS 1000's operating conditions are listed in Table A-1.

Table A-1. Operating Specifications

Operating Temperature	-20° to 50°C (-4°F to 122°F)
Storage Temperature	-40° to 60°C (-40° to 140°F) The battery may be stored at -40° C for up to 72 hours.
Humidity	5% to 95% non-condensing
Moisture Infiltration Resistance	Complies with MIL-STD-810D, 506.2, Procedure II-Drip
Altitude	Operation: 0 to 10,000 feet Storage: Up to 50,000 for 24 hours; rates of change up to 4,000 feet per minute
Mechanical Shock	5-foot drop to concrete

Storage

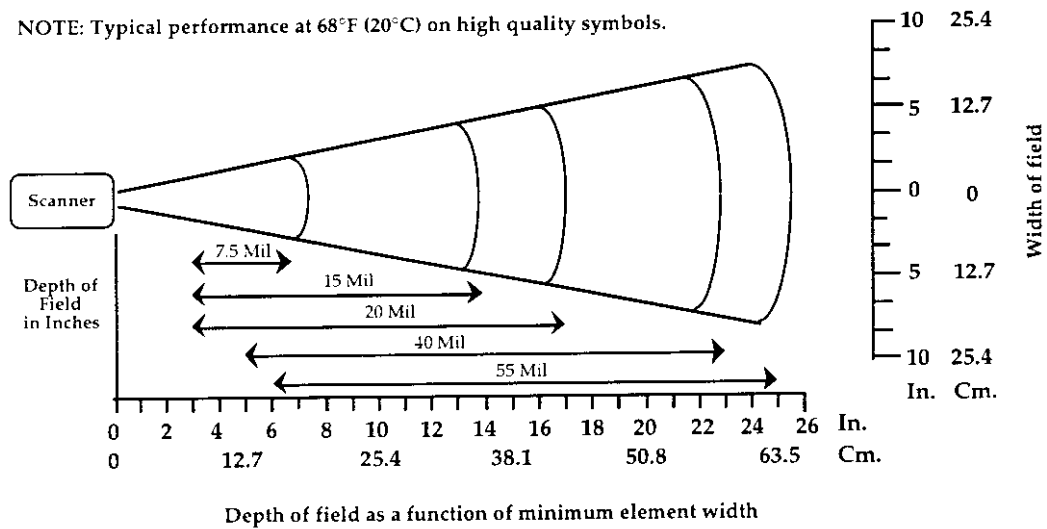
If the system is not used for more than a week, store it in a cool, dry place, away from dust. Remove the battery and repack the wrist computer and ring scanner in the original shipping container.

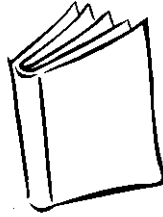


For a storage period of a few days, the battery pack can remain in the wrist computer. If the battery is left in the wrist computer for an extended period of time, data stored in memory may be lost. To avoid losing data, keep the batteries charged, and be sure to transfer any data before storing the wrist computer.

RS I Decode Zone

NOTE: Typical performance at 68°F (20°C) on high quality symbols.





Appendix B

WWC 1000 Keyboards

Introduction

The WWC 1000 wrist computer has a configurable 27-key keyboard. By combining keystrokes, the keyboard can emulate the full IBM-PC XT keyboard.

This appendix provides the standard keyboard definitions and indicates how key codes are produced on the WWC 1000 wrist computer.

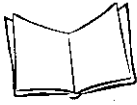
Keyboard Operation

On a PC, each key generates a scan code. The character code generated by a given key is determined by the scan code and the current keyboard state: unshifted, shifted, control, function, left shift, or right shift. The scan code generated by each key is constant, independent of the keyboard state.

The WWC 1000 keyboard emulates the full PC/XT keyboard by using one or more modifier keys in sequence, followed by a character key. The modifier keys are:

- Function (FUNC)
- Shift
- Control (CTRL)
- Left Shift
- Right Shift

The remaining keys (a through z, 0 through 9, special characters) are called “character keys.”



The character generated is a function of the key scan code and the keyboard state, as on a PC. The main difference is that the scan code generated by a key is also variable, determined by the keyboard state.

Keyboard Diagrams

The codes and characters generated by each modifier key or sequence are shown in the following figures.

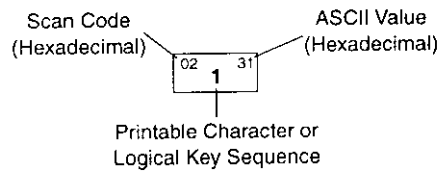
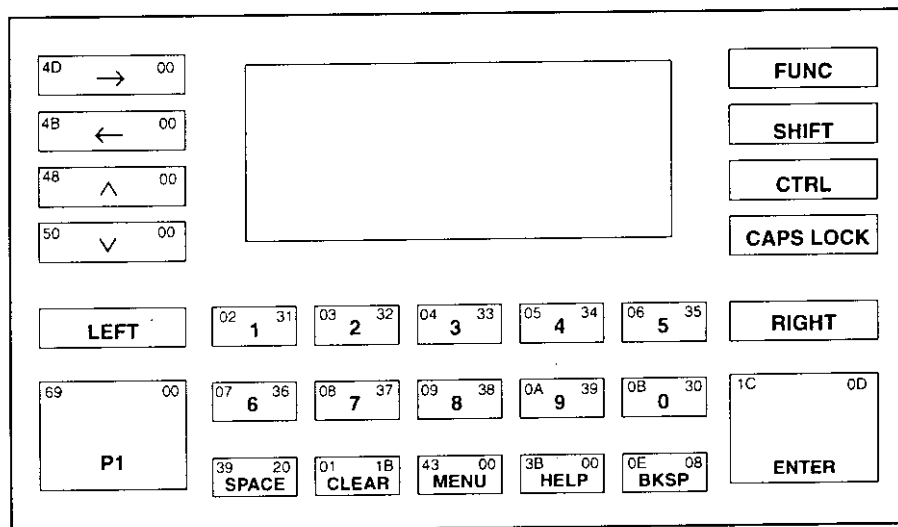


Figure B-1. Unmodified Keyboard

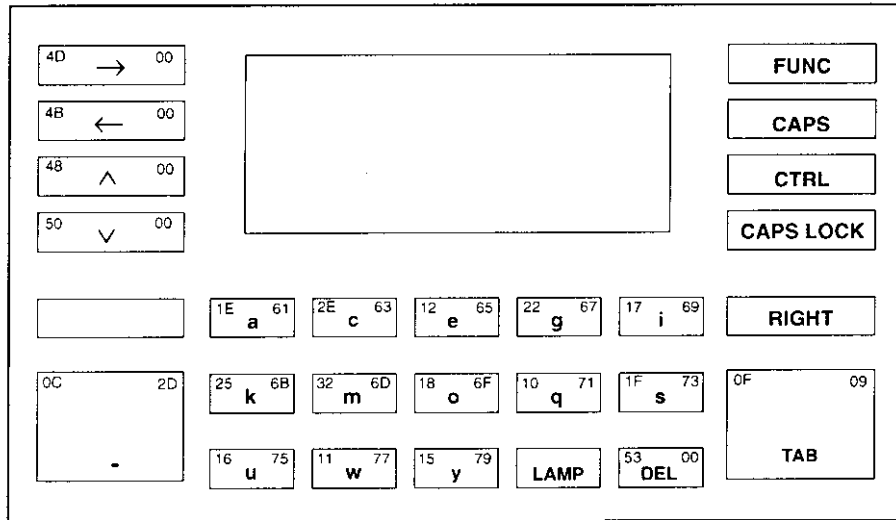


Figure B-2. Left Unmodified Keyboard

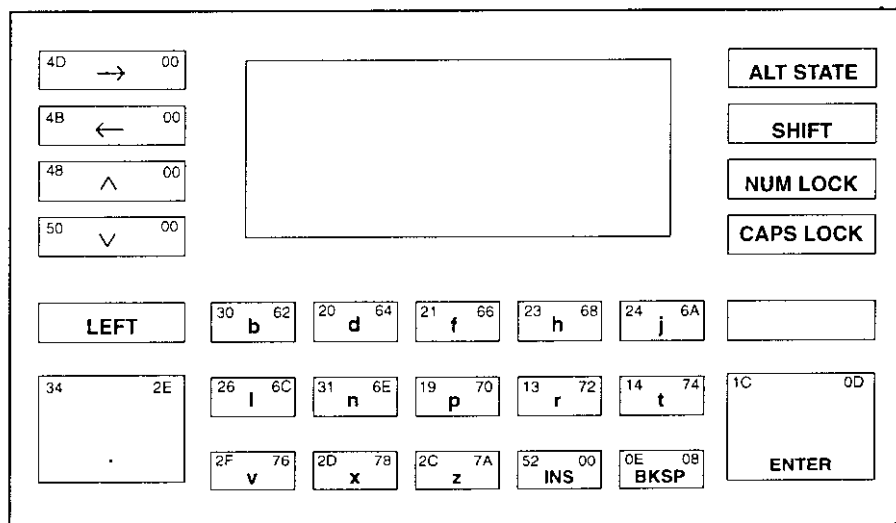


Figure B-3. Right Unmodified Keyboard

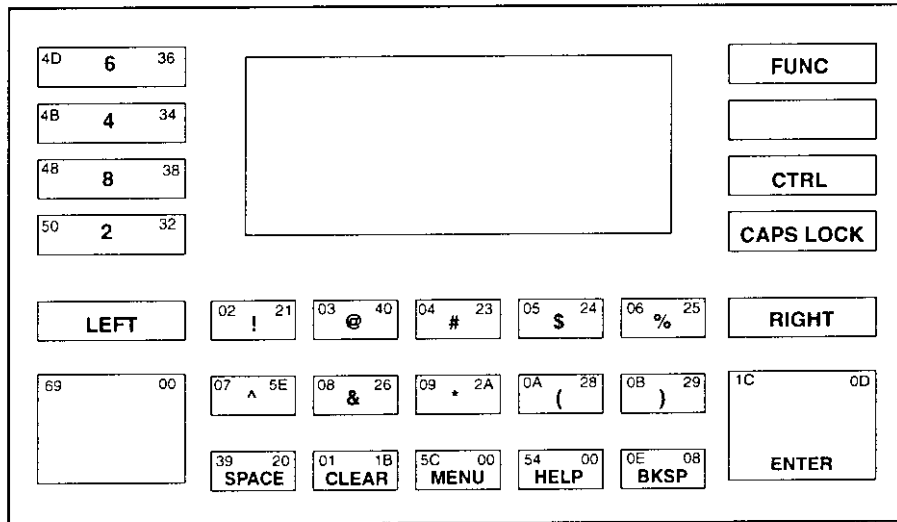
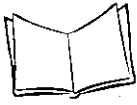


Figure B-4. Shift Modified Keyboard

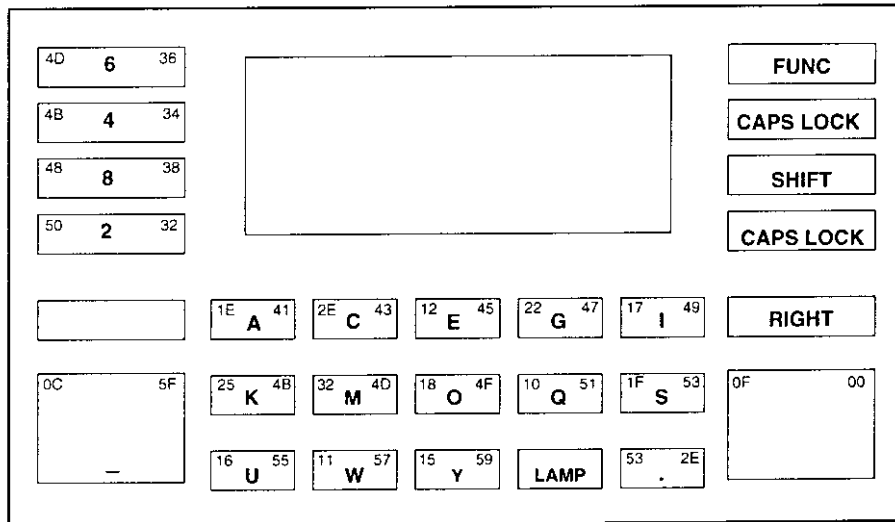


Figure B-5. Shift Left Modified Keyboard

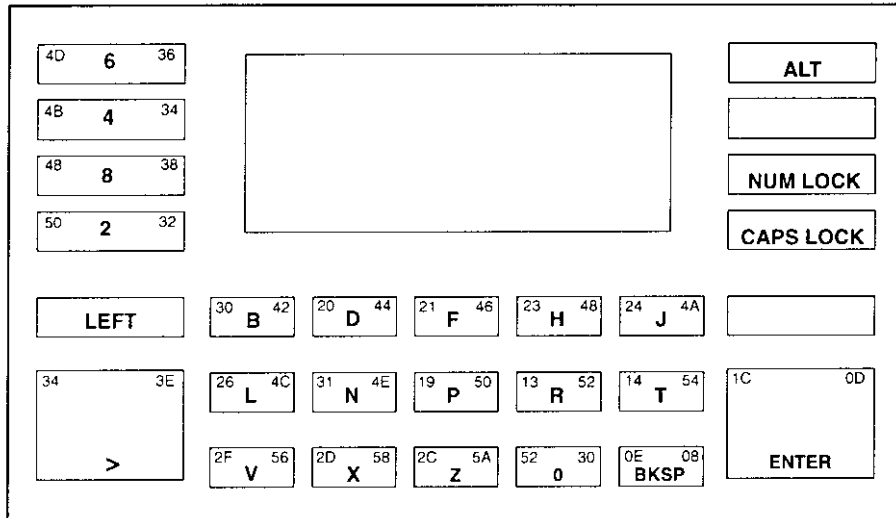


Figure B-6. Shift Right Modified Keyboard

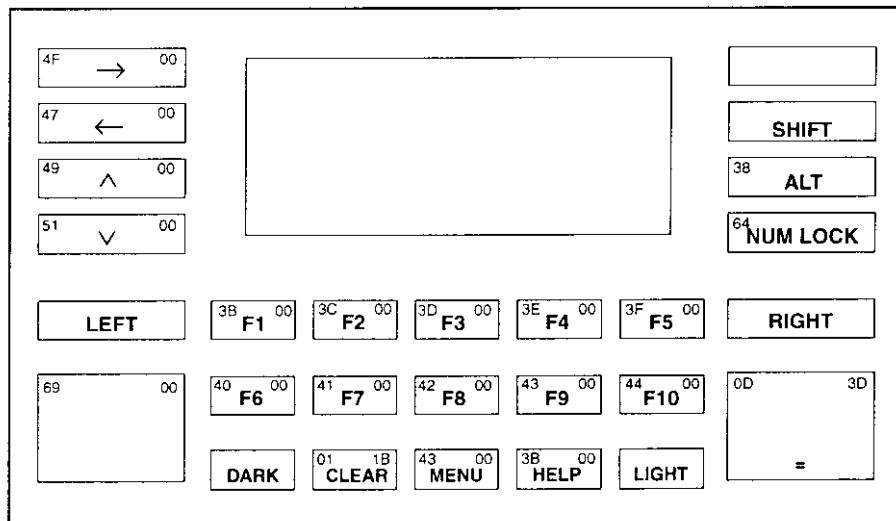


Figure B-7. Function Modified Keyboard

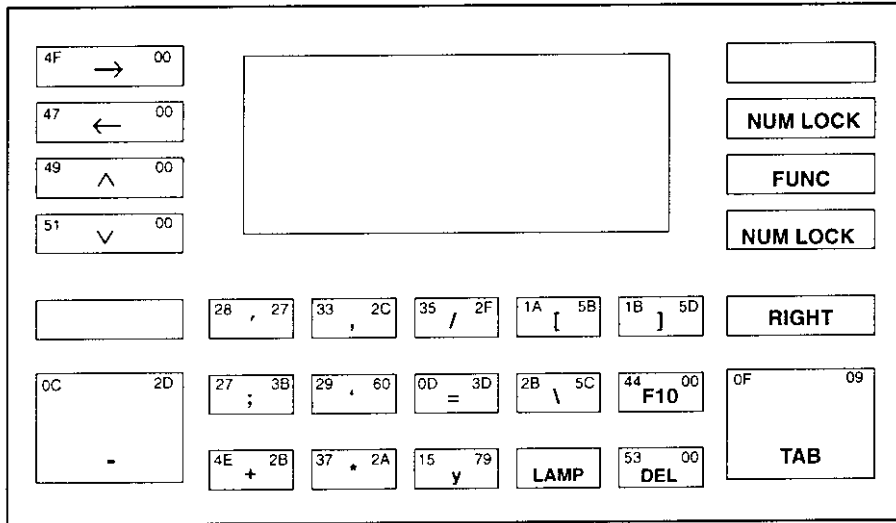
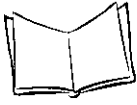


Figure B-8. Function Left Modified Keyboard

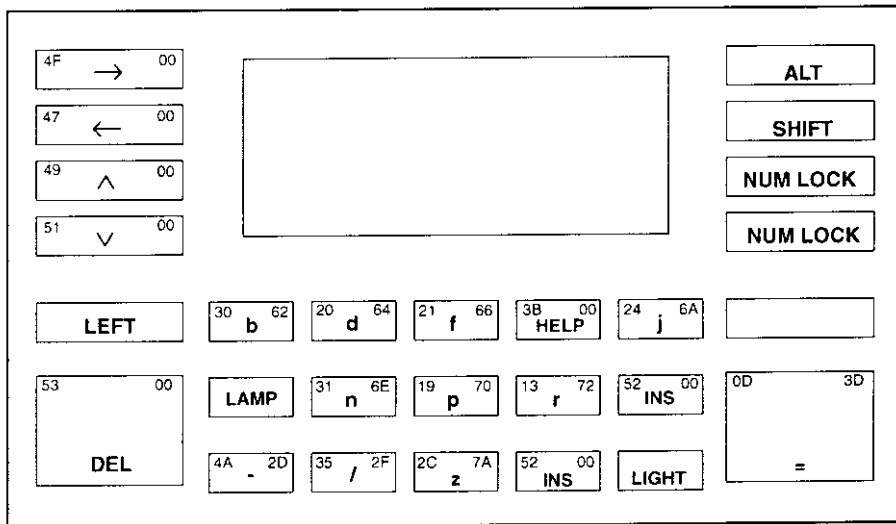


Figure B-9. Function Right Modified Keyboard

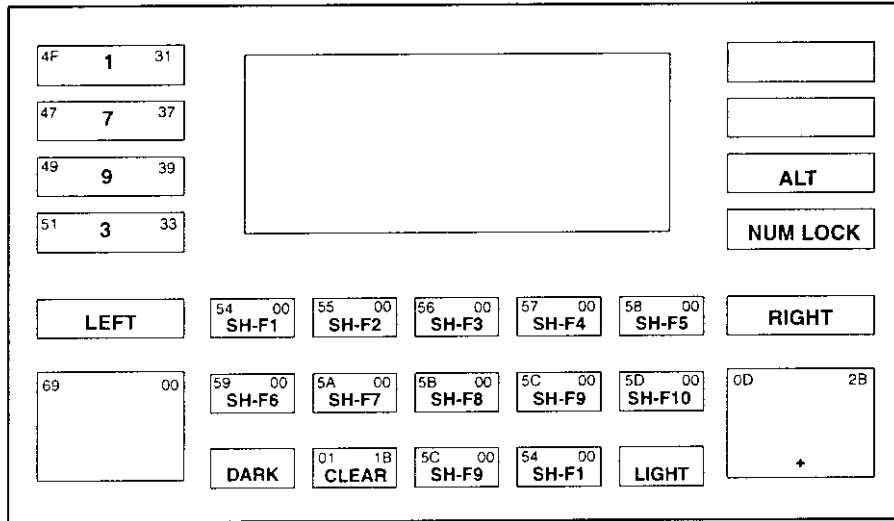


Figure B-10. Shift-Function Modified Keyboard

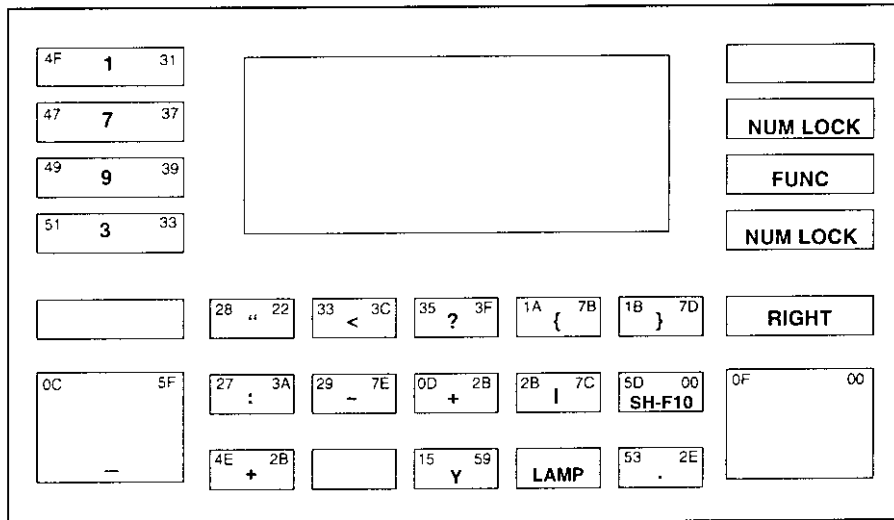


Figure B-11. Shift-Function Left Modified Keyboard

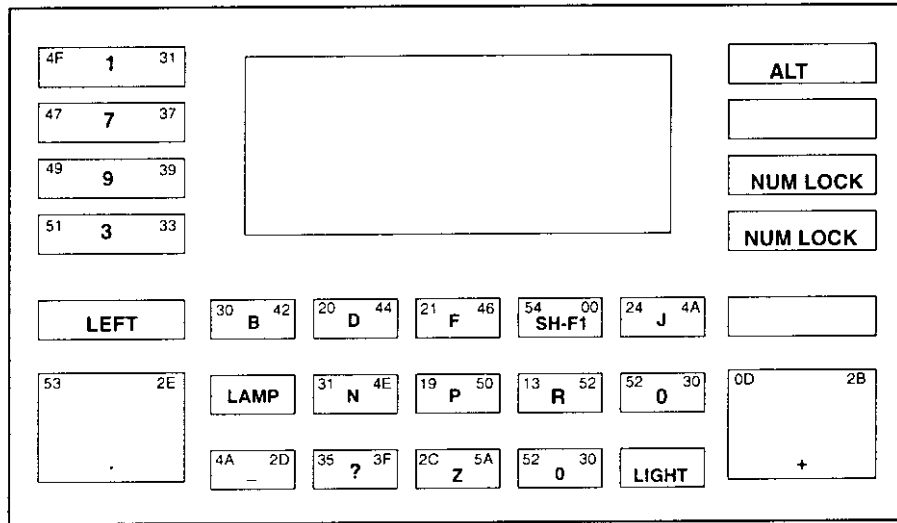
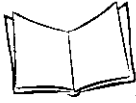
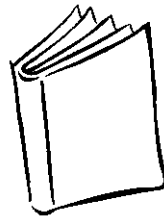


Figure B-12. Shift-Function Right Modified Keyboard



Appendix C

Communications Status Codes

The program loader status code consists of four hexadecimal digits which indicate whether or not the transfer was successful, and if not, the source of the communications error. A status code of 0000 indicates success; any other code indicates failure.

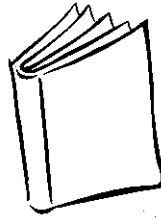
Table C-1 lists the failures associated with the status codes. The values are additive.

Table C-1. Communications Status Codes

Status Code	Meaning
0002	Receive overrun error
0004	Receive parity error
0008	Receive framing error
0010	Programming voltage not present
0020	Data Set Ready or Carrier Detect not detected on open
0080	ABORT key hit during comm
0100	Insufficient NVM for image
0200	Illegal Intel hexadecimal record
0400	Unsupported Intel record
0600	NVM EEPROM failed to erase
0800	Receive time-out error
1000	Control start character time-out
2000	Clear To Send inactive time-out error
4000	Receive buffer full



WSS 1000 Product Reference Guide



Appendix DSpectrum24 Network and Flash Disk Utilities

Introduction

Some supplemental utilities are provided for working with the flash disk in addition to the Flash disk driver and utilities described in the *Series 3000 ADK* (refer to the section on *FLASHDSK.SYS* in the *Device Driver* chapter of the *Series 3000 Application Programmer's Reference Manual*. These utilities include:

CFG24	executes from a DOS prompt to change parameters for radio communications.
DIAG24	executes from a DOS prompt to test radio connectivity and performance.
BOOTP	is automatically executed by the start-up procedure. Obtains IP address and sets up communications parameters. Should NOT be executed from a DOS prompt.
STAT24	is automatically executed by the start-up procedure. Indicates the status of the radio connection. Should NOT be executed from a DOS prompt.
FLASH.BAT	facilitates performing flash disk housekeeping functions, such as copying files to, deleting files from, and renaming files on the flash disk. Executes from a DOS prompt.



CFG24

The CFG24 utility enables the terminal operator to configure radio communications parameters. This utility must be run after the radio driver loads because the configuration parameters are saved in the radio card's flash memory, which is accessed using the radio driver services.

This program uses the text message file MSG.MSG which is read from the same drive and directory as the CFG24 executable (CFG24.COM). Corrupted screens are an indication that the message file was not found.

To ensure that all changes to parameters entered in CFG24 take effect, re-initialize (warm boot) the WSS 1040 after exiting.

Note: Changes to certain parameters (e.g., Terminal IP Address) do not take effect until the TCP/IP stack is reloaded. Changes to other parameters (e.g., Diversity) do not take effect until the driver is reloaded.

Syntax

CFG24

Description

CFG24 provides menus for editing the radio configuration parameters used to communicate in a Spectrum24 network. These values are saved in a buffer in the radio card's flash memory. The current parameters are set in the file NET.CFG on the RAM disk. NET.CFG is used by both the radio driver and the TCP/IP stack to obtain their configuration parameters.

Initially, CFG24 presents the main menu shown in Figure D-1.

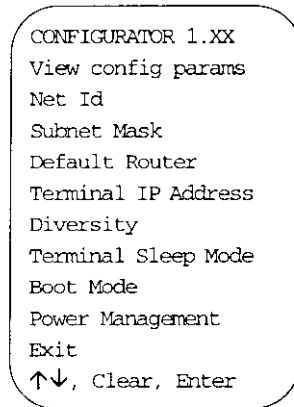


Figure D-1. CFG24 Main Menu

The current selectable option appears in reverse video. Because of the WSS 1040's small display, the top and bottom lines are shown, and the remaining lines are viewed by scrolling.

Use the ↑↓ keys to scroll through the options on the menu. Press <ENTER> to select an option. Press <CLEAR> to exit the menu (from this screen, has the same effect as selecting Exit).

1. To view the WWC 1040's default parameters, select VIEW CONFIG PARAMS (Figure D-2).

This screen is for display only; it is not a data entry screen. Use it to review the terminal's IEEE (or MAC) address, IP address, and Net Id. Press <CLEAR> or <ENTER> to return to the main menu.

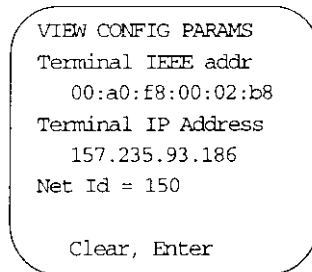
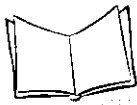


Figure D-2. View Configuration Parameters Screen



2. Select Net Id from the CFG24 Menu. The *Net Id* screen (Figure D-3) is displayed.

```
NET ID
Enter Net Id(hex) :
150

BkSp, Clear, Enter
```

Figure D-3. Net Id Screen

The Net Id identifies the radio network and differentiates between different radio networks. All equipment on one network must use the same Net Id.

To change the current Net Id value, backspace over the current value and type a new value, in hexadecimal format, in the range 101 to 1FE. Alphabetical hex values can appear in upper or lower case.

Press <ENTER> to effect the change. Press <CLEAR> to exit without changes.

3. Select Subnet Mask from the main configuration menu. The *Subnet Mask* screen (Figure D-4) is displayed.

```
SUBNET MASK
Enter Subnet Mask:
255.255.255.0

Bksp, Clear, Enter
```

Figure D-4. Subnet Mask Screen

To change the current Subnet Mask setting, backspace over the current value and type a new value, in decimal form. Each part of the four-part address must be in the range 0 to 255.

Press <ENTER> to effect the change. Press <CLEAR> to exit without changes.

4. Select **Default Router** from the main configuration menu. The *Default Router* screen (Figure D-5) is displayed.

```
DEFAULT ROUTER
Enter Default Router
157.235.93.178

BkSp, Clear, Enter
```

Figure D-5. Default Router Screen

The default router address is the address of the node where all packets going to remote networks are sent.

To change the current Default Router setting, backspace over the current value and type a new value, in decimal form. Each part of the four-part address must be in the range 0 to 255.

Press <ENTER> to effect the change. Press <CLEAR> to exit without changes.

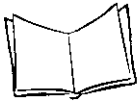
5. Select **Terminal IP Address** from the main configuration menu. The *Terminal IP Address* screen (Figure D-6) is displayed.

```
TERMINAL IP ADDRESS
Enter IP address:
157.235.93.186

BkSp, Clear, Enter
```

Figure D-6. Terminal IP Address Screen

Note: Entering a Terminal IP Address is necessary only if IP addresses are not being allocated by a boot server. IP address allocation is part of the BOOTP and DHCP process.



To change the current Terminal IP Address, backspace over the current value and type a new value in decimal form. Each part of the four-part address must be in the range 0 to 255.

Press <ENTER> to effect the change. Press <CLEAR> to exit without changes.

6. Select **Diversity** from the main configuration menu. The *Diversity* screen (Figure D-7) is displayed.

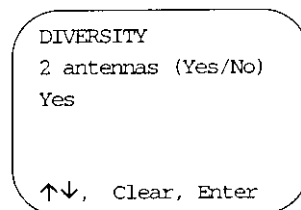


Figure D-7. Diversity Screen

If Diversity is set to “Yes”, the radio firmware attempts to use both antenna ports for communications. This setting gives better communications if two antennas are being used with the radio, but distinctly worse communications if only one antenna is used. The WSS 1040 has only one antenna; be sure to set Diversity to “No”.

To change the current Diversity setting, use the ↑↓ cursor keys to toggle between the settings “Yes” and “No”.

Press <ENTER> to effect the change. Press <CLEAR> to exit without changes.

7. Select **Terminal Sleep Mode** from the main configuration menu. The *Terminal Sleep Mode* screen (Figure D-8) is displayed.

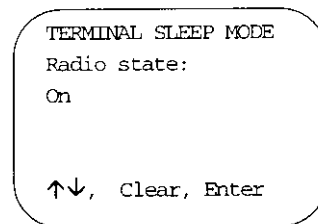


Figure D-8. Terminal Sleep Mode Screen

If this switch is set “On”, the radio is not powered off when an application powers down the terminal because of inactivity. The terminal can be awakened by a message

directed to it, but not by a broadcast message. If the switch is set to “Off”, the radio is powered off when an application powers down the terminal because of inactivity. The default setting is “On”.

To change the current Terminal Sleep Mode, use the ↑↓ keys to toggle between the “On” and “Off” settings.

Press <ENTER> to effect the change. Press <CLEAR> to exit without changes.

8. Select **Boot Mode** from the main configuration menu. The Boot Mode screen (Figure D-9) is displayed.

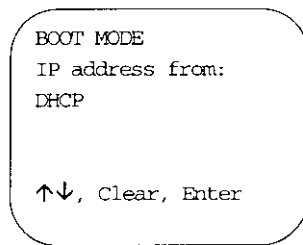


Figure D-9. Boot Mode Screen

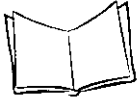
If boot mode is set to “Manual Entry”, no configuration messages are broadcast to the network. The current values of the network parameters which are saved in the radio’s flash, are used to connect to the network. “Manual entry” is the default.

If boot mode is set to “Boot” when the WSS 1040 is initialized, a TCP/IP BOOTP request message is broadcast to the network. Any boot servers on the network should respond if configured to do so. The terminal accepts the first valid response received. The response contains an IP address for the terminal’s use, and optionally, other network parameters. Parameters received in this BOOTP response override any parameters entered through CFG24.

If boot mode is set to “DHCP” when the terminal is initialized, the process is the same as for BOOTP, except the Dynamic Host Configuration Protocol is used.

Symbol’s BOOTP program accepts setting the following network parameters from the BOOTP and DHCP parameters:

- Sub-net Mask
- Default Router (first address from the router list)
- Terminal IP Address



To change the current boot mode setting, use the $\uparrow\downarrow$ keys to toggle between the three valid settings.

Press \langle ENTER \rangle to effect the change. Press \langle CLEAR \rangle to exit without changes.

9. Select **Power Management** from the main configuration menu. The *Power Management* screen (Figure D-10) is displayed.

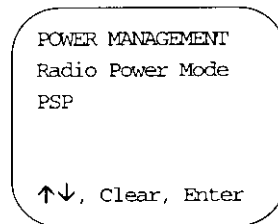


Figure D-10. Power Management Screen

If power management is set to PSP (default), the radio is powered up only when there is traffic on the network. This mode adapts to the radio activity to determine how long the radio is powered down. Because the radio is not always in a ready state when a message is sent to it, using PSP mode slows response times.

If power management is set to CAM, the radio is always ready to receive. In this mode, battery life is dramatically reduced. Because the WSS 1040 runs on a Lithium-Ion battery, you can use this method, but it is not recommended.

To change the current power management setting, use the $\uparrow\downarrow$ keys to toggle between the two settings.

Press \langle ENTER \rangle to effect the change. Press \langle CLEAR \rangle to exit without changes.

10. Select *Exit* from the main configuration menu and press \langle ENTER \rangle to exit the configurator and get to a DOS prompt.
11. Cold boot the WWC 1040 to re-initialize the terminal with the changed parameters.

BOOTP

The BOOTP program gets the IP address and sets up communications parameters for use by other parts of the system. How the program works depends on which boot mode setting was selected in CFG24, as follows:

- ◆ If “Boot” was selected, a TCP/IP BOOTP request is broadcasted to the network. Boot servers on the network configured to respond send a response. The terminal accepts the first valid response received, which contains a terminal IP address and other network parameters which over-ride any parameters entered through CFG24.
- ◆ If “DHCP” was selected, a similar process to the one described for BOOTP occurs, only using the Dynamic Host Configuration Protocol.
- ◆ If “Manual entry” was selected, no configuration messages are broadcast to the network and the current network parameters, saved in the radio flash, are used for connecting to the network.

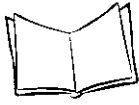
BOOTP uses the text message file **MSG.MSG**, read from the same drive and directory as the executable, **BOOTP.COM**. Corrupted screens are an indication that the message file was not found.

Description

BOOTP is responsible for updating **NET.CFG**, a standard file used by the TCP/IP software to set communications parameters. In **NET.CFG**, BOOTP includes any communication parameters returned by a server in the BOOTP or DHCP processes, or sets these parameters as configured through CFG24.

The priority of the various sources of communication parameters is as follows:

1. Any value returned by the BOOTP or DHCP process.
2. Any value entered through CFG24.
3. A previous value used and saved in the radio flash area.
4. The default value for that parameter, located in the original **NET.CFG** supplied with the system software.



Output

The following parameters in the radio flash save area are updated if changed by a BOOTP or DHCP process:

Sub-network Mask	BOOTP or DHCP response may change the sub-network mask. If no change is received from the BOOTP or DHCP response, uses the default of 255.0.0.0.
Default Router	Default router's IP address. The first router address is saved from the list returned by DHCP or BOOTP.
Terminal's IP Address	Saved in the radio flash so it is preserved through a terminal re-initialization.

The following environment variables are set:

YIADDR	Terminal's IP address in dotted format (e.g., 157.235.93.186).
SIADDR	Boot server's IP address in dotted format (e.g., 157.235.93.178).
DNSADDR	Domain name server's IP address. Only the first domain server IP address is saved from the list returned by BOOTP or DHCP.
BTPATH	File path on server where boot file can be found.
BTFILE	File name of boot file.

STAT24

STAT24 is a Terminate and Stay Resident (TSR) program used to provide the status of the radio connection. It can also be used to check for RF association and alternate actions in batch files depending on the association status. This utility is used mainly to check for associations with an AP when RF difficulties are experienced. Some applications may unload the STAT24 TSR if they cannot afford the program execution space it occupies.

STAT24 uses the text message file `MSG.MSG`, read from the same drive and directory as the executable, `STAT24.COM`. Corrupted screens are an indication that the message file was not found.

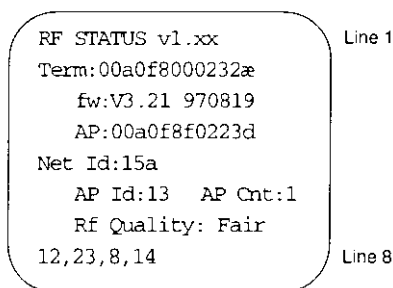
STAT24 is loaded during standard start-up procedures. To view the STAT24 pop-up screen (Figure D-11), press the hot-key sequence `<CTRL+FUNC+1>`.

Description

In the standard terminal initialization procedure, when the system software is loaded and connection to the RF network is attempted, STAT24 is used in two different ways:

- ◆ the program loops until the terminal either associates with an Access Point (AP) or times out. By default the default time-out is 10 seconds.
- ◆ the program installs itself as a TSR and provides a hot-key sequence that pops up a display of the current radio connection status and radio quality for the previous minute (refer to Figure D-11). When in this pop-up mode, the program returns to the application screen if any key is pressed.

Note: This program can be unloaded due to application memory constraints, if required.



```
RF STATUS v1.xx
Term:00a0f8000232æ
fw:V3.21 970819
AP:00a0f8f0223d
Net Id:15a
AP Id:13 AP Cnt:1
Rf Quality: Fair
12,23,8,14
```

The screenshot shows a terminal window with a rounded border. The text is displayed in a monospaced font. The first line is labeled 'Line 1' on the right. The last line is labeled 'Line 8' on the right.

Figure D-11. STAT24 Screen



The fields in Figure D-11 are interpreted as follows:

- | | |
|--------|---|
| Line 1 | Title and version number of STAT24. |
| Line 2 | The terminal's IEEE address. |
| Line 3 | The version and date of the adapter firmware. |
| Line 4 | The IEEE (MAC) address of the Access Point the terminal is associated with. |
| Line 5 | The Net Id for the network. |
| Line 6 | The AP identifier of the AP the terminal is associated with. |
| Line 7 | A qualitative statement about the radio transmissions over the previous minute. The analysis is simplistic and takes no account of how much other radio traffic there may be. The judgements are essentially for a terminal in a quiet environment: what is poor for a single terminal may be good in a heavy traffic environment. The range of statements is "Good", "Fair", and "Poor". |
| Line 8 | Four values used to derive the quality judgement provided in line 7. In order, they represent for the last full minute: <ul style="list-style-type: none">• total packets transmitted• total packets received• percent error packets transmitted• percent error packets received |

DIAG24

DIAG24 is intended for use in two situations:

- ◆ As a connectivity tool, using a ping that is not re-tried on transmission errors. This test is intrusive as pings are sent as fast as possible.
- ◆ As a diagnostic tool for potential radio problems. It can eliminate or confirm that the traffic problems are in the radio portion of the network. The round-trip time reported during the test indicates the portion of the transaction response time that is attributable to the radio network.

This program uses the text message file MSG.MSG which is read from the same drive and directory as the executable (DIAG24.EXE). Corrupted screens are an indication that the message file was not found.

Syntax

DIAG24

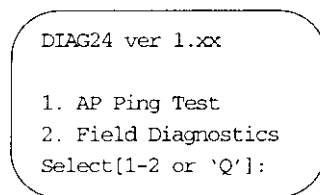
Description

To run DIAG24 on a WWC 1040:

1. At a DOS prompt on the terminal, type:
DIAG24

and press <ENTER>.

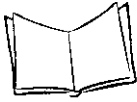
The menu shown in Figure D-12 is presented.



```
DIAG24 ver 1.xx
1. AP Ping Test
2. Field Diagnostics
Select[1-2 or 'Q']:
```

Figure D-12. DIAG24 Screen

2. Press either (1) AP Ping Test or (2) Field Diagnostics. Press Q to quit.



Whichever mode was selected from the DIAG24 menu, the set-up menus that follow are the same. The title line of the first screen (Figure D-13) indicates the selected test mode: AP PING TEST for selection 1; FIELD DIAGNOSTICS for selection 2.

```
<Test Mode>
1. Roaming Enabled
2. bb-----
3. bb-----
   :       :
   :       :
n. bb-----
Select [1-n or 'Q']:
```

Figure D-13. Test Mode Screen

3. Select the roaming mode. For each AP listed by line number:

bb represents the AP identifier (or BSS identifier)
----- is the 48-bit MAC address of the AP in hexadecimal notation.

- If you select Roaming Enabled, the terminal pings the associated AP and roams as required between APs.
- If you select a specific AP in the list, the test is conducted solely with that AP.
- If more APs are in range than can fit on one screen, the last selection is “More”. Select this to present more APs for selection.

4. To exit the screen select Q or press <CLEAR>.

```
<Test Mode>
MESSAGE SIZE
1. 100 bytes
2. 256 bytes
3. 512 bytes
Select[1-3 or 'Q']:
```

Figure D-14. Ping Message Size

5. Select the ping message size in the *Message Size* screen shown in Figure D-14. Press the corresponding number to make the selection and advance to the next screen.
Press Q or <CLEAR> to return to the main menu.

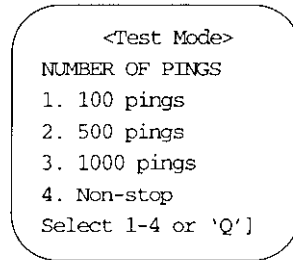


Figure D-15. Number Of Pings Screen

6. Select a counter for the number of test iterations in the *Number of Pings* screen shown in Figure D-15. Press the corresponding number to make the selection and advance to the next screen.
Press Q or <CLEAR> to return to the main menu.

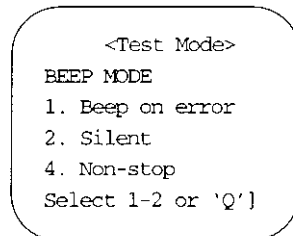
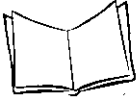


Figure D-16. Beep Mode Screen

7. Select whether to sound a beep if an error is encountered in the *Beep Mode* screen shown in Figure D-16. Press the corresponding number to make the selection and advance to the test screens.
Press Q or <CLEAR> to return to the main menu.



Ping Tests

During an AP ping test, the screen shown in Figure D-17 is displayed and continuously updated.

AP PING TEST				
A	Cnt	Err	AP	RS
	56	2	04	36
	57	2	04	36
	58	3	04	36 TMO
	59	3	04	36
	55	2	04	36
Press 'Q' to Quit				

Figure D-17. AP Ping Test Results

Each ping results in a new line being displayed, showing the cumulative ping count, error count, AP identifier of the AP the terminal is associated with, and the RSSI value of the terminal reception. If there was an error, an indicator appears at the right-hand end of the line (see line 5 in Figure D-17). The report wraps around so that, at any given time, the last five message reports are visible.

The 'A' at the left end of line 2 in Figure D-17 indicates that the terminal is associated with an AP. A 'U' indicates that the terminal is not associated.

When the ping test is running in non-stop mode, if either of the count fields overflows, the first detail line is pre-empted to show the most significant digits of the count, prefixed with an asterisk (Figure D-18).

AP PING TEST				
A	Cnt	Err	AP	RS
*	6	* 2	04	36
	57	2	04	36
	58	3	04	36 TMO
	59	3	04	36
	55	2	04	36
Press 'Q' to Quit				

Figure D-18. AP Ping Test Results (Non-Stop Mode)

In Figure D-18, the first detail line reads “*6*2...” showing that the real values for the counters in the second and subsequent detail lines are 600, 057, and 2,002.

Press <Q> or <CLEAR> to terminate the test and return to the DIAG24 menu.

```
AP PING TEST
Total secs = 7.4
Pings = 100
Packet size = 100
Retries = 0
Timeouts = 4

[R)epeat or [Q]uit
```

Figure D-19. AP Ping Test Summary

When the ping test is stopped, the summary screen (Figure D-19) is displayed, showing the elapsed time of the test, total pings transmitted, packet size used, retry count, and number of timeouts. To repeat the test with the same parameters, press <R>.

Press <Q> or <CLEAR> to terminate the test and return to the DIAG24 menu.

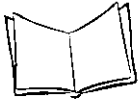
Field Diagnostics

During a field diagnostic test, the screen shown in Figure D-20 is displayed and continuously updated.

```
FIELD DIAGNOSTICS
A Cnt Err Rty ms AP
56 2 0 165 52
57 2 0 55 52
58 3 1 TMO 52
59 3 0 220 52
55 2 0 55 52
Press 'Q' to Quit
```

Figure D-20. Field Diagnostics (Screen 1)

Each ping results in a new line being displayed, showing the cumulative ping count, error count, retry count for this message, round-trip time in milliseconds for this message or



indication of error type if there was an error, and the AP identifier of the AP that responded to the message.

When the test stops, a summary screen is displayed (Figure D-21).

```
FIELD DIAGNOSTICS
Total secs = 8.2
Pings = 100
Packet size = 512
Retries = 6
Timeouts = 4

[R]epeat or [Q]uit
```

Figure D-21. Field Diagnostics Summary Screen

Press <Q> or <CLEAR> to terminate the test and return to the DIAG24 menu.

FLASH.BAT

The FLASH.BAT utility facilitates copying files to and deleting files from flash disk, and renaming files on the disk. The batch file takes care of switching to write mode on flash disk and restoring read-only mode after the operation.

Deleting Files from Flash Disk

To delete files, use the command:

```
FLASH DEL <filename>
```

For example:

```
FLASH DEL CS1.CFG
```

deletes the Spectrum One compatibility layer configuration file, CS1.CFG, from the current directory of the flash disk, and

```
FLASH DEL \*.*
```

deletes all files in the flash disk's root directory.

Note: There is no mention of the E: drive in the command

Copying Files to Flash Disk

To copy files to flash disk, use the command:

```
FLASH COPY <filename> \
```

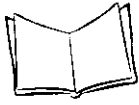
For example:

```
FLASH COPY NET.CFG \
```

copies NET.CFG, the protocol stack configuration file, from the current directory (normally D:) to the root directory on flash disk, and

```
FLASH COPY E:\SVTP\CS1.CFG \STEP
```

copies CS1.CFG from the SVTP directory on flash disk to the STEP directory on flash disk.



Note: *In the second example, the E: drive must be mentioned on the first command parameter, but is assumed on the second parameter and must NOT be mentioned.*

Renaming Files on Flash Disk

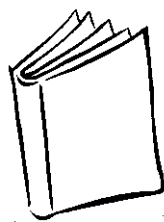
To rename files on the flash disk, use the command:

```
FLASH REN \<OLD FILE NAME> <NEW FILE NAME>
```

For example:

```
FLASH REN \NETCFG.1 NET.CFG
```

renames NETCFG.1 in the flash disk's root directory to NET.CFG. The standard restrictions on renaming files apply, e.g., NETCFG.1 must exist and NET.CFG must not exist in the directory before the command is executed.



Glossary

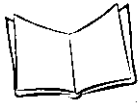
Access Point	A device that provides transparent access between Ethernet wired networks and IEEE 802.11 interoperable radio-equipped mobile units (MUs) such as Symbol's hand-held computers or other devices equipped with a PCMCIA slot. The mobile unit may roam among the APs in the same subnet while maintaining a continuous, seamless connection to the wired network. Refer to Subnet .
ADK	Refer to Application Development Kit .
AP	See Access Point .
Application Development Kit (ADK)	A kit used with WWC 1000 terminals that provides various libraries, examples, utilities, and drivers. Use to enable program segments and build program images for execution on a WWC 1000 terminal.
Application Programming Interface (API)	An interface by means of which one software component communicates with or controls another. Usually used to refer to services provided by one software component to another, via software interrupts or function calls.
ASCII	American Standard Code for Information Interchange. A 7-bit code representing 128 letters, numerals, punctuation marks, and control characters. It is a standard data transmission code in the U.S.
Bar Code	A pattern of variable-width bars and spaces which represents numeric or alphanumeric data in machine-readable form. The general format of a bar code symbol consists of a leading margin, start character, data or message character, check character (if any), stop character, and trailing margin. Within this framework, each recognizable symbology uses its own unique format. See <i>Symbology</i> .
BIOS	Basic Input Output System. A collection of ROM-based code with a standard API used to interface with standard PC hardware.



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Bit	Binary digit. One bit is the basic unit of binary information. Generally, eight consecutive bits compose one byte of data. The pattern of 0 and 1 values within the byte determines its meaning.
Bits per Second (bps)	Bits transmitted or received.
Byte	On an addressable boundary, eight adjacent binary digits (0 and 1) combined in a pattern to represent a specific character or numeric value. Bits are numbered from the right, 0 through 7, with bit 0 the low-order bit. One byte in memory can be used to store one ASCII character.
Codabar	A discrete self-checking code with a character set consisting of digits 0 to 9 and six additional characters: (- \$: / , +).
Code 128	A high density symbology which allows the controller to encode all 128 ASCII characters without adding extra symbol elements.
Code 3 of 9 (Code 39)	A versatile and widely used alphanumeric bar code symbology with a set of 43 character types, including all uppercase letters, numerals from 0 to 9, and 7 special characters (- . / + % \$ and space). The code name is derived from the fact that 3 of 9 elements representing a character are wide, while the remaining 6 are narrow.
Code 93	An industrial symbology compatible with Code 39 but offering a full character ASCII set and a higher coding density than Code 39.
Cradle	A cradle is used for charging the terminal battery and for communicating with a host computer, and provides a storage place for the terminal when not in use.
Data Communications Equipment (DCE)	A device (such as a modem) which is designed to attach directly to a DTE (Data Terminal Equipment) device.
Data Terminal Equipment (DTE)	A device (such as a terminal or printer) which is designed to attach directly to a DCE (Data Communications Equipment) device.
DCE	Refer to Data Communications Equipment .
Decode	To recognize a bar code symbology (e.g., UPC/EAN) and analyze the content of the specific bar code scanned.
Development Kits	A set of software tools provided to customers to help them create applications for their terminals. See <i>ADK</i> .

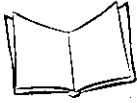
Discrete 2 of 5	A binary bar code symbology representing each character by a group of five bars, two of which are wide. The location of wide bars in the group determines which character is encoded; spaces are insignificant. Only numeric characters (0 to 9) and START/STOP characters may be encoded.
DTE	Refer to Data Terminal Equipment .
EAN	European Article Number. This European/International version of the UPC provides its own coding format and symbology standards. Element dimensions are specified metrically. EAN is used primarily in retail.
Flash Disk	A megabyte of non-volatile memory for storing application and configuration files.
File Transfer Protocol (FTP)	A TCP/IP application protocol governing file transfer via network or telephone lines. Refer to TCP/IP .
Frequency Hopping	The use of a random sequence of frequency channels to achieve spread spectrum compliance. Stations that use frequency hopping change their communications frequency at regular intervals. A hopping sequence determines the pattern at which frequencies are changed. Messages take place within a hop. Refer to Hopping Sequence and Spread Spectrum .
FTP	See File Transfer Protocol .
Hopping Sequence	A set of random frequencies designed to minimize interference with other sets of random frequencies. A hopping sequence determines the pattern with which a station that uses frequency hopping changes its communications frequency. Refer to Frequency Hopping .
Host	A computer that serves other terminals in a network, providing such services as network control, database access, special programs, supervisory programs, or programming languages.
Interleaved 2 of 5	A binary bar code symbology representing character pairs in groups of five bars and five interleaved spaces. Interleaving provides for greater information density. The location of wide elements (bar/spaces) within each group determines which characters are encoded. This continuous code type uses no intercharacter spaces. Only numeric (0 to 9) and START/STOP characters may be encoded.
IOCTL	Input/Output Control.
LCD	Refer to Liquid Crystal Display .
LED	Refer to Light Emitting Diode .



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Light Emitting Diode (LED)	A low power electronic light source commonly used as an indicator light. Uses less power than an incandescent light bulb but more than a Liquid Crystal Display (LCD).
Liquid Crystal Display (LCD)	A display that uses liquid crystal sealed between two glass plates. The crystals are excited by precise electrical charges, causing them to reflect light outside according to their bias. They use little electricity and react relatively quickly. LCDs require external light to reflect their information to the user.
NCU	Network Control Unit.
NDK	Network Development Kit. Use to enable Series 3000 terminals to run in a Spectrum24 network environment.
Null Modem	A special cable that allows direct connection of two DTE (Data Terminal Equipment) devices by making each perceive the other as a DCE (Data Communications Equipment) device.
NVM	Non-Volatile Memory.
ODI	Refer to Open Data-Link Interface.
Open Data-Link Interface	Novell's driver specification for an interface between network hardware and higher-level protocols. It supports multiple protocols on a single Network Interface Controller (NIC). It is capable of understanding and translating any network information or request sent by any other ODI-compatible protocol into something a NetWare client can understand and process.
PDT	Portable Data Terminal.
RAM	Random Access Memory.
RF	Radio Frequency.
Router	A device that connects to networks and supports the required protocols for packet filtering. Routers are typically used to extend the range of cabling and to organize the topology of a network into subnets. Refer to Subnet .
RTC	Real Time Clock

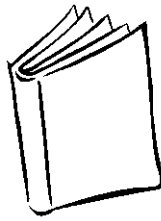
Scanner	An electronic device used to scan bar code symbols and produce a digitized pattern that corresponds to the bars and spaces of the symbol. Its three main components are: <ol style="list-style-type: none">1. Light source (laser or photoelectric cell) - illuminates a bar code.2. Photodetector - registers the difference in reflected light (more light reflected from spaces).3. Signal conditioning circuit - transforms optical detector output into a digitized bar pattern.
SDK	Software Development Kit
SE 1000, SE 1200	Symbol's laser scan modules that can be integrated into portable computing devices.
SHIP	Symbol Host Interface Program
Spectrum One	Symbol's implementation of the Spread Spectrum wireless network, using direct sequencing.
Spread Spectrum	A technique for uniformly distributing the information content of a radio signal over a frequency range larger than normally required for robust transmission of data. Spreading the signal without adding additional information adds significant redundancy, which allows the data to be recovered in the presence of strong interfering signals such as noise and jamming signals.
Subnet	A subset of nodes on a network that are serviced by the same router. Refer to Router .
Symbology	The structural rules and conventions for representing data within a particular bar code type (e.g. UPC/EAN, Code 39).
Spectrum24	Symbol's frequency-hopping, spread spectrum cellular network.
TCP/IP	Refer to Transmission Control Protocol/Internet Protocol .
Terminal	A Symbol portable computer product.
Terminate and Stay Resident (TSR)	A program under DOS that ends its foreground execution to remain resident in memory to service hardware/software interrupts, providing background operation. It remains in memory and may provide services on behalf of other DOS programs.
TSR	Refer to <i>Terminate and Stay Resident</i> .



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Transmission Control Protocol/Internet Protocol (TCP/IP) A suite of the standard network protocols that were originally used in UNIX environments but are now used in many others. The TCP governs sequenced data; the IP governs packet forwarding. TCP/IP is the primary protocol that defines the Internet.

UPC Universal Product Code. A relatively complex numeric symbology. Each character consists of two bars and two spaces, each of which can be any of four widths. The standard symbology for retail food packages in the United States.



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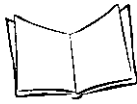
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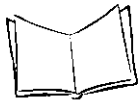
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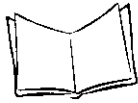
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