Palm® Developer Guide, Windows Mobile® Platform

Software and Hardware

Rev. G

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Document Revision History

Date	Revision	Description of Changes
September 5, 2006	B	Additions and revisions for Treo 700wx smartphones.
October 2, 2006	C	Additions and revisions for Treo 750v smartphones.
October 18, 2006	D	Additions and revisions for Treo 700wx (ROW) smartphones.
December 15, 2006	E	Additions and revisions for Treo 750 smartphones.
February 1, 2007	F	Additions and revisions for Treo 750 (ROW) smartphones.
February 21, 2007	G	Additions and revisions for Treo 700wx smartphones for Verizon and for Treo 750v smartphone maintenance release.

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Contents

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What's New

This section provides an overview of new features and product developments that have been implemented since the last release of the *Palm® Developer Guide, Windows Mobile® Platform*.

The current revision of this document reflects feature and specification additions for the Palm Treo™ 700wx smartphones for Verizon and the Treo™ 750v maintenance release.

Specific changes and additions to this document revision include:

- Added information on the Windows Vista operating system and Windows Mobile Device Center to **Section 1.3.3 on page 12** and **Section 7.3 on page 63**.
- Added information about the Designed for Palm Products program to **Section 1.4.3 on page 15**.
- Added information on Treo 700wx smartphones to **Section 2.2 on page 19**.
- Added information on the Treo 750v smartphone maintenance release to **Section 2.4 on page 24**.
- Added a table on supported Bluetooth profiles by device to **Section 2.9 on page 34**.
- Added information on ActiveSync connectivity issues to the Troubleshooting Guide in **Section 8.3.1 on page 68**.

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CHAPTER 1

1. Developer Guide Overview

This chapter explains the layout of the *Developer Guide* and includes Getting Started information on developing for the Palm devices on the Windows Mobile® platform, including how to locate API documentation for the Palm® Software Development Kit (SDK) for the Windows Mobile® platform.

1.1 Intended audience

The Palm SDK for the Windows Mobile platform and *Developer Guide* are intended for experienced developers who have a firm knowledge of the Windows Mobile platform. It is not meant to be a general introduction to Windows Mobile 5.0 programming. Instead, this guide describes the features that are unique to developing accessories and software applications for Windows Mobile-based Treo™ smartphones.

1.2 How this guide is organized

This *Developer Guide* contains an overview of the Windows Mobile-based Treo smartphone product line, including Treo 700w, Treo 700wx, Treo 750, and Treo 750v smartphones. It describes the differentiating software features of Windows Mobile-based Treo smartphones, and the tools, interfaces, and libraries of the SDK. It also describes hardware specifications and includes a general discussion of Treo APIs. For more detailed information on APIs, see the *Palm API Guide, Windows Mobile Platform*.

1.3 Getting started

Microsoft Windows Mobile is a robust and well-supported environment for developers to build applications for Palm smart mobile devices. Palm Windows Mobile-based devices are built on Window Mobile 5.0 Pocket PC Phone Edition, a multithreaded development environment that includes APIs for multimedia, networking, PIM management, and games, as well as an improved security model. Visual Studio 2005 and SQL Server 2005 Mobile Edition are included, with improved support for testing and debugging, as well as standardized API sets such as Direct3DMobile, Direct Draw, and Direct Show. Windows Media 10 Mobile is also included. The Windows Mobile platform is supported by a wide variety of technical resources for developers.

Use the steps in the following sections to set up your development environment and begin developing applications for Windows Mobile-based Palm devices.

1.3.1 Acquire Visual Studio 2005

To developer for Palm Windows Mobile-based smartphones, you will need to use Visual Studio 2005, Microsoft's integrated development environment (IDE). Purchase and download the tool from the following URL:

http://msdn2.microsoft.com/en-us/vstudio/default.aspx

NOTE: Previous embedded compilers can be used, however various features such as direct debugging are not supported.

1.3.2 Download Microsoft Windows Mobile 5.x SDK for Pocket PC

Microsoft's Windows Mobile 5.x SDK for Pocket PC extends Visual Studio 2005 in order for you to write software for Windows Mobile 5.0 based Pocket PC devices.

Download the SDK from the following URL:

http://www.microsoft.com/downloads/details.aspx?familyid=83A52AF2-F524-4EC5-9155-717CBE5D25ED&displaylang=en

For more information on getting started with Windows Mobile, go to **http://www.msdn.com**

1.3.3 Get ActiveSync 4.2 or Windows Mobile Device Center

To connect your device to a PC and manage synchronizations, you will need either ActiveSync 4.2 or Windows Mobile Device Center, depending on your operating system.

- **Windows XP or earlier -** you will need ActiveSync 4.2. Download it from the following URL:

  http://www.microsoft.com/windowsmobile/downloads/activesync42.mspx

- **Windows Vista -** your synchronization settings will be managed through the Windows Mobile Device Center. Download it from the following URL:

  http://www.microsoft.com/windowsmobile/devicecenter.mspx

1.3.4 Join the Palm Developer Network (PDN)

The Palm Developer Network (PDN) is a website resource for mobile hardware and software developers creating prosumer, enterprise, and services solutions targeting Palm devices who want to increase their solution sales, profitability and brand value.

PDN is a comprehensive mobile solution community developer program that offers developers a broad set of technical, marketing, and sales services. PDN was designed by developers for developers, and offers a comprehensive set of technical, marketing, and sales services designed to help mobile solutions developers move rapidly from concept to market with reduced cost and complexity.

For registered members of the Palm Developer Network (PDN) program, the PDN website provides resources including:

- Palm SDKs
- Emulators

- Debugging tools
- Documentation
- Knowledge Base of developers' frequently asked questions
- Developer community forums
- Newsletter
- Information on the Palm Device Loaner Program
- Information on the Palm Compatibility Logo Program
- Visit **https://pdn.palm.com** for complete details on the Palm Developer Network.

1.3.5 Download The Palm® SDK for the Windows Mobile® platform

The Palm SDK for the Windows Mobile platform contains the tools necessary to develop Windows Mobile 5.0 applications that take advantage of the differentiated features of Windows Mobile-based Treo smartphones. The SDK also includes interfaces and libraries of the released Treo APIs referenced in this *Developer Guide*, as well as sample applications and instructions.

The latest Palm SDK for Windows Mobile is available for download from the Palm Developer Network (PDN) at **https://pdn.palm.com**.

An installer, called **PalmWMHeadersAndLibs.msi**, integrates the Treo API header and library files into the Visual Studio 2005 development environment.

A carrier-specific emulator installer also installs the system image and skins for Windows Mobile-based Treo smartphones. Installers are currently available for the Treo 700w, Treo 700wx, and Treo 750/Treo 750v smartphone emulators at the PDN website.

1.3.5.1 Software requirements

Because the Treo APIs are an extension of Windows Mobile 5.0 functionality, the Palm SDK for Windows Mobile is also an extension of the Microsoft Windows Mobile 5.0 SDK. The Palm SDK for Windows Mobile provides only the additional Palm-specific libraries and functionality; it does not duplicate the Microsoft Windows Mobile 5.0 SDK.

Before installing the Palm SDK for the Windows Mobile platform, you must install the following software:

1. Visual Studio 2005 - **http://msdn.microsoft.com/vstudio/**.
2. The Microsoft Windows Mobile 5.0 Pocket PC SDK from **http://msdn.microsoft.com/windowsmobile**.
3. To use the Windows Mobile-based Treo smartphone emulators with Visual Studio 2005, download the Virtual Machine Network Driver from **http://www.microsoft.com/downloads/details.aspx?FamilyID=dc8332d6-565f-4a57-be8c-1d4718d3af65&displaylang=en**

1.3.5.2 Downloading the SDK

The latest Palm SDK for Windows Mobile is available for download from **https://pdn.palm.com**. The installer file, **PalmWMHeadersAndLibs.msi**, and all developer-specific documentation is available at this site.

1.3.5.3 Installing the SDK

To install the Palm SDK for Windows Mobile from PDN, double-click the **PalmWMHeadersAndLibs.msi** file in the zip file. The API header and library files are placed in the *..\wce500\Windows Mobile 5.0 PocketPC PC SDK\Include* and *..\wce500\Windows Mobile 5.0 PocketPC SDK\Lib* directories respectively, where " . ." represents the path on your local machine.

Next, install the emulator by double clicking the appropriate file for your device:

- **Treo 700w -** Treo700w1.10VerizonEmulatorVSInstaller.msi
- **Treo 700wx -** Treo700wxEmulatorVSInstaller.msi
- **Treo 750/Treo 750v -** Treo750EmulatorVSInstaller.msi

This installs the emulator and configures it to work automatically with Visual Studio 2005. For more information on the emulator, see **Chapter 5**.

1.3.5.4 Sample code

For sample code that gives examples for using specific APIs for Treo 700w, Treo 700wx, Treo 750, and Treo 750v smartphones, refer to the Sample Code section of the Palm SDK for Windows Mobile.

1.3.5.5 SDK documentation

For the most recent information about changes and updates to the Palm SDK for Windows Mobile, see the Release Notes, which are included in the SDK download.

Additional documentation, including the *Palm® Developer Guide, Windows Mobile® Platform* (this document), the *Palm API Guide*, *Windows Mobile Platform,* Application Notes, and Frequently Asked Questions, are available on PDN at **https://pdn.palm.com**.

1.4 Additional documentation and resources

1.4.1 Palm Customer Service and Support

User Manuals, support information, and other documentation on Palm devices can be found at the Palm Customer Service and Support website, **http://www.palm.com/us/support/**.

1.4.2 PDN Knowledge Base

Also, for a searchable collection of Frequently Asked Questions, visit the PDN website at **https://pdn.palm.com**. When you join the program and log in, click the Knowledge Base link on the navbar. Use the pull-down menus to sort for Windows Mobile platform-specific issues.

The PDN Knowledge Base is updated with new "Answers" on a monthly basis.

1.4.3 Designed for Palm® Products Program

The Designed for Palm Products (DFPP) Logo Program is Palm's compatibility and logo program for mobile application developers. Developers participate in the program by submitting applications for compatibility testing done by a third party testing facility, and upon passing, receive use of the Palm logo and other exclusive marketing benefits.

The Designed for Palm Products Program ensures seamless interoperability with Palm's mobile devices. When your solutions interoperate with Palm products, customers gain access to a wider choice of applications that suit their individual needs, as well as greater confidence in the Palm product line. The DFPP focus is on ensuring a high-quality experience for consumers and mobile professionals who use Palm products, so they can fully appreciate the value of your innovative solutions.

In addition to use of the DFPP Logo, developers whose products complete compatibility testing, receive the following:

- Use of the DFPP Logo Program on sales and marketing materials, product packaging, website and at tradeshows
- Sales and marketing opportunities
- Access to DFPP program developer forums
- And more

For complete program details and benefits, first join the Palm Developer Network (PDN) program at **https://pdn.palm.com**. Then, from the navbar on the left side of the PDN home page, select **Market > compatibility logo program**.

Here, you will find the Designed for Palm Product Program Datasheet and complete details on how to apply for and prepare your applications for the DFPP program.

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CHAPTER 2

2. Product Line Overview

This chapter describes Palm® Windows Mobile®-based Treo™ smartphones, their features, hardware specifications, and how they differ from other Windows Mobile devices.

IMPORTANT: An application written for a generic Windows Mobile 5.0 device will work correctly on Windows Mobile-based Treo smartphones as long as square-screen support is included and documented Microsoft APIs are followed.

2.1 Treo™ 700w smartphone

The Treo smartphone by Palm is a compact smartphone that integrates a mobile phone, wireless data applications, such as messenging and web browsing, and integrated organizer functionality. The Treo 700w smartphone is based on the Microsoft Windows Mobile 5.0 Pocket PC Phone Edition.

The Treo 700w smartphone features a dual-band CDMA2000 1xRTT/EvDO radio on the following frequencies:

- 800 MHz, Cellular band
- 1900 MHz, PCS band

The following Windows Mobile 5.0 features and custom software are available in the Treo 700w smartphone:

- ActiveSync
- Bubble Breaker
- Calculator
- Camera (still photos and video)
  - Still and video capture
  - Still and video management
- Download Agent
- Downloads
- File Explorer
- Internet Explorer Mobile
- Microsoft® Office Mobile
  - Word Mobile™

  - Excel® Mobile
  - PowerPoint® Mobile
- Microsoft Office Outlook® Mobile
  - Email
  - Calendar
  - Contacts
  - Tasks
  - Notes
- Microsoft Voice Command (v1.5)
- MMS Messaging
- Navigation
  - 5-way
  - Soft Keys
- Nonvolatile file system (NVFS) for user store
- Phone
- Piscel PDF Viewer
- Pocket MSN®
- Quick Tour
- Search
- SMS Messaging
- Solitaire
- Sounds Manager
- Terminal Services Client
- Windows Media® Player 10 Mobile
- Wireless Sync Email

2.1.1 What's not supported by Treo™ 700w smartphones

- Java (Java support can be added with a third-party Java Virtual Machine)
- Peripheral class detection

2.2 Treo™ 700wx smartphone

The Treo smartphone by Palm is a compact smartphone that integrates a mobile phone, wireless data applications, such as messenging and web browsing, and integrated organizer functionality. The Treo 700wx smartphone is based on the Microsoft Windows Mobile 5.2 (AKU 2.2.2) Pocket PC Phone Edition.

The Treo 700w smartphone features a dual-band CDMA2000 1xRTT/EvDO radio on the following frequencies:

- 800 MHz, Cellular band
- 1900 MHz, PCS band

The following Windows Mobile 5.2 features and custom software are available in the Treo 700w smartphone:

- ActiveSync
- Bubble Breaker
- Calculator
- Camera (still photos and video)
  - Still and video capture
  - Still and video management
- Dial-up networking via USB is supported between Treo 700wx smartphones and Windows-based PCs
- Download Agent
- File Explorer
- Good Mobile Messaging™ (Sprint only)
- Internet Explorer Mobile
- Microsoft® Office Mobile
  - Word Mobile™
  - Excel® Mobile
  - PowerPoint® Mobile
- Microsoft Office Outlook® Mobile
  - Email
  - Calendar
  - Contacts
  - Tasks
  - Notes
- Microsoft Voice Command (v1.5)
- MMS Messaging (Sprint only)
- My Treo (Sprint only)

- Navigation
  - 5-way
  - Soft Keys
- Nonvolatile file system (NVFS) for user store
- Peripheral class detection (Treo 700wx for Verizon only)
- Phone
- Piscel PDF Viewer
- Pocket MSN®
- Quick Tour
- Roam guard
- Search
- SMS Messaging
- Solitaire
- Sounds Manager
- Sprint On Demand (Sprint only)
- Sprint PCS Business Connection by SEVEN (Sprint only)
- Terminal Services Client
- Windows Media® Player 10 Mobile
- Windows Messaging and Security Feature Pack (MSFP), which allows for true push email from exchange servers.

2.2.1 Localized system images

Treo 700wx smartphone system images are available in the following single language versions:

- English
- Spanish
- French
- Brazilian Portuguese

2.2.2 What's not supported by Treo™ 700wx smartphones

- Dial-up networking via Bluetooth or IR
- Dial-up networking with a Macintosh
- Java (Java support can be added with a third-party Java Virtual Machine)
- Peripheral class detection (with the exception of the Treo 700wx for Verizon)

2.3 Treo™ 750 smartphone

The Treo smartphone by Palm is a compact smartphone that integrates a mobile phone, wireless data applications, such as messenging and web browsing, and integrated organizer functionality. The Treo 750 smartphone is based on the Microsoft Windows Mobile 5.2 (AKU 2.3) Pocket PC Phone Edition.

A Treo 750 Rest of World (ROW) release for specific carriers is available that upgrades the operating system to Windows Mobile 5.2 (AKU 2.6.3). This update provides Access Point Name (APN) support for Microsoft push email and HSDPA.

For updates, refer to the Palm Support website at the following URL:

http://www.palm.com/us/support/index.html

For the current list of carriers included in the Treo 750 ROW release, visit the Palm Developer Network website at **https://pdn.palm.com** and navigate to the Treo 750 device page.

NOTE: For information on device differentiation, see **Section 3.3 on page 38**.

The Treo 750 smartphone is currently available in a radio version that is optimized for the North American market. While it is a quad-band device, the radio does have reduced performance on the European and Asian 900 MHz band.

- **GSM/GPRS/EDGE radio (class B multi-slot class 10)**
  - 850 MHz (NA band)
  - 900 MHz (EU/Asia band)
  - 1800 MHz (EU/Asia band)
  - 1900 Mhz (NA band)
- **UMTS with HSDPA* supported at 1.8 Mbps (Category 12)**
  - UMTS 850 (Operating Band V - NA band)
  - UMTS 1900 (Operating Band II - NA band)
  - UMTS 2100 (Operating Band I - EU/Asia band)

* HSDPA is included only in the Treo 750 ROW release for specified carriers.

The following Windows Mobile 5.2 features and custom software are available in the Treo 750 smartphone:

- ActiveSync
- Bubble Breaker
- Calculator
- Camera (still photos and video)
  - Still and video capture
  - Still and video management
- Dial-up networking via Bluetooth and USB is supported between Treo 750v smartphones and Windows-based PCs
- Download Agent

- Downloads (link to Handango)
- File Explorer
- Good Mobile Messaging Stub (not available for Treo 750 ROW)
- Internet Explorer Mobile
- Microsoft® Office Mobile
  - Word Mobile™
  - Excel® Mobile
  - PowerPoint® Mobile
- Microsoft Office Outlook® Mobile
  - Email
  - Calendar
  - Contacts
  - Tasks
  - Notes
- Microsoft Voice Command (v1.5)
- MMS Messaging
- Navigation
  - 5-way
  - Soft Keys
- Nonvolatile file system (NVFS) for user store
- Phone
- Peripheral class detection
- Piscel PDF Viewer
- Pocket MSN®
- Quick Tour
- Search
- SMS Messaging
- Solitaire
- Sounds Manager
- Terminal Services Client
- Unified Messaging application
- Updated Today View to include GSM/UMTS data notification
- Windows Media® Player 10 Mobile
- Windows Messaging and Security Feature Pack (MSFP), which allows for true push email from exchange servers.
- Xpress Mail Stub

2.3.1 Localized system images

Treo 750 smartphone system image is available in the following single language versions:

- English

2.3.2 What's not supported by Treo™ 750 smartphones

- Java (Java support can be added with a third-party Java Virtual Machine)
- Keyboard light driver control
- SD expansion cards or SDIO external peripherals

2.4 Treo™ 750v smartphone

The Treo smartphone by Palm is a compact smartphone that integrates a mobile phone, wireless data applications, such as messenging and web browsing, and integrated organizer functionality. The Treo 750v smartphone is based on the Microsoft Windows Mobile 5.2 (AKU 2.3) Pocket PC Phone Edition.

A maintenance release is available that upgrades the operating system to Windows Mobile 5.2 (AKU 2.6.2), which provides Access Point Name (APN) support for Microsoft push email and HSDPA. For updates, refer to the Palm Support website at the following URL:

http://www.palm.com/us/support/index.html,

For information on device differentiation, see **Section 3.3 on page 38**.

The Treo 750v smartphone is currently available in a radio version that is optimized for the European and Asian markets. While it is a quad-band device, the radio does have reduced performance on the North American 850 MHz band.

- **GSM/GPRS/EDGE radio (class B multi-slot class 10)**
  - 850 MHz (NA band)
  - 900 MHz (EU/Asia band)
  - 1800 MHz (EU/Asia band)
  - 1900 Mhz (NA band)
- **UMTS with HSDPA supported at 1.8 Mbps (Category 12)**
  - UMTS 850 (Operating Band V - NA band)
  - UMTS 1900 (Operating Band II - NA band)
  - UMTS 2100 (Operating Band I - EU/Asia band)

The following Windows Mobile 5.2 features and custom software are available in the Treo 750v smartphone:

- ActiveSync
- Bubble Breaker
- Calculator
- Camera (still photos and video)
  - Still and video capture
  - Still and video management
- Dial-up networking via Bluetooth and USB is supported between Treo 750v smartphones and Windows-based PCs
- Download Agent
- File Explorer
- Internet Explorer Mobile
- Microsoft® Office Mobile

  - Word Mobile™
  - Excel® Mobile
  - PowerPoint® Mobile
- Microsoft Office Outlook® Mobile
  - Email
  - Calendar
  - Contacts
  - Tasks
  - Notes
- Microsoft Voice Command (v1.5)
- MMS Messaging
- Navigation
  - 5-way
  - Soft Keys
- Nonvolatile file system (NVFS) for user store
- Phone
- Peripheral class detection
- Piscel PDF Viewer
- Pocket MSN®
- Quick Tour
- Roaming Indicator
- Search
- SMS Messaging
- Solitaire
- Sounds Manager
- Terminal Services Client
- Unified Messaging application
- Updated Today View to include GSM/UMTS data notification
- Windows Media® Player 10 Mobile
- Windows Messaging and Security Feature Pack (MSFP), which allows for true push email from exchange servers.

2.4.1 Localized system images

Treo 750v smartphone system images are available in the following single language versions:

- English
- French
- Italian
- German
- Spanish

2.4.2 What's not supported by Treo™ 750v smartphones

- Java (Java support can be added with a third-party Java Virtual Machine)
- Keyboard light driver control
- SD expansion cards or SDIO external peripherals

2.5 Treo™ extensions and differentiations

The user interactions in Windows Mobile®-based Treo smartphones are not significantly different from devices that use the basic Windows Mobile 5.0 operating system. The few differences have very little impact on applications or developer APIs.

For more information on the Windows Mobile-based Treo smartphone differentiations, refer to the Treo 700w, Treo 700wx, Treo 750, and Treo 750v smartphone User Guides available at **http://www.palm.com/support**.

2.5.1 System extensions

The following features in Windows Mobile based Palm Treo smartphones have been extended and modified:

- Menu extensions and keyboard integration
  - Today View
  - Phone application
  - Contacts
  - Pictures application
- Soft Key modifications
  - Today view
  - Phone application
  - Pictures application
- Significant UI changes
  - Today View
  - Phone application

The following features in the Palm Treo 750 and Treo 750v smartphones have been extended and modified:

- Unified Messaging Application
  - Removes MMS/SMS from Outlook® Mobile
  - Uses a threaded view, as on the Palm OS-based Treo 650 and Treo 700p smartphones

2.5.2 Application plug-ins

All the software applications that Palm has added are available as plug-ins to the Today view.

- **Contacts lookup** - Provides the Treo experience of dialing by the contact name.
- **Speed dials** - Provides the UI and functionality for adding speed-dial numbers.
- **Picture** - Enables the user to display a picture in the Today View.
- **Phone Status** - Additional icons for showing current status.
- **Active Call** - UI for displaying information about the active call.

Some of these applications have APIs that enable you to access the same data or functionality for your own application purposes. For more information on specific APIs, see the *Palm API Guide, Windows Mobile Platform*.

2.6 Treo™ smartphone hardware feature matrix

Feature	Treo 700w	Treo 700wx	Treo 750/750v
Processor			
Type	Intel XScale PXA270	Intel XScale PXA270	Samsung 2440 POP SC32442x
Speed	312MHz	312MHz	300MHz
Memory			
RAM	32MB	64MB	64 MB
ROM *NAND Flash* *NOR Flash*	 *64MB* *64MB*	 *64MB* *64MB*	 *64MB* *64MB*
Battery			
Type	Rechargeable Lithium Ion	Rechargeable Lithium Ion	Rechargeable Lithium Ion
mAh	1800	1800	1200
Standby or use time	up to 15 days	up to 16 days	up to 10 days
Talk time	4.7 hours	- Cellular - 5 hrs - PCS - 4.6 hrs	4.5 hours
Removable	Yes	Yes	Yes
Form factor			
Size	2.3" W x 4.4" H x 0.9" D (without antenna) 58mm W x 113mm H x 23mm D	2.3" W x 4.4" H x 0.9" D (without antenna) 58mm W x 113mm H x 23mm D	2.3" W x 4.4" H x 0.8" D 58mm W x 111mm H x 22 mm D
5-way button	Yes	Yes	Yes
Keyboard	Built-in QWERTY keyboard	Built-in QWERTY keyboard	Three versions: – QWERTY (English) – AZERTY (French) – QWERTZ (German)
Color	gray / silver	ocean blue metallic (Sprint) gray / silver (Rest of World)	deep blue / silver
Display			
Resolution	240 x 240 pixels TFT touchscreen	240 x 240 pixels TFT touchscreen	240 x 240 pixels TFT touchscreen
Density	16-bit (65,536 colors)	16-bit (65,536 colors)	16-bit (65,536 colors)
Wireless			
	CDMA2000 EvDO backwards compatible with 1xRTT and IS95 networks Bluetooth 1.2	CDMA2000 EvDO backwards compatible with 1xRTT and IS95 networks Bluetooth 1.2	GSM/GPRS/EDGE Qualcomm 6275 UMTS Bluetooth 1.2
Camera			
	(1280 x 1024) 1.3 mega-pixels - Also offered without camera	(1280 x 1024) 1.3 mega-pixels	(1280 x 1024) 1.3 mega-pixels

Feature	Treo 700w	Treo 700wx	Treo 750/750v
Interface Connector			
	Multi-connector (USB, serial without flow control)	Multi-connector (USB, serial without flow control)	Multi-connector (USB, serial without flow control)
Audio			
	2.5mm headset jack, stereo compatible	2.5mm headset jack, stereo compatible	2.5mm headset jack, stereo compatible
	Speakerphone	Speakerphone	Speakerphone
SD			
	SD/SDIO	SD/SDIO	miniSD

2.7 Button mapping

This section describes the button mapping scheme for the Windows Mobile-based Treo smartphones, including the Treo 700w, Treo 700wx, Treo 750, and Treo 750v.

Soft Keys display menus and commands on Windows Mobile®-based devices. Modifications to the Soft Keys have been made for the Today View, Phone application, and Pictures application.

For information on virtual key codes, see **Section 3.2 on page 38**.

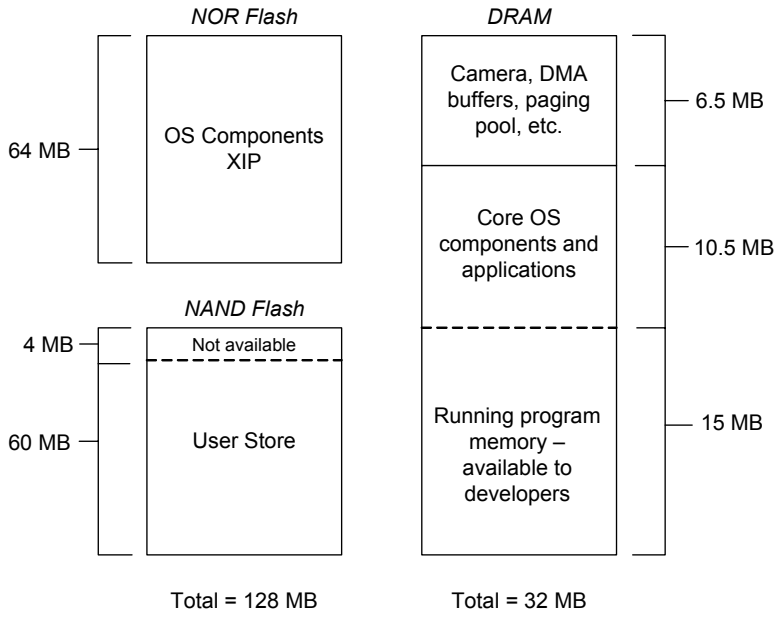
For more information on programmatically assigning Soft Keys, see Microsoft Developer Network at the following URL:

http://msdn2.microsoft.com/en-us/library/ms832349.aspx

2.8 Memory architecture

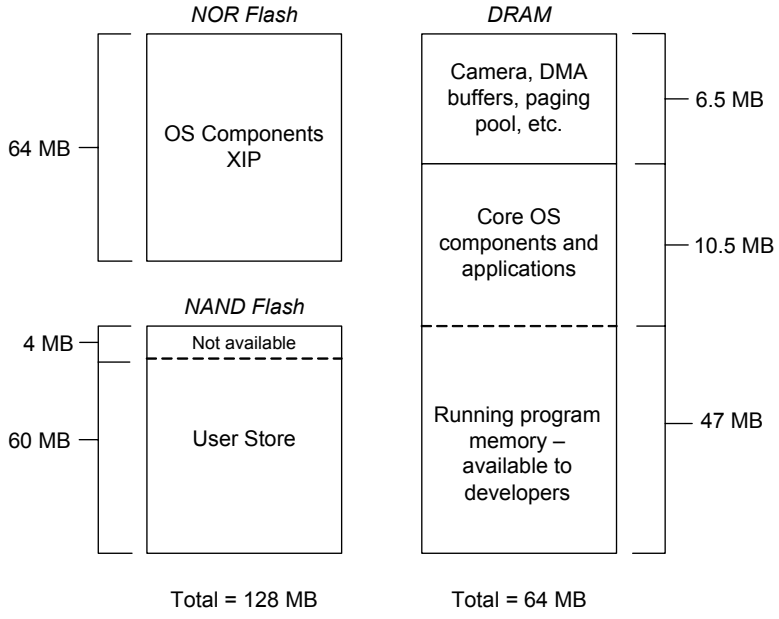
2.8.1 Treo™ 700w smartphone

The memory architecture of Treo 700w smartphone is illustrated in the following diagram.



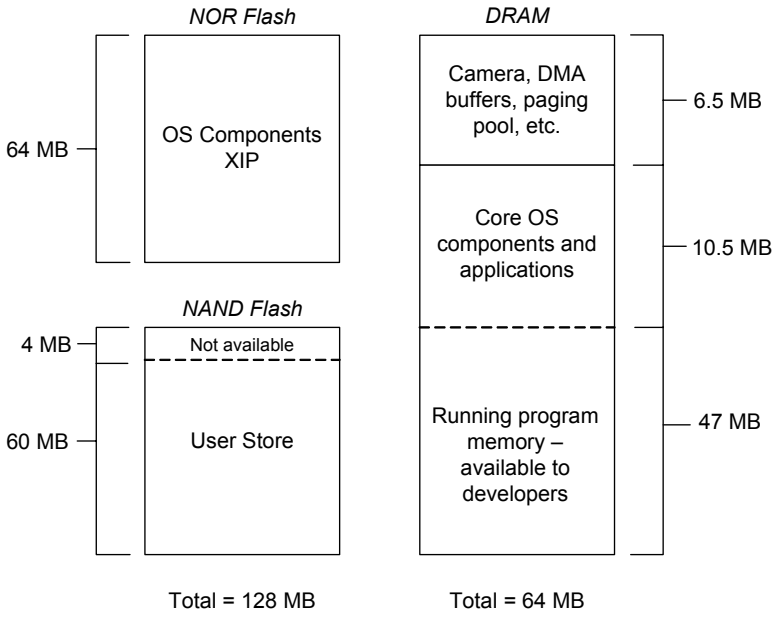
2.8.2 Treo™ 700wx smartphone

The memory architecture of Treo 700wx smartphone is illustrated in the following diagram.



2.8.3 Treo™ 750 and Treo™ 750v smartphone

The memory architecture of the Treo 750 and Treo 750v smartphones is illustrated in the following diagram.



2.8.4 Differences between NOR and NAND flash memory

The Treo 700w, Treo 700wx, Treo 750, and Treo 750v smartphones include both NOR and NAND flash memory. The main difference between NOR and NAND flash memory is that NOR flash has execute in place (XIP) ability. Code instructions cannot be executed out of NAND memory directly. The NOR flash houses the system image (ROM) while NAND flash houses the user store (user data). DRAM houses the memory where applications run.

Performing a soft reset wipes the DRAM clean and retrieves a fresh load of the system image from NOR flash memory. A hard reset additionally erases the user store that is in the NAND flash memory.

2.8.5 Low memory threshold

On Windows Mobile, there is a low memory check routine that the Shell calls every 5 seconds, which assesses the state of the system memory and takes action if necessary. If memory falls below the low memory threshold, then the Shell will shut down applications (in a least-recently-used fashion).

The low memory threshold of the Treo 700w smartphone in the initial system image release was 2MB. This was increased to 5MB in the Treo 700w system image update. The low memory threshold for the Treo 700wx, Treo 750, and Treo 750v smartphones is 5MB.

2.8.6 Virtual memory vs. physical memory

On Windows Mobile 5 every application has a virtual address space of 64MB. This space is split into two "slots" of 32MB each. Slot 0 always contains the running process, while Slot 1 contains the XIP system DLLs. On the Windows Mobile-based Treo smartphones, Slot 1 is completely occupied by OS DLLs, while approximately 15MB of Slot 0 is used by a combination of OS DLLs and Palm drivers.

On the Treo 700w, Treo 700wx, Treo 750, and Treo 750v this leaves approximately 17MB of virtual address space free in Slot 0. This means that each application that loads on the device has approximately 17MB of free space to load its own DLLs and allocate memory. Resource-only DLLs and system DLLs do not consume space in this 17MB block. Only application DLLs will use this memory.

NOTE: The 17MB limit is an approximation. If an application happens to allocate more memory, the allocation will probably succeed, but future DLL loads may fail. Under Windows Mobile 5, every application has a virtual address

2.8.7 Large memory area

Applications can allocate space outside of these two slots in what is known as the "Large Memory Area." Windows Mobile will page out read-only code pages as needed, but it will not page out read-write data pages. This means that although each application on the device can have 17MB of virtual address space, all of the applications running on the device must share the same RAM.

2.9 Bluetooth® wireless technology

Treo 700w, Treo 700wx, Treo 750, and Treo 750v smartphones include Bluetooth 1.2 wireless technology, and use the standard Microsoft Bluetooth stack and components with the following exception.

The only piece of the Bluetooth stack that Palm has implemented is the low-level transport layer that allows the stack to communicate to the Bluetooth chip. An additional service has been implemented to monitor the Bluetooth connections and to keep the device on (or in Unattended mode) when a connection is active.

NOTE: The Bluetooth implementation on the Treo 700w/700wx is different from the one used on the Treo 750/750v. On the Treo 750/750v, there is no longer a service to monitor the Bluetooth connections and keep the device on (or in Unattended mode) with an active connection.

For more information on Unattended mode, see **Section 8.1.9 on page 66**.

Bluetooth profiles supported by device are detailed in the following table.

BT Profile	Description	Treo 700w	Treo 700wx	Treo 750/750v
GAP	**Generic Access Profile**	●	●	●
GOEP (OBEX)	**Generic Object Exchange Profile**	●	●	●
SPP	**Serial Port Profile**	●	●	●
HSP	**Headset Profile**	●	●	●
HFP	**Handsfree Profile**	●	●	●
ActiveSync Profile	**Custom Microsoft stack for ActiveSync over Bluetooth**	●	●	●
Bluetooth Wireless Modem Mode (DUN)				●
A2DP	**Advanced Audio Distribution Profile and supporting profiles**		● *	●

* A2DP is on the Treo 700wx for Verizon only.

2.10 Security

The Treo 700w, Treo 700wx, Treo 750, and Treo 750v smartphones are configured to be one-tier security devices and they use the standard security configuration. This means:

- The end-user is prompted whenever an untrusted application attempts to install or run on the device. The user can accept or decline to run the application.
- Drivers and services that load at boot time must be signed to run.
- Remote API (RAPI) functionality is open for signed applications. For unsigned applications, a prompt is displayed so the user can accept or decline to run the application.

NOTE: To sign your application, contact a Microsoft Mobile2Market program testing partner.

The Treo 700w, Treo 700wx, Treo 750, and Treo 750v smartphones also support Windows Messaging and Security Feature Pack (MSFP), which allows for true push email from exchange servers.

For more information on security policies for Windows Mobile 5.0 devices, see "Windows Mobile-based Device Security Model" at the following URL:

http://msdn2.microsoft.com/en-us/library/ms890793.aspx

Also, see information on Mobile2Market, Microsoft's certification and marketing program for mobile applications, see the following URL:

http://msdn.microsoft.com/mobility/windowsmobile/partners/mobile2market/default.aspx.

2.11 Unified Messaging application

The Unified Messaging application on the Treo 750 and Treo 750v smartphones is similar to the Messaging application on the Palm OS Treo 650 and Treo 700p smartphones. It allows threaded SMS messages, which appears similar to an IM session.

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CHAPTER 3

3. Features and APIs

This chapter details the software libraries available in the SDK.

For detailed documentation on the APIs, refer to the separate *Palm® Windows Mobile® API Guide* in compressed HTML (.chm) format available at **https://pdn.palm.com**.

3.1 SpeedDial database

The SpeedDial Database library provides the ability to interact with records in differentiated SpeedDial databases. The header file is `SpeedDialDB.h` and is installed as part of the SDK. The operations provided in this library include:

- Open database
- Close database
- Get record by position order
- Get total number of records
- Replace record
- Add record
- Swap record
- Remove record
- Search by QuickKey
- Search by phone number
- Register for database write notifications

The SpeedDial Database stores speed dial contact information, but the Treo700w, Treo 700wx, Treo 750, and Treo 750v smartphones use the default Windows Mobile contact database (pim.vol) the same way other Windows Mobile 5.0 devices use it. The SpeedDial Database is only used to store speed dial information, which may include references to corresponding contact information in the default Windows Mobile contacts database.

For more information, refer to the *SpeedDialDB API Guide*.

For code examples, see the Sample Code section of the Palm SDK for Windows Mobile.

3.2 Keyboard extensions

The keyboard APIs can be accessed by means of the standard Windows Mobile® 5.0 APIs provided by Microsoft. No extra header or library files are required.

You can check the Option and Shift key modifier status by using the Microsoft `GetAsyncKeyState()` API. The following virtual key codes are assigned to represent the modifier states.

Modifier State	Description
`VK_OEM_SHIFT_DOWN - 0xC8`	A one-time shift is in effect.
`VK_OEM_SHIFT_LOCKED - 0xC9`	Shift Lock is in effect.
`VK_OEM_OPTION_DOWN - 0xCA`	A one-time option is in effect.
`VK_OEM_OPTION_LOCKED - 0xCB`	Option Lock is in effect.

Only one of these four virtual key codes is reported as "down" by `GetAsyncKeyState()` at any time. If no modifier is in effect, all four report "up."

IMPORTANT: It is *not* programmatically possible to change the state of the modifiers.

3.3 Device differentiation

For Treo 700wx, Treo 750, and Treo 750v smartphones, the `DeviceDifferentiation` sample application lets you to determine which device your application is running on by checking a registry key that contains a device identifier.

For Treo 700w smartphones, see **Section 3.4 on page 39**.

NOTE: If the registry key is not available, the device is a Verizon branded Treo 700w smartphone running the original system software.

In order to programmatically read the necessary registry key you will need to define `PALM_SWVERSIONSTRING_PATH` and `PALM_SWVERSIONSTRING_VALUE`. You can then use the `CheckSoftwareVersion()` and `DisplaySoftwareVersion()` functions. For more information, refer to the `DeviceDifferentiation` sample application in the Code Sample section of the Palm® Windows Mobile® SDK.

3.4 Determine the system image version for Verizon Treo™ 700w smartphones

For Verizon Treo 700w smartphones, you can determine the system image version number by using the following code, which displays the Microsoft software build number. The original software release was build number 1700, while the maintenance release was build number 195.

```
TCHAR OEMString[100];
SystemParametersInfo( SPI_GETOEMINFO, 100, OEMString, 0 );

if (wcscmp(OEMString,L"Palm Treo 700w") == 0) {
OSVERSIONINFO ovi;
GetVersionEx(&ovi);

if (ovi.dwBuildNumber == 1700)
{
//this is 1.02
}
else if (ovi.dwBuildNumber == 195)
{
//this is 1.10
}
}
```

3.5 Detecting the phone carrier

To programmatically detect a smartphone's mobile phone service provider, or carrier (operator), turn the phone on and use the following State and Notification query:

```
TCHAR tszOperatorName[1024];
RegistryGetString(HKEY_LOCAL_MACHINE, _T("System\\State\\Phone"),
"Current Operator Name", tszOperatorName, sizeof(tszOperatorName));
```

NOTE: The radio must be turned on for this to work.

3.6 Retrieving the phone number

To retrieve the phone number on a Windows Mobile-based Treo 700w or Treo 700wx CDMA smartphone, use `lineGetAddressCaps()`.

To retrieve the phone number on a Windows Mobile-based Treo 750 or Treo 750v GSM smartphone, use `lineGetGeneralInfo()`.

NOTE: If you use `lineGetGeneralInfo()` on the Treo 700w or 700wx, the electronic serial number (ESN) of the smartphone will be returned in the subscriber field.

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CHAPTER 4

4. Multimedia

This part of the guide details the Multimedia features of Windows Mobile®-based Treo™ smartphones.

4.1 Ringtone formats

Windows Mobile-based Treo smartphones support the following ringtone formats:

Ringtone Format	Treo 700w/700wx	Treo 750/750v
3GP	●	●
3G2	●	●
MP3	●	●
MIDI	●	●
QCELP	●	●
WAV	●	●
WMA	●	●
WMV	●	●
AAC		●
AAC+		●
AMR		●
H.263		●
MPEG-4		●

4.2 Set a ringtone

To set the current incoming ringtone programmatically, use the following code to change the related registry setting:

```
RegistrySetString(HKEY_CURRENT_USER,_T("ControlPanel\\Sounds\\PlmORingTone1"),
L"Sound", L"\\Windows\\Playful.mid");
```

4.3 Media formats supported by device

The following table details the codecs that are supported for audio and video features on Windows Mobile-based Treo smartphones.

Technology				**Product**		
Codec	**Description**	**Encoder**	**Decoder**	**Treo**		
				Treo 700w	Treo 700wx	Treo 750/v
AAC	MPEG-4 Audio		●			●
AAC+	MPEG-4 Audio		●			●
AMR	AMR-NB	●	●			●
AMR	AMR-WB		●			●
H.263	H.263 Baseline Level 10, 20, 30 and 40	●	●			●
MPEG-4	MPEG-4, Part 2: Level 0-3/DirectShow	●	●	●	●	
MPEG-4	MPEG-4, Part 2: Simple, Advanced Simple, Core		●			●
MP3	Audio Level 3 (MP3) MPEG-1 format		●	●	●	●
QCELP	QCELP 13K encoder library following the standard TIA/EIA IS733	●	●	●	●	
QCELP	QCELP QCELP (Purevoice) EVRC		●			●
WMA	Windows Media Audio		●	●	●	●
WMV	Windows Media Video		●	●	●	●

4.4 A2DP support

The Advanced Audio Distribution Profile, or A2DP, is commonly referred to as "wireless stereo" via Bluetooth headphones. This profile is included in the Treo 750 and Treo 750v smartphones as part of the default Windows Mobile 5.2 (AKU 2.3) Bluetooth stack. A2DP support is also included in the Treo 700wx for Verizon only.

For more information on implementing and using the A2DP profile, refer to the Windows Mobile 5 SDK.

You can find more information about Bluetooth profiles on MSDN at:

http://msdn2.microsoft.com/en-us/library/ms880969.aspx

For a table of Bluetooth profiles supported by Windows Mobile-based Palm device, see **Section 2.9 on page 34**.

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CHAPTER 5

5. Emulator

This chapter explains how to use the Microsoft Device Emulator in conjunction with Windows Mobile®-based Treo™ smartphone system images (ROM) to emulate devices for testing purposes.

5.1 Emulator overview

IMPORTANT: The emulator is currently only supported for the Windows XP operating system and earlier. It is not supported on Windows Vista.

The Microsoft Device Emulator, when used in conjunction with a Windows Mobile-based Treo smartphone emulator image, provides an easy way to test your application without the need for a hardware unit.

You can acquire the Microsoft Device Emulator as a component of Visual Studio 2005. One of the key features of the Microsoft Device Emulator is that it runs native ARM code. This differs from the Palm OS Simulators which run re-compiled x86 code. In most cases, if an application runs in the emulator it will run on a hardware device, and vice versa.

The emulator supports debugging via an ActiveSync connection. A crossover serial cable is not required.

5.2 System requirements

In order to run the Microsoft Device Emulator you must be running one of the following operating systems:

- Windows XP (Service Pack 2)
- Windows Server 2003 (Service Pack 1)

No other operating systems are supported.

In order for the Microsoft Device Emulator to sync with your system, ActiveSync 4.2 must be installed.

5.3 Acquiring the emulator

If you have a properly setup development system with a full version of Visual Studio 2005 and the Windows Mobile 5.0 SDK, the Microsoft Device Emulator should already be installed on your system.

5.4 Acquiring the Treo™ system images

By default the Microsoft Device Emulator ships with a generic Windows Mobile 5.0 system image. This image allows you to run most applications, but it does not support any of the Palm-specific features. In order to test your application in a Palm Treo environment, download the appropriate emulator image and skin pack from Palm Developer Network at **https://pdn.palm.com.**

- **Treo 700w -** Treo700w1.10VerizonEmulatorVSInstaller.msi
- **Treo 700wx -** Treo700wxEmulatorVSInstaller.msi
- **Treo 750/Treo 750v** - Treo750EmulatorVSInstaller.msi

5.5 Installing the system image

Treo system images are packaged as installers. In order to use the system image, you must first ensure that the Microsoft Device Emulator is installed on your system. If the emulator is not present, the system image installation WILL FAIL.

To install the system image, double click the appropriate file to start the installation.

5.6 Virtual Machine Network driver

By default, the Microsoft Device Emulator does not capture a unique IP address. In order to ensure that the virtual machine has a separate IP from your computer you must install the Virtual Machine Network driver.

The Virtual Machine Network driver allows the emulator to establish its own network connection. Because the physical network interface on the host machine is now "virtualized," you have a way to get two IP addresses - one for the host PC, and one for the Treo system image that is running within the emulator.

Microsoft Device Emulator users using the Virtual Machine Network driver can connect to the host machine over TCP or UDP as the alternative to the standard "ActiveSync over DMA" solution.

NOTE: If you do not have this driver installed, the emulator will still run, however you will be presented with the following error message every time you start the emulator:

Download the Virtual Machine Network driver directly from Microsoft at the following URL:

http://www.microsoft.com/downloads/details.aspx?FamilyID=dc8332d6-565f-4a57-be8c-1d4718d3af65&displaylang=en

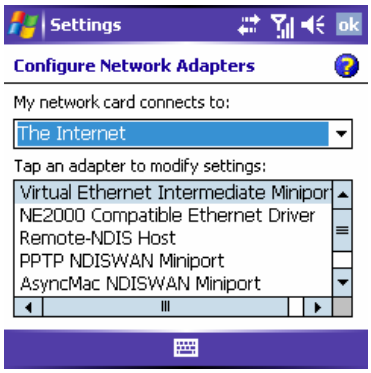
NOTE: It is recommended that you install the Virtual Machine Network driver, especially if you plan to test an application that uses an active data connection as the emulator does not have the ability to simulate an over the air (OTA) data session.

5.7 Configuring the device network connection

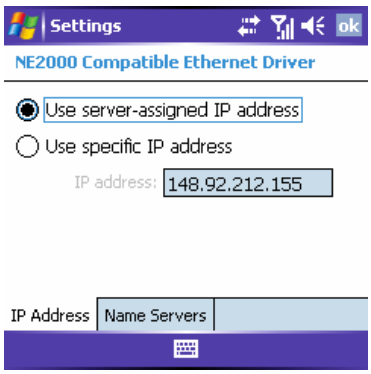
Installing the Virtual Machine Network Driver will assign the emulator an IP address, however the Treo system image defaults to a local network (Work) connection. This allows for local connections, but prevents applications from reaching the Internet.

To configure the emulator for full Internet access, use the following steps:

1. Ensure the host machine has a valid Internet connection.
2. Confirm that the Virtual Machine Network Driver has been installed.
3. Start the emulator with the Treo system image.
4. Within the emulator, tap **Start > Settings > Connections > Network Cards**.
5. Under the heading "My network card connects to:" choose "**The Internet**" from the drop-down menu.



6. Tap **NE2000 Compatible Ethernet Driver** to bring up the card properties.
7. Verify that the device has a valid IP address.



8. Tap **OK** to confirm.
9. Tap **OK** to dismiss the dialog box.
10. Tap **OK** a third time to close the settings panel.

You should now be able to use the data connection on the device. Verify that the connection is working by opening Internet Explorer and trying to load the page **http://www.palm.com**.

5.8 ActiveSync 4.2

If your application uses ActiveSync functionality (for example, a Windows-based installer) you will want to connect the emulator to your host PC via a virtual ActiveSync connection. If you do not already have ActiveSync 4.2 installed on your computer, download it from Microsoft at:

http://www.microsoft.com/downloads/details.aspx?FamilyID=7269173a-28bf-4cac-a682-58d3233efb4c&displaylang=en

NOTE: ActiveSync requires a reboot after the installation has finished.

5.9 Known Issues

5.9.1 Emulator keyboard

The Treo 700w, 700wx, Treo 750, and Treo 750v smartphone emulator keyboards are not fully functional. This includes the Alt, Option, Shift, application and soft keys. However, the key codes that the Alt, Option and Shift keys produce are available through the development machine's keyboard.

For example, on Treo 700w smartphones, the "Option r" key combination generates a "2". To generate a "2" while using the emulator, simply press the "2" key on the desktop keyboard.

Other keys function in the following ways:

- **OK -** Using the OK key produces the same behavior as tapping on the minimize or OK button at the upper right of an application window.
- **Soft Keys -** The soft keys can be accessed by tapping on the menu buttons on the bottom of the screen.
- **Green and Red -** The green and red keys are not accessible. There is no workaround.
- **Windows -** The Windows key is fully functional.

5.9.2 Windows Mobile® 5.0 SDK security certificates

There is a known bug in the emulator that causes it to freeze when the security certificates from the Windows Mobile 5.0 SDK are installed. This problem occurs because the components that are built on top of the Windows Mobile 5.0 platform are not being signed in a way that will load correctly when the emulator is configured to a higher security level.

To work around this known issue, use the standard Windows Mobile 5.0 square-screen emulator to test security.

5.9.3 Loading images

It is a known issue that `imgdecmp.dll` will not function on the emulator. To load images, use `SHLoadImageFile` and `SHLoadImageResource` instead of `imgdecmp.dll`.

`imgdecmp.dll` is currently considered deprecated by Microsoft. It is available on the Treo 700w and Treo 700wx smartphones, but it is not on the emulator. It will be removed from a future version of the Windows Mobile platform.

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CHAPTER 6

6. Multi-connector Specifications

This chapter defines the interfaces and interactions of the Palm® expansion Multi-connector and its surrounding circuits and controlling software.

6.1 Overview

This chapter specifies the electrical and software interface characteristics of Palm's Multi-connector. These characteristics include sets of various charging, cradle, and cable configurations, but from a smartphone perspective. The electrical specification and systems software requirements are consistent across multiple devices. Specific devices may not, however, implement all of the features of the Multi-connector.

The Multi-connector supports the following features:

- Charging power from an external adapter with adapter detection ability
- Universal Serial Bus (USB)
- Serial communications (no flow control, logic levels)
- Power out
- Stereo headphone-level output

The Multi-connector interface supports interaction with the following devices:

- USB HotSync® cables and cradles
- Other serial devices
- Pass-through peripherals

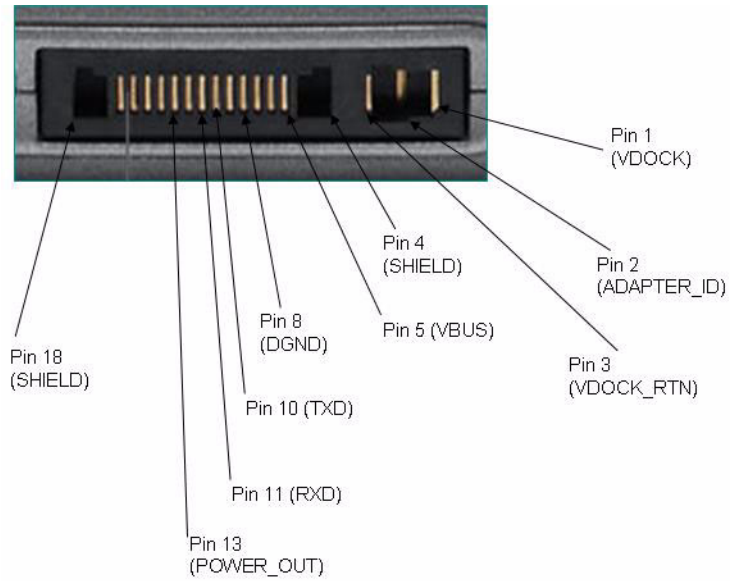
  These include peripherals that connect to a smartphone and have another connector to allow the peripheral to be connected to a USB HotSync cable or cradle.

6.2 Pinout of the Multi-connector

The pinout, with or without mounts, is described in the following table. All pin references that follow in this chapter refer to the device connector pin-numbering scheme shown in this table.

Pin # on device/ Multi-connector	Pin # on charger/ adapter connector	Pin# on data/ cable connector	Name	Direction with respect to the device	Default state with no attachment	Function
1	1		VDOCK	Power	CHRG_IN	DC charging voltage, 5.2V
2	2		ADAPTER_ID	Input	VCC, weak pull-up	Adapter identification
3	3		VDOCK_RTN	Power	GND	DC charging return
4	-	1	SHIELD	Shield	GND	Cable shield
5	-	2	VBUS	Power	VBUS_IN	USB charging voltage, 5V typical, 500 mA max
6	-	3	USB_DP	Input/output	Floating	USB Data +
7	-	4	USB_DN	Input/output	Floating	USB Data -
8	-	5	DGND	Power	GND	Digital ground, and VBUS return
9	-	6	Reserved	NA	NA	Do not connect
10	-	7	TXD	Input/output	VCC, weak pull-up	Transmit data, 3.3V logic level
11	-	8	RXD	Input	VCC, weak pull-up	Receive data, 3.3V logic level
12	-	9	HOTSYNC	Input	VCC, weak pull-up	HotSync input, active low, pulled up on device
13	-	10	POWER_OUT	Output	High impedance	Power output to external devices
14	-	11	SPKR_L	Analog output	AC coupled	Speaker output left
15	-	12	SPKR_R	Analog output	AC coupled	Speaker output right

Pin # on device/ Multi-connector	Pin # on charger/ adapter connector	Pin# on data/ cable connector	Name	Direction with respect to the device	Default state with no attachment	Function
16	-	13	AGND	Power	GND	Analog ground
17	-	14	MIC_IN	Analog input	DC coupled	Microphone input
18	-	15	SHIELD	Shield	GND	Cable shield



6.2.1 Shielding

On all peripheral devices, the shield pins 4 and 18 should be grounded with any available shielding system ground. For example, on a USB cable these pins should be connected to the USB cable outer shield, which in turn connects to the shield on the USB connector at the other end of the cable.

Where no external shielded ground is available peripherals should connect pins 4 and 18 to the peripheral's system ground.

6.2.2 USB

Pins 5, 6, 7, and 8 constitute the USB VBUS, D+, D-, and GND pins respectively.

The handheld is designed to accept the following parameters on pins 5, 6, 7, and 8:

Name	Description	Minimum	Average	Maximum	Units
(V)USB_VBUS_CHG	Input charging voltage	4.375	5.0	5.25	V
(V)USB_VBUS_CHG	Input serial peripheral detection voltage	2.97	3.3	3.63	V
(I)USB_VBUS_L	Input charging current, no negotiation, sunk from VBUS	-	-	100	mA
(I)IUSB_VBUS_H	Input charging current, with negotiation, sunk from VBUS	-	-	500	mA

6.2.3 Serial interface hardware

Pins 10 and 11 provide 3.3V logic-level serial connections with no dedicated hardware flow control pins. The direction of these pins with respect to the device is as follows:

- Pin 10 transmits from the handheld
- Pin 11 receives into the handheld.

The serial port connected to pins 10 and 11 supports the following bit rates and configuration options:

- 1,200 baud
- 2,400 baud
- 4,800 baud
- 9,600 baud
- 14,400 baud
- 19,200 baud
- 28,800 baud
- 38,400 baud
- 57,600 baud
- 115,200 baud
- 7 data bits
- 8 data bits
- No stop bits
- 1 stop bit
- Parity bit
- No parity bit

Both pins 10 and 11 are pulled high within the device by weak pull-ups.

Pins 10 and 11 operate at 3.3V nominal voltage levels.

Windows Mobile®-based Treo™ smartphones are designed to accept the following parameters on pins 10 and 11:

Name	Description	Minimum	Average	Maximum	Units
(V)RXTX_INL	Input logic low voltage*	0	-	0.594	V
(V)RXTX_INH	Input logic high voltage*	2.904	-	3.63	V
(V)TX_OUTL	Output logic low voltage*	0	-	0.3	V
(V)TX_OUTH	Output logic high voltage*	2.67	-	3.63	V
(V)TX_OC	Open circuit TX line voltage*	-	3.3	-	V
(V)RX_OC	Open circuit RX line voltage*	-	3.3	-	V

*With respect to digital ground, pin 8

6.2.4 Serial interface software

The Multi-connector serial pins interface with the Windows Mobile-based Treo smartphone software as a virtual serial port.

6.2.5 Power output

Pin 13 provides a power output to power an external peripheral. This power output is limited to low-current capability only. The power output is normally driven LOW or floated as a high impedance signal to minimize the chances of a short to GND damaging the device.

Windows Mobile-based Treo smartphones are designed to accept the following parameters on pin 13:

Name	Description	Minimum	Average	Maximum	Units
(V)POUT_L	Output inactive voltage*	0	-	0.363	V
(V)POUT_H	Output active voltage*	2.97	3.3	-	V
(I)POUT	Output current supplied	30	-	-	mA
(R)POUT	Minimum load series resistance to GND*	89	-	-	Ohms
(C)POUT	Maximum load capacitance	-	-	4.7	µF

*With respect to digital ground, pin 8

6.3 General serial peripherals

Serial peripherals should conform to the following requirements.

Name	Description	Minimum	Average	Maximum	Units
(T)PHL_SER_DLY == (T)DET_RXTX_DLY	Delay from POWER OUT applied to peripheral driving into Rx line	450	-	-	mS
RPHL_SER_DET	Series resistance to ground on TX and RX line before POWER_OUT applied for Serial Peripheral detection	6.8K	-	-	Ohms
VPHL_SER_DET	Minimum voltage on TX and RX line after POWER_OUT applied for Serial Peripheral detection	2.904	-	POWER_OUT	V
RPHL_SER_NDET	Maximum series resistance between VBUS and POWER_OUT for Serial Peripheral Detachment detection	-	-	10	Ohms

6.3.1 Interfacing with a serial peripheral

The recommended method for interfacing with a serial peripheral is for the peripheral to be wired as described in the following table:

Name	Pin #	Recommended configuration
VDOCK	1	Charging source if charging device; otherwise no connect.
ADAPTER_ID	2	Connect to pin 3 if charging device with >=1Amp source; otherwise no connect.
VDOCK_RTN	3	Charging source ground if charging device; otherwise system ground.
SHIELD	4	Shield ground or system ground.
VBUS	5	Connect to POWER_OUT.
USB_DP	6	No connect.
USB_DN	7	No connect.
DGND	8	System digital ground.
USB_ID	9	No connect.

Name	Pin #	Recommended configuration
TXD	10	680 Ohm pull-up to POWER_OUT. 6.8K Ohm pull-down to DGND.
RXD	11	680 Ohm pull-up to POWER_OUT. 6.8K Ohm pull-down to DGND.
HOTSYNC	12	The presence of pull-up on this pin can be used by a peripheral as a method to detect when a device is attached to the peripheral.
POWER_OUT	13	Connect to system power if required by peripheral.
SPKR_L	14	No connect.
SPKR_R	15	No connect.
AGND	16	No connect.
MIC_IN	17	No connect.
SHIELD	18	Shield ground or system ground.

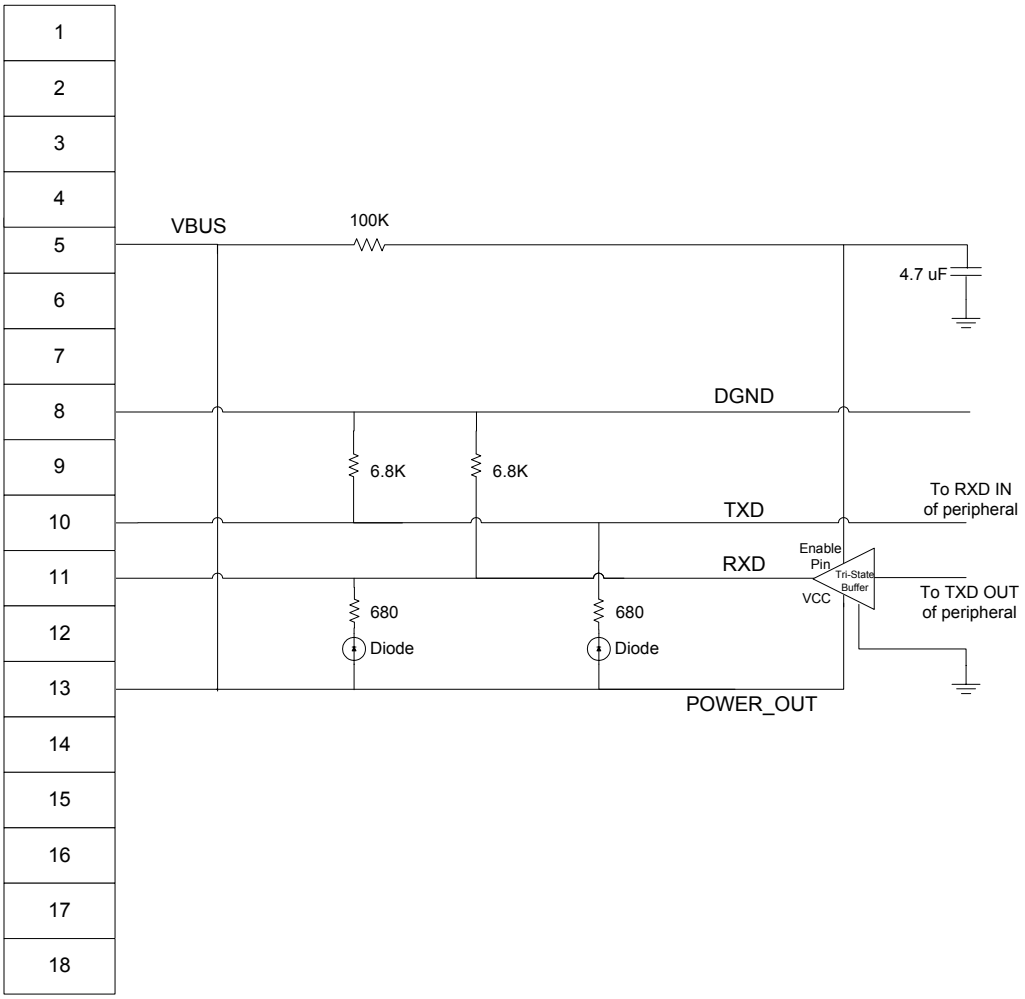
6.3.2 Electrical diagram of a serial peripheral

A peripheral that conforms to the following electrical diagram will be detected as a serial peripheral on Multi-connector devices.

To ensure that the peripheral works reliably with Windows Mobile-based smartphones, the serial peripheral's 1K resistors were changed to 680 ohm, and the 10K resistors were changed to 6.8K.

If the peripheral uses the POWER_OUT pin to detect that a device detached, it should include the diode shown in the circuit. This will ensure that there is no loop back from the Tx line (peripheral side) to the POWER_OUT pin. If a diode is included, then make sure to adjust for the voltage drop across the diode.

The Tx line of the peripheral always drives high according to the specification, and if the diode is not present, the POWER_OUT pin will drive high at all times. In this scenario, even if the device is removed, the POWER_OUT pin will stay high and prevent the peripheral from using the POWER_OUT pin to reliably detect that the device is detached.



6.3.3 Serial peripheral design guidelines

- (Optional) PWR_OUT tied to VBUS through a user selectable switch.
- 6.8K pull-down resistors on the TXD and RXD pins to ground.
- 680 Ohm pull-up resistors from TXD and RXD to PWR_OUT pins.
- Tie Multi-connector pins 4, 18 to pin 8 (digital ground).
- If the serial peripheral is going to be connected to a PC, a transceiver is needed to convert the logic level to RS-232. Make sure all flow control lines are handled at the DB9 side connected to PC. Connect pin 7 to pin 8 (RTS to CTS) and pin 1 and 6 to pin 4 (DSR to DTR and CD).
- Transceiver tied to TXD and RXD pins must be high impedance while PWR_OUT is low, and must remain high impedance 500mS after PWR_OUT goes high. This could be done with a charge up capacitor on the ENA or PWR pin of the transceiver or with a PIC microcontroller device. In other words, TXD and RXD must not be active while the peripheral detection is in progress. There should be no data on TXD and RXD while the detection is in progress.
- PWR_OUT will only source 30mA total.
- Do not drive any pins higher than 3.3 volts.
- Do not drive VBUS over 3.3V.

6.4 Serial peripheral usage

6.4.1 Serial support on the Multi-connector interface

The Multi-connector interface supports serial connections with no hardware flow control. It provides 3.3V logic-level serial connections. It DOES NOT support RS-232 level serial connections.

The Multi-connector's Rx, Tx, and Gnd pins cannot be connected directly to a PC's Tx, Rx, and Gnd pins, respectively. To connect the Multi-connector to a PC, you will need a transceiver to convert the logic level to RS-232.

6.4.2 Using the serial port on Treo™ 700w and Treo™ 700wx smartphones

For an example of how to use the serial port, see the Sample Code section of the Palm SDK for Windows Mobile. The sample `SerialPortSample` describes how to programmatically configure and open the serial port. It then illustrates how to send data and close the serial port when finished.

6.4.3 Enabling the serial port on Treo™ 750 and Treo™ 750v smartphones

The process for enabling the serial port on the Treo 750 and Treo 750v smartphones differs from the process used on the Treo 700w and Treo 700wx smartphones. In order to properly use the serial port across all Windows Mobile-based Treos you must first check the version of the hardware and then call the necessary functions to enable the serial port for the device in use.

To use the serial port on a Treo 750 or Treo 750v smartphone you must define the following:

```
IOCTL_SERIAL_CONFIGURE_ON
CTL_CODE(FILE_DEVICE_SERIAL_PORT,101,METHOD_BUFFERED,FILE_ANY_ACCESS)
```

This call is necessary to enable the serial port on the Treo 750 or Treo 750v.

```
IOCTL_SERIAL_CONFIGURE_OFF
CTL_CODE(FILE_DEVICE_SERIAL_PORT,102,METHOD_BUFFERED,FILE_ANY_ACCESS)
```

This call is necessary to disable the serial port on the Treo 750 or Treo 750v.

After the proper definitions have been made, you can use the following code to enable or disable the serial port on the Treo 750 or Treo 750v:

```
BOOL TurnOnSerial(HANDLE m_hPort, int bOn)

{

 DWORD cbActual;

 if(bOn == 1)

//To enable the serial port

  return DeviceIoControl(m_hPort, IOCTL_SERIAL_CONFIGURE_ON, NULL, 0, NULL,
0, &cbActual, NULL);

 else

//To disable the serial port

   return DeviceIoControl(m_hPort, IOCTL_SERIAL_CONFIGURE_OFF, NULL, 0,
NULL, 0, &cbActual, NULL);

}
```

For more information, refer to the `SerialPortSample` sample application in the Code Sample section of the Palm SDK for Windows Mobile.

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CHAPTER 7

7. Debugging

This chapter provides information on debugging applications for Palm® Windows Mobile®-based Treo™ smartphones.

7.1 Visual Studio 2005

To debug applications for Palm Windows Mobile-based Treo smartphones, use Microsoft Visual Studio 2005. Purchase and download the tool from the following URL:

http://msdn.microsoft.com/vstudio/

7.2 Virtual Machine Network driver

To use the Windows Mobile-based Treo emulators with Visual Studio 2005, you must download the Virtual Machine Network Driver from the following URL:

http://www.microsoft.com/downloads/details.aspx?FamilyID=dc8332d6-565f-4a57-be8c-1d4718d3af65&displaylang=en

For more information on the emulators, see **Chapter 5**.

7.3 ActiveSync 4.2 or Windows Mobile Device Center

To connect your device to a PC for debugging, you will need to install on your development machine either ActiveSync 4.2 or Windows Mobile Device Center, depending on your operating system.

- **Windows XP or earlier -** you will need ActiveSync 4.2. Download it from the following URL:

  http://www.microsoft.com/windowsmobile/downloads/activesync42.mspx

- **Windows Vista -** your synchronization settings will be managed through the Windows Mobile Device Center. Download it from the following URL:

  http://www.microsoft.com/windowsmobile/devicecenter.mspx

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CHAPTER 8

8.0 Troubleshooting Guide

8.1 Software issues

8.1.1 Closing dialog boxes when switching to the Today View

It is a feature of the Treo 700w, Treo 700wx, Treo 750, and Treo 750v smartphones that whenever the user presses the green phone key to either answer an incoming call or to place a call, the system automatically minimizes all top-level windows that could prevent the Today View from being shown in the foreground. This is done because of the unique integration of the Phone application into a Today View plug-in. The user must be able to answer an incoming phone call and therefore must have clear access to the Phone application plug-in.

The impact of this design decision on developers is that applications using top-level dialog boxes must gracefully handle receiving the Close message at any time.

8.1.2 Camera driver and DirectShow

DirectShow is a Microsoft API that allows you to perform various operations with media files. The DirectShow development tools are included in the Microsoft Windows Mobile Platform SDK.

On the Treo 700w, Treo 700wx, Treo 750, and Treo 750v smartphones, for the DirectShow filter to get uncompressed image data, the camera driver must provide the uncompressed image to DirectShow. However, at this time, the camera driver does not provide uncompressed image data to DirectShow.

8.1.3 Peripheral class detection

Peripheral class detection is not supported by the Treo 700w or Treo 700wx smartphones.

8.1.4 Keyguard

Currently, there is no way to programmatically determine the state of the keyguard.

8.1.5 Displaying icons

Currently, there is no way to programmatically display icons, such as Shift or Option.

8.1.6 Emulator issues

For known issues concerning the Treo smartphone emulators, see **Section 5.9 on page 48**.

8.1.7 Keylight driver

On the Treo 700w and Treo 700wx it was possible to control the keyboard backlight via an API call. This is no longer a supported function on the Treo 750 and Treo 750v. Calls to the keylight driver will fail on the Treo 750 and Treo 750v.

8.1.8 Bluetooth implementations by device

The Bluetooth implementation on the Treo 700w/700wx is different from the one used on the Treo 750/750v. On the Treo 750/750v, there is no longer a service to monitor the Bluetooth connections and keep the device on (or in Unattended mode) with an active connection.

8.1.9 Unattended mode

In Unattended mode, the keyboard light and the screen are off, and the device appears to be off to the user. This mode can be used by applications during background processing without directly changing the state of the keyboard or screen light.

To request that the device goes to Unattended mode, use the following code:

```
PowerPolicyNotify (PPN_UNATTENDEDMODE, TRUE);
```

To use Unattended mode, you must repeatedly reset the idle timer, because when Unattended mode times out, the device will move to the Suspended state and your application will not be able to do any processing. Call `SystemIdleTimerReset()` periodically to prevent this.

When your application has finished processing, you can stop resetting the idle timer, and the device will move to the Suspended state.

8.2 Hardware issues

8.2.1 Configuring the IR port to COM2

By default, the IR port on the Treo 700w and Treo 700wx does not require any special setup. However, if you configured COM2 to be used as a serial port, then you must reconfigure it to its default state to work for IR, because COM2 is shared between IR and serial.

For more information on enabling COM2 for the serial port, see the Sample Code section of the Palm Windows Mobile SDK for the example, `SerialPortSample`.

Use the same example to reconfigure COM2 for IR. However, where the sample application shows registry entries enabling COM2 for the serial port, make sure to enable COM2 for IR instead.

NOTE: After making changes to registry entries, you must perform a soft reset in order for the changes to take effect.

8.2.2 RNDIS support

The Treo 700w, Treo 700wx, Treo 750, and Treo 750v smartphones support Remote Network Driver Interface Specification (RNDIS) over USB.

8.2.3 Wi-Fi® card transfer speed

Wi-Fi card transfer speeds on the Treo 700w and Treo 700wx smartphones are typically in the range of 800K - 1.2MB. This limitation is in part due to SDIO bandwidth limitations and overall available processing power.

NOTE: Wi-Fi cards are purchased separately from Treo smartphones. Windows Mobile-based Treo smartphones use the same cards used in Palm OS-based smartphones.

8.3 Windows Mobile®-specific issues

8.3.1 ActiveSync connectivity issue

If your device is not being recognized during the sync process, you may need to change the USB connection type. To do this, use the following steps:

1. On your device, navigate to **Start > Settings > Connections > USB to PC**.
2. Uncheck **"Enable advanced network functionality."**
3. Press **OK**.

If this does not resolve the connectivity issue, uninstall the ActiveSync software and reinstall it.

8.3.2 Square-screen compatibility

The Windows Mobile-based Treo smartphones adhere to the Microsoft square-screen standard, but for your application to run properly, you may need to adjust your application's UI and content in one or more of the following ways:

1. Resize your UI and content.
2. Re-layout your UI and content.
3. Change your UI and content.

Games may be particularly difficult to port to a different screen size. For information on GAPI scaling, see **Section 8.3.3**.

For more information on porting games to a new screen size, refer to the Microsoft white paper, "Porting GAPI Games from Portrait to Square Screens" at **http://msdn2.microsoft.com/en-us/library/ms838277.aspx**.

8.3.3 GAPI scaling

GAPI application output is automatically scaled to fit the Treo smartphone's 240x240 screen. To ensure that applications adhere to this scaling, the height field in the `GXDisplayProperties` structure is returned as 320. This way, applications that programmatically check for the display height are "tricked" into thinking it is a 240x320 screen-sized device, and do not interfere with the automatic scaling.

However, an application must scale touch panel coordinates. To do so, remap the height coordinates of the user's screen touches.

8.3.4 .NET Compact Framework

The Windows Mobile-based Treo smartphones include .NET Compact Framework version 1.0.4292.0 (also called 1.0 SP3). However, you can install version 2.0 on the devices. Download the .NET Compact Framework version 2.0 from the following URL:

http://msdn.microsoft.com/netframework/

8.4 Java environments

Java Virtual Machines developed by third-party software developers exist for the Windows Mobile platform, however, we do not endorse any specific version, and Microsoft does not make a JRE for the Windows Mobile platform. In general, Palm devices do not natively support Java.

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Index

T

U

V

W

X

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