Mobile Knowledge

Series 9000 SDK

Getting Started

Document No.: 9000SDK-DOC-001

Revision: A5

Travis Gray

REVISION HISTORY

22 April 2005	A0	Initial Draft – Travis Gray
28 April 2005	A1	Updates with Cable Specifics
14 November 2006	A2	Notes Related to Limites of Intel Strata Flash Component
2 April 2007	A3	GPRS References Added as Section 4.
28 June 2007	A4	Updated GPRS Safety Notification.
9 July 2007	A5	Added additional statement to GPRS Safety Notification.

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For additional copies of this document, please contact:

Mobile Knowledge Corp
308 Legget Drive
Kanata, Ontario, Canada, K2K 1Y6
Phone: 1-613-287-5020
Fax: 1-613-287-5021
e-mail: info@mobile-knowledge.com
web: www.mobile-knowledge.com

Mobile Knowledge

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1. INTRODUCTION

The Mobile Knowledge Inc. Series 9000 Software Development Kit (SDK) includes everything you need to develop applications on the Series 9000 Mobile Data Terminal (MDT). The MDT and development environment are described in Section 2 – System Description.

1.1 What's Included

The Series 9000 SDK ships with the following hardware and software:

Hardware	Part Number
Series 9000 MDT	960-2470-xxx
Series 9000 Accessories Kit	360-2437-000
GPS Antenna (Magnetic Mount)	360-0004-SMA
Cable - Series 9000 Power	850-0231-000
Cable – Series 9000 COM/IO	850-0230-000
Cable – Series 9000 COM Extender	850-0233-000
Power Switch	650-0074-000
Emergency Switch	550-0111-000
Emergency Switch Collar	550-0112-000
Wire, Terminal Lugs, Mounting Screws, Fuse, Tie Wraps	Various
Compact Flash Ethernet Card (Socket Communications)	383-0003-000
Patch Cable (7ft, Black, Cat 5, RJ45-RJ 45)	550-0153-000
Cross-Over Cable (8ft, Cat 5, RJ45-RJ45)	850-0189-000
Null Modem Adapter (10ft, F-F)	850-0227-000
Mounting Bracket – HINT Dashboard	750-0002-000

Software	Part Number
Series 9000 SDK Software Kit (CD) (includes CE Image)	475-2470-004
Series 9000 SDK License Agreement	TBD
Getting Started Manual (PDF file on CD)	460-2470-004

The software CD contains the following:

SDK CD Directory	Contents
Series 9000 SDK	Readme.txt – this file contains basic getting started information.
Series 9000 SDK Cables	PDF files of the cable drawings and pin assignements.
Series 9000 SDK Manual	Series 9000 SDK Getting Started Manual in PDF format (this manual)

1.2 What's in this Document

The Series 9000 SDK Getting Started Manual contains the following information:

1. **Section 2 – System Description**
   - This section contains descriptions of the Series 9000 MDT and the tools provided on the SDK CD.

2. **Section 3 – Working with the Series 9000 SDK**
   - This section contains descriptions and instructions for the hardware and software setup to get started with development of applications using the Microsoft® eMbedded Visual Tools® and the Series 9000 SDK API. The sample eMbedded Visual Basic® and Visual C++® programs are described.

3. **Section 4 – Optional Public Data Radio Modem**
   - Provides cautions pertaining to Series 9000 configurations incorporating internal Wavecom Q2406/Q2426 internal GPRS modem module.

4. **Section 5 – Additional Resources**
   - This section contains links to additional resources for pertinent Microsoft eMbedded information.

5. **Section 6 – Series 9000 Cabling**
   - Provides drawings of cables included with standard Series 9000 accessories kit.

2. SYSTEM DESCRIPTION

This section describes the hardware and software configuration of the Series 9000 SDK.

2.1 Series 9000 MDT Hardware

The Series 9000 MDT features a 5.7" ¼VGA display with a resistive touch screen. The Microsoft Windows CE.Net operating system runs on the embedded Intel 200 MHz processor. The onboard peripherals and IO capabilities of the Series 9000 are illustrated in Figure 2-1 and described in Table 2-1:

Figure 2-1 – Series 9000 MDT

Table 2-1 – Series 9000 MDT Peripherals and I/O

Device	Description	Uses
Display with Resistive Touch Screen	5.7" ¼VGA with Resistive Touch Screen	The 5.7" ¼VGA (320 X 240 pixels, 16 bit color) display features a resistive touch screen. A software input panel keyboard is available on the unit, but alternately, a USB keyboard can be plugged into the Series 9000 USB port. The display is controlled via the Windows API.
Magnetic Card Swipe	Standard Track-I and Track-II Magnetic Card Swipe	The magnetic card swipe is a two-track reader. Track-I and Track-II data is accessible via the Series 9000 SDK.
Microphone, Speaker	Audio Input and Output	The sound features of the Series 9000 MDT are accessed through standard Windows API calls.
Compact Flash Slot	Compact Flash Slot	The CompactFlash I/O slot allows expansion via CF devices such as network cards, memory storage cards, etc. The CF functions are controlled via the Windows API.
MMC Slot	MMC Slot	The MMC I/O slot allows memory expansion via MMC format memory cards. The MMC functions are controlled via the Windows API.
GPS Connector	Standard GPS connector	The GPS antenna connector is used to connect a 3V GPS antenna. The GPS data is accessed through NMEA strings exposed by the Series 9000 SDK.
DB-26 Connector	DB-26 Connector	The DB-26 connector provides access to power, I/O, USB, and four RS-232 serial ports. Appendix A describes specifies the pin assignments associated with the primary and secondary I/O cables.

> **Note:** The Series 9000 Mobile Data terminal contains two types of embedded memory. The MDT has 64MB of RAM, and 64MB of Flash memory. The SDK developer has approximately 40MB of available space in the Intel Persisten Memory Manager section of Flash. This Intel Strata Flash component is rated for a minimum 100K erase cycles per block. The Intel PSM software also provides a measure of write-leveling to extend the lifecycle of this component.
>
> Typically, software implementation utilizes RAM memory (not limited in this fashion) for frequent non-persistent storage. Flash Memory should only be used to store minimum amounts of data as required to survive a restart. When engineering an application the usage of flash memory must be carefully calculated and accounted for during the design phase.

2.2   Series 9000 MDT Software

Folders of interest to developers on the Series 9000 MDT are shown in Figure 2-2 and described in Table 2-2:
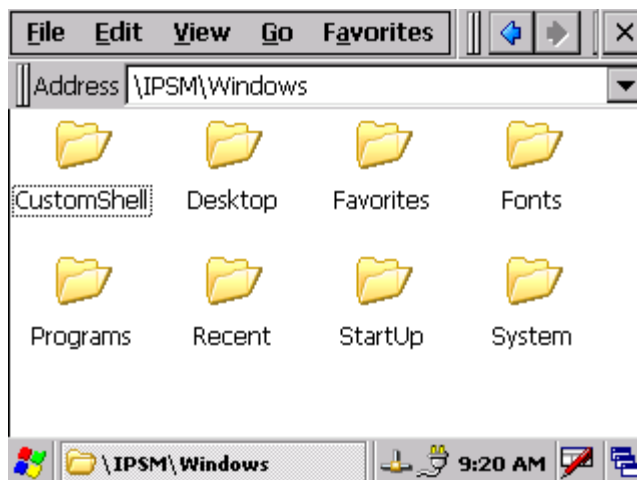
Figure 2-2 – Persistent Storage Folders

To access the IPSM folder, open the My Computer icon on the desktop, and then click the IPSM folder followed by the Windows folder. The IPSM folder provides persistent storage through power cycles (contents of the IPSM folder are saved to internal flash). The IPSM\Windows folder contains default subfolders as specified in Table 2-2:

Table 2-2 – Series 9000 MDT IPSM\Windows Directory

Custom Shell	Special ShortCuts files place here allow a your custom application to be launched instead of the Shell.
Desktop	Files stored in this folder will appear as desktop shortcuts on power up (if stored as shortcuts).
Favorites	Shortcuts stored in this folder will appear on the My Favorites menus.
Fonts	Additional system fonts can be stored here.
Programs	Items in this folder will appear in the Start → Programs menu.
Recent	Files here will appear in Start→Documents.
Startup	Shortcuts to applications in this folder will run at power up.
System	Storage for DLL files and other files to be included in Windows path.

NOTE: The contents in folders outside of the IPSM Folder are not saved after re-powering the Series 9000 MDT.

2.3   The Series 9000 SDK Software

The Series 9000 SDK includes SDK components for the eMbedded Visual C++ programming environment. The Series 9000 SDK Online Help becomes integrated within the eMbedded Visual Tools Help and provides code level descriptions of the SDK's API functions.

The Series 9000 SDK CD setup installs the components mentioned above and creates a samples directory in the Windows CE Tools directory containing examples of eMbedded Visual C++ applications.

3. WORKING WITH THE SERIES 9000 MDT

Establishing initial communications between the Series 9000 MDT and the Development PC requires the use of the Microsoft ActiveSync application. Creating the ActiveSync Partnership necessitates a serial connection to the PC via COM 5 of the 9000 MDT. Once this Partnership has been created, the Development PC can then communicate with the Development PC via an Ethernet connection using the Compact Flash Ethernet adapter (PN 383-0003-000) provided as part of the accessories kit.

3.1   Powering the Series 9000

Two steps must be taken to power the Series 9000:

1.   Connect Cable # 850-0231-000 to a 12VDC power supply (Red to DC+, Black to DC-)

2.   Connect the Blue wire of Cable # 850-0230-000 to the +12VDC power source. This is the ignition sense line for the device, and the Series 9000 will not power unless power is applied to this lead.

NOTE: The "Ignition Run Line" (Blue wire of Cable # 850-0230-000) must be connected to the +12VDC in order to power the Series 9000.

3.2   Initial Hardware Setup (RS-232 Serial)

The initial hardware setup must be utilized to create the initial ActiveSync Partnership between the Series 9000 and the Development PC. Once this has been accomplished, it will be possible to establish an ActiveSync connection via an Ethernet link as described in Section 3.

Figure 3-1 illustrates the initial RS-232 Serial connectivity required to establish the initial ActiveSync Partnership. Table 3-1 describes this connection in greater detail.
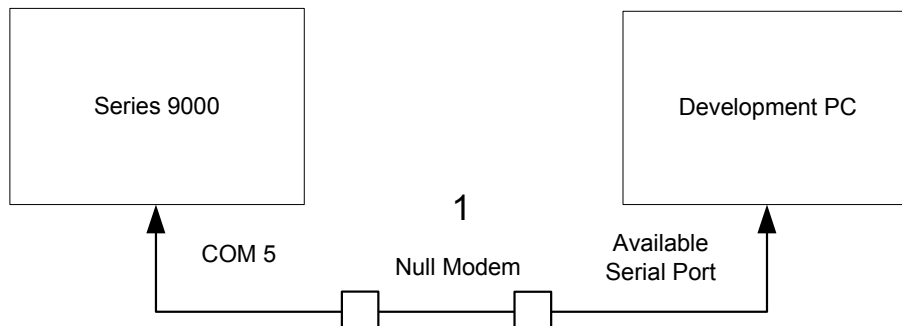

Figure 3-1 – Connecting the Series 9000 MDT to your Development PC (RS-232 Serial)

Refer to Section 3.5 for a step-by step description of the procedure required to establish the Partnership.

Table 3-1 – Connecting the Series 9000 MDT to your Development PC

	Configuration	Use
1	Series 9000 MDT COM 5 to development PC COM port (COM 1 or 2 – configurable with ActiveSync)	Used to establish the initial ActiveSync connection and Partnership through the development PC COM port.

NOTE: Use COM 5 to initiate a serial connection between the Series 9000 and the Development PC so as to establish the requisite ActiveSync partnership.

3.3   Subsequent Hardware Setup (Ethernet)

Figure 3-2 illustrates two configurations used to connect the Series 9000 MDT to the development PC following the creation of the ActiveSync Partnership described in Section 3.1. Refer to Table 3-2 for detailed descriptions of both configurations.
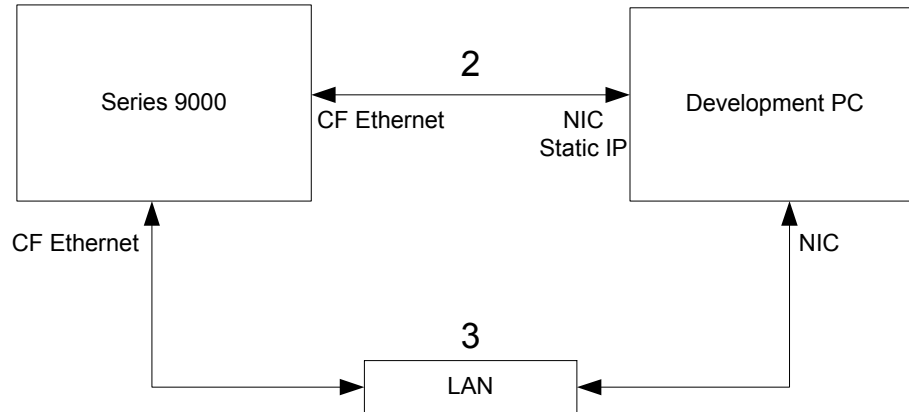

Figure 3-2 – Connecting the Series 9000 MDT to your Development PC (Ethernet)

Table 3-2 – Connecting the Series 9000 MDT to your Development PC

	Configuration	Use
2	Series 9000 MDT CF Ethernet card to development PC NIC with static IP.	Used to install the Windows CE image onto the Series 9000 MDT.
		The Crossover Cable (PN 850-0189-000) should be used to connect the Compact Flash Ethernet port of the 9000 to the NIC Card of the PC.
3	Series 9000 MDT CF Ethernet card to LAN on which development PC is also connected.	Used to establish an ActiveSync connection through a LAN. Can be done after an ActiveSync "Partnership" is created though the serial connection.
		The Patch Cable (PN 550-0153-000) should be used to connect the Compact Flash Ethernet port of the 9000 to your Local Area Network.

NOTE: When establishing the ActiveSync connection through the LAN, ensure the network's reverse DNS is enabled, as ActiveSync will search out the machine name, and not its IP number.

3.4   Software Setup

Setting up the software environment on the development PC requires that Microsoft eMbedded Visual Tools 4.0 be installed before the installation of the Series 9000 SDK.

The steps to be followed in creating the development environment on your development PC are:

1. Install Microsoft® eMbedded Visual C++® 4.0 and latest service pack.
2. Install Microsoft® ActiveSync 3.8
3. Install the Series 9000 SDK Software

3.4.1   Installing Microsoft® eMbedded Visual C++ and ActiveSync®

The following tools from Microsoft must be downloaded from the Microsoft Web Site and installed on the development PC:

Microsoft eMbedded Visual C++ is available at:

http://msdn.microsoft.com/embedded/default.aspx

Microsoft ActiveSync is available at:

http://www.microsoft.com/windowsmobile/downloads/activesync38.mspx

3.4.2   Installing the Series 9000 SDK Components

NOTE: eMbedded Visual Tools 4.0 must be installed prior to running the Series 9000 SDK installation.

To install the Series 9000 SDK:

1. Insert the Series 9000 SDK CD in the CD-Rom drive and double-click the file MKC_Series9000MDT_SDK.msi located in the CD's Setup folder. The Windows Installer starts.
2. Follow the installer prompts and accept the software license agreements. The installation performs the following tasks:
   - Installs Series 9000 SDK for eMbedded Visual C++
   - Installs the Series 9000 Online Help - integrated with the eMbedded Visual Tools Help
   - Creates the folder Samples in C:\Program Files\Windows CE Tools\wce420\Series9000

3.5   Development PC Setup

To get started, connect the Series 9000 MDT using hardware configurations 1 and 2 as shown in Figure 3-1, install ActiveSync on the development PC and follow the procedure below:

1. Start ActiveSync on the development PC.
2. Click File, Connection Settings. Check the "Allow serial cable..." check box (and the appropriate PC COM port from the list) as well as the "Allow network (Ethernet)... " check box (entering network parameters) and then click OK.
3. On the Series 9000 MDT, open the Start, Programs, Tools, and select ActiveSync (COMM). If the connection times out on the MDT run the ActiveSync (COMM) on the MDT again.
4. After you get a connection on the PC ActiveSync will ask you if you want to Set Up a Partnership, Select Yes and click Next.
5. On the Select Synchronization Setting dialog uncheck all the boxes and press Next.
6. Setup is complete click Finish.
7. On the MDT double click the ICON in the system tray for the ActiveSync connection and click Disconnect.
8. On the PC go to the ActiveSync Connection Settings in the File menu. Uncheck the Allow serial cable and press OK.
9. On the MDT open the Start menu go to Programs, Tools and click ActiveSync (Ethernet). Open the drop down and select Network Connection then press Connect. The MDT should reconnect to your PC.
10. On the MDT click Start, Programs, Tools, and select MDT Tester. Click the Tools menu item and click Save Registry to Flash. This will save the registry settings to flash.
11. To reconnect ActiveSync after a power cycle you will only need to do step 10. Only the CF Ethernet Card and crossover cable to the LAN are now required for development.

3.6 The Series 9000 SDK API Library and Online Help File

Once the Series 9000 SDK files for eMbedded Visual C++ are installed, the API function calls become available to the development environments, and the Series 9000 SDK Online Help file is incorporated as part of the existing eMbedded Visual C++ help.

3.6.1 eMbedded Visual C++ Help

When installing the Series 9000 SDK platform, the help containing procedures and API call descriptions are incorporated within the eMbedded Visual C++ help as shown in Figure 3-3.
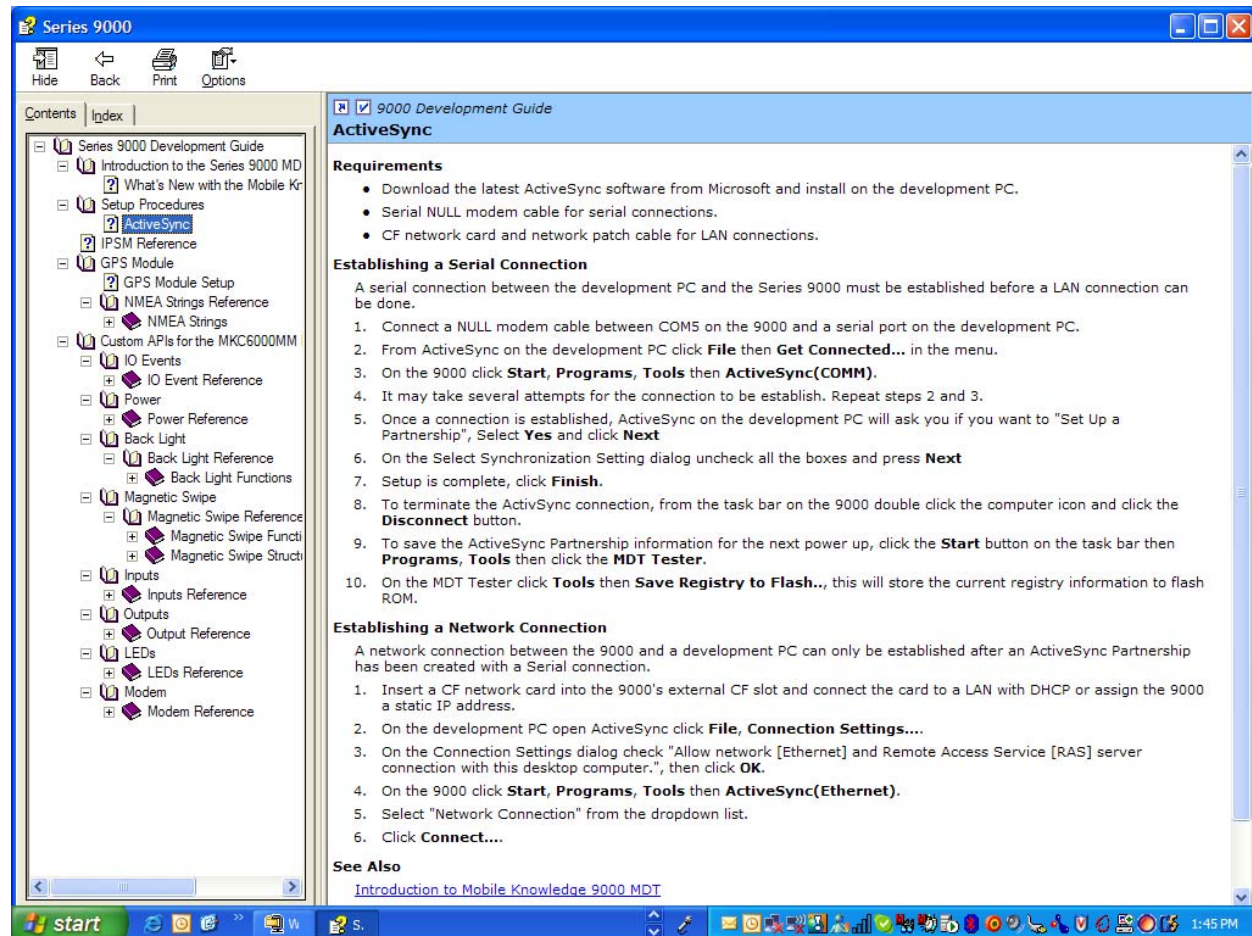

Figure 3-3 – Series 9000 SDK Help File

Note: The Series 9000 Mobile Data terminal contains two types of embedded memory. The MDT has 64MB of RAM, and 64MB of Flash memory. The SDK developer has approximately 40MB of available space in the Intel Persisten Memory Manager section of Flash. This Intel Strata Flash component is rated for a minimum 100K erase cycles per block. The Intel PSM software also provides a measure of write-leveling to extend the lifecycle of this component.

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4. OPTIONAL PUBLIC DATA RADIO MODEM

The Series 9000 is available with an optional internal Wavecom Q2406/Q2426 GPRS modem module. The following Series 9000 model numbers include the internal modem:

- 360-24wx-y1z – European Configuration (900/1800 MHz)

- 360-24wx-y2z – North American Configuration (850/1900 MHz)

  Where w, x, y, and z can be any integer.

In these configurations, the following safety precautions should be noted and taken:

4.1 Safety Notification:

To comply with RF safety requirements, please maintain a separation distance of 20cm from the antenna located on the exterior of the vehicle.

Modifications not expressly approved by ,Mobile Knowledge Corp. could

void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a

Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are

designed to provide reasonable protection against harmful interference in a

residential installation. This equipment generates, uses and can radiate radio

frequency energy and, if not installed and used in accordance with the

instructions, may cause harmful interference to radio communications. However,

there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception,

which can be determined by turning the equipment off and on, the user is

encouraged to try to correct the interference by one or more of the following

measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

5. ADDITIONAL RESOURCES

Microsoft Windows eMbedded page:
http://msdn.microsoft.com/embedded/

Microsoft Windows CE page:
http://www.microsoft.com/windowsmobile/resources/downloads/default.mspx

6. SERIES 9000 CABLING

6.1 Cable - Series 9000 Power (PN 850-0231-000)

6.2 Cable – Series 9000 COM/IO (PN 850-0230-000)

6.3 Cable – Series 9000 COM Extender (PN 850-0233-000)