Product Specifications Manual

TSP100 Series

Rev. No. 0.01

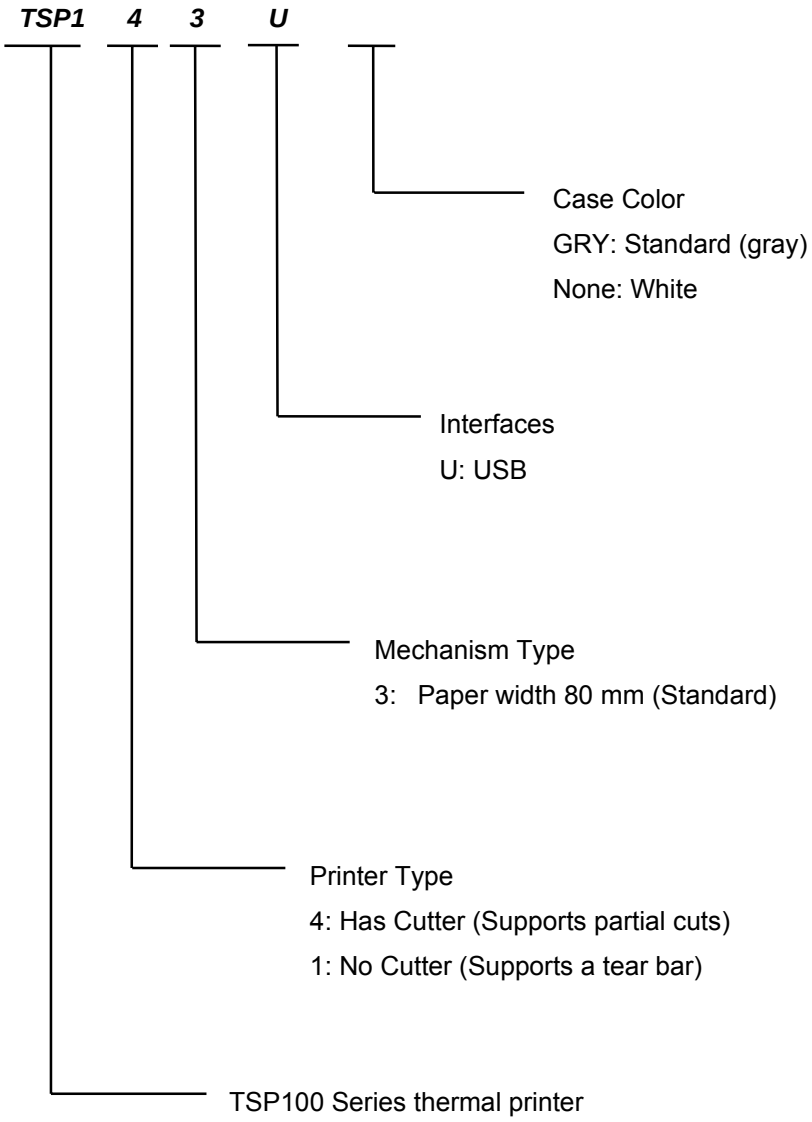
Star Micronics Co., Ltd.
Special Products Operating Division

Table of Contents

1. GENERAL DESCRIPTION

The TSP100 series printers are direct-line thermal printers with a clam-shell mechanism.

How to Display the Model Name



2. BASIC SPECIFICATIONS

2.1. Print Specifications

(1)	Printing Method:	Direct line thermal printing method
(2)	Dot Configuration:	576 Dots/Line
(3)	Dot Density:	8 dots/mm (203 dpi)
(4)	Printing Region:	Maximum 72mm
(5)	Printing Speed:	Max. 1000 dots per line/second (125mm/second)
(6)	Paper Feed:	Friction feed method
	Paper Feed Pitch:	0.125 mm (1 Motor Step)
(7)	Print Head:	Line thermal print head
(8)	Emulation:	STAR graphic mode

2.2. Paper Specifications (Thermal Paper)

(1) Paper Width: 79.5 ±0.5 (mm)/When using the accessory roll paper guide: 57.5 ±0.5 (mm)

Note: Do not change paper types while in use.

(2) External Dimensions

Take-up reel diameter: Maximum roll diameter: Ø 83 mm

Width (Roll-up dimensions): 80 ±0.5, -1 mm/58 ±0.5, -1 mm

(3) Paper thickness: 65 µm to 85 µm

(4) Recommended thermal paper

Manufacturer	Product Name	Quality Characteristics and Use	Paper Thickness (µm)
Mitsubishi Paper	P220AG	Normal type	65
	HP220AB-1	Long-storage type	75
	P220AGB	Normal type (For cards and tickets)	80
	PB670	2 Color type (red/black)	75
	PB770	2 Color type (blue/black)	75
Mitsubishi Paper Mills	F5041	Normal type	60
Oji Paper Company	PD150R	Normal type	75
	PD160R	Ultra-long-storage type	65/75
	PD750R	2 color type (red/black)	75
	PD700R	2 color type (blue/black)	75
Nippon Paper Industries	TF50KS-E2C	Normal type	65
KSP	P320RB	2 color type (red/black)	65
	P320BB	2 color type (blue/black)	65

(5) Shaft Core Inner Diameter (mm)/Outer Diameter (mm)

65 µm ≦ Paper Thickness ≦ 85 µm: Inner Diameter: Ø 12 ±1/Outer Diameter: Ø 18 ±1

(6) Effective Print Width

Paper Width (mm)	Left Margin (mm)	Right Margin (mm)	Effective Print Width (mm)
79.5±0.5	3.75	3.75	72
57.5±0.5	2.75	3.75	51

When using the accessory roll paper guide: 57.5 ±0.5 (mm)

(7) Others

- Coloring Side: Roll outer side
- Trailing Edge Treatment: Do not glue to fasten to roll paper and shaft core. The trailing edge should not be folded.

2.3. Cutting Specifications

2.3.1. Auto-Cutter Specifications (TSP143)

(1)	Cutting Methods:	Guillotine type
(2)	Cutting Modes:	Partial cut (leaves one uncut portion in center of paper) However, when using 57.5mm width paper, the cutter leaves one point cut approximately 40 mm from the right edge.
(3)	Cutting Duty:	3 seconds/cut
(4)	Paper Thickness:	65µm to 85µm
(5)	Cutting Position:	Distance from printing position to cutting position: Approximately 11mm
(6)	Minimum Cutting Length:	65 µm ≦ paper thickness ≦ 85 µm: 24 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, remove the front cover, and insert a screwdriver into the manual operation hole. This is located on the right side, when looking from the front, of the printer cover which is the storage position of the movable cutter blade. Rotate the worm-gear mounted on the motor shaft to return the cutter blade to its home position.

2: It is recommended that the blank space from the final printing position to the cutting position be at least 5 mm.

2.3.2. Tear Bar Specifications (TSP113)

(1)	Cutting Position:	Distance from Printing Position to Cutting Position: Approximately 11mm

Note

1: When printing after cutting the paper, including manual cuts, it is recommended that you feed paper at least 1mm (8-dot line).

2: When performing a manual cut, there is the possibility that the printer could operated, depending on how the paper is cut. Do not push on the printer with your hands when cutting.

3: It is recommended that the blank space from the final printing position to the cutting position be at least 5 mm.

2.4. Functions

2.4.1. Sensors

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

(2) PCB Temperature Detection: Detects the temperature of the printed circuit board with a thermistor.

(3) Paper Out Detection: A transmissive type photo-interrupter arranged with a lever in the center of a paper guide for paper insertion of the thermal mechanism detects the trailing edge of paper.

(4) Cover Open Detection: Detects that the cover (between head and platen) is closed.

2.5. Reliability Specifications

(1) Life: Mechanical Unit: 20 Million Lines

Head: 100 Million Pulses, 100 Km (Head average resistance value change rate: Max. ±15%)

When using 2 colors, 50 million pulses, or 50 Km (Head average resistance value change rate: Max. ±15%)

Auto-cutter: For 65 μm ≦ paper thicknesses ≦ 85 μm:

1 million cuts

<Conditions>

- Average print rate 12.5%
- Recommended thermal paper 65 μm

(2) MCBF: 60 Million Lines

MCBF is defined as overall failures including accidental failures and failures from part wear out leading to the life of the mechanical parts which is 20 million lines.

* Mechanical life is 20 million lines. The 60 million lines of MCBF relate to its durability life.

Note 1: The above provides the numerical values for reliability specifications when all use the recommended thermal paper. Reliability cannot be guaranteed if different paper is used.

3. EXTERNAL SPECIFICATIONS

3.1. External Specifications

3.1.1. External Specifications

(W) Approx. 142mm x (D) Approx. 204mm x (H) Approx. 132mm

3.1.2. Weight

TSP143: Approx. 1.72 Kg (without roll paper)

TSP113: Approx. 1.56 Kg (without roll paper)

3.2. Operating Unit Specifications

3.2.1. Switches

FEED: Feeds paper

3.2.2. LED

POWER: Green

ERROR: Red

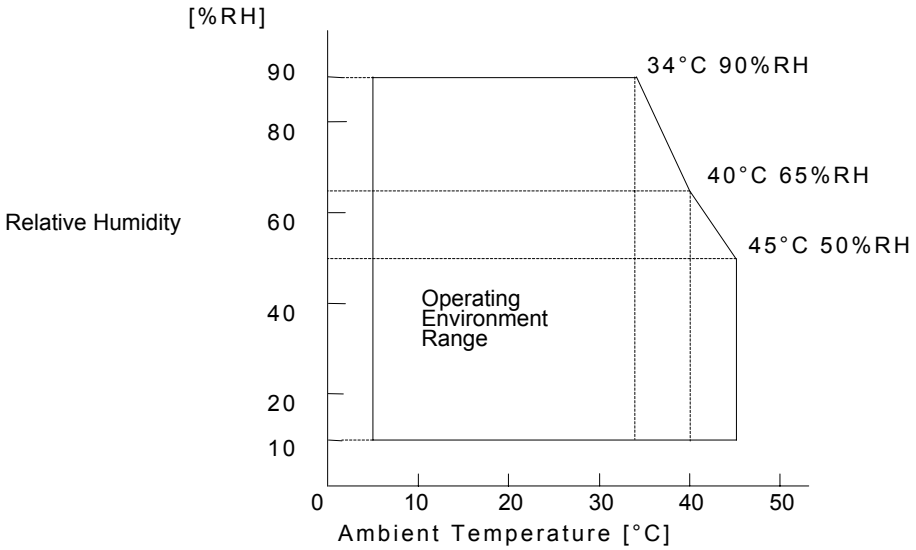
4. AMBIENT SPECIFICATIONS

4.1. Temperature and Humidity

(1) When Operating

Temperature: 5°C to +45°C

Humidity: 10% to 90% RH (No condensation)



<Development Evaluation Test Conditions>

Room Temperature and Room Humidity: 23°C with 50%RH/High Temperature: 45°C with 50%RH/High Temperature and High Humidity: 34°C with 90%RH

Low Temperature: 5°C; Low Humidity: 10°C with 20% RH

(2) Storage Environment (excluding roll paper)

Temperature: -20°C to +60°C

Humidity: 10% to 90% RH (No condensation)

* However, the combination of 40°C and 90% RH (no condensation) is considered the worst value regarding high temperatures and humidity.

<Development Evaluation Test Conditions>

High temperature: 60°C/Low temperature: -20°C/High humidity and high temperature: 40°C at 90% RH (no condensation).

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)	-

4.3. AC Line Noise Tolerance

	Test Specifications
Stand-alone tolerance (Self-Print)	±1200V
PC connection tolerance (ASCII continuous printing)	±500V

4.4. Vibration/Falling Shocks

(1) Vibration tests (when packing)

Vibration Direction: XYZ

Vibration Frequency: 7 Hz to 100 Hz

Sweep Time: Logarithmic frequency sweep rate: Reciprocal at 5 minutes

Vibration Acceleration

Speed: 1.5 G (Constant)

Printing Time: One hour (Total 3 hours)

Packing Status: Minimum packing status

Must be no visual or operational problems externally or internally after applying vibration.

(2) Drop Shock Tests (when packing)

Height of Drop: 80cm

Direction of Drop: 1 angle; 3 corners; 6 surfaces

Number of Drops: Once each time (total of 10 drops)

Packing Status: Minimum packing status

Must be no visual or operational problems externally or internally after dropping.

(3) Shock Tests (when not packing)

Height of Drop: 5cm

Direction of Drop: 4 Sides, side support

Number of Drops: 1 time each

Must be no visual or operational problems externally or internally after dropping when not operating.

4.5. Noise

Measured Rating: ANSI 1.29

Operating Time: Approx. 49 db (With Cutter)/Approx. 48 db (Without Cutter)

4.6. Dust

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

5. SAFETY

5.1. Standard

1) Safety Standards

UL	UL1950 Version 3
C-UL	C22.2 No. 950 Version 3
TÜV	EN60950 Version A11
Electrical Handling Law	-----

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

• CB Report (Eastern Europe)

• C-tick (Australia)

• CCC (China)

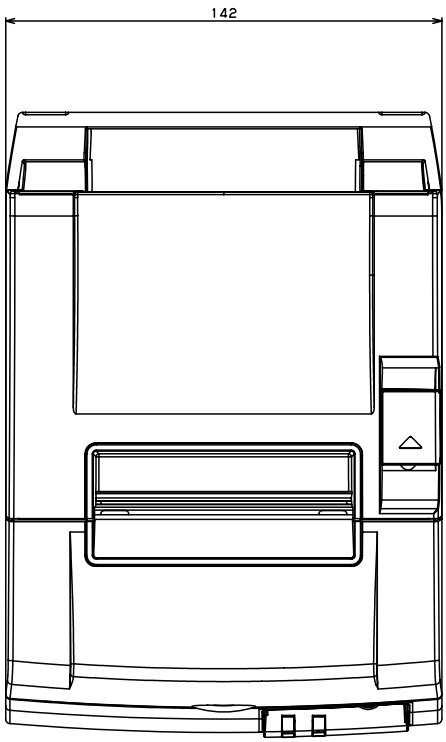
• GOST (Russia)

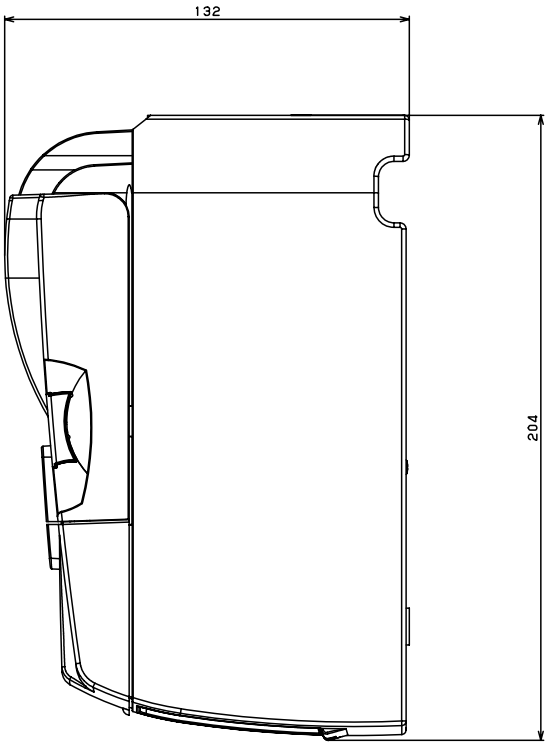
• MIC

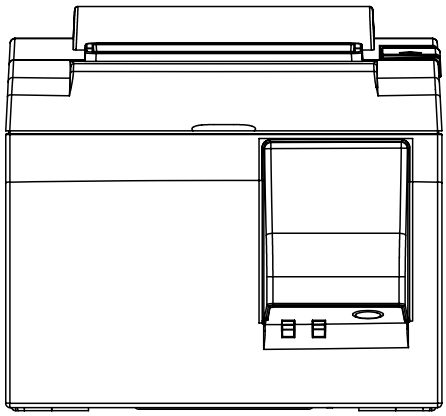
• RPCS

6. EXTERNAL DRAWINGS

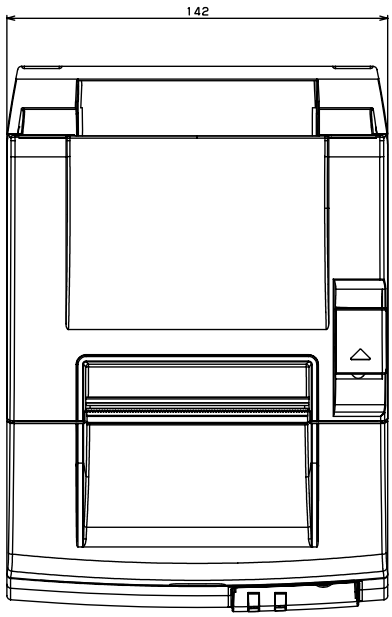
1) TSP143

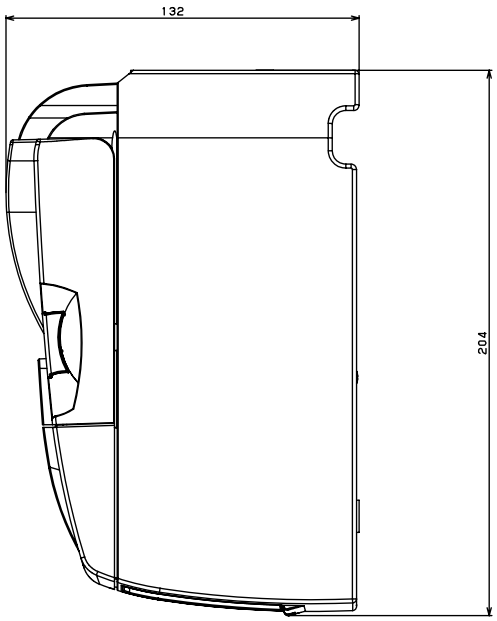


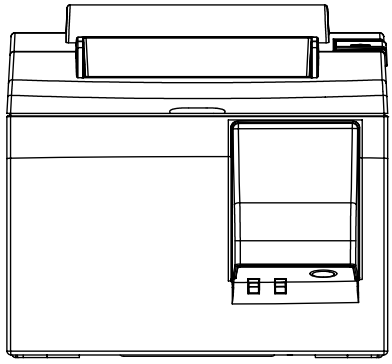




2) TSP113







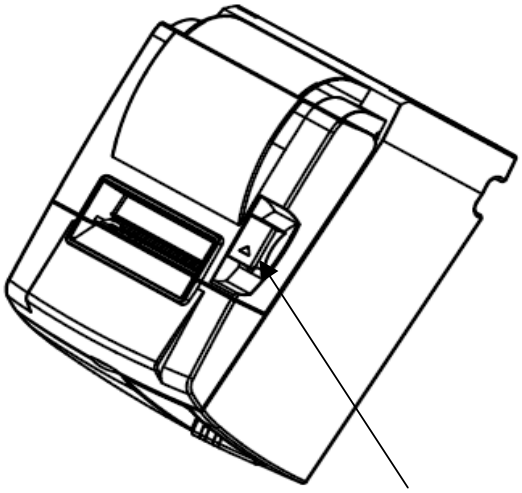
7. HOW TO SET ROLL PAPER

1. Pull the cover open lever toward in the direction of the Δ. Then open the printer cover by lifting the cover open lever.

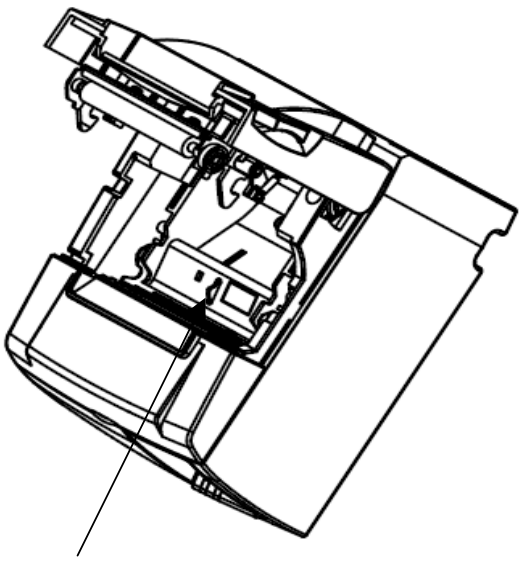
2. Set the roll paper and check that the paper is over the lever of the paper out sensor, then pull the end of the paper toward yourself.

3. Close the printer cover.

Note 1: When closing the printer cover, be careful that both sides close.



Cover Open Lever



Paper Out Sensor Lever

8. MAINTENANCE

Perform the following maintenance periodically.

Maintenance Periods: Every six months or after a million lines of printing.

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 that may be adhering to it.

(Rotate the platen to clean the entire surface.)

(Detectors and the Surrounding Areas)

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

Note1. Immediately after printing, the thermal head is extremely hot. Do not clean the thermal head.

Note 2. When cleaning the thermal head, handle it carefully because there is the danger of damaging it through static electrical discharges.

Note 3. Do not turn on the power until the alcohol has completely dried.

9. OTHER PRECAUTIONS

1. Absolutely never open the cover (rear cover or front cover) while printing or cutting.
2. Do not pull out paper with the printer cover closed.
3. Do not allow metal or sandpaper to come into contact with the thermal head heating elements and driver IC because they can be damaged.
4. Immediately after or while printing, the area around the head is extremely hot and can cause burns. Absolutely do not touch it with your bare hands.
5. Touching the head heating elements with your hands can cause them to become dirty. This will degrade print quality. Never touch the head heating elements with your bare hands.
6. The driver IC can be damaged by static electrical discharge.
7. Print quality and thermal head life cannot be guaranteed if you use recording paper other than what has been recommended. Particularly, if using paper that has [Na+, K+ and Cl-], the thermal head life will be notably decreased.
8. Do not print if the head surface has moisture, such as condensation, on it.
9. Edges of printer parts, (particularly the cutter blade on the TSP143 and tear bar on the TSP113) can cause physical injury if handled improperly or carelessly. Handle them carefully.
10. There are cutters (TSP143) and a tear bar (TSP113) at the paper discharge outlet . Never touch them either when the printer is operating or not.
11. Do not cover the paper discharge outlet.

10. BASIC PCB SPECIFICATIONS

(1) CPU

• HD64F2218U (Renesas) Name: H8S/2218U

Clock speed: 24 MHz;

Built-in RAM: 12 Kbytes; Built-in ROM: 128 Kbytes

or

• HD6432217 (Renesas) Name: H8S/2217

Clock speed: 24 MHz;

Built-in RAM: 8 Kbytes; Built-in ROM: 64 Kbytes

(2) SRAM

• 2 Mbits (256 K x 8)

(3) Mechanism Driving Circuits

• Thermal head drive circuit

• PF motor drive circuit (bipolar stepping motor)

• Auto-cutter drive circuit (DC motor forward/reverse drive)

(4) Sensor circuit

• Paper out sensor circuit (reflective type photosensor + lever)

• Cover open sensor circuit (leaf SW)

• Head temperature sensor circuit (thermistor)

• Head temperature sensor circuit (thermistor)

Voltage detection circuit (+24 V; +5 V)

(5) Buzzer

• None

(6) Power circuit

• DC – DC converter (5 V to 3.3 V; Output: 0.5 A)

(7) Drawer circuit

Drawer circuit: 2 circuits

Sensor input: 1 circuit

(8) USB I/F

11. BASIC PCB SPECIFICATIONS

11.1. Power Specifications

• JP	100VAC±10%	50/60Hz
• US	120VAC±10%	60Hz
• EU,UK	230VAC - 10% to 240VAC+10%	50/60Hz
• AS	240VAC±10%	50/60Hz
• CH	220VAC±10%	50/60Hz

Power consumption amount	When Idling	2.2 to 3.5 W
	When Printing Continuous ASCII	Approximately 40 W

12. INTERFACES

12.1. Specifications

USB 2.0 FULL-SPEED
Supports Printer class; Vendor class

12.2. Connectors

Type B

13. OPERATION PANEL AND FUNCTIONS

13.1. Operation Panel

13.1.1. POWER LED (Green)

Normally lights when printer power is turned on.

Combined with the ERROR LED, the printer status can be ascertained.

13.1.2. ERROR LED (Red)

Combined with the POWER LED, the printer status can be ascertained.

13.1.3. FEED Switch

Press this switch while online to feed paper.

Press the FEED switch while turning the power on. This will cause the printer to enter the test print mode.

13.2. LED Display

ONLINE Status

	Power LED	ERROR LED	Cause	Recovery Method
Head High Temp. Detected (Print Stopped)	Flashes (every 1/2 second)	Extinguished	Head is very hot.	Automatic recovery when the head temperature drops
PCB High Temp. Detected (Print Stopped)	Flashes (every 2 second)	Extinguished	PCB is very hot.	Automatic recovery when the PCB temperature drops

Error Status (OFFLINE, Recoverable)

	Power LED	ERROR LED	Cause	Recovery Method
Cover Open Error	Lit	Lit	Cover is open.	Close the cover.
No Paper Error	Lit	Flashes (every 1/2 second)	No paper	Set the paper

Error Status (OFFLINE, Not Recoverable)

	Power LED	ERROR LED	Cause	Recovery Method
Auto-cutter Error	Extinguished	Flashes (every 1/8 second)	Paper jam, or cutter operation problem	Turn off the power and remove the cause of the error. Check that the cutter has returned to its home position, then turn on the power. Or seek repair.
Head Thermistor Error	Flashes (every 1/2 second)	Flashes (every 1/2 second)	Erroneous Value for the Head Thermistor Resistor	Repair
PCB Thermistor Error	Flashes (every 2 second)	Flashes (every 2 second)	Erroneous Value for the PCB Thermistor Resistor	Repair
VM Voltage Error	Extinguished	Flashes (every 1 second)	Erroneous Value for the VM Power Voltage (When Idling)	Repair
Vcc Voltage Error	Flashes (every 1 second)	Flashes (every 1 second)	Erroneous Value for the Vcc Power Voltage	Repair
EEPROM Error	Flashes (every 1/4 second)	Flashes (every 1/4 second)	EEPROM Access Problem	Repair
USB Error	Flashes (every 5 second)	Flashes (every 5 second)	USB Status Error	Repair
CPU Error	Extinguished	Extinguished	CPU Built-in RAM Access Problem	Repair
SRAM Error	Extinguished	Lit	External SRAM Access Problem	Repair

13.3. FEED Switch Operations When Turning On the Power

13.3.1. Test Print Mode

With the cover closed, press the FEED switch while turning the power on. This will cause the printer to enter the test print mode.

The version number and switch settings are printed in the test print.

When the test print is completed, the printer will recover to its normal print mode if the FEED switch is not pressed.

14. MEMORY SWITCHES

14.1. General Description

Memory switches are loaded when the power is turned on or when the printer is reset by a reset command. Therefore, when you change the settings, enable them by turning the printer on again, or by executing a reset command. Commands are used to write the settings of the memory switches.

14.2. Setting Commands and Related Commands

(1) Memory switch setting commands

Code	ASCII	ESC	GS	#	m	N	n1	n2	n3	n4	LF	NUL
	Hex.	1B	1D	23	m	N	n1	n2	n3	n4	0A	00
	Decimal	27	29	35	m	N	n1	n2	n3	n4	10	0

Details

m = “W” Writes memory switch definition data to EEPROM and resets the printer.
- N: Fixed at “0”
- n1 n2 n3 n4: Fixed at “0”

m = "T" Writes memory switch definition data to EEPROM and resets the printer. Then, the printer executes a self-print.
- N: Fixed at “0”
- n1 n2 n3 n4: Fixed at “0”

m = "," Specifies memory switch definition data (Word Set)
- N: Memory switch number
- n1 n2 n3 n4: Specified data

m = "+" Specifies memory switch definition data (Bit Set)
- N: Memory switch number
- n1 n2 n3 n4: Bit number to set

m = "-" Specifies memory switch definition data (Bit Clear)
- N: Memory switch number
- n1 n2 n3 n4: Bit number to clear

m = "@" Initialize all memory switch definition data
- N: Fixed at “0”
- n1 n2 n3 n4: Fixed at “0”

EEPROM memory has a limit life for writing data. Do not apply this command for each single receipt. Overuse of this command will dramatically limit the life of the EEPROM memory. Printer operations cannot be guaranteed.

14.3. Functions

All settings are 0 at ex-factory.

14.3.1. Memory Switch 2 (MSW2)

Bit	Functions	0	1	Note
F				
E				
D				
C				
B				
A				
9				
8				
7				
6				
5	Print Speed	(See table below)		*1
4	Print Speed	(See table below)		*1
3				
2	Print Density	(See table below)		*2
1	Print Density	(See table below)		*2
0	Print Density	(See table below)		*2

[*1] • MSW2-5, 4 Printing Speed Details

n3	MSW2-5	MSW 2-4	Print Speed
“0”	0	0	Standard
“1”	0	1	Mid-speed
“2”	1	0	Slow speed

• When two-color printing mode is selected, this setting is disabled (printer speed is fixed.).

[*2] • MSW2-2 to 0 Print Density Details

n4	MSW2-2	MSW 2-1	MSW2-0	Print Density	Print Density Two Color Printing Mode
“0”	0	0	0	Standard	Standard
“1”	0	0	1	+1	Standard
“2”	0	1	0	+2	+
“3”	0	1	1	+3	+
“4”	1	0	0	Standard	Standard
“5”	1	0	1	-1	Standard
“6”	1	1	0	-2	-
“7”	1	1	1	-3	-

14.3.2. Memory Switch 4 (MSW4)

Bit	Functions	0	1	Note
F E D C				
B A 9 8				
7 6 5 4				
3 2 1 0	Printing region	72mm	51mm	

14.3.3. Memory Switch C (MSWC)

Bit	Functions	0	1	Note
F E D C				
B A 9 8				
7 6 5 4				
3 2 1 0	Serial number	Invalid	Valid	

15. COMMAND DETAILS

15.1. STAR Graphic Mode Command Details

Refer to the STAR Graphics Mode Command Specifications Manual.

16. ACCESSORIES

- Wall hanging chassis; mounting screws
- Rubber feet 12 x 12 TSP7 (for vertical layout)
- Switch cover
- Roll paper guide (guide for 57.5 mm width paper)
- USB cable
- Power cord
- CD-ROM

ELECTRONIC PRODUCTS DIVISION
STAR MICRONICS CO., LTD.
536 Nanatsushinya, Shimizu-ku,
Shizuoka, 424-0066 Japan
Tel : 0543-47-0112
Fax: 0543-48-5013

OVERSEAS SUBSIDIARY COMPANIES
STAR MICRONICS AMERICA, INC.
1150 King Georges Post Road, Edison,
NJ 08837-3729 U.S.A.
Tel : 732-623-5555
Fax: 732-623-5590
http://www.starmicronics.com

STAR MICRONICS U.K. LTD.
Star House, Peregrine Business
Park, Gomm Road, High Wycombe,
Bucks, HP13 7DL, U.K.
Tel : 01494-471111
Fax: 01494-473333
http://www.starmicronics.co.uk

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