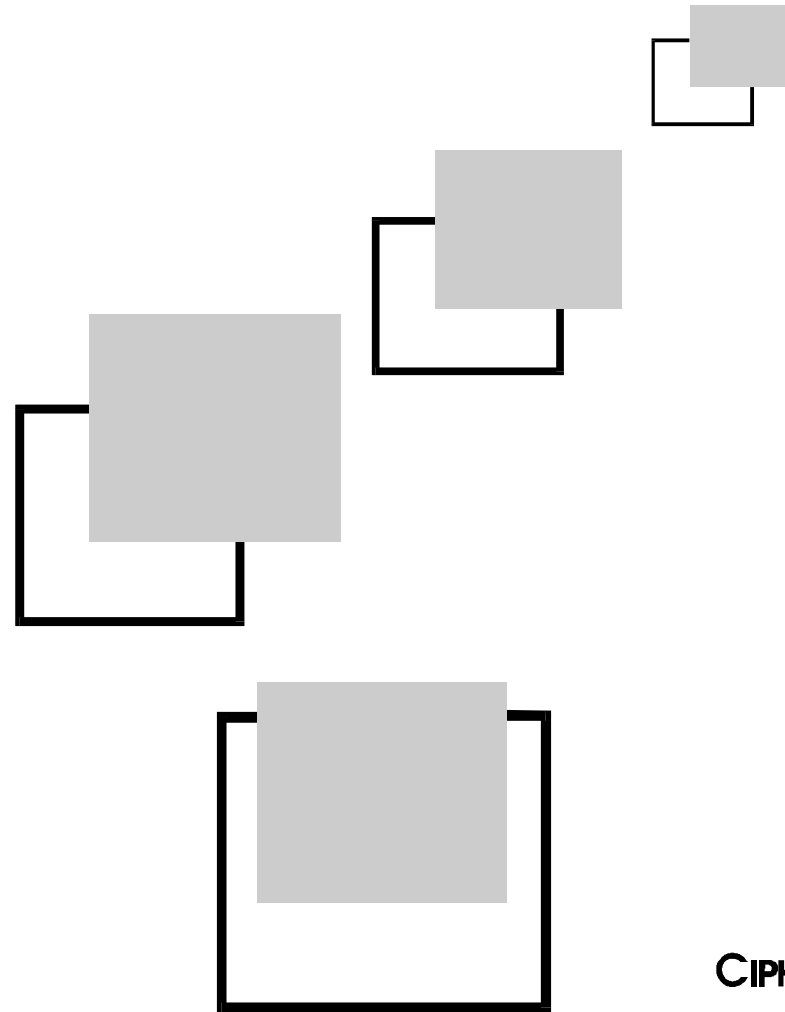


520 Programmable Terminal

User's Manual



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CIPHER LAB

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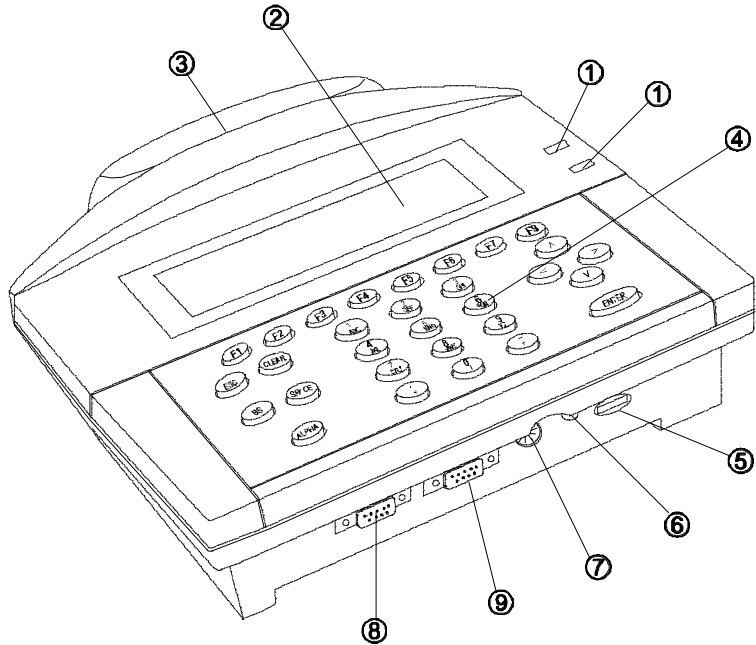
1. Features

The CIPHER-520 Programmable Terminal offers outstanding features in a compact and rugged housing suitable for industrial applications. It can be used alone or networked for up to 32 stations and is an ideal solution for companies of all sizes. It can be programmed in "C" or "Basic". With its versatile programmable features, it can be easily configured to accommodate most application needs. Features of the Cipher-520 are listed below.

- ÿ TLCS-900 16 bit CPU running at 14.7456 MHz
- ÿ Program : 512 KB flash memory
- ÿ Data memory : 128 KB battery back-up SRAM
- ÿ Memory card : optional, 512 KB to 2 MB SRAM (on a 512 KB basis)
- ÿ Fine-tunable calendar chip
- ÿ Memory & calendar chip backup 3.6V NiCd battery
- ÿ Optional 1.2V X 7, 1200 or 1800 mAh rechargeable NiMH battery X 1 or 2 for operation backup
- ÿ Battery/external DC voltage monitor circuit on-board
- ÿ Self-shutdown circuit on-board (to prevent battery over-discharge)
- ÿ Optional slot bar code reader or magnetic card reader
- ÿ 2 reader ports each for barcode scanners (Wand or Laser-emulation), or single/dual-track magnetic card readers
- ÿ 240X64 graphic type LCD display with LED back-light
- ÿ Rubber keyboard (up to 8 X 8)
- ÿ Up to 16 LEDs on the keyboard board
- ÿ 8 digital input/output, each can be configured to input or output
- ÿ External keyboard port for external PC/AT keyboard attachment
- ÿ RS232 port X 1
- ÿ Communication port X 2, each can be configured as CMOS RS232, RS232, RS485 (half-duplex), RS485 (full-duplex) or 20-mA current loop.

2. Components

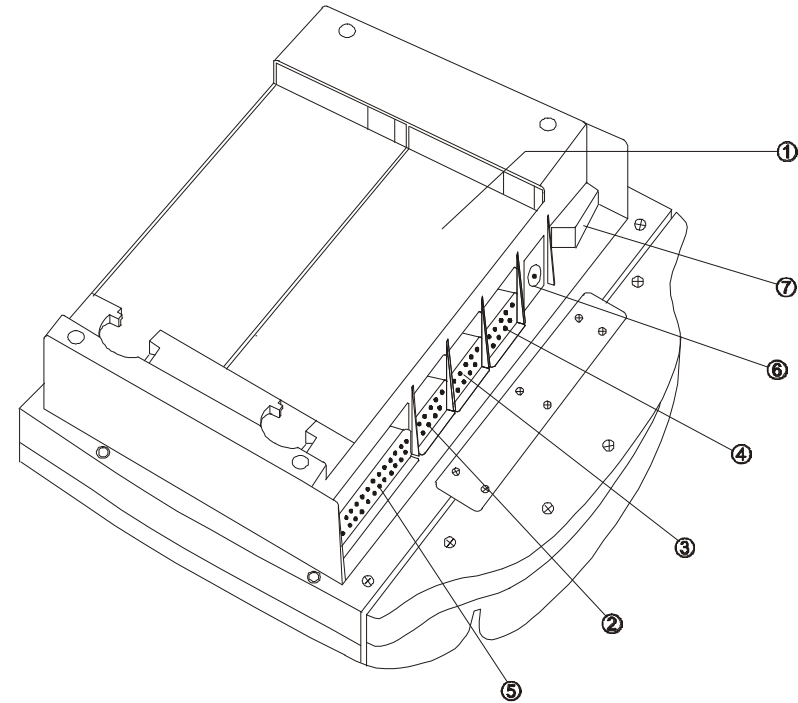
2.1. Front View



1. Red and Green LED for status indication
2. LCD display (240 X 64 or 128 X 64)
3. Optional slot-type reader (barcode or magnetic card)
4. Keyboard
5. Volume
6. External ear-phone connector
7. External PC/AT keyboard connector
8. Reader port #1
9. Reader port #2

2.2. Rear View

1. Optional Operational Battery
2. COM1 connector



3. COM2 connector
4. COM3 connector
5. Digital input/output connector
6. External power DC-jack
7. Power switch
8. Through-hole for slot reader cable
9. Table stand mounting hole

3. Characteristics

3.1. Electrical

- ÿ Main Power Supply Voltage : 12V \pm 5% DC
- ÿ Power consumption : 0.5W maximum with LCD backlight off and no external devices attached

3.2. Environmental

- ÿ Humidity (operating) : non-condensed 20% to 90%
- ÿ Humidity (storage): non-condensed 10% to 95%
- ÿ Temperature (operating): 0 to 50 °C
- ÿ Temperature (storage): -20 to 70 °C
- ÿ EMC regulation : FCC class A and CE approved

3.3. Physical

- ÿ Dimensions : 261 X 125 X 100 mm (including battery holder)
- ÿ Weight : 1Kg maximum including all batteries
- ÿ Material : ABS
- ÿ Color : dark-Gray

4. Installation

4.1. Power Source

The 520 can be powered from:

1. The external +12VDC, or
2. Operation backup battery. If line power was down, the 1200 or 1800 mAh NiMH battery pack then took the place to provide the system power.

4.2. Keypad

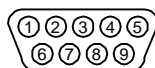
An 8 by 8 scanning circuitry has been reserved for accessing the built-in rubber keyboard and LED (up to 16) indicators. The standard keyboard provides the following keys,

- numbers 0~9
- function keys, F1-F8 (each has an corresponding LED)
- ESC, escape
- clear
- BS, back space
- Space
- Alpha, toggle between numbers and alphas (with LED)
- 4 direction keys (up, down, right and left)
- Enter

4.3. Reader Ports

There are total 2 reader ports provided, each can be either a Barcode slot reader, Barcode Scanner (Wand/Laser emulation), or up to dual-track magnetic card reader. They are equivalent in both hardware and software. Their connectors and pin-assignments are listed below.

DB-9 Male



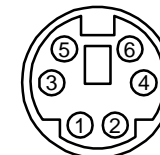
Front View

Pin Number	Barcode	Magnetic
1	Start Of Scan	Not used
2	Data	Clock 1
3	Good Read	Not used
4	Not Used	Data 1
5	Switch	Clock 2
6	Power Enable	Not used
7	Ground	Ground
8	Not used	Data 2
9	Vcc, +5V	Vcc, +5V

4.4. External Keyboard Port

Besides the built-in rubber keyboard, an external PC/AT keyboard can be attached for handy data entry. The connector and pin assignment conforms to PC/AT standard keyboard.

Mini-DIN 6M



Front View

Pin Number	Description
1	N.C.
2	data
3	+5V
4	Ground
5	N.C.
6	clock

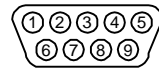
4.5. COM port

There are totally 3 serial communication ports, namely COM1, COM2 and COM3. They all features DB-9 female connector.

For flexibility, for COM1 & 2, 4 kinds of COM boards can be attached to accommodate application needs as follows,

- RS232
- Half-duplex RS485
- Full duplex RS485
- 20 mA current loop

DB-9 Male



Front View

Whereas the COM3 has been fixed to RS232.

1. RS232

This is an EIA-RS232C compatible interface and provides 4 signals as follows,



Pin No.	Description	Pin No.	Description
1	Ground	5	Ground
2	Transmit data	7	CTS
3	Receive data	8	RTS
4,6	No connection	9	+5V

2. Half-duplex RS485

This is a differential serial communication interface where all terminals send and receive data from a pair of signal lines.



Pin No.	Description
1	Inverting data
2	Ground
3	Non-inverting data
4 - 9	No connection

3. Full duplex RS485

This is a differential serial communication interface where all terminals send

and receive data each from a pair of signal lines.

Pin No.	Description	Pin No.	Description
1	Non-inverting transmit data	6	ground
2	Ground	7	Inverting receive data
3	Inverting transmit data	8	No connection
4	No connection	9	+5V
5	Non-inverting receive data		

RS485 transceivers (both half and full duplex board) are protected by a pair of surge protectors. Also, when the terminal is at either end of the RS485 bus, a terminator should be used to cancel signal echoing. This can be easily done by putting the slide switch to ON position which will connect 3 resistors onto the bus as follows,

4. 20-mA current loop

This is usually used when electrical isolation between communication sides is required. Pin assignments of the 20-mA current loop are as follows,

Pin No.	Description	Pin No.	Description
1	Transmit power	6	Receive cathode
2	Transmit collector	7	Ground
3	Transmit emitter	8	Ground
4	Receive power	9	+5V
5	Receive Anode		

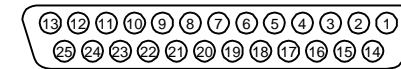
4.6. Digital Input / Output

4 digital input and 4 digital output pins has been reserved and an optional DIO board can be used to accommodate kinds of input/output needs.

- Digital Input-2 kinds of digital inputs are available,
 - CMOS type
 - Photo-coupled
- Digital Output3 kinds of digital outputs are available,

- CMOS type
- Open-collector
- Relay

DB-25 Female



Front View

No.	Description	No.	Description
1	Ground	23	+5V
2	Ground	24	+5V
3-22	DIO board dependent	25	+5V

4.7. Speaker & Earphone

A buzzer is equipped as the audio indicator. Its tone is software controllable whereas the volume is to be tuned via a variable resistor. Depending on application needs, an earphone can also be attached. The audio-jack has been intentionally designed to disable the buzzer while the earphone is connected. Usual earphone used in Walk-Man can be used with 520.

4.8. Wall-mount shelf/ Table Stand

Optional metal case or table stand can be used if mounting on the wall or table is required.



5. The Resided Time And Attendance System

The CIPHER-520 Programmable Terminal is flexible for versatile applications. Especially, the CIPHER-520 is a highly efficient yet cost effective tool for employee time and attendance control. Users can easily create their own program and download this program to the Cipher-520 as they wish. But for users' convenience, Syntech has developed the Time and Attendance system which is resided in the Cipher-520. Following describes the parameter settings of the resided system.

Beside normal working mode, a special mode called system management mode is also provided to setup system parameters, maintain and so on. To prevent from neither illegal nor unwanted entry, a special label (master card) must be swiped followed by correct password entry. Scanning this card will instruct the Cipher-520 to enter the **setup mode** and then the system parameters can be accessed. The default (factory) setting of the master card is **1234567890**. To further secure the system, a **password** (up to 6 digits) must be correctly entered after scanning of the master card. The default (factory) setting of the password is none which implies no password is needed.

Upon successful entry, the following message will be shown on the display,

```
System Manager
1.Setup
```

Under this mode, 2 major tasks can be done as follows,

- Setup
- Init System

5.1. Parameters Setup Procedures

For maximum clearness, a step-by-step procedure from the beginning is described below.

1. Make sure that the Cipher-520 is in working mode (520 displaying current system time on the LCD display). If not, the Cipher-520 might be already in the setup mode, press **F2** key to go back to the working mode.

```
Mar. 01
Mon      AM 12:00
Fl
```

2. Scan the **master card**. If successfully scanned with the correct master card, the Cipher-520 will show,

```
PASSWORD:
```

3. Now Cipher-520 is waiting for entry of the password. However, if the password was set to none, this message will not be shown and this step is simply ignored. The system manager must key in the password now. To avoid side-peeking the password, the screen will simply show "*" instead of the real password entered. Upon completion of the password entry, press the ENTER key. Note that neither the backspace key nor the clear key is active now, the system manager must enter the right password at one time. If the password was not correct, the Cipher-520 will activate a warning beep (lots of consecutive beeps) then go back to the working mode. If the password is correctly entered, Cipher-520 will be in the **System Management** mode.

```
System Manager
1.Setup
```

4. Press the ENTER key and now the Cipher-520 is in the setup mode and is ready to accept system parameter modification. The Cipher-520 will show the name of parameter on the upper side of the display and the original setting value on the lower side.

```
1. Line Connection:
=Master
```

5. Press ENTER key then you can change the setting value of this parameter. Use the "<" and ">" keys for selecting a new setting value or type in a new value via numeric keys. Then press ENTER key to conclude the new setting value.

```
1. Line Connection:
-><Single>
```

6. Instead of key in new value, simply press the "<" or ">" key will leave this setting unchanged and fine out another parameter. This is a handy way to simply peek the current settings. After all the system parameter modification are completed, the F1 key must be pressed to update these modifications and save the new settings into the program memory. System will restart with the new settings. If F2 key instead of F1 key is pressed, all modifications of the system parameters will be discarded and retain the original settings.

5.2. Setup

After enter the setup mode, user can program the setting of each system parameter via keypad. All the system parameters available are listed below with the parameter number shown on the headings. Detail descriptions are given and the allowed settings are shown.

1. Line Connection Setting

Selectable values of the communication line connection parameter are listed below.

- <Master> (default value)
- Reserved
- Single
- Slave

2. On Line Printing Setting

Selectable values of the On-line printing of the ID entries are listed below.

- <Disable> (default value)
- Enable

3. Prefix Code Setting

Selectable values of the prefix code are listed below.

- <Disable> (default value)
- Enable

4. Keyboard Entry Setting

Selectable values of the keyboard entry are listed below.

- < Enable > (default value)
- Disable

5. Station Lock Setting

Selectable values of the station lock are listed below.

- <Not Locked> (default value)
- Locked

6. Station ID Setting

Acceptable values of the keyboard entry are list below. Note that In case of multi-station connection, care should be taken not to set more than one station with the same station ID which will cause mal-function of the internal RS485 communications.

- <1> (default value)
- integer up to 99

7. Master Card Setting

The master card ID can be modified as needed. However, differing from other parameter modifications, the new master card must be inputted by scanning the card not by entering from keyboard. Up to 20 characters of master card ID can be set.

- <1234567890> (default value)
- please scan the new master card

8. Password Setting

Up to 6-digits passwords can be set to further secure the system. Note that if a null string was entered, the password examination will be skipped when entering setup mode. And if a single **ENTER** key is pressed without preceding digits, it will be treated as entering a *null* password. That is, peeking only function is not available for this parameter since there is no way to distinguish between peeking-only and a null password.

- <none> (default value)
- enter the new password

9. Time Setting

This is used to modify the system time of Cipher-520. A 14-digit value (YYYYMMDDHHNNSS) must be completely entered as follows,

- YYYY : total 4 digits of the year
- MM : month (1 - 12)
- DD : day of the month (1 - 31)

- HH : hour (24 hour format, 0 - 23)
- NN : minute (0 - 59)
- SS : second (0 - 59)

10. Timer Fine Tune Setting

A fine-tunable calendar chip is equipped in Cipher-520. The speed of the calendar chip can be tuned in units of ppm via a digital trimming register. The trimming range is from 0 to 255 ppm. The bigger value of the trimming register the slower the calendar chip runs. For instance, if the calendar chip is 1 second **slow** in one day then the value of the trimming register should **decrease** 12 to correctly adjust the calendar chip. During system initialization, this register is set to 186.

- <186> (default value)
- 0~255

11. ID Length Setting

A 2-digits value from 0 to 99 can be set to qualify the ID entries. If set to 0, ID length will not be checked.

- <0> (default value)
- 0~99

12 : Bar Code Symbology Setting

The Cipher-520 decoding software supports 6 types of symbology and each symbology can be individually enabled/disabled. Press the **ENTER** key for changing these settings and then press the **F2** key to conclude all the new settings.

12.1. Code 39

Selectable values of Code 39 are listed below.

- < Enable > (default value)
- Disable

12.2. Code 128

Selectable values of Code 128 are listed below.

- < Enable > (default value)
- Disable

12.3. Interleave 25

Selectable values of Interleave25 are listed below.

- <Enable> (default value)
- Disable

12.4. Industrial 25

Selectable values of Industrial25 are listed below.

- <Enable> (default value)
- Disable

12.5. Codebar

Selectable values of Codebar are listed below.

- <Enable> (default value)
- Disable

12.6. UPC/EAN

Selectable values of UPC/EAN are listed below.

- <Enable> (default value)
- Disable

13 : COM1 Setting

The communication port (COM1) attributes can be changed individually. Press the **ENTER** key for changing these settings and then press the **F2** key to conclude all the new settings.

13.1 COM1 BaudRate

Selectable values of COM1 baud rate are listed below.

- 115200
- 76800
- 57600
- 38400
- 19200
- <9600> (default value)
- 4800
- 2400

13.2 COM1 Parity

Selectable values of COM1 parity are listed below.

- <None> (default value)

- Odd
- Even

13.3 COM1 Data Bits

Selectable values of COM1 data bits are listed below.

- <8> (default value)
- 7

13.4 COM1 Handshake

Selectable values of COM1 stop bits are listed below.

- <None> (default value)
- XON/XOFF
- CTS/RTS

14 : COM3 Setting

Press the **ENTER** key for changing these settings and then press the **F2** key to conclude all the new settings.

14.1 COM3 BaudRate

Selectable values of COM3 baud rate are listed below.

- 115200
- 76800
- 57600
- 38400
- 19200
- <9600> (default value)
- 4800
- 2400

14.2 COM3 Parity

Selectable values of COM3 parity are listed below.

- <none> (default value)
- Odd
- Even

14.3 COM3 Data Bits

Selectable values of COM3 data bits are listed below.

- <8> (default value)
- 7

14.4 COM3 Handshake

Selectable values of COM3 stop bits are listed below.

- <none> (default value)
- XON/XOFF
- CTS/RTS

15. Alarm Table Setting

After selecting this parameter, the original settings will be shown on the display, for example,

15.Alarm 01 =16:00 010 SEC

For the example above, the original settings of the timetable entry 01 is 16:00 for 10 seconds. Following steps can be adopted,

- To modify this entry, enter a 7 digit string (HHMMSSS), where
 - HH : hour (24 hour format, 0 - 23)
 - MM : minute (0 - 59)
 - SSS : digital output duration in seconds (01 - 999, 00 if this entry is to be ignored)
- To exit from this parameter setting (peeking only), press **ENTER** key directly.
- Press the "<" or ">" key to shift to next timetable entry. The timetable entry will cycle from 01 to 16 accordingly.
- Press **F2** key to conclude above settings.

16. Workshift Table Setting

After selecting this parameter, the original settings will be shown on the display, for example,

16.work shift 01 =08:00-10:00 1

For the example above, the original settings of the timetable entry 01 is 08:00 to 10:00 for working shift type 1.

- To modify this entry, enter a 9-digits string (HHMMhhmmW), where,

- HH : hour of the starting time (24 hour format, 0 - 23)
- MM : minute of the starting time (0 - 59)
- hh : hour of the ending time (24 hour format, 0 - 23)
- mm : minute of the ending time (0 - 59)
- W : working shift type (1 to 4, 0 if this entry is to be ignored)
- Press the “<” or “>” key to shift to next timetable entry. The timetable entry will cycle from 01 to 16 accordingly.
- Press **F2** key to conclude above settings.

17 : LCD Backlight Setting

The LCD backlight can be adjusted by this parameter setting. Acceptable setting values are list below.

- <on> (default value)
- off

18 : Max Station ID Setting

The station ID number can be limited by this parameter setting. To modify this setting, enter a 2-digits number from 0 to 99.

- <99> (default value)
- 0-99

5.3. Init System

This is used to set all system parameters to their default value and initialize the file systems. Care should be taken, as this will destroy all data stored in the memory.

6. Kernel System

Press the "F1", "F2" and "F3" together while switching the power, user can get into the Kernel System Menu when turn on the power. All the system parameters available are listed below with the parameter number shown on the headings. Detail descriptions are given and the allowed settings are shown.

6.1. Memory Menu

1. Test Memory
Investigating the size of data memory and show it on the display.
2. Initialize Memory
Initializing the data memory. This function will destroy whole data in the memory.

6.2. Set Time

Time: 1999/03/01 12:00:00

New: __/__/__ __:__:__

Set a new time as YY/MM/DD hh:mm:ss; notice: just type last 2-digital for the year.

6.3. Reader

Reader 1:

Reader 2:

This is used for testing the reader port. It only accepts the Wand Emulation Readers. If Reader 1 or Reader 2 read the barcode successfully, it will show as "P, Q13, 1". P is a kind of Barcode type; Q13 means there is 13-digital in the barcode; 1 means scanning once.

6.4. Power

Main Power: 11.914V

Battery:

If the Main Power switched by adaptor, it will show "11.914V"; if not, show "Lost". And, the Battery power will be getting lower.

6.5. Test Menu

1. Buzzer: Buzzer testing
2. LCD: LCD will be on and off continually 15 seconds
3. LED: LED testing
4. KBD
 - (6) Membrane KBD testing
Each key shows on the display in reversed color. Press each key to become normal, done all of them to escape this function.
 - (7) PC/AT KBD testing
Connect with an external keyboard and type any key for testing.
5. Digital I/O
Display the situation of digital I/O port; Ok means on, Fail means off.
6. Communication
 - (1) COM1-COM3
Press "Enter", the display shows as below:
COM1 RTS...ON/OKOFF/FAIL
COM3 RTS...ON/OKOFF/FAIL
(Testing the Request To Send of COM1 or COM3 is available or not)
Txmit from COM1 to COM3...OK/FAIL
Txmit from COM3 to COM1...OK/FAIL
(Testing the data transmitting is work from COM1 to COM3 and COM3 to COM1)
 - (2) COM2-COM3
Similar to the above description.
 - (3) Self Loop-Back
The display will show the interface of COM1, COM2 and COM3 when communication ports plug in a special connector (please refer to the Cipher-520 Hardware Reference Manual).

6.6. Version

1. Version
2. Flash Download
Set the Baud Rate of COM3 (RS232 fixed) for the Basic/C program or data download. Meanwhile, you have to make sure the Baud Rate of your setting is the same as the Baud Rate of the front-end computer.

7. RS-232 Commands

This chapter explains how to control the Cipher-520 via the RS232 port. Each communication transaction starts from the host side and ends with an echoed message from the station (stand-alone, or the master station). The carriage return (hex0d) is used as the delimiter/terminator of each command or message. If any format error occurred, the station would echo a **NAK** message.

Commands have been categorized into 3 groups according to their functions. Their formats and usages are described below.

7.1. Data Management Commands

The commands listed in this section are used to manipulate the ID entry data stored in Cipher-520.

<i>Format</i>	<i>Usage</i>	<i>Return</i>
READ	Read 1 record of data	<i>OVER</i> : buffer is empty <i>Kppyyymmddhhnnabcq...q</i> where, K:"K", identifier of 520 yyymmddhhnn:date & time a:"0" b:working shift (1-4) c:prefix code (0-9) q...q:employee ID
REMOVE	Remove the record just read	<i>NEW</i> :done <i>OVER</i> :buffer empty
CLEAR	Initialize memory	<i>DONE</i> :done
X	on-line stations inquiry	<i>aabb..pp</i> each 2-digitss represent one station ID
TR	System time	<i>yyymmddhhnn</i> yy:year hh:hour mm:month nn:minute dd:day ss:second
TWyyymmddhhnn	System time	<i>yy</i> :year <i>hh</i> :hour <i>mm</i> :month <i>nn</i> :minute <i>dd</i> :day <i>ss</i> :second

7.2. Inquire System Parameter Setting Commands

The commands described in this section are used to get current system parameter settings of Cipher-520.

<i>Format</i>	<i>Usage</i>	<i>Return</i>
G01pp	Line connection	00:reserved, 10:slave 01:stand alone,11:master
G03pp	On-line printing	0:disable, 1:enable
G12pp	Barcode symbologies	ABCDEF A:Code 39 B:Code 128 C:Interleave 25 D:Industrial 25 E:Coda-Bar F:UPC/EAN 0:disable, 1:enable
G13pp	Prefix code	0:disable, 1:enable
G14pp	ID code keyboard entry	0:disable, 1:enable
G18pp	Master card	<i>nn..nn</i> , current master card
G19pp	Password	<i>nn..nn</i> , current password
NRppnn	Relay output timetable	Hhmmdd nn:entry number from 01 to 16 hh:starting hour mm:starting minute ddd:duration
DRppnn	Automatic shift change timetable	hhmmxxyyww nn:entry number from 01 to 16 hh:starting hour mm:starting minute xx:end hour yy:end minute w:working shift from 1 to 4
FRpp	ID length	<i>nn</i> :ID length
VRpp	Get current company code	n...n:current company code

7.3. Program system Parameter Commands

The commands described in this section are used to program the system parameters of Cipher-520. The host computer should receive a **DONE** string as the returning message to indicate success when a command is sent.

	code	up to 30 characters
Lnpp	Station lock	0:unlock, 1:lock

Format	Usage	Parameter
S01ppnn	Line connection	00:reserved, 10:slave 01:stand alone, 11:master
S03ppn	On-line printing	0:disable, 1:enable
S12ppABCDEF	Barcode symbologies	A :Code 39 B :Code 128 C :Interleave 25 D :Industrial 25 E :Coda-Bar F :UPC/EAN 0:disable, 1:enable
S13ppn	Prefix code	0:disable, 1:enable
S14ppn	ID code keyboard entry	0:disable, 1:enable
S18ppnn...nn	Master card	nn...nn :master card, up to 20 characters
S19ppnn...nn	Password	nn...nn : password, up to 6 digits
NWppnnhhmmdd	Set relay output timetable	Nn :entry number from 01 to 16 Hh :starting hour Mm :starting minute Ddd :duration
Dwppnnhhmmxxyy	Set automatic shift change timetable	Nn :entry number from 01 to 16 hh :starting hour mm :starting minute xx :end hour yy :end minute w :working shift from 1 to 4
FWppnn	ID length	nn :ID length allowed, from 0 to 99
VWppn...n	Set company	n...n :company code