CipherLab
Reference Manual

8400 Series Mobile Computer

8400/8470

Version 0.04

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.

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.

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
0.04	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

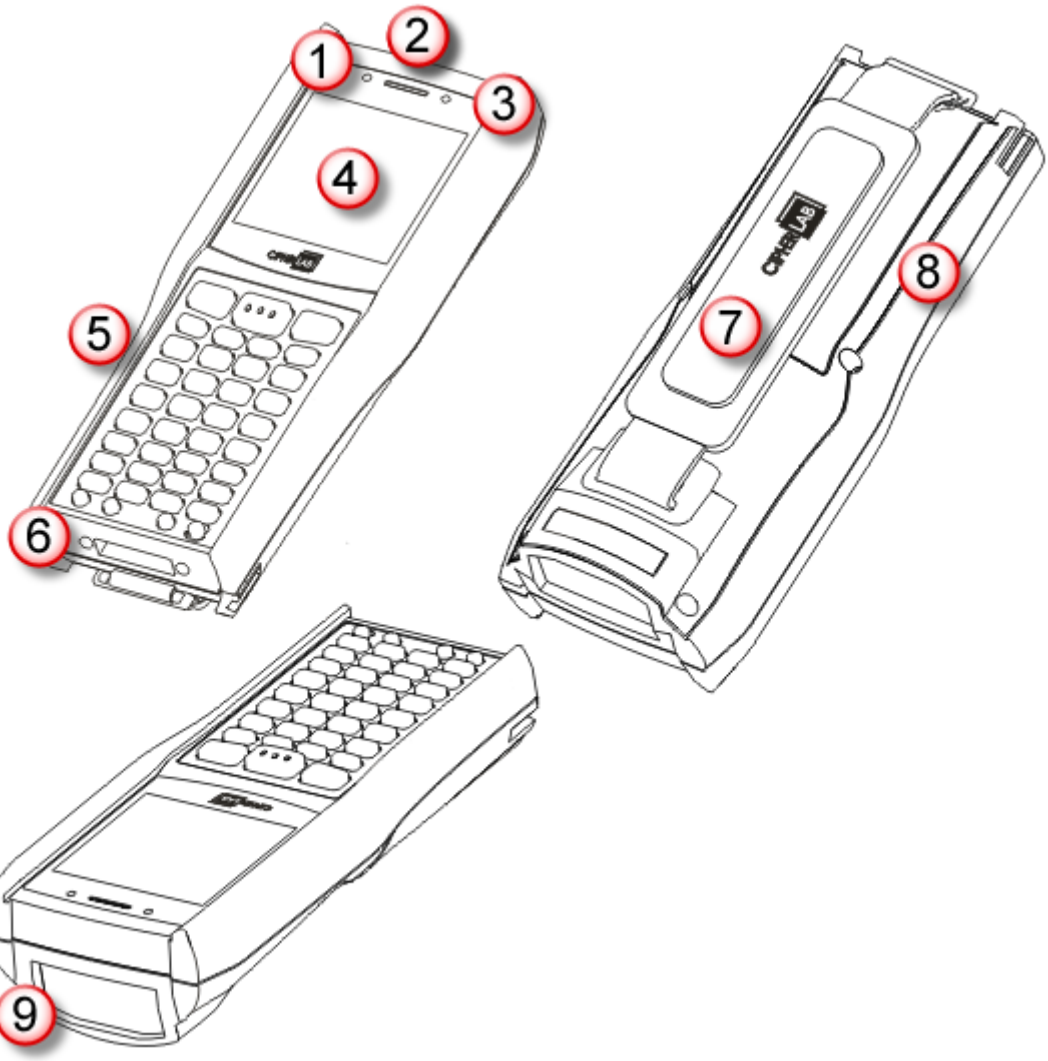


Figure 1: Overview

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.

CHARGING THE BATTERY

Instead of direct charging, you may use a cradle or charger to charge the Mobile Computer or spare batteries. Below is the 4-Slot Battery Charger.

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) 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.

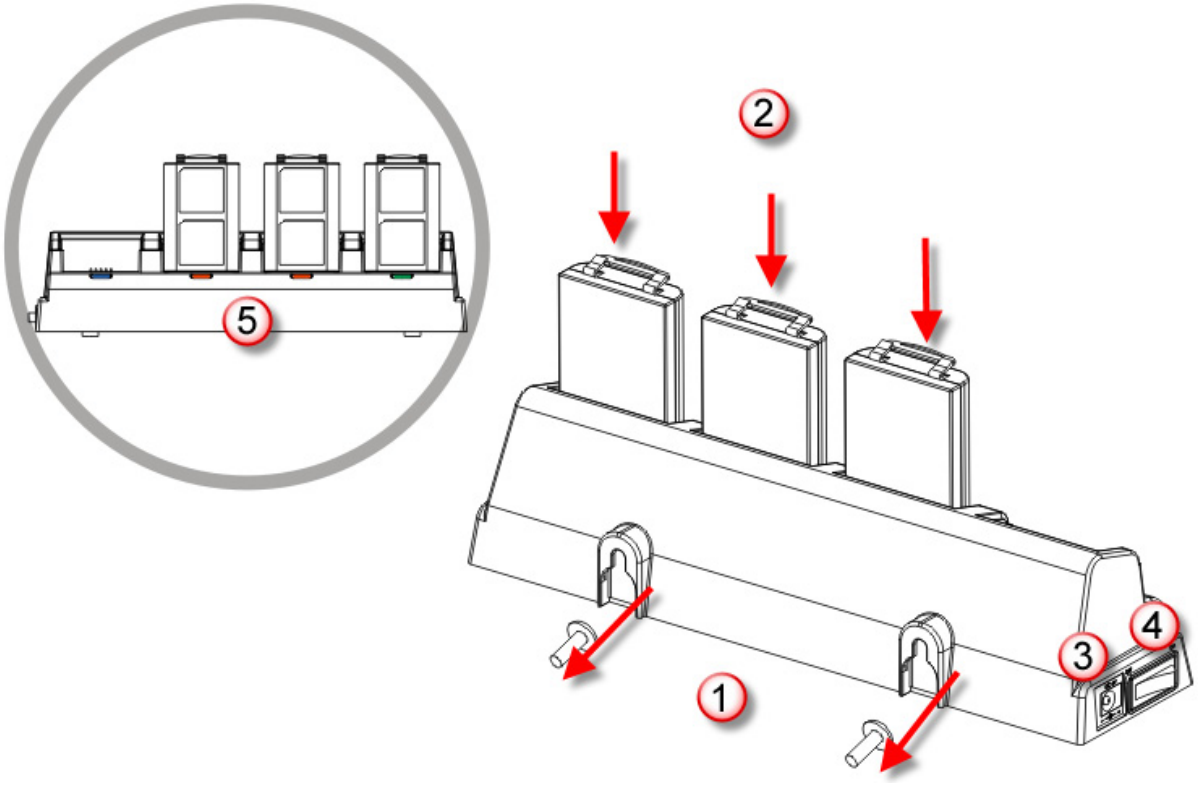


Figure 2: 4-Slot Battery Charger

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

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 or Ethernet (via cradle).
- 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 with 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 cable
- Charging & Communication Cradle
- Modem Cradle
- Ethernet Cradle (10/100 BASE-T)
- GPRS/GSM Cradle (EDGE/Quad-band)

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

- 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 four hous to charge it to full from the power adapter (via 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)

- 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 twenty-five days without the main battery. In the meantime, you have to replace the main battery as soon as possible.

  It takes at least thirty 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)

1.1.1 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.

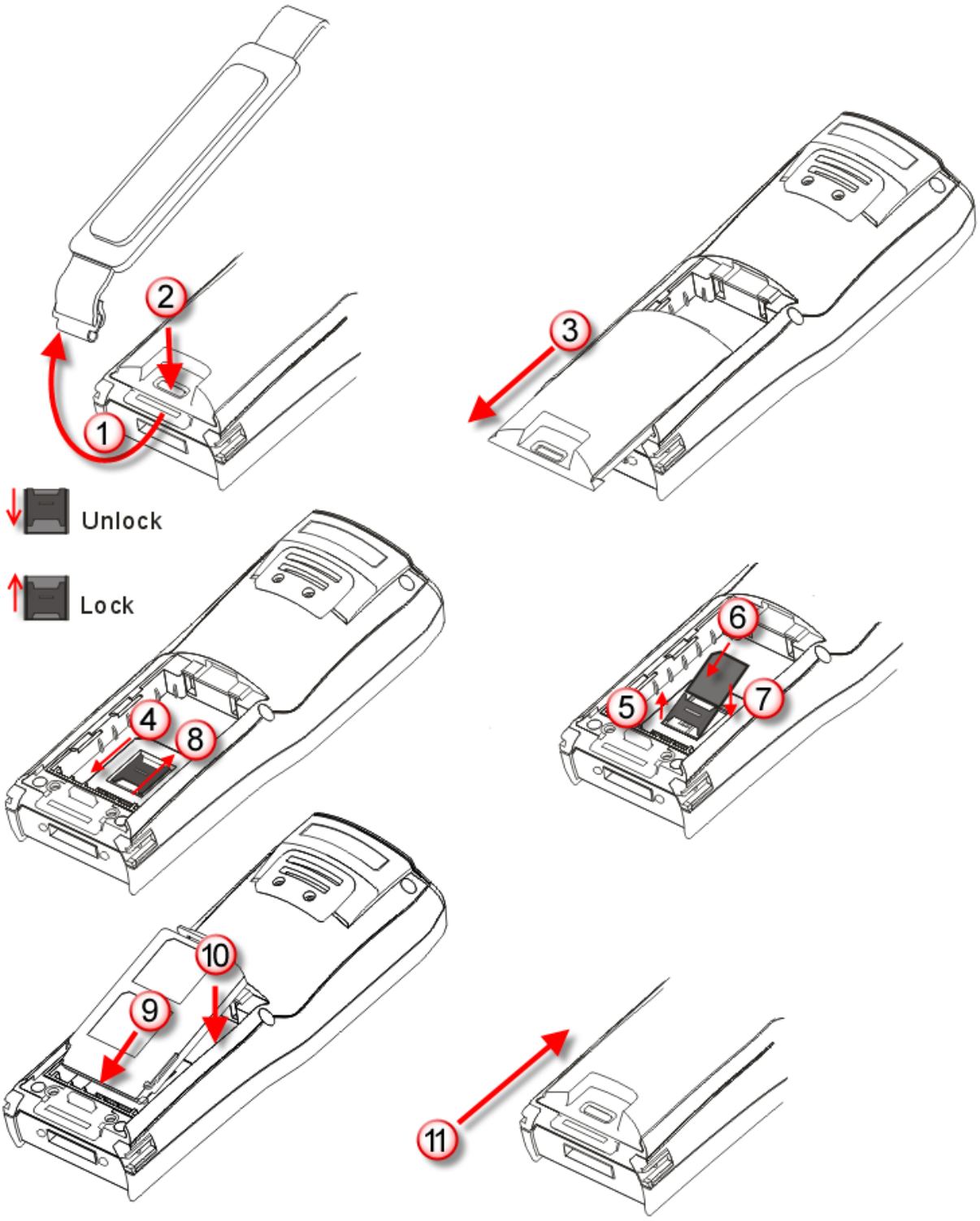


Figure 3: Installing the Main Battery & Memory Card

1.1.2 CHARGING THE BATTERY

The main and backup batteries may not be charged to full for shipment. When you first receive the package, you will need to charge batteries to full before using the mobile computer. (see section 1.7 Charging & Communications)

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

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.

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.

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.

1.1.4 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.

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

Up to 4 GB high capacity memory card (microSDHC) is supported. Refer to section 1.1.1 Inserting the Battery & Memory Card for how to insert the microSD or microSDHC card. It can be used as extended data memory or as a USB disk when connecting to your computer. (see section 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 section 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**.

1.3.1 29-KEY LAYOUT

The layout of the 29-key keypad is similar to that of a telephone, which consists of an alphanumeric keypad, navigation and function keys, as well as assorted characters.

Figure 4: 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 orange modifier key.

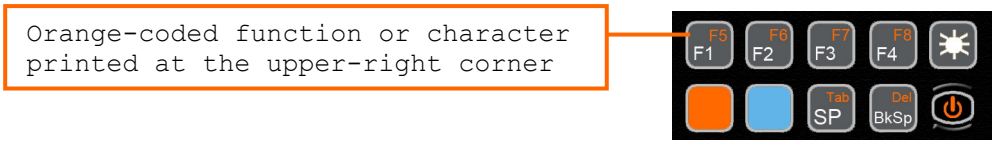
The alpha icon will appear on the lower-left corner of the screen in a sequence as shown below.

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".

- 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 , and its associated icon F will be displayed on the screen. Press the second key, say [F1], to complete the key combination and access the function [F5].

Key	Blue key pressed once	Blue key pressed twice	Key	Orange key pressed once	Orange key pressed twice
1	@	@	1	F11	1
2	ABC	abc	2	F12	2
3	DEF	def	3	F13	3
4	GHI	ghi	4	F14	4
5	JKL	jkl	5	F15	5
6	MNO	mno	6	F16	6
7	PQRS	pqrs	7	F17	7
8	TUV	tuv	8	F18	8
9	WXYZ	wxyz	9	F19	9
0	/*	/*	0	F20	0
-	+$	+$	-	F9	-
.	%#	%#	.	F10	.
			F1	F5	F1
			F2	F6	F2
			F3	F7	F3
			F4	F8	F4
			SP	Tab	SP
			BkSp	Del	BkSp

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.

Orange Modifier Key

This key is a modifier key that requires pressing a second key to get the orange-coded function or character printed on the upper-right corner of the second key.

Icon	Description
F	This icon appears when you press the orange modifier key  , indicating it is set to the function mode. Then, press a second key (F5~F8, Tab, Del) to get the desired function or character. The icon will go off then. - To get the value of another key combination modified by the blue key, repeat the above steps. - To exit the function mode, press  again and the icon will go off.

Blue Modifier Key

This key is a modifier key that requires pressing a second key to get the blue-coded symbol or character 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.

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 decrease the contrast.
	Press these keys at the same time to increase the contrast.
	Press these keys at the same time to increase the luminosity.
	Press these keys at the same time to decrease the luminosity.

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 KEYPAD

The layout of the 39-key keypad includes numeric, alphabetic, assorted characters, function and modifier keys.

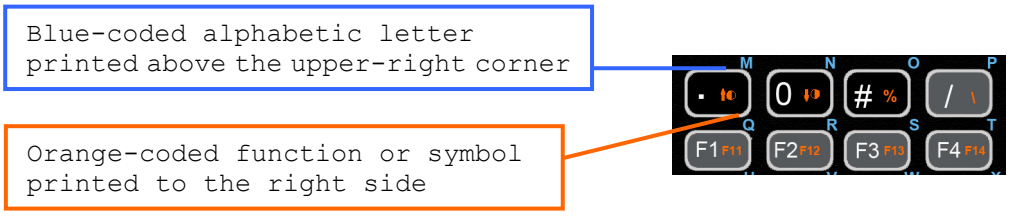
Figure 5: 39-key Layout

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 orange 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 , 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.

Key	Blue key pressed once	Blue key pressed twice	Key	Orange key pressed once	Orange key pressed twice
1	A	a	1	:	1
2	B	b	2	;	2
3	C	c	3	,	3
+	D	d	+	=	+
4	E	e	4	<	4
5	F	f	5	>	5
6	G	g	6	(	6

-	H	h	-	)	-
7	I	i	7	$	7
8	J	j	8	?	8
9	K	k	9	&	9
*	L	l	*	@	*
.	M	m	.		.
0	N	n	0		0
#	O	o	#	%	#
/	P	p	/	\	/
F1	Q	q	F1	F11	F1
F2	R	r	F2	F12	F2
F3	S	s	F3	F13	F3
F4	T	t	F4	F14	F4
F5	U	u	F5	F15	F5
F6	V	v	F6	F16	F6
F7	W	w	F7	F17	F7
F8	X	x	F8	F18	F8
F9	Y	y	F9	F19	F9
F10	Z	z	F10	F20	F10
			SP	Tab	SP
			BkSp	Del	BkSp

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  , these two keys  can be used to adjust the luminosity 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 blue modifier key  , it becomes the **Delete** key.

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.

Orange Modifier Key

This key is a modifier key that requires pressing a second key to get the orange-coded function or symbol printed to the right side of the second key.

Icon	Description
F	By default, the function toggle is set to Auto Resume 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 or symbol. The icon will go off then. ▸ To get the value of another key combination modified by the orange key, repeat the above steps.

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 of the screen backlight.

Key	Description
+ 0	Press these keys at the same time to decrease the contrast.
+ .	Press these keys at the same time to increase the contrast.
+ ▲	Press these keys at the same time to increase the luminosity.
+ ▼	Press these keys at the same time to decrease the luminosity.

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) Font size 8×16 (pixels)	26 characters by 18 lines 20 characters by 9 lines
Chinese font	Font size 12×12 (pixels) Font size 16×16 (pixels)	13 characters by 12 lines 10 characters by 9 lines
Other language fonts, company logo…	Programmable	

Note: Normally, 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.

Warning: Using backlight while on battery power will substantially reduce battery power. It is suggested to dim the backlight while working in a well-lit area or automatically turn it off when not in use.

Key Combination		Action
29-key	**39-key**	
		Toggle ON/OFF the backlight
		Turn ON the backlight of LCD and decrease its luminosity
		Turn ON the backlight of LCD and increase its luminosity
		Turn ON the backlight of LCD and increase its contrast
		Turn ON the backlight of LCD and decrease its contrast

Note: Hold down the [FN] key and press 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.

- LED1 is used to provide information on the charging status and barcode decoding.
- LED2 is used to provide information on wireless communications.

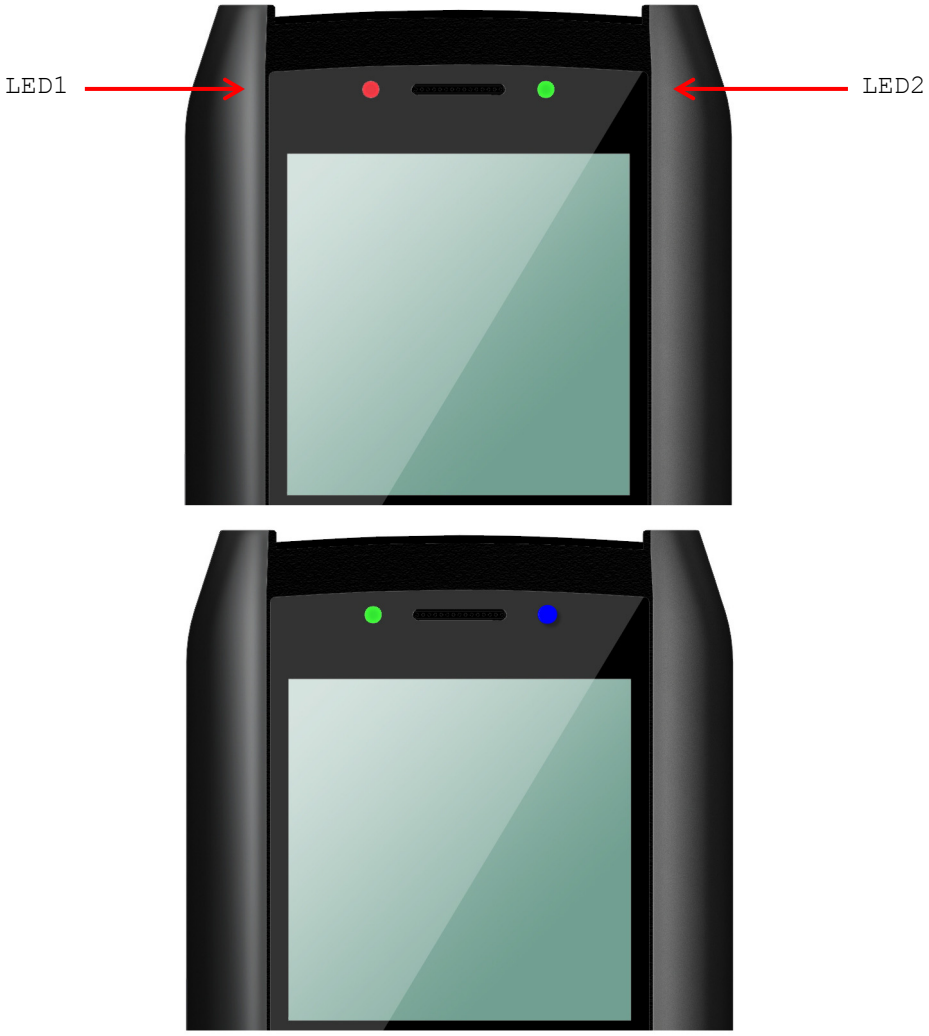


Figure 6: LED Indicators

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: 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
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 blue, quickly: Waiting for connection or connecting ▸ Flashing blue, slowly: Connected

1.5.2 AUDIO

The mobile computer has a low power transducer type buzzer. It can be programmed for status feedback. Its frequency and duration are software programmable.

1.5.3 VIBRATOR

The mobile computer is integrated with a vibrator, which is software programmable for feedback. This can be helpful when working in noisy environments.

1.6 DATA CAPTURE

A wide variety of scan engines is available for delivering flexibility to meet different requirements.

- 1D CCD scan engine
- 1D Laser scan engine
- 2D scan engine

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

Note: Instead of running the preloaded AG runtime or terminal emulation program, you can develop your own applications to control the scan engine for data collection.

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 section 3.3.1 Reader for functional test.

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

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

Symbologies Supported: 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
	EAN-128	Enabled	Enabled	Enabled
	ISBT-128	Disabled	Disabled	Disabled

Code 2 of 5	Industrial 25 (i.e. 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 (i.e. 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 (i.e. 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
RSS	RSS-14	Disabled	Disabled	Enabled
	RSS Limited	Disabled	Disabled	Enabled
	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.

1.7.1 INTERFACE CABLE OPTIONS

For charging via the USB cable without supplying a power adapter, 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. (see section 3.3.8 Charger)

USB Interface Cable

Task	USB Cable Only	USB Cable + Power Adapter
Charging	USB direct charging ▸ 500 mA: USB icon, flashing ▸ 100 mA: Highlighted USB icon, flashing	5 V charging from the adapter ▸ 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.	

RS-232 Interface Cable

Task	RS-232 Cable + Power Adapter
Charging	5 V charging from the adapter ▸ 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.

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 a separate manual for configuring the Ethernet Cradle or GPRS/GSM Cradle (EDGE/Quad-band).

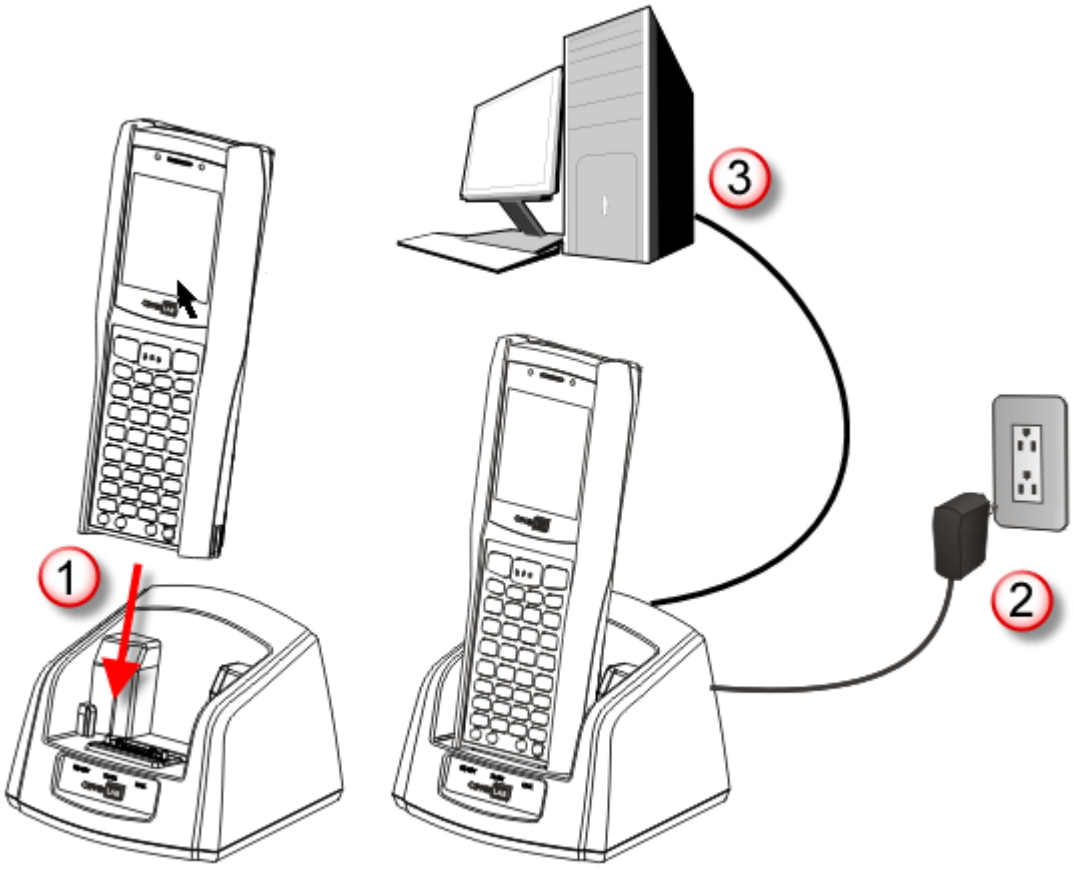
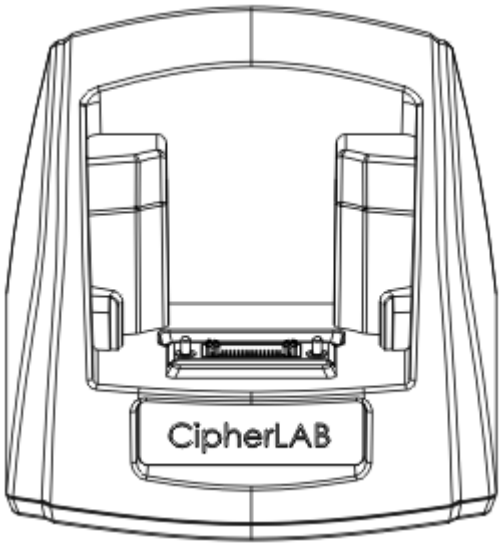
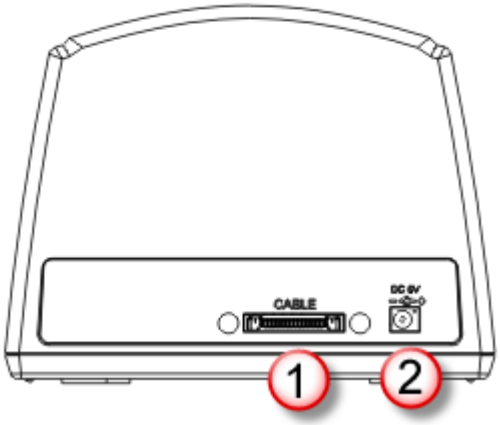


Figure 7: Setting up cradle

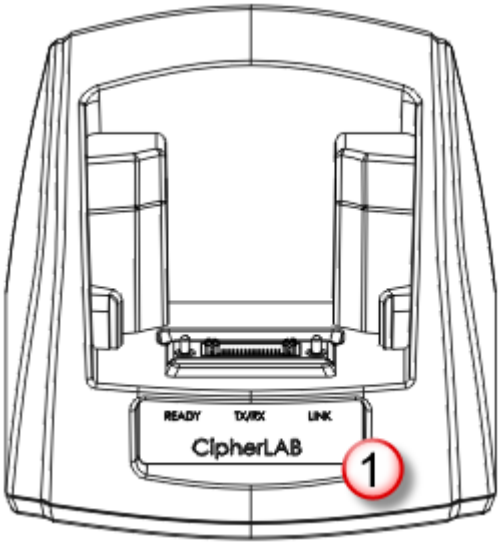
Charging & Communication Cradle

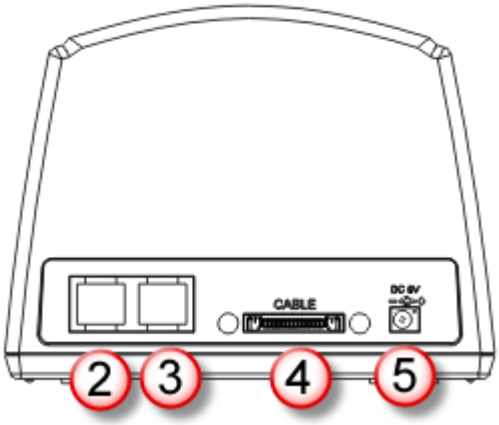




No.	Description	No.	Description
1	Cable Connector (USB or RS-232)	2	Power Jack

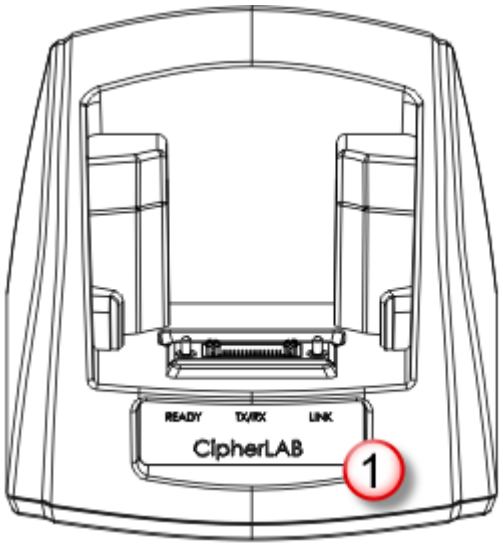
Modem Cradle

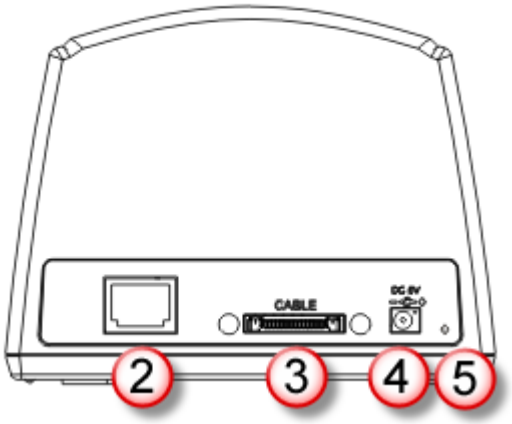




No.	Description	No.	Description
1	LED Indicators (Ready, TX/RX and Link)	2	Line/Phone Jack
3	Line/Phone Jack	4	Cable Connector (USB or RS-232)
5	Power Jack		

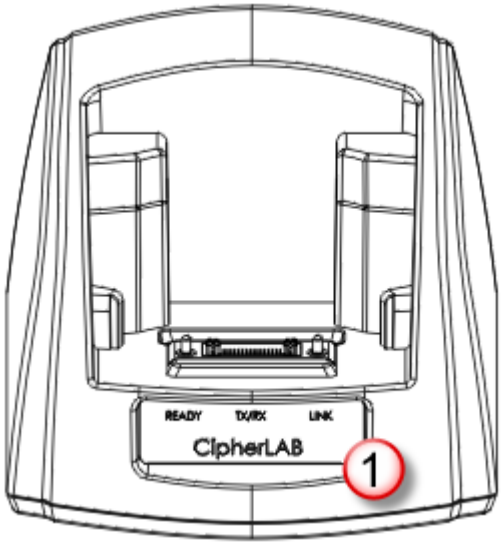
Ethernet Cradle

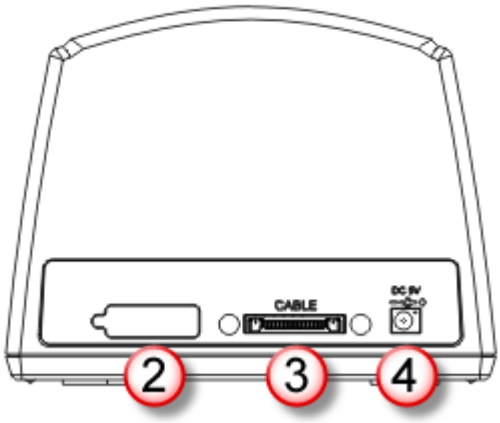




No.	Description	No.	Description
1	LED Indicators (Ready, TX/RX and Link)	2	Ethernet Port (RJ-45)
3	Cable Connector (USB or RS-232)	4	Power Jack
5	IP Reset Switch		

GPRS/GSM Cradle (EDGE/Quad-band)





No.	Description	No.	Description
1	LED Indicators (Ready, TX/RX and Link)	2	SIM Card Slot
3	Cable Connector (USB or RS-232)	4	Power Jack

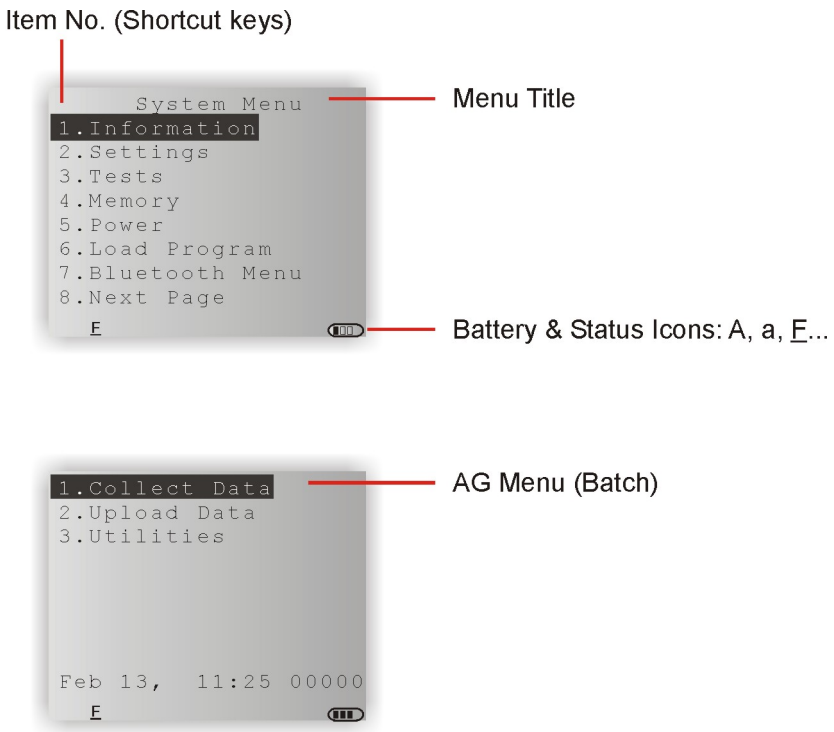
Chapter 2

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:

- using the [UP] and [DOWN] keys to move the highlight bar
- pressing 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 [Alpha] key.
- The status icon of function mode is controlled by the [FN] key.

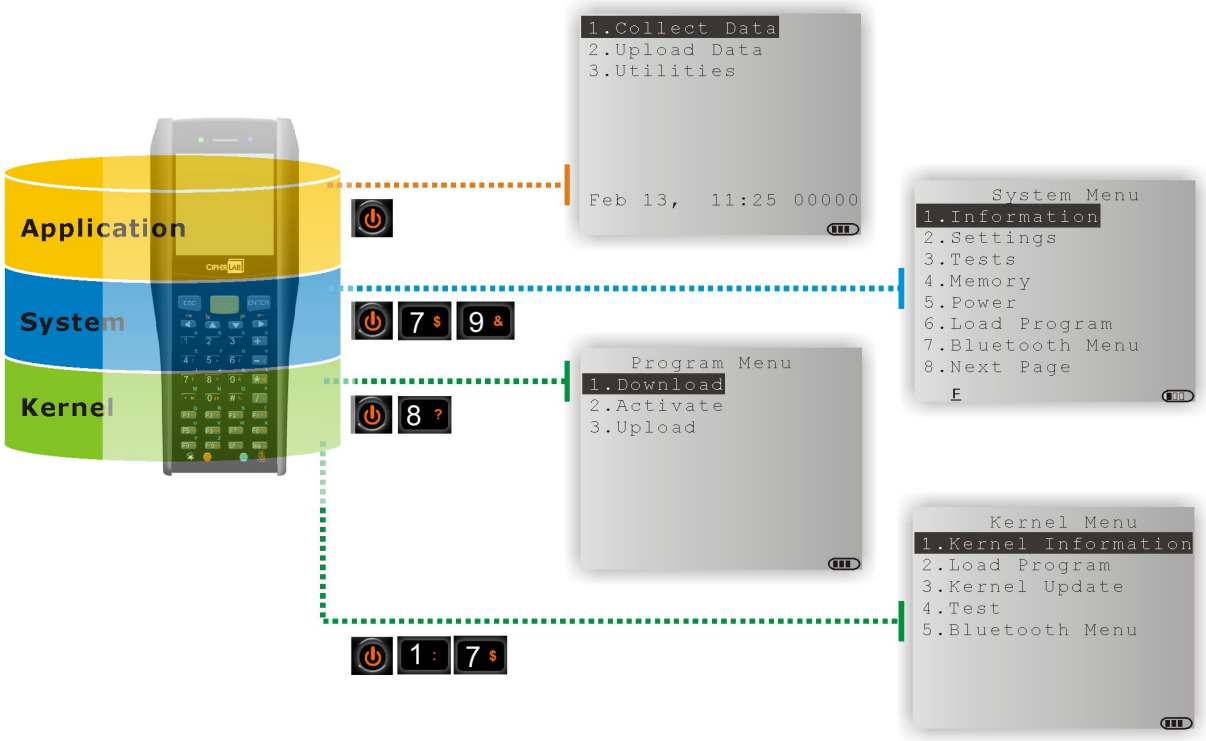


Figure 8: Software Architecture

IN THIS CHAPTER

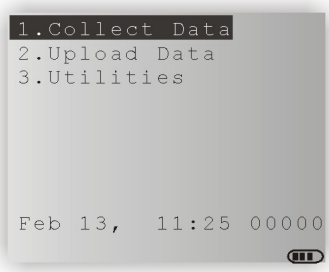
2.1 APPLICATION MODULE

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.

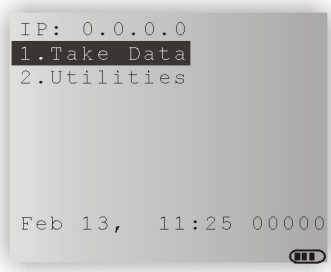
2.1.1 APPLICATION GENERATOR (AG)

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



WLAN AG



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 section 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

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 or the active application program, and configuring Bluetooth settings.

2.2.3 PROGRAM MANAGER

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

Chapter 3

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.

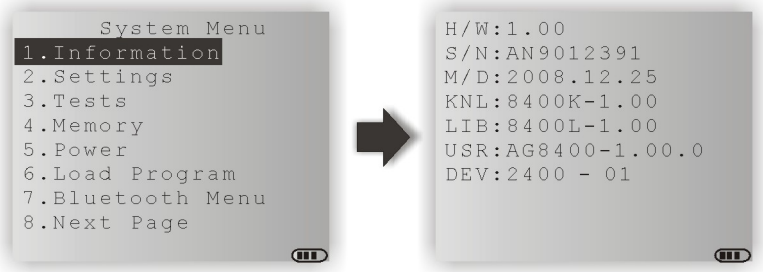
How to access the System Menu?

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	5-digit code for optional hardware configurations

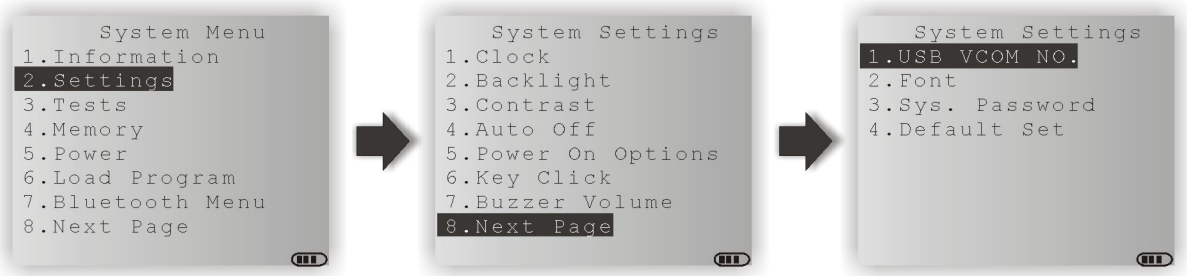
- For example, 2400-01 indicates the 39-key mobile computer is equipped with Laser scan engine and 802.11b/g connectivity.

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 Period	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	Large volume
USB VCOM No.	Fixed
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, i.e. 04 for 2004.

3.2.2 BACKLIGHT PERIOD

Set the backlight duration for the keypad and LCD.

- Enter a value between 0 and 9999 (second).
- Use the [UP] and [DOWN] keys to adjust the backlight level (4 levels).
- Use the [Left] key to adjust the shade effect.

3.2.3 CONTRAST

Set the contrast level for the LCD.

- Use the [UP] and [DOWN] keys 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:

Program Resume

Press [ENTER] to select "Program Resume" or "Program Restart". 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. Use the [UP] and [DOWN] keys 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.

- Use the [UP] and [DOWN] keys to adjust the volume level (3 levels).

3.2.8 USB VCOM NO.

When connecting more than one mobile computer to a host computer at the same time, you will need to use a unique virtual COM port number for each mobile computer.

- Use the [UP] and [DOWN] keys to select between "Fixed" and "Change with Serial Number".

3.2.9 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.

3.2.10 SYSTEM PASSWORD

Set a password to control user access to the **System Menu**. The password can be up to eight alphanumeric characters.

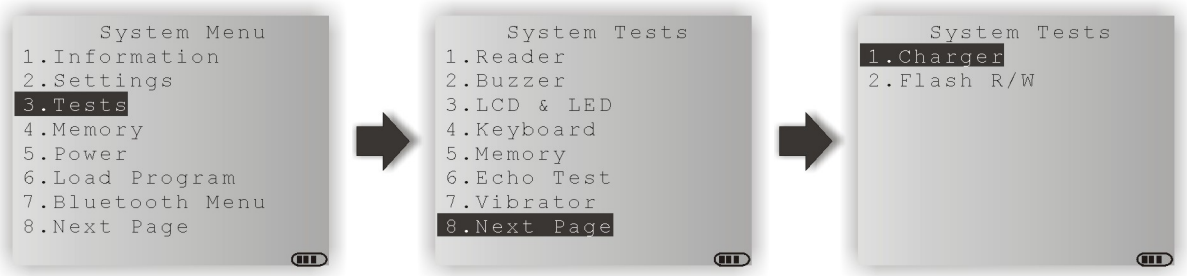
Note: The password is case-sensitive. To disable a previous password, enter blank on the "Input new password" and "Verify password" screens.

3.2.11 RESET TO DEFAULT

Reset system settings to the default values, except for the reader settings.

3.3 TESTS

Here provides functional tests for key parts.



3.3.1 READER

The supported symbologies depend on the scan engine you use. Refer to section 1.6 Data Capture for symbologies that are enabled by default. For symbologies that are disabled by default, they must be enabled through programming.

- Test the reading performance of the scanner. Press [SCAN] to start.
- To stop and exit the test, press any key.

3.3.2 BUZZER

Test the buzzer with different frequency/duration combinations. Press [Enter] to start. To stop and exit the test, press any key.

3.3.3 LCD & LED

Test the LCD display and LED indicators. Press [Enter] to start. To stop and exit the test, press any key.

3.3.4 KEYBOARD

Test the rubber keys. Press any key and its corresponding character will be shown on the screen. To stop and exit the test, press [ESC].

3.3.5 MEMORY

Test the data memory (SRAM), and the results will be shown on the screen. To stop and exit the test, press [ESC].

Warning!	The contents of the data memory (SRAM) will be wiped out after test.

3.3.6 ECHO TEST

After a physical connection is established properly, run a test utility on your computer and start the test on your mobile computer. Select a desired baud rate if necessary. To stop and exit the test, press [ESC].

Interface	Description	Test Utility
RS-232	This echo test is to verify connectivity via the RS-232 cable between the mobile computer and a host computer.	EchoTest.exe
Modem	This echo test is to verify connectivity via modem. A telephone line must be connected to the Modem Cradle.	EchoTest.exe
USB	This echo test is to verify connectivity via the USB cable between the mobile computer and a host computer. ▸ USB VCOM Echo — The mobile computer works as a generic USB device. ▸ USB HID — The mobile computer works as an input device; select keyboard type and Caps Lock status for running a test.	HyperTerminal.exe for Virtual COM Any text editor for HID

3.3.7 VIBRATOR

Test the vibrator. To stop and exit the test, press [ESC].

3.3.8 CHARGER

Test if charging via the interface cable, USB or RS-232, is working properly.

- USB direct charging
- USB + Power Adapter
- RS-232 + Power Adapter

To stop and exit the test, press [ESC].

Interface Cable	Charger Type	Charging Current/Voltage	Screen Icon
USB cable	USB charger	Press [ENTER] to select charging current: ▸ 500 mA for standard charging ▸ 100 mA for charging via a hub	▸ USB icon, flashing ▸ Highlighted USB icon, flashing
	Power adapter	5 V charging	Plug icon, flashing
RS-232 cable	Power adapter	5 V charging	Plug icon, flashing

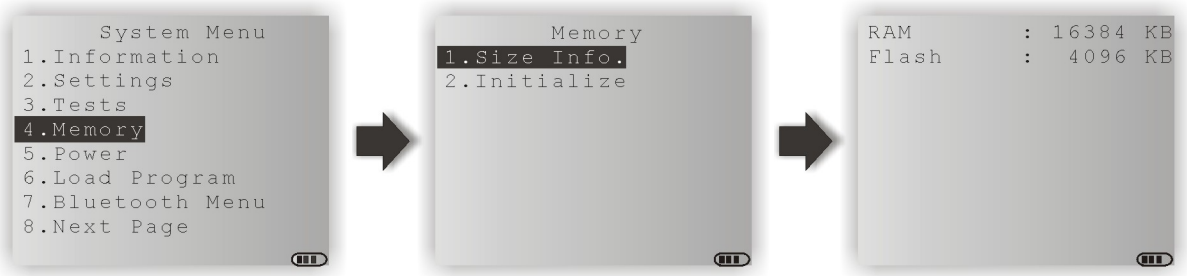
Note: For charging via the USB cable without supplying a power adapter, the standard charging current is 500 mA. If you connect the mobile computer to a USB hub, the charging current may be insufficient. In that case, change the charging current to 100 mA after connecting the USB cable. It will take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

3.3.9 FLASH R/W

Test the read/write operation to the flash memory. To stop and exit the test, press [ESC].

3.4 MEMORY

Here provides information and initialization function of the memory.



3.4.1 SIZE INFORMATION

- RAM — onboard SRAM for data memory
- Flash — program memory

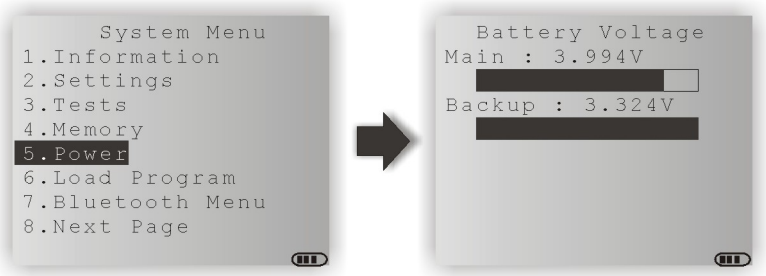
3.4.2 INITIALIZE

Initialize the data memory.

Warning!	The contents of the data memory (SRAM) will be wiped out after memory initialization.

3.5 POWER

Here shows current voltage consumption.



Main (battery)

It shows dynamic status of the battery pack, which is used as the main power source.

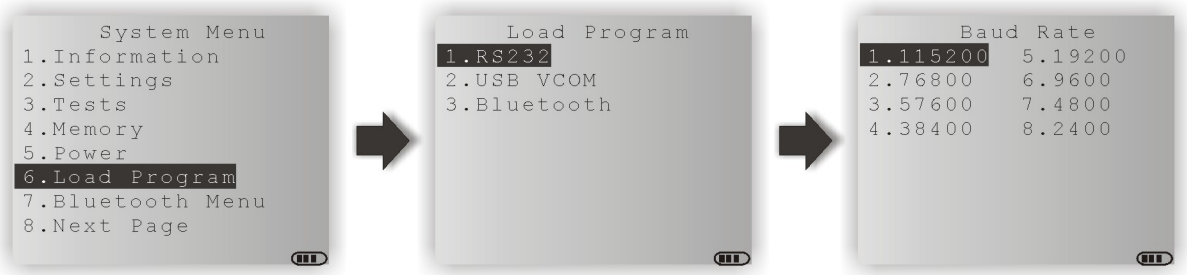
Backup (battery)

It shows dynamic status of the button cell, which is used to retain data in SRAM.

Warning! Always examine the battery icon on the device screen so that you will be alerted for a low battery condition.

3.6 LOAD PROGRAM

Here you can access the Load Program service provided by the kernel. Because the kernel will take over the job, you will not be able to return to the **System Menu** by pressing [ESC]. After downloading, restart the mobile computer to activate the new program.



.SHX Program	Download one of the following C program files and/or one font file:	
Program File	AG Runtime	(U*.shx)
	CipherNet Runtime	(84xx-5250.shx, 84xx-VT.shx)
	BASIC Runtime*	(BC*.shx)
	User program	
Font File	Refer to the Font Files folder on CD-ROM.	

If you have downloaded a BASIC Runtime program, the next time you enter the Load Program submenu you will be able to select whether to download a C program (.SHX) or BASIC program (.SYN).

Note: "Load Basic" menu is only available after you have downloaded a BASIC Runtime program.

3.7 BLUETOOTH MENU

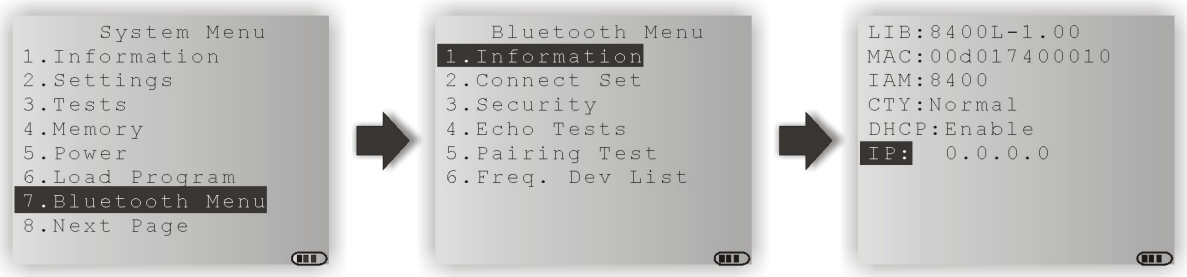
This submenu is for the built-in Bluetooth module to work with other Bluetooth enabled devices. You must configure these parameters correctly.

Bluetooth Settings	Default Value	SPP	DUN
Connect Setting		**Items Need to Be Checked**	
Local Name	Model no. + Serial no.	v	v
Remote Name	---	v	v
Broadcast Me	Enabled	v	v
Power Saving	Enabled	v	v
BT-GPRS AP Name	---	---	(v)*
Security			
Authentication	Disabled	v	v
PIN Code	---	v	v

Note: GPRS AP name is ONLY required for DUN-GPRS mode.

3.7.1 INFORMATION

Information of network configuration can be viewed here.



Bluetooth Menu > 1. Information

LIB C library version

MAC MAC ID of the Bluetooth module

IAM A name given to the mobile computer for identification.

- By default, it is made up of model number and the serial number. (Identical to 2. Connect Set > 1. Local Name)

CTY

- "Normal" means all 79 channels are available for frequency-hopping

(There are bandwidth limitations for 2.4 GHz ISM band in some countries. For example, only 23 RF channels are defined instead of 79 RF channels in Japan, Spain and France.)

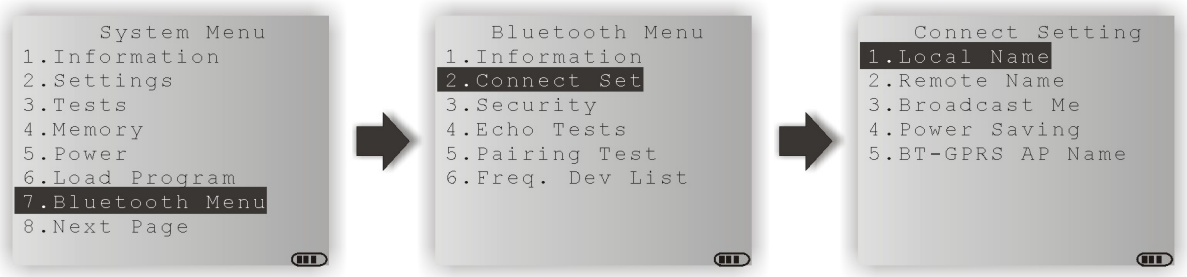
DHCP DHCP server in use or not

- It will automatically become enabled while connecting to a BT-GPRS AP.

IP IP address of the mobile computer

3.7.2 CONNECT SETTING

The 8400 mobile computer supports Bluetooth operated in DUN mode (point to point) and SPP mode (point to multi-point). Set the following parameters if necessary.



Local Name

Enter a name for identifying the mobile computer.

- By default, it is made up of model number and the serial number.

Remote Name

Enter a name for making a specific connection.

- The remote name must be one of those in the Freq. Dev. List. Otherwise, the mobile computer will fail to make a connection with any device without pairing.
- DO NOT specify any remote name when roaming across different groups of APs is required.

Broadcast Me

Options — Enable or Disable

- For initial connection, broadcasting must be enabled so that other Bluetooth devices can discover the mobile computer.
- For security concerns, you may disable it in future use to hide the mobile computer from other Bluetooth devices.

Power Saving

This refers to the low power consumption mode.

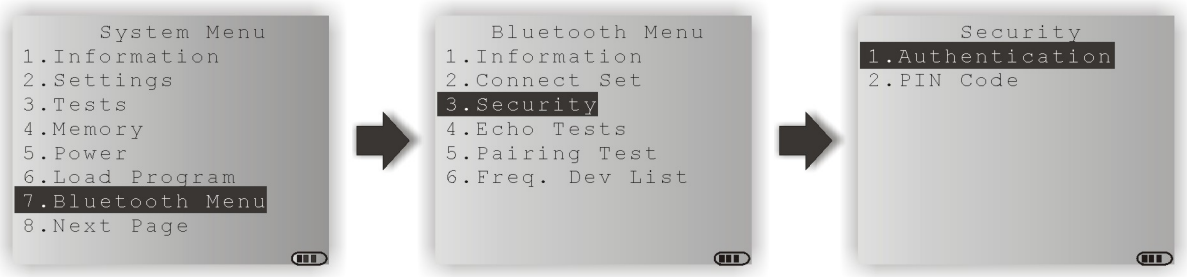
Options — Enable or Disable (Only the Sniff mode is supported.)

BT-GPRS AP Name

For DUN-GPRS mode, enter the AP name for connecting to the content server.

3.7.3 SECURITY

Set or modify security parameters.



Authentication

Options — Enable or Disable

PIN Code

Define the encryption key values.

- Up to 16 characters, using ASCII code.

Note: When authentication is enabled without providing a pre-set PIN code, the mobile computer supports dynamic input of PIN code during pairing.

3.7.4 ECHO TESTS

These echo tests are used for verifying connectivity to make sure the mobile computer is within coverage. Press [ESC] to stop and exit the test.

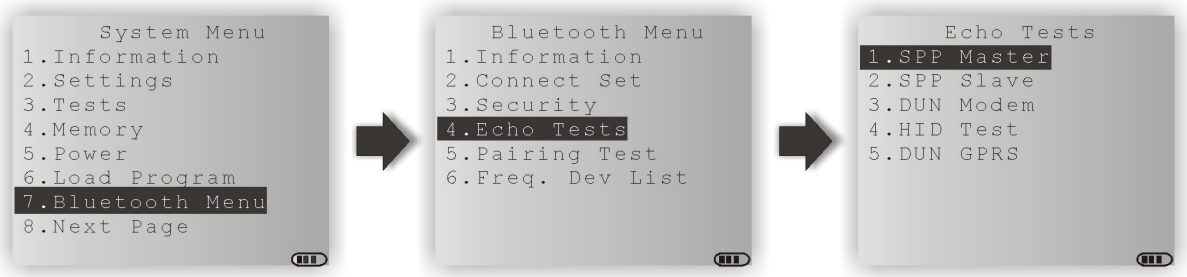
- SPP: Serial Port Profile

  It is used for ad hoc networking, without going through any access point.

- DUN: Dial-Up Networking Profile

  DUN Modem - It makes use of a Bluetooth modem or mobile phone as a wireless modem.

  DUN GPRS – It makes use of a mobile phone with GPRS functionality and connects to GPRS AP.



SPP Master

Set the mobile computer as a master device.

1. Pairing with your computer (slave) must be completed first.
2. Run the Echo Test program on your computer. Associated settings include
   - Select "RS-232" for interface.
   - Use the Bluetooth COM port that has been paired.
   - Set Action Mode to "Passive".
3. Start the echo test on both ends. The mobile computer will try to connect to PC (slave).

SPP Slave

Set the mobile computer as a slave device.

1. Enable Authentication and set your PIN code on the mobile computer.
2. Run the Echo Test program on your computer. Associated settings include
   - Select "RS-232" for interface.
   - Use the Bluetooth COM port that has been configured as "outgoing".
   - Set Action Mode to "Passive".
3. Start the echo test on both ends.
4. The mobile computer will wait for PC (master) to start the connection.
5. Enter the preset PIN code for authentication on your computer.

DUN Modem

The mobile computer will try to connect to a Bluetooth modem or mobile phone.

1. Pairing with your mobile phone must be completed first.
   Select "DialUp Network" for Target Machine options.
2. Run the Echo Test program on your computer. Associated settings include
   - Select "Modem" for interface.
   - Set Action Mode to "Passive".
3. Start the echo test on both ends.
4. The mobile computer will connect to your mobile phone that dials up to your computer.

HID Test

Set the mobile computer as an input device.

1. The mobile computer will wait for PC to start the connection. It is suggested to disable Authentication on the mobile computer.
2. Run a text editor on your computer.
3. Start to input data via the keypad on the mobile computer.

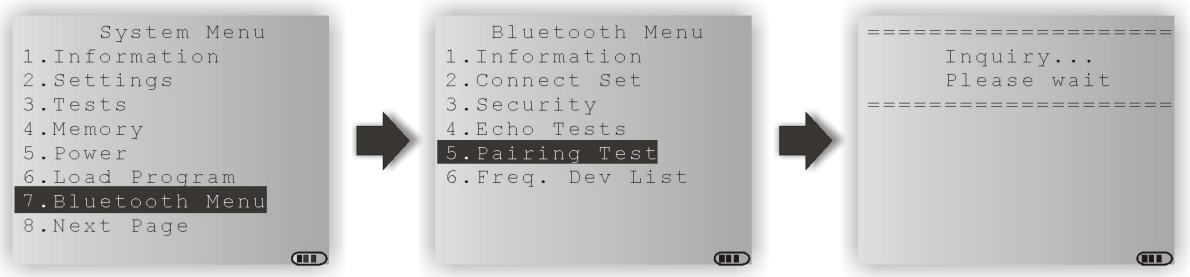
DUN GPRS

The mobile computer will try to connect to a mobile phone with GPRS functionality.

1. Pairing with your mobile phone must be completed first. Select "DialUp Network" for Target Machine options.
2. Run the Echo Test program on your computer. Associated settings include
   - Select "TCP/IP – Server" for interface.
   - Set Action Mode to "Passive".
3. Start the echo test on both ends.
4. Enter the server IP on the mobile computer.
5. The mobile computer will connect to your mobile phone that dials up a GPRS AP, and finally connect to your computer (server) through the GPRS AP.

3.7.5 PAIRING TEST

The pairing procedure is for the creation and exchange of a link key between two Bluetooth-enabled devices. The devices use the link key for future authentication when exchanging information.



1) The mobile computer will start with making an inquiry so that the system can generate a list of device(s) that has been discovered nearby.
2) Select a desired target device.
3) Select a Bluetooth service from the "Target Machine" menu. To stop and exit the test, press [ESC].
   - Serial Port (SPP)
   - DialUp Network (DUN)

   After pairing successfully, the target device will be added to the Frequent Device List for quick connection in the future.

Note: During the initial setting of Bluetooth wireless network, the pairing procedure must be carried out before the Echo tests.

3.7.6 FREQ. DEV. LIST

The Frequent Device List is used to store a list of target device(s) that the mobile computer has been connected to lately. After each successful pairing, the system will update the list.

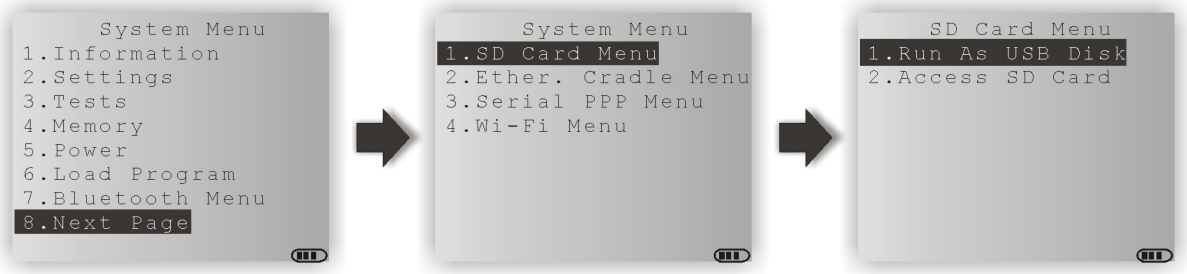
Note: To unpair any device, simply delete the device from this list.

This list can show information of up to eight target devices that provides different Bluetooth services.

- It can list only one device that provides the Bluetooth Serial Port service. (SPP)
- It can list only one device that provides the Bluetooth Dial-Up Networking service. (DUN)

3.8 SD CARD MENU

This submenu is for using the mobile computer equipped with a SD card as a USB mass storage device.



3.8.1 RUN AS USB DISK

Normally, the SD card will be treated as extended memory for the mobile computer to save the collected data. Yet, it can be used as a USB mass storage device. In that case, simply connect the mobile computer to your computer and select [Run as USB Disk].

Note: The SD card can be configured as extended memory through programming.

3.8.2 ACCESS SD CARD

Edit the file system or format the SD card.

Edit Files

View and edit the file system on the SD card.

Format

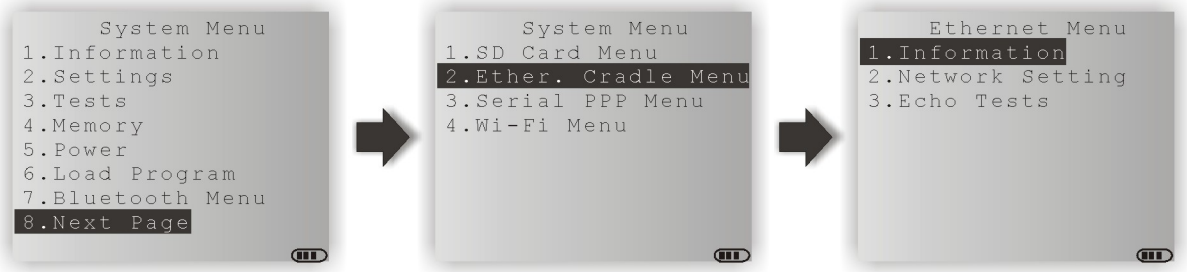
If the file system is not desired any more, you may format the SD card. The options for a FAT file system include —

- FAT16
- FAT32

Warning! The contents on the SD card will be wiped out after formatting.

3.9 ETHERNET CRADLE MENU

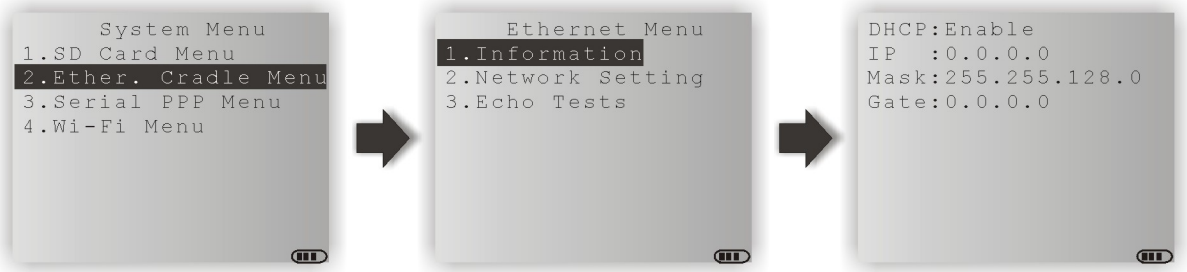
This submenu is for Ethernet connection. You must configure these parameters correctly.



Note: The Ethernet Cradle is required for establishing Ethernet connection.

3.9.1 INFORMATION

Information of Ethernet network configuration can be viewed here.

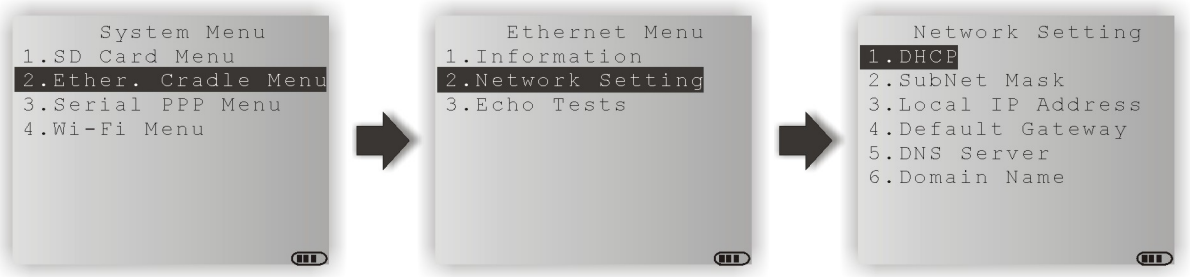


IR Network Menu > 1. Information

DHCP	DHCP server in use or not
IP	IP address of the mobile computer
Mask	Subnet Mask
Gate	Default Gateway

3.9.2 NETWORK SETTING

Set parameters for IP networking.



DHCP

Options - Enable or Disable

Subnet Mask

Enter a new Mask IP, if necessary.

Local IP Address

Enter a new address for the mobile computer, if necessary.

Default Gateway

Enter a new address for the default Gateway, if necessary.

DNS Server

Enter a new address for the DNS server, if necessary.

Domain Name

The domain name of the host is displayed when DHCP server is enabled.

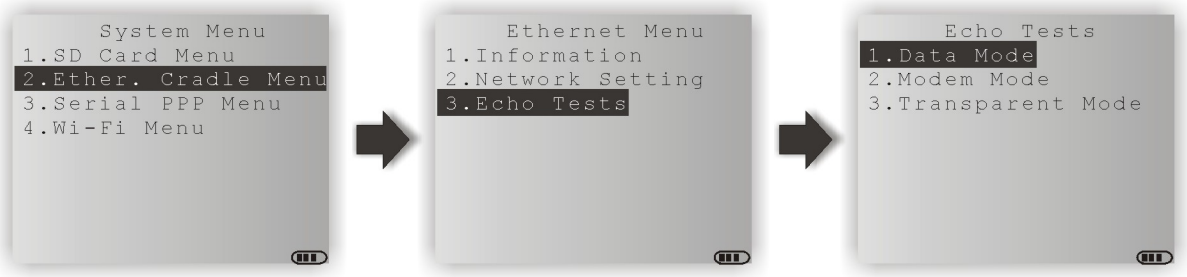
Note: Normally, DHCP is enabled and all of the settings can be obtained form the DHCP server.

3.9.3 ECHO TESTS

The Ethernet Cradle supports three working modes:

- Data Mode
- Modem Mode
- Transparent Mode

These echo tests are used for verifying connectivity via the Ethernet Cradle. For details, refer to the Ethernet Cradle manual.



Data Mode

Set the Ethernet Cradle in Data mode. The mobile computer works as a client.

Modem Mode

Set the Ethernet Cradle in Modem mode. The mobile computer works as a client.

Transparent Mode

1. Client Mode - Set the mobile computer as a client.

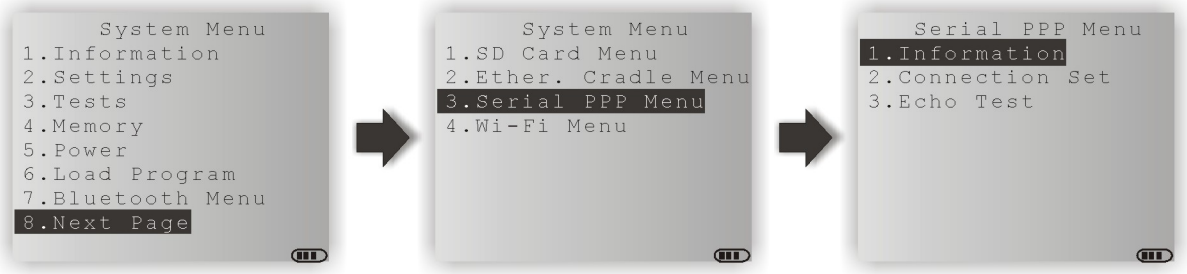
   Enter the IP address of a server with which a connection is desired.

2. Server Mode - Set the mobile computer as a server that waits for other devices to connect to.

Note: After the Ethernet connection is established properly, run the utility "EchoTest.exe" on your computer (TCP/IP – Server or Client), and then, start this test on your mobile computer.

3.10 SERIAL PPP MENU

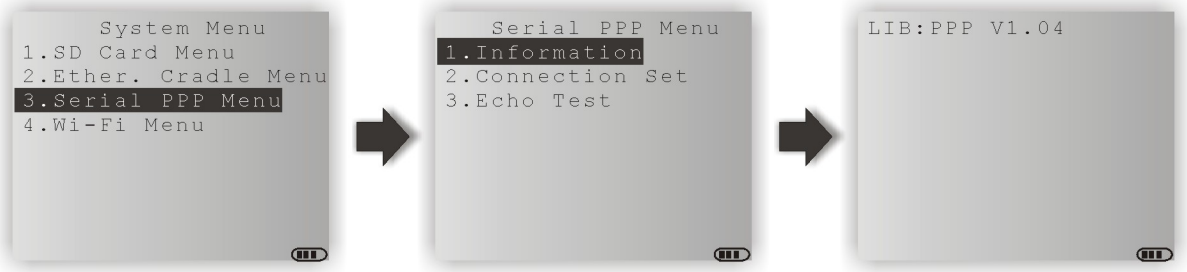
This submenu is for establishing a PPP connection via the Modem Cradle. You must configure these parameters correctly.



Note: Point-to-Point Protocol (PPP) is a method of connecting the mobile computer to the Internet over serial links. It sends TCP/IP packets to a server that connects to the Internet.

3.10.1 INFORMATION

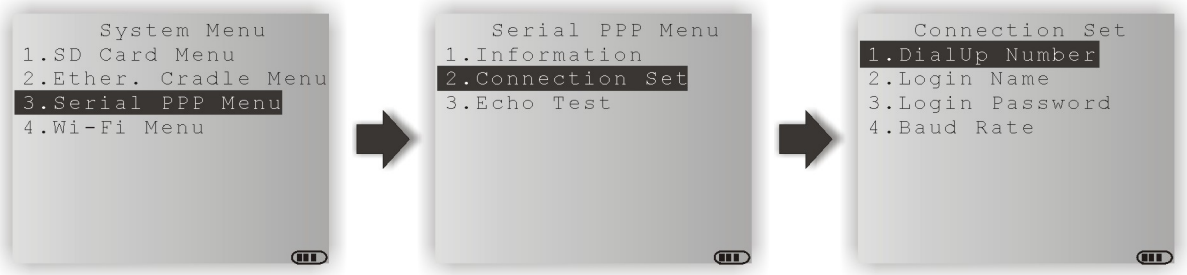
Information of library version can be viewed here.



Serial PPP Menu > 1. Information

LIB	PPP library version

3.10.2 CONNECTION SET



DialUp Number

Enter the number provided by your ISP.

Login Name

Enter the login name provided by your ISP.

Login Password

Enter the login password provided by your ISP.

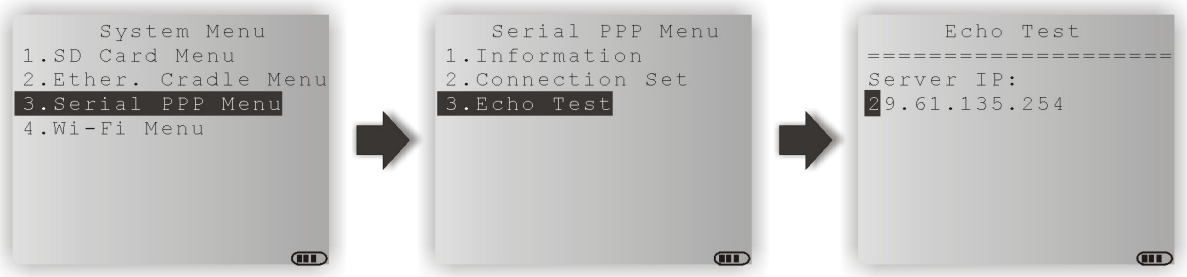
Baud Rate

Select a desired baud rate.

3.10.3 ECHO TEST

This echo test is used for verifying connectivity via Point-to-Point Protocol. For the Modem Cradle, its physical connectivity can be verified in **System Menu > Tests > Echo Test > MODEM**.

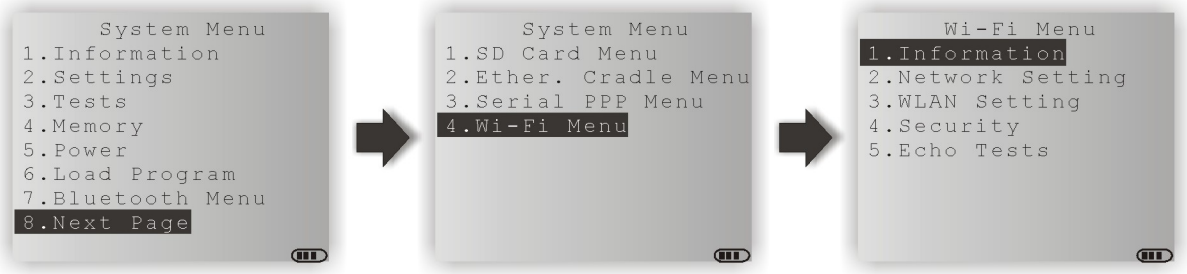
Enter the IP address of a server with which a PPP connection is desired. Then, it will try to connect to the server.



Note: After the PPP connection is established properly, run the utility "EchoTest.exe" on your computer (TCP/IP – Server), and then, start this test on your mobile computer.

3.11 WI-FI MENU

This submenu is for 802.11b/g wireless networking. You must configure these parameters correctly.

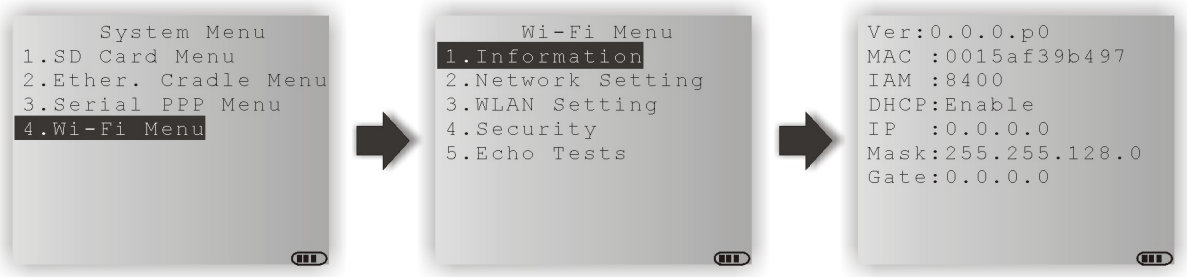


Note: This submenu is generated only when the Wi-Fi module is present.

Wi-Fi Settings	Default Value	Ad-hoc	Infrastructure
Network Setting		**Items Need to Be Checked**	
DHCP	Enabled	---	v
SubNet Mask	255.255.128.0	v	v
Local IP Address	0.0.0.0	v	v
Default Gateway	0.0.0.0	---	v
DNS Server	0.0.0.0	---	v
Domain Name	---	---	v
WLAN Setting			
Local Name	Model no. + Serial no.	v	v
SS ID	---	---	v
System Scale	Medium	---	v
Power Saving	Enabled	---	v
Preamble	Long	---	v
Ad-Hoc	Disabled	v	---
Security			
Authentication	Open System	---	v
WEP Menu	Disabled	---	v
EAP Menu	Disabled	---	v
WPA Menu	Disabled	---	v

3.11.1 INFORMATION

Information of network configuration can be viewed here.

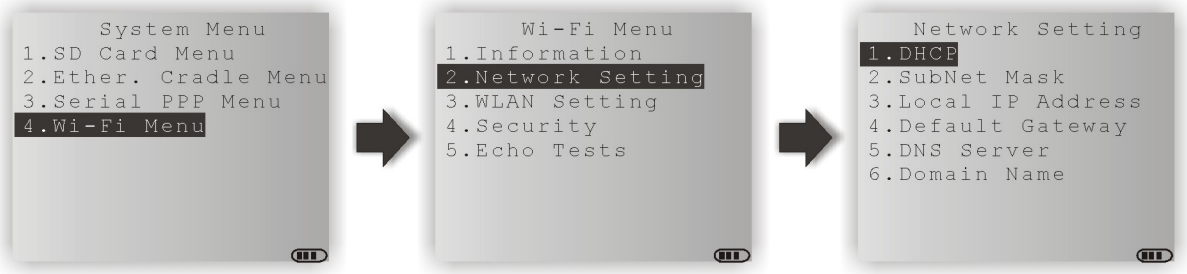


Wi-Fi Menu > 1. Information

Ver	Firmware version of the module chipset
MAC	MAC ID of the 802.11b/g module
IAM	A name given to the mobile computer for identification. ▸ By default, it is made up of model number and the serial number. (Identical to 3. WLAN Setting > 1. Local Name)
DHCP	DHCP server in use or not
IP	IP address of the mobile computer
Mask	Subnet Mask
Gate	Default Gateway

3.11.2 NETWORK SETTING

Set parameters for IP networking.



DHCP

Options — Enable or Disable

Subnet Mask

Enter a new Mask IP, if necessary.

Local IP Address

Enter a new address for the mobile computer, if necessary.

Default Gateway

Enter a new address for the default Gateway, if necessary.

DNS Server

Enter a new address for the DNS server, if necessary.

Domain Name

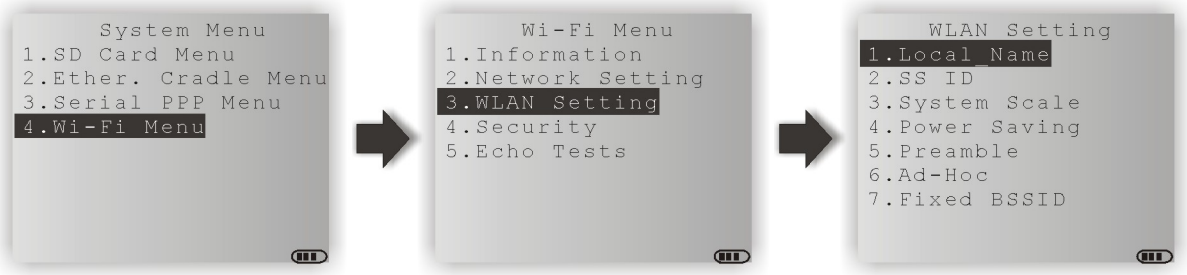
The domain name of the host is displayed when DHCP server is enabled.

Note: Normally, DHCP is enabled and all of the settings can be obtained form the DHCP server.

3.11.3 WLAN SETTING

Wireless networking can operate in two modes – (1) Ad-hoc mode: peer-to-peer, and (2) Infrastructure mode: point to multi-point through access points.

Set the following parameters.



Local Name

Enter a name for identifying the mobile computer.

- By default, it is made up of model number and the serial number.

SS ID

This refers to Service Set Identifier or AP name, which is used for remote device association.

- The mobile computer can ONLY communicate with access points that have the same SS ID.

System Scale

This refers to Access Point Density.

Options — [1] Low [2] Medium [3] High

- The value you set must match that set for the access point.
- "Low / Medium / High" means the mobile computer will search for other APs only when data transmission rate is below "1 / 2 / 5" Mbps individually.

Power Saving

This refers to the low power consumption mode.

Options — Enable or Disable

- The value you set must match that set for the access point.

Preamble

Options — [1] Long [2] Short [3] Both

- The value you set must match that set for the access point.

Ad-Hoc

This refers to peer-to-peer mode, without going through access points.

Options — Enable or Disable

Fixed BSSID

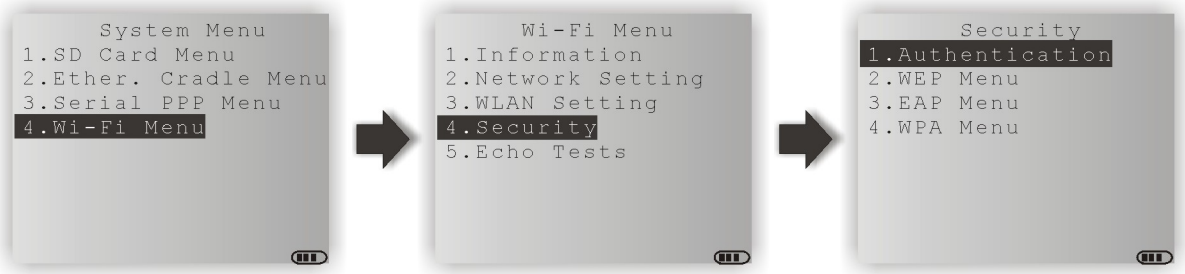
This refers to the use of a specific AP's MAC address as the fixed Basic Service Set Identifier.

- The mobile computer can ONLY communicate with this one and only access point.

3.11.4 SECURITY

Set or modify security parameters.

- WEP: Wired Equivalent Privacy
- EAP: Extensible Authentication Protocol
- WPA: Wi-Fi Protected Access



Authentication

[1] Open System	▸ Default authentication type
[0] Share Key	▸ This requires implementing WEP key.

WEP Menu

WEP Setting	▸ Enabled (For Share Key, it must be enabled!) ▸ Disabled (default)
WEP Key Length	▸ 64 bits ▸ 128 bits (default)
Default Key	WEP KEY1
WEP Key	Enter WEP Keys 1 ~ 4 in one of the following input data type: ▸ ASCII (up to 13 characters) ▸ Hexadecimal (up to 26 characters)

EAP Menu (for associating to Cisco access points)

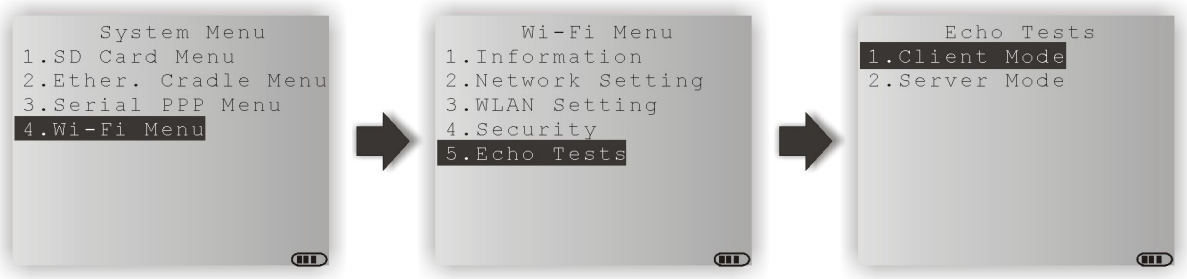
EAP Setting	▸ Enabled ▸ Disabled (default)
EAP ID	Enter a user name (up to 32 characters)
EAP Password	Enter a password (up to 32 characters)

WPA Menu (WPA-PSK)

WPA Setting	▸ Enabled ▸ Disabled (default)
WPA Passphrase	Enter a phrase as your password (8 ~ 63 characters)

3.11.5 ECHO TESTS

This function is used to measure the coverage of the range, estimate the number of APs and mobile computers needed, and determine the topology of deploying APs.



Client Mode

Set the mobile computer as a client. Enter the IP address of a server with which a connection is desired. Then, it will try to connect to an AP.

1. Run the Echo Test program on your computer. Associated settings include
   - Select "TCP/IP – Server" for interface.
   - Set Action Mode to "Passive".
2. Start the echo test on both ends.
3. Enter the server IP and port number on the mobile computer.

Server Mode

Set the mobile computer as a server. The mobile computer will try to connect to an AP.

1. Run the Echo Test program on your computer. Associated settings include
   - Select "TCP/IP – Client" for interface.
   - Set Action Mode to "Passive".
2. Start the echo test on both ends.

Note: Run the utility "EchoTest.exe" on your computer (TCP/IP – Server or Client), and start this test on your mobile computer.

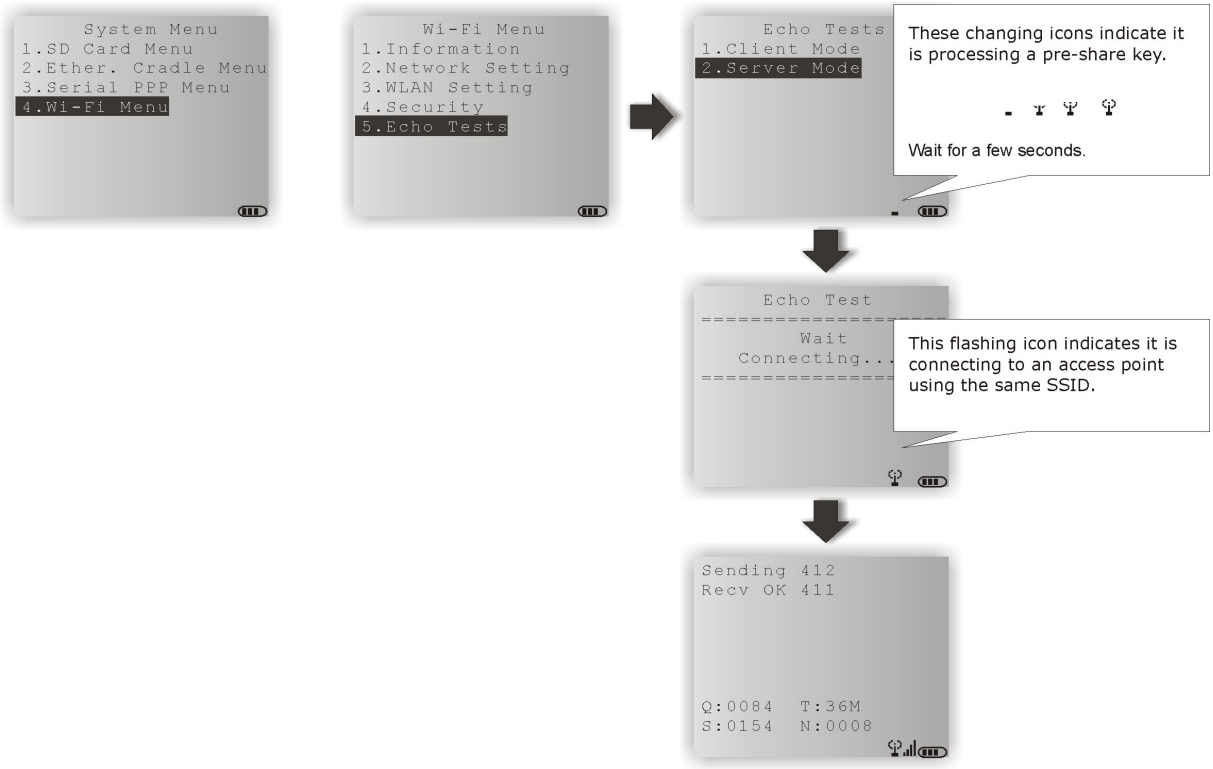
While running echo tests, if WPA setting is enabled for security, the SSID and Passphrase will be processed to generate a pre-share key.

Note: If you change the SSID or Passphrase, it will have to re-generate a pre-share key.

1) For initial association with an access point, you will see an antenna icon developing on the screen to indicate that the mobile computer is processing a pre-share key.

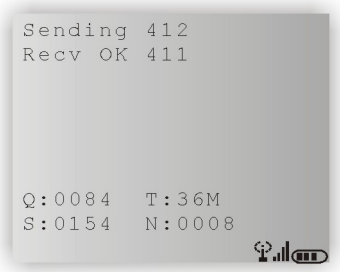
2) After having generated the pre-share key, the mobile computer proceeds to establish a connection with an access point, and you will see the whole antenna is flashing.

3) When the mobile computer has been connected to the access point successfully, you will see the whole antenna and the indication of wireless signal strength.



Note: If you are programming in C or BASIC, be aware that these icons will appear on the device screen after NetInit() or START TCPIP() is called. (WPA must be enabled first!)

Once the connection of echo test is established, the details will be displayed as illustrated below. Link Quality ("Q") will be the most important element while the others are for your reference.



Q (Link Quality)		T (Transmit Speed)		S (Signal Level)		N (Noise Level)	
0 ~ 10	Very Poor	1	Mbps	0 ~ 10	Weak	1	Weak
10 ~ 15	Poor	2	Mbps	30 ~ 60	Moderate	2 ~ 3	Moderate
15 ~ 30	Good	5.5	Mbps	Over 60	Strong	4 ~ 5	Strong
50 ~ 80	Very Good	11	Mbps				
		6	Mbps				
		9	Mbps				
		12	Mbps				
		18	Mbps				
		24	Mbps				
		36	Mbps				
		48	Mbps				
		54	Mbps				

Chapter 4

PROGRAM MANAGER & KERNEL

This chapter explains **Program Manager** and **Kernel** that manage multiple programs and firmware upgrade.

IN THIS CHAPTER

4.1 PROGRAM MANAGER

The mobile computer supports multiple applications and languages. In the menu of **Program Manager**, it allows storing up to seven programs and has one activated for the current use.

If there is no application program exists, the **Program Manager** will be displayed after you turn on the mobile computer.

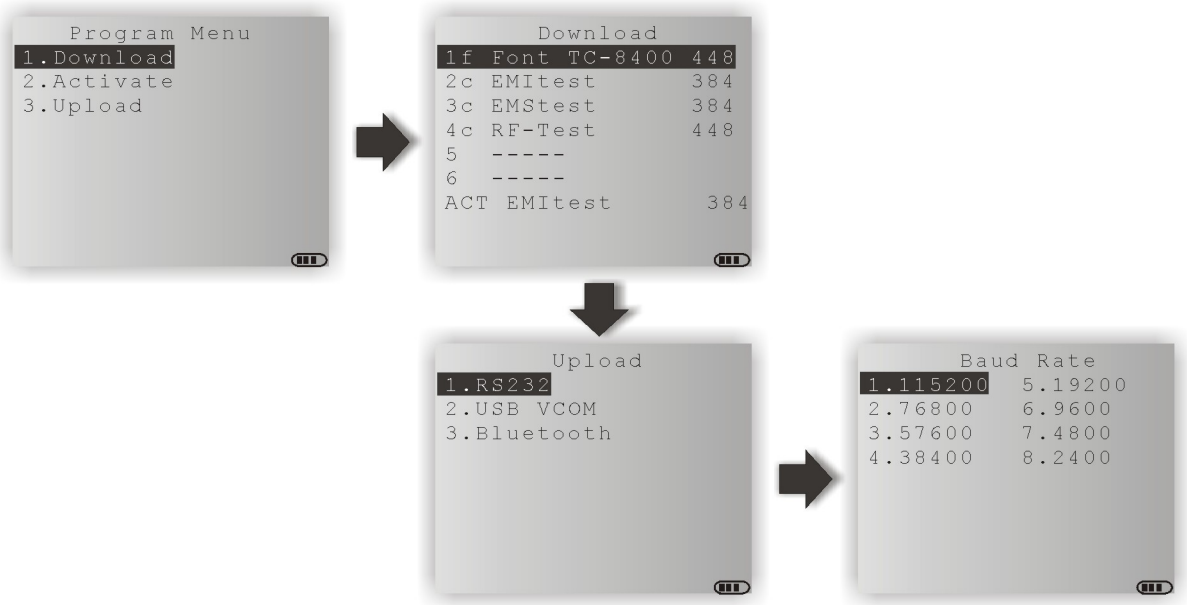
Warning!	The Program Manager menu is provided for managing programs in an administrative level.

How to access the Program Manager menu?

1) Turn off the mobile computer.
2) Press [8] + [Power].

4.1.1 DOWNLOAD

Here provides a full list of programs that are currently stored on the mobile computer with size information. Multiple application programs can be downloaded through a variety of interfaces. Upon completion of downloading, you are allowed to input a name for the program. If there is no need to rename the program, simply press [ENTER] to leave as it is.



The length of program name can be up to 12 characters. Program size is in kilo bytes.

A suffix letter after the memory sector (1 ~ 6) indicates the file type of program.

- "b" for BASIC program (.SYN)
- "c" for C program (.SHX)
- "f" for font file (.SHX)

Note: In addition to the system font, there can be only one font file downloaded to the mobile computer. The custom font file needs to be downloaded through the System Menu or Kernel Menu.

SPARE MEMORY SECTORS (1 ~ 6)

Additional program files can be directly downloaded to these sectors.

Download a program file to an empty sector:

1. Select an empty sector by pressing the corresponding number and then [Enter].
2. Select a desired baud rate for downloading.
3. Connect the RS-232 cable and wait for a few seconds to establish a connection…
4. To abort the action, press [ESC]. Then press [ESC] again to return to the menu.

Download a program file to an occupied sector:

If no available sectors, you'll have to replace one program with the new one.

1. Select a program that you want to delete by pressing the corresponding number and then [Enter].
2. The program information is displayed on the screen.

   Press [Alpha] to enter the Alpha mode, and then press [C].
3. Select a desired baud rate for downloading.
4. Connect the RS-232 cable and wait for a few seconds to establish a connection…
5. To abort the action, press [ESC]. Then press [ESC] again to return to the menu.

   From the menu, you'll see the program has been deleted but no new program is present (because you have canceled the download action).

If you simply want to delete a program, press [D] in step 2.

Note: [C], [D] are NOT case-sensitive.

ACTIVE MEMORY SECTOR ("ACT")

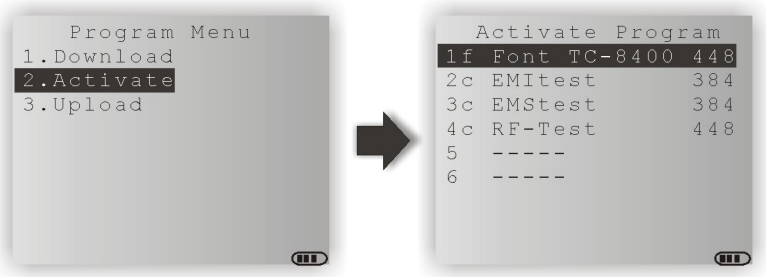
Only the application program, which needs to be activated immediately, can be downloaded to the active memory sector.

Download to Memory Sector "ACT":

1. Press the [Down] key to select the memory sector "ACT" (may be unoccupied), and then press [Enter].
2. Connect the RS-232 cable and wait for a few seconds to establish a connection…
3. If the active memory sector has already been occupied by an application program, the newly downloaded program will replace the currently active program and come into effect immediately.

4.1.2 ACTIVATE

The list shows the entire spare programs stored on the mobile computer. From the list, you can select from 1 to 6 and activate one of them. The selected program will be copied to the active memory sector and replace the current one.



Note: A font file cannot be activated.

TO CLEAR FILE SYSTEM

When <New Program Start> screen appears, "Press [ESC] to clear file" means the file system in the SRAM will be cleared out by pressing [ESC]. Then there will be no data (transactions, settings, etc.) stored on the mobile computer when the new program comes into effect.

TO KEEP FILE SYSTEM

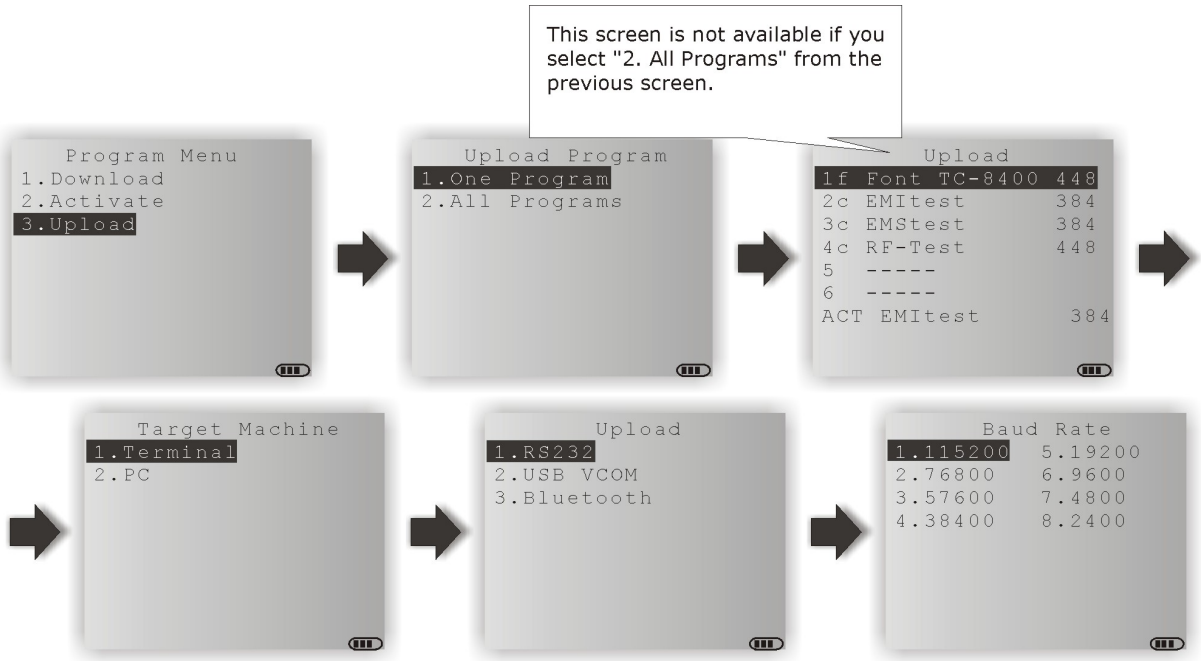
To keep the data, simply press any other key.

4.1.3 UPLOAD

You may duplicate one or all of the programs from the mobile computer to a host computer or another mobile computer. This can be used to clone software on mobile computers.

Note: To clone all of the programs, the target mobile computer cannot have any other program downloaded except the active one; that is, Memory Sectors 1~6 must be empty!

The procedures are similar to those for downloading programs.



4.2 KERNEL

The kernel resides in the innermost core of the system. It has the highest security and is always protected by the system. When the application program is corrupted and the **System Menu** fails, the **Kernel Menu** provides an access to fix the system.

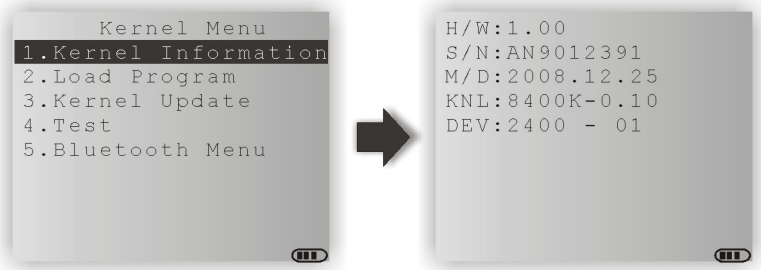
Warning! The Kernel Menu is NOT for the use of any end users.

How to access the Kernel Menu?

1) When the last session is in the **System Menu** or **Program Manager**, simply turn off the mobile computer. Otherwise, you must reload the battery pack.
2) Press [1] + [7] + [Power].

4.2.1 KERNEL INFORMATION

Here provides important system information to help diagnose the system.



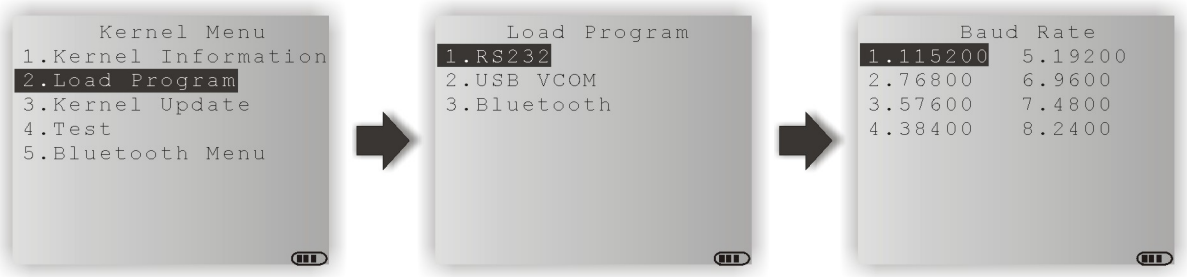
Kernel Menu > 1. Information	
H/W	Hardware version (PCB)
S/N	Serial number of the mobile computer
M/D	Manufacturing date
KNL	Kernel version
DEV	5-digit code for optional hardware configurations Refer to Understanding Device Code.

4.2.2 LOAD PROGRAM

You can download one program file to the active memory sector, as well as one font file to the memory address assigned by the system. After downloading, restart the mobile computer to activate the new program.

- New application program or program update
- And/or one font file, i.e. multi-language font

If you are using a custom font file rather the system font and you want to download another font file, it is necessary to delete the current font file from the program list displayed by the Program Manager first. Otherwise, downloading new font file is not allowed.



.SHX Program	Download one of the following C program files and/or one font file:	
Program File	AG Runtime	(U*.shx)
	CipherNet Runtime	(84xx-5250.shx, 84xx-VT.shx)
	BASIC Runtime*	(BC*.shx)
	User program	
Font File	Refer to the Font Files folder on CD-ROM.	

If you have downloaded a BASIC Runtime program, the next time you access the Load Program service through the **System Menu**, you will be able to select whether to download a C program (.SHX) or BASIC program (.SYN).

Note: To download a BASIC program (*SYN), go to **System Menu > 6. Load Program > 2. Load Basic**.

SETTINGS

Interface

RS232	Proceed to configure baud rate settings on your computer and the mobile computer.
USB VCOM	Connect the USB cable between your computer and the mobile computer.
Bluetooth	Approach the target Bluetooth enabled device.

Baud Rate

115200 (bps)	Supported on CipherLab software, including download utilities.
76800 (bps)	N/A
57600 (bps)	Supported on CipherLab software, including download utilities.
38400 (bps)	Supported on CipherLab software, including download utilities.
19200 (bps)	Supported on CipherLab software, including download utilities.
9600 (bps)	Supported on CipherLab software, including download utilities.
4800 (bps)	N/A
2400 (bps)	N/A

LOAD PROGRAM VIA BLUETOOTH

1) Go to **System Menu** > **7. Bluetooth Menu** > **3. Security**, and configure the following Bluetooth settings first.
   - Authentication
   - PIN code
2) Go to **System Menu** > **6. Load Program** and select Bluetooth.
3) Start the pairing procedure from your computer, for example, click [Pair Device] and/or [Connect Bluetooth Serial Port].
4) Run any of the download utilities: ProgLoad.exe or Download.exe

   - Select interface RS-232/IrDA for using Bluetooth SPP.

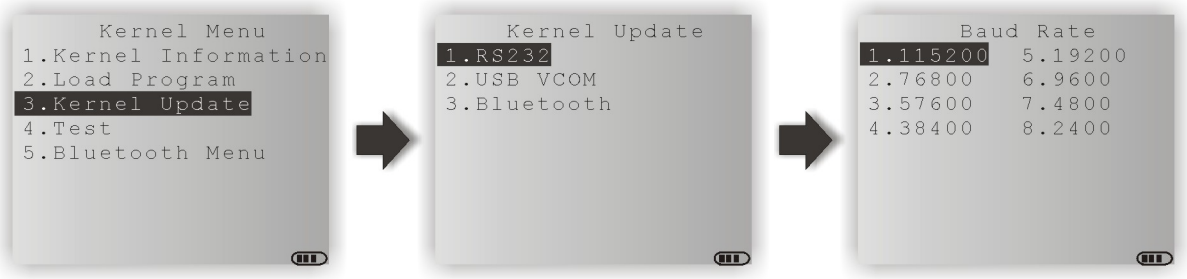
   - Select COM port properties that match with the serial port settings used on your computer.

4.2.3 KERNEL UPDATE

The kernel might need to be updated to improve performance or due to other considerations.

- To download a kernel update (K*.shx), the procedure is the same as that for downloading a program.
- Any attempt to download an older version will be rejected.
- The system will restart itself right after downloading.

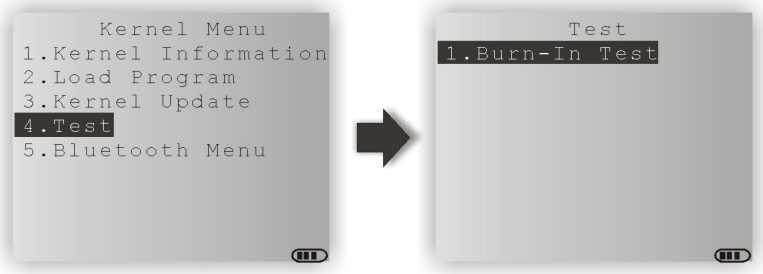
Warning: Do not turn off the mobile computer while downloading a kernel update or re-starting the mobile computer. Otherwise, it will crash the kernel forever. There is no way to recover it!



Note: CipherLab software, including download utilities, supports the following baud rate options: 115200/57600/38400/19200/9600 bps.

4.2.4 TEST & CALIBRATE

These tools are provided for manufacturing use.

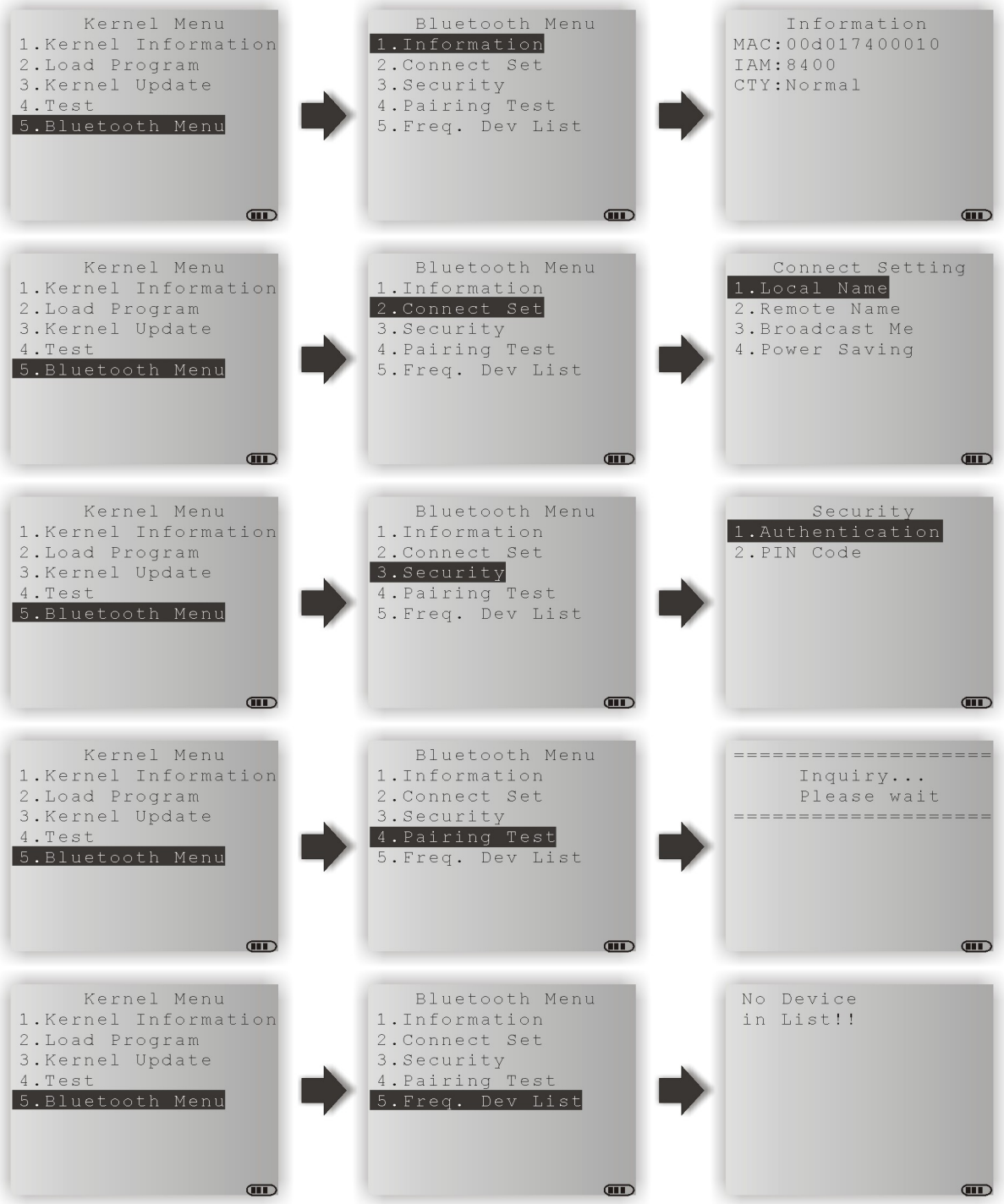


Warning! You should not perform any of these tests.

4.2.5 BLUETOOTH MENU

This submenu is the same as the one under the **System Menu** except for the following items:

- "2. Connect Set > 5. BT-GPRS AP Name" is not provided.
- "4. Echo Tests" is not provided.



SPECIFICATIONS

Model Designation		8400	8470		
Wireless Communications	Bluetooth Class 2	√	√		
	802.11b/g	√	√		
Readers	Barcode Reader	▸ CCD (linear imager) ▸ Standard Laser ▸ 2D Imager			
Electrical Characteristics	Main Battery	Rechargeable Li-ion battery – 3.7 V, 1800 mAh			
	Working Time	Laser, one scan per 5 seconds, without backlight: ▸ 110 hours in batch mode ▸ 35 hours in Wi-Fi mode ▸ 65 hours in Bluetooth mode			
	Backup Battery	▸ Rechargeable Lithium button cell – 3.0 V, 7 mAh ▸ Data retention – at least 25 days			
Physical Characteristics	CPU	32-bit Toshiba CMOS type, 60 MHz			
	Memory	▸ Program memory – 4 MB flash ▸ Data memory – onboard SRAM, options include 4 or 16 MB			
	Display	Graphic LCD, 160 x 160 pixels, FSTN with LED backlight programmable ▸ Font size 6x8: 26 characters by 18 lines ▸ Font size 8x16: 20 characters by 9 lines ▸ Font size 12x12: 13 characters by 12 lines ▸ Font size 16x16: 10 characters by 9 lines			
	Keypad	29 or 39 rubber keys, LED backlight programmable			
	Indicators	▸ LED – Dual-color (red/green), programmable ▸ Buzzer – 2.7 KHz, programmable			
	Vibrator	0.45G			
	Expansion Slot	Micro SDHC, up to 4 GB			
	Enclosure Material	Rubber & ABS plastic			
	Dimensions	171 mm (L) 72 mm (W) 41 mm (H)			
	Weight	Approx. 295 g (Laser, battery included)			
Environmental Characteristics	Temperature	Operating : -10 °C to 60 °C Storage: -20 °C to 70 °C			
	Humidity	Operating : 10% to 90% non-condensing Storage: 5% to 95% non-condensing			

	Impact Resistance	1.5 m, 5 drops per 6 sides
	Tumble Test	100 cm, 1000 cycles
	Splash / Dust Resistance	IP 54
	Electrostatic Discharge	± 15 kV air discharge, ± 8 kV contact discharge
	EMC Regulations	FCC, IC, CE, C-Tick, NCC, BSMI, TELEC, KCC, SRMC
Programming	Development Tools	C and BASIC
	Software & Utilities	Windows-based Application Generator (AG), AG utilities; Windows-based CipherNet for VT100/220, IBM 5250 emulation; Download utilities, testing tools, etc.
Accessories		▸ Protective cover ▸ Spare rechargeable battery pack ▸ 4-slot Battery Charger ▸ Charging & Communication Cradle ▸ Modem Cradle (Auto-detect) ▸ Ethernet Cradle (10/100 BASE-T) ▸ GPRS/GSM Cradle (EDGE/Quad-band) ▸ RS-232 cable

Appendix I

DOWNLOAD UTILITIES

For easy development of applications, the mobile computer ships with development tools on the CD-ROM. It includes Windows-based **Application Generator** programs, batch and WLAN, as well as download utilities.

The download utilities are provided for you to download a program (*.SHX or *.SYN) to the mobile computer. Currently, the program ProgLoad.exe has replaced several previously released utilities as shown below.

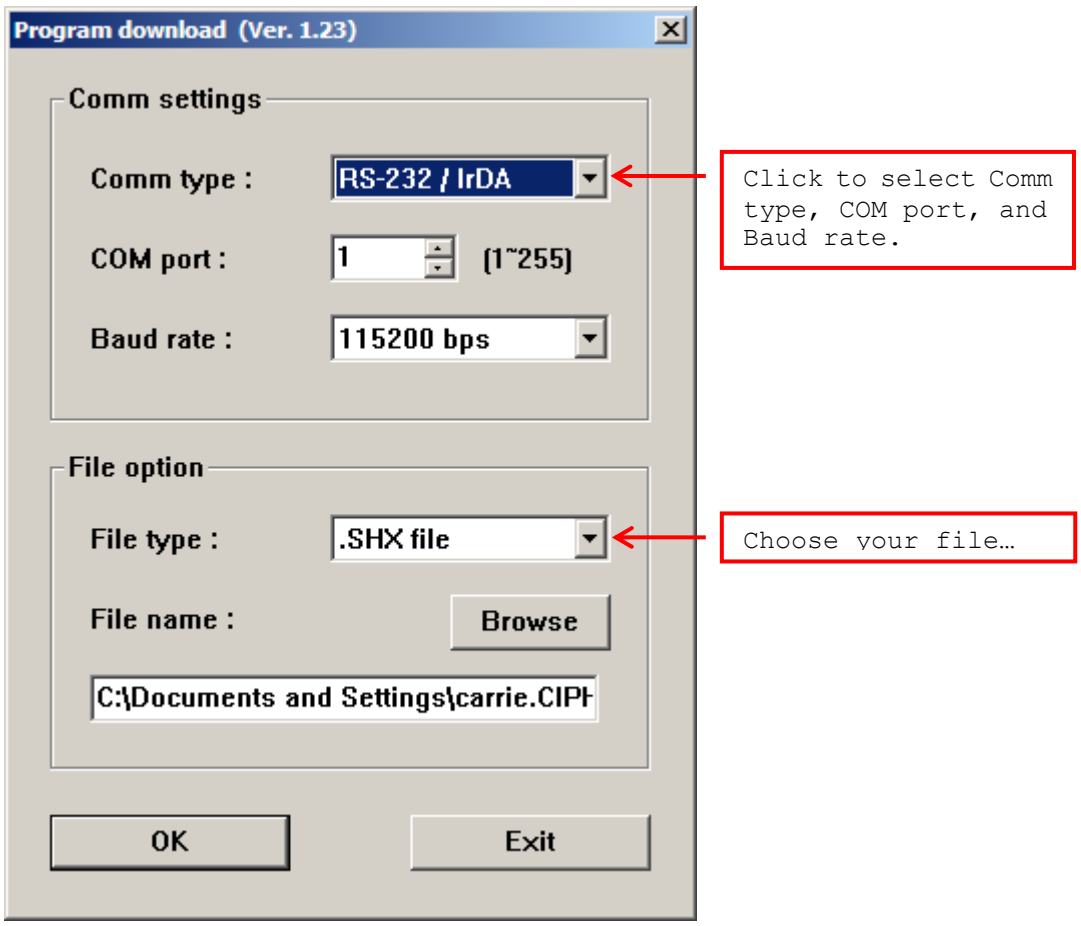
- Download.exe : to download a *.SHX file
- SynLoad.exe : to download a *.SYN file

Programs can be as follows —

Program Type		System Menu	Kernel Menu	Program Manager
AG Runtime	U*.SHX	√	√	√
CipherNet Runtime	84xx-VT.SHX 84xx-5250.SHX	√	√	√
BASIC Runtime	BC*.SHX	√	√	√
BASIC program	*.SYN	√	–	–
Font file	For example, Font-Multi-Language.SHX	√	√	–
Kernel update	K*.SHX	–	√	–

PROGLOAD.EXE

This all-in-one utility supports all the file types and communications interfaces. Run the program on your computer. The following dialog box pops up.



Communication Type

RS-232/IrDA	Connection via direct RS-232 cable, IrDA port, or Bluetooth SPP (= Download.exe)
Serial IR	Connection via cradle (= IRLoad.exe)
TCP/IP	Connection over networks (Not supported currently!)

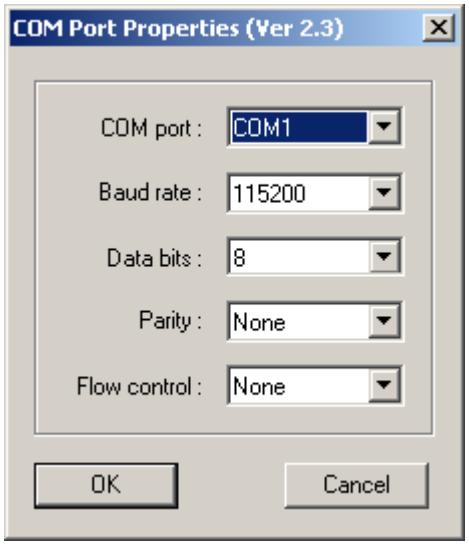
File Type

.SHX file	Any C program, such as AG Runtime, Basic Runtime, font file, etc.
.SYN file	Any Basic program after Basic Runtime has been installed first.

DOWNLOAD.EXE

This utility is provided when you establish a connection via serial interface, such as a direct RS-232 cable, IrDA port, or Bluetooth SPP.

1) Run the program.
2) Choose a .SHX file.
3) Select COM port properties.



COMMAND LINE

It also supports command line arguments.

Appendix II

TROUBLESHOOTING

The mobile computer cannot be turned on when you press the POWER key…

- Make sure the battery pack is installed properly.
- Re-charge the battery inside the mobile computer and monitor the charging status. (see 3.5)
- If the battery is faulty, replace it with a fresh and fully charged battery then.

Charging error…

- If using the USB cable for direct charging, perform the charger test to select a suitable charging current. (see 3.3.8)
- If joining the power adapter to the USB or RS-232 cable, make sure it is well connected between the power jack and an outlet.
- If using a cradle or charger, make sure the power cord is well connected the cradle/charger and an outlet.
- Check if the battery contacts of the battery itself and the battery compartment are clean.
- Try to re-charge the battery and monitor the charging status.

Warning!	Only use batteries or charging device manufactured by CipherLab. The use of wrong battery or charging device could result in damage to human body or the product itself, and will void your warranty.

The keyboard input seems not working properly…

- Perform the keyboard test. (see 3.3.4)
- If the problem persists, slide the battery latch to reload the battery pack. Then perform the test again.

The reader does not scan…

Low battery —

- Check if the battery icon on the screen indicates a low battery status. If so, replace it with a fresh battery then.
- If the problem persists, check if the battery contacts get dirty or the battery pack does not fit to the compartment.

Regarding the barcode reader —

- Perform the reader test to see if the reader is working. . (see 3.3.1)
- If the problem persists, slide the battery latch to reload the battery pack. Then perform the test again.

The reader does not decode after scanning...

Unreadable barcode —

- Check if the barcode is defaced. A defaced barcode may not be readable.

Un-programmed to read —

- Check if the scanner is programmed to read the symbologies (types of barcode) that you are trying to read.
- Try scanning a test barcode of the symbology you are trying to read.

Dirty scan window —

- Check if the scan window gets dirty. Wipe it with a clean and dry cloth, and try again.

Out of scanning range —

- Try adjusting the scanning distance from the scanner to the barcode.

The mobile computer cannot transmit/receive data to/from a host computer or other devices...

Over RS-232 cable —

- Check if the RS-232 connection is correct and secured.
- Make sure the serial port parameters on the host are configured to match the serial parameters on the mobile computer. Try to establish connection again.
- If the problem persists, run the RS-232 Echo Test to check the interface between the mobile computer and the host. (see 3.3.6)

Over USB cable —

- Check if the USB connection is correct and secured.
- If the problem persists, run the USB Echo Test to check the interface between the mobile computer and the cradle. (see 3.3.6)

Via Bluetooth —

- Make sure the distance between the mobile computer and a target device is within proper range. Try to establish connection again.
- Check if the relevant settings are correct. (see 3.7)
- Check if the connection is working properly. (see 3.7)

Over MODEM port via cradle —

- Check if the modem connection is correct and secured.
- Make sure the modem parameters are configured to match the parameters on the mobile computer. Try to establish connection again.
- Make sure the mobile computer is well seated inside the cradle. DO NOT remove the mobile computer or disconnect the cradle before communications are done.
- If the problem persists, run the Echo Test to check the MODEM interface between the mobile computer and the cradle. (see 3.3.6)

About abnormal response...

The LED or LCD seems not working properly —

- Perform the LCD & LED test. (see 3.3.3)
- If the problem persists, reload the battery pack and perform the test again.

The buzzer seems not working properly —

- Perform the buzzer test. (see 3.3.2)
- If the problem persists, reload the battery pack and perform the test again.

The mobile computer seems not working properly —

- Perform the flash read/write test. (see 3.3.9)
- First upload all data to a computer, and then perform the memory test. (see 3.3.5)
- If the problem persists, reload the battery pack and perform the test again.

The vibrator seems not working properly —

- Perform the vibrator test. (see 3.3.7)
- If the problem persists, reload the battery pack and perform the test again.