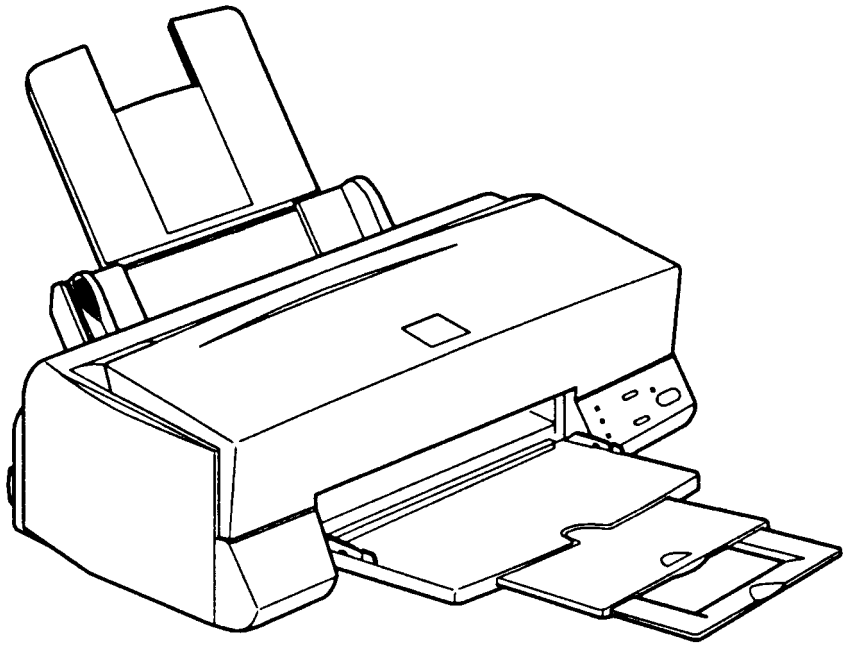
EPSON

COLOR INK-JET PRINTER

EPSON Stylus Color 400

SERVICE MANUAL



SEIKO EPSON CORPORATION

4007366

NOTICE

- All rights reserved. Reproduction of any part of this manual in any form whatsoever without SEIKO EPSON's express written permission is forbidden.
- The contents of this manual are subjects to change without notice.
- All efforts have been made to ensure the accuracy of the contents of this manual. However, should any errors be detected, SEIKO EPSON would greatly appreciate being informed of them.
- The above notwithstanding SEIKO EPSON can assume no responsibility for any errors in this manual or the consequences thereof.

EPSON is a registered trademark of SEIKO EPSON CORPORATION.

General Notice:

Other product names used herein are for identification purposes only and may be trademarks or registered trademarks of their respective companies.

PRECAUTIONS

Precautionary notations throughout the text are categorized relative to 1) personal injury and 2) damage to equipment.

WARNING Signals a precaution which, if ignored, could result in serious or fatal personal injury. Great caution should be exercised in performing procedures preceded by WARNING Headings.

CAUTION Signals a precaution which, if ignored, could result in damage to equipment.

The precautionary measures itemized below should always be observed when performing repair/maintenance procedures.

WARNING

1. ALWAYS DISCONNECT THE PRODUCT FROM BOTH THE POWER SOURCE AND PERIPHERAL DEVICES PERFORMING ANY MAINTENANCE OR REPAIR PROCEDURES.
2. NO WORK SHOULD BE PERFORMED ON THE UNIT BY PERSONS UNFAMILIAR WITH BASIC SAFETY MEASURES AS DICTATED FOR ALL ELECTRONICS TECHNICIANS IN THEIR LINE OF WORK.
3. WHEN PERFORMING TESTING AS DICTATED WITHIN THIS MANUAL. DO NOT CONNECT THE UNIT TO A POWER SOURCE UNTIL INSTRUCTED TO DO SO. WHEN THE POWER SUPPLY CABLE MUST BE CONNECTED, USE EXTREME CAUTION IN WORKING ON POWER SUPPLY AND OTHER ELECTRONIC COMPONENTS.

CAUTION

1. REPAIRS ON EPSON PRODUCT SHOULD BE PERFORMED ONLY BY EPSON CERTIFIED REPAIR TECHNICIAN.
2. MAKE CERTAIN THAT THE SOURCE VOLTAGE IS THE SAME AS THE RATED VOLTAGE, LISTED ON THE SERIAL NUMBER/RATING PLATE. IF THE EPSON PRODUCT HAS A PRIMARY AC RATING DIFFERENT FROM AVAILABLE POWER SOURCE, DO NOT CONNECT IT TO THE POWER SOURCE.
3. ALWAYS VERIFY THAT THE EPSON PRODUCT HAS BEEN DISCONNECTED FROM THE POWER SOURCE BEFORE REMOVING OR REPLACING PRINTED CIRCUIT BOARDS AND/OR INDIVIDUAL CHIPS.
4. IN ORDER TO PROTECT SENSITIVE MICROPROCESSORS AND CIRCUITRY, USE STATIC DISCHARGE EQUIPMENT, SUCH AS ANTI-STATIC WRIST STRAPS, WHEN ACCESSING INTERNAL COMPONENTS.
5. REPLACE MALFUNCTIONING COMPONENTS ONLY WITH THOSE COMPONENTS BY THE MANUFACTURE; INTRODUCTION OF SECOND-SOURCE ICs OR OTHER NONAPPROVED COMPONENTS MAY DAMAGE THE PRODUCT AND VOID ANY APPLICABLE EPSON WARRANTY.

PREFACE

This manual describes functions, theory of electrical and mechanical operations, maintenance, and repair of EPSON Stylus Color 400.

The instructions and procedures included herein are intended for the experience repair technician, and attention should be given to die precautions on the preceding page. The Chapters are organized as follows:

CHAPTER 1. GENERAL DESCRIPTION

Provides a general product overview, lists specifications, and illustrates the main components of the printer.

CHAPTER 2. OPERATING PRINCIPLES

Describes the theory of printer operation.

CHAPTER 3. DISASSEMBLY AND ASSEMBLY

Includes a step-by-step guide for product disassembly and assembly.

CHAPTER 4. ADJUSTMENT

Includes a step-by-step guide for adjustment.

CHAPTER 5. TROUBLESHOOTING

Provides EPSON-approved techniques for troubleshooting.

CHAPTER 6. MAINTENANCE

Describes preventive maintenance techniques and lists lubricants and adhesives required to service the equipment.

APPENDIX

Describes connector pin assignments, circuit diagrams, circuit board component layout and exploded diagram.

The contents of this manual are subject to change without notice.

REVISION SHEET

Revision	Issued Data	Contents
Rev. A	February18. 1997	First issue

TABLE OF CONTENTS

Chapter 1
Product Descriptions

1.1 Features

Stylus Color 400 is designed for PC users at home and low price for that high performance.
Also, this printer has the same high color print quality(720X720dpi) as Stylus ProXL. The major printer features are;

- High color print quality
  - 720(H) x 720(V) dpi printing
  - 4 color printing (YMCBk)
  - Traditional and New Microwave
  - Black 64 nozzles, CMY 21 nozzles (Black=180dpi, CMY=90dpi)
  - During 360 dpi printing, 1 dot is fired by 2 shots and 1 dot is fired by 1 shot during 720 dpi printing.
- Built-in auto sheet feeder
  - Holds 100 cut-sheets (55g/m^2)
  - Holds 10 envelopes
  - Holds 10 transparency films
  - Holds 65 special papers
- High-speed print
  - 200cps
  - By using head drive frequency 14.4KHz, printing speed is twice faster than Stylus Color.
- Compact size
  - Non-operating : 429mm(W) x 234mm(D) x 162mm(H)
  - Operating : 429mm(W) x 695mm(D) x 309mm(H)
  - Weight : 5.2Kg(without cartridge)
- Acoustic noise
  - Approximately 45 dB
- Bi-directional parallel I/F(IEEE-1284 level 1 device)
- One unit combined black and CMY head
- Windows exclusive

The following table shows consumable and option.

Table 1-1. Consumable

Item	Code	Remark
Black Ink Cartridge	S020093	Color: Black
Color Ink Cartridge	S020089	Color: Cyan/Magenta/Yellow
EPSON 360 dpi Ink Jet Paper	S041025	Size: A4(200 sheets)
EPSON 360 dpi Ink Jet Paper	S041059	Size: A4(100 sheets)
EPSON 360 dpi Ink Jet Paper	S041060	Size: Letter(100 sheets)
Photo Quality Ink Jet Paper	S041026	Size: A4(200 sheets)
Photo Quality Ink Jet Paper	S041061	Size: A4(100 sheets)
Photo Quality Ink Jet Paper	S041062	Size: Letter
Photo Quality Ink Jet Paper	S041067	Size: Legal
Photo Quality Glossy Paper(New Release)	S041126	Size: A4
Photo Quality Glossy Paper(New Release)	S041124	Size: Letter
Photo Quality Glossy Film	S041071	Size: A4
Photo Quality Glossy Film	S041124	Size: Letter
Photo Quality Glossy Film	S041107	Size: A6
Ink Jet Transparencies	S041063	Size: A4
Ink Jet Transparencies	S041064	Size: Letter
Photo Quality Ink Jet Card	S041054	Size: A6
Photo Quality Ink Jet Card	S041121	Size: 5 x 8 inches
Photo Quality Ink Jet Card	S041122	Size: 10 x 8 inches
Photo Quality Self Adhesive Sheet	S041106	Size: A4

1.2 Specifications

This section describes each specification for Stylus Color 400; 1) Printing specification, 2) Paper specification, 3) Adjust lever settings, 4) Printing area, 5) Environmental condition, 6) Ink Cartridge specification, 7) Physical specification, 8) Electric specification, 9) Reliability.

1.2.1 Printing Specification

- Print method
  - On demand ink jet (MACH type. One unit combined with black and CMY head)

- Nozzle configuration
  - Black 64 nozzles (32x2 staggered), Color 21 nozzles x 3 (Cyan, Magenta, Yellow)
    (Black = Staggering 2 lines, 180 dpi, CMY= one line for each color, 90 dpi)

Note) During 360 dpi printing mode, one line is completed by 2-pass for black and by 4-pass for CMY.

- Print direction
  - Bi-direction with logic seeking

- Print speed and Printable columns, character pitch and print quality
  - 360 dpi printing mode= 200 cps (Head drive frequency 14.4KHz)
  - 720 dpi printing mode= 200 cps (Head drive frequency 14.4KHz)
  - About 80 columns
  - 10 pitch
  - High quality (No draft mode)

- Printable area, available dot CR speed at Raster graphics mode
  - Refer to table 1-2.

Table 1-2.Raster Graphics Mode

Horizontal resolution	Printable area	Available dot	CR Speed
180 dpi	8.26 inch	1488	20 IPS
360 dpi	8.26 inch	2976	20 IPS
720 dpi	8.26 inch	5952	20 IPS

- Nozzle configuration
  - Refer to figure 1-1.

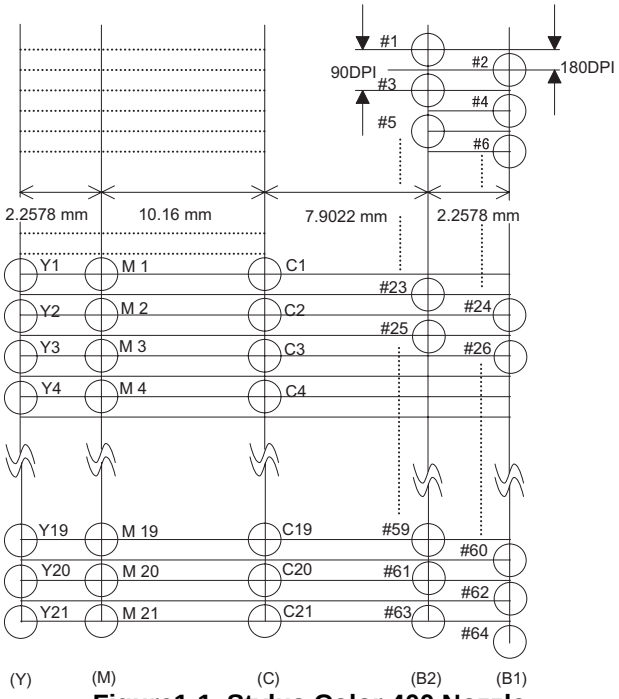


Figure1-1. Stylus Color 400 Nozzle Configuration

- Feeding method
  - Friction feed with ASF

- Paper feed resolution
  - 0.035mm(1/720 inch)

- Line spacing
  - 1/6 inch or programmable at 1/360 inch

- Paper path
  - Cut-sheet ASF(Top entry)

- Feeding speed
  - 66.6ms (1/6 inch)
  - 153.7ms (9.03mm line spacing)
  - 76.2ms (continues 3.0 inch/sec)

- Ink supply
  - Exclusive ink cartridge(Black and CMY)

- Paper holding capacity of Hopper
  - Size : Index card ~Legal
  - Thickness : Less than 8mm
  - Paper capacity : 100 Cut sheets
    : 10 Envelopes
    : 65 Coated papers (360 dpi)
    : 65 Coated papers (720 dpi)
    : 30 Glossy papers
    : 10 Transparent sheets
    : 30 Index cards

Note) Those numbers above should be considered as reference. The actual paper accumulation should be considered first.

- Character tables : 2 international character sets(Not Opened)
  - PC437(US, Standard Europe)
  - PC850(Multilingual)

- Typeface
  - Bit map LQ font : EPSON Courier 10CPI

- Control code
  - ESC/P Raster
  - EPSON Remote command

1.2.2 Paper Specification

This section describes the printable area and types of paper that can be used in this printer.

1.2.2.1 Cut Sheet

[Size] : A4 [Width 210mm(8.3”) x Length 297mm(11.7”)]
: Letter [Width 216mm(8.5”) x Length 279mm(11.0”)]
: B5 [Width 182mm(7.2”) x Length 257mm(10.1”)]
: Legal [Width 216mm(8.5”) x Length 356mm(14.0”)]
: Statement [Width 139.7mm(5.5”) x Length 215.9mm(8.5”)]
: Exclusive [Width 190.5mm(7.5”) x Length 254mm(10”)]

[Thickness] : 0.08mm(0.003”) - 0.11mm(0.004”)

[Weight] : 64g/m^2(17lb.) - 90g/m^2(24lb.)

[Quality] : Exclusive paper, Bond paper, PPC

1.2.2.2 Transparency, Glossy Paper

[Size] : A4[Width 210mm(8.3”) x Length 297mm(11.7”)]
: Letter[Width 216mm(8.5”) x Length 279mm(11.0”)]

[Thickness] : 0.075mm(0.003”) - 0.085mm(0.0033”)

Note) Transparency printing is only available at normal temperature.

1.2.2.3 Envelope

[Size] : No.10 Width 241mm(9 1/2”) x Length 104.8mm(4 1/8”)
: DL Width 220mm(8.7”) x Length 110mm(4.3”)
: C6 Width 162mm(6.4”) x Length 114mm(4.5”)

[Thickness] : 0.16mm(0.006”) - 0.52mm(0.02”)

[Weight] : 45g/m^2 (12lb.) - 75g/m^2 (20lb.)

[Quality] : Bond paper, Plain paper, Air mail

Note 1) Envelope printing is only available at normal temperature.
Note 2) Keep the longer side of the envelope horizontally at setting.

1.2.2.4 Index Card

[Size] : A6 Index card: Width 105mm(4.1”) x Length 148mm(5.8”)
: A5 Index card: Width 148mm(5.8”) x Length 210mm(8.3”)
: 5x8” Index card: Width 127mm(5.0” x Length 203mm(8.0”)
: 10x8” Index card: Width 127mm(5.0”) x Length 203mm(8.0”)

[Thickness] : Less than 0.23mm(0.0091”)

Note 1) No curled, wrinkled, scuffing or torn paper be used.
Note 2) Set the lever to the proper position according to the paper type you print. (Refer to section 1.2.3 for details)
Note 3) Printing should be performed at room temperature in spite of the paper types.

1.2.3 Adjust Lever Settings (PG adjust lever)

The adjust lever located on the right side(blue) under the printer cover needs to be set to the proper position according to the paper you print. (Refer to the table below). Also, if there is any dirt caused by friction on the wavy or wrinkled paper, this can be prevented by changing the lever position to rear position (marked with “+”) in spite of paper types.

Table 1-3.Adjust Lever Settings

Paper	Lever position	PG adjustment value
Normal paper, Coated paper	Front	0 mm (1.1mm between head and platen)
Envelopes	Rear	0.9 mm (2.0mm between head and platen)

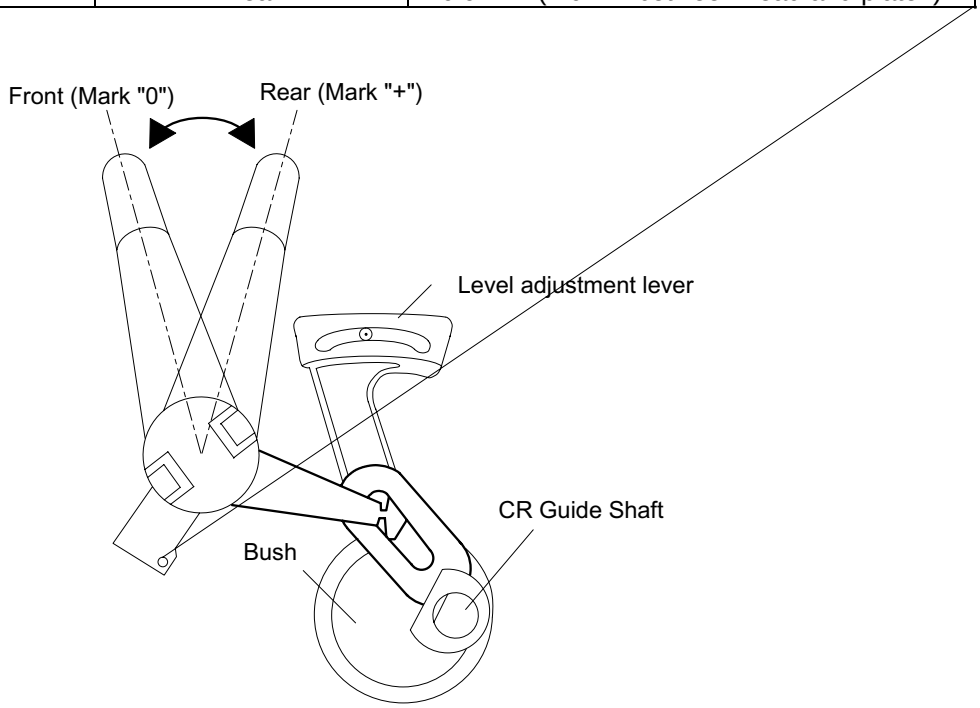


Figure 1-2. Adjust Lever Settings

1.2.4 Printing Area

[Cut Sheet]
Following tables show printable areas at Character mode and Raster Graphics mode.

Table 1-4. Character Table

Paper size	PW(Paper width) (typ)	PL(Paper Length) (typ.)	LM(Left margin) (min.)	RM(Right margin) (min.)	TM(Top margin) (min.)	BM(Bottom margin) (min.)
A4	210mm(8.3”)	297mm(11.7”)	3mm(0.12”)	3mm(0.12”)	3mm(0.12”)	14mm(0.54”)
Letter	216mm(8.5”)	279mm(11.0”)	3mm(0.12”)	9mm(0.35”)	3mm(0.12”)	14mm(0.54”)
B5	182mm(7.2”)	257mm(10.1”)	3mm(0.12”)	3mm(0.12”)	3mm(0.12”)	14mm(0.54”)
Legal	216mm(8.5”)	356mm(14.0”)	3mm(0.12”)	9mm(0.35”)	3mm(0.12”)	14mm(0.54”)
Statement	139.7mm(5.5”)	215.9mm(8.5”)	3mm(0.12”)	3mm(0.12”)	3mm(0.12”)	14mm(0.54”)
Executive	190.5mm(7.5”)	254mm(10”)	3mm(0.12”)	3mm(0.12”)	3mm(0.12”)	14mm(0.54”)

Table 1-5. Raster Graphics Mode

Paper size	PW(Paper width) (typ)	PL(Paper Length) (typ.)	LM(Left margin) (min.)	RM(Right margin) (min.)	TM(Top margin) (min.)	BM(Bottom margin) (min.)
A4	210mm(8.3”)	297mm(11.7”)	3mm(0.12”)	3mm(0.12”)	3mm(0.12”)	14mm(0.54”)
Letter	216mm(8.5”)	279mm(11.0”)	3mm(0.12”)	3mm(0.12”)	3mm(0.12”)	14mm(0.54”)
B5	182mm(7.2”)	257mm(10.1”)	3mm(0.12”)	3mm(0.12”)	3mm(0.12”)	14mm(0.54”)
Legal	216mm(8.5”)	356mm(14.0”)	3mm(0.12”)	3mm(0.12”)	3mm(0.12”)	14mm(0.54”)
Statement	139.7mm(5.5”)	215.9mm(8.5”)	3mm(0.12”)	3mm(0.12”)	3mm(0.12”)	14mm(0.54”)
Executive	190.5mm(7.5”)	254mm(10”)	3mm(0.12”)	3mm(0.12”)	3mm(0.12”)	14mm(0.54”)

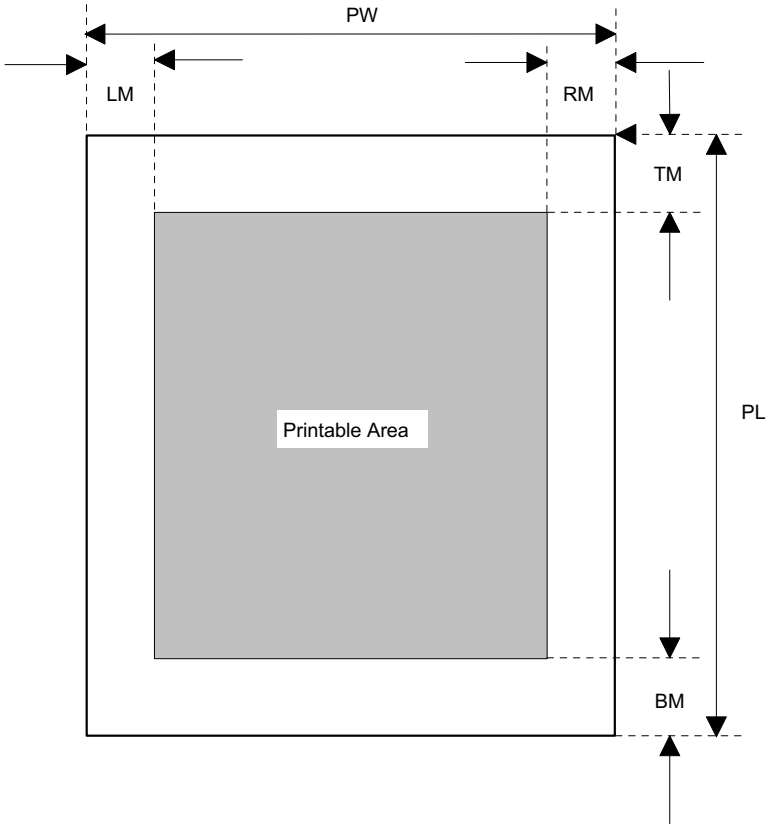


Figure 1-3. Printing Area for Cut Sheets

[Envelope]
The table and figure below show the printable area for envelopes.

Table 1-6. Printable Area for Envelope

Paper size	LM(Left margin) (min.)	RM(Right margin) (min.)	TM(Top margin) (min.)	BM(Bottom margin) (min.)
#10	3mm(0.12”)	28mm(1.10”)	3mm(0.12”)	14mm(0.55”)
DL	3mm(0.12”)	7mm(0.28”)	3mm(0.12”)	14mm(0.55”)
C6	3mm(0.12”)	3mm(0.12”)	3mm(0.12”)	14mm(0.55”)

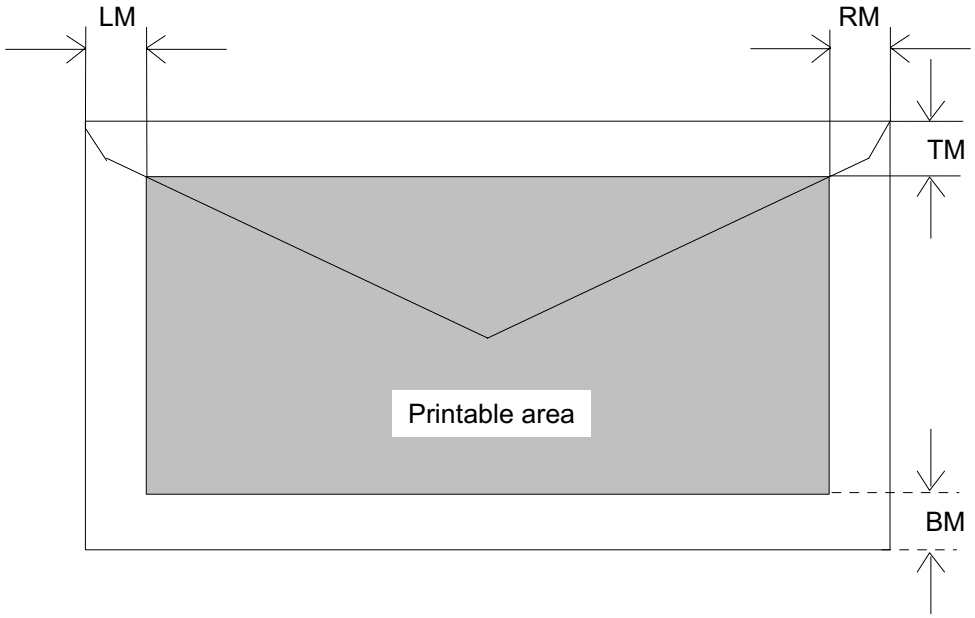


Figure 1-4. Printing Area for Envelope

1.2.5 Environmental Condition

- Temperature
  - Operating :10 to 35 °C (Refer to the figure below for condition)
  - Non-operating : -20 to 60 °C(with shipment container)

Note) 1 month at 40 °C and 120 hours at 60 °C

- Humidity
  - Operating : 20% ~ 80% RH (without condensation. Refer to the figure below for condition)
  - Non-operating : 5% ~ 85% RH (without condensation and with shipment container)

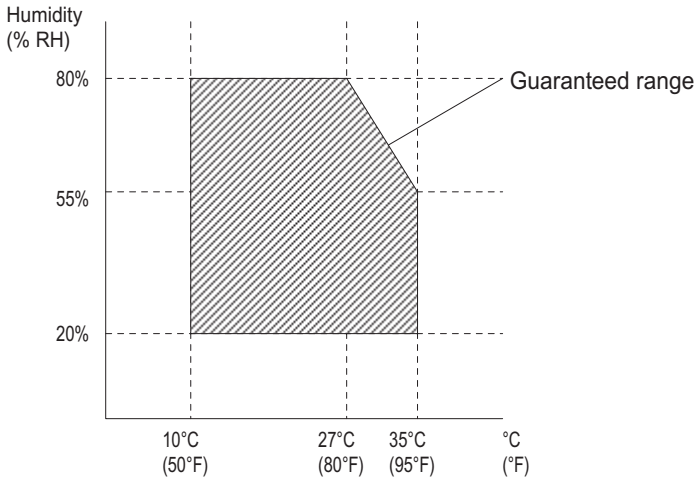


Figure 1-5. Temperature/Humidity of Range

- Resistance to shock
  - Operating : 1G, within 1 ms X,Y,Z directions
  - Non-operating : 2G, within 2 ms X,Y,Z directions (with shipment container)

- Resistance to vibration
  - Operating : 0.15G, 10~55Hz X,Y,Z directions
  - Non-operating : 0.50G, 10~55Hz X,Y,Z directions (with shipment container)

Note 1) During non-operating, make sure that the head is capped.
Note 2) During the transport, make sure that the head is capped and ink cartridge is installed to the printer.
Note 3) If the head is not capped at the power-off state, turn the power on with installed ink cartridge and turn off the power after confirming that Power on operation is completed and the head is capped.
Note 4) Ink will be frozen under -4°C environment, however it will be useable after placing it more than 3 hours at 25°C.

1.2.6 Ink Cartridge Specifications

[Black Ink Cartridge]

Table 1-7.Black Cartridge Specification

Item	Specifications
Type	Exclusive cartridge
Color	Black
Print capacity	540 pages / A4 (ISO/IE10561 Letter Pattern at 360 dpi)
Validity	2 years (sealed in package) / 6months(out of package)
Environmental conditions	❑ Temperature ■ Storage : -20°C~40°C(within a month at 40°C) ■ Packing storage : -30°C~40°C (within a month at 40°C) ■ Transit : -30°C~60°C (within 120 hours at 60°C and within a month at 40°C) ❑ Humidity ■ 5%~85%(without condensation) ❑ Resistance to vibration ■ Sealed in package : 5~55Hz ■ Acceleration : 29.4m/s less than <3G> ■ Direction : X, Y, Z direction ■ Time : 1 hour ❑ Drop ■ Sealed in package : ☐ Dropping height : Less than 0.08m ☐ Direction : Drop the printer facing the bottom, sides and one edge down. ■ Out of package: ☐ Dropping height : Less than 1.50m ☐ Frequency : Once
Dimension	19.8mm(W) x 52.7(D) x 38.5mm(H)
Weight	■ Total ink cartridge : 54g ■ Total ink : 16.4 ± 0.5g (Quantity in the ink cartridge) ■ Consumable ink : More than 12.1g(Useable ink quantity until ink ends)

Note 1) Ink cartridge can not re-fill, only ink cartridge is prepared for article of consumption.
Note 2) Do not use the ink cartridge which is passed away the ink life.
Note 3) Ink will be frozen under -4°C environment, however it will be usual after placing it more than 3 hours at room temperature.

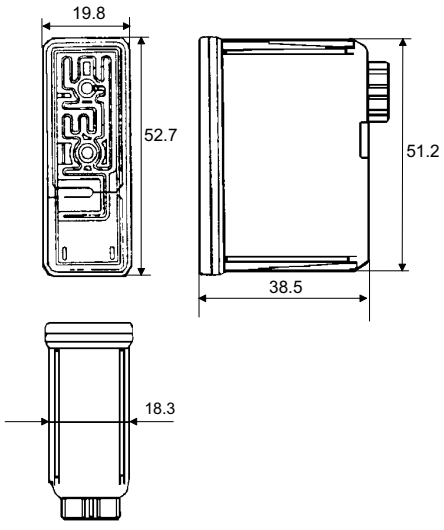


Figure 1-6. Ink Cartridge (Black)

[Color Ink Cartridge]

Table 1-8. Color Ink Cartridge Specification

Item	**Specifications**
Type	Exclusive cartridge
Color	Magenta, Cyan, Yellow
Print capacity	320 pages / A4 (360 dpi, 5% duty each color)
Validity	2 years (sealed in package) / 6months(out of package)
Environmental conditions	❑ Temperature ■ Storage : -20°C~40°C (within a month at 40°C) ■ Packing storage : -30°C~40°C (within a month at 40°C) ■ Transit : -30°C~60°C (within 120 hours at 60°C and within a month at 40°C) ❑ Humidity ■ 5%~85%(without condensation) ❑ Resistance to vibration ■ Sealed in package : 5~55Hz ■ Acceleration : 29.4m/s less than <3G> ■ Direction : X, Y, Z direction ■ Time : 1 hour ❑ Drop ■ Sealed in package : ☐ Dropping height : Less than 0.08m ☐ Direction : Drop the printer facing the bottom, sides and one edge down. ■ Out of package: ☐ Dropping height : Less than 1.50m ☐ Frequency : Once
Dimension	42.9mm(W) x 52.7(D) x 38.5mm(H)
Weight	■ Total ink cartridge : 68g ■ Total ink : 13.3 ± 0.5g (Quantity in the ink cartridge) ■ Consumable ink : More than 10.1g/each color(Useable ink quantity until ink ends)

Note 1) Ink cartridge can not re-fill, only ink cartridge is prepared for article of consumption.
Note 2) Do not use the ink cartridge which is passed away the ink life.
Note 3) Ink will be frozen under -4°C environment, however it will be usual after placing it more than 3 hours at room temperature.

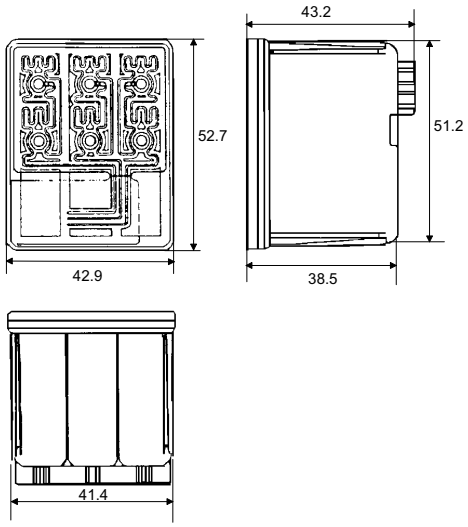


Figure 1-7. Ink Cartridge (Color)

1.2.7 Physical Specification

[Dimension] : 429mm(W) x 234mm(D) x 162mm(H)
: 429mm(W) x 695mm(D) x 309mm(H) with extended stacker and paper support.

[Weight] : 5.2Kg

1.2.8 Input Data Buffer

10 K byte

1.2.9 Electric Specification

[120V version]

[Rated voltage] : AC120V

[Input voltage range] : AC103.5~132V

[Rated frequency range] : 50~60Hz

[Input frequency range] : 49.5~60.5Hz

[Rated current] : 0.4A(Max. 0.5A)

[Power consumption] : Approx.15W(ISO/IEC 10561 Letter pattern)
: Energy Star compliant

[Insulation Resistance] : 10M ohms min.(between AC line and chassis, DC500V)

[Dielectric strength] : AC1000 V rms. 1 minute or AC1200 Vrms. 1 second (between AC line and chassis)

[220~240V version]

[Rated voltage] : AC220V~240V

[Input voltage range] : AC198~264V

[Rated frequency range] : 50~60Hz

[Input frequency range] : 49.5~60.5Hz

[Rated current] : 0.2 A(Max. 0.3A)

[Power consumption] : Approx.15W(ISO/IEC 10561 Letter pattern)
: Energy Star compliant

[Insulation Resistance] : 10M ohms min.(between AC line and chassis, DC500V)

[Dielectric strength] : AC1500 V rms. 1 minute (between AC line and chassis)

1.2.10 Reliability

[Total print volume] : 10,000 pages(A4, letter)
[Print head life] : 2000 million dots/nozzle

1.2.11 Safety Approvals

[120V version]
Safety standard : UL1950 with D3
: CSA22.2 No.950 with D3
EMI : FCC part 15 subpart B class B
: CSA C108.8 class B

[220~240V]
Safety standard : EN 60950(VDE,NEMKO)
EMI : EN55022(CISPR Pub.22) class B
: AS/NZS 3548 class B

1.2.12 Acoustic Noise

[Level] : Approx.45 dB(A) (According to ISO 7779)

1.2.13 CE Marking

[220-240V version]

Low voltage Directive 73/23/EEC	:EN60950
EMC Directive 89/336/EEC	:EN55022 Class B
	EN61000-3-2
	EN61000-3-3
	EN50082-1
	IEC801-2
	IEC801-3
	IEC801-4

1.2.14 Printer Language and Emulation

[Printer Language] : ESC/P Raster
: EPSON Remote

[ESC/P control codes]
< Character mode >

- General Operation
  - Initialize Printer : ESC@

- Paper feeding
  - Form Feed : FF
  - Line Feed : LF
  - Carriage Return : CR

<Graphic mode>

- General operation
  - Initialize Printer : ESC@
  - Unidirectional Printing : ESC U
  - CSF Mode Control : ESC EM

- Paper feeding:
  - Form Feed : FF
  - Line Feed : LF
  - Line Spacing : ESC+
  - Carriage Return : CR

- Page format
  - Page Length : ESC(C
  - Top/Bottom Margin : ESC(c

- Print position motion
  - Horizontal Print Position : ESC$,ESC\
  - Vertical Print Position : ESC (V,ESC (v

- Spacing
  - Define Unit : ESC(U

- Graphics
  - Graphics Mode : ESC(G
  - Raster Graphics : ESC.
  - Micro weave control : ESC(i

- Printing mode
  - Printing mode : ESC(K

- Color
  - Printing color : ESC r, ESC(r

- EEPROM control
  - EEPROM control : ESC |

1.3 Interface

This printer provides parallel interface as standard.

1.3.1 Parallel Interface (Forward Channel)

[Transmission mode] : 8 bit parallel, IEEE-1284 compatibility mode
[Synchronization] : By /STOPBE pulse
[Handshaking] : BY BUSY and /ACKLG signal
[Signal level] : TTL compatible level
[Adaptable connector] : 57-30360(amphenol) or equivalent

BUSY signal is set high before setting either/ERROR low or PE high and held high until all these signals return to their inactive state.

BUSY signal is at high level in the following cases.

- During data entry (see Data transmission timing)
- When input data buffer is full
- During -INIT signal is at low level or during hardware initialization
- During printer error (See /ERROR signal)

/ERROR signal is at low level when the printer is in one of the following states.

- Printer hardware error (fatal error)
- Paper-out error
- Paper-jam error
- Ink-out error

PE signal is at high level during paper-out error.

Table 1-9 shows the signal and connector pin assignments for parallel interface(forward channel*1). In case of these signals, twist pair line is used and returning side is connected to signal GND.
(*1): Forward channel is the mode when the ordinary data such as an order to print is sent from the PC to the printer.

Table 1-9. Signal and Connector Pin Assignment for Parallel Interface

Pin No.	Signal Name	Return GND pin	In/Out	Functional Description
1	/STROBE	19	In	The strobe pulse. Read-in of data is performed at the falling edge of this pulse.
2-9	DATA0-7	20-27	In	The DATA0 through DATA7 signals represent data bits 0 to 7, respectively. Each signal is at high level when data is logical 1 and low level when data is logical 0.
10	/ACKNLG	28	Out	This signal is a negative pulse indicating that the printer can again accept data.
11	BUSY	29	Out	A high signal indicates that the printer cannot receive data.
12	PE	28	Out	A high signal indicates paper-out error.
13	SLCT	28	Out	Always at high level when the printer is powered on.
14	/AFXT	30	In	Not used.
31	/INIT	30	In	The falling edge of a negative pulse or a low signal on this line causes the printer to initialize. Minimum 50 us pulse is necessary.
32	/ERROR	29	Out	A low signal indicates printer error condition.
36	/SLIN	30	In	Not used.
18	Logic H	-	Out	Pulled up to +5V via 3.9K ohm resistor.
35	+5V	-	Out	Pulled up to +5V via 3.3K ohm resistor.
17	Chassis GND	-	-	Chassis GND.
16,33,19-30	GND	-	-	Signal GND.
15,34	NC	-	-	Not connected.

Note) In/Out refers to the direction of signal flow from the printer's point of view.

1.3.2 Parallel Interface (Reverse Channel)

[Transmission mode] : IEEE-1284 nibble mode
[Synchronization] : Refer to the IEEE-1284 specification
[Handshaking] : Refer to the IEEE-1284 specification
[Data trans. timing] : Refer to the IEEE-1284 specification
[Signal level] : IEEE-1284 level 1 device
: TTL compatible level
[Adaptable connector] : 57-30360(amphenol) or equivalent
[Extensibility request] : The printer responds affirmatively when the extensibility request values are 00H or 04H, that mean,
00H :Request Nibble Mode Reverse Channel Transfer.
04H :Request device ID; Return Data using Nibble Mode Rev Channel Transfer.

Note) The printer sends following device ID string when it is requested.

Table 1-10. Device ID Description

<00H>	<3CH>	Contents
MFG	EPSON	Production Maker
CMD	ESCPL2,BDC	Command system
MDL	Stylus[SP]Color[SP] 400	Model name
CLS	PRINTER	Class

Note) [00H] denotes a hexadecimal value of zero. MDL value depends on the EEPROM setting.
Note) MDL value depends on the EEPROM setting. Model name can be changed by changing a certain address in the EEPROM.

The table below shows pin assignment for reverse channel(*3). In these case of signals, twist pair line is used and returning side is connected to Signal GND.(*3): Reverse channel is the mode that any data is transferred from the printer to the PC.

Table 1-11. Pin Assignment for Reverse Channel

Pin No.	Signal Name	Return GND pin	In/Out	Functional description
1	HostClk	19	In	Host clock signal.
2-9	Data0-7	20-27	In	The DATA0 through DATA7 signals represent data bits 0 to7, respectively. Each signal is at high level when data is logical 1 and low level when data is logical 0. These signals are used to transfer the 1284 extensibility request values to the printer.
10	PrtClk	28	Out	Printer clock signal.
11	PtrBusy, Data Bit-3,7	29	Out	Printer busy signal and reverse channel transfer data bit 3 or 7.
12	AckDataReq, DataBit-2,6	28	Out	Acknowledge data request signal and reverse channel transfer data bit 2 or 6.
13	Xflag, DataBit-1,5	28	Out	X-flag signal and reverse channel transfer data bit 1 or 5.
14	HostBusy	30	In	Host busy signal.
31	/INIT	30	In	Not used.
32	/DataAvail, DataBit-0,4	29	Out	Data available signal and reverse channel transfer data bit 0 or 4.
36	1284-Active	30	In	1284 active signal.
18	Logic-H	-	Out	Pulled up to +5V via 3.9K ohm resister.
35	+5V	-	Out	Pulled up to +5V via 3.3K ohm resister.
17	Chassis GND	-	-	Chassis GND.
16,33,19-30	GND	-	-	Signal GND.
15,34	NC	-	-	Not connected.

Note) In/Out refers to the direction of signal flow from the printer's point of view.

Following lists “Notes” when using Parallel Interface.

Note1) “Return GND pin” in the table means twist pair return and is used for all control signals except for Logic H,+5V, Chassis, GND and NC. In this twist pair return, returning side is connected to GND (16,33, 19-30 pin) for twist pair return. Also, these cables are shielded wires and it is effective to connect to each chassis GND in the PC and printer for electrostatic noise.

Note2) Conditions for Interface are based on TTL level. Rise and fall time should be within 0.2µs.

Note3) Refer to the figure 1-8 for transmission timing of each signals.

Note4) Do not perform data transmission ignoring /ACK or BUSY signal. (Perform the data transmission after confirming that /ACK and BUSY signals are Low.)

Note5) It is possible to perform the printing test including interface circuit without using equipment from outside when 8-bit data signal(20-27 pin) is set to appropriate word code and connect them forcefully to /ACK and /STRB.

[Data Transmission Timing for Forward Channel]

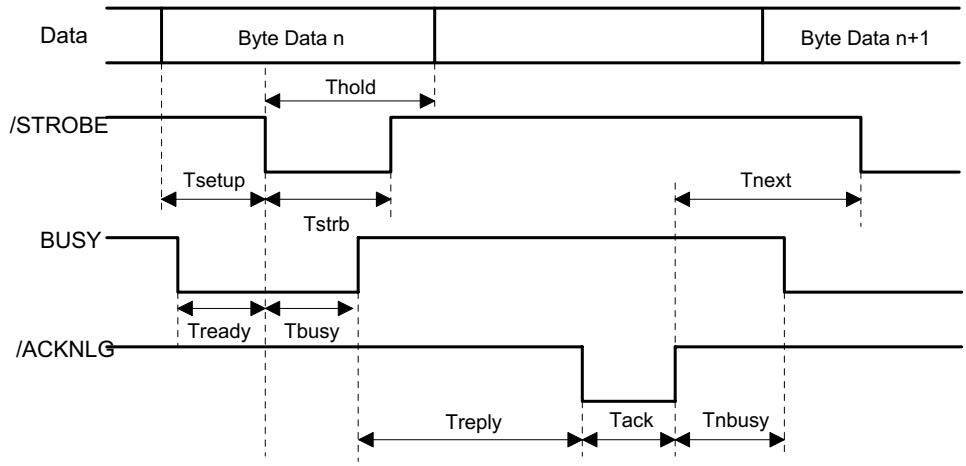


Figure 1-8. Parallel Interface Timing Chart(Forward Channel)

Table 1-12. Maximum and Minimum Timing for Data Transmission

Parameter	Minimum	Maximum
tsetup	500ns	---
thold	500ns	---
tstb	500ns	---
tready	0	---
tbusy	---	500ns
tt-out*	---	120ns
tt-in**	---	200ns
treply	0	---
tack	500ns	10us
tnbusy	0	---
tnext	0	---

* Rise and fall time of every output signals.

** Rise and fall time of every input signals.

Typical time of tack is shown below.

Table 1-13. Typical Time of Tack

Parallel I/F mode	Typical time of tack
High speed	2us
Normal speed	4us

[Signal level: TTL compatible (IEEE-1284 level 1 device)]

Table 1-14. Signal Level

Parameter	Minimum	Maximum	Condition
VOH*	---	5.5V	
VOL*	-0.5V	---	
IOH*	---	0.32mA	VOH = 2.4V
IOL	---	12mA	VOL = 0.4V
CO	---	50pF	
VIH	---	2.0V	
VIL	0.8V	---	
IIH	---	0.32mA	VIH = 2.0V
IIL	---	12mA	VIL = 0.8V
CI	---	50pF	

*A low logic level on the Logic H signal is 2.0V or less when the printer is powered off and this signal is equal or exceeding 3.0V when the printer is powered on. The receiver shall provide an impedance equivalent to 7.5K ohm to ground.

[Data Transmission Timing for Reverse Channel]

The figure below shows timing chart of Parallel Interface Reverse channel.

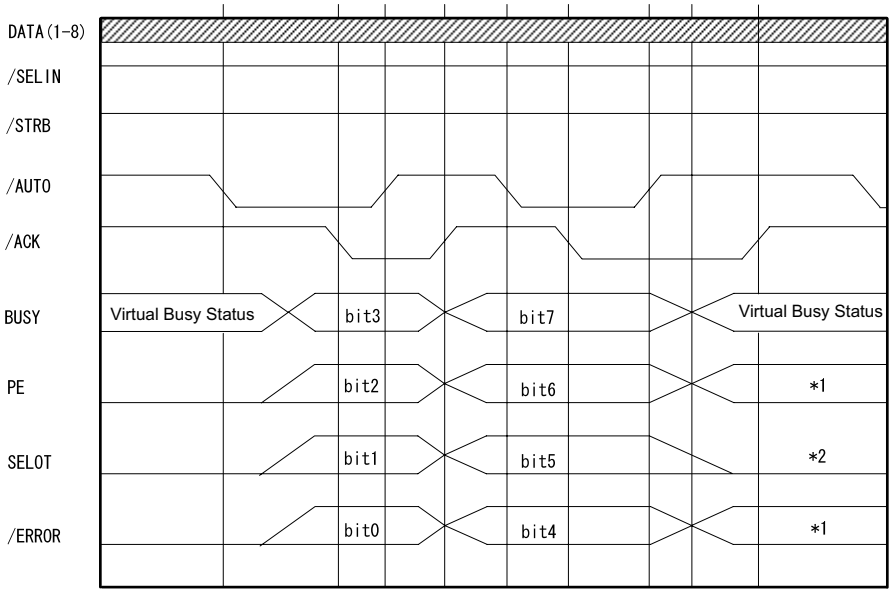


Figure 1-9. Parallel Interface Timing Chart(Reverse Channel)

1.3.3 Prevention Hosts from Data Transfer time-out

Generally, hosts abandon data transfer to peripherals when a peripheral is in the busy state for dozens of seconds continuously. To prevent hosts this kind of time-out, the printer receives data very slowly, several bytes per minute, even if the printer is in busy state. This showdown is started when the rest of the input buffer becomes several hundreds of bytes. Finally, the printer is in the busy state continuously when the input buffer is full.

1.4 Control Panel

Since Stylus Color 400 does not require many buttons since printer driver can start various settings and motions. Therefore, there are only 2 non-lock type push switches, 1 lock type push switch and 4 LEDs. Following figure shows control panel of Stylus Color 400.

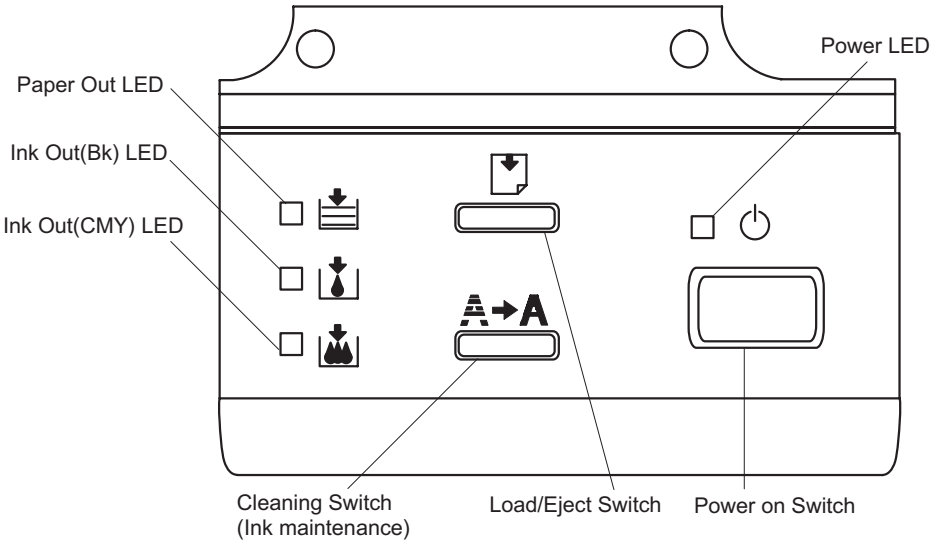


Figure 1-10. Control Panel

1.4.1 Indicators

(1) Power
Lights when the operate switch is “ON”, and AC power is supplied.

(2) Paper out
Lights during the paper-out condition, and blinks during the paper-jam condition.

(3) Ink Out (Black)
Lights during no Black ink condition, and blinks during the Black ink low condition.

(4) Ink Out (Color)
Lights during no Color ink condition, and blinks during the Color ink low condition.

1.4.2 Panel Functions

< Panel Functions >

Table 1-15. Panel Function

Switch	Function
Load/Eject (Pushing within 2 seconds*)	■ Loads or Eject the paper. ■ When carriage is on the Ink Cartridge change position, return carriage from Ink Cartridge change position.
Load/Eject (Pushing for 2 seconds*)	■ Starts the Ink Cartridge change sequence.** Moves the carriage to cartridge change position.
Cleaning (Pushing for 2 seconds*)	■ Stars the Cleaning of head. ■ In the condition of "Ink Low" or "Ink Out" or "No Ink Cartridge" starts the Ink Cartridge change sequence.**
Cleaning (Pushing within 2 seconds*)	■ When carriage is on the Ink Cartridge change position, return carriage from Ink Cartridge change position.

Note) * 3 seconds is required at the User's manual.
** This function is not available in printing status.

<Panel Functions with Power ON>

Table 1-16. Panel Function with Power On

Switch	Function
Load/Eject	■ Stars status printings.**
Cleaning	■ Changes a Code Page.
Load/Eject + Cleaning	■ Enters the particular settings mode. (Factory use only.) To enter the particular settings mode, it is necessary to push the cleaning switch while Paper Out LED is blinking.(It blinks about 3 seconds)

Note) ** status printings prints firmware version, ink counter, selected code page and nozzle check patterns.

<Maintenance Error Reset >

Table 1-17. Particular Setting Mode

Switch	Function
Cleaning	■ Initialize EEPROM and reset timer IC.

Note) The next page explains the detail procedure of the EEPROM reset.

[Maintenance Error Reset Procedure]

You can reset the maintenance error by pressing the cleaning switch after you enter the particular setting mode(Refer to table 1-15.) There are no function which can be reset the all address in EEPROM on the Stylus Color 400. Followings are detail procedure of maintenance error reset operation.

⚠ WARNING

- ☑ *Stylus Color 400 does not have "All Clear function" for EEPROM like other printers. Therefore, it is not necessary to replace the new ink cartridge after you perform this reset operation.*
- ☑ *Be sure to replace a waste ink pad in the printer enclosure with a new one after you perform this maintenance error reset operation.*

[Step 1] By pushing Load/Eject and Cleaning switches at the same time, turn on the switch.
(By operating this performance, the LED for paper out starts blinking.<3-seconds only>)

[Step 2] Push the cleaning switch while the LED for Paper Out is blinking (3 seconds).

Note) If the printer accepts this function correctly, it returns to the standby mode after the Maintenance LEDs(both Black and CMY) blink for 1 second. Following shows the lists that will be cleared by this performance.

1. Maintenance Error Reset
2. Time IC Reset
3. I/F selection (returns to AUTO)

**** The value of ink counter, Bi-D adjustment, VH voltage are not cleared. ****

1.4.3 Printer Condition and Panel Status

The table below shows printer condition and panel status. Since this table shows various error status and also present printer status, you can judge appropriate repair ways from this table.

Table 1-18. Printer Condition and Panel Status

Printer status	Indicators				Priority
	Power	Ink Out (Black)	Ink Out (Color)	Paper Out	
Power on condition	On	---	---	---	9
Ink sequence	Blink	---	---	---	6
Ink Cartridge change mode	Blink	---	---	---	5
Data processing	Blink	---	---	---	8
Paper Out	---	---	---	On	4
Paper jam condition	---	Off	Off	Blink	3
No Ink cartridge or Ink end(black)	---	On	---	---	7
Ink level low(black)	---	Blink	---	---	7
No Ink cartridge or Ink end(color)	---	---	On	---	7
Ink level low(color)	---	---	Blink	---	7
Enter EEPROM and Timer IC reset	---	On (1 second only)	On (1 second only)	On (1 second only)	--
Maintenance request	Blink	Blink	Blink	Blink	2
Fatal error	Blink	On	On	Blink	1

Note1)*: Refer to section 1.3.3 for error status.
Note2)*: It does not mean that all address would be cleared.
Note3)*: -- means no changes.

1.5 Error Status

When following status occur, the printer goes to the error status and stops taking data, setting the /ERROR signal in the interface as “Low”, and Busy signal as “High”. At this time, the printer goes to non printable status. Refer to section 1.4.3 for more details of LED Panel indicators during the various error status.

1.5.1 Ink Out

When the printer runs out the most part of the ink of any one color, it warns ink-low and keeps printing. When the printer runs out the whole ink of any one color, it stops printing and indicates ink-out error. User is requested to install a new ink-cartridge in this state. A ink-cartridge once taken out should never be used again. Re-installation of the cartridge not filled fully upsets the ink level detection and may cause a serious problem in the print head as a result.

⚠ WARNING

☑ *Never use the ink cartridge once taken out.*

Following explains above warning sign.

[Step 1] After the cartridge is once taken out, bubbles come in from the ink supply hole located at the top of cartridge and are absorbed into the head during printing performance. Therefore, the head will be unable to discharge the ink properly. Also, inevitable entering of bubbles when installing a new ink cartridge can be absorbed to ink itself since the ink itself in the cartridge is deaerated during the production process. However, this absorbing ability can last only about one hour after the cartridge is installed.

[Step 2] Even after the bubble absorbing ability described above stops, there is no worry about entering bubbles as long as the ink cartridge is being installed to the printer. However, if the ink cartridge which does not have absorbing ability any more is once removed from the printer, new coming bubbles into the cartridge will never disappear naturally. These bubbles may cause not only printing malfunction but also thickening ink. This thickened ink goes into the head and clogs ink path in the head or nozzle and may cause serious head damage.

[Step 3] As standard specification for Stylus Color 400, ink consumption counter is reset when the ink cartridge is removed. If an ink cartridge is removed and re-installed unnecessarily the value on the ink consumption monitor which the user can check will be wrong and printer may keep printing even though the ink cartridge is installed empty. This may cause head damage.

1.5.2 Paper Out

When printer fails to load a sheet after power on operation including timer-cleaning is done and Load/Eject button on the FF command or operation panel is pressed, it goes paper out error.

1.5.3 Paper Jam

When printer fails to eject a sheet even after feeding motion is completed or Load/Eject button on the FF command or operation panel is pressed, it goes paper jam error.