

**LCD  
CUSTOMER DISPLAY**

**USER'S MANUAL**

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## 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

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### Display Specifications

Display Type	Liquid Crystal Display (LCD)
Back Light	Cold Cathode Fluorescent Luminance (CCFL)
Display Format	40 Characters (20 columns x 2 lines)
Character Type	192 predefined characters in ROM 8 user down-loadable characters in RAM
Character Font	5 x 7 dot matrix + cursor row
Character Size	6.0 mm x 14 mm
Character Pitch	7.2 mm

### Power Supply Specifications

Supply Voltage	5.0 Volts DC +/-5%
Power Consumption	3 Watts max.

MTFB 20000 hours

### Physical Specifications

Height adjustment Two removable tubes

#### Dimensions

Total Height	208mm to 508mm
Panel	228mm (W) x 94mm (H) x 47.7mm (D)
Neck Height	54mm
Tube Height	150mm x 2
Base Section	228mm (W) x 60mm (H) x 114mm (D)

Weight	1.2kg.
Tilt Angle	0 - 30 in 3 steps
Swivel Angle	270°

LCD 4

**RS-232C Interface**

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

**Interface Cable Pin Assignment**

To LCD (RJ45)

1 GND1      \_\_\_\_\_  
4 GND2      \_\_\_\_\_  
2 RxD        \_\_\_\_\_  
3 TxD        \_\_\_\_\_  
5 Vcc1        \_\_\_\_\_



To Host (D9F)

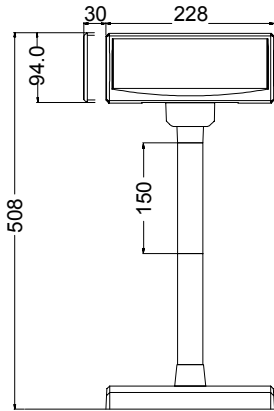
5 GND  
3 TxD  
2 RxD  
9 +5V DC  
4 DTR  
6 DSR  
7 RTS  
8 CTS

To Host (RCA-M)

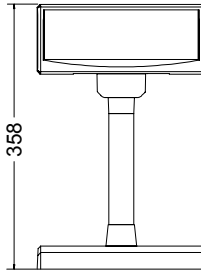
6 Vcc2      \_\_\_\_\_  
8 GND3      \_\_\_\_\_

Center +5V DC  
Outer GND

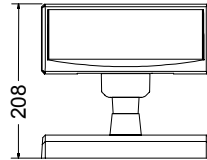
### Physical Appearance



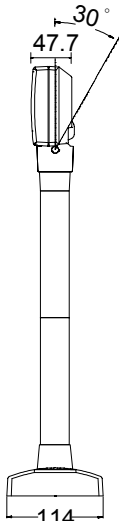
Front View - Full Height



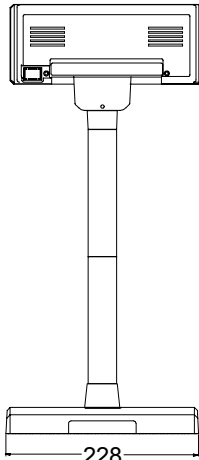
Front View - Mid Height



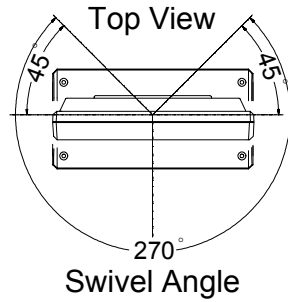
Front View - Min Height



Side View



Rear View



Swivel Angle

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## INSTALLATION

### LCD 6

For interface between the host system and the customer 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) 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 the head 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 head 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 head 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.

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## USAGE NOTES

### **Power Supply and Pin 9**

Pin 9 of DB9, originally designated as RI (ring indicator) input to host, is used as the power supply pin. Many POS systems has provision for supplying a +5V source on this pin to peripheral devices. **Precaution is necessary not to connect any device with the RI line active, such as a modem, to the Customer Display, failure to observe may lead to permanent damage.** To find out if it is safe to connect a device, use a voltmeter to measure the RI pin of the device while it is powered on. If the reading is within +/- 3V, it is likely to be safe.

### **Power Bracket Kit**

This kit is supplied in the typical configuration for Customer Display with 2.5mm DC jack. Using this feature eliminates the need for a AC adapter when power cannot be obtained from pin9 of RS-232 as described in previous note. A bracket with an RCA jack is included that fits the rear standard PC expansion slot location, with a connector to source +5V from system's peripheral power connector. A cable with a RCA plug on one end and a DC plug on the other end routes power to the Customer Display.



## COMMAND SET TABLE

LCD 8

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

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## DISPLAY MODES DESCRIPTION

LCD 10

There are basically four display modes for the Customer Display. 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.

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

## COMMAND SET DESCRIPTION

LCD 12

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

<b>Esc [ A</b>	/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.
<b>Esc [ B</b>	/Move cursor down/
<b>LF</b>	
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.

**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/

**B s**

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.



<b>Esc [ L</b>	/Move cursor to left-most position/
<b>CR</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>	/Move cursor to the right-most position/
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>	/Move cursor to the bottom position/
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>	/Move cursor to the specified position/
Dec. Format:	[027] [108] <i>x y</i> {1 <= <i>x</i> <= 20, 1 <= <i>y</i> <= 2}
Hex. Format:	[1Bh] [6Ch] <i>x y</i>
Description:	Move the cursor to the <i>x</i> -th column on the <i>y</i> -th line.
<b>Esc @</b>	/Initialise display/
Dec. Format:	[027] [064]
Hex. Format:	[1Bh] [40h]
Description:	Clear the data in the input buffer and reset settings to power on defaults.

<b>CLR</b>	/Clear display screen, and clear string mode/
Dec. Format:	[012]
Hex. Format:	[0Ch]
Description:	Clear all the characters displayed, clear string mode.
<b>CAN</b>	/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.
<b>ESC _ <i>n</i></b>	/Set cursor ON or OFF /
Dec. Format:	[027] [095] <i>n</i> {0 <= <i>n</i> <= 1}
Hex. Format:	[1Bh] [5Fh] <i>n</i>
Description:	Set cursor ON or OFF. When <i>n</i> = 0, cursor is set to OFF When <i>n</i> = 1, cursor is set to ON
<b>ESC W <i>s</i> <i>x1</i> <i>x2</i> <i>y</i></b>	/Set or cancel the window range at horizontal scroll mode/
Dec. Format:	[027] [087] [000] [027] [087] [001] <i>x1</i> <i>x2</i> <i>y</i> {1 <= <i>x</i> <= 20, 1 <= <i>y</i> <= 2}
Hex. Format:	[1Bh] [57h] [00h] [1Bh] [57h] [01h] <i>x1</i> <i>x2</i> <i>y</i>
Description:	Set or cancel the window on the display screen. When <i>s</i> = 0, window is cancelled. When <i>s</i> = 1, window is set, where <i>x1</i> and <i>x2</i> set the position of the left-most and the right-most columns of the window. <i>y</i> sets the upper or lower line. The window is effective in the horizontal scroll mode.

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

Data	Bit Pattern								Data Value 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

To generate the above character as character code 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

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	User 1			0	o	P	`	P				一	夕	三	o	P
1	User 2		!	1	A	Q	a	q			。	ア	チ	△	△	Q
2	User 3		"	2	B	R	b	r			「	イ	ツ	×	⊖	⊖
3	User 4		#	3	C	S	c	s			」	ウ	テ	⊖	⊖	⊖
4	User 5		\$	4	D	T	d	t			、	エ	ト	ヤ	μ	Ω
5	User 6		%	5	E	U	e	u			。	オ	ナ	1	⊖	⊖
6	User 7		&	6	F	V	f	v			ヲ	カ	ニ	ヨ	ρ	Σ
7	User 8		'	7	G	W	g	w			ア	キ	ヌ	ラ	Q	π
8	User 1		(	8	H	X	h	x			イ	ク	ネ	リ	ル	×
9	User 2		)	9	I	Y	i	y			ウ	ケ	ル	ル	ル	γ
A	User 3		*	:	J	Z	j	z			エ	コ	ソ	レ	i	キ
B	User 4		+	:	K	Γ	k	Γ			オ	サ	ヒ	ロ	°	ア
C	User 5		,	<	L	≠	l	l			ヤ	シ	フ	ワ	⊕	ア
D	User 6		-	=	M	l	m	l			ユ	ズ	ハ	ソ	ト	÷
E	User 7		.	>	N	^	n	→			ヨ	セ	ホ	°	ア	
F	User 8		/	?	O	_	o	+			ッ	ソ	マ	°	o	■

Font Table - Japanese Character Set

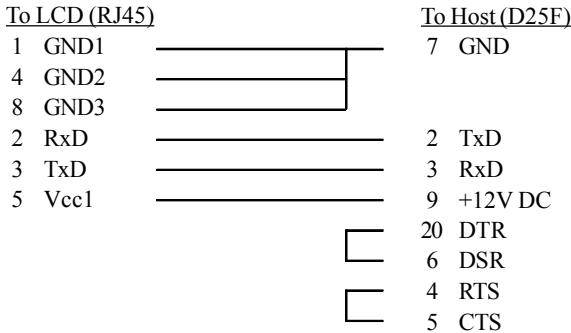
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	User 1			0	0P	'	P	S	E	á	'	r	M	B	τ	
1	User 2		!	1	A	Q	a	9	ú	æ	í	"	J	t	y	U
2	User 3		"	2	B	R	b	r	é	E	é	°	°	é	é	γ
3	User 4		#	3	C	S	c	s	á	á	ú	'	P	M	e	ψ
4	User 5		\$	4	D	T	d	t	á	á	¢	'	¢	Γ	Z	ω
5	User 6		%	5	E	U	e	u	á	á	£	°	†	Δ	n	¶
6	User 7		&	6	F	V	f	v	á	á	¥	°	↓	Θ	Θ	¶
7	User 8		'	7	G	W	w	w	°	°	R	×	÷	Δ	L	¶
8	User 1		(	8	H	X	h	x	é	é	f	÷	÷	ε	k	¶
9	User 2		)	9	I	Y	i	y	è	è	i	∠	Γ	Π	λ	¶
A	User 3		*	:	J	Z	j	z	è	è	á	∑	Γ	Σ	μ	F
B	User 4		+	;	K	L	k	l	í	í	R	á	°	L	†	¶
C	User 5		,	<	L	\	l	l	í	í	R	°	°	J	φ	ε
D	User 6		-	=	M	I	m	)	í	í	á	°	°	ψ	π	=
E	User 7		.	>	N	^	n	˘	á	á	ø	†	ø	Ω	ρ	ε
F	User 8		/	?	O	_	o	Δ	á	á	¢	°	°	α	σ	ε

Font Table - European character set



# 12V MODEL WITH DB25F

## Interface Cable Pin Assignment



## Installation

For interface between the host system and the customer 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 head 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 head 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 24