BJ-30

SERVICE MANUAL

Canon

Application

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I. ABOUT THIS MANUAL

This manual is divided into four sections, and contains information required for servicing the unit.

Part 1: Safety and Precautions
This section tells you how to service the unit safely. It is very important, so please read it.

Part 2: Product Specifications
This section outlines the unit and explains its specifications.

Part 3: Operating Instructions
This section explains how to operate the unit properly. Information required about installation and service made.

Part 4: Technical Reference
This section outlines the way the unit operates so you can understand it technically.

Part 5: Maintenance
This section explains how to maintain the unit. Descriptions of assembly/disassembly, adjustment for assembly, troubleshooting procedures, and wiring/circuit diagrams are given.

Procedures for assembly/disassembly are not given in this manual.
See the illustrations in the separate Parts Catalog.

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1. PERSONAL SAFETY PRECAUTIONS

1.1 Moving Sections of the Printer

Be careful not to let your hair, clothes, accessories, etc., become caught in any moving sections of the printer. The moving sections of the printer are the carriage belt, and the carriage, which are driven by the carriage motor, and the paper feed roller, the eject roller, the spur, the pickup roller, etc., which are driven by the paper feed motor.

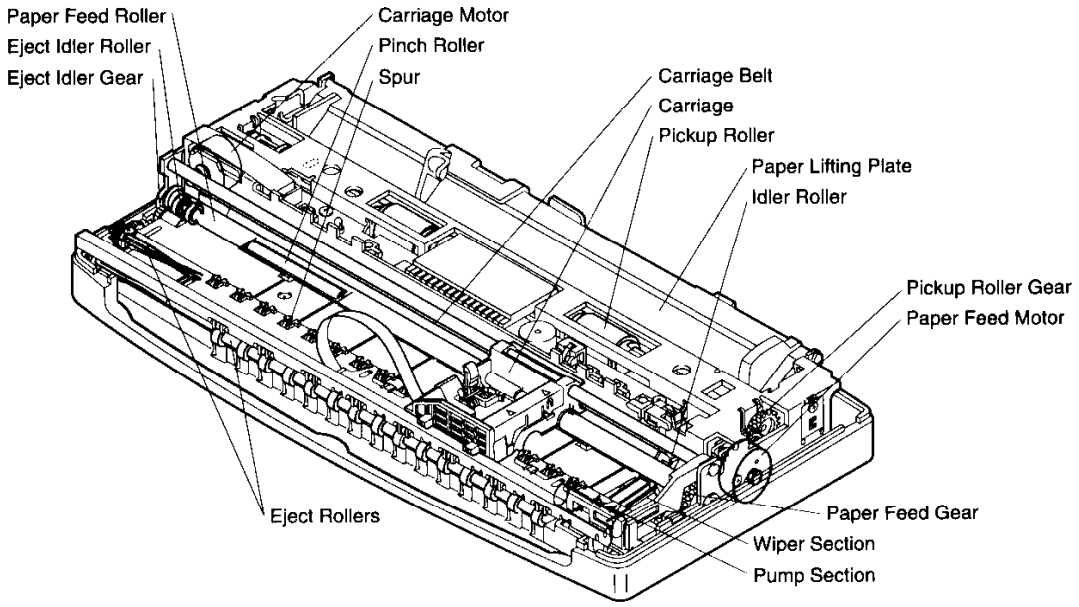


Figure 1-1 Moving Sections of the Printer

1.2 Ink Stains

1.2.1 Ink path

Be careful not to touch the ink path on the printer and get stains of the ink on work table, hands, clothes, etc., during repair.
The ink path is the nozzle section of the BJ cartridge, the head cap, the head wiper, the maintenance jet receiving section, and the waste ink absorber.
The ink inlets of the ink cartridge and the joint pipes of the print head body are also part of the ink path, so take the same care with them.

CAUTION

The ink is not a substance harmful to the human body, but it does contain an organic solvent (Black ink: isopropyl alcohol 67-63-0, glycerin 56-81-5, ethyleneglycol 107-21-1, Color ink: isopropyl alcohol 67-63-0). Be careful not to get any ink in your mouth or eyes. If you do get any into your eyes, wash it out with plenty of water and consult a doctor. If you somehow swallow a large amount of the ink, consult a doctor immediately.
At that time, please communicate the items written on the BJ cartridge label. Since this ink contains dyes, if you get it on your clothes, etc., it will not come out.

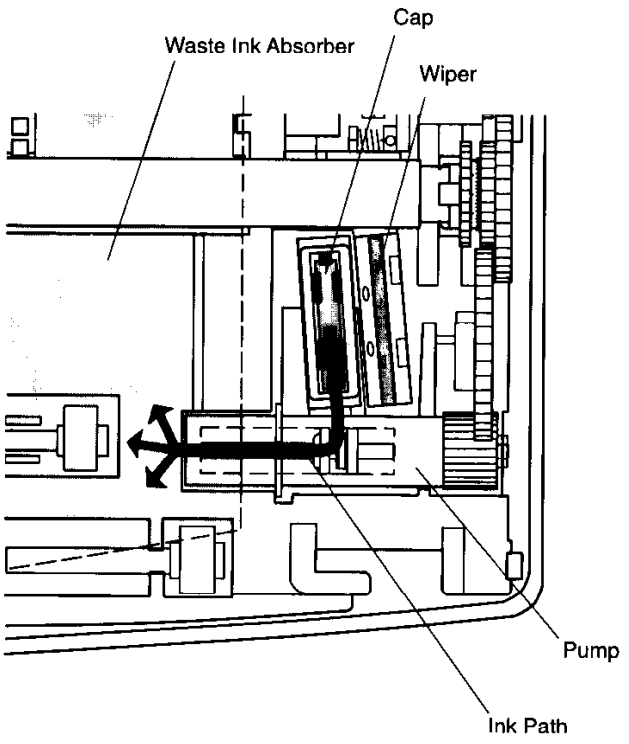
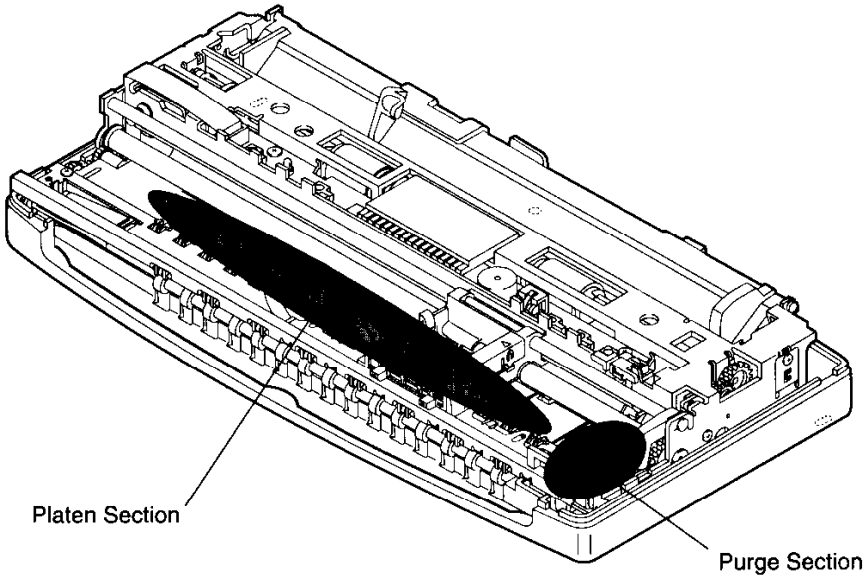


Figure 1-2 Ink Path

1.2.2 Ink mist

The BJ cartridge ejects the ink onto the paper. After the printer has been used for a long time or under heavy duty use, a small amount of ink mist bouncing back off the paper during printing may have soiled the platen section and the purge section. This soiling may soil the paper or the hands or clothes of service personnel, so wipe it off with a soft cloth or the like dampened with water.



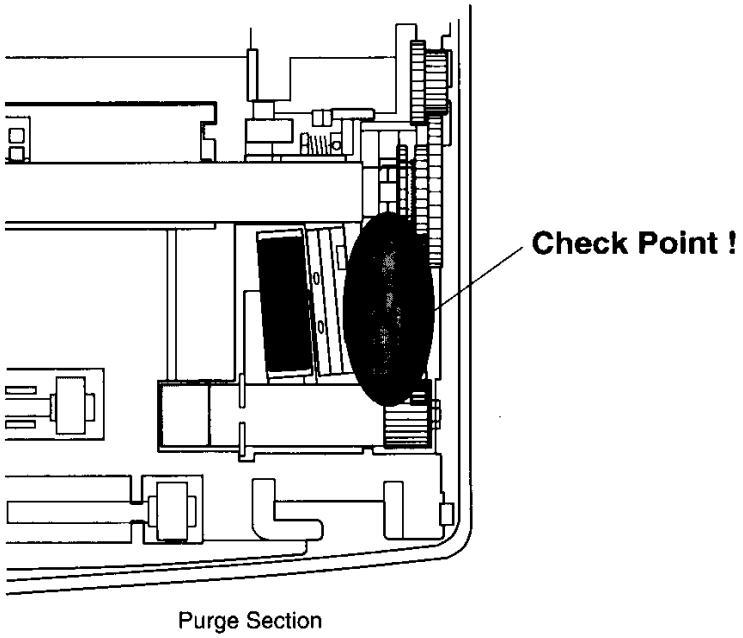
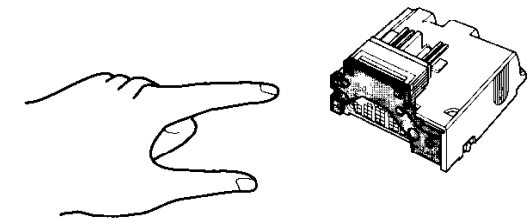


Figure 1-3 Ink Mist

1.3 BJ Cartridge Aluminum Plate

Do not touch the aluminum plate of the BJ cartridge. The aluminum plate heats up during printing and becomes particularly hot during continuous high duty printing. It also heats up if printing is operated after the ink in the cartridge has run out.



Danger ! High Temperature!

Figure 1-4 BJ Cartridge Aluminum Plate

NOTE This printer has the following functions to protect against the above temperature rise. The temperature is detected by the head temperature sensor in the BJ cartridge. (ex. approx.70°c at 100%Duty printing)

(1) When you attempt to move the carriage to the cartridge replacing position, if a temperature rise to above a certain temperature is detected, in order to prevent the user from touching the BJ cartridge aluminum plate, the beeper sounds 5 seconds and the carriage does not move. Let the BJ Cartridge cool down for several minutes, then try again.

(2) During printing, if a temperature rise to above a certain temperature is detected, in order to protect the printer, until the BJ Cartridge cools down, it prints in unidirectional and with a wait after each line. Also, when a temperature rise to above a certain temperature is detected, the " ◈ " indicator blinks, and printing is slowly. Then, if this temperature continues for more than a certain period of time, the beeper sounds 5 seconds, the " F " indicator , and "12 " indicator blinks to indicate the head temperature error.

Since the same type of temperature rise also occurs if printing is operated after the ink in the cartridge has run out, these protective functions are triggered. Therefore, the criterion for replacing the BJ cartridge or the ink cartridge is non-fire nozzles or diminished dot size during printing or the triggering of these protective functions.

REF. When printing is stopped by a head temperature error, handle the printer as explained in *Part 5:* 5. TROUBLESHOOTING (Page 5-5).

2. MACHINE PRECAUTIONS

2.1 BJ Cartridge

2.1.1 BJ cartridge handling

To prevent clogging at the nozzles due to foreign matters, never touch the nozzle section of the BJ cartridge or wipe it off with tissue paper or the like. For the BJ cartridge, take the same care with the ink filter of the print head body to prevent poor ink suction due to foreign matters. Also, once you have peeled off the protection tape from a BJ cartridge, either install the BJ cartridge in the printer or store it in the cartridge container (option) to prevent clogging at the nozzles due to ink drying or foreign objects. Do not reinstall the removed print head cap and protection tape on the BJ cartridge. For the BJ cartridge, either install it in the printer with the ink cartridge installed or store it in the cartridge container. If the ink cartridge is not attached, poor ink suction due to ink drying or foreign matters can occur. BJ cartridges cannot be disassembled, assembled, or washed.

NOTE If clogging at the nozzles or poor ink suction occurs, horizontal white lines appear in part of the printing. If cleaning does not restore proper printing, you must replace the BJ cartridge.

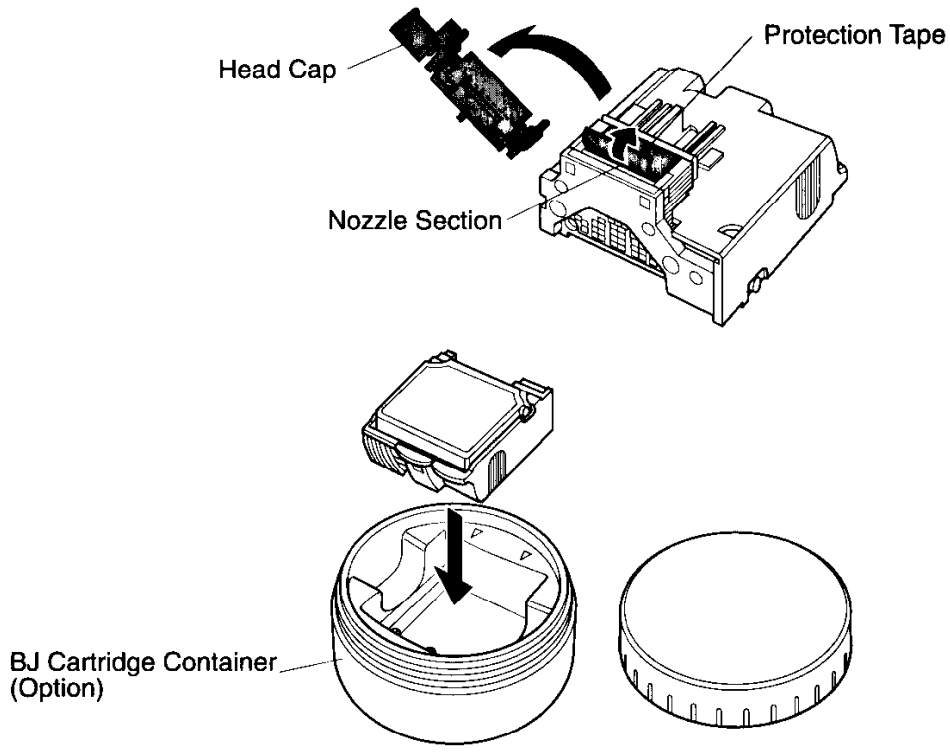


Figure 1-5 BJ Cartridge

2.1.2 Automatically capping

When the power is switched off with the *POWER* button, the printer automatically caps the nozzle section of the BJ cartridge to protect itself and prevent ink leakage.
If you unplug the DC plug by mistake and cut off the power supply to the printer, plug the DC plug back in, start up the printer normally, then switch off the power with the *POWER* button.

If the nozzle section is not capped, it may clog at the nozzles due to ink drying, or the ink may leak from the nozzles.

2.1.3 When not using the printer

Even when not using the printer, leave the BJ cartridge installed in the printer or store it in the cartridge container.(Cartridge container is option.)
Do the same when carrying, shipping or storing the printer.

If you remove the BJ cartridge from the printer and leave it as it is, foreign matters may stick or dry ink may clog the nozzle, making it impossible to use the BJ cartridge.

2.1.4 Ink conductivity

The ink in the BJ cartridge is electrically conductive. If it leaks onto a mechanical section, mop it up with a damp paper towel or the like. If it leaks onto an electrical section, mop it up completely with tissue paper or the like. Especially, if the ink enters as far as to the IC chip of the PCB, and it is hard to wipe off completely, a new PCB should be used.

If the AC adapter is connected to the printer with ink leaked, this may harm the electrical section. Never switch the power on if there has been a leak.

2.2 Ink Cartridge

2.2.1 Ink cartridge handling

To prevent poor ink suction due to foreign matters on the ink filter of the print head body, never touch the ink filter of the ink cartridge. When you remove the cap from an ink cartridge, install the ink cartridge on the print head body immediately to prevent clogging at the nozzles due to ink drying or foreign matters. Do not remove the ink cartridge unless you are replacing it.

Do not use the protection cap removed from the ink cartridge to store the ink cartridge. Install the ink cartridge in the print head immediately after unsealing the pillow bag.

NOTE If clogging at the nozzles or poor ink suction occurs, horizontal white lines appear in part of the printing. If cleaning does not restore proper printing, you must replace the BJ cartridge.

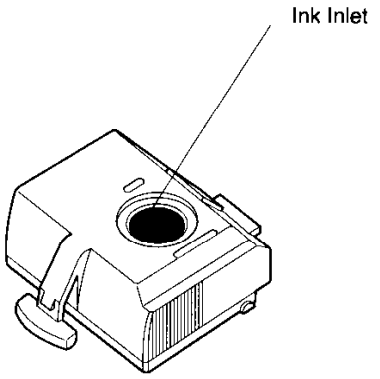


Figure 1-6 Ink Inlet of the Ink Cartridge

2.3 Printer Handling

2.3.1 Precautions to prevent damage from static electricity

The electrical charge accumulated on a person when clothes rub can damage electric elements or change their electrical characteristics. Never touch the contact section of the carriage ribbon cable.

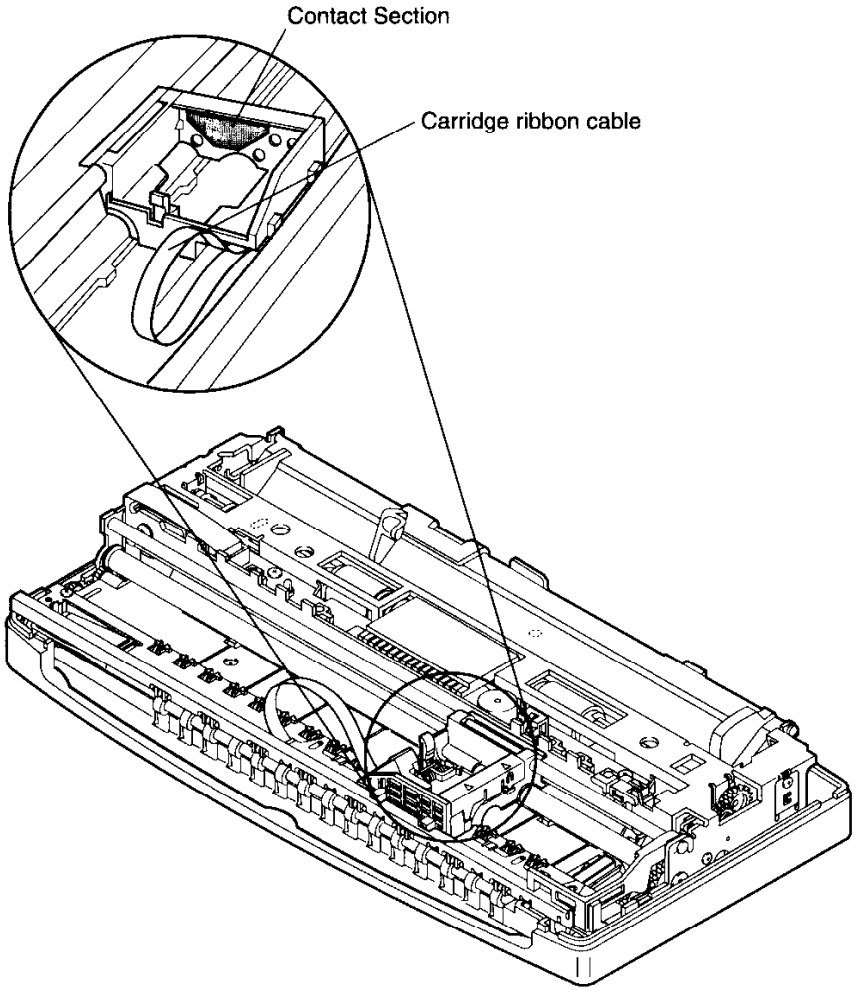


Figure 1-7 Contact Section of the Carriage Ribbon Cable

2.3.2 Ink leakage precautions

Do not carry, pack or store the printer without a BJ cartridge installed. The ink within the cap section will flow back and soil the inside of the printer.

The nozzle section of the BJ cartridge is capped automatically when the power is switched off with the *POWER* button. Be careful. If the power is cut off by unplugging the DC plug of the AC adapter, the BJ cartridge is not capped.

When the power is turned off, the carriage is locked so that it does not move from the capping position.

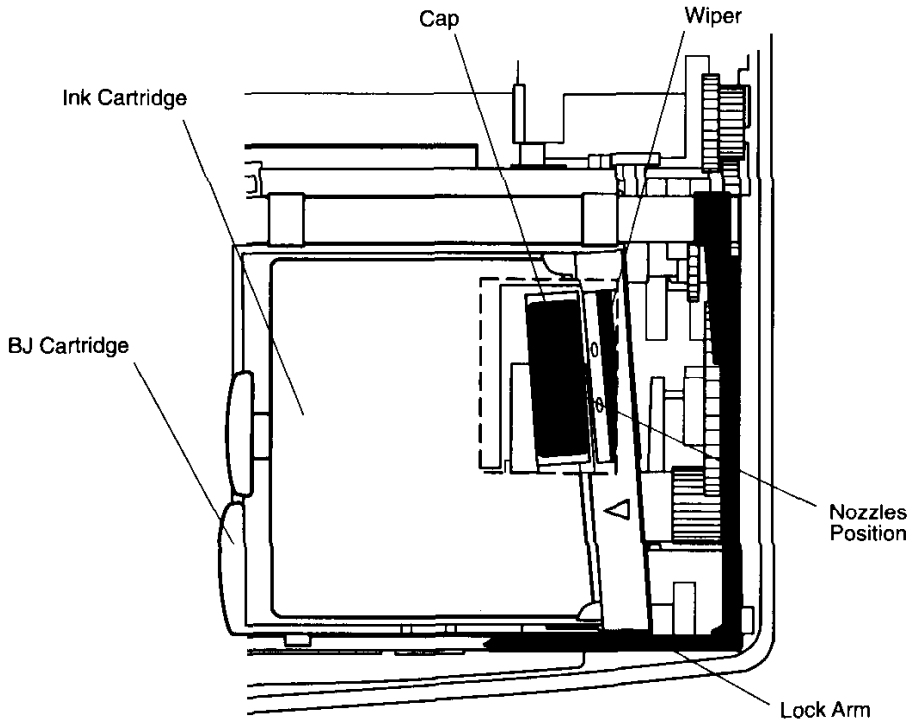


Figure 1-8 Capping Position

3. PRECAUTIONS FOR SERVICE

3.1 Precautions Concerning the Memory Data

This printer counts the total waste ink amount for the black BJ cartridge and the color BJ cartridge and stores these data in the EEPROM on the control board. Observe the following precautions during servicing.

1) Checking EEPROM data

The number of sheets printed is counted and stored in the EEPROM to show the printer operating status. This data can be printed by test print 3 (Ripple pattern print).

The waste ink quantity data is also stored in the EEPROM. This data is used to indicate a waste ink full error to prevent ink leakage if the amount of waste ink absorbed becomes full.

2) When replacing the control board

If the control board on which the EEPROM is mounted is replaced, the quantity of waste ink absorbed must be set in the EEPROM by visually checking the amount of waste ink absorbed into the absorber from behind the printer base unit.

If it is not set, the waste ink full error is not displayed, and ink may leak.

3) When replacing the printer base unit

If a waste ink full error is displayed and the printer base unit is replaced, the waste ink amount data in the EEPROM must be set to zero. If it is not set to zero, a waste ink full error is displayed and the printer stops operating before the waste ink absorber is filled with waste ink.

For details on checking the memory data with test print and for clearing them, see *Part 3:* 3.4 EEPROM Data Setting(Page 3-24).

When operation is stopped for the waste ink full error, handle the printer as explained in *Part 5:* 5. TROUBLESHOOTING (Page 5-5).

3.2 Precautions to Prevent Damage from Static Electricity

The electrical charge accumulated on a person when clothes rub can damage electric elements or change their electrical characteristics. In order to prevent static electricity, make sure to touch some metallic part that is grounded to release the static electricity accumulated on your body before disassembling the printer for service.

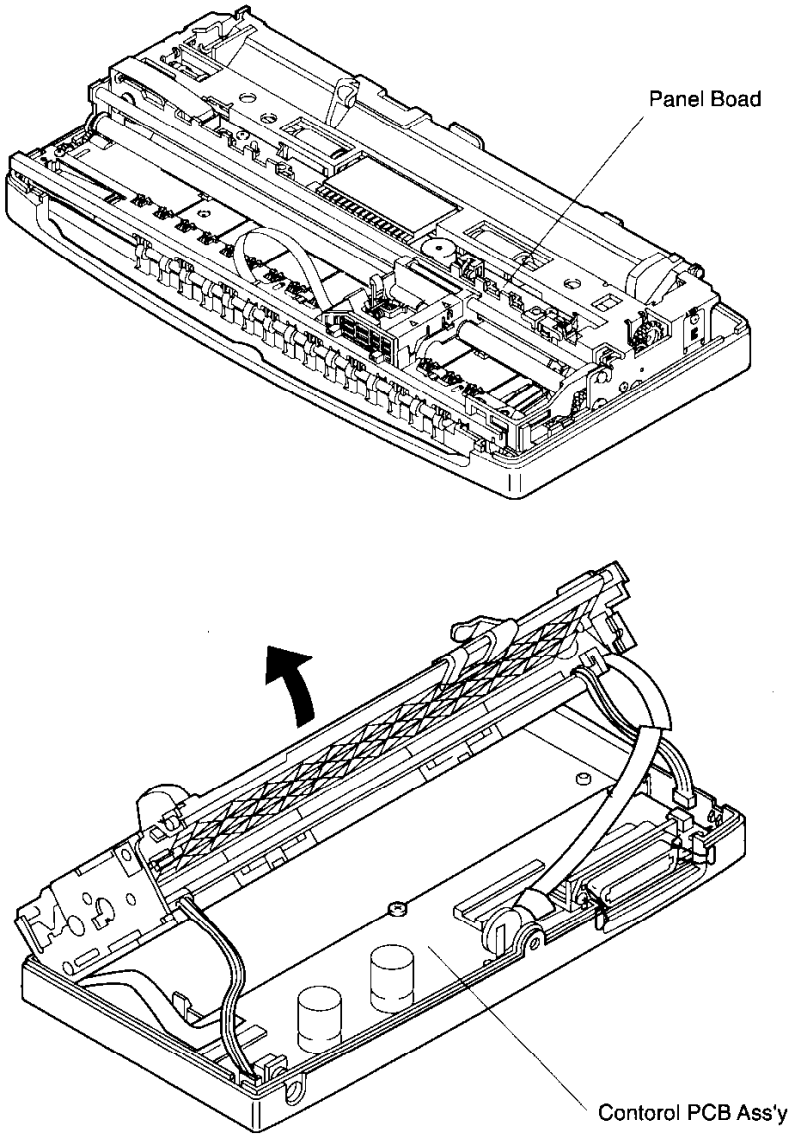


Figure 1-9 Electronic System of the Printer

3.3 Precautions for Disassembly/Assembly

The printer is made by combining many plastic parts. When disassembling the printer, be careful not to brake or bend plastic hooks.
Take special care not to deform or damage the separation sheet when replacing the printer base unit. (If the separation sheet is deformed or damaged, a paper feed error may occur.)
Details of disassembly and reassembly procedures are given in the Parts Catalog.

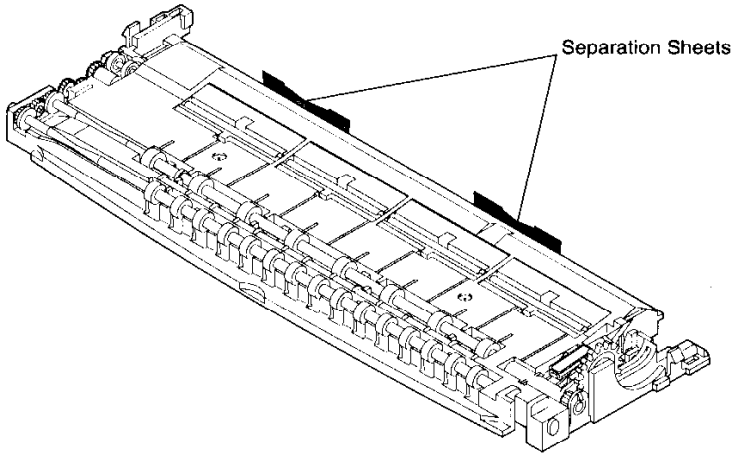


Figure 1-10 Printer Base Unit

CAUTION

Some of the plastic parts use high hardness materials with glass fibers to raise the part precision, but since their viscosity is low, plastic hooks break easily. Use a precision screwdriver or the like for disassembly, and do not apply excessive force to release a hook.

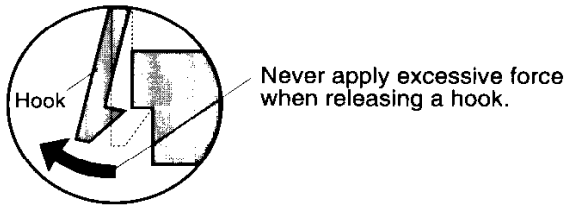


Figure 1-11 How to Release Plastic Hooks

3.4 Built-in Self-diagnostic Functions

The printer has built-in self-diagnostic functions to judge hardware defects. The results of self-diagnosis are indicated by the indicators and the beeper. For details, see *Part 3:* 3.1 Error Display (Page 3-11).

1. PRODUCT OUTLINE

1.1 Product Outline

This printer is a bubble-jet monochrome portable printer targeting the personal user market. Its main features are the use of new BJ cartridge (the black BC-10 with replaceable the ink cartridge and a head with 128 nozzles), high speed, high quality printing of 360 dpi (smoothing function is available in HQ mode), the ability to print on plain paper, small size and light weight, and low price.

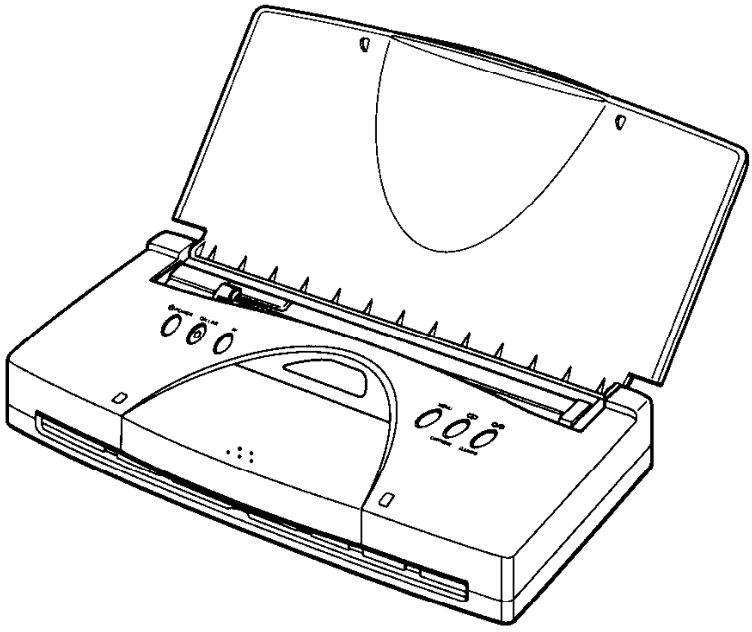


Figure 2-1 Printer Appearance

1.2 Features

1.2.1 Printer

- Compact portable size
  External dimensions: 300 mm (11.8") W x 157.6 mm (6.2") D x 55 mm (2.2") H
  Weight: Approx. 1.4 kg (3.1 lb)(including BJ cartridge)
- Built-in multi sheet feeder
- High-speed printing (bursts)

	HQ mode	HS mode
BC-10	173 cps (10 cpi)	277 cps (10 cpi)

- High quality printing at 360 dpi (smoothing function is available in HQ mode.)
- Two types of built-in printer control modes as standard
  BJ mode (IBM Proprinter X24E emulation)
  LQ mode (EPSON LQ printer emulation)
  (Canon expanded mode is supported when the BJ-30 printer driver is used.)
- New type of BJ cartridge that the user can easily change
  Black BJ cartridge BC-10: 128 nozzles (black), Ink cartridge replaceable
  Ink cartridge BCI-10 Black: Black ink cartridge for BC-10
- Power on/off button (A software power switch is used.)
  The printer does not have a mechanical power switch that physically connects and disconnects the AC adaptor. Instead, it has the *POWER* button that starts up and shuts down printer operation. As long as the printer is plugged in, power is always being supplied to it, even when it has been turned off.
- Printing up to legal size paper

1.3 BJ Cartridge

1.3.1 Black BJ cartridge [BC-10]

The BC-10 black BJ cartridge used for high speed monochrome printing is disposable. It combines the print head with 128 nozzles and the replaceable black ink cartridge. If a print defect occurs, perform a quick cleaning. If it cannot restore the print quality, perform one or two more quick cleanings. If they still cannot solve the problem, perform a long cleaning. [Quick cleaning: One beep, with *CLEANING* button; Long cleaning: Two beeps, with *CLEANING* button] If the long cleaning still cannot restore the print quality, replace the BJ head. If the ink runs out or if more than six months have passed after the BJ cartridge was unsealed and the print quality is not improved by performing quick cleaning once or twice, the ink cartridge should be replaced with a new one.

The BC-10 BJ cartridge can print approx. 154 sheets (HQ mode, 1500-character pattern) and prints with the same high quality at 360 dpi.

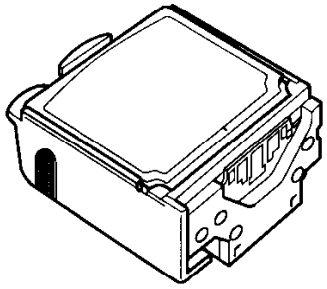


Figure 2-2 Black BJ Cartridge [BC-10]

To prevent nozzle clogging, after opening the seal, either install the BJ cartridge on the printer or store it in the BJ cartridge container. Also, never touch the print head (bubble jet nozzles) or wipe it with tissue paper or the like.

1.4 Options

1.4.1 BJ cartridge container

The BJ cartridge container is for storing the BJ cartridge removed from the printer. When storing a BJ cartridge, close the lid securely. One BJ cartridge container can store a BC-10 or a BC-11 (color BJ cartridge for BJC-70) alternately. When storing a BC-10, always store it with BCI-10 black ink cartridge installed. Store the BJ cartridge with the ink cartridge attached. If the ink cartridge is not attached, ink may spill out or nozzles may be clogged with ink.

When storing a BJ cartridge in the container, do not attach the protection tape and head cap to the cartridge.

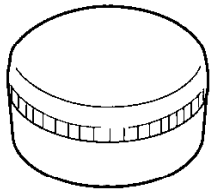


Figure 2-3 BJ Cartridge Container

1.4.2 Portable kit

The portable kit consists of a NiMH battery pack and a battery case. By installing the portable kit in the printer, it can be used with a NiMH battery in places where AC power is not available.

The NiMH battery pack can be removed from the battery case. When the NiMH battery pack is installed in the battery case and AC power is provided to the battery pack from the AC adapter supplied with the printer, the battery pack is charged automatically. It takes about 10 hours to fully charge the battery pack. The battery capacity may be lowered by the memory effect. To prevent this, the battery case has the refresh button,which can discharge the battery completely.

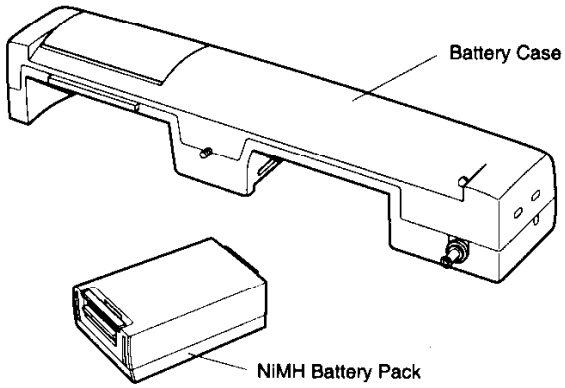


Figure 2-4 Portable Kit

1.5Consumables

1.5.1 BJ cartridge

Replacement BJ cartridge is the same as the one supplied with the printer.

1.5.2 Ink cartridge

The consumable ink cartridge is the same as the ink cartridge installed in BC-10 black BJ cartridge. Ink cartridge can be used for half a year after the seal is opened. Number of sheets printed.

BCI-10 Black Ink cartridge

Approx. 154 sheets (HQ mode) (1500-character pattern)

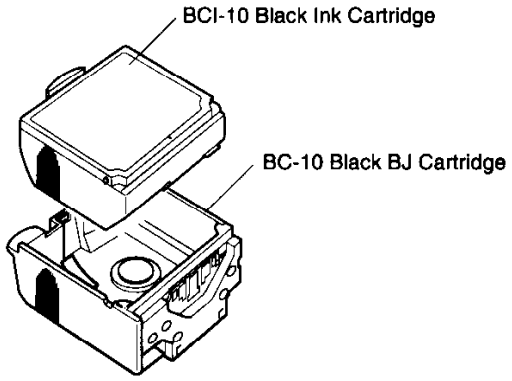


Figure 2-5 Consumables

2. SPECIFICATIONS

2.1 General Specifications

1. Type Portable serial printer (Bubble jet ink on-demand)

2. Paper handling Auto sheet feed

3. Sheet feeder capacity

3mm thickness (LTR, A4)
Max 1 sheet (LGL)
Envelope: 5 envelopes (U.S. Commercial number-10 or European DL)
Plain paper (75g/m²): Approx. 30 sheets
Transparency film : 10 sheets
BPF: 10 sheets

4. Paper weight

Automatic feed 64 to 105 g/m² (17 lbs to 28 lbs)

5. Printing speed

Burst

	BC-10 (Black printing)
HQ mode	173 cps (10 cpi)
HS mode	277 cps (10 cpi)
HQ mode smoothing	86 cps (10 cpi)

6. Printing direction (automatically selected according to the print data)

Text	Bi-directional/Unidirectional
Graphic	Bi-directional/Unidirectional
image	Bi-directional/Unidirectional

7. Print width Max. 203.2mm (8")

8. Line feed speed Approx. 120 ms/line (128"/360" line feed)

9. Built-in print control mode

BJ mode IBM Proprinter X24E emulation
LQ mode Epson LQ printer emulation
(Canon extended mode shall be selected when the Canon BJ-30 printer driver is used.)

10. Line feed pitch (n: programmable)

BJ mode	1/6", 1/8", n/60", n/72", n/180", n/216", and n/360" (n: programmable)
LQ mode	1/6", 1/8", n/180", n/216", and n/360"

11. Printing characters

Type face	Roman, Gothic, Courier, Prestige, Script and Draft	
Pitch	BJ mode	10, 12, 17 cpi, and PS
	LQ mode	10, 12, 15, 17, 20 cpi, and PS
Character matrix	HQ mode	36 (H) x 48 (V) dots
	HS mode	18 out of 36 (H) x 48 (V) dots
Character set	BJ mode	IBM character set 1, 2 and all (code page 437, 850, 860, 863, 865, 857, 855, 852, 864 and 869)
	LQ mode	Italic character set and Graphic character set

12. Number of columns printed

	Mode	Pitch	cpi
BJ mode	10 cpi	10 cpi	80 cpl
	10 cpi doublewide	5 cpi	40 cpl
	10 cpi condensed	17 cpi	137 cpl
	10 cpi condensed-doublewide	8.5 cpi	68 cpl
	12 cpi	12 cpi	96 cpl
	12 cpi doublewide	6 cpi	48 cpl
	Proportional spacing	PS	Varies
LQ mode	10 cpi	10 cpi	80 cpl
	10 cpi doublewide	5 cpi	40 cpl
	10 cpi condensed	17 cpi	137 cpl
	10 cpi condensed-doublewide	8.5 cpi	68 cpl
	12 cpi	12 cpi	96 cpl
	12 cpi doublewide	6 cpi	48 cpl
	12 cpi condensed	20 cpi	160 cpl
	12 cpi condensed-doublewide	10 cpi	80 cpl
	15 cpi	15 cpi	120 cpl
	15 cpi doublewide	7.5 cpi	60 cpl
	Proportional spacing	PS	Varies

13. Bit image

Vertical	8, 24 and 48 dots
Horizontal	60, 120, 180, 240, 360 and 720* dpi (* Smoothing mode only)

14. Buffer

	Input buffer	Download buffer
BJ mode	35 kB (or 3kB)	0 kB (or 32kB)
LQ mode	26 kB (or 3kB)	0 kB (or 23kB)

15. Interface 8-bit parallel (Centronics)

16. BJ cartridge

BC-10

Type	Ink cartridge replaceable type of black BJ cartridge
Print head	128 nozzles (vertically-lined)
Ink color	Black
No. of pages printed	Approx. 154 pages (in the HQ mode) / cartridge (1500-character pattern)
Weight	Approx. 25 g (3.0 oz) [including black ink cartridge]

17. Detection functions

Paper-out	Available
Paper width	None
Home position	Available
BJ cartridge	Available
Ink cartridge	None
Remaining ink level	Available (Default: None)
BJ cartridge identification	Available
Waste ink amount	Available

18. Acoustic noise level Approx. 45 dB (A) or less during operation
Sound pressure level: According to ISO 9296

19. Environmental requirements

	During operation	During storage
Temperature	5°C to 35°C (41°F to 95°F)	0°C to 35°C (32°F to 95°F)
Humidity	10% to 90%RH (no condensation)	5% to 95%RH (no condensation)

20. Power supply

when the AC adaptor (AD-300) is used.

	Voltage/Frequency	Power consumption	Stand-by status
USA/Canada	AC 120V 60 Hz	Max. 30 W	Max. 5 W
UK/Australia	AC 240V 50 Hz		
Europe	AC 230V 50 Hz		

21. External dimensions 300 mm (11.8") W x 157.6 mm (6.2") D x 55 mm (2.2") H

22. Weight Approx. 1.4 kg (3.1 lbs) (including BJ cartridge)

2.2 Paper Specifications

1. Paper size

Letter (8.5" x 11")
Legal (8.5" x 14")
A4 (210 mm x 297 mm)
Commercial number 10 envelope (4.1" x 9.5")
European DL-size (220 mm x 110 mm)

2. Paper type

Plain paper
Coated paper (Canon coated paper LC-101)
Envelope (Commercial number 10 or DL-size)
Transparency (Canon transparency film CF-102)
BPF (Canon back print film BF-102)
Glossy paper (Canon glossy paper GP-101)

3. Print paper

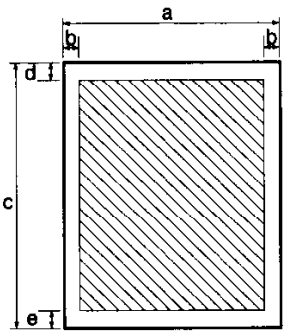
Type	Paper	Size	Paper feed direction ASF		Remarks
			Vertical	Horizontal	
Plain paper	PB-SK*	A4	○		
	PB-DK*	A4	○		
	Kangas	A4	○		
	Neusiedler	A4	○		
	Boise Cascade	LTR, LGL	○		Feedability: ○
	XX4024 (75g/m²)	LTR, LGL	▲		
	XX4024 (90g/m²)	LTR, LGL	▲		
	Plover Bond	LTR, LGL	▲		
Envelope	COM#10	240 × 106 (mm)	▲		Mailwell No.582
	DL-size	220 × 110 (mm)	▲		Chapman
Transparency film	CF-102	A4, LTR	▲		OHP film
Thick paper	91 to 105g/m²				
Coated paper	LC-101	A4, LTR	▲		
BPF	BF-102	A4, LTR	▲		Back Print Film
Glossy paper	GP-101	A4, LTR			

○ : Usable ▲: Usable (However, print quality and feedability may be deteriorated.)
(Blank): Not usable
*PB : PPC & BJ

4. Printing range

1) Plain paper and special media

The shaded position in the following figure shows the recommended printing area for papers and special media. The printer's mechanical printing area is inside the 3 mm top/bottom margins. We recommend setting the margins greater than 22 mm, however, because the print quality degrades below this.



Printable Area

A4 size				Letter size				Legal size			
a	210	mm	8.3"	a	216	mm	8.5"	a	216	mm	8.5"
b	3.4	mm	0.13"	b	6.4	mm	0.25"	b	6.4	mm	0.25"
c	297	mm	11.7"	c	279	mm	11.0"	c	356	mm	14.0"
d	3	mm	0.12"	d	3	mm	0.12"	d	3	mm	0.12"
e	3	mm	0.12"	e	3	mm	0.3"	e	7.6	mm	0.3"

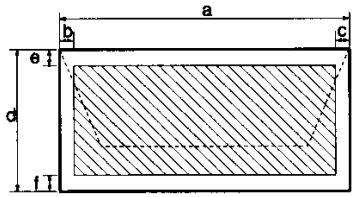
Recommended Printing Area

A4 size				Letter size				Legal size			
a	210	mm	8.3"	a	216	mm	8.5"	a	216	mm	8.5"
b	3.4	mm	0.13"	b	6.4	mm	0.25"	b	6.4	mm	0.25"
c	297	mm	11.7"	c	279	mm	11.0"	c	356	mm	14.0"
d	22	mm	0.87"	d	22	mm	0.87"	d	22	mm	0.87"
e	22	mm	0.87"	e	22	mm	0.87"	e	22	mm	0.87"

Figure 2-6 Printing Area

2) Envelope

The shaded portion in the following figure shows the recommended printing area for a U.S. Commercial 10 envelope (9.5 x 4.1 inches) and an European DL-size envelope (229 x 110 mm).



Printable Area

European DL				U.S. Commercial number 10			
a	220	mm	8.7"	a	241	mm	9.5"
b	6.4	mm	0.25"	b	6.4	mm	0.25"
c	10.4	mm	0.41"	c	31.4	mm	1.2"
d	110	mm	4.3"	d	104	mm	4.1"
e	3	mm	0.12"	e	3	mm	0.12"
f	3	mm	0.12"	f	3	mm	0.12"

Recommended Area

European DL				U.S. Commercial number 10			
a	220	mm	8.7"	a	241	mm	9.5"
b	6.4	mm	0.25"	b	6.4	mm	0.25"
c	10.4	mm	0.41"	c	31.4	mm	1.2"
d	110	mm	4.3"	d	104	mm	4.1"
e	22	mm	0.87"	e	22	mm	0.87"
f	22	mm	0.87"	f	22	mm	0.87"

Figure 2-7 Printing Area (Envelope)

2.3 Interface Specifications

The parallel interface sends 8 bits (one byte) of data at one time and is transistor-transistor-logic (TTL) compatible.
The interface cable must be constructed of American Wire Gauge (AWG) N0.28 or larger. The maximum length of the twisted-pair shielded cable must be 2.0 m (approximately 6.6 feet).

1) Interface Type:	Standard Centronics-type	
2) Data transfer:	8-bit parallel interface (Centronics compatible)	
3) Signal voltage levels:	Low:	0.0 V to +0.4 V
	High:	+2.4 V to +5.0 V
4) Input / output	Each signal pulled up with +5V.	
5) Interface cable:	Type:	Twisted-pair shielded cable
	Material:	AWG28 or larger
	Length:	Up to 2.0 m (6.6 feet)
6) Interface connectors:	Printer side:	Amphenol 57-40360 (or equivalent)
	Cable side:	Amphenol 57-30360 (or equivalent)

7) Input / output signals and pin layout

No.	Signal	I/O	No.	Signal	I/O
1	$\overline{\text{STROBE}}$	IN	19	$\overline{\text{STROBE}}$-RET*1	
2	DATA1	IN	20	DATA1-RET	
3	DATA2	IN	21	DATA2-RET	
4	DATA3	IN	22	DATA3-RET	
5	DATA4	IN	23	DATA4-RET	
6	DATA5	IN	24	DATA5-RET	
7	DATA6	IN	25	DATA6-RET	
8	DATA7	IN	26	DATA7-RET	
9	DATA8	IN	27	DATA8-RET	
10	$\overline{\text{ACKNLG}}$	OUT	28	$\overline{\text{ACKNLG}}$-RET	
11	BUSY	OUT	29	BUSY-RET	
12	P.E.	OUT	30	P.E.-RET	
13	SELECT	OUT	31	$\overline{\text{INIT}}$	IN
14	AUTO FEED XT*4	IN	32	$\overline{\text{ERROR}}$	OUT
15	N.C*2		33	GND	
16	GND		34	N.C.	
17	GND		35	+5.0V*3	
18	N.C.		36	$\overline{\text{SLCT IN}}$*4	IN

*1.All-RETs are connected to GND.
*2.N.C. means no connection.
*3.The level is raised to +5.0V at 5.6kΩ.
*4.These signals are valid only in LQ printer control mode.

8) Input / output signals

• **STROBE:** When the printer receives the STROBE low pulse of width greater than 0.5 µs from the computer, the printer reads the data from the interface and sets the BUSY line high.

• **DATA:** These signals are the 8 bits of parallel data sent from the computer. A high level indicates a logical 1; a low level indicates a logical 0. The printer reads the DATA lines when a STROBE pulse is received.

• **ACKNLG:** The ACKNLG pulse tells the computer that the data from the previous STROBE pulse has been read. An ACKNLG pulse is also generated when the printer is powered on, or at the completion of the printer initialization by an INIT requested from the computer.

• **BUSY:** When the printer sets BUSY high, it cannot receive data. The BUSY line goes high in response to a STROBE pulse. This line remains high until the data is read. BUSY is also high when:
The receive buffer is full of data.
The printer receives an INIT signal.
ON LINE button is pressed to go off-line.
A printer error condition such as out-of-paper, etc., has occurred.

• **P.E.:** The printer sets Paper End high when it determines that it has run out of the paper or that a paper jam has occurred. PE remains high until the operator loads paper and presses the *ON LINE* button.

• **SELECT:**
In BJ mode
When the printer is ready, it sets the SELECT line high. The SELECT line goes low when:
ON LINE button is pressed to go off-line.
An error condition such as out-of-paper, etc., has occurred.
The printer receives the "printer deselect" command. It ignores all incoming data except DC1, which returns the printer to a selected state.
In LQ mode
The SELECT line is always high (pulled up to +5V).

• **AUTO FEED XT:** When this signal is low, the printer automatically feeds the paper one line when a carriage return (CR) control code is received. This signal is valid only in LQ printer control mode.

• **INIT:** INIT from the system resets the printer to its initial power-on state. In BJ mode, the BUSY line goes high, and any received data is printed. In LQ mode, the BUSY line goes high, and the print buffer is cleared. When INIT goes low, the printer resets to the power-on default state.

• **ERROR:** The printer sets the ERROR line low if the printer detects an error or out-of-paper condition.

• **SLCT IN:** When this signal is high, the DC1 and DC3 control codes are valid; otherwise, they are invalid. This signal is valid only in LQ printer control mode.

9)Timing

The parallel interface transfers data in only one direction from computer to printer. The data path is 8 bits wide. The printer and the computer synchronize data transfer with the interface signals $\overline{\text{STROBE}}$, $\overline{\text{ACKNLG}}$, and BUSY. When the computer is ready to send a byte of data to the printer, the computer puts the byte of data on the data lines (DATA 1 through DATA 8). Then the computer sends a $\overline{\text{STROBE}}$ pulse to the printer. The printer responds with a BUSY signal. After the printer receives the data, the printer pulse $\overline{\text{ACKNLG}}$ line. This signals the computer that the printer has read the byte of data into printer memory. If the printer buffers are not full and the printer can receive more data, the printer removes the BUSY signal.

The timing chart below illustrates the data and handshake lines during transfer of one data byte to the computer. DATA 1 through DATA 8 and the $\overline{\text{STROBE}}$ line are driven by the computer; the $\overline{\text{ACKNLG}}$ line is driven by the printer.

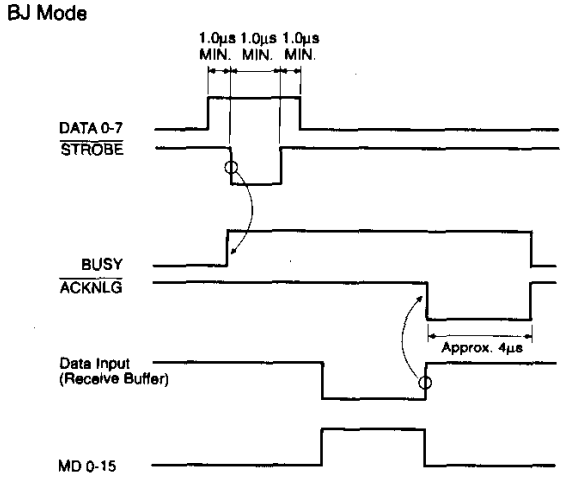


Figure 2-8 Timing Chart in BJ mode

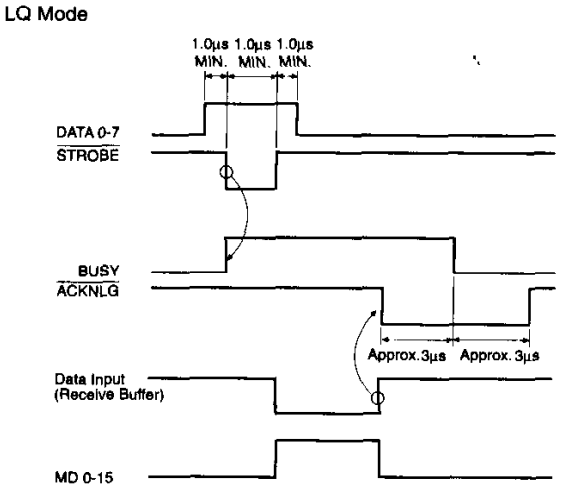


Figure 2-9 Timing Chart in LQ mode

2.4 Character Code Tables

Code page 437

Hex No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	Ø 0	▶ 16	SP 32	0 48	@ 64	P 80	` 96	p 112	Ç 128	É 144	á 160	■ 176	└ 192	╨ 208	α 224	≡ 240	0000
1	☺ 1	◀ 17	! 33	1 49	A 65	Q 81	a 97	q 113	ü 129	æ 145	í 161	■ 177	┴ 193	╤ 209	ß 225	± 241	0001
2	● 2	↕ 18	" 34	2 50	B 66	R 82	b 98	r 114	é 130	Æ 146	ó 162	■ 178	┬ 194	╥ 210	Γ 226	≥ 242	0010
3	♥ 3	‼ 19	# 35	3 51	C 67	S 83	c 99	s 115	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243	0011
4	♦ 4	¶ 20	$ 36	4 52	D 68	T 84	d 100	t 116	ä 132	ö 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244	0100
5	♣ 5	§ 21	% 37	5 53	E 69	U 85	e 101	u 117	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245	0101
6	♠ 6	▬ 22	& 38	6 54	F 70	V 86	f 102	v 118	å 134	û 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246	0110
7	• 7	↨ 23	' 39	7 55	G 71	W 87	g 103	w 119	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247	0111
8	◘ 8	↑ 24	(40	8 56	H 72	X 88	h 104	x 120	ê 136	ÿ 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248	1000
9	○ 9	↓ 25	) 41	9 57	I 73	Y 89	i 105	y 121	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	· 249	1001
A	■ 10	→ 26	* 42	: 58	J 74	Z 90	j 106	z 122	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250	1010
B	♂ 11	← 27	+ 43	; 59	K 75	[91	k 107	{ 123	ï 139	¢ 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251	1011
C	♀ 12	∟ 28	, 44	< 60	L 76	\ 92	l 108	| 124	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	ⁿ 252	1100
D	♪ 13	↔ 29	- 45	= 61	M 77	] 93	m 109	} 125	ì 141	¥ 157	¡ 173	╜ 189	═ 205	▌ 221	Ø 237	² 253	1101
E	♫ 14	▲ 30	. 46	> 62	N 78	^ 94	n 110	~ 126	Ä 142	Pts 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254	1110
F	☼ 15	▼ 31	/ 47	? 63	O 79	_ 95	o 111	⌂ 127	Å 143	ƒ 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255	1111
	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111	Binary No.

Code page 850

Hex No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	Ø 0	▶ 16	SP 32	0 48	@ 64	P 80	` 96	p 112	Ç 128	É 144	á 160	■ 176	└ 192	ð 208	Ó 224	¯ 240	0000
1	☺ 1	◀ 17	! 33	1 49	A 65	Q 81	a 97	q 113	ü 129	æ 145	í 161	■ 177	┴ 193	Ð 209	ß 225	± 241	0001
2	● 2	↕ 18	" 34	2 50	B 66	R 82	b 98	r 114	é 130	Æ 146	ó 162	■ 178	┬ 194	Ê 210	Ô 226	‗ 242	0010
3	♥ 3	‼ 19	# 35	3 51	C 67	S 83	c 99	s 115	â 131	ô 147	ú 163	│ 179	├ 195	Ë 211	Ò 227	¾ 243	0011
4	♦ 4	¶ 20	$ 36	4 52	D 68	T 84	d 100	t 116	ä 132	ö 148	ñ 164	┤ 180	─ 196	È 212	õ 228	¶ 244	0100
5	♣ 5	§ 21	% 37	5 53	E 69	U 85	e 101	u 117	à 133	ò 149	Ñ 165	Á 181	┼ 197	ı 213	Õ 229	§ 245	0101
6	♠ 6	▬ 22	& 38	6 54	F 70	V 86	f 102	v 118	å 134	û 150	ª 166	Â 182	ã 198	Í 214	µ 230	÷ 246	0110
7	• 7	↨ 23	' 39	7 55	G 71	W 87	g 103	w 119	ç 135	ù 151	º 167	À 183	Ã 199	Î 215	þ 231	¸ 247	0111
8	◘ 8	↑ 24	(40	8 56	H 72	X 88	h 104	x 120	ê 136	ÿ 152	¿ 168	© 184	╚ 200	Ï 216	Þ 232	° 248	1000
9	○ 9	↓ 25	) 41	9 57	I 73	Y 89	i 105	y 121	ë 137	Ö 153	® 169	╣ 185	╔ 201	┘ 217	Ú 233	¨ 249	1001
A	■ 10	→ 26	* 42	: 58	J 74	Z 90	j 106	z 122	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Û 234	· 250	1010
B	♂ 11	← 27	+ 43	; 59	K 75	[91	k 107	{ 123	ï 139	ø 155	½ 171	╗ 187	╦ 203	■ 219	Ù 235	¹ 251	1011
C	♀ 12	∟ 28	, 44	< 60	L 76	\ 92	l 108	| 124	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	ý 236	³ 252	1100
D	♪ 13	↔ 29	- 45	= 61	M 77	] 93	m 109	} 125	ì 141	Ø 157	¡ 173	¢ 189	═ 205	▌ 221	Ý 237	² 253	1101
E	♫ 14	▲ 30	. 46	> 62	N 78	^ 94	n 110	~ 126	Ä 142	× 158	« 174	¥ 190	╬ 206	ì 222	¯ 238	■ 254	1110
F	☼ 15	▼ 31	/ 47	? 63	O 79	_ 95	o 111	⌂ 127	Å 143	ƒ 159	» 175	┐ 191	¤ 207	▀ 223	´ 239	SP 255	1111
	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111	Binary No.

Code page 860

Hex No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	Ø 0	▶ 16	SP 32	0 48	@ 64	P 80	` 96	p 112	Ç 128	É 144	á 160	■ 176	└ 192	╨ 208	α 224	■ 240	0000
1	☺ 1	◀ 17	! 33	1 49	A 65	Q 81	a 97	q 113	ü 129	À 145	í 161	■ 177	┴ 193	╤ 209	ß 225	± 241	0001
2	● 2	↕ 18	" 34	2 50	B 66	R 82	b 98	r 114	é 130	È 146	ó 162	■ 178	┬ 194	╥ 210	Γ 226	≥ 242	0010
3	♥ 3	!! 19	# 35	3 51	C 67	S 83	c 99	s 115	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243	0011
4	♦ 4	¶ 20	$ 36	4 52	D 68	T 84	d 100	t 116	ã 132	õ 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244	0100
5	♣ 5	§ 21	% 37	5 53	E 69	U 85	e 101	u 117	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245	0101
6	♠ 6	▬ 22	& 38	6 54	F 70	V 86	f 102	v 118	Á 134	Ú 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246	0110
7	• 7	↨ 23	' 39	7 55	G 71	W 87	g 103	w 119	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247	0111
8	◘ 8	↑ 24	(40	8 56	H 72	X 88	h 104	x 120	ê 136	Ì 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248	1000
9	○ 9	↓ 25	) 41	9 57	I 73	Y 89	i 105	y 121	Ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249	1001
A	■ 10	→ 26	* 42	: 58	J 74	Z 90	j 106	z 122	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250	1010
B	♂ 11	← 27	+ 43	; 59	K 75	[91	k 107	{ 123	ï 139	¢ 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251	1011
C	♀ 12	∟ 28	, 44	< 60	L 76	\ 92	l 108	| 124	Ô 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	n 252	1100
D	♪ 13	↔ 29	- 45	= 61	M 77	] 93	m 109	} 125	ì 141	Ù 157	¡ 173	╜ 189	═ 205	▌ 221	Ø 237	2 253	1101
E	♫ 14	▲ 30	. 46	> 62	N 78	^ 94	n 110	~ 126	Ä 142	Pt 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254	1110
F	☼ 15	▼ 31	/ 47	? 63	O 79	_ 95	o 111	⌂ 127	Å 143	Ó 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255	1111
	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111	Binary No.

Code page 863

Hex No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	Ø 0	▶ 16	SP 32	0 48	@ 64	P 80	` 96	p 112	Ç 128	É 144	⌇ 160	■ 176	└ 192	╨ 208	α 224	■ 240	0000
1	☺ 1	◀ 17	! 33	1 49	A 65	Q 81	a 97	q 113	û 129	È 145	´ 161	■ 177	┴ 193	╤ 209	ß 225	± 241	0001
2	● 2	↕ 18	" 34	2 50	B 66	R 82	b 98	r 114	é 130	Ê 146	ó 162	■ 178	┬ 194	╥ 210	Γ 226	≥ 242	0010
3	♥ 3	!! 19	# 35	3 51	C 67	S 83	c 99	s 115	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243	0011
4	♦ 4	¶ 20	$ 36	4 52	D 68	T 84	d 100	t 116	À 132	Ë 148	¨ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244	0100
5	♣ 5	§ 21	% 37	5 53	E 69	U 85	e 101	u 117	à 133	Ï 149	¸ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245	0101
6	♠ 6	▬ 22	& 38	6 54	F 70	V 86	f 102	v 118	¶ 134	Ô 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	+ 246	0110
7	• 7	↨ 23	' 39	7 55	G 71	W 87	g 103	w 119	ç 135	ù 151	¯ 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247	0111
8	◘ 8	↑ 24	(40	8 56	H 72	X 88	h 104	x 120	ê 136	¤ 152	Î 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248	1000
9	○ 9	↓ 25	) 41	9 57	I 73	Y 89	i 105	y 121	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249	1001
A	■ 10	→ 26	* 42	: 58	J 74	Z 90	j 106	z 122	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250	1010
B	♂ 11	← 27	+ 43	; 59	K 75	[91	k 107	{ 123	ï 139	¢ 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251	1011
C	♀ 12	∟ 28	, 44	< 60	L 76	\ 92	l 108	| 124	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	n 252	1100
D	♪ 13	↔ 29	- 45	= 61	M 77	] 93	m 109	} 125	ì 141	Ù 157	¾ 173	╜ 189	═ 205	▌ 221	Ø 237	2 253	1101
E	♫ 14	▲ 30	. 46	> 62	N 78	^ 94	n 110	~ 126	À 142	Û 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254	1110
F	☼ 15	▼ 31	/ 47	? 63	O 79	_ 95	o 111	⌂ 127	§ 143	ƒ 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255	1111
	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111	Binary No.

Code page 865

Hex No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	Ø 0	▶ 16	SP 32	0 48	@ 64	P 80	` 96	p 112	Ç 128	É 144	á 160	■ 176	└ 192	⊥ 208	α 224	≡ 240	0000
1	☺ 1	◀ 17	! 33	1 49	A 65	Q 81	a 97	q 113	ü 129	æ 145	í 161	■ 177	┴ 193	╤ 209	ß 225	± 241	0001
2	● 2	↕ 18	" 34	2 50	B 66	R 82	b 98	r 114	é 130	Æ 146	ó 162	■ 178	┬ 194	╥ 210	Γ 226	≥ 242	0010
3	♥ 3	!! 19	# 35	3 51	C 67	S 83	c 99	s 115	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243	0011
4	♦ 4	¶ 20	$ 36	4 52	D 68	T 84	d 100	t 116	ä 132	ö 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244	0100
5	♣ 5	§ 21	% 37	5 53	E 69	U 85	e 101	u 117	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245	0101
6	♠ 6	▬ 22	& 38	6 54	F 70	V 86	f 102	v 118	å 134	û 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246	0110
7	• 7	↨ 23	' 39	7 55	G 71	W 87	g 103	w 119	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247	0111
8	◘ 8	↑ 24	(40	8 56	H 72	X 88	h 104	x 120	ê 136	ÿ 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248	1000
9	○ 9	↓ 25	) 41	9 57	I 73	Y 89	i 105	y 121	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249	1001
A	■ 10	→ 26	* 42	: 58	J 74	Z 90	j 106	z 122	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250	1010
B	♂ 11	← 27	+ 43	; 59	K 75	[91	k 107	{ 123	ï 139	ø 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251	1011
C	♀ 12	∟ 28	, 44	< 60	L 76	\ 92	l 108	| 124	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	n 252	1100
D	♪ 13	↔ 29	– 45	= 61	M 77	] 93	m 109	} 125	ì 141	Ø 157	¡ 173	╜ 189	═ 205	▌ 221	Ø 237	2 253	1101
E	♫ 14	▲ 30	. 46	> 62	N 78	^ 94	n 110	~ 126	Ä 142	Pts 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254	1110
F	☼ 15	▼ 31	/ 47	? 63	O 79	_ 95	o 111	⌂ 127	Å 143	ƒ 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255	1111
	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111	Binary No.

Code page 857

Hex No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	Ø 0	▶ 16	SP 32	0 48	@ 64	P 80	` 96	p 112	Ç 128	É 144	á 160	■ 176	└ 192	ð 208	Ó 224	- 240	0000
1	☺ 1	◀ 17	! 33	1 49	A 65	Q 81	a 97	q 113	ü 129	æ 145	í 161	■ 177	┴ 193	â 209	ß 225	± 241	0001
2	● 2	↕ 18	" 34	2 50	B 66	R 82	b 98	r 114	é 130	Æ 146	ó 162	■ 178	┬ 194	Ê 210	Ô 226	242	0010
3	♥ 3	!! 19	# 35	3 51	C 67	S 83	c 99	s 115	â 131	ô 147	ú 163	| 179	├ 195	Ë 211	Ò 227	╪ 243	0011
4	♦ 4	¶ 20	$ 36	4 52	D 68	T 84	d 100	t 116	ä 132	ö 148	ñ 164	┤ 180	─ 196	È 212	õ 228	¶ 244	0100
5	♣ 5	§ 21	% 37	5 53	E 69	U 85	e 101	u 117	à 133	ò 149	Ñ 165	Á 181	┼ 197	213	Õ 229	§ 245	0101
6	♠ 6	▬ 22	& 38	6 54	F 70	V 86	f 102	v 118	å 134	û 150	Ğ 166	Â 182	ã 198	Í 214	µ 230	÷ 246	0110
7	• 7	↨ 23	' 39	7 55	G 71	W 87	g 103	w 119	ç 135	ù 151	ğ 167	À 183	Ã 199	Î 215	231	¸ 247	0111
8	◘ 8	↑ 24	(40	8 56	H 72	X 88	h 104	x 120	ê 136	İ 152	¿ 168	© 184	╚ 200	Ï 216	× 232	° 248	1000
9	○ 9	↓ 25	) 41	9 57	I 73	Y 89	i 105	y 121	ë 137	Ö 153	® 169	╣ 185	╔ 201	┘ 217	Ú 233	¨ 249	1001
A	■ 10	→ 26	* 42	: 58	J 74	Z 90	j 106	z 122	è 138	Ü 154	¬ 170	½ 186	╩ 202	┌ 218	Û 234	· 250	1010
B	♂ 11	← 27	+ 43	; 59	K 75	[91	k 107	{ 123	ï 139	ø 155	£ 171	¾ 187	╦ 203	▌ 219	Ù 235	³ 251	1011
C	♀ 12	∟ 28	, 44	< 60	L 76	\ 92	l 108	| 124	î 140	Ø 156	¼ 172	© 188	╠ 204	▄ 220	ì 236	² 252	1100
D	♪ 13	↔ 29	– 45	= 61	M 77	] 93	m 109	} 125	ì 141	Ø 157	¢ 173	¥ 189	═ 205	▌ 221	ÿ 237	² 253	1101
E	♫ 14	▲ 30	. 46	> 62	N 78	^ 94	n 110	~ 126	Ä 142	Ş 158	« 174	¥ 190	╬ 206	▐ 222	Ì 238	■ 254	1110
F	☼ 15	▼ 31	/ 47	? 63	O 79	_ 95	o 111	⌂ 127	Å 143	ş 159	» 175	┐ 191	¤ 207	▀ 223	´ 239	SP 255	1111
	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111	Binary No.

Code page 855

Hex No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	Ø 0	▶ 16	SP 32	0 48	@ 64	P 80	` 96	p 112	ђ 128	Ъ 144	а 160	■ 176	└ 192	Б 208	Я 224	- 240	0000
1	☺ 1	◀ 17	! 33	1 49	A 65	Q 81	a 97	q 113	Ђ 129	Ъ 145	А 161	■ 177	┴ 193	Л 209	р 225	Ы 241	0001
2	● 2	↕ 18	" 34	2 50	B 66	R 82	b 98	r 114	ѓ 130	Њ 146	б 162	■ 178	┬ 194	В 210	Р 226	Ы 242	0010
3	♥ 3	!! 19	# 35	3 51	C 67	S 83	c 99	s 115	Ѓ 131	Њ 147	Б 163	¦ 179	├ 195	М 211	с 227	з 243	0011
4	♦ 4	¶ 20	$ 36	4 52	D 68	T 84	d 100	t 116	ё 132	ћ 148	ц 164	┤ 180	— 196	Г 212	С 228	Э 244	0100
5	♣ 5	§ 21	% 37	5 53	E 69	U 85	e 101	u 117	Ё 133	Ћ 149	Ц 165	х 181	┼ 197	Н 213	т 229	ш 245	0101
6	♠ 6	▬ 22	& 38	6 54	F 70	V 86	f 102	v 118	є 134	ќ 150	д 166	Х 182	к 198	З 214	Т 230	Ш 246	0110
7	• 7	↨ 23	' 39	7 55	G 71	W 87	g 103	w 119	Є 135	Ќ 151	Д 167	и 183	К 199	О 215	у 231	э 247	0111
8	◘ 8	↑ 24	(40	8 56	H 72	X 88	h 104	x 120	s 136	ў 152	е 168	И 184	╚ 200	п 216	У 232	Э 248	1000
9	○ 9	↓ 25	) 41	9 57	I 73	Y 89	i 105	y 121	S 137	Ў 153	Е 169	╣ 185	╔ 201	┘ 217	ж 233	щ 249	1001
A	■ 10	→ 26	* 42	: 58	J 74	Z 90	j 106	z 122	і 138	ц 154	ф 170	‖ 186	╩ 202	┌ 218	Ж 234	Щ 250	1010
B	♂ 11	← 27	+ 43	; 59	K 75	[91	k 107	{ 123	І 139	Ц 155	Ф 171	╗ 187	╦ 203	■ 219	в 235	ч 251	1011
C	♀ 12	└ 28	, 44	< 60	L 76	\ 92	l 108	| 124	ї 140	ю 156	г 172	╝ 188	╠ 204	▄ 220	В 236	Ч 252	1100
D	♪ 13	↔ 29	- 45	= 61	M 77	] 93	m 109	} 125	Ї 141	Ю 157	Г 173	й 189	═ 205	П 221	ь 237	§ 253	1101
E	♫ 14	▲ 30	. 46	> 62	N 78	^ 94	n 110	~ 126	j 142	ъ 158	« 174	Й 190	╬ 206	я 222	Ь 238	■ 254	1110
F	☼ 15	▼ 31	/ 47	? 63	O 79	_ 95	o 111	⌂ 127	J 143	Ъ 159	» 175	┐ 191	¤ 207	▀ 223	№ 239	SP 255	1111
	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111	Binary No.

Code page 852

Hex No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	Ø 0	▶ 16	SP 32	0 48	@ 64	P 80	` 96	p 112	Ç 128	É 144	á 160	■ 176	└ 192	đ 208	Ó 224	- 240	0000
1	☺ 1	◀ 17	! 33	1 49	A 65	Q 81	a 97	q 113	ü 129	Ĺ 145	í 161	■ 177	┴ 193	Đ 209	ß 225	˝ 241	0001
2	● 2	↕ 18	" 34	2 50	B 66	R 82	b 98	r 114	é 130	ĺ 146	ó 162	■ 178	┬ 194	Ď 210	Ô 226	˛ 242	0010
3	♥ 3	!! 19	# 35	3 51	C 67	S 83	c 99	s 115	â 131	ô 147	ú 163	¦ 179	├ 195	Ë 211	Ń 227	ˇ 243	0011
4	♦ 4	¶ 20	$ 36	4 52	D 68	T 84	d 100	t 116	ä 132	ö 148	Ą 164	┤ 180	— 196	ď 212	ń 228	˘ 244	0100
5	♣ 5	§ 21	% 37	5 53	E 69	U 85	e 101	u 117	ů 133	Ľ 149	ą 165	Á 181	┼ 197	Ň 213	ň 229	§ 245	0101
6	♠ 6	▬ 22	& 38	6 54	F 70	V 86	f 102	v 118	ć 134	ľ 150	Ž 166	Â 182	Ă 198	Í 214	Š 230	÷ 246	0110
7	• 7	↨ 23	' 39	7 55	G 71	W 87	g 103	w 119	ç 135	Ś 151	ž 167	Ě 183	ă 199	î 215	š 231	¸ 247	0111
8	◘ 8	↑ 24	(40	8 56	H 72	X 88	h 104	x 120	ł 136	ś 152	Ę 168	Ş 184	╚ 200	ě 216	Ř 232	° 248	1000
9	○ 9	↓ 25	) 41	9 57	I 73	Y 89	i 105	y 121	ë 137	Ö 153	ę 169	╣ 185	╔ 201	┘ 217	Ú 233	¨ 249	1001
A	■ 10	→ 26	* 42	: 58	J 74	Z 90	j 106	z 122	Ő 138	Ü 154	170	‖ 186	╩ 202	┌ 218	ŕ 234	· 250	1010
B	♂ 11	← 27	+ 43	; 59	K 75	[91	k 107	{ 123	ő 139	Ť 155	ź 171	╗ 187	╦ 203	■ 219	Ű 235	ű 251	1011
C	♀ 12	└ 28	, 44	< 60	L 76	\ 92	l 108	| 124	î 140	ť 156	Č 172	╝ 188	╠ 204	▄ 220	ý 236	Ř 252	1100
D	♪ 13	↔ 29	- 45	= 61	M 77	] 93	m 109	} 125	Ź 141	Ł 157	ş 173	Ź 189	═ 205	Ţ 221	Ý 237	ř 253	1101
E	♫ 14	▲ 30	. 46	> 62	N 78	^ 94	n 110	~ 126	Ä 142	× 158	« 174	ž 190	╬ 206	Ů 222	ţ 238	■ 254	1110
F	☼ 15	▼ 31	/ 47	? 63	O 79	_ 95	o 111	⌂ 127	Ć 143	č 159	» 175	┐ 191	¤ 207	▀ 223	´ 239	SP 255	1111
	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111	Binary No.

Code page 864

Hex No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	Ø 0	► 16	SP 32	0 48	@ 64	P 80	` 96	p 112	° 128	ß 144	160	٠ 176	¢ 192	ﺫ 208	ـ 224	ﹽ 240	0000
1	☺ 1	◄ 17	! 33	1 49	A 65	Q 81	a 97	q 113	· 129	∞ 145	– 161	١ 177	ﺀ 193	ﺭ 209	ﻓ 225	ﹼ 241	0001
2	♪ 2	↕ 18	" 34	2 50	B 66	R 82	b 98	r 114	• 130	Ø 146	ﺂ 162	٢ 178	ﺁ 194	ﺯ 210	ﻗ 226	ﻥ 242	0010
3	♫ 3	‼ 19	# 35	3 51	C 67	S 83	c 99	s 115	√ 131	± 147	£ 163	٣ 179	ﺃ 195	ﺳ 211	ﻛ 227	ﻩ 243	0011
4	○ 4	¶ 20	$ 36	4 52	D 68	T 84	d 100	t 116	■ 132	½ 148	¤ 164	٤ 180	ﺅ 196	ﺷ 212	ﻟ 228	ﻬ 244	0100
5	═ 5	§ 21	% 37	5 53	E 69	U 85	e 101	u 117	— 133	¼ 149	ﺄ 165	٥ 181	ﻊ 197	ﺻ 213	ﻣ 229	ﻰ 245	0101
6	║ 6	▬ 22	& 38	6 54	F 70	V 86	f 102	v 118	│ 134	≈ 150	166	٦ 182	ﺋ 198	ﺿ 214	ﻧ 230	ﻲ 246	0110
7	╬ 7	↨ 23	' 39	7 55	G 71	W 87	g 103	w 119	┼ 135	« 151	167	٧ 183	ﺍ 199	ﻁ 215	ﻫ 231	ﻐ 247	0111
8	╣ 8	↑ 24	(40	8 56	H 72	X 88	h 104	x 120	┤ 136	» 152	ﺎ 168	٨ 184	ﺑ 200	ﻅ 216	ﻭ 232	ﻕ 248	1000
9	╦ 9	↓ 25	) 41	9 57	I 73	Y 89	i 105	y 121	┬ 137	ﻷ 153	ﺏ 169	٩ 185	ﺓ 201	ﻋ 217	ﻯ 233	ﻵ 249	1001
A	╠ 10	→ 26	* 42	: 58	J 74	Z 90	j 106	z 122	├ 138	ﻸ 154	ﺕ 170	ﻑ 186	ﺗ 202	ﻏ 218	ﻳ 234	ﻶ 250	1010
B	╩ 11	← 27	+ 43	; 59	K 75	[91	k 107	{ 123	┴ 139	155	ﺙ 171	؛ 187	ﺛ 203	¦ 219	ﺽ 235	ﻝ 251	1011
C	╗ 12	∟ 28	, 44	< 60	L 76	\ 92	l 108	| 124	┐ 140	156	، 172	ﺱ 188	ﺟ 204	¬ 220	ﻌ 236	ﻙ 252	1100
D	╔ 13	•• 29	- 45	= 61	M 77	] 93	m 109	} 125	┌ 141	ﻻ 157	ﺝ 173	ﺵ 189	ﺣ 205	÷ 221	ﻎ 237	ﻱ 253	1101
E	╚ 14	▲ 30	. 46	> 62	N 78	^ 94	n 110	~ 126	└ 142	ﻼ 158	ﺡ 174	ﺹ 190	ﺧ 206	× 222	ﻍ 238	■ 254	1110
F	╝ 15	▼ 31	/ 47	? 63	O 79	_ 95	o 111	⌂ 127	┘ 143	ـ 159	ﺥ 175	؟ 191	ﺩ 207	ﻉ 223	ﻡ 239	SP 255	1111
	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111	Binary No.

Code page 869

Hex No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	Ø 0	► 16	SP 32	0 48	@ 64	P 80	` 96	p 112	128	Ί 144	ΐ 160	■ 176	└ 192	Τ 208	ζ 224	- 240	0000
1	☺ 1	◄ 17	! 33	1 49	A 65	Q 81	a 97	q 113	129	Ϊ 145	ί 161	■ 177	┴ 193	Υ 209	η 225	± 241	0001
2	● 2	↕ 18	" 34	2 50	B 66	R 82	b 98	r 114	130	Ό 146	ό 162	■ 178	┬ 194	Φ 210	θ 226	υ 242	0010
3	♥ 3	‼ 19	# 35	3 51	C 67	S 83	c 99	s 115	131	147	ύ 163	│ 179	├ 195	Χ 211	ι 227	φ 243	0011
4	♦ 4	¶ 20	$ 36	4 52	D 68	T 84	d 100	t 116	132	148	Α 164	┤ 180	─ 196	Ψ 212	κ 228	χ 244	0100
5	♣ 5	§ 21	% 37	5 53	E 69	U 85	e 101	u 117	133	Ύ 149	Β 165	Κ 181	┼ 197	Ω 213	λ 229	§ 245	0101
6	♠ 6	▬ 22	& 38	6 54	F 70	V 86	f 102	v 118	Ά 134	Ϋ 150	Γ 166	Λ 182	Π 198	α 214	μ 230	ψ 246	0110
7	• 7	↨ 23	' 39	7 55	G 71	W 87	g 103	w 119	135	© 151	Δ 167	Μ 183	Ρ 199	β 215	ν 231	΅ 247	0111
8	◘ 8	↑ 24	(40	8 56	H 72	X 88	h 104	x 120	· 136	Ώ 152	Ε 168	Ν 184	╚ 200	γ 216	ξ 232	° 248	1000
9	○ 9	↓ 25	) 41	9 57	I 73	Y 89	i 105	y 121	¬ 137	² 153	Ζ 169	╣ 185	╔ 201	┘ 217	ο 233	¨ 249	1001
A	◙ 10	→ 26	* 42	: 58	J 74	Z 90	j 106	z 122	¦ 138	³ 154	Η 170	║ 186	╩ 202	┌ 218	π 234	ω 250	1010
B	♂ 11	← 27	+ 43	; 59	K 75	[91	k 107	{ 123	‘ 139	ά 155	½ 171	╗ 187	╦ 203	█ 219	ρ 235	ϋ 251	1011
C	♀ 12	∟ 28	, 44	< 60	L 76	\ 92	l 108	| 124	’ 140	£ 156	Θ 172	╝ 188	╠ 204	▄ 220	σ 236	ΰ 252	1100
D	♪ 13	↔ 29	- 45	= 61	M 77	] 93	m 109	} 125	Έ 141	έ 157	Ι 173	Ξ 189	═ 205	δ 221	ς 237	ώ 253	1101
E	♫ 14	▲ 30	. 46	> 62	N 78	^ 94	n 110	~ 126	― 142	ή 158	« 174	Ο 190	╬ 206	ε 222	τ 238	■ 254	1110
F	☼ 15	▼ 31	/ 47	? 63	O 79	_ 95	o 111	⌂ 127	Ή 143	ί 159	» 175	┐ 191	Σ 207	▀ 223	΄ 239	SP 255	1111
	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111	Binary No.

1. PRINTER SETUP

1.1 Unpacking

After unpacking, check that you have the following:

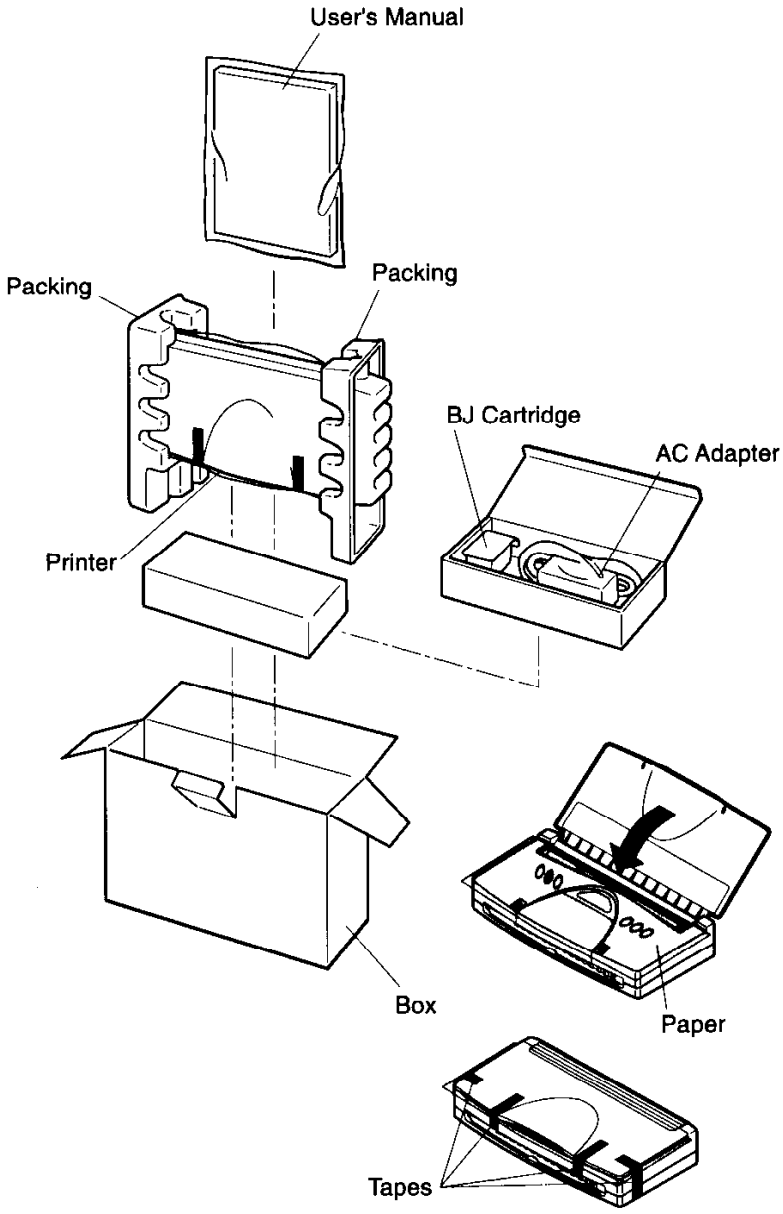


Figure 3-1 Packing Arrangement

1.2 Installation

1.2.1 Installation space

Install the printer with the clearances given below for the printer to be operated efficiently. The spaces required to install the printer are shown below.

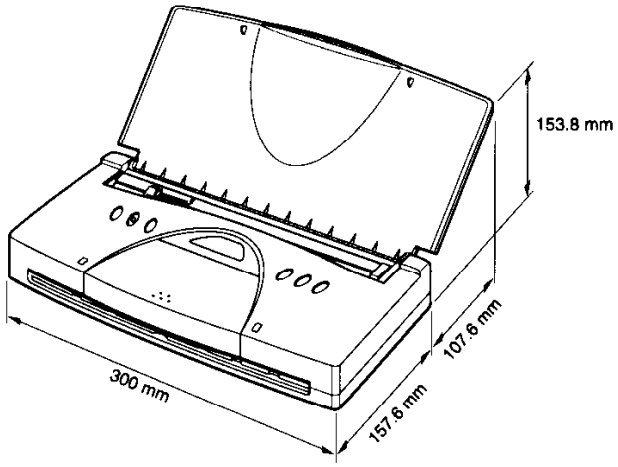


Figure 3-2 Installation Space

NOTE

- Use the printer within the following ranges of temperature and humidity:
  Ambient temperature: 5 °C to 35 °C
  Relative humidity: 10% to 90% (without condensation)
- Install the printer on a flat sturdy surface. Do not install it in places where it is subjected to vibration.
- Do not install the printer in places where it is exposed to direct sunlight or near a heater or air conditioner where the temperature changes greatly. Do not leave the printer in a car where the temperature rises suddenly.
- Do not install the printer in places where dust accumulates or it is subjected to salty wind.
- Do not place it near a television set, speaker, or other devices which generate magnetic fields.

1.2.2 Installation procedure

a) Connecting the AC adapter

Insert the DC plug into the AC adapter connector of the printer and the AC plug of the AC adapter into the outlet.

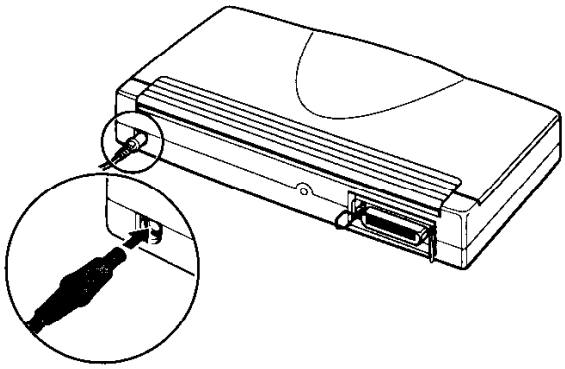


Figure 3-3 Connecting the AC Adapter

NOTE The printer powered with the AC adapter executes the initial operation automatically, and enters the power off mode.

CAUTION When the *POWER* button is held down and the AC adapter is plugged in, the service function (EEPROM data setting mode) is activated. See *Part 3:* 3.4 EEPROM Data Setting (page 3-24) for details.

b) Connecting the interface cable

Make sure that the printer and the computer are off. Plug the interface cable into the printer interface connector. Secure the cable with connector clips. Connect the other end of the interface cable to the computer and fix it securely.

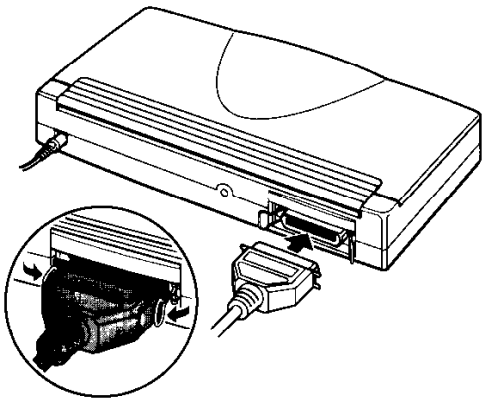


Figure 3-4 Connecting the Interface Cable

c) Switching on the power

Verify that the AC adapter is connected correctly, and press the *POWER* button to switch on the power. When the printer is powered up, it carries out the initial operations, then move the carriage to the cartridge replacing position (center of the printer). The *ON LINE* light blinks to show that the printer is on standby with a BJ cartridge installed. Switch on the power for the equipment in this order: computer, other peripheral equipment, printer.

d) Installing the BJ cartridge

Black BJ cartridge (BC-10) can be installed in the printer.

1) Removing the cap from the print head of the BJ cartridge

Remove the BJ cartridge from the cartridge pack, then remove the orange head cap and tape protecting the nozzles as shown in the figure below.

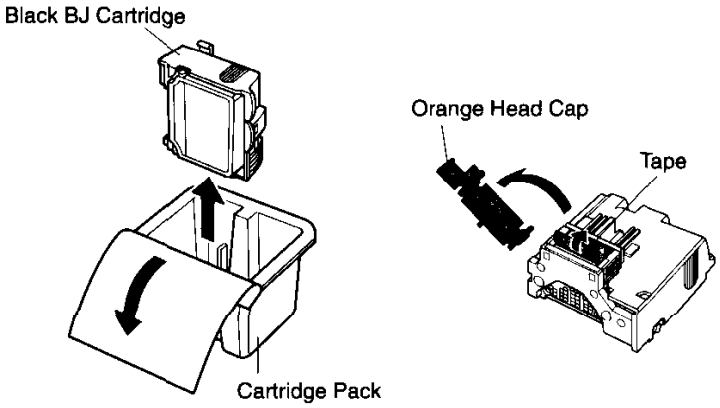


Figure 3-5 Removing the Head Cap and the Tape

CAUTION

Do not reuse a head cap and tape that have been removed once. If they are reused, the head may be clogged with foreign matter, or colors of ink may be mixed.

Peel off the tape protecting the nozzles without touching the print head. Poor printing may be caused by scratches on the print head or any foreign object adhered to it.

After removing the cap and the tape, do not shake the BJ cartridge. Ink could splatter out if you do.

2) Installing the BJ cartridge

Open the printer top cover and inner cover, and install a BJ cartridge in the carriage.

Press the *CARTRIDGE* button to return the carriage to the capping position.

After a BJ cartridge is installed, Bk is displayed.

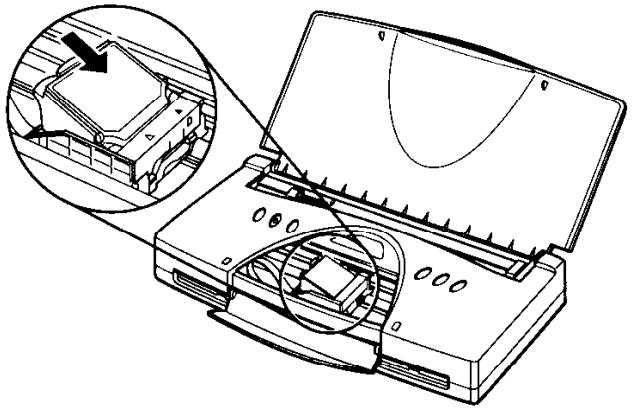


Figure 3-6 Installing the BJ Cartridge

CAUTION

If the BJ cartridge is not installed correctly, the beeper sounds once when the *CARTRIDGE* button is pressed, and the carriage cannot be returned to the capping position. If the carriage does not move to the capping position, remove and reinstall the BJ cartridge. If the error still persists, see *Part 5:* 5. TROUBLESHOOTING (page 5-5).

3) Replacing a BJ cartridge

Open the printer top cover and inner cover, press the *CARTRIDGE* button to return the carriage to the BJ cartridge replacing position (center of the printer).

Lift off the BJ cartridge. Install another BJ cartridge, press the *CARTRIDGE* button to return the carriage to the capping position. Place the removed BJ cartridge in the supplied cartridge container. (Cartridge container is option.)

CAUTION

Since the carriage is secured by the lock arm in the capping position, never pull the carriage ribbon cable to move the carriage to the center.

If the beeper sounds and the carriage does not move at all when the *CARTRIDGE* button is pressed, the BJ cartridge may be excessively hot. Leave the printer as it is for a while to let it cool and press the *CARTRIDGE* button again.

e) Replacing the ink cartridge

The ink cartridge of the BJ cartridge can be replaced. (BCI-10)

1) Ink cartridge replacement criteria

If the ink runs out or if more than six months have passed after the BJ cartridge was unsealed and the print quality is not improved by performing quick cleaning once or twice, the ink cartridge should be replaced with a new one.

NOTE If the print quality does not improve after replacing the ink cartridge, perform long cleaning. If the print quality does not still improve, the BJ cartridge must be replaced with a new one.

2) Removing the ink cartridge

Open the printer top cover and inner cover, and press the *CARTRIDGE* button to move the carriage to the BJ cartridge replacing position. Lift off the ink cartridge while holding down its tab.

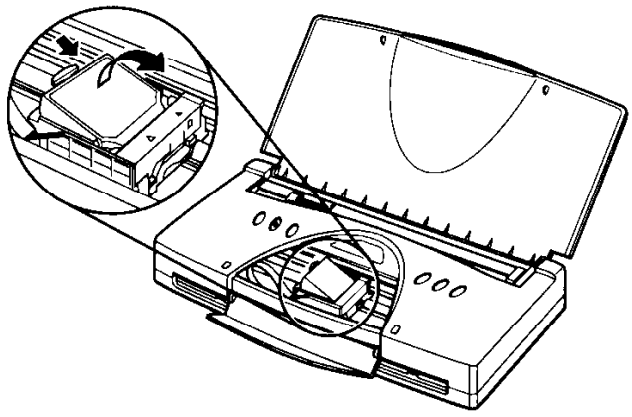


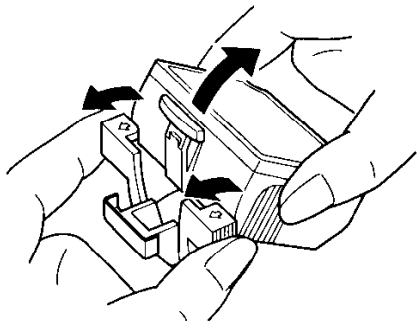
Figure 3-7 Replacing the Ink Cartridge

CAUTION Ink adheres to and around the ink cartridge's ink inlet, so handle the ink cartridge carefully not to stain your hands or clothes.

3) Installing the ink cartridge

Take out the ink cartridge from its bag, remove the protective cap for the ink inlet as shown in the figure, and install the ink cartridge in the printer with the reverse of the removal procedure.

After installing the ink cartridge, press the *CARTRIDGE* button in the same way as when installing a BJ cartridge to return the carriage to the capping position.



BCI-10

Figure 3-8 Removing the Cap (Ink Cartridge)

f) BJ cartridge container

The printer is supplied with a BJ cartridge container to contain an BJ cartridge. If the BJ cartridge is removed from the printer, place it in the container. If the BJ cartridge is not stored in the container, nozzles may be clogged with ink, the BJ head may be scratched, or the BJ cartridge does not eject the ink onto the paper. The BJ cartridge container can contain a color or black BJ cartridge.

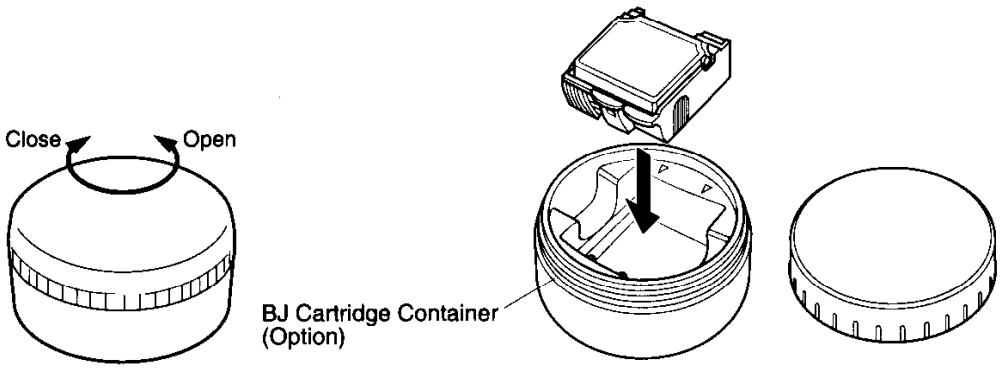


Figure 3-9 BJ Cartridge Container

CAUTION

Store the BJ cartridge with the ink cartridge attached. If the ink cartridge is not attached, ink may spill out or nozzles may be clogged with ink. Do not shake or fall the container. Otherwise, ink may leak.

1.3 Names and Functions of Parts

This section describes the names of the parts of the printer and their functions.

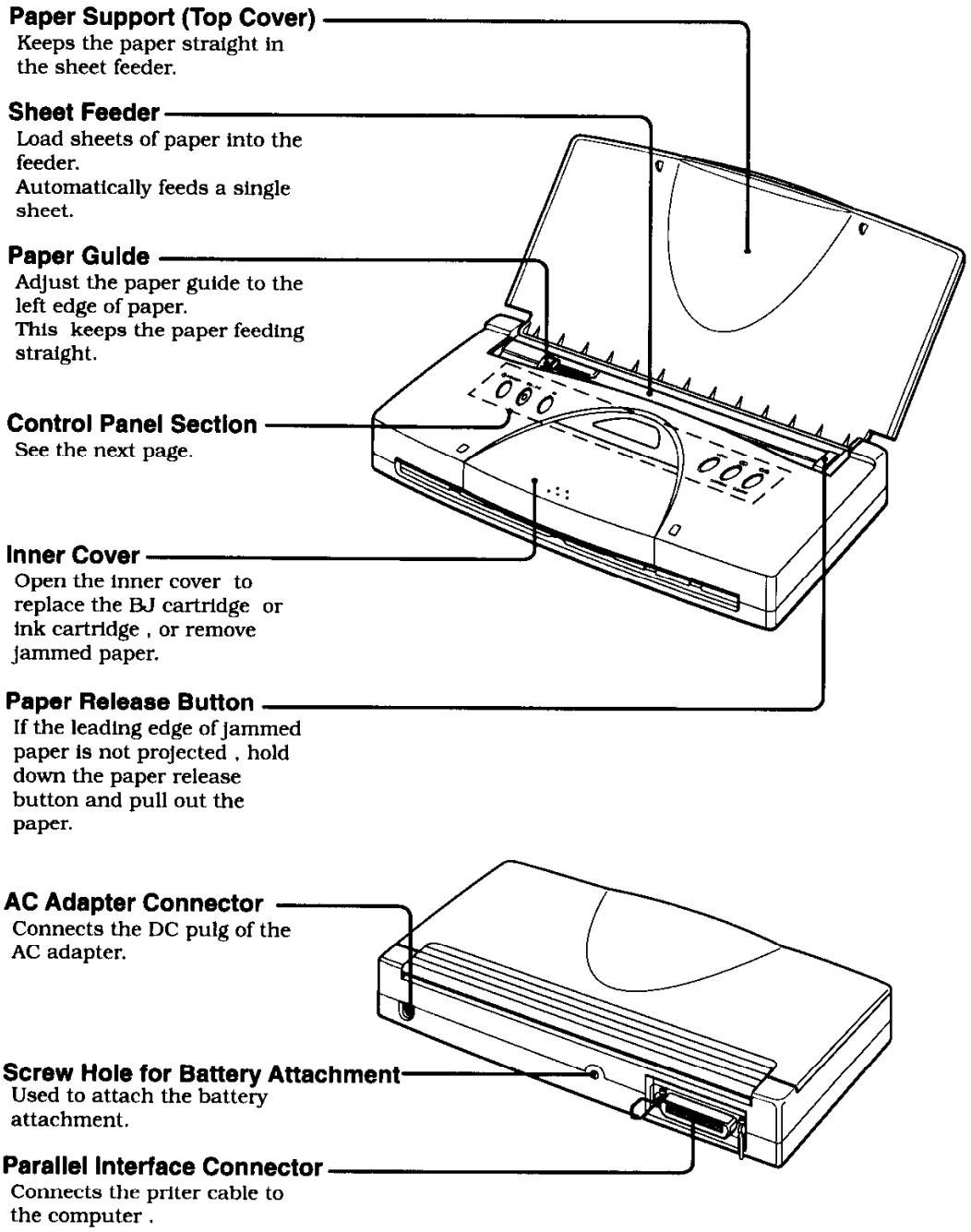
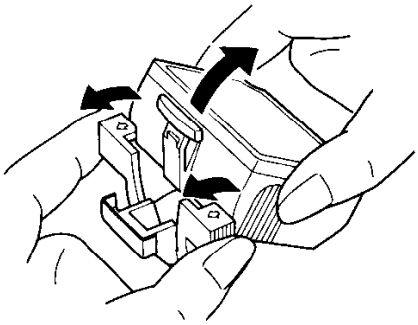


Figure 3-10 Names and Functions of Parts (1)

3) Installing the ink cartridge

Take out the ink cartridge from its bag, remove the protective cap for the ink inlet as shown in the figure, and install the ink cartridge in the printer with the reverse of the removal procedure.

After installing the ink cartridge, press the *CARTRIDGE* button in the same way as when installing a BJ cartridge to return the carriage to the capping position.



BCI-10

Figure 3-8 Removing the Cap (Ink Cartridge)

f) BJ cartridge container

The printer is supplied with a BJ cartridge container to contain an BJ cartridge. If the BJ cartridge is removed from the printer, place it in the container. If the BJ cartridge is not stored in the container, nozzles may be clogged with ink, the BJ head may be scratched, or the BJ cartridge does not eject the ink onto the paper. The BJ cartridge container can contain a color or black BJ cartridge.

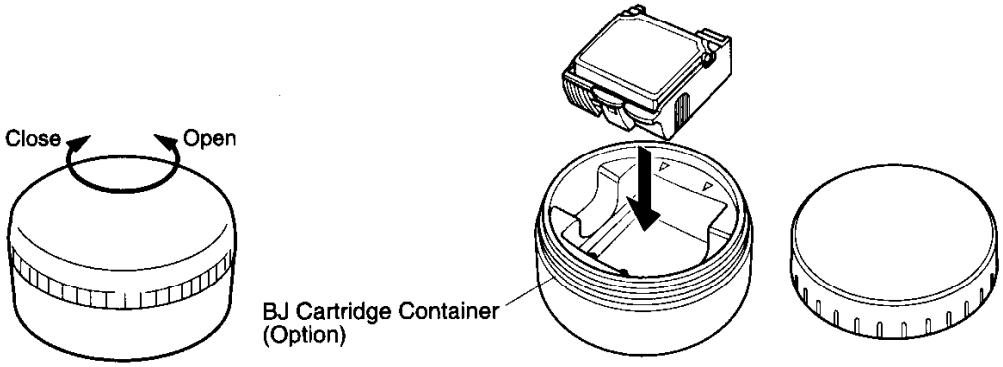
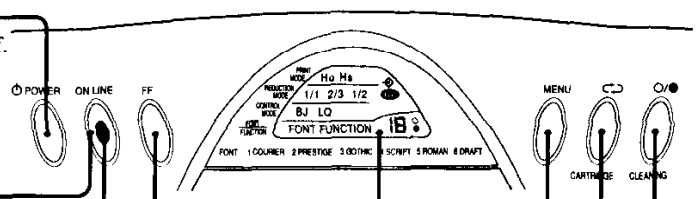


Figure 3-9 BJ Cartridge Container

CAUTION

Store the BJ cartridge with the ink cartridge attached. If the ink cartridge is not attached, ink may spill out or nozzles may be clogged with ink. Do not shake or fall the container. Otherwise, ink may leak.

Control Panel Section



Power Button
Turns the printer on and off.

ON LINE Button
Switches the printer between on line and off line modes.

ON LINE Light
Indicates whether the printer is on line or off line.
On: on line
Off: off line

FF Button
Loads paper into the printer or discharges a stacked paper.
This button is also used to fine-adjust the paper feed position.

Display
Shows the current printer states, such as the operating mode, print mode, reduction mode, font, and type of installed BJ cartridge.

MENU Button
Used to change printer settings. Press this button to print test patterns.

CARTRIDGE / ⊂⊃ Button
Used to move the carriage to the BJ cartridge replacing position or return it to the original capping position when replacing the BJ cartridge or ink cartridge .
When the *MENU* button is pressed, use this button to select a menu item.

CLEANING / ○/● Button
Starts BJ head cleaning. When the *MENU* button is pressed, use this button to set a function setting to on or off.(Function selector setting)

Figure 3-11 Names and Functions of Parts (2)

2. TRANSPORTING THE PRINTER

When carrying or transporting the printer, leave the BJ cartridge in or place it in the cartridge container to prevent ink leakage and drying of cartridge nozzles.

2.1 Carrying the Printer

Before carrying the printer, do the following:

1) Press the *POWER* button to turn the printer off and close the top cover. When the power goes off, the display turns off.
2) Unplug the interface cable.
3) Disconnect the DC plug of the AC adapter from the printer. Disconnect the AC plug of the AC adapter from the outlet.
4) Make sure that the BJ cartridge is at the capping position (right edge of the printer). If it is not at the capping position, turn the printer on again and perform step 1 and subsequent steps to move the carriage to the capping position.

If you cut off the power to the printer by just disconnecting the AC adapter or take out the BJ cartridge and carry it around by itself, the cartridge is not capped, so ink can leak or dry up in the nozzles.

2.2 Transporting the Printer

Before transporting the printer, do the following:

1) Disconnect the interface cable and the AC adapter in the same way as when carrying the printer.
2) If an optional NiMH battery is used, remove the battery attachment from the printer.
3) Pack the printer and AC adapter with the original packing materials.

If you have thrown the original packing materials away, pack the printer with plenty of shock absorbing material.

3. PRINTER SERVICE FUNCTION

3.1 Error Display

The printer displays three types of errors with beeps according to error conditions: fatal (F), error (E), and warning (C).

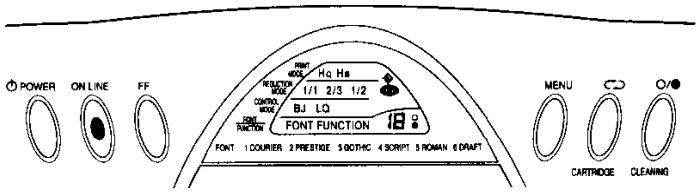


Figure 3-12 Control Panel

- Fatal (F): The beeper sounds for about five seconds, "FONT" and "◈ " disappear and "F" and a fatal number blink alternately.
- Error (E): The short beeper sounds twice, "FONT" and "◈ " disappear and "E" and an error number blink alternately.
- Warning (C): The short beeper sounds twice as when an error occurs, "FONT" and "◈ " disappear and "C" and a warning number blink alternately. (Except the ink low warning)

TABLE 3-1 ERROR DISPLAY

Error condition	ERROR No.	ON LINE	Bk	◈	○/●	Beeper
[Recoverable by customers]						
Low battery error (with battery)	F c	Turns off	...	...	...	Five seconds
Paper pickup error (No paper error)	E 1	Turns off	...	...	...	Twice
Paper delivery error (Paper jam error)	E 2	Turns off	...	...	...	Twice
BJ cartridge installation error (BJ cartridge not properly installed error)	E 6	Turns off	...	...	...	Twice
BJ cartridge mis-match error	E 8	Turns off	...	...	...	Twice
Waste ink absorber warning (Waste ink tank full notice)	C 1	Turns off	...	...	...	Twice
Low battery warning	C 5	Turns off	...	...	...	Twice
Cartridge leave warning (Automatic carriage change completion)	C 6	Turns off	Blinks	...	...	Twice
Ink low warning(*2)	Bk Blinks	Turns off	Blinks	...	...	Twice
[Unrecoverable by customers]						
ROM error(*1)	F 1A	Turns off	...	...	...	Five seconds
RAM error(*1)	F 1b	Turns off	...	...	...	Five seconds
EEPROM error	F 1C	Turns off	...	...	...	Five seconds
Home position sensor error	F 1	Turns off	...	...	...	Five seconds
Print position correction error	F 3	Turns off	...	...	...	Five seconds
Low battery error (with AC adapter)	F c	Turns off	...	...	...	Five seconds
Internal temperature sensor error	F 11	Turns off	...	...	...	Five seconds
Abnormal temperature rise	F 12	Turns off	...	...	...	Five seconds
No head installation error	F 13	Turns off	...	...	...	Five seconds
Waste ink full error (Waste ink tank full error)	F 14	Turns off	...	...	...	Five seconds

*1: The ROM or RAM error may not be displayed.

*2: The ink low warning is valid only when the ink low detection is ● (on).

For details of solutions for the above errors, see *Part 5:* 5. TROUBLESHOOTING (page 5-5).

3.2 Function Selector Setting

The printer settings can be modified by operating the control panel. The function menu shown on the display contains items numbered 1 to 19 and 1A. Select an item by selecting the number corresponding to the item with the *CARTRIDGE/*↻ button and set it to on or off with the ○/● button.

3.2.1 Function setting procedure

1) Press the *MENU* button, and release it when a short beeper sounds. The *ON LINE* light will go off.
2) Press the *MENU* button four times.
   The *ON LINE* light will go off and the function will appear on the last line on the display.
   "●" (on) or "○" (off) will blink at the upper right side of the number.
3) Press the *CARTRIDGE/*↻ button to display the number of the item to be specified.
4) Press the ○/● button to blink "●" (on) or "○" (off).
   To set the item to on, blink "●". To set it to off, blink "○".
5) Press the *ON LINE* button.
   The *ON LINE* light will come on and the printer can print with the selected settings.

NOTE

Each time the *CARTRIDGE/*↻ button is pressed, a number is displayed starting from 1. Whether the item is on (●) or off (○) is known by the "●"or"○"display. When a test print, such as Current Settings pattern, Ripple pattern, or Font pattern, is performed, a list of function settings is printed. For details of the printing, see *Part 3:* 3.3.3 Off line test (page 3-15).

3.2.2 List of function settings

TABLE 3-2 BJ MODE OPERATING CHARACTERISTICS

Counter No.	Function	●(On)	○(Off)	Factory Setting
1	A4/LTR left margin	A4	LTR	○ (off)
2	Page length setting	12inches	11inches	○ (off)
3	Text scale mode	Enable	Disable	○ (off)
4	Print start position setting	See TABLE 3-4		○ (off)
5				○ (off)
6	Smoothing	Enable (720dpi)	Disable (360dpi)	○ (off)
7	Auto power off	Enable	Disable	○ (off)
8	Font style rock out	Enable	Disable	○ (off)
9	Receive/down load buffer change	3KB/32KB	35KB/0KB	○ (off)
10	Automatic carriage return	LF+CR	CR	○ (off)
11	Automatic line feed	CR+LF	LF	○ (off)
12	AGM mode	Enable	Disable	○ (off)
13	Unused	...	...	○ (off)
14	Character set selection	Set 2	Set 1	○ (off)
15 to 18	Code page selection	See TABLE 3-5		○ (off)
19	Automatic emulation change	Enable	Disable	○ (off)
1A	Remaining ink amount detection	Enable	Disable	○ (off)

TABLE 3-3 LQ MODE OPERATING CHARACTERISTICS

Counter No.	Function	●(On)	○(Off)	Factory Setting
1	A4/LTR left margin	A4	LTR	○ (off)
2	Unused	...	...	○ (off)
3	Text scale mode	Enable	Disable	○ (off)
4	Print start position setting	See TABLE 3-4		● (on)
5				○ (off)
6	Smoothing	Enable (720dpi)	Disable (360dpi)	○ (off)
7	Auto power off	Enable	Disable	○ (off)
8	Font style rock out	Enable	Disable	○ (off)
9	Receive/down load buffer change	3KB/23KB	26KB/0KB	○ (off)
10	Automatic carriage return	LF+CR	CR	○ (off)
11	International character set	See TABLE 3-6		○ (off)
12				○ (off)
13				○ (off)
14	Character set selection	Graphic	Italic	○ (off)
15	Code page selection	See TABLE 3-5		○ (off)
16				○ (off)
17				○ (off)
18				○ (off)
19	Automatic emulation change	Enable	Disable	○ (off)
1A	Remaining ink amount detection	Enable	Disable	○ (off)

TABLE 3-4 PRINT START POSITION SETTING

Print Start Position	Counter No. 4	Counter No. 5
3mm	○ (off)	○ (off)
5mm	○ (off)	● (on)
8.5mm	● (on)	○ (off)
10mm	● (on)	● (on)

TABLE 3-5 CODE PAGE SELECTION

Code Page	Counter No. 15	16	17	18	
437	○ (off)	○ (off)	○ (off)	○ (off)	USA, English
850	○ (off)	○ (off)	○ (off)	● (on)	Multilingual
863	○ (off)	○ (off)	● (on)	○ (off)	Canadian, French
865	○ (off)	○ (off)	● (on)	● (on)	Norway
860	○ (off)	● (on)	○ (off)	○ (off)	Portuguese
857	○ (off)	● (on)	○ (off)	● (on)	Turkish
855	○ (off)	● (on)	● (on)	○ (off)	Cyrillic (Rossian)
852	○ (off)	● (on)	● (on)	● (on)	East Europe (Latin II)
864	● (on)	○ (off)	○ (off)	○ (off)	Arabic
869	● (on)	○ (off)	○ (off)	● (on)	Greek

Combinations other than the above make code page 437.

TABLE 3-6 INTERNATIONAL CHARACTER SET

Country	Counter No. 11	12	13
USA	○	○	○
UK	○	○	○
Germany	○	●	○
France	○	●	●
Denmark	●	○	○
Sweden	●	○	●
Italy	●	●	○
Spain	●	●	●

3.3 Service Function with Control Buttons

3.3.1 Cleaning the BJ cartridge

If the printed image is blurred or a print defect occurs, such as a white steak, print a test pattern to see whether the BJ head is clogged with ink. If nozzles are clogged with ink, use the *CLEANING* button to clean the BJ head and nozzles.
There are two types of cleaning: quick and long cleaning.

a) Quick cleaning

Perform quick cleaning to maintain the bubble jet nozzles to keep the print quality. When this cleaning is performed once or twice, nozzles clogged with ink and print defects caused by dust or dirt attached to the BJ head face can be corrected.

b) Long cleaning

Perform long cleaning if quick cleaning is carried out once or twice, but the print quality is not improved. Since this cleaning consumes much ink, it runs out soon if the cleaning is performed many times.

3.3.2 Cleaning procedure

To perform quick cleaning, hold down the *CLEANING* button until the beeper sounds once (about one second). To perform long cleaning, hold down the *CLEANING* button until the beeper sounds twice (about six seconds).
The *ON LINE* light blinks and BJ head cleaning starts after a while. Quick cleaning takes about 30 seconds, and long cleaning takes about one minute.
The printer carries out cleaning automatically in the following cases:

1) When the printer is turned on with the *POWER* button
2) When the printer is turned off
3) After replacing the BJ cartridge
4) After replacing the ink cartridge

3.3.3 Off line test

The printer has the "off line test" function that can be executed without connecting with a computer.

This section explains how to execute the off line test.

Hold down the *MENU* button while the printer is off line, release the *MENU* button when the beeper sounds twice, select the test print number with the *CARTRIDGE/* ⟲ button, and press the *MENU* button to start the off line test.

Test print mode	Selection number
Current Settings pattern print [Function information print]	1
All modes pattern print (only in BJ mode) [IBM mode print]*1	2
Ripple pattern print *1	3
Nozzle check pattern print	4
Demonstration pattern print *2	6
Font pattern print	7

*1: It prints by the font set by the control panel.

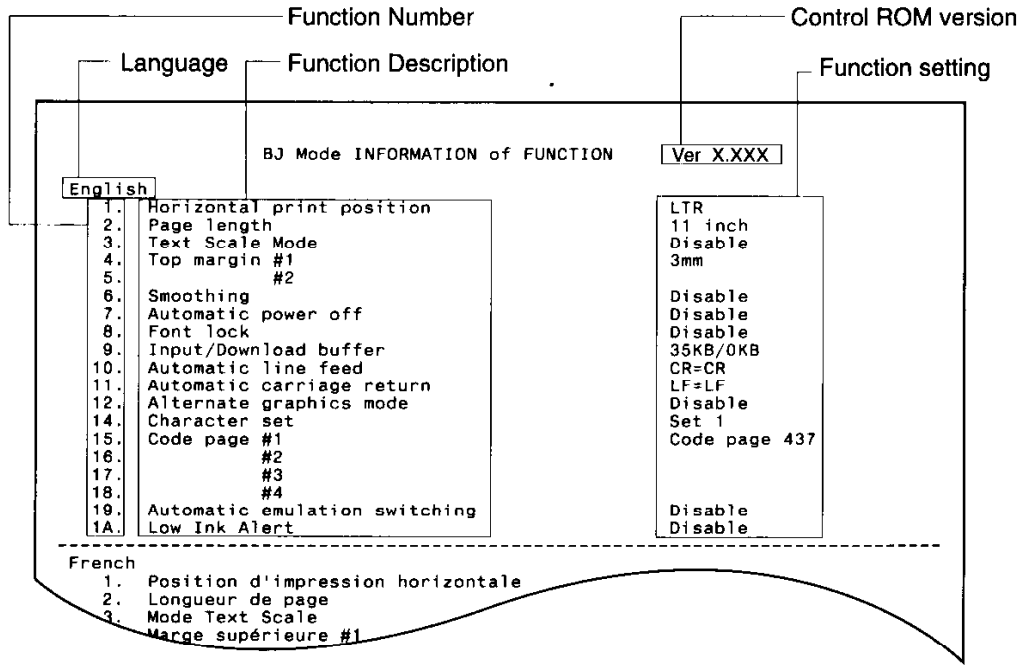
*2: The demonstration pattern print can be executed when the printer is on. Hold down the *MENU* button and switch the printer on, and keep it pressed until the beeper sounds, the printer executes the initial operation, then starts demonstration pattern printing.

Do not use any paper whose width is less than the A4-sized paper width when executing a print test. Test print data is designed to be printed on A4-sized sheets, so if any paper whose width is less than the A4-sized paper width is used, the platen in the printer base unit may be stained with ink.

a) Current Settings pattern print [Function information print]

The function settings shown on the display are printed on a sheet of paper in three languages (English, French, and German). After printing on a sheet of paper, the printer ends the test print and goes back to off line.

BJ mode



LQ mode

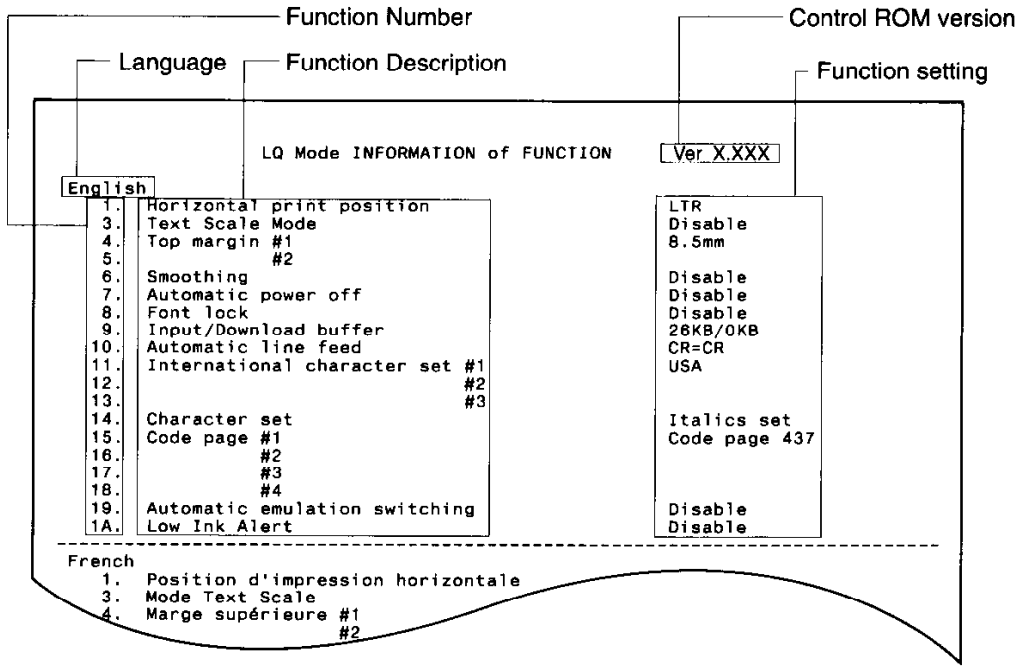


Figure 3-13 Current Settings Pattern Print [Function Information Print] (Sample)

b) All modes pattern print (only in BJ mode) [IBM mode print]

The font specified on the display is printed on a sheet of A4-sized paper in three lines in each of 11 kinds of modes. After printing on a sheet of paper, the printer ends the test print and goes back to off line.

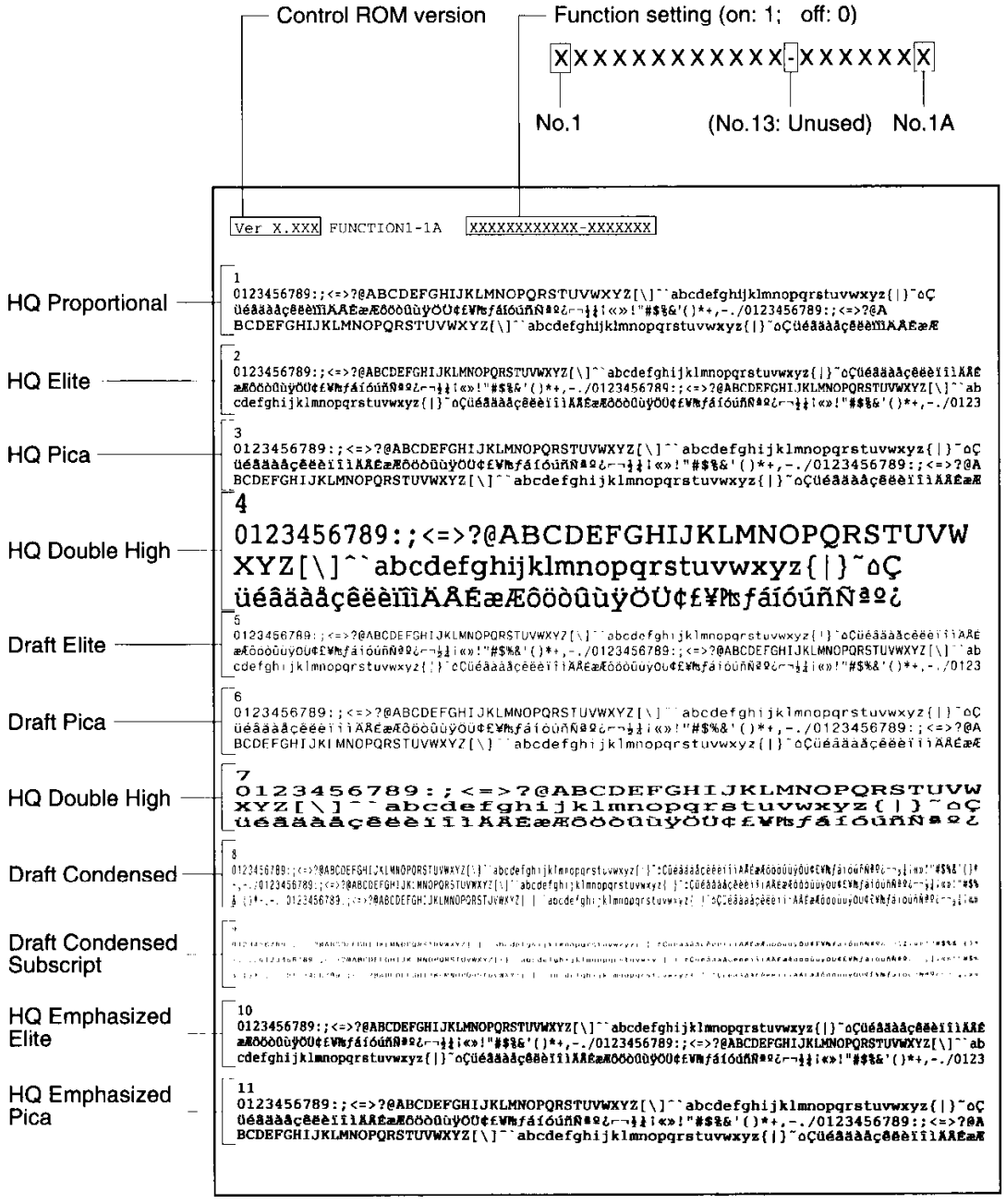


Figure 3-14 All Modes Pattern Print (Only in BJ mode) [IBM mode print] (Sample)

c) Ripple pattern print

The control ROM version, function settings, and printer status are printed, then ASCII characters are printed repeatedly with the font specified on the display until it is stopped by pressing the *ON LINE* button.

If an error occurs during printing, an alert appears on the display and the printer stops the test print.

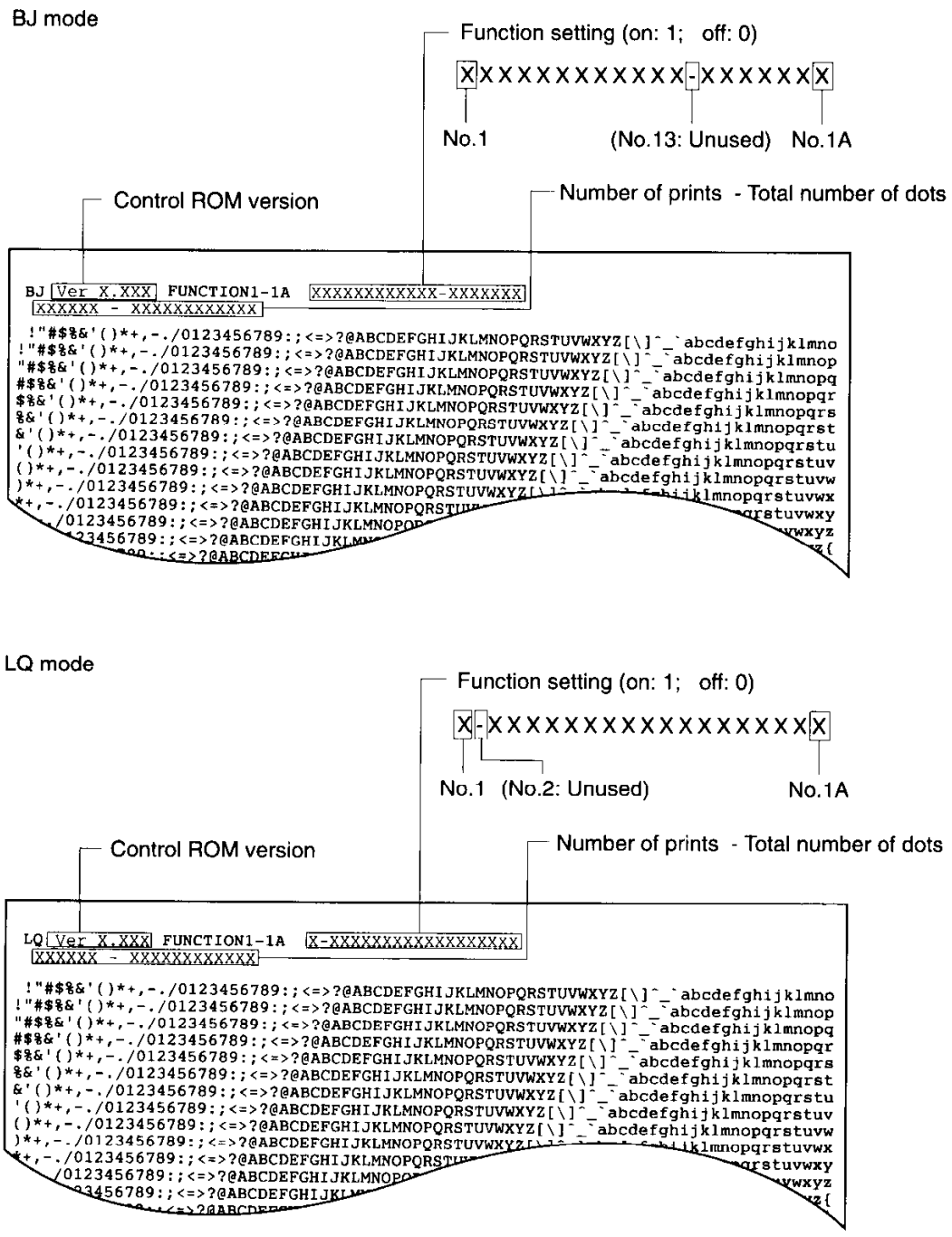


Figure 3-15 Ripple Pattern Print (Sample)

d) Nozzle check pattern print

The nozzle check pattern is printed by using all the nozzles. If this test print shows a print defect, perform cleaning operation.

(See *Part 3:* 3.3.2 Cleaning the BJ cartridge (Page 3-14))

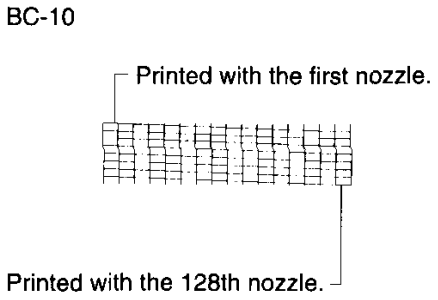
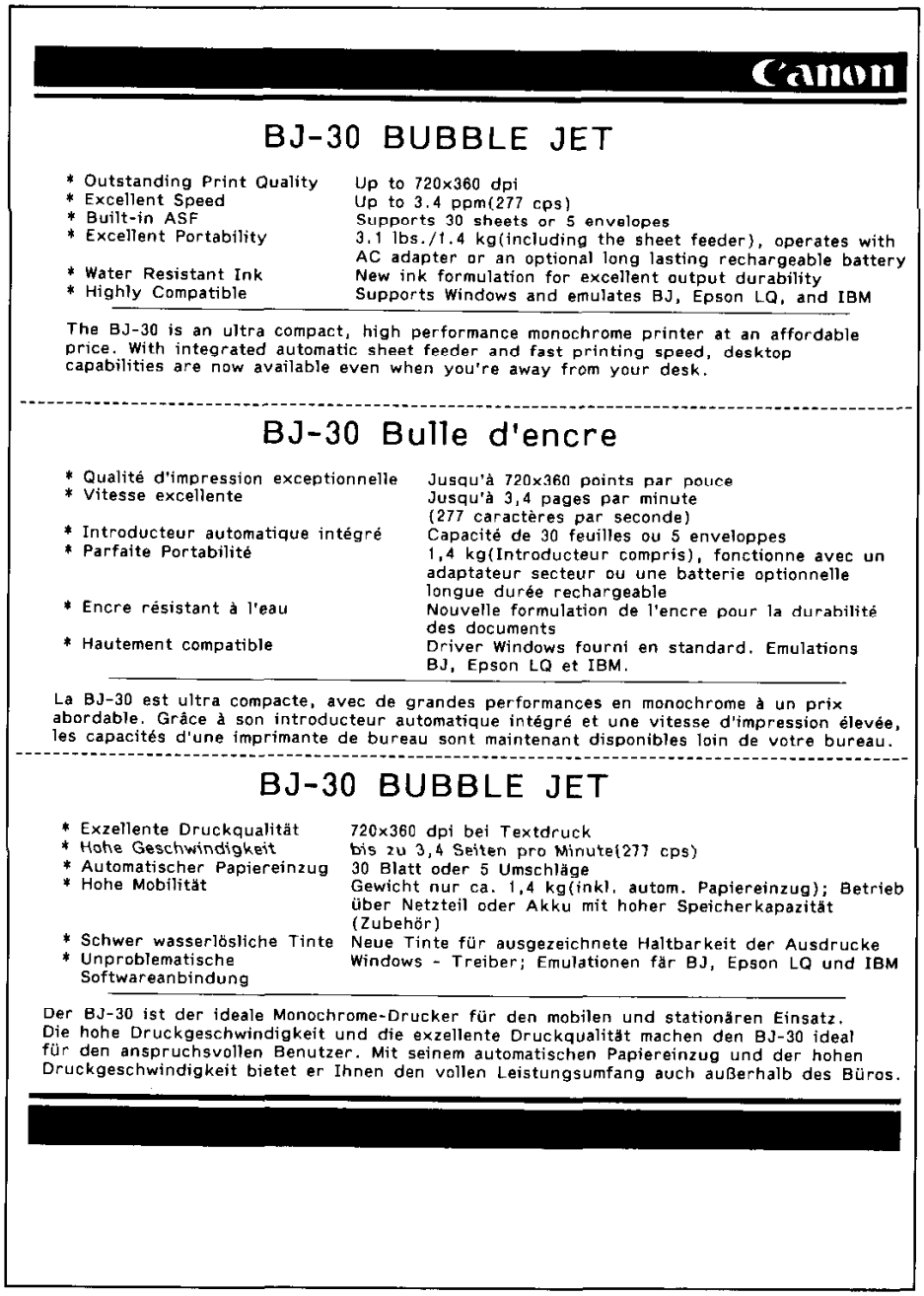


Figure 3-16 Nozzle Check Pattern Print

e) Demonstration pattern print

In this pattern, the main printer specifications are printed on a sheet of A4-sized paper in three languages (English, French, and German). After printing on a sheet of paper, the printer ends the test print and goes back to off line.



Canon

BJ-30 BUBBLE JET

* Outstanding Print Quality	Up to 720x360 dpi
* Excellent Speed	Up to 3.4 ppm(277 cps)
* Built-in ASF	Supports 30 sheets or 5 envelopes
* Excellent Portability	3.1 lbs./1.4 kg(including the sheet feeder), operates with AC adapter or an optional long lasting rechargeable battery
* Water Resistant Ink	New ink formulation for excellent output durability
* Highly Compatible	Supports Windows and emulates BJ, Epson LQ, and IBM

The BJ-30 is an ultra compact, high performance monochrome printer at an affordable price. With integrated automatic sheet feeder and fast printing speed, desktop capabilities are now available even when you're away from your desk.

BJ-30 Bulle d'encre

* Qualité d'impression exceptionnelle	Jusqu'à 720x360 points par pouce
* Vitesse excellente	Jusqu'à 3,4 pages par minute (277 caractères par seconde)
* Introducteur automatique intégré	Capacité de 30 feuilles ou 5 enveloppes
* Parfaite Portabilité	1,4 kg(Introducteur compris), fonctionne avec un adaptateur secteur ou une batterie optionnelle longue durée rechargeable
* Encre résistant à l'eau	Nouvelle formulation de l'encre pour la durabilité des documents
* Hautement compatible	Driver Windows fourni en standard. Emulations BJ, Epson LQ et IBM.

La BJ-30 est ultra compacte, avec de grandes performances en monochrome à un prix abordable. Grâce à son introducteur automatique intégré et une vitesse d'impression élevée, les capacités d'une imprimante de bureau sont maintenant disponibles loin de votre bureau.

BJ-30 BUBBLE JET

* Exzellente Druckqualität	720x360 dpi bei Textdruck
* Hohe Geschwindigkeit	bis zu 3,4 Seiten pro Minute(277 cps)
* Automatischer Papiereinzug	30 Blatt oder 5 Umschläge
* Hohe Mobilität	Gewicht nur ca. 1,4 kg(inkl. autom. Papiereinzug); Betrieb über Netzteil oder Akku mit hoher Speicherkapazität (Zubehör)
* Schwer wasserlösliche Tinte	Neue Tinte für ausgezeichnete Haltbarkeit der Ausdrucke
* Unproblematische Softwareanbindung	Windows - Treiber; Emulationen fär BJ, Epson LQ und IBM

Der BJ-30 ist der ideale Monochrome-Drucker für den mobilen und stationären Einsatz. Die hohe Druckgeschwindigkeit und die exzellente Druckqualität machen den BJ-30 ideal für den anspruchsvollen Benutzer. Mit seinem automatischen Papiereinzug und der hohen Druckgeschwindigkeit bietet er Ihnen den vollen Leistungsumfang auch außerhalb des Büros.

Figure 3-17 Demonstration Pattern Print

f) Font pattern print

The control ROM version, function setting, a code page of each font built in the printer are printed. The font pattern is printed repeatedly until the *ON LINE* button is pressed. If a black BJ cartridge is installed, all the pattern is printed in black

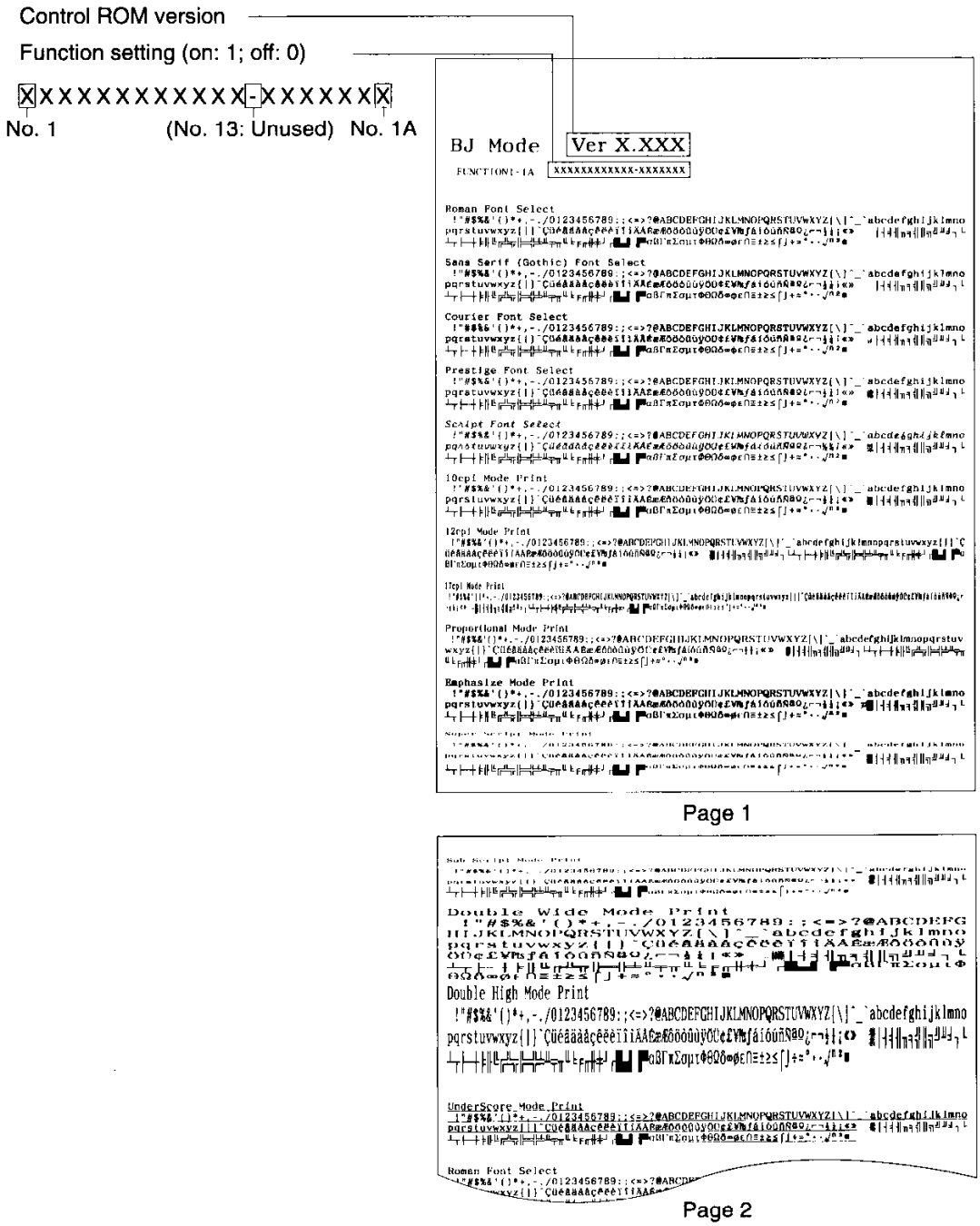


Figure 3-18 Font Pattern Print [BJ mode] (Sample)

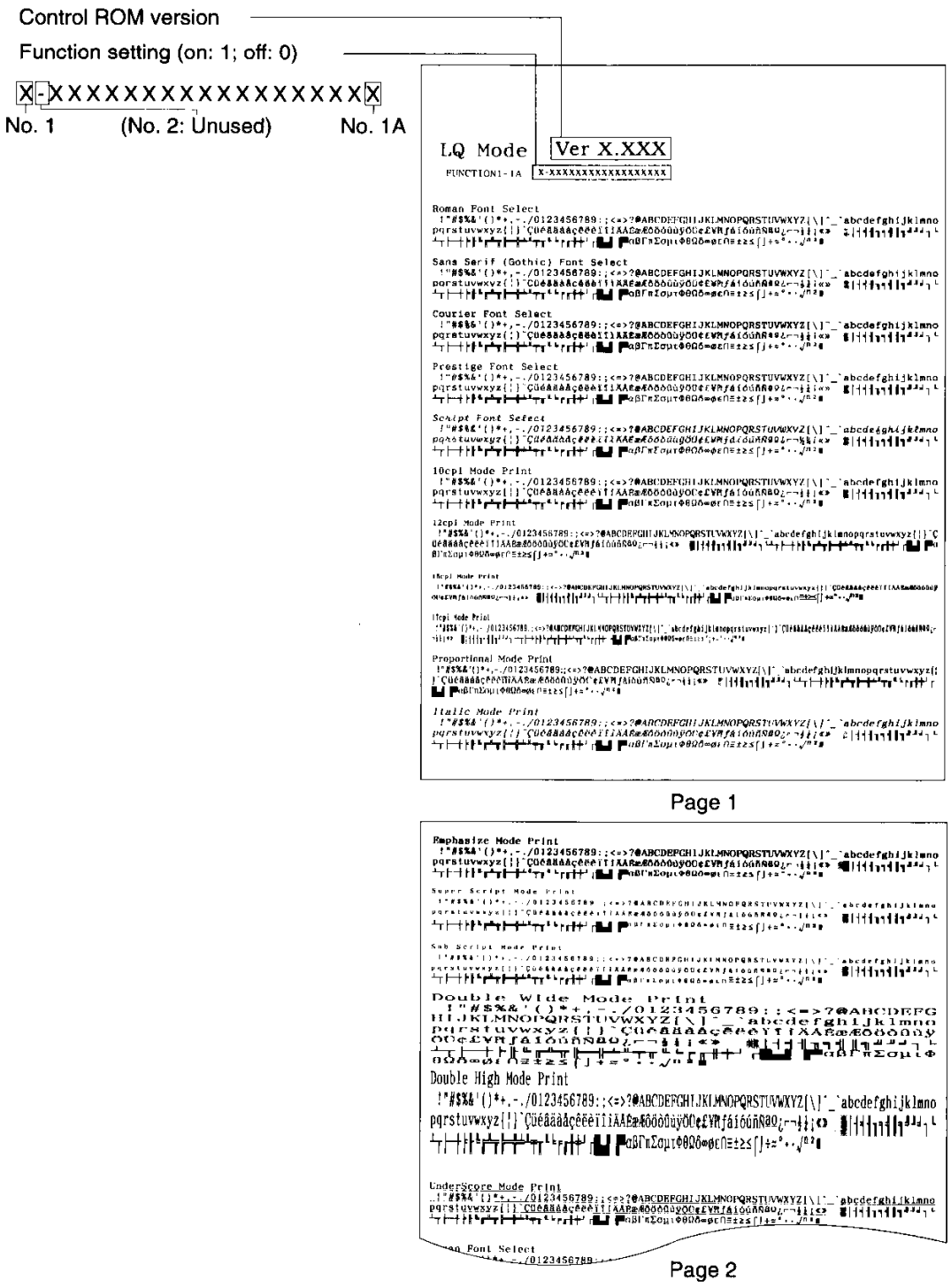


Figure 3-19 Font Pattern Print [LQ mode] (Sample)

NOTE

To stop the test print, press the *ON LINE* or *POWER* button. If the *ON LINE* button is pressed, the paper being printed is output, the *ON LINE* light comes on and the printer goes on line. If the test print is ended with the *POWER* button, the paper being printed is output, and the printer is powered off.

3.3.4 On line test

The printer has the "on line test" function that outputs hexadecimal dump lists when it is connected with a computer.
The hexadecimal dump test is carried out when the printer is on line to print the data coming from the computer in hexadecimal code (hexadecimal data).
While the printer is off line, hold down the *MENU* button, release the button when the beeper sounds twice, select the test print number with the *CARTRIDGE/* ↻ button, then press the *MENU* button.

Test print mode	Selected number
Hexadecimal dump test print	5

a) Hexadecimal dump test print

The data received by the printer is printed in hexadecimal notation. Since control codes are not recognized as control codes, the printer starts printing when the print buffer becomes full.

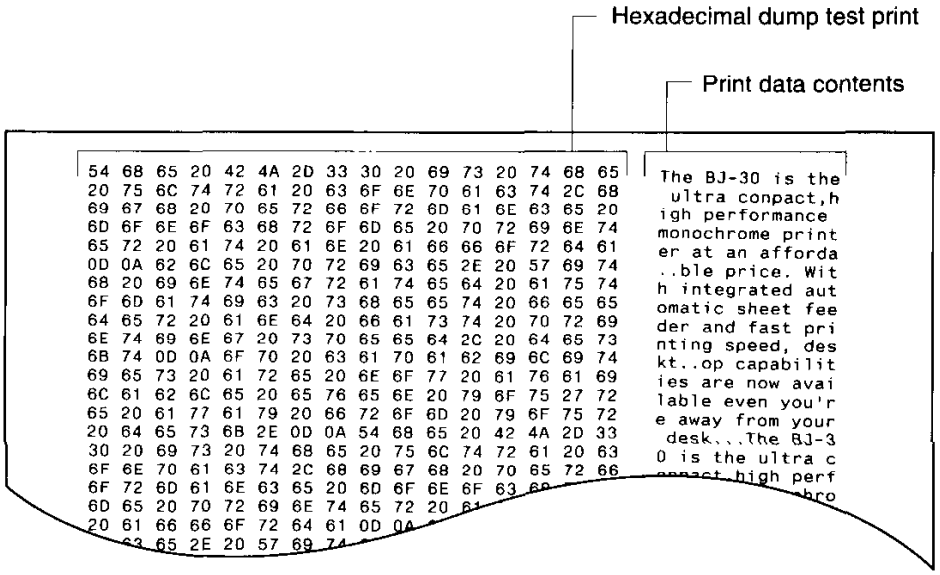


Figure 3-20 Hexadecimal Dump Test Print (Sample)

3.4 EEPROM Data Setting

3.4.1 EEPROM data setting mode

The required EEPROM data is set in this mode when replacing the control PCB assembly or the printer base unit (including the waste ink absorber).
The EEPROM (IC9) on the control PCB assembly contains machine specific data, such as waste ink amount and the remaining quantity of ink in the ink cartridge, data must be set in the EEPROM when replacing the control PCB assembly or the printer base unit (including the waste ink absorber).

a) When replacing the control PCB assembly

Before installing a new control PCB assembly, visually check the waste ink amount for the waste ink absorber in the printer base unit. After replacing the control PCB assembly, set the waste ink amount in the EEPROM.

b) When replacing the printer base unit (including the waste ink absorber)

Set 0% (EEPROM clear) after replacing the printer base unit.

3.4.2 Setting EEPROM data

1. While holding down the *POWER* button, insert the DC plug of AC adapter into the printer, and release the *POWER* button when the initial operation is completed.
2. While holding down the *FF* and *MENU* buttons, press the *POWER* button. Release all the buttons when a short beeper sounds. (EEPROM mode)
3. Set the waste ink amount for the waste ink absorber in the printer base unit. (Estimate the amount from to what extension the ink is absorbed in the waste ink absorber.)
   Press the *CARTRIDGE/* ↻ button to select the following number displayed on the LCD.

Displayed number	Waste ink amount
1A	0% (new ink absorber/EEPROM clear)
1d	25% used
1c	50% used
1b	75% used

4. Press the *ON LINE* button to perform the initial operation with a beep, and the data is written into the EEPROM. (When 1A is selected, the printer is changed from the EEPROM setting mode to the normal print mode. When other numbers are selected, the printer is powered off.)

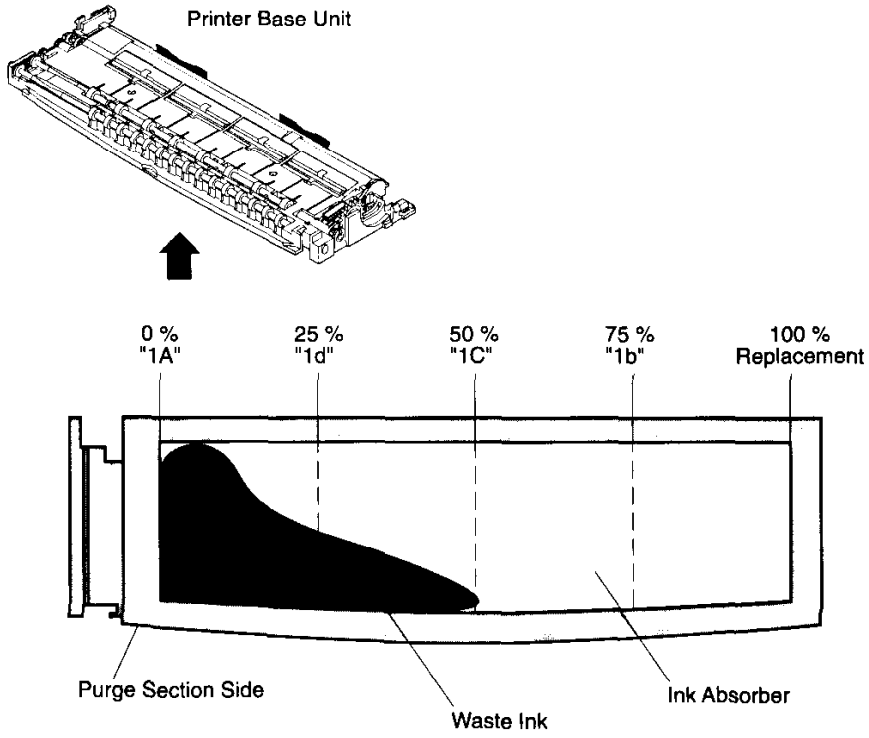


Figure 3-21 Waste Ink Absorber (50% used sample)

3.4.3 Displaying EEPROM data

The EEPROM contains the total waste ink amount and the total number of pages fed, which are counted while the printer is used. This data is useful to know the frequency of use of the printer.

1. While holding down the *POWER* button, insert the DC plug of AC adapter into the AC adapter connector of the printer, and release the *POWER* button when the initial operation is completed.
2. While holding down the *FF* and *MENU* buttons, press the *POWER* button. Release all the buttons when a short beeper sounds.
3. Set the number on the display to 9 by pressing the *CARTRIDGE/* ↻ button.
4. After pressing the *ON LINE* button, a long beeper and a short beeper sound and the test print starts.

1. OVERVIEW

1.1 Printer Block Diagram

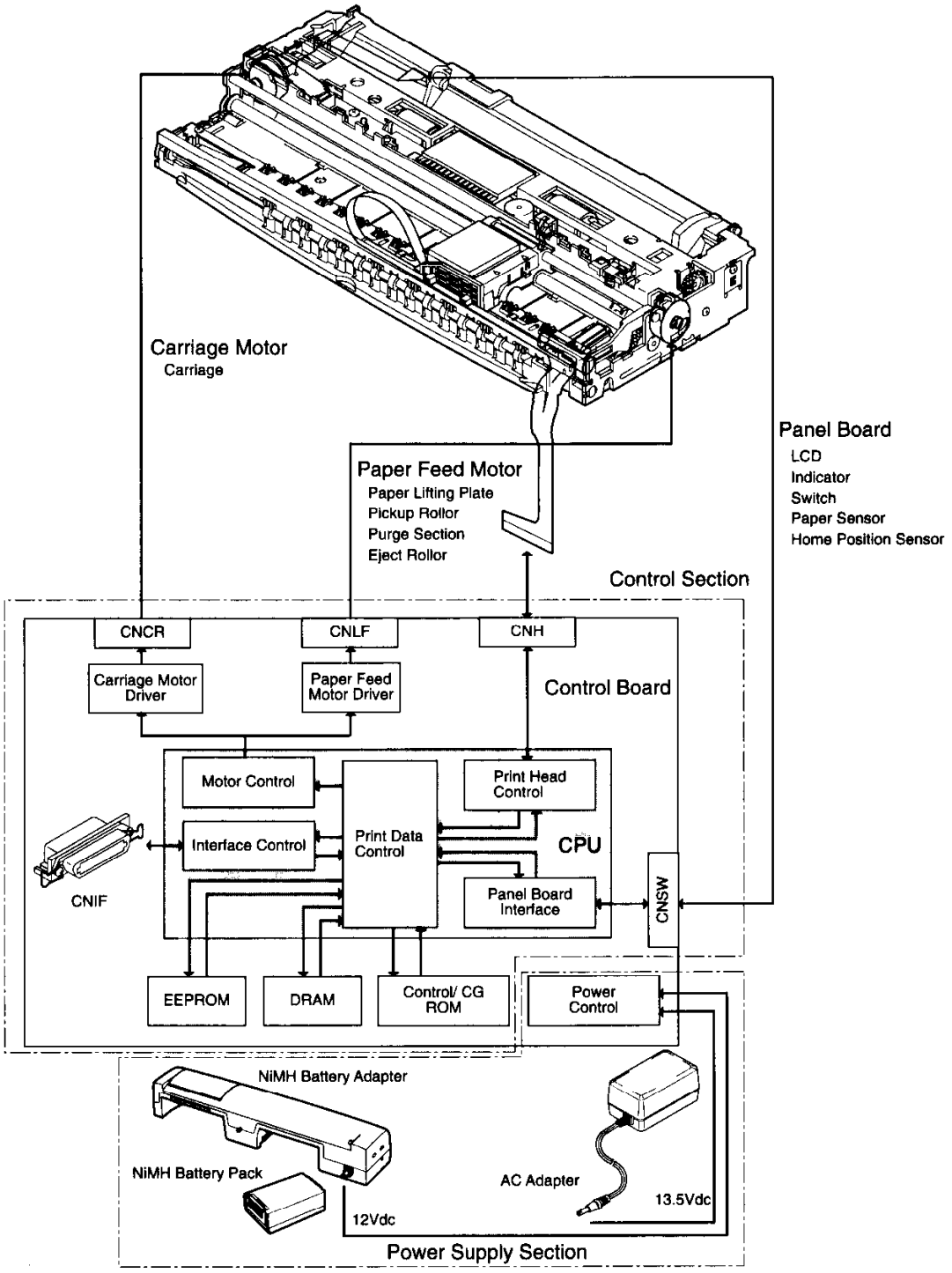
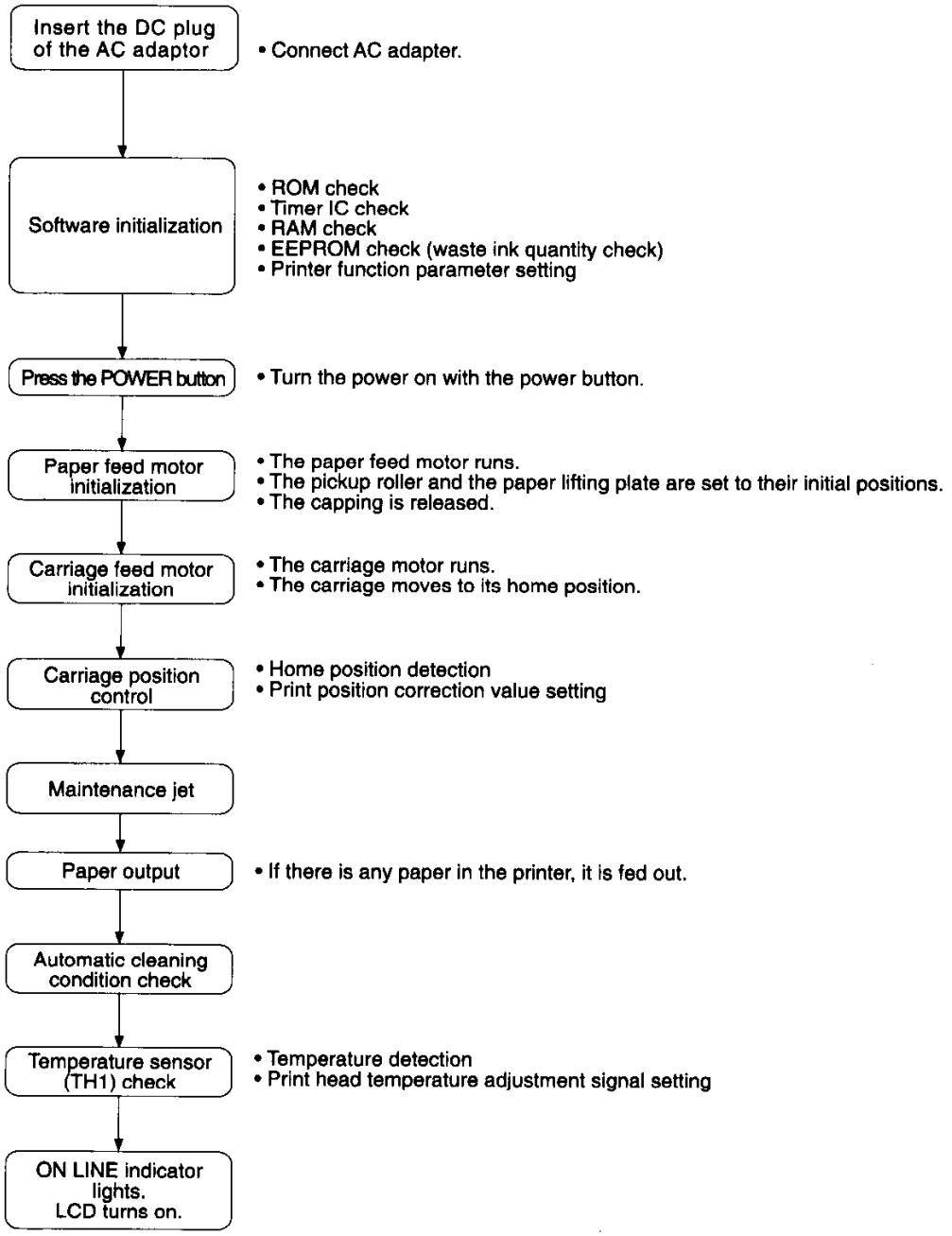


Figure 4-1 Printer Block Diagram

1.2 Initial Flowchart



1.3 Flow of Print Data to the Head

a) The CPU on the control board receives data from the host computer via the Centronics type (Parallel) interface and stores the data in the receive buffer area of the DRAM.

b) The print data stored in the receive buffer is divided by the CPU and control ROM into control commands and print data .

c) The print data is developed to the bit map data in the print buffer area of the DRAM. Control commands are processed by the CPU to control the mechanical function.

d) When the CPU receives a printing start request from the DRAM, it reads the data stored in the DRAM print buffer and the control signals stored in the control ROM.

e) The bit map data for one line of the print head is converted from parallel signals into serial signals by the CPU, and CPU drives the print head to print one line of data.

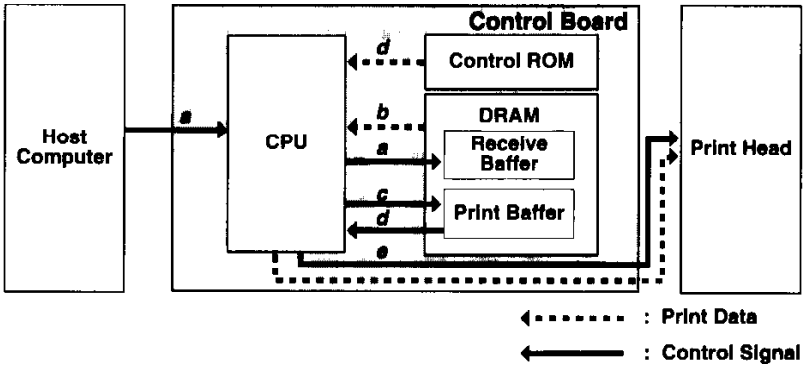


Figure 4-2 Signal Diagram

1.4 Head Drive

To eject ink from the head for printing, the CPU outputs control signals to the print head.

Control signals include a drive control signal, which ejects ink from the head nozzles, and a temperature adjustment signal that controls the head temperature to keep the amount of ink ejected constantly.

1.4.1 Head Drive Control

The head nozzles (128 black nozzles for BC-10) are divided into eight blocks, each of which is further divided into odd- and even-numbered positions. Nozzle-position control signals are output periodically. The drive-control signal consists of a pre-pulse and a main pulse. The pulse width of this drive control signal according to the rank of the installed head varies the inside temperature of the printer and head temperature. The nozzle No. and drive control signal are combined with print data (HDATA), and the ink is ejected from the nozzles.

The head-drive frequency is 3.125 kHz in HQ mode printing.
The drive frequency is switched to 6.25 kHz when using the smoothing function in HQ mode. When the smoothing function is used, the carriage movement pitch is set to 1/720 inch, and thus the print speed decreases. To prevent lowering of the print speed, the head-drive frequency is increased to 6.25 kHz.

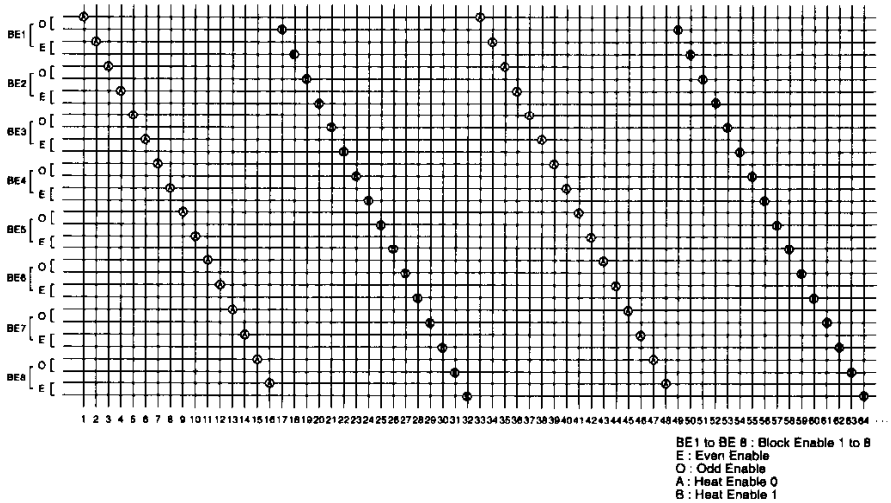


Figure 4-3 Print Sequence (HQ mode)

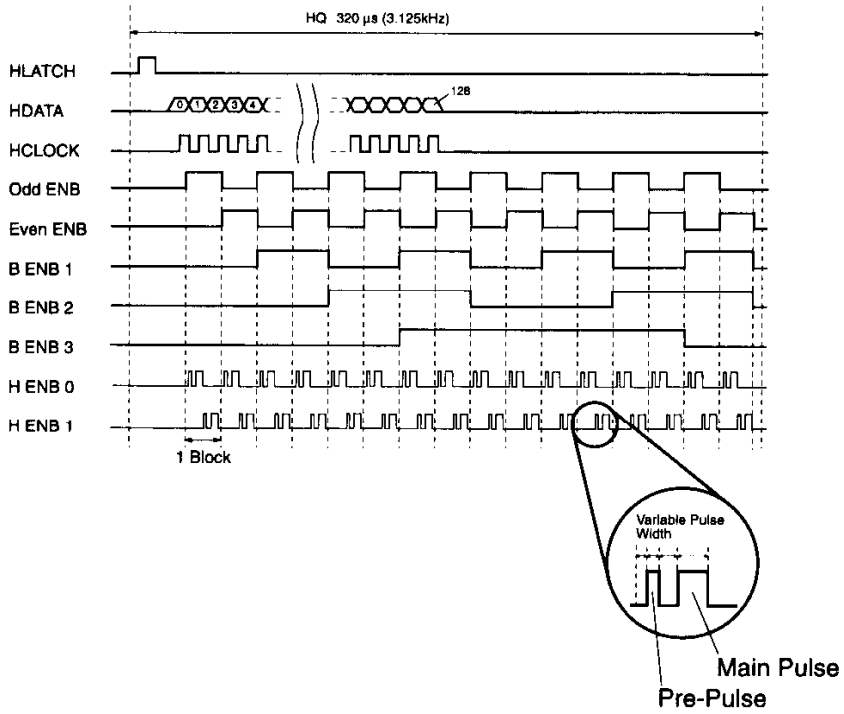


Figure 4-4 Printing Signal (HQ mode)

2. FIRMWARE

2.1 Transferring Parallel Interface Signals

The parallel interface transfers data 8 bits at a time. Data is transferred by handshaking via $\overline{\text{STROBE}}$, BUSY, and $\overline{\text{ACKNLG}}$ signals.

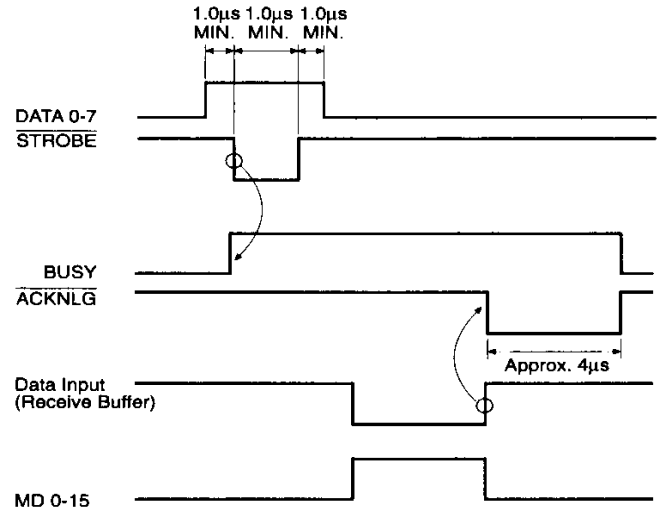
When data (Data 0 to 7) and $\overline{\text{STROBE}}$ signal are input to the printer from the host computer, the CPU in the printer outputs a BUSY signal and latches data by the timing of $\overline{\text{STROBE}}$ signal.

After transmitting the BUSY signal, the latched data is read into the DRAM receive buffer.

After writing data into the DRAM receive buffer, the CPU outputs $\overline{\text{ACKNLG}}$ signal.

When the CPU outputs $\overline{\text{ACKNLG}}$ signal, it sets the BUSY signal to LOW in accordance with the timing of the BJ or LQ mode, and waits for transmission of the next data.

BJ Mode



LQ Mode

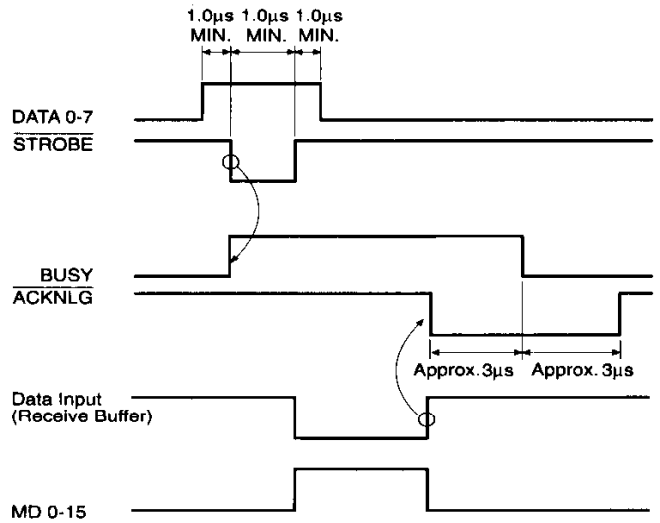


Figure 4-5 I/F Timing

2.2 Smoothing Function

When you perform monochrome printing with a black BJ cartridge (in HQ mode), the smoothing function can be used to increase the resolution of the outlines of characters and graphics to 720 dpi. Dots are added to or deleted from character outlines, or they are overstruck by being shifted horizontally half a dot width. This eliminates jags in outlines and provides twice the conventional horizontal resolution. However, since the carriage speed decreases, the total printing speed decreases even the head drive frequency is increased to 6.25 kHz.

The smoothing function is not available in the following cases:

- If the print mode is Hs mode

This smoothing function is not so much effective in the following characters and illustrations even if the function is used.

- TrueType fonts
- Outline fonts
- Shaded characters
- Illustrations

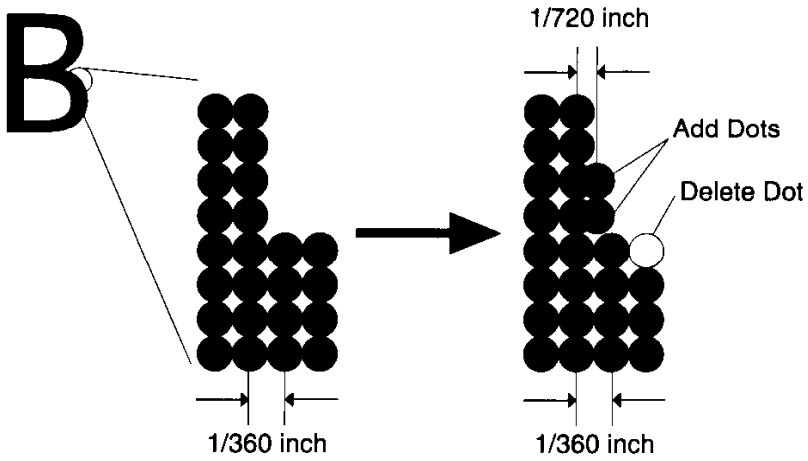


Figure 4-6 Smoothing Function

2.3 Automatic Emulation Selection

The printer analyzes control commands from the host computer, determines whether they are the BJ or LQ mode, and selects the appropriate emulation mode automatically.

2.3.1 Determination method

The printer identifies the received control commands by the command weight predetermined for each mode. This identification is conducted when the printer is not receiving data after it is turned on, or when it begins to receive data after it has not received data for at least 10 seconds and there is no data left in the printer.

2.3.2 Mode Change

The emulation mode is changed when the printer receives the data of 512 bytes or more, or when the printer has received no data for three seconds or more after receiving the data of 512 bytes or less is receiving.

Some control commands can not be correctly identified. If the emulation mode selected by automatic selection is incorrect, select the correct mode from the control panel.

3. PRINTER MECHANISM

3.1 Overview of the Mechanical System of the Printer

The mechanical system of the printer is comprised of the ink/BJ cartridge, purge section, ASF/paper feed section, and the carriage section.
The paper pick up/delivery operation of the mechanical system of the printer and the BJ cartridge maintenance operation are carried out by the paper feed motor and carriage motor.

3.1.1 Mechanical system configuration

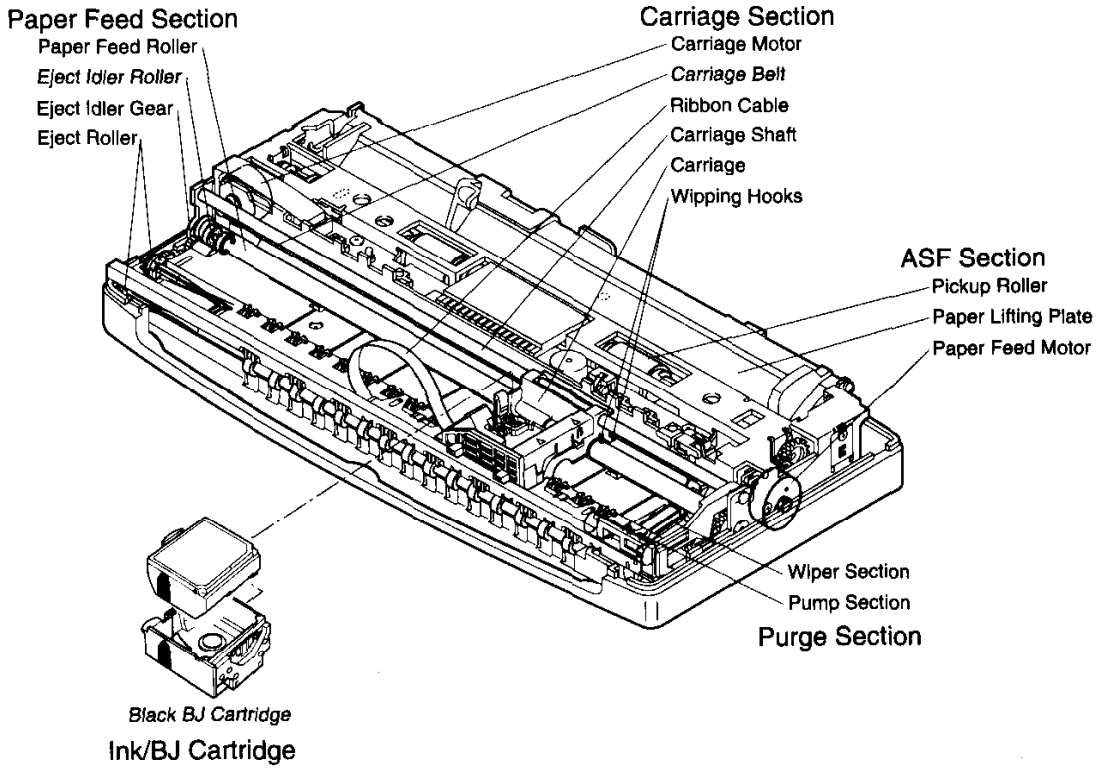


Figure 4-7 Printer Mechanism

a) Ink/BJ cartridge

The black BJ cartridge (BC-10) has a 360-dpi resolution and 128 nozzles. The ink cartridge (BCI-10) for the BC-10 and ink cartridges can be replaced respectively.

b) Purge section

The purge section has a function to maintain the high printing quality of the BJ cartridge bubble jet nozzles.

The purge section consists of the pump section and wiper section.

The pump section sucks ink within the BJ cartridge so that the nozzles are smoothly filled with ink for next printing. The wiper section wipes the head-face of the BJ cartridge.

The purge section is driven by the paper feed motor and carriage motor.

c) ASF/paper feed section

The built in automatic sheet feeder (ASF) can hold the cut sheet up to Legal size and a maximum 3 mm stacking height of sheets (A4 or Letter size) feed them automatically.

The cut sheets stacked in the ASF are fed to the paper feed unit by the pickup roller, which is driven by the paper feed motor.

The paper pick-up section moves the paper forward by using the paper-feed roller.

Since the paper feed unit of the printer does not have a manual-paper feed knob, all paper-feeding operations are carried out with control buttons.

d) Carriage section

The carriage that holds the BJ cartridge is moved horizontally by the carriage motor and the drive belt. The position of carriage is detected by the home-position sensor, which is located on the right side of printer. The printing signals sent from the control board are transferred to the BJ cartridge on the carriage through the ribbon cable.

The wiping hooks on the carriage move the latch lever and wiper lever to start wiping.

3.2 BJ Cartridge

3.2.1 Black BJ cartridge structure

The black BJ cartridge contains a 128-nozzle print head, and the print head and black ink cartridge can be replaced respectively.

a) Air hole

Air hole is provided in order to keep the ink cartridge at the same pressure as the outer atmospheric pressure.

b) Ink sponge

The ink sponge absorbs black ink.

c) Ink supplier

The ink supplier supplies a constant amount of ink to the connection between the head and ink cartridge.

d) Bubble jet head unit

The bubble jet head unit consists of the 128 nozzles and signal contacts.

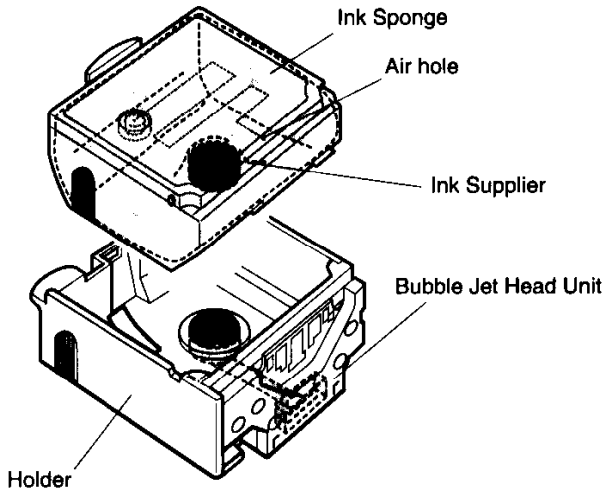


Figure 4-8 Black BJ Cartridge

3.2.2 Bubble jet head-unit structure

a) Bubble jet nozzles

The ink in the ink sponge is filtered through a meshed ink filter, and is fed to the bubble-jet nozzles through the ink path in the holder. When the head-drive-current flows to the heater board of each nozzle, ink is heated up, and bubbles are produced and subsequently form into one large bubble. The head drive current is cut off before a drop of ink is ejected from the nozzle, but bubbling continues due to the heat remaining in the heater and the drop of ink is ejected from the nozzle. After ejecting the ink drop, the nozzle is refilled with ink.

NOTE The heaters and their electrical elements within the bubble jet head are formed on a silicon plate by means of semiconductor technology. A photosensitive resin layer (nozzle wall) and plastic cover are bonded to the silicon plate, and nozzles are made in the photosensitive resin layer by laster.

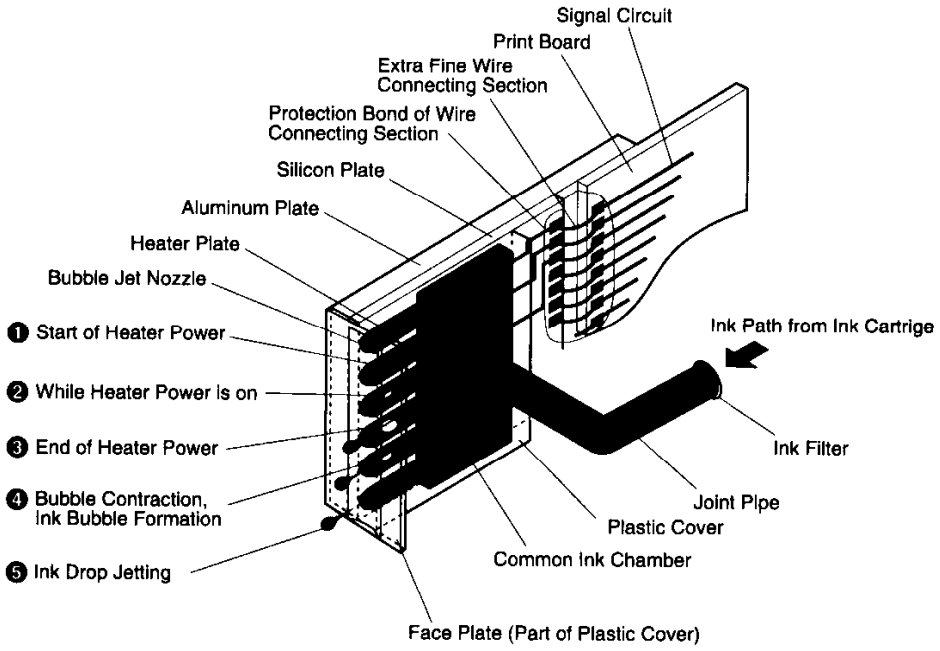
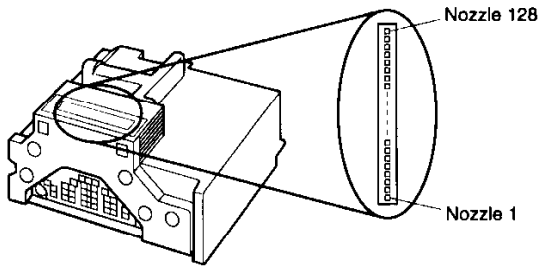


Figure 4-9 Bubble Jet Head

b) Nozzle arrangement

The bubble jet nozzles are arranged in a vertical line at intervals of 1/360 inch.



BC-10

Figure 4-10 Nozzle Arrangement

c) Signal contact part

The signal contact part of the bubble jet head contacts the carriage contact part to transfer control signals including print signal, to the bubble jet nozzles.

TABLE 4-1 SIGNAL CONTACT PART

Pin No.	Signal name	Description
3	MCH 0	Temperature-adjustment heater control signal
4	MCH 1	Temperature-adjustment heater control signal
7	WHT	Head subheater control signal
9	RNK	Head rank resistance
10	DIODE A	Head temperature sensor (anode side)
11	ID 0	BJ cartridge BC-10/BC-11 identification
28	HDATA	Print data signal
29	DIODE K	Head temperature sensor (cathode side)

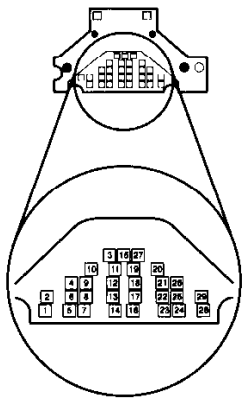


Figure 4-11 Contact Part

3.2.3 Head-Maintenance Function and Structure

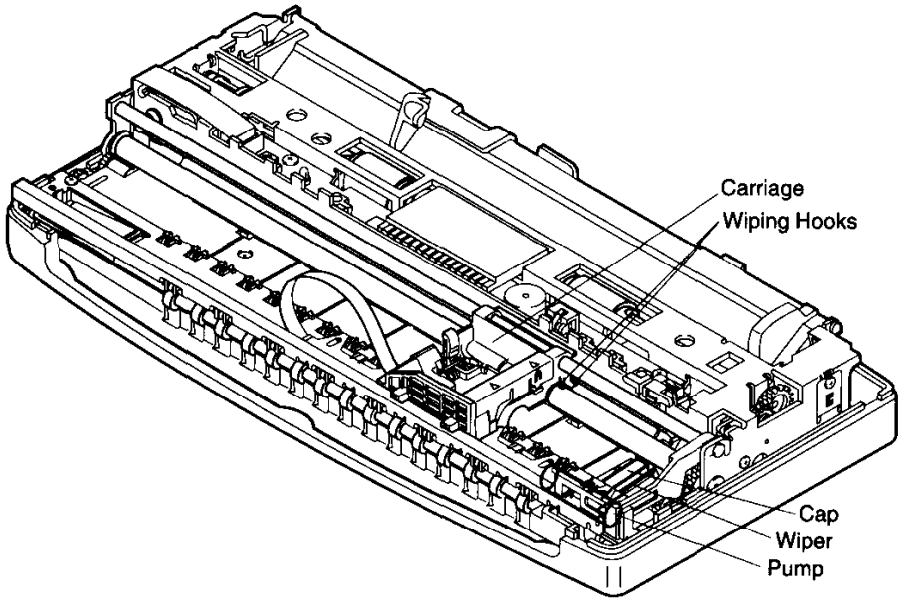


Figure 4-12 Purge Section

a) Cleaning function

Cleaning operation is performed to correct the print quality problem, which is caused by none-ejection of ink, and to prevent the print defects resulting from improper ink ejection from the BJ cartridge head nozzles.
Cleaning operation includes purging, wiping, capping, and maintenance jet. The cleaning time varies according to the type of BJ cartridge installed and the printer status.

The printer carries out cleaning in the following cases:

Printer status		Ink consumption (approx.···mg) BC-10
When the printer is turned ON with the *POWER* button	1) Less than 72 hours after the last cleaning operation	7
	2) 72 hours or more after the last cleaning operation	150
	3) 169 hours or more after the last cleaning operation	300
When the printer is turned off with the *POWER* button		3
When the BJ cartridge is replaced		300
When the *CLEANING* button is pressed	1) Quick Cleaning	150
	2) Long Cleaning	300

The cleaning operation is performed in the purge section. The cap, cylinder, and pump are operated by the gears and cams, which are driven by the paper-feed motor. (See *Part4:* 3.3 Purge Section Structure.(page 4-16))

b) Purging

Purging is performed to correct/prevent the non-ejection of ink, which is caused by unnecessary bubbles and dust on the head faceplate.
The cap and pump in the purge section are used for purging operation.

c) Capping

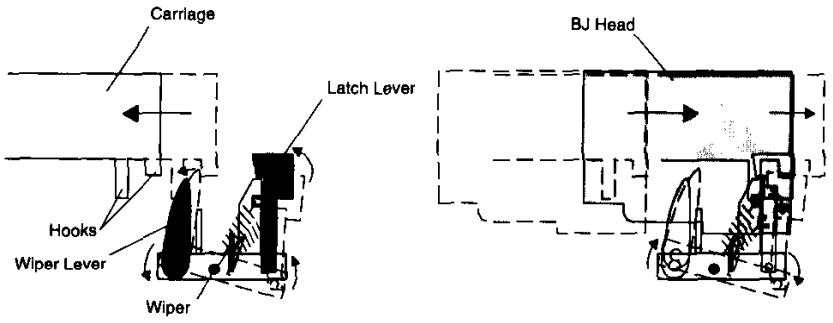
Capping operation is performed to correct/prevent the non-ejection of ink, which is caused by the dried-up of ink inside nozzles.
Cap is pressed against the head faceplate when the carriage moves to the home position.
When the cap moves away from the faceplate, waste ink in the cap is sucked by purging operation. The sucked ink is absorbed by the absorber in the pump and finally absorbed by the waste ink absorber.
Capping operation is performed in the following cases:

1. When the printer is turned off with the *POWER* button
2. When the printer receives no data during printing for a certain period, which is decided by the conditions

d) Wiping

Wiping operation is performed to correct/prevent the non-ejection of ink, which is caused by paper-powder on the head faceplate or by the foreign materials in ink.
The wiper is set and released by wiping hooks on the carriage.When the carriage moves from the home position, the wiper touches the aluminum plate of the head, removes the stain from the wiper and then wipes off the ink from the faceplate.
Wiping operation is performed in the following cases:

1. When the number of dots printed or the print time exceeds the preset value during printing
2. After purging
3. Before capping



1. Wiper is set. 2. Wiper is released.

Figure 4-13 Wiping Function

e) Maintenance jet

The maintenance jet is performed during cleaning to remove bubbles inside nozzles and the dust near ink ejection apertures.
In this operation, the ink is ejected from the head into the cap and sucked into the waste ink absorber through the pump section.

3.3 Purge Section Structure

3.3.1 Configuration

a) Cap section

When the carriage is at the home position, the cap is pressed against the print head faceplate to cap the head. The rubber cap connects to the pump, and ink is sucked from the head by the pump during cleaning. The sucked ink is absorbed by the ink absorber in the pump and finally collected in the waste-ink absorber. The cap is moved by the pump arm, which is driven by the pump gear.

b) Wiper section

The wiper wipes excess ink off the print head faceplate when the carriage moves from left to right. The wiper is moved up or down by the projections on the carriage. The ink attached to the wiper is removed by the aluminum plate on the head. Moreover when the wiper comes down, the ink remaining on it is splashed on the pump gear.

c) Pump section

The pump contains a rubber piston, whose piston shaft is linked with the cylinder gear. The cylinder gear is rotated by the pump gear. Then the pump is opened to absorb the ink collected in the cap into the waste ink absorber. The ink in the cap flows into the absorber in the pump, and then into the waste ink absorber.

d) Waste ink absorber

The ink sucked from the cap and the ink collected in the pump are sucked into the absorber in the pump, and absorbed into the waste-ink absorber.

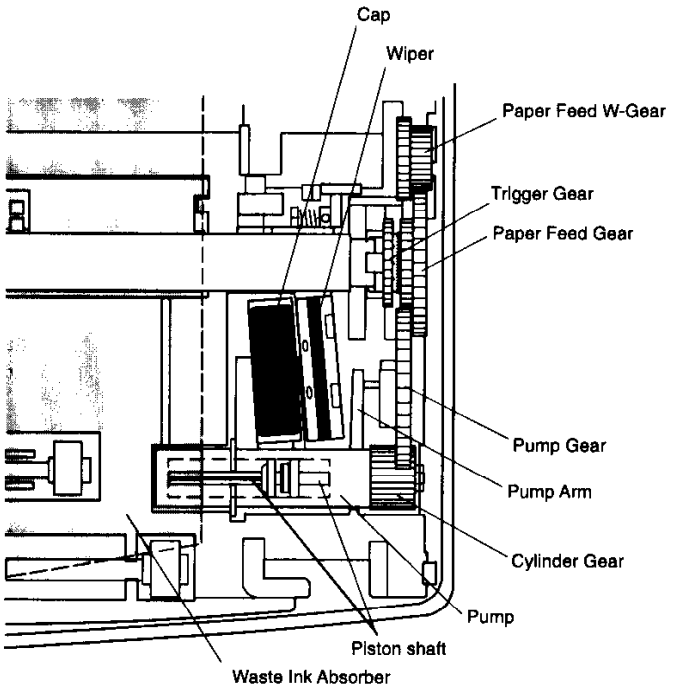


Figure 4-14 Purge Section Structure

3.3.2 Operation

The purge section is driven by the paper feed motor.
The paper feed motor drives the paper feed gear through the paper feed double gear. When the carriage moves to the right from the home position, the trigger gear rotates along with the paper feed gear, which rotates the pump gear and cylinder gear. At this time while the ink is stored in the cap, the cylinder gear rotates so as to move the piston shaft to the right. After that, the piston shaft is moved to the left so that the ink in the cap is absorbed into the waste ink absorber.
The cap moves up and down as the pump arm moves along the pump gear cam. (Capping)

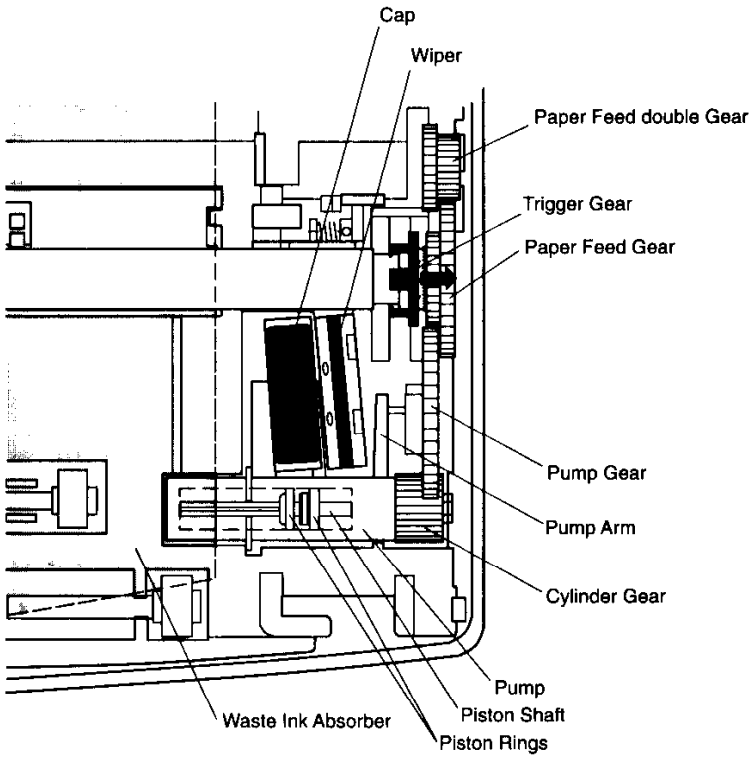


Figure 4-15 Purge Operation

3.4 ASF/Paper Feed Mechanism

3.4.1 Outline of ASF/paper feed mechanism

The ASF/paper feed mechanism of the printer is divided into the paper pick-up operation unit and printing/paper-delivery operation section.
These operations are driven by the paper feed motor. This motor can feed the paper at a line feed pitch of 1/360 inch.

a) Paper pickup operation section

When the paper is picked-up, the pickup roller, paper lifting plate, coil spring, and separation sheet are operated. Since the paper pickup operation makes use of the elasticity of the separation sheet, it is not necessary to change the paper setting method according to the thickness of the plain paper.

b) Printing/paper delivery operation section

After the paper is picked up, it is fed to the print start position by the paper feed roller and the pinch roller.
There is no need to adjust the head-to-paper distance since the paper is lifted up by the pinch roller. After the paper is printed, it is delivered out by driving the eject roller and spurs.

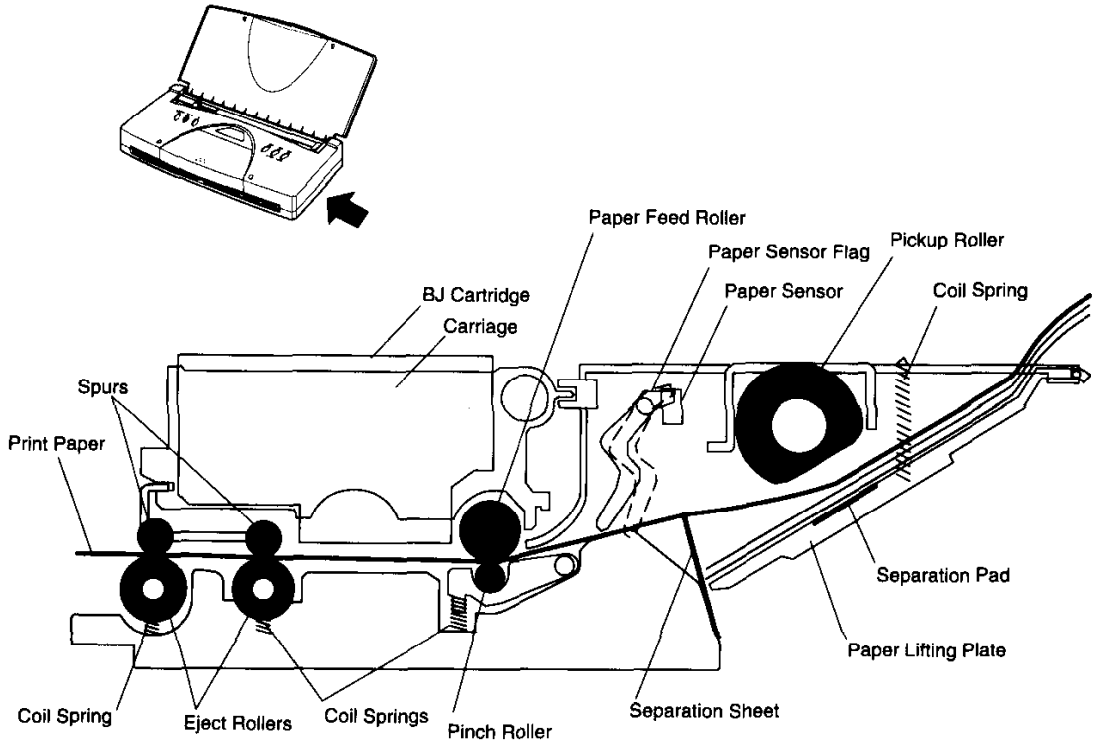


Figure 4-16 Paper Pass

3.4.2 Paper feed function and structure

a) Initial operation

When the printer is turned on, the paper feed motor rotates in a clockwise direction. When the paper feed motor is driven, gear A is rotated. At this time, gear A transmits power to the pickup roller gear to rotate the pickup roller. When the pickup roller gear rotates until it comes to the part having no tooth, the paper lifting plate is pushed down. Owing to this operation, a clearance is made between the paper lifting plate and the pickup roller for paper setting.

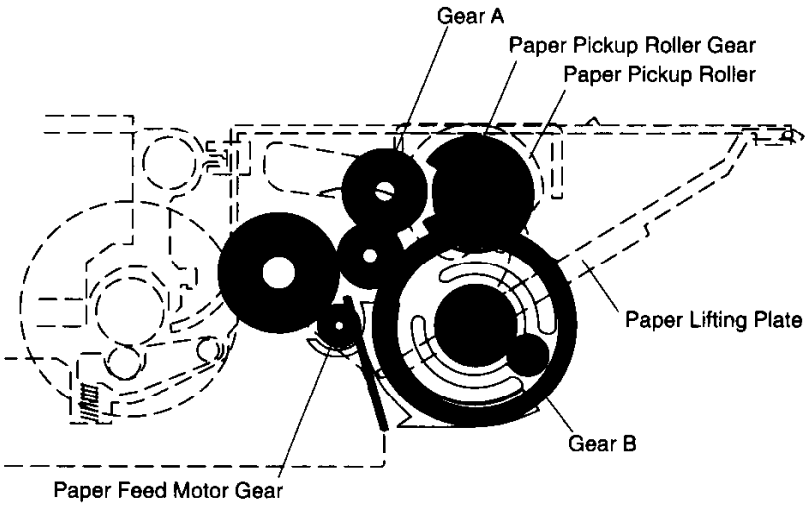


Figure 4-17 Initial Position

b) Paper feed operation

When a paper feed command is sent, the paper feed motor runs counterclockwise, starting the paper feeding operation.

The drive of paper feed motor is transmitted from gear B to gear C to rotate the pickup roller. Then the top sheet of the paper stack is picked up by the pickup roller.

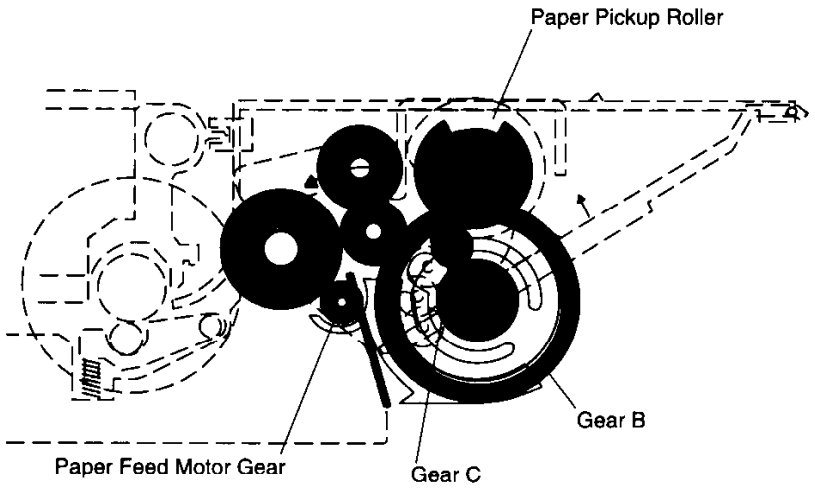


Figure 4-18 Paper Pickup (1)

When the paper is detected by the paper sensor, the paper feed motor is reversed. The paper feed roller and the pinch roller deliver the paper to the print start position set by the function selector. When paper feeding is completed, the pickup roller and paper lifting plate return to the initial position.

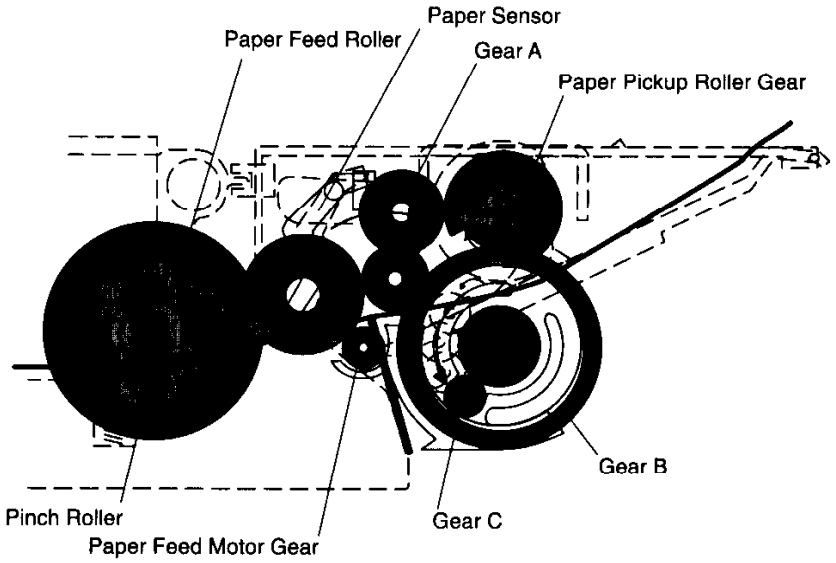


Figure 4-19 Paper Pickup (2)

c) Paper separation operation

The cut sheets stacked in the ASF are separated one by one using the separation sheets.

The two separation sheets attached to the printer base unit separate only the top sheet from the paper stack in the ASF due to their elasticity retained regardless of the paper thickness.

The shape of these separation sheets is designed to separate papers regardless of thickness and size of paper.

CAUTION

The paper feed performance of the printer depends upon the elasticity of the separation sheet. If the separation sheets are deformed or damaged, a paper feed problem may occur. To prevent this, handle it carefully during servicing.

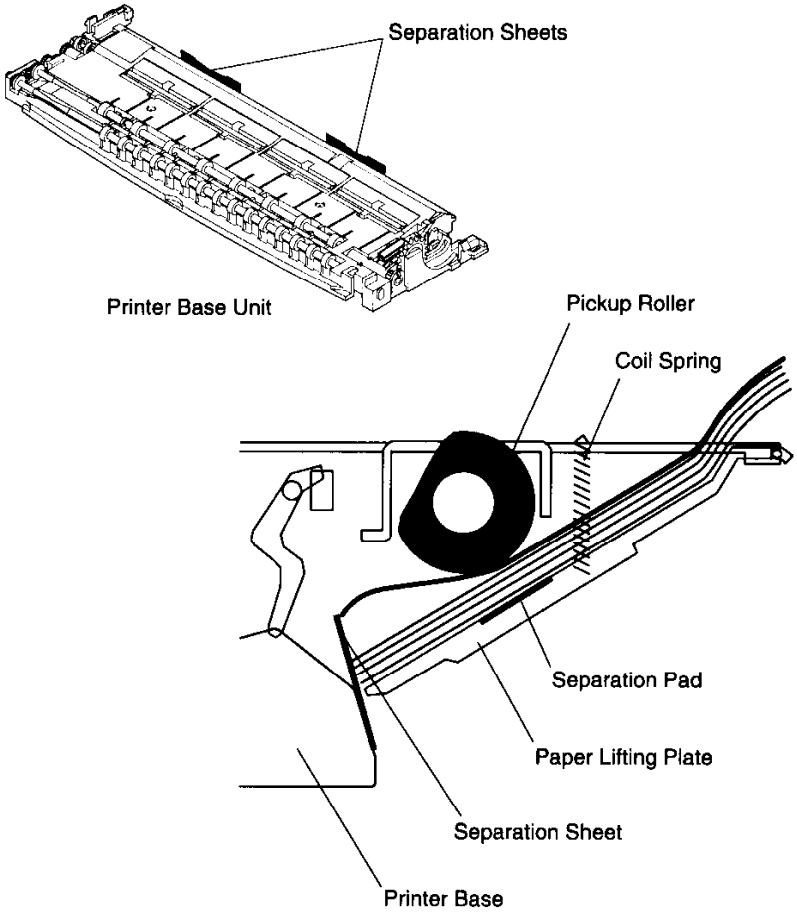


Figure 4-20 Paper Separation

3.4.3 Printing/paper feed function and structure

a) Printing/paper feed function and structure

The paper fed by the paper feed roller is printed on the platen, and output by the eject roller and spurs. Two eject rollers are installed to prevent the warp or deflection of paper being output, to reduce variations in paper feeding intervals, and to improve the print quality.

b) Automatic head-to-paper distance adjustment mechanism

The ejection idle roller and ejection roller are lifted against the paper feed roller and spurs by the coil springs. Owing to this, the clearance between the BJ cartridge head face and the paper is maintained constant regardless of the paper thickness. It is possible to perform printing without changing the position of carriage according to the paper thickness.

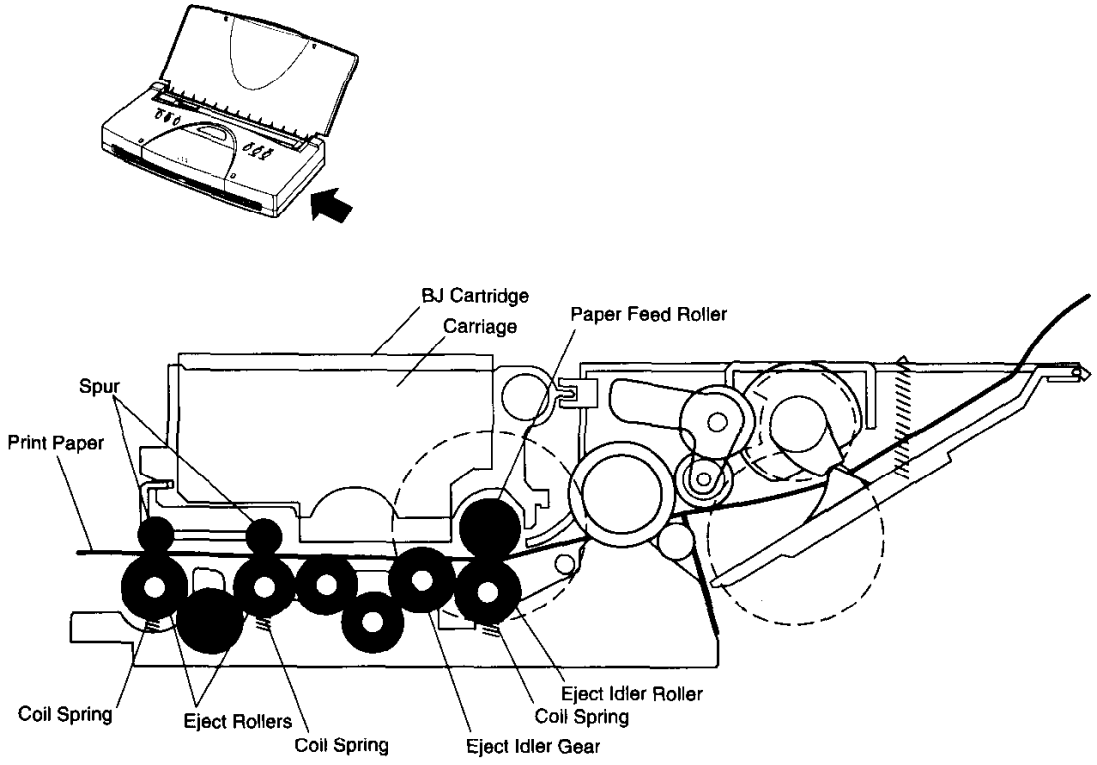


Figure 4-21 Paper Feed Structure

3.5 Carriage Section

3.5.1 Carriage section function

a) Ink/BJ cartridge mounting function

The carriage holds the BJ cartridge and connects it electronically to the control board through the carriage ribbon cable. When the power is off, the carriage is locked at the capping position where the carriage is locked by the lock arm.

b) Carriage drive function

The carriage is moved horizontally by the carriage belt, which is driven by the carriage motor.

c) BJ cartridge maintenance function

The printer performs the wiping operation and cleaning operation for the BJ cartridge by controlling the position of carriage.

1) Setting and Releasing the wiper

When the carriage moves horizontally, the wiper lever and the latch lever in the purge section are operated.

2) Start of the cleaning operation

The BJ cartridge cleaning starts when the carriage moves horizontally and the trigger gear is engaged with the paper feed gear to drive the pump gear.

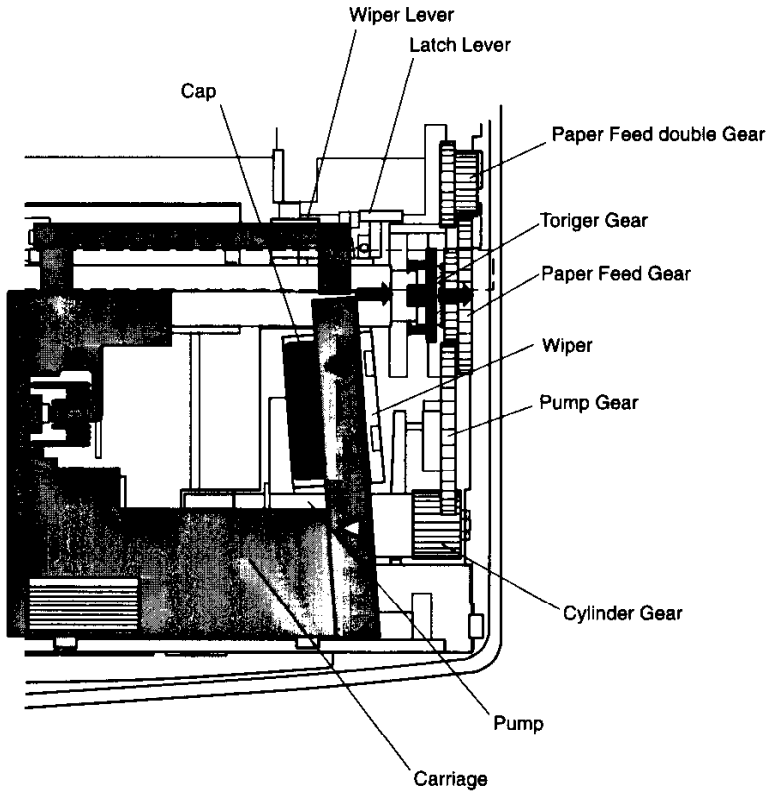


Figure 4-22 BJ Cartridge Section Function

3.5.2 Carriage section structure

a) BJ cartridge mounting section

The BJ cartridge is fixed to the carriage by the carriage contact spring.
When the BJ cartridge is mounted on the carriage, the contacts of the carriage ribbon cable connect with the signal contacts of the BJ cartridge to transfer printing signals sent from the control board.
There are wiping hooks that set and release the wiper on the back of the carriage.
There also is a home position edge that shields the home position sensor on the chassis on the back of the carriage.

b) Carriage drive section

The power from the stepping type carriage motor moves the carriage horizontally with the carriage belt. After the home position sensor attached to the rear of the carriage detects the home position edge, the carriage is controlled with the stepping pulses transmitted to the carriage motor. The pulses driving the carriage motor are controlled by the MPU section to have the optimum pulse width. (PWM control) This reduces the operating noise. Also, if the print position is shiftedmechanically, it is corrected automatically, the home position sensor detects the home position edge on the carriage, and the print start position is shifted with software. This adjustment is conducted when the initial operation is performed after the printer is powered on by the *POWER* button, or when the printing operation is performed after the print mode is changed.

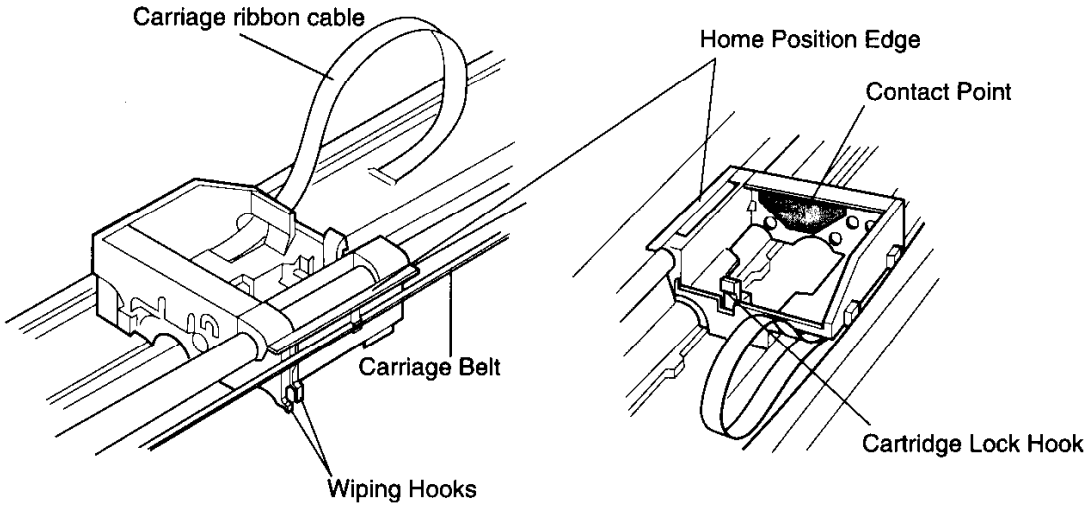


Figure 4-23 Carriage Section Structure

4. ELECTRONIC SYSTEM OF THE PRINTER

4.1 Overview of the Electronic System of the Printer

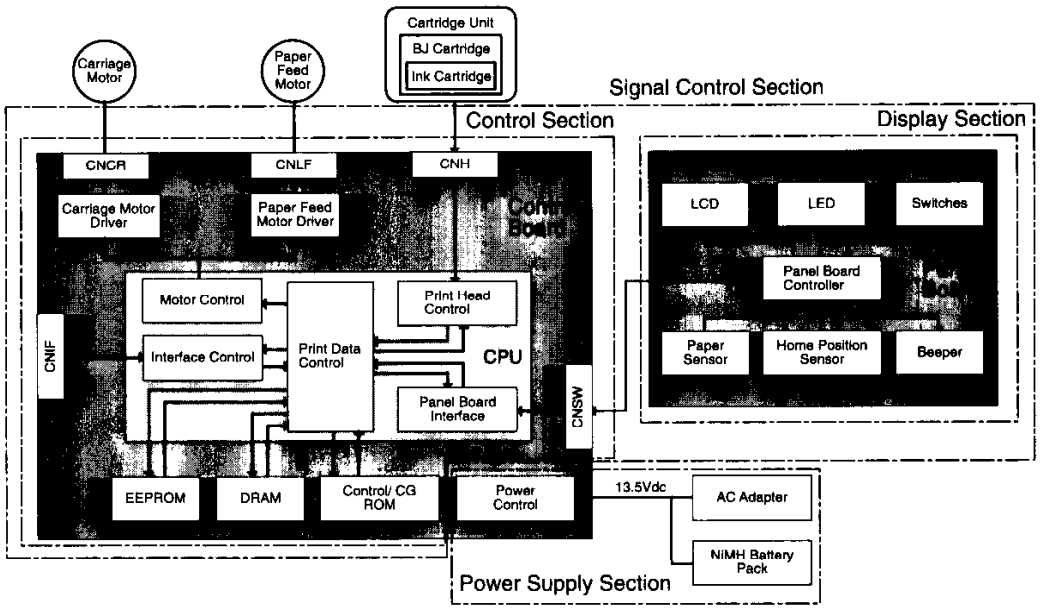


Figure 4-24 Printer Block Diagram

The printer's electronic system is comprised of a signal control section, a power supply section, and a display section.
The signal control section converts data transmitted from the interface into printing signals or control signals to control the printer operation.
The power supply section consists of the AC adapter and the power control section on the control board. The AC adapter converts AC power input to the DC power. The power control section converts the DC power from AC adapter to the various DC voltages, which are used for the signal control section print head or motors.
The display section indicates the printer status on the LCD. The panel board contains an HP (Home Position) sensor and a Paper sensor, in addition to the LCD.

When AC power is supplied to the power supply section, voltage (+5V DC) is always applied to the control board even the *POWER* button is off.

4.2 Signal Control Section

4.2.1 Control board block diagram

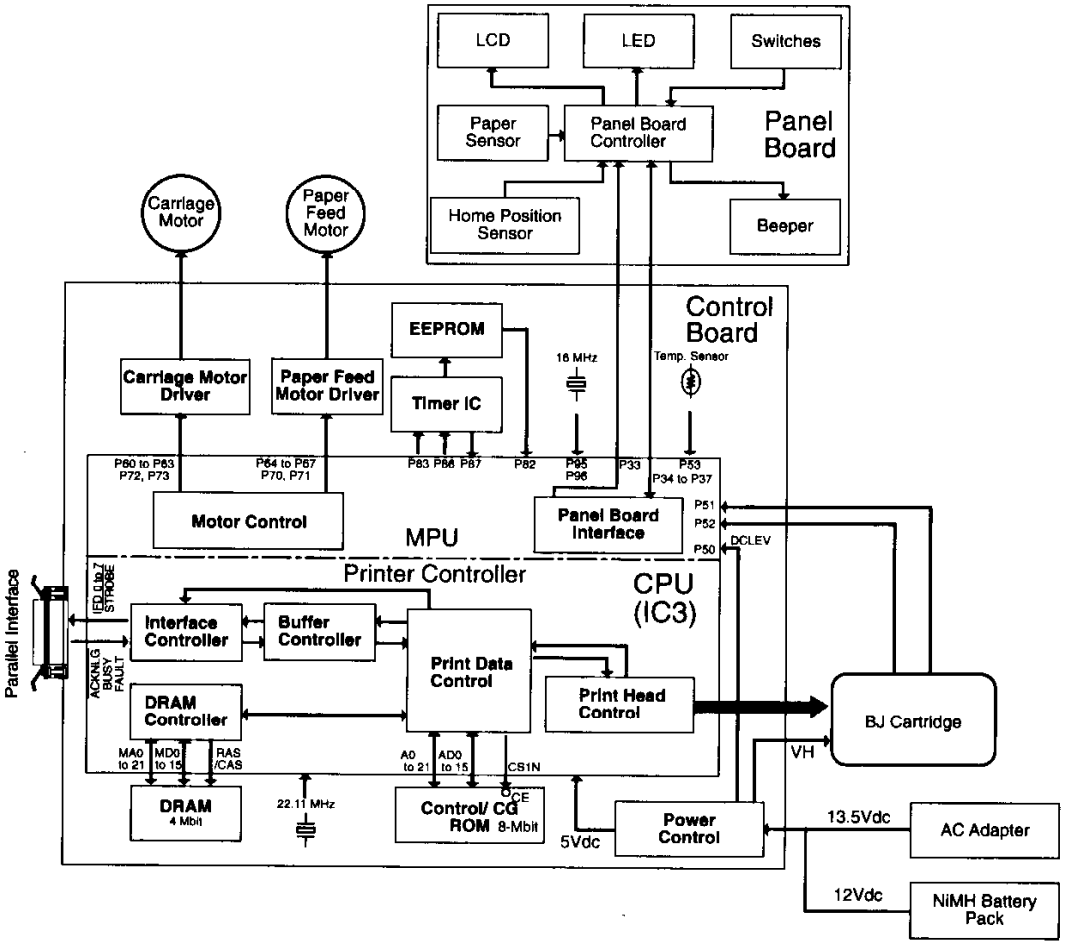


Figure 4-25 Control Board Block Diagram

4.2.2 Signal control section components

a) CPU (IC3)

The Toshiba-made T6W21A microcomputer chip is comprised of the MPU section and printer controller section. It contains 16-bit CPU with 1K-byte work RAM and operates in synchronized with 22.11 MHz and 16 MHz external clock, respectively.

1) MPU section

The MPU section includes a 16-bit address bus port, a 16-bit data bus port, an A/D converter, input/output ports and a carriage/paper-feed motor controller. It operates in synchronization with the 16-MHz external clock.

Address/data bus ports (AD0 to AD15)

The 16-bit address/data bus ports are controlled by the printer controller section in the CPU, and signals are transferred to and from the 8-Mbit external control ROM and the CG ROM. The control/CG ROM is chip-selected by the signal output by the MPU section.

A/D converter

The A/D converter converts the following analog signals to digital signals:

P50 (AN0): Inputs the DC voltage from the AC adapter to the power control unit to check the voltage level.

P51 (AN1): Inputs the head temperature from the diode sensor in the BJ cartridge.

P52 (AN2): Inputs the head rank from the rank resistor in the BJ cartridge.

P51 (AN1): Inputs the internal temperature inside the printer from the thermistor on the control board.

Carriage/paper-feed motor controller

The carriage/paper-feed motor controller outputs the two-phase signals that drive the carriage motor and paper feed motor.

The PWM (pulse width modulation) signal, which is programmed to drive the carriage motor, is appropriately output to the carriage motor driver.

To drive the paper-feed motor, three types of signals with different waveforms are output to the paper feed motor driver.

EEPROM write/read control

The TCLK signal output from the CPU is a clock signal for the EEPROM. The data is read out from the EEPROM with the TOE signal, which is output from the CPU. The read-out data is output from the EEPROM to the CPU with the TDATA signal.

Display unit control

The display unit is controlled by the panel board controller using six control signals sent from the CPU. The panel board controller receives the timing to write to and read data/address latch signals from CPU. The data from panel board controller is input to the CPU with the SDATA signal, which indicates each status of panel switch, home position sensor and panel sensor.

Input/output ports

The signal that distinguishes the type of the BJ cartridge and the internal-interrupt signal output from the printer controller section are input to the input ports.

The BJ cartridge detection signal is output from the output port.

2) Printer controller section

The printer controller contains the interface controller, the head driver controller, the DRAM controller, and the buffer controller. It operates in synchronization with the 22.11-MHz external clock input.

Interface controller

The Centronics-type parallel interface receives 8-bit parallel data sent from the host computer in synchronization with the $\overline{\text{STROBE}}$ signal by $\overline{\text{ACKNLG}}$/BUSY handshaking.

DRAM controller

The DRAM controller controls: the 4-Mbit DRAM 10-bit address/16-bit data bus that is independent from the CPU, read/write, RAS/CAS, and refreshing.

Buffer controller

The receive buffer controller has the receive buffer controller and print buffer controller. The receive buffer controller automatically writes received data from the host computer into the receive buffer in the DRAM, and controls the remaining data area of the buffer. The print buffer controller automatically reads data from the print buffer and sends it to the CPU. After it is completed, it erases the data in print buffer.

Print head controller

The print head drive controller converts the parallel print data read from the DRAM print buffer into serial data, and outputs it as an HDATA signal for driving the print head. In addition to this signal, the controller outputs the head nozzle position control signal and head-temperature adjustment signal, which controls the print head condition.

Input/output ports

The input/output ports include a display clock output port, and a port that outputs a chip select signal for the control/CG ROM.

b) Control/CG ROM

The IC6 8-Mbit control/CG ROM contains the printer control program in a 4-Mbit area and bit map font data in the remaining areas.

c) DRAM

The 4-Mbit DRAM is controlled by the CPU for use as the receive buffer, font download buffer, print buffer, and work area.

d) Paper feed motor driver IC/carriage motor driver IC (IC11/IC10)

The paper feed motor driver IC (IC11) is a driver IC designed for unipolar type constant voltage motor. The motor control signal output from the CPU controls the paper feed motor operation supplying constant voltage to each phase.
The carriage motor driver IC (IC10) is the same IC as the paper feed motor driver IC. The motor control signal output from the CPU controls the carriage motor operation supplying constant voltage to each phase.

e) EEPROM (IC9)

By using the EDT, TCLK, and TOE signals controlled by the CPU, the EEPROM data is read into the CPU at hardware/software power-ON, and is written into the EEPROM at hardware/software power-OFF or when paper is delivered out.
The data stored in the EEPROM include Lost-Ink Percentage for the waste ink absorber, number of sheets fed, the numbers of installations and removals of BJ cartridges, fonts, and function settings.

f) IC SOCKET (IC5)

There is an IC socket for a 4M EPROM to upgrade the printer control ROM version.

4.3 Display Sectiont

4.3.1 Panel board block diagram

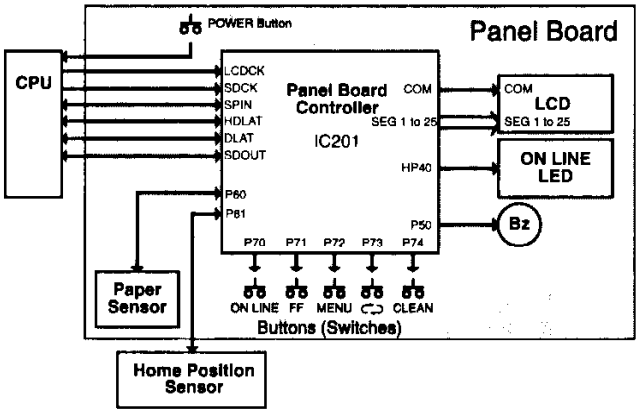


Figure 4-26 Panel Board Block Diagram

4.3.2 Panel board configuration

The control panel is comprised of an LCD module, six buttons, and are LED on the panel board. The panel board contains a paper sensor and a buzzer. The font/function settings made from the control panel and the HP sensor and paper sensor signals are controlled by the panel board controller (IC201).

a) Panel board controller

The panel board controller is a gate array that controls the control panel and transfers data with serial transmission method. The controller operates with the data transfer clock generated by the MPU section of the CPU and the 72-Hz clock for the LCD display. It has two input ports and six output ports. It selects ports and reads data from input ports or writes data into output ports by using six control signals from the CPU.
The control panel button signals and paper sensor and HP sensor signals are input into the input ports.
The LCD display, LED, and buzzer signals are output from the output ports.

b) LCD

The LCD uses TN-type liquid crystal display elements and displays positive images because of the use of reflective lighting. Icons are displayed, and the items are shown below. The display is controlled by 26 SEGMENT signals and one COM signal.

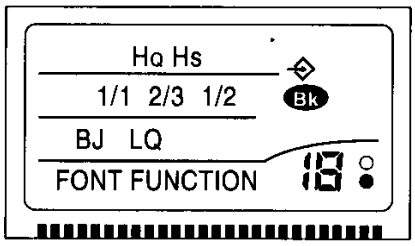


Figure 4-27 LCD

c) Power button

Unlike the other control panel buttons, the *POWER* button sends a signal directly to the CPU, not the panel board controller. When the *POWER* button is pressed, an NMI signal is input to the CPU.

4.4 Power Supply Section

4.4.1 Block diagram of power supply section

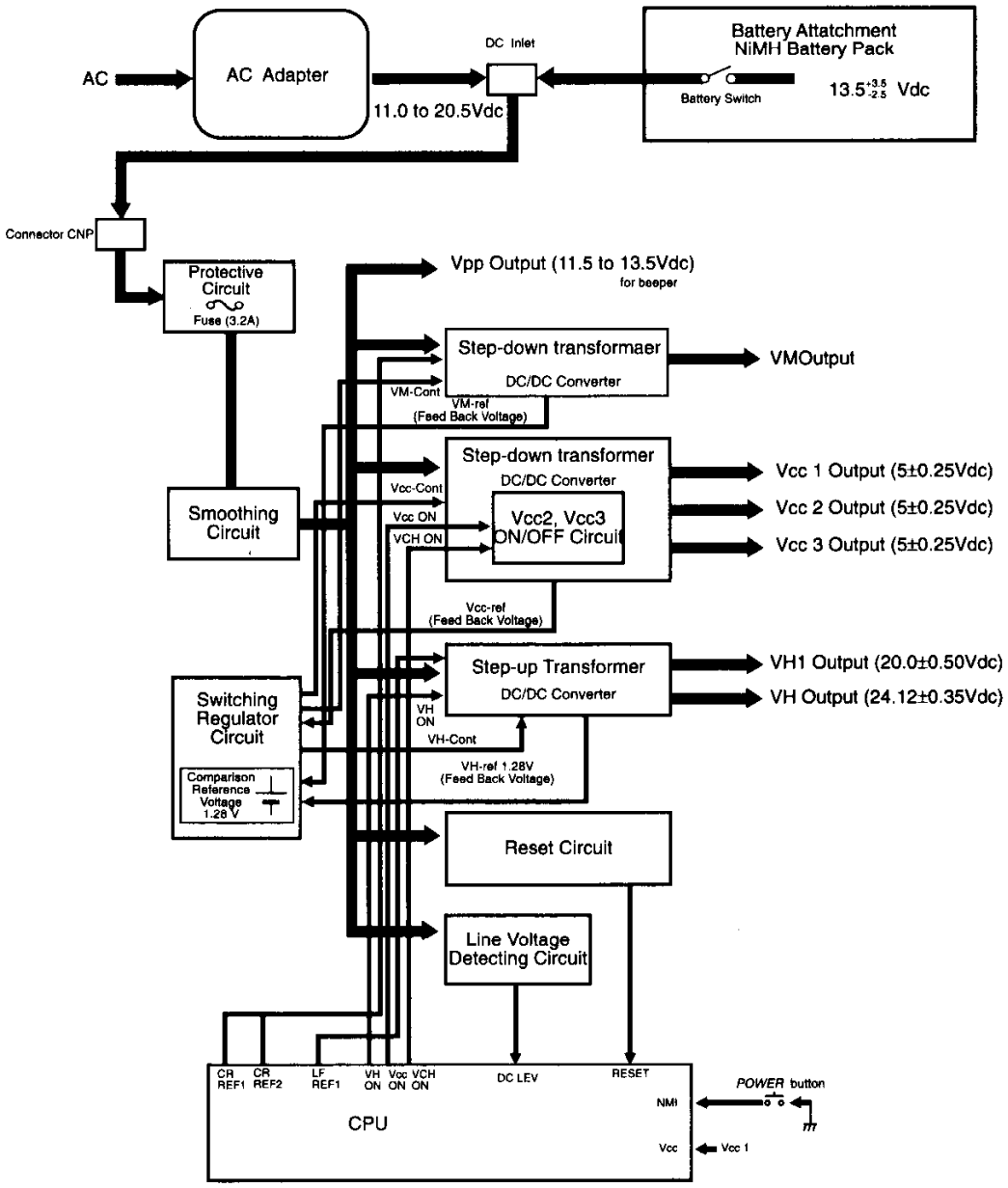


Figure 4-28 Block Diagram of Power Supply Section

i) Portable Kit (NK-300)

The portable kit is available as an option,and supplies the DC voltage to the printer by making use of the NiMH battery pack. The portable kit has a function to charge/discharge the NiMH battery pack. To charge it, connect the optional AC adaptor to the outlet, and do the DC plug to the portable kit. While the printer is not being operated, the NiMH battery pack charged. (The charging time is approximately 10 hours.)

To discharge the battery pack, connect the AC adaptor as well, and press the refresh button on the portable kit. The discharging time varies according to the battery voltage left in the battery pack, however, it is 10 hours or less. The battery capacity may be lowered by the memory effect. To prevent this, the battery pack has the refresh button, which can discharge the battery completely.

The refresh button is also used for switching to charging/discharging. If the button is pressed during charging, it will be switched to discharging. To stop charging/discharging, disconnect the power cord of the AC adaptor. (Power off the printer by pressing the power button, then disconnect the power cord.)

5. DETECTION FUNCTION

The printer uses HP sensor, paper sensor and inside temperature sensor, and head temperature sensor. Also, the capacity of the waste ink absorber is stored in the EEPROM. When the absorber becomes full, an error is output. The printer detects the level of the ink remaining in the ink cartridge by counting the number of dots ejected, and indicats when the ink runs out. The remaining ink level detection function can be enabled or disabled by function setting.

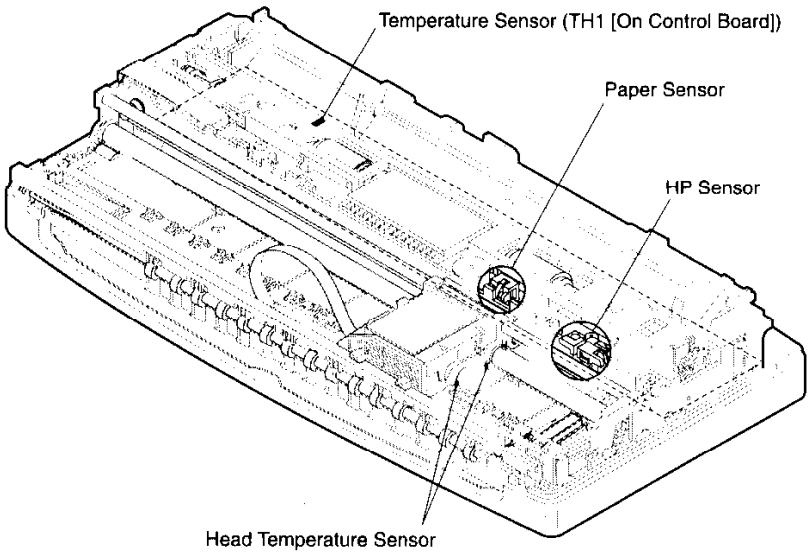


Figure 4-29 Sensor Location

5.1 HP Sensor

The photointerrupter type HP sensor detects the edge of the carriage in order to detect the carriage position.
After the carriage senses the edge, it moves to the right, and the print head is capped at its home position.

5.2 Paper Sensor

The photointerrupter type paper sensor detects the presence of paper.

5.3 Temperature Sensor

The temperature sensor on the control board detects the temperature inside the printer. The CPU detects a change in the thermistor resistance that changes along with changes of the inside temperature. The CPU converts the input analog value, which is a voltage converted from the thermistor resister to a digital value with the internal A/D converter. This value is used to control the pulse width of the head drive control signal and temperature adjustment signal.

5.4 Head Temperature Sensor

The head temperature sensor in the print head detects the head temperature. The CPU detects a change in the diode sensor that changes as a change in voltage along with changes in the head temperature. The CPU converts the input analog value to a digital value with the internal A/D converter. When the head temperature rises excessively, the digital value becomes large, which can stop ejecting the ink from the head.

5.5 Waste ink Level Detection

When ink is ejected from the head, the dot counter in the CPU counts the number of dots ejected. There is a counter for each color of ink. The values of the counters are summed and the dot count is converted to an amount of ink by the control ROM.

The control ROM calculates the capacity of the waste ink absorber from the total dot count and the number of cleaning operations by consideration of the amount of ink consumed and evaporated. It then writes the result into the specified area of the EEPROM when the *POWER* button is turned off or paper is output.

The CPU reads settings from the EEPROM at hardware and software power on. If the capacity of the waste ink absorber exceeds the permissible range, a warning is displayed. If the capacity increases further, the printer indicates an error and stops operating.

5.6 Remaining-ink Level Detection

This function detects the remaining ink level and notifies the user that the ink has run out. (The function is enabled or disabled by function setting.)
The dot counter for each color of ink in the CPU counts the number of dots ejected. When cleaning is performed, ink is consumed by purging, and the total combination of this consumption and that converted from the number of dots is written into the EEPROM (when the power is turned off, paper is delivered out, or cleaning operation ends.)

The CPU reads the EEPROM contents when the printer is turned on with the *POWER* button. If the remaining ink level reaches the prescribed value, a caution is displayed, notifying the user that the ink is low (the printer can operate even after a caution is displayed.)

Detection function	Description	Available	Remarks
Paper presence	Detection with paper end sensor.	available	
Paper width		None	
Home position	Detection with home position sensor.	available	
BJ cartridge presence	Detection with head rank, and head temperature sensor.	available	
Ink cartridge presence		None	
Remaining-ink level	Calculation from dot count and recovery count. Set the function to on or off by function setting.	available	Default: off
BJ cartridge identification	Identification by head ID0 and ID1.	available	
Waste ink absorption	Calculation from dot count and recovery count.	available	

1. MAINTENANCE

1.1 Periodically-replaced Parts

Level	Periodically-replaced parts
User	None
Service engineer	None

1.2 Consumables

Level	Consumables	
User	Black BJ cartridge	BC-10
	Ink cartridge	BCI-10 Black
Service engineer	None	

1.3 Periodic Maintenance

Level	Periodic maintenance
User	None
Service engineer	None

2. SERVICE TOOLS

2.1 List of Tools

General tool	Use
Phillips screwdriver	For removing screws
Flathead screwdriver	For removing plastic parts
Multi Mater	For troubleshooting
Tweezers	For fitting and removing coil springs

Special tool	Use
Grease (CK-0562-000)	MOLYKOTE PG-641

3. APPLYING THE GREASE

The points to grease with a special tool are shown below.
Apply a thin coat of grease to the specified points. See the Part Catalog for details of the printer disassembling and reassembling procedures.

CAUTION

Take special care not to apply grease to the wiper or the cap when greasing the guide shaft.

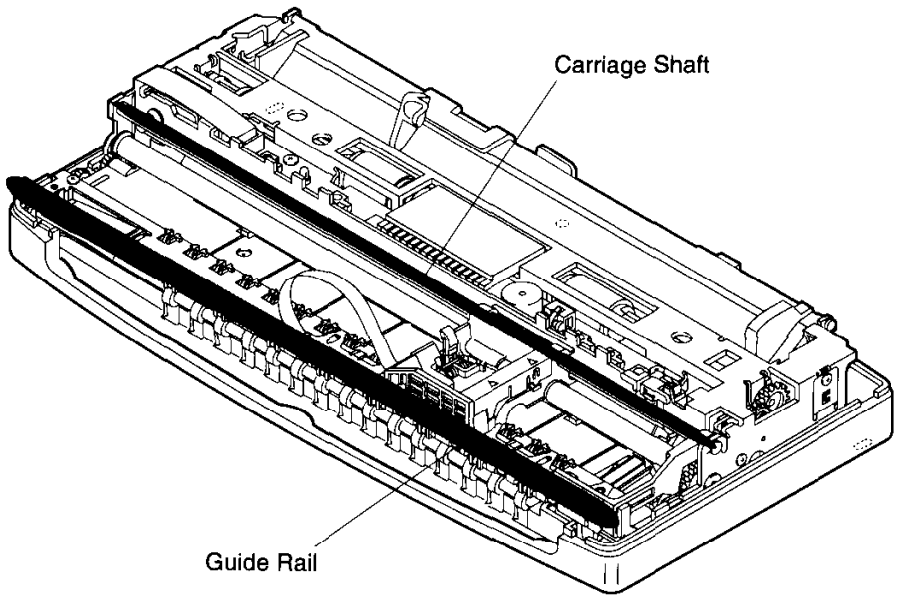


Figure 5-1 Grease Application Sections

4. ADJUSTMENT

No parts need to be adjusted.

5. TROUBLESHOOTING

5.1 Overview of Troubleshooting

5.1.1 Definition

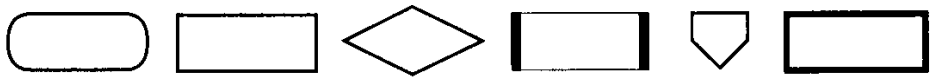
Troubleshooting consists of error condition diagnosis, which is required if the cause of an error is unknown, and error recovery, which is performed if the cause of an error is known. If the cause of an error is unknown, perform the error condition diagnosis, and if it is known, perform error recovery.

5.1.2 Precautions for troubleshooting

1. Before starting error condition diagnosis, make sure all the connectors and ribbon cables are plugged in.

2. If you repair the printer with its case removed and the AC adapter or battery pack installed, take utmost care to prevent electric shock from the power supply unit and PCB shorting.

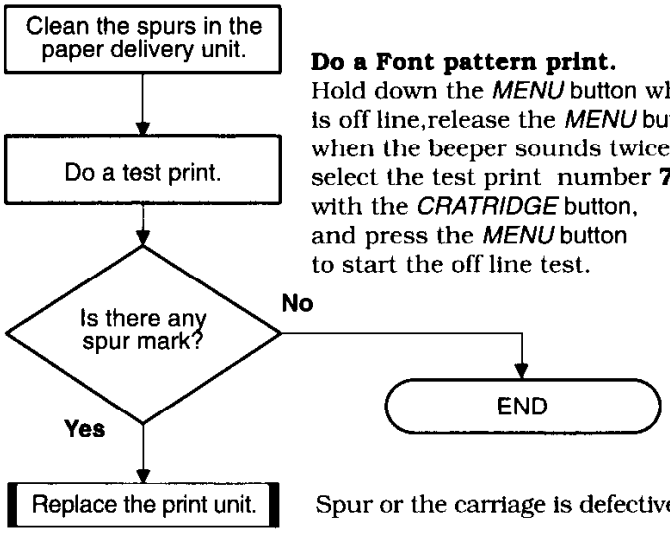
3. Troubleshooting procedures are given in flowcharts. The following symbols are used in the flowcharts:



Start/End Operation Judgement Action/Replace Jump Stop

4. After replacement or repair, do a test print to make sure the printer works properly. If the printer does not work properly, perform troubleshooting again, skipping the steps that were done before.

Example 1

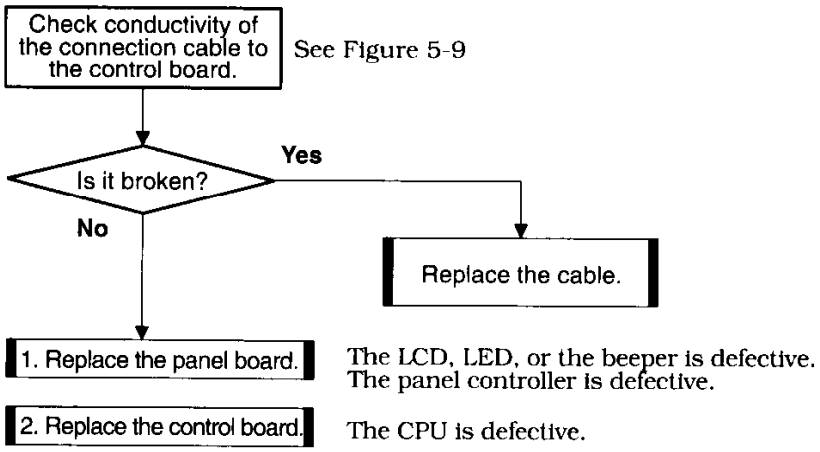


Do a Font pattern print.
Hold down the *MENU* button while the printer is off line,release the *MENU* button when the beeper sounds twice, select the test print number **7** with the *CRATRIDGE* button, and press the *MENU* button to start the off line test.

Spur or the carriage is defective.

5. Several measures may be described in the error condition diagnosis and error recovery.
   They are shown in each step to be done to solve the problem.
   Do a test print after completing each step to make sure the problem has been eliminated. If it persists, go to the next step.

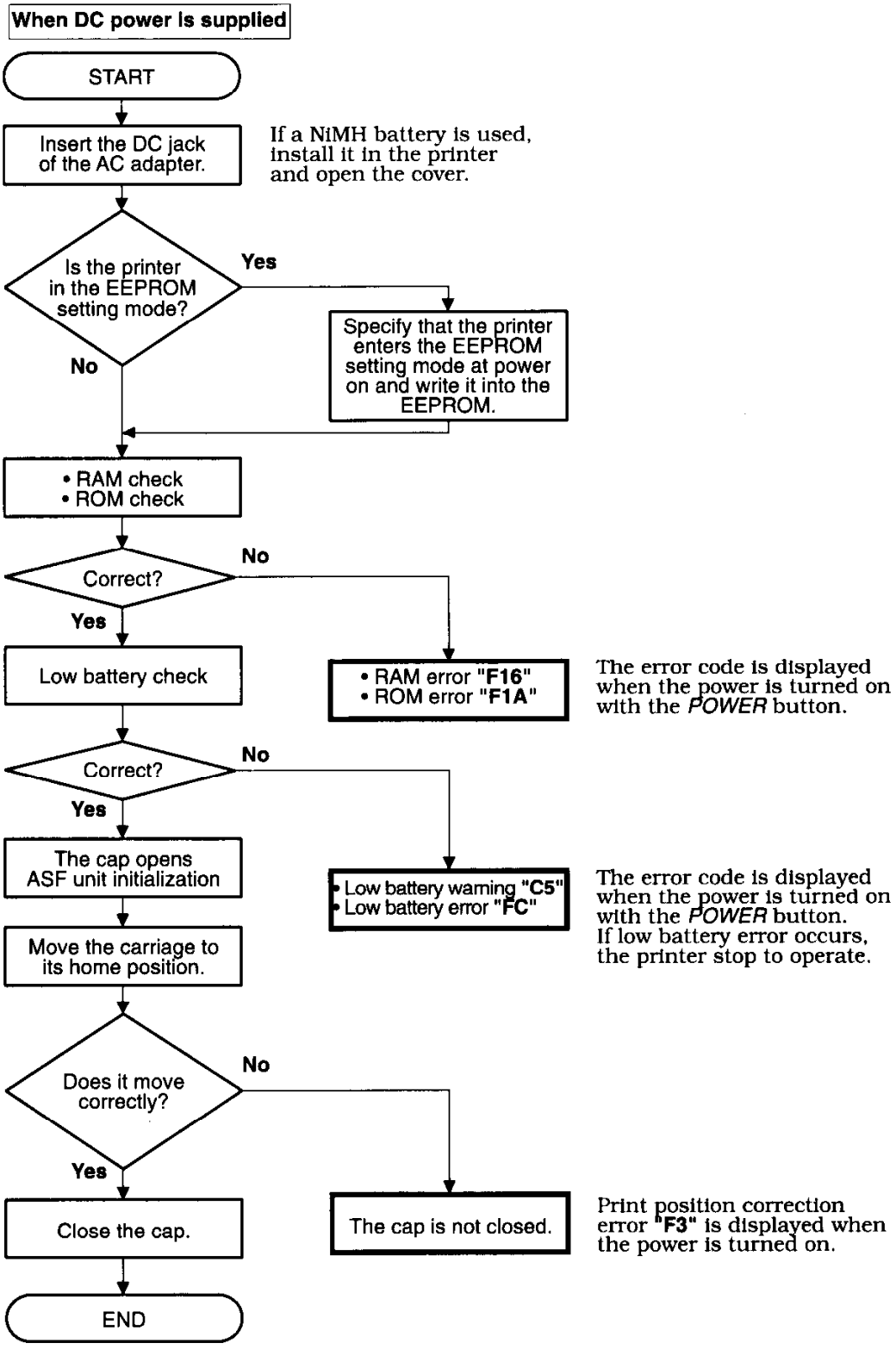
Example 2
After replacing the panel board in step 1, carry out a test print to make sure the problem has been solved.
If it still persists, go to step 2 and replace the control board.

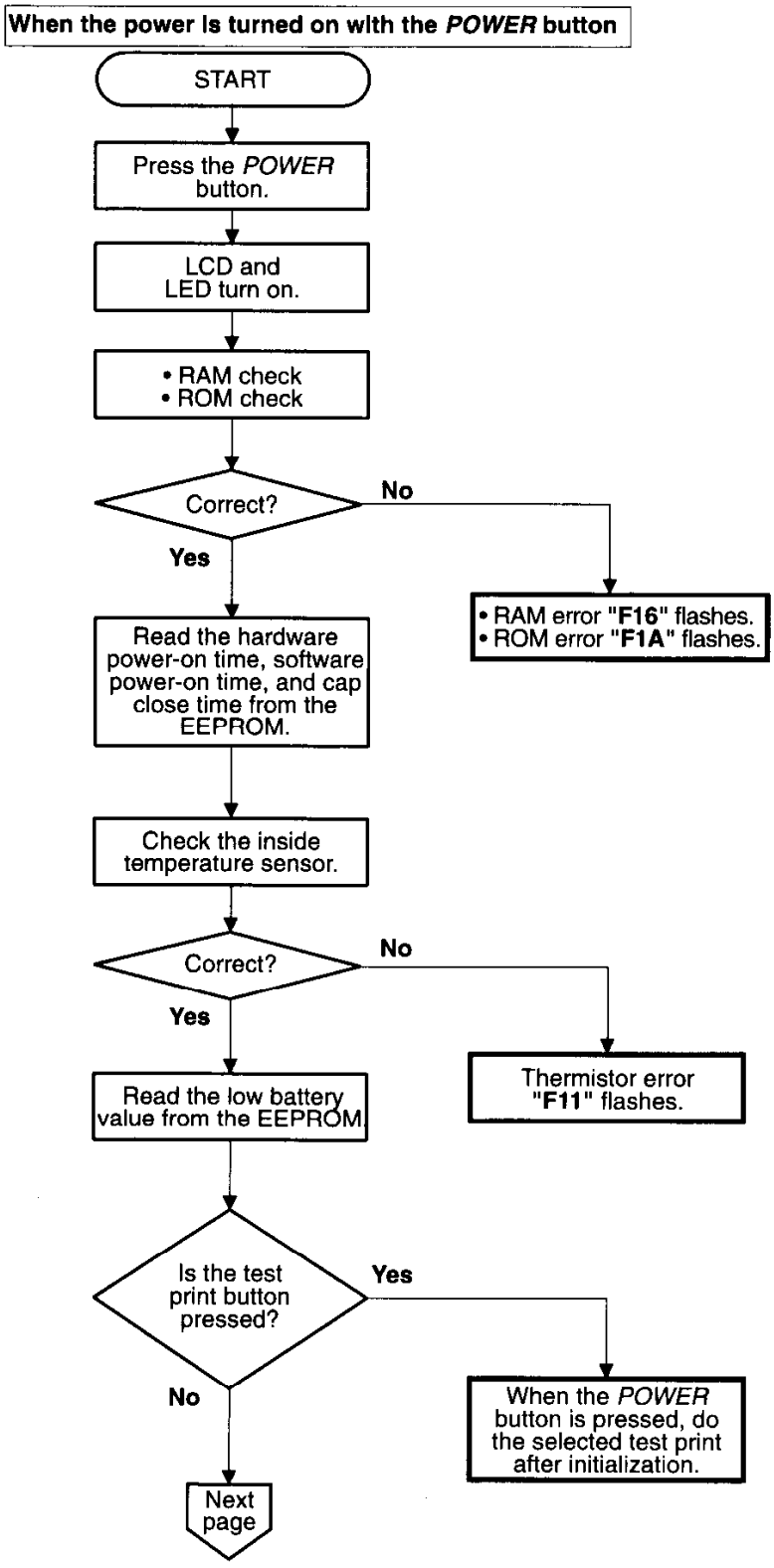


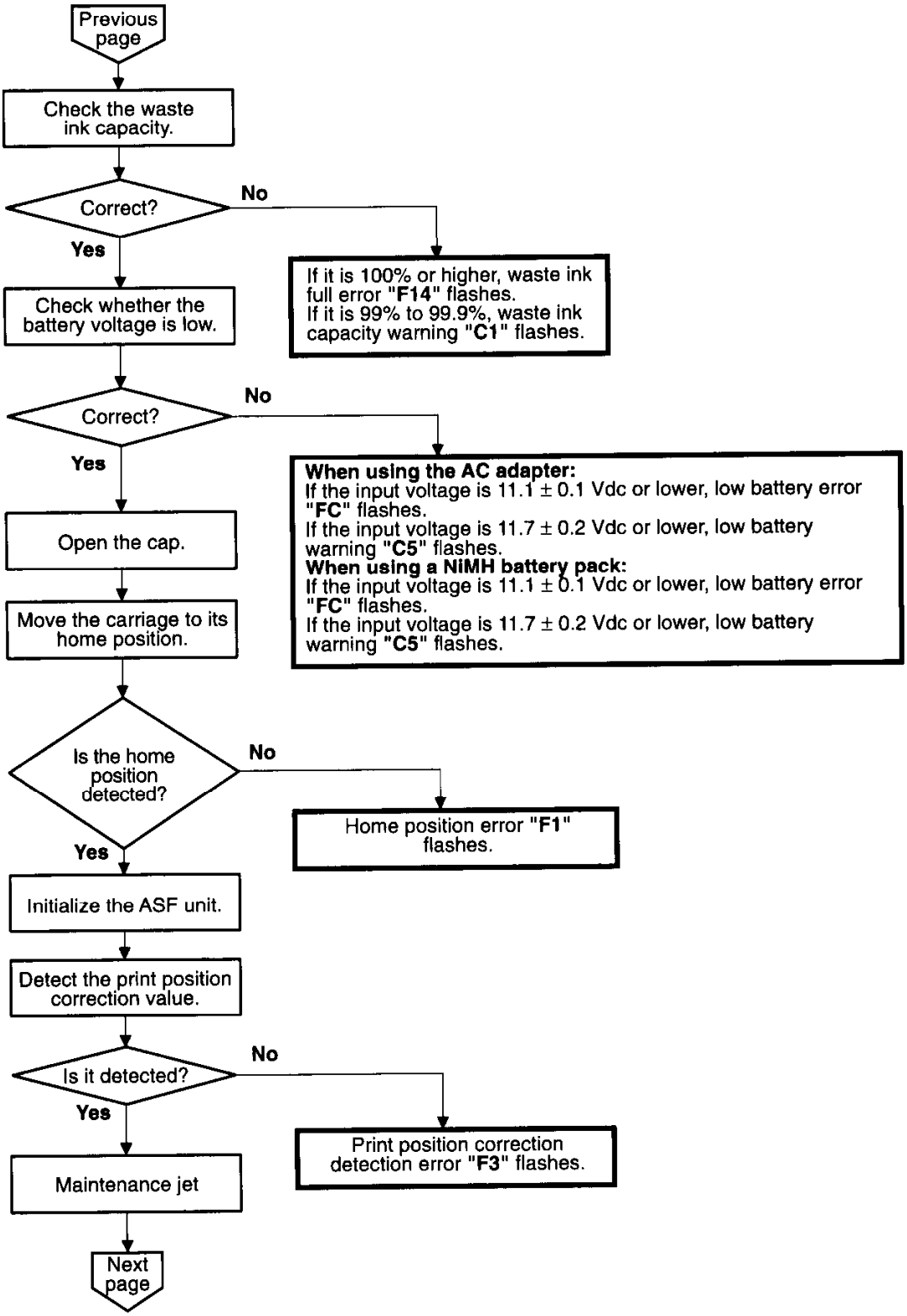
6. After troubleshooting, make sure that all the connectors have been plugged back in correctly and that all the screws are tight.

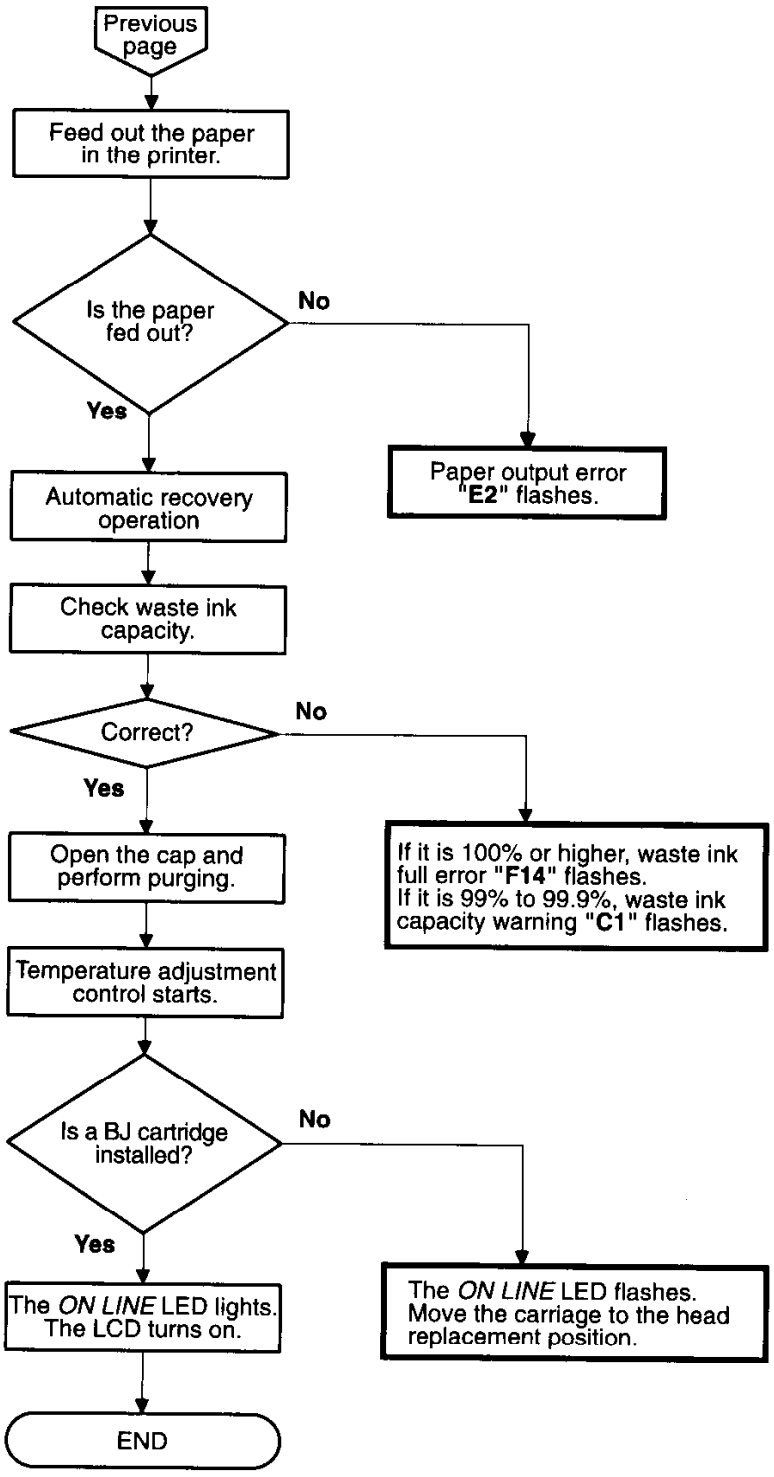
5.2 Error Condition Diagnosis

5.2.1 Diagnosis flowchart




When the power is turned on with the *POWER* button
START
Press the *POWER* button.
LCD and LED turn on.
• RAM check
• ROM check
Correct?
No
Yes
• RAM error "F16" flashes.
• ROM error "F1A" flashes.
Read the hardware power-on time, software power-on time, and cap close time from the EEPROM.
Check the inside temperature sensor.
Correct?
No
Yes
Thermistor error "F11" flashes.
Read the low battery value from the EEPROM.
Is the test print button pressed?
Yes
No
When the *POWER* button is pressed, do the selected test print after initialization.
Next page


Previous page
Check the waste ink capacity.
Correct?
No
Yes
If it is 100% or higher, waste ink full error "F14" flashes.
If it is 99% to 99.9%, waste ink capacity warning "C1" flashes.
Check whether the battery voltage is low.
Correct?
No
Yes
When using the AC adapter:
If the input voltage is 11.1 ± 0.1 Vdc or lower, low battery error "FC" flashes.
If the input voltage is 11.7 ± 0.2 Vdc or lower, low battery warning "C5" flashes.
When using a NiMH battery pack:
If the input voltage is 11.1 ± 0.1 Vdc or lower, low battery error "FC" flashes.
If the input voltage is 11.7 ± 0.2 Vdc or lower, low battery warning "C5" flashes.
Open the cap.
Move the carriage to its home position.
Is the home position detected?
No
Yes
Home position error "F1" flashes.
Initialize the ASF unit.
Detect the print position correction value.
Is it detected?
No
Yes
Print position correction detection error "F3" flashes.
Maintenance jet
Next page


Previous page
Feed out the paper in the printer.
Is the paper fed out?
No
Yes
Paper output error "E2" flashes.
Automatic recovery operation
Check waste ink capacity.
Correct?
No
Yes
If it is 100% or higher, waste ink full error "F14" flashes.
If it is 99% to 99.9%, waste ink capacity warning "C1" flashes.
Open the cap and perform purging.
Temperature adjustment control starts.
Is a BJ cartridge installed?
No
Yes
The ON LINE LED flashes. Move the carriage to the head replacement position.
The ON LINE LED lights. The LCD turns on.
END

5.2.2 Error recovery

a) Error codes

The printer indicates three types of errors: fatal errors (F), errors (E), and warnings(C).

Fatal errors (F)

The buzzer sounds for about five seconds, the "FONT" and "◈"displays disappear, and "F" and the fatal error code flash alternately.

Errors (E)

The buzzer sounds twice briefly, the "FONT" and "◈"displays disappear, and "E" and the error code flash alternately.

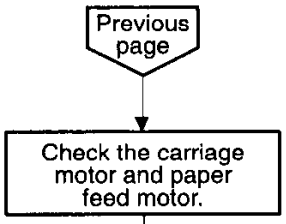
Warnings (C)

The buzzer sounds twice briefly as when an error occurs, the "FONT" and "◈"displays disappear, and "C" and the warning code flash alternately. However, the ink zero warning is an exception.

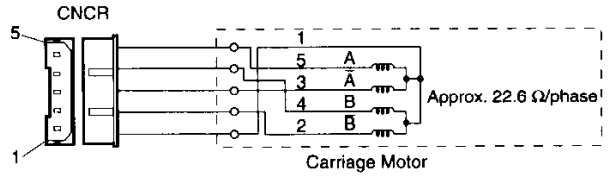
<ROM error>
<Cause> • The ROM contents cannot be read during initialization.
<Suspected part> Control/font ROM
<Measure> Replace the control board.

<RAM error>
<Cause> • The RAM contents cannot be read during initialization.
<Suspected part> DRAM
<Measure> Replace the control board.

<EEPROM error>
<Cause> • Data cannot be written into the EEPROM.
<Suspected part> EEPROM
<Measure> Replace the control board.



Carriage Motor

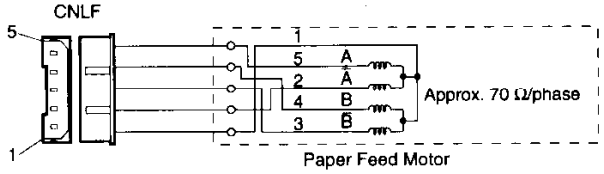


Meter connection		Reading
CNCR Pin No.	1-2 1-3 1-4 1-5	Approx. 22.6 Ω

Disconnect the carriage motor connector from the control board before check.

Figure 5-3 Carriage Motor

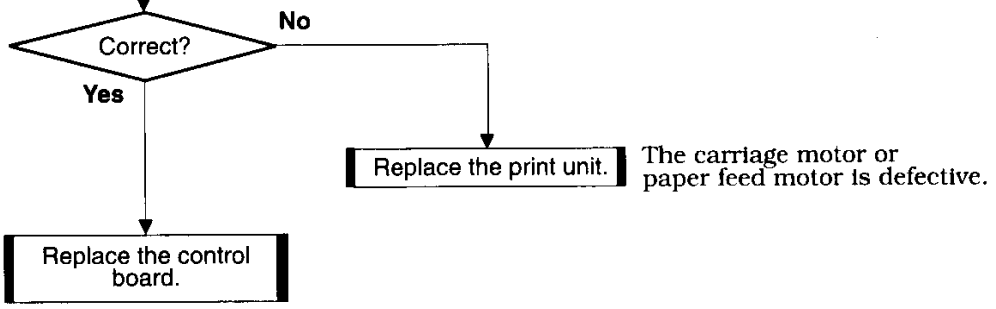
Paper Feed Motor



Meter connection		Reading
CNLF Pin No.	1-2 1-3 1-4 1-5	Approx. 70 Ω

Disconnect the paper feed motor connector from the control board before check.

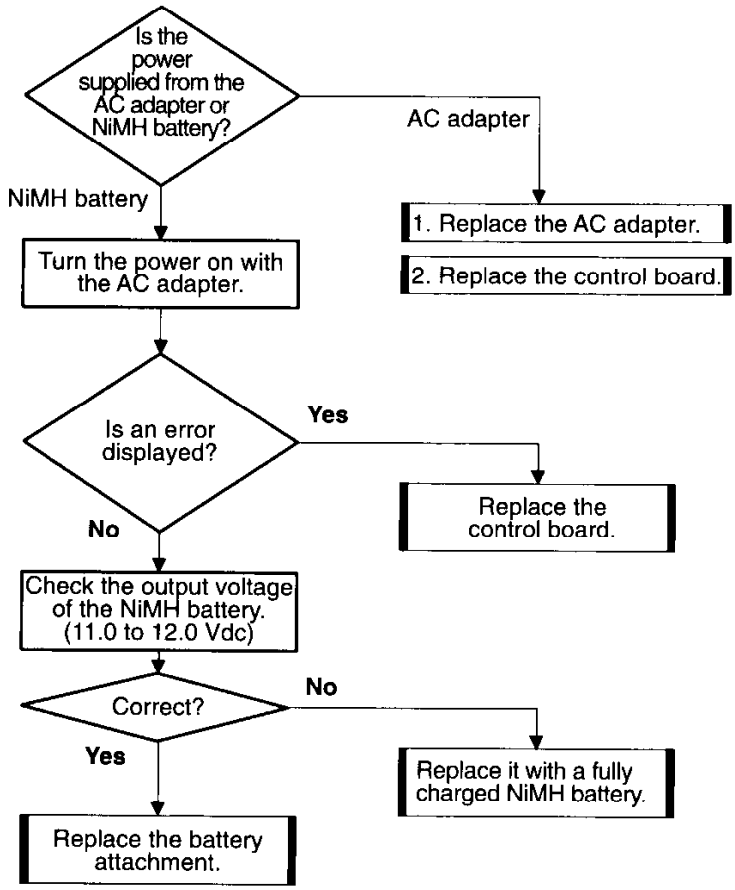
Figure 5-4 Paper Feed Motor



<Print position correction detection error>
<Cause> • Print position correction cannot be detected.
<Suspected part> Carriage motor, control board,home position sensor
<Measure> Same as when the home position sensor error (F1) is displayed.

<Low battery error>
<Cause> • The input voltage is incorrect. (11.1 ± 0.1 Vdc or lower)
<Suspected part> NiMH battery, AC adapter, Control board

<Measure>



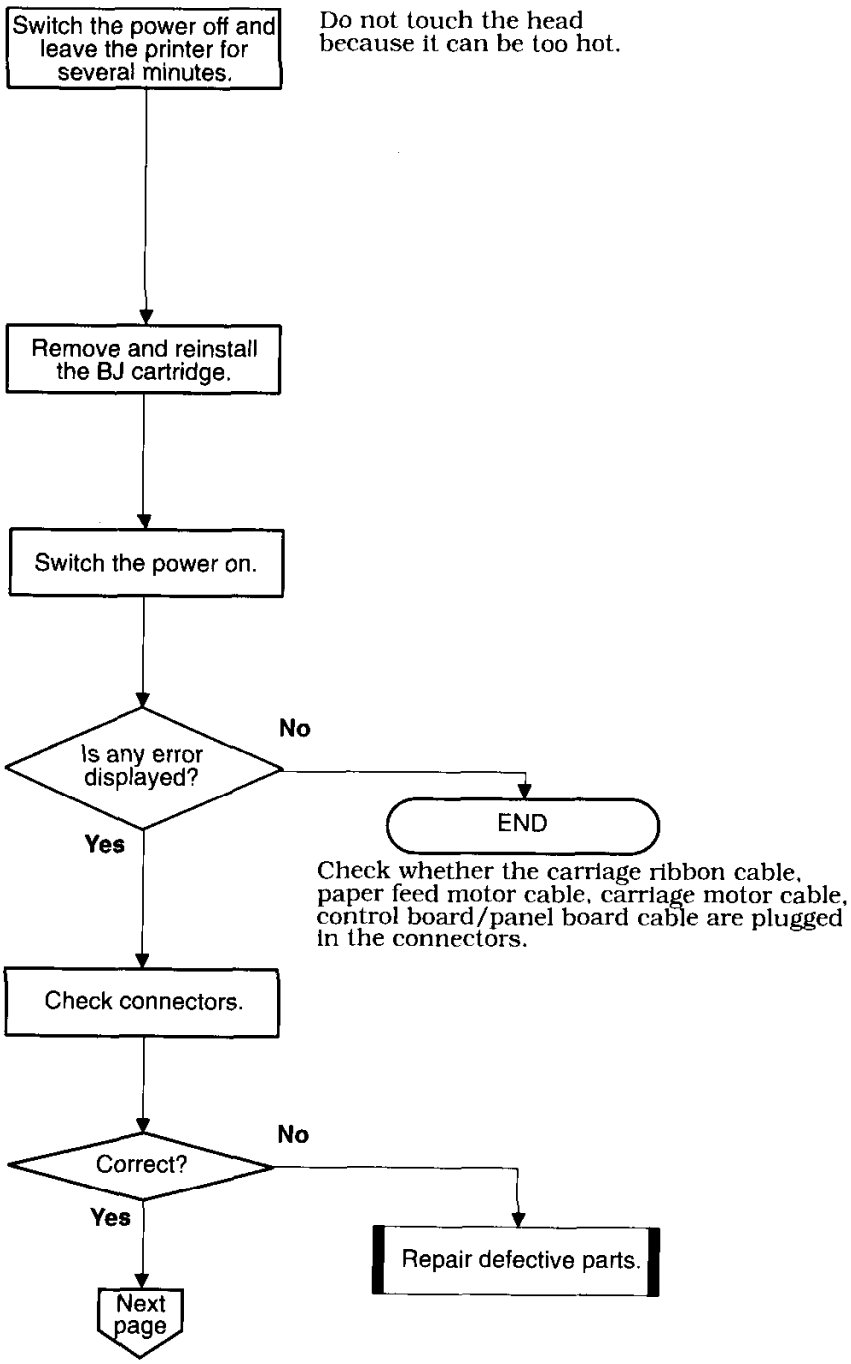
<Thermistor error>
<Cause> • The thermistor is faulty.
<Suspected part> Thermistor
<Measure> Replace the control board.

<Head temperature error>

<Cause> • The head temperature has risen excessively.

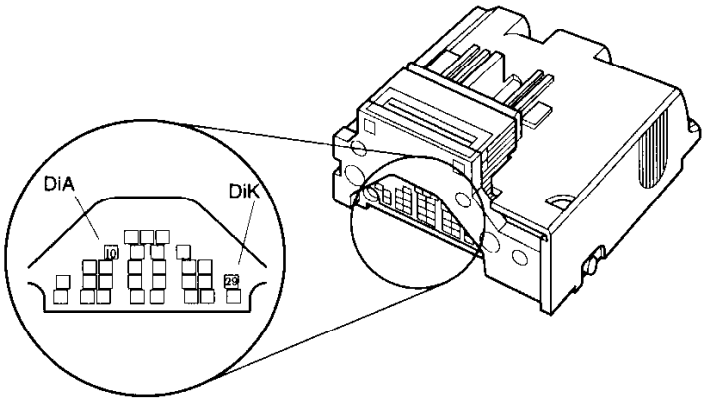
<Suspected part> BJ head or control board

<Measure>



Previous page

Check the BJ head temperature sensor resistance.



Meter connection			Reading
	+	−	
Pin No.	10	29	Conductivity
	29	10	No conductivity

The black BJ cartridge and the color BJ cartridge have the same meter connections and meter readings.

Figure 5-5 BJ Head Temperature Sensor

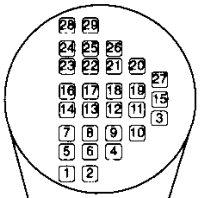
Correct?

No

Yes

Replace the BJ cartridge.

Check the carriage ribbon cable.



Check the conductivity of Pins 10,29 and 11.

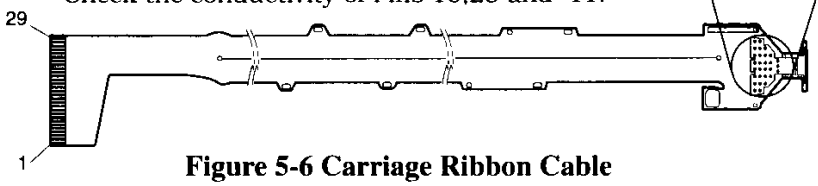


Figure 5-6 Carriage Ribbon Cable

Correct?

No

Yes

Replace the print unit.

The carriage ribbon cable is defective.

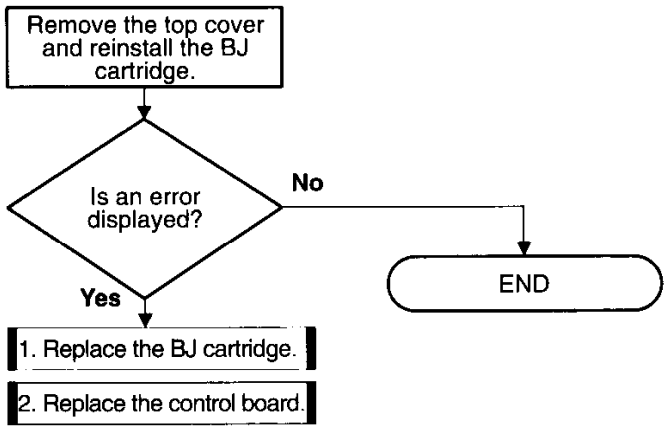
Replace the control board.

<No head error>

<Cause> • The BJ cartridge is removed from a position other than the BJ cartridge removal position.

<Suspected part> BJ cartridge or control board

<Measure>

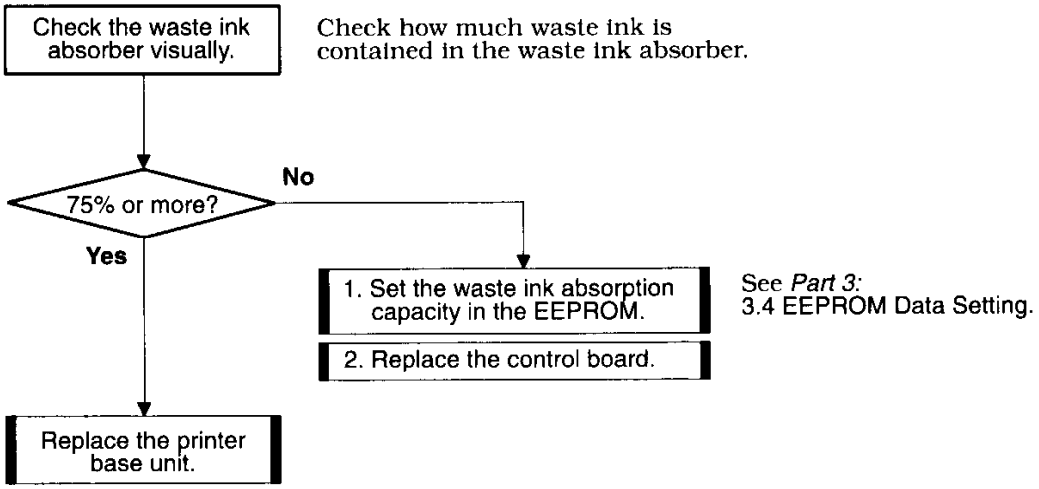


<Waste ink full error (The waste ink absorber is full.)>

<Cause> • The capacity of waste ink absorbed into the waste ink absorber reaches 100%.

<Suspected part> Waste ink absorber or control board

<Measure>

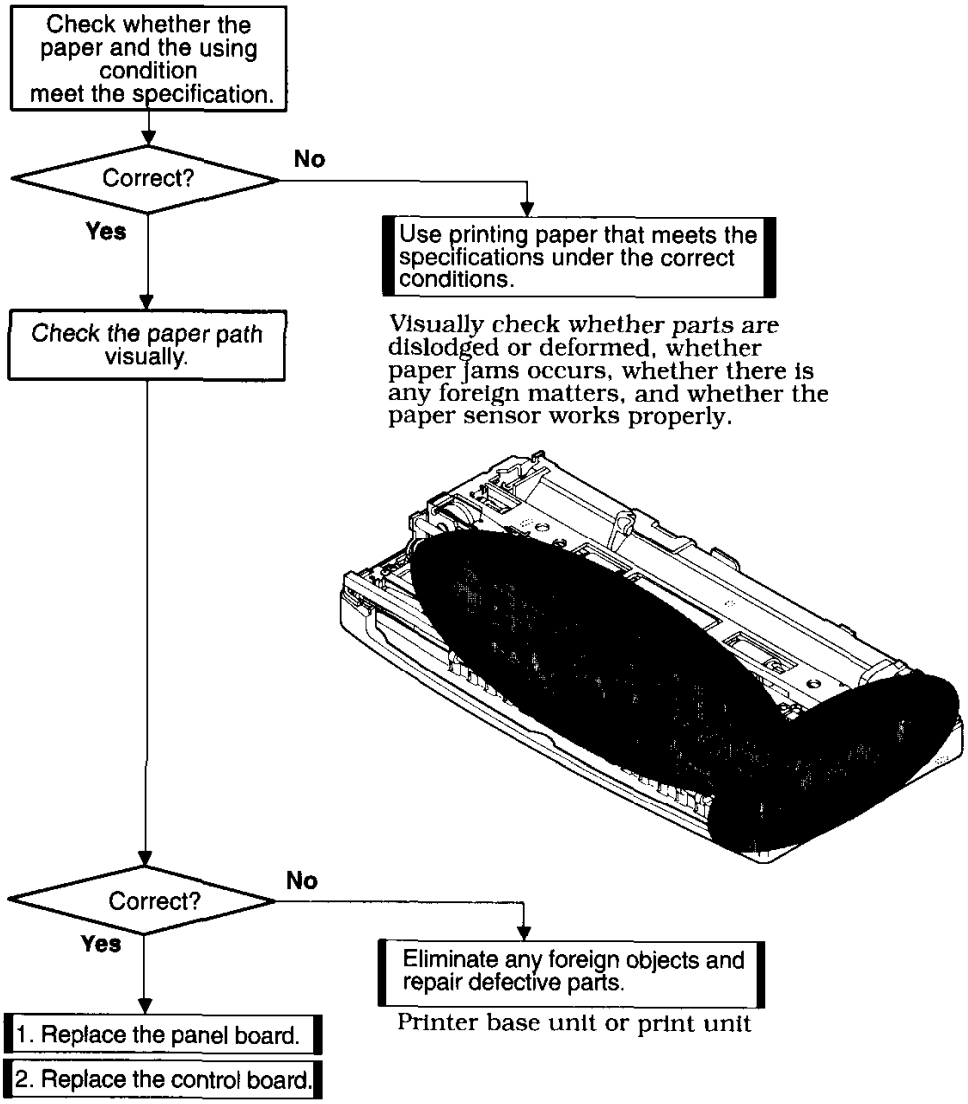


<Paper feed error>

<Cause> • Paper is fed, but is not detected.

<Suspected part> Paper sensor, separation sheet, panel board, or control board

<Measure>



<Paper delivery error>

<Cause> • The paper sensor detects a paper vertical length longer than 20 inches.(410.8 mm)

<Suspected part> Print unit

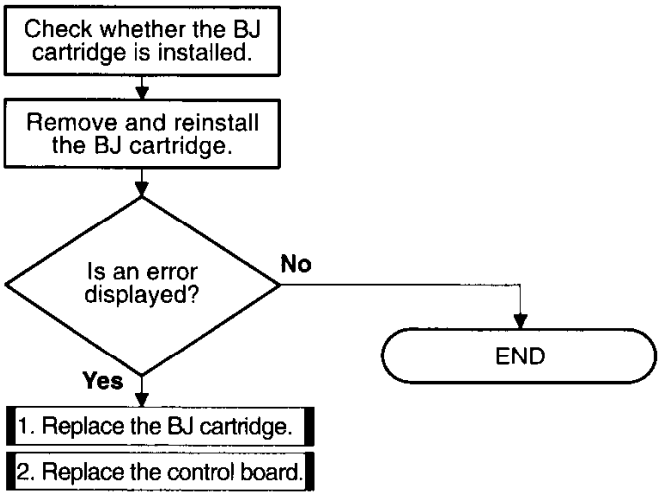
<Measure> Same as when paper feed error "**E1**" is displayed.

<BJ cartridge installation error>

<Cause> • This error appears when the carriage is returned to the home position without the BJ cartridge installed,or when presence of BJ cartridge is not recognized through it is installed.

<Suspected part> BJ cartridge

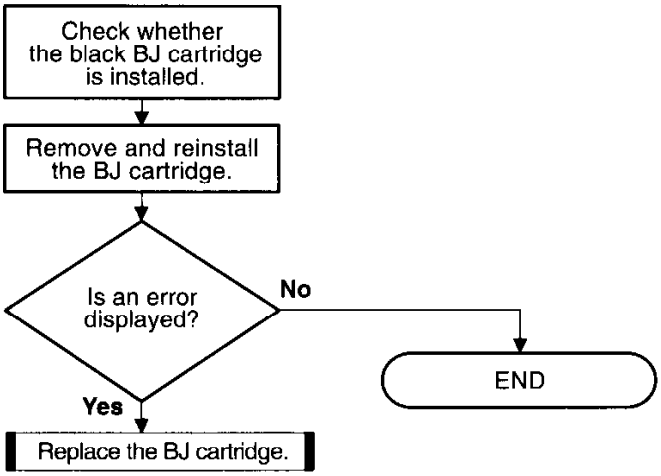
<Measure>



<BJ cartridge mis-match error>

<Cause> • This error appears when the color BJ cartridge is installed,or when presence of black BJ cartridge is not recognized through it is installed.

<Suspected part> BJ cartridge



<Waste ink capacity warning>

<Cause> • When the power is turned on or when recovery operation completes, the remaining capacity of the absorber is 1%.

<Suspected part> Waste ink absorber

<Measure> • Press the *ON LINE* button to recover.
• If the capacity of waste ink in the waste ink absorber reaches 100% (calculated value), a waste ink error occurs and "**F14**" is displayed.
• Replace the printer base unit.

<Low battery warning>

<Cause> • The input voltage is 11.8 ± 0.1 Vdc to 11.1 ± 0.1 Vdc. (Normal voltage: 13Vdc +2.5Vdc, -1.5 Vdc)

<Suspected part> NiMH battery, AC adapter

<Measure> **1) When using a NiMH battery**
• It can be recovered by pressing *ON LINE* button within five minutes after the warning displayed
• If the printer is recovered, it can print about one sheet of A4-sized paper. However, if the battery capacity falls below 11.1 ± 0.1 Vdc, a low battery error occurs and "**FC**" is displayed.
• If the voltage is not restored within five minutes after the warning is issued, the printer turns off automatically.
• Recharge the NiMH battery.

2) When using the AC adapter
• Replace the adapter.

<BJ cartridge warning>

<Cause> • This error appears when the carriade is left for five minutes at replacement positiion and the carriade is compursoly returnedto the home position.

<Suspected part> The BJ cartridge is in the replacement mode for five minutes or longer.

<Measure> • Press the *ON LINE* button to recover.
• Press the *CARTRIDGE* / ↻ button again and replace the cartridge.

Bk flash.

<Ink low warning (Default: Off)>

The ink low warning is displayed when the ink low warning function is enabled.

<Cause> • The ink consumption calculated from the numbers of dots, maintenance jets, and cleanings exceeds the maximum ink consumption value in EEPROM, Bk indicator on the LCD flashes.

<Suspected part> Ink cartridge (Out of ink)

<Measure> Replace the ink cartridge and reset the ink low warning.

How to reset the ink low warning

• Press the *MENU* button to reset Bk ink counter.

If the button is pressed an odd number of times, the buzzer sounds once briefly. If it is pressed an even number of times, the buzzer sounds once for a longer time.
If the buzzer sounds briefly, the counters are reset. If the buzzer sounds for a longer time, the reset is canceled.

The ink low resetting/canceling is effective only when the BJ cartridge is installed.

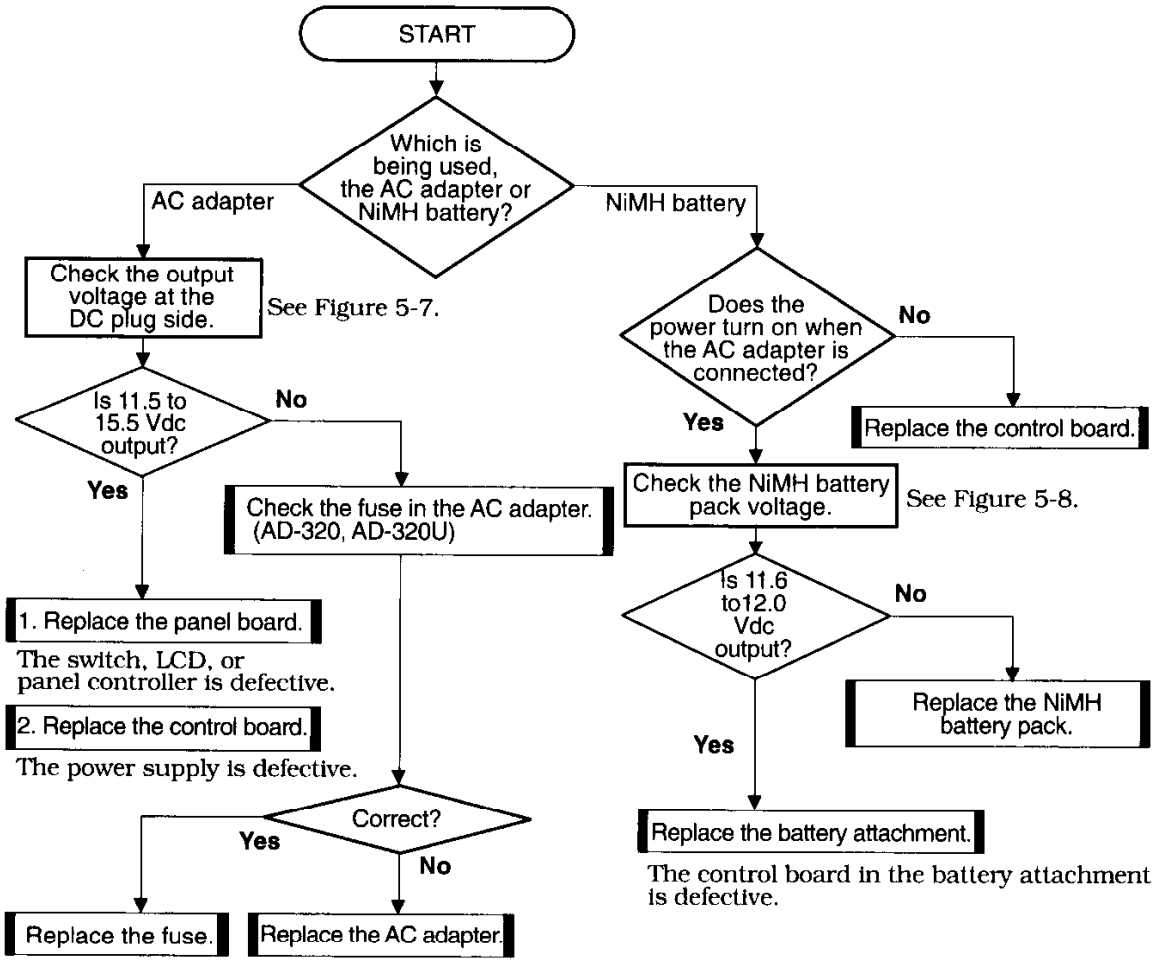
b) Symptoms

1. Power is not turned on.

<Symptom> • When the *POWER* button is pressed, the printer does not turn on.
• When DC power is supplied, the printer does not start initialization.

<Cause> The AC adapter, NiMH battery, control board, or panel board is defective.

<Measures>



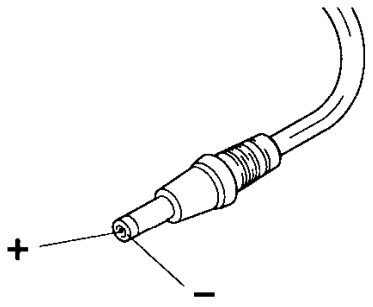


Figure 5-7 DC Plug

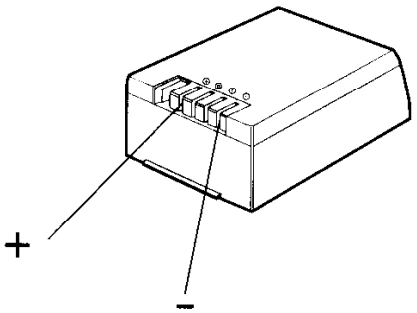


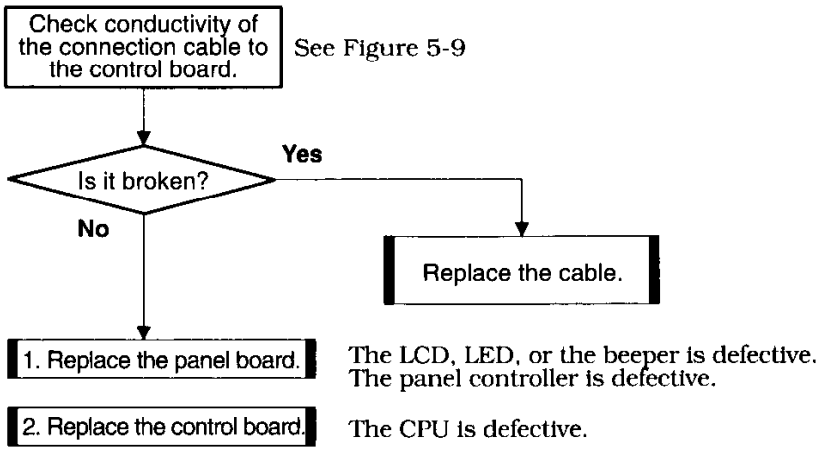
Figure 5-8 NiMH Battery Pack

2. Control panel failure

<Symptom>
- The LCD does not turn on. LED does not light.
- The buzzer does not sound. Test printing cannot be done.
- Operation buttons are ineffective.

<Cause> The LCD, LED, or the beeper is defective.
Buttons are defective.
The panel board (panel controller) is defective.
The control board is defective.

<Measures>



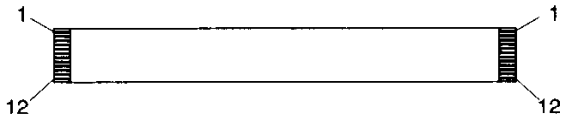


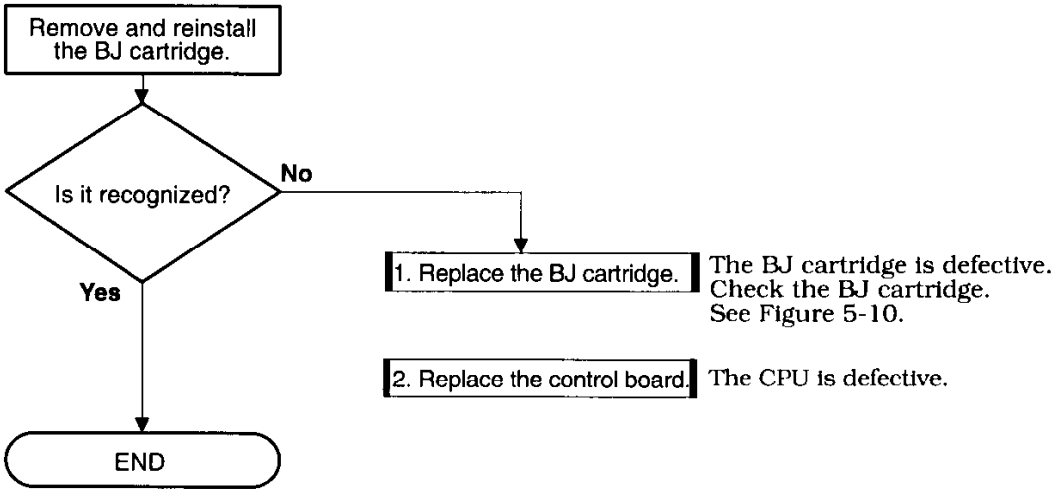
Figure 5-9 Cable

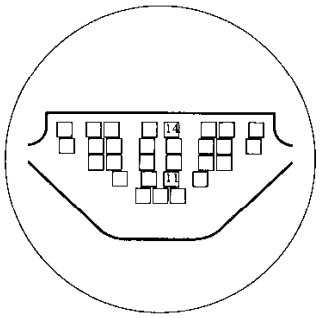
3. BJ cartridge is not recognized.

<Symptom>
- LCD display error
- The installed BJ cartridge is not recognized.
- When the BJ cartridge is installed, the carriage returns to the replacement position.
- The installed BJ cartridge is not recognized correctly.

<Cause> The BJ cartridge does not contact the carriage properly.
The BJ cartridge is defective.
The carriage is defective.
The control board is defective.

<Measures>





Meter connection			Reading	
Pin No.	11	14	Approx. 0 Ω	BC-10
	11	14	∞	BC-11

Figure 5-10 Head Connector

4. Paper feed error

<Symptom> • Paper cannot be fed. More than one sheet is fed at a time.
• Paper is not loaded horizontaly. Paper is not output.
• Paper jams frequently.

<Cause> The separation sheet is deformed.
The pickup roller does not work correctly.
Paper lifting is not done correctly.
The paper delivery roller does not work correctly.
Paper jam

<Measures>

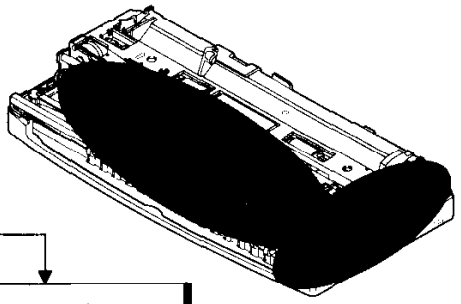
Check the conditions for using the printer and printing paper specifications.

Do they meet the specifications?

No → Use printing paper that meets the specifications.

Yes

Inspect the inside of the printer visually.
• Paper jam
• Deformed chassis, etc.
• Missing gear teeth



Print unit

Correct?

No → Replace defective parts or eliminate paper jams.

Yes

Does the printer feed paper correctly?

No → 1. Replace the paper lifting assembly.
2. Replace the print unit. — The pickup roller is defective.

Yes

Dose any paper feed error occur?

No → END

Yes

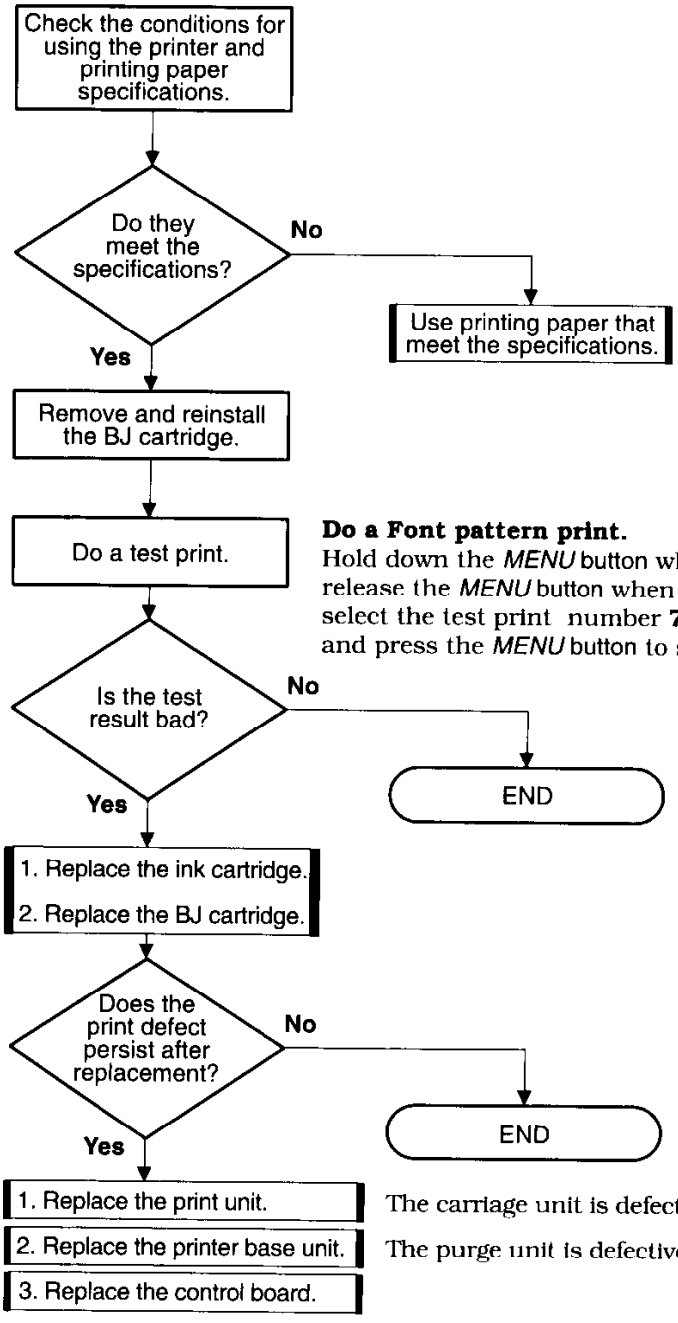
1. Replace the printer base unit. — The separation sheet is defective.
2. Replace the print unit. — Spurs are defective.

5. Print defect<1> The printer does not print.

<Symptom>
- The printer does not print at all.
- The printer does not print in the middle.
- The printer does not print one or more colors.

<Cause> No ink/defective BJ cartridge/ defective control board/defective carriage ribbon cable/defective purge unit

<Measures>



Do a Font pattern print.
Hold down the *MENU* button while the printer is off line, release the *MENU* button when the beeper sounds twice, select the test print number **7** with the *CRATRIDGE* button, and press the *MENU* button to start the off line test.

The carriage unit is defective.

The purge unit is defective.

6. Print defect<2> White streaks appear.

<Symptom> • The print is blurred.
• White streaks appear.

<Cause> The BJ cartridge, carriage ribbon cable, purge unit, or paper feed unit is defective (missing gear teeth).

<Measures>

Check the conditions for using the printer and printing paper specifications.

Do they meet the specifications? — No → Use printing paper that meet the specifications.

Yes

Remove and reinstall the BJ cartridge.

Do a test print.

Do a Font pattern print.
Hold down the *MENU* button while the printer is off line, release the *MENU* button when the beeper sounds twice, select the test print number **7** with the *CRATRIDGE* button, and press the *MENU* button to start the off line test.

Is the test result bad? — No → END

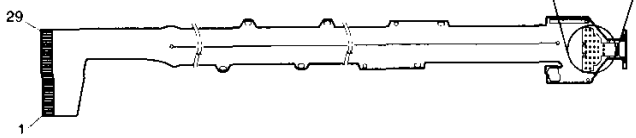
Yes

1. Replace the ink cartridge.
2. Replace the BJ cartridge.

Does the white steaks persist after replacement? — No → END

Yes

Check conductivity of the carriage ribbon cable.



Is it broken? — No →
1. Replace the printer base unit. — The purge unit is defective.
2. Replace the print unit. — The purge drive unit is defective.

Yes

Replace the print unit. — The carriage unit or carriage ribbon cable is defective.

White Line Sample

Troubleshooting consists of er
diagnosis, which is required if
error is unknown, and error re
performed if the cause of an er
cause of an error is unknown,
condition diagnosis, and if it is
error recovery.

7. Print defect<3> Vertical lines shift or black steaks appear.

<Symptom> • Vertical lines shift.
• Black steaks appear.

<Cause> The BJ cartridge or carriage drive unit is defective.
The guide rail or carriage shaft is bent or deformed.

<Measures>

Check the conditions for using the printer and printing paper specifications.

Do they meet the specifications? — No → Use printing paper that meet the specifications.

Yes

Remove and reinstall the BJ cartridge.

Do a test print.

Do a Font pattern print.
Hold down the *MENU* button while the printer is off line, release the *MENU* button when the beeper sounds twice, select the test print number **7** with the *CRATRIDGE* button, and press the *MENU* button to start the off line test.

Is the test result bad? — No → END

Yes

1. Replace the ink cartridge.
2. Replace the BJ cartridge.

Does the print defect persist after replacement? — No → END

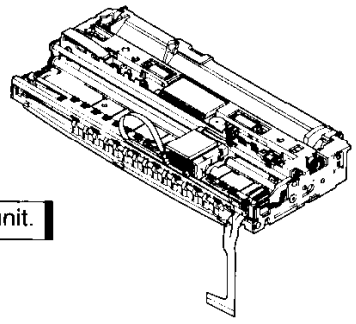
Yes

Check the print unit visually.

Is it deformed or bent? — No → Replace the print unit.

Yes

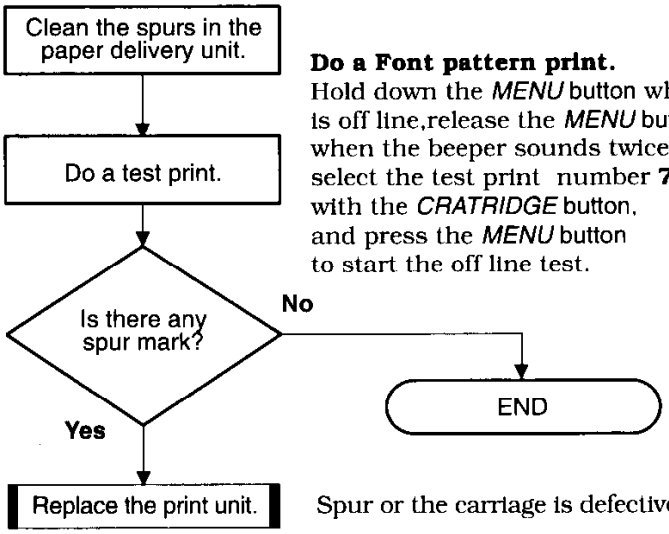
1. Replace the printer base unit.
2. Replace the paper lifting assembly.
3. Replace the print unit.



8. Print defect<4> Spur marks are appeared.

<Symptom> Spur marks are appeared.
<Cause> Spurs are dirty. (Paper delivery unit)

<Measures>



Do a Font pattern print.
Hold down the *MENU* button while the printer is off line,release the *MENU* button when the beeper sounds twice, select the test print number **7** with the *CRATRIDGE* button, and press the *MENU* button to start the off line test.

Spur or the carriage is defective.

9. Print defect<5> Printing paper stain

<Symptom> • The back side of printing paper is soiled.
• The printed side of paper is dirty.

<Cause> The pickup roller is dirty.
The platen is dirty.
The feed roller unit is dirty.
The purge unit is dirty.

<Measures>

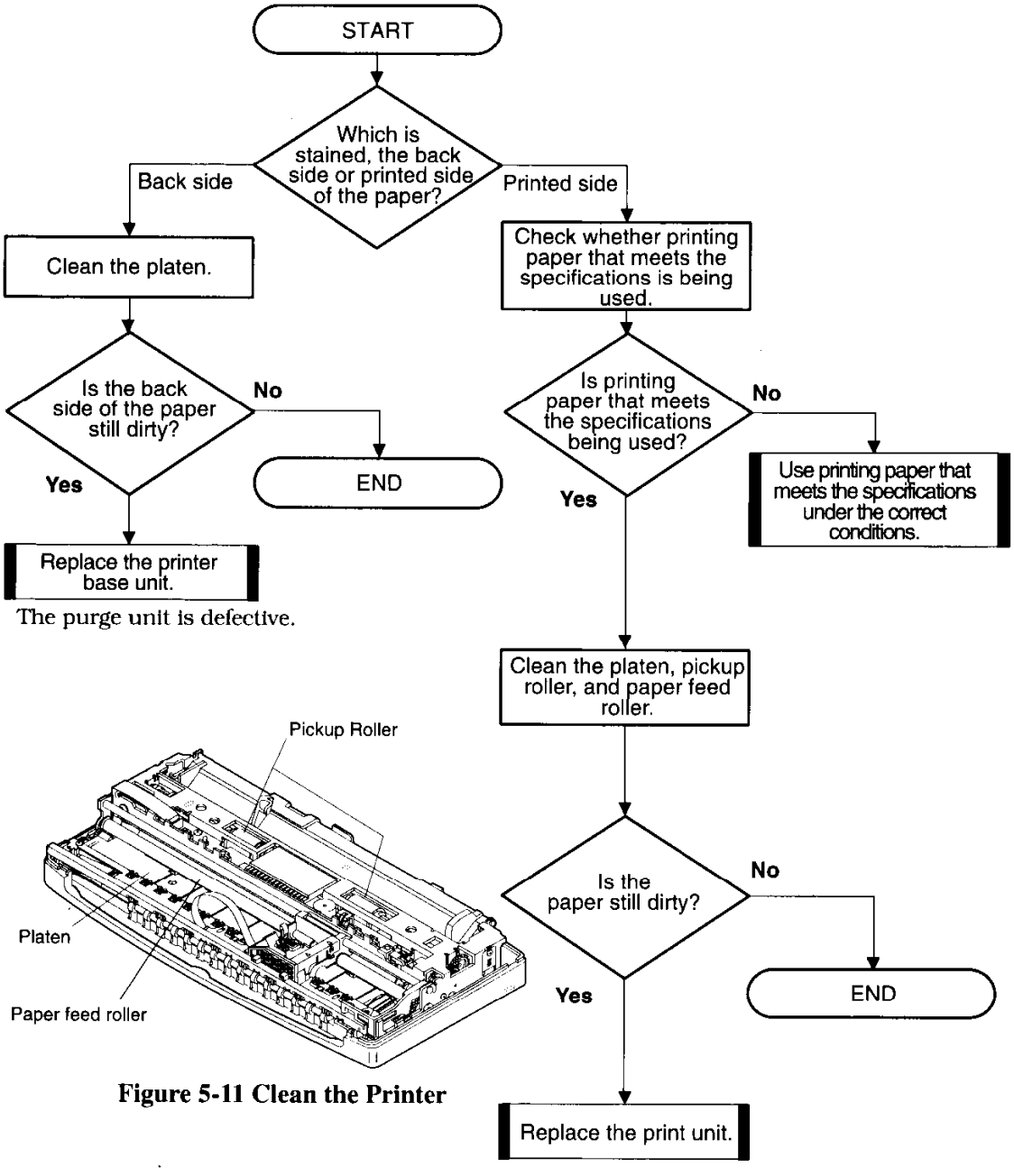


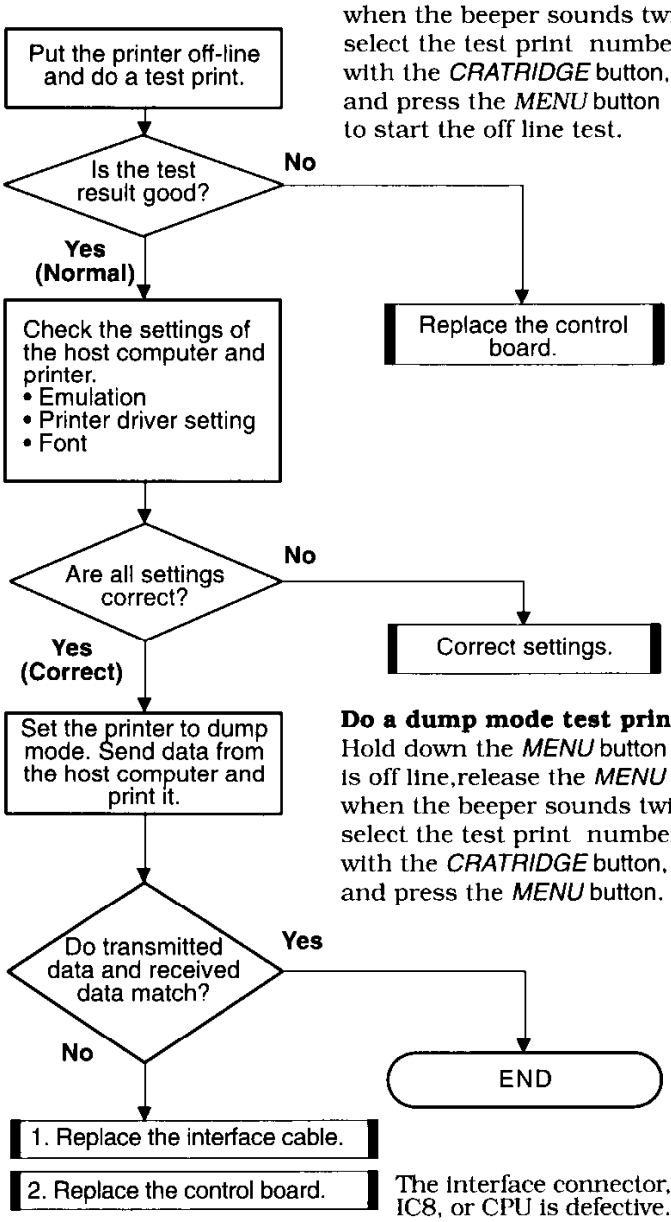
Figure 5-11 Clean the Printer

10. Print defect<6> Characters are incorrect.

<Symptom> • An unspecified font is used to print characters.
• Text is printed in an unspecified color.

<Cause> The printer driver is set incorrectly.
The interface cable is defective.
The control board is defective. (Printer)

<Measures>



Do a Font pattern print.
Hold down the *MENU* button while the printer is off line,release the *MENU* button when the beeper sounds twice, select the test print number **7** with the *CRATRIDGE* button, and press the *MENU* button to start the off line test.

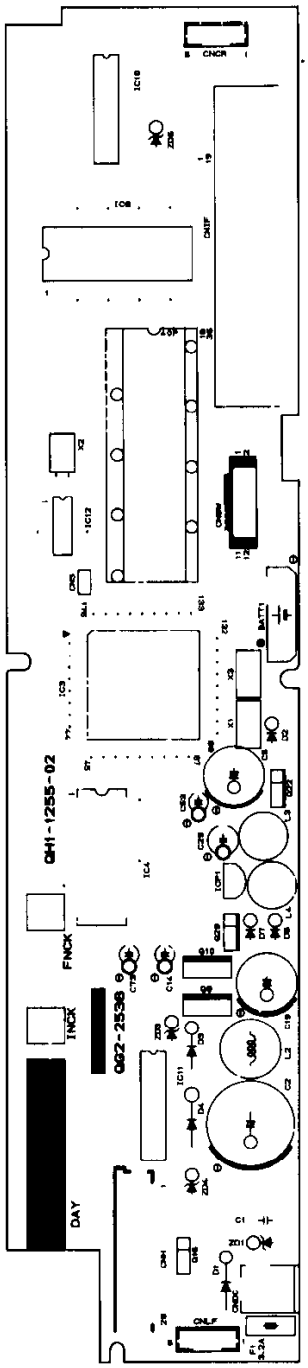
Do a dump mode test print.
Hold down the *MENU* button while the printer is off line,release the *MENU* button when the beeper sounds twice, select the test print number **5** with the *CRATRIDGE* button, and press the *MENU* button.

The interface connector, IC7, IC8, or CPU is defective.

6.CIRCUIT DIAGRAMS

6.1 Parts Layout

6.1.1 Control PCB assembly



6.1.2 Panel board unit