CipherLab 83×0 Series User Guide

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Preface

The **83×0 Series Portable Terminals** are rugged, versatile, high performance data terminals designed for all-day, everyday use. They are powered by a Li-ion rechargeable battery with working hour longer than 100 hours. They are supported by a rich set of development tools, including a Windows-based application generator, “C” and “Basic” compilers. With their integrated Laser/CCD barcode scanning unit and optional RF module, the **83×0 Series Portable Terminals** are ideal for both batch and real time applications such as inventory control, shop floor management, warehousing and distribution operations.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

General Features and Characteristics

Basic characteristics of the 83×0 Series Portable Terminal are listed below,

Electrical

- O**peration battery:** 3.7V Li-ion rechargeable battery, 700mAH or 1800mAH (8370 only).
- **Backup battery:** 3.0V, 7mAH rechargeable Lithium battery for SRAM & calendar
- **Working time:** over 100 hours for 8300 (batch model); over 20 hours for 8310 (433MHz RF model), 8 hours for 8350 (2.4GHz RF model), 36 hours for 8360 (Bluetooth model) and 16 hours for 8370 (802.11b).

Environmental

- **Operating Humidity**: non-condensed 10% to 90%
- **Storage Humidity:** non-condensed 5% to 95%
- **Operating Temperature:** -20 to 60 C
- **Storage Temperature:** -30 to 70 C
- **EMC regulation:** FCC, CE and C-tick
- S**hock resistance:** 1.2m drop onto concrete
- **IP rating:** IP65

Physical

- **Dimensions – Batch model:** 169mm (L) x 77mm (W) x 36mm (H)
- **Dimensions – RF model:** 194mm (L) x 77mm (W) x 44mm (H)
- **Weight – Batch model:** 230g (including battery)
- **Weight – RF model:** 250g (including battery)
- **Housing color**: Black
- **Housing material**: ABS

CPU

- Toshiba 16-bit CMOS type CPU
- Tunable clock, up to 22MHz

Memory

Program memory

- 1 M Bytes flash memory is used to store the program code, font, constant data, and so on. Data memory
- **Batch model (8300):** 2M / 4M Bytes SRAM
- **RF model (8310/8350/8360/8370):** 256K Bytes SRAM

Reader

The 8300 Series Terminal can be equipped with either Laser or Long Range CCD scanner. For batch models (8300C / 8300L), the angle of the scanning beam can be straight (0°) or 45° to the LCD plane. Detailed specifications are as follows:

8300L / 8310L / 8350L / 8360L / 8370L (Laser)

- **Light source:** visible Laser diode operating at 670±15nm
- **Scan rate:** 36±3 scans per second
- **Scan angle:** 42°nominal
- **Minimum print contrast:** 20% absolute dark/light reflectance at 670nm
- **Depth of field:** 5 ~ 95 cm, depends on barcode resolution

8300C / 8310C / 8350C / 8360C / 8370C (CCD)

- **Resolution:** 0.125mm ~ 1.00mm
- **Depth of field:** 2 ~ 20cm
- **Width of field:** 45mm ~ 124mm
- **Scan rate:** 100 scans/sec
- **Ambient Light Rejection:**
  1200 lux (Direct Sun-light)
  2500 lux (Fluorescent Light)

Display

- 128×64 graphic dots FSTN LCD display with LED back-light

Keypad

- 24 numeric or 39 alphanumeric rubber keys.

Indicator

Buzzer

- Software programmable audio indicator, 1KHz to 4KHz, low power transducer type.

LED

- Programmable, dual-color (green and red) LED for status indication.

Communication

- **RS-232:** baud rate up to 115200 bps
- **Serial IR:** baud rate up to 115200 bps
- **Standard IrDA:** baud rate up to 115200 bps
- **433MHz RF:** data rate up to 9600 bps
- **2.4GHz RF:** data rate up to 19200 bps
- **Bluetooth Class 1:** data rate up to 433 Kbps
- **IEEE-802.11b**: data rate up to 11 Mbps

RF Specification

433MHz RF (8310)

- **Frequency Range:** 433.12 ~ 434.62 MHz
- **Modulation:** FSK (Frequency Shift Keying)
- **Data Rate:** 9600 bps
- **Programmable Channels:** 4
- **Coverage:** 200M line-of-sight
- **Maximum Output Power:** 10mW (10dbm)
- **Standard:** ETSI

2.4GHz RF (8350)

- **Frequency Range:** 2.4000 ~ 2.4835 GHz, unlicensed ISM Band
- **Type:** Frequency Hopping Spread Spectrum Transceiver
- **Frequency Control:** Direct FM
- **Data Rate:** 19200 bps
- **Programmable Channels:** 6
- **Coverage:** 1000M line-of-sight
- **Maximum Output Power:** 100mW
- **Standard:** ISM

Bluetooth – Class 1 (8360)

- **Frequency Range:** 2.4020 ~ 2.4835 GHz
- **Modulation:** GFSK
- **Profiles:** BNEP, SPP
- **Data Rate:** 433 Kbps
- **Coverage:** 250M line-of-sight
- **Maximum Output Power:** 100mW
- **Standard:** Bluetooth spec. V1.1

IEEE-802.11b (8370)

- **Frequency Range:** 2.4 ~ 2.5 GHz
- **Modulation:** DSSS with DBPSK(1Mbps), DQPSK(2Mbps), CCK
- **Data Rate:** 11, 5.5, 2, 1 Mbps auto-fallback
- **Coverage:** 250M line-of-sight
- **Maximum Output Power:** 100mW
- **Standard:** IEEE 802.11b & Wi-Fi compliance

RF Base – 433MHz (3510)

- **Base to Host:** RS-232
- **Base Baud Rate:** up to 115,200 bps

- **Base to Base:** RS-485
- **Maximum Terminals** / **Base:** 15
- **Maximum Terminals** / **System:** 45
- **Maximum Bases** / **System:** 16

RF Base – 2.4GHz (3550)

- **Base to Host:** RS-232
- **Base Baud Rate:** up to 115,200 bps
- **Base to Base:** RS-485
- **Maximum Terminals** / **Base**: 99
- **Maximum Terminals** / **System:** 99
- **Maximum Bases** / **System:** 16

Bluetooth Access Point (3560)

- **Frequency Range:** 2.4020 ~ 2.4835 GHz
- **Profile:** BNEP V1.0 NAP
- **Maximum Output Power:** 100mW
- **Ethernet Connection:** 10/100 Base-T (Auto-switch)
- **Protocol:** TC/PIP, UDP/IP, ARP/RARP, DHCP for IPv4
- **Maximum Terminals** / **AP:** 7 terminals (Piconet)
- **Standard:** Bluetooth spec. V1.1

Software

- **Operating System:** CipherLab proprietary OS
- **Programming Tools:** “C” compiler, BASIC compiler and a Windows-based Application Generator

Accessories

- Charging & Communication cradle
- RS-232 cable
- Keyboard wedge cable
- Power adapter
- Li-ion rechargeable battery pack
- 3510 / 3550 RF base station
- 3560 Bluetooth Access Point
- 802.11b WLAN Access Point
- USB cable / cradle
- Modem cradle

RF System Configuration

IDs and Groups

An ID to a terminal / base is just like a name to a person. Each terminal / base in the same RF system should have a unique ID. If the IDs are duplicated, the system may not work properly. So before running your RF system, please make sure that every terminal / base has a unique ID.

For 433MHz RF system, up to 45 terminals and 16 bases can be supported by one system. The valid ID ranges from 1 to 45 for terminals, and 1 to 16 for bases. To support all 45 terminals, the 433MHz RF bases need to be configured to 3 groups. Each group and also each base can support up to 15 terminals.

- **Base IDs (433MHz):** 01 ~ 16
- **Terminal IDs (433MHz):** 01 ~ 45 (3 groups)
  01 ~ 15: supported by Group #1 Bases
  16 ~ 30: supported by Group #2 Bases
  31 ~ 45: supported by Group #3 Bases

For 2.4GHz RF system, up to 99 terminals and 16 bases can be supported by one system, and they all belong to the same group.

- Base IDs (2.4GHz): 01 ~ 16
- Terminal IDs (2.4GHz): 01 ~ 99

RF Terminal s

The configurable properties of a terminal are as follows:

433 MHz RF model (8310)

- ID: 01 ~ 45
- Channel: 1 ~ 4
- Time out: 1 ~ 99 seconds, duration of retries for sending data
- Output power: 1~5 levels (10, 5, 4, 0, -5dBm)
- Auto search: 0 ~ 99 sec, automatically search for available channel when connection to current channel is lost

2.4 GHz RF model (8350)

- ID: 01 ~ 99
- Channel: 1 ~ 6
- Output power: maximum 64mW
- Auto search: 0 ~ 99 sec, automatically search for available channel when connection to current channel is lost
- Time out: 1 ~ 99 seconds, duration of retries for sending data

RF Bases

The connection from the host computer to the base is RS-232, while the connection between bases is RS-485. Up to 16 bases can be connected together in one RF system. If two or more bases are connected together, the one connected to the host computer should be set to master mode, and the others in slave mode.

433 MHz Base Properties (3510)

- Mode: 1-standalone, 2-slave, 3-master
- Channel: 1 ~ 4
- ID: 01 ~ 16
- Group: 1 ~ 3
- Time out: 1 ~ 99 seconds, duration of retries for sending data
- Output power: 1~5 levels (10, 5, 4, 0, -5dBm)
- Baud rate: 115200, 57600, 38400, 19200, 9600

2.4 GHz Base Properties (3550)

- Mode: 1-standalone, 2-slave, 3-master
- Channel: 1 ~ 6
- ID: 01 ~ 16
- Group: 1
- Time out: 1 ~ 99 seconds, duration of retries for sending data
- Output power: maximum 64mW
- Baud rate: 115200, 57600, 38400, 19200, 9600

Software Architecture

The 8300 Series Terminal system software consists of three modules: the kernel & Application Manager module, the System module and the Application module.

Kernel & Application Manager

The kernel is the innermost core of the system. It has the highest security and is always protected by the system. Only the failure of flash memory or improperly power off during system restart after updating kernel will the kernel be destroyed. The kernel module ensures that users can always download their application program even the operating system was crashed by the user's program. The kernel provides the following services:

- **Kernel Information**
  Information includes hardware version, serial number, manufacturing date, kernel version and hardware configurations.
- **Load Application**
  To download the application program, BASIC run-time or font files.
- **Kernel Update**
  Sometimes the kernel might be changed for improving performance or other reasons. This function allows you to keep the kernel updated. The update procedure is same as download user program, but note that after updating the kernel, please do not power off until the system restart itself.
- **Test & Calibrate**
  To perform a burn-in test and tune the system clock. This function is for manufacturing purpose only.
  Besides the kernel menu, if there is no application program exists, then upon power up the terminal the following Application Manager's menu will be shown:
- **Download**

To download application programs (*.SHX), BASIC run-time (BC8300.SHX), BASIC programs (*.SYN) or font files (8xxx-XX.SHX) to the terminal. There are 6 resident locations and one Active Memory, i.e. at most 7 programs can be downloaded to the terminal. But only the one downloaded to the Active Memory will be activated and running. To run other programs, they need to be activated first, but only one at a time. Right after downloading, you can input a name for the program or just press the enter key to keep its current name if there is. And then the downloaded program's type, name and size will be shown on the list when entering the Download or Activate menu of the Application Manager. The file type is a small letter follows the program number (01~06), it can be either 'b', 'c' or 'f' which represents BASIC program, C program or font file respectively. The program name is up to 12 characters and the program size is in unit of K bytes.

- **Activate**
  To copy one of the 6 resident programs to the Active Memory to make it become the active program. After activating, the original program in the Active Memory will be replaced by the new one. Note a font file cannot be activated, and a BASIC program cannot be activated either if the BASIC run-time does not exist.
- **Upload**
  To transmit the application programs to a host PC or another terminal. The function allows a terminal to be cloned without going through a PC.

System

The system module provides the following services:

1. Information

The system information includes hardware version, serial number, manufacturing date, kernel version, C library or BASIC run-time version, application program version and hardware configurations.

2. Settings

The system settings include the following:

Clock

Set date and time for the system.

Backlight ON Period

Set the staying on duration for the keyboard and LCD backlight.
Default: the lights go off after 20 seconds.

CPU Speed

Set CPU running speed. There are five speeds available: Full speed, half speed, quarter speed, eighth speed and sixteenth speed. Default: Full speed

Auto Off

Set time threshold for automatically power off when no operation is taking place during that specified period. If this

value is set to zero, this function will be disabled. Default: 10 minutes

Power On Options

There are two possible selections: Program Resume, which starts from the program being used during the last session before the last power-off; and Program Restart, which starts with a new program.
Default: Program Resume

Key Click

Select a tone for the beeper or disable the beeper when the user presses a key button. Default: Enable

System Password

Set a password to protect the user from entering the system menu. Default: no password is set

3. Tests

Reader

To test the reading performance of the scanner. The following barcodes are default to enable:

Code 39
Industrial 25
Interleave 25
Codabar
Code 93
Code 128
UPCE
UPCE with ADDON 2
UPCE with ADDON 5
EAN8
EAN8 with ADDON 2
EAN8 with ADDON 5
EAN13
EAN13 with ADDON 2
EAN13 with ADDON 5
Other barcodes must be enabled through programming.

Buzzer

To test the buzzer with different Frequency/Duration. Press **ENTER** key to start and then press any key to stop the test.

LCD & LED

To test LCD display and LED indicator. Press **ENTER** key to start and then press any key to stop the test.

Keyboard

To test the rubber keys. Press a key and the result will be shown on the LCD display. Note that the FN key should be used in conjunction with numeral keys.

Memory

To test the data memory (SRAM). Note after the test, the contents of the memory space will be wiped out.

4. Memory

Size Information

Information includes sizes of the base memory (SRAM), memory card (SRAM) and program memory (FLASH) in the unit of kilobytes.

Initialize

To initialize the data memory (SRAM). Note the contents of the data space will be wiped out after memory initialization.

5. Power

Show the voltages of the main battery and backup battery.

6. Load Application

To download the application program, BASIC run-time or font file. There are three interfaces supported by the system, namely, the Direct-RS232, Cradle-IR and standard IrDA.

7. 433M Menu (8310)

This item will be shown only if the 433MHz RF module is installed. There are two menus if this item is selected:

Settings

The RF settings and their default values are as follows,
Terminal ID: 01
Terminal Channel: 01
Terminal Power: 01
Auto Search Time: 10
Send Timeout: 02

Tests

The RF tests include the follows,

1. Send Test
2. Receive Test
3. Echo Test
4. Channel Test

7. 2.4G Menu (8350)

This item will be shown only if the 2.4GHz RF module is installed. There are two menus if this item is selected:

Settings

The RF settings and their default values are as follows,
Terminal ID: 01
Terminal Channel: 01
Terminal Power: 01
Auto Search Time: 10
Send Timeout: 02

Tests

The RF tests include the follows,

1. Send Test
2. Receive Test
3. Echo Test
4. Channel Test

7.Bluetooth Menu (8360)

This item will be shown only if the Bluetooth module is installed. The Bluetooth menu includes the following items:

1. Information
2. IP Setting
3. BNEP Setting
4. Security
5. Echo Tests
6. Inquiry

7.802.11b Menu (8370)

This item will be shown only if the 802.11b module is installed. The 802.11b menu includes the following items:

1. Information
2. IP Setting
3. WLAN Setting
4. Security
5. Echo Tests

Application

The Application module runs on top of the System module. The 83×0 Series Portable Terminals are preloaded with the Application Generator's run-time program and the following menu will be shown upon powering the unit up:

Batch model (8300):

1. **Collect data**
2. **Upload data**
3. **Utilities**

RF models (8310 / 8350 / 8360 / 8370)

1. **Take data**
2. **Utilities**

The arrow keys can be used to select the menu item, and execute it by pressing the ENTER key.
Note if you use the Application Generator to create your application program, you need to download it to the terminal. And for RF models, you need to use the RF Database Manager to handle the in-coming and out-going data to and from the PC. For detailed information, please refer to “8300 Series Application Generator User’s Guide” and “RF Application Generator User’s Guide”.

Programming the terminal

There are three software tools available for developing application programs for the terminal.

1. **The Application Generator**
2. **The “BASIC” Compiler**
3. **The “C” Compiler**

For detailed information, please contact Syntech Information Co., Ltd.

Programming the communication cradle

The communication cradle of the 8300 Portable Data Terminal supports serial IR interface only. Before your PC application starts to communicate with the terminal via its cradle, first you need to configure the cradle through programming. There is a DLL available for this purpose. For more information, please contact Syntech Information Co., Ltd.

Operations

Batteries must be fresh and properly loaded before start operation.

Keypad operations

The 8300 Series Terminals have two keyboard layouts: 24 rubber keys and 39 rubber keys. The functions of some special keys are as follows:

SCAN
Scan a barcode.
Press this button will trigger the scanner to read a barcode if the scanner port is enabled.

ENTER
Enter.

There are two enter keys on the side of the scan key. Normally the enter keys are used for command execution or input confirmation.

ESC
Escape.
Usually this key is used to stop and exit current operation.

BS
Back Space.
If this key is being pressed down longer than one second, a clear code will be sent.

ALPHA /
The toggle key for Alphabet / Numeral input.
When the system is in alpha-mode, a small icon will be shown on the display. For the 24-key keyboard, each numeral key can be used to generate one of the three capital letters. For example, numeral 2 can be used to produce A, B or C. Pressing the same key twice within one second, will call the letter B. Pressing the same key without halting longer than one second, will cause the three letters to be shown in a circulating way. Only when stop pressing the key for longer than one second or pressing another key, will the system send the real key code to the application program.

FN
The function key.
This key cannot be activated alone, it must be pressed with one numeral key at
the same time. For example, FN + 1 generates function #1, FN + 2 generates function #2, etc (up to 9 functions). Also, this key can be combined with the UP/DOWN arrow keys to adjust the contrast of the LCD. And when this key is combined with the ENTER key, it will turn ON/OFF the backlight.

POWER
Power On/Off.
To prevent a faulty push, it needs about 1.5 sec continuous pressing to turn On/Off the power.

.23. Application mode

This is the default operation mode when turning on the power. The operation depends on the application module. Please refer to section 4.4.

System mode

To enter the system menu, you need to press the **7, 9** and **POWER** keys simultaneously upon power up the terminal. For details of the services provided by the system, please refer to section 4.2.

Kernel mode

To enter the kernel menu, you need to press **7, 9** and **POWER** keys simultaneously to enter the system menu first, then power off the unit and press **1, 7** and **POWER** key simultaneously. Or if the battery is just reloaded, then press **1, 7** and **POWER** key simultaneously will directly go to the kernel. For details of the services provided by the kernel, please refer to section 4.1.

Application Manager

Although the Application Manager is part of the kernel, to enter it, you need to press ‘8’ and **POWER** key simultaneously. Or if the application program does not exist, the unit will automatically go to the Application Manager’s menu upon power up.

The three services: Download, Activate and Upload provided by the Application Manager are explained in Section 4.1. But what if you need to update a program or delete it? For both cases, you need to select the Download menu and select the program to be updated or deleted. The Application Manager then shows the selected program's information such as Program Name, Download Time, Used and Free Flash memory. And then please input 'C' to update the selected program, or input 'D' to delete it.

Troubleshooting

a) Does not power up after pressing POWER key.

- Make sure the battery is loaded.
  Charge the battery and check the charging status. If no charging information shown on the display, reload the battery and check if the battery is properly installed then try again.
- Call for service if problem persists.

b) Cannot transmit data or programs via the terminal's communication port.

- Check if the cable is plugged tightly, then,
- Check if host communication parameters (COM port, baud rate, data bits, parity, stop bit) match with the Terminal's.

c) Keypad does not work properly,

- Turn off the power then press the 7, 9 and POWER keys simultaneously to enter the system menu.
- From the system menu, select the Test and then its sub-item KBD.
- Perform the key-in test.
- If problem persists, call for service.

d) Scanner does not scan,

- Check if the barcodes used are enabled, or
- Check if battery-low indicator is shown on the LCD display. If yes, charge the battery.
- If problem persists, call for service.

e) Abnormal responses,

- Open the battery cap and re-load the battery.
- Enter system menu by pressing 7, 9 and POWER keys simultaneously.
- Check if the terminal can have a correct response by performing tests.
- If problem persists, call for service.

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