

**VFD CUSTOMER
DISPLAY**

USER'S MANUAL

CONTENTS

1 VFD

Contents	1
Features	2
Specifications - 9mm	3
Block Diagram	6
Interface Connections	7
Usage Notes	9
Switch Settings	11
Firich Command Set Table	12
Firich Display Modes Description	14
Firich Command Set Description	16
Aedex Command Set Table	27
DSP800 Command Set Table	28
Epson Command Set Table	29
Font Tables	32

FEATURES

VFD 2

- High brightness vacuum fluorescent display for excellent visibility over a wide viewing angle.
 - Available in 9.0mm or high characters.
 - 40 characters in 20 columns by 2 lines format.
 - Thirteen sets of international characters, plus one set of user defined characters allows total flexibility in display fonts.
 - Standard RS-232C serial interface for data communication, with 9600 and 19200 baud rate selection.
 - A pass-through output is provided for cascading display or printer without additional serial port.
 - Easy programming using Escape sequence commands.
 - Emulation of Aedex, Epson and DSP800 command sets.
 - Display can swivel and tilt to a wide range of angles.
 - Adjustable display height.
 - Uses 9-24V DC unregulated supply.
 - Power may be sourced from system, with the bracket and cable kit supplied in typical configuration.
 - Optional AC adaptors in various configurations for all AC voltages.
-

SPECIFICATIONS - 9MM

3 VFD

Display Specifications

Display Type	Vacuum Fluorescent Display (VFD).
Display Color	Green.
Display Format	40 Characters (20 columns x 2 lines).
Character Type	13 sets of international characters 1 set of user definable characters.
Character Font	5 x 7 dot matrix.
Character Size	9.03mm(H) x 5.25mm(W).
Character Pitch	8.0mm.
MTBF	25000 hours
Operating Temperature:	5~45°C
Operating Humidity:	30%~85%
Storage Temperature:	-10~55°C
Storage Humidity:	10%~85%

RS-232C Interface Specifications

Data Transmission	Serial, asynchronous
Baud Rate	9600 or 19200
Data Bits	8 bits
Parity	None
Stop Bits	1

Power Supply Specifications

Supply Voltage	9-24 Volts DC
Consumption	6.0 Watts max.
Power Connector	A. 2.5mm concentric power jack B. 3pin interlocking Epson-style, with caseading.
Supply Kit	Bracket and cable for sourcing +12V from system.
Supply Options	12V 1A unregulated AC adaptor, 2.5mm connector 24V 1.8A switching AC adaptor, Epson-style connector. 24V 3.0A switching AC adaptor, Epson-style connector.

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

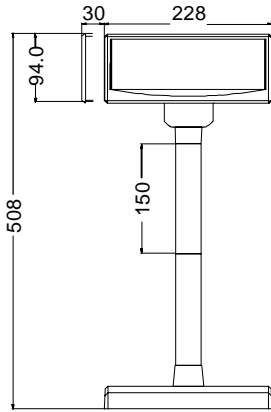
Base Section 228mm (W) x 60mm (H) x 114mm (D)

Weight 1.2kg.

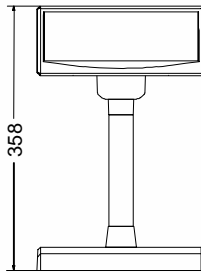
Tilt Angle 0 - 30 in 3 steps

Swivel Angle 270°

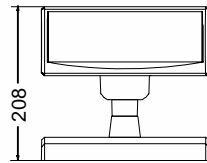
Physical Appearance



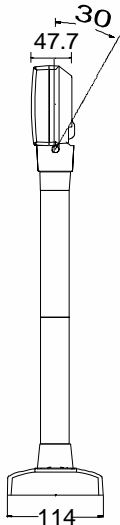
Front View - Full Height



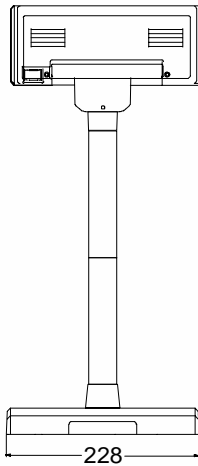
Front View - Mid Height



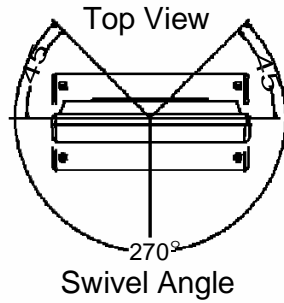
Front View - Min Height



Side View



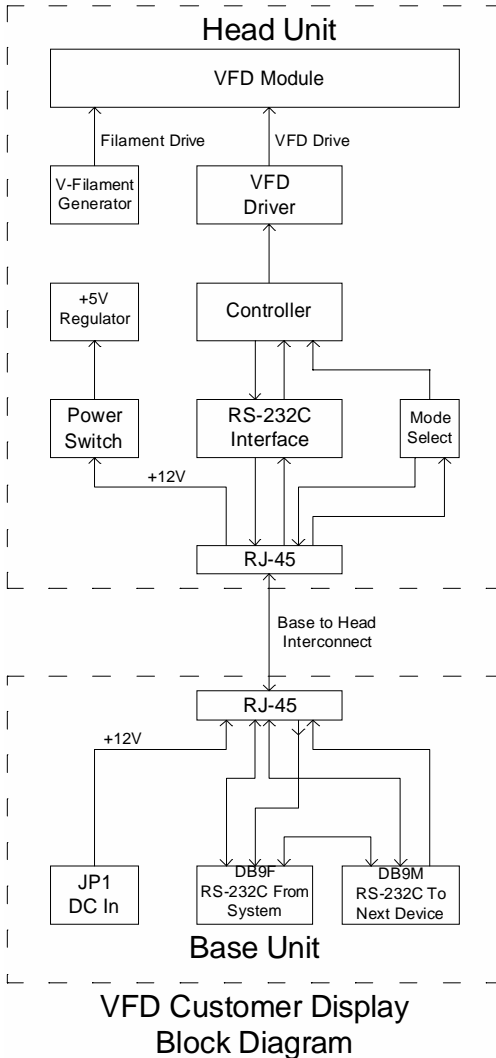
Rear View



Swivel Angle

BLOCK DIAGRAM

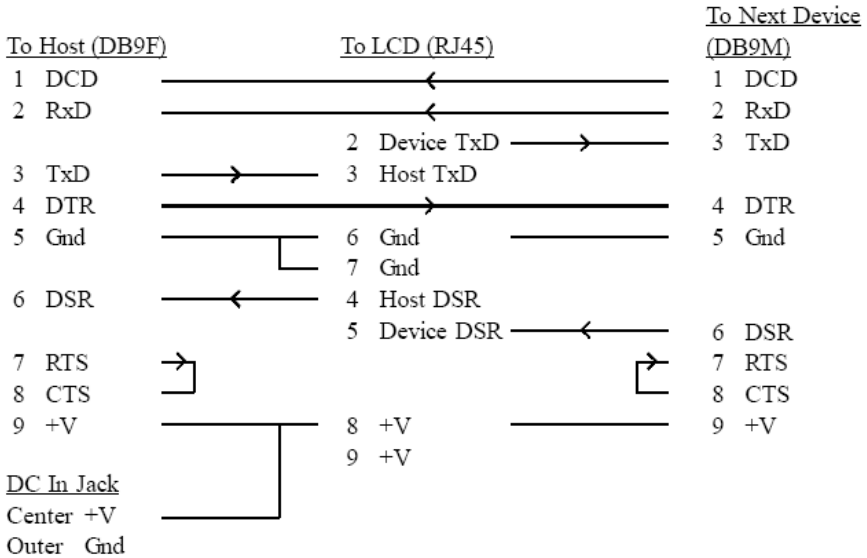
VFD 6



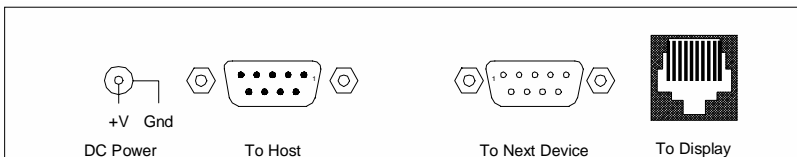
INTERFACE CONNECTIONS

7 VFD

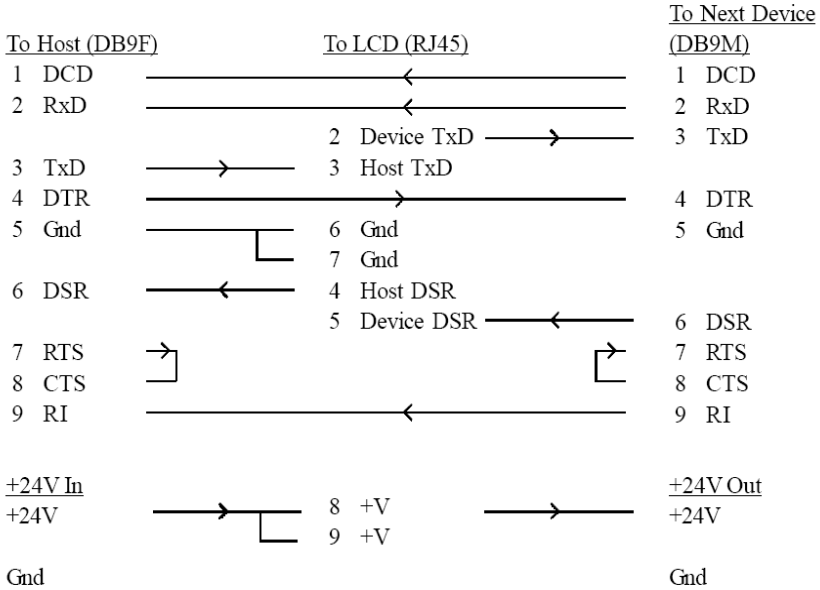
Interface Pin Assignment - 2.5mm DC Jack



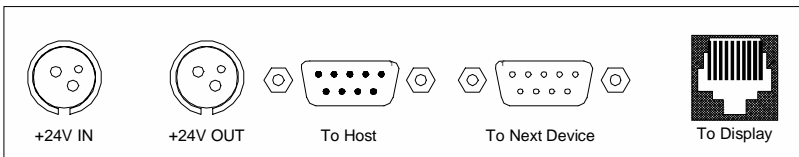
Base Interface Plate - 2.5mm DC Jack



Interface Pin Assignment - Epson Style Power



Base Interface Plate - Epson Style Powered (+24V)



USAGE NOTES

9 VFD

Signal Naming

Please note that the signal naming of the pin assignment for the DB9 RS-232 connectors on the Customer Display follows the convention for DCE. The host is viewed as DTE. Thus, TxD would be an output for the host, the same name applies to an input of the DCE, such as the Customer Display, which would be wired to the host pin by the same name.

Handshaking and Pass-through

The handshake signals are another source of confusion. There are essentially two sets of control lines, DTR/DSR and RTS/CTS. Disregarding the original designation for teletype purpose, they serve essentially identical function. DTR and RTS are from host to device, logical high on both signals the host is ready, either one low indicates a not-ready status. DSR and CTS are from device to host, logical high on both signals the device is ready. Printer some times use DCD as the ready signal to the host.

The Customer Display uses only TxD for receiving data from host, and DTR/DSR for handshaking. All the other signals are routed to the following device in such a way as to ensure proper pass-through function. The use of a printer with Customer Display should always have the printer connected to the next device connector of the Customer Display and the Customer Display connected to the host. Paralleling the signal lines, as some times done to connect multiple devices to a RS-232 port, may lead to improper operation.

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 systems has provision for supplying a +12V source on this pin to peripheral devices. The supply is then routed to the same pin on connector to the next device, a second Customer Display, for example. Printers usually has a separate power source, leaving pin 9 open. **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.

Epson-Style Version

This version is functionally identical to the standard version, except for power connectors which are compatible with Epson POS printers. Two power jacks are provided for cascading a single power source for use by both the Customer Display and printer. Two adaptors are available, 1.8A and 3.0A at 24V, the choice would depend on the combined consumption of the printer plus the Customer Display.

Power-on Moving Message

At Firich Command Set mode, upon power-on a moving message is displayed after self-check. This message is stored in EEPROM and may be changed by following the steps below.

1. Send **0Ch** to Customer Display to clear display.
2. Send desired message to Customer Display.
3. Send **1Bh 53h 31h** to store the message in EEPROM.

SWITCH SETTINGS

11 VFD

ISP Function Select

Sw1	ISP Select
On	ISP Off
Off	ISP On

Command Set Select

SW2	SW3	Mode	Command Set
On	On	A	Firich/CD5220
Off	On	B	Epson
On	Off	C	Aedex
Off	Off	D	DSP800

Character Set Select

Switch Settings				Character Set Selection	
SW4	SW5	SW6	SW7	Character Set (20h - 7Fh)	Code Table (80h - FFh)
On	On	On	On	U.S.A.	PC-437
On	On	On	Off	France	PC-858
On	On	Off	On	Germany	PC-858
On	On	Off	Off	U.K.	PC-858
On	Off	On	On	Denmark I	PC-858
On	Off	On	Off	Sweden	PC-858
On	Off	Off	On	Italy	PC-858
On	Off	Off	Off	Spain	PC-858
Off	On	On	On	Japan	Katakana
Off	On	On	Off	Norway	PC-858
Off	On	Off	On	Denmark II	PC-858
Off	On	Off	Off	U.S.A.	Slavonic
Off	Off	On	On	U.S.A.	Russia
Off	Off	On	Off	U.S.A.	PC-860
Off	Off	Off	On	U.K.	User Defined
Off	Off	Off	Off	User Defined	

Baud Rate Select

Sw8	Baud Rate
On	9600
Off	19200

Firich COMMAND SET TABLE

VFD 12

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<=n<=20	set string display mode, write string to upper line
Esc QB $d1...dn$ Cr	1B 51 42 $d1...dn$ 0D 1<=n<=20	set string display mode, write string to lower line
Esc QD $d1...dn$ Cr	1B 51 44 $d1...dn$ 0D 1<=n<=20	set string display mode, write string to upper line and scroll the message continuously
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 $x y$ 01h<=x<=14h y=01h, 02h	move cursor to specified position
Esc @	1B 40	initialize display

Command	Hex Code	Description
CLR	0C	clear display, clear string mode
CAN	18	clear cursor line, clear string mode
ESC _ n	1B 5F <i>n</i> <i>n</i> =00h, 01h	set cursor on/off
ESC W s x1 x2 y	1B 57 <i>s</i> <i>x1</i> <i>x2</i> <i>y</i> <i>s</i> =00h, 01h 01h<= <i>x1</i> <= <i>x2</i> <=14h <i>y</i> =01h, 02h	set/cancel the window range in horizontal scroll mode
ESC f n	1B 66 <i>n</i>	select international font set. Codes 00h-7Fh
ESC c n	1B 63 <i>n</i>	select code table. Codes 80h-FFh
ESC & s n m [<i>a</i> (<i>p1...pa</i>)] <i>x</i> (<i>m-n+1</i>)	1B 26 01 <i>n</i> <i>m</i> 20h<= <i>n</i> <= <i>m</i> <=FFh 00h<= <i>a</i> <=05h 00h<= <i>p</i> <i>n</i> <=FFh	define user defined characters
ESC ?	1B 3F	delete user defined characters
ESC %	1B 25	select/cancel download character set
ESC s 1	1B 73 01	store user defined character in EEPROM
ESC d 1	1B 64 01	restore user defined character from EEPROM
ESC S n	1B 53 <i>n</i> 31h<= <i>n</i> <=35h	save current display data as <i>n</i> 'th layer in EEPROM
ESC D n m	1B 44 <i>n</i> <i>m</i> 01h<= <i>n</i> <=1Fh 31h<= <i>m</i> <=33h	display saved data from EEPROM as animated message. Bit position in <i>n</i> selects the layer to be displayed.
ESC * n	1B 2A <i>n</i> 01h<= <i>n</i> <=04h	brightness adjustment
ESC = n	1B 3D <i>n</i>	select peripheral device <i>n</i> =01h : select nest device. <i>n</i> =02h : select display <i>n</i> =03h : select display and next device
US T h m	1F 54 h m	Display time : 0 ≤ <i>h</i> ≤ 23 ; 0 ≤ <i>m</i> ≤ 59
US U	1F 55	Display of time counter

Firich DISPLAY MODES DESCRIPTION

VFD 14

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.

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.

Firich COMMAND SET DESCRIPTION

VFD 16

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 <i>d1d2d3</i> . . . <i>dn</i> Cr	/Set string display mode, write string to upper line/
Dec.Format	[027] [081] [065] <i>d1d2d3</i> . . . <i>dn</i> [013]
Hex. Format:	[1Bh] [51h] [41h] <i>d1d2d3</i> . . . <i>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.
Esc QB <i>d1d2d3</i> . . . <i>dn</i> Cr	/Set string display mode, write string to lower line/
Dec.Format	[027] [081] [066] <i>d1d2d3</i> . . . <i>dn</i> [013]
Hex. Format:	[1Bh] [51h] [42h] <i>d1d2d3</i> . . . <i>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.

Esc QD *d1d2d3 . . . dn* **CR**

/Write string to the upper line and scroll the message continuously/

Dec.Format [027] [081] [068] *d1d2d3 . . . dn* [013]

Hex. Format: [1Bh] [51h] [44h] *d1d2d3 . . . dn* [0Dh]
{ 20h <= *dn* <= FFh, 1 <= *n* <= 20 }

Description: Scroll message continuously on the upper line. Upon receiving a new command, the upper line is cleared and the cursor is moved to the upper left end.

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:

he 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.

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.

Esc [L	<i>/Move cursor to left-most position/</i>
Cr	
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.
Esc [R	<i>/Move cursor to the right-most position/</i>
Dec. Format:	[027] [091] [082]
Hex. Format:	[1Bh] [5Bh] [52h]
Description:	Move the cursor to the right-most position on the current line.
Esc [K	<i>/Move cursor to the bottom position/</i>
Dec. Format:	[027] [091] [075]
Hex. Format:	[1Bh] [5Bh] [4Bh]
Description:	Move the cursor to the right-most position on the lower line.
Esc I x y	<i>/Move cursor to the specified position/</i>
Dec. Format:	[027] [108] <i>x y</i> {01h <= <i>x</i> <= 14h, 01h <= <i>y</i> <= 02h}
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.
Esc @	<i>/Initialise display/</i>
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] <i>n</i> {00h <= <i>n</i> <= 01h}
Hex. Format:	[1Bh] [5Fh] <i>n</i>
Description:	Set cursor ON or OFF. When <i>n</i> = 00h, cursor is set to OFF When <i>n</i> = 01h, 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] <i>x1 x2 y</i>
Hex. Format:	[1Bh] [57h] [00h] [1Bh] [57h] [01h] <i>x1 x2 y</i> {01h <= <i>x1</i> <= <i>x2</i> <= 14h, 01h <= <i>y</i> <= 02h}
Description:	Set or cancel the window on the display screen. When <i>s</i> = 00h, window is cancelled. When <i>s</i> = 01h, 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 f n /Select International font set/

Dec. Format: [027] [102] *n*

Hex. Format: [1Bh] [66h] *n*

Description: Select international font. Character codes 00h - 7Fh.

n	International Font Set	n	International Font Set
A	U.S.A.	L	Slavonic
D	Denmark I	N	Norway
E	Denmark II	R	Russia
F	France	S	Spain
G	Germany	U	U.K.
I	Italy	W	Sweden
J	Japan		

Esc c n /Select code set /

Dec. Format: [027] [099] *n* Hex.

Format: [1Bh] [63h] *n*

Description: Select international code set. Character codes 80h - FFh

n	International Code Set
A	Comply with ASCII code: PC437
J	Comply with JIS code: Katkana
L	Comply with Slavonic code
R	Comply with Russia code

Esc & s n m a(p1..pa)x(m-n+1) /Define user-defined characters /

Dec. Format: [027] [038] *n m [a(p1..pa)x(m-n+1)]*

Hex. Format: [1Bh] [26h] *n m [a(p1..pa)x(m-n+1)]*
 {20h <= *n* <= *m* <= FFh}
 {00h <= *a* <= 05h}
 {00h <= *p* <= FFh} Description:

Define user-defined characters.

n: Starting character code to be defined

m: Final character code to be defined

a: Numbers of columns in a character font, if *a* < 05h then the undefined columns at right side are filled with off.

p: Pattern data. Each byte represents the font pattern of one column.

Esc ? n /Undefine user-defined character /

Dec. Format: [027] [063] *n* {20h<=*n*<=FFh}

Hex. Format: [1Bh] [3Fh] *n*

Description: Undefine character code *n* previously defined by user. Built-in font is used subsequently.

Esc % n /Select/cancel user-defined character set/

Dec. Format: [027] [037] *n*

Hex. Format: [1Bh] [25h] *n*

Description: Set cursor ON or OFF.

n = 00h: Cancel user-defined character set. Built-in character set is used.

n = 01h: Enable user-defined character set.

Esc s 1 /Store user-defined character in EEPROM/
Dec. Format: [027] [115] [001]
Hex. Format: [1Bh] [7Fh] [01h]
Description: This command is valid only if the display is in enable mode, as set by Esc = command.

Esc d 1 /Restore user-defined character from EEPROM/
Dec. Format: [027] [100] [001]
Hex. Format: [1Bh] [64h] [01h]
Description: Restore user-defined character pattern that was previously stored by **Esc s 1** command.

Esc S n /Save current display data in EEPROM/
Dec. Format: [027] [083] *n* {31h<=*n*<=35h}
Hex. Format: [1Bh] [53h] *n*
Description: Store the current display image for future demo display.
n=31h: save image in layer 1.
n=32h: save image in layer 2.
...
n=35h: save image in layer 5.

Esc D <i>n m</i>	/Display saved data from EEPROM/
Dec. Format:	[027] [068] <i>n m</i> {01h <= <i>n</i> <= 1Fh}
Hex. Format:	[1Bh] [44h] <i>n m</i> {31h <= <i>m</i> <= 33h}
Description:	The data saved by Esc S <i>n</i> can be displayed by this command. The layer to be displayed is selected by the bit position within the byte of <i>n</i> . For example, <i>n</i> =01h selects layer 1, <i>n</i> =02h selects layer 2, <i>n</i> =10h selects layer 5. More than one layer can be selected by specifying more than one bit to one in <i>n</i> , ie. <i>n</i> =05h selects layers one and three. When more than one layer is selected, they will be displayed in sequence. The parameter, <i>m</i> , sets the message animation method. There are two types, <i>m</i> =31h and <i>m</i> =32h. If <i>m</i> =33h, the two methods will be applied alternately.
Esc * <i>n</i>	/Adjust brightness/
Dec. Format:	[027] [042] <i>n</i> {01h <= <i>n</i> <= 04h}
Hex. Format:	[1Bh] [2Ah] <i>n</i>
Description:	Adjust display brightness
Esc = <i>n</i>	/Set output device mode/
Dec. Format:	[027] [061] <i>n</i> {01h <= <i>n</i> <= 03h}
Hex. Format:	[1Bh] [3Dh] <i>n</i>
Description:	Set output device mode <i>n</i> = 01h, display disable, next device enable <i>n</i> = 02h, display enable, next device disable <i>n</i> = 03h, display enable, next device enable

AEDEX COMMAND SET TABLE

Command	Hex Code	Description
! # 1 <i>d1...d40</i> CR	21 23 31 <i>d1..d40</i> 0D	display string on upper line
! # 2 <i>d1...d40</i> CR	21 23 32 <i>d1..d40</i> 0D	display string on lower line
! # 4 <i>d1...d40</i> CR	21 23 34 <i>d1..d40</i> 0D	display string on upper line and scroll continuously
! # 5 <i>hh:mm</i> CR	21 23 35 <i>hh : mm</i> 0D h,m= '0'..'9'	display time
! # 6 <i>d1...d40</i> CR	21 23 36 <i>d1..d40</i> 0D	display string on upper line and scroll once
! # 8 <i>n m</i> CR	21 23 38 <i>n m</i> 0D 20h<= <i>n,m</i>	change attention code
! # 9 <i>d1...d40</i> CR	21 23 39 <i>d1..d40</i> 0D	display string on two lines

DSP800 COMMAND SET TABLE

VFD 28

Command	Hex Code	Description
EOT SOH P <i>n</i> ETB	04 01 50 <i>n</i> 17 31h<= <i>n</i> <=58h	move cursor to specified position
EOT SOH C <i>n m</i> ETB	04 01 43 <i>n m</i> 17 31h<= <i>n</i> <= <i>m</i> <=58h	clear display range from position <i>n</i> to position <i>m</i> and move cursor to position <i>n</i>
EOT SOH S <i>n</i> ETB	04 01 53 <i>n</i> 17 31h<= <i>n</i> <=35h	save current display data to <i>n</i> 'th layer in EEPROM
EOT SOH D <i>n m</i> ETB	04 01 44 <i>n m</i> 17 01h<= <i>n</i> <=1Fh 31h<= <i>m</i> <=33h	display data saved in EEPROM. Bit position in <i>n</i> selects the layers to be displayed. Please see note below.
EOT SOH A <i>n</i> ETB	04 01 41 <i>n</i> 17 31h<= <i>n</i> <=34h	adjust brightness
EOT SOH F <i>n</i> ETB	04 01 46 <i>n</i> 17 00h<= <i>n</i> <=FFh	blink display
EOT SOH I <i>n</i> ETB	04 01 49 <i>n</i> 17	select international character set
EOT SOH & <i>n p1...p5</i> ETB	04 01 26 <i>n p1..p5</i> 17 20h<= <i>n</i>	define user-defined character
EOT SOH ? <i>n</i> ETB	04 01 3F <i>n</i> 17 20h<= <i>n</i>	delete user-defined character
EOT SOH = <i>n</i> ETB	04 01 3D <i>n</i> 17 <i>n</i> =1,2	select peripheral device. <i>n</i> =1: next device <i>n</i> =2: display
EOT SOH % ETB	04 01 25 17	initialize display
EOT SOH @ ETB	04 01 40 17	self test

- * When using **display data saved in EEPROM** command (EOT SOH D), the data layer is selected by the bit position within a byte in *n*. For example *n*=01h selects layer one, *n*=04h selects layer three, whereas *n*=05h selects bothe layer one and three. When more than one layer is selected, they will be displayed in sequence.

EPSON COMMAND SET TABLE

Command	Hex Code	Description
Hr	09	move cursor right
Bs	08	move cursor left
Us LF	1F 0A	move cursor up
LF	0A	move cursor down
Us CR	1F 0D	move cursor to right-end
CR	0D	move cursor to left-end
HoM	0B	move cursor to home position
Us B	1F 42	move cursor to bottom position
Us \$ x y	1F 24 x y 01h<=x<=14h hy=01h, 02h	move cursor to position specified
CLR	0C	clear display
CAN	18	clear cursor line
Us C n	1F 43 n n=00h, 01h	set/cancel cursor display. n=0 hides cursor, n=1 displays cursor.
Esc t n	1B 74 n 01h<=n<=07h	select code table for character range 80h-FFh
Esc R n	1B 52 n 01h<=n<=0Fh	select international character set for character range 20h-7Fh
Us r n	1F 72 n n=00h, 01h	set/cancel reverse character
Us Mb1	1F 01	set overwrite mode
Us Mb2	1F 02	set vertical scroll mode
Us Mb3	1F 03	set horizontal scroll mode
Esc W n s x1 y1 x2 y2	1B 57 n s x1 y1 x2 y2 01h<=n<=04h s=00h, 01h 01h<=x1<=x2<=14h 01h<=y1<=y2<=14h	set/cancel window range

Command	Hex Code	Description
Esc % <i>n</i>	1B 25 <i>n</i> <i>n</i> =00h, 01h	select/cancel user-defined character set
Esc & <i>s n m</i> [<i>a</i> (<i>p</i> 1.. <i>pa</i>)] <i>x</i> (<i>m-n+1</i>)	1B 26 01 <i>n m ...</i> [<i>a</i> (<i>p</i> 1.. <i>p</i> 5)] [<i>m-n+1</i>]	define user-defined character. $21\text{h} \leq n \leq m \leq \text{FFh}$; <i>a</i> =5(<i>p</i> 1.. <i>p</i> 5=pattern1..pattern5) ; $00\text{h} \leq p \leq \text{FFh}$
Esc ?	1B 3F	delete user-defined character
Esc s 1	1B 73 01	store user-defined characters in EEPROM
Esc d 1	1B 64 01	load user-defined characters from EEPROM
Us :	1F 3A	set start/ending position of macro definition
Us ^ <i>n m</i>	1F 5E <i>n m</i> $00\text{h} \leq n \leq \text{FFh}$ $00\text{h} \leq m \leq \text{FFh}$	execute then quit macro
Us T <i>h m</i>	1F 54 <i>h m</i> $00\text{h} \leq h \leq 23\text{h}$ $00\text{h} \leq m \leq 59\text{h}$	set and display time counter. The time is in <i>hh:mm:ss</i> format, displayed on the bottom right corner. Any command moving the cursor to the bottom line would disable the time display,
Us U	1F 55	display the time counter at the bottom right corner. If the counter was not set previously with Us T command, its content starts from the last time the display was initialized.
Us E <i>n</i>	1F 45 <i>n</i> $01\text{h} \leq n \leq \text{FFh}$	blink display in <i>n</i> x 50mS interval.
Us X <i>n</i>	1F 58 <i>n</i> $01\text{h} \leq n \leq 04\text{h}$	adjust brightness
Esc @	1B 40	initialize display
Us @	1F 40	self test
Esc = <i>n</i>	1B 3D <i>n</i> <i>n</i> =01h, 02h, 03h	select peripheral device <i>n</i> =01h: select next device <i>n</i> =02h: select display <i>n</i> =03h: select display and next device

International Font Set for Epson (20h-7Fh)

n	International Font Set	n	International Font Set
0	U.S.A.	8	Japan
1	France	9	Norway
2	Germany	A	Denmark II
3	U.K.	B	Slavonic
4	Denmark I	C	Russia
5	Sweden	D	reserved
6	Italy	E	reserved
7	Spain	F	reserved

Code Table for Epson

n	International Font Set (80h - FFh)
0	Page 0: PC437: U.S.A., standard Europe
1	Page 1: Katakana for Japan
2	Page 2: PC858: multilingual
3	Page 3: PC860: Portuguese
4	Page 4: PC863: Canadian-French
5	Page 5: PC865: Nordic
6	Page 6: Russia
7	Page 7: Slavonic
8	Page 8: PC866

FONT TABLES

VFD 32

	0	1	2	3	4	5	6	7
0				0	1	P	'	P
1			!	1	A	Q	a	q
2			"	2	B	R	b	r
3			#	3	C	S	c	s
4			\$	4	D	T	d	t
5			%	5	E	U	e	u
6			&	6	F	V	f	v
7			'	7	G	W	g	w
8			(	8	H	X	h	x
9			)	9	I	Y	i	y
A			*	:	J	Z	j	z
B			+	;	K	[	k	[
C			,	<	L	\	l	l
D			-	=	M	]	m]
E			.	>	N	^	n	^
F			/	?	O	_	o	_

USA Font Set (00h - 7Fh)

n	Country	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
0	USA	#	\$	@	[	\	\]	^	'	(	|	)	~
1	France	#	\$	€	°	©	§	^	'	®	¢	®	¨
2	Germany	#	\$	€	€	Ö	Ü	^	'	®	®	®	®
3	U.K.	#	\$	@	[	\	\]	^	'	(	|	)	~
4	Denmark I	#	\$	@	£	Ø	Å	^	'	®	®	®	~
5	Sweden	#	Å	£	Å	Ö	Ä	Ü	®	®	®	®	®
6	Italy	#	\$	@	°	\	®	^	'	®	®	®	~
7	Spain	#	\$	@	|	®	^	'	'	®	~	~	~
8	Japan	#	\$	@	[	¥	]	^	'	(	|	)	~
9	Norway	#	Å	£	£	Ø	Ä	Ü	®	®	®	®	®
10	Denmark II	#	\$	£	£	®	Ä	Ü	®	®	®	®	®
11	Slavonic	#	\$	@	[	\	\]	^	'	(	|	)	~
12	Russia	#	\$	@	[	\	\]	^	'	(	|	)	~

Font Variations (00h - 7Fh)

	8	9	A	B	C	D	E	F
0	Ɔ	Ǝ	ǎ	⊗	⊥	⊚	⊘	≡
1	Ā	Ǽ	ǐ	⊗	⊥	⊚	⊘	±
2	ǂ	Ǝ	ǎ	■	⊥	⊚	⊘	≡
3	ǂ	ǎ	Ā	|	⊥	⊚	⊘	≡
4	ǂ	ǎ	ǐ	⊥	⊥	⊚	⊘	≡
5	ǂ	ǎ	ǐ	⊥	⊥	⊚	⊘	≡
6	ǂ	Ā	ǎ	⊥	⊥	⊚	⊘	≡
7	Ɔ	Ā	ǎ	⊥	⊥	⊚	⊘	≡
8	ǂ	Ā	ǎ	⊥	⊥	⊚	⊘	≡
9	ǂ	ǎ	⊥	⊥	⊥	⊚	⊘	≡
A	ǂ	Ā	⊥	⊥	⊥	⊚	⊘	≡
B	ǐ	ǂ	⊥	⊥	⊥	⊚	⊘	≡
C	ǐ	ǂ	⊥	⊥	⊥	⊚	⊘	≡
D	ǐ	ǂ	ǐ	⊥	⊥	⊚	⊘	≡
E	ǂ	ǂ	⊥	⊥	⊥	⊚	⊘	≡
F	ǂ	ǂ	⊥	⊥	⊥	⊚	⊘	≡

PC-437 Font Set

	8	9	A	B	C	D	E	F
0	Ɔ	Ǝ	ǎ	⊗	⊥	⊚	⊘	≡
1	Ā	Ǽ	ǐ	⊗	⊥	⊚	⊘	±
2	ǂ	Ǝ	ǎ	⊗	⊥	⊚	⊘	±
3	ǂ	ǎ	Ā	|	⊥	⊚	⊘	±
4	ǂ	ǎ	ǐ	⊥	⊥	⊚	⊘	±
5	ǂ	ǎ	ǐ	⊥	⊥	⊚	⊘	±
6	ǂ	Ā	ǎ	⊥	⊥	⊚	⊘	±
7	Ɔ	Ā	ǎ	⊥	⊥	⊚	⊘	±
8	ǂ	Ā	ǎ	⊥	⊥	⊚	⊘	±
9	ǂ	ǎ	⊥	⊥	⊥	⊚	⊘	±
A	ǂ	Ā	⊥	⊥	⊥	⊚	⊘	±
B	ǐ	ǂ	⊥	⊥	⊥	⊚	⊘	±
C	ǐ	ǂ	⊥	⊥	⊥	⊚	⊘	±
D	ǐ	ǂ	ǐ	⊥	⊥	⊚	⊘	±
E	ǂ	ǂ	⊥	⊥	⊥	⊚	⊘	±
F	ǂ	ǂ	⊥	⊥	⊥	⊚	⊘	±

PC-858 Font Set

	8	9	A	B	C	D	E	F
0	☐	☐	☐	☐	☐	☐	☐	☐
1	☐	☐	☐	☐	☐	☐	☐	☐
2	☐	☐	☐	☐	☐	☐	☐	☐
3	☐	☐	☐	☐	☐	☐	☐	☐
4	☐	☐	☐	☐	☐	☐	☐	☐
5	☐	☐	☐	☐	☐	☐	☐	☐
6	☐	☐	☐	☐	☐	☐	☐	☐
7	☐	☐	☐	☐	☐	☐	☐	☐
8	☐	☐	☐	☐	☐	☐	☐	☐
9	☐	☐	☐	☐	☐	☐	☐	☐
A	☐	☐	☐	☐	☐	☐	☐	☐
B	☐	☐	☐	☐	☐	☐	☐	☐
C	☐	☐	☐	☐	☐	☐	☐	☐
D	☐	☐	☐	☐	☐	☐	☐	☐
E	☐	☐	☐	☐	☐	☐	☐	☐
F	☐	☐	☐	☐	☐	☐	☐	☐

PC-860 Font Set

	8	9	A	B	C	D	E	F
0	☐	☐	☐	☐	☐	☐	☐	☐
1	☐	☐	☐	☐	☐	☐	☐	☐
2	☐	☐	☐	☐	☐	☐	☐	☐
3	☐	☐	☐	☐	☐	☐	☐	☐
4	☐	☐	☐	☐	☐	☐	☐	☐
5	☐	☐	☐	☐	☐	☐	☐	☐
6	☐	☐	☐	☐	☐	☐	☐	☐
7	☐	☐	☐	☐	☐	☐	☐	☐
8	☐	☐	☐	☐	☐	☐	☐	☐
9	☐	☐	☐	☐	☐	☐	☐	☐
A	☐	☐	☐	☐	☐	☐	☐	☐
B	☐	☐	☐	☐	☐	☐	☐	☐
C	☐	☐	☐	☐	☐	☐	☐	☐
D	☐	☐	☐	☐	☐	☐	☐	☐
E	☐	☐	☐	☐	☐	☐	☐	☐
F	☐	☐	☐	☐	☐	☐	☐	☐

PC-863 Font Set

	8	9	A	B	C	D	E	F
0	☪	☽	☾	☿	♁	♂	♃	♄
1	☽	☾	☿	☺	♁	♂	♃	♄
2	☽	☾	☿	☺	♁	♂	♃	♄
3	☽	☾	☿	☺	♁	♂	♃	♄
4	☽	☾	☿	☺	♁	♂	♃	♄
5	☽	☾	☿	☺	♁	♂	♃	♄
6	☽	☾	☿	☺	♁	♂	♃	♄
7	☽	☾	☿	☺	♁	♂	♃	♄
8	☽	☾	☿	☺	♁	♂	♃	♄
9	☽	☾	☿	☺	♁	♂	♃	♄
A	☽	☾	☿	☺	♁	♂	♃	♄
B	☽	☾	☿	☺	♁	♂	♃	♄
C	☽	☾	☿	☺	♁	♂	♃	♄
D	☽	☾	☿	☺	♁	♂	♃	♄
E	☽	☾	☿	☺	♁	♂	♃	♄
F	☽	☾	☿	☺	♁	♂	♃	♄

PC-865 Font Set

	8	9	A	B	C	D	E	F
0	☪	☽	☾	☿	♁	♂	♃	♄
1	☽	☾	☿	☺	♁	♂	♃	♄
2	☽	☾	☿	☺	♁	♂	♃	♄
3	☽	☾	☿	☺	♁	♂	♃	♄
4	☽	☾	☿	☺	♁	♂	♃	♄
5	☽	☾	☿	☺	♁	♂	♃	♄
6	☽	☾	☿	☺	♁	♂	♃	♄
7	☽	☾	☿	☺	♁	♂	♃	♄
8	☽	☾	☿	☺	♁	♂	♃	♄
9	☽	☾	☿	☺	♁	♂	♃	♄
A	☽	☾	☿	☺	♁	♂	♃	♄
B	☽	☾	☿	☺	♁	♂	♃	♄
C	☽	☾	☿	☺	♁	♂	♃	♄
D	☽	☾	☿	☺	♁	♂	♃	♄
E	☽	☾	☿	☺	♁	♂	♃	♄
F	☽	☾	☿	☺	♁	♂	♃	♄

Slavonic Font Set

	8	9	A	B	C	D	E	F
0	А	Р	а				Р	а
1	Б	С	В				С	В
2	В	Т	В				Т	К
3	Г	У	Г				У	К
4	Q	Ф	Q				Ф	Q
5	Е	Х	е				Х	У
6	Ж	Ц	ж				Ц	У
7	З	Ч	з				Ч	К
8	И	Ш	И				Ш	а
9	Й	Щ	Й				Щ	Г
A	К	Ь	к				Ь	К
B	Л	Ы	Л				Ы	К
C	М	Ъ	м				Ъ	Q
D	Н	Э	Н				Э	У
E	О	Ю	о				Ю	У
F	П	Я	п				Я	

Russia Font Set

	8	9	A	B	C	D	E	F
0	㊦	㊧		一	夕	ミ	↑	≦
1	β	Ξ	。	ア	チ	△	↓	≧
2	Γ	E	「	イ	ツ	×	←	キ
3	△	R	」	ウ	テ	モ	→	ニ
4	E	ノ	、	エ	ト	ホ	⇄	||
5	η	又	-	オ	ナ	ユ	↳	┆
6	θ	前	ヲ	カ	ニ	ヨ	ヲ	┆
7	λ	一	ア	キ	ヌ	ラ	㊦	⊗
8	ρ	2	イ	ク	ネ	リ	ト	⊗
9	π	3	ウ	ケ	ル	ル	㊦	㊦
A	ρ	×	エ	コ	シ	レ	㊦	㊦
B	δ	㊦	オ	サ	ヒ	ロ	㊦	≡
C	τ	ノ	ホ	シ	フ	フ	⊗	↑
D	φ	Γ	ユ	ヌ	ハ	フ	㊦	㊦
E	Ω	±	ヨ	セ	ホ	㊦	∴	⊗
F	Σ	■	ツ	ツ	マ	㊦	∴	⊗

Katakana Font Set

	80	90	A0	B0	C0	D0	E0	F0
0	А 128	Р 144	а 160		Л 192	ll 208	р 224	Ё 240
1	Б 129	С 145	б 161		l 193	т 209	с 225	ё 241
2	В 130	Т 146	в 162		т 194	π 210	т 226	Є 242
3	Г 131	У 147	г 163	| 179	† 195	ll 211	у 227	є 243
4	Д 132	Ф 148	д 164	† 180	- 196	l 212	Ф 228	Ї 244
5	Е 133	Х 149	е 165	† 181	† 197	Г 213	х 229	ï 245
6	Ж 134	Ц 150	ж 166	|| 182	† 198	π 214	ц 230	Ў 246
7	З 135	Ч 151	з 167	π 183	|| 199	π 215	ч 231	ў 247
8	И 136	Ш 152	и 168	† 184	ll 200	† 216	ш 232	° 248
9	Й 137	Щ 153	й 169	|| 185	Г 201	∟ 217	щ 233	• 249
A	К 138	Ъ 154	к 170	|| 186	ll 202	Г 218	ъ 234	• 250
B	Л 139	Ы 155	л 171	† 187	т 203	 219	ы 235	√ 251
C	М 140	Ь 156	м 172	ll 188	|| 204	 220	ь 236	N ^o 252
D	Н 141	Э 157	н 173	ll 189	= 205	 221	э 237	¤ 253
E	О 142	Ю 158	о 174	∟ 190	† 206	 222	ю 238	■ 254
F	П 143	Я 159	п 175	† 191	l 207	 223	я 239	NBSP 255

PC-866 Font Set