

HP ap5000 Vacuum Fluorescent Display (VFD)

Programming Guide



© Copyright 2007-2010 Hewlett-Packard Development Company, L.P.

The information contained herein is subject to change without notice. The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

HP Point of Sale (POS) ap5000 Vacuum Fluorescent Display (VFD) Programming Guide

Document Version B

September 2010

Table of Content

1	General Description	5
1.1	<i>Features</i>	5
1.2	<i>Configuration.....</i>	5
1.3	<i>Built-in Fonts</i>	5
2	Electrical Specifications.....	5
2.1	<i>Absolute Maximum Ratings</i>	5
2.2	<i>Electrical Characteristics.....</i>	6
3	Optical Specifications.....	6
4	Environmental Specifications.....	6
5	Physical Specifications	6
6	Applicable Specifications.....	7
7	Interface	7
7.1	<i>Interface Specification.....</i>	7
7.2	<i>Interface timing.....</i>	8
8	Operating mode.....	8
9	Function	9
9.1	<i>Command Configuration</i>	9
9.2	<i>Command List.....</i>	10
9.3	<i>Command Descriptions.....</i>	11
9.3.1	Character display	11
9.3.2	Back Space	13
9.3.3	Horizontal Tab	14
9.3.4	Line Feed	15
9.3.5	Home Position	15
9.3.6	Display Clear.....	15
9.3.7	Carriage Return	15
9.3.8	Line Clear.....	15
9.3.9	FROM User Font	16
9.3.10	Initialize display.....	16

Table of Content

9.3.11	International font set	16
9.3.12	Character table type	17
9.3.13	Over-write mode	17
9.3.14	Vertical scroll mode.....	17
9.3.15	Horizontal scroll mode	17
9.3.16	Upper line.....	18
9.3.17	Right end.....	18
9.3.18	Cursor set	18
9.3.19	End position	18
9.3.20	Cursor display	19
9.3.21	Blink screen	19
9.3.22	Brightness level setting.....	19
9.3.23	Reverse display	19
9.3.24	Display Power	20
9.3.25	User set up mode start	20
9.3.26	User set up mode end	20
9.3.27	FROM User Font control	21
9.3.28	FROM User Table control	22
9.3.29	Startup Message control	24
9.3.30	Read Status information	25
9.3.31	2-byte character	25
9.3.32	2-byte character type	25
9.3.33	Rewrite mode start.....	26
9.4	<i>Initial Settings</i>	26
9.5	<i>Startup Message</i>	26
9.6	<i>Font Register data format (15×16 dot)</i>	27
10	Connector details	27



1 General Description

This specification covers the operation and operating requirements of the Vacuum Fluorescent Display (VFD) module on the HP ap5000 Point of Sale system.

1.1 Features

- Power supply
 - DC 5V
- Interface
 - Serial Interface (RS-232-level, bi-directional, asynchronous)
- Functions
 - Character display
 - Control commands
 - FROM User Fonts, FROM User Table
 - International fonts

1.2 Configuration

This single-board display module consists of a 40-character (20 characters x 2 lines) VFD, refresh RAM, character generator, DC/DC converter, display controller and all necessary control logic. It is driven by a single 5V DC power supply.

1.3 Built-in Fonts

1-byte character:	International font	(Font spec. DS-1584-0002)
2-byte character:	Japanese	(Font spec. DS-1584-0003)
	Korean	(Font spec. DS-1584-0004)
	Simplified Chinese	(Font spec. DS-1584-0005)
	Traditional Chinese	(Font spec. DS-1584-0006)

2 Electrical Specifications

2.1 Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Power Supply Voltage	VCC	-0.3	-	6.0	VDC	-
Input Voltage RXD, DSR	VI1	-25	-	+25	VDC	-
Input Voltage TEST	VI2	-0.3	-	3.5	VDC	-



2.2 Electrical Characteristics

Measuring Conditions: Ambient temperature = 25 °C, $V_{CC} = 5.0 V_{DC}$

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Input voltage RXD,DSR	"H"	VIH1	3	-	15	VDC
	"L"	VIL1	-15	-	-3	VDC
Output voltage TXD,DTR	"H"	VOH1	5	-	-	VDC
	"L"	VOL1	-	-	-5	VDC
Signal input impedance RXD,DSR	RIN	3	-	7	KΩ	-
Input voltage TEST	"H"	VIH2	2.64	-	3.3	VDC
	"L"	VIL2	0	-	0.66	VDC
Power Supply Voltage	VCC	4.75	5.00	5.25	VDC	-
Power Supply Current	Icc1	-	625	800	mADC	All dots ON
	Icc2	-	510	660	mADC	All dots OFF
	Icc3	-	21	30	mADC	Disp. power off

Note:

Slow start power supply may cause erroneous operation. The rise time of supply voltage should not exceed 50 ms.

Inrush current at power-on may exceed twice normal current.

3 Optical Specifications

Luminance: Minimum 350 cd/m², typically 1000 cd/m²

Color of illumination: Green (Blue Green)

4 Environmental Specifications Operating temperature: -40 to +85 °C

Storage temperature: -40 to +85 °C

Operating humidity: 20 to 80 % R.H (non-condensing)

Storage humidity: 20 to 80 % R.H (non-condensing)

Vibration: 10-55-10Hz, all amplitude 1.0mm, 30 minutes, X-Y-Z (non-operating)

Shock: 392m/s² (40G) 9ms X-Y-Z, 3 times each direction (non-operating)

5 Physical Specifications

Number of characters: 40 (20 characters × 2 lines)

Character format: 15 × 16 dot matrix

Display area: 159.0 × 23.59 mm (X × Y)

Character size: 6.53 × 10.52 mm (X × Y)

Character pitch: 8.03 × 13.07 mm (X × Y)

Dot size: 0.30 × 0.52 mm (X × Y)

Dot pitch: 0.45 × 0.67 mm (X × Y)

Weight: Approximately 118g



6 Applicable Specifications

Applicable reliability spec: TT-99-3102
Applicable production spec: TT-98-3413

7 Interface

7.1 Interface Specification

Communication specification

Parameter	Details
Communication type	Asynchronous serial
Signal level	RS-232 standard
Port	COM2 (default) or COM1
Baud rate	38400
Data Bit	8
Parity	None
Bit format	Start(1) + Data(8bit) + Stop (1)
Flow Control	None
Handshaking	DTR, DSR

Buffer capacity

Receive buffer	128 bytes
Transmit buffer	64 bytes

DTR signal change timing

DTR change	1(READY)→0(BUSY)	0(BUSY)→1(READY)
Condition	Receive buffer remaining space is approximately 32 bytes or less	Receive buffer remaining space is approximately 64 bytes or more

Data receive

Received data is stored in the receive buffer and processed in order of receipt.

If data continues to be received when DTR is BUSY and there is no more remaining space in the receive buffer, received data is discarded.

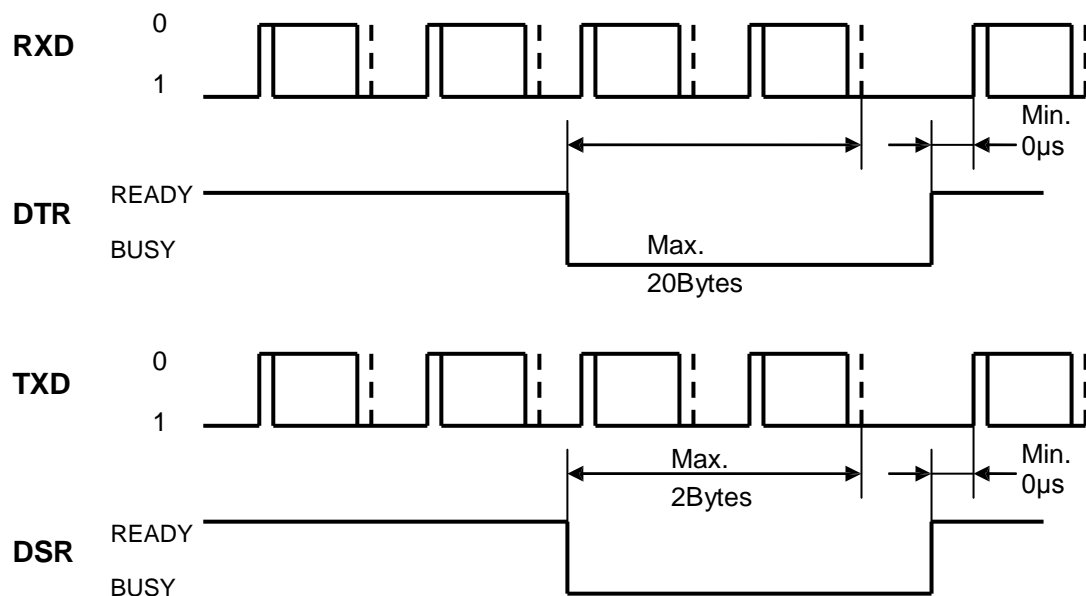
Data transmit

Transmit data is initially stored in the transmit buffer, and transmitted in order when DSR signal is READY.

If DSR remains BUSY and there is no more remaining space in the transmit buffer, command processing stops until space becomes available.

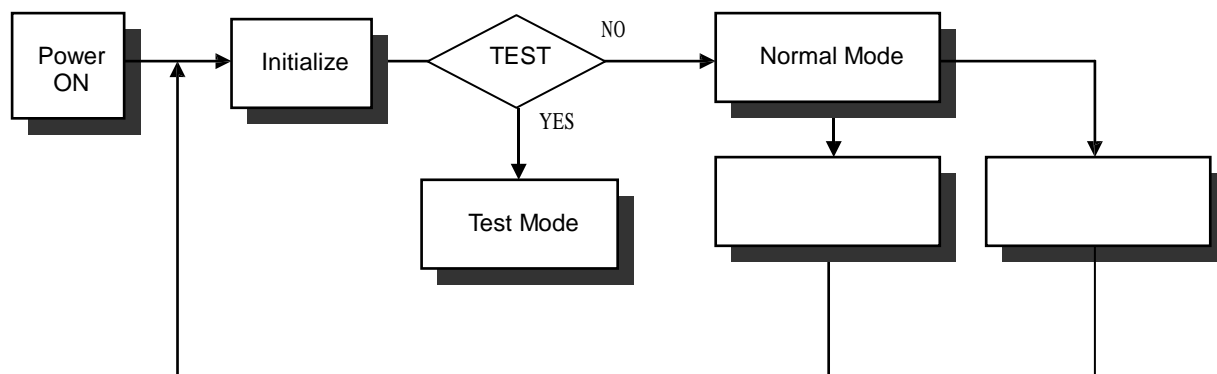


7.2 Interface timing



8 Operating mode

This display has the following operating modes.



Note: If User set up mode - related commands are executed in Normal Mode, display may flicker.



9 Function

Data received is stored in the receive buffer and processed in order of receipt.

9.1 Command Configuration

The display module's commands are configured as follows.

08h-18h	Control command
1Bh ...	ESC command
1Ch ...	Rewrite mode command
1Fh ...	User Setup command
- 1Fh 28h 61h ...	- Display Power control command
- 1Fh 28h 65h ...	- User set up mode commands
- 1Fh 28h 67h ...	- Character setting command
20h-FFh	Character display



9.2 Command List

Command Name	Hex Code				
	BYTE1	BYTE2	BYTE3	BYTE4	Parameter
Back Space	08h	-	-	-	-
Horizontal Tab	09h	-	-	-	-
Line Feed	0Ah	-	-	-	-
Home Position	0Bh	-	-	-	-
Display Clear	0Ch	-	-	-	-
Carriage Return	0Dh	-	-	-	-
Line Clear	18h	-	-	-	-
FROM User Font	1Bh	25h	-	-	N
Initialize display		40h	-	-	-
International font set (character codes: 23h, 24h, 40h, 5Bh-5Eh, 60h, 7Bh-7Eh)		52h	-	-	N
Character table type (Character codes: 80h-FFh)		74h	-	-	N
Over-write mode	1Fh	01h	-	-	-
Vertical scroll mode		02h	-	-	-
Horizontal scroll mode		03h	-	-	-
Upper line		0Ah	-	-	-
Right end		0Dh	-	-	-
Cursor set		24h	-	-	x y
End position		42h	-	-	-
Cursor display		43h	-	-	N
Blink screen		45h	-	-	N
Brightness level setting		58h	-	-	N
Reverse display		72h	-	-	N
Display Power		28h	61h	40h	P
User set up mode start			65h	01h	d1 d2
User set up mode end				02h	d1 d2 d3
FROM User Font control Delete all characters / Register / Read 1 character (Character code: 20h-FFh)			65h	30h	n m a ---
FROM User Table control Delete / Register / Read all characters (Character code: 80h-FFh)				31h	n m ---
Startup Message control				32h	MSG(0) --- MSG(63)
Read Status information				40h	a [b c]
2-byte character			67h	02h	N
2-byte character type				03h or 0Fh	N
Character display (1-byte character)	20-FFh	-	-	-	-
Character display (2-byte character)	c1	c2	-	-	-
Rewrite mode start	1Ch	7Ch	4Dh	D0h	d1 --- d6

Caution: FROM re-writing is limited (approximately 10,000 cycles).
Do not turn power off during FROM writing or deleting.



9.3 Command Descriptions

9.3.1 Character display

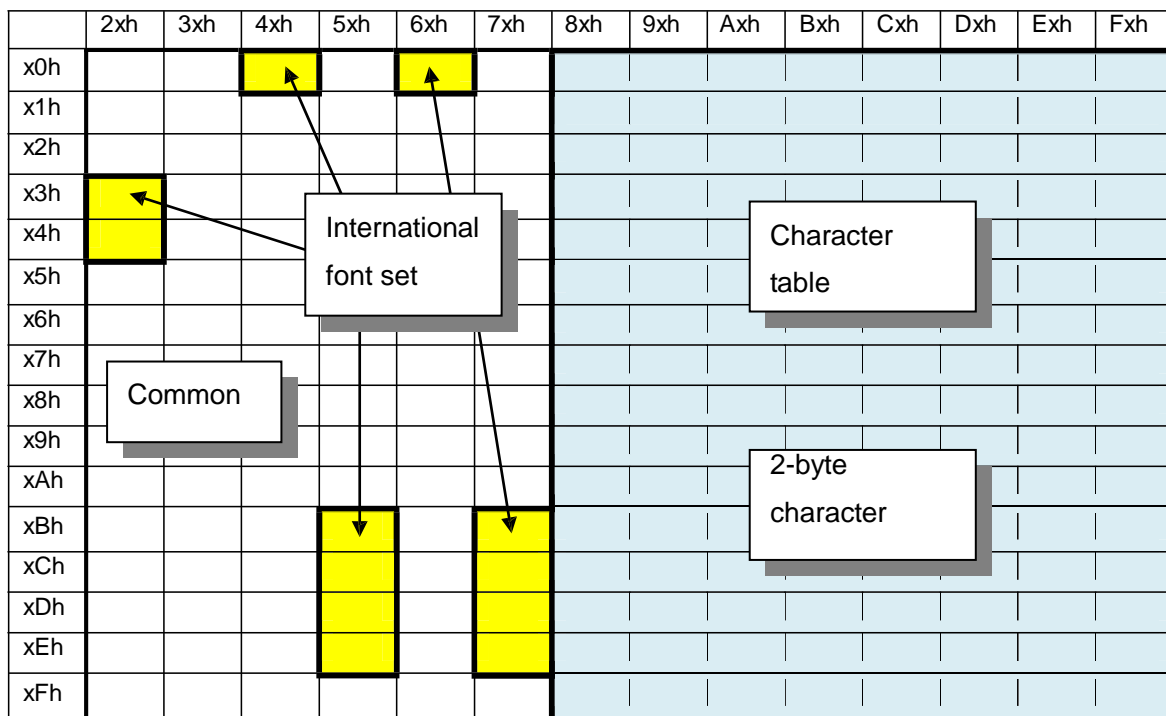
Code: 20h – FFh, or 2-byte character code c1 c2

Function: Displays a character at the current cursor position, and moves the cursor position one character to the right.

Characters are displayed as follows.

	Character	Code	Setting
1-byte character	Common (ASCII etc)	20h-7Fh (except International font set codes)	- - -
	International font set	23h,24h, 40h,5Bh-5Eh 60h,7Bh-7Eh	International font set n: 00h-0Dh
	Character table type	80h-FFh	Character table type n: 00h-05h,10h-13h
	FROM User Font	20h-FFh, applicable code	FROM User Font n: 01h
	FROM User Table	80h-FFh	FROM User Font Register Character table type n: FFh
2-byte character (See note)	Japanese JIS X0208(SHIFT-JIS)	c1: 81h-9Fh, E0h-EFh c2: 40h-7Eh, 80h-FCh	2-byte character n: 01h 2-byte character type n: 00h
	Korean KSC5601-87	c1: A1h-FEh c2: A1h-FEh	2-byte character n: 01h 2-byte character type n: 01h
	Simplified Chinese GB2312-80	c1: A1h-FEh c2: A1h-FEh	2-byte character n: 01h 2-byte character type n: 02h
	Traditional Chinese Big-5	c1: A1h-FEh c2: 40H-7EH, A1H-FEH	2-byte character n: 01h 2-byte character type n: 03h

Note: When 2-byte character is enabled, if c1 is outside the valid range, it is processed as a 1-byte character. If c1 is within the valid range, but c2 is outside the valid range, the 2-byte sequence is ignored, and nothing is displayed.



Cursor movement is as follows:

Overwrite mode

Cursor position		Operation
X(column)	Y(row)	
Not right end	-	Display character at cursor position. Cursor moves to the right by one character.
Right end	1 st line	Display character at cursor position. Cursor moves to left end of 2 nd line.
	2 nd line	Display character at cursor position. Cursor moves to left end of 1 st line.

Vertical scroll mode

Cursor position		Operation
X(column)	Y(row)	
Not right end	-	Display character at cursor position. Cursor moves to the right by one character.
Right end	1 st line	Display character at cursor position. Cursor moves to left end of 2 nd line.
	2 nd line	Display character at cursor position. Display contents shift up by one line, 2 nd line is cleared. Cursor moves to left end of 2 nd line.

**Horizontal scroll mode**

Cursor position		Operation
X(column)	Y(row)	
Not right end	-	Display character at cursor position. Cursor moves to the right by one character.
Right end	-	Display character at cursor position. Transition to Scroll ON mode.
Scroll ON mode		Current line display contents shift left by one column. Display character at cursor position.

Scroll ON mode is cancelled by the commands Back Space, Line Feed, Upper Line, Home, End Position, Display Clear, Carriage Return, Right End, Line Clear, Cursor Set, Overwrite mode, Vertical scroll mode, Horizontal scroll mode, and Initialize.

9.3.2 Back Space**Code: 08h**

Function: The cursor moves to the left by one character. The details of operation are as follows:

Overwrite mode

Cursor position		Operation
X(column)	Y(row)	
Not left end	-	Cursor moves to the left by one character.
Left end	1 st line	Cursor moves to right end of 2 nd line.
	2 nd line	Cursor moves to right end of 1 st line.

Vertical scroll mode

Cursor position		Operation
X(column)	Y(row)	
Not left end	-	Cursor moves to the left by one character.
Left end	1 st line	Display contents shift down by one line and 1 st line is cleared. Cursor moves to right end of 1 st line.
	2 nd line	Cursor moves to right end of 1 st line.

Horizontal scroll mode

Cursor position		Operation
X(column)	Y(row)	
Not left end	-	Cursor moves to the left by one character.
Left end	-	Current line display contents shift right by one character and display is cleared at cursor position.



9.3.3 Horizontal Tab

Code: 09h

Function: The cursor moves to the right by one character. The details of operation are as follows:

Overwrite mode

Cursor position		Operation
X(column)	Y(row)	
Not right end	—	Cursor moves to the right by one character.
Right end	1 st line	Cursor moves to left end of 2 nd line.
	2 nd line	Cursor moves to left end of 1 st line

Vertical scroll mode

Cursor position		Operation
X(column)	Y(row)	
Not right end	—	Cursor moves to the right by one character.
Right end	1 st line	Cursor moves to left end of 2 nd line.
	2 nd line	Display contents shift up by one line, 2 nd line is cleared. Cursor moves to left end of 2 nd line.

Horizontal scroll mode

Cursor position		Operation
X(column)	Y(row)	
Not right end	—	Cursor moves to the right by one character.
Right end	—	Current line display contents shift left by one character and display is cleared at cursor position. Transition to Scroll ON mode.
Scroll ON mode		Current line display contents shift left by one character and display is cleared at cursor position.

Scroll ON mode is cancelled by the commands Back Space, Line Feed, Upper Line, Home, End Position, Display Clear, Carriage Return, Right End, Line Clear, Cursor Set, Overwrite mode, Vertical scroll mode, Horizontal scroll mode, and Initialize, etc.



9.3.4 Line Feed

Code: 0Ah

Function: The cursor moves to next lower line. The details of operation are as follows:

Overwrite mode

Cursor position		Operation
X(column)	Y(row)	
-	1 st line	Cursor moves to 2 nd line.
	2 nd line	Cursor moves to 1 st line

Vertical scroll mode

Cursor position		Operation
X(column)	Y(row)	
-	1 st line	Cursor moves to 2 nd line.
	2 nd line	Display contents shift up by one line, 2 nd line is cleared. Cursor does not move.

Horizontal scroll mode

Cursor position		Operation
X(column)	Y(row)	
-	1 st line	Cursor moves to 2 nd line.
	2 nd line	No operation

9.3.5 Home Position

Code: 0Bh

Function: Cursor moves to the home position (left end of 1st line).

9.3.6 Display Clear

Code: 0Ch

Function: Display is cleared and cursor moves to home position (left end of 1st line).

9.3.7 Carriage Return

Code: 0Dh

Function: Cursor moves to left end of current line.

9.3.8 Line Clear

Code: 18h

Function: Current line is cleared and cursor moves to left end of current line.



9.3.9 FROM User Font

Code: 1Bh 25h n

Function: FROM User Font enable/disable.

n = 00h: Disable

n = 01h: Enable

Initial value: n = 00h

Characters already displayed are not affected.

9.3.10 Initialize display

Code: 1Bh 40h

Function: Clear display and return settings to initial state.

9.3.11 International font set

Code: 1Bh 52h n

Function: Select international font set

Valid range: n: 0 (00h) – 13 (0Dh)

Default: n = 0 (00h)

Characters already displayed are not affected.

International font set

n	Font set
0(00h)	America
1(01h)	France
2(02h)	Germany
3(03h)	England
4(04h)	Denmark 1
5(05h)	Sweden
6(06h)	Italy
7(07h)	Spain 1
8(08h)	Japan
9(09h)	Norway
10(0Ah)	Denmark 2
11(0Bh)	Spain 2
12(0Ch)	Latin America
13(0Dh)	Korea



9.3.12 Character table type

Code: 1Bh 74h n

Function: Select Character table type

Valid range: n = 0(00h), 1(01h), 2(02h), 3(03h), 4(04h), 5(05h),
16(10h), 17(11h), 18(12h), 19(13h), 255(FFh)

Default: n = 0 (00h)

Characters already displayed are not affected

Character table type

n	Character table type
0	PC437 (USA: Standard Europe)
1	Katakana
2	PC850 (Multilingual)
3	PC860 (Portuguese)
4	PC863 (Canadian-French)
5	PC865 (Nordic)
16	WPC1252
17	PC866 (Cyrillic #2)
18	PC852 (Latin 2)
19	PC858
255	FROM User Table

9.3.13 Over-write mode

Code: 1Fh 01h

Function: Display mode set to Over-write mode.

9.3.14 Vertical scroll mode

Code: 1Fh 02h

Function: Display mode set to Vertical scroll mode.

9.3.15 Horizontal scroll mode

Code: 1Fh 03h

Function: Display mode set to Horizontal scroll mode.



9.3.16 Upper line

Code: 1Fh 0Ah

Function: Move cursor up by one line.

Over-write mode

Cursor position		Operation
X(Column)	Y(Row)	
—	1 st line	Cursor moves to 2 nd line.
	2 nd line	Cursor moves to 1 st line.

Vertical scroll mode

Cursor position		Operation
X(Column)	Y(Row)	
—	1 st line	Display contents shift down by one line, top line cleared. Cursor does not move.
	2 nd line	Cursor moves to 1 st line.

Horizontal scroll mode

Cursor position		Operation
X(Column)	Y(Row)	
—	1 st line	Cursor does not move.
	2 nd line	Cursor moves to 1 st line.

9.3.17 Right end

Code: 1Fh 0Dh

Function: Cursor moves to right end of current line.

9.3.18 Cursor set

Code: 1Fh 24h x y

x: Cursor position x (1 char /unit)

y: Cursor position y (1 line /unit)

Definable area: x: 1 (01h) - 20 (14h)

Y: 1 (01h) - 2 (02h)

Default: x = 1 (01h), y = 1 (01h)

Function: The cursor moves to the specified X, Y position. If the specified X, Y position (X, Y, either or both) is outside the definable area, the command is ignored, and the cursor remains in the same position.

9.3.19 End position

Code: 1Fh 42h

Function: Cursor moves to end position (left end of 2nd line).



9.3.20 Cursor display

Code: 1Fh 43h n

n: Cursor display setting

Definable area:

n = 0 (00h): Cursor display off.

n = 1 (01h): Cursor display on (block cursor).

Default: n = 0 (00h)

Function: Specifies cursor display ON/OFF. Blink time for block cursor depends on time set in Blink screen command.

9.3.21 Blink screen

Code: 1Fh 45h n

n: Blink display time

Definable area: n = 0 (00h) Screen blink cancel.

n = 1 (01h) - 255 (FFh) Screen blink display.

Default : n=

Function: Screen blink control

For n=0, screen blink is cancelled.

For n=1-255, screen blinks with the period: Blink period = $n \times 100\text{ms}$

9.3.22 Brightness level setting

Code: 1Fh 58h n

n: Brightness level setting

Definable area: n: 1 (01h) - 4 (04h)

Default: n = 4 (04h)

Function: Set display brightness level.

n	Brightness level
01h	25 %
02h	50 %
03h	75 %
04h	100 %

9.3.23 Reverse display

Code: 1Fh 72h n

n: Reverse display setting

Definable area:

n = 0 (00h): Reverse display OFF. n = 1 (01h): Reverse display ON.

Default: n = 0 (00h)

Function: Reverse character display setting ON/OFF.



9.3.24 Display Power

Code: 1Fh 28h 61h 40h n

n: Display Power setting

Definable area:

n = 0 (00h): Display power OFF (power save mode)

n = 1 (01h): Display power ON Default: n = 1 (01h)

Function: Display power ON/OFF.

9.3.25 User set up mode start

Code: 1Fh 28h 65h 01h d1 d2

Definable area: d1 = 49h (Character "I")

d2 = 4Eh (Character "N")

Function: Start user set up mode.

Display screen is cleared and normal commands stop being accepted. The following data is transmitted in response:

Transmitted data	Hex	Data length
(1) Header	28h	1 byte
(2) Identifier1	65h	1 byte
(3) Identifier 2	01h	1 byte
(4) Data	00h	1 byte

9.3.26 User set up mode end

Code: 1Fh 28h 65h 02h d1 d2 d3

Definable area: d1 = 4Fh (Character "O")

d2 = 55h (Character "U")

d3 = 54h (Character "T")

Function: End user set up mode, and software reset of display is executed.

After this command is executed, software reset is executed, the receiving buffer is cleared, and all settings and the display screen are reset to initial power-on state.



9.3.27 FROM User Font control

Code: 1Fh 28h 65h 30h n m a ---

n: Character select

m: Operation mode

m = 00h: Delete all characters

1Fh 28h 65h 30h n m a b

n: Character select

m: Operation mode

a: Fixed data 1

b: Fixed data 2

m = 01h: Register single character

1Fh 28h 65h 30h n m a p(1) p(2) --- p(30)

n: Character select

m: Operating mode

a: Character code to register

m = 02h: Read data for single character

1Fh 28h 65h 30h n m a

n: Character select

m: Operating mode

a: Registered character code

Definable area:

Delete all characters

n = 02h, m = 00h, a = 55h, b = AAh

Register single character

n = 02h, m = 01h, a: 20h-FFh, p(1)-p(30): 00h-FFh

Read data for single character

n = 02h, m = 02h, a: 20h-FFh

Default: Deleted state

Function: Deletes all characters, registers a single character, or reads data for a single character for the FROM User Font. If this command is executed in Normal Mode, display may flicker. Deleted or registered data is effective from User set up mode end command, or next power-on.

m = 00h Delete all characters

This command deletes the User Font for all character codes, 20h-FFh.

Results of the operation are transmitted in the following format:

Transmitted data	Hex	Data length
(1) Header	28h	1 byte
(2) Identifier 1	65h	1 byte
(3) Identifier 2	30h	1 byte
(4) Data	00h,FFh	1 byte 00h: Normal FFh: Error



9.3.27 FROM User Font control (cont'd)

m = 01h: Register single character

This command registers the single character, given by character code a.

The registered font is displayed when User Font set is set ON.

A maximum of 224 characters, codes 20h-FFh, can be registered.

An already-registered character code cannot be re-registered unless Delete all characters is done.

Results of the operation are transmitted in the following format:

Transmitted data	Hex	Data length
(1) Header	28h	1 byte
(2) Identifier 1	65h	1 byte
(3) Identifier 2	30h	1 byte
(4) Data	00h, FFh	1 byte 00h: Normal FFh: Error (already registered)

m = 02h: Read data for one character

This command can be used to read the registered data for character code a.

Results of the operation are transmitted in the following format:

Transmitted data	Hex	Data length
(1) Header	28h	1 byte
(2) Identifier 1	65h	1 byte
(3) Identifier 2	30h	1 byte
(4) Registration status	00h, 01h	1 byte 00h: unregistered 01h: registered
(5) Pattern	00h-FFh	30 bytes

9.3.28 FROM User Table control

Code: 1Fh 28h 65h 31h n m ---

n: Character select m:
Operation mode

m = 00h: Delete all characters

1Fh 28h 65h 31h n m a b

n: Character select m:
Operation mode a:
Fixed data 1

b: Fixed data 2

m = 01h: Register all characters

1Fh 28h 65h 31h n m p(80h-1) --- p(80h-30) p(81h-1) --- p(FFh-30)

n: Character select m:
Operating mode

p(80h-1) – p(FFh-30):

30 bytes / character × 128 characters = 3840 bytes.

Pattern data (refer to 10.6 Font Register data format)



9.3.28 FROM User Table control (Cont'd)

m = 02h: Read data for all characters

1Fh 28h 65h 31h n m

n: Character select m:
Operating mod

Definable area:

Delete all characters

n = 02h, m = 00h, a = 55h, b = AAh

Register all characters

n = 02h, m = 01h, p(80h-1) – p(FFh-30): 00h-FFh

Read data for all characters n = 02h, m = 02h

Default: Deleted state

Function: Deletes, registers data, or reads data for all characters in the FROM User Table (80h-FFh). If this command is executed in Normal Mode, display may flicker. Deleted or registered data is effective from User set up mode end command, or next power-on.

m = 00h Delete all characters

This command deletes the User Font table for all character codes, 80h-FFh.

Results of the operation are transmitted in the following format:

Transmitted data	Hex	Data length
(1) Header	28h	1 byte
(2) Identifier 1	65h	1 byte
(3) Identifier 2	31h	1 byte
(4) Data	00h,FFh	1 byte 00h: Normal FFh: Error

m = 01h: Register all characters

This command registers all characters, 80h-FFh, for the User Font table.

The registered font is displayed when Character table type is set to FROM User Table.

128 characters, codes 80h-FFh, are registered.

Results of the operation are transmitted in the following format:

Transmitted data	Hex	Data length
(1) Header	28h	1 byte
(2) Identifier 1	65h	1 byte
(3) Identifier 2	31h	1 byte
(4) Data	00h,FFh	1 byte 00h: Normal FFh: Error



9.3.28 FROM User Table control (Cont'd)

m = 02h: Read data for all characters

This command can be used to read the registered data for the all character codes 80h-FFh in the User Font table.

Results of the operation are transmitted in the following format:

Transmitted data	Hex	Data length
(1) Header	28h	1 byte
(2) Identifier 1	65h	1 byte
(3) Identifier 2	31h	1 byte
(4) Pattern	00h-FFh	3840 bytes

9.3.29 Startup Message control

Code: 1Fh 28h 65h 32h MSG(0) - - - MSG(63)

MSG(0) – MSG(63) : Startup Message (64 bytes)

Definable area:

MSG(0) - MSG(63) :

01h-04h = Display Hold

01h	:	0.25sec.
02h	:	0.5sec
03h	:	0.75sec
04h	:	1sec

10h-14h = Scroll Speed Set

10h	:	less than 0.01sec/chr.
11h	:	0.25sec/chr. (default)
12h	:	0.5sec/chr.
13h	:	0.75sec/chr.
14h	:	1sec/chr.

20h-7Fh = Message Character Code

International font set = 00h, Character table type = 00h

Others = End Code

Default: MSG(0)-MSG(63) = **"HP ap5000 All-in-One Point of Sale System" for line 1**
".... Thank You and Have a Nice Day" for line 2.

Function: Register the startup message in FROM.

Function: Register the startup message in FROM.

Response format:

Transmitted data	Hex	Data length
(1) Header	28h	1 byte
(2) Identifier 1	65h	1 byte
(3) Identifier 2	32h	1 byte
(4) Data	00h	1 byte



9.3.30 Read Status information

Code: 1Fh 28h 65h 40h a [b c]

Definable area: a = 2 (02h), 3 (03h), 32 (20h), 48 (30h)

a = 02h: Firmware version information (b, c are not used)

a = 03h: Font data information (b, c are not used)

a = 20h: Memory checksum information

b: 00h-1Fh, 80h Start address

c: 01h-20h Data length

a = 30h: Product type information (b, c are not used)

Function: Respond with the requested display status information. Response is formatted as follows:

Transmitted data	Hex	Data length
1: Header	28h	1byte
2: Identifier 1	65h	1byte
3: Identifier 2	40h	1byte
4: Data	00h-FFh	a = 02h: 4 bytes a = 03h: 15 bytes a = 20h: 4 bytes a = 30h: 15 bytes

9.3.31 2-byte character

Code: 1Fh 28h 67h 02h n

n: 2-byte character setting

Valid range: n = 00h: 2-byte character OFF

n = 01h: 2-byte character ON

Default: n = 00h

Function: Sets 2-byte character ON/OFF.

9.3.32 2-byte character type

Code: 1Fh 28h 67h 03h n

n: 2-byte character type setting

Definable area: n = 00h: Japanese n = 01h: Korean

n = 02h: Simplified Chinese n = 03h: Traditional Chinese

Default: n = 00h

Function: Sets 2-byte character type.



9.3.33 Rewrite mode start

Code: 1CH 7CH 4DH m d1 ... d6

Definable area: m = D0h
 d1...d6 = "MODEIN"

Function: Shift to "Rewrite mode" from "Normal mode".

Rewrite mode is used for changing the firmware and fonts, etc on FROM that cannot be changed by user setup mode, and Rewrite tool is required.

Do not use this command.

9.4 Initial Settings

Item	Initial Setting	Note
Display screen	All characters space (blank)	
Cursor position	Left end of 1st line (x=01h, y=01h)	
Cursor display	OFF (n=00h)	
FROM User Font	Disabled (n=00h)	
International font set	America (n=00h)	
Character table type	PC437 (n=00h)	
Display Mode	Over-write mode	
Display Power	ON (n=01h)	
FROM User Font registration	Blank	See note
FROM User Table registration	Blank (All dots ON character)	See note
2-byte character	Disabled (n=00h)	
2-byte character type	Japanese (n=00h)	
Display Brightness	100% (n=04h)	
Reverse display	OFF (n=00h)	

Note: Data registered in FROM is not re-initialized on power-on or by Initialize command; it is retained until the next Delete or Register command.

9.5 Startup Message

When the display starts in normal mode, the startup message is displayed until data is received from the host.

The startup message can be changed by using the configuration utility located on the CD.

← ← ← ← Horizontal Scroll ← ← ← ←

[illegible]



9.6 Font Register data format (15×16 dot)

b7															
b6															
b5															
b4	p (1)	p (3)	p (5)	p (7)	p (9)	p (11)	p (13)	p (15)	p (17)	p (19)	p (21)	p (23)	p (25)	p (27)	p (29)
b3															
b2															
b1															
b0															
b7															
b6															
b5															
b4	p (2)	p (4)	p (6)	p (8)	p (10)	p (12)	p (14)	p (16)	p (18)	p (20)	p (22)	p (24)	p (26)	p (28)	p (30)
b3															
b2															
b1															
b0															

10 Connector details

7-pin: S7B-XH-A (JST)

Pin No.	Signal	Function	Direction
1	RXD	Receive data	Input
2	DTR	Display READY	Output
3	DSR	Host READY	Input
4	TXD	Transmit data	Output
5	TEST*	TEST terminal	Input
6	VCC	Power (5V)	Input
7	GND	Ground	Input



© Copyright 2007-2010 Hewlett-Packard Development Company, L.P.