CipherLab
Reference Manual

8400 Series Mobile Computer

8400/8470

Version 0.13

CIPHER LAB

CIPHERLAB CO., LTD.
Website: http://www.cipherlab.com

IMPORTANT NOTICES

FOR USA

This equipment has been tested and found to comply with the limits for a **Class B** digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

▶ Reorient or relocate the receiving antenna.

▶ Increase the separation between the equipment and receiver.

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

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

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

FOR CANADA

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of Industry Canada.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareil numerique respecte les limites de bruits radioelectriques applicables aux appareils numeriques de Classe B prescrites dans la norme sur le material brouilleur: "Appareils Numeriques," NMB-003 edictee par l'Industrie.

FOR HAND-HELD PRODUCT WITH RF FUNCTIONS

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body. It only operated in hand-held used.

If you only transfer data to Host wirelessly, please keep the minimum distance 20 cm between machine & your body.

FOR PRODUCT WITH LASER

Per FDA and IEC standards, the scan engines described in this manual are not given a laser classification. However, the following precautions should be observed:

CAUTION

This laser component emits FDA / IEC Class 2 laser light at the exit port. Do not stare into beam.

SAFETY PRECAUTIONS

RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS.

▶ The use of any batteries or charging devices, which are not originally sold or manufactured by CipherLab, will void your warranty and may cause damage to human body or the product itself.

▶ DO NOT disassemble, incinerate or short circuit the battery.

▶ DO NOT expose the scanner or the battery to any flammable sources.

▶ For green-environment issue, it's important that batteries should be recycled in a proper way.

▶ Under no circumstances, internal components are self-serviceable.

▶ The charging and communication cradle uses an AC power adaptor. A socket outlet shall be installed near the equipment and shall be easily accessible. Make sure there is stable power supply for the mobile computer or its peripherals to operate properly.

CARE & MAINTENANCE

▶ This mobile computer is intended for enterprise logistics use. The mobile computer is rated IP 54, however, it may do damage to the mobile computer when being exposed to extreme temperatures or soaked wet.

▶ When the body of the mobile computer gets dirty, use a clean and wet cloth to wipe off the dust. DO NOT use/mix any bleach or cleaner. Always keep the LCD dry.

▶ For a liquid crystal display (LCD), use a clean, non-abrasive, lint-free cloth to wipe dust off the screen. DO NOT use any pointed or sharp object to move against the surface.

▶ If you want to put away the mobile computer for a period of time, download the collected data to a host computer, and then take out the battery pack. Store the mobile computer and battery pack separately.

▶ When the mobile computer resumes its work, the main and backup batteries will take a certain time to become fully charged.

▶ If you shall find the mobile computer malfunctioning, write down the specific scenario and consult your local sales representative.

RELEASE NOTES

Version	Date	Notes
0.13	June 09, 2009	▶ New: Introduction — add Getting Started for battery charging and local time setting
		▶ Modified: 1.1 Battery — move some items to Getting Started
		▶ Modified: 1.7 Charging & Communications — add 4-Slot Charging Cradle
		▶ Modified: 3.2.9 USB Charge Current — add charging icons
		▶ Modified: Appendix II Troubleshooting
0.12	May 26, 2009	▶ Modified: 1.7.2 Cradle Options — update labels (POWER, DATA, READY)
		▶ Modified: 3.2 Settings — add new item "USB Charge Current"
		▶ Modified: 3.3 Tests — remove "8. Next Page"
		▶ Modified: 3.11.1 Information — add Wi-Fi library version
		▶ Modified: 3.11.4 Security — WPA2 disabled by default
0.11	May 12, 2009	▶ Modified: Inside the Package, Accessories
		▶ Modified: 1.7.1 Interface Cable Options
0.10	May 07, 2009	▶ Changes in response to Willie's and David's comments on version 0.08
0.09	May 05, 2009	▶ Changes in response to Han's and Carrie's comments on version 0.08
0.08	May 04, 2009	▶ Modified: 3.6 Load Program — Interface option for "SD Card"
		▶ Modified: 4.1.1 Download — Interface option for "SD Card"
		▶ Modified: 4.2.2 Load Program — Interface option for "SD Card"
		▶ Modified: 4.2.3 Kernel Update — Interface option for "SD Card"
0.07	Apr. 03, 2009	▶ Modified: 1.3 Keypad — Orange modifier key set to Toggle mode by default
0.06	Mar. 31, 2009	▶ Modified: Appendix III — Key Reference Tables (Extended Function keys through programming)
0.05	Mar. 20, 2009	▶ Modified: Inside the Package — USB cable (no power adaptor required)
		▶ Modified: Accessories — RS-232 cable with power adaptor
		▶ Modified: 1.1.4 Power Management — add references
		▶ Modified: 1.2.3 SD Card — refine description
		▶ Modified: 1.3 Keypad — add references
		▶ Modified: 1.4.1 Adjusting the Backlight — add references and correct typo error in table
		▶ Modified: 1.5.1 Status LED — correct LED2 typo error in table
		▶ Modified: 1.5.2 Audio — add references
		▶ Modified: 1.6 Data Capture — GS1-128 (EAN-128), GS1 DataBar Omnidirectional (RSS-14), GS1 DataBar Limited (RSS Limited), GS1 DataBar Expanded (RSS Expanded)

		▶	Modified: 1.7 Charging & Communications — update tables
		▶	Modified: 3.2.8 USB VCOM NO. — refine description
		▶	Modified: 3.8.1 Run as USB Disk — refine description
		▶	Modified: Appendix III — Key Reference Tables (moved from section 1.3 Keypad)
0.04	Feb. 06, 2009	▶	Changes in response to comments on version 0.03
0.03	Feb. 04, 2009	▶	Changes in response to comments on version 0.01
0.02	Feb. 04, 2009	▶	Modified: 1.3.1 29-Key Layout — add F9 ~ F20 to table
0.01	Jan. 21, 2009		Draft

CONTENTS

INTRODUCTION

Answering industrial demands for ruggedized, light-weight and versatile computers, the 8400 Series Mobile Computer is specifically designed for enterprise logistics use.

This line of product comes with built-in Bluetooth wireless technology and allows for optional module for 802.11b/g connectivity, enabling real time sharing of performance.

The 8400 Series Mobile Computer is bundled with powerful and rich features to ensure success in timely processing of information, , and thus, makes an ideal choice for inventory control, shop floor management, warehousing and distribution operations. Being programmable, this handy device can run custom applications or terminal emulation applications.

This manual serves to guide you through how to install, configure, and operate the mobile computer. We recommend you to keep one copy of the manual at hand for quick reference or maintenance purposes. To avoid any improper disposal or operation, please read the manual thoroughly before use.

Thank you for choosing CipherLab products!

GETTING FAMILIARIZED WITH 8400
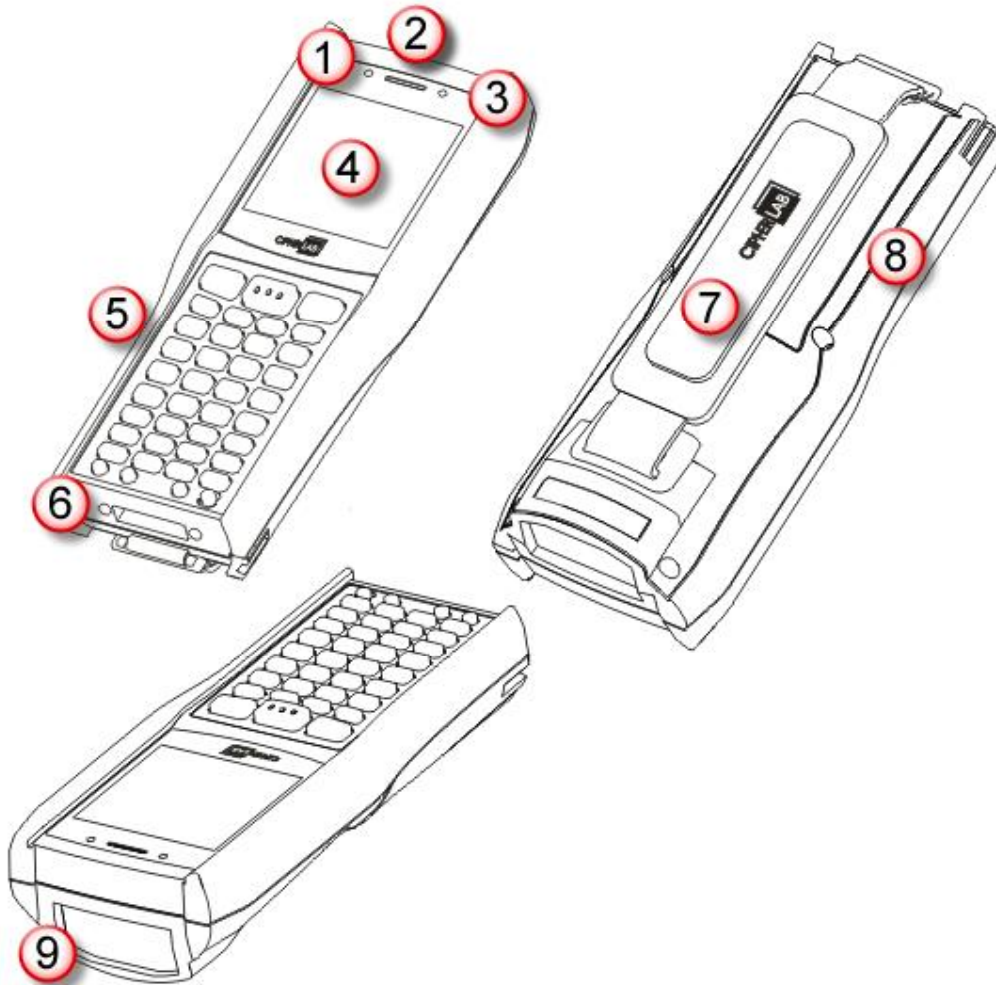
Figure 1: Overview

No.	Description	No.	Description
1	LED for Good Read and battery charging	2	Buzzer
3	LED for wireless communications	4	LCD screen
5	Keypad, 29 or 39 keys	6	Communication/charging port
7	Hand strap	8	Battery compartment
9	Scanning window		

Warning: Always make sure the hand strap is well hooked and screwed to the back of the mobile computer before use.

FEATURES

▸ Ergonomic design — ruggedized yet streamlined, with hand strap for secure hold.
▸ Built tough to survive drop test and sealed against moisture/dust to IP 54.
▸ Rich interface options — USB or RS-232 (cable), plus modem, Ethernet or GSM/GPRS (via cradle).
▸ Up to 8 GB high capacity memory card (microSDHC) supported
▸ Flexible wireless solutions — Bluetooth or 802.11b/g
▸ Graphic monochrome LCD supports double-byte characters and bitmap graphics.
▸ Programmable feedback includes buzzer, LED indicators and vibrator.
▸ Quick link to any backend database through Windows-based CipherNet programs for VT100/220 and IBM 5250 emulation.
▸ Easy customization of AG applications through Windows-based Application Generator (AG) programs for preloaded AG Runtime.
▸ Programming support includes BASIC & C compilers.
▸ Accessories include RS-232 cable, 4-Slot Battery Charger and a variety of charging/communications cradle, etc.

INSIDE THE PACKAGE

The following items are included in the package. Save the box and packaging material for future use in case you need to store or ship the mobile computer.

▸ 8400 Series mobile computer
▸ Rechargeable Li-ion battery pack
▸ Hand strap
▸ USB charging & communication cable
▸ Universal power adaptor
▸ Product CD

ACCESSORIES

Rich choices of optional accessories are available for you to enhance the total performance of the mobile computer.

▸ Protective cover
▸ Spare rechargeable Li-ion battery
▸ 4-slot battery charger
▸ RS-232 charging & communication cable
▸ Charging & communication Cradle
▸ Modem cradle
▸ Ethernet cradle (10/100 BASE-T)
▸ GPRS/GSM cradle (EDGE/Quad-band)

GETTING STARTED

INSERTING THE BATTERY & MEMORY CARD

For shipping and storage purposes, save the mobile computer and the main battery in separate packages. This will keep both batteries in good condition for future use.

Note: Any improper handling may reduce the battery life.

1) Unhook the hand strap from the bottom of the mobile computer. Make sure to turn off the mobile computer.

2) Hold the mobile computer still and press the release button to unlock the battery cover.

3) Slide off the battery cover.

4) Use your finger to slide the locking plate towards its hinge to unlock the SD card holder.

5) Flip up the SD card holder.

6) Insert your memory card (microSD or microSDHC) to the SD card holder.

7) Push the SD card holder down.

8) Slide the locking plate away from its hinge to secure the card.

9) Slide the battery pack into the battery compartment at a proper angle (30°~45°) so that the tabs on the bottom of the battery are hooked in the grooves of the compartment.

10) Push down the battery and make sure that the battery is snugly fit into the compartment.

11) Slide the battery cover back onto the mobile computer until it clicks into place.

Note: For a new battery, make sure it is fully charged before use. Always prepare a spare battery pack, especially when you are on the road.
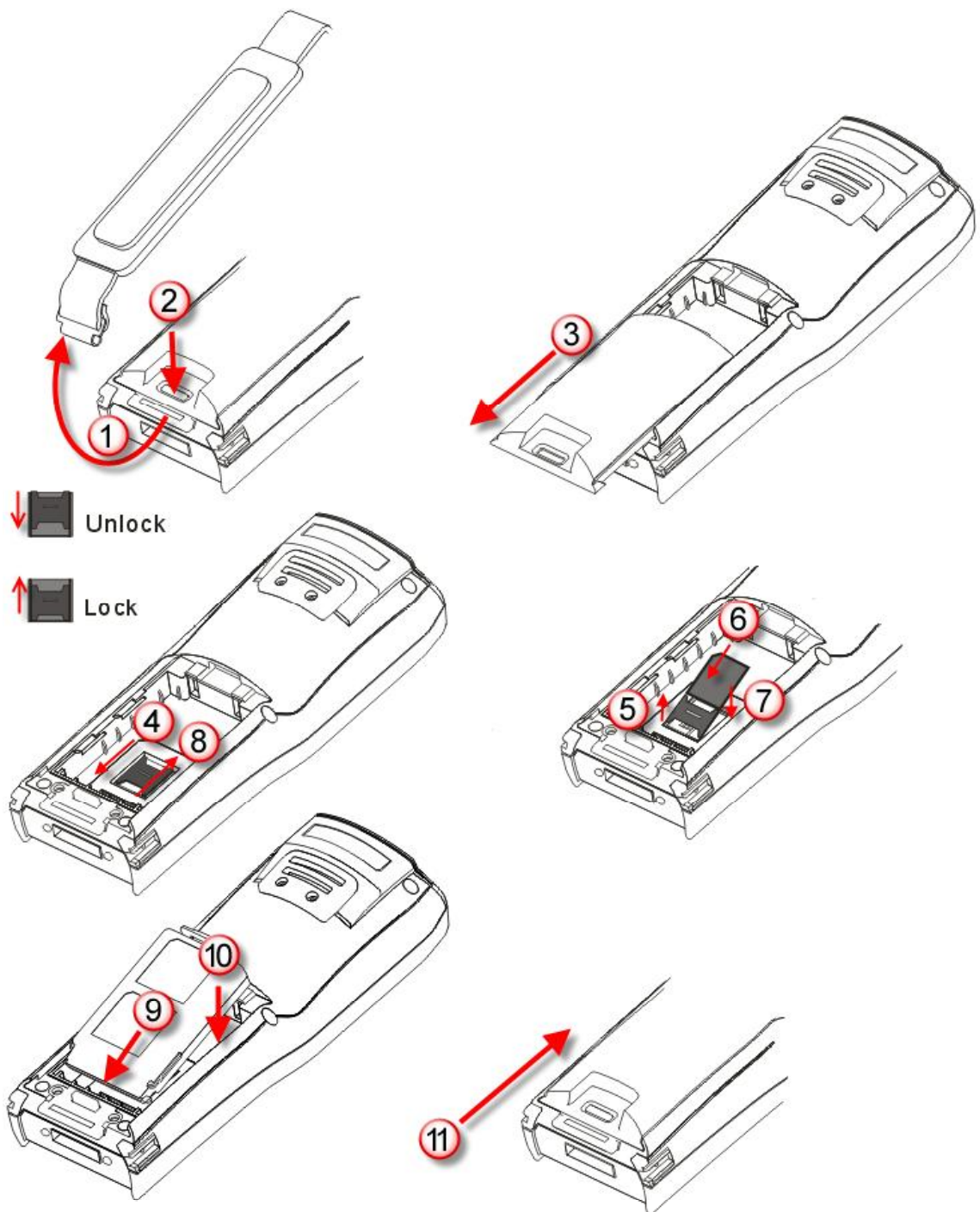
Figure 2: Installing the Main Battery & Memory Card

INITIAL CHARGING

The main and backup batteries may not be charged to full for shipment. When you first receive the package, you will need to charge the main battery to full before using the mobile computer. Instead of direct charging, you may use a cradle or charger to charge the Mobile Computer or spare batteries. Refer to 1.7 Charging & Communications.

Note: For initial charging, it takes approximately 3~5 hours to fully charge the main battery.

Warning: It is recommended that the charging devices be operated at room temperature (18°C to 25°C) for optimal performance. The charging devices will not charge the battery when the temperature exceeds 40°C.

Because the internal backup battery is constantly charged from the main battery, the initial charging requires inserting the battery pack to the mobile computer and then seating the mobile computer in the cradle for charging. This will have both the main and backup batteries charged at the same time. It takes at least 48 hours to fully charge the backup battery. However, it is not necessary to fully charge the backup battery for the mobile computer to work.

Note: In order to charge the backup battery to full, you must insert the main battery and leave it for at least 48 hours, whether the mobile computer is in use or not.

SETTING LOCAL TIME

If you need to set your local time, go to **System Menu | 2. Settings | 1. Clock**. Refer to 3.2.1 Clock.

POWER MANAGEMENT

For any portable device, power management is a critical issue especially when you are on the road. Below are some tips to help you save battery power.

Warning: Using backlight, wireless connectivity, and peripherals while on battery power will substantially reduce battery power.

▶ To speed up charging the mobile computer, turn off the mobile computer and seat it in the cradle or use the charging/communication cable.

▶ Bring a second battery pack on the road.

▶ Stop wireless connectivity, Bluetooth or 802.11b/g that is not in use.

▶ Go to **System Menu | 2. Settings | 2. Backlight**, and configure backlight period, luminosity, as well as the shade effect. Refer to 3.2.2 Backlight.

▶ Go to **System Menu | 2. Settings | 4. Auto Off**, and configure the amount of idle time that must pass before the system will shut down automatically. Refer to 3.2.4 Auto Off.

Chapter 1

USING 8400 MOBILE COMPUTER

This chapter explains the features and usage of the 8400 Series Mobile Computer. The 8400 family includes:

▶ 8400   Bluetooth Class 2
▶ 8470   Bluetooth Class 2 + 802.11b/g

IN THIS CHAPTER

1.1 BATTERY

1.1.1 MAIN BATTERY

The mobile computer is powered by a rechargeable 3.7 V/1800 mAh Li-ion battery pack. When the mobile computer is turned on, it takes approximately 4 hours to charge it to full from the power adaptor (using RS-232 cable or cradle) or less than 5 hours from the USB cable (at 500 mA).

For power-saving purpose, always turn off the backlight while working in a well-lit area. When the backlight is on for extended periods of time, the main battery will become low sooner than expected.

The smart battery icon on the LCD screen shows the status of power consumption. There are two ways to monitor a low battery charge or discharged battery from the screen.

▶ Examine the level of the 4-bar battery icon
▶ Monitor voltage level (see section 3.5 Power)

1.1.2 BACKUP BATTERY

The backup battery on the main board takes charge when the main battery is removed or drained out. When fully charged, the 3.0 V/7 mAh rechargeable Lithium button cell helps retain data in SRAM and maintain the running of the real-time clock and calendar for at least 25 days without the main battery. In the meantime, you have to replace the main battery as soon as possible. It takes at least 48 hours to fully charge the backup battery. However, it is not necessary to fully charge the backup battery for the mobile computer to work.

▶ Monitor voltage level (see section 3.5 Power)

1.1.3 CAUTION OF LOW BATTERY CHARGE

The battery pack is the only power source for the mobile computer to work. It also charges the backup battery on the main board so that the data stored in SRAM can be retained properly. Therefore, when the main battery charge goes low, you need to replace the battery pack with a charged one or charge it as soon as possible. Most of all, always save data before it is too late; you should upload important data on a regular basis.

Warning: Data loss may occur with SRAM during low battery condition. Always save data before running out of power or keep a fresh battery for replacement.

1.2 MEMORY

The collected data can be sent back to a host computer immediately over wireless networks, or stored in memory (SRAM) and upload later. The mobile computer is equipped with a calendar chip for accurate time/date logging. When the main battery is removed or drained, the backup battery on the main board is to retain the contents of SRAM and maintain the running of real-time clock and calendar for at least 25 days, on condition that the backup battery has already been fully charged.

If you want to put away the mobile computer for a couple of days, you should be aware that data loss occurs when both the main and backup batteries discharge completely. Therefore, it is necessary to upload data and files before putting away the mobile computer!

1.2.1 READ-ONLY MEMORY (ROM)

4 megabytes flash memory for storing core, OS, application programs, fonts, etc.

1.2.2 RANDOM-ACCESS MEMORY (RAM)

Options include 4 or 16 megabytes SRAM for storing data. Its contents will be retained by the backup battery.

1.2.3 SD CARD

Secure Digital (SD) card is a flash memory data storage device. Up to 8 GB high capacity memory card (microSDHC) is supported. Refer to Inserting the Battery & Memory Card for how to insert the microSD or microSDHC card.

When the mobile computer is equipped with a SD card and connected to your computer via the USB cable, it can be treated as a removable disk (USB mass storage device) as long as it is configured properly through programming or the **System Menu**. Refer to 3.8 SD Card Menu.

1.3 KEYPAD

The mobile computer can be equipped with a keypad of 29 keys or 39 keys for system setup, user entry and so on. The keypad comes with programmable LED backlight, like the screen. Refer to 1.4 LCD for screen & backlight settings.

Silicon rubber has been chosen for their durability and prompt feedback. The key click can be configured through programming or the **System Menu**. Refer to 3.2.6 Key Click.

1.3.1 29-KEY LAYOUT

The layout of the 29-key keypad is similar to that of a telephone, which includes alphanumeric, navigation and function keys, as well as assorted characters and two modifier keys. Refer to Appendix III — Key Reference Tables for color-coded keys.

Figure 3: 29-key Layout

This alphanumeric keypad is set to numeric mode by default. The blue modifier key serves as a toggle among numeric, alpha (lower-case alphabetic), and ALPHA (upper-case alphabetic) input modes.

Note: It is not necessary to hold down the blue modifier key.

The alpha icon will appear on the lower-left corner of the screen in a sequence as shown below.

Status Icon	Alpha Key	Input Mode
(none)	N/A	Numbers
A	Press ▭ one time	Capital letters
a	Press ▭ two times	Small letters

When in alpha mode, it takes turns to show alphabets and number when you keep pressing the same key; each press must not exceed one second. For example, keep pressing the number key [2], it will take turns to show "A", "B", "C" or "2" for upper-case, and "a", "b", "c" or "2" for lower-case.

‣ When you first press the number key [2], it will product the letter "A" or "a".

‣ When you press the number key [2] twice (the time interval must not exceed one second), it will produce the letter "B" or "b".

‣ When you press the number key [2] three times (the time interval between each press must not exceed one second), it will produce the letter "C" or "c".

‣ When you press the number key [2] four times (the time interval between each press must not exceed one second), it will produce the number "2".

In order to get the desired character, you will need to press the same key, one to four times (the time interval between each press must not exceed one second). Only when you stop pressing the same key for longer than one second or you press another key, will the system send the real key code to the application program.

The orange modifier key ▮ works with a key on which orange-coded function or character is printed at the upper-right corner. Press the orange key, and its associated icon ⌐ will be displayed on the screen. Press the second key, say [F1], to complete the key combination and access the function [F5]. The icon ⌐ will not go off until you press the orange key again.

Orange-coded function or character printed at the upper-right corner

Below briefly describes the functions of common keys on the mobile computer.

SCAN

This yellow key is used to trigger the scan engine so that it can read a barcode when the COM port is enabled.

ENTER

This key is on the right side of the **SCAN** key. Normally, it is used for command execution or input confirmation.

ESC (Escape)

This key is on the left side of the **SCAN** key. Normally, it is used to stop and exit the current operation.

Navigation Keys

These keys are used to move the cursor left, up, down, or right.

▶ While pressing [*], they can be used to adjust the luminosity and contrast of the screen backlight.

BkSp (Backspace)

This key is **Backspace** by default. If this key is being held down for more than one second, a `clear` code will be sent.

▶ While pressing the key along with the orange modifier key [ ], it becomes the **Delete** key.

Backlight Configuration Key

This key is used to turn ON/OFF the backlight of the LCD and keypad. Also, while pressing [*], the navigation keys can be used to adjust the luminosity and contrast of the screen backlight.

Key	Description
[*] [▶]	Press these keys at the same time to increase the contrast.
[*] [◀]	Press these keys at the same time to decrease the contrast.
[*] [▲]	Press these keys at the same time to increase the luminosity.
[*] [▼]	Press these keys at the same time to decrease the luminosity.

Orange Modifier Key

This key is a modifier key that requires pressing a second key to get the orange-coded function (F5~F8, Tab, Del) printed on the upper-right corner of the second key.

Icon	Description
F	By default, the function toggle is set to Toggle mode, and its behavior is as described below:
	This icon appears when you press the orange modifier key, indicating it is set to the function mode. Then, press a second key to get the desired function (F5~F8, Tab, Del).
	▸ The icon will not go off until you press the orange key again.

Blue Modifier Key

This key is a modifier key that requires pressing a second key to get the blue-coded letter (A~Z) or symbol printed on the right side of the second key.

Icon	Description
A	This icon appears when you press the blue key once, indicating it is set to alphabetic mode for typing capital letters.
a	This icon appears when you press the blue key twice, indicating it is set to alphabetic mode for typing small letters.

Power Key

In order to prevent an accidental press of the POWER key, you need to hold down this key for approximately 1.5 seconds to turn ON/OFF the mobile computer.

Note: (1) Functionality of keys is application-dependent. The system will send the associated key code to the application program, and it is up to the application program to interpret the key code.
(2) When a status icon appears on the screen, it indicates a certain mode is activated and it is not necessary to hold down the modifier key.

1.3.2 39-KEY LAYOUT

The layout of the 39-key keypad includes numeric, navigation and function keys, as well as assorted characters and two modifier keys.

Refer to Appendix III — Key Reference Tables for color-coded keys.

Figure 4: 39-key Layout

This alphanumeric keypad is set to numeric mode by default. The blue modifier key serves as a toggle among numeric, alpha (lower-case alphabetic), and ALPHA (upper-case alphabetic) input modes.

Note: It is not necessary to hold down the blue modifier key.

The alpha icon will appear on the lower-left corner of the screen in a sequence as shown below.

Status Icon	Alpha Key	Input Mode
(none)	N/A	Numbers
A	Press ⬡ one time	Capital letters
a	Press ⬡ two times	Small letters

The orange modifier key works with a key on which orange-coded function or symbol is printed on the right side. Press the orange key, and its associated icon will be displayed on the screen. Press the second key, say F1, to complete the key combination and access the function F11. The icon will not go off until you press the orange key again.

Blue-coded alphabetic letter printed above the upper-right corner

Orange-coded function or symbol printed to the right side

Below briefly describes the functions of common keys on the mobile computer.

SCAN

This yellow key is used to trigger the scan engine so that it can read a barcode when the COM port is enabled.

ENTER

This key is on the right side of the **SCAN** key. Normally, it is used for command execution or input confirmation.

ESC (Escape)

This key is on the left side of the **SCAN** key. Normally, it is used to stop and exit the current operation.

Navigation Keys

These keys are used to move the cursor left, up, down, or right.

▸ While pressing ✸, they can be used to adjust the luminosity and contrast of the screen backlight.

BkSp (Backspace)

This key is **Backspace** by default. If this key is being held down for more than one second, a `clear` code will be sent.

▸ While pressing the key along with the orange modifier key ⬤, it becomes the **Delete** key.

Backlight Configuration Key

This key is used to turn ON/OFF the backlight of the LCD and keypad. Also, while pressing ✸, the navigation keys can be used to adjust the luminosity and contrast of the screen backlight.

Key	Description
✸ ▶	Press these keys at the same time to increase the contrast.
✸ ◀	Press these keys at the same time to decrease the contrast.
✸ ▲	Press these keys at the same time to increase the luminosity.
✸ ▼	Press these keys at the same time to decrease the luminosity.
⬤ ▪•▪	Same as ✸ ▶
⬤ 0▪	Same as ✸ ◀

Orange Modifier Key

This key is a modifier key that requires pressing a second key to get the orange-coded function (F11~F20, Tab, Del) or symbol printed to the right side of the second key.

Icon	Description
F	By default, the function toggle is set to Toggle mode, and its behavior is as described below:
	This icon appears when you press the orange modifier key, indicating it is set to the function mode. Then, press a second key to get the desired function (F11~F20, Tab, Del) or symbol.
	▸ The icon will not go off until you press the orange key again.

Blue Modifier Key

This key is a modifier key that requires pressing a second key to get the blue-coded letter (A~Z) printed above the upper-right corner of the second key.

Icon	Description
A	This icon appears when you press the blue key once, indicating it is set to alphabetic mode for typing capital letters.
a	This icon appears when you press the blue key twice, indicating it is set to alphabetic mode for typing small letters.

Power Key

In order to prevent an accidental press of the POWER key, you need to hold down this key for approximately 1.5 seconds to turn ON/OFF the mobile computer.

Note: (1) Functionality of keys is application-dependent. The system will send the associated key code to the application program, and it is up to the application program to interpret the key code.
(2) When a status icon appears on the screen, it indicates a certain mode is activated and it is not necessary to hold down the modifier key.

1.4 LCD

The mobile computer comes with a 3" FSTN graphic LCD, 160 by 160 pixels resolutions, which can be programmed to display text or graphics, such as specific font and company logo, to meet varying application needs.

Options	Font Size (pixels)	Characters by lines
English font	Font size 6×8 (pixels)	26 characters by 18 lines
	Font size 8×16 (pixels)	20 characters by 9 lines
Chinese font	Font size 12×12 (pixels)	13 characters by 12 lines
	Font size 16×16 (pixels)	10 characters by 9 lines
Other language fonts, company logo...	Programmable	

Note: The bottom line (ICON_ZONE) is reserved to display status icons, such as the battery icon.

1.4.1 ADJUSTING THE BACKLIGHT

The backlight of screen and keypad helps ease reading under dim environments. It can be turned on and adjusted decreasingly or increasingly by the following key combinations. Keep pressing the key combination until the luminosity or contrast is decreased or increased to a desired level. Alternatively, the luminosity and contrast can be configured through programming or the **System Menu**. Refer to 3.2.2 Backlight and 3.2.3 Contrast.

Note: Using backlight while on battery power will substantially reduce battery power. We suggest you to dim the backlight while working in a well-lit area or have it set to be automatically turned off when not in use.

Key Combination		Action
29-key	**39-key**	
☀	✸	Toggle ON/OFF the backlight
☀ ▲	✸ ▲	Turn ON the backlight and increase the luminosity of LCD
☀ ▼	✸ ▼	Turn ON the backlight and decrease the luminosity of LCD
☀ ▶	✸ ▶	Turn ON the backlight and increase the contrast of LCD
☀ ◀	✸ ◀	Turn ON the backlight and decrease the contrast of LCD
	🔶 ⚫	Same as ✸ ▶
	🔶 0	Same as ✸ ◀

Note: Hold down the first key, and keep pressing the second key for adjustment.

1.5 NOTIFICATIONS

1.5.1 STATUS LED

There are two dual-color LED indicators above the screen. Both can be programmed to provide information that helps diagnosing. For example, if you are using AG runtime, you will be informed of the scanning result immediately. LED1 is used for "Good Read" and will become solid green upon reading a barcode successfully.

▶ LED1 is used to provide information on the charging status and barcode decoding.

▶ LED2 is used to provide information on wireless communications.
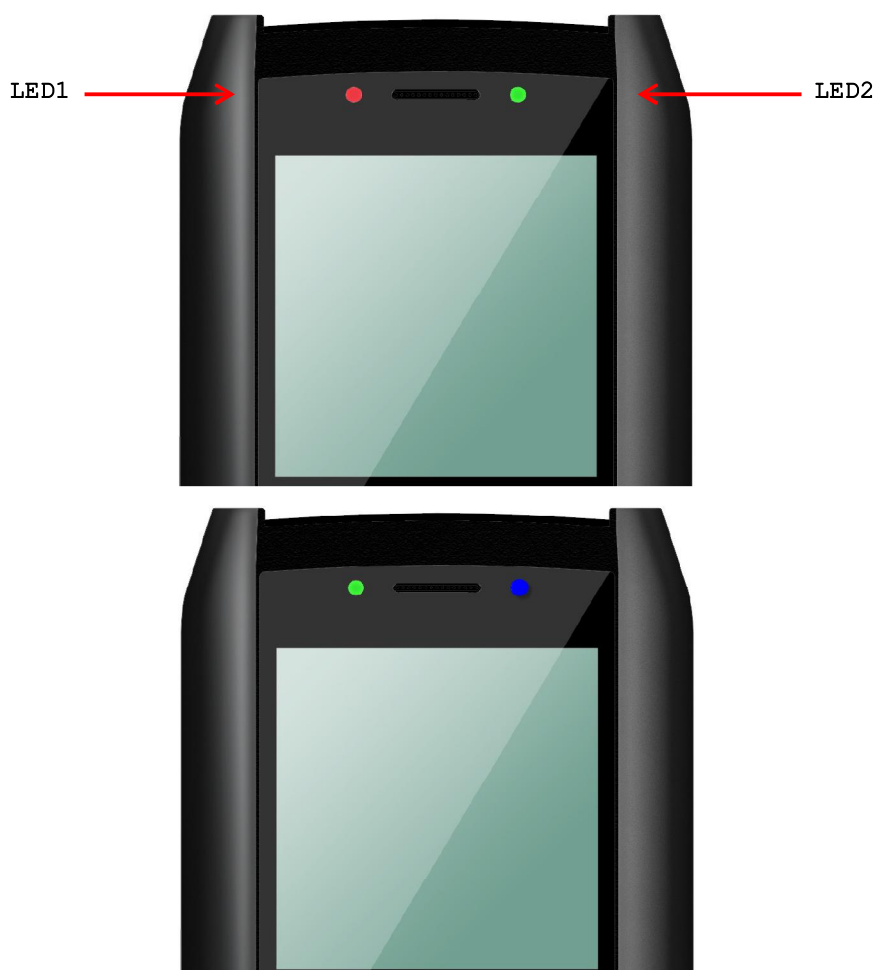
Figure 5: LED Indicators

LED1: Red/Green	Red	Green
User Power ON	User definable	User definable ▸ Solid green for Good Read by default
Power Off, Battery Charging	System default ▸ Flashing red: Charging	System default ▸ Flashing green: Charging done
Charging Error	System default ▸ Flashing red and green: Charging error occurs	

LED2: Blue/Green	Blue	Green
Bluetooth	System default ▸ Flashing blue, quickly: Waiting for connection or connecting ▸ Flashing blue, slowly: Connected	---
Wi-Fi	---	System default ▸ Flashing green, quickly: Waiting for connection or connecting ▸ Flashing green, slowly: Connected

1.5.2 AUDIO

The mobile computer has a low power transducer type buzzer, which can be programmed for status feedback. Its volume can be configured through programming or the **System Menu**. Refer to 3.2.7 Buzzer Volume.

In particular, its frequency and duration are software programmable for Good Read, such as in **CipherNet** programs.

1.5.3 VIBRATOR

The mobile computer is integrated with a vibrator, which can be programmed for status feedback. It can be helpful when working in noisy environments. In particular, the vibrator is software programmable for Good Read, such as in **CipherNet** programs.

1.6 DATA CAPTURE

A wide variety of scan engines is available for delivering flexibility to meet different requirements. Depending on the scan engine integrated, the mobile computer is capable of scanning barcodes of a number of symbologies that are enabled by default while running the preloaded AG runtime. Refer to 3.3.1 Reader for functional test.

If you need to scan barcodes that are encoded in a symbology, which is disabled by default in AG runtime, **Application Generator** (AG*.exe) allows configuring symbology settings, as well as reader settings. First, enable the desired symbologies, and then, download the application settings to the mobile computer.

Note: For details on configuring reader and symbology settings, please refer to the documentation of the software you use.

Varying by the scan engine installed, the supported symbologies are listed below.

▸ 1D CCD scan engine
▸ 1D Laser scan engine
▸ 2D scan engine

Note: In AG or CipherNet runtime, not all of the symbologies are enabled by default. Instead of running any of them, you can develop your own applications to control the scan engine for data collection.

Symbologies Supported (Default Setting: Enable/Disable)		CCD	Laser	2D
Codabar		Enabled	Enabled	Enabled
Code 11				Enabled
Code 93		Enabled	Enabled	Enabled
Composite Code	CC-A/B			Disabled
	CC-C			Disabled
	TCIF Linked Code 39			Enabled
MSI		Disabled	Disabled	Enabled
Plessey		Disabled	Disabled	
Postal Codes				Enabled
Telepen		Disabled	Disabled	
Code 128	Code 128	Enabled	Enabled	Enabled
	GS1-128 (EAN-128)	Enabled	Enabled	Enabled
	ISBT-128	Disabled	Disabled	Disabled
Code 2 of 5	Industrial 25 (Discrete 25)	Enabled	Enabled	Enabled
	Interleaved 25	Enabled	Enabled	Enabled
	Matrix 25	Disabled	Disabled	

Code 3 of 9	Code 39	Enabled	Enabled	Enabled
	Trioptic Code 39			Disabled
	Italian Pharmacode (Code 32)	Disabled	Disabled	Disabled
	French Pharmacode	Disabled	Disabled	
EAN/UPC	EAN-8	Enabled	Enabled	Enabled
	EAN-8 Addon 2	Disabled	Disabled	Enabled
	EAN-8 Addon 5	Disabled	Disabled	Enabled
	EAN-13	Enabled	Enabled	Enabled
	EAN-13 & UPC-A Addon 2	Disabled	Disabled	Enabled
	EAN-13 & UPC-A Addon 5	Disabled	Disabled	Enabled
	Bookland EAN (ISBN)	Disabled	Disabled	Disabled
	UPC-E0	Enabled	Enabled	Enabled
	UPC-E1	Disabled	Disabled	Disabled
	UPC-E Addon 2	Disabled	Disabled	Enabled
	UPC-E Addon 5	Disabled	Disabled	Enabled
	UPC-A	Enabled	Enabled	Enabled
GS1 DataBar (RSS)	GS1 DataBar Omnidirectional (RSS-14)	Disabled	Disabled	Enabled
	GS1 DataBar Limited (RSS Limited)	Disabled	Disabled	Enabled
	GS1 DataBar Expanded (RSS Expanded)	Disabled	Disabled	Enabled
2D Symbologies	PDF417			Enabled
	MicroPDF417			Enabled
	Data Matrix			Enabled
	Maxicode			Enabled
	QR Code			Enabled

1.7 CHARGING & COMMUNICATIONS

Normally, the mobile computer ships with a USB or RS-232 cable for charging and communications. A variety of cradles are available to meet different requirements.

USB Interface Cable

Task	USB Cable
Charging	USB direct charging ▶ 500 mA: USB icon, flashing ▶ 100 mA: Highlighted USB icon, flashing 5 V charging from the adaptor ▶ Plug icon, flashing
Communications	USB Virtual COM — If using Application Generator software, you may use a download utility to receive data on your computer; otherwise, run HyperTerminal.exe to receive data directly. USB HID — Run a text editor on your computer to receive data directly.

Note: If you are using USB Virtual COM for the first time, you must install its driver from the CD-ROM. Driver version 5.3 or later is required. Please remove older versions! The Virtual COM port will not be assigned until you run the Echo Test or enter the "Download" mode.

RS-232 Interface Cable

Task	RS-232 Cable
Charging	5 V charging from the adaptor ▶ Plug icon, flashing
Communications	If using Application Generator software, you may use a download utility to receive data on your computer; otherwise, run HyperTerminal.exe to receive data directly.

Cradle

Task	Cradle Interface
Charging	5 V charging from the adaptor ▶ Plug icon, flashing
Communications	Depends on the cradle type and its associated settings — ▶ USB ▶ RS-232 ▶ Modem ▶ Ethernet ▶ GPRS/GSM

Warning: It is recommended that the charging devices be operated at room temperature (18°C to 25°C) for optimal performance. The charging devices will not charge the battery when the temperature exceeds 40°C.

1.7.1 INTERFACE CABLE OPTIONS

For charging via the USB cable, the standard charging current is 500 mA. However, we recommend you to connect the power adaptor to speed up charging the battery.

▸ If you connect the mobile computer to a USB hub, the charging current may be insufficient. In that case, change the charging current to 100 mA after connecting the USB cable. It will take a longer time to charge to full. Refer to 3.2.9 USB Charge Current.
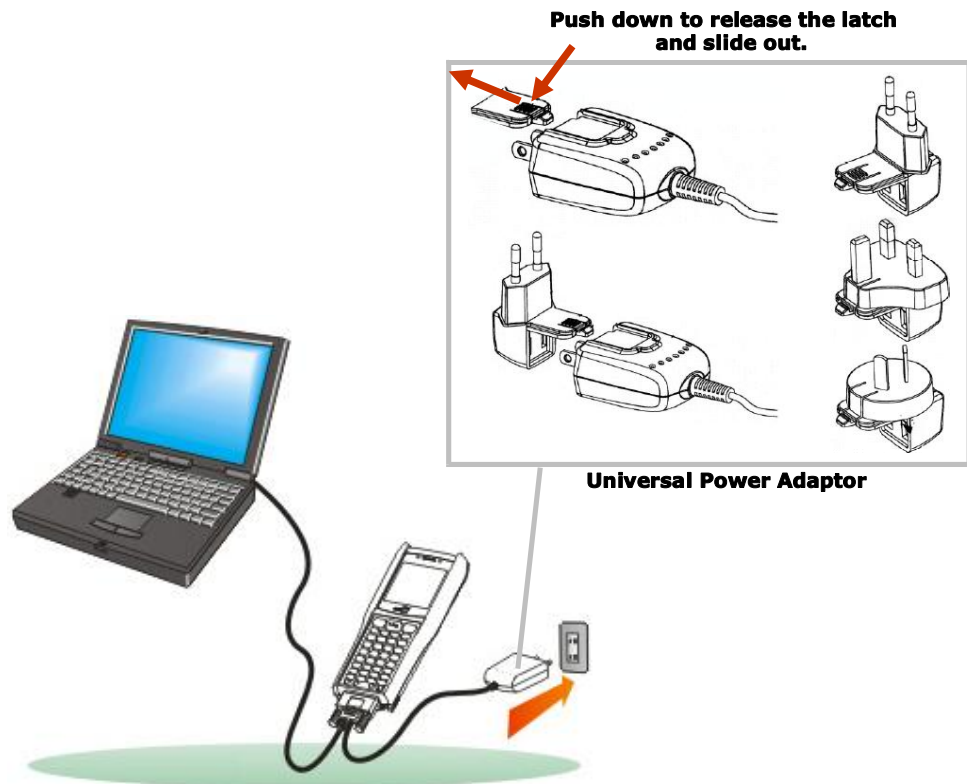

Figure 6: Using USB/RS-232 cable

Warning: The mobile computer may fail to function when it is solely on USB power and without a battery loaded. In that case, you should either install the battery or connect the power adaptor.

1.7.2 CRADLE OPTIONS

The cradle is designed for charging and communications at the same time. You may choose a cradle type that best suits your needs.

1) Place the cradle on a flat and clean surface, and seat the mobile computer in the cradle.

2) Connect the power supply cord to the power jack on the back of the cradle, and then connect the other end of the power supply cord to a suitable power outlet. The cradle is ready for charging the mobile computer.

3) If data communications are desired at the same time, you can establish a proper connection with a computer or remote host. Refer to the separate manual for configuring the Ethernet Cradle or GPRS/GSM Cradle (EDGE/Quad-band).

Figure 7: Setting up cradle

Charging & Communication Cradle
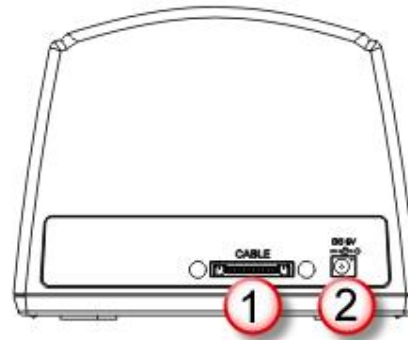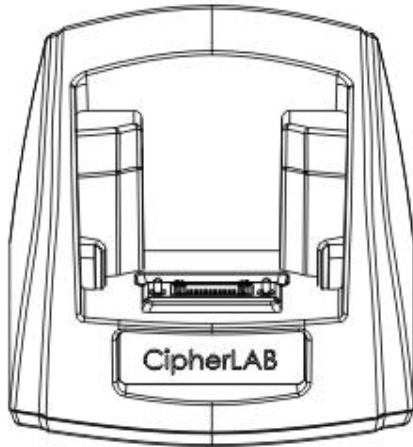
No.	Description	No.	Description
1	Cable Connector (USB or RS-232)	2	Power Jack

Modem Cradle
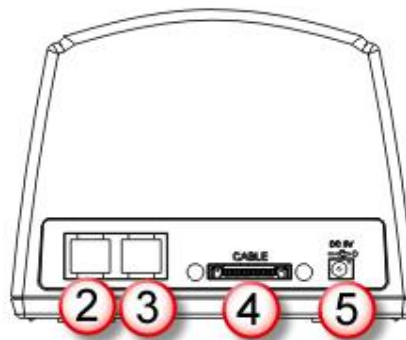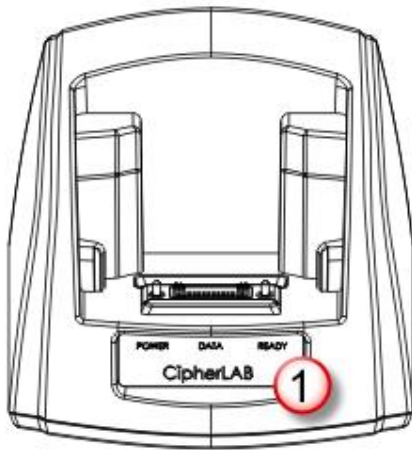
No.	Description	No.	Description
1	LED Indicators (POWER, DATA, READY)	2	Line/Phone Jack
3	Line/Phone Jack	4	Cable Connector (USB or RS-232)
5	Power Jack		

Ethernet Cradle
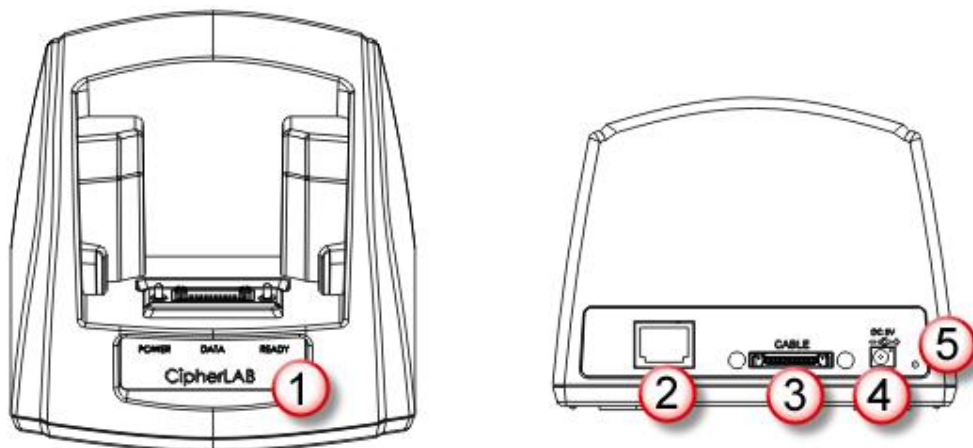
No.	Description	No.	Description
1	LED Indicators (POWER, DATA, READY)	2	Ethernet Port (RJ-45)
3	Cable Connector (USB or RS-232)	4	Power Jack
5	IP Reset Switch		

GPRS/GSM Cradle (EDGE/Quad-band)
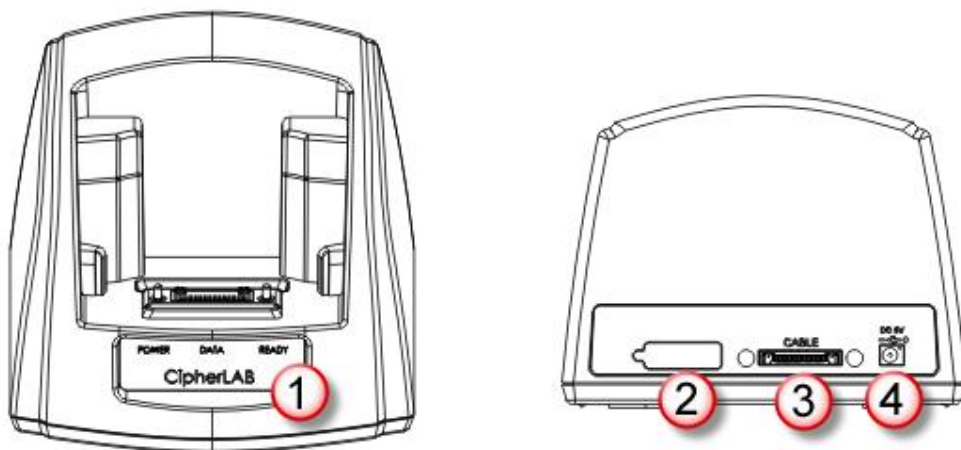
No.	Description	No.	Description
1	LED Indicators (POWER, DATA, READY)	2	SIM Card Slot
3	Cable Connector (USB or RS-232)	4	Power Jack

1.7.3 4-SLOT CHARGING CRADLE

Below is the 4-Slot Battery Charger.

1) The Battery Charger can be mounted on table or wall. Drill two holes (centers spaced 105 millimeters apart), secure the two supplied screws, and mount the Battery Charger by sliding over screws.

2) Seat batteries with contacts facing to back.

3) Connect the power supply cord to the power receptacle on the charger. Connect the other end of the power supply cord to a suitable power outlet.

4) Press the power switch on, and the Battery Charger's LED will be blue.

5) While charging, the LED of the battery compartment will be red. When fully charged, the LED will be green.

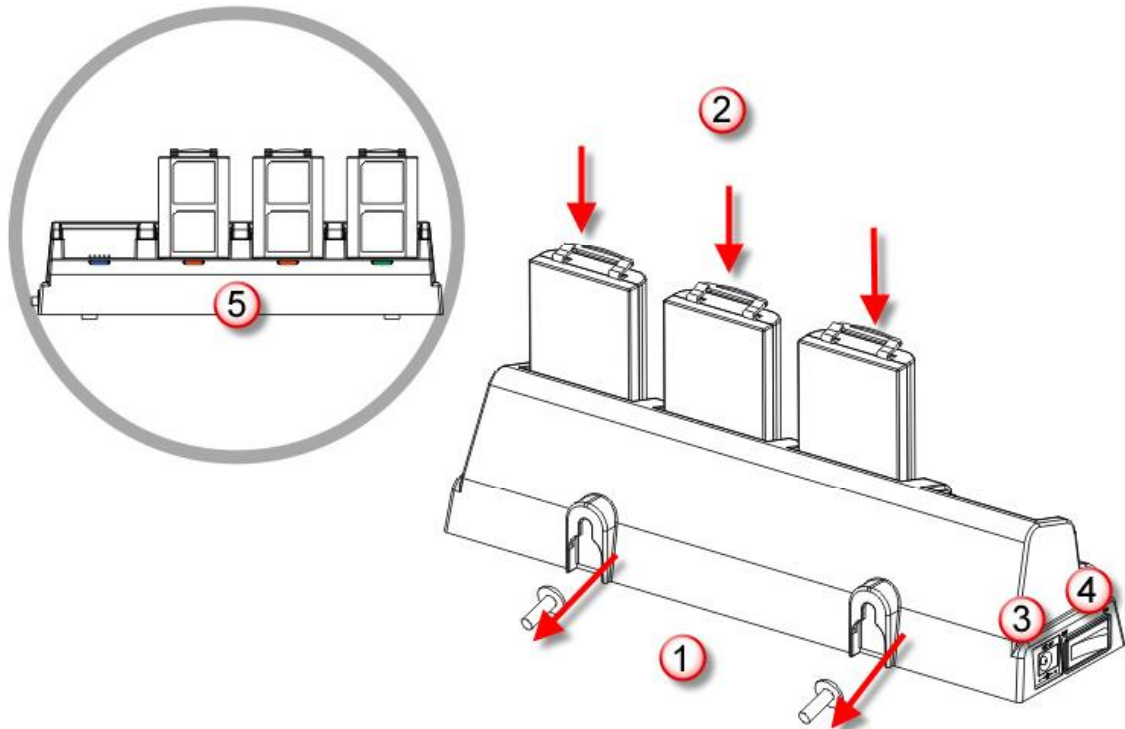*Figure 8: 4-Slot Battery Charger*

LED	Status	Meaning
Power	Solid blue	Power ON
	Off	Power OFF
Battery Charging	Solid red	Charging battery
	Solid green	Charging done
	Off	Battery not ready

Chapter 2

LEARNING SOFTWARE ARCHITECTURE

This chapter mainly describes the software inside the mobile computer. It consists of three modules — Kernel, System, and Application; each has a function menu.

When a menu is displayed, you may select an item by either of the following ways:

▶ Press the arrow keys ▲ (Up) ▼ (Down) to move the highlight bar.
▶ Press the number key that corresponds to the item number.
▶ Follow the on-screen instructions to change a specific setting, or press [ESC] to return to a previous page or menu.
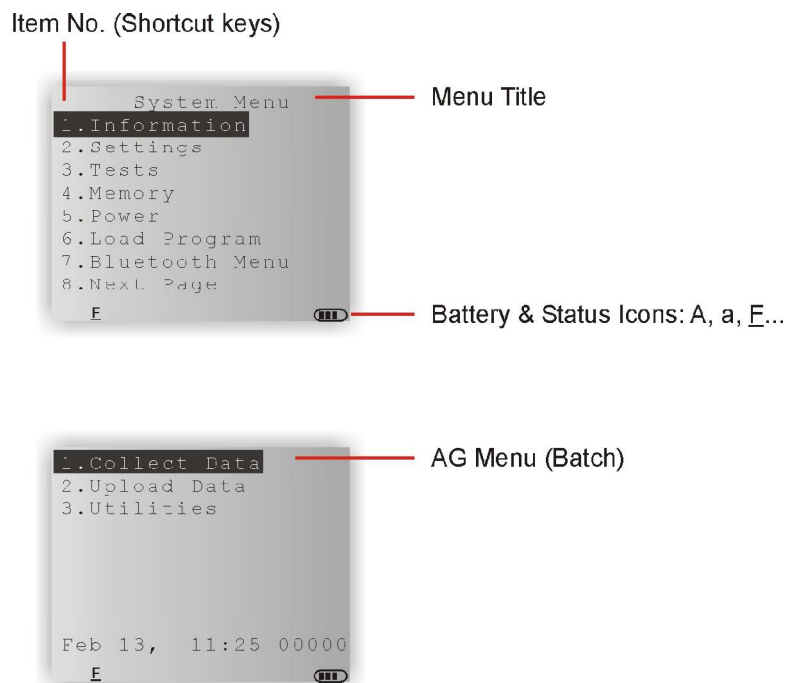
On each screen, the bottom line displays status icons, such as:

▶ The 4-bar battery icon indicates the current power status.

▶ The status icon of input mode is controlled by the blue modifier key: ▢ or ⬤

▶ The status icon of function mode is controlled by the orange modifier key: ▢ or ⬤

Figure 9: Software Architecture

IN THIS CHAPTER

2.1 APPLICATION MODULE

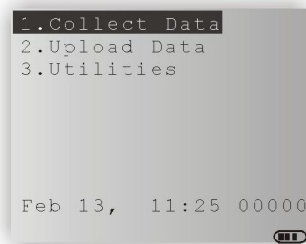For easy development of applications, the mobile computer ships with development tools on the CD-ROM. It includes Windows-based programs **Application Generator** (batch and WLAN), **CipherNet** (VT and 5250), download utilities, etc.
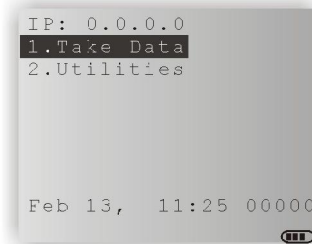
2.1.1 APPLICATION GENERATOR (AG)

The mobile computer is preloaded with AG runtime. When you turn on the mobile computer, it displays the Main Menu of AG application, as shown below.

Batch AG

```
1.Collect Data
2.Upload Data
3.Utilities




Feb 13,  11:25 00000
```

WLAN AG

```
IP: 0.0.0.0
1.Take Data
2.Utilities




Feb 13,  11:25 00000
```

Before using the mobile computer to collect data, you need to configure the application with the companion tool on your computer. This time-saving development tool helps create application templates on your computer.

For details on the AG application, please refer to separate user manual.

Application Generator	AG Runtime	Companion Tool on PC End
Batch AG	U8400*.SHX	AG8400.exe
WLAN AG	U84WLAN*.SHX	AG8400WLAN.exe

Note: The Application Generator (AG) software package includes
(1) a companion tool for quickly developing your application — Batch or WLAN AG;
(2) several download utilities to make it versatile in use.

2.1.2 CIPHERNET

The mobile computer supports VT100/220 and IBM 5250 terminal emulation for accessing a backend database. Instead of using **Application Generator**, you may download the terminal emulation program, i.e. **CipherNet Runtime**, to the mobile computer. Refer to 3.6 Load Program. Then, run individual companion tool on your computer.

For details on the **CipherNet** application, please refer to separate user manuals.

Terminal Emulation	CipherNet Runtime	Companion Tool on PC End
VT100/220	84xx-VT.SHX	CipherNet-VT.exe
IBM 5250	84xx-5250.SHX	CipherNet-5250.exe

2.1.3 USER PROGRAM

You may need to develop your own application program. For developing custom applications, CipherLab provides BASIC and C compliers through licensing. For detailed information, please contact your sales representative.

2.2 SYSTEM CONFIGURATION & CORE

For managing system configurations and multiple programs, each mobile computer comes with the **System Menu**, **Kernel**, and **Program Manager**. Refer to the following chapters on how to configure the 8400 Series Mobile Computer, regarding system configurations and program download.

2.2.1 SYSTEM MENU

The System Menu is bundled with BASIC Runtime or user programs that are written in "C". It is for system configuration, functionality testing, downloading font file and program.

2.2.2 KERNEL

Kernel is the innermost core of the OS. It provides services for downloading the active application program or font file, updating the kernel and configuring Bluetooth settings.

2.2.3 PROGRAM MANAGER

The Program Manager is part of the kernel. You may download as many as eight application programs, or seven programs plus one font file.

SYSTEM MENU

The **System Menu** is generated by a powerful utility, which offers an interface for engineers (programmers or system integrator) to view system information, change the configuration parameters, download programs and run diagnostics.

This menu is designed for engineering tests and maintenance ONLY. For this reason, the **System Menu** provides password protection to prevent unauthorized users from accidentally changing system settings.

Warning! The System Menu is NOT for the use of any end users. The system password helps ensure system safety and integrity.

How to access the System Menu?

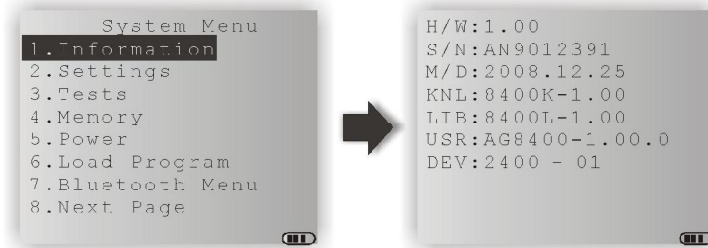1) Turn off the mobile computer.

2) Press [7] + [9] + [Power].

IN THIS CHAPTER

3.1 INFORMATION

Here provides important system information to help diagnose the system.

System Menu | 1. Information

H/W	Hardware version (PCB)
S/N	A serial number assigned to the mobile computer
M/D	Manufacturing date
KNL	Kernel version
LIB	C library version
BSC	BASIC Run-time version, if a BASIC application is downloaded
USR	Application program version
DEV	6-digit code for optional hardware configurations

‣ For example, 2400-01 indicates the 39-key mobile computer is equipped with Laser scan engine and 802.11b/g connectivity.

3.1.1 UNDERSTANDING DEVICE CODE

Device Code	Modular Component	Types	
1st digit	Reader module	0= none	
		1= CCD scan engine	
		2= Laser scan engine	
		3= 2D scan engine	
2nd digit	Wireless module	4= Bluetooth + 802.11b/g	(8470)
		5= Bluetooth only	(8400)
3rd digit	RFID module	0= N/A	
4th digit	Reserved	0	
5th digit	Keypad module	Keypad hardware version	
6th digit	Keypad Layout	0= 29-key	
		1= 39-key	

3.2 SETTINGS

You can change the default settings here.
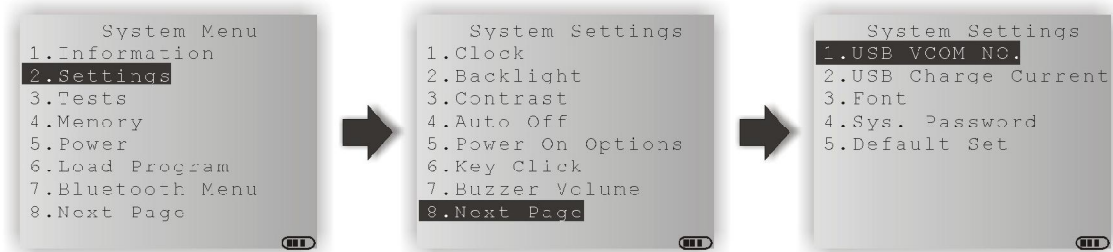
System Settings	Default Values
Clock	Current time
Backlight	20 seconds at level 2, backlight shade enabled
Contrast	Level 4
Auto Off	10 minutes
Power On Options	Program Resume
Key Click	Tone 2
Buzzer Volume	High volume level
USB VCOM No.	Fixed
USB Charge Current	500 mA
System Password	Open access
Font	System font
Reset to Default	Load factory settings

3.2.1 CLOCK

Set date and time for Real Time Clock. Enter two digits for the year, e.g. 04 for 2004.

3.2.2 BACKLIGHT

Set the backlight duration for the keypad and LCD.

‣ Enter a value between 0 and 9999 (second).
‣ Press the arrow keys ▲ (Up) ▼ (Down) to adjust the backlight level (4 levels).
‣ Press the ◀ (Left) key to adjust the shade effect.

3.2.3 CONTRAST

Set the contrast level for the LCD.

▶ Press the arrow keys [▲] (Up) [▼] (Down) to adjust the contrast level (7 levels).

3.2.4 AUTO OFF

The mobile computer will be turned off automatically when no operation is taking place during a specified period of time. Enter a value between 0 and 999 (minute).

Note: To disable this function, enter 0.

3.2.5 POWER ON (& WAKEUP EVENT) OPTIONS

Set the startup screen once the mobile computer is turned on, and specify which events will wake up the mobile computer:

Power On Options

Press the arrow keys [▲] (Up) [▼] (Down) to select "Program Resume" or "Program Restart", and then press [ENTER].

▶ Program Resume: When selected, the mobile computer will start from the last session of program before it is turned off.

▶ Program Restart: Press [ENTER] to select "Program Resume" or "Program Restart". When selected, the mobile computer will start from the first session of the program.

WakeUp Events

The specified events can wake up the mobile computer when the conditions are met. Press the arrow keys [▲] (Up) [▼] (Down) to select a specific event, and press [ENTER] to determine when it is treated as a wake-up event or not.

▶ PwrKey: If yes, it will wake up the mobile computer upon pressing the Power key.

▶ RS232: If yes, it will wake up the mobile computer upon connecting the RS-232 cable.

▶ RS232_RXD: If yes, it will wake up the mobile computer upon receiving a specific signal via the RS-232 cable.

▶ USB: If yes, it will wake up the mobile computer upon connecting the USB cable.

▶ Charging: If yes, it will wake up the mobile computer upon getting charged via the cradle or direct charging.

▶ Charged: If yes, it will wake up the mobile computer upon completion of charging.

▶ Alarm: If yes, it will wake up the mobile computer upon the alarm time is up. Alarm can be set up through programming only.

3.2.6 KEY CLICK

The system will produce an audible signal when any key on the keypad is pressed. The current value is highlighted. Select a desired tone for the buzzer or mute it.

3.2.7 BUZZER VOLUME

Set the buzzer volume.

▸ Press the arrow keys ▲ (Up) ▼ (Down) to adjust the volume level (3 levels).

3.2.8 USB VCOM NO

By default, it is set to use one Virtual COM port for all (=FIXED), regardless of how many 8400 mobile computers are connected to PC when USB Virtual COM is in use. This setting requires you to connect one 8400 at a time, and will facilitate configuring a great amount of 8400 mobile computers via the same Virtual COM port (for administrators' or factory use). If necessary, you can have it set to use variable Virtual COM port (=Change by Serial Number), which will vary by the serial number of each different 8400.

▸ Press the arrow keys ▲ (Up) ▼ (Down) to select between "Fixed" and "Change by Serial Number".

3.2.9 USB CHARGE CURRENT

By default, the USB charging current is set to 500 mA. For direct charging via the USB cable without supplying a power adaptor, the standard charging current is 500 mA. If you connect the mobile computer to a USB hub, the charging current may be insufficient. In that case, change the charging current to 100 mA after connecting the USB cable. It will take a longer time to charge to full.

▸ Press the arrow keys ▲ (Up) ▼ (Down) to select between "500 mA" and "100 mA".

Note: (1) USB direct charging, 500 mA: USB icon, flashing
(2) USB direct charging, 100 mA: Highlighted USB icon, flashing
(3) 5V charging from the adaptor: Plug icon, flashing

3.2.10 FONT

Font version information can be viewed here. It displays System Font if there is no custom font file. If a multi-language font file is downloaded, you will be able to select a font from the list.