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1. Introduction

The **CPT-720** Portable Terminal is a durable, versatile, rugged data terminal designed for all-day, everyday use. It is supported by a rich set of development tools, including a Windows-based application generator, “C” and “Basic” compilers. In order to satisfy heavy-duty applications, the **CPT-720** can withstand 1.5-meter drops onto concrete and can also be operated under extreme temperature. With its integrated Laser/LRCCD barcode scanning unit, expandable data memory, and multiple communication interfaces, the **CPT-720** is today’s most flexible and reliable data collection terminal.

2. General Features and Characteristics

Basic characteristics of the *CPT-720 Portable Terminal* are listed below,

2.1 Electrical

- Operation battery : two AAA size batteries or Ni-MH rechargeable battery pack
- Backup battery : 3.0V, 7.0mAh, rechargeable Lithium battery for SRAM & calendar
- Working time: 100 hours and more than 50,000 readings (with its CPU in low speed mode and 1 reading every 5 seconds).

2.2 Environmental

- Humidity (operating): non-condensed 10% to 90%
- Humidity (storage): non-condensed 5% to 95%
- Temperature (operating): -20 to 60 °C
- Temperature (storage): -30 to 70 °C
- EMC regulation: FCC class A, CE and C-Tick approved
- Water resistance: IP-54
- Shock resistance: 1.5m drop onto concrete

2.3 Physical

- Dimensions: 203.6mm (L) x 79mm (W) x 39.6mm (H)
- Weight: 330g (including batteries)
- Color: Dark gray
- Material: ABS

2.4 CPU

- Toshiba 16-bit CMOS type CPU
- Dual clock, can be switched to *Low Clock* to save power (refer to the *speed* setting in section 5.3).

2.5 Memory

Program memory

- 1 M Bytes flash memory is used to store the program code, font, constant data, and so on.

Data memory

- Base memory: 256 K Bytes SRAM.
- Extended memory: 8 M Bytes Smart-Media card.

2.6 Scanner

The *CPT-720 Portable Terminal* can be equipped with Laser or Long Range CCD scanners. Detail specifications are as following:

CPT-720L (Laser)

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

CPT-720C (CCD)

- Resolution: 0.15mm ~ 1.00mm
- Depth of field: 20cm
- Width of field: 45mm ~ 124mm
- Scan rate: 100 scans/sec
- Ambient Light Rejection:
1200 lux (Direct Sun-light)
2500 lux (Fluorescent Light)

2.7 Display

- 128x64 graphic dots STN LCD display with LED back-light
- Icons include battery low warning, alpha input, shift mode, and Smart-Media card indication.

2.8 Keypad

- 32 rubber keys, including alphanumeric keys, arrow keys, function keys, and scan trigger key.

2.9 Indicator

Buzzer

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

LED

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

2.10 Communication

Four kinds of communication are provided: standard RS-232, Infrared, RS-485, and RF.

- RS-232: Transmission speed up to 115200bps
- Infrared: Standard IrDA 1.0 and high speed IR.
Transmission speed up to 115200bps
Distance: 5 to 100 cm
View angle: 30 degrees
- RS-485: Through cradle, multi-drop up to 32 units
- RF: Transmission rate up to 9600bps
Distance: up to 100 m

2.11 Programming Language

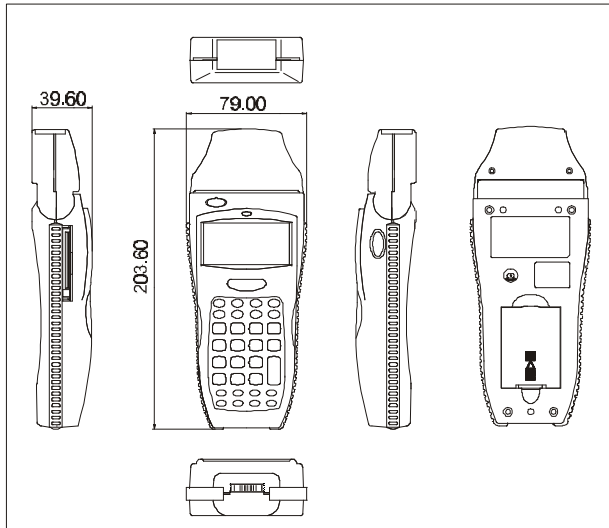
"C", "BASIC", and a Windows-based Application Generator

2.12 Accessories

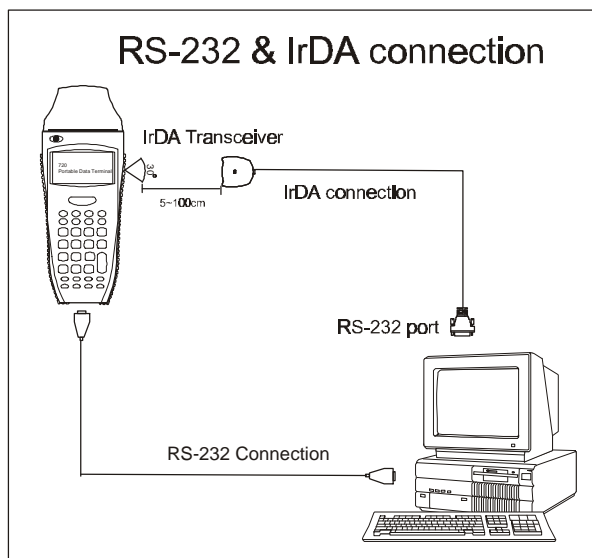
- RS-232 cable
- High speed IR Transceiver
- Cradle (for charging and communication)
- RF base station
- Smart-Media Card and Reader

3. Hardware Configuration

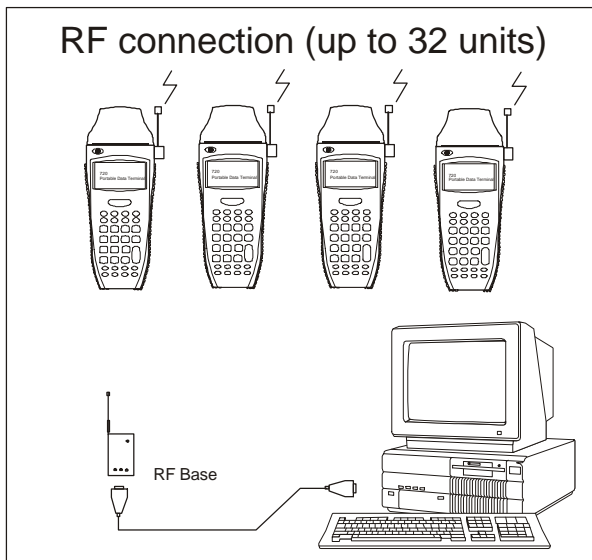
3.1 Front, Back and Side View



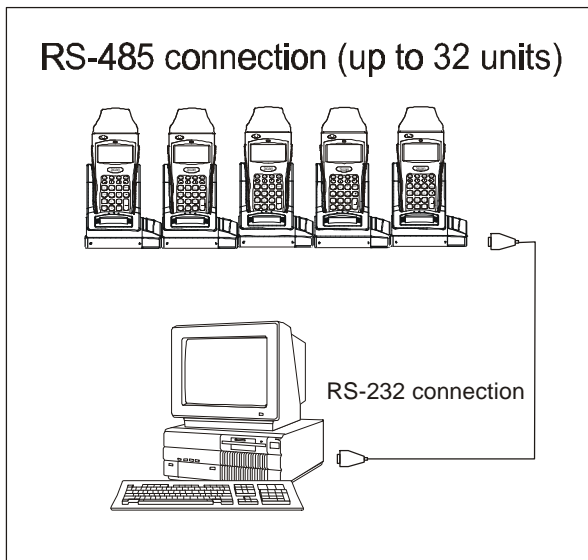
3.2 RS-232 connection & IrDA connection



3.3 RF connection



3.4 RS-485 connection



4. Software Organization

The system software of *CPT-720 Portable Terminal* consists of three modules: the *kernel module*, the *system module* and the *application module*.

4.1 Kernel module

Kernel module 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 user can always download their own program even the operating system was crashed by user's program. It provides the following services:

- **Program download**
- **Update kernel**
- **Test & Calibrate**

For detail operations, please refer to section 5.4.

4.2 System module

The system module provides the following system services

- **Memory**
- **Setting**
- **Reader**
- **Battery**
- **Test**
- **Download**
- **Version**

For detail operations, please refer to section 5.3.

4.3 Application module

The Application module runs on top of the System module. The *CPT-720 Portable Terminal* is preloaded with an application module that runs upon powering the unit up. The following menu will be shown:

- **Execute**
- **Clear Data**
- **Transmit Data**
- **Download Settings**

The arrow keys can be used to select the menu item, and execute it by pressing the *ENTER* key. The function and meaning of each item are as follows:

Execute Start the data collection process.
A new screen appears after *Execute* is selected and the *ENTER* key is pressed, showing the following two prompts:

Item:
Qty:

Data can be input from keypad or barcode reader. Pressing the *ENTER* key after the Quantity has been entered will save the data and the system will show the same prompts until the *ESC* key is pressed, which will bring back the main menu.

Clear Data To clear all the transaction data.
A submenu will be shown asking to confirm this action. Once executed, the transaction data will be lost and can not be retrieved. To abort this operation, *No* must be selected when asked to confirm the operation or by pressing the *ESC* key to go back to the main menu.

Transmit Data To upload transaction data to the host PC. There are three ways to transmit the data: via RS-232 or Infrared or standard IrDA. Note: terminal COM port settings should match the host PC settings.

Download Settings To download the menus and form prompts for the data collection process. The settings should be configured in the *Application Generator*; then downloaded to the terminal. The *Application Generator* allows to define menus and data input forms. For detail operation, please refer to the *Application Generator's Operation Guide*.

4.4 Build your own application module

There are three software tools available for developing application programs.

- 1. The Application Generator**
- 2. The "BASIC" Compiler**
- 3. The "C" Compiler**

For more information, please contact CipherLab USA or Syntech Information Co., Ltd.

5. Operations

Batteries must be fresh and properly loaded before start operation.

5.1 Keypad operations

The keypad of *CPT-720 Portable Terminal* consists of 32 rubber keys and one power switch. The functions of some special keys are as follows:

BS	<i>Back Space.</i> If pressed down longer than one second, a <i>clear</i> code will be sent.
Shift	<i>Shift</i> (toggle key) When it is in shift mode, an up-arrow icon will be shown in the screen. Alphabet input will be small letter and F8 can be used to turn on/off the display back-lit. Also the F6 and F7 can be used to adjust the display contrast.
Alpha	<i>The toggle key for Alphabet / Numeral input.</i> When the system is in alpha-mode, a small icon will be shown on the right most side of the display.
ESC	<i>Escape.</i> Usually this key is to exit current operation.
POWER	<i>Power On/Off.</i> To prevent a faulty push, it needs about 1.5 sec continuous pressing to turn On/Off the power.

5.2 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.

5.3 System mode

When pressing the 7, 9 and **POWER** keys simultaneously, the system will enter the System Mode with which provides the following services:

1. Memory

Size Information Includes the SRAM (Data memory) size, extended memory size (Smart-Media Card) and FLASH (Program memory) size in kilobytes.

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

Test To test the data memory. For 256 KB SRAM, it takes about 15 seconds to finish the test. Note that the contents of the data space will be wiped out too after memory test.

2. Setting

Clock To set new date and time.

Backlit To set the intensity of LCD back-light and the duration for staying on. *Default: High intensity, the lights go off after 20 seconds.*

Speed

To set CPU running speed. There are five speeds available:

Full speed, 1/2 speed, 1/4 speed, 1/8 speed and 1/16 speed; which need about 39mA, 22mA, 12mA, 7mA and 5mA, respectively, during normal operation (without scanning or data transmission). If high-speed operation is not required, selecting low CPU speed will save battery power.

Default: Full speed

Auto Off

Set time threshold for auto 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

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

3. Reader**Reading test**

To test the reading performance of the scanner. Following are the default enabled symbologies:

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 symbologies, must be enabled through programming.

4. Battery

Main Show voltage of the main battery power. If the main battery voltage is low, a battery icon (power-low indicator) will be shown on the LCD screen. The available power will be less than 25% of fresh batteries, The terminal will continue to work normally for a short period of time.

Backup Show voltage of the backup battery.

5. Test

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

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

KBD To test the rubber keys.
Press a key and the result will be shown on the LCD display.

6. Download

RS-232 To download the user program via RS-232 port. The transmission speed can be up to 115200 bps.

Docking To download the user program via communication cradle (charger). The transmission speed can be up to 115200 bps.

IR To download the user program via high speed IR transceiver. The transmission speed can be up to 115200 bps.

IrDA To download the user program via standard IrDA. The transmission speed can be up to 115200 bps.

7. Version

Version Info To show version information, including Hardware version, Firmware version, Serial Number and Manufacturing Date.

5.4 Kernel mode

Press the **7, 9** and **POWER** keys simultaneously to enter the System mode, then power off and press **1, 7** and **POWER** key simultaneously to enter the kernel mode which provides the following services:

Program download To download user program. The download procedure is same as download program in system mode. Please refer to the above section.

Update kernel To update system kernel. 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 adjust the system clock. This function is for manufacturing purpose only.

6. Troubleshooting

- a) Does not power up after pressing **POWER** key.
 - Change the batteries.

- b) Does not power up after changing batteries.
 - Check if the batteries are properly installed.
 - If problem persists, try to enter kernel menu by pressing **7**, **I** and **POWER** keys simultaneously.
 - If problem persists, call for service.

- c) Battery-low indicator is on,
 - Change the batteries.

- d) Cannot download application program from the host to the *CPT-720 Portable Terminal* or vice versa, via RS-232 port.
 - Check if the RS-232 cable is plugged tightly, then,
 - Check if host communication parameters (COM port, baud rate, data bits, parity, stop bit) match the *CPT-720 Portable Terminal's*.

- e) Cannot download application program from the host to the *CPT-720 Portable Terminal* or vice versa, via IrDA port.
 - Check if the IrDA transceiver tightly connected to host's COM port, then
 - Check if host communication parameters (COM port, baud rate, data bits, parity, stop bit) matched portable's.

- Check if the *CPT-720 Portable Terminal* is properly positioned within the reading range: (5 to 100cm, 30 degree solid angle) of the IrDA transceiver.
- f) Keypad does not work properly,
- Turn off the power then press the **7**, **9** and **POWER** keys simultaneously to enter the kernel mode operation.
 - From the system menu, select the **Test** and then its sub-item **KBD**.
 - Perform the key-in test.
 - If problem persists, call for service.
- g) Scanner does not scan,
- Check if symbologies used are enabled, or
 - Check if battery-low indicator is shown on the LCD display. If yes, change the batteries.
 - If problem persists, call for service.
- h) Abnormal responses,
- Open the battery holder and re-load the batteries.
 - Enter system menu by pressing **7**, **9** and **POWER** keys simultaneously.
 - Check if the *CPT-720 Portable Terminal* can have a correct response by performing entering data.
 - If problem persists, call for service.