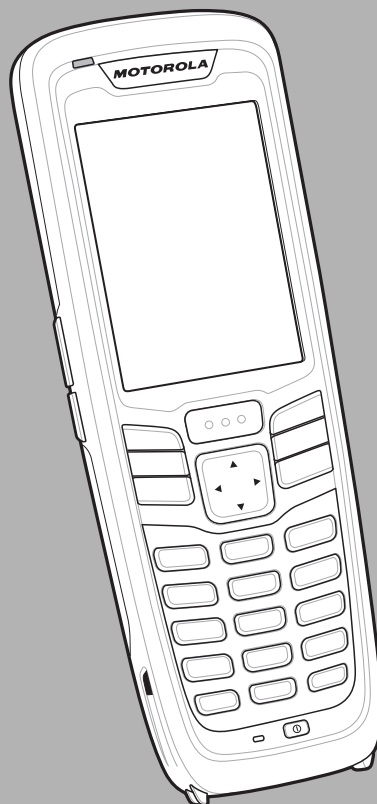


MC21XX SERIES MOBILE COMPUTER INTEGRATOR GUIDE



MC21XX SERIES INTEGRATOR GUIDE

72E-155021-01

Rev. A

December 2011

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Revision History

Changes to the original guide are listed below:

Change	Date	Description
-01 Rev. A	12/31/11	Initial Release.

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ABOUT THIS GUIDE

Introduction

This guide provides information about using the MC21XX and accessories.



NOTE

Screens and windows pictured in this guide are samples and may differ from actual screens.

Documentation Set

The documentation set for the MC21XX is divided into guides that provide information for specific user needs.

- **MC21XX Series Quick Start Guide** - describes how to use the MC21XX.
- **MC21XX Series MC21XX User Guide** - describes how to use the MC21XX.
- **MC21XX Series MC21XX Integrator Guide** - describes how to set up the MC21XX and the accessories.
- **Microsoft Applications for Windows Mobile 6.1 and CE 6.0 User Guide** - describes how to use Microsoft developed applications.
- **Application Guide for Motorola Enterprise Mobility Devices** - describes how to use Motorola Enterprise Mobility developed applications.
- **EMDK Help File** - provides API information for writing applications.

Configurations

This guide covers the following configurations:

Configuration	Radios	Display	Memory	Data Capture	Operating System
MC2100	None	Color, no touch	128 MB RAM/ 256 MB Flash	Linear or 1D laser	Windows CE 6.0
MC2180	WLAN: 802.11 b/g/n WPAN: Bluetooth	Color touch screen	128 MB RAM/ 256 MB Flash	Linear, 1D laser or 2D imager	Windows CE 6.0

Software Versions

This guide covers various software configurations and references are made to operating system or software versions for:

- OEM version
- Fusion version.

OEM Version

To determine the OEM software version:

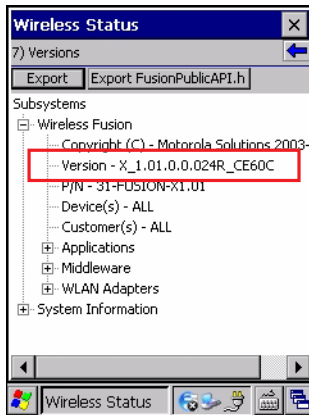
Tap **Start > Settings > Control Panel > System Info icon > System tab**.



Fusion Software

To determine the Fusion software version:

Tap **Wireless Strength icon > Wireless Status > Versions**.



Chapter Descriptions

Topics covered in this guide are as follows:

- [Chapter 1, Getting Started](#) - explains how to install and charge batteries and start the MC21XX for the first time.
- [Chapter 2, Accessories](#) provide setup information for the MC21XX accessories.
- [Chapter 3, Synchronization](#) - provides instructions for installing synchronization software and setting up a partnership between the MC21XX and a host computer.
- [Chapter 4, Application Development](#) - provides instructions for installing DCP and EMDK on the host computer and downloading software and files to the MC21XX.
- [Chapter 5, Maintenance and Troubleshooting](#) - includes instructions for cleaning and storing the MC21XX and provides troubleshooting solutions for potential problems during operation.
- [Appendix A, Specifications](#) - lists the technical specifications for the MC21XX and accessories.
- [Appendix B, Special Software Configurations](#) - provides information for setting the battery usage threshold and removing sample applications.

Notational Conventions

The following conventions are used in this document:

- The term “MC21XX” refers to the Motorola MC21XX.
- *Italics* are used to highlight the following:
 - Chapters and sections in this and related documents
 - Dialog box, window and screen names
 - Drop-down list and list box names
 - Check box and radio button names
 - Icons on a screen.
- **Bold** text is used to highlight the following:
 - Key names on a keypad
 - Button names on a screen.

- Bullets (•) indicate:
 - Action items
 - Lists of alternatives
 - Lists of required steps that are not necessarily sequential.
- Sequential lists (e.g., those that describe step-by-step procedures) appear as numbered lists.

Related Documents and Software

The following items provide more information about the MC21XX.

- *MC21XX Quick Start Guide*, p/n 72-155018-xx
- *MC21XX Regulatory Guide*, p/n 72-155019-xx
- *MC21XX User Guide*, p/n 72E-155021-xx
- *Application Guide for Motorola Enterprise Mobility Devices*, p/n 72E-68901-xx
- *Microsoft® Applications for Mobile 6.1 and CE 6.0 User Guide*, p/n 72E-108299-xx
- *Enterprise Mobility Developer Kit (EMDK) Help File*
- *Windows CE Platform SDK for MC2100c60*, available at: <http://supportcentral.motorola.com>
- *Enterprise Mobility Developer Kit for C (EMDK for C)*, available at: <http://supportcentral.motorola.com>
- ActiveSync software, available at: <http://www.microsoft.com>.

For the latest version of this guide and all guides, go to: <http://supportcentral.motorola.com>

Service Information

If you have a problem with your equipment, contact Motorola Solutions Global Customer Support for your region. Contact information is available at: <http://www.motorola.com/enterprisemobility/contactsupport>.

When contacting Motorola Solutions Global Customer Support, please have the following information available:

- Serial number of the unit
- Model number or product name
- Software type and version number

Motorola Solutions responds to calls by email, telephone or fax within the time limits set forth in support agreements.

If your problem cannot be solved by Motorola Solutions Global Customer Support, you may need to return your equipment for servicing and will be given specific directions. Motorola is not responsible for any damages incurred during shipment if the approved shipping container is not used. Shipping the units improperly can possibly void the warranty.

If you purchased your Motorola Solutions business product from a Motorola business partner, contact that business partner for support.

CHAPTER 1 GETTING STARTED

Introduction

This chapter describes the MC21XX's how to install and charge the batteries, how to remove and replace the handstrap and how to start the MC21XX for the first time.

Unpacking the MC21XX

Carefully remove all protective material from around the MC21XX and save the shipping container for later storage and shipping. Verify that the equipment listed below is included:

- Mobile computer
- Mini stylus and tether (touch screen configurations only)
- Battery
- Regulatory Guide
- Quick Start Guide.

Inspect the equipment for damage. If any equipment is missing or damaged, contact the Motorola Solutions Global Customer Support immediately. See [Service Information on page xvi](#) for contact information.

MC21XX Startup

To start using the MC21XX:

- Install the SD card (optional).
- Install the main battery.
- Charge the main battery and the backup battery.
- Start the MC21XX.

Install SD Card

The Secure Device (SD) card provides secondary non-volatile storage (the flash memory is slower than RAM). The SD card holder is located under the battery.



CAUTION Follow proper Electro-Static Discharge (ESD) precautions to avoid damaging the microSD card. Proper ESD precautions include, but are not limited to, working on an ESD mat and ensuring that the operator is properly grounded.

Do not use the microSD card slot for any other accessories.



NOTE Select microSD cards with environmental and/or the write cycle performance specifications that meet or exceed the application requirements.

To insert the microSD card:

1. Place the MC21XX face-down on surface.
2. Slide the card holder door down to unlock.
3. Lift the microSD card holder door.

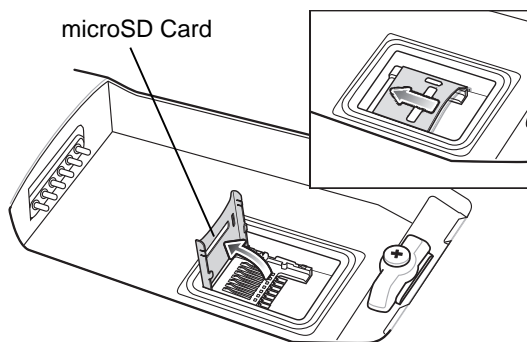


Figure 1-1 *Inserting the microSD Card*

4. Position the microSD card, with the contacts facing down, into the microSD holder.
5. Close microSD card door.
6. Slide the card holder up to lock.

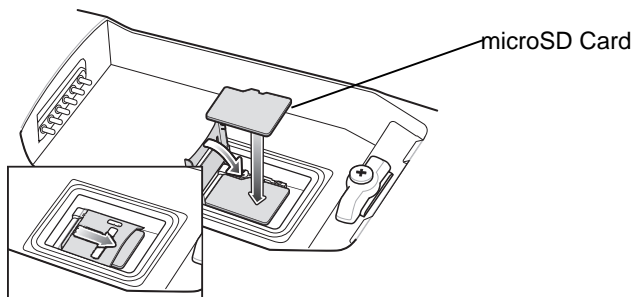


Figure 1-2 *Inserting the microSD Card*

Install Main Battery

If the main battery is charged, the MC21XX can be used immediately. If the main battery is not charged, see [Battery Charging on page 1-3](#). To remove the main battery, see [Main Battery Removal on page 1-6](#).

Insert the battery into the slot, bottom first and press the battery gently into the slot. The battery clip locks the battery into place.

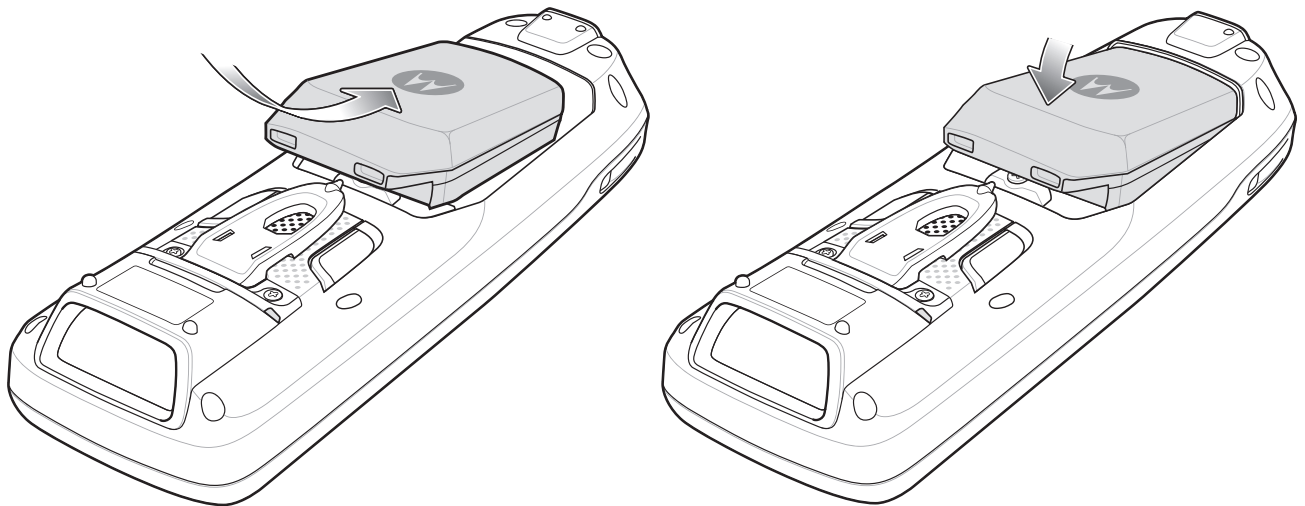


Figure 1-3 Insert Battery

Battery Charging



CAUTION Ensure that you follow the guidelines for battery safety described in [Battery Safety Guidelines on page 7-2](#).

The main battery can be charged before insertion into the MC21XX or after it is installed. Use the Four-slot Battery Charger to charge the main battery (out of the MC21XX) or the supplied power supply to charge the main battery while it is installed in the MC21XX.

Before using the MC21XX for the first time, fully charge the main battery until the LED Indicator remains lit (see [Table 1-1 on page 1-4](#) for charge status indications). The battery fully charges in less than four hours.

The MC21XX is equipped with a memory backup battery which automatically charges from the main battery whether or not the MC21XX is operating or is in suspend mode. The memory backup battery retains data in memory for at least 30 minutes when the MC21XX's main battery is removed or fully discharged. When the MC21XX is used for the first time or after the memory backup battery has fully discharged, the memory backup battery requires approximately 15 hours to fully charge. Do not remove the main battery from the MC21XX for 15 hours to ensure that the memory backup battery fully charges. If the main battery is removed from the MC21XX or the main battery is fully discharged, the memory backup battery completely discharges in several hours.

When the main battery reaches a very low battery state, the combination of main battery and backup battery retains data in memory for at least 72 hours.



NOTE Do not remove the main battery within the first 15 hours of use. If the main battery is removed before the backup battery is fully charged, data may be lost.

Batteries must be charged within the 0° to +40° C (32° to 104° F) ambient temperature range.

To charge the MC21XX using the optional power supply:

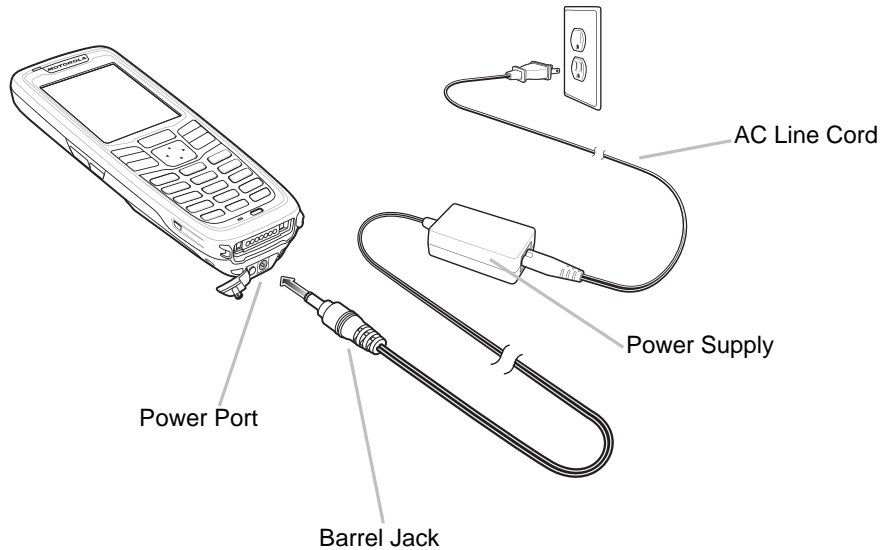


Figure 1-4 *Charging Using Power Supply*

1. Connect the AC Line Cord to the power supply.
2. Connect the AC plug to an AC outlet.
3. Lift the rubber plug covering the MC21XX power port.
4. Plug the power supply barrel jack into the power port on the bottom of the MC21XX.

The MC21XX starts to charge. The LED Indicator indicates the charging status.

Table 1-1 *LED Indicator*

LED	Indication
Off	MC21XX not placed correctly in the cradle; charge cable not connected correctly; charger is not powered.
Fast Blinking Amber	Error in charging; check placement of the MC21XX.
Slow Blinking Amber	MC21XX is charging.
Solid Amber	Charging complete. Note: When the battery is initially inserted in the MC21XX, the amber LED flashes once if the battery power is low or the battery is not fully inserted.

The following accessories can also be used to charge the battery:

- Cradle (and a power supply):
 - Single-slot USB Cradle.
- Cables (and a power supply):
 - USB ActiveSync/Charge Cable.
- Chargers (and a power supply):
 - Four-slot Spare Battery Charger.

Spare Battery Charging

To charge a spare battery:

1. Connect the Four-slot Battery Charger to the appropriate power source. See [Chapter 6, Accessories](#) for setup instructions.
2. Insert the spare battery into the spare battery charging slot and gently press down on the battery to ensure proper contact.

The battery starts to charge automatically. The LED Indicator blinks amber to indicate the battery is charging. See [Chapter 2, Accessories](#) for charging indications. The battery usually fully charges in less than four hours.

Starting the MC21XX

Press the **Power** button to turn on the MC21XX. If the MC21XX does not power on, perform a cold boot. See [Resetting the MC21XX on page 2-12](#).

When the MC21XX is powered on for the first time, it initializes. The Splash screen appears for a short period of time. On the MC2180 the **Calibration** screen appears.

If the MC21XX does not power on, see [Resetting the MC21XX on page 2-12](#).

Calibration Screen

✓ **NOTE** MC2180 only.

Use the **Calibration** screen to align the touch screen:

1. Remove the mini stylus from the back of the MC2180.
2. Carefully press and briefly hold the stylus tip on the center of the **Calibration** screen target. Repeat the procedure as the target moves and stops at different locations on the screen. This enters the new calibration settings.

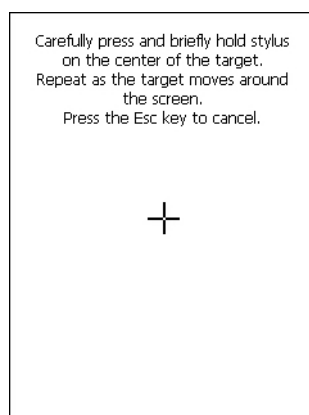


Figure 1-5 Calibration Screen

3. Once all of the new calibration settings are input, tap the screen or press the **ENTER** button to save the new calibration settings. Press **ESC** to discard the new calibration settings.

Main Battery Removal



CAUTION When removing the battery, follow the Safe Battery Swap procedures below otherwise loss of data or system corruption may occur. An error message, **Improper Shutdown**, displays on the screen indicating that the MC21XX was not shutdown properly.

When in Safe Battery Swap mode, the MC21XX goes into a low power suspend state. All wakeup are disabled.

To remove the main battery from an MC21XX:

1. If the MC21XX is in suspend mode, press the Power button to wake the MC21XX.
2. Press the Power button to place the MC21XX in suspend mode.
3. On the MC2180, tap **Safe Battery Swap**.
On the MC2100, using the navigation pad, scroll down to **Safe Battery Swap**. Press the **Enter** key.
4. Wait for the LED Indicator to turn red and then turn off.
5. Using thumbs, push the two battery latches up. The battery ejects slightly.

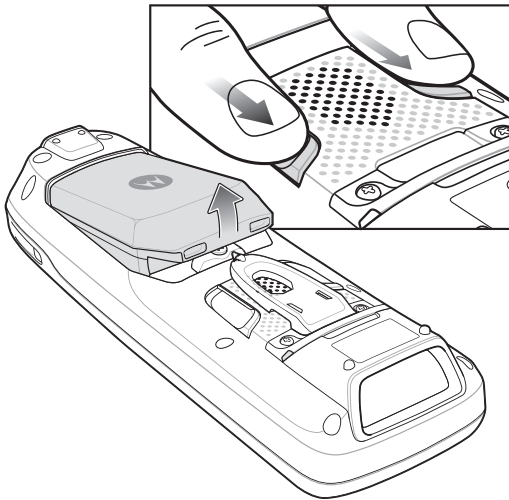


Figure 1-6 Release Latches

6. Remove the battery from the MC21XX.



CAUTION Replace the new battery within five minutes to prevent loss of data.

Safe System Shutdown/Re-boot

To ensure that data is not lost or that system corruption does not occurs, the user must follow the Safe Battery Swap procedure when replacing the battery. See [Main Battery Removal on page 1-6](#). If the Safe battery Swap procedure is not followed, a Improper Shutdown message appears on the screen.

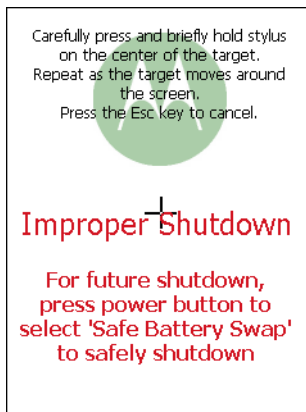


Figure 1-7 Improper Shutdown Message

If the MC21XX stops responding, first perform a warm boot. A warm boot maintains radio status and registry settings. Do not perform a cold boot unless necessary.

Performing a cold boot resets the MC21XX to factory defaults and loss of all registry settings.

To perform a warm boot, press and hold the Power button for five seconds.

Resetting the MC21XX

If the MC21XX stops responding to input, reset it. There are two reset functions, warm boot and cold boot. A warm boot restarts the MC21XX by closing all running programs. All data that is not saved is lost.

A cold boot also restarts the MC21XX, but erases all stored records and entries from RAM. In addition it returns formats, preferences and other settings to the factory default settings.

Perform a warm boot first. If the MC21XX still does not respond, perform a cold boot.

Performing a Warm Boot

To perform a warm boot:

1. Press the **Power** button for five seconds. As soon as the MC21XX starts to boot release the **Power** button.



CAUTION Files that remain open during a warm boot may not be retained.

Performing a Cold Boot

A cold boot restarts the MC21XX and erases all user stored records and entries from RAM. *Never perform a cold boot unless a warm boot does not solve the problem.*



CAUTION Cold boot resets the MC21XX, to the default settings. All added applications and all stored data are removed. Do not cold boot without support desk approval.

When removing the battery, follow the Safe Battery Swap procedures below otherwise loss of data or system corruption may occur. An error message, **Improper Shutdown**, displays on the screen indicating that the MC21XX was not shutdown properly.

To perform a cold boot:

1. If the MC21XX is in suspend mode, press the Power button to wake the MC21XX.
2. Press the Power button to place the MC21XX in suspend mode.
3. On the MC2180, tap **Safe Battery Swap**.
On the MC2100, using the navigation pad, scroll down to **Safe Battery Swap**. Press the **Enter** key.
4. Wait for the LED Indicator to turn red and then turn off.
5. Simultaneously press and then release the **1**, **9** and **Power** keys. As the MC21XX initializes, the splash window appears.

Performing a Clean Boot

A clean boot resets the MC21XX to the factory default settings. All data in the Application folder is retained. Download the Cleaner package file from the Support Central web site, <http://supportcentral.motorola.com> and install on the MC21XX. The Cleaner package contains two sets of files. One set cleans the Platform folder and the other cleans the Application folder.

To perform a clean boot:

1. Download the Cleaner package from the Support Central web site. Follow the instructions included in the package for installing the package onto the MC21XX.
2. Copy the Cleaner package to the root directory of a microSD card (using a host computer).
3. Remove the battery.
4. Install the microSD card.
5. Replace the battery.
6. Connect the MC21XX to AC power. See *Chapter 2, Accessories*.
7. Using Windows Explorer, navigate to the SD card folder.
8. Open the OSUpdate folder.
9. Double tap on the file: 2100c60Aen_SD.Ink
10. When the Update Loader application finds the appropriate file, it loads the package onto the MC21XX. A progress bar displays until the update completes.
11. When complete, the MC21XX re-boots.

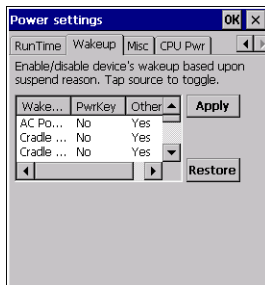
Waking the MC21XX

The wakeup conditions define what actions wake up the MC21XX after it has gone into suspend mode. The MC21XX can go into suspend mode by either pressing the Power button or automatically by Control Panel time-out settings. These settings are configurable and the factory default settings are shown in *Table 1-2*.

Table 1-2 *Wakeup Default Settings*

Condition for Wakeup	Power Button	Automatic Time-out
AC power is applied.	No	Yes
MC21XX is disconnected from a USB device.	No	Yes
A key is pressed.	No	Yes
The scan trigger or side trigger is pressed.	No	Yes
The screen is touched.	No	No
USB Host	No	No

To access the Wakeup settings tap **Start > Settings > Control Panel > Power icon > Wakeup** tab.

**Figure 1-8** *Wakeup Tab*

CHAPTER 2 ACCESSORIES

Introduction

The MC21XX accessories provide a variety of product support capabilities. Accessories include cradles, cables and spare battery chargers. [Table 2-1](#) lists the MC21XX accessories.

Table 2-1 MC21XX Accessories

Accessory	Part Number	Description
Cradles		
Single-slot USB Cradle	CRD2100-1000UR	Charges the MC21XX main battery and synchronizes the MC21XX with a host computer through a USB connection.
Four-slot Charge Only Cradle	CRD2100-4000CR	Charges up to four MC21XXs.
Four-slot Ethernet Cradle	CDRD2100-4000ER	Charges up to four MC21XX and provides Ethernet communication over a network.
Chargers		
Four-slot Spare Battery Charger	SAC2100-4000CR	Charges up to four MC21XX spare batteries.
Power Supply	PWRS-14000-148R	Provides power to the Four-slot Charge Only cradle and Four-slot Ethernet cradle.
Power Supply	PWRS-14000-241R	Provides power to the Four-slot Spare Battery Charger.
Power Supply	PWRS-14000-249R	Provides power to the MC21XX, USB ActiveSync/Charge cable and Single-slot USB cradle.
DC Line Cord	50-16002-042R	Provides power from the power supply to the Four-slot Ethernet cradle or Four-slot Charge Only cradle.

Table 2-1 MC21XX Accessories (Continued)

Accessory	Part Number	Description
US AC Line Cord	50-16000-182R	Provides power to the 2-wire power supply.
International AC Line Cord	-	Provides power to the 2-wire power supply. Purchase separately.
US AC Line Cord	23844-00-00R	Provides power to the 3-wire power supply.
International AC Line Cord	-	Provides power to the 3-wire power supply. Purchase separately.
Cables		
USB ActiveSync/Charge Cable	25-154073-01R	Provides USB client communication capabilities and charges the MC21XX.
USB Cable	25-128458-01R	Provides USB communication through the Single-slot USB cradle.
Soft Goods		
Handstrap	SG-MC2123225-01R	Optional handstrap with stylus.
Holster	SG-MC2121205-01R	Provides a soft, clip on holder and a shoulder strap for the MC21XX.
Lanyard	SG-MC2127225-01R	Optional lanyard for holding the MC21XX.
Miscellaneous		
Modem Dongle	MDM9000-100R	Provides modem connectivity through MC21XX or Single-slot USB cradle.
Modem Adapter Cable	25-154074-01R	Connects Modem Dongle to Single-slot USB cradle.
2400 mAh Battery	BTRY-MC21EAB0E	Replacement battery.
Mini Stylus	STYLUS-00007-03R	Replacement mini stylus (3-pack).
Pen Stylus	11-42794-03R	Replacement stylus (3-pack).
Tether	KT-133855-01R	Replacement tether (5-pack).
Screen protector	KT-158412-03R	Replacement screen protectors (3-pack).
Mating Adapter	21-158413-01R	Connects two Single-slot USB cradles together.

Single-slot USB Cradle

The Single-slot USB cradle:

- Provides 5.4VDC power for operating the MC21XX and charging the battery.
- Provides a USB port (micro AB receptacle) for data communication between the MC21XX and a host computer.
- Provides USB connection through the USB pass-through port for communication with a USB device, such as a host computer. For communication setup procedures, see [Chapter 3, Synchronization](#).



CAUTION Ensure that you follow the guidelines for battery safety described in [Battery Safety Guidelines on page 5-2](#).

Setup

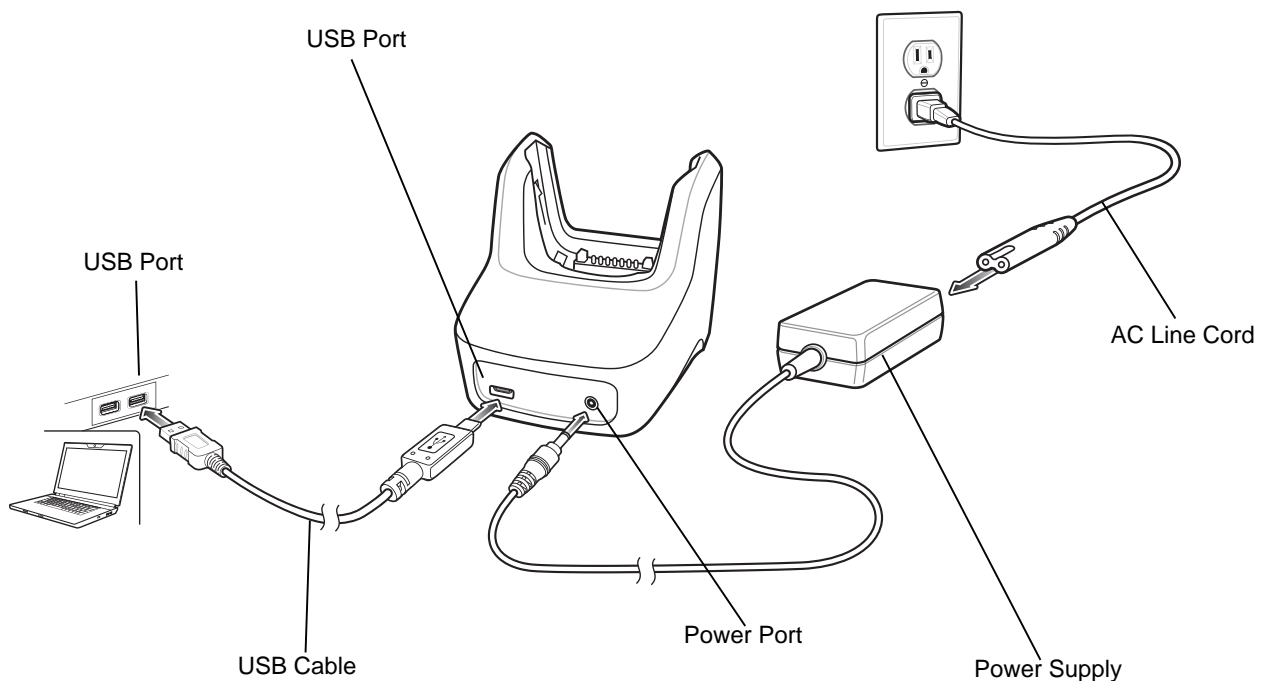


Figure 2-1 Single-slot USB Cradle Setup

Battery Charging

The Single-slot USB cradle can charge the MC21XX battery.

To charge the MC21XX:

1. Connect the Single-slot USB cradle to a Motorola approved power source.
2. Slide the MC21XX into the slot. The LED Indicator indicates the MC21XX battery charging status. The battery charges in less than four hours. See [Table 2-2](#) for charging status indications.

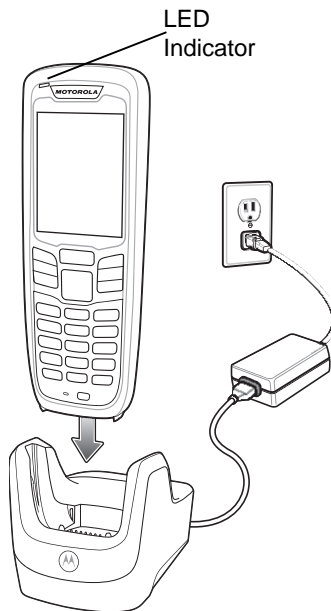


Figure 2-2 Single-slot USB Cradle

- When charging is complete, remove the MC21XX from the cradle.

The Single-slot USB cradle uses the LED Indicator to indicate MC21XX battery charging status. See [Table 2-2](#) for charging status indications.

Table 2-2 LED Charging Status Indicators

LED	Indication
MC21XX Charging (LED on MC21XX)	
Off	MC21XX not placed correctly in the cradle; cable not connected correctly; charger is not powered.
Fast Blinking Amber	Error in charging; check placement of MC21XX.
Slow Blinking Amber	MC21XX is charging.
Solid Amber	Charging complete. Note: When the battery is initially inserted in the MC21XX, the amber LED flashes once if the battery power is low or the battery is not fully inserted.

Communication Setup

To connect the Single-slot USB cradle to USB device:

- Connect Single-slot USB cradle cable to the communications port.
- Slide the MC21XX into the cradle. The LED Indicator indicates the MC21XX battery charging status and that the MC21XX is seated in the cradle. For more information on communications setup procedures, see [Chapter 3, Synchronization](#).

Four-slot Charge Only Cradle



CAUTION Ensure that you follow the guidelines for battery safety described in [Battery Safety Guidelines on page 5-2](#).

The Four-slot Charge Only cradle:

- Provides 5.4 VDC power for operating the MC21XX and charging the battery.
- Simultaneously charges up to four MC21XXs.

Setup

Connect the Four-slot Charge Only cradle to a Motorola approved power source.

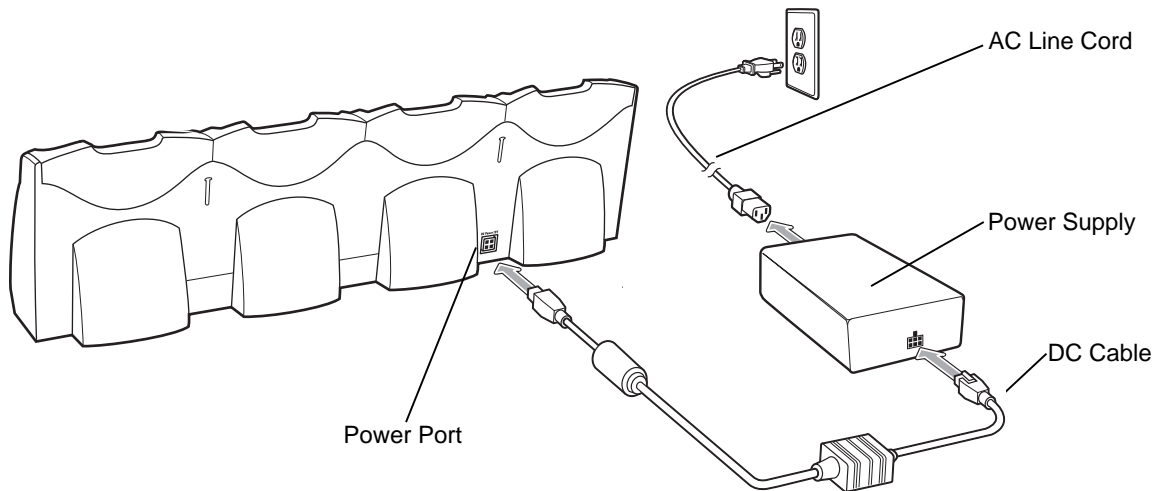


Figure 2-3 Four-slot Charge Only Cradle, Setup

Battery Charging

The Four-slot Charge Only cradle can charge up to four MC21XXs simultaneously. To charge the MC21XX:

1. Connect the Four-slot Charge Only cradle to a Motorola approved power source.
2. Slide the MC21XX into the MC21XX slot.

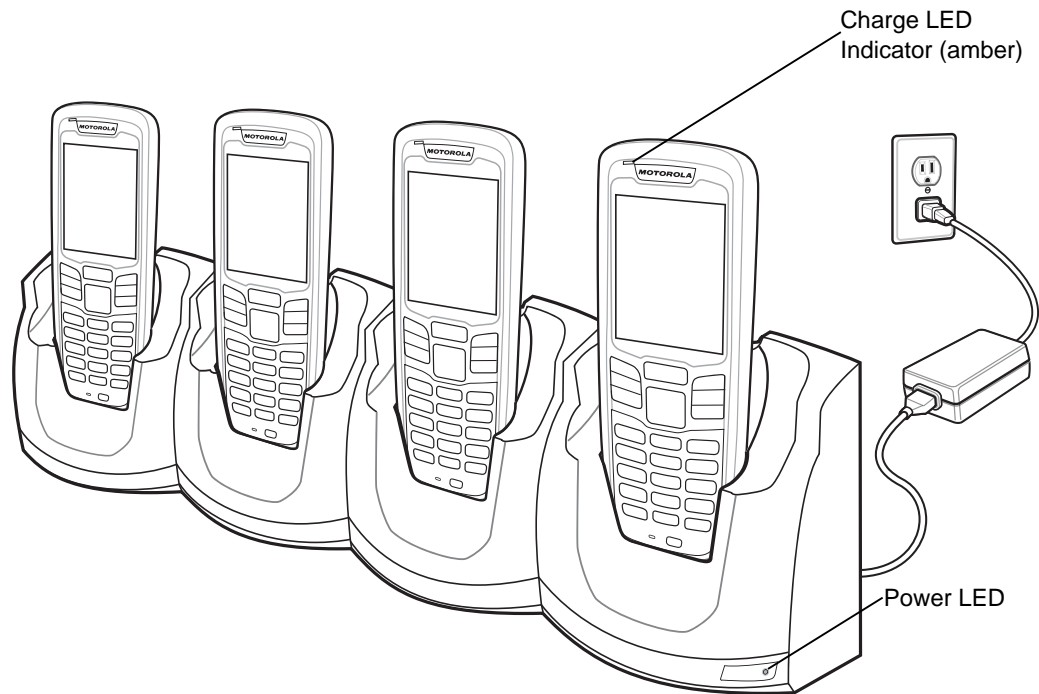


Figure 2-4 *Four-slot Charge Only Cradle*

3. The MC21XX amber Charge LED Indicator indicates the MC21XX battery charging status. The battery charges in approximately four hours. See [Table 2-2 on page 2-4](#) for charging status indications.
4. When charging is complete, remove the MC21XX from the cradle.

Power LED

The green Power LED lights to indicate that the Four-slot Charge Only cradle is connected to a power source.

Four-slot Ethernet Cradle



CAUTION Ensure that you follow the guidelines for battery safety described in [Battery Safety Guidelines on page 5-2](#).

The Four-slot Ethernet cradle:

- Provides 5.4 VDC power for operating the mobile computer.
- Connects the mobile computer (up to four) to an Ethernet network.

Synchronization with a host computer using ActiveSync cannot be performed with the Four-slot Ethernet cradle. To synchronize with a host computer, use the Single-slot USB cradle.

Setup

Connect the Ethernet cradle (Ethernet port 1) to an Ethernet hub or a port on the host device.

Connect the Ethernet cradle (power port) to a Motorola approved power supply.

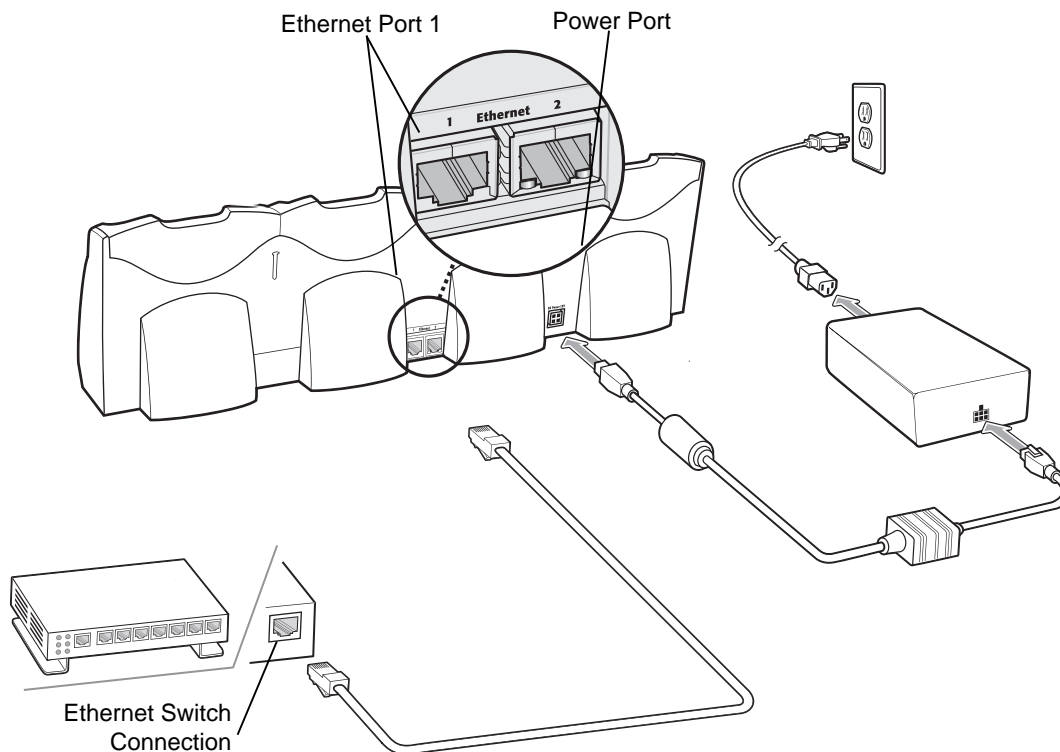


Figure 2-5 Four-slot Ethernet Cradle Connection

Ethernet Cradle Drivers

The Ethernet cradle drivers are pre-installed on the MC21XX and initiate automatically when the MC21XX is placed in a properly connected Four-slot Ethernet cradle.

When the MC21XX is inserted into the Four-slot Ethernet cradle, the LAN icon indicates that the MC21XX is connected to a network.

Double-tap the **LAN** icon to open the **LANNDS1** window. This window displays the TCP/IP information for the MC21XX.

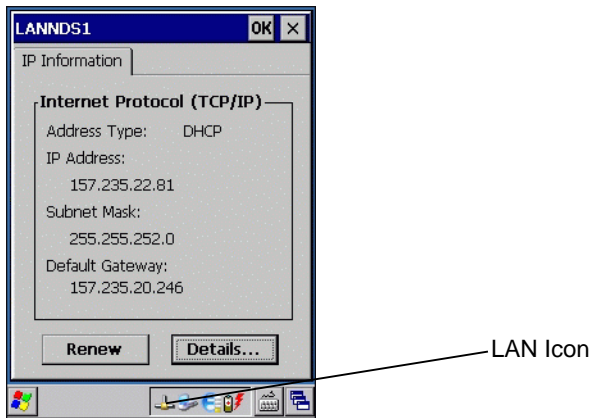


Figure 2-6 LANNDS1 Window

Charging and Communication

Insert the mobile computer into a slot to begin charging and initiate communication.

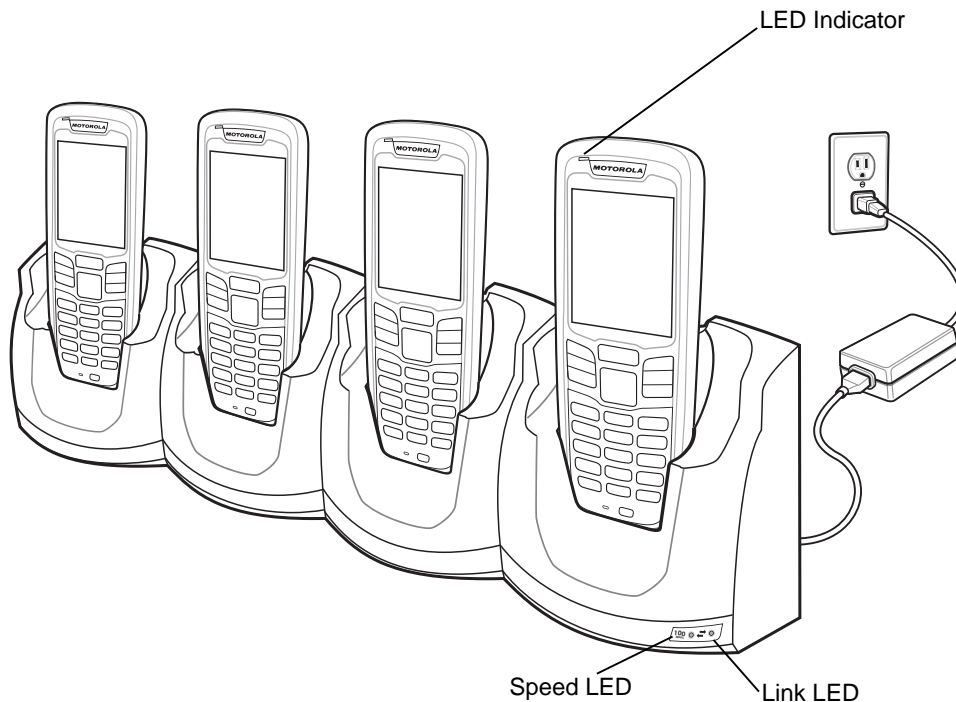


Figure 2-7 Four-slot Ethernet Cradle

LED Charge Indications

The charge LED shows the status of the battery charging in the MC21XX. The battery usually charges in less than four hours. See [Table 2-2 on page 2-4](#) for charging status indications.

Speed LED

The green Speed LED lights to indicate that the transfer rate is 100 Mbps. When it is not lit it indicates that the transfer rate is 10Mbps.

Link LED

The yellow Link LED blinks to indicate activity, or stays lit to indicate that a link is established. When it is not lit it indicates that there is no link.

Daisychaining Ethernet Cradles

Daisychain up to four cradles to connect several MC21XXs to an Ethernet network. Use either a straight or crossover cable. Daisy-chaining should not be attempted when the main Ethernet connection to the first cradle is 10 Mbps as throughput issues will almost certainly result.

To daisychain cradles:

1. Connect power to each Ethernet cradle to daisychain.
2. Connect an Ethernet cable to Port 1 of the first cradle as shown in [Figure 2-8](#).
3. Connect a second Ethernet cable between Port 2 of the first cradle and Port 1 of the second cradle.
4. Connect additional cradles as described in step 3.

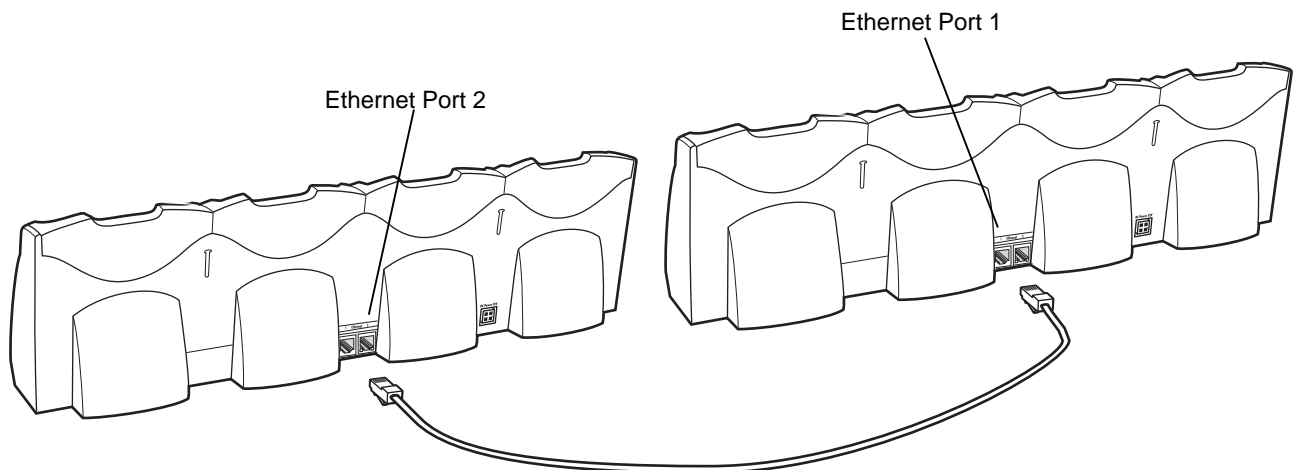


Figure 2-8 Daisychaining Four Slot Ethernet Cradles

Four-slot Spare Battery Charger



CAUTION Ensure that you follow the guidelines for battery safety described in [Battery Safety Guidelines on page 5-2](#).

The Four-slot Spare Battery Charger simultaneously charges up to four spare batteries.

Setup

Connect the Four-slot Spare Battery Charger to a Motorola approved power source.

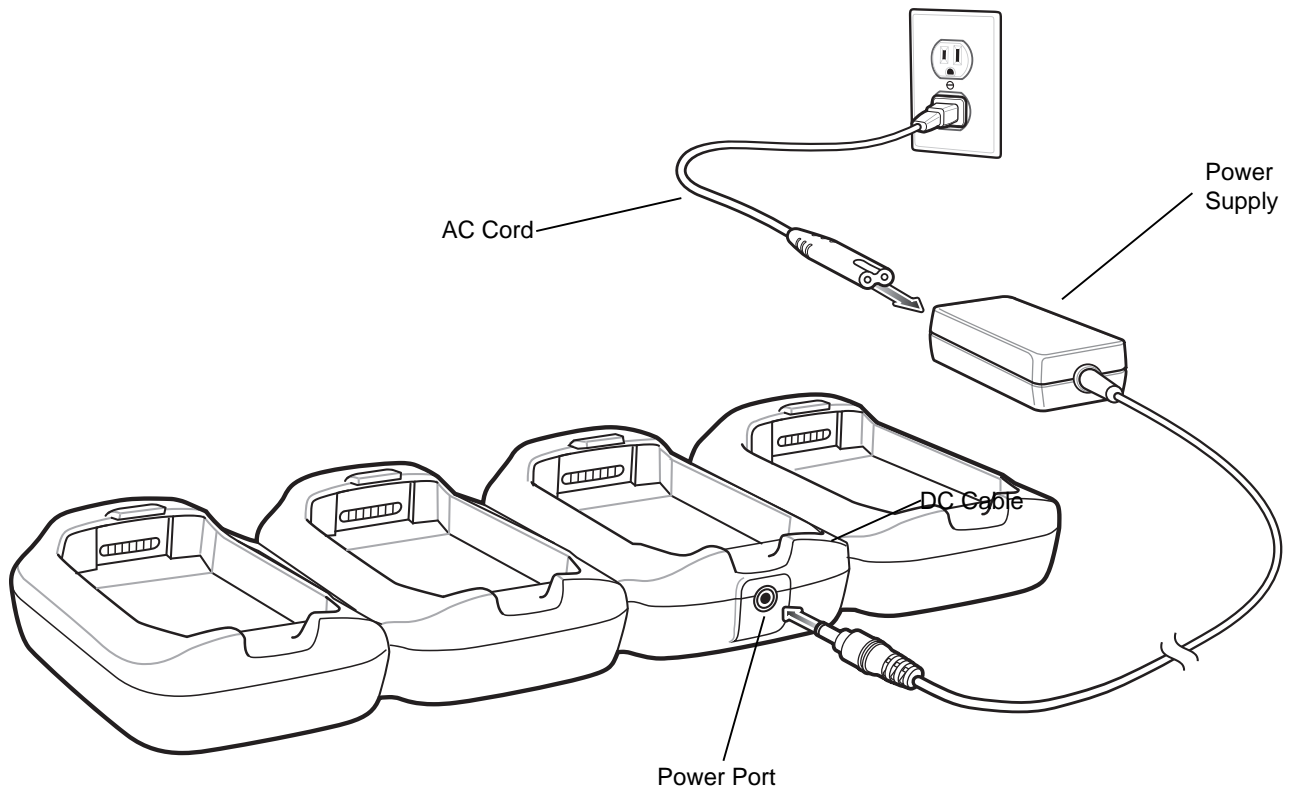


Figure 2-9 Four-slot Spare Battery Charger Setup

Spare Battery Charging

To charge up to four MC21XX spare batteries:

1. Insert the spare battery into the spare battery charging slot, bottom first.
2. Pivot the top of the battery down onto the contact pins.

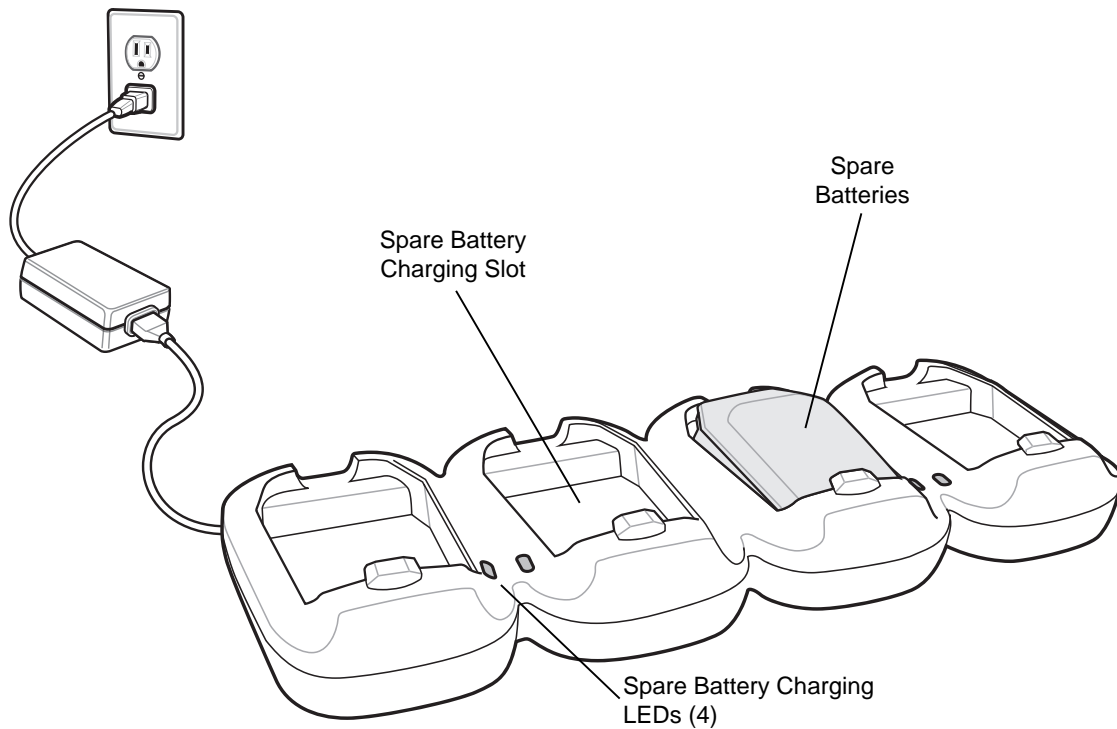


Figure 2-10 *Four Slot Spare Battery Charger*

3. Gently press down on the battery to ensure proper contact. The battery usually charges in less than four hours. See [Table 2-2 on page 2-4](#) for charging status indications.



WARNING! Do not use a tool to remove the battery.

LED Charge Indications

The Spare Battery Charging LEDs indicate the spare battery charging status. See [Table 2-2 on page 2-4](#) for charging status indications.

USB ActiveSync/Charge Cable

The USB ActiveSync/Charge cable:

- Provide the MC21XX with operating and charging power when used with the Motorola approved power supply.
- Synchronize information between the MC21XX and a host computer. With customized or third party software, it can also synchronize the MC21XX with corporate databases.
- Provide USB connection through the USB pass-through port for communication with a USB device, such as a host computer. For communication setup procedures, see [Chapter 3, Synchronization](#).

Setup

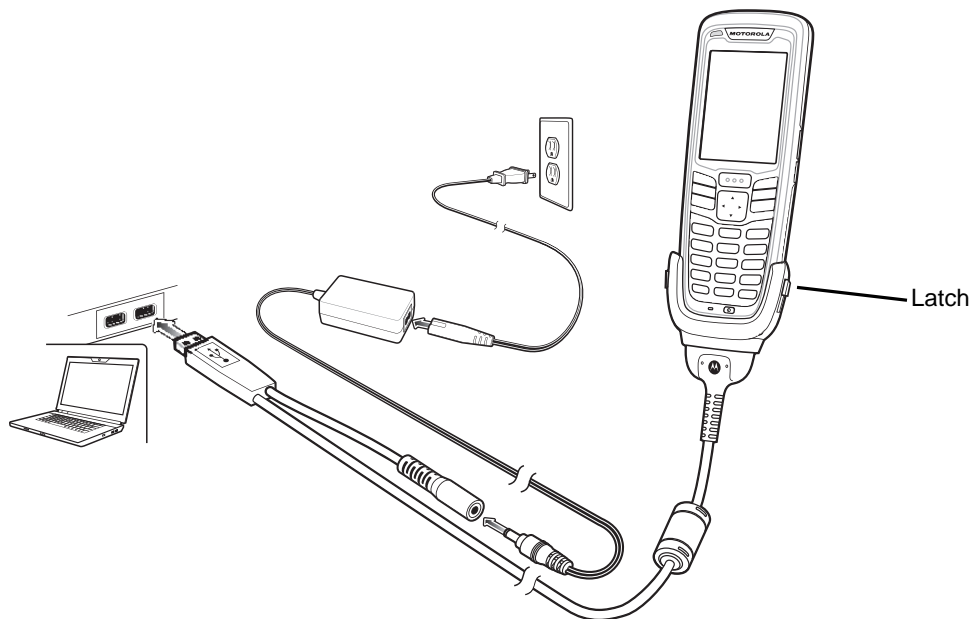


Figure 2-11 USB ActiveSync/Charge Cable Setup

Battery Charging

To charge the MC21XX battery:

1. Connect the USB ActiveSync/Charge cable power input connector to the Motorola approved power source.
2. Attach the bottom of the MC21XX to the cable cup connector.
3. Slide the two latches on the cable cup up to lock the cup to the MC21XX.
4. The MC21XX LED Indicator blinks amber indicates the MC21XX battery charging status. The battery usually charges in less than four hours. See [Table 2-2 on page 2-4](#) for charging status indications.
5. When charging is complete, slide the two latches down and remove the cable cup.

LED Charge Indications

The USB ActiveSync/Charge cable use the LED Indicator to indicate the MC21XX battery charging status. See [Table 2-2 on page 2-4](#) for charging status indications.

Communication Setup

To connect the USB ActiveSync/Charge cable to a USB device:

1. Connect USB end of the cable into the communications port.
2. Connect the connector cup to the MC21XX. For more information on ActiveSync communications, see [Chapter 3, Synchronization](#). For more information on USB communication see [Copying Files from a Host Computer on page 4-5](#).

CHAPTER 3 SYNCHRONIZATION

Introduction

Synchronization lets the user manage information between an MC21XX and a host computer so that changes made either on the MC21XX or on the host computer appear in both places. Download and install synchronization software to the host computer (either Microsoft ActiveSync for Windows XP or Windows Mobile Device Center (WMDC) for Windows Vista and Windows 7) in order to use the sync feature. Visit www.microsoft.com on the host computer for details.

The synchronization software:

- Allows working with MC21XX-compatible applications on the host computer. The sync software replicates data from the MC21XX to view, enter, and modify data on the host computer.
- Synchronizes files between the MC21XX and the host computer, converting the files to the correct format.
- Backs up the data stored on the MC21XX. Synchronization is a one-step procedure that ensures the data is always safe and up-to-date.
- Copies (rather than synchronizes) files between the MC21XX and the host computer.
- Controls when synchronization occurs by selecting a synchronization mode. For example, synchronize continuously while the MC21XX is connected to the host computer, or synchronize only on command.
- Selects the types of information to synchronize and control how much data is synchronized.

Installing the Sync Software

To download and install either Microsoft ActiveSync (for Windows XP) or WMDC (for Windows Vista and Windows 7), visit www.microsoft.com and follow the instructions provided.

MC21XX Setup



NOTE Microsoft recommends installing the synchronization software on the host computer before connecting the MC21XX.

The MC21XX can be set up to communicate with a USB connection. The MC21XX communication settings must be set to match the communication settings used with ActiveSync or WMDC.

1. On the MC21XX tap **Start > Settings > Control Panel > PC Connection**. The **PC Connection Properties** window appears.

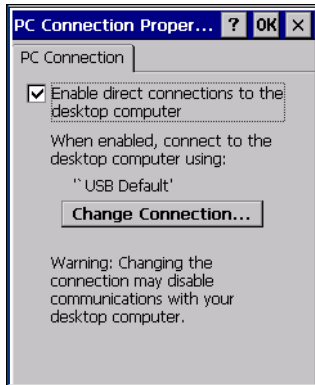


Figure 3-1 PC Connection Properties Window

2. Tap the **Change Connection** button.
3. Select the connection type from the drop-down list.
4. Tap **OK** to exit the **Change Connection** window and tap **OK** to exit the **PC Connection Properties** window.
5. Proceed with installing ActiveSync or WMDC on the host computer and setting up a partnership.

Setting Up a Sync Connection

ActiveSync (Windows XP)

1. Select **Start > Programs > Microsoft ActiveSync** on the host computer. The **ActiveSync Window** displays.

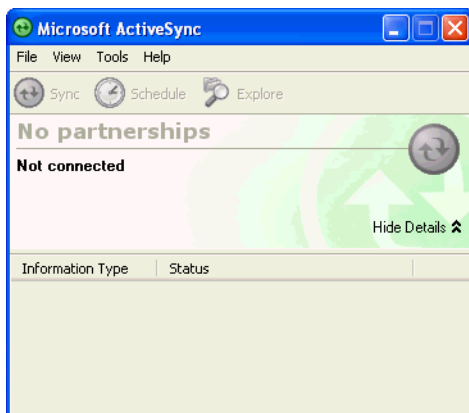


Figure 3-2 ActiveSync Window



NOTE Assign each MC21XX a unique device name. Do not try to synchronize more than one MC21XX to the same name.

2. In the **ActiveSync** window, select **File > Connection Settings**. The **Connection Settings** window appears.



Figure 3-3 Connection Settings Window

3. Select **Allow USB connections** check box.
4. Select the **Show status icon in taskbar** check box.
5. Select **OK** to save any changes made.

Windows Mobile Device Center (Windows 7)

1. Select **Start > All Programs > Windows Mobile Device Center** on the host computer.



Figure 3-4 Windows Mobile Device Center Window

2. In the WMDC window, under **Mobile Device Settings**, click **Connection settings**.

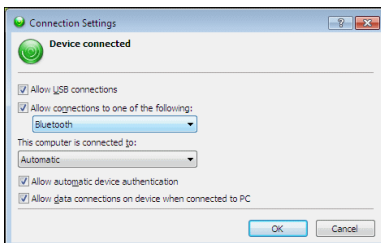


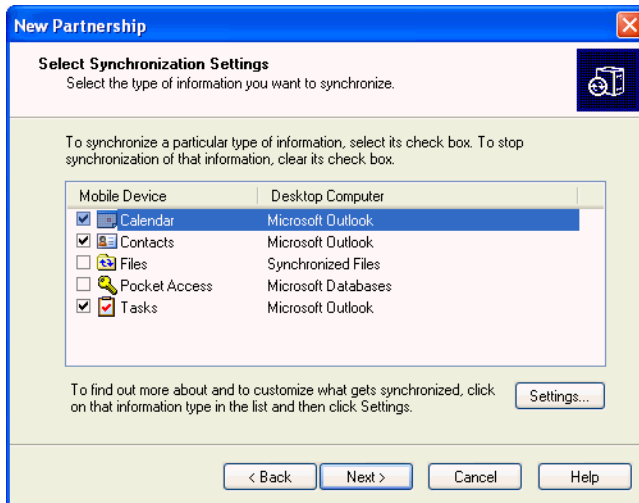
Figure 3-5 Connection Settings Window

3. Select **Allow USB connections and adjust any additional settings as needed**.
4. Click **OK** to save your settings.

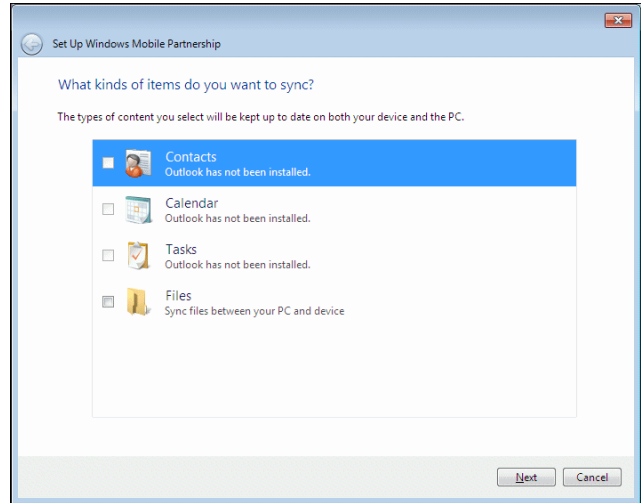
Setting up a Partnership

To set up a partnership:

1. If the **Get Connected** window does not appear on the host computer, select **Start > All Programs > Microsoft ActiveSync**.
2. Select if you want to create synchronize with the host computer or to connect as a guest.
3. Click **Next**.



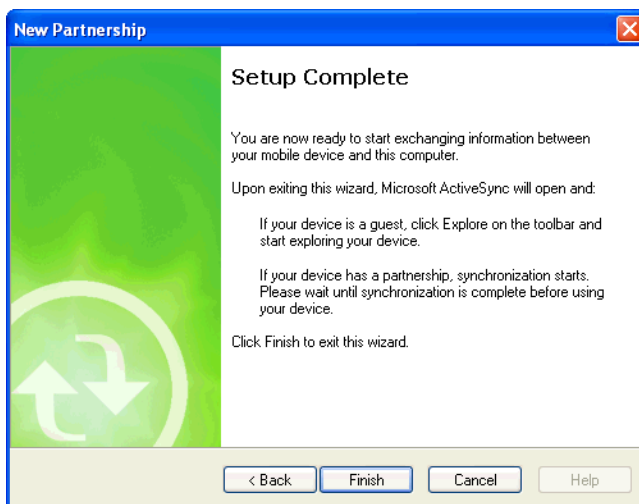
ActiveSync



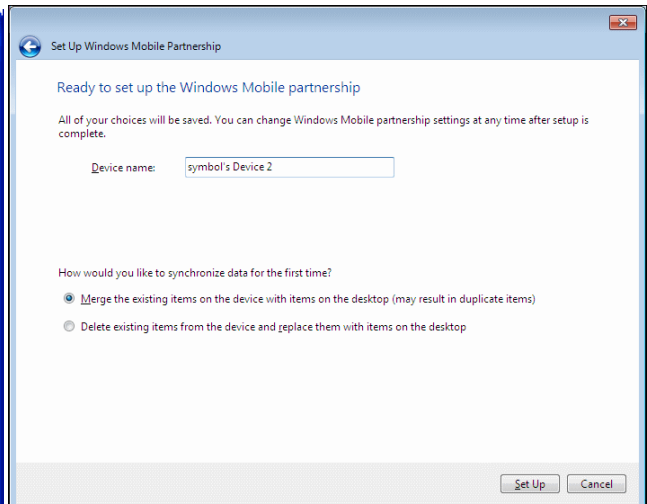
WMDC

Figure 3-6 Select Synchronization Setting Window

4. Select the appropriate settings and click **Next**.



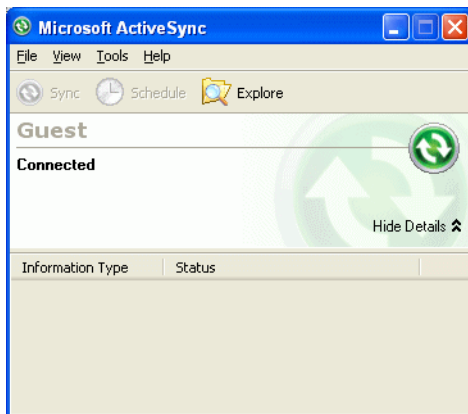
ActiveSync



WMDC

Figure 3-7 Setup Complete Window

5. Click **Finish** or **Setup**.



ActiveSync



WMDC

Figure 3-8 Connected Window

During the first synchronization, information stored on the MC21XX is copied to the host computer. When the copy is complete and all data is synchronized, the MC21XX can be disconnected from the host computer.

- ✓ **NOTE** The first synchronization operation must be performed with a local direct connection. To retain partnerships after a cold boot, capture partnership registry information in a .reg file and save it in the Flash File System, detailed information is provided in the EMDK Windows CE Help File for the Motorola MC21XX.

For more information about using ActiveSync or WMDC, start the application on the host computer, then see Help.

CHAPTER 4 APPLICATION DEVELOPMENT

Introduction

This chapter describes features in Windows CE 6.0 including how to package applications, and procedures for deploying applications onto the MC21XX.

Software Installation on Development PC

To develop applications to run on the MC21XX, use one or both of the following:

- Enterprise Mobility Developer Kit (EMDK) for C
- Platform Software Developer Kit (Platform SDK) for MC21XX

The EMDK for C is a development tool used to create native C and C++ applications for all Motorola Solutions devices. It includes documentation, header files (.H), and library files (.LIB) for native code application development that targets Motorola value-add APIs.

The *Windows CE Platform SDK for MC21XXc60* is used in conjunction with the EMDK for C to create Windows CE applications for the MC21XX. The Platform SDK installs a new Windows CE device type and its associated libraries onto the development PC.

The software requirements to use the EMDK for C are:

- Microsoft Windows XP 32-bit Edition or Microsoft Windows Vista 32-bit Edition
- Microsoft ActiveSync 4.5 or higher. (only for Windows XP, Windows Vista has its own Mobile Device Center)
- If developing applications for Windows CE 6.0
 - Microsoft® Visual Studio 2005
 - Microsoft® Visual Studio 2005 Service Pack1(or)
 - Microsoft® Visual Studio 2008
 - Microsoft® Visual Studio 2008 Service Pack1

- One or more of the following Platform SDK's:
 - Windows Mobile 6 Professional and Standard Software Development Kits Refresh
- For Windows CE embedded development use the Motorola Platform SDK (PSDK) for your specific device. The PSDK can be found on the device download page at <http://supportcentral.motorola.com>.

Platform SDK

To download and install the appropriate Platform SDK:

1. Download the appropriate Platform SDK from the Support Central web site, <http://supportcentral.motorola.com>.
 - a. Select *MC2100*. The *MC2100 Product* page displays.
 - b. On the *MC2100Product* page, select the appropriate *Platform SDK for MC2100* from the *Software Downloads* section. The *Platform SDK* page displays.
 - c. Save the .exe file to the development computer.
2. Run the file and follow the screen prompts to install.

EMDK for C

To download and install the EMDK for C:

1. Download the appropriate Platform SDK from the Support Central web site, <http://supportcentral.motorola.com>.
 - a. Select *MC2100*. The *MC2100 Product* page displays.
 - b. On the *MC2100 Product* page, select the appropriate *Enterprise Mobility Developer Kit for C* from the *Software Downloads* section. The *Enterprise Mobility Developer Kit for C* page displays.
 - c. Select the latest version, and save the .exe file to the development computer.
2. Locate the .exe file on the development computer, double-click the executable file and follow the install screen prompts.
3. Once installed, access the components of the EMDK for C from the *Enterprise Mobility Developer Kit for C* program group of the *Windows Start* menu.
4. The sample applications provide examples of how to interface with the Motorola API functions. To build a sample application, open the Samples folder from the *Windows Start* menu. Open the folder for the desired sample and then open the project file. The project file has an extension of vcproj. Microsoft Visual Studio automatically launches. Select *WinCE* as the Active WCE Configuration. Select Win32 (WCE ARMV4) Debug as the active configuration.

Installing Other Development Software

Developing applications for the MC21XX may require installing other development software, such as application development environments, on the development PC. Follow the installation instructions provided with the software.

Software Updates

Download updates to the EMDK for C from the Support Central web site at: <http://supportcentral.motorola.com>. Check this site periodically for important updates and new software versions.

Windows CE Flash Storage

In addition to the RAM-based storage standard on the MC21XX, the MC21XX is also equipped with a non-volatile Flash-based storage area which can store data (partitions) that can not be corrupted by a cold boot. This Flash area is divided into two categories: Flash File System (FFS) Partitions and Non-FFS Partitions.

FFS Partitions

The MC21XX includes two FFS partitions. These partitions appear to the MC21XX as a hard drive that the OS file system can write files to and read files from. Data is retained even if power is removed.

The two FFS partitions appear as two separate folders in the Windows CE file system and are as follows:

- Platform: The Platform FFS partition contains Motorola-supplied programs and Dynamic Link Libraries (DLLs). This FFS is configured to include DLLs that control system operation. Since these drivers are required for basic MC21XX operation, only experienced users should modify the content of this partition.
- Application: The Application FFS partition is used to store application programs needed to operate the MC21XX.

Working with FFS Partitions

Because the FFS partitions appear as folders under the Windows CE file system, they can be written to and read like any other folder. For example, an application program can write data to a file located in the Application folder just as it would to the Windows folder. However, the file in the Application folder is in non-volatile storage and is not lost on a cold boot (e.g., when power is removed for a long period of time).

Standard tools such as ActiveSync can be used to copy files to and from the FFS partitions. They appear as the "Application" and "Platform" folders to the ActiveSync explorer. This is useful when installing applications on the MC21XX. Applications stored in the Application folder are retained even when the MC21XX is cold booted, just as the Sample Applications program is retained in memory.

There are two device drivers included in the Windows CE image to assist developers in configuring the MC21XX following a cold boot: RegMerge and CopyFiles.

RegMerge.dll

RegMerge.dll is a built-in driver that allows registry edits to be made to the Windows CE registry. Regmerge.dll runs very early in the boot process and looks for registry files (.reg files) in certain Flash File System folders during a cold boot. It then merges the registry changes into the system registry located in RAM.

Since the registry is re-created on every cold boot from the default ROM image, the RegMerge driver is necessary to make registry modifications persistent over cold boots.

RegMerge is configured to look in the root of two specific folders for .reg files in the following order:

- \Platform
- \Application

Regmerge continues to look for .reg files in these folders until all folders are checked. This allows folders later in the list to override folders earlier in the list. This way, it is possible to override Registry changes made by the Platforms partitions folders. Take care when using Regmerge to make registry changes.

✓ **NOTE** Regmerge only merges the .reg files on cold boots. The merge process is skipped during a warm boot.

Making modifications to registry values for drivers loaded before RegMerge is not recommended. However, these values may require modification during software development. Since these early loading drivers read these keys before RegMerge gets a chance to change them, the MC21XX must be cold booted. The warm boot does not re-initialize the registry and the early loading driver reads the new registry values.

Do not use Regmerge to modify built-in driver registry values, or merge the same registry value to two files in the same folder, as the results are undefined.

CopyFiles

Windows CE expects certain files to be in the Windows folder, residing in volatile storage. Windows CE maintains the System Registry in volatile storage. CopyFiles copies files from one folder to another on a cold boot. Files can be copied from a non-volatile partition (Application or Platform) to the Windows or other volatile partition during a cold boot. During a cold boot CopyFiles looks for files with a .CPY extension in the root of the Platform and Application FFS partitions (Platform first and then Application). These files are text files containing the source and destination for the desired files to be copied separated by ">".

Files are copied to the Windows folder from the Flash File System using copy files (*.cpy) in the following order:

```
\Platform
\Application
```

Example:

```
\Application\ScanSamp2.exe>\Windows\ScanSamp2.exe
```

This line directs CopyFiles to copy the ScanSamp2.exe application from the \Application folder to the \Windows folder.

Non-FFS Partitions

Non-FFS partitions include additional software and data pre-loaded on the MC21XX that can be upgraded. Unlike FFS Partitions, these partitions are not visible when the operating system is running. They also contain system information. Non-FFS partitions include the following:

- Windows CE: The complete Windows CE operating system is stored on Flash devices. If necessary, the entire OS image may be downloaded to the MC21XX using files provided by Motorola. Any upgrades must be obtained from Motorola. This partition is mandatory for the MC21XX.
- Splash Screen: a bitmap smaller than 16 Kb (and limited to 16 bits per pixel) is displayed as the MC21XX cold boots. To download a customized screen to display, see *Creating a Splash Screen on page 4-16*.
- Bootloader: This program interfaces with the host computer and allows downloading via USB cable any or all of the partitions listed above, as well as updated versions of Bootloader. Use caution downloading updated Bootloader versions; incorrect downloading of a Bootloader causes permanent damage to the MC21XX. Bootloader is mandatory for the MC21XX.
- Partition Table: Identifies where each partition is loaded in the MC21XX.

Downloading Partitions to the MC21XX

USBDownload is used to specify a hex destination file for each partition and download each file to the MC21XX. This download requires a program loader stored on the MC21XX. The MC21XX comes with a program loading utility, Bootloader, stored in the MC21XX's write-protected flash.

Bootloader

Bootloader allows the user to upgrade the MC21XX with software updates and/or feature enhancements.

Partition Update vs. File Update

There are two types of updates supported by the MC21XX: partitions and files. The file system used by the MC21XX is the same as the file system used on a desktop computer. A file is a unit of data that can be accessed using a file name and a location in the file system. When a file is replaced, only the contents of the previous file are erased. The operating system must be running for a file to be updated, so the Bootloader cannot perform individual file updates as it is a stand-alone program that does not require the operating system to be running.

A typical partition is a group of files, combined into a single “partition” that represents a specific area of storage. Examples of partitions are the flash file systems such as Platform or Application. (Using the desktop computer comparison, these partitions are roughly equivalent to a C: or D: hard disk drive.) In addition to the “hard disk” partitions, some partitions are used for single items such as the operating system, monitor, or splash screen. (Again using a desktop computer comparison, these partitions are roughly the equivalent of the BIOS or special hidden system files.) When a partition is updated, all data that was previously in its storage region is erased - i.e. it is not a merge but rather a replacement operation. Typically, the operating system is not running when partitions are update, so Bootloader can perform partition updates.

All partition images suitable for use by Bootloader are in hex file format for transfer by USBDownloader from the development computer to the MC21XX.

Upgrade Requirements

Upgrade requirements:

- The hex files to be downloaded (on development computer)
- A connection from the host computer and the MC21XX
- USBDownloader (on development computer) to download the files.

Once these requirements are satisfied, the MC21XX can be upgraded by invoking Bootloader and navigating the menus. See *Bootloader on page 4-9* for procedures on downloading a hex file to the MC21XX.

Deployment

This section provides information about installing software and files on the MC21XX.

Software deployment can be performed by:

- Copying files from a host computer
- Updating images.

Copying Files from a Host Computer

ActiveSync

To copy files from a host computer to the MC21XX:

1. Ensure that ActiveSync is installed on the host computer and that a partnership was created. For more information see, [Chapter 3, Synchronization](#).

2. Connect the MC21XX to the host computer using a Single-slot USB cradle or an appropriate cable. See *Chapter 2, Accessories* for connection information.
3. On the host computer, select **Start > Programs > ActiveSync**.

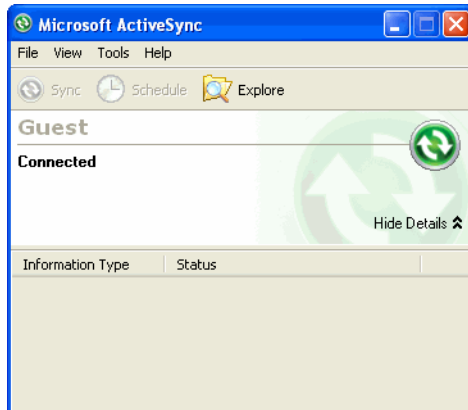


Figure 4-1 ActiveSync Connected Window

4. Select *Explore*.

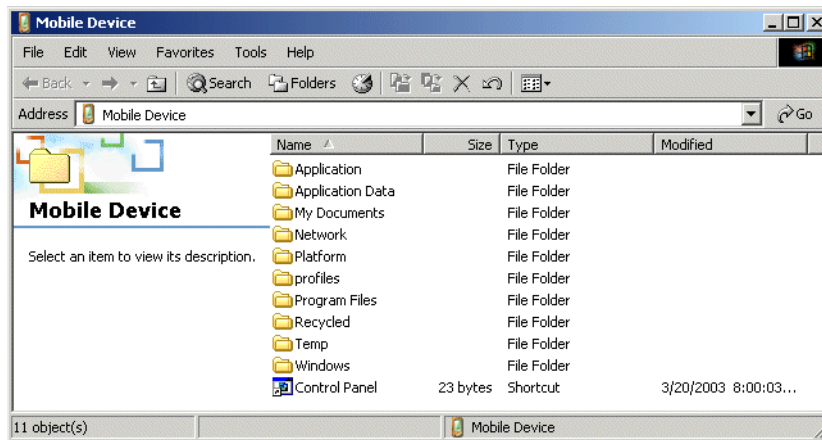


Figure 4-2 ActiveSync Explorer

5. Double-click the folder to expand the folder contents.

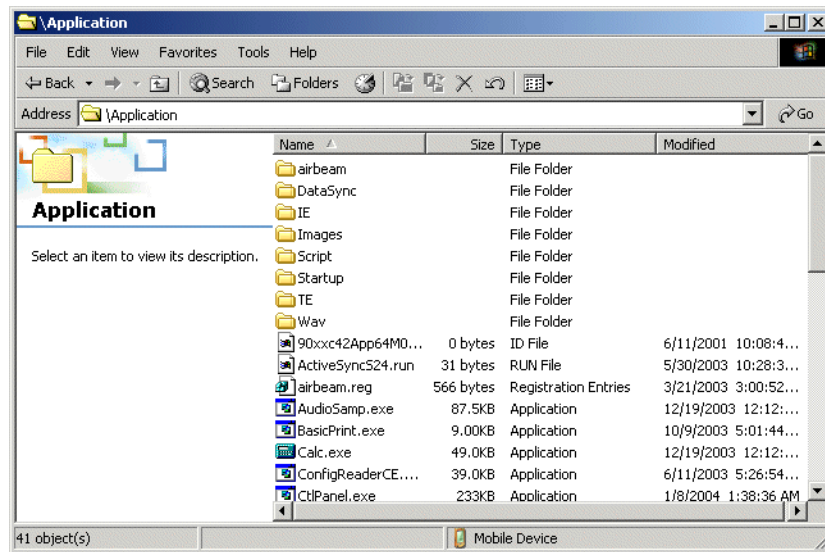


Figure 4-3 Application Folder Contents

- Use Explorer to locate the host computer directory that contains the file to download. Tap that directory in the left pane to display its contents in the right pane.
- Drag the desired file(s) from the host computer to the desired mobile device folder.

Mass Storage

To install an application or copy files to the MC21XX using a USB connection:

- On the MC21XX, tap **Start > Settings > Control Panel > USBConfig**.

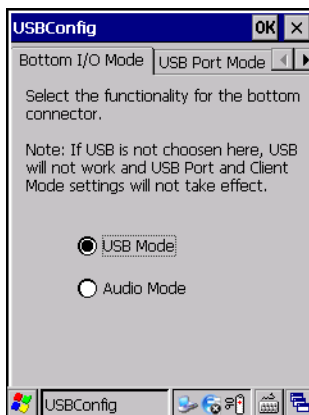


Figure 4-4 USBConfig Window

- On the **Bottom I/O Mode** tab, select **USB Mode**.
- On the **USB Port Mode** tab, select **USB Client Mode**.
- On the **USB Client Mode** tab, select **Mass Storage**.
- In the drop-down list, select **Storage Card**.
- Tap **OK**.

7. Connect the MC21XX to a host computer using either a Single-slot USB cradle or a USB ActiveSync/Charge cable.
8. On the host computer, open **Windows Explorer**. The MC21XX appears as a hard disk drive in **Windows Explorer**.
9. On the host computer, open another **Windows Explorer** window and locate the files to copy to the MC21XX.
10. Drag the files from the new window to the MC21XX folder window.
11. When complete, disconnect the MC21XX from the host computer.

Updating Images

The MC21XX contains tools that update all operating system components. All updates are distributed as packages and/or hex images. Update packages can contain either partial or complete updates for the operating system. Motorola distributes the update packages on the Support Central Web Site, <http://supportcentral.motorola.com>.

Update an operating system component using one of the following:

- MSP. See *Mobility Services Platform on page 4-16* for information.
- OS Update
- BootLoader.

OSUpdate Loader

Operating system component can be downloaded to the MC21XX using the Application folder or a microSD card.

Using the Application Folder

To initiate an update using the MC21XX Application folder:

1. Go to the Support Central web site, <http://supportcentral.motorola.com>.
2. Download the appropriate update package.
3. Connect the MC21XX to a host computer using the Single Slot USB Cradle or USB ActiveSync/Charge Cable. See *Chapter 2, Accessories*.
4. Using ActiveSync, copy the update package to the \Application folder on the MC21XX.
5. Using Windows Explorer, navigate to the \Application folder.
6. Open the OSUpdate folder.
7. Double tap on the file: 2100c60Aen_APP.Ink.
8. When the Update Loader application finds the appropriate file, it loads the package onto the MC21XX. A progress bar displays until the update completes.
9. When complete, the MC21XX re-boots.

Using microSD Card

To initiate an update using a microSD card:

1. Go to the Support Central web site, <http://supportcentral.motorola.com>.
2. Download the appropriate update package.
3. Copy the update package to the root directory of a microSD card (using a host computer).
4. Remove the battery.
5. Install the microSD card.
6. Replace the battery.
7. Connect the MC21XX to AC power. See *Chapter 2, Accessories*.
8. Using Windows Explorer, navigate to the SD card folder.
9. Open the OSUpdate folder.
10. Double tap on the file: 2100c60Aen_SD.Ink
11. When the Update Loader application finds the appropriate file, it loads the package onto the MC21XX. A progress bar displays until the update completes.
12. When complete, the MC21XX re-boots.

Bootloader

Use Bootloader to download hex files to the MC21XX from an microSD card or from a host computer via USB.

Loading Files From SD Card

To load the hex files on to the MC21XX using an SD card:

1. Copy the files to the root directory of an SD card.
2. If the MC21XX is in suspend mode, press the Power button to wake the MC21XX.
3. Press the Power button to place the MC21XX in suspend mode.
4. On the MC2180, tap **Safe Battery Swap**.
On the MC2100, using the navigation pad, scroll down to **Safe Battery Swap**. Press the **Enter** key.
5. Wait for the LED Indicator to turn red and then turn off.
6. Using thumbs, push the two battery latches up. The battery ejects slightly.
7. Insert the microSD card into the MC21XX.
8. Install the battery.
9. Simultaneously press the **Power** button and the **1** and **9** keys.
10. Immediately, as soon as the device starts to boot, press and hold the scan trigger.
11. Continue to hold the scan trigger while releasing the **1**, **9** and **Power** keys until the Bootloader screen appears.
12. When the **Bootloader** screen appears, release the scan trigger.

```

Select required operation
Download from SD card
Download from USB
Exit

Bootloader 1.09.3010

```

Figure 4-5 *Bootloader Menu*



CAUTION To ensure a successful download, do not remove power from the MC21XX while in Bootloader.

1. Use the up and down scroll buttons to select **Download from SD card**, then press **Enter**.
2. The Bootloader displays the hex files available on the SD card.

```

a:\
All Done
2100c60AenOSxxxxxx.hex
2100c60AenSCxxxxxx.hex
2100c60XenCPxxxxxx.hex
2100c60XenMOxxxxxx.hex
2100c60XenOBxxxxxx.hex
2100c60XenPM556401.hex
2100c60XenPT0134XX.hex
CleanAppl.hex
CleanPlat.hex

Bootloader 1.09.3010

```

Figure 4-6 *Hex File List*

1. Use the up and down scroll buttons to select a hex file, then press **Enter**.
2. The hex file is downloaded to the device.

```

Splash screen
#### (20)          100%
Download complete
in - 0.042 seconds
(1854142 bytes/second)

Hit Enter to Acknowledge

Bootloader 1.09.3010

```

Figure 4-7 Download Complete Screen

3. On completion, press **ENT** to return to the Bootloader menu to select the next file to download.
4. To exit Bootloader, select **Exit** from the Bootloader main screen and press **ENTER**.

Loading Files via USB

Use Bootloader to download customized flash file system partitions to the MC21XX and load hex files to the flash memory of the MC21XX.

To load the hex files on to the MC21XX using USB:

1. Download the **USBDownload** application from the Support Central web site. Follow the installation instructions with the application.
2. Connect the MC21XX to a host computer using the Single-slot USB Cradle or USB ActiveSync/Charge Cable.
3. On the host computer, launch the USBDownload application.

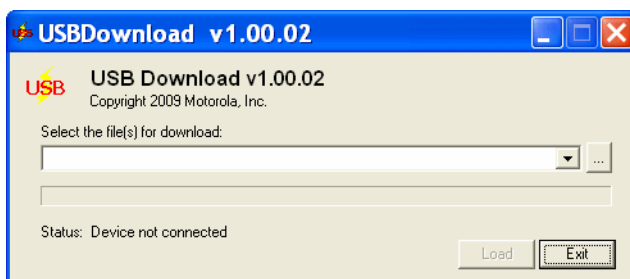


Figure 4-8 USB Download Window

4. If the MC21XX is in suspend mode, press the Power button to wake the MC21XX.
5. Press the Power button to place the MC21XX in suspend mode.
6. On the MC2180, tap **Safe Battery Swap**.
On the MC2100, using the navigation pad, scroll down to **Safe Battery Swap**. Press the **Enter** key.
7. Wait for the LED Indicator to turn red and then turn off.
8. Simultaneously press the **Power** button and the **1** and **9** keys.
9. Immediately, as soon as the device starts to boot, press and hold the scan trigger.

10. Continue to hold the scan trigger while releasing the **1**, **9** and **Power** keys until the Bootloader screen appears.
11. When the **Bootloader** screen appears, release the scan trigger.

```

Select required operation
Download from SD card
Download from USB
Exit

Bootloader 1.09.3010

```

Figure 4-9 *Bootloader Menu*



CAUTION To ensure a successful download, do not remove power from the MC21XX while in Bootloader.

1. Use the up and down scroll buttons to select **Download from USB**, then press **ENTER**.
2. The Bootloader displays the following:

```

Waiting for input. . .

Bootloader 1.09.3010

```

Figure 4-10 *Waiting for Input*

1. On the host computer, locate the hex files to download.



NOTE One hex file or multiple hex files can be selected. To select multiple files, press the **Ctrl** key while selecting files.

If selecting multiple files to download, USBDownload reads the header of the file and identifies the file type. If the Partition table file is among the files selected, then USBDownload downloads that file first. Similarly, USBDownload downloads the CPLD file last.

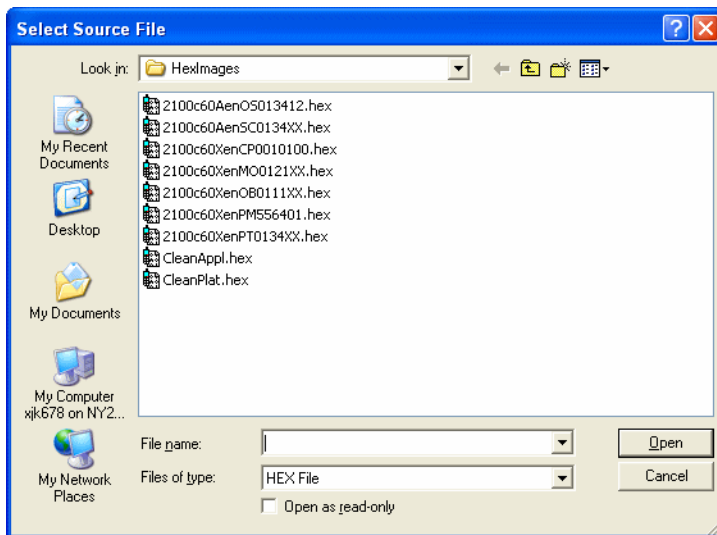


Figure 4-11 Select Source File Window

2. Select the hex files and the click **Open**.

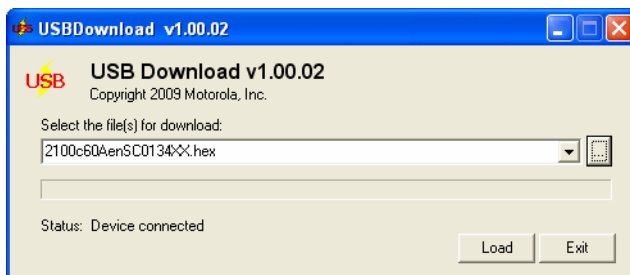


Figure 4-12 Select Hex File(s)

3. Click the **LOAD** button. The hex file(s) is downloaded to the device.

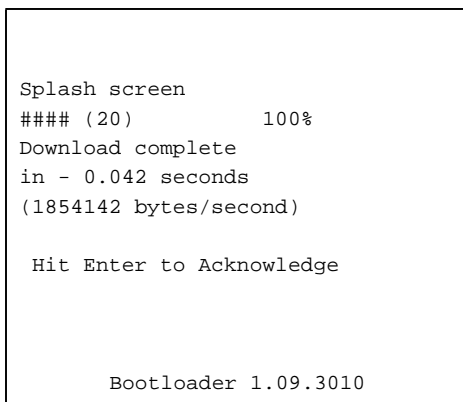


Figure 4-13 Download Complete Screen

4. On completion, press **ENTER** to return to the Bootloader main screen to select the next file to download.
5. To exit Bootloader, select **Exit** from the Bootloader main screen and press **ENTER**.

Bootloader Error Detection

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

This error message screen displays until a key is pressed. Once the screen is acknowledged, Bootloader returns to the main menu to wait for a new selection.

To find the probable cause of the error, use the error number and/or the error text displayed on the screen to look up the error in [Table 4-1](#).

Table 4-1 *Bootloader Errors*

Error Text	Error Number	Probable Cause
Unknown error	-1	A general error occurred. Retry the download. If the failure persists, it is most likely due to a hardware failure; the MC21XX requires servicing.
Cancelled by user	-2	The user cancelled the download.
Can't open the source	-7	An error occurred opening the source device (either USB or SDMMC). Check source device connectivity and retry.
Can't open the destination	-8	An error occurred opening the destination device (either NAND, RAM, Power Micro, or CPLD). Retry the download. If the failure persists, it is most likely due to a hardware failure; the MC21XX requires servicing.
Can't read from the source device	-9	The source device (either USB or SDMMC) could not be read from. Check source device connectivity and retry.
Can't write to the destination device	-10	The destination device (either NAND, RAM, Power Micro, IST, Keyboard Controller or CPLD) could not be written to. Retry the download. If the failure persists, it is most likely due to a hardware failure; the MC21XX requires servicing.
Transmission checksum error	-11	An error occurred during transmission from the source device (either USB or SDMMC) and the checksum check failed. Check source device connectivity and retry.
Readback checksum error	-12	A checksum, generated from reading back data that was written to the destination device, was incorrect. An error during transmission or a write error to the destination device could cause this.
There is no more heap space available	-14	There is no more heap space available for the download procedure. Restart Bootloader and retry the download. If the failure persists, contact service with details of what is being downloaded.
Invalid data in verify file	-19	The file contains invalid data. Check that the file is suitable for downloading on this terminal.

Table 4-1 *Bootloader Errors (Continued)*

Error Text	Error Number	Probable Cause
Insufficient memory for buffering data	-20	There is no more heap space available for the download procedure. Restart Bootloader and retry the download. If the failure persists, contact service with details of what is being downloaded.
Insufficient data available to complete record	-21	A HEX file download was attempted but the HEX file is invalid. Ensure the file is in proper HEX file format.
Invalid Symbol HEX file	-23	A HEX file download was attempted but the HEX file is invalid. Ensure the file is in proper HEX file format.
Unrecognized or unsupported HEX record	-24	The HEX file being downloaded contains an invalid or unrecognized HEX record. Ensure the file is in proper HEX file format.
Invalid data in HEX file	-25	The HEX file being downloaded contains invalid data. Ensure the file is in proper HEX file format with valid HEX data.
Exceeded max size	-26	The download file is too large to fit into the space allocated for it. Either make the file smaller or increase the space allocated for it by altering the partition table.
Partition is not valid on this device	-27	The downloaded file specifies a partition entry that does not exist on the device. Only download files that are valid for this device, or change the partition table so that the new file is valid on the device.
Wrong destination code	-28	A specific partition was chosen from the <i>Bootloader</i> main menu but the file selected for download was for another partition. Ensure that the partition selected from the <i>Bootloader</i> main menu matches the file selected for download.
Non-contiguous record found	-30	A HEX file download was attempted but the HEX file is invalid. Ensure the file is in proper HEX file format.
Timed Out - No data	-31	Bootloader was waiting for data from the source device but timed out before receiving any. Check the source device connectivity and retry.
Invalid file format	-33	The file format is invalid. Only HEX files are supported by Bootloader.
Partition Table not Valid	-34	The size of flash memory is different than that described in the partition table. Retry the download with the correct partition table file.
Invalid data in file	-35	The .bin or .sig file being downloaded contains invalid data. Ensure the file is in proper file format.
File cannot be loaded to this unit	-38	The file contains valid data that indicates it cannot be loaded onto the device.
File validation failed	-40	The file has either been signed incorrectly, or contains data that indicates that it cannot be loaded onto the terminal.

Mobility Services Platform

The MSP 3 Client Software is a set of software components that come pre-installed on the MC21XX. The MSP 3 Client software consists of the following components:

The RD Client provides support for MSP 3 Staging functionality, provides support for the MSP 3 Legacy Staging process, and provides support for backward-compatible legacy MSP 2.x Legacy Staging functionality.

The MSP 3 Agent provides MSP 3 Provisioning functionality and Control functionality when used with MSP 3.2 Control Edition.

Refer to the *Mobility Services Platform 3.2 User's Guide*, p/n 72E-100158-06, for instructions for using the Rapid Deployment and MSP3 Agent clients.

Creating a Splash Screen

A custom splash screen can be created and loaded onto the MC21XX. To create a custom splash screen:

1. Create a .bmp file using a graphic program with the following specifications:
 - Size: 240 (W) x 296 (H).
 - Colors: 256.
2. Modify the bitmap file and save.

To load the splash screen on the MC21XX Windows CE device:

1. Convert the bmp file into a hex file using the OSUpdate Package Builder that is part of MSP.
2. Copy the hex file to the MC21XX using BootLoader. See [Bootloader on page 4-9](#).

CHAPTER 5 MAINTENANCE AND TROUBLESHOOTING

Introduction

This chapter includes instructions on cleaning and storing the MC21XX, and provides troubleshooting solutions for potential problems during MC21XX operation.

Maintaining the MC21XX

For trouble-free service, observe the following tips when using the MC21XX:

- Do not scratch the screen of the MC21XX. When working with the MC21XX, use the supplied stylus or plastic-tipped pens intended for use with a touch-sensitive screen. Never use a pen or pencil or other sharp object on the surface of the MC21XX screen.

Motorola recommends using a screen protector, p/n KT-158412-03R.

- Although the MC21XX is water and dust resistant, do not expose it to rain or moisture for an extended period of time. In general, treat the MC21XX as a pocket calculator or other small electronic instrument.
- The screen of the MC21XX is glass. Do not to drop the MC21XX or subject it to strong impact.
- Protect the MC21XX from temperature extremes. Do not leave it on the dashboard of a car on a hot day, and keep it away from heat sources.
- Do not store or use the MC21XX in any location that is extremely dusty, damp, or wet.
- Use a soft lens cloth to clean the MC21XX. If the surface of the MC21XX screen becomes soiled, clean it with a soft cloth moistened with a diluted window-cleaning solution.
- Periodically replace the rechargeable battery to ensure maximum battery life and product performance. Battery life depends on individual usage patterns.

- A screen protector is applied to the MC21XX. Motorola recommends using this to minimize wear and tear. Screen protectors enhance the usability and durability of touch screen displays. Benefits include:
 - Protection from scratches and gouges
 - Durable writing and touch surface with tactile feel
 - Abrasion and chemical resistance
 - Glare reduction
 - Keeping the device's screen looking new
 - Quick and easy installation.

Battery Safety Guidelines



WARNING! Failure to follow these guidelines may result in fire, explosion, or other hazard.

- The area in which the units are charged should be clear of debris and combustible materials or chemicals. Particular care should be taken where the device is charged in a non commercial environment.
- Follow battery usage, storage, and charging guidelines found in this guide.
- Improper battery use may result in a fire, explosion, or other hazard.
- Do not use a tool to remove the battery from the MC21XX or battery charging accessory.
- To charge the mobile device battery, the battery and charger temperatures must be between +32°F and +104°F (0°C and +40°C)
- Do not use incompatible batteries and chargers. Use of an incompatible battery or charger may present a risk of fire, explosion, leakage, or other hazard. If you have any questions about the compatibility of a battery or a charger, contact Motorola Enterprise Mobility support.
- For devices that utilize a USB port as a charging source, the device shall only be connected to products that bear the USB-IF logo or have completed the USB-IF compliance program.
- To enable authentication of an approved battery, as required by IEEE1725 clause 10.2.1, all batteries will carry a Motorola hologram. Do not fit any battery without checking it has the Motorola authentication hologram.
- Do not disassemble or open, crush, bend or deform, puncture, or shred.
- Severe impact from dropping any battery-operated device on a hard surface could cause the battery to overheat.
- Do not short circuit a battery or allow metallic or conductive objects to contact the battery terminals.
- Do not modify or remanufacture, attempt to insert foreign objects into the battery, immerse or expose to water or other liquids, or expose to fire, explosion, or other hazard.
- Do not leave or store the equipment in or near areas that might get very hot, such as in a parked vehicle or near a radiator or other heat source. Do not place battery into a microwave oven or dryer.
- Battery usage by children should be supervised.
- Please follow local regulations to promptly dispose of used re-chargeable batteries.
- Do not dispose of batteries in fire.

- Seek medical advice immediately if a battery has been swallowed.
- In the event of a battery leak, do not allow the liquid to come in contact with the skin or eyes. If contact has been made, wash the affected area with large amounts of water and seek medical advice.
- If you suspect damage to your equipment or battery, contact Motorola Enterprise Mobility support to arrange for inspection.

Storage

When storing the MC21XX for long periods it is recommended to remove the main battery and place the device in storage mode. This disconnects the backup battery preventing it from completely discharging while being stored.

1. Ensure that the backup battery is fully charged.
2. Remove the main battery.
3. Simultaneously press the **1**, **9** and **Power** keys for three seconds.

The backup battery charge level should be verified at least once a year and charged to full charge.

Cleaning



CAUTION Always wear eye protection.

Read warning label on compressed air and alcohol product before using.

If you have to use any other solution for medical reasons please contact Motorola for more information.



WARNING! Avoid exposing this product to contact with hot oil or other flammable liquids. If such exposure occurs, unplug the device and clean the product immediately in accordance with these guidelines.

Materials Required

- Alcohol wipes
- Lens tissue
- Cotton tipped applicators
- Isopropyl alcohol
- Can of compressed air with a tube.

Cleaning the MC21XX

Housing

Using the alcohol wipes, wipe the housing including keys and in-between keys.

Display

The display can be wiped down with the alcohol wipes, but care should be taken not to allow any pooling of liquid around the edges of the display. Immediately dried the display with a soft, non-abrasive cloth to prevent streaking.

Scanner Exit Window

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

Connector

1. Remove the main battery from MC21XX.
2. Close battery door.
3. Dip the cotton portion of the cotton tipped applicator in isopropyl alcohol.
4. Rub the cotton portion of the cotton tipped applicator back-and-forth across the connector on the bottom of the MC21XX. Do not leave any cotton residue on the connector.
5. Repeat at least three times.
6. Use the cotton tipped applicator dipped in alcohol to remove any grease and dirt near the connector area.
7. Use a dry cotton tipped applicator and repeat steps 4 through 6.



CAUTION Do not point nozzle at yourself and others, ensure the nozzle or tube is away from your face.

8. Spray compressed air on the connector area by pointing the tube/nozzle about ½ inch away from the surface.
9. Inspect the area for any grease or dirt, repeat if required.

Cleaning Cradle Connectors

To clean the connectors on a cradle:

1. Remove the DC power cable from the cradle.
2. Dip the cotton portion of the cotton tipped applicator in isopropyl alcohol.
3. Rub the cotton portion of the cotton tipped applicator along the pins of the connector. Slowly move the applicator back-and-forth from one side of the connector to the other. Do not let any cotton residue on the connector.
4. All sides of the connector should also be rubbed with the cotton tipped applicator.



CAUTION Do not point nozzle at yourself and others, ensure the nozzle or tube is away from your face.

5. Spray compressed air in the connector area by pointing the tube/nozzle about ½ inch away from the surface.
6. Ensure that there is no lint left by the cotton tipped applicator, remove lint if found.
7. If grease and other dirt can be found on other areas of the cradle, use lint free cloth and alcohol to remove.

8. Allow at least 10 to 30 minutes (depending on ambient temperature and humidity) for the alcohol to air dry before applying power to cradle.

If the temperature is low and humidity is high, longer drying time is required. Warm temperature and dry humidity requires less drying time.

Cleaning Frequency

The cleaning frequency is up to the customer's discretion due to the varied environments in which the mobile devices are used. They may be cleaned as frequently as required. However when used in dirty environments it may be advisable to periodically clean the scanner exit window to ensure optimum scanning performance.

Troubleshooting

MC21XX

Table 5-1 *Troubleshooting the MC21XX*

Problem	Cause	Solution
MC21XX does not turn on.	Main battery not charged.	Charge or replace the main battery in the MC21XX.
	Main battery not installed properly.	Ensure the battery is installed properly. For more information see, Install Main Battery on page 1-3 .
	System crash.	Perform a warm boot. If the MC21XX still does not turn on, perform a cold boot. For more information see, Resetting the MC21XX on page 1-7 .
Battery did not charge.	Battery failed.	Replace battery. If the MC21XX still does not operate, try a warm boot, then a cold boot. For more information see, Resetting the MC21XX on page 1-7 .
	MC21XX removed from cradle while battery was charging.	Insert MC21XX in cradle and begin charging. The Standard Battery requires up to five hours to recharge fully and the Extended Life Battery requires up to eight hours to recharge fully.
	Extreme battery temperature.	Battery does not charge if ambient temperature is below 32°F (0°C) or above 104°F (40°C).
Cannot see characters on screen.	MC21XX not powered on.	Press the Power button.

Table 5-1 Troubleshooting the MC21XX (Continued)

Problem	Cause	Solution
During data communication, no data was transmitted, or transmitted data was incomplete.	MC21XX removed from cradle or unplugged from host computer during communication.	Replace the MC21XX in the cradle, or reattach the cable and re-transmit.
	Incorrect cable configuration.	See <i>Chapter 2, Accessories</i> for cable configurations.
	Communication software was incorrectly installed or configured.	Perform communication setup as described in <i>Chapter 3, Synchronization</i> .
MC21XX does not emit sound.	Volume setting is low or turned off.	MC21XX may be a beeper only configuration or incorrect setting is programmed into device.
MC21XX turns itself off.	MC21XX is inactive.	The MC21XX turns off after a period of inactivity. This period can be set from one to five minutes, in one-minute intervals.
	Battery is depleted.	Recharge or replace the battery.
	Battery is not inserted properly.	Insert the battery properly. For more information see, <i>Install Main Battery on page 1-3</i> .
Tapping the window buttons or icons does not activate the corresponding feature.	Touch screen not calibrated correctly.	Re-calibrate the screen, tap Start > Settings > Control Panel > Stylus > Calibration tab > Recalibrate or press Blue key - ESC .
	The system crashed.	Warm boot the system. To perform a warm boot, see <i>Resetting the MC21XX on page 1-7</i> .
A message appears stating that the MC21XX memory is full.	Too many files stored on the MC21XX.	Delete unused memos and records. If necessary, save these records on the host computer.
	Too many applications installed on the MC21XX.	Remove unused installed applications from the MC21XX to recover memory.

Table 5-1 *Troubleshooting the MC21XX (Continued)*

Problem	Cause	Solution
The MC21XX does not accept scan input.	Scanning application is not loaded.	Verify that the MC21XX is loaded with a scanning application.
	Unreadable bar code.	Ensure the symbol is not defaced.
	Distance between scan window and bar code is incorrect.	Ensure the MC21XX is within proper scanning range.
	MC21XX is not programmed for the bar code type.	Ensure the MC21XX is programmed to accept the type of bar code scanned.
	MC21XX is not programmed to generate a beep.	If a beep on a good decode is expected and a beep is not heard, check that the application is set to generate a beep on good decode.
	Battery is low.	Check the battery level. When the battery is low, the MC21XX automatically goes into suspend mode.
An error message, Improper Shutdown, displays on the screen.	The MC21XX was not shutdown properly.	When removing the battery, follow the Safe Battery Swap procedures, otherwise loss of data or system corruption may occur.

Single-slot USB Cradle

Table 5-2 *Troubleshooting the Single-slot USB Cradle*

Problem	Cause	Solution
MC21XX LED Indicator does not light when MC21XX inserted.	Cradle is not receiving power.	Ensure the power cable is connected securely to both the cradle and to AC power.
	MC21XX is not correctly seated.	Remove and re-insert the MC21XX into the cradle, ensuring it is correctly seated.
MC21XX battery is not charging.	MC21XX was removed from cradle or cradle was unplugged from AC power too soon.	Ensure cradle is receiving power. Ensure the MC21XX is seated correctly. If the MC21XX battery is fully depleted, it can take up to four hours to fully recharge a battery.
	Battery is faulty.	Verify that other batteries charge properly. If so, replace the faulty battery.
	The MC21XX is not fully seated in the cradle.	Remove and re-insert the MC21XX into the cradle, ensuring it is correctly seated.

Table 5-2 Troubleshooting the Single-slot USB Cradle (Continued)

Problem	Cause	Solution
During data communication, no data was transmitted, or transmitted data was incomplete.	MC21XX removed from cradle during communication.	Replace MC21XX in cradle and retransmit.
	Incorrect cable configuration.	See <i>Chapter 2, Accessories</i> for cable configurations.
	Communication software is not installed or configured properly.	Perform communication setup as described in <i>Chapter 3, Synchronization</i> .

Four-slot Charge Only Cradle

Table 5-3 Troubleshooting the Four-slot Charge Only Cradle

Problem	Cause	Solution
MC21XX LED Indicator does not light when MC21XX inserted.	Cradle is not receiving power.	Ensure the power cable is connected securely to both the cradle and to AC power.
	MC21XX is not correctly seated.	Remove and re-insert the MC21XX into the cradle, ensuring it is correctly seated.
MC21XX battery is not charging.	MC21XX was removed from cradle or cradle was unplugged from AC power too soon.	Ensure cradle is receiving power. Ensure MC21XX is seated correctly. If the MC21XX battery is fully depleted, it can take up to four hours to fully recharge a battery.
	Battery is faulty.	Verify that other batteries charge properly. If so, replace the faulty battery.
	The MC21XX is not fully seated in the cradle.	Remove and re-insert the MC21XX into the cradle, ensuring it is correctly seated.

Four-slot Spare Battery Charger

Table 5-4 Troubleshooting the Four-slot Spare Battery Charger

Problem	Cause	Solution
Spare Battery Charging LED does not light when spare battery is inserted.	Spare battery is not correctly seated.	Remove and re-insert the spare battery into the charging slot, ensuring it is correctly seated.

Table 5-4 Troubleshooting the Four-slot Spare Battery Charger (Continued)

Problem	Cause	Solution
Battery not charging.	Charger is not receiving power.	Ensure the power cable is connected securely to both the charger and to AC power.
	Battery is not correctly seated.	Remove and re-insert the battery into the charger, ensuring it is correctly seated.
	Battery was removed from charger or charger was unplugged from AC power too soon.	Ensure charger is receiving power. Ensure the battery is seated correctly. If a battery is fully depleted, it can take up to four hours to fully recharge a battery.
	Battery is faulty.	Verify that other batteries charge properly. If so, replace the faulty battery.

USB ActiveSync/Charge Cable

Table 5-5 Troubleshooting the USB ActiveSync/Charge Cable

Problem	Cause	Solution
MC21XX LED Indicator does not light when MC21XX attached.	Cable is not receiving power.	Ensure the power cable is connected securely to both the cable and to AC power.
	MC21XX is not seated correctly in the cable.	Remove and re-insert the MC21XX into the MC21XX connector, ensuring it is correctly seated.
MC21XX battery is not charging.	MC21XX was detached from cable or cable was unplugged from AC power too soon.	Ensure the cable is receiving power. Ensure MC21XX is seated correctly. If the MC21XX battery is fully depleted, it can take up to four hours to fully recharge a battery.
	Battery is faulty.	Verify that other batteries charge properly. If so, replace the faulty battery.
	The MC21XX is not fully seated in the cable.	Remove and re-insert the MC21XX into the cable, ensuring it is correctly seated.
During data communication, no data was transmitted, or transmitted data was incomplete.	Cable removed from MC21XX during communication.	Reattach cable to MC21XX and retransmit.
	Incorrect cable configuration.	See Chapter 2, Accessories for cable configurations.
	Communication software is not installed or configured properly.	Perform communication setup as described in Chapter 3, Synchronization .

APPENDIX A SPECIFICATIONS

MC21XX and Accessory Technical Specifications

Table A-1 summarizes the MC21XX technical specifications and intended operating environments.

Table A-1 MC21XX Technical Specifications

Item	Description
Physical Characteristics	
Dimensions	171.7 mm L x 60.9 mm W x 34.1 mm D (6.76 in L x 2.40 in W x 1.24 in D)
Weight (including battery)	MC2100: 228 g (8.04 oz) MC2180: 236 g (8.32 oz)
Display	2.8 inch TFT Color QVGA (240 x 320) display with backlight
Touch Panel	Analog resistive touch (MC2180 only)
Backlight	LED backlight
Battery	Rechargeable Lithium-ion 2400 mAh minimum (3.7V)
Expansion Slot	User accessible microUSB slot (located under battery); up to 32 GB.
Network Connections	Full-speed USB (host or client)* Bluetooth (MC2180 only) WLAN (MC2180 only) *USB available with appropriate cables only
Notification	LED and audible alert
Keypad Options	27-key Numeric, two side programmable key (MC2180 only)
Audio	Speaker and microphone (MC2180 only) Beeper (MC2100 only)

Table A-1 MC21XX Technical Specifications (Continued)

Item	Description
Performance Characteristics	
CPU	Marvell PXA320 processor at 624 MHz
Operating System	Microsoft® Embedded CE 6.0 Core
Memory	128 MB RAM/256MB Flash
Output Power	USB: 5 VDC @ 300 mA max.
User Environment	
Operating Temperature	-10°C to 50°C (-14°F to 122°F)
Storage Temperature	-40° to 70°C (-40° to 158°F) without battery
Charging Temperature	0° C to 40° C (32°F to 104°F)
Humidity	5 to 95% non-condensing
Drop Specification	4 ft. to concrete at room temperature 3 ft. to concrete across the operating temperature 4 ft. MIL-STD 810G specifications
Tumble	500 0.5 m (1.6 ft.) tumbles per IEC tumble specifications.
Electrostatic Discharge (ESD)	+/-15 kV air discharge +/- 8 kV direct discharge
Sealing	IP54 per IEC sealing specifications.
Wireless LAN Data and Voice Communications	
Wireless Local Area Network (WLAN) radio	IEEE® 802.11b/g/n
Data Rates Supported	1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54 Mbps and MCS0-7
Operating Channels	Channel 1-13 (2412-2472 MHz), Channel 14 (2484 MHz) Japan only; actual operating channels/frequencies depend on regulatory rules and certification agency
Security	WPA2 (Personal or Enterprise); 802.1x; EAP-TLS; TTLS (CHAP, MS-CHAP, MS-CHAPv2, PAP or MD5); PEAP (TLS, MSCHAPv2, EAP-GTC); LEAP, EAP-FAST (TLS, MS-CHAPv2, EAP-GTC); CCXv4 certified; support for IPv6; FIPS140-2 Certified
Spreading Technique	Direct Sequence Spread Spectrum (DSSS) and Orthogonal Frequency Division Multiplexing (OFDM)
Antenna	Internal
Wireless PAN (MC2180 only)	
Bluetooth	v2.0 with Enhanced Data Rate (EDR); integrated antenna

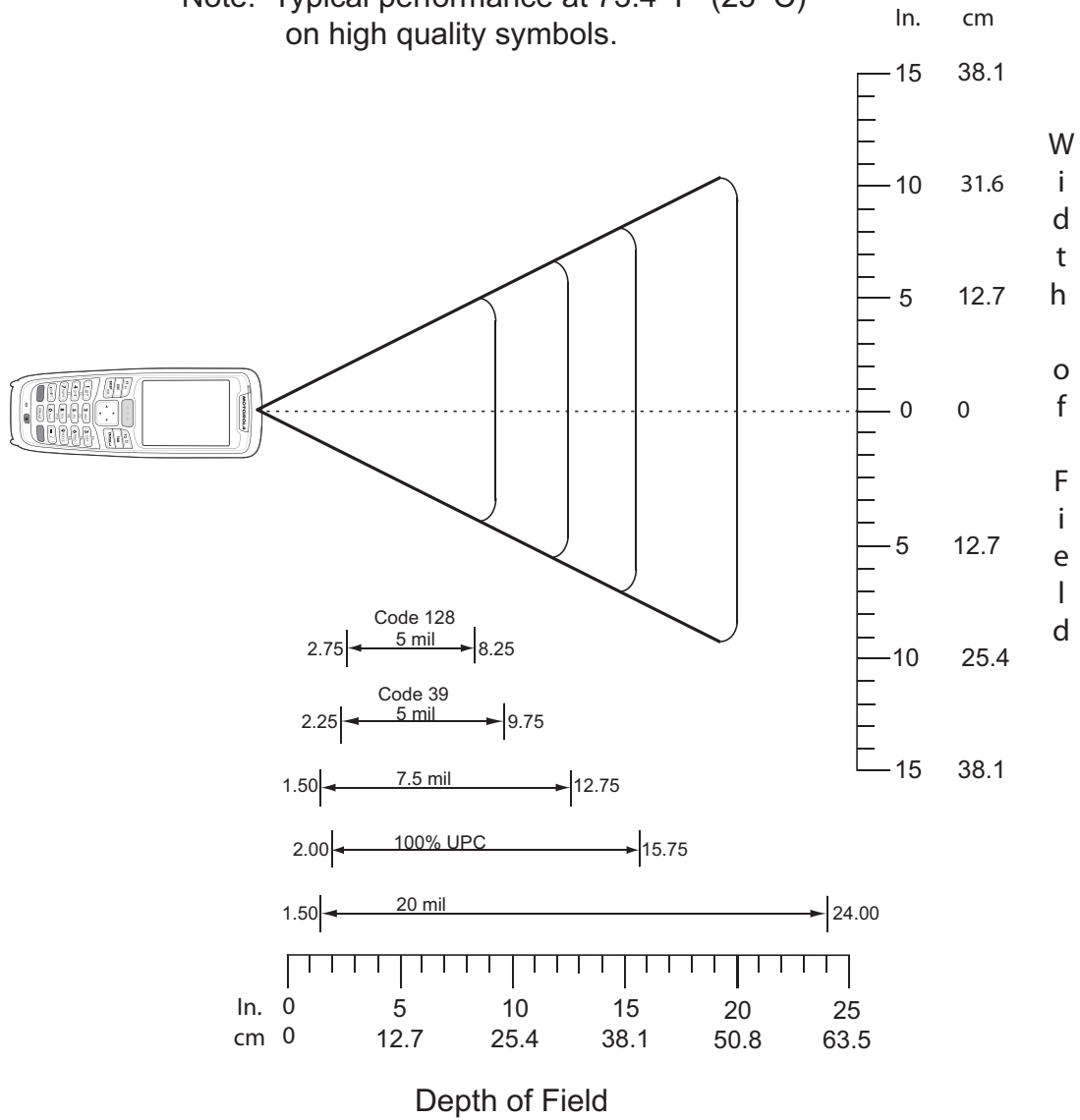
Table A-1 MC21XX Technical Specifications (Continued)

Item	Description
Data Capture Specifications	
Options	Linear imager 1D laser scanner 2D imager
Linear Imager Specifications	
Optical Resolution	5 mil minimum element width
Roll	$\pm 25^\circ$ from vertical
Pitch Angle	$\pm 65^\circ$ from normal
Skew Tolerance	$\pm 50^\circ$ from normal
Ambient Light	Sunlight - 9,690 Lux Artificial Light - 4,845 Lux
Scan Rate	50 scans/sec
Scan Angle	$53.3^\circ \pm 3^\circ$
Laser 1D Scanner Specifications	
Optical Resolution	5 mil minimum element width
Roll	$\pm 35^\circ$ from vertical
Pitch Angle	$\pm 65^\circ$ from normal
Skew Tolerance	$\pm 40^\circ$ from normal
Ambient Light	Sunlight - 107,640 Lux Artificial Light - 4,844 Lux
Scan Rate	104 (± 12) scans/sec (bidirectional)
Scan Angle	47° (typical)
2D Imager Engine Specifications	
Field of View	Horizontal: 39.2° Vertical: 25.4°
Optical Resolution	752 H x 480 V pixels (gray scale)
Roll	360°
Pitch Angle	$\pm 60^\circ$ from normal
Skew Tolerance	$\pm 60^\circ$ from normal
Ambient Light	Sunlight - 96,900 Lux
Aiming Element (VLD)	655 nm ± 10 nm Laser
Illumination Element (LED)	625 nm ± 5 nm LEDs (2x)

1D Linear Decode Zones

Figure A-1 shows the decode zone for the 1D linear scan engine. The figures are typical values. Table A-2 lists the typical distances for selected bar code densities. The minimum element width (or “symbol density”) is the width in mils of the narrowest element (bar or space) in the symbol.

Note: Typical performance at 73.4° F (23° C)
on high quality symbols.



*Minimum distance determined by symbol length and scan angle

Figure A-1 1D Linear Decode Zone

Table A-2 1D Linear Decode Distances

Symbol Density/ Bar Code Type	Typical Working Ranges	
	Near	Far
5.0 mil Code 128	2.75 in 7.0 cm	8.25 in 21.0 cm
5.0 mil Code 39	2.25 in 5.70 cm	9.75 in 24.8 cm
7.5 mil Code 39	1.50 in 3.80 cm	12.75 in 32.4 cm
13 mil 100% UPC	2.0* in 5.1 cm	15.75 in 40.0 cm
20 mil Code 39	1.5* in 3.8 cm	24.0 in 61.0 cm

Notes:

1. Distances are measured from the front flange surface of the image lens.
2. The distances marked with asterisk (*) are a result of the field of view (FOV) limitation.
3. Image signal should be with "Raw" option checked.
4. Successful decoder criteria: Less than 250ms decode time, maximum of two attempts.
5. Symbols are to be mounted with a pitch of 15 +/- 3 degrees away from the engine.
6. Maximum allowable roll angle of symbols relative to the engine mounting base plane is +/- 3.0 degrees.

1D Laser Decode Zones

Figure A-2 shows the decode zone for the 1D laser scan engine. The figures are typical values. Table A-3 lists the typical distances for selected bar code densities. The minimum element width (or “symbol density”) is the width in mils of the narrowest element (bar or space) in the symbol.

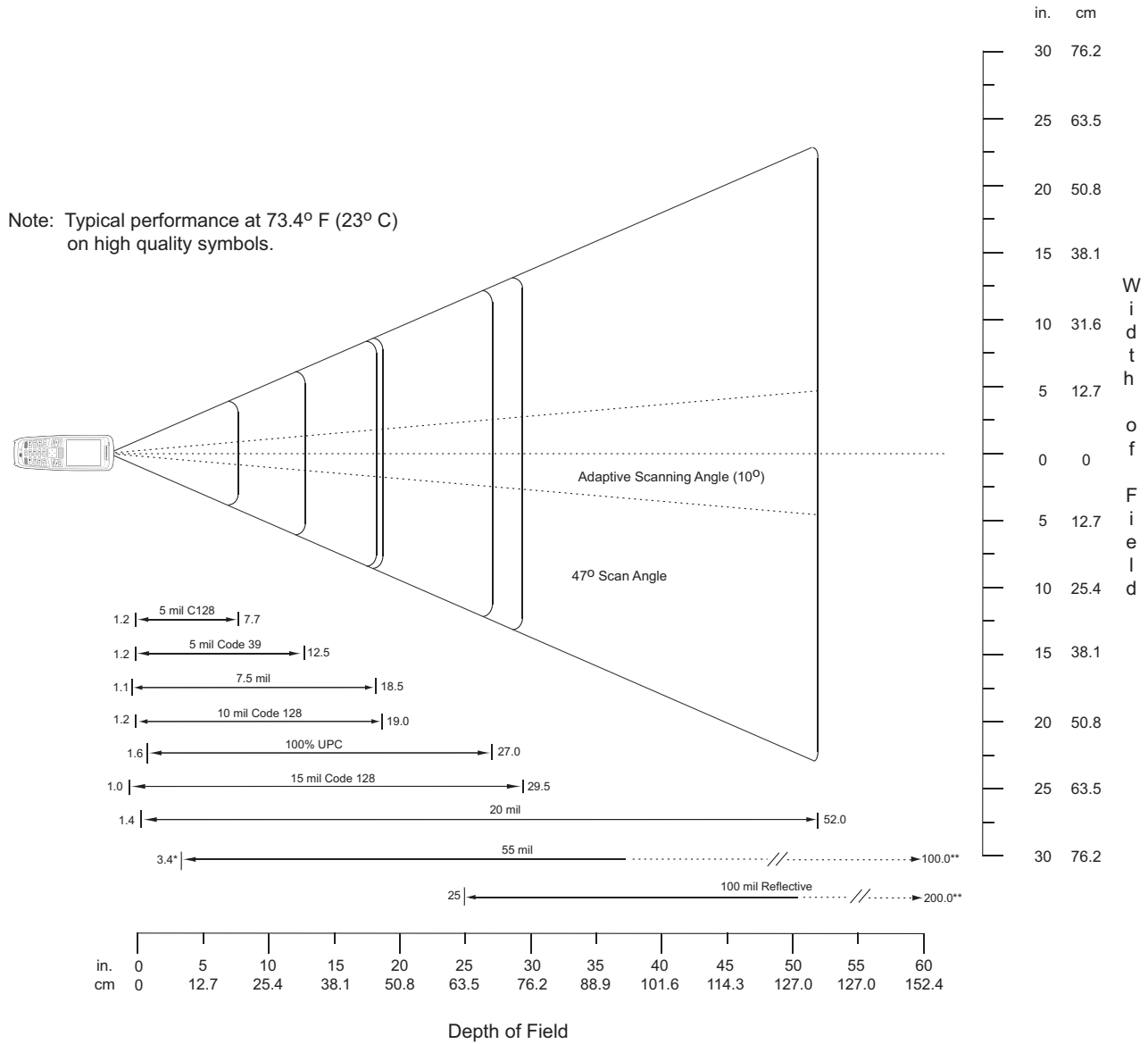


Figure A-2 ID Laser Decode Zone

Table A-3 1D Laser Decode Distances

Symbol Density/ Bar Code Type/ W-N Ratio	Bar Code Content/ Contrast ^{Note 1}	Typical Working Ranges	
		Near	Far
5.0 mil Code 128	1234 80% MRD	1.2 in 3.05 cm	7.7 in 19.56 cm
5.0 mil Code 39; 2.5:1	ABCDEFGH 80% MRD	1.2 in 3.05 cm	12.5 in 31.75 cm
7.5 mil Code 39; 2.5:1	ABCDEF 80% MRD	1.1 in 2.79 cm	18.5 in 46.99 cm
10 mil Code 128	1234 80% MRD	1.2 in 3.05 cm Note 3	19.0 in 48.26 cm
13 mil 100% UPC	12345678905 80% MRD	1.6 in 4.06 cm	27.0 in 68.58 cm
15 mil Code 128	1234 80% MRD	1.0 in 2.54 cm Note 3	29.5 in 74.93 cm
20 mil Code 39; 2.2:1	123 80% MRD	1.4 in 3.56 cm Note 3	52.0 in 132.08 cm
55 mil Code 39; 2.2:1	CD 80% MRD	3.4 in 8.64 cm Note 3	100.0 in 254.00 cm
100 mil Code 39; 3.0:1 reflective	123456 80% MRD	2 ft 60.96cm Note 3	17 ft 518.16 cm

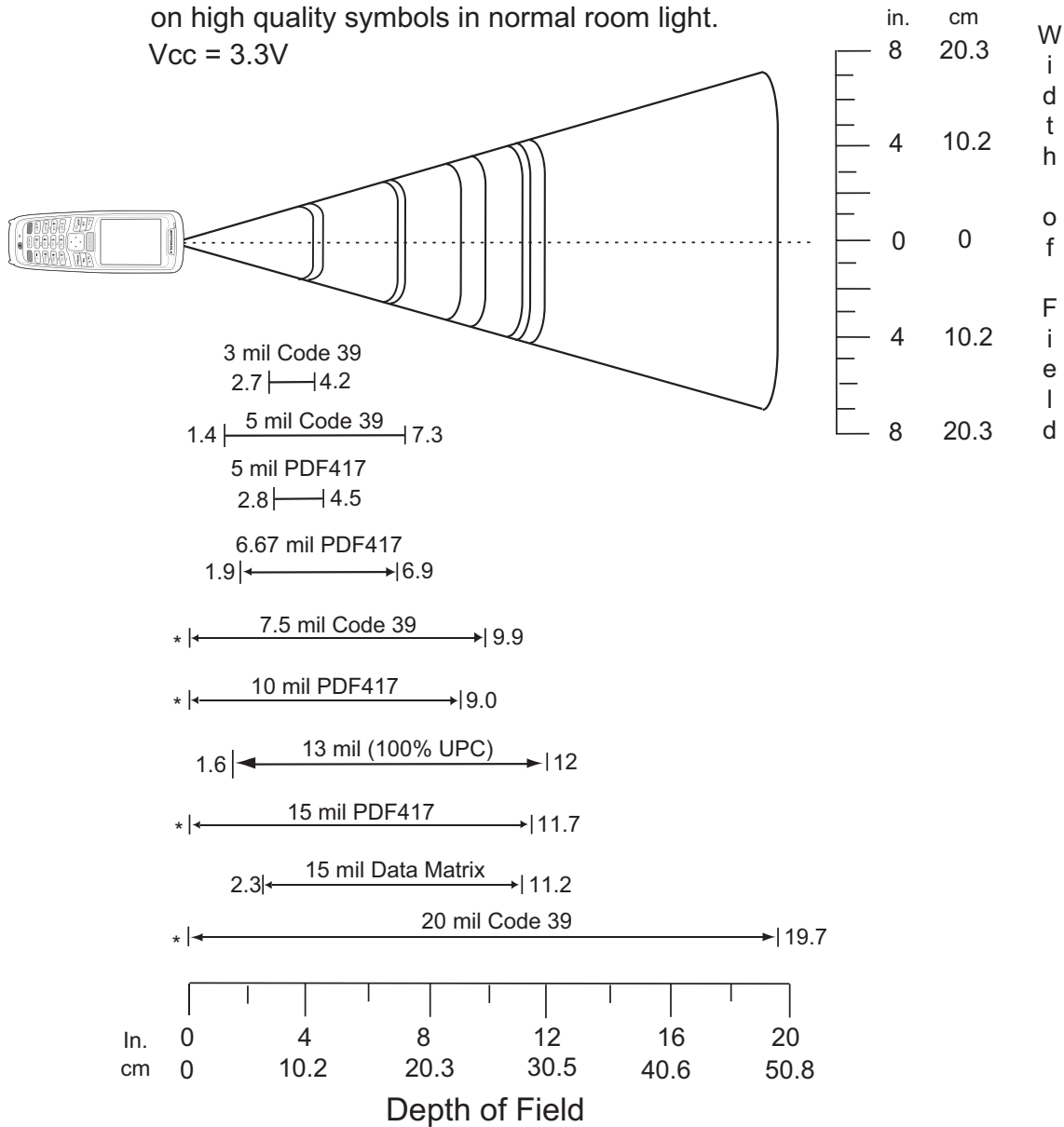
Notes:

1. Contrast measured as Mean Reflective Difference (MRD) at 650 nm.
2. Working range specifications at ambient temperature (23°C), photographic quality symbols. Pitch=10°, roll=0°, skew=0°, ambient light < 150 ft-candles using Symbol or equivalent decoder.
3. Dependent on width of bar code.
4. Distances measured from front edge of scan engine chassis.

2D Imager Decode Zones

Figure A-3 shows the decode zone for the 2D imager. Typical values appear. Table A-4 lists the typical distances for selected bar code densities. The minimum element width (or “symbol density”) is the width in mils of the narrowest element (bar or space) in the symbol.

Note: Typical performance at 73°F (23°C)
on high quality symbols in normal room light.
Vcc = 3.3V



* Minimum distance determined by symbol length and scan angle.

Figure A-3 2D Imager Decode Zone

Table A-4 2D Imager Decode Distances

Symbol Density/ Bar Code Type	Bar Code Content/ Contrast ^{Note 2}	Typical Working Ranges	
		Near	Far
3.0 mil Code 39	80% MRD	2.7 in 6.86 cm	4.2 in 10.67 cm
5.0 mil Code 39	ABCDEFGH 80% MRD	1.4 in 3.56 cm	7.3 in 18.54 cm
5.0 mil PDF417	80% MRD	2.8 in 7.11 cm	4.5 in 11.43 cm
6.67 mil PDF417	4 Col, 20 Rows 80% MRD	1.9 in 4.83 cm	6.9 in 17.53 cm
7.5 mil Code 39	ABCDEF 80% MRD	Note 1	9.9 in 25.15 cm
10 mil PDF417	3 Col, 17 Rows 80% MRD	Note 1	9.0 in 22.86 cm
13 mil UPC-A	012345678905 80% MRD	1.6 in 5.08 cm	12.0 in 30.48 cm
15 mil PDF417	80% MRD	Note 1	11.7 in 29.72 cm
15 mil Data Matrix	18 x 18 Modules 80% MRD	2.3 in 5.84 cm	11.2 in 28.45 cm
20 mil Code 39	123 80% MRD	Note 1	19.7 in 50.04 cm

Notes:

1. Near distances are FOV limited.
2. Contrast is measured as Mean Reflective Difference (MRD) at 670 nm.
3. Working range specifications at temperature = 23°C, pitch=18°, roll=0°, skew=0°, photographic quality, ambient light ~30 ft-c, humidity 45-70%RH.
4. Distances measured from front edge of scan engine chassis.

Accessory Specifications

Single-slot USB Cradle

Table A-5 *Single-slot USB Cradle Technical Specifications*

Feature	Description
Dimensions	Height: 13.02 cm (5.13 in.) Width: 15.24 cm (6.0 in.) Depth: 15.24 cm (6.0 in.)
Input Power	5.4 VDC
Interface	USB
Power Consumption	12 W
Operating Temperature	-25°C to 50°C (-13°F to 122°F)
Storage Temperature	-40°C to 70°C (-40°F to 158°F)
Charging Temperature	0°C to 40°C (32°F to 104°F)
Humidity	5% to 95% non-condensing
Drop	76.2 cm (30.0 in.) drops to vinyl tiled concrete at room temperature
Electrostatic Discharge (ESD)	+/- 15 kV air +/- 8 kV contact

Four-slot Ethernet Cradle

Table A-6 *Four Slot Ethernet Cradle Technical Specifications*

Feature	Description
Dimensions	Height: 10.16 cm (4.0 in.) Width: 48.77 cm (19.00 in.) Depth: 15.24 cm (6.0 in.)
Input Power	12 VDC
Interface	Ethernet
Power Consumption	55 W
Operating Temperature	-25°C to 50°C (-13°F to 122°F)
Storage Temperature	-40°C to 70°C (-40°F to 158°F)
Charging Temperature	0°C to 40°C (32°F to 104°F)

Table A-6 *Four Slot Ethernet Cradle Technical Specifications (Continued)*

Feature	Description
Humidity	5% to 95% non-condensing
Drop	76.2 cm (30.0 in.) drops to vinyl tiled concrete at room temperature
Electrostatic Discharge (ESD)	+/- 15 kV air +/- 8 kV contact

Four-slot Charge Only Cradle

Table A-7 *Four-slot Charge Only Cradle Technical Specifications*

Feature	Description
Dimensions	Height: 10.16 cm (4.0 in.) Width: 48.77 cm (19.00 in.) Depth: 15.24 cm (6.0 in.)
Input Power	12 VDC
Power Consumption	50 W
Operating Temperature	-25°C to 50°C (-13°F to 122°F)
Storage Temperature	-40°C to 70°C (-40°F to 158°F)
Charging Temperature	0°C to 40°C (32°F to 104°F)
Humidity	5% to 95% non-condensing
Drop	76.2 cm (30.0 in.) drops to vinyl tiled concrete at room temperature
Electrostatic Discharge (ESD)	+/- 15 kV air +/- 8 kV contact

Four-slot Battery Charger

Table A-8 *Four-slot Battery Charger Technical Specifications*

Feature	Description
Dimensions	Height: 10.16 cm (4.0 in.) Width: 15.24 cm (6.0 in.) Depth: 15.24 cm (6.0 in.)
Input Power	12 VDC
Power Consumption	35 W
Operating Temperature	0°C to 45°C (32°F to 113°F)
Storage Temperature	-40°C to 70°C (-40°F to 158°F)
Charging Temperature	0°C to 40°C (32°F to 104°F)

Table A-8 Four-slot Battery Charger Technical Specifications (Continued)

Feature	Description
Humidity	5% to 95% non-condensing
Drop	76.2 cm (30.0 in.) drops to vinyl tiled concrete at room temperature
Electrostatic Discharge (ESD)	+/- 15 kV air +/- 8 kV contact

MC21XX Pin-Outs

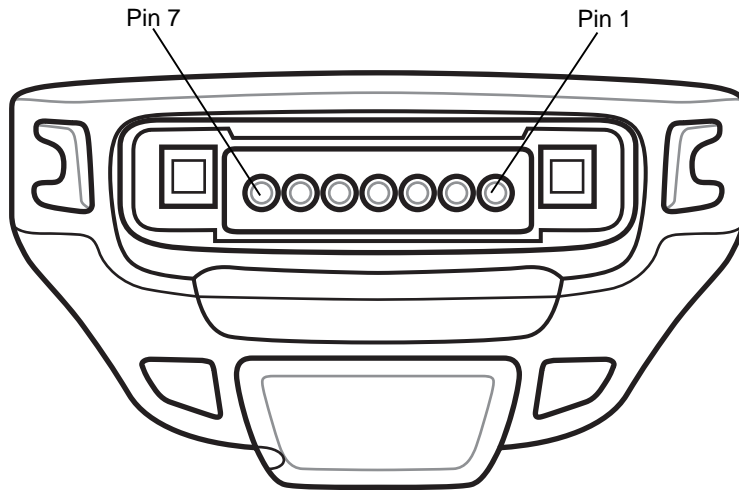


Figure A-4 MC21XX Connector

Table A-9 MC21XX Pin-Outs

PIN Number	Signal Name	Function
1	TRIGGER/PTT	* Tie to ground to indicate trigger key or PTT press.
2	USB_ID/MIC+	Shared USB ID or Microphone Line. Ground for USB Host, unconnected for Client Mode.
3	5.4V DC IN	+5.4 DC, $\pm 5\%$, 3A
4	USB_VBUS	Host Mode output = +5.0 VDC, 300 mA max. Client Mode VBUS detect input = +5.0 VDC.
5	UUSB_D-/TxD	Shared USB data negative or UART3 TXD (output).
6	USB_D+/EAR+/RxD	Shared USB data positive, headset earpiece drive, or UART3 RXD (input).
7	GND	Ground for all charging and USB communication.

APPENDIX B SPECIAL SOFTWARE CONFIGURATIONS

Battery Usage Threshold Setting

By default the Battery Usage Threshold value is set to a pre-defined value (400 by default). To change the threshold value, a registry key must be created to allow changing this value.

A battery becomes unhealthy when the *Battery Usage Indication* reach a predefined threshold (end of usable life).



NOTE The point at which a battery becomes unhealthy may vary depending upon the environment and charging conditions.

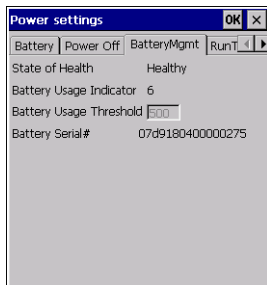


Figure B-1 Power BatteryMgmt Tab

Registry Setting

Create the following registry key:

[HKEY_LOCAL_MACHINE\ControlPanel\Power]

“EnableCycleCntThresholdEdit”=DWORD:0

where:

dword:0 = Enable threshold change

Warm boot the MC21XX to have the registry setting take effect.

1. Tap **Start > Settings > Power > BatteryMgmt** tab.

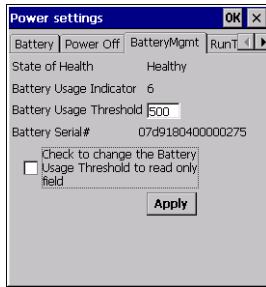


Figure B-2 *BatteryMgmt Tab with Threshold Change Checkbox*

2. In the **Battery Usage Threshold** text box, enter a new value.
3. Select the **Check to change the Battery Age Threshold to read only field** checkbox.
4. Tap **Apply**.
5. Tap **ok**. The new value is set and then the registry key is deleted.

Sample Applications and StartUpCtl Configuration

The MC21XX with Windows CE 6.0 contains a set of sample applications that can be installed on the device. As part of the installation, an application called StartUpCtl is also installed.

On the desktop, double-tap the **Install Samples** icon.

The Sample Applications and StartUpCtl application installs on the device and the Sample Applications window appears.

After a warm or cold boot, the **Sample Applications** window appears automatically.

StartUpCtl Application Configuration

StartUpCtl application can be used to automatically launch any application whenever a warm or cold boot is performed.

Refer to the StartUpCtl instruction available with the StartUpCtl software download available on the Support Central web site: <http://supportcentral.motorola.com>.

Removing Sample Applications and StartUpCtl Application

To remove the installed applications (before a cold boot is performed):

1. Tap **Start > Setting > Control Panel > Remove Programs** icon.
2. Select **Motorola Samples.C** from the list.
3. Tap the **Remove** button.
4. Tap the **Yes** button.
5. Select **Motorola startUpCtl** from the list.
6. Tap the **Remove** button.

7. Tap the **Yes** button.
8. Tap **OK**.

To remove the installed applications (after a cold boot is performed):

1. Tap **Start > Programs > Windows Explorer**.
2. Open the **Application** folder.
3. Delete the **Sample.C** folder and its contents.
4. Delete the **StartUpCtl** folder and its contents.
5. Delete the **Samples.C** file.
6. Open the **StartUp** folder.
7. Delete the **StartUpCtl** file.

After a cold boot the **Install Samples** icon appears on the desktop.

Radio Default Power State

By default the power states of the WLAN and Bluetooth radios are set to off after a cold boot. To change the default state a registry key must be created to allow changing this value.

Create the following registry keys:

```
[HKEY_LOCAL_MACHINE\Drivers\Builtin\WCRSRV]
```

```
    "InitialState"=DWORD:0
```

where:

```
    dword:0 = WLAN radio is on after a cold boot
```

```
    dword:4 = WLAN radio is off after a cold boot
```

Create the following registry key:

```
[HKEY_LOCAL_MACHINE\SOFTWARE\Motorola\Bluetooth\Status]
```

```
    "active"=DWORD:0
```

where:

```
    dword:0 = Bluetooth radio is off after cold boot
```

```
    dword:1 = Bluetooth radio is on after cold boot
```


GLOSSARY

Numeric

802.11/802.11abg. A radio protocol that may be used by the Motorola radio card.

A

Access Point. Access Point (AP) refers to Motorola's Ethernet Access Point. It is a piece of communications equipment that manages communications between the host computer system and one or more wireless terminals. An AP connects to a wired Ethernet LAN and acts as a bridge between the Ethernet wired network and IEEE 802.11 interoperable radio-equipped mobile units, such as a MC21XX. The AP allows a mobile user to roam freely through a facility while maintaining a seamless connection to the wired network.

AirBEAM® Manager. AirBEAM® Manager is a comprehensive wireless network management system that provides essential functions that are required to configure, monitor, upgrade and troubleshoot the wireless network and its components (including networked MC21XXs). Some features include event notification, access point configuration, diagnostics, statistical reports, auto-discovery, wireless proxy agents and monitoring of access points and mobile units.

AirBEAM® Smart Client. AirBEAM® Smart Client is part of Motorola's AirBEAM® suite, which also includes AirBEAM® Safe and AirBEAM® Manager. The AirBEAM® Smart Client system uses the network accessible host server to store software files that are to be downloaded to the MC21XXs. The AirBEAM® Smart Client provides the MC21XXs with the "smarts" to request software from the host. It allows them to request, download and install software, as well as to upload files and status data. The AirBEAM® Smart Client uses the industry standard FTP or TFTP file transfer protocols to check the host system for updates, and if necessary, to transfer updated software. Most often, AirBEAM® Smart Client is used with wireless networks, but any TCP/IP connection can be used. For more information, refer to the AirBEAM® Smart Windows® CE Client Product Reference Guide (p/n 72-63060-xx).

AP. See **Access Point**.

Aperture. The opening in an optical system defined by a lens or baffle that establishes the field of view.

ASCII. American Standard Code for Information Interchange. A 7 bit-plus-parity code representing 128 letters, numerals, punctuation marks and control characters. It is a standard data transmission code in the U.S.

Autodiscrimination. The ability of an interface controller to determine the code type of a scanned bar code. After this determination is made, the information content is decoded.

B

Bar. The dark element in a printed bar code symbol.

Bar Code. A pattern of variable-width bars and spaces which represents numeric or alphanumeric data in machine-readable form. The general format of a bar code symbol consists of a leading margin, start character, data or message character, check character (if any), stop character, and trailing margin. Within this framework, each recognizable symbology uses its own unique format. See **Symbology**.

Bar Code Density. The number of characters represented per unit of measurement (e.g., characters per inch).

Bar Height. The dimension of a bar measured perpendicular to the bar width.

Bar Width. Thickness of a bar measured from the edge closest to the symbol start character to the trailing edge of the same bar.

Bit. Binary digit. One bit is the basic unit of binary information. Generally, eight consecutive bits compose one byte of data. The pattern of 0 and 1 values within the byte determines its meaning.

Bits per Second (bps). Bits transmitted or received.

Bit. Binary digit. One bit is the basic unit of binary information. Generally, eight consecutive bits compose one byte of data. The pattern of 0 and 1 values within the byte determines its meaning.

bps. See **Bits Per Second**.

Byte. On an addressable boundary, eight adjacent binary digits (0 and 1) combined in a pattern to represent a specific character or numeric value. Bits are numbered from the right, 0 through 7, with bit 0 the low-order bit. One byte in memory is used to store one ASCII character.

boot or boot-up. The process a computer goes through when it starts. During boot-up, the computer can run self-diagnostic tests and configure hardware and software.

C

CDRH. Center for Devices and Radiological Health. A federal agency responsible for regulating laser product safety. This agency specifies various laser operation classes based on power output during operation.

CDRH Class 1. This is the lowest power CDRH laser classification. This class is considered intrinsically safe, even if all laser output were directed into the eye's pupil. There are no special operating procedures for this class.

CDRH Class 2. No additional software mechanisms are needed to conform to this limit. Laser operation in this class poses no danger for unintentional direct human exposure.

Character. A pattern of bars and spaces which either directly represents data or indicates a control function, such as a number, letter, punctuation mark, or communications control contained in a message.

Character Set. Those characters available for encoding in a particular bar code symbology.

Check Digit. A digit used to verify a correct symbol decode. The scanner inserts the decoded data into an arithmetic formula and checks that the resulting number matches the encoded check digit. Check digits are required for UPC but are optional for other symbologies. Using check digits decreases the chance of substitution errors when a symbol is decoded.

Codabar. A discrete self-checking code with a character set consisting of digits 0 to 9 and six additional characters: ("-", "\$", ":", "/", ",," and "+").

Code 128. A high density symbology which allows the controller to encode all 128 ASCII characters without adding extra symbol elements.

Code 3 of 9 (Code 39). A versatile and widely used alphanumeric bar code symbology with a set of 43 character types, including all uppercase letters, numerals from 0 to 9 and 7 special characters ("_", ":", "/", "+", "%", "\$" and space). The code name is derived from the fact that 3 of 9 elements representing a character are wide, while the remaining 6 are narrow.

Code 93. An industrial symbology compatible with Code 39 but offering a full character ASCII set and a higher coding density than Code 39.

Code Length. Number of data characters in a bar code between the start and stop characters, not including those characters.

Cold Boot. A cold boot restarts the MC21XX and erases all user stored records and entries.

COM port. Communication port; ports are identified by number, e.g., COM1, COM2.

Continuous Code. A bar code or symbol in which all spaces within the symbol are parts of characters. There are no intercharacter gaps in a continuous code. The absence of gaps allows for greater information density.

Cradle. A cradle is used for charging the terminal battery and for communicating with a host computer, and provides a storage place for the terminal when not in use.

D

Dead Zone. An area within a scanner's field of view, in which specular reflection may prevent a successful decode.

Decode. To recognize a bar code symbology (e.g., UPC/EAN) and then analyze the content of the specific bar code scanned.

Decode Algorithm. A decoding scheme that converts pulse widths into data representation of the letters or numbers encoded within a bar code symbol.

Decryption. Decryption is the decoding and unscrambling of received encrypted data. Also see, **Encryption** and **Key**.

Depth of Field. The range between minimum and maximum distances at which a scanner can read a symbol with a certain minimum element width.

Discrete Code. A bar code or symbol in which the spaces between characters (intercharacter gaps) are not part of the code.

Discrete 2 of 5. A binary bar code symbology representing each character by a group of five bars, two of which are wide. The location of wide bars in the group determines which character is encoded; spaces are insignificant. Only numeric characters (0 to 9) and START/STOP characters may be encoded.

E

EAN. European Article Number. This European/International version of the UPC provides its own coding format and symbology standards. Element dimensions are specified metrically. EAN is used primarily in retail.

Element. Generic term for a bar or space.

EMDK. Enterprise Mobility Developer's Kit.

Encoded Area. Total linear dimension occupied by all characters of a code pattern, including start/stop characters and data.

ESD. Electro-Static Discharge

ESN. Electronic Serial Number. The unique hardware number associated with a cellular device, which is transmitted to the system when the device communicates with the cellular system.

Ethernet. Ethernet communication port. Allows a wired interface to a radio network.

F

Flash Memory. Flash memory is nonvolatile, semi-permanent storage that can be electronically erased in the circuit and reprogrammed. Some MC21XXs use Flash memory to store the operating system (ROM-DOS), the terminal emulators, and the Citrix ICA Client for DOS.

FTP. See **File Transfer Protocol**.

Flash Memory. Flash memory is responsible for storing the system firmware and is non-volatile. If the system power is interrupted the data is not be lost.

G

Gateway Address. An IP address for a network gateway or router. A MC21XX may be part of a subnet as specified by its IP address and Netmask. It can send packets directly to any node on the same subnet. If the destination node is on a different subnet, then the terminal sends the packet to the gateway first. The gateway determines how to route the packet to the destination subnet. This field is an option used by networks that require gateways.

H

Hard Reset. See **Cold Boot**.

Hz. Hertz; A unit of frequency equal to one cycle per second.

Host Computer. A computer that serves other terminals in a network, providing such services as computation, database access, supervisory programs and network control.

I

IDE. Intelligent drive electronics. Refers to the solid-state hard drive type.

IEC. International Electrotechnical Commission. This international agency regulates laser safety by specifying various laser operation classes based on power output during operation.

IEC (825) Class 1. This is the lowest power IEC laser classification. Conformity is ensured through a software restriction of 120 seconds of laser operation within any 1000 second window and an automatic laser shutdown if the scanner's oscillating mirror fails.

Interleaved 2 of 5. A binary bar code symbology representing character pairs in groups of five bars and five interleaved spaces. Interleaving provides for greater information density. The location of wide elements (bar/spaces) within each group determines which characters are encoded. This continuous code type uses no intercharacter spaces. Only numeric (0 to 9) and START/STOP characters may be encoded.

imaging scanning . MC21XXs with an integrated imager use digital camera technology to take a digital picture of a bar code, store the resulting image in memory and execute state-of-the-art software decoding algorithms to extract the data from the image.

Intercharacter Gap. The space between two adjacent bar code characters in a discrete code.

Interleaved Bar Code. A bar code in which characters are paired together, using bars to represent the first character and the intervening spaces to represent the second.

Interleaved 2 of 5. A binary bar code symbology representing character pairs in groups of five bars and five interleaved spaces. Interleaving provides for greater information density. The location of wide elements (bar/spaces) within each group determines which characters are encoded. This continuous code type uses no intercharacter spaces. Only numeric (0 to 9) and START/STOP characters may be encoded.

Internet Protocol Address. See **IP**.

IP. Internet Protocol. The IP part of the TCP/IP communications protocol. IP implements the network layer (layer 3) of the protocol, which contains a network address and is used to route a message to a different network or subnetwork. IP accepts "packets" from the layer 4 transport protocol (TCP or UDP), adds its own header to it and delivers a "datagram" to the layer 2 data link protocol. It may also break the packet into fragments to support the maximum transmission unit (MTU) of the network.

IP Address. (Internet Protocol address) The address of a computer attached to an IP network. Every client and server station must have a unique IP address. A 32-bit address used by a computer on a IP network. Client workstations have either a permanent address or one that is dynamically assigned to them each session. IP addresses are written as four sets of numbers separated by periods; for example, 204.171.64.2.

L

LAN. Local area network. A radio network that supports data communication within a local area, such as within a warehouse of building.

laser scanner. A type of bar code reader that uses a beam of laser light.

LASER. Light Amplification by Stimulated Emission of Radiation. The laser is an intense light source. Light from a laser is all the same frequency, unlike the output of an incandescent bulb. Laser light is typically coherent and has a high energy density.

Laser Diode. A gallium-arsenide semiconductor type of laser connected to a power source to generate a laser beam. This laser type is a compact source of coherent light.

LED Indicator. A semiconductor diode (LED - Light Emitting Diode) used as an indicator, often in digital displays. The semiconductor uses applied voltage to produce light of a certain frequency determined by the semiconductor's particular chemical composition.

Light Emitting Diode. See **LED**.

M

MC. MC21XX.

MIL. 1 mil = 1 thousandth of an inch.

MIN. Mobile Identification Number. The unique account number associated with a cellular device. It is broadcast by the cellular device when accessing the cellular system.

Misread (Misdecode). A condition which occurs when the data output of a reader or interface controller does not agree with the data encoded within a bar code symbol.

MC21XX. In this text, MC21XX refers to the Motorola wireless handheld computer. It can be set up to run as a stand-alone device, or it can be set up to communicate with a network, using wireless radio technology.

N

Nominal. The exact (or ideal) intended value for a specified parameter. Tolerances are specified as positive and negative deviations from this value.

Nominal Size. Standard size for a bar code symbol. Most UPC/EAN codes are used over a range of magnifications (e.g., from 0.80 to 2.00 of nominal).

NVM. Non-Volatile Memory.

P

Parameter. A variable that can have different values assigned to it.

PDT. Portable Data Terminal.

Percent Decode. The average probability that a single scan of a bar code would result in a successful decode. In a well-designed bar code scanning system, that probability should approach near 100%.

Q

Quiet Zone. A clear space, containing no dark marks, which precedes the start character of a bar code symbol and follows the stop character.

R

RAM. Random Access Memory. Data in RAM can be accessed in random order, and quickly written and read.

Reflectance. Amount of light returned from an illuminated surface.

Resolution. The narrowest element dimension which is distinguished by a particular reading device or printed with a particular device or method.

RF. Radio Frequency.

ROM. Read-Only Memory. Data stored in ROM cannot be changed or removed.

ROM-DOS. The name of the licensed Disk Operating System loaded into the terminal's flash file system.

Router. A device that connects networks and supports the required protocols for packet filtering. Routers are typically used to extend the range of cabling and to organize the topology of a network into subnets. See **Subnet**.

S

Scan Area. Area intended to contain a symbol.

Scanner. An electronic device used to scan bar code symbols and produce a digitized pattern that corresponds to the bars and spaces of the symbol. Its three main components are:

1. Light source (laser or photoelectric cell) - illuminates a bar code.
2. Photodetector - registers the difference in reflected light (more light reflected from spaces).
3. Signal conditioning circuit - transforms optical detector output into a digitized bar pattern.

Scanning Mode. The scanner is energized, programmed and ready to read a bar code.

Scanning Sequence. A method of programming or configuring parameters for a bar code reading system by scanning bar code menus.

SDK. Software Development Kit

Self-Checking Code. A symbology that uses a checking algorithm to detect encoding errors within the characters of a bar code symbol.

Shared Key. Shared Key authentication is an algorithm where both the AP and the MU share an authentication key.

SID. System Identification code. An identifier issued by the FCC for each market. It is also broadcast by the cellular carriers to allow cellular devices to distinguish between the home and roaming service.

Soft Reset. See **Warm Boot.**

Space. The lighter element of a bar code formed by the background between bars.

Specular Reflection. The mirror-like direct reflection of light from a surface, which can cause difficulty decoding a bar code.

Start/Stop Character. A pattern of bars and spaces that provides the scanner with start and stop reading instructions and scanning direction. The start and stop characters are normally to the left and right margins of a horizontal code.

STEP. Symbol Terminal Enabler Program.

Subnet. A subset of nodes on a network that are serviced by the same router. See **Router.**

Subnet Mask. A 32-bit number used to separate the network and host sections of an IP address. A custom subnet mask subdivides an IP network into smaller subsections. The mask is a binary pattern that is matched up with the IP address to turn part of the host ID address field into a field for subnets. Default is often 255.255.255.0.

Substrate. A foundation material on which a substance or image is placed.

SVTP. Symbol Virtual Terminal Program.

Symbol. A scannable unit that encodes data within the conventions of a certain symbology, usually including start/stop characters, quiet zones, data characters and check characters.

Symbol Aspect Ratio. The ratio of symbol height to symbol width.

Symbol Height. The distance between the outside edges of the quiet zones of the first row and the last row.

Symbol Length. Length of symbol measured from the beginning of the quiet zone (margin) adjacent to the start character to the end of the quiet zone (margin) adjacent to a stop character.

Symbology. The structural rules and conventions for representing data within a particular bar code type (e.g. UPC/EAN, Code 39, PDF417, etc.).

T

Tolerance. Allowable deviation from the nominal bar or space width.

U

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

V

Visible Laser Diode (VLD). A solid state device which produces visible laser light.

W

WAN. Wide-Area Network. A radio network that supports data communication beyond a local area. That is, information can be sent across a city, state, or even nationwide.

Warm Boot. A warm boot restarts the MC21XX by closing all running programs. All data that is not saved to flash memory is lost.

Wireless Local Area Network (WLAN). See LAN.

Wireless Wide Area Network (WWAN). See WAN.

WNMP. (Wireless Network Management Protocol) This is a proprietary MAC layer protocol used for inter access point communication and other MAC layer communication.

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Motorola Solutions, Inc.
1301 E. Algonquin Rd.
Schaumburg, IL 60196-1078, U.S.A.
<http://www.motorolasolutions.com>

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72E-155021-01 Revision A - December 2011

