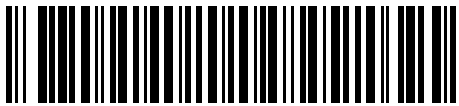
PDT 7500 Series

Product Reference Guide

PDT 7500 Series Product Reference Guide



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Revision A — October 2001

Symbol Technologies, Inc. One Symbol Plaza, Holtsville N.Y. 11742-1300

PDT 7500 Series
Product Reference Guide for DOS

72-39225-02
Revision A
October 2001

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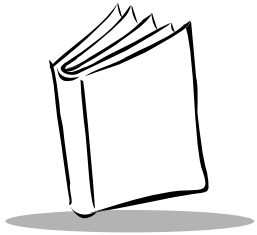

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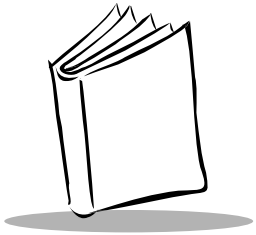

About This Guide

Introduction

The *PDT 7500 Series Product Reference Guide* provides general instructions for the System Administrator for setting up, initializing, operating, troubleshooting, and maintaining the PDT 7500 Series terminal.

Chapter Descriptions

Chapter 1, *Getting Started*, describes the procedures for setting up the terminal.

Chapter 2, *Software Installation on the Development PC*, provides an overview of the different pieces of development software used with the PDT 7500 Series terminal, and provides instructions on the installation of this software.

Chapter 3, *Cradle Setup and Operation*, describes the procedures for setting up the cradle, and details the use of the cradle to charge the terminal's battery and perform host communication.

Chapter 4, *Operating the Terminal*, provides detailed instructions on the operation of the terminal.

Chapter 5, *Terminal Configuration: Edit the Configuration Files*, provides instructions on the edits which must be made to the DOS files on the development PC.

Chapter 6, *Terminal Configuration: Build and Send the Hex Image*, details the use of the TCM (Terminal Configuration Manager) Utility and IPL (Initial Program Loader), which are used to build and send the hex image from the development PC to the terminal.

Chapter 8, *Terminal Configuration: Setup*, takes you through the setup utility provided on the terminal, which allows you to define specific settings on the unit, such as screen contrast, backlight, current date and time.

Chapter 10, *Maintenance and Troubleshooting* provides information about possible problems with the terminal and cradle, and suggested solutions to these problems.

Appendix A, *Specifications*, details the technical specifications for the product.

Appendix B, *Keyboard States, illustrates key codes for each keyboard layout*.

Notational Conventions

The following conventions are used in this document:

- "Operator" and "User" refer to anyone using an application on a PDT 7500 terminal.
- "PC" refers to the IBM personal computer or compatible system that you are using to develop applications.
- "Terminal" refers to a PDT 7500 terminal.
- "You" refers to the administrator who is using this manual as a reference aid to install, configure, operate, maintain, and troubleshoot the PDT 7500 terminal.
- **<Bracketed Bold>** type indicates keystrokes on the terminal or PC. For example:
  Select the <**F1**> key on the PC to access on-line help.
- **Bold** type is used to identify menu items and input or text fields on a terminal 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.
- The piping symbol | has the effect of "or" when it is used to separate inline parameters on a command line; i.e., it separates alternative values for 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 PDT 7500 terminal itself or about the tools and utilities that are available for writing applications for the terminal.

- *PDT 7500 Series Quick Reference Guide*
  p/n 72-38888-XX
- *Series 7000 System Software Manual*
  p/n 70-36860-XX
- *CRD 7500 Four-Slot Cradle Quick Reference Guide*
  p/n 70-37769-XX
- *VCD 7500 Vehicle Cradle Quick Reference Guide*
  p/n 72-38525-XX
- *Spectrum 24 Access Point User's Guide*
  p/n 70-12057-XX.

Service Information

If you have a problem with the PDT 7500 equipment, contact the Symbol Support Center. If your problem cannot be resolved over the phone, you may need to return your equipment for servicing. If that is necessary, you will be given special directions.

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 has not been kept, contact Symbol to have another sent to you.*

Symbol Support Centers

For service information, warranty information or technical assistance contact or call the Symbol Support Center in:

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Wear items and accessories having a Symbol serial number, will carry a 90-day limited warranty. Non-serialized items will carry a 30-day limited warranty.

Warranty Coverage and Procedure

During the warranty period, Symbol will repair or replace defective products returned to Symbol's manufacturing plan in the US. For warranty service in North America, call the Symbol Support Center at 1-800-653-5350. International customers should contact the local Symbol office or support center. If warranty service is required, Symbol will issue a Return Material Authorization Number. Products must be shipped in the original or comparable packaging, shipping and insurance charges prepaid. Symbol will ship the repaired or replacement product freight and insurance prepaid in North America. Shipments from the US or other locations will be made F.O.B. Symbol's manufacturing plant.

Symbol will use new or refurbished parts at its discretion and will own all parts removed from repaired products. Customer will pay for the replacement product in case it does not return the replaced product to Symbol within 3 days of receipt of the replacement product. The process for return and customer's charges will be in accordance with Symbol's Exchange Policy in effect at the time of the exchange.

Customer accepts full responsibility for its software and data including the appropriate backup thereof.

Repair or replacement of a product during warranty will not extend the original warranty term.

Symbol's Customer Service organization offers an array of service plans, such as on-site, depot, or phone support, that can be implemented to meet customer's special operational requirements and are available at a substantial discount during warranty period.

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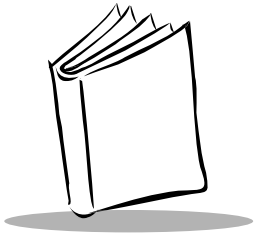
Except for the warranties stated above, Symbol disclaims all warranties, express or implied, on products furnished hereunder, including without limitation implied warranties of merchantability and fitness for a particular purpose. The stated express warranties are in lieu of all obligations or liabilities on part of Symbol for damages, including without limitation, special, indirect, or consequential damages arising out of or in connection with the use or performance of the product.

Seller's liability for damages to buyer or others resulting from the use of any product, shall in no way exceed the purchase price of said product, except in instances of injury to persons or property.

Some states (or jurisdictions) do not allow the exclusion or limitation of incidental or consequential damages, so the proceeding exclusion or limitation may not apply to you.



Chapter 1
Getting Started

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Introduction

The PDT 7500 is a portable terminal which puts the processing power of a 486 PC in the user's hand. The terminal combines touch screen technology and bar code scanning capability in a key-based terminal. With its high resolution CGA-compatible screen, the PDT 7500 can handle both keypad and touch panel input, and the integrated scanner adds bar code input capability. PDT 7500 units are also available with Spectrum 24® RF wireless LAN technology.

The PDT 7500 uses the standard MS-DOS 6.22 operating environment. The recommended application development tool is Microsoft® Visual C ++ V1.52.

Symbol provides extensions for non-PC peripherals (RF, scanning, power management, etc.), C libraries and TSRs for DOS. To assist in downloading files to the PDT 7500 terminal, Symbol provides the Windows-based Terminal Configuration Manager (TCM) that allows the user to create a script listing the files to include in a hex image, build the hex image, and transfer the hex image to the terminal.

The PDT 7500 Series

The PDT 7500 Series of terminals consists of the following models:

PDT 7500	performs batch processing
PDT 753x	performs wireless wide area networking via DITATAC, CDPD or GSM cellular radio.
PDT 754x	performs wireless communication via Symbol's Spectrum24® wireless LAN.

Unpacking the Terminal

Carefully remove all protective material from around the terminal and 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.

Parts of the Terminal

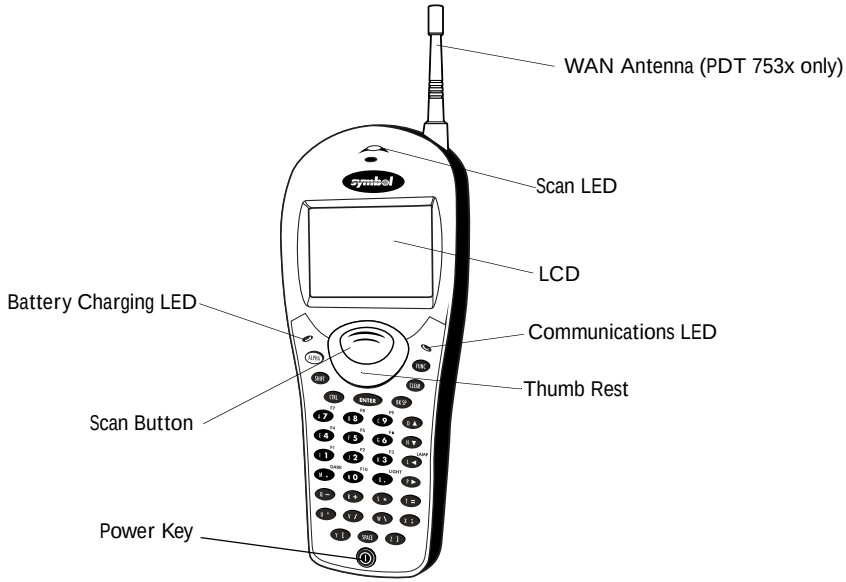


Figure 1-1. Front View

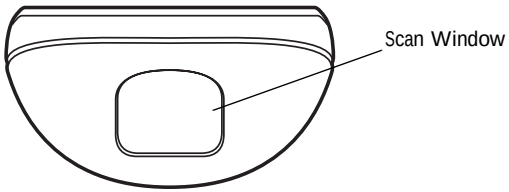


Figure 1-2. Top View

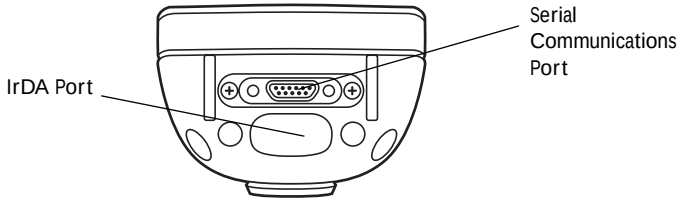


Figure 1-3. Bottom View

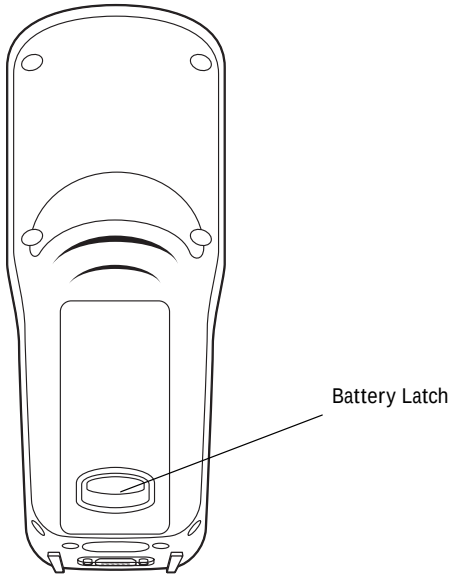


Figure 1-4. Back View

Accessories and Peripherals

CRD 7500

The CRD 7500 single- and four-slot cradles provide terminal storage and security, in-terminal battery charging, spare battery pack charging, and RS-232 communications to a host computer, or an external serial device such as a printer.

VCD 7500

The VCD 7500 vehicle cradle provides terminal storage and security, in-terminal and spare battery pack charging, and communications to a Symbol Mobile Gateway (SMG).

The SMG (a PC with one or more communication ports and an API enabling communications) allows a variety of peripherals to communicate with the terminal.

Holster

The holster provides convenient storage and protection for the terminal when not in use.

Handstrap

The handstrap provides a means of holding the terminal securely.

Battery Packs

Primary power for the PDT 7500 is provided by a 1400 mAh smart battery, which is a rechargeable Lithium Ion (Li-Ion) battery pack. Backup power is provided by supercaps. For information on installing and charging the battery pack, refer to Chapter 3, *Cradle Setup and Operation*.

Cables

Cables for use with the PDT 7500 include:

- RS-232 printer/host communications cable: a 3-foot coiled cable with squeeze lock which includes a null modem and attaches the terminal to a DTE device.
- RS-232 25-pin/9-pin modem cable: connects the terminal to a DCE device.

Power Supply

Power may also be supplied through an external AC adapter/ charging jack (p/n 50-14001-005) as an alternative to the cradle.

Stylus

PDT 753X WAN Terminals

The PDT 753X is equipped with a CDPD or GSM WAN cellular radio and WAN antenna that enables the terminal to operate in a wireless wide area network environment.

The optional stylus is available for performing pen functions.

PDT 754X Spectrum24 Radio Terminals

The PDT 754X is equipped with a Spectrum24 adapter card (Type II PC card connected to an internally mounted antenna) that enables the terminal to operate in a Spectrum24 network.

The software required (interface, drivers, and configuration files) is described in the *Series 7000 System Software Manual for DOS Applications* and in the *Spectrum24 NDK Product Reference Guide*. For information on configuration file edits to ensure proper operation of the PDT 754X in a Spectrum24 environment, refer to the Spectrum24 Network Developer's Kit for DOS.

SDK

The Series 7000 Software Development Kit (SDK) for DOS contains all software and documentation to assist you in developing applications to run on the PDT 7500.

You will need one or more application development environments (ADEs) from other vendors to develop applications for the PDT 7500, for example Microsoft C/C++ 1.52 for DOS.

Spectrum24 NDK

The Spectrum24 Network Development Kit (NDK) for DOS contains the network drivers, samples, and documentation to assist you in developing network-aware applications to run on the PDT 754X.

To develop applications for Spectrum24 for the PDT 754X, install both the PDT 7500 SDK and the Spectrum24 NDK for DOS.

Third-Party Software

Other application development environments are available, such as Zetes MCL® Collection. Contact your Symbol Representative for more information.

Before You Use the Terminal

Install and Charge Battery Pack

Prior to using the PDT 7500 for the first time, charge the Lithium-Ion battery pack. The battery pack can be charged while in the terminal or charged separately in the cradle's charging slot. See Chapter 3, *Cradle Setup and Operation*, for instructions on installing the cradle(s) and installing and charging the battery pack.

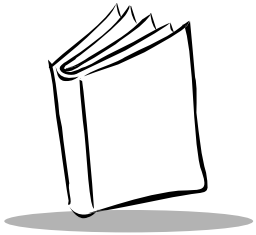
Note: *It is possible to run the PDT 7500 from an external AC adapter/ charging jack while waiting for the battery pack to charge.*

Configure the Terminal

Terminal configuration consists of loading the software and applications onto the terminal and setting the terminal's operating parameters. For more information on configuration see the Terminal Configuration chapters later in this manual.

Run Setup

Run the Setup, described in Chapter 8, *Terminal Configuration: Setup* before using the terminal for the first time.



Chapter 2 Software Installation on the Development PC

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Introduction

The Series 7000 Software Development Kit (SDK) for DOS and the Spectrum24 Network Development Kit (NDK) for DOS are available for developing applications to run on the PDT 7500. These kits include:

- Series 7000 Software Developer's Kit (SDK) for DOS
  - MS DOS 6.22
  - Symbol-provided DOS Files (TSRs)
  - PCMCIA Software
  - Default Hex Image
  - TCM Scripts
  - Sample Code.
- The Spectrum24 Network Developer's Kit (NDK) for DOS, which includes:
  - PDT 7500 Terminal Network Drivers for ODI
  - TCM Scripts
  - Sample Code
  - Spectrum24 NDK for DOS Reference Guide.

DOS

The SDK installation program loads the required MS DOS 6.22 components on the development PC used to create the hex files (via Terminal Configuration Manager) for download to the terminal.

Note: *The copy of MS DOS 6.22 supplied in the SDK is for use on the PDT 7500 ONLY. No license is included in the PDT 7500 SDK for using MS DOS on the development PC; you must have your own valid MS DOS license (preferably for MS DOS 6.22) for the development PC to use the SDK.*

The PDT 7500 is designed to run MS DOS 6.22, and all the programs provided by Symbol for the PDT 7500 are based on MS DOS 6.22. If you use any other version of DOS in the PDT 7500, Symbol cannot guarantee that all the terminal's features will function properly.

Spectrum24 NDK

The NDK provides the drivers, utilities, sample code, and documentation to interface to the Spectrum24 LAN.

The NDK also provides components of the Novell NetWare and LAN Workplace stacks for use with the PDT 754X. To obtain the full set of components and documentation, contact Novell.

Installing the SDK on the Development PC

The SDK is installed through Windows using Program Manager. The SDK uses a common directory, C:\SYMSDK\SDK7000 by default unless you change it. To install the SDK on your development PC:

1. On the development PC, insert the installation CD in the CD drive.
2. From the Program Manager's File Menu, choose **Run**.
3. On the command line, type:

   ```
   <drive>:SETUP
   ```

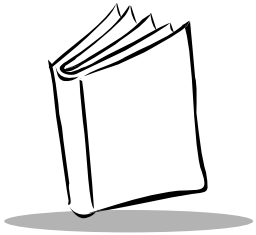
   and press **ENTER**.

Note: *To ensure the best operation of the SDK and NDK, do not change the base path set up in the installation.*

4. Follow the installation prompts that follow.
5. When the SDK installation is complete, follow these same instructions for the Spectrum24 NDK, if necessary.

Installing Other Development Software

Developing applications for the PDT 7500 may require installing other development software such as application development environments (e.g.Visual C++) on the development PC. Follow the installation instructions provided with this software.



Chapter 3
Cradle Setup and Operation

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Introduction

This chapter provides instructions for setting up and using the CRD 7500 single- and four-slot cradle and the VCD 7500 Vehicle Cradle.

Parts of the CRD 7500 Single-Slot Cradle

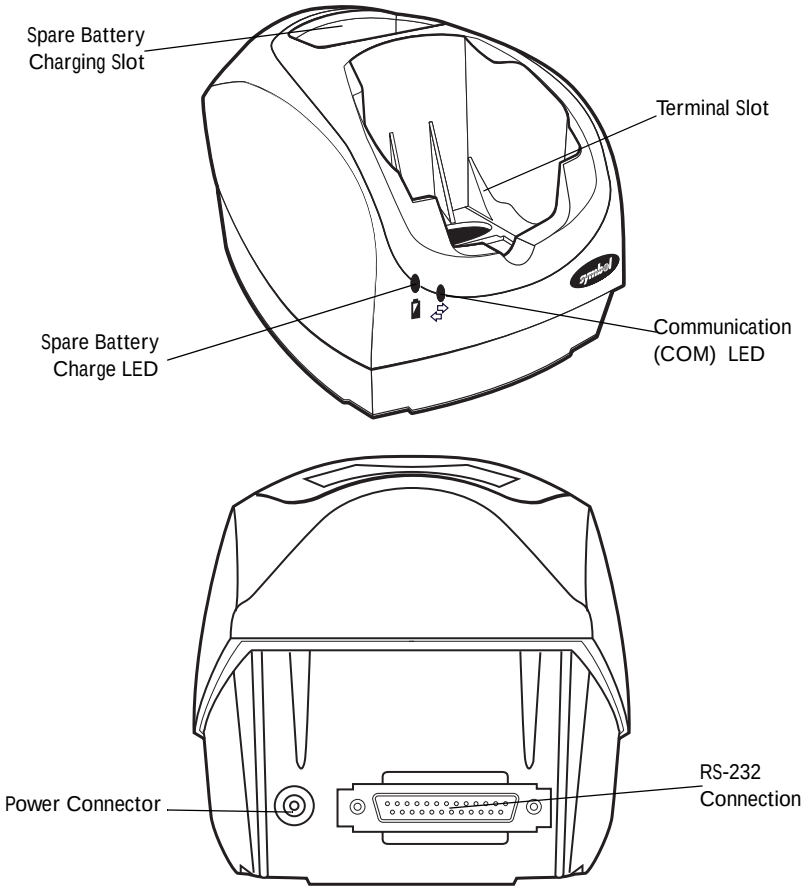


Figure 3-1. Parts of the CRD 7500 Single-slot Cradle

Parts of the CRD 7500 Four-Slot Cradle

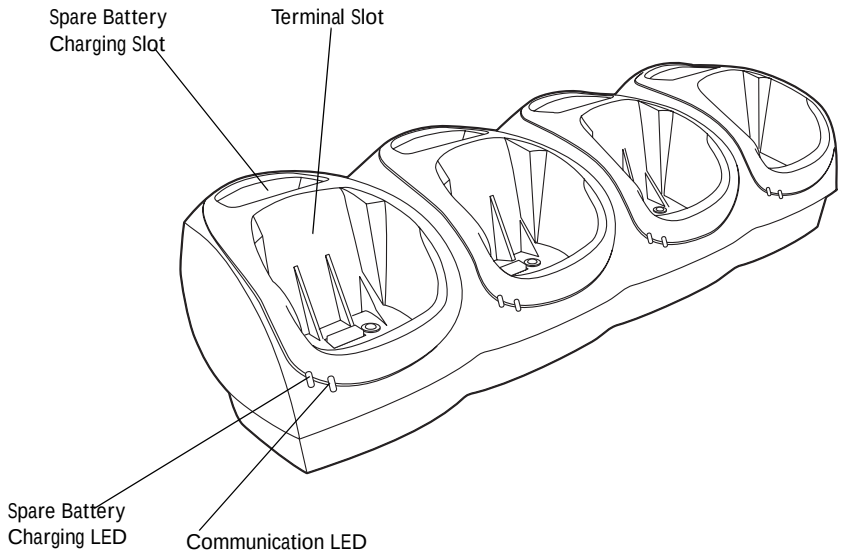


Figure 3-2. CRD 7500 4-Slot Cradle

Parts of the VCD 7500 Vehicle Cradle

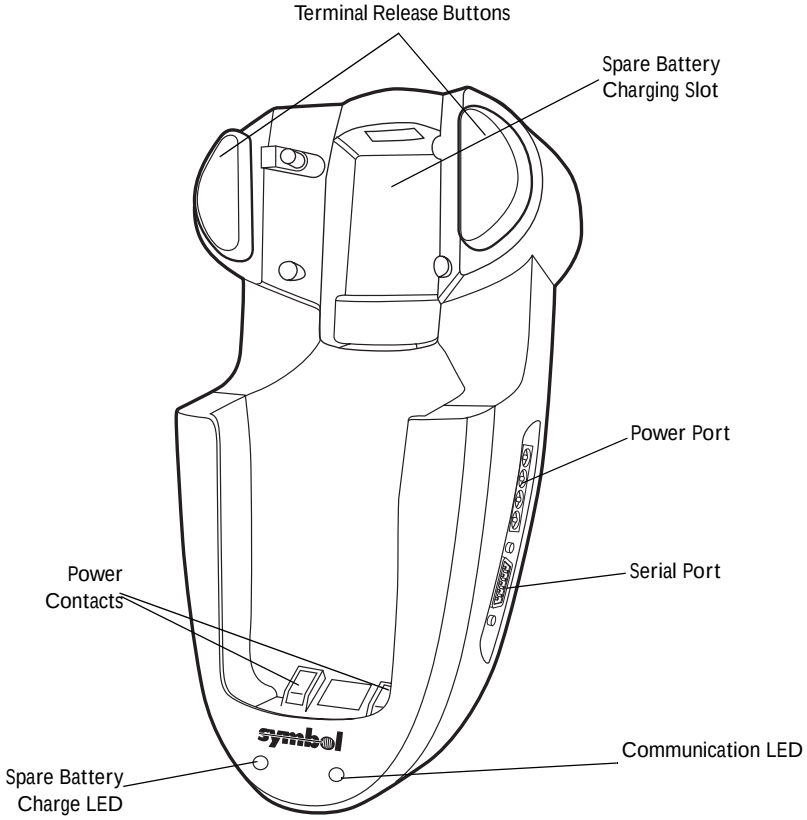


Figure 3-3. VCD 7500 Vehicle Cradle

Setting Up the CRD 7500 Single and Four-Slot Cradles

Setting up the single and four-slot cradle involves connecting power and connecting to a host device.

Connecting Power

To connect power to the cradle:

1. Connect the power supply cable to the power connector on the back of the cradle.
2. Connect the power supply cable AC plug to a standard electrical outlet.

At power-up, the cradle's COM LEDs lights yellow for 3 seconds. The COM LEDs blink seven times.

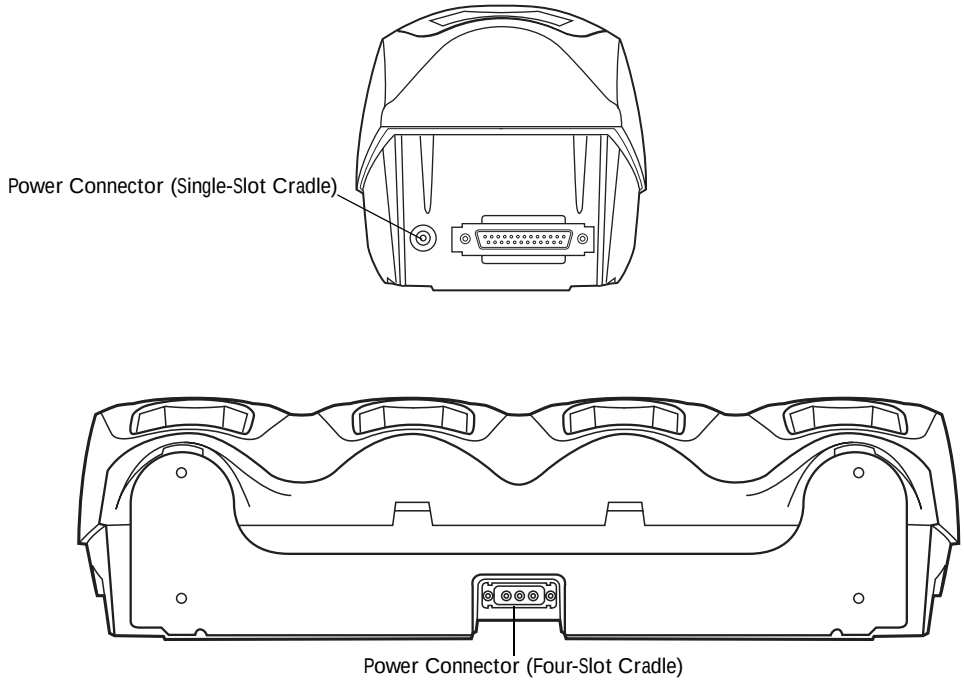


Figure 3-4. Connecting Power to the Cradles

Connecting the RS-232 Cable to a Host Computer

1. Plug an RS-232 serial cable into the communication port located on the back of the CRD 7500 Single-slot cradle, or on the right end of the four-slot cradle.

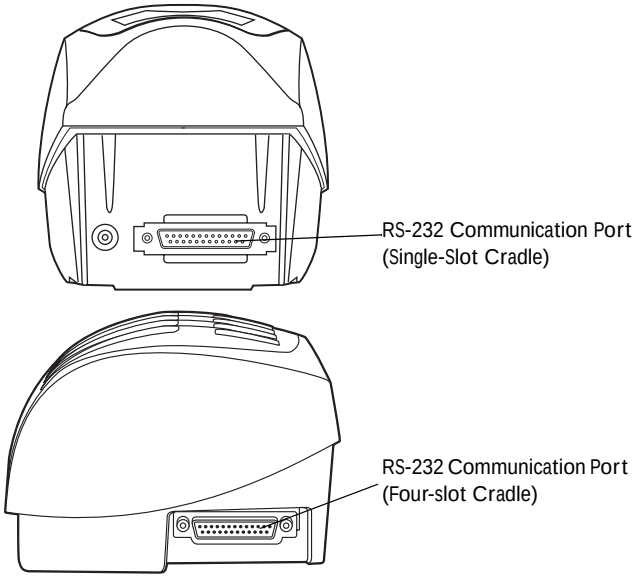


Figure 3-5. RS-232 Communication Port

2. Connect the other end of the cable to the serial (COM) port of the host computer.

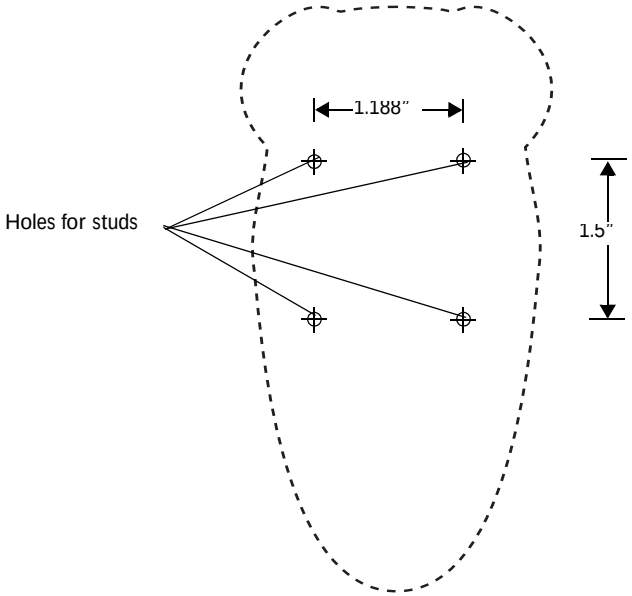
Setting Up the VCD 7500 Vehicle Cradle

This section provides the procedures for setting up the VCD 7500 Vehicle Cradle.

Installing the VCD 7500 Cradle

To install the vehicle cradle:

1. Prepare the mounting surface to accept four #8-32 studs in the pattern shown below.



Note: Not to Scale

Figure 3-6. Installation Pattern: VCD 7500 Vehicle Cradle

1. Install the cradle on the mounting surface.
   a. Position the cradle on the mounting surface.
   b. Fasten using the appropriate hardware (#8-32 screws).
2. Connect the red and black power supply input leads to a fuse panel. A qualified installer must perform the installation.

3. Insert the power connector from the power supply in the power port on the side of the cradle.

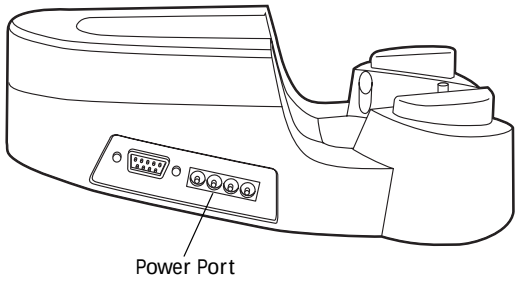


Figure 3-7. Power Connector: VCD 7500 Cradle

Connecting the VCD 7500 Vehicle Cradle a Host Computer

1. Plug a 9-pin serial cable into the communication port located next to the power port on the side of the cradle.

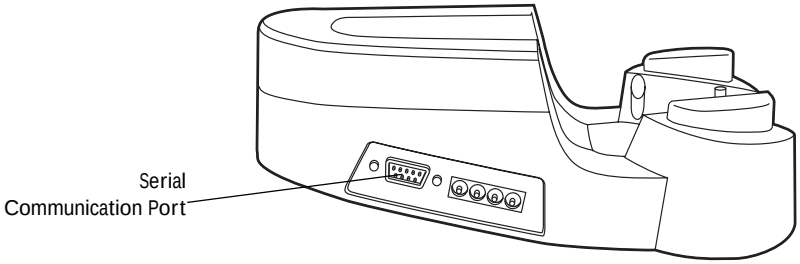


Figure 3-8. Serial Connector: VCD 7500 Cradle

2. Connect the other end of the cable to the serial (COM) port of the host computer.

Sending Data

To begin communication:

1. Insert the terminal in the cradle.
2. As determined by your specific application, press the appropriate key(s) on the terminal to initiate communication.

The cradle's Communications LED blinks yellow when communication begins.

Caution

Removing the terminal while the cradle's Communications LED is on or flashing yellow disrupts communication between the host and the terminal.

Cradle Self Test

On power up, the cradles perform a self-test which checks the RAM and ROM. The Communications LED flashes during the self-test. The Communications LED on the cradle reveals the status as follows:

Table 3-1. Cradle Power LED

Communications LED Condition	Status
Power up/Self-Test (7 flashes -> off)	No error in RAM or ROM
LED flashing (8 flashes/second)	RAM test failure
LED flashing slowly (4 flashes/second)	ROM (CRC on flash) failure

If the cradle fails self-test (RAM or ROM failure), power the cradle down and back up. If the self-test fails again, call the Symbol Support Center for assistance.

Batteries

Primary power for the PDT 7500 is provided by a Lithium-Ion battery. The batteries operate for 5 to 8 hours in typical operating environments, although battery life between charges varies drastically depending on conditions, equipment options, and power demands.

Battery Life

To increase the Lithium battery life, use software controls to decrease power demands, such as:

- Turn off communication ports not used.
- Turn off the backlight.

Backup Battery

Backup power is provided by supercaps. The backup batteries maintain RAM contents for a maximum of 5 minutes while the Lithium-Ion battery is replaced.

Installing a New or Recharged Battery

Caution

To ensure proper terminal operation, use ONLY the Symbol Li-Ion battery in the PDT 7500.

To install a new or recharged Li-Ion battery:

1. Hook the base of the new battery in the top of the battery compartment, then press the into place.

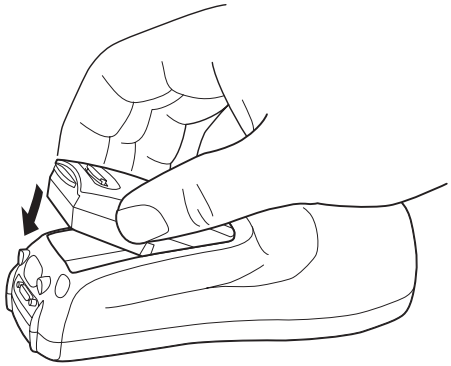


Figure 3-9. Inserting the Battery

2. Slide the battery latch to secure the battery.

If the battery latch is not closed, do not operate the terminal, otherwise data may be lost.

Caution

Do not expose the battery to temperatures in excess of 140°F (60°C). Do not disassemble, incinerate, or short circuit the battery.

Removing the Battery

To remove the Li-Ion battery from the terminal:

1. Suspend the terminal by pressing the PWR key.
2. Slide the battery release switch towards the top of the terminal until the lock releases.

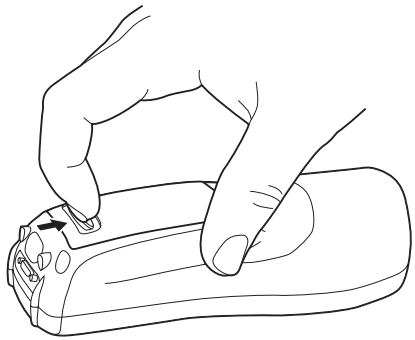


Figure 3-10. Removing the Battery

3. Lift the battery up to the first detent, then slowly lift the battery out of the battery compartment.

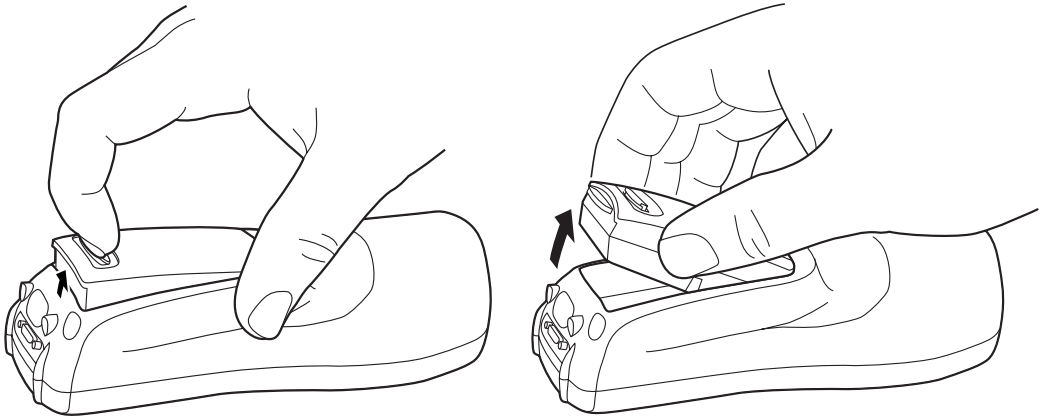


Figure 3-11. Lifting the Battery out of the Terminal

Replacing the Battery in an Active Terminal

If the terminal is active and power is supplied from an external source (wall cube adapter), you can remove and replace the battery at any time.

If the terminal is running from battery power *only*, unlatching and/or removing the battery causes the terminal to shut off power to the LCD display and to any PCMCIA cards that were powered (i.e., modem or radio cards). The terminal may lose the program state and any data stored in on-board RAM.

To avoid these problems, use the following procedure to replace the battery in an *active* terminal running on battery power:

1. Suspend the PDT 7500 by pressing the Power key.

   To ensure that the terminal is fully suspended and not timed out, press the Power key again, wait for the display to come on, then press the Power key again to fully suspend the terminal.

2. Press the battery eject latch to unlatch.
3. Lift the battery up to the first detent, then lift it slowly out of the battery compartment.
4. Replace the battery and relatch.

Charging the Battery

Charge the battery fully before using the terminal. Lithium-Ion batteries charge fully in 2 hours or less in the terminal using the cradle. A spare battery can be charged in the cradle in approximately 4 hours.To prevent overcharging, an internal monitoring circuit shuts off power to the battery once it reaches full capacity.

Charging the Battery in Cradle

The cradle automatically recharges the battery when the terminal is properly inserted in the cradle.

Note: *To avoid loss of data, ensure that terminals placed in the cradle have a battery installed.*

To charge a battery in the terminal:

1. Verify that the cradle has power.
   - For the CRD 7500 single- and four-slot cradle, connect the cradle's power supply jack to the power connector on the back of the cradle. Connect the power supply plug to a standard electrical outlet.
   - For the VCD 7500 vehicle cradle, connect the power supply to the power jack on the side of the cradle. Verify that the power cable is connected to a power source.
2. Insert the terminal in the cradle. The terminal powers on and the terminal's battery charging LED turns yellow.
3. The terminal's battery charging LED is yellow while charging. When the battery is fully charged, the LED switches to solid green.

   Leave the terminal in the cradle for 2 hours to recharge a fully discharged battery.

Charging the Battery Via Power Supply

The battery can be charged in the terminal using the power supply. The terminal can be used while the battery is charging.

1. Plug the power supply connector in the round power supply port, located on the back of the connector on the end of the serial cable.
2. Connect the power supply to the adapter cable.
3. Connect the other end of the adapter cable to a standard electrical outlet.

A fully discharged battery requires approximately 2 hours to recharge.

Charging the Spare Battery in the Cradle

To recharge a spare battery:

1. Verify that the cradle has power.
2. Insert the battery in the spare battery compartment charging slot.

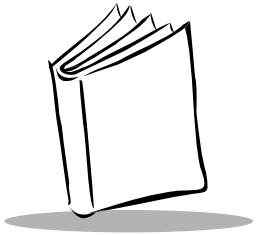
Note: *Spare batteries can only be inserted and removed when the terminal is not in the VCD 7500 cradle.*

---

3. Check the cradle LEDs to determine the spare battery's charging status (refer to Table 3-2).
   a. If the Spare Battery Charge LED is yellow, the battery is still charging and should not be used.
   b. When the LED changes to green, the battery is fully charged. The Spare Battery requires 4 hours to fully charge
4. To remove the battery from the charging slot, lift the battery out of the charging slot.

Table 3-2. Battery Charging LEDs

Condition	LED State
Battery Charging LED	
Off	Spare battery absent, no charge power, or outside temperature range required for charging battery.
Steady yellow	Spare battery is charging.
Steady green	Spare battery is charged.
Flashing yellow	Abnormal battery.
Communications LED	
Off	Terminal is not trying to communicate.
On (yellow)	Terminal is able to send and receive data.



Chapter 4
Operating the Terminal

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Introduction

This chapter describes how to operate a PDT 7500 terminal, including:

- powering the PDT 7500
- booting the terminal
- adjusting the display's contrast
- using the keyboard
- entering data through the integrated scanner
- communicating.

Once the terminal is initialized and power is applied via a fully charged battery pack or a power source, it is ready for operation.

Powering on the PDT 7500

Because the terminal is battery powered, it is important to save power whenever possible. You can minimize power loss and increase battery life by turning the terminal off when data is not being entered.

While the terminal's processor and display are off, programs or data in the system's memory are retained. Before the terminal powers up, it checks the batteries for enough power to ensure reliable operation and data storage. Power-up restores the display, and processing continues from where it was before power-down.

To power on the PDT 7500:

1. make sure a fully charged battery is installed in the terminal.
2. press the power key ⏻ .

To suspend the PDT 7500's operation, press the power key again.

Booting the Terminal

The warm boot process is similar to pressing the <Ctrl+Alt+Del> keys on a PC. To perform a warm boot, press and hold the power key for 6 seconds, then release.

Cold booting the terminal generates a system reset, the same as a power-on boot on a standard PC. To cold boot the terminal, hold down the Power key for 15 seconds or for the amount of time set in Setup. See Chapter 8, *Terminal Configuration: Setup* for more information on Setup.

Suspending and Resuming Operation

To suspend or resume operation, press the PWR key ⏻ on the PDT 7500. The terminal can also resume operation from various wakeup sources (if enabled through the application). The wakeup sources available on the PDT 7500 are listed in Table 4-1.

Note: *The default for enabling/disabling these wakeup sources depends on how the terminal is suspended (manual suspend using the PWR key vs. automatic suspend via timeout). An application can also control the source of a terminal wakeup, overriding the defaults.*

Table 4-1. PDT 7500 Wakeup Sources

Source	Manual Default (PWR key)	Automatic Default (timeout)
PWR key and touch panel power area	enabled	enabled
AC adapter connect	disabled	enabled
Cradle insert/remove	disabled	enabled
Battery insert	disabled	enabled

Table 4-1. PDT 7500 Wakeup Sources (Continued)

Source	Manual Default (PWR key)	Automatic Default (timeout)
Scan trigger(s)	disabled	enabled
keyboard (any key)	disabled	enabled
Touch pad (any touch)	disabled	enabled
Alarm timer	disabled	enabled
PCMCIA Slot (0/1)	disabled	enabled
COM ring (1/2)	disabled	enabled
COM Rx Data (1/2)	disabled	enabled

Terminal operation can be suspended in four ways:

- Manual suspension
  - the operator presses the PWR key. Refer to Table 4-1 for the default values.
- Automatic suspension
  - the terminal times out because of no operator activity. Refer to Table 4-1 for the default values.
- Program dependent suspension
  - the application requests a suspend via an API call
  - the application sets a wakeup
- Critical suspension
  - the battery pack is removed or is very low
  - PWR key is required to resume.

Adjusting the Display and Volume

The terminal's backlight illuminates the display in dimly lit areas.

Note: *Use of backlighting can significantly reduce battery life.*

To turn the backlight on or off, press the blue FUNC key, then press the LAMP key.

There are two ways to adjust the display's contrast and backlight, and the speaker volume on the PDT 7500:

- establish the initial values using the setup utility (refer to Chapter 8, *Terminal Configuration: Setup*).
- Contrast can be adjusting be pressing the FUNC key, then either the light or dark key.
- adjust the values through an application, if allowed by the software.

Scanning

The PDT 7500 offers two scanning capability options:

- 1-D standard
- PDF417 scanning.

Note: *The scanning application and scanner driver must be loaded on the terminal to perform scanning.*

Using the Scanner

To use the integrated laser scanner:

1. Verify that the system is on (the display is active).
2. Ensure that a scanning-capable application is loaded and running, and that the application is in a state to allow scanning.
3. Aim the scan window at the bar code.
4. Adjust the aim so that the thin, red laser beam covers the entire length of the bar code.

Optimal scanning distance varies with bar code density and scanner optics, but most combinations work within 4 to 10 inches. Generally:

- Hold the scanner farther away for larger symbols.
- Move the scanner closer for symbols with bars that are close together.

5. Press the scan button.
6. If the decode is successful, the LED turns from yellow to green. The terminal may also beep.

Note: *The procedure for your scanner may differ from the one listed above. Scanner operation depends on the application.*

Scanning Considerations

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

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 scanning device optics.

Scanning within range brings quick and constant decodes; scanning too close or too far away prevents decodes. So you need to find the right working range for the bar codes you are scanning. However, the situation is complicated by the availability of multiple integrated scanning modules, some with specialized capabilities such as long range and 2-D decode capability. The best way to specify appropriate working range per bar code density is through a chart called a decode zone for each scan module. A decode zone simply plots working range as a function of minimum element widths of bar code symbols.

Decode zones for integrated scan elements available on the PDT 7500 are provided in Appendix A, *Specifications*.

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 “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 sharp an angle; the scanner needs to collect scattered reflections from the scan to make a successful decode. Practice quickly shows what tolerances to work within.

Note: *Contact the Symbol Support Center if you have chronic difficulties scanning. Decoding of properly printed bar codes should be quick and effortless.*

Smart Raster Capability

All integrated 1-D/PDF417 scan elements may be programmed for "Smart Raster" capability, which causes the scanner to emit a raster pattern dynamically optimized to the particular PDF417 bar code's shape. To increase scanning efficiency and optimize decode time, the scanner determines the geometry of the bar code and opens at a rate and size optimal for decoding that bar code.

In normal Smart Raster operation, a trigger pull causes a slab raster pattern to appear. If the target is a 1-D bar code, the slab raster decodes the bar code. If the target bar code is PDF417, the scanning patterns open up to a full, optimized raster pattern as soon as the scanner is properly aligned over the bar code (Figure 4-1).

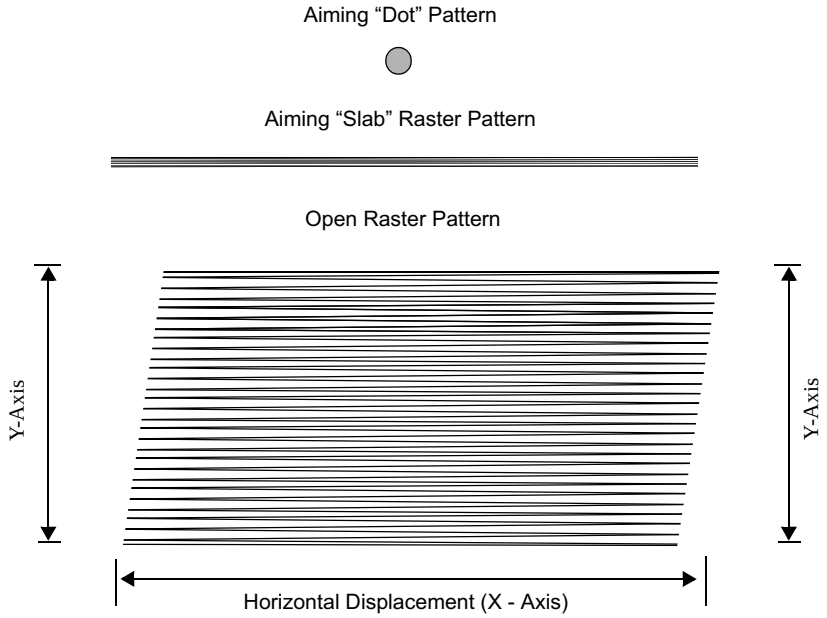


Figure 4-1. 1-D/PDF417 Scan Element Aiming and Scanning Patterns

For best operation in Smart Raster mode, keep the scan pattern as parallel to the symbol's rows as possible, keep the scanner as still as possible, and hold the scanner at an angle which does not give specular reflection (refer to *Angle* on page 4-6). The symbol should also be in good condition.

Scanning Mode Options

There are three scanning options: aiming with a dot pattern, scanning with a slab raster pattern, or always raster.

Aiming Dot Option

A trigger pull creates the single dot aiming pattern, which lasts for a fixed interval. This dot easily can be seen in outdoor or high ambient light environments. A slab raster pattern or an open raster pattern appears next, depending on the programmed scanning option. There are two programmable timeout periods for this option — normal and extended.

Slab Raster Aiming Option

A trigger pull creates the slab raster pattern. If the target is a 1-D bar code, the slab pattern decodes the bar code. If the target bar code is PDF417, the pattern opens up to an optimized raster pattern as soon as the scanner is properly aligned over the bar code.

Always Raster Option

When programmed to this option, the PDF417 scan element directly opens to a full raster pattern whenever the trigger is pulled.

Scanning PDF417 Bar Codes

Make sure the terminal is programmed for a slab raster aiming pattern and Smart Raster mode.

1. Aim the scanner at the symbol. Try to keep the nose of the scanner parallel with the symbol's rows.
2. Make sure the symbol you want to scan is within the scanning range; refer to the 1-D/PDF417 decode zones. Then pull the trigger.

   The scan pattern first covers the symbol horizontally (Figure 4-2). Make sure the

scan pattern extends at least three-quarters of an inch beyond the edges of the bar code.

Figure 4-2. Slab Raster Pattern on a PDF417 Bar Code

3. If the pattern is parallel to the symbol's rows, the pattern spreads vertically to cover the symbol (Figure 4-3). If the pattern does not cover the top and bottom of the symbol, pull the scanner back until it does.

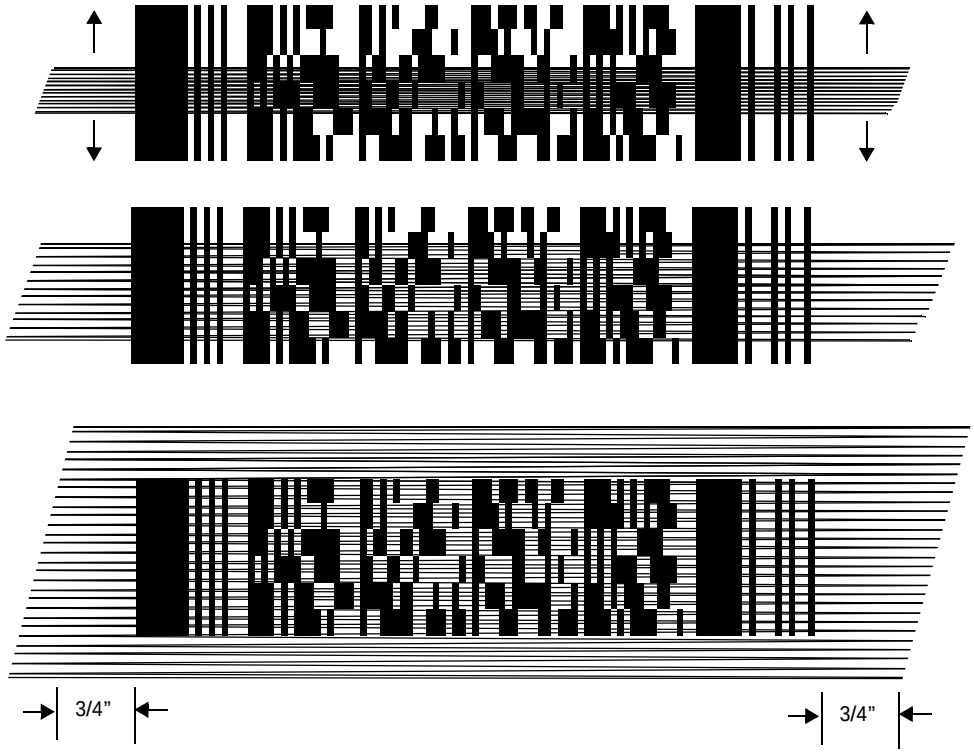


Figure 4-3. Scanning Pattern Spreading Over PDF417 Bar Code

The scanner has successfully decoded the symbol when the green LED lights and you hear a short, high tone beep.

Scan the Entire Bar Code Symbol

- The larger the symbol, the farther away you should hold the scanner to permit the raster pattern to cover the symbol (but not more than 8 inches). See the *1-D/PDF417 Scan Element Decode Zones*.
- Hold the scanner close for denser symbols (not less than 2 inches).
- In all cases, make sure the scan pattern extends *at least 3/4 inch* beyond each edge of the bar code (Figure 4-4).
- The PDF417 bar code symbol has multiple rows, but the raster pattern also has multiple scanning rows. For this reason, do three basic things as you scan:
  - Center the aiming pattern on the bar code, as illustrated before.
  - Keep the pattern in the same horizontal plane as the bar code.

Figure 4-4. Orienting Scanning Pattern On PDF417 Bar Code

- If the vertical scan pattern is not high enough to cover a “tall” PDF417 symbol, move the scanner slowly down toward the bottom of the symbol, keeping the beam horizontal to the rows, and then slowly back upward toward the top (Figure 4-5).

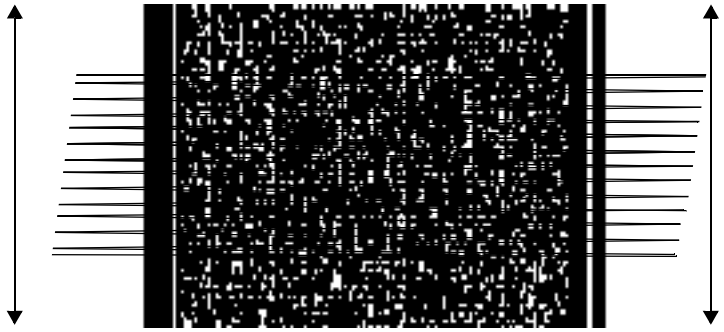


Figure 4-5. Moving Scan Pattern Upward and Downward on "Tall" PDF Symbol

- The scan beam does not have to be *perfectly* parallel with the top and bottom of the symbol (up to a 4^{o} tilt will work).

Scanning (Imager)

The Imager has the following features:

- omnidirectional reading of a variety of bar code symbologies, including the most popular linear, postal, PDF417, and 2D matrix code types.
- the ability to capture and download images to a host for a variety of imaging applications.
- advanced intuitive laser aiming for easy point-and-shoot operation.

Scanning

The Imager uses digital camera technology to take a digital picture of a bar code, stores the resulting image in its memory, and executes state-of-the-art software decoding algorithms to extract the data from the image. A typical bar code decoding process is as follows:

1. The user aims the Imager and presses the scan button.
2. The red laser aiming pattern turns on to assist in aiming the Imager.
3. If necessary, the Imager turns on its red LEDs to illuminate the target bar code.
4. The Imager takes a digital picture (image) of the bar code and stores it in memory for decoding.

5. A decode beep occurs and the Imager transmits the bar code data to the host.
6. The user releases the scan button.

This process usually occurs instantaneously. Steps 2 - 4 are repeated on poor or difficult bar codes as long as the scan button remains pressed.

Operational Modes

The Imager has two modes of operation: Decode Mode and Image Capture Mode, activated by pressing the scan button.

Decode zones for the Imager on the PDT 7500 are provided in Appendix A, *Specifications*

Decode Mode

In this default mode, upon pressing the scan button, the Imager attempts to locate and decode enabled bar codes within its field of view. The Imager remains in this mode as long as the scan button is pressed, or until a bar code is decoded.

Image Capture Mode

This mode can be entered via the Scanner API. The Imager turns on its laser aiming pattern to highlight the area to be captured in the image. The scan button press instructs the Imager to capture a high quality image and transmit it to the host. A short time may pass (less than 2 seconds) between when the scan button is pressed, and the image is captured as the Imager adjusts to the lighting conditions. Hold the terminal steady until the image is captured (denoted by a single beep).

Aiming the Imager

The Imager projects a laser aiming pattern (shown below) similar to those used on cameras. The aiming pattern allows you to position the bar code or object within the field of view.

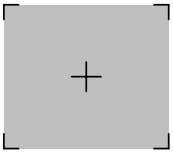


Figure 4-6. Laser Aiming Pattern

To scan a symbol with the Imager:

1. Center the symbol in any orientation within the aiming pattern. Be sure the entire symbol is within the rectangular area formed by the brackets in the aiming pattern.

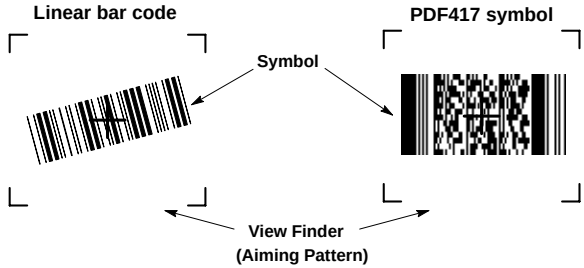


Figure 4-7. Centering Symbol in Aiming Pattern

The Imager can also read a bar code presented within the aiming pattern but not centered, such as the figure below on the left. The figure on the right, however, can not be decoded.

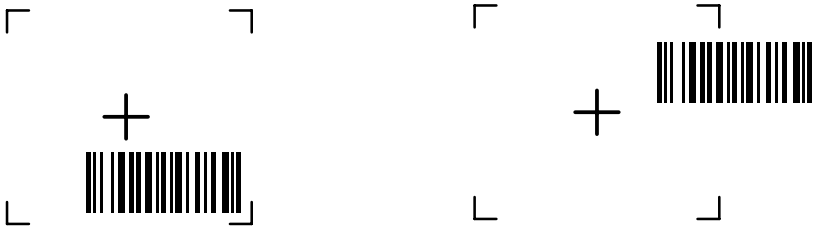


Figure 4-8. Acceptable and Incorrect Aiming

2. The aiming pattern is smaller when the Imager is closer to the symbol and larger when it is farther from the symbol. Scan symbols with smaller bars or elements (mil size) closer to the unit, and those with larger bars or elements (mil size) farther from the unit.
3. Hold the terminal between two and nine inches (depending on symbol density) from the symbol, centering the aiming pattern cross hairs on the symbol.
4. Press and hold the scan button until the terminal beeps, indicating the bar code is successfully decoded.

Performing Communications

The PDT 7500 terminal communicates with a host either through an RS -232 communications cable, or placed in a CRD 7500 or VCD 7500 cradle. PDT 7540 terminals communicate with a host computer or other wireless units over the Spectrum24 wireless LAN network.

Communicating via RS-232 Cable

To perform direct communications using an RS-232 cable, connect the terminal to the host via the communications port:

1. Suspend (temporarily power the terminal off) the terminal by pressing the PWR key.
2. Connect the communication cable's connector to the adapter cable's connector.
3. Plug the adapter's subminiature connector in the communications port on the bottom of the terminal.
4. Plug the other connector on the communication cable to the host's COMM port.
5. Start the communications program.

Communicating via Cradle

The cradle enables communications between the PDT 7500 and a computer, printer, modem, or other peripheral device.

CRD 7500 Four-Slot Cradle and VCD 7500 Vehicle Cradle

To begin communication:

1. Make sure all power and serial connections are secure.
2. Insert the terminal in the cradle.
3. As determined by your specific application, press the appropriate key(s) on the terminal to initiate communication.

The cradle's Communications LED blinks yellow when communication begins.

Caution

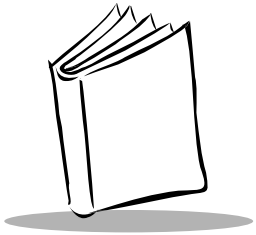
Removing the terminal while the cradle's Communications LED is on or flashing disrupts communication between the host and the terminal.

Note: *The Communications LED does not light if cradle mode is not enabled or if the terminal is not inserted in a cradle.*

Spectrum24 Communications

For information on changing subnets (changing ESS_ID) or performing network diagnostics on the terminal or general Spectrum24 configuration, refer to the *Spectrum24 NDK for DOS Reference Guide*, provided with the NDK.

For general information on the Spectrum24 wireless LAN network, refer to the *Spectrum24 Ethernet Access Point User Guide*, *Spectrum24 Wireless LAN PC Card User Guide*, and the *Spectrum24 Wireless LAN ISA Adapter User's Guide*.



Chapter 5 Terminal Configuration: Edit the Configuration Files

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Setup/Edit DOS Configuration Files

This section details the recommended edits of DOS system files. For more information on editing the DOS system files covered in this section, please refer to the Microsoft® MS-DOS User's Guide.

Note: *See the Spectrum24 NDK for DOS Reference Guide for CONFIG.SYS and AUTOEXEC.BAT file edits for use in the Spectrum24 environment.*

CONFIG.SYS

HIMEM.SYS Device Driver

This driver provides access to the terminal's extended memory (RAM beyond the first 1 MB). It provides services for managing the High Memory Area (HMA), which is the first 64K of extended memory, and an Extended Memory Specification (XMS) API for managing the remainder of extended memory.

Various uses of extended memory include:

- Loading DOS high (see DOS Settings: DOS = HIGH)
- Using Upper Memory Blocks (UMBs; see EMM386.EXE)
- Using Expanded Memory (EMS; see EMM386.EXE)
- Using DOS Extenders.

Note: *This driver must be loaded in CONFIG.SYS to allow use of extended memory. Most configurations created for the PDT 7500 should include this driver.*

Recommended usage in CONFIG.SYS is:

```
DEVICE=HIGHMEM.SYS/TESTMEM:OFF
```

The /TESTOFF:OFF option skips the memory test and speeds up the boot process.

EMM386.EXE Device Driver

This driver provides alternate access to extended memory. This driver requires that HIMEM.SYS be loaded first and uses the XMS API provided by HIMEM.SYS to further manage extended memory.

Extended memory is "translated" into other types of memory such as Upper Memory Blocks (UMBs) and Expanded Memory (EMS). UMBs allow additional RAM memory to be located in unused areas of the first 1 MB of the address space. TSRs and drivers can be loaded into UMBs via the LOADHIGH and DEVICEHIGH commands, leaving additional Transient Program Area (TPA) available for application use. Expanded memory uses a 64K page frame within the first 1MB of the address space to allow RAM to be mapped in 16K pages via the EMS (LIM 4.0) API.

Note: *Include this driver in the PDT 7500 configuration ONLY if UMBs or EMS are required.*

Recommended command line switches include:

1. If EMS memory is not required, add the following line to allocate all unused Upper Memory Blocks for DEVICEHIGH and LOADHIGH commands:

   ```
   DEVICE=EMM386.EXE NOEMS X=B000-BFFF
   ```

CONFIG.SYS DOS Settings

• *BREAK = [ON | OFF]*

Controls whether or not extended CTRL+C checking is enabled. Since this feature introduces additional overhead and is useful only when a keyboard is attached, it should be disabled under most circumstances. Off is the default setting; hence this command need not be used unless this feature is being enabled.

• *BUFFERS = n[,m] 1≤n≤99 0≤m≤8*

Specifies the number of disk buffers to be allocated for use by DOS. The default value for the PDT 7500 is n=15 and m=0. Many applications and environments request a larger setting. Windows, for example, recommends a setting of n=20 and m=0. Using too large a value wastes memory and using too small a value can reduce performance. Unless there is a specific requirement, we recommend using the n=20 and m=0 settings.

• *COUNTRY = XXX[,YYY]*

Specifies the country-specific settings. The default is U.S. This command is required only for a different country setting.

• *DEVICE = driver.ext*
DEVICEHIGH = driver.ext

This command causes a device driver to be loaded either low (into TPA) or high (into UMBs). Drivers cannot be loaded high until both HIMEM.SYS and EMM386.EXE have been loaded low and DOS=UMB has been specified.

• *DOS = [HIGH | UMB]*

This command allows DOS to load information into the HMA (DOS = HIGH), increasing the amount of TPA available for applications. This command also enables loading TSRs and drivers into UMBs via the LOADHIGH and DEVICEHIGH commands (DOS=UMB).

Note: *DOS = HIGH can only be used if HIMEM.SYS is loaded.*
DOS = UMB can be used only if both HIMEM.SYS and EMM386.EXE are loaded.

• *FILES = n 8≤n≤255*

Controls the number of files that DOS can open at once. The larger this number, the more memory DOS allocates for file handles. The default is 8, which is generally inadequate for most applications and environments. Allocating too many files wastes memory; allocating too few files may cause an application or environment to fail if it attempts to open too many files. Unless there is a specific requirement for more files, we recommend using a value of n=20.

• *INSTALL = file.ext*

This command loads a TSR from CONFIG.SYS. This command can be used to load TSRs (low only) that go along with drivers (as a convenience). Note that DOS does not load the TSRs until the end of CONFIG.SYS (as opposed to where they appear). If you use your application as a shell (see SHELL=), you can use this command to load TSRs prior to execution of the application as the shell.

• *LASTDRIVE = x*

Specifies the number of disk drives managed by DOS. This command is necessary only if the number of drive letters managed by DOS must be increased. DOS automatically allocates C: and possibly D:, E: and F:, if additional FLASH disk(s) are present.

The RAM disk driver and DRVSPACE are device drivers that allocate new drive letters beyond those automatically allocated by DOS. LASTDRIVE only adds new drive letters (to be managed by DOS) if the drive letter specified is greater than the last drive letter automatically allocated by DOS or by device drivers such as RAM Disk and/or DRVSPACE.

One common use of this command is to reserve one or more drive letters for use by the DOS SUBST command, in addition to the drives needed for RAM Disk and DRVSPACE.

For example, if DOS is managing drives A-F, set **LASTDRIVE=G**.

For Spectrum24 use with Novell Netware and LAN Workplace TCP/IP stack, LASTDRIVE= must be set to **Z**.

• *NUMLOCK = [ON | OFF]*

This command sets the state of the numeric lock key on the keyboard on boot up.

• *SET*

This command sets environment variables in CONFIG.SYS instead of in AUTOEXEC.BAT.

Note: *Environment variables are set in CONFIG.SYS only at the end of CONFIG.SYS, regardless of where the SET command occurs. Consequently, these settings cannot be used by device drivers, and this command is generally only used if environment variables are required by TSRs loaded via the INSTALL= command, or if the application is being used as a command shell (e.g., turn-key application).*

• *SET COMSPEC=*

This command specifies the drive and path where the shell can be found. Use this command only if the SHELL= command is used to select a program other than COMMAND.COM as the shell, or if the shell is located in a directory other than the root directory of the boot drive.

• *SHELL = file.ext*

This command specifies the command shell to be used. The default command shell is COMMAND.COM from the boot drive's root directory.

Reasons for using this command include:

- To increase the size of the environment table when running COMMAND.COM as the shell.

The recommended command line for this is:

```
SHELL=C:\COMMAND.COM/P/E:1024
```

For additional information, consult the *MS-DOS User's Guide*.

- To run (and store) COMMAND.COM in a directory other than the root directory (see also **SET COMSPEC=** above)

Note: *TCM automatically puts COMMAND.COM in the root directory of a FLASH disk marked as bootable, so this should seldom be needed.*

- To use an application other than COMMAND.COM as the shell.

• *STACKS = n, s0≤n≤64, 32≤s≤512*

This command controls the number and size of the DOS stacks used to service hardware interrupts. Unless there is a specific requirement otherwise, we recommend using a value of n=9 and s=256 to save memory.

MS-DOS Device Drivers

• *ANSI.SYS*

This driver provides text mode display attribute support for applications that desire ANSI terminal command set portability.

• *DISPLAY.SYS*

This driver allows internationalization of the text mode character set.

• *RAMDRIVE.SYS*

This driver creates a simulated "disk" using TPA, EMS, or XMS RAM.

• *SETVER.EXE*

This driver reports different version numbers for use with DOS-version-specific software programs. Consult the *MS-DOS User's Manual* for more information.

• *SMARTDRV.EXE*

This driver caches access to disk drives, thus increasing disk access speed. Due to the solid state nature of the "disks" available on the PDT 7500, this driver may be of limited use.

AUTOEXEC.BAT

Note: *AUTOEXEC.BAT is processed by COMMAND.COM and has no meaning if another program is used as a shell (see the section SHELL= above).*

DOS Settings

• ECHO [ON | OFF | TEXT]

This command (which is commonly used in batch files, especially AUTOEXEC.BAT) displays a text string (the TEXT option), or enables/disables the echoing of commands in the batch file as it is executed. When a batch file is used to execute a program, it gives a more "transparent" look if the commands which "set up" the applications's execution are hidden. To prevent the ECHO OFF command from itself echoing, precede it with an @ sign (e.g., @ECHO OFF).

• MODE

This command sets up and/or configures various drivers. Refer to the *MS-DOS User's Manual* for more information.

• PATH

This command sets the path(s) used to find executable programs.

• PROMPT

This command modifies the DOS COMMAND.COM shell prompt.

• SET

This command sets environment variables. This is normally used to set up environment variables required by TSRs or applications/environments.

Symbol-Supplied TSRs and Device Drivers

Symbol has provided the following device drivers and TSRs for use with the PDT 7500. For information on loading the TSRs device drivers, and on the APIs supported by each device driver or TSR, refer to the *Series 7000 System Software Manual for DOS* p/n 70-36860-XX.

• POWER7XT.EXE

The Power Management Driver TSR API provides operating-system level power management. Use this TSR *instead of* the POWER.EXE TSR supplied with MS-DOS. While

POWER.EXE can be used on the PDT 7500, it cannot be used in conjunction with POWER7XT.EXE, and does not provide as efficient a power management. POWER7XT.EXE requires that XBIOS7XT.EXE is loaded first and will not load unless one of these two files is present. When used on the development PC with XBIOS7XT.EXE, this TSR can be used for testing power management functionality of an application on the development PC.

• *XBIOS7XT.EXE*

This TSR provides extended BIOS-level functionality specific to Series 7000 features. XBIOS7XT.EXE can be loaded on the development PC or the Series 7000 terminal for use in testing and debugging Series 7000 applications on the development PC.

• *MOUSE7XT.EXE*

The Mouse TSR API provides Microsoft Mouse-compatible use to support the use of the pen and digitizer as a mouse. Mouse-aware applications can use this TSR to provide mouse emulation.

• *SCN1DQST.EXE and SCN2DQST.EXE*

The DOS Scanner API provides one- and two-dimensional bar code scanning support and supplies an API for controlling scanning from an application. These TSRs require the presence of POWER7XT.EXE and XBIOS7XT.EXE to load. Additionally, these drivers require the presence of Series 7000-specific hardware, and cannot be loaded on the development PC (even if XBIOS7XT.EXE is loaded).

• *WARMBEEP.EXE*

This application, when loaded on the terminal, causes an audible beep to sound when the defined warm boot time has expired. This is to assist the user in understanding the time when a warm boot occurs. See the Series 7000 System Software Manual for DOS Applications for more information.

CardSoft

• *CS_APM*

A TSR that must be loaded to utilize advanced power management functions for CardSoft. This TSR can also be installed in CONFIG.SYS with the CardSoft drivers using the Install command.

Note: *Do NOT load CS_APM in CONFIG.SYS and AUTOEXEC.BAT.*

• Spectrum24 ODI

The Spectrum24 ODI drivers provided by Symbol consist of Novell's Link Support Layer (LSL), Novell's TCP/IP, and Symbol's Multiple Link Interface Driver (MLID) layers. These executables are part of the Spectrum24 NDK for DOS.

• LSL.COM

The LSL manages communications between TCP/IP protocol stack and SL8ODIOS. This layer is a component of the Novell Open DataLink Interface (ODI) driver specification.

• TCPIP.EXE

This is Novell's TCP/IP Multiple Protocol Interface (MPI). It supports the Berkeley socket APIs. This layer is a component of the ODI driver specification.

• SL8ODIOS.COM

This is the Spectrum24 MLID Network Driver. The MLID layer controls a specific network interface and works below the LSL. The MLID manages the transmission and reception of packets to and from a physical or logical network interface. This layer is a component of the ODI driver specification.

Symbol-Supplied Utilities

• PDTSET.EXE

A utility that allows various system settings to be altered from AUTOEXEC.BAT. This utility is provided with the source code and an abstract explaining its use in the DOSSAMP\PDTSET directory.

• PDTCHECK.EXE

A utility that allows various system conditions to be tested (e.g., trigger, pen, drive letter presence, display size, etc.). This utility is provided with the source code and an abstract explaining its use in the DOSSAMP\PPTCHECK directory.

CardSoft is supplied with the Symbol Series 7000 SDK as a series of drivers which are loaded in CONFIG.SYS:

ATADRV.EXE DEVICEHIGH=atadrv.exe

CS.EXE	DEVICEHIGH=cs.exe
CSALLOC.EXE	DEVICEHIGH=csalloc.ini
SS365SL.EXE	DEVICEHIGH=ss365sl.exe
CARDID.EXE	DEVICE=cardid.exe

• *CSALLOC.INI*

This file is used by the CSALLOC.EXE driver to allocate memory, I/O, and interrupt resources to PCMCIA cards. Much of the upper memory area is used by the BIOS. This memory must be excluded from use by lines in the CSALLOC.INI file.

The default CSALLOC.INI file contains the following memory settings:

```
RIO=2F8-2FF,370-377,3E8-3FF,100-1FFF
MEMEXCLUDE=C000-CFFF,D000-DFFF,E000-EFFF
```

Generally, these lines are constant and should *never be changed* by the user.

The PDT 7500 has IRQ lines dedicated for internal system use, others are available for PCMCIA I/O cards. IRQ 11 and 15 are available to PCMCIA I/O cards; IRQ 3 and 4, although allocated for internal communication ports, can be used by PCMCIA modems when the internal communication ports (COM1 and COM2) are not active.

To allow use of an I/O card that requires an IRQ line in a PCMCIA slot, the default CSALLOC.INI contains the following lines:

```
IRQEXCLUDE=0-2,5-9,C-E
IRQINCLUDE=A-B,F
```

This restricts the I/O cards to IRQ lines 10, 11, and 15.

In addition to the IRQ lines discussed above, modem cards may also use IRQ lines 3 and 4 for COM3 and COM4, respectively. To use IRQ lines 3 and 4 for modem cards, modify the default CSALLOC.INI (below the resource modification line) to read:

```
IRQEXCLUDE=0-2,5-9,C-E
IRQINCLUDE=3-4,A-B,F
```

Consult the *CardSoft 3.1 User's Guide* for more information.

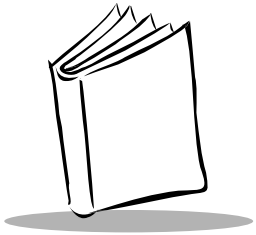
• *CARDID.INI*

Card identification initialization file (base).

Note:*. *CLB includes various card library files used in CARDID.INI to allow automatic recognition and configuration of PCMCIA cards.*

Symbol-Supplied Network Configuration Files

See the Spectrum24 NDK for DOS for specific network configuration instructions.



Chapter 6
Terminal Configuration:
Build and Send the Hex Image

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Overview

To assist in setting up the FLASH Disk image, Symbol includes a utility in the SDK, Terminal Configuration Manager (TCM), to simplify building and downloading hex images to the PDT 7500 terminal.

In TCM, you create a *script* that contains the information (commands to copy files and scripts) for building the image. TCM works with directory windows which display the directory structure of your script and the source directories, files, and scripts from which you pull components. You can open multiple scripts, drag and drop items from a drive/directory to the script, rename and delete files in the script, etc. Upon building the image, TCM adds all the files, directories, and scripts referenced in the script to the image.

The SDK includes a number of standard scripts, demos/samples, foundation scripts, and component scripts, for you to use as a base for creating your own scripts. These scripts can be found in the SYMSDK\SCRIPTS directory.

Note: *Before you being creating a script to build a hex image, take the time to identify the files required (system files, drivers, applications, etc.) and to locate the files' source directories to make the script building process easier.*

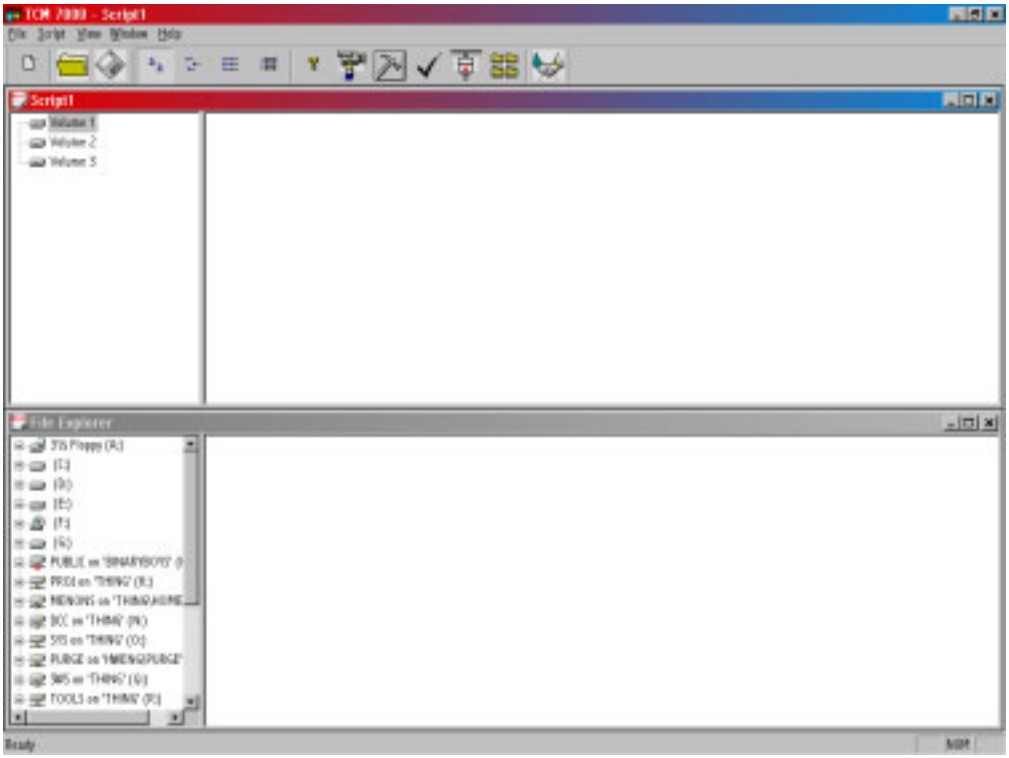
The required processes for building a hex image in TCM include:

- Starting TCM
- Creating or modifying a script
- Building the hex image
- Sending the hex image

Each process is described below.

Starting Terminal Configuration Manager

To start TCM, double click on the TCM icon in the SYMSDK group. The following screen appears, displaying two directory windows; Script1 and File Explorer. Each directory window is split; the left half (or *pane*) of the window displays the directory tree for the current drive, and the right half displays the directory contents for the current drive.



The following table lists the components of the TCM start-up screen.

TCM Screen Components

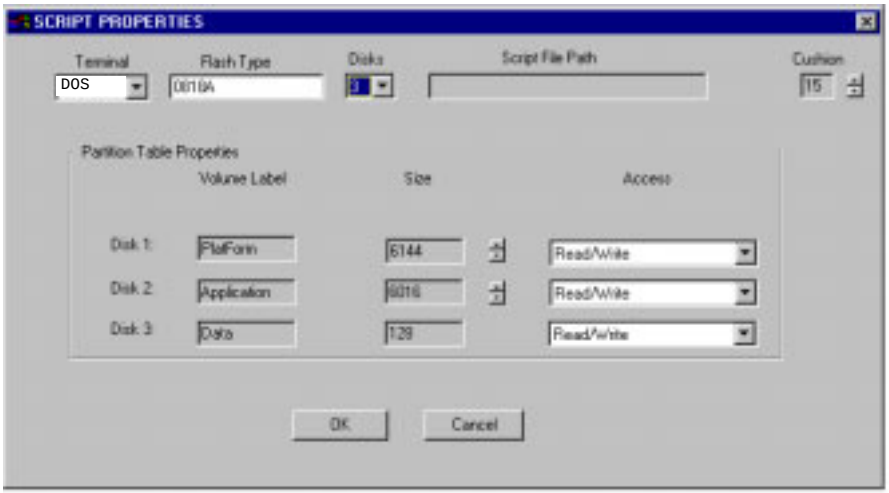
Component	Description			
Script Window	Associated with a script file containing the information to create a Flash Disk image. This window is the *target* window, or the primary TCM window in which you can create a script or change a script file's contents by copying, deleting, and renaming files and directories. More than one script window can be open at a time. The Script Window consists of two panes, the Directory Tree Pane on the left and the Directory Contents Pane on the right. Subordinate directories and files of each volume are listed in the Directory Contents Pane.			
File Explorer	A *read-only source* window for files and/or directories to include in the script being built.			
Tool Bar	Contains the tools, illustrated below, for taking action on a script.			
		Create a new script file.		Check script for existing files.
		Open a script file.		Select the hex image to load.
		Save a script file.		Tile windows.
		View script properties.		Build and send the hex image to the terminal.
		Build a script.		

Defining Script Properties

Before a script is created, the script properties must be defined. This defines the type of terminal, type of flash type, number of disks being created, the memory configuration of each disk volume.

To define the script properties:

1. With TCM open, click on the Script Window to make it the active window.
2. Under the script menu, select the Properties option.
   OR
   Click on from the tool bar. The Script Properties window displays.



3. Under the Terminal pull-down menu, select 7500DOS.
4. In the Flash Type field, enter the type of flash chip installed in your unit, as indicated by booting into IPL. Refer to *Invoking IPL* on page 6-15.
5. Under the Disks pull-down menu, select the number of disk volumes to be created.

Note: *The options available under the disks pull-down menu changes depending on the flash type. Some flash types only have one option for the number of disk volumes, others have two options.*

6. If you have selected three volumes under the disk pull-down menu, you have the option to change the memory configuration of the second and third volumes. To do so, click on the up or down arrow for either of the volumes, until the size of each is set to the desired value. You will notice that as you change the values for one of the volumes, the other volume is automatically changed accordingly.
7. Decide which volume will be the boot disk, and click on the boot disk box next to that volume.This disk becomes the C: drive.
8. For each disk volume, determine the Read/Write access option.
9. The current path for your operating system source displays in the System File Path field. If this is not the correct path, click on the Browse button and navigate to the correct directory.
10. The Script File Path displays the path of the selected script file.
11. Select a Cushion percentage from the Cushion pull-down menu to specify the percent of flash reserved for cushion. Choosing a higher number reduces disk storage space, but also increases write performance on fragmented disks or disks becoming full. To speed the writing process, select as high a number as your storage needs permit (up to 25%).

Creating the Script for the Hex Image

On start-up, TCM displays the screen shown on page 6-4, with the Script1 window and File Explorer window pointing to the SYMSDK\SCRIPTS directory and the SDK7X00 directory. The Script1 Window directory pane displays three volumes: Volume1, Volume2, and Volume3. Depending on the type of flash chip you have, the number of volumes may change. Files can be added to each of the volumes.

- Create a new script file or open an existing script
- Drag and drop existing files and directories to that script
- Set the script parameters
- Save the script
- Review and modify the script.

Each process is described in the sections that follow.

Open a New or Existing Script

Scripts are created in the Script Window.

To open a new script:

- Choose New from the File Menu, OR
- Click on from the tool bar.

To open an existing script (e.g., a standard script provided in the SDK):

- Choose Open from the File Menu and select the script file name, OR
- Click on from the toolbar and select the script file name, OR
- Double click on an existing script in the Script Browser window.

Note: *If you open and make changes to an existing script, saving the changes writes over the existing script. If you wish to use an original or Symbol-supplied standard script as a base and save the changes in a new script, use Save As instead of Save after making the changes.*

Copy Components to the Script

Copy files from the File Explorer Window to the Script Window using the drag and drop method with the mouse or the Copy command.

To copy *files or directories* to the script being generated:

1. Click on the File Explorer Window to make it the active window.
2. Click on the source directory in the Directory Tree Pane. TCM displays the directory contents in the Contents Pane.
3. Click on the file(s) and/or directory in File Explorer.

Note: *Optionally, use the standard Windows Shift+Left-click and Control+Left-click features to select multiple files and directories.*

---

4. Drag and drop the selected file(s) and/or directory from File Explorer to the target directory in the Script Window.

   OR

   Click on the target directory and select the File Explorer Copy icon from the toolbar.

Save the Script

To save the changes to a new script:

1. From the File menu, choose Save As.

   OR

   On the toolbar, click on .
2. Enter the path and filename. TCM appends a .TCM extension to the script.
3. Choose the OK button.

Note: *If you save an untitled script, TCM by default saves the script to the directory that the Script Browser is pointing to.*

To save changes to an existing script:

- From the File menu, choose Save, OR
- On the toolbar, click .

Note: *If you open and make changes to an existing script, saving the changes writes over the existing script.*

If you wish to use an original or Symbol-supplied standard script as a base and save the changes in a new script, use Save As instead of Save after making the changes.

Building the Image

As part of the build, TCM performs a check on the script which verifies that all files referenced in the script exist. If the image is bootable, TCM verifies that the boot files are available.

Note: *Performing a check is more important for previously existing scripts to ensure that files referenced in the script are still in the designated locations.*

To check a script:

1. In the Script Window, select the script.
2. Save the script, if not already saved.
3. From the Script Menu, choose Check.

   OR

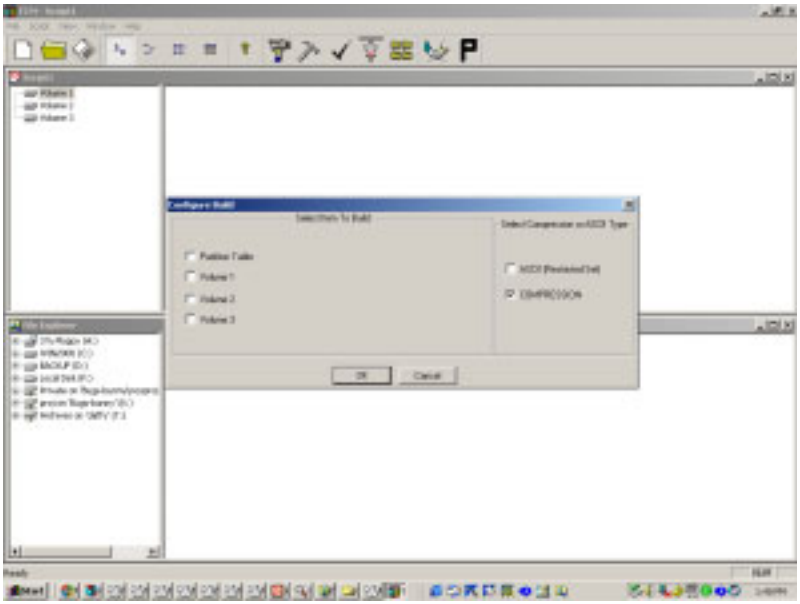
   On the toolbar, choose .
4. TCM verifies that files referenced in the script exist on available drives and lists an error message in the Errors found box for any missing files.
5. Choose the OK button to exit.

To build a script:

1. In the Script Window, select the script to be built.
2. From the Script menu, select Build.

   OR

   On the toolbar, choose . The Configure Build window appears.



3. Select whether to build the partition table, or one volume.
4. Select ASCII format for your hex image, or Compression, which reduces the size of most hex images in order to speed downloading. Click OK.
5. TCM performs a check. If the script is has no errors, TCM proceeds with the build.

If the Build Fails

If the build fails, TCM displays a message indicating which file(s) are missing.

If the total amount of flash required by the script exceeds the image size, a TCM error results and the build fails. To correct this, reduce the number of files in the volume, or make the disk non-bootable. Refer to *Defining Script Properties* on page 6-6 for more information on setting the image size appropriately.

Sending the Hex Image

Once the hex file is built, you are ready to download it to the terminal. A Hex image download requires both TCM and a program loader stored on the terminal. The terminal comes with a program loading utility, Initial Program Loader (IPL), stored in the terminal's write-protected flash. To run IPL, the terminal must be inserted in a cradle or connected to a host PC by direct serial connection. Refer to *Invoking IPL* on page 6-15.

Loading the BIOS

Uploading a new BIOS erases only the 128K of Flash where BIOS is stored. While IPL is updating the BIOS, the BIOS image is saved in memory until the entire BIOS is received and verified. The Flash Disk image and application storage area are unaffected.

Saving the Script

If you made changes to the script since last saving it, save the script again.

Connect The Terminal and Development PC

To send the hex file to the terminal, first link the terminal and development PC by one of the following devices:

- Direct serial link
- Cradle (refer to Chapter 3, *Cradle Setup and Operation* for more information on setting up the cradle).

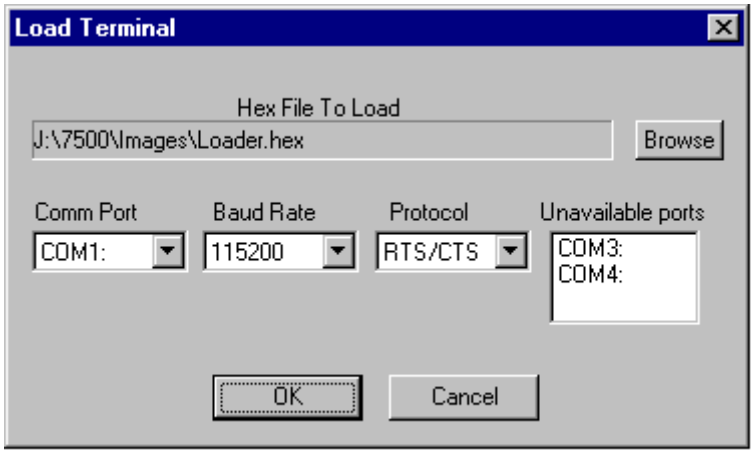
Begin the Send in TCM

In TCM on the PC:

Note: *IPL must be invoked before sending the image.*

---

1. Select the script.
2. From the file menu, choose Load Terminal.
   OR
   On the toolbar, choose . The Load Terminal screen displays.



3. If the correct hex file is not displayed in the Hex File to field, click on the browse button and navigate to the correct hex file to be downloaded.
4. Click on the Comm Port pull-down menu and select the COM port being used. Ports already in use display in the Unavailable Ports field.
5. Click on the Baud Rate pull-down menu and select the appropriate baud rate. Your options are 2400, 4800, 9600, 19200, 38400, 57600, 115200.
6. Click on the Protocol pull-down menu and select the appropriate protocol. Your options are: RTS/CTS and XON/XOFF.

Initial Program Loader (IPL)

Initial Program Loader (IPL) is a small utility program that is built into each terminal. The purpose of IPL is to verify the flash contents prior to a cold boot of the system, and to provide a simple method of updating the flash contents via the serial port or cradle. The images that IPL can accept are in the form of "hex" files" that contain not only the data to be downloaded to the terminal, but also sufficient extra information to ensure that each hex file contains an image for a single partition. Hex files for standard system components such as the BIOS are provided by Symbol. Hex files for custom components, such as disk images or custom partition maps are built on a PC using the TCM program. IPL is only capable of loading whole partitions (it cannot update individual files in a disk image).

Using the Keyboard

Operation of the IPL is controlled by the keyboard. IPL recognizes the following keys:

- Cursor Up
- Cursor Down
- Enter or Trigger
- Backlight
- Lighter
- Darker

The effects of these keys are as follows:

Cursor Up/Down	Whenever these keys are pressed in a menu screen, they cause the previous/next item in the menu to be highlighted. Moving off the end of a menu causes a wrap to the other end of the menu list. If the menu is longer than the screen is deep, then screen will automatically scroll up or down to keep the highlighted item visible on the screen.
Enter or Trigger	Whenever this key is pressed in a menu screen, the currently highlighted item is selected, and IPL advances to the next screen. If the system supports more than one trigger, then any of the triggers can be used as the Enter key.
Backlight	Pressing this key toggles the backlight (if present) between on and off. This key is always active (even if IPL is not in a menu screen).
Lighter/Darker	Each press of these keys adjusts the screen contrast up or down. The keys are always active (even if IPL is not in a menu screen).

Using the Touch Screen

If the system supports a touch screen, then the touch screen can be used instead of the keyboard to control IPL.

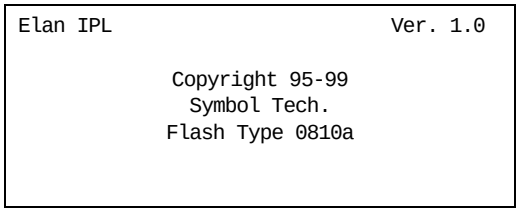
Cursor Up/Down	Touching the screen on the up or down arrows on the screen is exactly the same as using the Cursor Up/Down keys on the keyboard.
Enter	Touching the bottom of the screen exactly the same as pressing the Enter key on the keyboard.
Backlight	This can only be controlled from the touch screen on the 7500. Each tap on the backlight control area of the 7500 screen will toggle the backlight (if present) between on and off.
Contrast	The screen contrast can only be adjusted by the touch screen on the 7500. Tapping the contrast control area on the 7500 screen increases the screen contrast by one step with each tap. Continually pressing the contrast control area on the 7500 screen decreases the contrast at a rate of approximately five steps per second.

Invoking IPL

To deliberately invoke the IPL, hold the trigger while performing a cold boot by pressing and holding the Power Icon for the required amount of time. If the trigger is pressed when the terminal is reset, then control is passed to IPL instead of to the BIOS. If the trigger is not pressed, then IPL verifies all mandatory partitions to ensure that they are present, and verifies the checksum on all checksummed partitions (IPL, Partition Map, BIOS, and Setup). If any of these partitions is missing or corrupted, then control is automatically passed to IPL instead of the BIOS, so that the corrupted data can be reloaded before it causes any problems. If IPL is invoked accidentally, then either reset the terminal again without holding the trigger, or select Run System option in the baud rate menu.

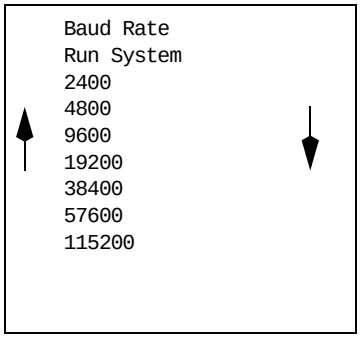
When IPL is invoked (by cold booting while pressing the trigger, or by detecting a corrupt flash partition), IPL sounds the beeper to indicate that IPL has been invoked, and displays the Copyright Screen.

The terminal displays the copyright screen for three seconds. During this time, IPL is verifying the Partition Map and the mandatory and checksummed partitions.



The version number on the top of the screen identifies the version of IPL you are using. The flash type at the bottom of the screen identifies the size and type of flash chip installed in the terminal, which you need for your TCM script generation. See *Defining Script Properties* on page 6-6.

Pressing the Enter key while the copyright screen is displayed advances the program to the Baud Rate Menu.

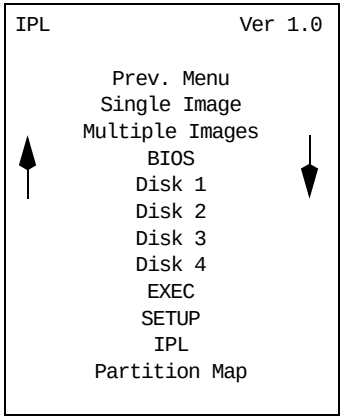


1. Use the up and down cursor keys, or tap the arrows on the touch screen to scroll to the appropriate baud rate. IPL supports baud rates from 2400 to 115200 baud. (default is 115200 baud)
2. Press the **Enter** key or the **Scan** key to accept the selected baud rate.

Note: *If IPL is selected accidentally, or the IPL session is complete, you may select "Run System" from this menu to exit IPL an boot the system. The only other way to exit IPL manually is to hold the Power Icon*

for 16 seconds. Both methods have the same effect, but selecting "Run System" is faster.

Once the selection is made, IPL proceeds to the Area Selection Menu.



3. Use the up and down cursor keys or the up and down arrows on the touch screen to select the area to be received. You have the following options on this screen:

Prev. Menu	Returns you to the Baud Rate menu to modify the baud rate.
Single Image	Indicates that a single image is to be received, without specifying the area to be received.
Multiple Images (default selection)	Indicates that more than one area is to be received contiguously. Note: TCM must be set up to respond to RTS/CTS handshaking. See *Sending the Hex Image* on page 6-12 for more information on this setting in TCM.
BIOS	Indicates that a new BIOS is to be received.
Disks 1 - 4	Indicates the specific disk volume(s) to be received.
EXEC	For factory diagnostic use only.

4. After selecting the area, press Enter. IPL checks for the presence of external power. If the system is running off battery power, IPL displays the Connect to Power Screen:

```
Insert in Cradle
Or
Connect Power Supply
```

5. Place the terminal in the cradle or connect the external power supply and serial connection. IPL waits at this screen until external power is supplied. If the terminal is already running from external power, this screen does not display. While this screen is displayed, pressing Enter or the Cursor Up/Down keys on the keyboard returns IPL to the Area Selection screen.
6. After the power and serial connections are made, select 'Multiple Images' from the main IPL page and the following screen displays:

```
Waiting for data
Multiple Images

115200
```

Note: *If a cradle is the input source, serial parameters are fixed at 38400 baud, no parity, 8 data bits, and 1 stop bit. These parameters cannot be changed.*

The second and fourth lines of this screen reflect the selections made on the Area Selection and Baud Rate menus, respectively. This screen continues to display until the first character of the image to be downloaded is received from the host. While this screen is displayed, pressing the Enter or Cursor Up/Down keys on the keyboard returns IPL to the Area Selection screen.

As soon as the first character of data is received, IPL displays the receiving screen:

```
              Multiple Images

Pages to Erase
Pages to Receive
Page to Write
```

The top line of this screen identifies the area selected in the Area Selection screen. Once a character has been received, IPL stays in this screen until an entire image has been received, or until an error is detected. The only other way to exit from this screen is to reset the terminal by holding the power switch down for 16 seconds. As more data is received, the Receiving Screen is updated to reflect the current status. The first record in the image identifies the area to be processed. When IPL receives the record, it verifies that the area is valid, and updates the Receiving screen as follows:

```
                    BIOS

Pages to Erase                          16
Pages to Receive                        16
Page to Write                           16
```

The top line of the display identifies the actual area being processed. The remainder of the display identifies the number of 8Kbyte pages to erase, receive and write. To process the data, IPL must receive, erase, and write the entire image. With the exception of the disk images, IPL receives the entire image before starting the erase, and completes the erase before starting to write. With disk images, IPL multiplexes all three operations as data is received. Eventually, (assuming no errors), all three counts reduce to 0.

When the entire image is received, and the flash is updated, IPL displays the Verify screen:

```
                    BIOS
                Verifying Image
```

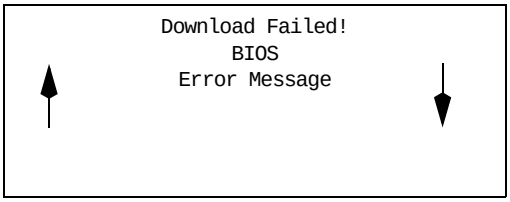
This screen continues to display while the image is being verified. Once the image is verified, IPL displays the Success screen:

```
                    BIOS
                Download Complete
                No Errors Detected
```

If the Multiple Images option was selected on the Area Selection screen, IPL then immediately returns to the Waiting for Data screen to wait for the next image. If any other selection was made on the Area Selection screen, then IPL stays at the success screen until the operator acknowledges the message by pressing Enter (or the trigger, or taps Enter on the touchscreen). Once the screen has been acknowledged, IPL returns to the Area Selection screen to wait for a new selection.

IPL Error Detection

While receiving data, IPL performs many checks on the data to ensure that the data is received correctly. If any error is detected, IPL immediately aborts the download, and reports the error on an error screen:



This screen is displayed until the operator acknowledges the error by pressing Enter (or trigger, or Enter on the touch screen). Once the screen has been acknowledged, IPL returns to the Area Selection screen to wait for a new selection.

The second line of the displays the area that was being processed when the error was detected. The third line of the screen identifies the cause of the error. The errors that can be reported, and the probable cause of the error, are as follows:

Table 6-1. IPL Errors

Error	Explanation
Erase Error	Either the flash is faulty, and the terminal needs to be returned for service, or an attempt was made to erase IPL. (IPL is write-protected, and cannot be erased or programmed without special hardware.)

Table 6-1. IPL Errors (Continued)

Error	Explanation
Line Stat Err	A framing error was detected in the incoming data. The most probable cause of this is a parameter mismatch between the terminal and the device used to transmit the data. The baud rate on both devices must be set to the same value, and the transmitting device must be set to 8 data bits, no parity, and at least one stop bit.
Baud too High	This error could be caused by transmitting large compressed images at a high baud rate, or by faulty flash.
Image Corrupt	This error indicates that the image received by the terminal is corrupt. The most probable cause of this error is inserting an IPL-enabled terminal into a cradle while the host is transmitting an image.
Wrong Area	This error indicates that the image being received has an incorrect area number. This could be caused by specifically selecting an area, and loading an image intended for another area, or by receiving an image for an area that is not defined in the partition map.
Not Hex File	This error is caused by transmitting the wrong file format to IPL. IPL can only receive Hex files supplied by Symbol, or generated by TCM.
Write Error	This error is caused by a failure of the flash device used to hold the image. If this error is seen, then the terminal requires maintenance.
Checksum Err	This error is occurs when one of the critical partitions (BIOS, Partition Map, or Setup) has been received with no apparent errors, but the received image does not pass the checksum check. The most probable cause of this error is a failure of the tool used to generate the image. If this error is displayed, then the original contents of the partition will not have been changed as the error is detected before any flash is updated.

Table 6-1. IPL Errors (Continued)

Error	Explanation
Verify Failed	This error is caused when the image has been written to flash, but cannot be read back correctly. It only applies to critical sections of the flash, and will prevent an exit from IPL as a critical section of the flash is damaged. If this error occurs, the terminal needs maintenance. Contact Symbol Support for help.
Lost Connection	This error displays when the terminal is removed from the cradle during an IPL session. The terminal should be replaced in the cradle when the host is no longer transmitting an image, and the image should be resent to the terminal that lost the connection. Disconnecting the serial cable does not generate this error, and attempting to reconnect the cable will result in an Image Corrupt error.
Cradle Error	This error indicates that corrupted data is being continually received from the cradle. The most probable cause of the error is an obstruction on the IRDA window on the terminal or the cradle. If cleaning the windows fails to correct the problem, then the terminal requires service. Contact Symbol Support for help.

To exit and restart IPL, hold the reset button for 12 seconds (or whatever value was set in Setup) or select Previous Menu and then select Run System.

Restarting after Download Fails

If the download fails, exit IPL by rebooting the terminal.

If possible, determine what caused the download to fail. If a communications failure occurred, check all the cables between the terminal and the host to ensure they are secure. If the hex file is too large to fit in the terminal's Flash disk, reset the hex file's size (refer to *Defining Script Properties* on page 6-6) and rebuild the image.

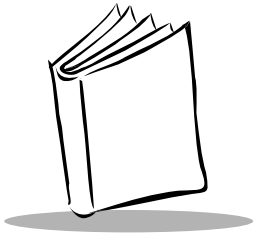
Exiting IPL

To exit IPL, cold boot the terminal (hold the reset switch for 15 seconds, or whatever value was set in Setup). The terminal should boot to an application or to a login screen.

Exiting TCM

To exit TCM on the development PC:

Choose Exit from the File Menu.
OR
Press **Alt**+**F4**.
OR
Double-click the close box.



Chapter 7 Terminal Configuration: Load a RAM Disk

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Loading a RAM Disk

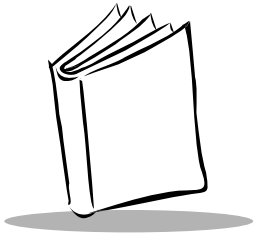
RAM disks allow the PDT 7500's RAM to be organized as a simulated disk for writable data storage. To create one or more RAM disks, you have the option of using RAMDRIVE.SYS (supplied as part of DOS).

Standard RAM Disk Driver

RAMDRIVE.SYS creates a RAM disk in extended, expanded, or conventional memory, or a combination of extended and conventional memory. The RAM disk created through RAMDRIVE.SYS is NOT protected, and its contents are always lost on terminal reboot (warm or cold).

Multiple RAM Disks

It is possible to create multiple RAM drives using Microsoft's RAMDRIVE.SYS. The multiple RAM drive option allows you to separate application files on more than one RAM drive letter.



Chapter 8
Terminal Configuration: Setup

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Introduction

The PDT 7500 Series terminal has a system setup program which allows you to configure many of the terminal's basic characteristics. Specifically, the setup program is made up of five screens and defines:

- contrast value
- backlight
- beeper volume
- beeper frequency
- suspend time
- backlight time
- cold boot time
- enable
- system date and time.

Setup also displays the RAM and Flash sizes. This section takes you through the setup program, enabling you to set each of these default values.

Navigating Setup

To scroll through the five setup screens, press the left and right arrow keys on the terminal's keypad. To scroll through the values in each field, press the (+) and (-) keys on the terminal's keypad. To scroll up and down on any of the screens, press the up and down arrow keys on the terminal's keypad.

Invoking Setup

To invoke the setup application:

1. Start the terminal by performing a cold boot (press the power button and the trigger button simultaneously until the terminal reboots).

   While the terminal is booting, a message displays on the bottom of the screen, "Hold Trig for Setup".

2. Press and hold the scan trigger button, until the setup application starts. The first setup screen displays.

```
Contrast [2]
Backligh [ON]
Volume   [HIGH]
Beep Fre [2670 Hz]
```

Figure 8-1. Setup Screen #1

Contrast

Set the screen contrast level to a comfortable level. Values are in increments of one, and span from 0-31. To change the displayed value, press the (+) key on the terminal's keypad to increment, or the (-) key to decrement the value. When the correct value appears in the field, press the down arrow key on the terminal's keypad to move to the Backlight field.

Backlight

Set the default backlight brightness level for working in dark areas. Values are OFF (default) and ON. To change this value, press the (+) key on the terminal's keypad to increment, or the (-) key to decrement the value. When the correct value appears in the field, press the down arrow key on the terminal's keypad to move to the Volume field.

Volume

Set the terminal's beeper volume. Valid levels are HIGH (default) and LOW. To change the value, press the (+) key on the terminal's keypad to increment, or the (-) key to decrement the value. When the correct value appears in the field, press the down arrow key on the terminal's keypad to move to the Beep Frequency field.

Beep Frequency

Set the sound frequency of the terminal's beeper. Values are in increments of 10, and span from 1000Hz to 4000Hz. To change the value, press the (+) key on the terminal's keypad to increment, or the (-) key to decrement the value.

After adjusting all settings on this screen, press the left arrow key on the terminal's keypad to move to the next setup screen.

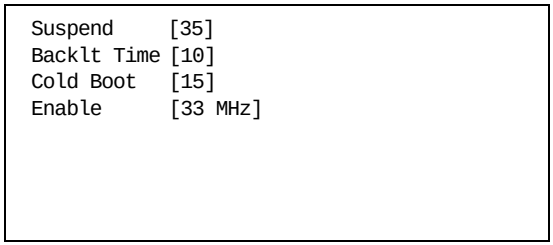


Figure 8-2. Setup Screen #2

Suspend

Set the length of time (in minutes) after which the terminal will suspend if left idle. Values are in increments of 5,and span 0-1000. The default value is 30. To change this value, press the (+) key on the terminal's keypad to increment, or the (-) key to decrement the value. When the correct value appears in the field, press the down arrow to move to the backlight time field.

Backlt Time

Set the length of time (in minutes) after which the backlight turns off. Values are in increments of 1, and span 0-60. The default value is 10. To change this value, press the (+) key on the terminal's keypad to increment, or the (-) key to decrement the value. When the correct value appears in the field, press the down arrow to move to the Cold Boot field.

Cold Boot

Set the time after which the terminal will perform a cold boot. Values are in increments of 1, and span 6-63. The default value is 15. To change the value, press the (+) key on the terminal's keypad to increment, or the (-) key to decrement the value. When the correct value appears in the field, press the down arrow to move to the Enable field.

Enable

Set the maximum allowable clockspeed. Values for this field are 33 MHz and 66 MHz. To change the value, press the (+) key on the terminal's keypad to increment, or the (-) key to decrement the value.

After adjusting all settings on this screen, press the left arrow key on the terminal's keypad to move to the next setup screen.

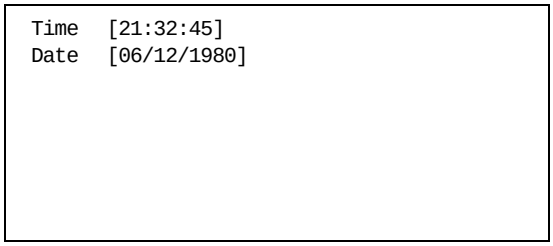


Figure 8-3. Setup Screen #3

Time

Set the correct system time, in the format HH:MM:SS. The system time is displayed in 24-hour format. To set the correct hour, press the (+) or (-) key on the terminal's keypad until the correct hour displays on the screen. Then press the space key (press the func key then the space key) on the terminal's keypad to move to the minutes field. Press the (+) or (-) key on the terminal's keypad until the correct minutes value displays on the screen. Then press the space key (press the func key and then the space key) on the terminal's keypad to move to the seconds field. Press the (+) or (-) key on the terminal's keypad until the correct seconds value displays on the screen. When the correct time displays on the screen, press the down arrow to move to the Date field. If you need to update any of the time fields, use the space key combination to move to the field needing update, then use the (+) or (-) key to update the value.

Date

Set the correct system date, in the format mm/dd/yyyy. To set the correct month, press the (+) or (-) key on the terminal's keypad until the correct month displays, then use the space key combination (func then space) on the terminal to move to the day field. Use the (+) or (-) key on the terminal's keypad until the correct date displays in the field. Then use the space key combination to move to the year field. Use the (+) or (-) key on the terminal's keypad until the correct year displays in the field. When the correct date appears in the date field, press the left arrow on the terminal's keypad to move to the next setup screen. If you need to update any of the values in the date field, use the space key combination (func then space) on the terminal's keypad until the correct date field is highlighted, then use the (+) or (-) field to update the value.

After adjusting all the settings on this screen, press the left arrow on the terminal's keypad to move to the next setup screen.

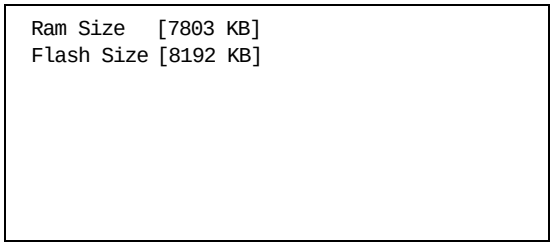


Figure 8-4. Setup Screen #4

This screen displays the size of the Ram and Flash disks. These are read-only fields, provided for reference only.

After reviewing the Ram and Flash Disk sizes, press the right arrow on the terminal's keypad to display the final setup screen.

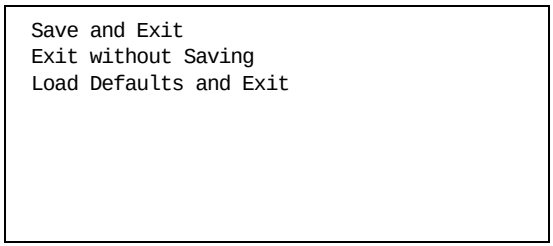
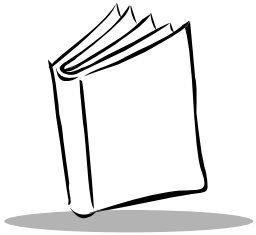


Figure 8-5. Setup Screen #5

On this screen, you have three options:

Save and Exit	Saves the current settings in all fields on the setup screens and exits the setup program. If selected, the terminal reboots.
Exit without Saving	Exits the setup program without saving any of the changes you have made to the fields on the setup screens. If selected, the terminal reboots.
Load Defaults and Exit	Resets all fields on the setup screens to their default values and exits the setup program. If selected, the terminal reboots.



Chapter 9
Terminal Configuration: Setting Up PCMCIA Cards

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Formatting PCMCIA Cards. 9-3
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Using DRVSPACE to Extend Storage on PCMCIA Cards 9-4

PCMCIA Cards

PCMCIA cards supplement the terminal's on-board flash or RAM, and provide additional I/O devices. There are many options regarding the type of card and format to use. For a discussion of PCMCIA card options, refer to Chapter 5, *Terminal Configuration Issues.*

Note: *Symbol's Scan Board provides a list of tested and approved PCMCIA cards for use with the PDT 7500.*

Formatting PCMCIA Cards

SRAM Cards

SRAM cards can be FAT-file formatted on the PDT 7500 terminal using the DOS format command.

Non-ATA Flash

Non-ATA flash cards are inexpensive, fast, nonvolatile, read only, and block erasable. We currently have no means of formatting these cards for use on the PDT 7500. FAT-file formatting using DOS format and CardSoft does not work on Non-ATA flashcards because DOS assumes that the card is a read/writable floppy, and these cards are not randomly writable. If an external method of FAT formatting non-ATA flash cards is available (some non-CardSoft PC card slots do support this), then CardSoft treats the card as if it were a write-protected SRAM.

ATA Cards

ATA Cards require a two-part formatting process: initialization and format.

1. To be formatted, the ATA card must first be initialized.
2. To initialize an ATA card, use CardSoft and the ATA initialization program ATAINIT.

   ATAINIT is provided with CardSoft. For more information, refer to the *CardSoft 3.1 User Guide*.

3. Once initialized, format the card using CardSoft and DOS format.

   Refer to the *CardSoft 3.1 User's Guide* for information on formatting the card.

Moving Files to PCMCIA Card

Once the cards are formatted, move or copy files to them as you would to any removable disk.

Using DRVSPACE to Extend Storage on PCMCIA Cards

DRVSPACE can be used to extend storage on PCMCIA cards in the same way it is used to extend storage on a standard PC drive. The process is as follows:

1. Insert an empty, formatted PCMCIA card in the development PC.
2. Type the following:

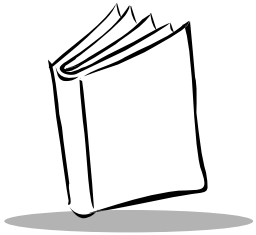
   ```
   create D: <Enter>
   ```

   where **D:** is the drive letter of the PCMCIA card.
3. DRVSPACE creates an empty compressed volume on the card.
4. Install the card in the PDT 7500, reboot the terminal.
5. When the terminal finishes booting, mount the card by typing:

   ```
   DRVSPACE D:
   ```

   where **D:** is the drive letter associated with the slot and card type being used.
6. If you use Chkdsk to check the amount of space available, there should be approximately twice as much space available as there is physical memory on the card.

For more information, refer to the *DRVSPACE User's Guide*, provided with the PDT 7500 SDK.



Chapter 10
Maintenance and Troubleshooting

Chapter Contents

Cleaning the Terminal 10-3
Storage 10-3
Terminal Troubleshooting 10-4
Cradle Problems 10-6

Cleaning the Terminal

The PDT 7500 requires a minimal amount of maintenance. To prolong its life and avoid problems, keep the terminal clean. Use a clean, soft cloth dampened with a mild cleanser such as soap and water to clean the terminal. Do NOT use abrasive paper/cloth or abrasive/ corrosive cleaners.

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

Storage

If the terminal will not be used for longer than a week, store it in a cool, dry place away from dust. Remove the battery pack and repackage the terminal in its original shipping container.

To store the terminal for a shorter period of time (a few days), leave the batteries in the terminal. Note that if the battery pack is left in the terminal for an extended amount of time, any data stored on the terminal may be lost. The Lithium-Ion battery pack must be kept charged to avoid loss of data.

Note: *If you leave the terminal without a main battery pack for longer than 20 minutes, reboot the terminal to reset the date and time.*

Terminal Troubleshooting

Table 10-1 covers some common terminal problems and corrective actions to take.

Table 10-1. Terminal Problems

Symptom	Possible Cause	Action
Terminal does not power up.	Battery pack not installed or fully charged.	Verify that the battery pack is installed in the terminal. Charge the battery pack, either in the terminal or separately, for a full 2 hours.
	Power supply is not plugged in.	Verify that the power supply is connected properly to the terminal and plugged in the wall socket.
	Battery pack is not properly latched.	Make sure the battery properly latched.
Cannot see screen.	Terminal not powered on.	Press the Power key on the terminal.
	Contrast not adjusted properly.	Press the blue FUNC key and then the Dark or Light keys to adjust contrast.
Touch screen not working	Display not properly calibrated.	Recalibrate the screen through calib75.com.
Scanner does not come on when trigger pressed.	Scanner driver is not loaded.	Verify that scanner driver is loaded on the terminal. Check application software to ensure that scanner driver is properly referenced.
Scanner does not decode a bar code.	Bar code is unreadable.	Verify that the bar code is not defective, i.e., smudged.
	Symbology not enabled.	Verify with the programmer that the application is designed to perform scanning.

Table 10-1. Terminal Problems (Continued)

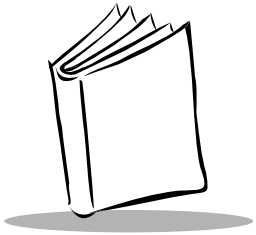
Symptom	Possible Cause	Action
Battery life is inadequate.	Battery pack not fully charged.	Charge the battery pack, either in the terminal or separately, for a full 2 hours.
	Battery pack is old.	Replace with a fresh, fully charged battery pack.
	Terminal being used in low-temperature conditions.	Battery life is shortened if used in extremely cold conditions.
	Unnecessary peripherals draining power.	Disconnect any peripherals not used to reduce the drain on the battery pack.
	The application is not designed for efficient power use.	Consider using power management services provided in Series 7000 SDK to reduce drain on battery pack.
Formatting SRAM card causes size error.	SRAM card is corrupt; the card format changed or was corrupted.	Use SRAMINIT utility, discussed in Chapter 9 to re-initialize the card.
Can't access SRAM card.		
Can't boot from SRAM card (COMMAND.COM not found).		

Cradle Problems

Table 10-2 lists some common cradle problems and actions to take to resolve them.

Table 10-2. Cradle Troubleshooting

Symptom	Probable Cause	Action
No communication between terminal and cradle.	Cradle driver not loaded.	Ensure that the cradle driver is loaded.
	Cradle mode was disabled by an API call.	Re-enable cradle mode via the appropriate API.
	Terminal not seated properly in cradle.	Reseat the terminal in cradle.
Rechargeable battery pack in terminal or spare battery pack did not charge.	Battery failed.	Replace battery pack
	Terminal or battery pack was removed from cradle too soon OR battery pack or terminal is improperly installed in cradle.	Replace terminal and/or spare battery pack in cradle and begin charging over. Battery pack requires 2 hours to recharge fully.



Appendix A
Specifications

Chapter Contents

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Decode Zones A-2
PDT 7500 Memory Map A-5

Environment

The PDT 7500 is designed to operate in harsh environments. Table A-1 below summarizes the PDT 7500's intended operating environment.

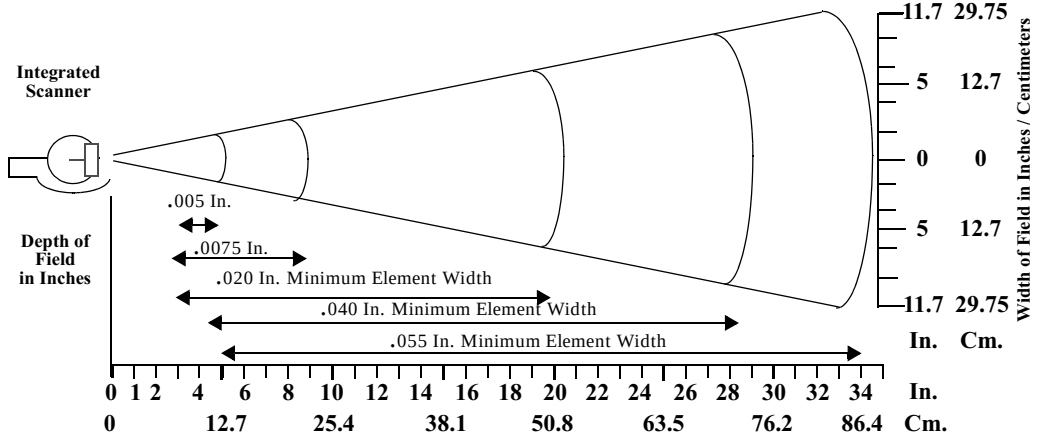
Table A-1. PDT 7500 Operating Environment

Operating Temperature	-20° C to 50° C*(-4° F to 122°) F
Humidity	0% to 95% non-condensing
Shipping and Storage Temperature	-30° C to 60° C (-22° F to 140° F)
Electrostatic Discharge	±15 kv
Drop to Concrete	2 meters (1 meter for full-screen VGA)
Sealing	IP 65 and Mil Standard 810E (windblown rain and dust)

Decode Zones

Standard Range

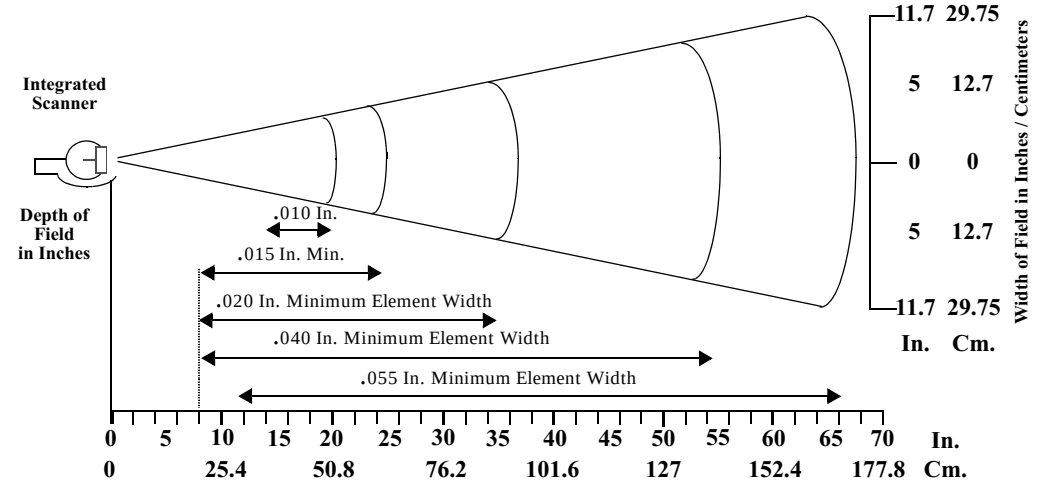
NOTE: Typical performance at 68° F (20° C) on high quality symbols.



Decode Zone: Depth of field as a function of minimum element width.

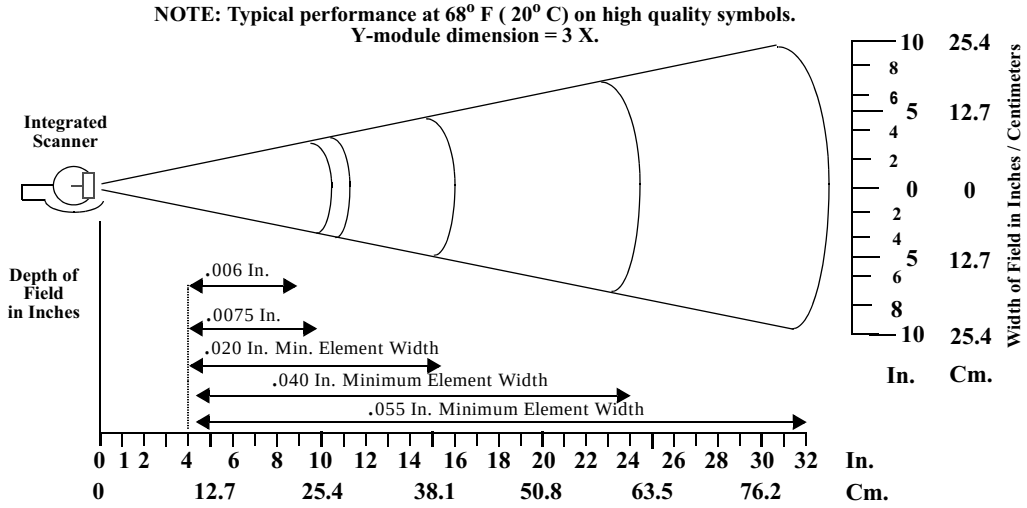
Long Range

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



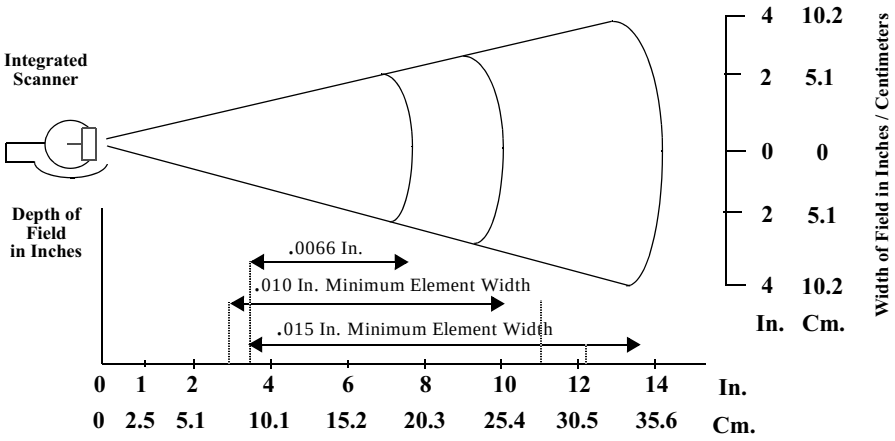
Long Range Decode Zone: Depth of field as a function of minimum element width.

SE 2000 1-D Decode Zone

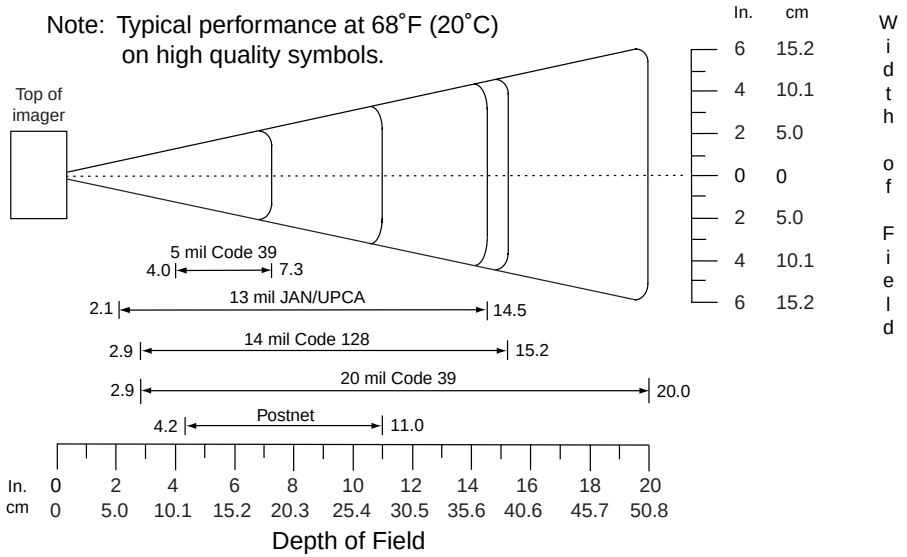


SE 2000 Decode Zone: Depth of field as a function of minimum element width.

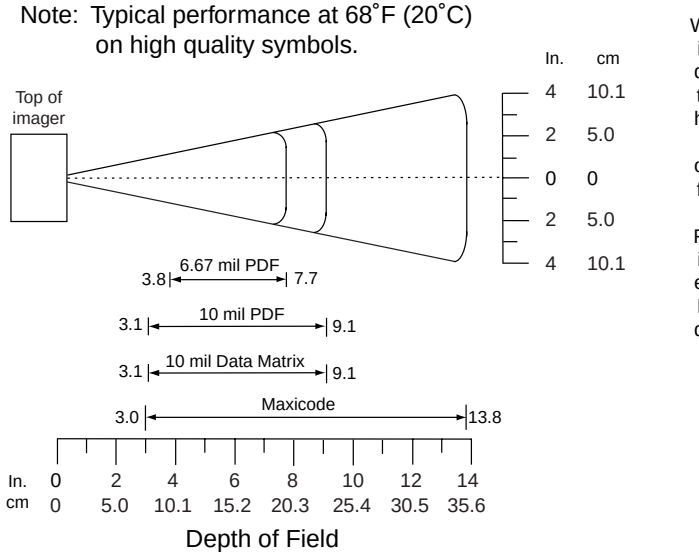
SE 2000 2-D Decode Zone (PDF417)



Imager 1-D Decode Zones



Imager 2-D Decode Zones



PDT 7500 Memory Map

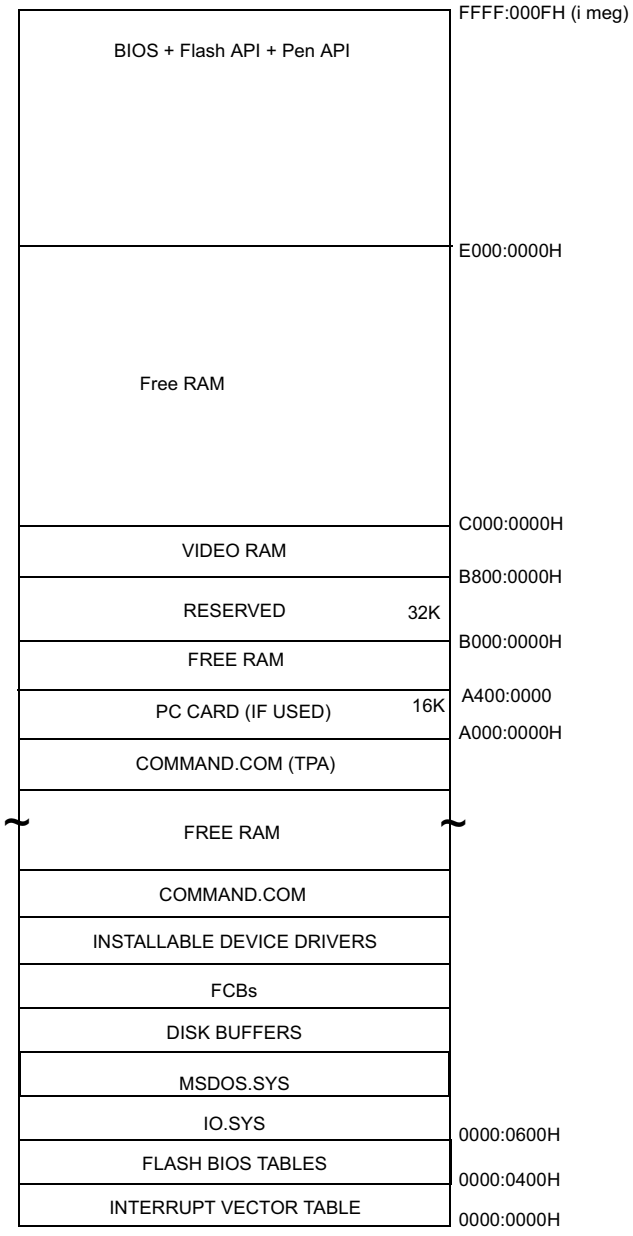


Table A-2. PDT 7500 Interrupt Definitions

DOS IRQ Name	**Win CE IRQ Name Interrupt ID Name Interrupt ID#**	**Interrupt Source**	**Interrupt Description**	**Notes/Comments**
IRQ 0	INTR_TIMER0 SYSINTR_RESCHEDULE 1	Internal to Elan	Timer Tick Interrupt (Internal Timer)	Standard PC Timer Tick
IRQ 1	INTR_KEYBOARD SYSINTR_KEYBOARD 8	Internal to Elan	AT Keyboard Interrupt (Emulation)	Emulated by SCP code in BIOS
IRQ 2	N/A	Internal to Elan	Cascade Interrupt (2nd 8259 - 2nd IRQ bank multiplex)	Not available for use.
IRQ 3	INTR_COM2 SYSINTR_SERIAL2 40	Internal to Elan	COM2 Interrupt (Elan Internal UART)	In 6200 and Cobalt 486, used for IrDA. In Cobalt 486, used for cradle status or debug port.
IRQ 4	INTR_COM1 SYSINTR_SERIAL 12	Elan PIRQ6 Pin	COM1 Interrupt (UART1 in ASIC)	In Cobalt 486, used for Primary Serial or Cradle Data. In 6200, used for Debug Port.
IRQ 5	INTR_COM3 SYSINTR_SERIAL3 39	Elan PIRQ7 Pin	COM3 Interrupt (UART3 in ASIC)	May be used for WAN, Cordless Printing, etc.

Table A-2. PDT 7500 Interrupt Definitions (Continued)

DOS IRQ Name	**Win CE IRQ Name Interrupt ID Name Interrupt ID#**	**Interrupt Source**	**Interrupt Description**	**Notes/Comments**
IRQ 6	INTR_PERIPH_MULITPLEX	Elan PIRQ4 Pin	Multiplex B in ASIC	Peripheral Multiplex Interrupt
	SYSINTR_PERIPH_KEYBOARD 37	Internal to ASIC (Keyboard)	Matrix Keypad Key Make Interrupt	IR or Switch Matrix key make activity
			Matrix Keypad Timer Interrupt	Matrix keypad timer logic
			Control-Alt-Delete Interrupt	Simulated CTL+ALT+DEL from timer on power switch.
			AT UART Interrupt	Interrupt from AT UART.
	SYSINTR_POWER 11	ASIC Input Pin	Power Key	Physical Power Key
	SYSINTR_TOUCH_CHANGED 19	ASIC Input Pin	Digitizer Pen Up Interrupt	Digitizer Pen Up activity
	SYSINTR_TOUCH 9	ASIC Input Pin	Digitizer Pen Down Interrupt	Digitizer Pen Down activity.
	SYSINTR_PERIPH_OPTBOARD 36	ASIC Input Pin	Option Board Interrupt	Option Board activity.
	SYSINTR_ADC 10	Internal to ASIC (ADC)	A/D Converter Interrupt	A/D Converter data ready.
	SYSINTR_AUDIO 13	ASIC Input Pin	Codec Interrupt	Codec data transfer complete.
IRQ 6 (cont'd)	SYSINTR_PERIPH_SPARE1 21	ASIC Input pin	Spare	ASIC Pin reserved for future expansion

Table A-2. PDT 7500 Interrupt Definitions (Continued)

DOS IRQ Name	**Win CE IRQ Name Interrupt ID Name Interrupt ID#**	**Interrupt Source**	**Interrupt Description**	**Notes/Comments**
IRQ 7	INTR_PCMCIA_B_DATA SYSINTR_PCMCIA_LEVEL 18	Internal to Elan	PC Card 2 Interrupt (PCMCIA Controller)	Used by PCMCIA card client driver.
IRQ 8	INTR_RTC SYSINTR_RTC_ALARM 20	Internal to Elan	RTC Alarm Interrupt 1 ms Tick Interrupt (Real Time Clock)	Optional
IRQ 9	N/A	Internal to Elan	Reserved for future PC-compatible Display Emulation (Cursor Write Trap)	Mapped to vector for IRQ2
IRQ 10	INTR_PCMCIA SYSINTR_PCMCIA_STATE 16	Internal to Elan	PCMCIA Status change interrupt (PCMCIA controller)	Used by PCMCIA card services.
IRQ 11	INTR_PCMCIA_DATA SYSINTR_PCMCIA_LEVEL 18	Internal to Elan	PC Card 1 Interrupt (PCMCIA controller)	Used by PCMCIA card client driver
IRQ 12	INTR_TIMER_MULTIPLEX	Elan PIRQ3 pin	Multiplex A in ASIC	Timer Multiplex Interrupt
	SYSINTR_TIMING 26	Internal to ASIC (Watch Dog)	Watch Dog Timer Interrupt	Low Resolution down counter

Table A-2. PDT 7500 Interrupt Definitions (Continued)

DOS IRQ Name	**Win CE IRQ Name Interrupt ID Name Interrupt ID#**	**Interrupt Source**	**Interrupt Description**	**Notes/Comments**
	SYSINTR_PROFILE 25	Internal to ASIC (1 ms timer)	Precision Timer Interrupt	Medium resolution down counter
	SYSINTR_TIMER_SPARE1 23	ASIC Input Pin	Spare	ASIC Pins reserved for future expansion
	SYSINTR_TIMER_SPARE2 22	ASIC Input Pin	Spare	ASIC Pins reserved for future expansion
IRQ 13	INTR_SPARE1 SYSINTR_SPARE1 38	Elan PIRQ1 Pin	Spare PIRQ	Spare Interrupt or Floppy Disk
IRQ 14	INTR_IDE SYSINTR_IDE 28	Elan PIRQ0 Pin	IDE Disk Interrupt (I/O address decoded by ASIC	In 6200, used for optional internal compact flash card.
IRQ 15	INTR_SCANNER_MULITPLEX	Elan PIRQ5 Pin	Multiplex C in ASIC	Scanner Multiplex Interrupt
	SYSINTR_TRIGGER	ASIC Input Pins	Right Trigger, Stage 1	State Change on ASIC pin.
			Right Trigger, Stage 2	State change on ASIC pin.
			Left Trigger, Stage 1	State change on ASIC pin
			Left Trigger, Stage 2	State change on ASIC pin.
			External Trigger, Stage 1	State change on ASIC pin
			External Trigger, Stage 2	State change on ASIC pin

Table A-2. PDT 7500 Interrupt Definitions (Continued)

DOS IRQ Name	**Win CE IRQ Name Interrupt ID Name Interrupt ID#**	**Interrupt Source**	**Interrupt Description**	**Notes/Comments**
	SYSINTR_SCANNER_SOS 34	Internal to ASIC (ASIC QSNAC)	SOS Interrupt	Non-decoded scanner DBP data ready
	SYSINTR_SCANNER_ZIF 33	ASIC Input Pin	ZIF Interrupt	Single or dual stage trigger status change.
	SYSINTR_SCANNER_DECODED 32	Internal to ASIC (ASIC UART 3)	UART 3 Interrupt	Decoded scanner transfer activity.
	SYSINTR_SCANNER_SPARE1 31	ASIC Input Pin	Spare	ASIC Pin reserved for future expansion
	SYSINTR_SCANNER_ SPARE2 30	ASIC Input Pin	Spare	ASIC Pin reserved for future expansion
	SYSINTR_SCANNER_SPARE3 29	ASIC Input Pin	Spare	ASIC Pin reserved for future expansion
XMI	XMI	Elan GPIO_CS0 Pin	XMI from ASIC	
	N/A	XMI Multiplex Interrupt	Soft XMI	Software generated XMI by writing to ASIC register.
			Clock Ready	Clock control module indication that clocks are ready for high speed mode
			Battery Eject	Battery eject switch status change
			Power Key	Physical Power Switch
			Keyboard Multiplex	ASIC Keyboard multiplex register
			Smart Battery Data Ready	Smart Battery data transfer complete.

Table A-2. PDT 7500 Interrupt Definitions (Continued)

DOS IRQ Name	**Win CE IRQ Name Interrupt ID Name Interrupt ID#**	**Interrupt Source**	**Interrupt Description**	**Notes/Comments**
			A/D Converter Channels 0-7 Data Ready	A/D Converter data conversion complete
Wake Up		Elan Suspres Pin	WAKEUP multiplex from ASIC	
	SUSPRES	WAKE UP Multiplex	COM1 Ring	Wakeup from RI signal change on ASIC internal UART1
			COM2 Ring	Reserved for wakeup from Elan internal UART
			PCMCIA Card 1	Reserved for wakeup from Elan internal PCMCIA Card 1 interrupt.
			PCMCIA Card 2	Reserved for wakeup from Elan internal PCMCIA Card 2 interrupt.
			COM3 Ring	Wakeup from RI signal change on ASIC internal UART3.
			RTC Alarm	Reserved for wakeup from Elan internal RTC Alarm interrupt.
			Touch Pad	Wakeup from ASIC external digitizer activity interrupt pin.

Table A-2. PDT 7500 Interrupt Definitions (Continued)

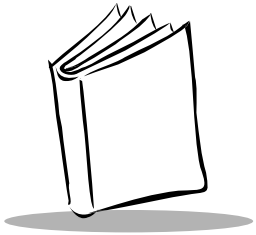
DOS IRQ Name	**Win CE IRQ Name Interrupt ID Name Interrupt ID#**	**Interrupt Source**	**Interrupt Description**	**Notes/Comments**
			Keyboard	Wakeup from ASIC internal Matrix Keyboard Key Press interrupt or ASIC intenal AT UART character receive interrupt.
			Right Trigger	Wakeup from signal change on ASIC external Trigger 0 or Trigger 3 interrupt pins indicating trigger press (not release)
			Left Trigger	Wakeup from signal change on ASIC external Trigger 1 or Trigger 4 interrupt pins indicating trigger press (not release)
			External Trigger	Wakeup from signal change on ASIC external Trigger 2 or Trigger 5 interrupt pins indicating trigger press (not release)
			Battery Insertion	Wakeup from signal change on ASIC external battery eject interrupt pin indicating closure of battery eject switch (e.g., battery present)

Table A-2. PDT 7500 Interrupt Definitions (Continued)

DOS IRQ Name	**Win CE IRQ Name Interrupt ID Name Interrupt ID#**	**Interrupt Source**	**Interrupt Description**	**Notes/Comments**
			Cradle Removal	Wakeup from signal change(s) on ASIC external AC power and cradle status pins indicating removal from cradle.
			Cradle Insertion	Wakeup from signal change(s) on ASIC external AC power and cradle status pins indicating insertion into cradle.
			AC connection	Wakeup from signal change on Elan external ACIN pin indicating connection of AC Power.
			Power Switch	Wakeup from signal change on ASIC external Power Switch pin indicating that Power Switch was pressed, held for less than the control-alt-delete time, then released.
			COM1 RXD	Wakeup from mark-to-space transition on RXD signal on ASIC internal UART1
			COM2 RXD	Reserved for wakeup from mark-to-space transition on RXD signal on Elan internal UART

Table A-2. PDT 7500 Interrupt Definitions (Continued)

DOS IRQ Name	**Win CE IRQ Name Interrupt ID Name Interrupt ID#**	**Interrupt Source**	**Interrupt Description**	**Notes/Comments**
			COM3 RXD	Wakeup from mark-to-space transition on RXD signal on ASIC internal UART3.



Appendix B
Keyboard States

Chapter Contents

Introduction B-1
Keyboard Operation. B-1
Keyboard Diagrams B-2

Introduction

The PDT 7500 terminal has a configurable keyboard. By combining keystrokes, the keyboard can emulate the full 101-key IBM-PC AT keyboard.

This appendix describes how key codes are produced on the PDT 7500 terminal, and provides the standard keyboard definitions. Instructions for writing keyboard mapping tables are covered in Chapter 10, *Maintenance and Troubleshooting*.

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, or alternate. The scan code generated by each key is constant, independent of the keyboard state.

The PDT 7500 keyboard emulates the full PC/AT keyboard by using one or more modifier keys in sequence, followed by a character key. The modifier keys are:

- Shift

- Function (Func)
- Alpha
- Control (Ctrl)
- Alternate (Alt).

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 Figure B-1 through Figure B-12.

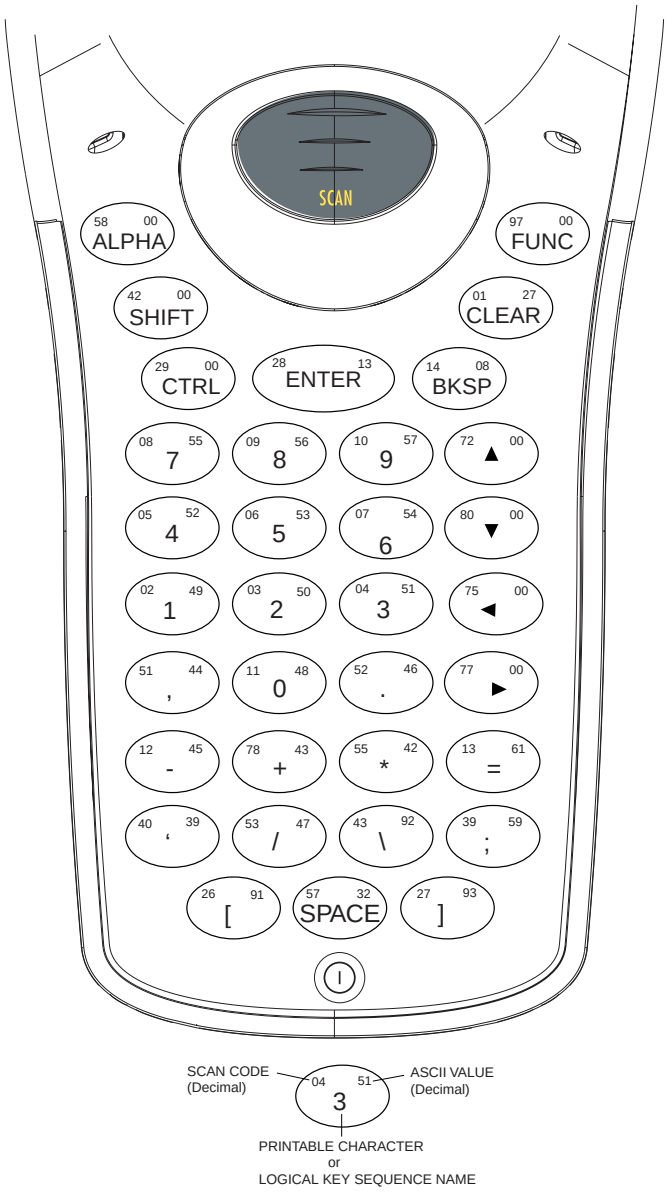


Figure B-1. PDT 7500 36-Key Unshifted State

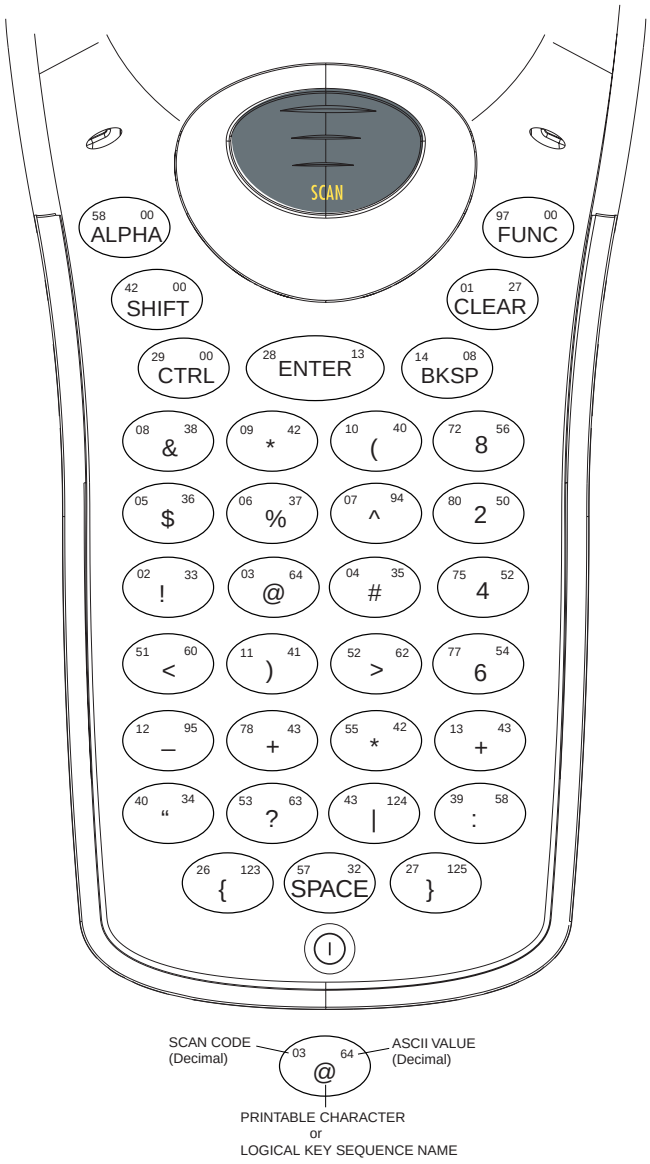


Figure B-2. PDT 7500 36-Key Shift State

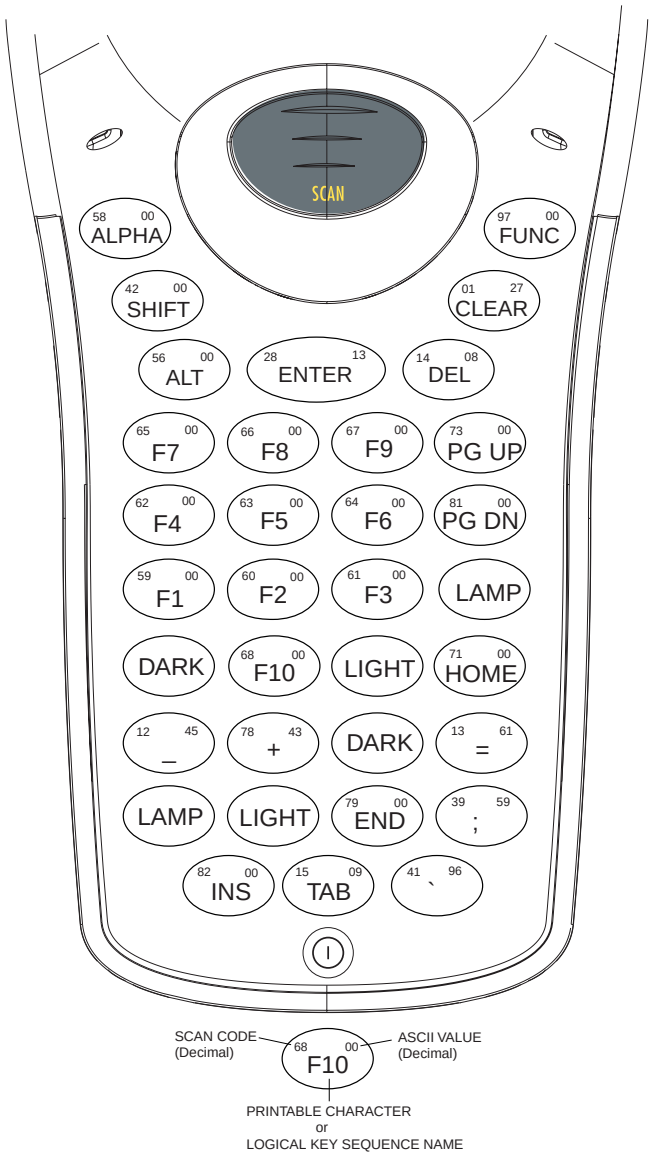


Figure B-3. PDT 7500 36-Key Func State

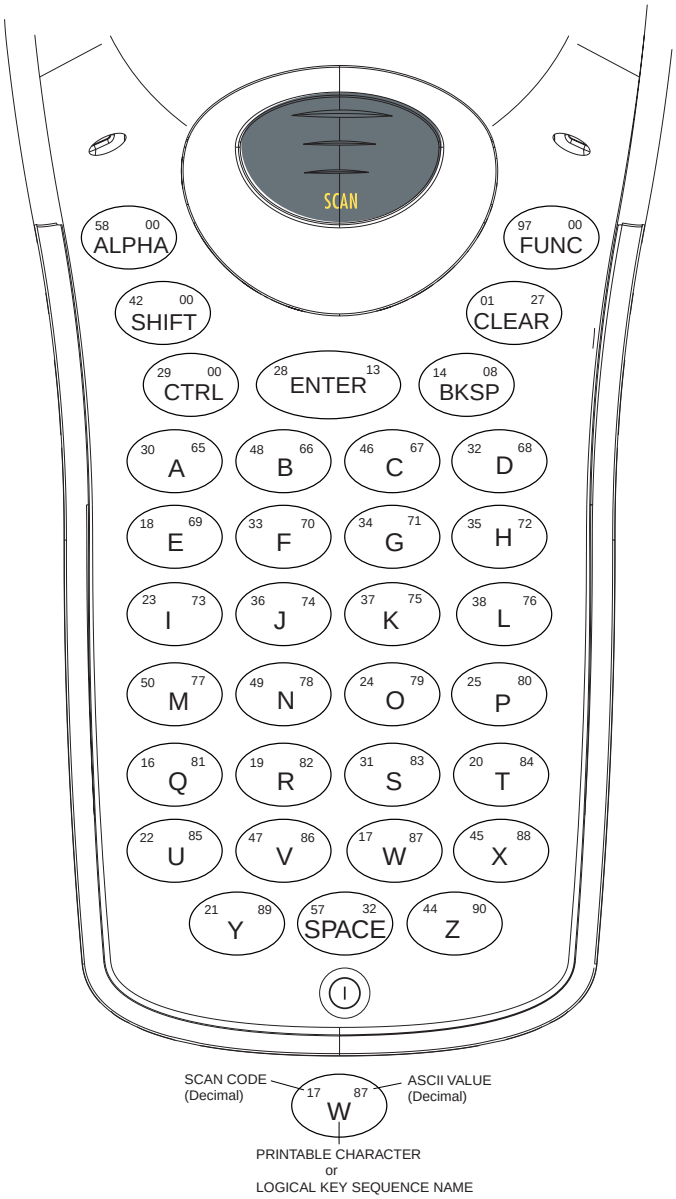


Figure B-4. PDT 7500 36-Key Alpha State

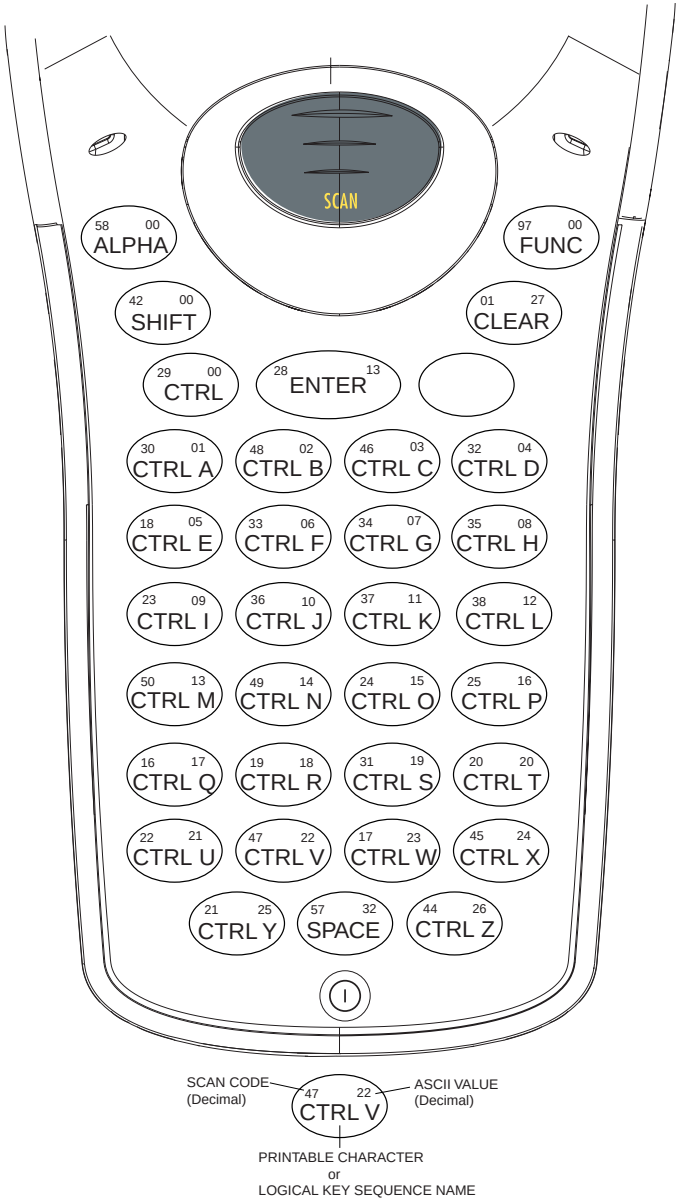


Figure B-5. PDT 7500 36-Key Control State

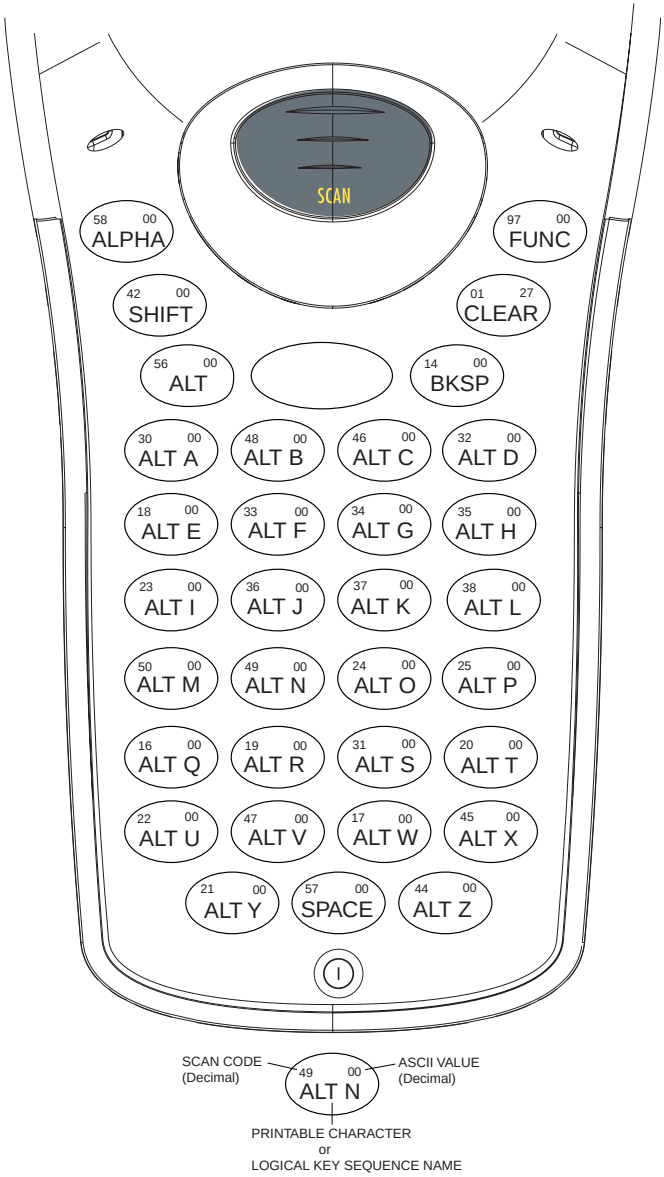


Figure B-6. PDT 7500 36-Key Alt (Func Ctrl) State

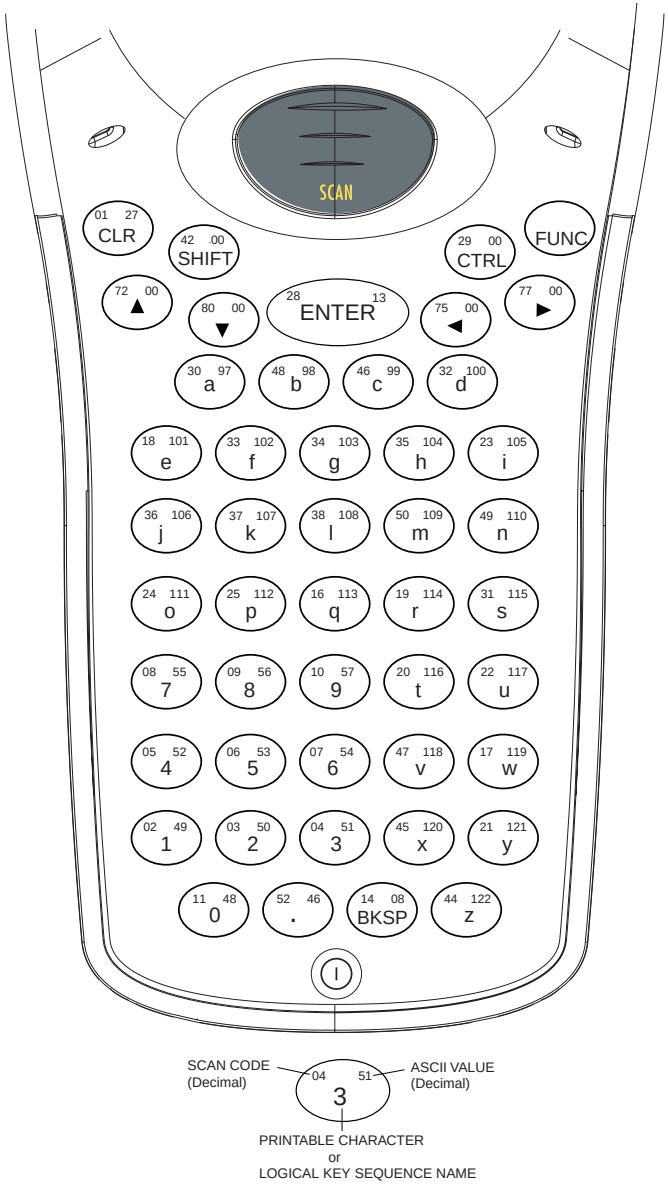


Figure B-7. PDT 7500 49-Key Unshifted State

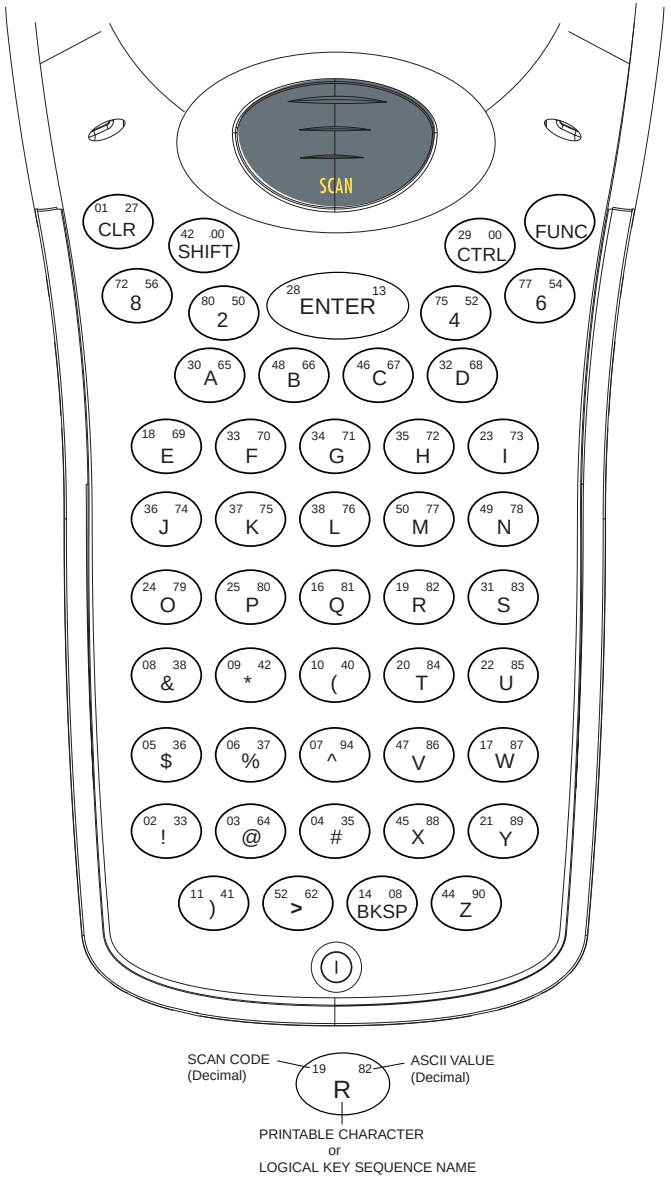


Figure B-8. PDT 7500 49-Key Shift State

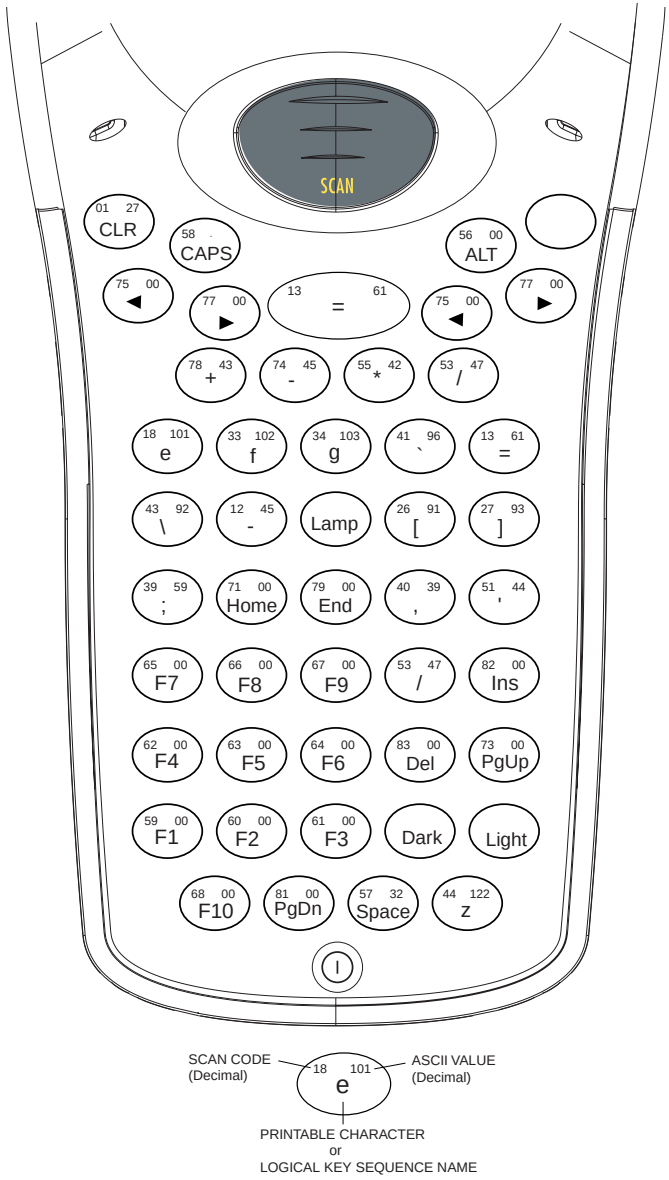


Figure B-9. PDT 7500 49-Key Func State

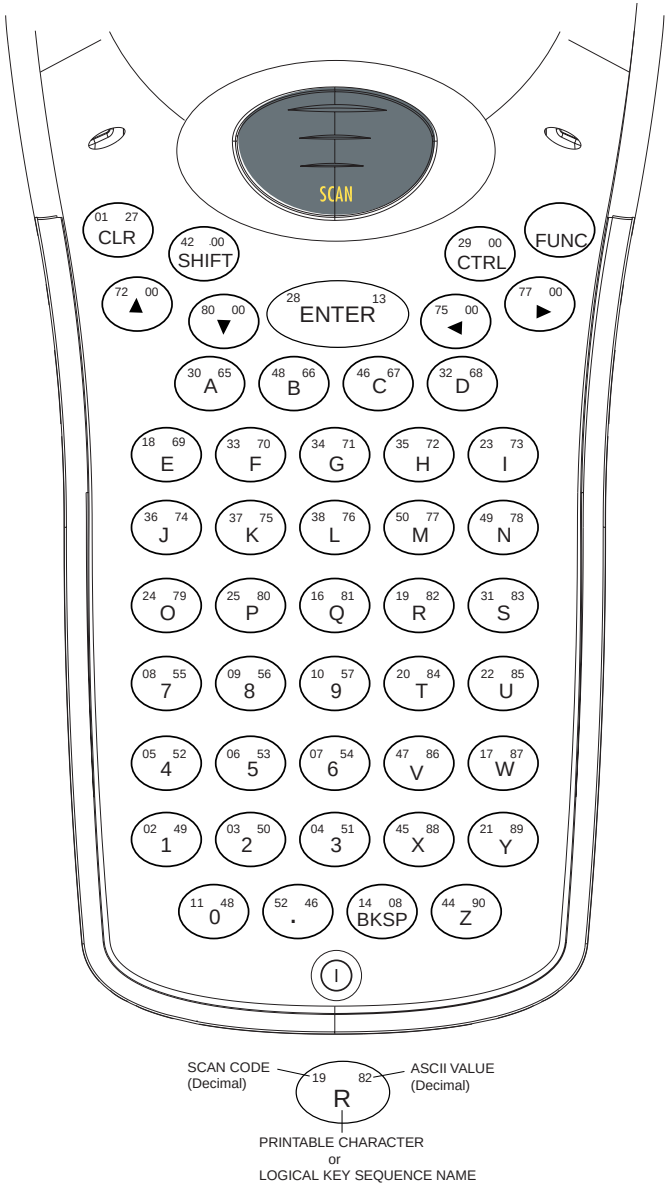


Figure B-10. PDT 7500 49-Key Alpha (Caps Lock) State

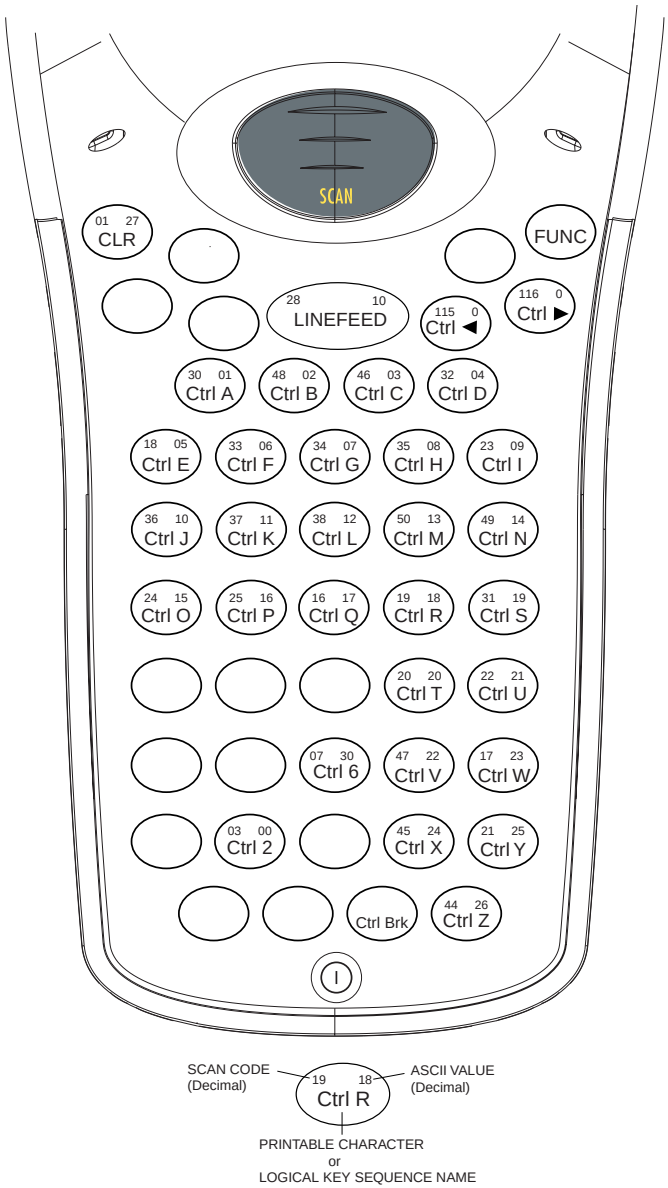


Figure B-11. PDT 7500 49-Key Control State

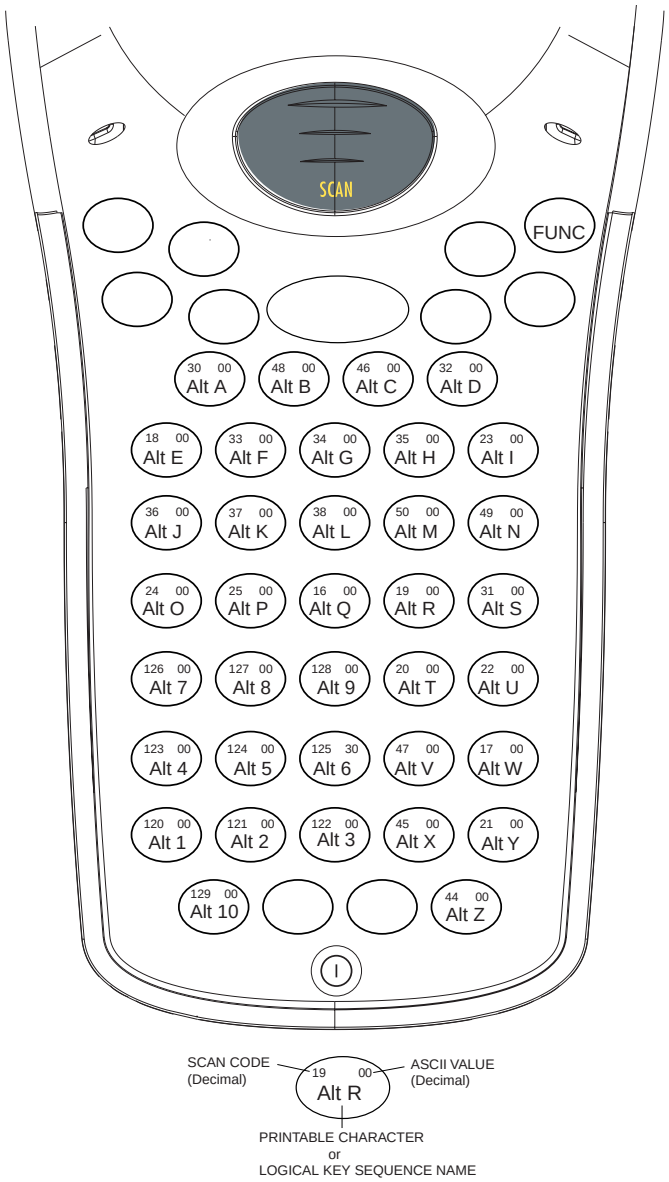


Figure B-12. PDT 7500 49-Key Alt (Func Ctrl) State

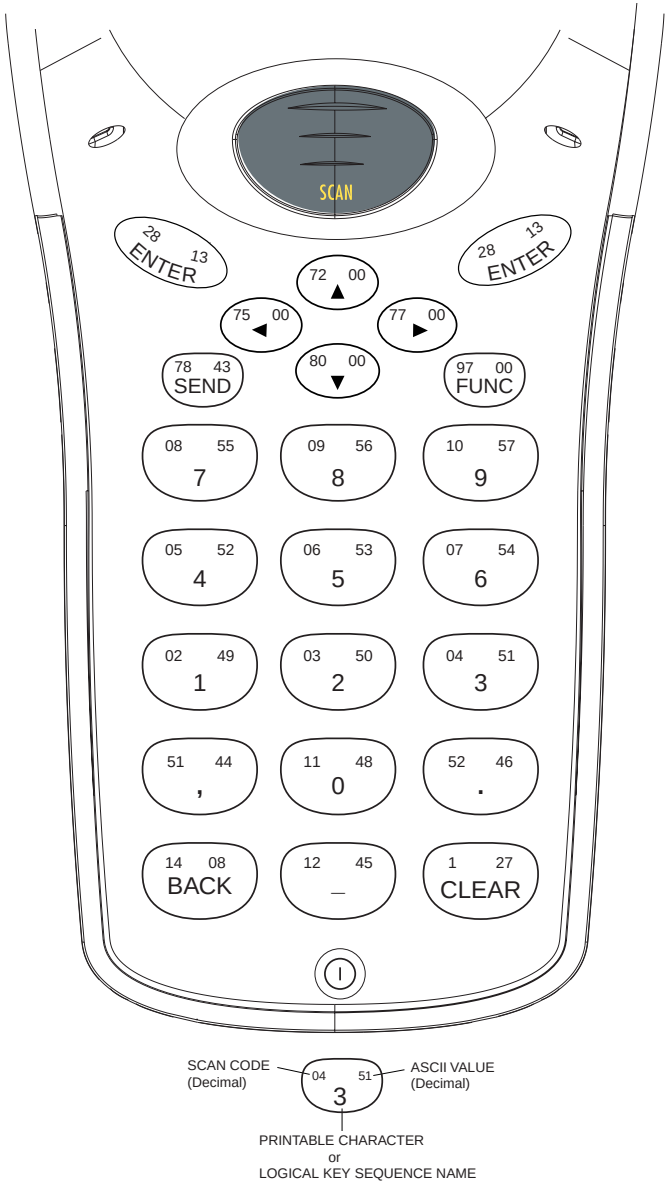


Figure B-13. PDT 7500 25-Key Unshifted State

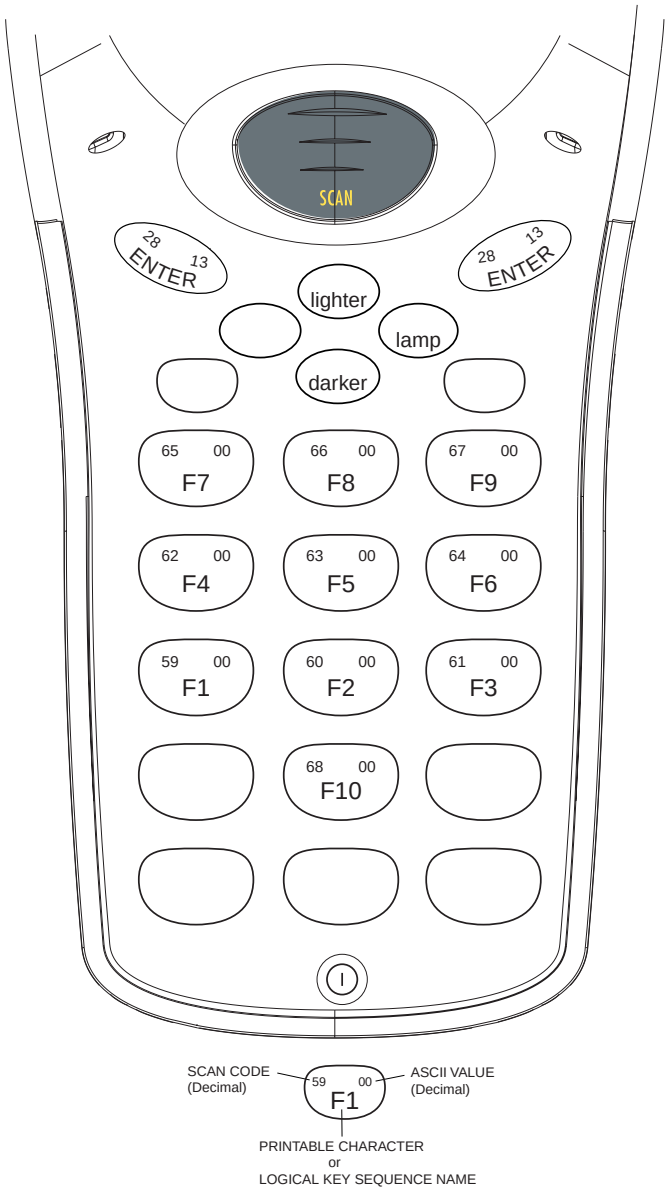
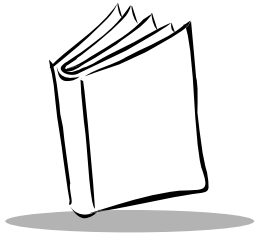


Figure B-14. PDT 7500 25-Key Func State



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_____

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_____
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