

SLIP PRINTER

SP298 SERIES

Programmer's Manual



Trademark acknowledgments

SP298: Star Micronics Co. Ltd.

ESC/POS, TM-295, TM-290: Seiko Epson Corporation

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TABLE OF CONTENTS

Chapter 1:	DIP Switch Settings	1
	Accessing the DIP switches	1
	Available DIP switch settings (Serial Interface)	3
	Available DIP switch settings (Parallel Interface)	4
Chapter 2:	Memory Switch Settings.....	5
Chapter 3:	Control Panel Operations	6
	Indicator lights	6
	Buttons	7
	Producing a test print	7
	Adjusting the dot alignment	7
	Hexadecimal dump	9
	Errors	10
Chapter 4:	Interface	11
	Serial Interface	11
	Serial interface pins and signal names	12
	Pins and Signal Names	12
	Interface connections	13
	Data protocol	14
	Parallel Interface	17
	Connectors and Signals	17
Chapter 5:	Peripheral Unit Driver Circuit	19
	Modular plug	19
	Drive circuit	20
Chapter 6:	Control Codes	21
	Star Mode Commands	21
	ESC/POS Mode Commands (TM-295 emulation)	26
	ESC/POS Mode Commands (TM-290 emulation)	28
	TM-295 mode emulation cautionary items	60
Appendix:	Character Code Tables	62

Please access the following URL

http://www.star-micronics.co.jp/service/sp_sup_e.htm

for the latest revision of the manual.

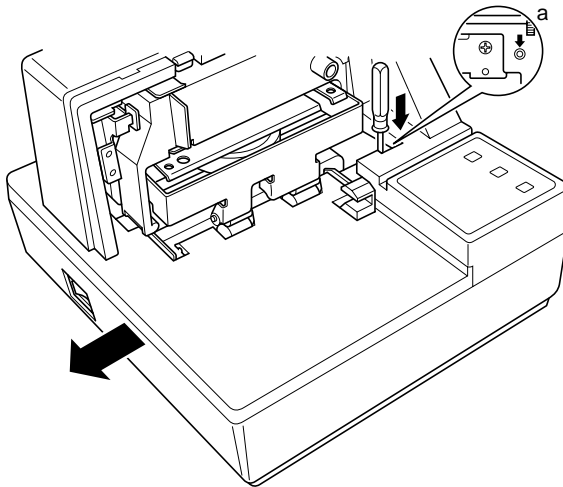
Chapter 1: DIP Switch Settings

The printer's DIP switches let you change communications parameters, input buffer size, and emulation. This chapter explains the settings you can make and tells you how to actually change DIP switch settings.

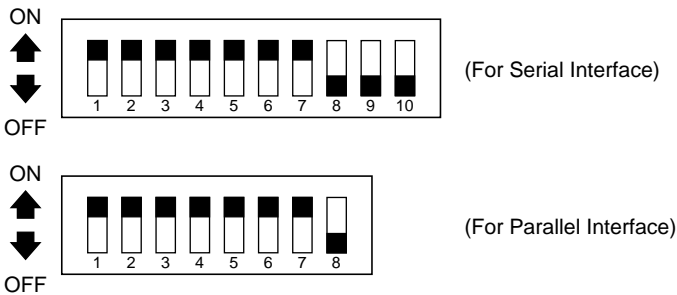
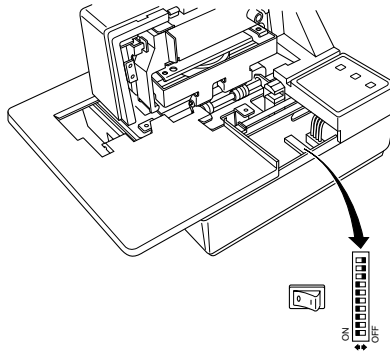
Accessing the DIP switches

The DIP switches are located inside the printer, underneath the document table. Use the following procedure to remove the document table so you can operate the DIP switches.

- Make sure that the printer is turned off and unplugged from its wall outlet.
- Remove the printer cover.
- While using a screwdriver or other similar instrument to press down at the location marked (a) in the illustration below, carefully slide the document table in the direction indicated by the arrow until it is out of the way.



It is not necessary to remove the document table completely, just move it enough so you can get at the DIP switches inside.



Note:

If the document table seems to be getting caught on the rollers, it means that you are not pressing down at point (a) enough. Pressing at point (a) should separate the rollers to the document table can slide freely.

- After the document table is opened sufficiently, use a thin flat-blade screwdriver or some other similar object to change DIP switch settings.

Note:

See the following section for details on available DIP switch settings.

- After making the settings you want, slide the document table back into place while pressing down at point (a). Make sure that the document table is correctly seated in place before releasing point (a).
- Replace the printer cover.

Available DIP switch settings (Serial Interface)

The following table shows all the possible settings for the DIP switch. The factory default settings are ON for switches 1 through 7 and OFF for switches 8 through 10.

Switch	Parameter	ON	OFF
1	Baud Rate	See table below.	
2			
3	Data Length	8 bits	7 bits
4	Parity Check	Disabled	Enabled
5	Parity	Odd	Even
6	Handshake	DTR/DSR	XON/XOFF
7	Command Emulation	See table below.	
8			
9	Pin 6 (DSR) Reset Signal	Enabled	Disabled
10	Pin 25 (INIT) Reset Signal	Enabled	Disabled

Baud Rate	Switch 1	Switch 2
1200BPS	OFF	OFF
2400BPS	ON	OFF
4800BPS	OFF	ON
9600BPS	ON	ON

Command Emulation	Switch 7	Switch 8
Star mode	ON	ON
ESC/POS (TM-295)	ON	OFF
ESC/POS (TM-290)	OFF	OFF
Not used (*1)	OFF	ON

*1: Never set switch 7 to OFF at the same time that switch 8 is set to ON.

Available DIP switch settings (Parallel Interface)

The following table shows all the possible settings for the DIP switch. The factory default settings are ON for switches 1 through 7 and OFF for switch 8.

Switch	Parameter	ON	OFF
1	Pin 31 / Pin 36 Reset Signal	See table below.	
2			
3	Not used	(Always ON)	
4			
5			
6			
7	Command Emulation	See table below.	
8			

Reset Signal	Switch 1	Switch 2
Pin 31 is enabled.	ON	ON
Pin 31/Pin 36 are enabled.	ON	OFF
Disabled	OFF	ON
Disabled	OFF	OFF

A reset can be performed with pin 31 on the interface by setting DIP switch 1 to ON (the factory default setting).

In addition, when a reset can be performed with pin 31, setting DIP switch 2 to OFF sets the unit to perform a reset when pin 31 and pin 36 are “LOW”.

Command Emulation	Switch 7	Switch 8
Star mode	ON	ON
ESC/POS (TM-295)	ON	OFF
ESC/POS (TM-290)	OFF	OFF
Not used (*1)	OFF	ON

*1: Never set switch 7 to OFF at the same time that switch 8 is set to ON.

Chapter 2: Memory Switch Settings

Each memory switch is a 16-bit word store in EEPROM. For details on the functions and settings of memory switches, refer to “Chapter 6”.

The table below shows the factory settings for the memory switches.

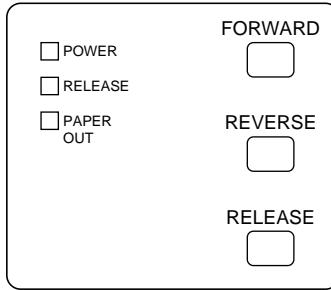
Memory Switch	Hexadecimal Code
0	0000
1	0000
2	0000
3	0000
4	0000
5	0000

Warning!

Changing the memory switch settings can cause the printer to fail to operate correctly.

Chapter 3: Control Panel Operations

The control panel gives you some push-button control over the slip printer operation. It also includes indicator lights, which tell you the current status of the printer at a glance.



Indicator lights

The following table describes the meaning of indicator lights when it is on, off, or flashing.

Indicator Light	Off	On	Flashing
POWER	Power off	Power on	Dot Alignment Adjust Mode
PAPER OUT	Paper inserted	No paper	Insert paper prompt
RELEASE	Slip paper engaged	Slip paper released	Mechanical error

Buttons

The following table describes the function of the three control buttons of the control panel.

Button	Description
FORWARD	Feeds the slip paper forward, toward the back of the printer. One press feeds one line, holding down performs continuous feed.
REVERSE	Feeds the slip paper back, toward the front of the printer. One press feeds one line, holding down performs continuous feed.
RELEASE	Activates the printer's paper release (the paper is not held in place by the paper feed roller). Clears recoverable errors.

Producing a test print

The following procedure can be used at any time to test the printer.

- Turn on the printer and insert a piece of paper (page 6, 11).
- Turn off printer power.
- While holding down **RELEASE**, turn printer back on. Keep **RELEASE** depressed for a few moments until the printer beeps and the printer test print starts.

The printer test will continue until it reaches the end of the paper.

Adjusting the dot alignment

You may never have to use the procedure described in this section, but after you have been using your printer for some time you may find that the dots of some graphics do not align correctly. For example, what should look like:



may come out looking like one of the following:



or like this

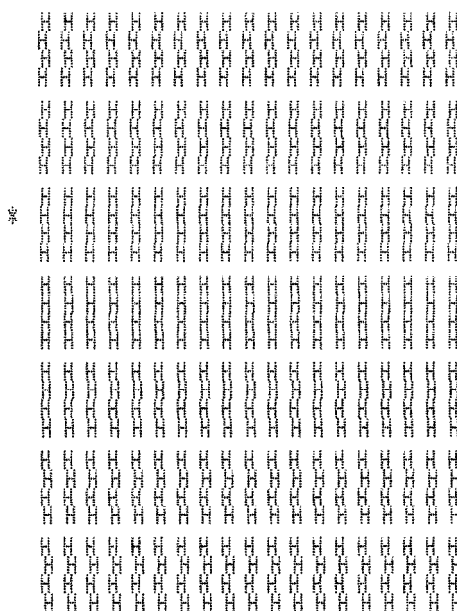


This is caused when mechanical parts of the printer get out of alignment. This happens only rarely and you may never experience it at all throughout the life of the printer. If you do have problems, use the following procedure to correct it.

- Turn on the printer and insert a piece of paper.
- Turn off printer power.
- While holding down the control panel's **FORWARD** and **REVERSE** buttons, turn the printer back on to enter the Dot Alignment Adjust Mode, which is indicator by a flashing **POWER** indicator flashes.

Entering the Dot Alignment Adjust Mode causes seven blocks to be printed, each of which indicates a dot alignment setting, as shown below. An asterisk to the left of the blocks indicates which block is currently selected.

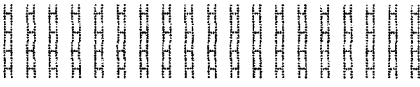
Dot Alignment Adjust Mode



- Use **FORWARD** to specify the block that appears to have the best aligned characters. Press **FORWARD** once to specify the first block, twice to specify the second block, and so on up to seven times to specify the seventh block.
Warning beep will sound if you press **FORWARD** more than seven times.
- After specifying a block, press **REVERSE** to register your selection and exit the Dot Alignment Adjust Mode.

The dots alignment adjustment setting you selected is stored in printer memory and a pattern is printed using the selected setting followed by the message “Adjust Complete!” The printer ejects the paper after printing is complete.

⌘



Adjust Completed!

Note:

*You setting is not registered if you turn off printer power before pressing REVERSE to exit the Dot Alignment Adjust Mode.
If a paper feed error occurs during this mode, the printer ejects the paper and this mode is cancelled.*

Hexadecimal dump

This procedure prints in hexadecimal format all codes (character codes and control codes) that are sent to the printer by the computer. The printer does not execute any control codes (such as 0A - linefeed), it just prints them out. The hexadecimal dump is useful when you are writing programs for printer control.

- Turn on the printer and insert a piece of paper.
- Turn off printer power.
- While holding down the control panel's **FORWARD** buttons, turn the printer back on to enter the Hex Dump Mode.
- To exit the Hex Dump Mode, turn the printer off.

Note:

The printer will not responde to any commands you send it while it is in the Hex Dump Mode.

Errors

There are three types of errors: *recoverable* errors that require some action by you before they clear, *non-recoverable* errors that require servicing by an authorized service provider, and a *data receive* error. Errors are indicated by and audible buzzer and the indicators.

Recoverable Errors

Error Type	Indicators			Recovery
	POWER	RELEASE	PAPER OUT	
Paper jam		Flashing		Correct the cause of the problem and then press RELEASE.
Carriage motor lockup				
Abnormal home position signal				
Abnormal timing signal				

Non-recoverable Errors

Error Type	Indicators			Recovery
	POWER	RELEASE	PAPER OUT	
RAM read/write	Off	On	On	Turn off the printer, then after waiting a few minutes, turn the printer back on. If the printer does not recover, contact your nearest service provider.
CPU lockup				

Data Receive Error

This type of error is caused whenever a problem is encountered during data receipt. The method used by the printer to recover from a data receive error depends on the current command mode.

Command mode	Data Receive Error Recover Procedure
Star mode	The printer prints a question mark.
ESC/POS mode	Memory switch 4-0=0 : The printer prints a question mark. Memory switch 4-0=1 : The printer discards the received data.

Chapter 4: Interface0

Serial Interface

- This chapter provides detailed specifications for the printer's standard serial interface (Connector Type: D-sub 25-pin).

Set the transmission parameters with DIP Switch.

Transmission type Asynchronous serial interface

Baud rate (bps) 1200, 2400, 4800 or 9600
(Selected by DIP switch)

Word format

Start bit: 1

Data bits: 7 or 8 (Selected by DIP switch)

Parity: Odd, Even, or None
(Selected by DIP switch)

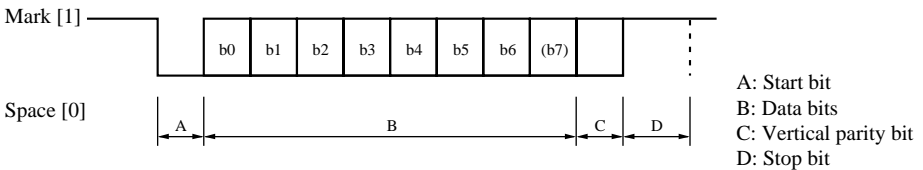
Stop bit: 1

Signal polarities

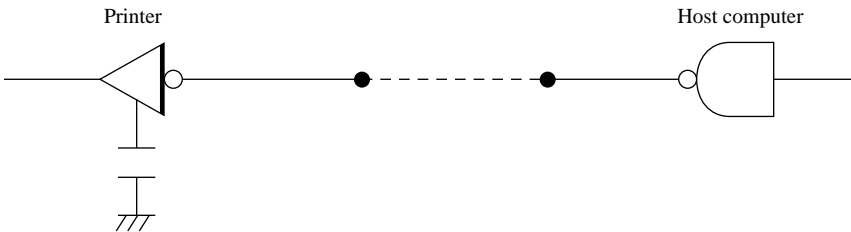
RS-232C Mark = Logic "1" (-3V to -15V)

Space = Logic "0" (+3V to +15V)

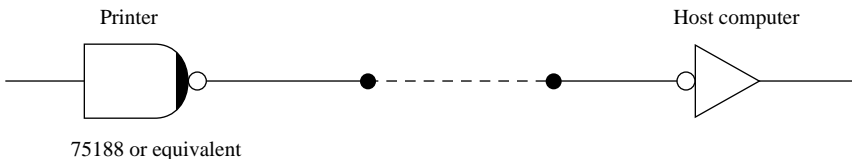
Handshaking DTR/DSR or XON/XOFF mode (Selected by DIP switch)



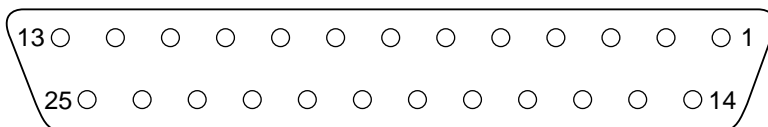
Input (RXD, DSR, INIT)



Output (DTR, TXD, RTS)



Serial interface pins and signal names



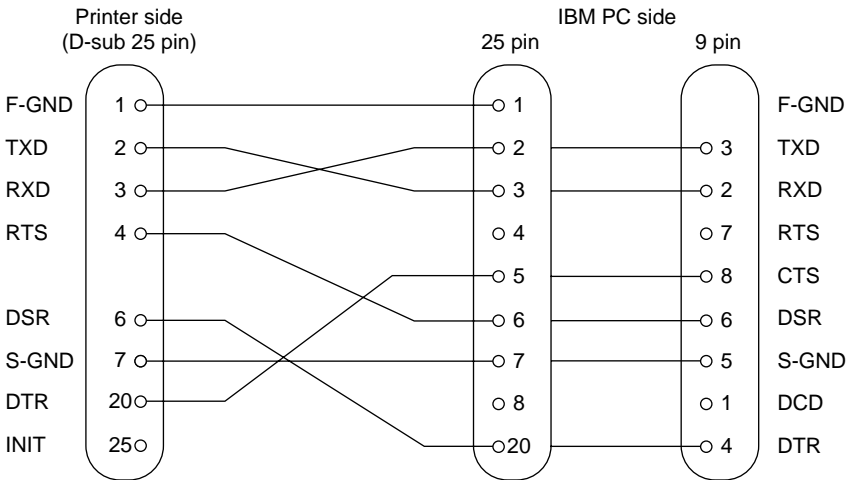
Pins and Signal Names

Pin No.	Signal Name	Direction	Function
1	FG	—	Frame ground
2	TXD	OUT	Transmission data
3	RXD	IN	Receive data
4	RTS	OUT	<p>STAR Mode When Memory Switch 4-D = 0: Same as DTR signal When Memory Switch 4-D = 1: Always SPACE</p> <p>ESC/POS Mode Same as DTR signal</p>
5	N.C.		Not connected
6	DSR	IN	<p>• DIP Switch 9 = OFF STAR Mode Status of this signal is not checked. ESC/POS Mode In DTR/DSR communication mode when Memory Switch4-5 = 0, indicates whether data receive from host is enabled or disabled. Space: Receive enabled Mark: Receive disabled This signal is not checked in the X-ON/X-OFF communication mode.</p> <p>• DIP Switch 9 = ON This signal used for external reset. Printer is reset whenever signal is in mark state with pulse width of 1mS or more.</p>
7	SG		Signal ground
8-19	N.C.		Not connected

Pin No.	Signal Name	Direction	Function
20	DTR	OUT	Indicates whether data receive from host is enabled or disabled. DTR/DSR Communication Mode Space when receive is enabled. X-On/X-Off Communication Mode Always space, except during following conditions: <ul style="list-style-type: none"> • Period between reset and communication enabled • During self-test printing and dot alignment adjustment
21-24	N.C.		Not connected
25	INIT	IN	<ul style="list-style-type: none"> • DIP Switch 10 = OFF This signal not used.
			<ul style="list-style-type: none"> • DIP Switch 10 = ON This signal becomes reset signal. Printer is reset whenever signal is in space state with pulse width of 1mS or more.

Interface connections

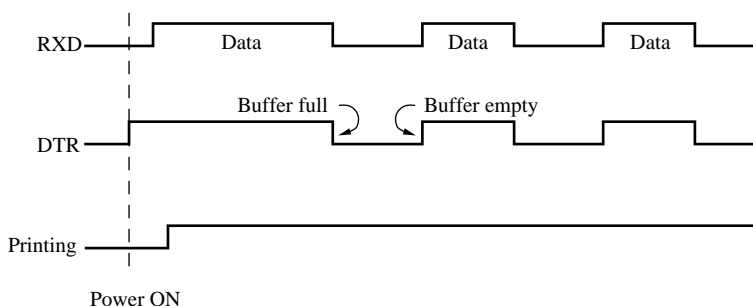
- ☐ Refer to the interface specifications for the host computer for details on connecting to its interface connector. The following illustration shows a typical connection configuration.



Data protocol

□ Outline of DTR/DSR mode operations

This communication mode is set when dip switches 1 to 6 are set at ON. The DTR signal shakes hands with the DSR signal (DSR signal: ESC/POS mode only) and performs communications. The DTR signal is assumed as the BUSY signal and then the control for the printer's data receiving operations are carried out, and a "space" means that the printer is to receive the data, and a "mark" means that the printer is not to receive the data.



The DTR signal line is set a "space" when the power supply is switched on and no error occurs with the printer. The host confirms that the DTR signal line is set at "space", and then transmits the text data to the RXD signal line.

The printer sets the DTR signal line at "mark" when the empty area in the data buffer is less than the prescribed number of bytes (*1: nearly full buffer condition.) The host confirms that the DTR signal line is set at "mark" and suspends text data transmission, but it is possible for the printer to continue receiving data for the amount of space remaining in the data buffer's empty area at this point. If the DTR signal is ignored and data transmitted, the data that exceeds the amount of space available in the empty area will be discarded. The empty area in the data buffer will increase as printing is carried out, and the DTR signal line will be set at "space" if the amount of empty space in the data buffer is more than the prescribed number of bytes (*2: near empty condition.)

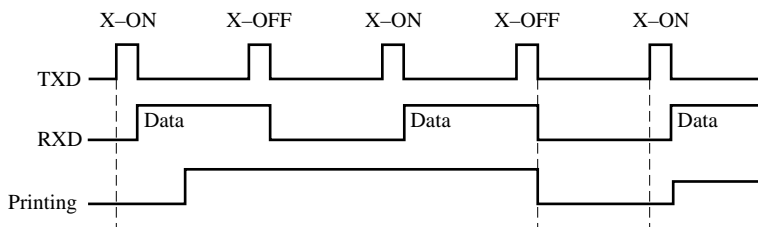
In addition to this, the host will confirm that receiving is possible (DSR signal = "space") and transmit the data only when memory switches 4 and 5 are set at 0 during printer status transmission in the ESC/POS mode's DTR/DSR communication mode. (With the exception of certain status transmission commands. Also, dip switches 1 to 9 must be at OFF when the DSR signal is confirmed.)

*1 Refer to the nearly full buffer conditions for details on nearly full buffer conditions.

*2 Refer to the nearly empty buffer conditions for details on nearly empty buffer conditions.

□ Outline of X-ON/X-OFF mode operations

This communication mode is set when dip switches 1 to 6 are set at OFF. This mode notifies the host of X-ON (DC1) data when receiving is possible and X-OFF (DC3) data when printing is not possible with the TXD signal. The timing conditions for the output of X-ON and X-ON in the STAR mode are set with the 4-C memory switch. When memory switch 4-C = 0 (set when the unit is shipped from the factory,) only one byte is output by X-ON during fluctuations from on-line (printer BUSY) to on-line (printer READY), and only one byte is output by X-OFF during fluctuations from on-line (printer READY) to on-line (printer BUSY). The same functions as above occur when in the ESC/POS mode regardless of the 4-C memory switch setting. When memory switch 4-C = 1, X-ON is output at regular three-second intervals.



X-ON (DC1 with the control code name and 11H with hexadecimal display) is output by the TXD signal line when the power supply is switched on and no error occurs with the printer. The text data is transmitted to the RSD signal line after the host has received X-ON.

X-OFF (DC3, 13H) is output when the empty area in the data buffer is less than the prescribed number of bytes (*1: nearly full buffer condition.) Also, if memory switch 4-C = 1, X-OFF is output for every byte of data received. The host that receives X-OFF suspends text data transmission, but it is possible for the printer to continue receiving data for the amount of space remaining in the data buffer's empty area at this point. If data that exceeds the amount of space available in the empty area is transmitted, it will be discarded.

The empty area in the data buffer will increase as printing is carried out, and X-ON is output if the amount of empty space in the data buffer is more than the prescribed number of bytes (*2: near empty condition.)

*1 Refer to the nearly full buffer conditions for details on nearly full buffer conditions.

*2 Refer to the nearly empty buffer conditions for details on nearly empty buffer conditions.

Nearly full buffer conditions

Emulation (DSW8)	Buffer size (DSW7)	Available area (during fluctuations)
STAR mode	2K byte	When 256 bytes or less are available
	35 byte	When 16 bytes or less are available
ESC/POS mode	512/35 bytes	When 10 bytes or more are available

Nearly empty buffer conditions

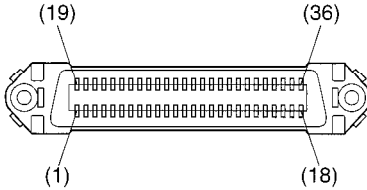
Emulation (DSW8)	Buffer size (DSW7)	Available area (during fluctuations)
STAR mode	2K byte	When 1792 bytes or less are available
	35 byte	When 20 bytes or less are available
ESC/POS mode	512/35 bytes	When 20 bytes or more are available

Parallel Interface

Connectors and Signals

Pin No.	Signal Name	IN/OUT	Function
1	STROBE	IN	Signals when data is ready to be read. Signal goes from HIGH to LOW (for at least 0.5 microsec.) when the data is available.
2-9	DATA1-8	IN	These signals provide the information of the first to eighth bits of parallel data. Each signal is at HIGH level for a logical 1 and at a LOW level for a logical 0.
10	ACK	OUT	A 9 microsecond LOW pulse acknowledges receipt of the data.
11	BUSY	OUT	When this signal goes to LOW, the printer is ready to accept data. When the printer is in one of the conditions below, "HIGH" is set. 1. Data is being entered 2. Off line 3. Error condition
12	PAPER OUT	OUT	This signal indicates the status of the paper sensor. [In Star mode] This signal goes to HIGH when either the TOF or the BOF sensor detects that there is no paper. The signal will go to LOW when both the TOF and BOF sensor detect that there is paper installed. [In the ESC/POS mode] This signal outputs the status of the sensor selected using the <ESC> "c3" command.
13	SELECTED	OUT	This signal is HIGH when the printer is online.
14-15	N/C		Unused
16	SIGNAL GND		Signal ground
17	CHASSIS GND		Chassis ground, isolated from logic ground
18	LOGIC HIGH		3.9 kΩ pull-up
19-30	GND		Twisted pair return the signal to ground level.
31	RESET	IN	This becomes a reset signal when DIP switch 1 is set to ON. (See page 4 for details.) When this signal goes to LOW (for at least 0.5 microsec.), the printer is reset to its power-on condition.
32	ERROR	OUT	This signal is normally HIGH. This signal goes to LOW to signal that the printer cannot print due to an error condition.
33	EXT GND		External ground
34	COMPULSION	OUT	Compulsion signal (See page 20.)
35	+5VDC		2.2 kΩ pull-up

Pin No.	Signal Name	IN/OUT	Function
36	SELECT IN	IN	Unused (However, this becomes a reset signal when DIP switch 1 is set to ON and DIP switch 2 is set to OFF. See page 4 for details.)



This connector mates with an Amphenol 57-30360 connector

Parallel interface connector (printer side)

Chapter 5: Peripheral Unit Driver Circuit

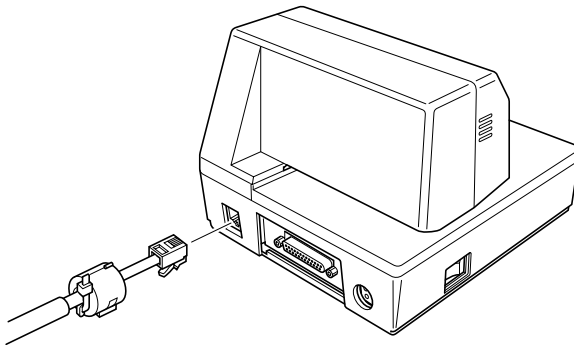
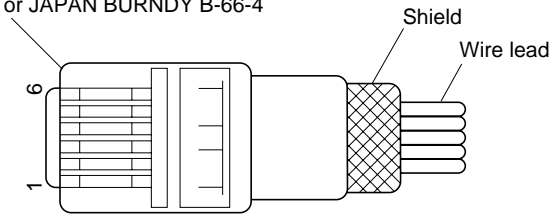
This printer is equipped with a circuit for driving peripheral units, such as cash drawers. A 6-pin modular connector for connection of the peripheral unit is located on the back of the printer. To connect to the drive circuit, connect the peripheral unit to the modular connector using a cable supplied by you like that one shown in the figure below.

Important!

Never connect any other type of plug to the peripheral unit connector.

Modular plug

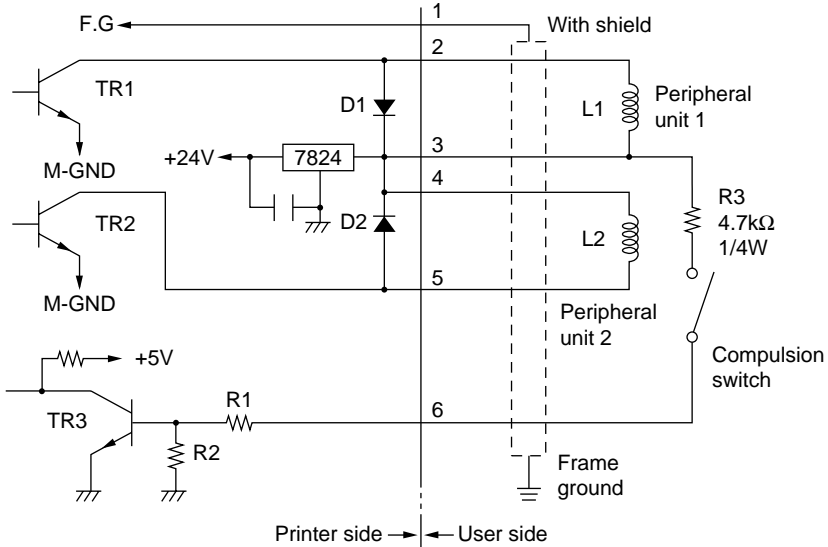
Modular plug: MOLEX 90075-0007,
AMP641337, or JAPAN BURNDY B-66-4



Drive circuit

The recommended drive unit is shown below.

Drive output: 24V, 1.0A max.



Notes

- Peripheral Units 1 and 2 cannot be driven simultaneously.
- For continuous driving, do not use drive duty greater than 20%.
- When using a serial interface, the compulsion switch status is available as status data. When using a parallel interface, the compulsion switch status can be worked out from the position of the number 34 pin of the interface connector. The switch status is ON when the number 34 pin is at LOW level.
- Minimum resistance for coils L1 and L2 is 24Ω.
- Absolute maximum ratings for diodes D1 and D2 ($T_a = 25^\circ\text{C}$) are:
Average Rectified Current $I_o = 1\text{A}$
Maximum forward surge current (60Hz, 1-cycle sine wave) $I_{\text{FSM}} = 40\text{A}$
- Absolute maximum rating for transistors TR1 and TR2 ($T_a = 25^\circ\text{C}$) are:
Collector current $I_c = 2\text{A}$
Collector loss $P_c = 1.2\text{W}$

Chapter 6: Control Codes

This printer supports two different command modes: the Star mode and the ESC/POS mode.

The Star mode emulates previous Star printers. The ESC/POS mode emulates the Epson TM-295 or TM-290 slip printer.

This chapter provides you with all of the commands supported by this printer.

Important!

Access the following URL for the latest version of this manual and for updates on supported commands: http://www.star-micronics.co.jp/service/sp_sup_e.htm

Star Mode Commands

The following tables show the Star mode commands that are supported by this printer.

Character Selection

Control Codes	Hexadecimal Codes	Function	Page
<ESC> "R" <i>n</i>	1B 52 <i>n</i>	Selects the international character set	30
<ESC> "/" "1" <ESC> "/" <1>	1B 2F 31 1B 2F 01	Selects slash zero	30
<ESC> "/" "0" <ESC> "/" <0>	1B 2F 30 1B 2F 00	Selects normal zero	30
<ESC> <GS> "t" <i>n</i>	1B 1D 74 <i>n</i>	Selects the character code table	30
<ESC> "M"	1B 4D	Selects the 7 × 9 (half dot) font	31
<ESC> "P"	1B 50	Selects the 5 × 9 (2 pulses per dot) font	31
<ESC> "."	1B 3A	Selects the 5 × 9 (3 pulses per dot) font	31
<ESC> <SP> <i>n</i>	1B 20 <i>n</i>	Sets character spacing	31
<SO>	0E	Sets the printing magnified double in character width	31
<DC4>	14	Resets the printing magnified in character width	31

Control Codes	Hexadecimal Codes	Function	Page
<ESC> "W" <i>n</i>	1B 57 <i>n</i>	Sets the magnification rate in character width	32
<ESC> "h" <i>n</i>	1B 68 <i>n</i>	Sets the magnification rate in character height	32
<ESC> "_ " "1" <ESC> "_ " <1>	1B 2D 31 1B 2D 01	Selects underlining	32
<ESC> "_ " "0" <ESC> "_ " <0>	1B 2D 30 1B 2D 00	Cancels underlining	32
<ESC> "_ " "1" <ESC> "_ " <1>	1B 5F 31 1B 5F 01	Selects upperlining	32
<ESC> "_ " "0" <ESC> "_ " <0>	1B 5F 30 1B 5F 00	Cancels upperlining	32
<ESC> "4"	1B 34	Selects highlight printing	33
<ESC> "5"	1B 35	Cancels unhighlight printing	33
<SI>	0F	Inverted printing	33
<DC2>	12	Cancels inverted printing	33
<ESC> <RS> "i" "0" <ESC> <RS> "i" <0>	1B 1E 96 30 1B 1E 96 00	Cancels rotated print mode for text (Default)	34
<ESC> <RS> "i" "1" <ESC> <RS> "i" <1>	1B 1E 96 31 1B 1E 96 01	Specifies rotated print mode for text with a 270° rotation.	34
<ESC> <RS> "i" "2" <ESC> <RS> "i" <2>	1B 1E 96 32 1B 1E 96 02	Specifies rotated print mode for text with a 90° rotation.	34
<ESC> "E"	1B 45	Selects emphasized printing	34
<ESC> "F"	1B 46	Cancels emphasized printing	34
<ESC> "U" <i>n</i>	1B 55 <i>n</i>	Selects print direction	34

Print Position Control

Control Codes	Hexadecimal Codes	Function	Page
<LF>	0A	Line feed	35
<CR>	0D	Carriage Return	35
<ESC> "a" <i>n</i>	1B 61 <i>n</i>	Feeds paper <i>n</i> lines	35
<HT>	09	Horizontal tab	35
<ESC> "A" <i>n</i>	1B 41 <i>n</i>	Defines <i>n</i> /72-inch line spacing	35
<ESC> "2"	1B 32	Sets <i>n</i> /72-inch line spacing	36
<ESC> "z" "0" <ESC> "z" <0>	1B 7A 30 1B 7A 00	Sets line spacing to 1/12-inch	36
<ESC> "z" "1" <ESC> "z" <1>	1B 7A 31 1B 7A 01	Sets line spacing to 1/6-inch	36
<ESC> "0"	1B 30	Sets line spacing to 1/8-inch	36
<ESC> "1"	1B 31	Sets line spacing to 7/72-inch	36
<ESC> "J" <i>n</i>	1B 4A <i>n</i>	One time <i>n</i> /72-inch feed	37
<ESC> "j" <i>n</i>	1B 6A <i>n</i>	One time <i>n</i> /72-inch backfeed	37
<ESC> "3" <i>n</i>	1B 33 <i>n</i>	Sets line spacing to <i>n</i> /216-inch approximately	37
<ESC> "y"	1B 79 <i>n</i>	Sets line spacing to <i>n</i> /144-inch	37
<ESC> "D" <i>n1 n2 ...</i> <0>	1B 44 <i>n1 n2 ... 00</i>	Sets horizontal tab stops	38
<ESC> "l" <i>n</i>	1B 6C <i>n</i>	Sets left margin	38
<ESC> "Q" <i>n</i>	1B 51 <i>n</i>	Sets right margin	38
<ESC> <GS> "a" "0" <ESC> <GS> "a" <0>	1B 1D 61 30 1B 1D 61 00	Left justification (Default)	39
<ESC> <GS> "a" "1" <ESC> <GS> "a" <1>	1B 1D 61 31 1B 1D 61 01	Centering	39
<ESC> <GS> "a" "2" <ESC> <GS> "a" <2>	1B 1D 61 32 1B 1D 61 02	Right justification	39

Dot Graphics Control

Control Codes	Hexadecimal Codes	Function	Page
<ESC> "K" <i>n</i> <0> <i>m1 m2 ...</i>	1B 4B <i>n 00 m1 m2</i> <i>...</i>	Prints normal density graphics	40
<ESC> "L" <i>n1 n2</i> <i>m1 m2 ...</i>	1B 4C <i>n1 n2 m1</i> <i>m2 ...</i>	Prints high density graphics	42

Download Graphics Printing

Control Codes	Hexadecimal Codes	Function	Page
<ESC> "&" <0> <i>n1 n2 ..</i>	1B 26 00 <i>n1 n2 ..</i>	Defines download characters	43
<ESC> "%" "1" <ESC> "%" <1>	1B 25 31 1B 25 01	Enables download character set	44
<ESC> "%" "0" <ESC> "%" <0>	1B 25 30 1B 25 00	Disables download character set	44

Peripheral Device Control

Control Codes	Hexadecimal Codes	Function	Page
<ESC> <BEL> <i>n1 n2</i>	1B 07 <i>n1 n2</i>	Defines drive pulse width for peripheral device #1	45
<BEL>	07	Controls peripheral device #1	45
<FS>	1C	Controls peripheral device #1 immediately	45
	19	Controls peripheral device #2 immediately	45
<SUB>	1A	Controls peripheral device #2 immediately	45

Slip Control

Control Codes	Hexadecimal Codes	Function	Page
<ESC> <SI> <i>n</i>	1B 0F <i>n</i>	Setting slip sensor	46
<ESC> <FF> <i>n</i>	1B 0C <i>n</i>	Slip function	46
<ESC> <VT> <i>m n</i>	1B 0B <i>m n</i>	Sets the paper eject direction/length	47
<EOT>	04	Slip status enquiry	47
<ESC> <i>m n</i> <LF> <NUL>	1B 19 <i>n m</i> 0A 00	Sets the wait time until the automatic clamp is activated	48

Page mode

Control Codes	Hexadecimal Codes	Function	Page
<ESC> "n"	1B 6E	Selects page mode	48
<ESC> "!"	1B 21	Selects line mode	50
<ESC> "**" ...	1B 2A ...	Setting print area in page mode	50
<ESC> "T" <i>n</i>	1B 54 <i>n</i>	Setting print direction in page mode	51
<FF>	0C	Prints in page mode	53

Other Commands

Control Codes	Hexadecimal Codes	Function	Page
<CAN>	18	Cancels printer buffer & Initialize printer (immediately)	54
<DC3>	13	Deselects printer	54
<DC1>	11	Sets select mode	54
<RS>	1E	Beeps the buzzer	54
<ESC> "#N, <i>n1 n2 n3 n4</i> " <LF> <NUL>	1B 23 N 2C <i>n1 n2 n3 n4</i> 0A 00	Sets memory switch	55
<ESC> "@"	1B 40	Initialize printer	58
<ENQ>	05	Enquiry	58
<ESC> "?" <LF> <NUL>	1B 3F 0A 00	Resets printer hardware and produces a test print	59

ESC/POS Mode Commands (TM-295 emulation)

The following table lists the TM-295 mode commands that are supported by this printer.

Control Codes	Hexadecimal Codes	Function
<HT>	09	Horizontal tab
<LF>	0A	Line feed
<FF>	0C	Paper eject in single sheet mode Paper mode print and return
<DLE> <EOT>	10 04	Enables real-time status send (Serial I/F only)
<CAN>	18	Cancels print data in page mode
<ESC> SP	1B 20	Sets size of space to right of character
<ESC> !	1B 21	Enables batch print mode
<ESC> #	1B 23	Sets memory switch
<ESC> %	1B 25	Enables/disables download character set
<ESC> &	1B 26	Defines download character
<ESC> *	1B 2A	Selects bit image mode
<ESC> 2	1B 32	Selects 1/6-inch line spacing
<ESC> 3	1B 33	Selects approximate $n/60$ -inch line spacing *1
<ESC> =	1B 3D	Selects peripheral device
<ESC> @	1B 40	Initializes the printer
<ESC> C	1B 43	Sets the eject length for single-sheet printing
<ESC> D	1B 44	Sets horizontal tab position
<ESC> F	1B 46	Enables/disables reverse feed for single-sheet mode
<ESC> J	1B 4A	Prints and $n/60$ -inch (approximate value) paper feed *1
<ESC> K	1B 4B	Prints and $n/60$ -inch (approximate value) reverse paper feed *1

*1: $n/60$ -inch line spacing and paper feed commands:

Since the minimum paper feed pitch for this printer is 1/144 inch, $n/60$ inch can be considered an approximate value. However, the actual value is $\text{INT}((6n/5) + 0.5)/72$ inch.

Control Codes	Hexadecimal Codes	Function
<ESC> L	1B 4C	Selects page mode
<ESC> R	1B 52	Selects international character set
<ESC> T	1B 54	Selects direction for page mode character printing
<ESC> U	1B 55	Selects print direction
<ESC> V	1B 56	Designates/cancels 90° character rotation
<ESC> W	1B 57	Sets print area for page mode printing
<ESC> a	1B 61	Aligns position
<ESC> c3	1B 63 33	Selects the paper-end sensor for sending the no-paper signal
<ESC> c4	1B 63 34	Selects the paper-end sensor for stopping printing
<ESC> c5	1B 63 35	Enables/disables control panel switches
<ESC> d	1B 64	Prints or feeds <i>n</i> lines
<ESC> e	1B 65	Prints or reverse feeds <i>n</i> lines
<ESC> f	1B 66	Sets single-sheet wait time
<ESC> p	1B 70	Generates specified pulse
<ESC> q	1B 71	Release
<ESC> t	1B 74	Selects character code table
<ESC> u	1B 75	Sends peripheral status (Serial I/F only)
<ESC> v	1B 76	Sends paper sensor status (Serial I/F only)
<ESC> {	1B 7B	Enables/disables inverted printing
<GS> l	1D 49	Sends printer ID (Serial I/F only)
<GS> a	1D 61	Enables/disables automatic send of printer status (Serial I/F only)
<GS> r	1D 72	Sends printer status (Serial I/F only)

ESC/POS Mode Commands (TM-290 emulation)

The following table lists the TM-290 emulation commands that are supported by this printer.

Control Codes	Hexadecimal Codes	Function
<HT>	09	Horizontal tab
<LF>	0A	Line feed
<FF>	0C	Paper eject in single sheet mode
<ESC> SP	1B 20	Sets size of space to right of character
<ESC> !	1B 21	Enables batch print mode
<ESC> #	1B 23	Sets memory switch
<ESC> *	1B 2A	Selects bit image mode
<ESC> 2	1B 32	Selects 1/6-inch line spacing
<ESC> 3	1B 33	Selects approximate $n/60$ -inch line spacing *1
<ESC> @	1B 40	Initializes the printer
<ESC> D	1B 44	Sets horizontal tab position
<ESC> M	1B 4D	Selects the 7×9 font
<ESC> P	1B 50	Selects the 5×9 font

*1: $n/60$ -inch line spacing and paper feed commands:

Since the minimum paper feed pitch for this printer is $1/144$ inch, $n/60$ inch can be considered an approximate value. However, the actual value is $\text{INT}((6n/5) + 0.5)/72$ inch.

Control Codes	Hexadecimal Codes	Function
<ESC> R	1B 52	Selects international character set
<ESC> c3	1B 63 33	Selects the paper-end sensor for sending the no-paper signal
<ESC> c4	1B 63 34	Selects the paper-end sensor for stopping printing
<ESC> c5	1B 63 35	Enables/disables control panel switches
<ESC> d	1B 64	Prints or feeds <i>n</i> lines
<ESC> h	1B 68	Sets/Cancel reverse line feed
<ESC> j	1B 6A	Selects character width in vertical printing mode
<ESC> q	1B 71	Release
<ESC> t	1B 74	Selects character code table
<ESC> v <i>n</i>	1B 76 <i>n</i>	Requests paper sensor status (Serial I/F only)
<ESC> {	1B 7B	Enables/disables inverted printing
<FS> J	1C 4A	Sets vertical printing mode
<FS> K	1C 4B	Cancel vertical printing mode
<FS> W	1C 57	Sets/Cancel double-height, double-width printing

Character Selection

CODE	<ESC>	“R”	<i>n</i>
------	-------	-----	----------

HEX	1B	52	<i>n</i>
-----	----	----	----------

FUNCTION Selects international character set

Selects an international character set according to the value of *n*, as shown below:

$0 \leq n \leq 12$, “0” $\leq n \leq$ “9”, “A” $\leq n \leq$ “C”

$n = 0$, “0” : U.S.A.	1, “1” : France	2, “2” : Germany
3, “3” : England	4, “4” : Denmark I	5, “5” : Sweden
6, “6” : Italy	7, “7” : Spain I	8, “8” : Japan
9, “9” : Norway	10, “A” : Denmark II	11, “B” : Spain II
12, “C” : Latin America		

Although the international character set can also be selected using a memory switch, the control code setting is given priority.

CODE	<ESC>	“/”	<i>n</i>
------	-------	-----	----------

HEX	1B	2F	<i>n</i>
-----	----	----	----------

FUNCTION Selects zero style

Causes subsequent zero characters to be printed with a slash when *n* is 1, and without a slash when *n* is 0.

The value of *n* can be set to 0(00H) or “0”(30H), or 1(0H) or “1”(31H).

The default may differ depending on the memory switch setting.

CODE	<ESC>	<GS>	“t”	<i>n</i>
------	-------	------	-----	----------

HEX	1B	1D	74	<i>n</i>
-----	----	----	----	----------

FUNCTION Selects the character code table

This function selects a character code table (as shown below).

The default settings follow the settings of the memory switch.

The range of *n* is: $0 \leq n \leq 10$

$n = (00)H$: Normal	(01)H : code page 437
(02)H : katakana	(03)H : code page 437
(04)H : code page 858	(05)H : code page 852
(06)H : code page 860	(07)H : code page 861
(08)H : code page 863	(09)H : code page 865
(0A)H : code page 866	

CODE	<ESC>	“M”
HEX	1B	4D
FUNCTION		

Selects 7 × 9 (half dot) font

CODE	<ESC>	“P”
HEX	1B	50
FUNCTION		

Selects 5 × 9 (2 pulses = 1 dot) font

CODE	<ESC>	“,”
HEX	1B	3A
FUNCTION		

Selects 5 × 9 (3 pulses = 1 dot) font

CODE	<ESC>	<SP>	<i>n</i>
HEX	1B	20	<i>n</i>
FUNCTION			

Sets character spacing
 Sets the spacing between characters according to the value of *n*.
 The value of *n* can be set from 0 through 15, or from “0” through “9”
 and “A” through “F”.
 The default value of *n* is 0.

CODE	<SO>
HEX	0E
FUNCTION	

Sets the printing magnified double in character width.
 Prints the subsequent data including a character spacing set by
 <ESC><SP> *n*, magnified double in character width.

CODE	<DC4>
HEX	14
FUNCTION	

Resets the printing magnified in character width.
 Resets the printing magnified in character width set by <SO>, and
 <ESC> “W”*n*.

CODE	<ESC>	“W”	<i>n</i>
------	-------	-----	----------

HEX	1B	57	<i>n</i>
-----	----	----	----------

FUNCTION

Sets the magnification rate in character width

Prints the subsequent data with a character width magnified by a rate specified by the value of *n*.

n= 0, “0”: Reset magnification (same as <DC4>)

1, “1”: Double magnification (same as <SO>)

CODE	<ESC>	“h”	<i>n</i>
------	-------	-----	----------

HEX	1B	68	<i>n</i>
-----	----	----	----------

FUNCTION

Sets the magnification rate in character height

Prints the subsequent data with a character height magnified by a rate specified by the value of *n*.

n= 0, “0”: Reset magnification

1, “1”: Double magnification

CODE	<ESC>	“_”	<i>n</i>
------	-------	-----	----------

HEX	1B	2D	<i>n</i>
-----	----	----	----------

FUNCTION

Underlining

When the value of *n* is 1, underlines the subsequent data including a character spacing set by <ESC><SP> *n*.

The part to be skipped by the horizontal tab setting and the block graphic characters are not underlined.

Resets the underline mode when the value of *n* is 0.

The value of *n* can be set to 0(00H) or “0”(30H), or 1(01H) or “1”(31H).

CODE	<ESC>	“_”	<i>n</i>
------	-------	-----	----------

HEX	1B	5F	<i>n</i>
-----	----	----	----------

FUNCTION

Upperlining

When the value of *n* is 1, over lines the subsequent data including a character spacing set by <ESC><SP> *n*.

The part to be skipped by the horizontal tab setting and the block graphic characters are not upper lined.

Resets the upper line mode when the value of *n* is 0.

The value of *n* can be set to 0(00H) or “0”(30H), or 1(01H) or “1”(31H).

CODE

<ESC> “4”

HEX

1B 34

FUNCTION

Selects highlight printing

Prints the subsequent data including a character spacing set by <ESC><SP> *n* reversed.

The part to be skipped by the horizontal tab setting is not reversed.

CODE

<ESC> “5”

HEX

1B 35

FUNCTION

Cancels highlight printing

CODE

<SI>

HEX

0F

FUNCTION

Inverted printing

Causes subsequent characters to be inverted.

Enter this command at the beginning of the line. If this code is entered at any other position, it will be invalid. Therefore, it is not possible to mix correct and inverted printing in one line.

CODE

<DC2>

HEX

12

FUNCTION

Cancels inverted printing

Enter this code at the beginning of the line.

CODE

<ESC> <RS> “i” *n*

HEX

1B IE 69 *n***FUNCTION**

This function defines and cancels rotated print mode for text with a 90° or 270° rotation for the line mode.

This function is for the line mode. It rotates the following data in a clockwise direction with a 90° or 270° rotation or cancels the rotation and then prints the text. The *n* value determines whether a rotational direction or a cancellation of the rotation is specified.

n value	Rotation specification
00H or “0”	Cancel rotation (0° rotation, default)
01H or “1”	270° rotation
02H or “2”	90° rotation

Underline or overline cannot be applied for rotated text.

The relationship of the vertical ratio and horizontal ratio for rotated text is the reverse of when the rotation is cancelled.

CODE

<ESC> “E”

HEX

1B 45

FUNCTION

Selects emphasized printing
Causes subsequent characters to be emphasized.

CODE

<ESC> “F”

HEX

1B 46

FUNCTION

Cancels emphasized printing

CODE

<ESC> “U” “1” or <ESC> “U” <1>

HEX

1B 55 31 1B 55 01

FUNCTION

Selects uni-directional printing
After printing the data in the line buffer, the printer enters the uni-directional mode.
The subsequent data is printed when the print head moves from left to right.

CODE

<ESC> “U” “0” or <ESC> “U” <0>

HEX

1B 55 30 1B 55 00

FUNCTION

Selects bi-directional printing
After printing the data in the line buffer, the printer enters the bi-directional mode.
In this mode, the data is printed faster than the uni-directional mode.

Print Position Control

CODE <LF>

HEX 0A

FUNCTION Line feed
Prints the current line and feeds the paper to the next line.

CODE <CR>

HEX 0D

FUNCTION Carriage return
The <CR> code is valid only if memory switch 3-1 is set to 1. (The factory setting is 0.)
If the <CR> code is valid:
The function of the <CR> code changes according to the setting of memory switch 5-8.

When memory switch 5-8 is set to 0 (factory setting): Functions in the same way as an <LF> code (CRLF).

When memory switch 5-8 is set to 1: Executed only when printing. The paper is not fed (CR).

CODE <ESC> "a" *n*

HEX 1B 61 *n*

FUNCTION Feed paper *n* lines
Prints the current line and feeds the paper *n* lines (where *n* is between 1 and 127).

CODE <HT>

HEX 09

FUNCTION Horizontal tab
Moves the print position to the next horizontal tab stop. Ignored if there is no next horizontal tab stop on the current line.

CODE <ESC> "A" *n*

HEX 1B 41 *n*

FUNCTION Defines *n*/72-inch line spacing
Defines the distance that the paper advances in subsequent line feed. The line spacing defined here is set by <ESC> "2".
 $0 \leq n \leq 85$
The default value of *n* is 12 (1/6-inch feed)

CODE

<ESC> "2"

HEX

1B 32

FUNCTIONSets line spacing to $n/72$ -inchSets the line spacing to $n/72$ -inch which is defined by <ESC> "A" n .

CODE

<ESC> "z" "0" or <ESC> "z" <0>

HEX

1B 7A 30 or 1B 7A 00

FUNCTIONSets line spacing to $1/12$ inchSets the distance that the paper advances in subsequent line feeds to $1/12$ inch.

CODE

<ESC> "z" "1" or <ESC> "z" <1>

HEX

1B 7A 31 or 1B 7A 01

FUNCTIONSets line spacing to $1/6$ inchSets the distance that the paper advances in subsequent line feeds to $1/6$ inch.

CODE

<ESC> "0"

HEX

1B 30

FUNCTIONSets line spacing to $1/8$ inchSets the distance that the paper advances in subsequent line feeds to $1/8$ inch.

CODE

<ESC> "1"

HEX

1B 31

FUNCTIONSets line spacing to $7/72$ -inchSets the subsequent line spacing to $7/72$ -inch.

CODE

<ESC> “J” n

HEX

1B 4A n **FUNCTION**One time $n/72$ -inch feed

Performs a line feed of $n/72$ -inch only once after printing the data in the line buffer. The space setting for lines does not change. The value of n is between 1 and 255.

CODE

<ESC> “j” n

HEX

1B 6A n **FUNCTION**One time $n/72$ -inch backfeed

Performs a line feed of $n/72$ -inch only once after printing the data in the line buffer. The space setting for lines do not change. The value of n is between 1 and 255.

CODE

<ESC> “3” n

HEX

1B 33 n **FUNCTION**Sets line spacing to $n/216$ -inchSets the subsequent line spacing to $n/216$ -inch.The value of n is between 1 and 255.

Since the min. pitch of the slip paper feed mechanism is $1/144$ -inch, the set value is approximated by the following formula

$$\text{INT} (n \times 2/3 + 0.5)/144 \text{ inch}$$

CODE

<ESC> “y” n

HEX

1B 79 n **FUNCTION**Sets line spacing to $n/144$ -inchSets the subsequent line spacing to $n/144$ -inch.The value of n is between 1 and 255.

CODE	<ESC>	“D”	<i>n1</i>	<i>n2</i>	...	<0>
HEX	1B	44	<i>n1</i>	<i>n2</i>	...	00

FUNCTION

Sets horizontal tab stops

Cancels all current horizontal tab stops and sets new tab stops at columns *n1*, *n2*, etc. at the current character pitch, where *n1*, *n2*, etc. are numbers between 1 and 255. A maximum of 16 horizontal tab stops can be set.

The tab stops must be specified in ascending order; any violation of ascending order terminates the tab stop list. Standard termination is by the <0> control code.

With <ESC> “D” <0>, all horizontal tab stops are cancelled. The left edge of the paper is always the reference point for the horizontal tab positions, regardless of the left margin setting. When the power is turned on, no horizontal tabs are set.

CODE	<ESC>	“1”	<i>n</i>
HEX	1B	6C	<i>n</i>

FUNCTION

Sets left margin at column *n* at the current character pitch.

The left margin does not move if the character pitch is changed later. If this function is set in the middle of a line, it will become valid starting with the following line. When the power is turned on, the left edge is set as the left margin.

The left margin must be at least 18 dots to the left of the right margin and within the limits below. If the size of one character and its spacing is larger than the print area defined by the margins, printing is not possible and “?” is printed, instead of the character.

The value of *n* is between 0 and the value of the right margin - 2.

CODE	<ESC>	“Q”	<i>n</i>
HEX	1B	51	<i>n</i>

FUNCTION

Sets right margin

Sets right margin at column *n* at the current character pitch.

The right margin does not move if the character pitch is changed later.

If this function is set in the middle of a line, it will become valid starting with the following line. When the power is turned on, the right edge is set as the right margin.

The right margin must be within the limits below and set so that the allowable print area is more than 18 dots. If the size of one character and its spacing is larger than the print area defined by the margins, printing is not possible and “?” is printed, instead of the character. The value of *n* is between 2 and the value of the maximum number of print columns.

CODE

<ESC> <GS> "a" *n*

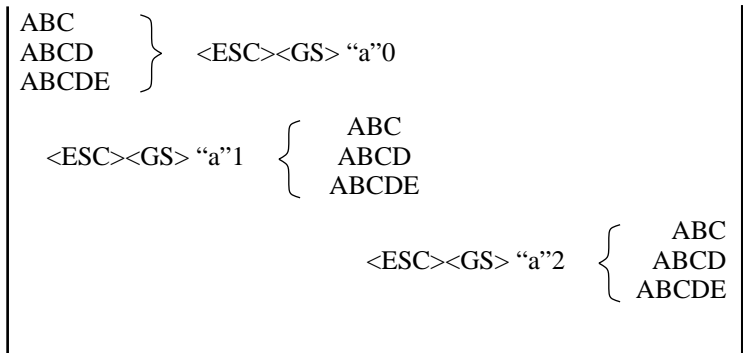
HEX

1B 1D 61 *n***FUNCTION**

This function specifies a position alignment.

This function aligns the specified position of all print data of 1 line. The position is aligned as shown below.

n = (00)H, "0": Left align (default)
 = (01)H, "1": Center
 = (02)H, "2": Right align

**Note:**

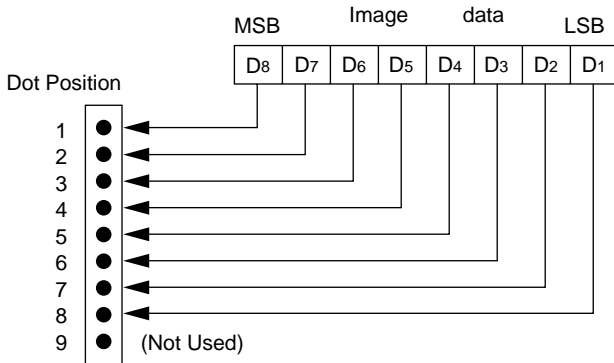
- This is only valid when it is input at the start of the line.
- The position alignment is executed on the width of the specified print area.
- The parts that are skipped because of horizontal tabs are also included in the data for position alignment.

Dot Graphics Printing

CODE	<ESC>	“K”	<i>n</i>	<0>	<i>m1</i>	<i>m2</i>	...
HEX	1B	4B	<i>n</i>	00	<i>m1</i>	<i>m2</i>	...

FUNCTION Prints normal density graphics

Prints a bit image of the number of dots specified by *n*. After printing the bit image, the printer automatically returns to the character mode. The relationship between the pins on the print head and the data is shown below.



The value of *n* is between 1 and 210.
 A maximum of 210 data bytes can be printed in one line. Any data exceeding 210 bytes is ignored. Only uni-directional printing is possible.

EXAMPLE

We will create the design below using a bit image.

	m1	m2	m3	m4	m5	m6	m7	m8	m9	m10	m11	m12	m13	m14	m15	m16	m17	m18	m19	m20	m21	m22	m23	m24	m25	m26	m27	m28	m29	m30
D8																														
D7				●		●																								
D6		●					●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
D5	●	●	●	●	●	●	●	●	●	●	●			●	●		●			●			●		●		●	●		
D4		●	●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
D3	●	●	●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
D2		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
D1	●			●	●			●	●						●	●									●	●				

First, since the volume of data is 30, $n1 = (1E)_H$. If the data $m1 \sim m30$ is converted to hexadecimal, it appears as shown below.

Data	Binary	Hexa- decimal	Data	Binary	Hexa- decimal	Data	Binary	Hexa- decimal
$m1$	00000001	01	$m11$	00111110	3E	$m21$	00111110	3E
$m2$	00011110	1E	$m12$	00000010	02	$m22$	00101110	2E
$m3$	00111110	3E	$m13$	00000010	02	$m23$	00101110	2E
$m4$	01011111	5F	$m14$	00111110	3E	$m24$	00111110	3E
$m5$	00011111	1F	$m15$	00111110	3E	$m25$	00101111	2F
$m6$	01011110	5E	$m16$	00101111	2F	$m26$	00101111	2F
$m7$	00011110	1E	$m17$	00101111	2F	$m27$	00111110	3E
$m8$	00111111	3F	$m18$	00111110	3E	$m28$	00111110	3E
$m9$	00101111	2F	$m19$	00101110	2E	$m29$	00000010	02
$m10$	00111110	3E	$m20$	00101110	2E	$m30$	00000010	02

Printing Sample

CODE

<ESC> “L” *n1 n2 m1 m2 ...*

HEX

1B 4C *n1 n2 m1 m2 ...*

FUNCTION

Prints high density graphics

Prints a high density bit image of the number of dots specified by *n1* and *n2*. The value of $n1 + 256 \times n2$ is between 1 and 420.

A maximum of 420 data bytes can be printed in one line. Any data exceeding 420 bytes is ignored.

After printing the bit image, the printer automatically returns to the character mode. The relationship between the pins on the print head and the data is the same as those shown for the previous bit image code <ESC> “K”.

While printing a high density bit image, the horizontally adjacent dots cannot be printed.

EXAMPLE

We will create the design below using a bit image.

	m1	m2	m3	m4	m5	m6	m7	m8	m9	m10	m11	m12	m13	m14	m15	m16	m17	m18	m19	m20	m21	m22	m23	m24	m25	m26	m27	m28	m29	m30			
D8																																	
D7				●		●																											
D6		●						●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●				
D5		●	●	●	●	●	●	●	●	●	●			●	●		●		●		●		●		●		●		●				
D4		●	●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
D3		●	●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
D2		●	●	●	●	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
D1	●			●	●			●	●						●	●									●	●							

First, since the volume of data is 30, $n1 = (1E)_H$. If the data $m1 \sim m30$ is converted to hexadecimal, it appears as shown below.

Data	Binary	Hexa-decimal	Data	Binary	Hexa-decimal	Data	Binary	Hexa-decimal
<i>m1</i>	00000001	01	<i>m11</i>	00111110	3E	<i>m21</i>	00111110	3E
<i>m2</i>	00011110	1E	<i>m12</i>	00000010	02	<i>m22</i>	00101110	2E
<i>m3</i>	00111110	3E	<i>m13</i>	00000010	02	<i>m23</i>	00101110	2E
<i>m4</i>	01011111	5F	<i>m14</i>	00111110	3E	<i>m24</i>	00111110	3E
<i>m5</i>	00011111	1F	<i>m15</i>	00111110	3E	<i>m25</i>	00101111	2F
<i>m6</i>	01011110	5E	<i>m16</i>	00101111	2F	<i>m26</i>	00101111	2F
<i>m7</i>	00011110	1E	<i>m17</i>	00101111	2F	<i>m27</i>	00111110	3E
<i>m8</i>	00111111	3F	<i>m18</i>	00111110	3E	<i>m28</i>	00111110	3E
<i>m9</i>	00101111	2F	<i>m19</i>	00101110	2E	<i>m29</i>	00000010	02
<i>m10</i>	00111110	3E	<i>m20</i>	00101110	2E	<i>m30</i>	00000010	02

Horizontal density is three times that of the bit image for <ESC>“k”. (Compare the print samples.)

Printing Sample

Download Graphics Printing

When the 7×9 (half dot) character size (default setting) is set:

CODE

<ESC> “&” <0> $n1\ n2\ [m0\ m1\ m2\ m3\ m4\ m5\ m6\ m7]\ n2 - n1 + 1$

HEX

1B 26 00 $n1\ n2\ [m0\ m1\ m2\ m3\ m4\ m5\ m6\ m7]\ n2 - n1 + 1$

When the 5×9 dot character size is set:

CODE

<ESC> “&” <0> $n1\ n2\ [m0\ m1\ m2\ m3\ m4\ m5]\ n2 - n1 + 1$

HEX

1B 26 00 $n1\ n2\ [m0\ m1\ m2\ m3\ m4\ m5]\ n2 - n1 + 1$

FUNCTION

Defines download character (7×9 (half dot) font or 5×9 dot font)

Defines download characters

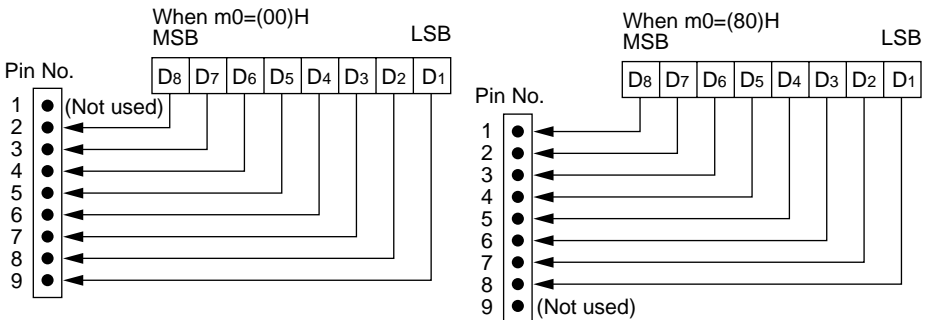
Up to 10 download characters can be defined and the defined character patterns can be stored in the printer's RAM.

The values of $n1$ and $n2$ are between $(21)_H$ and $(7F)_H$ with $n1$ less than or equal to $n2$ and the value of $m0$ is either $(00)_H$ or $(80)_H$.

Defining of download characters begins with character code $n1$ and completes with $n2$. When only one character is defined, $n1 = n2$.

$m0$ indicates the relationship between the character pattern and print head.

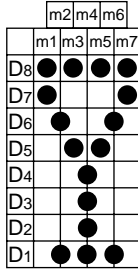
$m1\ m2\dots$ Indicate the character pattern



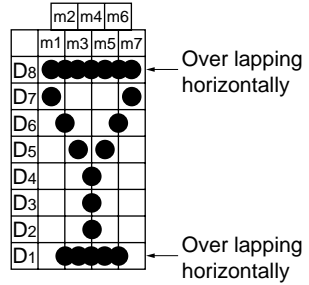
EXAMPLE

When the 7 × 9 (half dot) character size (default setting) is set, the horizontally adjacent dots cannot be printed.

Printing possible



Printing not possible



CODE

<ESC> “%” “1” or <ESC> “%” <1>

HEX

1B 25 31 or 1B 25 01

FUNCTION

Enables download character set
Enables the download character set.

CODE

<ESC> “%” “0” or <ESC> “%” <0>

HEX

1B 25 30 or 1B 25 00

FUNCTION

Disables download character set
Disables the selected download character set and returns to the built-in ROM character set.

Peripheral Device Control

CODE <ESC> <BEL> *n1* *n2*

HEX 1B 07 *n1* *n2*

FUNCTION Defines drive pulse width for peripheral device #1
 Defines the drive pulse width for peripheral devices requiring other than standard 200 ms pulse time and delay time.
n1 indicates the energizing time and *n2* indicates the delay time, using 10ms units.

CODE <BEL>

HEX 07

FUNCTION Controls peripheral device #1
 Executes drive pulse for peripheral device #1.

CODE <FS>

HEX 1C

FUNCTION Controls peripheral device #1 immediately
 Executes drive pulse for peripheral device #1 immediately.

CODE

HEX 19

FUNCTION Controls peripheral device #2 immediately
 Drives peripheral device #2. The drive pulse width and delay time are fixed at 200 ms.

CODE <SUB>

HEX 1A

FUNCTION Controls peripheral device #2 immediately
 Drives peripheral device #2. The drive pulse width and delay time are fixed at 200 ms.

Slip Control

CODE

<ESC> <SI> *n*

HEX

1B 0F *n***FUNCTION**

Setting slip sensor

Sets the slip printer TOF/BOF sensor according to the value of *n*.

	TOF Sensor	BOF Sensor
<i>n</i> = 00, "0" :	Valid	Valid
01, "1" :	Valid	Invalid
02, "2" :	Invalid	Valid
03, "3" :	Invalid	Invalid

The default value is *n*="0" when memory switch 5-2 = 0 (set when the unit is shipped from the factory,) and *n*="3" when memory switch 5-2 = 1.

CODE

<ESC> <FF> *n*

HEX

1B 0C *n***FUNCTION**

Slip function

After printing the data in the line buffer, operates the slip printer according to the value of *n*.

<i>n</i> = 00, "0" :	Operates the clamp
01, "1" :	Releases the paper
02, "2" :	Releases the paper and waits until it is removed
03, "3" :	Feeds the paper backward (backfeed) until it moves past the TOF sensor, then releases the paper. (See NOTE below.)
04, "4" :	Feeds the paper into the printer (operational feed) until it moves past the BOF sensor, then releases the paper.
05, "5" :	Feeds the paper according to the direction and length set by <ESC> <VT> <i>m n</i> (the paper is not released)

(NOTE) When the slip paper is attached to duplicates, a paper jam may occur if the paper is always fed backward. Therefore, the paper should not be ejected with *n*=3. To feed slip paper attached to duplicates backward, use <ESC> <VT> to set the eject length to about half of the paper length, then eject the paper using <ESC> <FF> 5.

CODE

<ESC> <VT> *m* *n*

HEX

1B 0B *m* *n***FUNCTION**

Sets the paper eject direction/length

Sets the length of the ejection operation performed using <ESC> <FF> 5 in line mode.

The value of *m* determines the ejection direction.When *m*= "+": the ejection direction is into the printer (operational feed), and the ejection length is *n* lines (at the current carriage return)When *m*= "-": the ejection direction is backward (backfeed), and the ejection length is *n* lines (at the current carriage return)When *m*= 0 : the ejection direction is backward (backfeed), and the ejection length is *n* inchesThe default value of *n* is 0.

CODE

<EOT>

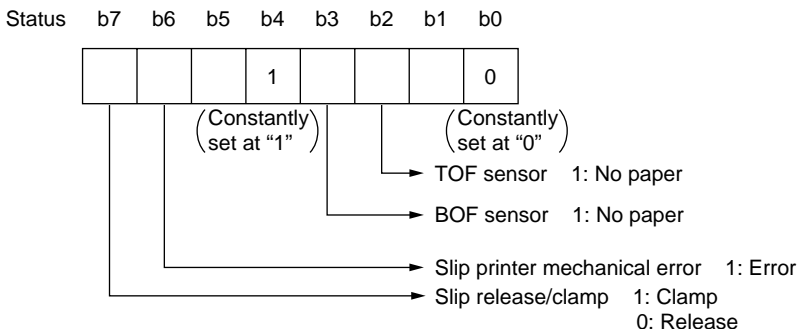
HEX

04

FUNCTION

Slip status enquiry

Sends slip printer status information to the host computer.



Status b1 and b5 is variable.

CODE	<ESC>		<i>n</i>	<i>m</i>	<LF>	<NUL>
HEX	1B	19	<i>n</i>	<i>m</i>	0A	00

FUNCTION

Sets the wait time until the automatic clamp is activated
 Sets the wait time between paper insertion (TOF/BOF sensor senses the paper) and automatic clamp activation by $n \times 0.1$ sec.
 The default value of n is 7 (wait time is 0.7 sec.)
 The value of m is fixed to 0.

Page Mode

CODE	<ESC>	" <i>n</i> "
HEX	1B	6E

FUNCTION

Selects page mode
 Switches from line mode (default) to page mode.
 This code is only valid when it is entered at the beginning of the line. The page mode is suitable even though data is printed in the rotational direction specified by <ESC> "T" n and in the page coordinate range specified by <ESC> "*" $\bullet\bullet$, and though paper with a horizontal length of a check, etc. is rotated 90 or 270 and printing is carried out in all modes.
 In page mode, since OR is applied to the data in the print area, characters and bit images can be printed overlapping each other and each character can be rotated and oriented independently.
 In page mode, if printing data and a command such as <CR> or <LF> are sent in the same way as in line mode, there is an automatic rotation to the printer side.
 All printing of data in the print area is performed according to <LF>. After printing according to <FF>, the printer returns to line mode. In addition, if <ESC> "!", <ESC> "@" or <CAN> are specified, printing is not performed and the printer leaves page mode and returns to line mode.
 While returning to line mode, the data in the printer buffer, the area coordinates and the rotation directions are all cleared.

The following restrictions exist in page mode.

- 1) In page mode, half-dot characters cannot be printed since printing is carried out in normal dot units.
 When entering page mode, the ANK font is automatically set to a 5×9 (2 pulses = 1 dot) font.
 Since the 7×9 font and 5×9 (3 pulses = 1 dot) font commands cannot be executed in page mode, they are executed after the printer returns to line mode.
 When the spacing between characters is an odd value, one half-dot is truncated.

Also, when characters are enlarged vertically, the top of the characters may not be printed on the first line of the page and the characters on the second line or lower lines may overlap the characters above them. This is because the characters are enlarged from their baseline.

Because of this, when vertically enlarged characters are contained in a line the print area must be secured so that the vertically extended characters can fit. This is done by adding an additional <LF> at the beginning of the print data line.

2) Paper feed command

In paper mode, the paper feed command and carriage return are executed in units of dots. A 1/72-inch (0.353-mm) paper feed is considered 1 dot. Since a 1-dot pitch in the horizontal direction is 0.30 mm and a 1-dot pitch in the vertical direction is 0.353 mm, the paper amount that is fed while printing using a 90 or 270 rotation is less when compared with a 0 or 150 rotation. As a result, when printing using a 90 or 270 rotation, execute a test print, check the horizontal and vertical dot alignment, then adjust the alignment as necessary.

3) The following commands are not executed in page mode, but are stored and executed when the printer returns to line mode.

Select 7 × 9 (half dot) font	<ESC> "M"
Select 5 × 9 (3 pulses = 1 dot) font	<ESC> ":",
Inverted printing/Cancel inverted printing	<SI>/<DC2>
Select highlight printing/Cancel highlight printing	<ESC> "4"/<ESC> "5"
Underlining	<ESC> "- " n
Upperlining	<ESC> "_ " n
Select print direction	<ESC> "U" n
Select emphasized printing/Cancel emphasized printing	<ESC> "E"/<ESC> "F"
Select left margin	<ESC> "I" n
Select right margin	<ESC> "Q" n
Specifies rotated print mode for text with a 90°/270° rotation	<ESC> <RS> "i" n

4) The following commands are ignored in page mode.

One time backfeed	<ESC> "j" n
Print high density graphics	<ESC> "L" ...
Slip function	<ESC> <FF> n

CODE

<ESC> “!”

HEX

1B 21

FUNCTION

Select line mode (default)

If this command is specified while in page mode, printing is not carried out and the printer returns to line mode.

CODE

<ESC> “*” XL XH YL YH dXL dXH dYL dYH

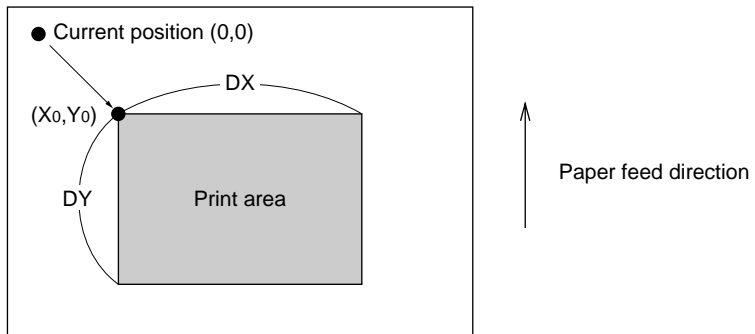
HEX

1B 2A XL XH YL YH dXL dXH dYL dYH

FUNCTION

Setting print area in page mode

The coordinates of the current position at the moment that page mode is entered are (0,0). The starting point of the print area is defined by XL, XH, YL and YH. In addition, the length DX in the X direction is specified by dXL and dXH, and the length DY in the Y direction is specified by dYL and dYH.



Starting point $X_0 = XL + (XH \times 256)$ dots

Starting point $Y_0 = YL + (YH \times 256)$ dots

Length in horizontal direction $DX = dXL + (dXH \times 256)$ dots

Length in vertical direction $DY = dYL + (dYH \times 256)$ dots

The values of XL, YL, dXL and dYL are between 0 and 255, and the values of XH, YH, dXH and dYH are between 0 and 1.

However, $dXL = dXH = 0$ and $dYL = dYH = 0$ are not included.

In addition, since the maximum range in the X direction ($X_0 + DX$) is 210 dots and the maximum range in the Y direction ($Y_0 + DY$) is 720 dots, each parameter should be specified to satisfy these ranges. When the power is turned on, $XL = XH = YL = YH = 0$ ($X_0, Y_0 = 0, 0$)

$dXL = 210, dXH = 0$ ($DX = 210$) and
 $dYL = 64, dYH = 2$ ($DY = 576$).

This command is stored, even in line mode, and the position at the time that page mode is entered is used as the standard point (0,0). Since the bottom of the character is used as the baseline, a minimum print area of 8 dots are necessary in the character height direction to print data in the page. (When printing a magnified character height, the paper must be fed before printing.)

CODE	<ESC>	“T”	<i>n</i>
HEX	1B	54	<i>n</i>

FUNCTION

Setting print direction in page mode

Sets the direction in which the printing will be executed in page mode according to the value of *n*.

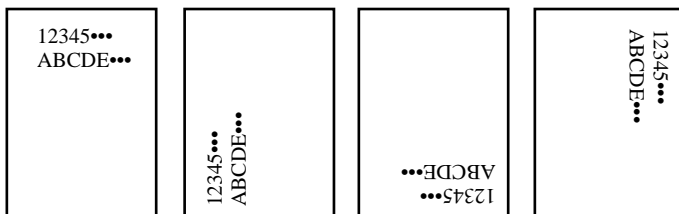
This command is only valid in line mode.

Value of <i>n</i>	Mode
0 or “0”	0 rotation mode (uni-directional printing)
1 or “1”	270 rotation mode (uni-directional printing)
2 or “2”	180 rotation mode (uni-directional printing)
3 or “3”	90 rotation mode (uni-directional printing)
4 or “4”	270 rotation mode (bi-directional printing)

The default value of *n* is 0.

<Rotation direction examples>

<i>n</i> = 0	<i>n</i> = 1 or 4	<i>n</i> = 2	<i>n</i> = 3
0° rotation	270° rotation	180° rotation	90° rotation



<N=4,“4”>: Check high-speed printing mode>

This parameter is only valid when no character data is expanded into the page area, and this command is added immediately after <ESC>“n”.

Also, once the check high-speed printing mode has been entered with <ESC>“T”4, it is not possible to move across to a different rotation mode (<ESC>“T”0-3) until the page mode has been exited.

The check high-speed printing mode provides high-speed printing with the check at a 270 degree rotation angle and bi-directional printing, and a wide range of limitations have been included to enable bi-directional printing.

This mode can only be used with printing data that uses a 5 X 9 (2P-1) font without decorations.

The limitations are listed below. The quality of the printed product cannot be guaranteed if these limitations are removed and the unit used.

[Limitations on the check high-speed printing mode]

- The only characters that can be printed are the 5 X 9 (2P-1) font ANK characters.
 - The double-sized width command cannot be used (the double-sized height command may be used.)
 - The bit image command cannot be used.
 - Horizontal tabs cannot be used.
 - The space setting command for the space between characters cannot be used.
 - The following limitations apply for the Y direction in the printing area (value set with <ESC>“*”...)
- ① As $T_0=0$ has been fixed as the starting point for the printing area, the printing area command set with <ESC>“*”.... Must be specified with $Y_0=Y_L=Y_H=0$. (It will forcibly set at 0 if it is at any other setting.)
 - ② The value of D_y must be a six-fold value.
As bi-directional printing in 6-pin units will be performed in this mode, there are cases where the characters that have been entered in a misaligned state will be printed in a wave-like style and will not be able to be distinguished when the value of D_y is anything other than a six-fold value as a joint will be established within a single character for return printing.
Consequently, setting anything other than the six-fold value must not be carried out. However, the printer will discard any remainders from dividing by six and automatically correct it into six-fold when any value other than six-fold has been set.

CODE

<FF>

HEX

0C

FUNCTION

Print in page mode (only valid when in page mode)

In page mode, all page data in the page area is printed, then the printer returns to line mode. After all the page data is printed, the data in the page, the page print area and the print direction are all initialized.

In addition, this command has no function in line mode.

Other Commands

CODE <CAN>

HEX 18

FUNCTION Cancels printer buffer & Initialize printer
 Clears the line buffer, and initializes the commands set already.
 Does not affect the external equipment drive conditions set by the code <ESC> <BEL> *n1 n2*. (This is the same during a mechanical error.)
 (Line buffer means the print data expansion area.)
 If <CAN> is specified in page mode while printing using the slip printer, printing is not carried out and the printer returns to line mode from page mode.
 In addition, <CAN> initializes the print station selection. If the slip printer was selected, the receipt printer will be re-selected.
 This command cannot recover from errors or return to the on-line status from off-line.

CODE <DC3>

HEX 13

FUNCTION Deselects printer
 Deselects the printer. The printer disregards all subsequent characters and commands except <DC1>, which activates the printer.

CODE <DC1>

HEX 11

FUNCTION Sets select mode
 When the printer receives a <DC1> code, the deselect mode is canceled and data following this code is input to the buffer.

CODE <RS>

HEX 1E

FUNCTION Beeps the buzzer
 Sounds a brief beep tone.

CODE

<ESC> “# N , n1n2n3n4” <LF> <NUL>

HEX

1B 23 N 2C n1n2n3n4 0A 00

FUNCTION

Sets the memory switch. In order to enable changed memory switch setting, turn the printer OFF and ON again or send printer reset command (<ESC> “?”<LF><NUL>”) to the printer. Changed memory switch settings are stored in EEPROM and these setting will be stored as long as the time when they are changed again.

N :Memory switch number (“0”, “1”, “2”, “3”, “4”, “5”)

n1n2n3n4 :Mode settings (For details see below)

1) N=0

n1 :Always “0”

n2 :Always “0”

n3 :Always “0”

n4 :Always “0”

2) N=1 (Star mode only)

n1 :Always “0”

n2 :Always “0”

(Default)

Parameter	Setting	“0”	“1”
n3	Zero style	Normal zero	Slashed zero
n4	International character set	See below	

n4	Country
“0”	USA
“1”	France
“2”	Germany

n4	Country
“3”	UK
“4”	Denmark #1
“5”	Sweden

n4	Country
“6”	Italy
“7”	Spain #1
“8”	Japan

n4	Country
“9”	Norway
“A”	Denmark #2
“B”	Spain #2

n4	Country
“C”	Latin America

3) N=2

n1 :Always "0"
 n2 :Always "0"
 n3 :Always "0"
 n4 :Always "0"

4) N=3 (Star mode only)

n1 :Always "0"
 n3 :Always "0"

(Default)

Parameter	Setting	"0"	"1"	"2"	"3"
n2	Character table	See below			
n4	CR code	Invalid	Invalid	Valid	Valid

n2	Character table	n2	Character table	n2	Character table
"0"	Normal	"4"	Code page 858	"8"	Code page 863
"1"	Katakana	"5"	Code page 852	"9"	Code page 865
"2"	IBM (Code page 437)	"6"	Code page 860	"A"	Code page 866
"3"	IBM (Code page 437)	"7"	Code page 861		

5) N=4 (Star mode)

n3 :Always "0"
 n4 :Always "0"

(Default)

Parameter	Setting	"0"	"1"	"2"	"3"
n1	X on/X off Timing	When Toggled	every 3 sec	When Toggled	every 3 sec
	RTS Signal Condition	Save as DTR	Save as DTR	always SPACE	always SPACE
n2	Receive buffer size	2k bytes	2k bytes	35 bytes	35 bytes

N=4 (ESC/POS mode)

n1 :Always "0"

(Default)

Parameter	Setting	"0"	"1"	"2"	"3"
n2	Receive buffer size	512 bytes (TM-295) 2k bytes (TM-290)	512 bytes (TM-295) 2k bytes (TM-290)	35 bytes	35 bytes
n3	DSR signal check during setting status transmission	Checked	Checked	Not checked	Not checked
n4	Data receipt error	"?" printed	Ignored	"?" printed	Ignored

- 6) N=5 (Star mode)
 n1 :Always “0”
 n3 :Always “0”

(Default)

Parameter	Setting	“0”	“1”	“2”	“3”
n2	When slip printer <CR> code is valid	Print + line feed (CRLF)	print (CR)	Print + line feed (CRLF)	print (CR)
n4	Initial status of the TOF/BOF sensor	Valid	Valid	Valid	Valid
	Slip printer automatic clamp	Valid	Valid	Invalid	Invalid
	Slip printer automatic starting print positioning	Valid	Invalid	Valid	Invalid

Parameter	Setting	“4”	“5”	“6”	“7”
n2	When slip printer <CR> code is valid	Print + line feed (CRLF)	print (CR)	Print + line feed (CRLF)	print (CR)
n4	Initial status of the TOF/BOF sensor	Invalid	Invalid	Invalid	Invalid
	Slip printer automatic clamp	Valid	Valid	Invalid	Invalid
	Slip printer automatic starting print positioning	Valid	Invalid	Valid	Invalid

- N=5 (ESC/POS mode)
 n2 :Always “0”
 n3 :Always “0”

Parameter	Setting	“0”	“1”	“2”	“3”
n1	<ESC> “q” command	See below			
n4	Initial status of the TOF/BOF sensor	Invalid	Invalid	Invalid	Invalid
	Slip printer automatic clamp	Valid	Valid	Invalid	Invalid
	Slip printer automatic starting print positioning	Valid	Invalid	Valid	Invalid

Parameter	Setting	“4”	“5”	“6”	“7”
n1	<ESC> “q” command	See below			
n4	Initial status of the TOF/BOF sensor	Valid	Valid	Valid	Valid
	Slip printer automatic clamp	Valid	Valid	Invalid	Invalid
	Slip printer automatic starting print positioning	Valid	Invalid	Valid	Invalid

n1	<ESC>"q" command function
"0"	Executes release
"1"	Executes release
"2"	Executes release after the paper has been completely released in the forward direction
"3"	Executes release after the paper has been completely released in the reverse direction

CODE

<ESC> "@

HEX

1B 40

FUNCTION

Initializes printer

Reinitializes the printer. Clears the print buffer and returns settings to their power-up values.

Does not clear the input buffer, downloaded characters, or conditions for peripheral devices.

If this command is specified in page mode while printing using the slip printer, printing is not carried out and the printer returns to line mode from page mode.

This command cannot recover from errors or return to the on-line status from off-line.

CODE

<ENQ>

HEX

05

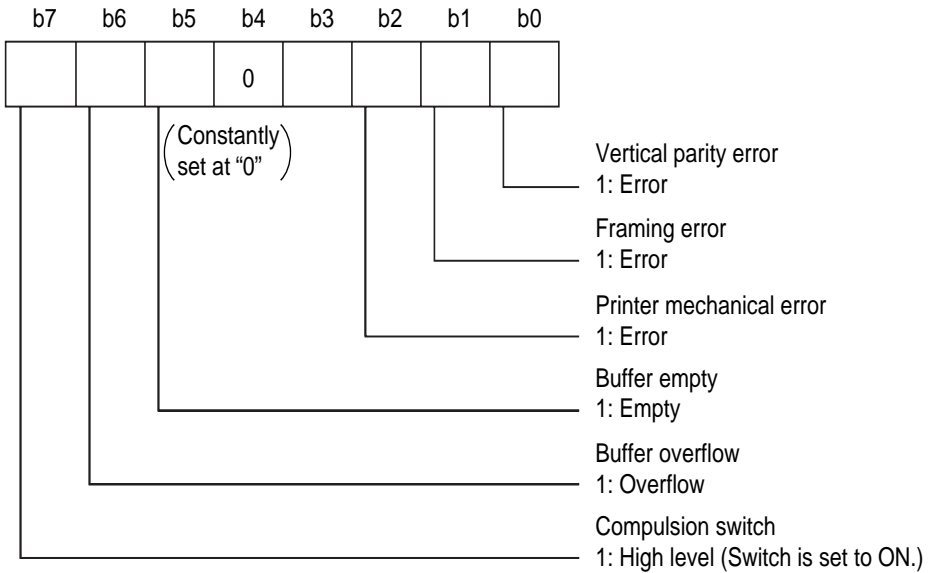
FUNCTION

Enquiry

Causes the printer to transmit a status byte.

Status byte

Status



Status b3 is variable.

CODE	<ESC>	“?”	<LF>	<NUL>
HEX	1B	3F	0A	00

FUNCTION

Resets the printer hardware.

Resets the printer hardware and produces a test print

TM-295 mode emulation cautionary items

Since, as shown below, the paper feed pitch, dot pitch and the installation distances between the TOF/BOF sensors and the print head differ depending on the mechanism of the SP298 and TM-295, the printing results may not be the same because of the differences in the mechanism. Also, even though, since the TM-295 is a shuttle printer, the paper feed set values and actual paper feed amount are different.

Difference	SP298	TM-295
Difference in the paper feed motor pitch	1/144 inch units	1/60 inch units
Difference in the vertical direction dot pitch	0.353mm	0.423mm
Difference in the horizontal direction dot pitch	0.30mm	0.315mm
Difference in the distance from the top of the paper to the top of the print head	26.5mm (When automatically feeding)	26.5mm ~ 36.5mm Variable with mechanical stopper
Difference in the distance from the TOF sensor to the top of the print head	26.0mm	3.0mm ~ 13.0mm Variable with mechanical stopper
Difference in the distance from the BOF sensor to the bottom of the print head	38.1mm	27.3mm

<Influence and command differences due to differences in paper feed motor pitch and horizontal/vertical dot pitch>

Since the pitches are different, the printing results are reduced in the vertical/horizontal direction compared to the TM-295. Especially in the page mode, since the coordinates are controlled in dots, the printing results are reduced. (There is a difference of $n/60$ " dots - $n/72$ " dots in the Y direction.)

In the case of the line mode, since the difference in the paper feed pitch is absorbed as much as possible, the commands which are connected with the $n/60$ inch unit paper feed (<ESC> "3" n , <ESC> "J" n , <ESC> "K" n) use $\text{INT}((6n/5)+0.5)$.

However, since even in this case, depending on the value of n , the paper feed amount may not be exactly the same, the vertical direction printing position may be different.

<Influence due to the difference in the TOF and BOF sensor positions>

The paper position when the condition of the TOF or BOF sensor changes due to the status is different to that of the TM-295.

Since the position of the BOF sensor is especially different, whereas the BOF sensor reports “no paper” at 27.3mm from the bottom of the paper with the TM-295, the BOF sensor reports “no paper” at approximately 38mm from the bottom of the paper with the SP298. Therefore, when the BOF “no paper” sensor is effective, the BOF sensor “no paper” is reported quicker than with the TM-295 and it may not be possible to print in the same position at the bottom of the same form.

For this reason, by controlling the printing so that it does not stop until approximately 27.3mm from the bottom of the paper even if the paper has passed the BOF sensor at the 38.1mm position, this difference is compensated. However, due to the differences in the paper feed pitch (star = $n/72$ ”, TM-295 = $n/60$ ”), the emulation is not perfect.

<Influence due to mechanical stopper position>

With the TM-295, by adjusting the mechanical stopper position, the paper top position can be changed between 0 to 10mm. However, since the mechanical stopper position is fixed with the SP298, if the TM-295 mechanical stopper position is changed and the printing results are compared, they may be different.

Appendix : Character Code Tables

Star Mode

(Character table: Normal)

Hexa-decimal	0	1	2	3	4	5	6	7
0	<NUL> 0		SP 16	0 32	@ 48	P 64	` 80	p 96
1		<DC1> 1	! 17	1 33	A 49	Q 65	a 81	q 97
2		<DC2> 2	" 18	2 34	B 50	R 66	b 82	r 98
3		<DC3> 3	# 19	3 35	C 51	S 67	c 83	s 99
4		<DC4> 4	\$ 20	4 36	D 52	T 68	d 84	t 100
5	<ENQ> 5		% 21	5 37	E 53	U 69	e 85	u 101
6			& 22	6 38	F 54	V 70	f 86	v 102
7	<BEL> 7		' 23	7 39	G 55	W 71	g 87	w 103
8		<CAN> 8	(24	8 40	H 56	X 72	h 88	x 104
9	<HT> 9	 25) 41	9 57	I 73	Y 89	i 105	y 121
A	<LF> 10	<SUB> 26	* 42	: 58	J 74	Z 90	j 106	z 122
B	<VT> 11	<ESC> 27	+ 43	; 59	K 75	[91	k 107	{ 123
C	<FF> 12	<FS> 28	, 44	< 60	L 76	\ 92	l 108	! 124
D	<CR> 13	<GS> 29	- 45	= 61	M 77	] 93	m 109	} 125
E	<SO> 14	<RS> 30	. 46	> 62	N 78	^ 94	n 110	~ 126
F	<SI> 15		/ 31	? 47	O 63	- 79	o 95	⊗ 111
								127

Note: The (7F)H code is a space when neither normal nor katakana.

Star Mode

(Character table: Normal)

Hexa- decimal	8	9	A	B	C	D	E	F
0	┌ 128	└ 144	Ä 160	é 176	ù 192	ā 208	┆ 224	┆ 240
1	┆ 129	┆ 145	Ö 161	è 177	ū 193	â 209	┆ 225	┆ 241
2	┆ 130	· 146	Ü 162	ē 178	û 194	° 210	┆ 226	┆ 242
3	┆ 131	· 147	ß 163	ê 179	ç 195	°C 211	┆ 227	┆ 243
4	┆ 132	· 148	š 164	ï 180	ı 196	°F 212	┆ 228	┆ 244
5	┆ 133	· 149	ā 165	í 181	ñ 197	Ω 213	┆ 229	┆ 245
6	┆ 134	/ 150	ō 166	ì 182	ņ 198	μ 214	┆ 230	┆ 246
7	┆ 135	\ 151	ƒ 167	ī 183	ē 199	Σ 215	┆ 231	· 247
8	┆ 136	◀ 152	ç 168	î 184	ó 200	σ 216	■ 232	· 248
9	┆ 137	▶ 153	½ 169	ö 185	ı 201	ā 217	■ 233	▶ 249
A	┆ 138	┆ 154	ₙ 170	ó 186	Å 202	TL 218	┆ 234	▶ 250
B	┆ 139	┆ 155	ₓ 171	ò 187	φ 203	X 219	← 235	= 251
C	┆ 140	┆ 156	¥ 172	ō 188	θ 204	∞ 220	↑ 236	|| 252
D	┆ 141	┆ 157	¼ 173	ô 189	ä 205	± 221	→ 237	┆ 253
E	┆ 142	· 158	Ā 174	ü 190	á 206	÷ 222	↓ 238	┆ 254
F	┆ 143	x 159	ë 175	ú 191	à 207	π 223	┆ 239	┆ 255

Star Mode

(Character table: katakana)

Hexa- decimal	8	9	A	B	C	D	E	F
0		┌		ー	タ	ミ	┐	└
	128	144	160	176	192	208	224	240
1	┌	┐	。	ア	チ	ム	━	━
	129	145	161	177	193	209	225	241
2	━	・	┌	イ	ツ	メ	━	━
	130	146	162	178	194	210	226	242
3	┌	・	┐	ウ	テ	モ	┌	━
	131	147	163	179	195	211	227	243
4	━	・	、	エ	ト	ヤ	└	┌
	132	148	164	180	196	212	228	244
5	┌	・	・	オ	ナ	ユ	┐	┌
	133	149	165	181	197	213	229	245
6	━	／	ヲ	カ	ニ	ヨ	┌	┌
	134	150	166	182	198	214	230	246
7	┌	＼	ア	キ	ヌ	ラ	┐	・
	135	151	167	183	199	215	231	247
8	━	▼	イ	ク	ネ	リ	■	・
	136	152	168	184	200	216	232	248
9	┌	▼	ウ	ケ	ノ	ル	■	▲
	137	153	169	185	201	217	233	249
A	━	┐	エ	コ	ハ	レ	└	▲
	138	154	170	186	202	218	234	250
B	┌	└	オ	サ	ヒ	ロ	←	=
	139	155	171	187	203	219	235	251
C	└	└	ヤ	シ	フ	ワ	↑	||
	140	156	172	188	204	220	236	252
D	━	・	ユ	ス	ヘ	ン	→	┐
	141	157	173	189	205	221	237	253
E	┌	・	ヨ	セ	ホ	・	↓	┐
	142	158	174	190	206	222	238	254
F	┐	×	ツ	ソ	マ	。	┐	┐
	143	159	175	191	207	223	239	255

Note: Other characters are the same as those for Character table: Normal.

Star Mode

(Character table: IBM (Code page 437))

Hexa- decimal	8	9	A	B	C	D	E	F
0	Ç 128	É 144	á 160	⋮ 176	Ł 192	⋈ 208	α 224	≡ 240
1	ü 129	æ 145	í 161	⋮ 177	⊥ 193	⌣ 209	β 225	± 241
2	é 130	Æ 146	ó 162	⋮ 178	⌣ 194	π 210	Γ 226	≥ 242
3	â 131	ô 147	ú 163	| 179	⌣ 195	⋈ 211	π 227	≤ 243
4	ä 132	ö 148	ñ 164	| 180	- 196	ƒ 212	Σ 228	∫ 244
5	à 133	ò 149	Ñ 165	ƒ 181	† 197	ƒ 213	σ 229	J 245
6	á 134	ú 150	á 166	|| 182	ƒ 198	π 214	μ 230	÷ 246
7	ç 135	ù 151	ó 167	π 183	|| 199	⋈ 215	τ 231	≈ 247
8	ê 136	ÿ 152	ı 168	ƒ 184	⋈ 200	⋈ 216	Φ 232	° 248
9	ë 137	Ö 153	┌ 169	|| 185	ƒ 201	┌ 217	Θ 233	· 249
A	è 138	Ü 154	┐ 170	|| 186	⋈ 202	┌ 218	Ω 234	- 250
B	ï 139	Ç 155	½ 171	π 187	⌣ 203	■ 219	δ 235	√ 251
C	î 140	£ 156	¼ 172	⋈ 188	|| 204	■ 220	∞ 236	∩ 252
D	ì 141	¥ 157	ı 173	⋈ 189	= 205	| 221	φ 237	² 253
E	Ä 142	Ɔ 158	« 174	ƒ 190	⋈ 206	| 222	ε 238	¡ 254
F	Å 143	f 159	» 175	┌ 191	⋈ 207	■ 223	∩ 239	255

Note: Other characters are the same as those for Character table: Normal

Star Mode

Code Page #858

Multi-lingual

	8	9	A	B	C	D	E	F
0	Ç	É	á	█	L	ö	ó	-
1	ü	æ	í	█	±	Ð	β	±
2	é	Æ	ó	█	τ	È	Ò	=
3	â	ô	ú	|	†	È	Ò	≠
4	ä	ö	ñ	†	-	È	ö	¶
5	à	ò	Ñ	A	±	€	Ö	§
6	â	û	æ	À	ä	í	μ	÷
7	ç	ù	ø	À	Ä	í	þ	°
8	ê	ý	¿	©	È	Ï	Ð	°
9	ë	ö	®	¶	¶	Ï	Û	°
A	è	Û	¬	¶	¶	Ï	Û	°
B	ï	ø	½	¶	¶	█	Û	°
C	î	£	¼	¶	¶	█	ý	°
D	ì	Ø	;	¶	=	;	ÿ	°
E	Ë	×	«	¶	¶	Ï	ÿ	°
F	À	f	»	¶	¶	█	'	

Code Page #852

Latin-2

	8	9	A	B	C	D	E	F
0	Ç	É	á	█	L	đ	Ó	-
1	ü	Ł	í	█	±	Ð	β	"
2	é	Í	ó	█	τ	Ð	Ò	˘
3	â	ô	ú	|	†	È	Ñ	˘
4	ä	ö	À	†	-	đ	ń	˘
5	û	Ł	ą	A	±	Ñ	ń	§
6	ć	ı	Z	À	Ä	ı	S	÷
7	ç	S	z	E	ä	ı	š	,
8	ı	ś	Ę	S	Ł	ë	Ŕ	°
9	ë	Ŕ	e	¶	¶	Ï	Û	°
A	Ö	Ů	e	¶	¶	Ï	Û	°
B	ő	T	z	¶	¶	█	Ů	ú
C	ı	č	Č	¶	¶	█	ý	Ŕ
D	Z	Ł	s	Z	=	T	Ÿ	ř
E	À	×	«	z	¶	Û	t	█
F	Č	č	»	¶	¶	█	'	

Code Page #860

Portuguese

	8	9	A	B	C	D	E	F
0	Ç	É	á	█	L	μ	α	≡
1	ü	À	í	█	±	τ	β	±
2	é	È	ó	█	τ	π	Γ	≥
3	â	ô	ú	|	†	μ	π	≤
4	ä	ö	ñ	†	-	ε	Σ	∫
5	à	ò	Ñ	†	±	F	σ	J
6	À	Ú	æ	¶	¶	π	μ	÷
7	ç	ù	ø	¶	¶	¶	τ	≈
8	ê	ÿ	¿	¶	¶	¶	Φ	°
9	ë	Ö	ð	¶	¶	¶	Θ	°
A	è	Û	¬	¶	¶	¶	Ω	°
B	ı	ç	½	¶	¶	█	δ	√
C	ó	£	¼	¶	¶	█	∞	n
D	ì	Ø	;	¶	=	█	∅	2
E	Ë	£	«	¶	¶	█	ε	█
F	À	ó	»	¶	¶	█	∩	

Code Page #861

Icelandic

	8	9	A	B	C	D	E	F
0	Ç	É	á	█	L	μ	α	≡
1	ü	æ	í	█	±	τ	β	±
2	é	Æ	ó	█	τ	π	Γ	≥
3	â	ô	ú	|	†	μ	π	≤
4	ä	ö	A	†	-	ε	Σ	∫
5	à	þ	I	†	±	F	σ	J
6	â	û	U	¶	¶	π	μ	÷
7	ç	Y	U	¶	¶	¶	τ	≈
8	ê	ý	¿	¶	¶	¶	Φ	°
9	ë	Ö	ð	¶	¶	¶	Θ	°
A	è	Û	¬	¶	¶	¶	Ω	°
B	Ð	ø	½	¶	¶	█	δ	√
C	ð	£	¼	¶	¶	█	∞	n
D	Ð	Ø	;	¶	=	█	∅	2
E	À	£	«	¶	¶	█	ε	█
F	À	f	»	¶	¶	█	∩	

Note: Other characters are the same as those for Character table: Normal

Code Page #863 Canadian French

	8	9	A	B	C	D	E	F
0	Ç	É	Í	⋮	Ł	Ш	α	≡
1	ü	È	´	⋮	⊥	⊥	β	±
2	é	È	ó	⋮	⊥	Π	Γ	≥
3	â	ô	ú	|	⊥	Π	π	≤
4	À	È	¨	⊥	⊥	Σ	∫	∫
5	à	Ï	ˆ	⊥	⊥	∫	σ	∫
6	¶	û	ˆ	⊥	⊥	∫	μ	÷
7	ç	ù	ˆ	⊥	⊥	∫	τ	≈
8	ê	è	î	⊥	⊥	∫	Φ	°
9	ë	ô	ı	⊥	⊥	∫	Θ	•
A	è	Û	ı	⊥	⊥	∫	Ω	•
B	ï	φ	¼	⊥	⊥	■	δ	√
C	î	£	¼	⊥	⊥	■	∞	n
D	=	Û	¼	⊥	=	■	∅	z
E	À	Û	«	⊥	⊥	■	ε	■
F	Š	f	»	⊥	⊥	■	∩	

Code Page #865 Nordic

	8	9	A	B	C	D	E	F
0	Ç	É	á	⋮	Ł	Ш	α	≡
1	ü	æ	í	⋮	⊥	⊥	β	±
2	é	Æ	ó	⋮	⊥	Π	Γ	≥
3	â	ô	ú	|	⊥	Π	π	≤
4	ä	ö	ñ	⊥	⊥	Σ	∫	∫
5	à	ò	Ñ	⊥	⊥	∫	σ	∫
6	ä	û	ˆ	⊥	⊥	∫	μ	÷
7	ç	ù	ˆ	⊥	⊥	∫	τ	≈
8	ë	ÿ	ˆ	⊥	⊥	∫	Φ	°
9	ë	ö	ı	⊥	⊥	∫	Θ	•
A	è	Û	ı	⊥	⊥	∫	Ω	•
B	ï	ø	¼	⊥	⊥	■	δ	√
C	î	£	¼	⊥	⊥	■	∞	n
D	i	Ø	i	⊥	=	■	∅	z
E	À	Û	«	⊥	⊥	■	ε	■
F	À	f	»	⊥	⊥	■	∩	

Code Page #866 Russian

	8	9	A	B	C	D	E	F
0	А	Р	а	⋮	Ł	Ш	р	È
1	Б	С	б	⋮	⊥	⊥	с	è
2	В	Т	в	⋮	⊥	Π	т	€
3	Г	У	г	|	⊥	Π	у	€
4	Д	Ф	д	⊥	⊥	∫	ф	ÿ
5	Е	Х	е	⊥	⊥	∫	х	ÿ
6	Ж	Ц	ж	⊥	⊥	∫	ц	ÿ
7	З	Ч	з	⊥	⊥	∫	ч	ÿ
8	И	Ш	и	⊥	⊥	∫	ш	°
9	Й	Щ	й	⊥	⊥	∫	щ	•
A	К	Ъ	к	⊥	⊥	∫	ъ	•
B	Л	Ы	л	⊥	⊥	■	ы	√
C	М	Ь	м	⊥	⊥	■	ь	№
D	Н	Э	н	⊥	=	■	э	¤
E	О	Ю	о	⊥	⊥	■	ю	¤
F	П	Я	п	⊥	⊥	■	я	

Note: Other characters are the same as those for Character table: Normal

Star Mode**International Character Set**

	35	36	64	91	92	93	94	96	123	124	125	126
U. S. A.	#	\$	@	[	\	\]	^	`	{	|	}	~
France	#	\$	à	°	ç	§	^	`	é	ù	è	¨
Germany	#	\$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
England	£	\$	@	[	\	\]	^	`	{	|	}	~
Denmark 1	#	\$	@	Æ	Ø	Å	^	`	æ	ø	å	~
Sweden	#	α	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
Italy	#	\$	@	°	\	é	^	ù	à	ò	è	ì
Spain 1	Rs	\$	@	ı	Ñ	ı	^	'	¨	ñ	}	~
Japan	#	\$	@	[	¥	]	^	`	{	|	}	~
Norway	#	α	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
Denmark 2	#	\$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
Spain 2	#	\$	á	ı	Ñ	ı	é	'	ı	ñ	ó	ú
Latin America	#	\$	á	ı	Ñ	ı	é	ü	ı	ñ	ó	ú

ESC/POS Mode

Page 0 (PC437)

Hexa- decimal	0	1	2	3	4	5	6	7
0	<NUL> 0	<DLE> 16	SP 32	0 48	@ 64	P 80	` 96	p 112
1	1	<XON> 17	! 33	1 49	A 65	Q 81	a 97	q 113
2	2	18	" 34	2 50	B 66	R 82	b 98	r 114
3	3	<XOFF> 19	# 35	3 51	C 67	S 83	c 99	s 115
4	<EOT> 4	20	\$ 36	4 52	D 68	T 84	d 100	t 116
5	<ENQ> 5	21	% 37	5 53	E 69	U 85	e 101	u 117
6	6	22	& 38	6 54	F 70	V 86	f 102	v 118
7	7	23	' 39	7 55	G 71	W 87	g 103	w 119
8	8	<CAN> 24	(40	8 56	H 72	X 88	h 104	x 120
9	<HT> 9	25	) 41	9 57	I 73	Y 89	i 105	y 121
A	<LF> 10	26	* 42	: 58	J 74	Z 90	j 106	z 122
B	11	<ESC> 27	+ 43	; 59	K 75	[91	k 107	{ 123
C	<FF> 12	28	, 44	< 60	L 76	\ 92	l 108	! 124
D	13	<GS> 29	- 45	= 61	M 77	] 93	m 109	} 125
E	14	30	. 46	> 62	N 78	^ 94	n 110	~ 126
F	15	31	/ 47	? 63	O 79	_ 95	o 111	SP 127

ESC/POS Mode

Page 0 (PC437)

Hexa- decimal	8	9	A	B	C	D	E	F
0	Ç 128	É 144	á 160	⋮ 176	Ⓕ 192	Ⓖ 208	α 224	≡ 240
1	ü 129	æ 145	í 161	⋮ 177	Ⓖ 193	Ⓗ 209	β 225	± 241
2	é 130	Æ 146	ó 162	⋮ 178	Ⓗ 194	π 210	Γ 226	≥ 242
3	â 131	ô 147	ú 163	| 179	Ⓗ 195	Ⓖ 211	π 227	≤ 243
4	ä 132	ö 148	ñ 164	Ⓗ 180	- 196	Ⓗ 212	Σ 228	∫ 244
5	à 133	ò 149	Ñ 165	Ⓗ 181	Ⓗ 197	Ⓗ 213	σ 229	∫ 245
6	á 134	û 150	ä 166	Ⓗ 182	Ⓗ 198	π 214	μ 230	÷ 246
7	ç 135	ù 151	o 167	π 183	Ⓗ 199	Ⓗ 215	τ 231	≈ 247
8	ê 136	ÿ 152	ı 168	Ⓗ 184	Ⓗ 200	Ⓗ 216	Φ 232	° 248
9	ë 137	Ö 153	Ⓗ 169	Ⓗ 185	Ⓗ 201	Ⓗ 217	Θ 233	• 249
A	è 138	Ü 154	Ⓗ 170	Ⓗ 186	Ⓗ 202	Ⓗ 218	Ω 234	· 250
B	ï 139	Ç 155	½ 171	Ⓗ 187	Ⓗ 203	■ 219	δ 235	√ 251
C	î 140	£ 156	¼ 172	Ⓗ 188	Ⓗ 204	■ 220	∞ 236	ⁿ 252
D	ì 141	¥ 157	ı 173	Ⓗ 189	= 205	| 221	φ 237	² 253
E	Ä 142	Ⓗ 158	« 174	Ⓗ 190	Ⓗ 206	| 222	ε 238	▪ 254
F	Å 143	f 159	» 175	Ⓗ 191	Ⓗ 207	■ 223	∩ 239	SP 255

ESC/POS Mode

Page 1 (Katakana)

Hexa-decimal	8	9	A	B	C	D	E	F
0	128	144	SP	ー	タ	ミ	=	×
1	129	145	。	ア	チ	ム	フ	円
2	130	146	「	イ	ツ	メ	キ	年
3	131	147	」	ウ	テ	モ	ト	月
4	132	148	、	エ	ト	ヤ	▲	日
5	133	149	・	オ	ナ	ユ	▶	時
6	134	150	ヲ	カ	ニ	ヨ	▼	分
7	135	151	ア	キ	ヌ	ラ	◀	秒
8	136	152	イ	ク	ネ	リ	♠	千
9	137	153	ウ	ケ	ノ	ル	♥	市
A	138	154	エ	コ	ハ	レ	♦	区
B	139	155	オ	サ	ヒ	ロ	♣	町
C	140	156	ヤ	シ	フ	ワ	●	村
D	141	157	ユ	ス	ヘ	ン	○	人
E	142	158	ヨ	セ	ホ	。	/	罫
F	143	159	ツ	ソ	マ	。	\	SP
	143	159	175	191	207	223	239	255

Note: Other characters are the same as those for Page 0.

ESC/POS Mode

Page 2 (PC858: Multilingual)

Hexa- decimal	8	9	A	B	C	D	E	F
0	Ç 128	É 144	á 160	⋮ 176	Ł 192	ǿ 208	α 224	— 240
1	ü 129	æ 145	í 161	⋮ 177	Ł 193	Đ 209	β 225	± 241
2	é 130	Æ 146	ó 162	⋮ 178	Ƨ 194	Ê 210	Ô 226	= 242
3	â 131	ô 147	ú 163	| 179	Ƨ 195	Ë 211	Ò 227	³ / ₄ 243
4	ä 132	ö 148	ñ 164	† 180	- 196	È 212	õ 228	¶ 244
5	à 133	ò 149	Ñ 165	Á 181	+ 197	€ 213	Õ 229	§ 245
6	â 134	û 150	ä 166	Â 182	ã 198	Ï 214	μ 230	÷ 246
7	ç 135	ù 151	o 167	À 183	Ã 199	Î 215	Ɔ 231	ˆ 247
8	ê 136	ÿ 152	ı 168	© 184	Ł 200	İ 216	Ɔ 232	° 248
9	ë 137	Ö 153	® 169	‡ 185	Ƨ 201	Ɔ 217	Ú 233	ˆ 249
A	è 138	Ü 154	¬ 170	|| 186	Ł 202	Ɔ 218	Û 234	ˆ 250
B	ï 139	ø 155	¹ / ₂ 171	¶ 187	Ƨ 203	■ 219	Ù 235	¹ 251
C	î 140	£ 156	¹ / ₄ 172	¶ 188	Ƨ 204	■ 220	Ý 236	³ 252
D	ì 141	Ø 157	i 173	Ç 189	= 205	| 221	Ý 237	² 253
E	Ä 142	× 158	« 174	¥ 190	‡ 206	Ï 222	— 238	■ 254
F	Å 143	f 159	» 175	† 191	Ɔ 207	■ 223	ˆ 239	SP 255

Note: Other characters are the same as those for Page 0.

ESC/POS Mode

International Character Set

	35	36	64	91	92	93	94	96	123	124	125	126
U. S. A.	#	\$	@	[	\	\]	^	`	{	|	}	~
France	#	\$	à	°	ç	§	^	`	é	ù	è	¨
Germany	#	\$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
England	£	\$	@	[	\	\]	^	`	{	|	}	~
Denmark 1	#	\$	@	Æ	Ø	Å	^	`	æ	ø	å	~
Sweden	#	α	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
Italy	#	\$	@	°	\	é	^	ù	à	ò	è	ì
Spain	₪	\$	@	ı	Ñ	ı	^	'	¨	ñ	}	~
Japan	#	\$	@	[¥]	^	`	{		}	~
Norway	#	α	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
Denmark 2	#	\$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü

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Please access the following URL

http://www.star-micronics.co.jp/service/sp_sup_e.htm

for the latest revision of the manual.

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