Product Specifications Manual

TSP1000 Series

Rev. 0.00

Star Micronics Co., Ltd.

Special Products Operating Division

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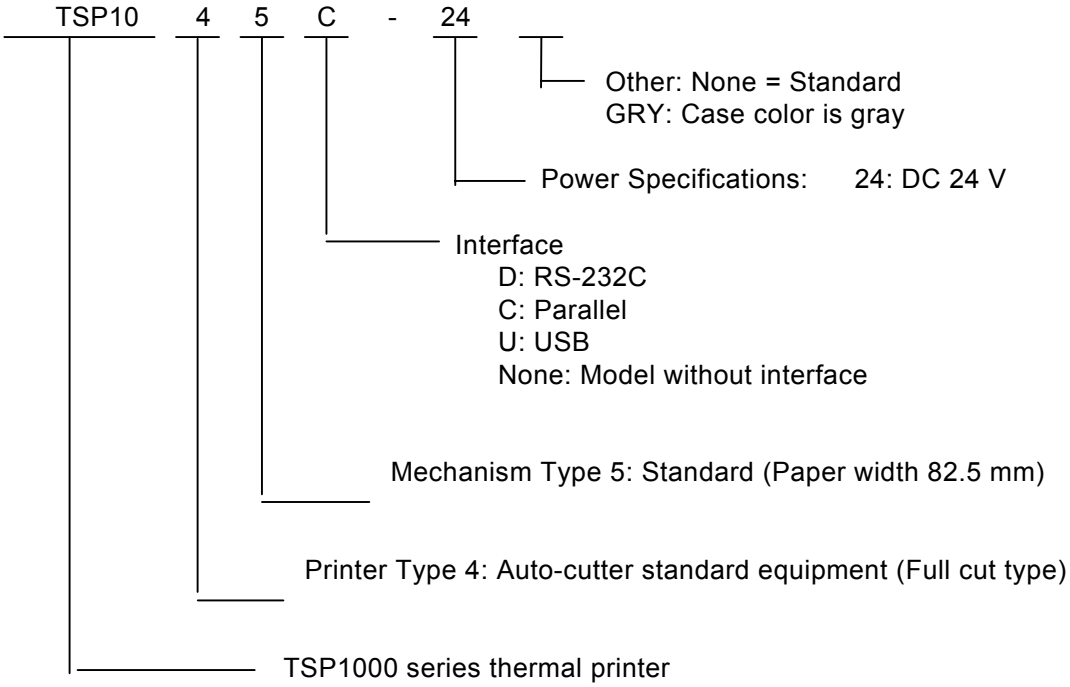
1. GENERAL DESCRIPTION

The TSP1000 series is a direct thermal printer mechanism having a clam-shell configuration that employs a thermal line dot printing system.

Model Name Display Directions



2. BASIC SPECIFICATIONS

2-1 Printing Specifications

1.	Printing Method:	Direct Line Thermal Printing Method
2.	Dot Configuration:	640 dots/Line
3.	Dot Density:	8 dots/mm (203 DPI)
4.	Printing Region:	Maximum 80 mm
5.	Printing Format:	Maximum 53 columns (12 x 24 fonts) Maximum 71 columns (9 x 24 fonts) Maximum 40 columns (16 x 24 fonts) Maximum 26 columns (24 x 24 Chinese character fonts; Only on Chinese character models)
6.	Character space:	Programmable
7.	Printing Speed:	When using black and white: Maximum of 180 mm/sec When using two-color printing: Maximum of 75 mm/sec

Note 1: Printing speed varies according to the processing speed of the controller and the temperature control using the head thermistor.
Also, printing speed is variable by changing the memory switch settings.

8.	Paper Feed:	Friction feed method Feed pitch: 0.125 mm (Paper feed amount at one motor step (2-2 phase excitation)
9.	Line Width:	STAR Mode: 4 mm or 3 mm ESC/POS Mode: 4.23 mm (1/6 inch) Can be set by command.
10.	Print Head:	Line thermal head
11.	Emulation:	STAR line mode STAR page mode ESC/POS mode

2-2 Character Specifications and Bar Code Specifications

2-2-1 STAR Line Mode

ANK

Font Type	Size (W x H)		Code Page	Int'l Char.
	Dot	mm		
Font-A	12 x 24 dot (*) IBM Block: 12 x 32 dot	1.50mm x 3.00mm (*) IBM Block: 1.50mm x 4.00mm	Page 40	16 Countries
Font-B	9 x 24 dot (*) IBM Block: 9 x 32 dot	1.125mm x 3.00mm (*) IBM Block: 1.125mm x 4.00mm	Page 40	16 Countries
OCR-B	16 x 24 dot	2.00mm x 3.00mm	--	--

Chinese Characters

Font Type		Character Count	Size (W x H)	
			dot	mm
Japanese Characters (Note 1)	English Language Characters	96 Characters	24 x 24 dot	3.00mm x 3.00mm
	Expanded Graphics	128 Characters		
	JIS First Standard Characters	3489 Characters		
	JIS Second Standard Characters	3390 Characters		
	Special Characters	83 Characters		
	Single Byte Characters	282 Characters	12 x 24dot	1.50mm x 3.00mm
Chinese Characters (Note 2)	English Language Characters	96 Characters	24 x 24 dot	3.00mm x 3.00mm
	Chinese Characters	7189 Characters		
Korean Characters	English Language Characters	96 Characters	24 x 24 dot	3.00mm x 3.00mm
	Symbols	1032 Characters		
	Korean Characters	2350 Characters		
Taiwan BIG 5 (F)	English Language Characters	96 Characters	24 x 24 dot	3.00mm x 3.00mm
	Taiwanese Language Characters	13877 Characters		

Note 1: JIS first and second standard Chinese characters conform to JISx0208-1990 and JISx0208-1997. They correspond to SHIFT-JIS code.

Note 2: Conforms to GB2312

Bar Codes

	Bar Code Types
Primary Bar Codes	UPC-A UPC-E JAN/EAN8 JAN/EAN13 ITF CODE39 CODE93 CODE128 CODABAR (NW-7)
Secondary Bar Codes	PDF417

2-2-2 STAR Page Mode

ANK

Font Type	Size (W x H)		Code Page	Int'l Char.
	dot	mm		
Small Characters	8 x 16 dot	1.00mm x 2.00mm	Page 2	14 Countries
Standard Characters	16 x 24 dot	2.00mm x 3.00mm	Page 2	14 Countries
Bold Characters	24 x 32 dot	3.00mm x 4.00mm	--	14 Countries
OCR-B	16 x 24 dot	2.00mm x 3.00mm	--	--

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Secondary Bar Codes	PDF417

2-2-3 ESC/POS Mode

ANK

Font Type	Size (W x H)		Code Page	Int'l Char.
	dot	mm		
Font-A	12 x 24 dot	1.50mm x 3.00mm	Page 40	16 Counties
Font-B	9 x 24 dot	1.125mm x 3.00mm	Page 40	16 Counties
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2-3 Paper Specifications (Thermal Paper)

1. Paper Width: 79.5 ±0.5 (mm)/82.5 ±0.5 (mm)

Note 1: Do not change paper types while the printer is in use.
Note 2: Paper specifications differ for printing on paper edges.
Note 3: It is necessary to adjust the position of the paper guides on the left and right to use paper with of 79.5 mm.

2. Paper Thickness: 80 μm to 105 μm
3. External Dimensions: Roll Diameter: Maximum value Ø 180 mm
   Width (Roll-up Dimensions): 80 ±0.5, -1 mm/83 ±0.5, -1 mm

Note 1: Be aware that roll paper will expand because it absorbs water if the printer is being used in a high temperature-high humidity environment. The printer must be used under the specifications provided above. If using this printer in a highly temperature, high humidity environment it is recommended that the paper roll diameter be a maximum of Ø175 considering the margin.

4. Shaft Core Inner Diameter/Outer Diameter:
   When paper thickness is 65 to 100 μm:
   Shaft core inner diameter: Min. 25.4 ±1 mm; Shaft core outer diameter: Min. 40 ±1 mm
   When paper thickness is 100 to 150 μm:
   Shaft core inner diameter: Min. 50.8 ±1 mm; Shaft core outer diameter: Min. 58 ±1 mm

Note 1: The tolerance value of the roll paper shaft core (paper tube) varies according to the thickness of the paper that you use.
The specifications above are recommended values. When using paper that is outside of the above specification ranges, paper jams may occur.
Note 2: The amount of paper remaining when using the near-end detector can vary depending on the roll paper shaft core (paper tube) diameter. Operate this apparatus after verifying the conditions of its use beforehand.

5. Roll Paper Finish
   The following should be carefully observed with regard to roll paper finish.
   A. The coloring surface of the thermal paper should be the outer surface of the roll.
   B. The core of the roll paper should not protrude from the edges.
   C. The end of the roll paper should not be glued or taped to the core.
      The trailing edge should not be folded.
   D. The roll paper should not come loose.
   E. There should be no deformation of the roll paper diameter and core.

6. Recommended Thermal Paper
   Print density settings must be changed according to the type and thickness of the paper.
   Density settings can be changed using the print density setting command <ESC> <RS> ‘d' n.

Manufacturer	Name	Quality Characteristics and Use	Paper Thickness (μm)	Value n
MPF (Mitsubishi Paper Mills, Ltd.)	T8037	For rotary	85	2
	TF8067	For rotary	84	1
	TF8075	For rotary	84	3 (Default)
KSP	Lotto482	For rotary	84	1
KANZAN	KLS46	For rotary	-	1
	KPO460	For rotary	-	3 (Default)

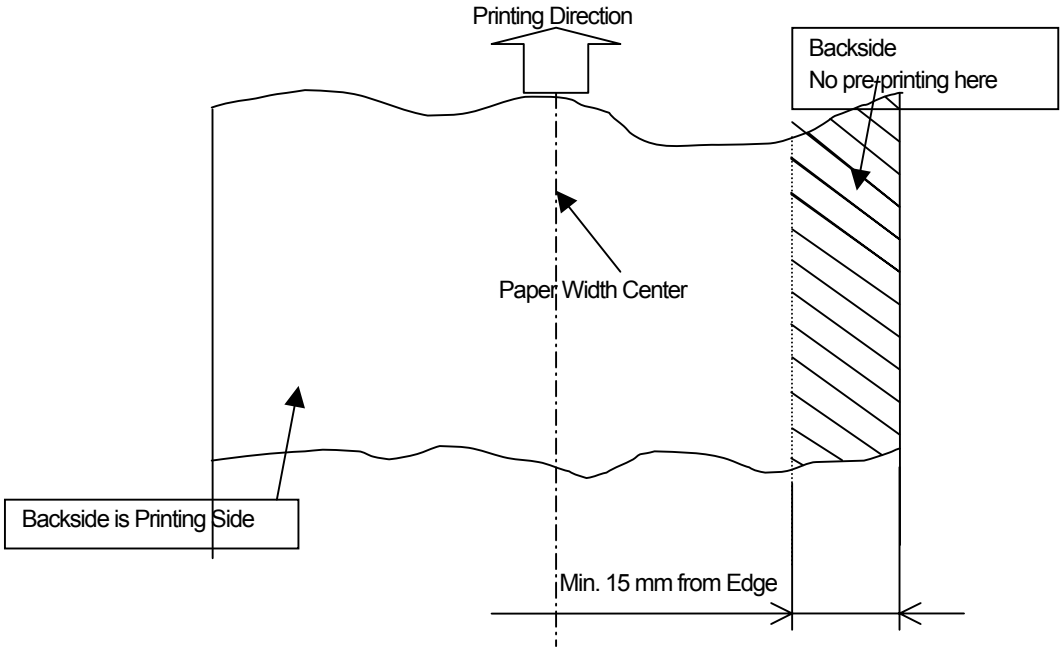
Note 1: Absolutely do not store roll paper in high temperature and high humidity environments because this can cause improper paper transport and defective printing.

7. Effective Print Width

Paper Width (mm)	Left/Right Margins (mm)	Effective Print Width (mm)	Printing Columns (12 x 24 fonts)	Remarks
79.5±0.5	4	72	48	Note 1
82.5±0.5	Left –2 to 1/Right 1.5 to 3	80	53	

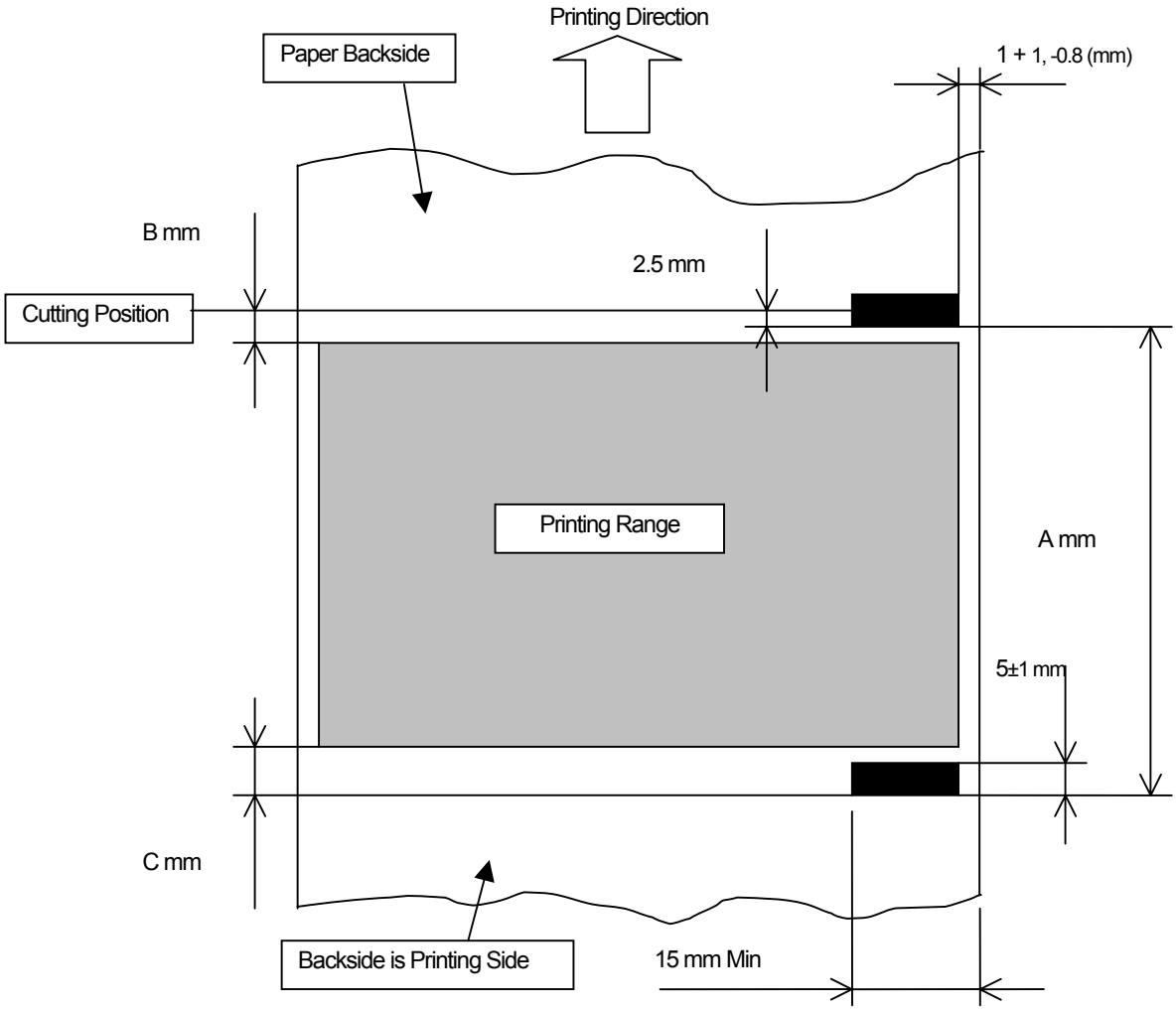
Note 1: It is necessary to adjust the position of the paper guides on the left and right to use paper with of 79.5 mm.

8. Pre-printing Range on the Backside of Recording Paper
When pre-printing to the backside of recording paper, it should meet the following specifications.



2-4 Black Mark Specifications

The following describes the recommended black mark specifications for printers that use the paper out detector as the black mark detector.



Note 1: The cutting position shown in the figure above is a default setting for the print starting position offset value of memory switch.

1. Black Mark Pitch (Dimension A)
   Black mark pitch can be set to a dimension of A = 50 to 300 mm.

Note 1: Black mark pitches can be set to the above describe range, but it is recommended to set the print layout in consideration of the variation in printing positions.

2. Black Mark Dimensions
   See the following drawings for the dimensions of black marks to be printed.

3. PCS Value
   The PCS value of black marks to be printed should be a minimum of 0.90 mm.

Note 1: The PCS value of black marks can cause page skipping problems or improper page length detection if they do not meet the aforementioned specifications.
For that reason, always ensure that the PCS value is met.

4. Top margin (Dimension B)
   Set the printing range, leaving plenty of top margin from the cutting position.
   When not using reverse paper feed, a top margin with a minimum total of 11 mm of the distance from the thermal head heating elements to the cutting position, and paper feed amount of 1 mm considering vibrations when starting the motor, results in a recommended top margin of 12 mm.

Note 1: If the top margin is not sufficiently taken, problems, such as a page being skipped, can occur. So, you must set for plenty of top margin.
Note 2: The setting of the printing range should not exceed the black mark pitch.

5. Bottom margin (Dimension C)
   Set the printing range leaving plenty of bottom margin from the trailing edge of the printing range to the black mark.
   It is necessary to consider the printing precision of the black mark, the printing TOF accuracy (±2 mm of the standard printing position), the setup ambient temperature of the printer, and part wear-out to set the bottom margin. It is recommended that the following bottom margin be secured to set the printing range.
   Bottom Margin (Dimension C) ≧ 3 mm + (Dimension A x 3%)

Note 1: If the bottom margin is not sufficiently taken, problems, such as a page being skipped, can occur. So, you must set for plenty of bottom margin.
Note 2: The setting of the printing range should not exceed the black mark pitch.

6. Example Setting of the Printing Region
   The following shows a printing range setting example when not reverse feeding recording paper.

   When Black Mark Pitch (Dimension A) is 100 mm:
   The top margin is set to 12 mm.
   The bottom margin is set to 3mm + (100 mm x 0.03) = 6 mm.
   According to the above, it is necessary to set the printing range to less than 100 mm – 12 mm - 6 mm = 82 mm.

Note 1: Print TOF positioning precision using the black mark detection is ±2 mm of the standard printing position. For printing length, it is ±2% of the setting value, in consideration of the differences of the initial ambient temperature and forming precision of the platen diameter. When the life of the printer is considered, the print layout should be carefully planned if using paper that has been pre-printed. An error of up to -5% of the setting values should be considered.
Note 2: If you have any questions regarding how to set the printing range for the black mark, consult with STAR Micronics.

7. Sensor Adjustments
   It is recommended to adjust the black mark sensor position if using black marks.

2-5 Auto-cutter Specifications

1. Cutting Method: Guillotine method
2. Cutting Modes: Full cut
3. Cut Duty: 1 Cut/within 3 seconds

Note 1: The auto-cutter life will notable shorten if it is not used within the above range.

4. Paper Thickness: 80 μm to 105 μm

Note 1: Cutter life specifications values may vary according to thickness of the paper that is used.

5. Cutter Position: Distance from Printing Position to Cutting Position: Approximately 11mm

Note 1: The cutting position can be changed using memory switch settings.

6. Minimum Cutting Length: 50 mm
7. Error Detection: Home position detected by mechanical sensor.

Note 1: If the cutter is not at its home position after an error occurs, either turn on the power again after removing the cause of the error, or turn off the power, and remove the front cover which is the storage position of the movable cutter blade. Rotate the emergency knob in the direction indicated by the arrows marked on the housing reaching in from the notch in the cutter unit housing. This will return the cutter blade to its home position. The emergency knob should be rotated using a tweezers, screwdriver or ball-point pen to prevent accidents.

Note 2: If the cover becomes locked because paper has jammed, absolutely never forcefully opened the printer cover. Forcefully opening the cover can damage the cutter.

2-6 Functions

2-6-1 Sensors

. 1. Head Temperature Detection: Detects the temperature of the thermal head with a thermistor.

2. Paper Out Detection: A photosensor is embedded in the paper guide on the thermal mechanism. This detects the trailing edge of the paper.

Note 1: The paper out detector duals as the black mark detector. In such cases, some restrictions exist for black mark pitch detection. Also, to detect black marks, it is necessary to change the settings of the memory switches.

3. Cover Open Detection: Detects that the printer cover (between head and platen) is closed.
4. Stacker Paper Detector: A reflective type photosensor is used to detect paper in the paper stacker.
5. Near End Detection: A reflective type photosensor detects the remaining amount of paper on the roll. The following shows the detecting diameter and the amount of paper remaining on the roll for each condition.

Paper Thickness (µm)	When Using Inner Diameter Ø 25.4/Outer Diameter Ø 40 Shaft Core Roll Paper					
	Detection Diameter (mm)			Residual Paper Amount (m)		
	Bottom Level 1	Central Value at Ex-factory	Top Level 1	Bottom Level 1	Central Value at Ex-factory	Top Level 1
80	Approx. Ø44	Approx. Ø48	Approx. Ø52	Approx. 3.5	Approx. 7.5	Approx. 12.5
105				Approx. 1.5	Approx. 4.5	Approx. 7.5

Note 1: The ex-factory setting is the central value.

Note 2: These dimensions are values calculated for sensor diameter and residual paper amounts, so there may be some differences caused by the paper take-up state, paper thickness, the core specifications, the mechanism and the print pattern.

Note 3: If the paper is thick (100 µm ≦ paper thickness ≦ 150 µm) roll paper itself can become loose causing erroneous detections. Therefore, set to top level one.

2-6-2 Paper Stacker

1. No. of Stackable Sheets: Maximum of 30 Sheets

Note 1: Receipt length is 50 mm to 150 mm to enable stacking of a maximum of 30 receipts.
Note 2: It is necessary to adjust the paper stopper to the appropriate position to obtain a stable paper stack.

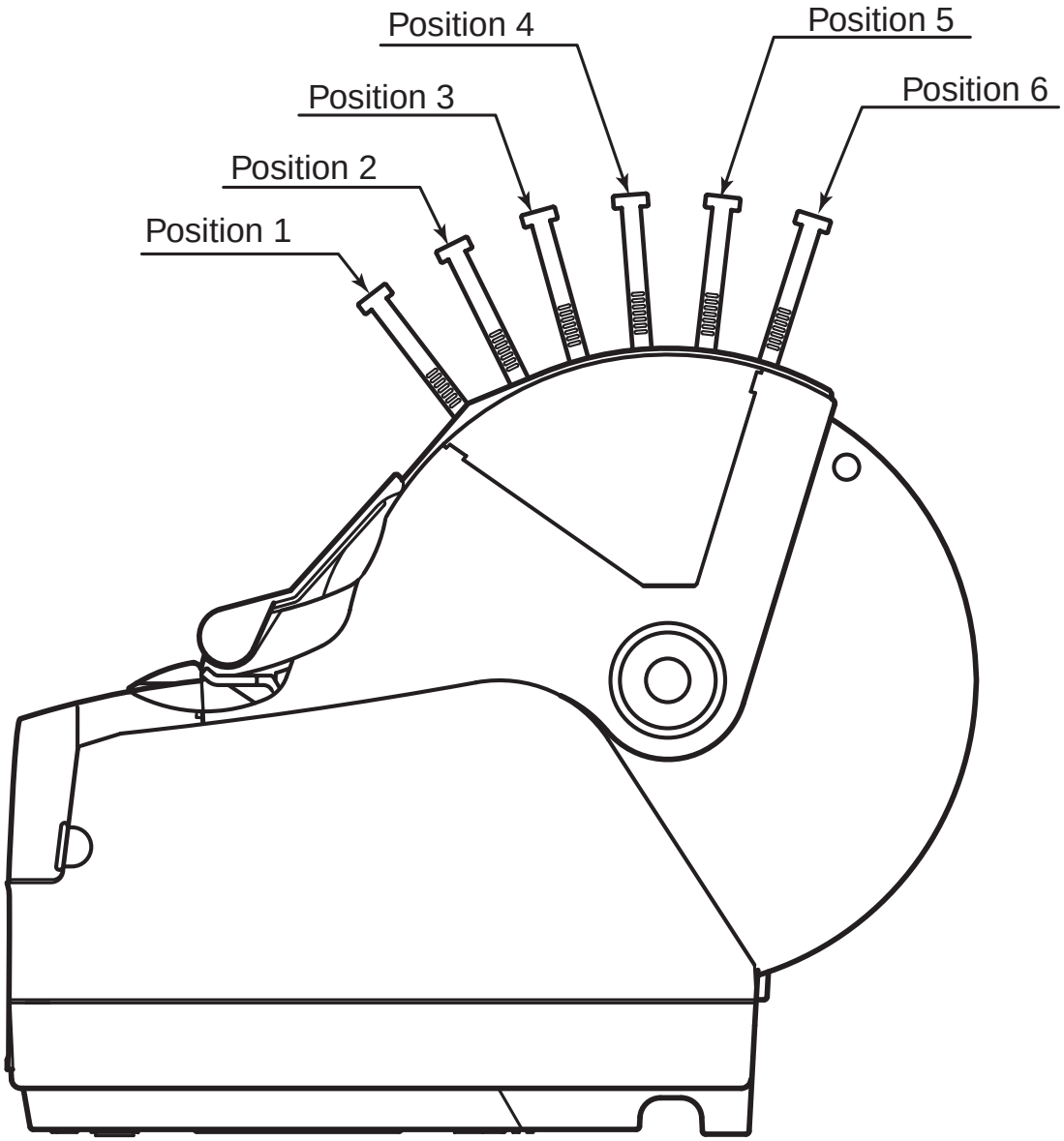
2. Length of Receipts that Can Be Stacked: 50 (mm) to 200 (mm)

Note 1: The paper stopper can be adjusted for the above receipt lengths. Receipts that exceed the above specifications cannot be issued, however the printer can be used by removing the paper stopper.

3. Paper Stopper: Adjustable to 6 levels
Set the paper stopper position for the length of the receipt. See the table below for detailed information on positions. See Fig. 2.6.2.

Paper Stopper Adjustment Position	Receipt Length (mm)
Position 1	50 to 100
Position 2	100 to 120
Position 3	120 to 140
Position 4	140 to 160
Position 5	160 to 180
Position 6	180 to 200

Fig. 2.6.2



Note 1: Fit the bosses on the left and right sides of the paper stopper and to the engaging hole on the printer cover to fasten.

Note 2: Six levels of adjustment are possible by changing the mounting direction of the paper stopper with regard to the engaging holes on the printer cover.

2-6-3 Paper Guide Adjustment Mechanism

It is necessary to adjust the paper guides position for the widths of the paper to be used to handle differing paper widths on this printer unit.

The ex-factory default setting for paper width is 82.5 ±0.5 mm. If using the printer with the paper with of 79.5 ±0.5 mm, loosen the paper guide unit screw that is on the right side when facing the front of the printer, and adjust it to the appropriate position. See section 7.1 Adjusting the Paper Guide Unit for details regarding how to adjust the paper guide unit.

2-7 Reliability Specifications

2-7-1 Life

1. Mechanical Unit: 20 million lines
2. Thermal Head: 100 Million Pulses, 100 Km (Head average resistance value change rate: Max. ±15%)
3. Auto-cutter: For Paper Thickness ≦ 100 μm: 1 Million Cuts
   For 100 μm < Paper Thickness: 300,000 Cuts

Note 1: Mechanical parts life is defined as the period at which failures from wear out is entered.
Note 2: The following outlines the conditions for this printer to satisfy the outlined life conditions.

<Conditions>

Average printing rate: 12.5%

- Recommended thermal paper: 80 μm ≦ Paper Thickness ≦ 85 μm
- Print Density Standard Setting (In Black/White Print Mode)

3. If the recommended paper is not used, the life of the printer cannot be guaranteed. Always use the recommended paper types.
4. Life for the head is prescribed when two or more adjacent dots have become damaged. However, this excludes damage (scratches) caused by the adherence of foreign matter or man-made damages.
5. When repeated printing under extremely high printing rates, the life of the thermal head will notable decrease. Carefully consider your print format before printing.

2-7-2 MCBF

1. MCBF: (Pending)

3. EXTERNAL SPECIFICATIONS

3-1 External Specifications

3-1-1 External Dimensions

(W) Approx. 161mm x (D) Approx. 307mm x (H) Approx. 249mm

Note 1: These dimensions do not include paper stopper or optional parts.

3-1-2 External Drawings

See Fig. 3.1.2 for details.

3-1-3 Mass

3.0±0.05 Kg

Note 1: Mass does not include roll paper or accessories (including optional parts).

3-2 Operation Panel Specifications

3-2-1 Switches

1.	FEED:	Feeds paper.
2.	POWER:	Turns the printer's power ON and OFF.

3-2-2 LED

1.	POWER:	Green
2.	ERROR:	Red

3-3 Interface

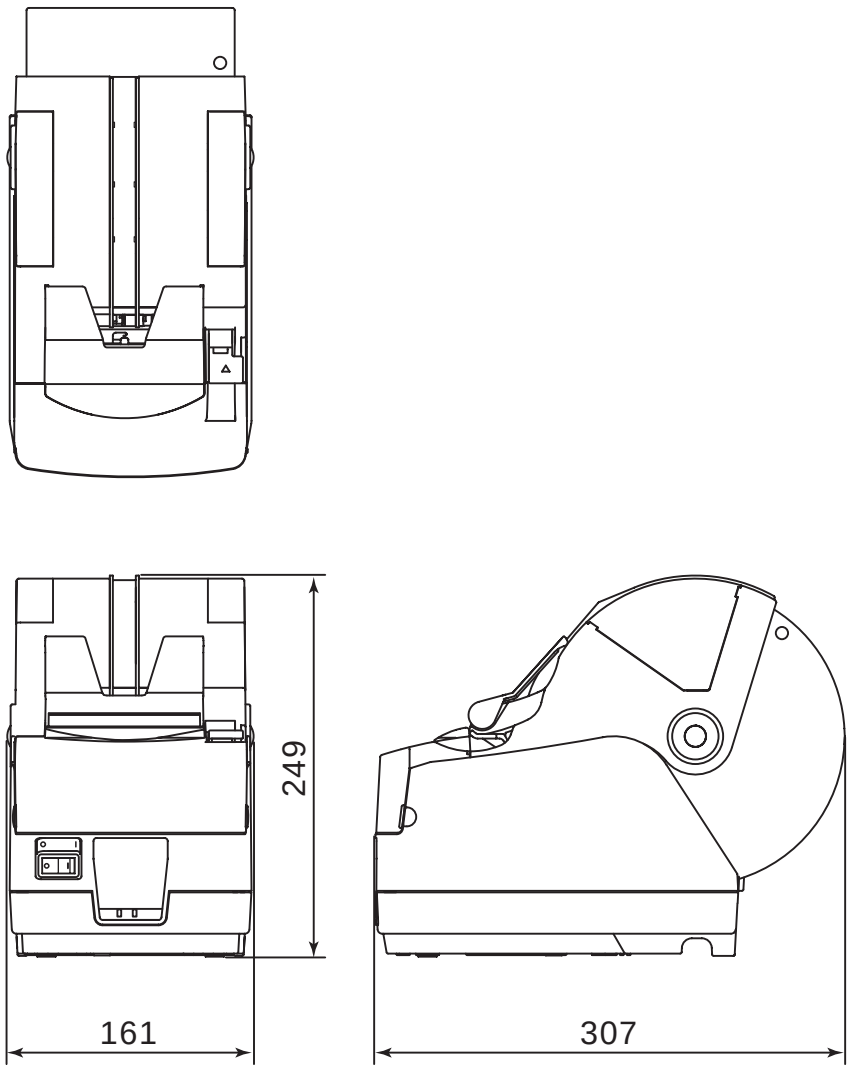
I/F Card Types

• Parallel	Amphenol 36 pins Conforms to IEEE 1284 (Compatibility Mode; Nibble Mode)
• Serial RS-232C	D-SUB 25 pin/D-SUB 9 pin
• USB	B Type
• Ethernet	R J - 45

3-4 DIP Switches

Can be changed on the bottom of the printer (main board).

Fig. 3.1.2



Unit : mm

4. AMBIENT SPECIFICATIONS

4-1 Temperature and Humidity

4-1-1 When Operating

1. Temperature: 5°C to 45°C
2. Humidity: 10% RH to 90% RH
   However, there must be no condensation. Assumes 90% RH at 34°C.

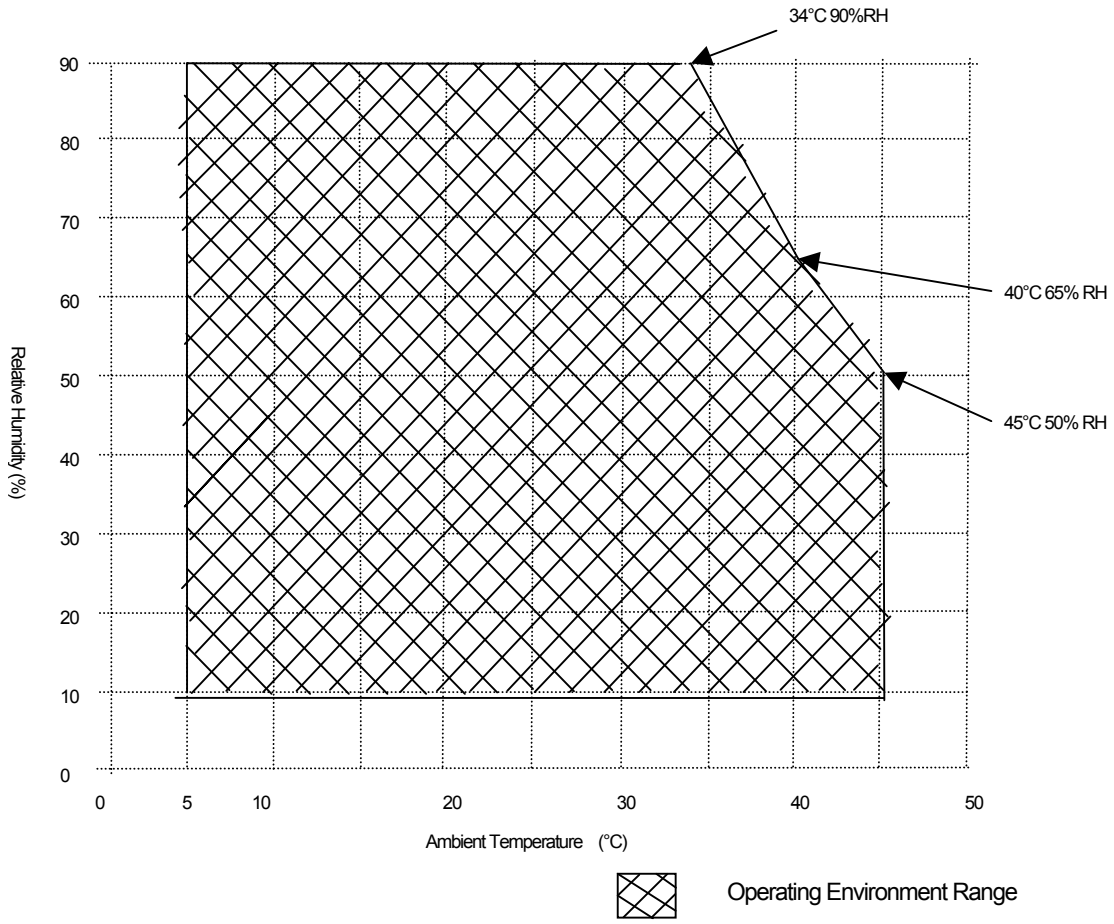


Fig. 4.1.1 Warrantee Temperature and Humidity Ranges

Note 1: When using the optional power adapter set, be aware that the operation guarantee range is determined by the operating environment specifications of the power adapter set.

4-1-2 When Stored (Excluding Roll Paper)

1. Temperature: -20°C to 60°C
2. Humidity: 10% RH to 90% RH
   However, there must be no condensation.

Note 1: The combination of 40°C and 90% RH (no condensation) is considered the worst values regarding high temperatures and humidity.

Note 2: Absolutely do not store roll paper in high temperature and high humidity environments because this can cause improper paper transport and defective printing.

4-2 Static Electricity Tolerance (ESD)

	Test Specifications	
	Error Rate: 5% Max.	Must be no damage to elements
Direct Contact Discharge (Self-Print) Outside of External Cover	±6 kV	±8 kV
Direct Through-air Discharge (When Idling) Inside of External Cover	±8 kV	±15 kV
Indirect Contact Discharge (Self-Print)	±6 kV ±4 kV (Checker connection)	-

Note 1: When using the optional power adapter (PS60L – 24A).

4-3 AC Line Noise Tolerance

	Test Specifications
Stand-alone Tolerance (Self-Print)	±1200 V
PC Connection Tolerance (ASCII Continuous Printing)	±500 V

Note 1: When using the optional power adapter (PS60L – 24A).

4-4 Vibration/Falling Shocks

4-4-1 Vibration Tests (When Packing)

1. Vibration waveform: Sine wave
2. Vibration frequency: 10 to 55 to 10Hz
3. Overall amplitude: 1.54 mm (Constant)
4. Acceleration speed: 0.3 to 9.3G
5. Direction: Three directions of X, Y and Z
6. Time: 2 hours in each direction
7. One-side Sweep Time: 5 minutes
8. Packing Status: Minimum Packing Status

4-4-2 Drop Tests (When Packing)

1. No. of Drops: 10 times
2. Height of Drop: 1 angle; 3 corners from 85 cm; 6 surfaces from 1m
3. Order of Drops: 1 angle; 3 corners; 6 surfaces
4. Packing Status: Minimum Packing Status

4-4-3 Shock Tests (When Not Packing)

1. Height of Drop: 5 cm
2. Direction: 4 Sides, Side Support
3. No. of Drops: 1 time each

4-5 Noise

Measuring Standard:	ANSI 1.29
Operating Sound Level:	Approximately 57 database

4-6 Dust

There is no affect on operation in a normal office environment.

5. SAFETY

5-1 Standard

1. Safety Standards

	Main Unit	Power Adapter (PS60L-24A)
UL	UL 1950	UL 1950 (Version 3)
C-UL	C22.2 No. 950	C22.2 No. 950 (Version 3)
TUV	EN60950	EN 60950 (Revised Version A11)
Electrical Handling Law	-----	Grade A

Note 1: When using the optional power adapter (PS60L – 24A).

2. EMI Standard

FCC Class A
VCCI Class A
EN55022 Class B

3. CE Marking: EMC Directive; Low Voltage Directive

4. Rating Values for Each Country
(Pending)

Note 1: When using the optional power adapter (PS60L – 24A).

6. HOW TO SET ROLL PAPER

The following describes how to set roll paper.

1. While the power is on, lift the cover open lever to open the printer cover.
2. Set the roll paper, then pull the leading edge of the paper toward the front of the printer. When doing so, pull the paper straight with regard to the printer. Set the roll paper so that it does not become loose around its circumference.
3. Close the printer cover. Be careful that both the left and right sides are firmly closed.
4. Use the auto-cutter to cut off the excess paper.

Note 1: If the paper is poorly mounted, paper can skew, or paper can jam with the initial paper feed operation. Reset the paper if that should happen.

7. OPERATING THE ADJUSTMENT MECHANISM

7-1 Adjusting the Paper Guide Unit

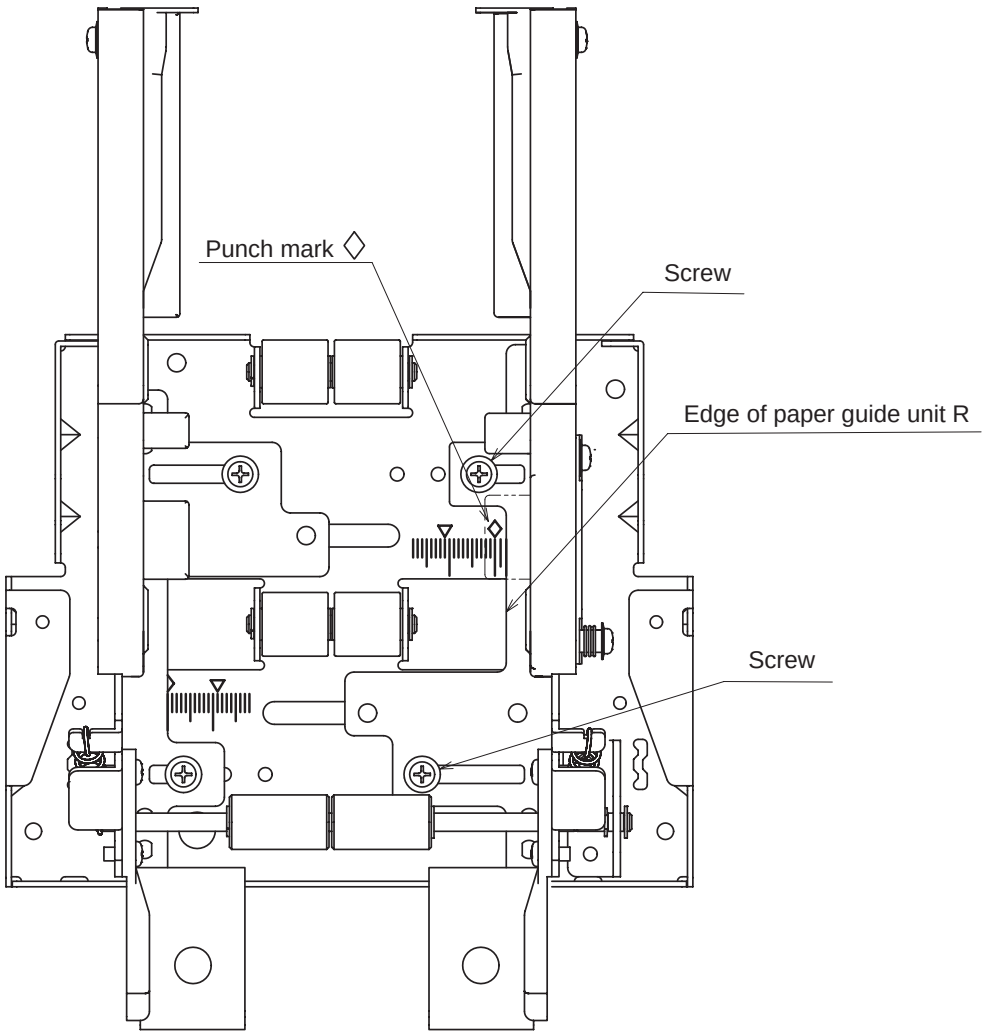
At the time of shipment, the left and right paper guide units, and the upper guide it that is arranged on the printer cover side, are assembled to handle paper having a width of 82.5 ±0.5 mm. For that reason, to use any other width of paper on this printer, it is necessary to adjust the paper guide units in the following ways.

7-1-1 Handling 79.5 ±0.5 mm Paper Width

The following shows how to adjust the paper guide unit to handle the paper of 79.5 ±0.5 mm.

1. Loosen the two screws that fasten the paper guide unit R on the right side when looking from the front of the printer.
2. Position the edge of the paper guides unit R in line with the gradations of marked on the top of the role stock base.
   When doing so, position the edge on the gradation of the diamond mark.
   See the figure below.
3. When the adjustment of the paper guide unit R position is completed, tighten the two screws. Be careful not to forget tightening the screws.

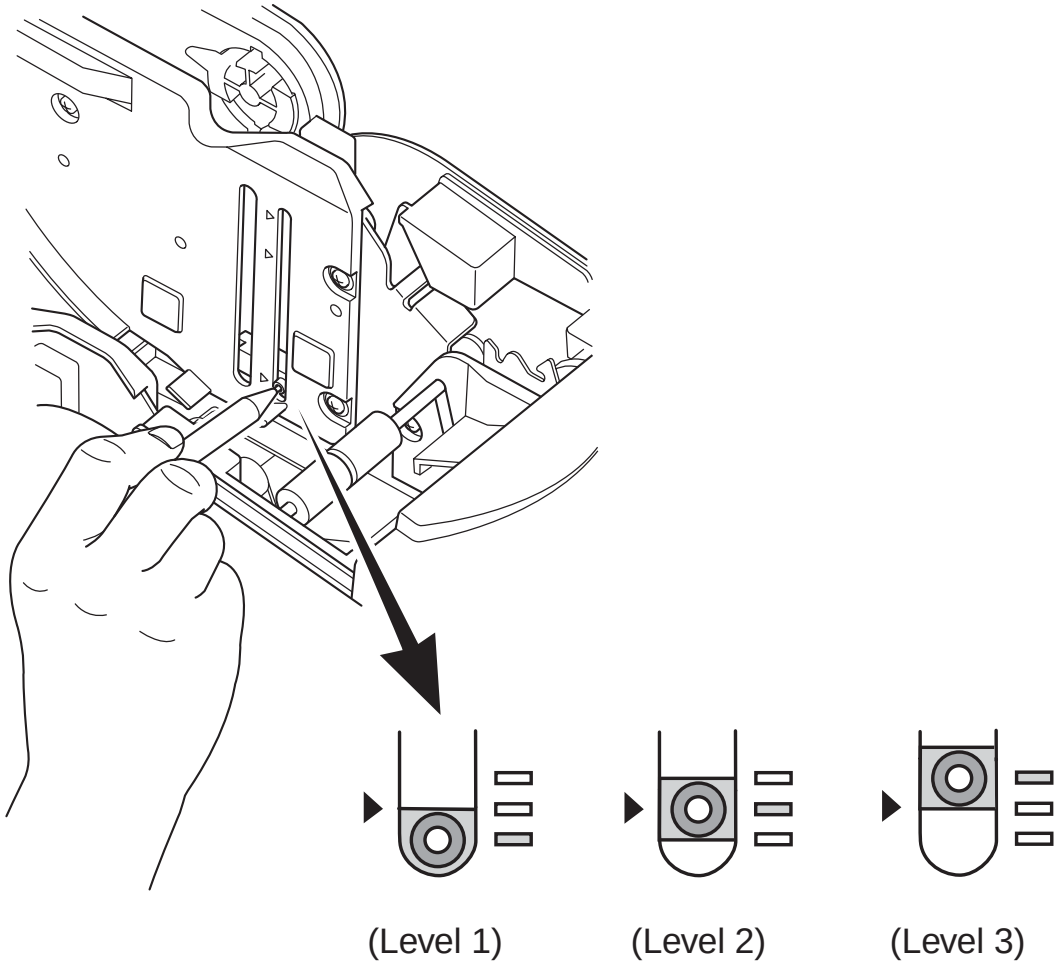
Note 1: Adjustments of the upper guide position are unnecessary to handle the paper of 79.5 ±0.5 mm.



7-2 Adjusting the Near End Sensor

It is necessary to adjust the near end sensor to detect the remaining amount of roll paper.
It is requested that the printer be used at the correct position according to the adjustments below.

1. Open the printer cover.
2. Push on the round boss groove using a ball point pen or another pointed object to slide the near end sensor holder (a transparent plastic part), shown in the figure below, to the adjusting position.
   Positioning grooves are arranged on the inside the mechanism for each sensor position. The near end sensor holder is locked at the adjustment position.
   The near end sensor is assembled to position marked ▲ (central value) when shipped from the factory. Position the upper level position and the lower level position according to the amount of the role to be detected.



7-3 Adjusting the Paper Stopper

This printer requires a paper stopper to be mounted onto the printer cover to prevent paper from raising in the stacker.
Use the following procedures to arrange the paper stopper at the appropriate position to use the printer.
Also, read the information listed in the other sections relating to the paper stopper position and the receipt lengths.

1. Grip both ends of the paper stopper, insert the side bosses on the paper stopper into the printer cover engaging holes elastically deforming the paper stopper.
2. To adjust a position again, elastically deform the paper stopper and change its position to the next position after removing the paper stopper.

Note 1: There are three positions in the printer cover. The paper stopper and the engaging holes are arranged in those positions.
By reversing the direction of mounting of the paper stopper, it is possible to make two types of paper stopper position settings with one engaging hole position on the printer cover.

Note 2: Do not forcefully remove the paper stopper from the printer cover when adjusting the position of the paper stopper. This can damage the parts.

8. MAINTENANCE

8-1 Periodic Maintenance

Perform the following maintenance periodically.
The printer power should be turned off when performing maintenance.

Period: Every six months, or every 1 million printed lines

Thermal Head:

- Dampen a cotton swab with alcohol (ethanol, methanol, isopropyl alcohol) and use that to wipe away dirt on the heating elements of the head.

Platen:

- Use a soft, dry cloth to gently wipe the platen to remove any foreign matter (paper dust) that may be adhering to it.

Detectors and the Surrounding Areas:

- Remove any dirt, dust or paper cuttings that may be adhering to the detectors (mainly the reflective type photosensor).

Note 1: Immediately after printing, the thermal head is extremely hot. Do not clean the thermal head.
Note 2: When cleaning the thermal head, there is the potential of damaging the head through exposure to static electricity. Be especially careful when performing maintenance in this area.
Note 3: After cleaning the thermal head, allow the alcohol to completely dry before turning on the power.

8-2 Handling Recording Paper Jams

If recording paper should become jammed, open the platen unit and remove the jammed paper.
Never pull on the jammed paper unnecessarily while the printer unit is closed because this can damage the drive system parts.
If the auto-cutter becomes locked because of jammed paper in the printer, absolutely never forcefully open the printer cover. This can damage the cutter unit. If the cutter locks, release the lock as described before opening the printer cover.
Remove jammed paper according to the following procedures.

8-3 Releasing the Cutter Lock

Use the following procedures to release the auto-cutter lock if trouble occurs, such as when paper becomes jammed.

1. Turn the printer power off.
2. Remove the front cover.
3. Rotate the emergency knob in the direction of the arrows on seals on the top of the auto-cutter unit housing and marks on the housing case to return the cutter blades to their home positions.
   The emergency knob should be rotated using a tweezers, screwdriver or ball-point pen to prevent accidents.
4. Return the front cover to its original position.

9. HANDLING THE PRINTER

9-1 Precautions for Handling

A If the printer prints intermittently with printing and paper feeds being temporarily terminated because of a data waiting status from the host, the paper feed will be disrupted between the first to three dot lines when starting printing. Be especially careful for printing of graphics.

B To prevent static electric damage to the thermal head's heating elements and the IC, handle the printer only after preparing for anti-static and grounding yourself. Handle the thermal head carefully because applying mechanical stress or shocks to it (including wear out by micro-granules), it is possible to damage the PCB surface of the heating elements.

C We cannot guarantee the print quality or the life of the printer if you use any paper type other than that we recommend. Therefore, always use the paper (thermal paper) recommended.

D Be careful not to allow condensation to form. If condensation does form, absolutely do no turn ON the power until it has evaporated.

E Absolutely never directly touch the thermal head heating elements, the electronic components on the control board, or the pins with your hands or a screwdriver.

F Avoid leaving the printer without paper. Also, avoid leaving the printer cover open.

G Be careful not to allow foreign objects to adhere to the recording paper and the platen.

H Do not pull on the paper without opening the printer cover.

I When connecting or disconnecting the interface cable to and from the printer, do not simply turn off the printer power. Also remove the AC power plug from the printer.

J AC adapters for Japan are a 2 pin AC cord (with FG cable). The FG pin should always be connected to an FG outlet.

K There are cases of discoloring of the recording paper, degradation of the coloring layer, the recording paper and platen fusing together or paper curling in the paper feed path, if the printer is left unused for extended periods. So, when using the printer after having been unused for extended periods, it is recommended to install new recording paper because these phenomena can cause improper printing or poor paper feeds. Also, even if you do not replace the paper with a new roll, you should discharge the part of the paper remaining for a long time in the paper feed path before using this printer.

L The platen rubber may deform making printing thinner in some places, if the printer is left unused for extended periods.

M Initial print may be thin when using the printer in a cold environment because the thermal head is cold.

N When using the printer in a high temperature environment, the print may run or characters may be distorted.

O Avoid sudden changes of the environment even if the ambient temperature and humidity are within standard.

P Do not store or use the printer in locations that are dusty, oily or exposed to metallic dust.

Q Because there is the possibility of mis-operation of the thermal head caused by noise, or damage to the thermal head or IC caused by surged voltages, the power line should be stabilized.

R This printer is provided with an auto-cutter as standard equipment. Absolutely never approach the auto-cutter blades while the cutter is operating because it is extremely dangerous. Also, if the cutter stops, absolutely never touch the blades directly with your fingers.

S Never unnecessarily disassemble the printer or its parts. When performing maintenance, always check that the power has been turned OFF before starting your work.

T The TS1000 series handles all paper widths within specifications. However, the width of paper on the same printer (auto-cutter) is limited to one type.

U Electrical power is used as the drive power for this printer.

9-2 Precautions Concerning Safety

To use this printer safely, you must carefully observe the contents described in the specifications manual and the following precautions.
Also, we accept absolutely no responsibility for any fires or damages caused by any other type of use of the apparatus.

- **A** During or after printing, the surfaces of the thermal head and motor are extremely hot. Do not touch them directly with your hands.
- **B** Do not touch the gears or rotating parts while the printer unit is operating.
- **C** Be very careful because there is the possibility of injury by handling the edges of the printer mechanism (particularly the metal parts).
- **D** The yellow caution seal affixed to the top of the printer mechanism base indicates that the thermal head is extremely hot while printing or immediately thereafter and therefore dangerous. Absolutely never touch them directly with your hands. The auto-cutter particularly is also extremely dangerous when it is operating, so absolutely never put your fingers in or near the auto-cutter blades or paper discharge outlet.
- **E** When performing maintenance on the printer mechanism, always unplug the power from its outlet before starting your work.
- **F** Absolutely never apply a voltage that exceeds the maximum rating to the power connector.
- **G** The environment for use must be within the ranges specified in the environment specifications.
- **H** Do not drop foreign matter with electrical conductivity, such as paper clips, onto the PCB.
- **I** Do not disassemble or modify the printer.
- **J** Absolutely never place the printer in an unstable location.
- **K** Never place the printer in a highly humid or dusty environment because there is the danger of printer failure, fire or electrical shocks.
- **L** Never place objects or sit on the printer.
- **M** When not using the printer for an extended period of time, always unplug it for safety.
- **N** Be careful not to allow your fingers or hands to get caught in the rotating parts when opening or closing the printer cover.

9-3 Voluntary Control of Electrical Wave Hazards

This printer is considered a Class A Information Technology equipment according to the standards as prescribed by the Voluntary Control Counsel for Interference by Information Technology Equipment (VCCI). This printer made cause electrical wave interference if used in a home environment. In such cases users should take the appropriate precautions.

10. GENERAL CIRCUIT SPECIFICATIONS

10-1 Basic PCB Specifications

The following table outlines the basic specifications of the circuit board used on this printer.

Configuring Parts/Circuit	Product Name and Specification
CPU	HD6412320F25 (RENESAS): Name H8S/2320 16 Bit CISC microcomputer, operating clock 25 MHz Embedded RAM: 4 Kbytes
Gate Array	LC24108B-TSPB (SANYO)
Flash ROM	8 MBits (512 K x 16): Boot, Main program, ANK fonts 8 MBits (512 K x 16): Memory SW, Logo data, Kanji fonts
SRAM	4 MBits (256 K x 16)
Power Circuit	DC-DC converter: 24 V to 5 V created; Output 1.0 A
	DC-DC converter: 5 V to 3.3 V created; Output 0.5 A
Drive Circuit for Mechanisms	Thermal Head Drive Circuit
	PF Motor Drive Circuit (Bi-polar constant current control stepping motor driver)
	Auto-cutter Drive Circuit (DC motor full-bridge driver)
Sensor Circuits	Paper Out Sensor Circuit (Reflective Type Photosensor) Near-end Sensor Circuit (Reflective Type Photosensor) Stacker Sensor Circuit (Reflective Type Photosensor) Cover Open Sensor Circuit (Micro SW) Head Temperature Sensor Circuit (Thermistor) • Voltage Detection Circuit
Buzzer Drive Circuit	Drive Circuit: 1 circuit
DIP Switches	8 Poles
	4 Poles
PCB External Dimensions	90mm x 120mm

I/F Card	Specifications
Parallel	Amphenol 36 pins
RS-232C	D-SUB 25 pin/D-SUB 9 pin DIP Switches: 8 Poles
USB	B Type
Network	RJ-45

11. GENERAL ELECTRICAL SPECIFICATIONS

11-1 Power Specifications

- Operating Voltage DC 24 V ±10% (Optional Power: PS60L-24A)
- Current Consumption (at DC 24 V, Room Temperature)

  When Idling Approximately 0.1 A

  ASCII Continuous Printing: Average Approximately 2.0 A

  (Print Rate: Approx. 17.5%)

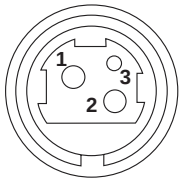
  100% Duty Continuous Printing Peak Approximately 10.0 A

  (When Printing) Average Approximately 5.0 A

  (Continuous printing should be within 10 seconds.)

11-2 Power Connector

- Power Connector Pin Array



Pin Number	Function
1	+24 V
2	GND
3	N.C
Shell	Frame GND

- Serial Number: TCS7960 (Hoshiden) or the equivalent
- Power Connector Pin Array: TCP8927 (Hoshiden) or the equivalent

11-3 Notices

<Preparing Power on the User Side>

Be careful of the following points when using your own power unit, instead of using the optional power unit (PS60L-24A).

• Power supply must be a minimum of DC 24 V ±10%; Min. 2.0 A.
(Select one with a current capacity that handles printing rates when actually used.)

• Take measures for the power supply to meet user side static electrical tolerance and AC noise tolerance values, by considering the noise in the location where the printer will be setup.

* AC Line Noise Tolerance Supplement

AC line noise testing should have the following conditions.

• Noise Pulse Width: 100 ns
• Noise Shape: Rectangular Shape (Power Synch)
• Noise Pulse Infusion Angle: 90° (+) and 270° (-)

12. INTERFACE

12-1 General Description

The interface can be changed by replacing the interface PCB. There are five types. Parallel (Amphenol, 36 pin); Serial RS-232C (D-SUB 25 Pin/D-SUB 9 Pin); USB (B Type); and Network (RJ-45)
Turn the power off before changing the PCB and interface type.

12-2 Parallel Interface (Amphenol 36 pins)

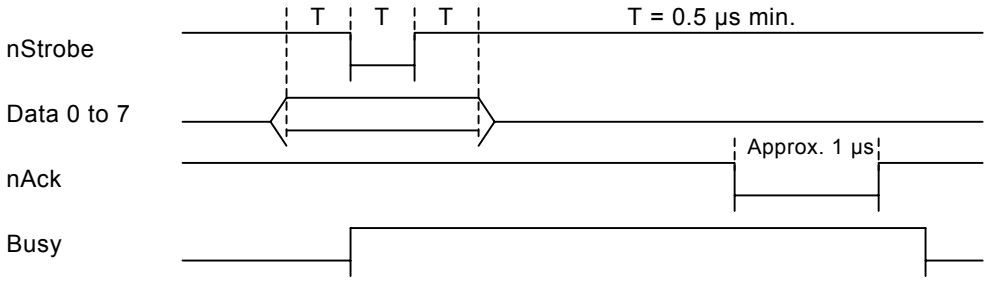
12-2-1 Specification

Standard:	Conforms to IEEE1284.
Mode:	Compatibility Mode; Nibble Mode

12-2-2 Connector (Compatibility Mode)

Pin No.	Compatibility Mode Signal Name	Nibble Mode Signal Name
1	nStrobe	HostClk
2 to 9	Data0 to 7	Data0 to 7
10	nAck	PtrClk
11	Busy	PtrBusy/Data3,7
12	PError	AckDataReq/Data2,6
13	Select	Xflag/Data1,5
14	-	HostBusy
15	-	-
16	Signal GND	Signal GND
17	Frame GND	Frame GND
18	+5V	+5V
19 to 30	Twisted Pair Return	Twisted Pair Return
31	nInit	nInit
32	nFault	nDataAvail/Data0,4
33	External GND	-
34	Compulsion Status	-
35	-	-
36	nSelectIn	1284Active

12-2-3 Timing (Compatibility Mode)



12-2-4 Connector (Nibble Mode)

Conforms to IEEE1284 Standards

12-2-5 Status (Nibble Mode)

STAR Mode

- See section 18.2.1 for details on automatic status.
- See section 16 Command Details for details regarding ENQ and EOT statuses.

ESC/POS Mode

- Refer to the ESC/POS Command Specifications Manual for details.

12-3 Serial RS-232C Interface (D-SUB 25 Pin/D-SUB 9 Pin)

12-3-1 Specification

Standard:	RS-232C
Transmission method:	Start-Stop synchronization method
Baud Rate:	4800, 9600, 19200, 38400 bps (Set by DIP switches)
Data length:	7 or 8 bits (Set by DIP switches)
Parity:	Parity or not (Set by DIP switches)
Parity bit:	Odd or even (Set by DIP switches)
Stop bit:	1 bit (Fixed)
Signal polarity:	Mark = Logic 1 (-3 V to -15 V) Space = Logic 0 (+3 V to +15 V)

12-3-2 Connector

Pin No 25 Pins	Pin No 9 Pins	Signal Name	Direction	Functions
1	-	FG	-	Frame ground
2	3	TXD	OUT	Transmission Data
3	2	RXD	IN	Reception Data
4	7	RTS	OUT	Always SPACE (Reception Possible)
5	-	N.C	-	Not Used
6	6	DSR	IN	1) DIP Switch 1-7 (on I/F Card) = OFF A. ESC/POS Mode Indicates whether the host can receive data. SPACE: Host is ready to receive data MARK: Host is not ready to receive data a) DTR/DSR Communications Mode Checks that status of this signal and sends data. (However, this excludes data transmission using <DEL><EOT>, <GS>a) b) XON/XOFF Communications Mode Does not check the status of this signal. B. STAR Mode Not Used 2) DIP Switch 1-7 (on I/F Card) = ON Becomes an external reset signal. Reset is applied when there is a mark status with over 1 ms pulse width.
-	8	CTS	IN	Same as DSR
7	5	SG	-	Signal ground
8-19	1	N.C	-	Not Used

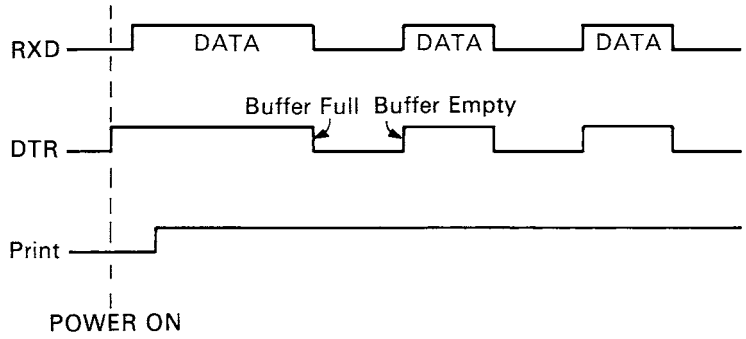
<table>
<tr><th>Pin No
25 Pins</th><th>Pin No
9 Pins</th><th>Signal
Name</th><th>Direction</th><th>Functions</th></tr>
<tr><td>20</td><td>4</td><td>DTR</td><td>OUT</td><td>A. ESC/POS Mode
1) For DTR/DSR Communications Mode
Indicates whether the printer is busy.
SPACE: Host is ready to receive data
MARK: Host is not ready to receive data
Conditions for a busy status change according to the memory switch settings.
<table>
<tr><th rowspan="2">Printer Status</th><th colspan="2">Memory SW
#4-4</th></tr>
<tr><th>1</th><th>0</th></tr>
<tr><td>1. Power on or I/F reset
Time until communications are ready after reset.</td><td>BUSY</td><td>BUSY</td></tr>
<tr><td>2. When test printing</td><td>BUSY</td><td>BUSY</td></tr>
<tr><td>3. When the cover is open</td><td>---</td><td>BUSY</td></tr>
<tr><td>4. When feeding paper using the paper feed switch</td><td>---</td><td>BUSY</td></tr>
<tr><td>5. When stopped because of paper out</td><td>---</td><td>BUSY</td></tr>
<tr><td>6. While waiting for switch input during MACRO</td><td>---</td><td>BUSY</td></tr>
<tr><td>7. When other errors occur</td><td>---</td><td>BUSY</td></tr>
<tr><td>8. When reception buffer is full</td><td>BUSY</td><td>BUSY</td></tr>
</table>
2) When in XON/XOFF Communications Mode
Indicates whether the printer is ready to receive data from the host.
Always a space excluding the following conditions.
1. Time until communications are ready and after reset.
2. When test printing

B. STAR Mode
Data terminal ready signal (SPACE: Printer ready to receive)
1) For DTR Mode
SPACE when printer is ready to receive.
2) For XON/XOFF Mode
Always a space excluding the following conditions.
1. Time until communications are ready after reset.
2. When test printing</td></tr>
<tr><td>21-24</td><td>-</td><td>N.C.</td><td></td><td>Not Used</td></tr>
<tr><td>25</td><td>-</td><td>/INIT</td><td>IN</td><td>1) DIP Switch 1-8 (on I/F Card) = OFF
Does not check the status of this signal.
2) DIP Switch 1-8 (on I/F Card) = ON
Becomes an external reset signal.
Reset is applied when there is a space status with over 1 ms pulse width.</td></tr>
</table>

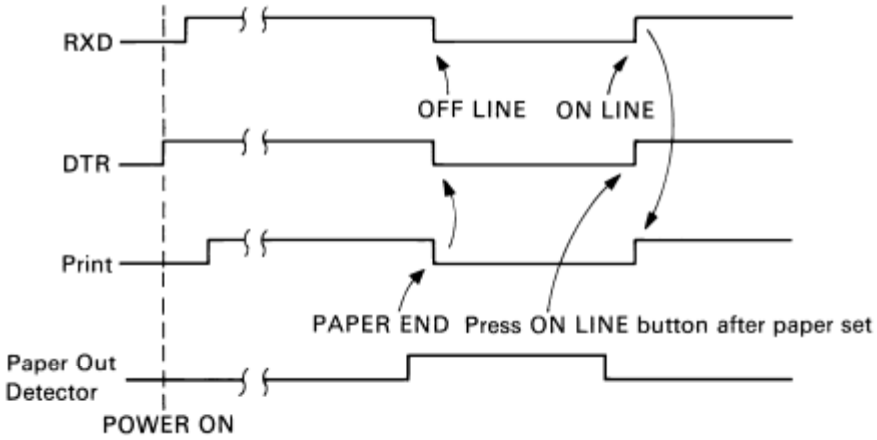
12-3-3 Communication Protocols

1) General description of operations in the DTR mode
This mode is set when the DIPSW #1-3 are turned ON. (The ex-factory setting)
This mode performs communication while handshaking with the DTR signals. In the operations to receive printer data, this mode controls the DTR signals by confirming the BUSY signal. A SPACE indicates that the printer is ready to receive data; conversely, a “mark” indicates that the printer cannot receive data.

<When online>

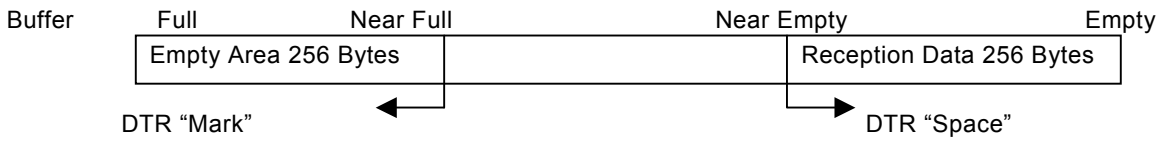


<When paper is out>



If there is no printer error after turning ON the power, the DTR signal line is set to a SPACE. When the host computer confirms that the DTR signal line is a SPACE, it sends the data text to the RXD signal line. The printer sets the DTR signal line to a “Mark” after the empty area of the data buffer reaches a maximum of 256 bytes. When the host computer confirms that the DTR signal line is a Mark, it stops the transmission of data text to the printer buffer, but at this point as well, the printer is still capable of receiving data, up to the amount of empty space in the data buffer. If the host computer ignores the DTR signal and transmits data, all data exceeding the amount of space in the data buffer is simply discarded. The printer sets the DTR signal line to SPACE again when the amount of empty space in the data buffer increased because of the printing and the data in the buffer is a maximum of 256 bytes.

2) Buffer full/Buffer full cancel in the DTR mode

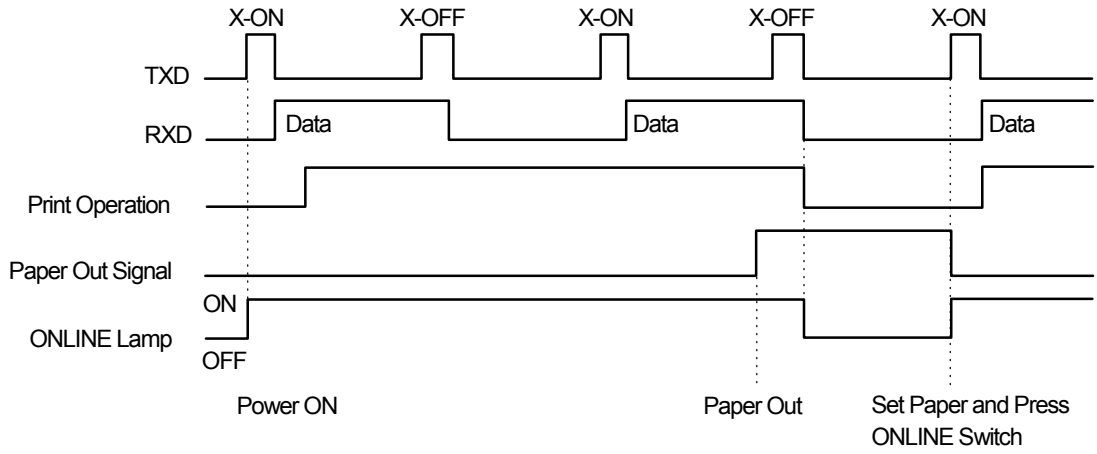


DTR is set to mark at the point the empty area is a maximum of 256 bytes.
DTR is set to SPACE when the data in the buffer is a minimum of 256 bytes.

3) General description of operations in the XON/XOFF mode

This mode is set when DIPSW #1-3 are turned OFF. This mode notifies the host of the XON (DC1) data when the printer can receive data and the XOFF (DC3) data when the printer cannot receive data, using the TXD signals.

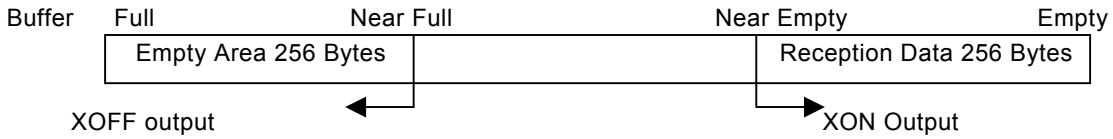
This functions so that XON outputs only 1 byte when the printer shifts from OFFLINE (printer busy) to ONLINE (printer ready) and; XOFF outputs 1 byte when the printer shifts from ONLINE (printer ready) to OFFLINE (printer busy) .



If there is no error after turning the power ON, XON (control code name: DC1; Hexadecimal name: 11H) is output by the TXD signal line. After the host computer receives the XON, it sends the data text to the RXD signal line. XOFF (DC3; 13H) is output when the empty space in the data buffer is a maximum of 256 bytes.

The host computer stops sending data text when it receives the XOFF, however, the printer is capable of receiving data at that time for the amount of empty space in the data buffer. Data exceeding the amount of empty space is discarded. As the empty space in the data buffer increases through printing, XON is output when the data in the buffer is a maximum of 256 bytes.

4) Buffer full/Buffer full cancel in the XON/XOFF mode



XOFF outputs only 1 byte when the empty area is a maximum of 256 bytes.

XON outputs 1 byte when the data in the buffer is a maximum of 256 bytes.

12-4 USB Interface (B Type)

12-4-1 Specifications

Conforms to USB 2.0

12-4-2 Connector

Type B

12-5 Network Interface (RJ-45)

12-5-1 Specification

Conforms to IEEE 802.3.

12-5-2 Cable

10BASE-T, 10BASE-TX

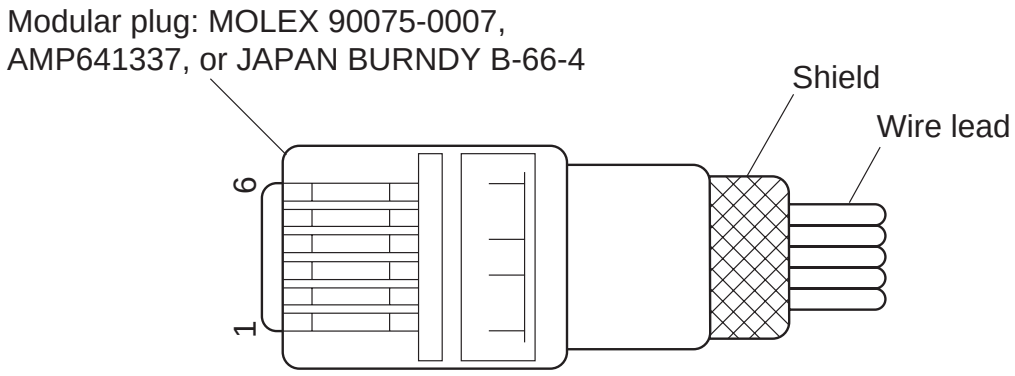
12-5-3 Connector

RJ45

13. BUZZER DRIVER CIRCUIT

This printer is provided a drive circuit for driving the buzzer.
The drive circuit output is mounted with a 6 P module jack connector.

[Recommended Cable Specifications]



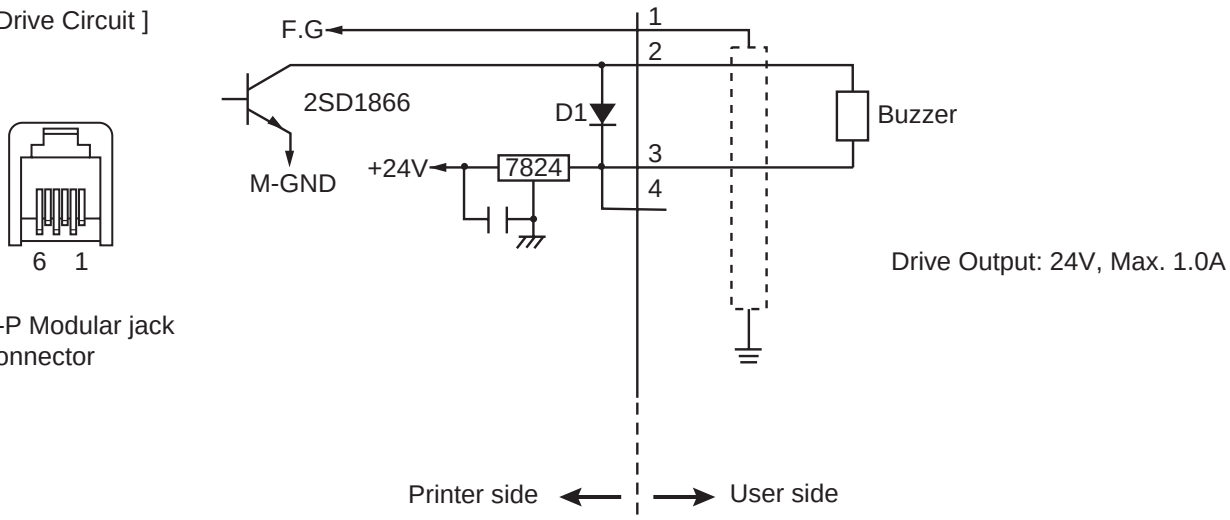
Manufacturer	Serial Number
MOLEX	9075-0007
AMP	641337
BURNDY	B-66-4

Note 1: Pin No. 1 (frame ground) is shielded.

Pin No.	Signal Name	Direction	Function
1	FG	-	Frame ground
2	DRV1	OUT	Drive Signal
3	+24 V	OUT	Power
4	+24 V	OUT	Power
5	N. C.	-	Not Used
6	N. C.	-	Not Used

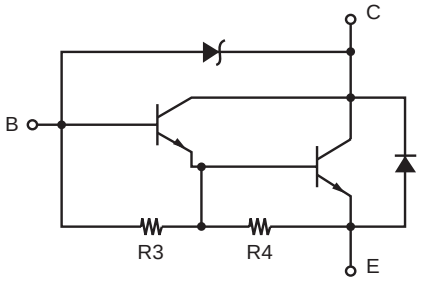
[Drive Circuit]

[Drive Circuit]



6-P Modular jack connector

Reference
2SD1866 Circuit Configuration



R3=3.5KΩ
R4=300Ω

[Handling Precautions]

1. Drive below 0.1 A to drive continuously.
2. Absolute maximum rating of the diode D1: Ta = 25°C
   Average rectifying current: Io = 1 A
3. Absolute maximum rating of the transistor 2SD1866: Ta = 25°C
   Collector current: IC = 2 A

14. DIPSW/MSW (MEMORY SWITCH) SPECIFICATIONS

To change the DIPSW settings, turn OFF the power to both the printer and the computer.

14-1 DIPSW

14-1-1 Memory Board DIP SW1

1) Parallel interface <At Ex-factory: ALL ON>

DIPSW1	Functions	ON	OFF
DIPSW1-1	Emulation (*1)	(See table below)	
DIPSW1-2	Emulation (*1)	(See table below)	
DIPSW1-3	(Reserved: Fixed at ON)	--	--
DIPSW1-4	Sensor adjustment mode	Enabled	Disabled
DIPSW1-5	Reset by INIT Signal	Enabled	Disabled
DIPSW1-6	BUSY Condition	Reception buffer or offline	Reception Buffer Full
DIPSW1-7	ASB	Disabled	Enabled
DIPSW1-8	(Reserved: Fixed at ON)	--	--

2) RS-232C interface <At Ex-factory: All ON>

DIPSW1	Functions	ON	OFF
DIPSW1-1	Emulation (*1)	(See table below)	
DIPSW1-2	Emulation (*1)	(See table below)	
DIPSW1-3	(Reserved: Fixed at ON)	--	--
DIPSW1-4	Sensor adjustment mode	Enabled	Disabled
DIPSW1-5	(Reserved: Fixed at ON)	--	--
DIPSW1-6	BUSY Condition	Reception buffer or offline	Reception Buffer Full
DIPSW1-7	ASB	Disabled	Enabled
DIPSW1-8	(Reserved: Fixed at ON)	--	--

3) USB interface <At Ex-factory: All ON>

DIPSW1	Functions	ON	OFF
DIPSW1-1	Emulation (*1)	(See table below)	
DIPSW1-2	Emulation (*1)	(See table below)	
DIPSW1-3	(Reserved: Fixed at ON)	--	--
DIPSW1-4	Sensor adjustment mode	Enabled	Disabled
DIPSW1-5	USB Mode	Mode-1 (Printer Class)	Mode-2 (Vendor Class)
DIPSW1-6	BUSY Condition	Reception buffer or offline	Reception Buffer Full
DIPSW1-7	ASB	Disabled	Enabled
DIPSW1-8	(Reserved: Fixed at ON)	--	--

4) Ethernet interface <At Ex-factory: All ON>

DIPSW1	Functions	ON	OFF
DIPSW1-1	Emulation (*1)	(See table below)	
DIPSW1-2	Emulation (*1)	(See table below)	
DIPSW1-3	(Reserved: Fixed at ON)	--	--
DIPSW1-4	Sensor adjustment mode	Enabled	Disabled
DIPSW1-5	(Reserved: Fixed at ON)	--	--
DIPSW1-6	BUSY Condition	Reception buffer or offline	Reception Buffer Full
DIPSW1-7	(Reserved: Fixed at ON)	--	--
DIPSW1-8	(Reserved: Fixed at ON)	--	--

5) Wireless LAN interface <At Ex-factory: All ON>

DIPSW1	Functions	ON	OFF
DIPSW1-1	Emulation (*1)	(See table below)	
DIPSW1-2	Emulation (*1)	(See table below)	
DIPSW1-3	(Reserved: Fixed at ON)	--	--
DIPSW1-4	Sensor adjustment mode	Enabled	Disabled
DIPSW1-5	(Reserved: Fixed at ON)	--	--
DIPSW1-6	BUSY Condition	Reception buffer or offline	Reception Buffer Full
DIPSW1-7	(Reserved: Fixed at ON)	--	--
DIPSW1-8	(Reserved: Fixed at ON)	--	--

*1) Details of Emulation

DIPSW1-1	DIPSW1-2	Emulation
ON	ON	STAR Line Mode
OFF	ON	STAR Page Mode (Supports TB9 Ver. 2.0 or later)
ON	OFF	(Reserved)
OFF	OFF	ESC/POS Mode (Supports TB9 Ver. 3.0 or later)

14-1-2 Memory Board DIP SW2

<At Ex-factory: All ON>

DIPSW2	Functions	ON	OFF
DIPSW2-1	Fixed at ON	---	---
DIPSW2-2	Fixed at ON	---	---
DIPSW2-3	Fixed at ON	---	---
DIPSW2-4	Fixed at ON	---	---

14-1-3 RS-232C Interface Board DIPSW 1

<At Ex-factory: DIPSW 1 – 7 is OFF, DIPSW 1-8 is OFF, all others are ON.>

DIPSW1	Functions	ON	OFF
DIPSW1-1	Baud rates:	(See table below)	
DIPSW1-2	(Reserved: Fixed at ON)		
DIPSW1-3	Data length:	8 bit	7 bit
DIPSW1-4	Parity Check:	Disabled	Enabled
DIPSW1-5	Parity Selection	Odd	Even
DIPSW1-6	Handshake:	DTR mode	Xon/Xoff Mode
DIPSW1-7	(Reserved: Fixed at OFF)	--	--
DIPSW1-8	(Reserved: Fixed at OFF)	--	--

Baud Rates (bps) Settings

DIPSW1-1	DIPSW1-2	Baud rates:
ON	ON	9600 bps
OFF	ON	4800 bps
ON	OFF	19200 bps
OFF	OFF	38400 bps

14-2 MSW (Memory Switch) Specifications

The following describes memory switch specifications.
The symbols used in the Emulation cells below mean the following:

- SL: STAR Line Mode
- SP: STAR Page Mode
- EP: ESC/POS Mode

14-2-1 MSW 0

Bit	Functions	OFF/"0"	ON/"1"	Emulation			Note
				SL	SP	EP	
F							
E							
D							
C							
B							
A							
9							
8							
7							
6	Japanese Language Chinese Characters	SHIFT-JIS Dedicated Mode	SHIFT-JIS/JIS Mixed Mode	-	○	-	*4
5	SHIFT-JIS Kanji Mode	Enabled	Disabled	○	-	-	*2
4	Destination Specifications	SBCS (Single Byte Countries)	DBCS (Double Byte Countries)	○	○	○	*3
3	(Reserved: Fixed at 0)						
2	(Reserved: Fixed at 0)						
1							
0							

*2) SHIFT-JIS Kanji Mode
Enabled when installed with Japanese language characters and DBCS settings.
See the table below for information relating to JIS kanji mode/SHIFT-JIS kanji mode when Japanese language kanji are installed. (JIS Kanji mode is ignored with the power is turned on.)

<STAR Line Mode Japanese Language Characters Installed: SHIFT-JIS/JIS Specifications>

SHIFT-JIS Kanji Mode	JIS Kanji Mode	Print Mode
Disabled	Disabled	Japanese Kanji ANK Mode (MSW 0-5 = "1")
Enabled	Disabled	SHIFT-JIS Kanji Mode (MSW 0-5 = "0")
Disabled	Enabled	JIS Kanji Mode
Enabled	Enabled	JIS Kanji Mode

*3) Specifications for Destination
The settings affect the selection of the ANK code table in the STAR page mode. They select the Katakana mode only when Japanese language characters are installed and went DBCS is set.

*4) Japanese Language Specifications
These settings are enabled only in STAR Page Mode and when Japanese language characters are installed.
When the SHIFT-JIS dedicated mode is selected, if the reception data is 0x20-0x7F, 0xA0-0xDF, the printer processes this as a one byte code. If the reception data is 0x81-0x9F, 0xE0-0xEF, the printer processes it as two byte codes with the subsequent data.
When the SHIFT-JIS/JIS mixed mode is selected, reception data is always processed as two byte codes.

14-2-2 MSW 1

Bit	Functions	OFF/“0”	ON/“1”	Emulation			Note
				SL	SP	EP	
F							
E							
D	(Reserved: Fixed at 0)						
C	(Reserved: Fixed at 0)						
B							
A	Set top margin	(See table below)		○	○	○	*2
9	Set top margin	(See table below)		○	○	○	*2
8	Black mark function	Disabled	Enabled	○	○	○	
7	(Reserved: Fixed at 0)						
6							
5							
4	Zero style	Normal Zero	Slash zero	○	○	○	
3	International Characters	(See table below)		○	○	-	*1
2	International Characters	(See table below)		○	○	-	*1
1	International Characters	(See table below)		○	○	-	*1
0	International Characters	(See table below)		○	○	-	*1

*1) Details of International Characters

N	MSW1-3	MSW1-2	MSW1-1	MSW1-0	International Characters
“0”	0	0	0	0	USA
“1”	0	0	0	1	France
“2”	0	0	1	0	Germany
“3”	0	0	1	1	UK
“4”	0	1	0	0	Denmark 1
“5”	0	1	0	1	Sweden
“6”	0	1	1	0	Italy
“7”	0	1	1	1	Spain 1
“8”	1	0	0	0	Japan
“9”	1	0	0	1	Norway
“A”	1	0	1	0	Denmark 2
“B”	1	0	1	1	Spain 2
“C”	1	1	0	0	Latin America
“D”	1	1	0	1	Korea
“E”	1	1	1	0	Ireland
“F”	1	1	1	1	Legal

STAR Line Mode

• This setting is disabled when installed with Japanese language characters and DBCS settings. International character settings are fixed to Japan (n = 8).

• This setting is disabled when installed with Korean language characters and DBCS settings. International character settings are fixed to Korea (n = 13).

STAR Page Mode

• n = “0” to “D” are enabled. “E” to “F” are disabled. When "E” to “F” are specified, the default settings are selected.)

• Japan (n = 8) is set as default for the international characters when installed with Japanese language characters and DBCS settings.

• Korean language (n = 13) is set as default for the international characters when installed with Korean language characters.

*2) Set Top Margin

The top margin of 3 mm with this function is realized by feeding paper after performing a full cut.

Top margin of 12 mm is a mode for improving paper jams at the top of form when printing. Paper is fed an additional 1 mm after a full cut.

N	MSW1-A	MSW1-9	Top Margin
“0”	0	0	11mm
“1”	0	1	3mm

14-2-3 MSW 2

Bit	Functions	OFF/"0"	ON/"1"	Emulation			Note
				SL	SP	EP	
F	Printing Startup Page Length	(See table below)		○	-	○	*4
E	Printing Startup Page Length	(See table below)		○	-	○	*4
D	Printing Startup Page Length	(See table below)		○	-	○	*4
C	Printing Startup Page Length	(See table below)		○	-	○	*4
B							
A							
9							
8							
7	Print quality	Standard	High Quality	○	○	○	*3
6							
5	(Reserved: Fixed at 0)						
4	(Reserved: Fixed at 0)						
3							
2	(Reserved: Fixed at 0)						
1	(Reserved: Fixed at 0)						
0	(Reserved: Fixed at 0)						

*3) Print Quality
This function measures separated printing in advance to control a slowdown. This function therefore, improves printing quality of print images such as lines, tables, and high duty.
Therefore, this function is effective for printing in which is separated printing such as lines, tables, and high duty occur.
However, when this function is set to high print quality, printing throughput decreases.

*4) Printing Startup Page Length

This function stores specified page length print data in the image buffer.

Printing begins when the specified page length is exceeded.

However, printing starts when trend data is not transmitted to the printer within a predetermined amount of time.

Normally, use with the maximum page length setting in default.

N	MSW2-F	MSW2-E	MSW2-D	MSW2-C	Printing Startup Page Length	
					Single Color Printing Mode	Two Color Printing Mode
“0”	0	0	0	0	300mm	150mm
“1”	0	0	0	1	280mm	140mm
“2”	0	0	1	0	260mm	130mm
“3”	0	0	1	1	240mm	120mm
“4”	0	1	0	0	220mm	110mm
“5”	0	1	0	1	200mm	100mm
“6”	0	1	1	0	180mm	90mm
“7”	0	1	1	1	160mm	80mm
“8”	1	0	0	0	140mm	70mm
“9”	1	0	0	1	120mm	60mm
“10”	1	0	1	0	100mm	50mm
“11”	1	0	1	1	80mm	40mm
“12”	1	1	0	0	60mm	30mm
“13”	1	1	0	1	40mm	20mm
“14”	1	1	1	0	20mm	10mm
“15”	1	1	1	1	Disabled	Disabled

14-2-4 MSW 3

Bit	Functions	OFF/"0"	ON/"1"	Emulation			Note
				SL	SP	EP	
F	Code Page	(See table below)		○	-	-	*3
E	Code Page	(See table below)		○	-	-	*3
D	Code Page	(See table below)		○	-	-	*3
C	Code Page	(See table below)		○	-	-	*3
B	Code Page	(See table below)		○	-	-	*3
A	Code Page	(See table below)		○	-	-	*3
9	Code Page	(See table below)		○	-	-	*3
8	Code Page	(See table below)		○	-	-	*3
7	(Reserved: Fixed at 0)						
6	(Reserved: Fixed at 0)						
5	Chinese Character Printing Position Count	(See table below)		○	-	-	*2
4	Printing Columns	(See table below)		○	-	-	*2
3							
2							
1	<CR> Code	Ignored	Handled as <LF> code	○	-	○	
0	Amount of Line Feed	4mm	3mm	○	-	-	

*2) Details for Kanji Printing Position/ANK Printing Position
The following shows the printing dot count for Font A (12 x 24 dots)
Kanji fonts (Japanese language, Chinese language, Korean language and Taiwanese language) are all 24 x 24 dots.

<For SBCS>

MSW3-4	Characters	Character Size (Font + Right Space)	Printing Region (MSW4-0 to MSW4-2)	Printing Columns
0	ANK	12 (12+0) dot	80mm (640 dot)	53 Columns
			72mm (576 dot)	48 Columns
			55mm (440 dot)	36 Columns
			52mm (416 dot)	34 Columns
			47mm (376 dot)	31 Columns
			42mm (336 dot)	28 Columns
1	ANK	15 (12+3) dot	80mm (640 dot)	42 Columns
			72mm (576 dot)	38 Columns
			55mm (440 dot)	29 Columns
			52mm (416 dot)	27 Columns
			47mm (376 dot)	25 Columns
			42mm (336 dot)	22 Columns

When installed with Japanese language characters and DBCS setting:

MSW3-5	Characters	Character Size (Left Space + Font + Right Space)	Printing Region (MSW4-0 to MSW4-2)	Printing Columns
0	Two Byte Chinese Characters	26 (1+24+1) dot	80mm (640 dot)	24 Columns
			72mm (576 dot)	22 Columns
			55mm (440 dot)	16 Columns
			52mm (416 dot)	16 Columns
			47mm (376 dot)	14 Columns
			42mm (336 dot)	12 Columns
	Single Byte Characters	13 (0+12+1) dot	80mm (640 dot)	49 Columns
			72mm (576 dot)	44 Columns
			55mm (440 dot)	33 Columns
			52mm (416 dot)	32 Columns
			47mm (376 dot)	28 Columns
			42mm (336 dot)	25 Columns
1	Two Byte Chinese Characters	30 (3+24+3) dot	80mm (640 dot)	21 Columns
			72mm (576 dot)	19 Columns
			55mm (440 dot)	14 Columns
			52mm (416 dot)	13 Columns
			47mm (376 dot)	12 Columns
			42mm (336 dot)	11 Columns
	Single Byte Characters	15 (1+12+2) dot	80mm (640 dot)	42 Columns
			72mm (576 dot)	38 Columns
			55mm (440 dot)	29 Columns
			52mm (416 dot)	27 Columns
			47mm (376 dot)	25 Columns
			42mm (336 dot)	22 Columns

MSW3-4	Characters	Character Size (Font + Right Space)	Printing Region (MSW4-0 to MSW4-2)	Printing Columns
0	ANK	12 (12+0) dot	80mm (640 dot)	53 Columns
			72mm (576 dot)	48 Columns
			55mm (440 dot)	36 Columns
			52mm (416 dot)	34 Columns
			47mm (376 dot)	31 Columns
			42mm (336 dot)	28 Columns
1	ANK	15 (12+3) dot	80mm (640 dot)	42 Columns
			72mm (576 dot)	38 Columns
			55mm (440 dot)	29 Columns
			52mm (416 dot)	27 Columns
			47mm (376 dot)	25 Columns
			42mm (336 dot)	22 Columns

<When set for anything other than Japanese language characters (When installed with anything other than Japanese Kanji and DBCS)>

MSW3-5	Characters	Character Size (Left Space + Font + Right Space)	Printing Region (MSW4-0 to MSW4-2)	Printing Columns
0	Chinese Character	26 (1+24+1) dot	80mm (640 dot)	24 Columns
			72mm (576 dot)	22 Columns
			55mm (440 dot)	16 Columns
			52mm (416 dot)	16 Columns
			47mm (376 dot)	14 Columns
			42mm (336 dot)	12 Columns
1	Chinese Character	30 (3+24+3) dot	80mm (640 dot)	21 Columns
			72mm (576 dot)	19 Columns
			55mm (440 dot)	14 Columns
			52mm (416 dot)	13 Columns
			47mm (376 dot)	12 Columns
			42mm (336 dot)	11 Columns

MSW3-4	Characters	Character Size (Font + Right Space)	Printing Region (MSW4-0 to MSW4-2)	Printing Columns
0	ANK	13 (12+1) dot	80mm (640 dot)	49 Columns
			72mm (576 dot)	44 Columns
			55mm (440 dot)	33 Columns
			52mm (416 dot)	32 Columns
			47mm (376 dot)	28 Columns
			42mm (336 dot)	25 Columns
1	ANK	15 (12+3) dot	80mm (640 dot)	42 Columns
			72mm (576 dot)	38 Columns
			55mm (440 dot)	29 Columns
			52mm (416 dot)	27 Columns
			47mm (376 dot)	25 Columns
			42mm (336 dot)	22 Columns

*3) Code Page Details

N	MSW8-F	MSW3-E	MSW3-D	MSW3-C	MSW3-B	MSW3-A	MSW3-9	MSW3-8	Character Table
“00”	0	0	0	0	0	0	0	0	Normal*
“01”	0	0	0	0	0	0	0	1	CodePage437 (USA, Std. Europe)
“02”	0	0	0	0	0	0	1	0	Katakana
“03”	0	0	0	0	0	0	1	1	CodePage437 (USA, Std. Europe)
“04”	0	0	0	0	0	1	0	0	Codepage 858 (Multilingual)
“05”	0	0	0	0	0	1	0	1	Codepage 852 (Latin-2)
“06”	0	0	0	0	0	1	1	0	Codepage 860 (Portuguese)
“07”	0	0	0	0	0	1	1	1	Codepage 861 (Icelandic)
“08”	0	0	0	0	1	0	0	0	Codepage 863 (Canadian French)
“09”	0	0	0	0	1	0	0	1	Codepage 865 (Nordic)
“0A”	0	0	0	0	1	0	1	0	Codepage 866 (Cyrillic Russian)
“0B”	0	0	0	0	1	0	1	1	Codepage 855 (Cyrillic Bulgarian)
“0C”	0	0	0	0	1	1	0	0	Codepage 857 (Turkey)
“0D”	0	0	0	0	1	1	0	1	Codepage 862 (Israel(Hebrew))
“0E”	0	0	0	0	1	1	1	0	Codepage 864 (Arabic)
“0F”	0	0	0	0	1	1	1	1	Codepage 737 (Greek)
“10”	0	0	0	1	0	0	0	0	Codepage 851 (Greek)
“11”	0	0	0	1	0	0	0	1	Codepage 869 (Greek)
“12”	0	0	0	1	0	0	1	0	Codepage 928 (Greek)
“13”	0	0	0	1	0	0	1	1	Codepage 772 (Lithuanian)
“14”	0	0	0	1	0	1	0	0	Codepage 774 (Lithuanian)
“15”	0	0	0	1	0	1	0	1	Codepage 874 (Thai)
“20”	0	0	1	0	0	0	0	0	Codepage 1252 (Windows Latin-1)
“21”	0	0	1	0	0	0	0	1	Codepage 1250 (Windows Latin-2)
“22”	0	0	1	0	0	0	1	0	Codepage 1251 (Windows Cyrillic)
“40”	0	1	0	0	0	0	0	0	Codepage 3840 (IBM-Russian)
“41”	0	1	0	0	0	0	0	1	Codepage 3841 (Gost)
“42”	0	1	0	0	0	0	1	0	Codepage 3843 (Polish)
“43”	0	1	0	0	0	0	1	1	Codepage 3844 (CS2)
“44”	0	1	0	0	0	1	0	0	Codepage 3845 (Hungarian)
“45”	0	1	0	0	0	1	0	1	Codepgae 3846 (Turkish)
“46”	0	1	0	0	0	1	1	0	Codepage 3847 (Brazil-ABNT)
“47”	0	1	0	0	0	1	1	1	Codepage 3848 (Brazil-ABICOMP)
“48”	0	1	0	0	1	0	0	0	Codepage 1001 (Arabic)
“49”	0	1	0	0	1	0	0	1	Codepage 2001 (Lithuanian-KBL)
“4A”	0	1	0	0	1	0	1	0	Codepage 3001 (Estonian-1)
“4B”	0	1	0	0	1	0	1	1	Codepage 3002 (Estonian-2)
“4C”	0	1	0	0	1	1	0	0	Codepage 3011 (Latvian-1)
“4D”	0	1	0	0	1	1	0	1	Codepage 3012 (Latvian-2)
“4E”	0	1	0	0	1	1	1	0	Codepage 3021 (Bulgarian)
“4F”	0	1	0	0	1	1	1	1	Codepage 3041 (Maltese)
“FF”	1	1	1	1	1	1	1	1	User Setting(Blank Code Page)

This function is valid only when set for SBCS and the code page is fixed set for DBCS.

14-2-5 MSW 4

Bit	Functions	OFF/“0”	ON/“1”	Emulation			Note
				SL	SP	EP	
F							
E							
D							
C							
B							
A							
9	(Reserved: Fixed at 0)						
8	Print Mode	Single Color Printing	2-Color Printing	-	-	○	
7							
6							
5							
4	(Reserved: Fixed at 0)						
3							
2	Printing Region	(See table below)		○	○	○	*1
1	Printing Region	(See table below)		○	○	○	*1
0	Printing Region	(See table below)		○	○	○	*1

*1) Details of Printing Region

N	MSW4-2	MSW4-1	MSW4-0	Printing Region
“0”	0	0	0	80mm (640dot)
“1”	0	0	1	72mm (576dot)

14-2-6 MSW 8

Bit	Functions	OFF/“0”	ON/“1”	Emulation			Note
				SL	SP	EP	
F							
E							
D							
C							
B							
A							
9							
8							
7							
6							
5							
4							
3							
2							
1	Specifies Loaded Performance When Power is Turned ON	(See table below)		-	○	-	*1
0	Specifies Loaded Performance When Power is Turned ON	(See table below)		-	○	-	*1

*1) Loaded Performance When Power is Turned ON

N	MSW8-1	MSW8-0	
“0”	0	0	No specification
“1”	0	1	Performance 1
“2”	1	0	Performance 2
“3”	1	1	(Reserved)

14-2-7 MSW A

Bit	Functions	OFF/"0"	ON/"1"	Emulation			Note
				SL	SP	EP	
F							
E							
D							
C	(Reserved: Fixed at 0)						
B							
A							
9							
8	(Reserved: Fixed at 0)						
7							
6							
5							
4	(Reserved: Fixed at 0)						
3							
2							
1							
0	Stack Sensor	Disabled	Enabled	○	○	○	*1

*1) Stack Sensor
Sets to enable or disable the stack sensor.
When stack sensor is enabled, the stack sensor status returns ASB.

15. OPERATING UNIT SPECIFICATIONS

15-1 Operation Panel Specifications

1. Power Specification:

Modes		Mode Enter Conditions										Operation
		SW	Cover	DIP SW1 Settings								
				1	2	3	4	5	6	7	8	
Self-test Print		Input	Close	*	*	*	ON	*	*	*	*	Self-test print + Printer Rest
Hex Dump		Input	Open	*	*	*	ON	*	*	*	*	Enters Hex Dump Mode
Sensor Adjusmemt Mode	PE/BM Sensor	--	--	*	*	*	OFF	ON	ON	ON	*	Enters Sensor Adjustment Mode Entered by LED Blinking
	NE Sensor	Input	--									Enters Sensor Adjustment Mode Entered by LED Blinking
	Stack Sensor	--	--	*	*	*	OFF	OFF	ON	ON	*	Enters Sensor Adjustment Mode Entered by LED Blinking

2. When Online

Modes	Mode Enter Conditions
Paper Feed During SW Input	SW Input

15-2 LED Specifications

Status		LED Specifications	
		Power LED	Error LED
Normal State		ON	OFF
Auto-recovery Error	Printing Stops by Detection of High Temperature Head	Blink 500msec	OFF
Recoverable Errors	PE Error	ON	Blink 500msec
	NE Error	ON	Blink 2000msec
	Cover Open Error	ON	ON
	Black Mark Error	ON	Blink 500msec
Non-recoverable Errors	Auto-cutter Error	OFF	Blink 125msec
	FLASH Access Errors	OFF	Blink 500msec
	EEPROM Access Errors	OFF	Blink 750msec
	SRAM Access Errors	OFF	Blink 1000msec
	Thermistor error	OFF	Blink 1500msec
	Power voltage error	OFF	Blink 2000msec

15-3 Error Specifications

15-3-1 Auto-recovery Error

This error automatically cancels errors by varying the status internally on the printer.

Error	LED		Cause	How to Recover
	Power	Error		
Printing Stops Because Detection of High Temperature Head	Blink 500msec	OFF	Head Thermistor Temperature Detected (When detected to be over 60°C)	Automatic Recovery when Head Thermistor Temperature Detected to Drop (When detected to be under 55°C)

15-3-2 Recoverable Error

This cancels errors while maintaining the printer's status, by executing a determined error recovery means.

Error	LED		Cause	How to Recover
	Power	Error		
NE Error	ON	Blink 2000msec	Not enough paper	Replace the paper
PE Error	ON	Blink 500msec	Paper Out Detection	Replace the paper
Cover Open Error	ON	ON	Cover Open	Cover Closed
Black mark Error	ON	Blink 500msec	Black Mark Paper Size Error White detected over 400 mm long	Change Black Mark Paper Adjust Sensor Sensitivity with Sensor Adjustment Mode

15-3-3 Non-recoverable Error

This error requires the printer to be reset after executing a determined error recovery means because a fatal error has occurred.

The printer many need to be repaired if the same error occurs even after resetting the printer.

Error	LED		Cause	How to Recover
	Power	Error		
Auto-cutter Error	OFF	Blink 125msec	Cutter Failure	Check/repair the cutter
FLASH Access Error	OFF	Blink 500msec	FLASH ROM Access Problem	Repair
EEPROM Access Error	OFF	Blink 750msec	EEPROM Access Problem	Repair
SRAM Access Error	OFF	Blink 1000msec	SRAM Access Problem	Repair
Thermistor error	OFF	Blink 1500msec	Head Thermistor Detected Erroneous Value	Repair
Power voltage error	OFF	Blink 2000msec	Power Voltage Error Value Detected	Check/repair the power supply

15-4 Sensor Adjustment Mode

This mode adjusts the sensitivity of the sensor by adjusting the variable resistor on the PCB.

15-4-1 PE/BM Common Sensor Adjustment Mode

<Operating Procedures>

A. Set paper into the PE sensor portion.
B. Turn the printer power on by setting DIPSW 1-4 = OFF, DIPSW 1-5 = ON, DIPSW 1-6 = ON, and DIPSW 1-7 = ON.
   The adjustment mode has been entered when the LED flashes.
C. PE/BM Common Sensor Adjustments
   Rotate the VR2 so that the POWER LED = ON, and the ERROR LED = ON. When adjustments using VR2 are not possible (the POWER LED = ON, and the ERROR LED = ON) the sensor cannot be adjusted.
D. Turn off the printer's power and set DIPSW 1 – 4 = ON. Set DIPSW 1-5, DIPSW 1-6, and DIPSW 1-7 to their original settings.

15-4-2 NE Sensor Adjustment Mode

<Operating Procedures>

A. Remove the paper so that the NE sensor is in a paper out state.
B. Set DIPSW 1-4 = OFF, DIPSW 1-5 = ON, DIPSW 1-6 = ON, and DIPSW 1-7 = ON. Press the SW while turning the printer on. The adjustment mode has been entered when the LED flashes.
C. NE Sensor Adjustments
   Rotate the VR6 in the counterclockwise direction (maximum sensitivity); (the POWER LED = ON, and the ERROR LED = OFF: Adjustment Position 2); Or if (the POWER LED = ON, and the ERROR LED = ON: Adjustment Position 1), the adjustment is completed: Proceed to step D.
   If the above is not possible, rotate the VR6 so that the POWER LED = ON, and the ERROR LED = ON. When adjustments using VR6 are not possible (the POWER LED = ON, and the ERROR LED = ON) the sensor cannot be adjusted.
D. Turn off the printer's power and set DIPSW 1 – 4 = ON. Set DIPSW 1-5, DIPSW 1-6, and DIPSW 1-7 to their original settings.

15-4-3 Stack Sensor Adjustment Mode

<Operating Procedures>

A. Remove the paper so that the stack sensor is in a paper out state.
B. Turn the printer power on by setting DIPSW 1-4 = OFF, DIPSW 1-5 = OFF, DIPSW 1-6 = ON, and DIPSW 1-7 = ON.
   The adjustment mode has been entered when the LED flashes.
C. Stack Sensor Adjustments
   Rotate the VR5 until POWER LED = ON and ERROR LED = ON.
   If adjustments using VR5 are not possible (POWER LED = ON and ERROR LED = ON) the sensor cannot be adjusted.
D. Turn off the printer's power and set DIPSW 1 – 4 = ON. Set DIPSW 1-5, DIPSW 1-6, and DIPSW 1-7 to their original settings.

16. COMMAND SPECIFICATIONS

16-1 STAR Line Mode

Refer to the “STAR Line Mode Command Specifications for Line Thermal Printers” for details.

16-2 STAR Page Mode

Refer to the “STAR Line Mode Command Specifications for Line Thermal Printers” for details.

16-3 ESC/POS Mode

Refer to the “ESC/POS Mode Command Specifications for Line Thermal Printers” for details.

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