

# **FAT820W Manual**

## **Version 1.3**

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# 1. Information

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.

## A. Model Classification:

**FAT 820 W X – 00**

① ② ③ ④ ⑤

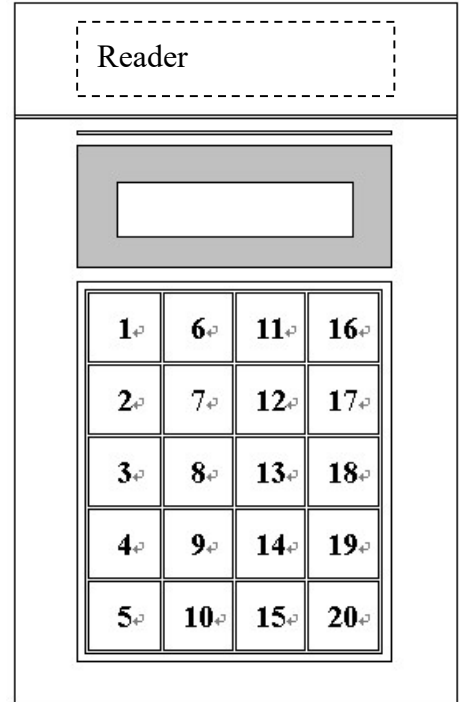
- ① **Model name:** FAT
- ② **Model:** 820
- ③ **Interface:** W → WIFI
- ④ **Reader:** M → MAG TK2  
 B → barcode reader, LED type  
 F → barcode reader, IR type  
 MF → RFID Mifare(13.56MHz) reader  
 none → without reader

⑤ **Type:00** → standard

## B. KeyPosition(KeyPos) Layout

The **Bold** text is used for the absolute position of Key on this keypad.  
 The *Italic* text means the Symbol(ASCII code) of key-position respectively. One key can only map one symbol. It will change what is your viewing type while you initialize device by **command 6-H**. If you want to redefine the key value, please see **command 6-J & 6-K**.

### Look Up Table for desktop viewing( factory default)



KeyPos	Symbol(ASCII)	KeyPos	Symbol(ASCII)	KeyPos	Symbol(ASCII)	KeyPos	Symbol(ASCII)
<b>1</b>	<i>ESC(1BH)</i>	<b>6</b>	<i>A(41H)</i>	<b>11</b>	<i>B(42H)</i>	<b>16</b>	<i>C(43H)</i>
<b>2</b>	<i>1(31H)</i>	<b>7</b>	<i>2(32H)</i>	<b>12</b>	<i>3(33H)</i>	<b>17</b>	<i>D(44H)</i>
<b>3</b>	<i>4(34H)</i>	<b>8</b>	<i>5(35H)</i>	<b>13</b>	<i>6(36H)</i>	<b>18</b>	<i>E(45H)</i>
<b>4</b>	<i>7(37H)</i>	<b>9</b>	<i>8(38H)</i>	<b>14</b>	<i>9(39H)</i>	<b>19</b>	<i>F(46H)</i>
<b>5</b>	<i>CLR(08H)</i>	<b>10</b>	<i>0(30H)</i>	<b>15</b>	<i>.(2EH)</i>	<b>20</b>	<i>ENT(0DH)</i>

### Look Up Table for wall-mount viewing

KeyPos	Symbol(ASCII)	KeyPos	Symbol(ASCII)	KeyPos	Symbol(ASCII)	KeyPos	Symbol(ASCII)
<b>1</b>	<i>ENT(0DH)</i>	<b>6</b>	<i>.(2EH)</i>	<b>11</b>	<i>0(30H)</i>	<b>16</b>	<i>CLR(08H)</i>
<b>2</b>	<i>F(46H)</i>	<b>7</b>	<i>9(39H)</i>	<b>12</b>	<i>8(38H)</i>	<b>17</b>	<i>7(37H)</i>
<b>3</b>	<i>E(45H)</i>	<b>8</b>	<i>6(36H)</i>	<b>13</b>	<i>5(35H)</i>	<b>18</b>	<i>4(34H)</i>
<b>4</b>	<i>D(44H)</i>	<b>9</b>	<i>3(33H)</i>	<b>14</b>	<i>2(32H)</i>	<b>19</b>	<i>1(31H)</i>
<b>5</b>	<i>C(43H)</i>	<b>10</b>	<i>B(42H)</i>	<b>15</b>	<i>A(41H)</i>	<b>20</b>	<i>ESC(1BH)</i>

## 2. Introduction

FAT820w is a three-in-one programmable keyboard that built-in with LCD and USB HID host (USB Keyboard interface), also enables to connect external Barcode scanner or RFID reader (keyboard emulation) as optional. Moreover, FAT820w is space-saving design and provides easy operation.

FAT820w provides both Wi-Fi and 100Base-T Ethernet interfaces for user selection. If you would like to switch to Wi-Fi or Ethernet mode, Please power off at first, then connect an external Keyboard and keep pressing No.6 key, then power on till the screen pops up “WIFI Enable? (1)Yes (2)No”, further you enable to choose which interface you prefer.

FAT820w supports many kinds of operation modes (buffer/un-buffer mode; asterisk/digit displaying; wall-mount/desk-top viewing); you can set any one of modes to meet your application by Paragraph **6-G** command. Once you set it, FAT820w will keep this setting in memory (EEPROM). When you power-up FAT820w, FAT820w will take the last setting for the unit.

FAT820w has built 12 text pages to quickly show messages. You just give the number of messages by Paragraph **6-B** command. FAT820w will show that message immediately. If you want to show message directly or change messages in one of 12 text pages, please refer to Paragraph **6-L** command.

FAT820w has RFID reader reserved at the hardware (Standard version do not build in).If your FAT820w has RFID reader; you can enable/disable reader by Paragraph **6-D** command. If you disable reader, the reader will get no action, until you enable the reader. The reader will reply **Notice Message**, refer to Paragraph **6-O**.

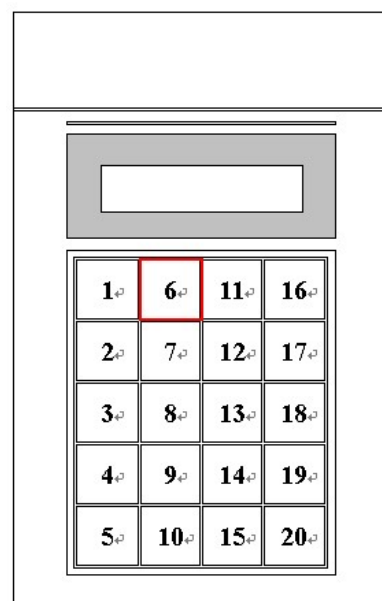
For keypad, you can enable/disable keypad by Paragraph **6-E** command.

**Note:** When you power-on FAT820w every time, both reader and keypad are always enabled, even though you did disable the reader or keypad last time.

## 3. Installation

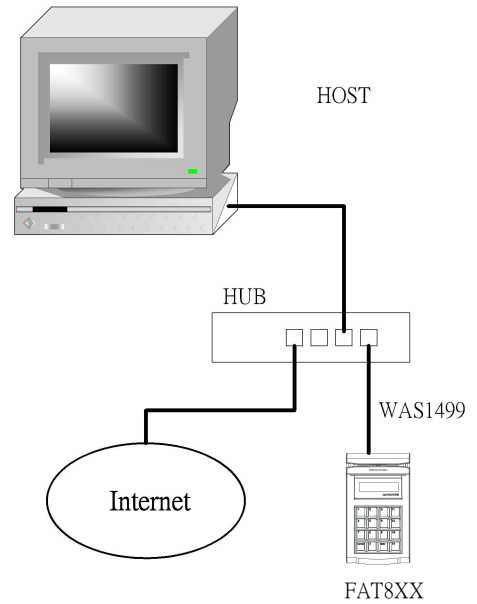
### Wi-Fi setting by USB keyboard

- 1) Connect USB keyboard to FAT820W.
- 2) Keep pressing key 6 down.
- 3) Plug in the DC power adaptor to the power jack on the FAT820W.
- 4) Plug the adaptor to the power line.
- 5) The FAT820W enter WIFI settings (On/Off, AP/Station, SSID, Password)
  - Press enter to set SSID and Password.
  - Number pad in USB keyboard cannot be used.
- 6) Update done, fat820w reset the process.



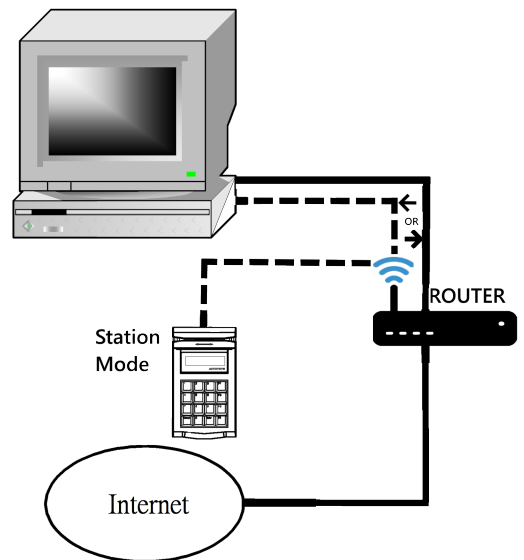
### A. Ethernet network

- 1) Do **Wi-Fi setting by USB keyboard** step and switch to Wi-Fi disable
- 2) Connect the cable (WAS-1499) to the RJ45 port of the hub.
- 3) Plug in the DC power adaptor to the power jack on the FAT820W.
- 4) Plug the adaptor to the power line.
- 5) Build connection with IP and Port shown at the screen.



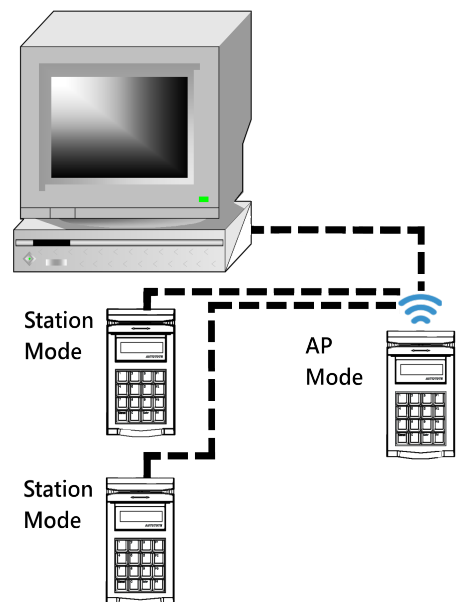
### B. Wireless network – Station Mode

- 1) Do **Wi-Fi setting by USB keyboard** step and switch to Wi-Fi enable and then choose station mode
- 2) Plug in the DC power adaptor to the power jack on the FAT820W.
- 3) Plug the adaptor to the power line.
- 4) Waiting for connection of Wi-Fi
- 5) Build connection with IP and Port shown at the screen.



### C. Wireless network – AP Mode(access point)

- 1) Do **Wi-Fi setting by USB keyboard** step and switch to Wi-Fi enable and then choose ap mode
- 2) Plug in the DC power adaptor to the power jack on the FAT820W.
- 3) Plug the adaptor to the power line.
- 4) Build connection with IP and Port shown at the screen.
  - **Host should connect with AP( Fat820w)**



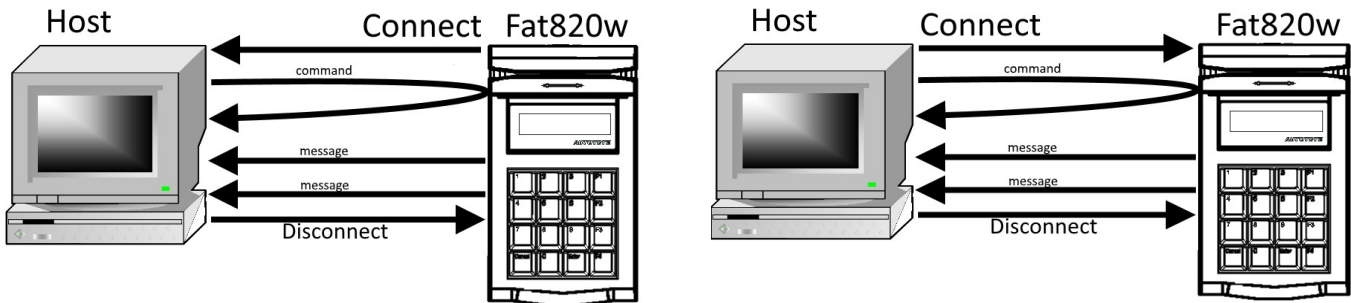
## 4. Pin Assignment

### DC power jack

Pin#	Signal
Center(D2.1mm)	+9V~+12VDC
Outer	GROUND

## 5. Operations

Fat820w always creates a **server** and waiting for PC or other device building connection with TCP port (factory default is **1001**). And fat820w also provide a **client** by Paragraph **6-O** command, trying to connect with server provide by host every 30 seconds.



When you start up FAT820W, FAT820W will set the boot-up status from memory (EEPROM). Then sound a beep and LCD shows the start-up page. After that, FAT820W will stay at stand-by state. You can give a command to FAT820W. For example, show a message to direct customer to do some action (refer to Paragraph **6-B** command). You can also blink the LCD by Paragraph **6-I** command to attract the customer attention.

You can press any key in the keypad. Please make sure keypad is enabled. If keypad is at “disable”, keypad doesn’t work. The power-up state is at “enable”. When you press the first key, the screen on LCD will be cleared, and the key will be shown on the left-top side. Following key-in will be left-to-right top-to-bottom showing on LCD by sequence. The key-in digits are 32 maximum. It will be ignored, if key-in digits over 32 maximum.

If LCD always show asterisk sign(\*) when you press key. It means FAT820W is on “asterisk” displaying type. In fact, asterisk sign is just only for displaying. Real key is as the same as you pressed. You can change displaying type as “normal” type by Paragraph **6-G** command. Then the LCD displaying will show what you are pressing.

The FAT820W have 2 operation modes. One mode is Un-Buffer mode. When you press one key, FAT820W send out that key(ASCII) by ETHERNET interface immediately. And the other one is Buffer mode. It will be kept in buffer, when you press keys, it will not send out all keys(ASCII) in the buffer by ETHERNET interface until you press ENTER and then the key-in digits on LCD will be erased. The buffer size is 32 maximum. It will be ignored, if key-in digits over buffer size 32 digits.

CLR key is used to backspace the last key.

ESC key is used to erase all keys in the LCD and buffer.

If you have already key-in some keys and then stop key-in over 10 seconds, FAT820W will erase all keys in LCD and buffer. And issue a timeout notice to host (refer to Paragraph 6-M).

Host can erase LCD and buffer by Paragraph 6-C command.

If you need reader to read barcode/magnetic stripe card, please make sure reader is enabled. If the card data can't be decoded, it sends an error notice to host. If the card data is correct, it sends the card data to host, and sounds a beep.

You can get the existing information and status on FAT820W by Paragraph 6-A command. We suggest you may use this command to make sure the correct correspondent settings you want between host and FAT820W.

FAT820W support 2 viewing. The one is desktop viewing; and the other one is wall-mount viewing. Once you change the viewing, the FAT820W will keep this setting and restart itself. So, please re-connect this FAT820W on ETHERNET network. After restart, you typing key and send text message will meet your specific viewing, but not the saved graphics message page. For the saved graphics message, we suggest you redraw and save it again.

## Setting IP address and port number of device

Setting network parameters by command, as following,

Ethernet Header(14)	IP Header(20)	UDP Header(8)	UDP command or response	CRC
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After got the device IP and port, we can operation

## UPD Broadcast & Networking configuration protocol

### 1. UDP Port Number

The port number of transferring is **883** (Factory default value)

### 2. Structure of a packet

The FAT820W devices are programmed using following command that can be sent through the Ethernet.

About the structure of packet was defined as below:

	STX	Command	Parameter	ETX
Bytes	1	1	N	1

**STX:** It is fixed at 0x02. That is the signal of broadcast packet.

**Command:** It is command code of the packet.

**Parameter:** the data that will be execute.

**ETX:** end of the packet. It is fixed at 0x03

### 3. Structure of a reply packet

Device returns the reply command to host with the result information of executing the operation of requested command. This command is sent from device to host.

About the structure of a reply packet was defined as below:

	STX	ACK	Parameter	ETX
Bytes	0x02	1: ASCII	N	0x03

**STX:** It is fixed at 0x02. That is the signal of broadcast packet.

**ACK:**

- 'A'(0x41) means command execute completely
- 'N' (0x4E) means there is no data.

**Parameter:**

This is the parameter data from AC101 which is depend on command code requested.

**ETX:** end of the packet. It is fixed at 0x03

#### 4. The command of FAT820W

The broadcast command is all ASCII chars. By the packet structure, the first byte must be 0x02 and last byte must be 0x03. All parameter will be split with the Tab char '\t' (0x09)

##### - Command: 'X'

**Description:** This command is used to get network information of the device.

**Parameter :** (Null)

**Reply ACK:** 'A'

Parameter: **mm** + '\t' + **DD** + '\t' + **PP** + '\t' + **SS** + '\t' + **GG**

**mm** AC101's MAC address get it by ASCII string like "8c-4a-ee-0-0-10"

**DD** DHCP enables, get it by ASCII char like '0'(disable) or '1' (enable)

**PP** IP address ,get it by ASCII string like "192.168.100.121"

**SS** Sub mask ,get it by ASCII string like "255.255.255.0"

**GG** Gateway,get it by ASCII string like "192.168.100.254"

##### - Command : 'N'

**Description:**

This command is used to setup network config. The parameter type 1 is DHCP enable mode. Parameter type 2 is DHCP disable mode.

**Parameter type1:** **DD** + **mm** + **TU**

**DD** DHCP enable ,it will be a binary code 0x31('1')

**mm** MAC address of device there are six binary code, 0x8c, 0x4a, 0xee, 0x00, 0x00, 0x10

**TU** Port number of device, there are 1 Integer(4 bytes) of this device.

Note: TCP port 1001(0xE9, 0x03), UDP port 883(0x73, 0x03)

**Parameter type2:** **DD** + **mm** + **PP** + **SS** + **GG** + **TU**

**DD** DHCP disable, it will be a binary code 0x30('0')

**mm** MAC address of device there are six binary code, 0x8c, 0x4a, 0xee, 0x00, 0x00, 0x10

**PP** IP address of device there are four binary code like  
0xC0(192),0xA8(168),0x64(100),0x79(121)

**SS** Sub mask of device there are four binary code like  
0xFF(255),0xFF(255),0xFF(255),0x00(0)

**GG** Gateway, of device there are four binary code like  
0xC0(192),0xA8(168),0x64(100),0xFE(254)

**TU** Port number of device, there are 1 Integer (4 bytes) of this device.  
Note: TCP port 1001(0xE9, 0x03), UDP port 883(0x73, 0x03)

**Reply ACK:** 'A'

– **Command: 'R'**

**Description:** This command is used to get network information of the device.

**Parameter :** **PP**

**PP** IP address of device there are four binary code like  
0xC0(192),0xA8(168),0x64(100),0x79(121) , If **PP** is set to 255.255.255.255, all device  
will reset after receive this command.

**Reply ACK:** 'A'



## 6. Communications

TCP is a connection-oriented protocol. Before either end can send data to the other, a connection must be established between them.

Host is the three-way handshake initiator.

After connection is established , host can send the dedicated command to achieve some application, as following .

Ethernet Header(14)	IP Header(20)	TCP Header(20)	TCP command or response	CRC
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Command symbols definitions are as below:

**STX**            02H  
**ETX**            03H  
**ACK**            06H  
**NACK**          15H  
**m**                1 byte parameter  
**n**                1 byte parameter  
**<Data...>**      contents of data

(command list)

Command	Hexadecimal Format	Description
V	<b>STX V ETX</b>	Get device firmware version & status
D	<b>STX Dmn ETX</b>	Show pre-saved message page on LCD
C	<b>STX C ETX</b>	Erase LCD and buffer
M	<b>STX Mn ETX</b>	Enable/Disable reader
K	<b>STX Kn ETX</b>	Enable/Disable keypad
B	<b>STX Bn ETX</b>	Control beep
P	<b>STX Pmn ETX</b>	Change operation parameters
@	<b>STX @ ETX</b>	Initialize device
F	<b>STX F ETX</b>	Blink the display
I	<b>STX I n ETX</b>	Inquiry the keycode of key
X	<b>STX X m n ETX</b>	Define the keycode of keys
Y	<b>STX Y n &lt;Data...&gt; ETX</b>	Show text message and save it to the text message page
b	<b>STX bn ETX</b>	Enable/Disable LCD backlight
R	<b>STX Rm&lt;P0 , ... , P3&gt; ETX</b>	Enable/Disable Client mode

(\* ) only work with graphic LCD models

### A. Get device firmware version & status

HOST to DEVICE (3 bytes)	<b>STX</b>	<b>V</b>	<b>ETX</b>
	<b>02H</b>	<b>56H</b>	<b>03H</b>
DEVICE to HOST (10 bytes)	"ROMXXXXV S"		

XXXX: Firmware Number

V: Revision

S: Status(8 bits as below)

B7	B6	B5	B4	B3	B2	B1	B0
0	Viewing	Keypad	Reader	Display	Mode	Baudrate	
	1:Desktop 0:Wall-Mount	1:enable 0:disable	1:enable 0:disable	1:asterisk 0:normal	1:buffer 0:unbuffer	00: 2400bps 01: 4800bps 10: 9600bps 11: 19200bps	

You can get device information and status by this command.

You will get nothing, if the computer's baudrate didn't match with the device.

## B. Show pre-saved page message on LCD

HOST to DEVICE (5 bytes)	STX	D	m	n	ETX
	02H	44H	bin	bin	03H
DEVICE to HOST (1 bytes)	ACK/NACK				

**m**: text page message, **m**=30H; graphic page message, **m**=31H

**n**: page number, 31H<=**n**=3CH(for **m**=30H, text page); 31H<=**n**=36H(for **m**=31H, graphic page)

You can show page message, which is kept in EEPROM, on your LCD.

Device will reply **ACK** and display the pre-saved message, if this command is acknowledged.

Otherwise, reply **NACK**.

The default text page table

Page#	Message	Page#	Message	Page#	Message
1	<b>Welcome</b>	5	<b>Card error</b>	9	<b>Verify fail</b>
2	<b>Enter PIN</b>	6	<b>Press ENT</b>	10	<b>Re-enter PIN</b>
3	<b>PIN error</b>	7	<b>Time out</b>	11	<b>Thank you</b>
4	<b>Swipe card</b>	8	<b>Please try again</b>	12	<b>Not working</b>

## C. Erase LCD and buffer

HOST to DEVICE (3 bytes)	STX	C	ETX
	02H	43H	03H
DEVICE to HOST (1 bytes)	ACK/NACK		

You can clear all screen and buffer by this command.

Device will reply **ACK**, if this command is acknowledged. Otherwise, reply **NACK**.

## D. Enable/Disable reader

HOST to DEVICE (4 bytes)	STX	M	n	ETX
	02H	4DH	bin	03H
DEVICE to HOST (1 bytes)	ACK/NACK			

**n**=31H, Enable reader(default)

**n**=30H, Disable reader

Device will reply **ACK**, if this command is acknowledged. Otherwise, reply **NACK**.

**Note:** Reader is always enabled when the unit is restarted even though you did disable the reader last time.

### E. Enable/Disable keypad

HOST to DEVICE (4 bytes)	STX	K	n	ETX
	02H	4BH	Bin	03H
DEVICE to HOST (1 bytes)	ACK/NACK			

n=31H, Enable keypad(default)

n=30H, Disable keypad

Device will reply **ACK**, if this command is acknowledged. Otherwise, reply **NACK**.

**Note:** Keypad is always enabled when the unit is restarted even though you did disable the keypad last time.

### F. Control beep

HOST to DEVICE (4 bytes)	STX	B	n	ETX
	02H	42H	bin	03H
DEVICE to HOST (1 bytes)	ACK/NACK			

n: beep string, composed of 0 and 1. Each 1 will activate buzzer, 0 will stop buzzer. Each bit control buzzer 0.1 sec.

For example, n=F5H(11110101), it sounds like “BBBB-B-B”.

Device will reply **ACK** and beep, if this command is acknowledged. Otherwise, reply **NACK**.

### G. Change Operation parameters

HOST to DEVICE (5 bytes)	STX	P	m	n	ETX
	02H	50H	bin	bin	03H
DEVICE to HOST (1 bytes)	ACK/NACK				

Parameter description as below;

Keypad (m=31H)	Mode (m=32H)	Displaying Type (m=33H)	*Viewing (m=34H)	*Reader (m=35H)	*Change Back Light (m=36H)
n=30H, Enable n=31H, Disable	n=30H, Non buffered mode n=31H, buffer mode(*)	n=30H, normal(*) n=31H, asterisk mark	n=30H, WALL-MOUNT n=31H, DESK-TOP(*)	n=30H, Enable n=31H, Disable	n=30H, On n=31H, Off

(\*) means factory default

When you set the parameter, device will keep this setting into memory(EEPROM).

Device will reply **ACK** and change as you selected, if this command is acknowledged.

Otherwise, reply **NACK**. M = 34H, 35H, 36H reserve now, reply **NACK** also.

### H. Initialize Device (Reset)

HOST to DEVICE (3 bytes)	<b>STX</b>	<b>@</b>	<b>ETX</b>
	<b>02H</b>	<b>40H</b>	<b>03H</b>
DEVICE to HOST (1 bytes)	<b>ACK/NACK</b>		

Host sets all settings into device as factory default. The key layout will meet the setting of viewing.

Device will reply **ACK** and reset all settings to factory default, if this command is acknowledged.

Otherwise, reply **NACK**.

### I. Blink the display

HOST to DEVICE (3 bytes)	<b>STX</b>	<b>F</b>	<b>ETX</b>
	<b>02H</b>	<b>46H</b>	<b>03H</b>
DEVICE to HOST (1 bytes)	<b>ACK/NACK</b>		

Display will blink by this command, until the device is interrupted by next operation, like communication, key-in, ...etc.

Device will reply **ACK**, if this command is acknowledged. Otherwise, reply **NACK**.

### J. Inquiry the keycode of key

HOST to DEVICE (4 bytes)	<b>STX</b>	<b>I</b>	<b>n</b>	<b>ETX</b>
	<b>02H</b>	<b>49H</b>	<b>Bin</b>	<b>03H</b>
DEVICE to HOST (1 bytes)	<b>Keyvalue+ACK</b> <b>Or NACK</b>			

Inquiry what is the keycode

### K. Define the keycode of keys

HOST to DEVICE (5 bytes min.)	<b>STX</b>	<b>X</b>	<b>m</b>	<b>n</b>	<b>ETX</b>
	<b>02H</b>	<b>58H</b>	<b>bin</b>	<b>bin</b>	<b>03H</b>
DEVICE to HOST (1 bytes)	<b>ACK/NACK</b>				

You can change the code of key by this command.

01H<=m<=14H, the key position where you want to changed.

**n**, the ASCII of key you programmed.

Device will reply **ACK**, if this command is acknowledged. Otherwise, reply **NACK**.

### L. Show text message and save it to the text message page

HOST to DEVICE (5 bytes min.)	<b>STX</b>	<b>Y</b>	<b>n</b>	<b>&lt;DATA...&gt;</b>	<b>ETX</b>
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	02H	59H	bin	<DATA...>	03H
DEVICE to HOST (1 bytes)	<b>ACK/NACK</b>				

**n**=30H, Show text message to LCD, but never keep it.

31H<=**n**<=3CH, Show text message to LCD, and save it to the text message page **n**.

The maximum number of text message is 32 digits for each page and can save 12 pages maximum.

**Note:** This new saved message will replace the pre-saved page or factory default page for next use.

Device will reply **NACK** if the message is over this maximum value.

Device will reply **ACK** and display this message on LCD, if this command is acknowledged.

### M. Enable/Disable LCD backlight

HOST to DEVICE (4 bytes)	<b>STX</b>	<b>b</b>	<b>n</b>	<b>ETX</b>
	02H	62H	Bin	03H
DEVICE to HOST (1 bytes)	<b>ACK/NACK</b>			

**n**=31H, Enable LCD backlight.

**n**=30H, Disable LCD backlight.

Device will reply **ACK**, if this command is acknowledged. Otherwise, reply **NACK**.

### N. Notice Message

Events	Message
Card read OK	<STX>+<S>+<TK data bytes>+<ETX>
Card read error	<STX>+<E>+<ETX>
Time out	<STX>+<O>+<ETX>

Notice Message is Device to send a notice to host automatically.

### O. Enable/Disable Client mode

HOST to DEVICE (4 bytes)	<b>STX</b>	<b>R</b>	<b>n</b>	<b>&lt;P0, ..., P3&gt;</b>	<b>ETX</b>
	02H	52H	Bin	Bin	03H
DEVICE to HOST (1 bytes)	<b>ACK/NACK</b>				

**n**=31H, Enable Client mode

**n**=30H, Disable Client (default)

Setting four bytes IP address like 0xc0(192),0xa8(168),0x64(100),0x79(121)

### P. Relay signal controll

HOST to DEVICE (4 bytes)	<b>STX</b>	<b>c</b>	<b>P0</b>	<b>P1</b>	<b>P2</b>	<b>ETX</b>
	02H	63H	Bin	Bin	Bin	03H
DEVICE to HOST (1 bytes)	<b>ACK/NACK</b>					

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P0 = <0x30H: signal high, others, signal low>

P1= <0x30H: signal high, others, signal low>

P2= <0x30H: signal high, others, signal low>

## 7. Specifications

A. Display:

- 122\*32 graphics LCD without backlight
- Number of characters: 32(16 columns \* 2 lines)
- 12 Text-Messages & 6 Graphics-Messages

B. Power consumption: 100mA@12VDC

C. Network: Ethernet RJ45

## 8. FCC Statement



FCC (U. S. Federal Communications Commission)

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.
2. This device must accept any interference received, including interference that may cause undesired operation.

### **FEDERAL COMMUNICATIONS COMMISSION INTERFERENCE STATEMENT**

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. The 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 of the following measures:

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- Reorient or relocate the receiving antenna.
- Increase the separation between 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.

**CAUTION:**

Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment

The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**RF exposure warning**

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provide with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.