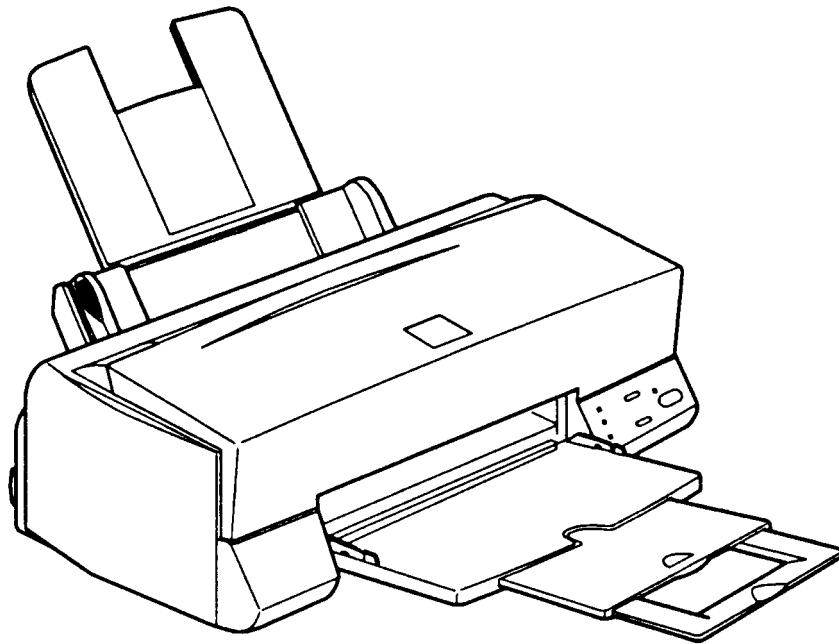


EPSON

COLOR INK-JET PRINTER

EPSON Stylus Color 400

SERVICE MANUAL



SEIKO EPSON CORPORATION

4007366

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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

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Chapter 1

Product Descriptions

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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/m²)
 - 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.

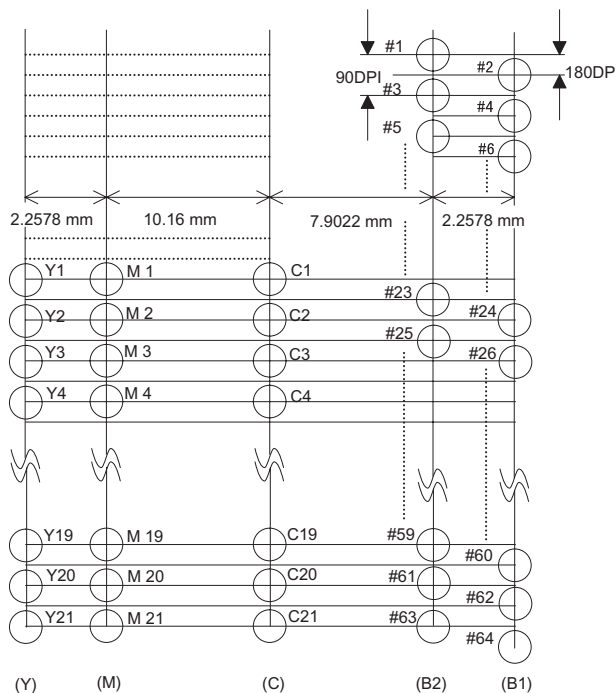


Figure1-1. Stylus Color 400 Nozzle Configuration

- ❑ 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/m²(17lb.) - 90g/m²(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/m² (12lb.) - 75g/m² (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)

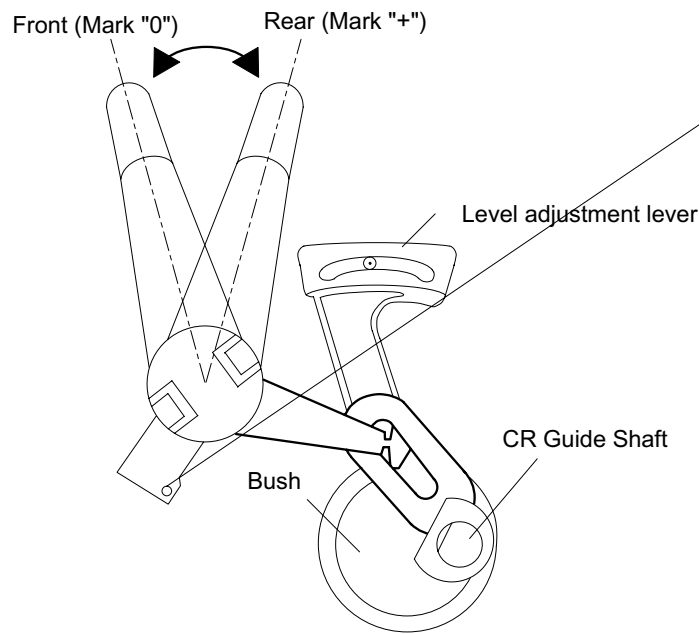


Figure 1-2. Adjust Lever Settings

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")

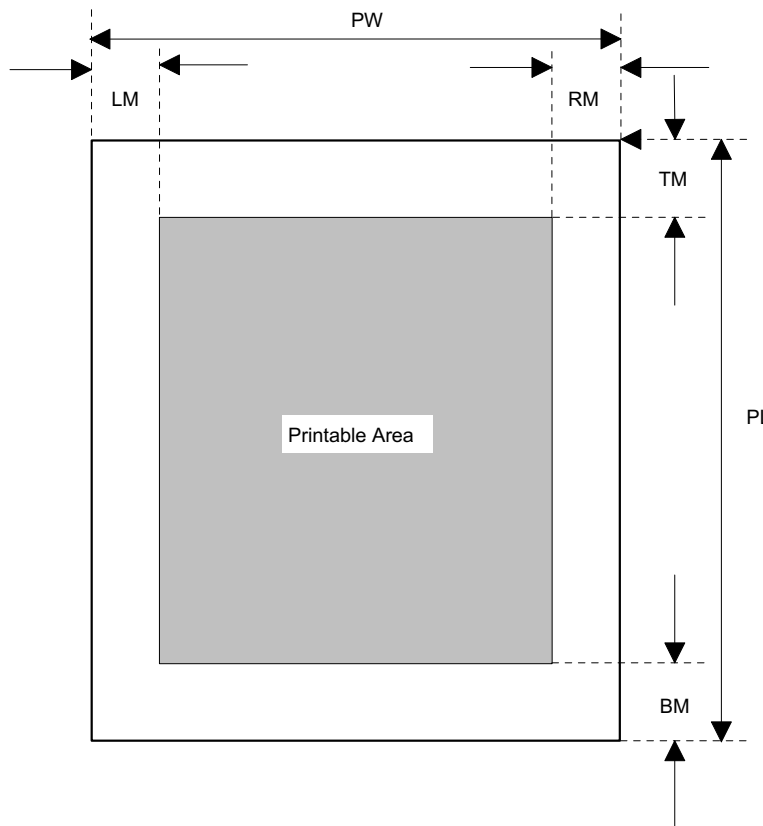


Figure 1-3. Printing Area for Cut Sheets

[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")

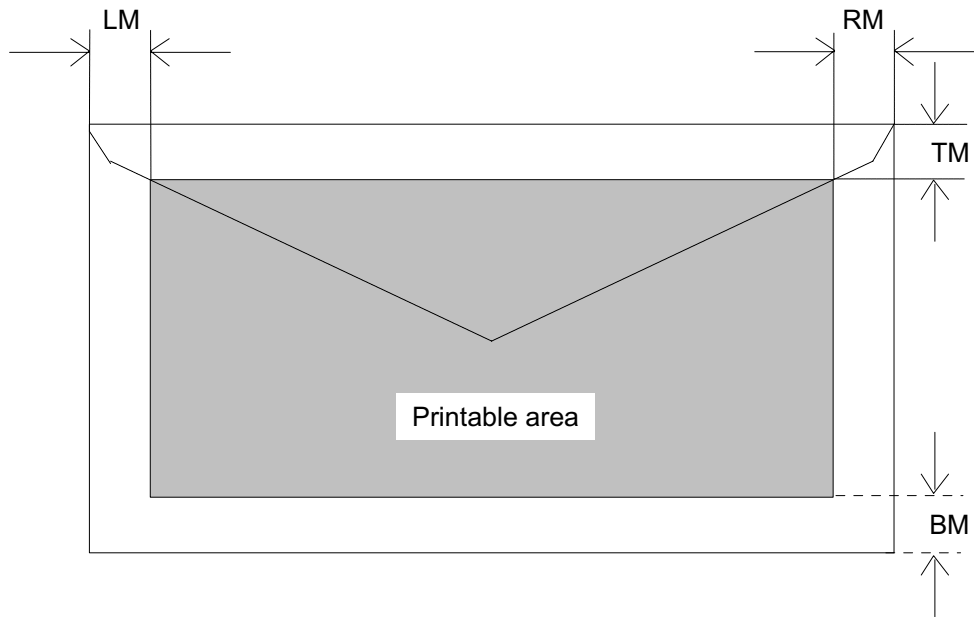


Figure 1-4. Printing Area for Envelope

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)

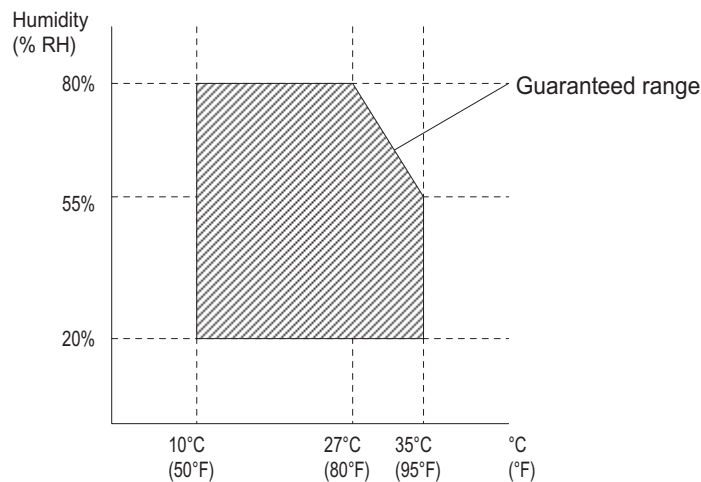


Figure 1-5. Temperature/Humidity of Range

- 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	<input type="checkbox"/> Temperature <ul style="list-style-type: none"> ■ 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) <input type="checkbox"/> Humidity <ul style="list-style-type: none"> ■ 5%~85%(without condensation) <input type="checkbox"/> Resistance to vibration <ul style="list-style-type: none"> ■ Sealed in package : 5~55Hz ■ Acceleration : 29.4m/s less than <3G> ■ Direction : X, Y, Z direction ■ Time : 1 hour <input type="checkbox"/> Drop <ul style="list-style-type: none"> ■ Sealed in package : <ul style="list-style-type: none"> <input type="checkbox"/> Dropping height : Less than 0.08m <input type="checkbox"/> Direction : Drop the printer facing the bottom, sides and one edge down. ■ Out of package: <ul style="list-style-type: none"> <input type="checkbox"/> Dropping height : Less than 1.50m <input type="checkbox"/> Frequency : Once
Dimension	19.8mm(W) x 52.7(D) x 38.5mm(H)
Weight	<ul style="list-style-type: none"> ■ 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.

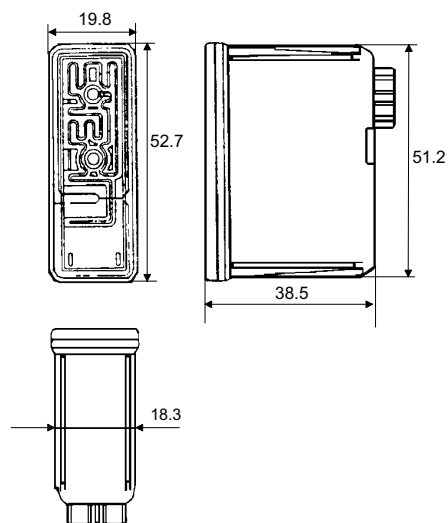


Figure 1-6. Ink Cartridge (Black)

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	<ul style="list-style-type: none"> <input type="checkbox"/> Temperature <ul style="list-style-type: none"> ■ 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) <input type="checkbox"/> Humidity <ul style="list-style-type: none"> ■ 5%~85%(without condensation) <input type="checkbox"/> Resistance to vibration <ul style="list-style-type: none"> ■ Sealed in package : 5~55Hz ■ Acceleration : 29.4m/s less than <3G> ■ Direction : X, Y, Z direction ■ Time : 1 hour <input type="checkbox"/> Drop <ul style="list-style-type: none"> ■ Sealed in package : <ul style="list-style-type: none"> <input type="checkbox"/> Dropping height : Less than 0.08m <input type="checkbox"/> Direction : Drop the printer facing the bottom, sides and one edge down. ■ Out of package: <ul style="list-style-type: none"> <input type="checkbox"/> Dropping height : Less than 1.50m <input type="checkbox"/> Frequency : Once
Dimension	42.9mm(W) x 52.7(D) x 38.5mm(H)
Weight	<ul style="list-style-type: none"> ■ 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.

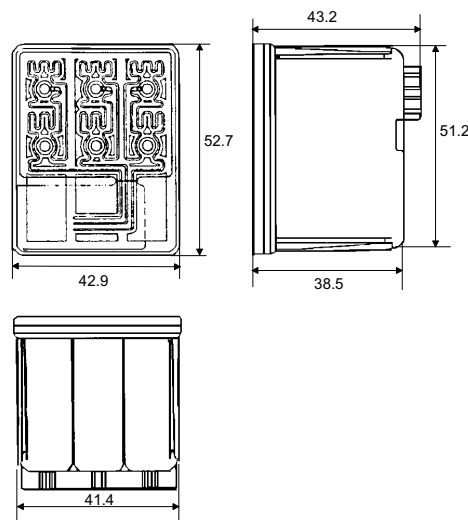


Figure 1-7. Ink Cartridge (Color)

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

Chapter1 Product Description

- 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 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.

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]

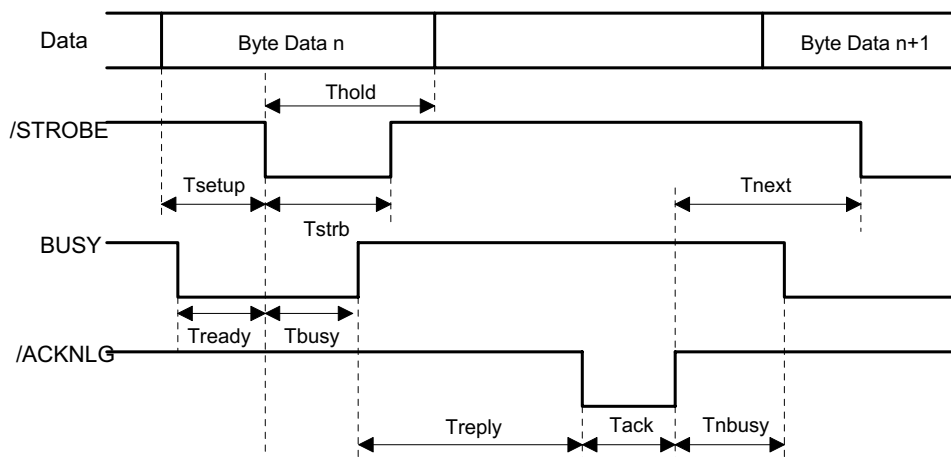


Figure 1-8. Parallel Interface Timing Chart(Forward Channel)

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	10µs
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	2µs
Normal speed	4µs

[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.

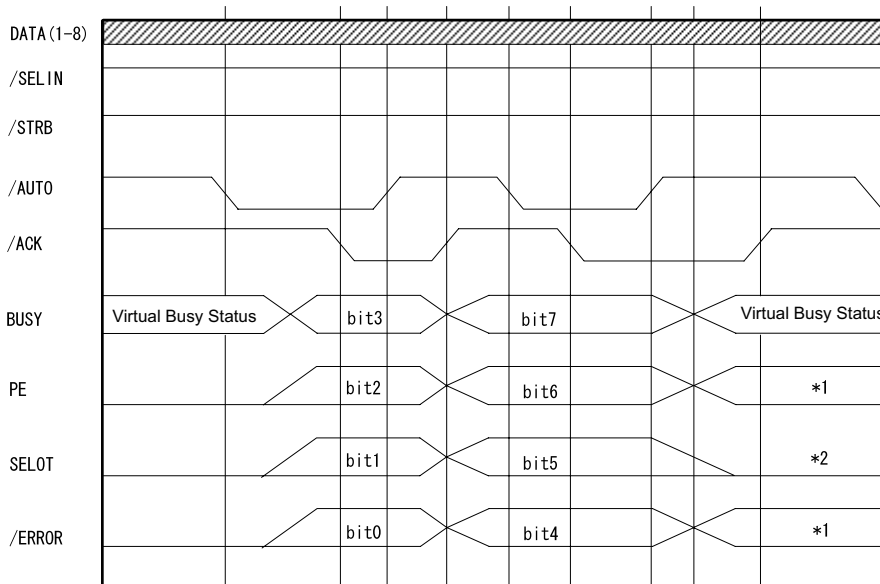


Figure 1-9. Parallel Interface Timing Chart(Reverse Channel)

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 slowdown 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.

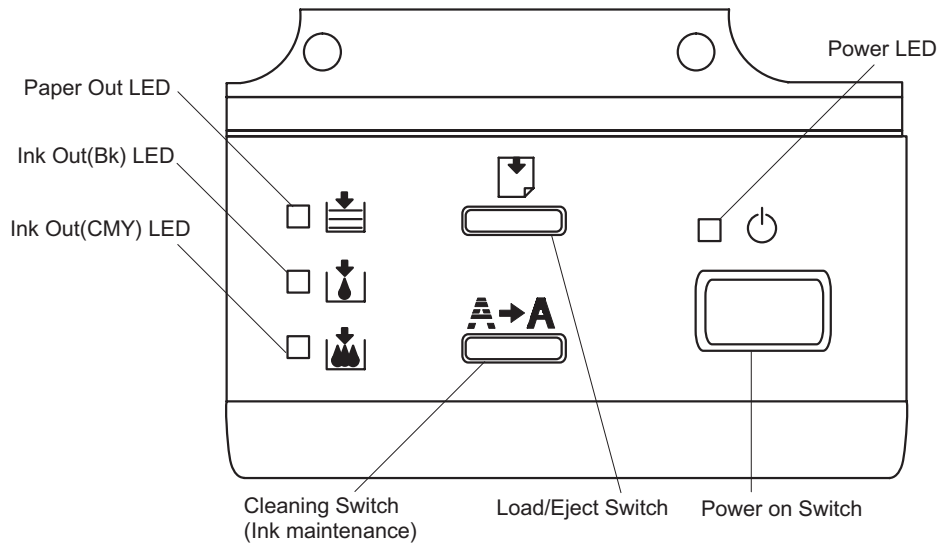


Figure 1-10. Control Panel

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*)	<ul style="list-style-type: none"> ■ 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*)	<ul style="list-style-type: none"> ■ Starts the Ink Cartridge change sequence.** ■ Moves the carriage to cartridge change position.
Cleaning (Pushing for 2 seconds*)	<ul style="list-style-type: none"> ■ 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*)	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ Stars status printings.**
Cleaning	<ul style="list-style-type: none"> ■ Changes a Code Page.
Load/Eject + Cleaning	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ 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.



- ☑ *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.



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.

1.5.4 No Ink-Cartridge

Following reasons can be the causes when printer goes this error mode.

- 1) When the printer is turned on for the first time.
(This is a normal error state and it returns to the normal state after installing an ink cartridge according to the ink cartridge exchange operation.)
- 2) Ink cartridge exchange operation is done correctly.
After the position of carriage is moved by exchange operation, if the cleaning switch is pushed without installing ink cartridge or if the carriage returns to the home-position automatically without doing any operation, it is considered as handling mistake. However, it returns to normal state by performing ink exchange operation again and installing cartridge correctly.
- 3) If “No ink-cartridge error” appears even after the ink cartridge is installed, the printer must be something wrong and around the sensor area in the carriage need to be repaired.
- 4) If sometimes printer can print normally but also sometimes “No ink-cartridge error” appears, the printer must be something wrong. (Same reason as 3) above)

1.5.5 Maintenance Request

When the total quantity of ink wasted through the cleanings and flushing reaches to the limit, printer indicates this error and stops. The absorber in the printer enclosure is needed to be replaced with new one by a service person.

The ink quantity that is absorbed by the absorber (waste ink pad) is monitored by the software counter as “total ink counter”. This counter is added by point system and absorber’s maximum ability is set at the following reference value.

$$*29500 \times 0.0102 \text{ ml} = \text{Approximately } 301 \text{ ml}$$

- 1-point = 0.0102 ml (the value which is multiplied evaporating rate and 1-dot ink weight 0.02 ml)
- 29500 = Maximum point number (Maintenance error threshold)

However, considering dispersion of ink absorbing quantity and the number of using nozzles, ink total value is calculated by the following formula.

$$*301 \times 1.1 \div 63\% = 526 \text{ ml (but up to } 532\text{ml can be retained)}$$



When you perform self- test after completing repairs, it is possible to check the present value of total ink counter and ink discharge conditions from all nozzles by performing status printing in the built-in function. Therefore, make sure that the printer has enough value of total ink counter (if the number is close to 29500 or not). If there is not enough value, the service man is required to judge if it is necessary to clear EEPROM after replacing the absorber (waste ink pad) or not. Refer to section 1.4.2 if you need to perform EEPROM Clear.

1.5.6 Fatal Errors

When printer detects fatal errors such as carriage control error or CG access error, it goes to this error mode. Refer to followings for each error.

- 1) Carriage control Error : Parallel adjustment malfunction, Home-position malfunction, Timing belt tension malfunction, shortage of lubricant on the carriage guide shaft, etc.
- 2) CG Access Error : Short circuit, etc.

1.6 Printer Initialization

Stylus Color 400 has three kinds of initialization methods. Following explains each initialization.

[1.Power-on initialization]

This printer is initialized when turning the printer power on, or printer recognized the cold-reset command (remote RS command).

When printer is initialized, following action is performed.

- (a) Initializes printer mechanism.
- (b) Clears input data buffer.
- (c) Clears print buffer.
- (d) Sets default values.

[2.Operator initialization]

This printer is initialized when turning the printer power on again within 10 seconds from last power off, or printer recognize the /INIT signal (negative pulse) of parallel interface.

When printer is initialized, following action is performed.

- (a) Cap the printer head.
- (b) Eject a paper.
- (c) Clears input data buffer.
- (d) Clears print buffer.
- (e) Sets default values.

[3. Software initialization]

The ESC@ command also initialize the printer.

When printer is initialized, following action is performed.

- (a) Clears print buffer.
- (b) Sets default values.

1.7 Initialization Settings

Stylus Color 400 initializes following settings when the initialization is performed. Also, if the user changes the settings in the Panel setting, Default setting or Remote command setting, values or settings which are possible to be stored are initialized as initialization settings.

- Page position : Page heading location as present paper location
- Line spacing : 1/6 inch
- Right margin position : 80 lines
- Left margin position : first line
- Character pitch : 10CPI
- Printing mode : Text mode (Not Raster graphics mode)

1.8 Main Components

Stylus Color 400 has following major units. Also, it is one of the major characteristics that the bottom of the Printer mechanism plays the role as Lower case at the same time. Each units from 2) to 4) are simply explained as following.

- 1) Upper case
- 2) Printer Mechanism
- 3) C206 Main control board
- 4) C206 PSB/PSE(Power Supply Board)
- 5) C206 PNL(Panel Board)

1.8.1 Printer Mechanism

Unlike EPSON's previous ink jet printer mechanisms, one of the major characteristics of Stylus Color 400 is that the printer has no Engage/Dis-Engage mechanism in order to change over pump mechanism and paper feeding mechanism. In stead, however, this change-over control is done by the distinction between turning direction of PF/Pump motor and position of present carriage unit. Also, another major characteristic is that print head is changed to be one unit combined with black and CMY.

Nozzle configuration for black is 64 nozzles (each line has 90-dpi and between #1-#2 has 180dpi). On the other hand, CMY nozzle has 21 nozzles(90dpi) for each color. Following figure shows exterior of mechanism.

1.8.2 C206 Main Control Board

C206 main control board controls Stylus Color 400 and consists of following major electric elements.

- | | |
|-------------------------------------|---|
| 1) CPU (TMP95C061F) | 5) EEPROM (3strings Serial Type:1K-bit) |
| 2) Gate Array (E05B44BA) | 6) LB1845 (Motor Driver) |
| 3) Program ROM (EEPROM or MASK ROM) | 7) With Heat Sink transistor A1469, C3746 |
| 4) D-RAM (1CAS/2WE Type: 1M-bit) | (MACH head type) |

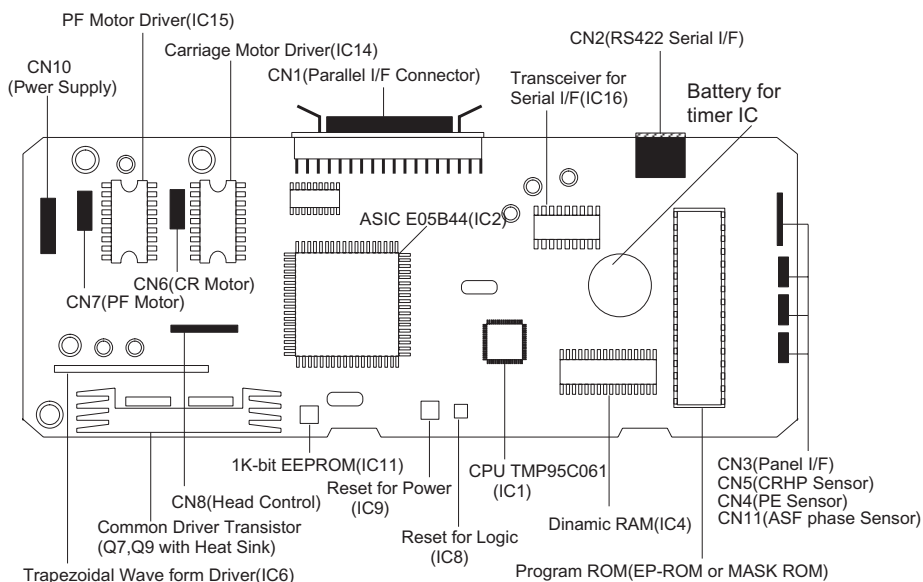


Figure 1-11. Exterior of C206 Main Control Board

1.8.3 C206 PSB/PSE Power Supply Board

In the electric boards for Stylus Color 400, switching regulator method is used and supplies stable logic and power voltages constantly. Also, since this C206PSB board has secondly type switch for its circuit system, it is possible to keep supplying electricity to the C206 main control board for 30 seconds even after the power switch is turned off.

Using this time difference, even when mis-operation is done by the user such as turning off the power during the middle of printing work, it prevents thickened ink from attaching around the nozzle plate by transferring the head to cap position.

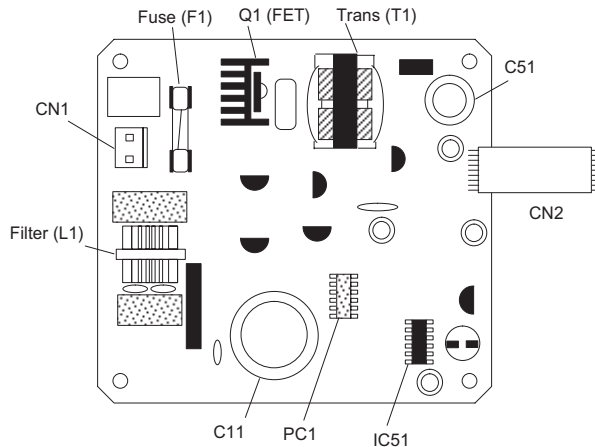


Figure 1-12. Exterior of C206 PSB/PSE Board

1.8.4 C206PNL(Panel) Board

Panel board (C206 PNL board) is located in the panel case where is in the right bottom of the front printer and consists of 3 switches, 4 LEDs and 1 connector.

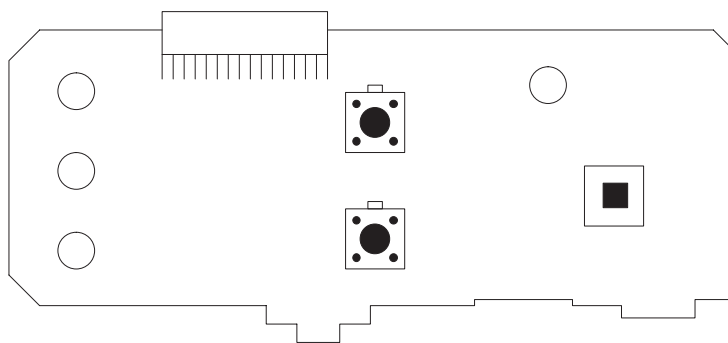


Figure 1-13. Exterior of C206 PNL Board

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2.1 OVERVIEW

This section describes Printer Mechanism, electric circuit board (C206 PSB/PSE, C206 Main, C206PNL board) of Stylus Color 400.

2.1.1 Printer Mechanism

Unlike previous EPSON Ink Jet printers, printer mechanism of Stylus Color 400 does not have exclusive mechanism to change over paper feeding and Pumping operation. In stead, this control is done by the turning direction of paper feed/pump motor and position of carriage at that time. Also, unlike previous print heads, print head of this printer became one unit combined with black and CMY head. Black head has 64 nozzles, 180 dpi(vertical direction) and CMY head has 21 nozzles, 90 dpi (vertical direction). Also, since these print head is driven by frequency 14.4Khz, this printer can print double resolution(1440 dpi/100-dpi) than Stylus Color. Following figure2-1 shows outline of printer mechanism.

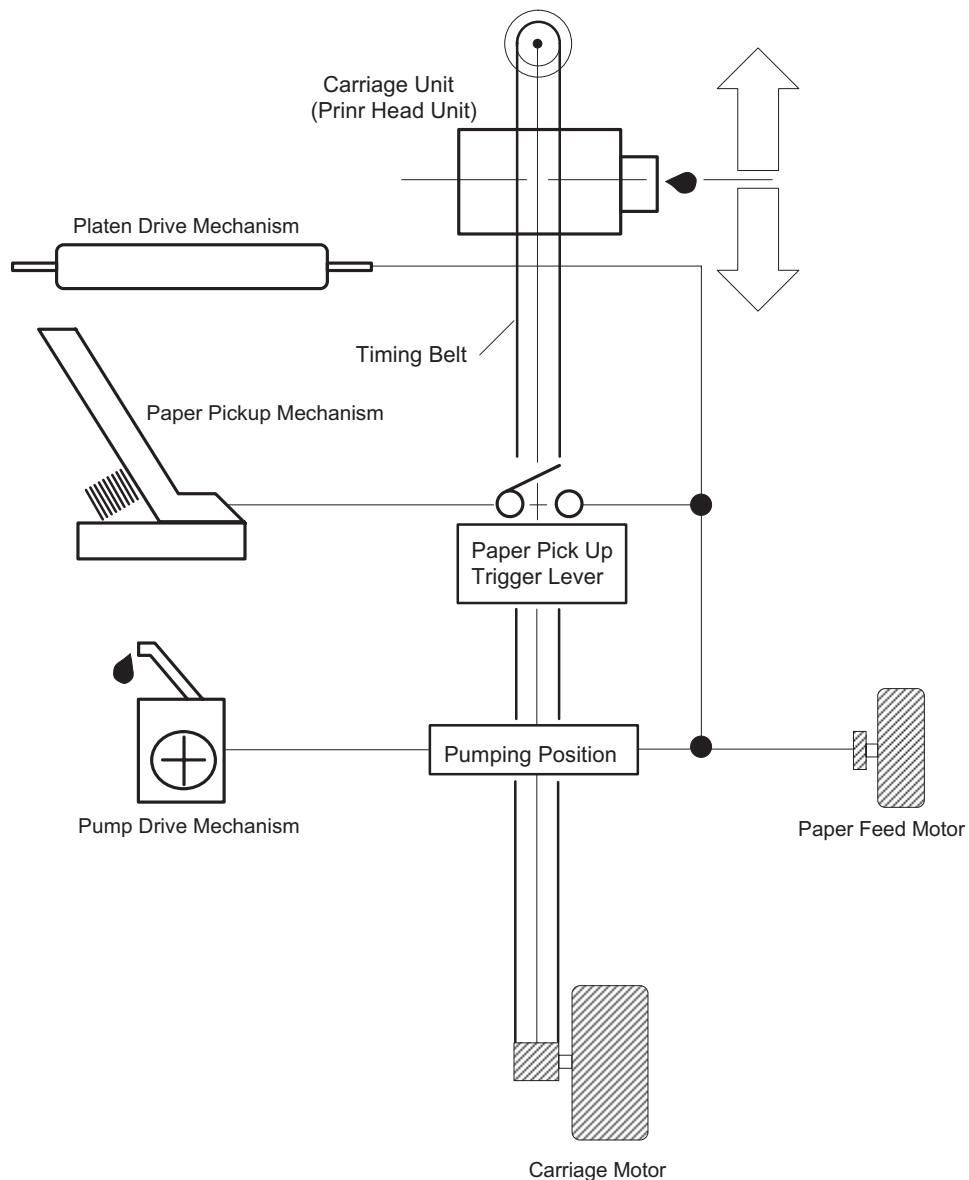


Figure 2-1. Stylus Color 400 Printer Mechanism Block Diagram

As major printer mechanisms in the figure 2-1, there are four major mechanisms as they are listed below.

- 1) Printing mechanism 2) Carriage unit 3) Paper pick up mechanism 4) Pump drive mechanism

2.1.1.1 Printing Mechanism

Basic principles of the print head which plays major role of printing mechanism is the same as previous models; on demand type MACH head method, but there is some difference in the resolution. (Refer to figure1-1) Also, unlike Stylus Color IIs, 820, 200 automatic correction type, in order to fix the dispersion of mufti layer piezo electric element which is used for driving each nozzles, it is necessary to input the VH value written on the side of print head by using exclusive program when you replace print head, control board, or the printer mechanism.(However, there are no resistor array to decide the VH voltage on the main control board.) Following explains print head.

- ❑ PZT
 - PZT is an abbreviation of Piezo Electric Element. Print signal from C206 board is sent through the driver board on the print head unit and to the PZT. Then, the PZT pushes the top cavity which has ink stored, and make the ink discharge from each nozzle located on the nozzle plate.
- ❑ Cavity Set
 - Ink which is absorbed from ink cartridge go through the filter and will be stored temporarily in this tank, which is called "cavity" until PZT is driven.
- ❑ Nozzle Plate
 - The board with nozzle holes on the printer head surface is called Nozzle Plate.
- ❑ Filter
 - When the ink cartridge is installed, if any dirt or dust around the cartridge needles are absorbed into the head inside, there is a great possibility of causing nozzle clog and disturbance of ink flow and finally causing alignment failure and dot-missing. In order to prevent this, filter is set at cartridge needle below and ink is once filtered here.

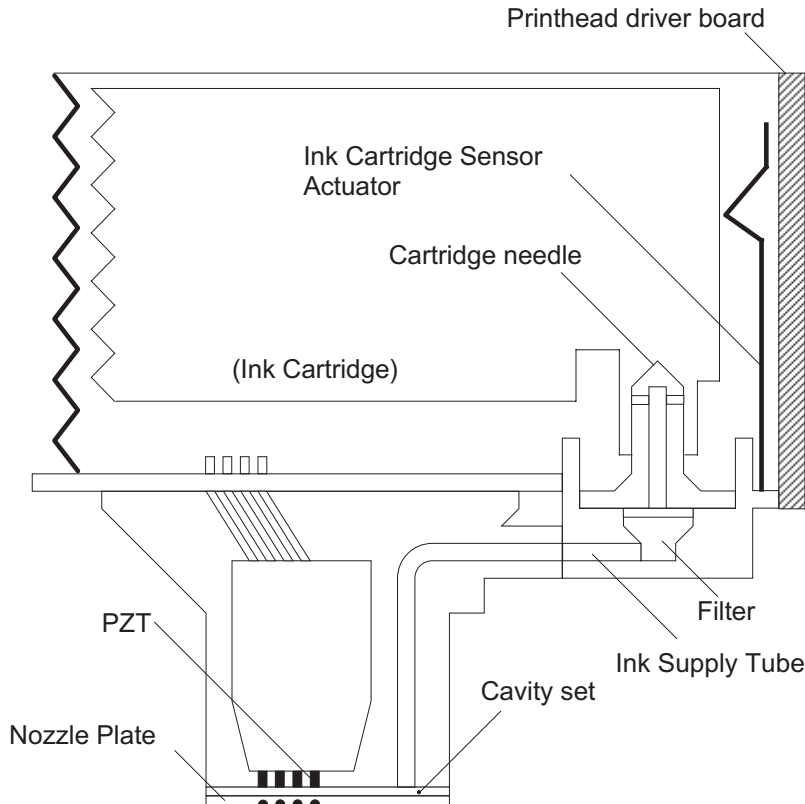


Figure 2-2. Print Head Sectional Drawing

2.1.1.1.1 Printing Process

Following figures indicate the sectional drawing of normal state and ejecting state of the print head.

(1) Normal State:

When the print signal is not output, PTZ also does not move in the waiting state(normal state).

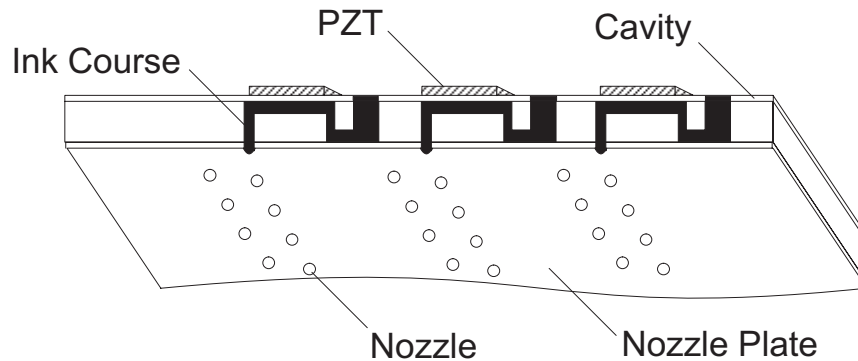


Figure 2-3. Print Head Normal State

(2) Ejecting State:

When the print signal is output from the C206 main board, IC(IR2C72C:Nozzle Selector) located on the Print head unit latches the data once by 1-byte unit. Appropriate PZT latched by nozzle selector is pushed into the cavity by applying common voltage from the C206 main board. By this operation, ink that is stored in the cavity pops out from nozzles.

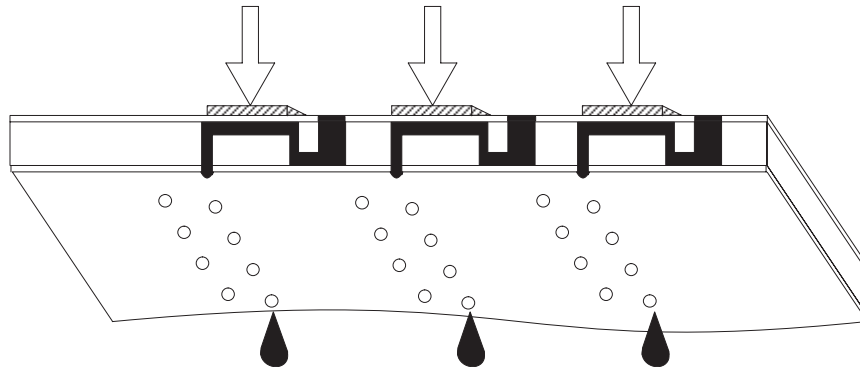


Figure 2-4. Print Head Ejecting State

2.1.1.1.2 Printing Method

This section explains printing method of actual printing such as printing text at various resolution select/printing mode and graphics printing. In order to prevent white or color banding which are peculiar problem of ink-jet, new Micro-Weave functions are added to the previous Micro-Weave function. The number of nozzles and printing mode according to the selected resolution are used separately by a user. The table below shows relation between selected resolution and printing mode.

- 1) Full Overlap Micro-Weave
- 2) Part Line Overlap Micro-Weave
- 3) Micro-Weave: (same as previous control)

Table 2-1. Resolution and Printing mode

Vertical direction [dpi]	Printing mode	Paper feed pitch [inch]	Forward Overlap-Nozzle	Non Overlap-Nozzle	Backward Overlap-Nozzle	Not used Nozzle
360	FOL M/W	15/360	#16~#30	---	#1~#15	#31~#32
	M/W	31/360	---	#1~#31	---	#32
720	FOL M/W	15/720	#16~#30	---	#1~#15	#31~#32
	POL M/W	29/720	#30~#32	#4~#29	#1~#3	---

Note1: M/W means Micro-Weave.

Note2: FOL means Full Overlap Micro-Weave.

Note3: POL means Part line Overlap Micro- Weave.

Note4: Forward Overlap-Nozzle and backward Overlap -Nozzle are described in the [1.Full Overlap Mirco-Weave] and [2.Part line Overlap Micro-Weave] below.

Following explains operation outlines of new Micro-Weave functions listed above.

[1. Full Overlap Micro-Weave]

In order to print one line at horizontal direction, this printing method is designed to complete a printing pattern by two-pass carriage operation with two different types of dot. When this two different types of dot pass one same line twice, it does not print the same dot twice.

- The nozzles whose configuration completely match to the black and CMY nozzle are used. (Usually Micro-Weave type)
- Therefore, all nozzles in case of CMY nozzle and #1~#63 nozzles in the B2 line in case of black head are its objects. (B1 line is not used at Micro-Weave. Refer to figure1-1 for detail of nozzle configuration.)
- Out of these 4 color nozzle objects, the number of all nozzles which are going to be used are divided equally into 2 groups.
- Paper feeding will be done as many as each number of nozzles which are divided into two groups and the same number of dots.(for example, if there are two 10-nozzle groups during 360-dpi printing at longitudinal direction, paper feeding of 10/360-inch becomes available.) At this time, two groups perform Micro-Weave individually and particular lines are passed by two different nozzles.

Note1) These nozzles which are divided into two groups must be set and divided in order to be a pair of odd and even number.

Note2) Two groups which are divided according to each elements will be divided either even dot or odd dot when particular lines(level direction line) are formed and eventually, these lines will be completed at selected resolution. Following is a conceptual figure when full overlap micro-weave orms a particular line.

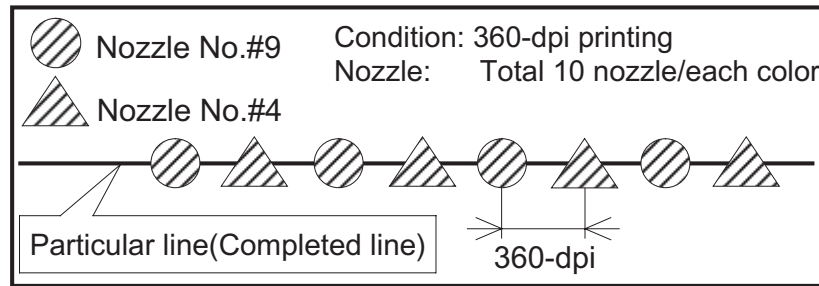


Figure 2-5. Full Overlap Micro-Weave

Note 3) The way firmware decides which nozzle becomes even dot or odd dot is determined as it is described below.

- If the line which is about to be printed is even line:
 - First dot prints odd dot lines and 2nd dot prints even dot lines.
- If the line which is about to be printed is odd line:
 - 1st dot prints even dot lines and 2nd dot prints odd dot lines. Eventually, horizontal resolution will be the same resolution as selected one.

[2.Part Line Overlap Micro-Weave]

This printing method is to perform Micro-Weave printing, overlapping a part of nozzles which are used for printing. As a result, a part of raster which is overlapped consists of different browse with different nozzles. The figure below shows 1-line Overlap at 5-dot sending as an example with explanation on the next page.

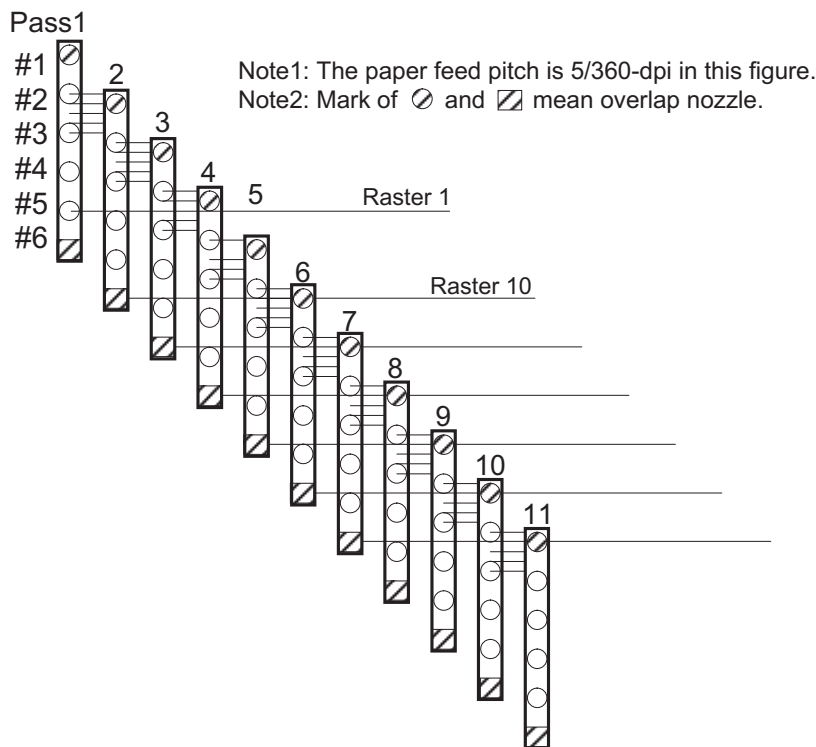


Figure 2-6. Part line Overlap Micro-Weave

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The difference between Full-Overlap Micro-Weave and Part line Overlap Micro-Weave are following;

- **Full-Overlap Micro-Weave:**
Printing is performed, judging if nozzles are even or odd dot by 2 different dots with all different rasters.
- **Part line Overlap Micro-Weave:**
After particular nozzles(only#1, and #6 in the figure2-7) are determined as overlap nozzles, even or odd dot will be determined like Full-overlap Micro-Weave does.
(Forward Overlap Nozzle is determined as even and backward nozzle is odd.)
Also, nozzles other than particular nozzles can print at even and odd dot just by one nozzle.

1) Overlap Nozzle : Head drive frequency is driven half of the ordinal one like 2) below.

2) Nozzle other than Overlap nozzle : Head drive frequency is twice as much as overlap nozzle.

Usually, the firmware changes over automatically these full overlap Micro-Weave, Part line Overlap Micro-Weave, and ordinal Micro-weave according to the selection of resolution. Also, when these three printing modes are performed by the Stylus Color 400, the printer performs top and bottom margin process in order to control the overprinting volume as little as possible.

2.1.1.2 Carriage Mechanism

Carriage mechanism is to drive the carriage with print head mounted from left to right or vice versa. The carriage drive motor in this printer is a 4-phase, 200-pole, stepping motor and is driven by 1-2phase, 2-2phase and W1-2phase drive method. This stepping motor allows the carriage to move freely to the particular positions which is necessary for various operation, such as paper feeding, ink absorbing, flashing, ink exchange and cleaning operations. The tables below shows carriage motor specifications and motor controls at each mode.

Table 2-2. Carriage Motor Specification

Item	Description
Motor type	4-phase/200-pole Stepping motor
Drive voltage Range	42VDC ± 5%
Internal coil resistance	7.8 Ohms ± 10%(per phase under 25 °C environment)
Driving speed(frequency) range[csp(pps)]	5(60)~340(4080)
Control method	Bi-Pola Drive

Table 2-3. Motor Control at Each Mode

Mode	Driving speed [CSP]	Drive frequency [PPS]	Drive method
High speed skip	340	4080	W1-2, 2-2,1-2phase drive*
Printing(Normal)	200	2400	W1-2phase drive
Printing(SLQ)	100	1200	W1-2phase drive
Capping	80	960	W1-2phase drive
Wiping	40	480	W1-2phase drive
Cap(valve release)	20	240	W1-2phase drive
Withdrawal of cap	5	60	W1-2phase drive

*Note 1): The reason why plural drive methods exist is that following some sequences described below exist in the each mode and stable carriage operation and printing are performed individually by different drive methods. This drive method is especially necessary for high speed skip.

Acceleration 1 mode → Acceleration 2 mode → Deceleration 1 mode → Deceleration 2 mode

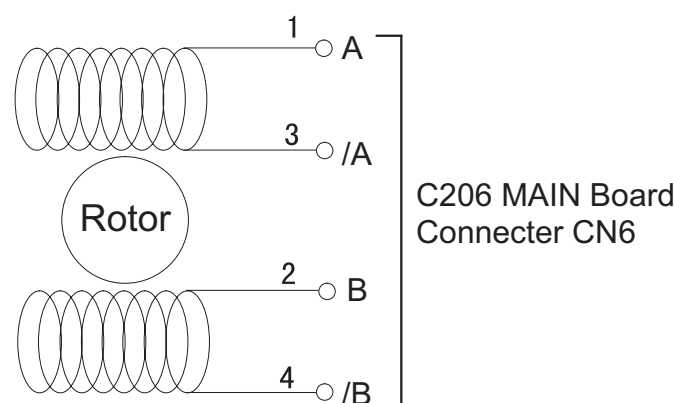


Figure 2-7. CR(PF) Motor Internal Block Diagram

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The table below shows W1-2 phase drive sequence at each steps when the rotor of carriage motor makes one rotation. In the Stylus Color 400, in addition to a function that printing is performed with W1-2 drive phase, high speed skip mode which is a function to skip over the blank from the end of the printing data to the next data starting point with high seed can be also performed by 2-2 and 1-2 phase drive. W1-2 phase requires 4 times as much steps as 2-2 phase drive, calculating 2-2 phase as standard. By using this method, it becomes possible to supply constant stable torque to the motor. As a result, it also became difficult to be influenced by vibration from the printer mechanism during printing.

Table 2-4. Motor Drive Sequence(W1-2 phase drive)

Sequence Number	Phase A				Phase B			
	Phase a	10a	I1a	Current Duty	Phase b	10b	I1b	Current Duty
0	0	1	0	+2/3	0	1	0	+2/3
1	0	0	1	+1/3	0	0	0	+1
2	X	1	1	0	0	0	0	+1
3	1	0	1	-1/3	0	0	0	+1
4	1	1	0	-2/3	0	1	0	+2/3
5	1	0	0	-1	X	0	1	+1/3
6	1	0	0	-1	1	1	1	0
7	1	0	0	-1	1	0	1	-1/3
8	1	1	0	-2/3	1	1	0	-2/3
9	1	0	1	-1/3	1	0	0	-1
10	X	1	1	0	1	0	0	-1
11	0	0	1	+1/3	1	0	0	-1
12	0	1	0	+2/3	1	1	0	-2/3
13	0	0	0	+1	1	0	1	-1/3
14	0	0	0	+1	X	1	1	0
15	0	0	0	+1	0	0	1	+2/3

This W1-2 phase drive (or 2W1-2 phase drive) is called Micro-step and is attached with so called 2/3 • Vref or 1/3 • Vref factor, compared with drive current value (Vref100%) which is supplied at 2-2phase drive. This Micro-Step allows the rotor to have delicate rotation. In the 2-2 phase drive method, it is usually required to take 4-step sequence in order to rotate the rotor once. However, in case of W1-2 phase, it is required to take 16-step sequence(in the table 2-4, sequence 0~15) which is 4 times more than 2-2 phase method to do that. Also, in case of 2W1-2 phase drive which can be seen in the Stylus Color etc., it takes 2-step to rotate the rotor once. The table below shows relation of rotation direction of rotor and carriage proceeding direction.

Table 2-5. Relationship Between Rotor Direction and Carriage Operation

Carriage proceeding direction	Rotation direction of Rotor	Drive method	Proceeding order of sequence
HP→80 column direction	Looking from rotor output side, clockwise direction	2-2, 1-2, W1-2 phase	Sequence No.0→15
80 column→HP direction	Looking from rotor output side, counterclockwise direction	2-2, 1-2, W1-2 phase	Sequence No.15→0

The figure below shows the carriage mechanism. The print head as a core of the printing mechanism is stored in the carriage unit. This print head keeps the tilt of print head in flexible and adjustable structure by moving the adjustment lever up and down by the tilt adjustment mechanism. (Refer to chapter 4 for more details) Also, parallelism adjustment lever is mounted on the left and right side of carriage guide shaft and it adjusts parallelism degree between platen and shaft when this shaft is installed to the printer mechanism.

After this adjustment is completed and operate PG adjustment lever, it becomes possible to change the space between the platen surface and the print head surface into 2 phases; either 1.1mm to 1.8mm. It is possible to vary the space between platen surface and print head by rotating the axis of carriage guide shaft which itself is decentralized, with the operation of PG lever. This is the mechanism that user can adjust the appropriate PG value by himself according to the paper thickness or any other environmental conditions such as paper curl.

Carriage lock mechanism is to prevent the carriage from being left at uncap position for a long time because of vibration during the printer transport or mishandling by the users. If the carriage is left at uncap position and uncap state of the print head for long time, an ink on the print head surface gradually becomes viscosity. As a result, the nozzle will be unable to discharge an ink. To make matters worse, the holes(crater) of nozzle may be completely clogged by the viscosity ink and it may not be able to return to the normal condition just by cleaning operation. In order to prevent this, printer goes to carriage lock state at the following conditions.

After Power OFF operation:

- If the power is turned off on the way of printing or any other performance, carriage lock will be performed in the end after completing initialize operation.

□ After power ON operation:

- After power is turned on and automatic P-On Cleaning is performed, then carriage lock will be performed. P-On Cleaning is an automatic head cleaning that is performed when the power is turned on. The timer IC always calculates printer's power OFF time by the power of lithium battery mounted on the C206 main board. P-on cleaning function automatically selects the cleaning level according to the time which the printer is not in used.

□ After Eject the paper:

After Load/Eject button is pressed and the paper is ejected, if the data is not input, the printer performs carriage lock and goes to standby state. However, if the paper is loaded to the printer inside by Load/Eject button, the printer does not perform carriage lock operation.

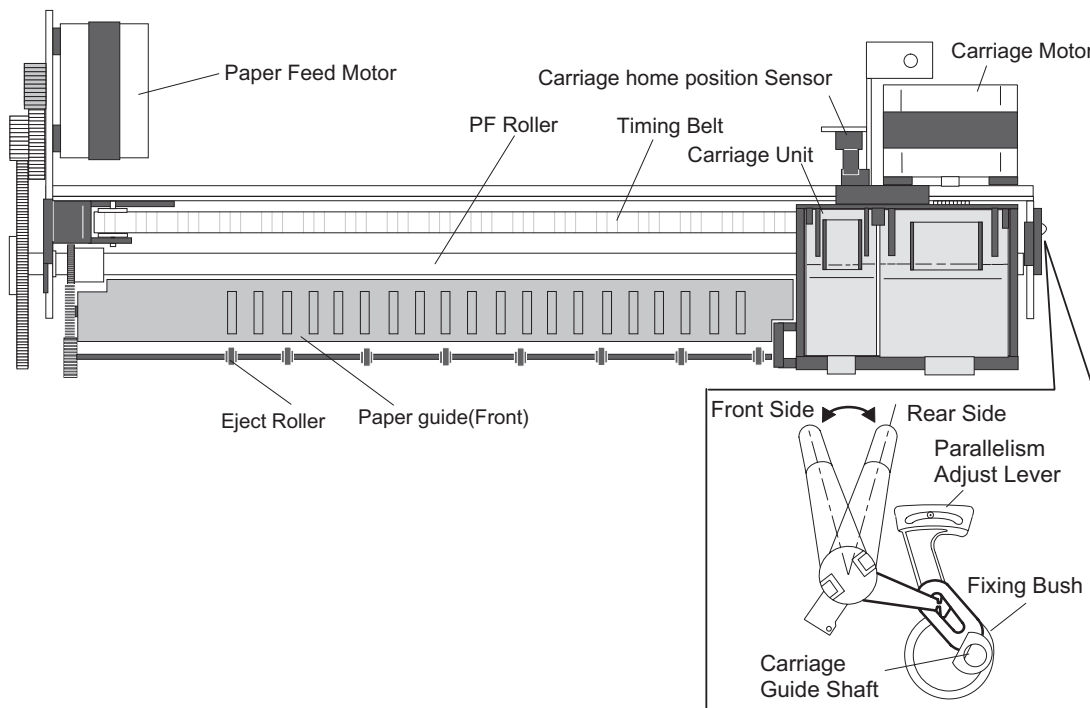


Figure 2-8. Carriage Mechanism Top (Viewing)

2.1.1.2.1 Paper Gap Adjust Mechanism

This mechanism can be set by the users and can prevent various problems related to low image density or print with any dirt by changing the positions of PG lever according to the paper types.

Table 2-6. Platen Gap Adjust Lever Setting

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

It is a major premise that parallel adjustment is done correctly for the space between head and platen (PG adjustment value above) which can be changed by platen gap adjustment. Parallel adjustment should be done when the serviceman mounts the carriage guide shaft on the printer mechanism during the production process or repair service. In the adjustment, the space between parallel adjustment lever and gage should be 1.04 mm.

2.1.1.3 Paper Feed Mechanism and Pump Mechanism

Mechanisms that send the paper in the hopper to inside the printer and perform constant paper feed in order to perform printing on the sent paper are called paper feed mechanism as generic name. In the Stylus Color 400, 4-phase, 200-pole hybrid type pulse motor is used in the PF motor as a motive power of the paper mechanism and driving is done at 2-2 and 1-2 phase drive method. This motor is not only used as a power source for paper feed mechanism but also used as power source of pump mechanism which is necessary for print head cleaning. By using this pulse motor, it becomes possible to use high speed driver or intermittent drive for the various paper feeds and pump operations such as paper feed, slight paper feed, high and low speed absorption of pump operations. Following tables (Table 2-7 and 2-8) show PF motor specifications and control method at each mode.

Table 2-7. PF Motor Specification

Item	Description
Motor type	4-phase/200-pole Stepping motor
Drive voltage	42VDC \pm 5%
Coil Resistance	7.8 Ohms \pm 10% (per 1 phase under 25°C environment)
Drive frequency [csp(pps)]	400-4320Hz
Control method	Bi-Pola Drive

Table 2-8. Motor Control Method at Each Mode

Mode	Drive Method	Drive Frequency [Hz]	Pulse Space (μ s)
Paper feed A	2-2 phase	4320	231
Slight paper feed	1-2 phase	400	2500
Slight paper feed	1-2 phase	2400	417
High speed attraction of pump	2-2 phase	4100	243
Low speed attraction of pump	1-2 phase	1800	555
Low speed paper feed	1-2 phase	1200	833
Paper feed B	2-2 phase	3400	294
Paper feed C	1-2 phase	4000	250
Ordinal absorption of pump	1-2 phase	4100	243

Following tables show 1-2phase drive method at PF motor drive and each drive sequence at 2-2phase drive method.

Table 2-9. 1-2 Phase Drive Method

Step No.	Clockwise		Counter clockwise	
	Phase A	Phase B	Phase A	Phase B
1	+2/3	+2/3	+2/3	+2/3
	0	+1	+1	0
2	-2/3	+2/3	+2/3	-2/3
	-1	0	0	-1
3	-2/3	-2/3	-2/3	-2/3
	0	-1	-1	0
4	+2/3	-2/3	-2/3	+2/3
	+1	0	0	+1

Table 2-10. Drive Sequence at 2-2 Phase Drive

Step No.	Clockwise(CW)		Counter clockwise(CCW)	
	A	B	A	B
1	+2/3	+2/3	+2/3	+2/3
2	-2/3	+2/3	+2/3	-2/3
3	-2/3	-2/3	-2/3	-2/3
4	+2/3	-2/3	-2/3	+2/3

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Papers on the ASF (auto-sheet-feeder) supplied by the user are carried to the printer inside by paper pick up sequence. Unlike the previous models, ASF of Stylus Color 400 has multi feed prevention mechanism. Following explains this function and figure below shows its mechanism.

[1. Multi feed prevention mechanism]

When the Load/Eject button is pressed, reversed rotation of PF motor is performed. The return lever resets papers which are already in the out of stand by position in the stand by position and make it possible to perform stable paper feeding by picking up the paper again.

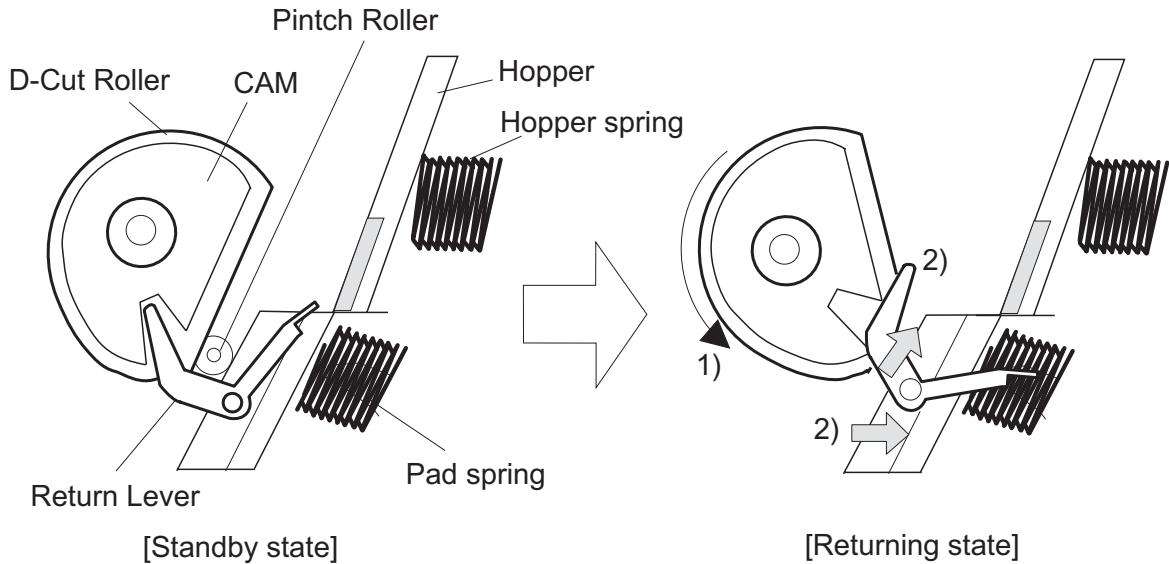


Figure 2-9. Multi Paper Feed Prevention Mechanism

Following explains process of multi feed prevention step by step. Refer to the figure above and confirm its operation.

- [Step 1]** When the load/Eject switch is pressed or printing order is input from the PC, PF motor rotates counterclockwise and makes the CAM rotate towards direction of 1 in the figure above.
- [Step 2]** When the CAM covers the notch by the return lever, that position is considered as home position, being monitored by ASF sensor.
- [Step 3]** When the CAM rotates toward 1 in the figure above, the return lever is pushed by the notch of CAM and falls towards 2. At this time, the return lever moves to direction 3 by this motion, and push down the pad which is waiting in the below part. At this time, friction of pinch roller and pad will be canceled.
- [Step 4]** The papers which are out of stand by position by the previous paper feed motion are returned to the paper stand by position by flip over strength of return lever. After this, PF motor rotates clockwise and the printer goes to pick up sequence.

In the paper pick up mechanism of Stylus Color 400, same mechanism as Stylus Color IIs/820 are applied. This mechanism changes adjoined lines of gear by colliding trigger lever with carriage unit and convey the motive power on the platen to the ASF side(paper roller). The figure below shows mechanism with explanation.

[2. Paper pick up mechanism]

When the Load/Eject switch is pressed or printing order is input, the carriage unit moves until the left edge and collides with paper pick up trigger lever. When the carriage collides with this trigger level, a planetary gear located on the same axis is also pushed at the same time and conveys the motive power on the platen to the adjoined gear line side for ASF drive.

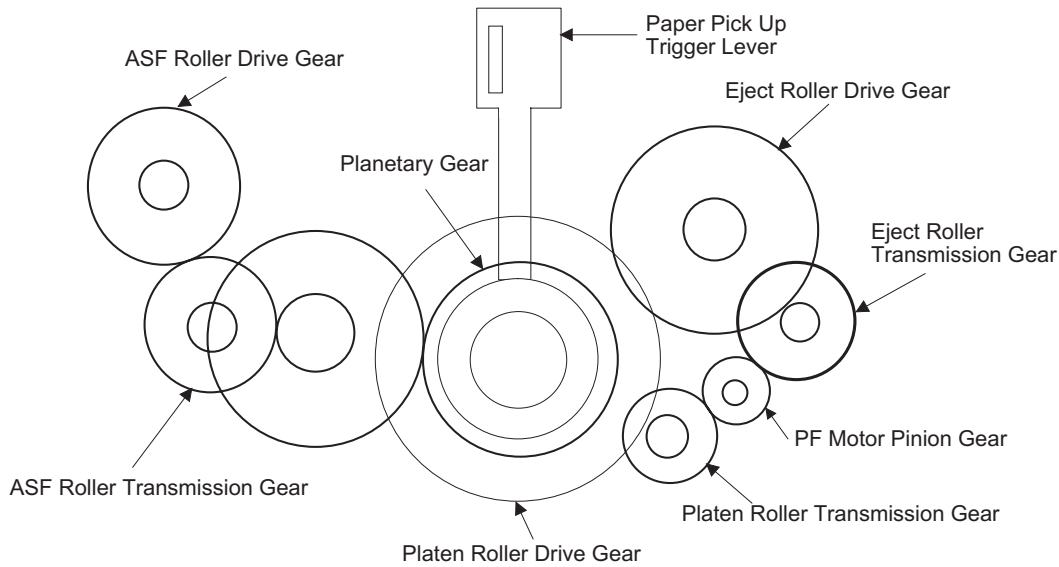


Figure 2-10. Paper Pick Up Mechanism

[3. Paper feed mechanism]

After papers in the ASF receive controls from pick up and multi feed prevention mechanism, they are sent to the printer inside. The papers picked up by paper roller in the ASF goes to between platen and roller support. Also, the eject roller pushes out the paper completely until the end and the roller support drops the paper in the eject tray. The eject roller is driven with an eject paper notched roller as pair where is located on the paper eject roller. Paper eject notched roller solves the deflection of paper that is in the between platen eject notched roller and paper eject roller and always keep a certain space between print head and paper surface. The figure below shows the paper feed mechanism.

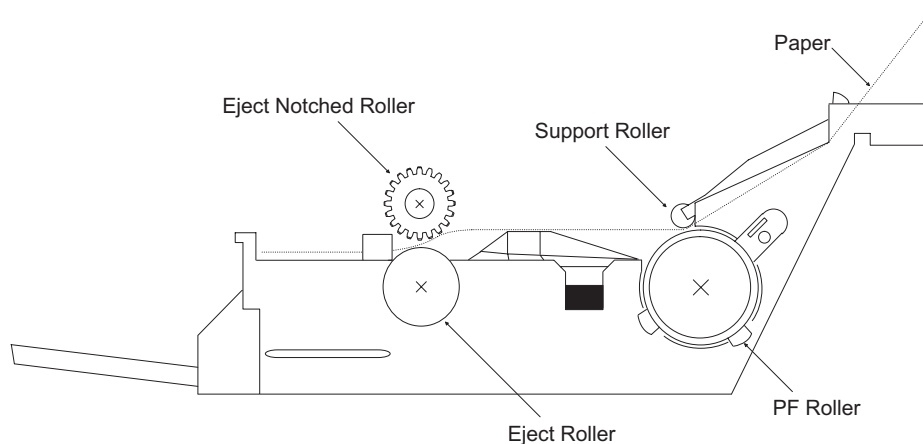


Figure 2-11. Paper Feed Mechanism

2.1.1.4 Ink System

Ink system mechanism consists of 1)cap mechanism, 2)pump mechanism, 3)carriage lock mechanism, 4)waste ink absorber and 5)ink sequence. Out of these mechanism, from 1) to 4) are physical mechanism and parts which are mounted on the printer mechanism and 5) ink sequence is performed automatically by firmware. Also, unlike previous models, since Stylus Color 400 has no engage/disengage mechanism to change over pump mechanism and paper feed mechanism, it is one of the major characteristics that pump and platen are always at work whenever the PF motor is driven. The figure below shows head positions when the ink system and various ink sequence are performed.

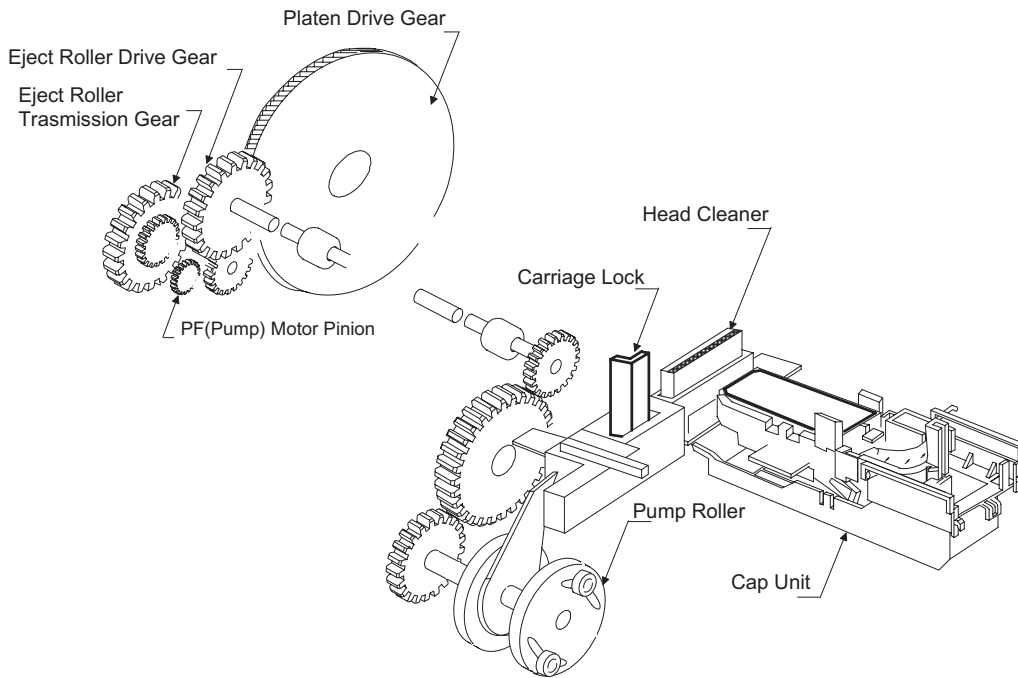


Figure 2-12. Ink System Mechanism

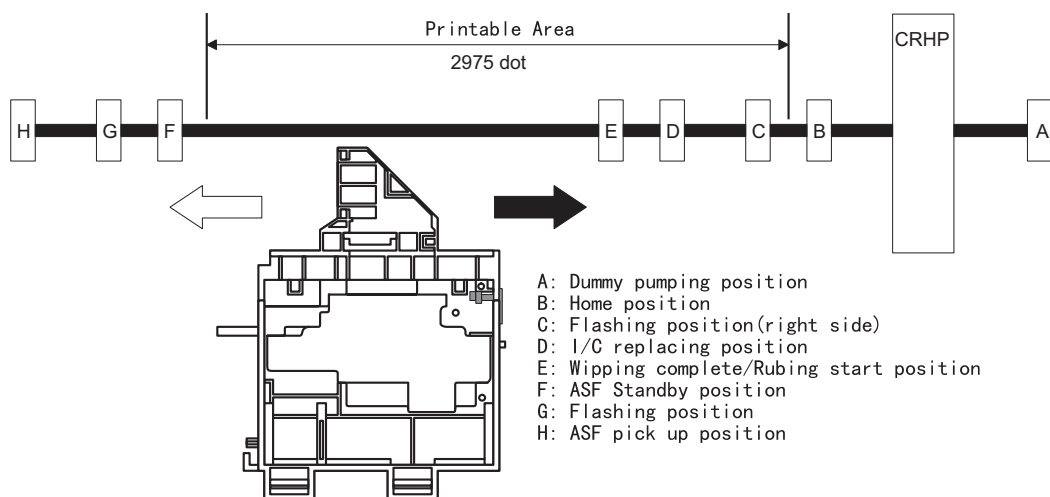


Figure 2-13. Major Ink Sequence Position on the Carriage Mechanism

2.1.1.4.1 Pump Mechanism

In the Stylus Color 400, there is no switch or mechanism to change over the pump/paper feed mechanism. Therefore, whenever the paper feed/pump motor rotate, pump drive roller in the pump unit inside rotates. However, ink absorption/non ink absorption are separated by the roller rotational direction. Also, even if the pump driver rotates toward ink absorption and the carriage position is in the false absorption position, only driving in the pump mechanism is performed and actual ink attraction is not done. The figure below shows process of conveying motive power to the pump drive roller.

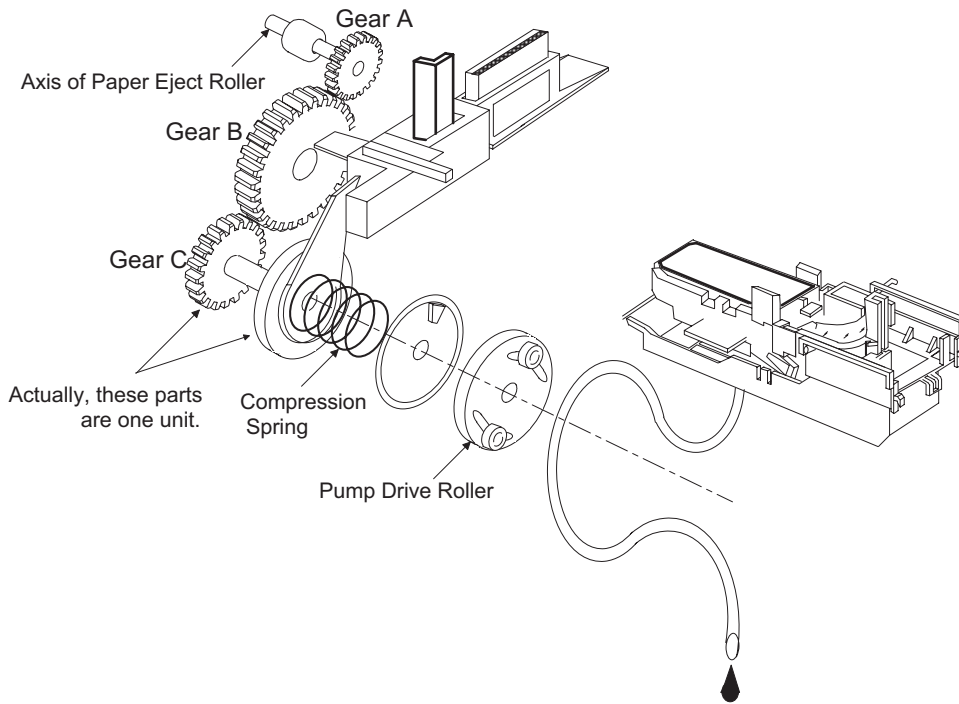


Figure 2-14. Pump Mechanism Power Transmission Process

The process of conveying the motive power to the paper eject roller by rotating the pinion of PF motor is described in figure 2-12. This motive power is conveyed to the Gear C through the Gear B. In the figure above, although the lever in order to drive Gear C, carriage lock, head cleaner mechanism is shown separately, it is constructed as one unit. Since the engagement of these two parts depends on the tension of the compression spring, if the lever is burdened, only Gear C and pump roller rotate and no more motive power is conveyed to the lever part.

The table below shows PF/Pump motor rotational direction and pump system operation.

Table 2-11. Relationship Between Pump Motor Rotation and Pump Operation

PF/Pump motor rotational direction	Pump unit operation
Clockwise(CW) forward rotation	1)Release from the Pump pressure welding 2)Head cleaner reset 3)Carriage lock reset
Counterclockwise(CCW) backward rotation	1)Rotation towards pump pressure welding 2)Head cleaner set 3)Carriage lock set

The figure below shows the pump operation at clockwise and counterclockwise rotation.

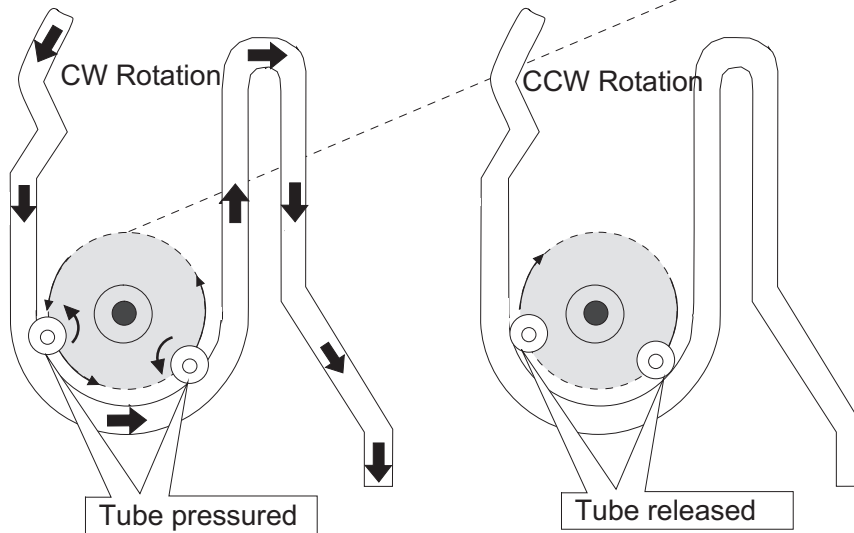


Figure 2-15. Pump Roller Rotation and it's Operation

In the ink absorptive operation such as cleaning, flushing and initial ink charge except for printing operation, ink in the ink cartridge drains to the waste ink absorber(pad) through the cap by the pump unit drive. In case of printing and flashing drive, ink is popped out by the PZT in the print head, but in case of absorptive operation such as cleaning and initial ink charge, ink absorption is performed only by the pump drive without PZT drive after the head surface is adhered to the cap. The next page explains cap mechanism and relation between printer operation and cap.

2.1.1.4.2 Cap Mechanism

In the cap mechanism, in order to prevent ink from being thickened on the head surface, it is controlled that the head surface stays adherent to the rubber frame of the cap surface when the power is off. The absorber is spread in the cap and can hold a certain amount of ink which is absorbed from the head without draining it to the waste ink pad. Also, in the bottom of absorber, there are two valves in order to control adhesion of head and cap surface, and one exit to drain ink to the waste ink pad.

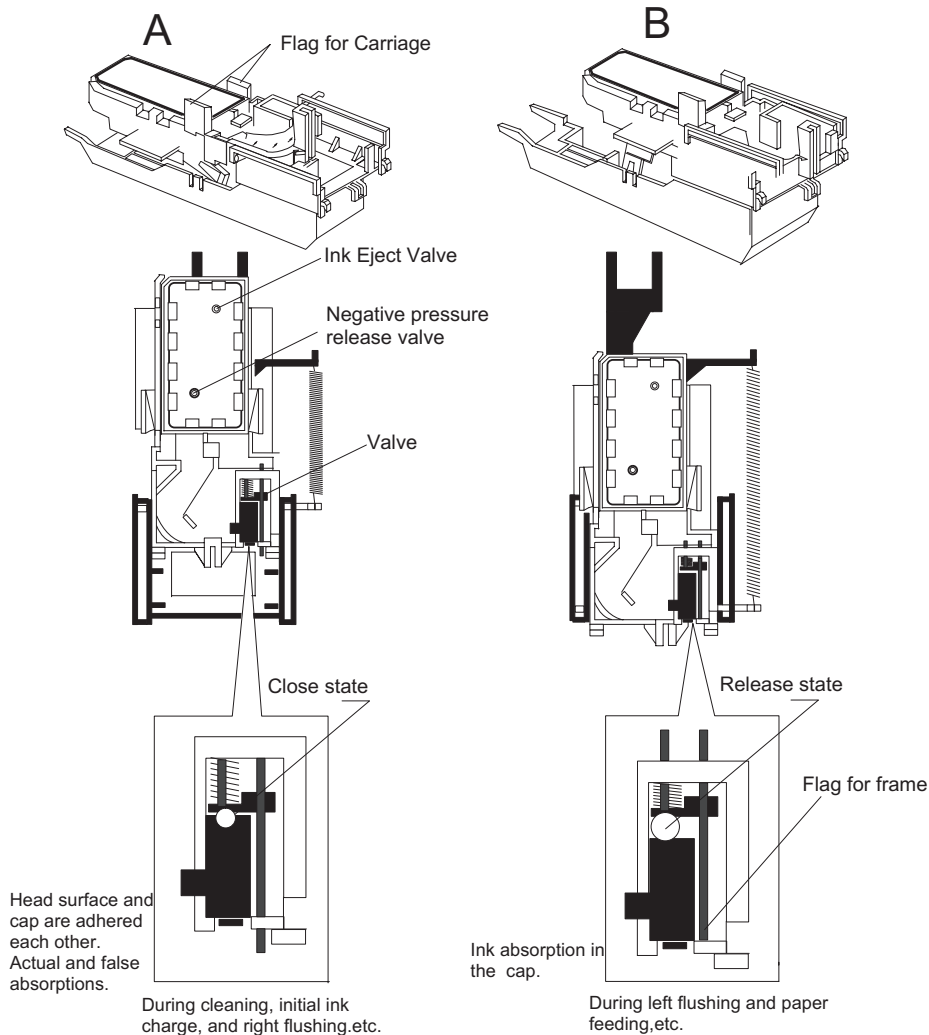


Figure 2-16. Cap Mechanism Operation Principle

If the carriage is out of HP (in this case, in the printable area or paper feed position), the valves on the cap mechanism stay in the position A in the figure above and are always closed. In this condition, the carriage collides with the flag, and actual ink absorption and slight ink absorption are performed. Also, by moving the carriage to the further right side and colliding the flag for opening the valves with the frame, negative pressure is released in the state that the head surface and cap are adhered. This makes it possible for ink on the nozzle plate surface to be ready for leaving from the cap in the stable condition.

2.2 Electrical Circuit Operating Principles

Stylus Color 400 contains the following four electric circuit boards.

- C206 PSB/PSE board
- C206 Main board
- Head Driver board
- C206 PNL board

C206 PSB/PSE, C206 board are explained in this section. The head drive board is installed in the head unit on the carriage. The figure below shows major connection of the 3 boards and their roles.

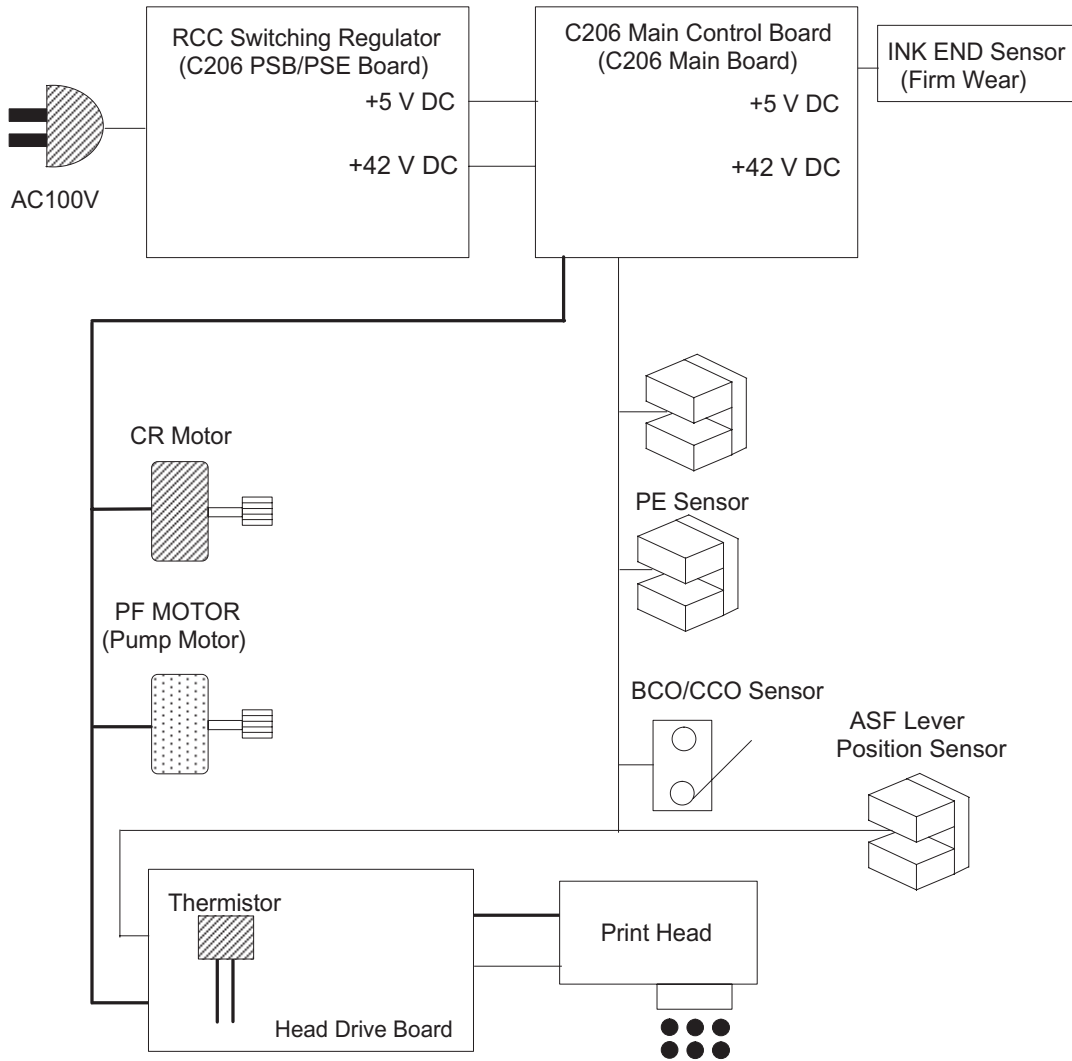


Figure 2-17. Electric Circuit of Stylus Color 400

2.2.1 C206 PSB/PSE Power Supply Board

C206 PSB/PSE board is a power supply board with a RCC switching regulator, which generates +42VDC for drive part and +5VDC for logic part to drive the printer. One of the major characteristic of this board is that the same secondary switch is used as Stylus Color series printer. By using this switch, the following difference can be seen as superficial phenomena compared with products applied with primary switch method, such as Stylus Color IIs, II and Stylus 800/1000 series printer. The table 2-12 below shows application of voltages generated by C206 PSB/PSE board.

- 1) Even if the switch is turned off during the middle of printer operation, since the driving power is turned off after the carriage goes back to the carriage lock position, the possibility of clogging ink nozzle will be decreased.
- 2) If the switch is turned off when the papers in the printer are still being carried except for the papers in the hopper, the same operation mentioned above is performed and the driving power is turned off after the paper is completely ejected.

Table 2-12. Application of DC Voltage

Voltages	Application
+42VDC	<ul style="list-style-type: none"> ■ CR Motor ■ PF/Pump Motor ■ Head driving power supply
+5VDC	<ul style="list-style-type: none"> ■ Power supply for logic control <ul style="list-style-type: none"> ▪ System control signal ▪ Sensor circuit power supply voltage ▪ LED panel drive power supply ▪ Nozzle selector control signal power supply voltage

Figure 2-18 shows block diagram of C206 PSB/PSE board. The process from the input of AC100V to the output of 42 V DC and 5 V is explained below.

- 1) Regardless of the state of power switch(On or OFF), the voltage is always applied in the primary side of the power supply board from the moment or at the state that AC-plug is plugged in. At this time, F1 plays a role of preventing AC100V from coming into the F1. L1 and R1-R2 also prevent high harmonic wave noise generated in the RC circuit filter which consist of C1~C4 and R1~R2 from going out, and eliminate the noise from outside here.
- 2) The AC is full-wave rectified by diode bridge DB1, and converted to $\sqrt{2}$ x AC in voltage by smoothing electrolytic capacitor C11.
- 3) The pressured up direct current makes Q1 On through the starting resistor R31 and starts the primary side of the circuit.
- 4) When the primary side is On state, the energy(current) led by the electromagnetic induction through the trans (T1) does not flow to the secondary side since the diode(D51) on the secondary side is installed in the opposite direction.
- 5) When the energy which is charged in the trans is reaching the saturated state, the voltage which makes the Q1 On becomes weak gradually. At the point that this voltage drops at the certain voltage, C13 absorbs the current in the opposite direction and Q1 is quickly shut off by the resulting sharp drop.
- 6) When the primary side is turned off, the energy charged in the T1 is opened according to the diode(D51) direction which is installed on the secondary side. Basically, 42 V DC is output by these circuit operations and the number of T1 spiral coil .
- 7) +5VDC is generated by pressured down this +42VDC as power supply. IC51 pressures down the +42VDC and generates precise +5VDC by chopping off the output, forming the standard santooth wave form by the outer RC integration circuit.

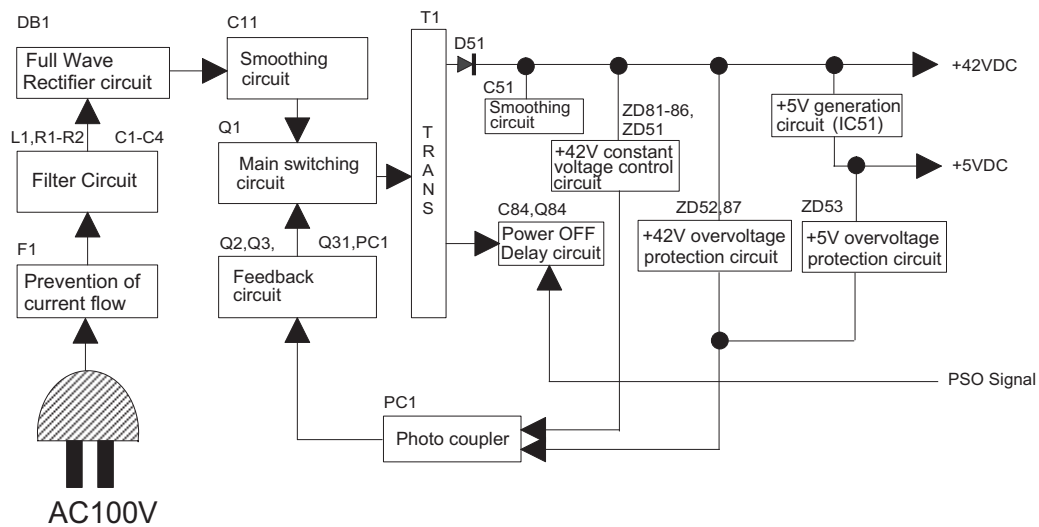


Figure 2-18. C206 PSB/PSE Board Block Diagram

The C206 PSB/PSE board has various control circuits to stop output if malfunction on the power supply board, on the main board or on the duty of printer mechanism happen. Following explains each control and protection circuits.

1) +42V Line Constant Voltage Control Circuit:

The output level of the +42V line is monitored by a detection circuit consisting of seven Zener diodes. This circuit prevents voltage from dropping for constant output voltage.

2) +5V Line Over voltage Protection Circuit:

This protection circuit is in the same line as +42V over voltage protection circuit is located. The output voltage level of the +5V line is monitored by a Zener diode. This circuit shuts down the circuit operation forcefully when the voltage level exceeds +9V.

3) +42VDC Line Over voltage Circuit:

This circuit is in the same line as +5V line over voltage protection circuit is located. The output level is monitored by two Zener diodes. If the voltage level exceeds +48VDC, this circuit stops circuit operation forcefully.

4) +5V Line Constant Voltage/Constant Current Control Circuit:

The output current is monitored by a +5VDC generation switching control IC(IC51), which also monitors the output voltage. This information is input to the internal comparator and stabilizes +5V line. Also, operation of the secondary side switch is explained below.

- 1) When the power is turned on, Q1 repeats ON/OFF automatically along with the increase and decrease of energy on the trans coil at the primary side. While the power is being on, PSC signal is input to the power supply board from the C206 main board.
- 2) This signal turns Q84 on and it becomes possible to discharge energy between 8-9 of T1. At this time, even if the power is turned off, the electrolytic capacitor keeps Q84 on for a while. By this electrolytic capacitor, output is hold at least 30 seconds even after the power is turned off. This time helps the printer to complete the P-Off operation.

2.2.2 C206 MAIN Board

Various DC voltage generated on the C206 PSB/PSE board is added various signals in order to drive the printer function on the C206 main board, and the drive of CR/PF(Pump) motor and printing head is performed. This control board consists of system part and drive part. In the system part, there are formation and controls of various signals in order to drive the CR/PF(pump) motor, sequence control by input from the sensor circuit, and also output of signal to select appropriate nozzle for the printing head. On the other hand, the drive part has constant current drive by the driver IC for the CR/PF(pump) motor drive and trapezoidal wave form circuit for head drive.

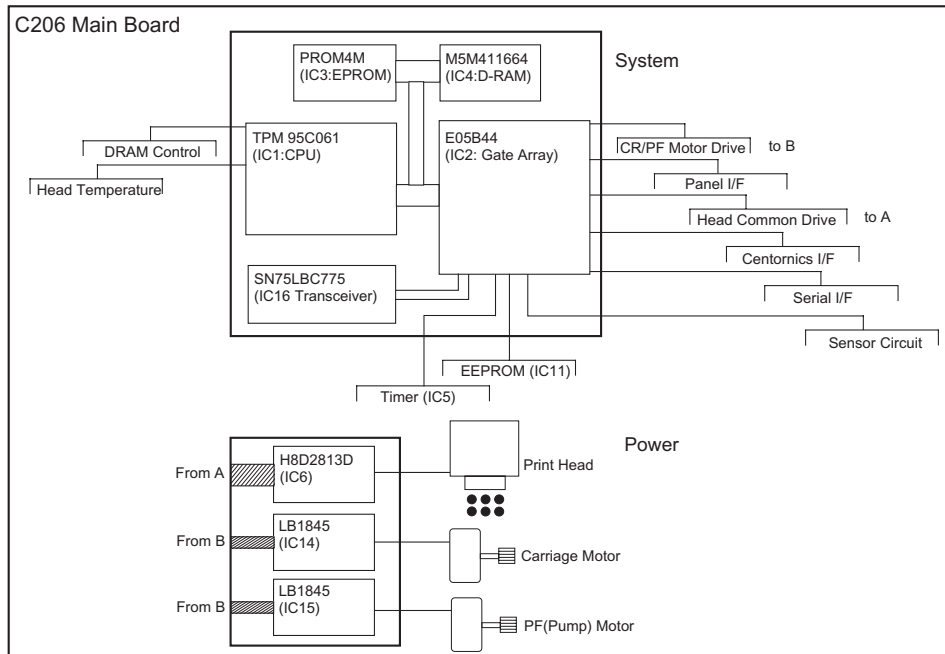


Figure 2-19. C206 Main Control Board Block Diagram

[CPU]

The C206 main board is controlled by a 16-bit CPU(TMP95C061AF) running at 25Mhz. Gate array manages most of controls and monitors. Likewise the Stylus Color, the D-RAM is applied for RAM which is used as work area for receiving data and developing the data and CPU manages its control such as CE, RAS/CAS controls.

[Gate Array]

E05B44 controls following functions.

- Motor control : Each motor performs data transmission(W1-2 phase) that motives Micro-Step.
- Head voltage control: In the ink jet printers, drive voltage wave form(trapezoidal wave form) in order to drive PZT is formed in the various shapes according to the types of the printers. Therefore, it is necessary to form appropriate drive form for each head. Head voltage control forms necessary wave form for each control signals and outputs them.
- EEPROM control: The correction value to eliminate the error of each printers at the production process is installed in the fixed address of IC. When the power is turned off, the contents set by users is written instantly, and is read to the RAM when the power is turned on.
- Sensor Data: The sensor detects information at the various conditions, which is necessary for the printer operation. The gate array recognizes signals and changes over to the next control.

EPSON Stylus Color 400 Service Manual

- **Timer Data:** The timer IC that uses lithium battery as power source monitors how long the power is off. When the power is turned on, it is changed to appropriate cleaning level according to the time that the power is off.
- **Serial Data:** The gate array receives serial data through the transceiver IC.
- **Parallel I/F control:** With the use of IEEE1284 Nibble mode, it became possible not only to receive the data from the host but also to return various information which the printer possesses to the host.

[Common Driver IC]

The trapezoidal wave form circuit for head drive is became to HIC from the previous discrete structure. Because of this, it is not necessary to adjust the adjustable VR on the board during production process. Various electric charge/discharge control signals are all processed in the HIC.

[CR/PF Motor Drive Circuit]

Constant current drive is performed by the HIC. Out of this, only CR Motor is controlled for Micro-Step control and HIC becomes possible to flow the appropriate current value at each steps. (PF Motor has only 1-2, 2-2phase drive method). Also, bipolar drive is performed on the 4 cables individually. Following pages explain each major control circuit.

2.2.2.1 Reset Circuits

The reset circuit prevents the CPU from running away, which is caused by the unstable voltage in the logic line during the power ON/OFF operation. Also, this circuit monitors level of power voltage at the over loading or malfunction on the circuit and manages the printer to operate normally, keeping the damage to the printer minimum during the abnormal situations. On the C206 main board, 2 ICs are mounted ; IC for monitoring the voltage level (logic line) and IC for monitoring the voltage level (power line) and both are monitored by the gate array and CPU.

The figure below shows reset circuit block diagram with explanation on the next page.

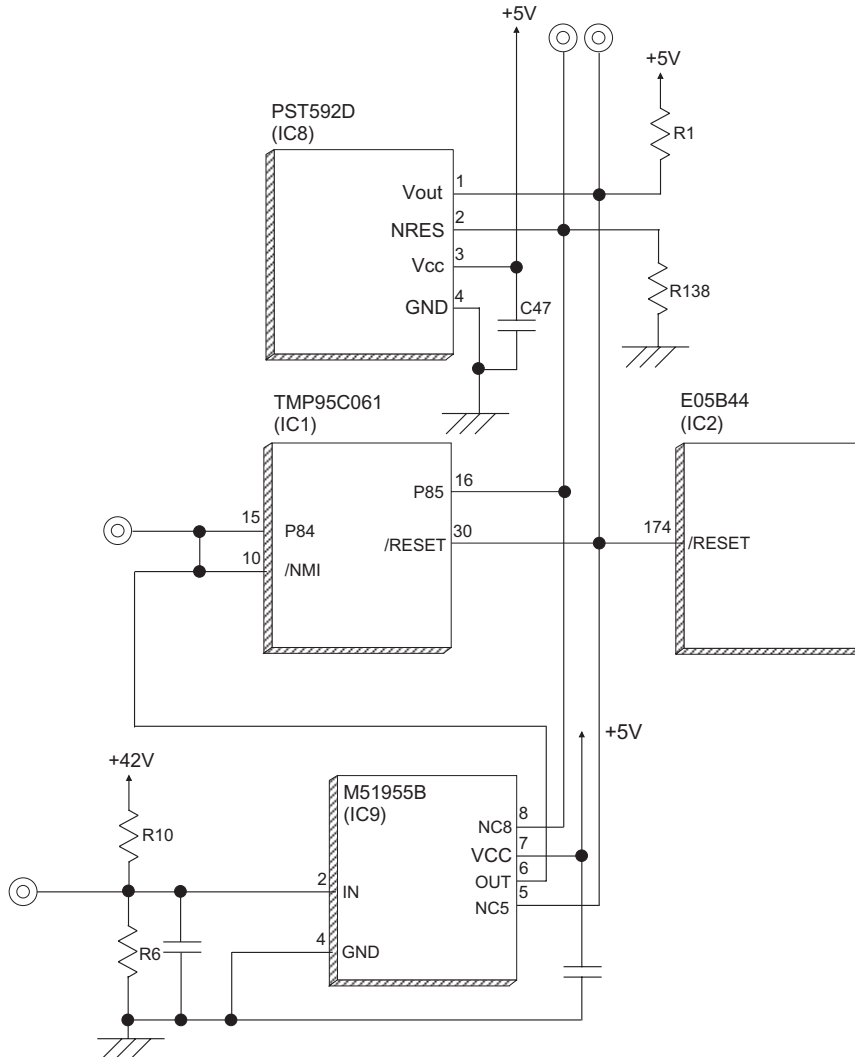


Figure 2-20. Reset Circuit Block Diagram

[PST592(IC8)]

The actual operation of the circuit is to keep outputting Low signal until +5V line goes up to +4.2V when the power is on, and to cancel the reset signal with output of High signal when the voltage goes up more than 4.2V.

[M51955(IC9)]

This IC also performs as monitor on the power line same as the reset IC for logic described above. High/Low is judged at the 33.2V.

[Relation between IC8 and IC9]

Reset signal which is low and output by IC9 is input to the CPU and gate array and system reset operation is performed. Also, this signal is detected on the IC9(IC for reset monitor, power line) and outputs the same Low signal towards CPU/NMI terminal by being input to NC5.

2.2.2.2 Sensor Circuits

The following sensor circuits are mounted in the Stylus Color 400 and selects appropriate operations based on the returned information.

- **ASF Sensor:** (Photo) An ASF sensor detects the position of return lever when the power is turned on, and causes the paper to be picked up by the pick up roller from the normal initial condition. (Refer to section 2.1.1.3 for detail.)
- **PE Sensor:** (Photo) A PE sensor determines if there is paper in the printer. Based on the signal form this sensor, a particular paper edge treatment such as Micro-weave printing is performed.
- **HP Sensor:** (Photo) A HP sensor detects the carriage home position. It is used for managing printing position and cleaning, etc.
- **Thermistor Sensor:** A thermistor sensor keeps stable printing quality, changing PZT drive voltage(VH) slightly according to changes of environmental temperature.
- **Cartridge Sensors:** Cartridge sensors are built into the Bk, CMY cartridge on the carriage unit respectively to determine if the cartridge is installed or not when it is exchanged or the power is turned on. In case of Stylus Color 400, the counter is reset at every time the cartridge is removed.

The figure below shows sensor circuit. Out of the data such as EPW with IEEE 1284 Nibble mode to be returned to the host, the data to indicate ink consumption is calculated and managed by the counter of the firmware. Therefore, it is omitted here.

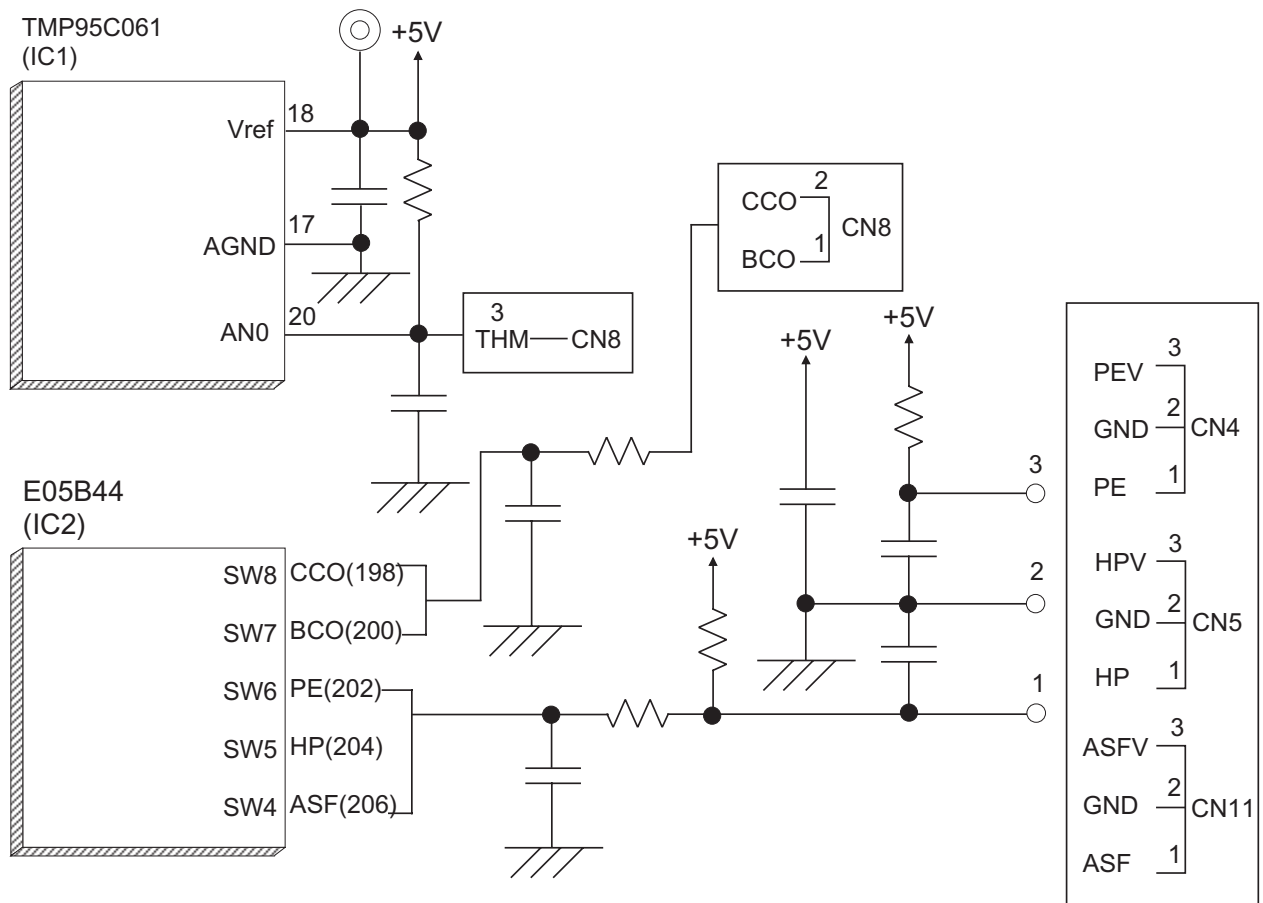


Figure 2-21. Sensor Circuit Block Diagram

2.2.2.3 EEPROM Control Circuits

The EEPROM of Stylus Color 400 has following contents. Gate array E05B44(IC2) controls operations of reading data when the power is on and writing data when the power is off.

- Ink consumption(Bk, CMY)
- CL counter(Various cleaning operations that are previously done are memorized)
- Destination information
- Information of various adjustment values(Bi-D, VH voltage, etc.)
- CPSI pass word
- Other various setting values by the user

EEPROM is connected to the Gate array by 4 lines and performs following functions.
The figure below shows EEPROM control circuit.

- CS : Chip selection signal
- CK : Data synchronism clock pulse
- DI : Data writing line(serial data) at power off.
- DO : Data reading line(serial data) at power on.

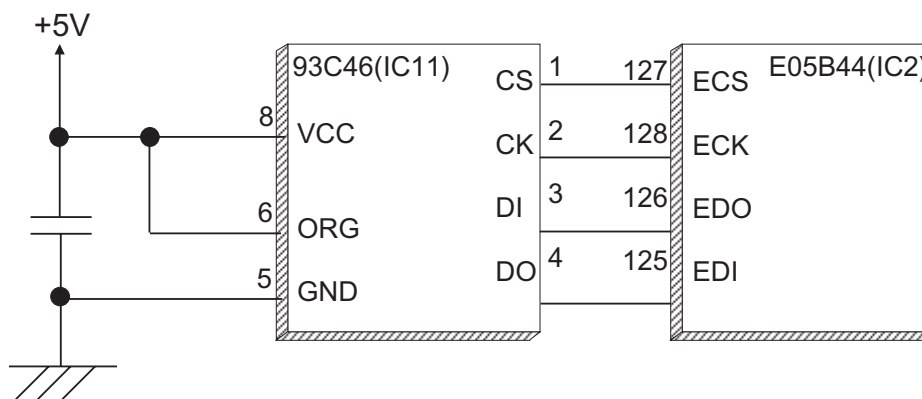


Figure 2-22. EEPROM Circuit Block Diagram

2.2.2.4 Timer Circuit

The lithium battery is mounted on the C206 main board and calculates how long the printer is not used. The timer IC(IC5) starts counting with oscillation motivated by the CR1 using this battery as a power source. The figure below shows connection of the Timer circuit.

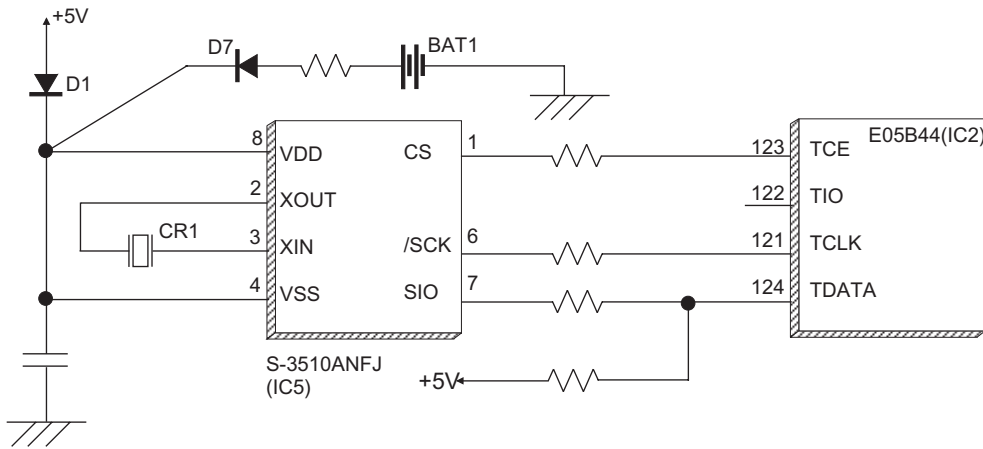


Figure 2-23. Timer Circuit Block Diagram

The followings explain about operation of this circuit.

- When the printer is on, power is supplied to the Timer IC by applying +5V quickly through the D1.
- This power is also used for the power to oscillate the outer CR1. The oscillation wave form is input to XIN terminal.
- Since the oscillation wave form of CR1 is analog wave form, it is processed into the pulse form in the Timer IC.
- When the printer is turned on, the Timer IC outputs power off time as serial data to the gate array.
- Once the printer is turned off, 3VDC of BAT1(lithium battery) is supplied as power source for the Timer IC through D7.
- Since +5V at the power on is higher than +3V of the lithium battery, the power is not being consumed from the lithium battery.

2.2.2.5 DRAM Control

In the Dynamic RAM control, output and formation of CAS and RAS control signals become necessary in addition to the output of CS signal. The CPU TMP95C061AF not only controls that but also perform the output of CS signal of P-ROM. Refresh timing is performed in the CAS Before RAS.

2.2.2.6 Print Head Control Circuit

The print head control circuit of Stylus Color 400 has following characteristics.

- Common wave form circuit became one HIC.
- Slight vibration mode is added.(when the CR motor is accelerating)
- High speed drive 14.4Khz (trapezoidal wave form)
- Big Nozzle configuration (resolution in the vertical direction)90dpi (However, black nozzle is 2 lines structure)

Also, Stylus Color 400 does not have Micro-dot control as dot shooting control, but there are two types; Normal-dot and Normal dot-2dot. Normal-dot-2dot was called Dual Firing in the Stylus Color IIs/820. These setting/change are controlled automatically by setting of the printer driver that is determined by the user. The followings are required conditions to perform the normal-dot 2-dot.

- At the OHP sheet setting (360X360 dpi)
- At the ordinary paper and resolution 360X360 dpi setting

The control circuit is considered as 2 divided parts; 1) trapezoidal wave form generation circuit (common drive circuit) to drive PZT in the head, and 2) Nozzle-selector drive circuit to determine which nozzle should be used. The Nozzle-Selector is attached to the head unit just like the previous models. The common drive circuit is summed as one HIC and mounted on the C206 main board.

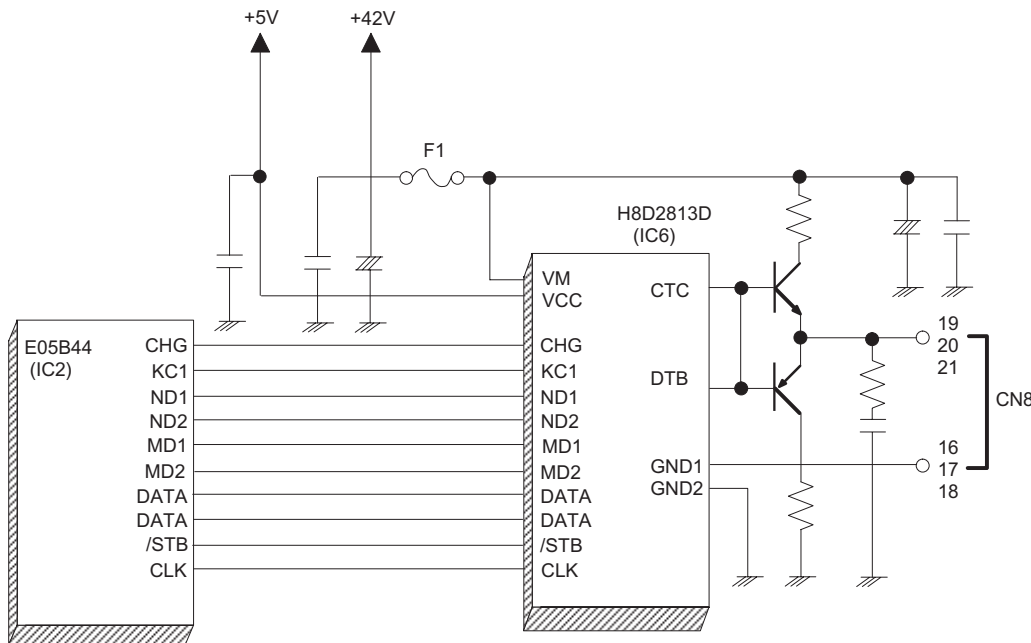


Figure 2-24. Print Head Control Circuit Block Diagram

[Common drive circuit]

The shape of trapezoidal wave form will be different according to the printing operation, slight vibrations at the non-printing nozzle and waiting condition. However, IC6(H8D2813) generates all wave forms as drive wave forms by resistance(electric) welding control of common voltage drive control signal that is output from the IC2(E05B44) in the figure above.

Table 2-13. Specifications of H8D2813 Operation

Item	Contents
Drive Power Voltage	42 ± 5 % Starts supplying after 5V rises and be stabilized./ Stops supplying before +5V drops.
Final drive element	2SC3746(for charging), 2SA1469(for discharging)
Operation at the Reset	Off on the both charging and discharging sides. Supplies drive power source.

This common voltage trapezoidal wave form can be observed anytime after the +5V rises even if there is printing data or not. (Q7:3-pin,Q9:3-pin and GND on the C206 main board)

[Nozzle Selector Drive Circuit]

In order to motivate the print head to carry out printing, it is necessary to transmit the printing data to the appropriate nozzles, which becomes direct signals to drive PZT. This data transmission is performed by the serial method, however the data output for each black and CMY head is transmitted by the parallel method. The figure below shows data transmission circuit.

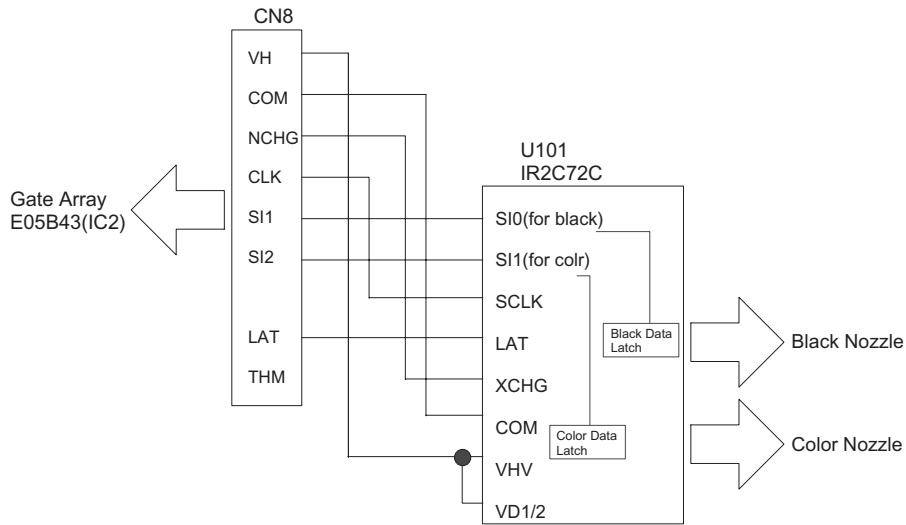


Figure 2-25. Nozzle Selector Circuit Block Diagram

CLK(Clock) pulse considered as source of serial communication is commonly used for both black and CMY. The serial data transmits data as 64-Clock unit, synchronizing with this pulse. After the data transmission of 64-Clock is completed, LAT(Latch) signal is activated and is hold temporarily in the IR2C72C. At this time, since the number of nozzle for Color head is fewer(21-nozzle) and different from the ones for black head, 0 is transmitted forcefully for the data for 43 nozzle (64-21=43).

After the data transmission by the nozzle selector(IR2C72C) is completed and a certain time passes, trapezoidal wave form generated by the common drive circuit once sends electric current to the PZT for the proper nozzles which are determined in the nozzle selector circuit. This motivates PZT and ejects the ink in the cavity. The figure below shows normal dot data transmission timing in order to form 1 dot.

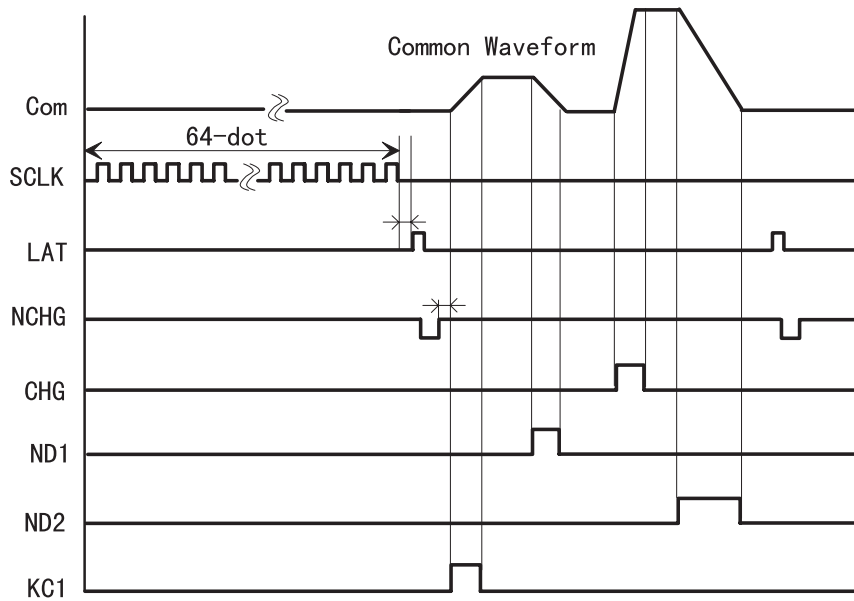


Figure 2-26. Timing Chart at the Generation of Normal Dot

2.2.2.7 PF (Pump) Motor Drive Circuit

IC15(LB1845) is used for driving PF(Pump) motor. In the IC, Bi-pola drive PWM current control type is performed, making it possible to provide stable current to each phase of motor. Also, it makes possible to change over the reference voltage as drive current settings by making 3 combinations(100%, 66% and 33%), using 4 current setting ports(input). (Refer to 2.1.1.3 for motor and details about sequence) However, firmware does not drive Micro-step in the Stylus Color 400. The figure below shows connection diagram of PF(Pump) motor drive circuit.

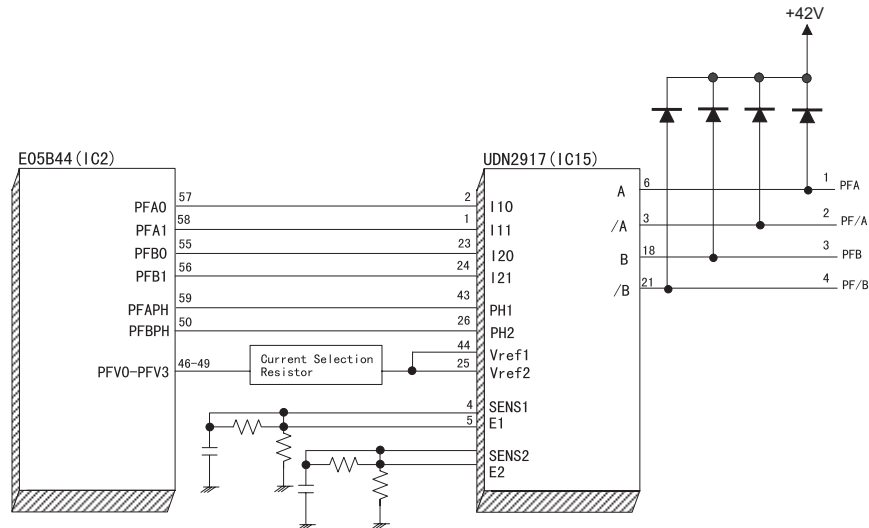


Figure 2-27. Connection Diagram of PF(Pump) Motor Drive Circuit

Unlike using Uni-Pola drive, there is no cable for GND in the motor since Bi-Pola drive is performed in the PF motor.(Refer to figure2-10 since carriage motor interior connection diagram has the same connection as the PF motor’s phase connection. This helps to understand the reason why the direction of current is controlled freely in each phase by the combinations of high/low control signals.

The current control is performed by output port(46~49 pin) of E05B44(IC2), its outer resistance circuit and driver IC(LB1845). First, firmware possesses 16 ways of current values as current table out of combinations made by 5 resistance which are connected to the output ports(46~49 pin) in the gate array. On the other hand, signals which are output by combination of these resistance’s on/off are input in the 26 and 17 pins. HIC is driven at the same standard voltage for each A and B phase.

Actual on/off control to send electricity through the motor is performed by the process that SEN1 and SEN2 terminals (2 and 13 pin) detect the input signal from the gate array which is monitored by the interior comparator, confirm the current that actually flew the phase as current value again and perform the feed back to the on/off. The figure below shows relation between input signal to the driver IC and motor control.

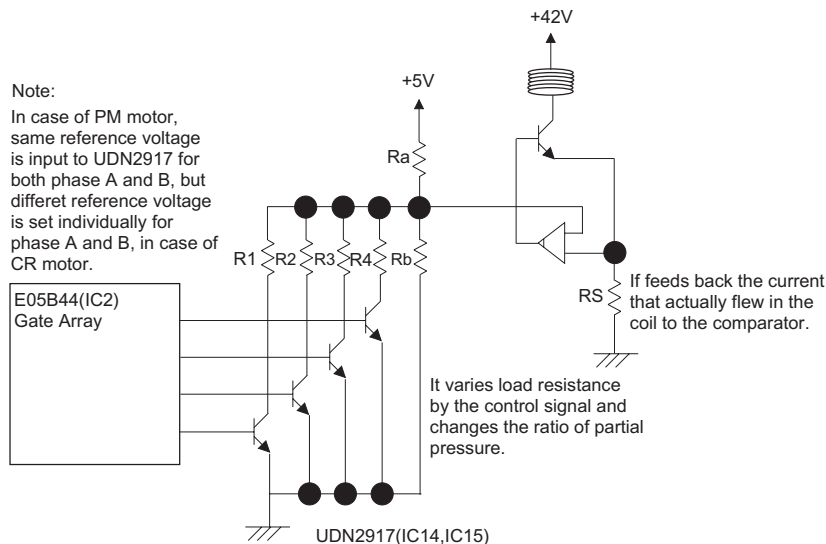


Figure 2-28. Motor Drive

2.2.2.8 CR Motor Drive Circuit

In the CR motor, the same LB1845(IC15) as the PF motor has is used. In the IC, Bi-pola drive PWM current control type is performed, making it possible to provide stable current to each phase of motor. Also, it makes possible to change over the reference voltage as drive current settings by making 3 combinations(100%, 66% and 33%), using 4 current setting ports(input). (Refer to 2.1.1.3 for motor and details about sequence) However, firmware performs Micro-step driving in the Stylus Color 400. The figure below shows carriage motor drive circuit.

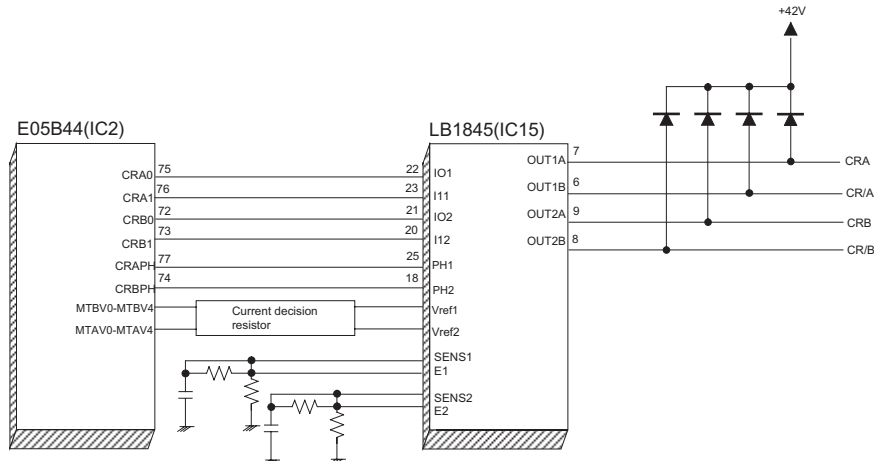


Figure 2-29. Connection Diagram CR Motor Drive Circuit

Unlike using Uni-Pola drive, there is no cable for GND in the motor since Bi-Pola drive is performed in the CR motor.(Refer to figure2-10 since carriage motor interior connection diagram has the same connection as the PF motor's phase connection. This helps to understand the reason why the direction of current is controlled freely in each phase by the combinations of high/low control signals.

The current control is performed by output port(46~49 pin) of E05B44(IC2), its outer resistance circuit and driver IC(LB1845). First, 10 resistance which are connected to the output port(60~61pin, 63~70pin) of the gate array divide each current values of phase A and B in the CR motor. The firmware possesses 16 different ways of current values individually as current table out of combinations made by 5 resistance which are connected to the output ports(46~49 pin) in the gate array. On the other hand, signals which are output by combination of these resistance's on/off are input independently in the 26 and 17 pins. HIC is driven at the different standard voltage for each phase A and B.

Actual on/off control to send electricity through the motor is performed by the process that SEN1 and SEN2 terminals (2 and 13 pin) detect the input signal from the gate array which is monitored by the interior comparator, confirm the current that actually flew the phase as current value again and perform the feed back to the on/off. (Refer to figure 3-31 since it is same as the one of PF motor)

Chapter 3

Disassembly and Assembly

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3.1 OVERVIEW

This section describes procedures for disassembling the main components of EPSON Stylus Color 400. Unless otherwise specified, disassembly units or components can be reassembled by reversing the disassembly procedure. Therefore, no assembly procedures are included in this section. Precautions for any disassembly or assembly procedure are described under the heading "WORK POINT". Any adjustments required after disassembling the units are described under the heading "REQUIRED ADJUSTMENT".

3.1.1 Precautions for Disassembling the Printer

See the precautions below when disassembling or assembling EPSON Stylus Color 400.

WARNING

- ☑ *Disconnect the power cable before disassembling or assembling the printer.*
- ☑ *Wear protective goggles to protect your eyes from ink. If ink gets in your eye, flush the eye with fresh water and see a doctor immediately.*
- ☑ *If ink comes into contact with your skin, wash it off with soap and water. If irritation occurs, contact a physician.*
- ☑ *A lithium battery is installed on the main board of this printer. Be sure to observe the following instructions when serving the battery:*
 - *Keep the battery away from any metal or other batteries so that electrodes of the opposite polarity do not come in contact with each other.*
 - *Do not heat the battery or put it near fire.*
 - *Do not solder on any part of the battery. (Doing so may result in leakage of electrolyte from the battery, burning or explosion. The leakage may affect other devices close to the battery.)*
 - *Do not charge the battery. (An explosion may be generated inside the battery, and cause burning or explosion.)*
 - *Do not dismantle the battery. (The gas inside the battery may hurt your throat. Leakage, burning or explosion may also be resulted.)*
 - *Do not install the battery in the wrong direction. (This may cause burning or explosion.)*
- ☑ *Danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacture. Dispose the used batteries according to government's law and regulations.*

ATTENTION

Risque d'explosion si la pile est remplacée incorrectement. Ne remplacer que par une pile du même type ou d'un type équivalent recommandé par le fabricant. Eliminer les piles déchargées selon les lois et les règles de sécurité en vigueur.

CAUTION

- ☑ *Never remove the ink cartridge from the carriage unless manual specify to do so.*
- ☑ *When transporting the printer after installing the ink cartridge, be sure to pack the printer for transportation without removing the ink cartridge.*
- ☑ *Use only recommended tools for disassembling, assembling or adjusting the printer.*
- ☑ *Apply lubricants and adhesives as specified. (See Chapter 6 for details.)*
- ☑ *Make the specified adjustments when you disassemble the printer. (See Chapter 4 for details.)*



- ☑ When assembling, if ink cartridge is removed and needs to be installed again, make sure to install new ink cartridge because of following reasons;
Once the ink cartridge mounted on the printer is removed, air comes into and becomes bubbles in the cartridge. These bubbles clog ink path and cause printing malfunction.
If an ink cartridge which are still in use is removed and is installed again, ink quantity will not be detected correctly since the counter to check ink consumption is cleared.
- ☑ Because of the reasons above, make sure to return the printer to the users with new ink cartridge installed.

3.1.2 Tools

Table 3-1 lists the tools recommended for disassembling, assembling, or adjusting the printer. Use only tools that meet these specifications.

Table 3-1. Recommended Tools

Tool	Purchasable	Code
Philips Screw Driver No.2	Yes	B743800200
Philips Screw Driver No.1	Yes	B743800400
Tweezers	Yes	B741000100
Hexagon Box Driver (Size:5.5mm)	Yes	B741700100

3.1.3 Specification for Screws

Table 3-2 below shows specifications for screws. During assembly and disassembly, make sure the locations for fixing screws and screw types, referring to the table below. Also, described screw number in the text corresponds to the No. in the table.

Table 3-2. Screw Identification

No.	Body	Name	Size
1		+Bind, S-tight	M3X6
2		+Bind, S-tight	M3X10
3		+Bind, P-tight (CBP tight)	M3X6
4		+Bind, P-tight (CBP tight)	M3X10
5		+Bind, P-tight (CBP tight)	M3X8
6		+Pan head (CP)	M3X4
7		+Bind, S-tight, Sems R2 (CBS Sems)	M3X6

3.1.4 Service Checks After Repair

Before returning the printer after service, use the check list in Table 3-3, which provides a record to make servicing and shipping more efficient.

Table 3-3. Inspection Check List for the Repaired Printer

Category	Component	Item to check	Is Check required?
Printer units	Self-test	Is the operation normal?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
	On-line test	Was the on-line test successful?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
	Print head	Is ink ejected normally from the all nozzles?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
	Carriage mechanism	Does the carriage move smoothly?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
		Any abnormal noise during movement?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
		Any dirt or obstacles around the axis of carriage guide?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
		Is the CR motor at the correct temperature(not over heating)?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
	Paper feeding mechanism	Is paper fed smoothly?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
		Does the paper get jammed?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
		Does the paper get skew during paper feeding?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
		Are papers multi fed?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
		Does the PF motor get overheated?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
		Abnormal noise during paper feeding?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
		Is the paper path clear of all obstructions?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
	Adjustment	Pointed adjustment items	Are adjusted conditions all right?
Lubricant	Pointed lubricant item	Is lubrication applied to the pointed locations?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
		Is the quantity of lubrication adequate?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
Function	ROM version	Newest version:	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
Shipment package	Ink cartridge	Is the ink cartridge installed correctly?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
	Protection conditions during transport	Is all the pointed parts firmly fixed?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary
Others	Attached items	Is all attached items from users included?	<input type="checkbox"/> Checked / <input type="checkbox"/> Not necessary

3.2 Disassembly Procedures

The figure below shows procedures for disassembly.

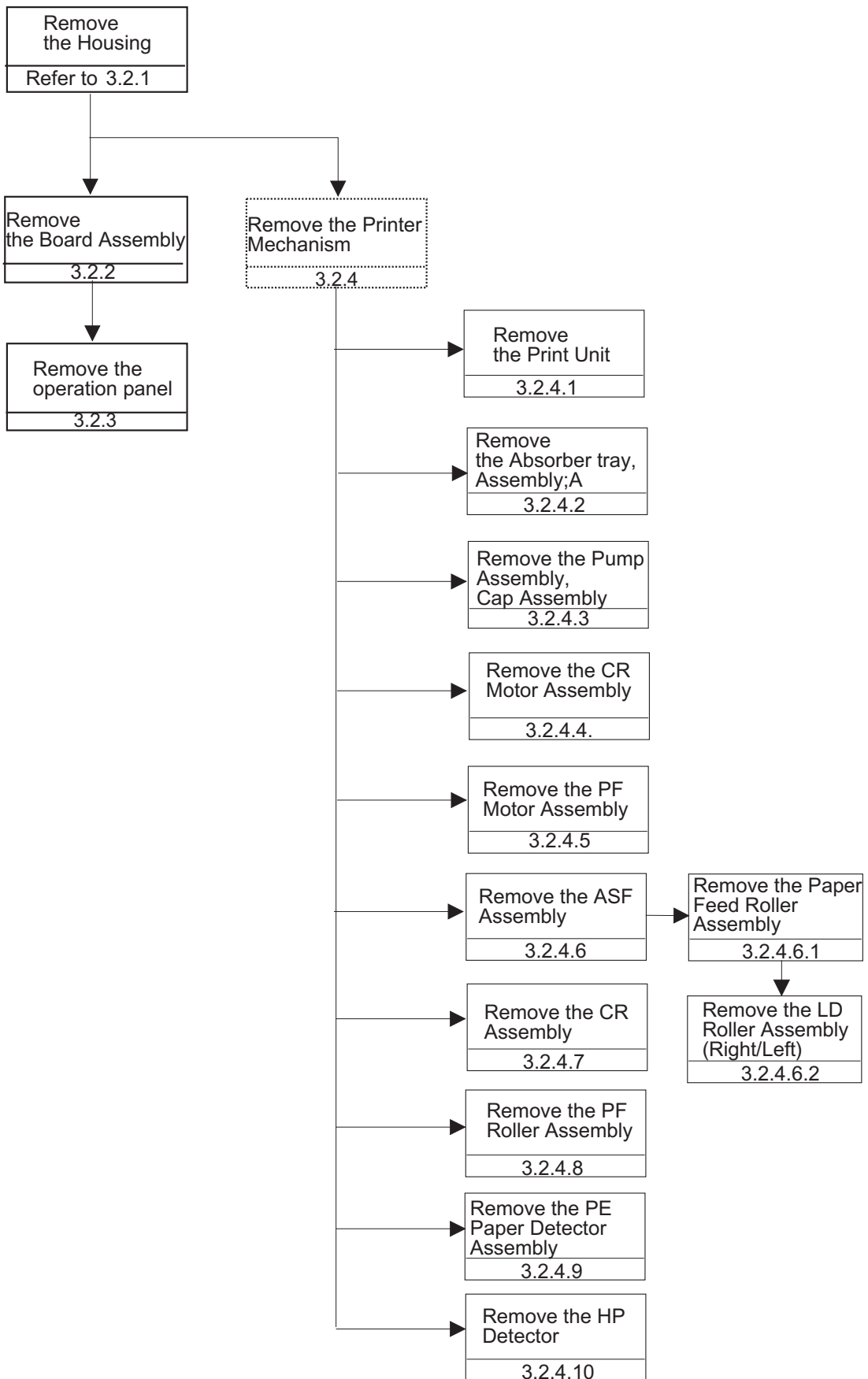


Figure 3-1. Flow Chart of Disassembly

3.2.1 Removing the Housing

Since the printer mechanism itself structures the bottom part, the printer mechanism appears just by removing the housing.

1. Open the printer cover and turn the PG adjustment lever towards (+) side.
2. Remove 4 screws(No.2) securing the housing, and remove the housing.

WORK POINT

Uplift and remove the housing, pulling it towards you. (Since it collides with carriage)

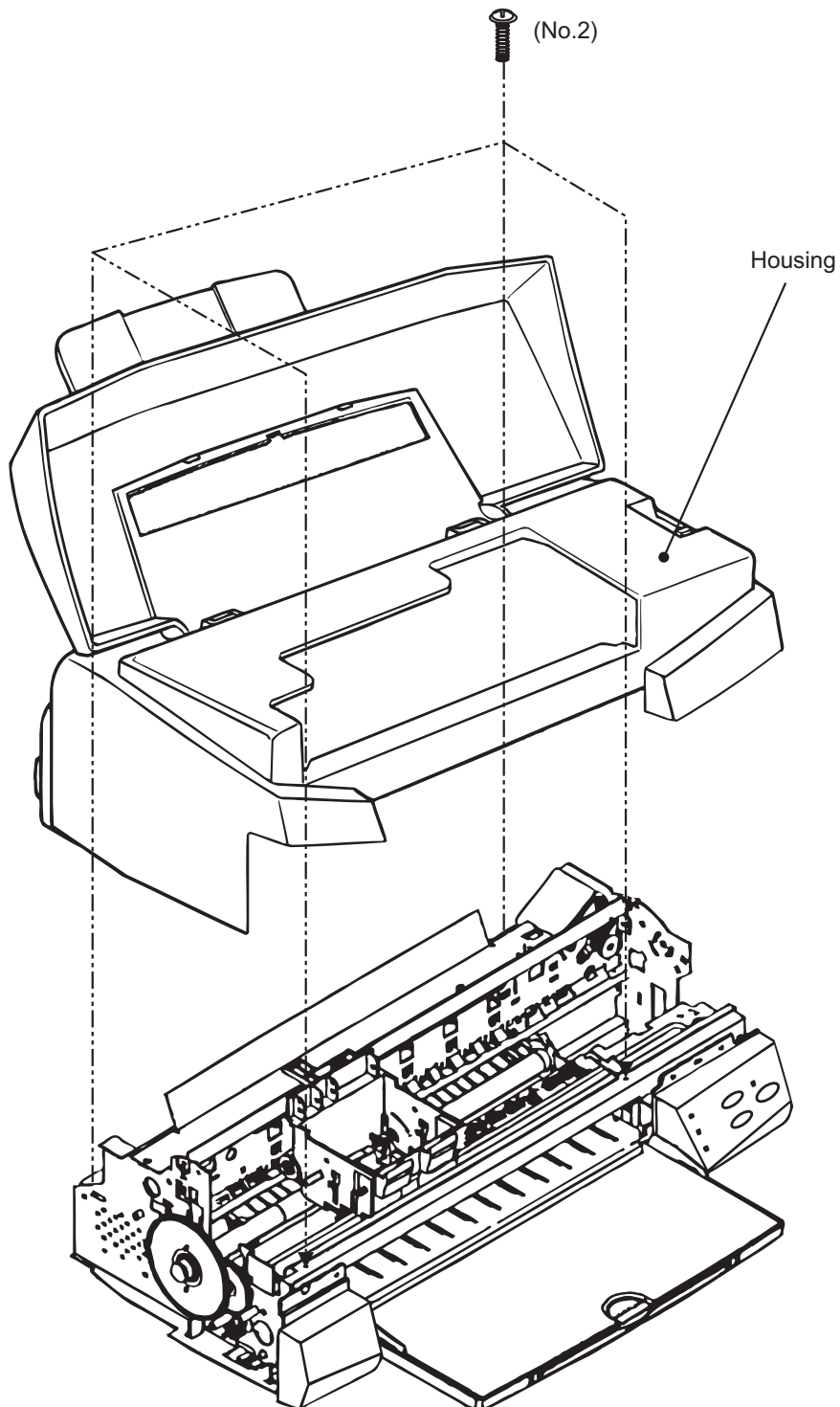


Figure 3-2. Removing the Housing

3.2.2 Removing the Board Assembly

Since the main board(C206 Main) and power supply circuit board(C206 PSB) are built in different bracket from the printer mechanism, remove the whole bracket from the printer mechanism.

1. Remove the housing.(Refer to 3.2.2)
2. Remove the 5 screws(No.1) securing the "M/B Shield plate" on the printer mechanism.
3. Pull out the "M/B Shield Plate" a little bit and remove cables which are hung on the A and B holders as you can see in the figure below.
Then, take all cables out of connectors on the C206 main board. (CN11 black, CN4 yellow, CN5 white, CN3 black and CN8 FFC)
4. After removing all the cables from the C206 main board, detach the "Shield plate M/B" completely from the printer mechanism.
5. When removing each board unit from the "M/B Shield plate", remove each screw securing each units and shield plate. [C206 Main: 10screws (7 No.1 screws, 3 No.6 screws), C206 PSB/PSE: 4screws(No.1)] Refer to the next page for the figure.
Also, when removing the power supply board(C206 PSB), disconnect and also remove the cable connecting to the Main board (CN6, 7 and 10 with lock device).

WORK POINT

- ☑ Since connector CN 6,7 and 10 are the connector with lock device, make sure to release the lock before removing the cable. Also, make sure to lock when installing these cables.
- ☑ When connecting cables to the connectors, each cable never cross each other in this printer. So, if there are two connectors sitting next to each other, the cable from right should be connected to the right connector and the cable from the left should be connected to the left one.

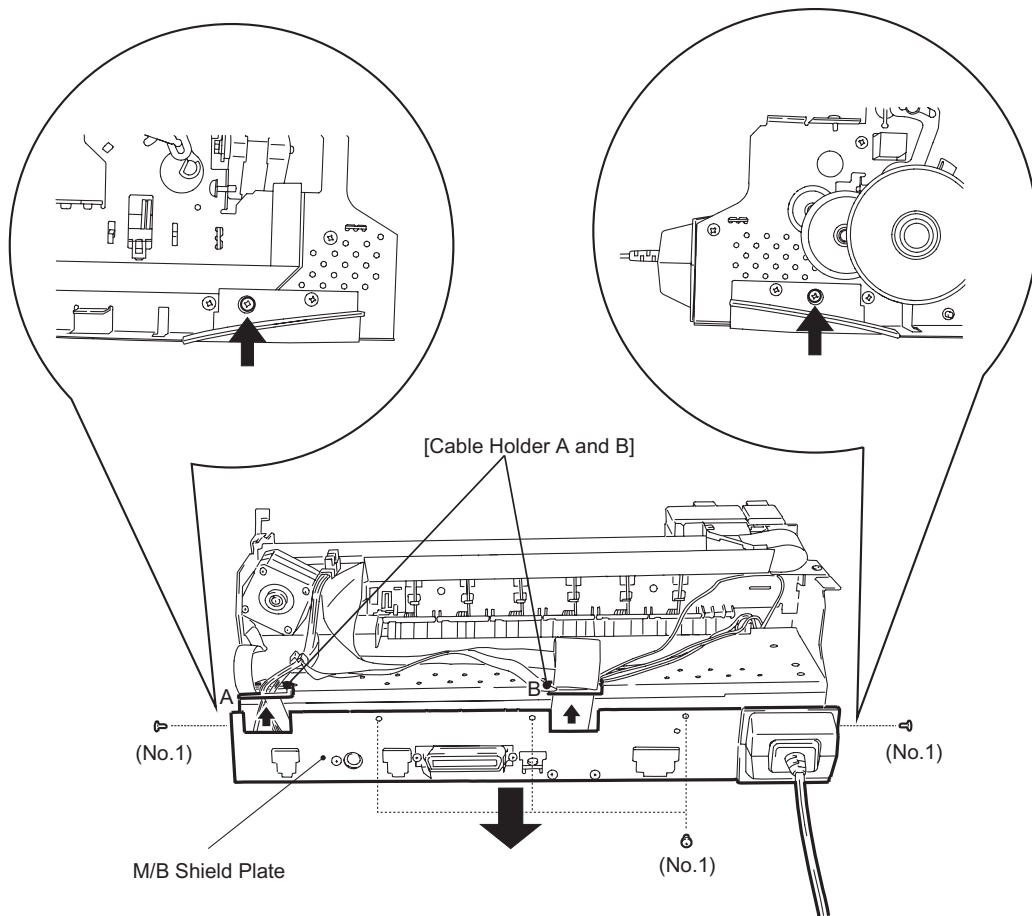


Figure 3-3. Removing the M/B Shield Plate

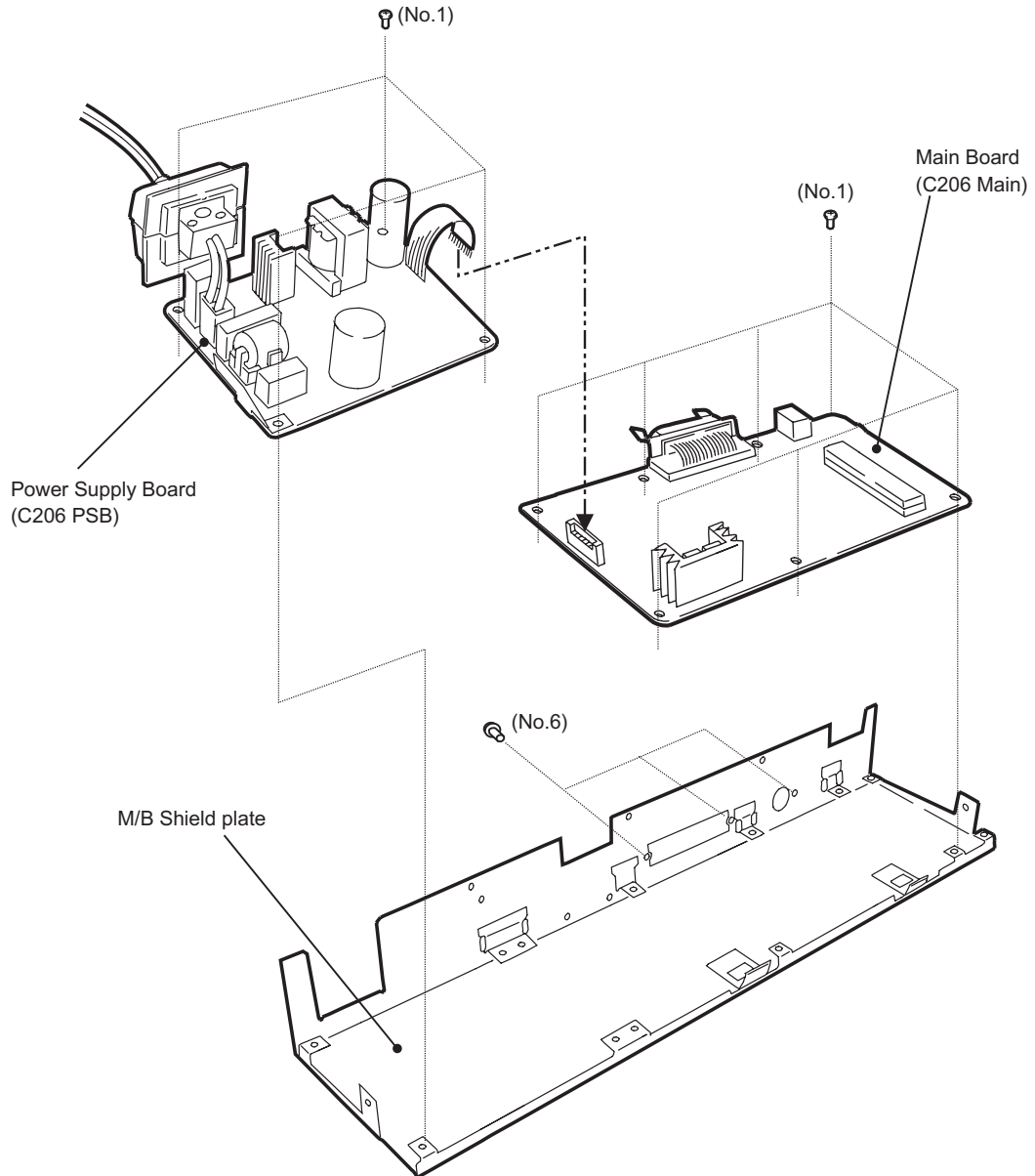


Figure 3-4. Removing the Boards

3.2.3 Removing the Operation Panel

1. Remove the housing. (Refer to 3.2.1)
2. Remove two screws (No.1) securing the operation panel and disconnect the operation panel from the printer mechanism.
3. Remove one screw (No.1) and detach the left panel housing.
4. Remove two screws (No.3) securing the panel board assembly and take C206 PNL board out of the panel assembly.
5. Disconnect the FFC from the connector on the C206 PNL board.

WORK POINT

Removing the operation panel also disconnects the stacker assembly, since the operation panel holds the stacker assembly.

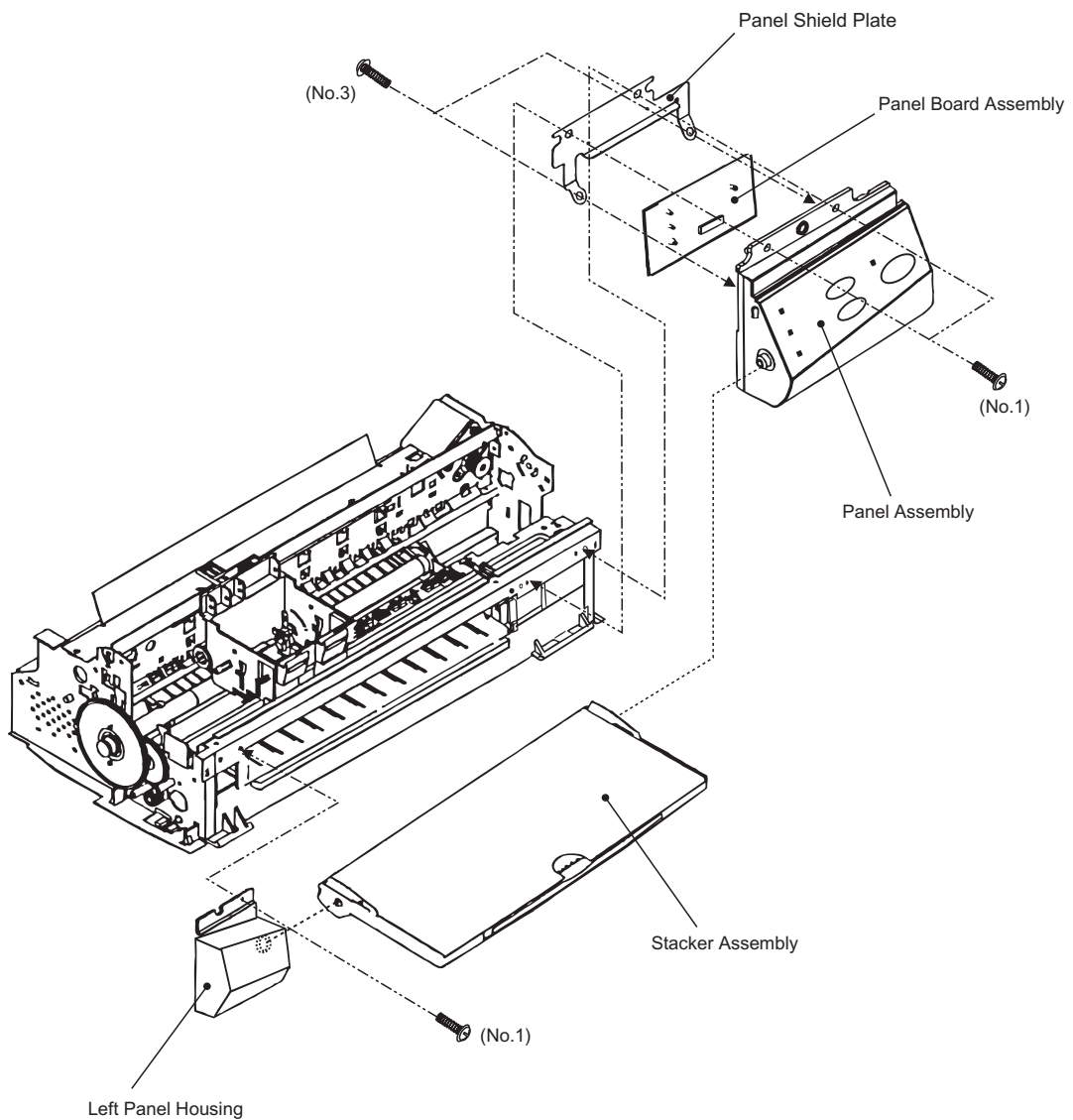


Figure 3-5. Removing the Operation Panel

3.2.4 Disassembling the Printer Mechanism

Since Stylus Color 400 does not have the lower housing, the printer mechanism part should be already appeared by now. Therefore, this section explains procedures for disassembling the major parts or units of printer mechanism.

3.2.4.1 Removing the Print Head Unit

1. Remove the housing. (Refer to 3.2.1)
2. Rotate the flat gear 67.2 towards yourself (front) and release the carriage lock mechanism. Then move the carriage to the left edge.
3. Take both black and color ink cartridges out of the print head unit.
4. Remove the blue covers for black and color ink cartridge from the carriage assembly.
5. Remove the torsion spring 49 and one screw(No.3) and take the fastener head out.
6. Remove the FFC being placed on the carriage assembly, and take the print head unit out of the carriage.
7. Disconnect the FFC from the connector on the drive board built in the print head unit.

WORK POINT

- ☑ *Make sure that earth board is installed to the carriage correctly. (There are 2 pins to determine the location.)*
- ☑ *When you built the print head into the carriage, make sure that a pin to determine the location on the carriage side is put into the notch of the print head.*

CAUTION

- ☑ *Since the ink cartridge once taken out can not be used again, be sure to install a new ink cartridge when you return the printer to the user.*
- ☑ *When you return the printer to the user, be sure to pack the printer for transportation with a new ink cartridge installed and at the state that carriage is in the home position when the user turns on the power.*

REQUIRED ADJUSTMENT

- ☑ *When you replace the print head unit, perform the following adjustment. (Refer to Chapter 4 for more details):*
 - 1) *Initial ink charge (Refer to Chapter 4 /4.2.2.2)*
 - 2) *Writing VH voltage ID (Refer to Chapter 4 /4.2.2.3)*
 - 3) *Head Angle Adjustment (Chapter 4 /4.2.2.4)*

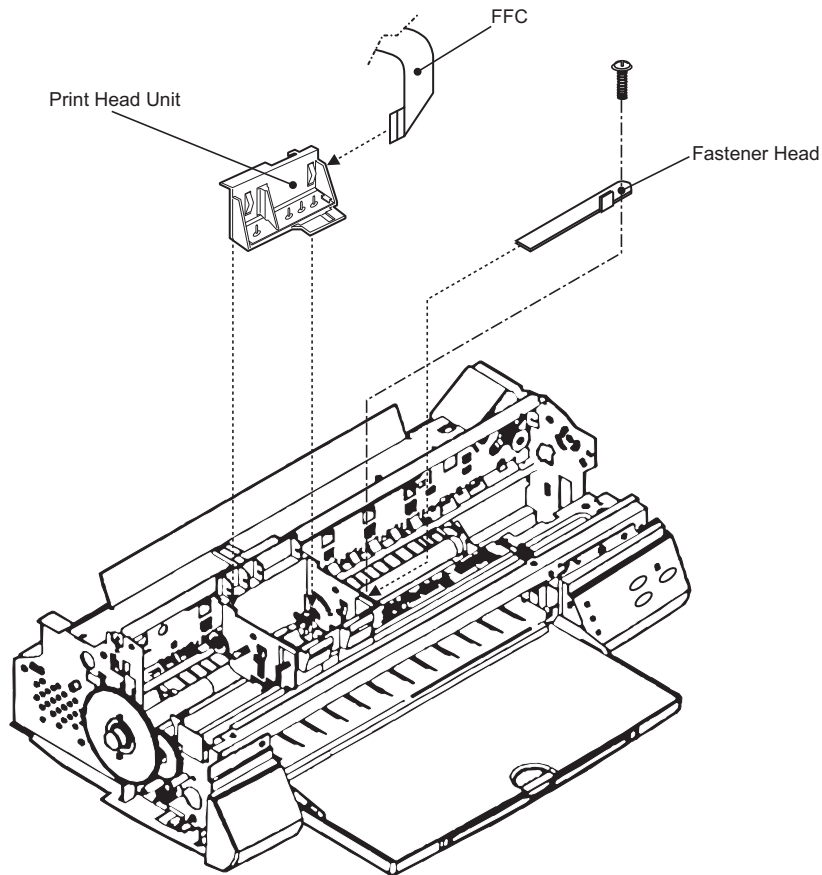


Figure 3-6. Removing the Print Head

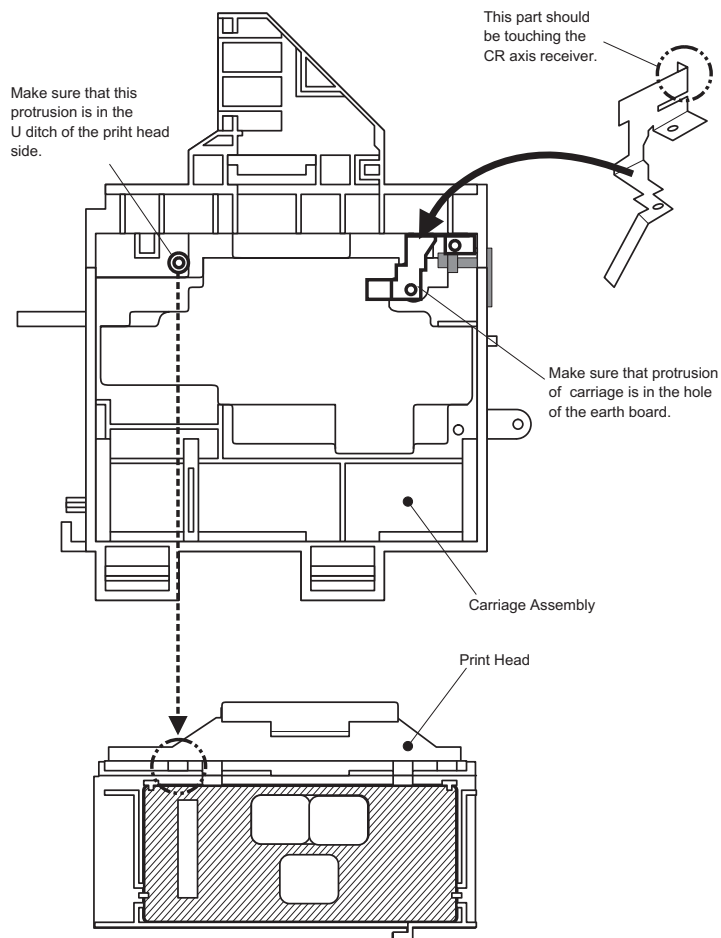


Figure 3-7. Installing the Print Head

3.2.4.2 Removing the Absorber Tray Assembly ;A

1. Remove the housing. (Refer to 3.2.1)
2. Remove the operation panel. (Refer to 3.2.3)
3. Remove one screw (No.4) securing "Absorber tray assembly" located on the right side of the printer mechanism.
4. On the same right side of the printer mechanism, release the hook securing the absorber tray assembly ;A on the frame and remove it, pulling it downward.

WORK POINT

- When installing the absorber tray assembly ;A, make sure to fix it with spacer tray in the left side of the printer mechanism.

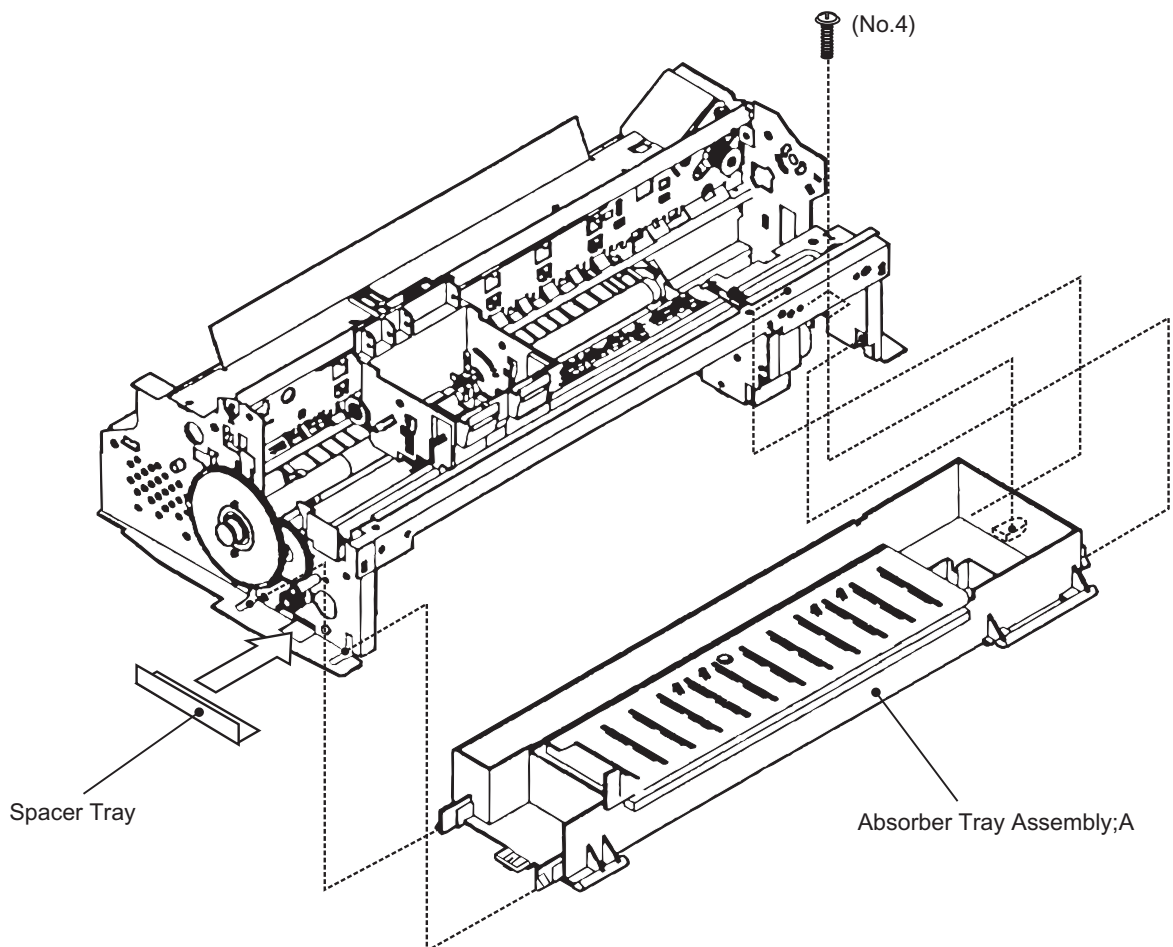


Figure 3-8. Removing the Absorber Tray Assembly ;A

3.2.4.3 Removing the Pump Assembly and Cap Assembly

1. Remove the housing .(Refer to 3.2.1)
2. Remove the operation panel. (Refer to 3.2.3)
3. Remove the absorber tray assembly ;A. (Refer to 3.2.4.2)
4. Loosen two screws located on the edges of the paper eject frame assembly and float the paper eject assembly.
5. Rise the printer mechanism toward ASF side so that you can see the bottom of the printer mechanism.
6. On the right side of frame, remove a hook holding the cap assembly and release two peaking attached to the frame, uplifting the right side of cap assembly, then take it out towards the bottom of the printer mechanism. However, the cap assembly is still connected to the pump assembly with a ink tube at this point. (Refer to figures on the next page.)
7. Remove two screws(No.5) securing the pump assembly to the frame. (Refer to figures on the next page.)
8. Release a hook securing the pump assembly to the frame and remove the pump assembly, moving it toward right direction. (Refer to figures on the next page.)

CAUTION

- ☑ *Do not damage the rubber part (black square) of the cap installed in the cap assembly.(If it gets damaged, it will not be able to attach closely with surface of the print head and may cause malfunction of operation.)*
- ☑ *When you deal with cleaner head built in the pump assembly for replacing, be careful about following points.*
 - *Do not touch the cleaner head with bare hands. Use gloves or tweezers.*
 - *Do not let the cleaner head attach with oil or grease.*
 - *When installing the cleaner head, the rubber side(darker black side) should be set toward on the right side of the frame.*
- ☑ *When installing the pump assembly, do not tighten the screw more than necessary torque.*

WORK POINT

- ☑ *Since the spring is included in the combination of gears in the pump assembly, be careful not for the parts being popped out during disassembly and assembly.*
- ☑ *When assembling, be careful not to crush or leave any stress on the ink tube connecting between pump assembly and cap assembly.*
- ☑ *After installing the pump assembly, make sure that the cleaner parts can move front and back by rotating the gear 67.2.*

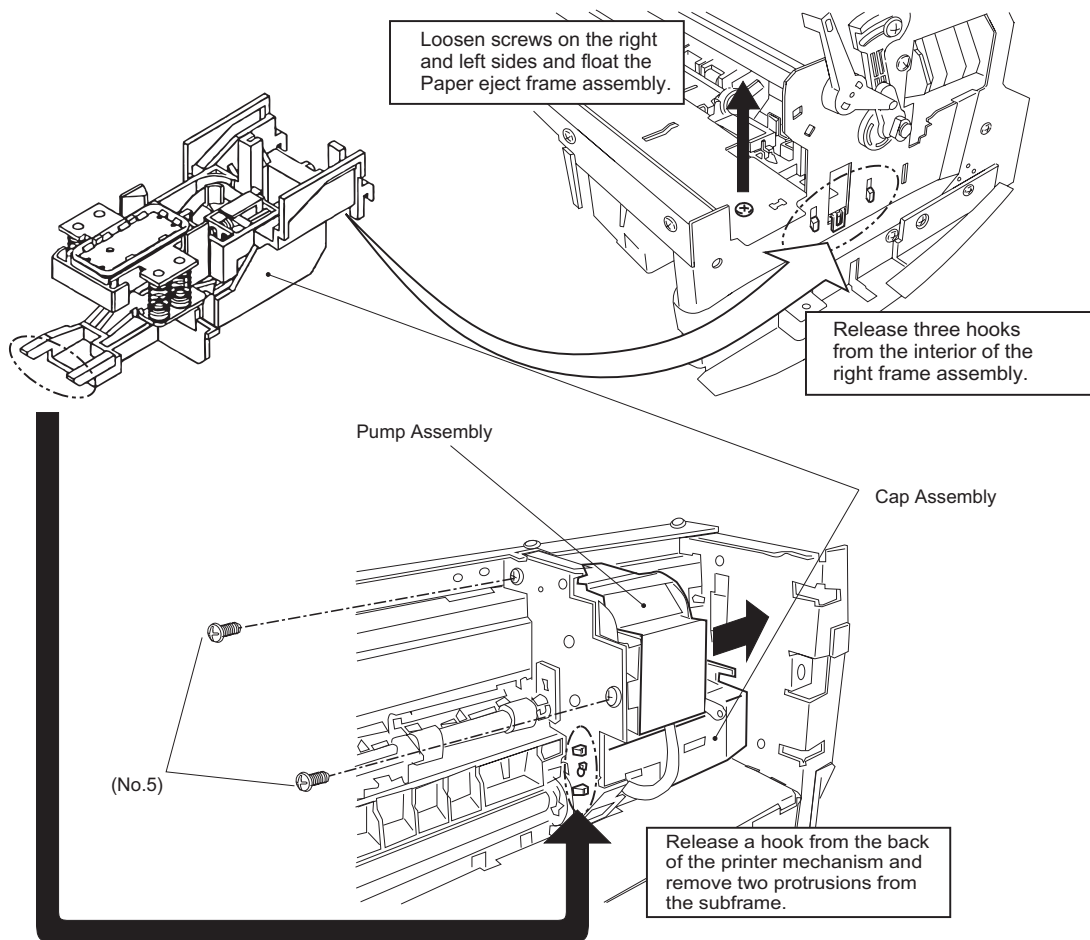


Figure 3-9. Removing the Cap and Pump Assemblies

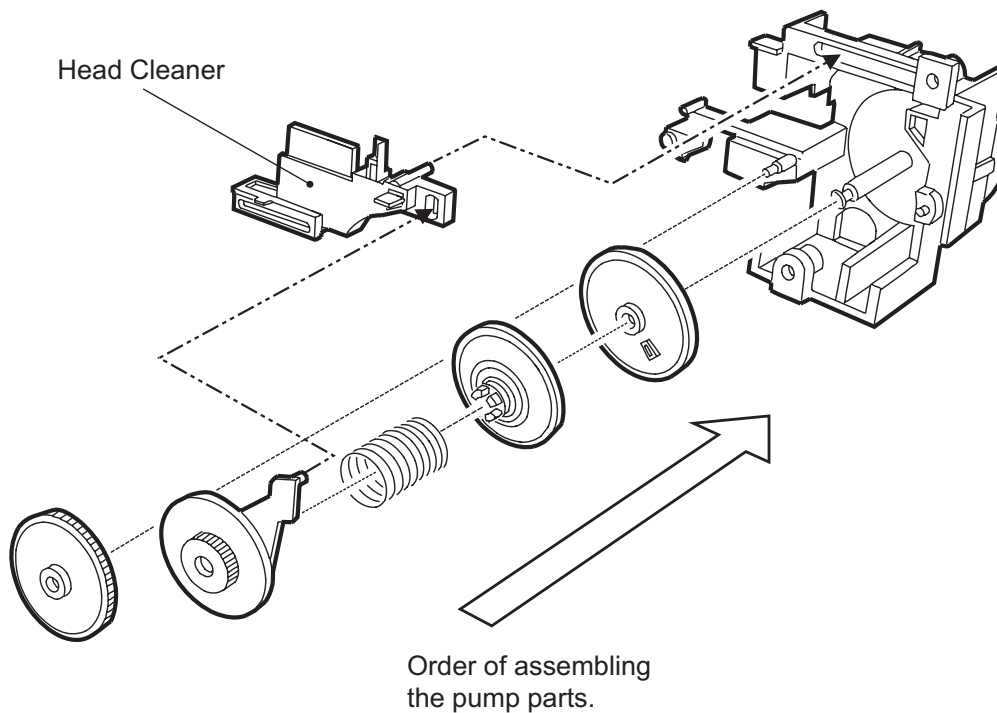


Figure 3-10. Component of Pump Assembly

3.2.4.4 Removing the CR Motor Assembly

1. Remove the housing. (Refer to 3.2.1)
2. Rotate the gear 67.2 toward you and release the carriage lock mechanism. Move the carriage to the center.
3. Loosen the timing belt by pushing the driven pulley holder and remove the timing belt from the pulley of the CR motor side.
4. Remove two screws(No.1) and take out the CR motor assembly.

WORK POINT

After installing the CR motor assembly, make sure that two peaking of motor bracket are in the holes for determining position on the frame. (Refer to the figure on the next page)

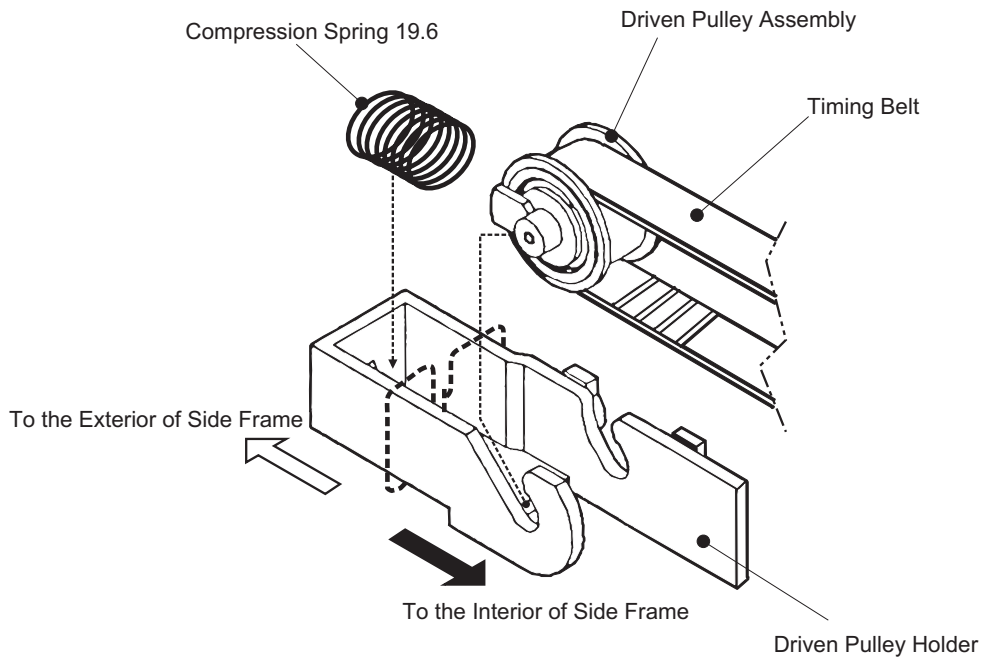
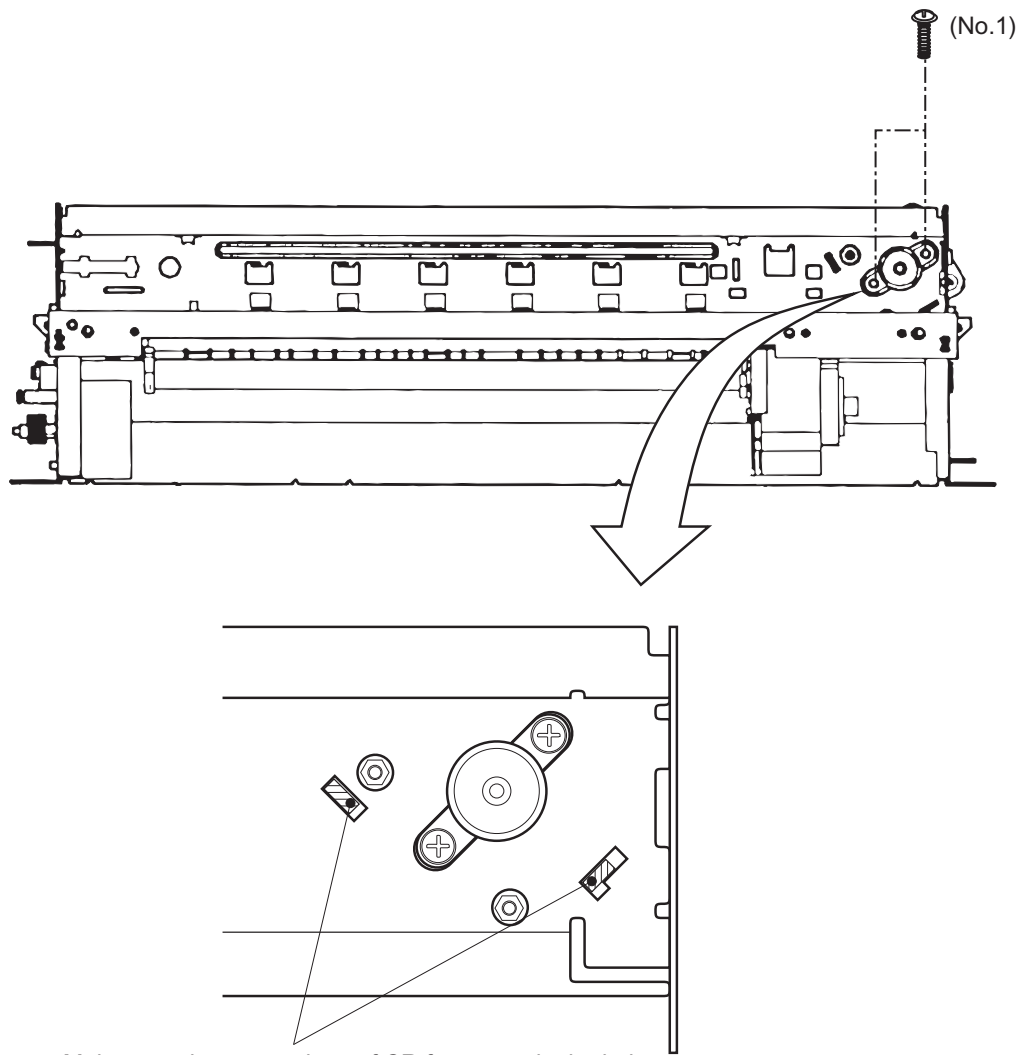


Figure 3-11. Removing the Timing Belt



Make sure that protrusions of CR frame are in the holes of the frame when installing the CR motor assembly.

Figure 3-12. Removing and Installing the CR Motor Assembly

3.2.4.5 Removing the PF Motor Assembly

1. Remove the housing.(Refer to 3.2.1)
2. Remove the absorber tray assembly ;A. (Refer to 3.2.4.2)
3. Remove the following gears located on the left side of the printer mechanism. Refer to the figure below.
 - Gear 67.2 (Remove the ring with tweezers or (-) driver. After the ring is removed, if you try to remove the gear 67.2 holding its edge, the gear may be broken. So, try to remove it holding the whole gear, slightly pulling it toward you.)
 - Combination gear 8.8,21.6
 - Combination gear 8,14.4
 - Gear 36
4. Remove 3 hexagon nuts and take the PF motor assembly out.

WORK POINT

- ✓ *When disassembling the PF motor assembly, pull the motor assembly out of the frame a little bit and remove it, sliding it into the bigger hole on the frame. (Refer to the figure next page)*
- ✓ *Be careful for the direction of wires from the PF motor assembly.*
- ✓ *Do not damage or leave any scars on the ditches of the gears during the disassembly and assembly.*

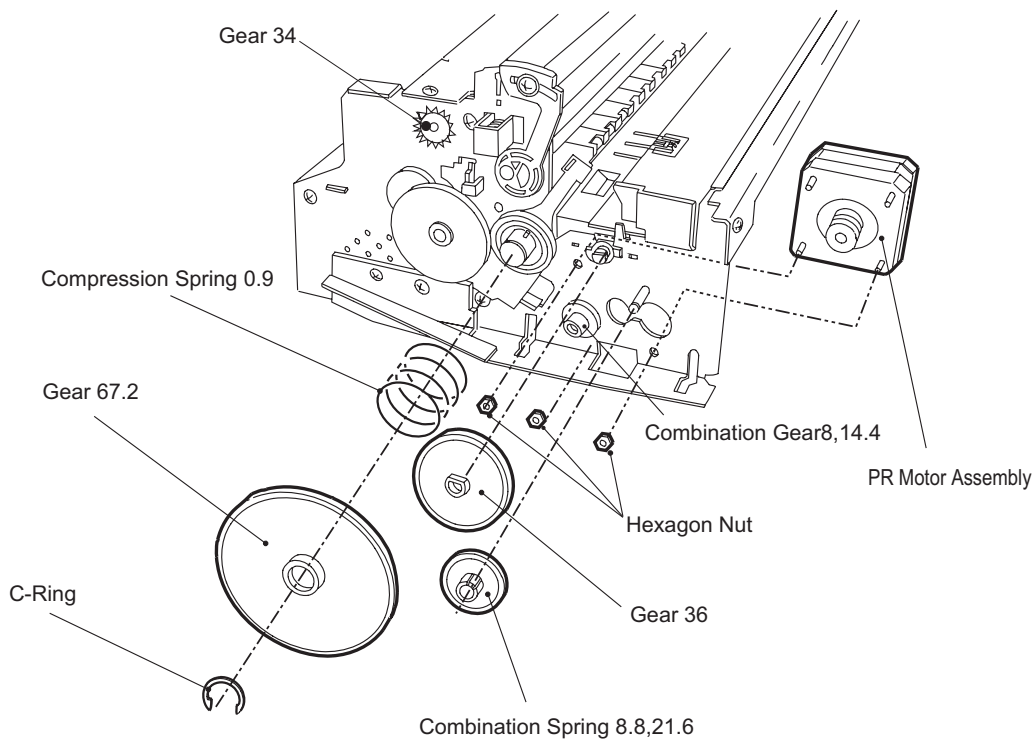


Figure 3-13. Removing the PF Motor Assembly

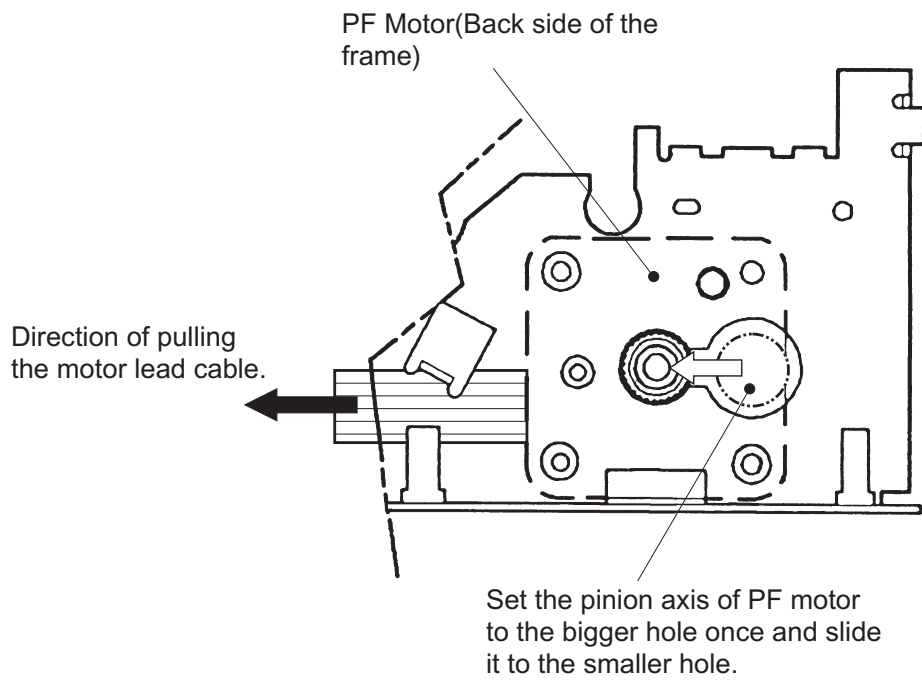


Figure 3-14. Installing the PF Motor Assembly

3.2.4.6 Removing the ASF Assembly

1. Remove the housing. (Refer to 3.2.1)
2. Release the fixed hook from the inside of printer mechanism and remove the gear 34 from the roller axis of the ASF assembly.
3. Take out cables from the cable hook on the printer mechanism and from the hook of the ASF assembly.
4. After removing 2 screws(one No.7 and one CR axis installation screw), remove the ASF assembly, detaching peaking on the left side of ASF assembly from the frame holes.

WORK POINT

- ✓ When installing the ASF assembly, make sure that the frame and ASF assembly are attached each other without any space.
- ✓ Screws for ASF assembly should be used at the following positions. (Looking from the back of printer)
 - Right : CR axis installation screw
 - Left : Screw No.7 (• {Bind, S- tight, Sems R2; with plane washers})

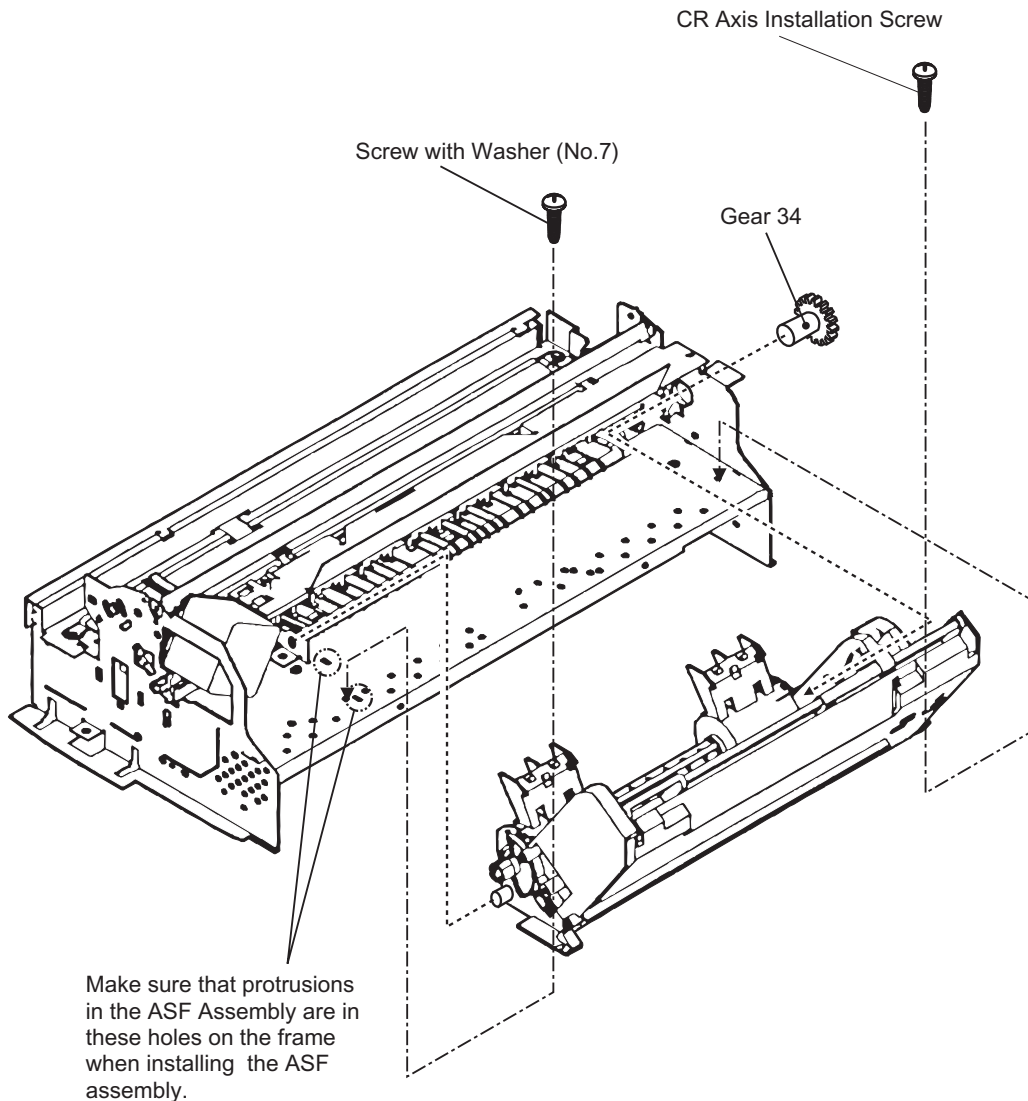


Figure 3-15.Removing the ASF Assembly

3.2.4.6.1 Removing the Paper Feed Roller Assembly

1. Remove the ASF assembly. (Refer to 3.2.4.6)
2. Remove the brake lever, releasing one leg of the torsion spring 41.2 from the hook of the ASF frame.
3. Remove the fixing axis bush from the right side of LD the roller axis and hopper lever release.
4. Move the left side of paper feed assembly part to the center and remove the cam fixed bush (white plastic) attached to the left side of LD roller axis.
5. Push the LD roller axis to the left and remove the left axis fixed bush after releasing its hook.
6. Remove right and left sides of hopper assembly from the peaking of the ASF frame.
7. Uplifting the right side of paper feed roller assembly a little bit, push the LD roller axis to the right and remove it from the left side of the ASF frame.
8. Holding the hopper assembly by hand, remove the cam part of hopper assembly from the right holes of ASF frame.

The procedures by here should disassemble right and left roller assembly and hopper assembly.

WORK POINT

- ☑ During disassembly and assembly of the hopper assembly, do not let the grease on the cam parts attach to the other parts. Wipe it if grease attached to the other parts.
- ☑ Be careful for the direction of the hopper lever release, when installing it.
- ☑ Make sure that right and left fixed bushes are installed steadily and do not slip off.
- ☑ During assembly, attach the cam fixing bush after installing CD roller-axis to the ASF frame.
- ☑ When installing right and left paper feed roller assemblies to the LD roller axis, a black paper feed roller assembly comes to right side and the EPSON standard color one comes to left on the axis.

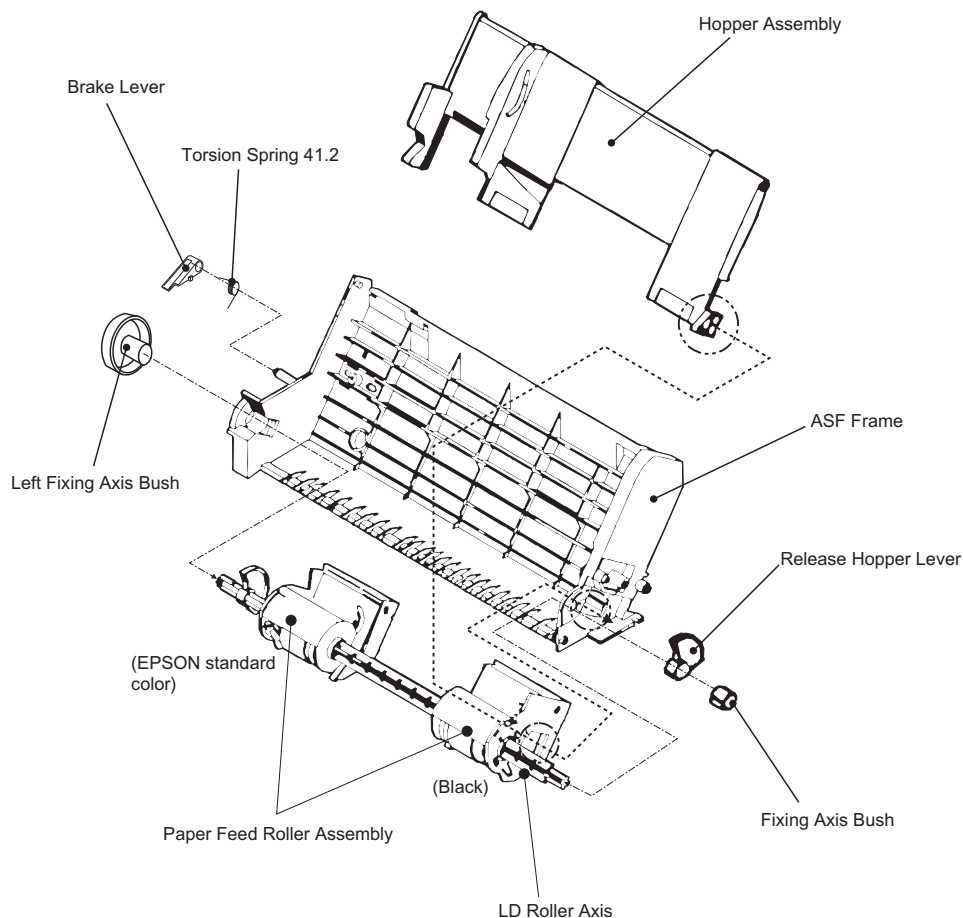


Figure 3-16. Disassembly of ASF Assembly

3.2.4.6.2 Removing the Right and Left LD Roller Assembly

1. Disassemble the ASF assembly and remove the paper feed roller assembly and hopper assembly from the ASF body. (Refer to 3.2.4.6)
2. Take out right and left compression springs 1.66 from the back of hopper assembly.
3. Pull out the cam part of the hopper assembly from the frame hole located on the right side of paper feed roller assembly.
4. Pull out the LD roller axis.
The paper feed roller assembly and hopper assembly should be disconnected by now.
5. Release the hook of LD roller assembly at the axis hole of the paper feed roller assembly.
Also, release the fixed hook of cover roller LD and remove the LD roller assembly.

WORK POINT

- ☑ When installing the LD roller assembly, make sure that the hooks are hung on the paper feed assembly.
- ☑ During assembly, when setting the compression spring 1.66 to the spring installation position in the paper feed assembly, hang the spring on the hook temporarily. Also, do not forget to release the hooks of these springs from the holes located on the back of paper feed assembly by rotating the spring. (Refer to the figure below.)

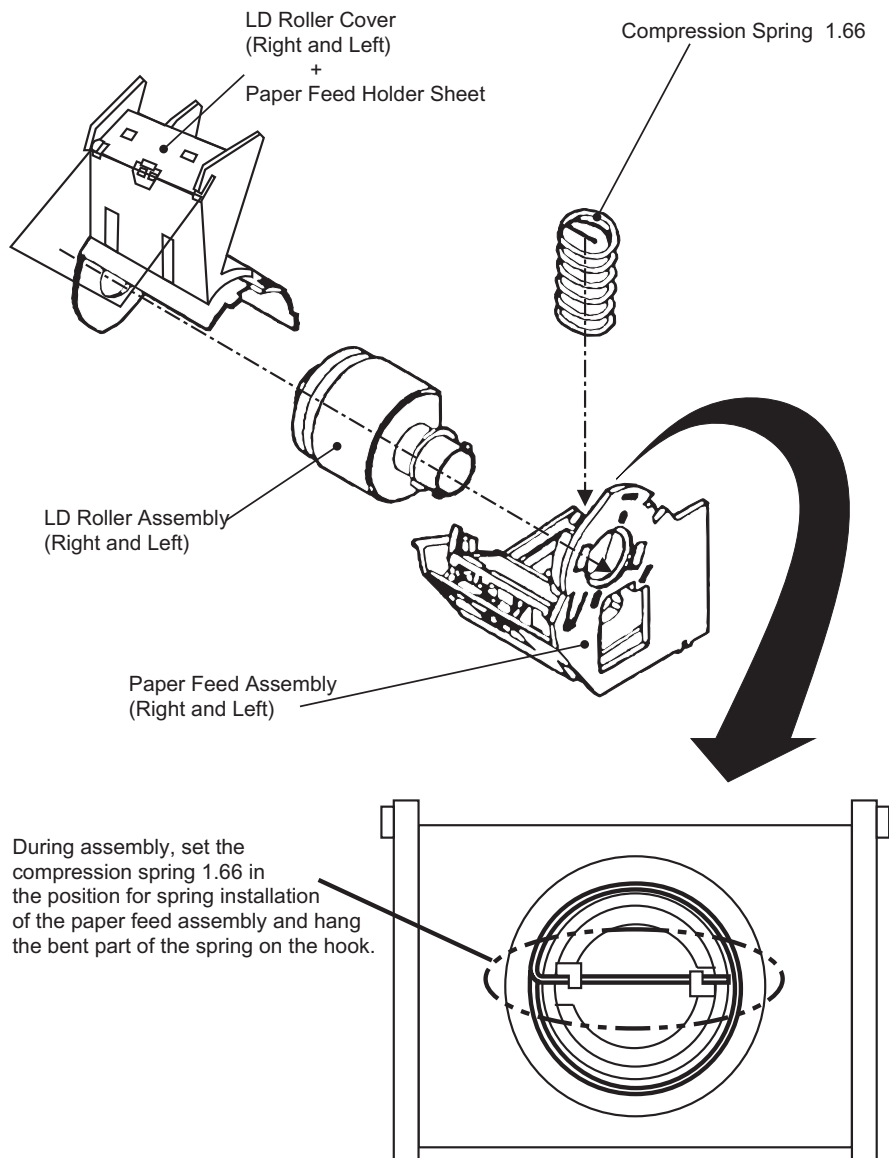


Figure 3-17. Disassembly of Paper Feed Roller Assembly

3.2.4.7 Removing the Carriage Assembly

1. Remove the housing. (Refer to 3.2.1)
2. Loosen the timing belt by pushing the driven pulley holder and remove the timing belt from the pulley of the CR motor side.
3. Take the compression spring 19.6 out of the driven pulley holder.
4. Remove the driven pulley assembly from the driven pulley holder with the timing belt. Slide the driven pulley holder and remove it from the frame.
5. Remove the torsion spring hanging on the frame and PG lever. Release the fixed hook of the PG lever and remove the lever.
6. Release the fixed hook of the PG lever support and remove the PG lever support and washer from the edge of CR guide axis. (Refer to the figure next page.)
7. Remove one screw(No.7) and rotate the right parallelism adjustment bush so that it fits to the notch of the frame, and remove it .
8. Remove CR assembly with CR guide axis.

WORK POINT

- ☑ When disassembling the parallelism adjustment right bush, mark present fixed location of the bush on the frame so that you can omit re-adjustment of gap when assembling.
- ☑ When installing the washer, pay attention to its direction.(Convex side should face to the right parallelism adjustment bush side.) Refer to the figure below.
- ☑ When installing the PG lever, refer to the figure below.

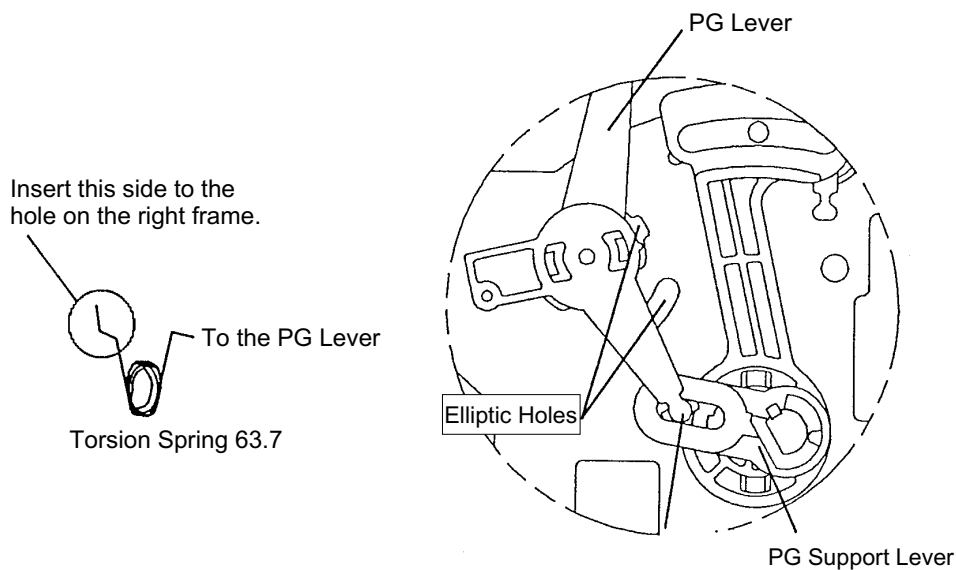


Figure 3-18. Installing the PG Lever

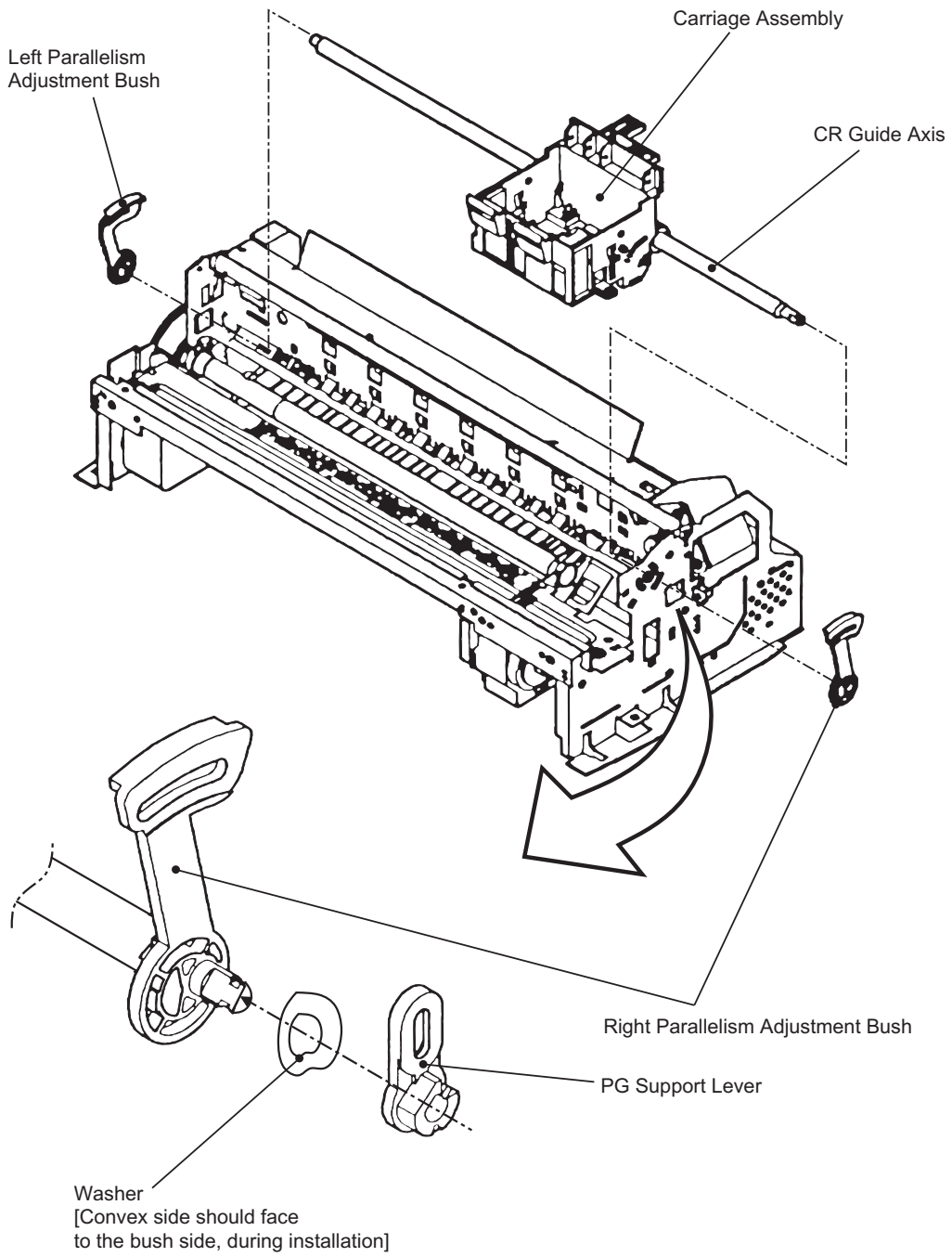


Figure 3-19. Removing the Carriage Assembly

3.2.4.8 Removing the PF Roller Assembly

1. Remove the housing.(Refer to 3.2.1)
2. Remove the carriage assembly.(Refer to 3.2.4.7)
3. Remove two screws(No.1) on the printer mechanism and disassemble the cable guide board.
4. Remove six upper paper guide assemblies, releasing their springs from the hooks of the frame.
5. Remove the front paper guide ;B, releasing the hooks. (Refer to next page)
6. Remove the paper eject roller assembly, releasing the fixed locks located on the right and left edge of axis.
7. Release the fixed hook located on the left side of PF roller assembly axis and rotate it so that protrusion of axis(white) and hole for receiving the frame axis can match.
8. Slide the PF roller assembly to the right direction and pull it out.

WORK POINT

- ☑ *During disassembly and assembly of upper paper guide assemblies, since one of the upper paper guide assemblies to be installed on the right side overlaps with the PE detector lever, pay attention not to damage the lever.*
- ☑ *Be careful not to damage the hook, during the disassembly and assembly of the front paper guide ;B.*
- ☑ *Be careful not to scar the PF roller assembly during the disassembly and assembly, since its surface is specially coated to improve paper feeding. (black part)*
- ☑ *Be careful not to damage the combination of gears.*

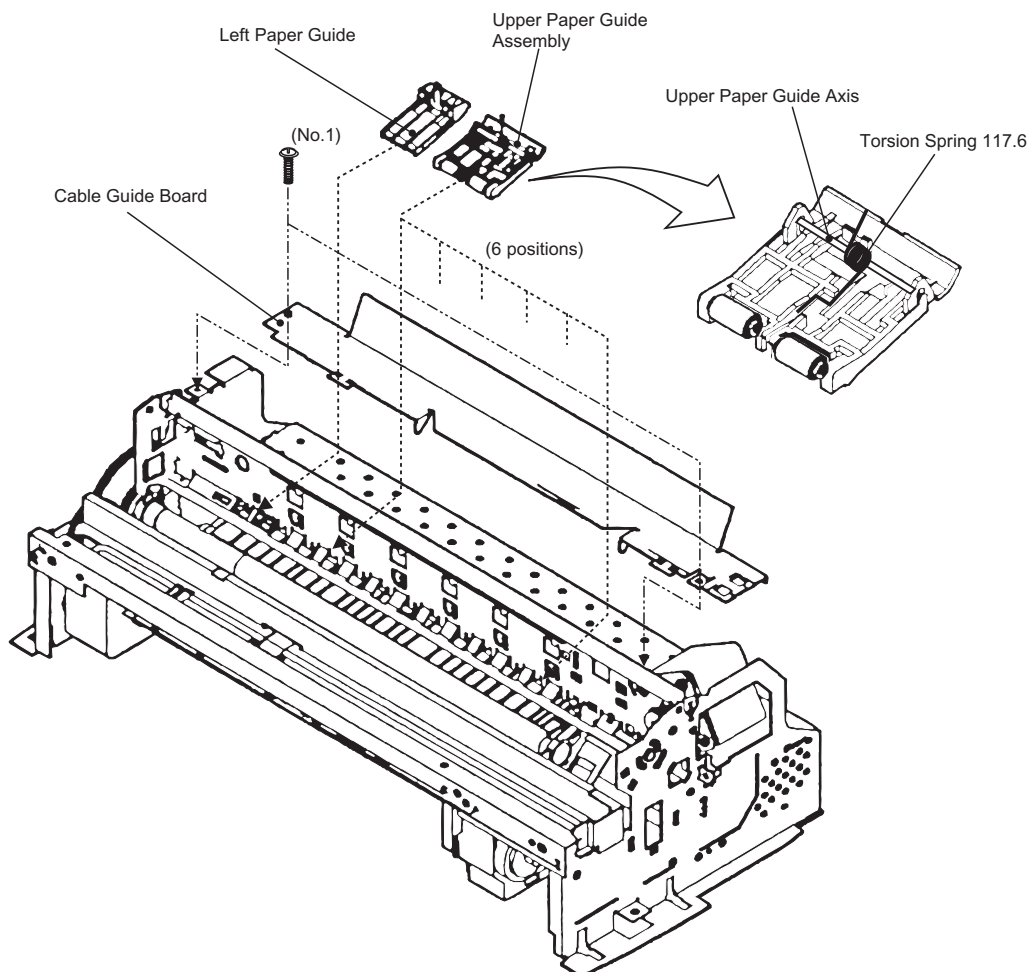


Figure 3-20. Removing the Paper Guide Assembly

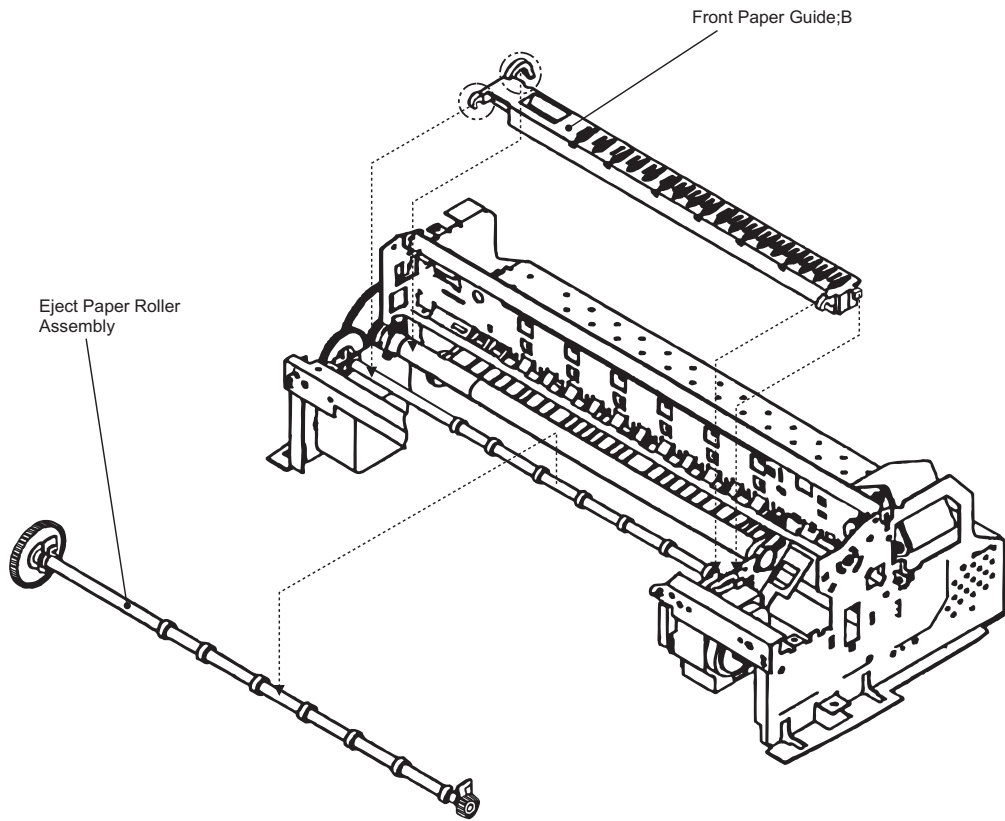


Figure 3-21. Removing the Paper Eject Roller Assembly

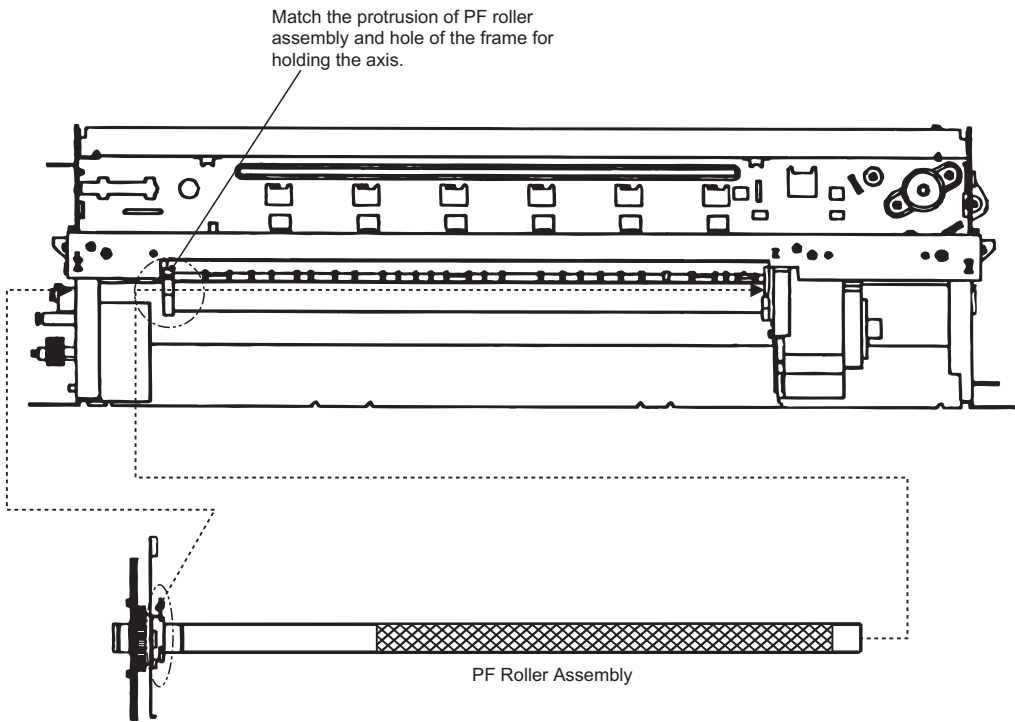


Figure 3-22. Removing the PF Roller Assembly

3.2.4.9 Removing the PE Paper Detector Assembly

1. Remove the housing.(Refer to 3.2.1)
2. Release two fixed hooks securing the PE detector assembly from the back of frame and remove the PE detector assembly, sliding it upward. Remove PE board assembly and PE lever if necessary.

WORK POINT

During assembly, make sure that the tip(sensor part) of the detector lever is in the hole of paper guide assembly.

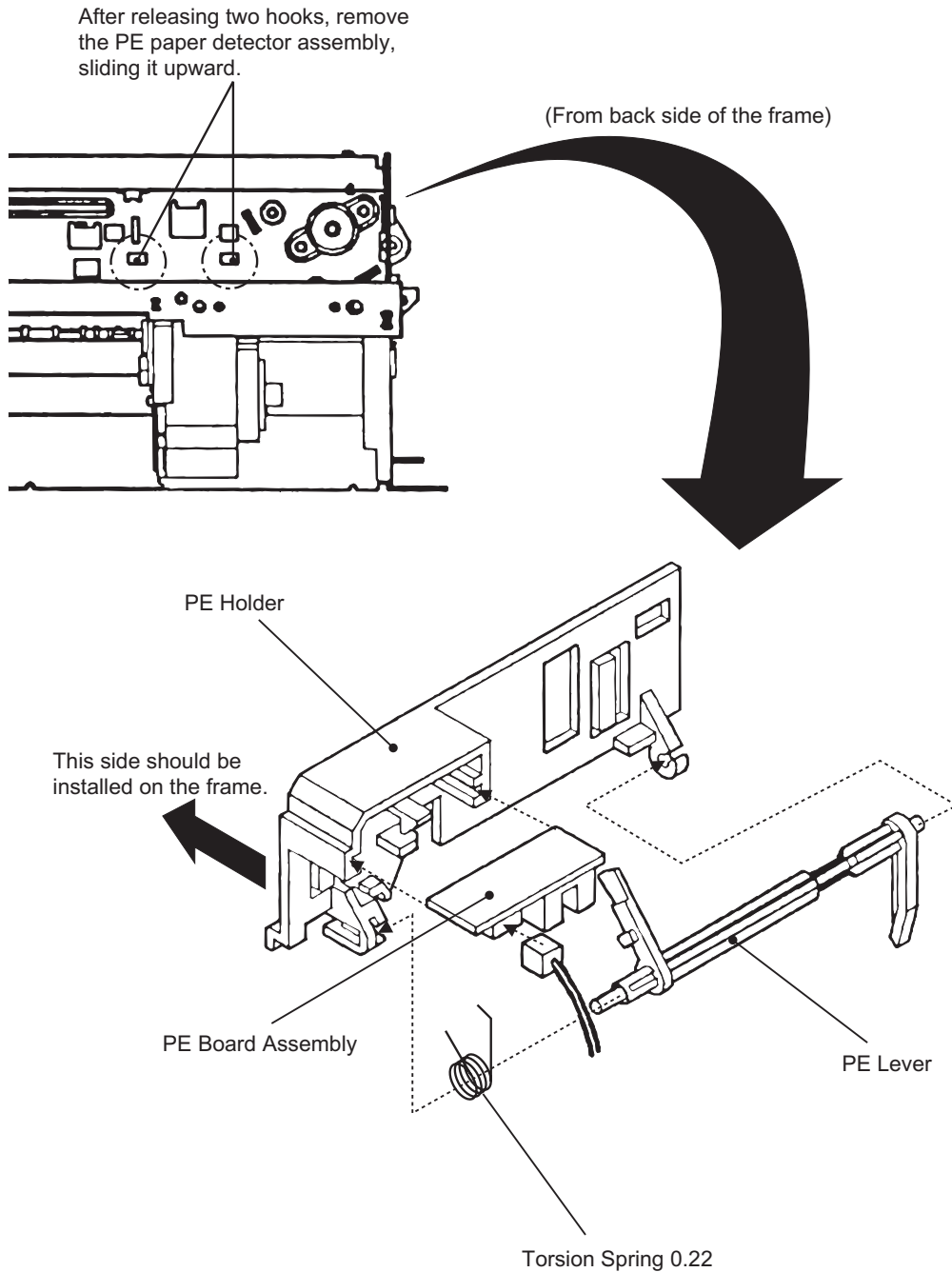


Figure 3-23. Removing the PE Paper Detector Assembly

3.2.4.10 Removing the HP Detector

1. Remove the housing. (Refer to 3.2.1)
2. Remove the cable from the HP detector and take it out after releasing the fixed hook.

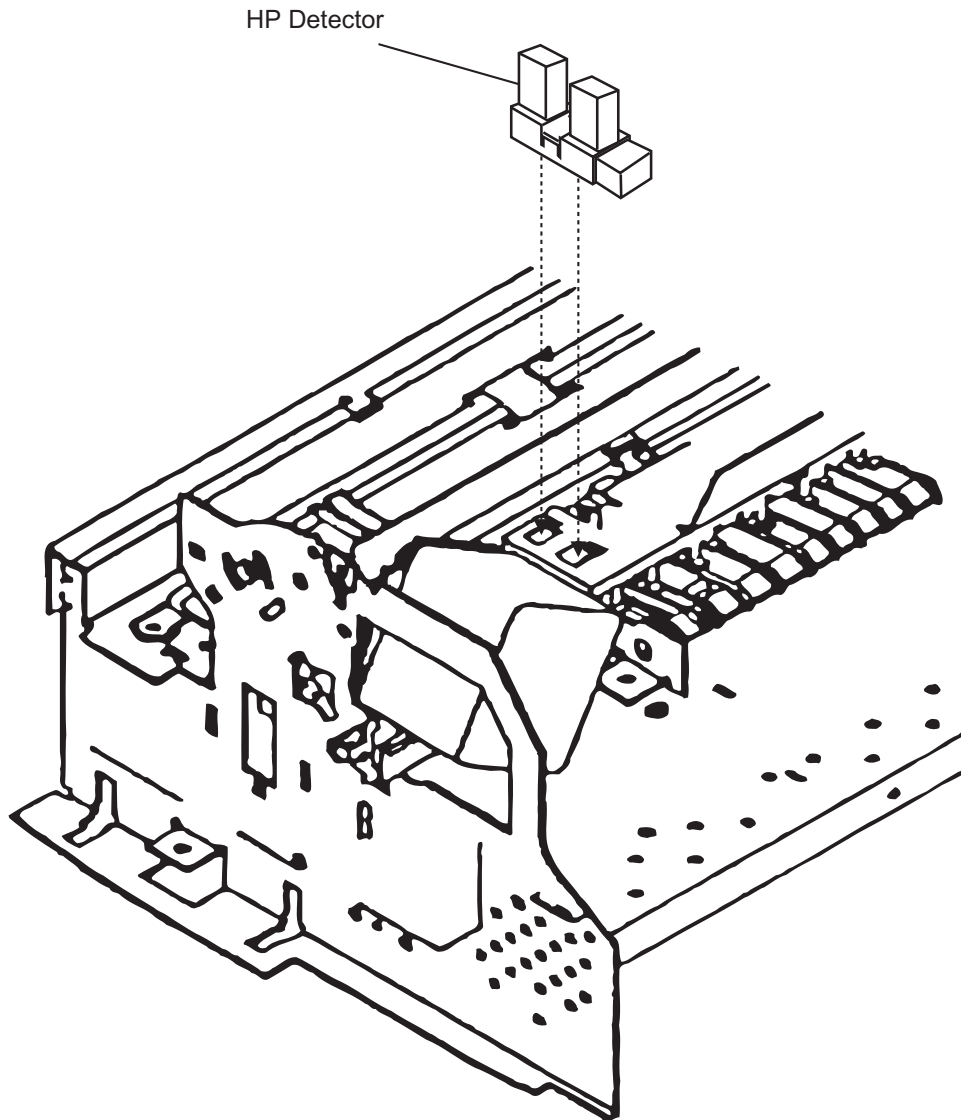


Figure 3-24. Removing the HP Detector

Chapter 4 Adjustment

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4.1 Overview

This section describes adjustments required when the printer is disassembled and assembled after repair.

4.1.1 Required Adjustments

Stylus Color 400 has following required adjustments.(Refer to table 4-1) Refer to figures for the actual procedure and perform appropriate adjustment for each exchanged unit.

Table 4-1. Required Adjustment and Contents

No.	Adjustment Item	Conditions
1	Parallel Adjustment	<ul style="list-style-type: none"> When you exchange or remove the Carriage guide shaft. When you move the parallelism adjustment bush.
2	Initial ink charge	<ul style="list-style-type: none"> When you exchange or remove the print head.
3	VH voltage Writing Operation	<ul style="list-style-type: none"> When you exchange or remove the print head. When you exchange the C206 main board. <i>Note)</i> The values of address are not lost by EEPROM reset operation.
4	Printing Head Angle Adjustment	<ul style="list-style-type: none"> When you exchange or remove the print head. When you move the head adjustment lever.
5	Bi-D adjustment	<ul style="list-style-type: none"> When you exchange or remove the print head. When you exchange the C206 main board.

Table 4-2. Operation and Adjustment Item

No.	Content of Operation	Adjustment Procedure
1	Exchange or Removal of Print head	1)Perform Vh voltage writing operation. (Only when the print head is exchanged) 2)Perform initial ink charge. 3)Perform print head angle adjustment. 4)Perform Bi-d Adjustment.
2	Exchange of C206 Main Board	1)Perform Vh voltage writing operation. 2)Perform Bi-d adjustment.
3	Exchange or Removal of Carriage Unit	1)Perform parallel adjustment. 2)Perform print head angle adjustment. 3)Perform Bi-d adjustment.
4	Exchange of CR Motor	1)Perform Bi-d adjustment.
5	Exchange of Printer Mechanism	1)Perform Vh voltage writing operation. 2)Perform initial ink charge. 3)Perform Bi-d adjustment.

4.1.2 Required Adjustment Tools

The table4-3 below shows adjustment tools for Stylus Color 400.

Table 4-3. Adjustment Tools for Stylus Color 400

No.	Name	Adjustment item	Content/Specification
1	Thickness Gage	Parallel Adjustment	Thickness=1.1mm(1.04mm)
2	Adjustment Program	Each Mechanism Settings	Exclusive Program("J80C10E")



- Never use the bent (curved or tilted) or rusty thickness gage.
- Erase any dirt, grease or obstacles on the thickness gage before you use it.

4.2 Adjustment

This section explains specific procedures for each adjustment required for Stylus Color 400.

4.2.1 Parallel Adjustment

When exchanging carriage assembly and or removing it along with disassembly of printer mechanism, perform parallel adjustment when assembling and set the standard distance from the surface of the print head to the paper surface.



- Do not scar the special coated surface of the PF roller assembly(platen) and lib surface of the front paper guide ;B.
- Be careful not to leave any scars or dirt on the surface of the print head.
(Never use the rusty or dirty thickness gage. Also, do not push hard the thickness gage to the head.)

[Right Parallelism Adjustment]

1. Install the "parallelism adjustment bush" for right and left frame and set them on the peaking of the upper frame side so that they match with "the standard mark of parallelism adjustment bush".
2. Set the PG lever front. (Gap is small.)
3. Move the carriage to the center and set the thickness gage on the fixed position of front paper guide ;B as you can see in the figure 4-1 on the next page
4. Move the carriage to the position that the print head overlaps the thickness gage.

WORK POINT

- Put the thickness gage on the flat side of the lib of the front paper guide ;B.
- When you move the carriage, move it, pulling the timing belt with your hand.

5. Move the right parallelism adjustment to the rear direction until the thickness gage moves with the carriage when you move the carriage 20mm back and forth in right and left direction.
(Gap will be narrowed.)
6. From the state of the thickness gage moves with carriage movement, move the gear for locating the position of the right parallelism adjustment bush one serration toward you.(Gap will be widen.
7. In the state that PG lever is set front(gap is small) and rear side respectively, move the carriage right and left and make sure that the thickness gage does not move at this time.

[Left Parallelism Adjustment]

8. Perform above procedures from 2 to 7 for left parallelism adjustment bush.

[Checking parallelism]

9. Perform procedures from 1 to 4 again.
10. Make sure that the thickness gage does not move along with carriage movement when the carriage is moved 20mm back and forth.
11. In the state that the right parallelism adjustment bush is moved one serration toward rear(Gap will be narrowed),make sure that the thickness gage moves along with carriage movement.
If the thickness gage does not move, perform procedures from 1 again.
12. Move the right parallelism adjustment bush one serration toward you(Gap will be widen).

[Fixing Parallelism Adjustment Bush]

13. Fix the right and left parallelism adjustment bushes by screws.(No.1 screw each for right and left.)

When completing this adjustment, check the overlap amount of print head and head cleaner.

1. Rotate the gear 67.2 and move the head cleaner to the print rear side.
2. Move the carriage next to the head cleaner and make sure that overlap between the tip of the print head and cleaner head is more than 0.5mm.
3. After that, rotate the gear 67.2 and return the head cleaner to the front position.

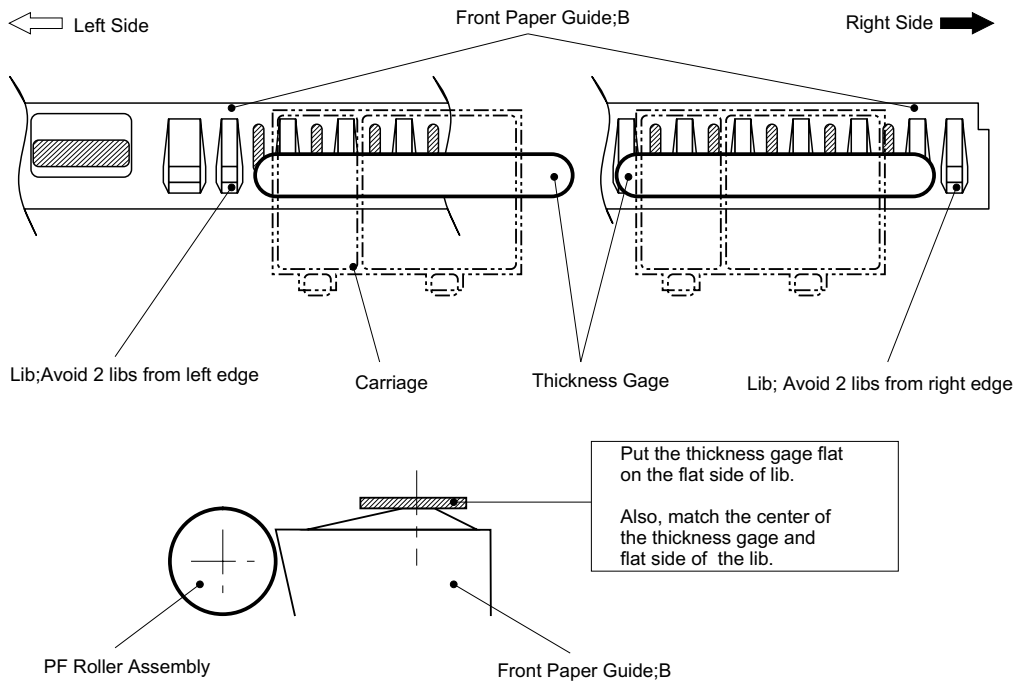


Figure 4-1. Setting of the Gage at Parallel Adjustment

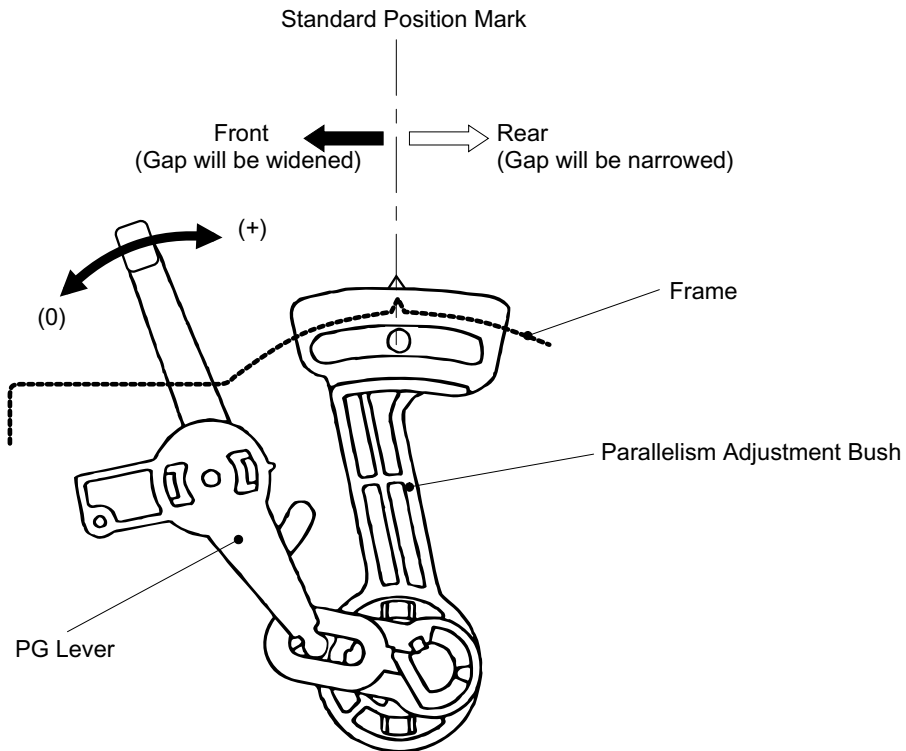


Figure 4-2. Parallel Adjustment

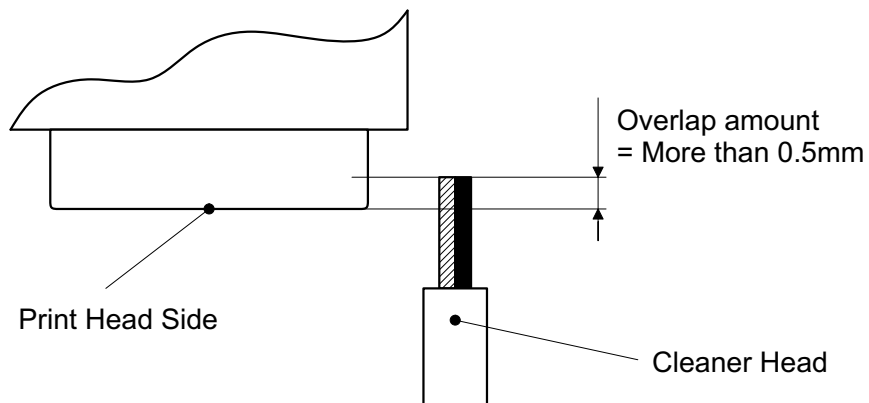


Figure 4-3. Overlap of Head Surface and Cleaner Blade

4.2.2 Adjustment by Adjustment Program

In this printer, it is necessary to set correct information for each printer mechanism in order to maintain homogeneous printing function and quality, erasing dispersion of each printer mechanism's characteristics.

Therefore, in case that the combination of printer mechanism and main board is changed or the print head is exchanged by repair service, it is required to set and register correct information in the main board, using the exclusive adjustment program.

4.2.2.1 Specification of Adjustment Program

Adjustment Program (Program name:"J80C10E") is to set various correct values in order to prevent development of malfunction and fluctuation of printing quality and printing function by dispersion of components and assembly when the printer components are exchanged during the repair service. Basic adjustment procedure by using this program are following.

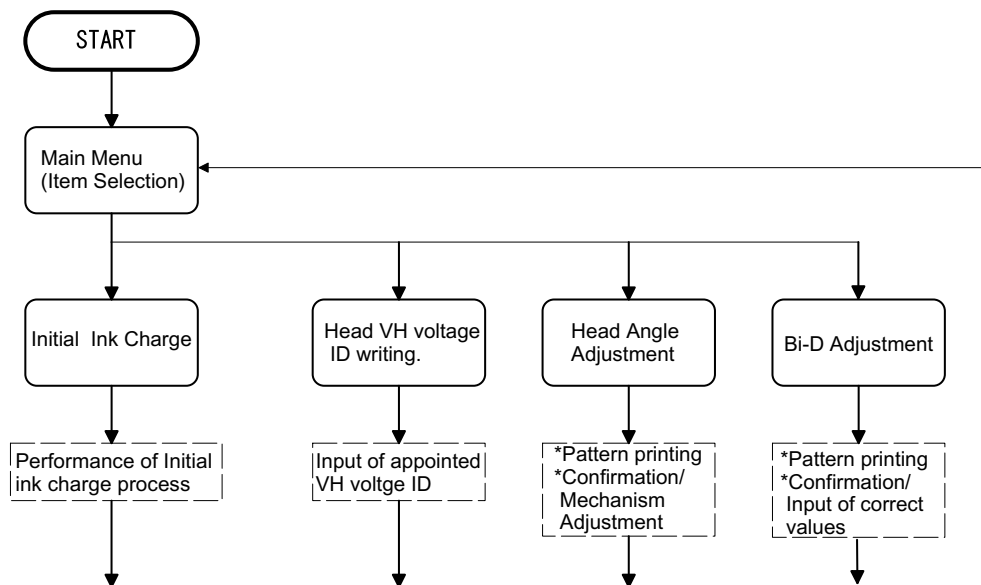


Figure 4-4. Flow of Adjustment Program

4.2.2.2 Initial Ink Charge Operation

There is no ink charged in the ink path of the print head that is mounted on the print head and printer mechanism as spare parts. Therefore, when the following units are exchanged, perform initial ink charge and return the printers after making sure that ink is discharged correctly from the print head.

- When exchanging the printer mechanism
- When exchanging the print head
- When exchanging the C206 main board (Refer to "Caution" below.)



- ☑ *Before or after performing this operation, perform appropriate adjustment or operation, referring to the table 4-2.*
- ☑ *Since this operation consumes quite amount of ink, do not perform more than necessary except for ink absorption for the recovery from nozzle clogging and exchange of C206 main board.*

Note) Refer to the end of this chapter for [Screen 1 to 6] when you perform procedures below.

1. Connect the printer and PC and turn on the printer. Install the newly just opened black and color ink cartridge. (When C206 main board is exchanged, it is not necessary to perform initial ink charge by the program since initial ink charge is performed automatically at this point.)
2. Insert the disk of adjustment program to the floppy disk drive of PC. Type Load" a:\J80C10E and press the return key.
3. After running the adjustment program, press the return key on the menu [Screen-1] indicated on the PC screen. Then, press the return key again on the [Screen-2].
4. Select "1"(WORLD) on the [Screen-3].
5. Input "2" (Cartridge) on the ink supply method selection screen [Screen-4] and press the return key.
Note) Do not press "1"(Jig) at this point, because it consumes ink more than necessary.
6. Initial menu screen [Screen-5] appears. At this point, select "1"(Production).
7. On the main screen [Screen-6], select "2"(Ink Charge). After this, initial ink charge is performed automatically.



- ☑ *Since [Screen-1] through [Screen-6] are attached in the end of this chapter, refer to them for procedures above.*

4.2.2.3 VH Voltage Writing Operation

There are dispersion in the PZT which are used for print head. It is necessary to set available and appropriate printing by registering mean values(VH voltage) of these PZT dispersion in the EEPROM. Therefore, when the next operations are done, it is necessary to confirm VH voltage ID and to register to EEPROM on the main board by the program.

- When exchanging the print head
- When exchanging the printer mechanism
- When exchanging the C206 main board



Before or after performing this operation, refer to the table 4-2 and perform appropriate adjustments or operations.

1. When exchanging parts above, make a note of VH voltage ID that is appointed in advance.
 - Indication position of the Print head : VH voltage ID is stamped on the side face of the print head.
 - Indication position of the printer mechanism : VH voltage ID is written on the label of the packing box of the printer.
2. Connect the printer and PC and turn on the printer. Install the newly just opened black and color link cartridge. (If C206 main board is exchanged, initial ink charge is performed automatically.)
3. Insert the disk of adjustment program to the floppy disk drive of PC. Type Load" a:\J80C10E and press the return key.
4. After running the adjustment program, press the return key on the menu [Screen-1] indicated on the PC screen. Then, press the return key again on the [Screen-2].
5. Select "1"(WORLD) on the Customer [Screen-3].
6. Input "2" (Cartridge) on the ink supply method selection screen, [Screen-4] and press the return key. *Note) Do not press "1"(Jig) at this point, because it consumes ink more than necessary.*
7. Initial menu screen [Screen-5] appears. At this point, select "1"(Production).
8. On the main screen [Screen-6], select "1"(VH setting). Input "0" in the M/C No. of the [Screen-7] and press the return key.
9. Input VH(3-code) that you made a note of VH voltage ID to the [Screen-8]. If you input wrong, press the space key and restart from procedure 7. After checking if correct selection is made, press the return key and return the screen to the main menu [Screen-6]. At this time, printer mechanism performs initialization.
10. When you perform only VH voltage input, turn the power off after completing initialization and register input value to the EEPROM. If you want to continue adjustments such as angular adjustment or Bi-d adjustment, using this program, perform the next adjustment on the main menu screen [Screen-6] without turning power off here.



Since [Screen-1] through [Screen-6] are attached in the end of this chapter, refer to them for procedures above.

4.2.2.4 Print Head Angle Adjustment

The dispersion of print head and carriage that is the base of installing the print head are caused during the production and gives bad influences on the angle of the print head. If the angle of the print head is not correct, overlap of colors is not performed correctly. This results in causing color lines or white lines. In order to prevent this, an exclusive lever to adjust the print head angle is installed in the side face of the carriage unit. This makes it possible to adjust the head angle without removing the ink cartridge. It is required to perform this adjustment at the following cases.

- When exchanging the print head
- When exchanging the carriage unit
- When moving the angle adjustment lever

Since the position for installing the print head is determined by the adjustment lever built in the carriage unit, this adjustment determines the position for installing the print head by the adjustment lever on the carriage unit according to the result of printing of the check patten to check the angle degree by the adjustment program.



Before or after performing this operation, refer to the table 4-2 and perform appropriate adjustments or operations.

1. Connect the printer and PC and turn on the printer. Install the newly just opened black and color link cartridge. (If C206 main board is exchanged, initial ink charge is performed automatically.)
2. Insert the disk of adjustment program to the floppy disk drive of PC. Type Load"a:\J80C10E and press the return key.
3. After running the adjustment program, press the return key on the [Screen-1] of the menu indicated on the PC screen. Then, press the return key again on the [Screen-2].
4. Select "1"(WORLD) on the Customer [Screen-3].
5. Input "2" (Cartridge) on the ink supply method selection screen, [Screen-4] and press the return key. *Note) Do not press "1"(Jig) at this point, because it consumes ink more than necessary.*
6. Initial menu screen [Screen-5] appears. At this point, select "1"(Production).
7. On the main screen[Screen-6], select "3"(Angular Adjust Print). At this time, the printer prints pattern automatically for checking the head angle. From the top, the printer prints in black • "YMC • " black/magenta. After checking this print result, if the pattern is printed normally, following steps are not necessary.
8. If more adjustment is necessary, select "K"(Angular Adjust Setting) on the main screen [Screen-6]. By performing this, since the carriage moves to the central position even if the upper case is attached, the adjust lever can be reached easily.
9. Refer to the next page.



Since [Screen-1] through [Screen-6] are attached in the end of this chapter, refer to them for procedures above.

- Loosen a screw securing the print head on the carriage.
(It is not necessary to remove it completely: Refer to the figure below.)

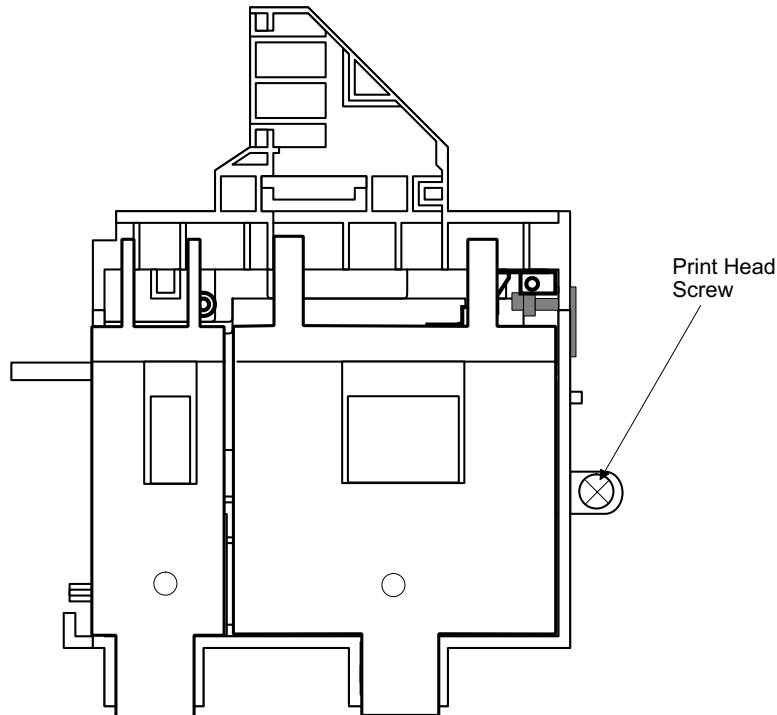


Figure 4-5. Position of the Print Head



Make sure to loosen the screw. If the screw is not loose, the print head angle can not be changed even if the position of the adjust lever is moved.

- Pay attention to the combination pattern of black/magenta and change the position of the adjust lever so that a magenta line comes to between above and below black lines, adjusting the print head angle by the adjust lever. The figure 4-6 below shows changes of actual printing pattern of black/magenta combination with the operation of the adjust lever.

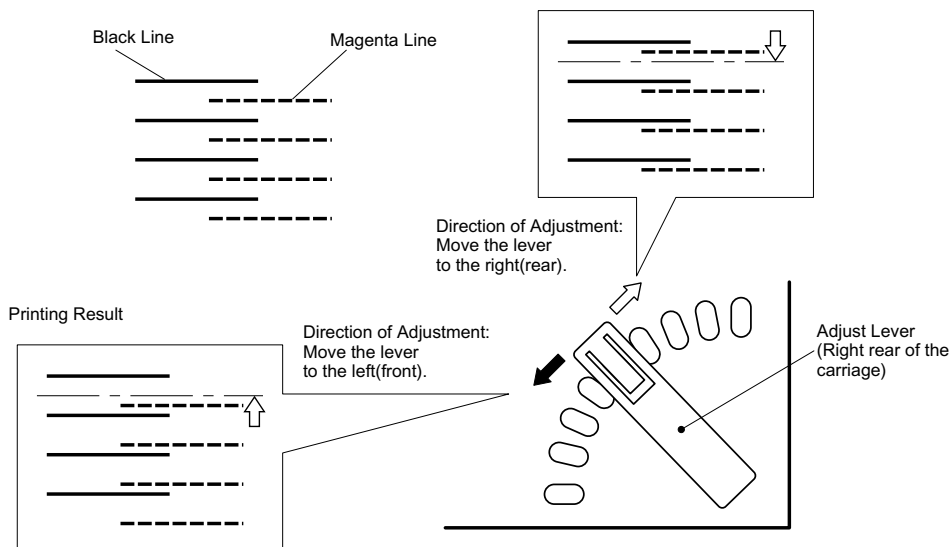


Figure 4-6. Adjustment of Combination Pattern of Black and Magenta

- After changing the position of the adjust lever, press “Y” key and return the carriage to the home position.
- Check again the combination pattern of black/magenta after changing the position of the adjust lever.
- Repeat the procedures from 7 to 12 until the combination pattern of black/magenta comes to proper position.
- After completing adjustment, select “K” (Angular Adjust Setting) on the main screen [Screen-6] and tighten the loosen screw steadily.

4.2.2.5 Bi-D Adjustment

This adjustment is to correct dispersion of printing positions caused by slippage of printing timing in right and left direction during the bi-directional printing. Therefore, it is required to perform this adjustment if the following operations are performed.

- | | |
|---------------------------------------|---------------------------------------|
| 1)When exchanging the Print mechanism | 2)When exchanging the C206 main board |
| 3)When exchanging the CR motor | 4)When exchanging the Carriage |
| 5)When exchanging the Assembly | 5)When exchanging the Print Head |

The values which are set in this adjustment are registered in the EEPROM of the main board as correct values of print timing in the right and left direction.



☑ Before performing this operation, refer to the table 4-2 and perform appropriate adjustments or operations.

1. Connect the printer and PC and turn on the printer. Install the newly opened black and color link cartridge. (If C206 main board is exchanged, initial ink charge is performed automatically.)
2. Insert the disk of adjustment program to the floppy disk drive of PC. Type Load"a:\J80C10E and press the return key.
3. After running the adjustment program, press the return key on the [Screen-1] of the menu indicated on the PC screen. Then, press the return key again on the [Screen-2].
4. Select "1"(WORLD) on the Customer [Screen-3].
5. Input "2" (Cartridge) on the ink supply method selection screen, [Screen-4] and press the return key.
Note) Do not press "1"(Jig) at this point, because it consumes ink more than necessary.
6. Initial menu screen [Screen-5] appears. At this point, select "1"(Production).
7. On the main screen [Screen-6], select "4"(Bi-D Adjust). After this, three Bi-D patterns are printed automatically back and forth, as centering the presently set center value.
8. Check the Bi-D pattern and find out that the value should be adjusted to (+) side or (-) side.
Note) At this time, if the predicted value is quite different, comparing the present center value, change the center value by the following procedures.
 - [Step8-1] On the [Screen-7], input "Y" once and return to the main screen [Screen-6].
At this time, the presently fed paper is once ejected.
 - [Step8-2] On the main screen, the screen goes back to initial menu [Screen-5] by inputting "E" key and pressing the return key.
 - [Step8-3] On the screen, input "6"(Bi-D Center) and press the return key.
 - [Step8-4] Since the screen asks you New Bi-D Center, input a now value and press the return key. The screen goes back to the initial menu screen [Screen-5] and make sure that the new value that you input is in the "6" of the Bi-D Center.
9. Determine a value as goal and input random value on the [Screen-7]. The Bi-D pattern will be printed again by pressing the return key.
If proper lines are found among the three patterns, input that value again on the [Screen-7] and press the return key. For confirmation, only the pattern by selected value will be printed.
If it is O.K., press "Y" and eject the paper. If you want to try again, input random value on the [Screen-7].
Note) Each time one parameter is changed, line moves at each 1440-DPI.
10. Repeat the procedure 7 through 9 until Bi-D pattern becomes appropriate.
11. After completing adjustment, turn off the power and input the setting value in the EEPROM.
From the next time, setting value will be reflected.



☑ Since [Screen-1] through [Screen-6] are attached in the end of this chapter, refer to them for procedures above.

[Screen 1]

DATE= XX-XX-1996
Date?

[Screen-2]

DATE= 12-17-1996
Date?
TIME=XX:XX:XX
TIME= _

[Screen-3]

1. 000:WORLD
2. 100:JAPAN
Select No. ?

[Screen-4]

1. Jig
2. Cartridge
Select No. ?

[Screen-5]

1. (Production)
2. (Outgoing Inspection)
3. Date/Time [XX-XX-199X] [XX:XX:XX]
4. Jig [CT]Jl=JIG CT=Cartridge WAIT= 80s
5. Customer [000:WORLD]
6. BI-D Center [0]
JIG:(Jig Maintenance)
Select No. ?

[Screen-6]

1. VH Setting
2. Ink Charge
3. Angular Adjust Print
K. Angular Adjust Setting
4. Bi-d Adjust

P. Printing Inspection (GOS)
L. Printing Inspection (S/F)
M. Printing Inspection (POST. CARD)
CL. Cleaning

9. INK Discharge
E. Go to SETTING MENU
Select No. ?

Chapter 5

Troubleshooting

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5.1 Troubleshooting

The printer may exhibit different symptoms for the same problem, which makes troubleshooting more difficult. This section, however, provides simple and effective ways to facilitate troubleshooting. The following flowchart illustrates the main steps of the trouble shooting process.

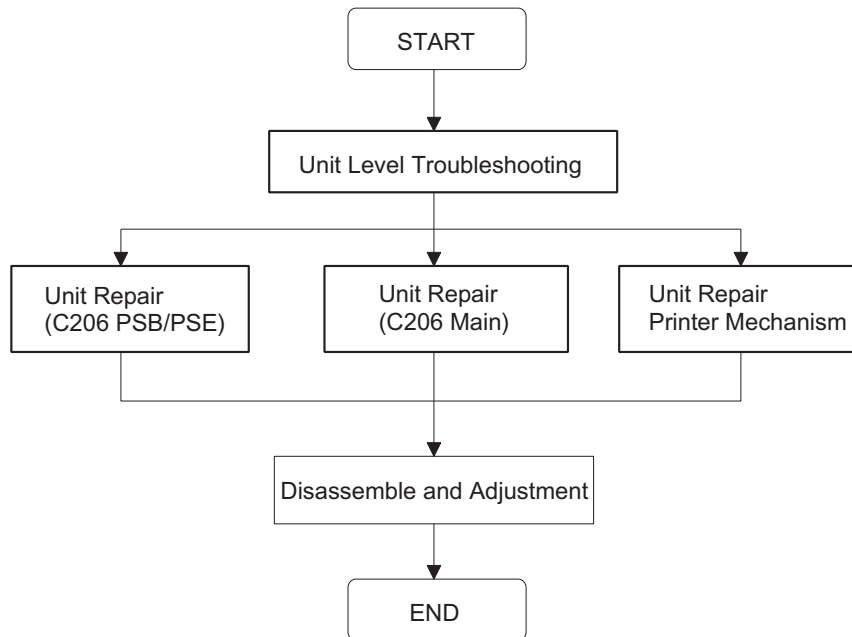


Figure 5-1. Troubleshooting Process Flowchart

Table 5-1. Motor Resistance and Measurement Procedure

Motor Name	Location	Check Point	Resistance
CR Motor	CN6(C206 MAIN)	1-pin & 3-pin, 2-pin & 4-pin	7.8 Ohms \pm 10%
PF(Pump) Motor	CN7(C206 MAIN)	1-pin & 3-pin, 2-pin & 4-pin	7.8 Ohms \pm 10%

Table 5-2. Sensor Check

Sensor Name	Check Point	Signal Level	Sensor Status
Paper end sensor	CN4 / 1-pin, 2-pin	Open: less than 0.7 V	Paper exit
		Close: more than 2.4 V	No paper
Carriage home position sensor	CN5 / 1-pin, 2-pin	Open: less than 0.7 V	Home position
		Close: more than 2.4V	Out of home position
ASF phase Sensor	CN11 / 1-pin, 2pin	Open: less than 0.7 V	Home position
		Close: more than 2.4 V	Out of home position
Black cartridge sensor	CN8 / 1-pin, 18pin	On: 0 V	Black cartridge out
		Off: more than 2.4 V	Black cartridge exit
Color cartridge sensor	CN8 / 2-pin, 18-pin	On: 0 V	Color cartridge out
		Off: more than 2.4 V	Color cartridge exit
Thermistor	CN8 / 3-pin, 18-pin	Analog data	Change the VH voltage of charge pulse for common driver circuit

Table 5-3. Printer Condition and Panel Status

Error status	Indicators				Recovery
	Power	Ink Out (Black)	Ink Out (Color)	Paper Out	
Paper Out	---	---	---	On	Load paper by pressing load/eject button.
Paper jam condition	---	Off	Off	Blink	Eliminate a paper then press load/eject button.
No Ink cartridge or Ink end(black)	---	On	---	---	Install a new black ink cartridge by pressing load/eject button for 3-seconds.
No Ink cartridge or Ink end(color)	---	---	On	---	Install a new color ink cartridge by pressing load/eject button for 3-seconds.
Maintenance request	Blink	Blink	Blink	Blink	Change the waste ink drain tank and reset the EEPROM.
Fatal error	Blink	On	On	Blink	Turn on the printer and turn it on again. If printer can not recover, repair the suitable part.

5.2 Unit Level Troubleshooting

When a problem occurs, you can identify the defective unit according to the symptoms exhibited. The table below lists the symptoms of certain problems. Once the problem is identified, refer to the flowchart that corresponds to the problem.

Table 5-4. Symptom and Problem

Symptom	Problem	Flowchart No.
Printer does not operate at power on	<ul style="list-style-type: none"> • ; LEDs do not light up. • ; Printer mechanism does not operate. 	Section 5.2.1
Error is detected	<ul style="list-style-type: none"> • ; Error is indicated by LED indication. 	Section 5.2.2
Failure occurs during printing	<ul style="list-style-type: none"> • ; Printing is not performed. • ; Abnormal printing(missing dot, etc.) • ; Print quality is poor 	Section 5.2.3
Printer does not feed the paper correctly	<ul style="list-style-type: none"> • ; No paper is fed. • ; Paper feed is irregular. • ; Paper jam occurs. 	Section 5.2.4
Control panel operation is abnormal	<ul style="list-style-type: none"> • ; No response to button access. 	Section 5.2.5

5.2.1 Printer does not operate at power on

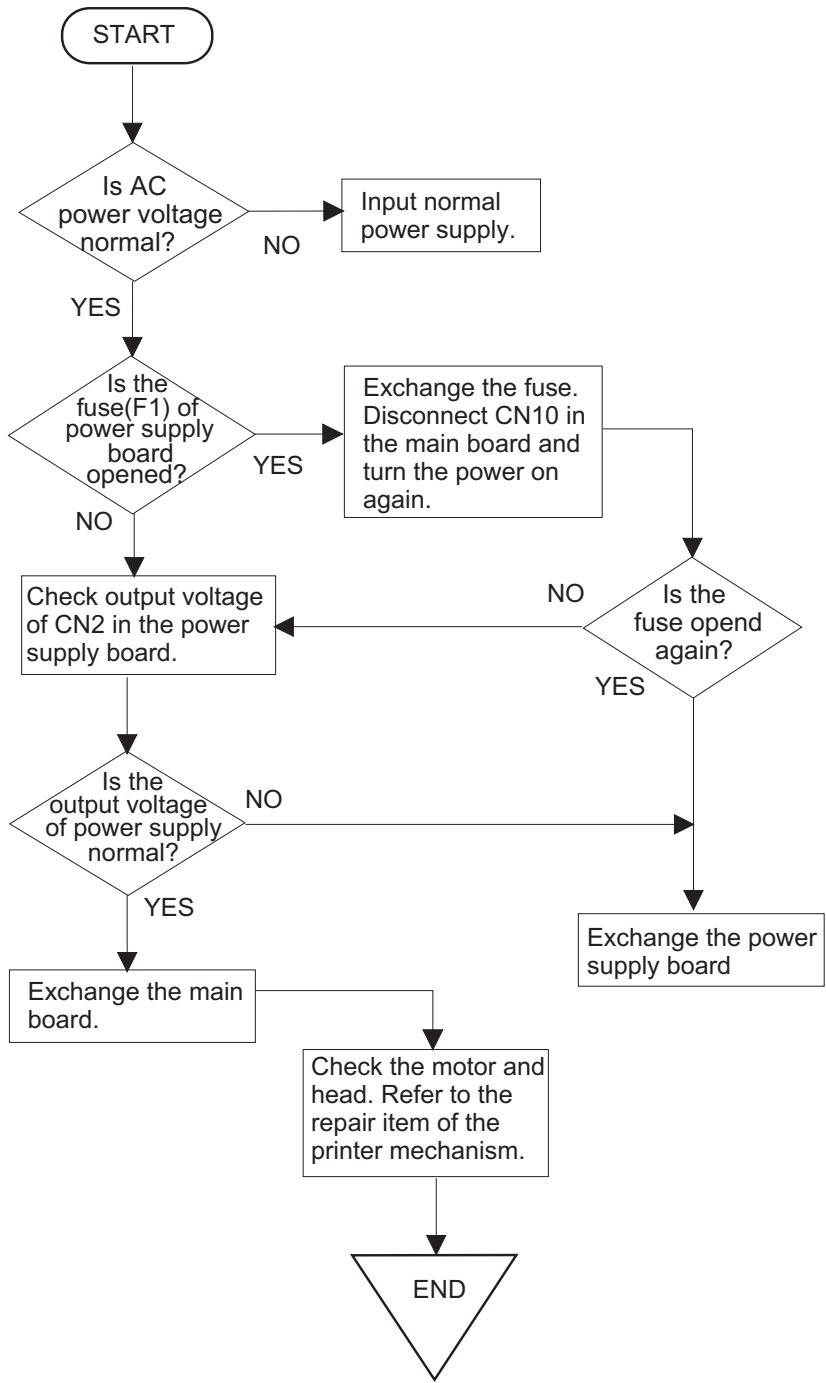


Figure 5-2. Flow Chart 1

5.2.2 Error is detected

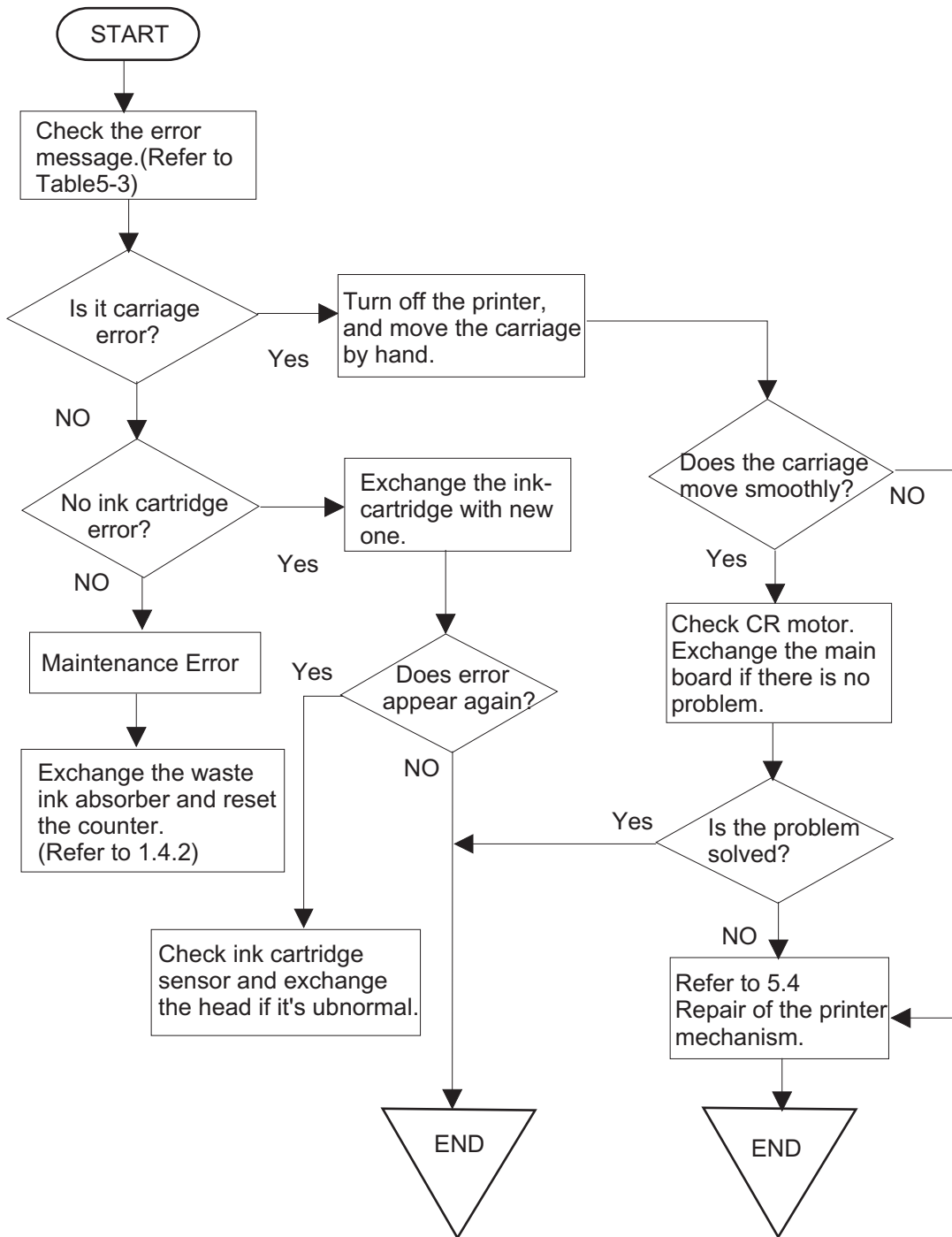


Figure 5-3. Flow Chart 2

5.2.3 Failure occurs during printing

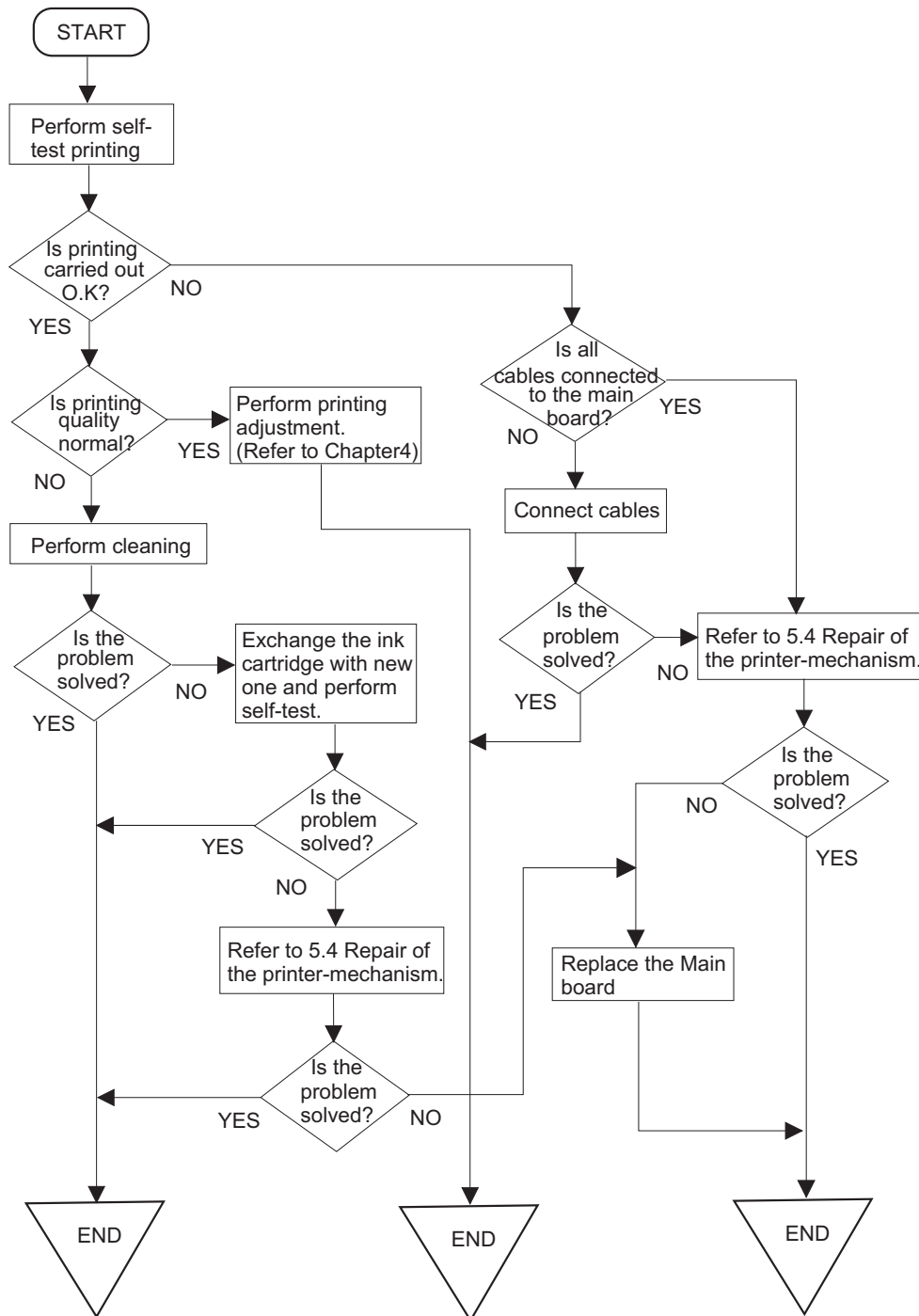


Figure 5-4.Flow Chart3

5.2.4 Printer does not feed the paper correctly

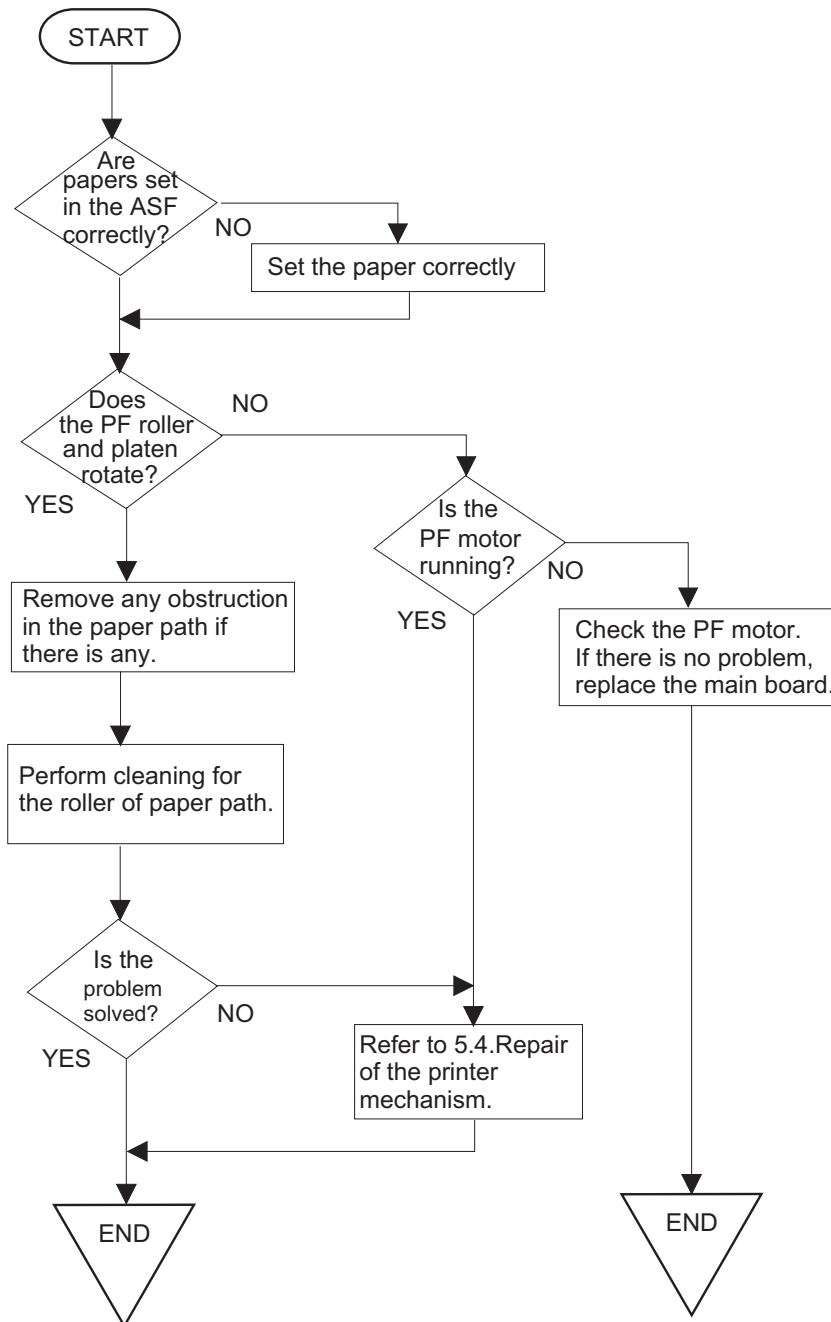


Figure 5-5. Flow Chart 4

5.2.5 Control panel operation is abnormal

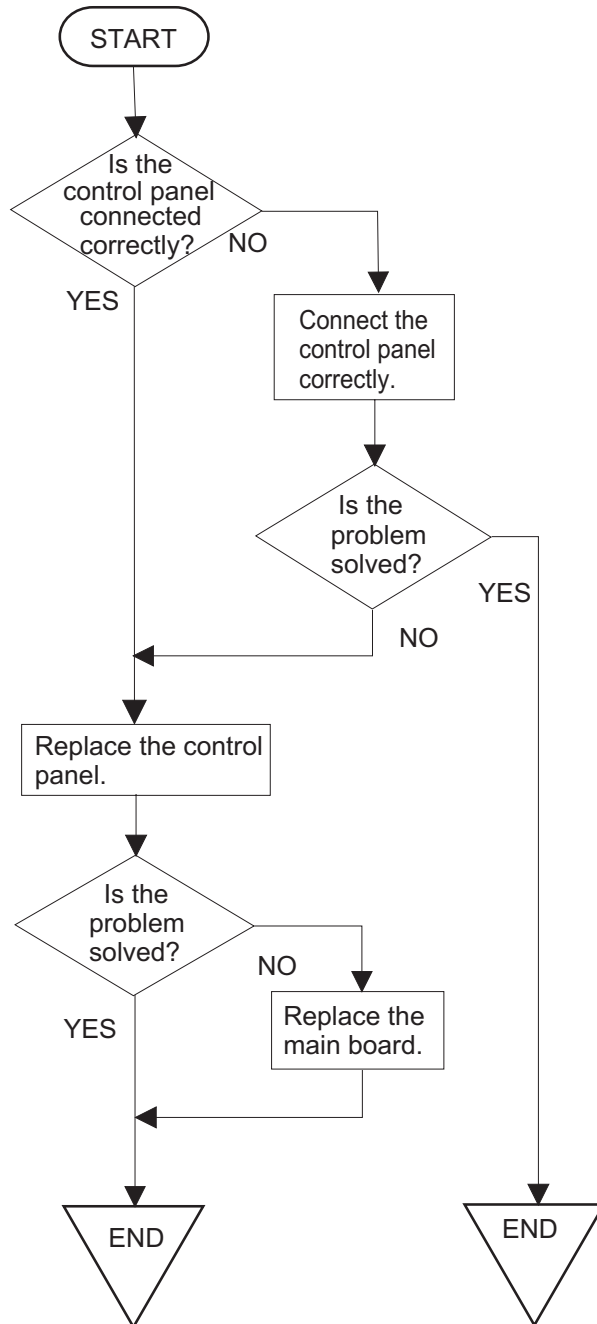


Figure 5-6. Flow Chart 5

5.3 Unit Repair C206 PSB/PSE Board

This section describes the problems related to the power supply board(C206 PSB/PSE). The table below provides various symptoms, likely causes, and checkpoints. The checkpoints refer to waveforms, resistance, and other values to be checked to evaluate the operation of each component.

Table 5-5. C206PSB Power Supply Borad

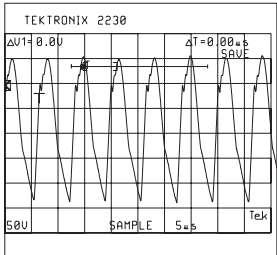
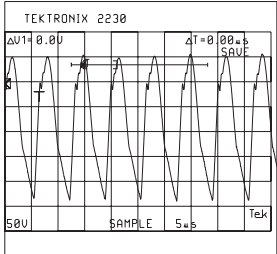
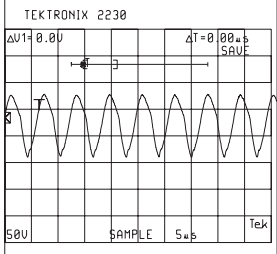
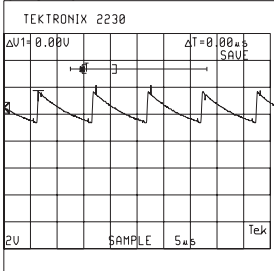
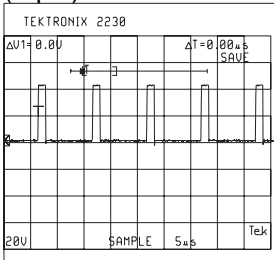
Symptom	Condition	Cause	Checkpoint	Solution
The printer does not operate at all.	+42V line is dead.	F1 is open.	Check F1 by using a tester. 	Replace F1.
		Transformer coils are open.	Check the waveform at the drain of Q1.	Replace T1.
		Switching FET (Q1) is dead.	Check drain side. 	Replace Q1.
		Feed back transistor(Q2, Q3) are dead.	Check corrector side. 	Replace Q2 or Q3.
		+42 V line is abnormal.	Check following parts. <ul style="list-style-type: none"> • ZD87,ZD83 • ZD51,ZD81 • ` ZD86 • PC1 	Replace suitable parts.

Table 5-6. C206PSB Power Supply Board (Continued)

Symptom	Condition	Cause	Checkpoint	Solution
	+5V line is dead.	IC51 (L4962E) is dead.	<p>Check the oscillation(5-pin) and switching (7-pin) waveform of IC51.</p> <p>(5-pin)</p>  <p>(7-pin)</p> 	Replace IC51.

5.3.1 Unit Repair - C206 MAIN Board

This section describes the problems related to the main controller board(C206 main). The table below provides various symptoms, likely causes, and checkpoints. The check points refer to waveforms, resistance, and other values to be checked to evaluate the operation of each component.

Table 5-7. Repair of the C206 MAIN Board

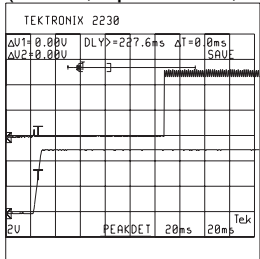
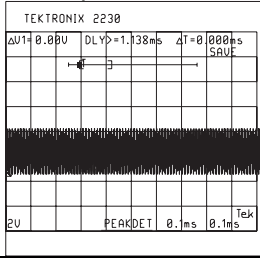
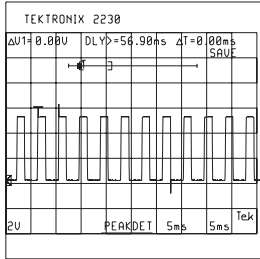
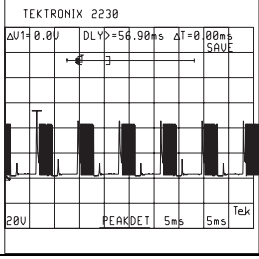
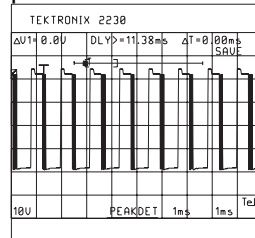
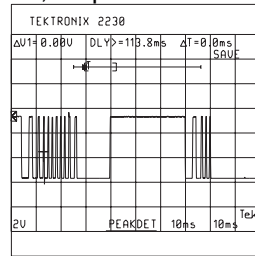
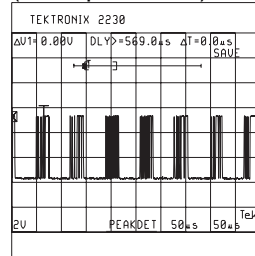
Symptom	Condition	Cause	Checkpoint	Solution
The printer does not operate at all.	CPU does not operate.	The reset circuit does not operate.	Check the waveform of the +5V and /Reset signal (IC8=5,1-pin/IC9=7,6-pin) 	Replace IC8 or IC9.
		Control ROM is not selected correctly or it's dead.	If you can not find the waveform at 2-pin of IC3, the IC1 is dead, and if you can not find it at 20-pin of IC3, the IC3 is dead.	Replace IC1 or IC3.
		RAM is not selected correctly or it's dead.	If you can not find the waveform at 29,14-pin of IC4, the IC1 is dead, and if you can not find it at 28-pin of IC4, the IC4 is dead.	Replace IC1 or IC 4.
		CRU2 is dead.	Check the waveform at 27,28-pin of IC1. 	Replace the CRU2.
The carriage does not operate normally.	Carriage motor does not operate at all.	IC2 is dead.	Check the waveform at 72,73 and 75, 76 pin of IC14. 	Replace IC2.
		IC14 is dead.	Check the waveform at 6-9 pin if IC14. 	Replace IC14.

Table 5-8.Repair of the C206 MAIN Board (Continued)

Symptom	Condition	Cause	Checkpoint	Solution
Printing is abnormal.	Printing is not execute.	IC7 is dead.	Check the trapezoidal waveform at 3-pin of Q7 on C206 main board.	Replace IC6, Q7, or Q9.
		IC2 is dead.	Check the control signal of trapezoidal from IC2. (at 80 pin of IC2)	Replace IC2.
Paper feed operation is abnormal.	Paper feed motor does not work.	IC2 is dead.	Check the output waveform of at 55, 56, 57, 58 pin of IC2.	Replace IC2
		IC15 is dead.	Check the output waveform of at 6, 7, 8, 9 pin of IC15.	Replace IC15



5.4 Repair of the Printer Mechanism

This section provides instruction for repairing the printer mechanism. It describes various problems, symptom, likely causes, checkpoints, and solutions. Select appropriate symptom from the table and check each parts and its function as described in the checkpoint.

Table 5-9. Repair of the Printer Mechanism

Symptom	Condition	Cause	Checkpoint	Solution
Abnormal pump mechanism operation	Abnormal PF motor operation when the power is turned on.	Foreign substances are loaded in the PF gears.	Manually drive the platen drive gear and check it if it rotates normally.	Remove any foreign substances.
		The PF motor is defective. (Refer to Table5-1)	Check the inner coil resistance and see if there is any disconnection of the coil.	Exchange the PF motor.
Ink is not absorbed or is poorly absorbed.	Used ink does not go through the waste ink tube.	The pump tube is crashed.	Check the tube visually.	Fix the crashed part by the airgun.
		Capping rubber is damaged or deformed.	Check the capping rubber visually.	Replace the cap mechanism.
		The tube is out of the cap.	Check if the tube is out of the cap visually.	Connect the tube properly.
		Pump bulb is not closed at absorption.	Check the bulb operation visually.	Replace the cap mechanism.
Abnormal carriage operation.	Abnormal carriage operation at power on.	Foreign substance in the CR drive gear.	Check visually if there is any substances or not.	Remove any foreign substances.
		CR motor is defective.	Check the inner coil resistance and see if there is any disconnection of the coil.	Replace the CR motor.
	Abnormal carriage operation during printing.	Carriage movement is not smooth.	Check whether the carriage moves smoothly when moved manually.	Clean and lubricate the carriage guide axis.
			Check tension of the timing belt.	Adjust tension mechanism or exchange it.
			Check if there is any foreign substances in the carriage path.	Remove any foreign substances.
	Printing is not performed.	The carriage moves, but no printing is performed.	Head FFC is out of connection.	Check if the head FFC on the board or carriage is connected surely.
The FFC is disconnected inside.			Check the FFC by using a tester.	Replace the FFC.
I/C is defective.			Install a new I/C and perform the self-test.	Replace I/C.
Head unit is defective.			If the condition does not improve even after 2or 3 times cleaning operation, replace the head unit and perform the self-test.	Replace the head unit.

Table 5-10. Repair of the Printer Mechanism (Continued.)

Symptom	Condition	Cause	Check-point	Solution
Abnormal printing	Only a particular dot causes abnormal printing.	Print head surface is not clean. (dot missing)	Perform the cleaning operation several times and check printing.	Perform the cleaning.
		The head unit is defective.	Perform the cleaning operation several times and check printing.	If condition does not improve even after the cleaning, replace the head.
		Capping absorber is touching the head surface.	Check the head absorber visually.	Replace the head absorber if it is deformed.
A dot is not printed occasionally.	A dot is not printed occasionally.	Print head surface is not clean. (dot-missing)	Perform the cleaning operation several times and check printing.	Perform the cleaning.
		The head FFC is disconnected inside.	Check the FFC by using a tester.	Replace the head FFC.
		The head FFC is out of connection.	Check if the head FFC on the board or carriage is connected surely.	Connect the FFC properly.
		The head unit is defective.	Perform the cleaning operation several times and check printing.	If condition does not improve even after the cleaning, replace the head.
		I/C is defective.	Install the new I/C and perform self-test.	Replace I/C.
Black specks or dots.	Black specks or dots.	The head FFC is out of connection.	Check if the head FFC on the board or carriage is connected surely.	Connect the FFC properly.
		The head unit is defective.	Check connection with the head FFC.	Replace the head if there is no connection problem with the FFC.
A vertical line is not aligned.	Bi-directional alignment is not adjusted.	Perform Bi-D adjustment.	Refer to Chapter4.	
White line appears in the image data.	White line appears in the image data.	Head angle is not correct.	Perform head angle adjustment.	Refer to Chapter4.
		Platen gap is not correct.	Perform platen gap adjustment.	Refer to Chapter4.
		Dot shooting direction is tilted because head surface is not clean	Perform the cleaning operation several times and check printing.	Perform the cleaning operation.
		I/C is defective.	Install a new I/C and perform the self-test.	Replace I/C.
		Head unit is defective.	Perform the cleaning operation several times and check printing.	Replace the head unit.

Table 5-11. Repair of the Printer Mechanism (Continued)

Symptom	Condition	Causes	Checkpoint	Solution
Abnormal paper feeding.	Paper is not fed.	Friction of the PF roller.	Check if the PF roller rotates when paper is not fed.	Clean the PF roller by the cleaning sheet. Replace the PF roller if it does not recover.
		Abnormal operation of the hopper.	Check movement of the ASF hopper visually.	Replace ASF.
		Malfunction of ASF drive change-over.	Check if the ASF gear rotates visually.	Replace gears of the ASF drive change-over.
		Friction of the PF roller.	Check if the PF roller slips during paper feeding.	Clean the PF roller by the cleaning sheet. Replace the PF roller if it does not recover.
Printer stops during initialization.	Fatal error appears.	ASF sensor is defective.	Check the signal level of the ASF sensor.(Refer to Table 5-2)	Replace ASF sensor.
		PE sensor is defective.	Check the signal level of the PE sensor.(Refer to Table 5-2)	Replace PE sensor.
		HP sensor is defective.	Check the signal level of the HP sensor .(Refer to Table 5-2.)	
		Head FFC is disconnected.	Check if the head FFC is connected.	Connect the head FFC.
		CR motor is defective.	Check the CR motor cable is connected.	Replace the CR motor if there is no problem in the cable connection.
		PF motor is defective.	Check if the PF motor cable is connected.	Replace the PF motor if there is no problem in the cable connection.

Chapter 6 Maintenance

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 6.1.2 Service Maintenance..... 6-1
 6.1.3 Lubrication 6-2

6.1 OVERVIEW

This section describes the points and the procedures for maintaining the printer in its optimum condition.

6.1.1 Cleaning

This printer has no mechanical components requiring regular cleaning. Therefore, the points described below are suggested to be checked for any dirt and make an appropriate cleaning if necessary.



- Never use the chemical solvents, such as thinner, to clean the printer. These chemicals can damage the components of the printer.*
- Be careful not to damage the components when you attempt to clean the inside of the printer.*
- Do not scratch surface of "ROLLER, ASSEMBLY, PF".
(Use soft brush to wipe off any dusts, or use soft cloth moistened with alcohol)*

- Housing:** Use clean soft cloth moistened with water and wipe off any dirt. If the housing stained with an ink, use a cloth moistened with a neutral detergent to wipe it off.
- Inside the printer:** Use a vacuum cleaner to remove any paper dust.

6.1.2 Service Maintenance

If the print irregularity (missing dot, white line, etc.) has occur or the printer indicates "MAINTENANCE ERROR", perform the following operation to clear the error.

Head Cleaning

The printer has a built-in head cleaning function and is executable from the control panel.

1. Confirm that the printer is in stand-by state (the POWER indicator is not blinking), and hold down the cleaning button on the control panel for more than 3sec.
2. The printer perform the built-in cleaning sequence. (during cleaning operation, the POWER indicator is blinking)

Maintenance Error Clear

Since the printer consumes the ink, not only for printing but also for another operation like cleaning, certain amount of ink are wasted. Therefore, the printer counts the amount of waste ink and they are collected at the waste ink pad, and once the amount of waste ink reaches the predefined limit, the printer indicates "MAINTENANCE ERROR" and the waste ink pad should be replaced as follows:

1. Replace the waste ink pad to new one.
2. After re-assemble the printer, turn the printer on while hold down the following buttons on the control panel:
"LOAD/EJECT" button
"CLEANING" button
3. Press "LOAD/EJECT" button again while "PAPER END" indicator is blinking. This clears the maintenance error condition and the waste ink counter value stored in EEPROM of the main board.

6.1.3 Lubrication

The type and amount of oil and grease used on this printer are determined based on the results of internal evaluations. Therefore, specified type and amount of oil and grease must be applied at specified part of the printer mechanism when servicing the printer.



- ☑ Never use the oil and the grease other than those specified in this manual and using different type of lubricant can damage the printer and the components.
- ☑ Never apply oil or grease exceeding the amount specified in this manual.

Table 6-1. Specified Lubricants

Type	Name	EPSON Code	Supplier
Grease	G-26	B702600001	EPSON
Oil	O-8	1019753	EPSON

Table 6-2. Lubrication Points

No.	Standard	Remarks
1	<Lubrication Point> Contact between "ROLLER, PF" and "PAPER GUIDE, REAR"	<ul style="list-style-type: none"> ● Apply grease while rotating "GEAR, 67.2". ● Do not put grease around the paper path. ● Use a syringe to apply it.
	<Lubricant Type> G-26	
	<Lubrication Amount> A half turn of "ROLLER, PF"	
2	<Lubrication Point> "Contact between "PAPER GUIDE, FRONT" and each rollers: 1) "ROLLER, PF" (1 point) 2) "ROLLER, EXIT" (2 points)	<ul style="list-style-type: none"> ● Apply to the contact of a hook of "PAPER GUIDE, FRONT" and each roller. ● Do not put grease around the paper path. ● Use a syringe to apply it.
	<Lubricant Type> G-26	
	<Lubrication Amount> 1) 10mm long 2) 2mm long	
3	<Lubrication Point> Contact between the carriage assembly and "FRAME, UPPER"	<ul style="list-style-type: none"> ● Verify that the carriage moves smoothly after lubricating it. ● Use a syringe to apply it.
	<Lubricant Type> G-26	
	<Lubrication Amount> From the HP sensor installation point to the point where "GUIDE PLATE, CABLE" is attached.	
4	<Lubrication Point> Gears: 1) "GEAR, 67.2" 2) "COMBINATION GEAR, 8, 14.4" 3) "GEAR, 23.2"	<ul style="list-style-type: none"> ● Rotating the gears after applying grease to evenly distribute it. ● Use a syringe to apply it.
	<Lubricant Type> G-26	
	<Lubrication Amount> 1) 1/4 of gear tooth 2) 1/3 of gear tooth 3) 1/3 of gear tooth 4) 1/3 of gear tooth	

Table 6-3. Lubrication Points (Continued)

No.	Standard	Remarks
5	<Lubrication Point> The shaft for "GEAR, 16, 40.8" at "FRAME, LEFT" <Lubricant Type> G-26 <Lubrication Amount> Approx. 5mm long	<ul style="list-style-type: none"> ● Use a syringe to apply it.
6	<Lubrication Point> Bush for "ROLLER, PF" 1) Left: Inside the bush 2) Right: Inside the bush (near the pump assembly) <Lubricant Type> G-26 <Lubrication Amount> Approx. 3mm diametrically	<ul style="list-style-type: none"> ● When applying to the right bush, apply it from the side of the paper path and wipe off any grease stick out to the cap assembly side. ● Rotate "ROLLER, PF" after applying the grease to evenly distribute it in the bush. ● Use a syringe to apply it.
7	<Lubrication Point> Both Left/Right Bush for "ROLLER, EXIT" <Lubricant Type> G-26 <Lubrication Amount> Evenly apply inside the bush	<ul style="list-style-type: none"> ● Do not put grease around the paper path. ● Use a syringe to apply it.
8	<Lubrication Point> Contact between "HOLDER, PULLEY, DRIVEN" and "FRAME, UPPER" <Lubricant Type> G-26 <Lubrication Amount> 2mm long at each specified point	<ul style="list-style-type: none"> ● Verify that the holder slides only with a spring force after applying the grease. ● Use a syringe to apply it.
9	<Lubrication Point> ASF; A round hole of the right frame of ASF (to hold the roller shaft) <Lubricant Type> G-26 <Lubrication Amount> Evenly apply inside the hole	<ul style="list-style-type: none"> ● Do not put grease to "ROLLER, ASSEMBLY, LD".
10	<Lubrication Point> ASF; Contact between "HOPPER" and "LEVER, HOPPER, RELEASE" <Lubricant Type> G-26 <Lubrication Amount> Evenly apply to the contact	<ul style="list-style-type: none"> ● Completely wipe off any grease stack out to inner side of ASF.

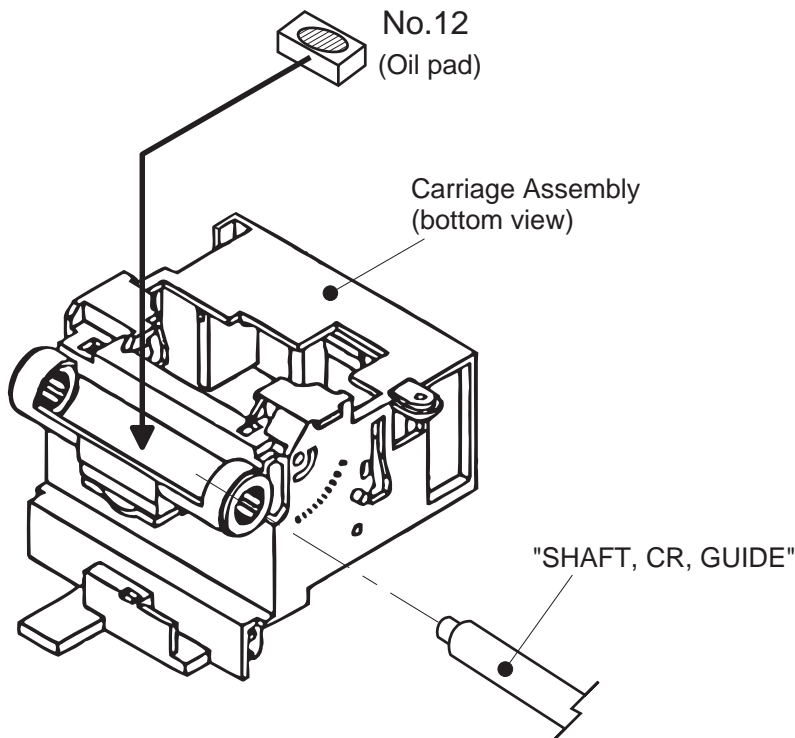
Table 6-4. Lubrication Points (Continued)

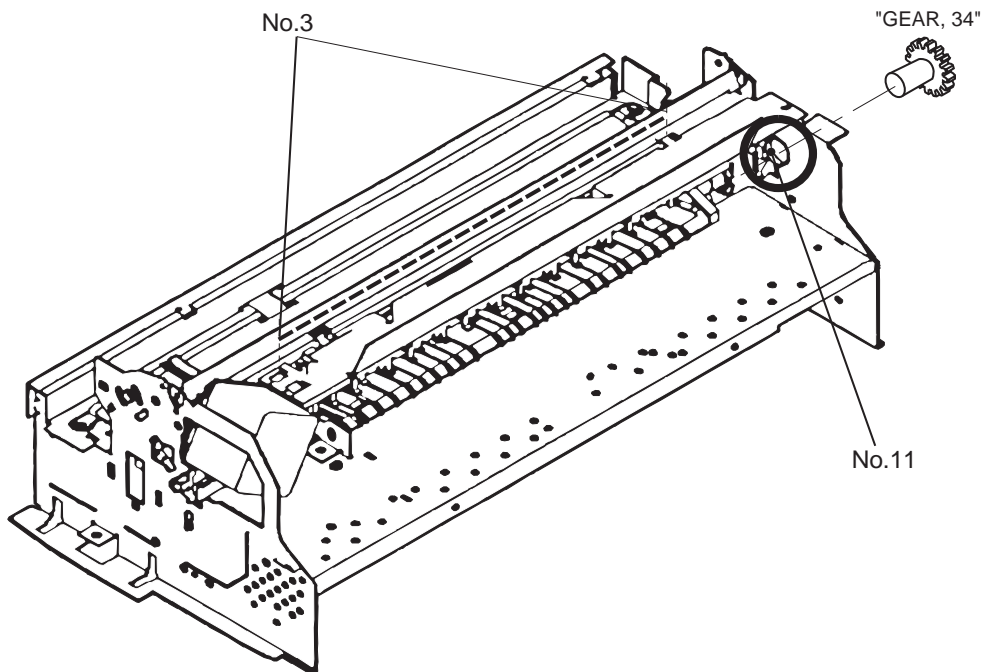
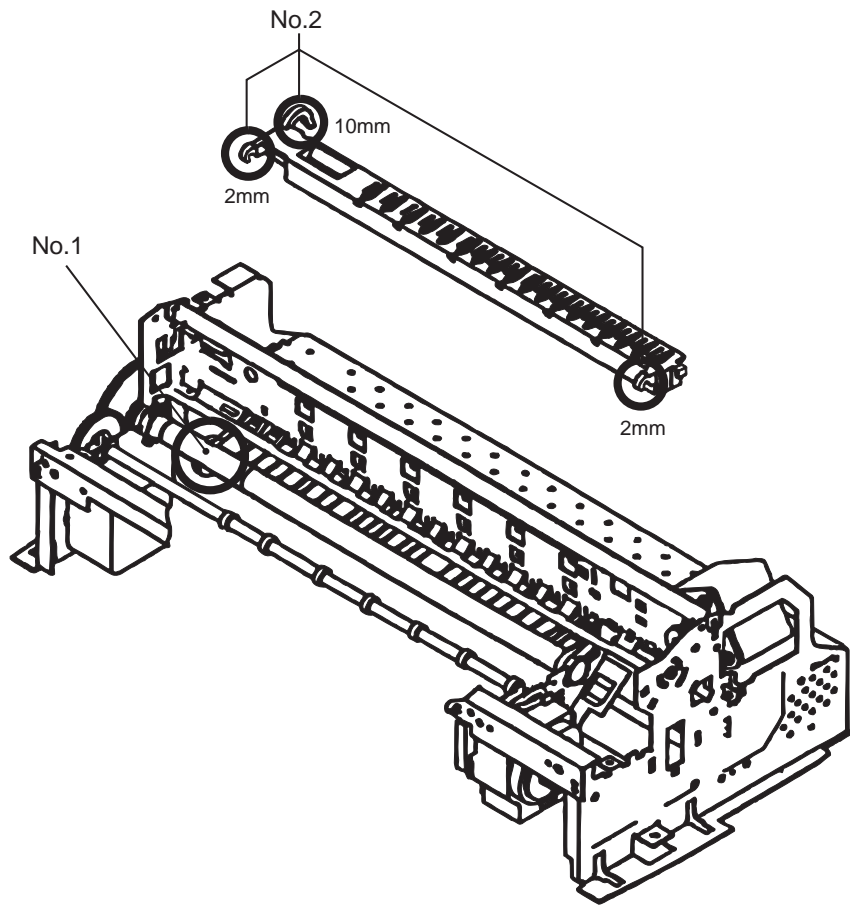
No.	Standard	Remarks
11	<Lubrication Point> A round hole of the left frame of ASF ("GEAR, 34" is inserting to this hole)	<ul style="list-style-type: none"> ● Completely wipe off any grease stack out to inner side of ASF.
	<Lubricant Type> G-26	
	<Lubrication Amount> Evenly apply inside the hole	
12	<Lubrication Point> Oil pad of carriage assembly	<ul style="list-style-type: none"> ● This application must be made only when; <ul style="list-style-type: none"> *Replacing the carriage assembly *Replacing oil pad ● Use a precise syringe to apply it. If accidentally apply too much oil to oil pad, thrown it away and take a new oil pad again. ● Leave oil pad for a while to wait until oil is evenly infiltrate and install it on the carriage assembly.
	<Lubricant Type> O-8	
	<Lubrication Amount> 0.6cc <i>Note that This is an amount to be applied new oil pad when replacing it.</i>	

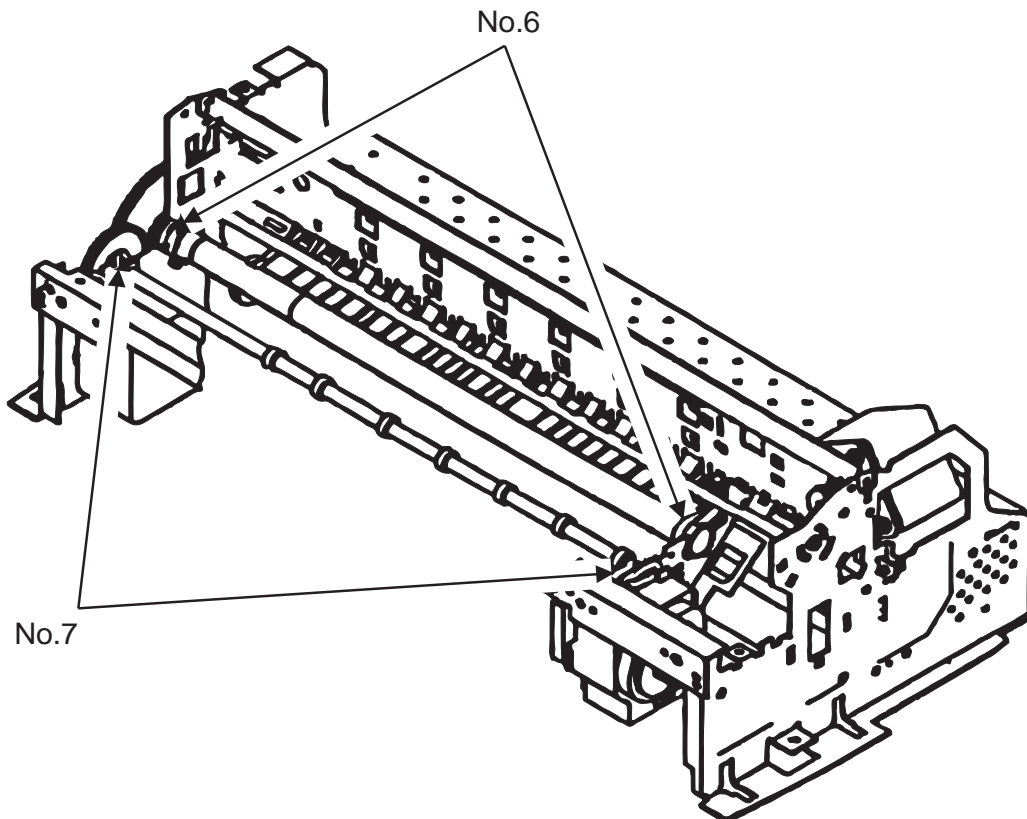
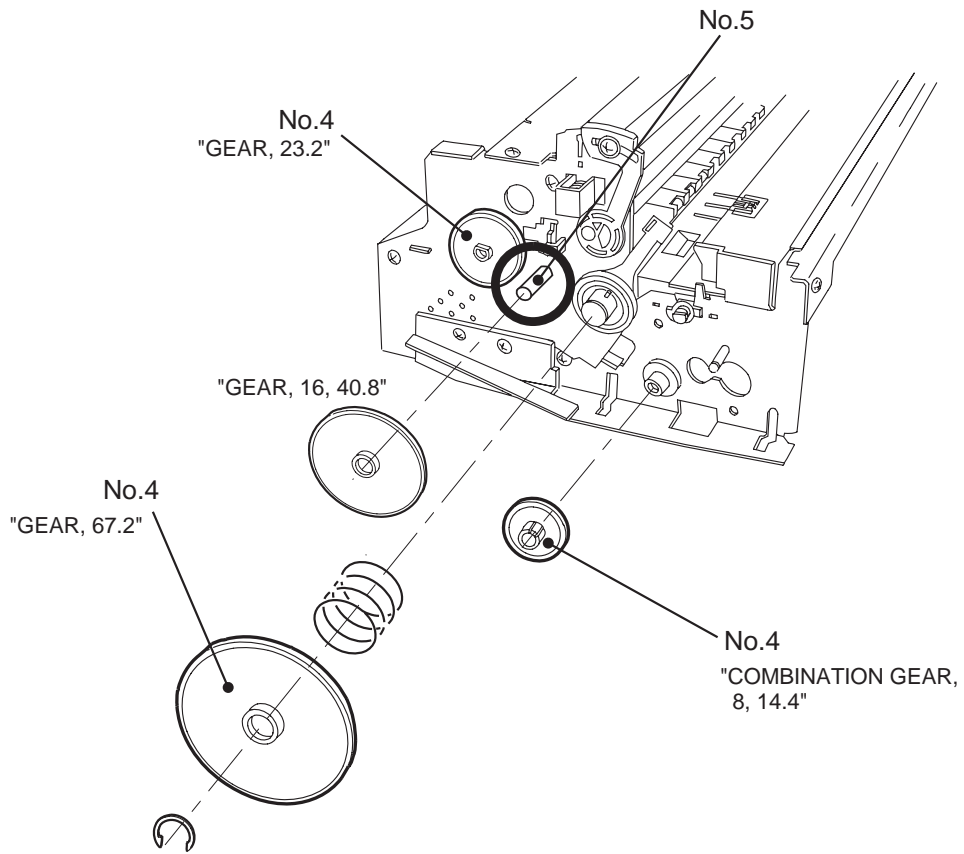
⚠ WARNING

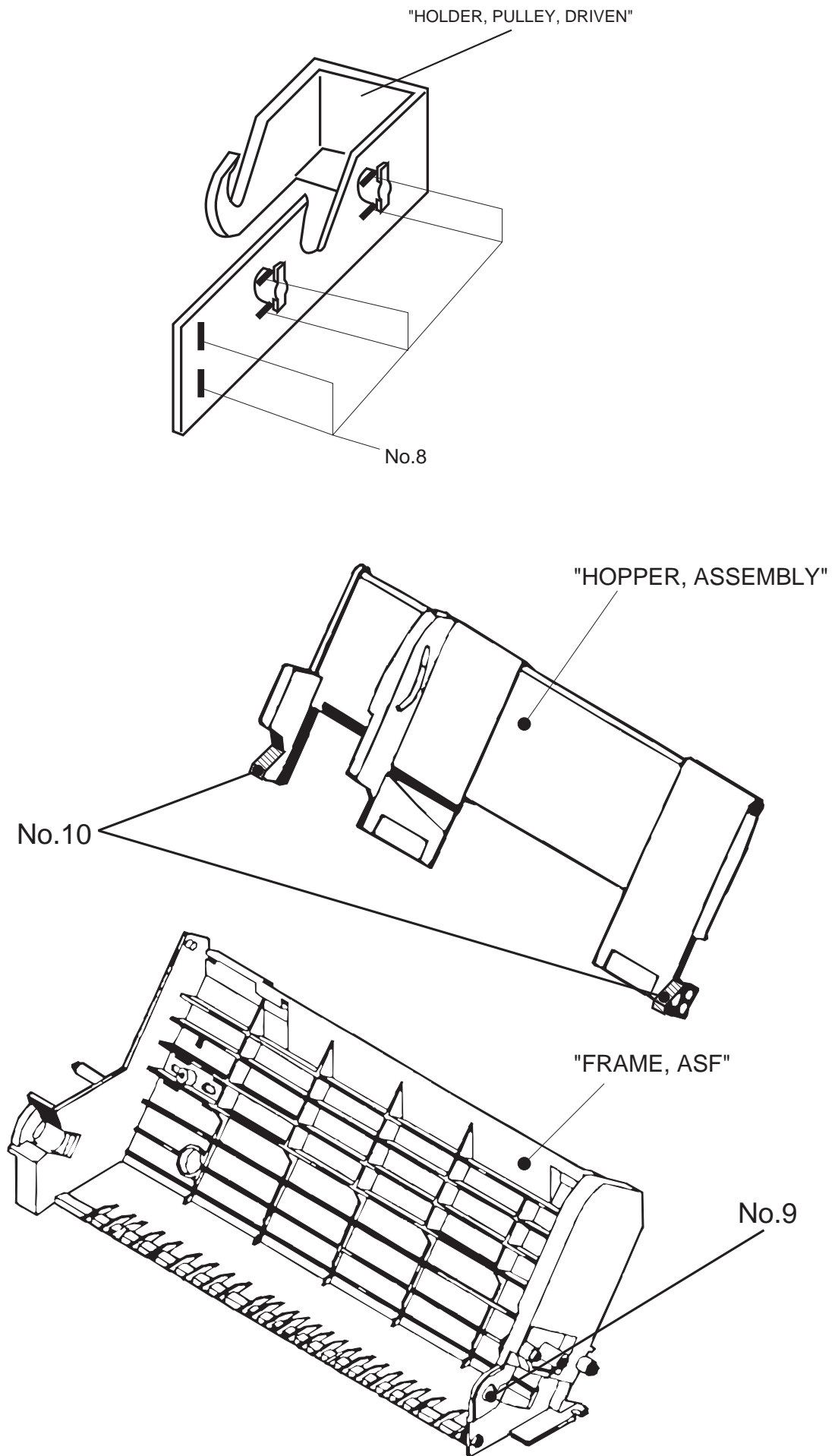
☑ *Never apply oil to the CR guide shaft directly or additionally apply to oil pad. This may cause fatal damage to the components of the printer.*

***Never apply the oil exceeding 0.6cc.**









Appendix

A.1 Connector Summary	A-1
A.2 Connector Summary	A-2
A.3 EEPROM Address Map	A-4
A.4 Circuit Board Component Layouts	A-8
A.5 Exploded Diagrams.....	A-12

A.1 Connector Summary

Stylus Color 400 has the following primary component units;

- Main Board(C206 Main)
- Power Supply Board (C206 PSB/PSE)
- Printer Mechanism

Figure A-1 below illustrates how these component units are connected.

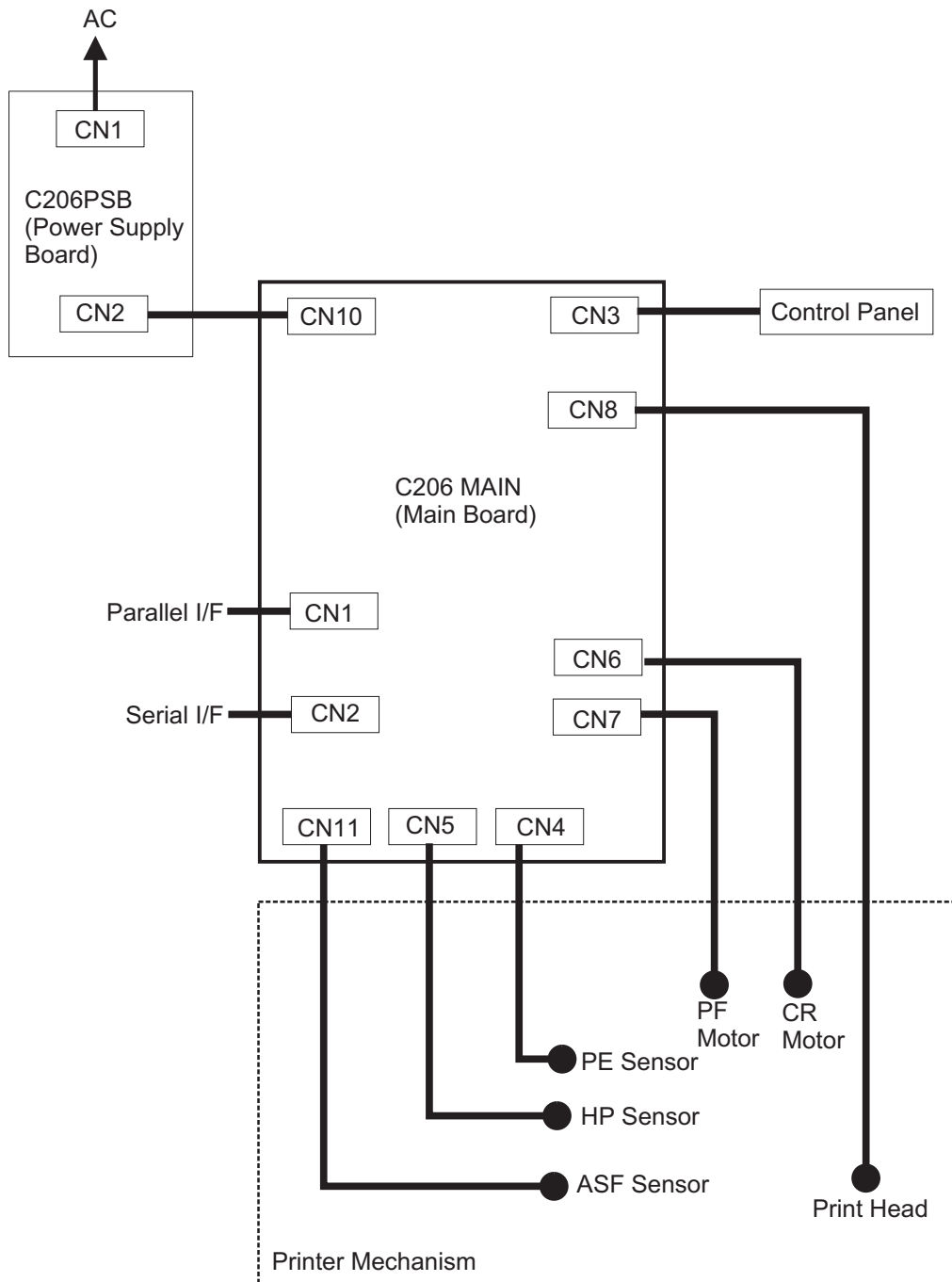


Figure A-1. Cable Connection

A.2 Connector Summary

Following tables show connector pin assignment of the C206 MAIN board.

Table A-1. Connector summary of the C206 MAIN board

Connector	Function	Table to refer
CN1	Parallel I/F connector	Chapter1/Table 1-10
CN2	Serial I/F connector	Chapter1
CN3	• Ξ Control panel	Table A-2
CN4	• Ξ PE sensor	Table A-3
CN5	• Ξ HP sensor	Table A-4
CN6	• Ξ CR motor	Table A-5
CN7	• Ξ PF motor	Table A-6
CN8	• Ξ Print head	Table A-7
CN10	• Ξ Power supply board (C206 PSB)	Table A-8
CN11	• Ξ ASF sensor	Table A-9

Table A-2. Connector CN3

Pin	Signal Name	I/O	Function
1	LED0	Out	LED drive signal (0)
2	GND	----	Ground
3	LED1	Out	LED drive signal (1)
4	GND	----	Ground
5	LED2	Out	LED drive signal (2)
6	+5V	----	Logic power supply
7	+5V	----	Logic power supply
8	LED4	Out	LED drive signal (4)
9	SW1	In	Panel switch input (1)
10	PSC	In	Power on/off switch
11	SW0	In	Panel switch on/off (0)
12	SW2	In	Panel switch on/off (2)

Table A-3. Connector CN4

Pin	Signal Name	I/O	Function
1	PE	In	Sensor detect signal
2	GND	---	Ground
3	PEV	---	Sensor power supply(+5V)

Table A-4. Connector CN5

Pin	Signal Name	I/O	Function
1	HP	In	Sensor detect signal
2	GND	---	Ground
3	HPV	---	Sensor power supply(+5V)

Table A-5. Connector CN6

Pin	Signal Name	I/O	Function
1	CRA	Out	Phase drive signal(A)
2	CR-A	Out	Phase drive signal (-A)
3	CRB	Out	Phase drive signal (B)
4	CR-B	Out	Phase drive signal(-B)

Table A-6. Connector CN7

Pin	Signal Name	I/O	Function
1	PFA	Out	Phase drive signal (A)
2	PF-A	Out	Phase drive signal (-A)
3	PFB	Out	Phase drive signal (B)
4	PF-B	Out	Phase drive signal(-B)

Table A-7. Connector CN8

Pin	Signal Name	I/O	Function
1	BCO	In	Black ink cartridge detect signal
2	CCO	In	Color ink cartridge detect signal
3	THM	In	Thermistor detect signal
4	GND	---	Ground
5	LAT	Out	Head data latch pulse output
6	GND	---	Ground
7	SI3	Out	Head data output (3)
8	GND	---	Ground
9	SI2	Out	Head data output (2)
10	GND	---	Ground
11	CLK	Out	Head data output (1)
12	GND	---	Ground
13	CLK	Out	Clock pulse for head data transfer
14	GND	---	Ground
15	NCHG	Out	Head all on pulse output
16	GND	---	Ground
17	VDD	---	Logic power supply (+5V)
18	GND2	---	Ground
19	GND2	---	Ground
20	GND2	---	Ground
21	COM	---	Head drive power supply
22	COM	---	Head drive power supply
23	COM	---	Head drive power supply
24	VHV	---	Head drive voltage control signal
25	VHV	---	Head drive voltage control signal

Table A-8. Connector CN10

Pin	Signal Name	I/O	Function
1	+42V	---	Mechanism drive power supply
2	+42V	---	Mechanism drive power supply
3	GND	---	Ground
4	GND	---	Ground
5	PSC	Out	Power supply switch output signal
6	GND	----	Ground
7	GND	---	Ground
8	+5V	---	Logic power supply

Table A-9. Connector CN11

Pin	Signal Name	I/O	Function
1	ASF	In	Sensor detect signal
2	GND	---	Ground
3	ASFV	---	Sensor power supply (+5V)

A.3 EEPROM Address Map

Address	Explanation	Setting	QPIT Settings	Factory Settings
00H	Password 0		54H	-
01H			0FH	-
02H	Market	0:Word 1:Japan 2:Custom(MJ)** 3:Custom(Stylus Color)** 4:Custom (other name)**	00H	(*1)
03H	1st dot adjustment	-40 ≤ n ≤ 40 (by 1/1440 inch)	00H	(*1)
04H	Bi-D adjustment data	-36 ≤ n ≤ 36 (by 1/1440 inch)	00H	(*1)
05H	Uni-D adjustment	-36 ≤ n ≤ 36 (by 1/1440 inch)	00H	(*1)
06H	Reserved		00H	-
07H	Reserved		00H	-
08H	Carriage speed adjustment data	-4 ≤ n ≤ 4 (by G.A timer unit)	00H	(*1)
09H	Reserved		00H	-
0AH	Head actuator rank ID for VhN		12H	(*1)
0BH	Head actuator rank ID for Twhs		01H	(*1)
0CH	Reserved		00H	-
0DH	Reserved		00H	-
0EH	Reserved		00H	-
0FH	Reserved		00H	-
10H	Password 1		5AH	-
11H			0FH	-
12H	Custom EEPROM sub number		00H	00H
13H			00H	00H
14H			00H	00H
15H			00H	00H
16H	Reserved		00H	-
17H	Reserved		00H	-
18H	CPSI password		00H	00H
19H			00H	00H
1AH			00H	00H
1BH			00H	00H
1CH	CPSI flags	bit7:CPSI license 0:Disable 1:Enable bit6:CPSI Font license 0:Disable 1:Enable	00H	00H
1DH	Reserved		00H	-
1EH	Reserved		00H	-
1FH	EEPROM Revision		42H	-
20H	Password 2		5AH	-
21H			0FH	-
22H	Interface selection	0:Auto 1:Parallel 2:Serial	00H	00H*2

Note) ** change model name of IEEE1284 device ID.

*1 Adjusted at factory.

*2 Initialized after performed panel initialization of EEPROM.

Address	Explanation	Setting	QPIT settings	Factory settings
23H	Interface wait time	0 to 255 (by second)	0AH	0AH
24H	Parallel I/F speed	0:High speed 1:Normal	00H	00H
25H	Reserved		00H	-
26H	Reserved		00H	-
27H	Print direction control	0:Bi-D 1:Uni-D 2:Auto	02H	02H
28H	CG table	0:PC437 1:PC850	00H	(*1)
29H	Reserved		00H	-
2AH	Auto LF/Network I/F mode	bit1:Network I/F mode (0=off, 1=on) bit0:Auto line feed (0=off, 1=on)	00H	00H
2BH	Panel mask function	bit5:Extended settings bit2:Cleaning bit1:Replace I/C bit0:Load/Eject	00H	00H
2CH	Reserved		00H	-
2DH	Reserved		00H	-
2EH	Reserved		00H	-
2FH	Reserved		00H	-
30H	Password 3		5AH	-
31H			0FH	-
32H	Reserved		00H	-
33H	Reserved		00H	-
34H	Top margin	42 to 44X360 (by 1/360 inch)	78H	78H
35H			00H	00H
36H	Reserved		00H	-
37H	Reserved		00H	-
38H	Reserved		00H	-
39H	Reserved		00H	-
3AH	Reserved		00H	-
3BH	Reserved		00H	-
3CH	Reserved		00H	-
3DH	Reserved		00H	-
3EH	CR-phase of Home		00H	00H
3FH	ERROR Number		00H	00H
40H	Password 4		5AH	-
41H			0FH	-
42H	Ink flags	bit7:reserved bit6:black "one time" bit5:color "one time" bit4:Initial fill required bit3:reserved bit2:in cleaning seq. bit1:black CL required bit0:color CL required	00H	10H
43H	Ink flags 2	bit2:YMC cartridge changed and cleaned 0:first cartridge 1:changed bit1:Black cartridge changed and cleaned 0:first cartridge 1:changed bit0:Black cartridge changed and cleaned 0:with YMC cartridge 1:alone	00H	00H

Appendix

Address	Explanation	Settings	QPIT settings	Factory settings
44H	Ink Counter Cb(total) 1count=100(ng)		00H	00H
45H			00H	00H
46H			00H	00H
47H			00H	00H
48H	Ink counter CY(total) 1count=100(ng)		00H	00H
49H			00H	00H
4AH			00H	00H
4BH			00H	00H
4CH	Ink counter Cy(total) 1count=100(ng)		00H	00H
4DH			00H	00H
4EH			00H	00H
4FH			00H	00H
50H	Password 5		5AH	-
51H			0FH	-
52H	Ink counter Cc(total) 1count=100(ng)		00H	00H
53H			00H	00H
54H			00H	00H
55H			00H	00H
56H	Ink counter Csm(total) 1count=100(ng)		00H	00H
57H			00H	00H
58H			00H	00H
59H			00H	00H
5AH	Ink counter Csc(total) 1count=100(ng)		00H	00H
5BH			00H	00H
5CH			00H	00H
5DH			00H	00H
5EH	Reserved		00H	-
5FH	Reserved		00H	-
60H	Password 6		5AH	-
61H			0FH	-
62H	Ink counter Rb		00H	00H
63H			00H	00H
64H	Ink counter Ry		00H	00H
65H			00H	00H
66H	Ink counter A		00H	00H*2
67H			00H	00H*2
68H	power off time		00H	00H*2
69H			00H	00H*2
6AH	CL time		00H	00H*2
6BH			00H	00H*2
6CH	accumulated printing time	0:0 minute 1:15 minutes	00H	00H
6DH		2:30 minutes 3:60 minutes	00H	00H
		4:90 minutes 5:120 minutes		
6EH	Reserved		00H	-
6FH	Reserved		00H	-
70H	Password 7		5AH	-
71H			0FH	-

Address	Explanation	Setting	QPIT settings	Factory settings
72H	customized model name	string of counter strings of model field for Device ID	00H	00H
73H			00H	00H
74H			00H	00H
75H			00H	00H
76H			00H	00H
77H			00H	00H
78H			00H	00H
79H			00H	00H
7AH			00H	00H
7BH			00H	00H
7CH			00H	00H
7DH			00H	00H
7EH			00H	00H
7FH			00H	00H

A.4 Circuit Board Component Layouts

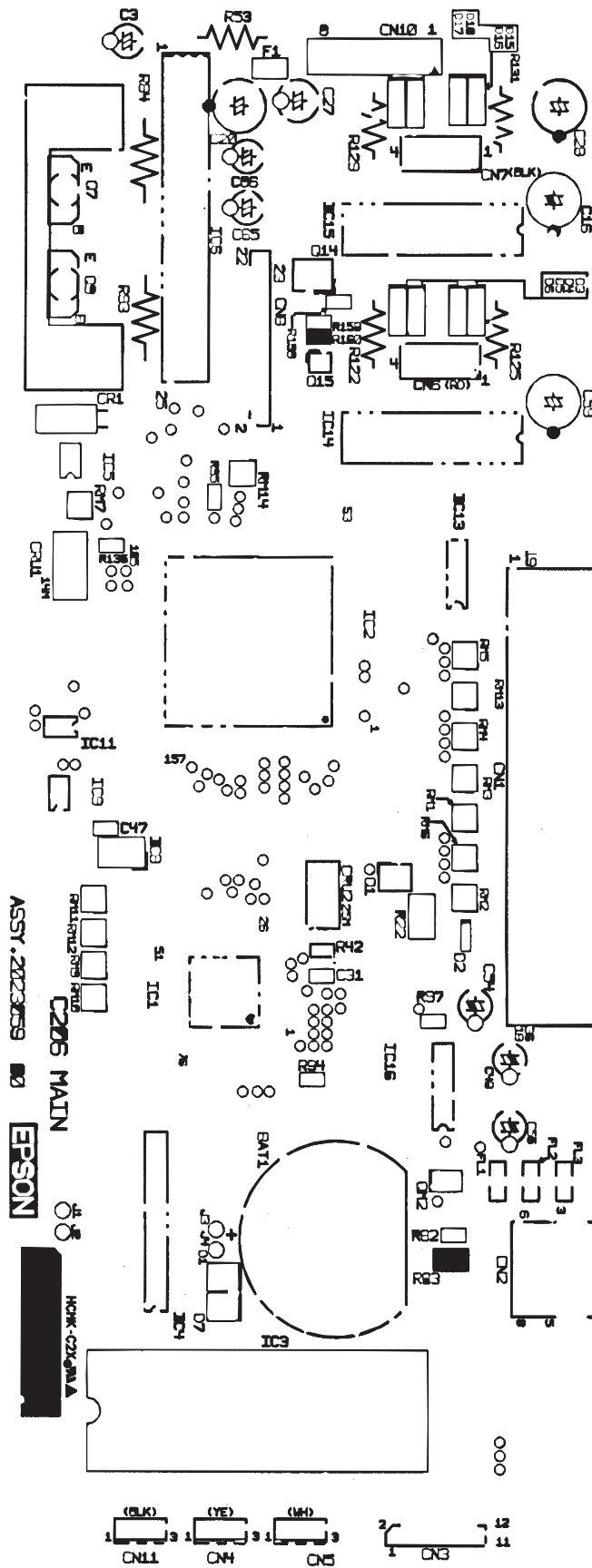


Figure A-2. C206 Main Board Component Layout

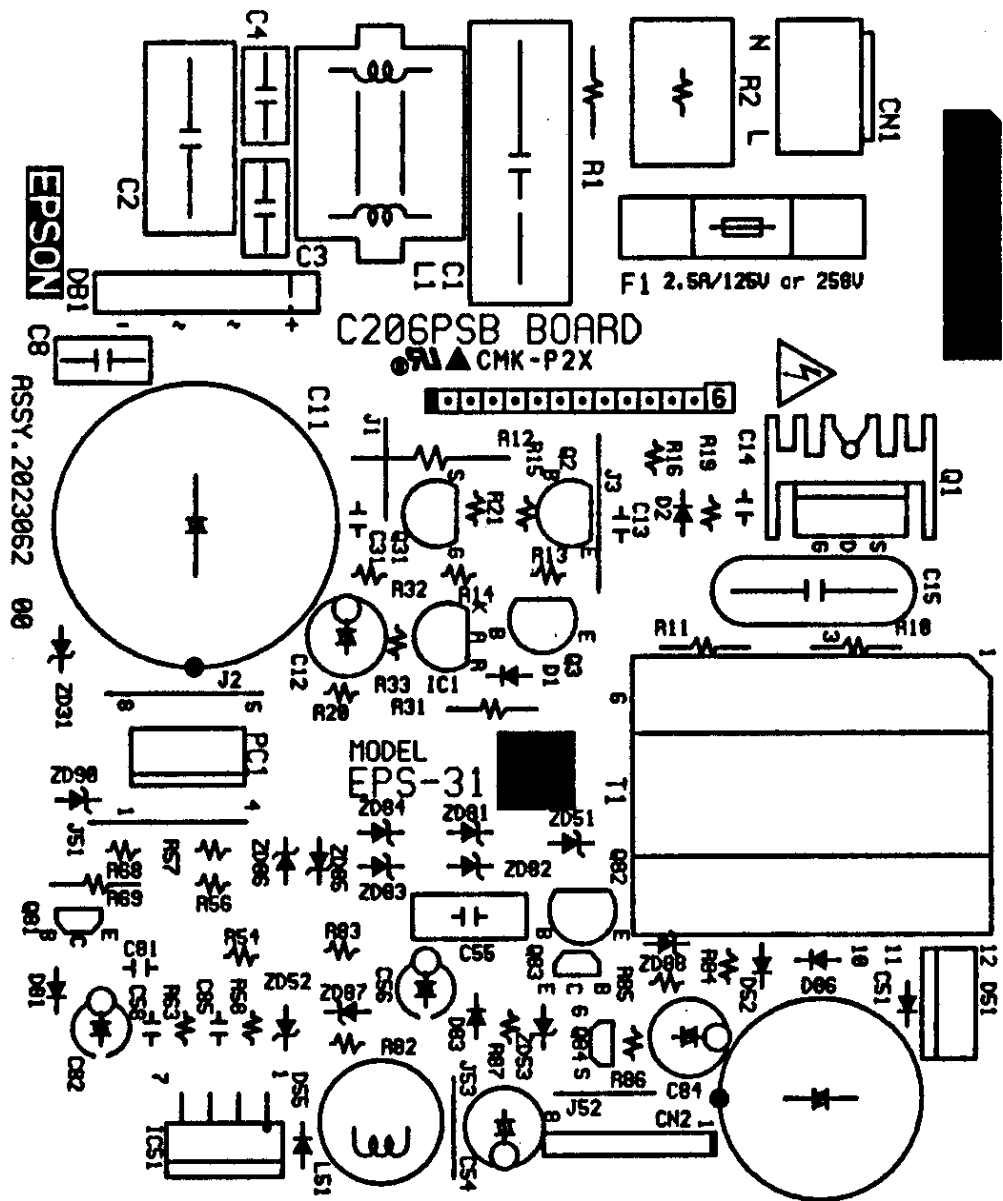


Figure A-3. C206 PSB Board Component Layout

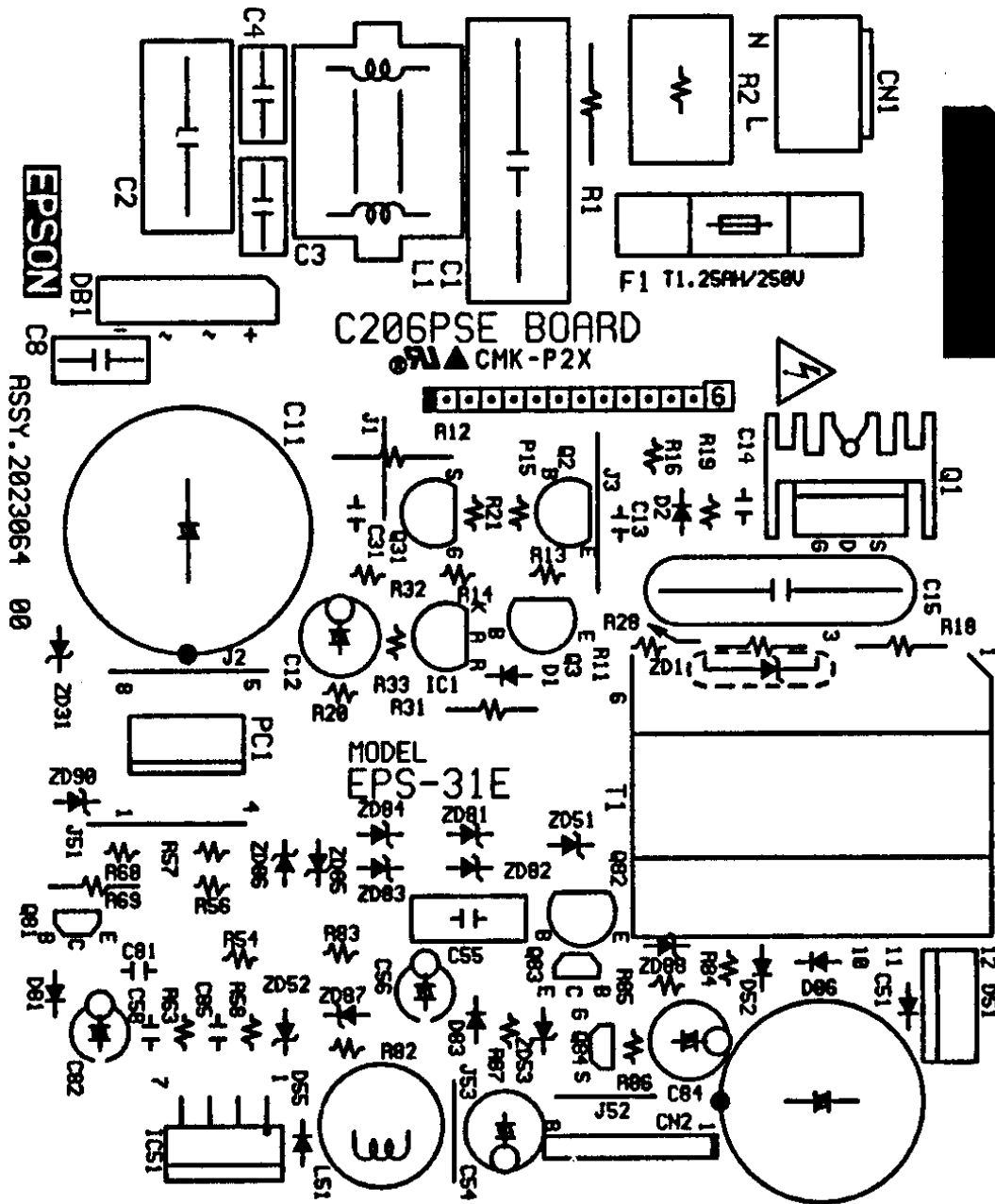


Figure A-4. C206 PSE Board Component Layout

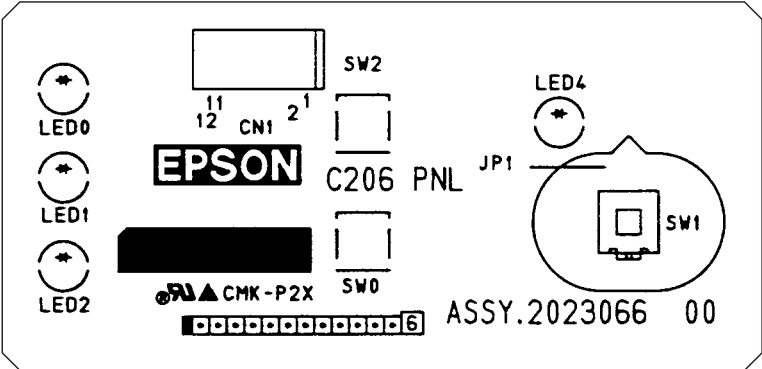


Figure A-5. C206 PNL Component Layout

A.5 Exploded Diagrams

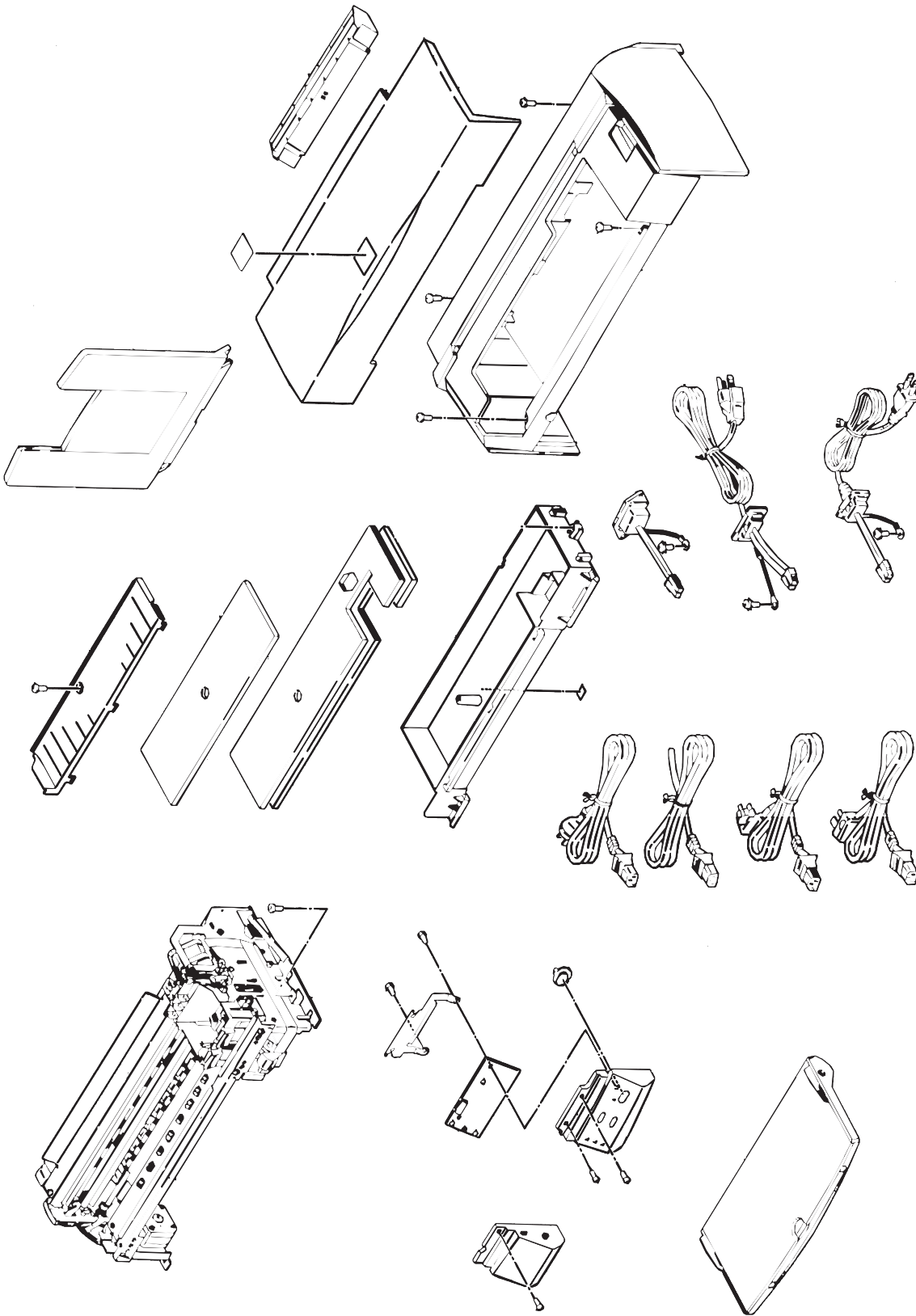


Figure A-6. Stylus Color 400 Exploded Diagram (1)

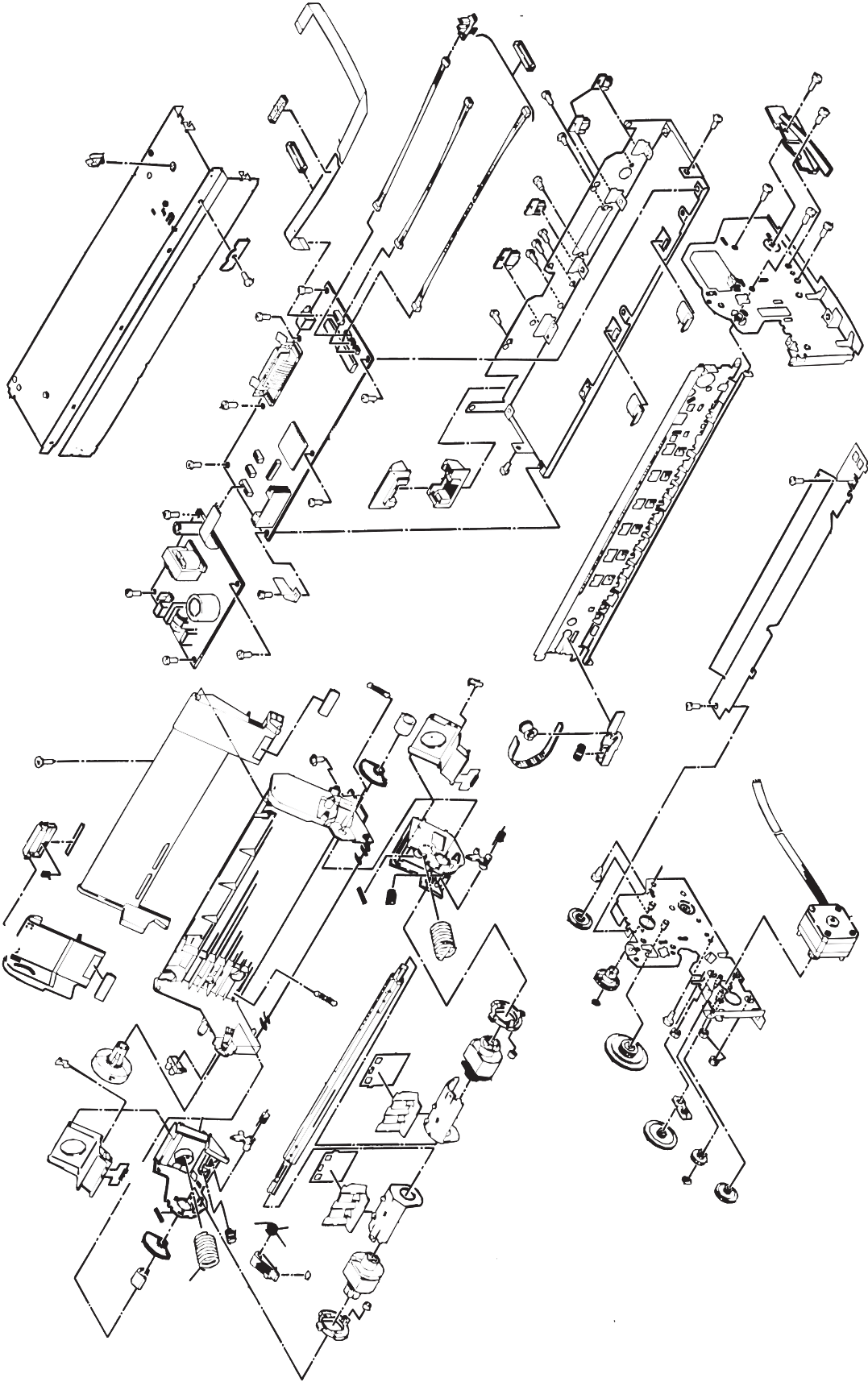


Figure A-7. Stylus Color 400 Exploded Diagram (2)

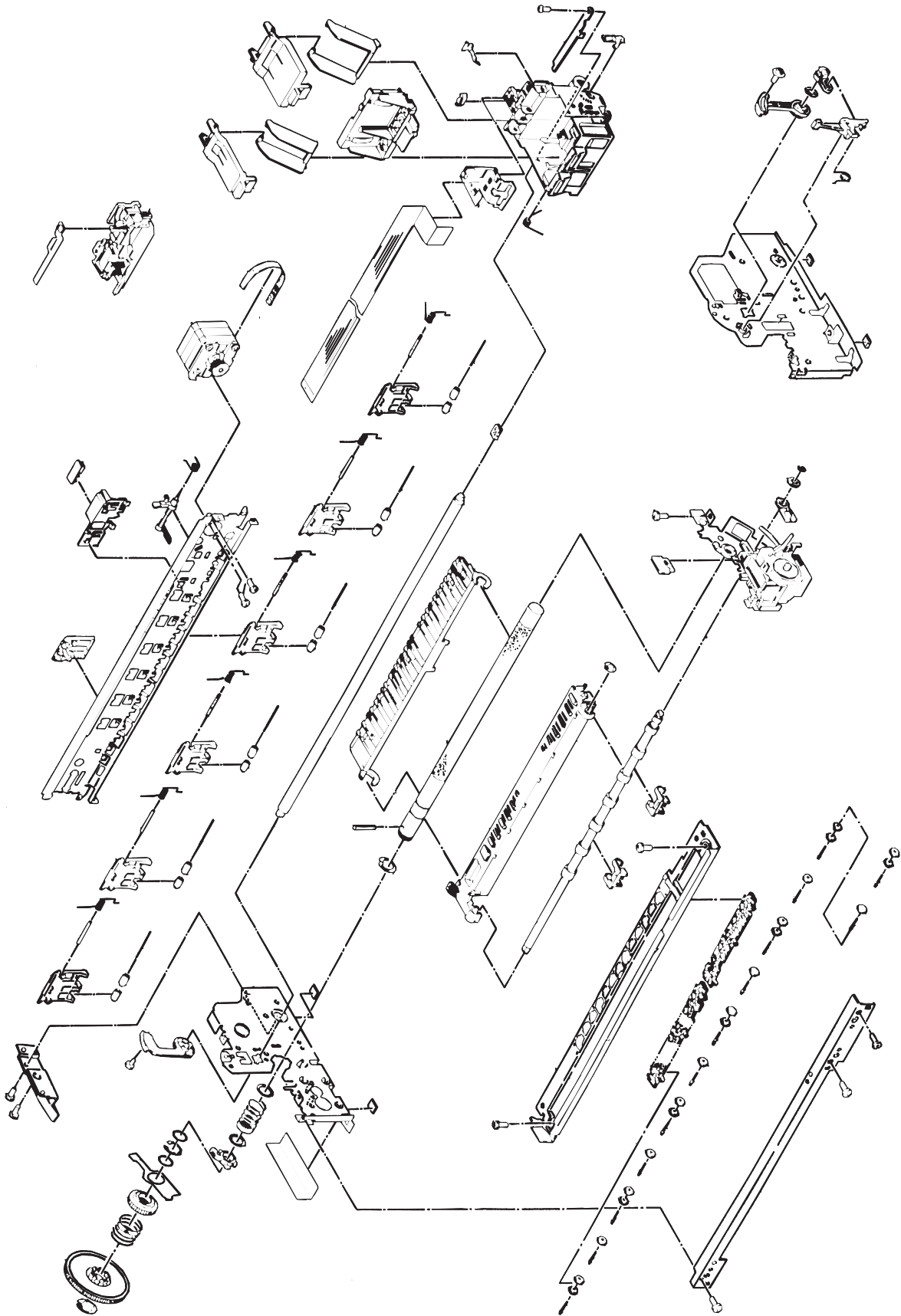


Figure A-8. Stylus Color 400 Exploded Diagram (3)

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