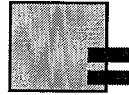


**CUSTOMER  
LCD DISPLAY**

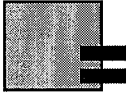
**USER'S MANUAL**

# CONTENTS



1 LCD

<b>Contents</b>	<b>1</b>
<b>Features</b>	<b>2</b>
<b>Specifications</b>	<b>3</b>
<b>Physical Dimensions</b>	<b>4</b>
<b>Interface</b>	<b>6</b>
<b>Installation</b>	<b>7</b>
<b>Command Set Table</b>	<b>8</b>
<b>Display Modes Description</b>	<b>10</b>
<b>Command Set Description</b>	<b>12</b>
<b>Character Font Table</b>	<b>20</b>
<b>12V Model with DB25F</b>	<b>21</b>

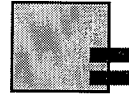


## FEATURES

### LCD 2

- \* Back-lit liquid crystal display (LCD) provides wide viewing angle and high display brightness.
- \* Large 6mm by 14mm character size in 5 x 7 dot matrix plus cursor line.
- \* 40 characters in 20 columns by 2 lines format.
- \* Built in character generator ROM with 192 preset characters
- \* Character generator RAM for eight user definable characters.
- \* Uses standard RS-232C interface for data communication, with baud rate fixed at 9600 bps.
- \* Easy programming using Escape sequence commands.
- \* Display can swivel and tilt to a wide range of angles.
- \* Selectable display height.
- \* Dual power options: use 5 Volt DC supplied by the host through either the RS232C port or the enclosed supply bracket.
- \* Optional 12V (9V - 25V) supply version is available.

## SPECIFICATIONS

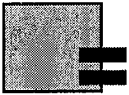


3 LCD

<b>Display Type:</b>	Liquid Crystal Display (LCD)
<b>Back Light:</b>	Cold Cathode Fluorescent Luminance (CCFL)
<b>Display Format:</b>	40 Characters (20 columns x 2 lines) <sup>(1)</sup>
<b>Character Type:</b>	192 predefined characters in ROM 8 user down-loadable characters in RAM
<b>Character Font:</b>	5 x 7 dot matrix + cursor row <sup>(1)</sup>
<b>Character Size:</b>	6.0 mm x 14 mm <sup>(1)</sup>
<b>Character Pitch:</b>	7.2 mm <sup>(1)</sup>
<b>Supply Voltage:</b>	5.0 Volts DC $\pm$ 5%
<b>Power Consumption:</b>	3 Watts max.
<b>MTFB:</b>	20000 hours
<b>Dimensions:</b>	
<b>Panel:</b>	226mm(W) x 92mm(H) x 50mm(D) <sup>(2)</sup>
<b>Support:</b>	76mm(H) x 33mm( $\phi$ ) 167mm(H) x 33mm( $\phi$ ) 308m m(H) x 33mm( $\phi$ ) 399m m(H) x 33mm( $\phi$ )
<b>Base Section:</b>	227mm(W) x 25mm(H) x 103mm(D)
<b>Weight:</b>	0.8kg.
<b>Viewing Angle:</b>	8° - 35° <sup>(3)</sup>
<b>Rotation Angle:</b>	270° max.

### Notes:

- (1) Refer to Figure 2-1
- (2) Refer to Figure 2-2
- (3) Refer to Figure 2-3



# PHYSICAL DIMENSIONS

LCD 4

## Display pattern sheet

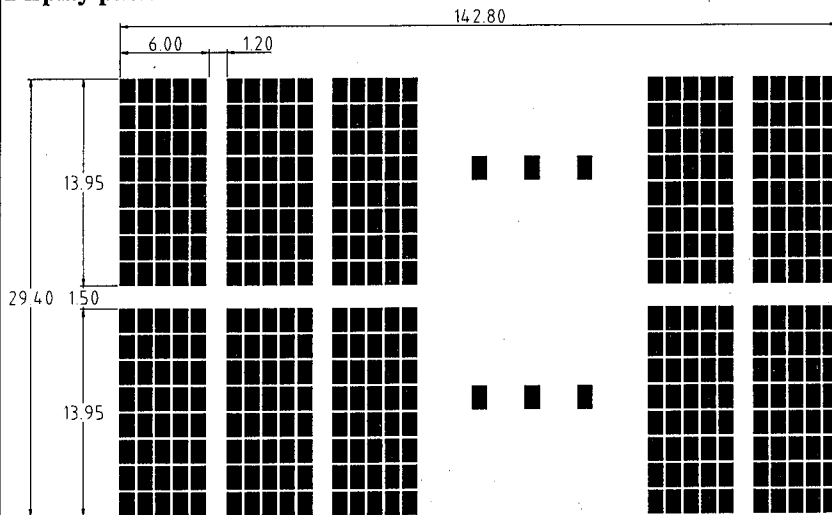


Figure 2-1

## Outside dimensions and selectable heights

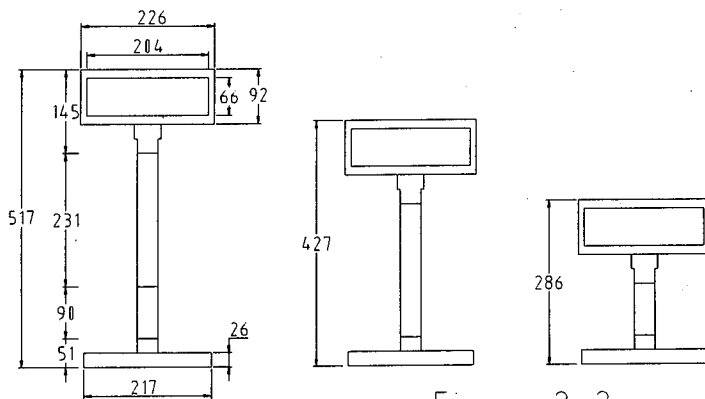
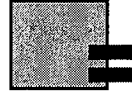


Figure 2-2



**Viewing angle and rotation**

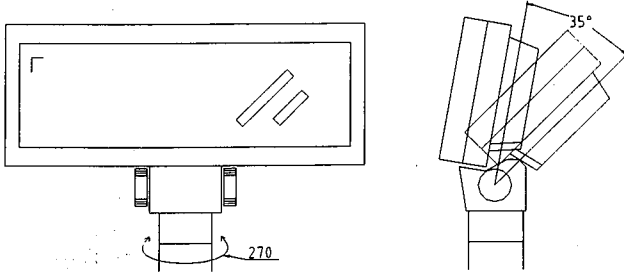
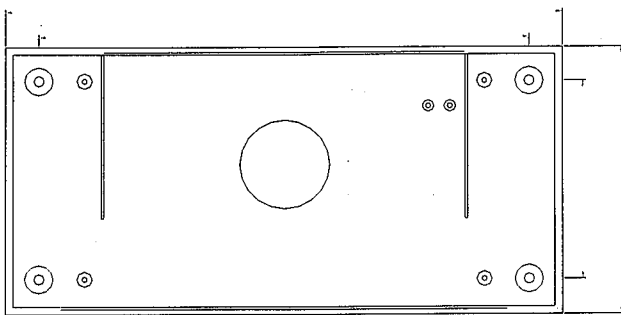


Figure 2-3

**Base**





## INTERFACE

LCD 6

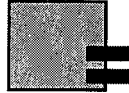
### RS-232C Interface

Data Transmission: Serial, asynchronous  
Baud Rate: 9600 bps  
Data Bit: 8 bits  
Parity: none  
Stop Bits: 1

### Interface Cable Pin Assignment

<u>To LCD (RJ45)</u>		<u>To Host (D9F)</u>
1 GND1	_____	5 GND
4 GND2	_____	
2 RxD	_____	3 TxD
3 TxD	_____	2 RxD
5 Vcc1	_____	9 +5V DC
	_____	4 DTR
	_____	6 DSR
	_____	7 RTS
	_____	8 CTS
		<u>To Host (RCA-M)</u>
6 Vcc2	_____	Center +5V DC
8 GND3	_____	Outer GND

## INSTALLATION



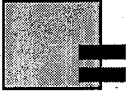
7 LCD

For interface between the host system and the LCD display, a cable is provided with an RJ45 plug at one end and a DB9F connector at the other. Please follow the steps below for installation:

1. Select the extension tube(s) for the desired display height.
2. Connect the tube(s) to the base portion.
3. Thread the RJ45 end of the interface cable from the bottom of the base portion to the other end.
4. Take LCD unit, locate the RJ45 receptacle through the neck opening, aim the RJ45 plug of the interface cable at the receptacle. Push the cable, assist with a finger if necessary, till the plug is in place with an affirmative click.
5. Secure the LCD unit onto the tube.
6. Secure the cable at the bottom of the base by pushing it between the two plastic poles near the base side cut-out.
7. Place the LCD display at desired location.
8. Connect the DB9F connector to the RS232C port of the system unit. Please consult the software instruction for the port number to use. If the RS232C port of the system unit has DC supply available at PIN 9, the installation is completely, else please perform the additional steps below.
9. Install the supply bracket into one of the unused expansion bracket location in the system unit. There are two connectors attached for power diversion, attach the female connector to one of the male connector from the system power supply. The male connector of the supply bracket may be used as any other system supply connector.
10. Attach the male RCA connector of the cable to the female connector of the supply bracket.

**Important:** Only one DC supply should be used at any one time. If DC supply is available on RS232C port, then the RCA plug should be left unconnected. If both supply methods are used, damage may result.



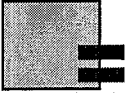


## COMMAND SET TABLE

LCD 8

Command	Hex Code	Description
Esc Dc1	1B 11	overwrite mode
Esc Dc2	1B 12	vertical scroll mode
Esc Dc3	1B 13	horizontal scroll mode
Esc QA $d1...dn$ Cr	1B 51 41 $d1...dn$ 0D $1 \leq n \leq 20$	set string display mode, write string to upper line
Esc QB $d1...dn$ Cr	1B 51 42 $d1...dn$ 0D $1 \leq n \leq 20$	set string display mode, write string to lower line
Esc [ A	1B 5B 41	move cursor up
Esc [ B	1B 5B 42	move cursor down
LF	0A	move cursor down
Esc [ C	1B 5B 43	move cursor right
Hr	09	move cursor right
Esc [ D	1B 5B 44	move cursor left
Bs	08	move cursor left
Esc [ H	1B 5B 48	move cursor home
Hom	0B	move cursor home
Esc [ L	1B 5B 4C	move cursor to left-end
Cr	0D	move cursor to left-end
Esc [ R	1B 5B 52	move cursor to right-end
Esc [ K	1B 5B 4B	move cursor to bottom
Esc I $x y$	1B 6C $x y$ $1 \leq x \leq 20, y=1,2$	move cursor to specified position
Esc @	1B 40	initialize display

Command	Hex Code	Description
<b>CLR</b>	0C	clear display, clear string mode
<b>CAN</b>	18	clear cursor line, clear string mode
<b>Esc _ n</b>	1B 5F n n=0,1	set cursor on/off
<b>Esc W s x1 x2 y</b>	1B 57 s x1 x2 y s=0,1 1<=x1<=x2<=20, y=1,2	set/cancel the window range in horizontal scroll mode
<b>Esc C n d0..d7</b>	1B 43 n d0..d7 0 <= n <= 7	create custom character pattern



## DISPLAY MODES DESCRIPTION

### LCD 10

There are basically four display modes for the LCD. The user may choose the mode that is most appropriate for the application.

#### **Overwrite Mode**

This is the default mode. **Esc Dc1** and **Esc @** commands would also put the display into this mode. The cursor moves from left to right, if it is at the end of the line, it moves to the beginning of the other line. Characters are displayed at the current cursor position, overwriting what is originally there, the cursor is then moved to the next position.

#### **Vertical Scroll Mode**

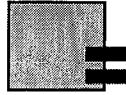
If the cursor is at the upper line it behaves like the **overwrite mode**. When it is at the end of the lower line, the next character would scroll the content of the lower line to upper line, the lower line is cleared and the cursor is moved to the beginning of the lower line.

#### **Horizontal Scroll Mode**

In this mode the cursor stays in what ever line it is at, unless changed by cursor movement commands. When the cursor is not at the end of the line, the input character is displayed at current cursor position, the cursor is then moved right. Once at the end of the line, subsequent character input would scroll the current line left one position, and the new character is displayed at the end position. There is also a command, **Esc W**, to set display window in this mode. The effective display line would be limited within the window as defined by the command.

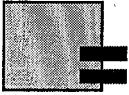
#### **String Mode**

This mode is perhaps the simplest used. The two display lines are treated independently. Only two commands, **Esc QA** and **Esc QB**, are needed. **Esc QA** followed by a string of no more than twenty characters would display the string on the upper line, left aligned. A **Cr (0Dh)** character terminates the command. If the string is less than twenty characters in length, the rest of the display line is padded with blank. **Esc QB** does the same for the lower display line. The only other



11 LCD

commands active in this mode are **CLR** and **CAN**. **CLR** would clear the display and change the LCD into **overwrite mode**. **CAN** clears the last line that was changed and change the LCD into **overwrite mode**. The initialisation command, **Esc @**, has no effect in this mode.



## COMMAND SET DESCRIPTION

### LCD 12

- Esc Dc1** /Set overwrite mode/  
Dec. Format [027] [017]  
Hex. Format: [1Bh] [11h]  
Description: Set the display to overwrite mode. This is the default power on display mode.
- Esc Dc2** /Set vertical scroll mode/  
Dec. Format [027] [018]  
Hex. Format: [1Bh] [12h]  
Description: Set the display to vertical scroll mode.
- Esc Dc3** /Set horizontal scroll mode/  
Dec. Format [027] [019]  
Hex. Format: [1Bh] [13h]  
Description: Set the display to horizontal scroll mode.
- Esc QA d1d2d3 . . . dn Cr** /Set string display mode, write string to upper line/  
Dec.Format [027] [081] [065] d1d2d3 . . . dn [013]  
Hex. Format: [1Bh] [51h] [41h] d1d2d3 . . . dn [0Dh]  
{20h <= dn <= FFh} {1 <= n <=20}  
Description: Set string display mode, write to the upper line.  
The string display mode can be cancelled with CLR or CAN.
- Esc QB d1d2d3 . . . dn Cr** /Set string display mode, write string to lower line/  
Dec.Format [027] [081] [066] d1d2d3 . . . dn [013]  
Hex. Format: [1Bh] [51h] [42h] d1d2d3 . . . dn [0Dh]  
{20h <= dn <= FFh} {1 <= n <=20}  
Description: Set string display mode, write to the lower line.  
The string display mode can be cancelled with CLR or CAN.



**Esc [ A** /Move cursor up/  
**Dec. Format:** [027] [091] [065]  
**Hex. Format:** [1Bh] [5Bh] [41h]  
**Description:** Move the cursor up one line.  
When the cursor is at the upper line, this command operates differently depending on the display mode:  
1. Overwrite mode:  
The cursor is moved to the same column on the lower line.  
2. Vertical scroll mode:  
The characters displayed on the upper line are scrolled to the lower line, and the upper line is cleared. The cursor remains at the same position.  
3. Horizontal scroll mode:  
The cursor is not moved.

**Esc [ B** /Move cursor down/  
**Lf**  
**Dec. Format:** [027] [091] [066]  
[010]  
**Hex. Format:** [1Bh] [5Bh] [42h]  
[0Ah]  
**Description:** Move the cursor down one line.  
When the cursor is at the lower line, this command operates differently depending on the display mode:  
1. Overwrite mode:  
The cursor is moved to the same column on the upper line.  
2. Vertical scroll mode:  
The characters displayed on the lower line are scrolled to the upper line, and the lower line is cleared. The cursor remains at the same position.  
3. Horizontal scroll mode:  
The cursor is not moved.



LCD 14

Esc [ C /Move cursor right/

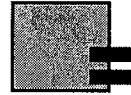
Hr

Dec. Format: [027] [091] [067]  
[009]

Hex. Format: [1Bh] [5Bh] [43h]  
[09h]

Description: Move the cursor one position to the right.  
When the cursor is at the right end, this command operates differently depending on the display mode:

1. Overwrite mode:  
The cursor moves to the left end of the other line.
2. Vertical scroll mode:  
When the cursor is at the upper right end, it is moved to the lower left end.  
When the cursor is at the lower right end, the lower line message is moved to the upper line. The lower line is cleared, and the cursor moves to the lower left end.
3. Horizontal scroll mode:  
All characters on the current line are scrolled one to the left in the window. The cursor is not moved but the character area at the right end of the window is cleared.



**Esc [ D** /Move cursor left/  
**Bs**

Dec. Format: [027] [091] [068]  
[008]

Hex. Format: [1Bh] [5Bh] [44h]  
[08h]

Description: Move the cursor one position to the left.  
When the cursor is at the left end, this command operates differently depending on the display mode:

1. Overwrite mode:  
The cursor moves to the right end of the other line.
2. Vertical scroll mode:  
When the cursor is at the lower left end, it is moved to the upper right end.  
When the cursor is at the upper left end, the upper line message is moved to the lower line. The upper line is cleared, and the cursor moves to the upper right end.
3. Horizontal scroll mode:  
All characters on the current line are scrolled one to the right in the window. The cursor is not moved but the character area at the left end of the window is cleared.

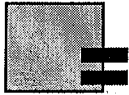
**Esc [ H** /Move cursor to home position/  
**Hom**

Dec. Format: [027] [091] [072]  
[011]

Hex. Format: [1Bh] [5Bh] [48h]  
[0Bh]

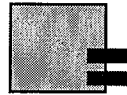
Description: Move the cursor to the left-most position on the upper line.





LCD 16

<b>Esc [ L</b> <b>CR</b>	<b>/Move cursor to left-most position/</b>
Dec. Format:	[027] [091] [076] [013]
Hex. Format:	[1Bh] [5Bh] [4Ch] [0Dh]
Description:	Move the cursor to the left-most position on the current line.
<b>Esc [ R</b>	<b>/Move cursor to the right-most position/</b>
Dec. Format:	[027] [091] [082]
Hex. Format:	[1Bh] [5Bh] [52h]
Description:	Move the cursor to the right-most position on the current line.
<b>Esc [ K</b>	<b>/Move cursor to the bottom position/</b>
Dec. Format:	[027] [091] [075]
Hex. Format:	[1Bh] [5Bh] [4Bh]
Description:	Move the cursor to the right-most position on the lower line.
<b>Esc I x y</b>	<b>/Move cursor to the specified position/</b>
Dec. Format:	[027] [108] x y      {1 <= x <= 20, 1 <= y <= 2}
Hex. Format:	[1Bh] [6Ch] x y
Description:	Move the cursor to the x-th column on the y-th line.
<b>Esc @</b>	<b>/Initialise display/</b>
Dec. Format:	[027] [064]
Hex. Format:	[1Bh] [40h]
Description:	Clear the data in the input buffer and reset settings to power on defaults.

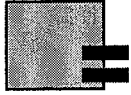


**CLR** /Clear display screen, and clear string mode/  
Dec. Format: [012]  
Hex. Format: [0Ch]  
Description: Clear all the characters displayed, clear string mode.

**CAN** /Clear cursor line, and clear string mode/  
Dec. Format: [024]  
Hex. Format: [18h]  
Description: Clear the line where the cursor is at, clear string mode.

**Esc \_ *n*** /Set cursor ON or OFF /  
Dec. Format: [027] [095] *n* {0 <= *n* <= 1}  
Hex. Format: [1Bh] [5Fh] *n*  
Description: Set cursor ON or OFF.  
When *n* = 0, cursor is set to OFF  
When *n* = 1, cursor is set to ON

**Esc W *s* *x1* *x2* *y*** /Set or cancel the window range at horizontal scroll mode/  
Dec. Format: [027] [087] [000]  
[027] [087] [001] *x1* *x2* *y* {1 <= *x* <= 20, 1 <= *y* <= 2}  
Hex. Format: [1Bh] [57h] [00h]  
[1Bh] [57h] [01h] *x1* *x2* *y*  
Description: Set or cancel the window on the display screen.  
When *s* = 0, window is cancelled.  
When *s* = 1, window is set, where *x1* and *x2* set the position of the left-most and the right-most columns of the window.  
*y* sets the upper or lower line.  
The window is effective in the horizontal scroll mode.



LCD 18

**Esc C n d0..d7** /Create character pattern /

Dec. Format: [027] [067] n d0d1d2 ... d7 {0 <= n <= 7}

Hex. Format: [1Bh] [43h] n d0d1d2 ... d7

Description: Create custom character patterns.

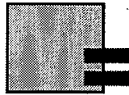
n specifies which custom character to be generated.

d0..d7 specify the bit pattern for the character to be generated.

There are eight customer definable characters. They are numbered from 0 to 7, corresponding to character codes 00h to 07h, and are duplicated at character codes 08h to 0Fh.

The relation between n and the character code is as follow:

n	char code	n	char code
0	00h	0	08h
1	01h	1	09h
2	02h	2	0Ah
3	03h	3	0Bh
4	04h	4	0Ch
5	05h	5	0Dh
6	06h	6	0Eh
7	07h	7	0Fh



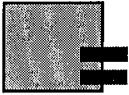
Below is an example for generating **R** as a custom character:

Data	Bit Pattern								DataValue in Hex
	7	6	5	4	3	2	1	0	
d0	*	*	*	1	1	1	1	0	1Eh
d1	*	*	*	1	0	0	0	1	11h
d2	*	*	*	1	0	0	0	1	11h
d3	*	*	*	1	1	1	1	0	1Eh
d4	*	*	*	1	0	1	0	0	14h
d5	*	*	*	1	0	0	1	0	12h
d6	*	*	*	1	0	0	0	1	11h
d7	*	*	*	0	0	0	0	0	00h

The asterisks (\*) in the bit pattern are unused bits.

To generate the above character as character 3. The following command would be sent to the display:

```
[1Bh][[5Bh][31h][03h][1Eh][11h][11h][1Eh][14h][12h][11h][00h]
```

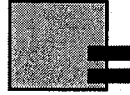


# CHARACTER FONT TABLE

LCD 20

Upper Lower 4bits 4bits	0000	0010	0011	0100	0101	0110	0111	1010	1011	1100	1101	1110	1111
xxxx0000	CGRAM (0)	0	1	P	`	P		-	夕	三	α	ρ	
xxxx0001	(1)	!	1	A	Q	a	q	。	ア	チ	△	ä	q
xxxx0010	(2)	"	2	B	R	b	r	Γ	イ	ツ	×	β	θ
xxxx0011	(3)	#	3	C	S	c	s	∟	ウ	テ	ε	ε	ω
xxxx0100	(4)	\$	4	D	T	d	t	、	エ	ト	ト	μ	Ω
xxxx0101	(5)	%	5	E	U	e	u	。	オ	ナ	1	ε	Ü
xxxx0110	(6)	&	6	F	V	f	v	ヲ	カ	ニ	ヨ	ρ	Σ
xxxx0111	(7)	'	7	G	W	g	w	ア	キ	ヌ	ラ	q	π
xxxx1000	(0)	(	8	H	X	h	x	イ	ク	ネ	リ	∫	Σ
xxxx1001	(1)	)	9	I	Y	i	y	ウ	ケ	ル	レ	∫	∫
xxxx1010	(2)	*	:	J	Z	j	z	エ	コ	ン	レ	i	∫
xxxx1011	(3)	+	;	K	L	k	l	オ	サ	ヒ	ロ	°	∫
xxxx1100	(4)	,	<	L	¥	l	l	ヤ	シ	フ	ワ	Φ	∫
xxxx1101	(5)	-	=	M	J	m	j	ユ	ス	ヘ	ン	も	÷
xxxx1110	(6)	.	>	N	^	n	^	ヨ	セ	ホ	°	ñ	
xxxx1111	(7)	/	?	O	_	o	_	ッ	ソ	マ	□	ö	■

## 12V MODEL WITH DB25F



21 LCD

### Interface Cable Pin Assignment

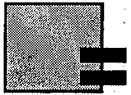
<u>To LCD (RJ45)</u>		<u>To Host (D25F)</u>
1 GND1	_____	7 GND
4 GND2	_____	
8 GND3	_____	
2 RxD	_____	2 TxD
3 TxD	_____	3 RxD
5 Vcc1	_____	9 +12V DC
	<input type="checkbox"/>	20 DTR
	<input type="checkbox"/>	6 DSR
	<input type="checkbox"/>	4 RTS
	<input type="checkbox"/>	5 CTS

### Installation

For interface between the host system and the LCD display, a cable is provided with an RJ45 plug at one end and a DB25F connector at the other. Please follow the steps below for installation:

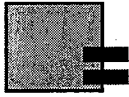
1. Take the cable with the RJ45 plug, thread it through the mounting fixtures and extension tubes.
2. Take LCD unit, locate the RJ45 receptacle through the neck opening, aim the RJ45 plug of the interface cable at the receptacle. Push the cable, assist with a finger if necessary, till the plug is in place with an affirmative click.
2. Secure the LCD unit onto the mounting fixture.
3. Connect the DB25F connector to the RS232C port of the system unit. Please consult the software instruction for the port number to use and make sure the RS232C port has +12V DC supply available at PIN 9.

Since there is a on-board switching voltage regulator, the supply does not have to be exactly +12V. A range from +9V to +24V would be tolerable.



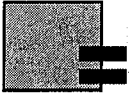
LCD 22

[The main body of the page contains extremely faint, illegible text, likely bleed-through from the reverse side of the document. The text is arranged in several paragraphs and is mostly obscured by noise and low contrast.]



23 LCD





LCD 24

