JetBox 8150 User Manual

WinCE 6.0

www.korenix.com

0.0.3

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Acknowledgments

Table of Content

Chapter 1 Introduction

Windows Embedded CE 6.0 is designed specifically for the professional embedded developer who needs software to bring a device to market.

CE 6.0 helps a device maker be successful by providing a hard real-time, small-footprint operating system (OS) with a redesigned kernel and embedded-specific development tools.

Windows Embedded CE is a portfolio of tools and OS features that interoperates with industry standards and Microsoft desktop and server technologies. Windows Embedded CE enhances the ability of a developer to innovate and create differentiated devices for a broad range of device categories with rapid time to market and reduced development costs.

Chapter 2 Software Specifications

2-1 Application – End User

Applications – End User	Description
ActiveSync	This item provides support for synchronizing data between a Windows-based desktop computer and Microsoft® Windows® CE-based devices.
CAB File Installer/Uninstaller	This item includes an application that enables installing and uninstalling CAB files. This application is for use with devices that include a display.

Table 1 Application – End User

2-2 Applications and Services Development

Applications and Services Development	Description
.NET Compact Framework 2.0 SP2	The Microsoft® .NET Compact Framework 2.0 is a hardware-independent program execution environment for applications that target resource-constrained computing devices. This environment offers a choice of languages, Microsoft Visual Basic® and Microsoft Visual C#®, and lessens problems with language interoperability.
Active Template Library (ATL)	Includes support for Active Template Library for Windows CE.
Microsoft Foundation Classes (MFC)	MFC for Windows CE is a comprehensive class library and complete object-oriented

Applications and Services Development	Description
	application framework designed to help build applications, COM components, and controls. You can create anything from a simple dialog box–based application to a sophisticated application that uses the full MFC document or view architecture.
C libraries and Runtimes	Supports full ANSI C run time, compiler C++ exception handling equivalent to the desktop C++ compilers, compiler Run-Time Type Information (RTTI) equivalent to the desktop C++ compilers, the standard input/output library, the standard input/output ASCII library and the standard ASCII string functions.
Component Object Model (COM & DCOM)	The Component Object Model (COM) is a platform-independent, object-oriented system for creating binary software components that can interact with other COM-based components in the same process space, in other processes, or on remote devices.
Message Queuing (MSMQ)	The Message Queuing implementation in Microsoft® Windows® CE makes it possible for applications to communicate with other applications across networks and systems that might be temporarily offline.
Object Exchange Protocol (OBEX)	The Object Exchange Protocol (OBEX) technology for Microsoft® Windows® CE provides an efficient, compact binary protocol that enables a wide range of devices to exchange data spontaneously in a simple, efficient manner.
SOAP Toolkit	The client-side SOAP Toolkit functionality in Microsoft® Windows® CE allows an

Applications and Services Development	Description
	application to invoke Web service operations, while the server-side functionality maps invoked Web service operations to Component Object Model (COM) object method calls.
SQL Server CE 3.5	SQL Server CE extends Microsoft SQL Server to Microsoft Windows CE-based mobile devices. SQL Server CE delivers relational database functionality, including a data store, a query processor, and scalable connectivity capabilities, all in a small footprint.
XML	Extensible Markup Language (XML) is the universal format for data on the Web. XML allows developers to describe and deliver rich, structured data from any application in a standard, consistent way. XML does not replace HTML; rather, it is a complementary format.

Table 2 Applications and Services Development

2-3 Communication Services and Networking

Communication Services and Networking	Description
Wired Local Area Network (802.3, 802.5)	This item provides support for wired local area networks that use 802.3 and 802.5.
Dial Up Networking (RAS/PPP)	This item provides support for accessing network resources on a remote computer.
Point-to-Point Protocol over Ethernet (PPPoE)	This item includes the ability to connect hosts to a Remote Access Concentrator.
Telephony API (TAPI 2.0)	This item includes an API that simplifies and abstracts the details of making telephony

Communication Services and Networking	**Description**
	connections between two or more devices.
Virtual Private Networking (VPN)	This Item includes a Layer Two Tunneling Protocol (L2TP)/IP Security Protocol (IPSec) implementation that enable a more secure virtual private network (VPN) connection to a server computer. This item includes a Point-to-Point Tunneling Protocol (PPTP) implementation that enables a virtual private network connection a server computer.
Domain Discovery	Domain Discovery for Microsoft® Windows® CE 6.0 enables a Windows CE device to discover an Active Directory server to query.
Extensible Authentication Protocol	The Extensible Authentication Protocol implementation in Microsoft® Windows® CE allows third-party authentication code to interact with the implementation of the Point-to-Point Protocol (PPP) included in the Windows CE–based Remote Access Service (RAS). The Extensible Authentication Protocol (EAP) is also used with 802.1x and EAP over LAN (EAPOL) authentication.
Firewall	The IP firewall is typically used on an Internet gateway device. It can also be used as a host firewall. The firewall protects the device on which it runs and protects devices on the private side of the gateway. The firewall blocks IP traffic at the IP and transport layers.
Internet Connection Sharing (ICS)	Internet Connection Sharing (ICS) for Microsoft® Windows® CE consists of a collection of technologies and services that

Communication Services and Networking	**Description**
	make it possible to connect multiple computing and information devices on a network located in a home, a small business, or a corporate branch office to the Internet through a single Internet connection.
IPSec v4	IPSec v4 enables two client devices on a network to establish peer-to-peer communication using the IP Security (IPSec) protocol. This technology enables Windows CE-based devices to participate in networks that are secured by IPSec.
NDIS Packet Capturing	NDIS Packet Capturing captures network traffic so that it can be read by the Microsoft Windows Network Monitor (NetMon).
Network Utilities	The Network Utilities includes IPConfig, IPv6tun, NetStat, Ping, Route and Tracert that you can use to troubleshoot network connections in your Windows CE-based device.
TCP/IP	TCP/IP for Microsoft® Windows® CE allows devices to participate as peers and servers on local area networks (LANs) and remote networks.
Windows Networking API/Redirector	The Windows Networking API/Redirector (SMB/CIFS) implementation in Microsoft® Windows® CE provides functions to establish and terminate network connections and to access files on servers supporting the Common Internet File System (CIFS). Access to this data is made possible by way of the networking API (WNet).
Winsock	Windows Sockets (Winsock) for Microsoft®

Communication Services and Networking	**Description**
	Windows® CE specifies a programming interface based on the familiar socket interface from the University of California at Berkeley. It includes a set of extensions designed to take advantage of the message-driven nature of Windows CE. Windows CE .NET 4.1 and later supports Winsock 2.2, which provides easier access to multiple transport protocols.
File Server	The File Server functionality in Microsoft® Windows® CE enables clients to access files and other resources over the network.
Ftp Server	The FTP Server implementation in Microsoft® Windows® CE can copy files to and from remote computer systems over a network using TCP/IP. The source code is provided to you as is, so that you can customize the implementation for your specific requirements.
SNTP Client and Server	Windows CE supports the Simple Network Time Protocol (SNTP) technology.
Telnet Server	The Telnet Server functionality in Microsoft® Windows® CE provides a sample Telnet server can be installed on a device to allow remote administration through a standard Telnet client. Using the Telnet sample, the current device can be manipulated as if it is running the command prompt on the device itself.
Web Server	The Web Server (HTTPD) implementation in Microsoft® Windows® CE enables you to monitor, configure, and remotely control a device or computer through the use of a Hypertext Transfer Protocol (HTTP) server.

Communication Services and Networking	**Description**
	The Web server provides this service for network printers, scanners, and other shared equipment.

Table 3 Communication Service and Networking

2-4 Core OS Service

Core OS Services	**Description**
Kernel Features	This item includes Fiber API, Format Message API, Memory Mapped Files, and Message Queue Point-to-Point.
Device Drivers	This item includes display, serial port, USB host, etc… drivers
Device Manager	Tracks all loaded device drivers and their interfaces, and issues notifications when device interfaces are added or removed. The Device Manager registers special file names with the kernel that do the following tasks: Map the stream interface functions Load and track drivers by reading and writing registry values Unload drivers when their devices are no longer needed
PNP Notifications	A functionality of the “AdvertiseInterface” system. This functionality is automatically included if either Storage Manager or Device Manager is selected.
Power Management	A fully implemented Power Manager framework, including all APIs and features. Power Manager applications and drivers can do the following tasks: Suspend the system Control device power levels

Core OS Services	**Description**
	Register for notifications of power-related activities such as suspend, absence of user/system activity, and change in battery level. Drivers can intelligently self-manage power.
USB Human Input Device (HID) Class Driver	A sample USB class driver that supports HID-compatible USB devices on a run-time image.
USB Printer Class Driver	A sample USB class driver that supports USB printer-class-compatible devices on a run-time image.
USB Remote NDIS Class Driver	A sample USB class driver that supports Remote NDIS-compatible Ethernet adapters.
USB Storage Class Driver	A sample USB class driver that supports USB Storage-class compatible devices.

Table 4 Core OS Service

2-5 Device Management

Device Management	**Description**
Device Management Client	Provides support for the Device Management Client in the run-time image.
Simple Network Management Protocol	Provides support for the Simple Network Management Protocol (SNMP) in the run-time image.

Table 5 Device Management

2-6 File System and Data Store

File System and Data Store	**Description**
Bit-based	Provides support for the Device Management Client in the run-time image.
Compression	Provides support for the Simple Network

File System and Data Store	Description
	Management Protocol (SNMP) in the run-time image.
Database support	An API that provides built-in CEDB database support.
Hive-based Registry	A registry system that stores data inside files, or hives, which can be kept on any file system
RAM and ROM File System	A file system driver capable of reading data from the ROM file system and the RAM file system in the object store.
Storage Manager	The Storage Manager is responsible for all external storage items, such as file systems, file system filters, and partitioning
System Password	An API that provides support for authentication on a device to prevent unauthorized access.

Table 6 File System and Data Store

2-7 Graphics and Multimedia Technologies

Graphics and Multimedia Technologies	Description
Audio	Supports Waveform audio.
Graphics	Supports Alphablend API, Direct3D Mobile, Direct Draw, and Gradient Fill.
Imaging	Support image decoders and encoders for BMP, GIF, ICO, JPG and PNG formats.
Audio Codecs and Renderers	Includes G.711 Audio Codec, GSM 6.10 Audio Codec, IMA ADPCM Audio Codec, MP3 Codec, MPEG-1 Layer 1 and 2 Audio Codec, MS ADPCM Audio Codec, Wave/AIFF/au/snd File Parser, Waveform Audio Renderer, WMA Codec and WMA Voice Codec.

Graphics and Multimedia Technologies	Description
DirectShow	Includes ACM Wrapper Filter, DirectShow Core, DirectShow Display, DirectShow Error Messages and DMO Wrapper Filter.
Media Formats	Includes AVI Filter and MPEG-1 Parser/Splitter.
Video Codecs and Renderers	Includes DirectShow Video Renderer, MPEG-1 Video Codes, MS RLE Video Codec, Overlay Mixer, Video/Image Compression Manager and WMV/MPEG-4 Video Codec.
WMA and MP3 Local Playback	This item provides support for playing Windows Media Audio (.wma) or MP3 files from local storage such as system memory or Compact Flash memory. This is an audio-only item and does not provide any video playback capabilities

Table 7 Graphics and Multimedia Technologies

2-8 Security

Security	Description
Authentication Services (SSPI)	This catalog item includes support for a programming interface for user authentication, and message protection. Available authentication providers include NTLM, Kerberos, and Secure Sockets Layer (SSL). Each provider contains different authentication and cryptographic schemes.
Credential Manager	This item includes a service for caching credentials, and enabling the sharing of common credentials.
Cryptography Services	This item includes a set of cryptographic

Security	Description
(CryptoAPI 1.0)	services that provide basic cryptography support for hashing, encrypting, and decrypting data.
Local Authentication Sub-System	This item includes support for the Local Authentication subsystem (LASS) infrastructure that will enable application independent user authentication, provide consistent authentication regardless of the mechanism used, and enable policy-based authentication.

Table 8 Security

2-9 Shell and User Interface

Shell and User Interface	Description
Graphics, Windowing and Events	Microsoft® Windows® CE combines the Microsoft Win32® application programming interface (API), user interface (UI), and graphics device interface (GDI) libraries into the Graphics, Windowing, and Events Subsystem (GWES) module (Gwes.exe). GWES is the interface between the user, your application, and the operating system (OS). GWES supports all the windows, dialog boxes, controls, menus, and resources that make up the Windows CE user interface (UI), which enables users to control applications. GWES also provides information to the user in the form of bitmaps, carets, cursors, text, and icons.
Command Shell	Command-line shell
Standard Shell	Similar to the Windows Explorer shell on Windows-based desktop operating systems.

Shell and User Interface	Description
User Interface	Includes Common Controls, Common Dialog, Control Panel Applets, Menu Tool Tip, Mouse, Network User Interface, Software Input and Panel.

Table 9 Shell and User Interface

Chapter 3 Software Feature

3-1 Korenix Utilities

3-1-1 Hive-Base Registry

Windows Embedded CE supports two different registry types: the RAM-based registry and the hive-based registry.

Most x86 system devices usually have a hard disk or a flash card. Windows CE 6.0 will store data in a hive file that is located on the disk. When the system boots or shutdown, any change to the registry data will be written to the hive file that exists on the disk.

The hive-based registry stores registry data inside files, or hives, which can be kept on any file system. This removes the need to perform backup and restore on power off. Removing this work during boot and power off makes the cold boot process faster.

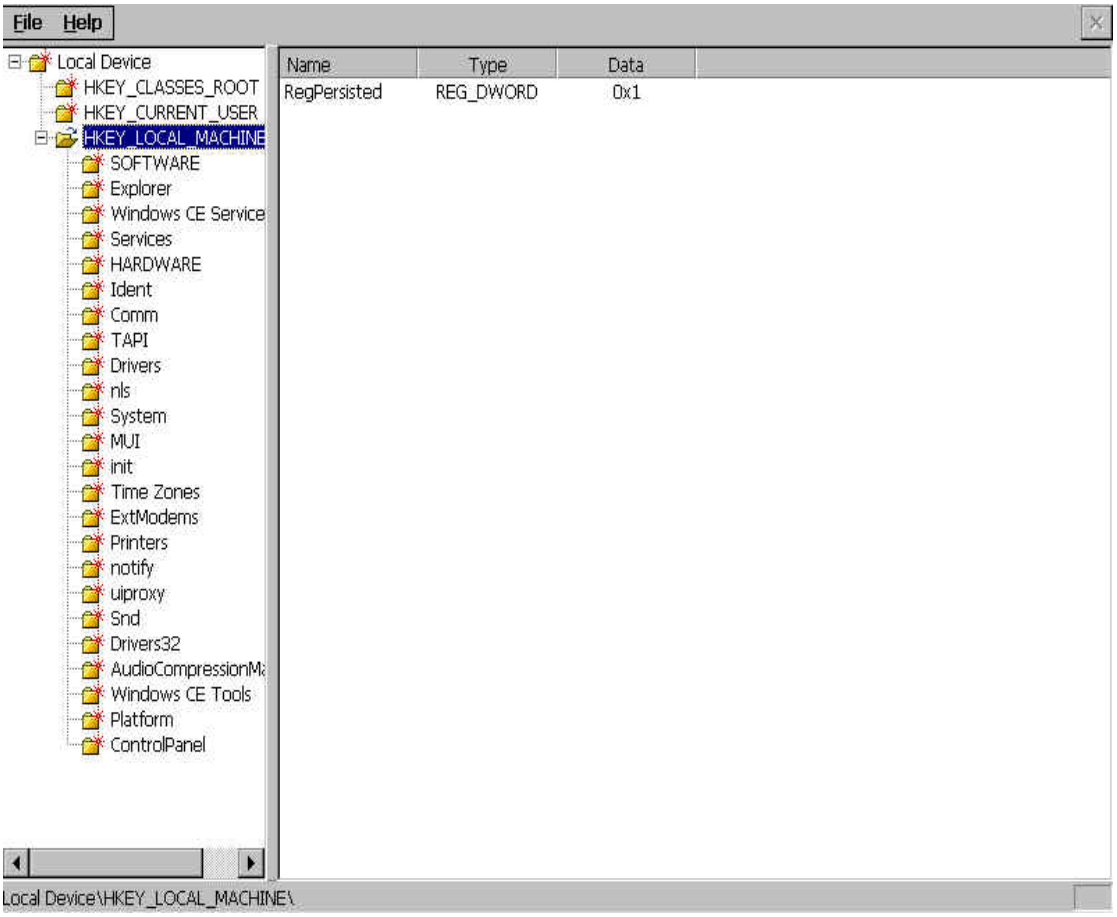
Korenix uses the **Hive-Based Registry** to store registry data for Windows CE 6.0. And we developed two tools to edit the registry and save the registry data.

3-1-2 Registry Editor Utility

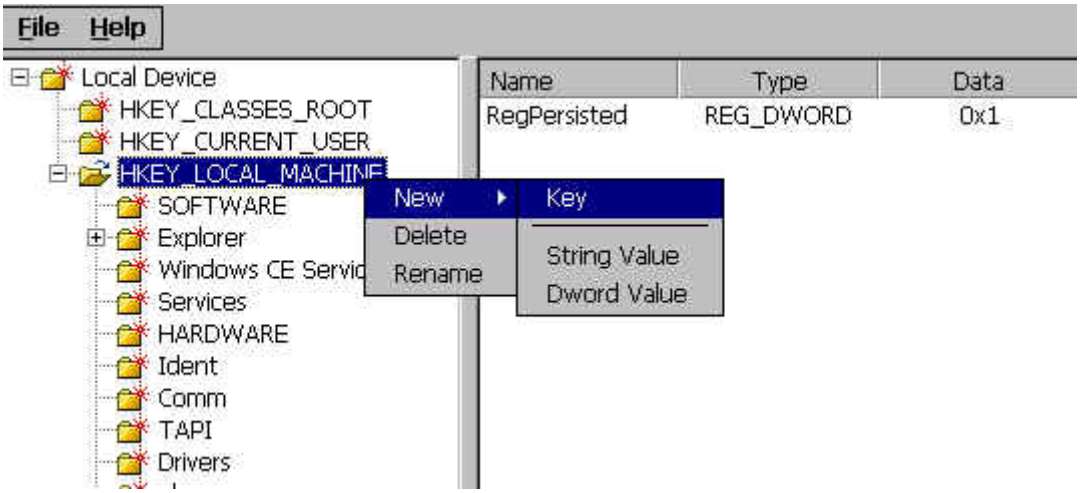
Below is an example that how to add the registry.

1. Click **Start → Run**, and type regedit

2. Double click to expand the registry



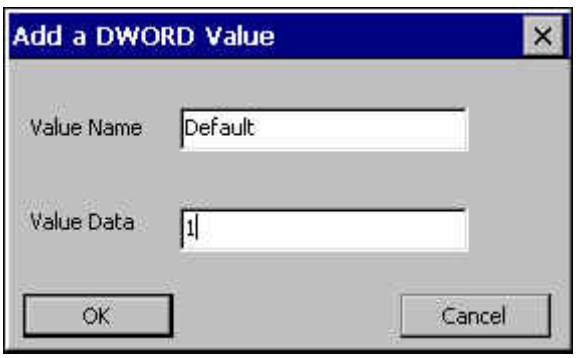
3. Right click to add a new key



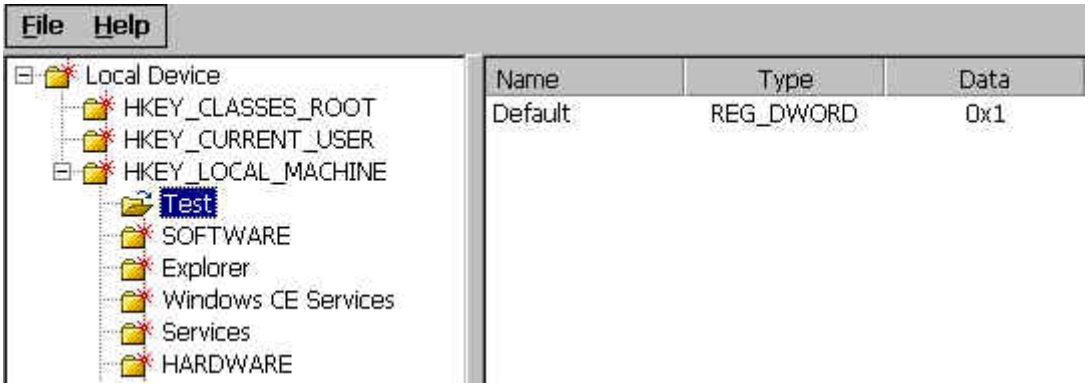
4. Type Key name

5. Right click to add a DWORD value

6. Type value name and specify the value



7. New registry



Note：Windows CE Registry Limitations：A key or value name can't exceed 255 characters. And we just support String and DWORD value.

3-1-3 Registry Flush Utility

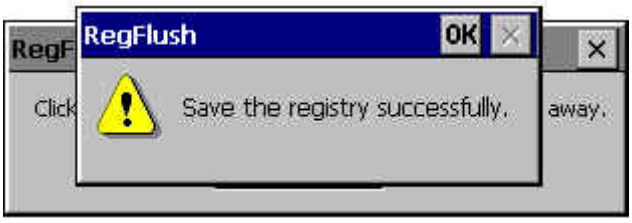
Outstanding registry data will be flushed on a suspend/resume cycle and any time the system goes through a software shutdown. However, data may be lost if power is suddenly removed. Because a software shutdown is not an UI option of JetBox, so to ensure that data is not lost, we provide a **RegFlush** tool. It will flush any unsaved changes in the hive to the persistent file.

To save the system resource, JetBox doesn't implement a daemon to flush registry data periodically. A utility named "RegFlush" is provided to flush the changed registry data.

1. Go to **Start→Programs→Utility** and select **RegFlush**

2. Click the "Flush" button.

3. Save the registry successfully.

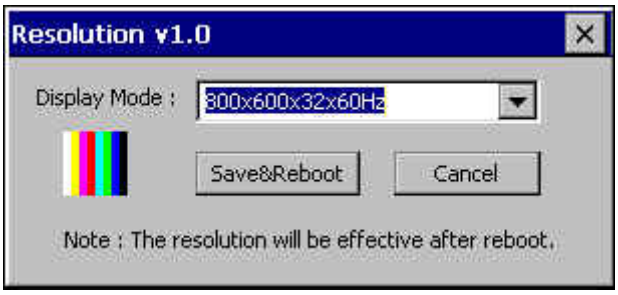


3-1-4 Adjust Resolution

Base on VIA VGA driver, we provide a utility to adjust resolution.

1. Go to **Start→Programs→Utility** and select **Resolution**

2. Select which resolution you want to change.



3. The resolution will be effective after reboot. So when you decide it, please click **Save&Reboot** button to reboot the system.

3-1-5 AutoRun Function

Introduction

When Windows CE begins loading, the kernel starts the file system and examines the **HKEY_LOCAL_MACHINE\Init** registry key to identify what applications to run. To control which applications run at system startup, create launch registry values. Launch registry values do not need to be sorted in the registry, although you can specify dependencies.

You can specify up to 32 applications. Below the table shows the named values for the **HKEY_LOCAL_MACHINE\Init** registry key.

HKEY_LOCAL_MACHINE\Init	
Value	**Description**
Launch*nn* : String	Specifies the application to launch in order "*nn*".
Depend*nn* : Binary	**Launch*nn*** registry values have optional dependencies as denoted by the **Depend*nn*** registry value.

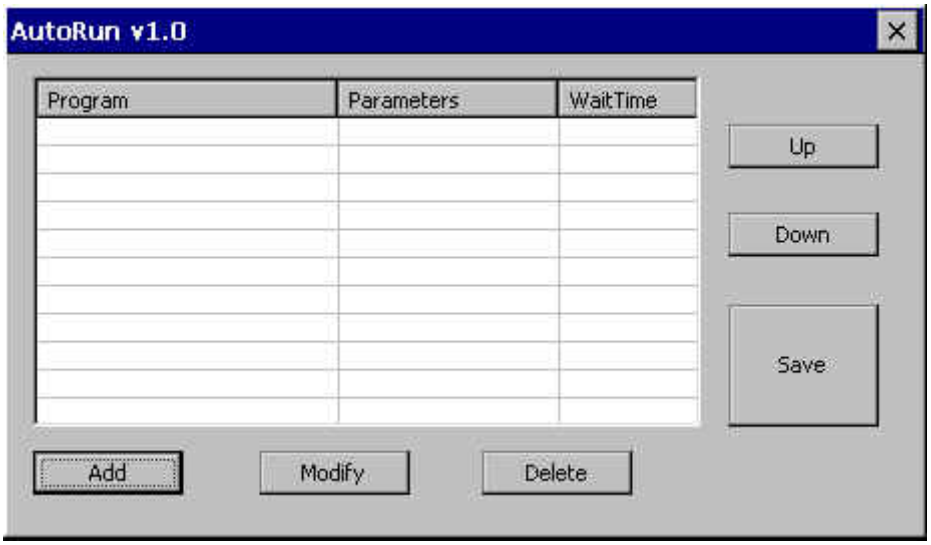
Depend*nn*：registry values specify applications that Windows CE must be running before the **Launch*nn*** applications run.
Depend*nn*：registry values begin with the keyword **Depend**, followed by the same decimal number as the **Launch*nn*** registry value.
The **Depend*nn*** registry values define an order in which Windows CE launches applications. One or more dependent applications can be specified per **Depend*nn*** value. Dependent applications are specified as a series of Words in hexadecimal notation. Below the table shows a typical **Init** registry entry using dependencies.

HKEY_LOCAL_MACHINE\Init	
Value Name	**Value**
Launch10	shell.exe
Launch20	device.exe
Launch30	gwes.exe
Depend30	hex:14,00
Launch50	taskman.exe
Depend50	hex:14,00, 1e,00

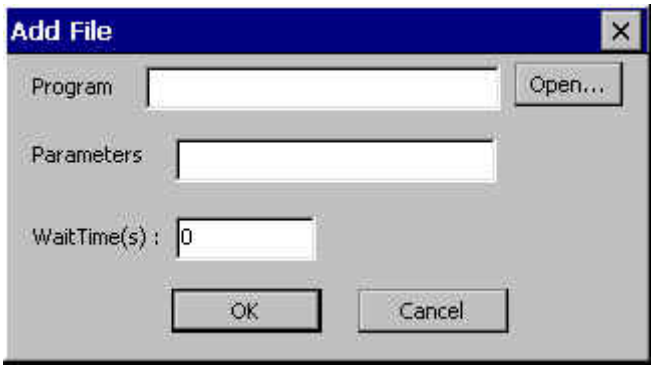
In the preceding example, Gwes.exe is dependent on Device.exe starting and Taskman.exe is dependent on Device.exe and Gwes.exe starting.
If you want to launch a application during Windows CE bootup, you have to add a special Registry key and rebuild the Windows CE Image. It is too complicated and not flexible enough for developers.
To solve this problem, we provide the "**AutoRun**" function. With this function, you can run your application during Windows CE bootup without rebuilding the Image.

1. Go to **Start→Programs→Utility** and select **AutoRun**

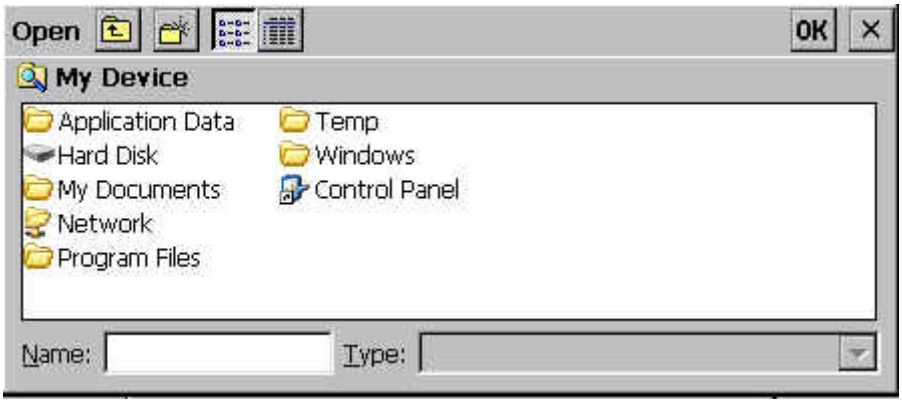
2. User interface of **AutoRun**



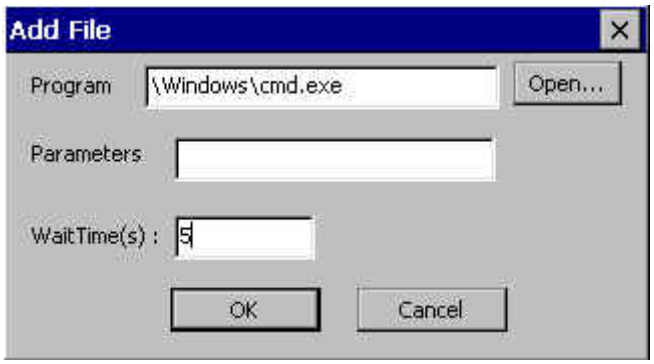
3. Click “Add” to add a application



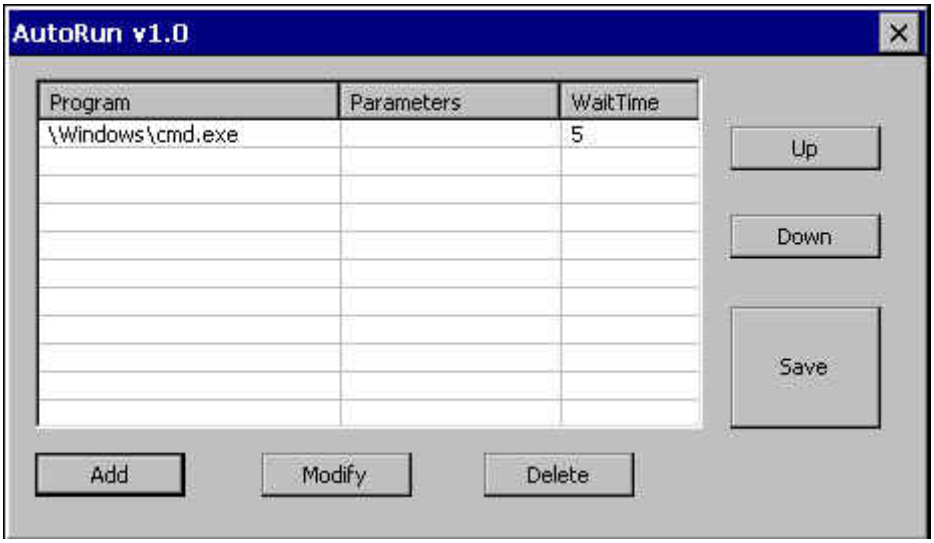
4. You can type the application name directly or click Open to select your application.



5. For example, we select the “\Windows\cmd.exe” without any parameter and Wait Time 5 seconds



6. You can see the detail information in the List Control



7. Detail information of **AutoRun** function

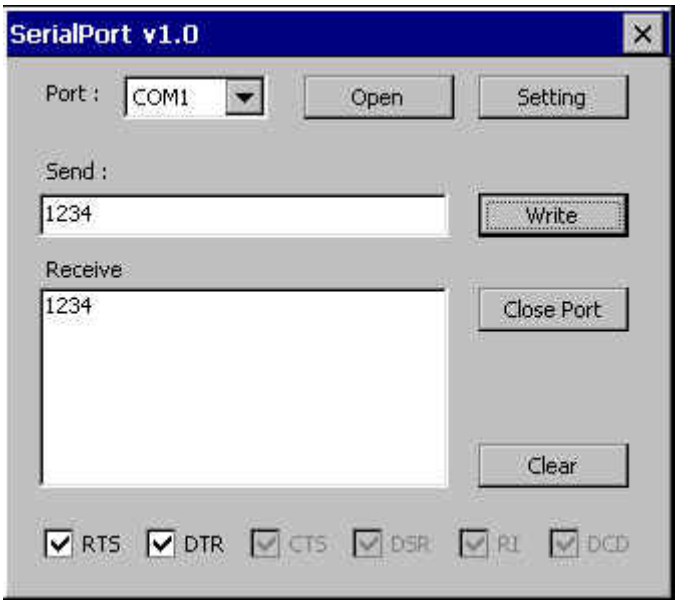
Utility Name: AutoRun	
User Interface	**Description**
Program:	Specifies the application path.
Open	Browses the application location.
Parameters:	Specifies the application arguments.
Up	Moves up the run order of selected application.
Down	Moves down the run order of selected application.
WaitTime (s):	The wait time in seconds before running application.
Add	Adds the specified application path into run list.
Modify	Updates the wait time or run once attributes of the selected application.
Delete	Removes the selected application from run list.
Save	Saves run list information **NOTE: Run flags attached with the specified applications will be set.**
List Ctrl	Shows and Controls the run list information.

3-1-6 Serial Port Test

We provide a serial test utility. You can use it to make sure the all serial port work correctly or not.

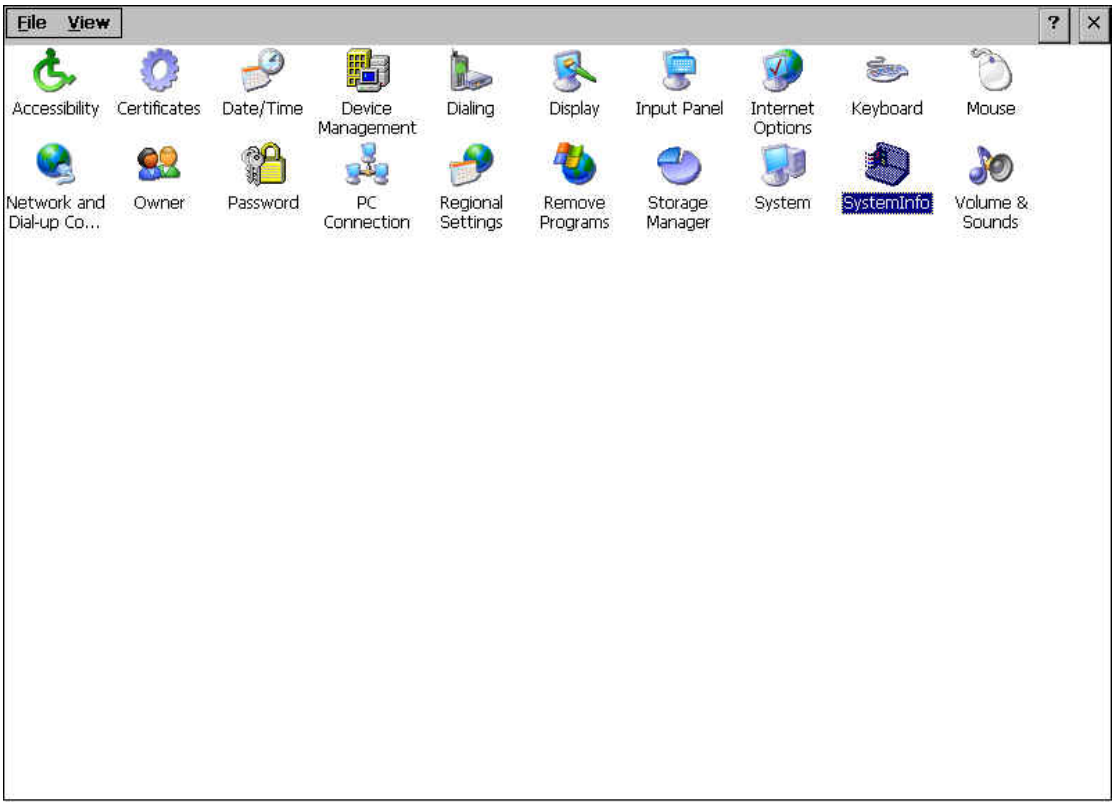
1. Go to **Start→Programs→Utility** and select **ComTest**

2. Click “Open” to open the serial port and plug a Loopback to test.



3-1-7 System Information

The control applet named “**SystemInfo**” provides a simple user interface to show the OS and Boot loader build information.



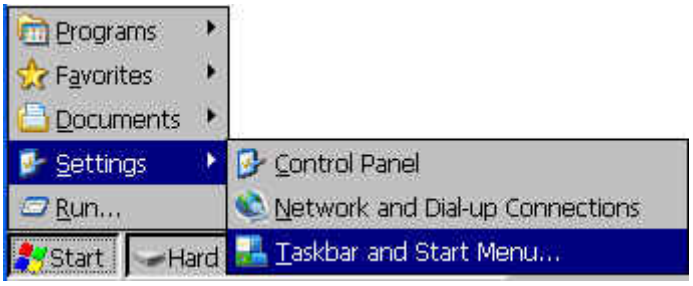
Applet Name: SystemInfo	
User Interface	**Description**
OS Version	System Version of Windows CE
Build Date	CE Image creation date.
Release Type	Release purpose type.
Product Name	Named product
Image Version	Image Version of Windows CE.

3-2 Basic Operation

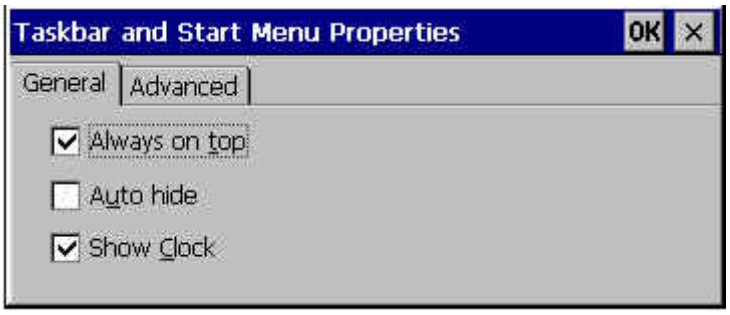
Here are the basics of CE 6.0. For other detail operation, please refer to Windows CE 6.0 online help.

3-2-1 Taskbar and Start Menu Properties

1. Select **Start→Setting→Taskbar and Start Menu..**



2. Setup the properties



3-2-2 Password Protect

1. Use a Device Lock password
   Select **Start→Setting→Control Panel** and open the **Password** icon.

2. Set up your password

Note：Please remember your password.

3-2-3 Setting the Device Name

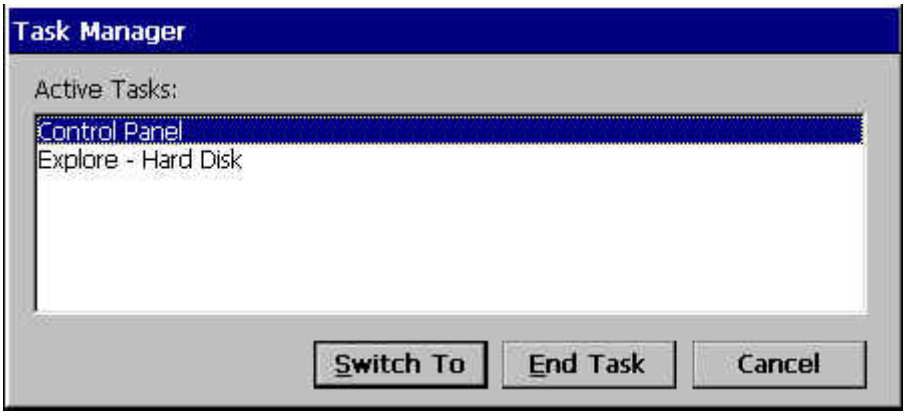
1. Select **Start→Setting→Control Panel** and click the **System** icon.

2. In the Device Name tab, enter your device name.

Note：The device name will be used to identify your Windows CE device to other computers.

3-2-4 Task Manager

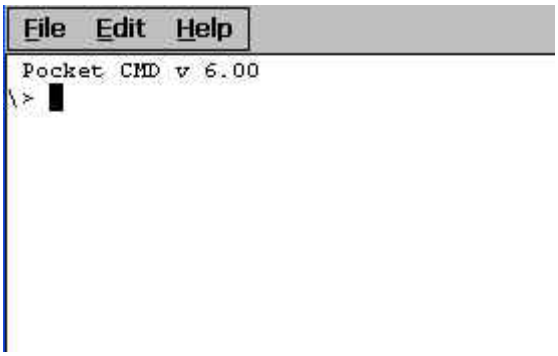
Press **Alt+Tab** key to run Task Manager



3-2-5 Command Prompt (CMD.EXE)

The command prompt provides similar commands as the DOS prompt.

1. Select **Start→Programs→Command Prompt** or just run cmd.exe



3-3 Telnet Server

Overview

JetBox provides a Telnet server to allow remote administration through a standard Telnet client. Using the Telnet server, the JetBox can be manipulated as if it is running the command prompt on the device itself. The Telnet server is also useful for device bring-up and debugging.

NOTE JetBox enables Telnet server without user authentication by default.

Default Registry Settings

It's necessary to be aware of the registry settings that impact security. The Telnet server settings are located under the **HKEY_LOCAL_MACHINE\Comm\TELNETD** registry key. Table 18 shows the named values for the Telnet server registry key. The Telnet server reads the values in the registry before servicing each request. Therefore, changes made to the registry take affect immediately and do not require the Telnet server to be restarted.

HKEY_LOCAL_MACHINE\Comm\TELNETD	
Value	**Description**
IsEnabled : DWORD	To disable the Telnet server, set this value to 0; otherwise, set it to nonzero. If the Telnet server is started and this value is not present, this value defaults to accepting connections.
UseAuthentication : DWORD	To require a password check on the user, set this value to 1; otherwise, set it to 0. By default, the value 0 is set to disable the authentication.
UserList : String	Provides a comma-separated list of allowed users. Requires **UseAuthentication** to be enabled. By default, the "asterisk" or the "at sign" and the asterisk (* or @*) is set to allow all users.

Table 108 Telnet Server Registry Key and Named Values

Security Notes

The security on the Telnet server is very light and vulnerable to security attacks. Even if the Telnet server is configured to require password authentication, the password is sent in plain text across the network and is therefore vulnerable to packet sniffing. A malicious user could obtain the password to JetBox by watching packets sent back and forth between the Telnet server and the client during the authentication stage. If a malicious user could log on to JetBox, they would have complete control over it. This could involve deleting or modifying key system files and the registry.
Because of these serious security risks, it is strongly recommended you only run the Telnet server for development and debugging purposes, on a controlled, private network where you trust the users. It is strongly recommended that you do not deploy this Telnet server on a public network such as the Internet.

Recommendations

NOTE: Set the User List and Domain variables to prevent hacker attacks on your device

If Telnet server is used without appropriate values set for the User List and Domain variables, your Telnet server will be vulnerable to hacker attacks. These variables are not set by default. A hacker must only guess the device's password, the way it is set in Control Panel, to obtain access to the server.
To prevent such an attack, the user name in the **UserList** registry value must be set for each of the servers that are currently running. The user will then need to log in with the specified user name and appropriate password to use the server.
You can also set the domain variable in the **DefaultDomain** registry value, which is located under the **HKEY_LOCAL_MACHINE\Comm\Redir** registry key.

3-4 FTP Server

Overview

JetBox implementation of FTP server enables you to transfer files from a desktop computer using a TCP/IP connection. The implementation of FTP server in JetBox is based on RFC 959. The included FTP server supports the minimum implementation of the FTP protocol defined in RFC 959. This minimum implementation includes configuration values, transfer parameters, and ASCII and Image data types, and allows FTP to operate with a minimum of error messages.

NOTE JetBox Enables FTP server by default.

Default Registry Settings

It's necessary to be aware of the registry settings that impact security. The FTP server settings are located under the **HKEY_LOCAL_MACHINE\Comm\FTPD** registry key. Table 19 shows the named values for the FTP server registry key.

HKEY_LOCAL_MACHINE\Comm\FTPD	
Value	**Description**
AllowAnonymous : DWORD	Default set to 1. Possible values are 0 (false) or 1 (true). Determines whether the server will allow anonymous access.
AllowAnonymousUpload : DWORD	Default set to zero (0). Possible values are 0 (false) or 1 (true). Determines whether authorization is required to upload files to the server, delete files from the server, and rename files.
AllowAnonymousVroots : DWORD	Default set to zero (0). Possible values are 0 (false) or 1 (true). Specifies whether access to virtual roots is granted or denied to anonymous users.
AllowLowPortValues : DWORD	Default set to false (0). Possible values are 0 (false) or 1 (true). If this value is set

HKEY_LOCAL_MACHINE\Comm\FTPD	
Value	**Description**
	to false, all PORT commands requesting a port equal to or lesser than 1023 will be rejected. If this key is set to true, low ports will be allowed.
DefaultDir : String	Default root directory. Directory and subdirectories of this key are accessible remotely. If this value is not set in the registry, the default is \Temp.
IsEnabled : DWORD	To disable the FTP server, set this value to 0; otherwise, set it to nonzero. If the FTP server is started and this value is not present, This value is typically used to keep the server disabled at boot time.
UseAuthentication : DWORD	To require a password check on the user, set this value to 1; otherwise, set it to 0. By default, the value 0 is set to disable the authentication.
UserList : String	Provides a comma-separated list of allowed users. Requires **UseAuthentication** to be enabled. By default, the “asterisk” or the “at sign” and the asterisk (* or @*) is set to allow all users.

Table 119 FTP Server Registry Key and Named Values

Security Notes

If **AllowAnonymous** is set to true, it will allow users to connect to the server without providing verifiable credentials. Anyone can log in using the username "anonymous" and any password to gain access. It is recommended that you set this value to false and use the **UserList** registry setting to specify all allowed users.

If **AllowAnonymousUpload** is set to true, unauthenticated users will be able to copy files to, and delete files from, your server. This can be very dangerous because attackers might upload dangerous applications and documents, or

they might delete important system files. It is not recommended to allow upload permission for anonymous users.

If **AllowAnonymousVroots** is set to false, anonymous users will only be able to access the main FTP share. If this value is set to true, unauthenticated users will also be able to access VROOTs as well as the main share. Therefore you should use this setting with caution.

Setting **UseAuthentication** to false enables clients to connect to the server without providing credentials. It is therefore strongly recommended that you do not set this value to false. Change this setting only if you have anonymous clients that must access the server but cannot or will not send USER and PASS credentials.

It is recommended that you set this value to a list of all users who should have access to the server and its member VROOTs. Specifying the allowed users in **UserList** and setting **AllowAnonymous** to false will help protect the device from most attackers and keep your files available only to those users who need to see them.

Recommendations

NOTE: Set the User List and Domain variables to prevent hacker attacks on your device

If the FTP Server functionality is used without appropriate values set for the User List and Domain variables, the FTP server will be vulnerable to hacker attacks. These variables are not set by default. A hacker must only guess the device's password, the way it is set in Control Panel, to obtain access to the server.

To prevent such an attack, the user name in the **UserList** registry value must be set for each of the servers that are currently running. The user will then need to log in with the specified user name and appropriate password to use the server.

You can set the domain variable in the **DefaultDomain** registry value, which is located under the **HKEY_LOCAL_MACHINE\Comm\Redir** registry key.

Setting the **DefaultDomain** registry value will require FTP clients to have valid domain credentials to log in.

3-5 Web Server

Overview

Web server facilitates the use of the Internet for communication between JetBox and network printers, scanners, and other shared equipment. The Web server applications send Hypertext Markup Language (HTML) pages to a requesting browser. Users only need to have an Internet connection and a browser to be able to make use of the Web server functionality. The Web server supports IPv6 and also supports the use of Active Server Pages (ASP).

Default Registry Settings

It's necessary to be aware of the registry settings that impact security. The Web server settings are located under the **HKEY_LOCAL_MACHINE\Comm\HTTPD** registry key. If you make changes to the Web server registry settings, it is necessary to stop the Web server and restart it to make the changes take effect. The **IsEnabled** registry value is checked only when the Web server is initially loaded. If the registry value is set to zero (0), the Web server does not start. Changing this value to zero (0) while the Web server is running has no effect. You also must stop the Web server to make it stop accepting connections. Table 20 shows the named values for the Web server registry key.

HKEY_LOCAL_MACHINE\Comm\HTTPD	
Value	**Description**
BasicRealm : STRING	Specifies the string that the Web server will send to clients as its Basic realm when performing basic authentication. If this registry value is not set, the Web server will default to using the string **"Microsoft-WinCE"**.
IsEnabled : DWORD	If the value is not set in the registry, the Web server is enabled. If the value is set to zero (0), the Web server does not accept connections from the network, even from

HKEY_LOCAL_MACHINE\Comm\HTTPD	
Value	**Description**
	the local host.
Port : DWORD	Default setting is 80. This port receives HTTP connections. Do not set the port to zero (0).
Basic : DWORD	Default setting is zero (0). If this value is nonzero, the Web server uses Basic authentication for client connections.
NTLM : DWORD	Default setting is 1. If this value is set to nonzero, the Web server uses NTLM authentication for client browser connections. Also, if this value is nonzero, the failure of Basic authentication forces NTLM authentication. If the value is not set in the registry, NTLM is not used.
DirBrowse : DWORD	Default setting is zero (0). If this value is set to nonzero, directory browsing is allowed. If this value is not set in the registry, directory browsing is turned off.
Filter DLLs : String	Default not set in the registry. List of DLL names, separated by commas that specifies the filters to use.
DefaultPage : String	Default not set in the registry. If the value is not present in the registry, the Web server will use **"default.htm;index.htm"**. List of page names, separated by semicolons that specifies file names interpreted by the Web server to be default pages. When browsing a directory, the Web server traverses this list searching for a file of the same name in the directory. If the file exists, it is sent to the client. If no matching file exists, the Web server sends a directory listing or returns an error, depending on whether directory browsing is enabled. If more than one

HKEY_LOCAL_MACHINE\Comm\HTTPD	
Value	**Description**
	DefaultPage file name is matched, the Web server uses the first matching file name.
AdminUsers : String	Default not set in the registry. List of user names, separated by semicolons. A user who has gained user access must be listed in this key to gain Administrator access.
LogFileDirectory : String	Default setting is "\windows\www" directory. If the name is not set or if the specified directory is inaccessible, no logging is performed. Name of the directory where the logging files are created.
PostReadSize : DWORD	If the value is not set in the registry, **PostReadSize** will default to 48 KB. The Web server uses a minimum value of 8150 bytes (8 KB). If the value in the registry is less than 8 KB, the value is ignored and the Web server will use 8 KB. Specifies the maximum number of bytes that the Web server reads when receiving POST data. To read more data, you must use a raw data filter or call ReadClient in an ISAPI extension.
MaxLogSize : DWORD	Default setting is 32 KB. If this value is not set in the registry, or if it is set to zero (0), no logging is performed. Maximum size, in bytes, that a log file can become before it is rolled over.
MaxHeaderSize : DWORD	Default setting is 48 KB in the registry. Maximum number of bytes that the Web server will read of HTTP headers. If the header size exceeds this value, the Web server will terminate the session and return a message to the client: 400 - Bad Request.
MaxConnections :	Default is not set in the registry. If the value

HKEY_LOCAL_MACHINE\Comm\HTTPD	
Value	**Description**
DWORD	is not set in the registry, **MaxConnections** will default to 10. Specifies the maximum number of simultaneous connections to the Web site. After the maximum number of connections is established, additional client requests will be sent a message: 503 – Server Too Busy.
ServerID : String	Default is not set in the registry. If the value is not set in the registry, **ServerID** will default to "Microsoft-WinCE/X.Y", where X is the major version and Y is the minor version of Windows CE-based device. If **ServerID** is set, the Web server returns the specified server name in the response header. Identifies the server name that is included when the Web server generates HTTP response headers. The response header includes a field name "Server: ". Optionally, you can include the software version number or any similar information in the string.

Table 20 Web Server Registry Key and Named Values

Security Notes

When using Basic authentication, the client browser sends the user identifier and password to the server in clear text. In addition, all data sent between the client and the browser is in clear text and therefore vulnerable to packet sniffing. You should consider using SSL to help protect sensitive information. Although the client browser sends the password to the server in encrypted format, all data sent between the client and the browser is in clear text and therefore vulnerable to packet sniffing. You should consider using SSL to help protect sensitive information.

DirBrowse turns on the Web server's ability to provide local directory browsing. This exposes the local file system to a remote browser through HTTP. Users

can view file lists and download files depending on virtual root and authentication registry settings. Enabling directory browsing increases the potential attack surfaces, therefore you should enable directory browsing only when necessary.
User names in this list identify the administrators of the site who have access to all virtual roots hosted on this Web site, including the restricted sites. Choose these users carefully and ensure that they set proper password, otherwise their accounts could be used to gain access to restricted sites.
Setting the value too small can block user access to the site. However, if the value is too large the Web server will consume more system resources. Based on your deployment model, choose this number appropriately.
To avoid revealing the server software information to malicious users, you may want to create a custom server name that obfuscates the Web server and operating system versions.

Recommendations

A typical deployment uses a Web server in a private network to provide a remote user interface to configure a headless device. The registry defines the number of connections and when the **MaxConnections** registry value is not set, the registry limits the number to 10.
A typical deployment uses the Web server to display status information or to host a family or community Web site. You should not use the Web Server to perform critical operations, such as machine control or financial processing.
Use NTLM and/or Basic authentication mechanism to limit access to known users only. You can set the option in the **HKEY_LOCAL_MACHINE\COMM\HTTPD** registry key.
SSL protocol helps to protect data from packet sniffing by anyone with physical access to the network.
Carefully choose your virtual roots and limit access to the appropriate files by providing appropriate user access lists. Anonymous users with access to the virtual root may be able to access files and directories within that virtual root. You can set the options in **HKEY_LOCAL_MACHINE\Comm\HTTPD\VROOTS** registry key.

3-6 File Server

Overview

The File Server technology enables clients to access files and other resources, such as printer, from a server over a network using TCP/IP. File Server uses the Common Internet File System (CIFS). This is an extension of the Server Message Block (SMB) file sharing protocol. CIFS enables a network-enabled application to access and manipulate files and directories on a remote server in the same way that it the application accesses and manipulates files and directories on the local system.

Default Registry Settings

The registry stores information necessary to configure the system for applications and hardware devices. The registry also contains information that the operating system continually references during operation. JetBox enables you to create virtual file server directories. To users who access your file server share, virtual directories appear as subdirectories of the file server share, although these directories may be located in a different folder. You can create a virtual root directory called "myCF" by specifying the following registry key: **HKEY_LOCAL_MACHINE\Services\SMBServer\Shares\Hard Disk**. **Note the maximum length of the virtual root directory is 12 characters.** Table 21 shows the named values for the **HKEY_LOCAL_MACHINE\Services\SMBServer\Shares** registry key.

HKEY_LOCAL_MACHINE\Services\SMBserver\Shares	
Value	**Description**
UseAuthentication : DWORD	No default set. Setting this value to 0 will disable the authentication on the file server. The file server will be accessible to all users on the network.

Table 21 Named Values of HKEY_LOCAL_MACHINE\Services\SMBServer\Shares Key.

Table 22 shows the named values that are stored under the virtual root key. An example of such a virtual root key is **HKEY_LOCAL_MACHINE\Services\SMBServer\Shares\Hard Disk**

HKEY_LOCAL_MACHINE\Services\SMBserver\Shares	
Value	**Description**
Path : String	Specifies the path to be shared.
Type : DWORD	Setting this value to 1 designates this as a print server share, setting this value to 0 (zero) designates this as a file server share.
UserList : String	Specifies a comma-separated list of allowed users.

Table 22 Named Values of HKEY_LOCAL_MACHINE\Services\SMBServer\Shares\Hard Disk Key

Security Notes

It is not recommended that you disable authentication on the file server and you share the \Windows or root directory.
You can specify a list of folders that cannot be shared. You can use any name for each folder you specify in the exclusion list. Setting the **HKEY_LOCAL_MACHINE\Services\Smbserver\Shares\ExcludePaths** registry key prevents the configuration functions from creating the specified shares, so that they cannot be accessed by an un-trusted application. Table 23 shows an example how to exclude the \Windows and \Documents and Settings directories:

HKEY_LOCAL_MACHINE\Services\Smbserver\Shares\ExcludePaths	
Value Name	**Value**
“Windows”	“\\Windows”
“My Documents”	“\\Documents and Settings”

Table 23 an Example to Exclude the Folders to be Shared

Recommendations

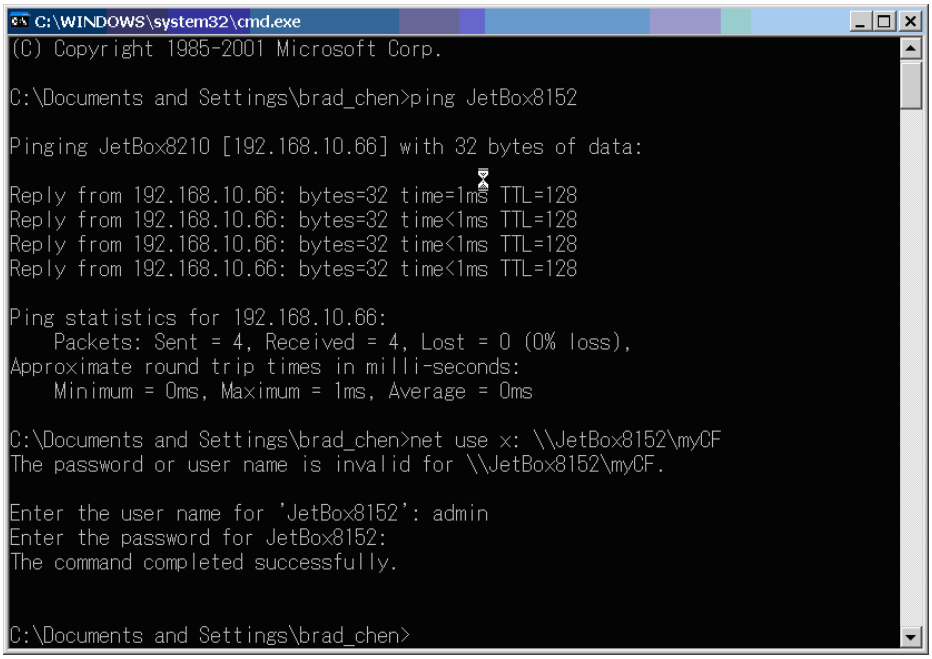
After you have configured your share folders by editing the registry manually or using the remote configuration tool, you can access and browse the folders you created in the following steps.

1. On the development workstation, from the **Start** menu, chooses **Run**.

In the **Open** box, type **\\JetBox<model name> (for example: \\JetBox8152)**, and then choose **OK**. The **Connect to JetBox dialog box appears**.

2. In the **Connect to JetBox** dialog box, type the user name you created and the corresponding password, and then choose **OK**. A window appears that shows the two root directories you created.
3. You can now browse the folders you created and access specific files in these folders.

The **net use** command can also to be used in the DOS command prompt tool, and below the Figure shows how to map the **myCF** folder of JetBox to a drive **x:** in your development workstation



Chapter 4 Connectivity Features

4-1 Overview

Microsoft® Windows® CE provides tools for testing and debugging a Windows CE–based device. Most tools for debugging and testing reside on the development workstation, and thus rely on a connectivity infrastructure that facilitates communication between the development workstation and a target device. Platform Manager supports application connectivity. Application connectivity is a communications framework that allows you to establish a connection between an application running on a development workstation and a target device. Remote Tools and eMbedded Visual C++ use the application connectivity support in Platform Manager to connect to a target device.

4-2 ActiveSync Connection

4-2-1 Introduction

ActiveSync allows you to create a synchronization relationship between your mobile device and PC using a cable, cradle, Bluetooth, or infrared connection. ActiveSync can also make it possible for your device to connect to other resources through your PC. It's recommended to setup an ActiveSync connection during developing your application with Microsoft eVC++4.0 or Visual Studio 2005. You can use a serial cable to connect JetBox to your PC.

Note: Setup up Microsoft ActiveSync 4.5 or above before connecting the JetBox with your PC. Microsoft ActiveSync 4.5 can be downloaded from the following link: http://www.microsoft.com/windowsmobile/activesync/activesync45.mspx

4-2-2 Connection via COM port

An alternative way to setup an ActiveSync connection with JetBox is using the RS232 port. Figure 4-1 to Figure 4-11 show the CE side procedures to establish an ActiveSync connection via RS232. Figure 4-12 to Figure 4-18 show the PC side procedures to establish an ActiveSync connection via RS232.

Note: JetBox configure the default PC connection as USB, so it's necessary to change the PC connection before establish ActiveSync connection via RS232.

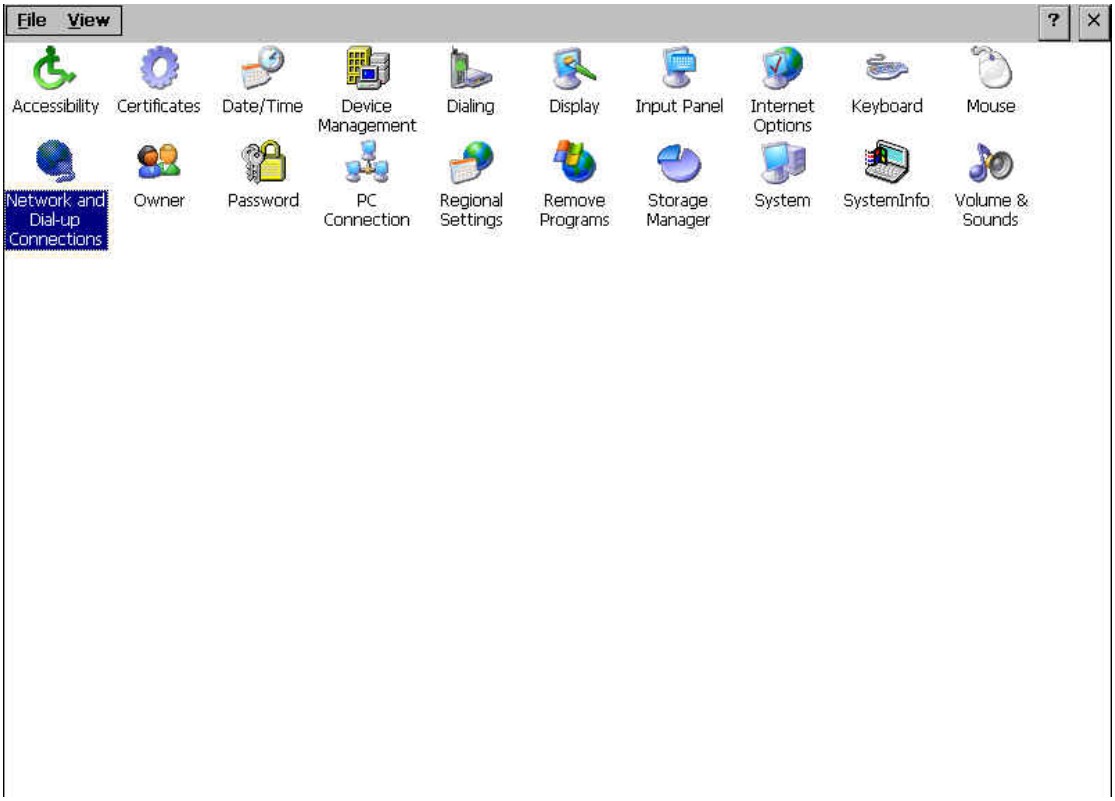


Figure 4-1 Launch "Network and Dial-up Connections" Control Applet

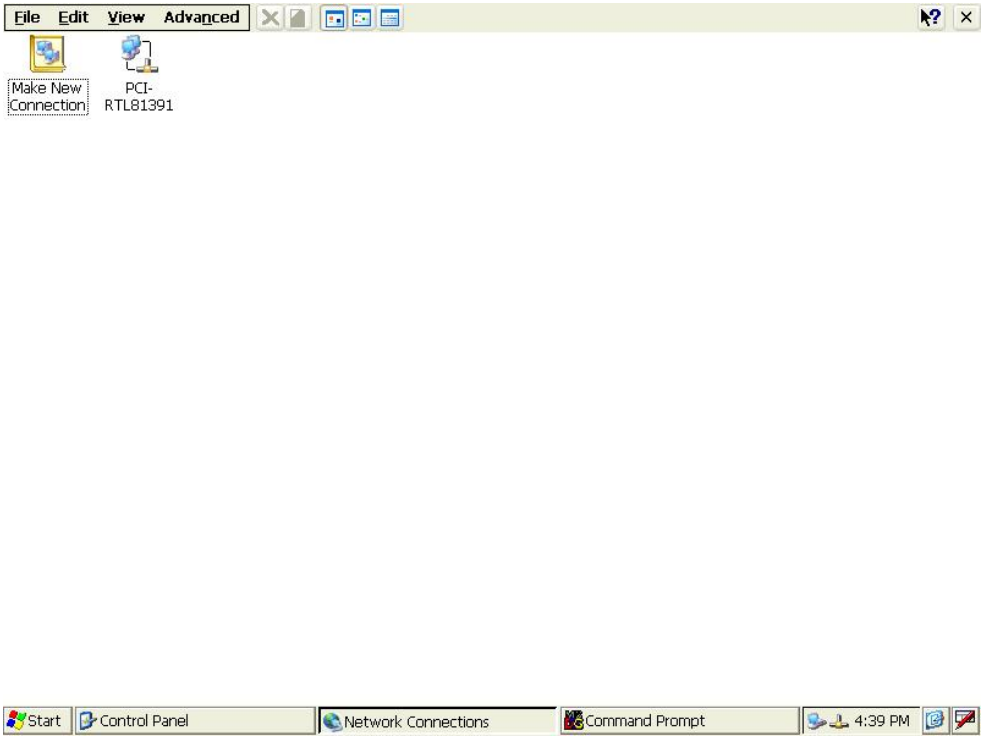


Figure 1 Make New Connection

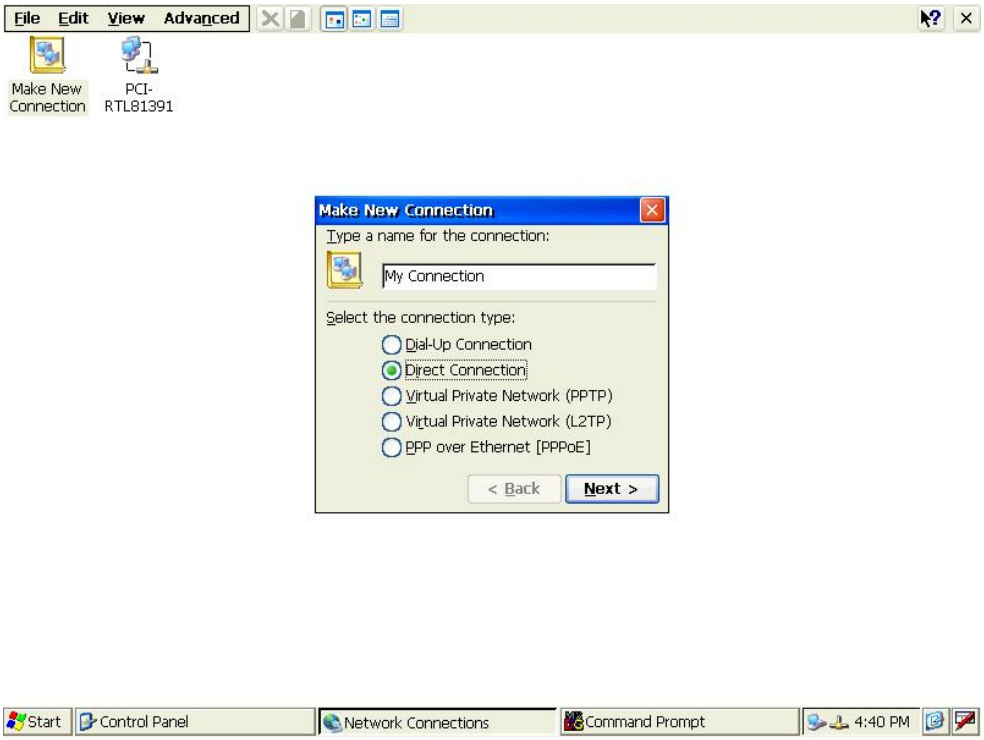


Figure 4-3 Choose “Direct Connection” Option

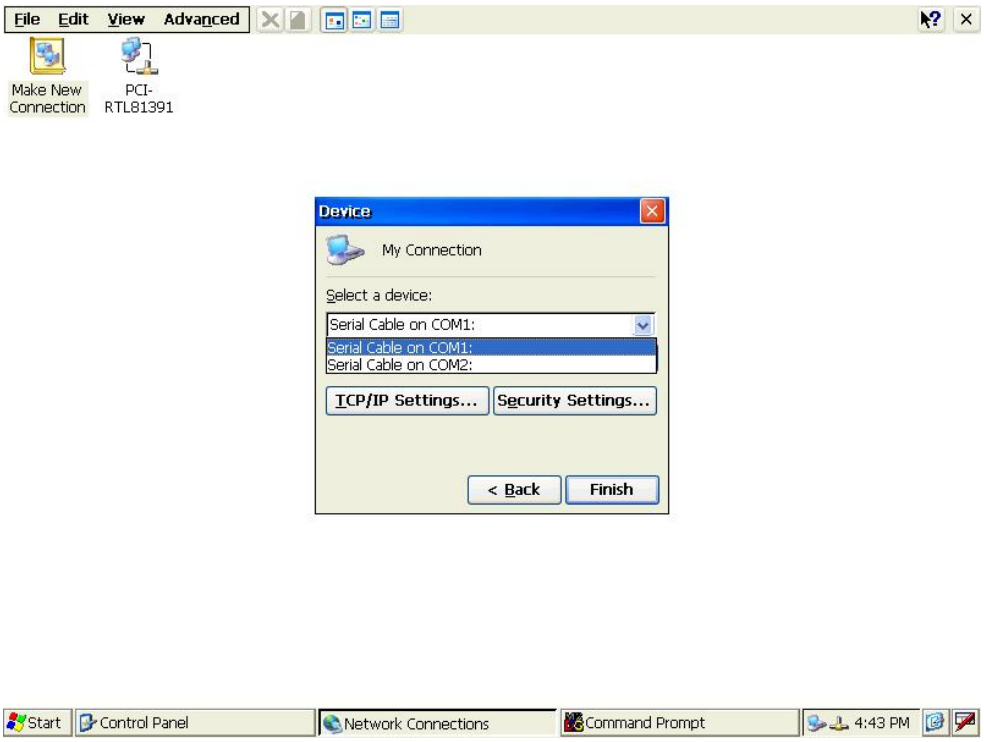


Figure 4-4 Choose a RS232 COM Port

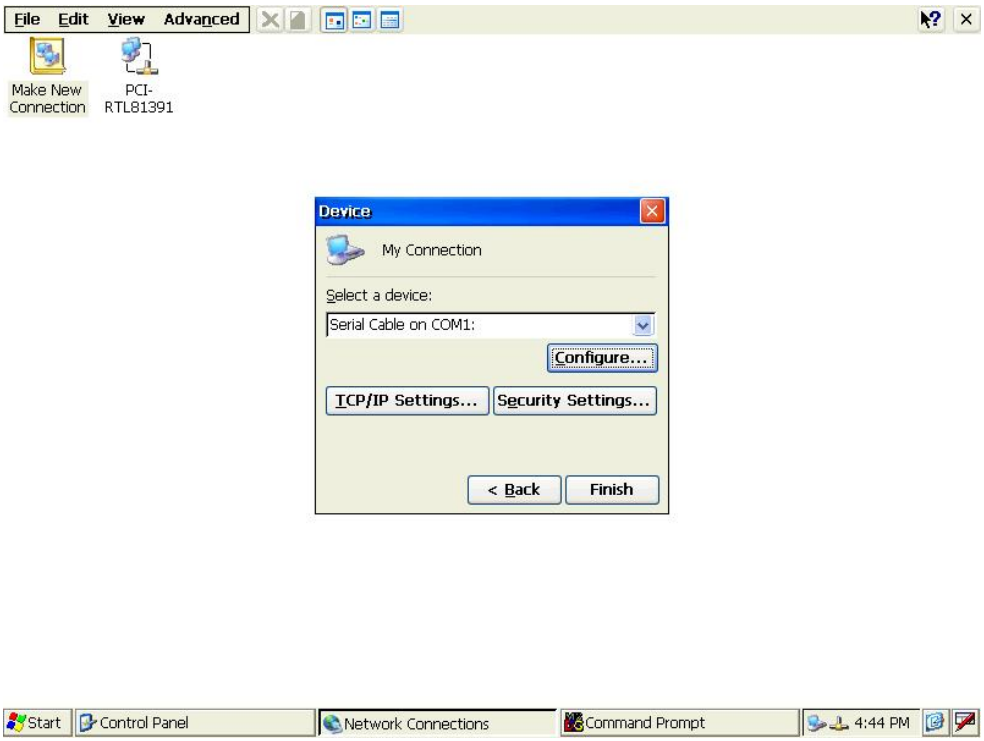


Figure 4-5 Configure the Selected COM Port

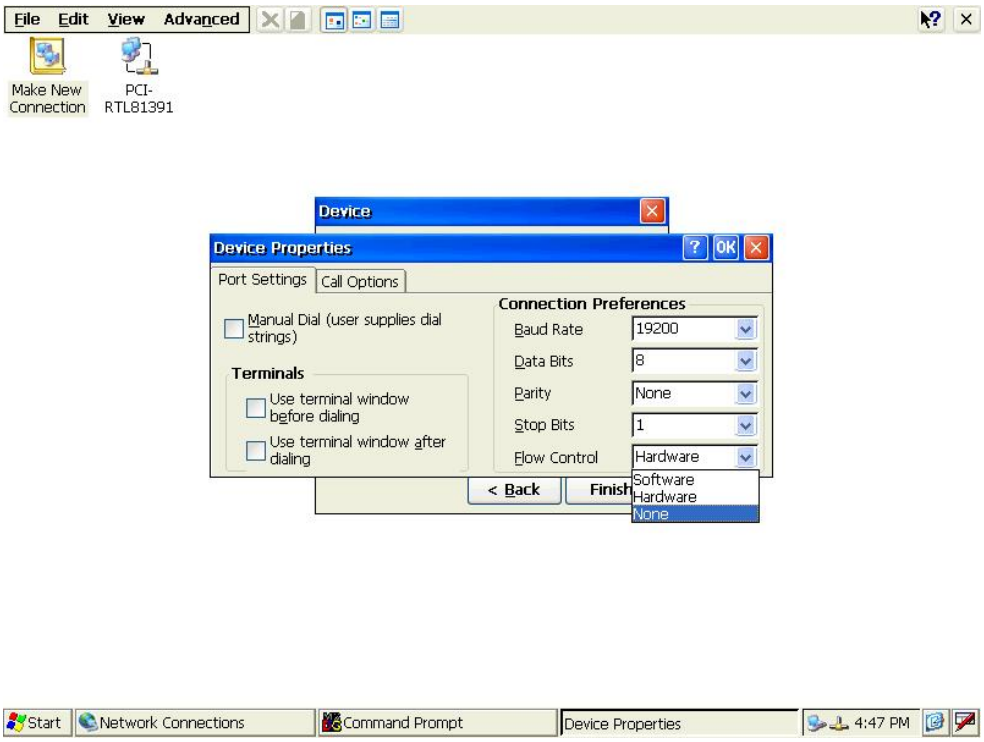


Figure 4-6 Set Flow Control as None

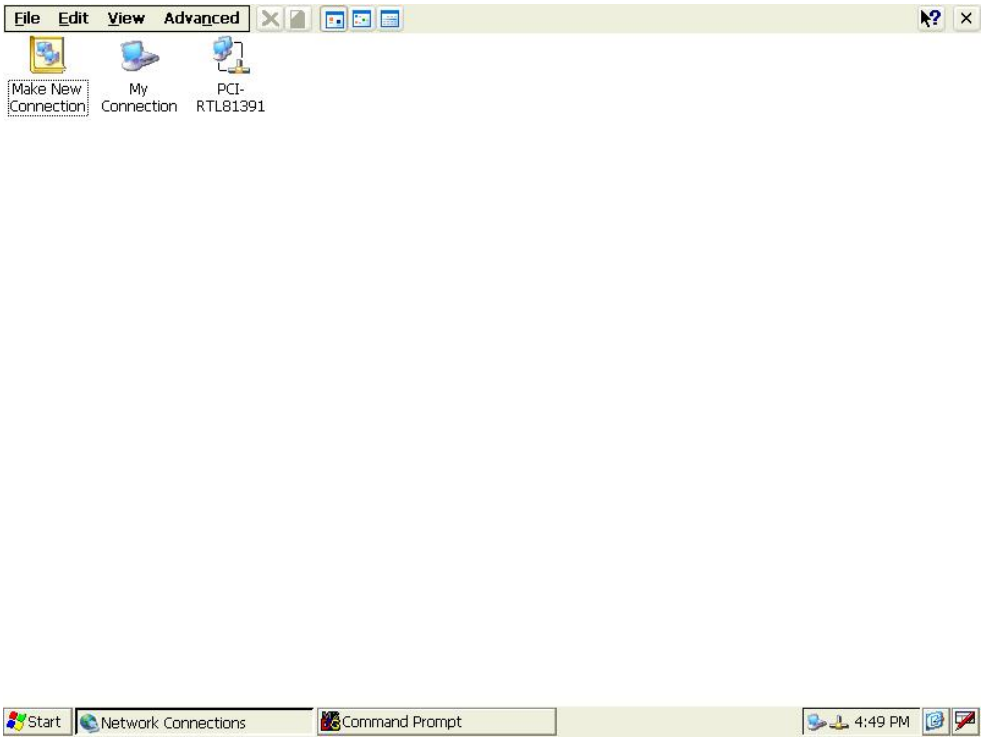


Figure 4-7 Make “My Connection” Is Completed

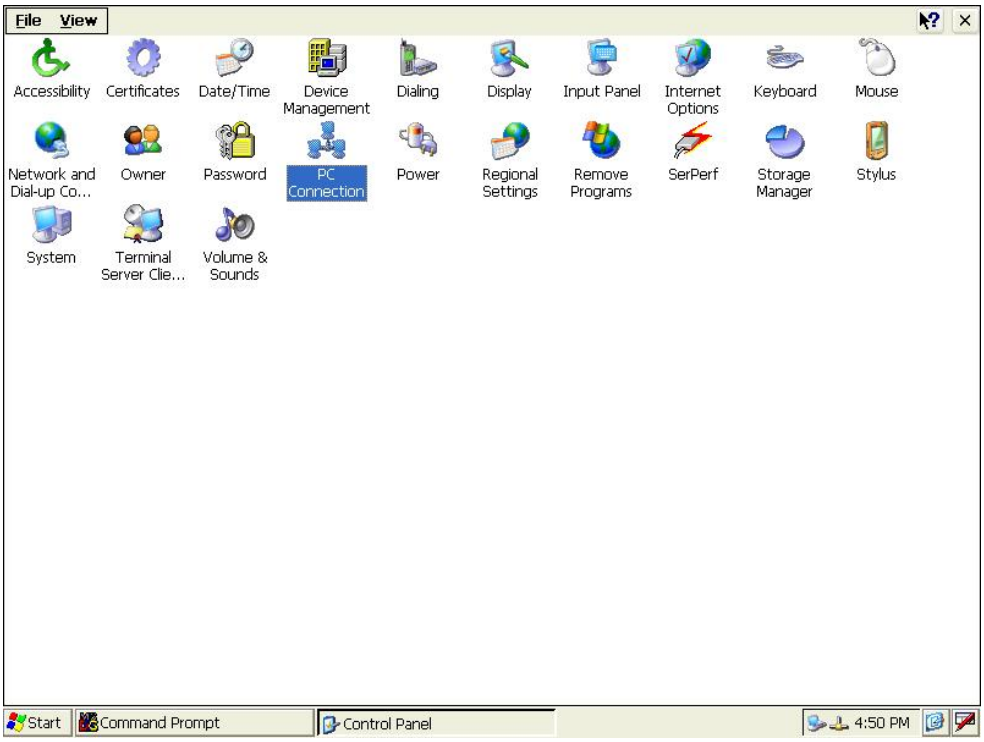


Figure 4-8 Launch “PC Connection” Control Applet

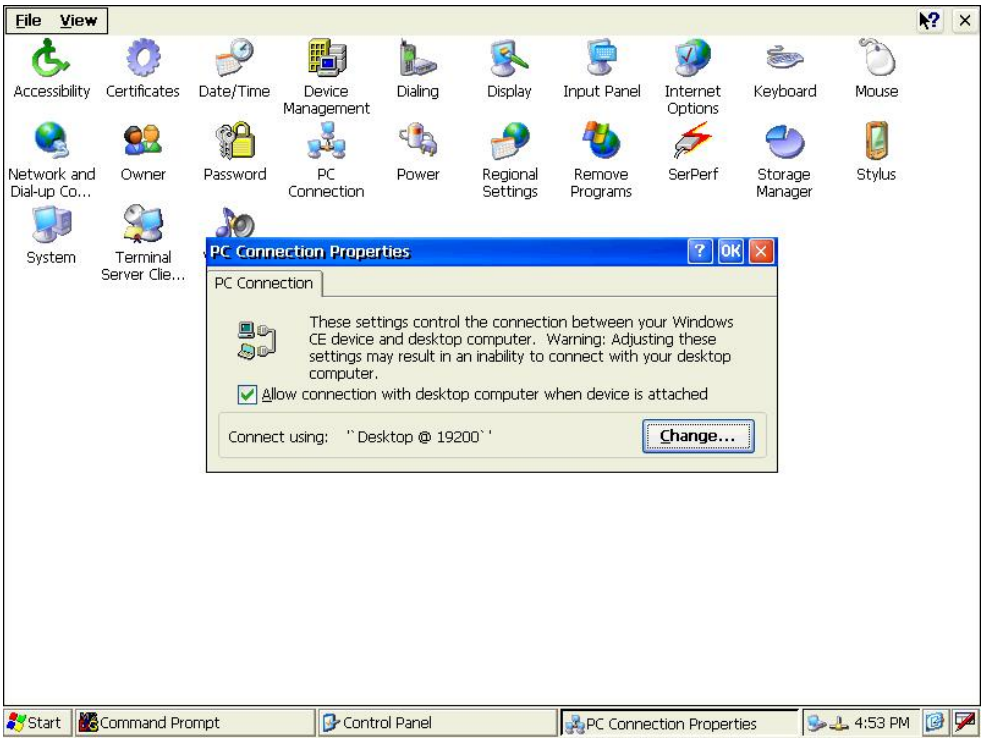


Figure 4-9 Select “Change…” to Change PC Connection

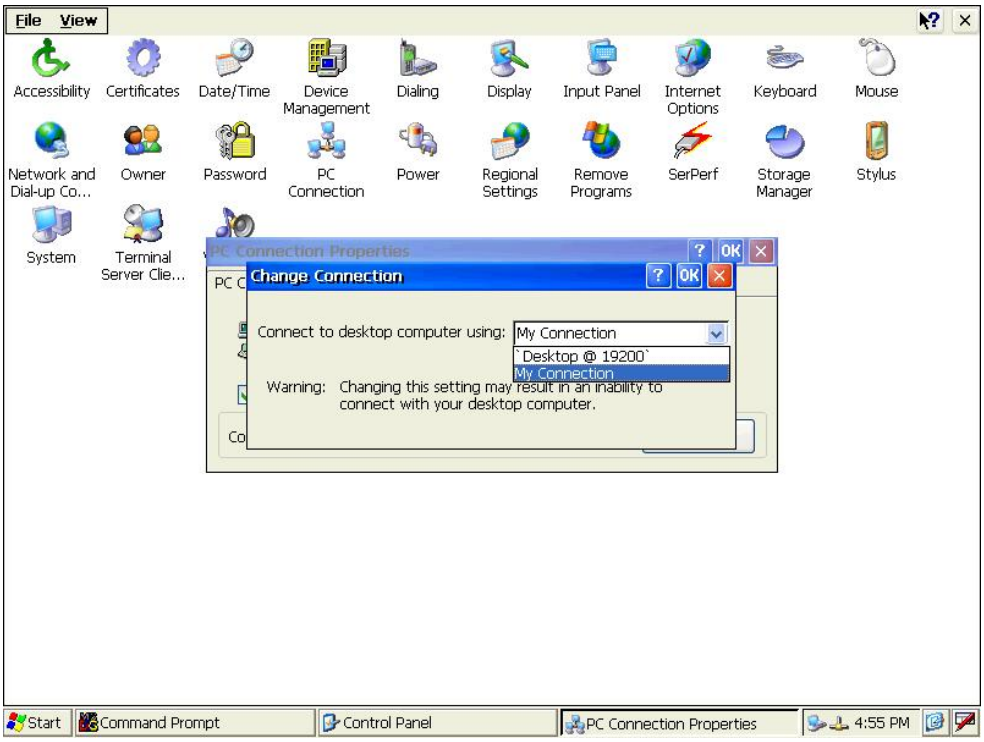


Figure 4-10 Change PC Connection to “My Connection”

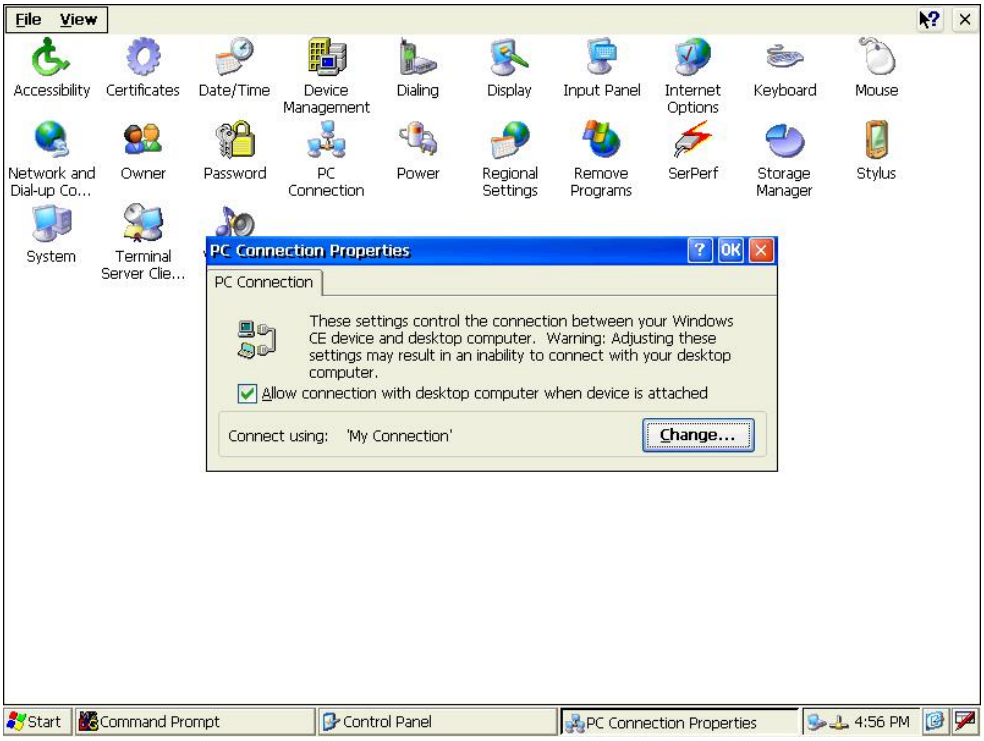


Figure 4-11 Change PC Connection Is Completed

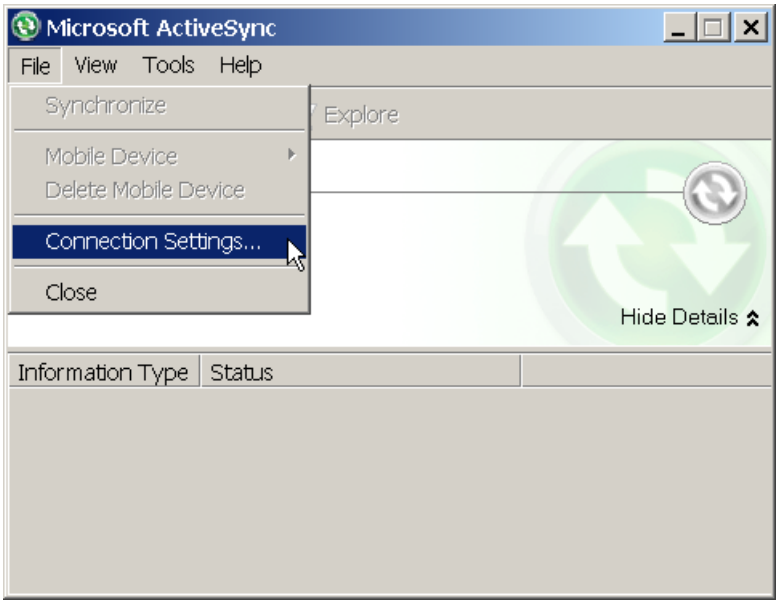


Figure 4-12 Configure ActiveSync Connection Settings

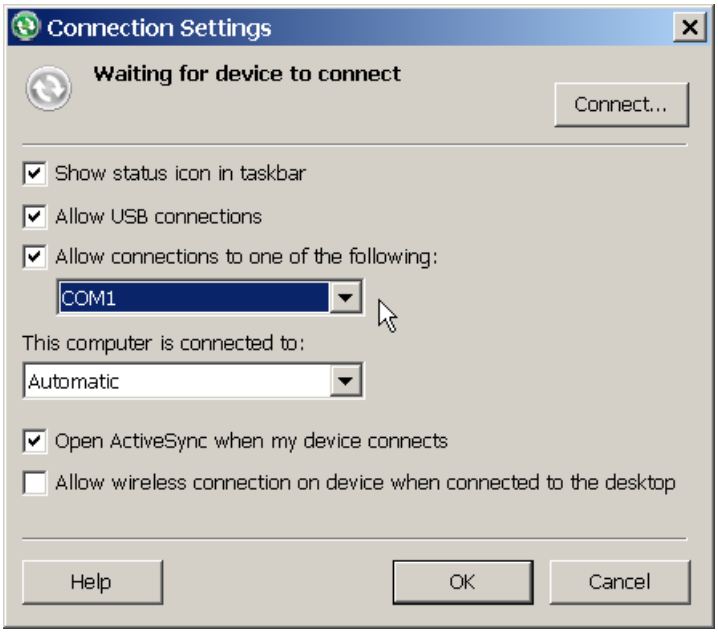


Figure 4-13 Allow Connections to COM1

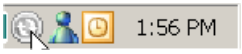


Figure 4-14 ActiveSync Is Not Connected

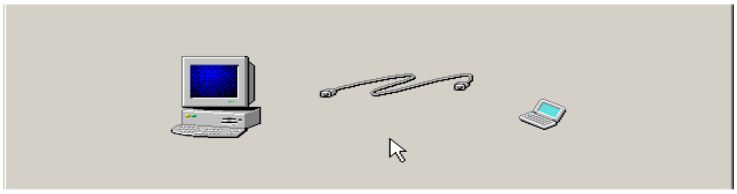


Figure 4-15 Connect JetBox with PC via RS232 Null Modem Cable

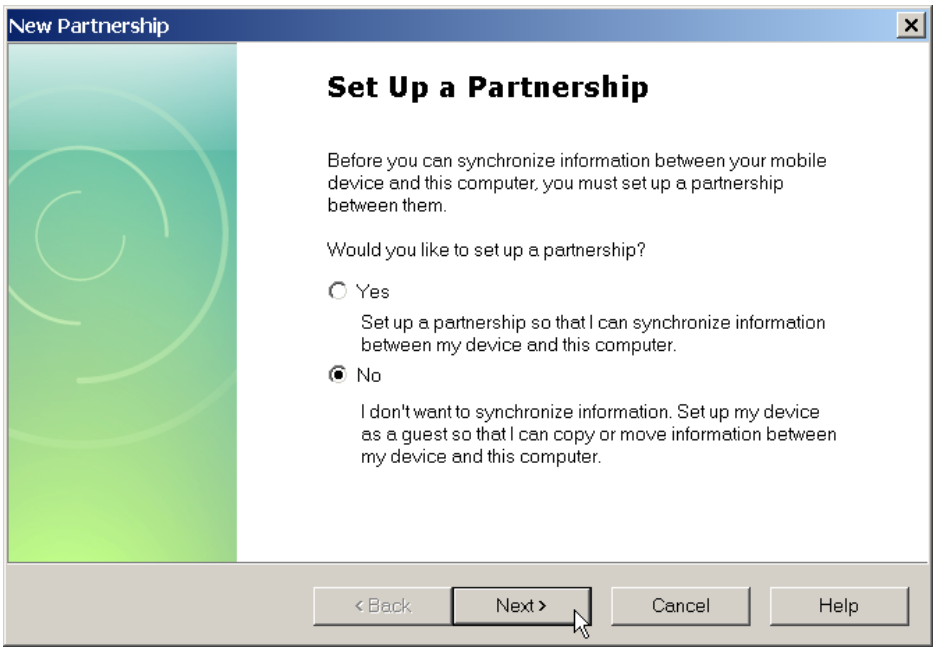


Figure 4-16 Choose “No” to Skip Setup a Partnership

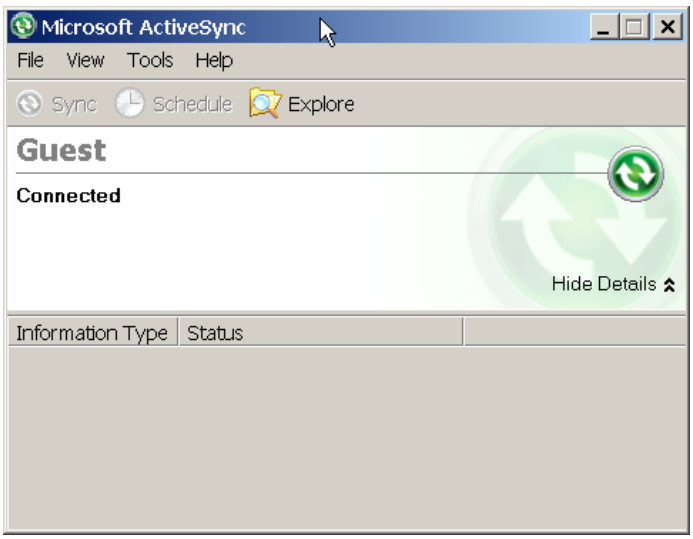


Figure 4-17 ActiveSync Is Connected

Figure 4-18 ActiveSync Is Connected

4-2-3 Explore JetBox

After ActiveSync connection has been established, click the Explore button to explore JetBox. Figure 4-19 shows a connected Microsoft ActiveSync window. Figure 4-20 shows a snapshot of exploring JetBox via ActiveSync. **It's recommended to exchange the application data with JetBox via ActiveSync connection during developing your applications.**

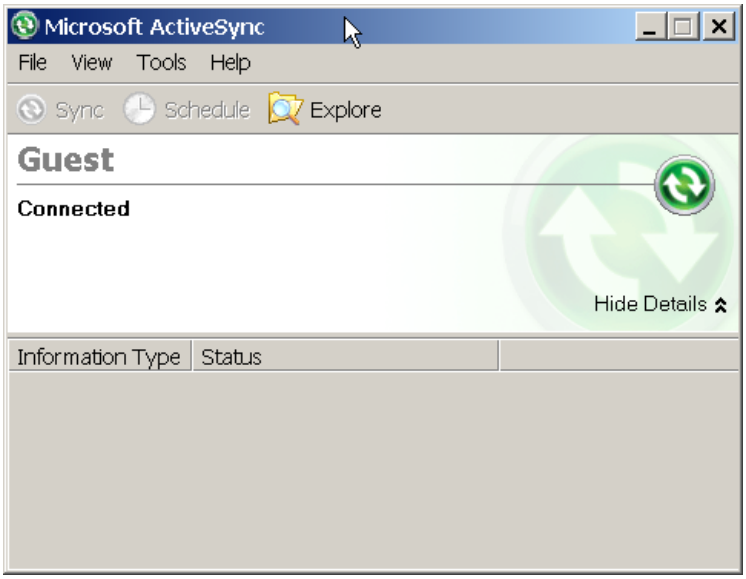


Figure 4-19 Microsoft ActiveSync

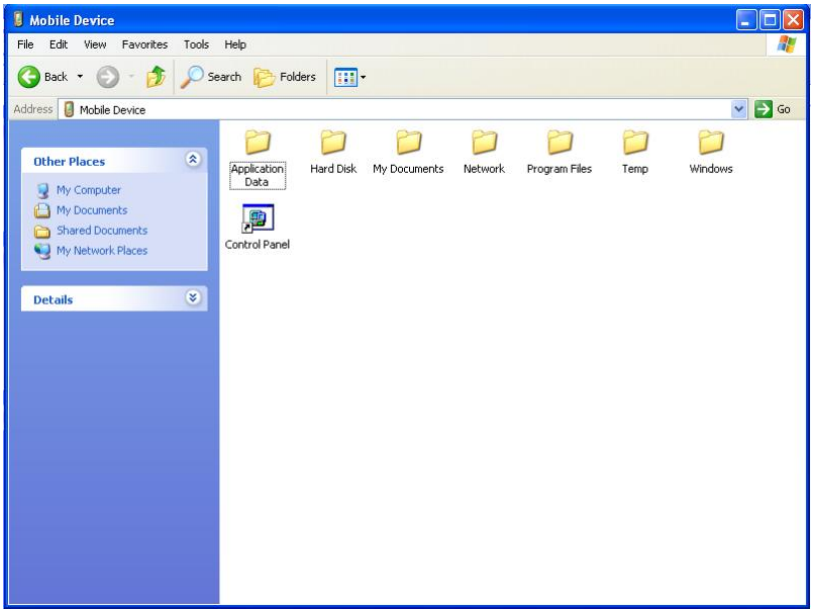


Figure 4-20 Explore the JetBox via ActiveSync

Chapter 5 Application Development

5-1 Overview

You can import JetBox SDK to Microsoft Visual Studio 2005/2008. An application developer can then use the SDK to create applications that run on JetBox run-time image.

5-2 Install JetBox SDK

Figure 5-1 to Figure 5-9 show the procedures of setup JetBox SDK. It use JB8150_SDK as an example.

Figure 2 Launch JB8150_SDK Setup file to Start Installing SDK

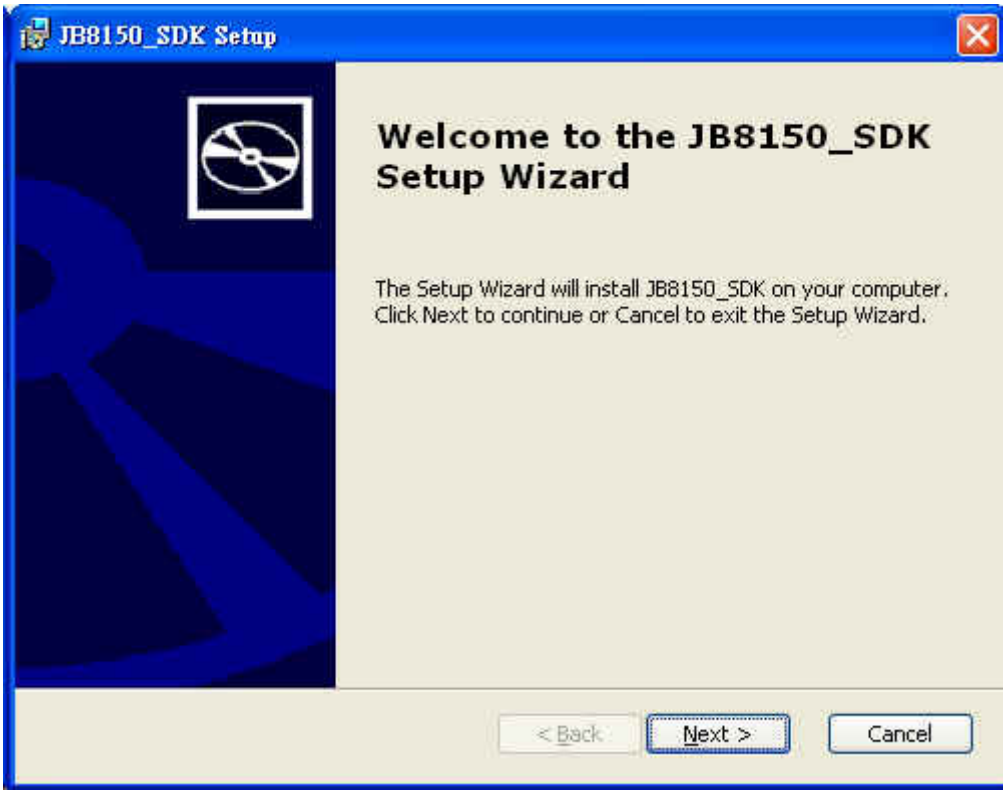


Figure 3 JB8150_SDK Setup Wizard

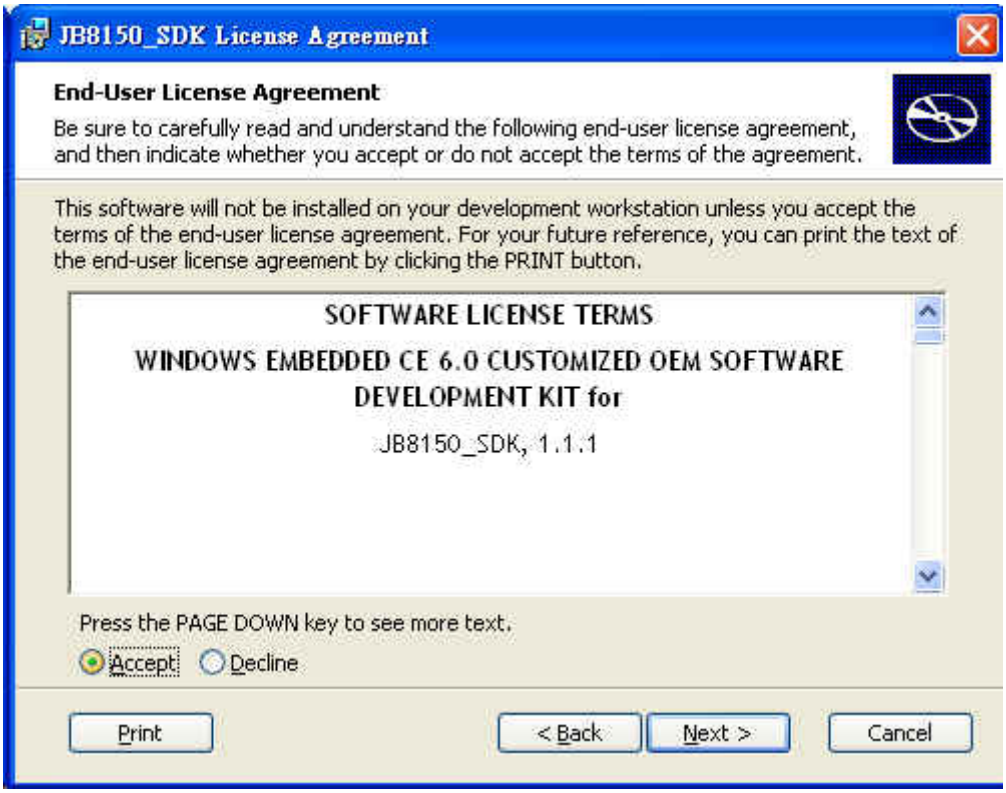


Figure 5-3 Accept End-User License Agreement

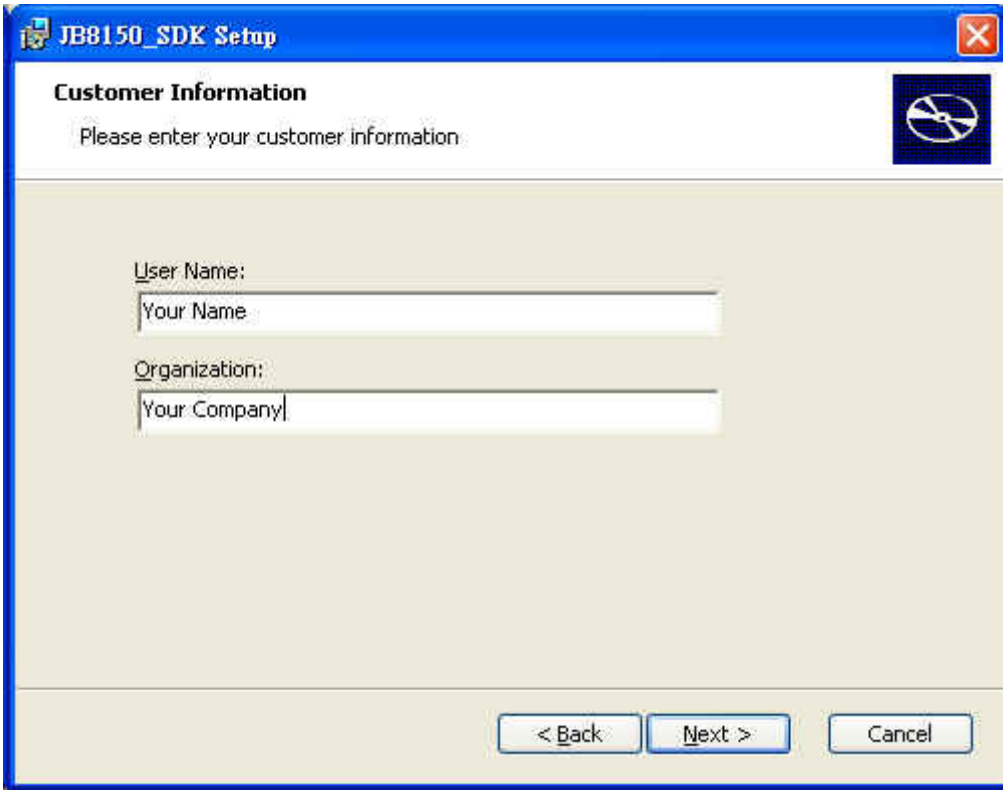


Figure 4 Enter Customer information

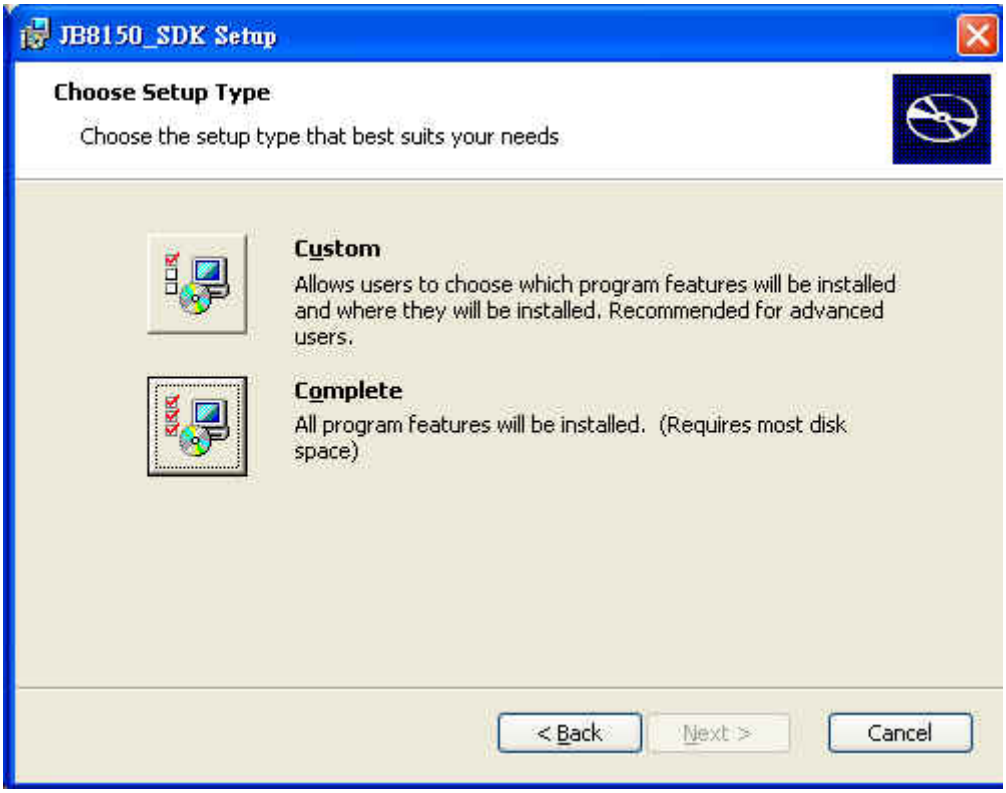


Figure 5 Choose “Complete” Setup Type

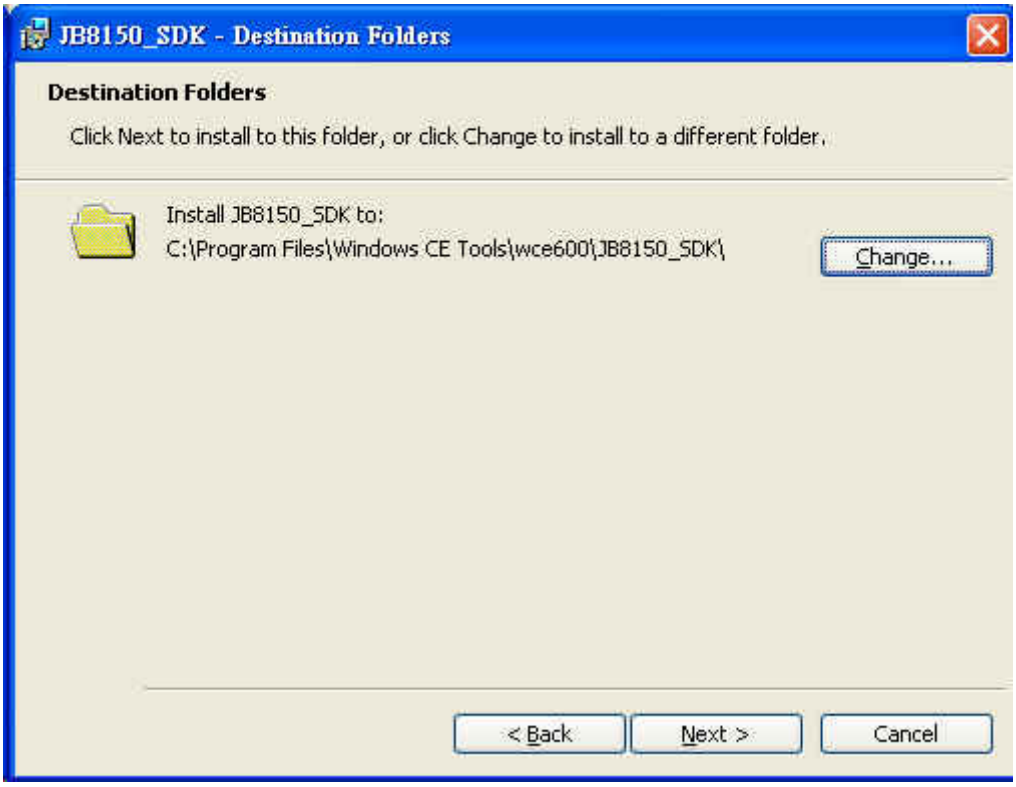


Figure 6 Choose the Destination Folder

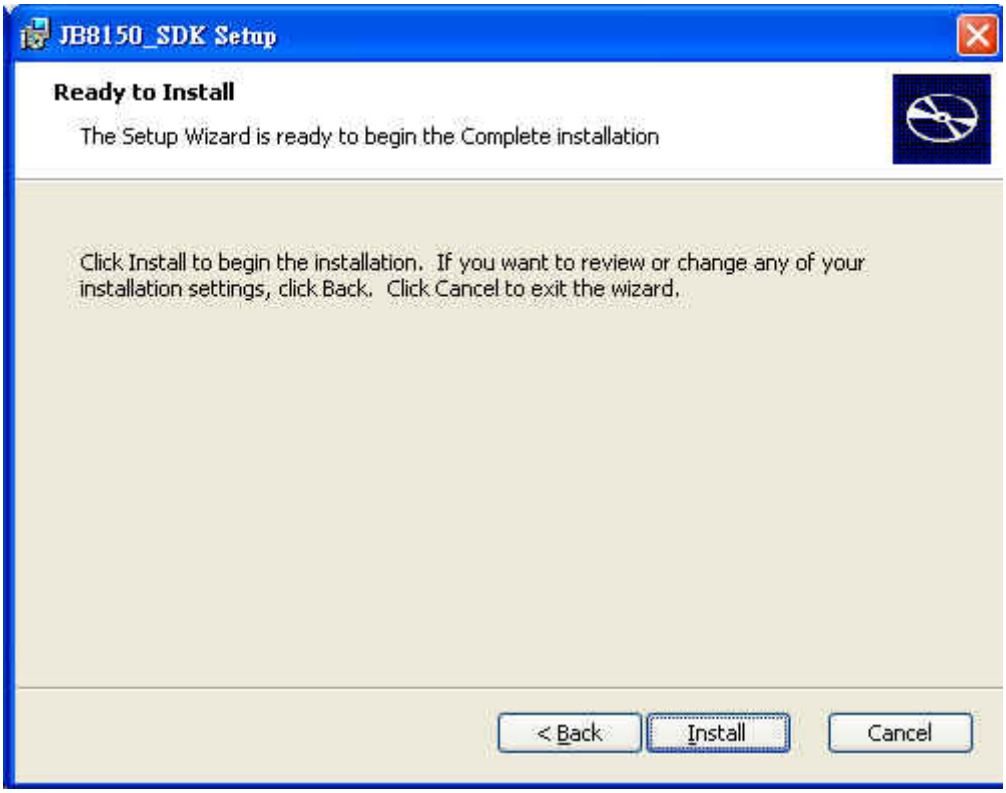


Figure 7 Ready to Install

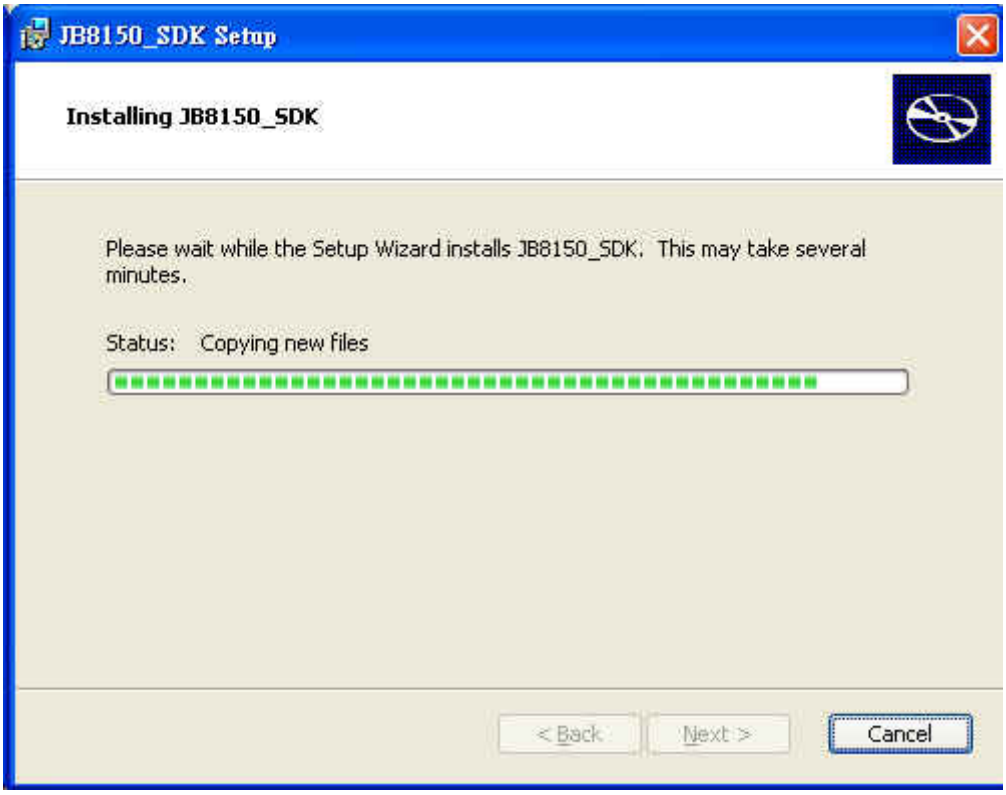


Figure 8 Install JB8150_SDK

Figure 9 Completing JB8150_SDK Setup Wizard

5-3 Hello World Application with VS2005

Figure 5-10 to Figure 5-16 show the procedures of developing a “Hello World” application with Microsoft Visual Studio 2005.

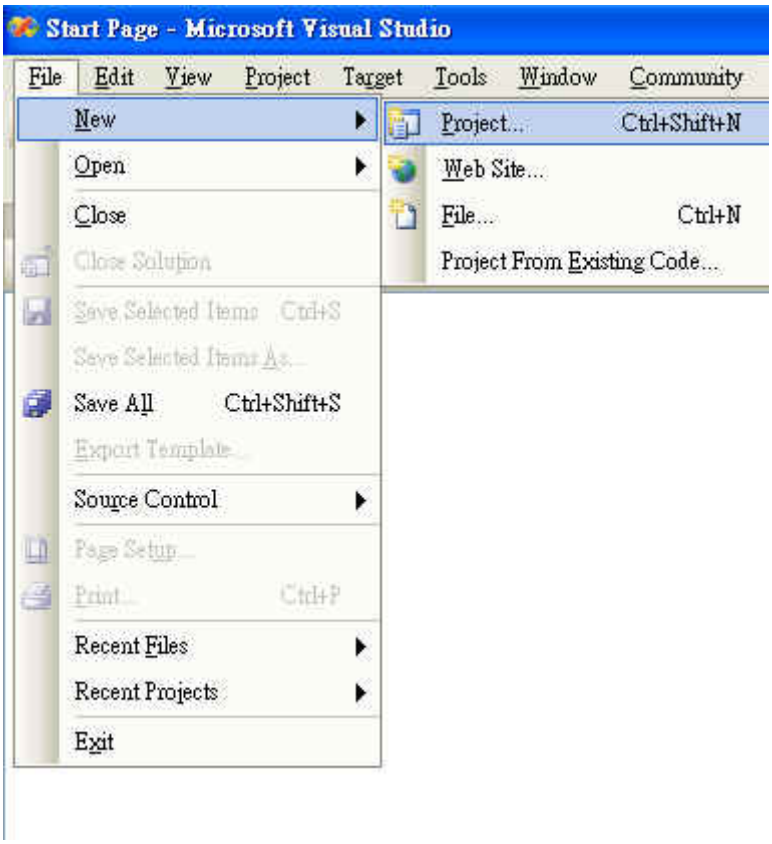


Figure 5-10 New an Application Project with VS2005

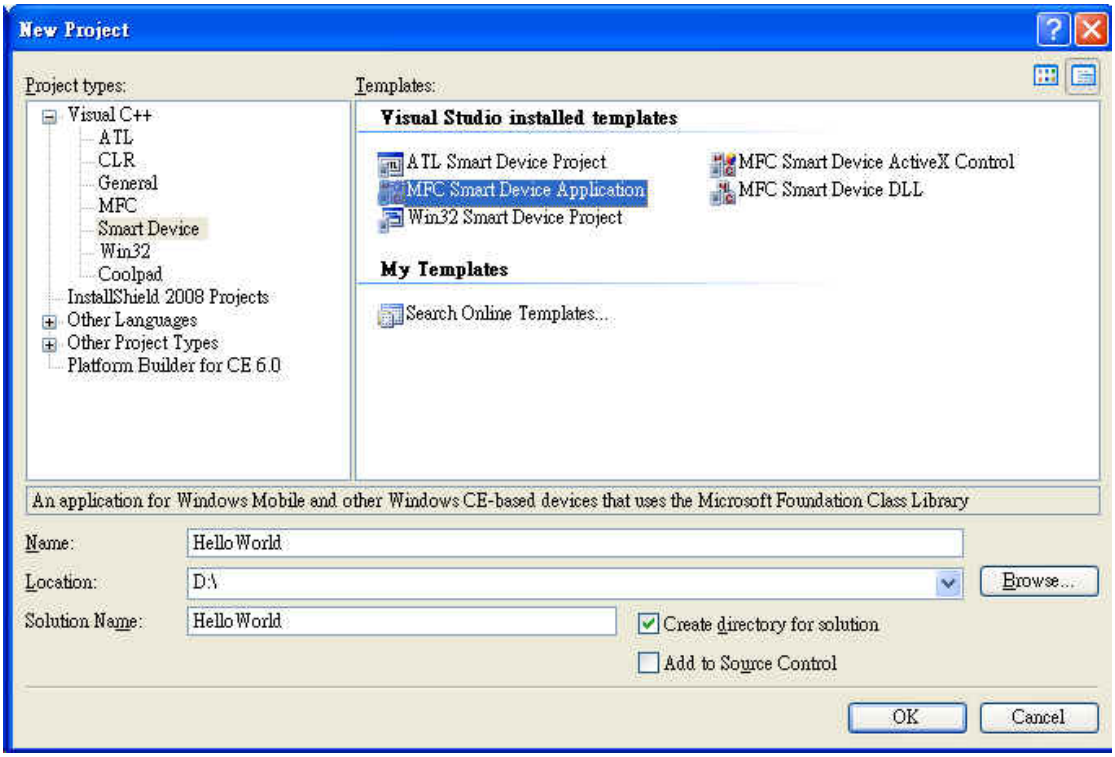


Figure 10 Create a Hello World Application for Windows CE 6.0 Smart Device Using MFC

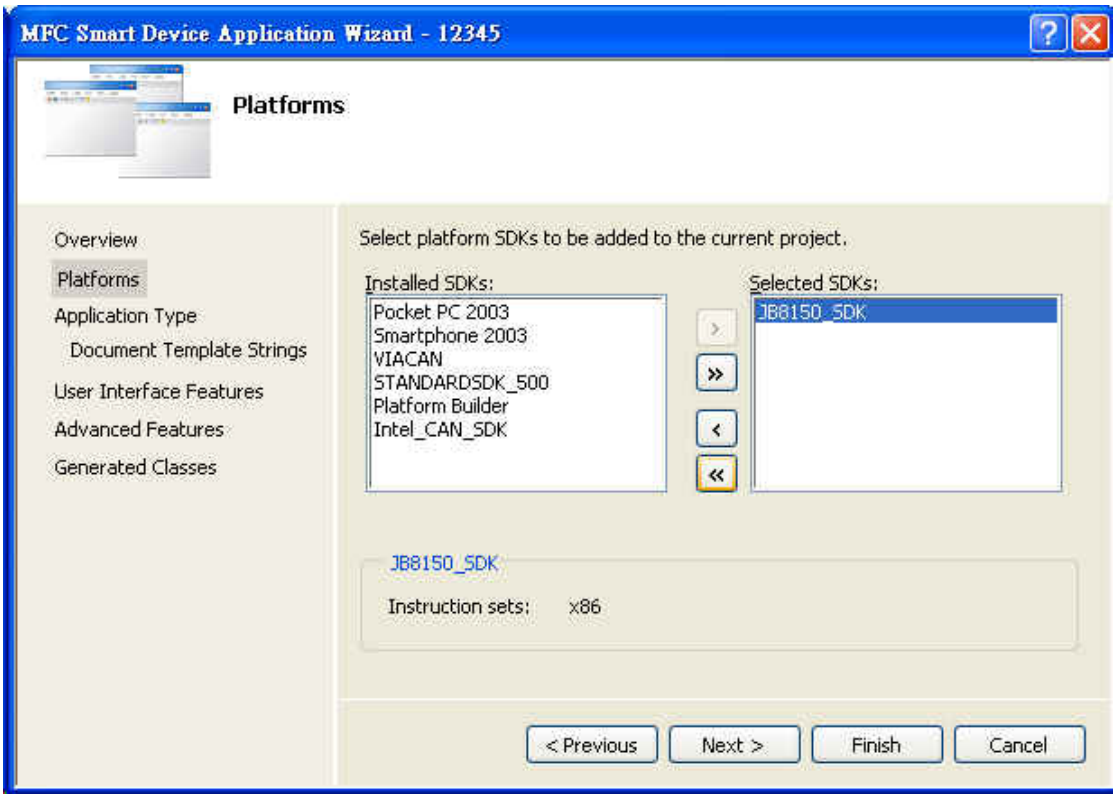


Figure 11 Click Next and Select platform SDK

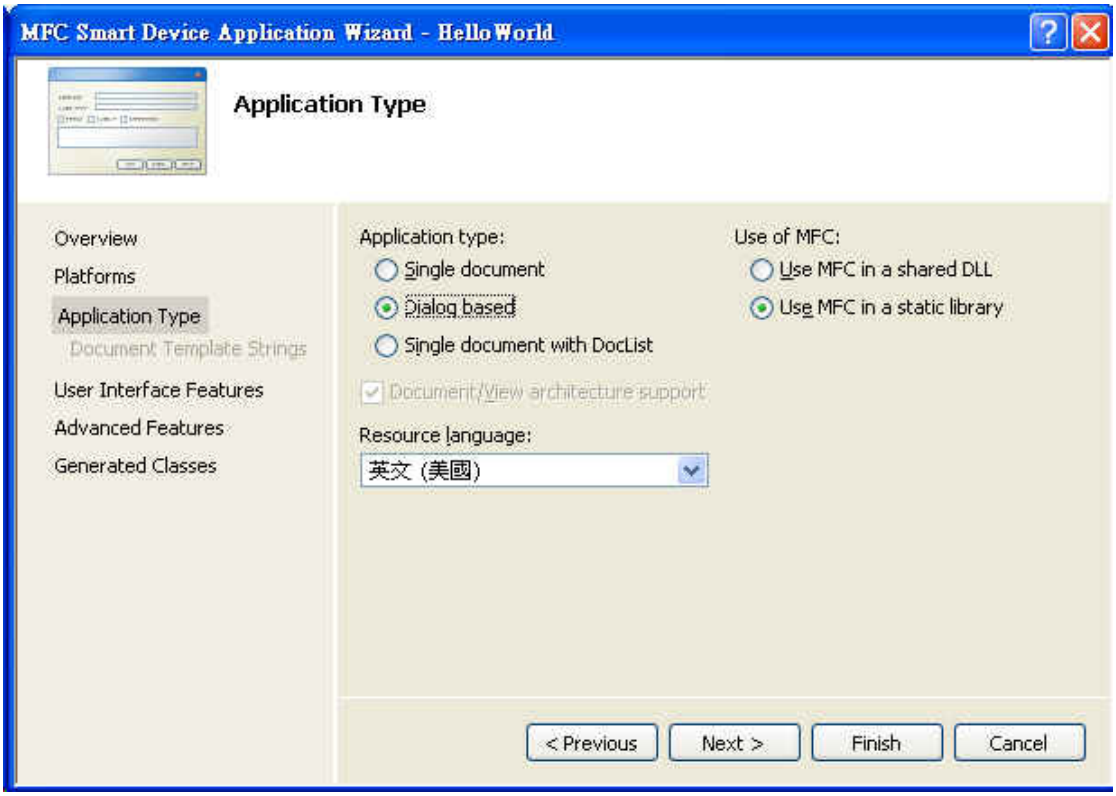


Figure 5-13 Select Dialog based and click Finish

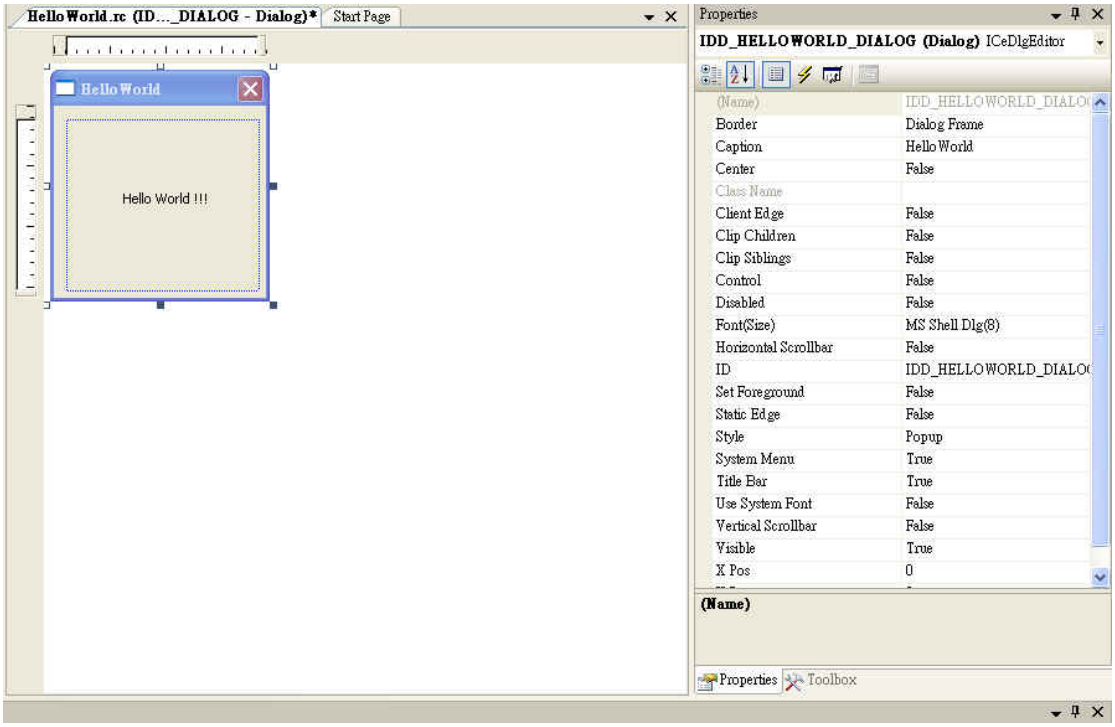


Figure 5-14 Edit the Appearance Text to Hello World!

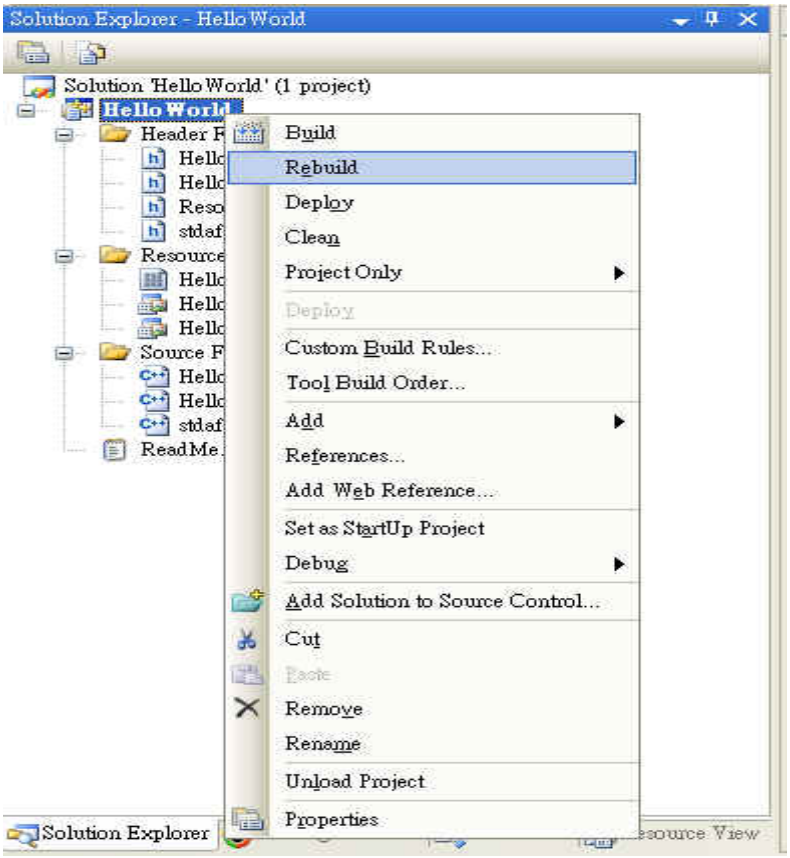


Figure 5-1512 Rebuild Solution

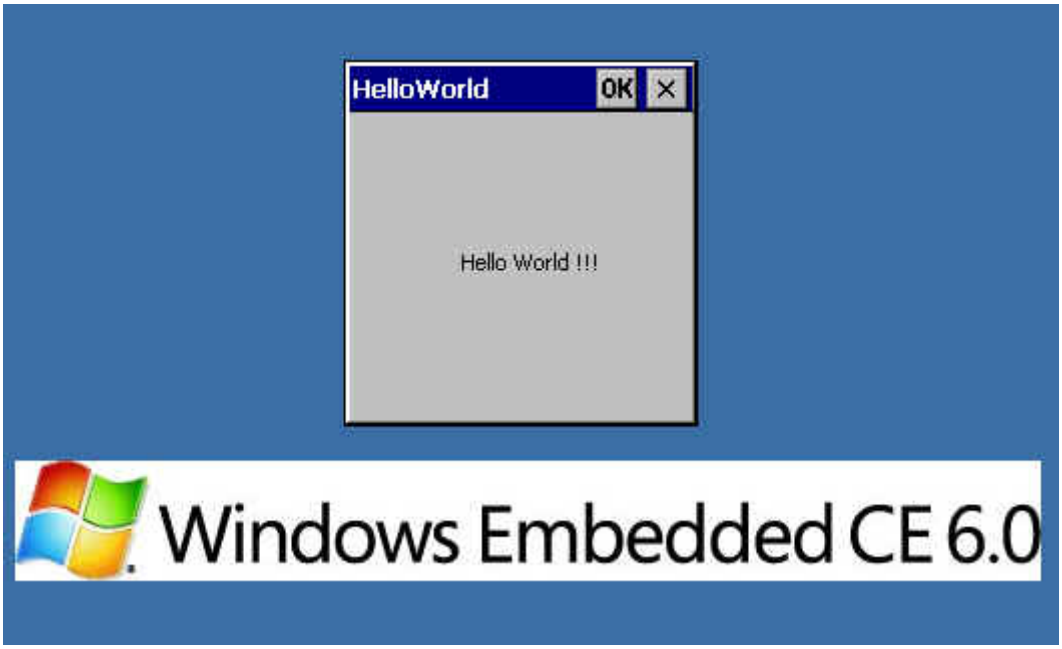


Figure 5-16 Snapshot of the Hello World Application on WinCE Device

Chapter 6 Appendix

6-1 Revision History

0.0.1 First draft
by 2012/05/22
0.0.2 Details modified
by 2012/05/22
0.0.3 Add difference between Core and Pro version
By 2012/08/07

6-2 Customer Service

Korenix Technologies Co., Ltd.
Business service: sales@korenix.com
Customer service: koreCARE@korenix.com

6-3 Difference between Core & Pro

Microsoft Windows Embedded 6.0

List of Operating System Components

The following is a comprehensive listing of the operating system components associated with the run-time licensing model for Windows® Embedded CE 6.0

An “X” in the box indicates that the corresponding catalog item is included in the particular run-time license. For a complete description of each feature that appears in the product catalog, please see Catalog Features in the online product documentation available at the MSDN Library.

Note: An asterisk (*) by several features indicates that we feel these features require additional clarification. Please see the end of the page for further information.

Catalog	Core	Professional
Applications - End User		
}ActiveSync	X	X
}File Sync	X	X
}Inbox Sync		X
}Pocket Outlook Database Sync		X
}CAB File Installer/Uninstaller	X	X
}Games	X	X
}Freecell	X	X
}Solitaire	X	X
}Help		X
}Remote Desktop Connection		X
}Windows Network Projector		X
„Sample Network Projector $2		X
}Remote Desktop Protocol (RDP)		X
„Audio Playback Redirection		X
„Cut/Copy/Paste Clipboard Redirection		X
„File Storage Redirection		X
‚Filtered File Storage Redirection		X
„License Information		X
„Printer Redirection		X
„Serial and Parallel Port Redirection		X
„Smart Card Redirection		X
„User Interface Dialog Boxes		X
}Terminal Emulator	X	X
}Windows Messenger		X
}WordPad		X
Applications and Services Development		
}.NET Compact Framework 2.0	X	X
}.NET Compact Framework 2.0	X	X
„.NET Compact Framework 2.0 String Resources	X	X
‚.Net Compact Framework 2.0 Localized String Resources	X	X

—String Resources Chinese(PRC)	X	X
—String Resources Chinese(Taiwan)	X	X
—String Resources French(France)	X	X
—String Resources German(Germany)	X	X
—String Resources Italian(Italy)	X	X
—String Resources Japanese(Japan)	X	X
—String Resources Korean(Korea)	X	X
—String Resources Portuguese(Brazil)	X	X
—String Resources Spanish(International Sort)	X	X
}.NET Compact Framework 2.0 - Headless	X	X
„.NET Compact Framework 2.0 String Resources - Headless	X	X
, .Net Compact Framework 2.0 Localized String Resources - Headless	X	X
—String Resources Chinese(PRC) - Headless	X	X
—String Resources Chinese(Taiwan) - Headless	X	X
—String Resources French(France) - Headless	X	X
—String Resources German(Germany) - Headless	X	X
—String Resources Italian(Italy) - Headless	X	X
—String Resources Japanese(Japan) - Headless	X	X
—String Resources Korean(Korea) - Headless	X	X
—String Resources Portuguese(Brazil) - Headless	X	X
—String Resources Spanish(International Sort) - Headless	X	X
}OS Dependencies for .NET Compact Framework 2.0	X	X
„OS Dependencies for .NET Compact Framework 2.0	X	X
„OS Dependencies for .NET Compact Framework 2.0 - Headless	X	X
}Active Template Library (ATL)	X	X
}C Libraries and Runtimes	X	X
„C++ Runtime Support for Exception Handling and Runtime Type Information	X	X
}Full C Runtime	X	X
}OEM Floating Point CRT (ARM only)	X	X
}Standard I/O (STDIO)	X	X
}Standard I/O ASCII (STDIOA)	X	X
}Standard String Functions - ASCII (corestra)	X	X
}Component Services (COM and DCOM)	X	X
}Component Object Model	X	X
„COM	X	X
,CoCreateGuid functionality for OLE32	X	X
,COM Storage	X	X
„DCOM	X	X
,COM Storage	X	X
,Minimal COM (No OLE Support)	X	X

,CoCreateGuid functionality for OLE32	X	X
,COM Storage	X	X
}Exchange Client	X	X
}Lightweight Directory Access Protocol (LDAP) Client	X	X
}Location	X	X
}GPS Intermediate Driver	X	X
}Location Framework	X	X
„Location Framework Core	X	X
„Location Framework GPS Plugin	X	X
„Location Framework Simulation Plugins	X	X
„Location Framework Wifi Plugin	X	X
}Message Queuing (MSMQ)	X	X
}MSMQ Activex Wrappers	X	X
}SOAP Reliable Messaging Protocol (SRMP)	X	X
}Object Exchange Protocol (OBEx)	X	X
}OBEx Client	X	X
}OBEx Server	X	X
„OBEx File Browser	X	X
„OBEx Inbox	X	X
}Pocket Outlook Object Model (POOM) API		X
}SOAP Toolkit	X	X
}Client	X	X
}Server	X	X
}Speech Interface	X	X
}Speech API (SAPI) 5.2	X	X
}Standard SDK for Windows Embedded CE		X
}String Safe Utility Functions	X	X
}xML	X	X
}MSxML 3.0	X	X
„xML Core Services and Document Object Model (DOM)	X	X
,xML Error Strings	X	X
,xML HTTP	X	X
,xML Query Languages (xQL)	X	X
—xML Stylesheet Language Transformations (xSLT)	X	X
,xML SAx	X	X
„xML Minimal Parser	X	X
Communication Services and Networking		
}Cellular	*see note	
}CELLCORE	*see note	
„All Modules	*see note	
„Cellular TAPI Service Provider	*see note	
„RIL Proxy	*see note	
„RIL Proxy Log	*see note	
„SIM Manager	*see note	
„SIM Toolkit	*see note	

„SMS	*see note	
„WAP	*see note	
„Wireless WAN	*see note	
}Networking - General	X	X
}Domain Discovery	X	X
}Extended DNS Querying and Update (DNSAPI)	X	X
„Secure DDNS	X	X
}Extensible Authentication Protocol	X	X
}Firewall	X	X
}Internet Connection Sharing (ICS)	X	X
„Gateway Logging	X	X
}IPSec v4	X	X
}NDIS Packet Capturing DLL	X	X
„NDIS User-mode I/O Protocol Driver	X	X
}Network Bridging	X	X
}Network Driver Architecture (NDIS)	X	X
}Network Utilities (IpConfig, Ping, Route)	X	X
}Reference Gateway User Interface	X	X
}Remote Configuration Framework	X	X
}TCP/IP	X	X
„IP Helper API	X	X
}TCP/IPv6 Support	X	X
}Universal Plug and Play (UPnP)	X	X
„Control Point API	X	X
„Device Host API	X	X
„Device Host API (Minimal Subset)	X	X
„Sample UPnP IGD Schema Implementation	X	X
„UPnP Audio-Video (AV) Device Control Protocol		X
‚AV Control Point API	X	X
‚AV Device API	X	X
‚AV Renderer Sample		X
„UPnP Tools	X	X
}USB Flash Config Tool	X	X
}Windows Networking API/Redirector (SMB/CIFS)	X	X
}Winsock Support	X	X
}Networking - Local Area Network (LAN)	X	X
„Wired Local Area Network (802.3, 802.5)	X	X
„Wireless LAN (802.11) STA - Automatic Configuration and 802.1x	X	X
}Networking - Personal Area Network (PAN)		X
}Bluetooth		X
„Bluetooth Profiles Support		X
‚Bluetooth DUN Gateway	X	X
‚Bluetooth HID Device Support		X
—Bluetooth HID - Keyboard	X	X

—Bluetooth HID - Mouse	X	X
,Bluetooth HS/HF and Audio Gateway Service	X	X
,Bluetooth LAP and Configuration Utility		X
,Bluetooth PAN	X	X
„Bluetooth Protocol Stack with Transport Driver Support	X	X
,Bluetooth Stack with Integrated CSR Chipset Driver	X	X
,Bluetooth Stack with Integrated SDIO Driver	X	X
,Bluetooth Stack with Integrated UART Driver	X	X
,Bluetooth Stack with Integrated USB Driver	X	X
,Bluetooth Stack with Universal Loadable Driver	X	X
}IrDA	X	X
}Networking - Wide Area Network (WAN)	X	X
}Dial Up Networking (RAS/PPP)	X	X
„AutoDial	X	X
„Standard Modem Support for Dial Up Networking	X	X
}Point-to-Point Protocol over Ethernet (PPPoE)	X	X
}Telephony API (TAPI 2.0)	X	X
„Unimodem support	X	X
}Virtual Private Networking	X	X
„L2TP/IPSec	X	X
„PPTP	X	X
}Servers	X	X
}Core Server Support	X	X
}File Server	X	X
„File Server (SMB/CIFS)	X	X
„File Server Customizable Web UI	X	X
}FTP Server	X	X
}Parental Controls	X	X
}Print Server (SMB/CIFS)	X	X
}RAS Server/PPTP Server (Incoming)		X
}Simple Network Time Protocol (SNTP)	X	X
„SNTP Automatic Updates and Server Synchronization	X	X
„SNTP Client with DST	X	X
„SNTP Server	X	X
}Telnet Server	X	X
}Web Proxy	X	X
}Web Server (HTTPD)	X	X
}Active Server Pages (ASP) Support	X	X
,JScript 5.6	X	X
,VBScript 5.6	X	X
„Web Server Administration ISAPI	X	X
„WebDAV Support	X	X
Core OS Services		
}System Event Log	X	X
}Battery Driver	X	X

}Debugging Tools	X	X
}Keyboard Test Application	X	X
}Remote Display Application	X	X
}Tiny Kernel Test Sample Application	X	X
}Toolhelp API	X	X
}Touch Driver Test Application	X	X
}Device Manager	X	X
}Display Support	X	X
}Internet Appliance (IABASE) Support	X	X
}Kernel Functionality	X	X
}Fiber API	X	X
}FormatMessage API	X	X
}FormatMessage API - System Error Messages	X	X
}Memory Mapped Files	X	X
}Message Queue - Point-to-Point	X	X
}Target Control Support (Shell.exe)	X	X
}Notification (Choose 1)	X	X
}Non UI based Notification	X	X
}UI based Notification	X	X
}Notification LED Support	X	X
}Parallel Port Support	X	X
}Power Management (Choose 1)	X	X
}Power Management (Full)	X	X
}Power Management (Minimal)	X	X
}Serial Port Support	X	X
}UI Proxy for Kernel-Mode Drivers	X	X
}USB Host Support	X	X
}USB Function Driver	X	X
}USB Host Support	X	X
}USB Human Input Device (HID) Class Driver	X	X
„USB HID Keyboard and Mouse	X	X
„USB HID Keyboard Only	X	X
„USB HID Mouse Only	X	X
}USB Printer Class Driver	X	X
}USB Remote NDIS Class Driver	X	X
}USB Storage Class Driver	X	X
}Windows Embedded CE Driver Development Kit Support Library	X	X
Device Management		
}Device Management Client	X	X
}Simple Network Management Protocol (SNMP)	X	X
File Systems and Data Store		
}Compression	X	X
}Database Support	X	X
}CEDB Database Engine	X	X

}EDB Database Engine	X	X
}File and Database Replication	X	X
}Bit-based	X	X
}File Cache Manager	X	X
}File System - Internal (Choose 1)	X	X
}RAM and ROM File System	X	X
}ROM-only File System	X	X
}Registry Storage (Choose 1)	X	X
}Hive-based Registry	X	X
}RAM-based Registry	X	X
}Storage Manager	X	X
}Binary Rom Image File System	X	X
}CD/UDFS File System	X	X
}exFAT File System	X	X
}FAT File System	X	X
}Partition Driver	X	X
}Release Directory File System	X	X
}Silent FAT File System UI	X	X
}Storage Manager Control Panel Applet	X	X
}Transaction-Safe FAT File System (TFAT)	X	X
}System Password	X	X
Fonts		
}Arial	X	X
}Arial (Subset 1_30)	X	X
}Arial Black	X	X
}Arial Bold	X	X
}Arial Bold Italic	X	X
}Arial Italic	X	X
}Comic Sans MS	X	X
}Comic Sans MS	X	X
}Comic Sans MS Bold	X	X
}Courier New	X	X
}Courier New (Subset 1_30)	X	X
}Courier New Bold	X	X
}Courier New Bold Italic	X	X
}Courier New Italic	X	X
}Georgia	X	X
}Georgia	X	X
}Georgia Bold	X	X
}Georgia Bold Italic	X	X
}Georgia Italic	X	X
}Impact	X	X
}Kino	X	X
}MSLogo	X	X
}Symbol	X	X

}Tahoma	X	X
}Tahoma (Subset 1_07)	X	X
}Tahoma Bold	X	X
}Times New Roman	X	X
}Times New Roman (Subset 1_30)	X	X
}Times New Roman Bold	X	X
}Times New Roman Bold Italic	X	X
}Times New Roman Italic	X	X
}Trebuchet MS	X	X
}Trebuchet MS	X	X
}Trebuchet MS Bold	X	X
}Trebuchet MS Bold Italic	X	X
}Trebuchet MS Italic	X	X
}Verdana	X	X
}Verdana	X	X
}Verdana Bold	X	X
}Verdana Bold Italic	X	X
}Verdana Italic	X	X
}Webdings	X	X
}Wingding	X	X
Graphics and Multimedia Technologies		
}Audio	X	X
}Audio Compression Manager	X	X
„GSM 6.10 Codec	X	X
„MSFilter Codec	X	X
}Waveform Audio	X	X
}Graphics	X	X
}Alphablend API (GDI version)	X	X
}Direct3D Mobile	X	X
}DirectDraw	X	X
}Gradient Fill Support	X	X
}Imaging	X	X
„Still Image Codec Support (Encode and Decode)	X	X
„Still Image Decoders	X	X
‚BMP Decoder	X	X
‚GIF Decoder	X	X
‚ICO Decoder	X	X
‚JPG Decoder	X	X
‚PNG Decoder	X	X
‚TIFF Decoder	X	X
„Still Image Encoders	X	X
‚BMP Encoder	X	X
‚GIF Encoder	X	X
‚JPG Encoder	X	X
‚PNG Encoder	X	X

,TIFF Encoder	X	X
}Multiple Monitor Support	X	X
}Raster Fonts Support	X	X
}V1 Font Compatibility	X	X
Media		
}Audio Codecs and Renderers	X	X
„G.711 Audio Codec	X	X
„GSM 6.10 Audio Codec	X	X
„IMA ADPCM Audio Codec	X	X
„MP3 Codec	X	X
„MPEG-1 Layer 1 and 2 Audio Codec	X	X
„MS ADPCM Audio Codec	X	X
„Wave/AIFF/au/snd File Parser	X	X
„Waveform Audio Renderer	X	X
„WMA Codec	X	X
„WMA Voice Codec	X	X
„WMAPro over S/PDIF Packetizer	X	X
}Digital Rights Management	X	X
„DRM License Acquisition OCx	X	X
„Windows Media DRM 10 PD	X	X
„WMDRM 10 for Networked Devices	X	X
,Windows Media DRM 10 ND	X	X
}DirectShow	X	X
„ACM Wrapper Filter	X	X
„DirectShow Core	X	X
„DirectShow Display	X	X
„DirectShow Error Messages	X	X
„DirectShow Video Capture	X	X
„DMO Wrapper Filter	X	X
}DVD-Video	X	X
„DVD-Video	X	X
„DVD-Video Samples	X	X
}DVR Engine		X
}Media Formats	X	X
„AVI Filter	X	X
„MPEG-1 Parser/Splitter	X	X
}NMD UI		X
}Streaming Media Playback		X
}Video Codecs and Renderers	X	X
„DirectShow Video Renderer	X	X
„MPEG-1 Video Codec	X	X
„MS RLE Video Codec	X	X
►↓Video/Image Compression Manager	X	X
„WMV/MPEG-4 Video Codec	X	X

}Windows Media Player		X
„Windows Media Player		X
„ Windows Media Player OCx		X
„Windows Media Technologies	X	X
▼↓ASx v1 and M3U File Support	X	X
,ASx v2 File Support	X	X
▼↓ASx v3 File Support	X	X
,NSC File Support	X	X
▼↓Windows Media Multicast and Multi-Bit Rate	X	X
,Windows Media Streaming from Local Storage	X	X
▼↓Windows Media Streaming over HTTP	X	X
,Windows Media Streaming over MMS	X	X
,WMA and MP3 Local Playback	X	X
}WMA and MP3 Streaming		X
International		
}Input Method Manager (IMM)	X	X
—Locale Services (Choose 1)	X	X
}English (US) National Language Support only	X	X
—National Language Support (NLS)	X	X
}Locale Specific Support	X	X
—Arabic	X	X
„Fonts	X	X
▼↓Arial (subset 1_08)	X	X
,Arial Bold (subset 1_08)	X	X
▼↓Courier New (subset 1_08)	X	X
,Tahoma (subset 1_08)	X	X
,Tahoma Bold (subset 1_08)	X	X
„Keyboard	X	X
,Arabic Keyboard (101)	X	X
„Unicode Script Processor for Complex Scripts	X	X
}Chinese (Simplified)	X	X
„East Asian Edit Control	X	X
„East Asian Word Wrap	X	X
„Fonts	X	X
,SimSun & NSimSun (Choose 1)	X	X
—SimSun & NSimSun	X	X
—SimSun & NSimSun (Subset 2_20)	X	X
—SimSun & NSimSun (Subset 2_50)	X	X
—SimSun & NSimSun (Subset 2_60)	X	X
—SimSun & NSimSun (Subset 2_70)	X	X
—SimSun & NSimSun (Subset 2_80)	X	X

—SimSun & NSimSun (Subset 2_90)	X	X
„GB18030 Data Converter	X	X
„Input Method Editor	X	X
‚MSPY 3.0 for Windows Embedded CE	X	X
—Double Spelling (Shuang Pin) soft keyboard - Large	X	X
—Double Spelling (Shuang Pin) soft keyboard - Small	X	X
—MSPY 3.0 for Windows Embedded CE Database (Choose 1)	X	X
—1.1 MB - Minimal Database	X	X
—1.3 MB - Compact Database	X	X
—1.7 MB - Standard Database	X	X
‚Pocket IME	X	X
—Double Spelling (Shuang Pin) soft keyboard - Small	X	X
„Monotype Imaging AC3 Font Compression	X	X
}Chinese (Traditional)	X	X
„East Asian Edit Control	X	X
„East Asian Word Wrap	X	X
„Fonts	X	X
‚MingLiu & PMingLiu (Choose 1)	X	X
—MingLiU & PMingLiU	X	X
—MingLiU & PMingLiU (Subset 2_70)	X	X
—MingLiU & PMingLiU (Subset 2_80)	X	X
—MingLiU & PMingLiU (Subset 2_90)	X	X
„Input Method Editor	X	X
‚Pocket IME	X	X
„Input Methods		X
‚Handwriting Recognizer Engine (HWx)		X
—MboxCHT HWx Sample UI		X
‚Input by Radical (Chang Jei)	X	X
‚Phonetic Input (Bopomofo)	X	X
„Monotype Imaging AC3 Font Compression	X	X
}English (U.S.)		X
„Input Methods		X
‚Transcriber Handwriting Recognition Application		X
„Keyboard	X	X
‚US Keyboard	X	X
}English (Worldwide)		X
„Input Methods		X
‚Handwriting Recognizer Engine (HWx)		X
}French	X	X
„Input Methods	X	X
‚Transcriber Handwriting Recognition Application		X
}German		X
„Input Methods		X
‚Transcriber Handwriting Recognition Application		X

}Hebrew	X	X
„Fonts	X	X
‚Arial (subset 1_08)	X	X
‚Arial Bold (subset 1_08)	X	X
‚Courier New (subset 1_08)	X	X
‚Tahoma (subset 1_08)	X	X
‚Tahoma Bold	X	X
„Keyboard	X	X
‚Hebrew Keyboard	X	X
„Unicode Script Processor for Complex Scripts	X	X
}Indic	X	X
„Gujarati	X	X
‚Fonts	X	X
•▪Shruti	X	X
‚Keyboard	X	X
—Gujarati Keyboard	X	X
„Hindi	X	X
‚Fonts	X	X
•▪Mangal	X	X
‚Keyboard	X	X
—Hindi Traditional Keyboard	X	X
„Kannada	X	X
‚Fonts	X	X
•▪Tunga	X	X
‚Keyboard	X	X
•▪Kannada Keyboard	X	X
„Marathi	X	X
‚Fonts	X	X
•▪Mangal	X	X
‚Keyboard	X	X
•▪Marathi Keyboard	X	X
„Punjabi	X	X
‚Fonts	X	X
•▪Raavi	X	X
‚Keyboard	X	X
•▪Punjabi Keyboard	X	X
„Tamil	X	X
‚Fonts	X	X
•▪Latha	X	X

‚Keyboard	X	X
•▪Tamil Keyboard	X	X
„Telugu	X	X
‚Fonts	X	X
•▪Gautami	X	X
‚Keyboard	X	X
•▪Telugu Keyboard	X	X
„Unicode Script Processor for Complex Scripts	X	X
}Japanese	X	X
„East Asian Edit Control	X	X
„East Asian Word Wrap	X	X
„Fonts	X	X
‚MS Gothic (Choose 1)		
—MS Gothic & MS PGothic & MS UI Gothic	X	X
—MS Gothic & MS PGothic & MS UI Gothic (Subset 1_50)	X	X
—MS Gothic & MS PGothic & MS UI Gothic (Subset 1_60)	X	X
—MS Gothic & MS PGothic & MS UI Gothic (Subset 1_70)	X	X
—MS Gothic & MS PGothic & MS UI Gothic (Subset 1_80)	X	X
—MS Gothic & MS PGothic & MS UI Gothic (Subset 1_90)	X	X
—MS Gothic & MS PGothic (Subset 30)	X	X
—MS Gothic & MS PGothic (Subset 30_1_19)	X	X
‚MS Mincho & MS PMincho	X	X
„Input Method Editor (Choose 1)		
‚IME 3.1	X	X
—IME 3.1 Database (Choose 1)		
—Compact Database	X	X
—Standard Database	X	X
—Optional UI Components		
—Dictionary Tool	X	X
—Properties Dialog Box	X	X
—Advanced Settings Dialog Box (Landscape mode only)	X	X
—System Tray Icon Manager	X	X
‚Pocket IME (Choose Additional Databases)	X	X
—Name/Place Database	X	X
—Supplemental Database	X	X
„Input Methods		X
‚All Characters List	X	X

,Handwriting Recognizer Engine (HWx)		X
—Character Auto Complete - HWx Sample UI		X
—Multibox HWx Sample UI		X
,Kana Soft Keyboard	X	X
,Romaji/English Soft Keyboard	X	X
,Search by Radical	X	X
,Search by Stroke	X	X
„Keyboard	X	X
,Japanese Keyboard	X	X
„Monotype Imaging AC3 Font Compression	X	X
}Korean	X	X
„East Asian Edit Control	X	X
„East Asian Word Wrap	X	X
„Fonts	X	X
,Gulim & GulimChe (Choose 1)	X	X
—Gulim & GulimChe (Subset 1_30)	X	X
—Gulim & GulimChe (Subset 1_40)	X	X
—Gulim & GulimChe (Subset 1_50)	X	X
—Gulim & GulimChe (Subset 1_60)	X	X
,Gulim (GL_CE)	X	X
„Input Method Editor	X	X
,IME 97	X	X
„Input Methods		X
,Handwriting Recognizer Engine (HWx)		X
—MboxKOR HWx Sample UI		X
,Korean Soft Keyboard Sample	X	X
„Keyboard	X	X
,Korean Keyboard	X	X
„Monotype Imaging AC3 Font Compression	X	X
}Thai	X	X
„Fonts	X	X
,Tahoma (subset 1_08)	X	X
„Keyboard	X	X
,Thai Kedmanee Keyboard	X	X
„Unicode Script Processor for Complex Scripts	X	X
}Multilingual User Interface (MUI)	X	X
Internet Client Services		
}Browser Application		X
}Internet Explorer 6.0 Windows Embedded CE - Standard Components		X
„Internet Explorer 6.0 Sample Browser		X
„TV-Style Navigation Components		X
}Internet Explorer 6.0 for Windows Embedded CE Components		X
}Internet Explorer Browser Control Host		X

}Internet Explorer HTML/DHTML API		X
„Filter and Translation		X
„Internet Explorer HTML Application		X
„Internet Explorer Plug-in Image Decoder API		X
,Internet Explorer PNG Image Decoder		X
„Internet Explorer Theme Library		X
„MSHTML Data Binding		X
„Internet Explorer Multiple-Language Base API	X	X
„Internet Explorer Multiple-Language Full API		X
„Optional Charset/Encoding in registry		X
}Internet Explorer RPC Support		X
}Internet Explorer TV-Style Navigation		X
„Customizable Font Range		X
„Directional Tabbing		X
„Disable Vertical Scroll Bar and Events		X
„Fixed-Width Layout		X
}URL Moniker Services	X	X
}Windows Internet Services	X	X
„Passport SSI 1.4 Authentication	X	X
„Platform for Privacy Preferences (P3P)	X	X
}xML Data Islands	X	X
}xML MIME Viewer	X	X
}Internet Options Control Panel		X
}Scripting	X	X
}JScript 5.6	X	X
„Script Authoring (Jscript)	X	X
„Script Encode (Jscript)	X	X
}VBScript 5.6	X	X
„MsgBox and InputBox support	X	X
„Script Authoring (VBScript)	X	X
„Script Encode (VBScript)	X	X
Security		
}Authentication Services (SSPI)	X	X
}Kerberos	X	X
}NTLM	X	X
}Schannel (SSL/TLS)	X	X
}Credential Manager	X	X
}Cryptography Services (CryptoAPI 1.0) with High Encryption Provider	X	X
}Certificates (CryptoAPI 2.0)	X	X
„Cryptographic Messaging (PKCS#7)	X	X
„Personal Information Exchange Standard (PKCS #12)	X	X
}Diffie-Hellman/DSS Provider	X	X
}Smart Card Encryption Provider	X	X
}Local Authentication Sub-System	X	X

}Password Local Authentication Plug-in	X	X
}Microsoft Certificate Enrollment Tool Sample	X	X
Shell and User Interface		
}Graphics, Windowing and Events	X	X
}Minimal GDI Configuration	X	X
}Minimal GWES Configuration	X	X
}Minimal Input Configuration	X	X
}Minimal Window Manager Configuration	X	X
}Shell		X
}AYGShell API Set		X
}Command Shell	X	X
„Command Processor	X	X
„Console Window	X	X
}Graphical Shell (Choose 1)		X
„Standard Shell	X	X
„Windows Thin Client Shell		X
}User Interface	X	X
}Accessibility	X	X
}Common Controls	X	X
„Animation Control	X	X
„Common Control	X	X
}Common Dialog Support	X	X
}Control Panel Applets	X	X
}Controls Option B	X	X
}Customizable UI	X	X
„Windows xP-like Sample Skin	X	X
}Menu Tool Tip	X	X
}Mouse	X	X
}Network User Interface	X	X
}Overlapping Menus	X	X
„Quarter VGA Resources - Portrait Mode	X	X
}Software Input Panel	X	X
„Software-based Input Panel (SIP) (Choose 1 or more)	X	X
‚SIP for Large Screens	X	X
‚SIP for Small Screens	X	X
„Software-based Input Panel Driver	X	X
}Touch Screen (Stylus)	X	X
Voice over IP Phone Services		
}PC Authentication	X	X
}Phone IME	X	X
}Real-time Communications (RTC) Client API	X	X
}Real-time Communications (RTC) Client API GSM Codec	X	X
}Telephony User Interface	X	X
}Voice over IP Contacts Application	X	X
}Voice over IP Dialer Application	X	X

}Voice over IP Home Screen Application	X	X
}Voice over IP Settings Application	X	X
}VoIP Application Interface Layer (VAIL)	X	X
}Phone Provisioner	X	X
}Reference Media Manager	X	X
}VAIL Database Store	X	X
Windows Embedded CE Error Reporting		
}Error Report Generator	X	X
}Error Report Transfer Driver	X	X
}Error Reporting Control Panel	X	X
}Report Upload Client	X	X
}Report Upload Client User Interface	X	X

Please note that this table is for informational purposes only. The official information pertaining licensing is included in the royalty bearing license agreement. Please consult with Microsoft, the Microsoft affiliate serving your country or your local Authorized Windows Embedded Distributor.

*** Cellcore**

Cellcore or its sub-components could be included in the Core runtime provided that the Embedded System:
(a) must be limited to data use only, and
(b) may not be used to make voice calls over a cellular network. This limitation includes any indirect use of the voice capabilities of cellular networks via peripheral devices to make the voice call and/or the voice call connection.

For more information please contact your local Authorized Windows Embedded Distributor.

*** Help**

Help is not included in the Core run-time because it requires a browser. The Windows Embedded CE help engine is HTML-based, and our help documentation comes in the form of HTM files. However, this help documentation is available for use, but it does require that customers create their own viewing software.

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