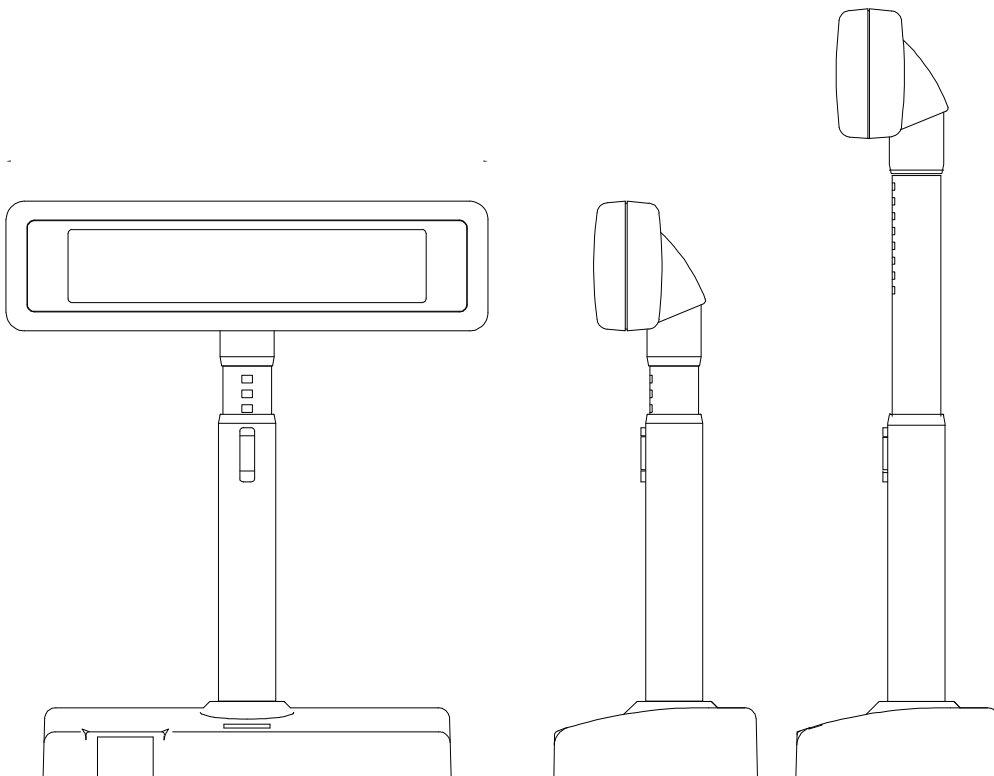


PD-2200 Series

USER'S MANUAL

**VFD CUSTOMER DISPLAY for
ALPHANUMERICAL DISPLAY
in 2 x 20 format**



SOME IMPORTANT NOTES

FCC NOTICE

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

WARRANTY LIMITS

Warranty will terminate automatically when the machine is opened by any person other than the authorized technicians. The user should consult his/her dealer for the problem happened. Warranty voids if the user does not follow the instructions in application of this merchandise. The manufacturer is by no means responsible for any damage or hazard caused by improper application.

ABOUT THIS MANUAL

This manual assists the user to utilize the VFD customer display PD-2200 series. The PD-2200 series provides versatile font formats and supports various instruction sets. This series of products receive instructions in serial communication protocols and is capable of entering pass through mode so that all instructions received pass on to next connected serial device if properly configured.

The manufacturer of the PD-2200 series heartily apologizes to the user for reserving the right to change or to modify this manual without notice due to the rapid and constant progress and improvement on science and technology. The user may always obtain the most up to date information through our web site: <http://www.mustekposiflex.com.tw>

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1. FEATURES

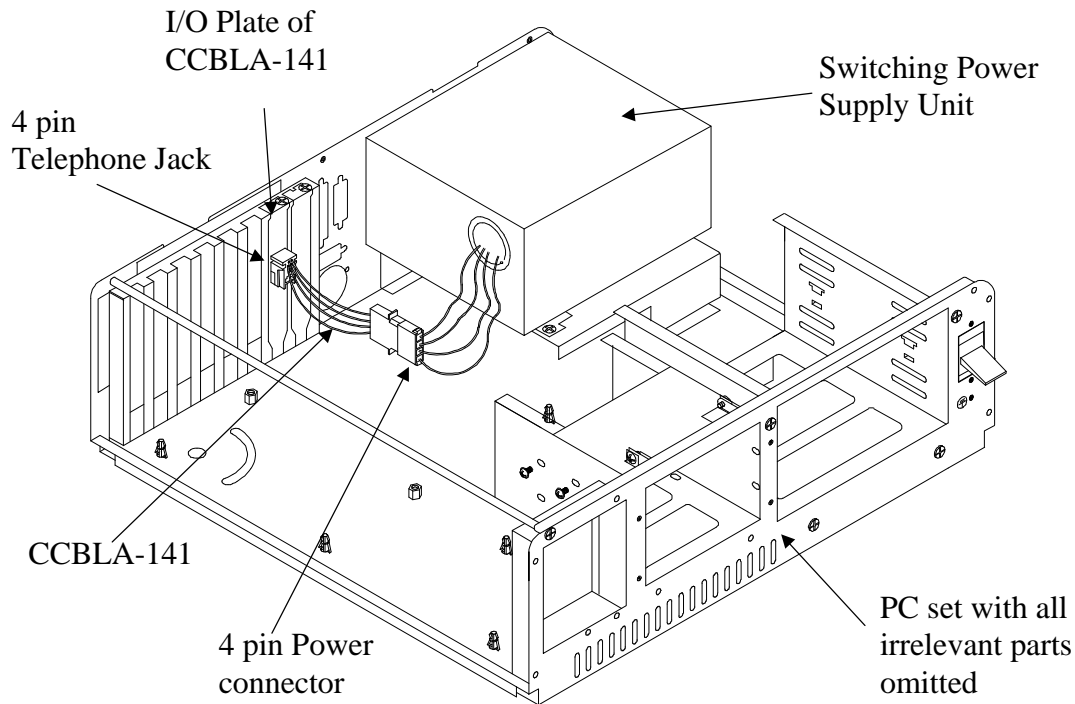
- Bright green fluorescent display
- Two-line display with 20 characters per line
- Large characters for easy viewing (11.25mm by 7.2mm)
- Long life and trouble free operation
- Two adjustable viewing angles
- Pole height adjustable
- Display frame is horizontally slided , and 360° rotated freely.
- Brightness adjustable by software.
- Simple installation
- Provide moving message sign feature under standby mode
- Direct interface connection with computers and peripherals
- Standard Serial Interface
- Serial Pass-through Interface by jumper setting

2. CARTON CONTENTS

1. Pole display, pre-assembled.
2. User's Manual.
3. Power supply (inside PC) cable CCBLA-141
4. Signal and power cable CCBLA-220
5. AC power adapter (option).

3. INSTALLATION

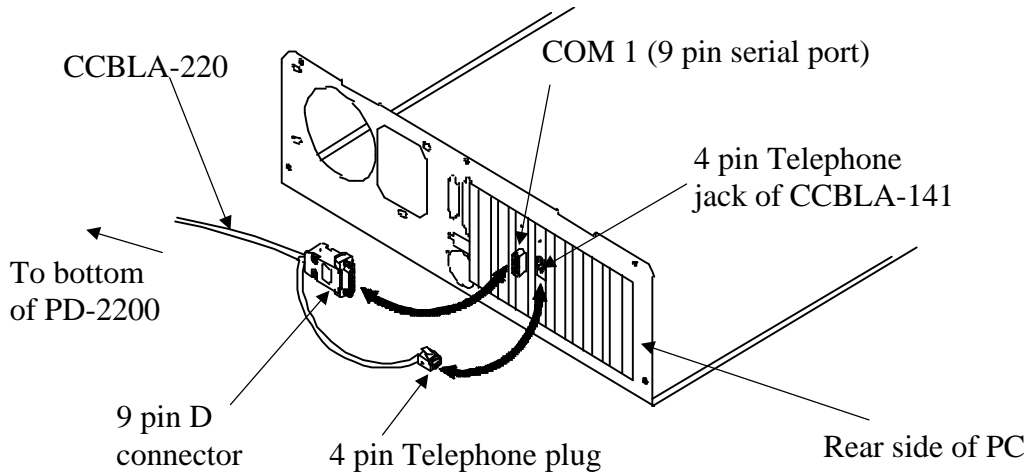
3.1 Establish power supply connector from PC



The cable CCBLA-141 in the accessory is a cable with the 4 pin connector for PC power supply connection and a PC I/O plate mounted with a 4 pin telephone jack. This cable is particularly suitable for obtaining DC power for the peripherals from the hosting PC. The drawing above indicates an example of how to install this CCBLA-141 into a PC. However, it is absolutely important to **turn all the power off** before removing any case or connecting any cable. Followings are the instructions for installing this cable.

1. Make sure the PC to supply power is turned off.
2. Open the case of PC according to its relevant manual.
3. Select one I/O plate position on rear window of PC to install the I/O plate of CCBLA-141.
4. Select one set of large 4 pin connector from the switching power supply unit of PC and connect the male 4 pin connector of CCBLA-141 to the connector from power supply. Connect the female 4 pin connector of CCBLA-141 to the I/O device of PC such as a HDD if necessary.
5. Assemble the case of PC back and get ready for use.

3.2 Connect the display for both signals and power



The cable CCBLA-220 is used to connect the customer display PD-2200 to the host PC and to get power supply for PD-2200 at the same time. Be sure that the power to the PC is turned off before connecting for CCBLA-220.

1. Turn the switch at the base of PD-2200 off and connect the 25 pin male connector of CCBLA-220 to the 25 pin female connector at the bottom of the base of PD-2200. Let the cable come out of the bottom of PD-2200 through the opening at the back of base so that the PD-2200 can stand securely.
2. Connect the 9 pin female connector of CCBLA-220 to the 9 pin male connector for serial port such as COM 1 of the host PC.
3. Connect the 4 pin telephone plug of CCBLA-220 to the 4 pin telephone jack on the I/O plate of CCBLA-141 which has been mounted as described in the previous paragraph.
4. Now the user may turn on the PC and the PD-2200 for application unless the user wants to use PD-2200 for pass through purpose.

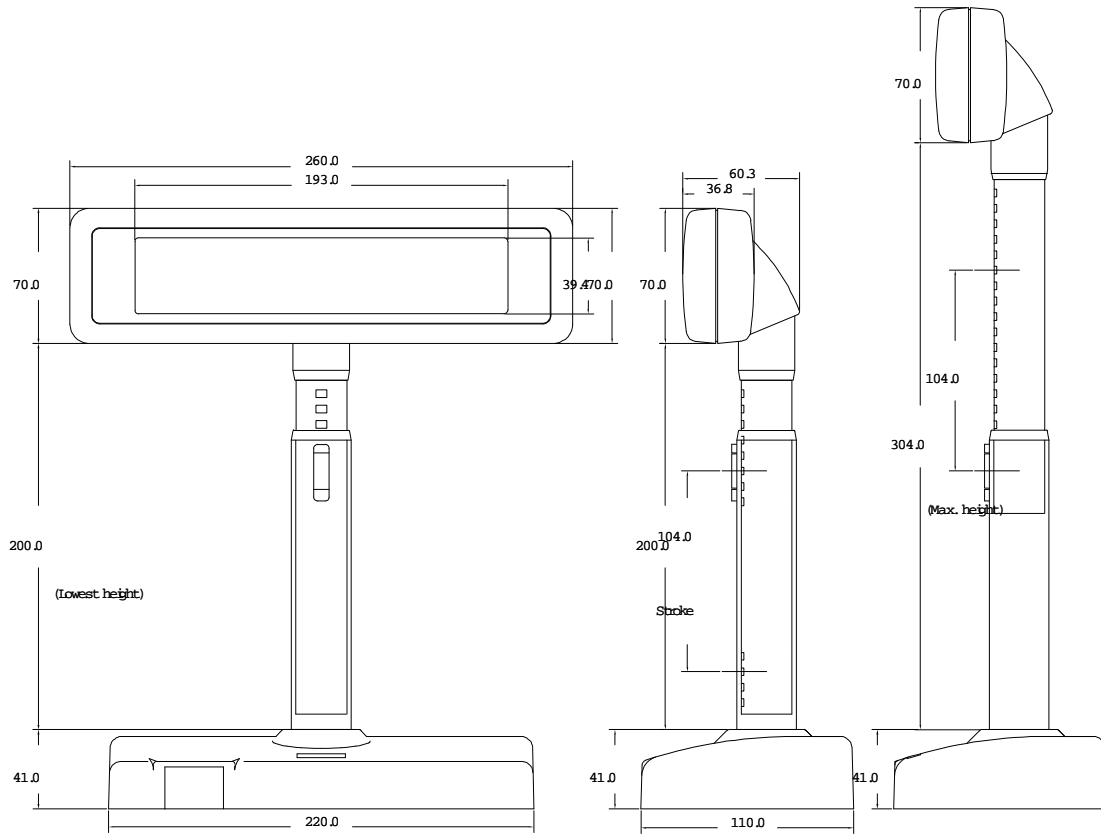
3.3 Connect for pass through operation

With reference to the drawing on page 9-1 of this manual, the user may have to unscrew the four screws at the bottom of PD-2200 to prepare it for pass through operation. When the base plate is opened, the user may find the PCB PD220SP screwed to the base plate and the user should change the jumper settings on PD220SP according to paragraph 4.5.2 of this manual to enable the pass through function. The user shall then screw the base plate back to the bottom of PD-2200 and connect CCBLA-220 to the 25 pin female connector and connect the pass through connected serial device to the 9 pin male connector.

3.4 Connect the optional power adaptor

The optional power adaptor used for PD-7000 should be able to supply 7.5V AC/1A through a 2.5/5.5 Ø plug if the user does not want to use the power from PC through CCBLA-141. The user shall connect the plug to the jack beside the 9 pin D connector.

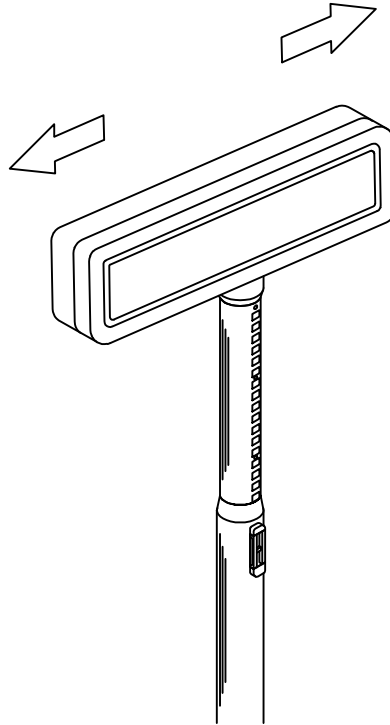
4. MECHANICAL ADJUSTMENT



In addition to the above drawing given, we are pleased to introduce our delicate and modern industrial design of PD-2200, not only in its functional features but also user friendly mechanical features as following.

4.1 Display frame sliding mechanism

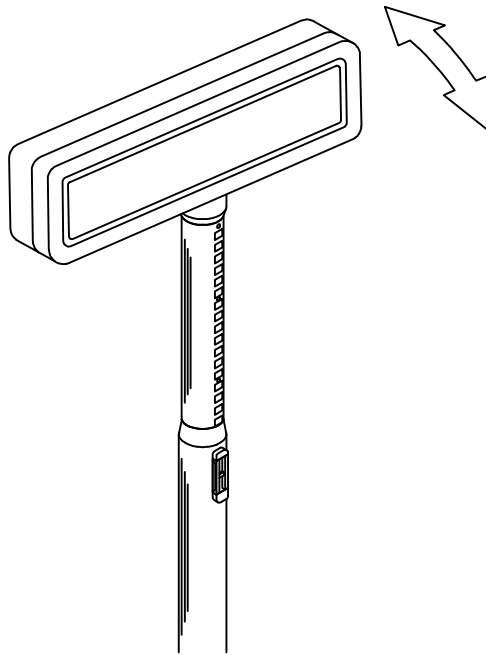
A delicate design of PD-2200 to fit updated store management system is a Horizontal Sliding Mechanism for Display Frame. The Display Frame of PD-2200 can be slided horizontally from leftmost side to rightmost side, and vice versa. Total sliding distance is 100mm.



HORIZONTAL SLIDING DISTANCE
FROM RIGHTMOST TO LEFTMOST IS 100MM

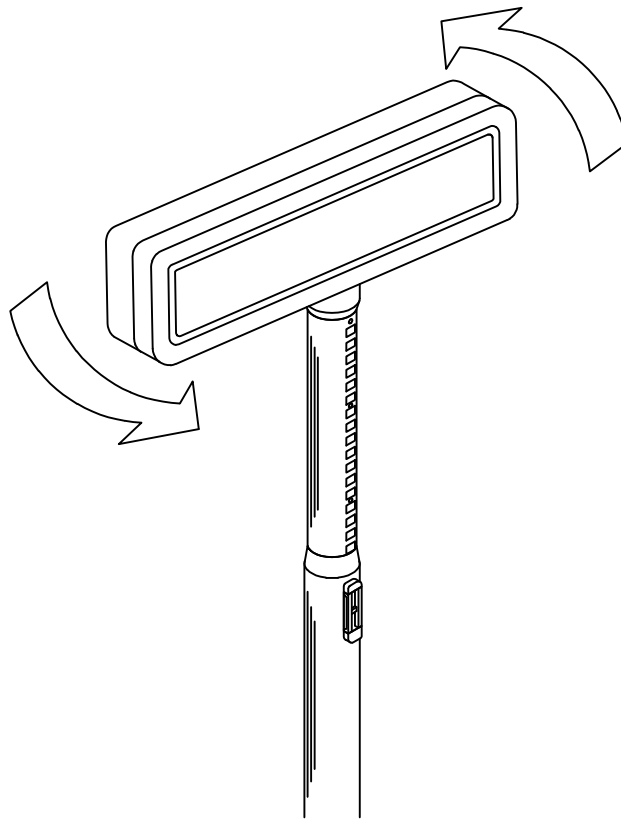
4.2 Viewing angle adjustment

To accommodate the special environment requirements of sales point, PD-2200 offers 2 different position of viewing angle ---14.5°, 30°.



4.3 360° rotation of display frame

Besides 11mm BIG Characters for better legibility, PD-2200 also provides a delicate design of almost 360 degree rotation of display frame, which enables customers from any direction to enjoy a good command of the transaction content. Meanwhile, in order to avoid the internal cable to be broken while it turns round over one circle, it also particularly makes the scope rotating within 360 degree.

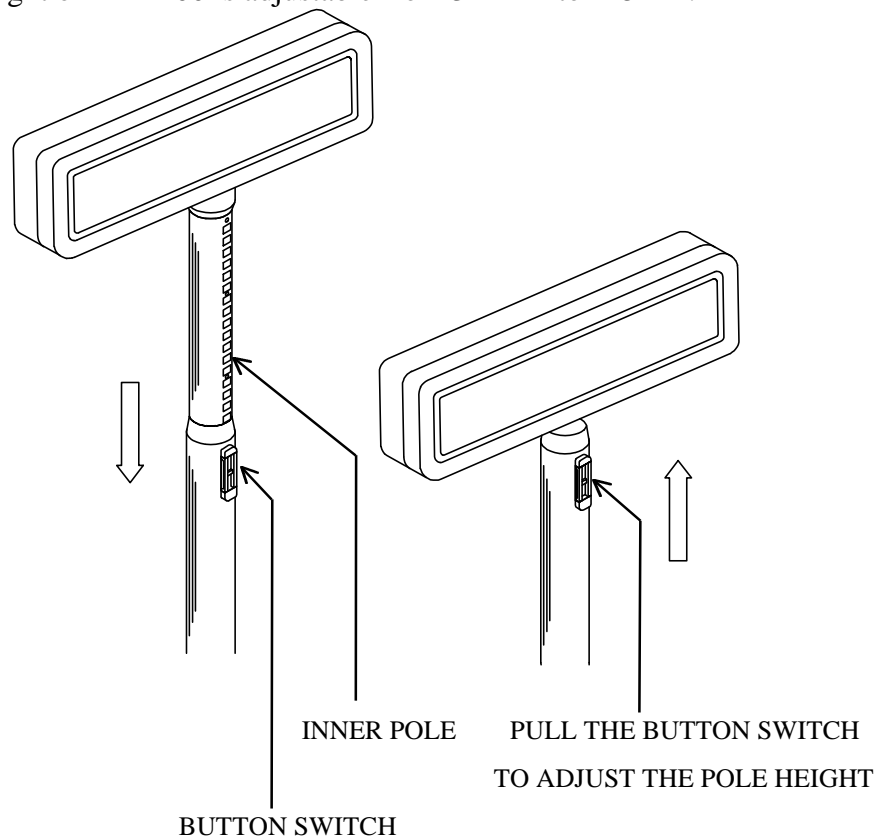


ROTATING ANGLE IS WITHIN 360°

4.4 Adjustable overall height by a special designed button switch.

The overall pole height of PD-2200 is composed by 2 sections and can be adjusted freely up and down by a unique button switch mechanism. All you have to do is:

- a. Pull the button switch, turn the inner pole a little bit, then release the button switch.
- b. Raise (or descend) the inner pole to a certain height you want.
- c. Turn the inner pole to let one of the various concave square cavities match on the button switch.
- d. Overall height of PD-2200 is adjustable from 311mm to 415mm.



5. FUNCTIONAL TEST

The following test sequence will verify if the pole display is working. This test procedure assumes the pole display is plugged into COM1 port of your computer. If other port like COM2 is used, change “COM1” to “COM2” in the following procedure. Note, the actual key entries are enclosed within the quotation marks. Do not type quotation marks as part of your entries. With your computer turned on:

- 1.Type “MODE COM1 96,N,8,1”. Hit the ENTER key.
- 2.Type “TYPE CON > COM1”. Hit the ENTER key.
- 3.Type “ABCDEFGHIJKLMNOPS”. Hit the ENTER key.

If the following characters are shown on the display, your pole display is working:

ABCDEFGHIJKLMNOPS

- 4.Hit Ctrl-C (press Ctrl and C keys together) to return the computer back to the normal display mode.

6. INTERFACE

6.1 PD2200S and PD2200SP

Your pole display is factory configured for serial RS232C interface with the following protocol:

- 9600 baud rate
- 8 Data bits
- 1 Stop bit
- No parity
- No handshake

Serial Input

DB25F to Computer

Pin 2 - RX
Pin 3 - TX
Pin 4 - RTS
Pin 5 - CTS
Pin 6 - DSR
Pin 7 - GND
Pin 8 - DCD
Pin 12 - +5V
Pin 13 - +5V
Pin 14 - GND
Pin 15 - GND
Pin 20 - DTR
Pin 22 - RI

Serial Pass-thru

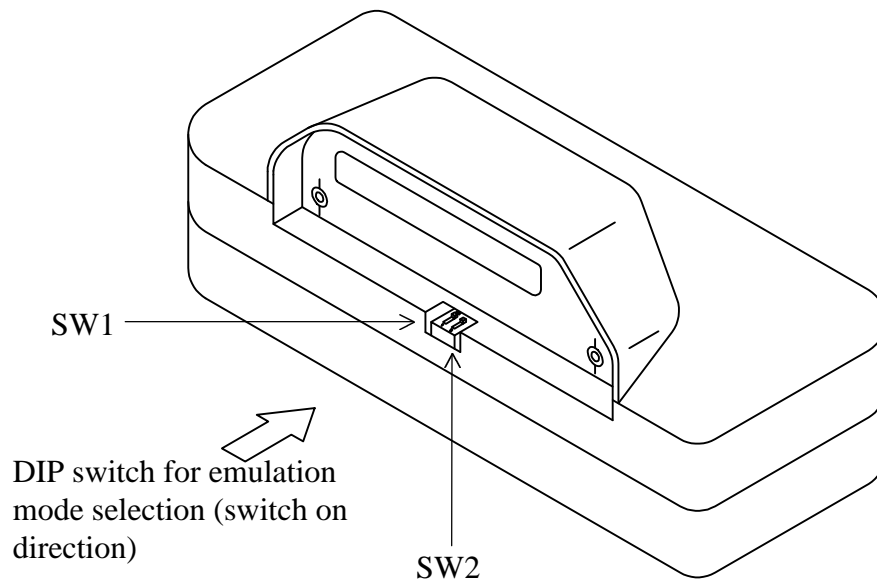
DB9M to Pass-thru Device

Pin 1 - DCD
Pin 2 - RX
Pin 3 - TX
Pin 4 - DTR
Pin 5 - GND
Pin 6 - DSR
Pin 7 - RTS
Pin 8 - CTS
Pin 9 - RI

7. COMMAND EMULATION

7.1 General Concept

This customer display provides 4 emulation modes for software programming in controlling the display. The emulation mode is defined by adjusting the DIP SW on the back. See the figure below.



The relationship between the switch position and the emulation mode is summarized in the following table.

Emulation Mode	Futaba	Noritake	Aedx	Epson
SW 1	on	off	on	off
SW 2	on	on	off	off

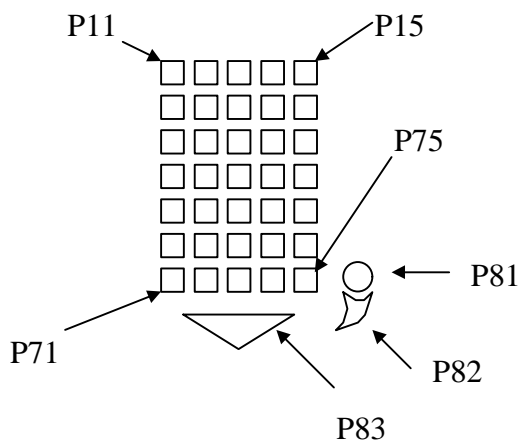
These DIP switches are not designed for changing every day and could be a little bit difficult to switch without proper tool. The switch positions must be changed only when power turned off to ensure appropriate operation.

The four emulation modes will be further explained later in this chapter, yet the followings are some brief introduction as they are compared to each other:

Mode	Futaba	Noritake	Aedex	Epson
Cursor	Displayable	Displayable	N.A. ^(Note 1)	Non-displayable
Default mode	V. scroll up	Overwrite	N.A.	Overwrite
User defined font	N.A.	2 characters	N.A.	2 characters
Brightness control	YES	YES	NO	YES
Pass through function	YES	YES	YES	YES
Leading code change	YES	YES	YES	NO
Font page select	YES	YES	NO	YES
Timer clock	NO	NO	NO	YES

Note 1: After power on sign turned off, there is a blinking block at the upper leftmost position, yet this blinking block will turn off as soon as any signal (command to VFD or any data to the pass through device) is received.

On the VFD, there are totally at most 40 characters in 2 rows to be displayed at the same time, while each character displayed in the format of 5 by 7 rectangular dot matrix. To the lower right corner of each dot matrix there are a round shaped dot and a tail to form period and comma marks. For the characters in 2nd row of the VFD, there is one more feature to be displayed, that is the downward pointing triangle under each character. This triangular mark shall be referred to as the under mark for identification later on.



As illustrated in the above drawing, each rectangular dot in the font format shall be identified as P11, P12, . . . , P15, P21, P22, . . . , P25, P31, . . . , P35, . . . , P71, . . . , P75, P81, P82, P83. Where “Pn1” means the leftmost dot in the nth row of the dot matrix and “Pn5” stands for the rightmost dot in the nth row. P81 means the round dot to the lower right corner, P82 notifies the tail to form a comma and P83 denotes the under mark. These notations will be used in user defined fonts.

In the following sections, it is assumed that before any command given, the PST system should have been previously prepared for issuing command to the VFD unit through the command given under DOS environment:

```
C:\> mode com1 96,n,8,1    (enter)
```

And, since a great deal of the command to be issued to the VFD unit shall be in the non-displayable range, the examples of issuing command will be done mostly with the “Debug” utility provided by DOS. However, should any notation like [Ctrl-Z] or [Alt-26] appear in the example, it shall be understood correctly as pressing and holding “Ctrl” key while pressing “Z” key or pressing and holding “Alt” key while pressing and releasing in sequence the “2” and “6” key of the numerical keypad (please note that do not press those numbers above the letters) on a PC keyboard. The notation of bracket “<>” indicates hexadecimal code, for example, <1F> means the hexadecimal code which has a decimal value of 31. Yet, the lower case letter in the bracket denotes some variable in hexadecimal code and should not be taken directly for the code. For example, <bb> may range from <00> to <FF> and <0p> may range from <00> to <0F>. In the BASIC programming example to match the display example or the printer result example in the later detail explanation of each command, it is presumed that the command **Open “COM1” for output as “#1”** has been issued beforehand. The above will be taken for granted and will no longer be mentioned separately.

7.2. Futaba Emulation Mode

This emulation mode comes into effect when both DIP switches are pushed up (turned on).

DIP SW	1	2
	on	on

The default status in this mode when power on after power on sign is that a block shaped cursor formed of 5 by 7 dots is blinking at a rate about 1 cycle per second at the leftmost position of the 1st row on the display area. Any displayable code under the correct protocol received will be displayed at the position of the cursor and the cursor will be moved to the right by one position. When the cursor is already at the rightmost position of either row, the leftmost position of the other row is considered as the position to the right. Yet, as this emulation mode defaults on vertical scroll up mode, the whole display will move upward and the cursor will move to the MSD (Most Significant Digit) of 2nd row when the cursor was at the rightmost position of 2nd row on receiving a displayable code. The non-displayable codes are basically used as commands to the display unit.

COMMAND SUMMARY

Listed below are commands available in this mode grouped by their functions, note that all the command codes given are expressed in Hexadecimal format:

Command Name	Hex Codes	Command Name	Hex Codes
Reset	1F	Cursor on	13
Brightness control	04 bb	Cursor off	14
Change font page	1E 0p	Back space	08
Moving sign	05 . . . 0D	Horizontal tab	11 09
Change leading code	06 x1 x2	Vertical scroll up	12 09

Set pass through flag	01	Cursor up/down	11 0A
Clear pass through flag	x1 x2 02	Line feed	12 0A
Digit select	10 pp	Carriage return	0D

COMMAND DETAIL

The followings are the detailed explanations on the commands applicable in Futaba emulation mode arranged in the (hexadecimal) numerical order of the command codes:

Command Code: <01>

Command Name: **Set pass through flag**

Command Result:

The customer display enters pass through mode until the clear pass through flag command is received. All data received by the VFD will be 100% passed on to the device connected at COM1 port.

Limitations:

It is recommended to connect only serial output device like a serial printer at COM1. The Clear pass through flag command should not create any puzzle to the printer.

Command Code: <04> <bb>

Command Name: **Brightness control**

Command Result:

When bb = 20, the brightness of VFD will be 20%.

When bb = 40, the brightness of VFD will be 40%.

When bb = 60, the brightness of VFD will be 60%.

When bb = FF, the brightness of VFD will be 100% of its maximum brightness.

Limitations:

Values of bb allowed are : (in hexadecimal) 20, 40, 60 and FF only

Command Code: <05> . . . <0D>

Command Name: **Moving sign**

Command Result:

The upper row of VFD will first be cleared on receiving of <05> command and the word "PST" as the ASCII display of <50> <53> <54> will appear from the right of 1st row marching one after another toward the left end and after the last character disappears from the left end the first character will start all over again from the right end.

Limitations:

The maximum number of displayable characters between the command code <05> and the ending code <0D> is 60 (decimal). If there are already 60 displayable characters after "05" before "0D", the moving sign starts without "0D". Any non-displayable character within the moving sign string will be disregarded. Any code received after start of moving sign will stop the moving sign operation.

Command Code: <06> <x1> <x2>

Command Name: **Change leading code**

Command Result:

When the VFD is set to pass through mode after change of the leading code, the clear command from pass through must bear the changed leading code to be effective. In this example the clear command becomes <03> <04> <02>.

Limitations:

The default leading code is <21> <23> in hexadecimal form or !# in displayed form. The changed leading code will be effective till the power of VFD is turned off.

Command Code: <08>

Command Name: **Back space**

Command Result:

Moves cursor to the left by one digit (position) and erases the character at that digit.

Limitations:

When the cursor is at the most significant digit (MSD) of one row, the least significant digit (LSD) of the other row is considered as the left position of the cursor.

Command Code: <09>

Command Name: **(Horizontal tab)**

Command Result:

Works as command <11> <09> Horizontal tab or as command <12> <09> Vertical scroll up.

Limitations:

At power on or if the last command between the two choices given to VFD is <12> <09>, this command works exactly like <12> <09>.

If no <12> <09> command given after a <11> <09> command to VFD, then this command works exactly like <11> <09>.

Command Code: <0A>

Command Name: **(Line feed)**

Command Result:

Works as command <11> <0A> Cursor up/down or as command <12> <0A> Line feed.

Limitations:

At power on or if the last command between the two choices given to VFD is <12> <0A>, this command works exactly like <12> <0A>.

If no <12> <0A> command given after a <11> <0A> command to VFD, then this command works exactly like <11> <0A>.

Command Code: <0D>

Command Name: **Carriage return**

Command Result:

Cursor moves to the MSD (leftmost position) of the current row.

Limitations:

None

Command Code: <10> <pp>

Command Name: **Digit select**

Command Result:

Moves cursor to the position defined by the hexadecimal number <pp>, where <pp> starts counting sequentially from the MSD of the 1st row to the LSD of the 1st row then to the MSD of the 2nd row and finally down to the LSD of the 2nd row. The count of <pp> starts from <00>.

Limitations:

<pp> ranges from <00> to <27> only.

Command Code: <11> <09>

Command Name: **Horizontal tab**

Command Result:

Moves cursor to the right by one digit (position).

Limitations:

When the cursor is at the least significant digit (LSD) of one row, the most significant digit (MSD) of the other row is considered as the position to the right of the cursor.

Command Code: <11> <0A>

Command Name: **Cursor up/down**

Command Result:

Cursor moves up or down to corresponding position of the other row.

Limitations:

None

Command Code: <12> <09>

Command Name: **Vertical scroll up**

Command Result:

When cursor at LSD of 2nd row, this command clears the 1st row and scrolls the 2nd row up to 1st row, with the cursor now positioned at MSD of 2nd row.

When cursor at other position this command just moves the cursor one digit to the right.

Limitations:

Scrolls up only at last position otherwise works just like Horizontal tab.

Command Code: <12> <0A>

Command Name: **Line feed**

Command Result:

With cursor at 2nd row, all the 2nd row characters are moved up to 1st row, leaving 2nd row blank and cursor position unchanged.

If the cursor is at the 1st row, only the cursor is moved down to the same position of 2nd row, with all other display unchanged.

Limitations:

Line feed only at 2nd row, otherwise just like Cursor up/down.

Command Code: <13>

Command Name: **Cursor on**

Command Result:

This command turns cursor on or keeps cursor lighted. This is the default status. The cursor is a blinking block of 5 by 7 dots.

Limitations:

None

Command Code: <14>

Command Name: **Cursor off**

Command Result:

This command turns cursor off or keeps cursor off. However cursor position is not changed.

Limitations:

None

Command Code: <1E> <0p>

Command Name: **Change font page**

Command Result:

Select font page according to the value of “p”. The entire display will be changed at the same time.

Limitations:

The value of “p” is now limited to “0” and “1”. When “0” is selected, US and European fonts are displayed. When “1” is selected, US and Japanese fonts are displayed.

Command Code: <1F>

Command Name: **Reset**

Command Result:

All characters displayed will be erased and all settings except the leading code for clearing pass through flag will return to power on conditions.

Limitations:

The leading code for clearing pass through flag will not return to the default value <21> <23> if ever been changed by the <06> command.

Command Code: <x1> <x2> <02>

Command Name: **Clear pass through flag**

Command Result:

When the VFD is set to pass through mode by the <01> command, the VFD monitors the data received for the Clear pass through flag command. The default values for <x1> and <x2> are <21> and <23> in hexadecimal format or !# in displayable form unless ever been changed by the <06> Change leading code command.

Limitations:

The default leading code is <21> <23> in hexadecimal form or !# in displayed form. If a <06> Change leading code command has been executed, the changed code should be used in front of the <02> code. This leading code change will not be changed back by the <1F> Reset command and will only be reset by VFD power off.

7.3 Noritake Emulation Mode (Default setting)

This emulation mode comes into effect when the left DIP switch is pushed down (turned off) and the right one is pushed up (turned on).

DIP SW	1	2
	off	on

The default status in this mode when power on after power on sign is that a block shaped cursor formed of 5 by 7 dots is blinking at a rate about 1 cycle per second at the leftmost position of the 1st row on the display area. Any displayable code under the correct protocol received will be displayed at the position of the cursor and the cursor will be moved to the right by one position. When the cursor is already at the rightmost position of either row, it will move to the leftmost position of the other row on receiving a displayable code. The non-displayable codes are basically used as commands to the display unit.

COMMAND SUMMARY

Listed below are commands available in this mode grouped by their functions, note that all the command codes given are expressed in Hexadecimal format:

Command Name	Hex Codes	Command Name	Hex Codes
Reset	1B 49	Cursor blinking Rate	1B 54 nn
Clear	0E	Cursor on	15
Brightness control	1B 4C bb	Cursor off	16
Change font page	1E 0p	Back space	08

Moving sign	05 . . . 0D	Horizontal tab	11 09
Change leading code	06 x1 x2	Vertical scroll up	12 09
Set pass through flag	01	Cursor up/down	11 0A
Clear pass through flag	x1 x2 02	Line feed	12 0A
Digit select	1B 48 pp	Form feed	0C
User defined graphics/fonts	1B 43 ad x1 ~ x5	Carriage return	0D

COMMAND DETAIL

The followings are the detailed explanations on the commands applicable in Noritake emulation mode arranged in the (hexadecimal) numerical order of the command codes:

Command Code: <01>

Command Name: **Set pass through flag**

Command Result:

The customer display enters pass through mode until the clear pass through flag command is received. All data received by the VFD will be 100% passed on to the device connected at COM1 port.

Limitations:

It is recommended to connect only serial output device like a serial printer at COM1. The Clear pass through flag command should not create any puzzle to the printer.

Command Code: <05> . . . <0D>

Command Name: **Moving sign**

Command Result:

The upper row of VFD will first be cleared on receiving of <05> command and the word "PST" as the ASCII display of <50> <53> <54> will appear from the right of 1st row marching one after another toward the left end and after the last character disappears from the left end the first character will start all over again from the right end.

Limitations:

The maximum number of displayable characters between the command code <05> and the ending code <0D> is 60 (decimal). If there are already 60 displayable characters after "05" before "0D", the moving sign starts without "0D". Any non-displayable character within the moving sign string will be disregarded. Any code received after start of moving sign will stop the moving sign operation.

Command Code: <06> <x1> <x2>

Command Name: **Change leading code**

Command Result:

When the VFD is set to pass through mode after change of the leading code, the clear command from pass through must bear the changed leading code to be effective. In this example the clear command becomes <03> <04> <02>.

Limitations:

The default leading code is <21> <23> in hexadecimal form or !# in displayed form. The changed leading code will be effective till the power of VFD is turned off.

Command Code: <08>

Command Name: **Back space**

Command Result:

Moves cursor to the left by one digit (position).

Limitations:

When the cursor is at the most significant digit (MSD) of 2nd row, this command moves the cursor to the least significant digit (LSD) of the 1st row. If the cursor is at the MSD of 1st row, nothing will happen.

Command Code: <09>

Command Name: **(Horizontal tab)**

Command Result:

Works as command <11> <09> Horizontal tab or as command <12> <09> Vertical scroll up.

Limitations:

At power on or if the last command between the two choices given to VFD is <12> <09>, this command works exactly like <12> <09>.

If no <12> <09> command given after a <11> <09> command to VFD, then this command works exactly like <11> <09>.

Command Code: <0A>

Command Name: **(Line feed)**

Command Result:

Works as command <11> <0A> Cursor up/down or as command <12> <0A> Line feed.

Limitations:

At power on or if the last command between the two choices given to VFD is <12> <0A>, this command works exactly like <12> <0A>.

If no <12> <0A> command given after a <11> <0A> command to VFD, then this command works exactly like <11> <0A>.

Command Code: <0C>

Command Name: **Form feed**

Command Result:

Moves cursor to the MSD (leftmost position) of the 1st row.

Limitations:

None

Command Code: <0D>

Command Name: **Carriage return**

Command Result:

Cursor moves to the MSD (leftmost position) of the current row.

Limitations:

None

Command Code: <0E>

Command Name: **Clear**

Command Result:

All characters displayed will be cleared from the screen while the cursor remains at the same position before this command.

Limitations:

None

Command Code: <11> <09>

Command Name: **Horizontal tab**

Command Result:

Moves cursor to the right by one digit (position).

Limitations:

When the cursor is at the least significant digit (LSD) of one row, the most significant digit (MSD) of the other row is considered as the position to the right of the cursor.

Command Code: <11> <0A>

Command Name: **Cursor up/down**

Command Result:

Cursor moves up or down to corresponding position of the other row.

Limitations:

None

Command Code: <12> <09>

Command Name: **Vertical scroll up**

Command Result:

When cursor at LSD of 2nd row, this command clears the 1st row and scrolls the 2nd row up to 1st row, with the cursor now positioned at MSD of 2nd row.

When cursor at other position this command just moves the cursor one digit to the right.

Limitations:

Scrolls up only at last position otherwise works just like Horizontal tab.

Command Code: <12> <0A>

Command Name: **Line feed**

Command Result:

With cursor at 2nd row, all the 2nd row characters are moved up to 1st row, leaving 2nd row blank and cursor position unchanged.

If the cursor is at the 1st row, only the cursor is moved down to the same position of 2nd row, with all other display unchanged.

Limitations:

Line feed only at 2nd row, otherwise just like Cursor up/down.

Command Code: <15>

Command Name: **Cursor on**

Command Result:

This command turns cursor on or keeps cursor lighted. This is the default status. The cursor is a blinking block of 5 by 7 dots.

Limitations:

None

Command Code: <16>

Command Name: **Cursor off**

Command Result:

This command turns cursor off or keeps cursor off. However cursor position is not changed.

Limitations:

None

Command Code: <1B> <43> <ad>
<x1> ~ <x5>

Command Name: User defined
graphics/fonts

Command Result:

This command creates a specific font to substitute the predefined font at the address defined by <ad> in the font table regardless of which font page is in use. The specific font is defined by the 5 bytes <x1>, <x2>, <x3>, <x4>, <x5> following the address code in a graphic manner. Referring to the dot definition as interpreted in page 3-4-4, to describe the 5 <x's> in bit form starting from MSB to LSB, we can list:

<x1> = P23, P22, P21, P15, P14, P13, P12, P11
<x2> = P41, P35, P34, P33, P32, P31, P25, P24
<x3> = P54, P53, P52, P51, P45, P44, P43, P42
<x4> = P72, P71, P65, P64, P63, P62, P61, P55
<x5> = DC , DC , P83, P82, P81, P75, P74, P73

The DC in the above means “don’t care”, that is the value of that bit will have no influence, the P83 will have influence only when displayed in the 2nd row. Each “1” bit means a lighted dot at the corresponding position of the user defined font.

Limitations:

<ad> ranges from <20> to <FF>. Recommended to be between <A0> and <FF>.

Totally at most two fonts to be user defined. The first user defined font will always remain until the reset command or power off. The second user defined font will be cleared off (back to predefined font) after the third user defined font defined, and then the third becomes the second. During the process of defining any user defined font, the previously user defined font will be momentarily disabled.

Command Code: <1B> <48> <pp>

Command Name: Digit select

Command Result:

Moves cursor to the position defined by the hexadecimal number <pp>, where <pp> starts counting sequentially from the MSD of the 1st row to the LSD of the 1st row then to the MSD of the 2nd row and finally down to the LSD of the 2nd row. The count of <pp> starts from <00>.

Limitations:

<pp> ranges from <00> to <27> only.

Command Code: <1B> <49>

Command Name: **Reset**

Command Result:

All characters displayed will be erased and all settings except the leading code for clearing pass through flag will return to power on conditions.

Limitations:

The leading code for clearing pass through flag will not return to the default value <21> <23> if ever been changed by the <06> command.

Command Code: <1B> <4C> <bb>

Command Name: **Brightness control**

Command Result:

When bb = 3F, the brightness of VFD will be 20%.

When bb = 7F, the brightness of VFD will be 50%.

When bb = BF, the brightness of VFD will be 75%.

When bb = FF, the brightness of VFD will be 100% of its maximum brightness.

Limitations:

Values of bb allowed are : (in hexadecimal) 3F, 7F, BF and FF only

Command Code: <1B> <54> <nn>

Command Name: **Cursor blinking rate**

Command Result:

This command is used to define the blinking rate of the cursor when the cursor is on. The number <nn> is used to determine the period of blinking by multiplying the number “k” induced from number “nn” with a constant “31 millisecond”. The relationship between “k” and “nn” is that if “nn” = “00” then “k” = 256, and if “nn” ranges from “01” to “FF” then “k” is the direct numerical translation of “nn” and ranges from 1 to 255.

Limitations:

<nn> is a byte ranging from <00> to <FF>.

Command Code: <1E> <0p>

Command Name: **Change font page**

Command Result:

Select font page according to the value of “p”. The entire display will be changed at the same time.

Limitations:

The value of “p” is now limited to “0” and “1”. When “0” is selected, US and European fonts are displayed. When “1” is selected, US and Japanese fonts are displayed.

Command Code: <x1> <x2> <02>

Command Name: **Clear pass through flag**

Command Result:

When the VFD is set to pass through mode by the <01> command, the VFD monitors the data received for the Clear pass through flag command. The default values for <x1> and <x2> are <21> and <23> in hexadecimal format or !# in displayable form unless ever been changed by the <06> Change leading code command.

Limitations:

The default leading code is <21> <23> in hexadecimal form or !# in displayed form. If a <06> Change leading code command has been executed, the changed code should be used in front of the <02> code. This leading code change will not be changed back by the <1B> <49> Reset command and will only be reset by VFD power off.

7.4 Aedex Emulation Mode

This emulation mode comes into effect when the left DIP switch is pushed up (turned on) and the right one is pushed down (turned off).

DIP SW	1	2
	on	off

When the VFD is powered on, a power on sign is displayed for about 5 seconds and then a blinking block shows up at the upper leftmost position notifying that the VFD is ready to function. This block stops blinking or disappears as soon as the VFD receives any signal either for the serial printer connected to VFD or for VFD itself. The VFD under this emulation mode is always set in the pass through mode whilst the VFD is monitoring the data received for the “attention code”. The attention code is composed of two characters and the default attention code is “!#” in displayed form or <21> <23> in hexadecimal internal code. Note that only alpha numerical codes are accepted in this emulation mode except the carriage return as the terminator for every command. Following procedures describes how the VFD works on the data received.

1. The VFD monitors whatever the data received and transmits the data to the pass through connected serial printer when the data does not match the first character of the attention code (defaulted as “!” the exclamation point). The data will be trapped by the VFD if it matches the first character of the attention code and the VFD starts checking for the second character of the attention code.
2. The data received will be transmitted to the pass through connected serial printer if it does not match the second character of the attention code (defaulted as “#” the number sign) and the VFD resumes monitoring for the first character of the attention code. The data will be further trapped by the VFD if it matches the second character of the attention code and the VFD starts checking for the “function code”.
3. The VFD will transmit the data received to the pass through connected serial printer and return to monitoring for the first character of the attention code if the data received does not match any of the function codes, which are some numbers ranging from 1 to 9. The VFD traps all data afterwards and takes these data to perform the function if the function code matches.

4. On receiving a complete command code (attention code + function code), the VFD clears the function area on the display (top, bottom or both rows) and get ready for that command. The limitation on the length of data for each function is different from each other. There must be a “CR” code (carriage return <0D>) immediately after the data as a terminator to conclude the function. After that carriage return, the VFD monitors all data received for the first character of the attention code and transmit them to the pass through connected serial printer again.

Based on the knowledge of the above procedure, the user can avoid problem with the pass through connected serial printer through following precautions:

1. Avoid the situation that the data to be transmitted to the pass through connected serial printer contain any part which resemble the attention code used, especially the 1st character of the attention code, or
2. Use the Change attention code command (function code “8”) to prevent the coincidence of attention code and data to pass through, or
3. If neither of the above is possible, check through the data to be pass through transmitted for the 1st character of the attention code and double it up, provided the second character of the attention code is different from the 1st character of the attention code, or
4. Use function code “7” to stop trapping of VFD and all data afterwards sent to the pass through connected serial printer with one disadvantage that the VFD no longer works until the reset by turning power to the VFD off and on again.

COMMAND SUMMARY

The available function codes and some of the limitations are listed in the following table. Note that the complete command form must be :

Attention code + Function code + Data + Carriage return

Function Code	Command Name	Function Area	Data Length
1	Display top	Top row	Max. 20 characters
2	Display bottom	Bottom row	Max. 20 characters
4	On going scroll	Top row	Max. 60 characters
6	One time scroll	Top row	Max. 40 characters
7	Stop trapping	N.A.	No characters
8	Change attention code	N.A.	2 characters
9	Display whole area	Both rows	Max. 40 characters

COMMAND DETAIL

The BASIC programming example and the display example and the printer result example are combined in the latest part of this section.

Function Code: 1

Command Name: Display top

Command Result:

The top row of VFD will first be cleared and all data between the function code “1” and the carriage return will be displayed from left to right on the 1st row of VFD.

Limitations:

Data length is limited to 20 characters. If there is no carriage return up to the 21st character of data, the 21st character will be transmitted to the pass through connected serial printer. This command can be used to terminate the On going scroll command (function code “4”).

Function Code: **2**

Command Name: **Display bottom**

Command Result:

The bottom row of VFD will first be cleared and all data between the function code “2” and the carriage return will be displayed from left to right on the 2nd row of VFD.

Limitations:

Data length is limited to 20 characters. If there is no carriage return up to the 21st character of data, the 21st character will be transmitted to the pass through connected serial printer.

Function Code: **4**

Command Name: **On going scroll**

Command Result:

The top row of VFD will first be cleared and all data between the function code “4” and the carriage return will be displayed from the right end of the 1st row marching toward the left end one character after another. It will start over repeatedly when the last character of the string disappears from the display.

Limitations:

Data length is limited to 60 characters. If there is no carriage return up to the 61st character of data, the 61st character will be transmitted to the pass through connected serial printer. This scrolling will be stopped when receiving next “display top” (function code “1”) or “display whole area” (function code “9”) command.

Function Code: 6

Command Name: One time scroll

Command Result:

The top row of VFD will first be cleared and all data between the function code “6” and the carriage return will be displayed from the right end of the 1st row marching toward the left end one character after another. The 1st row of VFD remains blank after the last character of the string disappears from the display.

Limitations:

Data length is limited to 60 characters. If there is no carriage return up to the 61st character of data, the 61st character will be transmitted to the pass through connected serial printer. However, when function code ”4” is working, this command is not applicable due to conflict in data buffer.

Function Code: 7

Command Name: Stop trapping

Command Result:

The VFD stops monitoring the data passed through for any attention code any longer, all data pass through to the serial device connected. The display on VFD remains unchanged until power of VFD turned off.

Limitations:

This command is seldom used and should be used only under great caution as it is a way of no return. The VFD can no longer respond to any command as it is instructed not to monitor the data. The only reset is power off/on.

Function Code: 8

Command Name: Change attention code

Command Result:

The attention code after this command will be changed to the two characters following the function code “8” in this command.

Limitations:

Only the displayable codes are accepted for new attention code. The carriage return “<0D>” must not be forgotten. This command is not only useful in avoiding the conflicts between the data to the pass through connected device and the default attention code, but also handy when several device each with different attention code are daisy chained to respond separately.

The attention code will reset back to the default “!#” every time power on.

Function Code: 9

Command Name: Display whole area

Command Result:

The top row of VFD will first be cleared and all data between the function code “9” and the carriage return will be displayed with the 1st 20 characters displayed from left to right on the 1st row of VFD and the 2nd 20 characters displayed from left to right on the 2nd row of VFD.

Limitations:

Data length is limited to 40 characters. If there is no carriage return up to the 41st character of data, the 41st character will be transmitted to the pass through connected serial printer. This command can be used to terminate the On going scroll command (function code “4”).

7.5 Epson Emulation Mode

This emulation mode comes into effect when both DIP switch are pushed down (turned off).

DIP	1	2
SW	off	off

The default status in this mode when power on after power on sign is a blank screen with an invisible cursor at the leftmost position of the 1st row on the display area. Any displayable code under the correct protocol received will be displayed at the position of the cursor and the cursor will be moved to the right by one position. When the cursor is already at the rightmost position of either row, the leftmost position of the other row is considered as the position to the right. The non-displayable codes are basically used as commands to the display unit.

COMMAND SUMMARY

Listed below are commands available in this mode grouped by their functions, note that all the command codes given are expressed in Hexadecimal format and denoted as “ <x>H ”.

Command	Name	Code	Function descriptions
BS	Move cursor left	<08>H	
HT	Move cursor right	<09>H	
LF	Move cursor down	<0A>H	
HOM	Move cursor home position	<0B>H	
CLR	Clear display screen	<0C>H	
CR	Move cursor to left-most position	<0D>H	
CAN	Clear cursor line	<18>H	
US MD1	Specify overwrite mode	<1F>H <01>H	
US MD2	Specify vertical scroll mode	<1F>H <02>H	
US MD3	Specify horizontal scroll mode	<1F>H <03>H	
US LF	Move cursor up	<1F>H <0A>H	
US CR	Move cursor to right-most position	<1F>H <0D>H	
US \$	Move cursor to specified position	<1F>H <24>H <n> <m>	1 ≤ n ≤ 20, m = 1, 2
US E	Set/cancel display screen blinking	<1F>H <45>H <n>	0 ≤ n ≤ 255
US T	Set and display counter (time)	<1F>H <54>H <h>H <m>H	0 ≤ h ≤ 24H, 0 ≤ m ≤ 59H
US U	Display counter (time)	<1F>H <55>H	
US X	Brightness adjustment	<1F>H <58>H <n>	1 ≤ n ≤ 4
ESC %	Set/cancel user-defined characters	<1B>H <25>H <n>	n = 0, 1
ESC &	Define user-defined characters	<1B>H <26>H <addr>H <x1>H <x2>H <x3>H	addr = address x1 ... x5 are 5bytes

		<x4>H <x5>H	defining the dots of 5x7 matrix to be turned on.
ESC ?	Delete user-defined characters	<1B>H <3F>H <n>	n = 0, 1
US @	Show firmware version	<1F>H <40>H	
ESC =	Select peripheral device	<1B>H <3D>H <n>	n = 0 printer select n = 1 display select n = 2 both
ESC T	Select character code page table	<1B>H <74>H <n>	n = 0 select page 0; n = 1 select page 1
US B	Move cursor to bottom position	<1F>H <42>H	
ESC @	Initialize display	<1B>H <40>H	
ESC R	Select International character set	<1B>H<52>H<n>	n= 00 ~ 0B

7.6 Character Set (Page 0)

	2x	3x	4x	5x	6x	7x	8x	9x	Ax	Bx	Cx	Dx	Ex	Fx
x0		0	@	P	`	p	Q	E	á	⊗	⊥	⊥	α	≡
x1	!	1	A	Q	a	q	ü	æ	í	⊗	⊥	⊥	β	±
x2	"	2	B	R	b	r	é	É	ó	⊗	⊥	⊥	Γ	≥
x3	#	3	C	S	c	s	À	á	Ú	ı	ı	ı	π	≤
x4	\$	4	D	T	d	t	ä	ö	ñ	ı	-	ı	Σ	ı
x5	%	5	E	U	e	u	à	ò	ñ	ı	ı	ı	σ	ı
x6	&	6	F	V	f	v	â	ô	ñ	ı	ı	ı	ı	ı
x7	'	7	G	W	g	w	ç	ö	ı	ı	ı	ı	ı	ı
x8	(	8	H	X	h	x	è	ù	ı	ı	ı	ı	ı	ı
x9	)	9	I	Y	i	y	ë	ö	ı	ı	ı	ı	ı	ı
xA	*	:	J	Z	j	z	ê	ü	ı	ı	ı	ı	ı	ı
xB	+	;	K	[	k	[	ï	ç	ı	ı	ı	ı	ı	ı
xC	,	<	L	\	ı	ı	î	ç	ı	ı	ı	ı	ı	ı
xD	-	=	M	]	m	]	ï	ç	ı	ı	ı	ı	ı	ı
xE	.	>	N	^	n	^	ä	ç	ı	ı	ı	ı	ı	ı
xF	/	?	O	_	o	_	Ä	ç	ı	ı	ı	ı	ı	ı

7.7 Character Set (Page 1)

	2x	3x	4x	5x	6x	7x	8x	9x	Ax	Bx	Cx	Dx	Ex	Fx
x0	0	@	P	`	p	_	|	-	夕	三	口	日		
x1	!	1	A	Q	a	q	.	。	ア	チ	△	■	月	
x2	"	2	B	R	b	r	■	■	「	イ	ツ	人	■	火
x3	#	3	C	S	c	s	■	■	」	ウ	テ	モ	○	本
x4	\$	4	D	T	d	t	■	■	,	エ	ト	フ	●	本
x5	%	5	E	U	e	u	■	※	=	オ	ナ	1	◇	金
x6	&	6	F	V	f	v	—	※	ヲ	カ	ニ	ヨ	+	土
x7	'	7	G	W	g	w	■	→	ア	キ	又	ラ	+	年
x8	(	8	H	X	h	x	■	←	イ	ク	本	リ	ト	円
x9	)	9	I	Y	i	y	■	↑	ウ	ケ	ノ	ル	+	分
xA	*	:	J	Z	j	z	■	↓	エ	コ	ハ	レ	▲	人
xB	+	;	K	[	k	[	■	×	オ	サ	ヒ	ロ	+	大
xC	,	<	L	\	l	||	||	÷	カ	ラ	フ	ワ	※	申
xD	-	=	M	]	m	}]	■	±	ユ	ズ	ハ	ン	※	小
xE	.	>	N	^	n	^	■	±	ヨ	セ	ホ	+	ト	ト
xF	/	?	O	_	o	■	■	±	ツ	ソ	マ	+	ト	ト

7.8 International Character Set

CODES & COUNTRIES	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
00 U.S.A.	#	\$	@	[	\	\]	^	`	c	l	o	~
01 FRANCE	#	\$	à	•	ç	ç	^	`	é	ù	è	·
02 GERMANY	#	\$	ä	Ä	ö	Ü	^	`	ä	ö	Ü	ß
03 ENGLAND	#	\$	@	[	\	\]	^	`	c	l	o	~
04 DENMARK I	#	\$	@	Æ	Ø	Å	^	`	æ	ø	å	~
05 SWEDEN	#	Ö	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
06 ITALY	#	\$	@	•	\	é	^	ù	á	ò	è	ì
07 SPAIN	#	\$	@	í	ñ	¿	^	`	·	ñ	o	~
08 JAPAN	#	\$	@	[	¥	]	^	`	c	l	o	~
09 NORWAY	#	Ö	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
0A DEMARK II	#	\$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
0B EX. JUGO.	#	\$	ž	š	Đ	Č	Č	ž	š	đ	č	č

8. SPECIFICATIONS

OPTICAL

Number of digits	20 digits/row, 2 rows
Dot matrix	5 X 7 dots
Digit height	11.25 mm
Digit width	7.2 mm
Color	Green, $\lambda = 505$ nm
Luminance	700 cd/m ⁴ (204 fL) Typ.

MECHANICAL

Weight	1.5 lbs
Height	301 ~ 415 mm
Width	260 mm
Depth	110 mm

ELECTRICAL

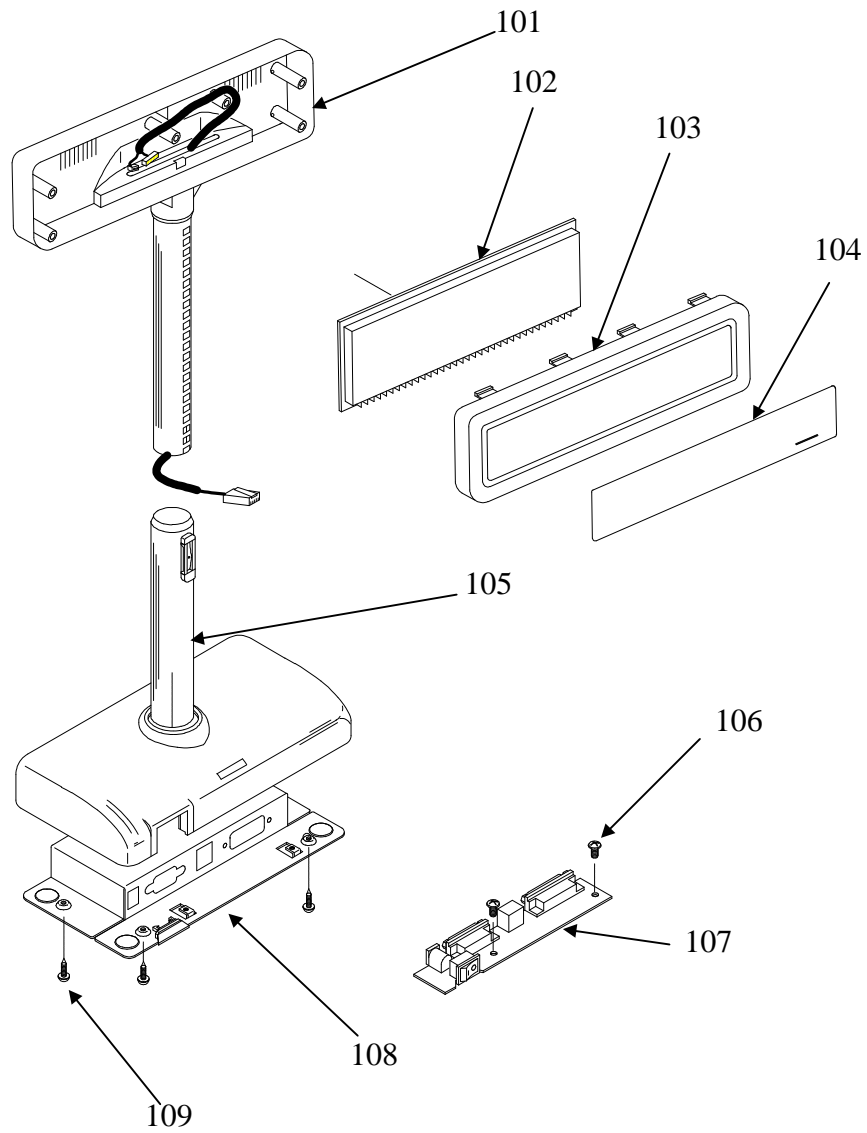
Power (Applied to adapter)	Input: 120VAC, 60 Hz or 220VAC, 50 Hz Output: 7.5VAC 1000 mA
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ENVIRONMENTAL

Operating temperature	-20 to +70°C
Storage temperature	-40 to +80°C
Relative humidity	90%, non-condensing
Vibration	4 G
Shock	40G

WARNING: If the user opens the pole display housing to make the changes, all product warranty's will be voided.

9. SERVICE & SPARE PARTS



Location	Choice	Part Number	Description
101	1	MPD21POLASY-1	PD-2200 Pole Ass'y incl.: MPD21BCKCVR-1 MPD21PLNEK-1 MPD21NEKATCH-1 MPD21UPTUB-1 MPD21BAR157*5-2 MSTSCRW3-12+R CCBLA124
102	1	PD220CPU	PD-2200 Module w/VFD
103	1	MPD21FRNTCVR-1	PD-2200 Front Cover
104	1	MPD21FLTR-P1	PD-2200 Filter
105	1	MPD22BSASY	PD-2200 Base Ass'y incl.: MPD21BMTUB-1 MPD21SNPNOB-1 MPD21SWVLPLT MPD21SNPSRN-1 MPLANWSHD3-1 MSTSCW3-10+TR MPD22PLSTCBSE
106	1	MSCRW#6-6L+P	Screw pan head #6-6L
107	1	PD220SP	PD-2200 I/O Board
108	1	MPD22BSPLT-1	PD-2200 Base plate w/rubber foot
109	1	MSTSCRW3-8+TR	Screw self tapping 3.0 - 8L