Using this online developer's guide

The words on the left side of this screen are **bookmarks** for all the topics in this guide.

Use the **scroll bar** next to the bookmarks to find any topic you want. Click a bookmark to instantly jump to its topic. (If you wish, you can increase the size of the bookmark area by dragging the dividing bar to the right.)

Use the **scroll bar** on the right side of this screen to move through the text.

Use the **zoom** tools to magnify or reduce the page display.

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Complete online documentation for Acrobat Reader is located in the Help directory for Acrobat Reader.

developer's guide

TM-H6000/H6000P

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EPSON

English

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Revision Information

Revision	Page	Altered Items and Contents
Rev. A		

About This Manual

Aim of the Manual

This manual was created to provide the information on the TM-H6000 printer for anyone who is developing hardware, installations, or programs. Programmers will also want to consult the "ESC/POS Application programming Guide."

Contents of the Manual

The configuration of the manual is as follows:

Chapter 1, "General Information"	General description of features plus information on such matters as DIP switches, memory switches, error processing, sensors, self tests, and hex dumps.
Chapter 2, "Hardware"	Contains specifications and interface information.
Chapter 3, "ESC/POS Commands"	Contains a list of commands supported by the TM-H6000 printer.
Chapter 4, "Programming Guide and Tips"	Includes programming guide for FAQ and other programming information.
Chapter 5, "Installation, Printer Handling, including MICR and endorsement printing, Removing a Paper Jam"	Gives information on how to install and use the printer. Provides much more information than the User's Manual.
Appendix A, "Character Code Tables"	Provides all the character code tables available for the printer.
Appendix B, "Case Specifications"	Outside dimensions of the printer.
Appendix C, "Maintenance Area"	Shows the area required for access to the printer.
Appendix D, "Definitions"	Definitions of useful terms.

✎ *Note:*
The contents regarding the firmware in this guide are described based on version 1.11 ESC/POS.

Related Software and Documents

Related software and documents

Software/document name	Description
Application Programming Guide	This provides descriptions in Acrobat format of the commands used by each TM printer, along with sample programs and other information about the printers
TM-H6000/H6000P User's Manual	Provides basic handling procedures for the end user of the printer
TM-H6000 Service Manual	Provides information for anyone who is maintaining and repairing the printer

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Safety Precautions

EMC and Safety Standards Applied

Product Name: TM-H6000/TM-H6000P

Type Name: M147A

The following standards are applied only to the printers that are so labeled. (EMC is tested using the EPSON PS-170 power supply.)

Europe: CE marking
                                     Safety: EN 60950

North America: EMI: FCC/ICES-003 Class A
                                     Safety: UL 1950/CSA C22.2 No. 950

Japan: EMC: VCCI Class A
                                            JEIDA-52

Oceania: EMC: AS/NZS 3548 Class B

WARNING

The connection of a non-shielded printer interface cable to this printer will invalidate the EMC standards of this device.

You are cautioned that changes or modifications not expressly approved by Seiko Epson could void your authority to operate the equipment.

CE Marking

The printer conforms to the following Directives and Norms

Directive 89/336/EEC

EN 55022 Class B
EN 50082-1
        IEC 801-2
        IEC 801-3
        IEC 801-4

Directive 90/384/EEC

EN45501

FCC Compliance Statement
For American Users

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

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For Canadian Users

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

GEREÄUSCHPEGEL

Gemäß der Dritten Verordnung zum Gerätesicherheitsgesetz (Maschinenlärminformations- Verordnung-3. GSGV) ist der arbeitsplatzbezogene Geräusch-Emissionswert kleiner als 70 dB(A) (basierend auf ISO 7779).

Key to Symbols

The following symbols are used in the documentation for this product. See the specific warnings and cautions at appropriate points throughout this guide.

⚠ WARNING:

Warnings must be followed carefully to avoid serious bodily injury.

⚠ CAUTION:

Cautions must be observed to avoid minor injury to yourself or damage to your equipment.

✎ *Note:*
Notes have important information and useful tips on the operation of your printer.

Safety Precautions

This section presents important information to ensure safe and effective use of this product. Please read this section carefully and store it in an accessible location.

⚠ *WARNING:*

❑ *Shut down your equipment immediately if it produces smoke, a strange odor, or unusual noise. Continued use may lead to fire or electric shock. Immediately unplug the equipment and contact your dealer or a Seiko Epson service center for advice.*

❑ *Never attempt to repair this product yourself. Improper repair work can be dangerous.*

❑ *Never disassemble or modify this product. Tampering with this product may result in injury, fire, or electric shock.*

❑ *Be sure to use the specified power source. Connection to an improper power source may cause fire or shock.*

❑ *Never insert or disconnect the power plug with wet hands. Doing so may result in severe shock.*

❑ *Do not allow foreign matter to fall into the equipment. Penetration of foreign objects may lead to fire or shock.*

❑ *If water or other liquid spills into this equipment, unplug the power cord immediately, and then contact your dealer or a Seiko Epson service center for advice. Continued usage may lead to fire or shock.*

❑ *Do not place multiple loads on the power outlet (wall outlet). Overloading the outlet may lead to fire.*

❑ *Always supply power directly from a standard domestic power outlet.*

❑ *Handle the power cord with care. Improper handling may lead to fire or shock.*

  • *Do not modify or attempt to repair the cord.*

  • *Do not place any object on top of the cord.*

  • *Avoid excessive bending, twisting, and pulling.*

  • *Do not place cord near heating equipment.*

  • *Check that the plug is clean before plugging it in.*

  • *Be sure to push the prongs all the way in.*

❑ *If the cord becomes damaged, obtain a replacement from your dealer or a Seiko Epson service center.*

⚠ *CAUTION:*

❏ *Do not connect cables other than as described in this manual. Different connections may cause equipment damage and burning.*

❏ *Be sure to set this equipment on a firm, stable, horizontal surface. Product may break or cause injury if it falls.*

❏ *Do not use in locations subject to high humidity or dust levels. Excessive humidity and dust may cause equipment damage, fire, or shock.*

❏ *Do not place heavy objects on top of this product. Never stand or lean on this product. Equipment may fall or collapse, causing breakage and possible injury.*

❏ *To ensure safety, please unplug this product prior to leaving it unused for an extended period.*

❏ *Do not touch the thermal head or paper feed motor. Wait for the head and the motor to be cool. The head and the motor can be very hot after printing for a long time. Touching them may cause burns.*

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Chapter 1

General Information

Features

The TM-H6000 and TM-H6000P are high-quality POS printers that can print on slip and receipt paper (paper roll). The printers have the following features:

Slip Section

❑ An optional Magnetic Ink Character Recognition (MICR) reader that enables the printer to perform consecutive reading and processing of MICR characters and an optional endorsement printer (E/P) that enables single-pass high speed printing of endorsements can be installed.

❑ Single-pass processing for checks eliminates the need to reverse the check paper for printing an endorsement.

❑ High throughput using bidirectional, minimum distance printing.

❑ Mechanical form stopper for stable slip printing

❑ Page mode for flexibility in printing formats

Receipt Section

❑ High-speed printing with batch processing

❑ High-speed graphic printing

❑ Autocutter provides easy user operation

❑ Easy drop-in paper roll loading

Both Receipt and Slip

❑ Small footprint and simple design

❑ EPSON customer display series connector available for the serial interface model

❑ Selectable receive buffer size (45 bytes or 4 KB)

❑ Command protocol based on the ECS/POS® standard.

❑ Automatic Status Back (ASB) function that automatically transmits changes in the printer status

❑ Non-volatile bit image buffer (384 KB) (*1)

❑ Non-volatile user memory (1 KB) (*1)

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(*1) The memory size can be set by the **GS (E** command

❏ A counter function that allows checking the printer by remote maintenance

❏ Several interface models (RS-232C, bidirectional parallel, USB) are supported

Model Names and Configurations

Model name	Interface board	MICR	Endorsement print mechanism
TM-H6000-011	Serial	No	No
TM-H6000-021	Serial	Yes	Yes
TM-H6000-031	Serial	Yes	No
TM-H6000-041	Serial	No	Yes
TM-H6000P-011	Parallel	No	No
TM-H6000-051	None	Yes	Yes

Printing Specifications

Slip Section

Printing method: Serial impact dot matrix

Head wire configuration: 9-pin vertical line, 0.353 mm (1/72-inch) wire pitch

Printing direction: Bidirectional, minimum distance printing

Printing speed Approximately 5.14 LPS (printing 40 columns per line with 17.8 CPI when the head energizing time is set to normal mode.)

Number of characters: Alphanumeric characters: 95

International characters: 37

Extended graphics: 128×12 pages (including two space pages)

Character size and print speed

Font	Character structure (horizontal dots × vertical dots)	Character spacing	Characters per inch	Characters per line	Character size (width×height)
A (default)	5 × 9	1 dot	13.3	45	1.56 × 3.1 mm (.06" × .12")
B	7 × 9	2 half-dots	17.8	60	1.24 × 3.1 mm (.05" × .12")

Receipt Section

Printing method: Thermal line printing

Dot density: 180 dpi × 180 dpi [the number of dots per 25.4 mm (1″)]

Printing direction: Unidirectional with friction feed

Printing width: 72 mm (2.83″), 512 dot positions

Characters per line: 42 (font A, default) 56 (font B)

Character spacing: 0.28 mm (.01″) (2 dots) (font A, default)
0.28 mm (.01″) (2 dots) (font B)
Programmable by control command.

Print speed: 44 lines/second maximum (when the line spacing is set to 3.18 mm
(1/8″), at 24V, 31° C (87.8° F) , density level 2)
140 mm/second maximum (approximately 5.5″/second)
Speed is switched automatically, depending on the voltage applied to
the printer and the head temperature of the printer.

Paper feed speed: Approximately 140 mm/second (approximately 5.5″/second)
continuous feeding

Line spacing (default): 4.23 mm (1/6″), programmable by control commands.

Number of characters: Alphanumeric characters: 95
International characters: 37

Extended graphics: 128 × 11 pages (including one space page)

Character structure: Font A: 12 × 24 (including 2-dot spacing in horizontal)

Font B: 9 × 17 (including 2-dot spacing in horizontal)

Font A is the default

Character size, characters per line

	Standard		Double-height		Double-width		Double-width/ Double-height	
	W x H in mm (inches)	CPL	W x H in mm (inches)	CPL	W x H in mm (inches)	CPL	W x H in mm (inches)	CPL
Font A 12 x 24	1.41 x 3.39 (.06″ x .13″)	42	1.41 x 6.77 (.06″ x .27″)	42	2.82 x 3.39 (.11″ x .13″)	21	2.82 x 6.77 (.11″ x .27″)	21
Font B 9 x 17	0.99 x 2.40 (.04″ x .09″)	56	0.99 x 4.80 (.04″ x .19″)	56	1.98 x 2.40 (.08″ x .09″)	28	1.98 x 4.80 (.08″ x .19″)	28

* CPL = characters per line

* Space between characters is not included

* Characters can be scaled up to 64 times the standard size.

* When using Font B in a font mode such as emphasized mode, some words may be hard to read. Check the font mode in advance when using Font B.

Endorsement Section

Printing method: Shuttle impact dot matrix

Head wire configuration   8 print solenoids in a horizontal line

Characters per line: 40 columns

Print speed: Approximately 1.9 LPS

Number of characters: Alphanumeric characters: 95
International characters: 37

Extended graphics: 128 × 11 pages (including one space page)

Character structure   5 × 7 (total 240 dots horizontally)

Character size   1.1 × 2.42 mm (W × H)

Connectors

⚠ *WARNING:*
Do not connect a telephone line to the drawer kick-out connector or the display module connector; otherwise the printer and the telephone line may be damaged.

You can connect up to four cables to the printer. They all connect to the connector panel (on the bottom rear of the printer), which is shown below.

interface connector

display module connector

drawer kick-out connector

power supply connector
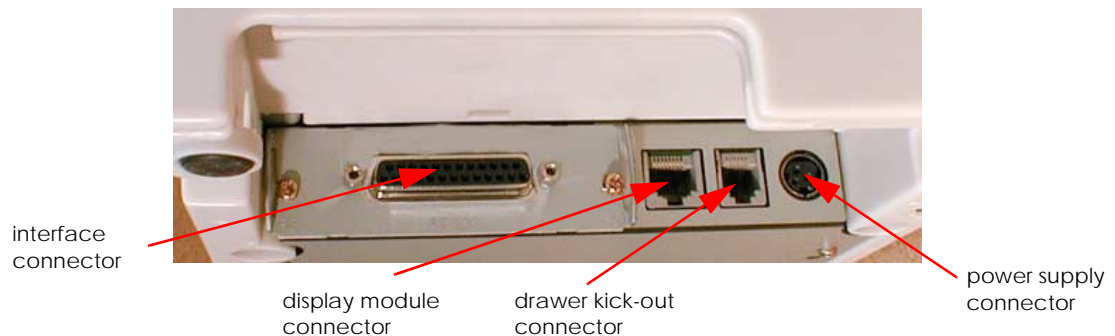
✎ *Note:*
This illustration shows the serial interface model. The parallel interface connector looks slightly different.

The Control Panel

LED

POWER

This light is on when the power is turned on.

ERROR

When this light is on but not blinking, it means that the printer is offline. Check to see if a cover is open. When this light is blinking, there is an error. See the Error Processing section later in this chapter.

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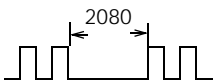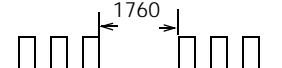
PAPER OUT

This light comes on when the printer is out, or nearly out, of roll paper. The printer has a paper end detector, and it also has a near-end detector (which can be adjusted) to warn you that the printer is nearly out of paper. See Chapter 5 for information on adjusting the detector.

This light blinks during the self-test printing standby state or macro execution standby state (when the macro execution command is used).

SLIP

❏ This light blinks when the printer is ready to receive slip paper. It stays on during printing on slip paper and blinks again when slip paper should be removed. When the slip paper is removed in the slip removal waiting state, the printer enters the paper roll mode two seconds later. The SLIP LED light is on during this time. The blinking patterns for the slip inserting and removal waiting states are different as follows:

State	SLIP LED Blinking Pattern ⇥ ⊦⇤ 320 ms
Slip insertion waiting	⊓⊔⊓⊔⊓⊔⊓⊔⊓⊔
Slip removal waiting	2080 ⊓⊔⊓___⊓⊔⊓
Check insertion waiting (only for MICR-equipped model)	1760 ⊓⊔⊓⊔___⊓⊔⊓⊔

Control Panel Buttons

The control panel has two paper buttons that you may have to use, although most paper handling functions will be handled by your software.

FEED

Use this button to feed roll paper or to start a roll paper self test. (See the instructions later in this chapter.)

RELEASE

Use this button to release slip paper or to start a slip paper self test. (See the instructions later in this chapter.)

Panel Button Operations

The command **ESC c 5** can be set to enable or disable the panel buttons, but in some situations the setting of **ESC c 5** is ignored, as you can see in the table below:

		Normal Mode			
		All covers are closed	**Paper roll cover is opened**	**Unit cover is opened**	**Front cover is opened**
If receipt is selected	FEED	Follow ESC c 5	Disabled	Disabled	Follow ESC c 5
	RELEASE	Follow ESC c 5	Enabled		
If slip is selected	FEED	Follow ESC c 5	Follow ESC c 5	Enabled	Enabled
	RELEASE	Follow ESC c 5	Enabled		

		Slip insertion waiting status	Slip ejection waiting status			
			All covers are closed	**Paper roll cover is opened**	**Unit cover is opened**	**Front cover is opened**
If receipt is selected	FEED	—	—	—	—	—
	RELEASE	—	—	—	—	—
If slip is selected	FEED	Disabled	Follow ESC c 5	Follow ESC c 5	Enabled	Enabled
	RELEASE	Disabled	Follow ESC c 5	Enabled		

Switches

DIP Switches

The printer has two sets of DIP switches. The functions of the switches are shown in the following tables.

Serial interface model

Set 1

SW	Function	ON	OFF
1-1	Data receive error	Ignored	Prints "?"
1-2	Receive buffer capacity	45 bytes	4K bytes
1-3	Handshaking	XON/XOFF	DTR/DSR
1-4	Data word length	7 bits	8 bits
1-5	Parity check	Enabled	Disabled
1-6	Parity selection	Even	Odd
1-7	Transmission speed (See the table below.)		
1-8			

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Transmission speed

Transmission Speed in BPS (bits per second)	1-7	1-8
4800	ON	ON
9600	OFF	ON
19200	ON	OFF
38400	OFF	OFF

Set 2

SW	Function	ON	OFF
2-1	Handshaking (BUSY condition)	Receive buffer full	Offline or receive buffer full
2-2	Customer display connection	Connected	Not connected
2-3	Print density (See the table below.)		
2-4			
2-5	Internal use	Fixed to OFF	
2-6	Internal use	Fixed to OFF	
2-7	I/F pin 6 reset signal	Enabled	Disabled
2-8	I/F pin 25 reset signal	Enabled	Disabled

Print density

Print Density	SW 2-3	SW 2-4
1 (Light)	ON	ON
2 ↑	OFF	OFF
3 ↓	ON	OFF
4 (Dark)	OFF	ON

Notes:

Changes in DIP switch settings (excluding switches 2-7 and 2-8, interface reset signals) are recognized only when the printer power is turned on or when the printer is reset by using the interface. If the DIP switch setting is changed after the printer power is turned on, the change does not take effect until the printer is turned on again or is reset.

If you turn on DIP switch 2-7 or 2-8 while the printer power is turned on, the printer may be reset, depending on the signal state. DIP switches should not be changed while the printer power is on.

If the print density is set to level 3 or 4, printing speed is usually reduced.

Parallel interface specification

Set 1

SW	Function	ON	OFF
1-1	Auto line feed	Always enabled	Always disabled
1-2	Receive buffer capacity	45 bytes	4KB
1-3~ 1-8	Reserved	Fixed to OFF	

Set 2

SW	Function	ON	OFF
2-1	Handshaking (BUSY condition)	Receive buffer full	Offline or receive buffer full
2-2	Internal use (Do not change setting.)	Fixed to OFF	
2-3	Print density (See the table below.)		
2-4			
2-5~ 2-6	Internal use (Do not change setting.)	Fixed to OFF	
2-7	Reserved (for serial interface)	Fixed to OFF	
2-8	I/F pin 31 reset signal (Do not change setting.)	Fixed to ON	

Print density

Print Density	SW 2-3	SW 2-4
1 (Light)	ON	ON
2 ↑	OFF	OFF
3 ↓	ON	OFF
4 (Dark)	OFF	ON

Notes:

Changes in DIP switch settings (excluding switch 2-8, interface reset signal) are recognized only when the printer power is turned on or when the printer is reset by using the interface. If the DIP switch setting is changed after the printer power is turned on, the change does not take effect until the printer is turned on again or is reset.

If you turn on DIP switch 2-8 while the printer is turned on, the printer may be reset, depending on the signal state. DIP switches should not be changed while the printer power is on.

If the print density is set to level 3 or 4, printing speed is usually reduced.

When using original paper

When you use the original paper such as P350 (F380), we recommend setting the DIP switch as shown in the table below. The setting differs depending on each paper specification. See the Other Qualified Suppliers for Thermal Paper section later in this chapter.

Original paper type	DIP SW2		Print density level
	3	4	
P350 (F380)	ON	ON	1
PD160R, AF50KS-E, P310, P300	OFF	OFF	2

Changing the DIP Switch Settings

If you need to change settings, follow the steps below to make your changes:

⚠ CAUTION:

Turn off the power while removing the DIP switch cover to prevent an electric short, which can damage the printer.

Use a Phillips (crosshead) screwdriver to remove the screw holding the DIP switch cover.

1. Make sure the printer is turned off.

2. Remove the screw from the DIP switch cover. Then take off the DIP switch cover.

DIP switch cover

3. Set switches using a pointed tool, such as tweezers or a small screwdriver.
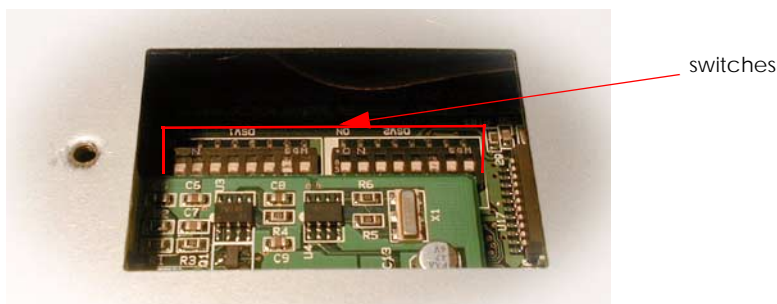
switches

4. Replace the DIP switch cover. Then secure it with the screw.

The new settings take effect when you turn on the printer.

Memory Switches

Function 3 of the **GS (E** command changes bits of the memory switch 1 or 8 to ON or OFF as shown in the table below (default: OFF):

• Switch 1

Bit	ON	OFF
1	Transmits the power ON notice	Does not transmit the power ON notice
2 ~8	Reserved (Do not change the setting)	

• Switch 8

Bit	ON	OFF
1-2	Reserved (Do not change the setting)	
3	Uses a 58 mm width roll paper	Uses an 80 mm width roll paper
4-7	Reserved (Do not change the setting)	
8	Becomes recoverable error if the unit cover is open during printing	Becomes offline if the unit cover is open during printing

✎ *Note:*
Settings of the memory switch are stored in the NV memory; therefore, even if the printer is turned off, the settings are maintained. Excessive use of this function may destroy the NV memory. As a guideline, do not use this function more than 10 times a day.
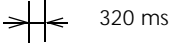
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Error Processing

Error Types

The printer stops all printer operations for the selected paper section, goes offline, and blinks the ERROR LED when detecting an error.

❑ Errors that automatically recover
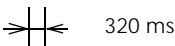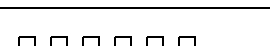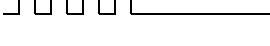
ERROR	Description	ERROR LED Blinking Pattern 320 ms	Recovery
Print head temperature error	The temperature of the print head is extremely high		Recovers automatically when the print head cools

✎ *Note:*
Print head temperature error is not abnormal.

❑ Errors that have the possibility of recovery:
When a recoverable error occurs, after removing the cause of the error, the printer can recover from the error by transmitting **DLE ENQ 1** or **DLE ENQ 2** without turning off the power:

ERROR	Description	ERROR LED Blinking Pattern 320 ms	Recovery
Autocutter error	The autocutter does not work correctly		Recovers by **DLE ENQ 1** or **DLE ENQ 2**
Home position detection error	The home position cannot be detected due to a paper jam		Recovers by **DLE ENQ 1** or **DLE ENQ 2**
Carriage detection error	The carriage is malfunctioning due to a paper jam, etc.		Recovers by **DLE ENQ 1** or **DLE ENQ 2**
Paper roll cover open error	Printing on the paper roll is not performed correctly due to a paper roll cover open or unit cover open		Recovers by **DLE ENQ 1** or **DLE ENQ 2** with the cover closed
Slip ejection error	The slip is not ejected when the printer feeds a specified amount of paper		Recovers by **DLE ENQ 1** or **DLE ENQ 2**
Unit cover open error	Printing on the paper roll or on the slip is not performed correctly due to a unit cover open		When bit 8 of memory switch 8 is set to OFF: Recovers by closing the unit cover When bit 8 of memory switch 8 is set to ON: Recovers by **DLE ENQ 1** or **DLE ENQ 2**

See Chapter 5 for removing a paper jam.
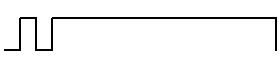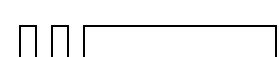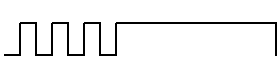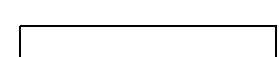
✎ *Note:*

When the printer recovers from an error using **DLE ENQ 1** *while slip paper is selected, the printer first ejects the slip, then loads paper. However, when the printer recovers from a slip ejection error, the printer only ejects the slip and does not load paper.*

When the printer recovers from an error using **DLE ENQ 2** *while slip paper is selected, the printer ejects the slip.*

❏ Errors that are impossible to recover:

ERROR	Description	ERROR LED Blinking Pattern 320 ms	Recovery
R/W error in memory or gate array	After R/W checking, the printer does not work correctly		Impossible to recover
High voltage error	The power supply voltage is extremely high		Impossible to recover
Low voltage error	The power supply voltage is extremely low		Impossible to recover
CPU execution error	The CPU executes an incorrect address or I/F board is not connected		Impossible to recover
Control circuit board error	There is an abnormality in the print head temperature, thermistor is detected incorrectly or thermistor wiring is not connected or the endorsement printer is broken, or the lever driving motor is broken		Impossible to recover

Data Receive Error

If one of the following errors occurs during serial interface communication, the printer prints "?" or ignores the data, depending on the setting of DIP switch 1-1.

❏ Parity error

❏ Framing error

❏ Overrun error

Sensors

Paper Sensors

Receipt section

❏ Paper roll near-end sensor:

- The sensor is located on the roll paper supply device on the receipt section. It detects the near-end of the paper roll by detecting the paper roll diameter. You can adjust the sensor. See Chapter 5 for details on adjustment.

- When the printer detects a paper near-end, it either stops or continues printing, depending on the **ESC c 4** setting.

- When the sensor is selected to stop printing, the sensor detects a paper near-end and the printer automatically goes offline after printing the current line. To restart printing, load the paper and set the printer back online by closing the printer cover. The printer starts initializing and continues printing data stored in the print buffer.

❏ Paper roll end sensor:

- The paper roll end sensor is located in the paper path on the receipt section. It detects the presence of paper in the paper path of the printer mechanism.

- When there is no paper in the paper path, the PAPER OUT LED lights.

- When the sensor detects a paper end, printing stops even if it is in the middle of one transaction; therefore, it is recommended to use the paper roll near-end sensor and use the paper end sensor as a supplement.

Slip section

❏ TOF (Top of Form) sensor: The slip TOF sensor is located in the slip paper path and detects the presence of slip paper in the paper path. The SLIP LED lights accordingly.

❏ BOF (Bottom of Form) sensor:

- The sensor is located in the slip entrance and detects whether the paper is inserted correctly and whether it is removed or not. The printer does not proceed to the next operation until the paper has been set correctly or removed. (The SLIP LED continues blinking.)

- When the printer detects a paper end, it either stops or continues printing, depending on the **ESC c 4** setting.

- When the sensor is selected to stop printing, the sensor detects a paper-end and the printer prints data up to the end of the printable area, ejects the slip when all the next print data is transmitted, and then waits for the slip to be removed. After the slip is removed, the printer enters the paper insertion waiting state.

❏ Slip eject sensor:

- The slip eject sensor is located in the slip paper exit and detects whether the paper is removed or not after printing. The printer does not proceed to the next operation until the paper has been removed.

Printer Cover Sensors

Receipt section

❏ Paper roll cover open sensor:

- When a paper roll is selected as the print sheet, if the sensor detects a cover open during printing, the printer goes offline, stops printing immediately, and the ERROR LED blinks. Even if the cover is closed, the ERROR LED still blinks. You need to transmit the **DLE ENQ** command to recover.

  If the printer continues printing, it starts printing from the beginning of the line where an error occurred; therefore, double printing or printing position shift may occur. It is recommended to clear the buffers and resend the print data.

- When a slip is selected as the print sheet, if the sensor detects a cover open during printing, the printer finishes printing data for the line when the cover open is detected, then stops the carriage movement and goes offline. The printer goes online when the cover is closed and restarts printing.

✎ *Note:*
Whether the cover is open or not does not affect the status reported by the paper roll end sensor.

When the printer is in the waiting status, the printer mechanism is initialized if the cover is opened and closed. Do not open/close the cover during printing, which may cause an error. Be sure not to open the cover during autocutter operation, which may damage the printer.

❏ Unit cover open sensor:

- When the sensor detects a unit cover open during printing, the printer goes offline depending on the setting of bit 8 for the memory switch.

  The default is that the printer finishes printing data for the line when the cover open is detected and stops printing. The printer goes online when the cover is closed and restarts printing.

  If a recoverable error is selected by memory switch, the printer goes offline, stops printing immediately and the ERROR LED blinks. Even if the cover is closed, the ERROR LED still blinks. You need to transmit the **DLE ENQ** command to recover. If the printer continues printing, it starts printing from the beginning of the line where an error occurred. In this case, double printing or printing position shift may occur. It is recommended to clear the buffers and resend the print data.

Slip section

❏ Front cover open sensor:

- When the sensor detects a cover open during printing, the printer finishes printing data for the line when the cover open is detected; then stops the carriage movement and goes offline. The printer goes online when the cover is closed and restarts printing.

Self Tests

The self tests let you know if your printer is operating properly. There are self tests for both roll paper and slip paper. They check the control circuits, printer mechanisms, print quality, control software version, and DIP switch settings.

These tests are independent of any other equipment or software, so it is a good idea to run them when you first set up the printer and if you have any trouble. If the self tests work correctly, the problem is in the other equipment or the software, not the printer.

Running the Self Test on the Paper Roll

1. Make sure the printer is turned off and the printer cover is closed properly.

2. While holding down the FEED button, turn on the printer using the switch on the front of the printer. The self test prints the printer settings and then prints the following, cuts the paper, and pauses. (The PAPER OUT light blinks.)

   If you want to continue SELF-TEST printing, Please press the FEED button.

3. Press the FEED button to continue printing. The printer prints a pattern using the built-in character set.

4. The self test automatically ends and cuts the paper after printing the following:

   *** completed ***

The printer is ready to receive data as soon as it completes the self test.

✎ *Note:*
If you want to pause the self test manually, press the FEED *button. Press the* FEED *button again to continue the self test.*

Running the Self Test with Slip Paper

1. Make sure the printer is turned off and the printer cover is closed properly.

2. While holding down the RELEASE button, turn on the printer using the switch on the front of the printer. (The SLIP light blinks.)

3. Feed a sheet of slip paper into the printer. The printer loads the paper automatically, prints the printer settings, and then ejects the paper. (The SLIP light blinks.)

4. Remove the paper from the printer and feed another sheet of slip paper into the printer to print characters from the character table. Continue to feed slip paper into the printer until the self test prints the following:

completed

The printer is ready to receive data as soon as it completes the self test.

Running the Self Test with the Optional Endorsement Function

If your printer has the optional endorsement function, the slip paper self test is slightly different. When you feed additional sheets of slip paper in step 4, two lines are printed on the back of the slip by the endorsement print mechanism; then the test continues printing on the surface side of the slip as described above.

Hexadecimal Dump

This feature allows experienced users to see exactly what data is coming to the printer. This can be useful in finding software problems. When you turn on the hex dump function, the printer prints all commands and other data in hexadecimal format, along with a guide section to help you find specific commands.

To use the hex dump feature, follow these steps:

1. After you make sure the printer is off, open the paper roll cover.

2. Hold down the FEED button while you turn on the printer to print on roll paper or hold down the RELEASE button to print on the surface side of a slip or execute the **GS (A** command.

3. Close the cover.

4. Run any software program that sends data to the printer. The printer prints "Hexadecimal Dump" and then all the codes it receives in a two-column format. The first column contains the hexadecimal codes and the second column gives the ASCII characters that correspond to the codes. Part of a hexadecimal dump is shown below:

```
Hexadecimal Dump

To terminate hexadecimal dump,
press FEED button three times.


1B 21 00 1B 26 02 40 40    . ! . . & . @ @
1B 25 01 1B 63 34 00 1B    . % . . c 4 . .
41 42 43 44 45 46 47 48    A B C D E F G H
```

- A period (.) is printed for each code that has no ASCII equivalent.

- In hex dump mode all commands except **DLE EOT**, **DLE ENQ**, and **DLE DC4** are disabled.

5. Open the cover to set the printer offline so that it will print the last line.

6. Close the cover and turn off the printer, press the FEED button three times, or reset the printer to turn off the hex dump mode.

Standard Parts Included with the Printer

❑ User's Manual

❑ Paper roll

❑ Hex screws

❑ Control panel label

❑ Power switch cover (using this cover enables you to prevent accidental turning off the power)

❑ Ribbon cassette ERC-32(P)

❑ Endorsement ribbon cassette (for printers equipped with the optional endorsement print mechanism)

Options

❑ EPSON power supply unit, PS-170

❑ MICR reader (factory-installed option) (available only for serial interface model)

❑ Endorsement printer (factory-installed option) (required for use with MICR)

❑ Direct connection customer display DM-D105/D205 or DM-D106/DM-D206 (available only for serial interface model)

❑ Paper-width variable plate for 58 mm or 60 mm (2.3 or 2.4 ")

Consumables

Ribbons

❑ EPSON ribbon cassette, ERC-32 (P)

❑ EPSON ribbon cassette ERC-41 (P) (for the optional endorsement print mechanism)

Thermal Paper

Thermal paper is available from the supplier in your area.

Specified Thermal Paper: NTP080-80

In Japan: Nakagawa Seisakujo
2-5-21 Nishiki-Cho Warabi-Shi
Saitama-Ken 335 Japan
Tel: (048) 444-8211
Fax: (048) 443-6652

In USA: Nakagawa Mfg (USA) Inc.
2305 Lincoln Avenue
Hayward, CA 94545 USA
Tel: (510) 782-0197
Fax: (510) 782-7124

In Europe: Nakagawa Mfg (Europe) GmbH
Krützpoort 16, 47804
Krefeld, Germany
Tel: 02151-711051
Fax: 02151-713293

In Southeast Asia: N.A.K. Mfg (Malaysia) SDN BHD
Lot 19-11, Bersatu Industrial Complex,
Jalan Satu, Kaw Per. Cheras Jaya,
Balakong Industrial Area, 43200 Cheras.
Selangor Darul Ehsan, Malaysia
Tel: 03-9047896, 9047900, 9047691
Fax: 03-9047889

Original paper: TF50KS-E
Nippon Paper Industry Co., Ltd.
1-12-1, Yuraku-Cho, Chiyoda-Ku
Tokyo 100 Japan
Tel: 03-3218-8000
Fax: 03-3216-1375

Other Qualified Suppliers for Thermal Paper

The following suppliers sell thermal paper that may be used if desired. Contact each company for information.

Original paper: PD 160R
New Oji Paper Mfg. Co., Ltd.
7-5 Ginza 4-Chome Chuo-Ku
Tokyo 104 Japan
Tel: 03-3563-4800
Fax: 03-3563-1136

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Original paper: AF50KS-E
Jujo Thermal Oy (Finland)
P.O. Box 92 FIN27501 Kauttua Finland
Tel: 38-3932900
Fax: 38-3932419

Original paper: P350(F380), P310, P300
Kanzaki Specialty Papers, Inc.
1500 Main Street
Springfield, MA 01115 USA
Tel: (413) 736-3216
Fax: (413) 734-5101

Chapter 2

Hardware

General Specifications

Slip Printer Section

Printing Specifications

Printing method:	Serial impact dot matrix
Head wire configuration:	9-pin vertical line, wire pitch 0.353 mm (1/72 inch)
Printing direction:	Bidirectional, minimum distance printing
Printing speed:	Approximately 5.14 LPS (printing 40 columns per line with 17.8 CPI when the head energizing time is set to normal mode.)
	(LPS: Lines Per Second)
	(CPI: Characters Per Inch)

Character Specifications

Number of characters: Alphanumeric characters: 95
Extended graphics: 128×12 pages (including two space pages)
International characters: 37

Character structure: Font A: 5×9 (total 270 half dots in horizontal)
Font B: 7×9 (total 540 dots in horizontal)

Character Size, Characters Per Line, Characters Per Inch

	Character structure	Character Size (mm) Width × Height	Character Dot Spacing	Characters Per Line (CPL)	Characters Per Inch (CPI)
	Horizontal dots × Vertical dots				
Font A	5 × 9	1.56 × 3.1	1 dot	45	13.3
Font B	7 × 9	1.24 × 3.1	2 half dots	60	17.8

Character structure in the default setting is font A.

5 × 9 Font Sample (Font A)

Alphanumeric and international characters   Graphics
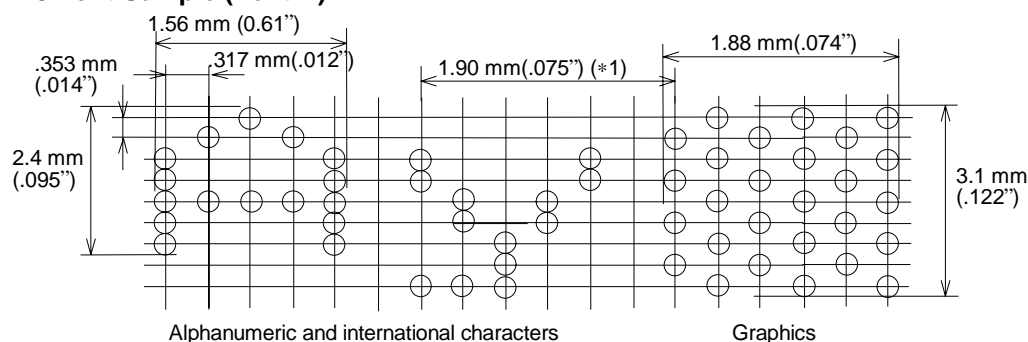
∗1: Character pitch

7 × 9 Font Sample (Font B)

Alphanumeric and
international characters   Graphics
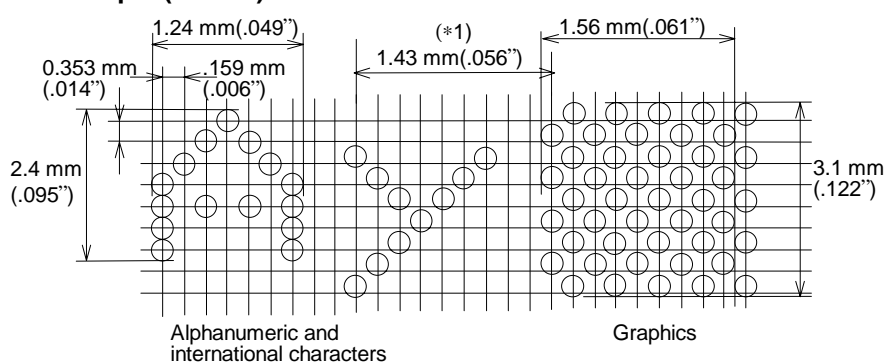
∗1: Character pitch

Character structure

Paper Specifications

1. Cut sheet

   Paper type: Normal paper, pressure-sensitive paper, carbon copy paper

   Paper size: 70 - 148 mm (W) × 150 - 210 mm (L) (2.8 - 5.8"(W) × 5.9 - 8.3"(L))

   Copy capability and paper thickness:

   - Normal paper (single-ply):   0.09 to 0.2 mm (0.0035 to 0.0079 in.)

   - Carbon copy paper
     combination: 4 sheets maximum (original + 2 copies)

Backing paper:	0.07 to 0.12 mm (0.0028 to 0.0047 in.)
Copy and original:	0.04 to 0.07 mm (0.0016 to 0.0028 in.)
Carbon paper:	Approximately 0.035 mm (0.0014 in.)
Total thickness:	0.09 to 0.31 mm (0.0035 to 0.0122 in.)

- Example: one original + 2 copies,

Original paper	0.04 mm
Carbon paper	0.07 mm (0.035 mm $\times$ 2 sheets)
Copy paper	0.04 mm
Backing paper	0.07 mm
Total thickness	0.22 mm (0.0087 in.)

Ambient temperature and copy capability:

Copy capability is greatly influenced by the ambient temperature, so printing must be performed under the conditions described in the table below.

Relationship between ambient temperature and number of copies

Number of copies	Ambient temperature
Original + 3 copies	10 to 40 °C (50 to 104 °F)
Original + 1 copy	5 to 45 °C (41 to 113 °F)

2. Notes on slip paper

- The slip paper must be flat, without curls or wrinkles, especially at the top edges. Otherwise, the paper may rub against the ribbon and become dirty.

- There must be no glue on the bottom edge of slip paper. Choose slip paper carefully when the glue is on the right or top edge, since paper feeding and insertion are affected by gluing conditions (e.g., glue quality, method, and length) and glue location (refer to the figure on the next page). Be especially careful when slip paper is wide and has the glue on the left edge, since skew may occur.

OK to use   Do not use   Use carefully   Use carefully

Paper feed
direction
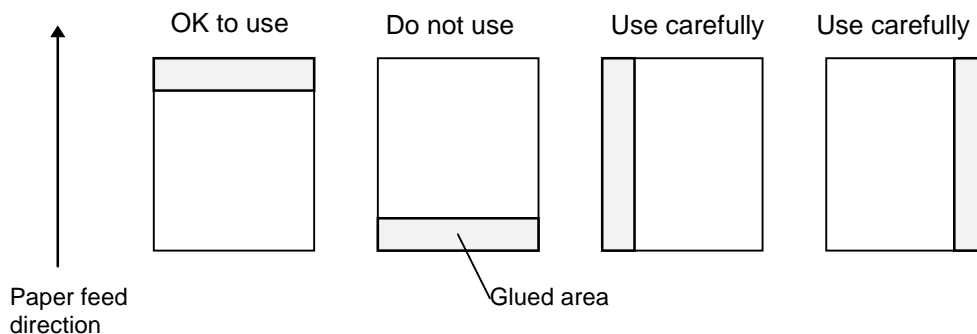
Glued area

Slip paper glued area

- Since the slip BOF sensor uses a photo sensor, do not use paper that has holes at the sensor position, or is translucent.

- Since the slip TOF sensor uses a reflective photo sensor and it detects from the back of slip paper, do not use paper that has holes or dark portions with low reflection (less than 40% reflection) at the sensor position.

- Since the slip paper ejection sensor uses a reflective photo sensor and it detects from the surface of the paper roll, do not use paper that has holes or dark portions with low reflection (less than 40% reflection) at the sensor position.

- Use thinner paper (N30 or equivalent) between the top and bottom sheets of multi-ply paper. If thick paper is used, the copy capability is lowered.

15   30   20   10

Area where paper holes are prohibited and reflection rate for the back on paper should be 40% or more.

Area where paper holes are prohibited and reflection rate for the surface on paper should be 40% or more.

Paper feed direction

Paper holes and translucence prohibited in this area.

[Units: mm (All the numeric values are typical.)]
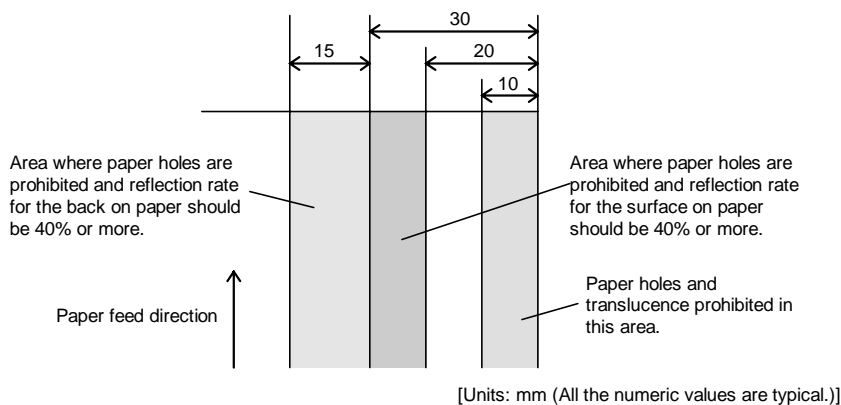
Prohibited area for paper holes and low reflection

Printable Area
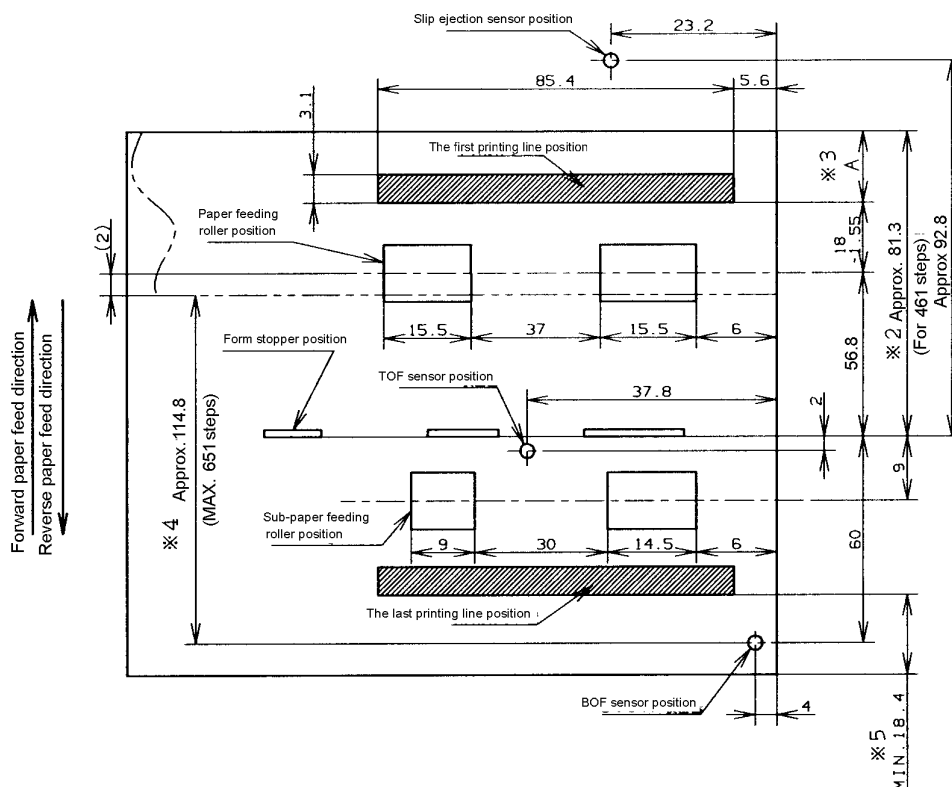
*2   The length from the form stopper to the tip of the paper.

*3   The length from the tip of the paper to the first printing line position.

*4   The printable area after the slip BOF sensor detects the end of the paper. (The bottom margin must be considered for a real printable area.)

*5   Bottom margin (calculated value).
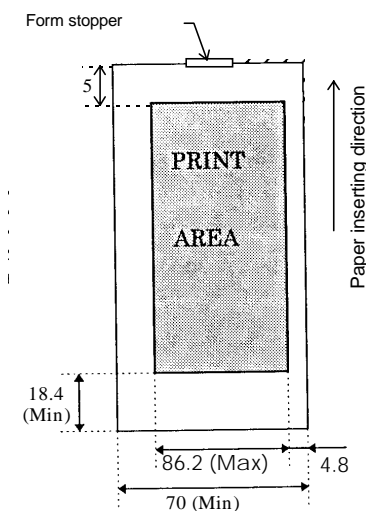
Printable area (for slip paper)

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Ribbon Cassette

Exclusive ribbon cassette for slip

Type:	ERC-32(P)
Color:	Purple
Ribbon life:	6,000,000 characters (at 25 °C (77 °F), continuous printing)

E/P Endorsement Print Mechanism Section (Factory-Installed Option)

The endorsement print mechanism enables printing of endorsements as part of a sequence that is automatically processed: MICR reading, printing an endorsement on the back side of the personal check, and printing on the surface of it.

Printing Specifications

Printing method:	Shuttle impact dot matrix
Head wire configuration:	8 print solenoids in a horizontal line
Printing speed:	Approximately 1.9 LPS
Characters per line:	40 columns

Character Specifications

Number of characters:	Alphanumeric characters: 95
	Extended graphics: 128×11 pages (including a space page)
	International characters: 37
Character structure:	5×7 (total 240 dots horizontally)

[Unit: mm]

For 1-dot column spacing
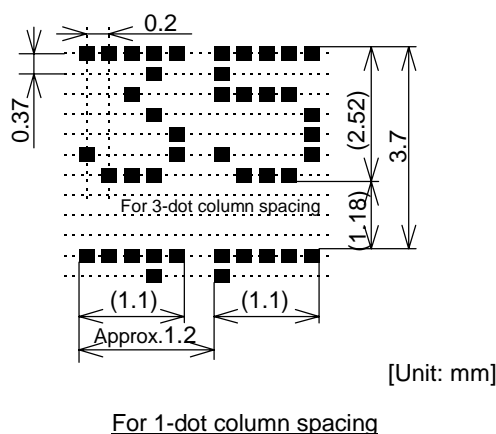
Character structure

Note: Character dot spacing can be changed by the **ESC SP** command.

Paper Specifications

Cut sheet

Paper type:	Normal paper
Paper size:	70-148 mm (W) × 150-210 mm (L) (2.8-5.8 in. (W) × 5.9-8.3 in. (L)
Paper thickness:	Single-ply (copy paper cannot be used) 0.09 mm - 0.2 mm (0.0035 - 0.0079 in.)

Printable Area

The print head consists of 8 print solenoids (A, B, C, D, E, F, G, and H) arranged in a horizontal line. The print head moves from the left (from the standby position) to the right, printing at 30 positions as each print solenoid is energized, so that one dot line is formed. The total number of dots per dot line is 240 (30 positions × 8 solenoids).

E/P printable area (for endorsement printing)

Ribbon Cassette

Exclusive ribbon cassette for E/P

Type:	ERC-41 (P)
Color:	Purple
Ribbon life:	1,000,000 characters (at 25 °C (77 °F), continuous printing)

Notes on Using the Endorsement Print Mechanism

❏ The endorsement print mechanism (abbreviated as E/P) enables printing of endorsements as part of a sequence that is automatically processed: MICR reading, printing an endorsement on the back side of a personal check, and printing on the surface of it. Once the end of the paper exceeds the E/P print head position, reverse paper feeding to the front side is not possible.

❏ When the endorsement printing is executed after a MICR reading, the printer feeds the paper forward automatically after receiving a command to print the endorsement; then the printer starts printing up to approximately 7.0 mm (0.28 in.) from the end of the check paper by using reverse paper feeding.

❏ Since the E/P printing format is assumed to print an endorsement on a U.S. personal check, the print begins on the back side of the paper. (As viewed from the front of the printer, the endorsement printing characters are upside down.)

❏ The printing sequence for slip paper is different, depending on whether an endorsement print mechanism is installed. That is, when the E/P is installed, once the printing exceeds the E/P printable area and the slip paper is fed forward, reverse paper feeding must be prohibited. Consider this when developing application programs.

❏ The E/P printing must be not performed on copy paper. Otherwise, a paper jam may occur or the E/P may be broken. Because E/P printing feeds the paper in a reverse paper feed direction, the paper may be wrinkled.

❏ In some case paper feeding may not be accurate when E/P printing is performed on check paper. This may depend on the width of the check paper. Therefore, it is recommended for the user to check in advance whether the check paper prints correctly or not.

Receipt Section

Printing Specifications

Printing method:	Thermal line printing
Dot density:	180 dpi $\times$ 180 dpi. The number of dots per 25.4 mm (1")
Printing direction:	Unidirectional with friction feed
Printing width:	72 mm (2.83"), 512 dot positions

| Characters per line (default): | Font A: 42 |
| | Font B: 56 |

Character spacing (default):	Font A: 0.28 mm (.01") (2 dots)
	Font B: 0.28 mm (.01") (2 dots)
	Programmable by control command.

Printing speed:	44 lines/second maximum
	(when the line spacing is set to 3.18 mm {1/8 inch})
	(at 24V, 31°C (87.8°F), density level 2) 140 mm/second
	maximum (5.5 inches/second maximum)
	Speeds are switched automatically, depending on the voltage
	applied to the printer and head temperature conditions.

Paper feed speed:	Approximately 140 mm/second
	(approximately 5.5 inches/second)
	(continuous paper feeding)

| Line spacing (default): | 4.23 mm (1/6 inch) |
| | Programmable by control command. |

Character Specifications

Number of characters:	Alphanumeric characters: 95
	Extended graphics: 128×11 pages (including one space page)
	International characters: 37

| Character structure: | Font A: 12×24 (including 2-dot spacing horizontally) |
| | Font B: 9×17 (including 2-dot spacing horizontally) |

Character sizes

	Standard		Double-height		Double-width		Double-width/ Double-height	
	W×H (mm)	CPL	W×H (mm)	CPL	W×H (mm)	CPL	W×H (mm)	CPL
Font A 12×24	1.41×3.39	42	1.41×6.77	42	2.82×3.39	21	2.82×6.77	21
Font B 9×17	0.99×2.40	56	0.99×4.80	56	1.98×2.40	28	1.98×4.80	28

- Space between characters is not included.
- Characters can be scaled up to 64 times the standard sizes.
- When using Font B with a font mode such as emphasized, some words may be hard to read. Check the font mode in advance when using Font B.

CPL = Characters per line

Autocutter

Partial cut: Cutting with one point left uncut

NOTES: 1. To prevent dot displacement, after cutting, feed paper approximately 1 mm (14/360 inches) or more before printing.
2. If the printer is stopped, you must feed paper over 40 mm (1.58 in.) before cutting

Paper Roll Supply Device Section

Supply method:	Drop-in paper roll
Near-end sensor	Detection method: Microswitch
	Paper roll spool diameter: Inside: 12 mm (.47") Outside: 18 mm (.71")
	Near-end adjustment: Adjusting screw
	Remaining amount: Fixed position #1 approximately 23 mm (0.9") #2 approximately 27 mm (1.06") (The adjusting screw has two positions.) See Chapter 5.
Paper roll end detection	Detection method: Reflective photo sensor

Note: You can use the ESC c 4 command to stop printing upon detection of a paper near-end.

Paper Specifications

Paper type:	Specified thermal paper
Form:	Paper roll
Paper width:	79.5 ± 0.5 mm (3.13" ± 0.02")
Paper roll size:	Roll diameter: Maximum 83 mm (3.27 in.) Take-up paper roll width: 80+0.0/-1.0 mm (3.15+0.02/-0.04 in.)
Specified paper (see Chapter 1 more details):	Specified thermal roll paper, NTP080-80

In Japan: Nakagawa, Seisakujo
In USA: Nakagawa Mfg. (USA) Inc.
In Europe: Nakagawa Mfg. (Europe) GmbH
In Southeast Asia: N.A.K. Mfg. (Malaysia) SDN BHD

[Original paper: TF50KS-E Nippon Paper Industries Co.,Ltd.]

The following paper can be used instead of the specified paper above:

Original paper: PD 160R (Oji Paper Mfg. Co. Ltd.)
Original paper: AF50KS-E (Jujo Thermal Oy (Finland))
Original paper: P350(F380), P310, P300
(Kanzaki Specialty Papers, Inc. (U.S.A.))

Paper roll spool diameter: Inside: 12 mm (.47") Outside: 18 mm (.71")

Note: Paper must not be pasted to the paper roll spool.
When paper other than that specified is used, the thermal print head may be worn out.Be sure to use the specified paper.
Depending on each paper specification, it is recommended to set the DIP switch as shown in Table below:

Original paper type	DIP SW2		Print density level
	3	4	
P350 (F380)	ON	ON	1
PD160R, AF50KS-E, P310, P300	OFF	OFF	2

Printable Area

The printable area of a paper roll with a width of 79.5 ± 0.5 mm (3.13" ± 0.02") is 72.2 ± 0.2 mm (2.84" ± 0.008") (512 dots), and the space on the right and left sides are approximately 3.7 ± 2 mm (0.15" ± 0.079").
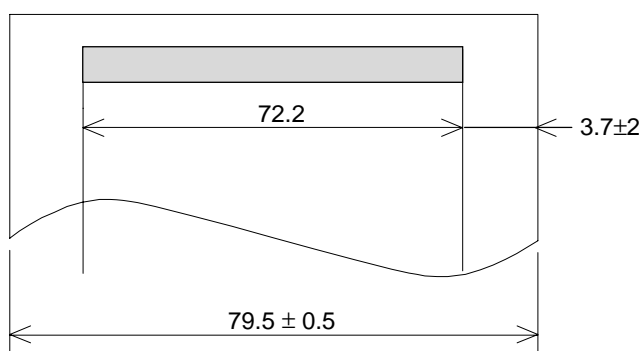
Printable area for paper roll

NOTE: The print position in the printable area of thermal elements for dots 257 to 512 is shifted approximately 0.07 mm (.003″) in the paper feed direction from the position for dots 1 to 256. Be sure not to print a ladder bar code across both printable areas, as this can cause variations in printing that are difficult to read.

Approximately 0.07mm (0.0028")
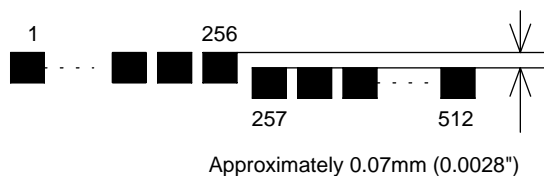
Shifting of the print position

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Printing and Cutting Positions

Manual cutter position

Autocutter head position

Center of the print dotline

Approx. 27

Approx.13

Paper feed direction

[Units: mm (All the numerical values are typical.)]
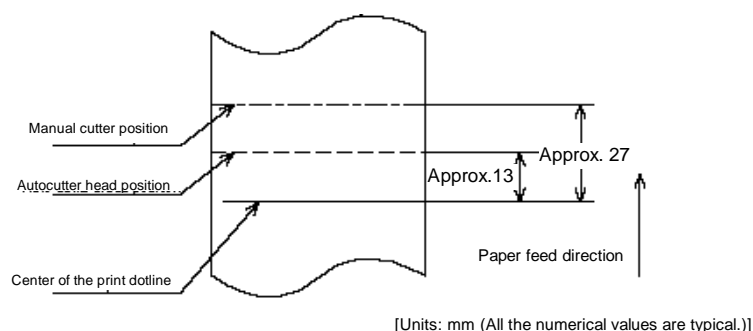
Printing and cutting positions

NOTE: Numeric values used here are typical values; the values may vary slightly as a result of paper slack or variations in the paper. Take this into account when setting the cutting position of the autocutter.

MICR Reader (When the Printer is Used with the MICR Reader)

Reading method

Magnetic bias

Recognition rating

98% or more (at 25 °C, 77 °F)

Recognition rating is defined as follows

$$\text{Recognition rating (\%)} = \frac{\text{Total number of checks} - (\text{number of sheets misread or not identified.})}{\text{Total number of checks}} \times 100$$

- Check paper used for test is EPSON standard check paper.

- Checks must be flat, without curls, folds, or wrinkles.

Inserting direction and endorsement printing

❏ Insert the check with the surface printed with the magnetic ink upward, following the slip side guide.

❏ The printer can perform endorsement printing.
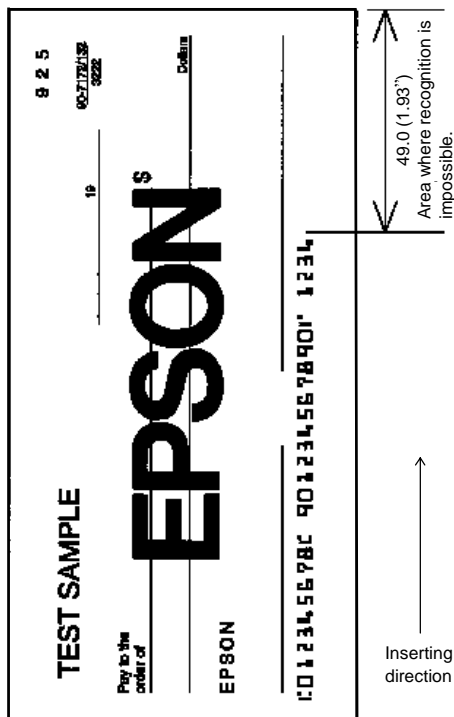
Area of personal check where MICR character recognition is impossible

❏ To print endorsements in the specified area (within 38.1 mm {1.5″} from the top), set the print position for the last line so that it is printed at least 3 mm {0.118″} above the bottom of the printable area (Especially when the printer is used near the display device, the user is required to check the recognition rate of the MICR).

Notes:

1. Do not install the printer near any magnetic fields, because this may cause MICR reading errors. (Be sure to check the MICR recognition rate when the printer is used near a display device.)

2. MICR characters may not be recognized when impact or vibration is applied to the printer.
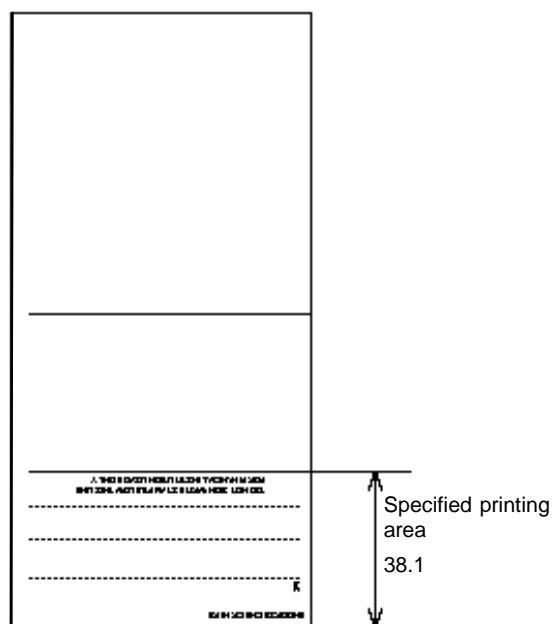
[Units: mm (All numeric values are typical.)]

Endorsement printing

Notes on using the MICR reader (only when the printer is used with MICR)

❏ The personal checks must be flat, without curls, folds, or wrinkles (especially at the edges). Otherwise, the check may rub against the ribbon and become ink-stained.

❏ Do not insert checks that have clips or staples. These may cause paper jams, MICR reading errors, and damage to the MICR head.

❏ Let go of the check immediately as soon as the printer starts feeding it. Otherwise, the paper is not fed straight, causing paper jams and MICR reading errors.

General Section

Internal Buffer

1. Receive buffer selectable as 45 or 4 KB using the DIP switch.

2. User-defined buffer (both for user-defined characters and user-defined bit images)
   Receipt: 12KB; Slip: 3KB

3. Macro buffer 2KB

4. NV (non-volatile) bit image buffer 384KB

5. NV (non-volatile) user memory 1KB

Electrical Characteristics

Supply voltage:	+24 VDC ± 10% (optional power supply: EPSON PS-170) Ripple voltage: 300 mVpp or less (only when the printer is used with the MICR reader)
Current consumption (at 24V except for drawer kickout driving)	Slip: Operating: Mean: Approximately 1.7A (Character font A α-N, all columns printing) Peak: Approximately 5.5A When the print platen is released: 2.0A (200 msec) Receipt: Operating: Mean: Approximately 1.8A (Character font A α-N, all columns printing) Peak: Approximately 7.7A Standby: Mean: Approximately 0.2A

EMI and Safety Standards Applied (EMC is Tested Using the EPSON PS-170 Power Supply)

Europe:	CE Marking
	  EN55022
	  EN50082-1
	  EN45501
	Safety Standards: EN 60950 (TÜV)

North America:	EMI: FCC/ICES-003 Class A Safety Standards: UL1950/CSA C22.2 No. 950
Japan:	EMC: VCCI Class A JEIDA-52
Oceania:	EMC: AS/NZS 3548 class B

Reliability

Slip printer section:

Life (when printing alphanumeric characters)	Mechanism: 7,500,000 lines The printer is defined to have reached the end of its life when it reaches the beginning of the Wearout Period. MICR reader mechanism (only when the printer is used with the MICR reader): 240,000 passes (when used with US personal checks)
MTBF	180,000 hours Failure is defined as a Random Failure occurring during the Random Failure Period.

| MCBF | 18,000,000 lines |
| | This is an average failure interval based on failures relating to Wearout and Random Failures up to the life of 7.5 million lines. |

| Print head life: | 200 million characters (when printed with font B only) |

Endorsement print mechanism section:

| Life | Mechanism: 1,350,000,000 lines |
| | The printer is defined to have reached the end of its life when it reaches the beginning of the Wearout Period. |

| Print head life: | 6,750,000 characters |

Receipt printer section:

| Life | Mechanism: 15,000,000 lines |
| | The printer is defined to have reached the end of its life when it reaches the beginning of the Wearout Period. |

| MTBF | 360,000 hours |
| | Failure is defined as a Random Failure occurring at the time of the Random Failure Period. |

| MCBF | 52,000,000 lines |
| | This is an average failure interval based on failures relating to Wearout and Random Failures up to the life of 15 million lines. |

| Thermal head life: | 100 million pulses, 100 Km |

| Autocutter life: | 1,500,000 cuts |

Environmental Conditions

| Temperature: | Operating: 5 to 45 °C (41 to 113°F) |
| | Storage: –10 to 50 °C (14 to 122°F) (except for paper and ribbon) |

| Humidity: | Operating: 10 to 90% RH |
| | Storage: 10 to 90% RH (except for paper and ribbon) |
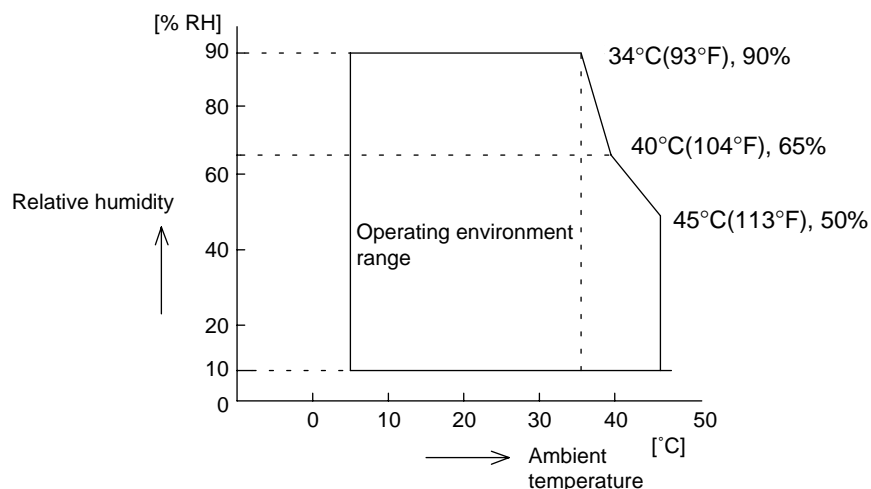
Operating temperature and humidity range

Vibration resistance:	When packed: Frequency: 5 to 55 Hz Acceleration: 2 G Sweep: 10 minutes (half cycle) Duration: 1 hour Directions: x, y, and z No external or internal damage should be found after the vibration test, and the unit should operate normally.
Impact resistance:	When packed: Package: EPSON standard package Height: 50 cm (19.69") Directions: 1 corner, 3 edges, and 6 surfaces No external or internal damage should be found after the drop test, and the unit should operate normally. When unpacked: Height: 5 cm (1.97") Directions: Lift one edge and release it (for all 4 edges). When the printer is not printing, no external or internal damage should be found after the drop test.

Acoustic noise (operating):   Receipt:

When using autocutter:
Approximately 52 dB (bystander position)

When not using autocutter:
Approximately 45 dB (bystander position)

Installation

The printer must be installed horizontally.

Configuration

Interfaces

RS-232 Serial Interface

Specifications

Data transmission:	Serial
Synchronization:	Asynchronous
Handshaking:	DTR/DSR or XON/XOFF control
Signal levels:	MARK = -3 to -15 V: Logic "1"
	SPACE = +3 to +15 V: Logic "0"
Stop bits:	1 bit (fixed)
Connector (printer side):	Female DSUB-25 pin connector

The data word length, baud rate, and parity depend on the DIP switch settings. (See "DIP Switches" in Chapter 1.) The stop bit for the printer side is fixed to 1.

Switching between online and offline

The printer does not have an online/offline switch. The printer goes offline:

1. Between when the power is turned on (including reset using the interface) and when the printer is ready to receive data.

2. During the self-test.

3. When the cover is open (the cover for the paper source selected by **ESC c 0**).

4. During paper feeding using the paper FEED switch.

5. When the printer stops printing due to a paper-end (only when the paper roll is not present).

6. When an error has occurred.

Interface connector terminal assignments and signal functions

Interface connector terminal assignments and signal functions are described below.

Printer status and signals

Pin No.	Signal name	Signal direction	Function
1	FG	—	Frame ground
2	TXD	Output	Transmit data
3	RXD	Input	Receive data
4	RTS	Output	DIP SW 2-2 OFF: Same as DTR signal (pin 20) DIP SW 2-2 ON: Logical product of DTR signals of DM-D and TM (If both are SPACE, the printer can receive data (SPACE).)
6	DSR	Input	This signal indicates whether the host computer can receive data. SPACE indicates that the host computer can receive data, and MARK indicates that the host computer cannot receive data. When DTR/DSR control is selected, the printer transmits data after confirming this signal (except when transmitting data by **DLE EOT, GS a**, or **FS (e**). When XON/XOFF control is selected, the printer does not check this signal. Changing the DIP switch setting enables this signal to be used as a reset signal for the printer. (See Chapter 1, "DIP Switches.") The printer is reset when the signal remains MARK for 1 ms or more.
7	SG	—	Signal ground
20	DTR	Output	1) When DTR/DSR control is selected, this signal indicates whether the printer is busy. SPACE indicates that the printer is ready to receive data, and MARK indicates that the printer is busy. The busy condition can be changed by using DIP SW 2-1 as follows:

		DIP SW 2-1 status	
Printer status		**ON**	**OFF**
1. During the period from when the power is turned on (including resetting using the interface) to when the printer is ready to receive data.		BUSY	BUSY

Printer status and signals (continued)

Pin No.	Signal name	Signal direction	Function		
			2. During the self-test.	BUSY	BUSY
			3. When the cover is open.	—	BUSY
			4. During paper feeding using the paper FEED switch.	—	BUSY
			5. When the printer stops printing due to a paper-end (only when the paper roll is not present).	—	BUSY
			6. During macro executing standby states.	—	BUSY
			7. When an error has occurred.	—	BUSY
			8. When the receive buffer becomes full. (*1)	BUSY	BUSY
			2) When XON/XOFF control is selected: The signal indicates whether the printer is correctly connected and is ready to receive data. SPACE indicates that the printer is ready to receive data. The signal is always SPACE except in the following cases: • During the period from when the power is turned on to when the printer is ready to receive data. • During the self-test.		
25	INIT	Input	Changing the DIP switch setting enables this signal to be used as a reset signal for the printer. The printer is reset when the signal remains SPACE for 1 ms or more.		

(In rows 2–8, the "Off-line" label appears rotated in the Function column.)

NOTES:

1. When the DIP switch 1-2 is Off (the receive buffer capacity is specified to 45 bytes):
   When the remaining space in the receive buffer drops to 16 bytes, the printer status becomes "buffer full" and it remains "buffer full" until the space in the receive buffer increases to 26 bytes.

2. When the DIP switch 1-2 is On (the receive buffer capacity is specified to 4 K bytes):
   When the remaining space in the receive buffer drops to 128 bytes, the printer status becomes "buffer full" and it remains "buffer full" until the space in the receive buffer increases to 256 bytes.

3. The printer ignores the data received when the remaining space in the receive buffer is 0 bytes.

XON/XOFF transmission timing

When XON/XOFF control is selected, the printer transmits XON or XOFF signals as follows. Transmission timing differs depending on the DIP SW1-3 setting.

XON/XOFF transmission timing

		DIP SW 2-1 status	
	Printer status	**ON**	**OFF**
XON transmission	1. When the printer goes online after turning on the power (or reset using interface)	Transmit	Transmit
	2. When the receive buffer is released from the buffer full state	Transmit	Transmit
	3. When the printer switches from offline to online	—	Transmit
	4. When the printer recovers from an error using the **DLE ENQ 1** or **DLE ENQ 2** commands	—	Transmit
XOFF transmission	5. When the receive buffer becomes full	Transmit	Transmit
	6. When the printer switches from online to offline	—	Transmit

NOTES:

- The XON code is <11>H and the XOFF code is <13>H.

- In case 3, XON is not transmitted when the receive buffer is full.

- In case 6, XOFF is not transmitted when the receive buffer is full.

- When the DIP SW 2-1 is set to OFF, XON is not transmitted if the printer is in offline state in case 2.

Notes on setting DIP switch 2-1 to ON

1. The printer mechanism stops but does not become busy when: an error has occurred, the cover is open, printing stops due to a paper-end, or paper is fed using the paper FEED button.

2. When setting DIP switch 2-1 to ON to enable handshaking with the printer, be sure to check the printer status using the **GS a** command and the ASB function. In this setting, the default value of *n* for **GS a** is 2. The printer automatically transmits the printer status, depending on online/offline changes.

3. When using **DLE EOT**, **DLE ENQ**, and **DLE DC4** be sure that the receive buffer does not become full.

   - When using a host that cannot transmit data when the printer is busy:
     If an error has occurred, **DLE EOT**, **DLE ENQ,** and **DLE DC4** cannot be used when the printer is busy due to a receive buffer-full state.

   - When using a host that can transmit data when the printer is busy:
     When the receive buffer becomes full while transmitting bit-image data, **DLE EOT** or **DLE ENQ,** and **DLE DC4** used while sending the bit-image data is processed as bit-image data. The data transmitted when the receive buffer is full may be lost.

   - Example: Check the printer status using **GS I** or **GS r** after transmitting each line of data and use the 4KB receive buffer. Transmit one line of data so that the receive buffer does not become full.

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Notes on resetting the printer using the interface

The printer can be reset using interface pins 6 and 25 by changing the DIP switch setting (see Chapter 1, "DIP Switches").

Reset switching

Signal Line	DIP Switch	Reset Condition
Pin 6 (DSR)	DSW 2-7: ON	MARK level input
Pin 25 (INIT)	DSW 2-8: ON	SPACE or TTL-HIGH level input

To reset the printer, the following requirements must be satisfied.

❏ DC characteristics:

Reset DC characteristics

		Pin 6 (DSR)	Pin 25 (INIT)
Input HIGH voltage	V_{IH}	+3 to +15 V	+2 to +15 V
Input LOW voltage	V_{IL}	–15 to + –3 V	–15 to + 0.8 V
Input HIGH current:	I_{IH}	5 mA (maximum)	1 mA (maximum)
Input LOW current:	I_{IL}	–5.3 mA (maximum)	–2 mA (maximum)
Input impedance:	R_{IN}	3 KΩ (minimum)	

❏ AC characteristics:
Minimum reset pulse width: TRS 1 msec (minimum)

❏ When using pin 6 (DSR) (DIP switch 2-7 is ON):

Minimum reset pulse width (pin 6)

❑ When using pin 25 (INIT) (DIP switch 2-8 is ON):

Minimum reset pulse width (pin 25)
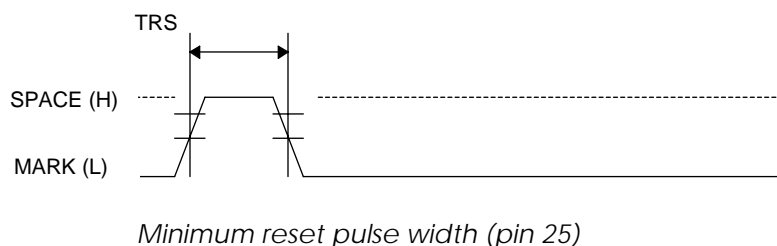
NOTES:

• When a signal that does not satisfy the requirements above is input, printer operation is not guaranteed. When a signal is input to pin 25 (INIT) at the TTL level, the requirements above must also be satisfied. Although a signal is input to pin 6 (DSR) at the TTL level, according to the DC characteristics described above, the operation is not guaranteed and pin 6 cannot be controlled.

• When pin 6 (DSR) and pin 25 (INIT) are open, the printer is operating.

IEEE 1284 Bidirectional Parallel Interface (Parallel Interface Specifications)

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Compatibility mode (data transmission from host to printer: Centronics-compatible)

Outline	Compatibility mode supports the compatibility with Centronics parallel interface.
Specifications	Data transmission: 8-bit Parallel Synchronization: Externally supplied nStrobe signals Handshaking: nAck and Busy signals Signal levels: TTL compatible Connector: 57RE-40360-830B (DDK) or equivalent (IEEE 1284 Type B)

Switching between online and offline

The printer is not equipped with any online/offline switch. The printer is placed into offline status in any of the following conditions:

1. When the power is turned on or until the printer becomes ready for data transmission after it is initialized by the reset signal (nInit) from the interface.

2. During the self-test.

3. When the cover is open.

4. During paper feeding using the FEED button.

5. When the printer stops printing due to a paper-end (only when the paper roll is not present).

6. During macro executing standby status.

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7. When a temporary abnormality occurs in the power supply voltage.

8. When an error has occurred.

Reverse mode (data transmission from printer to host)

The STATUS data transmission from the printer to the host proceeds in the Nibble or Byte mode.

❏ Description

This mode allows data transmission from the asynchronous printer under the control of the host.

Data transmissions in the Nibble Mode are made via the existing control lines in units of four bits (a nibble). In the Byte Mode, data transmissions proceed by making the eight-bit data lines bidirectional.

Both modes fail to proceed concurrently in the Compatibility Mode, causing half duplex transmission.

Interface pin assignments for each mode

Pin	Source	Compatibility mode	Nibble mode	Byte mode
1	Host	nStrobe	HostClk	HostClk
2	Host/Ptr	Data0 (LSB)	Data0 (LSB)	Data0 (LSB)
3	Host/Ptr	Data1	Data1	Data1
4	Host/Ptr	Data2	Data2	Data2
5	Host/Ptr	Data3	Data3	Data3
6	Host/Ptr	Data4	Data4	Data4
7	Host/Ptr	Data5	Data5	Data5
8	Host/Ptr	Data6	Data6	Data6
9	Host/Ptr	Data7 (MSB)	Data7 (MSB)	Data7 (MSB)
10	Printer	nAck	PtrClk	PtrClk
11	Printer	Busy	PtrBusy/Data3, 7	PtrBusy
12	Printer	PError	AckDataReq/Data2, 6	AckDataReq
13	Printer	Select	Xflag/Data1, 5	Xflag
14	Hostr	nAutoFd	HostBusy	HostBusy
15		NC	ND	ND
16		GND	GND	GND
17		FG	FG	FG
18	Printer	Logic-H	Logic-H	Logic-H
19		GND	GND	GND
20		GND	GND	GND
21		GND	GND	GND
22		GND	GND	GND
23		GND	GND	GND
24		GND	GND	GND

Pin	Source	Compatibility mode	Nibble mode	Byte mode
25		GND	GND	GND
26		GND	GND	GND
27		GND	GND	GND
28		GND	GND	GND
29		GND	GND	GND
30		GND	GND	GND
31	Host	nInit	nInit	nInit
32	Printer	nFault	nDataAvail/Data0, 4	nDataAvail
33		GND	ND	ND
34	Printer	DK_STATUS	ND	ND
35	Printer	+5V	ND	ND
36	Host	nSelectIn	1284-Active	1284-Active

* NC: Not connected

 ND: Not defined

NOTES:

1. A prefix "n" to signal names indicates LOW active signals. To the host not provided with the signal lines listed above, both-way communication fails.

2. For interfacing, signal lines shall use twisted pair cables with the return sides connected to signal ground level.

3. Interfacing conditions all shall be based on the TTL level to meet the characteristics described below. In addition, both rise time and fall time of each signal shall be 0.5 µs or less.

4. Data transmission shall not ignore the signal nAck or Busy. An attempt to transmit data with either signal, nAck or Busy, ignored can cause lost data. (Data transmissions to the printer shall be made after verifying the nAck signal or while the Busy signal is at the LOW level.)

5. Interface cables shall be the minimum length required and as short in length as possible.
   *NC: Not connected
   ND: Not defined

6. When the DTR/DSR control is selected, the printer enters the BUSY state under the following conditions.

		DIP SW 2-1 status	
	Printer status	**ON**	**OFF**
Offline	1. During the period from when the power is turned on (including resetting using the interface) to when the printer is ready to receive data.	BUSY	BUSY
	2. During the self-test.	BUSY	BUSY
	3. When the cover is open.	—	BUSY
	4. During paper feeding using the paper FEED switch.	—	BUSY
	5. When the printer stops printing due to a paper-end (only when the paper roll is not present).	—	BUSY
	6. During macro executing standby status.	—	BUSY
	7. When an error has occurred.		BUSY
	8. When the receive buffer becomes full.	BUSY	BUSY

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NOTES:

1. When the DIP switch 1-2 is Off (the receive buffer capacity is specified to 45 bytes): When the remaining space in the receive buffer drops to 16 bytes, the printer status becomes "buffer full" and it remains "buffer full" until the space in the receive buffer increases to 26 bytes.

2. When the DIP switch 1-2 is On (the receive buffer capacity is specified to 4K bytes): When the remaining space in the receive buffer drops to 128 bytes, the printer status becomes "buffer full" and it remains "buffer full" until the space in the receive buffer increases to 256 bytes.

3. The printer ignores the data received when the remaining space in the receive buffer is 0 bytes.

Electrical characteristics

DC characteristics (except logic-H, +5 V signals)

Characteristics	Symbol	Specifications		Conditions
		Min	**Max**	
Output HIGH voltage	V_{OH}	*2.4 V	5.5 V	*I_{OH}=0.32 mA
Output LOW voltage	V_{OL}	–0.5 V	*0.4 V	*I_{OL}=-12 mA
Output HIGH current	I_{OH}	0.32 mA	—	V_{OH}=0.32 V
Output LOW current	I_{OL}	–12 mA	—	V_{OL}=0.4 V
Input HIGH voltage	V_{IH}	2.0 V	—	
Input LOW voltage	V_{IL}	—	0.8 V	
Input HIGH current	V_{IH}	—	–0.32 mA	V_{IH}=2.0 V
Input LOW current	V_{IL}	—	12 mA	V_{IL}=0.8 V

Logic-H signal sender characteristics

Characteristics	Symbol	Specifications		Conditions
		Min	**Max**	
Output HIGH voltage	V_{OH}	3.0 V	5.5 V	
Output LOW voltage	V_{OL}	—	2.0 V	While the power is OFF

+5 V signal sender characteristics

Characteristics	Symbol	Specifications		Conditions
		Min	**Max**	
Output HIGH voltage	V_{OH}	*2.4 V	5.5 V	*IOH=0.32 mA
Output LOW voltage	V_{OL}	—	— **	While the power is OFF
Output HIGH current	I_{OH}	—	0.32 mA	VOH=2.4 V
Output LOW current	I_{OL}	— **	—	While the power is OFF

** No guarantee is offered to V_{OL} and I_{OL} while the power is OFF.

Data receiving timing (compatibility mode)
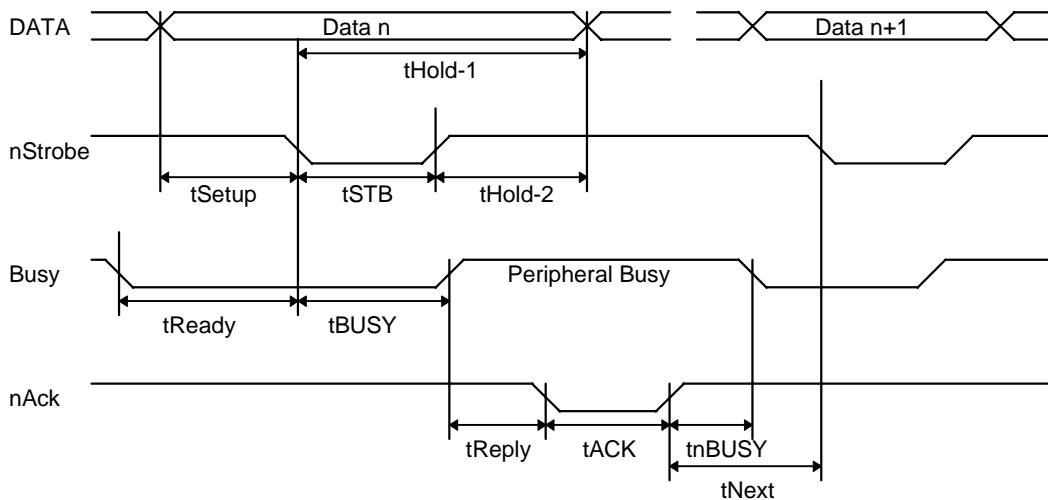
NOTE: The letter "n" preceding a signal name indicates active LOW.

Characteristics	Symbol	Specifications	
		Min (ns)	Max (ns)
Data Hold Time (host)	tHold-1	—	500
Data Hold Time (printer)	tHold-2	—	—
Data Setup Time	tSetup	—	500
STROBE Pulse Width	tSTB	—	500
READY Cycle Idle Time	tReady	—	—
BUSY Output Delay Time	tBUSY	0	500
Data Processing Time	tReply	0	∞
ACKNLG Pulse Width	tACK	500	10 μs
BUSY Release Time	tnBUSY	0	∞
ACK Cycle Idle Time	tNEXT	—	0

*The printer latches data at the nStrobe ↓ timing

Notes on resetting the printer through the interface

The printer reset is available through the interface nInit signal (pin #31) by changing the DIP switch setting.

The printer reset through the nInit signal is only available with the SelectIn (1284-Active) signal at LOW.
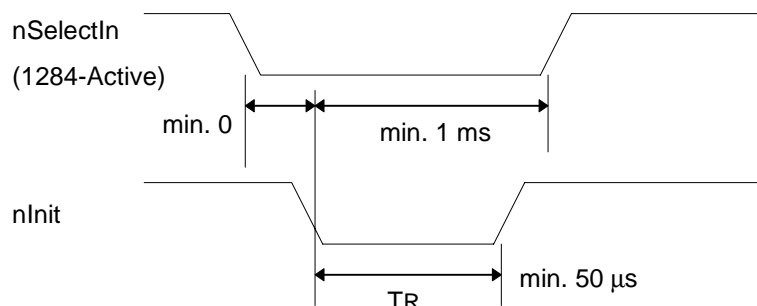
To enable the printer reset, the following signal timing shall be satisfied.

DC characteristics: TTL level
AC characteristics: Minimum reset pulse width TR: 50 μs (min)

NOTE: The letter "n" before a signal name indicates an active LOW signal.

Reception of status from the printer through the bidirectional parallel interface

In the bidirectional parallel interface specifications, printer status transmission is available by using the both-way communication facility in the Nibble/Byte Modes in accordance with IEEE 1284 specifications.

In this case, as opposed to the RS-232C serial interface specifications, the real-time interruptions from the printer to the host are disabled and thus precautions must be taken to the following:

1. The allowable capacity of the printer internal buffer is 99 bytes (except for ASB status). The status signals exceeding this capacity will be discarded. To prevent possible loss of status, the host shall be ready for data acceptance (Reverse Mode).

2. When ASB is used, the host is preferably in the wait state for data acceptance (Reverse Idle Mode). When this state is not available, the host shall enter the Reverse Mode to constantly monitor the presence of data.

3. When ASB is used, preference shall be given to the ASB status for transmission over the other status signals. Any accumulated ASB status signals left for transmission from the last to the newest ASB status transmission shall be transmitted together at a time as one ASB status showing the presence of change, followed by the latest ASB status.

   Example: In the normal (wait) state, the ASB status is configured as follows:

First Status	Second Status	Third Status	Fourth Status
0001 0000	0000 0000	0110 0000	0000 1111

When the following sequence of operations proceed — the near end is detected the printer cover is opened, and then the printer cover is closed — the following pieces of data are accumulated.

	First Status	Second Status	Third Status	Fourth Status	
①	0001 0000	0000 0000	0110 0011	0000 1111	Near end detection
②	0011 1000	0000 0000	0110 0011	0000 1111	The printer cover is opened.
③	0001 0000	0000 0000	0110 0011	0000 1111	The printer cover is closed.

When the ASB status is received following this, a total of eight (8) bytes of ASB will be transmitted as follows.

Accumulated ASB (①+②+③)

	First Status	Second Status	Third Status	Fourth Status
Accumulated ASB (①+②+③)	0011 0000	0000 0000	0110 0011	0000 1111
+	**First Status**	**Second Status**	**Third Status**	**Fourth Status**
The latest ASB (③)	0001 0000	0000 0000	0110 0011	0000 1111
Fourth Status				

Notes on setting DIP switch 2-1 to ON

1. The printer mechanism stops but does not become BUSY in the following cases:

    *   When an error occurs.

    *   When the cover is open.

    *   When the printer stops printing due to a paper end.

    *   When paper is fed using the FEED button.

2. When handshaking with the printer while using this switch setting, be sure to monitor the printer with the **GS a** command and the ASB function.

    With this switch setting, the default value of the **GS a** command *n* is 2. This automatically transmits the printer status, depending on online/offline changes.

3. When using the **DLE EOT** or **DLE ENQ** command, make sure that the receive buffer does not become full.

    *   Notes on using a host that cannot transmit data when the printer is BUSY:

        If an error occurs when the receive buffer is full and the printer is BUSY, the **DLE EOT** and **DLE ENQ** commands cannot be used.

- Notes on using a host that can transmit data when the printer is BUSY:

    If a **DLE EOT**, **DLE ENQ**, or **DLE DC 4** command is used while sending bit-image data, and the receive buffer-full state is encountered during transmission of the data, the **DLE EOT**, **DLE ENQ** or **DLE DC 4** is processed as bit-image data.

    In addition, the data transmitted during the receive buffer-full state may be lost.

Example of use:
Set the receive buffer to 4KB, and check the status using **GS l** or **GS r** after each line of printing is transmitted. Transmit one line of data at a time so that the receive buffer does not become full.

RS-485 Serial Interface

(RS-485 serial interface specification is a dealer option.)

Specifications (RS-485-compatible)

Data transmission:	Serial
Synchronization:	Asynchronous
Handshaking:	Depends on the DIP switch settings (DTR/DSR or XON/XOFF control)
Signal levels:	2.0 V to 5.0 V: Logic "1" 0.0 V to 0.8 V: Logic "0"
Baud rates:	2400, 4800, 9600, 19200 bps
Data word lengths:	7 or 8 bits
Parity settings:	None, even, odd
Stop bits:	1 bit (fixed)
Connector (printer side):	Female D-SUB-25 pin connector

NOTE:

The handshaking data, word length, baud rate, and parity depend on the DIP switches (see Chapter 1). Data transmitted from the printer has 1 stop bit (fixed).

DR1 > DR2 CS1 > CS2 indicates that:

Channel 1 is high.
Channel 2 is low.

DR1 < DR2 CS1 < CS2 indicates that:

Channel 2 is high.
Channel 1 is low.

Signal levels and communication control functions

CS1	CS2	Function
H	L	Communication is available
L	H	Communication is not available

If the electric potential of CS1 is higher than that of CS2, the printer is ready for communication (the host is ready to receive data). If the electric potential of CS1 is lower than that of CS2, the printer is not ready for communication (the host is not ready to receive data).

Signal levels and communication control functions

DR1	DR2	Function
H	L	Communication is available
L	H	Communication is not available

If the electric potential of DR1 is higher than that of DR2, the printer is ready for communication (the host is ready to receive data). If the electric potential of DR1 is lower than that of DR2, the printer is not ready for communication (the host is not ready to receive data).

Switching between online and offline

The printer does not have an online/offline switch.

The printer goes offline:

1. Between when the power is turned on (including reset using the interface) and when the printer is ready to receive data.

2. During the self-test.

3. When the cover is open.

4. During paper feeding using the FEED button.

5. When the printer stops printing due to paper-end (in cases when an empty paper supply is detected by either paper roll end detector or the paper roll near-end detector with a printing halt feature set to enabled by **ESC c 4**).

6. During macro executing standby status.

7. When a temporary abnormality occurs in the power supply voltage.

8. When an error has occurred.

9. When the receive buffer becomes full. (*1)

*1:
- When the DIP switch 1-2 is Off (the receive buffer capacity is specified to 45 bytes): When the remaining space in the receive buffer drops to 16 bytes, the printer status becomes "buffer full," and it remains "buffer full" until the space in the receive buffer increases to 26 bytes.

- When the DIP switch 1-2 is On (the receive buffer capacity is specified to 4 K bytes): When the remaining space in the receive buffer drops to 128 bytes, the printer status becomes "buffer full," and it remains "buffer full" until the space in the receive buffer increases to 256 bytes.

- The printer ignores the data received when the remaining space in the receive buffer is 0 bytes.

See "RS-232 Serial Interface" for notes on setting DIP switch 2-1 to ON.

Interface pin assignments

Printer status and signals

Pin number	Signal name	Signal direction	Function
1	FG	—	Frame ground
2	SD1	Output	Transmit data
3	SD2	Output	Transmit data
4	RD1	Input	Receive data
5	RD2	Input	Receive data
7	SG	—	Signal ground
8	DR1	Output	When DTR/DRS is selected, this signal indicates whether the host computer is BUSY or READY.
9	DR2	Output	1) DR1>DR2 indicates that the printer is READY and DR1<DR2 indicates that the printer is BUSY. The BUSY condition can be changed, depending on the offline conditions set by the DIP switches. When the DTR/DSR control is selected, the printer enters the BUSY state (DR1<DR2) under the following conditions.

Printer status	DIP SW 2-1 status	
	ON	OFF
1. During the period from when the power is turned on (including resetting using the interface) to when the printer is ready to receive data.	BUSY	BUSY
2. During the self-test.	BUSY	BUSY
3. When the cover is open.	—	BUSY
4. During paper feeding using the paper FEED switch.	—	BUSY
5. When the printer stops printing due to a paper-end (only when the paper roll is not present).	—	BUSY
6. During macro executing standby status.	—	BUSY
7. When an error has occurred.		BUSY
8. When the receive buffer becomes full. (*1)	BUSY	BUSY

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Printer status and signals (continued)

Pin number	Signal name	Signal direction	Function
			2) **When XON/XOFF control is selected,** this signal indicates whether the printer is correctly connected and is ready to receive data. SPACE indicates that the printer is ready to receive data. The signal is always DR1>DR2 (READY) to indicate that the printer is ready to receive data, except in the following cases: • During the period from when the power is turned on to when the printer is ready to receive data. • During the self-test.
10	CS1	Input	1) When DTR/DSR is selected, this signal indicates whether the host computer is BUSY or READY. CS1>CS2 indicates that the printer is READY and CS1<CS2 indicates that the printer is BUSY.
11	CS2		The signal is checked and data is transmitted only when the host is ready to receive data (READY) (except for transmissions by **DLE EOT**, **GS a** or **FS (e**). 2) When XON/XOFF control is selected, transmits data regardless of the status of this signal.

NOTES:

1. When the DIP switch 1-2 is Off (the receive buffer capacity is specified to 45 bytes): When the remaining space in the receive buffer drops to 16 bytes, the printer status becomes "buffer full," and it remains "buffer full" until the space in the receive buffer increases to 26 bytes.

2. When the DIP switch 1-2 is On (the receive buffer capacity is specified to 4 K bytes): When the remaining space in the receive buffer drops to 128 bytes, the printer status becomes "buffer full," and it remains "buffer full" until the space in the receive buffer increases to 256 bytes.

3. The printer ignores the data received when the remaining space in the receive buffer is 0 bytes.

XON/XOFF transmission timing

See "XON/XOFF transmission timing" under the "RS-232 Serial Interface" section earlier in this chapter.

For the DIP switch settings for the offline status, see Chapter 1.

Data format when using RS-485

Transmission data (8 bits, no parity)
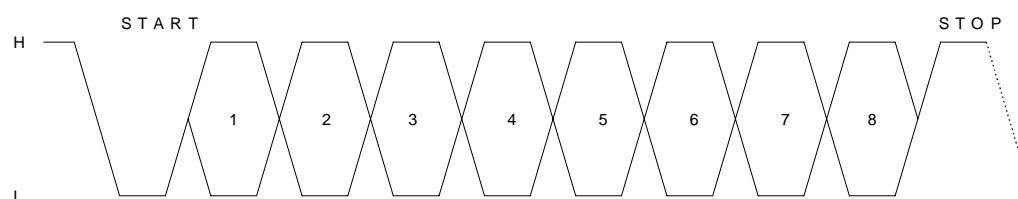
RS-485 communication data format

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"H" indicates:

  <Printer transmission data> SD1<SD2
  <Printer reception data> RD1<RD2

"L" indicates:

  <Printer transmission data> SD1<SD2
  <Printer reception data> RD1<RD2

The transmission data is H = 1, L = 0

NOTE: This format is used when the UART for RS-232 is connected to the RS-485 driver.

Printer reception data level

DR1	DR2	Read data
H	L	Receiving data line is at the low level
L	H	Receiving data line is at the high level

Printer transmission data level

SD1	SD2	Send data
H	L	Sending data line is at the low level
L	H	Sending data line is at the high level

Connectors
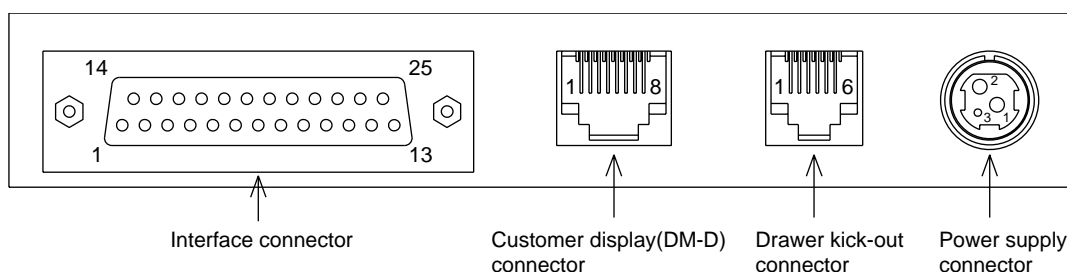
Serial interface connector panel external appearance
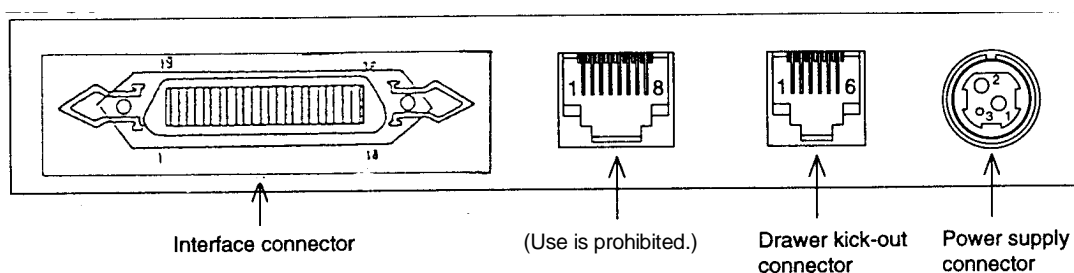
Parallel interface connector panel external appearance

Interface Connectors

See "Interfaces" earlier in this chapter.

Power Supply Connector

This connector is used to connect the printer to an external power source.

1. Pin assignments: See the table below.

2. Connector model: printer side: Hoshiden TCS7960-532010 or equivalent

Power supply connector pin assignments

Pin Number	Signal Name
1	+24 VDC
2	GND
3	NC
Shell	Frame GND
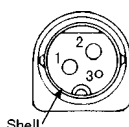
Power supply connector

Drawer Kick-out Connector (Modular Connector)

The pulse specified by **ESC p** or **DLE DC4** is output to this connector. The host can confirm the status of the input signal by using the **DLE EOT**, **GS r**, or **GS a** (ASB) commands.

1. Pin assignments: See the table on the next page.

2. Connector model: Printer side: MOLEX 52065-6615 or equivalent
User side: 6-position 6-contact (RJ12 telephone jack)

Drawer kick-out connector pin assignments

Pin Number	Signal name	Direction
1	Frame GND	—
2	Drawer kick-out drive signal 1	Output
3	Drawer open/close signal	Input
4	+24 V	—
5	Drawer kick-out drive signal 2	Output
6	Signal GND	—

+24 V is output through pin 4 when the power is turned on. However, pin 4 must be used only for the drawer.
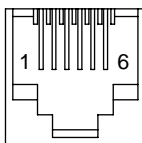
Drawer kick-out connector

3. Drawer kick-out drive signal

Output signal: Output voltage: Approximately 24 V
Output current: 1A or less

CAUTION:

To avoid an overcurrent, the resistance of the drawer kick-out solenoid must be 24 Ω or more.

Output waveform: Outputs the waveforms in the figure of Drawer Kick-out Drive Signal Output Waveform to the points A and B in the figure of Drawer Circuitry.

t1 (ON time) and *t2* (OFF time) are specified by **ESC p** or **DLE DC4**.
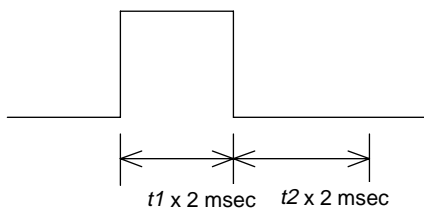
Drawer kick-out drive signal output waveform

4. Drawer open/close signal

Input signal level (connector pin 3): "L" = 0 to 0.8 V
"H" = 2 to 5 V
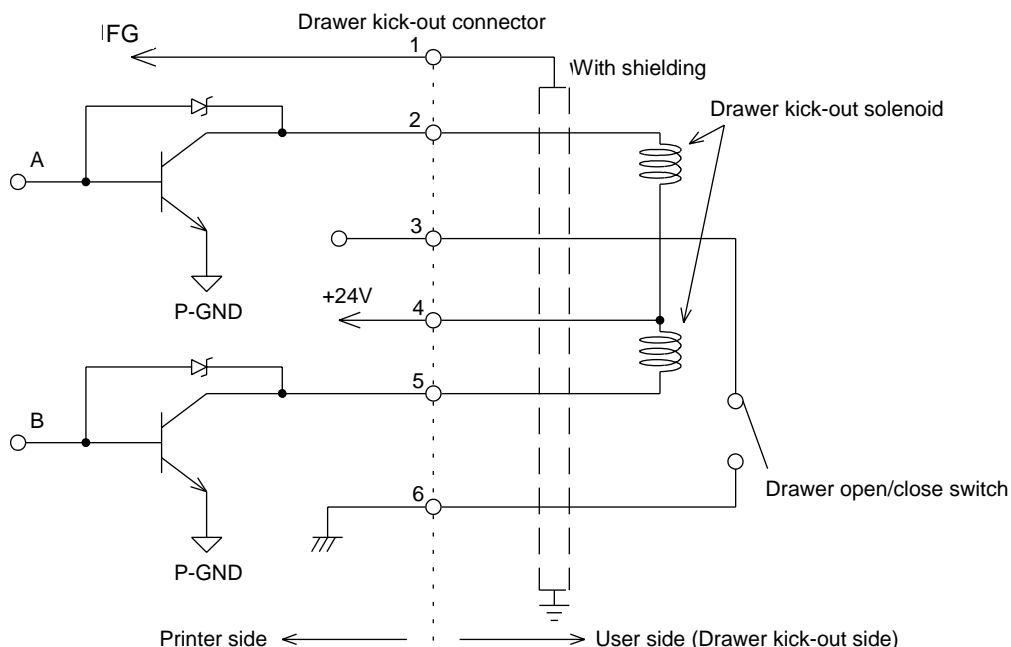
Drawer circuitry

NOTES:

1. Two driver transistors cannot be energized simultaneously.

2. The driver must not be energized continuously.

3. Be sure to use the printer power supply (connector pin 4) for the drawer power source.

4. The resistance of the drawer kick-out solenoid must not be less than the specified resistance. Otherwise, an overcurrent could damage the solenoid.

5. The drawer kick-out power (+24V) is supplied only when the drawer is driven.

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Customer display connector (available only for serial interface model)

1. Model:

   Receptacle: MOLEX 52065-8845 or equivalent

2. Pin assignments:

Customer display connector pin assignments

Pin Number	Signal Name	Direction
1	FG	—
2	NC	—
3	TXD	Output
4	DTR	Output
5	DSR	Input
6	SG	—
7	+24	—
8	PG	—

NOTE: NC = not connected

+24 V is always output through pin 7. The driving capability is 350 mA or less. Be sure not to use customer displays other than Seiko Epson DM-D series.
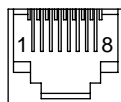
DM-D Connector

Chapter 3

ESC/POS Commands

TM-H6000 Supported Commands

MICR commands are listed in a separate table after the table below. See the "ESC/POS Application programming Guide" for detailed command explanations.

Command	Name	Function Type	Classification	
			Executing Cmds	**Setting Cmds**
HT	Horizontal tab	Print position	O	
LF	Print and line feed	Print	O	
FF	① Print and eject cut sheet (in standard mode) ② Print and return to standard mode (in page mode)	Print	O	
CR	Print and carriage return	Print	O	
CAN	Cancel print data in page mode	Character	O	
DLE EOT	Real-time status transmission	Status	O	
DLE EOT NUL	Real-time status transmission	Status	O	
DLE ENQ	Real-time request to printer	Miscellaneous function	O	
DLE DC4	Generate pulse at real time	Miscellaneous function	O	O
ESC FF	Print data in page mode	Print	O	
ESC SP	Set right-side character spacing	Character		O
ESC !	Select print mode(s)	Character		O
ESC $	Set absolute print position	Print position	O	
ESC %	Select/cancel user-defined character set	Character		O
ESC &	Define user-defined characters	Character		O
ESC ∗	Select bit-image mode	Bit image	O	
ESC –	Turn underline mode on/off	Character		O
ESC 2	Select default line spacing	Line spacing		O
ESC 3	Set line spacing	Line spacing		O
ESC <	Return home	Mechanism control	O	
ESC =	Select peripheral device	Miscellaneous function		O
ESC ?	Cancel user-defined characters	Character		O
ESC @	Initialize printer	Miscellaneous function	O	O
ESC D	Set horizontal tab positions	Print position		O
ESC E	Turn emphasized mode on/off	Character		O
ESC F	Set/cancel cut sheet reverse eject	Mechanism control		O
ESC G	Turn double-strike mode on/off	Character		O

Command	Name	Function Type	Classification	
			Executing Cmds	**Setting Cmds**
ESC J	Print and feed paper	Print	O	
ESC K	Print and reverse feed	Print	O	
ESC L	Select page mode	Miscellaneous function	O	
ESC M	Select character font	Character		O
ESC R	Select an international character set	Character		O
ESC S	Select standard mode	Miscellaneous function	O	
ESC T	Select print direction in page mode	Print position		O
ESC U	Turn unidirectional printing mode on/off	Mechanism control		O
ESC V	Turn 90° clockwise rotation mode on/off	Character		O
ESC W	Set printing area in page mode	Print position		O
ESC \	Set relative print position	Print position	O	
ESC a	Select justification	Print position		O
ESC c 0	Select paper type(s) for printing	Printing paper	O	O
ESC c 1	Select paper type(s) for command settings	Printing paper		O
ESC c 3	Select paper sensor(s) to output paper-end signals	Paper sensor		O
ESC c 4	Select paper sensor(s) to stop printing	Paper sensor		O
ESC c 5	Enable/disable panel buttons	Panel button		O
ESC d	Print and feed *n* lines	Print	O	
ESC e	Print and reverse feed *n* lines	Print	O	
ESC f	Set cut sheet wait time	Printing paper		O
ESC p	Generate pulse	Miscellaneous function	O	
ESC q	Paper release	Mechanism control	O	
ESC t	Select character code table	Character		O
ESC {	Turn upside-down printing mode on/off	Character		O
FS (e	Enable/disable Automatic Status Back (ASB) for optional functions	Status	O	O
FS p	Print NV bit image	Bit image	O	
FS q	Define NV bit image	Bit image	O	O
GS !	Select character size	Character		O
GS $	Set absolute vertical print position in page mode	Print position	O	
GS (A	Execute test print	Miscellaneous function	O	
GS (B	Customize ASB status bits	Status		O
GS (C	Edit NV user memory	Bit image	O	O
GS (E	User-defined commands	Miscellaneous function	O	O
GS (G	Select side of slip to print	Printing paper	O	

Command	Name	Function Type	Classification Executing Cmds	Setting Cmds
GS (L	Transmit NV bit-image memory size	Bit image	O	
GS *	Define downloaded bit image	Bit image		O
GS /	Print downloaded bit image	Bit image	O	
GS :	Start/end macro definition	Macro function	O	O
GS B	Turn white/black reverse printing mode on/off	Character		O
GS E	Select head control method	Miscellaneous function		O
GS H	Select printing position of HRI characters	Bar code		O
GS I	Transmit printer ID	Miscellaneous function	O	
GS L	Set left margin	Print position		O
GS P	Set horizontal and vertical motion units	Miscellaneous function		O
GS T	Set print position to the beginning of the print line	Print position	O	
GS V	Select cut mode and cut paper	Mechanism control	O	
GS W	Set printing area width	Print position		O
GS \	Set relative vertical print position in page mode	Print position	O	
GS ^	Execute macro	Macro function	O	
GS a	Enable/disable Automatic Status Back (ASB)	Status	O	
GS b	Turn smoothing mode on/off	Character	O	
GS f	Select font for HRI characters	Bar code	O	
GS g 0	Initialize maintenance counter	Miscellaneous function		O
GS g 2	Transmit maintenance counter	Miscellaneous function	O	
GS h	Set bar code height	Bar code	O	
GS k	Print bar code	Bar code	O	
GS r	Transmit status	Status	O	
GS v 0	Print raster bit image	Bit image	O	
GS w	Set bar code width	Bar code	O	

Note: NV = non-volatile

The following commands are supported only by printers with the optional Magnetic Ink Character Recognition (MICR) reader. (The MICR reader is a factory-installed option.)

Command	Name	Function Type	Classification Executing Cmds	Setting Cmds
DLE EOT BS	Real-time MICR status transmission	MICR	O	
FS (f	Select MICR data handling	MICR		O
FS a 0	Read check paper	MICR	O	
FS a 1	Load check paper to print starting position	MICR	O	

Command	Name	Function Type	Classification	
			Executing Cmds	**Setting Cmds**
FS a 2	Eject check paper	MICR	O	
FS b	Request retransmission of check paper reading result	MICR	O	
FS c	MICR mechanism cleaning	MICR	O	

Chapter 4

Programming Guide/Tips

See the "ESC/POS Application Programming Guide" for a detailed command explanation.

Maintenance Counter

The maintenance counter can be used for assuming the time for replacing consumed parts or cleaning. The maintenance counter is transmitted by **GS g 2** . Be sure to note that the value of the maintenance counter built in the printer is a reference value; therefore, there will be a difference in the value depending on the timing of occurring errors or turning off the power.

Bar Codes

Bar Code Printing

You can print bar codes, using the **GS k** command, for any of the following types of bar codes:

❏ UPC-A, UPC-E

❏ JAN 8 (EAN 8), JAN 13 (EAN 13)

❏ CODE 39

❏ ITF (Interleaved 2 of 5)

❏ CODABAR (NW-7)

❏ CODE 93

❏ CODE 128

The bar codes types are described in further detail below.

UPC-A, UPC-E

These product distribution codes were established in the United States and are used in the U.S. and Canada. The codes are based on JAN codes and EAN codes. Although the paragraphs below explain the three existing types of UPC codes, you can use only UPC-A and UPC-E with the TM-H6000.

❏ UPC-A

This code is very similar to the JAN 13 (EAN 13) code, and consists of the code for a 12-digit number. The standard value for the first digit is "0." When coding is performed at the store, the first digit is "2." The first digit is "3" for NDC (National Drug Code) and HRI (National Health Related Items Code) items. "4" is used for items protected by a check digit, and "5" is used for coupons. No standards have been determined for other items.

❏ UPC-D

Since only 12 digits can be used with UPC-A, UPC-D was established to allow the number of digits to be increased. Currently, it is not being used (and it cannot be used with the TM-H6000).

❏ UPC-E

This is an abbreviated bar code, in which bar codes created using the UPC-A standard are shortened by deleting data values of "0" according to certain rules.

Usage

You can use only numbers between 0 and 9. The bar code itself can be 11 or 12 digits long. When the bar code is 11 digits, a check character is assigned automatically, for a total of 12 digits.

JAN 8 (EAN 8), JAN 13 (EAN 13)

These are UPC-compliant common product codes used in Japan and Europe. These codes are seen very frequently since they are printed on ordinary products.

Usage

You can use only numbers between 0 and 9. The bar code itself is 8 digits (JAN 8, EAN 8) or 13 digits (JAN 13, EAN 13) long. If the code for either of these two types of codes is one digit less than 8 or 13, a check character is added automatically to make the code 8 or 13 digits.

CODE 39

This bar code consists of thick and thin bars, and spaces between them. There are five bars and four spaces, for a total of nine. "✳" is used as the start code and stop code, and the codes between the "✳" marks are the data.

Usage

You can use numbers between 0 and 9, letters and special codes (-, +, $, %, /, ., and space). The number of bar code digits differs, depending on command parameter *m*. There are no limitations on the number of digits, or up to 255 digits. A check digit is not added.

ITF (Interleaved 2 of 5)

CODE 39 uses thick and thin bars. Odd numbers are expressed with bars, and even numbers with spaces. Therefore, as a rule, there are only even-digit bar codes.

Usage

You can use numbers between 0 and 9. The number of bar code digits differs, depending on command parameter *m*. There are no limitations on the number of digits, up to 254 digits.

Printing is not performed when an odd data number is specified. However, when parameter *m* = 5, and an odd number is specified, printing is performed, with the last character being discarded.

No check digit is added.

CODABAR (NW-7)

One character is expressed with the NW-7 code by four thick and thin bars and 3 spaces, for a total of seven lines. This code has been used for a long time, due to its relatively simple configuration and the low printing precision requirements.

Usage

You can use numbers between 0 and 9, and six special codes (-, $, :, /, ., +). Four start/stop codes (A - D) can be used, and configured as desired.

CODE 93

This bar code was developed to shorten the Code 39 bar code. It consists of four bars and spaces.

Usage

You can use all ASCII code characters (0 - 127) for data, and you can set a bar code of up to 255 digits. A check digit is assigned automatically.

CODE 128

This bar code was developed to shorten the Code 39 bar code and increase the reliability of data. It consists of four bars and spaces.

Usage

You can use all ASCII code characters (0 - 127), and you can set a bar code of up to 255 digits. A check digit is assigned automatically.

The code set selection character must be at the beginning of the data string. It is two characters (2 bytes). "{A" is used to select code A, "{B" is used to select code B, "{C" is used to select code C. Accordingly, the shortest data string is two characters. Other special characters are also specified by two characters starting with "{." To specify a bracket ({), you use a double bracket ({{).

Bar Code Height

You can set the bar code height between 1 dot and 255 dots (35.9 mm or 1.4 in) with the **GS h** command. The initial value is 162 dots (22.8 mm or 0.9 in).

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Type of Bar Code, Relationship of Number of Characters, and Horizontal Width

You can set the horizontal width of the bar code to between 2 and 6 with the **GS w** command (The actual width changes, depending on the type and number of digits.), but printing cannot exceed the paper width. The table below indicates whether or not printing can be performed for the respective bar code horizontal widths.

	No. of Digits Limit	Horizontal Width Specification (GS w *n*) *n*=					Remarks
		2	3	4	5	6	
UPC-A	12	Printing possible	Printing possible	Printing possible	Printing possible	Printing not possible	
UPC-E	12	Printing possible	Printing possible	Printing possible	Printing possible	Printing possible	
JAN 13	13	Printing possible	Printing possible	Printing possible	Printing possible	Printing not possible	
JAN 8	8	Printing possible	Printing possible	Printing possible	Printing possible	Printing possible	
CODE 39	None	16 digits	10 digits	6 digits	4 digits	3 digits	
ITF	Even	30 digits	18 digits	14 digits	10 digits	8 digits	
CODABAR (NW-7)	None	21 digits	12 digits	9 digits	6 digits	5 digits	Excluding START/ STOP codes
CODE 93	None	24 digits	14 digits	10 digits	7 digits	5 digits	
CODE 128	None	20 digits	13 digits	8 digits	6 digits	4 digits	Double for code set C

HRI Character Printing

You can print HRI (Human Readable Interpretation) characters above or below the bar code by sending the **GS H** command. Select font A or B at this time for printing with the **GS f** command. The initial setting is font A.

Customizing the ASB Status Bit

ASB Status Bit Allocation

Bit 0 and bit 1, and bit 2 and bit 3 of the third ASB byte have the same meaning on the TM-H6000. The reason for this is to maintain send status compatibility with the TM-H5000II and other printers. However, only one bit is needed to indicate the status, allowing the other bit to be used for a different status. This enables the adding of a new command.

Bit 1 and bit 3 of the third byte can be changed, and the following functions can be allocated:

Bit 1 : Waiting for insertion of single sheet status

Bit 3 : Waiting for removal of single sheet status

Command Usage Example

Adding "Waiting for insertion of a single sheet" status

Send the following command (in decimal numbers):

```
GS ( B 3 0 97 49 44
```

If the value of bit 1 of the third byte is 0 when this status is added, the printer is not "Waiting for insertion of a single sheet," and if the value of bit 1 is 1, the printer is "Waiting for insertion of a single sheet."

Adding "Waiting for removal of a single sheet" status

Send the following command (in decimal numbers):

```
GS ( B 3 0 97 51 45
```

If the value of bit 3 of the third byte is 0 when this status is added, the printer is not "Waiting for removal of a single sheet," and if the value of bit 3 is 1, the printer is "Waiting for insertion of a single sheet."

Customize two bits simultaneously

You can customize two bits simultaneously by sending the following command (in decimal numbers):

```
GS ( B 5 0 97 49 44 51 45
```

Return to initial settings with a command other than the initialization command

You can send the **ESC @** initialization command to return changed settings to their initial status, but they can also be returned with a different command. Send the following command (in decimal numbers):

```
GS ( B 2 0 97 0
```

Usage of GS (B (ASB Status Bit Customization Command)

The ASB status bit customization command can specify a variety of parameters, allowing for future expansion. The rules for specification of the basic parameters with this command are described briefly in this section.

```
GS ( B pL pH m [a1  b1] ¨¨¨¨ [ak dk]
```

Parameters pL, pH specify the number of data bytes following parameter m. The maximum value that pL, pH can handle is FFh (255). The number of bytes is calculated with the following formula: $pL + pH$ x 256. You can specify a value between a minimum of 3 bytes and maximum of 65,535 bytes.

The value of m is fixed at 97. There is no parameter $b1$ for initialization of customization only.

Status Commands

Four types of commands can be used to confirm the status of the TM-H6000 printer. This section describes the differences for the respective commands and effective uses.

Status Send Request Command (GS r)

This command is stored in the TM receive buffer and is processed following the commands that were previously sent. It enables checking of whether or not there is a paper roll and paper slip, and checking of the drawer kick connector status.

In addition to the normal status check functions, by adding this command at the end of a series of commands, you can check whether or not that series of commands was processed and whether or not any data remains in the receive buffer.

Status Real Time Send Request Command (DLE EOT)

This command is processed before it is stored in the TM receive buffer, and the status is sent back immediately. You can check the status of various printer functions, whether or not there is paper, and error status. However, the TM side will go to the Busy status when an error is triggered by no paper or other such status, preventing data from being sent. Therefore, it is necessary for this command to be sent, ignoring the handshake for the serial I/F. Furthermore, the command cannot be sent by ignoring the Busy status with the parallel I/F.

After this command is processed, it is temporarily stored in the receive buffer. This is a consideration in case the command may be a portion of bitmap data. Accordingly, there is a possibility that this command alone may fill up the receive buffer when the printer is waiting for insertion of a slip. So, note the following points:

❏ Stop sending of the **DLE** command when the printer is waiting for slip insertion, or provide an ample interval between commands.

❏ Monitor the TOF and BOF sensors, and select slip mode after a slip is inserted.

Status Automatic Send Setting Command (GS a)

After this command is sent, the TM automatically sends the status every time the specified status changes. When using this command, it is necessary to monitor the PC receive buffer constantly so that changes in status are not overlooked.

MICR Status Real Time Send (DLE EOT BS)

Like the **DLE EOT** command, this command is processed before it is stored in the TM receive buffer, and the status is immediately sent back. You can check the following types of status: selection/non-selection of MICR, whether or not a cleaning sheet has been inserted, and other MICR related information.

However, when no paper or another cause has triggered an error, or when the receive buffer is full, the TM side will go to the Busy status, preventing data from being sent. Therefore, follow the same precautions as for the **DLE EOT** command.

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Bit Image Commands

The following are the bit image printing and setting commands:

❏ **ESC *** print only one bit image line command

❏ **GS v 0** print raster bit image command

❏ **GS *** download bit image registration command

❏ **GS /** download bit image print command

❏ **FS q** NV bit image registration command

❏ **FS p** NV bit image print command

Bit Image Print Command (ESC *)

Types of paper for printing

You can print on paper rolls and on the front or back of slips.

Printing size

Printing is one row of an eight-dot high bit image.

Download Bit Image Registration/Printing Commands (GS *, GS /)

Types of paper for printing

You can print on paper rolls and on the front of slips.

Printing size

After defining an 8 x 8 dot bit image as the minimum unit, you can print in the normal, double vertical, double horizontal, and quadruple modes by using the appropriate print commands.

NV Bit Image Registration/Printing Command (FS q, FS p /)

Types of paper for printing

Printing can be on paper rolls and on the front of slips.

Printing size

After defining an 8 x 8 dot bit image as the minimum unit, you can print in the normal, double vertical, double horizontal, and quadruple modes by using the appropriate print commands.

Limitations

The TM-H6000 can use NV bit images for slips. However, there is no data in the bit image data area to differentiate thermal images from slip images. Therefore, the user must remember which type of bit image the data is for.

Raster Bit Image Print Command (GS v 0)

Types of paper for printing

You can print on paper rolls and on the front of slips.

Printing size

The minimum unit is an 8-dot unit 1-dot row bit image.

Bit Image Command ESC *

One horizontal line of bit data is printed.

Command configuration

ESC * m nL nH d1 ¨¨¨¨ dk

(The value of *k* (data quantity) changes, depending on *m*, *nL*, *nH*.)

The relationship of the value of *m* to the printing area and the resulting print density are shown in the following table:

VD: Vertical Direction Yes: Possible No: Not possible   VDD: Vertical Dot Density HDD: Horizontal Dot Density

m	Mode	VD Data	Paper Roll			Slip (front)			Slip (back)		
			Usage	VDD	HDD	Usage	VDD	HDD	Usage	VDD	HDD
0	8-dot single-density	1 byte	Yes	60 dpi	90 dpi	Yes	72 dpi	80 dpi	Yes	72 dpi	127 dpi
1	8-dot double-density	1 byte	Yes	60 dpi	180 dpi	Yes	72 dpi	160 dpi	No	—	—
32	24-dot single-density	3 byte	Yes	180 dpi	90 dpi	No	—	—	No	—	—
33	24-dot single-density	3 byte	Yes	180 dpi	180 dpi	No	—	—	No	—	—

The maximum number of dots in the horizontal direction and the maximum data quantity per line for the respective modes are shown in the table below:

VD: Vertical Direction   Yes: Possible   No: Not possible
MHD: Maximum Horizontal Dots   MDQ: Maximum Data Quantity

m	Mode	VD Data	Paper Roll			Slip (front)			Slip (back)		
			Usage	MHD	MDQ	Usage	MHD	MDQ	Usage	MHD	MDQ
0	8-dot single-density	1 byte	Yes	256 dots	256 bytes	Yes	270 dots	270 bytes	Yes	240 dots	240 bytes
1	8-dot double-density	1 byte	Yes	512 dots	512 bytes	Yes	540 dots	540 bytes	No	—	—
32	24-dot single-density	3 byte	Yes	256 dots	768 bytes	No	—	—	No	—	—
33	24-dot single-density	3 byte	Yes	512 dots	1536 bytes	No	—	—	No	—	—

The *nL* and *nH* for the maximum dot quantity are as follows:

VD: Vertical Direction Yes: Possible No: Not possible

m	Mode	VD Data	Paper Roll			Slip (front)			Slip (back)		
			Usage	*nL*	*nH*	Usage	*nL*	*nH*	Usage	*nL*	*nH*
0	8-dot single-density	1 byte	Yes	0	1	Yes	14	1	Yes	240	0
1	8-dot double-density	1 byte	Yes	0	2	Yes	28	2	No	—	—
32	24-dot single-density	3 byte	Yes	0	1	No	—	—	No	—	—
33	24-dot single-density	3 byte	Yes	0	2	No	—	—	No	—	—

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Single Density Printing   Double Density Printing
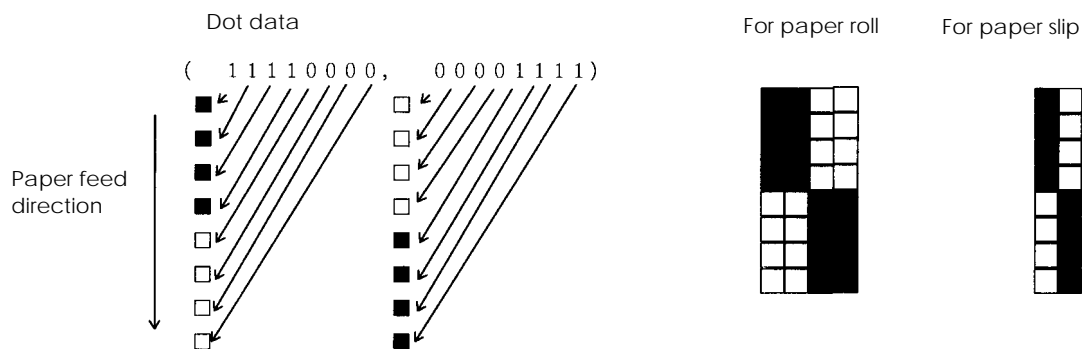

Not printed

✎ *Note:*

You cannot specify printing in 8-dot density (m = 1) when printing slips in page mode.
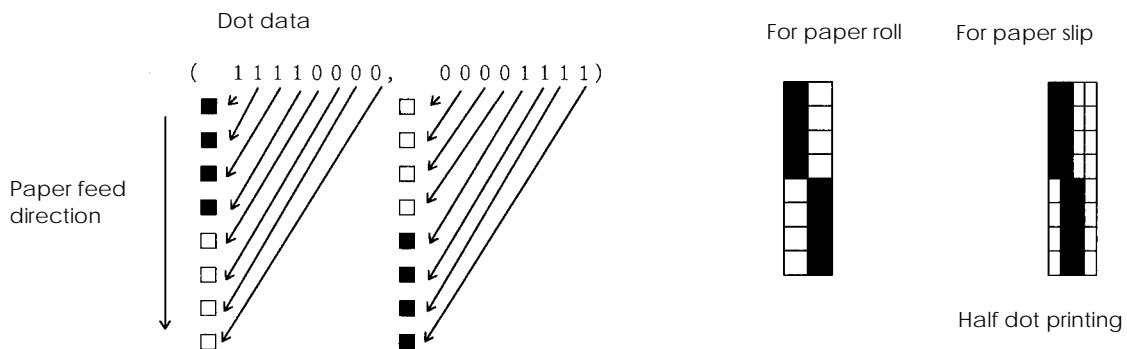
Data handling (for paper roll)

Data handling in the respective modes is as shown below (all data is *nL*=2, *nH*=0).
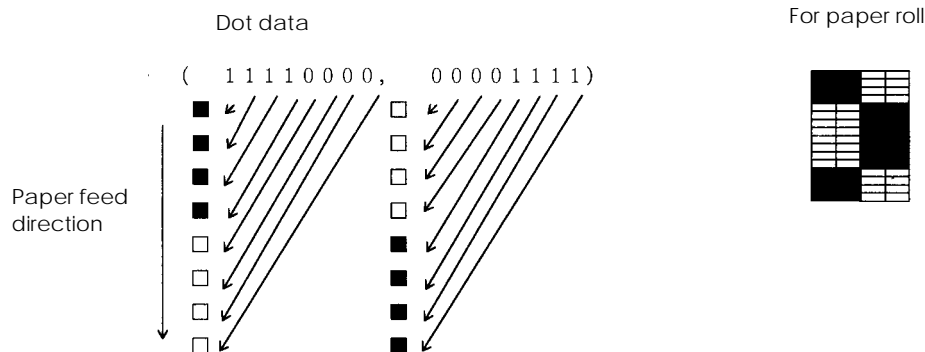
When *m* = 0

Data string = F0h, 0Fh (2 bytes required)

Dot data

(1 1 1 1 0 0 0 0,   0 0 0 0 1 1 1 1)

For paper roll   For paper slip

Paper feed direction

When *m* = 1

Dot data

(1 1 1 1 0 0 0 0,   0 0 0 0 1 1 1 1)

For paper roll   For paper slip

Paper feed direction

Half dot printing
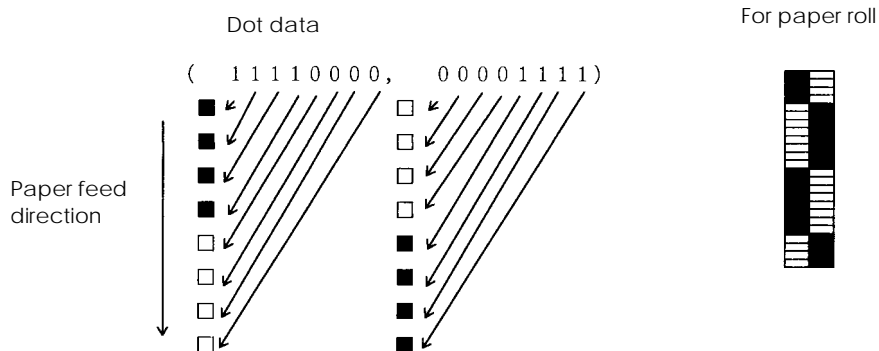
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When *m* = 32

Data string = F0h, 0Fh, F0h, 0Fh, F0h, 0Fh (6 bytes required)

When *m* = 33

Data string = F0h, 0Fh, F0h, 0Fh, F0h, 0Fh (6 bytes required)

Download Bit Image Command: GS ✳

This command saves bit image data in the printer's RAM memory. This data is deleted when the power is turned off or the printer is initialized.

Command configuration

```
GS ✳ x y d1 ¨¨¨¨ dk
```

($k = x \times y \times 8$)

Data handling example

Data bits from *d1* to *dk* are handled in the memory as shown in the diagram below.

Data string = *d1*, *d2*, *d3*, *d4*, *d5*, *d6*, *d7*, *d8*, *d9*, *d10* - *d32* (32 bytes)

For $x = 1, y = 4$

For $x = 2, y = 2$

Bit Image Command: GS /

The data saved in RAM is printed by the **GS ✷** command.

Command configuration

```
GS / m
```

The relationship of the *m* value to the printing area, and the resulting print densities are shown in the table below.

VDD: Vertical Dot Density HDD: Horizontal Dot Density MNHD: Maximum Number of Horizontal Dots
Yes: Possible No: Not possible DH: Double Horizontal DV: Double Vertical

m	Mode	Paper Roll				Slip (Front)				Slip (Back)
		Usage	VDD	HDD	MNHD	Usage	VDD	HDD	MNHD	Usage
0, 48	Normal mode	Yes	180 dpi	180 dpi	512 dots	Yes	72 dpi	160 dpi	540 dots	No
1, 48	DH mode	Yes	180 dpi	90 dpi	256 dots	Yes	72 dpi	80 dpi	270 dots	No
2, 48	DV mode	Yes	90 dpi	180 dpi	512 dots	No	—	—	—	No
3, 48	Quadruple mode	Yes	90 dpi	90 dpi	256 dots	No	—	—	—	No

Data printing (paper roll)

x = 1, *y* = 1, Data = {AAh, 55h, AAh, 55h, AAh, 55h, AAh, 55h}
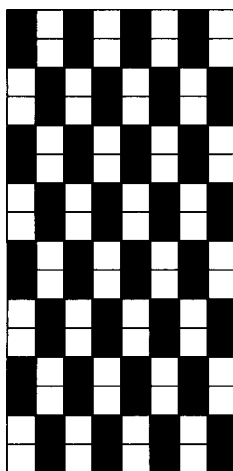
For *m* = 0 or 48

For *m* = 1 or 49
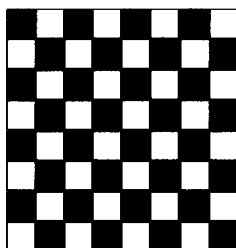
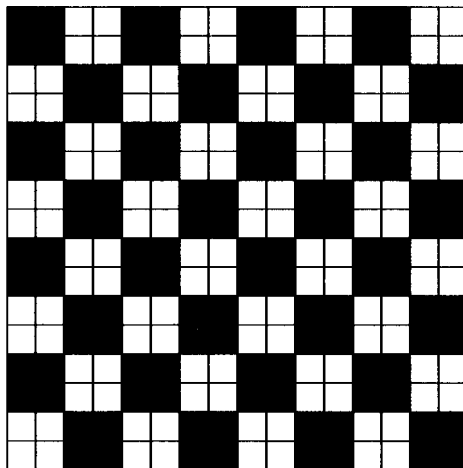For *m* = 2 or 50

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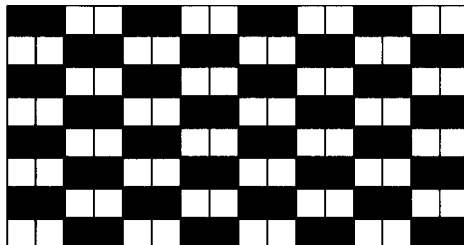
For *m* = 3 or 51

Data printing (slip paper)

x = 1, *y* = 1, Data = {AAh, 55h, AAh, 55h, AAh, 55h, AAh, 55h}

For *m* = 0 or 48
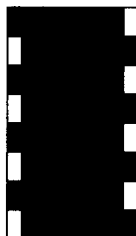
For *m* = 1 or 49
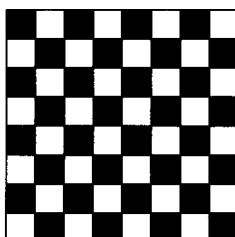
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✎ *Note:*

Half dots are printed when printing on slips in the normal mode (m = 0). Therefore, consecutive dots are not printed.

<div align="center">

Normal Mode Printing   Double Horizontal Mode Printing
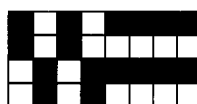
Not printed

</div>

✎ *Note:*

When slips are printed in page mode, the normal mode (m = 0) cannot be specified.

NV Bit Image Command: FS q

This command stores bit data in the TM printer's non-volatile memory. Please note that all data cannot be stored at one time. You can save bit images for both paper roll and slip, but you must manage which image is used in which mode for printing.

Command configuration

FS q n [xL xH yL yH d1 ¨¨¨ dk]1 ¨¨¨ [xL xH yL yH d1 ¨¨¨ dk]n

(Value of *k* changes depending on *xL*, *xH*, *yL*, *yH*.)

Data handling

Handling of bit image data is the same as with the **GS ✳** command.

NV Bit Image Command: FS p

Data stored in NV memory is printed with the **FS p** command.

Command configuration

FS p n m

The relationship of the *m* value to the printing area, and the resulting print densities are shown in the table below.

VDD: Vertical Dot Density HDD: Horizontal Dot Density MNHD: Maximum Number of Horizontal Dots
Yes: Possible No: Not possible DH: Double Horizontal DV: Double Vertical

m	Mode	Paper Roll				Slip (Front)				Slip (Back)
		Usage	VDD	HDD	MNHD	Usage	VDD	HDD	MNHD	Usage
0, 48	Normal mode	Yes	180 dpi	180 dpi	512 dots	Yes	72 dpi	160 dpi	540 dots	No
1, 48	DH mode	Yes	180 dpi	90 dpi	256 dots	Yes	72 dpi	80 dpi	270 dots	No
2, 48	DV mode	Yes	90 dpi	180 dpi	512 dots	No	—	—	—	No
3, 48	Quadruple mode	Yes	90 dpi	90 dpi	256 dots	No	—	—	—	No

Data printing

Data printing is the same as with the **GS /** command.

Raster Bit Image: GS v 0

This command sends one horizontal row of data for printing on a thermal paper roll. This differs from the **ESC ✱** command and reduces the waiting time for receipt of data, enabling high-speed printing. You also can print on slips in this mode.

Command configuration

```
GS v 0 m xL xH yL yH d1 ¨¨¨¨ dk
```

$dk = (xL + xH * 256) * (yL + yH * 256)$

The relationship of the *m* value with a paper roll to the printing area, and the resulting print densities are shown in the table below.

VDD: Vertical Dot Density HDD: Horizontal Dot Density MNHD: Maximum Number of Horizontal Dots
DH: Double Horizontal DV: Double Vertical

m	Mode	VDD	HDD	MNHD	*xL, xH* values for MNHD	
					xL	*xH*
0, 48	Normal mode	180 dpi	180 dpi	512 dots	64	0
1, 49	DH mode	180 dpi	90 dpi	256 dots	32	0
2, 50	DV mode	90 dpi	180 dpi	512 dots	64	0
3, 51	Quadruple mode	90 dpi	90 dpi	256 dots	32	0

The relationship of the *m* value for slip paper to the printing area, and the resulting print densities are shown in the table below.

m	Mode	VDD	HDD	MNHD	*xL*, *xH* values for MNHD	
					xL	xH
0, 48	Normal mode	72 dpi	160 dpi	540 dots	64	0
1, 49	DH mode	72 dpi	80 dpi	270 dots	32	0

Data handling (paper roll)

Data handling in the respective modes is as follows (all data is $xL = 2$, $xH = 0$, $yL = 2$, $yH = 0$).

Data string = 96h, 97Fh, A5h, A3h (4 bytes required)

(1 0 0 1 0 1 1 0 , 1 0 0 1 0 1 1 1 , 1 0 1 0 0 1 0 1 , 1 0 1 0 0 0 1 1)

Printed results:

For *m* = 0 or 48

For *m* = 1 or 49

For *m* = 2 or 50

For *m* = 3 or 51

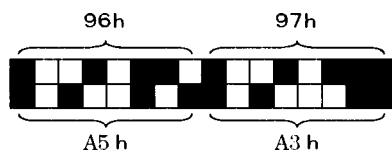*Data handling (slip paper)*

Data handling in the respective modes is as follows (all data is *xL* = 2, *xH* = 0, *yL* = 2, *yH* = 0).

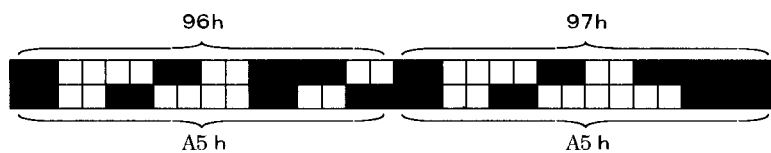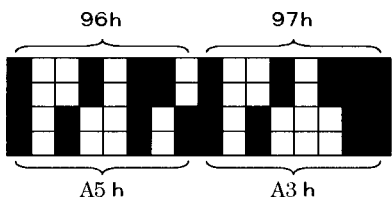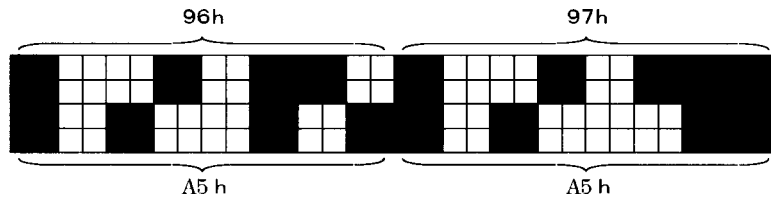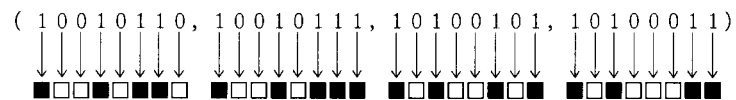Data string = 96h, 97h, A5h, A3h (4 bytes required)

Printed results

For *m* = 0 or 48
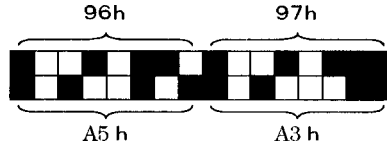
For *m* = 1 or 49
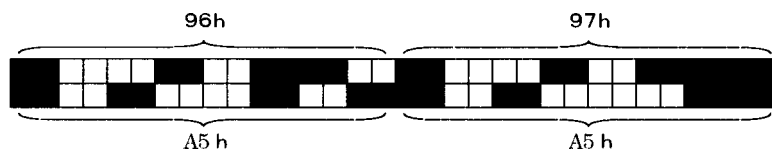
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✎ *Note:*
Consecutive dots cannot be printed in double density on slip paper (m = 0), because half dots are printed.

Normal Mode Printing   Double Horizontal Mode Printing
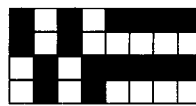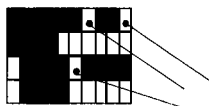
Not printed

✎ *Note:*
The normal mode (m = 0) cannot be specified when printing on slips in the page mode.

Slip Printer

New Slip Printer Functions

The following are the new slip printer functions:

❏ 90° Right Rotation Printing on Slips

• On the TM-H6000, you also can print characters rotated 90° to the right. Only font A can be used for this type of printing.

❏ Page Mode

• The TM-H6000 can print on the front of slips in the page mode. This enables 180° rotation of characters and other complicated printing.

❏ Printing on the Back of Slips

• A TM-H6000 with an E/P option can print on the back of paper slips without turning them over. This is an effective feature for printing on the back following MICR character reading. Only one font can be used, and a maximum of 40 digits and 8 lines can be printed.

90° Rotated Printing with the Slip Printer

With the TM-H5000 printer, the **ESC V** command could not be used to rotate characters 90° when printing on slips, and the printing direction could not be selected in the page mode (with the **ESC T** command). These features have been incorporated into the TM-H6000.

Please note that these features can be specified only for font A, and not for font B.

Usage of ESC V

(Specification/Cancellation of Character Rotation 90° to the Right)

This command specifies and cancels character rotation 90° to the right. In addition, when printing on slips (front), you can specify 1 dot or 1.5 dot spacing.

This section explains an actual example of printing on a slip (front). In this example, "ABC" is printed using font A.

ESC V 0 (normal printing)
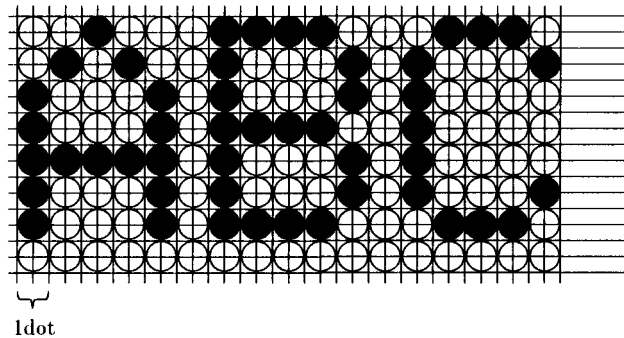
ESC V 1 (printing in the horizontal direction with 1 dot spacing)
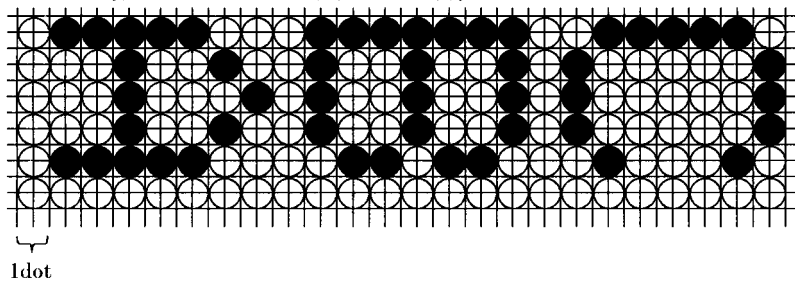
ESC V 2 (printing in horizontal direction with 1.5 dot spacing)
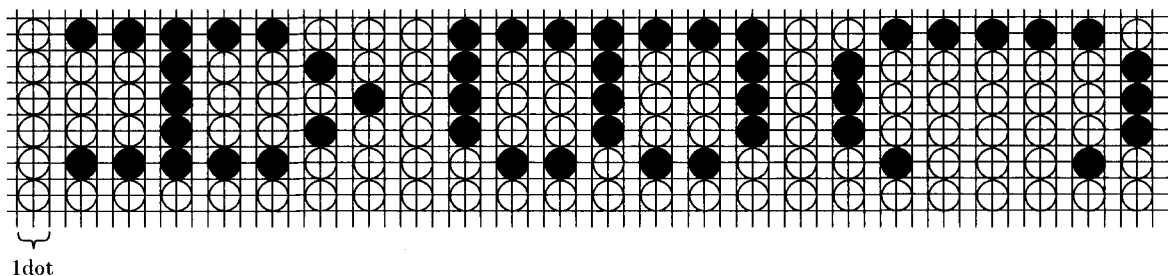
Slip Printing in Page Mode

The TM-H6000 printer can print on the front surface of slips in page mode.

The maximum number of dots in the horizontal direction is 540 half dots. When the initial value for the basic pitch is 160, the maximum values for d x 1 and d x 2 are 28 and 2, respectively, which are specified by the **ESC W** command.

In addition, you cannot specify the following values for bit image printing.

❑ Double-density specification with **ESC ✱** command ($m = 1$)

❑ Normal mode specification for printing of a downloaded bit image or NV bit image

❑ Normal mode ($m = 0$) or double vertical mode ($m = 2$) for raster bit images

ESC T (Selection of Character Printing Direction in Page Mode)

You can select the starting point of the printing direction in the page mode for printing on a paper roll or slip paper (front). The respective printing direction parameters are as follows:

ESC T 0 (0 or 48) (top left to right)

ABCDEFGHIJK
LMNOPQRSTUV

ESC T 1 (1 or 49) (upward from bottom left)

ESC T 2 (2 or 50) (down from top right)

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ESC **T** **3** (3 or 51) (down from top right)

```
LMNOPQRSTUV
ABCDEFGHIJK
```

Printing on the Back of Slip Paper

On a TM-H6000 with the endorsement printer mechanism option, you can print on the back of slips without turning them over. However, please note the following limitations:

Printed characters and number of characters

❏ You can print only 95 alphanumeric characters and 37 international characters in the 5 x 7 dot configuration.

❏ You can print a maximum of 40 characters on one line.

❏ Characters are printed upside down, since the paper is fed in the opposite direction when printing on the back of a slip.

❏ When the rear end of the slip goes past the E/P print head, the printer can no longer feed the slip in the opposite direction, and printing cannot be performed.

❏ You can print in the 26.8 mm (1.1 in) range, which starts 6.9 mm (0.3 in) from the rear end of the slip to a point 33.7 mm (1.3 in) from that location.

❏ You can print a maximum of eight lines.

Command Usage Example

Send the following command to select printing on the back of a slip (in decimal numbers):

```
GS ( G 2 0 48 68
```

Send the following command to select printing on the front of a slip (in decimal numbers):

```
GS ( G 2 0 48 4
```

These commands to select printing on the front or back are valid, regardless of the **ESC c 0** paper type selection command. The printer goes to the following status, depending on conditions immediately before this command is executed.

❏ When the paper roll was selected immediately before the command, the printer waits for insertion of a slip.

❏ The mode is not selected when the check reading function was previously selected.

❏ When this command selects printing on the back of a slip after the check reading operation, the slip is automatically fed in the forward direction in preparation for printing on the back.

Top of Slip Operation for Slip Printer

Use the following command to move to the top of the selected slip printing area (in decimal numbers). Refer to "Printing on the Back of Slip Paper" for limitations.

```
GS ( G 2 0 84 1
```

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This command is also valid after printing on the front of a slip is selected with the **ESC c 0** command.

NV User Memory

Since a Flash ROM is used for the NV memory, the data is not lost when power is turned off. Therefore, saving the data for bit images that are printed regularly eliminates the need to download the data, saving time. There is also an NV user area for data in the memory that can be used for a memo or other purposes.

The initial values for the memory areas are as follows: 384 KB for the NV bit image area and 1 KB for the NV user area. You can change these sizes with the **GS (E** command, depending on the particular application.

Editing of NV User Memory

You can store a variety of data in the NV user memory, but there are the following limitations:

❏ You can specify a data size between 1 byte and 65530 bytes, but data that exceeds the remaining memory capacity cannot be saved. In this case, the command is ignored.

❏ You can add a two-byte key code to identify the stored data and a 1-byte code to divide data added. Therefore, stored data uses the total data amount + 3 bytes of memory. This group of data is called a record.

❏ Key codes are defined as *K1*, *K2*, etc., in the example command, but you can actually use any ASCII codes from 32 to 126. These correspond to the characters from "Space" to "~."

❏ ASCII codes from 32 to 254 can be handled as data. These correspond to characters starting with "Space."

❏ When the same key already exists, it is overwritten.

❏ If you send a command containing key input only (without any data), it cannot be written as a record.

❏ The printer sends data every 80 bytes. (In actual practice, a maximum of 83 bytes are sent at a time, which consist of the data, plus 1 byte for the header, 1 byte for the identifier, 1 status byte, and 1 terminator byte following the data.)

❏ There are two types of status when data is sent: 40h and 41h. 40h indicates no data follows, and 41h indicates there is more data.

❏ After the printer sends a maximum of 83 bytes, it waits for instructions from the host. Therefore, it is necessary to send the following instructions:

Response			Procedure
ASCII	**Decimal**	**Hexadecimal**	
ACK	6	6	Send next data/End process
NAK	21	15	Resend previous data
CAN	24	18	Cancel process

Command Usage Example

This section describes the procedure to write the data, read the data you have written, and to delete the data.

Step 1: writing of data

"SEIKO EPSON" (11 characters) is saved as data in the record identified with the "*K1*" key, and a 150-character address is saved with the "*K2*" key.

Send the following command (in decimal numbers):

```
GS ( C 16 0 0 1 0 75 49 83 69 73 75 79 32 69 80 83 79 78
              K  1  S  E  I  K  O     E  P  S  O  N


GS ( C 155 0 0 1 0 75 50 ¨¨¨¨150 characters of data¨¨¨
              K  2 ¨¨¨¨¨¨¨¨¨¨¨¨¨¨¨¨¨¨¨¨¨¨¨¨¨¨¨¨¨¨
```

Step 2: reading of data 1

To read the data stored as "*K1*," send the following command (in decimal numbers):

```
GS ( C 5 0 0 2 0 75 49
```

When the printer receives this command, it sends back 15 bytes, consisting of the header (37h) + identifier (70h) + status (40h) + data + terminator (00h), and then the printer waits for a response from the host. The host sends ACK (6) to the printer when it receives data normally, and NAK (21 decimal or 15h) to request resending of the data.

Step 3: reading of data 2

Next, to read the data stored as "*K2*," send the following command (in decimal numbers):

```
GS ( C 5 0 0 2 0 75 50
```

When the printer receives this, it sends back 84 bytes, consisting of the header (37h) + identifier (70h) + status (41h) + data (80 characters) + terminator (00h), and then the printer waits for a response from the host.

The status of 41h in the paragraph above indicates there is more data. When the host receives data normally from the printer, it sends an ACK (6) code, requesting the subsequent data. The host sends NAK (21 decimal or 15h) to request resending of data, and CAN (24 decimal or 18h) to tell the printer to cancel the send procedure.

Step 3: reading of data 3

Three types of errors are possible when reading data:

❏   The specified key has not been stored.

❏   The key exists, but there is no data (0 bytes).

❏   NV memory malfunction.

In the first case above, FFh (1 byte) is sent as the data. Specifically, the following five bytes are sent: header (37h) + identifier (70h) + status (40h) + data (FFh) + terminator (00h). For the second and third cases above, where there is no data, four bytes are sent: header (37h) + identifier (70h) + status (40h) + terminator (00h).

	Case 1	Cases 2, 3
Header	37 h	37 h
Identifier	70 h	70 h
Status	40 h	40 h
Data	FF h	None
Terminator	00 h	00 h

Step 5: overwriting of data

You can overwrite data in the same way it is written. There are no particular limitations. Overwriting is performed if the key code is the same but the data differs.

Step 6: deletion of a record

Send the following command to delete the record "*K1*" (in decimal numbers):

```
GS ( C 5 0 0 0 0 75 49
                 K  1
```

This command causes the entire area occupied by record "*K1*" in the memory to be overwritten with FFh.

Step 7: confirming usage amount

Send the following command to confirm the amount of NV user memory currently being used (in decimal numbers):

```
GS ( C 3 0 0 3 0
```

The printer sends the following data: header (37h) + identifier (28h) + data (max. 8 bytes) + terminator (00h). Numbers are converted into ASCII codes and sent in byte units. For example, when 271 bytes are used, "32h + 37h + 31h" is sent.

Step 8: confirming available memory

Send the following command to confirm the amount of NV user memory currently available (in decimal numbers):

```
GS ( C 3 0 0 4 0
```

The printer sends the following data: header (37h) + identifier (29h) + data (max. 8 bytes) + terminator (00h). Numbers are converted into ASCII codes and sent in byte units. For example, when 753 bytes is available, "37h + 35h + 33h" is sent.

Step 9: overview of data sent

The data sent from the printer is compiled in the table below:

	Data sent from TM			Confirm memory used	Confirm memory available
	Normal data	**Record end detect**	**Memory error**		
Header	37 h	37 h	37 h	37 h	37 h
Identifier	70 h	70 h	70 h	28 h	29 h
Status	40 h / 41 h	40 h	40 h	None	None
Data	(Up to 80 bytes)	FF h	None	(Up to 8 bytes)	(Up to 8 bytes)
Terminator	00 h	00 h	00 h	00 h	00 h

Usage of GS (C (NV User Memory Editing Commands)

There are a variety of parameters for NV user memory commands. This allows for future expansion. The basic parameter specification rules for this command are explained briefly below.

```
GS ( C pL pH m a b [c1 c2] [d1 d2 d3 ¨¨¨ dk]
```

The pL, *pH* parameters specify the number of data bytes following parameter *m*. The maximum value that *pL*, *pH* can handle is FFh (255). The byte calculation formula is *pL* + *pH* x 256, allowing a maximum of 65535 bytes to be specified.

The value of *m* when using this function is always 0.

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The value of *a* defines the specific function.

The data from *d1* through *dk* determines the number of bytes used by each command, but it is not necessary to specify these parameters in some cases. Carefully check the specification procedure for the command function you are using.

Customization of the NV Area

The **GS (E** command can change the size of the NV user memory and NV bit image memory for a particular application. The allowable settings are described below. Please note that no models are currently being sold with "no expansion ROM."

Model with expansion ROM

NV User Memory Area	NV Bit Image Area
1KB	384KB or less
64KB	256KB or less
128KB	128KB or less
192KB	0KB

Model with no expansion ROM

NV User Memory Area	NV Bit Image Area
1KB	192KB or less
64KB	64KB or less

When the total of both specified values exceeds the installed size, the NV bit image memory area is adjusted automatically to a size that does not exceed the total memory.

When you change the settings with this command, the new setting becomes valid after one of the following operations is performed:

❏ Sending of command function 2, ending user setting mode and performing a reset (the recommended operation).

❏ Turning on the power

❏ Resetting hardware with the reset signal

Changing the setting clears all data in the area for which a change was made. Accordingly, be careful not to execute this command unless you are sure you want to make a change.

Command Usage Example

This section describes the actual procedure to customize the data area.

Step 1: changing to user setting mode

Send the following command (in decimal numbers):

```
GS ( E 3 0 1 73 78
```

After this command is sent, the printer returns data indicating that it has changed into the user setting mode. This confirmation consists of 3 bytes: header (37h) + identifier (20h) + NUL (00h). Be sure the printer has sent these three bytes to ensure the setting has been performed properly.

Step 2: customization of NV memory

This command allocates the NV memory. You can use the command below to expand the standard NV user memory from 1KB to 128KB. When you expand the NV user memory, the NV bit image memory is reduced to 128KB. Send the following command (in decimal numbers):

```
GS ( E 7 0 5 1 3 0 2 3 0
```

Step 3: end user setting mode

When you finish making the settings, end the user setting mode, and send the following command to activate the new settings (in decimal numbers):

```
GS ( E 4 0 2 79 85 84
```

The printer performs internal processing to activate the settings completed in the user mode. This consists of initialization of the memory. Data cannot be sent to the printer during this time.

You can also activate the settings by turning the power off and on again, or by resetting the hardware with the signal wire reset signal. However, unless there is a particular problem, end the mode by sending the command above.

Step 4: confirming setting

When the printer completes its internal processing, check to confirm that the settings have been activated. First, check the status of the NV user memory. Send the following command (in decimal numbers):

```
GS ( E 2 0 6 1
```

After the printer receives this command, it returns data indicating the NV user memory. The data is as follows: header (37h) + identifier (27h) + customizing value number + division code (1Fh) + customizing value + NUL (00h). In the example in "Step 2: customizing NV memory," the area is 128KB. Therefore, the printer returns (31h) as the number of the memory area you are checking, and returns (33h) as the customized value of the memory area size.

Next, confirm the NV bit image memory status. Send the following command (in decimal numbers):

```
GS ( E 2 0 6 2
```

After the printer receives this command, it sends back data indicating the NV bit image memory. The data is as follows: header (37h) + identifier (27h) + customizing value number + division code (1Fh) + customizing value + NUL (00h). In this case, the area is 128KB. Therefore, the printer returns (32h) as the number of the memory area you are checking, and returns (33h) as the customized value of the memory area size.

Step 5: overview of data sent

The data sent from the printer is compiled in the table below (all hexadecimal values):

	Change into User Setting Mode	Confirm Customized Values	
		NV User Memory	NV Bit Image Memory
Header	37	37	37
Identifier	20	27	27
Number Identifying Customized Memory Area (NV user = 31; NV bit image = 32)	None	31	32
Division Number	None	1F	1F
Customized Value (Memory Capacity)	None	(Up to 5 bytes)	(Up to 5 bytes)
Terminator	00	00	00

The customized memory area numbers and customized memory size values are compiled in the following table:

Customizing Value	Customizing Capacity Numbers	
(nL + nH x 256) =	1	2
	(NV user memory a=1)	(NV bit image a=2)
1	1KB	0 bytes
2	64KB	64KB
3	128KB	128KB
4	192KB	192KB
5	No setting	256KB
6	No setting	320KB
7	No setting	384KB

Usage of GS (E (User Setting Commands)

A variety of parameters are available for user setting commands, allowing for future expansion. This section briefly explains the basic parameter specification rules for this command.

```
GS ( E pL pH m [a1 nL1 nH1 ¨¨¨¨ ak nLk nHk]
```

The parameters *pL*, *pH* specify the number of data bytes following *m*. The maximum value that *pL*, *pH* can handle is FFh (255). The byte calculation formula is *pL* + *pH* x 256, allowing a maximum of 65535 bytes to be specified.

The value of *m* defines the function number of the command.

The data from *a1* through *nHk* determines the number of bytes used by each command, but it is not necessary to specify these parameters in some cases. Carefully check the specification procedure for each specific command function.

Notes on Usage of Programming Language

Visual Basic®

When programming with Visual Basic, limitations prevent data from 81h through 9Fh and E0h through FEh from being sent as characters. However, you can use the following procedure to send this data:

```
Dim Send_data(0) As Byte

Send_data(0) = &h81 '1 byte of sending data

MSComm1.Output = Send_data
```

Bit Image Out of Position

Programming Error

A bit image may print out of position when the actual quantity of data sent differs from the settings. Check the settings, referring to the calculation procedure for the specified bit image data.

Handshaking Error

The image also may print out of position if the handshake operation is not performed normally when a large bit image data record is sent. Confirm that the printer settings and program settings are correct.

Reducing Space Below Logo

Relationship of Print Head and Cutter Position

When the paper is cut on the 70th dot line immediately after completion of the previous printing operation, you can perform cutting at the end of the previous printing operation. This is possible because the thermal printing head is approximately 13 mm (0.5 in) away from the cutter position.

Space Between Characters

There are two types of dot impact characters: 5 x 9 dot characters, and 7 x 9 dot characters. These dot values do not include the space between characters. However, for actual printing (font configuration), the space between characters is included.

The font configuration for thermal characters includes a 2-dot space between characters. Furthermore, to set the amount of right space with the ESC/POS command, use the basic font + specified space value. As a rule, the space between characters cannot be set to 0, but the space between dots can be set to 0 with the **ESC $** absolute position specification command.

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Usage of a Hex Dump

When It is Required

Use the hex dump function to check data sent from the host when printed results differ from the data entered or when characters are missing.

Procedure for Changing to Dump Mode

Panel operation

Open the paper roll cover, and turn the power off and then on again. Then close the cover.

Command

Send the **GS (A** *pL pH n m* command. At this time, the following values are fixed: $pL = 2$, $pH = 0$, $m = 1$. When $n =$ 0 - 2 or 48 - 50, printing is on the paper roll, and when $n = 3 - 4$ or 51 - 52, printing is on slip paper.

Chapter 5

Installation, Printer Handling, Removing a Paper Jam

Unpacking

Your printer box should include the items shown in the illustration below. If any items are damaged or missing, please contact your dealer.

Endorsement ribbon (factory option)   Ribbon cassette   Hex screws   label   power switch cover   Paper roll
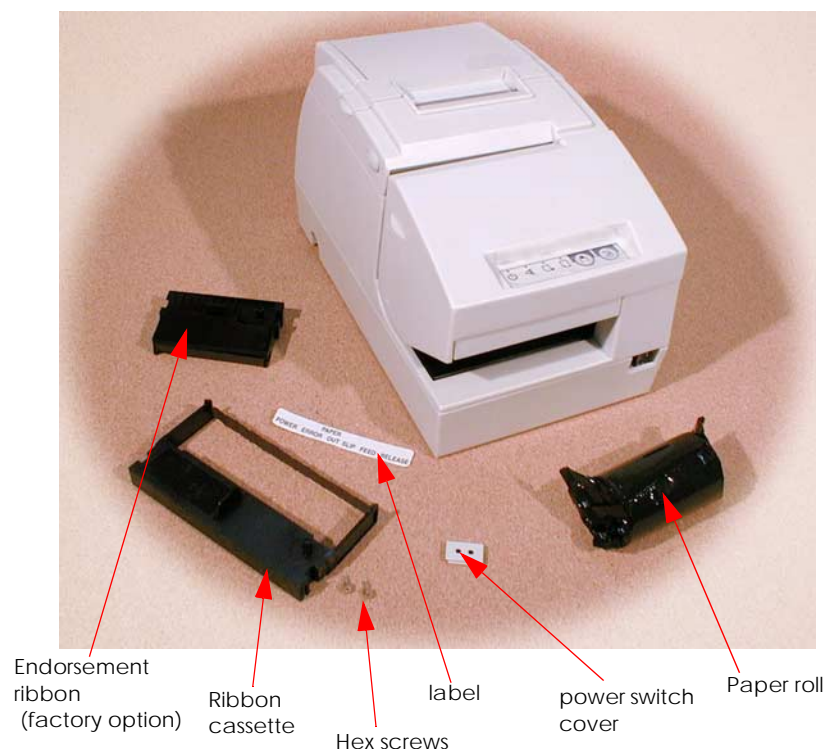
See the note on page 5-3 for information about the hexagonal lock screws.

Save the box that the printer came in so that you can use it if you ever need to transport the printer.

Packing Materials

After you unpack your printer, you must remove the packing materials. There is a spacer inserted in the slip paper slot and two pieces of tape holding the covers in place. Remove all three items.

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Labels

The following are the labels on this printer.
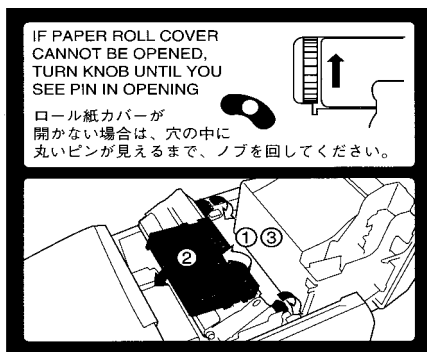
Paper roll cover and endorsement ribbon label
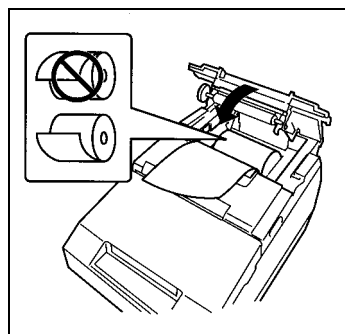
Paper loading label
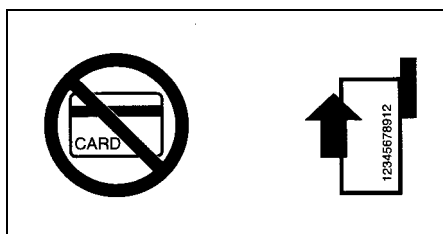
MICR insertion label
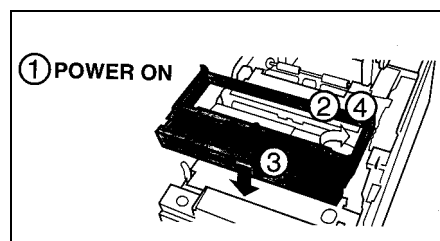
Ribbon installation label

Applying the Control Panel Label

Included with your printer is a label identifying the icons on the control panel. If you wish, you can attach this label in the position shown below.
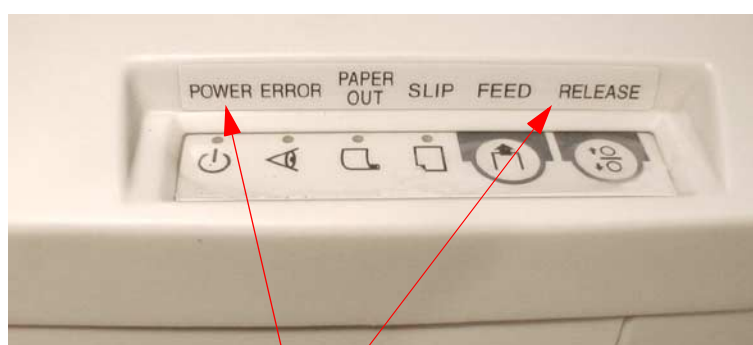
Label

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Connecting the Cables

You can connect up to four cables to the printer. They all connect to the connector panel (on the bottom rear of the printer), which is shown below.

✎ *Note:*
This illustration shows the serial interface model. If you have the parallel interface model, your interface connector will look different.

Before connecting any of the cables, make sure that both the printer and the host PC are turned off.

Connecting to the host PC

You need an appropriate serial interface or parallel interface cable to connect your computer to the printer. For the serial model, it is important that you use a null modem cable, not any other serial cable, and for the parallel model use an IEEE 1284 cable.

1. Plug the cable connector securely into the printer's interface connector.

2. If the cable connector has screws on it, tighten the screws on both sides of the connector.
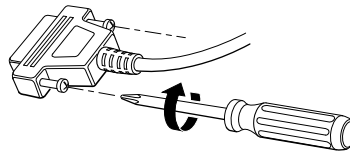
✎ *Note:*
Your printer has inch-type hexagonal lock screws installed. If your interface cable requires millimeter-type screws, replace the inch-type screws with the enclosed millimeter-type screws using a hex screwdriver (5 mm).
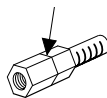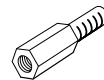
Inch screw   Millimeter screw

3. If your interface connector has a grounding wire, attach it to the printer using the screw labeled FG, which is next to the interface connector.

4. Attach the other end of the cable to the host PC.

Connecting the Drawer

⚠ WARNING:

Use a drawer that matches the printer specification. Using an improper drawer may damage the drawer as well as the printer.

Do not connect a telephone line to the drawer kick-out connector; otherwise the printer and the telephone line may be damaged.

Plug the drawer cable into the drawer kick-out connector on the connector panel in the location indicated below.

Drawer kick-out connector

Connecting to a Direct Connection Display Module

⚠ WARNING:

Be sure not to connect this cable to the drawer kick-out connector, which is next to the power connector.

Also do not connect a telephone line to the display module connector.

✎ *Note:*
The DM connector can be used only with the serial interface model of this printer.

1. Make sure the printer is turned off.

2. Plug the cable connector (provided with the direct connection display module) securely into the printer's display module connector until it clicks.
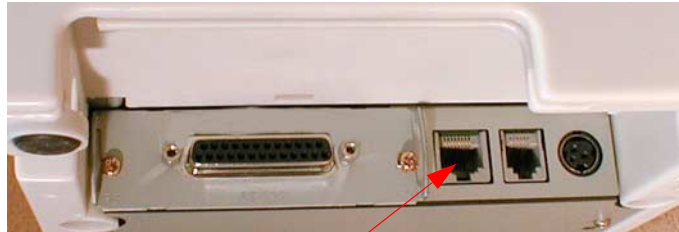
DM connector

Power Connection

Use the optional EPSON PS-170 power supply or equivalent for your printer.

⚠ WARNING:

Make sure you use the EPSON PS-170 power supply or equivalent. Using an incorrect power supply may cause fire or electrical shock.

⚠ CAUTION:

When connecting or disconnecting the power supply from the printer, make sure the power supply is not plugged into an electrical outlet. Otherwise you may damage the power supply or the printer.

If the power supply's rated voltage and your outlet's voltage do not match, contact your dealer for assistance. Do not plug in the power cord. Otherwise you may damage the power supply or the printer.

1. Make sure the printer's power switch is turned off, and the power supply's power cord is unplugged from the electrical outlet.

2. Check the label on the power supply to make sure the voltage required by the power supply matches that of your electrical outlet.

3. Plug the power supply cord into the connector shown below.

Power supply connector

✎ *Note:*
To remove the DC cable connector, make sure the power supply's power cord is unplugged; then grasp the connector at the arrow and pull it straight out.

Printer Handling

Part names

Control panel

Paper roll cover

Unit cover

Front cover

Using the Power Switch Cover

⚠ WARNING:

If an accident occurs when the power switch cover is attached, unplug the power cord from the outlet immediately to avoid fire or shock.

You can use the enclosed power switch cover to make sure the power switch is not accidentally pressed. The illustration below shows the power switch cover installed.

Power switch cover

If you need to turn the power on or off when the cover is installed, you can insert a thin tool into one of the holes in the cover to operate the switch.

Opening the Front Cover

You can open the front cover of the printer by using the tabs on each side of the cover.

Tab
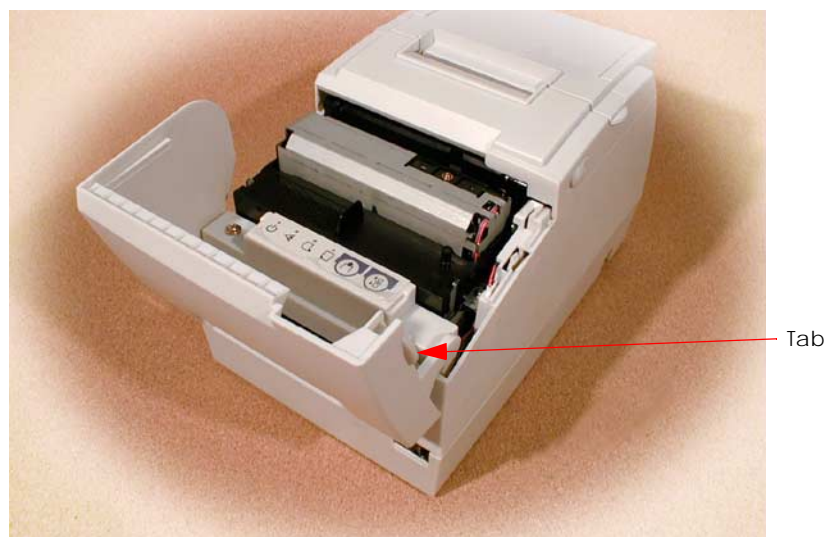
Installing or Replacing the Paper Roll

✎ *Note:*

Do not use paper rolls that have the paper glued or taped to the core because they might cause a paper jam.

To prevent paper jams, make sure that nothing obstructs paper coming out of the paper exit, and do not pull the paper out of the printer.

1. To prevent data loss make sure that the printer is not receiving data.

2. Open the paper roll cover by lifting up the two tabs on the paper roll cover and then pushing the cover back.

3. Remove the used paper roll core if there is one.

4. Insert the paper roll as shown.

5. Be sure to note the correct direction that the paper should come off the roll.
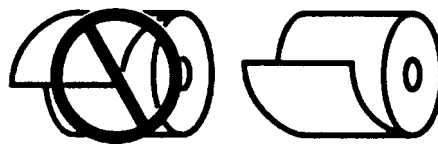
6. Pull out a small amount of paper, as shown. Then close the cover and tear off the extra paper by pulling it toward the front of the printer.

Installing the Ribbon Cassette

EPSON recommends the use of genuine EPSON ribbon cassettes. Ribbon cassettes not manufactured by EPSON may cause damage to your printer that is not covered by EPSON's warranties.

To install the ribbon cassette for the first time or to replace a used ribbon, follow the steps below:

✎ *Note:*
Be sure to turn on the power before installing a ribbon cassette.

1. Unpack the ribbon cassette and turn the knob in the direction shown to take up any slack.

Knob

2. Open the front cover of the printer, using the tabs on each side of the cover.

Tab
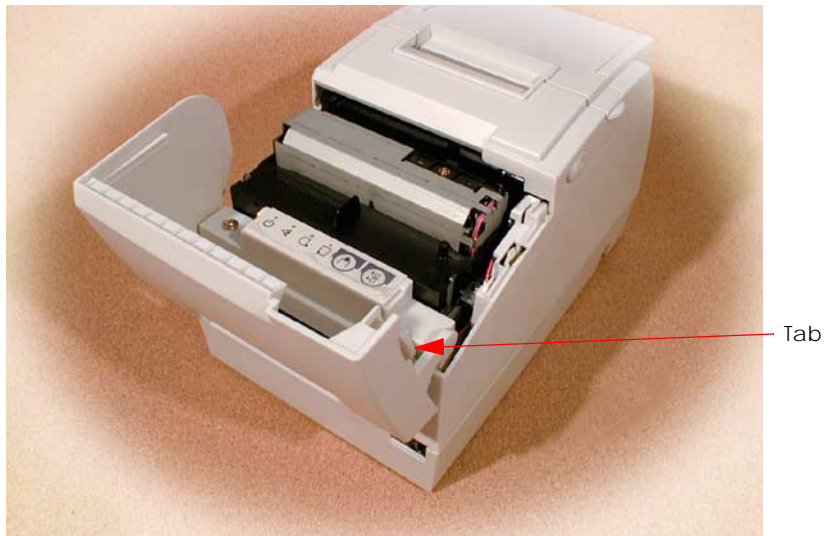
3. Remove the old ribbon, if there is one.

4. Insert the new ribbon cassette as shown.
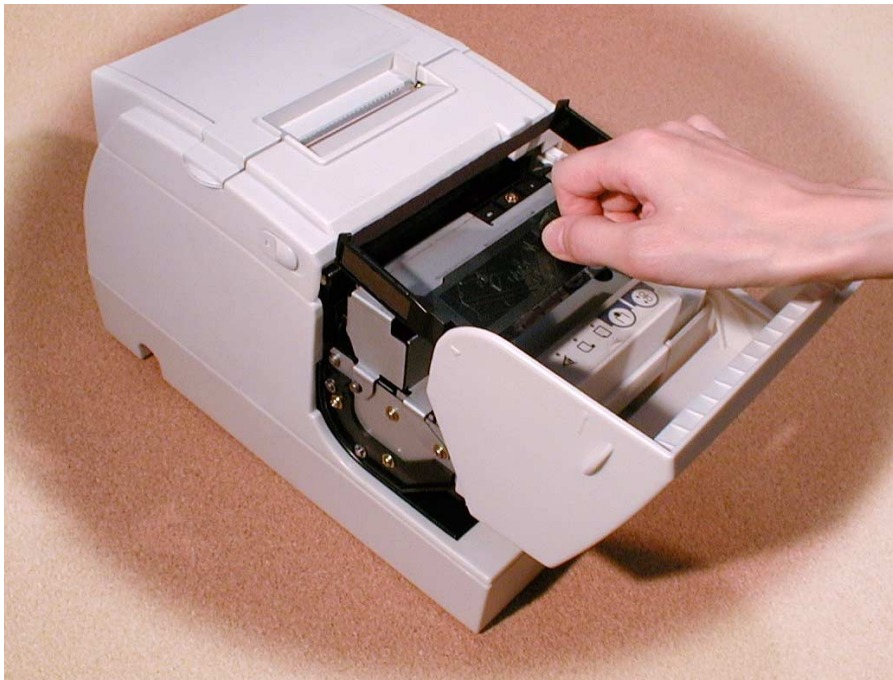
5. Turn the knob two or three times to make sure the ribbon is seated correctly. You can also look at the side of the slip unit to see if the ribbon is in the correct place. See below.

Edge of
ribbon
cassette
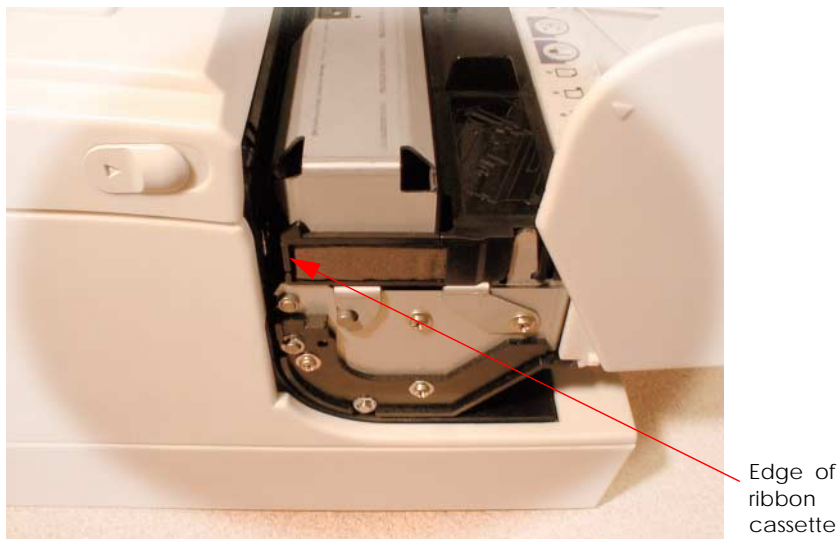
6. Close the front cover of the printer.

Installing the Optional Endorsement Ribbon Cassette

If your printer is equipped with the optional endorsement function, you also need to install the endorsement ribbon cassette, which is smaller than the standard ribbon cassette.

EPSON recommends the use of genuine EPSON ribbon cassettes. Ribbon cassettes not manufactured by EPSON may cause damage to your printer that is not covered by EPSON's warranties.

✎ *Note:*
Be sure to turn on the power before installing a ribbon cassette.

1. Unpack the ribbon cassette and turn the knob in the direction shown to take up any slack.

2. Open the unit cover, as shown below. Inside the printer, push the levers backward to open the unit.

✎ *Note:*
Do not open the unit during printing.
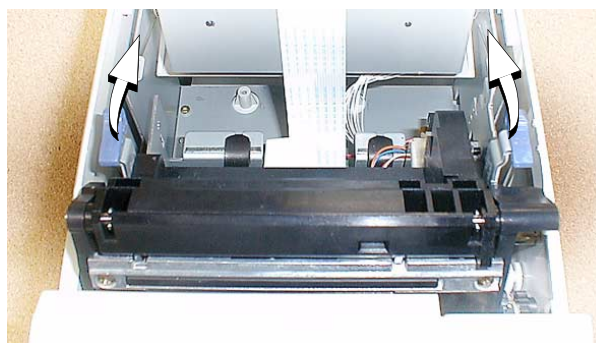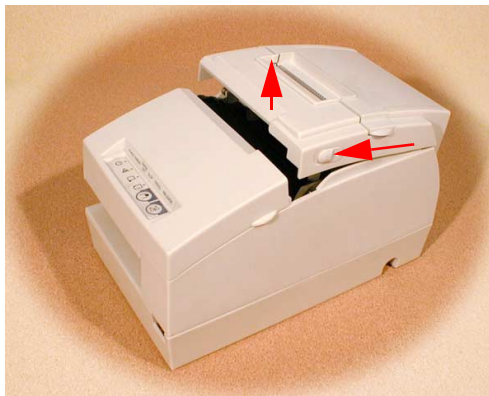
3. Insert the ribbon cartridge into the printer. You can see a properly installed ribbon in the illustration below with the arrow pointing to the knob.
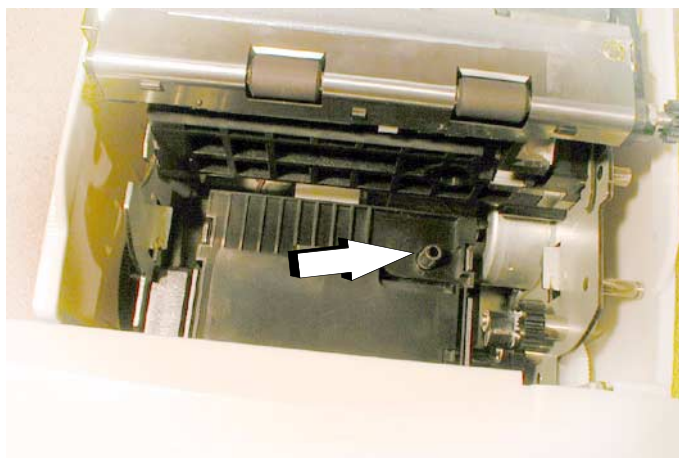
4. Turn the knob two or three times to make sure that the ribbon is seated correctly.

5. Close the cover of the printer.

Inserting Slip Paper

When you insert slip paper, be sure that the right side of the paper is against the right side of the paper guide, as shown below.

Printing on Slip paper

When you turn on the power, the paper roll is selected as the print sheet as a default. The printer is offline if the paper roll is not installed. In this case, you need to install the paper so that the printer becomes online and you can send a command to select the slip as the print sheet.

MICR and Endorsement Printing (Factory installed options)

Reading MICR characters on personal checks

⚠ *CAUTION:*

Do not insert checks with staples in them. This may cause paper jams, MICR reading errors, and damage to the MICR head.
Be sure the checks are flat, without curls, folds, or wrinkles.

Use the following procedure to read MICR characters.

	User Operation	Printer Operation
1	Transmit **FS a 0 <00>H**	Mechanically switches to MICR mode and waits for a personal check to be inserted. The SLIP LED blinks.
2	Insert a check (See the illustration on the next page)	Detects the check, lights the SLIP LED, and reads MICR characters. After reading, transmits the reading results.
3	Transmit **GS (G 2 0 48 68**	Select the back side of the check.

	User Operation	Printer Operation
4	Transmit **GS (G 2 0 84 1**	Select the print starting position on the back side of the check.
5	Transmit endorsement printing data	Prints data and feeds paper.
6	Transmit **FF**	After printing, ejects paper. The SLIP LED blinks until the check is removed.
7	Eject the check paper	The SLIP LED is off.

Notes on check sheet handling

❏ When insert a check for MICR reading or endorsement, insert the check as shown, with the side with the MICR characters facing up and with the MICR characters on the right side and the check against the right side of the paper guide.

MICR characters on this side, face up
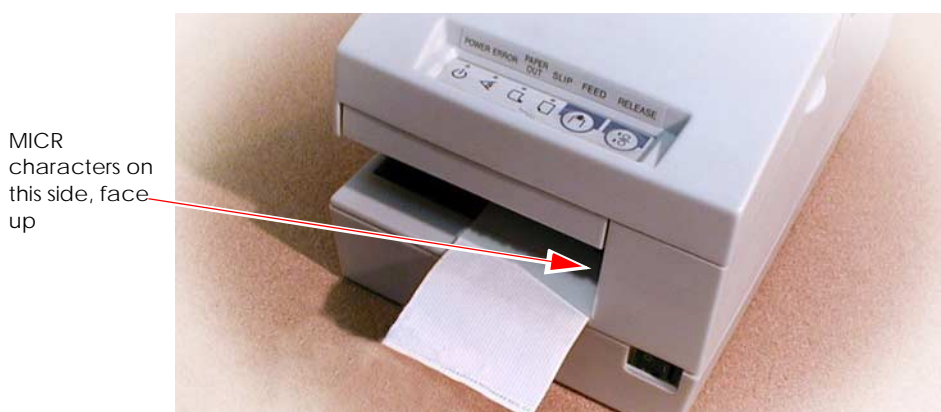
❏ The printer will detect the check and start drawing it in. When the printer starts drawing it in, let go of the check immediately. When the printer ejects the check and the SLIP light starts blinking again; remove the check by pulling it straight up; do not pull it at an angle.

❏ Checks are ejected in the forward direction only (the default is the forward direction).

❏ The check insertion waiting state is canceled using **DLE ENQ 3**.

❏ After the personal check is ejected, the SLIP LED lights, and the printer does not proceed to the next operation until the check is removed.

❏ The check waiting time and the interval from when a check is inserted to when the operation starts can be set using **ESC f**.

❏ To check the MICR function status, use **DLE EOT BS 1**.

Notes on using the MICR Reader

Do not install the printer near any magnetic fields. Be especially careful where you install your display device and be sure to check the recognition rate of the MICR reader with the display device in place.

Make sure that the printer is not subjected to any impact or vibration when it is performing a MICR reading.

Cleaning the Thermal Print Head

⚠ CAUTION:

After printing, the print head can be very hot. Be careful not to touch it. Also let it cool before you clean it.
Do not damage the print head by touching it with your fingers or any hard object.

1. Open the paper roll cover.

2. Clean the thermal element (the green part) of the print head with a cotton swab moistened with an alcohol solvent (ethanol, methanol, or IPA)

   Clean the thermal head periodically (generally every three months) to maintain receipt print quality.
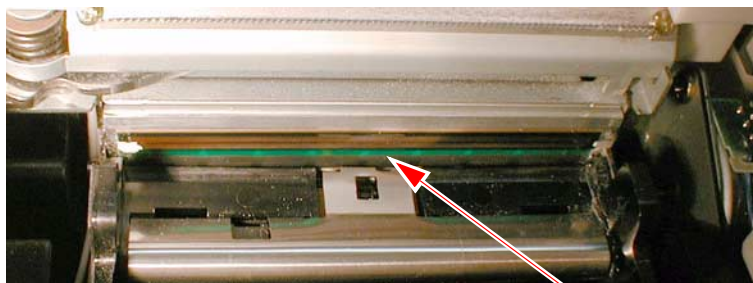
Print head

Cleaning the MICR Mechanism

Use a moistened cleaning sheet for the MICR head.

✎ *Note:*
Be sure not to use an adhesive cleaning sheet.

Cleaning frequency

Clean the MICR head every three months or 6000 passes.

Cleaning sheet

Use the following or an equivalent commercially available cleaning sheet:

PRESAT brand (KIC) "CHECK READER CLEANING CARD."

Cleaning procedure

You can perform cleaning either in self mode or command mode. These modes are described below.

Self mode

1. Load a paper roll in the printer.

2. Turn off the power.

3. Open the paper roll cover.

4. Turn the power back on while holding down the RELEASE button.

5. Press the RELEASE button seven times.

6. Close the paper roll cover.

7. The printer prints the following message on receipt paper and the SLIP light flashes.

```
****  RECOGNITION  MODE ****
        Please set check.
```

8. Load the cleaning sheet like a standard check.

⚠ CAUTION:

Be sure that the sheet is inserted with the correct side up and that it is inserted in the correct direction.

9. When the sheet is ejected, press the RELEASE button, and remove the sheet from the printer.

⚠ CAUTION:

Do not use a cleaning sheet more than once.

Command mode

1. Send the **FS c** cleaning command to the printer.

2. Perform steps 8 and 9, as described in self mode.

Removing a Paper Jam

⚠ CAUTION:

Do not touch the paper feed motor because it can be very hot.

If the paper is jammed in the paper roll section, turn the printer off. Next, open the paper roll cover. Then remove the jammed paper and put the roll back in the printer and close the cover.

If the paper is jammed in the slip section, turn off the printer and remove the jammed paper and use a fresh sheet. If you cannot remove the jammed paper easily, open the unit cover. Move the tabs on the sides of the cover forward and then lift the cover, as shown below.

Push the levers backward to open the unit as shown below, and then remove the jammed paper.
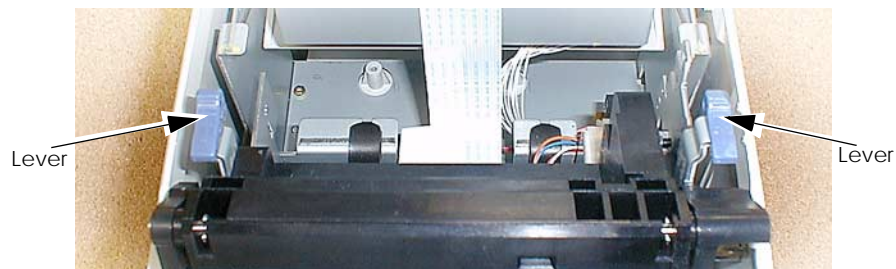
If the paper roll cover cannot be opened because paper is caught in the autocutter in the receipt section, follow the instructions in the autocutter section below.

Autocutter Jam

If a foreign object such as a push pin or paper clip drops in the autocutter and causes the auto cutter to lock up, the printer enters an error state and begins the recovery operation automatically.

If the problem is not serious, the autocutter returns to its normal position without any intervention by the user.

If the autocutter does not return to its normal position by itself, follow the steps below to correct the problem:

1. If the paper roll cover cannot be opened because paper is caught in the autocutter in the receipt section, open the unit cover. Move the tabs on the sides of the cover forward and then lift the cover, as shown on the previous page.

2. Following the instructions on the label inside the printer, turn the knob until you see a pin in the opening, as shown in the illustration below. This returns the cutter blade to the normal position.
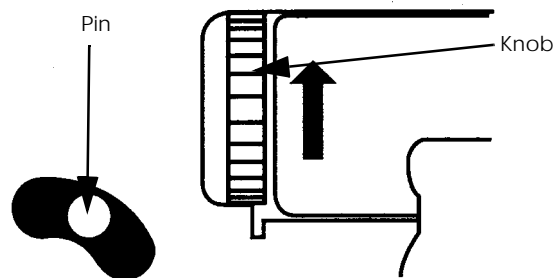
3. Close the unit cover.

Adjusting the Roll Paper Near End Detector

The paper near end detector detects when paper is almost gone by measuring the diameter of the paper roll. The detector has two settings.

✎ *Note:*
Because of variations in paper roll cores, it is not possible for the detector to measure exactly the length of paper left on the roll when the detector is triggered.

If you want more paper left when the detector is triggered, change the setting, as described below.

1. Open the printer cover, and remove the paper roll.

2. Loosen the adjusting screw with a coin, and carefully move the detecting lever up.
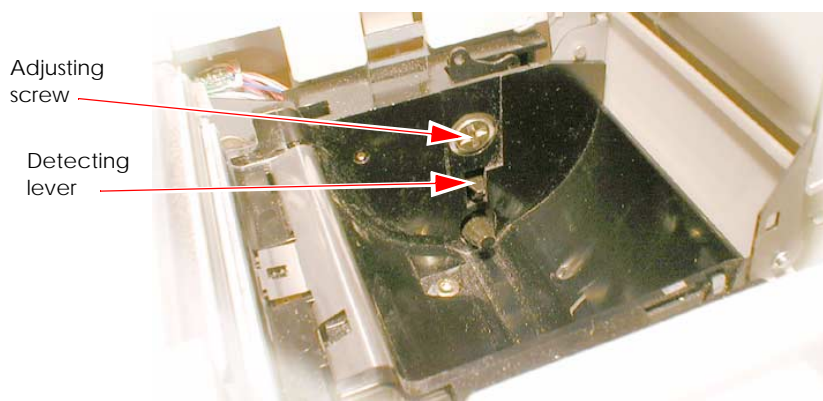
3. Tighten the adjusting screw, and check to be sure that the detecting lever moves freely.

4. Replace the paper roll.

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Appendix A
Character Code Tables

Page 0 (PC437: USA, Standard Europe) (International Character Set: USA)

NOTE: Character code tables show only character configurations, not the actual print pattern.

Page 1 (Katakana)

HEX	8	9	A	B ·	C	D	E	F
HEX BIN	1000	1001	1010	1011	1100	1101	1110	1111
0 0000	— 128	⊥ 144	SP 160	— 176	タ 192	ミ 208	二 224	× 240
1 0001	▬ 129	┬ 145	。 161	ア 177	チ 193	ム 209	┝ 225	円 241
2 0010	▬ 130	┤ 146	「 162	イ 178	ツ 194	メ 210	┿ 226	年 242
3 0011	▬ 131	├ 147	」 163	ウ 179	テ 195	モ 211	┥ 227	月 243
4 0100	■ 132	─ 148	、 164	エ 180	ト 196	ヤ 212	◢ 228	日 244
5 0101	■ 133	─ 149	・ 165	オ 181	ナ 197	ユ 213	◣ 229	時 245
6 0110	■ 134	│ 150	ヲ 166	カ 182	ニ 198	ヨ 214	◥ 230	分 246
7 0111	■ 135	│ 151	ァ 167	キ 183	ヌ 199	ラ 215	◤ 231	秒 247
8 1000	│ 136	┌ 152	ィ 168	ク 184	ネ 200	リ 216	♠ 232	〒 248
9 1001	▌ 137	┐ 153	ゥ 169	ケ 185	ノ 201	ル 217	♥ 233	市 249
A 1010	▌ 138	└ 154	ェ 170	コ 186	ハ 202	レ 218	◆ 234	区 250
B 1011	▌ 139	┘ 155	ォ 171	サ 187	ヒ 203	ロ 219	♣ 235	町 251
C 1100	■ 140	┌ 156	ャ 172	シ 188	フ 204	ワ 220	● 236	村 252
D 1101	■ 141	╲ 157	ュ 173	ス 189	ヘ 205	ン 221	○ 237	人 253
E 1110	■ 142	╲ 158	ョ 174	セ 190	ホ 206	゛ 222	╱ 238	▓ 254
F 1111	＋ 143	ノ 159	ッ 175	ソ 191	マ 207	゜ 223	＼ 239	SP 255

Page 2 (PC850: Multilingual)

HEX		8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	á 160	▓ 176	└ 192	ð 208	Ó 224	— 240
1	0001	ü 129	æ 145	í 161	▓ 177	⊥ 193	Đ 209	ß 225	± 241
2	0010	é 130	Æ 146	ó 162	▓ 178	⊤ 194	Ê 210	Ô 226	═ 242
3	0011	â 131	ô 147	ú 163	│ 179	├ 195	Ë 211	Ò 227	¾ 243
4	0100	ä 132	ö 148	ñ 164	┤ 180	─ 196	È 212	õ 228	¶ 244
5	0101	à 133	ò 149	Ñ 165	Á 181	┼ 197	ı 213	Õ 229	§ 245
6	0110	å 134	û 150	ª 166	Â 182	ã 198	Í 214	µ 230	÷ 246
7	0111	ç 135	ù 151	º 167	À 183	Ã 199	Î 215	þ 231	¸ 247
8	1000	ê 136	ÿ 152	¿ 168	© 184	╚ 200	Ï 216	Þ 232	° 248
9	1001	ë 137	Ö 153	® 169	╣ 185	╔ 201	┘ 217	Ú 233	¨ 249
A	1010	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Û 234	· 250
B	1011	ï 139	ø 155	½ 171	╗ 187	╦ 203	■ 219	Ù 235	¹ 251
C	1100	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	ý 236	³ 252
D	1101	ì 141	Ø 157	¡ 173	¢ 189	═ 205	¦ 221	Ý 237	² 253
E	1110	Ä 142	× 158	« 174	¥ 190	╬ 206	Ì 222	¯ 238	■ 254
F	1111	Å 143	ƒ 159	» 175	┐ 191	¤ 207	▀ 223	´ 239	SP 255

HEX		8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	á 160	▓ 176	└ 192	╨ 208	α 224	≡ 240
1	0001	ü 129	À 145	í 161	▓ 177	┴ 193	╤ 209	ß 225	± 241
2	0010	é 130	È 146	ó 162	▓ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	0011	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	0100	ã 132	õ 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	0101	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	0110	Á 134	Ú 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	0111	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	1000	ê 136	Ì 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	1001	Ê 137	Õ 153	Ò 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249
A	1010	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	1011	Í 139	¢ 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251
C	1100	Ô 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	ⁿ 252
D	1101	ì 141	Ù 157	¡ 173	╜ 189	═ 205	▌ 221	ø 237	² 253
E	1110	Ã 142	Pt 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254
F	1111	Â 143	Ó 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

Page 4 (PC863: Canadian-French)

HEX		8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	¦ 160	░ 176	└ 192	┴ 208	α 224	≡ 240
1	0001	ü 129	È 145	´ 161	▒ 177	┴ 193	┬ 209	β 225	± 241
2	0010	é 130	Ê 146	ó 162	▓ 178	┬ 194	┬ 210	Γ 226	≥ 242
3	0011	â 131	ô 147	ú 163	│ 179	├ 195	└ 211	π 227	≤ 243
4	0100	Â 132	Ë 148	¨ 164	┤ 180	─ 196	└ 212	Σ 228	⌠ 244
5	0101	à 133	Ï 149	¸ 165	╡ 181	┼ 197	┌ 213	σ 229	⌡ 245
6	0110	¶ 134	û 150	³ 166	╢ 182	├ 198	┌ 214	μ 230	÷ 246
7	0111	ç 135	ù 151	─ 167	╖ 183	╟ 199	┼ 215	τ 231	≈ 247
8	1000	ê 136	¤ 152	Î 168	╕ 184	└ 200	╪ 216	Φ 232	° 248
9	1001	ë 137	Ô 153	⌐ 169	╣ 185	╔ 201	┘ 217	θ 233	• 249
A	1010	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	1011	ï 139	¢ 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251
C	1100	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	ⁿ 252
D	1101	‗ 141	Ù 157	¾ 173	╜ 189	═ 205	█ 221	ø 237	² 253
E	1110	À 142	Û 158	« 174	╛ 190	╬ 206	█ 222	∈ 238	■ 254
F	1111	§ 143	ƒ 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

Page 5 (PC865: Nordic)

HEX		8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	á 160	▓ 176	└ 192	╨ 208	α 224	≡ 240
1	0001	ü 129	æ 145	í 161	▒ 177	┴ 193	╤ 209	ß 225	± 241
2	0010	é 130	Æ 146	ó 162	▓ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	0011	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	0100	ä 132	ö 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	0101	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	0110	å 134	û 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	0111	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	1000	ê 136	ÿ 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	1001	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249
A	1010	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	1011	ï 139	ø 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251
C	1100	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	ⁿ 252
D	1101	ì 141	Ø 157	¡ 173	╜ 189	═ 205	▌ 221	ø 237	² 253
E	1110	Ä 142	Pt 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254
F	1111	Å 143	ƒ 159	¤ 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

Page 16 (WPC1252)

HEX	BIN	8 1000	9 1001	A 1010	B 1011	C 1100	D 1101	E 1110	F 1111
0	0000	€ 128	SP 144	SP 160	° 176	À 192	Ð 208	à 224	ð 240
1	0001	SP 129	' 145	¡ 161	± 177	Á 193	Ñ 209	á 225	ñ 241
2	0010	‚ 130	' 146	¢ 162	² 178	Â 194	Ò 210	â 226	ò 242
3	0011	ƒ 131	" 147	£ 163	³ 179	Ã 195	Ó 211	ã 227	ó 243
4	0100	„ 132	" 148	¤ 164	´ 180	Ä 196	Ô 212	ä 228	ô 244
5	0101	… 133	• 149	¥ 165	µ 181	Å 197	Õ 213	å 229	õ 245
6	0110	† 134	– 150	¦ 166	¶ 182	Æ 198	Ö 214	æ 230	ö 246
7	0111	‡ 135	— 151	§ 167	· 183	Ç 199	× 215	ç 231	÷ 247
8	1000	ˆ 136	˜ 152	¨ 168	¸ 184	È 200	Ø 216	è 232	ø 248
9	1001	‰ 137	™ 153	© 169	¹ 185	É 201	Ù 217	é 233	ù 249
A	1010	Š 138	š 154	ª 170	º 186	Ê 202	Ú 218	ê 234	ú 250
B	1011	‹ 139	› 155	« 171	» 187	Ë 203	Û 219	ë 235	û 251
C	1100	Œ 140	œ 156	¬ 172	¼ 188	Ì 204	Ü 220	ì 236	ü 252
D	1101	SP 141	SP 157	- 173	½ 189	Í 205	Ý 221	í 237	ý 253
E	1110	Ž 142	ž 158	® 174	¾ 190	Î 206	Þ 222	î 238	þ 254
F	1111	SP 143	Ÿ 159	¯ 175	¿ 191	Ï 207	ß 223	ï 239	ÿ 255

HEX	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	А 128	Р 144	а 160	▓ 176	└ 192	╨ 208	р 224	Ё 240
1	0001	Б 129	С 145	б 161	▒ 177	┴ 193	╤ 209	с 225	ё 241
2	0010	В 130	Т 146	в 162	■ 178	┬ 194	╥ 210	т 226	Є 242
3	0011	Г 131	У 147	г 163	│ 179	├ 195	╙ 211	у 227	є 243
4	0100	Д 132	Ф 148	д 164	┤ 180	─ 196	╘ 212	ф 228	Ї 244
5	0101	Е 133	Х 149	е 165	╡ 181	┼ 197	╒ 213	х 229	ї 245
6	0110	Ж 134	Ц 150	ж 166	╢ 182	╞ 198	╓ 214	ц 230	Ў 246
7	0111	З 135	Ч 151	з 167	╖ 183	╟ 199	╫ 215	ч 231	ў 247
8	1000	И 136	Ш 152	и 168	╕ 184	╚ 200	╪ 216	ш 232	° 248
9	1001	Й 137	Щ 153	й 169	╣ 185	╔ 201	┘ 217	щ 233	• 249
A	1010	К 138	Ъ 154	к 170	║ 186	╩ 202	┌ 218	ъ 234	· 250
B	1011	Л 139	Ы 155	л 171	╗ 187	╦ 203	█ 219	ы 235	√ 251
C	1100	М 140	Ь 156	м 172	╝ 188	╠ 204	▄ 220	ь 236	№ 252
D	1101	Н 141	Э 157	н 173	╜ 189	═ 205	▌ 221	э 237	¤ 253
E	1110	О 142	Ю 158	о 174	╛ 190	╬ 206	▐ 222	ю 238	■ 254
F	1111	П 143	Я 159	п 175	┐ 191	╧ 207	▀ 223	я 239	SP 255

Page 18 (PC852: Latin2)

HEX		8	9	A	B	C	D	E	F
HEX	**BIN**	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	á 160	▤ 176	└ 192	đ 208	Ó 224	- 240
1	0001	ü 129	Ĺ 145	í 161	▦ 177	┴ 193	Đ 209	ß 225	˝ 241
2	0010	é 130	ĺ 146	ó 162	█ 178	┬ 194	Ď 210	Ô 226	˛ 242
3	0011	â 131	ô 147	ú 163	│ 179	├ 195	Ë 211	Ń 227	ˇ 243
4	0100	ä 132	ö 148	Ą 164	┤ 180	─ 196	ď 212	ń 228	˘ 244
5	0101	ů 133	Ľ 149	ą 165	Á 181	┼ 197	Ň 213	ň 229	§ 245
6	0110	ć 134	ľ 150	Ž 166	Â 182	Ă 198	Í 214	Š 230	÷ 246
7	0111	ç 135	Ś 151	ž 167	Ě 183	ă 199	Î 215	š 231	¸ 247
8	1000	ł 136	ś 152	Ę 168	Ş 184	└ 200	ě 216	Ŕ 232	° 248
9	1001	ë 137	Ö 153	ę 169	╣ 185	┌ 201	┘ 217	Ú 233	¨ 249
A	1010	Ő 138	Ü 154	· 170	║ 186	┴ 202	┌ 218	ŕ 234	· 250
B	1011	ő 139	Ť 155	ź 171	╗ 187	╤ 203	█ 219	Ű 235	ű 251
C	1100	î 140	ť 156	Č 172	╝ 188	╞ 204	▄ 220	ý 236	Ř 252
D	1101	Ź 141	Ł 157	ş 173	Ż 189	═ 205	Ţ 221	Ý 237	ř 253
E	1110	Ä 142	× 158	« 174	ż 190	╪ 206	Ů 222	ţ 238	█ 254
F	1111	Ć 143	č 159	» 175	┐ 191	¤ 207	▀ 223	´ 239	SP 255

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	á 160	▓ 176	└ 192	ð 208	Ó 224	─ 240
1	0001	ü 129	æ 145	í 161	▓ 177	┴ 193	Ð 209	ß 225	± 241
2	0010	é 130	Æ 146	ó 162	▓ 178	┬ 194	Ê 210	Ô 226	═ 242
3	0011	â 131	ô 147	ú 163	│ 179	├ 195	Ë 211	Ò 227	¾ 243
4	0100	ä 132	ö 148	ñ 164	┤ 180	─ 196	È 212	õ 228	¶ 244
5	0101	à 133	ò 149	Ñ 165	Á 181	┼ 197	€ 213	Õ 229	§ 245
6	0110	å 134	û 150	ª 166	Â 182	ã 198	Í 214	µ 230	÷ 246
7	0111	ç 135	ù 151	º 167	À 183	Ã 199	Î 215	þ 231	¸ 247
8	1000	ê 136	ÿ 152	¿ 168	© 184	└ 200	Ï 216	Þ 232	° 248
9	1001	ë 137	Ö 153	® 169	╣ 185	╔ 201	┘ 217	Ú 233	¨ 249
A	1010	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Û 234	· 250
B	1011	ï 139	ø 155	½ 171	╗ 187	╦ 203	█ 219	Ù 235	¹ 251
C	1100	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	ý 236	³ 252
D	1101	ì 141	Ø 157	¡ 173	¢ 189	═ 205	¦ 221	Ý 237	² 253
E	1110	Ä 142	× 158	« 174	¥ 190	╬ 206	Ì 222	─ 238	■ 254
F	1111	Å 143	ƒ 159	» 175	┐ 191	¤ 207	▀ 223	´ 239	SP 255

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Page 254 (Space Page)

HEX		8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	SP [128]	õ [144]	SP [160]	0 [176]	@ [192]	P [208]	` [224]	p [240]
1	0001	δ [129]	µ [145]	! [161]	1 [177]	A [193]	Q [209]	a [225]	q [241]
2	0010	Ð [130]	þ [146]	" [162]	2 [178]	B [194]	R [210]	b [226]	r [242]
3	0011	Ê [131]	Þ [147]	# [163]	3 [179]	C [195]	S [211]	c [227]	s [243]
4	0100	Ë [132]	Ú [148]	$ [164]	4 [180]	D [196]	T [212]	d [228]	t [244]
5	0101	È [133]	Û [149]	% [165]	5 [181]	E [197]	U [213]	e [229]	u [245]
6	0110	Í [134]	Ù [150]	& [166]	6 [182]	F [198]	V [214]	f [230]	v [246]
7	0111	Î [135]	ý [151]	' [167]	7 [183]	G [199]	W [215]	g [231]	w [247]
8	1000	Ï [136]	Ÿ [152]	([168]	8 [184]	H [200]	X [216]	h [232]	x [248]
9	1001	Ì [137]	± [153]	) [169]	9 [185]	I [201]	Y [217]	i [233]	y [249]
A	1010	Ó [138]	÷ [154]	* [170]	: [186]	J [202]	Z [218]	j [234]	z [250]
B	1011	ß [139]	. [155]	+ [171]	; [187]	K [203]	[[219]	k [235]	{ [251]
C	1100	Ô [140]	SP [156]	, [172]	< [188]	L [204]	\ [220]	l [236]		[252]
D	1101	Ò [141]	SP [157]	– [173]	= [189]	M [205]	] [221]	m [237]	} [253]
E	1110	SP [142]	SP [158]	. [174]	> [190]	N [206]	^ [222]	n [238]	~ [254]
F	1111	õ [143]	SP [159]	/ [175]	? [191]	O [207]	_ [223]	o [239]	. [255]

Page 255 (Space Page)

HEX		8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	á 160	. 176	. 192	H 208	SP 224	SP 240
1	0001	ü 129	æ 145	í 161	. 177	193	I 209	SP 225	SP 241
2	0010	é 130	Æ 146	ó 162	. 178	. 194	SP 210	SP 226	SP 242
3	0011	â 131	ô 147	ú 163	. 179	. 195	SP 211	SP 227	SP 243
4	0100	ä 132	ö 148	ñ 164	. 180	196	SP 212	SP 228	SP 244
5	0101	à 133	ò 149	Ñ 165	Á 181	. 197	SP 213	SP 229	SP 245
6	0110	å 134	û 150	Ğ 166	Â 182	â 198	. 214	SP 230	SP 246
7	0111	ç 135	ù 151	ğ 167	À 183	Ä 199	. 215	SP 231	SP 247
8	1000	ê 136	ÿ 152	¿ 168	İ 184	╚ 200	SP 216	SP 232	SP 248
9	1001	ë 137	Ö 153	. 169	╡ 185	╔ 201	SP 217	SP 233	SP 249
A	1010	è 138	Ü 154	. 170	‖ 186	╩ 202	SP 218	SP 234	SP 250
B	1011	ï 139	ø 155	. 171	╗ 187	╦ 203	SP 219	SP 235	SP 251
C	1100	î 140	£ 156	. 172	╝ 188	╠ 204	SP 220	SP 236	SP 252
D	1101	ì 141	Ø 157	¡ 173	¢ 189	= 205	SP 221	SP 237	SP 253
E	1110	Ä 142	Ş 158	. 174	. 190	╬ 206	SP 222	SP 238	SP 254
F	1111	Å 143	ş 159	¤ 175	. 191	. 207	SP 223	SP 239	SP 255

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International Character Sets

Country	ASCII code (Hex)											
	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
U.S.A	#	$	@	[	\	]	^	`	{	|	}	~
France	#	$	à	°	ç	§	^	`	é	ù	è	¨
Germany	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
U.K.	£	$	@	[	\	]	^	`	{	|	}	~
Denmark I	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~
Sweden	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
Italy	#	$	@	°	\	é	^	ù	à	ò	è	ì
Spain I	Pt	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
Japan	#	$	@	[	¥	]	^	`	{	|	}	~
Norway	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
Denmark II	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
Spain II	#	$	á	¡	Ñ	¿	é	`	í	ñ	ó	ú
Latin America	#	$	á	¡	Ñ	¿	é	ü	í	ñ	ó	ú
Korea	#	$	@	[	₩	]	^	`	{	|	}	~

Confidential

Appendix B

Case Specifications

External Dimensions and Weight

Width:	186 mm (7.32 in)
Depth:	298 mm (11.73 in) (except for the protrusion)
Height:	185 mm (7.28 in)
Weight:	Approximately 5.8 kg (12.8 lb)

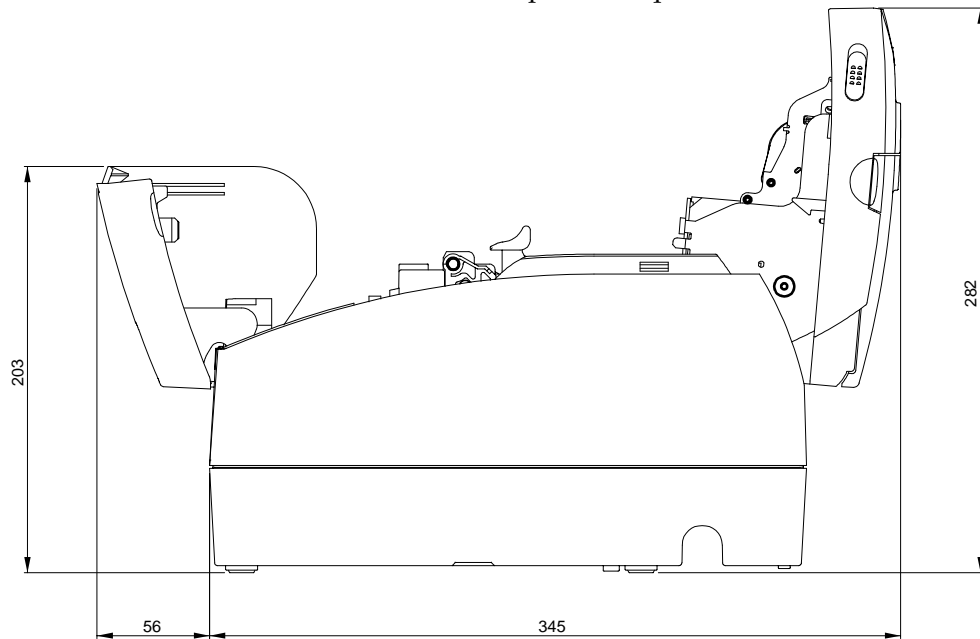(All the numeric values are typical.)

Color: EPSON standard color (ECW)
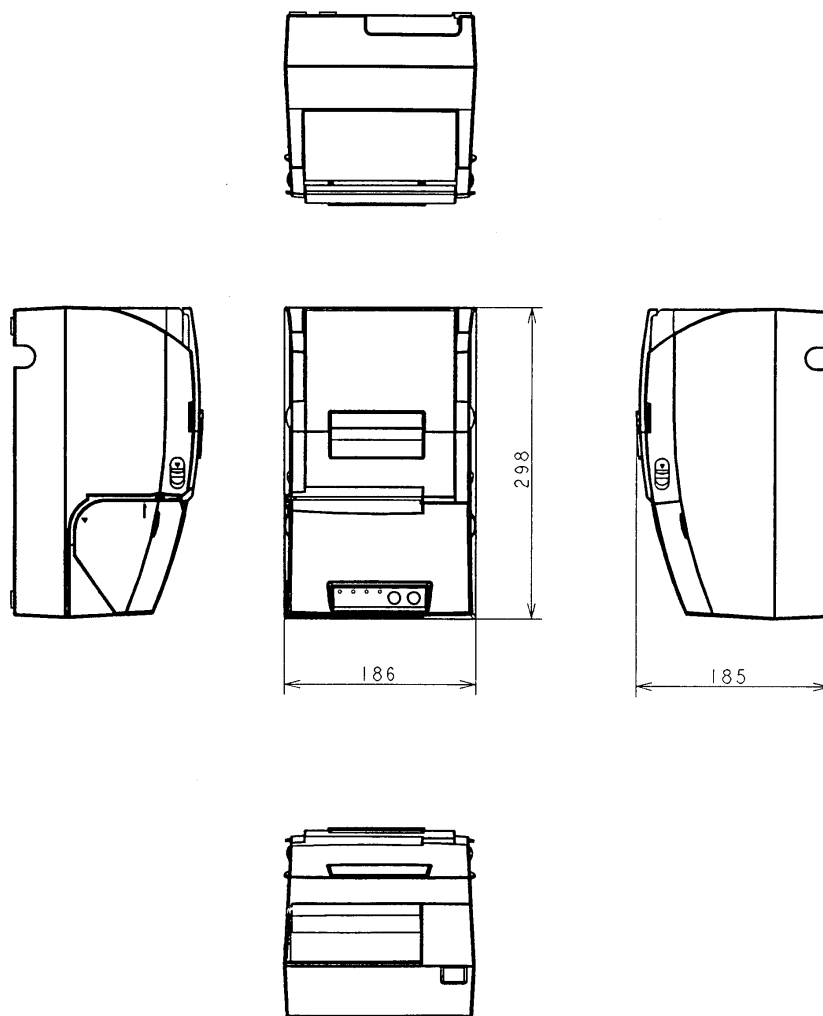
Appendix C
Maintenance Area

The illustrations below show the area around the printer required for maintenance.

203

282

56

345

NOTE: 203 mm = 8 in
56 mm = 2.2 in
345 mm = 13.6 in
282 mm = 11.1 in

Appendix D
Definitions

A

ASB — Auto status back: a feature that allows the printer to send status information back to the host comuter.

autocutter — Optional printer device that automatically cuts the receipt for the current transaction from the paper roll.

B

bidirectional — Two-way communication between the host and printer, which allows the printer to return status information to the host. The IEEE 1284 standard for the parallel interface used in the TM-H6000 has the capacity for bidirectional communication.

bitmap — A graphic or a character comprised of individual pixels or dots (as opposed to a vector or scalable image, created with mathematical algorithms).

black mark — A positioning mark printed on slips, such as ATM receipts.

BOF — Bottom of form: the vertical point on the paper at which the printer skips to the top of the next form. (Or, the point on the sheet where the bottom margin begins.) The TM-H6000 has a BOF sensor for slip paper.

buffer — A memory area in the printer that holds incoming data until it is processed. In the TM-H6000, there is a receive buffer (DIP switch selectable as 45 bytes or 45KB), a user-defined buffer (12KB for receipts and 3KB for slips), an NV bit image buffer (384KB, default), and an NV user memory buffer (1KB).

C

carbonless paper — A type of copy paper for impact printers. When a pin fires and strikes the ribbon against the top sheet, the pressure causes a chemical interaction between the top sheet and the sheets below, creating a corresponding dot on those sheets also.

confidentiality — The agreement required for anyone to use this document.

CPL — Characters per line.

E

endorsement print mechanism —
> An optional, factory-installed shuttle printer mechanism for the TM-H6000 that allows it to print an endorsement automatically as the check is processed. This device is abbreviated as "E/P."

ESC/POS — EPSON's standard command language for POS devices.

F

font A — The default font. In the TM-H6000 receipt printer, font A uses 12 x 24 dot characters (including 2 dots of horizontal spacing); in the slip printer, font A uses 5 x 9 dot characters (including one dot of horizontal spacing).

font B — In the TM-H6000 receipt printer, font B uses 9 x 17 dot characters (including 2 dots of horizontal spacing); in the slip printer, font B uses 7 x 9 dot characters (including 2 half dots of horizontal spacing).

H

hex dump — A test mode in which the printer prints hexadecimal numbers representing characters and codes. Run a hex dump by opening the cover and turning on power while holding down the FEED button and then closing the cover.

I

IEEE 1284 — The standard used for the TM-H6000 parallel interface. This type of interface allows both bidirectional communications and unidirectional ("compatibility mode") communications.

J

JavaPOS — A vendor-independent standard for using Sun Microsystems' Java programming commands to support POS devices. (Compare with OPOS.)

L

LPS — Lines per second.

M

MICR — Magnetic ink character recognition. A MICR reader can recognize the type of ink found at the bottom of checks and deposit slips.

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MSR — Magnetic stripe reader. Magnetic stripes are found on the back of credit cards.

N

null modem cable —
A type of serial cable wired so that the send data (SD) line from the host goes to the receive data (RD) pin of the printer connector, and the send data (SD) signal from the printer returns to the receive data (RD) pin of the host's serial connector. It is also called a "cross cable." This type of cable is required for serial communications between a host and printer. (Communications from a host to a modem use a straight-through cable.)

NV — Non-volatile. The data in this type of memory is not lost when power is turned off.

O

OLE POS — Also called OPOS. A standard using Microsoft's OLE technology to support POS devices in a Windows environment.

P

page mode — In this mode, the printer collects data and formatting commands in its buffer until printing is specified with the **ESC FF** or **FF** command. (See standard mode for reference.) This mode gives the printer more flexibility in formatting, so that it can print character data and bar code data or other graphics data on the same line. Printer values can be stored separately in page mode and standard mode.

partial cut — This type of cut made by the autocutter leaves one small segment of the receipt uncut.

R

ribbon — The TM-H6000 slip printer uses an ERC-32 (P) ribbon; the TM-H6000 endorsement printer uses an ERC-41 (P) ribbon.

RS-232C — The standard serial interface available for this printer.

RS-485 — A serial interface type available as a dealer option.

S

single-pass processing —
The technology used in this printer to eliminate the need to turn a check over to print an endorsement.

standard mode —

    In this mode, the printer acts on print and command data as it is received from the host. (See page mode for reference.) Printer values can be stored separately in page mode and standard mode.

T

Thermal printer —

    A thermal printer uses heat elements to create dots on heat-sensitive paper.

Thermal paper —

    Heat-sensitive paper specially developed for thermal printers. Use only the thermal paper specified in TM-H6000 documentation.

TOF —   Top of form: the point on the page at which the printer begins printing the top line of text or graphics. (Or, the beginning of the printable area, immediately below the top margin.) The TM-H6000 has a TOF sensor for slip paper.

U

USB —   Universal Serial Bus. A serial interface that allows you to add peripheral devices dynamically on a single bus.

V

VAR —   Value added reseller.

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